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ARGONNE CODE CENTER:
COMPILATION OF PROGRAM ABSTRACTS

by

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1223-1226	1223-1226	ACC Abstract 651 revised
1245-1248	1245-1248	ACC Abstract 661 revised
1251-1254	1251-1254	ACC Abstract R664 revised
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9	FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	360	F4	RS L	T	C 24
14	HAFEVER, HAUSER-FESHBACH INELASTIC SCATTERING	CDC	1604	F63	RS P		A 26
18	2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090	FLOCO	RSBP		C 28
28	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	F4	RS	T	C 30
28	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	1604	F63	RS P	T	C 30
28	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	7090	F2	RS P	T	C 30
29	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	OSUC	370	F4	RS PL	CT	C 32
29	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PL	T	C 32
29	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS PL	T	C 32
30	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC	360	F4	RS P		C 34
30	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	1604	F63	RS		C 34
30	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	7090	F2	PS		C 34
32	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	1604	F63	RS P	T	C 36
32	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	F2	RS P	T	C 36
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PLX	T	B 38
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS LX	T	B 38
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	F2	RS PLX	T	B 38
39	EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	7090	F2	RS P	T	C 40
40	ZOGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	1604	F63	RS P	T	C 42
40	ZOGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	F2	RS P	T	C 42
41	ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB	T	A 44
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R 43	CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	6600	F+ASC	RS P	T	P 47.1
45	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	F63	RS P		J 48
45	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	F2	RS P		J 48
46	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	1604	F63	RS P		J 50
46	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	F2	RS P		J 50
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	F4	RS P		G 52
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	F63	RS P		G 52
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS P		G 52
48	FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090	F2	RS		I 54
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	360	F4	RS PL	T	B 56
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	1604	F63	RS PL	T	B 56
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS PL	T	B 56
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	OSUC	370	F4	RS PLXCT		B 58
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51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	F2	RS PL	T	B 58
52	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	F63	RS P		B 60
52	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	F2	RS P		B 60
53	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P		B 62
53	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS		B 62
55	AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	AI	7090	F2	RS P		D 64
56	SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA	7090	F2	RS	T	A 66
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	360	F4	RSBP X	T	D 68
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	F63	RS L	T	D 68
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	7090	F2	RS L	T	D 68
59	MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCO	7090	F2	RS P		C 70
62	LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094	F4	RS	T	P 72
75	GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW	7090	FLOCO	RSBP	T	C 74
R 80	SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	F4	RS P	T	I 76.1
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89	ARES2, RESONANCE INTEGRAL X-SECTION CALC	CDC	1604	F63	RS PL	T	A 79
89	ARES2, RESONANCE INTEGRAL X-SECTION CALC	AI	7090	F2	RS PL	T	A 79
91	FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	7090	F2	RS		J 81
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102	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	F63	PSBP		F 85
103	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC	360	F+RAL	PS P	T	C 87
103	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7090	F+FAP	RSBPL	T	C 87
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120	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PLX	T	C 107
120	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L	T	C 107
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121	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	1604	F63	RS P		E 110
121	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090	F2	RS		E 110
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129	CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LLL	7090	F2	RS P		F 116
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143	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	F2	RSBPL	T	J 132
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148	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS P	T	C 144
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207	CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	7044	F+SPS	PSBP T	N	266
208	TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	7094	F+MAP	RS PLX T	A	268
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	360	F+BAL	RS P T	C	270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC	625	F+MAP	RS P T	C	270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	6600	F4	RS P T	C	270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	F4	RS P T	C	270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LER	7094	F4	RS P T	C	270
210	DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW	1604	LAG1	RS P	N	273
211	MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW	1604	LAG1	RS P	C	275
212	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	360	F4	RS P T	C	277
212	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	6600	F4	RS P T	C	277
213	RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	F36	PSBP X T	B	279
214	MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	F36	RSBP	A	281
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217	LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	7044	F4	RS P X	A	287
218	GAVER, ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	F4	RS P	L	289
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222	GAMBLES, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	F+BAL	RS P T	C	297
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224	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	PS P	D	301
225	TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	GGA	7044	F4	PS P T	C	303
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237	BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090	F2	RS P	B				327
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262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	MTS	360	F4	RSBPLXCT	C				377
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	F36	PS P X T	C				377
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	6500	F4	PS PLX	T C				377
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277	HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM	DP	360	F+RAL	RS P XCT	B				409
278	WHAM6, LIQUID-FILLED PIPING SYSTEM ANALYSIS	ANC	3608	F+RAL	RS P	T G				411
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281	RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	RSBP X	T B				417
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R343	M0756,LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P	T J	548
R344	GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600	F+ASC	PS P	T I	550
345	GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108	F4	RS P X	T L	552
346	THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP	T H	554
347	CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UICS	360	F4	RS P	A	556
R348	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	F4	PS P	T H	558
349	TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS P	T H	560
350	ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	360	F4	RS P CT	M	562
350	ETOE, ENDF/B TO MC**2 DATA CONVERSION	APDA	3600	ASAF4	PS P	T M	562
R352	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	F4	PS P	F	567
353	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	F36	RSBP	I	569
354	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	360	F4	RS P	T D	571
354	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P	T D	571
355	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	360	F4	RS P CT	B	573
355	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600	F36	RS P	T B	573
356	ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES	GGA	1108	BIN	R L	T Z	575
357	SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	3600	F36	RS P	T I	578
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358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	6600D	F4	RS P	T C	580
358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600D	F4	RS P	T C	580
R359	PUNI, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	F4	RS P	T A	582
360	TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	6600	F4	RS P	T A	584
361	GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	LASL	6600	F4	RS P	T B	586
362	WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360	F4	RS P	B	588
363	BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB	360	F4	RS P	E	590
R364	SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS P	T P	592
365	BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	F36	SBP	I	594
366	CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	F36	RSBP	G	596
367	ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	1108	F5	RSBPL	T D	598
368	FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	360B	F4	RS P XCT	B	600
369	RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY	ANC	360E	F+8AL	RSBPLXCT	G	602
369	RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY	ANC	7600B	F+COM	RS PLXCT	G	602
369	RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY	ANC	7600C	F+COM	RS PLXCT	G	602
370	GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	F4	RS P	T F	604
R371	NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS P	T F	607
372	RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	NED	635	F4	RS P	D	609
R373	BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	F4	RS P	T L	611
374	IDX, 1-D DIFFUSION FAST X-SECTION GENERATION	ANL	360	F+8AL	RSBP XCT	B	613
374	IDX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	F4	RS P X T	B	613
375	SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI	360	F+8AL	RSB L CT	M	615
376	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	6600	F4	RS P	A	617
376	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	7094	F4	RS P	A	617
377	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	6600	F4	RS P	A	619
R378	TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS P	I	621
379	SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS	GGA	1108	F4	RS P	I	623
380	GATT, 3-D FEW-GP DIFFUSION CALC HEX-2 MESH	GGA	1108	F4	RS P	T C	625
381	LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	ORNL	7090	F2	PS	A	627
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R383	M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	PS P	T I	630
384	CHECKER,CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC	BNL	6600B	F4	RS	T M	632
385	COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	F4	RS P X	A	635
386	DATATRAN2, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM	RS P	T M	637
387	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTI-GP	ORNL	3601	F4	RS P	T K	639
388	ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR IDX	HEDL	360	F4	RSBP XCT	B	640.2
388	ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR IDX	HEDL	1108B	F4	RS P X T	B	640.2
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390	CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	360	F4	RS P	O	646
R391	SORSDB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	F4	RS	I	648
392	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	360B	F+8AL	RS P	T B	650
393	XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	360	F4	RS PLX	T B	652
R394	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P	T O	654
395	FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	1108	F5	RS P	H	656
R396	WASP2, WATER PROPERTIES FOR SAFETY ANALYSIS	BAPL	7600	F4	RS P	T H	658
R397	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS P	T I	660
R398	BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	6600	F4	RS P	T C	662
R399	SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	F4	RS P	T A	664
400	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	F4	RS P	T F	666
400	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	6600	F4	RS P	T F	666
401	GAMTRI, 2-D MULTI-GP DIFFUSION TRIANGULAR MESH	GGA	1108	F+8AL	RS P	T C	668
R402	SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	360	F4	RS P	T I	670
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406	DATATRAN2, RAD1 GEOMETRY MODULES 2-D INPUT GEN	KAPL	6600	F+C+D	PS P	T L	679
407	DATATRAN2, UTILITY PLOT MODULES, F(X) & F(X,Y)	KAPL	6600	F+C+D	RS P	T P	681
408	TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	F5	RS P	T H	683
409	LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	6600	F4	RS P	N	685
410	TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	1108	F4	RS P	T A	687
R411	M0661,M0657,M0626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	PS P	T P	689
R412	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	6600B	F4	RS P	T I	691
413	ALPHA-M, RESOLUTION OF GAMMA-RAY SPECTRA	ORNL	360	F4	RS P	O	693
414	TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	1108	F5	RS P	T H	695
415	CEXE,INCEXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P X T	F	697
416	PART1, OPTIMAL GROUP OR MESH COLLAPSING	RW	6500	F4	RS P	B	699
417	ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL	360	F4	PS P	T A	701
418	CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GEC	635	F4	RSBP	D	703
419	CASCADE,CLUSTER, RADIATION DAMAGE IN METALS	GEC	7094	F+FAP	PSRP	T Q	705
420	GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	GEC	635	F4	RSBP	T B	707
421	MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	F4	RSBP	O	709
422	SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	7090	FAP	PSBP X T	Q	711
423	DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC	635	F4	RSBP	D	713
R424	GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	6600	F4	PS P	T H	715
R425	REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P	T O	717
R426	PAX03, HARMONY-PDQ X-SECTION GENERATION CODE	BAPL	6600	F+COM	RS P X T	B	719
427	FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	BW	6600	F+COM	RS P X T	D	721
R428	DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL	6600	F+ASC	PS P	T P	725
R429	ASPI5, GAMMA-RAY SOURCE BUILDUP FACTOR CALC	BAPL	6600	F+ASC	RS P	T J	727
430	GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	F+BAL	PS P	T C	729
431	SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	ORNL	360	F4	RS P	T B	731
432	COBRA41, ROD BUNDLE & CORE THERMAL-HYDRAULICS	BNW	7600	F4	RS P XCT	H	733
433	CONTEMPT-LT/026, PRESSURE-TEMPERATURE RESPONSE	ANC	360	F+BAL	RSBPLXCT	G	735
434	HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	6600	F4	PS P	N	738
435	BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	360	F4	RS P X	G	740
436	ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6600	F4	RS P	T B	742
437	ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FCRAT	WAPD	6600	F4	PS PL	T B	744
438	BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA	1108	F+BAL	RS P	T D	747
439	BUGTRI, 2D MULTIGP DIFFUSION & BURNUP TRI-MESH	GGA	1108	F+EAL	RS P	T D	749
440	DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	F4	RS P	T H	751
441	PWCOST, REACTOR FUEL CYCLE COST CALCULATION	GGA	1108	F4	PS P	T D	753
R442	SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL	6600	F+ASC	PS	P	755
443	HAA3B, AEROSOL BEHAVIOR LOGNORMAL MODEL	AI	370	F	PS P	T G	757
R444	ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	6600	F4	RS P	P	759
R445	LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	6600	F+ASC	PS P	T P	761
R446	MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	F4	PS P	P	763
447	ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD	6600	BC7	R L	T Z	764
R448	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	MA-G	360	F4	RSBP	CT G	766
R448	FLASH6, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	7600	F4	RS P	T G	766
R449	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	AN-T	360B	F4	RSBP	CT I	768
R449	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	6600	F4	PS P	T I	768
450	KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	DP	360B	F+BAL	RSBP	CT C	770
450	KENO4, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	360C	F+BAL	RSBPLXCT	C	770
450	KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFD	6600B	F+COM	RS PLX	T C	770
451	SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	GGA	1108	F5	RS P	T I	772
452	SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	GGA	1108	F5	RS P	T I	774
453	RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	360	F4	RS P	T B	776
454	PHENIX, 2-D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P	T D	778
455	DACL, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	F4	PS P	N	781
456	DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNW	1108	F5	RS P	T D	783
457	GSSLRN1B, LEAST SQUARES PHOTOPEAK SPECTRA CODE	BNW	1108	F+BAL	RS P	T O	785
458	VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	635	F4	RS P	T H	787
459	DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NED	635	F4	RS P	T C	789
R460	LIFE3, MIXED-OXIDE FUEL ELEMENT PERFORMANCE	ANL	370	F4	RS P	CT I	791
R460	LIFE3, MIXED-OXIDE FUEL ELEMENT PERFORMANCE	ANL	7600	F4	RS P	T I	791
R461	EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	6600	F4	RS P	T B	793
R462	SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	BAPL	6600B	F+ASC	RS P	T J	795
463	3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS P	T D	799
R464	DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	F4	RS P	O	801
R464	DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	F4	RS P	O	801
465	RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES	BNL	6600B	F4	RS P	T A	803
466	APRFX1, 99-GP DLC-2B LIBRARY GROUP-COLLAPSING	APG	6600	F4	PS	B	806
467	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	360	F4	RS PLX	T B	808
467	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	1108	F4	RS PLX	T B	808
R468	BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	6600	F4	RS P	T I	810
469	PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCND	360B	F+BAL	RS P	O	812

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R470	GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	6600	F4	RS P	A	814		
471	GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT	GGA	1108	F5	RS P	T	N	816	
472	MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	360	F4	RS		M	818	
472	MERMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	3600	36F	RSBP	T	M	818	
R473	CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	F4	RS P	T	H	820	
474	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	360	F4	PS PL CT	F		822	
474	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	3600	36F	RS PL CT	F		822	
475	CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	F4	RS P	T	M	825	
475	CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC	BNL	6600B	F4	RS	T	M	825	
476	CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GGA	1108	F5	RS P	T	O	829	
R477	3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	F4	RS P	T	D	831	
478	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	6600A	F+ASC	RS	T	P	833	
478	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW	6600B	F+ASC	RS	T	P	833	
478	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2	CDC	6600C	F+COM	PS	T	P	833	
478	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3	CDC	6600D	F+COM	RS	T	P	833	
478	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0	CEND	7600B	F4	RS	T	P	833	
479	FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NED	635	F4	RS P	T	G	836	
480	FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NED	635	F4	RS P	T	D	839	
R481	BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	F4	RS P	T	I	841	
482	COMNUC,CASCADE, COMPOUND NUCLEUS REACTION	AI	360	F+BAL	RS P	T	A	843	
483	REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW	1108	F5	RS P	CT	H	845	
484	FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS	T	P	847	
R485	GASPAN, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS	T	O	849	
486	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	F4	RS P	T	E	851	
486	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	6600	F4	RS P	T	E	851	
487	STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BG&E	360C	F4	RS	T	H	853	
488	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	1108	F5	RS P	X	T	F	855
488	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	7090	F4	RS P	T	F	855	
489	TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS P		E	857	
490	JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S	T	M	859	
491	MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360	F4	RS P	X	T	E	861
492	RAMPL, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL	6600	F4	RS P		A	864	
493	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	635	F4	RS P	T	M	866	
493	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	F5	RS P	T	M	866	
494	ADEP, 1-D & 2-D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	F4	RS P	T	F	868	
495	SYN, 2D SYNTHESIS MULTIGP DIFF & IGP DEPLETION	NED	635	F+GMP	RS P	T	D	870	
R496	KAPL PLOT, KAPL CALCOMP PLOTTING ROUTINES	KAPL	6600	F+COM	RS	T	P	873	
R497	RELO1, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	6600	F4	RS P		P	875	
498	CONCEPT4, POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL	360B	F4	RS P	X	T	D	877
498	CONCEPT3, POWER PLANT CONCEPTUAL COST ESTIMATE	GGA	1108	F4	RS P	XCT	D	877	
499	MIRAB,MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400B	F4	RS P	X	G	879	
500	FRCL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	F4	RS P		G	882	
501	ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	FBRD	635	F+GMP	RS P	XCT	B	884	
502	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	360B	F4	RS	PL	CT	M	887
502	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	6600	F4	RS P	T	M	887	
R503	DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	F+COM	RS P	T	I	889	
504	THRES2, STATISTICAL MODEL REACTION X-SECTION	ENEA	360	F4	RS P		A	892	
504	THRES2, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600B	F4	RS P		A	892	
505	TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	FBRD	635	F+GMP	RS P	XCT	B	894	
R506	JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	6600	F4	RS P	T	A	896	
R507	PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	6600	F4	RS P	T	A	898	
508	MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	F4	PS P	X	T	G	900
509	ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPD	7600	F4	RS P	T	B	902	
510	VIM1X, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	360	F4	RSBPLXCT		C	904	
510	VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600	F4	RS	PLX	T	C	904
511	VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	360	F4	RS P	XCT	F	907	
512	THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC	360	F4	RSBP	X	T	G	910
513	TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	3600	F36	RS P	XCT	C	912	
514	FORSIM, SOLN OF PARTIAL OR ORDINARY DIFF EQNS	CRNL	6600B	F4	RS P	CT	P	914	
515	GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	635	F+GMP	RS	T	P	916	
516	PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360	ANC	360	PL1	RS P	T	P	920	
517	HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	ORNL	360B	F4	RS P	T	H	922	
518	ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC	360	F4	RS	PL	CT	M	924
519	NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC	360	BAL	RSB		T	P	926
520	PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	360	F4	RS	PLXCT	B	928	
521	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	F4	RS P		G	930	
521	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	HEDL	1108	F4	RS P		G	930	
522	ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	360	F+BAL	RSBP	CT	M	932	
523	ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	360	F+BAL	RSBPL	CT	C	934	
524	BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600	F4	RS P		A	936	
525	ORTHIS,ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	360	F4	RS P	X	T	H	938
526	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	JAER	230	F4	RS P	T	B	940	
526	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	360	F4	RS P	T	B	940	

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528	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	360	F4	RSBP CT	G	944
528	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	1108	F4	RS P T	G	944
529	ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCO	635	F4	RS	G	946
530	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	360	F4	RS P	L	948
530	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	6600	F4	RS P	L	948
R531	CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	6600	F4	PS P	A	950
532	LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL	6600	BCD	R LX T	Z	952
533	ARC-NUI002, BCD INPUT DATA PROCESSING MODULE	ANL	360	F4	RSBP CT	L	954
534	EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	360B	F4	RSBP XCT	P	956
534	EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	PD10B	F4	RS P X T	P	956
534	EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	1110B	F4	RS P X T	P	956
534	EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	6600B	F4	PS P X T	P	956
534	EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	6700B	F4	RS P X T	P	956
534	EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	6700B	F4	RS P X T	P	956
R535	MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	6600	F4	PS P	A	959
536	RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP	360	F+BAL	S X T	B	961
R537	FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	F4	RS P T	I	963
538	ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	7600	F4	RS P T	B	965
539	STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	360	F4	RSBP CT	I	968
540	PACTOLUS,CLOTHO, NUCLEAR POWER PLANT COST CODE	HEDL	1108	F5	RS P X T	D	970
541	WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	ANL	360B	F+ASM	RSB CT	P	972
542	PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	360	F4	RS P CT	I	974
543	THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS	DP	360	BCD	R LX T	Z	976
544	PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	360	F4	RS P T	N	978
R545	BETTY, ENTRAINED PARTICLES SAMPLING STUDY	BAPL	6600	F4	RS P T	O	980
546	EMERALD REV. 1, PWR ACCIDENT ACTIVITY RELEASE	PGE	360	F4	RS P T	G	982
547	GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	6600	F4	RS L T	B	984
548	CEBUG, STEAM GENERATOR SODIUM-WATER REACTION	CEND	7600	F4	RS P T	G	987
549	BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC.	ORNL	1604	F2	RS P	Q	989
550	REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	F4	RS P CT	F	991
551	MOXY/MOD032, BWR CORE HEAT TRANSFER CODE	ANC	360B	F4	RSBP XCT	H	993
552	PWR-PPM, BORATION-DILUTION TABLES FOR PWR DPN	OPPD	6400	F4	S P	H	995
553	U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI	360	F+BAL	RS P CT	A	997
554	DISPER, AEROSOL PARTICLE TRANSPORT STUDY	RFD	3600	F36	RS P	G	999
555	PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	360	F+BAL	RSBP CT	G	1001
556	KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	ORNL	360	F4	RS P	P	1004
R557	SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	6600	F4	RS P T	M	1006
558	TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	ORNL	360	F4	RS P XCT	E	1008
559	SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	RS P T	G	1010
R560	HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	6600	F+COM	RS P	H	1012
561	TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	360	F4	RS P	X	1014
562	AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E	ANL	360	F+P+A	RS T	P	1016
563	AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F	ANL	360	F+BAL	RS T	P	1022
564	AMDLIRGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL	360	F+P+A	RS T	P	1028
565	INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC	360	F4	RS PL CT	B	1031
566	RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC	AI	360	F4	RS P T	Q	1033
567	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P CT	D	1035
567	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEDL	1108	F4	RS P T	D	1035
567	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	FBRD	635	F4	RS P CT	I	1038
R568	BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	ANC	360	F4	RSBP CT	J	1040
569	VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	EAPL	6600	F4	RS P	I	1042
R570	STRIPE, FUEL ROD CLAD STRAIN & PELLETT CRACKING	ANL	360	F4	RS	T	1044
571	RIGEL, ENDF/B V3 DATA PROCESSING CODE	BNL	6600	F4	RS	T	1044
571	CHECK3,RIGEL3, ENDF/B V3 PROCESSING CODES	ORNL	360	F4	RSBP XCT	B	1046
572	XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	LASL	7600	F4	RS P T	C	1049
573	TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH	ANC	360	F4	RS P CT	W	1051
574	MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	ANL	360	F4	RS P CT	W	1056
575	MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	UICS	360	F4	RS P CT	D	1059
576	GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	ANL	360	F4	RS P CT	V	1061
577	FFEARs, LAPLACE EQUATION ISOTROPIC DIELECTRICS	ANL	360	F4	RS P T	V	1061
577	FFEARs, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	6600B	F4	RS P	P	1063
R578	PLOTR, 2-D CONTOUR PLOTS & AREA CALCULATION	SLA	6600	F4	RSBP CT	D	1065
579	DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	F4	RS P T	H	1067
580	ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	360	F4	RS P T	H	1067
580	ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	BCAC	6600	F4	RS P T	H	1067
581	SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA	6600	F4	RS P T	I	1069
582	MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360	F4	RSBP CT	C	1072
583	STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	ORNL	360	F4	RS P C	G	1074
584	FPPM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	F4	RSBP CT	G	1076
585	TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	FBRD	H600	F4	RS P CT	C	1078
586	PLENUM, FLOW DLST. IN CYL COOLANT INLET PLENUM	DP	360	F4	RS P	H	1080
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592	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600C	F4	RS P X	P	1092
594	ARC-XSECI, MICROSCOPIC X-SECTION MANIPULATION	ANL	360	F4	RSBPL CT	L	1096
595	MAPPER, PREDICTING MANUFACTURING REQUIREMENTS	GEPI	GETS	BASIC	R	M	1098
596	ENDF82,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS	GGA	1108	F5	RS P	T B	1100
R597	MATUS, 3-D FINITE-ELEMENT ELASTIC ANALYSIS	BAPL	6600	F+COM	RS P X T	I	1104
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599	TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HEDL	1108	F5	RS P	T P	1109
600	EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	DP	360	F4	RS P	G	1111
601	ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS P	P	1113
602	LENDSDE, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	6600	F+COM	RS P	T P	1115
G603	RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMO	360	F+C+F	RSBP	T M	1117
R604	TCBO1, CREEP-BUEKING OF TUBES UNDER PRESSURE	BAPL	6600	F4	RS P	I	1119
605	GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)	ANC	360	F4	RSBP XCT	U	1121
606	GAPER1D, 1-D TRANSPORT PERTURBATION THEORY	GGA	1108	F4	RS P XCT	C	1123
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608	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	F4	RSBP CT	C	1127
608	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	F4	RS P	T C	1127
608	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	F4	RS P	T C	1127
609	INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	6600	F+COM	RS P	T Q	1129
610	FUNPACK2, SPECIAL FUNCTION ROUTINES	ANL	370B	F4	S P X T	P	1131
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611	CHILES, LINEAR ELASTIC SINGULARITY MODELING	SLA	6600	FTN	RS P	T I	1134
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612	QMESH,RENUM, SELF-ORGANIZING MESH GENERATION	SLA	6600	F4	RS P	T L	1136
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618	GAPCON-THERMAL2, FUEL PIN GAP CONDUCTANCE CALC	BNW	6600	F4	RS P	T I	1151
R619	ISOTAB, PU POWER OUTPUT FROM MIXED ISOTOPES	MLMO	360	F4	RSBP CT	Q	1153
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620	GROUP2, GROUP THEORY OF LATTICE DYNAMICS	LASL	6600	F4	RS P	T Q	1155
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625	VARI-1D, 1-D VARIATIONAL SENSITIVITY	ANL	360	F4	RSBPL CT	C	1167
626	ARC-DIF1D, 1-D MULTI-GP DIFFUSION & INVENTORY	ANL	360	F4	RSBP CT	C	1169
627	TOODY2, 2-D LAGRANGIAN EQNS OF MOTION SOLUTION	SLA	3600	F36	RS P	T S	1171
628	ETOT3, ENDF/B V3 DATA TO THERMAL LIBRARY FORM	WAPD	7600	F4	RS P	T B	1173
629	ORRIBLE, ROD BUNDLE FLOW & TEMPERATURE DIST.	ORNL	360	F4	RS P	T H	1176
630	LATIN SQ, NXN LATIN SQUARE EXPERIMENTAL DESIGN	MLMO	360	F4	RSBP	C P	1178
631	RAFFLE2/MOD2, MONTE CARLO NEUTRON TRANSPORT	ANC	360	F+BAL	RSBPL CT	B	1180
632	MMM3, COORDINATE ANALYSES SEMI-RIGID MOLECULES	ANC	360	F4	RS P	W	1182
633	LASL18, LOS ALAMOS SUBROUTINE LIBRARY ROUTINES	LASL	6600C	F+COM	RS	T P	1184
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635	SLACMON/370, VERSION 4.0 VS SOFTWARE MONITOR	SLAC	370	BAL	RSB	CT P	1191
636	6KILR, CORE HEATUP CODE FOR BWR/6 ANALYSIS	EI	360	F+BAL	PS P CT	H	1193
637	GAMTAB, RADIOACTIVE-DECAY GAMMA-RAY CATALOG	DP	360B	EBDCDC	R	L T Z	1195
638	RIGEL4,CHECK4,... ENDF/B V4 PROCESSING CODES	BNL	6600B	F4	PS	T M	1197
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640	DE/STEP,INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	6600D	F4	RS P X T	P	1201
641	SAP4, STRUCTURAL ANALYSIS OF LINEAR SYSTEMS	ANL	360B	F4	RS P CT	I	1203
642	PROGLOOK, USER PROGRAM PERFORMANCE MONITOR	SLAC	360B	F+BAL	RSB	CT P	1205
643	NUBOW, STRUCTURAL ANALYSIS BOWED REACTOR CORES	ANL	360B	F4	RS P	I	1207
644	GETCOR,FRECOR, FORTRAN DYNAMIC STORAGE ALLOC	ORNL	360	BAL+F	RS P CT	P	1209
645	DYNAMIC ANALYSIS OF GASES BY MASS SPECTROMETRY	RFD	360	F4	PS P	U	1211
646	COPYCAT, IBM OS SYSTEM CATALOG UTILITY ROUTINE	ANL	360D	BAL	PS	X T P	1213
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648	LUGS, STRESS FOR INTEGRAL ATTACHMENTS TO PIPE	ORNL	360	F4	RS P	I	1218
649	COMQC, QUALITY CONTROL DATA ANALYSIS ROUTINES	BKC	360	F4	RS P	P	1220
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651	SOLA,SOLA-SURF, TRANSIENT FLUID FLOW ALGORITHM	LASL	7600B	F	PS P	H	1224
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654	MATHLIB, SANDIA MATHEMATICAL SUBROUTINES	SLA	6600C	F+COM	RS P X T	P		1230
655	XDTRAP, HYDROGEN PERMEATION WITH TRAPPING	DP	360	F4	RSBP	Q		1232
656	BESSEL FUNCTIONS, AIRY & LOG GAMMA SUBROUTINES	SLA	6600	F4	RS P T	P		1234
657	LINDA, EVALUATION OF STRAIN-GAGE DATA	ORNL	360	F+BAL	RS P T	I		1237
658	FRAP-T, TRANSIENT ANALYSIS OF OXIDE FUEL RODS	ANC	360	F+BAL	RSBP XCT	G		1239
659	COBRA3M, FUEL PIN THERMAL-HYDRAULIC ANALYSIS	ANL	360B	F4	RSBP CT	H		1242
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661	GEARB, SOLVE ODE SYSTEM WITH BANDED JACOBIAN	LLL	360C	F4	RS P X T	P		1246
661	GEARB, SOLVE ODE SYSTEM WITH BANDED JACOBIAN	LLL	6600C	F4	RS P X T	P		1246
662	SOLVEX, SOLVENT EXTRACTION PROCESS SIMULATION	DP	360	F4	RS P	U		1248
663	COMRADEX3, RADIOLOGICAL DOSE ACCIDENT STUDY	AI	370	F4	RS P CT	G		1250
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R665	BETTIS PROGRAMMING ENVIRONMENT LIBRARY	BAPL	7600	F+COM	RS	T P		1254
666	FTA, FAULT TREE ANALYSIS SYSTEM	ARHC	6600	F+COM	RS P CT	G		1256
667	BUCKLE, CREEP BUCKLING OF INITIALLY OVAL TUBE	BNW	6600C	F4	RS P	I		1258
G668	METRICATION, CONVERSION TO OR FROM SI UNITS	RDYN	370B	F4	RS P T	P		1261
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R670	RECAP-12, MONTE CARLO CRITICALITY CALCULATIONS	BAPL	7600	F+COM	RS P T	C		1265
R671	RECAP-0, RECAP-12 X-SECTION LIBRARY GENERATION	BAPL	6600	F+COM	RS P T	B		1267
672	HONDO, A DYNAMIC RESPONSE FINITE-ELEMENT CODE	SLA	6600B	F4	RS P T	I		1270
673	SIEX, LMFBR FUEL PIN THERMAL PERFORMANCE MODEL	HEDL	6600	F	RS P T	H		1272
674	SAFTAC, MONTE CARLO FAULT TREE SIMULATION CODE	UNI	1108	F+SLE	RS P	G		1274
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R676	DEMO4, CRBR REACTOR & PLANT TRANSIENT ANALYSIS	WARD	7600	F4	RS P T	K		1279
677	MARGE/SLUMP, MAXIMUM TEMPERATURE LMFBR FUEL PIN	ANL	360	F4	PS P	H		1282
678	MORTAN2, MACRO-BASED STRUCTURED FORTRAN	SLAC	360	F4	RSBP XCT	P		1284
679	RANDOM SAMPLING TABLE, FOR NON-BIAS ORDERING	MLMO	360	F+COB	RSBP XC	P		1286
680	MARLOWE, BINARY COLLISION CASCADE SIMULATION	ORNL	360B	F+BAL	RS P X T	Q		1288
681	ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT BOARDS	SLA	1108	F+BAL	RSBP T	T		1290
681	ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT BOARDS	SLA	6600	F+COM	RS P T	T		1290
682	GNATS,MESH2,GPRINT, 2-D NONLINEAR ANALYSIS	SLL	6600	F+COM	RS P T	I		1292
683	NUFUEL, NUCLEAR FUEL CYCLE REQUIREMENTS	ERDA	370B	F4	RS P CT	D		1294
684	GEOCOST, GEOTHERMAL ENERGY COST ANALYSIS	BNW	6600	F4	RS P T	O		1296
685	EMERALD-NORMAL, PWR ACTIVITY RELEASE AND DOSE	PGE	360	F4	RS P T	G		1298
686	VENTURE, 1, 2, OR 3-D MULTIGROUP DIFFUSION	ORNL	360	F+BAL	RS P CT	C		1300
687	SITE2, ENERGY FACILITY SITING ASSESSMENT	ANL	360	F4	RS P T	R		1303
688	OMCST, POWER PLANT NON-FUEL O & M COST STUDY	ORNL	360	F+BAL	RS P	D		1305
689	FLANGE-ORNL, ANALYSIS OF FLANGED JOINTS	ORNL	360	F4	RS P T	I		1307
690	SEPHIS, SOLVENT EXTRACTION PROCESS SIMULATION	ORNL	360	F4	RS P T	U		1309
691	LASIP3, CCCC STANDARD INTERFACE FILE PROCESSOR	LASL	360	F4	RS P CT	M		1311
692	SOLSYS, SOLAR ENERGY SYSTEM SIMULATION PROGRAM	SLA	6600	F4	RS PL T	R		1313
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693	SOLDATABQ62, ALBUQUERQUE 1962 SOLAR DATA	SLA	6600B	BCD	R L T Z			1316
694	FRAP-S1, STEADY STATE ANALYSIS OXIDE FUEL RODS	ANC	360	F+BAL	RS P X T	H		1318
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696	ENERGY, LMFBR COOLANT TEMPERATURE PREDICTION	MIT	370	F4	RS P T	H		1322
697	FO355, SHAPER CUTTER CONTOUR GENERATOR	ANL	360	F4	RS P	T		1324
697	FO355, SHAPER CUTTER CONTOUR GENERATOR	BKC	6600	F4	RS P	T		1324
698	DUMP, USER-ORIENTED MEMORY DUMP UTILITY	BKY	7600	F+COM	RS P T	P		1326
699	ORSIM, OPTIMIZING UTILITY GENERATION PLANNING	ORNL	360	F+BAL	RS P X T	D		1328
700	MELT3, FAST REACTOR TRANSIENT OVERPOWER STUDY	HEDL	6600	F4	RS P CT	F		1331
R701	BEAMCRP, FINITE-ELEMENT BEAM CREEP ANALYSIS	HEDL	6600	F4	RS P T	I		1334
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702	COMPARE, TRANSIENT FLOW IN VENTED FLUID SYSTEM	LASL	7600	F4	RS P T	H		1337
703	ORCENT, NUCLEAR STEAM TURBINE CYCLE ANALYSIS	ORNL	360	F4	RS P T	H		1339
704	COMCAN, SYSTEM SAFETY COMMON CAUSE ANALYSIS	ANC	360	F+BAL	RS P T	G		1341
705	EPISSOE, SOLVE ODE SYST WITH BANDED JACOBIAN	LLL	360	F4	RS P X T	P		1343
706	THI3D, THERMAL-HYDRAULIC MULTICHANNEL ANALYSIS	ANL	370	F4	RS P CT	H		1346
R707	CREEP-PLAST, 2-D INELASTIC STRUCTURAL ANALYSIS	ORNL	360	F4	RS P T	I		1348
R708	WIGL3, 1-D SPACE-TIME DIFFUSION W/FEEDBACK	BAPL	6600	F4	RS P T	F		1350
709	NIXLIN, LEAST SQUARES FIT TO NONLINEAR FORMS	DP	360	F4	RS P	P		1353
710	HAMOC, FLUID HAMMER ANALYSIS OF PIPING SYSTEM	HEDL	6600	F4	PS P T	G		1355
711	GEOCOST-BC, BINARY CYCLE GEOTHERMAL COST STUDY	BNW	6600	F4	RS P T	D		1357
712	WREM-TOODEEZ/MOD3, 2D TIME-DEP FUEL ELEM STUDY	NRC	370	F4	RSBP CT	G		1359
713	SYN3D, SINGLE-CHANNEL FLUX SYNTHESIS DIFFUSION	ANL	370	F+BAL	RS PLXCT	C		1361
R714	SPOOL-FIRE, SPRAY-POOL BURNING OF SODIUM	ANL	370	F+CSM	RS P	G		1363
715	IMPAC2, B SHIPPING CONTAINER IMPACT ANALYSIS	LASL	7600	F4	RS P	I		1365
716	SPRAY2, SODIUM SPRAY RELEASE SAFETY ANALYSIS	HEDL	7600	FTN	RS P	G		1367
717	NAHAMMER, FLUID HAMMER ANALYSIS PIPING SYSTEM	ANL	360	F4	RS P	G		1369
717	NAHAMMER, FLUID HAMMER ANALYSIS PIPING SYSTEM	ANL	7600	F4	RS P	G		1369
718	NATTRANSIENT, FLUID HAMMER ANALYSIS 1-D PIPING	ANL	360	F4	RS P	G		1371

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719	NATRAN2, FLUID HAMMER ANALYSIS 1D & 2D SYSTEMS	ANL	360	F4	RS	P	T	G		1373
720	RICE-LASL, CHEMICALLY REACTIVE MIXTURE FLOW	LASL	6600	F4	RS	P	T	U		1375
721	WFLLL2B, WIRE CONFIGURATION FREQUENCY DOMAIN	LLL	7600	F4	RS	P	T	T		1377
722	CRAC, CALC OF REACTOR ACCIDENT CONSEQUENCES	NRC	370	F4	RS	PLX	T	G		1379
723	SOLA-ICE, TRANSIENT COMPRESSIBLE FLUID FLOW	LASL	7600	F4	RS	P		H		1381

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9. STATUS - Abstract first distributed April 1967.
CDC3600 version submitted June 1966, sample problem executed by ACC.
10. REFERENCES - A. De Volpi, K. G. Porges and G. Jensen, Computer Code for Reduction of Coincidence Counting Data, International Journal of Applied Radiation and Isotopes, Vol. 17, pp. 277-285, 1966.
G. Jensen, COINC, For Reduction of Coincidence Counting Data, ANL Program Library Report 1198/RP-258, June 9, 1966.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN 63
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
A. De Volpi, K. G. Porges, and G. Jensen
Applied Physics Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
16. MATERIAL AVAILABLE -
Source deck (3600-540 cards)
Binary deck (3600-280 cards)
Sample problem (3600-195 cards)
Reference reports
17. CATEGORY - 0
KEYWORDS - coincidence methods, statistics, decay measurements,
data processing

1. NAME OR DESIGNATION OF PROGRAM - LASER
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/370
3. DESCRIPTION OF PROBLEM OR FUNCTION - LASER is based on modified versions of the slowing-down program MUFT and the thermalization transport theory program THERMOS, and performs a calculation of the neutron spectrum in a uniform lattice made up of cylindrical rods, cladding, and surrounding moderator. The thermal cutoff in LASER is 1.855 eV. The program performs a burnup calculation for the lattice. The spatial distribution of burnup within the fuel rods is explicitly calculated. The program will, at option, account for all non-linearities and mutual connections in the system of burnup equations. This calculation accounts for the variation of the neutron flux in space and energy during each time-step. A buckling, and a boron poison, criticality search are provided as options. Output includes edits in the energy range 0.LE.E.LE.0.625 eV.
4. METHOD OF SOLUTION - The methods used in solving the neutron transport equation are essentially those utilized by the MUFT and THERMOS programs. The nonlinear effects in the burnup equations are accounted for by computing the rate of change of the neutron flux with time and by using the Runge-Kutta numerical procedure to recover the flux as a function of time. The depletion equations are solved by assuming a polynomial expansion for exponential functions. The production and loss of chain members during irradiation are evaluated by simple matrix algebra. The procedure allows for a time-dependent flux in the form of a power series.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - This version of LASER is restricted to one-dimensional, cylindrical geometry. The maximum number of space points is 14, with a maximum of five space points in the fuel region. The code is restricted to four mixtures (moderator, non-absorbing heavy scatter, cladding, fuel). The moderator can be either light water (Nelkin or free gas scattering kernel), or heavy water (Nelkin scattering kernel). The cladding material can be stainless steel, aluminum or zircalloy-2. The fuel can be a metal oxide or cermet. The epithermal and fast energy ranges include 50 energy groups. The thermal range includes 35 energy groups. Only the U235 chain (through U236) and the U238 chain (through Pu242) are available in the code. The fission products are separated into Xe135, the directly-produced Sm149, and all other fission products lumped into one pseudo fission product. The cross sections for the lumped fission products are represented by polynomials in the burnup. The spatial distribution of U238 resonance captures within the fuel rods is given as input.
6. TYPICAL RUNNING TIME - The greater part of the LASER execution time is consumed by the THERMOS calculation. Execution times for

6. TYPICAL RUNNING TIME (CONTINUED)
no-burnup cases are approximately 1-2 minutes when the maximum number of space points is specified. For a burnup problem, execution time is 1-2 minutes when the linear approximation is chosen, and 4-6 minutes when non-linear effects are included.
7. UNUSUAL FEATURES OF THE PROGRAM - The program provides a complete edit for the lattice in the energy range 0.LE.E.LE.10 MeV, including integral quantities and homogenized few-group cross sections. The user has a choice of thermal neutron scattering kernels, resonance self-shielding treatments, and cell criticality searches. Linear and nonlinear treatments of the burnup equations are provided. The detailed spatial burnup distribution within the fuel rods is taken into account. A burnup problem can be continued after any time-step, by using the special input deck punched after each time-step.
8. RELATED AND AUXILIARY PROGRAMS - The original IBM7094 version of LASER was prepared by C. G. Poncelet of the Westinghouse PWR Plants Division, Pittsburgh, Pennsylvania. LIBP generates the thermal library tape. SIG1 converts, by interpolation, the cross section data corresponding to a given energy mesh to cross section data suitable for input to the LIBP program.
9. STATUS - Abstract first distributed April 1967.
IBM7094 version submitted August 1966, deleted February 1977.
IBM360 version submitted February 1973, replaced September 1973, replaced by Edition B February 1977,
sample problem executed by ACC February 1977 on
an IBM370/195.
10. REFERENCES - C. G. Poncelet, Burnup Physics of Heterogeneous Reactor Lattices, WCAP-6069, June 1965.
C. G. Poncelet, LASER - A Depletion Program for Lattice Calculations Based on MUFT and THERMOS, WCAP-6073, April 1966.
LASER, ACC No. 249.360, ACC Programming Note 74-7, October 1973.
11. MACHINE REQUIREMENTS - 150K with library tape and 2 scratch units
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
C. E. Carson
Nuclear Engineering Branch
Tennessee Valley Authority

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
303 Power Building
Chattanooga, Tennessee 37401
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (LASER 7778 cards, LIBP 385 cards, SIG1 165 cards)
2314 load module (LASER2.LOAD 383 blocks)
Sample problems (LASER 15 cards, LIBP 1496 cards)
Libraries (LASER 140 binary records)
Control information (JCL 20 cards)
Reference reports and ACC Note
17. CATEGORY - B
KEYWORDS - slowing down, thermalization, spectra, lattices, depletion, 1-dimensional, cylinders, criticality searches, LIBP codes, SIG1 codes, MUFT codes, THERMOS codes

1. NAME OR DESIGNATION OF PROGRAM - PDQ7
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - PDQ7 solves few-group neutron diffusion-depletion problems in one, two, and three dimensions. Adjoint solutions are also available and two overlapping thermal groups may be used in one and two-dimensional problems. Either pointwise or regionwise depletion may be performed using the HARMONY depletion system. The geometry may be rectangular, cylindrical, or spherical in one dimension; rectangular, cylindrical, or hexagonal in two dimensions; and rectangular or hexagonal in three dimensions. All geometries provide for variable mesh spacing in all dimensions. Zero flux, zero current, and rotational symmetry boundary conditions are available, and boundary value problems may be solved by specifying the flux values on one or more boundaries. The Bettis Revised PDQ7 edition may be used to solve additive fast-source and simplified PL problems as well as the three-dimensional synthesis eigenvalue problem. Control searches, thermal feedback, and xenon feedback are optional.
4. METHOD OF SOLUTION - Difference equations are obtained at each point by integrating the differential equations over an appropriate mesh element. The resulting equations are three-point, five-point, and seven-point in one, two, and three dimensions except for hexagonal geometry, where the number of points is increased by two. The group equations are solved using a single-line cyclic Chebyshev semi-iterative technique, and the source iterations are accelerated by a procedure based on Chebyshev polynomials.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The total number of groups is limited to 5. The product of groups and points cannot exceed 300,000 and the plane size in three-dimensional problems is restricted to 8000 points. For the Bettis Revised PDQ7 six equations may be solved when the fast group treatment is simplified P3. There are very few fixed constraints on spatial problem sizes. The Bettis Revised PDQ7 has successfully run explicit three-dimensional problems up to about 800,000 group points. Three-dimensional synthesis problems up to 15,000,000 group points have also been executed successfully.
6. TYPICAL RUNNING TIME - The running time in hours may be estimated by dividing the product of groups and points by 150,000. The actual time may vary widely from this estimate due either to special convergence difficulties or to the complexity of the depletion formulation. Sample problem running time on the 360/195 is about 4 minutes.
7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - HARMONY table sets may be input on cards or may be obtained from a file generated by a cross section program. On request, PDQ7 will prepare output files containing flux, concentration, power, integral, geometry, and synthesis integral data, and these files may be further processed in auxiliary programs. The Bettis Revised PDQ7 uses the new Bettis Environmental Library (ACC Abstract 665) and the M0899, HOH program (ACC Abstract 294). The B&W version uses the B&W version of the Bettis Environmental Routines (ACC Abstract 478).
9. STATUS - Abstract first distributed December 1967.
 - CDC6600 (BETTIS) version submitted May 1967, replaced by revised edition June 1971.
 - IBM360 (IBM) version submitted February 1969, deleted November 1971.
 - CDC6600 (B&W) version submitted February 1970.
 - IBM360 (ANC) version Edition B submitted April 1970, revised to Edition C April 1971, replaced by Edition D August 1972, Edition E March 1973, Edition F March 1974, Edition G February 1977, sample problem executed by ACC March 1974 on an IBM370/195.
 - CDC6600 KRONOS (Boeing) version submitted July 1973.
10. REFERENCES - W. R. Cadwell, PDQ-7 Reference Manual, WAPD-TM-678, January 1967.
 - R. J. Breen, O. J. Marlowe, and C. J. Pfeifer, HARMONY - System for Nuclear Reactor Depletion Computation, WAPD-TM-478, January 1965.
 - R. J. Wagner, ACC No. 275.360D-G, Operational notes for PDQ7/14, ANC Note.
 - C. J. Pfeifer, PDQ-7 Reference Manual II, WAPD-TM-947(L), February 1971.
 - C. J. Pfeifer, CDC-6600 FORTRAN Programming - Bettis Environmental Report, WAPD-TM-668, January 1967.
 - PDQ7 Transmittal Tape (ACC 275.360D-G), ANC Note.
 - A. W. Brown, J. A. McClure, and R. J. Wagner, Summary of PDQ-7 (IBM-360-370 Version) Input Data Requirements and Operating Procedures, ANCR-1061, March 1972.
 - UPD, A Program to Update Source Decks, ANC Note P01750.
 - NRTS Environmental Subroutine Manual, ANC Document, December 1972.
 - PDQ7, ACC No. R275.6600D, Argonne Code Center Programming Note 74-16, December 3, 1973.
11. MACHINE REQUIREMENTS - The central memory size for the Bettis version must be at least 64K and there must be four non-system disks, each on its own channel. The 360 version requires at least 400K bytes of core and Model 2314 or 3330 disk packs.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV and ASCENT (6600), FORTRAN IV(H) and BAL (360)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.0 (BETTIS Rev.), SCOPE 3.1.6 (B&W 6600), OS/360 (360), and
KRONOS 2.0 (BCS 6600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
The required software environment is described in reference 5.
It includes routines for program loading, input conversion and
processing, storage and retrieval of permanent files, scratch
input/output, and storage allocation. CALL REMARK in subroutine
CASENN refers to a 6600 system routine for display of messages on
the operator scope. CALL TICK refers to a 6600 system routine for
logging job time used. Substitute routines will be required for
use of this program on other machines.
15. NAME AND ESTABLISHMENT OF AUTHORS -
6600	W. R. Cadwell and C. J. Pfeifer
Bettis Atomic Power Laboratory
Westinghouse Electric Corporation
Box 79
West Mifflin, Pennsylvania 15122
360A	R. J. Creasy
International Business Machines Corporation
2670 Hanover Street
Palo Alto, California 94304
360B-G	R. J. Wagner and A. W. Brown
Computer Science Branch
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, Idaho 83401
360B-G	J. A. McClure
Energy Incorporated
P. O. Box 736
Idaho Falls, Idaho 83401
6600 B&W	M. L. Dech and R. W. McCraney
Control Data Corporation
G. R. Poetschat and G. L. Russell
Power Generation Division
The Babcock & Wilcox Company
P. O. Box 1260
Lynchburg, Virginia 24505
6600 KRONOS	F. M. Knox
Boeing Computer Services, Inc.
P. O. Box 24346
Seattle, Washington 98124
16. MATERIAL AVAILABLE - Restricted Distribution
Magnetic Tape Transmittal (Bettis 6600-3 tapes, B&W
6600-2 tapes, Aerojet 360-1 tape, BCS 6600-1 tape)

16. MATERIAL AVAILABLE (CONTINUED)

Source decks (Bettis 6600-51,497 cards, B&W 6600-27446 cards, Aerojet 360-38,268 cards)
Update files (Boeing UPDATE form OLDPL of PDQ7 6600-238 records, UPDATE OLDPL of Bettis Environmental Routines 6600-130 records, modify OPL of PDQ, MFN, CATLIST 6600-20 records)
Load module (2314 Aerojet PDS PDQTRNMT 360-1862 blocks)
Load module (3330 Aerojet PDS PDQTRNMT 360-1862 blocks)
Sample problems (Bettis 6600-80 cards, Aerojet 360-761 cards, B&W 6600-69 cards)
Auxiliary programs (Aerojet BUFR 246 cards, PDQDI 31 cards, PDQD 148 cards, PDQR 107 cards, PDQTL 53 cards, miscellaneous 3135 cards)
Flux files (Aerojet 360-137 blocks)
Sample problem output listings (Bettis 6600-36 pages, Aerojet 360-89 pages)
Reference reports, WAPD-TM-678, WAPD-TM-668, WAPD-TM-947(L), ANCR-1061, NRTS manual, and Notes as appropriate

17. CATEGORY - D

KEYWORDS - depletion, diffusion equations, 1-dimensional, slabs, cylinders, spheres, 2-dimensional, hexagonal, x-y, r-z, 3-dimensional, x-y-z, synthesis, few-group, searches, HARMONY codes, UPD codes, BUFR codes, PDQDI codes, PDQD codes, PDQR codes, PDQTL codes

1. NAME OR DESIGNATION OF PROGRAM - WHAM6
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370, CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - WHAM6 is used to calculate pressure, velocity, and force transients in liquid-filled piping networks. It can be applied to multiloop complex piping networks consisting of dead ends, elbows, orifices, multiple-branch tees, changes of flow passage cross section, check valves, pumps, pressurizers or tanks, and exit valves or breaks. Hydraulic losses are considered. Transients can be initiated either by closure or opening of one or more exit valves (equivalent to system ruptures) or by a prescribed gas pressure history in a pressurizer tank.
4. METHOD OF SOLUTION - The unsteady fluid motion is described by the set of mass, momentum, and energy conservation laws, the equation of state for the fluid, and the initial and boundary conditions for all dependent variables. The well-known water-hammer equations for liquid-filled pipes are then evaluated by use of the wave superposition method. The frictionless case may be considered if desired.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
 - 100 legs (see item 14)
 - 50 nodes per leg (see item 14)
 - 2 different valves or breaks (additional ones have the properties of the second one)
 - 4 pumps
 - 1 pressurizer
 - 1 case per execution

Turbine operation range is not considered because it is assumed that each pump is provided with a check valve. The results of WHAM6 are valid only for the portion of the system in which the fluid is subcooled and into which no waves from the moving two-phase boundary have penetrated.
6. TYPICAL RUNNING TIME - To compile and execute the sample problem: 3 minutes (IBM370/195), 40 CP seconds (CDC7600).
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - WATER-HAMMER, WHAM, WHAM2, BURST (ACC Abstract 435), and BAM (ACC Abstract 108). WATER-HAMMER, WHAM, and WHAM2 are earlier editions of WHAM6. S. Fabric developed the original WATER-HAMMER program at Kaiser Engineers. WHAM was prepared at Kaiser Engineers as a successor to WATER-HAMMER, and converted to the IBM360 at the University of Missouri-Columbia. The WHAM2 edition was written at Aerojet Nuclear Company.

9. STATUS - Abstract first distributed December 1967.
- WATER-HAMMER
 - CDC3600 version submitted May 1967, replaced by WHAM December 1967, deleted February 1976.
 - IBM360 version submitted July 1967, replaced by WHAM January 1974, deleted February 1976.
 - WHAM
 - CDC3800 version submitted December 1967, revised September 1969, sample problem executed by ACC on a CDC3600, deleted February 1976.
 - IBM360 version submitted January 1974, sample problem executed by ACC May 1974, deleted February 1976.
 - WHAM2
 - IBM360 version submitted August 1974, sample problem executed by ACC, deleted February 1976.
 - CDC6600 version converted from IBM360 version by ACC September 1974, sample problem executed by ACC, deleted February 1976.
 - WHAM6
 - IBM360 version submitted October 1975, replaced by revised Edition B July 1977, sample problem executed by ACC July 1977 on an IBM370/195.
 - CDC7600 version converted from IBM360 version by ACC November 1975, replaced by revised Edition B July 1977, sample problem executed by ACC July 1977 on a CDC7600.
10. REFERENCES - Stanislav Fabic, Computer Program WHAM for Calculation of Pressure, Velocity, and Force Transients in Liquid Filled Piping Networks, 67-49-R, November 1967.
V. T. Berta, WHAM/MOD-006 Summary, Aerojet Nuclear Company, December 11, 1975.
ACC Programming Note 76-24, March 3, 1976, revised July 11, 1977.
11. MACHINE REQUIREMENTS - 480K bytes of memory (IBM370/195), 101,000 (octal) words (CDC7600)
12. PROGRAMMING LANGUAGES USED - FORTRAN IV and BAL (IBM360), FORTRAN IV (CDC7600)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370 (IBM360,370), SCOPE 2.1.3 (CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The package as distributed provides for maxima of 100 legs and 50 nodes per leg. These limits are imposed by DIMENSION and DATA statements, and can be changed to accommodate other models whenever memory space is available. Applications using 244 legs, 26 nodes per leg, for the hydraulic model have been completed at EG&G.

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15. NAME AND ESTABLISHMENT OF AUTHORS -

360 WHAM6 V. T. Berta
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, Idaho 83401

7600 WHAM6 H. Edwards
Argonne Code Center
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal

Source decks (WHAM6 360-1379 cards, 7600-1396 cards,
DATE 360-66 cards)
Sample problem input (56 cards)
Sample problem output (23 pages)
Reference reports and Note

17. CATEGORY - G

KEYWORDS - accidents, coolants, blowdown, liquids, loft reactors,
heat transfer, WATER-HAMMER codes, WHAM codes

1. NAME OR DESIGNATION OF PROGRAM - LEOPARD/SPOTS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - LEOPARD is a unit cell homogenization and spectrum generation (MUFT-SOFOCATE) program with a fuel depletion option.
4. METHOD OF SOLUTION - The MUFT-SOFOCATE homogeneous medium spectrum analyses with heterogeneous corrections are used. The monoenergetic Amouyal-Benoist thermal disadvantage factor is applied at each of 172 SOFOCATE energy levels up to 0.625 eV. The U238 resonance integral is forced to agree with a generalized Hellstrand correlation.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - LEOPARD works with nuclides commonly used in water reactors. Thorium and U238 fuel chains are allowed.
6. TYPICAL RUNNING TIME - Running time is about 15 seconds per case on an IBM360/75. On a UNIVAC1108 the sample problem executes in 40 seconds.
7. UNUSUAL FEATURES OF THE PROGRAM - LEOPARD is an engineering design code featuring simple input requirements of physical data.
8. RELATED AND AUXILIARY PROGRAMS - SPOTS converts a cross section data deck into a LEOPARD library tape.
9. STATUS - Abstract first distributed December 1967.
IBM7090 version submitted May 1967, replaced by IBM360 version October 1968, IBM360 version revised to Edition B December 1975, revised to Edition C February 1977, sample problem executed by ACC December 1975 on an IBM370/195.
UNIVAC1108 version submitted January 1971, revised to Edition B February 1977.
10. REFERENCES - L. E. Strawbridge and R. F. Barry, Criticality Calculations for Uniform Water-Moderated Lattices, Nuclear Science and Engineering 23, pp. 58-73, 1965.
R. F. Barry, LEOPARD - A Spectrum Dependent Non-spatial Depletion Code for the IBM7094, WCAP-3269-26, September 1963, and revisions, August 30, 1968.
11. MACHINE REQUIREMENTS - IBM360 Level-H compiler library file 50K (decimal) memory
12. PROGRAMMING LANGUAGES USED - FORTRAN IV(H) (IBM360) and FORTRAN V (UNIVAC1108)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360 (IBM360) and EXEC2 (UNIVAC 1108).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
IBM360 FORTRAN IV H-level compiler library file
15. NAME AND ESTABLISHMENT OF AUTHORS -
360 R. F. Barry
Westinghouse Atomic Power Division
Box 355
Pittsburgh, Pennsylvania 15230

1108 H. E. P. Krug, Jr.*
Jersey Nuclear Company
- * Present address-
U. S. Nuclear Regulatory Commission
Washington, DC 20555
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (LEOPARD 360-2084 cards, 1108-2119 cards, SPOTS
360-828 cards, 1108-829 cards)
Sample problems (LEOPARD 360-37 cards, 1108-37 cards)
Libraries (SPOTS 360-3789 cards, 1108-3789 cards)
Control information (JCL LEOPARD 360-8 cards; SPOTS 360-8
cards)
Sample problem output (LEOPARD 42 pages, SPOTS 17 pages)
Reference reports and revisions
17. CATEGORY - B
KEYWORDS - cell calculation, spectra, depletion, disadvantage
factors, SPOTS codes

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
from the National Nuclear Data Center at Brookhaven National Laboratory.
15. NAME AND ESTABLISHMENT OF AUTHORS -
H. C. Honeck and D. R. Finch
Computer Applications Division
Savannah River Laboratory
E. I. duPont de Nemours and Co., Inc.
Aiken, South Carolina 29801
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (FLANGE2 3251 cards, KERINT 351 cards)
Sample problems (FLANGE2 23 cards, KERINT 75 cards)
Control information (JCL FLANGE2 78 cards, KERINT 21 cards)
Reference report and correction notice
17. CATEGORY - B
KEYWORDS - thermal multigroup cross sections, scattering law,
angular distribution, resonance parameters, KERINT
codes

1. NAME OR DESIGNATION OF PROGRAM - RELAP4/MOD5
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - RELAP4 has been developed to describe the behavior of water-cooled nuclear reactors subjected to postulated transients, such as those resulting from loss-of-coolant, pump failure, or power excursions. The program calculates fluid conditions such as flow, pressure, mass inventory, and quality; thermal conditions such as surface temperatures, temperature profiles, and energy distributions; and heat fluxes in power generating and dissipating elements. The program also calculates reactor power, decay heat, and reactivity. In addition to describing transients in boiling-water and pressurized-water reactors, the program is sufficiently versatile to describe transients in experimental thermal-hydraulic systems.
4. METHOD OF SOLUTION - The RELAP4 user must define the geometric features of the system to be analyzed as well as an appropriate set of initial conditions. RELAP4 then solves an integral form of the fluid conservation and state equations applied to each user-defined control volume.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
 - 9 minor edit variables
 - 20 time-step cards
 - 20 trip control cards
 - 100 junctions (flow paths) between volumes
 - 5 bubble-parameter sets
 - 5 time-dependent volume descriptions on cards
 - 12 pumps
 - 75 control volumes
 - 10 check valve types
 - 5 normalized leak-area-versus-time curves
 - 20 fill system curves
 - 50 heat slabs
 - 20 heat slab geometries
 - 7 heat slab materials
 - 50 core sections
 - 20 data sets for heat exchangers without conduction
6. TYPICAL RUNNING TIME - For a PWR modeled with 30 to 40 fluid volumes, running time through refill may range from 15 to 60 minutes or more on the CDC7600 and from 2 to 8 hours or more on the IBM360/75.
7. UNUSUAL FEATURES OF THE PROGRAM - RELAP4 provides the following features: a fully-implicit integration technique, steam tables that contain derivatives, heat conduction between fluid volumes, momentum flux terms in the hydraulic equations, a pump model with inertia and friction, a limited air flow capability,

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
a separate hot channel calculation, and core cross flow.
RELAP4/MOD5 contains the following four program operations - standard RELAP4 (minimum controls), RELAP4-EM (a part of the NRC evaluation model), RELAP4-FLOOD (reflooding rates), and RELAP4-CONTAINMENT (special containment models).
8. RELATED AND AUXILIARY PROGRAMS - RELAP4/MOD5 uses PLOT4M to produce both CalComp and microfilm plots of appropriate variables versus time from data stored on a RELAP4 output data tape. STH20G is used to generate tables of water properties in the proper RELAP4 format for the IBM360 version.
9. STATUS - Abstract first distributed September 1969.
IBM7044 version of RELAP2 submitted February 1969, deleted December 1971.
IBM360 version of RELAP3 submitted December 1971, 1st revision June 1972, 2nd revision January 1973, 3rd revision July 1973; replaced by RELAP4 submitted March 1974, replaced by Edition B May 1974, and revised September 1974, replaced by Edition C November 1974, replaced by Edition D February 1975, replaced by RELAP4/MOD5 Edition E submitted September 1976, sample problem executed by ACC November 1976 on an IBM370/195.
UNIVAC1108 version of RELAP3 submitted January 1972, deleted March 1974.
CDC6600 version of RELAP3 submitted January 1972, deleted March 1974.
CDC7600 version of RELAP4/MOD5 submitted September 1976, replaced by revised Edition B June 1977 and Edition C April 1977.
10. REFERENCES - RELAP4/MOD5, A Computer Program for Transient Thermal-hydraulic Analysis of Nuclear Reactors and Related Systems, User's Manual, Volume I: RELAP4/MOD5 Description, Volume II: Program Implementation, Volume III: Checkout Applications, ANCR-NUREG-1335, September 1976.
RELAP4/MOD5 Update 2, ACC No. 369.7600B, Tape Contents Description, ACC Programming Note 77-3, October 29, 1976.
RELAP4/MOD5 Update 2, ACC No. 369.7600C, Tape Contents Description, ACC Programming Note 77-35, July 31, 1977.
RELAP4/MOD5 Update 2, ACC No. 369.360E, Tape Contents Description, ACC Programming Note 77-11, December 28, 1976.
W. H. Rettig, UPD - A Program to Update Source Decks, P01752; Addendum 1 to UPD by R. C. Young and N. H. Marshall; Addendum 2 to UPD by G. L. Singer; and Addendum 3 to UPD by W. H. Rettig.
R. C. Young and S. D. Matthews, PLOT4M, RELAP4 Version 3 Plot Processing Program, ANCR Note, May 1974.
G. D. Brown, C. H. Bush, and R. A. Berman, The Integrated Graphics System for the SC4060: I. User's Manual, RM-5660-PR, December 1968.

10. REFERENCES (CONTINUED)

R. J. Wagner, STH20, A Subroutine Package to Compute the Thermodynamic Properties of Water, ANCR Note, 1975.

11. MACHINE REQUIREMENTS - 850K bytes (IBM360), 160,000 (octal) words (CDC7600), 3 tape drives, and a CalComp plotter

12. PROGRAMMING LANGUAGES USED - FORTRAN IV (95%) and BAL (5%)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370 (IBM360,370), SCOPE (CDC7600).

14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PLOT4M as executed at NRTS makes use of the SC-4060 integrated graphics system for microfilm output in addition to the CalComp graphical output. The IGS subroutines SUBJEG, TITLEG, MODESG, SETUPG, GRIDG, LABELG, LINESG, POINTG, ERRZZ, SETSMG, PAGEG, and EXITG are included in the environmental subroutines file for the IBM360 version only.

The IBM360 transmittal tape contains 2314 and 3330 load modules of a special FORTRAN (H) compiler equivalent to the standard (H) compiler except that it uses a large table area allowing compilation of all RELAP4 source routines, including the large MIXFLO subroutine. A compilation region of 400K is sufficient for RELAP4; the OPT=2 option should be invoked.

15. NAME AND ESTABLISHMENT OF AUTHORS -

C. F. Obenchain, G. L. Singer*, and J. E. Tolli+
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, Idaho 83401

* 7600 contact

+ 360 contact

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal

Source decks (RELAP4 360-45,571 cards, 7600B-802 records*, 7600C-803 records*)

2314 and 3330 load modules (RELAP4.LOADM0D 360-908 blocks, ENVIRO 360-557 blocks, FORT.H.LARGE 360-578 blocks)

Object deck (BUFIO 360-52 cards)

Sample problems (RELAP4 360-1163 cards, 7600B-29 records*, 7600C-28 records*, PLOT4M 360-11 cards, 7600B-2 records*, 7600C-2 records*)

Water property library (360-79 blocks, 7600B-15 records*, 7600C-16 records*)

Auxiliary source decks (PLOT4M 360-2190 cards, 7600B-19 records*, 7600C-19 records*, UPD 360-1528 cards, 7600B-15 records*, 7600C-15 records*, conversion program 360-24 cards, 7600B-2 records*, 7600C-3 records*)

Environmental subroutines (360-22,131 cards, 7600B-47 records*, 7600C-72 records*)

16. MATERIAL AVAILABLE (CONTINUED)

Control information (JCL RELAP4 360-160 cards, PLOTR4M 360-61 cards, UPD 360-52 cards, DOUT 360-39 cards, loader cards RELAP4 7600B-2 records*, 7600C-2 records*)

Sample problem output (RELAP4 360-1097 blocks, 7600B-234 records*, 7600C-210 records*)

Reference reports, ANCR-NUREG-1335, ANCR PLOTR4M Note, ACC Note for appropriate version, and P01752 Description with Addenda

* 512-word maximum length

17. CATEGORY - G

KEYWORDS - accidents, blowdown, excursions, heat transfer, hydrodynamics, power plants, reactor safety, transients, BWR reactors, PWR reactors, PLOTR4M codes, RELAP2 codes, RELAP3 codes, RELAP4 codes

1. NAME OR DESIGNATION OF PROGRAM - GAKIT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - GAKIT solves the multigroup, one-dimensional, time-dependent diffusion theory kinetics equations including delayed neutron effects and temperature feedback based on two-dimensional heat transfer calculations. For the one-dimensional multigroup kinetics equations an arbitrary scattering matrix and arbitrary fission transfer are allowed, and plane, cylindrical, or spherical geometry can be used. A piecewise linear time-dependent inhomogeneous source can be specified. Feedback is available from xenon buildup and temperature dependence of cross sections. The heat transfer calculation is performed for two-dimensional r-z fuel element models assuming predetermined axial power shape functions and time-dependent power amplitudes obtained from the one-dimensional kinetics calculations. For the fuel elements average fuel and moderator temperatures are calculated which determine, based on tables, the temperature-dependent cross sections. Transients may be introduced by step changes of cross sections, by piecewise linear time-dependent cross sections (rod withdrawal accidents), by step changes of the flow rates or by step changes of the coolant inlet temperatures.
4. METHOD OF SOLUTION - The multigroup, one-dimensional, time-dependent diffusion theory kinetics equations are solved by a semi-implicit time integration method (see references 1, 2, and 3). The heat transfer equations are solved by a quasi two-dimensional method, assuming the axial heat conduction is negligible compared with the heat transport due to coolant flow. For the numerical solution of the kinetics equations and also for the solution of the heat transfer equations finite difference methods in space and time are employed. The material properties are assumed to be regionwise constant and the time-step size is held constant in each time zone.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
 - One-dimensional kinetics calculation - maxima of -
 - 10 prompt neutron energy groups
 - 6 delayed neutron groups
 - 10 homogeneous regions (channels)
 - 100 mesh points
 - Fuel element geometry for heat transfer calculation - In the axial direction the fuel element may consist of a bottom reflector, a core section, and a top reflector. The bottom and top reflectors must have uniform densities and uniform thermal properties, while within the core section of the fuel element up to 5 radial regions may be used. Maxima of -
 - 15 radial mesh points
 - 20 axial mesh points

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1. NAME OR DESIGNATION OF PROGRAM - DATATRAN2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - DATATRAN2 is a data base management system for a scientific and engineering modular program environment. DATATRAN consists of a set of extensions to the FORTRAN language designed to simplify the development, inter-connection and use of large computer programs in a scientific and engineering environment. It allows users to easily connect a series of functional program units (modules) to perform a specific task.
4. METHOD OF SOLUTION - Modules perform tasks such as plotting, solving partial differential equations, and even entire reactor life studies. Modules performing complex tasks are constructed by linking elementary modules. Collections of data may be assigned a name and manipulated by name being created in one module and supplied for use in another.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The program size is limited only by auxiliary storage capacity and available computer time.
6. TYPICAL RUNNING TIME - This varies from a few seconds to several hours depending upon the nature of the problem.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - DATATRAN2 RAD1 Geometry Modules (ACC Abstract 406) and DATATRAN2 Utility Plotting Modules (ACC Abstract 407)
9. STATUS - Abstract first distributed May 1970.
CDC6600 version of DATATRAN submitted July 1969, replaced by DATATRAN2 received May 1976, processed December 1976.
10. REFERENCES - H. J. Kopp, DATATRAN 2 Primer, KAPL-M-7313, August 1973.
H. J. Kopp, Editor, DATATRAN User's Guide, KAPL-M-7372, October 1974.
H. J. Kopp, W. E. Schilling, D. S. Selengut, R. G. Stieglitz, K. L. Hanawalt and J. J. Urbaniak, DATATRAN 2 Implementation, KAPL-M-7386, October 1974.
1. MACHINE REQUIREMENTS - 64K memory, 2 disks, and permanent storage media such as tapes are required; in addition, CDC6600 usage requires 30K words of ECS and CDC7600 usage 20K words of LCM.
12. PROGRAMMING LANGUAGES USED - FORTRAN (85%), COMPASS (15%)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.1 or SCOPE 3.2 (CDC6600) and SCOPE 1.1 (CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
Normal user resource allocation is 140,000 (octal) central memory, 200,000 words of ECS, and disk as available.
The transmittal tape is written for use with the CDC update utility to create a program library file since this software is only applicable to CDC computers. Insertion of a *DEF-6600 or *DEF-7600 card in the system or environmental routines update runs will produce the appropriate source. Insertion of a *DEF,FTN or *DEF,RUN card in the environmental routines update RUN will produce source for the FTN or RUN compilers. The RUN compiler is required for the remainder of the package material. Each sub-program or test case starts with the card reading *DECK followed by the name. Test cases are identified by names with the initial character T.
15. NAME AND ESTABLISHMENT OF AUTHOR -
H. J. Kopp
Knolls Atomic Power Laboratory
General Electric Company
Box 1072
Schenectady, New York 12301
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (335 records*)
Environmental routines (39 records*)
Sample problems (53 records*)
Reference reports
* 512-word maximum length
17. CATEGORY - M
KEYWORDS - data base, modular programming, DATATRAN codes,
DATATRAN2 codes

1. NAME OR DESIGNATION OF PROGRAM - CITATION
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - CITATION is designed to solve problems involving the finite-difference representation of diffusion theory treating up to three space dimensions with arbitrary group-to-group scattering. X-y-z, theta-r-z, hexagonal-z, and triagonal-z geometries may be treated. Depletion problems may be solved and fuel managed for multi-cycle analysis. Extensive first-order perturbation results may be obtained, given microscopic data and nuclide concentrations. Statics problems may be solved and perturbation results obtained with microscopic data.
4. METHOD OF SOLUTION - Explicit, finite-difference approximations in space and time have been implemented. The neutron-flux-eigenvalue problems are solved by direct iteration to determine the multiplication factor or the nuclide densities required for a critical system.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CITATION has been designed to attack problems which can be run in a reasonable amount of time. Storage of data is allocated dynamically to give the user flexibility in dimensioning. Typically, a finite-difference diffusion problem could have 200 depleting zones, 10,000 nuclide densities, and 30,000 space-energy point flux values.
6. TYPICAL RUNNING TIME - The two-dimensional finite-difference diffusion theory eigenvalue problems iterate at a rate of about 0.1 millisecond per point per iteration with alternating-direction line relaxation (two sweeps per iteration) with 8-byte words on the IBM360/91 (0.5 on the 360/75). Since about 30 iterations are required for each succeeding eigenvalue problem, machine time for a depletion problem is about .003 second per point per time-step. Machine time for most auxiliary calculations is usually insignificant. For a representative fast breeder depletion problem, 68 percent of the machine CPU time is spent in solving eigenvalue problems.
7. UNUSUAL FEATURES OF THE PROGRAM - CITATION is considered unusual in that it should be relatively easy to modify the contents or to add routines. Effective techniques are incorporated to determine a critical system. More than one set of microscopic cross sections may be used in a system and nuclide behavior can be followed on a sub-zone scale within depletion regions. The user has flexible control over the route of a calculation as well as the edit of results.
8. RELATED AND AUXILIARY PROGRAMS - The microscopic cross section tape for this program may be generated by various codes, but XSDRN

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
(ACC Abstract 393) is designed specifically for this purpose. The microscopic cross section routines, formerly an auxiliary program, were integrated into the code to permit such data to be supplied from cards or modified in the same run the problem is solved.
9. STATUS - Abstract first distributed May 1970.
IBM360 version submitted July 1969, revised January 1970,
2nd revision April 1970, 3rd revision November 1971,
4th revision April 1972, 5th revision June 1972,
6th revision August 1972, 7th revision November 1972,
8th revision August 1974, 9th revision, Edition I,
November 1976, sample problem executed by ACC
December 1976 on an IBM370/195.
10. REFERENCES - T. B. Fowler, D. R. Vondy, and G. W. Cunningham,
Nuclear Reactor Core Analysis Code CITATION, ORNL-TM-2496,
Revision 2, July 1971, Supplement 1, October 1971, Supplement 2,
March 1972, Supplement 3, July 1972.
N. M. Greene and C. W. Craven, Jr., XSDRN, A Discrete
Ordinates Spectral Averaging Code, ORNL-TM-2500, July 1969.
D. R. Vondy and T. B. Fowler, Job Stream of Cases
for the Computer Code CITATION, ORNL-TM-3793, July 1972.
11. MACHINE REQUIREMENTS - IBM360/91 or equivalent with at least
128,000 32-bit words of directly-addressable main storage, 7 to 32
I/O devices depending upon the calculation, excluding input and
output devices and system requirements.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
Now CITATION contains about 25,000 source statements. Without
overlay, storage for the code instructions would approach 150,000
32-bit words, but with overlay of storage requirement is about
43,000 for the program and fixed storage, including 10,000 for
system library routines.
15. NAME AND ESTABLISHMENT OF AUTHORS -
T. B. Fowler, D. R. Vondy, and G. W. Cunningham
Oak Ridge National Laboratory
P. O. Box X
Oak Ridge, Tennessee 37830
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (28,480 cards)
Sample problem (850 cards)
Reference report, ORNL-TM-2496, Rev. 2, Supplements 1, 2, and 3
Reference report, ORNL-TM-3793, available upon request

17. CATEGORY - K

KEYWORDS - 1-dimensional, 2-dimensional, 3-dimensional, multi-group, diffusion, criticality searches, buckling, x-y-z, r-theta, hexagonal, depletion, fuel management, XSDRN codes

1. NAME OR DESIGNATION OF PROGRAM - ETOX3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - ETOX3 (ENDF/B to 1DX) calculates multigroup constants for nuclear reactor calculations using data from the Evaluated Nuclear Data File (ENDF/B) Version II or Version III format. It can also process Version I materials that do not call for partial energy distribution laws 1, 2, 4, 6, or 8 (see ENDF/B, File 5). The code is designed to compute and punch -
 - (a) infinite dilute cross sections,
 - (b) temperature-dependent, self-shielding factors for arbitrary values of microscopic σ_{total} (total cross section per atom) in the Russian (Bondarenko) format, and
 - (c) inelastic-scattering probability matrices.
4. METHOD OF SOLUTION - Microscopic cross section values are constructed as specified by ENDF/B. Group constants are obtained by integrating the microscopic data over group intervals using the flux weighting scheme-- $\phi(u)$ is proportional to $1/\sigma_{\text{group}}(u)$, $\sigma_{\text{group}}(u) = n(j) * \text{microscopic } \sigma_{\text{group}}(j) + n(j) * \text{microscopic } \sigma_{\text{total}}$. Integration methods used include Romberg, Gaussian quadrature, n-point, Simpson, and trapezoidal. The code allows as input arbitrary sets of values of group energies, temperatures, and microscopic σ_{total} , σ_{group} .
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - The UNIVAC1108 ETOX3 calculation using 26-group data for a representative set of 14 isotopes required about 28 minutes. On the IBM370/195 a U238 30-group sample problem took 75 seconds of CPU time.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - WLIB is a short program included with ETOX3. It creates a table of complex integrals used by ETOX3. ETOX3 requires the ENDF/B tape in standard arrangement binary mode. Since the ENDF/B tapes do not normally come in this mode, they must be processed by the RIGEL code (ACC Abstracts 475 and 571) prior to using them with ETOX3. The format of the ETOX3 output is compatible for input to the computer code 1DX (ACC Abstract 374), a multipurpose diffusion code for generating cross sections to be used in fast reactor analysis.
9. STATUS - Abstract first distributed May 1970.
UNIVAC1108 version of ETOX submitted July 1969, revised April 1970, replaced by ETOX2 December 1970, replaced by ETOX3 June 1973.

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
job limit. Use of the statement CALL WARN (IWARN) returns a negative value of IWARN until the job enters the specified warning time interval after which a positive value is assigned. This routine is used to initiate writing to tape of restart data for subsequent runs.
15. NAME AND ESTABLISHMENT OF AUTHOR -
G. J. Malek
General Atomic Company
P. O. Box 81608
San Diego, California 92138
16. MATERIAL AVAILABLE -
Source deck (1210 cards)
Sample problem (90 cards)
Reference report
17. CATEGORY - H
KEYWORDS - fluid flow, temperature distribution, pressure distribution, gases, heat conduction, HTGR reactors

1. NAME OR DESIGNATION OF PROGRAM - WASP2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - WASP2 is a FORTRAN IV computer program which performs a spline function fit to data obtained from the WASP subprogram (see reference 1) for thermodynamic and transport properties of water and steam. The properties calculated by WASP2 are: pressure and temperature as functions of specific volume and specific internal energy; specific volume as a function of pressure and enthalpy; and viscosity, thermal conductivity, and specific heat as functions of pressure and temperature.
4. METHOD OF SOLUTION - The subroutines for calculating pressure, temperature, and specific volume use cubic and bicubic spline interpolation procedures. Two types of mathematical splines are used. For one independent variable a cubic spline is used and for two independent variables a bicubic spline is applied. Both are as described in reference 2 with modifications that a non-uniform mesh is allowed for the cubic spline and first derivative boundary conditions are permitted for both cubic and bicubic splines. The data points or knots for the splines are obtained from the NASA WASP program (reference 1) which generates very smooth surfaces.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The WASP2 procedures are restricted to be within a pressure range from below atmospheric to near critical for saturation states and for single phase vapor, and to over 10,000 psia for single phase liquid. The temperature range is approximately 40 degrees F to 650 degrees F for the liquid and from saturation temperature to approximately 2200 degrees F for the vapor regions.
6. TYPICAL RUNNING TIME - Computer time to compute specific volume given pressure and enthalpy is 50 microseconds on a CDC7600. Time to compute pressure from internal energy and specific volume is 100 microseconds for vapor and 45 microseconds for liquid on a CDC7600.
7. UNUSUAL FEATURES OF THE PROGRAM - Cubic and bicubic splines provide a fast and accurate method for computing water properties on a large computer running long problems. The approximations also have smooth derivatives which facilitates the modeling of large systems of differential equations.
8. RELATED OR AUXILIARY PROGRAMS - WASP2 replaces an earlier Bettis WASP program developed for use in FLASH2, reference WAPD-TM-839. The source for the stored data points or knots for the spline interpolation routines is the NASA WASP program documented in reference 1.

9. STATUS - Abstract first distributed May 1970.
CDC6600 version of WASP submitted August 1969, replaced
by CDC6600,7600 version of WASP2 submitted February
1977.
10. REFERENCES - R. C. Hendricks, I. C. Peller, and A. K. Baron,
WASP - A Flexible FORTRAN-IV Computer Code for Calculating Water
and Steam Properties, NASA TN D-7391, November 1973.
T. M. Davis and A. L. Kontis, Spline Interpolation
for Track-Type Survey Data with Applications to the Computation
of Mean Gravity Anomalies, Naval Oceanographic Office Technical
Report No. 226, 1970.
W. R. Cadwell, Editor, Reference Manual - Bettis
Programming Environment, WAPD-TM-1181, September 1974.
D. A. Spragg, C. S. Caldwell, F. T. Dunckhorst,
and G. W. Swartele, WASP2 - A FORTRAN-IV Computer Program for
Calculating Water Properties Used in Reactor Safety Analysis
(LWBR Development Program), WAPD-TM-1211, June 1976.
G. W. Swartele, BAPL Note - WASP2 Compliance with
American Standard FORTRAN, February 1977.
11. MACHINE REQUIREMENTS - The WASP2 procedure requires 200,000
(octal) words of CDC7600 large core memory (LCM) for storing the
coefficients for the spline functional fit of the water and steam
surfaces.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.3 (CDC6600), SCOPE 1.1 (CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
The WASP2 edit program utilizes environmental routines INTTAP,
OUTTAP, LINES, and FINISH which are documented in reference 3.
These routines can easily be replaced and do not require obtaining
the entire programming environment (reference 3). Simple extended
core storage routines READDEC and WRITEEC documented in reference 3
are used for transferring data between large and small core
storage.
15. NAME AND ESTABLISHMENT OF AUTHORS -
D. A. Spragg, C. S. Caldwell, F. T. Dunckhorst,
G. W. Swartele, and T. R. Feher
Bettis Atomic Power Laboratory
Westinghouse Electric Corporation
Box 79
West Mifflin, Pennsylvania 15122
16. MATERIAL AVAILABLE - Restricted Distribution
Magnetic Tape Transmittal
Source deck (4526 cards)
Sample problem (8 cards)
Sample problem output (29 selected pages, 1 microfiche)
Reference report, WAPD-TM-1211, and BAPL note

17. CATEGORY - H

KEYWORDS - water, steam, thermodynamics, pressure, temperature,
BETTIS ENVIRONMENTAL LIBRARY codes, FLASH2 codes

1. NAME OR DESIGNATION OF PROGRAM - GAPL3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - GAPL3 determines the inelastic, large-deflection behavior of thin plates or axially symmetric shells with pressure loading and deflection restraints.
4. METHOD OF SOLUTION - The deformation of the body is described by a set of parameters $\zeta(i)$. The strains are found in terms of the $\zeta(i)$ by geometric relations, and the stresses are found in terms of the strains by material property relations. The principle of virtual work is used to set up simultaneous equations which may be solved for the $\zeta(i)$. The solution is iterated until the stresses and strains do not change appreciably.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The thickness of the plate or shell should fall within the limits of thin shell theory.
6. TYPICAL RUNNING TIME - A small elastic problem will take less than a minute. A large plastic one can require over 10 minutes.
7. UNUSUAL FEATURES OF THE PROGRAM - GAPL3 is quite versatile and may be applied to most thin plate or axially symmetric shell problems. It is particularly appropriate when nonlinear material or geometric effects are important. Among its distinguishing features are -
 - (1) large-deflection theory is used,
 - (2) either deformation theory or incremental theory may be specified,
 - (3) elastic-plastic material properties are used,
 - (4) almost any boundary conditions may be considered,
 - (5) the rigid deflection restraint may take any shape and orientation, and
 - (6) bodies having a variable thickness may be analyzed.
8. RELATED AND AUXILIARY PROGRAMS - GAPL3 is an extensive modification of GAPL1 and GAPL2 to permit the solution of a broad class of problems. GAPL3 uses the Bettis Environmental Routines (ACC Abstract 478).
9. STATUS - Abstract first distributed May 1970.
CDC6600 version submitted August 1969.
10. REFERENCES - A. L. Thurman, GAPL-3, A Computer Program for the Inelastic Large-Deflection Stress Analysis of a Thin Plate or Axially Symmetric Shell with Pressure Loading and Deflection Restraints, WAPD-TM-791, June 1969.
C. M. Friedrich, W. H. Guilinger, A. E. Sumner, Jr., GAPL-1, A Computer Program for the Plastic Stress Analysis of a Horizontal Plate with Pressure Loading Above and Deflection

1. NAME OR DESIGNATION OF PROGRAM - DATATRAN2 RAD1 Geometry Modules
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - This series of DATATRAN modules is designed to provide the computerized two-dimensional geometry descriptions required for engineering and nuclear design computations. The modules communicate via DATATRAN N-dot data-sets, and the user must link the appropriate modules to perform a specific task. Modules are designed to accept as input data transcribed from engineering drawings, to plot, check, and edit the generated geometric data, and to calculate moments of inertia and area intersections.
4. METHOD OF SOLUTION - The modules constructed for this purpose and their individual functions are:
 - RAD1 - converts user-oriented geometry input into a computerized form which can be used by other modules. Specification may be in inches or centimeters.
 - PLOT20 - plots the boundaries of a collection of two-dimensional regions. Film, printer, CalComp, and GRAIL output options are available.
 - AREA - calculates areas, centroids, and moments of inertia of two-dimensional figures. Calculation of the intersection of lines with a two-dimensional figure is available as an option.
 - REPLACE - provides facilities to replace complex contours by parallelograms or rectangles of equivalent areas, to align edges of many regions, and to modify dimensions.
 - MASKER - compares two collections (coarse and detail) of two-dimensional geometry to determine the areal intersection of the components.
 - MASKED - coalesces and alphabetizes coarse and detail region area data.
 - PLOT - produces an output data set containing all of the basic region names and contour information for a hierarchical region.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Curves are limited to straight-line approximations in most modules and to second-order curves in principal modules. The total geometric complexity is not limited.
 - RADI - comparison to .00001 inch is invoked to determine congruency of points. A maximum of 495 vertices is allowed for any region boundary.
 - PLOT20 - regions are limited to 490 vertices.
 - MASKER - the coarse geometry is limited to 800 regions.
6. TYPICAL RUNNING TIME - For the CDC6600, less than 10 seconds are used to specify a geometry. It takes approximately three minutes to plot a complex geometry and a variable amount of time, usually less than one minute, to calculate properties.

7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - DATATRAN2 (ACC Abstract 386) and DATATRAN2 Utility Plotting Modules (ACC Abstract 407).
9. STATUS - Abstract first distributed May 1970.
CDC6600 version of DATATRAN 2-D Geometry Input submitted July 1969, replaced by DATATRAN2 RAD1 Geometry Modules received May 1976, processed December 1976.
10. REFERENCES - R. H. Beam, Jr. and H. J. Kopp, RAD1 Geometry Modules, KAPL-M-7339, June 1974.
H. J. Kopp, DATATRAN 2 Primer, KAPL-M-7313, August 1973.
H. J. Kopp, Editor, DATATRAN User's Guide, KAPL-M-7372, October 1974.
H. J. Kopp, W. E. Schilling, D. S. Selengut, R. G. Stieglitz, K. L. Hanawalt and J. J. Urbaniak, DATATRAN 2 Implementation, KAPL-M-7386, October 1974.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN (90%), COMPASS (5%), DATATRAN2 (5%)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - DATATRAN2 with SCOPE 3.1 or SCOPE 3.2 (CDC6600), SCOPE 1.1 (CDC7600)
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - These modules operate under the DATATRAN2 system. Only changes to subroutine SLOP in module PLOT20 should be required to accommodate local plotting software. The transmittal tape is written for use with the CDC update utility to create a program library file since this software is only applicable to CDC computers using the DATATRAN2 system. Each subprogram or test case starts with the card reading *DECK followed by the name. Test cases are identified by names with the initial character T. run decks are described in KAPL-M-7339. Sample problems generate self-explanatory output.
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. H. Bean and H. J. Kopp
Knolls Atomic Power Laboratory
General Electric Company
Box 1072
Schenectady, New York 12301
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (196 records*)
Reference report, KAPL-M-7339
* 512-word maximum length

17. CATEGORY - L
KEYWORDS - input data geometries, plotting, 2-dimensional,
DATATran codes, DATATran2 codes

1. NAME OR DESIGNATION OF PROGRAM - DATATRAN2 Utility Plotting Modules
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, 7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - This series of DATATRAN modules is designed to provide basic plotting capability in an easy-to-use package. Functions of one or two variables can be accommodated. The modules may be used to plot results of calculations performed by other modules or to display data read from cards or tapes.
4. METHOD OF SOLUTION - The modules constructed for this purpose and their individual functions are:
 - PLOT1 - designed for the CalComp and report quality output, plots functions of one variable, has histogram capability and logarithmic scaling options.
 - PLOT2 - designed for printer, CalComp, electrostatic plotter, and microfilm applications, plots functions of one variable, has logarithmic scaling and multiple y-axes options.
 - PLOT3 - plots on visual display units functions of two variables, produces contour, perspective, and stereographic plots for data specified on a regular grid.
 - PLOT4 - designed for the CalComp and report quality output, plots functions of two variables, produces contour plots for non-uniform but regular geometry grids.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

There is a limit of approximately 8,000 points per curve for functions of one variable and 16,000 points for functions of two variables.

 - PLOT1 - maximum of 15 curves for a given figure.
 - PLOT2 - maximum of 15 curves for a given figure using one or more y-axes. Logarithmic scaling is necessarily tied to the flexibility of the output device.
 - PLOT3 - the function to be plotted must be continuous.
 - PLOT4 - maximum of 40 contour lines on a single plot, 6000 entries per data set.
6. TYPICAL RUNNING TIME - Less than one minute on a CDC6600.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - DATATRAN2 (ACC Abstract 386) and DATATRAN2 RAD1 Geometry Modules (ACC Abstract 406).
9. STATUS - Abstract first distributed May 1970.
 - CDC6600 version of DATATRAN Utility Modules submitted July 1969, replaced by DATATRAN2 Utility Plotting Modules received May 1976, processed December 1976.

10. REFERENCES - H. J. Kopp, R. P. DiStefano, B. L. Hennig, C. N. Hodgins, A. N. Lord, and E. J. Binney, Utility Plotting Modules, KAPL-M-7325, May 1974.
H. J. Kopp, DATATRAN 2 Primer, KAPL-M-7313, August 1973.
H. J. Kopp, Editor, DATATRAN User's Guide, KAPL-M-7372, October 1974.
H. J. Kopp, W. E. Schilling, D. S. Selengut, R. G. Stieglitz, K. L. Hanawalt and J. J. Urbaniak, DATATRAN 2 Implementation, KAPL-M-7386, October 1974.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN (80%), COMPASS (15%), DATATRAN2 (5%)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1 or SCOPE 3.2 (CDC6600) and SCOPE 1.1 (CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - These modules operate under the DATATRAN2 system. Only changes to a single subroutine SLOT which provides an interface to local plotting software should be required. The transmittal tape is written for use with the CDC update utility to create a program library file since this software is only applicable to CDC computers using the DATATRAN2 system. Each subprogram or test case starts with the card reading *DECK followed by the name. Test cases are identified by names with the initial character T. Run decks are described in KAPL-M-7325. Sample problems generate self-explanatory graphical output.
15. NAME AND ESTABLISHMENT OF AUTHORS -
H. J. Kopp, R. P. DiStefano, B. L. Hennig,
C. N. Hodgins, A. N. Lord, E. J. Binney
Knolls Atomic Power Laboratory
General Electric Company
Box 1072
Schenectady, New York 12301
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (121 records*)
Reference report, KAPL-M-7325
* 512-word maximum length
17. CATEGORY - P
KEYWORDS - plotting, modular programming, contour, perspective, graphs, DATATRAN codes, DATATRAN2 codes

1. NAME OR DESIGNATION OF PROGRAM - COBRA4I
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - COBRA4I performs steady-state and transient thermal-hydraulic analysis of rod bundle nuclear fuel elements and cores via the subchannel analysis method.
4. METHOD OF SOLUTION - The conservation equations of flow and energy are solved for interconnected subchannel control volumes via conventional finite differencing techniques. The steady-state calculations are solved by implicit finite differencing whereas the transient calculations are performed by either an implicit or explicit finite difference scheme. Internal rod temperatures are calculated by an orthogonal collocation approximation to the heat conduction equation.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Using the COBRA4I code option to store variables on peripheral storage devices eliminates any practical limit as to maximum problem size. However, computer core requirements and code execution time is always a consideration when determining the complexity of the problem to be solved.
6. TYPICAL RUNNING TIME - On a CDC7600 running time is .004 seconds per cell-iteration using the implicit solution scheme and .00006 seconds per cell-iteration using the explicit scheme. The number of cells is determined as the number of subchannels times the number of axial nodes. The number of iterations required per time-step varies according to convergence criteria and complexity of physics; however, typical values are from 10 to 20 iterations for the implicit scheme and 10 to 50 iterations for the explicit scheme.
7. UNUSUAL FEATURES OF THE PROGRAM - Listed are the improved capabilities of COBRA4I over its predecessor COBRA3C.
 - (a) A new explicit solution scheme to calculate severe transients involving flow reversals, recirculations and expulsion and reentry flows with either a flow or pressure boundary condition specified.
 - (b) Improved storage allocation to reduce central memory requirements; improved running time.
 - (c) Improved fuel rod heat conduction model to calculate interior-rod temperatures with axial conduction and variable thermal conductivity included. Also, each rod may now consist of axially-varying materials.
 - (d) Addition of a set of correlations to calculate the properties of superheated steam and a set of heat transfer correlations covering the complete range of heat transfer from subcooled through boiling.

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)

- (e) Problem "Dump and Restart" capabilities which allow the solution to be saved for subsequent use either to continue calculations or to be used as an initial guess to a different problem which can result in significant time savings for similar problems.
- (f) Auxiliary program to redimension COBRA according to user selected input defining problem size and code options desired, thus minimizing core storage requirements.
- (g) Auxiliary program to generate COBRA input for hexagonal rod-bundle geometry. Input for card groups 4, 7, and 8 can be generated, thus greatly reducing the amount of input required.
- (h) Line printer plotting capability to plot pressure drop, mass flux, enthalpy and/or crossflow versus axial position for all or a specified number of gaps and channels.
- (i) A thermally-conducting wall model which can conduct heat between two channels on opposite sides of a wall.

8. RELATED AND AUXILIARY PROGRAMS - COBRA4I is an extended version of the COBRA3C computer program. The auxiliary program SPECSET redimensions COBRA4I according to user-specified problem size, and the auxiliary program GEOM calculates COBRA input for data groups 4, 7, and 8 for hexagonal rod bundles.

9. STATUS - Abstract first distributed December 1970.

UNIVAC1108 version of COBRA2 submitted December 1970, replaced by COBRA3 in June 1971, replaced by COBRA3C in April 1973, deleted August 1977.

IBM360 version of COBRA2 submitted February 1970, replaced by COBRA3 in September 1971, replaced by COBRA3C in April 1973, deleted August 1977.

CDC6600 version of COBRA3C submitted June 1973, replaced by CDC7600 version of COBRA4I in August 1977, sample problems executed by ACC May 1977 on a CDC7600.

10. REFERENCES - C. L. Wheeler, C. W. Stewart, R. J. Cena, D. S. Rose, and A. M. Sutey, COBRA-IV-I: An Interim Version of COBRA for Thermal-hydraulic Analysis of Rod Bundle Nuclear Fuel Elements and Cores, BNWL-1962, March 1976.

C. W. Stewart, C. L. Wheeler, R. J. Cena, C. A. McMonagle, J. M. Cuta, and D. S. Trent, COBRA-IV: The Model and the Method, BNWL-2214, July 1977.

C. W. Stewart, C. A. McMonagle, M. J. Thurgood, T. L. George, D. S. Trent, J. M. Cuta, and G. D. Seybold, Core Thermal Model: COBRA-IV Development and Applications, BNWL-2212, January 1977.

COBRA4I, ACC No. 432.7600 Tape Contents Description, ACC Programming Note 77-37, July 31, 1977.

D. S. Rowe, COBRA-IIIC: A Digital Computer Program for Steady-state and Transient Thermal-hydraulic Analysis of Rod Bundle Nuclear Fuel Elements, BNWL-1695, March 1973.

11. MACHINE REQUIREMENTS - 202,000 (octal) words and 4 scratch units besides the standard input/output units.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
C. L. Wheeler*, C. W. Stewart, J. F. Cena,
D. S. Rowe, and A. M. Sutey
Pacific Northwest Laboratories
Battelle
P. O. Box 999
Richland, Washington 99352

* Contact

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (COBRA4I 7600-6635 cards, SPECSET 7600-210 cards,
GEOM 7600-622 cards)
Sample problems (COBRA4I 7600-214 cards, SPECSET 7600-281
cards, GEOM 7600-8 cards)
Control information (7600-94 cards)
Reference reports, BNWL-1962, BNWL-2212, and BNWL-2214, and
ACC Note
17. CATEGORY - H
KEYWORDS - blowdown, gas coolants, cores, dynamics, enthalpy,
fluid flow, fuel elements, heat transfer, hexagonal
hydrodynamics, liquids, pressure, reactor safety,
transients, COBRA codes, LMFBR reactors, water
reactors

1. NAME OR DESIGNATION OF PROGRAM - CONTEMPT-LT/026
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - CONTEMPT-LT was developed to predict the long-term behavior of water-cooled nuclear reactor containment systems subjected to postulated loss-of-coolant accident (LOCA) conditions. CONTEMPT-LT calculates the time variation of compartment pressures, temperatures, mass and energy inventories, heat structure temperature distributions, and energy exchange with adjacent compartments. The program is capable of describing the effects of penetration and small crack leakage on containment response. Models are provided for fan cooler and cooling spray engineered safety systems. One to four compartments can be modeled, and any compartment except the reactor system may have both a liquid pool region and a vapor atmosphere region above the pool. Each region is assumed to have a uniform temperature, but the two regions may be different. The user determines the compartments to be used, specifies input mass and energy additions, defines heat structure and leakage systems, and prescribes the time advancement and output options.
4. METHOD OF SOLUTION - The initial conditions of the containment atmosphere are calculated from input values, and the initial temperature distributions through the containment structures are determined from the steady-state solution of the heat conduction equations. A time advancement proceeds as follows. The input water and energy rates are evaluated at the midpoint of a time interval and added to the containment system. Pressure suppression, spray system effects, and fan cooler effects are calculated using conditions at the beginning of a time-step. Leakage and heat losses or gains, extrapolated from the last time-step, are added to the containment system. Containment volume pressure and temperatures are estimated by solving the mass, volume, and energy balance equations. Using these results as boundary conditions, the heat conduction equations describing structure behavior are advanced using an implicit technique. The resulting heat transfer rates are used to correct the previous estimates of the water and energy storage in the containment volume, and the containment conditions are obtained by solving for the second time the containment balance equations. The pressure suppression routines use the conditions at the beginning of a time-step to calculate both the initial expulsion of water from the vents and the flow through the vents. From the calculated flow rates, mass and energy are removed from the dry well and added to the wet well.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
 - 20 pipe elements in normal (unfailed) pressure suppression vent piping
 - 50 flow elements in one segment of the horizontal vent pressure suppression system

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)
10 horizontal vents (or branches) in a segment
CONTEMPT-LT can be used to model all standard boiling-water reactor (BWR) pressure suppression systems including Mark I, Mark II, and Mark III systems; to model pressurized-water reactor (PWR) dry containments, subatmospheric containments, and dual containments with an annular region; and can be used to describe containment responses in experimental systems.
6. TYPICAL RUNNING TIME - On the IBM360/75, approximately .021 second per time advancement is required with 90 mesh points for heat structures without pressure suppression. The pressure suppression timing is not easily predicted but two sample problems ranged from .3 to 2 seconds per time advancement.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - CONTEMPT-LT/026 is the most recent of a series of computer programs developed to describe the thermal-hydraulic conditions attendant to various postulated transients in the containment of light-water reactor systems. This edition replaces CONTEMPT (ACC Abstract 297), CONTEMPT-CONPS, CONTEMPT-PS, CONTEMPT-LT/022, and CONTEMPT-LT/025 (which contained known errors and was never distributed by the Code Center).
9. STATUS - Abstract first distributed December 1970.
IBM360 version of CONTEMPT-CONPS submitted February 1970, replaced by CONTEMPT-PS April 1971, replaced by CONTEMPT-LT/020 August 1973, replaced by CONTEMPT-LT/022 December 1973, replaced by Edition B July 1974, replaced by CONTEMPT-LT/026 April 1976, sample problem executed by ACC June 1976 on an IBM370/195.
10. REFERENCES - L. L. Wheat, R. J. Wagner, G. F. Niederauer, and C. F. Obenchain, CONTEMPT-LT - A Computer Program for Predicting Containment Pressure-Temperature Response to a Loss-of-Coolant Accident, ANCR-1219, June 1975.
K. D. Richert, BUFIO, A Subroutine to Permit FORTRAN Access to IOOP, Phillips Petroleum Note, February 1966.
A. J. Smith, Standard Package Description, Calcomp Plotter Subroutines (S0010.0), Appendix D, January 1971.
W. H. Rettig, R. C. Young, and N. H. Marshall, UPD - A Program to Update Source Decks, P01751, and Addendum.
R. J. Wagner, STH20, A Subroutine Package to Compute the Thermodynamic Properties of Water, ANCR Note, 1975.
NRTS Environmental Subroutine Manual, ANC Document, December 1972.
W. J. Mings, Fan Cooler Containment Model in CONTEMPT-LT/025, SRD-25-76, November 1975.
W. J. Mings, Correction to Uchida Model of CONTEMPT-LT/025 Program, SRD-43-76, December 1976.
W. J. Mings, Version 26 Modifications to the CONTEMPT-LT Program, SRD-83-76, April 1976.

11. MACHINE REQUIREMENTS - 430K bytes and a CalComp or SC4060 plotter for graphical output.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV and BAL
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 MVT.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
The thermodynamic properties of water and steam required by the program are generated by the STH20 program and made available as a library data set. For non-360 users a formatted water properties library and an auxiliary FORTRAN program (READER) to read this library have been provided.
15. NAME AND ESTABLISHMENT OF AUTHORS -
L. L. Wheat and W. J. Mings
Idaho National Engineering Laboratory
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, Idaho 83401
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (CONTEMPT 9951 cards, NRTS Environmental Sub-routines 22,103 cards)
Sample problems (52 cards)
Control information (JCL 110 cards)
Reference reports, subroutine descriptions, and SRD notes
For 360 use:
Load modules (CNTMPT for both 2314 and 3330 disks 476 blocks, ENVIR for both 2314 and 3330 disks 559 blocks)
Water properties library (56 blocks*)
For non-360 use:
Water properties library (1813 cards)
Auxiliary program source deck (READER 35 cards)
* 800-byte maximum length
17. CATEGORY - G
KEYWORDS - accidents, temperature distribution, pressure distribution, containment, water, thermodynamics, leakage, heat transfer, CONTEMPT codes

1. NAME OR DESIGNATION OF PROGRAM - HEATMESH
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - HEATMESH is used to generate geometrical data required for studies of heat transfer in axisymmetric structures represented as surfaces of revolution. The program consists of two distinct phases. The first subdivides the given parts into a nodal network and evaluates the geometrical properties of the nodes. The second determines adjacent nodes and edits geometrical data for the thermal model.
4. METHOD OF SOLUTION - The structure to be studied, represented as a body of revolution, is divided into parts having common material properties and represented as bodies of revolution. Each part is then described as four surfaces of revolution subdivided into nodes which form a mesh. Data for each part are collected, i. e. volume, area, and part number of each node, and node surfaces on the part boundary and inside the part boundary. The distance between the center and the midpoint of each surface of the node is tabulated also.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
Number of subdivisions between 1 and 50 for sides 1 and 3
Number of subdivisions between 1 and 12 for sides 2 and 4
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - The input data are constructed in the same manner as used in the APT program. Data generated by APT can be used in HEATMESH with only minor changes.
8. RELATED AND AUXILIARY PROGRAMS - The data generated by HEATMESH are used in the difference equations of the HEATFLOW program which solves transient heat transfer problems.
9. STATUS - Abstract first distributed December 1970.
CDC6600 version submitted January 1970.
10. REFERENCES - V. K. Gabrielson, HEATMESH, A Computer Code for Generating Geometrical Data Required for Studies of Heat Transfer in Axisymmetric Structures, SCL-DR-67-30, September 1967, and Errata, 1970.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.

1. NAME OR DESIGNATION OF PROGRAM - HAA3B
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM370
3. DESCRIPTION OF PROBLEM OR FUNCTION - HAA3B was written to provide an engineering method for calculating heterogeneous aerosol behavior and transport following various hypothetical LMFBR accidents. HAA3B evaluates an approximation to the general integro-differential equation which describes aerosol behavior. The physical model includes particle generation, Brownian and gravitational agglomeration, settling, plating, and leakage for spherical particles. The approximation is the requirement that the size distribution function be lognormal.
4. METHOD OF SOLUTION - HAA3B employs a time-dependent lognormal distribution when agglomeration is prevalent, then switches to a stirred-settling model. The time-dependent parameters which characterize the lognormal size-distribution function are obtained by numerical integration of three simultaneous differential equations for the zeroth through the second volume moments. The volume moments differential equations were obtained by analytic integration of the appropriate moments of the integro-differential equation. Additional differential equations for the plated, settled, and leaked functions are included in the simultaneous set; a mix of Adams-Moulton, Runge-Kutta, and Gaussian procedures are used to solve the system of simultaneous, first-order differential equations.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
 - 1000 time-steps in lognormal model part
 - 42 discrete radii for leakage distribution calculations
 - 50 source-rate input values
 - 50 leak-rate input valuesApplicability has been verified for moderate concentrations in moderate-sized vessels, and for limited types of sources, only.
6. TYPICAL RUNNING TIME - Approximately 15 seconds are required for execution on a Model 168.
7. UNUSUAL FEATURES OF THE PROGRAM - The program computes plated, settled, suspended, and leaked masses, distribution parameters, and effective radii. It prepares input cards, which describe leaked mass, for use in evaluating aerosol behavior in a second compartment, has a Klyachko correction calculation, and includes input parameters to characterize effective density and collision efficiency.
8. RELATED AND AUXILIARY PROGRAMS - Leak rates may be obtained from the AI SOFIRE code. Fallout rate data may be used in COMRADEX3 (ACC Abstract 663).

9. STATUS - Abstract first distributed December 1970.
IBM360 version of HAA3 submitted February 1970, replaced in April 1977 by IBM370 version of HAA3B submitted January 1976, sample problem executed by ACC March 1977 on an IBM370/195.
10. REFERENCES - R. S. Hubner, E. U. Vaughn and L. Baurmash, HAA-3B User Report, AI-AEC-13038, March 1973.
J. M. Otter, Understanding the HAA-3B Input Parameters Used to Characterize the Aerosol Particle Size Distribution, N707-TI-130-041, August 1975.
11. MACHINE REQUIREMENTS - A logical unit 5 for input, unit 6 for output, 16 for a scratch unit, and a card punch unit.
SC-4020 CRT coding is included as comment cards. Storage allocation is less than 150K bytes.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV (H)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
O/S Release 21.6.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. Otter, E. U. Vaughan, L. Baurmash, R. Koontz
Atomics International Division
Rockwell International
8900 De Soto Avenue
Canoga Park, California 91304
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (2119 cards)
Sample problem (18 cards)
Reference reports
17. CATEGORY - G
KEYWORDS - aerosols, lognormal distribution, leakage, particles,
HAA3 codes, SOFIRE codes, COMRADEX codes

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8. RELATED AND AUXILIARY PROGRAMS - The CRECT code was used to make the necessary alterations to the ENDF/B tapes. The data decks were created for the MUFT4, MUFT5, GAM1 (ACC Abstract 33), and GAM2 programs.
9. STATUS - Abstract first distributed December 1970.
CDC6600 version submitted February 1970.
10. REFERENCE - S. Kellman and D. E. Kusner, Description of the Generation of Data Decks by ETOG-1 for Use in Creating MUFT and GAM Libraries, WCAP-3845-2 (ENDF-133), January 1970.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED -
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
S. Kellman and D. E. Kusner
PWR Systems Division
Westinghouse Electric Corporation
Box 355
Pittsburgh, Pennsylvania 15230
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal (5 tapes*)
MUFT4 (1 tape 59 files)
MUFT5 (1 tape 59 files)
GAM1 (1 tape 47 files)
GAM2 (2 tapes TAPE1-25 files, TAPE2-22 files)
Reference report
* variable number of 80-character records per file
17. CATEGORY - Z
KEYWORDS - cross sections, libraries, MUFT4 codes, MUFT5 codes, GAM1 codes, GAM2 codes, ETOG codes, CRECT codes

1. NAME OR DESIGNATION OF PROGRAM - FLASH6/FLASH4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370, CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - FLASH6 and earlier FLASH programs are used to determine the transient response of a water-cooled reactor or hydraulic system to severe variable pressure operation. As with previous editions, FLASH6 permits the user to model the reactor plant using a flexible combination of control volumes (nodes), connecting flow paths, pumps, and steam generators. A detailed representation of the core region may be obtained by using up to 80 pressure-determining nodes within the core. The core nodes are connected in one-dimensional chains to represent up to 20 core flow paths. A one-dimensional heat conduction model with up to five radial nodes is used to represent the flow of heat from the fuel element to each core fluid node. Thermal resistance of the fuel-clad gap is continuously calculated during the transient as a function of varying gap dimension, temperature, and pressure. Thirty nodes and 60 flow paths are available to model the non-core regions of the plant.
4. METHOD OF SOLUTION - The FLASH6 program uses an implicit numerical integration technique to solve the conservation equations of mass and energy for the control volumes and conservation of momentum for the flow paths. Thermodynamic equilibrium is assumed. Pressure in the control volumes is obtained from the equation of state for water. In addition, heat may be added to control volumes by the reactor core model, steam generator models, and plant metal heat capacity models. Fluid properties are generated from stored data.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - In FLASH6 up to 30 pressure-determining nodes and 60 flow paths are available to represent the reactor plant. A maximum of 80 pressure-determining nodes may be used to describe the reactor core detail, with axial sectioning of up to 20 parallel core channels.

In FLASH4 up to 20 pressure-determining nodes and 40 flow paths are available to represent the reactor plant. The plant and core geometry are assumed fixed in time, hence the solution is not applicable after significant dimensional change.
6. TYPICAL RUNNING TIME - FLASH4 running time varies between .001 and 100 times real time, depending on the type of the problem.
7. UNUSUAL FEATURES OF THE PROGRAM - FLASH4 can be applied to any water-cooled reactor geometry or plant configuration. It includes acoustic effects for both subcooled and saturated blowdowns. The numerical techniques of FLASH4 result in shorter running time for the long-term solutions of slowly varying transients, e.g. small leaks.

8. RELATED AND AUXILIARY PROGRAMS - Earlier FLASH editions were FLASH and FLASH2 (ACC Abstract 295). FLASH4 uses the environmental routines which were converted for the IBM360 version of PDQ7 (ACC Abstract 275). FLASH6 is an updated version of FLASH5, which was an outgrowth of FLASH4. FLASH6 uses the environmental routines from the Bettis Environmental Library (ACC Abstract 665).
9. STATUS - Abstract first distributed December 1970.
CDC6600 version of FLASH4 submitted January 1970,
replaced by CDC7600 version of FLASH6 October 1976.
IBM360 version of FLASH4 submitted August 1974, sample
problem executed by ACC October 1974 on an
IBM370/195.
10. REFERENCES - J. J. Beyer, W. D. Peterson, D. A. Prelewicz, and
G. W. Swartele, FLASH-6: A FORTRAN-IV Computer Program for Reactor
Plant Loss-of-Coolant Accident Analysis, WAPD-TM-1249, July 1976.
J. H. Murphy, J. A. Redfield, and V. C. Davis,
FLASH-5: A FORTRAN-IV Program for Transient Simulation of a
Reactor Plant with a Detailed Core, WAPD-TM-999, May 1973.
T. A. Porsching, J. H. Murphy, J. A. Redfield, and
V. C. Davis, FLASH4, A Fully-implicit FORTRAN IV Program for the
Digital Simulation of Transients in a Reactor Plant, WAPD-TM-840,
March 1969.
J. A. Redfield, J. H. Murphy, V. C. Davis, FLASH-2,
A FORTRAN IV Program for the Digital Simulation of a Multinode
Reactor Plant During Loss-of-Coolant, WAPD-TM-666, April 1967.
S. G. Margolis and J. A. Redfield, FLASH, A Program
for Digital Simulation of the Loss-of-Coolant Accident, WAPD-TM-
534, May 1966.
C. J. Pfeifer, CDC-6600 Fortran Programming - Bettis
Environmental Report, WAPD-TM-668, January 1967.
W. R. Cadwell, Ed., Reference Manual - Bettis Pro-
gramming Environment, WAPD-TM-1181, September 1974.
G. W. Swartele, FLASH6 Compliance with American
Standard Fortran, BAPL Note, October 1976.
IBM360/370 FLASH4 Reactor Transients Simulation Pro-
gram Listing, MDC N2267-094, Volumes 1 and 2, July 1974.
11. MACHINE REQUIREMENTS - 250K bytes (IBM360), 144K central memory
and 200K ECS or LCM memory (CDC6600 or 7600)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360,370 (IBM360,370), SCOPE 3.3 (CDC6600), SCOPE 1.1 (CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
All the FLASH4 subroutines were converted to the IBM360 except the
plotting routines. However, all references to the plotting were
left intact so that anyone wishing to add this feature will find
it less difficult. The majority of the FLASH6 program conforms
to ANSI FORTRAN (1966). Exceptions are PRINT and PUNCH state-

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
ments, DATA statements with implied DO loops, and ENCODE statements. The viscosity routine VISL contains an ENTRY statement. The environmental routine NEXT called to load overlays may have a different number of arguments on each call. The environmental function JPARAM is called with a Hollerith argument.
15. NAME AND ESTABLISHMENT OF AUTHORS -
7600 FLASH6 J. J. Beyer, W. D. Peterson, D. A. Prelewicz,
and G. W. Swartele
Bettis Atomic Power Laboratory
Westinghouse Electric Corporation
Box 79
West Mifflin, Pennsylvania 15122

360 FLASH4 C. K. Herkstroeter and K. Geib
McDonnell Douglas Automation Company
Box 516
St. Louis, Missouri 63166
Gilbert Associates, Inc.
P. O. Box 1498
525 Lancaster Avenue
Reading, Pennsylvania 19603
16. MATERIAL AVAILABLE - Restricted Distribution
Magnetic Tape Transmittal
Source decks (FLASH6 7600-29,910 cards, FLASH4 360-15,907
cards)
Sample problems (FLASH6 7600-217 cards, FLASH4 360-23 cards)
Sample problem output (FLASH6 37 selected pages, 1 microfiche)
Control information (FLASH4 JCL 360-78 cards)
2314 load module FLASH (FLASH4 360-320 blocks)
Reference reports
FLASH6 WAPD-TM-1249 and BAPL Note
FLASH4 WAPD-TM-840, WAPD-TM-666, MDC N2267-094
17. CATEGORY - G
KEYWORDS - reactors, transients, accident, containment, fuels,
fluid flow, pressure distribution, coolants, blowdown,
reactor safety, FLASH codes

1. NAME OR DESIGNATION OF PROGRAM - CYGRO3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - CYGRO3 is an extensive modification of CYGRO1 and CYGRO2 (ACC Abstract 266). Basically the program calculates temperatures, deformation, and stresses in clad fuel rods as a function of a history of power and coolant conditions. Axial and circumferential uniformity are assumed. Bubble growth and migration are included. The main changes from CYGRO1 and CYGRO2 are in the area of void migration, fuel cracking, clad collapse, representation of in-pile creep and clad anisotropy.
4. METHOD OF SOLUTION - The fuel and clad are divided into a number of concentric rings. Equations for balance of forces and displacements between the rings are used to establish equilibrium. Plastic flow (creep) is treated on an incremental basis. The required sizes of time-steps are calculated internally on the basis of allowed stress and strain increments.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maximum of - 30 rings (fuel plus clad)
6. TYPICAL RUNNING TIME - Each basic time-step takes about 0.01 second per fuel ring (i. e. 0.1 second for 10 rings). The number of time-steps per history input-step varies between 50 and 500.
7. UNUSUAL FEATURES OF THE PROGRAM - Bending moments to hold the fuel rod straight when situated in a power gradient are calculated by a perturbation analysis. Corresponding deflections if allowed to go free are also determined. Axial forces produced by supports can be factored into the calculations. The effect of a central heat producing plug inside the fuel can be calculated. Clad collapse pressures can be specified as a function of time.
8. RELATED AND AUXILIARY PROGRAMS - CYGRO1 and CYGRO2. CYGRO3 uses the Bettis Environmental Routines (ACC Abstract 478).
9. STATUS - Abstract first distributed December 1970.
CDC6600 version submitted July 1970, replaced
by corrected version August 1971.
IBM360,370 preliminary version submitted February 1973,
replaced by Edition B March 1975, sample problems
executed by ACC April 1975 on IBM370/195.
10. REFERENCES - E. Duncombe and C. M. Friedrich, CYGRO-3 - A Computer Program to Determine Temperatures, Stresses and Deformations in Oxide Fuel Rods (LWBR Development Program), WAPD-TM-961, March 1970.

C. J. Pfeifer, CDC-6600 FORTRAN Programming - Bettis

10. REFERENCES (CONTINUED)
Environmental Report, WAPD-TM-668, January 1967.
ACC Programming Note 73-4, August 28, 1972.
Input Description for CYGRO-3 (TVA-Aerojet IBM 360/370 Version), ACC Note 75-36, April 28, 1975.
11. MACHINE REQUIREMENTS - 140,000 (octal) words
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (CDC6600), FORTRAN IV and Assembly language (IBM360)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC6600), OS/360,370 (IBM360,370).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - CYGRO3 calls a subroutine TICK which is not included with the program nor with the Bettis Environmental Routines. Therefore, the user will have to provide his own subroutine TICK. CALL TICK(HRS) is used to obtain elapsed time for the current job. It sets HRS (REAL) to the elapsed charge time in hours.
15. NAME AND ESTABLISHMENT OF AUTHORS -
6600 E. Duncombe and C. M. Friedrich
Bettis Atomic Power Laboratory
Westinghouse Electric Corporation
Box 79
West Mifflin, Pennsylvania 15122

360,370 R. N. Hagen
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, Idaho 83401
D. C. Bell and T. R. Walker
Tennessee Valley Authority
523 Power Building
Chattanooga, Tennessee 37401
16. MATERIAL AVAILABLE - Restricted Distribution
Magnetic Tape Transmittal
Source decks (6600-5206 cards, 360-6000 FORTRAN cards and 2299 BAL cards)
Load module (2314 297 blocks)
Sample problems (6600-95 cards, 360-483 cards)
Sample problem output (6600-15 pages, 360-81 selected pages)
Reference reports and Notes
17. CATEGORY - I
KEYWORDS - stresses distribution, fuel elements, deformation, temperature, pressure, CYGRO codes

1. NAME OR DESIGNATION OF PROGRAM - KENO2/KENO4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - KENO is a multigroup, Monte Carlo criticality code containing a special geometry package which allows easy description of systems composed of cylinders, spheres, and cuboids (rectangular parallelepipeds) arranged in any order with only one restriction. Each geometrical region must be described as completely enclosing all regions interior to it. For systems not describable using this special geometry package, the program can use the generalized geometry package (GEOM) developed for the O5R Monte Carlo code. It allows any system that can be described by a collection of planes and/or quadratic surfaces, arbitrarily oriented and intersecting in arbitrary fashion. Rectangular arrays of fissile units are allowed with or without external reflector regions. Output from KENO consists of keff for the system plus an estimate of its standard deviation and the leakage, absorption, and fissions for each energy group plus the totals for all groups. Flux as a function of energy group and region and fission densities as a function of region are optional output.
4. METHOD OF SOLUTION - The scattering treatment used in KENO assumes that the differential neutron scattering cross section can be represented by a P1 Legendre polynomial. Absorption of neutrons in KENO is not allowed. Instead, at each collision point of a neutron tracking history the weight of the neutron is reduced by the absorption probability. When the neutron weight has been reduced below a specified point for the region in which the collision occurs, Russian roulette is played to determine if the neutron's history is to be terminated at that point or if the neutron is to survive with an increased weight. Splitting of high-weight neutrons is allowed in order to minimize the variance in keff for systems with regions of widely varying average weights.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - KENO4 is flexibly dimensioned so that the allowed size of a problem is limited only by the total data storage available. A method for determining the size of a problem is included in reference 8.
6. TYPICAL RUNNING TIME - Typical KENO2 problems run between 2 and 30 minutes on the CDC6600, depending on the number of histories requested, the statistical weighting used, and the presence or absence of reflectors. Running time for the IBM360 version of KENO2 depends on the problem and number of histories. For unmoderated metal arrays approximately 3 minutes are required on an IBM360/65. For a moderated system, approximately 15 to 30 minutes give adequate statistics.

KENO4 running times are highly problem-dependent. A bare 2x2x2 array of highly-enriched cylindrical units was executed on an

6. TYPICAL RUNNING TIME (CONTINUED)
IBM360/195. A total of 22,500 neutron histories were run in 0.281 minutes for a deviation of 0.52% in k-effective. The corresponding 360/91 time is 0.5 minutes. The same problem was run with a 6-inch paraffin reflector, tracking 18,600 histories for a deviation of 0.69% in k-effective in 2.249 minutes of 360/195 time. The time required to execute a problem depends on the complexity of the geometry, the number of energy groups, and the type of materials in the problem.
7. UNUSUAL FEATURES OF THE PROGRAM - KENO2 (CDC6600) input is extensively checked for consistency and completeness. For the IBM360 version of KENO2 a simplified geometry description is permitted when no surfaces intersect.
KENO4 has a simple geometry input, easily describes arrays of units, allows the description of several units of different size and shape in the same problem, and uses multigroup cross sections. A restart capability is available, enabling the user to run a long problem in several short passes. A search option is available for altering the unit size or the spacing between units in order to achieve a predetermined value of keff.
8. RELATED AND AUXILIARY PROGRAMS - Related codes include ANISN, DOT, GEOM, and O5R. The 6600 version includes an auxiliary program, named K2TAPE, to read the cross section library data and create a binary file to be read by KENO2.
KENO4, an extension and improvement of KENO, is a module of AMPX at ORNL. KENO4 can read cross sections from an AMPX working format interface library. HANDY is a program to aid in preparing O5R (generalized geometry) input for KENO4; GEOMCHK reads and checks the geometry input for KENO4; PICTURE aids in preparing correct input data for the general geometry routine GEOM.
9. STATUS - Abstract first distributed January 1972.
IBM360 version of KENO submitted May 1970, replaced by second version September 1971, replaced by KENO4 December 1975, sample problems executed by ACC July 1976 on an IBM360/195, card-image libraries and conversion routines added May 1977.
CDC6600 version of KENO2 submitted July 1973, library and auxiliary program added August 1974.
IBM360 version of KENO2 submitted August 1973, revised April 1974, sample problem executed by ACC.
10. REFERENCES - G. E. Whitesides and N. F. Cross, KENO - A Multigroup Monte Carlo Criticality Program, CTC-5, September 10, 1969.
KENO Data Guide, CTC-5 Errata pp. 21-32, September 1971.
Deanne Dickinson, Rocky Flats KENO II Manual, April 1973.
ACC 450 KENO2 CDC6600 Programming Notes, July 1973.
KENO2, ACC No. 450.360B, Argonne Code Center Programming Note 74-26, March 6, 1974.

10. REFERENCES (CONTINUED)

- H. K. Clark, KENO-II Memorandum, DPST-70-449 (revised), August 1, 1973.
- KENO2, 450.6600, Tape Description, Argonne Code Center Programming Note 75-21, January 1975.
- L. M. Petrie and N. F. Cross, KENO IV - An Improved Monte Carlo Criticality Program, ORNL-4938, November 1975.
- References for KENO IV Support Codes, ORNL Note, 1975.
- G. E. Whitesides, Adjoint Biasing in Monte Carlo Criticality Calculations, Transactions of the American Nuclear Society, Vol. 2, No. 1, June 1968.
- J. R. Knight and L. M. Petrie, 16 and 123 Group Weighting Functions for KENO, ORNL-TM-4660, November 1975.
- N. M. Greene, J. L. Lucius, W. E. Ford, III, J. E. White, R. Q. Wright, and L. M. Petrie, AMPX - A Modular Code System for Generating Coupled Multigroup Neutron-Gamma Libraries from ENDF/B, ORNL-TM-3706, March 1976.
- D. C. Irving and R. M. Freestone, Jr., O5R, A General Purpose Monte Carlo Transport Code, ORNL-3622, February 1965.
- D. C. Irving and G. W. Morrison, PICTURE: An Aid in Debugging Input Data, ORNL-TM-2892, May 1970.
- G. R. Handley and J. N. McLeod, A User's Manual for HANDY (A FORTRAN IV Program for Calculating Numerical Coefficients of the General Second-degree Equation in Three Variables), Y-1615, June 1968.

11. MACHINE REQUIREMENTS - The CDC6600 program requires 64K words of fast core, a disk facility or one or more tape units. The IBM360 version of KENO2 requires approximately 150K of core with larger problems requiring more core. The IBM360 version of KENO4 requires 1 to 6 scratch units besides the standard input/output units and a minimum of about 200K core.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV and Assembly language (IBM360), FTN FORTRAN with COMPASS subroutine (CDC6600)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360) and SCOPE 3.3 (CDC6600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The enclosed cross section and albedo data are included for the sole purpose of allowing the sample problems to be run for instructional purposes and should not be assumed useful for any other purpose without close examination as to their applicability. The Assembly language subroutines mentioned in item 12 include TIMFAC, DATIM, ALOCAT, a random number package RANDNUM (entries FLTRN, AZIRN, EXPRN, and GTISO), and a timing subroutine PULL (entries PULL and ITIME). Substitute FORTRAN routines are supplied for all KENO4 Assembly language routines except the random number routine, FLTRN.

15. NAME AND ESTABLISHMENT OF AUTHORS -

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E. I. du Pont de Nemours and Company, Inc.
Aiken, South Carolina 29801
- 360 KENO4 L. M. Petrie and N. F. Cross
Oak Ridge National Laboratory
P. O. Box X
Oak Ridge, Tennessee 37830

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal

- Source decks (KENO2 6600-5109 cards, 360-5408 cards, KENO4 360-8485 cards)
- Auxiliary program source decks (KENO2 K2TAPE 6600-77 cards, KENO4 HANDY 360-263 cards, PICTURE 360-199 cards, GEOMCHK 360-77 cards, Cross section library processor 360-239 cards, Albedo library processor 360-27 cards, Weight library processor 360-25 cards)
- Object deck (KENO2 360-78 cards)
- 2314 load modules (KENO2 360-312 blocks, KENO4 360-525 blocks)
- Sample problem (KENO2 6600-369 cards, 360-569 cards, KENO4 360-342 cards)
- Libraries (KENO2 6600-7725 cards, KENO4 360-Cross sections 68 records* and 8263 cards, Albedos 46 records+ and 12,365 cards, Weights 8 records# and 1117 cards)
- Control information (KENO2 360-43 cards, KENO4 360-84 cards)
- Sample problem output (KENO2 6600-58 pages)
- Reference reports, Errata, Manual, Notes, and Memorandum appropriate to version
- * 1200-byte maximum length
- + 9000-byte maximum length
- # 28,160-byte maximum length

17. CATEGORY - C

KEYWORDS - multigroup, Monte Carlo method, criticality, leakage, absorption, fission, statistics, 3-dimensional, geometries, lifetime, multidimensional, reactivity, x-y-z, flux, transport theory, searches, ANISN codes, DOT codes, GEOM codes, O5R codes, K2TAPE codes, HANDY codes, PICTURE codes, GEOMCHK codes

1. NAME OR DESIGNATION OF PROGRAM - SAFE-CRACK
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - SAFE-CRACK performs a visco-elastic analysis of plane and axisymmetric composite concrete structures subjected to transient temperature and mechanical loadings. The specific creep of concrete as an age and temperature-dependent function, and concrete failure under combined stresses are considered. Particular emphasis is placed on the cracking analysis in concrete structures and the nonlinear dependence of creep property on transient temperature.
4. METHOD OF SOLUTION - The program uses the finite-element method which reduces the problem to the solution of a system of coupled integral equations. The Cholesky method is used to solve the linear system of equations and the trapezoidal rule is applied for the time integration.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
300 nodes
675 elements
70 time-steps
6. TYPICAL RUNNING TIME - 90 minutes are required for a full-capacity problem.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - SAFE-CREEP (ACC Abstract 300)
9. STATUS - Abstract first distributed January 1972.
UNIVAC1108 version submitted May 1970.
10. REFERENCES - Y. R. Rashid, Nonlinear Quasi-static Analysis of Two-dimensional Concrete Structures, Part I Theory, Part II Computer Program Manual, GA-9994, March 23, 1970.
R. D. Browne, Properties of Concrete in Reactor Vessels, Conference on Prestressed Concrete Pressure Vessels at Church House, Westminster, S.W. 1, 13-17 March 1967, The Institute of Civil Engineers, London, 1968, pp. 131-151.
NTRAN, I/O Routines for Tape and Drum, excerpt from UNIVAC 1107 FORTRAN IV Programmers Reference Manual, UP-3569, Rev. 1.
11. MACHINE REQUIREMENTS - 65K memory and 13 tapes
12. PROGRAMMING LANGUAGE USED - FORTRAN V
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC2.

1. NAME OR DESIGNATION OF PROGRAM - LIFE3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM370, CDC7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - The LIFE3 computer code was developed to calculate the thermal and mechanical response of mixed-oxide fuel elements in a fast-reactor environment. It incorporates a one-dimensional, steady-state heat-transfer analysis and a finite-strain-theory structural analysis based on generalized plane strain and the method of successive elastic solutions. An incremental approach is used so that temperatures, stresses, and strains can be calculated during any specified history of reactor power cycling. Fuel-cladding and sodium-cladding chemical attack is treated by a cladding wastage model. Up to six axial sections are allowed to account for axial variations in power and coolant temperature. Fuel restructuring; migration of fabricated and swelling porosities; fuel and cladding thermal expansion, elasticity, swelling, and creep; fission-gas release; and fuel cracking, crack healing, and hot pressing are included in the analysis. LIFE3 is the reference ERDA code for calculating the performance of fast breeder reactor fuel elements under normal operating conditions, including power cycling.
4. METHOD OF SOLUTION - The fuel element is assumed axisymmetric for purposes of the analysis. The thermal and mechanical conditions of the fuel element are calculated incrementally as a function of time. The reactor operating conditions are averaged over each time-step, and the behavior of the fuel element is calculated as a function of the reactor operating history. Thermal calculations are based on the assumption of steady-state radial heat flux in the fuel and cladding. The steady-state axial temperature distribution in the coolant is calculated at the beginning of each time-step based on specified coolant inlet and outlet temperatures, the axial power distribution of the element, and fuel-element dimensions at the end of the previous step. Then the radial temperature distribution is calculated from the local coolant temperature, linear heat rating, cladding-coolant and fuel-cladding heat transfer coefficients, and fuel and cladding thermal conductivity. Once the temperature distribution is calculated for a time-step, the incremental fuel restructuring and fission-gas release, thermal expansion of fuel and cladding, and plenum pressure are calculated. The mechanical analysis is based on generalized plane strain and the method of successive elastic solutions. The plenum pressure, coolant pressure, and axial loads imposed by the core restraint system provide the boundary conditions.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The fuel element is assumed to be axisymmetric with maxima of -
 - 5 equal-length fueled sections
 - 20 cylindrical shells per fueled section

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)
1 plenum section
The thermal calculations assume steady-state radial heat flux in fuel and cladding, and steady-state axial temperature distribution in the coolant.
For a closed fuel-cladding gap, the interface pressure is calculated under the assumption that the fuel and cladding displacement increments are equal at the interface.
6. TYPICAL RUNNING TIME - To compile and execute the sample problem required 4 minutes on the IBM370/195, 60 CP seconds on the CDC7600.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED OR AUXILIARY PROGRAMS - LIFE1 and LIFE2 are earlier editions.
9. STATUS - Abstract first distributed January 1972.
IBM360 version of LIFE1 submitted August 1970, replaced by IBM370 version of LIFE3 submitted November 1976, sample problem executed by ACC July 1977 on an IBM370/195.
CDC7600 version of LIFE3 submitted November 1976, sample problem executed by ACC July 1977 on a CDC7600 via I/O terminal at Brookhaven National Laboratory.
10. REFERENCES - M. C. Billone, B. L. Harbourne, V. Z. Jankus, R. B. Poeppel, T. S. Roth, W. J. Shack, J. D. Stephen, B. Sundquist, F. R. Taraba, J. E. Turner, and S. Zawadzki, The LIFE-III Fuel-Element Performance Code, ERDA-77-56, July 1977.
11. MACHINE REQUIREMENTS - 325K bytes of memory (IBM370/195) and 125,000 (octal) words (CDC7600) with one scratch file and one file for restart information, in addition to the system input and output units.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/370 (IBM370), SCOPE 2.1 (CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - Logical unit 8 is used for problem input and logical unit 6 for printed output. Logical unit 5 is used as a scratch file and logical unit 15 is used to write or read restart data. IBM users must specify GO.FT05F001 with RECFM=VBS. Since LIFE3 has no provision for plotting, specifying NPLOT.NE.0 on input card number 3 will have no effect. TLEFT is part of the ANL IBM370 environment. The function is called with one dummy argument which returns to the calling program the difference, in hundredths of a second, between the user's time estimate for the job and the elapsed time, i.e. the time left. The function TLEFT supplied

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
with the package returns TLEFT=10000.0 in the IBM version or
TLEFT=100.0*(TIMLIM-(CP seconds used)), where TIMLIM=2000.0 in
the CDC version.
15. NAME AND ESTABLISHMENT OF AUTHORS -
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T. S. Roth and B. E. Sundquist
Advanced Reactors Division
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Box 158
Madison, Pennsylvania 15663
- * Engineering contact
- + Program contact
16. MATERIALS AVAILABLE - Restricted Distribution
Magnetic Tape Transmittal
Source decks (LIFE3 370-5801 cards, 7600-5871 cards,
TLEFT 370-10 cards)
Sample problem input (370-33 cards, 7600-33 cards)
Sample problem output (370-36 selected pages, 1 microfiche;
7600-32 selected pages, 1 microfiche)
Control information (JCL 370-72 cards)
Reference report
17. CATEGORY - I
KEYWORDS - fuel elements, fast reactors, steady state, thermal
performance, mechanical performance, heat transfer,
temperature distribution, fuel-clad interaction,
clad failure, deformation, gap conductance, internal
pressure, stress, swelling, porosity, creep, cracking,
crack healing, hot pressing, LIFE codes

1. NAME OR DESIGNATION OF PROGRAM - CONCEPT4/CONCEPT3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - CONCEPT3 generates a capital cost estimate for a selection of single unit and multiple unit PWR, BWR, coal, oil and gas, steam-electric power plants with run-of-river, mechanical draft, or natural draft cooling systems of specified electrical output for any of twenty U. S. cities, a hypothetical Middletown, and two Canadian cities, and prints as a result a detailed cost breakdown.
In addition to the above, CONCEPT4 provides added cost models for HTGR plants, modified second-unit cost models, and modifications to simplify data input for optional calculations, to accept time-dependent escalation rates, and to calculate allowances for interest during construction and escalation during construction based on cash flow curves modified for a specified receipt-of-construction-permit date.
4. METHOD OF SOLUTION - CONCEPT is supported by two auxiliary-generated libraries - (1) CONTAC which generates cost model files where the model is extrapolated by CONCEPT to other sizes by internal scaling equations, and (2) CONLAM which generates files containing historical data for labor and materials that are used for adjusting costs at a base location and time to a specified location and time.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CONCEPT3 accepts power levels of 500 to 2000 MW(e), while CONCEPT4 accepts levels of 500 to 1500 MW(e). The auxiliary program CONLAM is limited to 30 time periods of cost history for 23 locations without program alterations.
6. TYPICAL RUNNING TIME - A single CONCEPT3 or CONCEPT4 cost estimate is generated in less than 1 minute.
7. UNUSUAL FEATURES OF THE PROGRAM - CONCEPT utilizes execution-time NAMELIST variations of stored constants, printer plotting cash flow curves, and numerous output and solution options.
8. RELATED AND AUXILIARY PROGRAMS - CONCEPT requires the use of CONLAM to generate a user file of labor and materials cost history and CONTAC to generate a user file of cost models to support CONCEPT.
9. STATUS - Abstract first distributed January 1972.
IBM360 version of CONCEPT submitted September 1971,
replaced by CONCEPT2 March 1973, replaced by CONCEPT3 March 1974, replaced by CONCEPT4 April 1976,
replaced by Edition B February 1977, sample
problem executed by ACC April 1977 on an IBM370/195.
UNIVAC1108 version of CONCEPT3 submitted May 1975.

10. REFERENCES - H. I. Bowers, R. C. DeLozier, L. D. Reynolds, and B. E. Srite, CONCEPT - Computerized Conceptual Cost Estimates for Steam-Electric Power Plants - Phase II User's Manual, ORNL-4809, April 1973, as amended by CONCEPT User's Memoranda 1-4, April-June 1973.
CONCEPT III Supplemental User's Instructions, ORNL Note, March 25, 1974.
R. J. Barnard, CONCEPT User's Memo #6, March 27, 1974.
R. J. Barnard, CONCEPT User's Memo #8, April 30, 1974.
H. I. Bowers, CONCEPT User's Memo #9, October 28, 1974.
H. I. Bowers, R. C. DeLozier, R. J. Barnard, CONCEPT - A Computer Code for Conceptual Cost Estimates of Steam-Electric Power Plants, Phase IV User's Manual, ERDA-108, June 1975.
R. J. Barnard, CONCEPT Phase IV System (CONSYS4), Union Carbide Corporation Note, March 1976.
R. J. Barnard, CONCEPT IV User's Memo #4-1, April 1976.
R. J. Barnard, CONCEPT IV User's Memo #4-2, May 17, 1976.
CONCEPT4, ACC No. 498.360, Argonne Code Center Programming Note 76-43, July 15, 1976.
11. MACHINE REQUIREMENTS - 150K bytes, one scratch disk or tape, two support tapes, and the standard I/O units are needed for CONCEPT3; less than 220K bytes, three scratch files, two support files, and the standard I/O units for CONCEPT4.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV (G)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360) and EXEC8 (UNIVAC1108).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The CONCEPT4 main program uses the IBM FORTRAN Extended error feature (ERRSET) to permit zero division and exponent overflow which may require local alterations. The job control language supplied is designed for use on ASP 3.2 at ORNL and will require alterations for other supervisory systems. The program rewinds the system input file on ASP 3.2.
15. NAME AND ESTABLISHMENT OF AUTHORS -
360 CONCEPT4 H. I. Bowers and C. R. Hudson, II
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R. C. DeLozier and R. J. Barnard*
Computer Sciences Division
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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

Oak Ridge, Tennessee 37830

1108 CONCEPT3 J. E. Gratteau and T. J. Zielinski
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* 360 Contact

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal

Source decks (CONCEPT3 1108-1672 cards, CONCEPT4 360-2448 cards, IDAY 360-63 cards)

Sample problems (CONCEPT3 1108-8 cards, CONLAM3 1108-3359 cards, CONTAC3 1108 42 files-737 cards each; CONCEPT4 360-304 cards, CONLAM4 360-3474 cards, CONTAC4 360 48 files with a total of 24,384 cards)

Control information (CONCEPT3 1108-47 cards)

Auxiliary programs (CONLAM3 1108-499 cards, CONTAC3 1108-647 cards; CONLAM4 360-499 cards, CONTAC4 360-579 cards)

Sample problem output (CONCEPT3 1108-79 selected pages)

Reference reports, supplemental user's instructions, user's memos, UCC Note, and ACC Note appropriate to version

17. CATEGORY - D

KEYWORDS - economics, power plants, PWR reactors, BWR reactors, HTGR reactors, CONCEPT codes, CONLAM codes, CONTAC codes

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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
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16. MATERIAL AVAILABLE - Restricted Distribution
Magnetic Tape Transmittal (2 tapes)
Source decks (DUZ2 part 1-12,808 cards, DUZ2 part 2-12,823 cards)
Sample problem (72 cards)
Reference report, WAPD-TM-926
17. CATEGORY - I
KEYWORDS - inelastic stresses, 2-dimensional, finite-element, deformation, HOT2 codes, BETTIS ENVIRONMENTAL ROUTINES codes

1. NAME OR DESIGNATION OF PROGRAM - THRES2
IT IS OPERABLE - CDC6600, IBM360
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH
IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - THRES2 calculates neutron-induced reaction cross sections from 0 to 20 MeV and fission spectrum averages for nuclides having 21 to 82 protons. Reaction products considered are 2n, 3n, p, d, t, He-3, alpha, np, nd, nt, n-He3, n-alpha, pn, 2p, p-alpha, alpha-n, alpha-p, and dn.
4. METHOD OF SOLUTION - A statistical model with empirically determined parameters is employed. Binding energies, if calculated by the program, are calculated from an empirical mass formula due to Hillman (BNL-846). Since direct reaction effects can be important the calculations are normalized to compensate partly for deficiencies in the model. The empirical model is similar to previous (n,2n) work but is extended to include charged particle emission.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maximum of -
19 reaction types
6. TYPICAL RUNNING TIME - Approximately 30 seconds per nuclide are required on a CDC6600 for the calculation of 19 reactions in the energy range 0 to 20 MeV in 0.5 MeV steps. Approximately 1 minute per nuclid is required for fission spectrum averages of the 19 reaction cross sections.
7. UNUSUAL FEATURES OF THE PROGRAM - Fitting parameters and binding energies are supplied by the program but may optionally be specified as input by the user. Output in the ENDF format is available. Uncertainties are estimated.
8. RELATED AND AUXILIARY PROGRAMS - THRES2 replaces the earlier THRESH program.
9. STATUS - Abstract first distributed October 1972.
CDC6600 version of THRESH submitted October 1971,
replaced by CDC6600 version of THRES2 June 1976,
sample problem executed by ACC June 1976 on a
CDC6600, revised to Edition B June 1977.
IBM360 version of THRES2 submitted January 1977, sample
problem executed by ACC June 1977 on an IBM370/195.
10. REFERENCES - S. Pearlstein, Neutron-Induced Reactions in Medium Mass Nuclei, J. Nuc. Energy, Vol. 27, pp. 81-99, 1973.
S. Pearlstein, Analysis of (n,2n) Cross Sections for Medium and Heavy Mass Nuclei, Nuclear Science and Engineering, Vol. 23, pp. 238-250, 1965.
S. Pearlstein, Neutron Cross Sections and Their

10. REFERENCES (CONTINUED)
Uncertainties Obtained from Nuclear Systematics, NBS Special Publication 425, pp. 332-334, 1975.
S. Pearlstein, Program THRES2, NNCSC Report, December 1975.
11. MACHINE REQUIREMENTS - The program uses 13K (decimal) on the CDC6600.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC6600), OS/360 (IBM360).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - A PDP10 version of THRES2 has been prepared and used at BNL also.
15. NAME AND ESTABLISHMENT OF AUTHORS -
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National Nuclear Data Center
Brookhaven National Laboratory
Upton, Long Island, New York 11973

360 L. Garcia de Viedma
OECD NEA Computer Program Library
Casella Postale N. 15
Ispra (Varese) Italy
16. MATERIAL AVAILABLE -
Source deck (6600-1246 cards, 360-1246 cards)
Sample problems (6600-11 cards, 360-11 cards)
Reference reports, BNL-16271 and NNCSC Report
17. CATEGORY - A
KEYWORDS - cross sections, fission spectra, neutrons,
THRESH codes

1. NAME OR DESIGNATION OF PROGRAM - TDOWN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635
3. DESCRIPTION OF PROBLEM OR FUNCTION - TDOWN generates spatial and composition-dependent cross section sets from a Bondarenko type, generalized cross section file called GMUG. A TDOWN problem can be a simple description of material compositions with an input flux spectra or a problem can consist of a multi-region, two-dimensional reactor description with several zero- or one-dimensional flux solutions to provide the flux for spectral adjustments of the cross section sets.
4. METHOD OF SOLUTION - TDOWN uses the rapid cross section adjustment procedure and a generalized file. For each material, the file contains the groupwise values of infinitely-dilute cross sections, resonance self-shielding factors which are tabulated for temperatures and a range of $\sigma(o)$ - the material composition parameter, and scattering matrices. Self-shielding of a cross section is accomplished by computing $\sigma(o)$ and using interpolation routines to determine the self-shielding factor for the $\sigma(o)$ and input temperature. Self-shielding is an iterative procedure with the convergence criteria specified in the input. Spectral adjustments to the elastic removal are carried out directly if the flux sets are input. Zero- or one-dimensional flux solutions may be specified to generate the flux sets. The flux solutions are iterated until spectral adjustments converge to the criteria specified by the user.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Most of the restrictions on TDOWN are due to the limitations of the linked codes. Some of these limitations are - a generalized file has a maximum of 100 energy groups, and up to 120 material cross section sets may be generated.
6. TYPICAL RUNNING TIME - Problems with all the flux spectra input use a maximum of a few minutes on the GE635. A 29-energy-group problem generating 100 materials in 15 compositions with the flux spectra computed by two one-dimensional flux solutions, 9 iterations each, required 18 minutes of processor time.
7. UNUSUAL FEATURES OF THE PROGRAM - TDOWN gives the user flexibility in determining the detail a particular output cross section file will have with respect to composition and spatial effects. Output cross sections sets from the compositions are not automatic. Each set is selected from particular compositions and then the user can apply any spectral set to correct the elastic removal. If the problem requires flux solutions and consequently regional descriptions, compositions may be defined outside of the regions.

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360 MVT.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
This module is executed in an ARC System environment (ACC Abstract 522).
15. NAME AND ESTABLISHMENT OF AUTHORS -
E. A. Kovalsky
Applied Mathematics Division
B. J. Toppel*
Applied Physics Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
- * Contact
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (PDS NUI002.SOURCE)
Object modules (PDS NUI002.SEGLIB)
Linkage editor control statements (PDS NUI002.OVERLAY)
Load modules (PDS NUI002.MODLIB)
Control information (JCL IEHMOVE 20 cards)
Sample problem (263 cards)
Sample problem output (IEHMOVE 2 pages, execution 16 pages)
Reference reports and supplemental information
17. CATEGORY - L
KEYWORDS - modular system, input data, ARC codes

1. NAME OR DESIGNATION OF PROGRAM - EISPACK Release 2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370, CDC6000-7000, UNIVAC1108,1110, DEC-PDP10, Honeywell635,6070, and Burroughs6700
3. DESCRIPTION OF PROBLEM OR FUNCTION - EISPACK is a collection of FORTRAN subroutines to solve the standard eigenproblem for any one of the following classes of matrices - real general, certain real tridiagonal, real symmetric, real symmetric band, real symmetric tridiagonal, complex general and complex Hermitian; to solve the generalized eigenproblem for real symmetric positive-definite and real general matrix systems; and to perform the singular value decomposition of a real rectangular matrix and solve an associated least squares problem. The individual subroutines are -

IDENTIFICATION	DESCRIPTION
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BAKVEC	F281	Back transform vectors of matrix formed by FIGI
BALANC	F269	Balance a real general matrix
BALBAK	F270	Back transform vectors of matrix formed by BALANC
BANDR	F226	Reduce sym. band matrix to sym. tridiag. matrix
BANDV	F227	Find some vectors of sym. band matrix
BISECT	F294	Find some values of sym. tridiag. matrix
BQR	F236	Find some values of sym. band matrix
CBABK2	F272	Back transform vectors of matrix formed by CBAL
CBAL	F271	Balance a complex general matrix
CG	F301	Driver subroutine for a complex general matrix
CH	F302	Driver subroutine for a complex Hermitian matrix
CINVIT	F297	Find some vectors of complex Hess. matrix
COMBAK	F283	Back transform vectors of matrix formed by COMHES
COMHES	F282	Reduce complex matrix to complex Hess. (elementary)
COMLR	F295	Find all values of complex Hess. matrix (LR)
COMLR2	F296	Find all values/vectors of complex Hess. matrix (LR)
COMQR	F245	Find all values of complex Hess. matrix (QR)
COMQR2	F246	Find all values/vectors of complex Hess. matrix (QR)
CORTB	F247	Back transform vectors of matrix formed by CORTH
CORTH	F244	Reduce complex matrix to complex Hess. (unitary)
EISPAK	F299	Control program for EISPACK (IBM version only)
ELMBAK	F274	Back transform vectors of matrix formed by ELMHES
ELMHES	F273	Reduce real matrix to real Hess. (elementary)
ELTRAN	F220	Accumulate transformations from ELMHES (for HQR2)
FIGI	F280	Reduce nonsym. tridiag. matrix to sym. tridiag.
FIGI2	F222	Reduce nonsym. tridiag. matrix to sym. tridiag.
HQR	F286	Find all values of real Hess. matrix
HQR2	F287	Find all values/vectors of real Hess. matrix
HTRIBK	F285	Back transform vectors of matrix formed by HTRIDI
HTRIB3	F243	Back transform vectors of matrix formed by HTRID3
HTRIDI	F284	Reduce Hermitian matrix to sym. tridiag.
HTRID3	F242	Reduce Hermitian packed matrix to sym. tridiag.
IMTQLV	F234	Find all values of sym. tridiag. matrix
IMTQL1	F291	Find all values of sym. tridiag. matrix
IMTQL2	F292	Find all values/vectors of sym. tridiag. matrix
INVIT	F288	Find some vectors of real Hess. matrix

3. DESCRIPTION OF PROBLEM OR FUNCTION (CONTINUED)

MINFIT	F233	Singular value decomposition & least squares soln.
ORTBAK	F276	Back transform vectors of matrix formed by ORTHES
ORTHES	F275	Reduce real matrix to real Hess. (orthogonal)
ORTRAN	F221	Accumulate transformations from ORTHES (for HQR2)
QZHES	F238	Reduce real generalized matrix system
QZIT	F239	Further reduce real generalized matrix system
QZVAL	F240	Find all values of reduced real generalized system
QZVEC	F241	Find all vectors of real generalized matrix system
RATQR	F298	Find extreme values of sym. tridiag. matrix
REBAK	F225	Back transform vectors of matrix formed by REDUC
REBAKB	F231	Back transform vectors of matrix formed by REDUC2
REDUC	F224	Reduce sym. generalized matrix system to standard
REDUC2	F230	Reduce sym. generalized matrix system to standard
RG	F303	Driver subroutine for a real general matrix
RGG	F312	Driver subroutine for a real generalized system
RS	F304	Driver subroutine for a real sym. matrix
RSB	F308	Driver subroutine for a real sym. band matrix
RSG	F309	Driver subroutine for a real sym. generalized system
RSGAB	F310	Driver subroutine for a real sym. generalized system
RSGBA	F311	Driver subroutine for a real sym. generalized system
RSP	F307	Driver subroutine for a real sym. packed matrix
RST	F305	Driver subroutine for a real sym. tridiag. matrix
RT	F306	Driver subroutine for a nonsym. tridiag. matrix
SVD	F232	Singular value decomposition of rectangular matrix
TINVIT	F223	Find some vectors of sym. tridiag. matrix
TQLRAT	F235	Find all values of sym. tridiag. matrix
TQL1	F289	Find all values of sym. tridiag. matrix
TQL2	F290	Find all values/vectors of sym. tridiag. matrix
TRBAK1	F279	Back transform vectors of matrix formed by TRED1
TRBAK3	F229	Back transform vectors of matrix formed by TRED3
TRED1	F277	Reduce sym. matrix to sym. tridiag. matrix
TRED2	F278	Reduce sym. matrix to sym. tridiag. matrix
TRED3	F228	Reduce sym. packed matrix to sym. tridiag. matrix
TRIDIB	F237	Find some values of sym. tridiag. matrix
TSTURM	F293	Find some values/vectors of sym. tridiag. matrix

4. METHOD OF SOLUTION - QR, LR, QL, rational QR, bisection, QZ, and inverse iteration methods are used.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - Running time varies and detailed information appears in reference 2. The CP time required for compilation of the 28 sample cases on the CDC6600 ranged from slightly less than 1 second to almost 6 seconds; CDC6600 execution of the test drivers took from .11 to 7.2 CP seconds to compute the detailed results and varied from .04 to 3.8 CP seconds for the summary runs. On the IBM370/195 the total CPU time measured for compilation, link editing, and execution ranged from 3 to 15 seconds to compute the detailed results; all summary runs were completed in less than 15 seconds.

7. UNUSUAL FEATURES OF THE PROGRAM - These routines have been certified under the NATS project for the machines and operating systems indicated in item 13 and for the compilers indicated in item 12.

The NATS project fully supports certified routines in the sense that reports of poor or incorrect performance on at least the machines and operating systems listed will be examined and necessary corrections made.

8. RELATED AND AUXILIARY PROGRAMS - EISPACK Release 2 replaces EISPACK, an earlier package submitted in May 1972 and distributed by the Code Center as ACC No. 534 prior to this release.

9. STATUS - Abstract first distributed October 1972.

IBM360 version of EISPACK submitted May 1972, replaced by IBM360,370 version of EISPACK2 July 1975, revised February 1976, revised to Edition B February 1977, test cases executed by ACC on IBM370/195, November 1975.

CDC6000-7000 version of EISPACK submitted May 1972, replaced by EISPACK2 July 1975, revised February 1976, revised to Edition B February 1977, test cases executed by ACC on CDC6600, November 1975.

UNIVAC1108 version of EISPACK submitted May 1972, replaced by UNIVAC1108,1110 version of EISPACK2 July 1975, revised February 1976, revised to Edition B February 1977.

DEC-PDP10 and Honeywell635 version of EISPACK submitted May 1972, replaced by DEC-PDP10 and Honeywell635,6070 version of EISPACK2 July 1975, revised February 1976, revised to Edition B February 1977.

Burroughs6700 version submitted July 1975, revised February 1976, revised to Edition B February 1977.

10. REFERENCES - J. H. Wilkinson and C. Reinsch, Handbook for Automatic Computation, Volume II, Linear Algebra, Springer-Verlag, New York, Heidelberg, Berlin, 1971.

B. T. Smith, J. M. Boyle, J. J. Dongarra, B. S. Garbow, Y. Ikebe, V. C. Klema, and C. B. Moler, Matrix Eigensystem Routines-EISPACK Guide, Lecture Notes in Computer Science, Volume 6 2nd Edition, G. Goos and J. Hartmanis, Springer-Verlag, New York, Heidelberg, Berlin, 1976.

B. S. Garbow, J. M. Boyle, J. J. Dongarra, and C. B. Moler, Matrix Eigensystem Routines-EISPACK Guide Extension, Lecture Notes in Computer Science, Volume 51, G. Goos and J. Hartmanis, Springer-Verlag, Berlin, Heidelberg, New York, 1977.

Burton S. Garbow and Jack J. Dongarra, EISPACK Eigensystem Package Path Chart Release 2, Informal Note, April 1974.

Jack J. Dongarra & Burton S. Garbow, Instructions for the Use of Release 2 of EISPACK IBM Version, April 27, 1976.

Jack J. Dongarra & Burton S. Garbow, Instructions for

10. REFERENCES (CONTINUED)

the Use of Release 2 of EISPACK Non-IBM Versions, May 4, 1976.

James M. Boyle, Carl H. Hauser, and Harold R. Rothaar, EISPAC Eigensystem Package Path Chart Release 2, Informal Note, February 1975.

J. J. Dongarra & B. S. Garbow, Incompatibility Between the Two Releases of the EISPAC Control Program, Informal Note, March 22, 1976.

11. MACHINE REQUIREMENTS - Vary according to usage. Two machine-dependent parameters, RADIX and MACHEP, appear in various sub-routines and all test drivers included in this package. RADIX specifies the base of the machine floating-point representation; MACHEP the relative precision of floating-point arithmetic. RADIX is included in routines BALANC and CBAL; MACHEP in BANDV, BISECT, CINVT, COMLR, COMLR2, COMQR, COMQR2, HQR, HQR2, IMTQLV, IMTQL1, IMTQL2, INVIT, MINFIT, RATQR, SVD, TINVT, TQLRAT, TQL1, TQL2, TRIDIB, and TSTURM.

12. PROGRAMMING LANGUAGES USED -

FORTTRAN IV(G)	IBM370/168, IBM370/195
FORTTRAN IV(H)	IBM370/168
FORTTRAN IV(H 21.7)	IBM360/75, IBM370/195
FORTTRAN IV(H Extended 2.1)	IBM360/75, IBM370/165
WATFIV	IBM370/195
FTN(3.0)	CDC6400
FTN(4.2)	CDC6600
FUN	CDC6400-6500
MNF	CDC6600-6400
RUN(2.3)	CDC6400, CDC6600
RUN(60.2)	CDC6600-6400
RUNW	CDC6600-6400
FORTTRAN V(9)	UNIVAC1110
FORTTRAN F40	DEC-PDP10
FORTTRAN-Y (SR-F)	Honeywell16070
FORTTRAN IV(2.6)	Burroughs6700

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360/75, IBM370/165, IBM370/195), MTS (IBM370/168), KRONOS 2.1 (CDC6600), SCOPE 3.3 (CDC6400), SCOPE 3.4.2 (CDC6600), UT2D-85 (CDC6600-6400), EXEC-8 (UNIVAC1110), TOPS-10(506B) (DEC-PDP10), GECOS SR-F (Honeywell16070), and MCP 2.6 (Burroughs6700).

14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

The set of sample problems, or testing aids, consists of drivers, data input subroutines, residual calculation routines, and test data. The output available is from Code Center execution of summary runs.

The specification statements used in the IBM and DEC-Honeywell versions for inline and library functions are modified to comment statements in the Burroughs, CDC, and UNIVAC machine versions.

The IBM distribution includes all programs listed under item

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)

3. Other machine versions do not include the EISPAC F299 control program.

The February 1976 revision consisted of modification of the F226 BANDR program and changes to the machine-readable documentation for F226 BANDR, F233 MINFIT, and F232 SVD.

Edition B revisions consisted of modifications of the F294 BISECT, F239 QZIT, F240 QZVAL, F237 TRIDIB, and F293 TSTURM programs and the associated machine-readable documentation.

Locations and machines used for EISPACK testing were -

Machine	Test Site
IBM360/75	Stockholm Data Center
IBM360/75.	University of Illinois at Urbana-Champaign
IBM370/165	University of Toronto
IBM370/168	The University of Michigan
IBM370/195	Argonne National Laboratory
CDC6400	Northwestern University
CDC6400-6500	Purdue University
CDC6600-6400	The University of Texas at Austin
CDC6600	ICASE/NASA Langley Research Center
CDC6600	Kirtland Air Force Base/AFWL
CDC7600	National Center for Atmospheric Research
UNIVAC1110	The University of Wisconsin-Madison
DEC-PDP10	Yale University
Honeywell16070	Bell Laboratories at Murray Hill
Burroughs6700	University of California, San Diego

15. NAME AND ESTABLISHMENT OF AUTHOR -

Contact Burton S. Garbow
 Applied Mathematics Division
 Argonne National Laboratory
 9700 South Cass Avenue
 Argonne, Illinois 60439

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal

Source decks (360-15,337 cards, 1110-11,612 cards, other machine versions-11,542 cards)

Object decks (360-38 cards)

Test drivers and data (360-18,237 cards, 1110-test drivers 10,158 cards, data 3344 cards, other versions-test drivers 10,109 cards, data 3324 cards)

Control information (JCL 360-1253 cards)

Test output (360-36 selected pages, 6600-31 selected pages)

Machine-readable documentation (360 2 files-22,654 cards each, other versions-20,966 cards)

Reference notes and instructions appropriate to machine version

17. CATEGORY - P

KEYWORDS - eigenvalue, eigenvector, matrices, matrix systems, numerical calculation, singular value

1. NAME OR DESIGNATION OF PROGRAM - MOXY/MOD032
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - MOXY is used for the thermal analysis of a planar section of a boiling water reactor (BWR) fuel element during a loss-of-coolant accident (LOCA). The code employs models that describe heat transfer by conduction, convection, and thermal radiation, and heat generation by metal-water reaction and fission product decay. Models are included for considering fuel-rod swelling and rupture, energy transport across the fuel-cladding gap, and the thermal response of the canister. MOXY requires that time-dependent data for the power, normalized to the steady-state power, for the heat-transfer coefficient, and for the fluid temperature be provided as input during the blowdown process. Internal models provide these parameters during the heatup and emergency cooling phases.
4. METHOD OF SOLUTION - An implicit numerical solution of the one-dimensional Fourier heat conduction equation is used to compute heat conduction in fuel rods, solid inactive rods, and hollow inactive rods. Interchange of thermal radiation among surfaces is calculated using the network method described by Sparrow and Cess (see reference 5).
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
 - 10 time-step sets
 - 10 print-interval sets
 - 50 normalized power-time pairs in considering time-dependent heat source
 - 50 convection heat transfer coefficient-time pairs in considering time-dependent convection
 - 50 fluid temperature-time pairs in considering time-dependent fluid temperature
6. TYPICAL RUNNING TIME - Approximately 3 minutes of CPU time are required to execute the sample problems on an IBM370/195.
7. UNUSUAL FEATURES OF THE PROGRAM - MOXY allows the use of fairly large time-steps (greater than 1 second).
8. RELATED AND AUXILIARY PROGRAMS - MOXY/MOD032 is part of the Water Reactor Evaluation Model (WREM) as are RELAP4/MOD5 (ACC Abstract 369) and WREM-TOODEE2/MOD3 (ACC Abstract 712). View factors are computed using an extension of the method used in the VIEWPIN code (ACC Abstract 569). The model for fuel-to-cladding gap heat transfer coefficient was adapted from the GAPCON-THERMAL1 code.
9. STATUS - Abstract first distributed December 1973.
 - IBM360 version of MOXY/MOD001 submitted June 1972,
 - replaced by MOXY/MOD032 revised Edition B February

9. STATUS (CONTINUED)
1977, sample problems executed by ACC April 1977 on an IBM370/195.
UNIVAC1108 version submitted June 1972, deleted April 1977.
CDC7600 version submitted February 1977.
10. REFERENCES - D. R. Evans, MOXY, A Digital Computer Code for Core Heat Transfer Analysis, IN-1392, August 1970.
D. R. Evans, The MOXY Core Heat Transfer Code: Model Description and User's Guide, PG-R-76-003, December 1976.
D. R. Evans, The MOXY Core Heat Transfer Program: View Factor Model Improvements, RE-E-77-114, February 8, 1977.
WREM: Water Reactor Evaluation Model, Revision 1, NUREG-75/056.
E. M. Sparrow and R. D. Cess, Radiation Heat Transfer, Belmont, California, Brooks-Cole, 1966.
NRTS Environmental Subroutine Manual, ANC Document, December 1972.
MOXY/MOD032, ACC No. 551.360B, Tape Contents Description, Argonne Code Center Programming Note 77-23.
11. MACHINE REQUIREMENTS - 300K bytes of storage (IBM360) and 5 units are required in addition to the standard input/output units.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV and Assembly language
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360), SCOPE (CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - MOXY reads the radiation matrix from a direct access storage device.
15. NAME AND ESTABLISHMENT OF AUTHOR -
D. R. Evans
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, Idaho 83401
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (360-3905 cards)
2314 load modules (MOXY32LM 360-261 blocks, ENVIR 360-479 blocks)
Sample problems (360-96 cards)
Auxiliary source deck (Conversion program 360-24 cards)
Environmental subroutines (360-22,152 cards)
Control information (JCL 360-114 cards)
Sample problem output (360-55 selected pages, 1292 blocks)
Reference reports, PG-R-7600-003, RE-E-77-114, ANC document, and ACC Programming Note

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17. CATEGORY - H

KEYWORDS - heat transfer, BWR reactors, fuel elements, LOCA, WREM,
RELAP4 codes, TOODEE2 codes, GAPCON-THERMAL1 codes,
VIEWPIN codes

1. NAME OR DESIGNATION OF PROGRAM - FFEARS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600, IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - FFEARS is generally applicable for the solution of boundary value problems involving the Laplace equation using difference equations in axisymmetric or rectangular coordinates. It will handle virtually any configuration of dielectrics and floating electrodes, producing both equipotential and equifield plots, if desired.
4. METHOD OF SOLUTION - Basic relaxation techniques are used. The difference equations employed are derived from Laplace's equation for isotropic dielectrics. These are solved iteratively at all points within the electrode configuration except on the interfaces between materials of different dielectric constant. Dielectric interfaces are solved by a technique developed by C. N. Dorny (Letters, Proc. IEEE, Vol. 57, pp. 856-858). Floating electrodes are treated as special dielectrics.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The program treats any rectangular or axisymmetric configuration of dielectrics and small floating electrodes that can be described by a matrix of up to 201 x 201 points. All electrode and dielectric surfaces must lie on matrix points.
6. TYPICAL RUNNING TIME - Solutions with errors of less than five percent are obtained in less than ten minutes.
7. UNUSUAL FEATURES OF THE PROGRAM - A blowup routine permits the expansion and recomputation of sections of the plot to permit greater resolution.
8. RELATED AND AUXILIARY PROGRAMS - This package is a modification of ALO-00262, transferred from the ALO-COSMIC collection.
9. STATUS - Abstract first distributed January 1974.
CDC6600 version submitted May 1973, 1st revision Edition B submitted February 1975, sample problem executed with dummy plotting routines by ACC October 1976 on a CDC7600.
IBM360 version converted from CDC6600 Edition B by ACC July 1975, sample problem executed by ACC October 1976 on an IBM370/195.
10. REFERENCES - J. E. Boers, FFEARS, A Digital Computer Program for the Simulation of Laplace Equation Including Dielectric Interfaces and Small Ungrounded Electrodes, SC-RR-71 0377, July 1971.
Argonne Code Center Programming Note 77-6, FFEARS, ACC No. 577.360, November 22, 1976.
Argonne Code Center Programming Note 74-21, Environ-

10. REFERENCES (CONTINUED)
mental Subroutines Required by FFEARS, ACC No. 577.6600B, Rev.
November 18, 1976.
11. MACHINE REQUIREMENTS - The CDC6600 version requires 122,000
(octal) words of memory, 12 files on disk storage, and a SC-4020
plotter. The IBM360 version requires 350K bytes to compile, 288K
bytes to execute, 11 files on disk storage, and a CalComp plotter.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.3 (CDC6600), SCOPE 2.1 (CDC7600), OS/360 (IBM360),
OS/370 (IBM370).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
Several subroutines and functions necessary to the operation of
the plotting portion of the program are not included in the source
deck. For the CDC6600 version, they are a part of the standard
SCORS plotter package for the SC-4020 plotter, and must be
furnished by the user or replaced by equivalent locally-available
subroutines. The IBM360 version uses standard CalComp plotting
calls.
15. NAME AND ESTABLISHMENT OF AUTHOR -
6600 J. E. Boers
Division 2354
Sandia Laboratories
P. O. Box 5800
Albuquerque, New Mexico 87115

360 Argonne Code Center
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (6600-1434 cards, 360-1690 cards)
Sample problems (6600-258 cards, 360-259 cards)
Control information (JCL 360-80 cards)
Sample problem output (42 selected pages, 1 microfiche, and
5 plots)
Reference report and ACC Programming Note applicable to machine
version
17. CATEGORY - V
KEYWORDS - potentials, equipotentials, equifield, Laplace equation

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1. NAME OR DESIGNATION OF PROGRAM - FUNPACK Release 2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370, CDC6000-7000, UNIVAC1108,1110
3. DESCRIPTION OF PROBLEM OR FUNCTION - FUNPACK is a collection of FORTRAN subroutines to evaluate certain special functions. The individual subroutines are -

IDENTIFICATION	DESCRIPTION
NATSI0 F2I0	Bessel function I-sub-0
NATSI1 F2I1	Bessel function I-sub-1
NATSJ0 F2J0	Bessel function J-sub-0
NATSJ1 F2J1	Bessel function J-sub-1
NATSK0 F2K0	Bessel function K-sub-0
NATSK1 F2K1	Bessel function K-sub-1
NATSBESY F2BY	Bessel function Y-sub-nu
DAW F1DW	Dawson's integral
DELIPK F1EK	Complete elliptic integral of the first kind
DELIPE F1EE	Complete elliptic integral of the second kind
DEI F1EI	Exponential integrals
NATSPSI F2PS	Psi (logarithmic derivative of gamma function)
MONERR F1MC	Error monitoring package
4. METHOD OF SOLUTION - FUNPACK uses evaluation of minimax approximations.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - These routines have been certified under the NATS project for the machines and operating systems indicated in item 13 and for the compilers indicated in item 12. Extensive testing on these machines has shown no evidence of performance difficulties. Exceptions, if any, follow -

CDC versions of these subroutines are tuned to perform best using the rounded arithmetic option on CDC compilers.

The accuracy of the subroutines for the elementary functions (EXP, ALOG, etc.) can affect the accuracy of FUNPACK subroutines.

The IBM version of this package assumes the IBM-supplied traceback subroutine ERRTRA is available.

The NATS project fully supports certified routines in the sense that reports of poor or incorrect performance on at least the machines and operating systems listed will be examined and necessary corrections made. This assurance of support applies only when the software is obtained directly from the Argonne Code Center and has not been modified.
8. RELATED AND AUXILIARY PROGRAMS - FUNPACK Release 2 replaces FUNPACK, an earlier package submitted in July 1973 and distributed by the Code Center as ACC No. 610 prior to this release. Subroutines identified as F1xx in item 3 above are unmodified

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
from the previous release, with the possible exception of the test material for the IBM machines.
9. STATUS - Abstract first distributed July 1973.
IBM360,370 version of FUNPACK submitted August 1973,
replaced by FUNPACK Release 2 September 1976,
replaced by revised Edition B July 1977, sample
problems executed by ACC September 1976 on an
IBM370/195.
CDC6000-7000 version of FUNPACK submitted August 1973,
replaced by FUNPACK Release 2 September 1976,
replaced by revised Edition B July 1977, sample
problems executed by ACC October 1976.
UNIVAC1108 version of FUNPACK submitted August 1973,
replaced by UNIVAC1108,1110 version of FUNPACK
Release 2 September 1976, replaced by revised
Edition B July 1977.
10. REFERENCES - J. M. Blair and C. A. Edwards, Stable Rational
Minimax Approximations to the Modified Bessel Functions $I_0(x)$ and
 $I_1(x)$, AECL-4928, 1974.
J. M. Blair and A. E. Russon, Rational Minimax
Approximations for the Bessel Functions $K_0(x)$ and $K_1(x)$,
AECL-3461, 1969.
W. J. Cody, Chebyshev Approximations for the Complete
Elliptic Integrals K and E , Math. Comp. 19, 105-112 (1965).
W. J. Cody, R. M. Motley, and L. W. Fullerton, The
Computation of Real Fractional Order Bessel Functions of the
Second Kind, Applied Mathematics Division Technical Memorandum
No. 291, ANL, 1976.
W. J. Cody, K. A. Paciorek, and H. C. Thacher, Jr.,
Chebyshev Approximations for Dawson's Integral, Math. Comp. 24,
171-178 (1970).
W. J. Cody, A. J. Strecok, and Henry C. Thacher, Jr.,
Chebyshev Approximations for the Psi Function, Math. Comp. 27,
123-127 (1973).
W. J. Cody and Henry C. Thacher, Jr., Rational
Chebyshev Approximations for the Exponential Integral $E_1(x)$, Math.
Comp. 22, 641-649 (1968).
W. J. Cody and Henry C. Thacher, Jr., Rational
Chebyshev Approximations for the Exponential Integral $E_i(x)$,
Math. Comp. 23, 289-303 (1969).
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED -

FORTRAN IV(G)	IBM360/75,195,IBM370/165,195
FORTTRAN IV(G 21)	IBM360/65,75,91,IBM370/158
FORTTRAN IV(G1)	IBM360/75,195
FORTTRAN IV(H)	IBM360/65,67,75,195,IBM370/165
FORTTRAN IV(H 20.1)	IBM360/65,75,195,AMDAHL470V/6
FORTTRAN IV(H 21.6)	IBM360/75,91

12. PROGRAMMING LANGUAGE USED (CONTINUED)
FORTRAN IV(H 21.7)	IBM360/75
FORTRAN IV(H 21.8)	IBM360/65
FORTRAN IV(H Extended)	IBM370/195
FORTRAN IV(H Extended 2.1)	IBM360/75,91,IBM370/168,168-II
FORTRAN IV(WATFIV)	IBM360/67
FORTRAN IV(WATFIV 1.4)	IBM370/158
FTN	CDC6400,6500
FTN(4.642)	CDC6600,CY173,175
FTN(3.0)	CDC6400
RUN	CDC6400,6500,6600-6400,7600
RUN(2.3)	CDC6400
FUN	CDC6400-6500,6600,6700
FTN V	UNIVAC1108
FTN V(S10A-0)	UNIVAC1108
FTN V(MACC 1.175)	UNIVAC1110
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360	IBM360/67
OS/360(19.6)	IBM360/65
OS/360(20.1)	IBM370/165
OS/360(20.7)	IBM360/75,195
OS/360(21.0)	IBM360/75,91
OS/360(21.7)	IBM360/75,370/195
OS/360(21.8)	IBM360/75
OS/MVT(21.7)	IBM370/165-II
OS/MVT(21.8)	IBM360/65,91,IBM370/158
OS/VS2(1.6)	IBM370/168
MTS	IBM360/67,AMDAHL470V/6
Stanford University	IBM360/67
Purdue University	CDC6500,6400-6500
Lawrence Berkeley Laboratory	CDC6600,7600
Lawrence Livermore Laboratory	CDC6600,7600
NCAR	CDC6600,7600
SCOPE(3.3)	CDC6400
SCOPE(3.4)	CDC6600
UT2D	CDC6600-6400
EXEC 8	UNIVAC1108
EXEC 31.244E	UNIVAC1108
EXEC MACC 31.66	UNIVAC1110
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
-	Locations and machines used for FUNPACK testing were -	
--	--
Machine	Test Site
IBM360/65,IBM370/158	Ames Laboratory, Iowa State University
IBM360/75,195,370/195	Argonne National Laboratory
IBM360/75,91	Oak Ridge National Laboratory
IBM360/67,91,370/168	Stanford University
IBM360/75	Stockholm Data Center
IBM360/65	The University of Chicago
IBM360/75	University of Illinois at Urbana-Champaign

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)

IBM360/67,AMDAHL470V/6	The University of Michigan
IBM360/67	The University of New Mexico
IBM370/165,165-II	University of Toronto
CDC6600	Kirtland Air Force Base/AFWL
CY173,175	ICASE/NASA Langley Research Center
CDC6600,7600	Lawrence Berkeley Laboratory
CDC6600,7600	Lawrence Livermore Laboratory
CDC6600,7600	National Center for Atmospheric Research
CDC6400	Northwestern University
CDC6400-6500	Purdue University
CDC6600-6400	The University of Texas at Austin
UNIVAC1108	Illinois Institute of Technology
UNIVAC1108	Jet Propulsion Laboratory
UNIVAC1108,1110	University of Wisconsin

15. NAME AND ESTABLISHMENT OF AUTHOR -

Author W. J. Cody

Contact Burton S. Garbow
Applied Mathematics Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal

Source decks (370-3902 cards, 7600-3983 cards, 1110-4115 cards)
Demonstration program source decks (370-2083 cards, 7600-2151 cards, 1110-2211 cards)
Demonstration output (370-61 pages, 7600-58 pages, 1110-44 pages)
Machine-readable documentation (370-4532 cards, 7600-4518 cards, 1110-4518 cards)

17. CATEGORY - P

KEYWORDS - special functions, exponential integrals, complete elliptic integrals, Dawson's integral, Bessel functions, Neumann functions, psi function

1. NAME OR DESIGNATION OF PROGRAM - CHILES
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - CHILES is a finite element computer program that calculates the strength of singularities in linear elastic bodies. Plane stress, plane strain, and axisymmetric conditions are treated. Crack tip singularity problems are solved by this version of the code, but any type of integrable singularity may be properly modeled by modifying selected sub-routines in the program.
4. METHOD OF SOLUTION - A generalized, quadrilateral finite element that includes a singular point at a corner node is incorporated in the code. The displacement formulation is used and inter-element compatibility is maintained so that monotone convergence is preserved.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CHILES allows three singular points to be modeled in the body being analyzed and each singular point may have coupled Mode I and II deformations. 1000 nodal points may be used.
6. TYPICAL RUNNING TIME - Less than 2 minutes is required for a typical problem.
7. UNUSUAL FEATURES OF THE PROGRAM - A pre-created mesh may be read from an external file and computed results are written on an external file for plotting.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed April 1974.
CDC6600 version submitted January 1974.
10. REFERENCES - S. E. Benzley and Z. E. Beisinger, CHILES - A Finite Element Computer Program that Calculates the Intensities of Linear Elastic Singularities, SLA-73-0894, September 1973.
S. E. Benzley, Representation of Singularities with Isoparametric Finite Elements, International Journal for Numerical Methods in Engineering, (to be published).
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN (FORTRAN Extended)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

10. REFERENCES (CONTINUED)

A. J. Duncan, Quality Control and Industrial Statistics, Richard D. Erwin, Inc., Homewood, Illinois, 1960.

C. R. Hicks, Fundamental Concepts in the Design of Experiments, Holt and Rinehart, and Winston, Inc., 1964.

N. L. Johnson and F. C. Leone, Statistics and Experimental Design in Engineering and the Physical Sciences, Vols. I and II, John Wiley and Sons, New York, N. Y., 1964.

H. L. Harter, Order Statistics and their Use in Testing and Estimation, Vol. 1, Aerospace Research Laboratories, U. S. Air Force, 1969.

11. MACHINE REQUIREMENTS - 25K memory

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - DOS/360.

14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

A. D. Grandillo and T. C. Bishop
Mound Laboratory
Monsanto Research Corporation
Miamisburg, Ohio 45342

16. MATERIAL AVAILABLE -

Source deck (372 cards)

Object deck (171 cards)

Sample problem (62 cards)

Control information (JCL 14 cards)

Reference report, Monsanto Research Corporation document

17. CATEGORY - P

KEYWORDS - analysis of variance, statistics, Latin Square

1. NAME OR DESIGNATION OF PROGRAM - RAFFLE2/MOD2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - RAFFLE is a three-dimensional general-purpose Monte Carlo program for the solution of static neutron transport problems. Either fission source iteration or external source problems can be solved. Reaction rates and fluxes or cell-averaged P0 and P1 transfer matrices can be obtained for up to 100 input energy groups. Multiplication factors, lifetimes, generation times, and probable errors are also computed. Group-wise currents from any region to adjacent regions can be computed. A zone geometry option, designated "mixed" zone geometry, is included to simplify the preparation of input data for problems having an array of fuel pins. This option combines features of the rectangular, cylindrical r-z, and cylindrical r-theta-z zone geometries in a two-level zone search.
4. METHOD OF SOLUTION - A Monte Carlo method is used with options of path type, ray type, or KENO scoring techniques. Standard biasing techniques including weight, reduction, neutron splitting, and Russian roulette are available.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
100 energy groups for editing
200 surfaces
400 regions
6. TYPICAL RUNNING TIME - Running time is very problem dependent, but often 1 to 2 hours are required on an IBM360/75. The sample problem requires 1 minute.
7. UNUSUAL FEATURES OF THE PROGRAM - Features include the combined use of multigroup and pointwise cross sections, optional use of multigroup thermal cross sections, and the solution of external source problems.
8. RELATED AND AUXILIARY PROGRAMS - The INCITE program (ACC Abstract 565) can be used to prepare the multigroup thermal libraries used by RAFFLE.
9. STATUS - Abstract first distributed December 1974.
IBM360 versions of RAFFLE-ANC submitted October 1974,
replaced by RAFFLE2/MOD2 edition March 1976, sample
problem executed by ACC October 1976 on an
IBM370/195.
10. REFERENCES - W. E. Vesely, F. J. Wheeler, and R. S. Marsden, The Raffle General Purpose Monte Carlo Code, ANCR-1022, April 1973.
R. S. Marsden, F. J. Wheeler, and D. E. Wessol, A Mixed Zone Geometry Option for the RAFFLE General Purpose Monte

10. REFERENCES (CONTINUED)
Carlo Code, ANCR-1206, February 1975.
RAFFLE2/MOD2 Notes, Aerojet Memorandum February 1976,
revised by ACC December 1976.
11. MACHINE REQUIREMENTS - 570K bytes of memory
12. PROGRAMMING LANGUAGES USED - FORTRAN IV and Assembly language
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360,370.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
W. E. Vesely*, F. J. Wheeler, R. S. Marsden, and
D. E. Wessol
Idaho National Engineering Laboratory
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, Idaho 83401

* Present address-
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (13,143 cards)
2314 and 3330 load modules RAFL2.LOAD (300 blocks)
Sample problem (308 cards)
Sample problem output (49 pages, 196 blocks)
Control information (JCL 71 cards)
Libraries (FAST 5900 cards, THERMAL 2913 cards)
Reference reports and memorandum
17. CATEGORY - B
KEYWORDS - Monte Carlo method, transport theory, reactivity, flux
distribution, reaction rates, INCITE codes, RAFFLE-ANC
codes

1. NAME OR DESIGNATION OF PROGRAM - MMM3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - MMM3 computes the eigenvalues (frequencies) and eigenvectors (normal modes) for a semi-rigid molecule, and computes the transformation matrix for expressing the Cartesian displacements of the atoms in terms of the normal coordinates. Computation of the effective atomic masses and mean-squared amplitudes of vibration for use in slow neutron scattering calculations is included as well.
4. METHOD OF SOLUTION - The procedure centers around the manipulation of matrices: 1) the force constant matrix, 2) the transformation matrix which describes changes in bond angles and distances, and 3) the new coordinate matrix. In formulating a problem for solution, the group vibration method is used, i. e. a molecule is divided into groups of atoms with each atom in one and only one group, and the motion of each atom is described as the sum of displacements within a group (intragroup motions), together with translational and rotational motions of the groups considered as rigid units (skeletal motions).
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Matrices with dimensions up to 55 x 55 are acceptable.
6. TYPICAL RUNNING TIME - 3 seconds are required to execute the sample problem.
7. UNUSUAL FEATURES OF THE PROGRAM - The group vibration approach systematizes and simplifies preparation of the input data.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed June 1974.
IBM360 version submitted April 1974, sample problem
executed by ACC June 1974 on an IBM370/195.
10. REFERENCES - D. H. Speas, Matrix Routine for Calculating Normal Modes, Frequencies, and Atom Displacements in Molecules, Aerojet Nuclear Company Program Description No. P00320, August 1964.
H. L. McMurry, A Simplified Group Vibration Method for Calculating Normal Vibrations of Large Molecules, Spectrochimica Acta, Vol. 21, pp. 2091-2103, 1965.
H. L. McMurry and D. Speas, Vibrational Analysis of Propane and Its Symmetrical Deuterium Substituted Isomers, Spectrochimica Acta, Vol. 21, pp. 2105-2117, 1965.
11. MACHINE REQUIREMENTS - 300K bytes of memory
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
NOS 1.1.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
Routine M401A is currently being revised. It is not included in
this package but will be available at a later date.
15. NAME AND ESTABLISHMENT OF AUTHOR -
Contact Ray Davenport
'C' Division
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico 87545
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (10,140 cards)
LASL 6600 Subroutine Library Descriptions, May 1974, with
revisions March 1975 and May 1976
17. CATEGORY - P
KEYWORDS - floating-point arithmetic, elementary functions,
special functions, polynomials, interpolation,
matrices, simultaneous linear equations, eigensystems,
graphs, input data, output data, utility routines

1. NAME OR DESIGNATION OF PROGRAM - REBUS2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - Using one or more specified external fuel supplies to load the reactor and a fixed fuel management scheme, REBUS2 computes the equilibrium (i.e. infinite-time) operating conditions of a fast reactor. Optionally, reprocessing plants may be included in the specification of the external fuel cycle and discharged fuel may be recycled back into the reactor. The code will automatically optimize, at user option -
 - (a) the burn cycle time in order to achieve a specified discharge fuel burnup,
 - (b) the fresh fuel enrichment in order to achieve a specified effective reproduction constant at a specified time during the burn cycle, and
 - (c) the poison control to achieve a specified value of keff.Non-equilibrium problems consisting of an explicit sequence of burn/shutdown/refuel cycles may also be handled although fuel recycle is not allowed.
4. METHOD OF SOLUTION - The total burn cycle time is broken into one or more subintervals. An explicit burnup is performed in each region of the reactor over each of these subintervals using the average reaction rates over the subinterval. These average reaction rates are based on fluxes obtained from an explicit, two-dimensional, diffusion theory neutronics solution computed at both the beginning and end of the subinterval. The isotopes to be considered in the burnup equations, as well as their transmutation reactions, are specified by the user.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Fuel recycle is not allowed for non-equilibrium problems. Only two-dimensional problems are handled.
6. TYPICAL RUNNING TIME - Three to 30 minutes are required on the IBM 370/195 depending on the size of the problem.
7. UNUSUAL FEATURES OF THE PROGRAM - REBUS2 will handle both equilibrium and non-equilibrium problems using a number of core geometries including hexagonal mesh. The program has an automatic restart capability.
8. RELATED AND AUXILIARY PROGRAMS - This is a stand-alone version of the ARC System (reference 7) fuel cycle analysis code REBUS2. It utilizes the ARC System's two-dimensional, diffusion theory capability (reference 6), an improved version of the cross section homogenization code NUC001 (reference 8), the neutronic input processor NUI002 (reference 9), and the hexagonal mesh input processor NUI004.

9. STATUS - Abstract first distributed December 1974.
IBM360 version submitted April 1974, revised November 1974, replaced by Edition B April 1976, modified August 1976, sample problem executed by ACC July 1976 on an IBM370/195.
10. REFERENCES - A. P. Olson, A User's Manual for the Reactor Burnup System, REBUS-2, ANL Report, March 1974.
R. P. Hosteny, An IBM 360/370 Stand-alone Version of REBUS-2: A Supplement to the REBUS-2 User's Manual, 1976.
R. P. Hosteny, Description of Cross Section Libraries Used by REBUS2, ANL-Applied Physics Note, January 6, 1975.
#634.360 REBUS2 List of Subroutines and Overlay Structure, September 1976.
J. Hoover, G. K. Leaf, D. A. Meneley, and P. M. Walker, The Fuel Cycle Analysis System, REBUS, Nuclear Science and Engineering, Vol. 45, pp. 52-65 (1971).
T. A. Daly, G. K. Leaf, and A. S. Kennedy, The ARC System Two-dimensional Theory Capability, DARC2D, ANL-7716, May 1972.
L. C. Just, H. Henryson, II, A. S. Kennedy, S. D. Sparck, B. J. Toppel, and P. M. Walker, The System Aspects and Interface Data Sets of the Argonne Reactor Computation (ARC) System, ANL-7711, April 1971.
E. A. Kovalsky, J. Zapatka, H. Henryson, II, J. Hoover, and P. M. Walker, The ARC System Cross-section Homogenization and Modification Capabilities, ANL-7714, June 1971.
E. A. Kovalsky and D. E. Neal, The ARC System Neutronics Input Processor, ANL-7713, January 1971.
11. MACHINE REQUIREMENTS - At least 400K storage is required (580K for the sample problem).
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (99.9%)
Assembly language (0.1%)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - Creation of a load module requires a total of approximately 8.4 million bytes of direct-access storage.
15. NAME AND ESTABLISHMENT OF AUTHORS -
Contacts R. P. Hosteny and B. J. Toppel
Applied Physics Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
For 360 users:
Source deck (3330 PDS REBSRC 5466 blocks)

16. MATERIAL AVAILABLE (CONTINUED)

Object module (3330 PDS REBOBJ 3870 blocks)

Load module (3330 PDS REBMOD 1892 blocks)

Sample problem (634 cards)

Sample problem output (157 pages)

Control information (JCL 152 cards)

Libraries (XSISO1 1 block*, XSISO2 1 block)
6447 bytes)

Reference report, ANL report, and supplement

Reference reports ANL-7711, ANL-7713, ANL-7714, and ANL-7716
are available as microfiche copies upon request

For non-360 users:

Source deck (53,204 cards)

Control information (152 overlay cards)

Sample problem (634 cards)

Sample problem output (157 pages)

Reference reports as for 360 users plus Applied Physics Note
and list of subroutines and overlay structure

17. CATEGORY - D

KEYWORDS - 2-dimensional, breeding, criticality, depletion, LMFBR
reactors, fuel cycle

1. NAME OR DESIGNATION OF PROGRAM - PROGLOOK
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - PROGLOOK makes it possible to monitor the execution of virtually any OS/MVT or OS/VS2 Release 1.6 load module. The main reason for using PROGLOOK is to find out which portions of a code use most of the CPU time so that those parts of the program can be rewritten to reduce CPU time. For large production programs, users have typically found it possible to reduce CPU time by 10 to 30 percent without changing the program's function.
4. METHOD OF SOLUTION - PROGLOOK determines how much of the total CPU time for a run is used by each portion of the load module by attaching the load module as a subtask. The status of this subtask (the user's load module) is sampled regularly, and a record of it is written on an intermediate file. After the run is completed, a postprocessor is invoked which summarizes and plots the data collected.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The measured task cannot attach more than 254 subtasks. If the data produced by PROGTIME exceeds 127 distinct entities or 2500 histogram cells PROGLOOK terminates, producing no histograms.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - PROGLOOK can be used to monitor something as simple as a FORTRAN main program or as complex as the PL/I compiler or HASP.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed March 1975.
IBM360 version submitted November 1974, replaced by revised Edition B July 1976.
10. REFERENCES - R. Johnson and T. Johnston, PROGLOOK User's Guide, User Note 33, Revision 5, May 15, 1976.
PROGLOOK Version 6 Notes, July 1976.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN IV and Assembly language
3. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PROGLOOK monitoring overhead is on the order of 6 percent.

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
PROGLCOK consists of two programs PROGTIME and PROGLOOK. PROGTIME is an Assembly language program which uses the interval timer to catch a picture of any program running under it and records this information in a data set. PROGLOOK is a FORTRAN program which uses the data set produced by PROGTIME to create the summary reports and plots.
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. H. Johnson* and T. Johnston
Stanford Center for Information Processing
Stanford Linear Accelerator Center
Stanford University
P. O. Box 4349
Stanford, California 94305
- * Contact
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (PROGLOOK 1049 cards, PROGTIME 1421 cards)
2314 load module (129 blocks)
Control information (JCL 38 cards)
Reference report and notes
17. CATEGORY - P
KEYWORDS - data processing performance

1. NAME OR DESIGNATION OF PROGRAM - SLOP/CROSS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHER ON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - The package contains two PL/I codes, SLOP (Structural Layout Of Programs) and CROSS, designed to check IBM FORTRAN H source programs. SLOP examines the SYSPRINT file produced by a FORTRAN H compilation for local errors and sends its observations to CROSS which detects potential global errors. SLOP summarizes variables, labels, common blocks, and other items in a subroutine, showing which symbols are being improperly used. Optionally, the SLOP program can list the output from the original FORTRAN subroutine compilation, can list and/or save a 'corrected' and resequenced FORTRAN file, and save and/or list the information intended for the CROSS routine.

For each subroutine CROSS tabulates:

- the subroutine name and size,
- entry points,
- listed but unused symbols,
- uninitialized variables,
- unreferenced statement numbers,
- internal statement numbers of input-output statements,
- symbols which appear in input-output statements,
- called subroutines, and
- the active variables in common and/or equivalence blocks, together with block names and addresses.

CROSS lists common and/or equivalenced variables in alphabetic order with addresses and corresponding block names, along with the names of routines in which these variables are actively used. Any suspicious-looking or inconsistent items are flagged. The same information will also be sequenced and listed according to block names and addresses within each block. CROSS also produces a table designed to show instantly which routines need attention because SLOP found errors in them, which are missing or defined more than once, and which routine is calling (and how many times it is being called by) another. Finally, if any cycles of subroutine calls are detected, then a second table indicating these recursive calls will be produced.

The test case supplied with this package is designed to be self-explanatory, removing the need for reference documents.

4. METHOD OF SOLUTION - The SLOP code processes the results of the IBM FORTRAN H compilation using the XREF option. This compilation produces records of varying length, allowing SLOP to isolate useful information without examining these records directly. Compilation results normally contain FORTRAN source code if the record length is 105, the 'SYMBOL INTERNAL STATEMENT NUMBERS' data if the record length is 133, the 'NAME TAG TYPE ADD.' information if the record length is 128, the 'LABEL DEFINED REFERENCES' information if the record length is 133, and the error messages if the record length is 155. The final record for each subroutine

4. METHOD OF SOLUTION (CONTINUED)
block is indicated by a record length of 100. If an input FORTRAN line is not a comment or continuation line, then the first few non-blank characters after column 6 are examined and used to set a one-character classification tag: A(dimension), C(common), D(data), E(equivalence), G(integer), H(logical), I(if), L(loop), N(entry), R(read), S(store), V(real), W(write or punch or print), X(subroutine or function call), or Z(namelist).
If a READ, WRITE, PUNCH, or PRINT occurs in an IF statement, the tag 'I' is replaced by a corresponding 'W' or 'R'. When the 'NAME TAG TYPE ADD.' information is encountered, the corresponding data are placed into another type of internal tag. These internal tags and the one-character classification tags are used for each tabulated symbol to identify entries, errors, etc. Errors in the FORTRAN code are corrected whenever possible.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A program containing up to 300 routines can be processed.
6. TYPICAL RUNNING TIME - This varies according to size and complexity of the tested FORTRAN program and the options which are exercised. The sample test case took 19 seconds of CPU time on Argonne's Model 195 to execute the three-step procedure, including compilations of the FORTRAN data and the SLOP and CROSS source.
7. UNUSUAL FEATURES OF THE PROGRAM - Both PL/I and FORTRAN are used.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed November 1975. Both programs have been used by the Code Center in checking out library program packages. Edition B was prepared and tested by ACC May 1977.
10. REFERENCES -
11. MACHINE REQUIREMENTS - 600K of core storage is required.
12. PROGRAMMING LANGUAGE USED - PL/I
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 with IBM FORTRAN H and PL/I compilers.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SLOP was designed to examine only output produced from the IBM FORTRAN H compiler, using the XREF option.
15. NAME AND ESTABLISHMENT OF AUTHOR -
A. J. Strecok
Argonne Code Center
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9700 South Cass Avenue
Argonne, Illinois 60439

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08/77

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (SLOP 806 cards, CROSS 352 cards)
Sample problems (SLOP FORTRAN test deck 292 cards, option
control input 1 card)
Control information (JCL 42 cards)
Sample problem output (SLOP 69 cards, 34 pages)
17. CATEGORY - P
KEYWORDS - FORTRAN, data processing, program checking

1. NAME OR DESIGNATION OF PROGRAM - LUGS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - LUGS calculates stresses, stress indices, and flexibility factors for a rectangular attachment on a cylindrical shell.
4. METHOD OF SOLUTION - The program implements Bijlaard's series solution to the thin-shell equations.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Caution is recommended in using the code for attachments on very thin shells that have large circumferential dimension and small longitudinal dimension (GAMMA.GE.80, BETA2.LE.0.05, and BETA1.GE.0.3) as series convergence and/or numeric problems seem to exist.
6. TYPICAL RUNNING TIME - Approximately 30 seconds are required to execute the sample problems.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed March 1976.
IBM360 version submitted May 1975, sample problem executed by ACC March 1976 on an IBM370/195.
10. REFERENCES - W. G. Dodge, Secondary Stress Indices for Integral Structural Attachments to Straight Pipe, ORNL-TM-3476 (June 1973); Welding Research Council Bulletin 198, September 1974.
E. C. Rodabaugh, W. G. Dodge, and S. E. Moore, Stress Indices at Lug Supports on Piping Systems, ORNL-TM-4211 (May 1974); Welding Research Council Bulletin 198, September 1974.
11. MACHINE REQUIREMENTS - 468K bytes of core storage are used.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
W. G. Dodge
Oak Ridge National Laboratory
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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

Oak Ridge National Laboratory

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) Oak Ridge, Tennessee 37830

16. MATERIAL AVAILABLE -

Source decks (707 cards)

Sample problem (3 cards)

Reference report, ORNL-TM-4098

17. CATEGORY - I

KEYWORDS - curved pipe, stress analysis, pipe elbows, flexibility factors, stress indices

1. NAME OR DESIGNATION OF PROGRAM - SOLA/SOLA-SURF
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - SOLA and SOLA-SURF are numerical solution algorithms for transient fluid flows. SOLA is for incompressible fluid flows without free surfaces. SOLA-SURF, an extension of the SOLA code, permits a free surface or curved rigid boundary (free-slip) to be located across the top or bottom of the fluid region.
4. METHOD OF SOLUTION - SOLA uses a finite difference technique, based on the marker-and-cell (MAC) method, to solve the Navier-Stokes equations for an incompressible fluid in two-dimensional plane or axisymmetric coordinates. Boundaries of the rectangular computing region can be chosen as (1) rigid walls with free-slip or no-slip tangential velocities, (2) specified inflow or outflow boundaries, (3) continuative outflow boundaries, or (4) periodic boundaries. Internal walls and obstacles or sources and sinks can be added by inserting additional boundary conditions in a special section of the code reserved for this purpose.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The surfaces used in SOLA-SURF must be definable by single-valued functions, for example, $y=h(x,t)$ for the top surface and $y=hb(x,t)$ for the bottom surface. Also, the slope of the surface must not exceed the cell aspect ratio, deltay/deltax .
6. TYPICAL RUNNING TIME - The SOLA-SURF test problem required 15 seconds of CP time on the CDC7600 to run to a problem time of 10 (50 cycles).
7. UNUSUAL FEATURES OF THE PROGRAM - The basic solution algorithm contained in the SOLA code can serve as a foundation for developing other codes. For example, a scalar transport equation for density (or temperature) can be added to investigate buoyancy-driven flows and flows of stratified fluids.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed January 1976.
CDC7600 version submitted April 1975, replaced by revised Edition B March 1977, sample problems executed by ACC March 1977 on a CDC7600 via remote terminal to Brookhaven National Laboratory.
10. REFERENCES - C. W. Hirt, B. D. Nichols, and N. C. Romero, SOLA - A Numerical Solution Algorithm for Transient Fluid Flows, LA-5852, April 1975, and Addendum, December 1975, revised March 1977.
11. MACHINE REQUIREMENTS -

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12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
SOLA and SOLA-SURF call a number of LASL subroutines - DATE1,
CLOCK1, and several film output routines. These will have to be
replaced by the user for his environment.
15. NAME AND ESTABLISHMENT OF AUTHORS -
C. W. Hirt, B. D. Nichols, and N. C. Romero
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico 87544
16. MATERIAL AVAILABLE -
Source decks (SOLA 303 cards, SOLA-SURF 550 cards)
Sample problems (SOLA 8 cards, SOLA-SURF 9 cards)
Reference report and addendum
17. CATEGORY - H
KEYWORDS - fluid flow, transients, marker-and-cell, Navier-
Stokes equations

1. NAME OR DESIGNATION OF PROGRAM - STFODE/COLODE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - COLODE is a subroutine intended primarily for solving first-order systems of stiff differential equations by collocation methods. STFODE is a driver routine written to simplify the use of COLODE.
4. METHOD OF SOLUTION - The principal subroutine COLODE uses one-step collocation to integrate over a given interval, taking two equal steps at a time. The collocation method, chosen either by COLODE or by the user, is fixed during the integration, but the size of each pair of steps is automatically varied. At each step a vector of continuous n th degree piecewise polynomials is made to satisfy the o.d.e. at n Gauss-Legendre or Radau (right-end) points, where $1 \leq n \leq 12$. The Gauss-Legendre methods are a -stable and of order $2n$, while the Radau methods are strongly a -stable and of order $2n-1$.

STFODE, the driver for COLODE, is intended for users who never want to supply a Jacobian subroutine or select the method.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Storage requirements limit the number of equations to about 100 for the CDC6600 version.
6. TYPICAL RUNNING TIME - Running time varies widely with the number and type of equations and the magnitude and type of error tolerance requested.
7. UNUSUAL FEATURES OF THE PROGRAM - The user has two options which are uncommon to o.d.e. solvers. First, the user may indicate that the Jacobian of the derivative vector is constant, allowing COLODE to economize on Jacobian evaluations. Second, the user may choose to obtain results only at the end of the integration interval or to have intermediate returns after each pair of steps yielding the results from both steps.

COLODE is particularly effective on stiff problems with (a) extremely rapidly decaying solution components, (b) all nonreal eigenvalues of the Jacobian, (c) periodic transients, or (d) any stiff problem with very small error tolerances.
8. RELATED AND AUXILIARY PROGRAMS - COLODE actually uses a third subroutine, TWOSTP, to advance the solution two steps.
9. STATUS - Abstract first distributed April 1975.

CDC6600 version submitted February 1975, sample problems executed by ACC March 1975 on a CDC6600.

IBM360 version submitted March 1975, sample problems executed by ACC March 1975 on an IBM370/195.

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
A. S. Klein and M. Passiakos
Central Research Library
Oak Ridge National Laboratory
P. O. Box X
Oak Ridge, Tennessee 37830
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (11,788 cards)
Sample problems (89 cards)
Libraries (4 files containing 21 variable-sized blocks*)
Control information (JCL 235 cards)
Reference report, ORNL-4837, and ACC Note
* 320-byte maximum length
17. CATEGORY - M
KEYWORDS - libraries, journals, maintenance

1. NAME OR DESIGNATION OF PROGRAM - GEARB
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370/195, CDC6600,7600 (see item 14)
3. DESCRIPTION OF PROBLEM OR FUNCTION - GEARB is a package of seven subroutines for the numerical solution of the initial value problem for systems of first order ordinary differential equations for which the Jacobian matrix is banded. The package is suitable for either stiff or non-stiff systems. It can also be used if the Jacobian matrix can be approximated by a banded matrix.
4. METHOD OF SOLUTION - GEARB contains two variable-order integration methods, which change step-size by interpolation. The two methods are an implicit Adams (non-stiff) method of orders one through twelve, and an implicit backward differentiation (Gear or stiff) method of orders one through five.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The Jacobian matrix is assumed to be banded. Current dimensioning allows for 100 simultaneous equations. Systems involving intermittent high-speed transients can lead to numerical instability or high overhead.
6. TYPICAL RUNNING TIME - Less than 1 minute is needed to compile and execute the sample problem.
7. UNUSUAL FEATURES OF THE PROGRAM - The user may select from two basic integration methods (stiff and non-stiff) and from four nonlinear system solvers. A flexible driver (subroutine DRIVEB) returns output data at a previously-specified point by interpolation, provides output data by hitting the prescribed output point without interpolation, or returns data after each step. DRIVEB controls the integration process and prints any error messages.
8. RELATED AND AUXILIARY PROGRAMS - GEAR (ACC Abstract 592) and EPISODE (ACC Abstract 675) for systems with a full Jacobian; EPISODEB (ACC Abstract 705) for systems with a banded Jacobian. EPISODE and EPISODEB are especially suited for systems with intermittent high-speed transients.
9. STATUS - Abstract first distributed August 1975.
IBM360 version submitted May 1975, replaced by revised Edition B February 1976, replaced by revised Edition C January 1977, sample problem executed by ACC December 1976 on an IBM370/195.
CDC6600 version submitted May 1975, replaced by revised Edition B February 1976, replaced by revised Edition C January 1977, sample problem executed by ACC December 1976 on a CDC7600 at Brookhaven National Laboratory.

10. REFERENCES - A. C. Hindmarsh, GEARB: Solution of Ordinary Differential Equations having Banded Jacobian, UCID-30059 Rev. 1, March 1975, with corrections January 1976 and July 1976.
A. C. Hindmarsh, Banded Linear Systems with Pivoting, UCID-30060, Rev. 1, May 1976.
A. C. Hindmarsh, GEAR: Ordinary Differential Equation System Solver, UCID-30001, Rev. 3, December 1974.
A. C. Hindmarsh and G. D. Byrne, EPISODE: An Experimental Package for the Integration of Systems of Ordinary Differential Equations, UCID-30112, May 1975.
G. D. Byrne, ACC Programming Note 76-3, revised January 5, 1977.
11. MACHINE REQUIREMENTS - 98K bytes (IBM370/195), 22,100 (octal) words (CDC6600,7600).
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370 (IBM360,370), ORDER, CHAT, SCOPE 3.4.3 (CDC6600), ORDER, CHAT, SCOPE 2.1.2 (CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The code is heavily commented. It is intended to be readily portable. If GEARB is to be used on other systems, UROUND (the machine unit roundoff) may need to be evaluated and set in subroutine DRIVEB. The package contains an auxiliary subroutine, MACHIN, and its driver (supplied to ACC by L. F. Shampine and M. K. Gordon of SLA) which may be adapted to verify or calculate UROUND. During integration, diagnostic and warning messages may be written on logical unit LOU, where LOU currently is set to 3 in a data statement, both in subroutine DRIVEB and in the main program of the test deck. Suitable disposition of TAPE3 output should be specified.
15. NAME AND ESTABLISHMENT OF AUTHOR -
A. C. Hindmarsh
Numerical Mathematics Group, L-310
Lawrence Livermore Laboratory
P. O. Box 808
Livermore, California 94550
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (360-1251 cards, 6600-1208 cards)
Sample problems (360-133 cards, 6600-126 cards)
Auxiliary programs (360-28 cards, 6600-26 cards)
Sample problem output (360-7 pages, 6600-4 pages)
Reference report, UCID-30059 Rev. 1 with corrections, and ACC Note 76-3
17. CATEGORY - P
KEYWORDS - ordinary differential equations, stiff, banded Jacobian matrix, numerical calculations, predictor-corrector, GEAR codes, EPISODE codes, EPISODEB codes

1. NAME OR DESIGNATION OF PROGRAM - SOLVEX
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - SOLVEX simulates the dynamic and steady-state behavior of solvent extraction banks composed of either mixer-settlers or centrifugal contactors. Two options permit terminating dynamic phases by time or by achieving steady-state, and a third option permits artificial rapid close to steady-state. Distribution data may be expressed in the form of tables or cubic polynomial equations.
4. METHOD OF SOLUTION - SOLVEX uses a finite-difference solution of the differential equations describing the material balance. For both dynamic and steady-state options the calculation proceeds from stage 1 through the last stage specified by the user for successive time intervals, beginning at time zero with pure water and pure solvent in the bank. In the steady-state case time merely corresponds to number of iterations. The rate of change in the inventory of a given component in either the mixer or a settler zone is proportional to the flow of that component in less the component flow out. Input concentrations to the stage are taken as the output concentrations from adjacent stages during the previous time interval and the equations are solved for the aqueous and organic exit concentrations during the current time interval. Concentrations from the mixer and each settler zone are calculated before proceeding to the next stage.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
 - 24 stages for the bank
 - 5 chemical components
 - 5 tables and 5 equations of distribution data
 - 2 methods of expressing distribution of each component
6. TYPICAL RUNNING TIME - Three seconds per steady-state problem is typical. One second of computer time simulates approximately eight minutes of the solvent extraction process. The sample problem took about six minutes of CPU time to compile and execute on Argonne's IBM370/195.
7. UNUSUAL FEATURES OF THE PROGRAM - SOLVEX allows multiple problem input, as many as 50 lumped parameter zones in each settler, and flexible distribution data input.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed April 1976.
 - IBM360 version submitted March 1976, sample problem executed by ACC April 1976 on an IBM370/195.

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10. REFERENCES - J. M. Otter and P. A. Conners, Description of the COMRADEX-III Code, TI-001-130-053, June 30, 1975.
11. MACHINE REQUIREMENTS - 250K bytes of memory are required. Two logical units are used as input and output (units 5 and 6), and two additional units may be needed. Use of several other units is optional.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV (H)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/370 Release 21.6.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. Otter and P. Conners
Atomics International Division
Rockwell International
8900 De Soto Avenue
Canoga Park, California 91304
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (1409 cards)
Sample problem (1304 cards)
Control information (JCL 7 cards)
Reference report
17. CATEGORY - G
KEYWORDS - containment, meteorology, radiation, exposure, dose, LMFBR reactors, RIBD2 codes, HAA3B codes

1. NAME OR DESIGNATION OF PROGRAM - FLOW3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600,6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - FLOW3 was developed for the steady-state thermal and hydraulic analysis of two-phase flow in three-dimensional geometries. The program was developed with particular application to the analysis of flow on the primary and secondary sides of a steam generator and may be applied to a variety of fluid flow problems of a general nature. The program employs a network representation of the flow field and predicts local fluid conditions based on a boundary value solution method. The FLOW3 program user specifies a flow region of interest as a network of nodes with interconnecting links. Flow may enter or leave the network at designated boundary nodes (where the pressure is fixed) or at designated source nodes (where the flow is fixed). The conservation equations for mass, energy, and momentum are solved for the steady-state enthalpy and pressure at each node and the flow in each link. Heat may be added to any links, and two-phase flow is allowed.
4. METHOD OF SOLUTION - The network conservation equations are non-linear, and a nested inner-outer iterative method is employed. In the inner iterations the equations are solved with fixed fluid property values. A block, successive overrelaxation method is employed. In the outer iterations, the fluid properties are updated and the inner iterations repeated. A pseudo time-dependent term is added to the momentum equation to force the outer iterations to creep slowly to the steady-state solution, thereby avoiding convergence difficulties.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
350 nodes
700 links
6. TYPICAL RUNNING TIME - The sample problem requires about 25 seconds on a CDC7600.
7. UNUSUAL FEATURES OF THE PROGRAM - The program has a special capability to analyze flow conditions in the secondary loop of steam generators. The network representation is used to model the tube bundle region. Special correlations are provided for vapor fraction and pressure drop across tube banks. Separate calculations are performed for the riser, separator, and downcomer, and the program adjusts the recirculation flow rate iteratively so that the conservation equations are satisfied throughout the loop. Heat transfer calculations are used to iteratively determine the heat flux distribution and system pressure concurrently with the recirculation rate.

8. RELATED AND AUXILIARY PROGRAMS - FLOW3 uses the Bettis Environmental Routines (ACC Abstract 478) and the Bettis Environmental Library (ACC Abstract 665). Fluid properties are obtained through the use of subroutine HOH (ACC Abstract 294).
9. STATUS - Abstract first distributed October 1975.
CDC6600 version submitted November 1974, replaced by
CDC7600 revised Edition B June 1976.
10. REFERENCES - S. G. Beus and J. H. Anderson, FLOW3 - A Computer Program for Network Analysis of Two Phase Flow in Three Dimensions, WAPD-TM-1177(L), October 1974, with Appendix A replacement, April 1975, and Addendum 1, May 1976.
W. R. Cadwell (Ed.), Reference Manual - Bettis Programming Environment, WAPD-TM-1181, September 1974.
11. MACHINE REQUIREMENTS - Large core memory (7600) or extended core storage (6600)
12. PROGRAMMING LANGUAGES USED - FORTRAN IV and COMPASS
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 1.1 (7600), SCOPE 3.3 (6600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FLOW3 is written completely in FORTRAN, however, some of the environmental library routines used by FLOW3 are in Assembly language.
The (4,0) overlay is used to read and write restart files for long running jobs. The Bettis file management routines, which are called by this overlay and are part of the Bettis Environmental Routines, are highly installation-dependent and will probably have to be rewritten by the user. FMEROR, which is called by RSFM and is not part of the Bettis Environmental Routines, provides error messages.
15. NAME AND ESTABLISHMENT OF AUTHORS -
S. G. Beus and J. H. Anderson
Bettis Atomic Power Laboratory
Westinghouse Electric Corporation
Box 79
West Mifflin, Pennsylvania 15122
16. MATERIAL AVAILABLE - Restricted Distribution
Magnetic Tape Transmittal
Source deck (20,997 cards)
Sample problem (78 cards)
Reference report and addendum
7. CATEGORY - H
KEYWORDS - 3-dimensional, steady state, fluid flow, steam generators, network analysis, HOH codes, BETTIS ENVIRONMENTAL ROUTINES codes, BETTIS ENVIRONMENTAL LIBRARY codes

1. NAME OR DESIGNATION OF PROGRAM - BETTIS ENVIRONMENTAL LIBRARY
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, 7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - The BETTIS ENVIRONMENTAL LIBRARY consists of a large number of subroutines and functions which are available for use in application programs. These routines effectively extend the FORTRAN language in such areas as system communication, decimal input, file management, scratch I/O, storage allocation, and plotting.
4. METHOD OF SOLUTION - The intent is to maintain all system-dependent routines in a well-documented central library to minimize system conversion problems. Routines included are:
 - CARDS and INPF systems - for conversion and processing of free-field decimal input.
 - FTB-4 system - for very high, disk-streaming rates with storage management and allocation capabilities.
 - FMG routine - to interface the file management system and the using program.
 - RANDIO routines - for reading and writing indexed files which can be moved between the 6600 and 7600 computers.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - The BETTIS ENVIRONMENTAL LIBRARY is used by the newer Bettis programs; an earlier edition of the Bettis Environmental Routines appeared as ACC Abstract 478.
9. STATUS - Abstract first distributed April 1975.
 - CDC6600 (RUN compiler) version submitted November 1974.
 - CDC6600 (FTN compiler) version submitted January 1975.
 - CDC7600 (RUN compiler) version submitted November 1974.
 - CDC7600 (FTN compiler) version submitted January 1975.
10. REFERENCES - W. R. Cadwell, Ed., Reference Manual - Bettis Programming Environment, WAPD-TM-1181, September 1974.
 - C. J. Pfeifer, CDC-6600 FORTRAN Programming - Bettis Environmental Report, WAPD-TM-668, January 1967.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - Almost all of the environmental routines are written in FORTRAN IV, the remainder in COMPASS.
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1 and 3.2 (CDC6600), SCOPE 1.1 (CDC7600).

1. NAME OR DESIGNATION OF PROGRAM - LASIP3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - LASIP3 processes Version III standard interface data files specified by the Reactor Physics Committee on Computer Code Coordination (CCCC). This processor performs two distinct tasks: namely, transforming free-field format, BCD data, into well-defined binary files and providing for printing and punching data in the binary files.
4. METHOD OF SOLUTION - The LASIP3 code contains two basic modules: one (input) for converting free-field format BCD data into binary files, and one (file-print) for printing the binary-file data. Standard routines for file management (SEEK) and I/O (REED and RITE) are used.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - Instead of maintaining two versions of LASIP3 for long- and short-word computers, one version containing coding for both systems is made available. Unnecessary coding for a specific system is made nonexecutable by comment cards.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed August 1976.
IBM360 version submitted March 1976, sample problem executed by ACC July 1976 on an IBM370/195.
10. REFERENCES - G. E. Bosler, R. D. O'Dell, and W. M. Resnik, LASIP-III, A Generalized Processor for Standard Interface Files, LA-6280-MS, April 1976, and Errata, June 1976.
B. M. Carmichael, Standard Interface Files and Procedures for Reactor Physics Codes, Version III, LA-5486-MS, February 1974.
11. MACHINE REQUIREMENTS - 25 logical units besides the standard input/output units
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

G. E. Bosler, R. D. O'Dell, and W. M. Resnik
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico 87544

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal

Source deck (360-8748 cards)
Sample problem (360-107 cards)
Control information (JCL 360-63 cards)
Reference report, LA-6280-MS with Errata

17. CATEGORY - M

KEYWORDS - standard interface files, CCCC, REED codes, RITE codes,
SEEK codes

1. NAME OR DESIGNATION OF PROGRAM - SOLSYS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, 7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - SOLSYS simulates the transient response of solar energy systems. It can be used to predict performance characteristics of a system; parametric studies can be performed for optimization and to determine auxiliary fuel requirements.

The program consists of a component subroutine library, an information subroutine library, a control-component subroutine library, and an executive program.
4. METHOD OF SOLUTION - Component subroutines modeling the performance of fluid-handling components can be connected to construct almost any desired energy system. This library presently contains 21 routines modeling collectors, storage units, power-generation cycles, transmission and distribution hardware, heat exchangers, house equipment, and auxiliary energy components. The library of information subroutines supplies time-dependent solar, weather, and load parameters to the appropriate components. Time is incremented in steps, and at each step, simple iteration is used to achieve convergence of component outlet temperatures.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A maximum of 80 components can be used in a system. Two dummy subroutines, EXSUB1 and EXSUB2, may be replaced by subroutines which describe components which are not already modeled in the subroutine library.
6. TYPICAL RUNNING TIME - The sample problem required less than 1 CP minute for compilation and execution. Very large systems with 60 or more components can be simulated using one-hour time-steps for a four-week period in approximately 30 minutes of CP time.
7. UNUSUAL FEATURES OF THE PROGRAM - Nearly any component configuration defining a solar energy system may be studied. Parametric changes or system revisions can be studied by changing only pertinent data in a single sequence of cases.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed August 1976.

CDC6600 version submitted December 1975, sample problem executed by ACC August 1976 on a CDC7600 at BNL.
10. REFERENCES - M. W. Edenburn and N. R. Grandjean, Energy System Simulation Computer Program - SOLSYS, SAND75-0048, June 1975, and Errata November 1975.

M. W. Edenburn, Sandia Laboratories Energy System Simulation Computer Program, Proc. 1975 ISES Meeting, Los Angeles,

10. REFERENCES (CONTINUED)
CA, July 1975.

M. W. Edenburn, Performance of a Focusing Cylindrical Parabolic Solar Energy Collector, Analysis and Computer Program, SLA-74-0031, April 1974.

J. P. Abbin and W. R. Leuenberger, Program Cycle: A Rankine Cycle Analysis Routine, SAND74-0099, October 1974.

Norman R. Grandjean, PLOT40, A Routine Using Disk Storage for Input, SLA-73-0148, April 1973.

ACC Programming Note 76-50, revised, May 5, 1977.

ACC Programming Note 77-25, May 5, 1977.

11. MACHINE REQUIREMENTS - SOLSYS requires 170K (octal) words for program storage. An additional 45K (octal) of ECS is needed for data storage. Two tape drives are used, one for a solar data tape and one for a weather data tape, and a disk or tape file is generated if the plotting option is exercised.

12. PROGRAMMING LANGUAGE USED - FORTRAN Extended

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3, 3.4 (CDC6600); SCOPE 2.1 (CDC7600).

14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - Logical unit 60 is equivalenced to input. Solar data are read from logical unit 7. Weather data are read from logical unit 6. Information for subsequent plotting is written to logical unit 40. The program uses end-of-file checks to determine end of input data or end of information read from tapes.

Solar data and weather data files normally will be supplied to CDC users as binary data. Non-CDC users will receive BCD or EBCDIC versions of the same information to allow them to make the necessary conversion to their machine. Specify machine and tape format with package request.

At present, no documentation is available for the component subroutines ADOBEHL, AIRCOL, and ROKSTOR. If the plotting option is elected, an alternative for SKPFIL, a local file-positioning subroutine, must be supplied. A dummy SKPFIL, supplied with the package, allows execution of the sample problem. Report SLA-73-0148 describes PLOT40, which the authors used to interface with the local SCORS plotting package for the SC-4020 plotter.

15. NAME AND ESTABLISHMENT OF AUTHORS -

M. W. Edenburn
Solar Total Energy Program Division
N. R. Grandjean
System Studies Division
Sandia Laboratories
P. O. Box 5800
Albuquerque, New Mexico 87115

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal (2 tapes)
Source decks (7519 cards)

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16. MATERIAL AVAILABLE (CONTINUED)

Sample problem input (43 cards)

Sample problem output (11 pages)

For 6600 use:

Data libraries (binary)

For non-6600 use:

Data libraries (7-track BCD or 9-track EBCDIC)

Reference reports, SAND75-0048 and SLA-73-0148, and ACC

Programming Note appropriate to machine and tape format

17. CATEGORY - R

KEYWORDS - solar energy, system simulation

1. NAME OR DESIGNATION OF PROGRAM - SOLDATABQ62
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - SOLDATABQ62 is a data collection consisting of readings of direct and total solar radiation intensities and related parameters for solar energy systems studies. The solar data measurements are for Albuquerque, New Mexico for the year 1962. The items presented are: hour, wind direction, wind speed, dry bulb temperature, wet bulb temperature, dew point, atmospheric pressure, sky cover, visibility, atmospheric precipitable water vapor content, hourly integral of direct-normal radiation, hourly integral of total-horizontal radiation, six readings of direct-normal intensity at 10-minute intervals, and six readings of total-horizontal radiation at 10-minute intervals. These data were compiled from strip-chart recordings of the National Climatic Center, Asheville, North Carolina.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The data apply to Albuquerque, New Mexico for the year 1962.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - SOLDATABQ62 is a general-purpose data library. No related programs are available currently.
9. STATUS - Abstract first distributed August 1976.
CDC6600 binary Edition submitted August 1975.
CDC6600 BCD Edition B submitted April 1976.
10. REFERENCES - E. C. Boes, Solar Data Albuquerque 1962, SOLDATABQ62, Documentation, August 1975.
ACC Programming Note 76-51 for Binary Edition, August 20, 1976.
ACC Programming Note 76-56 for BCD Edition, August 20, 1976.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED -
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CDC6600 (SCOPE).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SOLDATABQ62 will be supplied to CDC users on tape in SCOPE internal format. Non-CDC users can receive a BCD version of the same information.

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15. NAME AND ESTABLISHMENT OF AUTHOR -
Eldon C. Boes
Sandia Laboratories
P. O. Box 5800
Albuquerque, New Mexico 87115
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Reference document and Programming Note appropriate to edition
6600:
Binary data (variable-length records 300-word maximum length)
6600B for non-6600 use:
BCD data (9125 140-character records)
17. CATEGORY - Z
KEYWORDS - weather, solar, radiation, energy, atmosphere, data

1. NAME OR DESIGNATION OF PROGRAM - FRAP-S1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - The FRAP-S1 program predicts the thermal, mechanical, and internal gas pressure response of a water-cooled oxide fuel rod during steady-state reactor operation. The code considers the coupled effects of the response parameters by iterating to convergence at each power-time step.
4. METHOD OF SOLUTION - The fuel rod to be analyzed is divided into axial and radial nodes. A one-dimensional radial heat conduction solution using the integration method to determine the radial temperature distribution at each axial node is used. Fuel and clad temperatures are used in conjunction with internal and external pressure forces to calculate mechanical deformation. Mechanical deformation effects on fuel clad gap and internal volume are fed back to the conduction solution and the internal pressure calculation. An iterative solution considering all the coupled effects is carried out for each power-time step.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The code is limited to a single rod analysis with up to 15 axial and 11 radial nodes, assuming thermal reactor fuel rods with water coolant.
6. TYPICAL RUNNING TIME - The running time varies with the time-step selected and the number of nodes. For a typical power analysis, the running time is approximately 0.5 minutes of CPU time per 1000 hours of reactor operation.
7. UNUSUAL FEATURES OF THE PROGRAM - FRAP-S1 is a developmental code and is still being updated through comparison of calculated and experimental results. Certain known simplifications in the code are being updated as part of the developmental process.
8. RELATED AND AUXILIARY PROGRAMS - FRAP-T (ACC Abstract 658) is the transient fuel rod analysis code which is designed to analyze fuel rods under accident conditions such as loss-of-coolant accidents, power coolant mismatch, etc.
9. STATUS - Abstract first distributed August 1976.
IBM360 version submitted September 1975, sample problem executed by ACC July 1976 on an IBM370/195.
10. REFERENCES - J. A. Dearien, G. A. Berna, D. R. Coleman, P. E. MacDonald, and J. M. Broughton, FRAP-S: A Computer Code for the Steady State Analysis of Oxide Fuel Rods, Volume 1 FRAP-S Analytical Models and Input Manual, Aerojet Nuclear Company, Interim Report I-309-13.1, August 1975.
R. L. Miller, R. R. Hobbins, V. F. Baston, W. A. Yuill, and P. E. MacDonald, FRAP-2: A Computer Code for the

10. REFERENCES (CONTINUED)

Steady State Analysis of Oxide Fuel Rods, Volume 2 MATPRO Material Properties Subcode, Aerojet Nuclear Company Interim Report, August 31, 1975.

D. R. Coleman, FRAP-S: A Computer Code for the Transient Analysis of Oxide Fuel Rods, Volume 3 Model Verification Report, Aerojet Nuclear Company Interim Report, October 1975.

11. MACHINE REQUIREMENTS - 260K bytes of memory are required for execution.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV (85%) and BAL (15%)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

J. A. Dearien, G. A. Berna, D. R. Coleman,
P. E. MacDonald, and J. M. Broughton
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, Idaho 83401

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (FRAP-S1 4149 cards, PLOT 1243 cards)
Sample problem (14 cards)
Reference reports & errata

17. CATEGORY - H

KEYWORDS - rod analysis, radial heat conduction, fuel temperatures, clad temperatures, mechanical deformation, FRAP-T codes

1. NAME OR DESIGNATION OF PROGRAM - NMMSS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM370
3. DESCRIPTION OF PROBLEM OR FUNCTION - Three basic programs in the Nuclear Materials Management and Safeguards System (NMMSS) for processing incoming transaction data and maintaining the current transaction data file are: TJEDIT, TJUPDT, and COMPAT. TJEDIT prepares, verifies, and maintains the integrity of data as it is introduced into the data base. TJUPDT maintains the current transaction data file on a daily basis. COMPAT maintains consistency between related data sets on the transaction data master file.
4. METHOD OF SOLUTION - TJEDIT examines input data and, depending on data specifications, accepts or rejects it, passing the accepted data to the TJUPDT program, and producing reports on all data submitted and data found to be in error. TJUPDT edits incoming data sets in relation to those already on the master file and rejects any invalid updating attempts. Data sets that pass the editing phase cause new data to be added to the master file, and existing data sets to be deleted or replaced depending upon the updating action indicated in the data. COMPAT examines all combinations of data sets within each transfer series and transfer number, suspends those that are incompatible from the file, and produces an error report when necessary.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - No specific limits are imposed on the number of data sets that can be processed in any given execution since only those sets within a given transfer series and transfer number are stored simultaneously.
6. TYPICAL RUNNING TIME - On the 360/195, TJEDIT takes about 10 seconds for 2000 data items. A typical run of TJUPDT takes about 17 seconds of CPU time, and a typical daily compatibility edit using COMPAT takes about 7 minutes of CPU time.
7. UNUSUAL FEATURES OF THE PROGRAM - The IBM SORT routine is used by the three programs. TJUPDT selects toll enriching transaction data and creates a file of these records for interfacing with an external system.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed August 1976.
IBM370 version submitted November 1975.
10. REFERENCES - ERDA Manual Chapter Appendix 7401-C.
Instructions to ERDA and Agreement State Licensees for Reporting Nuclear Material Transfers on Form ERDA 741 - Nuclear Material Transaction Report.

10. REFERENCES (CONTINUED)

E. H. Foreman, W. G. Gregg, and D. A. Hyde, Nuclear Materials Information System Transaction Data Base, UCCND-CSD-INF-63, September 1975.

11. MACHINE REQUIREMENTS - The three programs require utility input and output units for the IBM SORT procedure and a printer. TJEDIT requires 260K bytes for execution and two input/output devices (tape and direct-access). TJUPDT requires 158K bytes of storage for execution and four input/output devices. COMPAT requires 238K bytes of storage for execution, three input/output devices (two of which must be direct-access), and one card punch unit.

12. PROGRAMMING LANGUAGE USED - ANS COBOL Version 3

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/370.

14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The two routines IDAY and ITIME are routines local to the UCCND/CSD environment.

15. NAME AND ESTABLISHMENT OF AUTHORS -

E. Hunter Foreman and William G. Gregg
Computer Sciences Division
Union Carbide Corporation, Nuclear Division
P. O. Box P
Oak Ridge, Tennessee 37830

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (TJEDIT 3668 cards, TJUPDT 1060 cards, COMPAT 2652 cards)
Control language for execution (105 cards)
Reference report, UCCND-CSD-INF-63

17. CATEGORY - M

KEYWORDS - nuclear materials, data specifications, edit, transaction data, data errors, master file update, compatibility edit

1. NAME OR DESIGNATION OF PROGRAM - ENERGY
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM370
3. DESCRIPTION OF PROBLEM OR FUNCTION - This package consists of four independent programs, ENERGY1, ENERGY2, ENERGY3, and SUPERENERGY developed for predicting coolant temperature distributions in wire wrapped fuel and blanket assemblies of a liquid-metal-cooled, fast breeder reactor.
4. METHOD OF SOLUTION - The rod array in a LMFBR is divided into two regions, the central and wall regions, each treated as a continuum by viewing the wire-wrapped bundle as a porous body; energy generation by the rods is modeled by a continuous volumetric heat source distribution. The energy transfer in the transverse direction is modeled by the effective eddy diffusivity including fluid oscillations due to the presence of wire wraps and other means of energy transport, like natural turbulence. The finite difference equations are solved explicitly. That is, once temperatures at a given level are known, the temperatures in the next are calculated uniquely.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Since two empirical constants used by the ENERGY codes were obtained from available data, these computer programs should not be used outside these ranges, which are summarized by E. Khan in the C00-2245-17TR report. The ENERGY1 code must be used for predicting temperature distributions in bundles in forced convections only. ENERGY2 and ENERGY3 can be used for bundles in forced or mixed convection. Each of the ENERGY codes has an option permitting subchemical analysis. The ENERGY1, 2, and 3 codes do not include inter-assembly heat transfer, which is computed for the forced convection flow-regime only in the SUPERENERGY code.
6. TYPICAL RUNNING TIME - ENERGY2 should take more time than ENERGY1, but less than ENERGY3. Observed times for compiling and executing test cases on the Argonne IBM370/195 were about 68 seconds for SUPERENERGY, 6 seconds for ENERGY1, 48 seconds for ENERGY2, and more than 15 minutes for ENERGY3.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed October 1976.
IBM370 version submitted August 1975, revised August 1976, sample problems executed by ACC August through October 1976 on an IBM370/195.
10. REFERENCES - E. U. Khan, W. M. Rohsenow, A. A. Sonin, and N. E. Todreas, Manual for ENERGY I, II, III Computer Programs,

10. REFERENCES (CONTINUED)

C00-2245-18TR, Revision 1, July 1976.

E. U. Khan, W. M. Rohsenow, A. A. Sonin, and
N. E. Todreas, Input Parameters to the ENERGY Code (to be used
with the ENERGY Codes Manual), C00-2245-17TR, Revision 1, December
1976.

Brian Cheng-Jean Chen and Neil E. Todreas,
Prediction of Coolant Temperature Field in a Breeder Reactor
Including Interassembly Heat Transfer, C00-2245-20TR, May 1975.

11. MACHINE REQUIREMENTS - Compilation and execution required approxi-
mately 250K bytes storage for ENERGY1, 2, and 3; approximately
360K for SUPERENERGY.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/370.

14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

Brian Cheng-Jean Chen,
E. U. Khan, W. M. Rohsenow,
A. A. Sonin, and Neil E. Todreas
Department of Mechanical and Nuclear Engineering
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal

Source decks (ENERGY1 626 cards, ENERGY2 963 cards, ENERGY3
1047 cards, SUPERENERGY 828 cards)

Sample problems (ENERGY1 112 cards, ENERGY2 112 cards, ENERGY3
108 cards, SUPERENERGY 417 cards)

Reference reports

17. CATEGORY - H

KEYWORDS - coolant temperature distribution, heat transfer,
convection effects, fuel bundles, LMFBR reactors

1. NAME OR DESIGNATION OF PROGRAM - F0355
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600, IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - Program F0355 produces a plot which shows the geometry of the cutter required to produce a given external circular spur gear or ratchet wheel. It is particularly applicable for non-involute tooth forms. In addition, the program can provide a comparator chart for inspecting cutters, indicate whether a given geometry can be shaped, and be used to determine the effects of changes in pitch diameter and related variables. The output of the program is a magnified drawing of the shaper cutter, the workpiece, and the paths of the cutter teeth. The program does not print a numerical description of the cutter profile.
4. METHOD OF SOLUTION - Essentially, the program rolls the workpiece around a round cutter blank. All portions of the cutter blank which fall within the workpiece contour as it is rotated around the cutter are removed. The resulting information is the contour of a cutter which can be used to produce the workpiece.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Only one plot is drawn per computer run. Current dimensioning allows for a maximum of 2000 points to describe the complete profile of the workpiece. These restrictions are not difficult to remove. Only the points for one tooth need to be specified as input.
6. TYPICAL RUNNING TIME - The sample problem required approximately 500 seconds of CP time on a CDC6600 and 180 seconds on an IBM370/195 CPU. Plotting took 15 minutes on a CalComp 780 plotter.
7. UNUSUAL FEATURES OF THE PROGRAM - The output is entirely graphical.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed November 1976.
CDC6600 version submitted February 1976, sample problem executed by ACC, using dummy plot routines, on a CDC7600.
IBM360 version converted from the CDC6600 version August 1976, sample problem executed by ACC September 1976 on an IBM370/195 with plotting on a CalComp 780 plotter.
10. REFERENCES - L. K. Gillespie, F0355 - A Program for Generating Shaper Cutter Contours, Bendix Corporation, Kansas City Division, May 9, 1974.
R. W. Stiles, Shaping Ratchet Teeth, BDX-613-973,

10. REFERENCES (CONTINUED)
Bendix Corporation, Kansas City Division, August 1973.
G. E. Volkland, Computer Designed Shaper Cutters, SME Paper MR74-193, 1974.
G. E. Volkland, Shaper Cutters Generated by Computers, Tooling & Production, pp. 36-39, February 1976.
ACC Programming Note 77-2, October 11, 1976.
11. MACHINE REQUIREMENTS - Approximately 55,000 (octal) words (CDC6600) or 126K bytes (IBM370) storage are required and auxiliary plotting equipment is used.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.4 (CDC6600), SCOPE 2.1 (CDC7600), OS/360,370 (IBM360,370).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The revised input deck format is described in ACC Programming Note 77-2. The program uses the CalComp plotting package and subroutine CIRCL from the CalComp functional software. The sample problem, which calls CIRCL with a zero radius, may be executed by use of the dummy CIRCL subroutine supplied with the package.
15. NAME AND ESTABLISHMENT OF AUTHOR -
6600 L. K. Gillespie and D. Wantoch
The Bendix Corporation
Kansas City Division
P. O. Box 1159
Kansas City, Missouri 64141

360 H. S. Edwards
Argonne Code Center
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
16. MATERIAL AVAILABLE -
Source decks (6600-209 cards, 360-212 cards)
Sample problem input (182 cards)
Sample problem output (a single plot)
Reference reports and ACC Programming Note
17. CATEGORY - T
KEYWORDS - spur gear, ratchet wheel, gear shaper, design, manufacture, inspection

1. NAME OR DESIGNATION OF PROGRAM - DUMP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC 6200,6400,6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - DUMP is a user-oriented program dumping routine which provides diagnostics in English. It can be used to print a job's exchange package (operating registers) and part or all of its memory. It will print messages telling where the program was executing when it quit, why DUMP thinks it quit, and what routines have been called.
4. METHOD OF SOLUTION - DUMP includes tracebacks for routines, and gives addresses in absolute and in relative positioning in the block. It has the ability to minimize long printouts by selective dumping of only those routines used. System routines are ignored. DUMP will not abort unless given a control card without a termination.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed September 1976.
CDC DUMP V9 submitted May 1976.
10. REFERENCES -
11. MACHINE REQUIREMENTS - 12,000 (octal) words of storage, a disk and printer are used.
12. PROGRAMMING LANGUAGES USED - FTN V.3 and COMPASS V3
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - BKY software.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - Some system library routines, the exchange package, core image and load map are required. Adaptation to local environment will be required.
15. NAME AND ESTABLISHMENT OF AUTHOR -
Thomas H. Strong, Bldg. 50A
Lawrence Berkeley Laboratory
Berkeley, California 94720
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (UPDATE format 57 records,

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16. MATERIAL AVAILABLE (CONTINUED)
 - maximum size of 512 words)
 - Sample problem (232 cards)
 - Computer listings for documentation, structure description, and regression test cases (170 pages)
17. CATEGORY - P
KEYWORDS - dump, data processing, program checking

1. NAME OR DESIGNATION OF PROGRAM - ORSIM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - ORSIM is an electric power generating system integration model which simulates the multi-year operation of a mixed power system consisting of fossil, nuclear, hydro, and pumped-storage units. For any specified refueling schedule for nuclear units and forecast of future load, the model determines a plan of operation for the system which attempts to minimize the total discounted operating cost over a specified study period.

The analysis considers the effects of forced outages, spinning reserve operating constraints, and scheduled introduction and retirement of generating stations. The model determines a maintenance schedule for the non-nuclear stations (nuclear stations are maintained during refueling outages) and the optimum allocation of energy-fixed nuclear and hydro resources. It calculates the expected energy generated by each station in the system, period by period over the planning horizon, based on input or calculated incremental operating cost. It also calculates the expected loss-of-load probability and unserved energy demand for each period in the planning horizon. An optimum operating plan, designed to minimize the discounted total production cost, is then calculated, as are the costs of operating each station in the system and the discounted total production cost for the derived plan of operation.
4. METHOD OF SOLUTION - ORSIM searches for a particular mode of operation which, over a multi-year planning horizon, will minimize the total system operating cost of a particular electric power generation system, discounted to the beginning of the planning horizon. It does this by:
 - (a) calculating the planned maintenance outages for all units;
 - (b) estimating the incremental discounted cost of energy produced by each station in the system for every subinterval of the planning horizon;
 - (c) utilizing the incremental discounted costs of energy generation to calculate, via probabilistic simulation, the economic optimum energies generated by each station in the system in each subinterval of the planning horizon;
 - (d) utilizing these expected energies in a feedback loop to calculate the total discounted operating cost and to produce a new set of incremental discounted costs, thereby setting the stage for the next iteration.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - The sample problem provided requires about 10 minutes on an IBM370/195. A one-year simulation problem is executed in approximately 7 minutes on an IBM360/91, printing nearly 5000 lines and issuing about 6000 I/O requests.

7. UNUSUAL FEATURES OF THE PROGRAM - Applications of ORSIM to utility planning problems demonstrate that the model is well suited for investigating (1) exploration of preselected strategic operating plans over a range of conditions, (2) economic interpretation of restrictions and policies, and (3) sensitivity analyses to determine critical system parameters. Some examples include:
 - (a) evaluation of alternative plant addition schedules to meet system growth,
 - (b) evaluation of the cost effects of construction delays, nuclear plant deratings, and changes in refueling schedules, and
 - (c) assessment of the effects of proposed fuel policy changes on utility costs.
8. RELATED OR AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed September 1976.
IBM360,370 version submitted July 1976, sample problem executed by ACC September 1976 on an IBM370/195.
10. REFERENCES - J. C. Turnage, B. E. Prince, D. J. Joy, and L. L. Bennett, The Oak Ridge System Integration Model (ORSIM) for Optimization of Utility Generation Planning, ORNL-TM-4506, October 1975, and Errata, February 1976.
B. E. Prince and J. C. Turnage, Use of Incremental Energy Costs and Loading Order Rules in the ORSIM Procedure for Midrange Optimization of Electric Utility Operations, ORNL-TM-4507, October 1975.
11. MACHINE REQUIREMENTS - 750K bytes storage are required for execution and card as well as printer output is generated.
12. PROGRAMMING LANGUAGES USED - Approximately 95 percent is written in FORTRAN IV. Two subprograms are written in assembly language.
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The assembly language subprograms IPACK and IFLD are used for packing storage files. No use is made of external functions. The ORSIM package consists of 19 subroutines in addition to the main program, IPACK, and IFLD.
15. NAME AND ESTABLISHMENT OF AUTHORS -
 - J. C. Turnage
Yankee Atomic Electric Company
20 Turnpike Road
Westboro, Massachusetts 01581
 - B. E. Prince, 9104-1
Union Carbide Corporation, Nuclear Division
P. O. Box Y
Oak Ridge, Tennessee 37830

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (3986 cards)
Sample problem (591 cards)
Sample problem output (450 blocks)
Reference reports
17. CATEGORY - D
KEYWORDS - planning, energy generation, power plants, electric
utilities, optimization

1. NAME OR DESIGNATION OF PROGRAM - MELT3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC CYBER74, CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - MELT3 is a multichannel, neutronics, thermal-hydraulics digital computer program developed to investigate the transient behavior of a fast reactor during postulated transient overpower conditions. Reactivity feedback resulting from Doppler broadening, coolant density change and expulsion, bulk core expansion, and fuel movement are explicitly taken into account. The bulk of the modeling detail has been addressed to the in-vessel portion of the reactor plant, although the friction and inertial aspects of up to three separate closed primary loops can be simulated. A wide variety of accident conditions may be investigated. Particular modeling emphasis has, however, been placed on the simulation capabilities required for an unprotected transient overpower accident sequence.
4. METHOD OF SOLUTION - The energy equations are solved by a Crank-Nicholson type implicit scheme. The momentum equations are solved by an iterative implicit scheme.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Calculations for up to 20 channels (e.g., 20 pins representative of subassembly clusters) and 20 axial segments within the fuel region may be performed simultaneously. A total of 10 different axial coolant flow zones having different flow areas (comprising a total of 75 nodes) can be explicitly modeled in the axial direction. Radial heat transfer calculations within each pin axial segment are performed using up to 12 radial fuel nodes (including one surface node), 3 cladding nodes (including inner and outer surface nodes), a coolant node, and a structural node.
6. TYPICAL RUNNING TIME - Typical CDC7600 run times for cases using essentially full geometric detail are approximately 0.6 second per channel for steady-state calculations, 0.2 second per channel per time-step up to the time of cladding failure, and 0.4 second per channel per time-step after cladding failure. These time estimates appear to increase by about a factor of two for the CDC CYBER 74.
7. UNUSUAL FEATURES OF THE PROGRAM - A zero neutron lifetime approximation is available to allow large time-steps to be taken during slow-moving portions of the transient. Protection is included, however, to assure that failure criteria levels are not overshoot.
8. RELATED AND AUXILIARY PROGRAMS - MELT3 is a continuation of the MELT code series with MELT1 and MELT2 being its predecessors. MELT3 has significant modeling improvements over the two previous codes, particularly with regard to system hydraulics. It also has incorporated as a subroutine, the SIEX code (ACC Abstract 673) for steady-state fuel pin simulation.

9. STATUS - Abstract first distributed December 1976.
CYBER74 version submitted October 1975, sample problem executed with dummy plot routines by ACC November 1976 on a CDC6600.
10. REFERENCES - Alan E. Waltar, et al., MELT-III, A Neutronics, Thermal-hydraulics Computer Program for Fast Reactor Safety Analysis, HEDL-TME 74-47, December 1974.
D. S. Dutt and R. B. Baker, SIEX, A Correlated Code for the Prediction of Liquid Metal Fast Breeder Reactor (LMFBR) Fuel Performance, HEDL-TME 74-55, September 1974.
11. MACHINE REQUIREMENTS - With dummy plot routines, the steady-state program requires 111,000 (octal) words of storage and 4 logical units. The transient program requires 161,000 (octal) words of storage and approximately 300K (decimal) words of peripheral storage on 9 logical units for wrapup and plotting.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.4 (CYBER74, CDC6600), SCOPE 2.1 (CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - File STEADY, which is written by the steady-state program, is mandatory input for the transient program. The transient program requires the FORTRAN Extended Record Manager File Processing System. Plotting capability is provided to supplement the printed output, but plots are not necessary for MELT3 operation. The sample problems may be executed while using the dummy CalComp plot routines supplied with the package. A more efficient alternative is to supply dummy subroutines for PLOT, PLOTS, and DRAW in the steady-state program, and a dummy subroutine for XPLOTX in the transient program. Both the steady-state and the transient program assume that the operating system will zero the memory at load time.
15. NAME AND ESTABLISHMENT OF AUTHORS -
Alan E. Waltar, et al.
Hanford Engineering Development Laboratory
Westinghouse Hanford Company
Richland, Washington 99352
Richard J. Shields
Computer Sciences Corporation
Richland, Washington 99352
16. MATERIALS AVAILABLE - Magnetic Tape Transmittal
Source decks (steady-state-3171 cards, transient-8559 cards, dummy plot routines-44 cards)
Sample problem input (steady-state-181 cards, transient-73 cards, restart-31 cards)
Control information (49 cards)
Sample problem output (3 microfiche)
Reference report, HEDL-TME 74-47

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17. CATEGORY - F

KEYWORDS - accidents, excursions, feedback, LMFBR reactors, MELT
codes, SIEX codes

1. NAME OR DESIGNATION OF PROGRAM - BEAMCRP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - BEAMCRP is a finite element computer program which solves for stresses and total strains (elastic plus creep) in beams. The beams may have variable cross sections along the length (x-direction). However, the cross sections must be symmetrical about the y-axis. Besides prescribed displacements and tractions, the boundary conditions may also include limited free travel and elastic spring supports. Time-dependent variations in applied loads, thermal gradients and material swelling can also be analyzed. Arbitrary creep and material swelling laws can be used.
4. METHOD OF SOLUTION - The solution algorithm consists of an incremental procedure. Initially, the elastic stress distribution is calculated for the applied loads. A small time-step is selected wherein the stresses remain constant. However, creep strains develop according to the material law. The resulting creep strains are used to calculate an equivalent change in applied loads. The incremental changes in total strains and in stresses are then calculated from the equivalent change in applied load. The incremental stress change is then added to the initial stress value and the new stress level is assumed to remain constant during the next time-step. This procedure is repeated until the stresses converge to a steady-state solution or until a pre-selected total elapsed time is reached. Structural boundary condition and temperature gradients can be changed at any point in time.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - For beam bending in the x-y plane only, a maximum of 100 elements and 101 nodes can be used. A beam can be constructed of as many as 10 layers of different materials and may have up to 15 changes in cross section along its length. For combined beam bending in the x-y and x-z planes, the maxima of elements and nodes are 50 and 51, respectively.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - BEAMCRP has subroutines that allow circular and hexagonal cross section properties to be calculated using a single input card. The user may suppress the printout by specifying the elements to be included in the stress report. The program automatically calculates the maximum allowable time-step to insure that the stress change remains negligibly small and that the creep strain change is not excessive. The program has a restart feature to permit analysis of thermal cycles. The user may specify times when selected beam supports are to be removed and when the beam is to be cooled instantaneously to a uniform temperature.

8. RELATED AND AUXILIARY PROGRAMS - The initial two-dimensional version (x-y plate) was known as CRASIB.
9. STATUS - Abstract first distributed November 1976.
CDC6600 version submitted January 1974, documentation received October 1976, sample problem executed by ACC October 1976 on a CDC7600 via remote terminal to Brookhaven National Laboratory.
10. REFERENCES - W. H. Sutherland, A Finite Element Computer Code (AXICRP) for Creep Analysis, BNWL-1142, October 1969.
W. H. Sutherland and V. B. Watwood, Jr., Creep Analysis of Statically Indeterminate Beams, BNWL-1362, June 1970.
W. H. Sutherland and J. D. Rector, CRASIB, Creep Analysis of Statically Indeterminate Beams, User's Guide and Program Manual, BNWL Report, March 23, 1970.
R. B. Stallwood, BEAMCREEP, A Creep Analysis Program for Statically Indeterminate Beams, CSC Report, October 31, 1974.
11. MACHINE REQUIREMENTS - 145,000 (octal) words of storage, a plot tape, and 7 input/output files besides the system input/output units.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
W. H. Sutherland
Hanford Engineering Development Laboratory
Westinghouse Hanford Company
P. O. Box 1970
Richland, Washington 99352
16. MATERIAL AVAILABLE - Restricted Distribution
Magnetic Tape Transmittal
Source deck (2237 cards)
Sample problem (101 cards)
Sample output (43 selected pages)
Reference reports
17. CATEGORY - I
KEYWORDS - finite-element, stresses, beams, swelling, x-y, CRASIB
codes, AXICRP codes

1. NAME OR DESIGNATION OF PROGRAM - COMPARE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600, IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - COMPARE performs transient calculation of the thermodynamic conditions in volumes connected by flowing junctions with provision for mass and energy addition. Volume thermodynamics and junction flows are for homogeneous mixtures of: steam, two-phase water, any three perfect gases, or combinations of the above. Critical vent flow is based on the Moody equation. Subcritical flow is based on compressible orifice flow of an ideal gas-like mixture with inlet and exit losses resulting in a polytropic flow process. Flow with inertia is calculated on the basis of an incompressible subelement relationship. The program was written to perform transient subcompartment analysis of nuclear power plants.
4. METHOD OF SOLUTION - Volume thermodynamics and junction flows are determined independently in a quasi-static explicit manner. Mass and energy inflow or outflow accounting for each volume is done first for each time increment, assuming vent flows are constant. Thermodynamic equilibrium is assumed and state points determined. The resulting thermodynamic conditions are assumed constant and used to calculate the new vent flows between volumes for the next time interval. Flow with inertia is calculated on the basis of a solution to the momentum equation with constant density and flow area.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The program currently provides for maxima of:
 - 100 volumes
 - 200 junctions
 - 5 mass and energy addition tables (blowdown sets)Water temperature is restricted to the range 278-620 deg. K (40-656 deg. F).
6. TYPICAL RUNNING TIME - A two-volume, one-junction problem requires 0.002 second per time-step (CDC7600) or 0.012 second (IBM370/165).
7. UNUSUAL FEATURES OF THE PROGRAM - Ideal-like gas polytropic equations are used to calculate orifice flow, including losses. Two-phase water with air flow is calculated, and inertial effects are included.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed March 1977.
 - CDC7600 version submitted September 1976, sample problem executed by ACC February 1977 on a CDC7600.
 - IBM360 version submitted February 1977, sample problem executed by ACC March 1977 on an IBM370/195.

10. REFERENCES - R. G. Gido, R. G. Lawton, C. I. Grimes, and J. A. Kudrick, COMPARE: A Computer Program for the Transient Calculation of a System of Volumes Connected by Flowing Vents, LA-NUREG-6488-MS, September 1976.
11. MACHINE REQUIREMENTS - 35,000 (octal) words (CDC6600,7600) or 125K bytes (IBM360,370)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.4 (CDC6600), SCOPE 2.1 (CDC7600), OS/360,370 (IBM360,370).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - Numerical output may show system-dependent variations, particularly for the small values printed for the early time-steps.
15. NAME AND ESTABLISHMENT OF AUTHOR -
7600 R. G. Gido and R. G. Lawton
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico 87544
370 C. I. Grimes and J. A. Kudrick
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555
16. MATERIALS AVAILABLE - Magnetic Tape Transmittal
Source decks (7600-1749 cards, 370-1709 cards)
Sample problem input (7600-66 cards, 370-66 cards)
Sample problem output (1 microfiche)
Reference report
17. CATEGORY - H
KEYWORDS - reactor safety, containment analysis, subcompartment analysis, fluid flow, compressible flow, polytropic flow, Moody flow, thermodynamics, blowdown

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1. NAME OR DESIGNATION OF PROGRAM - ORCENT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OF FUNCTION - ORCENT performs full-load design point heat and mass balance calculations for steam turbine cycles supplied with throttle steam, characteristic of light water reactor plants. The program handles both condensing and back-pressure turbine exhaust arrangements. Turbine performance calculations are based on the General Electric Company method for large steam turbine-generators operating with saturated and low superheat throttle steam. Output includes all information normally shown on a turbine cycle heat balance diagram.
4. METHOD OF SOLUTION - The code follows the procedure outlined in General Electric Report GER-2454A. The efficiency calculation method is based on detailed consideration of the effect of expansion moisture on stage efficiency.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
12 feed-water heaters
5 moisture removal stages in the low-pressure turbine section
Throttle steam temperature should be between 0 and 200 degrees F above saturation temperature. Throttle steam pressure should be between 200 and 2000 psia. Generator rating may be between 100 and 1500 Mva. One, two, or three turbine sections in series (tandem-compound arrangement only) may be specified. Turbine speed should be 1800 or 3600 rpm.
6. TYPICAL RUNNING TIME - Execution time for a single case is approximately 1 second on the IBM360/91.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed November 1976.
IBM360 version submitted June 1976, sample problem
executed by ACC September 1976 on an IBM370/195.
10. REFERENCES - H. I. Bowers, ORCENT: A Digital Computer Program for Saturated and Low Superheat Steam Turbine Cycle Analysis, ORNL-TM-2395, January 1969.
F. G. Baily, K. C. Cotton, and R. C. Spencer, Predicting the Performance of Large Steam Turbine-generators Operating with Saturated and Low Superheat Steam Conditions, GER-2454A, American Power Conference, Chicago, Illinois, April 25-27, 1967.
11. MACHINE REQUIREMENTS - 166K bytes storage were needed for execution of the sample problem on an IBM370/195.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
H. I. Bowers
Oak Ridge National Laboratory
P. O. Box X
Oak Ridge, Tennessee 37830
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (4187 cards)
Sample problem (21 cards)
Sample problem output (13 pages)
Reference report, ORNL-TM-2395
17. CATEGORY - H
KEYWORDS - heat balance, steam cycle, turbine generators, power plants, LWR reactors, PWR reactors, BWR reactors

1. NAME OR DESIGNATION OF PROGRAM - COMCAN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - COMCAN is designed to analyze complex systems, such as nuclear plants for common causes of failure. A common cause event, or common mode failure, is a secondary cause that may contribute to the development of more than one component malfunction. A significant common cause event is a secondary cause common to all basic events in one or more minimal cut sets. These minimal cut sets are common cause candidates. If all components represented by the basic events in a minimal cut set share a common location, that minimal cut set is called a prime common cause candidate. Components share a common location if no barriers capable of insulating them from the secondary cause are present.
4. METHOD OF SOLUTION - COMCAN searches the fault tree minimal cut sets for shared susceptibility to various secondary events (common causes) and common links between components. In the case of common causes, a location check may also be performed to determine whether barriers to the common cause exist between components. The program can locate common manufacturers of components having events in the same minimal cut set. A relative ranking scheme for secondary event susceptibility is included in the program.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Limited to the fault tree minimal cut sets.
6. TYPICAL RUNNING TIME - Less than 2 seconds is required to execute the sample problem on an IBM370/195.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - The format used for COMCAN is compatible with the input format of programs for qualitative and quantitative reliability and safety analyses, such as MOCUS (ACC Abstract 653) and PREP,KITT (ACC Abstract 528). The cut set input deck can be punched by MOCUS.
9. STATUS - Abstract first distributed January 1977.
IBM360 version submitted October 1976, sample problem executed by ACC December 1976 on an IBM370/195.
10. REFERENCES - Gary R. Burdick, Neldon H. Marshall, James R. Wilson, COMCAN - A Computer Program for Common Cause Analysis, ANCR-1314, May 1976.
J. B. Fussell, G. R. Burdick, D. M. Rasmuson, J. R. Wilson, J. C. Zipperer, A Collection of Methods for Reliability and Safety Engineering, ANCR-1273, April 1976.
W. E. Vesely and R. E. Narum, PREP and KITT: Com-

10. REFERENCES (CONTINUED)
puter Codes for the Automatic Evaluation of a Fault Tree, IN-1349, August 1970.
J. B. Fussell, E. B. Henry, N. H. Marshall, MOCUS:
A Computer Program to Obtain Minimal Sets from Fault Trees,
ANCR-1156, August 1974.
11. MACHINE REQUIREMENTS - 140K bytes of memory
12. PROGRAMMING LANGUAGES USED - FORTRAN IV and Assembly language
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The four Assembly language routines included in the package are the FORTRAN input-output and abnormal termination dump routines: FABEND, FIOCS, IBCOM# and INFILQ. These are a part of the NRTS Environmental Routines package (ACC Abstract 613).
15. NAME AND ESTABLISHMENT OF AUTHORS -
G. R. Burdick, N. H. Marshall,
and J. R. Wilson
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, Idaho 83401
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (FORTRAN-1882 cards, BAL-4080 cards)
Sample problem (211 cards)
Reference report, ANCR-1314
17. CATEGORY - G
KEYWORDS - reliability, safety analysis, fault tree, failure,
MOCUS codes, PREP, KITT codes

1. NAME OR DESIGNATION OF PROGRAM - EPISODEB
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370 (see item 14)
3. DESCRIPTION OF PROBLEM OR FUNCTION - EPISODEB is a package of eight subroutines for the numerical solution of the initial value problem for systems of first order ordinary differential equations whose Jacobian matrices are banded or can be approximated by band matrices. The package can be used for either stiff or non-stiff systems whose Jacobians can be approximated by band matrices. It is especially suited to problems with intermittent high-speed transients or waves.
4. METHOD OF SOLUTION - EPISODEB contains both a variable-step, variable-order, backward differentiation method of orders one through five and a variable-step, variable-order, implicit Adams method of orders one through twelve. The user may select either method to solve a stiff or a non-stiff system. The user may also select from four nonlinear system solvers.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The Jacobian is assumed to be banded. Because the step-size is truly variable, EPISODEB is best suited to problems with intermittent high-speed transients or waves. Smooth or linear problems can lead to high overhead costs. Current dimensioning allows for 100 simultaneous equations. The documentation and comments in EDRIVB show how to alter the limit on the system size and the bandwidth. Limits on the bandwidth and total storage also are described in detail in UCID-30132.
6. TYPICAL RUNNING TIME - Less than 1 minute is needed to compile and execute the sample problem.
7. UNUSUAL FEATURES OF THE PROGRAM - The user may select from two integration methods (for stiff and non-stiff problems), and from four nonlinear system solvers. A flexible driver (subroutine EDRIVB) returns output data at a previously-specified point by interpolation, provides output data by hitting the prescribed output point without interpolation, or returns data after each step. Absolute error, true relative error, or a quasi-relative error may be controlled. EDRIVB controls the integration process and prints any error messages.
8. RELATED AND AUXILIARY PROGRAMS - EPISODE (ACC Abstract 675) and GEAR (ACC Abstract 592) for systems with a full Jacobian. GEARB (ACC Abstract 661) for systems with a banded Jacobian matrix.
9. STATUS - Abstract first distributed March 1977.
IBM360 version submitted July 1976, sample problem
executed by ACC January 1977 on an IBM370/195,
converted to CDC single-precision and executed by ACC

9. STATUS (CONTINUED)
December 1976 on a CDC7600 at Brookhaven National Laboratory.
10. REFERENCES - G. D. Byrne and A. C. Hindmarsh, EPISODEB: An Experimental Package for the Integration of Systems of Ordinary Differential Equations with Banded Jacobians, UCID-30132, April 1976.
A. C. Hindmarsh and G. D. Byrne, EPISODE: An Experimental Package for the Integration of Systems of Ordinary Differential Equations, UCID-30112, May 1975.
A. C. Hindmarsh, Banded Linear Systems with Pivoting, UCID-30060, Rev. 1, May 1976.
A. C. Hindmarsh and G. D. Byrne, Applications of EPISODE: An Experimental Package for the Integration of Systems of Ordinary Differential Equations, in Numerical Methods for Differential Systems, L. Lapidus and W. E. Schiesser, Eds., Academic Press, 1976. Also published as UCRL-75868, June 1975.
G. D. Byrne and A. C. Hindmarsh, A Polyalgorithm for the Numerical Solution of Ordinary Differential Equations, ACM Transactions on Mathematical Software, Vol. 1, pp. 71-96, March 1975. (Also in UCRL-75652, April 1974.)
A. C. Hindmarsh, GEARB: Solution of Ordinary Differential Equations having Banded Jacobian, UCID-30059, Rev. 1, March 1975.
G. D. Byrne, ACC Programming Note 76-3, revised January 5, 1977.
11. MACHINE REQUIREMENTS - 102K bytes are used to execute the double-precision version of the sample problem.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370 (IBM360,370).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The code is heavily commented. An auxiliary routine, CONVRT, and its driver are provided to change precision from double to single. The user then need only change UROUND in subroutine EDRIVB as indicated in the code. CDC6000-7000, DEC PDP10, or UNIVAC1100 versions can be prepared from the IBM version with only minor changes. If EPISODEB is to be used on other systems, UROUND (the machine unit roundoff) may need to be evaluated and set in subroutine EDRIVB. The package contains an auxiliary subroutine, MACHIN, and its driver (supplied to ACC by L. F. Shampine and M. K. Gordon of SLA) which may be adapted to calculate or verify UROUND. Program-supplied error messages and the output of the sample problem are written on logical unit 3.
15. NAME AND ESTABLISHMENT OF AUTHORS -
G. D. Byrne
Department of Mathematics and Statistics &
Department of Chemical and Petroleum Engineering

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
University of Pittsburgh
Pittsburgh, Pennsylvania 15260
A. C. Hindmarsh, L-310
Numerical Mathematics Group
Lawrence Livermore Laboratory
P. O. Box 808
Livermore, California 94550
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (1764 cards)
Sample problem (196 cards)
Auxiliary programs (157 cards)
Sample problem output (7 pages)
Reference report, UCID-30132, and ACC Programming Note 76-3
17. CATEGORY - P
KEYWORDS - ordinary differential equations, stiff, numerical
calculations, predictor-corrector, linear multistep,
initial value problem, banded Jacobian matrix, GEAR
codes, GEARB codes, EPISODE codes

1. NAME OR DESIGNATION OF PROGRAM - THI3D
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM370
3. DESCRIPTION OF PROBLEM OR FUNCTION - THI3D is a computer program for steady-state, single-phase, thermal-hydraulic multichannel analysis. The model accounts for conservation of mass, energy, and momentum (both axial and transverse) subject to pressure-drop boundary conditions and leads to a nonlinear, multipoint boundary-value problem. Turbulent interchange, radial thermal conduction, and forced flow due to the wire wrap or grid between channels are explicitly taken into account. Temperature distributions in the coolant, cladding, fuel, and duct wall, and the size of the central void of the oxide fuel after thermal restructuring are computed. Three different thermal-hydraulic channel arrangements (square, hexagonal, and triangular) can be treated. Multipin analysis with transverse interactions, or multiassembly calculations without transverse interactions between the channels, can be performed. Problems of partial flow blockage (porous blockage) can be analyzed, and the effect on the redistribution of the inlet mass velocity can be taken into account.
4. METHOD OF SOLUTION - THI3D solves multipoint boundary-value rod-bundle thermal-hydraulic problems by means of mixed implicit and explicit finite differencing of conservation of mass, energy, and momentum equations. The Newton-Raphson method is employed for iteration on boundary conditions.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maximum of 217-pin bundle problem with unlimited axial steps. Sonic-velocity propagation effects are not considered. A lumped-parameter approach is assumed valid, i.e., a reactor channel may be either a fuel pin or a fuel assembly with associated coolant. All system parameters within a channel at a given elevation are uniform and radially isotropic. Axial heat conduction is neglected.
6. TYPICAL RUNNING TIME - About 1.5 minutes are required to execute the sample problem (19-pin rod bundle) on an IBM370/195.
7. UNUSUAL FEATURES OF THE PROGRAM - THI3D features include -
 - (1) pressure-drop boundary condition,
 - (2) computation of cladding, fuel and duct wall temperature distributions,
 - (3) bypass fluid option,
 - (4) wire-wrap model.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed January 1977.
IBM370 version submitted October 1976, replaced by
revised version submitted May 1977, sample problem
executed by ACC June 1977 on an IBM370/195.

10. REFERENCES - W. T. Sha and R. C. Schmitt, THI3D--A Computer Program for Steady-state Thermal-hydraulic Multichannel Analysis, ANL-8112, December 1975.
William T. Sha, Robert C. Schmitt, and T. R. Huebotter, Boundary-Value Thermal-Hydraulic Analysis of a Reactor Fuel Rod Bundle, Nuclear Science and Engineering, Vol. 59, 140-160, (1976).
11. MACHINE REQUIREMENTS - 260K bytes storage (for 19-pin bundle) and 2 scratch disks or tapes.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/MVT.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The package supplied is the 19-pin bundle overlay version. Other versions (61-pin and 217-pin) may be obtained by changing the common blocks in the block data subprogram as indicated by the output obtained when attempting to run a case requiring more storage. The Argonne version uses three routines which may be deleted or replaced by similar routines used at other installations:
 - ERRSET - A routine allowing user processing upon underflow, overflow or divide check used for debugging.
 - TLEFT - Time function returning amount of time left in run used for timing and restart control.
 - LOCF - Location function returning absolute address of argument used for clearing large blocks of storage.
15. NAME AND ESTABLISHMENT OF AUTHORS -
 - W. T. Sha and R. C. Schmitt
 - Components Technology Division
 - Argonne National Laboratory
 - 9700 South Cass Avenue
 - Argonne, Illinois 60439
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
 - Source deck (7076 cards)
 - Sample problem (57 cards)
 - Control information (JCL 45 cards)
 - Sample problem output (28 selected pages)
 - Reference report, ANL-8112
17. CATEGORY - H
KEYWORDS - fluid flow, heat transfer, thermodynamics, fuel elements, temperature distributions, LMFBR reactors

1. NAME OR DESIGNATION OF PROGRAM - CREEP-PLAST
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - CREEP-PLAST is a two-dimensional inelastic structural analysis program for static loadings and for elastic-plastic-creep material behavior.
4. METHOD OF SOLUTION - CREEP-PLAST is based on a incremental displacement-finite-element approach. Constructive equations for time-independent plasticity and time-dependent creep behavior are handled through tangent stiffness and initial strain algorithms respectively. Creep can be treated either by equation of state or memory integral theory. Kinematic descriptions are linear.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Maxima of -
900 nodes
1800 elements
200 solution increments
6. TYPICAL RUNNING TIME - CPU times vary from 1 minute to about 1 hour depending on the problem size.
7. UNUSUAL FEATURES OF THE PROGRAM -
 - (a) The analysis methods of RDT Standard F9-5 are incorporated.
 - (b) Creep descriptions for austenitic stainless steels are programmed.
 - (c) Memory integral description for nonlinear creep is included.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed July 1977.
IBM360,370 version submitted March 1977, sample problem executed by ACC April 1977 on an IBM370/195.
10. REFERENCES - Y. R. Rashid, Part I, Theory Report for CREEP-PLAST Computer Program, GEAP-10546, January 1972.
J. A. Clinard and J. S. Crowell, ORNL User's Manual for CREEP-PLAST Computer Program, ORNL-TM-4062, November 1973.
11. MACHINE REQUIREMENTS - Maximum of 400K bytes required for out-of-core solutions. Size may vary to 1500K bytes for in-core solution of larger problems. An overlay system is used and significant scratch storage space is required for large problems.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370 Level 21.6.

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14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
CREEP-PLAST calls two installation systems routines (ICTICK and ITIME) and a plotting routine. These will have to be replaced by the user for his environment.
15. NAME AND ESTABLISHMENT OF AUTHOR -
Author Y. R. Rashid
General Electric Company
Nuclear Fuel Department
San Jose, California 95114

Contact J. A. Clinard
Oak Ridge National Laboratory
Engineering Technology Division
P. O. Box Y
Oak Ridge, Tennessee 37830
16. MATERIAL AVAILABLE - Restricted Distribution
Magnetic Tape Transmittal
Source deck (3756 cards)
Sample problem (133 cards)
Reference reports
17. CATEGORY - I
KEYWORDS - two-dimensional, deformation, finite-element, stresses,
structural analysis

1. NAME OR DESIGNATION OF PROGRAM - WIGL3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNATED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - WIGL3 is a program for the steady-state and transient solution of the one-dimensional, two-group, space-time diffusion equations. The program will treat slab, cylindrical, and spherical geometries and includes non-boiling heat transfer. Control rod motion and control system feedback based on total core power or outlet coolant temperature can be simulated. Transients may be excited by prescribed changes in inlet coolant temperature, coolant flow rate, or rod position. For the steady-state option, criticality may be achieved by adjusting control rod position, reference coolant density, or reference fuel temperature.
4. METHOD OF SOLUTION - The neutron equations along with the various feedback processes form a nonlinear system of equations. The solution is obtained by computing the changes in nuclear parameters during a given time-step by using the neutron fluxes at the beginning of the time-step. The time-difference form of the diffusion equations is obtained by replacing continuous time by a sequence of times and introducing a set of internally computed time-dependent parameters (thetas) to increase the stability and accuracy of the numerical method. The theta-method is discussed in detail in reference 1. At each time-step, the spatial equations are solved by a simultaneous inversion of the two-group operator; thus no spatial iteration is required. The coefficients of these equations are functions of local coolant temperature, fuel metal temperature, and control motion which for the transient solution are also obtained from a time-difference form of their representative equations. For the steady-state option, the no delayed precursor neutron balance equations are solved as transient equations but all other balance equations are solved as steady-state equations.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - No restrictions are placed on single parameters related to problem size. The total amount of storage set aside for all parameters is 14,000 memory locations. This allows the user to decide which area requires a more detailed representation.
6. TYPICAL RUNNING TIME - A problem with 50 spatial points, 20 thermal-hydraulic regions, and 20 nuclear regions would run less than one second per time-step. The time increases with an increase in these parameters. The amount of printing requested also affects running time. Typical computing times for 100 space point steady-state problems run from 20 to 100 seconds.
7. UNUSUAL FEATURES OF THE PROGRAM - The theta-method used in the difference equations is unique in WIGL2 and WIGL3. Also, the

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
program performs an automatic critical rod search and contains rather complete feedback.
8. RELATED AND AUXILIARY PROGRAMS - WIGL3 is an extension of the WIGL2 program (ACC Abstract 274). WIGL3 has most of the features of WIGL2 with the addition of a steady-state calculation. WIGL3 uses many of the Bettis Environmental Routines (ACC Abstract 478).
9. STATUS - Abstract first distributed July 1977.
CDC6600 version submitted May 1977.
10. REFERENCES - A. V. Vota, N. J. Curlee, Jr., and A. F. Henry, WIGL3 - A Program for the Steady-state and Transient Solution of the One-dimensional, Two-group, Space-time Diffusion Equations Accounting for Temperature, Xenon, and Control Feedback, WAPD-TM-788, April 1968.
A. F. Henry and A. V. Vota, WIGL2 - A Program for the Solution of the One-Dimensional, Two-group, Space-time Diffusion Equations Accounting for Temperature, Xenon, and Control Feedback, WAPD-TM-532, October 1965.
A. F. Henry and A. V. Vota, WIGL2 Addendum 1 - A Program for the Solution of the One-dimensional, Two-group, Space-time Diffusion Equations Accounting for Temperature, Xenon and Control Feedback, WAPD-TM-532 Addendum 1, January 1967.
C. J. Pfeifer, CDC-6600 FORTRAN Programming - Bettis Environmental Report, WAPD-TM-668, January 1967.
11. MACHINE REQUIREMENTS - 154,000 (octal) central memory words and one disk for storage of permanent files. The number of central memory words required could be decreased by decreasing the amount of storage set aside for parameters. This would also further limit problem size. If the ability to store data on disk for succeeding WIGL3 problems is not desired, the disk is not needed.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The required software environment is described by Pfeifer (reference 4). It includes routines for program loading, input conversion, and the storage, retrieval, and processing of permanent files.
15. NAME AND ESTABLISHMENT OF AUTHORS -
Authors A. V. Vota, N. J. Curlee, Jr., and A. F. Henry
Contact L. D. Eisenhart
Bettis Atomic Power Laboratory
Westinghouse Electric Corporation
Box 79
West Mifflin, Pennsylvania 15122

16. MATERIAL AVAILABLE - Restricted Distribution

Magnetic Tape Transmittal

Source deck (5158 cards)

Sample problem (79 cards)

Reference report, WAPD-TM-788

17. CATEGORY - F

KEYWORDS - space-time, 1-dimensional, diffusion equations,
2-group, slabs, cylinders, spheres, heat transfer,
temperature, control, feedback, WIGL2 codes

1. NAME OR DESIGNATION OF PROGRAM - NIXLIN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - NIXLIN performs a function minimization by a direct search iterative process that has the advantage of requiring no derivative evaluations. This particular version is well-suited to fitting nonlinear models to experimental data and to the solution of systems of nonlinear simultaneous equations.
4. METHOD OF SOLUTION - The program uses the Simplex method for function minimization.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The dimensions may be increased to accommodate larger problems.
6. TYPICAL RUNNING TIME - Less than 30 seconds is required for a typical problem.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed February 1977.
IBM360 version submitted November 1976, sample problems executed by ACC January 1977 on an IBM370/195.
10. REFERENCES - J. A. Nedler and R. Mead, "A Simplex Method for Function Minimization", Computer Journal, Vol. 7, pp. 308-313, 1965.
11. MACHINE REQUIREMENTS - The program requires 240K bytes to compile, 76K bytes to execute.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
L. M. Arnett
Savannah River Laboratory
E. I. du Pont de Nemours and Company, Inc.
Aiken, South Carolina 29801
16. MATERIAL AVAILABLE -
Source deck (400 cards)
Sample problems (39 cards)

16. MATERIAL AVAILABLE (CONTINUED)
Sample problems output (2 pages)
Reference reprint
17. CATEGORY - P
KEYWORDS - data processing, least squares, nonlinear

1. NAME OR DESIGNATION OF PROGRAM - HAMOC
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600, CYBER74-18
3. DESCRIPTION OF PROBLEM OR FUNCTION - HAMOC determines the pressure transients in piping systems attached to a reactor vessel which has been perturbed, by a hypothetical core disruptive accident (HCDA) for example. The continuity and momentum equations are solved. The energy equation is not programmed, but simplified column separation logic is included to treat vapor pressures below saturation. This simplified approach has been checked against experimental data. HAMOC was written specifically for problems in which forcing pressures are known as a function of time at certain end boundary conditions, rather than as a general purpose code for the solution of pump coastdown or valve closing problems.
4. METHOD OF SOLUTION - The differential equations of continuity and momentum are solved by the method of characteristics. When column separation occurs, special internal boundary conditions are temporarily established which fix the pressure at the saturated vapor pressure during the existence of the cavity. Special equations give the pressure rise when the cavity collapses.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The program currently provides for maxima of:
 - 56 legs
 - 50 nodes per leg
 - 15 three-way junctions
 - 50 plots
 - 1000 points per plot
 - 1 line per plot

The fluid properties are those for sodium, and the pipe properties are those for Type 304 stainless steel. The above restrictions should not be difficult to alter; the following restrictions are more stringent. There may be 1 or 2 pipe ends with prescribed pressure-time history. All pumps have the same set of characteristics. Fluid temperatures must be constant with time, must be the same for all points within a leg, and must be the same for all connecting legs at a pump, at a tee, or at a Y-junction. The minimum leg length must not be smaller than

$$(\text{time-step}) * (\text{pressure-pulse-speed} + \text{fluid-velocity}).$$
6. TYPICAL RUNNING TIME - The 45-leg sample problem requires about 110 seconds (CYBER74-18) or 21 seconds (CDC7600) execution time for a run of 0.1 seconds real time. Typically, execution time on the CYBER74-18 is about 0.00057 second per mesh-point per time plane. Running times can be reduced significantly, with little loss of accuracy, by using a constant friction factor.
7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED OR AUXILIARY PROGRAMS - WHAM6 (ACC Abstract 278).
9. STATUS - Abstract first distributed March 1977.
CDC6600 version submitted July 1976, sample problem
executed with dummy plot routines by ACC February
1977 on a CDC7600.
10. REFERENCES - H. G. Johnson, HAMOC - A Computer Program for Fluid
Hammer Analysis, HEDL-TME 75-119, December 1975.
11. MACHINE REQUIREMENTS - A 131K machine is required with dummy plot
routines; HAMOC requires 101,000 (octal) words of storage. A tape
is used to store data for offline plotting.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.4.2 (CYBER74-18), SCOPE 3.4.4 (CDC6600), SCOPE 2.1.3
(CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - It is
assumed that the operating system will zero the memory at load
time. Plotting calls are to standard CalComp subroutines. The
source file contains COMDECKs. It should be processed by the
UPDATE utility before compilation.
15. NAME AND ESTABLISHMENT OF AUTHOR -
H. G. Johnson
Hanford Engineering Development Laboratory
Westinghouse Hanford Company
P. O. Box 1970
Richland, Washington 99352
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (HAMOC-2115 cards, dummy plot routines-50 cards)
Sample problem input (70 cards)
Sample problem output (1 microfiche)
Reference report
17. CATEGORY - G
KEYWORDS - fluid flow, fluid hammer, liquid metals, pressure,
reactor safety, transients, WHAM6 codes

ACC ABSTRACT 711

08/77

1. NAME OR DESIGNATION OF PROGRAM - GEOCOST-BC
 2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, CYBER74
 3. DESCRIPTION OF PROBLEM OR FUNCTION - GEOCOST calculates the cost of generating electricity from geothermal energy. The version of GEOCOST in this release, GEOCOST-BC, simulates the production of electricity using a binary fluid cycle based upon a hydrothermal resource.
 4. METHOD OF SOLUTION - GEOCOST is a simulation model which combines both technical processes and economic factors into one systematic framework. The simulation is composed of two principal parts: a reservoir model which simulates the exploration, development, and operation of a geothermal reservoir, and a power plant model which simulates the design, construction, and operation of the power plant. Each of these parts is composed of several submodels which treat fluid transmission and disposal, geothermal fluid/working fluid heat exchangers, turbine, generators, working fluid condenser, pumps, heat rejection, and calculation of thermodynamic state points in basic subcritical and supercritical Rankine cycles for a variety of working fluids. Working fluids which are now in the model include isobutane, n-butane, R-11, R-12, R-22, R-113, R-114, and ammonia. Thermodynamic properties of the working fluids at the state points are calculated using empirical equations of state. The Starling equation of state is used for hydrocarbons and the Martin-Hou equation of state is used for fluorocarbons and ammonia. A wide variety of financial and tax structures can be simulated through varying the rates of return on equity and debt, the debt-equity ratio, and tax rates. Using discounted cash flow analyses, GEOCOST calculates the cost of energy by equating the present worth of the revenues and expenses over the economic life of the reservoir and plant.
 5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Current array dimensions provide for a maximum well field size of 625 wells and maximum operating period of 50 years from reservoir exploration through the economic life of the power plant.
 6. TYPICAL RUNNING TIME - From 15 seconds to 2 minutes are required for the majority of simulation cases.
 7. UNUSUAL FEATURES OF THE PROGRAM -
 8. RELATED AND AUXILIARY PROGRAMS -
- STATUS - Abstract first distributed July 1977.
CDC6600 version submitted September 1976, sample problem executed by ACC June 1977 on a CDC7600.

10. REFERENCES - H. D. Huber, R. A. Walter, and C. H. Bloomster, User Manual for GEOCOST: A Computer Model for Geothermal Cost Analysis, Volume 2, Binary Cycle Version, BNWL-1931-V2, March 1976.
- C. H. Bloomster, P. D. Cohn, J. G. Desteese, H. D. Huber, P. N. Lamori, D. W. Shannon, J. F. Sheff, and R. A. Walter, GEOCOST: A Computer Program for Geothermal Cost Analysis, BNWL-1888, February 1975.
- C. H. Bloomster, An Economic Model for Geothermal Cost Analysis, BNWL-SA-5378, May 1975.
- P. D. Cohn, and C. H. Bloomster, Capital Cost Models for Geothermal Power Plants, BNWL-1990, July 1976.
- R. A. Walter, C. H. Bloomster, and S. E. Wise, Thermodynamic Modeling of Geothermal Power Plants, BNWL-1911, May 1975.
- CYBER Control Information for GEOCOST, BNWL Note, 1976.
11. MACHINE REQUIREMENTS - At least 55K (decimal) memory
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.4.3.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - Users without access to the CDC Math Sciences Library will have to supply a replacement for the subroutine RQNWT used to solve systems of nonlinear equations. The GEOCOST-BC source includes the 1967 ASME Steam Table data.
15. NAME AND ESTABLISHMENT OF AUTHORS -
- H. D. Huber, C. H. Bloomster, and R. A. Walter
Pacific Northwest Laboratories
Battelle
Battelle Boulevard
Richland, Washington 99352
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
- Source deck (15,218 cards)
Sample problem input (4 cards)
Sample problem output (60 selected pages, 3591 tape records)
Reference report, BNWL-1942-V2, and BNWL Note
17. CATEGORY - D
- KEYWORDS - geothermal energy, simulation, economic cost analysis, electricity, hydrothermal resource, working fluids, binary-fluid Rankine cycle, Starling equation-of-state, Martin-Hou equation-of-state, heat exchangers, reservoir, binary power plant, subcritical cycle, supercritical cycle

ACC ABSTRACT 712

08/77

1. NAME OR DESIGNATION OF PROGRAM - WREM-TOODEE2/MOD3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - WREM-TOODEE2 is a two-dimensional, time-dependent, fuel-element thermal analysis program. Its primary purpose is to evaluate fuel-element thermal response during post-LOCA refill and reflood in a pressurized water reactor (PWR).
4. METHOD OF SOLUTION - TOODEE2 calculations are carried out in a two-dimensional mesh region defined in slab or cylindrical geometry by orthogonal grid lines. Coordinates which form order pairs are labeled x-y in slab geometry, and those in cylindrical geometry are labeled r-z for the axisymmetric case and r-theta for the polar case. Conduction and radiation are the only heat transfer mechanisms assumed within the boundaries of the mesh region. Convective and boiling heat transfer mechanisms are assumed at the boundaries. The program numerically solves the two-dimensional, time-dependent, heat conduction equation within the mesh region.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - WREM-TOODEE2 considers only axisymmetric geometry although the equations for slab and polar geometry are included in the program.
6. TYPICAL RUNNING TIME - The sample problem executes in 6 or 7 minutes on an IBM370/195.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - WREM-TOODEE2 was developed from the earlier TOODEE program (ACC Abstract 349). It is part of the Water Reactor Evaluation Model (WREM) package which also includes the RELAP4/MOD5 (ACC Abstract 369) and MOXY-EM (ACC Abstract 551) programs.
9. STATUS - Abstract first distributed February 1977.
IBM360 version submitted September 1976, sample problem executed by ACC February 1977 on an IBM370/195.
10. REFERENCES - WREM: Water Reactor Evaluation Model (Revision 1), NUREG-75/056, May 1975.
G. N. Lauben, TOODEE2: A Two Dimensional Time Dependent Fuel Element Thermal Analysis Program, NUREG-75/057, May 1975.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360,370.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
G. N. Lauben
Division of Technical Review
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (6968 cards)
Sample problems (118 cards)
2314 and 3330 load modules (TOODEE 395 blocks)
Control information (JCL 74 cards)
Sample problem output (44 selected pages, 1 microfiche)
Reference report, NUREG-75/057
17. CATEGORY - G
KEYWORDS - fuel elements, 2-dimensional, x-y, r-z, r-theta,
geometries, heat conduction, space-time, thermal
reactors, RELAP4/MOD5 codes, MOXY-EM codes

1. NAME OR DESIGNATION OF PROGRAM - SYN3D
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - SYN3D solves the direct and adjoint, diffusion theory, static eigenvalue equations in two and three dimensions. The geometries available are x-y, r-z, x-y-z and triangular-z.
4. METHOD OF SOLUTION - SYN3D uses single-channel spatial flux synthesis to calculate approximate solutions to the three-dimensional (or two-dimensional) diffusion theory difference equations. Synthesis expansion functions must be supplied by the user from two-dimensional (or one-dimensional) finite-difference calculations performed by some other code. SYN3D sets up the synthesis equations and solves them by power iteration with Wielandt acceleration. Each iteration is an exact inversion of the block-tridiagonal synthesis equations by forward-elimination, backward-substitution.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The only serious limitation is on the product of the number of groups and the maximum number of expansion functions used at any particular axial elevation.
6. TYPICAL RUNNING TIME - Exclusive of the time required to generate expansion functions, SYN3D will solve an 11-group, 12,000 mesh point model with two expansion functions in 0.9 minutes of Model 195 CPU time. A 28-group, 30,000 mesh point model with three expansion functions requires 8.9 minutes of CPU time on the Model 195.
7. UNUSUAL FEATURES OF THE PROGRAM - The difference equations SYN3D solves are the mesh-interval-centered type. Expansion functions should be generated using diffusion theory codes solving the same equations. The code is designed with restart capabilities which reduce, on the average, the running times for individual problems when a series of similar problems is to be run. SYN3D requires input cross sections, expansion functions, and geometry descriptions in the Version III formats defined by the ERDA RDD Reactor Physics Branch Computer Code Coordination Committee (CCCC). Special options include group collapsing and the use of different expansion functions in different axial zones of the model.
8. RELATED AND AUXILIARY PROGRAMS - SYN3D requires binary input files containing cross sections, expansion functions, and geometry descriptions. Although a small program is provided with the code to read these data from cards, the user may wish to use other programs which generate CCCC files. LASIP3 (ACC Abstract 691) can be used to generate CCCC standard interface files from specially formatted card input. A finite-difference, diffusion theory

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
program is required to generate expansion functions. VENTURE (ACC Abstract 686) is one such program.
9. STATUS - Abstract first distributed February 1977.
IBM360 version submitted April 1976, sample problems executed by ACC February 1977 on an IBM370/195.
10. REFERENCES - C. H. Adams, SYN3D - A Single-Channel, Spatial Flux Synthesis Code for Diffusion Theory Calculations, ANL 76-21, January 1976.
B. M. Carmichael, Standard Interface Files and Procedures for Reactor Physics Codes, Version III, LA-5486-MS, February 1974.
11. MACHINE REQUIREMENTS - The code requires at least 35K full-word storage to execute small problems and runs more efficiently with larger storage. Depending on the complexity of the problem, SYN3D may require up to 45 logical units.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (FORTRAN H Extended compiler) and Assembly language.
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/370.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
C. H. Adams
Applied Physics Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (SYN3D 370-19, 164 cards, CDFILE 370-665 cards, BPOINTER 370-501 cards)
Sample problems (370-95 cards)
Auxiliary information (370-1418 cards)
Control information (JCL 370-108 cards)
Reference report, ANL 76-21
17. CATEGORY - C
KEYWORDS - 2-dimensional, 3-dimensional, diffusion equations, synthesis, x-y, r-z, x-y-z, triangular-z, LASIP3 codes, VENTURE codes

1. NAME OR DESIGNATION OF PROGRAM - SPOOL-FIRE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM370
3. DESCRIPTION OF PROBLEM OR FUNCTION - SPOOL-FIRE calculates the pressure and temperatures within a containment building as a result of a sodium fire. The fire is assumed to occur in two distinct phases: a spray and a pool. The spray fire is conservatively assumed to occur instantaneously. The code calculates all important temperatures, accounting for heat loss from the building to the environment, as well as leakage of the containment atmosphere under conditions of internal overpressure.
4. METHOD OF SOLUTION - The pool fire model used is the SOFIRE-II model developed by Atomics International which is based on computing a sodium burning rate proportional to the rate of diffusion of oxygen to the pool surface. Conventional equations of heat transfer by conduction, convection, and radiation are used to perform heat balances and compute temperatures. The IBM Continuous System Modeling Program (CSMP) is used to solve the set of applicable differential equations. The KAPL ROPE program is treated as a subroutine to solve for the 'equilibrium' gas temperature following the spray fire.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - The sample problem required approximately 5-1/2 minutes to execute.
7. UNUSUAL FEATURES OF THE PROGRAM - With the IBM CSMP, the user can make code modifications relatively simply by adding or modifying differential equations to describe a particular physical situation not considered in the present model.
8. RELATED AND AUXILIARY PROGRAMS - SPOOL-FIRE uses the pool-burning model incorporated in the code SOFIRE2 (ACC Abstract 559) and includes the ROPE program (ACC Abstract 444).
9. STATUS - Abstract first distributed April 1977.
IBM370 version submitted February 1976, sample problem executed by ACC March 1976 on an IBM370/195.
10. REFERENCES - Ira Charak and Lucy W. Person, SPOOL-FIRE -- An IBM 370/195 Code for the Analysis of Combined Spray and Pool Burning of Sodium (draft).
11. MACHINE REQUIREMENTS - 178K bytes of memory
PROGRAMMING LANGUAGES USED - FORTRAN IV and CSMP
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/370.

14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

I. Charak and L. W. Person
Reactor Analysis and Safety Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

16. MATERIAL AVAILABLE - Restricted Distribution

Source deck and sample input parameters (984 cards)
Sample problem output (11 pages)
Reference draft

17. CATEGORY - G

KEYWORDS - sodium fire, pressure, temperature, CSMP codes, ROPE
codes, SOFIRE2 codes

1. NAME OR DESIGNATION OF PROGRAM - IMPAC2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - IMPAC2 solves the equations of motion for a one-dimensional, lumped-mass, nonlinear spring mathematical container model. The program was designed to analyze the dynamic response of metallic shipping containers impacting an unyielding surface. The container may consist of several hollow concentric cylinders, each of a different material and length.
4. METHOD OF SOLUTION - An iteration technique (Newmark-Beta) is used to solve the equations of motion for displacement, velocity, and acceleration of the masses at each time-step.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The maximum number of masses is 100. The program is written for a maximum of 10 different materials. The first seven have been given the following designations:
 - 1 steel
 - 2 clad lead
 - 3 uranium
 - 4 pine
 - 5 lead
 - 6 balsa
 - 7 marine plywoodStress-strain characteristics for materials 1, 3, 4, and 6 are approximated by a bilinear curve fit which requires as input the modulus of elasticity, the stress at the intersection of the two lines and the slope of the second line.
6. TYPICAL RUNNING TIME - The sample problem took less than 2 minutes of CDC7600 time.
7. UNUSUAL FEATURES OF THE PROGRAM - The input is specifically written to accommodate shipping container geometry and requires only overall dimensions, rather than the dimensions of each mass and spring.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed April 1977.
CDC7600 version submitted January 1977, sample problem executed by ACC March 1977 on a CDC7600 at Brookhaven National Laboratory.
10. REFERENCES - J. Counts and J. B. Payne, IMPAC2--A Lumped-Mass Nonlinear Spring Computer Program to Analyze Type B Shipping Container Impact Problems, LA-6643-MS, January 1977.
11. MACHINE REQUIREMENTS - CDC7600 with card input and printer

12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
LASL CROS Operating System and CDC SCOPE.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. B. Payne, MS 312
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico 87545
J. Counts
Division of Environmental Control Technology
U. S. Energy Research and
Development Administration
Washington, D.C. 20545
16. MATERIAL AVAILABLE -
Source deck (999 cards)
Sample problem input (7 cards)
Sample problem output (6 pages)
Reference report
17. CATEGORY - I
KEYWORDS - TYPE B container, dynamic response, lumped-mass

1. NAME OR DESIGNATION OF PROGRAM - SPRAY2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - SPRAY2 performs the calculations of thermodynamics, heat and mass transfer, and combustion of sodium spray droplets released in an LMFBR cell as a result of postulated piping failure.
4. METHOD OF SOLUTION - Nodal temperature solutions are obtained from instantaneous heat and mass balances by the explicit forward-difference method.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - Present verification of the code against experimental evidence limits the droplet size to .02-.03 inch with oxygen concentrations ranging from 0 to 21 percent. The number of space increments should be in the range of 30 to 50 for stability and accuracy.
6. TYPICAL RUNNING TIME - Approximately 200 seconds running time is required for a typical 45 second problem.
7. UNUSUAL FEATURES OF THE PROGRAM - SPRAY2 treats short-term heat and combustion of sodium droplets, differing in this respect from the SOFIRE code which treats sodium pools. The simplified one-dimensional gas convection model in the cell atmosphere differs from the more exact convection model utilized in the SOMIX code. SPRAY2 includes forced or free-convection heat transfer to the cell walls, differing from the NARX code which is adiabatic on the gas space.
8. RELATED OR AUXILIARY PROGRAMS - The SPRAY2 code is an advanced version of the original SPRAY code developed at HEDL but never documented for release to the Argonne Code Center. The earlier version was limited to .05-.30 inch droplets in the range of 0 to 2 percent oxygen concentration.
9. STATUS - Abstract first distributed May 1977.
CDC7600 version submitted July 1976, sample problem
executed by ACC April 1977 on a CDC7600, via remote
terminal to Brookhaven National Laboratory.
10. REFERENCES - SPRAY-II Code Description, HEDL Document, June 1976.
P. R. Shire, A Combustion Model for Hypothetical
Sodium Spray Fire within Containment for an LMFBR, M.S. Thesis,
University of Washington (1972).
P. R. Shire, et al., A Sodium Droplet Combustion
Model for Reactor Accident Analysis, ANS Transactions, 15(2) p.
812, November 1972.
P. R. Shire, Reactor Sodium Coolant Hypothetical
Spray Release for Containment Accident Analysis: Comparison of

10. REFERENCES (CONTINUED)

Theory with Experiment, ANS Topical Conference on Fast Reactor Safety, CONF-740401-P1, 1974.

11. MACHINE REQUIREMENTS - An input device to read cards or card-image input data and output devices for paper and microfiche copy of digital information and micrographic for plot output are utilized. These requirements may be easily modified.

12. PROGRAMMING LANGUAGE USED - FORTRAN (FTN compiler)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.4.

14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - Some initially-undefined variables require that the memory be set to zero before execution. The proprietary ISSCO DISSPLA package is utilized for SPRAY2 plotting. Dummy routines (BGNPL, CURVE, DONEPL, ENDPL, GFR80, GRAPH, HEIGHT, MESSAG, PAGE, REALNO, TITLE) included in the package will have to be replaced by the appropriate routines for the local environment.

15. NAME AND ESTABLISHMENT OF AUTHOR -

P. R. Shire
Hanford Engineering Development Laboratory
Westinghouse Hanford Company
P. O. Box 1970
Richland, Washington 99352

16. MATERIAL AVAILABLE -

Source deck (1062 cards)
Sample problem (20 cards)
Sample problem output (55 selected pages, 3 microfiche)
Reference code description

17. CATEGORY - G

KEYWORDS - sodium spray release, safety analysis, LMFBR reactors, SOFIRE codes, SOMIX codes, NARX codes

ACC ABSTRACT 717

08/77

1. NAME OR DESIGNATION OF PROGRAM - NAHAMMER
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370, CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - NAHAMMER analyzes short-term pressure-pulse transients in a closed hydraulic system consisting of series or parallel piping, pipe junctions, diameter discontinuities, elbows, junctions of three to six branches, orifices, acoustic-impedance discontinuities, dummy junctions, dead ends, and free surfaces in surge tanks. The working fluid is assumed to be sodium without cavitation.
4. METHOD OF SOLUTION - NAHAMMER considers a simplified one-dimensional linear inviscid set of governing equations. Classical fluid-hammer theory was linearized by neglecting the viscosity and recognizing that convective terms are negligible when the ratio of flow velocity to sonic speed is less than 0.01. Numerical solutions are obtained by a simple superposition technique for tracing the waves traveling along each characteristic and for extending the solution from one constant time line to the next.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The program currently provides for maxima of:
 - 50 legs
 - 120 nodes per leg
 - 50 junctions
 - 10 plenums (surge tanks)

The assumption of linearity restricts the maximum pressure at any propagating wave front in sodium to about 5800 psi. Calculations are limited to liquid sodium in the absence of cavitation. Friction-free fluid motion maintains its energy within any pipe section, but conventional energy losses based on steady-state incompressible fluid flow are taken into account for elbows, diameter discontinuities, and orifice-like restrictions. To specify a working fluid other than sodium, the source coding must be changed.
6. TYPICAL RUNNING TIME - Execution of the 48-leg sample problem requires about 16 CPU seconds on an IBM370/195 or about 4 CP seconds on a CDC7600.
7. UNUSUAL FEATURES OF THE PROGRAM - In NAHAMMER the initial transient is followed by a pressure pulse from a molten-fuel coolant interaction (MFCI) that produces a local pressure generation in the fuel (heat-producing) region of the system. At the user's option, the pressure-time history during the MFCI either is calculated in subroutine DIFFUN according to an ANL rate-limited parametric model or is input. The source region is a special region through which the waves are not allowed to travel.

8. RELATED AND AUXILIARY PROGRAMS - WHAM6 (ACC Abstract 278), COMPARE (ACC Abstract 702), HAMOC (ACC Abstract 710), NATRANSIENT (ACC Abstract 718), and NATRAN2 (ACC Abstract 719).
9. STATUS - Abstract first distributed April 1977.
IBM360 version submitted June 1975, sample problem executed by ACC March 1977 on an IBM370/195.
CDC7600 version converted by ACC from the IBM360 version, sample problem executed by ACC March 1977 on a CDC7600.
10. REFERENCES - W. L. Chen, D. H. Thompson, and Y. W. Shin, NAHAMMER, A Computer Program for Analysis of One-dimensional Pressure-pulse Propagation in a Closed Fluid System, ANL-8059, May 1974.
11. MACHINE REQUIREMENTS - 362K bytes (IBM360,370), or 126,000 (octal) words (CDC6600,7600) of storage
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370 (IBM360,370), SCOPE 3.4.3 (CDC6600), or SCOPE 2.1.2 (CDC7600).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
360 W. L. Chen and D. H. Thompson
 Reactor Analysis and Safety Division, and
 Y. W. Shin
 Components Technology Division
 Argonne National Laboratory
 9700 South Cass Avenue
 Argonne, Illinois 60439

7600 H. S. Edwards
 Argonne Code Center
 Argonne National Laboratory
 9700 South Cass Avenue
 Argonne, Illinois 60439
16. MATERIAL AVAILABLE -
Source decks (360-1013 cards, 7600-904 cards)
Sample problem input (360-75 cards, 7600-75 cards)
Sample problem output (360-28 pages, 7600-27 pages)
Reference report
17. CATEGORY - G
KEYWORDS - fluid flow, fluid hammer, liquid metals, pressure, reactor safety, transients, 1-dimensional, LMFBR reactors, WHAM codes, COMPARE codes, HAMOC codes, NATRANSIENT codes, NATRAN2 codes

1. NAME OR DESIGNATION OF PROGRAM - NATRANSIENT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - NATRANSIENT analyzes short-term pressure-pulse transients in a closed hydraulic system consisting of series or parallel piping, pipe junctions, diameter discontinuities, junctions of three to six branches, closed ends, surge tanks, far ends, dummy junctions, acoustic impedance discontinuities, and rupture disks. The working fluid is assumed to be liquid sodium without cavitation. The source pressure pulse is assumed to be generated by a sodium-water reaction according to the dynamic model of Zaker and Salmon.
4. METHOD OF SOLUTION - The governing partial differential equations for one-dimensional unsteady flows are reduced to a set of ordinary differential equations by the method of characteristics. The governing equations include the complete Navier-Stokes equation in which the viscous term is written in terms of the Darcy-Weisbach friction factor. By appropriate matching of the boundary conditions at the pipe junctions, the flow conditions following a sodium-water reaction can be determined for the entire network. The resulting characteristics and compatibility conditions are reduced to finite difference equations which are solved by stepwise numerical integration.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The program currently provides for maxima of:
 - 50 legs
 - 120 nodes per leg
 - 50 junctions
 - 10 surge tanksCavitation is assumed to be absent. To specify a working fluid other than sodium, the source program must be changed.
6. TYPICAL RUNNING TIME - Execution of the 48-leg sample problem requires about 4 seconds of CPU time on the IBM370/195.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - NATRANSIENT is included as a subroutine in the NATRAN2 program (ACC Abstract 719). Related codes are WHAM6 (ACC Abstract 278), COMPARE (ACC Abstract 702), HAMOC (ACC Abstract 710), and NAHAMMER (ACC Abstract 717).
9. STATUS - Abstract first distributed April 1977.
 - IBM360 version submitted June 1975, sample problem executed by ACC March 1977 on an IBM370/195.
10. REFERENCES - Yong Woo Shin, The Method of Characteristics for Analysis of Pressure Transients Resulting from Sodium-Water

10. REFERENCES (CONTINUED)
Reaction in Hydraulic Networks, ANL-8049 with Errata, December 1973.
T. A. Zaker and M. A. Salmon, Effects of Tube Rupture in Sodium Heated Steam Generator Units, ASME Publication 69-WA/NE-18, November 1969.
11. MACHINE REQUIREMENTS - 166K bytes of storage are required.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
Y. W. Shin
Components Technology Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
16. MATERIAL AVAILABLE -
Source deck (757 cards)
Sample problem input (107 cards)
Sample problem output (8 pages)
Reference report, ANL-8049 with errata
17. CATEGORY - G
KEYWORDS - fluid flow, fluid hammer, liquid metals, pressure, reactor safety, transients, 1-dimensional, NATRAN2 codes, WHAM6 codes, COMPARE codes, HAMOC codes, NAHAMMER codes

1. NAME OR DESIGNATION OF PROGRAM - NATRAN2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - NATRAN2 analyzes short-term pressure-pulse transients in a closed hydraulic system consisting of a two-dimensional axisymmetric domain connected to a one-dimensional piping network. The one-dimensional network may consist of series or parallel piping, pipe junctions, diameter discontinuities, junctions of three to six branches, closed ends, surge tanks, far ends, dummy junctions, acoustic impedance discontinuities, and rupture disks. By default, the working fluid is assumed to be liquid sodium without cavitation; but another working fluid can be specified in terms of its density, sonic speed, and viscosity. The source pressure pulse can arise from one of the following: a pressure-time function specified at some point in the two-dimensional domain, a pressure-time function or a sodium-water reaction specified at some point in the one-dimensional domain. The pressure pulse from a sodium-water reaction is assumed to be generated according to the dynamic model of Zaker and Salmon.
4. METHOD OF SOLUTION - For the two-dimensional region, NATRAN2 uses a numerical integration technique, based on the method of characteristics and formulated for the system of quasi-linear hyperbolic equations describing fluid-hammer phenomena in a closed two-dimensional axisymmetric domain. The set of nonlinear partial differential equations is first converted to a system of integral equations written along bicharacteristics. The solution is constructed in a step-by-step procedure by approximating the integral equations by the trapezoidal formula and using the resulting difference relations along four bicharacteristics and one streamline through each point. Spatial derivatives of the dependent variables are eliminated from the difference relations. The solution at any point then is obtained explicitly by a linear combination of the remaining difference relations.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - The program currently provides for maxima of:
 - 1 two-dimensional cylindrical region
 - 30 grid points in the r-direction
 - 60 grid points in the z-direction
 - 50 one-dimensional pipe branches
 - 120 nodes per pipe branch
 - 50 junctions
 - 10 surge tanksCavitation is assumed to be absent. In the two-dimensional analysis, viscosity effects are neglected. A sufficiently large length-to-diameter ratio must be allowed for extended regions both upstream and downstream of the two-dimensional domain, since the matching of the boundary conditions at the interfaces neglects any two-dimensionality close to the interface.

6. TYPICAL RUNNING TIME - Execution of the sample problem requires approximately 135 CPU seconds on an IBM370/195.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - The NATRANSIENT code (ACC Abstract 718) is used as a subroutine within NATRAN for one-dimensional system calculations. Related programs include WHAM6 (ACC Abstract 278), COMPARE (ACC Abstract 702), HAMOC (ACC Abstract 710), and NAHAMMER (ACC Abstract 717).
9. STATUS - Abstract first distributed April 1977.
IBM360 version submitted June 1975, sample problem executed by ACC March 1977 on an IBM370/195.
10. REFERENCES - Y. W. Shin and Richard A. Valentin, Two-dimensional Fluid-hammer Analysis by the Method of Characteristics in a Closed Axisymmetric Cylindrical Domain, ANL-8090, August 1974.
T. A. Zaker and M. A. Salmon, Effects of Tube Rupture in Sodium Heated Steam Generator Units, ASME Publication 69-WA/NE-18, November 1969.
11. MACHINE REQUIREMENTS - 452K bytes of storage are required. If plotting information is to be written on logical unit 10, a disk or tape unit is needed for this purpose.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - To execute the sample problem, specify file FT10F001 as dummy, or with RECFM=FB, LRECL=40, and a BLKSIZE appropriate to the storage unit being used.
15. NAME AND ESTABLISHMENT OF AUTHORS -
Y. W. Shin and R. A. Valentin
Components Technology Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (2085 cards)
Sample problem input (21 cards)
Sample problem output (1 microfiche)
Reference report, ANL-8090 with errata
17. CATEGORY - G
KEYWORDS - fluid flow, fluid hammer, liquid metals, pressure, reactor safety, transients, 1-dimensional, 2-dimensional, NATRANSIENT codes, WHAM6 codes, COMPARE codes, HAMOC codes, NAHAMMER codes

1. NAME OR DESIGNATION OF PROGRAM - RICE-LASL
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600,6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - The fluid dynamics of chemically reactive mixtures are calculated at arbitrary flow speeds with the RICE-LASL program. Application is made to continuous wave HF chemical lasers to compute the supersonic mixing and chemical reactions that take place in the lasing cavity.
4. METHOD OF SOLUTION - The dynamics are governed by the two-dimensional, time-dependent Navier-Stokes equations together with the species transport equations and the mass-action rate equations for the chemical reactions. The mass and momentum equations for the mixture are solved implicitly by the Implicit Continuous-fluid Eulerian (ICE) technique. The equations for total energy and species transport are solved explicitly while the chemical rate equations are solved implicitly with a time-step that may be a submultiple of the hydrodynamic time-step.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - .0006 seconds of 7600 time/cell/cycle for single component fluids is required. This varies with increased species and chemical reaction.
7. UNUSUAL FEATURES OF THE PROGRAM - RICE-LASL allows triangular and rectangular obstacles, with or without inflow boundaries, in the computing mesh.
8. RELATED OR AUXILIARY PROGRAMS -
9. STATUS - Abstract first distributed August 1977.
CDC7600 version submitted July 1975, sample problem executed by ACC July 1977 on a CDC7600.
10. REFERENCES - W. C. Rivard, O. A. Farmer, T. D. Butler, RICE: A Computer Program for Multicomponent Chemically Reactive Flows at All Speeds, LA-5812, March 1975.
Note to LA-5812, User Information, July 23, 1975.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - LASL CROS system.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - Calls to DATAREL and to most plotting routines have been changed to comments.

15. NAME AND ESTABLISHMENT OF AUTHORS -

W. C. Rivard, O. A. Farmer, and T. D. Butler
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico 87544

16. MATERIAL AVAILABLE - Magnetic Tape Transmittal

Source deck (2818 cards)
Sample problem (30 cards)
Auxiliary program (PREP 24 cards)
Reference report and Note

17. CATEGORY - U

KEYWORDS - 2-dimensional fluid dynamics, chemical reactions,
time dependent Navier-Stokes equations, species
transport, C-W lasers

1. NAME OR DESIGNATION OF PROGRAM - WFLLL2B
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - WFLLL2B solves the problem of electromagnetic radiation from wire structures in free space or in the presence of a lossy half-space, including structures penetrating the interface. Antenna structures may be composed of many interconnected wires of differing radii, which may be impedance loaded. Electric space and surface wave fields may be evaluated.
4. METHOD OF SOLUTION - The solution is effected in the frequency domain via the application of the thin-wire electric-field integral equation. A moments method is applied to obtain the numerical solution. Four methods used for the ground treatment include two derived from a geometric optics approach with either the normal incidence or specular plane-wave reflection coefficients accounting for the reflected fields, a third applying Norton's formulas when the distances and ground parameters are in the applicable range, and the fourth, most rigorous approach, involving two representations for Sommerfeld integrals. The program automatically chooses the more efficient of the two forms: Hankel or Bessel function. The integrals are evaluated by performing numerical complex contour integration using an adaptive Romberg integration scheme.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - At least six current samples/wavelength should be used in setting up a numerical model, and the segment-length to wire-radius ratio should be greater than 5 for the thin-wire approximations to be valid. The two geometric optics ground treatment methods and Norton's formulas are valid only for structures located in the upper half-space. No more than 300 segments can be processed.
6. TYPICAL RUNNING TIME - The running time varies depending on the number of segments, the ground treatment, and the inherent symmetry of the structure. The test case run by ACC took approximately 62 seconds to execute.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - WFLLL2B represents a replacement of WFLLL2A as described in UCRL-51821; the errata sheet contains these changes. The code was originally developed at MB Associates, San Ramon, California. At LLL, F. J. Deadrick and E. K. Miller made extensive improvements, including development of the capability for allowing complex wave numbers in both the upper and lower half space. D. L. Lager and R. J. Lytle added the Sommerfeld and Norton ground treatments. G. A. Burrell, The Ohio State University, converted the code to FORTRAN.

9. STATUS - Abstract first distributed May 1977.
CDC7600 version submitted October 1976, sample problem
executed by ACC March 1977 on the Brookhaven CDC7600.
10. REFERENCES - Darrel L. Lager, R. Jeff Lytle, FORTRAN Subroutines
for the Numerical Evaluation of Sommerfeld Integrals Unter
Anderem, UCRL-51821, May 21, 1975.
F. J. Deadrick, WAMP-A User's Manual for the Wire
Antenna Modelling Program, UCID-30084, December 10, 1973.
R. J. Lytle, Numerical Evaluation of Sommerfeld
Integrals, UCRL-52688, October 23, 1974.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - The program was written originally in
LRLTRAN and converted to FORTRAN.
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
Subroutine SCLOK1 used to start the CP time clock and function
RCLOK1, which is used to return CP time in seconds, are dummy
routines which will have to be replaced with the appropriate ones
for the local environment. The program is run at Ohio State on
the IBM370/168.
15. NAME AND ESTABLISHMENT OF AUTHORS -
D. L. Lager and R. J. Lytle
Lawrence Livermore Laboratory
P. O. Box 808
Livermore, California 94550
G. A. Burrell
Electroscience Laboratory
The Ohio State University
1320 Kinnear Road
Columbus, Ohio 43212
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source deck (5132 cards)
Sample problem input (31 cards)
Sample problem output (9 pages)
Reference report, UCRL-51821
17. CATEGORY - T
KEYWORDS - thin-wire approximation, antennas, electromagnetic
radiation, WAMP codes, WFLLL2A codes

ACC ABSTRACT 722

05/77

1. NAME OR DESIGNATION OF PROGRAM - CRAC
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - The CRAC code was developed in support of the Reactor Safety Study (WASH-1400) to assess the risk from potential accidents at nuclear power plants.
4. METHOD OF SOLUTION - The assessment of accident risk entails the coupling of a series of mathematical and statistical models. CRAC requires as input an inventory of radioisotopes released from the reactor containment to the environment and a description of the accident conditions. It (1) models the meteorological dispersion of the cloud of radioactive material; (2) determines the health effects of the material upon the surrounding population; and (3) estimates the costs to the public from the accident. CRAC samples specific meteorological conditions from a set of representative reactor locations and probabilistically combines the results to form frequency distributions of consequence from a reactor accident. The code includes detailed meteorological, population, economic, and health data. In addition CRAC models emergency planning procedures, such as evacuation. Detailed parametric and sensitivity studies can be simply accomplished in one computer run.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - One trial (one postulated accident occurrence) modeled for one wind direction and a spatial mesh of 34 intervals required 7.6 seconds on an IBM370/168.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - Two utility routines are included in the CRAC package. They are used to move the data libraries from tape to disk and to edit these libraries.
9. STATUS - Abstract first distributed May 1977.
IBM360 version submitted February 1977, sample problem executed by ACC April 1977.
10. REFERENCES - Calculations of Reactor Accident Consequences - CRAC Computer Code User's Manual, U. S. Nuclear Regulatory Commission Draft Report, February 1977.
Reactor Safety Study, U. S. Nuclear Regulatory Commission, WASH-1400 Appendix VI, October 1975.
11. MACHINE REQUIREMENTS - The program requires 190K when overlayed on the IBM360/370, and over 300K if not overlayed. Disk files should be available. Tapes may be substituted but will degrade the execution time substantially.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/VS2 Release 3.7A (IBM370), OS/MVT (IBM360).
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - The CRAC site and dose libraries are in unformatted form suitable only for IBM360,370 usage. Formatted libraries will be made available for non-370 usage.
15. NAME AND ESTABLISHMENT OF AUTHOR -
Roger M. Blond
Office of Nuclear Regulatory Research
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555
16. MATERIAL AVAILABLE - Magnetic Tape Transmittal
Source decks (CRAC (main)-660 cards, CRAC (other routines)-4878 cards, utility routines-115 cards)
Sample problems (642 cards)
Libraries (site data-102 blocks of maximum length 3124, health data-11 blocks of maximum length 3036)
Sample problem output (58 selected pages, 4561 records of maximum length 133)
Draft report
17. CATEGORY - G
KEYWORDS - radioisotope release, accidents, meteorological dispersion, emergency planning, evacuation

1. NAME OR DESIGNATION OF PROGRAM - SOLA-ICE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600,6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - SOLA-ICE is a numerical solution algorithm for transient, arbitrarily compressible fluid flows.
4. METHOD OF SOLUTION - SOLA-ICE uses a finite-difference technique, which includes the Implicit Continuous-fluid Eulerian (ICE) method as an optional feature, to solve the Navier-Stokes equations in two-dimensional plane or cylindrical coordinates. A wide variety of boundary conditions are possible, including free-slip, no-slip, specified inflow-outflow, continuative outflow, and periodic boundaries. Implicit pressure gradients are used to eliminate the Courant condition as a stability requirement, making the code useful at all Mach numbers.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A simple equation of state and constant diffusion coefficients are assumed, and there is no provision for internal obstacles. However, the code is designed to make it easy to remedy any such deficiencies for particular problems.
6. TYPICAL RUNNING TIME - The 'grind' time, or time to advance the solution in one cell by one time-step, is typically 0.7 ms on a CDC7600.
7. UNUSUAL FEATURES OF THE PROGRAM - SOLA-ICE is designed to be easy to understand and modify so it can serve as a foundation for developing other codes. Examples of possible additions are species transport equations, internal obstacles, and a self-consistent gravitational field.
8. RELATED AND AUXILIARY PROGRAMS - SOLA and SOLA-SURF (ACC Abstract 651).
9. STATUS - Abstract first distributed June 1977.
CDC7600 version submitted September 1976, sample problem executed by ACC May 1977 on a CDC7600 via I/O terminal to Brookhaven National Laboratory.
10. REFERENCES - L. D. Cloutman, C. W. Hirt, and N. C. Romero, SOLA-ICE: A Numerical Solution Algorithm for Transient Compressible Fluid Flows, LA-6236, July 1976.
C. W. Hirt, B. D. Nichols, and N. C. Romero, SOLA - A Numerical Solution Algorithm for Transient Fluid Flows, LA-5852, April 1975.
F. H. Harlow and A. A. Amsden, A Numerical Fluid Dynamics Method for All Flow Speeds, J. Comp. Phys., Vol. 8, p. 197 (1971).

11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
CROS, SCOPE, KRONOS, and NOS.
14. OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
SOLA-ICE calls a number of LASL plotting subroutines. These will
have to be replaced or deleted by the user.
15. NAME AND ESTABLISHMENT OF AUTHORS -
L. D. Cloutman, C. W. Hirt, and N. C. Romero
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico 87545
16. MATERIAL AVAILABLE -
Source deck (460 cards)
Sample problem (10 cards)
Reference report, LA-6236
17. CATEGORY - H
KEYWORDS - fluid flows, Navier-Stokes, 2-dimensional, SOLA codes,
SOLA-SURF codes, ICE method

VI. LIBRARY PROGRAMS BY PROBLEM CLASSIFICATION

CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

8/77

14 HAFEVER HAFEVER CALCULATES THE ENERGY EXCHANGE INELASTIC SCATTERING CROSS SECTION ACCORDING TO THE HAUSER-FESHBACH THEORY MODIFIED TO INCLUDE THE EFFECT OF SPIN-ORBIT COUPLING. THE CROSS SECTION IS INTEGRATED OVER ANGLE.

41 ZUT ZUT COMPUTES RESONANCE INTEGRALS FROM RESONANCE PARAMETERS FOR A WIDE VARIETY OF TEMPERATURES, COMPOSITIONS, AND GEOMETRIES FOR THE RESOLVED RESONANCES.

42 TUZ TUZ COMPUTES RESONANCE INTEGRALS FOR A WIDE VARIETY OF TEMPERATURES, COMPOSITIONS, AND GEOMETRIES FOR THE UNRESOLVED RESONANCES.

56 SUMMIT SUMMIT EVALUATES THE DIFFERENTIAL ENERGY-TRANSFER CROSS SECTION FOR SCATTERING BY A CRYSTALLINE MODERATOR, UTILIZING THE SO-CALLED PHONON EXPANSION. THE SCATTERING KERNEL FOR A 1-PHONON CHANGE IN ENERGY IS ADDED TO THAT FOR A 2-PHONON ENERGY EXCHANGE, AND SO ON. THIS PROGRAM HAS BEEN USED TO DETERMINE SCATTERING MATRICES FOR BERYLLIUM, GRAPHITE, AND OXYGEN.

$$\text{SIGMA}(E(0) \text{ TO } E) / \text{SIGMA}(0) = (((M+1)/M)**2) * \text{SQRT}(E/E(0)) * 1/2$$

THE INTEGRAL FROM -1 TO 1 OF $\text{SIGMA}(E(0) \text{ TO } E, \cos(\theta))$
 $D(\cos(\theta))$

WHERE $E(0)$ AND E ARE THE INITIAL AND FINAL ENERGIES, θ IS THE ANGLE OF SCATTERING, $\text{SIGMA}(0)$ THE FREE-ATOM CROSS SECTION, AND M THE RATIO OF THE MASS OF THE SCATTERING NUCLEUS TO THAT OF THE NEUTRON.

89 ARES2 ARES2 IS USED TO CALCULATE EFFECTIVE RESONANCE INTEGRALS AND MULTIGROUP CROSS SECTIONS FOR LUMPS AND MIXTURES USING RESONANCE PARAMETERS. IT COMBINES IN A SINGLE CODE, THE RESOLVED, UNRESOLVED, AND $1/V$ PARTS OF THE CALCULATION WHICH WERE PREVIOUSLY IN SEPARATE CODES. THE MULTIGROUP CROSS SECTIONS ARE PRINTED IN A FORM FOR USE IN MULTIGROUP REACTOR CALCULATIONS. FOR EXAMPLE, THEY CAN BE INSERTED INTO THE AIM6 (ACC ABSTRACT 29) OR FAIM (ACC ABSTRACT 120) LIBRARIES. THE ENERGY BREAKPOINTS ARE INPUT DATA AND A RESONANCE PARAMETER LIBRARY IS INCLUDED.

171 NEARREX NEARREX COMPUTES NEUTRON-INDUCED, AVERAGE FLUCTUATION (OR COMPOUND NUCLEUS) CROSS SECTIONS. PROVISION IS MADE FOR THE COMPUTATION OF COMPOUND ELASTIC AND INELASTIC NEUTRON CROSS SECTIONS, RADIATIVE CAPTURE AND FISSION CROSS SECTIONS, AS WELL AS OTHER PROCESSES, SUCH AS PROTON EMISSION. IT CAN ALSO BE USED TO COMPUTE PROTON-INDUCED AVERAGE CROSS SECTIONS.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

8/7'

176 RAPTURE THIS CODE COMPUTES
RESONANCE INTEGRALS, AVERAGES THEM OVER RESONANCE PARAMETRIC
DISTRIBUTIONS, AND COMPUTES FISSION AND CAPTURE CROSS SECTIONS
AS A FUNCTION OF FUEL TEMPERATURE AND OF POTENTIAL SCATTERING
CROSS SECTION PER ABSORBER ISOTOPE.

177 DOPIE
THE EFFECTS OF -

DOPIE WAS DEVELOPED TO STUDY

- (1) OVERLAP OF RESONANCES OF UNLIKE FUEL ISOTOPES SUCH AS U238 AND THE PLUTONIUM ISOTOPES, AND
- (2) THE TEMPERATURE DEPENDENCE OF THE AVERAGE FLUX OVER AN ENERGY INTERVAL CONTAINING RESONANCES IN THE CALCULATION OF THE DOPPLER COEFFICIENT.

DOPIE COMPUTES FLUX-AVERAGED CROSS SECTIONS OVER A GIVEN ENERGY RANGE UNDER THE FOLLOWING ASSUMPTION

- (1) INTERFERENCE SCATTERING CORRECTIONS WILL BE SMALL AND CAN BE IGNORED.
- (2) SCATTERED NEUTRONS ARE DISTRIBUTED UNIFORMLY OVER THE RANGE OF ENERGY DEGRADATION CONSTANT FOR EACH MATERIAL.
- (3) ALL RESONANCES ARE RESOLVED OR CAN BE TREATED AS RESOLVED.
- (4) LEAKAGE IS INSIGNIFICANT, MAKING $\Sigma R(J) = \text{POTENTIAL SCATTERING}$.

203 COMBCO (40.0279) THE PROGRAM PERMITS COMPUTING
AND CONVOLUTING A COMBINATION CROSS SECTION CURVE COMPOSED OF THE
CROSS SECTION CURVES OF A SAMPLE AND UP TO FOUR CONTAMINANTS.

208 TRIXL **TRIXL CALCULATES MULTI-**
GROUP, DOPPLER-BROADENED EFFECTIVE RESONANCE INTEGRALS AND
CROSS SECTIONS AND THEIR TEMPERATURE COEFFICIENTS FOR A
HETEROGENEOUS RESONANCE ABSORBER. USING BASIC RESONANCE
PARAMETERS, GEOMETRY AND CONCENTRATIONS, THE CODE COMBINES
RESOLVED RESONANCE, UNRESOLVED RESONANCE, AND $1/V$ AND NEGATIVE
ENERGY RESONANCE CALCULATIONS. FISSILE ISOTOPE CALCULATION
IS AVAILABLE. L=1 UNRESOLVED RESONANCE CALCULATIONS ARE
AVAILABLE FOR ISOTOPES OF ALL SPINS. EQUIVALENCE RELATIONSHIPS
ARE CODED FOR CYLINDERS, SPHERES, AND PLANES. INTERFERENCE
BETWEEN RESONANCE AND POTENTIAL SCATTERING AND ITS TEMPERATURE
DEPENDENCE ARE AVAILABLE. THE NARROW-RESONANCE, INFINITE-
MASS, AND INTERMEDIATE REPRESENTATIONS OF SCATTERINGS WITH
ABSORBER ATOMS ARE ALL AVAILABLE. THE ISOLATED SINGLE-LEVEL
BRFIT-WIGNER LINE SHAPE IS USED.

214 MISH MASH THE PROGRAM COMPUTES RESONANCE INTEGRALS FOR INFINITE HOMOGENEOUS MIXTURES FOR ABOVE THERMAL ENERGIES. THE MAJOR PHYSICAL APPROXIMATION IS THAT RESONANCES ARE REPRESENTED BY THE SINGLE-LEVEL BREIT-WIGNER

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

8/77

FORMULATION. IT IS ALSO ASSUMED THAT SCATTERING IS ELASTIC AND THAT A NONRESONANT MATERIAL HAS A CONSTANT SCATTERING CROSS SECTION.

215 CHAD CHAD IS DESIGNED TO FACILITATE ANALYSIS AND HANDLING OF DIFFERENTIAL NEUTRON SCATTERING DATA. IT PRODUCES LEGENDRE SCATTERING COEFFICIENTS FROM ANGULAR DISTRIBUTION DATA TABULATED IN MANY DIFFERENT FORMATS. IT CAN TRANSFORM ANGULAR DATA INTO LEGENDRE SCATTERING COEFFICIENTS IN EITHER THE LABORATORY OR THE CENTER-OF-MASS FRAME OF REFERENCE. IT CALCULATES THE AVERAGE COSINE OF THE SCATTERING ANGLE IN THE LABORATORY SYSTEM AND THE AVERAGE LOGARITHMIC ENERGY DECREMENT PER ELASTIC COLLISION.

216 FSDP3 FSDP3 COMPUTES POINTWISE CROSS SECTIONS FROM SINGLE-LEVEL BREIT-WIGNER RESONANCE PARAMETERS.

217 LEGCOEF3/GEORGE CALCULATES LEGENDRE EXPANSION COEFFICIENTS FOR THE ANGULAR DISTRIBUTION OF ELASTICALLY SCATTERED NEUTRONS.

238 EXT/XO GIVEN A SET OF BREIT-WIGNER RESONANCE PARAMETERS (ZERO TEMPERATURE) EXT CALCULATES THE EFFECTIVE DOPPLER-BROADENED CROSS SECTIONS FOR ANY TEMPERATURE. THE EFFECTIVE CROSS SECTION WHEN MULTIPLIED BY THE TARGET DENSITY AND THE NEUTRON VELOCITY (LAB) GIVES THE REACTION RATE PER INCIDENT NEUTRON. A MAXWELLIAN VELOCITY DISTRIBUTION IS ASSUMED FOR THE TARGET NUCLEI. THE ANALYSIS IS CARRIED OUT FOR SUFFICIENTLY LOW ENERGIES SO THAT ONLY ZERO NEUTRON ANGULAR MOMENTA ($L = 0$) INTERACTIONS ARE IMPORTANT. INTERFERENCE BETWEEN LEVELS IS NEGLECTED, HOWEVER, INTERFERENCE BETWEEN RESONANCE SCATTERING AND POTENTIAL SCATTERING IS INCLUDED. THERE ARE PROVISIONS FOR ADDING A CORRECTION CROSS SECTION OF THE FORM $1.0/\text{SQRT}(E)$ FOR LEVELS NOT EXPLICITLY CONSIDERED. ALSO THE CROSS SECTION IN THE WINGS OF A NEGATIVE ENERGY RESONANCE, $\text{CONSTANT}/(\text{SQRT}(E)*(E-E_0)**2)$ MAY BE ADDED.

247 FLANGE1 FLANGE1 COMPUTES NEUTRON SCATTERING KERNELS FOR A LARGE CLASS OF MODERATORS. NEUTRON SCATTERING KERNELS ARE OBTAINED FROM THE SCATTERING LAW COMPUTED BY THE CODE GASKET. FLANGE1 ALLOWS THE CALCULATION OF DOUBLE DIFFERENTIAL CROSS SECTIONS, ANGULAR CROSS SECTIONS, TOTAL CROSS SECTIONS, AND LEGENDRE MOMENTS OF THE SCATTERING KERNEL. THE SHORT COLLISION TIME APPROXIMATION IS USED FOR ENERGY TRANSFERS LARGER THAN THE MAXIMUM PROVIDED BY GASKET.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

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254 2PLUS THE 2PLUS CODE SOLVES THE PROBLEM OF THE SCATTERING OF CHARGED OR UNCHARGED NUCLEONS BY A NUCLEUS REPRESENTED BY A DEFORMED NUCLEAR POTENTIAL. THE MODEL ASSUMES THAT THE TARGET NUCLEUS HAS A 0+ GROUND STATE AND A 2+ FIRST EXCITED LEVEL, AND THE INTERACTION POTENTIAL HAS A QUADRUPOLE DEFORMATION. A HAUSER-FESHBACH COMPOUND NUCLEUS CALCULATION HAS BEEN INCLUDED. THE OUTPUT CONTAINS TOTAL, POTENTIAL ELASTIC, POTENTIAL INELASTIC (2+), REACTION, AND COMPOUND NUCLEUS CROSS SECTIONS AS WELL AS ELASTIC AND INELASTIC ANGULAR DISTRIBUTIONS.

263 GASKET GASKET CALCULATES THE THERMAL NEUTRON SCATTERING LAW, $S(\alpha, \beta)$, FOR A LARGE CLASS OF MODERATORS. PROVISION HAS BEEN MADE IN GASKET FOR THE FOLLOWING DYNAMICAL MODES OF THE SCATTERER -

- (1) FREE TRANSLATION (GAS).
- (2) DIFFUSIVE OR BROWNIAN MOTION.
- (3) HARMONIC ISOTROPIC VIBRATIONS WITH CONTINUOUS FREQUENCY SPECTRUM.
- (4) HARMONIC ANISTROPIC VIBRATIONS WITH CONTINUOUS FREQUENCY SPECTRUM (AS APPLIED FOR INSTANCE TO GRAPHITE).
- (5) HARMONIC ISOTROPIC VIBRATIONS WITH DISCRETE FREQUENCY SPECTRUM.

289 GAKER THE GAKER CODE EVALUATES THE INELASTIC DOUBLE-DIFFERENTIAL NEUTRON SCATTERING CROSS SECTIONS FOR MODERATORS WITH PHONON SPECTRA WHICH CAN BE REPRESENTED AS SUMS OF DELTA-FUNCTIONS. IT IS BASED ON THE ORIGINAL MODEL FOR LIGHT WATER BY NELKIN, WHICH CONSISTED OF A TRANSLATOR, A HINDERED ROTATOR (TREATED AS AN ISOTROPIC OSCILLATOR), AND SEVERAL VIBRATIONAL OSCILLATORS. THE CODE HAS BEEN MODIFIED SEVERAL TIMES TO INCLUDE MORE OSCILLATORS AND TO TREAT ANISOTROPIC EFFECTS. FINAL ENERGY-INTEGRATED CROSS SECTIONS ARE ALSO CALCULATED.

292 PSEUDO RESONANCE PARAMETERS ARE CONSTRUCTED FROM AVERAGE NUCLEAR PROPERTIES IN THE RESOLVED RESONANCE REGION.

305 STRIP CAPTURE AND FISSION RESONANCE INTEGRALS ARE CALCULATED BY A FAST METHOD IN THE RESOLVED RESONANCE RANGE, TAKING EXPLICIT ACCOUNT OF OVERLAP AND INTERFERENCE BETWEEN RESONANCES IN A MIXTURE OF RESONANCE ABSORBERS. THE RESONANCE INTEGRALS ARE CALCULATED OVER ARBITRARY ENERGY BANDS. OPTIONALLY, THE NEUTRON FLUX AS A FUNCTION OF ENERGY IN ONE OR TWO REGIONS MAY BE PRINTED OUT.

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308 JUPITOR1(JP1) JUPITOR1 IS USED TO PERFORM COUPLED-CHANNEL CALCULATIONS TO EVALUATE THE CROSS SECTIONS FOR THE SCATTERING OF NUCLEAR PARTICLES BY VARIOUS COLLECTIVE NUCLEI.

323 MUFFLE THIS PROGRAM COMPUTES THE NEUTRON CROSS SECTIONS FOR A FISSILE NUCLIDE IN WHICH ONE TO THREE REACTION CHANNELS ARE OPEN FOR THE FISSION PROCESS. PROVISION IS MADE FOR TWO INDEPENDENT SPIN STATES WITH INTERFERING LEVELS AS WELL AS A SET OF NON-INTERFERING LEVELS. THE CROSS SECTIONS ARE INTEGRATED OVER A SPECIFIED GROUP STRUCTURE TO YIELD RESONANCE INTEGRALS.

334 PEGGY PEGGY IS A LEAST SQUARES SEARCH PROGRAM WHICH ANALYZES, IN TERMS OF PHASE SHIFTS, THE ELASTIC SCATTERING OF SPIN ZERO AND SPIN ONE-HALF PARTICLES BY SPIN ZERO NUCLEI. REAL OR COMPLEX PHASE SHIFTS MAY BE USED WITH OR WITHOUT SPIN-ORBIT COUPLING. DIFFERENTIAL CROSS SECTION AND POLARIZATION ANGULAR DISTRIBUTIONS MAY BE ANALYZED EITHER SEPARATELY OR SIMULTANEOUSLY.

335 RAMES RAMES COMPUTES BOTH LOCAL AND NONLOCAL RADIAL INTEGRALS OF A VARIETY OF RADIAL OPERATORS USING SINGLE-PARTICLE WAVE FUNCTIONS WHICH ARE EIGENSTATES OF MOTION IN A WOODS-SAXON POTENTIAL WELL. THE OPERATORS CURRENTLY AVAILABLE ARE R^*N , $N=0,1,2,3,4,5$ AND THE DERIVATIVE WITH RESPECT TO X OF $1/(\exp(X)+1)$ WHERE $X=(R-R(0))/A(0)$.

341 GANDY3 GANDY3 EVALUATES TEMPERATURE-DEPENDENT EFFECTIVE NEUTRON CAPTURE, FISSION, AND SCATTERING CROSS SECTIONS IN THE UNRESOLVED RESONANCE REGION FROM AVERAGE RESONANCE PARAMETERS.

347 CODILLI A LEAST SQUARES ANALYSIS OF NEUTRON RESONANCE DATA IS PERFORMED USING THE MULTI-LEVEL EXPANSION. THE PROGRAM CAN HANDLE ONLY ONE SET OF CROSS SECTIONS AT A TIME. OPTIONS ARE PROVIDED FOR THE ANALYSIS OF REACTION OR TOTAL CROSS SECTION DATA, AND FOR THE DIRECT HANDLING OF TRANSMISSION DATA. BY OPTION, ONE CAN INCLUDE THE MULTI-LEVEL INTERFERENCE OR PERFORM THE FIT IN TERMS OF SUPERIMPOSED SYMMETRIC BREIT-WIGNER LINES, WHILE THE POTENTIAL SCATTERING INTERFERENCE IS ALWAYS INCLUDED IN THE TRIAL FUNCTION FOR THE TOTAL CROSS SECTION. PROVISIONS ARE GIVEN FOR GAUSSIAN AND NON-GAUSSIAN RESOLUTION FUNCTIONS. IN THE LATTER CASE, MODIFICATION OF ONE SUBROUTINE ALLOWS FOR ADAPTATION TO ANY KIND OF EXPERIMENTAL CONDITIONS. THE RELEVANT CONVOLUTION INTEGRALS INVOLVING THE TRIAL FUNCTION ARE EVALUATED BY SIMPSON INTEGRATION WITH AN OPTIONAL NUMBER OF INTEGRATION STEPS. BESIDES THE RESONANCES TO BE FITTED, THE TRIAL FUNCTION

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CONTAINS AN OPTIONAL NUMBER OF RESONANCES HAVING KNOWN PARAMETERS, WHICH MAY REPRESENT RESONANCES EXTERNAL TO THE REGION BEING FITTED AS WELL AS RESONANCES WITHIN THE ENERGY INTERVAL OF INTEREST, THUS PERMITTING IMPURITY EFFECTS TO BE DESCRIBED, OR, IF NEEDED, SPIN STATES SEPARATED.

359 PUN1 PUN1 EVALUATES UNRESOLVED RADIATIVE CAPTURE INTEGRALS AND RELATED MULTIGROUP CROSS SECTIONS. THE UNRESOLVED DISTRIBUTIONS MAY HAVE VARIOUS ORBITAL ANGULAR MOMENTUM QUANTUM NUMBERS AND THE EFFECTS OF DOPPLER BROADENING AND SELF-SHIELDING ARE INCLUDED.

360 TOR THE TOR PROGRAM CALCULATES THE SCATTERING LAW FOR A CRYSTALLINE MATERIAL IN THE INCOHERENT APPROXIMATION, FROM THE PHONON FREQUENCY DISTRIBUTION AND A SPECIFIED TEMPERATURE. A PROPORTIONAL QUANTITY IS PUNCHED IN THE FORM OF A TABLE FOR INTERPOLATION OF THE DOUBLE DIFFERENTIAL CROSS SECTION. AS AN ALTERNATIVE, THE PROGRAM OBTAINS THE ANALOGOUS QUANTITIES FOR A MONATOMIC GAS.

376 AVERAGE AVERAGE CALCULATES AVERAGE SCATTERING, CAPTURE, AND FISSION CROSS SECTIONS FROM S- AND P-WAVE DATA OF THE UNRESOLVED PARAMETERS OF FILE 2 OF ENDF/B.

377 SIGPLOT SIGPLOT CALCULATES THE SCATTERING, CAPTURE, FISSION, AND TOTAL CROSS SECTIONS FROM RESONANCE PARAMETERS OF VERSION I DATA FROM FILE 2 OF ENDF/B. SCATTERING CROSS SECTIONS MAY BE CALCULATED WITH OR WITHOUT LEVEL-LEVEL INTERFERENCE. PROVISION IS ALSO MADE TO NUMERICALLY DOPPLER-BROADEN ANY OF THE CROSS SECTIONS.

381 LYNNE LYNN PERFORMS A MULTIPOLE EXPANSION OF THE WOODS-SAXON POTENTIAL. THE NUMBERS GENERATED ARE SUITABLE FOR MICROSCOPIC CALCULATIONS OF INELASTIC SCATTERING FROM NUCLEI WHICH USE A WOODS-SAXON INTERACTION BETWEEN THE PROJECTILE AND THE TARGET NUCLEONS.

385 COHBE/PREP THE PROGRAMS, PREP AND COHBE CALCULATE THE COHERENT ONE-PHONON SCATTERING LAW FOR POLYCRYSTALLINE BERYLLIUM, USING AN ISOTROPIC DEBYE-WALLER FACTOR AS AN APPROXIMATION FOR BERYLLIUM. THE DEBYE-WALLER FACTOR W IS CONSISTENT WITH THE DEFINITION $\exp^{**}(-2*W*ALPHA)$ IN THE SCATTERING LAW.

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399 SUMOR(M0271) SUMOR CALCULATES S-WAVE NEUTRON CROSS SECTIONS AT SELECTED ENERGIES. THE CROSS SECTIONS ARE CALCULATED IN THREE APPROXIMATIONS TO R-MATRIX THEORY - THE REICH AND MOORE APPROXIMATION, THE FESHBACH, PORTER, AND WEISSKOPF APPROXIMATION, AND THE SUMS OF SINGLE-LEVEL FORMULAE APPROXIMATION. THESE CALCULATED CROSS SECTIONS OR, ALTERNATIVELY, INPUT LISTS OF CROSS SECTIONS, ARE DOPPLER BROADENED USING EXACT CALCULATION FOR TARGET NUCLEI IN MAXWELLIAN MOTION. CALCULATED CROSS SECTIONS OR CROSS SECTIONS DIVIDED BY NEUTRON ENERGY CAN BE INTEGRATED BETWEEN ARBITRARY ENERGY LIMITS.

410 TACASI TACASI IS USED TO DETERMINE THE PARAMETERS OF A SINGLE NEUTRON RESONANCE. THE CODE ACCEPTS MEASURED VALUES OF CAPTURE AREAS, SELF-INDICATION AREAS, SELF-INDICATION RATIOS AND TRANSMISSION AREAS AND THEIR ASSOCIATED UNCERTAINTIES IN ANY COMBINATION AND DETERMINES BEST ESTIMATES OF THE NEUTRON AND RADIATION WIDTHS AND THEIR STANDARD DEVIATIONS.

417 ATHENA4 ATHENA4 COMPUTES FORM FACTORS FOR INELASTIC SCATTERING CALCULATIONS, USING SINGLE-PARTICLE WAVE FUNCTIONS THAT ARE EIGENSTATES OF MOTION IN EITHER A WOODS-SAXON POTENTIAL WELL OR A HARMONIC OSCILLATOR WELL. TWO-BODY FORCES OF GAUSS, COULOMB, YUKAWA, AND A SUM OF CUT-OFF YUKAWA RADIAL DEPENDENCES ARE AVAILABLE.

465 RESEND/ADLER RESEND GENERATES INFINITELY DILUTE, UNBROADENED POINT CROSS SECTIONS IN THE ENDF FORMAT BY COMBINING ENDF FILE 3, BACKGROUND CROSS SECTIONS WITH POINTS CALCULATED FROM ENDF FILE 2, RESONANCE PARAMETER DATA.

ADLER CALCULATES TOTAL, CAPTURE AND FISSION CROSS SECTIONS FROM THE CORRESPONDING ADLER-ADLER PARAMETERS IN THE ENDF/B FILE 2 VERSION II DATA AND ALSO DOPPLER-BROADENS CROSS SECTIONS.

470 GRAMP GRAMP RANDOMLY GENERATES REICH AND MOORE PARAMETERS FOR MULTILEVEL UNRESOLVED RESONANCES OF FISSION ISOTOPES.

482 COMNUC/CASCADE COMNUC CALCULATES NEUTRON REACTION CROSS SECTIONS USING A STATISTICAL MODEL FOR DECAY OF THE COMPOUND NUCLEUS. COMPETING REACTION TYPES PERMITTED ARE ELASTIC, DISCRETE AND CONTINUUM INELASTIC, GAMMA RAY EMISSION, CAPTURE, FISSION, AND $n, 2n$.

CASCADE SOLVES THE INTRANUCLEAR GAMMA RAY CASCADE EQUATION TO DETERMINE SECONDARY PARTICLE EMISSION PROBABILITIES. COMPETING PROCESSES CONSIDERED ARE GAMMA RAY EMISSION, NEUTRON EMISSION AND FISSION.

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492 RAMP1 RAMP1 CALCULATES SCATTERING, CAPTURE, FISSION AND TOTAL CROSS SECTIONS FROM REICH-MOORE RESOLVED RESONANCE PARAMETERS. THE RESONANCE PARAMETERS ARE ASSUMED TO BE IN ENDF/B VERSION II DATA FORMAT. CROSS SECTIONS MAY BE DOPPLER BROADENED IF SO DESIRED.

504 THRES2 THRES2 CALCULATES NEUTRON-INDUCED REACTION CROSS SECTIONS FROM 0 TO 20 MEV AND FISSION SPECTRUM AVERAGES FOR NUCLIDES HAVING 21 TO 82 PROTONS. REACTION PRODUCTS CONSIDERED ARE 2N, 3N, P, D, T, HE-3, ALPHA, NP, ND, NT, N-HE3, N-ALPHA, PN, 2P, P-ALPHA, ALPHA-N, ALPHA-P, AND DN.

506 JP1XR PIXR COMPUTES SCATTERING CROSS SECTIONS AND RELATED QUANTITIES FOR THE SCATTERING OF NUCLEONS OR COMPOSITE PARTICLES FROM ANY COLLECTIVE NUCLEUS, EVEN OR ODD A, VIBRATIONAL OR ROTATIONAL. THE PROJECTILE CAN BE CHARGED OR UNCHARGED AND CAN HAVE SPIN 0, 1/2, OR 1.

507 PHASER HASER COMPUTES THE FOLLOWING QUANTITIES FOR THE SCATTERING OF NEUTRONS FROM NUCLEII - TOTAL, ELASTIC, AND REACTION CROSS SECTIONS, DIFFERENTIAL SHAPE AND COMPOUND ELASTIC CROSS SECTIONS, DIFFERENTIAL POLARIZATIONS, DIFFERENTIAL AND INTEGRATED COMPOUND LEVEL INELASTIC CROSS SECTIONS, COMPOUND AND SHAPE ELASTIC LEGENDRE MOMENTS IN THE CENTER-OF-MASS SYSTEM.

524 BESFIT BESFIT CALCULATES DIFFERENTIAL ELASTIC SCATTERING CROSS SECTIONS USING A BESSEL FUNCTION EXPANSION, BASED ON A DIFFRACTION MODEL. CONSTANT TERMS MAY EITHER BE SUPPLIED AS INPUT DATA OR OBTAINED BY A LEAST SQUARES FITTING OF THE DATA.

531 CLEM CLEM GENERATES CONSTRAINED LEGENDRE MOMENTS FOR NEUTRON SCATTERING ANGULAR DISTRIBUTIONS. THE CONSTRAINT IS THAT THE ANGULAR DISTRIBUTION ITSELF SHOULD BE NON-NEGATIVE.

535 MULTI MULTI COMPUTES SCATTERING CROSS SECTIONS.

553 U3R U3R NUMERICALLY CONSTRUCTS TABLE OF THE CUMULATIVE PROBABILITY DISTRIBUTION FUNCTIONS OF UNRESOLVED RESONANCE CROSS SECTIONS IN A NARROW ENERGY RANGE.

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639 POLLA THE PROGRAM TRANSFORMS A SET OF R-MATRIX NUCLEAR RESONANCE PARAMETERS INTO A SET OF EQUIVALENT S-MATRIX (OR KAPUR-PEIERLS) RESONANCE PARAMETERS.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS,
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33 GAM1/REP/UPDATE THIS PROGRAM COMPUTES THE SLOWING-DOWN SPECTRUM IN EITHER THE P1 OR THE B1 APPROXIMATION USING 68 GROUPS OF NEUTRONS WITH A CONSTANT GROUP WIDTH $\Delta U=0.25$. MULTIGROUP CONSTANTS ARE CALCULATED FOR UP TO 32 FAST GROUPS.

50 TEMPEST2 TEMPEST2 IS A NEUTRON THERMALIZATION PROGRAM BASED UPON THE WIGNER-WILKINS APPROXIMATION FOR LIGHT MODERATORS AND THE WILKINS APPROXIMATION FOR HEAVY MODERATORS. A MAXWELLIAN DISTRIBUTION MAY ALSO BE USED. THE MODEL USED MAY BE SELECTED AS A FUNCTION OF ENERGY. THE SECOND-ORDER DIFFERENTIAL EQUATIONS ARE INTEGRATED DIRECTLY RATHER THAN TRANSFORMED TO THE RICCATI EQUATION. THE PROGRAM PROVIDES MICROSCOPIC AND MACROSCOPIC CROSS SECTION AVERAGES OVER THE THERMAL NEUTRON SPECTRUM.

51 FORM THE FORM, OR FORTRAN-MUFT, PROGRAM IS A FOURIER TRANSFORM SLOWING-DOWN CODE. A LIBRARY TAPE CONTAINING 54-GROUP MICROSCOPIC CROSS SECTIONS, RESONANCE PARAMETERS, INELASTIC SCATTERING MATRICES, AND SOURCE SPECTRA IS USED TO GENERATE A 54-GROUP FLUX SPECTRUM AND FEW-GROUP CONSTANTS.

52 SAIL THE MONOENERGETIC NEUTRON TRANSPORT EQUATION IS SOLVED USING THE DISCRETE SN METHOD FOR A ONE-DIMENSIONAL PLANE CELL. CELL PROPERTIES ARE COMPUTED.

53 S4 CYLINDRICAL GEOMETRY CELL C THIS PROGRAM SOLVES THE ONE-DIMENSIONAL MONOENERGETIC BOLTZMANN EQUATION IN CYLINDRICAL GEOMETRY, USING THE S4 APPROXIMATION. IN ADDITION TO THE FLUX DISTRIBUTION, CELL-AVERAGED PARAMETERS ARE COMPUTED.

108 BAM BAM COMPUTES THERMAL CONSTANTS, SPATIAL AND ENERGY DISTRIBUTIONS IN HETEROGENEOUS CYLINDRICAL CELLS BY ASSUMING SEPARABILITY OF SPACE AND ENERGY IN THE BOLTZMANN EQUATION.

113 ZOT ZOT TAKES MULTIGROUP NEUTRON CROSS SECTION SETS IN THE SN FORMAT (SNG, DSN, ETC.) AND REDUCES THE NUMBER OF GROUPS (COLLAPSES) ACCORDING TO A GIVEN OR COMPUTED MULTIGROUP FLUX SPECTRUM. AVERAGE VELOCITIES FOR THE FEW-GROUP SET MAY BE GENERATED ON THE BASIS OF THE FLUXES AND VOLUMES FOR A GIVEN REACTOR CONFIGURATION.

119 QUICKIE QUICKIE SOLVES THE NEUTRON SLOWING DOWN AND THERMALIZATION PROBLEM IN INFINITE MEDIA BY INVERTING A SET OF SIMULTANEOUS MULTIGROUP EQUATIONS. THE CODE USES

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THE ULCER (ACC ABSTRACT 118) LIBRARY TAPE AND IS IN EXCELLENT AGREEMENT WITH ULCER FOR THOSE CASES WHERE BUCKLING IS KNOWN.

147 AILMOE AILMOE IS A MODIFIED FORM OF THE ANL ELMOE PROGRAM. THE FOURIER TRANSFORM OF THE FAST NEUTRON FLUX IS FOUND FOR A MIXTURE OF MODERATORS HEAVIER THAN HYDROGEN WITH THE MODERATOR SCATTERING LAW RIGOROUSLY ACCOUNTED FOR.

149 TYCHE3 TYCHE3 IS A MONTE CARLO CODE DESIGNED TO FIND THE SECOND, FOURTH AND SIXTH MOMENTS OF THE NEUTRON SLOWING DOWN DENSITY DISTRIBUTION IN AN INFINITE HOMOGENEOUS MEDIUM. NEUTRON WEIGHTS ARE USED TO AVOID THE TERMINATION OF A HISTORY BY ABSORPTION AND MINIMIZE THE RUNNING TIME. PROVISIONS ARE MADE FOR RESTART OF NON-CONVERGED PROBLEMS, GRAPHICAL DISPLAYS OF THE MOMENTS AND AVERAGE FISSION ENERGY AS A FUNCTION OF THE NUMBER OF SETS OF HISTORIES AND CALCULATION OF THE CORRECTION TO FLUX MOMENTS.

150 DANCOFF JR. THIS CODE EVALUATES MODERATOR SPACE CHORD DISTRIBUTION FUNCTIONS OF ZEROth AND FIRST ORDER, PLUS THEIR LINEAR, SQUARE, LOGARITHMIC AND EXPONENTIAL MOMENTS, FOR REGULAR AND IRREGULAR LATTICES OF CYLINDRICAL FUEL RODS CLAD WITH MATERIAL OF NEGLIGIBLE TOTAL CROSS SECTION. OF PARTICULAR SIGNIFICANCE FOR REACTOR DESIGN CALCULATIONS IS THE EXPONENTIAL MOMENT, OR DANCOFF CORRECTION, WHICH CAN BE CALCULATED EXACTLY IN INFINITE SQUARE AND HEXAGONAL LATTICES, IN CLUMPED SQUARE LATTICES WITH STRAIGHT OR CRUCIFORM WATER GAPS, OR IN CLUSTERS OF TWO, THREE, SEVEN, AND NINETEEN FUEL RODS.

160 SOPHIST SOPHIST1 CALCULATES TEMPERATURE-DEPENDENT MULTIGROUP ENERGY TRANSFER COEFFICIENTS FOR A MAXWELL GAS MODERATOR WITH ELASTIC, ISOTROPIC SCATTERING IN THE CENTER OF MASS SYSTEM. SOPHIST2 CALCULATES TEMPERATURE-DEPENDENT MULTIGROUP CROSS SECTIONS FOR A MAXWELL GAS. SOPHIST5 CALCULATES MULTIGROUP ENERGY TRANSFER MATRICES FOR ANISOTROPIC ELASTIC SCATTERING.

162 GRAVE GRAVE IS THE PROGRAM TO FORM GROUP-AVERAGED CROSS SECTIONS USING THE NEUTRON CROSS SECTION MASTER TAPE DEVELOPED UNDER THE ATOMICS INTERNATIONAL AUTOMATED CROSS SECTION PROGRAM. NINETEEN GROUP-AVERAGED PARAMETERS ARE OBTAINABLE AS FOLLOWS - SIGMA T, SIGMA EL, SIGMA N, SIGMA F, NUBAR, MUBAR, XIBAR, SIGMA IN, SIGMA N-ALPHA, SIGMA N-P, SIGMA N-2N, SIGMA A, SIGMA TR, SIGMA NON-EL, ALPHABAR, XI*SIGMA EL, NU*SIGMA F, MUBAR*SIGMA EL, AND SIGMA R. THE SPECTRUM IS CONSTRUCTED FROM A COMBINATION OF FISSION, E**N, POWER SERIES, MAXWELLIAN OR INPUT SPECTRA.

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178 SPARTA SPARTA COMPUTES SPATIALLY-AVERAGED DOPPLER COEFFICIENTS AND SPATIALLY-AVERAGED DOPPLER REACTIVITY CHANGES.

184 ANL THERMOS/BRT1 ANL THERMOS AND BRT1, LIKE THE ORIGINAL THERMOS CODE DEVELOPED BY H. HONECK OF BROOKHAVEN NATIONAL LABORATORY, COMPUTE THE SCALAR THERMAL NEUTRON SPECTRUM AS A FUNCTION OF POSITION IN A LATTICE BY SOLVING THE INTEGRAL TRANSPORT EQUATION WITH ISOTROPIC SCATTERING. ONE-DIMENSIONAL SLAB OR CYLINDRICAL GEOMETRY MAY BE USED. AS OUTPUT THE CODE SUPPLIES FLUX-AVERAGED VALUES OF SIGMA A, SIGMA F, NU SIGMA F, SIGMA S, AND D FOR THE CELL COMPOSITION AND THE VALUES OF SIGMA A, SIGMA F, NU SIGMA F, SIGMA S, AND SIGMA TR FOR THE ISOTOPIC CONSTITUENTS.

185 GAMTEC2 GAMTEC2 GENERATES MULTIGROUP CONSTANTS IN THE ENERGY RANGE FROM 0 TO 10 MEV FOR EITHER HOMOGENEOUS MIXTURES OR HETEROGENEOUS ARRAYS CONSISTING OF CYLINDERIZED LATTICE CELLS. THE THERMAL GROUP CONSTANTS ARE AVERAGED OVER EITHER (1) WIGNER-WILKINS LIGHT MODERATOR SPECTRUM, (2) WILKINS HEAVY MODERATOR SPECTRUM, OR (3) A MAXWELLIAN DISTRIBUTION. FOR HETEROGENEOUS ARRAYS THE SPATIAL THERMAL FLUX IS CALCULATED BY A MONOENERGETIC P3 APPROXIMATION. FOR EPITHERMAL ENERGIES, THE SLOWING-DOWN DISTRIBUTION IS DESCRIBED BY EITHER A B1 OR P1 APPROXIMATION TO THE BOLTZMANN EQUATION. RESONANCE ABSORPTION AND FISSION ARE TREATED BY THE ADLER-NORDHEIM METHOD. AN IMPROVED METHOD OVER THAT IN GAM-I FOR AVERAGING THE RESONANCE ABSORPTION CONTRIBUTION TO THE MULTIGROUP CONSTANTS IS INCLUDED. FUEL LUMPING EFFECTS ON THE FAST FISSION OF U238 AND TH232 ARE TREATED BY AN N-FLIGHT COLLISION PROBABILITY TECHNIQUE. GROUP CONSTANTS ARE PUNCHED ON CARDS IN HFN (DIFFUSION CODE) AND DTF (SN TRANSPORT CODE) FORMATS.

195 FORTRAN FMC-N/FMC-G THE FLEXIBLE MONTE CARLO PROGRAMS FMC-N AND FMC-G WERE ORIGINALLY WRITTEN IN ASSEMBLY LANGUAGE FOR THE IBM704 BY GE-ANP. THESE PROGRAMS HAVE BEEN CONVERTED TO FORTRAN FOR THE CDC1604B BY PRATT AND WHITNEY. THE PROGRAMS APPLY MONTE CARLO METHODS TO SIMULATE NEUTRON AND GAMMA RAY LIFE HISTORIES, RESPECTIVELY, IN A SOURCE-SHIELD CONFIGURATION. AS THE NAMES IMPLY, THE CODES ARE DESIGNED FOR FLEXIBILITY IN THE GEOMETRICAL, MATERIAL, NUCLEAR, AND SOURCE DESCRIPTIONS OF SOURCE-SHIELD CONFIGURATIONS AND VARIANCE REDUCTION TECHNIQUES.

201 EPITHERMOS THE EPITHERMOS CODE IS A MODIFICATION OF THE THERMOS THERMAL TRANSPORT THEORY CODE OF HONECK. THE ESSENTIAL DIFFERENCE BETWEEN THE CODES IS IN THE LIBRARY PREPARATION SUBROUTINE BASK. THE EPITHERMOS CODE IS

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DESIGNED TO COMPUTE THE NEUTRON DENSITY ABOVE 0.7849 EV, THE MAXIMUM ENERGY OF THE USUAL THERMOS CALCULATION. EPITHERMOS COMPUTES THE SCALAR NEUTRON DENSITY AS A FUNCTION OF POSITION AND SPEED IN A ONE-DIMENSIONAL SLAB OR CYLINDRICAL SYSTEM. THE SCATTERING MODEL IS ARBITRARY IN THE THERMAL RANGE AND THE BUILT-IN FREE GAS MODEL IS USED IN THE EPITHERMAL RANGE.

202 MCS THE MCS CODE DETERMINES THE SPATIAL DISTRIBUTION OF SOME NUCLEAR REACTION FOR A GIVEN NEUTRON SOURCE IN A GIVEN CONFIGURATION OF MATERIALS. THE MONTE CARLO ESTIMATE OF THE SOLUTION CONSISTS OF PICKING A SAMPLE OF NEUTRONS FROM THE GIVEN SOURCE AND FOLLOWING EACH NEUTRON THROUGH A SEQUENCE OF SURFACE CROSSINGS AND COLLISIONS UNTIL THE NEUTRON EITHER ESCAPES OR IS NO LONGER OF INTEREST TO THE SOLUTION. THE DESIRED FLUX OR COLLISION DENSITY IS ACCUMULATED FOR EVERY NEUTRON OF THE SAMPLE, AND THE SAMPLE SIZE INCREASED UNTIL RESULTS OF SUFFICIENT STATISTICAL SIGNIFICANCE ARE OBTAINED.

204 AGN-GAM AGN-GAM CALCULATES THE SUBGROUP FLUXES AND CURRENT TERMS FROM A SOLUTION OF THE P1 OR B1 EQUATIONS. THE P1 EQUATIONS INCORPORATE BOTH VOLUME AND SURFACE SOURCES, ALLOWING SPECTRAL CALCULATIONS IN REFLECTOR REGIONS. OTHER SPECTRAL OPTIONS ARE FLUX KNOWN, CURRENT TERM CALCULATED AND BOTH FLUX AND CURRENT TERMS KNOWN. THE AGE FOR THE MATERIAL IS OBTAINED FROM A SECOND MOMENTS CALCULATION. THE 75 SUBGROUPS USED IN THE CALCULATIONS ARE ESTABLISHED AS QUARTER LETHARGY GROUPS FROM 10 MEV TO 0.07EV. ELASTIC SCATTERING MATRICES MAINTAIN THE ENERGY-ANGLE CORRELATION BY INCLUDING BOTH P0 AND P1 TERMS. ISOTROPIC SCATTERING MATRICES ARE INCLUDED FOR INELASTIC AND (N,2N) PROCESSES. THE METHOD OF ADLER, HINMAN AND NORDHEIM IS USED TO CALCULATE RESONANCE ABSORPTION AND FISSION CROSS SECTIONS. MULTIGROUP CONSTANTS ARE GENERATED BY SPECTRAL AVERAGING OVER THE SUBGROUPS.

213 RIFF RAFF RIFF RAFF COMPUTES RESONANCE INTEGRALS FOR ABSORBERS IN A ROD IN A TWO-REGION CIRCULARIZED CELL FOR ABOVE THERMAL ENERGIES. THE FLUX DISTRIBUTION IN THE CELL IS ALSO COMPUTED AND CAN BE PRINTED. THE METHOD OF SOLUTION IS BASED UPON THE FOLLOWING ASSUMPTIONS - ISOTROPIC SCATTERING IN THE LABORATORY SYSTEM, CONSTANT TOTAL CROSS SECTION IN THE MODERATOR AND ISOTROPIC NEUTRON FLUXES ENTERING AND LEAVING THE ROD.

219 GAROL GAROL COMPUTES EFFECTIVE GROUP CROSS SECTIONS FOR THE RESOLVED RESONANCES OF A MIXTURE OF ISOTOPES IN A TWO-REGION CELL. BASIC CROSS SECTIONS INCLUDE TEMPERATURE DEPENDENCE. THE PROGRAM ALLOWS A CHOICE OF GEOMETRIES

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AND CAN ACCEPT AN ARBITRARY TABLE OF ESCAPE PROBABILITIES. A DANCOFF CORRECTION MAY BE USED TO ACCOUNT FOR SHADOWING EFFECTS IN A TIGHT LATTICE, AND CROSS SECTIONS MAY BE $1/V$, CONSTANT, COMPUTED FROM BREIT-WIGNER RESONANCE PARAMETERS, OR GIVEN IN TABULAR FORM. THE MESH MAY BE CHOSEN AT EQUAL ENERGY OR LETHARGY INTERVALS, PROPORTIONAL TO THE NEUTRON VELOCITY, OR AS AN ARBITRARY TABLE OF VALUES.

235 GAMMA-P(NMP468) CROSS SECTIONS FOR THE PRODUCTION OF GAMMA RAYS BY NEUTRON RADIATIVE CAPTURE, BY NEUTRON INELASTIC SCATTERING, AND BY NEUTRON-INDUCED FISSIONING ARE COMPUTED AS A FUNCTION OF NEUTRON LETHARGY GROUPS AND PHOTON ENERGY GROUPS.

237 BOUNCE BOUNCE DETERMINES THE ONE-GROUP THERMAL NEUTRON FLUX DISTRIBUTION WITHIN THE PIN BUNDLE OF A MULTIPLE-PIN FUEL ELEMENT. ALL SCATTERING WITHIN THE PINS IS CONSIDERED TO BE ISOTROPIC. ELEMENTS WITH 6, 7, 12, 13, 18, AND 19 FUEL PINS, WHERE EACH PIN IS COMPOSED OF A CENTRAL FUEL PELLET SURROUNDED BY A CLADDING MATERIAL, MAY BE TREATED. THE COOLANT REGION AROUND THE PINS IS ASSUMED TO CONTAIN A VOID.

243 AGN-SIGMA AGN-SIGMA CALCULATES THE LEGENDRE COMPONENTS OF THE MULTIGROUP TRANSFER MATRICES $\Sigma(L, G \text{ TO } G+N)$ FOR FAST NEUTRONS. REACTIONS CONSIDERED ARE ELASTIC SCATTERING, INELASTIC SCATTERING (LEVEL EXCITATION AND THE EVAPORATION MODEL), AND THE FOLLOWING FIVE DECAY MODES FOR THE $(N, 2N)$ REACTION -- $A(N, N1)A^*(N2)(A-1)^*$, 3- AND 4- BODY PHASE SPACE MODEL, EVAPORATION MODEL, AND THE CLUSTER MODEL, WHERE A^* IS THE RECOIL NUCLEUS. ALL NUCLEAR LEVELS INVOLVED IN THE TRANSITIONS ARE DISCRETE. THE CODE MAY ALSO BE USED TO CALCULATE GROUP AVERAGED CROSS SECTIONS AS WELL AS TO MANIPULATE, E.G., ADD, MULTIPLY, ETC., THE OUTPUT MATRICES. THE NEUTRON SPECTRUM MAY BE A COMBINATION OF FISSION AND $1/E$ OR ARBITRARY INPUT DATA.

249 LASER LASER IS BASED ON MODIFIED VERSIONS OF THE SLOWING-DOWN PROGRAM MUFT AND THE THERMALIZATION TRANSPORT THEORY PROGRAM THERMOS, AND PERFORMS A CALCULATION OF THE NEUTRON SPECTRUM IN A UNIFORM LATTICE MADE UP OF CYLINDRICAL RODS, CLADDING, AND SURROUNDING MODERATOR. THE THERMAL CUTOFF IN LASER IS 1.855 EV. THE PROGRAM PERFORMS A BURNUP CALCULATION FOR THE LATTICE. THE SPATIAL DISTRIBUTION OF BURNUP WITHIN THE FUEL RODS IS EXPLICITLY CALCULATED. THE PROGRAM WILL, AT OPTION, ACCOUNT FOR ALL NON-LINEARITIES AND MUTUAL CONNECTIONS IN THE SYSTEM OF BURNUP EQUATIONS. THIS CALCULATION ACCOUNTS FOR THE VARIATION OF THE NEUTRON FLUX IN SPACE AND ENERGY DURING EACH TIME-STEP. A BUCKLING, AND A BORON POISON, CRITICALITY SEARCH ARE PROVIDED AS OPTIONS. OUTPUT INCLUDES EDITS IN THE ENERGY RANGE 0.1E.E.0.625 EV.

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257 REAX REAX CALCULATES EPITHERMAL FLUX, ACTIVITIES AND CROSS SECTIONS AS A FUNCTION OF RADIUS AND ENERGY FOR A CONSTANT TEMPERATURE FUEL ROD IMMERSED IN A HOMOGENEOUS MEDIUM.

276 AVOID AVOID COMPUTES THE EQUIVALENT DIFFUSION COEFFICIENT AND LOSS CROSS SECTION OF AN ANNULAR VOID IN A CYLINDRICAL REACTOR AND THE RADIAL FLUX DISTRIBUTION IN THE VOID.

277 HAMMER/LITHE/HELP HAMMER PERFORMS INFINITE LATTICE, ONE-DIMENSIONAL CELL MULTIGROUP CALCULATIONS, FOLLOWED (OPTIONALLY) BY ONE-DIMENSIONAL, FEW-GROUP, MULTIREGION REACTOR CALCULATIONS WITH NEUTRON BALANCE EDITS.

279 LEOPARD/SPOTS LEOPARD IS A UNIT CELL HOMOGENIZATION AND SPECTRUM GENERATION (MUFT-SOFOCATE) PROGRAM WITH A FUEL DEPLETION OPTION.

280 M0807 M0807 SOLVES THE TWO-DIMENSIONAL FIXED-SOURCE DIFFUSION EQUATION FOR THE ABSORPTION AND REMOVAL MACROSCOPIC CROSS SECTIONS REQUIRED TO YIELD A SPECIFIED REACTION RATE DISTRIBUTION.

281 RABBLE/WLIB/FLAT RABBLE COMPUTES EFFECTIVE CROSS SECTIONS FOR ABOVE THERMAL ENERGIES BASED ON RESOLVED SINGLE-LEVEL RESONANCE PARAMETERS FOR INFINITE HOMOGENEOUS OR HETEROGENEOUS SYSTEMS.

285 RESQ2/RESQ0/DBF1 RESQ2 CALCULATES THE RESONANCE INTEGRAL IN A TWO-DIMENSIONAL, HEXAGONAL SYSTEM CONSISTING OF FUEL, CLAD AND WATER WITH A REFLECTING BOUNDARY CONDITION.

291 HEXSCAT HEXSCAT CALCULATES P_0 THROUGH P_3 COMPONENTS OF THE POLYCRYSTALLINE COHERENT ELASTIC NEUTRON SCATTERING CROSS SECTION PER NUCLEUS FOR A HEXAGONAL LATTICE. THE CODE AVERAGES POINT VALUES OVER INPUT GROUP BOUNDARIES TO GIVE SMOOTHED GROUP CROSS SECTIONS.

298 GGC4 THE GGC4 PROGRAM SOLVES THE MULTIGROUP SPECTRUM EQUATIONS WITH SPATIAL DEPENDENCE REPRESENTED BY A SINGLE INPUT BUCKLING. BROAD GROUP CROSS SECTIONS (SHIELDED OR UNSHIELDED) ARE PREPARED FOR DIFFUSION AND TRANSPORT CODES BY AVERAGING WITH THE CALCULATED SPECTRA OVER INPUT-DESIGNATED

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ENERGY LIMITS. THE CODE IS DIVIDED INTO THREE MAIN PARTS. A FAST (GAM) SECTION WHICH COVERS THE ENERGY RANGE FROM 14.9 MEV TO 0.414 EV, A THERMAL (GATHER) SECTION WHICH COVERS THE ENERGY RANGE FROM 0.001 TO 2.38 EV, AND A COMBINING (COMBO) SECTION WHICH COMBINES FAST AND THERMAL CROSS SECTIONS INTO SINGLE SETS. BASIC NUCLEAR DATA FOR THE FAST SECTION WHICH CONSISTS OF FINE GROUP-AVERAGED CROSS SECTIONS AND RESONANCE PARAMETERS IS READ FROM A DATA TAPE. THE FINE GROUP ABSORPTION AND FISSION CROSS SECTIONS MAY BE ADJUSTED BY PERFORMING A RESONANCE INTEGRAL CALCULATION. UTILIZING A FISSION SOURCE AND AN INPUT BUCKLING, THE CODE SOLVES THE P_1 , B_1 , B_2 , OR B_3 APPROXIMATION TO OBTAIN THE ENERGY-DEPENDENT FAST SPECTRUM. TWO OR SIX SPATIAL MOMENTS OF THE SPECTRUM (DUE TO A PLANE SOURCE) MAY ALSO BE EVALUATED. INSTEAD OF PERFORMING A SPECTRUM CALCULATION, THE USER MAY ENTER THE LEGENDRE COMPONENTS OF THE ANGULAR FLUX DIRECTLY. FOR AS MANY INPUT-DESIGNATED BROAD GROUP STRUCTURES AS DESIRED, THE CODE CALCULATES AND SAVES (FOR THE COMBINING SECTION) SPECTRUM-WEIGHTED AVERAGES OF MICROSCOPIC AND MACROSCOPIC CROSS SECTIONS AND TRANSFER ARRAYS. SLOWING DOWN SOURCES ARE CALCULATED AND SAVED FOR USE IN THE LOWER ENERGY RANGE. GIVEN BASIC NUCLEAR DATA, THE THERMAL SECTION OF GGC4 DETERMINES A THERMAL SPECTRUM BY EITHER READING IT AS INPUT, BY CALCULATING A MAXWELLIAN SPECTRUM FOR A GIVEN TEMPERATURE, OR BY AN ITERATIVE SOLUTION OF THE P_0 , B_0 , P_1 , OR B_1 EQUATIONS FOR AN INPUT BUCKLING. TIME MOMENTS OF THE TIME AND ENERGY-DEPENDENT DIFFUSION EQUATIONS ARE CALCULATED (AS AN OPTION) USING THE INPUT BUCKLING TO REPRESENT LEAKAGE. BROAD GROUP CROSS SECTIONS ARE PREPARED BY AVERAGING FINE GROUP CROSS SECTIONS OVER THE CALCULATED SPECTRA. BROAD GROUP STRUCTURES ARE READ AS INPUT. THE COMBINING SECTION OF GGC4 TAKES THE BROAD GROUP-AVERAGED CROSS SECTIONS FROM THE FAST AND THERMAL PORTIONS OF GGC4 AND FORMS MULTIGROUP CROSS SECTION TABLES. THESE TABLES ARE PREPARED IN STANDARD FORMATS FOR TRANSPORT OR DIFFUSION THEORY CALCULATIONS. IN ADDITION, IT IS POSSIBLE TO USE THE COMBINING SECTION TO PRODUCE MIXTURES NOT USED IN THE SPECTRUM CALCULATION OR TO COMBINE THE RESULTS OF DIFFERENT FAST AND THERMAL SECTION CALCULATIONS AND SO ON. THESE OPTIONS ARE DESCRIBED IN REFERENCE 4.

306 FCC4

FCC4 IS A MULTIPURPOSE DATA MANIPULATION CODE FOR USE IN FAST REACTOR ANALYSIS. THE CODE CAN BE USED TO - (A) COMPUTE RESONANCE-SHIELDED CROSS SECTIONS USING DATA IN THE RUSSIAN FORMAT (SHIELDING FACTORS AND INFINITE-DILUTION CROSS SECTIONS), (B) COMPUTE MULTIGROUP FUNDAMENTAL-MODE FLUX AND ADJOINT FLUX, (C) COMPUTE AND PUNCH GROUP-COLLAPSED MICROSCOPIC OR MACROSCOPIC CROSS SECTIONS IN THE DTF FORMAT, (D) COMPUTE FUEL BURNUP AT CONSTANT FLUX OR POWER DENSITY.

307 HWO CR-SAFE

HWO CR-SAFE IS A MONTE CARLO THERMAL REACTOR ANALYSIS PROGRAM DESIGNED FOR USE WITH PROPOSED HWO CR LATTICE CONFIGURATIONS. IT IS A BENCHMARK TOOL TO CHECK MULTIGROUP DIFFUSION AND TRANSPORT CALCULATIONS AND TO EVALUATE THE EFFECT OF THEIR USE OF GEOMETRIC APPROXIMATIONS.

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316 GAFGAR/P3T/PROC/TAPCOP THE PROBLEM IS TO OBTAIN VERY DETAILED NEUTRON FLUX AND CURRENT DISTRIBUTIONS AS FUNCTIONS OF ENERGY CONSIDERING EXPLICITLY THE POSSIBLE OVERLAP EFFECTS BETWEEN RESONANCES OF A RESONANCE ABSORBER AND OF MIXTURES OF RESONANCE ABSORBERS AND TO USE THESE DISTRIBUTIONS TO PREPARE GROUP-AVERAGED CROSS SECTIONS AND TRANSFER ARRAYS FOR USE IN FAST REACTOR ANALYSES.

355 MC**2 MC**2 IS USED TO CALCULATE MULTIGROUP CROSS SECTIONS USING AN EVALUATED NUCLEAR DATA FILE (ENDF) AND THESE CROSS SECTIONS ARE SUITABLE FOR DIRECT USE BY NEUTRONICS CODES WITHOUT PERFORMING ANCILLARY CALCULATIONS.

361 GLEN THE GLEN PROGRAM INTERPOLATES VALUES OF A FACTOR PROPORTIONAL TO THE SCATTERING LAW FROM THE PUNCHED OUTPUT OF THE TOR CODE (ACC ABSTRACT 360). THE DIFFERENTIAL CROSS SECTION DETERMINED FROM THESE IS INTEGRATED OVER THE SCATTERING ANGLE TO OBTAIN COEFFICIENTS OF AN EXPANSION IN LEGENDRE POLYNOMIALS OF THIS ANGLE FOR $L = 0, 1, 2, 3$. INTEGRATION OVER FINAL ENERGIES YIELDS VALUES OF THE TOTAL SCATTERING CROSS SECTION AND TRANSPORT CROSS SECTION. FOR EACH OF A SERIES OF ISOTOPIC COMPOSITIONS (UP TO 10 COMPOSITIONS) THE GLEN CODE CALCULATES THE DIFFUSION LENGTH AND VALUES OF THE FLUX-WEIGHTED GROUP AVERAGE MACROSCOPIC SCATTERING, ABSORPTION, FISSION, AND TRANSFER CROSS SECTIONS.

362 WELWING WELWING WAS DEVELOPED TO CALCULATE THE MATERIAL BUCKLING OF REACTOR SYSTEMS CONSISTING OF ANNULAR FUEL ELEMENTS IN HEAVY WATER AS MODERATOR FOR VARIOUS MODERATOR TO FUEL RATIOS. THE MODERATOR TO FUEL RATIO FOR THE MAXIMUM MATERIAL BUCKLING FOR THE PARTICULAR SYSTEM IS SELECTED AUTOMATICALLY AND THE CORRESPONDING MATERIAL BUCKLING IS CALCULATED.

368 FLANGE2(71-1) FLANGE2 TAKES CROSS SECTIONS, ANGULAR DISTRIBUTION, RESONANCE PARAMETER, AND THERMAL SCATTERING LAW DATA FROM ENDF/B FORMAT II OR III DATA TAPES AND PREPARES THERMAL MULTIGROUP CROSS SECTIONS AND SCATTERING MATRICES.

374 1DX 1DX IS A MULTIPURPOSE, ONE-DIMENSIONAL DIFFUSION CODE FOR GENERATING CROSS SECTIONS TO BE USED IN FAST REACTOR ANALYSES. THE CODE IS DESIGNED TO -

- (A) COMPUTE AND PUNCH RESONANCE SHIELDED CROSS SECTIONS USING DATA IN THE RUSSIAN (SEE REFERENCE 2) FORMAT,
- (B) COMPUTE AND PUNCH GROUP-COLLAPSED MICROSCOPIC AND/OR MACROSCOPIC CROSS SECTIONS AVERAGED OVER THE SPECTRUM IN ANY SPECIFIED ZONE, AND

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- (C) COMPUTE KEFF AND PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION, MATERIAL CONCENTRATIONS, ZONE DIMENSIONS, AND BUCKLING USING EITHER A FLUX OR AN ADJOINT MODEL.

388 ETOX3 ETOX3 (ENDF/B TO 1DX) CALCULATES MULTIGROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS USING DATA FROM THE EVALUATED NUCLEAR DATA FILE (ENDF/B) VERSION II OR VERSION III FORMAT. IT CAN ALSO PROCESS VERSION I MATERIALS THAT DO NOT CALL FOR PARTIAL ENERGY DISTRIBUTION LAWS 1, 2, 4, 6, OR 8 (SEE ENDF/B, FILE 5). THE CODE IS DESIGNED TO COMPUTE AND PUNCH -

- (A) INFINITE DILUTE CROSS SECTIONS,
- (B) TEMPERATURE-DEPENDENT, SELF-SHIELDING FACTORS FOR ARBITRARY VALUES OF MICROSCOPIC SIGMA0 (TOTAL CROSS SECTION PER ATOM) IN THE RUSSIAN (BONDARENKO) FORMAT, AND
- (C) INELASTIC-SCATTERING PROBABILITY MATRICES.

392 RAFFLE RAFFLE CALCULATES NEUTRON FIRST FLIGHT COLLISION PROBABILITIES FOR A WIDE VARIETY OF THREE-DIMENSIONAL CELL GEOMETRY CONFIGURATIONS. THE OUTER BOUNDARIES OF THE CELL CROSS SECTION MAY BE CIRCULAR, SQUARE, OR HEXAGONAL. THE CELL MAY CONTAIN ANNULAR REGIONS AND/OR CLUSTERS OF RODS.

393 XSDRN XSDRN USES THE NORDHEIM INTEGRAL TREATMENT, NARROW RESONANCE, OR INFINITE MASS APPROXIMATION TO PROCESS RESONANCE DATA ON A MASTER CROSS SECTION LIBRARY AND THUS OBTAIN MICROSCOPIC FINE-GROUP CROSS SECTIONS FOR A LARGE NUMBER OF NUCLIDES. THE CODE WILL THEN USE THESE CROSS SECTIONS IN AN INDEPENDENT CALCULATION TO SOLVE FOR FLUXES, EIGENVALUES, CRITICAL DIMENSIONS, ETC., USING DISCRETE ORDINATES, DIFFUSION, OR AN INFINITE MEDIUM THEORY CALCULATION. THE FINE-GROUP FLUXES THUS OBTAINED CAN THEN BE USED TO COLLAPSE THE FINE-GROUP CROSS SECTION DATA TO A MORE TENABLE BROAD-GROUP STRUCTURE FOR USE IN SEVERAL INDEPENDENT COMPUTER CODES.

416 PARTI PARTI IS A GROUP COLLAPSING CODE WHICH DETERMINES THE OPTIMUM DISCRETE REPRESENTATION OF A VARIABLE FOR SUBSEQUENT REPETITIVE CALCULATIONS.

420 GROUSE GROUSE COMPUTES EFFECTIVE MULTIGROUP CROSS SECTIONS AS A FUNCTION OF POSITION IN THE CORE OF A REACTOR OR THE ABSORBER REGION OF A FUEL OR CONTROL ELEMENT. THE FLUX WEIGHTING USES SYNTHESIZED FLUXES GENERATED IN FINE ENERGY DETAIL FROM PARAMETRIC FLUX TRAVERSES SUPPLIED AS INPUT AS A FUNCTION OF THE CORE ABSORPTION AND SCATTER CROSS SECTIONS.

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426 PAX03 PAX03 PERFORMS INFINITE MEDIUM, TIME-DEPENDENT CALCULATIONS OF NEUTRON FLUX SPECTRA IN HOMOGENEOUS, HYDROGENOUS MEDIA. A HARMONY FILE CONTAINING FEW-GROUP MICROSCOPIC AND/OR MACROSCOPIC CROSS SECTIONS FOR PDQ7 PROBLEMS MAY BE GENERATED. THE ONE-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION MAY BE SOLVED USING A P1 TO P7 APPROXIMATION IN RECTANGULAR, CYLINDRICAL, OR SPHERICAL GEOMETRY. HETEROGENEOUS RESONANCE INTEGRALS AND THERMAL SHIELDING FACTORS ARE CALCULATED FOR EITHER PLATE OR ROD GEOMETRY. BLACKNESS PARAMETERS ARE CALCULATED AND COEFFICIENTS FOR TEMPERATURE FEEDBACK CALCULATIONS ARE OBTAINED. FEW-GROUP CONSTANTS ARE AVAILABLE IN BOTH THE FAST AND THERMAL ENERGY RANGES.

431 SUPERTOG SUPERTOG ACCEPTS NUCLEAR DATA IN EITHER A POINT BY POINT OR PARAMETRIC REPRESENTATION AS SPECIFIED BY ENDF/B. THIS DATA IS AVERAGED OVER EACH SPECIFIED GROUP WIDTH. THE EXPLICIT ASSUMPTION IS MADE THAT THE FLUX PER UNIT LETHARGY IS CONSTANT OR THAT A SUITABLE WEIGHT FUNCTION WILL BE SUPPLIED BY THE USER. WHEN RESONANCE DATA IS AVAILABLE, RESOLVED AND UNRESOLVED RESONANCE CONTRIBUTIONS ARE CALCULATED AND USED AS SPECIFIED BY INPUT OPTIONS. FINE GROUP CONSTANTS SUCH AS ONE-DIMENSIONAL REACTION ARRAYS (ABSORPTION, FISSION, ETC.), PN ELASTIC SCATTERING MATRICES, AND INELASTIC AND (N,2N) SCATTERING MATRICES ARE GENERATED AND PLACED ON TAPES IN FORMATS SUITABLE FOR USE BY THE GAM1 (ACC ABSTRACT 33), GAM2, ANISN, OR DOT PROGRAMS.

436 ETOM1 ETOM1 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN THE ENDF/B FORMAT AND PRODUCES DATA DECKS FOR USE IN GENERATION OF MUFT4 AND MUFT5 LIBRARIES.

437 ETOG1 TOG1 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN THE ENDF/B FORMAT AND PRODUCES DATA DECKS FOR USE IN GENERATION OF MUFT4, MUFT5, GAM1, GAM2, AND ANISN LIBRARIES.

453 RICE THE PROGRAM CALCULATES AN ENERGY EXCHANGE MATRIX WHICH DESCRIBES THE PROBABILITY THAT A NEUTRON WITH ENERGY E WILL PRODUCE A RECOIL ATOM WITH ENERGY T IN A GIVEN MATERIAL. IN ADDITION, THE PROGRAM CAN CALCULATE THE PRIMARY RECOIL ATOM ENERGY SPECTRUM FOR A GIVEN NEUTRON SPECTRUM, THE DAMAGE CROSS SECTION FOR THE MATERIAL, AND AN OPTIMUM LOWER ENERGY LIMIT FOR USE IN COMPARING THE RELATIVE DAMAGE IN DIFFERENT REACTOR SPECTRA. THE PROGRAM ACCEPTS NEUTRON SCATTERING DATA DIRECTLY FROM THE ENDF/B LIBRARY TAPES AND, IN THE CASE OF A RESONANCE NUCLIDE, FROM A TAPE GENERATED BY THE PROGRAM SUPERTOG (ACC ABSTRACT 431).

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461 EPOCH EPOCH SOLVES FOR FINE DETAIL P-1 FLUX SPECTRA IN SIMPLY BUCKLED MEDIA AND IS ABLE TO CALCULATE NEUTRON AGES FROM THE SPECTRA. IT OBTAINS NUCLEAR CROSS SECTIONS FROM THE ENDF/B LIBRARY IGNORING RESONANCE FILES AND IS MOST USEFUL FOR HIGHER ENERGIES WHERE RESONANT REACTIONS ARE WEAK OR ABSENT. THE PRESENT VERSION READS ONLY VERSION 1 ENDF/B TAPES.

466 APRFX1 APRFX1 COLLAPSES AND COMBINES CROSS SECTION SETS FOR MULTIGROUP TRANSPORT CALCULATIONS. IT PERFORMS GROUP COLLAPING FOR AS MANY ISOTOPES, MIXTURES AND LEGENDRE EXPANSION SETS AS DESIRED FROM THE DLC-2B LIBRARY. THE DLC-2B LIBRARY STRUCTURE EMPLOYS TENTH LETHARGY UNIT INTERVALS FROM 15 MEV TO 111 KEV AND QUARTER LETHARGY INTERVALS DOWN TO 0.414 EV. A 100TH GROUP 0.0 TO 0.414 EV IS USED AS A SINK GROUP. THE CODE ALSO DETERMINES THE BROAD GROUP INPUT SOURCE AND GENERATES AVERAGED NEUTRON VELOCITIES FOR USE WITH TRANSPORT CALCULATIONS.

467 HRG3 THE CODE COMPUTES THE SLOWING DOWN SPECTRUM OVER THE ENERGY RANGE 10 MEV TO .414 EV IN EITHER THE B1 OR P1 APPROXIMATION, USING 68 GROUPS OF NEUTRONS WITH A CONSTANT GROUP WIDTH OF $\Delta U = .25$. THE CALCULATED FLUX AND CURRENT SPECTRA ARE USED TO REDUCE THE ORIGINAL 68-GROUP CROSS SECTION DATA TO AVERAGE VALUES OVER AS MANY AS 33 BROAD GROUPS. OUTPUT IS PRINTED AND MAY ALSO BE PUNCHED IN FORMATS FOR INPUT TO ANY OF SEVERAL SPATIAL MULTIGROUP CODES.

501 ENDRUN2 ENDRUN2 IS USED TO CALCULATE MULTIGROUP CONSTANTS FROM ENERGY-DEPENDENT, MICROSCOPIC CROSS SECTIONS, RESONANCE PARAMETERS, AND INELASTIC LEVEL DATA INPUT IN THE EVALUATED NUCLEAR DATA FILE (ENDF/B) FORMATS. DATA IS PROCESSED FOR ONE MATERIAL AT A TIME AND THE OUTPUT MULTIGROUP FILE INCLUDES BOTH INFINITELY-DILUTE GROUP CROSS SECTIONS AND SELF-SHIELDING, BONDARENKO-TYPE F-FACTORS SO THAT THE RESULTING GENERALIZED FILE IS INDEPENDENT OF REACTOR COMPOSITION. THE MULTIGROUP DATA MAY BE OUTPUT ON PUNCHED CARDS, A STANDARD LIBRARY TAPE, OR PLOTTED OVER ANY ENERGY RANGE.

505 TDOWN TDOWN GENERATES SPATIAL AND COMPOSITION-DEPENDENT CROSS SECTION SETS FROM A BONDARENKO TYPE, GENERALIZED CROSS SECTION FILE CALLED GMUG. A TDOWN PROBLEM CAN BE A SIMPLE DESCRIPTION OF MATERIAL COMPOSITIONS WITH AN INPUT FLUX SPECTRA OR A PROBLEM CAN CONSIST OF A MULTI-REGION, TWO-DIMENSIONAL REACTOR DESCRIPTION WITH SEVERAL ZERO- OR ONE-DIMENSIONAL FLUX SOLUTIONS TO PROVIDE THE FLUX FOR SPECTRAL ADJUSTMENTS OF THE CROSS SECTION SETS.

509 ETOT2 ETOT2 PROCESSES BASIC
NUCLEAR INFORMATION GIVEN IN THE ENDF/B LIBRARY TAPE FORMATS I AND
II AND PRODUCES DATA DECKS FOR USE IN THE GENERATION OF KATE,
THERMOS (ACC ABSTRACT 184), TEMPEST (ACC ABSTRACT 50), AND LASER
(ACC ABSTRACT 249) LIBRARIES.

520 PHROG PHROG GENERATES ENERGY
DEPENDENT FAST NEUTRON SPECTRA AND ASSOCIATED MULTIGROUP CROSS
SECTION DATA SUITABLE FOR USE IN DIFFUSION AND TRANSPORT THEORY
REACTOR DESIGN ANALYSIS. THE SOLUTION UTILIZES 68 EQUAL LETHARGY
GROUPS OF CROSS SECTION, SOURCE, AND LEAKAGE DATA OVER AN ENERGY
RANGE EXTENDING FROM 10 MEV TO .414 EV. THESE DATA ARE THEN
COALESCED INTO BROAD GROUP FORM USING THE FLUXES AND CURRENTS AS
WEIGHTING FUNCTIONS.

526 CLUP77 CLUP77 COMPUTES THE COLLISION
PROBABILITIES IN A MULTI-REGION SQUARE ASSEMBLY OF CLUSTERED FUEL
RODS. THE ASSEMBLY CAN BE MADE UP OF RODS OF INFINITE HEIGHT AND
DIVIDED INTO RECTANGULAR PILLARS CONTAINING A NEST OF CONCENTRIC
ANNULI OF DIFFERENT MATERIALS. THE OUTER BOUNDARY OF THE ASSEMBLY
MAY BE TREATED AS REFLECTIVE OR A VACUUM.

536 RAHAB LATTICE PHYSICS MODULES RAHAB IS A TWO-DIMENSIONAL, MULTIGROUP, NEUTRON INTEGRAL TRANSPORT CODE. ITS CAPABILITY INCLUDES FULL OR SUBDIVIDED ANNULAR, SQUARE AND HEXAGON REGIONS, CLUSTERS AND MULTICELL (MIXED LATTICES). THE MULTIGROUP STRUCTURE CAN INCLUDE THERMAL, EPITHERMAL, AND FAST ENERGY REGIONS. THE NUMBER OF ENERGY GROUPS IS VARIABLE FROM 1 TO 100. BUCKLING AND TIME EIGENVALUE SEARCHES ARE ALLOWED OPTIONS.

538 ETOG3 ETOG3 PROCESSES BASIC NUCLEAR
INFORMATION GIVEN IN ENDF/B VERSION III FORMAT PRODUCING DATA
DECKS FOR USE IN GENERATION OF MUFI4, MUFT5, GAM1, GAM2, AND ANISN
LIBRARIES.

547 GAMB1T GAMB1T IS A PROGRAM THAT WAS
DESIGNED TO CALCULATE MULTIGROUP NEUTRON CROSS SECTIONS IN THE
HIGH ENERGY AND THE THERMAL ENERGY RANGES. IT WAS CREATED BY
JOINING GAM, WHICH DOES THE HIGH ENERGY CALCULATION, AND BIT,
WHICH DOES THE THERMAL CALCULATION.

565 INCITE INCITE GENERATES ENERGY-
DEPENDENT THERMAL NEUTRON SPECTRA AND APPROPRIATE AVERAGE MULTI-
GROUP CROSS SECTIONS USING ARBITRARY SCATTERING KERNELS. THE
PHYSICAL MODEL IS A HOMOGENEOUS, CRITICAL, ONE-DIMENSIONAL BASE
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572 XLACS XLACS CALCULATES FINE-GROUP AVERAGED NEUTRON CROSS SECTIONS FROM ENDF/B DATA. ITS PRIMARY PURPOSE IS TO PRODUCE FULL RANGE MULTIGROUP LIBRARIES FOR THE XSDRN PROGRAM (ACC ABSTRACT 493). PROVISIONS ARE INCLUDED FOR TREATING FAST, RESONANCE, AND THERMAL ENDF/B DATA. FINE-GROUP ENERGY STRUCTURES AND EXPANSION ORDERS USED TO REPRESENT DIFFERENTIAL CROSS SECTIONS FOR XSDRN CAN BE ARBITRARILY SET BY THE USER. CROSS SECTIONS CAN BE AVERAGED OVER AN ARBITRARY INPUT WEIGHTING FUNCTION OR BY ANY OF SEVERAL BUILT-IN FUNCTIONS.

596 ENDFB2/GAND2/GFE2 ENDFB2 CONVERTS ENDF/B CROSS SECTION DATA FROM A CARD-IMAGE TO A BINARY TAPE FOR USE BY THE GAND2 AND/OR GFE2 CODES.

GAND2 PREPARES THE CROSS SECTIONS NEEDED FOR DETAILED COMPUTATIONS OF NEUTRON ENERGY SPECTRA IN REACTORS FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B VERSION II OR III FORMATS (ALSO RETAINS THE ENDF/B VERSION I CAPABILITY OF GAND).

GFE2 PREPARES 1/E OR FISSION-SPECTRUM WEIGHTED, ZERO TEMPERATURE, INFINITE DILUTION GROUP-AVERAGED CROSS SECTIONS AND SCATTERING TRANSFER ARRAYS FOR USE IN THE FAST SECTIONS OF THE GGC AND MICROX CODES FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B VERSION II OR III FORMATS (THE ENDF/B VERSION I FORMAT CAPABILITY OF THE ORIGINAL GFE CODE IS ALSO RETAINED).

628 ETOT-3 ETOT-3 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN THE ENDF/B FORMAT (REFERENCE 3) AND PRODUCES DATA DECKS FOR USE IN GENERATION OF KATE, THERMOS, TEMPEST AND LASER LIBRARIES.

631 RAFFLE2/MOD2 RAFFLE IS A THREE-DIMENSIONAL GENERAL-PURPOSE MONTE CARLO PROGRAM FOR THE SOLUTION OF STATIC NEUTRON TRANSPORT PROBLEMS. EITHER FISSION SOURCE ITERATION OR EXTERNAL SOURCE PROBLEMS CAN BE SOLVED. REACTION RATES AND FLUXES OR CELL-AVERAGED P0 AND P1 TRANSFER MATRICES CAN BE OBTAINED FOR UP TO 100 INPUT ENERGY GROUPS. MULTIPLICATION FACTORS, LIFETIMES, GENERATION TIMES, AND PROBABLE ERRORS ARE ALSO COMPUTED. GROUP-WISE CURRENTS FROM ANY REGION TO ADJACENT REGIONS CAN BE COMPUTED. A ZONE GEOMETRY OPTION, DESIGNATED "MIXED" ZONE GEOMETRY, IS INCLUDED TO SIMPLIFY THE PREPARATION OF INPUT DATA FOR PROBLEMS HAVING AN ARRAY OF FUEL PINS. THIS OPTION COMBINES FEATURES OF THE RECTANGULAR, CYLINDRICAL R-Z, AND CYLINDRICAL R-THETA-Z ZONE GEOMETRIES IN A TWO-LEVEL ZONE SEARCH.

671 RECAP-0(M0481) RECAP-0 CALCULATES DETAILED DOPPLER-BROADENED NEUTRON RESONANCE CROSS SECTIONS FROM UNRESOLVED AND EITHER SINGLE LEVEL OR MULTILEVEL RESOLVED RESONANCE PARAMETERS, FOR UP TO 10 NUCLIDES, WITHIN AN ARBITRARY ENERGY STRUCTURE CONSISTING OF UP TO 49 EPITHERMAL GROUPS AND 1 THERMAL

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS,
LATTICE AND CELL PROBLEMS

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GROUP. THE HIGHEST ENERGY GROUPS ARE DIVIDED INTO AS MANY AS 500 ENERGY INTERVALS FOR RESONANCE CROSS SECTION DETAIL. THESE GROUPS ALSO ALLOW INELASTIC SCATTERING, EXPRESSED THROUGH GROUPWISE TRANSFER MATRICES, FOR THE RESONANCE NUCLIDES AND FOR AS MANY AS 5 ADDITIONAL NUCLIDES WITHOUT DETAILED RESONANCE DESCRIPTIONS. SUBSEQUENT EPITHERMAL GROUPS MAY BE SUBDIVIDED INTO 1000 INTERVALS, AND THE THERMAL GROUP MAY CONTAIN 299 INTERVALS. ELASTIC SCATTERING FOR EACH NUCLIDE IS DESCRIBED BY THE FIRST FOUR COMPONENTS OF THE DIFFERENTIAL SCATTERING CROSS SECTIONS IN THE CM SYSTEM, AND THE THERMAL GROUP WILL TREAT TWO P-3 THERMAL KERNELS THROUGH 25 X 25 TRANSFER MATRICES. ALL DATA USED FOR CONSTRUCTION OF NEUTRON JOB LIBRARIES ARE TAKEN FROM A MASTER NEUTRON CROSS SECTION LIBRARY.

C. STATIC DESIGN STUDIES

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7 FIRM FIRM SOLVES THE TWO-DIMENSIONAL SN APPROXIMATION IN FINITE CYLINDRICAL GEOMETRY. IT IS A FORTRAN ADAPTATION OF THE LOS ALAMOS TDC PROGRAM WRITTEN BY BENGT CARLSON AND CLARENCE LEE. FIRM IS LIMITED TO A MAXIMUM OF SIX GROUPS AND THE S2, S4 OR S6 APPROXIMATION.

9 FIRES5 FIRES5 SOLVES THE ONE-DIMENSIONAL MULTIGROUP AGE-DIFFUSION EQUATIONS FOR SLAB (SYMMETRIC AND ASYMMETRIC), CYLINDER, AND SPHERE GEOMETRIES. AN EXTENSION OF THE ORIGINAL LOS ALAMOS FIRE PROGRAM WRITTEN BY F. W. BRINKLEY AND C. B. MILLS, IT CONTAINS A 34-GROUP LIBRARY OF 10 ELEMENTS. FIRES5 CAN BE USED FOR CELL CALCULATIONS WITH THE BOUNDARY CONDITION THAT THE CURRENT BE ZERO ON THE OUTER BOUNDARY. THE EFFECTIVE CROSS SECTIONS AND DIFFUSION COEFFICIENTS FOR A HOMOGENISED REGION CONSISTING OF ANY NUMBER OF NEIGHBORING REGIONS CAN ALSO BE OBTAINED, BUT ONLY FOR CYLINDRICAL GEOMETRY. FIRES5 ALSO COMPUTES THE MACROSCOPIC FLUX-WEIGHTED CROSS SECTIONS FOR COLLAPSED GROUPS IN EACH REGION.

18 2DXY THE 2DXY PROGRAM SOLVES THE HOMOGENEOUS OR INHOMOGENEOUS MULTIGROUP EQUATIONS IN X-Y GEOMETRY, USING THE SN TRANSPORT EQUATION APPROXIMATION. VACUUM, SURFACE SOURCE, OR REFLECTING BOUNDARY CONDITIONS ARE AVAILABLE AS OPTIONS. IN THE HOMOGENEOUS CASE THE USER MAY REQUEST THE COMPUTATION OF REACTIVITY, REACTOR PERIOD, CRITICAL CONCENTRATIONS OF SOME COMPOSITION, OR THE CRITICAL THICKNESS OF A ZONE.

28 FOG THE FOG PROGRAM SOLVES THE ONE-DIMENSIONAL FEW-GROUP DIFFUSION EQUATIONS IN ANY OF THREE GEOMETRIES SLAB, CYLINDER, OR SPHERE. PROVISIONS ARE MADE FOR CALCULATING THE FLUX, THE ADJOINT FLUX, AND VARIOUS CRITICALITY SEARCHES AS WELL AS A BUCKLING ITERATION AND AUTOMATIC TSCHEBYSCHIEFF POLYNOMIAL COMPUTATION OF SOURCE EXTRAPOLATION FACTORS.

29 AIM6 AIM6 SOLVES THE ONE-DIMENSIONAL MULTIGROUP DIFFUSION EQUATIONS UTILIZING A MICROSCOPIC CROSS SECTION LIBRARY. ANY OF THREE GEOMETRIES ARE AVAILABLE SLAB, CYLINDER OR SPHERE. CRITICALITY SEARCHES ARE PROVIDED INCLUDING A CONCENTRATION SEARCH ON ONE OR TWO ELEMENTS. HOMOGENEOUS AND INHOMOGENEOUS PROBLEMS MAY BE SOLVED WITH A VARIETY OF BOUNDARY CONDITION OPTIONS.

30 PERT PERT IS A PERTURBATION PROGRAM DESIGNED FOR USE WITH THE AIM6 AND FOG PROGRAMS. PUNCHED CARD OUTPUT FROM THESE CODES IS USED AS INPUT TO PERT. USING CROSS SECTION DATA, FLUXES, AND ADJOINT FLUXES, THE RELATIVE

C. STATIC DESIGN STUDIES

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CHANGE IN K_{eff} CAN BE CALCULATED. CROSS SECTIONS MAY BE WEIGHTED WITH THE ADJOINT FLUX AND/OR DIRECT FLUX. THE NEUTRON LIFETIME FOR THE DELAY GROUPS MAY ALSO BE DETERMINED.

32 WHIRLAWAY WHIRLAWAY SOLVES THE TWO-GROUP, THREE-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN X-Y-Z GEOMETRY.

39 EQUIPOISE3 EQUIPOISE3 SOLVES THE TWO-GROUP, TWO-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY.

40 ZOGRAND ZOGRAND SOLVES THE FEW-GROUP, TWO-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY.

59 MIST MIST OBTAINS THE SOLUTION TO THE ONE-DIMENSIONAL BOLTZMANN EQUATION IN SLAB GEOMETRY. THE NUMERICAL APPROXIMATION USED IS A LINEAR ONE WHICH CAN BE DESCRIBED AS AN EXTENSION AND GENERALIZATION OF THE SN APPROXIMATION. THE EQUATIONS ARE FORMULATED IN TERMS OF A DOUBLE SN APPROXIMATION. THE BOUNDARY CONDITIONS FOR EACH GROUP MAY BE INDEPENDENTLY SPECIFIED AND PERMIT VERY GENERAL SPECIFICATIONS WITH RESPECT TO -

- (A) PERFECT MIRROR REFLECTION OR SYMMETRY, BY INPUT OF MIRROR ALBEDOS,
- (B) ANISOTROPIC DIFFUSE SOURCES, BY INPUT OF LEGENDRE POLYNOMIAL COEFFICIENTS UP TO $\lambda = 9$, OR A SHORT TABLE DESCRIBING A KNOWN ANGULAR DISTRIBUTION OF THE FLUX,
- (C) ISOTROPIC (LAMBERT SURFACE) REFLECTION.

ISOTROPIC VOLUME SOURCES IN EACH GROUP MAY ALSO BE INDEPENDENTLY SPECIFIED. THE SCATTERING FROM ONE GROUP TO ANOTHER IS ASSUMED TO BE ISOTROPIC BUT THE SCATTERING FUNCTION WITHIN EACH GROUP CAN BE A SECOND-ORDER LEGENDRE POLYNOMIAL SERIES.

75 GE-HAPO-S13 PROGRAM S CONSTRUCTS BILINEARLY COUPLED TIME-VARIANT MULTIENERGY NEUTRON-AND-PHOTON TRANSPORT AND NUCLIDE-TRANSMUTATION FIELDS HAVING SLAB, CYLINDRICAL, OR SPHERICAL SYMMETRY. ASSURANCE OF UNBIASED CONVERGENCE IS PROVIDED BY USE OF A DUAL ADJOINT-AND-FLUX LOOP CONSTRUCTED IN PRECISE CORRESPONDENCE WITH THE PHYSICS OF SUCCESSIVE FREE FLIGHTS.

87 EQUIPOISE-3A EQUIPOISE-3A SOLVES THE TWO-DIMENSIONAL TWO-GROUP DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY. IT IS A SLIGHTLY REVISED VERSION OF EQUIPOISE3 (ACC ABSTRACT 39). IN ADDITION TO THE STANDARD OUTPUT, A PICTURE IS

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PRINTED OF THE MATERIAL ARRANGEMENT IN THE REACTOR. IF THE ADJOINT FLUX OPTION IS USED, THE PROMPT NEUTRON LIFETIME IS CALCULATED AND PRINTED, WITH THE REACTIVITY PER UNIT CHANGE IN EACH GROUP CONSTANT IN EACH REGION OF THE REACTOR.

103 CRAM CRAM IS USED TO SOLVE THE MULTIGROUP DIFFUSION EQUATIONS IN TWO-DIMENSIONS (R-Z, X-Y, OR R-THETA GEOMETRY), OR IN ONE-DIMENSION (SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY). NEUTRONS MAY SCATTER FROM ANY GROUP TO ANY OTHER. REAL, ADJOINT, AND SOURCE-TYPE PROBLEMS ARE ALL SOLVABLE. THE PROGRAM WILL COMPUTE THE K-EFFECTIVE OF THE SYSTEM OR ALTERNATIVELY SEARCH FOR CRITICALITY BY MOVING SPATIAL BOUNDARIES, VARYING MATERIAL COMPOSITIONS, OR VARYING TRANSVERSE BUCKLING.

118 ULCER ULCER IS A MULTIGROUP, ONE-DIMENSIONAL DIFFUSION EQUATION CODE WITH UPSCATTER BASED ON FAIM (ACC ABSTRACT 120). ULCER DIFFERS FROM FAIM IN THAT -

- (A) UPSCATTERING IS INCLUDED,
- (B) DOWNSCATTER TO ALL LOWER GROUPS,
- (C) MICROSCOPIC CROSS SECTIONS ARE ON TAPE,
- (D) PROVISION FOR MULTIPLE FISSION SPECTRA,
- (E) RESTART DUMP,
- (F) FEW-GROUP REDUCTION, AND
- (G) SPECTRUM COMPUTATION AND GRAPHICAL DISPLAY.

120 FAIM/FAIMOS FAIM IS A MULTIGROUP, ONE-DIMENSIONAL DIFFUSION EQUATION PROGRAM BASED ON AIM6 (ACC ABSTRACT 29). THE PRINCIPAL FEATURES ARE -

- (A) THREE GEOMETRIES,
- (B) CALCULATION OF FLUXES AND MULTIPLICATION FACTOR,
- (C) ONE-ITERATION PROBLEMS,
- (D) CHOICE OF ONE OF FIVE SETS OF BOUNDARY CONDITIONS AT BOTH BOUNDARIES,
- (E) CRITICALITY SEARCHES ON TRANSVERSE BUCKLING, HOMOGENEOUS POISON, CRITICAL RADIUS, ONE, TWO, OR THREE ELEMENT CONCENTRATION, LOCATION OF POISON REGION BOUNDARY, LOCATION OF A FUEL REGION BOUNDARY,
- (F) ADJOINT FLUX CALCULATION, AND
- (G) EXTENSIVE DATA EDIT.

FAIMOS IS A MODIFIED VERSION OF FAIM. THREE GENERAL MODIFICATIONS WERE MADE -

- (A) THE MICROSCOPIC CROSS SECTION LIBRARY AND ITS ASSOCIATED SUBROUTINES WERE REMOVED. AS A RESULT, OPTIONS REQUIRING THE USE OF MICROSCOPIC CROSS SECTIONS ARE NOT AVAILABLE.
- (B) FAIM RAN AS A CHAIN JOB. OVERLAYS ARE NOT USED BY FAIMOS.
- (C) THE PROGRAM LANGUAGE WAS CONVERTED FROM FORTRAN II TO FORTRAN IV(H). THIS MODIFICATION MADE NECESSARY A MINOR CHANGE IN THE DATA INPUT FORMAT.

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THE ANGULAR FLUX.
INDEPENDENT SPECIFICATION OF ISOTROPIC FIXED VOLUME SOURCES FOR EACH GROUP IS ALSO ALLOWED.
AS IMPLIED, BOTH HOMOGENEOUS AND INHOMOGENEOUS PROBLEMS ARE SOLVED, AND FISSIONS CAN OCCUR IN EITHER TYPE OF PROBLEM.

151 DTF2/ANISN THE MULTIGROUP, ONE-SPACE DIMENSION NEUTRON TRANSPORT EQUATION IS SOLVED. ISOTROPIC OR LINEAR ANISOTROPIC SCATTERING IS PERMITTED BETWEEN ALL GROUPS AND A DIFFUSION SOLUTION MAY BE OBTAINED FOR ANY OR ALL GROUPS. HIGH-ORDER ANISOTROPIC SCATTERING PROBLEMS (PL) CAN BE RUN USING ANISN, THE 360 VERSION OF DTF2. WHITE/GREY BOUNDARY CONDITIONS ARE AVAILABLE, AND AN ALBEDO CAN BE SPECIFIED FOR EACH GROUP. A VOID STREAMING CORRECTION IS INCLUDED. A COMPLETE SHELL SOURCE DESCRIPTION BY GROUP, POSITION, AND ANGLE IS AVAILABLE. GRAPHICAL DISPLAY (CRT) FEATURES ARE AVAILABLE WITH ANISN.

156 EXTERMINATOR/EXTERMINATOR2 THE MULTIGROUP, TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN X-Y, R-Z, OR R-THETA GEOMETRY.

161 FORTRAN TDC TDC SOLVES THE BOLTZMANN EQUATION IN MULTIGROUP FORM FOR THE TRANSPORT OF NEUTRONS OR THE ADJOINT EQUATION IN FINITE (R,Z) CYLINDRICAL GEOMETRY BY THE DISCRETE SN METHOD. THE PROBLEM MAY BE HOMOGENEOUS (NO SOURCES INDEPENDENT OF FLUXES) OR INHOMOGENEOUS, BUT ALL SOURCES MUST BE ISOTROPIC. NEUTRON SCATTERING MUST ALSO BE ISOTROPIC. A HOMOGENEOUS PROBLEM MAY BE SOLVED FOR THE EIGENVALUE K-EFF OR THE EIGENVALUE ALPHA (TIME CONSTANT). ALTERNATIVELY, THE HOMOGENEOUS PROBLEM MAY BE SOLVED FOR THE SIZE (RADIUS, HEIGHT OR BOTH) OF THE SYSTEM CORRESPONDING TO A SPECIFIED K-EFF OR FOR THE ATOM CONCENTRATION OF SOME MATERIAL CORRESPONDING TO A SPECIFIED EIGENVALUE K-EFF OR ALPHA. FOR INHOMOGENEOUS PROBLEMS, THE IMPOSED SOURCE MAY BE AN ISOTROPIC VOLUME-DISTRIBUTED SOURCE OR AN ISOTROPIC SHELL SOURCE ON THE OUTER BOUNDARY.

167 FLARE FLARE IS AN INEXPENSIVE CALCULATIONAL METHOD TO DETERMINE CORE REACTIVITY AND CORE POWER DISTRIBUTION. A SCOPING CALCULATION OF THIS TYPE IS VALUABLE IN APPRAISING THE PHYSICS CHARACTERISTICS OF PLANNED TEST MODES OF OPERATION SO THAT DETAILED ANALYSIS CAN BE RESERVED FOR THOSE CORE CALCULATIONS OF GREATER INTEREST FROM EITHER A TECHNICIAN OR SAFETY STANDPOINT.

173 2DF 2DF IS A TWO-DIMENSIONAL MULTIGROUP PROGRAM WRITTEN IN FORTRAN FOR SOLVING THE NEUTRON TRANSPORT EQUATION USING THE SN METHOD. THE PROGRAM CAN

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DETERMINE THE REAL OR ADJOINT SOLUTION FOR X-Y, R-Z, OR R-THETA GEOMETRY. ISOTROPIC OR A FORM OF LINEAR ANISOTROPIC SCATTERING MAY BE CONSIDERED. VARIOUS BOUNDARY CONDITIONS ARE ALLOWED. THE PROGRAM ALSO CONTAINS A NUMBER OF SEARCH OPTIONS WHEREBY ONE CAN VARY DIMENSIONS OR CONCENTRATIONS TO ARRIVE AT A PREDETERMINED EIGENVALUE. A DISTRIBUTED SOURCE MAY BE SPECIFIED. A LIBRARY OF CROSS SECTIONS IS AVAILABLE ON MAGNETIC TAPE. CROSS SECTIONS MAY BE READ FROM THE LIBRARY TAPE AND/OR FROM CARDS.

192 2DXYL THE 2DXY PROGRAM (ACC ABSTRACT 18) HAS BEEN CONVERTED FROM FLOCO TO FORTRAN 63 FOR USE ON THE CDC1604 WITH CHANGES TO PERMIT THE INCLUSION OF FIXED SOURCE TERMS FROM TDC - TERMS REPRESENTING THE EFFECTIVE NET LOSS PER UNIT VOLUME DUE TO AXIAL LEAKAGE. IN THIS MANNER, A THREE-DIMENSIONAL FLUX SYNTHESIS CODE IS ACHIEVED.

199 TDP TDP IS A TWO-DIMENSIONAL LINEAR PERTURBATION THEORY CODE WHICH CALCULATES REACTIVITY COEFFICIENTS, PROMPT NEUTRON LIFETIMES, AND EFFECTIVE DELAYED FRACTIONS USING FLUXES FROM TDC CYLINDRICAL (R-Z) OR RECTANGULAR (X-Y) GEOMETRY.

209 DTF4 THE LINEAR, TIME-INDEPENDENT, BOLTZMANN EQUATION FOR PARTICLE TRANSPORT IS SOLVED FOR THE ENERGY SPACE, AND ANGULAR DEPENDENCE OF THE PARTICLE DISTRIBUTION IN ONE-DIMENSIONAL SLABS, CYLINDERS, AND SPHERES. INDEPENDENT SOURCE OR EIGENVALUE (MULTIPLICATION, TIME-ABSORPTION, ELEMENT CONCENTRATION, ZONE THICKNESS OR SYSTEM DIMENSION) PROBLEMS ARE SOLVED SUBJECT TO VACUUM, REFLECTIVE, OR PERIODIC BOUNDARY CONDITIONS. A COMPLETE ENERGY-TRANSFER SCATTERING MATRIX IS ALLOWED FOR EACH LEGENDRE COMPONENT OF THE SCATTERING CROSS SECTION MATRICES.

211 MGDSN, MANY GROUP DSN MGDSN IS A MODIFICATION OF DSN, THE ONE-DIMENSIONAL THEORY CODE DESIGNED TO ACCOMMODATE 100 GROUP ISOTROPIC MATERIAL CROSS SECTION DATA TAPES PREPARED BY CSP1 AND CSP2A.

212 VARI-QUIR THE TIME-DEPENDENT, MULTI-GROUP, TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN X-Y OR R-Z GEOMETRY.

220 GASP2 GASP2 CALCULATES THE ONE-DIMENSIONAL DISTRIBUTION OF FISSILE AND FERTILE MATERIALS IN A NUCLEAR REACTOR WHICH WILL YIELD ANY DESIRED POWER DISTRIBUTION AND APPROXIMATELY RETAIN THIS DESIRED POWER DISTRIBUTION DURING

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THE BURNUP HISTORY OF THE REACTOR CORE. A POISON AND POISON DISTRIBUTION SEARCH FOR A DESIRED MULTIPLICATION AND MINIMUM POWER DISTRIBUTION PERTURBATION CAN ALSO BE PERFORMED.

222 GAMBLE4/GAMBLE5 THE HOMOGENEOUS 2-DIMENSIONAL MULTIGROUP DIFFUSION THEORY EQUATIONS WITH ARBITRARY GROUP-TO-GROUP SCATTERING AND ARBITRARY FISSION TRANSFER ARE SOLVED FOR HETEROGENEOUS ASSEMBLIES IN X-Y AND R-Z GEOMETRY. HOMOGENEOUS LOGARITHMIC BOUNDARY CONDITIONS ARE USED AT THE OUTER SURFACE OF THE ASSEMBLY AND AT THE SURFACE OF NON-DIFFUSION REGIONS. THE RESULTS INCLUDE THE GROUP AND POINT DEPENDENT NEUTRON FLUXES, THE POWER DISTRIBUTION, THE NEUTRON MULTIPLICATION FACTOR (K-EFFECTIVE), AND A DETAILED NEUTRON BALANCE.

225 TEMCO TEMCO COMPUTES REACTOR TEMPERATURE COEFFICIENTS.

241 HFN HFN SOLVES THE HOMOGENEOUS OR INHOMOGENEOUS ONE-DIMENSIONAL MULTIGROUP DIFFUSION EQUATION FOR IT LOWEST EIGENVALUE AND THE CORRESPONDING DIRECT AND/OR ADJOINT EIGENVECTORS. INHOMOGENEOUS BOUNDARY CONDITIONS AND A FLEXIBLE SCATTER-TRANSFER MATRIX STRUCTURE ARE INCLUDED. OPTIONAL CALCULATIONS INCLUDE CRITICALITY SEARCHES, DETECTOR ACTIVATION TRAVERSES, AND INTEGRALS FOR PERTURBATION THEORY ANALYSIS.

262 MACH1 MACH1 PERFORMS ONE-DIMENSIONAL MULTIGROUP DIFFUSION SOLUTIONS AND ASSOCIATED CALCULATIONS, INCLUDING CRITICALITY SEARCHES, PERTURBATION, REACTION SUMMARY, BETA EFFECTIVE, GROUP COLLAPSING, AND POINTWISE REACTION RATES AND RATIOS. SEVERAL CARD DUMPS OF COMPUTED DATA ARE AVAILABLE ON OPTION. A SPECTRAL SYNTHESIS OPTION IS AVAILABLE IN THE IBM VERSION.

264 VARI-QUIR3 THE STEADY-STATE, MULTIGROUP, TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN X-Y, R-Z, AND R-THETA GEOMETRY.

270 CAESAR4/LIBLST CAESAR4 SOLVES THE ONE-DIMENSIONAL, MULTIGROUP DIFFUSION EQUATIONS IN ANY OF THREE GEOMETRIES AND PROVIDES A WIDE CHOICE OF BOUNDARY CONDITIONS, CRITICALITY SEARCHES, EDITS AND OTHER AUXILIARY COMPUTATIONS.

287 BISYN BISYN SOLVES THE TWO-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION EQUATIONS IN X-Y OR R-Z GEOMETRY USING A NONITERATIVE SYNTHESIS METHOD. THIS APPROACH IS DE-

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SIGNED TO GREATLY REDUCE THE COMPUTER COST OF RUNNING TWO-DIMENSIONAL MULTIGROUP PROBLEMS AT THE RISK OF SOME LOSS IN ACCURACY OF THE DETAILED FLUX DISTRIBUTION.

288 SNARG-1D THE PROGRAM IS DESIGNED TO SOLVE THE ONE-DIMENSIONAL NEUTRON TRANSPORT EQUATIONS. SNARG-1D IS WRITTEN FOR THE SOLUTION OF ONE-DIMENSIONAL PROBLEMS USING THE ORDER $N = 2, 4, 6, 8, 12, 16, \text{OR } 32$, AND APPLICABLE TO PLANE, CYLINDRICAL AND SPHERICAL GEOMETRIES. THE REAL OR ADJOINT SOLUTION MAY BE CALCULATED AND HOMOGENEOUS OR INHOMOGENEOUS PROBLEMS MAY BE SOLVED. FOUR CRITICALITY SEARCH OPTIONS ARE PROVIDED FOR WHICH A FIXED K_{EFF} OR ALPHA, INVERSE PERIOD, VALUE MAY BE SPECIFIED RATHER THAN THE CRITICALITY VALUE, $K_{\text{EFF}} = 1$. EITHER OF TWO INHOMOGENEOUS SOLUTIONS MAY BE OBTAINED (SHELL OR DISTRIBUTED SOURCE CALCULATIONS). LINEAR ANISOTROPIC COMPONENTS OF BOTH THE SHELL SOURCE AND THE SCATTERING CROSS SECTIONS MAY BE INCLUDED. FISSION SPECTRUM MATRICES ARE ALLOWED AS BOTH MATERIAL-DEPENDENT AND INCIDENT NEUTRON ENERGY-DEPENDENT FUNCTIONS.

304 PERT4 PERT4 COMPUTES REACTIVITY COEFFICIENT TRAVERSES IN X-Y, R-Z, OR R-THETA GEOMETRY USING THE FIRST-ORDER PERTURBATION EQUATIONS IN THE DIFFUSION APPROXIMATION. FLUX AND ADJOINT INPUT CAN BE TAKEN DIRECTLY FROM 2-D CALCULATIONS OR SYNTHESIZED FROM RADIAL AND AXIAL 1-D CALCULATIONS. THE CODE CAN ALSO BE USED TO COMPUTE ACTIVITY TRAVERSES FOR ANY CROSS SECTION OF ANY MATERIAL, THE NEUTRON GENERATION TIME, AND THE EFFECTIVE DELAYED NEUTRON FRACTION.

312 TDSN THE LINEAR, TIME-INDEPENDENT, BOLTZMANN EQUATION IS SOLVED FOR THE ENERGY, SPACE, AND ANGULAR DEPENDENCE OF THE NEUTRON DISTRIBUTION IN ONE-DIMENSIONAL SLABS, CYLINDERS OR SPHERES OR IN TWO-DIMENSIONAL X-Y OR R-Z GEOMETRY. FIXED SOURCE OR MULTIPLICATION FACTOR (ADJOINT OR FLUX) PROBLEMS ARE SOLVED SUBJECT TO VACUUM, PLANE REFLECTIVE, ISOTROPIC REFLECTIVE OR 180 DEGREE ROTATIONALLY SYMMETRIC BOUNDARY CONDITIONS. A COMPLETE ENERGY TRANSFER SCATTERING MATRIX IS ALLOWED FOR EACH LEGENDRE COMPONENT OF SCATTERING CROSS SECTION MATRICES THROUGH P1.

319 GASP7 GASP7 CALCULATES THE ONE DIMENSIONAL DISTRIBUTION OF FISSIONABLE AND FERTILE MATERIALS IN A NUCLEAR REACTOR WHICH WILL YIELD ANY DESIRED POWER DISTRIBUTION DURING THE BURNUP HISTORY OF THE REACTOR CORE. A POISON AND POISON DISTRIBUTION SEARCH FOR A DESIRED MULTIPLICATION AND MINIMUM POWER DISTRIBUTION PERTURBATION CAN ALSO BE PERFORMED.

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320 TEMCO7
PERATURE COEFFICIENTS.

TEMCO7 COMPUTES REACTOR TEM-

342 M0648
SIONAL SLAB TRANSPORT PROBLEM WITH SLOWING DOWN FOR AN ARBITRARY
SPATIAL EXTERNAL SOURCE AND ARBITRARY SCATTERING.

M0648 SOLVES THE ONE-DIMEN-

358 TWOTRAN2
DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN (X,Y), (R,THETA), AND
(R,Z) GEOMETRIES. BOTH REGULAR AND ADJOINT, INHOMOGENEOUS AND
HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO
VACUUM, REFLECTIVE, PERIODIC, WHITE OR INPUT-SPECIFIED BOUNDARY
FLUX CONDITIONS ARE SOLVED. GENERAL ANISOTROPIC SCATTERING IS
ALLOWED AND ANISOTROPIC INHOMOGENEOUS SOURCES ARE PERMITTED.

TWOTRAN2 SOLVES THE TWO-

380 GATT
FEW-GROUP NEUTRON DIFFUSION THEORY PROGRAM FOR CALCULATING THE
DETAILED SPATIAL FLUX AND POWER DISTRIBUTION FOR REACTORS WITH
HEXAGONAL CORE CONFIGURATION. THE PROGRAM USES A UNIFORM TRI-
ANGULAR MESH IN THE HORIZONTAL MESH PLANES AND ASSUMES A RELA-
TIVELY SIMPLE REGION STRUCTURE IN THE AXIAL DIRECTION. IT WAS
DESIGNED TO REPRESENT THE SPECIAL PATCH-TYPE CORE STRUCTURE OF THE
HTGR REACTOR AS CLOSELY AS POSSIBLE.

GATT IS A THREE-DIMENSIONAL

398 BE21
DISCRETE ORDINATES EQUATIONS IN SLAB GEOMETRY. EITHER HOMOGENEOUS
OR INHOMOGENEOUS PROBLEMS CAN BE SOLVED.

BE21 SOLVES THE FEW-GROUP

401 GAMTRI
SIONAL MULTIGROUP DIFFUSION THEORY EQUATIONS WITH ARBITRARY GROUP-
TO-GROUP SCATTERING AND ARBITRARY FISSION TRANSFER ARE SOLVED FOR
HETEROGENEOUS ASSEMBLIES IN (UNIFORM MESH) TRIANGULAR GEOMETRY.
HOMOGENEOUS LOGARITHMIC BOUNDARY CONDITIONS ARE USED AT THE OUTER
SURFACE OF NON-DIFFUSION REGIONS. THE RESULTS INCLUDE THE GROUP
AND POINT-DEPENDENT NEUTRON FLUXES, THE POWER DISTRIBUTION, THE
NEUTRON MULTIPLICATION FACTOR, AND A DETAILED NEUTRON BALANCE.

THE HOMOGENEOUS TWO-DIMEN-

430 GAZE2
MULTIGROUP, NEUTRON DIFFUSION THEORY PROGRAM. IT INCLUDES ALL
FOUR OF THE STANDARD ONE-DIMENSIONAL GEOMETRIES - SLAB, SPHERE,
RADIAL CYLINDER, AND AXIAL CYLINDER, THE LAST OF WHICH IS IDENTI-
CAL TO SLAB GEOMETRY EXCEPT WHEN THE ZOOM ALBEDO-TYPE TRANSVERSE
BOUNDARY CONDITION IS USED.

GAZE2 IS A ONE-DIMENSIONAL,

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450 KENO2/KENO4 KENO IS A MULTIGROUP, MONTE CARLO CRITICALITY CODE CONTAINING A SPECIAL GEOMETRY PACKAGE WHICH ALLOWS EASY DESCRIPTION OF SYSTEMS COMPOSED OF CYLINDERS, SPHERES, AND CUBOIDS (RECTANGULAR PARALLELEPIPEDS) ARRANGED IN ANY ORDER WITH ONLY ONE RESTRICTION. EACH GEOMETRICAL REGION MUST BE DESCRIBED AS COMPLETELY ENCLOSING ALL REGIONS INTERIOR TO IT. FOR SYSTEMS NOT DESCRIBABLE USING THIS SPECIAL GEOMETRY PACKAGE, THE PROGRAM CAN USE THE GENERALIZED GEOMETRY PACKAGE (GEOM) DEVELOPED FOR THE OSR MONTE CARLO CODE. IT ALLOWS ANY SYSTEM THAT CAN BE DESCRIBED BY A COLLECTION OF PLANES AND/OR QUADRATIC SURFACES, ARBITRARILY ORIENTED AND INTERSECTING IN ARBITRARY FASHION. RECTANGULAR ARRAYS OF FISSION UNITS ARE ALLOWED WITH OR WITHOUT EXTERNAL REFLECTOR REGIONS. OUTPUT FROM KENO CONSISTS OF KEFF FOR THE SYSTEM PLUS AN ESTIMATE OF ITS STANDARD DEVIATION AND THE LEAKAGE, ABSORPTION, AND FISSIONS FOR EACH ENERGY GROUP PLUS THE TOTALS FOR ALL GROUPS. FLUX AS A FUNCTION OF ENERGY GROUP AND REGION AND FISSION DENSITIES AS A FUNCTION OF REGION ARE OPTIONAL OUTPUT.

459 DOT2DB DOT2DB SOLVES BOTH THE MULTI-GROUP DISCRETE ORDINATES TRANSPORT THEORY AND THE MULTIGROUP DIFFUSION THEORY EQUATIONS IN TWO DIMENSIONS. ANISOTROPIC SCATTERING OF ANY ORDER LEGENDRE EXPANSION IS ALLOWED IN THE TRANSPORT THEORY OPTION. ANISOTROPIC SCATTERING IN THE DIFFUSION THEORY OPTION IS TREATED WITH THE TRANSPORT APPROXIMATION, USING THE P1 SCATTERING MATRIX, WHEN PROVIDED, TO CALCULATE THE TRANSPORT CROSS SECTION. OPTIONS INCLUDE SOLUTIONS IN (X,Y), (R,Z), (R,THETA), AND, IN THE DIFFUSION THEORY OPTION, TRIANGULAR GEOMETRIES. BOTH DIRECT AND ADJOINT FLUXES MAY BE COMPUTED FOR FIXED VOLUME-DISTRIBUTED SOURCE, MULTIPLICATION CONSTANT ITERATION, TIME ABSORPTION ITERATION, CONCENTRATION SEARCH, ZONE THICKNESS SEARCH, AND FIXED BOUNDARY SOURCE PROBLEMS. IN ADDITION TO THE FIXED BOUNDARY SOURCE PROBLEM, OPTIONS INCLUDE VACUUM, REFLECTION, PERIODIC AND WHITE BOUNDARY CONDITIONS. CROSS SECTIONS MAY BE ENTERED FROM CARDS OR FROM TAPE IN THE DTF FORMAT. ACTIVITIES FOR ANY MATERIAL IN THE SYSTEM MAY BE OUTPUT BY INTERVAL (OPTIONAL) AND ZONE. OTHER OUTPUT INCLUDES THE INTERVAL FLUXES AND SOURCES AND A REACTION SUMMARY TABLE FOR EACH ZONE AND FOR THE SYSTEM.

510 VIM1/VIMX VIM1 IS A MONTE CARLO CODE DESIGNED FOR THE ANALYSIS OF FAST CRITICAL EXPERIMENTS. IT HAS BEEN EXPRESSLY PREPARED FOR THE ANALYSIS OF FAST CRITICAL ASSEMBLIES OF THE PLATE-DRAWER TYPE SUCH AS ZPPR, ZPR-3, AND ZEBRA. THE LIBRARY USES POINT CROSS SECTION DATA, RATHER THAN MULTIGROUP CONSTANTS.

513 TESS TESS SOLVES THE TRANSPORT EQUATION IN SLAB AND SPHERICAL GEOMETRY USING THE DOUBLE-SN APPROXIMATION FOR SLAB GEOMETRY.

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523 ESP ESP IS A GENERAL-PURPOSE MONTE CARLO REACTOR ANALYSIS CODE. IT COVERS THE COMPLETE ENERGY RANGE OF INTEREST IN REACTOR CALCULATIONS AND IS DESIGNED FOR BOTH EIGENVALUE AND FIXED SOURCE REACTOR AND REACTOR CELL CALCULATIONS. BASIC DATA ARE ACCEPTED ONLY IN THE VERSION I, II, AND III ENDF/B FORMAT. IN ADDITION TO SMOOTH DATA, THE CROSS SECTION PREPARATION INCLUDES A DETAILED TREATMENT OF RESOLVED AND UNRESOLVED RESONANCES AND THE FREE GAS AND S(ALPHA,BETA) THERMAL MODELS. THE COLLISION AND SOURCE ROUTINES UTILIZE THE ENDF/B NONELASTIC SECONDARY DISTRIBUTIONS, THE ANISOTROPIC SCATTERING DATA, AND THE FISSION SPECTRA. THE ENERGY RANGE MAY BE DIVIDED INTO AS MANY AS 25,000 INTERVALS, AND OVER EACH INTERVAL THE APPROPRIATELY AVERAGED CROSS SECTIONS ARE USED AS CONSTANT POINT-ENERGY VALUES. A GENERAL THREE-DIMENSIONAL GEOMETRY DESCRIPTION IS AVAILABLE, AS WELL AS SEVERAL SPECIALIZED GEOMETRIES. USE OF FIXED-SOURCE OPTIONS ALLOWS CALCULATIONS ON NON-MULTIPLYING SYSTEMS. A STEADY-STATE ANALYSIS OF NEUTRON HISTORIES IS PERFORMED IN COMPUTER CORE FOR SUCH QUANTITIES AS NEUTRON FLUXES, REACTION RATES, AND CROSS SECTIONS, AVERAGED OVER ARBITRARY ENERGY AND SPATIAL REGIONS.

573 TWOTRAN-PNVW TWOTRAN-PNVW SOLVES TWO-DIMENSIONAL PARTICLE TRANSPORT PROBLEMS FOR X-Y, R-Z, AND R-THETA GEOMETRIES. BOTH DIRECT AND ADJOINT, HOMOGENEOUS (KEFF OR PARAMETRIC EIGENVALUE SEARCHES) OR INHOMOGENEOUS TIME-INDEPENDENT PROBLEMS ARE SOLVED SUBJECT TO VACUUM, REFLECTIVE, PERIODIC OR INPUT SPECIFICATION OF BOUNDARY FLUX CONDITIONS. BOTH ANISOTROPIC INHOMOGENEOUS PROBLEMS AND GENERAL ANISOTROPIC SCATTERING PROBLEMS ARE TREATED.

582 MONA MONA SOLVES THE MULTIGROUP, ONE-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS IN SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY FOR EITHER THE DIRECT OR ADJOINT FLUX. BOUNDARY SOURCES AND SPATIALLY DEPENDENT VOLUME SOURCES CAN BE GROUP DEPENDENT. MULTIPLE THERMAL GROUPS ARE ALLOWED.

585 TRIAL TRIAL CARRIES OUT A SIMPLE LINKING OF SEVERAL TWO-DIMENSIONAL, MULTIGROUP NEUTRON (DIRECT OR ADJOINT) FLUX SETS TO GIVE A THREE-DIMENSIONAL REPRESENTATION.

606 GAPERID REACTIVITY COEFFICIENTS ARE COMPUTED USING FIRST-ORDER TRANSPORT PERTURBATION THEORY FOR ONE-DIMENSIONAL MULTI-REGION REACTOR ASSEMBLIES. THE NUMBER OF SPATIAL MESH POINTS AND ENERGY GROUPS IS ARBITRARY. AN ELEMENTARY SYNTHESIS SCHEME IS EMPLOYED FOR TREATMENT OF TWO- AND THREE-DIMENSIONAL PROBLEMS. THE CONTRIBUTIONS TO THE CHANGE IN INVERSE MULTIPLICATION FACTOR, $\Delta(1/K)$, FROM PERTURBATIONS IN THE INDIVIDUAL CAPTURE, NET FISSION, TOTAL SCATTERING, $(N,2N)$, INELASTIC SCATTERING, AND LEAKAGE CROSS SECTIONS ARE COMPUTED. A MULTI-DIMENSIONAL PROMPT NEUTRON LIFETIME CALCULATION IS ALSO AVAILABLE.

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617 KEFF,MGBS,TGAN

THREE CODES FOR NUCLEAR CRITICALITY SAFETY EVALUATIONS MAKE UP THIS PACKAGE. THE PRINCIPAL CODES ARE A CODE FOR COMPUTING THE BUCKLING OF FISSILE MATERIAL MODERATED BY WATER (MGBS) AND A TWO-GROUP DIFFUSION THEORY CODE THAT USES PARAMETERS GENERATED BY THE BUCKLING CODE (TGAN). KEFF IS AN AUXILIARY CODE. KEFF COMPUTES KEFF FROM DIMENSIONS AND EXTRAPOLATION DISTANCES, OR ALTERNATIVE DIMENSIONS, VOLUMES, AND MASSES CORRESPONDING TO VALUES OF KEFF.

626 ARC-DIF1D THE ARC 1D-DIFFUSION CAPA-
BILITY PROVIDES COMPLETE ONE-DIMENSIONAL SOLUTIONS OF THE MULTI-
GROUP DIFFUSION EQUATIONS WITH EDITS AND A NEUTRON INVENTORY ON
OPTION.

686 VENTURE VENTURE SOLVES THE USUAL NEUTRONICS EIGENVALUE, ADJOINT, FIXED SOURCE, AND CRITICALITY SEARCH (DIRECT AND INDIRECT) PROBLEMS, TREATING UP TO THREE GEOMETRIC DIMENSIONS, MAPS POWER DENSITY AND DOES FIRST-ORDER PERTURBATION ANALYSIS AT THE MACROSCOPIC CROSS SECTION LEVEL.

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713 SYN3D SYN3D SOLVES THE DIRECT AND
ADJOINT, DIFFUSION THEORY, STATIC EIGENVALUE EQUATIONS IN TWO AND
THREE DIMENSIONS. THE GEOMETRIES AVAILABLE ARE X-Y, R-Z, X-Y-Z
AND TRIANGULAR-Z.

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55 AIMFIRE THIS PROGRAM WAS DESIGNED TO COMPARE THE COSTS OF VARIOUS FUEL CYCLES. THE PROGRAM CONTAINS A LIBRARY OF FAST AND THERMAL MICROSCOPIC CROSS SECTIONS, DECAY CONSTANTS, AND FISSION YIELDS FOR 50 ISOTOPES. THE PRESENT VERSION IS USED TO INVESTIGATE THE ECONOMICS OF URANIUM FUEL SYSTEMS.

58 SIZZLE SIZZLE SOLVES THE ONE-DIMENSIONAL, OR MULTIGROUP BURNUP PROBLEM IN THE DIFFUSION THEORY APPROXIMATION FOR FAST INTERMEDIATE REACTORS. AFTER THE INITIAL CALCULATION AT $T=0$, AVERAGE CROSS SECTIONS ARE COMPUTED FOR FURTHER CALCULATIONS USING ONE TO SIX ENERGY GROUPS. CRITICALITY MAY BE MAINTAINED BY USE OF A CONCENTRATION SEARCH. THE CONCENTRATION OF THE VARIOUS ISOTOPES IS PERMITTED TO VARY ONLY FROM REGION-TO-REGION. CHAINS INCLUDED ARE TH232, U238, AND A FISSION PRODUCT POISON CHAIN.

99 DUO DIMENSIONAL BURNOUT (DDB) THE FIVE-GROUP, TWO-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN CYLINDRICAL GEOMETRY ARE SOLVED WITH BURNOUT OPTIONS AND CONTROL ROD SEARCH OPTIONS.

117 FEVER FEVER PERFORMS ONE-DIMENSIONAL FEW-GROUP DEPLETION CALCULATIONS. OPTIONS ARE AVAILABLE TO ADJUST CONTROL POISONS IN VARIOUS REGIONS OF THE REACTOR, SELF-SHIELDING OF LUMPED POISONS, AND TO CALCULATE HOT MAXIMUM AND COLD SHUT-DOWN MULTIPLICATION.

134 NUCY THE CALCULATION OF NUCLIDE CONCENTRATIONS AT A POINT IN A REACTOR AT SUCCESSIVE TIME INTERVALS, WITH EXPOSURE TO A TWO-GROUP NEUTRON FLUX. INFINITE SYSTEM CRITICALITY IS CALCULATED.

146 NPRFCCP NUCLEAR FUEL CYCLE COSTS IN DOLLARS PER YEAR (\$/YR), AND IN MILLS PER KILOWATT-HOUR (MILLS/KWHR) ARE COMPUTED AND TABULATED FOR EACH REGION OF A MULTIREGION REACTOR CORE, ON THE BASIS OF AEC-LEASED NUCLEAR FUEL MATERIAL AND OF PRIVATELY-OWNED NUCLEAR FUEL MATERIAL. FUEL CYCLE COSTS ARE COMPUTED SEPARATELY FOR EACH REGION OR ZONE, FOR CORE DESIGNS OF ANY CONFIGURATION OR COMBINATION OF MATERIAL DEPLETION OR ENRICHED URANIUM FUEL OR OTHER SPECIAL NUCLEAR MATERIAL. PRINTED OUTPUT OF THE PROGRAM INCLUDES (A) DETAILED FUEL CYCLE COSTS FOR EACH ZONE IN TABULAR FORM, FOR AEC-LEASED AND PRIVATELY-OWNED NUCLEAR FUEL MATERIAL, RESPECTIVELY, (B) A SUMMARY TABULATION OF NUCLEAR FUEL COSTS FOR ALL REGIONS OF THE COMPLETE CORE, INCLUDING FIXED CHARGES ON WORKING CAPITAL REQUIRED FOR CORE FABRICATION AND FOR NUCLEAR FUEL MATERIAL, (C) A SUMMARY TABULATION OF CERTAIN COMPUTED PERFORMANCE AND ECONOMIC DATA, VIZ., AVERAGE RESIDENCE

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TIME, ANNUAL FUEL THROUGHPUT, UNIT ELECTRICAL ENERGY YIELD, ANNUAL POWER GENERATION, AND CORE FABRICATION COSTS, AND (D) A TABULATION OF ALL INPUT DATA FOR ALL REGIONS. THE PRINTING OF DATA DESCRIBED IN (A) AND (D) ABOVE IS OPTIONAL WITH PROGRAM USE.

179 ISOTOPES THIS PROGRAM CAN BE USED TO CALCULATE FOR ANY NEUTRON FLUX THE OPTIMUM TIME OF IRRADIATION FOR MAXIMUM YIELD, THE SPECIFIC ACTIVITY OF THE PRODUCT ISOTOPE IN CURIES PER GRAM OF TARGET MATERIAL, AND THE COMBINED SPECIFIC ACTIVITY OF THE TARGET AND PRODUCT ISOTOPES. THE PRODUCT ISOTOPE MAY BE PRODUCED BY ANY SIMPLE REACTION SUCH AS (N,GAMMA), (N,P), (N,2N), ETC., OR IT MAY BE PRODUCED BY DECAY OF A PARENT ISOTOPE.

180 ISOCRUNCH ISOCRUNCH CAN BE USED TO COMPUTE THE AMOUNT OF EACH ISOTOPE IN A REACTION AND DECAY CHAIN FOR ANY SPECIFIED NEUTRON FLUX AND TIME, TO SUM THE CONTRIBUTIONS OF VARIOUS CHAINS TO THE SAME ISOTOPE, TO GRAPH ON AN ASSOCIATED ELECTROPLOTTER OR CALCOMP THE YIELD OF AN ISOTOPE VS. TIME FOR A GIVEN FLUX, AND TO FIND THE OPTIMUM TIME FOR MAXIMUM YIELD OF AN ISOTOPE IN A CHAIN. THE PROGRAM DOES NOT TAKE INTO ACCOUNT THE SELF-SHIELDING OF A TARGET IN A REACTOR OR THE DEPENDENCE OF REACTION CROSS SECTIONS ON NEUTRON ENERGY WHICH CAN BE HANDLED BY ADJUSTING THE INPUT DATA.

221 RELOAD FEVER A FEW-GROUP, 1-D DEPLETION CALCULATION WHICH ALLOWS FUEL IN VARIOUS STAGES OF IRRADIATION TO BE HOMOGENIZED INTO THE SAME REGION FOR PURPOSES OF THE DIFFUSION CALCULATION BUT FOLLOWS THE DEPLETION OF EACH OF THE SUB-REGIONS SEPARATELY. THE CALCULATION MAY BE INTERRUPTED PERIODICALLY FOR REFUELING ONE OR MORE REGIONS. RECYCLING IS OPTIONAL AND THERE IS NO LIMIT TO THE NUMBER OF REFUELINGS WHICH MAY BE PERFORMED. A CONTROL POISON SEARCH IS AVAILABLE AND CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ONE LUMPED POISON.

223 REVISED GAD THIS INFINITE-MEDIUM DEPLETION PROGRAM PERFORMS FUEL CYCLE CALCULATIONS ON REACTORS EMPLOYING PARTIAL REFUELING. THE BURN-UP OF UP TO 12 DISCRETE FUEL COMPOSITIONS (REGIONS OR STAGES OF IRRADIATION) MAY BE FOLLOWED SIMULTANEOUSLY. THE BURN-UP CALCULATION MAY BE INTERRUPTED PERIODICALLY TO REMOVE THE CONTENTS AND TO REFUEL ONE OR MORE REGIONS. FUEL MAY BE PARTIALLY OR COMPLETELY RECYCLED.

224 WAMPUM THIS PROGRAM CALCULATES FUEL CYCLE COSTS ON A DETAILED BASIS, USING RESULTS OF NUCLEAR DEPLETION CALCULATIONS AND CERTAIN SPECIFIED ECONOMICS ASSUMPTIONS. THE PURPOSE IS TO PROVIDE A MEASURE OF PERFORMANCE FOR COMPARING OR OPTIMIZING FUEL CYCLES AND ASSOCIATED REACTOR CORE AND FUEL ELEMENT CHARACTERISTICS.

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226 OPUS THE CODE GENERATES A FLOW NETWORK EQUIVALENT TO A GAS-COOLED NUCLEAR POWER PLANT OF SPECIFIED ELECTRICAL OUTPUT (IN THE RANGE OF 100 TO 1000 MW) ACCORDING TO INPUT DATA AND PROGRAMMED RULES, PROCEEDS TO EVALUATE THE PLANT PERFORMANCE AND PRICE OF THE TURBOGENERATOR SET (ACCORDING TO GENERAL ELECTRIC PRICE DATA), AND PRINTS AS A RESULT A CODED LIST OF ALL PLANT COMPONENTS AND A DETAILED PERFORMANCE MAP.

227 STMGEN STMGEN CAN BE USED IN A PLANT OPTIMIZATION PROGRAM. THIS CODE DETERMINES THE AREA OF EACH SECTION OF A STEAM GENERATOR REQUIRED TO SATISFY THE DESIGN CONDITIONS OF HEAT TRANSFER, PRESSURE DROP AND MAXIMUM TUBE TEMPERATURE CONSTRAINTS. THE COST OF THE GENERATOR IS COMPUTED AS A FUNCTION OF THE TOTAL HEAT TRANSFER AREA, THE NON-PRODUCTIVE TUBE LENGTH REQUIRED TO CONNECT THE HEADERS, PLUS THE COST OF THE HEADERS.

231 RAD2 THIS PROGRAM CALCULATES THE FISSION PRODUCT ACTIVITY DISTRIBUTIONS IN A HIGH TEMPERATURE GAS-COOLED REACTOR SYSTEM.

240 ASSAULT. MULTIGROUP, TWO-DIMENSIONAL REACTOR DEPLETION. GIVEN NUCLIDE CONCENTRATIONS AND MICROSCOPIC CROSS SECTIONS, THE STEADY-STATE MULTIREGION, MULTIGROUP DIFFUSION EQUATIONS ARE SOLVED IN ONE OR TWO DIMENSIONS OVER A FINITE-DIFFERENCE SYSTEM OF MESH POINTS. THE CALCULATED NEUTRON FLUXES ARE THEN USED TO DETERMINE NUCLIDE CONCENTRATIONS AFTER A SPECIFIED PERIOD OF EXPOSURE. THESE CALCULATIONS ARE REPEATED FOR A SPECIFIED NUMBER OF TIME-STEPS.

260 GARGOYLE GARGOYLE IS AN INFINITE-MEDIUM DEPLETION CODE FOR FUEL CYCLE CALCULATIONS ON REACTORS EMPLOYING PARTIAL REFUELING. THE BURNUP OF UP TO 12 DISCRETE FUEL COMPOSITIONS (REGIONS OR STAGES OF IRRADIATION) MAY BE FOLLOWED SIMULTANEOUSLY. THE BURNUP CALCULATION MAY BE INTERRUPTED PERIODICALLY TO REMOVE THE CONTENTS OF AND TO REFUEL ONE OR MORE REGIONS. FUEL MAY BE COMPLETELY OR PARTIALLY RECYCLED. A CONTROL POISON SEARCH MAY BE PERFORMED AT EACH TIME-STEP. FEED FUEL SEARCHES ARE PERMITTED AT THE END OF EACH BURNUP CYCLE BEFORE REFUELING. CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ANY NUCLIDE EXCEPT MODERATORS. THE NUCLIDE SCHEME EMPLOYED, ALTHOUGH NOT COMPLETELY GENERAL, IS FLEXIBLE.

269 DTF-BURN DTF-BURN IS A ONE-DIMENSIONAL, MULTIGROUP BURNUP CODE BASED ON TRANSPORT THEORY. A DIFFERENT TYPE OF EIGENVALUE CALCULATION (MULTIPLICATION, PERIOD,

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NUCLIDE CONCENTRATION, ZONE THICKNESS, OR SYSTEM DIMENSION) CAN BE PERFORMED AT THE BEGINNING OF EACH OF A SPECIFIED SET OF TIME-STEPS. THIS FEATURE PERMITS THE SIMULATION, IN A SINGLE PROBLEM RUN, OF A SYSTEM IN WHICH VARIOUS CONTROL METHODS ARE USED AS A FUNCTION OF TIME. THE CONCENTRATION OF THE VARIOUS NUCLIDES IS PERMITTED TO VARY FROM REGION-TO-REGION OR POINT-BY-POINT. NUCLIDES CONSIDERED ARE U235, U236, U238, NP239, PU239, PU240, PU241, PU242, AND FP, A PSEUDO FISSION PRODUCT PAIR.

275 PDQ7 PDQ7 SOLVES FEW-GROUP NEUTRON DIFFUSION-DEPLETION PROBLEMS IN ONE, TWO, AND THREE DIMENSIONS. ADJOINT SOLUTIONS ARE ALSO AVAILABLE AND TWO OVERLAPPING THERMAL GROUPS MAY BE USED IN ONE AND TWO-DIMENSIONAL PROBLEMS. EITHER POINTWISE OR REGIONWISE DEPLETION MAY BE PERFORMED USING THE HARMONY DEPLETION SYSTEM. THE GEOMETRY MAY BE RECTANGULAR, CYLINDRICAL, OR SPHERICAL IN ONE DIMENSION; RECTANGULAR, CYLINDRICAL, OR HEXAGONAL IN TWO DIMENSIONS; AND RECTANGULAR OR HEXAGONAL IN THREE DIMENSIONS. ALL GEOMETRIES PROVIDE FOR VARIABLE MESH SPACING IN ALL DIMENSIONS. ZERO FLUX, ZERO CURRENT, AND ROTATIONAL SYMMETRY BOUNDARY CONDITIONS ARE AVAILABLE, AND BOUNDARY VALUE PROBLEMS MAY BE SOLVED BY SPECIFYING THE FLUX VALUES ON ONE OR MORE BOUNDARIES. THE BETTIS REVISED PDQ7 EDITION MAY BE USED TO SOLVE ADDITIVE FAST-SOURCE AND SIMPLIFIED PL PROBLEMS AS WELL AS THE THREE-DIMENSIONAL SYNTHESIS EIGENVALUE PROBLEM. CONTROL SEARCHES, THERMAL FEEDBACK, AND XENON FEEDBACK ARE OPTIONAL.

301 FREVP6 THE FREVP TYPE OF CODE FOR ESTIMATING THE RELEASE OF LONGER-LIVED METALLIC FISSION PRODUCTS FROM HTGR FUEL ELEMENTS HAS BEEN DEVELOPED TO TAKE INTO ACCOUNT THE COMBINED EFFECTS OF THE RETENTION OF METALLIC FISSION PRODUCTS BY FUEL PARTICLES AND THE RATHER STRONG ABSORPTION OF THESE FISSION PRODUCTS BY THE GRAPHITE OF THE FUEL ELEMENTS. RELEASE CALCULATIONS ARE MADE ON THE BASIS THAT THE LOSS OF FISSION PRODUCT NUCLIDES SUCH AS OF STRONTIUM, CESIUM, AND BARIUM IS DETERMINED BY THEIR EVAPORATION FROM THE GRAPHITE SURFACES AND THEIR TRANSPIRATION INDUCED BY THE FLOWING HELIUM COOLANT. THE CODE IS DEVISED SO THAT CHANGES OF FISSION RATE (FUEL ELEMENT POWER), FUEL TEMPERATURE, AND GRAPHITE TEMPERATURE MAY BE INCORPORATED INTO THE CALCULATION. TEMPERATURE IS QUITE IMPORTANT IN DETERMINING RELEASE BECAUSE, IN GENERAL, BOTH RELEASE FROM FUEL PARTICLES AND LOSS BY EVAPORATION (TRANSPIRATION) VARY EXPONENTIALLY WITH THE RECIPROCAL OF THE ABSOLUTE TEMPERATURE.

302 GAFFE A ZERO-DIMENSIONAL CALCULATION OF FEED FUEL REQUIREMENTS IS PERFORMED TO PRODUCE A SPECIFIED END OF CYCLE MULTIPLICATION FACTOR FOR THE EQUILIBRIUM FUEL CYCLE, GIVEN FEED COMPOSITION, LENGTH OF CYCLE AND REACTOR POWER. IT IS ALTERNATELY POSSIBLE TO COMPUTE CYCLE LENGTH OR FEED ENRICHMENT. THE CODE IS A SURVEY TOOL WHICH ASSUMES PERIODIC REFUELING AND

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PERMITS COMPLETE OR PARTIAL RECYCLING OF MATERIALS. THE SEGREGATED FUEL CONCEPT CAN BE HANDLED WITHIN THE FRAMEWORK OF THE CALCULATION.

313 CINDER(M0102) CINDER IS A FOUR-GROUP, ONE-POINT DEPLETION AND FISSION PRODUCT PROGRAM BASED ON THE EVALUATION OF A GENERAL ANALYTICAL SOLUTION OF NUCLIDES COUPLED IN ANY LINEAR SEQUENCE OF RADIOACTIVE DECAYS AND NEUTRON ABSORPTIONS IN A SPECIFIED NEUTRON FLUX SPECTRUM. THE DESIRED DEPLETION AND FISSION PRODUCT CHAINS AND ALL PHYSICAL DATA ARE SPECIFIED BY THE PROBLEM ORIGINATOR. THE PROGRAM COMPUTES INDIVIDUAL NUCLIDE NUMBER DENSITIES, ACTIVITIES, NINE ENERGY-GROUP DISINTEGRATION RATES, AND MACROSCOPIC AND BARNES/FISSION POISONS AT EACH TIME-STEP AS WELL AS SELECTED SUMMARIES OF THESE DATA.

314 NAP NAP CALCULATES THE SPECTRUM AND SPATIAL DISTRIBUTION IN ONE DIMENSION OF ACTIVATION GAMMA RAYS FOLLOWING NEUTRON IRRADIATION.

318 FEVER7 FEVER7 PERFORMS A MULTIGROUP, 1-DIMENSIONAL DEPLETION CALCULATION WHICH ALLOWS FUEL IN VARIOUS STAGES OF IRRADIATION TO BE HOMOGENIZED INTO THE SAME REGION FOR PURPOSES OF THE DIFFUSION CALCULATION BUT FOLLOWS THE DEPLETION OF EACH OF THE SUBREGIONS SEPARATELY. THE CALCULATION MAY BE INTERRUPTED PERIODICALLY FOR REFUELING ONE OR MORE REGIONS. RECYCLING IS OPTIONAL AND THERE IS NO LIMIT TO THE NUMBER OF REFUELINGS WHICH MAY BE PERFORMED. A CONTROL POISON SEARCH IS AVAILABLE AND CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO A NUMBER OF LUMPED POISONS.

322 ISOSEARCH THE PROGRAM WAS DEVELOPED TO CALCULATE THE UNKNOWN REACTION CROSS SECTION, FLUX VALUE, OR PRODUCT ACTIVITY IN AN ISOTOPE-PRODUCTION SCHEME CONSISTING OF TWO OR THREE NUCLIDES.

325 2DB 2DB IS A FLEXIBLE, TWO-DIMENSIONAL (X-Y, R-Z, R-THETA, HEX GEOMETRY) DIFFUSION CODE FOR USE IN FAST REACTOR ANALYSES. THE CODE CAN BE USED TO -

- (A) COMPUTE FUEL BURNUP USING A FLEXIBLE MATERIAL SHUFFLING SCHEME,
- (B) PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION (ALPHA), MATERIAL CONCENTRATIONS, AND REGION DIMENSIONS USING A REGULAR OR ADJOINT MODEL. CRITICALITY SEARCHES CAN BE PERFORMED DURING BURNUP TO COMPENSATE FOR FUEL DEPLETION,
- (C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANEIOUS SOURCE.

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336 PDQ5 THE FEW-GROUP TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED. UP TO FIVE GROUPS MAY BE USED WITH SCATTERING ALLOWED BETWEEN ADJACENT GROUPS. IN ADDITION, DEPLETION PROBLEMS MAY BE SOLVED WITH PDQ5.

339 GAUGE THE TWO-DIMENSIONAL FEW-GROUP NEUTRON DIFFUSION THEORY EQUATIONS FOR A UNIFORM TRIANGULAR MESH ARE SOLVED TO OBTAIN THE MULTIPLICATION FACTOR AND THE SPATIAL FLUX AND POWER DISTRIBUTION OF REACTORS WITH HEXAGONAL CORE CONFIGURATION. COMPLETE REACTOR LIFE HISTORIES WITH PARTIAL REFUELING AT A NUMBER OF RELOAD TIME POINTS CAN BE CALCULATED. AT EACH DISCRETE TIME POINT A CONTROL ROD SEARCH MAY BE PERFORMED TO MAINTAIN CRITICALITY AT ALL TIMES. THE DEPLETION SCHEME OF ALL BURNABLE NUCLIDES IS SPECIFIED BY THE USER AT EXECUTION TIME. THREE MODES OF OPERATION ARE POSSIBLE - (1) STRAIGHT BURNUP CALCULATION, (2) CONTROL ROD CRITICALITY SEARCH, ALLOWING THE ADJUSTMENT OF A NUMBER OF CONTROL ROD BANKS ACCORDING TO A PRESCRIBED ROD SEQUENCING SCHEME, AND (3) A SERIES OF STATIC CALCULATIONS WITH INSERTION OF RODS INTO FIXED PRESCRIBED POSITIONS.

340 POWERCO POWERCO CALCULATES THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ASSUMING ALL CASH EXPENSES SUCH AS INVESTMENT AND FUEL COSTS, OPERATING EXPENSES, AND TAXES ARE KNOWN. THE POWER COST IS HELD CONSTANT THROUGHOUT THE PROJECT LIFE.

354 CINCAS CINCAS IS A NUCLEAR FUEL CYCLE COST CODE WHICH MAY BE USED FOR EITHER ENGINEERING ECONOMY PREDICTIONS OF FUEL CYCLE COSTS OR FOR ACCOUNTING FORECASTING OF SUCH COSTS. FEATURES OF CINCAS INCLUDE -

- (1) MONTHLY CALCULATION OF DOLLAR COSTS AND MASS INVENTORY ON A BATCH AND CASE BASIS FOR EACH MONTH OF A PERIOD WHICH IS USUALLY DEFINED AS (BUT NOT RESTRICTED TO) BEGINNING WITH THE DELIVERY OF FUEL TO THE REACTOR SITE AND ENDING WITH THE WITHDRAWAL OF FUEL FROM THE REACTOR.
- (2) A GENERAL FORMULA FOR THE UNIT PRICE OF ENRICHED URANIUM WHICH ALLOWS FOR VARIABLE FEED AND TAILS ENRICHMENTS, COSTS OF FEED, CHEMICAL CONVERSION, SEPARATIVE WORK, AND LOSSES IN CONVERSION AND FABRICATION.

367 ISOGEN ISOGEN CALCULATES RADIOISOTOPE GENERATION AND DECAY, USING TWO-GROUP NEUTRON CROSS SECTIONS.

372 RAPFU RAPFU CALCULATES EQUILIBRIUM FUEL CYCLE ISOTOPICS IN FAST BREEDER REACTORS. THE RECYCLED PLUTONIUM IS PERMITTED TO HAVE DIFFERENT ISOTOPIC COMPOSITIONS IN TWO DIFFERENT CORE ZONES, AND SEVERAL RECYCLE SCHEMES ARE AVAIL-

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ABLE AS OPTIONS. OUTPUT DATA INCLUDES THE INITIAL, AVERAGE, AND DISCHARGED FUEL ISOTOPIC CONCENTRATIONS FOR EACH REGION OF THE CORE ZONES AND THE BLANKETS, BREEDING RATIO, DOUBLING TIME, AND (OPTIONALLY) FUEL COSTS CALCULATED USING SIMPLIFIED RELATIONSHIPS.

418 CHAINS CHAINS COMPUTES THE ATOM DENSITY OF MEMBERS OF A SINGLE RADIOACTIVE DECAY CHAIN. THE LINEARITY OF THE BATEMAN EQUATIONS ALLOWS TRACING OF INTERCONNECTING CHAINS BY MANUALLY ACCUMULATING RESULTS FROM SEPARATE CALCULATIONS OF SINGLE CHAINS. RE-ENTRANT LOOPS CAN BE TREATED AS EXTENSIONS OF A SINGLE CHAIN. LOSSES FROM THE CHAIN ARE ALSO TALLIED.

+23 DOS DOS COMPUTES THE LOCAL NEUTRON FLUX PER REFERENCE REACTOR POWER LEVEL WHICH WILL PRODUCE THE MEASURED ACTIVITY OF A DOSIMETER. ALTERNATIVELY, IF THE FLUX VALUE IS SUPPLIED, THE CORRESPONDING DOSIMETER ACTIVITY WILL BE CALCULATED.

427 FARED FARED CONTAINS AN INTERNAL CROSS SECTION AVERAGING ROUTINE WHICH IS RESPONSIBLE FOR PREPARING BROAD GROUP CROSS SECTION SETS FOR VARIOUS MATERIAL REGIONS OF THE REACTOR. THE CROSS SECTION AVERAGING IS PERFORMED IN PROGRAM REGA, WHICH COMPUTES A B1 FLUX AND CURRENT IN UP TO 20 REACTOR BLOCK COMPOSITIONS FOR USE AS WEIGHTING FUNCTIONS IN THE CROSS SECTION COLLAPSING CALCULATION. A HOMOGENEOUS OR HETEROGENEOUS RESOLVED AND UNRESOLVED RESONANCE TREATMENT IS PROVIDED TO COMPUTE EFFECTIVE MICROGROUP RESONANCE CROSS SECTIONS FOR THE BLOCK MIXTURE OR UP TO 2 CELL TYPES PER BLOCK. REAL AND ADJOINT FLUX DISTRIBUTIONS ARE CALCULATED FOR ONE-DIMENSIONAL SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRIES. THE REAL FLUXES ARE NORMALIZED TO YIELD DESIRED TOTAL REACTOR POWER. CRITICALITY SEARCHES MAY BE PERFORMED ON THE REACTOR DIMENSION, TRANSVERSE BUCKLING OR ZONE COMPOSITIONS. ENRICHMENT SEARCHES MAY BE PERFORMED TO YIELD DESIRED RATIOS OF MAXIMUM (OR AVERAGE) POWER DENSITIES IN SEVERAL ZONES. ZONEWISE DEPLETION IS CALCULATED EITHER FOR A GIVEN TIME PERIOD OR UNTIL SPECIFIED CRITICALITY, BURNUP OR NUCLIDE CONCENTRATIONS ARE SATISFIED. FLEXIBLE FUEL MANAGEMENT IS AVAILABLE PERMITTING SPECIFIED MATERIAL UNITS TO BE MOVED INTO, OUT OF OR SHUFFLED WITHIN THE REACTOR. A WIDE VARIETY OF EDITS MAY BE PERFORMED, INCLUDING PERTURBATION AND KINETIC PARAMETERS CALCULATIONS.

438 BUG2 THE 2-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION THEORY EQUATIONS FOR X-Y OR R-Z GEOMETRY ARE SOLVED TO OBTAIN THE MULTIPLICATION FACTOR AND THE SPATIAL FLUX AND POWER DISTRIBUTIONS. COMPLETE REACTOR LIFE HISTORIES WITH PARTIAL REFUELING AT A NUMBER OF RELOAD POINTS CAN BE CALCULATED. THE DEPLETION SCHEME OF ALL BURNABLE NUCLIDES IS SPECIFIED BY THE USER AT EXECUTION TIME. A REGIONWISE DEPLETION SCHEME IS USED.

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CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ANY NUCLIDE.

439 BUGTRI THE 2-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION THEORY EQUATIONS FOR TRIANGULAR GEOMETRY ARE SOLVED TO OBTAIN THE MULTIPLICATION FACTOR AND THE SPATIAL FLUX AND POWER DISTRIBUTIONS. COMPLETE REACTOR LIFE HISTORIES WITH PARTIAL REFUELING AT A NUMBER OF RELOAD TIME POINTS CAN BE CALCULATED. THE DEPLETION SCHEME OF ALL BURNABLE NUCLIDES IS SPECIFIED BY THE USER AT EXECUTION TIME. A REGIONWISE DEPLETION SCHEME IS USED. CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ANY NUCLIDE.

441 PWCOST PWCOST IS USED TO CALCULATE NUCLEAR REACTOR FUEL CYCLE COSTS. INPUT FOR ALL COMPONENTS OF THE FUEL CYCLE ARE TIME-DEPENDENT. WORKING CAPITAL CHARGE RATES MAY BE SPECIFIED SEPARATELY FOR IN-CORE AND OUT-OF-CORE TIME PERIODS.

454 PHENIX PHENIX IS A TWO-DIMENSIONAL, MULTIGROUP, DIFFUSION-BURNUP-REFUELING CODE FOR USE WITH FAST REACTORS. THE CODE IS DESIGNED PRIMARILY FOR FUEL-CYCLE ANALYSIS OF FAST REACTORS AND CAN BE USED TO CALCULATE THE DETAILED BURNUP AND REFUELING HISTORY OF FAST BREEDER REACTOR CONCEPTS HAVING ANY GENERALIZED FRACTIONAL BATCH RELOADING SCHEME. EITHER ORDINARY KEFF CALCULATIONS OR SEARCHES ON MATERIAL CONCENTRATION OR REGION DIMENSIONS CAN BE PERFORMED AT ANY TIME DURING THE BURNUP HISTORY. THE COMPLETE FUEL CYCLE HISTORY CAN BE CALCULATED IN ONE RUN, OR THE INDIVIDUAL BURNUP INTERVALS CAN BE TREATED SEPARATELY. THE REFUELING OPTION OF THE CODE ACCOUNTS FOR THE SPATIAL FLUX SHIFTS OVER THE REACTOR LIFETIME IN THE CALCULATION OF FUEL DISCHARGE.

456 DBUFIT1 DBUFIT1 IS DESIGNED TO EXTRACT INTEGRAL CROSS SECTION INFORMATION FROM ISOTOPIC BURNUP DATA. THIS INFORMATION IS OBTAINED BY FITTING BURNUP EQUATIONS TO THE ISOTOPIC DATA USING LEAST SQUARES FITTING TECHNIQUES. BURNUP EQUATIONS FOR THE FOLLOWING TRANSMUTATION CHAINS HAVE BEEN PROGRAMMED - PU239 TO PU242, U238 TO PU242, PU242 TO CM244 AND U235 TO PU238.

463 3DDT 3DDT IS A THREE-DIMENSIONAL (X-Y-Z OR R-THETA-Z) MULTIGROUP DIFFUSION THEORY CODE FOR USE IN FAST REACTOR ANALYSIS. THE CODE CAN BE USED TO COMPUTE KEFF OR TO PERFORM CRITICALITY SEARCHES ON REACTOR COMPOSITION, TIME ABSORPTION, AND REACTOR DIMENSIONS BY EITHER THE REGULAR OR THE ADJOINT FLUX EQUATIONS. MATERIAL BURNUP AND FISSION PRODUCT BUILDUP CAN BE COMPUTED FOR SPECIFIED TIME INTERVALS, AND CRITICALITY

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SEARCHES CAN BE PERFORMED DURING BURNUP TO COMPENSATE FOR FUEL DEPLETION AND FISSION PRODUCT GROWTH.

477 3DXT/DEP3 THESE TWO CODES WERE
DEVELOPED FOR USE WITH DETAILED REACTOR PHYSICS CALCULATIONS TO
OBTAIN 3-DIMENSIONAL XENON TRANSIENT (3DXT) AND DEPLETION (DEP3)
CALCULATIONS. THEY ARE WELL SUITED FOR SURVEY STUDIES AND BECAUSE
THEY INCORPORATE THREE-DIMENSIONAL EFFECTS WITH THERMAL FEEDBACK
AND ROD SEARCH CAPABILITIES, ARE USEFUL FOR ASSESSING SITUATIONS
SUCH AS ROD MISALIGNMENTS OR FUEL LOADING AND COOLANT FLOW ASYMMETRIES WHICH ARE TIME-CONSUMING AND OFTEN IMPOSSIBLE TO DETECT WITH
DETAILED 1- OR 2-DIMENSIONAL CODES.

480 FUMBLE
FUMBLE COMPUTES THE FUEL BURNUP IN REACTOR OPERATIONS. THIS INCLUDES THE EVALUATION OF REACTIVITY EFFECTS, BREEDING (OR DEPLETION) AND INVENTORIES OF FUEL, AND FUEL COSTS FOR CHANGING ECONOMIC CONDITIONS AND SUPPLIED FUEL COMPOSITIONS THROUGHOUT THE REACTOR LIFETIME (OR FOR AS MANY REFUELING OPERATING INTERVALS AS DESIRED). CONSIDERABLE FLEXIBILITY IS ALLOWED IN THE SPECIFICATIONS OF REACTOR REFUELING, INCLUDING FUEL COMPOSITIONS FOR THE STARTUP REACTOR, RECYCLE SCHEMES AND FISSILE MAKEUP COMPOSITIONS FOR SUBSEQUENT CORE LOADINGS, AMOUNTS OF FUEL TO BE REPLACED IN DIFFERENT POSITIONS OF THE REACTOR AT ANY REFUELING, AND SHUFFLING OF FUEL FROM ONE PART OF THE REACTOR TO ANOTHER OR TEMPORARILY STORING FUEL DISCHARGED FROM THE REACTOR FOR LATER ADDITIONAL BURNUP. THE REFUELING SPECIFICATIONS MAY BE CHANGED FROM ONE REFUELING OPERATING INTERVAL TO ANOTHER, AS WELL AS OPERATING INTERVAL TIME, POWER RATING, AND LOAD FACTOR. FUEL COSTS MAY BE EVALUATED FOR SEVERAL DIFFERENT SETS OF COST INPUT DATA (DIFFERENT ECONOMIC ASSUMPTIONS) AND MAY BE BASED ON NET COSTS ACCRUED AND ENERGY PRODUCED BY SPENT FUEL BATCHES AND/OR ON NET COSTS INCURRED FOR ALL FUEL HELD AND ENERGY PRODUCED BY THE ENTIRE REACTOR FOR EACH OPERATING INTERVAL.

495 SYN SYN CONTAINS TWO MAJOR SEGMENTS, BISYN AND BICYCL. THE BISYN SEGMENT SOLVES THE TWO-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION THEORY EQUATIONS IN R,Z OR X,Y GEOMETRY USING A NONITERATIVE SYNTHESIS METHOD. THIS APPROACH IS DESIGNED TO GREATLY REDUCE THE COMPUTER COST OF RUNNING TWO-DIMENSIONAL MULTIGROUP PROBLEMS AT THE RISK OF SOME LOSS IN ACCURACY OF THE DETAILED FLUX DISTRIBUTION. THIS SEGMENT ALSO CONTAINS A PERTURBATION AND EFFECTIVE DELAYED NEUTRON FRACTION CALCULATION.

THE BICYCL SEGMENT USES OUTPUT FROM BISYN TO SOLVE THE ONE-GROUP NEUTRON DEPLETION EQUATIONS. BICYCL ALLOWS THE USER TO SEARCH ON MAKEUP OR RECYCLE ISOTOPIC COMPOSITIONS FOR A FIRST CYCLE OF A FIRST CORE OR FOR EQUILIBRIUM CONCENTRATIONS. IT ALSO HAS PROVISIONS FOR FUEL SHUFFLING AND THE OPTION TO CYCLE BACK TO BISYN IN ORDER TO UPDATE THE FLUXES, ONE-GROUP CROSS SECTIONS, ETC.

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498 CONCEPT4/CONCEPT3 CONCEPT3 GENERATES A CAPITAL COST ESTIMATE FOR A SELECTION OF SINGLE UNIT AND MULTIPLE UNIT PWR, BWR, COAL, OIL AND GAS, STEAM-ELECTRIC POWER PLANTS WITH RUN-OF-RIVER, MECHANICAL DRAFT, OR NATURAL DRAFT COOLING SYSTEMS OF SPECIFIED ELECTRICAL OUTPUT FOR ANY OF TWENTY U. S. CITIES, A HYPOTHETICAL MIDDLETOWN, AND TWO CANADIAN CITIES, AND PRINTS AS A RESULT A DETAILED COST BREAKDOWN.

IN ADDITION TO THE ABOVE, CONCEPT4 PROVIDES ADDED COST MODELS FOR HTGR PLANTS, MODIFIED SECOND-UNIT COST MODELS, AND MODIFICATIONS TO SIMPLIFY DATA INPUT FOR OPTIONAL CALCULATIONS, TO ACCEPT TIME-DEPENDENT ESCALATION RATES, AND TO CALCULATE ALLOWANCES FOR INTEREST DURING CONSTRUCTION AND ESCALATION DURING CONSTRUCTION BASED ON CASH FLOW CURVES MODIFIED FOR A SPECIFIED RECEIPT-OF-CONSTRUCTION-PERMIT DATE.

540 PACTOLUS/CLOTHO PACTOLUS IS A CODE FOR COMPUTING NUCLEAR POWER COSTS USING THE DISCOUNTED CASH FLOW METHOD. THE CASH FLOWS ARE GENERATED FROM INPUT UNIT COSTS, TIME SCHEDULES AND BURNUP DATA. CLOTHO CALCULATES AND COMMUNICATES TO PACTOLUS MASS FLOW DATA TO MATCH A SPECIFIED LOAD FACTOR HISTORY.

567 3DB 3DB IS A THREE-DIMENSIONAL (X-Y-Z, R-THETA-Z, TRIANGULAR-Z) MULTIGROUP DIFFUSION CODE FOR USE IN DETAILED FAST-REACTOR CRITICALITY AND BURNUP ANALYSIS. THE CODE CAN BE USED TO -

- (A) COMPUTE KEFF AND PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION, REACTOR COMPOSITION, AND REACTOR DIMENSIONS BY MEANS OF EITHER A FLUX OR AN ADJOINT MODEL,
- (B) COMPUTE MATERIAL BURNUP USING A FLEXIBLE MATERIAL SHUFFLING SCHEME, AND
- (C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANEEOUS SOURCE.

576 GEM GEM IS USED TO PREDICT FUEL CYCLE COSTS FOR ANY TYPE NUCLEAR SYSTEM (I.E., BWR, HTGR, PWR, LMFBR, GCFR, . . .). THE CURRENT VERSION IS LIMITED TO THERMAL REACTORS. GEM IS DESIGNED FOR PRODUCTION USE BY LARGE UTILITIES WHICH HAVE SEVERAL REACTOR TYPES ON THEIR SYSTEM. GEM HAS BEEN WRITTEN SO AS TO ACCOMMODATE ALL MAJOR FUEL MANAGEMENT ACTIVITIES UNDERTAKEN BY A UTILITY -

- (1) FUEL BID ANALYSIS,
- (2) EVALUATION OF ACTUAL DAY TO DAY OPERATION, AND
- (3) SYSTEM SIMULATION AND OPTIMIZATION STUDIES.

579 DWARF DWARF ALLOWS ONE-DIMENSIONAL SIMULATION OF REACTOR BURNUP AND XENON OSCILLATION PROBLEMS IN SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY USING A FEW-GROUP DIFFUSION THEORY MODEL.

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588 ORCOST2 ORCOST2 ESTIMATES THE COST OF ELECTRICAL ENERGY PRODUCTION FROM SINGLE-UNIT STEAM-ELECTRIC POWER PLANTS. CAPITAL COSTS AND OPERATING AND MAINTENANCE COSTS ARE CALCULATED USING BASE COST MODELS WHICH ARE INCLUDED IN THE PROGRAM FOR EACH OF THE FOLLOWING TYPES OF PLANTS: PWR, BWR, HTGR, COAL, OIL, AND GAS. THE USER MAY SELECT ONE OF SEVEN INPUT/OUTPUT OPTIONS FOR CALCULATION OF CAPITAL COST, OPERATING AND MAINTENANCE COST, LEVELIZED ENERGY COSTS, FIXED CHARGE RATE, ANNUAL CASH FLOWS, CUMULATIVE CASH FLOWS, AND CUMULATIVE DISCOUNTED CASH FLOWS. OPTIONS INCLUDE THE INPUT OF CAPITAL COST AND/OR FIXED CHARGE RATE TO OVERRIDE THE NORMAL CALCULATIONS. TRANSMISSION AND DISTRIBUTION COSTS ARE NOT INCLUDED. FUEL COSTS MUST BE INPUT BY THE USER.

634 REBUS2 USING ONE OR MORE SPECIFIED EXTERNAL FUEL SUPPLIES TO LOAD THE REACTOR AND A FIXED FUEL MANAGEMENT SCHEME, REBUS2 COMPUTES THE EQUILIBRIUM (I.E. INFINITE-TIME) OPERATING CONDITIONS OF A FAST REACTOR. OPTIONALLY, REPROCESSING PLANTS MAY BE INCLUDED IN THE SPECIFICATION OF THE EXTERNAL FUEL CYCLE AND DISCHARGED FUEL MAY BE RECYCLED BACK INTO THE REACTOR. THE CODE WILL AUTOMATICALLY OPTIMIZE, AT USER OPTION -

- (A) THE BURN CYCLE TIME IN ORDER TO ACHIEVE A SPECIFIED DISCHARGE FUEL BURNUP,
- (B) THE FRESH FUEL ENRICHMENT IN ORDER TO ACHIEVE A SPECIFIED EFFECTIVE REPRODUCTION CONSTANT AT A SPECIFIED TIME DURING THE BURN CYCLE, AND
- (C) THE POISON CONTROL TO ACHIEVE A SPECIFIED VALUE OF KEFF.

NON-EQUILIBRIUM PROBLEMS CONSISTING OF AN EXPLICIT SEQUENCE OF BURN/SHUTDOWN/REFUEL CYCLES MAY ALSO BE HANDLED ALTHOUGH FUEL RECYCLE IS NOT ALLOWED.

669 TPT01 TPT01 SOLVES THE FEW-GROUP NEUTRON TRANSPORT EQUATION WITH P1 SCATTERING IN TWO DIMENSIONS USING THE DISCRETE ORDINATE METHOD. THE GEOMETRIES AVAILABLE ARE RECTANGULAR AND CYLINDRICAL. THE PROBLEM ALLOWS ARBITRARY UP- AND DOWN-SCATTERING BETWEEN GROUPS. EXPLICIT SOLUTIONS ARE AVAILABLE FOR BOTH FIXED-SOURCE AND EIGENVALUE PROBLEMS. THE PROGRAM PERFORMS GROSS BLOCK DEPLETION FOR ALL ISOTOPES IN ALL DEPLETABLE REGIONS AND ALSO PERFORMS FINE BLOCK DEPLETION FOR ANY SUBSET OF THE ISOTOPES IN SELECTED REGIONS.

683 NUFUEL GIVEN A FORECAST OF NUCLEAR ELECTRIC GENERATING CAPACITY, IT IS IMPORTANT TO KNOW THE CONSEQUENT TIME-RELATED MATERIALS AND SERVICES REQUIRED TO SUPPORT IT. THESE REQUIREMENTS DEPEND ON A NUMBER OF PARAMETERS SUCH AS REACTOR TYPES, PLANT OPERATING CAPACITY FACTOR, EXPECTED AVAILABILITY OF SPENT FUEL REPROCESSING, POLICIES CONCERNING PLUTONIUM UTILIZATION (AS BREEDER FUEL AND LWR RECYCLE). THESE AND OTHER CONDITIONS ARE SIMULATED BY NUFUEL WHICH CALCULATES AND PRINTS

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ANNUAL REQUIREMENTS FOR SEPARATIVE WORK AND URANIUM RELATED TO A SCHEDULE OF NUCLEAR PLANT ADDITIONS. RELATED FUEL CYCLE QUANTITIES SUCH AS PLUTONIUM PRODUCTION AND REQUIREMENTS, REQUIREMENTS FOR CONVERSION TO UF(6), FOR FUEL FABRICATION, AND FOR SPENT FUEL REPROCESSING ARE ALSO CALCULATED AND REPORTED ON A REAL-TIME BASIS.

684 GEOCOST GEOCOST CALCULATES THE COST OF GENERATING ELECTRICITY FROM GEOTHERMAL ENERGY. THE VERSION OF GEOCOST IN THIS RELEASE SIMULATES THE PRODUCTION OF ELECTRICITY USING A STEAM POWER CONVERSION CYCLE BASED UPON EITHER A DRY STEAM OR HYDROTHERMAL RESOURCE. FUTURE EXTENSIONS TO THE MODEL WILL SIMULATE THE PRODUCTION OF ELECTRICITY USING OTHER POWER CONVERSION TECHNOLOGIES, PARTICULARLY THE BINARY FLUID CYCLE.

688 OMCST OMCST ESTIMATES ANNUAL OPERATING AND MAINTENANCE EXPENSES OF STEAM-ELECTRIC POWER PLANTS. EXCLUSIVE OF FUEL. BASE LOAD NUCLEAR AND FOSSIL-FUELED PLANT TYPES ARE INCLUDED. COSTS ARE ADJUSTED FOR VARIOUS WASTE HEAT REJECTION METHODS. PLANTS CONTAINING ONE THROUGH FOUR UNITS WITH UNIT NET ELECTRICAL OUTPUT FROM 400 THROUGH 2000 MW(E) MAY BE EVALUATED. OMCST INCLUDES THE OPTION OF A LIMESTONE WET SCRUBBING SYSTEM FOR FLUE GAS DESULFURIZATION FOR COAL- AND OIL-FIRED PLANTS.

699 ORSIM ORSIM IS AN ELECTRIC POWER GENERATING SYSTEM INTEGRATION MODEL WHICH SIMULATES THE MULTI-YEAR OPERATION OF A MIXED POWER SYSTEM CONSISTING OF FOSSIL, NUCLEAR, HYDRO, AND PUMPED-STORAGE UNITS. FOR ANY SPECIFIED REFUELING SCHEDULE FOR NUCLEAR UNITS AND FORECAST OF FUTURE LOAD, THE MODEL DETERMINES A PLAN OF OPERATION FOR THE SYSTEM WHICH ATTEMPTS TO MINIMIZE THE TOTAL DISCOUNTED OPERATING COST OVER A SPECIFIED STUDY PERIOD.

THE ANALYSIS CONSIDERS THE EFFECTS OF FORCED OUTAGES, SPINNING RESERVE OPERATING CONSTRAINTS, AND SCHEDULED INTRODUCTION AND RETIREMENT OF GENERATING STATIONS. THE MODEL DETERMINES A MAINTENANCE SCHEDULE FOR THE NON-NUCLEAR STATIONS (NUCLEAR STATIONS ARE MAINTAINED DURING REFUELING OUTAGES) AND THE OPTIMUM ALLOCATION OF ENERGY-FIXED NUCLEAR AND HYDRO RESOURCES. IT CALCULATES THE EXPECTED ENERGY GENERATED BY EACH STATION IN THE SYSTEM, PERIOD BY PERIOD OVER THE PLANNING HORIZON, BASED ON INPUT OR CALCULATED INCREMENTAL OPERATING COST. IT ALSO CALCULATES THE EXPECTED LOSS-OF-LOAD PROBABILITY AND UNSERVED ENERGY DEMAND FOR EACH PERIOD IN THE PLANNING HORIZON. AN OPTIMUM OPERATING PLAN, DESIGNED TO MINIMIZE THE DISCOUNTED TOTAL PRODUCTION COST, IS THEN CALCULATED, AS ARE THE COSTS OF OPERATING EACH STATION IN THE SYSTEM AND THE DISCOUNTED TOTAL PRODUCTION COST FOR THE DERIVED PLAN OF OPERATION.

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711 GEOCOST-BC GEOCOST CALCULATES THE COST
OF GENERATING ELECTRICITY FROM GEOTHERMAL ENERGY. THE VERSION OF
GEOCOST IN THIS RELEASE, GEOCOST-BC, SIMULATES THE PRODUCTION OF
ELECTRICITY USING A BINARY FLUID CYCLE BASED UPON A HYDROTHERMAL
RESOURCE.

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121 AIREK3 AIREK3 FINDS THE NUMERICAL SOLUTION TO THE SPACE INDEPENDENT REACTOR KINETICS EQUATIONS BASED ON THE METHOD DEVELOPED BY E. R. COHEN. INPUT AND OUTPUT ARE SIMPLIFIED AND THE POWER, INVERSE PERIOD, FEEDBACKS, AND PRE-CURSORS ARE DISPLAYED GRAPHICALLY.

122 SNAPKIN5/SNAPKIN-5A SNAPKIN5 PROVIDES A ONE-REGION TIME-DEPENDENT CALCULATION OF POWER, ENERGY, TEMPERATURE, REACTIVITY, INVERSE PERIOD, AND HYDROGEN LOSS IN A SNAP REACTOR AFTER A PERTURBATION FROM GIVEN INITIAL CONDITIONS. SNAPKIN-5A, IN ADDITION, WEIGHTS POWER, HEAT CAPACITY, AND REACTIVITY IMPORTANCE FOR TWENTY-FIVE OR FEWER REGIONS.

135 TRAFICORPORATION EXPERIMENTAL FREQUENCY RESPONSE DATA OBTAINED FROM A LINEAR DYNAMIC SYSTEM IS PROCESSED TO OBTAIN THE TRANSFER FUNCTION AS A RATIO OF TWO FREQUENCY-DEPENDENT POLYNOMIALS. THE TRANSFER FUNCTION MAY HAVE NON-MINIMUM PHASE.

163 AIROS AIROS SOLVES THE SPACE-INDEPENDENT REACTOR KINETICS EQUATIONS AND PROVIDES FOR THE DETERMINATION OF REACTIVITY BY SOLVING IN ADDITION THE DISCRETIZED EQUATIONS WHICH REPRESENT THE SPATIAL HEAT AND MASS TRANSFER MODEL FOR SEVERAL FUEL CHANNELS. IN ADDITION, VARIATION OF THE FILM COEFFICIENT WITH FLOW IS ACCOUNTED FOR AS WELL AS THE PROVISION FOR FLOW DECAY AND AFTERGLOW HEATING. SCRAMS CAN BE INITIATED BY DELAYED SIGNALS FROM INSTRUMENTS WHICH SENSE ANY QUANTITY CALCULATED, E.G., POWER, INVERSE PERIOD OR TEMPERATURE. GENERALIZED FEEDBACK EQUATIONS ARE USED TO PROVIDE FLEXIBILITY IN THE MODELS THAT REPRESENT MULTICHANNEL HEAT TRANSFER INCLUDING CONDUCTION AND CONVECTION, ENERGY, PRESSURE AND OTHER PHENOMENON. THE REACTIVITY EQUATION IS ALSO GENERALIZED. THE REACTIVITY FEEDBACK COEFFICIENTS CAN BE CONSTANT OR VARY AS THE SQUARE ROOT OR RECIPROCAL OF TEMPERATURE. FURTHERMORE ANY FEEDBACK VARIABLE CAN BE USED TO INITIATE A REACTIVITY SCRAM, EACH WITH A UNIQUE DELAY TIME.

168 INVERSE KINETICS(R102) GIVEN THE SPACE-INDEPENDENT, ONE ENERGY GROUP REACTOR KINETICS EQUATIONS AND THE INITIAL CONDITIONS, THIS PROGRAM DETERMINES THE TIME VARIATION OF REACTIVITY REQUIRED TO PRODUCE THE GIVEN INPUT OF FLUX-TIME DATA.

188 CMPXMAT A SYSTEM OF N LINEAR EQUATIONS DERIVED FROM THE LAPLACE TRANSFORM OF A SET OF LINEARIZED DIFFERENTIAL EQUATIONS IS SOLVED FOR AMPLITUDE AND PHASE ANGLE AS A FUNCTION OF FREQUENCY.

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255 R101 R101 SOLVES THE SPACE-INDEPENDENT, ONE-ENERGY GROUP REACTOR KINETICS EQUATIONS TO DETERMINE THE TIME VARIATION OF NEUTRON DENSITY GIVEN SPECIFIED INITIAL CONDITIONS. ANY OF FOUR PROGRAMMED REPRESENTATIONS OF EXCESS REACTIVITY CAN BE SELECTED.

290 GASA (STABILITY ANALYSIS) GASA DETERMINES THE STABILITY OF ANY PHYSICAL SYSTEM WHOSE MOTION IS DESCRIBABLE BY A SET OF FIRST-ORDER LINEAR DIFFERENTIAL EQUATIONS. IN PARTICULAR GASA EVALUATES THE STABILITY OF A REACTOR DESCRIBED BY THE LINEAR REACTOR KINETICS EQUATIONS WITH TEMPERATURE FEEDBACK, AGAINST PERTURBATIONS ABOUT ANY OPERATING POWER LEVEL. THE PROGRAM WILL ALSO CALCULATE AND PLOT THE TRANSFER FUNCTION BETWEEN ANY STATE VARIABLE OF THE SYSTEM AND A GIVEN EXTERNAL FORCING FUNCTION (SUCH AS AN EXTERNAL REACTIVITY PERTURBATION) OR ANOTHER STATE VARIABLE OF THE SYSTEM.

303 BLOOST6 BLOOST6 COMBINES A REACTOR SPACE-INDEPENDENT KINETICS CODE WITH A TWO-DIMENSIONAL HEAT TRANSFER CODE, AND A TIME-DEPENDENT SPHERICAL GEOMETRY HEAT TRANSFER ROUTINE FOR FUEL PARTICLES. THE CODE IS APPLICABLE TO PROBLEMS FOR WHICH THE SPACE-INDEPENDENT FORM OF THE REACTOR KINETICS EQUATION IS APPLICABLE.

317 GAPOTKIN GAPOTKIN IS A POINT KINETICS CODE THAT SOLVES THE SPACE-INDEPENDENT KINETICS EQUATIONS FOR A VERY GENERAL FORM OF THE REACTIVITY FUNCTION.

326 AIROS2A AIROS2A SOLVES THE SPACE-INDEPENDENT REACTOR KINETICS EQUATIONS AND PROVIDES FOR THE DETERMINATION OF REACTIVITY BY SOLVING IN ADDITION THE DISCRETIZED EQUATIONS THAT REPRESENT THE SPATIAL HEAT AND MASS TRANSFER MODEL FOR SEVERAL FUEL CHANNELS. IN ADDITION, VARIATION OF THE FILM COEFFICIENT WITH FLOW IS ACCOUNTED FOR ALONG WITH THE PROVISION FOR FLOW DECAY AND AFTERGLOW HEATING. SCRAMS CAN BE INITIATED BY DELAYED SIGNALS FROM INSTRUMENTS THAT SENSE ANY QUANTITY CALCULATED, E.G., POWER, INVERSE PERIOD OR TEMPERATURE. GENERALIZED FEEDBACK EQUATIONS ARE USED TO PROVIDE FLEXIBILITY IN THE MODELS THAT REPRESENT MULTICHANNEL HEAT TRANSFER INCLUDING CONDUCTION AND CONVECTION, ENERGY, PRESSURE AND OTHER PHENOMENON SUCH AS FUEL MELTING, COOLANT BOILING AND VOIDING BURN-OUT. THE REACTIVITY EQUATION IS ALSO GENERALIZED. THE REACTIVITY FEEDBACK COEFFICIENTS CAN BE CONSTANT OR VARY AS THE SQUARE ROOT OR RECIPROCAL OF TEMPERATURE. FURTHERMORE, ANY FEEDBACK VARIABLE CAN BE USED TO INITIATE A REACTIVITY SCRAM, EACH WITH A UNIQUE DELAY TIME. AN INPUT GENERATOR COMPUTES THE CONDUCTION AND CONVECTION COEFFICIENTS FOR AN $N \times M$ NODAL, MULTICHANNEL SYSTEM USING BUILT-IN TABLES OF SPECIFIC HEAT, DENSITY, CONDUCTIVITY AND VISCOSITY FOR

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THE COMMON FUEL, STRUCTURE AND COOLANT MATERIALS, AND PERFORMS AN INITIAL TEMPERATURE CALCULATION. THE FILM COEFFICIENTS MAY BE SPECIFIED OR CALCULATED USING LYONS EQUATION OR THE DITTUS-BOELTER EQUATION.

363 BLAST BLAST HAS BEEN DEVELOPED TO STUDY ACCIDENT CONDITIONS IN CRITICAL AND SUBCRITICAL THERMAL MULTIPLYING SYSTEMS. THE PROGRAM COMPUTES THE TIME BEHAVIOR OF THE THERMAL NEUTRON DENSITY AND THE SYSTEM TEMPERATURE FOLLOWING A STEP CHANGE IN REACTIVITY. THE INTEGRATED THERMAL NEUTRON DENSITY IS ALSO COMPUTED, FROM WHICH THE TOTAL NUMBER OF FISSIONS DURING AN EXCURSION MAY BE OBTAINED.

486 ANCON ANCON SOLVES THE POINT-REACTOR KINETIC EQUATIONS INCLUDING THERMAL FEEDBACK. LUMP-TYPE HEAT BALANCE EQUATIONS ARE USED TO REPRESENT THE THERMODYNAMICS, AND THE HEAT CAPACITY OF EACH LUMP CAN VARY WITH TEMPERATURE. THERMAL FEEDBACK CAN BE EITHER A LINEAR OR A NON-LINEAR FUNCTION OF LUMP TEMPERATURE, AND THE IMPRESSED REACTIVITY CAN BE EITHER A POLYNOMIAL OR SINUSOIDAL FUNCTION.

489 TRIFIDO THE CODE CALCULATES THE DECAY CONSTANT AND THE POPULATION OF THE FUNDAMENTAL PROMPT NEUTRON MODE EXTRAPOLATED TO INITIAL TIME, USING PULSED NEUTRON EXPERIMENTAL DATA. THESE DATA ARE THE RESULTING TIME PROFILE OF THE NEUTRON DENSITY OF A SUBCRITICAL MULTIPLICATIVE ASSEMBLY WHICH IS REPETITIVELY PULSED WITH SHORT BURSTS OF NEUTRONS. THE TIME PROFILE IS MEASURED WITH AN APPROPRIATE DETECTOR AND RECORDED WITH A TIME ANALYSER. WITH THE CALCULATED PARAMETERS THE CODE DETERMINES THE VALUES OF $(k \cdot \beta)/L$ AND REACTIVITY BY MEANS OF THE GARELIS-RUSSELL METHOD, AND REACTIVITIES USING THE GOZANI AND SJOSTRAND METHODS.

491 MOD5 MOD5 CALCULATES THE TIME- AND ENERGY-DEPENDENT EVOLUTION OF THE NEUTRON DENSITY IN HOMOGENEOUS MEDIA FOLLOWING INITIATION OF A) A MONOENERGETIC SOURCE DISTRIBUTED OVER A FINITE TIME INTERVAL, OR B) A SOURCE OF ARBITRARY SPECTRUM WITH A DELTA-FUNCTION DISTRIBUTION IN TIME. EFFECTIVELY THE CODE PRODUCES GREEN'S FUNCTION SOLUTIONS TO THE SLOWING-DOWN EQUATION IN DISCRETE NUMERICAL FORM. LEAKAGE IS TREATED IN THE DIFFUSION APPROXIMATION. THE PROGRAM A) CALCULATES SPECTRA AND ENERGY MOMENTS AT SELECTED TIMES FOLLOWING THE BURST OF SOURCE NEUTRONS, B) EVALUATES THE TIME-DEPENDENT NEUTRON DENSITY AND SLOWING-DOWN DENSITY AT SELECTED ENERGIES AND COMPUTES MOMENTS OF THESE DENSITIES, C) CALCULATES TIME-DEPENDENT DISTRIBUTIONS OF CAPTURE, LEAKAGE AND FIRST FISSION, AND MOMENTS OF THESE DISTRIBUTIONS, D) CALCULATES STEADY-STATE CENTRAL CORE NEUTRON FLUX AND LEAKAGE FLUX IN DETAIL AND IN GROUP-AVERAGED FORM, AND E) CALCULATES PARAMETERS SUCH AS k_{eff} .

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558 TASK TASK SOLVES THE ONE-DIMENSIONAL MULTIGROUP FORM OF THE REACTOR KINETICS EQUATIONS, USING EITHER TRANSPORT OR DIFFUSION THEORY AND ALLOWING AN ARBITRARY NUMBER OF DELAYED NEUTRON GROUPS. THE PROGRAM CAN ALSO BE USED TO SOLVE STANDARD STATIC PROBLEMS EFFICIENTLY SUCH AS EIGENVALUE PROBLEMS, DISTRIBUTED SOURCE PROBLEMS, AND BOUNDARY SOURCE PROBLEMS. CONVERGENCE PROBLEMS ASSOCIATED WITH SOURCES IN HIGHLY MULTIPLICATIVE MEDIA ARE CIRCUMVENTED, AND SUCH PROBLEMS ARE READILY CALCULABLE.

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102 AX1 AX1 PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION. GIVEN A SPHERICALLY SYMMETRIC, SUPERPROMPT CRITICAL SYSTEM, THE PROGRAM COMPUTES THE VARIATION IN TIME AND SPACE OF THE SPECIFIC ENERGY, TEMPERATURE, PRESSURE, DENSITY AND VELOCITY.

129 CONEC CONEC IS A COUPLED NEUTRONIC-ELASTICITY CODE DESIGNED FOR APPLICATION TO PULSED FAST REACTOR SYSTEMS. IT IS A ONE-DIMENSIONAL CALCULATION, CAPABLE OF DEALING WITH SOLID SPHERES OR SPHERICAL SHELLS. SPECIFICALLY, CONEC CALCULATES THE ALPHA OF A SYSTEM, THE TEMPERATURE DISTRIBUTION, THE RADIAL AND TANGENTIAL STRESS DISTRIBUTIONS, AND FROM THESE THE ACCELERATIONS, VELOCITIES, AND DISPLACEMENTS THROUGHOUT THE SYSTEM.

145 WEAK EXPLOSION PROGRAM THIS PROGRAM PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION FOR A SPHERICALLY SYMMETRIC REACTOR CORE WITH A GIVEN COMPOSITION TO OBTAIN THE TIME-DEPENDENT ENERGY RELEASE THAT RESULTS FROM THE INSERTION OF REACTIVITY AT A GIVEN RATE. THE BASIC USE FOR THIS PROGRAM IS FOUND IN ANALYSIS OF FAST REACTOR CORE COLLAPSE ACCIDENTS.

153 HATCHET HATCHET IS A MAJOR MODIFICATION OF THE AX1 CODE DESIGNED TO STUDY BURST CHARACTERISTICS OF A SUPERPROMPT CRITICAL, CONCENTRIC SHELL, PULSED REACTOR. IT COMPUTES SPECIFIC ENERGY, TEMPERATURE, PRESSURE, DENSITY AND VELOCITY VARIATIONS AS A FUNCTION OF TIME AND SPACE. THE CODE ALSO COMPUTES REACTIVITY AS A FUNCTION OF INVERSE REACTOR PERIOD, POWER, THE TOTAL AND KINETIC ENERGIES, AND THE POSITION OF THE SHELLS WHICH COMPRISE THE SYSTEM.

174 FORE/FORE2 FORE CALCULATES REACTOR POWER AND TEMPERATURES OF FUEL, COOLANT, CLAD, AND STRUCTURE AS FUNCTIONS OF TIME IN RESPONSE TO A PROGRAMMED REACTIVITY INSERTION SPECIFIED AS A SERIES OF RAMPS. TEMPERATURE PROFILES ARE COMPUTED AT SPECIFIED AXIAL POSITIONS FOR AN AVERAGE CHANNEL AND FOR THE PEAK POWER (CENTRAL) CHANNEL. THE HEAT OF FUSION ACCOMPANYING FUEL MELTING IS TAKEN INTO ACCOUNT. FEEDBACK REACTIVITY MECHANISMS THAT RESPOND TO CHANGES OF TEMPERATURES INCLUDE THE FUEL DOPPLER EFFECT AND THERMAL EXPANSION OF THE CORE (AND AXIAL BLANKET OR REFLECTOR) MATERIALS. FORE2 IS A COUPLED THERMAL HYDRAULICS-POINT KINETICS DIGITAL COMPUTER CODE DESIGNED TO CALCULATE SIGNIFICANT REACTOR PARAMETERS UNDER STEADY-STATE CONDITIONS, OR AS FUNCTIONS OF TIME DURING TRANSIENTS. THE TRANSIENTS MAY RESULT FROM A PROGRAMMED REACTIVITY INSERTION OR A POWER CHANGE. VARIABLE INLET COOLANT FLOW RATE AND TEMPERATURE ARE CONSIDERED. THE CODE CALCULATES THE REACTOR POWER, THE INDIVIDUAL REACTIVITY FEEDBACKS, AND THE TEMPERATURE OF COOLANT, CLADDING, FUEL, STRUCTURE,

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AND ADDITIONAL MATERIAL FOR UP TO SEVEN AXIAL POSITIONS IN THREE CHANNEL TYPES WHICH REPRESENT RADIAL ZONES OF THE REACTOR. THE HEAT OF FUSION ACCOMPANYING FUEL MELTING, THE LIQUID METAL VOIDING REACTIVITY, AND THE SPATIAL AND THE TIME VARIATION OF THE FUEL CLADDING GAP COEFFICIENT DUE TO CHANGES IN GAP SIZE ARE CONSIDERED.

191 AX-TNT

AX-TNT SOLVES

- (A) THE COUPLED HYDRODYNAMIC, THERMODYNAMIC AND NEUTRONIC EQUATIONS WHICH DESCRIBE A SPHERICAL, SUPER-PROMPT CRITICAL REACTOR SYSTEM DURING AN EXCURSION,
- (B) THE COUPLED EQUATIONS OF MOTION, AND IDEAL GAS EQUATION OF STATE FOR THE DETONATION OF A SPHERICAL CHARGE IN A GAS.

274 WIGL2

WIGL2 IS A ONE-DIMENSIONAL TWO-GROUP SPACE-TIME DIFFUSION THEORY PROGRAM WITH ZERO, ONE, OR SIX DELAYED NEUTRON GROUPS. THE PROGRAM WILL TREAT SLAB, CYLINDRICAL, AND SPHERICAL GEOMETRIES AND INCLUDES NON-BOILING HEAT TRANSFER. IT ACCOUNTS FOR XENON FEEDBACK AND FEEDBACK EFFECTS DUE TO FUEL AND COOLANT TEMPERATURE. CONTROL ROD MOTION AND CONTROL SYSTEM FEEDBACK BASED ON TOTAL CORE POWER OR OUTLET COOLANT TEMPERATURE CAN BE SIMULATED. TRANSIENTS MAY BE EXCITED BY PRESCRIBED CHANGES IN INLET COOLANT TEMPERATURE, COOLANT FLOW RATE, OR ROD POSITION.

293 MARS

MARS PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION FOR A FINITE CYLINDER CORE WITH CONCENTRIC REGIONS OF DIFFERENT COMPOSITIONS AND CHARACTERISTICS TO OBTAIN THE TIME-DEPENDENT ENERGY RELEASE THAT RESULTS FROM THE INSERTION OF REACTIVITY ACCORDING TO A PRESCRIBED PROGRAM. THE BASIC USE FOR THIS PROGRAM IS FOUND IN ANALYSIS OF FAST REACTOR CORE COLLAPSE ACCIDENTS. THE REACTIVITY CHANGES DUE TO MATERIAL DISPLACEMENT IS DETERMINED BY THE USE OF PERTURBATION THEORY AND THE PRESSURE GENERATION FOR THE HYDRODYNAMICS CALCULATION IS DETERMINED BY THE THE USE OF AN EXPONENTIAL FORM FOR THE SATURATED VAPOR PRESSURE CURVE. THE DOPPLER EFFECT IS DETERMINED BY THE USE OF A FLEXIBLE $T^{*(-N)}$ FORM WHERE N IS A PARAMETER THAT IS SPECIFIED AT THE TIME OF EXECUTION. THE EXTERNAL REACTIVITY INSERTION CAN BE IN THE FORM OF A STEP, A LINEAR RAMP OR A PARABOLIC RAMP, WITH A LIMIT ON THE AMOUNT OF REACTIVITY WHICH CAN BE INSERTED BEING A DEFINABLE QUANTITY. TABULATED VALUES OF THE POWER AND MATERIAL WORTH DISTRIBUTIONS ARE ACCEPTED AS INPUT. THE CHARACTERISTICS OF EACH REGION (DENSITY, SPECIFIC HEAT, DOPPLER COEFFICIENT, EQUATION OF STATE, GEOMETRIC LIMITS) ARE SPECIFIED INDEPENDENTLY FOR EACH REGION TO PROVIDE FLEXIBILITY IN THE TREATMENT OF CORES OF UNUSUAL CONFIGURATION. THE NEUTRON KINETICS CALCULATIONS ARE DONE WITH A POINT REACTOR MODEL AND DELAYED NEUTRONS ARE USED.

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309 TSN THE TIME-DEPENDENT NEUTRON TRANSPORT EQUATION IS SOLVED. ENERGY DEPOSITION IS ALLOWED TO CAUSE VARIATION IN THE NEUTRON CROSS SECTIONS FOR THE CORE REGION, IN THE CORE DENSITY, AND IN CORE HEIGHT. THE RESULT IS A KINETICS CALCULATION INCLUDING SPATIAL DEPENDENCE BOTH IN FEEDBACK EFFECTS AND IN NEUTRON DENSITY. THE RESULTS ARE SUMMARIZED IN A MANNER SIMILAR TO POINT-KINETICS CODES, AND SPATIAL DISTRIBUTIONS ARE ALSO GIVEN. GRAPHICAL SUMMARIES OF THE SIGNIFICANT VARIABLES AND SPATIAL DISTRIBUTIONS ARE GIVEN. IN THE IBM360 VERSION, EITHER THE NEUTRON YIELD FROM FISSION OR THE THICKNESS OF A SPECIFIED ZONE CAN BE CHANGED AS AN INDEPENDENT FUNCTION OF TIME AS SPECIFIED BY THE USER. THIS PROVIDES TWO WAYS OF ALLOWING EXPLICIT REACTIVITY VARIATION WITH TIME.

310 GAKIN2 GAKIN2 SOLVES THE TIME-DEPENDENT MULTIGROUP NEUTRON DIFFUSION EQUATIONS IN ONE SPACE DIMENSION.

338 TWIGL/TWIGGLE TWIGL SOLVES THE TWO-DIMENSIONAL, TWO-GROUP, SPACE-TIME NEUTRON DIFFUSION EQUATIONS IN RECTANGULAR OR CYLINDRICAL GEOMETRY IN THE PRESENCE OF TEMPERATURE FEEDBACK. THE NEUTRON DIFFUSION AND DELAYED PRECURSOR EQUATIONS ARE DIFFERENCED IN BOTH SPACE AND TIME. THE THERMAL-HYDRAULIC DESCRIPTION IS BASED ON A NO-BOILING, ONE-PASS MODEL FORMULATED IN TERMS OF REGIONWISE-AVERAGED COOLANT AND FUEL METAL TEMPERATURES.

352 RAUMZEIT RAUMZEIT SOLVES SYSTEMS OF ONE-DIMENSIONAL, TIME-DEPENDENT, MULTIGROUP DIFFUSION-TYPE EQUATIONS USING EITHER OF TWO TREATMENTS OF THE TIME DEPENDENCE, FINITE DIFFERENCING OR THE TIME-INTEGRATED APPROACH (SEE REFERENCE 2).

370 GAKIT GAKIT SOLVES THE MULTIGROUP, ONE-DIMENSIONAL, TIME-DEPENDENT DIFFUSION THEORY KINETICS EQUATIONS INCLUDING DELAYED NEUTRON EFFECTS AND TEMPERATURE FEEDBACK BASED ON TWO-DIMENSIONAL HEAT TRANSFER CALCULATIONS. FOR THE ONE-DIMENSIONAL MULTIGROUP KINETICS EQUATIONS AN ARBITRARY SCATTERING MATRIX AND ARBITRARY FISSION TRANSFER ARE ALLOWED, AND PLANE, CYLINDRICAL, OR SPHERICAL GEOMETRY CAN BE USED. A PIECEWISE LINEAR TIME-DEPENDENT INHOMOGENEOUS SOURCE CAN BE SPECIFIED. FEEDBACK IS AVAILABLE FROM XENON BUILDUP AND TEMPERATURE DEPENDENCE OF CROSS SECTIONS. THE HEAT TRANSFER CALCULATION IS PERFORMED FOR TWO-DIMENSIONAL R-Z FUEL ELEMENT MODELS ASSUMING PRE-DETERMINED AXIAL POWER SHAPE FUNCTIONS AND TIME-DEPENDENT POWER AMPLITUDES OBTAINED FROM THE ONE-DIMENSIONAL KINETICS CALCULATIONS. FOR THE FUEL ELEMENTS AVERAGE FUEL AND MODERATOR TEMPERATURES ARE CALCULATED WHICH DETERMINE, BASED ON TABLES, THE TEMPERATURE-DEPENDENT CROSS SECTIONS. TRANSIENTS MAY BE INTRODUCED

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BY STEP CHANGES OF CROSS SECTIONS, BY PIECEWISE LINEAR TIME-DEPENDENT CROSS SECTIONS (ROD WITHDRAWAL ACCIDENTS), BY STEP CHANGES OF THE FLOW RATES OR BY STEP CHANGES OF THE COOLANT INLET TEMPERATURES.

371 NOWIG NOWIG IS USED TO SOLVE THE ONE-DIMENSIONAL TWO-GROUP NEUTRON DIFFUSION AND DELAYED PRE-CURSOR EQUATIONS USING A SHAPE-SPECIFIED POINT KINETICS APPROXIMATION. FEEDBACK DUE TO CHANGES IN THE FUEL METAL TEMPERATURE AND COOLANT DENSITY IS ACCOUNTED FOR BY USING A MODEL WHICH IS IDENTICAL WITH THAT USED IN THE WIGL2 (ACC ABSTRACT 274) PROGRAM.

389 STINT3 STINT3 SOLVES STATIC (EIGEN-VALUE) AND TIME-DEPENDENT SYSTEMS OF COUPLED, ONE-DIMENSIONAL, DIFFUSION TYPE EQUATIONS IN SLAB GEOMETRY AND IS PRIMARILY INTENDED FOR SOLVING SINGLE-CHANNEL, FLUX-SYNTHESIS EQUATIONS. THE CODE PROVIDES FOR CONTROL ROD MOTION AND TEMPERATURE FEEDBACK.

400 SASIA SASIA IS USED FOR THE ANALYSIS OF FAST REACTOR POWER AND FLOW TRANSIENTS. THE PROGRAM CONSISTS OF FOUR DRIVER PROGRAMS EACH CALLED BY THE MAIN PROGRAM. THESE DRIVERS HANDLE THE AREAS OF (1) INPUT/OUTPUT, WITH DIAGNOSTICS, (2) STEADY-STATE INITIALIZATION, TO DEFINE THE CORE OPERATING CONDITIONS BEFORE THE INITIATION OF THE TRANSIENT, (3) THE TRANSIENT PORTION, AND (4) THE DISASSEMBLY (WEAK EXPLOSION) ANALYSIS.

405 NOAH NOAH SOLVES THE ONE-DIMENSIONAL, ONE-GROUP SPACE-TIME DIFFUSION EQUATION ACCOUNTING FOR THE EFFECTS OF FUEL, CLAD, AND COOLANT TEMPERATURES (OR BY CHANGING SUBROUTINES FUEL, COOLANT, AND SOLID MODERATOR TEMPERATURES) ON FISSION AND ABSORPTION CROSS SECTIONS, AND ON THE DIFFUSION COEFFICIENT AND THE TRANSVERSE BUCKLING. IT CAN ACCOUNT FOR THE EFFECTS OF XENON-IODINE FEEDBACK. IF DESIRED, IT WILL DETERMINE LONG-TIME XENON-FLUX BEHAVIOR ASSUMING THE TEMPERATURES TO BE IN QUASI-STATIC EQUILIBRIUM. NUMEROUS METHODS OF PERTURBATION ARE ALLOWED AND CONTROL OF THE TRANSIENT IS ALSO PROVIDED.

415 CEXE/INCEXE CEXE SOLVES THE THREE-DIMENSIONAL XYZ TIME-DEPENDENT XENON SPATIAL OSCILLATION PROBLEM USING A MODIFIED ONE ENERGY GROUP THEORY AND A NODAL REPRESENTATION.

474 QX1 QX1 SOLVES THE MULTIGROUP, ONE-DIMENSIONAL, TIME-DEPENDENT DIFFUSION EQUATIONS. PROBLEM GEOMETRY MAY BE PLANE, CYLINDRICAL, OR SPHERICAL. STEADY-STATE INITIAL CONDITIONS MAY BE ESTABLISHED EITHER FOR A SOURCE-FREE

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SYSTEM OR FOR A SYSTEM WITH AN EXTERNAL NEUTRON SOURCE. THE REACTOR MAY BE PERTURBED BY CHANGING MATERIAL VOLUME FRACTIONS AND/OR TEMPERATURES OR BY CHANGING THE NEUTRON SOURCE LEVEL. A FIRST-COLLISION PULSED SOURCE DISTRIBUTION MAY BE SPECIFIED. RESONANCE ABSORPTION FEEDBACK IS CALCULATED BY GROUPWISE INTERPOLATION IN A CROSS-SECTION VERSUS TEMPERATURE TABLE. A HIGHLY SIMPLIFIED FUEL TEMPERATURE MODEL IS INCLUDED.

488 NOISY1 AUTO- AND CROSS-SPECTRAL DENSITY FUNCTIONS ARE CALCULATED FOR NEUTRON FLUCTUATIONS IN NUCLEAR REACTORS. THE CALCULATIONS ARE POINT-WISE, SPACE-DEPENDENT IN CUBICAL REACTORS WHICH ARE HOMOGENEOUS AND BARE. EITHER NEUTRON FLUCTUATIONS OR THE FLUCTUATIONS SEEN BY A NEUTRON DETECTOR CAN BE SPECIFIED. FLUCTUATIONS BETWEEN EITHER TWO POINTS OR BETWEEN TWO FINITE REGIONS CAN BE CONSIDERED. THE FINITE REGIONS OR SIMULATED DETECTORS MUST EITHER FULLY OVERLAP OR NOT OVERLAP AND ARE RESTRICTED IN SHAPE TO RECTANGULAR PARALLELEPIPEDS.

494 ADEP THE TIME-DEPENDENT FEW-GROUP NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN ONE OR TWO DIMENSIONS. LUMPED PARAMETER THERMAL-HYDRAULIC EQUATIONS ARE USED TO CALCULATE FEEDBACK.

511 VENUS VENUS COMPUTES THE POWER, ENERGY RELEASE AND SPACE-TIME (R-Z GEOMETRY) HISTORY OF THE TEMPERATURE, PRESSURE, DENSITY AND MATERIAL MOTION OF AN LMFBR DURING A DISASSEMBLY EXCURSION. REACTIVITY FEEDBACK DUE TO DOPPLER BROADENING AND MOTION OF THE REACTOR MATERIAL IS TAKEN INTO ACCOUNT.

550 REXCO-H (RELEASE 1) REXCO-H CALCULATES THE TWO-DIMENSIONAL HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT TO A HIGH-ENERGY EXCURSION.

615 REXCO-H (RELEASE 2) REXCO-H CALCULATES THE TWO-DIMENSIONAL HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT TO A HIGH-ENERGY EXCURSION.

700 MELT3 MELT3 IS A MULTICHANNEL, NEUTRONICS, THERMAL-HYDRAULICS DIGITAL COMPUTER PROGRAM DEVELOPED TO INVESTIGATE THE TRANSIENT BEHAVIOR OF A FAST REACTOR DURING POSTULATED TRANSIENT OVERPOWER CONDITIONS. REACTIVITY FEEDBACK RESULTING FROM DOPPLER BROADENING, COOLANT DENSITY CHANGE AND EXPULSION, BULK CORE EXPANSION, AND FUEL MOVEMENT ARE EXPLICITLY TAKEN INTO ACCOUNT. THE BULK OF THE MODELING DETAIL HAS BEEN

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ADDRESSED TO THE IN-VESSEL PORTION OF THE REACTOR PLANT, ALTHOUGH THE FRICTION AND INERTIAL ASPECTS OF UP TO THREE SEPARATE CLOSED PRIMARY LOOPS CAN BE SIMULATED. A WIDE VARIETY OF ACCIDENT CONDITIONS MAY BE INVESTIGATED. PARTICULAR MODELING EMPHASIS HAS, HOWEVER, BEEN PLACED ON THE SIMULATION CAPABILITIES REQUIRED FOR AN UNPROTECTED TRANSIENT OVERPOWER ACCIDENT SEQUENCE.

708 WIGL3 WIGL3 IS A PROGRAM FOR THE STEADY-STATE AND TRANSIENT SOLUTION OF THE ONE-DIMENSIONAL, TWO-GROUP, SPACE-TIME DIFFUSION EQUATIONS. THE PROGRAM WILL TREAT SLAB, CYLINDRICAL, AND SPHERICAL GEOMETRIES AND INCLUDES NON-BOILING HEAT TRANSFER. CONTROL ROD MOTION AND CONTROL SYSTEM FEEDBACK BASED ON TOTAL CORE POWER OR OUTLET COOLANT TEMPERATURE CAN BE SIMULATED. TRANSIENTS MAY BE EXCITED BY PRESCRIBED CHANGES IN INLET COOLANT TEMPERATURE, COOLANT FLOW RATE, OR ROD POSITION. FOR THE STEADY-STATE OPTION, CRITICALITY MAY BE ACHIEVED BY ADJUSTING CONTROL ROD POSITION, REFERENCE COOLANT DENSITY, OR REFERENCE FUEL TEMPERATURE.

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47 CLOUD THE CLOUD PROGRAM CALCULATES THE EXTERNAL GAMMA-RAY DOSE RATE AND TOTAL INTEGRATED DOSE RESULTING FROM THE CONTINUOUS RELEASE OF RADIOACTIVE MATERIALS TO THE ATMOSPHERE.

172 AISITE2/R153 AISITE2 IS LARGELY BASED ON METHODS PROPOSED BY THE AEC IN TID-14844 BUT DIFFERS IN CERTAIN OF THE ASSUMPTIONS AND MODELS. THE CODE AUTOMATICALLY VARIES ANY ONE OF 46 PARAMETERS SUCH AS REACTOR POWER, BUILDING LEAK RATE, IODINE CLEAN-UP RATE, AND HALOGEN FILTER EFFICIENCY, COMPUTING THE EXCLUSION AREA, AND LOW POPULATION BOUNDARY ZONES AS FUNCTIONS OF THAT PARAMETER. THE EDIT INCLUDES DOSE VS. DISTANCE DATA, FRACTIONAL CONTRIBUTION BY ISOTOPE GROUP TO THE INHALATION DOSE, AND CRITICAL DISTANCES PROVIDING BOTH PRINTED AND GRAPHICAL DATA. THREE MODELS ARE AVAILABLE FOR FISSION PRODUCT RELEASE WITH UP TO 4 LEVELS OF CONTAINMENT.

196 CURIE/DOSE/THUNDERHEAD CURIE CALCULATES THE FISSION PRODUCT INVENTORY PRODUCED IN A REACTOR DURING CONSTANT POWER OPERATION AND RELEASES DIFFERENT PERCENTAGES OF THE NOBLE GASES, HALOGENS, AND PARTICULATES TO THE ATMOSPHERE AT REACTOR SHUTDOWN. DOSE CALCULATES THE TOTAL DOSE TO 13 INTERNAL BODY ORGANS RESULTING FROM INHALATION OF THE PASSING RADIOACTIVE CLOUD. THUNDERHEAD CALCULATES THE EXTERNAL CLOUD GAMMA EXPOSURE DOSE FROM THE RELEASED FISSION PRODUCTS.

200 SATURATED BLOWDOWN2 CALCULATION OF LOCAL PRESSURES, MASS FLOW RATES, FLUID QUALITIES, SPECIFIC VOLUMES, TEMPERATURES AND LOCAL HEAT TRANSFER COEFFICIENTS AT WETTED WALLS, DURING BLOWDOWN OF THE REACTOR PRIMARY COOLANT LOOP.

228 PRECON THE PURPOSE OF THE PROGRAM IS TO DETERMINE, FOR A GAS-COOLED REACTOR, THE CONTAINMENT PRESSURE AS A FUNCTION OF TIME, AFTER RUPTURES HAVE BEEN ASSUMED TO OCCUR IN THE PRIMARY SYSTEM OR IN CONJUNCTION WITH STEAM GENERATOR RUPTURES.

229 ELBOW DEFLECTIONS, RESTRAINT FORCES AND STRESSES ARE DETERMINED IN A FUEL ELEMENT SUBJECTED TO ASYMMETRIC POWER GENERATION, CIRCUMFERENTIALLY NON-UNIFORM COOLANT TEMPERATURE DISTRIBUTION, AND ASYMMETRIC FAST NEUTRON FLUX DAMAGE.

261 GADOSE/DOSET THE GADOSE PROGRAM CALCULATES RADIOACTIVITY AND DOSES RESULTING FROM INSTANTANEOUS ACCIDENTAL RELEASE OF ACTIVITY WHILE THE COMPANION PROGRAM DOSET INCLUDES THE EFFECTS OF A TIME-DEPENDENT ACCIDENTAL FISSION PRODUCT RELEASE FOR

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THE HTGR TYPE OF PLANT. GIVEN AN INITIAL FISSION PRODUCT INVENTORY RELEASED INTO A REACTOR VESSEL OR CONTAINMENT VOLUME, THE QUANTITY OF EACH ISOTOPE IS CALCULATED AT A NUMBER OF TIMES AT A NUMBER OF LOCATIONS (IN THE CONTAINMENT, CONTAINMENT RECIRCULATING CLEANUP FILTERS, LEAK COLLECTOR, PLANT EXHAUST FILTERS AND IN THE ATMOSPHERE AT A NUMBER OF DISTANCES FROM THE PLANT). EACH DECAY CHAIN IS CALCULATED SEPARATELY CONSIDERING BUILDUP AND DECAY OF EACH ISOTOPE. RADIOLOGICAL DOSES ARE CALCULATED FOR ANY THREE BODY ORGANS AND THE WHOLE BODY BASED ON METEOROLOGICAL AND PHYSIOLOGICAL INPUT PARAMETERS. FALLOUT AND RAINOUT ARE INCLUDED.

265 RSAC RSAC GENERATES A FISSION PRODUCT INVENTORY FROM A GIVEN SET OF REACTOR OPERATING CONDITIONS AND THEN COMPUTES THE EXTERNAL GAMMA DOSE, THE DEPOSITION GAMMA DOSE, AND/OR THE INHALATION-INGESTION DOSE TO CRITICAL BODY ORGANS AS A RESULT OF EXPOSURE TO THESE FISSION PRODUCTS. PROGRAM OUTPUT INCLUDES REACTOR OPERATING HISTORY, FISSION PRODUCT INVENTORY, DOSAGES, AND INGESTION PARAMETERS.

268 TRANS-FUGUEL TRANS-FUGUEL IS A TRANSIENT SINGLE CHANNEL, TWO-PHASE FLOW, AND HEAT TRANSFER CODE FOR ANALYSIS OF POSTULATED REACTOR INCIDENTS INVOLVING BOILING. THE CODE IS BASED ON A HOMOGENEOUS HYDRODYNAMIC MODEL WHICH ASSUMES EQUAL PHASE TEMPERATURES AND VELOCITIES. IT ASSUMES VAPOR GENERATION TO BE HEAT TRANSFER LIMITED ONLY, AND CALCULATES AXIAL DISTRIBUTION OF VELOCITY, VOID FRACTION, PRESSURE, COOLANT TEMPERATURE, AND FUEL TEMPERATURE. TRANSIENTS SIMULATING POWER EXCURSIONS, LOSS OF FLOW, LOSS OF PRESSURE AND CHANNEL PLUGGING CAN BE STUDIED.

278 WHAM6 WHAM6 IS USED TO CALCULATE PRESSURE, VELOCITY, AND FORCE TRANSIENTS IN LIQUID-FILLED PIPING NETWORKS. IT CAN BE APPLIED TO MULTILoop COMPLEX PIPING NETWORKS CONSISTING OF DEAD ENDS, ELBOWS, ORIFICES, MULTIPLE-BRANCH TEES, CHANGES OF FLOW PASSAGE CROSS SECTION, CHECK VALVES, PUMPS, PRESSURIZERS OR TANKS, AND EXIT VALVES OR BREAKS. HYDRAULIC LOSSES ARE CONSIDERED. TRANSIENTS CAN BE INITIATED EITHER BY CLOSURE OR OPENING OF ONE OR MORE EXIT VALVES (EQUIVALENT TO SYSTEM RUPTURES) OR BY A PRESCRIBED GAS PRESSURE HISTORY IN A PRESSURIZER TANK.

284 M0555(ACT1) THIS PROGRAM WILL PREDICT THE PRESSURE TRANSIENT IN THE CONTAINMENT VESSEL AS A FUNCTION OF TIME AS A RESULT OF A MAJOR RUPTURE IN THE PRIMARY SYSTEM OF A PRESSURIZED WATER REACTOR. MEANS ARE AVAILABLE FOR INTRODUCING WATER AND HEAT INTO THE CONTAINMENT VESSEL. THERE ARE ALSO PROVISIONS FOR SPECIFYING VARIOUS TYPES OF HEAT SINKS FOR ENERGY ABSORPTION. THE TEMPERATURE DISTRIBUTION IN THESE HEAT SINKS IS CALCULATED AS A FUNCTION OF TIME. DISCHARGE RATES OF THE CONTAINMENT MAY ALSO

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BE DETERMINED AS A FUNCTION OF BOTH TIME AND THE INTERNAL PRESSURE.

295 FLASH3 FLASH3 DETERMINES THE TRANSIENT RESPONSE OF A WATER-COOLED REACTOR TO A LOSS-OF-COOLANT ACCIDENT OR SEVERE VARIABLE PRESSURE OPERATION.

328 NURLOC-1.0 NURLOC-1.0 PERFORMS CORE/PRESSURE VESSEL THERMAL ANALYSIS FOR A NUCLEAR REACTOR LOSS-OF-COOLANT ACCIDENT.

330 ECCSA4 ECCSA4 PREDICTS THE THERMAL AND HYDRAULIC BEHAVIOR OF A SINGLE FUEL ROD AND ITS ASSOCIATED CORE FLOW CHANNEL DURING A LOSS-OF-COOLANT ACCIDENT AND SUBSEQUENT EMERGENCY CORE COOLING INJECTION.

366 CHEMLOC2 CHEMLOC2 IS USED TO COMPUTE THE EXTENT OF CORE HEATING AND METAL-STEAM REACTION FOLLOWING A HYPOTHETICAL LOSS-OF-COOLANT ACCIDENT, INCLUDING EMERGENCY CORE-COOLING FAILURE, IN A WATER-COOLED REACTOR. THE PROGRAM INCLUDES THE EFFECTS OF HEAT PRODUCTION BY DECAY HEATING IN THE FUEL AS WELL AS BY STEAM-METAL CHEMICAL REACTION, HEAT TRANSFER FROM THE CORE TO THE BOTTOM AND TOP GRID-SUPPORT PLATES AND TO THE WALL SURROUNDING THE CORE, AND METHODS OF CALCULATING THE EFFECTS OF CORE MOVEMENT AND MATERIAL TRANSFER ON REACHING SLUMPING TEMPERATURE.

369 RELAP4/MOD5 RELAP4 HAS BEEN DEVELOPED TO DESCRIBE THE BEHAVIOR OF WATER-COOLED NUCLEAR REACTORS SUBJECTED TO POSTULATED TRANSIENTS, SUCH AS THOSE RESULTING FROM LOSS-OF-COOLANT, PUMP FAILURE, OR POWER EXCURSIONS. THE PROGRAM CALCULATES FLUID CONDITIONS SUCH AS FLOW, PRESSURE, MASS INVENTORY, AND QUALITY; THERMAL CONDITIONS SUCH AS SURFACE TEMPERATURES, TEMPERATURE PROFILES, AND ENERGY DISTRIBUTIONS; AND HEAT FLUXES IN POWER GENERATING AND DISSIPATING ELEMENTS. THE PROGRAM ALSO CALCULATES REACTOR POWER, DECAY HEAT, AND REACTIVITY. IN ADDITION TO DESCRIBING TRANSIENTS IN BOILING-WATER AND PRESSURIZED-WATER REACTORS, THE PROGRAM IS SUFFICIENTLY VERSATILE TO DESCRIBE TRANSIENTS IN EXPERIMENTAL THERMAL-HYDRAULIC SYSTEMS.

433 CONTEMPT-LT/026 CONTEMPT-LT WAS DEVELOPED TO PREDICT THE LONG-TERM BEHAVIOR OF WATER-COOLED NUCLEAR REACTOR CONTAINMENT SYSTEMS SUBJECTED TO POSTULATED LOSS-OF-COOLANT ACCIDENT (LOCA) CONDITIONS. CONTEMPT-LT CALCULATES THE TIME VARIATION OF COMPARTMENT PRESSURES, TEMPERATURES, MASS AND ENERGY INVENTORIES, HEAT STRUCTURE TEMPERATURE DISTRIBUTIONS, AND ENERGY EX-

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CHANGE WITH ADJACENT COMPARTMENTS. THE PROGRAM IS CAPABLE OF DESCRIBING THE EFFECTS OF PENETRATION AND SMALL CRACK LEAKAGE ON CONTAINMENT RESPONSE. MODELS ARE PROVIDED FOR FAN COOLER AND COOLING SPRAY ENGINEERED SAFETY SYSTEMS. ONE TO FOUR COMPARTMENTS CAN BE MODELED, AND ANY COMPARTMENT EXCEPT THE REACTOR SYSTEM MAY HAVE BOTH A LIQUID POOL REGION AND A VAPOR ATMOSPHERE REGION ABOVE THE POOL. EACH REGION IS ASSUMED TO HAVE A UNIFORM TEMPERATURE, BUT THE TWO REGIONS MAY BE DIFFERENT. THE USER DETERMINES THE COMPARTMENTS TO BE USED, SPECIFIES INPUT MASS AND ENERGY ADDITIONS, DEFINES HEAT STRUCTURE AND LEAKAGE SYSTEMS, AND PRESCRIBES THE TIME ADVANCEMENT AND OUTPUT OPTIONS.

435 BURST1 BURST1 PROVIDES FOR THE STUDY OF PRESSURIZED LIQUID IN A CYLINDRICAL SYSTEM IMMEDIATELY AFTER A RUPTURE OCCURS AT ONE OR BOTH ENDS OF THE SYSTEM. PRESSURE, MASS VELOCITY, AND ENTHALPY ARE CALCULATED AT EQUALLY-SPACED MESH POINTS ALONG THE LENGTH OF THE SYSTEM. THIS IS A ONE-DIMENSIONAL REPRESENTATION, ASSUMING UNIFORM CONDITIONS THROUGHOUT ANY GIVEN CROSS-SECTIONAL AREA. FORCES ON DESIGNATED SECTIONS OF THE SYSTEM CAN ALSO BE COMPUTED, WITH PROVISION FOR DIRECTIONAL CHANGES.

443 HAA3B HAA3B WAS WRITTEN TO PROVIDE AN ENGINEERING METHOD FOR CALCULATING HETEROGENEOUS AEROSOL BEHAVIOR AND TRANSPORT FOLLOWING VARIOUS HYPOTHETICAL LMFBR ACCIDENTS. HAA3B EVALUATES AN APPROXIMATION TO THE GENERAL INTEGRO-DIFFERENTIAL EQUATION WHICH DESCRIBES AEROSOL BEHAVIOR. THE PHYSICAL MODEL INCLUDES PARTICLE GENERATION, BROWNIAN AND GRAVITATIONAL AGGLOMERATION, SETTLING, PLATING, AND LEAKAGE FOR SPHERICAL PARTICLES. THE APPROXIMATION IS THE REQUIREMENT THAT THE SIZE DISTRIBUTION FUNCTION BE LOGNORMAL.

448 FLASH6/FLASH4 FLASH6 AND EARLIER FLASH PROGRAMS ARE USED TO DETERMINE THE TRANSIENT RESPONSE OF A WATER-COOLED REACTOR OR HYDRAULIC SYSTEM TO SEVERE VARIABLE PRESSURE OPERATION. AS WITH PREVIOUS EDITIONS, FLASH6 PERMITS THE USER TO MODEL THE REACTOR PLANT USING A FLEXIBLE COMBINATION OF CONTROL VOLUMES (NODES), CONNECTING FLOW PATHS, PUMPS, AND STEAM GENERATORS. A DETAILED REPRESENTATION OF THE CORE REGION MAY BE OBTAINED BY USING UP TO 80 PRESSURE-DETERMINING NODES WITHIN THE CORE. THE CORE NODES ARE CONNECTED IN ONE-DIMENSIONAL CHAINS TO REPRESENT UP TO 20 CORE FLOW PATHS. A ONE-DIMENSIONAL HEAT CONDUCTION MODEL WITH UP TO FIVE RADIAL NODES IS USED TO REPRESENT THE FLOW OF HEAT FROM THE FUEL ELEMENT TO EACH CORE FLUID NODE. THERMAL RESISTANCE OF THE FUEL-CLAD GAP IS CONTINUOUSLY CALCULATED DURING THE TRANSIENT AS A FUNCTION OF VARYING GAP DIMENSION, TEMPERATURE, AND PRESSURE. THIRTY NODES AND 60 FLOW PATHS ARE AVAILABLE TO MODEL THE NON-CORE REGIONS OF THE PLANT.

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479 FREADM1 FREADM1 IS A FAST REACTOR MULTICHANNEL ACCIDENT ANALYSIS PROGRAM DESIGNED TO EFFICIENTLY SIMULATE A REACTOR TRANSIENT FROM INITIATION TO THE POINT OF CORE DISASSEMBLY. MODELS ARE INCLUDED FOR NUCLEAR KINETICS (POINT MODEL), CORE THERMO-HYDRAULICS, VOIDING, FUEL REDISTRIBUTION, FAILURE PROPAGATION, PROGRAMMED REACTIVITY INSERTION, AND THE DYNAMICS OF PRIMARY SYSTEM COOLANT FLOW. A BROAD RANGE OF ASSUMED ACCIDENT INITIATING AND PROPAGATING ACTIVITIES MAY BE SIMULATED USING TRIGGERING LOGIC INCLUDED IN THE CODE.

499 MIRAB/MIRAP THE CODE MIRAB IS USED FOR BWR REACTORS AND MIRAP IS FOR PWR REACTORS. THE CODES CALCULATE THE REMOVAL OF FISSION PRODUCT IODINE FROM A DRY-TYPE BWR/PWR CONTAINMENT SYSTEM ATMOSPHERE UNDER REACTOR ACCIDENT CONDITIONS. THE METHOD CONSIDERS THE SIMULTANEOUS REMOVAL BY NATURAL DEPOSITION ON SURFACES OR ABSORPTION IN WATER, BY ENGINEERED SPRAY SYSTEM OPERATION, BY ADSORPTION ON FILTERS, AND BY LEAKAGE FROM THE CONTAINMENT. IN ADDITION, THE SIMULTANEOUS BEHAVIOR OF THREE IODINE FORMS IS MODELED - SPECIFICALLY ELEMENTAL IODINE, METHYL IODINE, AND PARTICULATE IODINE. THE PROGRAMS GENERATE IODINE CONCENTRATIONS AND ACCUMULATIONS THROUGHOUT THE CONTAINMENT SYSTEM AS A FUNCTION OF TIME AFTER START OF THE ACCIDENT.

500 FRCRL2 THE CODE CALCULATES THE CUMULATIVE FRACTIONAL RELEASE OF FISSION PRODUCTS FROM NUCLEAR REACTOR FUEL UNDER POSTULATED LOSS-OF-COOLANT ACCIDENT CONDITIONS. THE MATHEMATICAL MODEL FOR RELEASE IS BASED ON SIMPLE VOLUME DIFFUSION THEORY AND THE EQUIVALENT-SPHERE APPROXIMATION OF FUEL POROSITY. BOTH THE OPERATIONAL PREACCIDENT RELEASE COMPONENT AND THE ACCIDENT CORE THERMAL TRANSIENT-INDUCED RELEASE COMPONENT ARE CALCULATED. DETAILED CORE TEMPERATURE DATA ARE NEEDED TO MAKE THE LATTER SET OF COMPUTATIONS. IN ADDITION, SPECIFIC CORE POWER DISTRIBUTION FACTORS AND FISSION PRODUCT DIFFUSION PARAMETERS MUST BE SUPPLIED.

508 MUCHA1/MUCHA2 MUCHA1 PREDICTS THE THERMAL AND HYDRAULIC BEHAVIOR OF ANY TWO REACTOR FUEL RODS AND THEIR ASSOCIATED PARALLEL FLOW CHANNELS DURING A LOSS-OF-COOLANT ACCIDENT USING AS BOUNDARY CONDITIONS PLENUM FLUID CONDITIONS DETERMINED BY MUCHA2 OR A SYSTEM-ORIENTED CODE. MUCHA2 PREDICTS THE THERMAL AND HYDRAULIC BEHAVIOR OF THE PRIMARY COOLANT WITHIN THE REACTOR PRESSURE VESSEL DURING A LOSS-OF-COOLANT ACCIDENT. THE HEATED CORE IS REPRESENTED BY TWO EQUIVALENT FUEL RODS AND THEIR ASSOCIATED PARALLEL FLOW CHANNELS. A PLENUM MODEL HAS BEEN DEVELOPED TO PREDICT THE UPPER AND LOWER PLENUM FLUID CONDITIONS THROUGHOUT THE ACCIDENT SEQUENCE FOR USE AS BOUNDARY CONDITIONS FOR THE PARALLEL CORE CHANNELS.

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512 THETA1B THETA1B COMPUTES THE THERMAL
RESPONSE CHARACTERISTICS OF A NUCLEAR FUEL ROD SUBJECTED TO A
LOSS-OF-COOLANT ACCIDENT ENVIRONMENT.

521 SOCOOL2 SOCOOL2 CALCULATES THE
TRANSIENT TEMPERATURES, PRESSURES, AND MECHANICAL WORK ENERGY
WHEN A MOLTEN MATERIAL IS INSTANTANEOUSLY AND UNIFORMLY DISPERSED
IN LIQUID SODIUM WHICH IS INITIALLY UNDER ACOUSTIC CONSTRAINT.

528 PREP/KITT THE PREP/KITT COMPUTER PROGRAM PACKAGE OBTAINS SYSTEM RELIABILITY INFORMATION FROM A SYSTEM FAULT TREE. THE PREP PROGRAM FINDS THE MINIMAL CUT SETS AND/OR THE MINIMAL PATH SETS OF THE SYSTEM FAULT TREE. (A MINIMAL CUT SET IS A SMALLEST SET OF COMPONENTS SUCH THAT IF ALL THE COMPONENTS ARE SIMULTANEOUSLY FAILED THE SYSTEM IS FAILED. A MINIMAL PATH SET IS A SMALLEST SET OF COMPONENTS SUCH THAT IF ALL OF THE COMPONENTS ARE SIMULTANEOUSLY FUNCTIONING THE SYSTEM IS FUNCTIONING.) THE KITT PROGRAMS DETERMINE RELIABILITY INFORMATION FOR THE COMPONENTS OF EACH MINIMAL CUT OR PATH SET, FOR EACH MINIMAL CUT OR PATH SET, AND FOR THE SYSTEM. EXACT, TIME-DEPENDENT RELIABILITY INFORMATION IS DETERMINED FOR EACH COMPONENT AND FOR EACH MINIMAL CUT SET OR PATH SET. FOR THE SYSTEM, RELIABILITY RESULTS ARE OBTAINED BY UPPER BOUND APPROXIMATIONS OR BY A BRACKETING PROCEDURE IN WHICH VARIOUS UPPER AND LOWER BOUNDS MAY BE OBTAINED AS CLOSE TO ONE ANOTHER AS DESIRED. THE KITT PROGRAMS CAN HANDLE INDEPENDENT COMPONENTS WHICH ARE NONREPAIRABLE OR WHICH HAVE A CONSTANT REPAIR TIME. ANY ASSORTMENT OF NONREPAIRABLE COMPONENTS AND COMPONENTS HAVING CONSTANT REPAIR TIMES CAN BE CONSIDERED. ANY INHIBIT CONDITIONS HAVING CONSTANT PROBABILITIES OF OCCURRENCE CAN BE HANDLED. THE FAILURE INTENSITY OF EACH COMPONENT IS ASSUMED TO BE CONSTANT WITH RESPECT TO TIME. THE KITT2 PROGRAM CAN ALSO HANDLE COMPONENTS WHICH DURING DIFFERENT TIME INTERVALS, CALLED PHASES, MAY HAVE DIFFERENT RELIABILITY PROPERTIES.

529 ANVENT THE ANVENT PROGRAM WAS DEVELOPED TO ANALYZE THERMAL EFFECTS OF A LOSS-OF-COOLANT ACCIDENT (LOCA) IN A WESTINGHOUSE ICE CONDENSER NUCLEAR UNIT, SIMILAR TO THE DUKE POWER COMPANY'S MCGUIRE UNITS. THE PROGRAM IS CAPABLE OF EVALUATING (1) STEADY-STATE RADIAL TEMPERATURE DISTRIBUTIONS CORRESPONDING TO FIXED INSIDE AND OUTSIDE TEMPERATURES, (2) RADIAL TEMPERATURE DISTRIBUTIONS IN THE STEEL CONTAINMENT SHELL AND THE CONCRETE REACTOR (SHIELD) BUILDING DURING THE POST-LOCA TRANSIENT, (3) TEMPERATURE AND PRESSURE IN THE ANNULUS BETWEEN THE CONTAINMENT SHELL AND REACTOR BUILDING DURING THE POST-LOCA TRANSIENT, AND (4) CAPABILITY OF THE ANNULUS VENTILATION FAN TO QUICKLY ATTAIN AND MAINTAIN A VACUUM IN THE ANNULUS AFTER A LOCA OCCURS.

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546 EMERALD REVISION 1 THE EMERALD PROGRAM IS DESIGNED FOR THE CALCULATION OF RADIATION RELEASES AND EXPOSURES RESULTING FROM ABNORMAL OPERATION OF A LARGE PRESSURIZED WATER REACTOR (PWR). THE APPROACH USED IN EMERALD IS SIMILAR TO AN ANALOG SIMULATION OF A REAL SYSTEM. EACH COMPONENT OR VOLUME IN THE PLANT WHICH CONTAINS A RADIOACTIVE MATERIAL IS REPRESENTED BY A SUBROUTINE WHICH KEEPS TRACK OF THE PRODUCTION, TRANSFER, DECAY AND ABSORPTION OF RADIOACTIVITY IN THAT VOLUME. DURING THE COURSE OF THE ANALYSIS OF AN ACCIDENT, ACTIVITY IS TRANSFERRED FROM SUBROUTINE TO SUBROUTINE IN THE PROGRAM AS IT WOULD BE TRANSFERRED FROM PLACE TO PLACE IN THE PLANT. FOR EXAMPLE, IN THE CALCULATION OF THE DOSES RESULTING FROM A LOSS-OF-COOLANT ACCIDENT THE PROGRAM FIRST CALCULATES THE ACTIVITY BUILT UP IN THE FUEL BEFORE THE ACCIDENT, THEN RELEASES SOME OF THIS ACTIVITY TO THE CONTAINMENT VOLUME. SOME OF THIS ACTIVITY IS THEN RELEASED TO THE ATMOSPHERE. THE RATES OF TRANSFER, LEAKAGE, PRODUCTION, CLEANUP, DECAY, AND RELEASE ARE READ IN AS INPUT TO THE PROGRAM. SUBROUTINES ARE ALSO INCLUDED WHICH CALCULATE THE ON-SITE AND OFF-SITE RADIATION EXPOSURES AT VARIOUS DISTANCES FOR INDIVIDUAL ISOTOPES AND SUMS OF ISOTOPES. THE PROGRAM CONTAINS A LIBRARY OF PHYSICAL DATA FOR THE TWENTY-FIVE ISOTOPES OF MOST INTEREST IN LICENSING CALCULATIONS, AND OTHER ISOTOPES CAN BE ADDED OR SUBSTITUTED. BECAUSE OF THE FLEXIBLE NATURE OF THE SIMULATION APPROACH, THE EMERALD PROGRAM CAN BE USED FOR MOST CALCULATIONS INVOLVING THE PRODUCTION AND RELEASE OF RADIOACTIVE MATERIALS DURING ABNORMAL OPERATION OF A PWR. THESE INCLUDE DESIGN, OPERATIONAL, AND LICENSING STUDIES.

548 CEBUG THE TRANSIENT HYDRAULIC BEHAVIOR OF THE SODIUM IN A SODIUM-HEATED STEAM GENERATOR IN WHICH A SODIUM-WATER REACTION OCCURS DUE TO A LARGE WATER LEAK IS CALCULATED FOR FLOWS IN UP TO THREE DIMENSIONS.

554 DISPER DISPER DETERMINES THE AEROSOL PARTICLE SOURCE STRENGTH OUTSIDE AN ENCLOSURE DUE TO A RELEASE OF AEROSOL PARTICLES WITHIN THE ENCLOSURE. THE RELEASE IS ASSUMED TO PRESSURIZE THE ENCLOSURE AND THE AIRBORNE PARTICLES ARE CARRIED BY THE ESCAPING GAS INTO LEAK PATHS IN THE ENCLOSURE WALLS. HERE, THEY MAY BE DEPOSITED ON THE LEAK PATH WALLS OR REMAIN ENTRAINED AND ESCAPE FROM THE ENCLOSURE.

555 PARET THIS PROGRAM IS DESIGNED FOR USE IN PREDICTING THE COURSE AND CONSEQUENCES OF NONDESTRUCTIVE REACTIVITY ACCIDENTS IN SMALL REACTOR CORES.

559 SOFIRE2 1- AND 2-CELL SOFIRE2 ONE CELL, CALCULATES THE CONSEQUENCES OF A SODIUM POOL FIRE IN A CLOSED VAULT. GAS PRESSURE IN THE VAULT IS CALCULATED FROM THE GAS DENSITY AND TEM-

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PERATURE. SOFIRE2 TWO CELL, CALCULATES THE CONSEQUENCES OF A SODIUM POOL FIRE IN A VAULT CONNECTED TO A CONTAINMENT STRUCTURE THROUGH A RESTRICTED OPENING. COLD GAS FLOWS FROM THE CONTAINMENT TO THE VAULT DUE TO MASS DIFFERENCES WHILE HOT GAS FLOWS FROM THE VAULT TO THE CONTAINMENT TO EQUILIBRATE PRESSURES. PRESSURE IN THE CONTAINMENT IS CALCULATED FROM THE GAS DENSITY AND TEMPERATURE. IN BOTH PROGRAMS THE SODIUM BURNING RATE IS GOVERNED BY THE RATE OF OXYGEN DIFFUSION TO THE SODIUM SURFACE.

583 STEFEG STEFEG CALCULATES GASEOUS SOURCE TERMS. IT COMPUTES THE GASEOUS RELEASES THROUGH VARIOUS PATHS FROM BOILING WATER REACTORS AND/OR PRESSURIZED WATER REACTORS.

584 FPFM FPFM IS USED IN RADIOLOGICAL SAFETY ANALYSES OF LINE REACTORS (BWR'S AND PWR'S ONLY) TO CALCULATE: (1) MAXIMUM NOBLE GAS RELEASE TO THE FUEL CLADDING GAP FOR TOTAL CORE DURING STEADY-STATE OPERATION, (2) NOBLE GAS RELEASED TO THE REACTOR PRIMARY SYSTEM FOR SELECTED PIN PERFORATIONS, AND (3) INTERNAL PIN PRESSURE (OPTIONAL).

590 INTEG/INSPEC THESE PROGRAMS ANALYZE THE CHARACTERISTICS OF A GENERAL MODEL DEVELOPED TO REPRESENT THE SAFETY ASPECTS OF AN OPERATING NUCLEAR REACTOR. THESE CHARACTERISTICS ARE THE FREQUENCIES OF INCIDENTS THAT ARE DEPARTURES FROM THE EXPECTED BEHAVIOR OF THE REACTOR. EACH INCIDENT IS ASSUMED TO BE PRECEDED BY A SEQUENCE OF EVENTS STARTING AT SOME INITIATING EVENT. AT EACH MEMBER IN THIS SEQUENCE THERE MAY BE FUNCTIONS SUCH AS SAFETY CIRCUITS, AND PERSONNEL OPERATIONS THAT STOP THE SEQUENCE AT THAT MEMBER. WHEN MECHANICAL DEVICES FAIL THEY ARE ASSUMED TO REMAIN INOPERATIVE UNTIL REPAIRED. THE MODEL ACCOUNTS FOR SCHEDULED INSPECTION AND MAINTENANCE OF ALL EQUIPMENT IN THE SYSTEM.

600 EGAD EGAD CALCULATES GAMMA DOSE INTEGRALS TO A GROUND LEVEL RECEPTOR, FOR INCREMENTAL VALUES OF THE VERTICAL DISPERSION PARAMETER Σ , AS A FUNCTION OF GAMMA ENERGY AND SPATIAL DISTRIBUTION OF THE RADIOACTIVE MATERIAL. THE DOSE INTEGRALS ARE REPRESENTATIVE OF SECTOR AVERAGES SINCE THE DISTRIBUTION OF MATERIAL IS ASSUMED TO BE GAUSSIAN IN THE VERTICAL, HOMOGENEOUS IN THE HORIZONTAL, AND BOUNDED BETWEEN GROUND LEVEL AND AN INVERSION LID. CALCULATED DOSE INTEGRALS ARE INDEPENDENT OF RADIOACTIVE DECAY, TRANSPORT VELOCITY, DOWNWIND DISTANCE, AND SECTOR WIDTH. SPACE ATTENUATION AND BUILDUP ARE TAKEN INTO ACCOUNT.

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653 MOCUS FROM A DESCRIPTION OF THE BOOLEAN FAILURE LOGIC OF A SYSTEM, CALLED A FAULT TREE, AND CONTROL PARAMETERS SPECIFYING THE MINIMAL CUT SET LENGTH TO BE OBTAINED MOCUS DETERMINES THE SYSTEM FAILURE MODES, OR MINIMAL CUT SETS, AND THE SYSTEM SUCCESS MODES, OR MINIMAL PATH SETS.

658 FRAP-T THE FRAP-T PROGRAM PREDICTS THE THERMAL, MECHANICAL AND INTERNAL GAS PRESSURE RESPONSE OF A WATER-COOLED, ZIRCALOY-CLAD, OXIDE FUEL ROD DURING A LOSS-OF-COOLANT ACCIDENT (LOCA), POWER-COOLANT MISMATCH (PCM), OR FLOW BLOCKAGE ACCIDENT.

THE CODE CONSIDERS THE COUPLED EFFECTS OF THESE RESPONSE PARAMETERS BY ITERATING TO CONVERGENCE AT EACH TIME-STEP IN A TRANSIENT. TRANSIENT HEAT CONDUCTION IS ANALYZED.

663 COMRADEX3 COMRADEX3 CALCULATES THE EFFECTS OF CONTAINMENT ON THE RELEASE OF RADIOACTIVE INVENTORY AND THE SUBSEQUENT DOWNWIND TRANSPORT. THE INITIAL ISOTOPIC INVENTORY MUST BE SUPPLIED TO THE CODE, AS WELL AS THE LEAKAGE AND FALLOUT RATES FOR EACH LEVEL OF CONTAINMENT. WITH THE EFFORTS OF CONTAINMENT DETERMINED, THE CODE THEN CALCULATES (1) THE POTENTIAL DIRECT GAMMA DOSE FROM THE CONTAINMENT, (2) THE POTENTIAL INTERNAL RADIOLOGICAL DOSE RESULTING FROM INHALATION OF ACTIVITY IN THE RELEASED CLOUD, (3) THE POTENTIAL EXTERNAL GAMMA DOSE FROM THE RELEASED CLOUD, AND (4) THE POTENTIAL EXTERNAL BETA DOSE FROM THE RELEASED CLOUD. THE METEOROLOGICAL MODEL FOR DISPERSION OF THE RADIOACTIVE CLOUD CAN BE CHANGED AT THREE TIME INTERVALS. SITE METEOROLOGY MAY BE USED DIRECTLY. ISOTOPIC CLASS, AND CHAMBER-DEPENDENT FILTRATION MAY BE STARTED AT INPUT TIME. RADIOLOGICAL DOSES ARE CALCULATED FOR UP TO 20 DOWNWIND AND CROSSWIND DISTANCES AND FOR UP TO FIVE RELEASE TIMES.

666 FTA THE FTA (FAULT TREE ANALYSIS) SYSTEM WAS DESIGNED TO PREDICT PROBABILITIES OF THE MODES OF FAILURE FOR COMPLEX SYSTEMS AND TO GRAPHICALLY PRESENT THE STRUCTURE OF SYSTEMS. THERE ARE THREE PROGRAMS IN THE SYSTEM. PROGRAM ALLCUTS PERFORMS THE CALCULATIONS. PROGRAM KILMER CONSTRUCTS A CALCOMP PLOT FILE OF THE SYSTEM FAULT TREE. PROGRAM BRANCH BUILDS A CROSS-REFERENCE LIST OF THE SYSTEM FAULT TREE.

674 SAFTAC SAFTAC IS A MONTE CARLO FAULT TREE SIMULATION PROGRAM THAT PROVIDES A SYSTEMATIC APPROACH FOR ANALYZING SYSTEM DESIGN, PERFORMING TRADE-OFF STUDIES, AND OPTIMIZING SYSTEM CHANGES OR ADDITIONS.

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685 EMERALD-NORMAL EMERALD-NORMAL IS DESIGNED FOR THE CALCULATION OF RADIATION RELEASES AND EXPOSURES RESULTING FROM NORMAL OPERATION OF A LARGE PRESSURIZED WATER REACTOR. THE APPROACH USED IS SIMILAR TO AN ANALOG SIMULATION OF A REAL SYSTEM. EACH COMPONENT OR VOLUME IN THE PLANT WHICH CONTAINS A RADIOACTIVE MATERIAL IS REPRESENTED BY A SUBROUTINE WHICH KEEPS TRACK OF THE PRODUCTION, TRANSFER, DECAY, AND ABSORPTION OF RADIOACTIVITY IN THAT VOLUME. DURING THE COURSE OF THE ANALYSIS, ACTIVITY IS TRANSFERRED FROM SUBROUTINE TO SUBROUTINE IN THE PROGRAM AS IT WOULD BE TRANSFERRED FROM PLACE TO PLACE IN THE PLANT. SOME OF THIS ACTIVITY IS THEN RELEASED TO THE ATMOSPHERE AND TO THE DISCHARGE CANAL. THE RATES OF TRANSFER, LEAKAGE, PRODUCTION, CLEAN-UP, DECAY, AND RELEASE ARE READ AS INPUT TO THE PROGRAM. SUBROUTINES ARE ALSO INCLUDED WHICH CALCULATE THE OFF-SITE RADIATION EXPOSURES AT VARIOUS DISTANCES FOR INDIVIDUAL ISOTOPES AND SUMS OF ISOTOPES. THE PROGRAM CONTAINS A LIBRARY OF PHYSICAL DATA FOR THE FORTY ISOTOPES OF MOST INTEREST IN LICENSING CALCULATIONS, AND OTHER ISOTOPES CAN BE ADDED OR SUBSTITUTED. BECAUSE OF THE FLEXIBLE NATURE OF THE SIMULATION APPROACH, THE EMERALD-NORMAL PROGRAM CAN BE USED FOR MOST CALCULATIONS INVOLVING THE PRODUCTION AND RELEASE OF RADIOACTIVE MATERIAL. THESE INCLUDE DESIGN, OPERATION, AND LICENSING STUDIES.

704 COMCAN COMCAN IS DESIGNED TO ANALYZE COMPLEX SYSTEMS, SUCH AS NUCLEAR PLANTS FOR COMMON CAUSES OF FAILURE. A COMMON CAUSE EVENT, OR COMMON MODE FAILURE, IS A SECONDARY CAUSE THAT MAY CONTRIBUTE TO THE DEVELOPMENT OF MORE THAN ONE COMPONENT MALFUNCTION. A SIGNIFICANT COMMON CAUSE EVENT IS A SECONDARY CAUSE COMMON TO ALL BASIC EVENTS IN ONE OR MORE MINIMAL CUT SETS. THESE MINIMAL CUT SETS ARE COMMON CAUSE CANDIDATES. IF ALL COMPONENTS REPRESENTED BY THE BASIC EVENTS IN A MINIMAL CUT SET SHARE A COMMON LOCATION, THAT MINIMAL CUT SET IS CALLED A PRIME COMMON CAUSE CANDIDATE. COMPONENTS SHARE A COMMON LOCATION IF NO BARRIERS CAPABLE OF INSULATING THEM FROM THE SECONDARY CAUSE ARE PRESENT.

710 HAMOC HAMOC DETERMINES THE PRESSURE TRANSIENTS IN PIPING SYSTEMS ATTACHED TO A REACTOR VESSEL WHICH HAS BEEN PERTURBED, BY A HYPOTHETICAL CORE DISRUPTIVE ACCIDENT (HCDA) FOR EXAMPLE. THE CONTINUITY AND MOMENTUM EQUATIONS ARE SOLVED. THE ENERGY EQUATION IS NOT PROGRAMMED, BUT SIMPLIFIED COLUMN SEPARATION LOGIC IS INCLUDED TO TREAT VAPOR PRESSURES BELOW SATURATION. THIS SIMPLIFIED APPROACH HAS BEEN CHECKED AGAINST EXPERIMENTAL DATA. HAMOC WAS WRITTEN SPECIFICALLY FOR PROBLEMS IN WHICH FORCING PRESSURES ARE KNOWN AS A FUNCTION OF TIME AT CERTAIN END BOUNDARY CONDITIONS, RATHER THAN AS A GENERAL PURPOSE CODE FOR THE SOLUTION OF PUMP COASTDOWN OR VALVE CLOSING PROBLEMS.

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712 WREM-TOODEE2/MOD3 WREM-TJODEE2 IS A TWO-DIMENSIONAL, TIME-DEPENDENT, FUEL-ELEMENT THERMAL ANALYSIS PROGRAM. ITS PRIMARY PURPOSE IS TO EVALUATE FUEL-ELEMENT THERMAL RESPONSE DURING POST-LOCA REFILL AND REFLOOD IN A PRESSURIZED WATER REACTOR (PWR).

714 SPOOL-FIRE SPOOL-FIRE CALCULATES THE PRESSURE AND TEMPERATURES WITHIN A CONTAINMENT BUILDING AS A RESULT OF A SODIUM FIRE. THE FIRE IS ASSUMED TO OCCUR IN TWO DISTINCT PHASES: A SPRAY AND A POOL. THE SPRAY FIRE IS CONSERVATIVELY ASSUMED TO OCCUR INSTANTANEOUSLY. THE CODE CALCULATES ALL IMPORTANT TEMPERATURES, ACCOUNTING FOR HEAT LOSS FROM THE BUILDING TO THE ENVIRONMENT, AS WELL AS LEAKAGE OF THE CONTAINMENT ATMOSPHERE UNDER CONDITIONS OF INTERNAL OVERPRESSURE.

716 SPRAY2 SPRAY2 PERFORMS THE CALCULATIONS OF THERMODYNAMICS, HEAT AND MASS TRANSFER, AND COMBUSTION OF SODIUM SPRAY DROPLETS RELEASED IN AN LMFBR CELL AS A RESULT OF POSTULATED PIPING FAILURE.

717 NAHAMMER NAHAMMER ANALYZES SHORT-TERM PRESSURE-PULSE TRANSIENTS IN A CLOSED HYDRAULIC SYSTEM CONSISTING OF SERIES OR PARALLEL PIPING, PIPE JUNCTIONS, DIAMETER DISCONTINUITIES, ELBOWS, JUNCTIONS OF THREE TO SIX BRANCHES, ORIFICES, ACOUSTIC-IMPEDANCE DISCONTINUITIES, DUMMY JUNCTIONS, DEAD ENDS, AND FREE SURFACES IN SURGE TANKS. THE WORKING FLUID IS ASSUMED TO BE SODIUM WITHOUT CAVITATION.

718 NATRANSIENT NATRANSIENT ANALYZES SHORT-TERM PRESSURE-PULSE TRANSIENTS IN A CLOSED HYDRAULIC SYSTEM CONSISTING OF SERIES OR PARALLEL PIPING, PIPE JUNCTIONS, DIAMETER DISCONTINUITIES, JUNCTIONS OF THREE TO SIX BRANCHES, CLOSED ENDS, SURGE TANKS, FAR ENDS, DUMMY JUNCTIONS, ACOUSTIC IMPEDANCE DISCONTINUITIES, AND RUPTURE DISKS. THE WORKING FLUID IS ASSUMED TO BE LIQUID SODIUM WITHOUT CAVITATION. THE SOURCE PRESSURE PULSE IS ASSUMED TO BE GENERATED BY A SODIUM-WATER REACTION ACCORDING TO THE DYNAMIC MODEL OF ZAKER AND SALMON.

719 NATRAN2 NATRAN2 ANALYZES SHORT-TERM PRESSURE-PULSE TRANSIENTS IN A CLOSED HYDRAULIC SYSTEM CONSISTING OF A TWO-DIMENSIONAL AXISYMMETRIC DOMAIN CONNECTED TO A ONE-DIMENSIONAL PIPING NETWORK. THE ONE-DIMENSIONAL NETWORK MAY CONSIST OF SERIES OR PARALLEL PIPING, PIPE JUNCTIONS, DIAMETER DISCONTINUITIES, JUNCTIONS OF THREE TO SIX BRANCHES, CLOSED ENDS, SURGE TANKS, FAR ENDS, DUMMY JUNCTIONS, ACOUSTIC IMPEDANCE DISCONTINUITIES, AND RUPTURE DISKS. BY DEFAULT, THE WORKING FLUID IS ASSUMED TO BE LIQUID SODIUM WITHOUT CAVITATION; BUT ANOTHER

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WORKING FLUID CAN BE SPECIFIED IN TERMS OF ITS DENSITY, SONIC SPEED, AND VISCOSITY. THE SOURCE PRESSURE PULSE CAN ARISE FROM ONE OF THE FOLLOWING: A PRESSURE-TIME FUNCTION SPECIFIED AT SOME POINT IN THE TWO-DIMENSIONAL DOMAIN, A PRESSURE-TIME FUNCTION OR A SODIUM-WATER REACTION SPECIFIED AT SOME POINT IN THE ONE-DIMENSIONAL DOMAIN. THE PRESSURE PULSE FROM A SODIUM-WATER REACTION IS ASSUMED TO BE GENERATED ACCORDING TO THE DYNAMIC MODEL OF ZAKER AND SALMON.

722 CRAC THE CRAC CODE WAS DEVELOPED
IN SUPPORT OF THE REACTOR SAFETY STUDY (WASH-1400) TO ASSESS THE
RISK FROM POTENTIAL ACCIDENTS AT NUCLEAR POWER PLANTS.

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152 ARGUS(RE248) THIS PROGRAM CALCULATES TRANSIENT TEMPERATURES IN A CONCENTRIC, CYLINDRICAL CONFIGURATION. UP TO 25 CONCENTRIC REGIONS ARE ALLOWED, EACH CONTAINING EITHER A STATIONARY (SOLID OR NON-FLOWING LIQUID) OR TURBULENTLY FLOWING (LIQUID OR GAS) MATERIAL. ANY STATIONARY REGION CAN HAVE SPATIAL- AND TIME-DEPENDENT HEAT GENERATION. TEMPERATURES ARE CALCULATED AT NODE POINTS EQUALLY-SPACED WITHIN A REGION. FILM COEFFICIENTS ON FLOWING REGION BOUNDARIES ARE CALCULATED BY THE PROGRAM. TIME-DEPENDENT COOLANT VELOCITIES ARE PERMITTED. THE HEAT SOURCE IS ASSUMED TO BE ANGULAR INDEPENDENT. AXIAL HEAT CONDUCTION IS NEGLECTED, BUT AXIAL HEAT TRANSPORT DUE TO MATERIAL MOTION IS CONSIDERED IN THE FLOWING REGIONS.

155 PTH1 THIS PROGRAM CALCULATES CONTAINMENT SHELL PRESSURE-TEMPERATURE HISTORY RESULTING FROM AQUEOUS COOLANT SYSTEM BLOWDOWN.

182 AXFLU AXFLU CALCULATES HEAT TRANSFER FROM A LATTICE OF FLUID CYLINDRICAL FUEL PINS TO COOLANT IN EITHER SLUG OR FULLY-DEVELOPED LAMINAR FLOW. SOLUTION IS ANALYTIC AND CLOSED, EXCEPT FOR SATISFYING BOUNDARY CONDITIONS AT A FINITE, (BUT ARBITRARY), NUMBER OF BOUNDARY POINTS.

183 AXTHRM AXTHRM CALCULATES HEAT TRANSFER FROM A TRIANGULAR LATTICE OF CLAD SOLID CYLINDRICAL FUEL PIN TO COOLANT IN EITHER SLUG OR FULLY-DEVELOPED LAMINAR FLOW. SOLUTION IS ANALYTIC AND CLOSED, EXCEPT FOR SATISFYING BOUNDARY CONDITIONS AT A FINITE, (BUT ARBITRARY), NUMBER OF BOUNDARY POINTS.

198 HEATING2 HEATING2 IS A GENERALIZED HEAT TRANSFER CODE CAPABLE OF SOLVING TRANSIENT AND/OR STEADY-STATE COORDINATE SYSTEMS. THE SIMPLIFIED INPUT MAKES IT A VERY USEFUL CODE FOR THOSE PROBLEMS HAVING GEOMETRICAL CONFIGURATIONS WHICH CAN BE DESCRIBED BY PARALLEL AND PERPENDICULAR LINES OR PLANES, OR CONCENTRIC CIRCLES. THESE FIGURES CAN BE BROKEN UP INTO A MAXIMUM OF 100 ONE-MATERIAL REGIONS WITH POSITION AND TIME-DEPENDENT VOLUMETRIC HEAT GENERATION RATES. UP TO 40 MATERIALS WITH CONSTANT PROPERTIES CAN BE DESCRIBED, AND THE INITIAL TEMPERATURES OF THESE REGIONS ARE POSITION-DEPENDENT. THE BOUNDARIES OF THESE REGIONS CAN BE CONTACT, INSULATED, TIME-DEPENDENT TEMPERATURE CONTROLLED, OR FORCED CONVECTION WITH A TIME-DEPENDENT SINK TEMPERATURE. ALSO A RADIATION BOUNDARY WITH A TIME-DEPENDENT SINK TEMPERATURE IS INCLUDED.

205 BLOOST5 BLOOST5 COMBINES A REACTOR KINETICS CODE WITH A TWO-DIMENSIONAL HEAT TRANSFER CODE, AND IS APPLICABLE TO PROBLEMS FOR WHICH THE SPACE-INDEPENDENT FORM OF THE REACTOR KINETICS EQUATION IS APPLICABLE.

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242 RATH MESHER/RATH WANTON THESE CODES SOLVE THE TWO- AND THREE-DIMENSIONAL HEAT CONDUCTION PROBLEM IN GENERAL GEOMETRIES. TIME, TEMPERATURE, AND POSITION-DEPENDENT PHYSICAL PROPERTIES CAN BE USED.

246 FLOW-MODEL A MULTI-CHANNEL, TWO-DIMENSIONAL, TWO-PHASE FLOW MODEL, DESIGNED TO COMPUTE THE AXIAL AND RADIAL COOLANT DENSITY AND QUALITY PROFILES, THE AXIAL PRESSURE PROFILE AND THE WEIGHT FLOW DISTRIBUTION FOR AN OPEN MATRIX FLOW, BOILING WATER REACTOR.

256 MANTA MANTA IS A PROGRAM WHICH PROVIDES A THERMAL-HYDRAULIC NODAL ANALYSIS IN THE STEADY STATE. IT WAS DESIGNED TO ANALYZE FUEL ELEMENT CONFIGURATION IN THE SUPER-HEAT DEVELOPMENT PROGRAM. MANTA ANALYZES MIXING BETWEEN COOLANT CHANNELS, ALLOWS FOR TEMPERATURE VARIANT CONDUCTIVITY IN ADMITTANCE CALCULATIONS, AND MULTIPLE STACKED SEGMENTS THROUGH THE FUEL REGION FOR A 7 ELEMENT CLUSTER ANALYSIS OVER A LENGTH OF UP TO 8 FEET. MANTA IS DESIGNED FOR SINGLE-PASS STEAM FLOW. THE FLOW DIRECTION IN THE COOLANT CHANNELS MAY BE EITHER UP OR DOWN, THEREBY PERMITTING THE ANALYSIS OF TWO-PASS AS WELL AS SINGLE-PASS FUEL ELEMENTS. MANTA ACCOUNTS FOR THE HEAT TRANSFER AND PRESSURE DROP THAT MAY OCCUR BETWEEN COOLANT CHANNELS DUE TO MIXING AS WELL AS TO THE CONVENTIONAL HEAT TRANSFER AND PRESSURE DROP RELATIONSHIPS DUE TO FRICTION, DISCONTINUITIES, ACCELERATION, CONVECTION, CONDUCTION, AND RADIATION. MANTA ALLOWS FOR THE CALCULATION AT EACH NODE OF THE MATERIAL PROPERTIES VISCOSITY, SPECIFIC HEAT, CONDUCTIVITY, AND SPECIFIC VOLUME TO CORRESPOND TO THE ACTUAL NODE TEMPERATURE BEING SOLVED FOR. THE CDC6600 VERSION USES SODIUM FOR THE WORKING FLUID RATHER THAN STEAM.

267 WATER WATER IS A SUBROUTINE USED TO EXTRACT THERMODYNAMIC AND TRANSPORT PROPERTIES OF LIQUID, VAPOR, AND SUPERCRITICAL WATER BY TABULAR INTERPOLATION OVER THE RANGE OF STATES - 14.5 TO 14,500 PSIA AND 32 TO 1472 DEGREES F. THESE PROPERTIES ARE SPECIFIC VOLUME, SPECIFIC ENTHALPY, DYNAMIC VISCOSITY, AND THERMAL CONDUCTIVITY, TABULATED FOR PRESSURE AND TEMPERATURE CONDITIONS.

272 FIGRO FIGRO CALCULATES THE ONE-DIMENSIONAL STEADY-STATE TEMPERATURE DISTRIBUTION AND TOTAL FUEL SWELLING FOR METAL-CLAD, AXISYMMETRIC, BULK-OXIDE CYLINDRICAL FUEL ELEMENTS. THE FUEL PELLET MAY BE SOLID, ANNULAR, OR CONTAIN TWO RADIAL ZONES. OXIDE FUEL THERMAL CONDUCTIVITY IS A FUNCTION OF TEMPERATURE, DEPLETION, AND POROSITY. FUEL SWELLING IS A FUNCTION OF TEMPERATURE, DEPLETION, INTERNAL HYDROSTATIC PRESSURE, AND FISSIIONING RATE. FUEL-CLAD GAP CONDUCTANCE IS A FUNCTION OF GAS COMPOSITION, TEMPERATURE, AND GAP THICKNESS AT OPERATING CONDITIONS.

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EITHER THE CLAD SURFACE FLUX OR THE TEMPERATURE AT THE INSIDE RADIUS OF THE FUEL MAY BE SPECIFIED AS A BOUNDARY CONDITION FOR THE HEAT CONDUCTION EQUATION. THERMAL EXPANSION OF THE FUEL AND CLADDING IS ACCOUNTED FOR. TRANSIENT TEMPERATURE CALCULATIONS CAN THEN BE PERFORMED STARTING FROM THE STEADY-STATE SOLUTION WITH USER-SPECIFIED HEAT GENERATION AND WATER TEMPERATURE TABLES.

286 HOT2 HOT2 IS A DIGITAL COMPUTER PROGRAM TO SOLVE TWO-DIMENSIONAL PLANE AND AXIALLY SYMMETRIC STEADY-STATE AND TRANSIENT HEAT CONDUCTION PROBLEMS WITH DIAGONAL BOUNDARIES AND INTERFACES. MESH SPACING (AT MOST 5000 POINTS) IS COMPLETELY VARIABLE. AS MANY AS 99 REGIONS ARE PERMITTED IN ORDER TO DESCRIBE SPATIAL VARIATIONS IN MATERIAL PROPERTIES, HEAT GENERATION RATES, AND BOUNDARY CONDITIONS. THE HEAT GENERATION RATE AND BOUNDARY CONDITIONS MAY VARY WITH TIME.

294 M0899/HOH BY MAKING CALLS ON A SUBROUTINE CALLED HOH, M0899 EDITS THERMODYNAMIC AND TRANSPORT PROPERTIES OF WATER OVER THE RANGE 14.5 TO 2538 PSIA AND UP TO 608 DEGREES FAHRENHEIT BELOW SATURATION AND 932 DEGREES FAHRENHEIT ABOVE SATURATION.

299 LION4 LION4 IS A COMPUTER PROGRAM FOR CALCULATING ONE-, TWO-, OR THREE-DIMENSIONAL TRANSIENT AND STEADY-STATE TEMPERATURE DISTRIBUTIONS IN REACTOR AND REACTOR PLANT COMPONENTS. IT IS USED PRIMARILY FOR THERMAL-STRUCTURAL ANALYSES. IT UTILIZES FINITE DIFFERENCE TECHNIQUES WITH FIRST-ORDER FORWARD DIFFERENCE INTEGRATION AND IS CAPABLE OF HANDLING A WIDE VARIETY OF BOUNDING CONDITIONS.

HEAT TRANSFER SITUATIONS ACCOMMODATED INCLUDE FORCED AND FREE CONVECTION IN BOTH REDUCED AND FULLY-AUTOMATED TEMPERATURE DEPENDENT FORMS, COOLANT FLOW EFFECTS, A LIMITED THERMAL RADIATION CAPABILITY, A STATIONARY OR STAGNANT FLUID GAP, A DUAL DEPENDENCY (TEMPERATURE DIFFERENCE AND TEMPERATURE LEVEL) HEAT TRANSFER, AN ALTERNATIVE HEAT TRANSFER MODE COMPARISON AND SELECTION FACILITY COMBINED WITH HEAT FLUX DIRECTION SENSOR, AND ANY FORM OF TIME-DEPENDENT BOUNDARY TEMPERATURES. THE PROGRAM, WHICH HANDLES TIME AND SPACE DEPENDENT INTERNAL HEAT GENERATION, CAN ALSO PROVIDE TEMPERATURE DEPENDENT MATERIAL PROPERTIES WITH LIMITED NON-ISOTROPIC PROPERTIES. USER-ORIENTED CAPABILITIES AVAILABLE INCLUDE TEMPERATURE MEANS WITH VARIOUS WEIGHTINGS AND A COMPLETE HEAT FLOW RATE SURVEILLANCE SYSTEM.

331 M0219(FLOT1) FLOT1 WILL PREDICT THE STEADY-STATE FLOW AND THE FLOW TRANSIENT DUE TO THE SUBSEQUENT LOSS OF POWER TO ALL PUMPS AND TERMINATE THE TRANSIENT AT A SPECIFIED TIME OR IT WILL PREDICT THE FLOW TRANSIENT IN WHICH ONLY SOME OF THE PUMPS ARE LOST. THIS LATTER TRANSIENT MAY BE TERMI-

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NATED BY A MAXIMUM TRANSIENT TIME OR BY CHECK VALVE CLOSURES IN ALL LOOPS IN WHICH PUMPING POWER IS LOST. IN THE LATTER EVENT, THE PROGRAM WILL PREDICT THE SUBSEQUENT STEADY-STATE FLOW DISTRIBUTION.

346 THTE THTE (TRANSIENT HEAT TRANSFER VERSION E) PROVIDES A SOLUTION CAPABILITY FOR LARGE COMPLEX, THREE-DIMENSIONAL TRANSIENT AND STEADY-STATE HEAT TRANSFER PROBLEMS WHICH CAN INCLUDE CONDUCTION, CONVECTION, AND RADIATION WITH THE OPTION TO COMPUTE FLUID FLOW RATES ON A ONE-DIMENSIONAL BASIS.

348 TOPS THE TOPS PROGRAM IS A DIGITAL SIMULATION OF PRESSURIZER DYNAMICS BASED ON A RIGOROUS APPLICATION OF THE FIRST LAW OF THERMODYNAMICS AND PHENOMOLOGICAL HEAT AND MASS TRANSFER LAWS WITH EMPIRICALLY DETERMINED COEFFICIENTS. THE PROGRAM IS USEFUL IN STUDYING THE THERMODYNAMIC PATHS OF PRESSURIZER TRANSIENTS AND IS CONVENIENT TO USE AS A DESIGN TOOL.

349 TOODEE THE TOODEE PROGRAM CALCULATES TEMPERATURES AT THE CENTER POINTS OF A TWO-DIMENSIONAL ARRAY IN X-Y, R-Z, OR R-THETA GEOMETRY. THE MESH IN THIS ARRAY MAY BE VARIABLY-SPACED. AVERAGED MATERIAL CONSTANTS ARE USED WHICH MAY BE SPATIAL AND TEMPERATURE DEPENDENT. PROVISION IS MADE IN THE PROGRAM FOR MATERIAL PHASE CHANGES. CHANNELS FOR FORCED FLOW COOLANT MAY BE INCLUDED AT EXTERIOR BOUNDARIES. IN ADDITION TO THE TEMPERATURE ARRAY, PROGRAM OUTPUT INCLUDES SURFACE TEMPERATURES AND HEAT FLUXES.

382 RAPP RAPP COMPUTES THE RELATIONSHIP AMONG MASS FLOW, PRESSURE, AND PIPING RESISTANCE (K-FACTOR) FOR HIGH VELOCITY FLOW OF A TWO-PHASE MIXTURE OF STEAM AND WATER. THE SOURCE FLUID MAY BE SUBCOOLED OR SATURATED WATER, SATURATED STEAM, OR A MIXTURE OF STEAM AND WATER. THE DOWNSTREAM PRESSURE MUST BE BELOW THE SATURATION PRESSURE OF THE SOURCE FLUID. SPECIFIC APPLICATIONS INCLUDE PRESSURIZER SURGE LINE PRESSURE DROP AND PRESSURE DISTRIBUTION DOWNSTREAM OF A RELIEF VALVE.

395 FLAC THE FLOW ANALYSIS CODE FLAC CALCULATES THE STEADY-STATE FLOW AND PRESSURE DISTRIBUTION IN AN ARBITRARY NETWORK. THE PROGRAM INCLUDES THE POSSIBILITY OF HEAT ADDITION AND MASS ADDITION IN ANY PORTION OF THE NETWORK.

396 WASP2 WASP2 IS A FORTRAN IV COMPUTER PROGRAM WHICH PERFORMS A SPLINE FUNCTION FIT TO DATA OBTAINED FROM THE WASP SUBPROGRAM (SEE REFERENCE 1) FOR THERMODYNAMIC AND TRANSPORT PROPERTIES OF WATER AND STEAM. THE PROPER-

TIES CALCULATED BY WASP2 ARE: PRESSURE AND TEMPERATURE AS FUNCTIONS OF SPECIFIC VOLUME AND SPECIFIC INTERNAL ENERGY; SPECIFIC VOLUME AS A FUNCTION OF PRESSURE AND ENTHALPY; AND VISCOSITY, THERMAL CONDUCTIVITY, AND SPECIFIC HEAT AS FUNCTIONS OF PRESSURE AND TEMPERATURE.

408 TAC2D TAC2D IS DESIGNED TO TREAT TRANSIENT, TWO-DIMENSIONAL HEAT TRANSFER PROBLEMS. STEADY-STATE PROBLEMS ARE TREATED BY CONSIDERING THE PROBLEM TO BE A TRANSIENT, STARTING WITH AN ASSUMED TEMPERATURE DISTRIBUTION AND RUNNING UNTIL EQUILIBRIUM CONDITIONS ARE ESTABLISHED. GEOMETRICALLY, RECTANGULAR (X-Y), CYLINDRICAL (R,Z), OR CIRCULAR (R,THETA) COORDINATES MAY BE USED.

414 TAC3D TAC3D IS DESIGNED TO TREAT TRANSIENT, THREE-DIMENSIONAL HEAT TRANSFER PROBLEMS. STEADY-STATE PROBLEMS ARE TREATED BY CONSIDERING THE PROBLEM TO BE A TRANSIENT, STARTING WITH AN ASSUMED TEMPERATURE DISTRIBUTION AND RUNNING UNTIL EQUILIBRIUM CONDITIONS ARE ESTABLISHED. GEOMETRICALLY, THE PROBLEM MAY BE DEFINED BY EITHER RECTANGULAR (X,Y,Z) OR CYLINDRICAL (R,Z,THETA) COORDINATES.

424 GLUB1 GLUB1 SOLVES THE WATERLOGGING TRANSIENT CAUSED BY THE EXISTENCE OF A FUEL ELEMENT CLADDING DEFECT DURING AN INCREASE IN POWER. THE POWER IS EITHER - CASE 1, PUT IN AS AN ARBITRARY FUNCTION OF TIME, OR CASE 2, ASSUMED TO BE A SERIES OF LINEAR RAMPS TO A NEW STEADY-STATE WITH STEEPER AND STEEPER SLOPES. ALL THE GEOMETRY AND METAL PROPERTIES ARE INPUT QUANTITIES. WATER PROPERTIES ARE OBTAINED FROM INTERNAL TABLES. CLAD AND FUEL THERMAL, STRESS, AND STRAIN COMPUTATIONS ARE PERFORMED. THE OUTPUT CONSISTS OF INTERNAL PRESSURE AND DEFECT FLOW. FOR CASE 1, THE CLAD STRESS VERSUS TIME IS OUTPUT, AND FOR CASE 2, THE NEW STEADY-STATE POWER WHICH JUST CAUSES CLAD FAILURE IS OUTPUT.

432 COBRA4I COBRA4I PERFORMS STEADY-STATE AND TRANSIENT THERMAL-HYDRAULIC ANALYSIS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS AND CORES VIA THE SUBCHANNEL ANALYSIS METHOD.

440 DYNAM DYNAM PERFORMS A DYNAMIC ANALYSIS OF ONCE-THROUGH BOILING FLOW OSCILLATIONS WITH STEAM SUPERHEAT. THE MODEL DESCRIBING THE SUPERHEAT REGIME (SINGLE-PHASE, VARIABLE DENSITY FLUID) FOR SUBCRITICAL PRESSURE OPERATION IS ALSO APPLICABLE TO THE STUDY OF ONCE-THROUGH OPERATION USING SUPERCRITICAL PRESSURE WATER.

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458 VELVET2 VELVET2 SOLVES THE COUPLED HEAT TRANSFER EQUATIONS IN THE FUEL, GAP, CLADDING, AND COOLANT FOR A TRIANGULAR-SPACED, CLOSE-PACKED FUEL ROD BUNDLE WITH LIQUID METAL COOLANT. THE MODEL INCLUDES TEMPERATURE-DEPENDENT MATERIAL PROPERTIES, TURBULENT VELOCITY DISTRIBUTION IN THE COOLANT, AND CONTRIBUTIONS TO COOLANT HEAT TRANSFER BY TURBULENT MIXING.

473 CHIC-KIN CHIC-KIN TREATS FAST AND INTERMEDIATE REACTIVITY TRANSIENTS IN A WATER-COOLED HETEROGENEOUS NUCLEAR REACTOR. THE PROGRAM CALCULATES THE POWER, TEMPERATURES, AND INTERNAL PRESSURE SURGES WHEN CONTROL ROD MOTION, INLET TEMPERATURE, INLET FLOW, AND SYSTEM PRESSURE ARE KNOWN FUNCTIONS OF TIME. THE REACTOR MODEL CONSIDERED IS A SINGLE PASS WATER-COOLED CORE REPRESENTED BY A SINGLE FUEL ELEMENT-COOLANT PASSAGE SYSTEM WITH REACTIVITY FEEDBACK TO THE KINETICS EQUATIONS.

483 REPP THE REPP COMPUTER CODE PROVIDES A METHOD FOR (1) EVALUATING FUEL TEMPERATURES AND CRITICAL HEAT FLUX MARGINS FOR A FIXED REACTOR CORE AND FUEL DESIGN, (2) DETERMINING THE NUMBER OF FUEL PINS REQUIRED TO MAINTAIN SPECIFIED HEAT FLUX MARGINS FROM BURNOUT AT A GIVEN REACTOR POWER LEVEL, (3) DETERMINING THE DIAMETER OF A FUEL PIN TO DESIGN WITHIN FUEL CENTERLINE TEMPERATURE LIMITS AT A SPECIFIED REACTOR POWER LEVEL, (4) EVALUATING THE SINTERING EFFECT ON FUEL TEMPERATURE, (5) CALCULATING PRESSURE DROP AND COOLANT PROPERTIES FOR SINGLE-PHASE AND TWO-PHASE FLOW FOR FUEL OPERATING AT AVERAGE REACTOR CONDITIONS AND A THEORETICAL HOT PIN HOT CHANNEL CONDITION, AND (6) CALCULATING PRESSURE DROP ACROSS SEVERAL TYPES OF FUEL PIN SPACERS.

487 STEAM-67 STEAM-67 IS A SET OF ROUTINES FOR CALCULATING THE PROPERTIES OF STEAM AND WATER ACCORDING TO THE ASME STEAM TABLES, 1967, WHICH HAVE BEEN MODIFIED IN ACCORDANCE WITH THE ASME PAPER (REFERENCE 3). MODIFICATIONS WERE MADE TO IMPROVE PROGRAM RUNNING TIME AS WELL AS TO CORRECT SOME EXISTING PROGRAM ERRORS. CORRECTIONS WERE ALSO MADE TO ROUTINES FOR THE LIQUID REGION TO IMPROVE ACCURACY ON THE IBM360 COMPUTER.

517 HEATING3 HEATING3 IS DESIGNED TO SOLVE STEADY-STATE AND/OR TRANSIENT HEAT CONDUCTION PROBLEMS IN ONE-, TWO-, OR THREE-DIMENSIONAL CARTESIAN OR CYLINDRICAL COORDINATES. THERMAL CONDUCTIVITY, DENSITY, AND SPECIFIC HEAT MAY BE DEPENDENT ON TEMPERATURE. HEAT GENERATION RATES MAY BE DEPENDENT ON POSITION AND TIME, AND THE BOUNDARY TEMPERATURES MAY BE TIME-DEPENDENT. THE BOUNDARY CONDITIONS MAY BE FIXED TEMPERATURES OR ANY COMBINATION OF CONSTANT HEAT FLUX, FORCED CONVECTION, NATURAL CONVECTION, AND RADIATION. THEY CAN BE FROM SURFACE-TO-BOUNDARY, SURFACE-TO-SURFACE, OR SURFACE-TO-SURFACE PLUS CONDUCTION. THE MESH SPACING CAN BE VARIABLE ALONG EACH AXIS.

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525 ORTHIS/ORTHAT ORTHIS AND ORTHAT ARE DESIGNED TO SOLVE STEADY-STATE AND TRANSIENT HEAT CONDUCTION PROBLEMS, RESPECTIVELY, IN TWO-DIMENSIONAL GEOMETRIES. EITHER CARTESIAN (X-Y) OR CYLINDRICAL (R-Z, R-THETA) COORDINATE SYSTEMS MAY BE USED. THERMAL PROPERTIES, HEAT GENERATION RATES, AND BOUNDARY CONDITIONS MAY BE FUNCTIONS OF POSITION, TIME, OR TEMPERATURE.

545 BETTY BETTY DESCRIBES SPATIAL AND TEMPORAL CONCENTRATION BEHAVIOR OF A SUSPENSION IN A PIPE, AS A RESULT OF DEPOSITION AND EROSION OF THE PARTICLES.

551 MOXY/MOD032 MOXY IS USED FOR THE THERMAL ANALYSIS OF A PLANAR SECTION OF A BOILING WATER REACTOR (BWR) FUEL ELEMENT DURING A LOSS-OF-COOLANT ACCIDENT (LOCA). THE CODE EMPLOYS MODELS THAT DESCRIBE HEAT TRANSFER BY CONDUCTION, CONVECTION, AND THERMAL RADIATION, AND HEAT GENERATION BY METAL-WATER REACTION AND FISSION PRODUCT DECAY. MODELS ARE INCLUDED FOR CONSIDERING FUEL-ROD SWELLING AND RUPTURE, ENERGY TRANSPORT ACROSS THE FUEL-CLADDING GAP, AND THE THERMAL RESPONSE OF THE CANISTER. MOXY REQUIRES THAT TIME-DEPENDENT DATA FOR THE POWER, NORMALIZED TO THE STEADY-STATE POWER, FOR THE HEAT-TRANSFER COEFFICIENT, AND FOR THE FLUID TEMPERATURE BE PROVIDED AS INPUT DURING THE BLOWDOWN PROCESS. INTERNAL MODELS PROVIDE THESE PARAMETERS DURING THE HEATUP AND EMERGENCY COOLING PHASES.

552 PWR-PPM PWR-PPM GENERATES BORATION-DILUTION TABLES USED BY THE REACTOR OPERATOR OF A PWR. THE COMPUTER PRINTED TABLES PLOT INITIAL AND FINAL REACTOR COOLANT SYSTEM BORON CONCENTRATION IN UNITS OF PPM BORON AGAINST THE GALLONS OF MAKEUP WATER AND BORIC ACID SOLUTION REQUIRED TO OBTAIN THE DESIRED PPM CHANGE. THESE TABLES REPLACE NOMOGRAPHS NORMALLY REQUIRED FOR BORATION AND DILUTION OPERATIONS.

560 HYMAS HYMAS GENERATES THE HYDRODYNAMIC MASS MATRIX PER UNIT DEPTH ASSOCIATED WITH A MULTI-MASS SYSTEM IMMERSED IN A LIQUID ENVIRONMENT. IT IS ASSUMED THAT THE LIQUID ENVIRONMENT MAY BE REPRESENTED BY A SERIES OF FLOW-CHANNELS AND NODES. FLOW-CHANNELS ARE INTRODUCED IN THE REGION BETWEEN SURFACES OF NEIGHBORING SOLIDS, AND NODES ARE USED TO CONNECT TWO OR MORE FLOW-CHANNELS. ALSO, IT IS ASSUMED THAT THE SOLID BODIES UNDERGO UNIDIRECTIONAL MOTION, THAT POTENTIAL FLOW THEORY IS APPLICABLE, THAT THE WIDTH OF A FLOW-CHANNEL IS SMALL COMPARED WITH THE LENGTH SO THERE IS NO PRESSURE DROP ACROSS THE FLOW-CHANNEL, AND THAT NODAL VOLUME IS SMALL COMPARED WITH FLOW-CHANNEL VOLUME.

580 ASTEM

ASTEM IS A MODULAR SET OF
FORTRAN IV SUBROUTINES TO EVALUATE THE GIBBS, HELMHOLTZ, AND
SATURATION LINE FUNCTIONS AS PUBLISHED BY THE AMERICAN SOCIETY OF
MECHANICAL ENGINEERS (1967). ANY THERMODYNAMIC QUANTITY INCLUDING
DERIVATIVE PROPERTIES CAN BE OBTAINED FROM THESE ROUTINES BY A
USER-SUPPLIED MAIN PROGRAM.

616 HAFMAT HAFMAT WAS DEVELOPED FOR THE CALCULATION OF THE STEADY-STATE DISTRIBUTION OF FLOW TO ALL PATHS OF ANY GIVEN FLOW SYSTEM WHEN THE FLOW GEOMETRY AND HEAT ADDITION ARE SPECIFIED FOR EVERY FLOW PATH AND THE SYSTEM BOUNDARY CONDITIONS ARE DEFINED. THE SYSTEM IS CONSIDERED AS A NETWORK OF FLOW PATHS OR PIPES.

636 6KILER 6KILER WAS DEVELOPED FOR PRE-
 PICTIVE AND POST-TEST ANALYSES OF CORE HEAT TRANSFER DURING A
 LOSS-OF-COOLANT ACCIDENT FOR A GENERAL ELECTRIC BWR/6 TYPE NUCLEAR
 REACTOR PLANT.

651 SOLA/SOLA-SURF SOLA AND SOLA-SURF ARE
NUMERICAL SOLUTION ALGORITHMS FOR TRANSIENT FLUID FLOWS. SOLA IS
FOR INCOMPRESSIBLE FLUID FLOWS WITHOUT FREE SURFACES. SOLA-SURF,
AN EXTENSION OF THE SOLA CODE, PERMITS A FREE SURFACE OR CURVED
RIGID BOUNDARY (FREE-SLIP) TO BE LOCATED ACROSS THE TOP OR BOTTOM
OF THE FLUID REGION.

659 COBRA3M COBRA3M CALCULATES THE STEADY
STATE AND TRANSIENT FLOW, COOLANT TEMPERATURE AND PRESSURE DROP IN
THE SUBCHANNELS OF NUCLEAR FUEL PIN BUNDLES. IN ADDITION, IT CAL-
CULATES TEMPERATURES OF FUEL, CLADDING, AND DUCT WALL.

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664 FLOW3 FLOW3 WAS DEVELOPED FOR THE STEADY-STATE THERMAL AND HYDRAULIC ANALYSIS OF TWO-PHASE FLOW IN THREE-DIMENSIONAL GEOMETRIES. THE PROGRAM WAS DEVELOPED WITH PARTICULAR APPLICATION TO THE ANALYSIS OF FLOW ON THE PRIMARY AND SECONDARY SIDES OF A STEAM GENERATOR AND MAY BE APPLIED TO A VARIETY OF FLUID FLOW PROBLEMS OF A GENERAL NATURE. THE PROGRAM EMPLOYS A NETWORK REPRESENTATION OF THE FLOW FIELD AND PREDICTS LOCAL FLUID CONDITIONS BASED ON A BOUNDARY VALUE SOLUTION METHOD. THE FLOW3 PROGRAM USER SPECIFIES A FLOW REGION OF INTEREST AS A NETWORK OF NODES WITH INTERCONNECTING LINKS. FLOW MAY ENTER OR LEAVE THE NETWORK AT DESIGNATED BOUNDARY NODES (WHERE THE PRESSURE IS FIXED) OR AT DESIGNATED SOURCE NODES (WHERE THE FLOW IS FIXED). THE CONSERVATION EQUATIONS FOR MASS, ENERGY, AND MOMENTUM ARE SOLVED FOR THE STEADY-STATE ENTHALPY AND PRESSURE AT EACH NODE AND THE FLOW IN EACH LINK. HEAT MAY BE ADDED TO ANY LINKS, AND TWO-PHASE FLOW IS ALLOWED.

673 SIEX SIEX IS A STEADY-STATE HEAT TRANSFER CODE FOR THE CALCULATION OF MIXED-OXIDE FUEL PIN THERMAL PERFORMANCE AND DIMENSION CHANGE (SWELLING AND THERMAL EXPANSION) IN A FAST NEUTRON ENVIRONMENT. FUEL RESTRUCTURING, FUEL AND CLADDING DISPLACEMENTS DUE TO SWELLING AND THERMAL EXPANSION, FUEL-TO-CLADDING GAP HEAT TRANSFER, AND FISSION GAS RELEASE ARE INCLUDED TO PROVIDE AN ASSESSMENT OF FUEL, CLADDING, AND COOLANT TEMPERATURES.

677 MARGE/SLUMP THE MARGE/SLUMP CODE PERFORMS A SERIES OF ONE-DIMENSIONAL (RADIAL) CALCULATIONS AT FIXED INTERVALS ALONG THE AXIAL LENGTH OF A LMFBR FUEL ELEMENT TO DETERMINE SODIUM TEMPERATURE, CLAD TEMPERATURE, FUEL TEMPERATURE, CENTRAL VOID DIAMETER, AND AMOUNT OF FUEL ADDITION OR REMOVAL NECESSARY TO MAINTAIN THE INNER SURFACE OF THE CENTRAL VOID AT THE MELTING TEMPERATURE OF MIXED OXIDE FUEL.

694 FRAP-S1 THE FRAP-S1 PROGRAM PREDICTS THE THERMAL, MECHANICAL, AND INTERNAL GAS PRESSURE RESPONSE OF A WATER-COOLED OXIDE FUEL ROD DURING STEADY-STATE REACTOR OPERATION. THE CODE CONSIDERS THE COUPLED EFFECTS OF THE RESPONSE PARAMETERS BY ITERATING TO CONVERGENCE AT EACH POWER-TIME STEP.

696 ENERGY THIS PACKAGE CONSISTS OF FOUR INDEPENDENT PROGRAMS, ENERGY1, ENERGY2, ENERGY3, AND SUPERENERGY DEVELOPED FOR PREDICTING COOLANT TEMPERATURE DISTRIBUTIONS IN WIRE WRAPPED FUEL AND BLANKET ASSEMBLIES OF A LIQUID-METAL-COOLED, FAST BREEDER REACTOR.

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702 COMPARE COMPARE PERFORMS TRANSIENT CALCULATION OF THE THERMODYNAMIC CONDITIONS IN VOLUMES CONNECTED BY FLOWING JUNCTIONS WITH PROVISION FOR MASS AND ENERGY ADDITION. VOLUME THERMODYNAMICS AND JUNCTION FLOWS ARE FOR HOMOGENEOUS MIXTURES OF: STEAM, TWO-PHASE WATER, ANY THREE PERFECT GASES, OR COMBINATIONS OF THE ABOVE. CRITICAL VENT FLOW IS BASED ON THE MOODY EQUATION. SUBCRITICAL FLOW IS BASED ON COMPRESSIBLE ORIFICE FLOW OF AN IDEAL GAS-LIKE MIXTURE WITH INLET AND EXIT LOSSES RESULTING IN A POLYTROPIC FLOW PROCESS. FLOW WITH INERTIA IS CALCULATED ON THE BASIS OF AN INCOMPRESSIBLE SUBELEMENT RELATIONSHIP. THE PROGRAM WAS WRITTEN TO PERFORM TRANSIENT SUBCOMPARTMENT ANALYSIS OF NUCLEAR POWER PLANTS.

703 ORCENT ORCENT PERFORMS FULL-LOAD DESIGN POINT HEAT AND MASS BALANCE CALCULATIONS FOR STEAM TURBINE CYCLES SUPPLIED WITH THROTTLE STEAM, CHARACTERISTIC OF LIGHT WATER REACTOR PLANTS. THE PROGRAM HANDLES BOTH CONDENSING AND BACK-PRESSURE TURBINE EXHAUST ARRANGEMENTS. TURBINE PERFORMANCE CALCULATIONS ARE BASED ON THE GENERAL ELECTRIC COMPANY METHOD FOR LARGE STEAM TURBINE-GENERATORS OPERATING WITH SATURATED AND LOW SUPERHEAT THROTTLE STEAM. OUTPUT INCLUDES ALL INFORMATION NORMALLY SHOWN ON A TURBINE CYCLE HEAT BALANCE DIAGRAM.

706 TH13D TH13D IS A COMPUTER PROGRAM FOR STEADY-STATE, SINGLE-PHASE, THERMAL-HYDRAULIC MULTICHANNEL ANALYSIS. THE MODEL ACCOUNTS FOR CONSERVATION OF MASS, ENERGY, AND MOMENTUM (BOTH AXIAL AND TRANSVERSE) SUBJECT TO PRESSURE-DROP BOUNDARY CONDITIONS AND LEADS TO A NONLINEAR, MULTIPOINT BOUNDARY-VALUE PROBLEM. TURBULENT INTERCHANGE, RADIAL THERMAL CONDUCTION, AND FORCED FLOW DUE TO THE WIRE WRAP OR GRID BETWEEN CHANNELS ARE EXPLICITLY TAKEN INTO ACCOUNT. TEMPERATURE DISTRIBUTIONS IN THE COOLANT, CLADDING, FUEL, AND DUCT WALL, AND THE SIZE OF THE CENTRAL VOID OF THE OXIDE FUEL AFTER THERMAL RESTRUCTURING ARE COMPUTED. THREE DIFFERENT THERMAL-HYDRAULIC CHANNEL ARRANGEMENTS (SQUARE, HEXAGONAL, AND TRIANGULAR) CAN BE TREATED. MULTIPIN ANALYSIS WITH TRANSVERSE INTERACTIONS, OR MULTIASSEMBLY CALCULATIONS WITHOUT TRANSVERSE INTERACTIONS BETWEEN THE CHANNELS, CAN BE PERFORMED. PROBLEMS OF PARTIAL FLOW BLOCKAGE (POROUS BLOCKAGE) CAN BE ANALYZED, AND THE EFFECT ON THE REDISTRIBUTION OF THE INLET MASS VELOCITY CAN BE TAKEN INTO ACCOUNT.

723 SOLA-ICE SOLA-ICE IS A NUMERICAL SOLUTION ALGORITHM FOR TRANSIENT, ARBITRARILY COMPRESSIBLE FLUID FLOWS.

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48 FUGUE THE FUGUE PROGRAM COMPUTES STEADY-STATE WALL AND BULK FLUID TEMPERATURE, VOID FRACTION, AND LOCAL PRESSURE IN LIQUID-COOLED CLOSED CHANNELS IN WHICH THE HEATING RATE IS SPECIFIED. THE REQUIRED RELATIONSHIPS ARE EXPRESSED IN GENERAL, NON-DIMENSIONAL FORM AND COMBINED IN AN INTERNALLY CONSISTENT MANNER TO ALLOW PREDICTIONS FOR A VARIETY OF COOLANTS AND SPECIFIED OPERATING CONDITIONS.

80 SOR3 SOR3 IS USED FOR THE ANALYSIS OF SYMMETRICALLY LOADED SHELLS OF REVOLUTION. THE PROGRAM COMPUTES STRESSES, STRAINS, FORCES AND DEFLECTIONS PRODUCED BY THERMAL AND MECHANICAL LOADS. NORMAL AND TRANSVERSE SHEAR STRESSES AND WALL THICKNESS CHANGES ARE TAKEN INTO ACCOUNT. THE PROGRAM IS BASED ON CONSTITUTIVE EQUATIONS WHICH RETAIN TERMS THROUGH THE SECOND ORDER IN THE RATIO OF THE THICKNESS TO THE LOCAL RADIUS OF CURVATURE. THESE FEATURES MAKE THE PROGRAM APPLICABLE TO SHELL STRUCTURES WITH MODERATELY LARGE THICKNESS TO RADIUS RATIOS.

109 4RESTRAINT PIPE STRESS CODE THIS PROGRAM EVALUATES A FOUR RESTRAINT PIPING SYSTEM DESIGNED FOR HIGH TEMPERATURE OPERATION.

112 CROCK CROCK SELECTS THE MINIMUM WEIGHT DESIGN FOR A SPACE POWER PLANT IN WHICH THE WASTE CYCLE HEAT IS RADIATED DIRECTLY TO SPACE FROM THE CONDENSER. IT ACCOUNTS FOR HEAT TRANSFER, FLUID FLOW, METEOROID PROTECTION, AND THE GEOMETRIC PROPERTIES OF A RADIATOR-CONDENSER.

114 SHOCK SHOCK SELECTS THE MINIMUM WEIGHT DESIGN FOR A HEAT-REJECTION SYSTEM FOR A SPACE POWER PLANT IN WHICH THE SENSIBLE HEAT LOST FROM A SINGLE-PHASE FLUID IS RADIATED TO SPACE. IT ACCOUNTS FOR HEAT TRANSFER, FLUID FLOW, METEOROID PROTECTION AND RADIATOR GEOMETRY.

187 CENTRIFUGAL PUMP IMPELLER DESIGN THIS SYSTEM HAS BEEN DEVELOPED FOR THE DESIGN AND DEVELOPMENT OF HIGH SPEED TURBOMACHINERY FOR PUMPING HIGH TEMPERATURE LIQUID METALS. AFTER INITIALIZING THE ANALYSIS AND DESIGN EFFORT BY ESTABLISHING THE PUMP CONDITIONS OF SERVICE THE CODES ARE USED TO DEFINE THE PUMP IMPELLER DESIGN. IN ALL PROGRAMS, REAL FLUID EFFECTS ARE NOT CONSIDERED. THE MACHINING CODE PRODUCES A PAPER TAPE FOR USE IN THE ACTUAL FABRICATION OF THE IMPELLER.

190 WOPEXPRT, WEIGHT OPTIMIZATION THE PURPOSE OF THE CODE IS TO CHOOSE THE LIGHTEST REACTOR RESULTING FROM ALL POSSIBLE COMBINATIONS OVER THE RANGE OF REACTOR INDEPENDENT VARIABLES SPECIFIED. THE ENGINEERING CALCULATIONS FOR EACH REACTOR DESIGN

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ARE BASED ON A LIQUID-COOLED CYLINDRICAL REACTOR HAVING PIN-TYPE FUEL ELEMENTS. REACTOR CONTROL IS ASSUMED TO BE EFFECTED BY MOVABLE SIDE REFLECTORS SURROUNDING THE CORE. NECESSARY PHYSICS DATA IS INPUT IN THE FORM OF SECOND-DEGREE EQUATIONS AS A FUNCTION OF THE INDEPENDENT VARIABLES.

232 GAZELLES DETERMINATION OF GAS-COOLED FAST REACTOR CORE PROPORTIONS REQUIRED TO SATISFY SPECIFIED DESIGN CONSTRAINTS AND COMPUTATION OF RESULTING PERFORMANCE CHARACTERISTICS.

233 CORE THE REACTOR CORE CONFIGURATION DESIGNED BY THE CORE PROGRAM CONSISTS OF CYLINDRICAL FUEL ELEMENTS ARRANGED ON AN EQUILATERAL PITCH SPACING WITH INTERNAL AND EXTERNAL COOLING. THE FUEL ELEMENT IS COMPOSED OF THREE CONCENTRIC GRAPHITE RINGS, AN INTERNAL COOLANT CHANNEL, AND A SPINE. THE COOLANT CHANNEL IS FORMED BY THE SPINE AND INNER GRAPHITE RING. THE FUEL IS CONTAINED IN THE MIDDLE GRAPHITE RING. CORE WILL DETERMINE THE NUMBER OF FUEL ELEMENTS OF A SPECIFIED DIAMETER AND LENGTH REQUIRED TO SATISFY A GIVEN CENTRAL FUEL TEMPERATURE. IT ALSO ADJUSTS THE PITCH SPACING REQUIRED TO PRODUCE A DESIRED PRESSURE DROP AS WELL AS PROVIDING A SPECIFIED INTERNAL COOLING RATE.

244 CYCLOPS1 CYCLOPS1 IS A PROGRAM FOR THE ANALYSIS OF THERMODYNAMIC SYSTEMS. IT IS A GENERAL PURPOSE PROGRAM THAT PERFORMS A HEAT AND MASS BALANCE FOR THERMODYNAMIC SYSTEMS COMPOSED OF PUMPS, TURBINES, SEPARATORS, HEAT EXCHANGERS, COMPRESSORS AND FLOW THROTTLING DEVICES. THESE COMPONENTS MAY BE CONNECTED IN ANY DESIRED WAY. THE THERMODYNAMIC FLUIDS THAT MAY BE USED ARE WATER, AIR, NITROGEN, AND PARA-HYDROGEN.

250 SAFE-PCRS SAFE-PCRS NUMERICALLY DETERMINES THE STRESS AND STRAIN DISTRIBUTION WITHIN EITHER HOMOGENEOUS OR HETEROGENEOUS THICK-WALLED BODIES OF REVOLUTION. IT IS DESIGNED FOR THE ANALYSIS OF MULTI-MATERIAL AXISYMMETRIC COMPOSITE STRUCTURES SUCH AS REINFORCED AND/OR PRESTRESSED CONCRETE VESSELS. DEFORMATIONS MUST BE WITHIN THE ELASTIC LIMIT OF THE MATERIALS CONSIDERED AND ONLY BODIES OF REVOLUTION SUBJECTED TO AXISYMMETRIC LOADING CAN BE TREATED.

251 SAFE-AXISYM SAFE-AXISYM IS A PROGRAM FOR THE ANALYSIS OF MULTI-MATERIAL AXISYMMETRIC COMPOSITE STRUCTURES. IT IS DESIGNED FOR THE ANALYSIS OF HETEROGENEOUS STRUCTURES SUCH AS REINFORCED AND/OR PRESTRESSED CONCRETE VESSELS. THE STRUCTURE IS ASSUMED TO BE LINEARLY ELASTIC, AND ONLY BODIES OF REVOLUTION SUBJECTED TO AXISYMMETRIC LOADING CAN BE TREATED.

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252 SAFE-PLANE SAFE-PLANE IS APPLIED TO TWO-DIMENSIONAL STRUCTURES OF ARBITRARY GEOMETRY UNDER IN-PLANE LOADS. EITHER PLANE STRESS OR PLANE STRAIN CONDITIONS MAY BE IMPOSED. MECHANICAL AND/OR THERMAL LOADS ARE PERMITTED.

253 SAFE-SHELL SAFE-SHELL IS USED TO DESIGN AND ANALYZE AXISYMMETRIC THIN SHELL STRUCTURES OF ARBITRARY GENERATRICES UNDER AXISYMMETRIC MECHANICAL AND/OR THERMAL LOADING CONDITIONS. THE INTERSECTION OF TWO OR MORE SHELLS CAN BE TREATED.

266 CYGRO2 CYGRO2 IS USED TO DETERMINE STRESSES AND STRAINS DURING STEADY-STATE AND TRANSIENT POWER OPERATION OF AN OXIDE-FUELED, METAL CLAD ROD-TYPE FUEL ELEMENT IN A PRESSURIZED ENVIRONMENT. MAJOR LOADING CONDITIONS INCLUDE FUEL SWELLING, FISSION GAS AND COOLANT PRESSURE, CLAD GROWTH AND DIFFERENTIAL THERMAL EXPANSION. THE APPLICATION FOR WHICH THE PROGRAM HAS BEEN DEVELOPED IS ZIRCALOY TUBES CONTAINING BULK OXIDE FUEL. AXIAL AND AZIMUTHAL SYMMETRY OF TEMPERATURE AND STRESSES IS ASSUMED.

282 SEALSHELL2(M0110) THE SEALSHELL2 PROGRAM DETERMINES STRESSES, STRAINS, DEFLECTIONS, AND REACTIONS IN A THICK SHELL OF REVOLUTION WITH AXISYMMETRIC LOADING. THE LOADING CONSISTS OF A TEMPERATURE DISTRIBUTION, INSIDE AND OUTSIDE PRESSURE DISTRIBUTIONS, AND CIRCUMFERENTIAL FORCES AND MOMENTS APPLIED TO THE MIDDLE SURFACE. THE SHELL IS LINEAR-ELASTIC WITH TENSILE, BENDING, AND SHEAR STRAINS.

283 M0552 M0552 SOLVES THE TRANSIENT RESPONSE PROBLEM OF LINEAR ELASTIC, LUMPED-MASS SYSTEMS SUBJECTED TO A UNIDIRECTIONAL FOUNDATION TRANSIENT THAT CAN BE EITHER A VELOCITY OR ACCELERATION TRANSIENT. NORMAL MODE THEORY IS USED AND THE INPUT TO THE PROGRAM CONSISTS OF THE MODE SHAPES, FREQUENCIES, AND FOUNDATION TRANSIENT. ELEMENT EFFECTS ARE ALSO EVALUATED AS A FUNCTION OF TIME. MODAL DAMPING COEFFICIENTS MAY BE SPECIFIED.

300 SAFE-CREEP SAFE-CREEP PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE OR AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES WITH AGE- AND TEMPERATURE-DEPENDENT CREEP DATA.

315 WIREX WIREX PRODUCES WIRING LISTS CONTAINING ALL THE INFORMATION NORMALLY FOUND ON DETAILED WIRING DRAWINGS. THESE LISTS ARE PRESENTED TO THE ELECTRICIANS AS A JOB BOOK CONTAINING INFORMATION IN THE ORDER IN WHICH IT IS REQUIRED

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FOR LOGICAL PROCEDURE THROUGH A WIRING JOB. WIREX LISTS WERE USED EXTENSIVELY DURING INSTALLATION FOR THE UHTREX PROJECT.

329 M0457(PPIPE) PIPE PERFORMS AN ELASTIC STRESS ANALYSIS OF A 3-DIMENSIONAL PIPING STRUCTURE WITH THERMAL STRESSES, REDUNDANT LOOPS, AND CONCENTRATED LOADS.

332 SAFE-3D SAFE-3D IS A FINITE-ELEMENT PROGRAM FOR THE THREE-DIMENSIONAL ELASTIC ANALYSIS OF HETEROGENEOUS COMPOSITE STRUCTURES. THE PROGRAM USES THE FOLLOWING TYPES OF FINITE ELEMENTS - (1) TETRAHEDRAL ELEMENTS TO REPRESENT THE CONTINUUM, (2) TRIANGULAR PLANE STRESS MEMBRANE ELEMENTS TO REPRESENT INNER LINER OR OUTER CASE, AND (3) UNIAXIAL TENSION-COMPRESSION ELEMENTS TO REPRESENT INTERNAL REINFORCEMENT. THE STRUCTURE CAN BE OF ARBITRARY GEOMETRY AND HAVE ANY DISTRIBUTION OF MATERIAL PROPERTIES, TEMPERATURES, SURFACE LOADINGS, AND BOUNDARY CONDITIONS.

337 STEM STEM CALCULATES AND PUNCHES OUT PARTIALLY-COUPLED MASS, STIFFNESS AND INTERNAL LOAD FUNCTION MATRICES FOR A STRUCTURAL SYSTEM OF BEAMS HAVING PRISMATIC SEGMENTS. SHEAR DEFORMATION AND ROTATIONAL INERTIA ARE INCLUDED IN THE CALCULATIONS.

344 GEM GEM IS INTENDED PRIMARILY TO PERFORM VIBRATION STUDIES WITH THE CAPABILITY OF GENERATING INPUT FOR THE VEP (VIBRATION EIGENVALUE PROBLEM) ROUTINE AND PERFORMING ADDITIONAL OPERATIONS ON THE OUTPUT FROM THE SHO (SHOCK) SEGMENT. GIVEN A SYSTEM OF MASSES AND SPRINGS, THE VEP ROUTINE COMPUTES THE NATURAL FREQUENCIES OF THE VIBRATING SYSTEM AS WELL AS THE MODE SHAPES FOR EACH FREQUENCY. GIVEN THE MODE SHAPES, FREQUENCIES, AND MASSES OF A VIBRATING SYSTEM, THE SHO ROUTINE WILL COMPUTE THE DEFLECTIONS AND FORCES AT THE MASS POINTS.

353 SWELL2 SWELL2 WAS DEVELOPED TO PROVIDE THE FUEL-ELEMENT LIFETIME DATA REQUIRED FOR POWER PLANT OPTIMIZATION STUDIES. THE PROGRAM COMMENCES BY CALCULATING RADIAL AND AXIAL TEMPERATURES IN A FUEL ELEMENT. THE FUEL WHICH IS HOTTER THAN THE EFFECTIVE-FISSION-GAS-RELEASE-TEMPERATURE IS CONSIDERED TO RELEASE ITS FISSION GAS IMMEDIATELY TO A PLENUM, AND THE PRESSURE OF ALL PLENUM GAS IS CALCULATED. THE PRESSURE OF THE GAS RETAINED FOR A WHILE IN THE COLDER FUEL IS ALSO CALCULATED. AT EACH AXIAL POSITION THE PLENUM PRESSURE IS COMPARED WITH THE PRESSURE EXERTED BY RETAINED FISSION GAS, AND THE LARGER OF THE TWO PRESSURES IS CONSIDERED TO BE THE EFFECTIVE PRESSURE AS FAR AS CLADDING DAMAGE IS CONCERNED. THE CLADDING IS ASSUMED TO FAIL WHEN ITS CUMULATIVE DAMAGE EQUALS UNITY AT ANY AXIAL POSITION.

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DAMAGE COMPONENTS ARE PRIMARY CREEP, SECONDARY CREEP, RATCHETING GROWTH DUE TO THERMAL CYCLING, FATIGUE DUE TO THERMAL CYCLING, AND STRAIN DUE TO INEXORABLE FUEL SWELLING. AT EACH STEP OF THE CALCULATIONS THE FUEL ELEMENT IS SUBJECTED TO SEVERAL CONDITIONS OF ABNORMAL OPERATION (OVERPOWER, FLOW COASTDOWN, ETC.) TO ENSURE THEY COULD NOT PRODUCE ENOUGH ADDITIONAL DAMAGE TO CAUSE FAILURE AT THAT TIME.

357 SUPORAN SUPORAN SOLVES FOR STEADY-STATE DEFORMATION AND STRENGTH CHARACTERISTICS OF A NUCLEAR REACTOR CORE SUPPORT STRUCTURE. THIS STRUCTURE IS ASSUMED TO BE MADE OF TWO CIRCULAR PLATES WHICH ARE LOCATED ABOVE EACH OTHER AND ARE INTERCONNECTED PERPENDICULARLY WITH CONCENTRIC ROWS OF TUBULAR MEMBERS. THE GEOMETRY OF THE STRUCTURE AND ITS LOADING (TRANSVERSE PRESSURE AND INTERNAL TEMPERATURE GRADIENTS) ARE ALL OF AXISYMMETRICAL NATURE.

365 BOW2 BOW2 IS USED TO CALCULATE DEFLECTIONS OF CLOSELY-SPACED PARALLEL BEAMS, EACH WITH LIMITED-PIVOT SUPPORT AT ONE END, POSSIBLE BEAM INTERACTIONS AT THE OTHER END AND AT ONE INTERMEDIATE POSITION, ASSUMING AN ARBITRARY TEMPERATURE DISTRIBUTION.

378 TUBE TUBE SOLVES FOR THE STRESSES DUE TO PRESSURE AND TEMPERATURE IN A U-TUBE TYPE HEAT EXCHANGER. SPECIFICALLY, IT HANDLES A CONFIGURATION CONSISTING OF A SPHERICAL HEAD, PRIMARY TRANSITION CYLINDER, AND SECONDARY CYLINDER. THE TRANSITION CYLINDERS MAY BE CONICAL AND TAPERED IN THICKNESS, BUT THE REMAINING SHELLS ARE OF UNIFORM THICKNESS. THE SPHERICAL HEAD AND THE TRANSITION CYLINDERS MAY BE OMITTED FROM A PROBLEM.

379 SAFE-2D SAFE-2D PERFORMS THE ELASTIC STRESS ANALYSIS OF GENERAL AXISYMMETRIC, PLANE, AND COMBINED AXISYMMETRIC AND PLANE COMPOSITE STRUCTURES.

383 M0266 M0266 COMPUTES THE DYNAMIC SHOCK FORCES AND MODAL FREQUENCIES ACTING ON A LUMPED MASS, LINEAR ELASTIC MODEL OF A STRUCTURE SUBJECTED TO SHOCK SPECTRUM INPUTS. THE MODEL EMPLOYED IS A COLLECTION OF LUMPED MASSES CONNECTED BY WEIGHTLESS FLEXIBLE ELEMENTS. IF THE ORIGINAL STRUCTURE IS NOT STATICALLY DETERMINATE, REDUNDANT FORCES MUST BE INTRODUCED TO ENSURE A PRIMARY STRUCTURE THAT IS.

391 SORSDB SORSDB WAS WRITTEN TO CALCULATE THE STRESS INTENSITIES AND FATIGUE USAGE FACTORS FOR PRESSURE VESSELS (STRUCTURAL MEMBERS) IN ACCORDANCE WITH THE ASME

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CODE, NUCLEAR VESSELS, SECTION 3. THE INPUT REQUIRES THE BASIC MEMBRANE AND BENDING STRESSES GENERATED BY THE SOR2 CODE (ACC ABSTRACT 80) OR ANY ADAPTABLE SHELL PROGRAM. THE OUTPUT INCLUDES STRESS DIFFERENCES, STRESS INTENSITIES, AND FATIGUE USAGE FACTORS.

397 GAPL3 GAPL3 DETERMINES THE INELASTIC, LARGE-DEFLECTION BEHAVIOR OF THIN PLATES OR AXIALLY SYMMETRIC SHELLS WITH PRESSURE LOADING AND DEFLECTION RESTRAINTS.

402 SABOR4 SABOR4 IS A DISCRETE ELEMENT DISPLACEMENT PROGRAM FOR THE LINEAR-ELASTIC, STATIC, LOAD-DEFLECTION ANALYSIS OF MERIDIONALLY-CURVED, VARIABLE-THICKNESS, BRANCHED, THIN SHELLS OF REVOLUTION WHICH MAY BE SUBJECTED TO CONCENTRATED OR DISTRIBUTED EXTERNAL LOADING AND TO ISOTHERMAL OR NONUNIFORM TEMPERATURE CONDITIONS. THE PROGRAM CONSISTS OF FIVE PRIMARY SUBPROGRAMS - HAL4, MELT4, LANCE4, MAINS4, AND SUMPLOT4. THREE OF THESE (HAL4, MELT4, AND LANCE4) PROCESS EXTERNAL-MECHANICAL-LOAD OR THERMAL-LOAD DATA TO DETERMINE THE GENERALIZED NODAL FORCES FOR EACH DISCRETE ELEMENT. MAINS4 COMPUTES THE DISCRETE-ELEMENT STIFFNESS AND MASS MATRICES AND FORMS THESE MATRICES FOR THE ASSEMBLED STRUCTURE. SUMPLOT4 CALCULATES THE OTHER QUANTITIES OF INTEREST, SUMS CONTRIBUTIONS FROM VARIOUS LOADING HARMONICS, AND PREPARES RESULTS FOR CALCOMP PLOTTING.

404 FINEL FINEL IS A COLLECTION OF 3 PROGRAMS FOR THE CALCULATION OF THE ELASTIC AND PLASTIC BEHAVIOR OF STRUCTURES. THE STRUCTURES ARE BUILT UP FROM PLATES AND BARS, WHICH CAN BE ARRANGED IN EITHER 2-DIMENSIONAL OR 3-DIMENSIONAL ASSEMBLIES. THE PLATES CAN BE IN PLANE STRESS OR PLANE STRAIN. FINEL2 HANDLES 2-D STRUCTURES ONLY. FINEL3 CAN HANDLE BOTH 2- AND 3-D STRUCTURES, BUT IS SLOWER.

412 MANE1 THE MANE1 PROGRAM FINDS THE MAGNETIC FLUX IN EACH BRANCH OF A MAGNETIC NETWORK CONSISTING OF A NUMBER OF BRANCHES OF IRON AND AIR. THE PROBLEM IS ONE STEP IN THE DESIGN OF SLOW SPEED RELUCTANCE MOTORS IN WHICH THE MAGNETIC FLUX IS DETERMINED IN ALL COMPONENT PARTS FOR A POSITION OF THE ROTOR WITH RESPECT TO THE STATOR.

449 CYGRO3 CYGRO3 IS AN EXTENSIVE MODIFICATION OF CYGRO1 AND CYGRO2 (ACC ABSTRACT 266). BASICALLY THE PROGRAM CALCULATES TEMPERATURES, DEFORMATION, AND STRESSES IN CLADDED FUEL RODS AS A FUNCTION OF A HISTORY OF POWER AND COOLANT CONDITIONS. AXIAL AND CIRCUMFERENTIAL UNIFORMITY ARE ASSUMED. BUBBLE GROWTH AND MIGRATION ARE INCLUDED. THE MAIN CHANGES FROM CYGRO1 AND CYGRO2 ARE IN THE AREA OF VOID MIGRATION, FUEL CRACKING, CLAD COLLAPSE, REPRESENTATION OF IN-PILE CREEP AND CLAD ANISOTROPY.

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451 SAFE-CRACK SAFE-CRACK PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE AND AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES SUBJECTED TO TRANSIENT TEMPERATURE AND MECHANICAL LOADINGS. THE SPECIFIC CREEP OF CONCRETE AS AN AGE AND TEMPERATURE-DEPENDENT FUNCTION, AND CONCRETE FAILURE UNDER COMBINED STRESSES ARE CONSIDERED. PARTICULAR EMPHASIS IS PLACED ON THE CRACKING ANALYSIS IN CONCRETE STRUCTURES AND THE NONLINEAR DEPENDENCE OF CREEP PROPERTY ON TRANSIENT TEMPERATURE.

452 SHELL5 SHELL5 PERFORMS AN ELASTIC STRESS ANALYSIS OF SMOOTHLY CURVED, ARBITRARILY SHAPED, THREE-DIMENSIONAL THIN SHELLS WITH ANY DESIRED DISTRIBUTIONS OF MATERIAL PROPERTIES, BOUNDARY CONSTRAINTS, AND MECHANICAL, THERMAL, AND DISPLACEMENT LOADING CONDITIONS.

460 LIFE3 THE LIFE3 COMPUTER CODE WAS DEVELOPED TO CALCULATE THE THERMAL AND MECHANICAL RESPONSE OF MIXED-OXIDE FUEL ELEMENTS IN A FAST-REACTOR ENVIRONMENT. IT INCORPORATES A ONE-DIMENSIONAL, STEADY-STATE HEAT-TRANSFER ANALYSIS AND A FINITE-STRAIN-THEORY STRUCTURAL ANALYSIS BASED ON GENERALIZED PLANE STRAIN AND THE METHOD OF SUCCESSIVE ELASTIC SOLUTIONS. AN INCREMENTAL APPROACH IS USED SO THAT TEMPERATURES, STRESSES, AND STRAINS CAN BE CALCULATED DURING ANY SPECIFIED HISTORY OF REACTOR POWER CYCLING. FUEL-CLADDING AND SODIUM-CLADDING CHEMICAL ATTACK IS TREATED BY A CLADDING WASTAGE MODEL. UP TO SIX AXIAL SECTIONS ARE ALLOWED TO ACCOUNT FOR AXIAL VARIATIONS IN POWER AND COOLANT TEMPERATURE. FUEL RESTRUCTURING; MIGRATION OF FABRICATED AND SWELLING POROSITIES; FUEL AND CLADDING THERMAL EXPANSION, ELASTICITY, SWELLING, AND CREEP; FISSION-GAS RELEASE; AND FUEL CRACKING, CRACK HEALING, AND HOT PRESSING ARE INCLUDED IN THE ANALYSIS. LIFE3 IS THE REFERENCE ERDA CODE FOR CALCULATING THE PERFORMANCE OF FAST BREEDER REACTOR FUEL ELEMENTS UNDER NORMAL OPERATING CONDITIONS, INCLUDING POWER CYCLING.

468 BUBL1 BUBL1 PREDICTS FUEL SWELLING AND FISSION GAS RELEASE FROM NUCLEAR FUELS, BASED ON MOVEMENT OF FISSION GAS BUBBLES IN SOLIDS BY A SURFACE DIFFUSION MECHANISM UNDER THE ACTION OF A THERMAL GRADIENT (SEE REFERENCE 3). INTERACTIONS OF THE BUBBLES WITH DISLOCATIONS AND GRAIN BOUNDARIES PROVIDE TEMPORARY TRAPPING SITES, PRIOR TO RELEASE.

481 BUSHL BUSHL DETERMINES THE LOAD AT WHICH A FINITE LENGTH SHELL OF REVOLUTION WILL BUCKLE WHEN SUBJECTED TO HYDROSTATIC PRESSURE, AXIAL COMPRESSION, OR A COMBINATION OF THE TWO. ELASTIC-PLASTIC MATERIAL PROPERTIES ARE USED WITH DEFORMATION THEORY AND THIN SHELL THEORY TO ANALYZE THE SHELL. BUSHL WAS DEVELOPED PRIMARILY FOR THE BUCKLING COLLAPSE ANALYSIS OF ZIRCALOY-CLAD OXIDE FUEL RODS.

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503 DUZ2 DUZ2 PERFORMS TWO-DIMENSIONAL ELASTIC-PLASTIC STRESS CALCULATIONS. THE PROGRAM TREATS AXIALLY SYMMETRIC BODIES OR PLANE REGIONS (PLANE STRESS OR PLANE STRAIN) ASSUMING DEFORMATION THEORY. LOADING CONDITIONS MAY BE A NON-UNIFORM TEMPERATURE DISTRIBUTION, BODY FORCES, AND BOUNDARY DISPLACEMENTS OR STRESSES.

537 M0678(FUGIT1) FUGIT1 PERFORMS A TRANSIENT STEP ANALYSIS OF AN ELASTIC STRUCTURE MOUNTED ON A RIGID BASE WHICH HAS A GIVEN SHOCK HISTORY OF MOTION. THE STRUCTURE MAY HAVE NONLINEAR CONSTRAINTS AND DAMPING.

539 STRAP THE CODE STRAP (STRUCTURAL ANALYSIS PACKAGE) WAS DEVELOPED TO ANALYZE THE RESPONSE OF STRUCTURAL SYSTEMS TO STATIC AND DYNAMIC LOADING CONDITIONS. STRAP-S SOLVES FOR THE DISPLACEMENTS AND MEMBER FORCES OF STRUCTURAL SYSTEMS UNDER STATIC LOADS AND TEMPERATURE GRADIENTS. STRAP-D WILL SOLVE NUMERICALLY A GIVEN STRUCTURAL DYNAMICS PROBLEM.

542 PSA2 PSA2 COMPUTES THE REACTIONS AND STRESSES CAUSED BY THERMAL EXPANSION AND LOADS IN A MULTI-ANCHOR PIPING SYSTEM WHICH MAY CONTAIN LOOPS AND MAY BE PARTIALLY RESTRAINED AT ANY POINT IN ANY DIRECTION.

568 BEHAVE2 BEHAVE2 CALCULATES THE POSITION IN SPACE OF CLADDING, FUEL, AND VOIDAGE IN AN OPERATING OXIDE FUEL PIN WITH UNFAILED CLADDING. AXIAL SYMMETRY IS ASSUMED THROUGHOUT THE PROGRAM. ALSO CALCULATED ARE STRESS, STRAIN, DISPLACEMENT, AND TEMPERATURE FIELDS. INFLUENTIAL PROCESSES SIMULATED INCLUDE CRACKING OF FUEL, DILATATION OF FUEL AND CLADDING DUE TO IRRADIATION EFFECTS AND THERMAL EXPANSION, FUEL DENSIFICATION BY BOTH STRESS- AND DIFFUSION-CONTROLLED PROCESSES, AXIAL SLIPPAGE OR LOCKING AT THE FUEL-CLADDING INTERFACE AND AXIAL FLOW OF FUEL.

570 STRIPE(M0650) STRIPE EXAMINES THE DEFORMATIONS IMPOSED ON THE CLADDING OF CYLINDRICAL FUEL ELEMENTS DUE TO DIFFERENTIAL THERMAL EXPANSIONS DURING ABRUPT POWER INCREASES. THE TITLE IS TAKEN FROM STRESSES AND CRACKING IN PELLETS. THE CALCULATIONAL MODEL INCLUDES EFFECTS OF PELLET CRACKING, THE CONSTRAINT OF SYSTEM PRESSURE AND CLADDING, COMPRESSIVE PLASTIC FLOW IN THE FUEL AND THE TEMPERATURE DEPENDENCE OF MATERIAL PROPERTIES.

581 SLADE-D SLADE-D ANALYZES THE TRANSIENT DYNAMIC RESPONSE OF ELASTIC SHELLS.

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597 MATUS MATUS PERFORMS SMALL-STRAIN
ELASTIC ANALYSIS OF THREE-DIMENSIONAL SOLIDS.

598 PELEN PELEN SOLVES A TWO-DIMENSION-
AL, AXISYMMETRICAL MODEL OF A FUEL PELLET AND CLAD ELEMENT FOR
THE TEMPERATURE, STRESS, AND DEFORMATION THROUGHOUT A TIME HIS-
TORY. IN A GENERAL TIME INCREMENT, THE COMPUTATIONAL SEQUENCE
IS - (1) A HEAT CONDUCTION ANALYSIS OF BOTH FUEL AND CLAD TO
DETERMINE THE CURRENT TEMPERATURE FIELD WHICH IS DEPENDENT ON THE
POWER RATE, THE MATERIAL PROPERTIES, AND THE GEOMETRICAL CONFIGU-
RATION, (2) AN INCREMENTAL STRESS ANALYSIS OF BOTH FUEL AND CLAD
TO DETERMINE THE CURRENT STRESS AND DEFORMATION FIELDS WHICH ARE
DEPENDENT ON THE INELASTIC STRAIN INCREMENTS (TEMPERATURE, CREEP,
VOLUME EXPANSION, ETC.), THE MATERIAL PROPERTIES, AND THE GEOME-
TRICAL CONFIGURATION, AND (3) A CONTACT ANALYSIS OF BOTH FUEL AND
CLAD TO DETERMINE THE CORRECTED CURRENT STRESS AND DEFORMATION
FIELDS WHICH ARE DEPENDENT ON THE EXTENT OF CONTACT BETWEEN ADJA-
CENT FUEL PELLETS AND/OR THE FUEL AND CLAD.

604 TCB01 A TUBE UNDER EXTERNAL PRES-
SURE, AT ELEVATED TEMPERATURE, AND INITIALLY OUT-OF-ROUND WILL
CREEP, BECOMING MORE OUT-OF-ROUND AND EVENTUALLY WILL COLLAPSE.
TCB01 ATTEMPTS TO PREDICT THE TIME OF COLLAPSE.

611 CHILES CHILES IS A FINITE ELEMENT
COMPUTER PROGRAM THAT CALCULATES THE STRENGTH OF SINGULARITIES IN
LINEAR ELASTIC BODIES. PLANE STRESS, PLANE STRAIN, AND AXISYMME-
TRIC CONDITIONS ARE TREATED. CRACK TIP SINGULARITY PROBLEMS ARE
SOLVED BY THIS VERSION OF THE CODE, BUT ANY TYPE OF INTEGRABLE
SINGULARITY MAY BE PROPERLY MODELED BY MODIFYING SELECTED SUB-
ROUTINES IN THE PROGRAM.

618 GAPCON-THERMAL2 GAPCON-THERMAL2 WAS DEVELOPED
AS A TOOL FOR ESTIMATING FUEL-CLADDING GAP CONDUCTANCES AND FUEL
STORED ENERGY. GAPCON-THERMAL2 MAKES NUCLEAR FUEL PIN STEADY
STATE THERMAL PERFORMANCE PREDICTIONS, USING MODELS WHICH INCLUDE
POWER HISTORY, FISSION GAS GENERATION AND RELEASE, FUEL RELOCATION
AND DENSIFICATION, AND FUEL CLADDING GAP CONDUCTANCE. THE GAS
RELEASE AND RELOCATION MODELS CAN BE USED TO MAKE EITHER BEST
ESTIMATE OR CONSERVATIVE PREDICTIONS.

641 SAP4 SAP4 IS A STRUCTURAL ANALYSIS
PROGRAM FOR DETERMINING THE STATIC AND DYNAMIC RESPONSE OF LINEAR
SYSTEMS. THE STRUCTURAL SYSTEMS TO BE ANALYZED MAY BE COMPOSED OF
COMBINATIONS OF A NUMBER OF DIFFERENT STRUCTURAL ELEMENTS. PRE-
SENTLY, THE PROGRAM CONTAINS THE FOLLOWING ELEMENT TYPES -
(A) THREE-DIMENSIONAL TRUSS ELEMENT,

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- (B) THREE-DIMENSIONAL BEAM ELEMENT,
- (C) PLANE STRESS AND PLANE STRAIN ELEMENT,
- (D) TWO-DIMENSIONAL AXISYMMETRIC SOLID,
- (E) THREE-DIMENSIONAL SOLID,
- (F) VARIABLE-NUMBER-NODES THICK SHELL AND THREE-DIMENSIONAL ELEMENT,
- (G) THIN PLATE OR THIN SHELL ELEMENT,
- (H) BOUNDARY ELEMENT, AND
- (I) PIPE ELEMENT (TANGENT AND BEND).

643 NUBOW NUBOW PERFORMS A TWO-DIMENSIONAL ELASTIC ANALYSIS OF REACTOR CORE SYSTEMS SUBJECTED TO THERMAL AND/OR MECHANICAL BOWING. REACTOR ASSEMBLIES ARE CONSIDERED TO BE ELASTIC BEAM MEMBERS WHICH MAY HAVE VARIABLE GEOMETRY. EQUILIBRIUM FORCES AND POSITIONS ARE CALCULATED ALONG WITH THE SHAPES OF INDIVIDUAL ROWS. CLEARANCE AND LOCAL FLEXIBILITY ARE ALLOWED AT ALL CONTACTS.

648 LUGS LUGS CALCULATES STRESSES, STRESS INDICES, AND FLEXIBILITY FACTORS FOR A RECTANGULAR ATTACHMENT ON A CYLINDRICAL SHELL.

650 ELBOW-ORNL ELBOW-ORNL CALCULATES THE STRESSES, STRESS INDICES, AND FLEXIBILITY FACTORS FOR IN-PLANE AND OUT-OF-PLANE BENDING OF ELBOWS AND CURVED PIPE SUBJECTED TO INTERNAL PRESSURE. COMPARISON WITH EXPERIMENTS INDICATES THAT THE RESULTS ACCURATELY REPRESENT THE MAXIMUM STRESSES WHICH OCCUR AT THE CENTER OF THE BEND.

657 LINDA LINDA IMPLEMENTS A DIAGNOSTIC PROCEDURE WHICH DEPENDS UPON THE HYPOTHESIS THAT STRAIN MEASUREMENTS OBTAINED FROM A LINEAR ELASTIC STRUCTURAL TEST SHOULD BE PROPORTIONAL TO THE APPLIED LOADS. NONLINEARITIES IN THE DATA FROM SUCH A TEST ARE EXPECTED TO ARISE FROM ERRORS IN MEASURING OR RECORDING EITHER THE STRAINS OR THE LOADS. THE DIAGNOSTIC PROCEDURE PROVIDES A MEANS TO IDENTIFY AND DISTINGUISH BETWEEN THE TWO TYPES OF ERRORS.

667 BUCKLE BUCKLE IS A ONE-DIMENSIONAL COMPUTER CODE COMPILED TO CALCULATE THE CHANGE IN OVALITY, OF AN INITIALLY OVAL, CLOSED-END FINITE LENGTH TUBE, AS A FUNCTION OF TIME, TEMPERATURE, NEUTRON FLUX AND UNIFORM EXTERNAL PRESSURE. THE BASIC CONCEPT EMPLOYED IN BUCKLE IS THAT A TUBE, WHICH IS SLIGHTLY OUT-OF-ROUND, TENDS TO BECOME MORE OUT-OF-ROUND WITH TIME WHEN SUBJECTED TO NET UNIFORM EXTERNAL PRESSURE. THE TIMELIKE CHANGE IN OVALITY OCCURS AS A CONSEQUENCE OF CREEP DEFORMATIONS ARISING FROM TANGENTIAL COMPRESSIVE AND TANGENTIAL BENDING

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STRESSES PRODUCED BY UNIFORM EXTERNAL PRESSURES ACTING ON AN INITIALLY OVAL TUBE.

672 HONDO HONDO IS USED TO COMPUTE THE TIME-DEPENDENT DISPLACEMENTS, VELOCITIES, ACCELERATIONS, AND STRESSES WITHIN ELASTIC OR INELASTIC, TWO-DIMENSIONAL OR AXISYMMETRIC BODIES OF ARBITRARY SHAPES AND MATERIALS.

682 GNATS/MESH2/GPRINT GNATS IS A FINITE ELEMENT COMPUTER PROGRAM DESIGNED FOR NONLINEAR ANALYSIS OF AXISYMMETRIC AND TWO-DIMENSIONAL STATIC STRUCTURES.

689 FLANGE-ORNL FLANGE-ORNL CALCULATES APPROPRIATE LOADS, STRESSES, AND DISPLACEMENTS FOR THE FLANGES, BOLTS, AND GASKETS THAT COMPRISE A FLANGED PIPING JOINT FOR INTERNAL PRESSURE OR MOMENT LOADING ON THE PIPE, TEMPERATURE DIFFERENCE BETWEEN THE FLANGE HUB AND RING, AND VARIATIONS IN BOLT LOAD THAT RESULT FROM PRESSURE, HUB-RING TEMPERATURE GRADIENT AND/OR BOLT-RING TEMPERATURE DIFFERENCES. FLANGES CONSIDERED MAY BE TAPERED-HUB, STRAIGHT OR BLIND.

701 BEAMCRP BEAMCRP IS A FINITE ELEMENT COMPUTER PROGRAM WHICH SOLVES FOR STRESSES AND TOTAL STRAINS (ELASTIC PLUS CREEP) IN BEAMS. THE BEAMS MAY HAVE VARIABLE CROSS SECTIONS ALONG THE LENGTH (X-DIRECTION). HOWEVER, THE CROSS SECTIONS MUST BE SYMMETRICAL ABOUT THE Y-AXIS. BESIDES PRESCRIBED DISPLACEMENTS AND TRACTIONS, THE BOUNDARY CONDITIONS MAY ALSO INCLUDE LIMITED FREE TRAVEL AND ELASTIC SPRING SUPPORTS. TIME-DEPENDENT VARIATIONS IN APPLIED LOADS, THERMAL GRADIENTS AND MATERIAL SWELLING CAN ALSO BE ANALYZED. ARBITRARY CREEP AND MATERIAL SWELLING LAWS CAN BE USED.

707 CREEP-PLAST CREEP-PLAST IS A TWO-DIMENSIONAL INELASTIC STRUCTURAL ANALYSIS PROGRAM FOR STATIC LOADINGS AND FOR ELASTIC-PLASTIC-CREEP MATERIAL BEHAVIOR.

715 IMPAC2 IMPAC2 SOLVES THE EQUATIONS OF MOTION FOR A ONE-DIMENSIONAL, LUMPED-MASS, NONLINEAR SPRING MATHEMATICAL CONTAINER MODEL. THE PROGRAM WAS DESIGNED TO ANALYZE THE DYNAMIC RESPONSE OF METALLIC SHIPPING CONTAINERS IMPACTING AN UNYIELDING SURFACE. THE CONTAINER MAY CONSIST OF SEVERAL HOLLOW CONCENTRIC CYLINDERS, EACH OF A DIFFERENT MATERIAL AND LENGTH.

J. GAMMA HEATING AND SHIELD DESIGN

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45 GRACE1 GRACE1 IS A MULTIGROUP, MULTIREGION, GAMMA-RAY ATTENUATION PROGRAM DESIGNED PRIMARILY FOR COMPUTING GAMMA-RAY HEATING AND GAMMA-RAY DOSE RATES IN MULTIREGION FINITE OR SEMI-INFINITE SLAB SHIELDS. A DIFFERENT BUILDUP FACTOR MAY BE SPECIFIED FOR EACH SOURCE REGION CONSIDERED.

46 GRACE2 GRACE2 IS A MULTIGROUP, MULTIREGION, GAMMA-RAY ATTENUATION PROGRAM TO COMPUTE THE TOTAL DOSE RATE OR HEAT GENERATION RATE FROM EITHER A SPHERICAL OR A CYLINDRICAL SOURCE. THE SOURCE, WHICH MAY BE LOCATED IN EITHER THE CENTRAL REGION OF THE SYSTEM OR IN A CONCENTRIC SHELL REGION SURROUNDING IT, MAY BE UNIFORM, EXPONENTIAL, OR HAVE A POLYNOMIAL VARIATION IN THE RADIAL DIRECTION. IN THE CASE OF CYLINDRICAL GEOMETRY, IT MAY ALSO HAVE A POLYNOMIAL VARIATION IN THE AXIAL DIRECTION.

91 FARSE-1A THE PROGRAM COMPUTES THE NEUTRON LEAKAGE FROM A SHIELD ANNULUS. THE REMOVAL CROSS SECTIONS INCORPORATE MULTISCATTERING EFFECTS. DOSE DEPOSIT AT THE TARGET MESH IS THEN DETERMINED FROM THE ANGULAR DISTRIBUTION OF THE LEAKAGE NEUTRONS, INTEGRATED OVER THE SHIELD SURFACE.

110 SCARF2 SCARF2 EVALUATES THE FIRST-ORDER APPROXIMATION OF THE FAST NEUTRON CURRENT AT THE PAY LOAD SURFACE DUE TO NEUTRONS WHICH SCATTER FROM THE RADIATOR FINS. IT USES SNAP GEOMETRY AND IS A COMPLEMENTARY PROGRAM TO FARSE.

111 SCAR1 SCAR1 PERFORMS SINGLE SCATTER RAY TRACING AND EVALUATES SCATTERING FROM A RING. IT IS COMPLEMENTARY TO FARSE.

123 LIPRECAN1 LIPRECAN1 IS A TWO-DIMENSIONAL MONTE CARLO PROGRAM TO COMPUTE THE PENETRATION AND ENERGY DEPOSITION OF NEUTRONS IN PURE HYDROGENOUS MEDIA. THE CODE OFFERS THREE POSSIBLE GEOMETRIES, I. E., CONICAL, CYLINDRICAL AND ONE-DIMENSIONAL INFINITE SLAB GEOMETRY (THIS LATTER OPTION TO THE EXTENT THAT AN INFINITE SLAB MAY BE APPROXIMATED BY A CYLINDER OF LARGE RADIUS). THE CODE MAY BE USED WITH A MONO-DIRECTIONAL POINT OR BEAM SOURCE AND IS MODIFIED EASILY TO HANDLE ANGULAR DISTRIBUTIONS. ISOTROPIC SCATTERING IN THE CENTER OF MASS SYSTEM IS ASSUMED. THE FOLLOWING RESULTS ARE TABULATED WITH EACH SUMMARY -

- (A) ENERGY DEPOSITION DISTRIBUTION,
- (B) PARTICLE DEPOSITION DISTRIBUTION,
- (C) PARTICLE LEAKAGE FRACTION,
- (D) PARTICLE ABSORPTION FRACTION,
- (E) THE FRACTION OF PARTICLES REACHING THE CUTOFF ENERGY WHICH HAVE NEITHER LEAKED NOR HAVE BEEN ABSORBED,

J. GAMMA HEATING AND SHIELD DESIGN

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- (F) THE AVERAGE ENERGY PER PARTICLE LEAKING FROM THE SYSTEM,
- (G) THE AVERAGE ENERGY PER PARTICLE REMAINING IN THE SYSTEM AS HEAT GENERATION,
- (H) THE AVERAGE NUMBER OF COLLISIONS PER HISTORY,
- (I) THE TOTAL NUMBER OF HISTORIES CURRENTLY BEING SUMMARIZED,
- (J) THE AVERAGE ENERGY DEPOSIT PER HISTORY THROUGH ABSORPTION,
- (K) THE AVERAGE ENERGY OF PARTICLES ABSORBED.

141 RATRAP THE RATRAP PROGRAM COMPUTES THE DOSE RATE AT SPECIFIED SPATIAL POINTS ABOUT A SYSTEM OF SNAP GEOMETRY.

142 MORTIMER MORTIMER COMPUTES THE DOSE RATE AT SPECIFIED SPATIAL POINTS ABOUT A SYSTEM OF SNAP GEOMETRY.

143 MAC MAC PERFORMS SLAB GEOMETRY, MULTIGROUP NEUTRON AND GAMMA RAY PENETRATION ANALYSIS FOR A MULTI-REGION REACTOR SHIELD. THE CODE CALCULATES THE FOLLOWING INFORMATION AS A FUNCTION OF DISTANCE THROUGH A REACTOR SHIELD ASSEMBLY -
 NEUTRON FLUXES FOR UP TO 35 ENERGY GROUPS,
 NEUTRON DOSE RATES,
 THE APPROXIMATE NEUTRON SPECTRUM,
 GAMMA RAY FLUXES FOR 7 ENERGY GROUPS,
 TOTAL GAMMA DOSE RATE, WITH A BREAKDOWN OF THE CONTRIBUTION FROM SOURCES IN EACH REACTOR AND SHIELD REGION,
 THE APPROXIMATE GAMMA RAY SPECTRUM.

197 SHOE THE SHOE CODE MAKES USE OF THE METHOD OF STEEPEST DESCENT TO FIND THE DIMENSIONS OF A MINIMUM-WEIGHT, THREE-LAYER SHIELD IN SPHERICAL GEOMETRY. THE WEIGHT MINIMIZATION IS CARRIED OUT SUBJECT TO THE CONSTRAINING CONDITION OF A CONSTANT DOSE RATE AT SOME SELECTED POINT OUTSIDE THE SHIELD.

259 MUSCAT MUSCAT COMPUTES THE INCIDENT SCATTERED NEUTRON CURRENTS AS A FUNCTION OF POSITION WITHIN (1) THE CAVITY FORMED BY TWO TRUNCATED CONCENTRIC SPHERES, (2) THE CAVITY BETWEEN TWO CONCENTRIC CIRCULAR CYLINDERS, OR (3) A CYLINDRICAL CAVITY.

343 M0756(LETO) LETO WILL SOLVE THE GAMMA RAY TRANSPORT AND ENERGY DEPOSITION PROBLEM IN ONE-DIMENSIONAL LAMINAR SLAB GEOMETRY. THE ENERGY GROUP SCHEME IS EMPLOYED TO ACCOUNT FOR PHOTON ENERGY DEGRADATION. AN ARBITRARY EXTERNAL SPATIAL ISOTROPIC SOURCE MAY BE SPECIFIED WITH AN ARBITRARY ENERGY SPECTRUM. THE BOUNDARY CONDITIONS MAY BE (A) FREE BOUNDARIES WITH ARBITRARY INCIDENT, (B) SYMMETRY ON THE LEFT ARBITRARY INCIDENT ON THE RIGHT, AND (C) SYMMETRY ON BOTH ENDS.

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429 ASPIS ASPIS COMPUTES THE ENERGY, DOSE AND ENERGY DEPOSITION BUILDUP FACTORS FOR MONOENERGETIC GAMMA RAYS FOR A PLANE ISOTROPIC, PLANE MONODIRECTIONAL, OR PLANE SLANT SOURCE, IN AN ARBITRARY LAMINAR ARRAY.

462 SPAN4 SPAN4 CALCULATES THE FAST NEUTRON DOSE RATE, THERMAL NEUTRON FLUX, GAMMA-RAY FLUX, DOSE RATE, AND ENERGY-ABSORPTION RATE IN RECTANGULAR, CYLINDRICAL, AND SPHERICAL GEOMETRIES BY INTEGRATING APPROPRIATE EXPONENTIAL KERNELS OVER A SOURCE DISTRIBUTION. THE SHIELD CONFIGURATION IS FLEXIBLE - A FIRST-LEVEL SHIELD MESH, USING ANY ONE OF THE THREE GEOMETRIES, IS SPECIFIED. REGIONS OF THIS SAME GEOMETRY OR OF OTHER GEOMETRIES, HAVING THEIR OWN (FINER) MESHES, MAY THEN BE EMBEDDED BETWEEN THE FIRST-LEVEL MESH LINES, DEFINING SECOND-LEVEL SHIELD MESHES. THIS PROCESS IS TELESCOPIC - THIRD-LEVEL SHIELD MESHES MAY BE EMBEDDED BETWEEN SECOND-LEVEL MESH LINES IN TURN. ALL MESHES MAY HAVE VARIABLE SPACING. SOURCES AND DETECTORS MAY BE LOCATED ARBITRARILY WITH RESPECT TO ANY SHIELD MESH. THE SOURCE IS DEFINED BY THE FUNCTION -

$$S = S_0 + S_1(A) * S_2(B) * S_3(C) + S_4(A, B) * S_3(C) + S_5(A, C) * S_2(B) + S_6(B, C) * S_1(A) + S_7(A, B, C)$$

WHERE A, B, AND C REPRESENT COORDINATES. IF ANY FACTOR IS MISSING, THE CORRESPONDING TERMS ARE ZERO. CROSS SECTIONS, BUILDUP FACTORS, STANDARD COMPOSITIONS, ENERGY STRUCTURES, DOSE-CONVERSION FACTORS, INFINITE LINE AND INFINITE PLANE SOURCE KERNELS, AND QUADRATURES ARE CONTAINED IN A LIBRARY OF APPROXIMATELY 10,000 ITEMS.

569 VIEWPIN THE PROGRAM CALCULATES VIEW FACTORS FOR CYLINDRICAL PINS WHENEVER THE PROBLEM CAN BE REPRESENTED TWO-DimensionALLY.

273 THREDES THREDES IS A SCIENTIFIC APPLICATIONS PROGRAMMING SYSTEM. INCORPORATED IN THIS SYSTEM ARE THE NECESSARY MODULES TO PERFORM PARAMETRIC DESIGN STUDIES OF THERMAL REACTORS INCLUDING THE THERMAL CELL HOMOGENIZATION (BAM - ACC ABSTRACT 108), THE FAST SPECTRUM CALCULATION (FORM - ACC ABSTRACT 51), REACTOR DIFFUSION THEORY (FOG - ACC ABSTRACT 28), AND ZERO-DIMENSIONAL BURNUP (KINDLE) CALCULATIONS. THESE MODULES CAN BE USED IN CONJUNCTION WITH ONE ANOTHER OR INDIVIDUALLY.

387 CITATION CITATION IS DESIGNED TO SOLVE PROBLEMS INVOLVING THE FINITE-DIFFERENCE REPRESENTATION OF DIFFUSION THEORY TREATING UP TO THREE SPACE DIMENSIONS WITH ARBITRARY GROUP-TO-GROUP SCATTERING. X-Y-Z, THETA-R-Z, HEXAGONAL-Z, AND TRIAGONAL-Z GEOMETRIES MAY BE TREATED. DEPLETION PROBLEMS MAY BE SOLVED AND FUEL MANAGED FOR MULTI-CYCLE ANALYSIS. EXTENSIVE FIRST-ORDER PERTURBATION RESULTS MAY BE OBTAINED, GIVEN MICROSCOPIC DATA AND NUCLIDE CONCENTRATIONS. STATICS PROBLEMS MAY BE SOLVED AND PERTURBATION RESULTS OBTAINED WITH MICROSCOPIC DATA.

676 DEMO4 DEMO IS A SIMULATION MODEL USED TO GENERATE THERMAL-HYDRAULIC TRANSIENTS FOR THE CLINCH RIVER LMFBR DEMONSTRATION PLANT. THE THREE HEAT TRANSPORT LOOPS OF THE PLANT ARE SIMULATED BY A TWO-LOOP MODEL. ONE LOOP, THE L-LOOP, REPRESENTS TWO OF THE ACTUAL PLANT LOOPS, AND THE SECOND LOOP, THE S-LOOP, REPRESENTS A SINGLE PLANT LOOP.

THERMAL POWER IS GENERATED BY POINT NEUTRON KINETICS AND DECAY HEAT TABLES. THE VESSEL INTERNALS ARE REPRESENTED BY A LOWER PLENUM, LOWER AXIAL BLANKET, ACTIVE CORE, UPPER AXIAL BLANKET, RADIAL BLANKET, BYPASS CHANNEL AND AN UPPER PLENUM WITH A VARIABLE SODIUM LEVEL AND A COVER GAS. PLENUM STRATIFICATION ON REDUCED FLOW CAN BE MODELLED. THE HEATED SODIUM LEAVES THE VESSEL UPPER PLENUM TO THE PRIMARY HEAT TRANSPORT SYSTEM AND RETURNS TO THE VESSEL LOWER PLENUM. THE OVERFLOW NOZZLE OF THE SODIUM PURIFICATION SYSTEM EFFECTS THE VESSEL UPPER PLENUM LEVEL, AS WELL AS A USER-INPUT RETURN FLOW FROM THIS SYSTEM.

EACH PRIMARY HEAT TRANSPORT SYSTEM IS REPRESENTED BY PIPING, VALVES, THE PRIMARY PUMP TANK WITH A FREE SURFACE AND COVER GAS, AND THE SHELL SIDE OF THE IHX. EACH INTERMEDIATE HEAT TRANSPORT SYSTEM IS REPRESENTED BY PIPING, THE TUBE SIDE OF THE IHX, THE SHELL SIDE OF THE SUPERHEATER AND EVAPORATOR, AND THE INTERMEDIATE PUMP.

EACH WATER-STEAM SYSTEM IS REPRESENTED BY PIPING, RECIRCULATION PUMPS, THE TUBE SIDE OF THE SUPERHEATER AND EVAPORATOR, AND A STEAM DRUM. THE STEAM LEAVING ALL SUPERHEATERS ENTERS A COMMON STEAM HEADER, FLOWS THROUGH PIPING TO THE TURBINE THROTTLE VALVE AND A STEAM DUMP VALVE. LIMITED MODELLING IS PROVIDED FOR THE FEEDWATER SYSTEM.

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CALCULATION OF SN CONSTANTS

234 DPC DPC PREPARES INPUT DATA
FOR TWO-DIMENSIONAL NEUTRONIC CALCULATIONS FROM ENGINEERING DATA.
A GENERAL DESCRIPTION OF REGIONS, IN TERMS OF MULTIPLE SUBREGIONS,
ALLOWS FOR EXPLICIT CONSIDERATION OF DETAILED STRUCTURAL FORMS.
DURING THE TRANSFORMATION OF DATA, GENERAL THERMAL EXPANSIONS ARE
INCLUDED. ALSO, CONSIDERABLE DATA CHECKING AND EVALUATION ARE
PERFORMED. COMBINED WITH THE FLEXIBLE NARRATIVE INPUT, THESE
FEATURES MAKE THE CODE USEFUL IN THE PREPARATION OF ERROR-FREE
INPUT FOR COMPLEX PROBLEMS.

L. DATA PREPARATION

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296 GRDWRK GRDWRK GENERATES AS PUNCHED OUTPUT THE BASIC FINITE ELEMENT REFERENCE GRID WORK FOR THE SAFE CODES. THIS GENERATED GRID CONSISTS OF TRIANGULAR ELEMENTS AND NODES, UNIAXIAL ELEMENTS, SUCH AS REINFORCEMENT BARS, TENDONS, AND ANCHORS, AND BIAXIAL MEMBRANES, SUCH AS ANY THIN SHELL OR LINER. THE PUNCHED OUTPUT SERVE AS DIRECT INPUT DATA TO THE SAFE CODES.

345 GAND GAND PREPARES THE CROSS SECTIONS NEEDED FOR DETAILED COMPUTATIONS OF NEUTRON ENERGY SPECTRA IN FAST REACTORS FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B FORMAT.

373 BL47 BL47 IS A PLOTTING ROUTINE DESIGNED FOR PLANE STRUCTURES THAT ARE TO UNDERGO STRESS ANALYSIS. POINTS AND LINES ARE INPUT IN VARIOUS PARAMETRIC FORMS, AND CURVED SEGMENTS ARE DRAWN BETWEEN GIVEN POINTS ALONG THE GIVEN LINES. THE PROGRAM MAY BE USED AS A DRAFTING TOOL TO CONSTRUCT ENGINEERING DRAWINGS. BL47 USES THREE POINTS ON A STRAIGHT LINE SEGMENT TO OBTAIN DIMENSIONS FOR SEALSHELL2 (ACC ABSTRACT 282) INPUT DATA.

406 DATATRAN2 RAD1 GEOMETRY MODULE THIS SERIES OF DATATRAN MODULES IS DESIGNED TO PROVIDE THE COMPUTERIZED TWO-DIMENSIONAL GEOMETRY DESCRIPTIONS REQUIRED FOR ENGINEERING AND NUCLEAR DESIGN COMPUTATIONS. THE MODULES COMMUNICATE VIA DATATRAN N-DOT DATA-SETS, AND THE USER MUST LINK THE APPROPRIATE MODULES TO PERFORM A SPECIFIC TASK. MODULES ARE DESIGNED TO ACCEPT AS INPUT DATA TRANSCRIBED FROM ENGINEERING DRAWINGS, TO PLOT, CHECK, AND EDIT THE GENERATED GEOMETRIC DATA, AND TO CALCULATE MOMENTS OF INERTIA AND AREA INTERSECTIONS.

530 GENRD GENRD WILL READ AND PROCESS FREE-FORMAT NUMERIC AND HOLLERITH INPUT DATA FROM CARDS.

533 ARC-NU1002 BCD INPUT PROCESSOR THE MODULE ARC(NU1002) PROCESSES GENERAL NEUTRONICS INPUT DATA SETS FOR SUBSEQUENT USE BY THE NEUTRONICS-COMPUTATIONAL MODULES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM.

594 ARC-XSEC1 ARC-XSEC1 PROVIDES THE CAPABILITY OF MANIPULATING MULTIGROUP MICROSCOPIC CROSS SECTION DATA IN THE XS.ISO FORMAT TO AFFECT MODIFICATIONS OF THE ISOTOPIC CROSS SECTION COMPONENTS, TO COLLAPSE THE ENERGY GROUP STRUCTURE TO FEWER GROUPS, AND TO HOMOGENIZE MIXTURES INTO MATERIAL AND COMPOSITION LEVEL DATA FOR USE BY THE NEUTRONICS MODULES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM.

L. DATA PREPARATION

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612 QMESH/RENUM QMESH GENERATES MESHES HAVING QUADRILATERAL ELEMENTS ON ARBITRARILY SHAPED TWO-DIMENSIONAL (PLANAR OR AXISYMMETRIC) BODIES. THE MAIN INTENDED APPLICATION IS IN FINITE ELEMENT ANALYSIS. A FLEXIBLE HIERARCHAL INPUT SCHEME IS USED TO DESCRIBE BODIES TO QMESH AS COLLECTIONS OF REGIONS. A MESH FOR EACH REGION IS DEVELOPED INDEPENDENTLY, WITH THE FINAL ASSEMBLY AND BANDWIDTH MINIMIZATION PERFORMED BY THE SEPARATE PROGRAM, RENUM.

M. DATA MANAGEMENT

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159 MOMUS MOMUS IS THE PROGRAM USED TO CONSTRUCT AND MAINTAIN THE NEUTRON CROSS SECTION MASTER TAPE DEVELOPED UNDER THE ATOMICS INTERNATIONAL AUTOMATED CROSS SECTION PROGRAM. THE LIBRARY CONTAINS 21 ELEMENTS WITH DATA FOR 11 PARAMETERS IN THE RANGE 0.001 EV TO 10 MEV. MOMUS WILL PERFORM THE FOLLOWING TASKS -

- (A) MAKE THE BINARY MASTER TAPE FROM CARDS,
- (B) LIST SELECTED ELEMENTS,
- (C) UPDATE - ADD, CORRECT AND REPLACE ANY DATA,
- (D) MAKE A SHORT TAPE CONTAINING SELECTED ELEMENTS,
- (E) PROVIDE GRAPHICAL DISPLAY OF SELECTED DATA, AND
- (F) PUNCH MICROSCOPIC DATA.

181 XLIBIT USING THE ANL STANDARD CROSS SECTION DATA CARDS AS INPUT, THE PROGRAM CAN PERFORM THE FOLLOWING OPERATIONS -

- (A) PREPARE A LIBRARY TAPE CONSISTING OF THE CROSS SECTION DATA FOR SETS OF MATERIALS, INCLUDING A DIRECTORY GIVING THE SETS ON THE TAPE AND THE MATERIALS IN EACH SET,
- (B) GIVEN AN EXISTING LIBRARY TAPE, THE PROGRAM CAN PREPARE A DUPLICATE TAPE OR A MODIFIED TAPE, THE MODIFICATIONS CONSISTING OF THE ADDITION AND DELETION OF SETS, THE ADDITION AND DELETION OF MATERIALS WITHIN A SET, AND THE RE-ORDERING OF THE SETS ON THE TAPE,
- (C) ANY OF THE DATA ON A LIBRARY TAPE MAY BE PRINTED, AND THE PROGRAM WILL PUNCH THE CROSS SECTION DATA CARDS THAT WERE USED TO PLACE ANY OF THE MATERIALS OR SETS ON THE TAPE WITH ALTERED SET AND MATERIAL NAMES IF DESIRED.

206 UNPACK UNPACK RETRIEVES NEUTRON CROSS SECTION DATA AND RELATED INFORMATION FROM A SCISRS (BROOKHAVEN NATIONAL LABORATORY) DATA TAPE. THE FORMAT AND STRUCTURE OF THE SCISRS TAPE IS DESCRIBED IN BNL-883 BY FRIEDMAN AND PLATT, JULY 1964.

236 DFSR DATA FILE SERVICE ROUTINES (DFSR) ARE USED TO STORE, DISTRIBUTE, AND CHECK THE DATA ON THE EVALUATED NUCLEAR DATA FILE (ENDF). THERE ARE 6 ROUTINES -

- DFSR1 - STORES DATA ON MASTER LIBRARY TAPES.
- DFSR2 - PROCESSES REQUESTS FOR DATA BY FINDING THE APPROPRIATE DATA ON THE MASTER TAPES AND COPYING THEM ONTO THE REQUESTORS TAPE.
- DFSR3 - CORRECTS DATA ON THE MASTER TAPES.
- DFSR4 - COPIES/PRINTS/PUNCHES SELECTED DATA FROM THE MASTER TAPES.
- DFSR5 - PRINTS LIST OF DATA RECENTLY ADDED TO MASTER TAPES AND PREPARES A CROSS-REFERENCE LIST OF ALL DATA ON THE MASTER TAPES.
- DFSR6 - MAKES COPIES AND CHECKS THE MASTER TAPES.

M. DATA MANAGEMENT

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271 CLIP CLIP IS THE CROSS SECTION LIBRARY PREPARATION AND MAINTENANCE PROGRAM FOR FORM AND THREDES.

350 ETOE ETOE (ENDF/B TO MC**2 DATA CONVERSION) ACCEPTS CROSS SECTION DATA FROM A MODE 2 ENDF/B TAPE (SEE REFERENCE 3) AND PREPARES THE BINARY CROSS SECTION AND LEGENDRE POLYNOMIAL TAPE FOR THE MC**2 CODE WRITTEN BY ARGONNE NATIONAL LABORATORY. THE ETOE PROGRAM PROCESSES FORMATS I, II, AND III ENDF/B DATA TAPES.

375 SCORE3 SCORE IS AN INTERACTIVE NEUTRON CROSS SECTION EVALUATION SYSTEM.

384 CHECKER/CRECT/DAMMET/PLOTFB/ THIS PACKAGE OF FIVE PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B (EVALUATED NUCLEAR DATA FILE VERSION B) VERSION I TAPES.

CHECKER CHECKS THAT THE ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERYWHERE POSITIVE.

CRECT, WHICH CAN PROCESS ENDF/B VERSION III DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETION OF DATA.

DAMMET SELECTIVELY MERGES DATA FROM ONE OR TWO ENDF/B LIBRARY TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) AND ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PROCESS.

PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PROCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

386 DATATRAN2 DATATRAN2 IS A DATA BASE MANAGEMENT SYSTEM FOR A SCIENTIFIC AND ENGINEERING MODULAR PROGRAM ENVIRONMENT. DATATRAN CONSISTS OF A SET OF EXTENSIONS TO THE FORTRAN LANGUAGE DESIGNED TO SIMPLIFY THE DEVELOPMENT, INTERCONNECTION AND USE OF LARGE COMPUTER PROGRAMS IN A SCIENTIFIC AND ENGINEERING ENVIRONMENT. IT ALLOWS USERS TO EASILY CONNECT A SERIES OF FUNCTIONAL PROGRAM UNITS (MODULES) TO PERFORM A SPECIFIC TASK.

403 TIGIR2 TIGIR IS A MODULAR PROGRAM DESIGNED TO GENERATE AND MAINTAIN LIBRARIES OF DOCUMENT INFORMATION (ABSTRACTS, BIBLIOGRAPHIC INFORMATION, INDEX TERMS, AND OTHER SIGNIFICANT INFORMATION), TO RETRIEVE THE INFORMATION SELECTIVELY, TO PRINT THE RETRIEVED INFORMATION IN VARIOUS OUTPUT FORMATS, AND TO GENERATE STATISTICS OF THE INFORMATION FILES.

472 MERMC2/MAGIC THE PROGRAMS MERMC2 AND MAGIC ARE SERVICE ROUTINES FOR USE WITH THE BINARY CROSS-SECTION LIBRARY TAPES OF THE MC**2 MULTIGROUP CROSS-SECTION PROGRAM.

MERMC2 TAKES AS INPUT TWO MC**2 LIBRARY TAPES AND PRODUCES A NEW MC**2 LIBRARY TAPE CONTAINING DATA FROM BOTH INPUT TAPES WITH DELETION OF PARTICULAR MATERIALS AS DESIRED, OR MERMC2 MAY BE USED TO CREATE A NEW LIBRARY TAPE FROM A SINGLE INPUT TAPE BY SIMPLY DELETING SELECTED MATERIALS.

MAGIC PRODUCES LIBRARY TAPE LISTINGS AND TAPES FOR OFF-LINE CALCOMP PLOTTING OF SELECTED DATA FROM AN MC**2 LIBRARY TAPE.

475 CRECT/CHECKER/RIGEL/PLOTFB/ THIS PACKAGE OF EIGHT PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B II (EVALUATED NUCLEAR DATA FILE VERSION B FORMAT II) TAPES.

CRECT, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETION OF DATA.

CHECKER CHECKS THAT THE ENDF/B BCD CARD IMAGE FORMAT TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE CHECKED TO ENSURE THEY ARE EVERYWHERE POSITIVE.

RIGEL WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTO FROM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE VERSA) AND CHANGE TAPE MODE.

LISTFC, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PRODUCES INTERPRETED LISTINGS OF INFORMATION FROM BCD STANDARD ARRANGEMENT ENDF/B TAPES.

DICTION CONSTRUCTS A NEW SECTION DICTIONARY (FILE 1, SECTION 451) FOR AN ENTIRE ENDF/B TAPE. IF A SECTION DICTIONARY IS ALREADY PRESENT IT IS REPLACED.

PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PROCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

DAMMET SELECTIVELY MERGES DATA FROM ONE OR TWO ENDF/B LIBRARY

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TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) AND ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PROCESS.

490 JOSHUA OPERATING SYSTEM JOSHUA IS A SCIENTIFIC MODULAR DATA BASED SYSTEM FOR BATCH AND TERMINAL OPERATION. LARGE VOLUMES OF DATA CAN BE STORED AND RETRIEVED FOR COMPUTATION AND DISPLAY.

493 TROUT TROUT IS A FILE MAINTENANCE PROGRAM WHICH ALLOWS THE USER TO ALTER, MERGE, DELETE, OVERLAY OR CREATE MULTIGROUP CROSS SECTION FILES IN MUG FORMAT.

502 EDITOR EDITOR PRODUCES READABLE LISTINGS OF THE CONTENTS OF ENDF/B NUCLEAR DATA CROSS SECTION TAPES. IT ALSO ALLOWS COPYING, ALTERING MODE, MERGING AND PUNCHING OF THE DATA ON ONE OR MORE ENDF/B TAPES.

522 ARC-SYSTEM ARC-SYSTEM IS THE COLLECTION OF SYSTEMS SUBPROGRAMS AND MODULES WHICH PROVIDE THE SOFTWARE ENVIRONMENT NECESSARY TO EXECUTE THE MODULAR COMPUTATIONAL CAPABILITIES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM ON IBM360 SYSTEMS.

557 SHLOG SHLOG PROVIDES GENERAL-PURPOSE DATA MANIPULATION FUNCTIONS FOR DATA ANALYSIS. THESE FUNCTIONS INCLUDE CREATING, MAINTAINING, AND STORING FILES, DISPLAYING THE CONTENTS OF A FILE VIA EITHER THE LINE PRINTER OR AN ON-LINE PLOTTER, SEARCHING FOR DATA POINTS BY COMPARING VALUES WITH SPECIFIED CRITERIA, AND PERFORMING CERTAIN STATISTICAL OPERATIONS ON THE DATA POINTS.

571 CHECK3/RIGEL3 THESE PROGRAMS ARE USED TO PROCESS ENDF/B VERSION III DATA. IN ADDITION, THE CDC6600 PROGRAMS WILL PROCESS ENDF/B VERSION IV DATA. CHECK3 CHECKS THAT THE ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERYWHERE POSITIVE. RIGEL3 WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTO FROM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE-VERSA) AND CHANGE TAPE MODE.

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587 AEC-ALO FAU THE AEC-ALO RADIO FREQUENCY ASSIGNMENTS AND USES PROGRAM (FAU) PROVIDES FOR MAINTAINING RADIO FREQUENCY ASSIGNMENT AND TRANSACTION RECORDS. IT LISTS ALL RADIO FREQUENCY ASSIGNMENTS AND USES FROM INITIAL APPLICATION (AEC-310) THROUGH AUTHORIZATIONS (IRAC DOCKET). THE PROGRAM ALLOWS FOR SORTING BY OFFICE, SYSTEM NUMBER, LOCATION, FREQUENCY, EXPIRATION DATE, ALO OR AEC SERIAL NUMBER, AND IRAC DOCKET NUMBER.

589 BECOM AEC REGULATIONS REQUIRE THAT A PURCHASE VS. LEASE ANALYSIS BE MADE ON EACH PIECE OF DATA PROCESSING EQUIPMENT AS PART OF THE STUDY PRECEDING THE LEASE OR PURCHASE OF SUCH EQUIPMENT. IN ADDITION, IT IS REQUIRED THAT A PURCHASE VS. LEASE ANALYSIS BE PREPARED ANNUALLY FOR EACH ITEM OF DATA PROCESSING EQUIPMENT LEASED WITH AEC FUNDS. BECOM WAS DEVELOPED TO FACILITATE THE RAPID AND ACCURATE PREPARATION OF AN AEC PURCHASE VS. LEASE SCHEDULE FOR AN ITEM OF DATA PROCESSING EQUIPMENT.

595 MAPPER MAPPER IS A COMPUTER PROGRAM FOR PREDICTING EQUIPMENT REQUIREMENTS. IT WAS DESIGNED AS AN AID TO MANAGEMENT AND CAN INTERPRET COMPONENT PRODUCTION REQUIREMENTS BACKWARD FROM SHIPPING SCHEDULES TO THE PROCESS OF INTEREST, CALCULATE EQUIPMENT CAPACITY, DISPLAY SIX MONTHS PRIOR EQUIPMENT UTILIZATION AND PROCESS YIELD DATA.

603 RALCRTPH RALCRTPH IS A RESOURCE ALLOCATION SYSTEM USED TO PROVIDE THE PROJECT PLANNER WITH A TOOL TO HELP HIM SCHEDULE RESOURCES INVOLVED IN A PROJECT. INFORMATION ON WHICH JOBS ARE CRITICAL AND THE RESOURCES AVAILABLE IS NECESSARY FOR PROJECT SCHEDULING. THIS SYSTEM IS ORIENTED TOWARD THE USER WHO IS PLANNING A PLANT SHUTDOWN. HOWEVER, IT ALSO HAS APPLICATIONS IN OTHER AREAS.

607 SPIRAL THE GENERAL ABILITY OF SPIRAL IS BUILDING, PERHAPS GRADUALLY, A MACHINE-READABLE ENCYCLOPEDIA OF INFORMATION ITEMS THAT ARE OR MAY BECOME IMPORTANT TO A PARTICULAR PROJECT, AND THEN LATER, RECALLING BITS OF INFORMATION AS REQUIRED. THE INFORMATION CONTENT OF A COLLECTION CAN RANGE FROM CRYPTIC COMMENTS (AS OCCUR IN SOME TEST AND INSPECTION RECORDS) TO MORE LENGTHY ENTRIES (SUCH AS TECHNICAL ABSTRACTS AND MANAGEMENT BRIEFS) AS WELL AS FULL TEXT OF DOCUMENTS.

638 RIGEL4/CHECK4/SUMUP4/LISTF4 THESE PROGRAMS ARE UPDATED VERSIONS OF ENDF/B CHECKING, RETRIEVAL, AND DISPLAY CODES CAPABLE OF PROCESSING THE VERSION-IV DATA FILES.

RIGEL4 RETRIEVES ENDF/B DATA AND CHANGES MODE (BCD-BIN) OR ARRANGEMENT. UPDATED VERSION PROCESSES DECAY DATA (MF=1, MT=457)

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AND ERROR FILES.

CHECK4 CHECKS THE STRUCTURE, CONSISTENCY, AND FORMATS OF ENDF DATA FILES. UPDATED VERSION RECOGNIZES NEWLY DEFINED MT AND MF NUMBERS, CHECKS MT=457 AND THE FORMATS OF THE ERROR FILES, CONTAINS RSIC PHOTON FILE CHANGES.

SUMUP4 CHECKS WHETHER PARTIAL CROSS SECTIONS ADD UP TO THE TOTAL. UPDATED VERSION FLAGS GRID POINTS PRESENT IN THE PARTIAL CROSS SECTION, ABSENT IN THE TOTAL.

LISTF4 PRODUCES INTERPRETED LISTINGS OF ENDF/B DATA. UPDATED VERSION LISTS MT=457, SKIPS OVER ERROR FILES, CONTAINS MINOR CORRECTIONS.

PLOTF4 PRODUCES PLOTS OF ENDF/B DATA. UPDATED VERSION PLOTS MT=457, SKIPS OVER ERROR FILES, CONTAINS MINOR CORRECTIONS.

RESEND PROCESSES ENDF MATERIALS WITH RESONANCE PARAMETERS INTO A POINTWISE FORM. CAPABILITY OF PROCESSING ADLER-ADLER PARAMETERS ADDED.

CRECT CORRECTS ENDF/B DATA FILES.

DICT4 GENERATES A SECTION TABLE OF CONTENTS (DICTIONARY) FOR ENDF/B MATERIALS.

CAREN4 TESTS FOR DISCONTINUITIES ACROSS THE LIMITS OF RESONANCE RANGES OF AN ENDF/B MATERIAL. UPDATED VERSION CONTAINS MINOR CORRECTIONS.

660 JOURNAL CONTROL SYSTEM THE JOURNAL CONTROL SYSTEM IS A SERIES OF PROGRAMS DESIGNED TO HANDLE ALL JOURNAL ORDERING FOR THE THREE UNION CARBIDE INSTALLATIONS IN OAK RIDGE - ORNL, Y-12, AND ORG-DP. THIS SERIES OF PROGRAMS PROVIDES:

- (1) MANAGEMENT INFORMATION IN THE FORM OF COST, SUBSCRIBER, AND TITLE STATISTICS,
 - (2) SEVEN-COPY PURCHASE REQUISITIONS, AND
 - (3) CLAIM LETTERS TO VENDORS RELATING TO MISSING ISSUES.
- IN ADDITION, COMPUTER CHECK-IN, NOTIFICATION OF BINDING, AND RECORDING OF JOURNAL ARRIVAL IS SUPPLIED FOR THE ORNL LIBRARY OPERATION.

679 RANDOM SAMPLING TABLE(RND424RQ THIS PROGRAM IS DESIGNED TO GENERATE A UNIFORMLY RANDOM SEQUENCE OF NUMBERS FOR ORDERING LABORATORY TEST SAMPLES TO ELIMINATE ANY BIAS FROM THE TESTING.

691 LASIP3 LASIP3 PROCESSES VERSION III STANDARD INTERFACE DATA FILES SPECIFIED BY THE REACTOR PHYSICS COMMITTEE ON COMPUTER CODE COORDINATION (CCCC). THIS PROCESSOR PERFORMS TWO DISTINCT TASKS: NAMELY, TRANSFORMING FREE-FIELD FORMAT, BCD DATA, INTO WELL-DEFINED BINARY FILES AND PROVIDING FOR PRINTING AND PUNCHING DATA IN THE BINARY FILES.

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695 NMMSS

THREE BASIC PROGRAMS IN THE NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM (NMMSS) FOR PROCESSING INCOMING TRANSACTION DATA AND MAINTAINING THE CURRENT TRANSACTION DATA FILE ARE: TJEDIT, TJUPDT, AND COMPAT. TJEDIT PREPARES, VERIFIES, AND MAINTAINS THE INTEGRITY OF DATA AS IT IS INTRODUCED INTO THE DATA BASE. TJUPDT MAINTAINS THE CURRENT TRANSACTION DATA FILE ON A DAILY BASIS. COMPAT MAINTAINS CONSISTENCY BETWEEN RELATED DATA SETS ON THE TRANSACTION DATA MASTER FILE.

N. SUBSIDIARY CALCULATIONS

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133 WED THIS PROGRAM EDITS THE MAGNETIC TAPE PRODUCED BY W-DSN CALCULATING REACTION RATES BY ENERGY AND BY VOLUME WITH TOTALS. IT CAN ALSO PRODUCE REACTION RATES FOR FED-IN CROSS SECTIONS.

207 CROSSPLOT/CROSSPLOT DATA TAPE AUTOMATIC PLOTS ARE GENERATED FROM NEUTRON CROSS SECTION DATA.

210 DTX THE DTX CODE CALCULATES EFFECTIVE MACROSCOPIC, HOMOGENEOUS, GROUP CROSS SECTIONS WHICH ARE SPACE-AVERAGED OVER THE FLUXES AND CURRENTS PRE-CALCULATED IN A ONE-DIMENSIONAL NEUTRON TRANSPORT CODE SUCH AS DTK OR DSN. ISOTROPIC AND ANISOTROPIC CROSS SECTIONS MAY BE INCLUDED.

239 CPS CPS PROVIDES A GRAPHICAL MEANS OF COMPARING EXPERIMENTAL CROSS SECTION VALUES OBTAINED FROM THE SCISRS LIBRARY TAPE WITH AN OPTION TO INCLUDE READING IN NEW EXPERIMENTAL OR CALCULATED VALUES.

409 LARCA MULTIGROUP CROSS SECTIONS ARE WEIGHTED BY THE FLUX IN THE APPROPRIATE GROUPS AND REGIONS, AND CROSS SECTIONS FOR THE ASSEMBLY ARE COMPUTED AND PUNCHED IN DTF4 FORMAT. THE PROGRAM ALSO COMPUTES THE INFINITE MEDIUM FLUX, REACTION RATES, AND THE INFINITE MULTIPLICATION FACTOR AND MATERIAL BUCKLING.

434 HEATMESH HEATMESH IS USED TO GENERATE GEOMETRICAL DATA REQUIRED FOR STUDIES OF HEAT TRANSFER IN AXISYMMETRIC STRUCTURES REPRESENTED AS SURFACES OF REVOLUTION. THE PROGRAM CONSISTS OF TWO DISTINCT PHASES. THE FIRST SUBDIVIDES THE GIVEN PARTS INTO A NODAL NETWORK AND EVALUATES THE GEOMETRICAL PROPERTIES OF THE NODES. THE SECOND DETERMINES ADJACENT NODES AND EDITS GEOMETRICAL DATA FOR THE THERMAL MODEL.

455 DAC1 DAC1 USES ANGULAR FLUXES FROM THE DTF4 SN CODE TO CALCULATE REACTIVITY PERTURBATIONS, EFFECTIVE DELAYED NEUTRON FRACTIONS, AND GENERATION TIMES IN REACTORS. THE REFERENCE REACTOR SPECIFICATIONS ARE INPUT TO DAC1 BY A DIRECT READING OF THE DTF4 INPUT DECK. CONSEQUENTLY, THE ONLY ADDITIONAL INPUT NEEDED ARE THE PERTURBATION SPECIFICATIONS.

471 GAPER2D GAPER2D IS A TWO-DIMENSIONAL TRANSPORT PERTURBATION THEORY PROGRAM USING THE REAL AND ADJOINT FLUXES AND CURRENTS FROM 2DF (ACC ABSTRACT 173) PROBLEM RESULTS TO COMPUTE REACTIVITY CHANGES DUE TO SMALL PERTURBATIONS IN REFLECTED MULTIREGION SYSTEMS.

544 PLOT-3D PLOT-3D IS A PACKAGE OF SUB-PROGRAMS DESIGNED TO DRAW THREE-DIMENSIONAL SURFACES FROM ARRAYS OF POINTS (X,Y,Z). THE SURFACES CAN BE DRAWN AFTER ARBITRARY ROTATIONS ABOUT THE THREE COORDINATE AXES.

D. EXPERIMENTAL DATA PROCESSING

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154 CROC90 THE CROC90 CODE WAS DEVELOPED FOR USE IN THE DATA REDUCTION OF OUT-OF-PILE FLUID FLOW EXPERIMENTS ON THE ML-1 FUEL ELEMENTS. THE CODE IS SPECIFICALLY DESIGNED TO EVALUATE FRICTION FACTORS, ENTRANCE AND EXIT COEFFICIENTS, AND ORIFICE CALIBRATIONS FROM HYDRODYNAMIC DATA OBTAINED FROM SINGLE PHASE EXPERIMENTAL FLUID FLOW TESTS IN AXIAL FLOW DUCTS.

164 BURP1 THE PROGRAM CALCULATES ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAY INTERACTIONS IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR THE POINT ISOTROPIC SOURCE LOCATED ALONG THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL.

165 BURP2 THE PROGRAM CALCULATES THE ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAYS INTERACTING IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR HOMOGENEOUS, ISOTROPIC CIRCULAR DISK OR CYLINDRICAL VOLUME SOURCES. SOURCES MUST BE SYMMETRICAL WITH THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL. SOURCE ABSORPTION AND SCATTERING MAY BE INCLUDED FOR VOLUME SOURCES.

166 BURP3 THE PROGRAM CALCULATES ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAY INTERACTIONS IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR POINT ISOTROPIC SOURCES LOCATED BOTH ON AND OFF THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL. THE EFFICIENCIES FOR POINTS LOCATED AT SPECIFIED RADIAL OFF-AXIS POSITIONS, FOR A SINGLE AXIAL SOURCE-CRYSTAL DISTANCE, ARE NORMALIZED TO THE ON-AXIS EFFICIENCY FOR THE SAME AXIAL DISTANCE. THE ABSOLUTE EFFICIENCY FOR THE ON-AXIS POINT IS GIVEN.

169 BURP4 BURP4 CALCULATES THE PHOTO-FRACTION FOR MONOENERGETIC GAMMA RAYS INTERACTING IN SOLID CYLINDRICAL SCINTILLATION DETECTORS. PHOTO-FRACTION IS DEFINED AS THE FRACTION OF INTERACTING SOURCE GAMMAS THAT ARE TOTALLY ABSORBED (INCLUDING SECONDARIES) IN THE CRYSTAL. ISOTROPIC SOURCE GEOMETRIES ALLOWED ARE ISOTROPIC POINTS (ON OR OFF-AXIS), DISKS, CYLINDRICAL VOLUMES. ALLOWED MONODIRECTIONAL SOURCES, NORMAL TO

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CRYSTAL FACE, ARE NARROW BEAM COLLIMATED TO CRYSTAL AXIS, BROAD BEAM ILLUMINATING ENTIRE CRYSTAL FACE, AND COLLIMATED BEAM OF ANY SPECIFIED DIAMETER.

170 BURP5 BURP5 CALCULATES THE PHOTO-FRACTION FOR MONOENERGETIC GAMMA RAYS INTERACTING IN WELL-TYPE CYLINDRICAL SCINTILLATION DETECTORS. PHOTO-FRACTION IS DEFINED AS THE FRACTION OF INTERACTING SOURCE GAMMAS THAT ARE TOTALLY ABSORBED (INCLUDING SECONDARIES) IN THE CRYSTAL. ISOTROPIC SOURCE GEOMETRIES ALLOWED ARE ISOTROPIC POINTS (ON OR OFF-AXIS), DISKS, CYLINDRICAL VOLUMES. ALSO ALLOWS NARROW MONODIRECTIONAL BEAM COLLIMATED TO CRYSTAL AXIS, INCIDENT NORMAL TO WELL BOTTOM.

248 COINC COINCIDENCE COUNTING DATA ARE TREATED TO OBTAIN SPECIFIC DISINTEGRATION RATES, CHANNEL EFFICIENCIES AND COUNT RATES, WEIGHTED MEANS, AND ALL ASSOCIATED STANDARD ERRORS. CORRECTIONS ARE MADE FOR UNEQUAL DEADTIME LOSS IN EACH CHANNEL, COINCIDENCE RESOLVING TIME LOSSES, DECAY DURING COUNTING, DECAY FROM A REFERENCE TIME, AND BACKGROUND IN EACH OF THE THREE CHANNELS. INPUT VARIABLES INCLUDE SAMPLE IDENTIFICATION, START TIME FOR COUNTING, SAMPLE REFERENCE TIME, COUNTING INTERVAL, TOTAL NUMBER OF COUNTS IN TWO SINGLE CHANNELS AND ONE COINCIDENCE CHANNEL, AND NORMALIZING SAMPLE VOLUME. INPUT PARAMETERS CONSIST OF DEADTIMES OF EACH SINGLE CHANNEL, COINCIDENCE RESOLVING TIME FOR ALL THREE CHANNELS, DECAY CONSTANT, BACKGROUND COUNT RATE FOR ALL THREE CHANNELS, AND STANDARD ERRORS FOR EACH OF THE ABOVE PARAMETERS. OPTIONAL INPUT ALLOWS DATE, GROUP CLASSIFICATION, AND A 3-DIGIT USER CODE. OUTPUT CONTAINS CORRECTED SINGLE CHANNEL, COINCIDENCE, AND DISINTEGRATION RATES REFERRED TO START OF COUNT, SPECIFIC DISINTEGRATION RATE (COUNTS/SECOND/UNIT VOLUME OR WEIGHT) REFERRED TO REFERENCE TIME, WEIGHTED MEAN AND ERROR OF ANY NUMBER OF PROBLEMS IN A GROUP, EFFICIENCIES OF THE TWO INDEPENDENT DETECTOR CHANNELS, DATE, SUMMARY OF BACKGROUND VALUES USED, IDENTIFICATION NUMBER, COUNT START TIME, AND UPPER AND LOWER LIMIT (ONE STANDARD DEVIATION) OF EACH OF THE COMPUTED QUANTITIES.

258 EXPN EXPN ANALYZES PULSED NEUTRON DATA USING THE GARELIS-RUSSEL TECHNIQUE (REFERENCE 1). BASICALLY THE CODE COMPUTES THE PROMPT DECAY CONSTANT, ALPHA, AND THE PARAMETER $(K \cdot \text{BETA}/L)$ FROM EXPERIMENTAL DATA, WHICH IS DIRECTLY EXTRACTED FROM A TIME ANALYZER STORAGE MEMORY AND READ ONTO A PUNCHED PAPER TAPE. THE ALPHA-DETERMINATION PART OF THE CODE WAS ORIGINALLY OBTAINED UNDER THE NAME EXPLICIT FROM KNOLLS ATOMIC POWER LABORATORY BUT HAS SINCE BEEN MODIFIED. THE CODE PROVIDES OPTIONS FOR A PRE-BURST OR A POST-BURST BACKGROUND ANALYSIS. THAT IS, THE PARAMETERS ALPHA AND $(K \cdot \text{BETA}/L)$ ARE OBTAINED USING A BACKGROUND MEASURED PRIOR TO THE BURST OR MEASURED AFTER THE BURST.

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311 BURNUP BURNUP CORRELATES HEAVY ELEMENT ISOTOPIC ANALYSIS WITH FISSION PRODUCT NEODYMIUM, URANIUM, AND PLUTONIUM CONCENTRATIONS IN AN IRRADIATED URANIUM FUEL FOR CALCULATION OF BURNUP (ATOM PER CENT FISSION AND MWD/MT). REACTOR PARAMETERS, INCLUDING EFFECTIVE NEUTRON ABSORPTION CROSS SECTIONS FOR ALL URANIUM AND PLUTONIUM ISOTOPES, CAPTURE-TO-FISSION RATIOS FOR U235, PU239, AND PU241, A TWO-GROUP DESCRIPTION OF THE NEUTRON SPECTRUM, THE AVERAGE NEUTRON TEMPERATURE, THE REACTOR FAST FISSION FACTOR, AND THE DISTRIBUTION OF THE SOURCES OF FISSION AMONG THE FISSIONABLE NUCLIDES ARE COMPUTED FROM THE EXPERIMENTAL DATA OBTAINED FROM THE MASS SPECTROMETRIC ANALYSIS OF URANIUM, PLUTONIUM, AND NEODYMIUM.

333 TOAD TOAD IS USED TO PROCESS AND ANALYZE GAMMA RAY SPECTRA.

390 CORGAM A CORRELATION ALGORITHM IS CODED TO ALLOW THE UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA TYPICALLY COLLECTED IN A NEUTRON ACTIVATION ANALYSIS PROCEDURE. CORGAM (1) WILL COMPENSATE FOR ELECTRONIC SHIFTS IN THE DATA, (2) WILL CORRECT FOR BACKGROUND, (3) WILL NORMALIZE THE DATA TO A FIXED NEUTRON FLUX LEVEL, (4) ALLOWS A CHOICE OF WEIGHTING FACTORS, AND (5) ALLOWS A CHOICE OF METHODS FOR CALCULATION OF STANDARD DEVIATIONS. THE CODE REQUIRES A MATRIX OF REFERENCE GAMMA-RAY SPECTRA. THESE SPECTRA CAN BE IN A RAW-DATA FORM. ALL OF THE MODIFICATIONS AVAILABLE TO THE COMPLEX GAMMA-RAY SPECTRA ARE AVAILABLE TO THE REFERENCE GAMMA-RAY SPECTRA. IN ADDITION, A DECAY CORRECTION IS AVAILABLE FOR THE REFERENCE GAMMA-RAY SPECTRA. ONLY THE REFERENCE GAMMA-RAY SPECTRA THAT HAVE INTENSITY COEFFICIENTS WHICH ARE SIGNIFICANT AT A PRESCRIBED LEVEL OF SIGNIFICANCE ARE RETAINED IN THE FINAL SOLUTION. THE INTERMEDIATE SOLUTIONS, I.E., THOSE SOLUTIONS THAT CONTAIN REFERENCE GAMMA-RAY SPECTRA WHICH HAVE NONSIGNIFICANT INTENSITY COEFFICIENTS AT THE PRESCRIBED LEVEL, ARE PRINTED OUT. THEREFORE, SEVERAL SOLUTIONS ARE IMBEDDED IN THE FINAL SOLUTION.

394 JITER JITER COMPUTES THE FOLLOWING QUANTITIES MEASURED IN REACTOR FLUCTUATION EXPERIMENTS - THE DISPERSION PARAMETER γ , THE MODIFIED COEFFICIENT OF CORRELATION MCC, THE FREQUENCY DEPENDENT PART OF THE POWER SPECTRAL DENSITY PSD, AND THE CROSS POWER SPECTRAL DENSITY CPSD.

413 ALPHA-M ALPHA-M IS USED FOR DETERMINING RADIOISOTOPES BY LEAST SQUARES RESOLUTION OF THE GAMMA RAY SPECTRA. IT CAN HANDLE A VERY LARGE LIBRARY OF GAMMA RAY SPECTRA AND TAKES INTO ACCOUNT CORRECTIONS SUCH AS BACKGROUND SUBTRACTION, COUNTING TIME, DECAY TIME, DEAD TIME, AUTOMATIC COMPENSATION FOR GAIN AND THRESHOLD SHIFTS, SIZE OF THE ALIQUOT, VOLUME REDUCTION PRIOR TO COUNTING, AND SO ON.

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421 MICHROD THE VICKERS PYRAMID NUMBER AND THE MICROHARDNESS INCREMENT FRACTION ARE COMPUTED FROM FILAR MICROMETER EYEPIECE READINGS. THESE READINGS ARE MADE ON INDENTS, WHICH HAVE BEEN MADE BY AN INDENTER, IN THE MATERIAL BEING TESTED.

425 REDUX REDUX IS USED FOR THE REDUCTION OF DATA FROM REACTOR FLUCTUATION EXPERIMENTS. FROM INPUT COUNT SAMPLES RECORDED BY ONE OR TWO COUNTING CHANNELS, THE PROGRAM COMPUTES UNBIASED SAMPLE ESTIMATES OF MOMENTS AND FUNCTIONS OF MOMENTS OF THE COUNT DISTRIBUTIONS, INCLUDING THE DISPERSION PARAMETER γ AND THE MODIFIED COEFFICIENT OF CORRELATION MCC. STANDARD ERROR ESTIMATES ARE COMPUTED FOR γ AND MCC.

457 GSSLRN1B GSSLRN1B IS UTILIZED FOR EVALUATIONS AND STATISTICAL DETERMINATION OF PHOTOPEAKS IN PHOTON SPECTRA. THE CODE PERFORMS EVALUATIONS OF PHOTOPEAK SPECTRA USING AS INPUT THE DIGITIZED PULSE HEIGHT DISTRIBUTION WHICH IS OUTPUT FROM A LARGE MULTICHANNEL ANALYZER. PHOTOPEAKS ARE LOCATED, FUNCTIONS FIT TO EACH REAL PEAK, AND THE RELATIVE INTENSITY OF EACH FITTED PEAK ABOVE THE BACKGROUND CONTINUUM IS CALCULATED. THE CODE IS EASILY ADAPTABLE FOR ANALYSIS OF ANY SPECTRA WHICH CAN BE ADEQUATELY DEFINED BY PEAKS REPRESENTED IN ANALYTIC FORM.

464 DYN01 DYN01 CALCULATES THE DISTRIBUTION OF ELECTRONS THAT ARE EMITTED FROM A PHOTOMULTIPLIER COMPOSED OF A SERIES OF DYNODES.

469 PMS1 PMS1 CORRECTS EXPERIMENTAL FAST NEUTRON POLARIZATION DATA FOR FINITE GEOMETRY AND MULTIPLE SCATTERING EFFECTS, WHEN LIQUID HELIUM IS THE POLARIZER ANALYZER.

476 CAGE/BIRD/SPEC CAGE/BIRD/SPEC IS A PACKAGE OF THREE INDEPENDENT CODES DESIGNED FOR THE REDUCTION AND PROCESSING OF NEUTRON TIME-OF-FLIGHT SPECTRA IN PULSED MULTIPLYING OR NON-MULTIPLYING ASSEMBLIES.

485 GASPAN GASPAN ANALYZES OUTPUT PULSES FROM A LITHIUM-DRIFTED GERMANIUM SEMICONDUCTOR DETECTOR TO DEFINE COMPLEX GAMMA-RAY SPECTRA OF ROUTINE CRUD AND FILTRATE SAMPLES.

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43 CURFIT

CURFIT IS A COMPOSITE PROGRAM FOR FITTING EXPERIMENTAL DATA POINTS WITH DIFFERENT TYPES OF COMMON ANALYTIC CURVES. THERE ARE AT PRESENT FIVE FITS AVAILABLE -

- (1) POLYNOMIAL $Y = \text{SUMMATION OVER } I \text{ OF } A(I) * (X^{**}(I))$
- (2) EXPONENTIAL $Y = A * \exp(BX)$
- (3) COSINE $Y = A * \cos(B(X+C))$
- (4) SERIES OF CUBICS $Y = A(J) + B(J) * X + C(J) * (X^{**}2) + D(J) * (X^{**}3)$
- (5) FOURIER SERIES

62 LOS ALAMOS LEAST SQUARES

THIS PROGRAM PERFORMS LEAST SQUARES FITTING OF LINEAR OR NONLINEAR FUNCTIONS IN SEVERAL INDEPENDENT VARIABLES. THE PROGRAM WILL DETERMINE AN ESTIMATE OF A IN THE FUNCTION $Y=F(X,A)$ BY MINIMIZING THE SUM OF SQUARES.

IN THE FUNCTION, X IS A VECTOR OF OBSERVED VARIABLES AND A IS A VECTOR OF PARAMETERS TO BE DETERMINED. IN THIS CONTEXT, A LINEAR FUNCTION IS ONE WHOSE PARTIAL DERIVATIVES WITH RESPECT TO THE ELEMENTS OF A ARE ALL INDEPENDENT OF A. A NONLINEAR FUNCTION HAS AT LEAST ONE OF THE ELEMENTS OF A APPEARING IN AT LEAST ONE OF THESE PARTIAL DERIVATIVES.

186 LAG1/LAG2

LAG IS A SINGLE PASS LOAD AND GO ASSEMBLER DESIGNED TO ACCEPT IBM7090 FLOCO II INSTRUCTIONS.

321 EXPALS

THIS PROGRAM FITS BY LEAST SQUARES A FUNCTION WHICH IS A LINEAR COMBINATION OF REAL EXPONENTIAL DECAY FUNCTIONS. THE FUNCTION IS

$$Y(K) = \text{SUMMATION OVER } J \text{ OF } A(J) * \exp(-\text{LAMBDA}(J) * K).$$

VALUES OF THE INDEPENDENT VARIABLE (K) AND THE DEPENDENT VARIABLE Y(K) ARE SPECIFIED AS INPUT DATA. WEIGHTS MAY BE SPECIFIED AS INPUT INFORMATION OR SET BY THE PROGRAM ($W(K) = 1/Y(K)$).

324 FRANTIC

FRANTIC IS DESIGNED TO PROCESS RAW COUNTING DATA AND TO FIT IN THE LEAST SQUARES SENSE THESE DATA TO THE MULTIPLE EXPONENTIAL GROWTH AND DECAY EQUATIONS. THE PROGRAM CAN BE USED FOR SUMS OF EXPONENTIALS WITH POSITIVE, NEGATIVE, OR ZERO EXPONENTS AND POSITIVE OR NEGATIVE COEFFICIENTS.

327 DAFT1

DAFT1 IS A PROGRAM FOR WEIGHTED LEAST SQUARES FITTING OF 0.0253 EV NEUTRON DATA FOR FISSILE NUCLIDES. THE PROGRAM ALSO CARRIES OUT COMPUTATIONS RELEVANT TO DISCERNING OVERALL GOODNESS OF FIT, PARTICULARLY DEVIANT DATA, AND DATA WHOSE IMPROVEMENT WOULD LEAD TO LARGE REDUCTIONS IN ERROR OF EACH FITTED PARAMETER.

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364 SNEQ SNEQ CONSISTS OF THE TWO CODES, SNAP AND EQPLT, WHICH HAVE BEEN MERGED DUE TO THEIR COMMON USE OF THE SLIP COMPILER. SNAP INTERPRETS AND SOLVES PSEUDO-FORTRAN INPUT EQUATIONS REPRESENTING NONLINEAR ALGEBRAIC SYSTEMS. EQPLT INTERPRETS PSEUDO-FORTRAN INPUT EQUATIONS AND CALCULATES AND PLOTS MULTIPLE CURVES ON A SINGLE GRAPH. EQPLT IS USEFUL FOR PARAMETER STUDIES.

407 DATATRAN2 UTILITY PLOTTING THIS SERIES OF DATATRAN MODULES IS DESIGNED TO PROVIDE BASIC PLOTTING CAPABILITY IN AN EASY-TO-USE PACKAGE. FUNCTIONS OF ONE OR TWO VARIABLES CAN BE ACCOMMODATED. THE MODULES MAY BE USED TO PLOT RESULTS OF CALCULATIONS PERFORMED BY OTHER MODULES OR TO DISPLAY DATA READ FROM CARDS OR TAPES.

411 M0661/M0657/M0626 M0661, M0657, AND M0626 PERFORM STATISTICAL ANALYSES OF DATA BASED ON A LEAST SQUARES POLYNOMIAL FIT.

428 DOGGY DOGGY CAN PERFORM MOST ROUTINE FORM SHEET CALCULATIONS. THE PROGRAM CAN HANDLE COMMON ARITHMETIC MANIPULATIONS ON COLUMNS OF INPUT SUCH AS ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION. IT ALSO HAS PROVISIONS FOR THE USE OF SPECIAL FUNCTIONS SUCH AS LOGARITHMIC, TRIGONOMETRIC, ARC TRIGONOMETRIC, HYPERBOLIC, EXPONENTIAL, SQUARE ROOT, MAXIMA, MINIMA, AND RAISING A NUMBER TO ANY POWER. DOGGY ALSO CALCULATES WATER PROPERTIES SUCH AS THERMAL CONDUCTIVITY, VISCOSITY, AND PRANDTL NUMBER OVER A WIDE RANGE OF TEMPERATURE AND PRESSURE.

442 SIMPLE1 SIMPLE1 COMPILES AND EXECUTES MULTISTATEMENT CALCULATIONS TYPED IN A FAMILIAR ALGEBRAIC NOTATION AT A TIME-SHARED TERMINAL, IMMEDIATELY RETURNING REQUESTED RESULTS TO THE TERMINAL AND PERMITTING AD LIB CONTINUATION OF A CALCULATION. THE USER MAY USE THE SYSTEM AS AN EXTENDED AND POWERFUL ELECTRONIC CALCULATOR OR AS A CALCULATOR OF SMALL LOAD-AND-GO RUNS. ERRORS ARE DETECTED AND CORRECTED ON AN AS-YOU-GO BASIS. CALCULATIONS MAY INCLUDE INTERACTIVE INPUT/OUTPUT, FUNCTIONS, AND LOOPS.

444 ROPE ROPE IS USED TO CALCULATE ROOTS OF POLYNOMIALS.

445 LIZARD4 LIZARD4 IS USED TO SOLVE NON-LINEAR, ORDINARY DIFFERENTIAL EQUATIONS AS A ONE-SHOT EFFORT. IT WAS WRITTEN TO SOLVE INITIAL VALUE EQUATIONS, THAT IS, THE VALUES

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OF THE DEPENDENT VARIABLES MUST BE SPECIFIED AT SOME INITIAL VALUE OF THE INDEPENDENT VARIABLE. ONE-DIMENSIONAL STEADY-STATE BOUNDARY VALUE PROBLEMS CAN BE SOLVED WITH LIZARD4, PROVIDING AN ITERATIVE METHOD IS EMPLOYED BY THE USER WHERE ONE OF THE BOUNDARY CONDITIONS IS SPECIFIED AND INTEGRATION PROCEEDS UNTIL THE ALTERNATE BOUNDARY CONDITION IS MET.

446 MOST MOST IS DESIGNED TO VARY A SET OF COORDINATES $(X_1, X_2, \dots, X_N)$ REPRESENTING THE VECTOR X IN SUCH A WAY THAT A SPECIFIED FUNCTION $Y(X)$, $Y(X)$ GREATER THAN OR EQUAL TO 0, IS MINIMIZED.

478 BETTIS ENVIRONMENTAL ROUTINES: THE BETTIS ENVIRONMENTAL ROUTINES EXTEND THE FORTRAN LANGUAGE BY MODIFYING SOME OF THE STANDARD CDC6600 LIBRARY ROUTINES AND BY ADDING ROUTINES TO THE LIBRARY TO FACILITATE DECIMAL INPUT AND OUTPUT, FILE MAINTENANCE, SCRATCH I/O, STORAGE ALLOCATION, UTILITY FUNCTIONS, OPERATING SYSTEM INTERFACING, AND OPERATOR COMMUNICATION.

MODEL (MODIFIED ENVIRONMENTAL LIBRARY) DIFFERS FROM THE ORIGINAL BETTIS VERSION IN THAT IT ALLOWS THE OPERATING SYSTEM, RATHER THAN THE ENVIRONMENTAL PACKAGE, TO CONTROL THE OPERATING ENVIRONMENT.

484 FIGS FIGS IS A FORTRAN CALLABLE SUBROUTINE PACKAGE FOR THE SUPPORT OF INTERACTIVE COMPUTING PROGRAMS UTILIZING AN IBM SYSTEM/360 COMPUTER AND AN IBM2250 DISPLAY UNIT.

496 KAPLPLOT KAPLPLOT IS THE SET OF STANDARD CALCOMP SUBROUTINES WRITTEN AT KNOLLS ATOMIC POWER LABORATORY TO PROVIDE GRAPHIC OUTPUT.

GRLIN IS USED TO DRAW AN AXIS SYSTEM, ESTABLISH SCALING FACTORS, AND ENABLE THE USER TO DRAW LINEAR GRAPHS.

GRLOG IS USED TO DRAW AN AXIS SYSTEM, ESTABLISH SCALING FACTORS, AND PERMIT USERS TO DRAW FULL LOGARITHMIC GRAPHS.

LINLG PROVIDES THE CAPABILITY OF DRAWING SEMI-LOGARITHMIC GRAPHS WITH LINEARLY SCALED ABSCISSAS WHILE LOGLN PROVIDES THE SAME CAPABILITY WITH LINEARLY SCALED ORDINATES.

PENSET INITIALIZES THE PLOTTING SUBROUTINES AND DRAWS THE JOB IDENTIFICATION, TIME, DATE, AND CHARGE NUMBER.

PENEND MOVES THE PEN OFF A COMPLETED PLOT AND PREVENTS SUBSEQUENT PLOTS FROM OVERWRITING THE COMPLETED PLOTS.

IPLOT MOVES THE PLOTTER PEN FROM ITS CURRENT POSITION TO A NEW POSITION.

IDPLOT MOVES THE PEN A SPECIFIED INCREMENTAL DISTANCE IN INCHES FROM ITS PRESENT POSITION.

PSCALE ESTABLISHES THE VALUE OF FACTORS TO BE USED BY THE SPLOT SUBROUTINE IN SCALING USER DATA TO FIT ON PLOTTER COORDINATES.

SPLIT CAUSES THE PEN TO MOVE TO COORDINATES WHICH ARE OBTAINED BY APPLYING PSCL SCALE FACTORS TO USER DATA.

XCPLT AND YCPLT CAUSE ALPHABETIC INFORMATION TO BE WRITTEN PARALLEL TO THE DIRECTION OF THE ABSCISSA AXIS, XCPLT, OR THE ORDINATE AXIS, YCPLT.

PMARK CAUSES A DISTINCTIVE SYMBOL TO BE PLOTTED AT THE CURRENT POSITION OF THE PEN.

PLTSIZE CONVEYS TO THE PLOTTING SYSTEM INFORMATION WHICH WILL ENABLE THE PLOTTING SYSTEM TO PLACE THE MAXIMUM NUMBER OF PLOTS IN A MINIMUM LENGTH OF PAPER.

497 RELO1 RELO1 COMPUTES THE FAILURE PROBABILITY FOR A SINGLE FAILURE MODE. TWO OPTIONS ARE AVAILABLE - OPTION 1 CALCULATES THE INTERACTION OF TWO NORMALLY DISTRIBUTED VARIATES AND OPTION 2 CALCULATES THE INTERACTION OF TWO TRUNCATED NORMALLY DISTRIBUTED VARIATES.

514 FORSIM FORSIM IS A FORTRAN ORIENTED SIMULATION PROGRAM WHICH AUTOMATES THE CONTINUOUS TRANSIENT SOLUTION OF SYSTEMS OF ORDINARY AND/OR PARTIAL DIFFERENTIAL EQUATIONS. THE USER WRITES HIS EQUATIONS IN A FORTRAN SUBROUTINE, FOLLOWING PRESCRIBED RULES, AND LOADS THIS ROUTINE ALONG WITH THE EXECUTIVE ROUTINES. THE EXECUTIVE ROUTINES THEN READ IN INITIAL DATA SUPPLIED BY THE USER AND PROCEED WITH THE INTEGRATION.

515 GENED ENVIRONMENTAL ROUTINES THE GENED ENVIRONMENTAL ROUTINES CONSIST OF A SET OF STANDARD ROUTINES WRITTEN AT THE GENERAL ELECTRIC NUCLEAR ENERGY DIVISION AND A SET OF STANDARD GE635 SYSTEM ROUTINES. THE FIRST SET INCLUDES THE FOLLOWING -

BITA MOVES BITS FROM ONE WORD TO ANOTHER WITHOUT ALTERING THOSE BITS OUTSIDE THE RANGE OF THE CALL.

CASE POSITIONS AN INPUT FILE SO THAT THE INPUT DATA FOLLOWING A CASE CARD CAN BE READ.

CASERR ASSUMES THAT AN ERROR WAS DETECTED IN THE LAST DATA CASE AND FORCES THE CASE SUBROUTINE TO ADVANCE THE DATA INPUT FILE TO THE NEXT INDEPENDENT CASE CARD OR TO THE END OF THE INPUT DATA, WHICHEVER OCCURS FIRST.

DRAW IS A GENERAL-PURPOSE PLOTTING ROUTINE USED TO (A) DRAW A GRID NETWORK, (B) LABEL THE GRID NETWORK, (C) DRAW CURVES WITHIN THE GRID NETWORK, (D) ALLOW TWO DIFFERENT Y-AXIS VALUES, AND (E) PRODUCE A BAR OR HISTOGRAM PLOT.

ERRSYS IS A GENERAL ERROR INDICATING ROUTINE THAT SETS UP DIAGNOSTIC INFORMATION FOR USE IN ERROR RECOVERY WITHIN PROGRAM SYSTEMS.

F4TRBK PROVIDES A TRACE OF CALLING PROGRAMS FROM LEVEL TO LEVEL UP TO THE ORIGINAL CALLING LEVEL. F4TRAC PRINTS OUT A TRACE AND THEN RETURNS TO THE STATEMENT AFTER THE CALL TO F4TRAC. F4TRID PROVIDES THE NAME OF THE PROGRAM WHICH CALLED ERRSYS.

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FLEXO WRITES A MESSAGE ON THE ON-LINE TYPEWRITER DURING PROGRAM EXECUTION TO SERVE AS A GUIDE TO THE OPERATOR OR USER.

FLTBCD CONVERTS A FORTRAN FLOATING-POINT NUMBER TO A BCD NUMBER IN EITHER F OR E FORMAT.

FSNOW IS A SPECIAL SUBROUTINE TO SAVE A FILE CODE IN THE CELL .SPEC.

FSUP PERMITS THE USER TO SUPPRESS A FLOATING-POINT NUMBER OR BINARY CONFIGURATION WHEN PRINTING OR PUNCHING WITH FORTRAN I/O.

FSUPC IS CALLED TO DISABLE THE SUPPRESS FUNCTION PERFORMED BY FSUP AND RETURN TO NORMAL FORTRAN I/O PROCESSING.

HELP IS USED TO SUPPLY A USER WITH THE TYPE OF DEVICE (TAPE/ DISC/DRUM) AND THE NUMBER OF LINKS USED IF THE DEVICE IS A DISC OR DRUM UNIT.

IDFTAP CREATES A LOGICAL UNIT DESIGNATOR (REFERRED TO AS A LUD), FROM THE INFORMATION GIVEN TO THE IDFTAP FUNCTION BY THE USER, AND RETURNS THE LUD TO THE USER.

ISERVE IS A FUNCTION WITH VARIOUS OPTIONS TO PICK UP AND/OR CONVERT ONE OF THE FOLLOWING - DATE, CLOCK TIME, CASE NUMBER, USER IDENTIFICATION, AND COMPUTER PROCESSOR TIME.

ISUP PERMITS THE USER TO SUPPRESS A FIXED-POINT NUMBER OR BINARY CONFIGURATION WHEN PRINTING OR PUNCHING WITH FORTRAN I/O.

ISUPC IS CALLED TO DISABLE THE SUPPRESS FUNCTION PERFORMED BY ISUP AND RETURN TO NORMAL FORTRAN I/O PROCESSING.

LIMRTN PERMITS THE USER TO REGAIN CONTROL AFTER AN I8 ABORT (RUNNING TIME EXCEEDED) OCCURS, ALLOWING THE PROGRAM AN ADDITIONAL 5 MINUTES OF PROCESSOR TIME.

LISTFORM CONSISTS OF TWO SUBPROGRAMS, JGEGEN AND JGEOUT, AND ENABLES THE FORTRAN USER TO WRITE OUTPUT TAPES (FOR PRINTING OR PUNCHING) IN A MORE EFFICIENT AND FASTER MANNER THAN IS POSSIBLE WITH A FORTRAN WRITE (I,N) LIST STATEMENT, WHICH MUST SCAN THE FORMAT STATEMENT EACH TIME OUTPUT IS INITIATED.

LOCF4 IS A FUNCTION USED TO CONVERT THE ADDRESS OF A VARIABLE OR AN ARRAY INTO A FORTRAN INTEGER.

NBCDFX CONVERTS A BCD NUMBER, INCLUDING THE SIGN, TO A FORTRAN INTEGER.

NFXBCD CONVERTS A FORTRAN INTEGER TO A BCD NUMBER.

NIPS INTERPRETS AN ARRAY OF BCD CHARACTERS IN INTEGER, REAL, OR HOLLERITH FORMAT.

NPOST IS A MULTIPLE ENTRY SUBROUTINE INCORPORATING THE FUNCTIONS OF VTAB, REWIND, POSWDS, POSLIN, POSTMW, POSASN, POSPOS, PRID, PWID, POSTSF, POSTSB, POSTRB, AND POSTWB. IT SERVES AS A DRIVER TO RWSBT FOR GROUPS OF DATA WHICH ARE UNIQUELY DEFINED ON A PHYSICAL DEVICE CALLED A LINE (A DISK, DRUM, OR TAPE FILE).

NSORT PROVIDES A FLEXIBLE ASCENDING-ORDER SORTING CAPABILITY TO A FORTRAN PROGRAM THAT REQUIRES A TAPE OR DISC SORT.

PLOTRC PROVIDES A SERIES OF CALCOMP PLOTTER ROUTINES. THESE INCLUDE PENSET, PSCALE, SPLOT, IPLOT, IDPLOT, XCPLT, YCPLT, PMARK, AND PENEND.

PRNTHD CAUSES A PRINTER OUTPUT HEADING TO BE WRITTEN AT THE TOP OF A NEW PAGE.

REREAD ALLOWS THE USER TO RE-READ (RE-FORMAT) THE LAST BCD RECORD READ IN, UNDER A DIFFERENT FORMAT CONTROL. CONVRT PERMITS

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CHARACTER MANIPULATION AND CONVERSION OF ANY DATUM/DATA IN MEMORY.

RWSBT MANIPULATES INFORMATION IN BINARY FORM ON TAPE, DISC, OR DRUM PHYSICAL DEVICES. IT INCLUDES BLKSIZ, RDBT, WTBT, SBTF, SBITB, RWD, RWDLO, AND MOVEBT.

VAMPIR PROVIDES THE COMPLETE SETUP OF LINEAR GRAPHS TO BE PRODUCED ON A DIGITAL PLOTTER.

ZERO CAUSES DIVISION BY ZERO TO YIELD A FIXED OR FLOATING POINT ZERO AS THE DIVIDEND INSTEAD OF THE MACHINES MAXIMUM. IT ALSO SUPPRESSES THE ASSOCIATED DIVIDE CHECK AND ERROR MESSAGES.

THE SET OF STANDARD GE635 SYSTEM ROUTINES INCLUDE -

DUMP WHICH DUMPS THE INDICATED LIMITS OF CORE STORAGE AND TERMINATES EXECUTION BY RETURNING CONTROL TO THE OPERATING SYSTEM.

PDUMP WHICH DUMPS THE INDICATED LIMITS OF CORE STORAGE AND THEN CONTINUES EXECUTION.

LINK WHICH ENABLES THE PROGRAMMER TO CALL PROGRAM OVERLAYS AND LLINK WHICH LOADS A LINK AND THEN RETURNS TO THE NEXT SEQUENTIAL STATEMENT OF THE CALLING ROUTINE.

FLGEOF WHICH IS USED TO PROCESS END-OF-FILE CONDITIONS.

516 PTAC11 PTAC11 ALLOWS A PROGRAMMER TO ASSEMBLE BINARY CODE FOR THE DIGITAL EQUIPMENT CORPORATION PDP-11 COMPUTER ON THE IBM360/75, TAKING ADVANTAGE OF THE FACILITIES AND SPEED OF THE LARGER MACHINE.

518 ERREST ERREST SORTS THE ROD BUNDLE LIBRARY OF CRITICAL HEAT FLUX DATA AND PERFORMS ERROR CALCULATIONS ON SORTED SUBSETS.

519 NRTS OS/360 REMOTE JOB ENTRY NRTS ALLOWS USERS AT REMOTE LOCATIONS TO SUBMIT JOBS OVER SLOW OR HIGH SPEED COMMUNICATION LINES TO AN IBM SYSTEM 360/75 USING THE OPERATING SYSTEM THAT PROVIDES MULTIPROGRAMMING WITH A VARIABLE NUMBER OF TASKS. THIS PROGRAM IS AN EXTENSION OF THE STANDARD RJE PROGRAM. ONCE A JOB HAS BEEN ENTERED EXECUTION PROCEEDS UNDER OS JOB MANAGEMENT ROUTINES.

534 EISPACK RELEASE 2 EISPACK IS A COLLECTION OF FORTRAN SUBROUTINES TO SOLVE THE STANDARD EIGENPROBLEM FOR ANY ONE OF THE FOLLOWING CLASSES OF MATRICES - REAL GENERAL, CERTAIN REAL TRIDIAGONAL, REAL SYMMETRIC, REAL SYMMETRIC BAND, REAL SYMMETRIC TRIDIAGONAL, COMPLEX GENERAL AND COMPLEX HERMITIAN; TO SOLVE THE GENERALIZED EIGENPROBLEM FOR REAL SYMMETRIC POSITIVE-DEFINITE AND REAL GENERAL MATRIX SYSTEMS; AND TO PERFORM THE SINGULAR VALUE DECOMPOSITION OF A REAL RECTANGULAR MATRIX AND SOLVE AN ASSOCIATED LEAST SQUARES PROBLEM. THE INDIVIDUAL SUBROUTINES ARE -

IDENTIFICATION	DESCRIPTION
BAKVEC F281	BACK TRANSFORM VECTORS OF MATRIX FORMED BY FIG1
BALANC F269	BALANCE A REAL GENERAL MATRIX

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BALBAK	F270	BACK TRANSFORM VECTORS OF MATRIX FORMED BY BALANC
BANDR	F226	REDUCE SYM. BAND MATRIX TO SYM. TRIDIAG. MATRIX
BANDV	F227	FIND SOME VECTORS OF SYM. BAND MATRIX
BISECT	F294	FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
BQR	F236	FIND SOME VALUES OF SYM. BAND MATRIX
CBABK2	F272	BACK TRANSFORM VECTORS OF MATRIX FORMED BY CBAL
CBAL	F271	BALANCE A COMPLEX GENERAL MATRIX
CG	F301	DRIVER SUBROUTINE FOR A COMPLEX GENERAL MATRIX
CH	F302	DRIVER SUBROUTINE FOR A COMPLEX HERMITIAN MATRIX
CINVIT	F297	FIND SOME VECTORS OF COMPLEX HESS. MATRIX
COMBAK	F283	BACK TRANSFORM VECTORS OF MATRIX FORMED BY COMHES
COMHES	F282	REDUCE COMPLEX MATRIX TO COMPLEX HESS. (ELEMENTARY)
COMLR	F295	FIND ALL VALUES OF COMPLEX HESS. MATRIX (LR)
COMLR2	F296	FIND ALL VALUES/VECTORS OF COMPLEX HESS. MATRIX (LR)
COMQR	F245	FIND ALL VALUES OF COMPLEX HESS. MATRIX (QR)
COMQR2	F246	FIND ALL VALUES/VECTORS OF COMPLEX HESS. MATRIX (QR)
CORTB	F247	BACK TRANSFORM VECTORS OF MATRIX FORMED BY CORTH
CORTH	F244	REDUCE COMPLEX MATRIX TO COMPLEX HESS. (UNITARY)
EISPAC	F299	CONTROL PROGRAM FOR EISPACK (IBM VERSION ONLY)
ELMBAK	F274	BACK TRANSFORM VECTORS OF MATRIX FORMED BY ELMHES
ELMHES	F273	REDUCE REAL MATRIX TO REAL HESS. (ELEMENTARY)
ELTRAN	F220	ACCUMULATE TRANSFORMATIONS FROM ELMHES (FOR HQR2)
FIGI	F280	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
FIGI2	F222	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
HQR	F286	FIND ALL VALUES OF REAL HESS. MATRIX
HQR2	F287	FIND ALL VALUES/VECTORS OF REAL HESS. MATRIX
HTRIBK	F285	BACK TRANSFORM VECTORS OF MATRIX FORMED BY HTRIDI
HTRIB3	F243	BACK TRANSFORM VECTORS OF MATRIX FORMED BY HTRID3
HTRIDI	F284	REDUCE HERMITIAN MATRIX TO SYM. TRIDIAG.
HTRID3	F242	REDUCE HERMITIAN PACKED MATRIX TO SYM. TRIDIAG.
IMTQLV	F234	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
IMTQL1	F291	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
IMTQL2	F292	FIND ALL VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
INVIT	F288	FIND SOME VECTORS OF REAL HESS. MATRIX
MINFIT	F233	SINGULAR VALUE DECOMPOSITION & LEAST SQUARES SOLN.
ORTBAK	F276	BACK TRANSFORM VECTORS OF MATRIX FORMED BY ORTHES
ORTHES	F275	REDUCE REAL MATRIX TO REAL HESS. (ORTHOGONAL)
ORTRAN	F221	ACCUMULATE TRANSFORMATIONS FROM ORTHES (FOR HQR2)
QZHES	F238	REDUCE REAL GENERALIZED MATRIX SYSTEM
QZIT	F239	FURTHER REDUCE REAL GENERALIZED MATRIX SYSTEM
QZVAL	F240	FIND ALL VALUES OF REDUCED REAL GENERALIZED SYSTEM
QZVEC	F241	FIND ALL VECTORS OF REAL GENERALIZED MATRIX SYSTEM
RATQR	F298	FIND EXTREME VALUES OF SYM. TRIDIAG. MATRIX
REBAK	F225	BACK TRANSFORM VECTORS OF MATRIX FORMED BY REDUC
REBAKB	F231	BACK TRANSFORM VECTORS OF MATRIX FORMED BY REDUC2
REDUC	F224	REDUCE SYM. GENERALIZED MATRIX SYSTEM TO STANDARD
REDUC2	F230	REDUCE SYM. GENERALIZED MATRIX SYSTEM TO STANDARD
RG	F303	DRIVER SUBROUTINE FOR A REAL GENERAL MATRIX
RGG	F312	DRIVER SUBROUTINE FOR A REAL GENERALIZED SYSTEM
RS	F304	DRIVER SUBROUTINE FOR A REAL SYM. MATRIX
RSB	F308	DRIVER SUBROUTINE FOR A REAL SYM. BAND MATRIX
RSG	F309	DRIVER SUBROUTINE FOR A REAL SYM. GENERALIZED SYSTEM

RSGAB	F310	DRIVER SUBROUTINE FOR A REAL SYM. GENERALIZED SYSTEM
RSGBA	F311	DRIVER SUBROUTINE FOR A REAL SYM. GENERALIZED SYSTEM
RSP	F307	DRIVER SUBROUTINE FOR A REAL SYM. PACKED MATRIX
RST	F305	DRIVER SUBROUTINE FOR A REAL SYM. TRIDIAG. MATRIX
RT	F306	DRIVER SUBROUTINE FOR A NONSYM. TRIDIAG. MATRIX
SVD	F232	SINGULAR VALUE DECOMPOSITION OF RECTANGULAR MATRIX
TINVIT	F223	FIND SOME VECTORS OF SYM. TRIDIAG. MATRIX
TQLRAT	F235	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
TQL1	F289	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
TQL2	F290	FIND ALL VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
TRBAK1	F279	BACK TRANSFORM VECTORS OF MATRIX FORMED BY TRED1
TRBAK3	F229	BACK TRANSFORM VECTORS OF MATRIX FORMED BY TRED3
TRED1	F277	REDUCE SYM. MATRIX TO SYM. TRIDIAG. MATRIX
TRED2	F278	REDUCE SYM. MATRIX TO SYM. TRIDIAG. MATRIX
TRED3	F228	REDUCE SYM. PACKED MATRIX TO SYM. TRIDIAG. MATRIX
TRID18	F237	FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
TSTURM	F293	FIND SOME VALUES/VECTORS OF SYM. TRIDIAG. MATRIX

541 WSP-HASP/DOS THE WSP (WORK STATION PACKAGE) IS A MODIFICATION OF THE STANDARD HASP/RMT360 PACKAGE SUPPLIED BY IBM AND RUNS ON A MULTIPROGRAMMED DOS SYSTEM/360/30 USING MULTI-LEAVING AND BINARY SYNCHRONOUS COMMUNICATIONS TO COMMUNICATE WITH A SYSTEM/360/195/ASP CENTRAL CPU.

556 KEELE KEELE IS A LINEARLY CONSTRAINED NONLINEAR PROGRAMMING ALGORITHM FOR LOCATING A LOCAL MINIMUM OF A FUNCTION OF N VARIABLES WITH THE VARIABLES SUBJECT TO LINEAR EQUALITY AND/OR INEQUALITY CONSTRAINTS.

562 AMDLIBAE AMDLIBAE IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE NATIONAL LABORATORY. THIS SUBSET INCLUDES LIBRARY CATEGORIES A-E:

IDENTIFICATION	DESCRIPTION
A152S A MPA	MULT. PREC. FLOATING POINT ARITH. PACKAGE
B156S A ARSIN	ARCSINE, ARCCOSINE
B157S A SIN/COS	SINE, COSINE
B158S A DSIN/DCOS	DP SINE, COSINE
B159S A DTAN/DCOT	DP TANGENT, COTANGENT
B252S A SINH/COSH	HYPERBOLIC SINE, COSINE
B353S A ALOG	SP LOGARITHM
B354S A DEXP	DP EXPONENTIAL
B355S A DLOG	DP LOGARITHM
B456S A DCUBRT	DP CUBE ROOT
B457S A ARGPOWER	X**Y
B458S A ARGFDXPD	DP X**Y
C150S F DQD	Q. D. ALGORITHM APPLIED TO A POWER SERIES
C151S F DCONF1	EVAL. CONT. FRACT. Q. D. OF POWER SERIES
C250S F CUBIC	ROOTS OF CUBIC POLYNOMIAL EQUATION

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

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C251S F	QUARTIC	ROOTS OF QUARTIC POLYNOMIAL EQUATION
C252S F	RSSR	ALL ROOTS OF POLY EQS. WITH REAL COEF.
C253S F	POLDRV	DRIVER FOR C254S
C254S F	CPOLY	ROOTS ARB. POLY. JENKINS-TRAUB ALGORITHM
C353S F1		ANG. MOM. COEF.- CLEBSCH, RACAH, WIGNER
C354S A	ELLIPK	SP COMPLETE ELLIPTIC INTEGRAL K
C355S A	ELLIPE	SP COMPLETE ELLIPTIC INTEGRAL E
C365S A	ALGAMA	LOGARITHM OF THE GAMMA FUNCTION
C366S A	DGAMMA/DLGAMA	DP GAMMA AND LOG(GAMMA) FUNCTIONS
C367S A	GAMMA/ALGAMA	GAMMA AND LOG(GAMMA) FUNCTIONS
C368S F	EONE	EXPONENTIAL INTEGRAL E1
C369S F	DEONE	DP EXPONENTIAL INTEGRAL E1
C370S F	BESJY	BESSEL FUNCTIONS J AND Y
C371S F	BESIK	BESSEL FUNCTIONS I AND K
C372S F	CHIPRB	CHI-SQUARE INTEGRAL
C373S A	DELIPK	DP COMPLETE ELLIPTIC INTEGRAL K
C374S A	DELIPE	DP COMPLETE ELLIPTIC INTEGRAL E
C375S F1	DEI	EXPONENTIAL INTEGRALS IN LONG PRECISION
C377S F1	DDAW	DAWSON'S INTEGRAL IN DOUBLE PRECISION
C380S F	DRZETA	LONG PRECISION ZETA, ZETA-1 FUNCTIONS
C382S F	DCGAM	LONG PRECISION COMPLEX GAMMA
C383S A	DERF/DERFC	DP ERROR FUNCTION
C384S F	BFJ1	BESSEL FUNCTION J1
C385S F	COULMB	REGULAR COULOMB WAVE FUNCTIONS
C386S F1	DSGMAL	COULOMB PHASE SHIFT
C387S F	BFJYR	BESSEL FUNCTIONS J0,J1,Y0,Y1
C388S F	IRCOUL	LP IRREGULAR COULOMB WAVE FUNCTIONS
C389S F	GAMIN	INCOMPLETE GAMMA FUNCTION
C390S F	LQ	ASSOC. LEGENDRE FUNCTIONS OF 2ND. KIND
C393S F	CDEONE	MODIFIED COMPLEX EXPONENTIAL INTEGRAL
D150S F	HAVIE	QUADRATURE BY HAVIE'S ALGORITHM
D150S P	HAVIEP	QUADRATURE BY HAVIE'S ALGORITHM
D151S F	ROMBRG	ROMBERG QUADRATURE
D151S P	ROMBRG	ROMBERG QUADRATURE
D152S F1	CHER	CLENSHAW-CURTIS QUADRATURE
D153S F	DROMB	TWO-DIMENSIONAL ROMBERG QUADRATURE
D153S P	DROMBP	TWO-DIMENSIONAL ROMBERG QUADRATURE
D154S F	CMQUAD	MODIFIED CLENSHAW-CURTIS QUADRATURE
D155S F	SIMP	ADAPTIVE SIMPSON QUADRATURE
D157S F	ASIMP	IMPROVED ADAPTIVE SIMPSON QUADRATURE
D157S P	ASIMPP	IMPROVED ADAPTIVE SIMPSON QUADRATURE
D158S F	ANC4	ADAP. QUAD. USING 4-TH ORDER NEWTON-COTES
D158S P	ANC4P	ADAP. QUAD. USING 4-TH ORDER NEWTON-COTES
D161S F	GAUSS	ARBITRARY GAUSSIAN WEIGHTS AND NODES
D162S F	SQUANK	SIMPSON'S QUAD. USED ADAPTIVELY
D252S F	DDFSUB	DP NEVILLE OR STOER SOL. LIN. DIF. EQNS.
D253S F	DDFSYS	DRIVER FOR D252S
D254S F	DEGEAR	GEAR'S SOL. OF DIF. EQS.
D255S F	DFBND	STOER SOL. DIF. EQS. WITH ERROR BOUNDS
D256S F	DFBDRV	DRIVER FOR D256
E206S F	LSQPOL	LEAST SQUARES WEIGHTED POLYNOMIAL FIT
E208S F1		ARBITRARY FUNCTION FIT, LEAST SQUARES

E209S F	CALLSQ	DRIVER FOR E206S
E212S F		GENERAL LEAST SQUARES FIT + FNCTION EVAL.
E250S F	VA02A	LEAST SQUARES FUNCT. MIN. W/O DERIVATIVES
E252S F	MINMAX	CHEBYSHEV LINE FIT
E253S F		ARBITRARY FUNCTIONAL FIT II
E256S F	BGPOL	LEAST SQUARES FIT WITH POLYNOMIALS
E257S F	BGLSSQ	LEAST SQUARES FIT WITH ARBITRARY FUNCTION
E350S F	SMOOTH	SMOOTHING BY CUBIC SPLINES

563 AMDLIBF AMDLIBF IS A SUBSET OF THE
 IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT
 ARGONNE. THIS SUBSET INCLUDES LIBRARY CATEGORY F:

IDENTIFICATION	DESCRIPTION
F105S F MATEQ,UNIQUE	GENERALIZED MAT. INV. AND SOL. LIN. EQS.
F150S F HERM	EIGENSYSTEMS OF HERMITIAN MATRICES
F152S F SYMINV	INVERT SYM. MATRICES, SOLVE LIN. SYSTEMS
F154S A DOTP	DOUBLE PLUS PRECISION ACCUM. INNER PROD.
F155S F HESSEN	RED. COMPLEX NON-HERM. MAT. TO UP. HESS.
F156S F RAYCOR	RAYLEIGH CORRECTIONS FOR EIGENVALUES
F157S F SINGLVL	SINGULAR VALUE DECOMP. OF REAL MATRIX
F161S F XTRADP	A FAST EXTENDED PRECISION INNER PRODUCT
F202S F1 EIGEN	EIGENSYSTEM FOR REAL SYMMETRIC MATRIX
F203S F	DRIVER FOR F202S
F220S F ELTRAN	ACCUM. TRANSFORMATIONS FROM ELMHES (HQR2)
F221S F ORTRAN	ACCUM. TRANSFORMATIONS FROM ORTHES (HQR2)
F222S F FIGI2	REDUCE NONSYM. TO SYM. TRIDIAG. (TQL2)
F223S F1 TINVIT	FIND SOME EIGENVEC. OF SYM. TRIDIAG. MAT.
F224S F REDUC	REDUCE GEN. SYM. EIGENPROB. AX-L*BX
F225S F REBAK	BACKTRANSFORM VECTORS REDUC FORMED MATRIX
F226S F BANDR	REDUCE BAND SYM. MATRIX TO SYM. TRIDIAG.
F227S F BANDV	FIND EIGENVECTORS OF BAND SYM. MATRIX
F228S F TRED3	REDUCE PACKED SYM. MAT. TO SYM. TRIDIAG.
F229S F TRBAK3	BACKTRANSFORM VECTORS TRED3 FORMED MATRIX
F250S F FRANCI	EIGENVALUES OF A REAL MATRIX
F251S F FRANCC	EIGENVALUES OF COMPLEX MATRICES
F252S F GEIGEN	GENERALIZED SYMMETRIC EIGENPROBLEM
F255S F SDIAG	EIGENSYSTEM OF REAL SYM. DP MATRICES
F257S F TSTMTZ	GENERATES TEST MATRICES
F258S F LRCHZ	EIG. VALS. REAL SYM. MAT. VIA LR-CHOLEQ.
F259S F BYSECT	EIGENVALUES OF TRIDIAG. MAT. BY BISECTION
F260S F JACOBI	EIGENSYSTEM OF REAL MATRICES
F261S F EIGINV	INVERSE EIGENVALUE PROBLEM
F262S F VEC5	EIGENVECTORS OF PENTADIAG. SYM. MATRICES
F263S F BANDRD	REDUCE SYM. BAND MATRIX TO TRIDIAG. FORM
F264S F BANDVC	ORTHONORM. EIGENVEC. OF SYM. BAND MAT.
F265S F EIGENP	EIGENSYSTEM OF REAL GENERAL MATRIX
F269S F1 BALANC	BALANCE A REAL GENERAL MATRIX
F270S F1 BALBAK	BACKTRANSFORM VECTORS BALANCE FORMED MAT.
F271S F1 CBAL	BALANCE A COMPLEX GENERAL MATRIX
F272S F1 CBABK2	BACKTRANSFORM VECTORS CBAL FORMED MATRIX
F273S F1 ELMHES	REDUCE REAL MATRIX TO REAL HESS. (ELEM.)

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

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F274S F1 ELMLBAK	BACKTRANSFORM VECTORS ELMHES FORMED MAT.
F275S F1 ORTHES	REDUCE REAL MAT. TO REAL HESS. (ORTHOG.)
F276S F1 ORTBAK	BACKTRANSFORM VECTORS ORTHES FORMED MAT.
F277S F1 TRED1	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
F278S F1 TRED2	REDUCE SYM. MAT. TO SYM. TRIDIAG. (TQL2)
F279S F1 TRBAK1	BACKTRANSFORM VECTORS TRED1 FORMED MATRIX
F280S F1 FIGI	REDUCE NONSYM. TO SYM. TRIDIAG. MATRIX
F281S F1 BAKVEC	BACKTRANSFORM VECTORS FIGI FORMED MATRIX
F282S F1 COMHES	REDUCE COMPLEX MATRIX TO COMPLEX HESS.
F283S F1 COMBAK	BACKTRANSFORM VECTORS COMHES FORMED MAT.
F284S F1 HTRIDI	REDUCE HERMITIAN MATRIX TO SYM. TRIDIAG.
F285S F1 HTRIBK	BACKTRANSFORM VECTORS HTRIDI FORMED MAT.
F286S F1 HQR	FIND ALL VALUES OF REAL HESS. MATRIX
F287S F1 HQR2	FIND ALL VALUES/VECTORS REAL HESS. MAT.
F288S F1 INVIT	FIND SOME VECTORS OF REAL HESS. MATRIX
F289S F2 TQL1	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
F290S F2 TQL2	ALL VALUES/VECTORS SYM. TRIDIAG. MAT.
F291S F1 IMTQL1	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
F292S F1 IMTQL2	ALL VALUES/VECTORS SYM. TRIDIAG. MAT.
F293S F1 TSTURM	SOME VALUES/VECTORS SYM. TRIDIAG. MAT.
F294S F2 BISECT	FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
F295S F1 COMLR	FIND ALL VALUES OF COMPLEX HESS. MATRIX
F296S F1 COMLR2	ALL VALUES/VECTORS COMPLEX HESS. MAT.
F297S F1 CINVT	FIND SOME VECTORS OF COMPLEX HESS. MATRIX
F298S F1 RATQR	FIND EXTREME VALUES OF SYM. TRIDIAG. MAT.
F299S FA1EISPAC	CONTROL PROGRAM F220S-F223S + F269S-F298S
F402S F MATINV	MATRIX INVERSION AND SOL. OF LINEAR EQNS.
F403S F	DRIVER FOR F402S
F452S F CHOLLU,CHOLEQ	SYM. DECOMP. OF POS. DEF. BAND MATRICES
F453S F MATINC	INVERSION OF COMPLEX MATRICES
F454S F CROUT	SOLUTION OF SIMULTANEOUS LINEAR EQUATIONS
F455S F CROUTC	SOL. OF SIMULTANEOUS COMPLEX LINEAR EQNS.
F456S F1 DIAG	INTEGER PRESERVING GAUSSIAN ELIMINATION

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 GORIES G-Z:

IDENTIFICATION	DESCRIPTION
G552S F RANF	RANDOM NUMBER GENERATOR
J552S F1 PLOTSFLM	CALCOMP PLOTS TO IBM 2280
J952S F YOLYPLOT	CALCOMP PLOTS
J955S P GRAF	PRINTS A GRAPH OF POINTS ON LINE PRINTER
K250S A1	CORE TO CORE CONVERSION
K251S A HEXINP	HEXADECIMAL INPUT FOR PL/I PROGRAMS
K252S A HEXOUT	HEXADECIMAL OUTPUT CONV. PL/I PROGRAMS
M101S F SORT	ALGEBRAIC SORT
M150S F CSORT	ALGEBRAIC SORT
M151S P2 ANLKWIC	KWIC SORT
M250S A SMALLIST	SQUEEZES ASSEMBLER LISTING TO 8X11
N251S A ABEND	CALLS ABEND DUMP

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

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Q052S A	CLOCK	TIME
Q053S A	COPYAGO	COPY LOAD MODULE FROM TAPE TO DISK
Q054S A	DATE	CURRENT DATE IN FORM MM/DD/YY
Q055S A	TIME	TIME (24 HOUR CLOCK) IN EBCDIC HH.MM.SS
Z013S F		VARIABLE METRIC MINIMIZATION
Z057S A	LOCF	LOCATE MACHINE ADDRESSES OF VARIABLES
Z071S A	ALLOC	ALLOCATE LCS FOR FORTRAN PROGRAMS
Z073S A	LCSGET	ALLOCATE LCS FOR PL/I PROGRAMS
Z074S A	ANLMNP	EXPONENT & MANTISSA MANIPULATIVE FUNCTS.

578 PLOTR PLOTR AND THE AUXILIARY ROUTINE XYGRD CONTOUR A FUNCTION DEFINED OVER A TWO-DIMENSIONAL GRID AND COMPUTE THE AREA WITHIN THE CONTOURS.

592 GEAR GEAR IS A PACKAGE OF SUBROUTINES FOR THE NUMERICAL SOLUTION OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS, GIVEN THE INITIAL VALUES. IT IS PARTICULARLY WELL-SUITED FOR STIFF SYSTEMS, BUT CAN BE USED GENERALLY.

601 ERF/ERFC ERF AND ERFC ARE USED TO COMPUTE VALUES OF THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION FOR ANY REAL NUMBER. THEY MAY BE USED TO COMPUTE OTHER RELATED FUNCTIONS SUCH AS THE NORMAL PROBABILITY INTEGRALS.

602 LENSDES LENSDES ANALYZES THE PERFORMANCE OF OPTICAL LENSES BY COMPUTING THE IMAGE ERRORS FOUND WHEN BUNDLES OF SKEW RAYS ARE TRACED FROM OBJECT POINTS TO THE IMAGE SURFACE. LENS PERFORMANCE IS OPTIMIZED BY VARYING SELECTED LENS PARAMETERS UNDER DIRECTION OF THE NONLINEAR LEAST SQUARES PROGRAM, OPTIMIZ.

610 FUNPACK RELEASE 2 FUNPACK IS A COLLECTION OF FORTRAN SUBROUTINES TO EVALUATE CERTAIN SPECIAL FUNCTIONS. THE INDIVIDUAL SUBROUTINES ARE -

IDENTIFICATION	DESCRIPTION
NATSIO F2IO	BESSEL FUNCTION I-SUB-0
NATSII F2II	BESSEL FUNCTION I-SUB-1
NATSJO F2JO	BESSEL FUNCTION J-SUB-0
NATSJI F2JI	BESSEL FUNCTION J-SUB-1
NATSKO F2KO	BESSEL FUNCTION K-SUB-0
NATSK1 F2K1	BESSEL FUNCTION K-SUB-1
NATSRESY F2BY	BESSEL FUNCTION Y-SUB-NU
DAW F1DW	DAWSON'S INTEGRAL
DELIPK F1EK	COMPLETE ELLIPTIC INTEGRAL OF THE FIRST KIND
DELIPE F1EE	COMPLETE ELLIPTIC INTEGRAL OF THE SECOND KIND
DEI F1EI	EXPONENTIAL INTEGRALS
NATSPSI F2PS	PSI (LOGARITHMIC DERIVATIVE OF GAMMA FUNCTION)
MONERR F1MO	ERROR MONITORING PACKAGE

2. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

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613 NRTS ENVIRONMENTAL SUBROUTINES THE NRTS ENVIRONMENTAL SUBROUTINES ARE A COLLECTION OF ROUTINES DESIGNED TO AID THE PROGRAMMER BY PROVIDING EXTENSIONS TO THE FORTRAN LANGUAGE, DATA MANAGEMENT SERVICES, AND PROGRAMMING AIDS.

ASTEM EVALUATES THE 1967 ASME EQUATIONS OF STATE FOR WATER/STEAM AND DERIVATIVES OF THESE EQUATIONS.

DOUT EXTRACTS DECKS FROM A FILE AND WRITES EACH DECK AS A SEPARATE FILE SO THAT THEY CAN BE PROCESSED BY THE ASSEMBLER WHICH CAN HANDLE ONLY ONE DECK PER STEP.

UMRG IS USED TO MERGE PARTS OF UPDATE TAPES.

UPD IS USED TO UPDATE SOURCE DECKS.

STHG GENERATES WATER THERMODYNAMIC PROPERTY TABLES.

AND, IAND, DAND, OR, IOR, AND DOR GIVE THE LOGICAL PRODUCT (AND) AND LOGICAL SUM (OR) FOR 4 AND 8-BYTE WORDS.

CVI CONVERTS EBCDIC INFORMATION TO BINARY INFORMATION.

COMPAR COMPARES A CHARACTER STRING BEGINNING AT LOCATION A(I) WITH ANOTHER CHARACTER STRING BEGINNING AT LOCATION B(J). THE COMPARISON IS MADE ONE CHARACTER AT A TIME AND TERMINATED AFTER ALL REQUESTED CHARACTERS ARE TESTED OR AFTER THE FIRST INEQUALITY IS FOUND.

DATE CONVERTS THE JULIAN DATE MAINTAINED BY THE OS OPERATING SYSTEM INTO THE FORM MM/DD/YY WHERE MM IS THE MONTH, DD THE DAY, AND YY THE YEAR.

FABEND CAUSES AN ABNORMAL TERMINATION OF THE JOB STEP, AND A CORE DUMP IS PRINTED IF A SYSUDUMP OR SYSABEND DD CARD IS INCLUDED IN THE JOB STEP JCL.

THE FETCH FUNCTION RETURNS THE VALUE OF THE VARIABLE WHOSE ADDRESS IS SPECIFIED AS THE ARGUMENT.

THE EXTENDED IBCOM# ROUTINE PROVIDES AUTOMATIC PAGE CONTROL, AND OPTIONALLY, PERMITS FROM ONE TO THREE LINES TO BE INSERTED AS PAGE HEADINGS IN THE OUTPUT TO A SPECIFIED SYSOUT UNIT.

THE INP SET OF SUBROUTINES, A DATA INPUT PACKAGE FOR USE WITH FORTRAN PROGRAMS, IS A CONVERSION OF THE INPF FORTRAN PACKAGE WRITTEN BY BETTIS FOR THE CDC6600 AND CAN BE USED IN THE CONVERSION OF BETTIS PROGRAMS THAT USE INPF.

INFILQ IS AN INCORE READ AND WRITE SUBROUTINE THAT MODIFIES IBCOM# IN SUCH A WAY THAT THE NEXT READ OR WRITE REQUEST CAUSES INFORMATION IN THE USER'S LIST TO BE PLACED IN A CORE BUFFER.

JBIDZZ RETURNS THE NAME OF THE JOB ENTERED ON THE NAME FIELD OF THE JOB CARD.

JULIAN RETURNS A 5-BYTE NUMERIC JULIAN DATE IN EBCDIC CHARACTERS FROM THE OS OPERATING SYSTEM.

LOCFCN RETURNS THE ABSOLUTE CORE ADDRESS OF THE VARIABLE SPECIFIED AS THE ARGUMENT.

MAINS AND MAIND ARE MATRIX INVERSION SUBROUTINES IN SINGLE- AND DOUBLE-PRECISION, RESPECTIVELY.

MOVE TRANSFERS DATA ASSUMED TO BE IN CHARACTER, FULL-WORD, OR DOUBLE-WORD FORM FROM ONE ARRAY TO A SECOND ARRAY.

RUNOUT CAN BE USED TO OBTAIN A SECOND COPY OF THE PRINTED OUTPUT.

ISL, ISR, ISRL, SL, SR, SRL, DSL, DSR, AND DSRL ARE ARITHMETIC AND LOGICAL SHIFT FUNCTIONS FOR 4 AND 8-BYTE WORDS.

THE INTERVAL TIME ROUTINE PROVIDES THE USER WITH THE MEANS OF DETERMINING THE ELAPSED TIME OF HIS TASK.

TYME WILL RETURN THE TIME OF DAY AS THE SECOND ARGUMENT.

VCLSER PROVIDES THE VOLUME SERIAL NUMBER(S), DATA SET NAME, AND CREATION DATE OF DATA SETS RESIDING ON PERIPHERAL DEVICES (DISK OR TAPE UNITS).

ZEROUT SETS TO ZERO AN ARBITRARY LENGTH OF SEQUENTIAL 8-BYTE WORDS BEGINNING ON A DOUBLE-WORD BOUNDARY.

THE FTB PACKAGE IS A SET OF SUBROUTINES FOR CONTROLLING DYNAMIC STORAGE ALLOCATION IN FAST CORE, BULK CORE, FOUR DISK DATA SETS, AND ONE DRUM DATA SET AND PERFORMING THE I/O OPERATIONS TO DISK AND DRUM STORAGE.

SUBROUTINE FLINK ALLOWS ACCESS TO THE LINK MACRO.

THE FIDSET ROUTINE IS USED TO OVERRIDE THE FORTRAN CONVENTION FOR NAMING DD CARDS.

REMTYM GIVES THE USER ACCESS TO HIS UNUSED CPU TIME.

THE STANDARD CALCOMP PLOTTER SUBROUTINES ARE ALSO PART OF THE PACKAGE.

THE INTEGRATED GRAPHICS SYSTEM (IGS) USED AT THE RAND CORPORATION TO SUPPORT AN SC4060 STORED-PROGRAM RECORDING SYSTEM IS ALSO INCLUDED.

614 HISTOGRAMS HISTOGRAMS PROVIDES GRAPHICAL REPRESENTATION OF LOT SAMPLE CHARACTERISTICS IN THE FORM OF HISTOGRAM BARS. ON LARGE LOT SAMPLES, IF A HISTOGRAM BAR SHOULD EXCEED FIFTY UNITS, THE ENTIRE HISTOGRAM PLOT IS AUTOMATICALLY SCALED BY THE SMALLEST INTEGER THAT WILL CAUSE THE LARGEST FREQUENCY TO FALL WITHIN THE MAXIMUM PLOT OF FIFTY UNITS. THE NUMBER OF CELLS IN THE HISTOGRAM CAN VARY FROM 3 TO 22. THE EQUAL INTERVALS ARE DETERMINED BY THE DIFFERENCE OF THE UPPER AND LOWER BOUNDARIES DIVIDED BY THE NUMBER OF CELLS LESS TWO. IN ADDITION TO THE PLOT, THE PROGRAM PROVIDES STATISTICAL CHARACTERISTICS IN THE FORM OF: THE MEAN, STANDARD DEVIATION, SKEWNESS, KURTOSIS, RANGE, NUMBER OF STANDARD DEVIATIONS BETWEEN THE MEAN AND THE TWO SPECIFICATION LIMITS, AND UP TO NINETEEN VALUES FALLING OUTSIDE THE BOUNDARY LIMITS.

621 BH99 BH99 IS USED FOR THE STATISTICAL ANALYSIS OF DATA BASED ON THE EXTREME VALUE DISTRIBUTION.

623 SETS SETS IS USED TO ACHIEVE THE SYMBOLIC MANIPULATION OF SET (OR BOOLEAN) EQUATIONS, PARTICULARLY THE REDUCTION OF SET EQUATIONS BY THE APPLICATION OF SET IDENTITIES.

624 GRAPH THIS PROGRAM CALCULATES AND GRAPHS STATISTICAL RESULTS OF EXPERIMENTAL DATA. IT CALCULATES THE LINEAR REGRESSION, CORRELATION COEFFICIENTS, THE CONFIDENCE

D301A F4	TBPSDN	TRUNCATED BUNEMAN POISSON SOLVER
E102A F4	SPL1D1	SPLINE INTERPOLATION-COEFFICIENT EVAL.
E103A F4	SPL1D2	SPLINE INTERPOLATION-FUNCTION EVALUATION
E104A F4	SPL2D1	2-D BI-CUBIC SPLINE INTERP.-COEFF. CALC.
E105A F4	SPL2D2	2-D BI-CUBIC SPLINE INTERP.-FUNCT. EVAL.
E106A F4	AKNINT	INTERPOLATION BY AITKEN'S REPEATED PROCESS
E107A F4	SPL2D3	SPLINE INTERP. FN. TO BE USED WITH E105A
E203A F4	SMOOTH	LEAST-SQUARE SPLINE APPROXIMATION
E208A F4	PFTS	ORTHOGONAL POLYNOMIAL LEAST SQUARES
F115A F4	MAXV	VECTOR MAX., MIN., MAX. ABS. OR MIN. ABS.
F116A F4	MAXM	MATRIX MAX., MIN., MAX. ABS., MIN. ABS.
F119A F4	MATTRS	MATRIX TRANSPOSE IN PLACE
F120A F4	MATMOV	MATRIX MOVE
F121A F4	MATTRA	MATRIX MOVE & TRANSPOSE
F122A F4	MATMPY	MATRIX MULTIPLY ROUTINE
F123A F4	MTMPY	MATRIX TRANSPOSE MULTIPLY ROUTINE
F124A COM	DOTPRD	INNER PRODUCT OF TWO VECTORS (DOT PRODUCT)
F128A F4	MGS	MODIFIED GRAM-SCHMIDT ORTHOGONALIZATION
F132A F4	MATINV	MATRIX INVERSE
F133A COM	VECSUM	VECTOR ADDITION
F134A F4	ECMATPY	ECS MATRIX MULTIPLY
F135A F4	ECMTRPY	ECS MATRIX TRANSPOSE MULTIPLY
F136A F4	COTPRD	INNER PRODUCT OF TWO COMPLEX VECTORS
F137A F4	CATINV	COMPLEX MATRIX INVERSION
F139A COM	ADDVEC	VECTOR ADDITION
F222A F4	SMEVAL	EIGENVALUE ROUTINE--REAL SYMMETRIC MATRIX
F223A F4	SMHSTR	TRIDIAGONALIZE REAL SYMMETRIC MATRIX
F224A F4	SMEVEV	EIGENVAL/EIGENVEC ROUT. FOR REAL SYMM. MTRX
F225A F4	PRODHH	CPUTE TRANSFORM TO TRIDIAG. A SYMM. MATRIX
F226A F4	HMEVAL	EIGENVALUE ROUTINE--CMLX HERMITIAN MTRX
F227A F4	HMHSTR	TRIDIAGONALIZE COMPLEX HERMITIAN MATRIX
F228A F4	HMEVEV	EIGENVAL/EIGENVEC ROUT. FOR HERMITIAN MTRX
F229A F4	PROHHH	CPUTE TRANSFORM TO TRIDIAG. HERMITIAN MTRX
F230A F4	BISECT	CPUTE SUBSET OF EIGENVALS OF TRIDIAG. MTRX
F404A F4	LSS	LINEAR SYSTEM SOLVER
F405A F4	GLSS	GENERAL LINEAR SYSTEM SOLVER
F409A F4	MATFAC	LIN. SYST. SOLVER & MTRX FACTORIZATION(LU)
F410A F4	LSSIT	ITERATIVE SOLUTION OF LINEAR SYSTEMS
F411A F4	BANMAT	BAND MTRX FACTORIZATION & LIN. SYST. SOLVER
F413A COM	ABTDSS	SYMM. CONSTANT TRIDIAG. LINEAR SYST. SOLVER
F414A F4	SPERLSS	SYMMETRIC PERIODIC LINEAR SYSTEM SOLVER
F415A F4	ECSGLSS	ECS GENERAL LINEAR SYSTEM SOLVER
F416A F4	CATFAC	COMPLEX LINEAR SYSTEM SOLVER
F417A F4	CLSIT	SOLN OF CMLX LIN. SYST. BY ITERATIVE RFNMT
F418A COM	FACTTD	LU DECOMP. OF DIAG. DOM. TRIDIAG. MATRIX
F419A COM	SOLTDM	SOLVE DIAG. DOMINANT TRIDIAG. LINEAR SYSTEM
G601A F4	SPCTRL	SPECTRAL ANALYSIS OF TIME SERIES
G602A F4	ACFCN	AUTOCOVARANCE/AUTOCORRELATION FUNCTION
G603A F4	WINDOW	LAG-WINDOW GENERATOR
G604A F4	PWRSPCT	POWER SPECTRUM COMPUTATION
I401A F4	LOAD	LOAD FORTRAN IV FORMAT FREE INPUT
J506A COM	ADV	ADVANCE FILM

. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

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J510A F4	ASCL	AUTOMATIC GRAPH SCALING
J516A COM	PLT	PLOT A POINT
J517A COM	DRV	DRAW VECTOR
J518A COM	GXA	GENERATE X OR Y AXIS
J520A COM	TSP	TYPE SPECIFIC POINT
J521A COM	TCP	TYPE CURRENT POINT
J522A COM	TSPV	TYPE SPECIFIED POINT VERTICALLY
J523A COM	FRAME	DRAW FRAME
J524A COM	STB	STORE WORD IN BUFFER
J526A F4	CONVRT	CONVERT TO 4020 COORDINATE
J527A F4	TCR	TEST COORDINATE FOR RANGE
J528A COM	DGA	DEFINE GRAPH AREA
J529A F4	DLNLN	DRAW LINEAR-LINEAR GRID
J530A F4	DLNLG	DRAW COMBINATION OF LINEAR & LOG GRIDS
J533A F4	SLLIN	SCALE LEFT SIDE LINEARLY
J535A F4	SBLIN	SCALE TOP OR BOTTOM OF GRAPH LINEARLY
J540A F4	SBLOG	SCALE ANY BOUNDARY OF GRAPH LOGARITHMICALLY
J541A F4	PLOT	PLOT N POINTS
J542A COM	WLCH	WRITE LARGE CHARACTERS HORIZONT. OR VERT.
J562A F4	PLOJB	STANDARDIZED PLOT ON FILM
J565A COM	BS4020	DOUBLE BUFFER FILM OUTPUT
J567A F4	DLCH	DRAW LARGE CHARACTERS
J569A F4	COLOR	COLOR
J592A F4,COM	PICTURE	PICT-PERSPEC PLOTS, HIGN LINES REMVD, COLOR
K203A COM	ECR	ECR READS ONE WORD FROM ECS
K204A COM	ECW	ECW WRITES ONE WORD TO ECS
M101A F4	SORT1	EXTENDED SORT ROUTINE
M117A F4	SORT2	TWO LEVEL EXTENDED SORT ROUTINE
M118A F4	SEARCH	RAPID SEARCH OF A FLOATING-POINT TABLE
M119A F4,COM	ESEARCH	BINARY SEARCH THROUGH EXTENDED CORE STORAGE
M401A COM	SHIFT	SHIFT WORD W/O ZERO END AROUND OR SIGN EXT.
M403A COM	PUTFCH	PUTS & FETCHES CHARACTERS
N103A F4	LABRT	LOS ALAMOS ABORTER & MESSAGE PRINTER
Q408A COM	RWPRU	READ/WRITE BINARY PRU (PHYSICAL RECORD)
Q409A F4	ECSBUFO	DATA TRANSFER FROM ECS TO FILE & VICE-VERSA
W113A COM	OPEN	OPEN & CLOSE FILES
N103A F4	LABRT	LOS ALAMOS ABORTER & MESSAGE PRINTER

635 SLACMON, SLACMON/370

SLACMON AND SLACMON/370

OPERATING AS SYSTEMS' TASKS OR JOBS UNDER OS/VS2, ARE DESIGNED TO MONITOR HARDWARE AND SOFTWARE PERFORMANCE OVER A GIVEN PERIOD OF TIME. INPUT SPECIFIED IN THE PARAMETER FIELD ON THE EXECUTE CARD COUPLED WITH THE CORRESPONDING OPERAND IN THE OPERATOR'S START COMMAND ALLOWS SELECTED FUNCTIONS TO BE PERFORMED. FIVE DATA SETS OPTIONALLY PROVIDE NAMES OF QUEUES, I/O DEVICES, OR MODULES THAT THE PROGRAMS MONITOR. OUTPUT CONSISTS OF A NUMBER OF REPORTS FOLLOWED BY A SUMMARY PAGE; CERTAIN SUMMARY DATA MAY APPEAR ON THE CONSOLE DEVICE. THE OUTPUT IS MOST USEFUL FOR IDENTIFYING BOTTLENECKS AND INTERACTIONS, TUNING A SYSTEM FOR PEAK PERFORMANCE AND FOR INDICATING DESIRABLE HARDWARE AND SOFTWARE RECONFIGURATION.

640 DE/STEP,INTRP; DEROOT/STEP,INT DE/STEP,INTRP PERFORMS THE SOLUTION OF AN INITIAL VALUE PROBLEM FOR A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS TO A FIXED ENDPOINT. WITH THE COMPANION PROGRAM, DEROOT/STEP,INTRP, THE ENDPOINT MAY BE SPECIFIED IMPLICITLY AS THE ROOT OF A NONLINEAR FUNCTION OF THE INDEPENDENT VARIABLE, THE SOLUTION, AND ITS FIRST DERIVATIVE. EACH OF THESE PROGRAMS IS SUPPLIED IN BOTH A BASIC AND IN A MORE VERSATILE EXTENDED VERSION.

642 PROGLOOK PROGLOOK MAKES IT POSSIBLE TO MONITOR THE EXECUTION OF VIRTUALLY ANY OS/MVT OR OS/VS2 RELEASE 1.6 LOAD MODULE. THE MAIN REASON FOR USING PROGLOOK IS TO FIND OUT WHICH PORTIONS OF A CODE USE MOST OF THE CPU TIME SO THAT THOSE PARTS OF THE PROGRAM CAN BE REWRITTEN TO REDUCE CPU TIME. FOR LARGE PRODUCTION PROGRAMS, USERS HAVE TYPICALLY FOUND IT POSSIBLE TO REDUCE CPU TIME BY 10 TO 30 PERCENT WITHOUT CHANGING THE PROGRAM'S FUNCTION.

644 GETCOR/FRECOR GETCOR AND FRECOR ARE ASSEMBLY LANGUAGE SUBROUTINES WHICH MAY BE CALLED FROM FORTRAN SUBROUTINES DURING EXECUTION TO ALLOCATE AND RELEASE CORE STORAGE. THOSE VARIABLES FOR WHICH CORE STORAGE IS TO BE ALLOCATED MUST BE PASSED AS ARGUMENTS OF THE FORTRAN SUBROUTINES. THESE PROGRAMS ALLOW VARIABLE DIMENSIONING IN SUBROUTINES WITHOUT A PREVIOUS SPECIFICATION OF THE MAXIMUM ALLOWABLE DIMENSIONS.

646 COPYCAT COPYCAT IS AN OS UTILITY PROGRAM DESIGNED TO PRODUCE AN EFFICIENT SYSTEM-WIDE CATALOG WHICH MAY RESIDE ON MANY VOLUMES. SUBSTANTIAL IMPROVEMENT IN PERFORMANCE MAY ALSO BE OBTAINED ON A SYSTEM WITH ONLY A SINGLE CATALOG. FIRST, CATALOG ENTRIES FROM MANY DIFFERENT CATALOGS MAY BE REDISTRIBUTED TO EQUALIZE THE LOAD ON EACH CATALOG. SECOND, EACH INDIVIDUAL CATALOG IS RESTRUCTURED IN A WAY DESIGNED TO MINIMIZE THE I/O TIME REQUIRED FOR SEARCHING AND UPDATING. REDISTRIBUTION AND RESTRUCTURING PARAMETERS ARE UNDER USER CONTROL. MODEL DSCB'S FOR GENERATION DATA GROUPS AND ALIAS ENTRIES ARE ALSO PROCESSED. CATALOGS ON ALL DIRECT ACCESS DEVICES, INCLUDING DATA CELLS, ARE SUPPORTED. BACKUP COPIES MAY ALSO BE MADE.

647 SLOP/CROSS THE PACKAGE CONTAINS TWO PL/I CODES, SLOP (STRUCTURAL LAYOUT OF PROGRAMS) AND CROSS, DESIGNED TO CHECK IBM FORTRAN H SOURCE PROGRAMS. SLOP EXAMINES THE SYSPRINT FILE PRODUCED BY A FORTRAN H COMPILATION FOR LOCAL ERRORS AND SENDS ITS OBSERVATIONS TO CROSS WHICH DETECTS POTENTIAL GLOBAL ERRORS. SLOP SUMMARIZES VARIABLES, LABELS, COMMON BLOCKS, AND OTHER ITEMS IN A SUBROUTINE, SHOWING WHICH SYMBOLS ARE BEING IMPROPERLY USED. OPTIONALLY, THE SLOP PROGRAM CAN LIST THE OUTPUT FROM THE ORIGINAL FORTRAN SUBROUTINE COMPILATION, CAN LIST AND/OR

SAVE A 'CORRECTED' AND RESEQUENCED FORTRAN FILE, AND SAVE AND/OR LIST THE INFORMATION INTENDED FOR THE CROSS ROUTINE.

FOR EACH SUBROUTINE CROSS TABULATES:

THE SUBROUTINE NAME AND SIZE,
ENTRY POINTS,
LISTED BUT UNUSED SYMBOLS,
UNINITIALIZED VARIABLES,
UNREFERENCED STATEMENT NUMBERS,
INTERNAL STATEMENT NUMBERS OF INPUT-OUTPUT STATEMENTS,
SYMBOLS WHICH APPEAR IN INPUT-OUTPUT STATEMENTS,
CALLED SUBROUTINES, AND
THE ACTIVE VARIABLES IN COMMON AND/OR EQUIVALENCE BLOCKS,
TOGETHER WITH BLOCK NAMES AND ADDRESSES.

CROSS LISTS COMMON AND/OR EQUIVALENCED VARIABLES IN ALPHABETIC ORDER WITH ADDRESSES AND CORRESPONDING BLOCK NAMES, ALONG WITH THE NAMES OF ROUTINES IN WHICH THESE VARIABLES ARE ACTIVELY USED. ANY SUSPICIOUS-LOOKING OR INCONSISTENT ITEMS ARE FLAGGED. THE SAME INFORMATION WILL ALSO BE SEQUENCED AND LISTED ACCORDING TO BLOCK NAMES AND ADDRESSES WITHIN EACH BLOCK. CROSS ALSO PRODUCES A TABLE DESIGNED TO SHOW INSTANTLY WHICH ROUTINES NEED ATTENTION BECAUSE SLOP FOUND ERRORS IN THEM, WHICH ARE MISSING OR DEFINED MORE THAN ONCE, AND WHICH ROUTINE IS CALLING (AND HOW MANY TIMES IT IS BEING CALLED BY) ANOTHER. FINALLY, IF ANY CYCLES OF SUBROUTINE CALLS ARE DETECTED, THEN A SECOND TABLE INDICATING THESE RECURSIVE CALLS WILL BE PRODUCED.

THE TEST CASE SUPPLIED WITH THIS PACKAGE IS DESIGNED TO BE SELF-EXPLANATORY, REMOVING THE NEED FOR REFERENCE DOCUMENTS.

649 COMQC COMQC IS A QUALITY CONTROL DATA ANALYSIS STATISTICAL PROGRAM THAT CALCULATES MEAN, STANDARD DEVIATION, RANGE, SKEWNESS AND KURTOSIS. TOLERANCE LIMITS, CONFIDENCE LIMITS ON THE PERCENT DEFECTIVE, AND A ONE-WAY ANALYSIS OF VARIANCE ARE ALSO PROVIDED.

652 STFODE/COLODE COLODE IS A SUBROUTINE INTENDED PRIMARILY FOR SOLVING FIRST-ORDER SYSTEMS OF STIFF DIFFERENTIAL EQUATIONS BY COLLOCATION METHODS. STFODE IS A DRIVER ROUTINE WRITTEN TO SIMPLIFY THE USE OF COLODE.

654 MATHLIB MATHLIB CONTAINS ROUTINES FOR LINEAR ALGEBRAIC EQUATIONS, EIGENVALUES AND EIGENVECTORS, NUMERICAL QUADRATURE, ORDINARY DIFFERENTIAL EQUATIONS, DATA FITTING, FOURIER TRANSFORMS, ZEROS AND OPTIMIZATION OF FUNCTIONS, ZEROS OF POLYNOMIALS, SPECIAL FUNCTIONS, AND NUMERICAL SORTING.

656 BESSEL FUNCTION PACKAGE SUBROUTINES FOR EVALUATING BESSEL FUNCTIONS:
JO(X), J1(X), IO(X), I1(X) FOR X BETWEEN + AND - INFINITY;

678 MORTRAN2 MORTRAN2 IS A FORTRAN
LANGUAGE EXTENSION THAT PERMITS A RELATIVELY EASY TRANSITION FROM
FORTRAN TO A MORE CONVENIENT AND STRUCTURED LANGUAGE. ITS FEAT-
URES INCLUDE FREE-FIELD FORMAT; ALPHANUMERIC STATEMENT LABELS;
FLEXIBLE COMMENT CONVENTION; NESTED BLOCK STRUCTURE; FOR-BY-TO,
DO, WHILE, UNTIL, LOOP, IF-THEN-ELSEIF-ELSE, EXIT, AND NEXT
STATEMENTS; MULTIPLE ASSIGNMENT STATEMENTS; CONDITIONAL COMPILA-

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

8/77

TION; AND AUTOMATIC LISTING INDENTATION. THE LANGUAGE IS IMPLEMENTED BY A MACRO-BASED PRE-PROCESSOR AND IS FURTHER EXTENSIBLE BY USER-DEFINED MACROS.

698 DUMP DUMP IS A USER-ORIENTED PROGRAM DUMPING ROUTINE WHICH PROVIDES DIAGNOSTICS IN ENGLISH. IT CAN BE USED TO PRINT A JOB'S EXCHANGE PACKAGE (OPERATING REGISTERS) AND PART OR ALL OF ITS MEMORY. IT WILL PRINT MESSAGES TELLING WHERE THE PROGRAM WAS EXECUTING WHEN IT QUIT, WHY DUMP THINKS IT QUIT, AND WHAT ROUTINES HAVE BEEN CALLED.

705 EPISODEB EPISODEB IS A PACKAGE OF EIGHT SUBROUTINES FOR THE NUMERICAL SOLUTION OF THE INITIAL VALUE PROBLEM FOR SYSTEMS OF FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS WHOSE JACOBIAN MATRICES ARE BANDED OR CAN BE APPROXIMATED BY BAND MATRICES. THE PACKAGE CAN BE USED FOR EITHER STIFF OR NON-STIFF SYSTEMS WHOSE JACOBIANS CAN BE APPROXIMATED BY BAND MATRICES. IT IS ESPECIALLY SUITED TO PROBLEMS WITH INTERMITTENT HIGH-SPEED TRANSIENTS OR WAVES.

709 NIXLIN NIXLIN PERFORMS A FUNCTION MINIMIZATION BY A DIRECT SEARCH ITERATIVE PROCESS THAT HAS THE ADVANTAGE OF REQUIRING NO DERIVATIVE EVALUATIONS. THIS PARTICULAR VERSION IS WELL-SUITED TO FITTING NONLINEAR MODELS TO EXPERIMENTAL DATA AND TO THE SOLUTION OF SYSTEMS OF NONLINEAR SIMULTANEOUS EQUATIONS.

Q. MATERIALS

8/7

419 CASCADE/CLUSTER CASCADE IS A SIMULATION OF THE COLLISION CASCADE RESULTING FROM THE DISPLACEMENT OF A PRIMARY KNOCK-ON ATOM BY AN ENERGETIC NEUTRON IN A BODY-CENTERED-CUBIC OR FACE-CENTERED-CUBIC CRYSTAL STRUCTURE. CLUSTER ANALYZES THE SPATIAL DISTRIBUTION OF THE RESULTING RADIATION DAMAGE IN TERMS OF VACANCY AND INTERSTITIAL CLUSTERS, TAKING INTO ACCOUNT THE EXACT CRYSTAL STRUCTURE.

422 SPECTRA SPECTRA COMPUTES THE NUMBER AND SPECTRUM OF PRIMARY KNOCK-ON ATOMS RESULTING FROM NEUTRON COLLISION SEQUENCES IN A MATERIAL UNDER IRRADIATION.

549 BIGDEAL BIGDEAL IS USED TO (1) CALCULATE THE MAXIMUM TEMPERATURES OF A SPENT YANKEE ATOMIC TYPE POWER REACTOR FUEL ASSEMBLY (36 0.305-IN. -OD BY 102-IN. - LONG STAINLESS STEEL FUEL RODS ON 0.422-IN. CENTERS) DURING SHEAR-LEACH PROCESSING, AND (2) CALCULATE PRESSURE BUILDUP WITHIN A BATCH DISSOLVER AS THE HOT FUEL IS QUENCHED BY COLD NITRIC ACID IN PREPARATION FOR AQUEOUS PROCESSING. THE FOLLOWING FIVE CASES, RELATED TO THE UNIT OPERATIONS OF SHEAR-LEACH, MAY BE INVESTIGATED - (1) FUEL SUBASSEMBLY SUSPENDED VERTICALLY IN WATER, (2) SUBASSEMBLY SUSPENDED HORIZONTALLY IN AIR, (3) SUBASSEMBLY CONTAINED WITHIN THE SHEAR FEED ENVELOPE, (4) 16 5-, 7-3/4-, OR 10-IN. ID BASKETS OF SHEARED FUEL STORED IN A 4 X 4 ARRAY ON 12-IN. CENTERS, AND (5) LEACHING OF 6 BASKETS IN A BATCH DISSOLVER.

566 RESPOND RESPOND CALCULATES THE RELATIVE ENERGY ABSORPTION OF A SMALL REGION OF ONE MATERIAL IN A LARGE BODY OF ANOTHER MATERIAL EXPOSED TO GAMMA- OR X-RADIATION.

609 INDX INDX PROVIDES A MEANS FOR RAPIDLY DEFINING AND TESTING TRIAL UNIT CELLS AS AN AID TO INDEXING POWDER PATTERNS OF CRYSTAL STRUCTURES OF UNKNOWN SYMMETRY.

619 ISOTAB ISOTAB COMPUTES POWER OUTPUT OF A SAMPLE OF MIXED ISOTOPES (PU238, PU239, PU240, PU241, PU242, AM241) AT ANY DESIRED DATE GIVEN THE MEASURED CALORIMETER VALUES, ISOTOPIC RATIOS AND CORRESPONDING DATES.

620 GROUP2 THIS PROGRAM CALCULATES THE SYMMETRY PROPERTIES OF LATTICE VIBRATIONS EITHER FOR ATOMIC CRYSTALS OR FOR EXTERNAL MODES OF MOLECULAR CRYSTALS AND GENERATES THE IRREDUCIBLE MULTIPLIER REPRESENTATIONS (IMR'S) INCLUDING THE EFFECTS OF TIME REVERSAL INVARIANCE (TRI) ON THE SYMMETRY COORDINATES.

Q. MATERIALS

8/77

655 XDTRAP XDTRAP CALCULATES GAS DIFFU-
SION WITH TRAPPING. THE EFFECT OF TRAPPING ON HYDROGEN PERMEATION
AND EVOLUTION WAS EXPLORED FOR A RANGE OF PARAMETER VALUES FROM
COMPUTER-GENERATED TABLES OF CONCENTRATIONS OF DIFFUSING AND
TRAPPED HYDROGEN.

680 MARLOWE MARLOWE GENERATES ATOMIC
DISPLACEMENT CASCADES IN CRYSTALLINE SOLIDS AND ANALYZES MANY
OF THEIR PROPERTIES.

527 HERMES THE HERMES MODEL CALCULATES THE REGIONAL RADIONUCLIDE RELEASES AND RADIATION DOSE TO THE POPULACE IN A GIVEN YEAR ARISING FROM THE OPERATION OF NUCLEAR FACILITIES TO MEET ELECTRICAL GENERATION DEMANDS WITHIN A GIVEN STUDY REGION.

591 PLETHS PLETHS IS A TIME-SHARING ISOPLETH-AREA PROGRAM FOR DETERMINING GROUND-LEVEL AREAS OF HIGH POLLUTANT CONCENTRATION DOWNWIND OF A SINGLE SOURCE OF EMISSION. THESE ELLIPTICAL AREAS ARE ENCLOSED BY ISOPLETHS OF CONSTANT CONCENTRATION PRODUCED BY CONTINUOUS POLLUTANT EMISSIONS FROM ONE SMOKE STACK OR GROUND SOURCE, OR FROM A CLOSELY ASSOCIATED GROUP OF SINGLE SOURCES. STACK HEIGHT, WEATHER CONDITIONS, AND SOURCE EMISSION RATE ARE TYPED IN AND THE PROGRAM CALCULATES AND DESCRIBES THE HIGH POLLUTION AREAS ENCLOSED BY ISOPLETHS.

599 TOPLYR2 TOPLYR2 APPLIES THE FIRST LAW OF THERMODYNAMICS TO COMPUTE THE TEMPERATURE OF A WATER MASS FLOWING IN AN OPEN CHANNEL. THE PROGRAM IS DESIGNED TO ACCOMMODATE VARIABLE DEPTH, VELOCITY, AND CROSS SECTION. THE SOURCE OF ENERGY (LOCATION OF THE DISCHARGE) IS ASSUMED TO BE SUFFICIENTLY DISTANT FROM THE RIVER SEGMENT UNDER EXAMINATION THAT THE MOMENTUM ASSOCIATED WITH THE DISCHARGE IS INSIGNIFICANT. VELOCITY DISTRIBUTION AT BOTH THE INLET AND OUTLET OF THE REACH AS WELL AS THE TEMPERATURE DISTRIBUTION AT THE INLET AS A FUNCTION OF TIME AND AT THE OUTLET INITIALLY ARE SPECIFIED. EDDY DIFFUSIVITIES, AMBIENT METEOROLOGICAL CONDITIONS, AND GEOMETRY ARE ALSO SUPPLIED TO THE CODE. ALTHOUGH THE LATERAL EDDY DIFFUSIVITY IS ALLOWED TO VARY SPATIALLY, THE EFFECT OF DENSITY DISPARITY IS NOT TREATED EXPLICITLY BY THE CODE. TEMPORAL BEHAVIOR INDUCED BY VARIATIONS IN THE AMBIENT METEOROLOGICAL AND BOUNDARY CONDITIONS ARE COMPUTED.

687 SITE2 SITE2 IS DESIGNED TO (1) SCREEN CANDIDATE ENERGY FACILITY SITES OR AREAS WITHIN AN ELECTRIC UTILITY REGION, BASED ON THE REGION'S PHYSICAL AND SOCIOECONOMIC ATTRIBUTES, THE PLANNED FACILITY'S CHARACTERISTICS, AND IMPACT ASSESSMENTS, AND (2) EVALUATE THE CUMULATIVE REGIONAL IMPACTS ASSOCIATED WITH ALTERNATE ENERGY SUPPLY OPTIONS AND INTERREGIONAL ENERGY IMPORT/EXPORT PRACTICES, SPECIFICALLY, COMPARISON OF DIFFERENT ENERGY TECHNOLOGIES AND THEIR REGIONAL DISTRIBUTION IN CLUSTERED OR DISPERSED PATTERNS.

692 SOLSYS SOLSYS SIMULATES THE TRANSIENT RESPONSE OF SOLAR ENERGY SYSTEMS. IT CAN BE USED TO PREDICT PERFORMANCE CHARACTERISTICS OF A SYSTEM; PARAMETRIC STUDIES CAN BE PERFORMED FOR OPTIMIZATION AND TO DETERMINE AUXILIARY FUEL REQUIREMENTS.

THE PROGRAM CONSISTS OF A COMPONENT SUBROUTINE LIBRARY, AN

R. ENVIRONMENTAL AND EARTH SCIENCES

8/77

INFORMATION SUBROUTINE LIBRARY, A CONTROL-COMPONENT SUBROUTINE
LIBRARY, AND AN EXECUTIVE PROGRAM.

627 TOODY2 TOODY2 IS USED TO COMPUTE
WAVE PROPAGATION IN TWO DIMENSIONS IN RECTANGULAR OR CYLINDRICAL
COORDINATES.

T. ELECTRONICS AND ENGINEERING EQUIPMENT

8/77

681 ACCEL MOD2 ACCEL IS A SET OF COMPUTER PROGRAMS DESIGNED TO AID IN THE CONSTRUCTION OF ELECTRONIC PRINTED CIRCUIT BOARDS. THE ACCEL SYSTEM PERFORMS THE FOLLOWING TASKS -

- (1) EDITS THE ENGINEERS' DATA, RESOLVES THE SCHEMATIC INTO A NODE COMPONENT-LIST, LOOKS UP PHYSICAL AND ELECTRICAL DATA FOR THE PARTS USED IN THE CIRCUIT, AND NOTES ANY ERRORS IN THE DATA.
- (2) LOCATES THE COMPONENTS ON THE BOARD BY AN ITERATIVE PROCESS.
- (3) LAYS OUT THE INTERCONNECTION PATTERN BETWEEN THE COMPONENTS, AND
- (4) GENERATES THE OUTPUT PLOTS.

697 F0355 PROGRAM F0355 PRODUCES A PLOT WHICH SHOWS THE GEOMETRY OF THE CUTTER REQUIRED TO PRODUCE A GIVEN EXTERNAL CIRCULAR SPUR GEAR OR RATCHET WHEEL. IT IS PARTICULARLY APPLICABLE FOR NON-INVOLUTE TOOTH FORMS. IN ADDITION, THE PROGRAM CAN PROVIDE A COMPARATOR CHART FOR INSPECTING CUTTERS, INDICATE WHETHER A GIVEN GEOMETRY CAN BE SHAPED, AND BE USED TO DETERMINE THE EFFECTS OF CHANGES IN PITCH DIAMETER AND RELATED VARIABLES. THE OUTPUT OF THE PROGRAM IS A MAGNIFIED DRAWING OF THE SHAPER CUTTER, THE WORKPIECE, AND THE PATHS OF THE CUTTER TEETH. THE PROGRAM DOES NOT PRINT A NUMERICAL DESCRIPTION OF THE CUTTER PROFILE.

721 WFLLL2B WFLLL2B SOLVES THE PROBLEM OF ELECTROMAGNETIC RADIATION FROM WIRE STRUCTURES IN FREE SPACE OR IN THE PRESENCE OF A LOSSY HALF-SPACE, INCLUDING STRUCTURES PENETRATING THE INTERFACE. ANTENNA STRUCTURES MAY BE COMPOSED OF MANY INTERCONNECTED WIRES OF DIFFERING RADII, WHICH MAY BE IMPEDANCE LOADED. ELECTRIC SPACE AND SURFACE WAVE FIELDS MAY BE EVALUATED.

8/77

720 RICE-LASL THE FLUID DYNAMICS OF CHEM-
ICALLY REACTIVE MIXTURES ARE CALCULATED AT ARBITRARY FLOW SPEEDS
WITH THE RICE-LASL PROGRAM. APPLICATION IS MADE TO CONTINUOUS
WAVE HF CHEMICAL LASERS TO COMPUTE THE SUPERSONIC MIXING AND
CHEMICAL REACTIONS THAT TAKE PLACE IN THE LASING CAVITY.

V. PARTICLE ACCELERATORS AND HIGH VOLTAGE MACHINES

8/77

577 FFEARS

FFEARS IS GENERALLY APPLICABLE FOR THE SOLUTION OF BOUNDARY VALUE PROBLEMS INVOLVING THE LAPLACE EQUATION USING DIFFERENCE EQUATIONS IN AXISYMMETRIC OR RECTANGULAR COORDINATES. IT WILL HANDLE VIRTUALLY ANY CONFIGURATION OF DIELECTRICS AND FLOATING ELECTRODES, PRODUCING BOTH EQUIPOTENTIAL AND EQUIFIELD PLOTS, IF DESIRED.

574 MACS LATTICE VIBRATION CODES THIS PACKAGE OF SEVEN RELATED CODES IS BASICALLY AIMED AT GIVING MAXIMUM CAPABILITY FOR CALCULATING SLOW-NEUTRON SCATTERING BY MODERATORS.

MACS-C COMPUTES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF PARTS ARISING FROM SHORT-RANGE FORCES AND LONG-RANGE COULOMB INTERACTIONS. IT ALSO OBTAINS JACOBIAN MATRICES FOR DETERMINING ADJUSTMENTS IN FORCE CONSTANTS AND IONIC CHARGE WHICH CAN LEAD TO IMPROVED AGREEMENT WITH DATA. STRUCTURE FACTORS FOR NEUTRON INELASTIC SCATTERING CAN ALSO BE CALCULATED.

MACS-J COMPUTES THE DYNAMICAL MATRIX FOR THE HARMONIC OSCILLATIONS OF A CRYSTAL, ITS EIGENVALUES AND EIGENVECTORS, THE CORRESPONDING STRUCTURE FACTORS FOR COHERENT SINGLE-PHONON SCATTERING OF NEUTRONS, AND JACOBIAN MATRICES FOR USE IN ADJUSTING FORCE CONSTANTS TO FIT CALCULATED TO OBSERVED DISPERSION CURVES.

REVISED-D CALCULATES VALANCE COORDINATES IN TERMS OF MASS ADJUSTED ATOM DISPLACEMENTS, TOGETHER WITH COORDINATES WHICH DEFINE RIGID GROUP ROTATIONS.

REVISED-MVFC CONSTRUCTS FORCE CONSTANT MATRICES FOR USE IN VALANCE FORCE POTENTIAL FUNCTIONS WHICH ARE USED IN OTHER PROGRAMS DEALING WITH MOLECULAR AND CRYSTAL VIBRATIONS.

ADJUSTER IS A FORCE ADJUSTER PROGRAM TO OBTAIN A LEAST SQUARES FIT TO OBSERVED FREQUENCIES OF MOLECULES AND CRYSTALS.

DIPOLE-SUM CALCULATES DIPOLE SUMS FOR AN ARBITRARY CRYSTAL.

MODEL-PI CALCULATES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF SHORT-RANGE AND LONG- OR INTERMEDIATE-RANGE TERMS IN THE DIPOLE COORDINATE APPROXIMATION. IT ALSO OBTAINS JACOBIAN MATRICES FOR USE IN ADJUSTING INPUT PARAMETERS.

575 MSCAT IN A THERMAL NEUTRON SCATTERING EXPERIMENT, THE MEASURED CROSS SECTION INCLUDES BOTH SINGLE AND MULTIPLE SCATTERING EVENTS. IN ORDER TO EXTRACT THE SINGLE SCATTERING CROSS SECTION, THE CROSS SECTION FOR MULTIPLE SCATTERING MUST BE KNOWN. SINCE THIS CONTRIBUTION IS GENERALLY A SMOOTHER FUNCTION OF ANGLE AND SCATTERED ENERGY THAN THE SINGLE SCATTERING, IT IS LESS SENSITIVE TO DETAILS OF THE SINGLE SCATTERING CROSS SECTION. IT IS THEREFORE FEASIBLE TO CALCULATE THE MULTIPLE SCATTERING USING AN APPROXIMATE SCATTERING FUNCTION, AND TO SUBTRACT IT FROM THE MEASUREMENTS IN ORDER TO OBTAIN THE SINGLE SCATTERING. MSCAT CALCULATES THE SINGLE AND MULTIPLE SCATTERING CROSS SECTIONS, FOR A SPECIFIED EXPERIMENTAL SITUATION, GIVEN A SINGLE SCATTERING FUNCTION AS INPUT.

622 GAUSS6 GAUSS6 IS USED FOR THE PRODUCTION ANALYSIS OF GAMMA-RAY SPECTRA OBTAINED WITH A GE(LI) DETECTOR AND A MULTICHANNEL PULSE-HEIGHT ANALYZER SYSTEM. IN ADDITION TO DETERMINING GAMMA-RAY ENERGIES AND INTENSITIES, IT PROVIDES ISOTOPIC IDENTIFICATION, DECAY CORRECTIONS AND CORRELATION OF DATA FROM DIFFERENT PEAKS AND DIFFERENT SPECTRA TO OBTAIN ISOTOPIC DECAY RATES.

1. PHYSICS

8/77

632 MMM3 MMM3 COMPUTES THE EIGENVALUES (FREQUENCIES) AND EIGENVECTORS (NORMAL MODES) FOR A SEMI-RIGID MOLECULE, AND COMPUTES THE TRANSFORMATION MATRIX FOR EXPRESSING THE CARTESIAN DISPLACEMENTS OF THE ATOMS IN TERMS OF THE NORMAL COORDINATES. COMPUTATION OF THE EFFECTIVE ATOMIC MASSES AND MEAN-SQUARED AMPLITUDES OF VIBRATION FOR USE IN SLOW NEUTRON SCATTERING CALCULATIONS IS INCLUDED AS WELL.

X. CONTROLLED THERMONUCLEAR RESEARCH

8/

561 TOKMINA/TOKMINA2 TOKMINA FINDS THE MINIMUM MAGNETIC FIELD, B_M , REQUIRED AT THE TOROIDAL COIL OF A TOKAMAK TYPE FUSION REACTOR WHEN THE INPUT IS β (RATIO OF PLASMA PRESSURE TO MAGNETIC PRESSURE), Q (KRUSKAL-SHAFRANOV PLASMA STABILITY FACTOR), AND Y (RATIO OF PLASMA RADIUS TO VACUUM WALL RADIUS: R_P/R_W) AND ARRAYS OF P_T (TOTAL THERMAL POWER FROM BOTH D-T AND TRITIUM BREEDING REACTIONS), P_W (WALL LOADING OR POWER FLUX) AND T_B (THICKNESS OF BLANKET), FOLLOWING THE METHOD OF GOLOVIN, ET AL. TOKMINA2 FINDS THE TOTAL POWER, P_T , OF SUCH A FUSION REACTOR, GIVEN A SPECIFIED MAGNETIC FIELD, B_M , AT THE TOROIDAL COIL.

Z. DATA

8/77

356 GAF/GAR DATA TAPES USED IN GGA A BENCHMARK STUDY OF ZPR-III ASSEMBLY 48 USING ENDF/B CROSS SECTIONS WAS UNDERTAKEN TO IDENTIFY POSSIBLE CROSS SECTION DISCREPANCIES IN THE MICROSCOPIC ENDF/B DATA. THIS WORK WAS DONE FOR THE CSEWG TESTING SUBCOMMITTEE AS PART OF THEIR PHASE I DATA TESTING. THIS PACKAGE CONTAINS THE CROSS SECTION DATA GENERATED FOR THIS STUDY IN THE FORM OF THE ULTRA-FINE GROUP CROSS SECTIONS OF THE MATERIALS OF ZPR-III ASSEMBLY 48 IN THE FORMAT OF THE GGA GAF/GAR PROGRAM DATA TAPES.

447 ETOG1 DATA FOR MUFT AND GAM THE DATA REQUIRED FOR THE CREATION OF MUFT4, MUFT5, GAM1, AND GAM2 LIBRARIES WERE GENERATED FROM THE BROOKHAVEN NATIONAL NUCLEAR DATA CENTER ENDF/B TAPES 114 THROUGH 117 BY THE ETOG1 PROGRAM (ACC ABSTRACT 437).

532 LASL GROUP-AVERAGED X-SECTIONS GROUP CONSTANTS AND COMPUTED NEUTRON CROSS SECTIONS ARE TABULATED FOR A VARIETY OF MATERIALS INCLUDING - AL, B, BE, C, CD, CL, D, GA, F194, FE, H, K, LI6, MO, NA, NI, O, PU239, PU240, PU249, TH, U233, U235, U238, AND ZR. THESE ARE PRESENTED AS 18-, 24-, AND 25-GROUP CALCULATIONS FOR REACTORS WITH NEUTRON ENERGIES RANGING FROM FAST TO THERMAL.

543 ENDF/B-THERMOS THESE DATA ARE 30-GROUP THERMOS THERMAL SCATTERING KERNELS FOR P0 TO P5 LEGENDRE ORDERS FOR EVERY TEMPERATURE OF EVERY MATERIAL FROM S(ALPHA,BETA) DATA STORED IN THE ENDF/B LIBRARY. THESE SCATTERING KERNELS WERE GENERATED USING THE FLANGE2 COMPUTER CODE (ACC ABSTRACT 368). TO TEST THE KERNELS, THE INTEGRAL PROPERTIES OF EACH SET OF KERNELS WERE DETERMINED BY A PRECISION INTEGRATION OF THE DIFFUSION LENGTH EQUATION AND COMPARED TO EXPERIMENTAL MEASUREMENTS OF THESE PROPERTIES. IN GENERAL, THE AGREEMENT WAS VERY GOOD. DETAILS OF THE METHODS USED AND RESULTS OBTAINED ARE CONTAINED IN THE REFERENCE. THE SCATTERING KERNELS ARE ORGANIZED INTO A TWO VOLUME MAGNETIC TAPE LIBRARY FROM WHICH THEY MAY BE RETRIEVED EASILY FOR USE IN ANY 30-GROUP THERMOS LIBRARY. THE CONTENTS OF THE TAPES ARE AS FOLLOWS -

VOLUME I		
MATERIAL	ZA	TEMPERATURES (DEGREES K)
MOLECULAR H2O	100.0	296, 350, 400, 450, 500, 600, 800, 1000
MOLECULAR D2O	101.0	296, 350, 400, 450, 500, 600, 800, 1000
GRAPHITE	6000.0	296, 400, 500, 600, 700, 800, 1000, 1200, 1600, 2000
POLYETHYLENE	205.0	296, 350
BENZENE	106.0	296, 350, 400, 450, 500, 600, 800, 1000
VOLUME II		
MATERIAL	ZA	TEMPERATURES (DEGREES K)
ZR BOUND IN ZRHX	203.0	296, 400, 500, 600, 700, 800,

Z. DATA

8/77

H BOUND IN ZRHX	230.0	1000, 1200 296, 400, 500, 600, 700, 800, 1000, 1200
BERYLLIUM-9	4009.0	296, 400, 500, 600, 700, 800, 1000, 1200
BERYLLIUM OXIDE	200.0	296, 400, 500, 600, 700, 800, 1000, 1200
URANIUM DIOXIDE	207.0	296, 400, 500, 600, 700, 800, 1000, 1200

637 GAMTAB THIS PACKAGE CONTAINS A TWO-PART CATALOG OF GAMMA RAYS EMITTED BY NUCLIDES IN RADIOACTIVE DECAY AND A LIST OF CORRESPONDING REFERENCES. THE FIRST PART LISTS THE GAMMA RAYS IN ORDER OF ASCENDING ENERGY. THIS LISTING CONSISTS OF GAMMA-RAY ENERGY AND UNCERTAINTY, ABUNDANCE, HALF-LIFE, PRODUCTION MODE, AND THE ENERGIES OF TWO OF THE MORE ABUNDANT ASSOCIATED GAMMA RAYS. THE SECOND PART OF THE CATALOG LISTS UP TO 50 OF THE MORE ABUNDANT GAMMA RAYS FOR EACH NUCLIDE. THE LISTING FOR EACH NUCLIDE INCLUDES HALF-LIFE, PRODUCTION MODE, POSSIBLE GENETIC RELATIONSHIPS, AND REFERENCES. THIS LISTING IS FOLLOWED BY THE ENERGY, UNCERTAINTY IN ENERGY, AND ABUNDANCE OF EACH GAMMA RAY. REFERENCES AVAILABLE THROUGH MAY 1973 CORRESPONDING TO THE REFERENCE KEYS LISTED FOR EACH NUCLIDE IN PART 2 ARE LISTED AS THE THIRD FILE.

693 SOLDATABQ62 SOLDATABQ62 IS A DATA COLLECTION CONSISTING OF READINGS OF DIRECT AND TOTAL SOLAR RADIATION INTENSITIES AND RELATED PARAMETERS FOR SOLAR ENERGY SYSTEMS STUDIES. THE SOLAR DATA MEASUREMENTS ARE FOR ALBUQUERQUE, NEW MEXICO FOR THE YEAR 1962. THE ITEMS PRESENTED ARE: HOUR, WIND DIRECTION, WIND SPEED, DRY BULB TEMPERATURE, WET BULB TEMPERATURE, DEW POINT, ATMOSPHERIC PRESSURE, SKY COVER, VISIBILITY, ATMOSPHERIC PRECIPITABLE WATER VAPOR CONTENT, HOURLY INTEGRAL OF DIRECT-NORMAL RADIATION, HOURLY INTEGRAL OF TOTAL-HORIZONTAL RADIATION, SIX READINGS OF DIRECT-NORMAL INTENSITY AT 10-MINUTE INTERVALS, AND SIX READINGS OF TOTAL-HORIZONTAL RADIATION AT 10-MINUTE INTERVALS. THESE DATA WERE COMPILED FROM STRIP-CHART RECORDINGS OF THE NATIONAL CLIMATIC CENTER, ASHEVILLE, NORTH CAROLINA.

VII. KWIC INDEX

A-E

AI

E	ANL	360	F+P+A	RS	T	P	\$AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT.	562
AEC	360	F+BAL	RS P	T	C		\$CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	103
ABSORPTION REMOVAL	X-SECS	BAPL	6600	F4	RS	T	B \$M0807, 2-D DIFFUSION	R280
ABSORPTION, CELL	ANL	3600	F36	RSBP X	T	B	\$RABBLE, WLIB, FLAT, RESONANCE	281
ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT BOARDS				SLA	1108	F+BAL	RSBP T T \$	681
ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT BOARDS				SLA	6600	F+CCM	RS P T T \$	681
ACCIDENT ACTIVITY RELEASE	PGE	360	F4	RS P	T	G	\$EMERALD REV. 1, PWR	546
ACCIDENT ANALYSIS	BAPL	6600	F4	RS P	T	G	\$FLASH3, LOSS-OF-COOLANT	R295
ACCIDENT ANALYSIS	NED	635	F4	RS P	T	G	\$FREADM1, FAST REACTOR CORE	479
ACCIDENT ANALYSIS	BAPL	6600	F4	RS P	T	G	\$M0555, ACT1, LOSS-OF-COOLANT	R284
ACCIDENT ANALYSIS DOSE CALC	GGA	1108	F4	RS	T	G	\$GAOSE, DOSET, HTGR	261
ACCIDENT CONSEQUENCES	NRC	370	F4	RS PLX	T	G	\$CRAC, CALC OF REACTOR	722
ACCIDENT STUDY	AI	370	F4	RS P	CT	G	\$COMRADEX3, RADIOLOGICAL DOSE	663
ACTIVITY DIST STUDY	GGA	7044	F4	RS P	D		\$RAD2, HTGR FISSION PRODUCT	231
ACTIVITY RELATION	GEC	635	F4	RSBP	D		\$DOS, NEUTRON FLUX-DOSIMETER	423
ACTIVITY RELEASE	PGE	360	F4	RS P	T	G	\$EMERALD REV. 1, PWR ACCIDENT	546
ACTIVITY RELEASE AND DOSE	PGE	360	F4	RS P	T	G	\$EMERALD-NORMAL, PWR	685
ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P	T	G	\$M0555,	R284
ADP, 1-D & 2-D FEW-GROUP SPACE-TIME KINETICS				BCL	6400	F4	RS P T F \$	494
ADLER, ENDF/B RESONANCE XSECTION CODES				BNL	6600B	F4	RS P T A \$RESEND,	465
AEB	360	F4	RS L	T	C		\$FIRES, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	9
AEB	360	F4	RS P	B			\$WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	362
AEB	360	F4	RS P	E			\$AIRESK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	121
AEB	360	F4	RS P	E			\$BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	363
AEC DP PURCHASE VERSUS LEASE ANALYSIS				SLA	360	COBOL	RSBP CT M \$BECOM,	R589
AEC DP PURCHASE VERSUS LEASE ANALYSIS				SLA	1108	COBOL	RS P M \$BECOM,	R589
AEC-ALO FAU, RADIO FREQUENCY MANAGEMENT SYSTEM				ALOO	360	COBOL	RS P M \$	587
AEG	7090	F2	RS	B			\$DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	150
AEROSOL BEHAVIOR LOGNORMAL MODEL				AI	370	F	RS P T G \$HAA3B,	443
AEROSOL PARTICLE TRANSPORT STUDY				RFD	3600	F36	RS P G \$DISPER,	554
AGC	7090	F+FAP	RSBP	T	B		\$AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	204
AGC	7090	FLOCO	RSBP	C			\$20XY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	18
AGC	7090	F2	RS P	B			\$BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	237
AGC	7090	F2	RS P	D			\$CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	154
AGC	7090	F2	RS P	T	B		\$AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	243
AGC	7090	F2	RSB	F			\$HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	153
AGE CALCULATION OF ENDF/B DATA				BAPL	6600	F4	RS P T B \$EPOCH, NEUTRON	R461
AGE-DIFFUSION SLAB CYLINDER SPHERE				AEB	360	F4	RS L T C \$FIRES, 1-D	9
AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC				AGC	7090	F+FAP	RSBP T B \$	204
AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES				AGC	7090	F2	RS P T B \$	243
AI	360	F+BAL	RS	T	P		\$FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	484
AI	360	F+BAL	RS P	T	A		\$COMNUC, CASCADE, COMPOUND NUCLEUS REACTION	482
AI	360	F+BAL	RS P	T	E		\$AIROS2A, SIMULATION OF REACTOR DYNAMICS	326
AI	360	F+BAL	RS P	CT	A		\$U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	553
AI	360	F+BAL	RS P	X	T	B	\$HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	307
AI	360	F+BAL	RSB L	CT	M		\$SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	375
AI	360	F4	RS P	T	F		\$TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	309
AI	360	F4	RS P	T	G		\$AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	172
AI	360	F4	RS P	T	G		\$SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	559
AI	360	F4	RS P	T	Q		\$RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC	566
AI	360	F4	RS P	CT	I		\$PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	542
AI	360	F4	RS PLX	T	B		\$AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	147
AI	360	F4	RSB L	T	M		\$CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	271
AI	360	F4	RSBP	T	K		\$THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	273
AI	360	F4	RSBP X	T	D		\$SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	58
AI	360	F4	RSBP	T	C		\$ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	151
AI	360	F4	RSBP	T	C		\$CAESAR4, LIBLST, 1-D MULTI-GP DIFFUSION & LIB.	270
AI	370	F	RS P	T	G		\$HAA3B, AEROSOL BEHAVIOR LOGNORMAL MODEL	443
AI	370	F4	RS P	CT	G		\$COMRADEX3, RADIOLOGICAL DOSE ACCIDENT STUDY	663
AI	7090	F+FAP	RS	T	I		\$4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	109
AI	7090	F+FAP	RS L	T	B		\$QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	119
AI	7090	F+FAP	RS L	T	C		\$FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	120
AI	7090	F+FAP	RS L	T	C		\$ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	118
AI	7090	F+FAP	RS PL	T	B		\$STEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	50

AI

ALLOC

AI	7090	F+FAP	RS	PL	T	C	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	2	
AI	7090	F2	RS			B	\$S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	53	
AI	7090	F2	RS			C	\$PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	30	
AI	7090	F2	RS			E	\$AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	121	
AI	7090	F2	RS			E	\$SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	122	
AI	7090	F2	RS			I	\$CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	112	
AI	7090	F2	RS			I	\$FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	48	
AI	7090	F2	RS			I	\$SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	114	
AI	7090	F2	RS			J	\$FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	91	
AI	7090	F2	RS			J	\$MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	142	
AI	7090	F2	RS			J	\$SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	110	
AI	7090	F2	RS			J	\$SCAR1, SCATTER FROM A RING SNAP GEOMETRY	111	
AI	7090	F2	RS	L	T	D	\$SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	58	
AI	7090	F2	RS	P		B	\$BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	108	
AI	7090	F2	RS	P		B	\$SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	52	
AI	7090	F2	RS	P		D	\$AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	55	
AI	7090	F2	RS	P		G	\$CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	47	
AI	7090	F2	RS	P		J	\$GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	45	
AI	7090	F2	RS	P		J	\$GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	46	
AI	7090	F2	RS	P		J	\$RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY	141	
AI	7090	F2	RS	P	T	C	\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	28	
AI	7090	F2	RS	PL	T	A	\$ARES2, RESONANCE INTEGRAL X-SECTION CALC	89	
AI	7090	F2	RS	PL	T	B	\$FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	51	
AI	7090	F2	RS	PLX	T	C	\$DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	151	
AI	7094	F+FAP	RS	L	T	M	\$MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	159	
AI	7094	F+FAP	RS	P		J	\$SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	197	
AI	7094	F+FAP	RS	P	T	G	\$AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	172	
AI	7094	F+FAP	RS	PL	T	B	\$AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	147	
AI	7094	F+FAP	RS	PL	T	B	\$GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	162	
AI	7094	F+FAP	RS	PL	T	B	\$TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	149	
AI	7094	F+FAP	RS	PL	T	G	\$CURIE, DOSE, THUNDERHEAD, EXTERNAL+INTERNAL DOSE	196	
AI	7094	F+MAP	RS	P		A	\$CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	215	
AI	7094	F+MAP	RS	P	T	E	\$AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	163	
AI	7094	F+MAP	RS	P	T	F	\$TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	309	
AI	7094	F+MAP	RS	PLX	T	A	\$TRIX1, RESONANCE INTEGRAL X-SECTION CALC	208	
AI	7094	F2	RS	P		H	\$FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	246	
AI	7094	F2	RS	P	T	A	\$2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	254	
AI	7094	F2	RS	P	T	G	\$TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	268	
AI	7094	F2	RS	PL	T	I	\$CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	244	
AI	7600	F4	RS	PLX	T	C	\$VIMI, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	510	
AI-A	360	F4	RSBPLXCT			C	\$VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	510	
AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	360	F4	RS	PLX	T	B	\$	147
AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	F+FAP	RS	PL	T	B	\$	147
AIM AND FOG CODES	AI	7090	F2	RS		C	\$PERT, 1-D PERTURBATION FOR		30
AIM AND FOG CODES	BHSC	360	F4	RS	P	C	\$PERT, 1-D PERTURBATION FOR		30
AIM AND FOG CODES	CDC	1604	F63	RS		C	\$PERT, 1-D PERTURBATION FOR		30
AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	AI	7090	F2	RS	P	D	\$		55
AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS	PL	T	C	\$	29
AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS	PL	T	C	\$	29
AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	OSUC	370	F4	RS	PL	CT	C	\$	29
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	360	F4	RS	P	E	\$		121
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090	F2	RS		E	\$		121
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	1604	F63	RS	P	E	\$		121
AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7094	F+MAP	RS	P	T	E	\$	163
AIROS2A, SIMULATION OF REACTOR DYNAMICS	AI	360	F+BAL	RS	P	T	E	\$	326
ATRY & LOG GAMMA SUBROUTINES	SLA	6600	F4	RS	P	T	P	\$BESSEL FUNCTIONS,	656
AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	360	F4	RS	P	T	G	\$	172
AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	7094	F+FAP	RS	P	T	G	\$	172
ALAMOS SUBROUTINE LIBRARY ROUTINES	LASL	6600C	F+CCM	RS		T	P	\$LASLIB, LOS	633
ALBUQUERQUE 1962 SOLAR DATA	SLA	6600	BIN	R	L	T	Z	\$SOLDATABQ62,	693
ALBUQUERQUE 1962 SOLAR DATA	SLA	6600B	BCD	R	L	T	Z	\$SOLDATABQ62,	693
ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS	P	T	P	\$SNEQ, NONLINEAR	R364
ALGORITHM LASL 7600B	F		RS	P	H			\$SOLA, SOLA-SURF, TRANSIENT FLUID FLOW	651
ALLOC	ORNL	360	BAL+F	RS	P	CT	P	\$GETCOR, FRECOR, FORTRAN DYNAMIC STORAGE	644

ALLOCATION

ANL

LLOCATION PROJECT PLANNING	MLMO	360	F+C+R	RSBP	T	M	\$RALCRTPH, RESOURCE	G603
ALOM 360 COBOL RS P	M	\$AEC-ALO	FAU,	RADIO	FREQUENCY	MANAGEMENT	SYSTEM	587
ALPHA-M, RESOLUTION OF GAMMA-RAY SPECTRA	ORNL	360	F4	PS	P	O	\$	413
AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E	ANL	360	F+P+A	RS	T	P	\$	562
AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F	ANL	360	F+BAL	PS	T	P	\$	563
AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL	360	F+P+A	RS	T	P	\$	564
AN-T 360B F4	RSBP	CT	I	\$CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION				P449
ANALYSES SEMI-RIGID MOLECULES	ANC	360	F4	RS	P	W	\$MMM3, COORDINATE	632
ANALYZER GAMMA-RAY SPECTRA	GGA	1108	F+BAL	RS	P	T	O	\$TOAD, PROCESSING OF
ANC 360 HAL	RSB	T	P	\$NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM				333
ANC 360 F+BAL	RS	P	T	G	\$COMCAN, SYSTEM SAFETY COMMON CAUSE ANALYSIS			519
ANC 360 F+BAL	RS	P	X	T	H	\$FRAP-S1, STEADY STATE ANALYSIS OXIDE FUEL RODS		704
ANC 360 F+BAL	RSBP	XCT	G	\$FRAP-T, TRANSIENT ANALYSIS OF OXIDE FUEL RODS				694
ANC 360 F+BAL	RSBPL	CT	B	\$RAFFLE2/MOD2, MONTE CARLO NEUTRON TRANSPORT				658
ANC 360 F+BAL	RSBPL	CT	G	\$PARET, WATER-COOLED COPE TRANSIENT ANALYSIS				631
ANC 360 F+BAL	RSBPLXCT	G	\$CCONTEMPT-LT/026, PRESSURE-TEMPERATURE RESPONSE					555
ANC 360 F+P+A	RSBP	XCT	W	\$GAUSS6, BATCH ANALYSIS OF GAMMA-RAY SPECTRA				433
ANC 360 F4	RS	P	W	\$MMM3, COORDINATE ANALYSES SEMI-RIGID MOLECULES				622
ANC 360 F4	RS	P	T	H	\$ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM			632
ANC 360 F4	RS	P	CT	W	\$MACS LATTICE VIBRATION NEUTRON SCATTERING CODES			580
ANC 360 F4	RS	PL	CT	B	\$INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS			574
ANC 360 F4	RS	PL	CT	M	\$ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS			565
ANC 360 F4	RS	PLXCT	B	\$PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC				518
ANC 360 F4	RSBP	CT	C	\$MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH				520
ANC 360 F4	PSBP	CT	D	\$DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM				582
ANC 360 F4	RSBP	CT	G	\$FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL				579
ANC 360 F4	RSBP	CT	G	\$MOCUS, MINIMAL SETS FROM FAULT TREES				584
ANC 360 F4	RSBP	CT	G	\$PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES				653
ANC 360 F4	RSBP	CT	I	\$STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS				528
ANC 360 F4	RSBP	CT	J	\$VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS				539
ANC 360 F4	RSBP	X	T	G	\$THETA1-R, FUEL ROD THERMAL RESPONSE LOCA			569
ANC 360 F4	RSBP	XCT	U	\$GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)				512
ANC 360 PL1	RS	P	T	P	\$PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360			605
ANC 360B F+BAL	RS	P	T	G	\$WHAM6, LIQUID-FILLED PIPING SYSTEM ANALYSIS			516
ANC 360B F+BAL	RSB	T	P	\$NRTS ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES				278
ANC 360B F4	RSBP	CT	G	\$RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM				613
ANC 360B F4	RSBP	XCT	H	\$MOXY/MOD032, BWR CORE HEAT TRANSFER CODE				265
ANC 360E F+BAL	RSBPLXCT	G	\$RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY					551
ANC 360G F+BAL	RS	P	XCT	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION			369
ANC 1108 F4	RS	P	T	G	\$PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES			R275
ANC 7600B F+COM	RS	PLXCT	G	\$RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY				528
ANC 7600C F+COM	RS	PLXCT	G	\$RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY				369
ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	F4	RS	P	T	E	\$
ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	6600	F4	RS	P	T	E	\$
ANGULAR DIST GGA 7044 F4	RS	P	X	A	\$LEGCOEF3, LEGENDRE COEF CALC FOR			486
ANGULAR DIST DATA AI 7094	F+MAP	RS	P	A	\$CHAD, LEGENDRE COEF CALC FOR			217
ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	6600	F4	RS	P	A	\$CLEM,	R531
ANISN X-SEC FORMAT WAPD 6600	F4	RS	PL	T	B	\$ETOG1, ENDF/B TO MUFT, GAM,		437
ANISN X-SEC FORMAT WAPD 7600	F4	RS	P	T	B	\$ETOG3, ENDF/B TO MUFT, GAM,		538
ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	F4	RSBPLX	T	C	\$	151
ANL 360 F	RSBP	T	P	\$STFODE,COLODE, COLLOCATION SOLN OF STIFF ODE'S				652
ANL 360 F+BAL	RS	T	P	\$AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F				563
ANL 360 F+BAL	RS	P	T	C	\$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM			209
ANL 360 F+BAL	RSBP	CT	M	\$ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES				522
ANL 360 F+BAL	RSBP	XCT	B	\$IDX, 1-D DIFFUSION FAST X-SECTION GENERATION				374
ANL 360 F+P+A	RS	T	P	\$AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E				562
ANL 360 F+P+A	RS	T	P	\$AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z				564
ANL 360 F4	RS	M	\$MERMC2, MC*2 BINARY LIBRARY TAPE MAINTENANCE					472
ANL 360 F4	RS	T	M	\$RIGEL, ENDF/B V3 DATA PROCESSING CODE				571
ANL 360 F4	RS	P	D	\$NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA				146
ANL 360 F4	RS	P	E	\$R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS				255
ANL 360 F4	RS	P	E	\$R102, SPACE-INDEPENDENT INVERSE KINETICS CALC				168
ANL 360 F4	RS	P	F	\$TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION				R338
ANL 360 F4	RS	P	G	\$NAHAMMER, FLUID HAMMER ANALYSIS PIPING SYSTEM				717

ANL

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ANL	360	F4	RS P	G	\$NATTRANSIENT, FLUID HAMMER ANALYSIS 1-D PIPING	7
ANL	360	F4	RS P	G	\$SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	521
ANL	360	F4	RS P	H	\$MARGE/SLUMP, MAXIMUM TEMPERATURE LMFBR FUELPIN	677
ANL	360	F4	RS P	D	\$DOYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	R464
ANL	360	F4	RS P	T	\$F0355, SHAPER CUTTER CONTOUR GENERATOR	697
ANL	360	F4	RS P	X	\$TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	561
ANL	360	F4	RS P	T B	\$CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	526
ANL	360	F4	RS P	T E	\$ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	486
ANL	360	F4	RS P	T F	\$SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	400
ANL	360	F4	RS P	T G	\$NATRAN2, FLUID HAMMER ANALYSIS 1D & 2D SYSTEMS	719
ANL	360	F4	RS P	T M	\$CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	475
ANL	360	F4	RS P	T N	\$PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	544
ANL	360	F4	RS P	T Q	\$GROUP2, GROUP THEORY OF LATTICE DYNAMICS	620
ANL	360	F4	RS P	T R	\$SITE2, ENERGY FACILITY SITING ASSESSMENT	687
ANL	360	F4	PS P	CT B	\$MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	355
ANL	360	F4	RS P	CT D	\$3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	567
ANL	360	F4	RS P	CT F	\$REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	550
ANL	360	F4	RS P	CT F	\$REXCO-H2, 2-D HYDRODYNAM RESPONSE TO EXCURSION	R615
ANL	360	F4	RS P	CT L	\$QMESH,RENUM, SELF-ORGANIZING MESH GENERATION	612
ANL	360	F4	RS P	CT M	\$ETOE, ENDF/B TO MC**2 DATA CONVERSION	350
ANL	360	F4	RS P	CT V	\$FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	577
ANL	360	F4	PS P	CT W	\$MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	575
ANL	360	F4	RS P	X T F	\$FORE2, FAST REACTOR EXCURSION CALCULATIONS	174
ANL	360	F4	RS P	XCT F	\$VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	511
ANL	360	F4	RS PL	CT F	\$QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	474
ANL	360	F4	RSBP	CT C	\$ARC-DIF1D, 1-D MULTI-GP DIFFUSION & INVENTORY	626
ANL	360	F4	RSBP	CT L	\$ARC-NUI002, BCD INPUT DATA PROCESSING MODULE	533
ANL	360	F4	RSBP	CT C	\$VARI-1D, 1-D VARIATIONAL SENSITIVITY	625
ANL	360	F4	RSBP	CT L	\$ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION	594
ANL	360B	F+ASM	RSB	CT P	\$WSP-HASP/DQS, DOS-MFT REMOTE WORKSTATION PKG	541
ANL	360B	F+RAL	RSBP	CT D	\$REBUS2, FUEL CYCLE ANALYSIS FOR FAST REACTORS	634
ANL	360B	F4	RS P	I	\$NUBOW, STRUCTURAL ANALYSIS BOWED REACTOR CORES	643
ANL	360B	F4	PS P	CT I	\$SAP4, STRUCTURAL ANALYSIS OF LINEAR SYSTEMS	641
ANL	360B	F4	RSBP	CT H	\$COBRA3M, FUEL PIN THERMAL-HYDRAULIC ANALYSIS	659
ANL	360B	F4	RSBP	XCT P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	534
ANL	360B	PL1	S P	CT P	\$SLOP,CROSS, IBM360 FORTRAN H PROGRAM CHECKER	647
ANL	360C	F4	RS P	X P	\$GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	592
ANL	360D	BAL	RS	X T P	\$COPYCAT, IBM OS SYSTEM CATALOG UTILITY ROUTINE	646
ANL	370	F+BAL	RS PLXCT	C	\$SYN3D, SINGLE-CHANNEL FLUX SYNTHESIS DIFFUSION	713
ANL	370	F+CSM	RS P	G	\$SPOOL-FIRE, SPRAY-POOL BURNING OF SODIUM	R714
ANL	370	F4	RS P	CT H	\$THI3D, THERMAL-HYDRAULIC MULTICHANNEL ANALYSIS	706
ANL	370	F4	RS P	CT I	\$LIFE3, MIXED-OXIDE FUEL ELEMENT PERFORMANCE	R460
ANL	370B	F4	S P	X T P	\$FUNPACK2, SPECIAL FUNCTION ROUTINES	610
ANL	GETS	F	R	R	\$PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	591
ANL	PD10B	F4	RS P	X T P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	534
ANL	1108B	F5	S P	X T P	\$FUNPACK2, SPECIAL FUNCTION ROUTINES	610
ANL	1110B	F4	RS P	X T P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	534
ANL	1604	F63	RS P	H	\$M0899,H0H, STEAM TABLES 14.5-2538 PSIA	R294
ANL	3600	F36	SBP	I	\$BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	365
ANL	3600	F36	RS P	T B	\$MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	355
ANL	3600	F36	RS P	T C	\$SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	288
ANL	3600	F36	RS P	T I	\$SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	357
ANL	3600	F36	RS P	X T C	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	262
ANL	3600	F36	RS P	XCT C	\$TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	513
ANL	3600	F36	RSBP	A	\$MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	214
ANL	3600	F36	RSBP	G	\$SCHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	366
ANL	3600	F36	RSBP	I	\$SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	353
ANL	3600	F36	RSBP	X T B	\$RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL	281
ANL	3600	F36	RSBP	X T B	\$RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	213
ANL	3600	F4	RSBP	T D	\$2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	325
ANL	3600	F63	RS	LX T B	\$GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	33
ANL	3600	F63	RSBP	A	\$NEARREX, COMPOUND NUCLEUS X-SECTION CALC	171
ANL	3600	F63	RSBP	E	\$R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	255
ANL	3600	F63	RSBP	E	\$R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	171

ANL

AX-TNT

ANL	3600	F63	RSBP	G	\$COINC, COINCIDENCE COUNTING DATA REDUCTION	248
ANL	3600	F63	RSBP	T A	\$2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	254
ANL	3600	F63	RSBP	T E	\$TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	135
ANL	3600	F63	RSBP	T G	\$R153, PARAMETRIC SITE REQUIREMENT STUDY	172
ANL	3600	F63	RSBP	T H	\$ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	152
ANL	3600	F63	RSBP	T M	\$XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE	181
ANL	3600	F63	PSBP	XCT B	\$THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	184
ANL	3600	F63	RSBPL	T J	\$MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	143
ANL	3600	36F	RS PL	CT F	\$QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	474
ANL	3600	36F	RSBP	T M	\$MERMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES	472
ANL	6600	F4	RS P	T F	\$SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	400
ANL	6600B	F	S P	X T P	\$FUNPACK2, SPECIAL FUNCTION ROUTINES	610
ANL	6600B	F4	RS P	X T P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	534
ANL	6700B	F4	RS P	X T P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	534
ANL	7600	F4	RS P	G	\$NAHAMMER, FLUID HAMMER ANALYSIS PIPING SYSTEM	717
ANL	7600	F4	RS P	T I	\$LIFE3, MIXED-OXIDE FUEL ELEMENT PERFORMANCE	R460
ANL	7600B	F4	RS P	T G	\$WHAM6, LIQUID-FILLED PIPING SYSTEM ANALYSIS	278
ANNULAR VOID X-SECTION CALCULATION					GEC 625 F4 PS P B \$AVOID,	276
ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS DUCO					635 F4 RS G \$	529
APDA	3600	ASAF4	RS P	T M	\$ETOE, ENDF/B TO MC**2 DATA CONVERSION	350
APDA	7094	F2	RS P	F	\$WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	145
APDA	7094	F4	RS P	F	\$MARS, 2-D EXCURSION CALCULATION RZ GEOMETRY	293
APG	6600	F4	RS	B	\$APRFX1, 99-GP DLC-2B LIBRARY GROUP-COLLAPSING	466
APRFX1, 99-GP DLC-2B LIBRARY GROUP-COLLAPSING					APG 6600 F4 RS B \$	466
ARC-DIF1D, 1-D MULTI-GP DIFFUSION & INVENTORY					ANL 360 F4 RSBP CT C \$	626
ARC-NU1002, BCD INPUT DATA PROCESSING MODULE					ANL 360 F4 RSBP CT L \$	533
ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES					ANL 360 F+BAL RSBP CT M \$	522
ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION					ANL 360 F4 RSBPL CT L \$	594
AREA CALCULATION SLA 6600 F4 RS P					P \$PLOTR, 2-D CONTOUR PLOTS &	R578
ARES2, RESONANCE INTEGRAL X-SECTION CALC					AI 7090 F2 RS PL T A \$	89
ARES2, RESONANCE INTEGRAL X-SECTION CALC					CDC 1604 F63 RS PL T A \$	89
ARGONNE SUBROUTINE LIBRARY CAT. A-E					ANL 360 F+P+A RS T P \$AMDLIBAE,	562
ARGONNE SUBROUTINE LIBRARY CAT. F					ANL 360 F+BAL RS T P \$AMDLIBF,	563
ARGONNE SUBROUTINE LIBRARY CAT. G-Z					ANL 360 F+P+A RS T P \$AMDLIBGZ,	564
ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER					ANL 3600 F63 RSBP T H \$	152
ARHC 6600 F+CCM RS P CT G \$FTA, FAULT TREE ANALYSIS SYSTEM						666
ASAF4 RS P T M \$ETOE, ENDF/B TO MC**2 DATA CONVERSION					APDA 3600	350
ASME STEAM AND WATER PROPERTIES BGE 3600 F4 RS					T H \$STEAM-67, 1967	487
ASPI5, GAMMA-RAY SOURCE BUILDUP FACTOR CALC					BAPL 6600 F+ASC RS P T J \$	R429
ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE					ORNL 7090 F+PAP RS P T D \$	240
ASSEMBLER FOR FLOCO2 INSTRUCTION SET					PW 1604 F+CDP RS P T P \$LAG,	186
ASSEMBLER FOR THE PDP-11 ON 360					ANC 360 PL1 RS P T P \$PTAC11, 2-PASS	516
ASSEMBLY ANALYSIS AI 7600 F4 RS PLX T C					\$VIM1, MONTE CARLO CRITICAL	510
ASSEMBLY ANALYSIS AI-A 360 F4 RSBPLXCT C					\$VIM1X, MONTE CARLO CRITICAL	510
ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES					GGA 1108 BIN R L T Z \$ZPR-III	356
ASSESSMENT ANL 360 F4 RS P T R					\$SITE2, ENERGY FACILITY SITING	687
ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM					ANC 360 F4 RS P T H \$	580
ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM					BCAC 6600 F4 RS P T H \$	580
ATHENA4, INELASTIC SCATTERING FORM FACTORS					ORNL 360 F4 RS P T A \$	417
ATOM SPECTRA ENDF/B DATA ORNL 360 F4					RS P T B \$RICE, PRIMARY RECOIL	453
ATTACHMENTS TO PIPE ORNL 360 F4 RS P					I \$LUGS, STRESS FOR INTEGRAL	648
ATTENUATION CYL SPHERE GEOM AI 7090 F2					RS P J \$GRACE2, GAMMA-RAY	46
ATTENUATION CYL SPHERE GEOM CDC 1604 F63					RS P J \$GRACE2, GAMMA-RAY	46
ATTENUATION SLAB GEOMETRY AI 7090 F2					RS P J \$GRACE1, GAMMA-RAY	45
ATTENUATION SLAB GEOMETRY CDC 1604 F63					RS P J \$GRACE1, GAMMA-RAY	45
AUTO- AND CROSS-SPECTRAL DENSITIES BNW 1108 F5					RS P X T F \$NOISY1,	488
AUTO- AND CROSS-SPECTRAL DENSITIES BNW 7090 F4					RS P T F \$NOISY1,	488
AVERAGE X-SEC CALC BNL 6600 F4 RS P					A \$AVERAGE, UNRESOLVED REGION	376
AVERAGE X-SEC CALC BNL 7094 F4 RS P					A \$AVERAGE, UNRESOLVED REGION	376
AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC					BNL 6600 F4 RS P A \$	376
AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC					BNL 7094 F4 RS P A \$	376
AVERAGING GGA 7044 F4 RS P L					\$GAVER, ENERGY INTERVAL X-SECTION	218
AVOID, ANNULAR VOID X-SECTION CALCULATION					GEC 625 F4 RS P B \$	276
AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH					PW 1604 F63 RS P F \$	191

AXFLU

BAPL

AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H	\$	18
AXISYM LOAD	BAPL	6600	F4	RS P	T	I	\$SEALSHLL2, SHELL STRESS ANALYSIS
AXISYM LOAD	SR	360	F4	RS P	T	I	\$SEALSHLL2, SHELL STRESS ANALYSIS
AXISYM LOAD	WTSC	6600B	F4	RS P	T	I	\$SEAL SHELL, SHELL STRESS ANALYSIS
AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	F+COM	RS P	T	I	\$DUZ2, 2-D
AXISYMMETRIC LOAD	GGA	7044	F4	RSBP	CT	I	\$SAFE-PCRS, STRESS ANALYSIS
AXISYMMETRIC LOAD	GGA	7044	F4	RS P	T	I	\$SAFE-AXISYM, STRESS ANALYSIS
AXISYMMETRIC STRESS ANALYSIS	GGA	1108	F4	RS P	I		\$SAFE-2D, PLANE &
AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H	\$	183
AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	F63	RSBP	F	\$	102
B-W MULTI-LEVEL CONVOLUTION	PPCO	7040	F+MAP	RS P	A		\$COMBCO, COMBINED
B-W PARAMETERS	GGA	1108	F5	RS P	CT	A	\$FSDP3, POINTWISE XSECS. FROM
B-W RESONANCE PARAMETERS	WANL	7094	F2	RS P	A		\$EXT, X-SECTIONS FROM
B-W X-SEC CALC	BNL	6600	F4	RS P	A		\$SIGPLOT, RESOLVED MULTILEVEL
BAL RS CT P	\$SLACMON 2.2, OS360 MVT/MFT PERFORMANCE MONITOR	SLAC	360				635
BAL RS X T P	\$COPYCAT, IBM OS SYSTEM CATALOG UTILITY ROUTINE	ANL	360D				646
BAL RSB T P	\$NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC	360				519
BAL RSB CT P	\$SLACMON/370, VERSION 4.0 VS SOFTWARE MONITOR	SLAC	370				635
BAL+F RS P CT P	\$GETCOR, FRECOR, FORTRAN DYNAMIC STORAGE ALLOC	ORNL	360				644
BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS P	B	\$	108
BANDED JACOBIAN	LLL	360C	F4	RS P	X	T	P
BANDED JACOBIAN	LLL	6600C	F4	RS P	X	T	P
BANDED JACOBIAN	LLL	360	F4	RS P	X	T	P
BAPL 6600 F+ASC RS P T J	\$ASPIS, GAMMA-RAY SOURCE BUILDUP FACTOR CALC						R429
BAPL 6600 F+ASC RS P X T B	\$RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL						R285
BAPL 6600 F+COM RS T P	\$BETTIS PROGRAMMING ENVIRONMENT LIBRARY						R665
BAPL 6600 F+COM RS P H	\$HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION						R560
BAPL 6600 F+COM RS P T B	\$RECAP-0, RECAP-12 X-SECTION LIBRARY GENERATION						R671
BAPL 6600 F+COM RS P T I	\$DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC						R503
BAPL 6600 F+COM RS P T I	\$GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY						R397
BAPL 6600 F+COM RS P X T B	\$PAX03, HARMONY-PDQ X-SECTION GENERATION CODE						R426
BAPL 6600 F+COM RS P X T I	\$MATUS, 3-D FINITE-ELEMENT ELASTIC ANALYSIS						R597
BAPL 6600 F4 RS T B	\$MO807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS						R280
BAPL 6600 F4 RS T C	\$MO648, 1-D SLAB TRANSPORT WITH SLOWING DOWN						R342
BAPL 6600 F4 RS T H	\$WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF						R267
BAPL 6600 F4 RS T I	\$CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT						R266
BAPL 6600 F4 RS P A	\$GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES						R470
BAPL 6600 F4 RS P D	\$CINDER, MO102, POINT DEPLETION FISSION PRODUCT						313
BAPL 6600 F4 RS P I	\$STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING						R570
BAPL 6600 F4 RS P I	\$TC801, CREEP-BUCKLING OF TUBES UNDER PRESSURE						R604
BAPL 6600 F4 RS P P	\$BH99, EXTREME VALUE DISTRIBUTION DATA ANALYSIS						R621
BAPL 6600 F4 RS P P	\$RELO1, RELIABILITY FOR A SINGLE FAILURE MODE						R497
BAPL 6600 F4 RS P T A	\$PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS						R359
BAPL 6600 F4 RS P T A	\$SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION						R399
BAPL 6600 F4 RS P T B	\$EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA						R461
BAPL 6600 F4 RS P T C	\$BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY						R398
BAPL 6600 F4 RS P T F	\$NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK						R371
BAPL 6600 F4 RS P T F	\$TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK						R338
BAPL 6600 F4 RS P T F	\$WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM						R274
BAPL 6600 F4 RS P T F	\$WIGL3, 1-D SPACE-TIME DIFFUSION W/FEEDBACK						R708
BAPL 6600 F4 RS P T G	\$FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS						R295
BAPL 6600 F4 RS P T G	\$MO555, ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS						R284
BAPL 6600 F4 RS P T H	\$CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS						R473
BAPL 6600 F4 RS P T H	\$FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY						R272
BAPL 6600 F4 RS P T H	\$FLOT1, MO219, PWR FLOW TRANSIENT ANALYSIS						R331
BAPL 6600 F4 RS P T H	\$GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS						R424
BAPL 6600 F4 RS P T H	\$HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM						R286
BAPL 6600 F4 RS P T H	\$MO899, HOH, STEAM TABLES 14.5-2538 PSIA						R294
BAPL 6600 F4 RS P T H	\$TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS						R348
BAPL 6600 F4 RS P T I	\$BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION						R468
BAPL 6600 F4 RS P T I	\$BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS						R481
BAPL 6600 F4 RS P T I	\$CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION						R449
BAPL 6600 F4 RS P T I	\$FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES						R537
BAPL 6600 F4 RS P T I	\$MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS						R383

BAPL

BHSC

APL	6600	F4	RS	P	T	I	\$M0457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	R329
BAPL	6600	F4	RS	P	T	I	\$M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	R283
BAPL	6600	F4	RS	P	T	I	\$PELEN, FUEL PELLET TEMPERATURE & DEFORMATION	R598
BAPL	6600	F4	RS	P	T	I	\$SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	R282
BAPL	6600	F4	RS	P	T	J	\$M0756, LETO, 1-D SLAB GAMMA-RAY TRANSPORT	R343
BAPL	6600	F4	RS	P	T	L	\$BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	R373
BAPL	6600	F4	RS	P	T	M	\$SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS	R557
BAPL	6600	F4	RS	P	T	Q	\$BETTY, ENTRAINED PARTICLES SAMPLING STUDY	R545
BAPL	6600	F4	RS	P	T	O	\$JITER, FLUCTUATION EXPERIMENT ANALYSIS	R394
BAPL	6600	F4	RS	P	T	O	\$REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	R425
BAPL	6600	F4	RS	P	T	P	\$DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	R327
BAPL	6600	F4	RS	P	T	P	\$M0661, M0657, M0626, POLYNOMIAL CURVE FITTING	R411
BAPL	6600A	F+ASC	RS		T	P	\$BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	478
BAPL	6600A	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	R275
BAPL	6600B	F+ASC	RS	P	T	J	\$SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	R462
BAPL	6600B	F4	RS	P	T	I	\$MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	R412
BAPL	6600C	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	R275
BAPL	7600	F+COM	RS		T	P	\$BETTIS PROGRAMMING ENVIRONMENT LIBRARY	R665
BAPL	7600	F+CGM	RS	P	T	C	\$RECAP-12, MONTE CARLO CRITICALITY CALCULATIONS	R670
BAPL	7600	F+COM	RS	P	T	D	\$TPT01, 2-D FEW-GROUP TRANSPORT WITH DEPLETION	R669
BAPL	7600	F4	RS	P	T	G	\$FLASH6, FULLY-IMPLICIT TRANSIENT SIMULATION	R448
BAPL	7600	F4	RS	P	T	H	\$WASP2, WATER PROPERTIES FOR SAFETY ANALYSIS	R396
BAPL	7600B	F4	RS	P	T	H	\$FLOW3, NETWORK ANALYSIS OF 3-D TWO-PHASE FLOW	R664
BASIC	R		M				\$MAPPER, PREDICTING MANUFACTURING REQUIREMENTS GEPI GETS	595
BATCH	ANALYSIS	OF	GAMMA-RAY	SPECTRA		ANC	360 F+P+A RSBP XCT W \$GAUSS6,	622
BC	625	F+MAP	RS	P	T	C	\$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	209
BC	625	F4	RS		T	C	\$EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	156
BC	625	F4	RS		T	C	\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	28
BC	625	F4	RS	PLX	T	B	\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	185
BCAC	6600	F4	RS	P	T	H	\$ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	580
BCD	R	L	T	Z			\$ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2 WAPD 6600	447
BCD	R	L	T	Z			\$SOLATABQ62, ALBUQUERQUE 1962 SOLAR DATA SLA 6600B	693
BCD	R	LX	T	Z			\$LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS LASL 6600	532
BCD	R	LX	T	Z			\$THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS DP 360	543
BCD	INPUT	DATA	PROCESSING	MODULE		ANL	360 F4 RSBP CT L \$ARC-NU1002,	533
BCL	6400	F4	RS	P		G	\$FRCL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	500
BCL	6400	F4	RS	P	T	F	\$ADEP, 1-D & 2-D FEW-GROUP SPACE-TIME KINETICS	494
BCL	6400	F4	RS	P	T	G	\$ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	330
BCL	6400	F4	RS	P	T	G	\$NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	328
BCL	6400	F4	RS	P	X	T	\$MUCHA1, MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	508
BCL	6400B	F4	RS	P	X	G	\$MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	499
BCSS	6600D	F+ASC	R	B	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	R275
BEAM	CREEP	ANALYSIS					HEDL 6600 F4 RS P T I \$BEAMCRP, FINITE-ELEMENT	R701
BEAMCRP,	FINITE-ELEMENT	BEAM	CREEP	ANALYSIS			HEDL 6600 F4 RS P T I \$	R701
BEAMS	ANL	3600	F36			SBP	I \$BOW2, DEFLECTION CALCULATION PARALLEL	365
BEAMS	KAPL	6600	F4	RS	P	I	\$STEM, MATRIX GENERATION FOR A SYSTEM OF	R337
BECOM,	AEC	DP	PURCHASE	VERSUS	LEASE	ANALYSIS	SLA 360 COBOL RSBP CT M \$	R589
BECOM,	AEC	DP	PURCHASE	VERSUS	LEASE	ANALYSIS	SLA 1108 COBOL RS P M \$	R589
BEHAVE2,	OXIDE	FUEL	PERFORMANCE	FINITE-ELEMENT		FBRD	635 F4 RS P CT I \$	R568
BEHAVIOR	LOGNORMAL	MODEL				AI	370 F RS P T G \$HAA3B, AEROSOL	443
BESFIT,	DIFFRACTION	MODEL	ELASTIC	SCAT	X-SEC	BNL	6600 F4 RS P A \$	524
BESSEL	FUNCTIONS,	AIRY	&	LOG	GAMMA	SUBROUTINES	SLA 6600 F4 RS P T P \$	656
BETTIS	ENVIRNMNTL	LIB	SCOPE2.0	CEND	7600B	F4	RS T P \$MODEL, MODIFIED	478
BETTIS	ENVIRNMNTL	LIB	SCOPE3.2	CDC	6600C	F+COM	RS T P \$MODEL, MODIFIED	478
BETTIS	ENVIRNMNTL	LIB	SCOPE3.3	CDC	6600D	F+COM	RS T P \$MODEL, MODIFIED	478
BETTIS	ENVIRONMENTAL	ROUTINES,	SUBROUTINE	LIB.		BAPL	6600A F+ASC RS T P \$	478
BETTIS	ENVIRONMENTAL	ROUTINES,	SUBROUTINE	LIB.		BW	6600B F+ASC RS T P \$	478
BETTIS	PROGRAMMING	ENVIRONMENT	LIBRARY			BAPL	6600 F+COM RS T P \$	R665
BETTIS	PROGRAMMING	ENVIRONMENT	LIBRARY			BAPL	7600 F+COM RS T P \$	R665
BETTY,	ENTRAINED	PARTICLES	SAMPLING	STUDY		BAPL	6600 F4 RS P T O \$	R545
BE21,	FEW-GP	DISCRETE	ORDINATES	SLAB	GEOMETRY	BAPL	6600 F4 RS P T C \$	R398
BGE	360C	F4	RS		T	H	\$STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	487
BHSC	360	F4	RS	P		C	\$PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	30
BHSC	360	F4	RS	P	T	C	\$FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	120

BHSC

BODIES

BHSC	360	F4	RS PL T B	\$TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS					
BH99,	EXTREME VALUE DISTRIBUTION DATA ANALYSIS	BAPL	6600	F4	RS P	P	\$		R621
BIGDEAL,	SPENT YANKEE-FUEL TEMPERATURE CALC.	ORNL	1604	F2	RS P	Q	\$		549
BIN	R L T Z	\$SOLDATA8062, ALBUQUERQUE 1962 SOLAR DATA			SLA	6600			693
BIN	R L T Z	\$ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES			GGA	1108			356
BINARY COLLISION CASCADE SIMULATION	ORNL	360B	F+BAL	RS P X T	Q	\$MAPLOWE,			680
BINARY CYCLE GEOTHERMAL COST STUDY	BNW	6600	F4	RS P	T D	\$GEOCOST-BC,			711
BINARY LIBRARY TAPE MAINTENANCE	ANL	360	F4	RS	M	\$MERMC2, MC**2			472
BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GGA	1108	F5	RS P	T O	\$CAGE,			476
BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	635	F4	RS PL T C	\$				287
BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	1108	F4	RS P	T C	\$			287
BKC	360	F4	RS P	P	\$COMQC, QUALITY CONTROL DATA ANALYSIS ROUTINES				649
BKC	360	F4	RSBP	P	\$GRAPH, LINEAR REGRESSION W/CONFIDENCE LIMITS				624
BKC	360	F4	RSBP	P	\$HISTOGRAMS, QUALITY CONTROL SAMPLE STATISTICS				614
BKC	6600	F4	RS P	T	\$F0355, SHAPER CUTTER CONTOUR GENERATOR				697
BKY	7600	F+COM	RS P	T P	\$DUMP, USER-ORIENTED MEMORY DUMP UTILITY				698
BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB	360	F4	RS P	E	\$			363
BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	F+MAP	RS P	T H	\$			205
BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	GGA	1108	F+BAL	RS P	T E	\$			303
BLOWDOWN PPCO	360	F4	RS P X	G	\$BURST1, HYDRODYNAMIC ANALYSIS DURING				435
BLOWDOWN ANALYSIS LOFT	KECS	7094	F+MAP	RSBP	T G	\$SATURATED BLOWDOWN2,			200
BLOWDOWN PRESSURE TEMPERATURE HISTORY	KECS	7094	F2	RSBP	T H	\$PTH1,			155
BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KECS	7094	F+MAP	RSBP	T G	\$SATURATED			200
BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	F4	RS P	T L	\$			R373
BNL	6600	F4	RS	T M	\$CHECK3,RIGEL3, ENDF/B V3 PROCESSING CODES				571
BNL	6600	F4	RS P	A	\$AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC				376
BNL	6600	F4	RS P	A	\$BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC				524
BNL	6600	F4	RS P	A	\$RAMPL, REICH-MOORE RESOLVED REGION X-SECTIONS				492
BNL	6600	F4	RS P	A	\$SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC				377
BNL	6600	F4	RS P	T F	\$NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK				405
BNL	6600	F4	RS P	T I	\$SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES				252
BNL	6600B	F4	RS	T M	\$CHECKER,CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC				384
BNL	6600B	F4	RS	T M	\$CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC				47
BNL	6600B	F4	RS	T M	\$RIGEL4,CHECK4,... ENDF/B V4 PROCESSING CODES				638
BNL	6600B	F4	RS P	A	\$THRES2, STATISTICAL MODEL REACTION X-SECTIONS				504
BNL	6600B	F4	RS P	T A	\$RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES				465
BNL	7090	F+FAP	RS P	T M	\$DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES				236
BNL	7094	F4	RS P	A	\$AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC				376
BNW	1107	F4	RS P	T C	\$HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE				241
BNW	1107	F4	RS PL T B		\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV				185
BNW	1108	F+BAL	RS P	T O	\$GSSLRN18, LEAST SQUARES PHOTOPEAK SPECTRA CODE				457
BNW	1108	F4	RS P	C	\$PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY				304
BNW	1108	F4	RS P	T B	\$FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC				306
BNW	1108	F4	RS P	T D	\$20B, 2-D MULTIGROUP DIFFUSION AND DEPLETION				325
BNW	1108	F4	RS P X T B		\$10X, 1-D DIFFUSION FAST X-SECTION GENERATION				374
BNW	1108	F4	RS PLX T B		\$HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS				467
BNW	1108	F5	RS P	T D	\$DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS				456
BNW	1108	F5	RS P	CT H	\$REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN				483
BNW	1108	F5	RS P X T F		\$NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES				488
BNW	1108	F5	RS PLX T B		\$BRT1, THERMAL SPECTRUM X-SECTION CALC				184
BNW	1108	F5	RSBPL T D		\$ISOGEN, RADIONUCLIDE GENERATION AND DECAY				367
BNW	6600	F4	PS P	T D	\$GEOCOST-BC, BINARY CYCLE GEOTHERMAL COST STUDY				711
BNW	6600	F4	RS P	T D	\$GEOCOST, GEOTHERMAL ENERGY COST ANALYSIS				684
BNW	6600	F4	RS P	T I	\$GAPCON-THERMAL2, FUEL PIN GAP CONDUCTANCE CALC				618
BNW	6600C	F4	RS P	I	\$BUCKLE, CREEP BUCKLING OF INITIALLY OVAL TUBE				667
BNW	7090	F+FAP	RS PL T B		\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV				185
BNW	7090	FLOCO	RSBP	T C	\$GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX				75
BNW	7090	F2	RSBPL T J		\$MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY				143
BNW	7090	F4	RS P	T F	\$NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES				488
BNW	7600	F4	RS P XCT H		\$COBRA4I, ROD BUNDLE & CORE THERMAL-HYDRAULICS				432
BOARDS	SLA	1108	F+BAL	RSBP	T T	\$ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT			681
BOARDS	SLA	6600	F+COM	RS P	T T	\$ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT			681
BODIES	BNL	6600	F4	RS P	T I	\$SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D			252
BODIES	GGA	1108	F4	RS P	I	\$SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D			252

BOILING

CAUSE

BOILING FLOW STEAM	GGA	1108	F4	RS P	T H	\$DYNAM, DYNAMIC ANALYSIS	440
BORATION-DILUTION TABLES FOR PWR OPN	OPPD	6400	F4	S P	H	\$PWP-PPM,	552
BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090	F2	PS P	B	\$	237
BOWED REACTOR CORES	ANL	360B	F4	RS P	I	\$NUBOW, STRUCTURAL ANALYSIS	643
BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	F36	SBP	I	\$	365
BREEDERS	NED	635	F4	RS P	D	\$RAPFU, FUEL CYCLE PARAMETERS FAST	372
BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	1108	F5	RS PLX T B	\$		184
BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	6600	F4	RS P	T I	\$	P468
BUCKLE, CREEP BUCKLING OF INITIALLY OVAL TUBE	BNW	6600C	F4	RS P	I	\$	667
BUCKLING COLLAPSE ANALYSIS	BAPL	6600	F4	RS P	T I	\$BUSHL, CYL SHELL	R481
BUCKLING CYL FUEL ELEMENTS	AEB	360	F4	RS P	B	\$WELWING, MATERIAL	362
BUCKLING OF INITIALLY OVAL TUBE	BNW	6600C	F4	RS P	I	\$BUCKLE, CREEP	667
BUGTRI, 2D MULTIGP DIFFUSION & BURNUP TRI-MESH	GGA	1108	F+BAL	RS P	T D	\$	439
BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA	1108	F+BAL	RS P	T D	\$	438
BUILDUP FACTOR CALC	BAPL	6600	F+ASC	RS P	T J	\$ASPI, GAMMA-RAY SOURCE	P429
BUNDLE	NED	635	F4	RS P	T H	\$VELVET2, TURBULENT FLOW IN LMFR ROD	458
BUNDLE & CORE THERMAL-HYDRAULICS	BNW	7600	F4	RS P	XCT H	\$COBRA4I, ROD	432
BUNDLE CHF DATA ANALYSIS	ANC	360	F4	RS PL	CT M	\$ERRST, LOCA ROD	518
BUNDLE FLOW & TEMPERATURE DIST.	ORNL	360	F4	RS P	T H	\$ORRIPLE, ROD	629
BUNDLES	LASL	7094	F2	RSBP	H	\$AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE	182
BUNDLES	LASL	7094	F2	RSBP	H	\$AXTHRM, HEAT TRANSFER SOLID FUEL TUBE	183
BURNING OF SODIUM	ANL	370	F+CSM	RS P	G	\$SPOOL-FIRE, SPFRAY-POOL	R714
BURNUP & MANAGEMENT	NED	635	F4	RS P	T D	\$FUMBLE, FAST REACTOR FUEL	480
BURNUP ANALYSIS	ANL	360	F4	RS P	CT D	\$3DB, 3-D MULTIGROUP DIFFUSION	567
BURNUP ANALYSIS	HEDL	1108	F4	RS P	T D	\$3DB, 3-D MULTIGROUP DIFFUSION	567
BURNUP ANALYSIS	NED	635	F4	RS P	T D	\$BURNUP, HEAVY ELEMENT ISOTOPIC	311
BURNUP CYL LATTICE	TVA	360B	F4	RSBPLXCT	B	\$LASEP, SPECTRUM CALC WITH	249
BURNUP POWER DISTRIBUTION SEARCH	GGA	1108	F4	RS P	T C	\$GASP7, 1-D	319
BURNUP REFUELING HISTORY	LASL	6600	F4	RS P	T D	\$PHENIX, 2-D DIFFUSION	454
BURNUP RZ GEOMETRY	GGA	7090	F+PAP	RSBP	T D	\$DDB, 2-D FEW-GP DIFFUSION	99
BURNUP TRI-MESH	GGA	1108	F+BAL	RS P	T D	\$BUGTRI, 2D MULTIGP DIFFUSION &	439
BURNUP XY, RZ	GGA	1108	F+BAL	RS P	T D	\$BUG2, 2-D MULTIGROUP DIFFUSION &	438
BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	NED	635	F4	RS P	T D	\$	311
BURP1, DETECTOR EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB	O	\$	164
BURP2, DETECTOR EFFICIENCY DISK SOURCE	MTS	7090	MAD	RSB	O	\$	165
BURP3, DETECTOR EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB	O	\$	166
BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	MTS	7090	MAD	RSB	O	\$	169
BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	MTS	7090	MAD	RSB	O	\$	170
BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	360	F4	RS P	X G	\$	435
BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	F4	RS P	T I	\$	R481
BW	2000	F4	RS	A	\$STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION		305
BW	6600	F+CGM	RS P	X T D	\$FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY		427
BW	6600B	F+ASC	RS	T P	\$BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.		478
BW	6600B	F+ASC	RS P	T D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION		R275
BWR CORE HEAT TRANSFER CODE	ANC	360B	F4	RSBP	XCT H	\$MOXY/MOD032,	551
BWR GASEOUS RELEASE	ORNL	360	F4	RS P	C G	\$STEFEG, ANALYSIS OF PWR &	583
BWR/6 ANALYSIS	EI	360	F+BAL	RS P	CT H	\$6KILER, CORE HEATUP CODE FOR	636
C+BAL	RS PL	CT M	\$JOURNAL CONTROL, LIBRARY JOURNAL MANAGEMENT	ORNL	360		660
CAESAR4, LIBLIST, 1-D MULTI-GP DIFFUSION & LIB.	AI	360	F4	RSBPLX	T C	\$	270
CAGE, BIRD, SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GGA	1108	F5	RS P	T D	\$	476
CALCOMP PLOTTING ROUTINES	KAPL	6600	F+COM	RS	T P	\$KAPLPLOT, KAPL	R496
CALCOMP780	ANL	360	F4	RS P	T N	\$PLOT-3D, 3-D PLOTS ON IBM2280 OR	544
CAPITAL COST ESTIMATING	ORNL	360	F+BAL	RS P	T D	\$ORCOST2, POWER PLANT	588
CARD INPUT PROCESSOR	LASL	360	F4	RS P	L	\$GENRD, FREE-FORMAT	530
CARD INPUT PROCESSOR	LASL	6600	F4	RS P	L	\$GENRD, FREE-FORMAT	530
CASCADE SIMULATION	ORNL	360B	F+BAL	RS P	X T Q	\$MARLOWE, BINARY COLLISION	680
CASCADE2, COMPOUND NUCLEUS REACTION	AI	360	F+BAL	RS P	T A	\$COMNUC,	482
CASCADE, CLUSTER, RADIATION DAMAGE IN METALS	GEC	7094	F+PAP	RSBP	T Q	\$	419
CAT. A-E	ANL	360	F+P+A	RS	T P	\$AMDLIBAE, ARGONNE SUBROUTINE LIBRARY	562
CAT. F	ANL	360	F+BAL	RS	T P	\$AMDLIBF, ARGONNE SUBROUTINE LIBRARY	563
CAT. G-Z	ANL	360	F+P+A	RS	T P	\$AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY	564
CATALOG	DP	360B	EBDC	R	L T Z	\$GAMTAB, RADIOACTIVE-DECAY GAMMA-RAY	637
CATALOG UTILITY ROUTINE	ANL	360D	BAL	RS	X T P	\$COPYCAT, IBM OS SYSTEM	646
CAUSE ANALYSIS	ANC	360	F+BAL	RS P	T G	\$COMCAN, SYSTEM SAFETY COMMON	704

CAVITY

CINCAS

CAVITY GEOM	GGA	1108	F4	RS P	T J	\$MUSCAT, VIEW FACTOR SHIELDING CODE	259
CCCC STANDARD INTERFACE FILE	PROCESSOR	LASL	360	F4	RS P CT M	\$LASIP3,	691
CDC 1604	F63	RS	C	\$PERT, 1-D PERTURBATION FOR AIM AND FOG CODES			30
CDC 1604	F63	RS L T	D	\$SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION			58
CDC 1604	F63	RS P	A	\$HAFTER, HAUSER-FESHBACH INELASTIC SCATTERING			14
CDC 1604	F63	RS P	B	\$SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY			52
CDC 1604	F63	RS P	R	\$S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION			53
CDC 1604	F63	RS P	E	\$AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK			121
CDC 1604	F63	RS P	G	\$CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD			47
CDC 1604	F63	RS P	J	\$GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY			45
CDC 1604	F63	RS P	J	\$GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM			46
CDC 1604	F63	RS P T	C	\$EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB			87
CDC 1604	F63	RS P T	C	\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE			28
CDC 1604	F63	RS P T	C	\$WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY			32
CDC 1604	F63	RS P T	C	\$20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER			40
CDC 1604	F63	RS PL T	A	\$ARES2, RESONANCE INTEGRAL X-SECTION CALC			89
CDC 1604	F63	RS PL T	B	\$FORM, FAST NEUTRON SPECTRUM X-SECTION CALC			51
CDC 1604	F63	RS PL T	B	\$TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS			50
CDC 1604	F63	RS PL T	C	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE			29
CDC 1604	F63	RS PLX T	B	\$GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC			33
CDC 1604	F63	RS PLX T	C	\$FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE			120
CDC 3600	F63	RSBP	F	\$AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE			102
CDC 3600	F63	RSBP T	C	\$FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION			167
CDC 6600C	F+COM	RS	T P	\$MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2			478
CDC 6600D	F+COM	RS	T P	\$MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3			478
CEBUG, STEAM GENERATOR SODIUM-WATER REACTION	CEND	7600	F4	RS P T G	\$		548
CELL ANL 3600	F36	RSBP X T	B	\$RABBLE, WLIB, FLAT, RESONANCE ABSORPTION,			281
CELL ANL 3600	F36	RSBP X T	B	\$RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG			213
CELL BAPL 6600	F+ASC	RS P X T	B	\$RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX			F285
CELL CALCULATION	AI	360	F+BAL	RS P X T B	\$HWOCR-SAFE, 2-D MONTE CARLO		307
CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS P B	\$BAM, S4 CYL		108
CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS B	\$S4 CYL		53
CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P B	\$S4 CYL		53
CELL COLLISION PROBABILITY CALC	ANL	360	F4	RS P T B	\$CLUP77, SQUARE		526
CELL COLLISION PROBABILITY CALC	JAER	230	F4	RS P T B	\$CLUP77, SQUARE		526
CEND 360	F4	RS P X T	F	\$CEXE, INCXE, 1-GP 3-D XYZ XENON OSCILLATION			415
CEND 6600	F4	RS P T	C	\$EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM			156
CEND 7600	F4	RS P T	G	\$CEBUG, STEAM GENERATOR SODIUM-WATER REACTION			548
CEND 7600B	F4	RS T	P	\$MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0			478
CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	1604	F63	RS P T I	\$PIP,		187
CEXE, INCXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P X T F	\$		415
CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	7094	F+MAP	RS P A	\$		215
CHAIN ANALYSIS	ORNL	1604	F63	RS P D	\$ISOCRUNCH, REACTION DECAY		180
CHAIN ANALYSIS	ORNL	7090	F2	RSBP D	\$ISOCRUNCH, REACTION DECAY		180
CHAIN EQUATIONS	ORNL	7090	F2	RSBP D	\$NUCY, SOLUTION OF NUCLIDE		134
CHAINS GEC 635	F4	RSBP D	\$CHAINS, ANALYSIS OF RADIOACTIVE DECAY				418
CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GEC	635	F4	RSBP D	\$		418
CHANNEL ANALYSIS ECC BCL 6400	F4	RS P X T	G	\$MUCHA1, MUCHA2, MULTIPLE			508
CHANNEL X-SEC EVALUATION	ENEA	360	F4	RS P CT A	\$JUPITOR1, COUPLED		308
CHECKER ANL 360B	PL1	S P CT	P	\$SLOP, CROSS, IBM360 FORTRAN H PROGRAM			647
CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	F4	RS P T M	\$CRECT,		475
CHECKER, CRECT, DAMMET, PLOTFB, ... ENDF/B V1 PROC	BNL	6600B	F4	RS T M	\$		384
CHECKER, RIGEL, PLOTFB, ... ENDF/B V2 PROC	BNL	6600B	F4	RS T M	\$CRECT,		475
CHECK3, RIGEL3, ENDF/B V3 PROCESSING CODES	BNL	6600	F4	RS T M	\$		571
CHECK4, ... ENDF/B V4 PROCESSING CODES	BNL	6600B	F4	RS T M	\$RIGEL4,		638
CHEMICALLY REACTIVE MIXTURE FLOW	LASL	6600	F4	RS P T U	\$PRICE-LASL,		720
CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	F36	RSBP G	\$		366
CHF DATA ANALYSIS	ANC	360	F4	RS PL CT M	\$ERREST, LOCA ROD BUNDLE		518
CHI 1108A	F4	RS P T H	\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM				R299
CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	F4	RS P T H	\$		R473
CHILES, LINEAR ELASTIC SINGULARITY MODELING	SLA	6600	FTN	RS P T I	\$		611
CHORD DIST FUNCT	AEG	7090	F2	RS B	\$DANCOFF JR, MODERATOR SPACE		150
CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	360	F4	RS P T D	\$		354
CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P T D	\$		354

CINDER

CONCEPTUAL

CINDER,M0102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P	D	\$	313
CINDER,M0102, POINT DEPLETION FISSION PRODUCT	CP	360	F+BAL	RS P	T D	\$	313
CITATION, 1,2,3-D DIFFUSION DEPLETION MULTI-GP	ORNL	360I	F4	RS P	T K	\$	387
CLAD STRAIN & PELLET CRACKING	BAPL	6600	F4	RS P	I	\$STRIPE, FUEL ROD	R570
CLADDING-STEAM REACTION ANL	3600	F36	RSBP	G	\$CHEMLOC2, CORE HEATING		366
CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	6600	F4	RS P	A	\$	R531
CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	360	F4	RSB L	T M	\$	271
CLOTHO, NUCLEAR POWER PLANT COST CODE	HEDL	1108	F5	RS P X T D	\$PACTOLUS,		540
CLOUD	AI	7090	F2	RS P	G	\$	47
CLOUD	CDC	1604	F63	RS P	G	\$	47
CLOUD	DP	360	F4	RS P	G	\$	47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS P	G	\$	47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	F63	RS P	G	\$	47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	F4	RS P	G	\$	47
CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	360	F4	RS P	T B	\$	526
CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	JAER	230	F4	RS P	T B	\$	526
CLUSTER, RADIATION DAMAGE IN METALS	GEC	7094	F+FAP	RSBP	T Q	\$CASCAD, E	419
CMXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	F63	RS P	E	\$	188
CNEA	360	F4	RS P	E	\$TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS		489
COBOL RS CT M	\$NMMSS, NUCLEAR MATERIALS MANAGEMENT SYSTEM	UCND	370				695
COBOL RS P M	\$AEC-ALO FAU, RADIO FREQUENCY MANAGEMENT SYSTEM	ALOO	360				587
COBOL RS P M	\$BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA	1108				R589
COBOL RSBP CT M	\$BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA	360				R589
COBRA3M, FUEL PIN THERMAL-HYDRAULIC ANALYSIS	ANL	3608	F4	RSBP	CT H	\$	659
COBRA4I, ROD BUNDLE & CORE THERMAL-HYDRAULICS	BNW	7600	F4	RS P XCT	H	\$	432
COEDILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UICS	360	F4	RS P	A	\$	347
COEF CALC	GGA	7044	F4	RS P T C	\$STEMCO, 1-D FEW-GP DIFFUSION TEMP		225
COEF CALC FOR ANGULAR DIST	GGA	7044	F4	RS P X	A	\$LEGCOEF3, LEGENDRE	217
COEF CALC FOR ANGULAR DIST DATA	AI	7094	F+MAP	RS P	A	\$CHAD, LEGENDRE	215
COEFFICIENT CALCULATION	GGA	1108	F4	RS P T C	\$STEMCO7, TEMPERATURE		320
COEFFICIENTS	LLL	7090	F+FAP	RS P T B	\$SOPHIST1/2/5, MULTI-GP TRANSFER		160
COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	F4	RS P X	A	\$	385
COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	F4	RS P X	A	\$COHBE,	385
COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	F63	RSBP	O	\$	248
COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	F63	RSBP	O	\$COINC,	248
COLLAPSE ANALYSIS	BAPL	6600	F4	RS P T I	\$BUSHL, CYL SHELL BUCKLING		R481
COLLAPSING	RW	6500	F4	RS P	B	\$PARTI, OPTIMAL GROUP OR MESH	416
COLLISION CASCADE SIMULATION	ORNL	3608	F+BAL	RS P X T Q	\$MARLOWE, BINARY		680
COLLISION PROBABILITIES MC	ORNL	3608	F+BAL	RS P T B	\$RAFFLE, 1ST FLIGHT		392
COLLISION PROBABILITY CALC	ANL	360	F4	RS P T B	\$CLUP77, SQUARE CELL		526
COLLISION PROBABILITY CALC	JAER	230	F4	RS P T B	\$CLUP77, SQUARE CELL		526
COLLOCATION SOLN OF STIFF ODE'S	ANL	360	F	RSBP	T P	\$STFODE, COLODE,	652
COLLOCATION SOLN OF STIFF ODE'S	SLA	6600	F	RS P T P	\$STFODE, COLODE,		652
COLODE, COLLOCATION SOLN OF STIFF ODE'S	ANL	360	F	RSBP	T P	\$STFODE,	652
COLODE, COLLOCATION SOLN OF STIFF ODE'S	SLA	6600	F	RS P T P	\$STFODE,		652
COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	7040	F+MAP	RS P	A	\$	203
COMCAN, SYSTEM SAFETY COMMON CAUSE ANALYSIS	ANC	360	F+BAL	RS P T G	\$		704
COMMON CAUSE ANALYSIS	ANC	360	F+BAL	RS P T G	\$COMCAN, SYSTEM SAFETY		704
COMNUC, CASCADE, COMPOUND NUCLEUS REACTION	AI	360	F+BAL	RS P T A	\$		482
COMPARE, TRANSIENT FLOW IN VENTED FLUID SYSTEM	LASL	7600	F4	RS P T H	\$		702
COMPARE, TRANSIENT FLOW IN VENTED FLUID SYSTEM	NRC	370	F4	RS P T H	\$		702
COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS P	P	\$ERF, ERFC, ERROR &	601
COMPLEX GAMMA-RAY SPECTRA	KSUN	360	F4	RS P	O	\$CORGM, UNFOLDING OF	390
COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS	T O	\$GASPN,	R485
COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	F4	RS P T I	\$SAFE-3D, 3-D		332
COMPOSITE STRUCTURE STRESS STUDY	ORNL	360	F+BAL	RS P T I	\$SAFE-3D, 3-D		332
COMPOSITION-DEPENDENT X-SECS	FBRD	635	F+GMP	RS P XCT B	\$TDOWN, SPATIAL &		505
COMPOUND NUCLEUS REACTION	AI	360	F+BAL	RS P T A	\$CCMNUC, CASCADE,		482
COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	F63	RSBP	A	\$NEARREX,	171
COMPRESSIBLE FLUID FLOW	LASL	7600	F4	RS P	H	\$SOLA-ICE, TRANSIENT	723
COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	7090	F+FAP	RS P	I	\$WIREX,	315
COMQC, QUALITY CONTROL DATA ANALYSIS ROUTINES	BKC	360	F4	RS P	P	\$	649
COMRADEX3, RADIOLOGICAL DOSE ACCIDENT STUDY	AI	370	F4	RS P CT G	\$		663
CONCEPTUAL COST ESTIMATE	GGA	1108	F4	RS P XCT D	\$CONCEPT3, POWER PLANT		498

CONCEPTUAL

CORGAM

CONCEPTUAL COST ESTIMATE OFNL	360B	F4	RS P X T D	\$CONCEPT4, POWER PLANT	498		
CONCEPT3, POWER PLANT CONCEPTUAL COST ESTIMATE	GGA	1108	F4	RS P XCT D	\$ 498		
CONCEPT4, POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL	360B	F4	RS P X T D	\$ 498		
CONCRETE	GGA	1108	F4	RS P I	\$SAFE-CREEP, VISCOELASTIC ANALYSIS	300	
CONCRETE	GGA	1108	F5	RS P T I	\$SAFE-CRACK, VISCOELASTIC ANALYSIS OF	451	
CONDUCTANCE CALC	BNW	6600	F4	RS P T I	\$GAPCON-THERMAL2, FUELPIN GAP	618	
CONDUCTION	PPCO	7044	F+MAP	RS P T H	\$TOODEE, 2-D TIME-DEPENDENT HEAT	349	
CONDUCTION	ORNL	360	F4	RS P X T H	\$ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT	525	
CONDUCTION LUMPED MASS	LASL	7030	F4	RS T H	\$RATH, 2- OR 3-D HEAT	242	
CONDUCTION LUMPED MASS	LASL	7094	FAP	RS P T H	\$RATH, 2- OR 3-D HEAT	242	
CONDUCTION PROGRAM	BAPL	6600	F4	RS P T H	\$HOT2, 2-D TRANSIENT HEAT	R286	
CONDUCTION PROGRAM	ORNL	360B	F4	RS P T H	\$HEATING3, 1,2, OR 3-D HEAT	517	
CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LLL	7090	F2	RS P F	\$	129	
CONFIGURATION FREQUENCY DUMAIN	LLL	7600	F4	RS P T T	\$WFLLL2B, WIRE	721	
CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	F4	RS I	\$CORE, CORE	233	
CONSEQUENCES	NRC	370	F4	RS PLX T G	\$CRAC, CALC OF REACTOR ACCIDENT	722	
CONSTANT & FAST SPECTRA CALC	ANC	360	F4	RS PLXCT B	\$PHROG, MULTI-GP	520	
CONSTANT CALC	AGC	7090	F+MAP	RSBPLX T B	\$AGN-GAM, FAST SPECTRUM MULTI-GP	204	
CONSTANT CALC FROM TOR OUTPUT	LATA	LASL	6600	F4	RS P T B	\$GLEN, GROUP	361
CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS PLX T B	\$GAMTEC2, MULTI-GP	185	
CONSTANT CALC 0 TO 10 MEV	BNW	1107	F4	RS PL T B	\$GAMTEC2, MULTI-GP	185	
CONSTANT CALC 0 TO 10 MEV	BNW	7090	F+MAP	RS PL T B	\$GAMTEC2, MULTI-GP	185	
CONSTANT CALC 0 TO 10 MEV	UVAC	6400	F4	RS PLX T B	\$GAMTEC2, MULTI-GP	185	
CONSTANTS	ANC	360	F4	RS PL CT B	\$INCITE, THERMAL SPECTRA & MULTI-GP	565	
CONSTANTS	ORNL	360	F4	RS PLX T B	\$XSDRN, DISCRETE ORDINATE MULTIGROUP	393	
CONSTANTS	BNW	1108	F4	RS PLX T B	\$HRG3, SLOWING-DOWN SPECTRUM, MULTIGP	467	
CONSTANTS	TVA	360	F4	RS PLX T B	\$HRG3, SLOWING-DOWN SPECTRUM, MULTIGP	467	
CONSTANTS FOR DSN TDC	PW	1604	F63	RS P L	\$SNC, CALCULATION OF SN	189	
CONSTANTS FROM ENDF/B DATA	FBRD	635	F+GMP	RS P XCT B	\$ENDRUN2, MULTIGROUP	501	
CONSTANTS FROM ENDF/B FOR 10X	HEDL	360	F4	RSBP XCT B	\$ETOX3, MULTI-GP	388	
CONSTANTS FROM ENDF/B FOR 10X	HEDL	1108B	F4	RS P X T B	\$ETOX3, MULTI-GP	388	
CONSTANTS GENERATION	ORNL	360	F4	RS P T B	\$SUPERTO, ENDF/B FINE-GP	431	
CONTAINER IMPACT ANALYSIS	LASL	7600	F4	RS P I	\$IMPAC2, B SHIPPING	715	
CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	F4	RS X T G	\$PRECCN, HTGR	228	
CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400B	F4	RS P X G	\$MIRAB, MIRAP,	499	
CONTEMPT-LT/026, PRESSURE-TEMPERATURE RESPONSE	ANC	360	F+BAL	RSBPLXCT G	\$	433	
CONTOUR GENERATOR	ANL	360	F4	RS P T	\$F0355, SHAPER CUTTER	697	
CONTOUR GENERATOR	BKC	6600	F4	RS P T	\$F0355, SHAPER CUTTER	697	
CONTOUR PLOTS & AREA CALCULATION	SLA	6600	F4	RS P P	\$PLOTP, 2-D	R578	
CONTROL DATA ANALYSIS ROUTINES	BKC	360	F4	RS P P	\$COMOC, QUALITY	649	
CONTROL SAMPLE STATISTICS	BKC	360	F4	RSBP P	\$HISTOGRAMS, QUALITY	614	
CONTROL, LIBRARY JOURNAL MANAGEMENT	ORNL	360	C+BAL	RS PL CT M	\$JOURNAL	660	
CONVERSION	ANL	360	F4	RS P CT M	\$ETOE, ENDF/B TO MC**2 DATA	350	
CONVERSION	APDA	3600	ASAF4	RS P T M	\$ETOE, ENDF/B TO MC**2 DATA	350	
CONVERSION TO OR FROM SI UNITS	RDYN	370B	F4	RS P T P	\$METRICATION,	G668	
CONVERTS R-MATRIX RESONANCE PARAMETERS	ORNL	360	F4	RS P A	\$POLLA,	639	
CONVOLUTION	PPCO	7040	F+MAP	RS P A	\$COMBCO, COMBINED B-W MULTI-LEVEL	203	
COOLANT INLET PLENUM	DP	360	F4	RS P H	\$PLENUM, FLOW DIST. IN CYL	586	
COOLANT TEMPERATURE PREDICTION	MIT	370	F4	RS P T H	\$ENERGY, LMFBR	696	
COOLING	BCL	6400	F4	RS P T G	\$ECCSA4, LOSS-OF-COOLANT & EMERGENCY	330	
COORDINATE ANALYSES SEMI-RIGID MOLECULES	ANC	360	F4	RS P W	\$MMM3,	632	
COPYCAT, IBM OS SYSTEM CATALOG UTILITY ROUTINE	ANL	360D	BAL	RS X T P	\$	646	
CORE ACCIDENT ANALYSIS	NED	635	F4	RS P T G	\$FREADM1, FAST REACTOR	479	
CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	F4	RS I	\$CORE,	233	
CORE HEAT TRANSFER CODE	ANC	360B	F4	RSBP XCT H	\$MOXY/MOD032, BWR	551	
CORE HEATING CLADDING-STEAM REACTION	ANL	3600	F36	RSBP G	\$CHEMLDC2,	366	
CORE HEATUP CODE FOR BWR/6 ANALYSIS	EI	360	F+BAL	RS P CT H	\$6KILER,	636	
CORE SUPPORT STRESS ANALYSIS	ANL	3600	F36	RS P T I	\$SUPORAN, REACTOR	357	
CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS P I	\$GAZELLES, GAS-COOLED	232	
CORE THERMAL-HYDRAULICS	BNW	7600	F4	RS P XCT H	\$COBRA4I, ROD BUNDLE &	432	
CORE TRANSIENT ANALYSIS	ANC	360	F+BAL	RSBPL CT G	\$PARET, WATER-COOLED	555	
CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	F4	RS I	\$	233	
CORES	ANL	360B	F4	RS P I	\$NUBOW, STRUCTURAL ANALYSIS BOWED REACTOR	643	
CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	360	F4	RS P O	\$	390	

CORRECTION

CSP2A

CORRECTION CALC	AI	360	F4	RS	P	T	Q	\$RESPOND, DISSIMILAR MEDIA TLD	566			
COST ANALYSIS	BNW	6600	F4	RS	P	T	D	\$GEOCOST, GEOTHERMAL ENERGY	684			
COST ANALYSIS	AI	7090	F2	RS	P		D	\$AIMFIRE, URANIUM FUEL CYCLE	55			
COST AND ECONOMICS	CWE	360	F4	RS	P	T	D	\$CINCAS, NUCLEAR FUEL CYCLE	354			
COST AND ECONOMICS	WAPD	6600	F4	RS	P	T	D	\$CINCAS, NUCLEAR FUEL CYCLE	354			
COST CALCULATION	GGA	1108	F4	RS	P	T	D	\$PWOCOST, REACTOR FUEL CYCLE	441			
COST CODE HEDL	1108	F5		RS	P	X	T	\$PACTOLUS, CLOTHO, NUCLEAR POWER PLANT	540			
COST ESTIMATE	GGA	1108	F4	RS	P	X	T	\$CONCEPT3, POWER PLANT CONCEPTUAL	498			
COST ESTIMATE	ORNL	360B	F4	RS	P	X	T	\$CONCEPT4, POWER PLANT CONCEPTUAL	498			
COST ESTIMATING	ORNL	360	F+BAL	RS	P	T	D	\$ORCOST2, POWER PLANT CAPITAL	588			
COST STUDY	ORNL	360	F+BAL	RS	P		D	\$OMCST, POWER PLANT NON-FUEL O & M	688			
COST STUDY	BNW	6600	F4	RS	P	T	D	\$GEOCOST-BC, BINARY CYCLE GEOTHERMAL	711			
COSTS	ORNL	1604	F63	RS	P		D	\$POWERCO, NUCLEAR STATION ELECTRICITY	340			
COSTS	UEC	6600	F4	RS	P		D	\$POWERCO, NUCLEAR STATION ELECTRICITY	340			
COSTS	GGA	7044	F4	RS	P	T	D	\$STMGEN, STEAM GENERATOR DESIGN CRITERIA	227			
COSTS PERFORMANCE DATA	ANL	360	F4	RS	P		D	\$NPRFCCP, FUEL CYCLE	146			
COSTS PERFORMANCE DATA	UEC	6600	F4	RS	P		D	\$NPRFCCP, FUEL CYCLE	146			
COSTS PERFORMANCE STUDY	GGA	7044	F4	RS	P		D	\$WAMPUM, FUEL CYCLE	224			
COSTS PERFORMANCE STUDY	UEC	6600	F4	RS	P		D	\$WAMPUM, FUEL CYCLE	224			
COUNTING DATA REDUCTION	ANL	3600	F63	RSBP			D	\$COINC, COINCIDENCE	248			
COUPLED CHANNEL X-SEC EVALUATION				ENEA	360	F4	RS	P	CT	A	\$JUPITOR1,	308
COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	F2	RS	P		F				\$WEAK EXPLOSION,	145
COUPLED NEUTRONICS-HYDRODYNAMICS	CODE	AGC	7090	F2	RSB		F				\$HATCHET,	153
COUPLED NEUTRONICS-HYDRODYNAMICS	SPH	PW	1604	F63	RS	P	F				\$AX-TNT,	191
COUPLED NEUTRONICS-HYDRODYNAMICS	SPHERE	CDC	3600	F63	RSBP		F				\$AX1,	102
COUPLED NEUTRONICS-HYDRODYNAMICS	SPHERE	LLL	7090	F2	RS	P	F				\$CONEC,	129
COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	6600	F4	RS	P	T	A				\$JP1XP,	R506
COUPLED-CHANNEL X-SEC EVALUATION	ORNL	1604	F63	RS	P	T	A				\$JUPITOR1,	308
CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	F+FAP	RSBP		T	N				\$	239
CRAC, CALC OF REACTOR ACCIDENT CONSEQUENCES	NRC	370	F4	RS	PLX	T	G				\$	722
CRACKING BAPL	6600	F4	RS	P	I						\$STRIPE, FUEL ROD CLAD STRAIN & PELLET	R570
CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC	360	F+BAL	RS	P	T	C				\$	103
CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7090	F+FAP	RSBP		T	C				\$	103
CRBR REACTOR & PLANT TRANSIENT ANALYSIS	WARD	7600	F4	RS	P	T	K				\$DEMO4,	R676
CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	F4	RS	P	T	M				\$	475
CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC	BNL	6600B	F4	RS		T	M				\$	475
CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC	BNL	6600B	F4	RS		T	M				\$CHECKER,	384
CREEP ANALYSIS	HEDL	6600	F4	RS	P	T	I				\$BEAMCRP, FINITE-ELEMENT BEAM	R701
CREEP BUCKLING OF INITIALLY OVAL TUBE	BNW	6600C	F4	RS	P		I				\$BUCKLE,	667
CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	6600	F4	RS	P		I				\$TCB01,	R604
CREEP-PLAST, 2-D INELASTIC STRUCTURAL ANALYSIS	ORNL	360	F4	RS	P	T	I				\$	R707
CRITERIA COSTS	GGA	7044	F4	RS	P	T	D				\$STMGEN, STEAM GENERATOR DESIGN	227
CRITICAL ANALYSIS SYSTEM	DP	360	F+BAL	RS	P	X	T	B			\$HAMMER,LITFE,HELP,	277
CRITICAL ASSEMBLY ANALYSIS	AI	7600	F4	RS	PLX	T	C				\$VIM1, MONTE CARLO	510
CRITICAL ASSEMBLY ANALYSIS	AI-A	360	F4	RSBP	PLX	T	C				\$VIM1X, MONTE CARLO	510
CRITICALITY CALCULATIONS	BAPL	7600	F+COM	RS	P	T	C				\$RECAP-12, MONTE CARLO	R670
CRITICALITY CODE	DP	360B	F+BAL	RSBP	CT		C				\$KENO2, MONTE CARLO MULTIGROUP	450
CRITICALITY CODE	ORNL	360C	F+BAL	RSBP	PLX	T	C				\$KENO4, MONTE CARLO MULTIGROUP	450
CRITICALITY CODE	RFD	6600B	F+CCM	RS	PLX	T	C				\$KENO2, MONTE CARLO MULTIGROUP	450
CRITICALITY SAFETY	DP	360	F4	RS	P	T	C				\$KEFF,MGBS,TGAN, NUCLEAR	617
CRNL	6600B	F4	RS	P	CT	P					\$FORSIM, SOLN OF PARTIAL OR ORDINARY DIFF EQNS	514
CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS			I				\$	112
CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS	P		O				\$	154
CROSS SECTIONS	LASL	6600	F4	RS	P		N				\$LARCA, FLUX-WEIGHTING OF DTF4	409
CROSS-SPECTRAL DENSITIES	BNW	1108	F5	RS	P	X	T	F			\$NOISY1, AUTO- AND	488
CROSS-SPECTRAL DENSITIES	BNW	7090	F4	RS	P	T	F				\$NOISY1, AUTO- AND	488
CROSS, IBM360 FORTRAN H PROGRAM CHECKER	ANL	360B	PL1	S	P	CT	P				\$SLOP,	647
CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	7044	F+SPS	RSBP		T	N				\$	207
CRYSTAL	MTS	7090	MAD	RSB		O					\$BURP5, GAMMA-RAY PHOTOFRACTION WELL	170
CRYSTAL	MTS	7090	MAD	RSB		O					\$BURP4, GAMMA-RAY PHOTOFRACTION SOLID	169
CRYSTALLINE MATERIALS	LASL	6600	F4	RS	P	T	A				\$TOR, THERMAL SCATTERING	360
CRYSTALLINE SCATTERING KERNEL CALC	GGA	7090	F2	RS		T	A				\$SUMMIT,	56
CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS			L				\$	194
CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS			L				\$	193

CURFIT

CYLINDEX

CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	6600	F+ASC	RS P	T P	\$	R			
CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	F+FAP	RS PL	T G	\$	190			
CURVE FITTING	LASL	7094	F4	RS	T P	\$	62			
CURVE FITTING	BAPL	6600	F4	RS P	T P	\$M0661,M0657,M0626, POLYNOMIAL	R411			
CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	6600	F+ASC	RS P	T P	\$	R 43			
CURVE PLOT	KAPL	6600	F+ASC	RS P	T P	\$SNEQ, NONLINEAR ALGEBRAIC EQN SOLN	R364			
CURVES	LLL	7094	F2	RS P	P	\$EXPALS, LEAST SQUARES EXPONENTIAL DECAY	321			
CUTTER CONTOUR GENERATOR				ANL	360	F4	RS P	T	\$F0355, SHAPER	697
CUTTER CONTOUR GENERATOR				BKC	6600	F4	RS P	T	\$F0355, SHAPER	697
CWE	360	F4	RS P	T D	\$CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS		354			
CYCLE ANALYSIS	AI	7094	F2	RS PL	T I	\$CYCLOPS1, THERMODYNAMIC	244			
CYCLE ANALYSIS	ORNL	360	F4	RS P	T H	\$ORSENT, NUCLEAR STEAM TURBINE	703			
CYCLE ANALYSIS FOR FAST REACTORS	ANL	360B	F+BAL	RSBPL	CT D	\$REBUS2, FUEL	634			
CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	F4	RS P	T D	\$GARGOYLE, FUEL	260			
CYCLE ANALYSIS W/REFUELING	GGA	7044	F4	RS P	T D	\$REVISED-GAD, FUEL	223			
CYCLE CALCULATION	GGA	1108	F4	S	T D	\$GAFFE, EQUILIBRIUM FUEL	302			
CYCLE COST ANALYSIS	AI	7090	F2	RS P	D	\$AIMFIRE, URANIUM FUEL	55			
CYCLE COST AND ECONOMICS	CWE	360	F4	RS P	T D	\$CINCAS, NUCLEAR FUEL	354			
CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P	T D	\$CINCAS, NUCLEAR FUEL	354			
CYCLE COST CALCULATION	GGA	1108	F4	RS P	T D	\$PWOST, REACTOR FUEL	441			
CYCLE COSTS PERFORMANCE DATA	ANL	360	F4	RS P	D	\$NPRFCCP, FUEL	146			
CYCLE COSTS PERFORMANCE DATA	UEC	6600	F4	RS P	D	\$NPRFCCP, FUEL	146			
CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	D	\$WAMPUM, FUEL	224			
CYCLE COSTS PERFORMANCE STUDY	UEC	6600	F4	RS P	D	\$WAMPUM, FUEL	224			
CYCLE ECONOMICS	UICS	360	F4	RS P	CT D	\$GEM, ANALYSIS OF NUCLEAR FUEL	576			
CYCLE GEOTHERMAL COST STUDY	BNW	6600	F4	RS P	T D	\$GEOCOST-BC, BINARY	711			
CYCLE PARAMETERS FAST BREEDERS	NED	635	F4	RS P	D	\$RAPFU, FUEL	372			
CYCLE REQUIREMENTS	ERDA	370B	F4	RS P	CT D	\$NUFUEL, NUCLEAR FUEL	683			
CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	7094	F2	RS PL	T I	\$	244			
CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	F4	RS	T I	\$	R266			
CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	AN-T	360B	F4	RSBP	CT I	\$	R449			
CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	6600	F4	RS P	T I	\$	R449			
CYL	ORNL	7090	F2	RS P	T C	\$EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB	39			
CYL	GGA	1108	F+BAL	RS P	T C	\$GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH,	430			
CYL	PW	1604	F63	RS	T C	\$2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM	192			
CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS P	B	\$BAM, S4	108			
CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS	B	\$S4	53			
CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P	B	\$S4	53			
CYL COOLANT INLET PLENUM	DP	360	F4	RS P	H	\$PLENUM, FLOW DIST. IN	586			
CYL FUEL ELEMENT	BAPL	6600	F4	RS	T I	\$CYGR02, STRESS ANALYSIS	R266			
CYL FUEL ELEMENTS	AEB	360	F4	RS P	B	\$SWELWING, MATERIAL BUCKLING	362			
CYL LATTICE	TVA	360B	F4	RSBPLXCT	B	\$LASER, SPECTRUM CALC WITH BURNUP	249			
CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	F4	RS P	T I	\$BUSHL,	R481			
CYL SPHERE	BNW	1107	F4	RS P	T C	\$SHFN, 1-D MULTI-GP DIFFUSION SLAB	241			
CYL SPHERE	AI	7090	F+FAP	RS L	T C	\$FAIM, 1-D MULTI-GP DIFFUSION SLAB	120			
CYL SPHERE	AI	7090	F+FAP	RS PL	T C	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB	29			
CYL SPHERE	CDC	1604	F63	RS PL	T C	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB	29			
CYL SPHERE	CDC	1604	F63	RS PLX	T C	\$FAIM, 1-D MULTI-GP DIFFUSION SLAB	120			
CYL SPHERE	OSUC	370	F4	RS PL	CT C	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB	29			
CYL SPHERE	AI	7090	F+FAP	RS L	T C	\$ULCER, 1-D MULTI-GP DIFFUSION SLAB	118			
CYL SPHERE	ANL	3600	F36	RS P	X T C	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB	262			
CYL SPHERE	MTS	360	F4	RSBPLXCT	C	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB	262			
CYL SPHERE	PURD	6500	F4	RS PLX	T C	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB	262			
CYL SPHERE	PW	1604	LAG1	RS P	C	\$MGDSN, 1-D MULTI-GP SN APPROX SLAB	211			
CYL SPHERE	UK-W	7090	F2	RS P	T C	\$W-DSN, 1-D MULTI-GP SN APPROX SLAB	132			
CYL SPHERE	BHSC	360	F4	RS P	T C	\$FAIMOS, 1-D MULTI-GP DIFFUSION SLAB	120			
CYL SPHERE GEOM	AI	7090	F2	RS P	J	\$GRACE2, GAMMA-RAY ATTENUATION	46			
CYL SPHERE GEOM	CDC	1604	F63	RS P	J	\$GRACE2, GAMMA-RAY ATTENUATION	46			
CYL, SPH	ANC	360	F4	RSBP	CT C	\$MONA, 1-D MULTIGROUP DIFFUSION SLAB,	582			
CYLINDER	ANL	3600	F63	RSBP	T H	\$ARGUS, TRANSIENT TEMPERATURE CALC	152			
CYLINDER	PPCO	7040	F4	RS P	T C	\$TOPIC, 1-D FEW-GP SN APPROXIMATION	148			
CYLINDER	PPCO	7090	F2	RS P	T C	\$TOPIC, 1-D FEW-GP SN APPROXIMATION	148			
CYLINDER	CDC	1604	F63	RS P	T C	\$20GRAND, 2-D FEW-GROUP DIFFUSION SLAB	40			
CYLINDER	ORNL	7090	F2	RS P	T C	\$20GRAND, 2-D FEW-GROUP DIFFUSION SLAB	40			

CYLINDER

DEFLECTION

CYLINDER SLAB	CDC	1604	F63	RS P	T C	\$EQUIPOISE3A, 2-D 2-GP DIFFUSION	87
CYLINDER SLAB	ORNL	7090	F2	RS P	T C	\$EQUIPOISE3A, 2-D 2-GP DIFFUSION	87
CYLINDER SPHERE	AEB	360	F4	RS	L T C	\$FIRE5, 1-D AGE-DIFFUSION SLAB	9
CYLINDER SPHERE	AI	7090	F2	RS P	T C	\$FOG, 1-D FEW-GP DIFFUSION SLAB	28
CYLINDER SPHERE	BC	625	F4	RS	T C	\$FOG, 1-D FEW-GP DIFFUSION SLAB	28
CYLINDER SPHERE	CDC	1604	F63	RS P	T C	\$FOG, 1-D FEW-GP DIFFUSION SLAB	28
CYLINDRICAL PINS	ANC	360	F4	RSBP	CT J	\$VIEWPIN, VIEW FACTOR CALC FOR	569
DAC	7090	F2	RSBP	J		\$LIPRECANI, MC NEUTRON PENETRATION CALCULATION	123
DAC1, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	F4	RS P	N	\$	455
DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	6600	F4	RS P	T P	\$	R327
DAMAGE IN METALS	GEC	7094	F+FAP	RSBP	T Q	\$CASCADE, CLUSTER, RADIATION	419
DAMMET, PLOTFB, ... ENDF/B V1 PFOC	BNL	6600B	F4	RS	T M	\$CHECKER, CRECT,	384
DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	AEG	7090	F2	PS	B	\$	150
DATA	ORNL	360	F+BAL	RS P	T I	\$LINDA, EVALUATION OF STRAIN-GAGE	657
DATA	SLA	6600	BIN	R	L T Z	\$SOLDATA8Q62, ALBUQUERQUE 1962 SOLAR	693
DATA	SLA	6600B	BCD	R	L T Z	\$SOLDATA8Q62, ALBUQUERQUE 1962 SOLAR	693
DATA	WAPD	7600	F4	RS P	T B	\$ETOT2, THERMAL LIBRARIES FROM ENDF/B	509
DATA	ANL	360	F4	RS P	D	\$NPRFCCP, FUEL CYCLE COSTS PERFORMANCE	146
DATA	UEC	6600	F4	RS P	D	\$NPRFCCP, FUEL CYCLE COSTS PERFORMANCE	146
DATA	NED	635	F4	RS P	T Q	\$FXPN, ANALYSIS OF PULSED NEUTRON SOURCE	258
DATA	BAPL	6600	F4	RS P	T B	\$EPCCCH, NEUTRON AGE CALCULATION OF ENDF/B	R461
DATA	BAPL	6600	F4	RS P	T P	\$DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE	R327
DATA	DP	360B	F4	RS P	XCT B	\$FLANGE2(71-1), ENDF/B THERMAL SCATTERING	368
DATA	ORNL	360	F4	RS P	T B	\$PRICE, PRIMARY RECDIL ATOM SPECTRA ENDF/B	453
DATA	AI	7094	F+MAP	RS P	A	\$CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST	215
DATA	FBRD	635	F+GMP	RS P	XCT B	\$ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B	501
DATA	LASL	6600	F4	RS P	T B	\$GLEN, GROUP CONSTANT CALC FROM TOP OUTPUT	361
DATA	UICS	360	F4	RS P	A	\$CODILLI, LEAST SQUARES ANALYSIS RESONANCE	347
DATA ANALYSIS	ANC	360	F4	RS	PL CT M	\$ERREST, LOCA ROD BUNDLE CHF	518
DATA ANALYSIS	CNEA	360	F4	RS P	E	\$STRIFDC, PULSED NEUTRON SOURCE	489
DATA ANALYSIS	GGA	1108	F5	RS P	T Q	\$CAGE, BIRD, SPEC, TIME-OF-FLIGHT	476
DATA ANALYSIS	BAPL	6600	F4	RS P	P	\$BH99, EXTREME VALUE DISTRIBUTION	R621
DATA ANALYSIS ROUTINES	BKC	360	F4	RS P	P	\$COMQC, QUALITY CONTROL	649
DATA CONVERSION	ANL	360	F4	RS P	CT M	\$ETOE, ENDF/B TO MC**2	350
DATA CONVERSION	APDA	3600	ASAF4	RS P	T M	\$ETOE, ENDF/B TO MC**2	350
DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	7090	F+FAP	RS P	T M	\$DFSR,	236
DATA HEAT TRANSFER STUDY SLL	6600	F4	RS P	N		\$HEATMESH, GEOMETRICAL	434
DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD	6500	BCD	R	L T Z	\$ETOG1	447
DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	6600	F4	RS P	T M	\$SHLOG,	R557
DATA POINTS	KAPL	6600	F+ASC	RS P	T P	\$CURFIT, CURVE FITTING EXPERIMENTAL	R 43
DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	F+FAP	RS P	T L	\$DPC,	234
DATA PROCESSING CODE	ANL	360	F4	RS	T M	\$RIGEL, ENDF/B V3	571
DATA PROCESSING MODULE	ANL	360	F4	RSBP	CT L	\$ARC-NU1002, BCD INPUT	533
DATA REDUCTION	ANL	3600	F63	RSBP	D	\$COINC, COINCIDENCE COUNTING	248
DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S	T M	\$JOSHUA,	490
DATA SYSTEM	KAPL	6600	F+CCM	RS P	T M	\$DATATRAN2, MODULAR PROGRAMMING AND	386
DATA TAPES	GGA	1108	BIN	R	L T Z	\$ZPR-III ASSEMBLY 48 GAFGAR ENDF/B	356
DATA TO THERMAL LIBRARY FORM	WAPD	7600	F4	RS P	T B	\$ETOT3, ENDF/B V3	628
DATATRAN2, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM	RS P	T M	\$	386
DATATRAN2, RAD1 GEOMETRY MODULES 2-D INPUT GEN	KAPL	6600	F+C+D	RS P	T L	\$	406
DATATRAN2, UTILITY PLOT MODULES, F(X) & F(X,Y)	KAPL	6600	F+C+D	RS P	T P	\$	407
DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS P	X T B	\$RESC2, RESQO,	R285
DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNW	1108	F5	RS P	T D	\$	456
DOB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP	RSBP	T D	\$	99
DE/STEP, INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	3600	F4	RS P	X T P	\$	640
DE/STEP, INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	6600D	F4	RS P	X T P	\$	640
DECAY	BNW	1108	F5	RSBP	T D	\$ISJGEN, RADIONUCLIDE GENERATION AND	367
DECAY	ORNL	1604	F63	RS P	D	\$ISOTOPES, MAXIMUM YIELD FROM REACTION OR	179
DECAY CHAIN ANALYSIS	ORNL	1604	F63	RS P	D	\$ISOCRUNCH, REACTION	180
DECAY CHAIN ANALYSIS	ORNL	7090	F2	RSBP	D	\$ISOCRUNCH, REACTION	180
DECAY CHAINS	GEC	635	F4	RSBP	D	\$CHAINS, ANALYSIS OF RADIOACTIVE	418
DECAY CURVES	LLL	7094	F2	RS P	P	\$EXPALS, LEAST SQUARES EXPONENTIAL	321
DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	F36	SBP	I	\$BOW2,	365
DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS P	T I	\$GAPL3, INELASTIC LARGE	R397

DEFORMATION

DIFFERENTIAL

DEFORMATION	AN-T	360B	F4	RSBP	CT	I	\$CYGR03, OXIDE FUEL ROD STRESS &	R449				
DEFORMATION	BAPL	6600	F4	RS	P	T	I	\$CYGR03, OXIDE FUEL ROD STRESS &	R449			
DEFORMATION	BAPL	6600	F4	RS	P	T	I	\$PELEN, FUEL PELLET TEMPERATURE &	R598			
DEMO4, CRBR REACTOR & PLANT TRANSIENT ANALYSIS				WARD	7600	F4	RS	P	T	K	\$	R676
DENSITIES	BNW	1108	F5	RS	P	X	T	F	\$NOISY1, AUTO- AND CROSS-SPECTRAL			488
DENSITIES	BNW	7090	F4	RS	P	T	F	\$NOISY1, AUTO- AND CROSS-SPECTRAL				488
DENSITY CALC	AI	7094	F+FAP	RS	PL	T	B	\$TYCHE3, MONTE CARLO SLOWING-DOWN				149
DEPLETION	AI	360	F4	RSBP	X	T	D	\$SIZZLE, 1-D MULTIGROUP DIFFUSION				58
DEPLETION	AI	7090	F2	RS	L	T	D	\$SIZZLE, 1-D MULTIGROUP DIFFUSION				58
DEPLETION	CDC	1604	F63	RS	L	T	D	\$SIZZLE, 1-D MULTIGROUP DIFFUSION				58
DEPLETION	KAPL	6600	F4	RS	P	T	D	\$3DXT,DEP3, 3-D XENON TRANSIENT &				R477
DEPLETION	LASL	7030	F4	RS	P	T	D	\$DTF-BURN, 1-D MULTI-GP DTF4 WITH				269
DEPLETION	ANC	360G	F+BAL	RS	P	XCT	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION				R275
DEPLETION	ANL	3600	F4	RSBP	T	D	\$2DB, 2-D MULTIGROUP DIFFUSION AND					325
DEPLETION	BAPL	6600A	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION				P275
DEPLETION	BAPL	6600C	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION				R275
DEPLETION	BCSS	6600D	F+ASC	R	B	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION				R275
DEPLETION	BNW	1108	F4	RS	P	T	D	\$2DB, 2-D MULTIGROUP DIFFUSION AND				325
DEPLETION	BW	6600B	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION				R275
DEPLETION	IBM	360A	F+BAL	RS	P	T	D	\$PDQ5, 2-D FEW-GROUP DIFFUSION AND				R336
DEPLETION	JNC	1108B	F5	RS	PLX	T	B	\$LEOPARD,SPOTS, SPECTRUM CALC WITH				279
DEPLETION	LASL	6600	F4	RS	P	T	D	\$2DB, 2-D MULTIGROUP DIFFUSION AND				325
DEPLETION	MIT	360B	F+BAL	RSBP	T	D	\$PDQ5, 2-D FEW-GROUP DIFFUSION AND					R336
DEPLETION	WAPD	360C	F4	RS	PLXCT	B	\$LEOPARD,SPOTS, SPECTRUM CALC WITH					279
DEPLETION	GGA	7044	F4	RS	P	T	D	\$RELOAD-FEVER, 1-D FEW-GP DIFFUSION				221
DEPLETION	BAPL	7600	F+COM	RS	P	T	D	\$TPT01, 2-D FEW-GROUP TRANSPORT WITH				R669
DEPLETION	GGA	1108	F4	RS	P	T	D	\$FEVER7, 1-D MULTIGROUP DIFFUSION AND				318
DEPLETION	GGA	1108	F4	RS	P	T	D	\$GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION				339
DEPLETION	NED	635	F+GMP	RS	P	T	D	\$SYN, 2D SYNTHESIS MULTIGP DIFF & IGP				495
DEPLETION CODE ORNL	7090	F+FAP	RS	P	T	D	\$ASSAULT, 2-D MULTI-GP DIFFUSION					240
DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS	P	T	D	\$CINDER,M0102, POINT				313
DEPLETION FISSION PRODUCT	DP	360	F+BAL	RS	P	T	D	\$CINDER,M0102, POINT				313
DEPLETION MULTI-GP ORNL	360I	F4	RS	P	T	K	\$CITATION, 1,2,3-D DIFFUSION					387
DEPLETION PROGRAM	ANC	360	F4	RSBP	CT	D	\$DWARF, 1-D FEW-GP DIFFUSION					579
DEPLETION PROGRAM	GGA	7090	F2	RSB	T	D	\$FEVER, 1-D FEW-GP DIFFUSION					117
DEP3, 3-D XENON TRANSIENT & DEPLETION				KAPL	6600	F4	RS	P	T	D	\$3DXT,	R477
DESIGN	BNW	1108	F5	RS	P	CT	H	\$REPP, THERMAL-HYDRAULIC WATER REACTOR				483
DESIGN	MLMO	360	F4	RSBP	C	P	\$LATIN SQ, NXN LATIN SQUARE EXPERIMENTAL					630
DESIGN & SURVEY STUDY	BW	6600	F+COM	RS	P	X	T	D	\$FARED, 1-D FAST REACTOR			427
DESIGN CRITERIA COSTS	GGA	7044	F4	RS	P	T	D	\$STMGEN, STEAM GENERATOR				227
DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	F63	RSBP	T	J	\$MAC, SHIELD					143
DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	F2	RSBP	T	J	\$MAC, SHIELD					143
DESIGN OF PRINTED-CIRCUIT BOARDS	SLA	1108	F+BAL	RSBP	T	T	\$ACCEL(MOD2),					681
DESIGN OF PRINTED-CIRCUIT BOARDS	SLA	6600	F+COM	RS	P	T	T	\$ACCEL(MOD2),				681
DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$CROCK, SPACE POWER PLANT						112
DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$SHOCK, SPACE POWER PLANT						114
DESIGN PROGRAMS	LASL	7090	F+FAP	RS	P	T	L	\$DPC, DATA PREPARATION FOR 2-D				234
DESIGN STUDY	PW	1604	F63	RS	P	T	I	\$PIP, CENTRIFUGAL PUMP IMPELLER				187
DESIGN STUDY	GGA	7044	F4	RS	P	I	\$GAZELLE5, GAS-COOLED CORE THERMAL					232
DESIGN SYSTEM	AI	360	F4	RSBP	T	K	\$THREDES, 1-D FEW-GP DIFFUSION					273
DESIGN SYSTEM	LASL	6600	F+COM	RS	P	T	P	\$LENSEDES, NONLINEAR LEAST SQ LENS				602
DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL	6600	F+ASC	RS	P	T	P	\$DOGGY,				R428
DETECTOR EFFICIENCY DISK SOURCE	MTS	7090	MAD	RSB	O	\$BURP2,						165
DETECTOR EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB	O	\$BURP1,						164
DETECTOR EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB	O	\$BURP3,						166
DFSR, DATA FILE SERVICE ROUTINES	ENDF	TAPES	BNL	7090	F+FAP	RS	P	T	M	\$		236
DIELECTRICS	ANL	360	F4	RS	P	CT	V	\$FFEARS, LAPLACE EQUATION ISOTROPIC				577
DIELECTRICS	SLA	6600B	F4	RS	P	T	V	\$FFEARS, LAPLACE EQUATION ISOTROPIC				577
DIFF & IGP DEPLETION	NED	635	F+GMP	RS	P	T	D	\$SYN, 2D SYNTHESIS MULTIGP				495
DIFF EQNS	CRNL	6600B	F4	RS	P	CT	P	\$FORSIM, SOLN OF PARTIAL OR ORDINARY				514
DIFF EQUATION SYSTEM SOLVER	LLL	360	F4	RS	P	X	T	P	\$EPISODE, ORDINARY			675
DIFF EQUATIONS	SLA	360D	F4	RS	P	X	T	P	\$DE/STEP,INTRP, SOLN OF ORDINARY			640
DIFF EQUATIONS	SLA	6600D	F4	RS	P	X	T	P	\$DE/STEP,INTRP, SOLN OF ORDINARY			640
DIFFERENTIAL EQN SYSTEM SOLVER	ANL	360C	F4	RS	P	X	P	\$GEAR, ORDINARY				592

DIFFERENTIAL

DIFFUSION

DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600C	F4	RS P X	P	\$GEAR, CRDINARY	592
DIFFERENTIAL EQNS. SOLUTION	KAPL	6600	F+ASC	RS P T P		\$LIZARD, NONLINEAR	R445
DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600	F4	RS P	A	\$BESFIT,	524
DIFFRACTION POWDER PATTERN INDEXING	LASL	6600	F+COM	RS P T Q		\$INDX, XRAY	609
DIFFUSION	ANL	360	F4	RS P	F	\$TWIGGLE, 2-D 2-GP SPACE-TIME	R338
DIFFUSION	ORNL	360	F+BAL	RS P CT C		\$VENTURE, 1, 2, OR 3-D MULTIGROUP	686
DIFFUSION	UMCC	360	F4	RS P T C		\$VARI-QUIR, TIME-DEP 2-D MULTI-GP	212
DIFFUSION	WANL	6600	F4	RS P T C		\$VARI-QUIR, TIME-DEP 2-D MULTI-GP	212
DIFFUSION	ANL	370	F+BAL	RS PLXCT C		\$SYN3D, SINGLE-CHANNEL FLUX SYNTHESIS	713
DIFFUSION	MIT	370	F4	RS P T F		\$GAKIN2, 1D MULTIGROUP TIME-DEPENDENT	310
DIFFUSION & BURNUP TRI-MESH	GGA	1108	F+BAL	RS P T D		\$BUGTRI, 2D MULTIGP	439
DIFFUSION & BURNUP XY, RZ	GGA	1108	F+BAL	RS P T D		\$BUG2, 2-D MULTIGROUP	438
DIFFUSION & INVENTORY	ANL	360	F4	RSBP CT C		\$ARC-DIF1D, 1-D MULTI-GP	626
DIFFUSION & LIB.	AI	360	F4	RSBPLX T C		\$CAESAR4, LIBLST, 1-D MULTI-GP	270
DIFFUSION & SN THEORY	NED	635	F4	RS P T C		\$DOT20B, 2-D MULTIGROUP	459
DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS	T B	\$M0807, 2-D	R280
DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP T D		\$2DB, 2-D MULTIGROUP	325
DIFFUSION AND DEPLETION	BNW	1108	F4	RS P T D		\$2DB, 2-D MULTIGROUP	325
DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P T D		\$PDQ5, 2-D FEW-GROUP	R336
DIFFUSION AND DEPLETION	LASL	6600	F4	RS P T D		\$2DB, 2-D MULTIGROUP	325
DIFFUSION AND DEPLETION	MIT	360B	F+BAL	RSBP T D		\$PDQ5, 2-D FEW-GROUP	R336
DIFFUSION AND DEPLETION	GGA	1108	F4	RS P T D		\$FEVER7, 1-D MULTIGROUP	318
DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P CT D		\$3DB, 3-D MULTIGROUP	567
DIFFUSION BURNUP ANALYSIS	HEDL	1108	F4	RS P T D		\$3DB, 3-D MULTIGROUP	567
DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P T D		\$PHENIX, 2-D	454
DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP	RSBP T D		\$DD8, 2-D FEW-GP	99
DIFFUSION CALC	KAPL	6600	F4	RS P F		\$RAUMZEIT, 1-D TIME-DEPENDENT	R352
DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS P T C		\$GATT, 3-C FEW-GP	380
DIFFUSION CYLINDER SLAB	CDC	1604	F63	RS P T C		\$EQUIPOISE3A, 2-D 2-GP	87
DIFFUSION CYLINDER SLAB	ORNL	7090	F2	RS P T C		\$EQUIPOISE3A, 2-D 2-GP	87
DIFFUSION DEPLETION	AI	360	F4	RSEP X T D		\$SIZZLE, 1-D MULTIGROUP	58
DIFFUSION DEPLETION	AI	7090	F2	RS L T D		\$SIZZLE, 1-D MULTIGROUP	58
DIFFUSION DEPLETION	CDC	1604	F63	RS L T D		\$SIZZLE, 1-D MULTIGROUP	58
DIFFUSION DEPLETION	ANC	360G	F+BAL	RS P XCT D		\$PDQ7, 1,2 OR 3-D FEW-GP	R275
DIFFUSION DEPLETION	BAPL	6600A	F+ASC	RS P T D		\$PDQ7, 1,2 OR 3-D FEW-GP	R275
DIFFUSION DEPLETION	BAPL	6600C	F+ASC	RS P T D		\$PDQ7, 1,2 OR 3-D FEW-GP	R275
DIFFUSION DEPLETION	BCSS	6600D	F+ASC	R B T D		\$PDQ7, 1,2 OR 3-D FEW-GP	R275
DIFFUSION DEPLETION	BW	6600B	F+ASC	RS P T D		\$PDQ7, 1,2 OR 3-D FEW-GP	R275
DIFFUSION DEPLETION	GGA	7044	F4	RS P T D		\$RELOAD-FEVER, 1-D FEW-GP	221
DIFFUSION DEPLETION	GGA	1108	F4	RS P T D		\$GAUGE, 2-D FEW-GP HEX GEOM	339
DIFFUSION DEPLETION CODE	ORNL	7090	F+FAP	RS P T D		\$ASSAULT, 2-D MULTI-GP	240
DIFFUSION DEPLETION MULTI-GP	ORNL	360I	F4	RS P T K		\$CITATION, 1,2,3-D	387
DIFFUSION DEPLETION PROGRAM	ANC	360	F4	RSBP CT D		\$DWARF, 1-D FEW-GP	579
DIFFUSION DEPLETION PROGRAM	GGA	7090	F2	RSB T D		\$FEVER, 1-D FEW-GP	117
DIFFUSION DESIGN SYSTEM	AI	360	F4	RSBP T K		\$THREDES, 1-D FEW-GP	273
DIFFUSION FAST X-SECTION GENERATION	ANL	360	F+BAL	RSBP XCT B		\$IDX, 1-D	374
DIFFUSION FAST X-SECTION GENERATION	BNW	1108	F4	RS P X T B		\$IDX, 1-D	374
DIFFUSION FEEDBACK	BAPL	6600	F4	RS P T F		\$TWIGL, 2-D 2-GP SPACE-TIME	R338
DIFFUSION FEEDBACK	BNL	6600	F4	RS P T F		\$NOAH, 1-D ONE-GP SPACE-TIME	405
DIFFUSION POWER DIST SEARCH	GGA	7044	F4	RS P T C		\$GASP2, 1-D FEW-GP	220
DIFFUSION PROGRAM	A4EC	360	F+BAL	RS P T C		\$SCRAM, 1-D AND 2-D MULTI-GP	103
DIFFUSION PROGRAM	ORNL	7090	F+FAP	RS P T C		\$EXTERMINATOR, 2-D MULTI-GP	156
DIFFUSION PROGRAM	UK-R	7090	F+FAP	RSBPL T C		\$SCRAM, 1-D AND 2-D MULTI-GP	103
DIFFUSION PROGRAM	BC	625	F4	RS T C		\$EXTERMINATOR2, 2-D MULTI-GP	156
DIFFUSION PROGRAM	CEND	6600	F4	RS P T C		\$EXTERMINATOR2, 2-D MULTI-GP	156
DIFFUSION PROGRAM	ORNL	360	F4	RS P T C		\$EXTERMINATOR2, 2-D MULTI-GP	156
DIFFUSION SLAB CYL	ORNL	7090	F2	RS P T C		\$EQUIPOISE3, 2-D 2-GROUP	39
DIFFUSION SLAB CYL SPHERE	BNW	1107	F4	RS P T C		\$HFN, 1-D MULTI-GP	241
DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L T C		\$FAIM, 1-D MULTI-GP	120
DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS PL T C		\$AIM6, 1-D MULTI-GP	29
DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PL T C		\$AIM6, 1-D MULTI-GP	29
DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PLX T C		\$FAIM, 1-D MULTI-GP	120
DIFFUSION SLAB CYL SPHERE	OSUC	370	F4	RS PL CT C		\$AIM6, 1-D MULTI-GP	29
DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L T C		\$ULCER, 1-D MULTI-GP	118

DIFFUSION

DOSE

DIFFUSION	SLAB	CYL	SPHERE	ANL	3600	F36	RS	P	X	T	C	\$MACH1, 1-D MULTI-GP	202		
DIFFUSION	SLAB	CYL	SPHERE	MTS	360	F4	RSBPLXCT	C				\$MACH1, 1-D MULTI-GP	202		
DIFFUSION	SLAB	CYL	SPHERE	PURD	6500	F4	RS	PLX	T	C		\$MACH1, 1-D MULTI-GP	262		
DIFFUSION	SLAB	CYL	SPHERE	BHSC	360	F4	RS	P	T	C		\$FAIMOS, 1-D MULTI-GP	120		
DIFFUSION	SLAB	CYLINDER	CDC	1604	F63		RS	P	T	C		\$20GRAND, 2-D FEW-GROUP	40		
DIFFUSION	SLAB	CYLINDER	ORNL	7090	F2		RS	P	T	C		\$20GRAND, 2-D FEW-GROUP	40		
DIFFUSION	SLAB	CYLINDER	SPHERE	AI	7090	F2	RS	P	T	C		\$FOG, 1-D FEW-GP	28		
DIFFUSION	SLAB	CYLINDER	SPHERE	BC	625	F4	RS			T	C	\$FOG, 1-D FEW-GP	28		
DIFFUSION	SLAB	CYLINDER	SPHERE	CDC	1604	F63	RS	P	T	C		\$FOG, 1-D FEW-GP	28		
DIFFUSION	SLAB, CYL, SPH		ANC	360	F4		RSBP	CT	C			\$MONA, 1-D MULTIGROUP	582		
DIFFUSION	SLAB, SPH, CYL		GGA	1108	F+BAL		RS	P	T	C		\$GAZE2, 1-D MULTIGROUP	430		
DIFFUSION	SYNTHESIS	CALC	NED	635	F4		RS	PL	T	C		\$BISYN, 2-D MULTI-GP	287		
DIFFUSION	SYNTHESIS	CALC	NED	1108	F4		RS	P	T	C		\$BISYN, 2-D MULTI-GP	287		
DIFFUSION	TEMP	COEF	CALC	GGA	7044	F4	RS	P	T	C		\$STEMCO, 1-D FEW-GP	225		
DIFFUSION	TRIANGULAR	MESH	GGA	1108	F+BAL		RS	P	T	C		\$GAMTRI, 2-D MULTI-GP	401		
DIFFUSION	W/FEEDBACK		BAPL	6600	F4		RS	P	T	F		\$WIGL3, 1-D SPACE-TIME	R708		
DIFFUSION	XY RZ	GEOMETRY	GGA	1108	F+BAL		RS	P	T	C		\$GAMBLE5, 2-D MULTI-GP	222		
DIFFUSION	XY RZ	GEOMETRY	GGA	7044	F+MAP		RSRP			T	C	\$GAMBLE4, 2-D MULTI-GP	222		
DIFFUSION	XY RZ	RTH	WANL	7094	F4		RS	P	X	T	C	\$VARI-QUIR3, 2-D MULTI-GP	264		
DIFFUSION	XYZ	GEOMETRY	CDC	1604	F63		RS	P		T	C	\$WHIRLAWAY, 3-D 2-GROUP	32		
DIFFUSION	XYZ	GEOMETRY	ORNL	7090	F2		RS	P		T	C	\$WHIRLAWAY, 3-D 2-GROUP	32		
DIFFUSION	XYZ	R-THETA-Z	LASL	6600	F4		RS	P	T	D		\$3DDT, 3-D MULTIGROUP	463		
DIFFUSION	3-GEOM		BAPL	6600	F4		RS	P	T	F		\$WIGL2, 1-D 2-GP SPACE-TIME	R274		
DIFFUSION	3-GEOM		GGA	1108	F4		RS	P	T	F		\$WIGL2, 1-D 2-GP SPACE-TIME	R274		
DISASSEMBLY			ANL	360	F4		RS	P	XCT	F		\$VENUS, 2-D LMFBR POWER EXCURSION	511		
DISCHARGE	STUDY		HEDL	1108	F5		RS	P	T	R		\$TOPLYR2, POWER PLANT THERMAL	599		
DISCRETE	ORDINATE	CALC		AI	7090	F2	RS	PLX	T	C		\$DTF2, 1-D MULTI-GP	151		
DISCRETE	ORDINATE	CALC		AI	360	F4	RSBPLX	T	C			\$ANISN, 1-D MULTI-GP	151		
DISCRETE	ORDINATE	CALC		UNC	1604	F63	RS	PL	T	C		\$DTF, 1-D MULTIGROUP	144		
DISCRETE	ORDINATE	CALC		ANL	3600	F36	RS	P		T	C	\$SNARG-1D, 1-D MULTI-GP	288		
DISCRETE	ORDINATE	CODE		GGA	1108	F5	RS	P		T	C	\$2DF, 2-D MULTI-GP	173		
DISCRETE	ORDINATE	CODE		UNC	1604	F63	RS				C	\$2DF, 2-D MULTI-GP	173		
DISCRETE	ORDINATE	MULTIGROUP		CONSTANTS	ORNL	360	F4	RS	PLX	T	B	\$XSDRN,	393		
DISCRETE	ORDINATE	PROGRAM		ANL	360	F+BAL	RS	P		T	C	\$DTF4, 1-D MULTI-GP	209		
DISCRETE	ORDINATE	PROGRAM		BC	625	F+MAP	RS	P		T	C	\$DTF4, 1-D MULTI-GP	209		
DISCRETE	ORDINATE	PROGRAM		LASL	6600	F4	RS	P		T	C	\$DTF4, 1-D MULTI-GP	209		
DISCRETE	ORDINATE	PROGRAM		LASL	7030	F4	RS	P		T	C	\$DTF4, 1-D MULTI-GP	209		
DISCRETE	ORDINATE	PROGRAM		LER	7094	F4	RS	P		T	C	\$DTF4, 1-D MULTI-GP	209		
DISCRETE	ORDINATE	PROGRAM		LER	7090	F+MAP	RS	P		T	C	\$TDSN, 2-D MULTIGROUP	312		
DISCRETE	ORDINATES	SLAB	GEOMETRY	BAPL	6600	F4	RS	P		T	C	\$BE21, FEW-GP	R398		
DISCRETE-ELEMENT	ANALYSIS	THIN	SHELLS	MIT	360	F4	RS	P	T	I		\$SABOR4,	R402		
DISK	SOURCE		MTS	7090	MAD	RSB				O		\$BURP2, DETECTOR EFFICIENCY	165		
DISPER, AEROSOL	PARTICLE	TRANSPORT	STUDY				RFD	3600	F36	RS	P	G	\$	554	
DISPLAY	DP		360	F+BAL	S	T	M			\$JOSHUA, DATA STORAGE, RETRIEVAL, AND			490		
DISSIMILAR	MEDIA	TLD	CORRECTION	CALC	AI	360	F4	RS	P	T	Q	\$RESPOND,	566		
DLC-2B	LIBRARY	GROUP	COLLAPSING		APG	6600	F4	RS			B	\$APRFX1, 99-GP	466		
DOCUMENT	INFORMATION	SYSTEM		KAPL	6600B	F+ASC	RSB	X	T	M		\$TIGIR2, MODULAR	R403		
DOGGY, DESK	CALCULATOR	FORM	SHEET	DP	PACKAGE		KAPL	6600	F+ASC	RS	P	T	P	\$	R428
DOMAIN	LLL		7600	F4	RS	P	T	T		\$WELL2B, WIRE CONFIGURATION FREQUENCY			721		
DOPIE, RESOLVED	RESONANCE	X-SECTION	CALC				NED	2000	F2	RS	P	A	\$	177	
DOPPLER	EFFECTS		NED	2000	F2	RS	P		B			\$SPARTA, SPATIALLY-AVERAGED	178		
DOS-MFT	REMOTE	WORKSTATION	PKG	ANL	360B	F+ASM	RSB	CT	P			\$WSP-HASP/DOS,	541		
DOS, NEUTRON	FLUX-DOSIMETER	ACTIVITY	RELATION		GEC	635	F4	RSBP		D		\$	423		
DOSE	PGE		360	F4	RS	P	T	G				\$EMERALD-NORMAL, PWR ACTIVITY RELEASE AND	685		
DOSE	AI		7094	F+MAP	RS	PL	T	G				\$CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL	196		
DOSE	ACCIDENT	STUDY		AI	370	F4	RS	P	CT	G		\$COMRADEX3, RADIOLOGICAL	663		
DOSE	CALC		AI	7094	F+MAP	RS	P		J			\$SHOE, SHIELD WEIGHT OPTIMIZATION	197		
DOSE	CALC		GGA	1108	F4	RS	T	G				\$GADOSE,DOSET, HTGR ACCIDENT ANALYSIS	261		
DOSE	INTEGRALS		DP	360	F4	RS	P		G			\$EGAD, CALC OF EXTERNAL GAMMA	600		
DOSE	RATE	CALCULATION	SNAP	GEOMETRY		AI	7090	F2	RS	P	J	\$RATRAP,	141		
DOSE	RATE	CALCULATION	SNAP	GEOMETRY		AI	7090	F2	RS			\$MORTIMER,	142		
DOSE	RATE	FROM	A	CLOUD		AI	7090	F2	RS	P	G	\$CLOUD, GAMMA-RAY	47		
DOSE	RATE	FROM	A	CLOUD		CDC	1604	F63	RS	P	G	\$CLOUD, GAMMA-RAY	47		
DOSE	RATE	FROM	A	CLOUD		DP	360	F4	RS	P	G	\$CLOUD, GAMMA-RAY	47		

DOSE

EBCDC

DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	7090	F2	RS	J	\$FARSELA,	91
DOSE, THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	F+FAP	RS	PL	T G \$CURIE,	196
DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	F4	RS	T G	\$GADOSE,	261
DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NED	635	F4	RS	P T C	\$	459
DOUBLE SN APPROX	RNW	7090	FLOCO	RSBP	T C	\$GE-HAPO-SL3, 1-D MULTI-GP	75
DOUBLE SN APPROX SLAB GFGM POCO		7090	F2	RS	P C	\$MIST, 1-D FEW-GP SN	59
DP 360 BC7 R LX T Z						\$THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS	543
DP 360 F+BAL S T M						\$JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	490
DP 360 F+BAL S X T B						\$RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES	536
DP 360 F+BAL RS P T D						\$CINDER, MO102, POINT DEPLETION FISSION PRODUCT	313
DP 360 F+BAL RS P XCT B						\$HAMMER, LITHE, HELP, CRITICAL ANALYSIS SYSTEM	277
DP 360 F4 RS P G						\$CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	47
DP 360 F4 RS P G						\$EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	600
DP 360 F4 RS P G						\$INTEG, INSPEC, MARKOV SIMULATION OF REACTOR OPN	590
DP 360 F4 RS P H						\$PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	586
DP 360 F4 RS P P						\$NIXLIN, LEAST SQUARES FIT TO NONLINEAR FORMS	709
DP 360 F4 RS P U						\$SOLVEX, SOLVENT EXTRACTION PROCESS SIMULATION	662
DP 360 F4 RS P T C						\$KEFF, MGBS, TGAN, NUCLEAR CRITICALITY SAFETY	617
DP 360 F4 RSBP Q						\$XDTRAP, HYDROGEN PERMEATION WITH TRAPPING	655
DP 360B EBCDC R L T Z						\$GAMTAB, RADIOACTIVE-DECAY GAMMA-RAY CATALOG	637
DP 360B F+BAL RSBP CT C						\$KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	450
DP 360B F4 RS P XCT B						\$FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	368
DP 360B F4 RSHP CT C						\$HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION	136
DP PACKAGE KAPL 6600 F+ASC RS P T P						\$DOGGY, DESK CALCULATOR FORM SHEET	R428
DP PURCHASE VERSUS LEASE ANALYSIS SLA 360						COBOL RSBP CT M \$BECOM, AEC	R589
DP PURCHASE VERSUS LEASE ANALYSIS SLA 1108						COBOL RS P M \$HECCM, AEC	R589
DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	F+FAP	RS	P T L	\$	234
DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	F4	RS	P T L	\$BL47,	R373
DSN OUTPUT PW 1604 LAG1 RS P N						\$DTX, EFFECTIVE X-SECTION CALC FROM	210
DSN TDC PW 1604 F63 RS P L						\$SNC, CALCULATION OF SN CONSTANTS FOR	189
DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	LASL	7030	F4	RS	P T D	\$	269
DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	UNC	1604	F63	RS	PL T C	\$	144
DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	7090	F2	RS	PLX T C	\$	151
DTF4 CROSS SECTIONS LASL 6600 F4 RS P N						\$LARCA, FLUX-WEIGHTING OF	409
DTF4 FLUXES LASL 6600 F4 RS P N						\$DAC1, SN PERTURBATION CODE USING	455
DTF4 WITH DEPLETION LASL 7030 F4 RS P T D						\$DTF-BURN, 1-D MULTI-GP	269
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	360	F+BAL	RS	P T C	\$	209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC	625	F+MAP	RS	P T C	\$	209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	6600	F4	RS	P T C	\$	209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	F4	RS	P T C	\$	209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LER	7094	F4	RS	P T C	\$	209
DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW	1604	LAG1	RS	P N	\$	210
DUCC 635 F4 RS G						\$ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	529
DUKE POWER MCGUIRE UNITS DUCC 635 F4 RS						G \$ANVENT, LOCA ANALYSIS	529
DUMP UTILITY BKY 7600 F+COM RS P T P						\$DUMP, USER-ORIENTED MEMORY	698
DUMP, USER-ORIENTED MEMORY DUMP UTILITY	BKY	7600	F+COM	RS	P T P	\$	698
DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	F+COM	RS	P T I	\$	R503
DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	F4	RSBP	CT D	\$	579
DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	F4	RS	P T H	\$	440
DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	F4	RS	P T H	\$DYNAM,	440
DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	F4	RS	P T I	\$M0552,	R283
DYNAMIC ANALYSIS OF GASES BY MASS SPECTROMETRY	RFO	360	F4	RS	P U	\$	645
DYNAMIC ANALYSIS OF THIN SHELLS	SLA	6600	F4	RS	P T I	\$SLADE-D,	581
DYNAMIC RESPONSE FINITE-ELEMENT CODE	SLA	6600B	F4	RS	P T I	\$HONDO, A	672
DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	F4	RS	P T I	\$FUGIT,	R537
DYNAMIC STORAGE ALLOC ORNL 360						\$GETCOR, FRECOR, FORTRAN	644
DYNAMIC STRUCTURAL ANALYSIS	ANC	360	F4	RSBP	CT I	\$STRAP, STATIC &	539
DYNAMICS AI 360 F+BAL RS P T E						\$AIROS2A, SIMULATION OF REACTOR	326
DYNAMICS ANL 360 F4 RS P T Q						\$GROUP2, GROUP THEORY OF LATTICE	620
DYNAMICS LASL 6600 F4 RS P T Q						\$GROUP2, GROUP THEORY OF LATTICE	620
DYNAMICS BAPL 6600 F4 RS P T I						\$M0266, LINEAR ELASTIC STRUCTURAL	R383
DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	F4	RS	P O	\$	R464
DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	F4	RS	P O	\$	R464
EDC R L T Z \$GAMTAB, RADIOACTIVE-DECAY GAMMA-RAY CATALOG						DP 360B	637

ECC

ENDF/B

ECC	BCL	6400	F4	RS P X T G	\$MUCHA1, MUCHA2, MULTIPLE CHANNEL ANALYSIS	506
ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL	6400	F4	RS P T G	\$	330
ECONOMICS	CWE	360	F4	RS P T D	\$CINCAS, NUCLEAR FUEL CYCLE COST AND	354
ECONOMICS	UICS	360	F4	RS P CT D	\$GEM, ANALYSIS OF NUCLEAR FUEL CYCLE	576
ECONOMICS	WAPD	6600	F4	RS P T D	\$CINCAS, NUCLEAR FUEL CYCLE COST AND	354
EDIT REACTION RATES	UK-W	7090	F2	RS	N \$WED, W-DSN OUTPUT TAPE	133
EDITING	ORNL	360B	F4	RS PL CT M	\$EDITOR, ENDF/B TAPE PROCESSING AND	502
EDITING	ORNL	6600	F4	RS P T M	\$EDITOR, ENDF/B TAPE PROCESSING AND	502
EDITING, & ANALYSIS	BAPL	6600	F4	RS P T M	\$SHLOG, DATA MANAGEMENT,	R557
EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	360B	F4	RS PL CT M	\$	502
EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	6600	F4	RS P T M	\$	502
EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW	1604	LAG1	RS P	N \$DXT,	210
EFFICIENCY DISK SOURCE	MTS	7090	MAD	RSB	O \$BURP2, DETECTOR	165
EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB	O \$BURP1, DETECTOR	164
EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB	O \$BURP3, DETECTOR	166
EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	DP	360	F4	RS P	G	\$
EI	360	F+BAL	RS P CT M	\$6KILER, CORE HEATUP CODE FOR BWR/6 ANALYSIS		636
EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600	F+ASC	RS P T I	\$GEM,	R344
EIGENVALUE/VECTOR PACKAGE	ANL	360B	F4	RSBP XCT P	\$EISPACK2, MATRIX	534
EIGENVALUE/VECTOR PACKAGE	ANL	PD10B	F4	RS P X T P	\$EISPACK2, MATRIX	534
EIGENVALUE/VECTOR PACKAGE	ANL	1110B	F4	RS P X T P	\$EISPACK2, MATRIX	534
EIGENVALUE/VECTOR PACKAGE	ANL	6600B	F4	RS P X T P	\$EISPACK2, MATRIX	534
EIGENVALUE/VECTOR PACKAGE	ANL	6700B	F4	RS P X T P	\$EISPACK2, MATRIX	534
EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	360B	F4	RSBP XCT P	\$	534
EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	PD10B	F4	RS P X T P	\$	534
EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	1110B	F4	RS P X T P	\$	534
EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	6600B	F4	RS P X T P	\$	534
EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	6700B	F4	RS P X T P	\$	534
ELASTIC ANALYSIS	BAPL	6600	F+COM	RS P X T I	\$MATUS, 3-D FINITE-ELEMENT	R597
ELASTIC SCAT RESONANCES	AI	360	F4	RS PLX T B	\$AILMOE, X-SECTION CALC	147
ELASTIC SCAT RESONANCES	AI	7094	F+FAF	RS PL T B	\$AILMOE, X-SECTION CALC	147
ELASTIC SCAT X-SEC	BNL	6600	F4	RS P	A \$BESFIT, DIFFRACTION MODEL	524
ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA	1108	F4	RS	B \$HEXSCAT,	291
ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL	1604	F63	RS P	A \$PEGGY,	334
ELASTIC SINGULARITY MODELING	SLA	6600	FTN	RS P T I	\$CHILES, LINEAR	611
ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P T I	\$M0457, PIPE,	R329
ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P T I	\$M0266, LINEAR	R383
ELASTIC STRUCTURES	BAPL	6600	F4	RS P T I	\$FUGIT, DYNAMIC RESPONSE OF	R537
ELASTIC SYSTEMS	BAPL	6600	F4	RS P T I	\$M0552, DYNAMIC ANALYSIS LINEAR	R283
ELASTIC-PLASTIC	BAPL	6600	F+COM	RS P T I	\$DUZ2, 2-D AXISYMMETRIC & PLANE	R503
ELBOW-ORNL, PIPE STRESS & FLEXIBILITY CALC	ORNL	360	F+BAL	RS P	I	\$
ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	F4	RS P T G	\$	229
ELECTRICITY COSTS	ORNL	1604	F63	RS P	D \$POWERCO, NUCLEAR STATION	340
ELECTRICITY COSTS	UEC	6600	F4	RS P	D \$POWERCO, NUCLEAR STATION	340
ELECTRON DISTRIBUTION	ANL	360	F4	RS P	O \$DYN01, PHOTOMULTIPLIER	R464
ELECTRON DISTRIBUTION	KAPL	6600	F4	RS P	O \$DYN01, PHOTOMULTIPLIER	R464
ELEM STUDY	NRC	370	F4	RSBP CT G	\$WREM-TOODEE2/MOD3, 2D TIME-DEP FUEL	712
EMERALD REV. 1, PWR ACCIDENT ACTIVITY RELEASE	PGE	360	F4	RS P T G	\$	546
EMERALD-NORMAL, PWR ACTIVITY RELEASE AND DGSE	PGE	360	F4	RS P T G	\$	685
EMERGENCY COOLING	BCL	6400	F4	RS P T G	\$ECCSA4, LOSS-OF-COOLANT &	330
ENDF MULTIGROUP X-SECTION CALCULATION	ANL	360	F4	RS P CT B	\$MC**2,	355
ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600	F36	RS P T B	\$MC**2,	355
ENDF TAPES	BNL	7090	F+FAF	RS P T M	\$DFSR, DATA FILE SERVICE ROUTINES	236
ENDF/B	ORNL	360	F4	RSBP XCT B	\$XLACS, XSDRN MULTIGROUP LIBRARIES FROM	572
ENDF/B DATA	WAPD	7600	F4	RS P T B	\$ETOT2, THERMAL LIBRARIES FROM	509
ENDF/B DATA	BAPL	6600	F4	RS P T B	\$EPOCH, NEUTRON AGE CALCULATION OF	R461
ENDF/B DATA	ORNL	360	F4	RS P T B	\$RICE, PRIMARY RECOIL ATOM SPECTRA	453
ENDF/B DATA	FBRD	635	F+GMP	RS P XCT B	\$ENDRUN2, MULTIGROUP CONSTANTS FROM	501
ENDF/B DATA TAPES	GGA	1108	BIN	R L T Z	\$ZPR-III ASSEMBLY 48 GAFGAR	356
ENDF/B FINE-GP CONSTANTS GENERATION	ORNL	360	F4	RS P T B	\$SUPERTO, G	431
ENDF/B FOR 1DX	HEDL	360	F4	RSBP XCT B	\$ETOX3, MULTI-GP CONSTANTS FROM	388
ENDF/B FOR 1DX	HEDL	1108B	F4	RS P X T B	\$ETOX3, MULTI-GP CONSTANTS FROM	388
ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6600	F4	RS P T B	\$ETOM1,	436
ENDF/B GRAPHIC X-SEC EVALUATION	AI	360	F+BAL	RSB L CT M	\$SCORE3, SCISRS	

ENDF/B

ETOG1

ENDF/B RESONANCE XSECTION CODES	BNL	6600B	F4	RS	P	T	A	\$PSEND,ADLER,	465	
ENDF/B SCAT KERNELS	DP	360	BCD	R	LX	T	Z	\$THERMOS LIBRARY, 30-GP	543	
ENDF/B TAPE PROCESSING AND EDITING	ORNL	360B	F4	RS	PL	CT	M	\$EDITOR,	502	
ENDF/B TAPE PROCESSING AND EDITING	ORNL	6600	F4	RS	P	T	M	\$EDITOR,	502	
ENDF/B THERMAL SCATTERING DATA	DP	360B	F4	RS	P	XCT	B	\$FLANGE2(71-1),	368	
ENDF/B TO GAFGAR X-SECTIONS	GGA	1108	F5	RS	P	T	B	\$ENDFB2,GAND2,GFE2,	596	
ENDF/B TO MC**2 DATA CONVERSION	ANL	360	F4	RS	P	CT	M	\$ETOE,	350	
ENDF/B TO MC**2 DATA CONVERSION	APDA	3600	ASAF4	RS	P	T	M	\$ETOE,	350	
ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	6600	F4	RS	PL	T	B	\$ETOG1,	437	
ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	7600	F4	RS	P	T	B	\$ETOG3,	538	
ENDF/B V1 PROC	BNL	6600B	F4	RS	T	M		\$CHECKER,CRECT,DAMMET,PLOTFB,...	384	
ENDF/B V2 PROC	BNL	6600B	F4	RS	T	M		\$CRECT,CHECKER,RIGEL,PLOTFB,...	475	
ENDF/B V2 PROCESSING CODES	ANL	360	F4	RS	P	T	M	\$CRECT,CHECKER,	475	
ENDF/B V3 DATA PROCESSING CODE	ANL	360	F4	RS	T	M		\$RIGEL,	571	
ENDF/B V3 DATA TO THERMAL LIBRARY FORM	WAPD	7600	F4	RS	P	T	B	\$ETOT3,	628	
ENDF/B V3 PROCESSING CODES	BNL	6600	F4	RS	T	M		\$CHECK3,RIGEL3,	571	
ENDF/B V4 PROCESSING CODES	BNL	6600B	F4	RS	T	M		\$RIGEL4,CHECK4,...	638	
ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS	GGA	1108	F5	RS	P	T	B	\$	596	
ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	FBRD	635	F+GMP	RS	P	XCT	B	\$	501	
ENEA 360 F4 RS P A								\$PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	292	
ENEA 360 F4 RS P A								\$THRES2, STATISTICAL MODEL REACTION X-SECTION	504	
ENEA 360 F4 RS P CT A								\$JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	308	
ENERGY COST ANALYSIS	BNW	6600	F4	RS	P	T	D	\$GEOCOST, GEOTHERMAL	684	
ENERGY FACILITY SITING ASSESSMENT	ANL	360	F4	RS	P	T	R	\$SITE2,	687	
ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	F4	RS	P	L		\$GAVER,	218	
ENERGY SYSTEM SIMULATION PROGRAM	SLA	6600	F4	RS	PL	T	R	\$SOLSYS, SOLAR	692	
ENERGY, LMFBR COOLANT TEMPERATURE PREDICTION	MIT	370	F4	RS	P	T	H	\$	696	
ENTRAINED PARTICLES SAMPLING STUDY	BAPL	6600	F4	RS	P	T	O	\$BETTY,	R545	
ENTRY SYSTEM	ANC	360	BAL	RSB	T	P		\$NRTS-RJE, OS/360 MVT REMOTE JOB	519	
ENVIRNMNTL LIB SCOPE2.0	CEND	7600B	F4	RS	T	P		\$MODEL, MODIFIED BETTIS	478	
ENVIRNMNTL LIB SCOPE3.2	CDC	6600C	F+CGM	RS	T	P		\$MODEL, MODIFIED BETTIS	478	
ENVIRNMNTL LIB SCOPE3.3	CDC	6600D	F+CGM	RS	T	P		\$MODEL, MODIFIED BETTIS	478	
ENVIRONMENT LIBRARY	BAPL	6600	F+COM	RS	T	P		\$BETTIS PROGRAMMING	R665	
ENVIRONMENT LIBRARY	BAPL	7600	F+COM	RS	T	P		\$BETTIS PROGRAMMING	R665	
ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES	ANC	360B	F+BAL	RSB	T	P		\$NRTS	613	
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	635	F+GMP	RS	T	P		\$GENED	515	
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	6600A	F+ASC	RS	T	P		\$BETTIS	478	
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW	6600B	F+ASC	RS	T	P		\$BETTIS	478	
EPISODE, ORDINARY DIFF EQUATION SYSTEM SOLVER	LLL	360	F4	RS	P	X	T	P	\$	
EPISODEB, SOLVE ODE SYST WITH BANDED JACOBIAN	LLL	360	F4	RS	P	X	T	P	\$	
EPITHERMAL X-SECTIONS	NED	635	F4	RS	P	T	B	\$REAX, RESOLVED RESONANCE	257	
EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	NED	7094	F+FAF	RS	P	T	B	\$	201	
EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	6600	F4	RS	P	T	B	\$	R461	
EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS	P	T	P	\$SNEQ, NONLINEAR ALGEBRAIC	R364	
EQN SYSTEM SOLVER	ANL	360C	F4	RS	P	X	P	\$GEAR, ORDINARY DIFFERENTIAL	592	
EQN SYSTEM SOLVER	LLL	6600C	F4	RS	P	X	P	\$GEAR, ORDINARY DIFFERENTIAL	592	
EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	F4	S	T	D		\$GAFFE,	302	
EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	7090	F2	RS	P	T	C	\$	39	
EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CDC	1604	F63	RS	P	T	C	\$	87	
EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	7090	F2	RS	P	T	C	\$	87	
ERDA 370B F4 RS P CT D								\$NUFUEL, NUCLEAR FUEL CYCLE REQUIREMENTS	683	
ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS	P	P		\$	601	
ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS	P	P		\$ERF,	601	
ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC	360	F4	RS	PL	CT	M	\$	518	
ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS	P	P		\$ERF,ERFC,	601	
ERROR FUNCTION	SLA	6600	F4	RS	P	P		\$ERF,ERFC, ERROR & COMPLEMENTARY	601	
ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	360	F+BAL	RSBPL	CT	C		\$	523	
ESTIMATE	GGA	1108	F4	RS	P	XCT	D	\$CCNCEPT3, POWER PLANT CONCEPTUAL COST	498	
ESTIMATE	ORNL	360B	F4	RS	P	X	T	D	\$CONCEPT4, POWER PLANT CONCEPTUAL COST	498
ESTIMATING	ORNL	360	F+BAL	RS	P	T	D	\$ORCOST2, POWER PLANT CAPITAL COST	588	
ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	360	F4	RS	P	CT	M	\$	350	
ETOE, ENDF/B TO MC**2 DATA CONVERSION	APDA	3600	ASAF4	RS	P	T	M	\$	350	
ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD	6600	BCD	R	L	T	Z	\$	447	
ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	6600	F4	RS	PL	T	B	\$	437	

ETQG3

F+BAL

ETQG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	7600	F4	RS P	T B	\$	538
ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6600	F4	RS P	T B	\$	436
ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPD	7600	F4	RS P	T B	\$	509
ETOT3, ENDF/B V3 DATA TO THERMAL LIBRARY FORM	WAPD	7600	F4	RS P	T B	\$	628
ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX	HEDL	360	F4	RSBP	XCT B	\$	386
ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX	HEDL	1108B	F4	RS P	X T B	\$	288
EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS P	I	\$TURE, U-TUBE HEAT	R378
EXCURSION ANL 360 F4	RS P	CT F	\$REXCO-H, 2-D HYDRODYNAM RESPONSE TO				550
EXCURSION ANL 360 F4	RS P	CT F	\$REXCO-H2, 2-D HYDRODYNAM RESPONSE TO				R615
EXCURSION CALCULATION PZ GEOMETRY	APDA	7094	F4	RS P	F	\$MAPS, 2-D	293
EXCURSION CALCULATIONS	NED	2000	F4	RS P	T F	\$FORE, FAST REACTOR	174
EXCURSION CALCULATIONS	ANL	360	F4	RS P	X T F	\$FORE2, FAST REACTOR	174
EXCURSION CALCULATIONS	NED	635	F4	RS P	X T F	\$FORE2, FAST REACTOR	174
EXCURSION DISASSEMBLY	ANL	360	F4	RS P	XCT F	\$VENUS, 2-D LMFBR POWER	511
EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LLL	7094	F2	RS P	P	\$	321
EXPERIMENT UCND 360B F+BAL RS P	O	\$PMS1, FAST NEUTRON POLARIZATION					469
EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P	T O	\$JITER, FLUCTUATION	R394
EXPERIMENT ANALYSIS	AGC	7090	F2	RS P	O	\$CROC90, ML-1 FLUID FLOW	154
EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P	T O	\$REDUX, REACTOR FLUCTUATION	F425
EXPERIMENTAL DATA POINTS	KAPL	6600	F+ASC	RS P	T P	\$CURFIT, CURVE FITTING	P 43
EXPERIMENTAL DESIGN	MLMD	360	F4	RSBP	C P	\$LATIN SQ, NXN LATIN SQUARE	630
EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	F2	RS P	F	\$WEAK	145
EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED	635	F4	RS P	T O	\$	258
EXPONENTIAL DECAY CURVES	LLL	7094	F2	RS P	P	\$EXPALS, LEAST SQUARES	321
EXPONENTIALS	MIT	7090	F2	RS P	P	\$FRANTIC, LEAST SQUARES FIT SUM OF	324
EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL	7094	F2	PS P	A	\$	238
EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	7090	F+AP	RS P	T C	\$	156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	625	F4	PS	T C	\$	156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CEND	6600	F4	RS P	T C	\$	156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	360	F4	RS P	T C	\$	156
EXTERNAL GAMMA DOSE INTEGRALS	DP	360	F4	RS P	G	\$EGAD, CALC OF	600
EXTERNAL+INTERNAL DOSE	AI	7094	F+AP	RS PL	T G	\$CURIE, DOSE, THUNDERHEAD,	196
EXTRACTION PROCESS SIMULATION	DP	360	F4	RS P	U	\$SOLVEX, SOLVENT	662
EXTRACTION PROCESS SIMULATION	ORNL	360	F4	RS P	T U	\$SEPHIS, SOLVENT	690
EXTREME VALUE DISTRIBUTION DATA ANALYSIS	BAPL	6600	F4	RS P	P	\$BH99,	F621
F S P X T P	\$FUNPACK2, SPECIAL FUNCTION ROUTINES	ANL	6600B				610
F R	\$PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	ANL	GFTS				591
F RS P	\$SOLA, SOLA-SURF, TRANSIENT FLUID FLOW ALGORITHM	LASL	7600B				651
F RS P T G	\$HAA3B, AEROSOL BEHAVIOR LOGNORMAL MODEL	AI	370				443
F RS P T H	\$SIEX, LMFBR FUEL PIN THERMAL PERFORMANCE MODEL	HEDL	6600				673
F RS P T P	\$STFODE, COLODE, COLLOCATION SOLN OF STIFF ODE'S	SLA	6600				652
F RSBP T P	\$STFODE, COLODE, COLLOCATION SOLN OF STIFF ODE'S	ANL	360				652
F(X) & F(X,Y)	KAPL 6600 F+C+D RS P T P	\$DATATRAN2, UTILITY PLOT MODULES,					407
F(X,Y)	KAPL 6600 F+C+D RS P T P	\$DATATRAN2, UTILITY PLOT MODULES, F(X) &					407
F+ASC R B T D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BCSS	6600D				R275
F+ASC RS P	\$SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL	6600				R442
F+ASC RS T P	\$BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	6600A				478
F+ASC RS T P	\$BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW	6600B				478
F+ASC RS P T D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600A				R275
F+ASC RS P T D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600C				R275
F+ASC RS P T D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BW	6600B				R275
F+ASC RS P T H	\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	6600				R299
F+ASC RS P T I	\$GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600				R344
F+ASC RS P T J	\$ASPIS, GAMMA-RAY SOURCE BUILDUP FACTOR CALC	BAPL	6600				R429
F+ASC RS P T J	\$SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	BAPL	6600B				R462
F+ASC RS P T P	\$CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	6600				R 43
F+ASC RS P T P	\$DCGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL	6600				R428
F+ASC RS P T P	\$LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	6600				R445
F+ASC RS P T P	\$SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	6600				R364
F+ASC RS P X T B	\$RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600				R285
F+ASC RSB X T M	\$TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	6600B				R403
F+ASM RSB CT P	\$WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	ANL	360B				541
F+BAL S T M	\$JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360				490
F+BAL S X T B	\$RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP	360				536

F+BAL

F+COM

F+BAL	RS	T	P	\$AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F	ANL	360	563
F+BAL	RS	T	P	\$FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	AI	360	484
F+BAL	RS	P	D	\$ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	360	322
F+BAL	RS	P	D	\$OMCST, POWER PLANT NON-FUEL O & M COST STUDY	ORNL	360	688
F+BAL	RS	P	I	\$ELBOW-ORNL, PIPE STRESS & FLEXIBILITY CALC	ORNL	360	650
F+BAL	RS	P	O	\$PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCND	360R	469
F+BAL	RS	P	T	A \$CGMNUC, CASCADE, COMPOUND NUCLEUS REACTION	AI	360	482
F+BAL	RS	P	T	B \$RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	360B	392
F+BAL	RS	P	T	C \$GRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC	360	103
F+BAL	RS	P	T	C \$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	360	209
F+BAL	RS	P	T	C \$GAMBLES, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	222
F+BAL	RS	P	T	C \$GAMTRI, 2-D MULTI-GP DIFFUSION TRIANGULAR MESH	GGA	1108	401
F+BAL	RS	P	T	C \$GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	430
F+BAL	RS	P	T	D \$BUGTRI, 2D MULTIGP DIFFUSION & BURNUP TRI-MESH	GGA	1108	439
F+BAL	RS	P	T	D \$BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA	1108	438
F+BAL	RS	P	T	D \$CINDER, MU102, POINT DEPLETION FISSION PRODUCT	DP	360	313
F+BAL	RS	P	T	D \$ORCOST2, POWER PLANT CAPITAL COST ESTIMATING	ORNL	360	588
F+BAL	RS	P	T	D \$PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	P336
F+BAL	RS	P	T	E \$AIRGS2A, SIMULATION OF REACTOR DYNAMICS	AI	360	326
F+BAL	RS	P	T	E \$BLQOST6, COMBINED KINETICS 2-D HEAT TRANSFER	GGA	1108	303
F+BAL	RS	P	T	G \$COMCAN, SYSTEM SAFETY COMMON CAUSE ANALYSIS	ANC	360	704
F+BAL	RS	P	T	G \$WHAM6, LIQUID-FILLED PIPING SYSTEM ANALYSIS	ANC	360B	278
F+BAL	RS	P	T	I \$LINDA, EVALUATION OF STRAIN-GAGE DATA	ORNL	360	657
F+BAL	RS	P	T	I \$SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL	360	332
F+BAL	RS	P	T	O \$GSSLRN18, LEAST SQUARES PHOTOPEAK SPECTRA CODE	BNW	1108	457
F+BAL	RS	P	T	O \$TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	333
F+BAL	RS	P	CT	A \$U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI	360	553
F+BAL	RS	P	CT	C \$VENTURE, 1, 2, OR 3-D MULTIGROUP DIFFUSION	ORNL	360	686
F+BAL	RS	P	CT	H \$6KILER, CORE HEATUP CODE FOR BWR/6 ANALYSIS	EI	360	636
F+BAL	RS	P	X	T B \$HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI	360	307
F+BAL	RS	P	X	T D \$ORSIM, OPTIMIZING UTILITY GENERATION PLANNING	ORNL	360	699
F+BAL	RS	P	X	T H \$FRAP-S1, STEADY STATE ANALYSIS OXIDE FUEL RODS	ANC	360	694
F+BAL	RS	P	X	T Q \$MARLOWE, BINARY COLLISION CASCADE SIMULATION	ORNL	360B	680
F+BAL	RS	P	X	CT B \$HAMMER, LITHE, HELP, CRITICAL ANALYSIS SYSTEM	DP	360	277
F+BAL	RS	P	X	CT D \$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC	360G	R275
F+BAL	RS	P	PL	XCT C \$SYN3D, SINGLE-CHANNEL FLUX SYNTHESIS DIFFUSION	ANL	370	713
F+BAL	RSB	T	P	\$NRTS ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES	ANC	360B	613
F+BAL	RSB	CT	P	\$PROGLOOK, USER PROGRAM PERFORMANCE MONITOR	SLAC	360B	642
F+BAL	RSB	L	CT	M \$SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI	360	375
F+BAL	RSBP	T	D	\$PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	360B	R336
F+BAL	RSBP	T	M	\$SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	1108	R607
F+BAL	RSBP	T	T	\$ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT BOARDS	SLA	1108	681
F+BAL	RSBP	CT	C	\$KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	DP	360B	450
F+BAL	RSBP	CT	M	\$ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	360	522
F+BAL	RSBP	X	CT	B \$1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	ANL	360	374
F+BAL	RSBP	X	CT	G \$FRAP-T, TRANSIENT ANALYSIS OF OXIDE FUEL RODS	ANC	360	658
F+BAL	RSBPL	CT	B	\$RAFFLE2/MOD2, MONTE CARLO NEUTRON TRANSPORT	ANC	360	631
F+BAL	RSBPL	CT	C	\$ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	360	523
F+BAL	RSBPL	CT	D	\$REBUS2, FUEL CYCLE ANALYSIS FOR FAST REACTORS	ANL	360B	634
F+BAL	RSBPL	CT	G	\$PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	360	555
F+BAL	RSBPL	X	CT	C \$KENO4, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	360C	450
F+BAL	RSBPL	X	CT	G \$CONTEMPT-LT/026, PRESSURE-TEMPERATURE RESPONSE	ANC	360	433
F+BAL	RSBPL	X	CT	G \$RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY	ANC	360E	369
F+C+D	RS	P	T	L \$DATATRAN2, PAD1 GEOMETRY MODULES 2-D INPUT GEN	KAPL	6600	406
F+C+D	RS	P	T	P \$DATATRAN2, UTILITY PLOT MODULES, F(X) & F(X,Y)	KAPL	6600	407
F+C+R	RSBP	T	M	\$RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMO	360	G603
F+CDP	RS	P	T	P \$LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET	PW	1604	186
F+CDP	RS	P	X	T B \$FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	1604	195
F+COB	RSBP	X	CT	P \$RANDOM SAMPLING TABLE, FOR NON-BIAS ORDERING	MLMO	360	679
F+COM	RS	T	P	\$BETTIS PROGRAMMING ENVIRONMENT LIBRARY	BAPL	6600	R665
F+COM	RS	T	P	\$BETTIS PROGRAMMING ENVIRONMENT LIBRARY	BAPL	7600	R665
F+COM	RS	T	P	\$KAPL PLOT, KAPL CALCOMP PLOTTING ROUTINES	KAPL	6600	R496
F+COM	RS	T	P	\$LASLIB, LOS ALAMOS SUBROUTINE LIBRARY ROUTINES	LASL	6600C	633
COM	RS	T	P	\$MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.2	CDC	6600C	478

F+COM

F+MAP

F+COM	RS	T	P	\$MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3	CDC	6600D	470
F+COM	RS	P	H	\$HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	6600	R560
F+COM	RS	P	T	\$RECAP-0, RECAP-12 X-SECTION LIBRARY GENERATION	BAPL	6600	R671
F+COM	RS	P	T	\$RECAP-12, MCNTE CARLO CRITICALITY CALCULATIONS	BAPL	7600	R670
F+COM	RS	P	T	\$TPT01, 2-D FEW-GROUP TRANSPORT WITH DEPLETION	BAPL	7600	R669
F+COM	RS	P	T	\$DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	R503
F+COM	RS	P	T	\$GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	R397
F+COM	RS	P	T	\$GNATS, MESH2, GPRINT, 2-D NONLINEAR ANALYSIS	SLL	6600	682
F+COM	RS	P	T	\$DATATRAN2, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	386
F+COM	RS	P	T	\$DUMP, USER-ORIENTED MEMORY DUMP UTILITY	BKY	7600	698
F+COM	RS	P	T	\$LENSEDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	6600	602
F+COM	RS	P	T	\$INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	6600	609
F+COM	RS	P	T	\$ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT BOARDS	SLA	6600	681
F+COM	RS	P	CT	\$FTA, FAULT TREE ANALYSIS SYSTEM	ARHC	6600	666
F+COM	RS	P	X	\$PAX03, HARMONY-PDQ X-SECTION GENERATION CODE	BAPL	6600	R426
F+COM	RS	P	X	\$FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	BW	6600	427
F+COM	RS	P	X	\$MATUS, 3-D FINITE-ELEMENT ELASTIC ANALYSIS	BAPL	6600	R597
F+COM	RS	P	X	\$MATHLIB, SANDIA MATHEMATICAL SUBROUTINES	SLA	6600C	654
F+COM	RS	PLX	T	\$KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFD	6600B	450
F+COM	RS	PLXCT	G	\$RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY	ANC	7600B	369
F+COM	RS	PLXCT	G	\$RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY	ANC	7600C	369
F+COM	RS	P	G	\$SPOOL-FIRE, SPRAY-POOL BURNING OF SODIUM	ANL	370	R714
F+FAP	RS	T	I	\$4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	109
F+FAP	RS	L	T	\$QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	7090	119
F+FAP	RS	L	T	\$FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	120
F+FAP	RS	L	T	\$ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	118
F+FAP	RS	L	T	\$MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	7094	159
F+FAP	RS	P	I	\$WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	7090	315
F+FAP	RS	P	J	\$SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	7094	197
F+FAP	RS	P	T	\$EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	NED	7094	201
F+FAP	RS	P	T	\$SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LLL	7090	160
F+FAP	RS	P	T	\$EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	7090	156
F+FAP	RS	P	T	\$ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	ORNL	7090	240
F+FAP	RS	P	T	\$AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	7094	172
F+FAP	RS	P	T	\$DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	234
F+FAP	RS	P	T	\$DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	7090	236
F+FAP	RS	PL	T	\$SAILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	147
F+FAP	RS	PL	T	\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	185
F+FAP	RS	PL	T	\$GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	7094	162
F+FAP	RS	PL	T	\$STEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	7090	50
F+FAP	RS	PL	T	\$TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	149
F+FAP	RS	PL	T	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	29
F+FAP	RS	PL	T	\$CURIE, DOSE, THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	196
F+FAP	RSB	T	A	\$TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	42
F+FAP	RSB	T	A	\$ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	41
F+FAP	RSBP	T	D	\$DDB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	99
F+FAP	RSBP	T	Q	\$CASCADE, CLUSTER, RADIATION DAMAGE IN METALS	GEC	7094	419
F+FAP	RSBPL	T	C	\$CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7090	103
F+FAP	RSBPL	T	N	\$CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	239
F+FAP	RSBPLX	T	B	\$AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	204
F+GMP	RS	T	P	\$GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	635	515
F+GMP	RS	P	T	\$SYN, 2D SYNTHESIS MULTIGP DIFF & IGP DEPLETION	NED	635	495
F+GMP	RS	P	XCT	\$ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	FBRD	635	501
F+GMP	RS	P	XCT	\$TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	FBRD	635	505
F+GMP	RSBP	T	H	\$THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	346
F+MAP	RS	P	A	\$CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	7094	215
F+MAP	RS	P	A	\$COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	7040	203
F+MAP	RS	P	T	\$GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	219
F+MAP	RS	P	T	\$GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	219
F+MAP	RS	P	T	\$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC	625	209
F+MAP	RS	P	T	\$TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	312
F+MAP	RS	P	T	\$AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7094	163
F+MAP	RS	P	T	\$TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	309
F+MAP	RS	P	T	\$BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	209

F+MAP

FEEDBACK

F+MAP	RS P	T H	\$TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	349
F+MAP	RS PLX T	A	\$TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	7094	208
F+MAP	RSBP	M	\$UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	7044	206
F+MAP	RSBP	T C	\$GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	222
F+MAP	RSBP	T G	\$SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KECS	7094	200
F+P+A	RS	T P	\$AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E	ANL	360	562
F+P+A	RS	T P	\$AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL	360	564
F+P+A	RSBP XCT	W	\$GAUSS6, BATCH ANALYSIS OF GAMMA-RAY SPECTRA	ANC	360	622
F+SLE	RS P	G	\$SAFTAC, MONTE CARLO FAULT TREE SIMULATION CODE	UNI	1108	674
F+SLE	RS P XCT	R	\$HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	HEDL	1108	527
F+SPS	RSBP	T N	\$CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	7044	207
FACILITY SITING ASSESSMENT			ANL 360 F4 RS P T R \$SITE2, ENRGY			687
FACTOR CALC	BAPL 6600	F+ASC	RS P T J \$ASPI5, GAMMA-RAY SOURCE BUILDUP			R429
FACTOR CALC FOR CYLINDRICAL PINS	ANC 360	F4	RSBP CT J \$VIEWPIN, VIEW			569
FACTOR SHIELDING CODE CAVITY GEOM	GGA 1108	F4	RS P T J \$MUSCAT, VIEW			259
FACTORS	ORNL 360	F4	RS P T A \$ATHENA4, INELASTIC SCATTERING FORM			417
FAILURE MODE	BAPL 6600	F4	RS P P \$RELO1, RELIABILITY FOR A SINGLE			R497
FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP RS L T C \$			120
FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63 RS PLX T C \$			120
FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BHSC	360	F4 RS P T C \$			120
FAP	RS P T H	\$RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7094	242	
FAP	RSBP X T Q	\$SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	7090	422	
FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	BW	6600	F+COM RS P X T D \$			427
FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	7090	F2 RS J \$			91
FAST + INTERMEDIATE POWER TRANSIENTS	BAPL 6600	F4	RS P T H \$CHIC-KIN,			R473
FAST BREEDERS	NED 635	F4	RS P D \$RAPFU, FUEL CYCLE PARAMETERS			372
FAST NEUTRON POLARIZATION EXPERIMENT	UCND	360B	F+BAL RS P O \$PMS1,			469
FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	F2 RS PL T B \$FORM,			51
FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63 RS LX T B \$GAM1,			33
FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63 RS PL T B \$FORM,			51
FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63 RS PLX T B \$GAM1,			33
FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	F2 RS PLX T B \$GAM1,			33
FAST NEUTRON SPECTRUM X-SECTION CALC	OSUC	370	F4 RS PLXCT B \$FORM,			51
FAST REACTOR CORE ACCIDENT ANALYSIS	NED 635	F4	RS P T G \$FREADM1,			479
FAST REACTOR DESIGN & SURVEY STUDY	BW 6600	F+COM	RS P X T D \$FARED, 1-D			427
FAST REACTOR EXCURSION CALCULATIONS	NED 2000	F4	RS P T F \$FORE,			174
FAST REACTOR EXCURSION CALCULATIONS	ANL 360	F4	RS P X T F \$FORE2,			174
FAST REACTOR EXCURSION CALCULATIONS	NED 635	F4	RS P X T F \$FORE2,			174
FAST REACTOR FUEL BURNUP & MANAGEMENT	NED 635	F4	RS P T D \$FUMBLE,			480
FAST REACTOR POWER AND FLOW TRANSIENTS	ANL 360	F4	RS P T F \$SASIA,			400
FAST REACTOR POWER AND FLOW TRANSIENTS	ANL 6600	F4	RS P T F \$SASIA,			400
FAST REACTOR TRANSIENT OVERPOWER STUDY	HEDL 6600	F4	RS P CT F \$MELT3,			700
FAST REACTOR X-SEC CALC	BNW 1108	F4	RS P T B \$FCC4, FUNDAMENTAL MODE			306
FAST REACTORS	ANL 360B	F+BAL	RSBP CT D \$REBUS2, FUEL CYCLE ANALYSIS FOR			634
FAST SPECTRA CALC	ANC 360	F4	RS PLXCT B \$PHROG, MULTI-GP CONSTANT &			520
FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC 7090	F+PAP	RSBP CT B \$AGN-GAM,			204
FAST THERMAL SPECTRA	GGA 1108B	F4	RS PLXCT B \$GGC4, MULTI-GP X-SECTIONS			298
FAST THERMAL SPECTRA	WANL 6600	F4	RS L T B \$GGC4, MULTI-GP X-SECTIONS			298
FAST X-SECTION GENERATION	ANL 360	F+BAL	RSBP XCT B \$1DX, 1-D DIFFUSION			374
FAST X-SECTION GENERATION	BNW 1108	F4	RS P X T B \$1DX, 1-D DIFFUSION			374
FATIGUE	KAPL 6600	F4	RS I \$SORSDB, PRESSURE VESSEL STRESS AND			R391
FAU, RADIO FREQUENCY MANAGEMENT SYSTEM	ALGO 360	COBCL	RS P M \$AEC-ALO			587
FAULT TREE ANALYSIS SYSTEM	ARHC 6600	F+COM	RS P CT G \$FTA,			666
FAULT TREE EVALUATION CODES	ANC 360	F4	RSBP CT G \$PREP,KITT, SYSTEM			528
FAULT TREE EVALUATION CODES	ANC 1108	F4	RS P T G \$PREP,KITT, SYSTEM			528
FAULT TREE SIMULATION CODE	UNI 1108	F+SLE	RS P G \$SAFTAC, MONTE CARLO			674
FAULT TREES	ANC 360	F4	RSBP CT G \$MOCUS, MINIMAL SETS FROM			653
FBRD 635	F+GMP	RS P XCT B	\$ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA			501
FBRD 635	F+GMP	RS P XCT B	\$TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS			505
FBRD 635	F4	RS P CT I	\$BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT			R568
FBRD H600	F4	RS P CT C	\$TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS			585
FCC4, FUNDAMENTAL MODE	FAST REACTOR X-SEC CALC	BNW 1108	F4 RS P T B \$			306
FEEDBACK	BAPL 6600	F4	RS P T F \$NOWIG, 1-D 2-GP KINETICS TEMPERATURE			R371
FEEDBACK	BAPL 6600	F4	RS P T F \$TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION			R338

FEEDBACK

FITTING

FEEDBACK	BNL	6600	F4	RS P	T F	\$NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION	405
FEEDBACK	GGA	1108	F4	RS P	T F	\$GAKIT, 1-D MULTIGP KINETICS WITH TEMP	370
FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	F2	RSB	T D	\$	117
FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108	F4	RS P	T D	\$	318
FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP	RSBP	T D	\$CDP, 2-D	99
FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS P	T C	\$GATT, 3-D	380
FEW-GP DIFFUSION DEPLETION	ANC	360G	F+BAL	RS P	XCT D	\$PDQ7, 1,2 OR 3-D	R275
FEW-GP DIFFUSION DEPLETION	BAPL	6600A	F+ASC	RS P	T D	\$PDQ7, 1,2 OR 3-D	R275
FEW-GP DIFFUSION DEPLETION	BAPL	6600C	F+ASC	RS P	T D	\$PDQ7, 1,2 OR 3-D	R275
FEW-GP DIFFUSION DEPLETION	BCSS	6600D	F+ASC	R B	T D	\$PDQ7, 1,2 OR 3-D	R275
FEW-GP DIFFUSION DEPLETION	BW	6600B	F+ASC	RS P	T D	\$PDQ7, 1,2 OF 3-D	R275
FEW-GP DIFFUSION DEPLETION	GGA	7044	F4	RS P	T D	\$RELOAD-FEVER, 1-D	221
FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	F4	RSBP	CT D	\$QWAF, 1-D	579
FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	F2	RSB	T D	\$FEVER, 1-D	117
FEW-GP DIFFUSION DESIGN SYSTEM	AI	360	F4	RSBP	T K	\$THREDES, 1-D	273
FEW-GP DIFFUSION POWER DIST SEARCH	GGA	7044	F4	RS P	T C	\$GASP2, 1-D	220
FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	7090	F2	RS P	T C	\$FOG, 1-D	28
FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	F4	RS	T C	\$FOG, 1-D	28
FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	1604	F63	RS P	T C	\$FOG, 1-D	28
FEW-GP DIFFUSION TEMP COEF CALC	GGA	7044	F4	RS P	T C	\$STEMCO, 1-D	225
FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	6600	F4	RS P	T C	\$RE21,	R398
FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS P	T D	\$GAUGE, 2-D	339
FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	F4	RS P	T C	\$TOPIC, 1-D	148
FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS P	T C	\$TOPIC, 1-D	148
FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCO	7090	F2	RS P	C	\$MIST, 1-D	59
FEW-GP S4 APPROXIMATION RZ GEOMETRY	LLL	709	F2	RS	C	\$FIRN, 2-D	7
FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P	T D	\$PDQ5, 2-D	R336
FEW-GROUP DIFFUSION AND DEPLETION	MIT	360B	F+BAL	RSBP	T D	\$PDQ5, 2-D	R336
FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	1604	F63	RS P	T C	\$20GRAND, 2-D	40
FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	F2	RS P	T C	\$20GRAND, 2-D	40
FEW-GROUP SPACE-TIME KINETICS	BCL	6400	F4	RS P	T F	\$ADEP, 1-D & 2-D	494
FEW-GROUP TRANSPORT WITH DEPLETION	BAPL	7600	F+COM	RS P	T D	\$TPT01, 2-D	R669
FFEARs, LAPLACE EQUATION ISOTROPIC DIELECTRICS	ANL	360	F4	RS P	CT V	\$	577
FFEARs, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	6600B	F4	RS P	T V	\$	577
FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	F4	RS P	T H	\$	R272
FIGs, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS	T P	\$	484
FILE PROCESSOR LASL	360	F4	RS P	CT M	\$LASIP3, CCCC STANDARD INTERFACE		691
FILE SERVICE ROUTINES ENDF TAPES	BNL	7090	F+FAP	RS P	T M	\$DFSR, DATA	236
FINDING ROOTS OF A POLYNOMIAL	KAPL	6600	F4	RS P	P	\$ROPE,	R444
FINE-GP CONSTANTS GENERATION	ORNL	360	F4	RS P	T B	\$SUPERTOG, ENDF/B	431
FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	F4	RS P	X I	\$	R404
FINITE-ELEMENT FBRD	635	F4	RS P	CT I	\$BEHAVE2, OXIDE FUEL PERFORMANCE		R568
FINITE-ELEMENT BEAM CREEP ANALYSIS	HEDL	6600	F4	RS P	T I	\$BEAMCRP,	R701
FINITE-ELEMENT CODE	SLA	6600B	F4	RS P	T I	\$HONDO, A DYNAMIC RESPONSE	672
FINITE-ELEMENT ELASTIC ANALYSIS	BAPL	6600	F+COM	RS P	X T I	\$MATUS, 3-D	R597
FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	F4	RS P	X I	\$FINEL,	R404
FINS SNAP GEOM	AI	7090	F2	RS	J	\$SCARF2, SCATTER FROM RADIATOR	110
FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	RS P	T G	\$SOFIRE2, SODIUM POOL	559
FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	360	F4	RS	L T C	\$	9
FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LLL	709	F2	RS	C	\$	7
FISSILE NUCLIDE DATA	BAPL	6600	F4	RS P	T P	\$DAFT1, LEAST SQUARES FIT	R327
FISSILE NUCLIDE X-SECTION EVALUATION	ORNL	7090	F4	RSBP	A	\$MUFFLE,	323
FISSION PRODUCT	BAPL	6600	F4	RS P	D	\$CINDER,M0102, POINT DEPLETION	313
FISSION PRODUCT	DP	360	F+BAL	RS P	T D	\$CINDER,M0102, POINT DEPLETION	313
FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	F4	RS P	D	\$RAD2, HTGR	231
FISSION PRODUCT FUEL MODEL	ANC	360	F4	RSBP	CT G	\$FPFM, STEADY-STATE	584
FISSION PRODUCT RELEASE	GGA	1108	F4	RS P	D	\$FREVAP6, HTGR METALLIC	301
FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	F4	RS P	G	\$FRCRL2, LOCA	500
FIT FISSILE NUCLIDE DATA	BAPL	6600	F4	RS P	T P	\$DAFT1, LEAST SQUARES	R327
FIT SUM OF EXPONENTIALS	MIT	7090	F2	RS P	P	\$FRANTIC, LEAST SQUARES	324
FIT TO NONLINEAR FORMS	DP	360	F4	RS P	P	\$NIXLIN, LEAST SQUARES	709
FITTING	LASL	7094	F4	RS	T P	\$LASL LEAST SQUARES, GENERAL CURVE	62
FITTING	BAPL	6600	F4	RS P	T P	\$M0661,M0657,M0626, POLYNOMIAL CURVE	R411
FITTING	KAPL	6600	F4	RS P	A	\$CLEM, ANGULAR DISTRIBUTION LEGENDRE	R531

FITTING

FLUX

FITTING EXPERIMENTAL DATA POINTS	KAPL	6600	F+ASC	RS P	T P	\$CURFIT, CURVE	R 43
FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	1108	F5	RS P	H	\$	395
FLANGE-ORNL, ANALYSIS OF FLANGED JOINTS	ORNL	360	F4	RS P	T I	\$	689
FLANGED JOINTS	ORNL	360	F4	RS P	T	\$FLANGE-ORNL, ANALYSIS OF	689
FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	1108	F5	RS P	A	\$	247
FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	360B	F4	RS P	XCT B	\$	368
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	3600	F63	RSBP	T C	\$	167
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360	F4	RS P	CT C	\$	167
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	635	F4	RS P	T C	\$	167
FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P	T G	\$	R295
FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	MA-G	360	F4	RSBP	CT G	\$	R448
FLASH6, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	7600	F4	RS P	T G	\$	R448
FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	RSBP	X T B	\$RABBLE, WL1B,	281
FLEXIBILITY CALC	ORNL	360	F+BAL	RS P	I	\$ELBOW-ORNL, PIPE STRESS &	650
FLIGHT COLLISION PROBABILITIES MC	ORNL	360B	F+BAL	RS P	T B	\$RAFFLE, 1ST	392
FLOCO RS P B	\$MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	7090				202
FLOCO RS P B	\$ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	7090				113
FLOCO RSBP C	\$2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090				18
FLOCO RSBP T C	\$GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW	7090				75
FLOCO2 INSTRUCTION SET	PW	1604	F+CDP	RS P	T P	\$LAG, ASSEMBLER FOR	186
FLOT1, MO219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T H	\$	R331
FLOW AI 7094 F2	RS P H	\$FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE					246
FLOW MSS 360 F4	RS P H	\$FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE					246
FLOW LASL 6600 F4	RS P T U	\$PRICE-LASL, CHEMICALLY REACTIVE MIXTURE					720
FLOW LASL 7600 F4	RS P H	\$SOLA-ICE, TRANSIENT COMPRESSIBLE FLUID					723
FLOW BAPL 7600B F4	RS P T H	\$FLOW3, NETWORK ANALYSIS OF 3-D TWO-PHASE					R664
FLOW & TEMPERATURE DIST.	ORNL	360	F4	RS P	T H	\$HORRIBLE, ROD BUNDLE	629
FLOW ALGORITHM LASL 7600B F	RS P H	\$SOLA, SOLA-SURF, TRANSIENT FLUID					651
FLOW AND HEAT TRANSFER AI 7094 F2	RS P T G	\$TRANS-FUGUE1, TRANSIENT					268
FLOW DIST. IN CYL COOLANT INLET PLENUM	DP	360	F4	RS P	H	\$PLENUM,	586
FLOW DISTRIBUTION KAPL 6600 F4	RS P T H	\$SHAFMAT, SYSTEM STEADY-STATE					R616
FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS P	O	\$CROC90, ML-1 FLUID	154
FLOW IN LMFBR ROD BUNDLE	NED	635	F4	RS P	T H	\$VELVET2, TURBULENT	458
FLOW IN VENTED FLUID SYSTEM	LASL	7600	F4	RS P	T H	\$COMPARE, TRANSIENT	702
FLOW IN VENTED FLUID SYSTEM	NRC	370	F4	RS P	T H	\$COMPARE, TRANSIENT	702
FLOW STEAM	GGA	1108	F4	RS P	T H	\$DYNAM, DYNAMIC ANALYSIS BOILING	440
FLOW STUDY STEAM-WATER MIX	KAPL	6600	F4	RS P	H	\$RAPP, HIGH-VELOCITY	R382
FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T H	\$FLOT1, MO219, PWR	R331
FLOW TRANSIENTS	ANL	360	F4	RS P	T F	\$SASIA, FAST REACTOR POWER AND	400
FLOW TRANSIENTS	ANL	6600	F4	RS P	T F	\$SASIA, FAST REACTOR POWER AND	400
FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094	F2	RS P	H	\$	246
FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	F4	RS P	H	\$	246
FLOW, PRESSURE DISTRIBUTION	GGA	1108	F5	RS P	H	\$FLAC, STEADY-STATE	395
FLOW3, NETWORK ANALYSIS OF 3-D TWO-PHASE FLOW	BAPL	7600B	F4	RS P	T H	\$	R664
FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P	T O	\$JITER,	R394
FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P	T O	\$REDUX, REACTOR	R425
FLUID FLOW	LASL	7600	F4	RS P	H	\$SOLA-ICE, TRANSIENT COMPRESSIBLE	723
FLUID FLOW ALGORITHM	LASL	7600B	F	RS P	H	\$SOLA, SOLA-SURF, TRANSIENT	651
FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS P	O	\$CROC90, ML-1	154
FLUID HAMMER ANALYSIS OF PIPING SYSTEM	HEDL	6600	F4	RS P	T G	\$HAMOC,	710
FLUID HAMMER ANALYSIS PIPING SYSTEM	ANL	360	F4	RS P	G	\$NAHAMMER,	717
FLUID HAMMER ANALYSIS PIPING SYSTEM	ANL	7600	F4	RS P	G	\$NAHAMMER,	717
FLUID HAMMER ANALYSIS 1-D PIPING	ANL	360	F4	RS P	G	\$NATRANSIENT,	718
FLUID HAMMER ANALYSIS 1D & 2D SYSTEMS	ANL	360	F4	RS P	T G	\$NATRAN2,	719
FLUID SYSTEM	LASL	7600	F4	RS P	T H	\$COMPARE, TRANSIENT FLOW IN VENTED	702
FLUID SYSTEM	NRC	370	F4	RS P	T H	\$COMPARE, TRANSIENT FLOW IN VENTED	702
FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090	F2	RS P	B	\$BOUNCE,	237
FLUX INPUT	PW	1604	F63	RS	C	\$TDP, 2-D PERTURBATION TDC OR 2DXY	199
FLUX SETS	FBRD	H600	F4	RS P	CT C	\$TRIAL, 3-D REACTION RATES FROM 2-D	585
FLUX SYNTHESIS DIFFUSION	ANL	370	F+BAL	RS	PLXCT C	\$SYN3D, SINGLE-CHANNEL	713
FLUX SYNTHESIS PROGRAM CYL	PW	1604	F63	RS	T C	\$2DXYL, 3-D MULTI-GP	192
FLUX-DOSIMETER ACTIVITY RELATION	GEC	635	F4	RSBP	D	\$DOS, NEUTRON	423
FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	6600	F4	RS P	N	\$LARCA,	409
FLUX, X-SEC CALC	ORNL	360	F+BAL	RS P	D	\$ISOSEARCH, ISOTOPE PRODUCTION	322

FLUX

FUEL

FLUX, X-SEC CALC	ORNL	1604	F63	RS P	D	\$ISOSEARCH, ISOTOPE PRODUCTION	322
FLUXES	LASL	6600	F4	RS P	N	\$DAC1, SN PERTURBATION CODE USING DTF4	455
FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS P	X T B	\$FMC-N,	195
FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	GGA	7044	F4	RS P	T B	\$	195
FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS P	X T B	\$	195
FOG CODES	AI	7090	F2	RS	C	\$PERT, 1-D PERTURBATION FOR AIM AND	30
FOG CODES	BHSC	360	F4	RS P	C	\$PERT, 1-D PERTURBATION FOR AIM AND	30
FOG CODES	CDC	1604	F63	RS	C	\$PERT, 1-D PERTURBATION FOR AIM AND	30
FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	7090	F2	RS P	T C	\$	28
FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	F4	RS	T C	\$	28
FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	1604	F63	RS P	T C	\$	28
FORE, FAST REACTOR EXCURSION CALCULATIONS	NED	2000	F4	RS P	T F	\$	174
FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360	F4	RS P	X T F	\$	174
FORE2, FAST REACTOR EXCURSION CALCULATIONS	NED	635	F4	RS P	X T F	\$	174
FORM WAPD 7600	F4	RS P	T B	\$ETOT3, ENDF/B V3 DATA TO THERMAL LIBRARY			628
FORM FACTORS	ORNL	360	F4	RS P	T A	\$ATHENA4, INELASTIC SCATTERING	417
FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	360	F4	RSB-L	T M	\$CLIP,	271
FORM SHEET DP PACKAGE	KAPL	6600	F+ASC	RS P	T P	\$DOGGY, DESK CALCULATOR	428
FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	F2	PS PL	T B	\$	51
FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PL	T B	\$	51
FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	OSUC	370	F4	RS PLXCT	B	\$	51
FORMAT WAPD 6600	F4	RS PL	T B	\$ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC			437
FORMAT WAPD 7600	F4	RS P	T B	\$ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC			538
FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6600	F4	RS P	T B	\$ETOM1, ENDF/B	436
FORMAT X-SECTIONS	WAPD	6600	F4	RS P	T B	\$ETOM1, ENDF/B	436
FORMS	DP	360	F4	RS P	P	\$NIXLIN, LEAST SQUARES FIT TO NONLINEAR	709
FORSIM, SOLN OF PARTIAL OR ORDINARY DIFF EQNS	CRNL	6600B	F4	RS P	CT P	\$	514
FORTRAN	SLAC	360	F4	RSBP	XCT P	\$MORTAN2, MACRO-BASED STRUCTURED	678
FORTRAN DYNAMIC STORAGE ALLOC	ORNL	360	BAL+F	RS P	CT P	\$GETCOR, FRECOR,	644
FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS	T P	\$FIGS, IBM360&2250	484
FORTRAN H PROGRAM CHECKER	ANL	360B	PL1	S P	CT P	\$SLOP, CROSS, IBM360	647
FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ	PW	1604	F63	RS P	T C	\$	161
FORTRAN UTILITIES	ANC	360B	F+BAL	RSB	T P	\$NRTS ENVIRONMENTAL ROUTINES,	613
FPPM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	F4	RSBP	CT G	\$	584
FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	F2	RS P	P	\$	324
FRAP-S1, STEADY STATE ANALYSIS OXIDE FUEL RODS	ANC	360	F+BAL	RS P	X T H	\$	694
FRAP-T, TRANSIENT ANALYSIS OF OXIDE FUEL RODS	ANC	360	F+BAL	RSBP	XCT G	\$	658
FRCL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	F4	RS P	G	\$	500
FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NED	635	F4	RS P	T G	\$	479
FRECOR, FORTRAN DYNAMIC STORAGE ALLOC	ORNL	360	BAL+F	RS P	CT P	\$GETCOR,	644
FREE-FORMAT CARD INPUT PROCESSOR	LASL	360	F4	RS P	L	\$GENRD,	530
FREE-FORMAT CARD INPUT PROCESSOR	LASL	6600	F4	RS P	L	\$GENRD,	530
FREQUENCY DOMAIN	LLL	7600	F4	RS P	T T	\$WFLLL2B, WIRE CONFIGURATION	721
FREQUENCY MANAGEMENT SYSTEM	ALGO	360	COBOL	RS P	M	\$AEC-ALD FAU, RADIO	587
FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P	D	\$	301
FSDP3, POINTWISE XSECS. FROM B-W PARAMETERS	GGA	1108	F5	RS P	CT A	\$	216
FTA, FAULT TREE ANALYSIS SYSTEM	ARHC	6600	F+COM	RS P	CT G	\$	666
FTN	RS P	G	\$SPRAY2, SODIUM SPRAY RELEASE SAFETY ANALYSIS			HEDL 7600	716
FTN	RS P	T I	\$CHILES, LINEAR ELASTIC SINGULARITY MODELING			SLA 6600	611
FTN	RS P	T P	\$SETS, SET EQUATION TRANSFORMATION SYSTEM			SLA 6600B	623
FUEL BURNUP & MANAGEMENT	NED	635	F4	RS P	T D	\$FUMBLE, FAST REACTOR	480
FUEL CYCLE ANALYSIS FOR FAST REACTORS	ANL	360B	F+BAL	RSBP	CT D	\$REBUS2,	634
FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	F4	RS P	T D	\$GARGOYLE,	260
FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	F4	RS P	T D	\$REVISED-GAD,	223
FUEL CYCLE CALCULATION	GGA	1108	F4	S	T D	\$GAFFE, EQUILIBRIUM	302
FUEL CYCLE COST ANALYSIS	AI	7090	F2	RS P	D	\$AIMFIRE, URANIUM	55
FUEL CYCLE COST AND ECONOMICS	CWE	360	F4	RS P	T D	\$CINCAS, NUCLEAR	354
FUEL CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P	T D	\$CINCAS, NUCLEAR	354
FUEL CYCLE COST CALCULATION	GGA	1108	F4	RS P	T D	\$PWOCOST, REACTOR	441
FUEL CYCLE COSTS PERFORMANCE DATA	ANL	360	F4	RS P	D	\$NPRFCCP,	146
FUEL CYCLE COSTS PERFORMANCE DATA	UEC	6600	F4	RS P	D	\$NPRFCCP,	146
FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	D	\$WAMPUM,	224
FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	6600	F4	RS P	D	\$WAMPUM,	224
FUEL CYCLE ECONOMICS	UICS	360	F4	RS P	CT D	\$GEM, ANALYSIS OF NUCLEAR	576

FUEL

F2

FUEL CYCLE PARAMETERS FAST BREEDERS	NED	635	F4	PS P	D	\$RAPFU,	372
FUEL CYCLE REQUIREMENTS	ERDA	370B	F4	RS P	CT D	\$NUFUEL, NUCLEAR	683
FUEL ELEM STUDY NRC	370	F4	RSBP	CT G	\$WREM-TOODEE2/MOD3, 2D TIME-DEP		712
FUEL ELEMENT	BAPL	6600	F4	RS	T I	\$CYGRO2, STRESS ANALYSIS CYL	R266
FUEL ELEMENT	AGC	7090	F2	RS P	B	\$BOUNCE, FLUX DIST IN MULTI-PIN	237
FUEL ELEMENT ANALYSIS	BAPL	6600	F4	RS P	T H	\$GLUB1, WATER-LOGGED	R424
FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	F36	RSBP	I	\$SWELL2,	353
FUEL ELEMENT PERFORMANCE	ANL	370	F4	RS P	CT I	\$LIFE3, MIXED-OXIDE	R460
FUEL ELEMENT PERFORMANCE	ANL	7600	F4	RS P	T I	\$LIFE3, MIXED-OXIDE	R460
FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	F4	RS P	T G	\$ELBOW,	229
FUEL ELEMENTS	AEB	360	F4	RS P	B	\$WELWING, MATERIAL BUCKLING CYL	362
FUEL MODEL ANC	360	F4	RSBP	CT G	\$FPFM, STEADY-STATE FISSION PRODUCT		584
FUEL PELLET TEMPERATURE & DEFORMATION	BAPL	6600	F4	RS P	T I	\$PELEN,	R598
FUEL PERFORMANCE FINITE-ELEMENT	FBRD	635	F4	RS P	CT I	\$BEHAVE2, OXIDE	R568
FUEL PIN THERMAL PERFORMANCE MODEL	HEDL	6600	F	RS P	T H	\$SIEX, LMFBR	673
FUEL PIN THERMAL-HYDRAULIC ANALYSIS	ANL	3608	F4	RSBP	CT H	\$COBRA3M,	659
FUEL ROD CLAD STRAIN & PELLET CRACKING	BAPL	6600	F4	RS P	I	\$STRIPE,	R570
FUEL ROD STRESS & DEFORMATION	AN-T	360B	F4	RSBP	CT I	\$CYGRO3, OXIDE	R449
FUEL ROD STRESS & DEFORMATION	BAPL	6600	F4	RS P	T I	\$CYGRO3, OXIDE	R449
FUEL ROD THERMAL RESPONSE LOCA	ANC	360	F4	RSBP	X T G	\$THETA1-B,	512
FUEL RODS ANC	360	F+BAL	RSBP	XCT G	\$FRAP-T, TRANSIENT ANALYSIS OF OXIDE		658
FUEL RODS ANC	360	F+BAL	RS P	X T H	\$FRAP-S1, STEADY STATE ANALYSIS OXIDE		694
FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	6600	F4	RS P	T I	\$RUBL1,	R468
FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	F4	RS P	T H	\$FIGRO, LWBR	R272
FUEL TEMPERATURE CODE	GGA	7044	F4	RS	I	\$CORE, CORE CONFIGURATION	233
FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H	\$AXFLU, HEAT TRANSFER MOLTEN	182
FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H	\$AXTHRM, HEAT TRANSFER SOLID	183
FUELPIN ANL	360	F4	RS P	H	\$MARGE/SLUMP, MAXIMUM TEMPERATURE LMFBR		677
FUELPIN GAP CONDUCTANCE CALC	BNW	6600	F4	RS P	T I	\$GAPCON-THERMAL2,	618
FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	F4	RS P	T I	\$	R537
FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090	F2	RS	I	\$	48
FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	1108	F+BAL	RSBP	T M	\$SPIRAL,	R607
FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	7600	F4	RS P	T G	\$FLASH6,	R448
FULLY-IMPLICIT TRANSIENT SIMULATION	MA-G	360	F4	RSBP	CT G	\$FLASH4,	R448
FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NED	635	F4	RS P	T D	\$	480
FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW	1108	F4	RS P	T B	\$FCC4,	306
FUNPACK2, SPECIAL FUNCTION ROUTINES	ANL	370B	F4	S P	X T P	\$	610
FUNPACK2, SPECIAL FUNCTION ROUTINES	ANL	1108B	F5	S P	X T P	\$	610
FUNPACK2, SPECIAL FUNCTION ROUTINES	ANL	6600B	F	S P	X T P	\$	610
FUSION REACTOR STUDY	ANL	360	F4	RS P	X	\$TOKMINA/TOKMINA2, TOKAMAK	561
FW	360	F4	RS P	CT H	\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM		R299
FW	1108B	F4	RS P	T H	\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM		R299
F0355, SHAPER CUTTER CONTOUR GENERATOR	ANL	360	F4	RS P	T	\$	697
F0355, SHAPER CUTTER CONTOUR GENERATOR	BKC	6600	F4	RS P	T	\$	697
F2	RS	A	\$LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	ORNL	7090		381
F2	RS	B	\$DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	AEG	7090		150
F2	RS	B	\$S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090		53
F2	RS	C	\$FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LLL	709		7
F2	RS	C	\$PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	7090		30
F2	RS	E	\$AIRESK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090		121
F2	RS	E	\$SNAPKINS/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	7090		122
F2	RS	I	\$CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090		112
F2	RS	I	\$FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090		48
F2	RS	I	\$SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090		114
F2	RS	J	\$FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	7090		91
F2	RS	J	\$MCRTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090		142
F2	RS	J	\$SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	AI	7090		110
F2	RS	J	\$SCAR1, SCATTER FROM A RING SNAP GEGMETRY	AI	7090		111
F2	RS	N	\$WED, W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W	7090		133
F2	RS	T	\$SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA	7090		56
F2	RS	L	\$SOZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	7090		58
F2	RS P	A	\$DOPIE, RESOLVED RESONANCE X-SECTION CALC	NED	2000		177
F2	RS P	A	\$EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL	7094		238
F2	RS P	A	\$RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NED	2000		176

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F2	RS	P	B	\$BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	10
F2	RS	P	B	\$BGRNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090	23
F2	RS	P	B	\$SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	52
F2	RS	P	B	\$SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NED	2000	178
F2	RS	P	C	\$MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCO	7090	59
F2	RS	P	D	\$AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	AI	7090	55
F2	RS	P	F	\$CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LLL	7090	129
F2	RS	P	F	\$WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	145
F2	RS	P	G	\$CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	47
F2	RS	P	H	\$FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094	246
F2	RS	P	J	\$GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	45
F2	RS	P	J	\$GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	46
F2	RS	P	J	\$RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090	141
F2	RS	P	O	\$CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	154
F2	RS	P	P	\$EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LLL	7094	321
F2	RS	P	P	\$FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	324
F2	RS	P	Q	\$BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC.	ORNL	1604	549
F2	RS	P	T A	\$2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	7094	254
F2	RS	P	T B	\$AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	7090	243
F2	RS	P	T C	\$EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	7090	39
F2	RS	P	T C	\$EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	7090	87
F2	RS	P	T C	\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	7090	28
F2	RS	P	T C	\$TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	148
F2	RS	P	T C	\$W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	7090	132
F2	RS	P	T C	\$WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	32
F2	RS	P	T C	\$20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	40
F2	RS	P	T G	\$TPANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	268
F2	RS	PL	T A	\$ARES2, RESONANCE INTEGRAL X-SECTION CALC	AI	7090	89
F2	RS	PL	T B	\$FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	51
F2	RS	PL	T I	\$CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	7094	244
F2	RS	PLX	T B	\$GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	33
F2	RS	PLX	T C	\$DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	7090	151
F2	RSB		F	\$FATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	7090	153
F2	RSB	T	D	\$FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	117
F2	RSBP		D	\$ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	7090	180
F2	RSBP		D	\$NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	ORNL	7090	134
F2	RSBP		H	\$AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	7094	182
F2	RSBP		H	\$AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	183
F2	RSBP		J	\$LIPRECAN1, MC NEUTRON PENETRATION CALCULATION	DAC	7090	123
F2	RSBP	T	H	\$PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KECS	7094	155
F2	RSBPL	T	J	\$MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	143
F36	SBP		I	\$BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	365
F36	RS	P	G	\$DISPER, AEROSOL PARTICLE TRANSPORT STUDY	RFD	3600	554
F36	RS	P	T B	\$MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600	355
F36	RS	P	T C	\$SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	3600	288
F36	RS	P	T I	\$SUPURAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	3600	357
F36	RS	P	T S	\$TGODY2, 2-D LAGRANGIAN ECNS OF MOTION SOLUTION	SLA	3600	627
F36	RS	P	X T C	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	262
F36	RS	P	XCT C	\$TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	3600	513
F36	RSBP		A	\$MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	214
F36	RSBP		G	\$CHEMLQC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	366
F36	RSBP		I	\$SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	353
F36	RSBP	X	T B	\$RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	281
F36	RSBP	X	T B	\$RIFF-PAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	213
F4	S		T D	\$GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	302
F4	S	P	H	\$PWR-PPM, BORATION-DILUTION TABLES FOR PWR OPN	OPPD	6400	552
F4	S	P	X T P	\$FUNPACK2, SPECIAL FUNCTION ROUTINES	ANL	3708	610
F4	RS		A	\$STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	305
F4	RS		B	\$APRFX1, 99-GP DLC-2B LIBRARY GROUP-COLLAPSING	APG	6600	466
F4	RS		B	\$HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA	1108	291
F4	RS		E	\$R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	168
F4	RS		G	\$ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCC	635	529
F4	RS		I	\$CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	233
F4	RS		I	\$SORSD8, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	R391

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F4	RS		M	\$MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	360	472
F4	RS	T	B	\$M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	R280
F4	RS	T	C	\$EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	625	156
F4	RS	T	C	\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	28
F4	RS	T	C	\$M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	R342
F4	RS	T	G	\$GADGSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	261
F4	RS	T	H	\$RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	242
F4	RS	T	H	\$STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BG&E	360C	487
F4	RS	T	H	\$WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	R267
F4	RS	T	I	\$CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	R266
F4	RS	T	M	\$CHECKER,CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC	BNL	6600B	384
F4	RS	T	M	\$CHECK3,RIGEL3, ENDF/B V3 PROCESSING CODES	BNL	6600	571
F4	RS	T	M	\$CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC	BNL	6600B	475
F4	RS	T	M	\$RIGEL, ENDF/B V3 DATA PROCESSING CODE	ANL	360	571
F4	RS	T	M	\$RIGEL4,CHECK4,... ENDF/B V4 PROCESSING CODES	BNL	6600B	638
F4	RS	T	D	\$GASSPAN, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	R485
F4	RS	T	P	\$LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094	62
F4	RS	T	P	\$MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0	CEND	7600B	478
F4	RS	X	T	\$PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	228
F4	RS	L	T	\$GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	6600	547
F4	RS	L	T	\$GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	WANL	6600	298
F4	RS	L	T	\$FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	360	9
F4	RS	P	A	\$AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	6600	376
F4	RS	P	A	\$AVEKAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	7094	376
F4	RS	P	A	\$BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600	524
F4	RS	P	A	\$CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	6600	R531
F4	RS	P	A	\$CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UICS	360	347
F4	RS	P	A	\$GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	GGA	1108	289
F4	RS	P	A	\$GASKET, THERMAL SCATTERING LAW CALCULATION	GGA	1108	263
F4	RS	P	A	\$GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	6600	R470
F4	RS	P	A	\$MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	6600	R535
F4	RS	P	A	\$POLLA, CONVERTS R-MATRIX RESONANCE PARAMETERS	ORNL	360	639
F4	RS	P	A	\$PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	ENEA	360	292
F4	RS	P	A	\$PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	292
F4	RS	P	A	\$RAMPL, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL	6600	492
F4	RS	P	A	\$SIGLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	6600	377
F4	RS	P	A	\$THRES2, STATISTICAL MODEL REACTION X-SECTION	ENEA	360	504
F4	RS	P	A	\$THRES2, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600B	504
F4	RS	P	B	\$AVOID, ANNULAR VOID X-SECTION CALCULATION	GEC	625	276
F4	RS	P	B	\$GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	GEC	7094	235
F4	RS	P	B	\$PARTI, OPTIMAL GROUP OR MESH COLLAPSING	RW	6500	416
F4	RS	P	B	\$PELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360	362
F4	RS	P	C	\$PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC	360	30
F4	RS	P	C	\$PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	1108	304
F4	RS	P	D	\$CINDER,M0102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	313
F4	RS	P	D	\$FREVA6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	301
F4	RS	P	D	\$NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	ANL	360	146
F4	RS	P	D	\$NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	UEC	6600	146
F4	RS	P	D	\$POWERCO, NUCLEAR STATION ELECTRICITY COSTS	UEC	6600	340
F4	RS	P	D	\$RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	231
F4	RS	P	D	\$RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	NED	635	372
F4	RS	P	D	\$WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	224
F4	RS	P	D	\$WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	6600	224
F4	RS	P	E	\$AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	360	121
F4	RS	P	E	\$BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB	360	363
F4	RS	P	E	\$GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	317
F4	RS	P	E	\$GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	290
F4	RS	P	E	\$RI01, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	360	255
F4	RS	P	E	\$RI01, SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094	255
F4	RS	P	E	\$RI02, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	360	168
F4	RS	P	E	\$TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	489
F4	RS	P	F	\$MARS, 2-D EXCURSION CALCULATION RZ GEOMETRY	APDA	7094	293
F4	RS	P	F	\$RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	R352
F4	RS	P	F	\$STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	R389

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F4	PS	P	F	\$TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	R33E
F4	RS	P	G	\$CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	47
F4	RS	P	G	\$EGAU, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	DP	360	600
F4	RS	P	G	\$FRCEL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	500
F4	RS	P	G	\$INTEG,INSPEC, MARKOV SIMULATION OF REACTOR OPN	DP	360	590
F4	RS	P	G	\$NAHAMMER, FLUID HAMMER ANALYSIS PIPING SYSTEM	ANL	360	717
F4	RS	P	G	\$NAHAMMER, FLUID HAMMER ANALYSIS PIPING SYSTEM	ANL	7600	717
F4	RS	P	G	\$NATTRANSIENT, FLUID HAMMER ANALYSIS 1-D PIPING	ANL	360	718
F4	RS	P	G	\$SOCOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	521
F4	RS	P	G	\$SOCOL2, SODIUM-FUEL INTERACTION ANALYSIS	HEDL	1108	521
F4	RS	P	H	\$FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	246
F4	RS	P	H	\$HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	SSDC	370	198
F4	RS	P	H	\$MARGE/SLUMP, MAXIMUM TEMPERATURE LMFBR FUEL PIN	ANL	360	677
F4	RS	P	H	\$PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	DP	360	586
F4	RS	P	H	\$RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	6600	P382
F4	RS	P	H	\$SOLA-ICE, TRANSIENT COMPRESSIBLE FLUID FLOW	LASL	7600	723
F4	RS	P	I	\$BUCKLE, CREEP BUCKLING OF INITIALLY OVAL TUBE	BNW	6600C	667
F4	RS	P	I	\$GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	232
F4	RS	P	I	\$IMPAC2, B SHIPPING CONTAINER IMPACT ANALYSIS	LASL	7600	715
F4	RS	P	I	\$LUGS, STRESS FOR INTEGRAL ATTACHMENTS TO PIPE	ORNL	360	648
F4	RS	P	I	\$NUBCW, STRUCTURAL ANALYSIS BOWED REACTOR CORES	ANL	360B	643
F4	RS	P	I	\$SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA	1108	300
F4	RS	P	I	\$SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	GGA	1108	252
F4	RS	P	I	\$SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	GGA	1108	253
F4	RS	P	I	\$SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS	GGA	1108	379
F4	RS	P	I	\$STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	6600	P337
F4	RS	P	I	\$STRIPE, FUEL ROD CLAD STRAIN & PELLET CPACKING	BAPL	6600	R570
F4	RS	P	I	\$TCB01, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	6600	R604
F4	RS	P	I	\$TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	R378
F4	RS	P	L	\$GAVER, ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	218
F4	RS	P	L	\$GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	360	530
F4	RS	P	L	\$GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	6600	530
F4	RS	P	L	\$GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	1108	296
F4	RS	P	N	\$DAC1, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	455
F4	RS	P	N	\$HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	6600	434
F4	RS	P	N	\$LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	6600	409
F4	RS	P	O	\$ALPHA-M, RESOLUTION OF GAMMA-RAY SPECTRA	ORNL	360	413
F4	RS	P	O	\$CORGM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	360	390
F4	RS	P	O	\$DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	R464
F4	RS	P	O	\$DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	R464
F4	RS	P	P	\$RH99, EXTREME VALUE DISTRIBUTION DATA ANALYSIS	BAPL	6600	R621
F4	RS	P	P	\$CGMCC, QUALITY CONTROL DATA ANALYSIS ROUTINES	BKC	360	649
F4	RS	P	P	\$ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	601
F4	RS	P	P	\$KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	ORNL	360	556
F4	RS	P	P	\$MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	P446
F4	RS	P	P	\$NIXLIN, LEAST SQUARES FIT TO NONLINEAR FORMS	DP	360	709
F4	RS	P	P	\$PLOTB, 2-D CONTOUR PLOTS & AREA CALCULATION	SLA	6600	R578
F4	RS	P	P	\$RELO1, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	6600	R497
F4	RS	P	P	\$ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	6600	R444
F4	RS	P	T	\$FO355, SHAPE CUTTER CONTOUR GENERATOR	ANL	360	697
F4	RS	P	T	\$FO355, SHAPE CUTTER CONTOUR GENERATOR	BKC	6600	697
F4	RS	P	U	\$DYNAMIC ANALYSIS OF GASES BY MASS SPECTROMETRY	RFD	360	645
F4	RS	P	U	\$SOLVEX, SOLVENT EXTRACTION PROCESS SIMULATION	DP	360	662
F4	RS	P	W	\$MMM3, COORDINATE ANALYSES SEMI-RIGID MOLECULES	ANC	360	632
F4	RS	P	X	\$TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	360	561
F4	RS	P	T	\$ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL	360	417
F4	RS	P	T	\$GANDY3, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108B	341
F4	RS	P	T	\$JPIXR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	6600	R506
F4	RS	P	T	\$PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	6600	R507
F4	RS	P	T	\$PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	R359
F4	RS	P	T	\$RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES	BNL	6600B	465
F4	RS	P	T	\$SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	R399
F4	RS	P	T	\$TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	1106	410
F4	RS	P	T	\$TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	6600	360

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F4	RS	P	T	B	\$CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	360	526
F4	RS	P	T	B	\$CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	JAER	230	526
F4	RS	P	T	B	\$EPGCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	6600	R461
F4	RS	P	T	B	\$ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	7600	538
F4	RS	P	T	B	\$ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6600	436
F4	RS	P	T	B	\$ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPD	7600	509
F4	RS	P	T	B	\$ETOT3, ENDF/B V3 DATA TO THERMAL LIBRARY FORM	WAPD	7600	628
F4	RS	P	T	B	\$FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW	1108	306
F4	RS	P	T	B	\$FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	GGA	7044	195
F4	RS	P	T	B	\$GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	LASL	6600	361
F4	RS	P	T	B	\$REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NED	635	257
F4	RS	P	T	B	\$PRICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	360	453
F4	RS	P	T	B	\$SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	ORNL	360	431
F4	RS	P	T	C	\$BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	6600	R398
F4	RS	P	T	C	\$BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	1108	287
F4	RS	P	T	C	\$DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NED	635	459
F4	RS	P	T	C	\$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	6600	209
F4	RS	P	T	C	\$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	209
F4	RS	P	T	C	\$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LER	7094	209
F4	RS	P	T	C	\$EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CEND	6600	156
F4	RS	P	T	C	\$EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	360	156
F4	RS	P	T	C	\$FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	RHSC	360	120
F4	RS	P	T	C	\$FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	635	167
F4	RS	P	T	C	\$GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	7044	220
F4	RS	P	T	C	\$GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	1108	319
F4	RS	P	T	C	\$GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108	380
F4	RS	P	T	C	\$HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BNW	1107	241
F4	RS	P	T	C	\$KEFF,MGBS,TGAN, NUCLEAR CRITICALITY SAFETY	DP	360	617
F4	RS	P	T	C	\$TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	GGA	7044	225
F4	RS	P	T	C	\$TEMCO7, TEMPERATURE COEFFICIENT CALCULATION	GGA	1108	320
F4	RS	P	T	C	\$TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	148
F4	RS	P	T	C	\$TRIPLT, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	608
F4	RS	P	T	C	\$TRIPLT, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	608
F4	RS	P	T	C	\$TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH	LASL	7600	573
F4	RS	P	T	C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	6600D	358
F4	RS	P	T	C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600D	358
F4	RS	P	T	C	\$VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	360	212
F4	RS	P	T	C	\$VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	6600	212
F4	RS	P	T	D	\$CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	360	354
F4	RS	P	T	D	\$CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	6600	354
F4	RS	P	T	D	\$DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	LASL	7030	269
F4	RS	P	T	D	\$FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108	318
F4	RS	P	T	D	\$FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NED	635	480
F4	RS	P	T	D	\$GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	260
F4	RS	P	T	D	\$GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	339
F4	RS	P	T	D	\$GEOCOST-BC, BINARY CYCLE GEOTHERMAL COST STUDY	BNW	6600	711
F4	RS	P	T	D	\$GEOCOST, GEOTHERMAL ENERGY COST ANALYSIS	BNW	6600	684
F4	RS	P	T	D	\$PHENIX, 2-D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	454
F4	RS	P	T	D	\$PWOCOST, REACTOR FUEL CYCLE COST CALCULATION	GGA	1108	441
F4	RS	P	T	D	\$RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	GGA	7044	221
F4	RS	P	T	D	\$REVISED-GAD, FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	223
F4	RS	P	T	D	\$STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	7044	227
F4	RS	P	T	D	\$2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	325
F4	RS	P	T	D	\$2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	325
F4	RS	P	T	D	\$3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEDL	1108	567
F4	RS	P	T	D	\$3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	463
F4	RS	P	T	D	\$3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	R477
F4	RS	P	T	E	\$ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	486
F4	RS	P	T	E	\$ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	6600	486
F4	RS	P	T	F	\$ADEP, 1-D & 2-D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	494
F4	RS	P	T	F	\$FORE, FAST REACTOR EXCURSION CALCULATIONS	NED	2000	174
F4	RS	P	T	F	\$GAKIN2, 1D MULTIGROUP TIME-DEPENDENT DIFFUSION	MIT	370	310
F4	RS	P	T	F	\$GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	370
F4	RS	P	T	F	\$NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	405

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F4	RS	P	T	F	\$NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	7090	4
F4	RS	P	T	F	\$NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	R311
F4	RS	P	T	F	\$SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	400
F4	RS	P	T	F	\$SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	6600	400
F4	RS	P	T	F	\$TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	309
F4	RS	P	T	F	\$TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	R338
F4	RS	P	T	F	\$WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	R274
F4	RS	P	T	F	\$WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	R274
F4	RS	P	T	F	\$WIGL3, 1-D SPACE-TIME DIFFUSION W/FEEDBACK	BAPL	6600	R708
F4	RS	P	T	G	\$AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	360	172
F4	RS	P	T	G	\$CEBUC, STEAM GENERATOR SODIUM-WATER REACTION	CEND	7600	548
F4	RS	P	T	G	\$ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL	6400	330
F4	RS	P	T	G	\$ELBUW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	229
F4	RS	P	T	G	\$EMERALD REV. 1, PWR ACCIDENT ACTIVITY RELEASE	PGE	360	546
F4	RS	P	T	G	\$EMERALD-NORMAL, PWR ACTIVITY RELEASE AND DOSE	PGE	360	685
F4	RS	P	T	G	\$FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	R295
F4	RS	P	T	G	\$FLASH6, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	7600	R448
F4	RS	P	T	G	\$FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NED	635	479
F4	RS	P	T	G	\$HAMOC, FLUID HAMMER ANALYSIS OF PIPING SYSTEM	HEDL	6600	710
F4	RS	P	T	G	\$MO555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	R284
F4	RS	P	T	G	\$NATRAN2, FLUID HAMMER ANALYSIS 1D & 2D SYSTEMS	ANL	360	719
F4	RS	P	T	G	\$NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	6400	328
F4	RS	P	T	G	\$PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	1108	528
F4	RS	P	T	G	\$SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	559
F4	RS	P	T	G	\$WHAM6, LIQUID-FILLED PIPING SYSTEM ANALYSIS	ANL	7600B	278
F4	RS	P	T	H	\$ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	360	580
F4	RS	P	T	H	\$ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	BCAC	6600	580
F4	RS	P	T	H	\$CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	R473
F4	RS	P	T	H	\$COMPARE, TRANSIENT FLOW IN VENTED FLUID SYSTEM	LASL	7600	702
F4	RS	P	T	H	\$COMPARE, TRANSIENT FLOW IN VENTED FLUID SYSTEM	NRC	370	702
F4	RS	P	T	H	\$DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	440
F4	RS	P	T	H	\$ENERGY, LMFBR COOLANT TEMPERATURE PREDICTION	MIT	370	696
F4	RS	P	T	H	\$FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	R272
F4	RS	P	T	H	\$FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	R331
F4	RS	P	T	H	\$FLOW3, NETWORK ANALYSIS OF 3-D TWO-PHASE FLOW	BAPL	7600B	R664
F4	RS	P	T	H	\$GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	6600	R424
F4	RS	P	T	H	\$HAFMAT, SYSTEM STEADY-STATE FLOW DISTRIBUTION	KAPL	6600	R616
F4	RS	P	T	H	\$HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	ORNL	360B	517
F4	RS	P	T	H	\$HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	R286
F4	RS	P	T	H	\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108A	R299
F4	RS	P	T	H	\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	FW	1108B	R299
F4	RS	P	T	H	\$MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	635	256
F4	RS	P	T	H	\$MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600	256
F4	RS	P	T	H	\$MO899,HOH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	R294
F4	RS	P	T	H	\$ORCENT, NUCLEAR STEAM TURBINE CYCLE ANALYSIS	ORNL	360	703
F4	RS	P	T	H	\$ORRIBLE, ROD BUNDLE FLOW & TEMPERATURE DIST.	ORNL	360	629
F4	RS	P	T	H	\$STOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	R348
F4	RS	P	T	H	\$VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	635	458
F4	RS	P	T	H	\$WASP2, WATER PROPERTIES FOR SAFETY ANALYSIS	BAPL	7600	R396
F4	RS	P	T	I	\$BEAMCRP, FINITE-ELEMENT BEAM CREEP ANALYSIS	HEDL	6600	R701
F4	RS	P	T	I	\$BUBBL, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	6600	R468
F4	RS	P	T	I	\$BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	R481
F4	RS	P	T	I	\$CREEP-PLAST, 2-D INELASTIC STRUCTURAL ANALYSIS	ORNL	360	R707
F4	RS	P	T	I	\$CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	6600	R449
F4	RS	P	T	I	\$FLANGE-ORNL, ANALYSIS OF FLANGED JOINTS	ORNL	360	689
F4	RS	P	T	I	\$FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	R537
F4	RS	P	T	I	\$GAPCON-THERMAL2, FUEL PIN GAP CONDUCTANCE CALC	BNW	6600	618
F4	RS	P	T	I	\$HONDO, A DYNAMIC RESPONSE FINITE-ELEMENT CODE	SLA	6600B	672
F4	RS	P	T	I	\$LIFE3, MIXED-OXIDE FUEL ELEMENT PERFORMANCE	ANL	7600	R460
F4	RS	P	T	I	\$MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	6600B	R412
F4	RS	P	T	I	\$M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	R383
F4	RS	P	T	I	\$M0457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	R329
F4	RS	P	T	I	\$M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	R283
F4	RS	P	T	I	\$PELEN, FUEL PELLETT TEMPERATURE & DEFORMATION	BAPL	6600	R598

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F4	RS	P	T	I	\$SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	360	R402
F4	RS	P	T	I	\$SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	251
F4	RS	P	T	I	\$SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	BNL	6600	252
F4	RS	P	T	I	\$SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	332
F4	RS	P	T	I	\$SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	6600B	R282
F4	RS	P	T	I	\$SEALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	R282
F4	RS	P	T	I	\$SEALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	360	R282
F4	RS	P	T	I	\$SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA	6600	581
F4	RS	P	T	I	\$SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	R 80
F4	RS	P	T	J	\$MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	259
F4	RS	P	T	J	\$M0756,LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	R343
F4	RS	P	T	K	\$CITATION, 1,2,3-D DIFFUSION DEPLETION MULTI-GP	ORNL	360I	387
F4	RS	P	T	K	\$DEMO4, CRHR REACTOR & PLANT TRANSIENT ANALYSIS	WARD	7600	R676
F4	RS	P	T	L	\$BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	R373
F4	RS	P	T	L	\$QMESH,RENUM, SELF-ORGANIZING MESH GENERATION	SLA	6600	612
F4	RS	P	T	M	\$CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	475
F4	RS	P	T	M	\$EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	6600	502
F4	RS	P	T	M	\$SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	6600	R557
F4	RS	P	T	M	\$TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	635	493
F4	RS	P	T	N	\$PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	360	544
F4	RS	P	T	O	\$BETTY, ENTRAINED PARTICLES SAMPLING STUDY	BAPL	6600	R545
F4	RS	P	T	O	\$BURNUP, HEAVY ELEMENT ISOTOPIIC BURNUP ANALYSIS	NED	635	311
F4	RS	P	T	O	\$EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED	635	258
F4	RS	P	T	O	\$JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	R394
F4	RS	P	T	O	\$REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	R425
F4	RS	P	T	P	\$BESSEL FUNCTIONS, AIRY & LOG GAMMA SUBROUTINES	SLA	6600	656
F4	RS	P	T	P	\$DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	6600	R327
F4	RS	P	T	P	\$METRICATION, CONVERSION TO OR FROM SI UNITS	RDYN	370B	G668
F4	RS	P	T	P	\$M0661,M0657,M0626, POLYNOMIAL CURVE FITTING	BAPL	6600	R411
F4	RS	P	T	Q	\$GROUP2, GROUP THEORY OF LATTICE DYNAMICS	ANL	360	620
F4	RS	P	T	Q	\$GROUP2, GROUP THEORY OF LATTICE DYNAMICS	LASL	6600	620
F4	RS	P	T	Q	\$RESPOND, DISSIMILAR-MEDIA TLD CORRECTION CALC	AI	360	566
F4	RS	P	T	R	\$SITE2, ENERGY FACILITY SITING ASSESSMENT	ANL	360	687
F4	RS	P	T	T	\$WFLLL2B, WIRE CONFIGURATION FREQUENCY DOMAIN	LLL	7600	721
F4	RS	P	T	U	\$PRICE-LASL, CHEMICALLY REACTIVE MIXTURE FLOW	LASL	6600	720
F4	RS	P	T	U	\$SEPHIS, SOLVENT EXTRACTION PROCESS SIMULATION	ORNL	360	690
F4	RS	P	T	V	\$FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	6600B	577
F4	RS	P	C	G	\$STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	ORNL	360	583
F4	RS	P	CT	A	\$JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	360	308
F4	RS	P	CT	B	\$MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	360	355
F4	RS	P	CT	C	\$FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360	167
F4	RS	P	CT	C	\$TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	FBRD	H600	585
F4	RS	P	CT	D	\$GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS	360	576
F4	RS	P	CT	D	\$NUFUEL, NUCLEAR FUEL CYCLE REQUIREMENTS	ERDA	370B	683
F4	RS	P	CT	D	\$OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	1108	226
F4	RS	P	CT	D	\$3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	567
F4	RS	P	CT	F	\$MELT3, FAST REACTOR TRANSIENT OVERPOWER STUDY	HEDL	6600	700
F4	RS	P	CT	F	\$REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	550
F4	RS	P	CT	F	\$REXCO-H2, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	R615
F4	RS	P	CT	G	\$COMRADEX3, RADIOLOGICAL DOSE ACCIDENT STUDY	AI	370	663
F4	RS	P	CT	H	\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	FW	360	R299
F4	RS	P	CT	H	\$THI3D, THERMAL-HYDRAULIC MULTICHANNEL ANALYSIS	ANL	370	706
F4	RS	P	CT	I	\$BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	FBRD	635	R568
F4	RS	P	CT	I	\$LIFE3, MIXED-OXIDE FUEL ELEMENT PERFORMANCE	ANL	370	R460
F4	RS	P	CT	I	\$PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	360	542
F4	RS	P	CT	I	\$SAP4, STRUCTURAL ANALYSIS OF LINEAR SYSTEMS	ANL	360B	641
F4	RS	P	CT	L	\$QMESH,RENUM, SELF-ORGANIZING MESH GENERATION	ANL	360	612
F4	RS	P	CT	M	\$ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	360	350
F4	RS	P	CT	M	\$LASIP3, CCCC STANDARD INTERFACE FILE PROCESSOR	LASL	360	691
F4	RS	P	CT	P	\$FORSIM, SOLN OF PARTIAL OR ORDINARY DIFF EQNS	CRNL	6600B	514
F4	RS	P	CT	V	\$FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	ANL	360	577
F4	RS	P	CT	W	\$MACS LATTICE VIBRATION NEUTRON SCATTRING CODES	ANC	360	574
F4	RS	P	CT	W	\$MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	360	575
F4	RS	P	X	A	\$COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	385

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F4	RS P X	A	\$LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	7044	221
F4	RS P X	G	\$BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	360	435
F4	RS P X	G	\$MIRAB,MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400B	499
F4	RS P X	I	\$FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	R404
F4	RS P X	P	\$GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	ANL	360C	592
F4	RS P X	P	\$GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600C	592
F4	RS P X T	B	\$ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR IDX	HEDL	1108B	388
F4	RS P X T	B	\$GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	316
F4	RS P X T	B	\$IDX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	374
F4	RS P X T	C	\$VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	7094	264
F4	RS P X T	C	\$CONCEPT4, POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL	360B	498
F4	RS P X T	E	\$MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360	491
F4	RS P X T	F	\$CEXE,INCEXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	360	415
F4	RS P X T	F	\$FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360	174
F4	RS P X T	F	\$FOKE2, FAST REACTOR EXCURSION CALCULATIONS	NED	635	174
F4	RS P X T	G	\$MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	508
F4	RS P X T	H	\$ORTHIS,ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	360	525
F4	RS P X T	L	\$GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108	345
F4	RS P X T	P	\$DE/STEP,INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	360D	640
F4	RS P X T	P	\$DE/STEP,INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	6600D	640
F4	RS P X T	P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	PD10B	534
F4	RS P X T	P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	1110B	534
F4	RS P X T	P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	6600B	534
F4	RS P X T	P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	6700B	534
F4	RS P X T	P	\$EPISODE, ORDINARY DIFF EQUATION SYSTEM SOLVER	LLL	360	675
F4	RS P X T	P	\$EPISODEB, SOLVE ODE SYST WITH BANDED JACOBIAN	LLL	360	705
F4	RS P X T	P	\$GEARB, SOLVE CDE SYSTEM WITH BANDED JACOBIAN	LLL	360C	661
F4	RS P X T	P	\$GEARB, SOLVE CDE SYSTEM WITH BANDED JACOBIAN	LLL	6600C	661
F4	RS P XCT	B	\$FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	360B	368
F4	RS P XCT	C	\$GAPER1D, 1-D TRANSPORT PERTURBATION THEORY	GGA	1108	606
F4	RS P XCT	D	\$CONCEPT3, POWER PLANT CONCEPTUAL COST ESTIMATE	GGA	1108	498
F4	RS P XCT	E	\$TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	ORNL	360	558
F4	RS P XCT	F	\$VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	360	511
F4	RS P XCT	H	\$COBRA4I, ROD BUNDLE & CORE THERMAL-HYDRAULICS	BNW	7600	432
F4	RS PL T	B	\$ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	6600	437
F4	RS PL T	B	\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107	185
F4	RS PL T	B	\$TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	360	50
F4	RS PL T	C	\$RISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	635	287
F4	RS PL T	R	\$SOLSYS, SOLAR ENERGY SYSTEM SIMULATION PROGRAM	SLA	6600	692
F4	RS PL CT	B	\$INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC	360	565
F4	RS PL CT	C	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	OSUC	370	29
F4	RS PL CT	F	\$QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	360	474
F4	RS PL CT	M	\$EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	360B	502
F4	RS PL CT	M	\$ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC	360	518
F4	RS PLX T	B	\$AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	360	147
F4	RS PLX T	B	\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	185
F4	RS PLX T	B	\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVAC	6400	185
F4	RS PLX T	B	\$HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	1108	467
F4	RS PLX T	B	\$HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	360	467
F4	RS PLX T	B	\$XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	360	393
F4	RS PLX T	C	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	6500	262
F4	RS PLX T	C	\$VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600	510
F4	RS PLX T	G	\$CRAC, CALC OF REACTOR ACCIDENT CONSEQUENCES	NRC	370	722
F4	RS PLXCT	B	\$FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	OSUC	370	51
F4	RS PLXCT	B	\$GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108B	298
F4	RS PLXCT	B	\$LEOPARD,SPOTS, SPECTRUM CALC WITH DEPLETION	WAPD	360C	279
F4	RS PLXCT	B	\$PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	360	520
F4	RSB L T	M	\$CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	360	271
F4	RSBP	A	\$MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	ORNL	7090	323
F4	RSBP	D	\$CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GEC	635	418
F4	RSBP	D	\$DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC	635	423
F4	RSBP	O	\$MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	421
F4	RSBP	P	\$GRAPH, LINEAR REGRESSION W/CONFIDENCE LIMITS	BKC	360	624
F4	RSBP	P	\$HISTOGRAMS, QUALITY CONTROL SAMPLE STATISTICS	BKC	360	

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F4	RSBP	O	\$XDTRAP, HYDROGEN PERMEATION WITH TRAPPING	DP	360	655
F4	RSBP	T B	\$GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	GEC	635	420
F4	RSBP	T D	\$2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	325
F4	RSBP	T K	\$THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	360	273
F4	RSBP	C P	\$LATIN SQ, NXN LATIN SQUARE EXPERIMENTAL DESIGN	MLMD	360	630
F4	RSBP	CT C	\$ARC-DIF10, 1-D MULTI-GP DIFFUSION & INVENTORY	ANL	360	626
F4	RSBP	CT C	\$HERFSY3, 2-D HETEROGENEOUS REACTOR CALCULATION	DP	360B	136
F4	RSBP	CT C	\$MCNA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360	582
F4	RSBP	CT C	\$TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	260	608
F4	RSBP	CT C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	360D	358
F4	RSBP	CT D	\$DWAPF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	579
F4	RSBP	CT G	\$FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	MA-G	360	R448
F4	RSBP	CT G	\$FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	584
F4	RSBP	CT G	\$MOCUS, MINIMAL SETS FROM FAULT TREES	ANC	360	653
F4	RSBP	CT G	\$PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	360	528
F4	RSBP	CT G	\$PSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	360B	265
F4	RSBP	CT G	\$WPEM-TGODEE2/MOD3, 2D TIME-DEP FUEL ELEM STUDY	NRC	370	712
F4	RSBP	CT H	\$COBRA3M, FUEL PIN THERMAL-HYDRAULIC ANALYSIS	ANL	360B	659
F4	RSBP	CT I	\$CYGRO3, OXIDE FUEL FOD STRESS & DEFORMATION	AN-T	360B	R449
F4	RSBP	CT I	\$SAFE-PCPS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	250
F4	RSBP	CT I	\$STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	360	539
F4	RSBP	CT J	\$VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	ANC	360	569
F4	RSBP	CT L	\$APC-NUT002, BCD INPUT DATA PROCESSING MODULE	ANL	360	533
F4	RSBP	CT Q	\$ISOTAE, PU POWER OUTPUT FROM MIXED ISOTOPES	MLMD	360	R619
F4	RSBP	X T D	\$SIZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	360	58
F4	RSBP	X T G	\$THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC	360	512
F4	RSBP	XCT B	\$ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 10X	HEDL	360	388
F4	RSBP	XCT B	\$XLACS, XSDPN MULTIGROUP LIBRARIES FROM ENDF/B	ORNL	360	572
F4	RSBP	XCT H	\$MOXY/MOD032, BWR CORE HEAT TRANSFER CODE	ANC	360B	551
F4	RSBP	XCT P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	360B	534
F4	RSBP	XCT P	\$MORTAN2, MACRO-BASED STRUCTURED FORTRAN	SLAC	360	678
F4	RSBP	XCT U	\$GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)	ANC	360	605
F4	RSBPL	CT C	\$VARI-1D, 1-D VARIATIONAL SENSITIVITY	ANL	360	625
F4	RSBPL	CT L	\$ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION	ANL	360	594
F4	RSBPLX	T C	\$ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	151
F4	RSBPLX	T C	\$CAESAR4,LIBLST, 1-D MULTI-GP DIFFUSION & LIB.	AI	360	270
F4	RSBPLX	T D	\$NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	314
F4	RSBPLXCT	B	\$LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA	360B	249
F4	RSBPLXCT	C	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	MTS	360	262
F4	RSBPLXCT	C	\$VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	360	510
F5	S P X T	P	\$FUNPACK2, SPECIAL FUNCTION ROUTINES	ANL	1108B	610
F5	RS P	A	\$FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	1108	247
F5	RS P	H	\$FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	1108	395
F5	RS P	T B	\$ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS	GGA	1108	596
F5	RS P	T C	\$2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GGA	1108	173
F5	RS P	T D	\$DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNW	1108	456
F5	RS P	T H	\$TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	408
F5	RS P	T H	\$TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	1108	414
F5	RS P	T I	\$SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	GGA	1108	451
F5	RS P	T I	\$SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	GGA	1108	452
F5	RS P	T M	\$TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	493
F5	RS P	T N	\$GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT	GGA	1108	471
F5	RS P	T O	\$CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GGA	1108	476
F5	RS P	T R	\$TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HEDL	1108	599
F5	RS P	CT A	\$FSDP3, POINTWISE XSECS. FROM R-W PARAMETERS	GGA	1108	216
F5	RS P	CT H	\$REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW	1108	483
F5	RS P X T	D	\$PACTOLUS,CLC2HO, NUCLEAR POWER PLANT COST CODE	HEDL	1108	540
F5	RS P X T	F	\$NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	1108	488
F5	RS PLX	T B	\$BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	1108	184
F5	RS PLX	T B	\$LEOPARC,SPOTS, SPECTRUM CALC WITH DEPLETION	JNC	1108B	279
F5	RSBPL	T D	\$ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	1108	367
F63	RS	C	\$PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	1604	30
F63	RS	C	\$TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT	PW	1604	199
F63	RS	C	\$2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	173

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GAMBLES

F63	RS	I	\$WOPEXPT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	1604	190
F63	RS	L	\$CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	194
F63	RS	L	\$CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	193
F63	RS	T C	\$2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW	1604	192
F63	RS	L T D	\$SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	58
F63	RS	LX T B	\$GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	33
F63	RS	P A	\$HAFAVER, HAUSER-FESHBACH INELASTIC SCATTERING	CDC	1604	14
F63	RS	P A	\$PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL	1604	334
F63	RS	P A	\$RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	335
F63	RS	P B	\$SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	52
F63	RS	P B	\$S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	53
F63	RS	P D	\$ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	1604	180
F63	RS	P D	\$ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	1604	322
F63	RS	P D	\$ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	1604	179
F63	RS	P D	\$POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL	1604	340
F63	RS	P E	\$AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	1604	121
F63	RS	P E	\$CMPXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	188
F63	RS	P F	\$AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH	PW	1604	191
F63	RS	P G	\$CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	47
F63	RS	P H	\$MO899, HOH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	R 294
F63	RS	P J	\$GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	45
F63	RS	P J	\$GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	1604	46
F63	RS	P L	\$SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC	PW	1604	189
F63	RS	P T A	\$JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	ORNL	1604	308
F63	RS	P T C	\$EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CDC	1604	87
F63	RS	P T C	\$FCG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	1604	28
F63	RS	P T C	\$FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ	PW	1604	161
F63	RS	P T C	\$WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	1604	32
F63	RS	P T C	\$20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	1604	40
F63	RS	P T I	\$PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	1604	187
F63	RS	PL T A	\$ARES2, RESONANCE INTEGRAL X-SECTION CALC	CDC	1604	89
F63	RS	PL T B	\$FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	51
F63	RS	PL T B	\$TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	1604	50
F63	RS	PL T C	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	29
F63	RS	PL T C	\$DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	UNC	1604	144
F63	RS	PLX T B	\$GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	33
F63	RS	PLX T C	\$FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	120
F63	RSBP	A	\$NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	171
F63	RSBP	E	\$R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	3600	255
F63	RSBP	E	\$R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	168
F63	RSBP	F	\$AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	102
F63	RSBP	O	\$COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	248
F63	RSBP	T A	\$2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	3600	254
F63	RSBP	T C	\$FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	3600	167
F63	RSBP	T E	\$TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL	3600	135
F63	RSBP	T G	\$R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	3600	172
F63	RSBP	T H	\$ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	3600	152
F63	RSBP	T M	\$XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	3600	181
F63	RSBP	XCT B	\$THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	3600	184
F63	RSBPL	T J	\$MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	143
G-Z	ANL	360	F+P+A RS T P \$AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT.			564
GADOSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	F4 RS T G \$			261
GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	F4 RS P X T B \$			316
GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	F4 S T D \$			302
GAFGAR ENDF/B DATA TAPES	GGA	1108	BIN R L T Z \$ZPR-III ASSEMBLY 48			356
GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108	F4 RS P X T L \$GAND,			345
GAFGAR X-SECTIONS	GGA	1108	F5 RS P T B \$ENDFB2,GAND2,GFE2, ENDF/B TO			596
GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	GGA	1108	F4 RS P A \$			289
GAKIN2, 1D MULTIGROUP TIME-DEPENDENT DIFFUSION	MIT	370	F4 RS P T F \$			310
GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	F4 RS P T F \$			370
GAM, ANISN X-SEC FORMAT WAPD 6600 F4 RS PL T B			\$ETOG1, ENDF/B TO MUFT,			437
GAM, ANISN X-SEC FORMAT WAPD 7600 F4 RS P T B			\$ETOG3, ENDF/B TO MUFT,			538
GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	F+MAP RSBP T C \$			222
GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	F+BAL RS P T C \$			222

GAMBIT

GAZE2

GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	6600	F4	RS	L	T	B	\$	547
GAMMA DOSE INTEGRALS	DP	360	F4	RS	P			G \$EGAD, CALC OF EXTERNAL	600
GAMMA SUBROUTINES	SLA	6600	F4	RS	P	T	P	\$BESSEL FUNCTIONS, AIRY & LOG	656
GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	GEC	7094	F4	RS	P		B	\$	235
GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	F2	RS	P	J		\$GRACE2,	46
GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	1604	F63	RS	P	J		\$GRACE2,	46
GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	F2	RS	P	J		\$GRACE1,	45
GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	F63	RS	P	J		\$GRACE1,	45
GAMMA-RAY CATALOG	DP	360B	EBCDC	R	L	T	Z	\$GAMTAB, RADIOACTIVE-DECAY	637
GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS	P	G		\$CLOUD,	47
GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	F63	RS	P	G		\$CLOUD,	47
GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	F4	RS	P	G		\$CLOUD,	47
GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS	P	X	T	B \$FMC-N, FMC-G, MC NEUTRON,	195
GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	MTS	7090	MAD	RSB		O		\$BURP4,	169
GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	MTS	7090	MAD	RSB		O		\$BURP5,	170
GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBPLX	T	O		\$NAP, NEUTRON-INDUCED	314
GAMMA-RAY SOURCE BUILDUP FACTOR CALC	BAPL	6600	F+ASC	RS	P	T	J	\$ASPIS,	R429
GAMMA-RAY SPECTRA	ORNL	360	F4	RS	P			O \$ALPHA-M, RESOLUTION OF	413
GAMMA-RAY SPECTRA	ANC	360	F+P+A	RSBP	XCT	W		\$GAUSS6, BATCH ANALYSIS OF	622
GAMMA-RAY SPECTRA	GGA	1108	F+BAL	RS	P	T	O	\$TOAD, PROCESSING OF ANALYZER	333
GAMMA-RAY SPECTRA	KSUN	360	F4	RS	P		O	\$CORGAM, UNFOLDING OF COMPLEX	390
GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS		T	O	\$GASPAR, COMPLEX	R485
GAMMA-RAY SPECTRA GE(LI)	ANC	360	F4	RSBP	XCT	U		\$GAUSS5, ANALYSIS OF	605
GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS	P	T	J	\$M0756,LETO, I-D SLAB	R343
GAMMA-RAYS	GEC	7094	F4	RS	P		B	\$GAMMA-P, PRODUCTION X-SECTIONS FOR	235
GAMTAB, RADIOACTIVE-DECAY GAMMA-RAY CATALOG	DP	360B	EBCDC	R	L	T	Z	\$	637
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS	PLX	T	B	\$	185
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107	F4	RS	PL	T	B	\$	185
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	F+PAP	RS	PL	T	B	\$	185
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVAC	6400	F4	RS	PLX	T	B	\$	185
GAMTRI, 2-D MULTI-GP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	RS	P	T	C	\$	401
GAM1 OR 2	WAPD	6600	BCD	R	L	T	Z	\$ETOG1 DATA LIBRARIES, MUFT4 OR 5,	447
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS	LX	T	B	\$	33
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS	PLX	T	B	\$	33
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	F2	RS	PLX	T	B	\$	33
GAND, GAFFAR X-SECTION LIBRARY PREPARATION	GGA	1108	F4	RS	P	X	T	L \$	345
GANDY3, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108B	F4	RS	P	T	A	\$	341
GAND2,GFE2, ENDF/B TO GAFFAR X-SECTIONS	GGA	1108	F5	RS	P	T	B	\$ENDFB2,	596
GAP CONDUCTANCE CALC	BNW	6600	F4	RS	P	T	I	\$GAPCON-THERMAL2, FUELPIN	618
GAPCON-THERMAL2, FUELPIN GAP CONDUCTANCE CALC	BNW	6600	F4	RS	P	T	I	\$	618
GAPER1D, 1-D TRANSPORT PERTURBATION THEORY	GGA	1108	F4	RS	P	XCT	C	\$	606
GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT	GGA	1108	F5	RS	P	T	N	\$	471
GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS	P	T	I	\$	R397
GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	F4	RS	P		E	\$	317
GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	F4	RS	P	X	T	B \$GAF,	316
GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	F4	RS	P	T	D	\$	260
GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS	P	T	B	\$	219
GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	F+MAP	RS	P	T	B	\$	219
GAS RELEASE SIMULATION	BAPL	6600	F4	RS	P	T	I	\$BUBL1, FUEL SWELLING &	R468
GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS	P		I	\$GAZELLE5,	232
GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	F4	RS	P		E	\$	290
GASEOUS RELEASE	ORNL	360	F4	RS	P	C		G \$STEFEG, ANALYSIS OF PWR & BWR	583
GASES BY MASS SPECTROMETRY	RFD	360	F4	RS	P		U	\$DYNAMIC ANALYSIS OF	645
GASKET, THERMAL SCATTERING LAW CALCULATION	GGA	1108	F4	RS	P		A	\$	263
GASPAR, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS		T	O	\$	R485
GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	7044	F4	RS	P	T	C	\$	220
GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	1108	F4	RS	P	T	C	\$	319
GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS	P	T	C	\$	380
GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS	P	T	D	\$	339
GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)	ANC	360	F4	RSBP	XCT	U		\$	605
GAUSS6, BATCH ANALYSIS OF GAMMA-RAY SPECTRA	ANC	360	F+P+A	RSBP	XCT	W		\$	622
GAVER, ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	F4	RS	P		L	\$	218
GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS	P		I	\$	232
GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	F+BAL	RS	P	T	C	\$	430

GE(LI)

GGA

GE(LI)	ANC	360	F4	RSBP	XCT	U	\$GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA	600
GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX							BNW 7090 FLOCO RSBP T C \$	75
GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	ANL	360C	F4	RS	P	X	P \$	592
GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600C	F4	RS	P	X	P \$	592
GEARB, SOLVE ODE SYSTEM WITH BANDED JACOBIAN	LLL	360C	F4	RS	P	X	T P \$	661
GEARB, SOLVE ODE SYSTEM WITH BANDED JACOBIAN	LLL	6600C	F4	RS	P	X	T P \$	661
GEC 625 F4 RS P B							\$AVOID, ANNULAR VOID X-SECTION CALCULATION	276
GEC 635 F+GMP RSBP T H							\$THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	346
GEC 635 F4 RSBP C							\$CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	418
GEC 635 F4 RSBP D							\$DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	423
GEC 635 F4 RSBP D							\$MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	421
GEC 635 F4 RSBP T B							\$GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	420
GEC 7090 FAP RSBP X T Q							\$SPECTRA, MC CALCULATION IRRADIATED MATERIAL	422
GEC 7094 F+FAP RSBP T Q							\$CASCADE, CLUSTER, RADIATION DAMAGE IN METALS	419
GEC 7094 F4 RS P B							\$GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	235
GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS	360	F4	RS	P	CT	D \$	576
GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600	F+ASC	RS	P	T	I \$	R344
GEN KAPL 6600 F+C+D RS P T L							\$DATATRAN2, RAD1 GEOMETRY MODULES 2-D INPUT	406
GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	635	F+GMP	RS	T	P	\$	515
GENERATOR ANL 360 F4 RS P T							\$F0355, SHAPER CUTTER CONTOUR	697
GENERATOR BKC 6600 F4 RS P T							\$F0355, SHAPER CUTTER CONTOUR	697
GENERATOR DESIGN CRITERIA COSTS	GGA	7044	F4	RS	P	T	D \$	227
GENERATOR SODIUM-WATER REACTION	CEND	7600	F4	RS	P	T	G \$	548
GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	360	F4	RS	P	L	\$	530
GENRD, FREE-FORMAT CARD INPUT PPROCESSOR	LASL	6600	F4	RS	P	L	\$	530
GEOCOST-BC, BINARY CYCLE GEOTHERMAL COST STUDY	BNW	6600	F4	RS	P	T	D \$	711
GEOCOST, GEOTHERMAL ENERGY COST ANALYSIS	BNW	6600	F4	RS	P	T	D \$	684
GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	6600	F4	RS	P	N	\$HEATMESH,	434
GEOTHERMAL COST STUDY	BNW	6600	F4	RS	P	T	D \$	711
GEOTHERMAL ENERGY COST ANALYSIS	BNW	6600	F4	RS	P	T	D \$	684
GEPI GETS BASIC R M							\$MAPPER, PREDICTING MANUFACTURING REQUIREMENTS	595
GETCOR, FRECOR, FORTRAN DYNAMIC STORAGE ALLOC	ORNL	360	BAL+F	RS	P	CT	P \$	644
GETS BASIC R M							\$MAPPER, PREDICTING MANUFACTURING REQUIREMENTS	595
GETS F R R							\$PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	591
GFE2, ENDF/B TO GAFGAR X-SECTIONS	GGA	1108	F5	RS	P	T	B \$	596
GGA 1108 BIN R L T Z							\$ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES	356
GGA 1108 F+BAL RS P T C							\$GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	222
GGA 1108 F+BAL RS P T C							\$GAMTRI, 2-D MULTI-GP DIFFUSION TRIANGULAR MESH	401
GGA 1108 F+BAL RS P T C							\$GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	430
GGA 1108 F+BAL RS P T D							\$BUGTRI, 2D MULTIGP DIFFUSION & BURNUP TPI-MESH	439
GGA 1108 F+BAL RS P T D							\$BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	438
GGA 1108 F+BAL RS P T E							\$BLQOST6, COMBINED KINETICS 2-D HEAT TRANSFER	303
GGA 1108 F+BAL RS P T O							\$TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	333
GGA 1108 F4 S T D							\$GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	302
GGA 1108 F4 RS B							\$HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	291
GGA 1108 F4 RS T G							\$GADOSE, DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	261
GGA 1108 F4 RS P A							\$GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	289
GGA 1108 F4 RS P A							\$GASKET, THERMAL SCATTERING LAW CALCULATION	263
GGA 1108 F4 RS P A							\$PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	292
GGA 1108 F4 RS P D							\$FREVP6, HTGR METALLIC FISSION PRODUCT RELEASE	301
GGA 1108 F4 RS P E							\$GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	317
GGA 1108 F4 RS P E							\$GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	290
GGA 1108 F4 RS P I							\$SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	300
GGA 1108 F4 RS P I							\$SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	252
GGA 1108 F4 RS P I							\$SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	253
GGA 1108 F4 RS P I							\$SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS	379
GGA 1108 F4 RS P L							\$GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	296
GGA 1108 F4 RS P T A							\$TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	410
GGA 1108 F4 RS P T C							\$GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	319
GGA 1108 F4 RS P T C							\$GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	380
GGA 1108 F4 RS P T C							\$STEMC07, TEMPERATURE COEFFICIENT CALCULATION	320
GGA 1108 F4 RS P T D							\$FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	318
GGA 1108 F4 RS P T D							\$GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	339
GGA 1108 F4 RS P T D							\$PWCOST, REACTOR FUEL CYCLE COST CALCULATION	441

GGA

GRAPH

GGA	1108	F4	RS	P	T	F	\$GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	370	
GGA	1108	F4	RS	P	T	F	\$WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	R274	
GGA	1108	F4	RS	P	T	H	\$OYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	440	
GGA	1108	F4	RS	P	T	I	\$SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	332	
GGA	1108	F4	RS	P	T	J	\$MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	259	
GGA	1108	F4	RS	P	CT	D	\$OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	226	
GGA	1108	F4	RS	P	X	A	\$COHBE, COHERENT INELASTIC SCATTERING LAW CALC	385	
GGA	1108	F4	RS	P	X	T	B	\$GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	316
GGA	1108	F4	RS	P	X	T	L	\$GAND, GAFGAR X-SECTION LIBRARY PREPARATION	345
GGA	1108	F4	RS	P	XCT	C	\$GAPER1D, 1-D TRANSPORT PERTURBATION THEORY	606	
GGA	1108	F4	RS	P	XCT	D	\$CONCEPT3, POWER PLANT CONCEPTUAL COST ESTIMATE	498	
GGA	1108	F5	RS	P		A	\$FLANGE1, SCATTERING LAW X-SECTION CALCULATION	247	
GGA	1108	F5	RS	P		H	\$FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	395	
GGA	1108	F5	RS	P	T	B	\$ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS	596	
GGA	1108	F5	RS	P	T	C	\$2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	173	
GGA	1108	F5	RS	P	T	H	\$TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	408	
GGA	1108	F5	RS	P	T	H	\$TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	414	
GGA	1108	F5	RS	P	T	I	\$SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	451	
GGA	1108	F5	RS	P	T	I	\$SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	452	
GGA	1108	F5	RS	P	T	N	\$GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT	471	
GGA	1108	F5	RS	P	T	Q	\$CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	476	
GGA	1108	F5	RS	P	CT	A	\$FSDP3, POINTWISE XSECS. FROM B-W PARAMETERS	216	
GGA	1108B	F4	RS	P	T	A	\$GANDY3, UNRESOLVED RESONANCE X-SECTION CALC	341	
GGA	1108B	F4	RS	PLXCT		B	\$GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	298	
GGA	7044	F+MAP	RS	P	T	B	\$GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	219	
GGA	7044	F+MAP	RS	P	T	H	\$BLGOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	205	
GGA	7044	F+MAP	RSBP			M	\$UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	206	
GGA	7044	F+MAP	RSBP		T	C	\$GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	222	
GGA	7044	F+SPS	RSBP		T	N	\$CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	207	
GGA	7044	F4	RS			I	\$CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	233	
GGA	7044	F4	RS		X	T	G	\$PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	228
GGA	7044	F4	RS	P		D	\$RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	231	
GGA	7044	F4	RS	P		D	\$WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	224	
GGA	7044	F4	RS	P		I	\$GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	232	
GGA	7044	F4	RS	P		L	\$GAVER, ENERGY INTERVAL X-SECTION AVERAGING	218	
GGA	7044	F4	RS	P	T	B	\$FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	195	
GGA	7044	F4	RS	P	T	C	\$GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	220	
GGA	7044	F4	RS	P	T	C	\$STEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	225	
GGA	7044	F4	RS	P	T	D	\$GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	260	
GGA	7044	F4	RS	P	T	D	\$RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	221	
GGA	7044	F4	RS	P	T	D	\$REVISED-GAD, FUEL CYCLE ANALYSIS W/REFUELING	223	
GGA	7044	F4	RS	P	T	D	\$STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	227	
GGA	7044	F4	RS	P	T	G	\$ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY	229	
GGA	7044	F4	RS	P	T	I	\$SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	251	
GGA	7044	F4	RS	P	X	A	\$LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	217	
GGA	7044	F4	RSBP		CT	I	\$SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	250	
GGA	7090	F+FAP	RSB		T	A	\$TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	42	
GGA	7090	F+FAP	RSB		T	A	\$ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	41	
GGA	7090	F+FAP	RSBP		T	D	\$DDB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	99	
GGA	7090	F2	RS		T	A	\$SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	56	
GGA	7090	F2	RS	PLX	T	B	\$GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	33	
GGA	7090	F2	RSB		T	D	\$FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	117	
GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108B	F4	RS	PLXCT	B	\$	298	
GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	WANL	6600	F4	RS	L	T	B	\$	298
GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	LASL	6600	F4	RS	P	T	B	\$	361
GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	6600	F4	RS	P	T	H	\$	R424
GNATS,MESH2,GPRINT, 2-D NONLINEAR ANALYSIS	SLL	6600	F+COM	RS	P	T	I	\$	682
GPRINT, 2-D NONLINEAR ANALYSIS	SLL	6600	F+CCM	RS	P	T	I	\$GNATS,MESH2,	682
GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	F2	RS	P		J	\$	45
GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	F63	RS	P		J	\$	45
GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	F2	RS	P		J	\$	46
GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	1604	F63	RS	P		J	\$	46
GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	6600	F4	RS	P		A	\$	R470
GRAPH, LINEAR REGRESSION W/CONFIDENCE LIMITS	BKC	360	F4	RSBP			P	\$	624

GRAPHIC

HEDL

GRAPHIC X-SEC EVALUATION	AI	360	F+BAL	RSB	L	CT	M	\$SCORE3, SCISRS	ENDF/B	375							
GRAPHICS SUBROUTINES	AI	360	F+BAL	RS	T	P		\$FIGS, IBM360&2250	FORTRAN	484							
GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS				AI	7094	F+FAP	RS	PL	T	B	\$	162					
GRDWRK, GRID GENERATION FOR SAFE PROGRAMS				GGA	1108	F4		RS	P		L	\$	296				
GRID GENERATION FOR SAFE PROGRAMS				GGA	1108	F4		RS	P		L	\$	296				
GROUP CONSTANT CALC FROM TOP OUTPUT DATA				LASL	6600	F4		RS	P	T	B	\$	GLEN,	361			
GROUP OR MESH COLLAPSING				RW	6500	F4		RS	P		B	\$	PARTI, OPTIMAL	416			
GROUP THEORY OF LATTICE DYNAMICS				ANL	360	F4		RS	P	T	Q	\$	GROUP2,	620			
GROUP THEORY OF LATTICE DYNAMICS				LASL	6600	F4		RS	P	T	Q	\$	GFOUP2,	620			
GROUP-AVERAGED X-SEC CALC				GGA	1108	F4		RS	P	X	T	B	\$	GAF,GAR, SPECTRA AND	316		
GROUP-AVERAGING X-SECTIONS PARAMETERS				AI	7094	F+FAP	RS	PL	T	B		\$	GRAVE,	162			
GROUP-COLLAPSING				APG	6600	F4		RS		B		\$	APRFX1, 99-GP	DLC-2B LIBRARY	466		
GROUP-COLLAPSING OF MULTI-GP X-SECTIONS				LASL	7090	FLOCO	RS	P		B		\$	ZOT,		113		
GROUP2, GROUP THEORY OF LATTICE DYNAMICS				ANL	360	F4		RS	P	T	Q	\$			620		
GROUP2, GROUP THEORY OF LATTICE DYNAMICS				LASL	6600	F4		RS	P	T	Q	\$			620		
GROUSE, SPACE-DEPENDENT X-SECTION GENERATION				GEC	635	F4		RSBP		T	B	\$			420		
GSSLRN1B, LEAST SQUARES PHOTOPEAK SPECTRA CODE				BNW	1108	F+BAL	RS	P		T	Q	\$			457		
HAA3B, AEROSOL BEHAVIOR LOGNORMAL MODEL				AI	370	F		RS	P		T	G	\$			443	
HAFAVER, HAUSER-FESHBACH INELASTIC SCATTERING				CDC	1604	F63		RS	P		A	\$				14	
HAFMAT, SYSTEM STEADY-STATE FLOW DISTRIBUTION				KAPL	6600	F4		RS	P		T	H	\$			R616	
HAMMER ANALYSIS OF PIPING SYSTEM				HEDL	6600	F4		RS	P		T	G	\$	SHAMOC, FLUID		710	
HAMMER ANALYSIS PIPING SYSTEM				ANL	360	F4		RS	P		G	\$	NAHAMMER, FLUID			717	
HAMMER ANALYSIS PIPING SYSTEM				ANL	7600	F4		RS	P		G	\$	NAHAMMER, FLUID			717	
HAMMER ANALYSIS 1-D PIPING				ANL	360	F4		RS	P		G	\$	NATRANSIENT, FLUID			718	
HAMMER ANALYSIS 1D & 2D SYSTEMS				ANL	360	F4		RS	P		T	G	\$	NATRAN2, FLUID		719	
HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM				DP	360	F+BAL	RS	P	X	T	B	\$				277	
HAMOC, FLUID HAMMER ANALYSIS OF PIPING SYSTEM				HEDL	6600	F4		RS	P		T	G	\$			710	
HARMONY-PDQ X-SECTION GENERATION CODE				BAPL	6600	F+COM	RS	P	X	T	B	\$	PAX03,			P.426	
HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE				AGC	7090	F2		RSB			F	\$				153	
HAUSER-FESHBACH INELASTIC SCATTERING				CDC	1604	F63		RS	P		A	\$	HAFAVER,			14	
HEAT CONDUCTION				PPCO	7044	F+MAP	RS	P		T	H	\$	TOODEE, 2-D TIME-DEPENDENT			349	
HEAT CONDUCTION				ORNL	360	F4		RS	P	X	T	H	\$	ORTHIS,ORTHAT, 2-DIMENSIONAL		525	
HEAT CONDUCTION LUMPED MASS				LASL	7030	F4		RS		T	H	\$	RATH, 2- OR 3-D			242	
HEAT CONDUCTION LUMPED MASS				LASL	7094	FAP		RS	P		T	H	\$	RATH, 2- OR 3-D		242	
HEAT CONDUCTION PROGRAM				BAPL	6600	F4		RS	P		T	H	\$	HOT2, 2-D TRANSIENT		R286	
HEAT CONDUCTION PROGRAM				ORNL	3608	F4		RS	P		T	H	\$	HEATING3, 1,2, OR 3-D		517	
HEAT EXCHANGER STRESS ANALYSIS				KAPL	6600	F4		RS	P		I	\$	TUBE, U-TUBE			R378	
HEAT TRANSFER				GGA	1108	F+BAL	RS	P		T	E	\$	BLOOST6, COMBINED KINETICS 2-D			303	
HEAT TRANSFER				AI	7094	F2		RS	P		T	G	\$	TRANS-FUGUE1, TRANSIENT FLOW AND		268	
HEAT TRANSFER				GGA	7044	F+MAP	RS	P		T	H	\$	BLOOST5, POINT-KINETICS WITH 2-D			205	
HEAT TRANSFER				SSDC	370	F4		RS	P		H	\$	HEATING2, TRANSIENT STEADY-STATE			198	
HEAT TRANSFER CODE				ANC	3608	F4		RSBP	X	T	H	\$	MOXY/MOD032, BWR CORE			551	
HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES				LASL	7094	F2		RSBP		H	\$	AXFLU,				182	
HEAT TRANSFER PROGRAM				GEC	635	F+GMP	RSBP		T	H	\$	THTE, 3-D TRANSIENT				346	
HEAT TRANSFER PROGRAM				GGA	1108	F5		RS	P		T	H	\$	TAC3D, TRANSIENT 3-D		414	
HEAT TRANSFER SOLID FUEL TUBE BUNDLES				LASL	7094	F2		RSBP		H	\$	AXTHRM,				183	
HEAT TRANSFER STUDY				SLL	6600	F4		RS	P		N	\$	HEATMESH, GEOMETRICAL DATA			434	
HEATING CLADDING-STEAM REACTION				ANL	3600	F36		RSBP		G	\$	CHEMLOC2, CORE				366	
HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER				SSDC	370	F4		RS	P		H	\$				198	
HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM				ORNL	3608	F4		RS	P		T	H	\$			517	
HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY				SLL	6600	F4		RS	P		N	\$				434	
HEATUP CODE FOR BWR/6 ANALYSIS				EI	360	F+BAL	RS	P		CT	H	\$	6KILER, CORE			636	
HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS				NED	635	F4		RS	P		T	O	\$	BURNUP,			311
HEDL				360	F4	RSBP	X	T	B		\$	ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX				388	
HEDL				1108	F+SLE	RS	P	X	T	R		\$	SHERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS			527	
HEDL				1108	F4	RS	P		G		\$	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS				521	
HEDL				1108	F4	RS	P		T	D		\$	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS			567	
HEDL				1108	F5	RS	P		T	R		\$	TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY			599	
HEDL				1108	F5	RS	P	X	T	D		\$	PACTOLUS,CLOTHO, NUCLEAR POWER PLANT COST CODE			540	
HEDL				1108B	F4	RS	P	X	T	B		\$	ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX			388	
HEDL				6600	F	RS	P		T	H		\$	SIEH, LMFBR FUEL PIN THERMAL PERFORMANCE MODEL			673	
HEDL				6600	F4	RS	P		T	G		\$	SHAMOC, FLUID HAMMER ANALYSIS OF PIPING SYSTEM			710	
HEDL				6600	F4	RS	P		T	I		\$	BEAMCRP, FINITE-ELEMENT BEAM CREEP ANALYSIS			R701	
HEDL				6600	F4	RS	P		CT	F		\$	MELT3, FAST REACTOR TRANSIENT OVERPOWER STUDY			700	

HEDL

INPUT

HEDL 7600	FTN	RS P	G	\$SPRAY2, SODIUM SPRAY RELEASE SAFETY ANALYSIS	716
HELP, CRITICAL ANALYSIS SYSTEM	DP	360	F+BAL	RS P XCT B \$HAMMER, LITHE,	277
HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION	DP	360B	F4	RSBP CT C \$	136
HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	HEDL	1108	F+SLE	RS P XCT R \$	527
HETEROGENEOUS REACTOR CALCULATION	DP	360B	F4	RSBP CT C \$HERESY3, 2-D	136
HEX CELL BAPL 6600	F+ASC	RS P X T B	\$RESQ2, RESQ0, DBF1,	RESONANCE INTEGRAL	R285
HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS P T D \$GAUGE, 2-D FEW-GP	339
HEX LATTICE	GGA	1108	F4	RS B \$HEXSCAT, ELASTIC SCAT X-SECTIONS	291
HEX-Z MESH	GGA	1108	F4	RS P T C \$GATT, 3-D FEW-GP DIFFUSION CALC	380
HEXSCAT, ELASTIC SCAT X-SECTIONS	HEX LATTICE	GGA	1108	F4 RS B \$	291
HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BNW	1107	F4	RS P T C \$	241
HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	6600	F4	RS P H \$RAPP,	R382
HISTOGRAMS, QUALITY CONTROL SAMPLE STATISTICS	BKC	360	F4	RSBP P \$	614
HISTORIES	GGA	7044	F4	RS P T B \$FMC-N, MONTE CARLO CALC NEUTRON	195
HISTORIES	PW	1604	F+CDP	RS P X T B \$FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY	195
HISTORY	KECS	7094	F2	RSBP T H \$PTH1, BLOWDCWN PRESSUPE TEMPERATURE	155
HISTORY LASL 6600	F4	RS P T D	\$PHENIX, 2-D DIFFUSION BURNUP REFUELING	454	
HQH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P H \$M0899,	R294
HQH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P T H \$M0899,	R294
HOMOGENEOUS	ANL	3600	F36	RSBP A \$MISH-MASH, RESONANCE INTEGRAL CALC	214
HONDO, A DYNAMIC RESPONSE FINITE-ELEMENT CODE	SLA	6600B	F4	RS P T I \$	672
HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	F4	RS P T H \$	R286
HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	1108	F4	RS PLX T B \$	467
HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	360	F4	RS PLX T B \$	467
HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108	F4	RS T G \$GADOSE, DOSET,	261
HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	F4	RS X T G \$PRECON,	228
HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	F4	RS P D \$RAD2,	231
HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P D \$FREVA6,	301
HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI	360	F+BAL	RS P X T B \$	307
HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	F4	RS P CT F \$REXCO-H, 2-D	550
HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	F4	RS P CT F \$REXCO-H2, 2-D	R615
HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	360	F4	RS P X G \$BURST1,	435
HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	6600	F+CCM	RS P H \$HYMAS,	R560
HYDROGEN PERMEATION WITH TRAPPING	DP	360	F4	RSBP Q \$XOTRAP,	655
HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	6600	F+COM	RS P H \$	R560
H600	F4	RS P CT C	\$TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	FBRD	585
IBM 360A	F+BAL	RS P T D	\$PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION		R336
IBM OS SYSTEM CATALOG UTILITY ROUTINE	ANL	360D	BAL	RS X T P \$COPYCAT,	646
IBM2280 OR CALCOMP780	ANL	360	F4	RS P T N \$PLOT-3D, 3-D PLOTS ON	544
IBM360 FORTRAN H PROGRAM CHECKER	ANL	360B	PL1	S P CT P \$SLOP, CROSS,	647
IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS T P \$FIGS,	484
IITR 7094	F4	RSBP LX T D	\$SNAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY		314
IMPACT ANALYSIS	LASL	7600	F4	RS P I \$IMPAC2, B SHIPPING CONTAINER	715
IMPAC2, B SHIPPING CONTAINER IMPACT ANALYSIS	LASL	7600	F4	RS P I \$	715
IMPELLER DESIGN STUDY	PW	1604	F63	RS P T I \$PIP, CENTRIFUGAL PUMP	187
INCXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P X T F \$CEXE,	415
INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC	360	F4	RS PL CT B \$	565
INDEXING	LASL	6600	F+COM	RS P T Q \$INDEX, XRAY DIFFRACTION POWDER PATTERN	609
INDEX, XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	6600	F+COM	RS P T Q \$	609
INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS P T I \$GAPL3,	R397
INELASTIC SCAT X-SECTION CALC MODERATOR	GGA	1108	F4	RS P A \$GAKER,	289
INELASTIC SCATTERING	CDC	1604	F63	RS P A \$HAFAVER, HAUSER-FESHBACH	14
INELASTIC SCATTERING FORM FACTORS	ORNL	360	F4	RS P T A \$ATHENA4,	417
INELASTIC SCATTERING LAW CALC	GGA	1108	F4	RS P X A \$COHBE, COHERENT	385
INELASTIC STRUCTURAL ANALYSIS	ORNL	360	F4	RS P T I \$CREEP-PLAST, 2-D	R707
INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS L T B \$QUICKIE,	119
INFORMATION SYSTEM	KAPL	6600B	F+ASC	RSB X T M \$TIGIR2, MODULAR DOCUMENT	R403
INITIALLY OVAL TUBE	BNW	6600C	F4	RS P I \$BUCKLE, CREEP BUCKLING OF	667
INLET PLENUM	DP	360	F4	RS P H \$PLENUM, FLOW DIST. IN CYL COOLANT	586
INPUT	PW	1604	F63	RS C \$STOP, 2-D PERTURBATION TDC OR 2DXY FLUX	199
INPUT DATA PROCESSING MODULE	ANL	360	F4	RSBP CT L \$ARC-NUI002, BCD	533
INPUT GEN	KAPL	6600	F+C+D	RS P T L \$DATATRAN2, RAD1 GEOMETRY MODULES 2-D	406
INPUT PROCESSOR	LASL	360	F4	RS P L \$GENRD, FREE-FORMAT CARD	530
INPUT PROCESSOR	LASL	6600	F4	RS P L \$GENRD, FREE-FORMAT CARD	530

INSPEC

KAPL

INSPEC, MARKOV SIMULATION OF REACTOR OPN	DP	360	F4	RS P	G	\$INTEG,	590
INSTRUCTION SET	PW	1604	F+CDP	RS P	T P	\$LAG, ASSEMBLER FOR FLOCO2	186
INTEG, INSPEC, MARKOV SIMULATION OF REACTOR OPN	DP	360	F4	RS P	G	\$	590
INTERACTION ANALYSIS	ANL	360	F4	RS P	G	\$SOCOOL2, SODIUM-FUEL	521
INTERACTION ANALYSIS	HEDL	1108	F4	RS P	G	\$SOCOOL2, SODIUM-FUEL	521
INTERFACE FILE PROCESSOR	LASL	360	F4	RS P	CT M	\$LASIP3, CCCC STANDARD	691
INTERMEDIATE POWER TRANSIENTS	PAPL	6600	F4	RS P	T H	\$CHIC-KIN, FAST +	R473
INTERVAL X-SECTION AVERAGING	GGA	7044	F4	RS P	L	\$GAVER, ENERGY	218
INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	3600	F4	RS P	X T P	\$DE/STEP,	640
INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	6600	F4	RS P	X T P	\$DE/STEP,	640
INVENTORY	ANL	360	F4	RSBP	CT C	\$ARC-DIF10, 1-D MULTI-GP DIFFUSION &	626
INVERSE KINETICS CALC	ANL	360	F4	RS P	E	\$R102, SPACE-INDEPENDENT	168
INVERSE KINETICS CALC	ANL	3600	F63	RSBP	E	\$R102, SPACE-INDEPENDENT	168
INVERSE KINETICS CALC	WANL	7094	F4	RS	E	\$R102, SPACE-INDEPENDENT	168
IODINE REMOVAL	BCL	6400B	F4	RS P	X	G \$MIRAB, MIRAP, CONTAINMENT SYSTEM	499
IRRADIATED MATERIAL	GEC	7090	FAP	RSRP	X T Q	\$SPECTRA, MC CALCULATION	422
ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS				ORNL	1604	F63 RS P D \$	180
ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS				ORNL	7090	F2 RSBP D \$	180
ISOGEN, RADIONUCLIDE GENERATION AND DECAY				BNW	1108	F5 RSBP L T D \$	367
ISOPLETH-AREA CALC FROM SINGLE SOURCE	ANL	GETS	F	R	R	\$PLFTHS,	591
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	CRNL	360	F+BAL	RS P	D	\$	322
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	1604	F63	RS P	D	\$	322
ISOTAB, PU POWER OUTPUT FROM MIXED ISOTOPES	MLMO	360	F4	PSBP	CT Q	\$	R619
ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	360	F+BAL	RS P	D	\$ISCSEARCH,	322
ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	1604	F63	PS P	D	\$ISCSEARCH,	322
ISOTOPES	MLMO	360	F4	RSBP	CT Q	\$ISOTAB, PU POWER OUTPUT FROM MIXED	R619
ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	1604	F63	RS P	D	\$	179
ISOTOPIC BURNUP ANALYSIS	NED	635	F4	RS P	T O	\$BURNUP, HEAVY ELEMENT	311
ISOTROPIC DIELECTRICS	ANL	360	F4	RS P	CT V	\$FFEARS, LAPLACE EQUATION	577
ISOTROPIC DIELECTRICS	SLA	6600B	F4	RS P	T V	\$FFEARS, LAPLACE EQUATION	577
JACOBIAN	LLL	360C	F4	RS P	X T P	\$GEARB, SOLVE ODE SYSTEM WITH BANDED	661
JACOBIAN	LLL	6600C	F4	RS P	X T P	\$GEARB, SOLVE ODE SYSTEM WITH BANDED	661
JACOBIAN	LLL	360	F4	RS P	X T P	\$EPISODEB, SOLVE ODE SYST WITH BANDED	705
JAER	230	F4	RS P	T B	\$CLUP77, SQUARE CELL COLLISION PROBABILITY CALC		526
JITER, FLUCTUATION EXPERIMENT ANALYSIS				BAPL	6600	F4 RS P T O \$	R394
JNC	1108B	F5	RS PLX	T B	\$LEOPARD, SPOTS, SPECTRUM CALC WITH DEPLETION		279
JOB ENTRY SYSTEM	ANC	360	BAL	RSB	T P	\$NRTS-RJE, OS/360 MVT REMOTF	519
JOINTS	ORNL	360	F4	RS P	T I	\$FLANGE-ORNL, ANALYSIS OF FLANGED	689
JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP	360	F+BAL	S	X T B	\$RAHAB,	536
JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S	T M	\$	490
JOURNAL CONTROL, LIBRARY JOURNAL MANAGEMENT	ORNL	360	C+BAL	RS PL	CT M	\$	660
JOURNAL MANAGEMENT	ORNL	360	C+BAL	RS PL	CT M	\$JOURNAL CONTROL, LIBRARY	660
JPIXR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	6600	F4	RS P	T A	\$	R506
JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	360	F4	RS P	CT A	\$	308
JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	ORNL	1604	F63	RS P	T A	\$	308
KAPL 6600	F+ASC	RS	P			\$SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	R442
KAPL 6600	F+ASC	RS P	T H			\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	R299
KAPL 6600	F+ASC	RS P	T I			\$GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	R344
KAPL 6600	F+ASC	RS P	T P			\$CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	R 43
KAPL 6600	F+ASC	RS P	T P			\$DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	R428
KAPL 6600	F+ASC	RS P	T P			\$LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	R445
KAPL 6600	F+ASC	RS P	T P			\$SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	R364
KAPL 6600	F+C+D	RS P	T L			\$DATATRAN2, RAD1 GEOMETRY MODULES 2-D INPUT GEN	406
KAPL 6600	F+C+D	RS P	T P			\$DATATRAN2, UTILITY PLOT MODULES, F(X) & F(X,Y)	407
KAPL 6600	F+COM	RS	T P			\$KAPL PLOT, KAPL CALCOMP PLOTTING ROUTINES	R496
KAPL 6600	F+COM	RS P	T M			\$DATATRAN2, MODULAR PROGRAMMING AND DATA SYSTEM	386
KAPL 6600	F4	RS	I			\$SORSDB, PRESSURE VESSEL STRESS AND FATIGUE	R391
KAPL 6600	F4	RS	T O			\$GASPAR, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	R485
KAPL 6600	F4	RS P	A			\$CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	R531
KAPL 6600	F4	RS P	A			\$MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	R535
KAPL 6600	F4	RS P	F			\$RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	R352
KAPL 6600	F4	RS P	F			\$STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	R389
KAPL 6600	F4	RS P	H			\$RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	R382
KAPL 6600	F4	RS P	I			\$STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	R337

KAPL

LASIP3

APL	6600	F4	RS	P	I	\$TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	R378
KAPL	6600	F4	RS	P	O	\$OYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	R464
KAPL	6600	F4	RS	P	P	\$MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	R446
KAPL	6600	F4	RS	P	P	\$R0PE, FINDING ROOTS OF A POLYNOMIAL	R444
KAPL	6600	F4	RS	P	T A	\$JPIXR, COUPLED-CHANNEL SCATTERING X-SEC CALC	R506
KAPL	6600	F4	RS	P	T A	\$PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	R507
KAPL	6600	F4	RS	P	T D	\$3DXT, DEP3, 3-D XENON TRANSIENT & DEPLETION	R477
KAPL	6600	F4	RS	P	T H	\$HAFMAT, SYSTEM STEADY-STATE FLOW DISTRIBUTION	R616
KAPL	6600	F4	RS	P	X I	\$FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	R404
KAPL	6600B	F+ASC	RSB	X	T M	\$TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	R403
KAPL	6600C	F4	RS	P	T I	\$SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	R 80
KAPL	CALCOMP	PLOTTING	ROUTINES			KAPL 6600 F+COM PS T P \$KAPLPLOT,	R496
KAPL	PLOT,	KAPL	CALCOMP	PLOTTING	ROUTINES	KAPL 6600 F+COM RS T P \$	R496
KECS	7094	F+MAP	RSBP	T	G	\$SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	200
KECS	7094	F2	RSBP	T	H	\$PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	155
KEELE,	LINEARLY-CONSTRAINED	OPTIMIZATION				ORNL 360 F4 RS P P \$	556
KEFF,	MG8S, TGAN,	NUCLEAR	CRITICALITY	SAFETY		DP 360 F4 RS P T C \$	617
KEND2,	MONTE CARLO	MULTIGROUP	CRITICALITY	CODE		DP 360B F+BAL RSBP CT C \$	450
KEND2,	MONTE CARLO	MULTIGROUP	CRITICALITY	CODE		RFD 6600B F+COM RS PLX T C \$	450
KEND4,	MONTE CARLO	MULTIGROUP	CRITICALITY	CODE		ORNL 360C F+BAL RSBPLXCT C \$	450
KERNEL	CALC	GGA	7090	F2	RS	T A \$SUMMIT, CRYSTALLINE SCATTERING	56
KERNELS	DP	360	BCD	R	LX T Z	\$THERMOS LIBRARY, 30-GP ENDF/B SCAT	543
KEX	OPTIONS	ANL	360	F4	RS P	E \$R101, SPACE-INDEPENDENT KINETICS	255
KEX	OPTIONS	ANL	3600	F63	RSBP	E \$R101, SPACE-INDEPENDENT KINETICS	255
KEX	OPTIONS	WANL	7094	F4	RS P	E \$R101, SPACE-INDEPENDENT KINETICS	255
KINETICS	AI	360	F4	RS	P T F	\$TSN, SPATIALLY-DEPENDENT REACTOR	309
KINETICS	AI	7094	F+MAP	RS	P T F	\$TSN, SPATIALLY-DEPENDENT REACTOR	309
KINETICS	GGA	1108	F4	RS	P E	\$GAPOTKIN, SPACE-INDEPENDENT REACTOR	317
KINETICS	BCL	6400	F4	RS	P T F	\$ADEP, 1-D & 2-D FEW-GROUP SPACE-TIME	494
KINETICS	CALC	ANL	360	F4	RS P	E \$R102, SPACE-INDEPENDENT INVERSE	168
KINETICS	CALC	ANL	3600	F63	RSBP	E \$R102, SPACE-INDEPENDENT INVERSE	168
KINETICS	CALC	WANL	7094	F4	RS	E \$R102, SPACE-INDEPENDENT INVERSE	168
KINETICS	CODE	ANL	360	F4	RS P T E	\$ANCON, SPACE-INDEPENDENT REACTOR	486
KINETICS	CODE	ANL	360	F4	RS PL CT F	\$QX1, QUASISTATIC SPATIAL REACTOR	474
KINETICS	CODE	ANL	3600	F6F	RS PL CT F	\$QX1, QUASISTATIC SPATIAL REACTOR	474
KINETICS	CODE	LASL	6600	F4	RS P T E	\$ANCON, SPACE-INDEPENDENT REACTOR	486
KINETICS	EQNS	GGA	1108	F4	RS P	E \$GASA, STABILITY ANALYSIS REACTOR	290
KINETICS	KEX	OPTIONS	ANL	360	F4	RS P E \$R101, SPACE-INDEPENDENT	255
KINETICS	KEX	OPTIONS	ANL	3600	F63	RSBP E \$R101, SPACE-INDEPENDENT	255
KINETICS	KEX	OPTIONS	WANL	7094	F4	RS P E \$R101, SPACE-INDEPENDENT	255
KINETICS	PROGRAM	ORNL	360	F4	RS P XCT E	\$TASK, 1-D MULTIGROUP REACTOR	558
KINETICS	SNAP	GEOMETRY	AI	7090	F2	RS E \$SNAPKIN5/5A, 1-REGION	122
KINETICS	TEMPERATURE	DIST	STUDY	AEB	360 F4	RS P E \$BLAST, REACTOR	363
KINETICS	TEMPERATURE	FEEDBACK	BAPL	6600	F4	RS P T F \$NOWIG, 1-D 2-GP	R371
KINETICS	W/FEEDBACK	AI	7094	F+MAP	RS P T E	\$AIROS, SPACE-INDEPENDENT	163
KINETICS	W/FEEDBACK	AEB	360	F4	RS P E	\$AIRESK3, SPACE-INDEPENDENT	121
KINETICS	W/FEEDBACK	AI	7090	F2	RS E	\$AIRESK3, SPACE-INDEPENDENT	121
KINETICS	W/FEEDBACK	CDC	1604	F63	RS P E	\$AIRESK3, SPACE-INDEPENDENT	121
KINETICS	WITH	TEMP	FEEDBACK	GGA	1108	F4 RS P T F \$GAKIT, 1-D MULTIGP	370
KINETICS	2-D	HEAT	TRANSFER	GGA	1108	F+BAL RS P T E \$BLOOST6, COMBINED	303
KITT,	SYSTEM	FAULT	TREE	EVALUATION	CODES	ANC 360 F4 RSBP CT G \$PREP,	528
KITT,	SYSTEM	FAULT	TREE	EVALUATION	CODES	ANC 1108 F4 RS P T G \$PREP,	528
KSUN	360	F4	RS	P	O	\$CORGM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	390
LAG,	ASSEMBLER	FOR	FLOCO2	INSTRUCTION	SET	PW 1604 F+CDP RS P T P \$	186
LAGRANGIAN	EQNS	OF	MOTION	SOLUTION	SLA	3600 F36 RS P T S \$TOODY2, 2-D	627
LAI1	RS	P	C	\$MGDSN,	1-D	MULTI-GP SN APPROX SLAB CYL SPHERE PW 1604	211
LAI1	RS	P	N	\$DTX,	EFFECTIVE	X-SECTION CALC FROM DSN OUTPUT PW 1604	210
LANGUAGE	KAPL	6600	F+ASC	PS	P	\$SIMPLE1, TIME-SHARING PROGRAMMING	R442
LAPLACE	EQUATION	ISOTROPIC	DIELECTRICS	ANL	360	F4 RS P CT V \$FFEARS,	577
LAPLACE	EQUATION	ISOTROPIC	DIELECTRICS	SLA	6600B	F4 RS P T V \$FFEARS,	577
LARCA,	FLUX-WEIGHTING	OF	DTF4	CROSS	SECTIONS	LASL 6600 F4 RS P N \$	409
LARGE	DEFLECTION	STRESS	STUDY	BAPL	6600	F+COM RS P T I \$GAPL3, INELASTIC	R397
LASER,	SPECTRUM	CALC	WITH	BURNUP	CYL	LATTICE TVA 360B F4 RSBPLXCT B \$	249
LASIP3,	CCCC	STANDARD	INTERFACE	FILE	PROCESSOR	LASL 360 F4 RS P CT M \$	691

LASL

LEAST

LASL	360	F4	RS	P	L	\$GENRD, FREE-FORMAT CARD INPUT PROCESSOR	53
LASL	360	F4	PS	P	CT	M \$LASIP3, CCCC STANDARD INTERFACE FILE PROCESSOR	69
LASL	360	F4	RSBP	CT	C	\$TRIPLT, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	608
LASL	360D	F4	RSBP	CT	C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	358
LASL	6600	BCD	R	LX	T	Z \$LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS	532
LASL	6600	F+COM	RS	P	T	P \$LENDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	602
LASL	6600	F+COM	RS	P	T	Q \$INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING	609
LASL	6600	F4	RS	P	L	\$GENRD, FREE-FORMAT CARD INPUT PROCESSOR	530
LASL	6600	F4	RS	P	N	\$DAC1, SN PERTURBATION CODE USING DTF4 FLUXES	455
LASL	6600	F4	RS	P	N	\$LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	409
LASL	6600	F4	RS	P	T	A \$TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	360
LASL	6600	F4	RS	P	T	B \$GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	361
LASL	6600	F4	RS	P	T	C \$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	209
LASL	6600	F4	RS	P	T	C \$TRIPLT, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	608
LASL	6600	F4	RS	P	T	D \$PHENIX, 2-D DIFFUSION BURNUP REFUELING HISTORY	454
LASL	6600	F4	RS	P	T	D \$2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	325
LASL	6600	F4	RS	P	T	D \$3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	463
LASL	6600	F4	RS	P	T	E \$ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	486
LASL	6600	F4	RS	P	T	Q \$GROUP2, GROUP THEORY OF LATTICE DYNAMICS	620
LASL	6600	F4	RS	P	T	U \$RICE-LASL, CHEMICALLY REACTIVE MIXTURE FLOW	720
LASL	6600C	F+COM	RS	T	P	\$LASLIB, LOS ALAMOS SUBROUTINE LIBRARY ROUTINES	633
LASL	6600D	F4	RS	P	T	C \$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	358
LASL	7030	F4	RS	T	H	\$RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	242
LASL	7030	F4	RS	P	T	C \$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	209
LASL	7030	F4	RS	P	T	D \$DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	269
LASL	7090	F+FAP	RS	P	I	\$WIREX, COMPUTER-PRODUCED WIRING LISTS UHTPEX	315
LASL	7090	F+FAP	RS	P	T	L \$DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	234
LASL	7090	FLQCD	RS	P	B	\$MCS, MONTE CARLO NEUTRON PENETRATION STUDY	202
LASL	7090	FLQCD	RS	P	B	\$ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	113
LASL	7094	FAP	RS	P	T	H \$RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	242
LASL	7094	F2	RSBP	H		\$AXFLU, HEAT TRANSFER MCLTEN FUEL TUBE BUNDLES	182
LASL	7094	F2	RSBP	H		\$AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	183
LASL	7094	F4	RS	T	P	\$LASL LEAST SQUARES, GENERAL CURVE FITTING	62
LASL	7600	F4	RS	P	H	\$SOLA-ICE, TRANSIENT COMPRESSIBLE FLUID FLOW	723
LASL	7600	F4	RS	P	I	\$IMPAC2, B SHIPPING CONTAINER IMPACT ANALYSIS	715
LASL	7600	F4	RS	P	T	C \$TRIPLT, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	608
LASL	7600	F4	RS	P	T	C \$TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH	573
LASL	7600	F4	RS	P	T	H \$COMPARE, TRANSIENT FLOW IN VENTED FLUID SYSTEM	702
LASL	7600B	F	RS	P	H	\$SOLA, SOLA-SURF, TRANSIENT FLUID FLOW ALGORITHM	651
LASL	7600D	F4	RS	P	T	C \$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	358
LASL	LEAST SQUARES, GENERAL CURVE FITTING					LASL 7094 F4 RS T P \$	62
LASL	XSEC SETS, SN 18- 24- AND 25-GROUP SETS					LASL 6600 BCD R LX T Z \$	532
LASL	LIB, LOS ALAMOS SUBROUTINE LIBRARY ROUTINES					LASL 6600C F+COM RS T P \$	633
LATIN SQ, NXN LATIN SQUARE EXPERIMENTAL DESIGN						MLMO 360 F4 RSBP C P \$	630
LATIN SQUARE EXPERIMENTAL DESIGN						MLMO 360 F4 RSBP C P \$LATIN SQ, NXN	630
LATTICE	GGA	1108	F4	RS	B	\$HEXSCAT, ELASTIC SCAT X-SECTIONS HEX	291
LATTICE	TVA	360B	F4	RSBP	LXCT	B \$LASER, SPECTRUM CALC WITH BURNUP CYL	249
LATTICE DYNAMICS			ANL	360	F4	RS P T Q \$GROUP2, GROUP THEORY OF	620
LATTICE DYNAMICS			LASL	6600	F4	RS P T Q \$GROUP2, GROUP THEORY OF	620
LATTICE EFFECTS	GGA	7044	F+MAP	RS	P	T B \$GAROL, RESONANCE OVERLAP AND	219
LATTICE EFFECTS	LER	7094	F+MAP	RS	P	T B \$GAROL, RESONANCE OVERLAP AND	219
LATTICE PHYSICS MODULES	DP		360	F+BAL	S	X T B \$RAHAB, JOSHUA SYSTEM	536
LATTICE VIBRATION NEUTRON SCATTERING CODES	ANC		360	F4	RS	P CT W \$MACS	574
LEAKAGE	AI	7090	F2	RS	J	\$FARSE1A, DOSE RATE FROM SNAP SHIELD	91
LEASE ANALYSIS	SLA	360	COBOL	RSBP	CT	M \$BECOM, AEC DP PURCHASE VERSUS	P 589
LEASE ANALYSIS	SLA	1108	COBOL	RS	P	M \$BECOM, AEC DP PURCHASE VERSUS	R 589
LEAST SQ LENS DESIGN SYSTEM	LASL	6600	F+COM	RS	P	T P \$LENDES, NONLINEAR	602
LEAST SQUARES ANALYSIS RESONANCE DATA	UICS	360	F4	RS	P	A \$CODILLI,	347
LEAST SQUARES EXPONENTIAL DECAY CURVES	LLL	7094	F2	RS	P	P \$EXPALS,	321
LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	6600	F4	RS	P	T P \$DAFT1,	R 327
LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	F2	RS	P	P \$FRANTIC,	324
LEAST SQUARES FIT TO NONLINEAR FORMS	DP	360	F4	RS	P	P \$NIXLIN,	709
LEAST SQUARES PHOTOPEAK SPECTRA CODE	BNW	1108	F+BAL	RS	P	T O \$GSSLRN1B,	457
LEAST SQUARES TRANSMUTATION ANALYSIS	BNW	1108	F5	RS	P	T D \$DBUFIT1,	456

LITHE

MANIPULATION

LITHE,HELP, CRITICAL ANALYSIS SYSTEM	DP	360	F+BAL	PS P	XCT B	\$HAMMER,	277
LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	6600	F+ASC	RS P	T P	\$	P445
LLL 360 F4 RS P X T P	\$EPISODE, ORDINARY DIFF EQUATION SYSTEM SOLVER						675
LLL 360 F4 RS P X T P	\$EPISODEB, SOLVE ODE SYST WITH BANDED JACOBIAN						705
LLL 360C F4 RS P X T P	\$GEARB, SOLVE ODE SYSTEM WITH BANDED JACOBIAN						661
LLL 709 F2 RS	\$FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY						7
LLL 6600C F4 RS P X	\$GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER						592
LLL 6600C F4 RS P X T P	\$GEARB, SOLVE ODE SYSTEM WITH BANDED JACOBIAN						661
LLL 7090 F+CAP RS P T B	\$SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS						160
LLL 7090 F2 RS P F	\$CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE						129
LLL 7094 F2 RS P P	\$EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES						321
LLL 7600 F4 RS P T T	\$WFLLL2B, WIPE CONFIGURATION FREQUENCY DOMAIN						721
LMFBR COOLANT TEMPERATURE PREDICTION	MIT	370	F4	RS P	T H	\$ENERGY,	696
LMFBR FUEL PIN THERMAL PERFORMANCE MODEL	HEDL	6600	F	RS P	T H	\$STEX,	673
LMFBR FUEL PIN ANL 360 F4 RS P	H \$MARGE/SLUMP, MAXIMUM TEMPERATURE						677
LMFBR POWER EXCURSION DISASSEMBLY ANL 360 F4	RS P XCT F \$VENUS, 2-D						511
LMFBR ROD BUNDLE NED 635 F4	RS P T H \$VELVET2, TURBULENT FLOW IN						458
LOAD GGA 7044 F4 PSBP CT I	\$SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC						250
LOAD BAPL 6600 F4 PS P T I	\$SEALSHL2, SHELL STRESS ANALYSIS AXISYM						R282
LOAD SR 360 F4 RS P T I	\$SEALSHL2, SHELL STRESS ANALYSIS AXISYM						R282
LOAD WTSC 6600B F4 PS P T I	\$SEAL SHELL, SHELL STRESS ANALYSIS AXISYM						R282
LOAD GGA 7044 F4 RS P T I	\$SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC						251
LOCA ANC 360 F4 RSBP X T G	\$THETA1-B, FUEL ROD THERMAL RESPONSE						512
LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCE 635 F4 RS					\$ANVENT,	529
LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL 6400 F4 RS P					\$FRCP2,	500
LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC 360 F4 RS PL CT M					\$ERREST,	518
LOFT KECS 7094 F+MAP RSBP T G	\$SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS						200
LOG GAMMA SUBROUTINES SLA 6600 F4	RS P T P \$BESSEL FUNCTIONS, AIRY &						656
LOGNORMAL MODEL AI 370 F	RS P T G \$HAA3B, AEROSOL BEHAVIOR						443
LOS ALAMOS SUBROUTINE LIBRARY ROUTINES	LASL 6600C F+CGM RS					\$LASLIB,	633
LOSS-OF-COOLANT & EMERGENCY COOLING	BCL 6400 F4 RS P T G					\$ECCSA4,	330
LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL 6600 F4 RS P T G					\$FLASH3,	P295
LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL 6600 F4 RS P T G					\$M0555,ACT1,	R284
LOSS-OF-COOLANT THERMAL ANALYSIS	BCL 6400 F4 RS P T G					\$NURLOC-1.0,	328
LUGS, STRESS FOR INTEGRAL ATTACHMENTS TO PIPE	ORNL 360 F4 RS P					\$	648
LUMPED MASS LASL 7030 F4 RS	T H \$RATH, 2- OR 3-D HEAT CONDUCTION						242
LUMPED MASS LASL 7094 FAP RS P T H	\$RATH, 2- OR 3-D HEAT CONDUCTION						242
LWBR FUEL SWELLING TEMPERATURE STUDY	EAPL 6600 F4 RS P T H					\$FIGRO,	R272
LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	ORNL 7090 F2 RS					\$	381
MA-G 360 F4 RSBP CT G	\$FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION						R448
MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL 3600 F63 RSBP T J					\$	143
MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW 7090 F2 RSBP T J					\$	143
MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL 3600 F36 RS P X T C					\$	262
MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	MTS 360 F4 RSBP XCT C					\$	262
MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD 6500 F4 RS PLX T C					\$	262
MACRO-BASED STRUCTURED FORTRAN	SLAC 360 F4 RSBP XCT P					\$MORTAN2,	678
MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	ANC 360 F4 RS P CT W					\$	574
MAD RSB 0 \$BURP1, DETECTOR EFFICIENCY POINT SOURCE	MTS 7090						164
MAD RSB 0 \$BURP2, DETECTOR EFFICIENCY DISK SOURCE	MTS 7090						165
MAD RSB 0 \$BURP3, DETECTOR EFFICIENCY POINT SOURCE	MTS 7090						166
MAD RSB 0 \$BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	MTS 7090						169
MAD RSB 0 \$BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	MTS 7090						170
MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL 3600 36F RSBP T M					\$MERMC2,	472
MAGNETIC NETWORK SOLUTION	BAPL 6600B F4 RS P T I					\$MANE1, RECTANGULAR	P412
MAINTENANCE ANL 360 F4 RS	M \$MERMC2, MC**2 BINARY LIBRARY TAPE						472
MAINTENANCE NED 635 F4 RS P T M	\$TROUT, MUG MULTIGROUP XSEC LIBRARY						493
MAINTENANCE NED 1108 F5 RS P T M	\$TROUT, MUG MULTIGROUP XSEC LIBRARY						493
MANAGEMENT ORNL 360 C+BAL PS PL CT M	\$JOURNAL CONTROL, LIBRARY JOURNAL						660
MANAGEMENT NED 635 F4 RS P T D	\$FUMBLE, FAST REACTOR FUEL BURNUP &						480
MANAGEMENT SYSTEM UCND 370 COBOL RS	CT M \$NMMS, NUCLEAR MATERIALS						695
MANAGEMENT SYSTEM ALDO 360 COBOL RS P	M \$AEC-ALO FAU, RADIO FREQUENCY						587
MANAGEMENT, EDITING, & ANALYSIS	BAPL 6600 F4 RS P T M					\$SHLOG, DATA	P557
MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL 6600B F4 RS P T I					\$	R412
MANIPULATION ANL 360 F4 RSBP CT L	\$ARC-XSEC1, MICROSCOPIC X-SECTION						594

MANTA

MGDSN

MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	635	F4	RS P	T H	\$	256
MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600	F4	RS P	T H	\$	256
MANUFACTURING REQUIREMENTS GEPI, GETS BASIC R	M			\$MAPPER, PREDICTING			595
MAPPER, PREDICTING MANUFACTURING REQUIREMENTS	GEPI	GETS	BASIC	R	M	\$	595
MARGE/SLUMP, MAXIMUM TEMPERATURE LMFBR FUELPIN	ANL	360	F4	RS P	H	\$	677
MARKOV SIMULATION OF REACTOR OPN DP	360	F4	RS P	G	\$INTEG, INSPEC,		590
MARLOWE, BINARY COLLISION CASCADE SIMULATION	ORNL	360B	F+BAL	RS P X T Q	\$		680
MARS, 2-D EXCURSION CALCULATION RZ GEOMETRY	APDA	7094	F4	RS P	F	\$	293
MASS LASL 7030 F4 RS T H	\$RATH, 2- OR 3-D	HEAT CONDUCTION LUMPED					242
MASS LASL 7094 FAP RS P T H	\$RATH, 2- OR 3-D	HEAT CONDUCTION LUMPED					242
MASS MATRIX GENERATION	BAPL	6600	F+COM	RS P	H	\$HYMAS, HYDRODYNAMIC	R560
MASS SPECTROMETRY RFD	360	F4	RS P	U	\$DYNAMIC ANALYSIS OF GASES BY		645
MATERIAL GEC 7090 FAP RSBP X T Q	\$SPECTRA, MC CALCULATION IRRADIATED						422
MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360	F4	RS P	B	\$WELWING,	362
MATERIALS LASL 6600 F4 RS P T A	\$TOR, THERMAL SCATTERING CRYSTALLINE						360
MATERIALS MANAGEMENT SYSTEM	UCND	370	COBOL	RS	CT M	\$NNMSS, NUCLEAR	695
MATHEMATICAL SUBROUTINES	SLA	6600C	F+CCM	RS P X T P	\$MATHLIB, SANDIA		654
MATHLIB, SANDIA MATHEMATICAL SUBROUTINES	SLA	6600C	F+COM	RS P X T P	\$		654
MATRICES AGC 7090 F2 RS P T B	\$AGN-SIGMA, CALC OF MULTI-GP TRANSFER						243
MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	360B	F4	RSBP XCT P	\$EISPACK2,		534
MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	PD10B	F4	RS P X T P	\$EISPACK2,		534
MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	1110B	F4	RS P X T P	\$EISPACK2,		534
MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	6600B	F4	RS P X T P	\$EISPACK2,		534
MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	6700B	F4	RS P X T P	\$EISPACK2,		534
MATRIX GENERATION	BAPL	6600	F+CCM	RS P	H	\$HYMAS, HYDRODYNAMIC MASS	R560
MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	6600	F4	RS P	I	\$STEM,	R337
MATUS, 3-D FINITE-ELEMENT ELASTIC ANALYSIS	BAPL	6600	F+COM	RS P X T I	\$		R597
MAXIMUM MOMENT CALC	AI	7090	F+FAP	RS	T I	\$4RESTRAINT PIPE STRESS,	109
MAXIMUM TEMPERATURE LMFBR FUELPIN	ANL	360	F4	RS P	H	\$MARGE/SLUMP,	677
MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	1604	F63	RS P	D	\$ISOTOPES,	179
MC ORNL 360B F+BAL RS P T B	\$RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES						392
MC CALCULATION IRRADIATED MATERIAL	GEC	7090	FAP	RSBP X T Q	\$SPECTRA,		422
MC NEUTRON PENETRATION CALCULATION	DAC	7090	F2	RSBP	J	\$LIPRECAN1,	123
MC NEUTRON, GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS P X T B	\$FMC-N, FMC-G,		195
MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	360	F4	RS	M	\$MERMC2,	472
MC**2 DATA CONVERSION	ANL	360	F4	RS P CT M	\$ETOE, ENDF/B TO		350
MC**2 DATA CONVERSION	APDA	3600	ASAF4	RS P T M	\$ETOE, ENDF/B TO		350
MC**2 LIBRARY SERVICE ROUTINES	ANL	3600	36F	RSBP T M	\$MERMC2, MAGIC,		472
MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	360	F4	RS P CT B	\$		355
MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600	F36	RS P T B	\$		355
MCGUIRE UNITS DUCD 635 F4 RS	G	\$ANVENT, LOCA ANALYSIS DUKE POWER					529
MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	7090	FLOCO	RS P	B	\$	202
MEASUREMENT ANALYSIS	GEC	635	F4	RSBP	O	\$MICHRD, MICROHARDNESS	421
MEASUREMENTS	GGA	1108	F4	RS P T A	\$TACASI, ANALYSIS OF RESONANCE		410
MEDIA TLD CORRECTION CALC	AI	360	F4	RS P T Q	\$RESPOND, DISSIMILAR		566
MEDIUM SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS L T B	\$QUICKIE, INFINITE		119
MELT3, FAST REACTOR TRANSIENT OVERPOWER STUDY	HEDL	6600	F4	RS P CT F	\$		700
MEMORY DUMP UTILITY	BKY	7600	F+COM	RS P T P	\$DUMP, USER-ORIENTED		698
MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	360	F4	RS	M	\$	472
MERMC2, MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	3600	36F	RSBP T M	\$		472
MESH GGA 1108 F4 RS P T C	\$GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z						380
MESH GGA 1108 F+BAL RS P T C	\$GAMTRI, 2-D MULTI-GP DIFFUSION TRIANGULAR						401
MESH COLLAPSING	RW	6500	F4	RS P	B	\$PARTI, OPTIMAL GROUP OR	416
MESH GENERATION	ANL	360	F4	RS P CT L	\$QMESH, RENUM, SELF-ORGANIZING		612
MESH GENERATION	SLA	6600	F4	RS P T L	\$QMESH, RENUM, SELF-ORGANIZING		612
MESH TRANSPORT PROGRAM	LASL	360	F4	RSBP CT C	\$TRIPLET, 2-D TRIANGULAR		608
MESH TRANSPORT PROGRAM	LASL	6600	F4	RS P T C	\$TRIPLET, 2-D TRIANGULAR		608
MESH TRANSPORT PROGRAM	LASL	7600	F4	RS P T C	\$TRIPLET, 2-D TRIANGULAR		608
MESH2, GPRINT, 2-D NONLINEAR ANALYSIS	SLL	6600	F+COM	RS P T I	\$GNATS,		682
METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P	D	\$FREVAP6, HTGR	301
METALS GEC 7094 F+FAP RSBP T Q	\$CASCADE, CLUSTER, RADIATION DAMAGE IN						419
METRICATION, CONVERSION TO OR FROM SI UNITS	RDYN	370B	F4	RS P T P	\$		G668
MGBS, TGAN, NUCLEAR CRITICALITY SAFETY	DP	360	F4	RS P T C	\$KEFF,		617
MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW	1604	LAG1	RS P	C	\$	211

MICHRD

MCFTRAN2

MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	F4	RSBP	Q	\$	4
MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	F4	RSBP	Q	\$MICHRD,	421
MICROSCOPIC X-SECTION MANIPULATION	ANL	360	F4	RSBPL CT	L	\$ARC-XSEC1,	594
MINIMAL SETS FROM FAULT TREES	ANC	360	F4	PSBP CT	G	\$MOCUS,	653
MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400B	F4	RS P X	G	\$	499
MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400B	F4	RS P X	G	\$MIRAB,	499
MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	F36	RSBP	A	\$	214
MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCO	7090	F2	RS P	C	\$	59
MIT 360 F4 RS P T I	\$SABOR4,	DISCRETE-ELEMENT ANALYSIS THIN SHELLS					R402
MIT 360B F+BAL RSBP T D	\$PDQ5,	2-D FEW-GROUP DIFFUSION AND DEPLETION					R336
MIT 370 F4 RS P T F	\$GAKIN2,	1D MULTIGROUP TIME-DEPENDENT DIFFUSION					310
MIT 370 F4 RS P T H	\$ENERGY,	LMFBR COOLANT TEMPERATURE PREDICTION					696
MIT 7090 F2 RS P P	\$FRANTIC,	LEAST SQUARES FIT SUM OF EXPONENTIALS					324
MIX KAPL 6600 F4 RS P H	\$RAPP,	HIGH-VELOCITY FLOW STUDY STEAM-WATER					R382
MIXED ISOTOPES	MLMQ	360 F4	RSBP CT	Q	\$ISOTAB,	PU POWER OUTPUT FROM	R619
MIXED-OXIDE FUEL ELEMENT PERFORMANCE	ANL	370 F4	FS P CT	I	\$LIFE3,		R460
MIXED-OXIDE FUEL ELEMENT PERFORMANCE	ANL	7600 F4	RS P T	I	\$LIFE3,		R460
MIXTURE FLOW	LASL	6600 F4	RS P T	U	\$RICE-LASL,	CHEMICALLY REACTIVE	720
ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090 F2	RS P	Q	\$CROC90,		154
MLMQ 360 F+C+P RSBP T M	\$RALCRPH,	RESOURCE ALLOCATION PROJECT PLANNING					G603
MLMQ 360 F+COM RSBP XC P	\$RANDOM	SAMPLING TABLE, FOR NON-BIAS ORDERING					679
MLMQ 360 F4 RSBP C P	\$LATIN SQ,	NXN LATIN SQUARE EXPERIMENTAL DESIGN					630
MLMQ 360 F4 RSBP CT Q	\$ISOTAB,	PU POWER OUTPUT FROM MIXED ISOTOPES					R619
MMM3, COORDINATE ANALYSES SEMI-RIGID MOLECULES	ANC	360 F4	PS P	W	\$		632
MOCUS, MINIMAL SETS FROM FAULT TREES	ANC	360 F4	RSBP CT	G	\$		653
MODE BAPL 6600 F4 RS P P	\$RELO1,	RELIABILITY FOR A SINGLE FAILURE					R497
MODE FAST REACTOR X-SEC CALC BNW 1108 F4	RS P T	B	\$FCC4,	FUNDAMENTAL			306
MODELING SLA 6600 FTN RS P T I	\$CHILES,	LINEAR ELASTIC SINGULARITY					611
MODERATOR GGA 1108 F4 RS P A	\$GAKER,	INELASTIC SCAT X-SECTION CALC					289
MODERATOR SPACE CHORD DIST FUNCT AFG 7090 F2 RS B	\$DANCOFF JR,						150
MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0	CEND	7600B F4	RS	T P	\$MODEL,		478
MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2	CDC	6600C F+CCM	RS	T P	\$MODEL,		478
MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3	CDC	6600D F+CCM	RS	T P	\$MODEL,		478
MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	6600B F+ASC	RSB X T M	\$TIGIR2,			R403
MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600 F+COM	RS P T M	\$DATATRAN2,			386
MODULE ANL 360 F4 RSBP CT L	\$ARC-NUI002,	BCD INPUT DATA PROCESSING					533
MODULES ANL 360 F+BAL RSBP CT M	\$ARC-SYSTEM,	SYSTEM SUBPROGRAMS AND					522
MODULES DP 360 F+BAL S X T B	\$RAHAB,	JOSHUA SYSTEM LATTICE PHYSICS					536
MODULES 2-D INPUT GEN KAPL 6600 F+C+D RS P T L	\$DATATRAN2,	RA01 GEOMETRY					406
MODULES, F(X) & F(X,Y) KAPL 6600 F+C+D RS P T P	\$DATATRAN2,	UTILITY PLOT					407
MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360 F4	RS P X T F	\$			491
MOLECULES ANC 360 F4 RS P W	\$MMM3,	COORDINATE ANALYSES SEMI-RIGID					632
MOLTEN FUEL TUBE BUNDLES LASL 7094 F2	RSBP H	\$AXFLU,	HEAT TRANSFER				182
MOMENT CALC AI 7090 F+FAP RS T I	\$4RESTPAINT	PIPE STRESS, MAXIMUM					109
MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	7094 F+FAP	RS L T M	\$			159
MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360 F4	RSBP CT C	\$			582
MONITOR SLAC 360B F+BAL RSB CT P	\$PROGLOOK,	USER PROGRAM PERFORMANCE					642
MONITOR SLAC 370 BAL RSB CT P	\$SLACMON/370,	VERSION 4.0 VS SOFTWARE					635
MONITOR SLAC 360 BAL RS CT P	\$SLACMON 2.2,	OS360 MVT/MFT PERFORMANCE					635
MONTE CARLO CALC NEUTRON HISTORIES	GGA	7044 F4	RS P T B	\$FMC-N,			195
MONTE CARLO CELL CALCULATION AI 360 F+BAL RS P X T B	\$HWOCR-SAFE,	2-D					307
MONTE CARLO CRITICAL ASSEMBLY ANALYSIS AI 7600 F4	RS PLX T C	\$VIM1,					510
MONTE CARLO CRITICAL ASSEMBLY ANALYSIS AI-A 360 F4	RSBPLXCT C	\$VIM1X,					510
MONTE CARLO CRITICALITY CALCULATIONS BAPL 7600 F+COM RS P T C	\$RECAP-12,						R670
MONTE CARLO FAULT TREE SIMULATION CODE UNI 1108 F+SLE RS P G	\$SAFTAC,						674
MONTE CARLO MULTIGROUP CRITICALITY CODE DP 360B F+BAL RSBP CT C	\$KENO2,						450
MONTE CARLO MULTIGROUP CRITICALITY CODE ORNL 360C F+BAL RSBPLXCT C	\$KENO4,						450
MONTE CARLO MULTIGROUP CRITICALITY CODE RFD 6600B F+CCM RS PLX T C	\$KENO2,						450
MONTE CARLO NEUTRON PENETRATION STUDY LASL 7090 FLOCO RS P B	\$MCS,						202
MONTE CARLO NEUTRON TRANSPORT ANC 360 F+BAL RSBPL CT B	\$RAFFLE2/MOD2,						631
MONTE CARLO REACTOR ANALYSIS CALCULATION ORNL 360 F+BAL RSBPL CT C	\$ESP,						523
MONTE CARLO SLOWING-DOWN DENSITY CALC AI 7094 F+FAP RS PL T B	\$TYCHE3,						149
MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY AI 7090 F2 RS J	\$						142
MORTRAN2, MACRO-BASED STRUCTURED FORTRAN SLAC 360 F4 RSBP XCT P	\$						678

MOST

MULTI-GP

MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	F4	RS P	P	\$	R446
MOTION SOLUTION SLA 3600 F36 RS P T S	\$TODDY2, 2-D LAGRANGIAN EQNS OF						627
MOXY/MOD032, BWR CORE HEAT TRANSFER CODE	ANC	3608	F4	RSBP XCT H	\$		551
MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	360	F4	RS P CT W	\$		575
MSS 360 F4 RS P H	\$FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW						246
MSS 360 F4 RS P CT C	\$FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION						167
MTS 360 F4 RSBPLXCT C	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE						262
MTS 7090 MAD RSB	\$BURP1, DETECTOR EFFICIENCY POINT SOURCE						164
MTS 7090 MAD RSB	\$BURP2, DETECTOR EFFICIENCY DISK SOURCE						165
MTS 7090 MAD RSB	\$BURP3, DETECTOR EFFICIENCY POINT SOURCE						166
MTS 7090 MAD FSB	\$BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL						169
MTS 7090 MAD RSB	\$BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL						170
MUCHA1, MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	F4	RS P X T G	\$		508
MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	F4	FS P X T G	\$MUCHA1,		508
MUFFLE, FISSILE NUCLEIDE X-SECTION EVALUATION	ORNL	7090	F4	RSBP	A	\$	323
MUFT FORMAT X-SECTIONS WAPD 6600 F4	RS P T B	\$ETOM1, ENDF/B FORMAT TO					436
MUFT, GAM, ANISN X-SEC FORMAT WAPD 6600 F4	RS PL T B	\$ETOG1, ENDF/B TO					437
MUFT, GAM, ANISN X-SEC FORMAT WAPD 7600 F4	RS P T B	\$ETOG3, ENDF/B TO					538
MUFT4 OR 5, GAM1 OR 2 WAPD 6600 BCD	R L T Z	\$ETOG1 DATA LIBRARIES,					447
MUG MULTIGROUP XSEC LIBRARY MAINTENANCE NED	635	F4	RS P T M	\$TROUT,			493
MUG MULTIGROUP XSEC LIBRARY MAINTENANCE NED	1108	F5	RS P T M	\$TROUT,			493
MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094	F2	RS P H	\$FLOW-MODEL,		246
MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	F4	RS P H	\$FLOW-MODEL,		246
MULTI-GP ORNL 360I F4 RS P T K	\$CITATION, 1,2,3-D DIFFUSION DEPLETION						387
MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	360	F4	RS PLXCT B	\$PHROG,		520
MULTI-GP CONSTANT CALC AGC 7090 F+FAP	RSBP LX T B	\$AGN-GAM, FAST SPECTRUM					204
MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS PLX T B	\$GAMTEC2,		185
MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107	F4	RS PL T B	\$GAMTEC2,		185
MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	F+FAP	RS PL T B	\$GAMTEC2,		185
MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVAC	6400	F4	RS PLX T B	\$GAMTEC2,		185
MULTI-GP CONSTANTS	ANC	360	F4	RS PL CT B	\$INCITE, THERMAL SPECTRA &		565
MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX	HEDL	360	F4	RSBP XCT B	\$ETOX3,		388
MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX	HEDL	11088	F4	RS P X T B	\$ETOX3,		388
MULTI-GP DIFFUSION	UMCC	360	F4	RS P T C	\$VARI-QUIR, TIME-DEP 2-D		212
MULTI-GP DIFFUSION	WANL	6600	F4	RS P T C	\$VARI-QUIR, TIME-DEP 2-D		212
MULTI-GP DIFFUSION & INVENTORY	ANL	360	F4	RSBP CT C	\$ARC-DIF1D, 1-D		626
MULTI-GP DIFFUSION & LIB. AI	360	F4	RSBP LX T C	\$CAESAP4, LIBLST, 1-D			270
MULTI-GP DIFFUSION DEPLETION CODE	CRNL	7090	F+FAP	RS P T D	\$ASSAULT, 2-D		240
MULTI-GP DIFFUSION PROGRAM	AAEC	360	F+BAL	RS P T C	\$GRAM, 1-D AND 2-D		103
MULTI-GP DIFFUSION PROGRAM	GRNL	7090	F+FAP	RS P T C	\$EXTERMINATOR, 2-D		156
MULTI-GP DIFFUSION PROGRAM	UK-R	7090	F+FAP	RSBP T C	\$GRAM, 1-D AND 2-D		103
MULTI-GP DIFFUSION PROGRAM	BC	625	F4	RS T C	\$EXTERMINATOR2, 2-D		156
MULTI-GP DIFFUSION PROGRAM	CEND	6600	F4	RS P T C	\$EXTERMINATOR2, 2-D		156
MULTI-GP DIFFUSION PROGRAM	ORNL	360	F4	RS P T C	\$EXTERMINATOR2, 2-D		156
MULTI-GP DIFFUSION SLAB CYL SPHERE	BNW	1107	F4	RS P T C	\$FFN, 1-D		241
MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L T C	\$FAIM, 1-D		120
MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS PL T C	\$AIM6, 1-D		29
MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PL T C	\$AIM6, 1-D		29
MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PLX T C	\$FAIM, 1-D		120
MULTI-GP DIFFUSION SLAB CYL SPHERE	OSUC	370	F4	RS PL CT C	\$AIM6, 1-D		29
MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L T C	\$ULCER, 1-D		118
MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	F36	RS P X T C	\$MACH1, 1-D		262
MULTI-GP DIFFUSION SLAB CYL SPHERE	MTS	360	F4	RSBP LXCT C	\$MACH1, 1-D		262
MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	6500	F4	RS PLX T C	\$MACH1, 1-D		262
MULTI-GP DIFFUSION SLAB CYL SPHERE	BHSC	360	F4	RS P T C	\$FAIMOS, 1-D		120
MULTI-GP DIFFUSION SYNTHESIS CALC	NED	635	F4	RS PL T C	\$BISYN, 2-D		287
MULTI-GP DIFFUSION SYNTHESIS CALC	NED	1108	F4	RS P T C	\$BISYN, 2-D		287
MULTI-GP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	RS P T C	\$GAMTRI, 2-D		401
MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	F+BAL	RS P T C	\$GAMBLE5, 2-D		222
MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	F+MAP	RSBP T C	\$GAMBLE4, 2-D		222
MULTI-GP DIFFUSION XY RZ RTH	WANL	7094	F4	RS P X T C	\$VARI-QUIR3, 2-D		264
MULTI-GP DISCRETE ORDINATE CALC	AI	7090	F2	RS PLX T C	\$DTF2, 1-D		151
MULTI-GP DISCRETE ORDINATE CALC	AI	360	F4	RSBP LX T C	\$ANISN, 1-D		151
MULTI-GP DISCRETE ORDINATE CALC	ANL	3600	F36	RS P T C	\$SNARG-1D, 1-D		288

MULTI-GP

MULTIGROUP

MULTI-GP DISCRETE ORDINATE CODE	GGA	1108	F5	RS P	T C	\$2DF, 2-D	1
MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	F63	RS	C	\$2DF, 2-D	173
MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	360	F+BAL	RS P	T C	\$DTF4, 1-D	209
MULTI-GP DISCRETE ORDINATE PROGRAM	BC	625	F+MAP	RS P	T C	\$DTF4, 1-D	209
MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	6600	F4	RS P	T C	\$DTF4, 1-D	209
MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	F4	RS P	T C	\$DTF4, 1-D	209
MULTI-GP DISCRETE ORDINATE PROGRAM	LER	7094	F4	RS P	T C	\$DTF4, 1-D	209
MULTI-GP DOUBLE SN APPROX	BNW	7090	FLOCO	RSBP	T C	\$GE-HAPO-S13, 1-D	75
MULTI-GP DTF4 WITH DEPLETION	LASL	7030	F4	RS P	T D	\$DTF-BURN, 1-D	269
MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW	1604	F63	RS	T C	\$2DXYL, 3-D	192
MULTI-GP SN APPROX SLAB CYL SPHERE	PW	1604	LAG1	RS P	C	\$MGDSN, 1-D	211
MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	7090	F2	RS P	T C	\$W-DSN, 1-D	132
MULTI-GP SN APPROXIMATION RZ	PW	1604	F63	RS P	T C	\$FORTRAN IDC, 2-D	161
MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090	FLOCO	RSBP	C	\$2CXY, 2-D	18
MULTI-GP TRANSFER COEFFICIENTS	LLL	7090	F+FAP	RS P	T B	\$SOPHIST1/2/5,	160
MULTI-GP TRANSFER MATRICES	AGC	7090	F2	RS P	T B	\$AGN-SIGMA, CALC OF	243
MULTI-GP TRANSPORT XY RZ RTHETA	LASL	360D	F4	RSBP	CT C	\$TWOTRAN2, 2-D	358
MULTI-GP TRANSPORT XY RZ RTHETA	LASL	6600D	F4	RS P	T C	\$TWOTRAN2, 2-D	358
MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600D	F4	RS P	T C	\$TWOTRAN2, 2-D	358
MULTI-GP X-SECTIONS	LASL	7090	FLOCO	RS P	B	\$ZOT, GROUP-COLLAPSING OF	113
MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108B	F4	RS	PLXCT B	\$GGC4,	298
MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	WANL	6600	F4	RS	L T B	\$GGC4,	298
MULTI-LEVEL CONVOLUTION	PPCO	7040	F+MAP	RS P	A	\$COMBCO, COMBINED B-W	203
MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	6600	F4	RS P	A	\$MULTI,	R535
MULTI-PIN FUEL ELEMENT	AGC	7090	F2	RS P	B	\$BOUNCE, FLUX DIST IN	237
MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	6600	F4	RS P	A	\$	R535
MULTIANCHOR PIPE SYSTEM	AI	360	F4	RS P	CT I	\$PSA2, STRESS ANALYSIS	542
MULTICHANNEL ANALYSIS	ANL	370	F4	RS P	CT H	\$THI3D, THERMAL-HYDPAULIC	706
MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	F4	RS P	P	\$MNST, A	R446
MULTIGP CONSTANTS	BNW	1108	F4	RS	PLX T B	\$HRG3, SLOWING-DOWN SPECTRUM,	467
MULTIGP CONSTANTS	TVA	360	F4	RS	PLX T B	\$HRG3, SLOWING-DOWN SPECTRUM,	467
MULTIGP DIFF & IGP DEPLETION	NED	635	F+GMP	RS P	T D	\$SYN, 2D SYNTHESIS	495
MULTIGP DIFFUSION & BURNUP TRI-MESH	GGA	1108	F+BAL	RS P	T D	\$BUGTRI, 2D	439
MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	F4	RS P	T F	\$GAKIT, 1-D	370
MULTIGROUP CONSTANTS	ORNL	360	F4	RS	PLX T B	\$XSDRN, DISCRETE ORDINATE	393
MULTIGROUP CONSTANTS FROM ENDF/B DATA	FBRD	635	F+GMP	RS P	XCT B	\$ENCFUN2,	501
MULTIGROUP CRITICALITY CODE DP	360B	F+BAL	RSBP	CT C	\$KENO2, MONTE CARLO	450	
MULTIGROUP CRITICALITY CODE ORNL	360C	F+BAL	RSBP	PLXCT C	\$KENO4, MONTE CARLO	450	
MULTIGROUP CRITICALITY CODE RFD	6600B	F+CGM	RS	PLX T C	\$KENO2, MONTE CARLO	450	
MULTIGROUP DIFFUSION	ORNL	360	F+BAL	RS P	CT C	\$VENTURE, 1, 2, OR 3-D	686
MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA	1108	F+BAL	RS P	T D	\$BUG2, 2-D	438
MULTIGROUP DIFFUSION & SN THEORY	NED	635	F4	RS P	T C	\$DOT2DB, 2-D	459
MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP	T D	\$2DB, 2-D	325
MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	F4	RS P	T D	\$2DB, 2-D	325
MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	F4	RS P	T D	\$2DB, 2-D	325
MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108	F4	RS P	T D	\$FEVER7, 1-D	318
MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P	CT D	\$3DB, 3-D	567
MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEDL	1108	F4	RS P	T D	\$3DB, 3-D	567
MULTIGROUP DIFFUSION DEPLETION	AI	360	F4	RSBP	X T D	\$SIZZLE, 1-D	58
MULTIGROUP DIFFUSION DEPLETION	AI	7090	F2	RS	L T D	\$SIZZLE, 1-D	58
MULTIGROUP DIFFUSION DEPLETION	CDC	1604	F63	RS	L T D	\$SIZZLE, 1-D	58
MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360	F4	RSBP	CT C	\$MONA, 1-D	582
MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	F+BAL	RS P	T C	\$GAZE2, 1-D	430
MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS P	T D	\$3CDT, 3-D	463
MULTIGROUP DISCRETE ORDINATE CALC	UNC	1604	F63	RS	PL T C	\$DTF, 1-D	144
MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	F+MAP	RS P	T C	\$TDSN, 2-D	312
MULTIGROUP LIBRARIES FROM ENDF/B	ORNL	360	F4	RSBP	XCT B	\$XLACS, XSDRN	572
MULTIGROUP REACTOR KINETICS PROGRAM	ORNL	360	F4	RS P	XCT E	\$TASK, 1-D	558
MULTIGROUP SLAB GEOMETRY	ANL	3600	F63	RSBP	T J	\$MAC, SHIELD DESIGN	143
MULTIGROUP SLAB GEOMETRY	BNW	7090	F2	RSBP	T J	\$MAC, SHIELD DESIGN	143
MULTIGROUP TIME-DEPENDENT DIFFUSION	MIT	370	F4	RS P	T F	\$GAKIN2, 1D	310
MULTIGROUP X-SECTION CALCULATION	ANL	360	F4	RS P	CT B	\$MC**2, ENDF	355
MULTIGROUP X-SECTION CALCULATION	ANL	3600	F36	RS P	T B	\$MC**2, ENDF	355
MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	635	F4	RS P	T M	\$TROUT, MUG	48

MULTIGROUP

NEUTRON

MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	F5	RS	P	T	M	\$TPCUT, MUG	493
MULTILEVEL B-W X-SEC CALC	BNL	6600	F4	RS	P	A		\$SIGPLOT, RESOLVED	377
MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	F4	RS	P	X	T	G \$MUCHA1, MUCHA2,	508
MULTIPLE SCATTERING CALC	ANL	360	F4	RS	P	CT	W	\$MSCAT, SLOW NEUTRON	575
MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	F4			RS	P	T J \$	259
MVT REMOTE JOB ENTRY SYSTEM	ANC	360	BAL	RSB	T	P		\$NRTS-RJE, QS/360	519
MVT/MFT PERFORMANCE MONITOR	SLAC	360	BAL	RS	CT	P		\$SLACMON 2.2, QS360	635
MO102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS	P	D		\$CINDER,	313
MO102, POINT DEPLETION FISSION PRODUCT	DP	360	F+BAL	RS	P	T	D	\$CINDER,	313
MO219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS	P	T	H	\$FLOT1,	R331
MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4			RS	P	T I \$	R383
MO457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4			RS	P	T I \$	R329
MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	F4			RS	P	T I \$	R283
MO555, ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4			RS	P	T G \$	P284
MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS	P	T	P	\$MO661, MO657,	F411
MO648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS		T	C	\$	F342
MO657, MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS	P	T	P	\$MO661,	R411
MO661, MO657, MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS	P	T	P	\$	R411
MO756, LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS	P	T	J	\$	R343
MO807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS		T	B	\$	R280
MO899, HOH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS	P	H		\$	R294
MO899, HOH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS	P	T	H	\$	R294
NAHAMMER, FLUID HAMMER ANALYSIS PIPING SYSTEM	ANL	360	F4	RS	P	G		\$	717
NAHAMMER, FLUID HAMMER ANALYSIS PIPING SYSTEM	ANL	7600	F4	RS	P	G		\$	717
NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBPLX	T	D		\$	314
NATTRANSIENT, FLUID HAMMER ANALYSIS 1-D PIPING	ANL	360	F4	RS	P	G		\$	718
NATRAN2, FLUID HAMMER ANALYSIS 1D & 2D SYSTEMS	ANL	360	F4	RS	P	T	G	\$	719
NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	F63	RSBP		A		\$	171
NED 635 F+GMP RS T P								\$GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	515
NED 635 F+GMP RS P T D								\$SYN, 2D SYNTHESIS MULTIGP DIFF & IGP DEPLETION	495
NED 635 F4 RS P G								\$RAPFU, FUEL CYCLE PARAMETERS FAST REFEDEPS	372
NED 635 F4 RS P T B								\$REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	257
NED 635 F4 RS P T C								\$DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	459
NED 635 F4 RS P T C								\$FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	167
NED 635 F4 RS P T D								\$FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	480
NED 635 F4 RS P T G								\$FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	479
NED 635 F4 RS P T H								\$MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	256
NED 635 F4 RS P T H								\$VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	458
NED 635 F4 RS P T M								\$TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	493
NED 635 F4 RS P T O								\$BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	311
NED 635 F4 RS P T O								\$EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	258
NED 635 F4 RS P X T F								\$FORE2, FAST REACTOR EXCURSION CALCULATIONS	174
NED 635 F4 RS PL T C								\$BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	287
NED 1108 F4 RS P T C								\$BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	287
NED 1108 F5 RS P T M								\$TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	493
NED 2000 F2 RS P A								\$DOPIE, RESOLVED RESONANCE X-SECTION CALC	177
NED 2000 F2 RS P A								\$RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	176
NED 2000 F2 RS P B								\$SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	178
NED 2000 F4 RS P T F								\$FORE, FAST REACTOR EXCURSION CALCULATIONS	174
NED 7094 F+GMP RS P T B								\$EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	201
NETWORK ANALYSIS OF 3-D TWO-PHASE FLOW	BAPL	7600B	F4	RS	P	T	H	\$FLOW3,	R664
NETWORK SOLUTION	BAPL	6600B	F4	RS	P	T	I	\$MANE1, RECTANGULAR MAGNETIC	R412
NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	6600	F4	RS	P	T	B	\$EPOCH,	R461
NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC	635	F4	RSBP		D		\$DOS,	423
NEUTRON HISTORIES	GGA	7044	F4	RS	P	T	B	\$FMC-N, MONTE CARLO CALC	195
NEUTRON MULTIPLE SCATTERING CALC	ANL	360	F4	RS	P	CT	W	\$MSCAT, SLOW	575
NEUTRON PENETRATION CALCULATION	DAC	7090	F2	RSBP		J		\$LIPRECANI, MC	123
NEUTRON PENETRATION STUDY	LASL	7090	FLOCO	RS	P	B		\$MCS, MONTE CARLO	202
NEUTRON POLARIZATION EXPERIMENT	UCND	360B	F+BAL	RS	P	O		\$PMS1, FAST	469
NEUTRON SCATTERING CODES ANC	360	F4	RS	P	CT	W		\$MACS LATTICE VIBRATION	574
NEUTRON SLOWING-DOWN NPGS	360	F4	RS	P	X	T	E	\$MOD5, STOCHASTIC MODEL OF	491
NEUTRON SOURCE DATA	NED	635	F4	RS	P	T	O	\$EXPN, ANALYSIS OF PULSED	258
NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS	P	E		\$TRIFIDO, PULSED	489
NEUTRON SPECTRUM X-SECTION CALC	AI	7090	F2	RS	PL	T	B	\$FORM, FAST	51

NEUTRON

ODE'S

NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS LX T B	\$GAM1, FAST	33	
NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PL T B	\$FORM, FAST	51	
NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PLX T B	\$GAM1, FAST	33	
NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	F2	RS PLX T B	\$GAM1, FAST	33	
NEUTRON SPECTRUM X-SECTION CALC	OSUC	370	F4	RS PLXCT B	\$FORM, FAST	51	
NEUTRON SPECTRUM X-SECTIONS AI	7090	F+FAP	RS PL T B	\$TEMPEST2, THERMAL	50		
NEUTRON SPECTRUM X-SECTIONS BHSC	360	F4	RS PL T B	\$TEMPEST2, THERMAL	50		
NEUTRON SPECTRUM X-SECTIONS CDC	1604	F63	RS PL T B	\$TEMPEST2, THERMAL	50		
NEUTRON TRANSPORT ANC	360	F+BAL	RSBPL CT B	\$RAFFLE2/MOD2, MONTE CARLO	631		
NEUTRON X-SECTION CALCULATION	EAPL	6600	F4	RS P T A	\$SUMOR, S-WAVE	P399	
NEUTRON-HYDRODYNAMICS APDA	7094	F2	RS P	F	\$WEAK EXPLOSION, COUPLED	145	
NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBPLX T D	\$NAP,	314	
NEUTRON, GAMMA-RAY HISTORIES PW	1604	F+CDP	RS P X T B	\$FMC-N, FMC-G, MC	195		
NEUTRONICS-HYDRODYNAMICS CODE AGC	7090	F2	RSB	F	\$HATCHET, COUPLED	153	
NEUTRONICS-HYDRODYNAMICS SPH	PW	1604	F63	RS P	F	\$AX-INT, COUPLED	191
NEUTRONICS-HYDRODYNAMICS SPHERE CDC	3600	F63	RSBP	F	\$AX1, COUPLED	102	
NEUTRONICS-HYDRODYNAMICS SPHERE LLL	7090	F2	RS P	F	\$CCNEC, COUPLED	129	
NIXLIN, LEAST SQUARES FIT TO NONLINEAR FORMS DP	360	F4	PS P	P	\$	709	
NMMSS, NUCLEAR MATERIALS MANAGEMENT SYSTEM UCND	370	COBOL	FS	CT M	\$	695	
NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK BNL	6600	F4	RS P	T F	\$	405	
NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES BNW	1108	F5	RS P X T F	\$	488		
NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES BNW	7090	F4	RS P	T F	\$	488	
NON-BIAS ORDERING MLMO	360	F+COB	RSBP XC P	\$RANDOM SAMPLING TABLE, FOR	679		
NON-FUEL O & M COST STUDY ORNL	360	F+BAL	RS P	D	\$OMCST, POWER PLANT	688	
NON-SPHERICAL OPTICAL MODEL X-SECTIONS AI	7094	F2	RS P	T A	\$2PLUS,	254	
NON-SPHERICAL OPTICAL MODEL X-SECTIONS ANL	3600	F63	RSBP	T A	\$2PLUS,	254	
NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT KAPL	6600	F+ASC	RS P	T P	\$SNEQ,	R364	
NONLINEAR ANALYSIS SLL	6600	F+COM	RS P	T I	\$GNATS, MESH2, GPRINT, 2-D	682	
NONLINEAR DIFFERENTIAL EQNS. SOLUTION KAPL	6600	F+ASC	RS P	T P	\$LIZARD,	R445	
NONLINEAR FORMS DP	360	F4	RS P	P	\$NIXLIN, LEAST SQUARES FIT TO	709	
NONLINEAR LEAST SQ LENS DESIGN SYSTEM LASL	6600	F+COM	RS P	T P	\$LENDES,	602	
NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK BAPL	6600	F4	RS P	T F	\$	R371	
NPGS 360 F4 RS P X T E \$MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN						491	
NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA ANL	360	F4	RS P	D	\$	146	
NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA UEC	6600	F4	RS P	D	\$	146	
NRC 370 F4 RS P T H \$COMPARE, TRANSIENT FLOW IN VENTED FLUID SYSTEM						702	
NRC 370 F4 RS PLX T G \$CRAC, CALC OF REACTOR ACCIDENT CONSEQUENCES						722	
NRC 370 F4 RSBP CT G \$WREM-TOODEE2/MOD3, 2D TIME-DEP FUEL ELEM STUDY						712	
NRTS ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES ANC	360B	F+BAL	RSB	T P	\$	613	
NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM ANC	360	BAL	RSB	T P	\$	519	
NURDW, STRUCTURAL ANALYSIS BOWED REACTOR CORES ANL	360B	F4	RS P	I	\$	643	
NUCLEAR CRITICALITY SAFETY DP	360	F4	RS P	T C	\$KEFF, MGBS, TGAN,	617	
NUCLEAR FUEL CYCLE COST AND ECONOMICS CWF	360	F4	RS P	T D	\$CINCAS,	354	
NUCLEAR FUEL CYCLE COST AND ECONOMICS WAPD	6600	F4	RS P	T D	\$CINCAS,	354	
NUCLEAR FUEL CYCLE ECONOMICS UICS	360	F4	RS P	CT D	\$GEM, ANALYSIS OF	576	
NUCLEAR FUEL CYCLE REQUIREMENTS ERDA	370B	F4	RS P	CT D	\$NUFUEL,	683	
NUCLEAR MATERIALS MANAGEMENT SYSTEM UCND	370	COBOL	RS	CT M	\$NMMSS,	695	
NUCLEAR POWER PLANT COST CODE HEDL	1108	F5	RS P X T D	\$PACTOLUS, CLOTHO,	540		
NUCLEAR STATION ELECTRICITY COSTS ORNL	1604	F63	RS P	D	\$POWERCO,	340	
NUCLEAR STATION ELECTRICITY COSTS UEC	6600	F4	RS P	D	\$POWERCO,	340	
NUCLEAR STEAM TURBINE CYCLE ANALYSIS ORNL	360	F4	RS P	T H	\$GRCENT,	703	
NUCLEUS REACTION AI	360	F+BAL	RS P	T A	\$COMNUC, CASCADE, COMPOUND	482	
NUCLEUS X-SECTION CALC ANL	3600	F63	RSBP	A	\$NEARREX, COMPOUND	171	
NUCLIDE CHAIN EQUATIONS ORNL	7090	F2	RSBP	D	\$NUCY, SOLUTION OF	134	
NUCLIDE DATA BAPL	6600	F4	RS P	T P	\$DAFT1, LEAST SQUARES FIT FISSILE	R327	
NUCLIDE X-SECTION EVALUATION ORNL	7090	F4	RSBP	A	\$MUFFLE, FISSILE	323	
NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS ORNL	7090	F2	RSBP	D	\$	134	
NUFUEL, NUCLEAR FUEL CYCLE REQUIREMENTS ERDA	370B	F4	RS P	CT D	\$	683	
NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS BCL	6400	F4	RS P	T G	\$	328	
NXN LATIN SQUARE EXPERIMENTAL DESIGN MLMO	360	F4	RSBP	C P	\$LATIN SQ,	630	
ODE SYST WITH BANDED JACOBIAN LLL	360	F4	RS P X T P	\$EPISODEB, SOLVE	705		
ODE SYSTEM WITH BANDED JACOBIAN LLL	360C	F4	RS P X T P	\$GEARB, SOLVE	661		
ODE SYSTEM WITH BANDED JACOBIAN LLL	6600C	F4	RS P X T P	\$GEARB, SOLVE	661		
ODE'S ANL	360	F	RSBP	T P	\$STFODE, COLODE, COLLOCATION SOLN OF STIFF	652	

ODE'S

ORNL

ODE'S	SLA	6600	F	RS P	T P	\$STFODE, COLCODE, COLLOCATION SOLN OF STIFF	652	
QMCST, POWER PLANT NON-FUEL O & M COST STUDY	ORNL	360	F+BAL	RS P	D	\$	688	
ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P	T F	\$NOAH, 1-D	405	
OPN OPPD	6400	F4	S P	H	\$PWR-PPM, BORATION-DILUTION TABLES FOR PWR		552	
OPN DP	360	F4	RS P	G	\$INTEG, INSPEC, MARKOV SIMULATION OF PFACTOR		590	
OPPD	6400	F4	S P	H	\$PWR-PPM, BORATION-DILUTION TABLES FOR PWR OPN		552	
OPTICAL MODEL X-SECTIONS	AI	7094	F2	RS P	T A	\$2PLUS, NON-SPHERICAL	254	
OPTICAL MODEL X-SECTIONS	ANL	3600	F63	RSBP	T A	\$2PLUS, NON-SPHERICAL	254	
OPTIMAL GROUP OR MESH COLLAPSING			RW	6500	F4	RS P B	\$PARTI,	416
OPTIMIZATION	ORNL	360	F4	RS P	P	\$KEELE, LINEARLY-CONSTRAINED	556	
OPTIMIZATION	AI	7090	F2	RS	I	\$CROCK, SPACE POWER PLANT DESIGN	112	
OPTIMIZATION	AI	7090	F2	RS	I	\$SHOCK, SPACE POWER PLANT DESIGN	114	
OPTIMIZATION DOSE CALC	AI	7094	F+MAP	RS P	J	\$SHOE, SHIELD WEIGHT	197	
OPTIMIZATION SCHEME	KAPL	6600	F4	RS P	P	\$MOST, A MULTIDIMENSIONAL	R446	
OPTIMIZATION STUDY	PW	1604	F63	PS	I	\$WOEXPRT, REACTOR WEIGHT	190	
OPTIMIZING UTILITY GENERATION PLANNING	ORNL	360	F+BAL	RS P X T D	\$ORSIM,		699	
OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	1108	F4	RS P CT C	\$		226	
ORCENT, NUCLEAR STEAM TURBINE CYCLE ANALYSIS	ORNL	360	F4	RS P T H	\$		703	
ORCOST2, POWER PLANT CAPITAL COST ESTIMATING	ORNL	360	F+BAL	RS P T D	\$		588	
ORDERING	MLMD	360	F+COR	RSBP XC	P	\$RANDOM SAMPLING TABLE, FOR NON-BIAS	679	
ORDINARY DIFF EQNS	ORNL	6600B	F4	RS P CT P	\$FORSIM, SOLN OF PARTIAL OR		514	
ORDINARY DIFF EQUATION SYSTEM SOLVER	LLL	360	F4	RS P X T P	\$EPISODE,		675	
ORDINARY DIFF EQUATIONS	SLA	360D	F4	RS P X T P	\$DE/STEP, INTRP, SOLN OF		640	
ORDINARY DIFF EQUATIONS	SLA	6600D	F4	RS P X T P	\$DE/STEP, INTRP, SOLN OF		640	
ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	ANL	360C	F4	RS P X P	\$GEAR,		592	
ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600C	F4	RS P X P	\$GEAR,		592	
ORDINATE CALC	AI	7090	F2	RS PLX T C	\$DTF2, 1-D MULTI-GP DISCRETE		151	
ORDINATE CALC	AI	360	F4	PSBPLX T C	\$ANISN, 1-D MULTI-GP DISCRETE		151	
ORDINATE CALC	UNC	1604	F63	RS PL T C	\$DTF, 1-D MULTIGROUP DISCRETE		144	
ORDINATE CALC	ANL	3600	F36	RS P T C	\$SNARG-1D, 1-D MULTI-GP DISCRETE		288	
ORDINATE CODE	GGA	1108	F5	RS P T C	\$2DF, 2-D MULTI-GP DISCRETE		173	
ORDINATE CODE	UNC	1604	F63	RS	C	\$2DF, 2-D MULTI-GP DISCRETE	173	
ORDINATE MULTIGROUP CONSTANTS	ORNL	360	F4	RS PLX T B	\$XSDRN, DISCRETE		393	
ORDINATE PROGRAM	ANL	360	F+BAL	RS P T C	\$DTF4, 1-D MULTI-GP DISCRETE		209	
ORDINATE PROGRAM	BC	625	F+MAP	RS P T C	\$DTF4, 1-D MULTI-GP DISCRETE		209	
ORDINATE PROGRAM	LASL	6600	F4	RS P T C	\$DTF4, 1-D MULTI-GP DISCRETE		209	
ORDINATE PROGRAM	LASL	7030	F4	RS P T C	\$DTF4, 1-D MULTI-GP DISCRETE		209	
ORDINATE PROGRAM	LER	7094	F4	RS P T C	\$DTF4, 1-D MULTI-GP DISCRETE		209	
ORDINATE PROGRAM	LER	7090	F+MAP	RS P T C	\$TDSN, 2-D MULTIGROUP DISCRETE		312	
ORDINATES SLAB GEOMETRY	BAPL	6600	F4	RS P T C	\$BE21, FEW-GP DISCRETE		R398	
ORNL	360	BAL+F	RS P CT P	\$GETCOR, FRECOR, FORTRAN DYNAMIC STORAGE ALLOC			644	
ORNL	360	C+BAL	RS PL CT M	\$JOURNAL CONTROL, LIBRARY JOURNAL MANAGEMENT			660	
ORNL	360	F+BAL	RS P D	\$ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC			322	
ORNL	360	F+BAL	RS P D	\$QMCST, POWER PLANT NON-FUEL O & M COST STUDY			688	
ORNL	360	F+BAL	RS P I	\$ELBOW-ORNL, PIPE STRESS & FLEXIBILITY CALC			650	
ORNL	360	F+BAL	RS P T D	\$ORCOST2, POWER PLANT CAPITAL COST ESTIMATING			588	
ORNL	360	F+BAL	RS P T I	\$LINDA, EVALUATION OF STRAIN-GAGE DATA			657	
ORNL	360	F+BAL	RS P T I	\$SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY			332	
ORNL	360	F+BAL	RS P CT C	\$VENTURE, 1, 2, OR 3-D MULTIGROUP DIFFUSION			686	
ORNL	360	F+BAL	RS P X T D	\$ORSIM, OPTIMIZING UTILITY GENERATION PLANNING			699	
ORNL	360	F+BAL	RSBP CT C	\$ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION			523	
ORNL	360	F4	RS P A	\$POLLA, CONVERTS R-MATRIX RESONANCE PARAMETERS			639	
ORNL	360	F4	RS P I	\$LUGS, STRESS FOR INTEGRAL ATTACHMENTS TO PIPE			648	
ORNL	360	F4	RS P O	\$ALPHA-M, RESOLUTION OF GAMMA-RAY SPECTRA			413	
ORNL	360	F4	RS P P	\$KEELE, LINEARLY-CONSTRAINED OPTIMIZATION			556	
ORNL	360	F4	RS P T A	\$ATHENA4, INELASTIC SCATTERING FORM FACTORS			417	
ORNL	360	F4	RS P T B	\$RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA			453	
ORNL	360	F4	RS P T B	\$SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION			431	
ORNL	360	F4	RS P T C	\$EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM			156	
ORNL	360	F4	RS P T H	\$ORCENT, NUCLEAR STEAM TURBINE CYCLE ANALYSIS			703	
ORNL	360	F4	RS P T H	\$ORRIBLE, ROD BUNDLE FLOW & TEMPERATURE DIST.			629	
ORNL	360	F4	RS P T I	\$CREEP-PLAST, 2-D INELASTIC STRUCTURAL ANALYSIS			R707	
ORNL	360	F4	RS P T I	\$FLANGE-ORNL, ANALYSIS OF FLANGED JOINTS			689	
ORNL	360	F4	RS P T U	\$SEPHIS, SOLVENT EXTRACTION PROCESS SIMULATION			690	

ORNL

PARTICLE

ORNL	360	F4	RS	P	C	G	\$STEFFG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	583			
ORNL	360	F4	RS	P	X	T	H	\$ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	525		
ORNL	360	F4	RS	P	X	C	T	E	\$TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	558	
ORNL	360	F4	RS	PL	X	T	B		\$XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	393	
ORNL	360	F4	RS	BP	X	C	T	B	\$XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	572	
ORNL	360B	F+BAL	RS	P		T	H		\$RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	392	
ORNL	360B	F+BAL	RS	P	X	T	Q		\$MARLOWE, BINARY COLLISION CASCADE SIMULATION	680	
ORNL	360B	F4	RS	P		T	H		\$HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	517	
ORNL	360B	F4	RS	P	X	T	D		\$CONCEPT4, POWER PLANT CONCEPTUAL COST ESTIMATE	498	
ORNL	360B	F4	RS	PL	C	T	M		\$EDITOR, ENDF/B TAPE PROCESSING AND EDITING	502	
ORNL	360C	F+BAL	RS	PL	X	C	T	C	\$KENO4, MONTE CARLO MULTIGROUP CRITICALITY CODE	450	
ORNL	360I	F4	RS	P		T	K		\$CITATION, 1,2,3-D DIFFUSION DEPLETION MULTI-GP	387	
ORNL	1604	F2	RS	P			Q		\$BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC.	549	
ORNL	1604	F63	RS	P			A		\$PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	334	
ORNL	1604	F63	RS	P			A		\$RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	335	
ORNL	1604	F63	RS	P			C		\$ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	180	
ORNL	1604	F63	RS	P			D		\$ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	322	
ORNL	1604	F63	RS	P			D		\$ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	179	
ORNL	1604	F63	RS	P			D		\$POWERCO, NUCLEAR STATION ELECTRICITY COSTS	340	
ORNL	1604	F63	RS	P		T	A		\$JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	308	
ORNL	6600	F4	RS	P		T	M		\$EDITOR, ENDF/B TAPE PROCESSING AND EDITING	502	
ORNL	7090	F+FAF	RS	P		T	C		\$EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	156	
ORNL	7090	F+FAF	RS	P		T	D		\$ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	240	
ORNL	7090	F2	RS				A		\$LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	381	
ORNL	7090	F2	RS	P		T	C		\$EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	39	
ORNL	7090	F2	RS	P		T	C		\$EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	87	
ORNL	7090	F2	RS	P		T	C		\$WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	32	
ORNL	7090	F2	RS	P		T	C		\$20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	40	
ORNL	7090	F2	RS	BP			D		\$ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	180	
ORNL	7090	F2	RS	BP			D		\$NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	134	
ORNL	7090	F4	RS	BP			A		\$MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	323	
ORRIBLE, ROD BUNDLE FLOW & TEMPERATURE DIST.	ORNL	360	F4	RS	P	T	H	\$		629	
ORSIM, OPTIMIZING UTILITY GENERATION PLANNING	ORNL	360	F+BAL	RS	P	X	T	D	\$	699	
ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	360	F4	RS	P	X	T	H	\$ORTHIS,	525	
ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	360	F4	RS	P	X	T	H	\$	525	
OS SYSTEM CATALOG UTILITY ROUTINE	ANL	360D	BAL	RS	X	T	P	\$COPYCAT, IBM		646	
OS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC	360	BAL	RS	B	T	P	\$NRTS-RJE,		519	
OSCILLATION	CEND	360	F4	RS	P	X	T	F	\$CEXE, INCEXE, 1-GP 3-D XYZ XENON	415	
OSUC	370	F4	RS	PL	C	T	C		\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	29	
OSUC	370	F4	RS	PL	X	C	T	B	\$FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	51	
OS360 MVT/MFT PERFORMANCE MONITOR	SLAC	360	BAL	RS	C	T	P	\$SLACMON 2.2,		635	
OUTPUT	PW	1604	LAG1	RS	P		N	\$DTX, EFFECTIVE X-SECTION CALC FROM DSN		210	
OUTPUT	GGA	1108	F5	RS	P		T	N	\$GAPER2D, 2-D PERTURBATION CALC FROM 2DF	471	
OUTPUT DATA	LASL	6600	F4	RS	P		T	B	\$GLEN, GROUP CONSTANT CALC FROM TOR	361	
OUTPUT FROM MIXED ISOTOPES	MLMQ	360	F4	RS	BP	C	T	Q	\$ISOTAB, PU POWER	R619	
OUTPUT TAPE EDIT REACTION RATES	UK-W	7090	F2	RS			N	\$WED, W-DSN		133	
OVAL TUBE	BNW	6600C	F4	RS	P		I	\$BUCKLE, CREEP BUCKLING OF INITIALLY		667	
OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS	P		T	B	\$GAROL, RESONANCE	219	
OVERLAP AND LATTICE EFFECTS	LER	7094	F+MAP	RS	P		T	B	\$GAROL, RESONANCE	219	
OVERPOWER STUDY	HEDL	6600	F4	RS	P	C	T	F	\$MELT3, FAST REACTOR TRANSIENT	700	
OXIDE FUEL PERFORMANCE FINITE-ELEMENT	FBRD	635	F4	RS	P	C	T	I	\$BEHAVE2,	R568	
OXIDE FUEL ROD STRESS & DEFORMATION	AN-T	360B	F4	RS	BP	C	T	I	\$CYGR03,	R449	
OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	6600	F4	RS	P		T	I	\$CYGR03,	R449	
OXIDE FUEL RODS	ANC	360	F+BAL	RS	BP	X	C	T	G	\$FRAP-T, TRANSIENT ANALYSIS OF	658
OXIDE FUEL RODS	ANC	360	F+BAL	RS	P	X	T	H	\$FRAP-S1, STEADY STATE ANALYSIS	694	
PACTOLUS, CLOTHO, NUCLEAR POWER PLANT COST CODE	HEDL	1108	F5	RS	P	X	T	D	\$	540	
PARALLEL BEAMS	ANL	3600	F36	SBP			I	\$BOW2, DEFLECTION CALCULATION		365	
PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	360	F+BAL	RS	BP	L	C	T	G	\$	555
PARTI, OPTIMAL GROUP OR MESH COLLAPSING	RW	6500	F4	RS	P		B	\$		416	
PARTIAL OR ORDINARY DIFF EQNS	CRNL	6600B	F4	RS	P	C	T	P	\$FORSIM, SOLN OF	514	
PARTIAL REFUEL	GGA	7044	F4	RS	P		T	D	\$GARGOYLE, FUEL CYCLE ANALYSIS	260	
PARTICLE TRANSPORT STUDY	RFD	3600	F36	RS	P		G	\$DISPER, AEROSOL		554	
PARTICLE TRANSPORT XY RZ RTH	LASL	7600	F4	RS	P		T	C	\$TWOTRAN-PNVW, 2-D	573	
PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	F63	RS	P		A	\$RAMES,		335	

PARTICLES

PIPE

PARTICLES SAMPLING STUDY	BAPL	6600	F4	RS P	T O	\$BETTY, ENTRAINE	F545
PATTERN INDEXING	LASL	6600	F+CCM	RS P	T Q	\$INDX, XRAY DIFFRACTION POWDER	609
PAX03, HARMONY-PDQ X-SECTION GENERATION CODE	BAPL	6600	F+CCM	RS P	X T B	\$	R426
PDP-11 ON 360 ANC	360	PL1	RS P	T P	\$PTAC11, 2-PASS ASSEMBLER FOR THE		516
PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P	T D	\$	P336
PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	360B	F+BAL	RSBP	T D	\$	P336
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC	360G	F+BAL	RS P	XCT D	\$	F275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600A	F+ASC	RS P	T D	\$	R275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600C	F+ASC	RS P	T D	\$	R275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BCSS	6600D	F+ASC	R B	T D	\$	F275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BW	6600E	F+ASC	RS P	T D	\$	R275
PD108 F4	RS P	X T P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL			534
PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL	1604	F63	RS P	A	\$	334
PELEN, FUEL PELLET TEMPERATURE & DEFORMATION	BAPL	6600	F4	RS P	T I	\$	R598
PELLET CRACKING	BAPL	6600	F4	RS P	I	\$STRIPE, FUEL ROD CLAD STRAIN &	R570
PELLET TEMPERATURE & DEFORMATION	BAPL	6600	F4	RS P	T I	\$PELEN, FUEL	R598
PENETRATION CALCULATION	CAC	7090	F2	RSBP	J	\$LIPRECAN1, MC NEUTRON	123
PENETRATION STUDY	LASL	7090	FLOCO	RS P	B	\$MCS, MONTE CARLO NEUTRON	202
PERFORMANCE	ANL	370	F4	RS P	CT I	\$LIFE3, MIXED-OXIDE FUEL ELEMENT	R460
PERFORMANCE	ANL	7600	F4	RS P	T I	\$LIFE3, MIXED-OXIDE FUEL ELEMENT	R460
PERFORMANCE AND PRICE STUDY	GGA	1108	F4	RS P	CT D	\$OPUS, POWER PLANT	226
PERFORMANCE DATA	ANL	360	F4	RS P	D	\$NPRFCCP, FUEL CYCLE COSTS	146
PERFORMANCE DATA	UEC	6600	F4	RS P	D	\$NPRFCCP, FUEL CYCLE COSTS	146
PERFORMANCE FINITE-ELEMENT	FBRD	635	F4	RS P	CT I	\$BEHAVE2, OXIDE FUEL	R568
PERFORMANCE MODEL	HEDL	6600	F	RS P	T H	\$SIEX, LMFBR FUEL PIN THERMAL	673
PERFORMANCE MONITOR	SLAC	360B	F+BAL	RSB	CT P	\$PROGLOOK, USER PROGRAM	642
PERFORMANCE MONITOR	SLAC	360	EAL	RS	CT P	\$SLACMON 2.2, OS360 MVT/MFT	635
PERFORMANCE STUDY	GGA	7044	F4	RS P	D	\$WAMPUM, FUEL CYCLE COSTS	224
PERFORMANCE STUDY	UEC	6600	F4	RS P	D	\$WAMPUM, FUEL CYCLE COSTS	224
PERMEATION WITH TRAPPING	DP	360	F4	RSBP	Q	\$XDTRAP, HYDROGEN	655
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	7090	F2	RS	C	\$	30
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC	360	F4	RS P	C	\$	30
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	1604	F63	RS	C	\$	30
PERTURBATION CALC FROM 2DF OUTPUT	GGA	1108	F5	RS P	T N	\$GAPER2D, 2-D	471
PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	F4	RS P	N	\$CAC1, SN	455
PERTURBATION FOR AIM AND FOG CODES	AI	7090	F2	RS	C	\$PERT, 1-D	30
PERTURBATION FOR AIM AND FOG CODES	BHSC	360	F4	RS P	C	\$PERT, 1-D	30
PERTURBATION FOR AIM AND FOG CODES	CDC	1604	F63	RS	C	\$PERT, 1-D	30
PERTURBATION TDC OR 2DXY FLUX INPUT	PW	1604	F63	RS	C	\$TDP, 2-D	199
PERTURBATION THEORY	GGA	1108	F4	RS P	XCT C	\$GAPER1D, 1-D TRANSPORT	606
PERTURBATION XY RZ RTHETA GEOMETRY	BNW	1108	F4	RS P	C	\$PERT4, 2-D	304
PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	1108	F4	RS P	C	\$	304
PGE	360	F4	RS P	T G	\$EMERALD REV. 1, PWR ACCIDENT ACTIVITY RELEASE		546
PGE	360	F4	RS P	T G	\$EMERALD-NORMAL, PWR ACTIVITY RELEASE AND DOSE		685
PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	6600	F4	RS P	T A	\$PHASER,	R507
PHASE-SHIFT ANALYSIS	ORNL	1604	F63	RS P	A	\$PEGGY, ELASTIC SCATTERING	334
PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	6600	F4	RS P	T A	\$	R507
PHENIX, 2-D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P	T D	\$	454
PHOTOFRACTION SOLID CRYSTAL	MTS	7090	MAD	RSB	O	\$BURP4, GAMMA-RAY	169
PHOTOFRACTION WELL CRYSTAL	MTS	7090	MAD	RSB	O	\$BURP5, GAMMA-RAY	170
PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	F4	RS P	O	\$DYN01,	R464
PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	F4	RS P	O	\$DYN01,	R464
PHOTOPEAK SPECTRA CODE	BNW	1108	F+BAL	RS P	T O	\$GSSLRN1B, LEAST SQUARES	457
PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	360	F4	RS	PLXCT B	\$	520
PHYSICS MODULES	DP	360	F+BAL	S	X T B	\$RAHAB, JOSHUA SYSTEM LATTICE	536
PIN THERMAL PERFORMANCE MODEL	HEDL	6600	F	RS P	T H	\$SIEX, LMFBR FUEL	673
PIN THERMAL-HYDRAULIC ANALYSIS	ANL	360B	F4	RSBP	CT H	\$COBRA3M, FUEL	659
PINS	ANC	360	F4	RSBP	CT J	\$VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL	569
PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	1604	F63	RS P	T I	\$	187
PIPE	ORNL	360	F4	RS P	I	\$LUGS, STRESS FOR INTEGRAL ATTACHMENTS TO	648
PIPE STRESS & FLEXIBILITY CALC	ORNL	360	F+BAL	RS P	I	\$ELBOW-ORNL,	650
PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	F+FAP	RS	T I	\$4RESTRAINT	109
PIPE SYSTEM	AI	360	F4	RS P	CT I	\$PSA2, STRESS ANALYSIS MULTIANCHOR	542
PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P	T I	\$M0457,	R329

PIPING

POWER

PIPING	ANL	360	F4	RS P	G	\$NATRANSIENT, FLUID HAMMER ANALYSIS 1-D	718	
PIPING SYSTEM	BAPL	6600	F4	RS P	T I	\$M0457, PIPE, ELASTIC STRESS OF	P329	
PIPING SYSTEM	ANL	360	F4	RS P	G	\$NAHAMMER, FLUID HAMMER ANALYSIS	717	
PIPING SYSTEM	ANL	7600	F4	RS P	G	\$NAHAMMER, FLUID HAMMER ANALYSIS	717	
PIPING SYSTEM	HEDL	6600	F4	RS P	T G	\$HAMOC, FLUID HAMMER ANALYSIS OF	710	
PIPING SYSTEM ANALYSIS	ANC	360B	F+BAL	RS P	T G	\$WHAM6, LIQUID-FILLED	278	
PIPING SYSTEM ANALYSIS	ANL	7600B	F4	RS P	T G	\$WHAM6, LIQUID-FILLED	278	
PKG	ANL	360B	F+ASM	RSB	CT P	\$WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION	541	
PLANE & AXISYMMETRIC STRESS ANALYSIS	GGA	1108	F4	RS P	I	\$SAFE-2D,	379	
PLANE ELASTIC-PLASTIC	BAPL	6600	F+COM	RS P	T I	\$DUZ2, 2-D AXISYMMETRIC &	R503	
PLANE STRESS ANALYSIS, 2-D BODIES	BNL	6600	F4	RS P	T I	\$SAFE-PLANE,	252	
PLANE STRESS ANALYSIS, 2-D BODIES	GGA	1108	F4	RS P	I	\$SAFE-PLANE,	252	
PLANE STRUCTURES	BAPL	6600	F4	RS P	T L	\$BL47, DRAFTING TOOL TO PLOT	R373	
PLANNING	ORNL	360	F+BAL	RS P	X T D	\$ORSIM, OPTIMIZING UTILITY GENERATION	699	
PLANNING	MLMO	360	F+C+R	RSBP	T M	\$RALCRTPH, RESOURCE ALLOCATION PROJECT	G603	
PLANT CAPITAL COST ESTIMATING	OPNL	360	F+BAL	RS P	T D	\$ORCOST2, POWER	588	
PLANT CONCEPTUAL COST ESTIMATE	GGA	1108	F4	RS P	XCT D	\$CONCEPT3, POWER	498	
PLANT CONCEPTUAL COST ESTIMATE	ORNL	360B	F4	RS P	X T D	\$CONCEPT4, POWER	498	
PLANT COST CODE	HEDL	1108	F5	RS P	X T D	\$PACTOLUS, CLOTHO, NUCLEAR POWER	540	
PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$CROCK, SPACE POWER	112	
PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$SHOCK, SPACE POWER	114	
PLANT NON-FUEL D & M COST STUDY	ORNL	360	F+BAL	RS P	D	\$OMCST, POWER	688	
PLANT PERFORMANCE AND PRICE STUDY	GGA	1108	F4	RS P	CT D	\$CPUS, POWER	226	
PLANT THERMAL DISCHARGE STUDY	HEDL	1108	F5	RS P	T R	\$TOPLYR2, POWER	599	
PLANT TRANSIENT ANALYSIS	WARD	7600	F4	RS P	T K	\$DEMO4, CRBR REACTOR &	R676	
PLENUM	DP	360	F4	RS P	H	\$PLENUM, FLOW DIST. IN CYL COOLANT INLET	586	
PLENUM, FLOW DIST. IN CYL COOLANT INLET	PLENUM	DP	360	F4	RS P	H	\$	586
PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	ANL	GETS	F	P	R	\$	591	
PLOT	KAPL	6600	F+ASC	RS P	T P	\$SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE	R364	
PLOT MODULES, F(X) & F(X,Y)	KAPL	6600	F+C+D	RS P	T P	\$DATATRAN2, UTILITY	407	
PLOT PLANE STRUCTURES	BAPL	6600	F4	RS P	T L	\$BL47, DRAFTING TOOL TO	R373	
PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	360	F4	RS P	T N	\$	544	
PLOTFB,... ENDF/B V1 PROC	BNL	6600B	F4	RS	T M	\$CHECKER, CRECT, DAMMET,	384	
PLOTFB,... ENDF/B V2 PROC	BNL	6600B	F4	RS	T M	\$CRECT, CHECKER, RIGEL,	475	
PLOTR, 2-D CONTOUR PLOTS & AREA CALCULATION	SLA	6600	F4	RS P	P	\$	R578	
PLOTS & AREA CALCULATION	SLA	6600	F4	RS P	P	\$PLOTR, 2-D CONTOUR	R578	
PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	F+FAP	RSBPL	T N	\$CPS, SC4020	239	
PLOTS FROM X-SECTION TAPES	GGA	7044	F+SPS	RSBP	T N	\$CROSSPLOT, SC4020	207	
PLOTS ON IBM2280 OR CALCOMP780	ANL	360	F4	RS P	T N	\$PLOT-3D, 3-D	544	
PLOTTING ROUTINES	KAPL	6600	F+COM	RS	T P	\$KAPLPLOT, KAPL CALCOMP	R496	
PL1	S P	CT P	\$SLOP, CROSS, IBM360 FORTRAN H PROGRAM CHECKER	ANL	360B		647	
PL1	RS P	T P	\$PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360	ANC	360		516	
PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCND	360B	F+BAL	RS P	O	\$	469	
POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P	D	\$CINDER, M0102,	313	
POINT DEPLETION FISSION PRODUCT	DP	360	F+BAL	RS P	T D	\$CINDER, M0102,	313	
POINT SOURCE	MTS	7090	MAD	RSB	O	\$BURP1, DETECTOR EFFICIENCY	164	
POINT SOURCE	MTS	7090	MAD	RSB	O	\$BURP3, DETECTOR EFFICIENCY	166	
POINT-KERNEL SHIELD EVALUATION CODE	BAPL	6600B	F+ASC	RS P	T J	\$SPAN4, A	R462	
POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	F+MAP	RS P	T H	\$BLOCST5,	205	
POINTS	KAPL	6600	F+ASC	RS P	T P	\$CURFIT, CURVE FITTING EXPERIMENTAL DATA	R 43	
POINTWISE XSECS. FROM B-W PARAMETERS	GGA	1108	F5	RS P	CT A	\$FSDP3,	216	
POLARIZATION CALC	KAPL	6600	F4	RS P	T A	\$PHASER, PHASE SHIFT X-SEC &	R507	
POLARIZATION EXPERIMENT	UCND	360B	F+BAL	RS P	O	\$PMS1, FAST NEUTRON	469	
POLLA, CONVERTS R-MATRIX RESONANCE PARAMETERS	ORNL	360	F4	RS P	A	\$	639	
POLYNOMIAL	KAPL	6600	F4	RS P	P	\$ROPE, FINDING ROOTS OF A	R444	
POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P	T P	\$M0661, M0657, M0626,	R411	
POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	RS P	T G	\$SQFIRE2, SODIUM	559	
POST RUPTURE	GGA	7044	F4	RS	X T G	\$PRECON, HTGR CONTAINMENT PRESSURE	228	
POTENTIAL SHAPE CALCULATION	ORNL	7090	F2	RS	A	\$LYNNE, WOODS-SAXON	381	
POWDER PATTERN INDEXING	LASL	6600	F+COM	RS P	T Q	\$INDX, XRAY DIFFRACTION	609	
POWER AND FLOW TRANSIENTS	ANL	360	F4	RS P	T F	\$SASIA, FAST REACTOR	400	
POWER AND FLOW TRANSIENTS	ANL	6600	F4	RS P	T F	\$SASIA, FAST REACTOR	400	
POWER DIST SEARCH	GGA	7044	F4	RS P	T C	\$GASP2, 1-D FEW-GP DIFFUSION	220	
POWER DISTRIBUTION	CDC	3600	F63	RSBP	T C	\$FLARE, 3-D REACTIVITY AND	167	

POWER

PROGLOOK

POWER DISTRIBUTION	MSS	360	F4	RS P	CT C	\$FLARE, 3-D REACTIVITY AND	167
POWER DISTRIBUTION	NEC	635	F4	RS P	T C	\$FLARE, 3-D REACTIVITY AND	167
POWER DISTRIBUTION SEARCH	GGA	1108	F4	RS P	T C	\$GASP7, 1-D BURNUP	319
POWER EXCURSION DISASSEMBLY	ANL	360	F4	RS P	XCT F	\$VENUS, 2-D LMFBR	511
POWER MCGUIRE UNITS	DUCC	635	F4	RS	G	\$ANVENT, LOCA ANALYSIS DUKE	529
POWER OUTPUT FROM MIXED ISOTOPES	MLMD	360	F4	RSBP	CT Q	\$ISOTAB, PU	P619
POWER PLANT CAPITAL COST ESTIMATING	ORNL	360	F+BAL	RS P	T D	\$CPCOST2,	588
POWER PLANT CONCEPTUAL COST ESTIMATE	GGA	1108	F4	RS P	XCT D	\$CCNCEPT3,	498
POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL	360B	F4	RS P	X T D	\$CCNCEPT4,	498
POWER PLANT COST CODE	HEDL	1108	F5	RS P	X T D	\$PACTOLUS,CLOTHO, NUCLEAR	540
POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$CROCK, SPACE	112
POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$SHOCK, SPACE	114
POWER PLANT NON-FUEL O & M COST STUDY	ORNL	360	F+BAL	RS P	D	\$CMCST,	688
POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	1108	F4	RS P	CT D	\$OPUS,	226
POWER PLANT THERMAL DISCHARGE STUDY	HEDL	1108	F5	RS P	T R	\$TOPLYR2,	599
POWER TRANSIENTS	BAPL	6600	F4	RS P	T H	\$CHIC-KIN, FAST + INTERMEDIATE	R473
POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL	1604	F63	RS P	D	\$	340
POWERCO, NUCLEAR STATION ELECTRICITY COSTS	UEC	6600	F4	RS P	D	\$	340
PPCO 360	F4	RS P	X	G	\$BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN		435
PPCO 7040	F+MAP	RS P	A	\$COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION			203
PPCO 7040	F4	RS P	T C	\$TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER			148
PPCO 7044	F+MAP	RS P	T H	\$TQDDEE, 2-D TIME-DEPENDENT HEAT CONDUCTION			349
PPCO 7090	F2	RS P	C	\$MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM			59
PPCO 7090	F2	RS P	T C	\$TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER			148
PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	F4	RS	X T G	\$	228
PREDICTING MANUFACTURING REQUIREMENTS	GEPI	GETS	BASIC P	M	\$MAPPER,		595
PREDICTION	MIT	370	F4	RS P	T H	\$ENERGY, LMFBR COOLANT TEMPERATURE	696
PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	360	F4	RSBP	CT G	\$	528
PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	1108	F4	RS P	T G	\$	528
PREPARATION	GGA	1108	F4	RS P	X T L	\$GAND, GAFGAR X-SECTION LIBRARY	345
PREPARATION	PW	1604	F63	RS	L	\$CSP1, SN X-SECTION LIBRARY TAPE	194
PREPARATION	PW	1604	F63	RS	L	\$CSP2A, SN X-SECTION LIBRARY TAPE	193
PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	F+MAP	RS P	T L	\$DPC, DATA	234
PRESSURE	BAPL	6600	F4	RS P	I	\$TCB01, CREEP-BUCKLING OF TUBES UNDER	R604
PRESSURE DISTRIBUTION	GGA	1108	F5	RS P	H	\$FLAC, STEADY-STATE FLOW,	395
PRESSURE POST RUPTURE	GGA	7044	F4	RS	X T G	\$PRECON, HTGR CONTAINMENT	228
PRESSURE TEMPERATURE HISTORY	KECS	7094	F2	RSBP	T H	\$PTH1, BLOWDOWN	155
PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	F4	RS	I	\$SORSDB,	R391
PRESSURE-TEMPERATURE RESPONSE	ANC	360	F+BAL	RSBP	LXCT G	\$CONTEMPT-LT/026,	433
PRESSURIZERS	BAPL	6600	F4	RS P	T H	\$TOPS, TRANSIENT THERMODYNAMICS OF	R348
PRICE STUDY	GGA	1108	F4	RS P	CT D	\$OPUS, POWER PLANT PERFORMANCE AND	226
PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	360	F4	RS P	T B	\$RICE,	453
PRINTED-CIRCUIT BOARDS	SLA	1108	F+BAL	RSBP	T T	\$ACCEL(MOD2), DESIGN OF	681
PRINTED-CIRCUIT BOARDS	SLA	6600	F+COM	RS P	T T	\$ACCEL(MOD2), DESIGN OF	681
PROBABILITIES MC	ORNL	360B	F+BAL	RS P	T B	\$RAFFLE, 1ST FLIGHT COLLISION	392
PROBABILITY CALC	ANL	360	F4	RS P	T B	\$CLUP77, SQUARE CELL COLLISION	526
PROBABILITY CALC	JAER	230	F4	RS P	T B	\$CLUP77, SQUARE CELL COLLISION	526
PROBABILITY TABLES	AI	360	F+BAL	RS P	CT A	\$U3R, UNRESOL RESONANCE XSEC	553
PROC BNL 6600B	F4	RS	T M	\$CRECT,CHECKER,RIGFL,PLOTFB,... ENDF/B V2			475
PROC BNL 6600B	F4	RS	T M	\$CHECKER,CRECT,DAMMET,PLOTFB,... ENDF/B V1			384
PROCESS SIMULATION	DP	360	F4	RS P	U	\$SOLVEX, SOLVENT EXTRACTION	662
PROCESS SIMULATION	ORNL	360	F4	RS P	T U	\$SEPHIS, SOLVENT EXTRACTION	690
PROCESSING AND EDITING	ORNL	360B	F4	RS PL	CT M	\$EDITOR, ENDF/B TAPE	502
PROCESSING AND EDITING	ORNL	6600	F4	RS P	T M	\$EDITOR, ENDF/B TAPE	502
PROCESSING CODE	ANL	360	F4	RS	T M	\$RIGEL, ENDF/B V3 DATA	571
PROCESSING CODES	ANL	360	F4	RS P	T M	\$CRECT,CHECKER, ENDF/B V2	475
PROCESSING CODES	BNL	6600	F4	RS	T M	\$CHECK3,RIGEL3, ENDF/B V3	571
PROCESSING CODES	BNL	6600B	F4	RS	T M	\$RIGEL4,CHECK4,... ENDF/B V4	638
PROCESSING MODULE	ANL	360	F4	RSBP	CT L	\$ARC-NU1002, BCD INPUT DATA	533
PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	F+BAL	RS P	T O	\$TOAD,	333
PROCESSOR	LASL	360	F4	RS P	L	\$GENRD, FREE-FORMAT CARD INPUT	530
PROCESSOR	LASL	6600	F4	RS P	L	\$GENRD, FREE-FORMAT CARD INPUT	530
PROCESSOR	LASL	360	F4	RS P	CT M	\$LASIP3, CCCC STANDARD INTERFACE FILE	691
PROGLOOK, USER PROGRAM PERFORMANCE MONITOR	SLAC	360B	F+BAL	RSB	CT P	\$	642

PROGRAMMING

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PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+CCM	RS	P	T	M	\$DATATRAN2, MODULAR	386					
PROGRAMMING ENVIRONMENT LIBRARY	BAPL	6600	F+CCM	FS		T	P	\$BETTIS	R665					
PROGRAMMING ENVIRONMENT LIBRARY	BAPL	7600	F+CCM	FS		T	P	\$BETTIS	R665					
PROGRAMMING LANGUAGE	KAPL	6600	F+ASC	RS		P		\$SIMPLE1, TIME-SHARING	R442					
PROJECT PLANNING	MLMD	360	F+C+R	RSBP	T	M		\$RALCRTPH, RESOURCE ALLOCATION	G603					
PROPERTIES HG&E	3600	F4		T	H			\$STEAM-67, 1967 ASME STEAM AND WATER	487					
PROPERTIES FOR SAFETY ANALYSIS	BAPL	7600	F4		RS	P	T	H	\$WASP2, WATER	R396				
PROPERTIES WATER & STEAM	ANC	360	F4		RS	P	T	H	\$ASTEM, THERMODYNAMIC	580				
PROPERTIES WATER & STEAM	BCAC	6600	F4		RS	P	T	H	\$ASTEM, THERMODYNAMIC	580				
PSA2, STRESS ANALYSIS	MULTIANCHOR	PIPE	SYSTEM	AI		360	F4	RS	P	CT	I	\$	542	
PSEUDO, STATISTICAL RESONANCE	PARAMETER	CALC	ENEA		360	F4		RS	P		A	\$	292	
PSEUDO, STATISTICAL RESONANCE	PARAMETER	CALC	GGA		1108	F4		PS	P		A	\$	292	
PTAC11, 2-PASS ASSEMBLER FOR THE	PDP-11	ON	360	ANC		360	PL1	RS	P	T	P	\$	516	
PTHL, BLOWDOWN PRESSURE	TEMPERATURE	HISTORY	KECS		7094	F2		RSBP	T	H		\$	155	
PU POWER OUTPUT FROM MIXED ISOTOPES	MLMD	360	F4		RSBP	CT	Q		\$ISOTAB,			R619		
PULSED NEUTRON SOURCE DATA	NED	635	F4		RS	P	T	O		\$EXPN, ANALYSIS OF		258		
PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4		RS	P		E		\$TRIFIDO,		489		
PUMP IMPELLER DESIGN STUDY	PW	1604	F63		RS	P	T	I		\$PIP, CENTRIFUGAL		187		
PUN1, UNRESOLVED RESONANCE	INTEGRALS	X-SECS	BAPL	6600	F4			RS	P	T	A	\$	P359	
PURCHASE VERSUS LEASE ANALYSIS	SLA	360	COBOL	RSBP	CT	M		\$BECOM, AEC DP				R589		
PURCHASE VERSUS LEASE ANALYSIS	SLA	1108	COBOL	RS	P		M	\$BECOM, AEC DP				F589		
PURD	6500	F4	RS	PLX	T	C		\$MACH1, 1-D MULTI-GP DIFFUSION	SLAB	CYL	SPHERE	262		
PW	1604	F+CDP	RS	P	T	P		\$LAG, ASSEMBLER FOR FLOCO2	INSTRUCTION	SET		186		
PW	1604	F+CDP	RS	P	X	T	B	\$FMC-N, FMC-G, MC NEUTRON,	GAMMA-RAY	HISTORIES		195		
PW	1604	F63	RS		C			\$TDP, 2-D PERTURBATION	TDC	OR	2DXY	FLUX	INPUT	199
PW	1604	F63	RS		I			\$WDPEXPRT, REACTOR WEIGHT	OPTIMIZATION	STUDY		190		
PW	1604	F63	RS		L			\$CSP1, SN X-SECTION	LIBRARY	TAPE	PREPARATION	194		
PW	1604	F63	RS		L			\$CSP2A, SN X-SECTION	LIBRARY	TAPE	PREPARATION	193		
PW	1604	F63	RS		T	C		\$2DXYL, 3-D MULTI-GP	FLUX	SYNTHESIS	PROGRAM	CYL	192	
PW	1604	F63	RS	P		E		\$CMPXMAT, TRANSFER	FUNCTION	EVALUATION		188		
PW	1604	F63	RS	P		F		\$AX-TNT, COUPLED	NEUTRONICS-HYDRODYNAMICS	SPH		191		
PW	1604	F63	RS	P		L		\$SNC, CALCULATION OF	SN	CONSTANTS	FOR	DSN	TDC	189
PW	1604	F63	RS	P	T	C		\$FORTRAN	TDC, 2-D	MULTI-GP	SN	APPROXIMATION	RZ	161
PW	1604	F63	RS	P	T	I		\$PIP, CENTRIFUGAL	PUMP	IMPELLER	DESIGN	STUDY	187	
PW	1604	LAG1	RS	P		C		\$MGDSN, 1-D MULTI-GP	SN	APPROX	SLAB	CYL	SPHERE	211
PW	1604	LAG1	RS	P		N		\$CTX, EFFECTIVE	X-SECTION	CALC	FROM	DSN	OUTPUT	210
PWCOST, REACTOR FUEL CYCLE	COST	CALCULATION	GGA	1108	F4		RS	P	T	O		\$	441	
PWR & BWR GASEOUS RELEASE	ORNL	360	F4		RS	P	C	G		\$STEFFG, ANALYSIS OF		583		
PWR ACCIDENT ACTIVITY RELEASE	PGE	360	F4		RS	P	T	G		\$EMERALD REV. 1,		546		
PWR ACTIVITY RELEASE AND DOSE	PGE	360	F4		RS	P	T	G		\$EMERALD-NORMAL,		685		
PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	F4		RS	P	T	H		\$FLOT1, M0219,		R331		
PWR OPN	OPPD	6400	F4		S	P	H		\$PWR-PPM, BORATION-DILUTION	TABLES	FOR	552		
PWR-PPM, BORATION-DILUTION	TABLES	FOR	PWR	OPN	OPPD	6400	F4		S	P	H	\$	552	
QMESH, RENUM, SELF-ORGANIZING	MESH	GENERATION	ANL	360	F4		RS	P	CT	L		\$	612	
QMESH, RENUM, SELF-ORGANIZING	MESH	GENERATION	SLA	6600	F4		RS	P	T	L		\$	612	
QUALITY CONTROL DATA ANALYSIS	ROUTINES	BKC	360	F4		RS	P		P		\$COMQC,		649	
QUALITY CONTROL SAMPLE	STATISTICS	BKC	360	F4		RSBP		P		\$HISTOGRAMS,		614		
QUASISTATIC SPATIAL REACTOR	KINETICS	CODE	ANL	360	F4		RS	PL	CT	F		\$QX1,	474	
QUASISTATIC SPATIAL REACTOR	KINETICS	CODE	ANL	3600	36F		RS	PL	CT	F		\$QX1,	474	
QUICKIE, INFINITE MEDIUM	SPECTRUM	X-SECTIONS	AI	7090	F+FAP	PS	L	T	B		\$	119		
QX1, QUASISTATIC SPATIAL	REACTOR	KINETICS	CODE	ANL	360	F4		RS	PL	CT	F	\$	474	
QX1, QUASISTATIC SPATIAL	REACTOR	KINETICS	CODE	ANL	3600	36F		RS	PL	CT	F	\$	474	
R-M PARAMETERS OF UNRESOLVED	RESONANCES	BAPL	6600	F4		PS	P		A		\$GRAMP,		R470	
R-MATRIX RESONANCE	PARAMETERS	ORNL	360	F4		RS	P		A		\$POLLA, CONVERTS		639	
R-THETA-Z	LASL	6600	F4		RS	P	T	D		\$3DDT, 3-D MULTIGROUP	DIFFUSION	XYZ	463	
RABBLE, WLIB, FLAT, RESONANCE	ABSORPTION, CELL	ANL	3600	F36		RSBP	X	T	B		\$	281		
RADIAL INTEGRALS	ORNL	1604	F63		RS	P		A		\$RAMES, PARTICLE	WAVE	FUNCTION	335	
RADIATION DAMAGE IN METALS	GEC	7094	F+FAP	RSBP	T	Q		\$CASCADE, CLUSTER,				419		
RADIATOR FINS SNAP	GEOM	AI	7090	F2		RS	J		\$SCARF2, SCATTER	FROM		110		
RADIO FREQUENCY MANAGEMENT	SYSTEM	ALOO	360	COBOL	RS	P		M		\$AEC-ALO	FAU,	587		
RADIOACTIVE DECAY CHAINS	GEC	635	F4		RSBP	D		\$CHAINS, ANALYSIS	OF			418		
RADIOACTIVE-DECAY	GAMMA-RAY	CATALOG	DP	360B	EBCDC	R	L	T	Z		\$GAMTAB,	637		
RADIOACTIVITY	IITR	7094	F4		RSBP	PLX	T	O		\$NAP, NEUTRON-INDUCED	GAMMA-RAY	314		
RADIOLOGICAL DOSE	ACCIDENT	STUDY	AI	370	F4		RS	P	CT	G		\$COMRADEX3,	663	

RADIOLOGICAL

RELOAD-FEVER

RADIOLOGICAL EFFECTS ANALYSIS	HEDL	1108	F+SLE	RS P	XCT	R	\$HERMES, REGIONAL	527
RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	360B	F4	RSBP	CT	G	\$RSAC,	265
RADIONUCLIDE GENERATION AND DECAY	BNW	1108	F5	RSBPL	T	D	\$ISOGEN,	367
RADI GEOMETRY MODULES 2-D INPUT GEN	KAPL	6600	F+C+D	RS	P	T	L \$DATATPAN2,	406
RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	F4	RS	P	D	\$	231
RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	360B	F+BAL	RS	P	T	B \$	392
RAFFLE2/MOD2, MONTE CARLO NEUTRON TRANSPORT	ANC	360	F+BAL	RSBPL	CT	B	\$	631
RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP	360	F+BAL	S	X	T	B \$	536
RALCRPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMO	360	F+C+R	RSBP	T	M	\$	6603
RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	F63	RS	P	A	\$	335
RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL	6600	F4	RS	P	A	\$	492
RANDOM SAMPLING TABLE, FOR NON-BIAS ORDERING	MLMO	360	F+COR	RSBP	XC	P	\$	679
RAPFU, FUEL CYCLE PAFAMETERS FAST PREEDERS	NED	635	F4	RS	P	D	\$	372
RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	6600	F4	RS	P	H	\$	R382
RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NED	2000	F2	RS	P	A	\$	176
RATES UK-W 7090 F2 RS N	\$WED, W-DSN	OUTPUT TAPE EDIT	REACTION					133
RATES FROM 2-D FLUX SETS FBRD H600 F4	RS	P	CT	C	\$TRIAL, 3-D	REACTION		585
RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	F4	RS	T	H	\$	242
RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7094	FAP	RS	P	T	H \$	242
RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090	F2	RS	P	J	\$	141
RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	F4	RS	P	F	\$	R352
RDYN 370B F4 RS P T P	\$METRICATION, CONVERSION TO OR FROM SI UNITS							G668
REACTION AI 360 F+BAL RS P T A	\$CGMNUC, CASCADE, COMPOUND NUCLEUS							482
REACTION CEND 7600 F4 RS P T G	\$CEBUG, STEAM GENERATOR SODIUM-WATER							548
REACTION ANL 3600 F36 RSBP G	\$CHEMLOC2, CORE HEATING CLADDING-STEAM							366
REACTION DECAY CHAIN ANALYSIS ORNL 1604 F63	RS P D \$ISOCRUNCH,							180
REACTION DECAY CHAIN ANALYSIS ORNL 7090 F2	RSBP D \$ISOCRUNCH,							180
REACTION OR DECAY ORNL 1604 F63 RS P D	\$ISOTOPES, MAXIMUM YIELD FROM							179
REACTION RATES UK-W 7090 F2 RS N	\$WED, W-DSN	OUTPUT TAPE EDIT						133
REACTION RATES FROM 2-D FLUX SETS FBRD H600 F4	RS	P	CT	C	\$TRIAL, 3-D			585
REACTION X-SECTION ENEA 360 F4 RS P A	\$THRES2, STATISTICAL MODEL							504
REACTION X-SECTIONS BNL 6600B F4 RS P A	\$THRES2, STATISTICAL MODEL							504
REACTIVE MIXTURE FLOW LASL 6600 F4 RS P T U	\$PRICE-LASL, CHEMICALLY							720
REACTIVITY AND POWER DISTRIBUTION CDC 3600 F63 RSBP T C	\$FLARE, 3-D							167
REACTIVITY AND POWER DISTRIBUTION MSS 360 F4 RS P CT C	\$FLARE, 3-D							167
REACTIVITY AND POWER DISTRIBUTION NED 635 F4 RS P T C	\$FLARE, 3-D							167
REACTORS ANL 360B F+BAL RSBPL CT D	\$REBUS2, FUEL CYCLE ANALYSIS FOR FAST							634
REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS NED 635 F4 RS P T B	\$							257
REBUS2, FUEL CYCLE ANALYSIS FOR FAST REACTORS ANL 360B F+BAL RSBPL CT D	\$							634
RECAP-0, RECAP-12 X-SECTION LIBRARY GENERATION BAPL 6600 F+COM RS P T B	\$							R671
RECAP-12 X-SECTION LIBRARY GENERATION BAPL 6600 F+COM RS P T B	\$RECAP-0,							R671
RECAP-12, MONTE CARLO CRITICALITY CALCULATIONS BAPL 7600 F+COM RS P T C	\$							R670
RECOIL ATOM SPECTRA ENDF/B DATA ORNL 360 F4 RS P T B	\$PRICE, PRIMARY							453
RECTANGULAR MAGNETIC NETWORK SOLUTION BAPL 6600B F4 RS P T I	\$MANE1,							R412
REDUCTION ANL 3600 F63 RSBP D	\$COINC, COINCIDENCE COUNTING DATA							248
REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS BAPL 6600 F4 RS P T D	\$							R425
REFUEL GGA 7044 F4 RS P T D	\$GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL							260
REFUELING HISTORY LASL 6600 F4 RS P T D	\$PHENIX, 2-D DIFFUSION BURNUP							454
REGIONAL RADIOLOGICAL EFFECTS ANALYSIS HEDL 1108 F+SLE RS P XCT R	\$HERMES,							527
REGRESSION W/CONFIDENCE LIMITS BKC 360 F4 RSBP P	\$GRAPH, LINEAR							624
REICH-MOORE RESOLVED REGION X-SECTIONS BNL 6600 F4 RS P A	\$FAMP1,							492
RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY ANC 360E F+BAL RSBPLXCT G	\$							369
RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY ANC 7600B F+COM RS PLXCT G	\$							369
RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY ANC 7600C F+COM RS PLXCT G	\$							369
RELATION GEC 635 F4 RSBP D	\$COS, NEUTRON FLUX-DOSIMETER ACTIVITY							423
RELEASE ORNL 360 F4 RS P C G	\$STEFEG, ANALYSIS OF PWR & BWR GASEOUS							583
RELEASE PGE 360 F4 RS P T G	\$EMERALD REV. 1, PWR ACCIDENT ACTIVITY							546
RELEASE GGA 1108 F4 RS P	\$FREVP6, HTGR METALLIC FISSION PRODUCT							301
RELEASE ANALYSIS BCL 6400 F4 RS P G	\$FRCRL2, LOCA FISSION PRODUCT							500
RELEASE AND DOSE PGE 360 F4 RS P T G	\$EMERALD-NORMAL, PWR ACTIVITY							685
RELEASE SAFETY ANALYSIS HEDL 7600 FTN RS P G	\$SPRAY2, SODIUM SPRAY							716
RELEASE SIMULATION BAPL 6600 F4 RS P T I	\$BUBL1, FUEL SWELLING & GAS							R468
RELIABILITY FOR A SINGLE FAILURE MODE BAPL 6600 F4 RS P P	\$REL01,							R497
RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION GGA 7044 F4 RS P T D	\$							221

REL01

RFD

REL01, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	6600	F4	RS	P	P	\$	P49	
REMOTE JOB ENTRY SYSTEM	ANC	360	BAL	RSB	T	P	\$NRTS-RJE, OS/360 MVT	519	
REMOTE WORKSTATION PKG	ANL	360B	F+ASM	RSB	CT	P	\$WSP-HASP/DOS, DOS-MFT	541	
REMOVAL RCL	6400B	F4	RS	P	X	G	\$MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE	499	
REMOVAL X-SECS	BAPL	6600	F4	RS	T	B	\$M0807, 2-D DIFFUSION ABSORPTION	R280	
RENUM, SELF-ORGANIZING MESH GENERATION	ANL	360	F4	RS	P	CT	L \$QMESH,	612	
RENUM, SELF-ORGANIZING MESH GENERATION	SLA	6600	F4	RS	P	T	L \$QMESH,	612	
REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW	1108	F5	RS	P	CT	H \$	483	
RESEND, ADLER, ENDF/B RESONANCE XSECTION CODES	BNL	6600B	F4	RS	P	T	A \$	465	
RESOLUTION OF GAMMA-RAY SPECTRA	ORNL	360	F4	RS	P	O	\$ALPHA-M,	413	
RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	6600	F4	RS	P	A	\$SIGPLOT,	377	
RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB	T	A	\$ZUT,	41	
RESOLVED REGION X-SECTIONS	BNL	6600	F4	RS	P	A	\$RAMPL, REICH-MODE	492	
RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NED	635	F4	RS	P	T	B \$REAX,	257	
RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	F4	RS	P	A	\$STRIP,	305	
RESOLVED RESONANCE X-SECTION CALC	NED	2000	F2	RS	P	A	\$DOPIE,	177	
RESONANCE ABSORPTION, CFLL	ANL	3600	F36	RSBP	X	T	B \$RABBLE, WLIR, FLAT,	281	
RESONANCE DATA UICS	360	F4	RS	P	A	\$CODILLI, LEAST SQUARES ANALYSIS	347		
RESONANCE EPITHERMAL X-SECTIONS	NED	635	F4	RS	P	T	B \$REAX, RESOLVED	257	
RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB	T	A	\$ZUT, RESOLVED REGION	41	
RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB	T	A	\$TUZ, UNRESOLVED REGION	42	
RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	F36	RSBP	A	\$MISH-MASH,	214		
RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	F36	RSBP	X	T	B \$RIFF-PAFF,	213	
RESONANCE INTEGRAL CALCULATION	BW	2000	F4	RS	P	A	\$STRIP, RESOLVED	305	
RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS	P	X	T	B \$RESQ2, RESQ0, DBF1,	R285
RESONANCE INTEGRAL X-SECTION CALC	AI	7090	F2	PS	PL	T	A \$ARES2,	89	
RESONANCE INTEGRAL X-SECTION CALC	AI	7094	F+MAP	RS	PL	T	A \$TRIX1,	208	
RESONANCE INTEGRAL X-SECTION CALC	CGC	1604	F63	RS	PL	T	A \$ARES2,	89	
RESONANCE INTEGRAL X-SECTION CALC	NED	2000	F2	RS	P	A	\$RAPTURE,	176	
RESONANCE INTEGRALS X-SECS	BAPL	6600	F4	RS	P	T	A \$PUN1, UNRESOLVED	F359	
RESONANCE MEASUREMENTS	GGA	1108	F4	RS	P	T	A \$TACASI, ANALYSIS OF	410	
RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS	P	T	B \$GAROL,	219	
RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	F+MAP	RS	P	T	B \$GAROL,	219	
RESONANCE PARAMETER CALC	ENEA	360	F4	RS	P	A	\$PSEUDO, STATISTICAL	292	
RESONANCE PARAMETER CALC	GGA	1108	F4	RS	P	A	\$PSEUDO, STATISTICAL	292	
RESONANCE PARAMETERS	OFNL	360	F4	RS	P	A	\$POLLA, CONVERTS P-MATRIX	639	
RESONANCE PARAMETERS	WANL	7094	F2	RS	P	A	\$EXT, X-SECTIONS FROM B-W	238	
RESONANCE THEORY XSEC CALC	KAPL	6600	F4	RS	P	A	\$MULTI, MULTI-LEVEL	P535	
RESONANCE X-SECTION CALC	NED	2000	F2	RS	P	A	\$DOPIE, RESOLVED	177	
RESONANCE X-SECTION CALC	GGA	1108B	F4	RS	P	T	A \$GANDY3, UNRESOLVED	341	
RESONANCE XSEC PROBABILITY TABLES	AI	360	F+BAL	RS	P	CT	A \$U3R, UNRESOL	553	
RESONANCE XSECTION CODES	BNL	6600B	F4	RS	P	T	A \$RESEND, ADLER, ENDF/B	465	
RESONANCES	AI	360	F4	RS	PL	T	B \$AILMOE, X-SECTION CALC ELASTIC SCAT	147	
RESONANCES	AI	7094	F+FAP	RS	PL	T	B \$AILMOE, X-SECTION CALC ELASTIC SCAT	147	
RESONANCES	BAPL	6600	F4	RS	P	A	\$GRAMP, R-M PARAMETERS OF UNRESOLVED	P470	
RESOURCE ALLOCATION PROJECT PLANNING	MLMO	360	F+C+R	RSBP	T	M	\$RALCRTPH,	G603	
RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC	AI	360	F4	RS	P	T	Q \$	566	
RESPONSE ANC	360	F+BAL	RSBPLXCT	G	\$CONTEMPT-LT/026, PRESSURE-TEMPERATURE			433	
RESPONSE FINITE-ELEMENT CODE	SLA	6600B	F4	RS	P	T	I \$HCNDO, A DYNAMIC	672	
RESPONSE LOCA	ANC	360	F4	RSBP	X	T	G \$THETA1-B, FUEL ROD THERMAL	512	
RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	F4	RS	P	T	I \$FUGIT, DYNAMIC	F537	
RESPONSE TO EXCURSION	ANL	360	F4	RS	P	CT	F \$REXCO-H, 2-D HYDRODYNAM	550	
RESPONSE TO EXCURSION	ANL	360	F4	RS	P	CT	F \$REXCO-H2, 2-D HYDRODYNAM	R615	
RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS	P	X	T	B \$PESQ2,	R285
RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS	P	X	T	B \$	R285
RETRIEVAL	SLA	1108	F+BAL	RSBP	T	M	\$SPIRAL, FULL-TEXT STORAGE, SEARCH &	P607	
RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	7044	F+MAP	RSBP	M	\$UNPACK,		206	
RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S	T	M	\$JOSHUA, DATA STORAGE,	490	
REV. 1, PWR ACCIDENT ACTIVITY RELEASE	PGE	360	F4	RS	P	T	G \$EMERALD	546	
REVISED-GAD, FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	F4	RS	P	T	D \$	223	
REVOLUTION	KAPL	6600C	F4	RS	P	T	I \$SOR3, STRESS ANALYSIS SHELLS OF	R 80	
REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	F4	RS	P	CT	F \$	550	
REXCO-H2, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	F4	RS	P	CT	F \$	R615	
RFD	360	F4	RS	P	U	\$DYNAMIC ANALYSIS OF GASES BY MASS SPECTROMETRY		645	

RFD

SAFE-3D

..FD	3600	F36	RS P	G	\$DISPER, AEROSOL PARTICLE TRANSPORT STUDY	554
RFD	6600B	F+COM	RS PLX T C	\$KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	450	
RICE-LASL, CHEMICALLY REACTIVE MIXTURE FLOW	LASL	6600	F4	RS P T U	\$	720
RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	360	F4	RS P T B	\$	453
RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	F36	RSBP X T B	\$	213
RIGEL, ENDF/B V3 DATA PROCESSING CODE	ANL	360	F4	RS T M	\$	571
RIGEL, PLOT FB, ... ENDF/B V2 PROC	BNL	6600B	F4	RS T M	\$CRECT, CHECKER,	475
RIGEL3, ENDF/B V3 PROCESSING CODES	BNL	6600	F4	RS T M	\$CHECK3,	571
RIGEL4, CHECK4, ... ENDF/B V4 PROCESSING CODES	BNL	6600B	F4	RS T M	\$	638
RING SNAP GEOMETRY	AI	7090	F2	RS J	\$SCAR1, SCATTER FROM A	111
ROD BUNDLE	NED	635	F4	RS P T H	\$VELVET2, TURBULENT FLOW IN LMFBR	458
ROD BUNDLE & CORE THERMAL-HYDRAULICS	BNW	7600	F4	RS P XCT H	\$COBRA4I,	432
ROD BUNDLE CHF DATA ANALYSIS	ANC	360	F4	RS PL CT M	\$ERREST, LOCA	518
ROD BUNDLE FLOW & TEMPERATURE DIST.	ORNL	360	F4	RS P T H	\$HORRIBLE,	629
ROD CLAD STRAIN & PELLETT CRACKING	BAPL	6600	F4	RS P I	\$STRIPE, FUEL	R570
ROD STRESS & DEFORMATION	AN-T	360B	F4	RSBP CT I	\$CYGRO3, OXIDE FUEL	R449
ROD STRESS & DEFORMATION	BAPL	6600	F4	RS P T I	\$CYGRO3, OXIDE FUEL	R449
ROD THERMAL RESPONSE LOCA	ANC	360	F4	RSBP X T G	\$THETA1-8, FUEL	512
RODS	ANC	360	F+BAL	RSBP XCT G	\$FRAP-T, TRANSIENT ANALYSIS OF OXIDE FUEL	658
RODS	ANC	360	F+BAL	RS P X T H	\$FRAP-S1, STEADY STATE ANALYSIS OXIDE FUEL	694
ROOTS OF A POLYNOMIAL	KAPL	6600	F4	RS P P	\$ROPE, FINDING	R444
ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	6600	F4	RS P P	\$	R444
RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	360B	F4	RSBP CT G	\$	265
RTH	WANL	7094	F4	RS P X T C	\$VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ	264
RTH	LASL	7600	F4	RS P T C	\$TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ	573
RTHETA	LASL	360D	F4	RSBP CT C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ	358
RTHETA	LASL	6600D	F4	RS P T C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ	358
RTHETA	LASL	7600D	F4	RS P T C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ	358
RTHETA GEOMETRY	BNW	1108	F4	RS P C	\$PERT4, 2-D PERTURBATION XY RZ	304
RUPTURE	GGA	7044	F4	RS X T G	\$PRECON, HTGR CONTAINMENT PRESSURE POST	228
RW	6500	F4	RS P B	\$PARTI, OPTIMAL GROUP OR MESH COLLAPSING		416
RZ	PW	1604	F63	RS P T C	\$FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION	161
RZ	GGA	1108	F+BAL	RS P T D	\$BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY,	438
RZ GEOMETRY	APDA	7094	F4	RS P F	\$MARS, 2-D EXCURSION CALCULATION	293
RZ GEOMETRY	GGA	7090	F+MAP	RSBP T D	\$DOB, 2-D FEW-GP DIFFUSION BURNUP	99
RZ GEOMETRY	LLL	709	F2	RS C	\$FIRN, 2-D FEW-GP S4 APPROXIMATION	7
RZ GEOMETRY	GGA	1108	F+BAL	RS P T C	\$GAMBLE5, 2-D MULTI-GP DIFFUSION XY	222
RZ GEOMETRY	GGA	7044	F+MAP	RSBP T C	\$GAMBLE4, 2-D MULTI-GP DIFFUSION XY	222
RZ RTH	WANL	7094	F4	RS P X T C	\$VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY	264
RZ RTH	LASL	7600	F4	RS P T C	\$TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY	573
RZ RTHETA	LASL	360D	F4	RSBP CT C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY	358
RZ RTHETA	LASL	6600D	F4	RS P T C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY	358
RZ RTHETA	LASL	7600D	F4	RS P T C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY	358
RZ RTHETA GEOMETRY	BNW	1108	F4	RS P C	\$PERT4, 2-D PERTURBATION XY	304
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	360	F4	RS P E	\$	255
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	3600	F63	RSBP E	\$	255
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094	F4	RS P E	\$	255
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	360	F4	RS P E	\$	168
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	F63	RSBP E	\$	168
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	F4	RS E	\$	168
R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	3600	F63	RSBP T G	\$	172
S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	F4	RS P T A	\$SUMOR,	R399
SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	360	F4	RS P T I	\$	R402
SAFE PROGRAMS	GGA	1108	F4	RS P L	\$GROWRK, GRID GENERATION FOR	296
SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RS P T I	\$	251
SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	GGA	1108	F5	RS P T I	\$	451
SAFE-CREEP, VISCOELASTIC ANALYSIS OF CONCRETE	GGA	1108	F4	RS P I	\$	300
SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RSBP CT I	\$	250
SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	BNL	6600	F4	RS P T I	\$	252
SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	GGA	1108	F4	RS P I	\$	252
SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	GGA	1108	F4	RS P I	\$	253
SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS	GGA	1108	F4	RS P I	\$	379
SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	F4	RS P T I	\$	332
SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL	360	F+BAL	RS P T I	\$	332

SAFETY

SAFETY	DP	360	F4	RS P	T C	\$KEFF, MGBS, TGAN, NUCLEAR CRITICALITY	617
SAFETY ANALYSIS	BAPL	7600	F4	RS P	T H	\$WASP2, WATER PROPERTIES FOR	R396
SAFETY ANALYSIS	HEDL	7600	FTN	RS P	G	\$SPRAY2, SODIUM SPRAY RELEASE	716
SAFETY ANALYSIS PROGRAM	ANC	360B	F4	RSBP	CT G	\$RSAC, RADIOLOGICAL	265
SAFETY COMMON CAUSE ANALYSIS	ANC	360	F+BAL	RS P	T G	\$COMCAN, SYSTEM	704
SAFTAC, MONTE CARLO FAULT TREE SIMULATION CODE	UNI	1108	F+SLE	RS P	G	\$	674
SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	F2	RS P	B	\$	52
SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	F63	RS P	B	\$	52
SAMPLE STATISTICS	BKC	360	F4	RSBP	P	\$HISTOGRAMS, QUALITY CONTROL	614
SAMPLING STUDY	BAPL	6600	F4	RS P	T O	\$BETTY, ENTRAINED PARTICLES	R545
SAMPLING TABLE, FOR NON-BIAS ORDERING	MLMO	360	F+COB	RSBP	XC P	\$RANDOM	679
SANDIA MATHEMATICAL SUBROUTINES	SLA	6600C	F+COM	RS P	X T P	\$MATHLIB,	654
SAP4, STRUCTURAL ANALYSIS OF LINEAR SYSTEMS	ANL	360B	F4	RS P	CT I	\$	641
SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	F4	RS P	T F	\$	400
SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	6600	F4	RS P	T F	\$	400
SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KECS	7094	F+MAP	RSBP	T G	\$	200
SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	AI	7090	F2	RS	J	\$	110
SCAR1, SCATTER FROM A RING SNAP GEOMETRY	AI	7090	F2	RS	J	\$	111
SCAT KERNELS	DP	360	BCD	R	LX T	Z \$THERMOS LIBRARY, 30-GP ENDF/B	543
SCAT RESONANCES	AI	360	F4	RS	PLX T	B \$AILMOE, X-SECTION CALC ELASTIC	147
SCAT RESONANCES	AI	7094	F+FAP	RS	PL T	B \$AILMOE, X-SECTION CALC ELASTIC	147
SCAT X-SEC	BNL	6600	F4	RS P	A	\$BESFIT, DIFFRACTION MODEL ELASTIC	524
SCAT X-SECTION CALC MODERATOR	GGA	1108	F4	RS P	A	\$GAKER, INELASTIC	289
SCAT X-SECTIONS HEX LATTICE	GGA	1108	F4	RS	B	\$HEXSCAT, ELASTIC	291
SCATTER FROM A RING SNAP GEOMETRY	AI	7090	F2	RS	J	\$SCAR1,	111
SCATTER FROM RADIATOR FINS SNAP GEOM	AI	7090	F2	RS	J	\$SCARF2,	110
SCATTERING	CDC	1604	F63	RS P	A	\$HAFFER, HAUSER-FESHBACH INELASTIC	14
SCATTERING CALC	ANL	360	F4	RS P	CT W	\$MSCAT, SLOW NEUTRON MULTIPLE	575
SCATTERING CRYSTALLINE MATERIALS	LASL	6600	F4	RS P	T A	\$TOR, THERMAL	360
SCATTERING DATA	DP	360B	F4	RS P	XCT B	\$FLANGE2(71-1), ENDF/B THERMAL	368
SCATTERING FORM FACTORS	ORNL	360	F4	RS P	T A	\$ATHENA4, INELASTIC	417
SCATTERING KERNEL CALC	GGA	7090	F2	RS	T A	\$SUMMIT, CRYSTALLINE	56
SCATTERING LAW CALC	GGA	1108	F4	RS P	X	A \$COHBE, COHERENT INELASTIC	385
SCATTERING LAW CALCULATION	GGA	1108	F4	RS P	A	\$GASKET, THERMAL	263
SCATTERING LAW X-SECTION CALCULATION	GGA	1108	F5	RS P	A	\$FLANGE1,	247
SCATTERING PHASE-SHIFT ANALYSIS	ORNL	1604	F63	RS P	A	\$PEGGY, ELASTIC	334
SCATTERING X-SEC CALC	KAPL	6600	F4	RS P	T A	\$JP1XR, COUPLED-CHANNEL	R506
SCATTRING CODES	ANC	360	F4	RS P	CT W	\$MACS LATTICE VIBRATION NEUTRON	574
SCHEME	KAPL	6600	F4	RS P	P	\$MOST, A MULTIDIMENSIONAL OPTIMIZATION	R446
SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI	360	F+BAL	RSB L	CT M	\$SCORE3,	375
SCISRS X-SECTION TAPE	GGA	7044	F+MAP	RSBP	M	\$UNPACK, RETRIEVAL FROM	206
SCISRS X-SECTION TAPES	WANL	7094	F+FAP	RSBPL	T N	\$CPS, SC4020 PLOTS FROM	239
SCOPE2.0	CEND	7600B	F4	RS	T P	\$MODEL, MODIFIED BETTIS ENVIRNMNTL LIB	478
SCOPE3.2	CDC	6600C	F+COM	RS	T P	\$MODEL, MODIFIED BETTIS ENVIRNMNTL LIB	478
SCOPE3.3	CDC	6600D	F+COM	RS	T P	\$MODEL, MODIFIED BETTIS ENVIRNMNTL LIB	478
SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI	360	F+BAL	RSB L	CT M	\$	375
SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	F+FAP	RSBPL	T N	\$CPS,	239
SC4020 PLOTS FROM X-SECTION TAPES	GGA	7044	F+SPS	RSBP	T N	\$CRSSPLOT,	207
SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	6600B	F4	RS P	T I	\$	R282
SEALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	F4	RS P	T I	\$	R282
SEALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	360	F4	RS P	T I	\$	R282
SEARCH	GGA	1108	F4	RS P	T C	\$GASP7, 1-D BURNUP POWER DISTRIBUTION	319
SEARCH	GGA	7044	F4	RS P	T C	\$GASP2, 1-D FEW-GP DIFFUSION POWER DIST	220
SEARCH & RETRIEVAL	SLA	1108	F+BAL	RSBP	T M	\$SPIRAL, FULL-TEXT STORAGE,	R607
SECTIONS	LASL	6600	F4	RS P	N	\$LARCA, FLUX-WEIGHTING OF DTF4 CROSS	409
SELF-ORGANIZING MESH GENERATION	ANL	360	F4	RS P	CT L	\$QMESH, RENUM,	612
SELF-ORGANIZING MESH GENERATION	SLA	6600	F4	RS P	T L	\$QMESH, RENUM,	612
SEMI-RIGID MOLECULES	ANC	360	F4	RS P	W	\$MMM3, COORDINATE ANALYSES	632
SENSITIVITY	ANL	360	F4	RSBPL	CT C	\$VARI-1D, 1-D VARIATIONAL	625
SEPHIS, SOLVENT EXTRACTION PROCESS SIMULATION	ORNL	360	F4	RS P	T U	\$	690
SERVICE ROUTINES	ANL	3600	36F	RSBP	T M	\$MERM2, MAGIC, MC**2 LIBRARY	472
SERVICE ROUTINES ENDF TAPES	BNL	7090	F+FAP	RS P	T M	\$DFSR, DATA FILE	236
SETS	FBRD	H600	F4	RS P	CT C	\$TRIAL, 3-D REACTION RATES FROM 2-D FLUX	585
SETS	LASL	6600	BCD	R	LX T Z	\$LASL XSEC SETS, SN 18- 24- AND 25-GROUP	532

SETS

SLA

TS FROM FAULT TREES	ANC	360	F4	RSBP	CT	G	\$MOCUS, MINIMAL	653		
SETS, SET EQUATION TRANSFORMATION SYSTEM	SLA	6600B	FTN	RS	P	T	P	\$	623	
SETS, SN 18- 24- AND 25-GROUP SETS	LASL	6600	BCD	R	LX	T	Z	\$LASL XSEC	532	
SHAPE CALCULATION ORNL 7090	F2	RS	A	\$LYNNE, WOODS-SAXON	POTENTIAL				381	
SHAPER CUTTER CONTOUR GENERATOR	ANL	360	F4	RS	P	T	\$F0355,		697	
SHAPER CUTTER CONTOUR GENERATOR	BKC	6600	F4	RS	P	T	\$F0355,		697	
SHEET DP PACKAGE	KAPL	6600	F+ASC	RS	P	T	P	\$DOGGY, DESK CALCULATOR FORM	R428	
SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	F4	RS	P	T	I	\$BUSHL, CYL	R481	
SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	F4	RS	P	T	I	\$SEALSHLL2,	R282	
SHELL STRESS ANALYSIS AXISYM LOAD	SR	360	F4	RS	P	T	I	\$SEALSHLL2,	R282	
SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	6600B	F4	RS	P	T	I	\$SEAL SHELL,	R282	
SHELL 3-D STRUCTURAL ANALYSIS	GGA	1108	F5	RS	P	T	I	\$SHELL5, THIN	452	
SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	6600B	F4	RS	P	T	I	\$SEAL	R282	
SHELLS	GGA	1108	F4	RS	P	I	\$SAFE-SHELL, STRESS ANALYSIS THIN		253	
SHELLS	SLA	6600	F4	RS	P	T	I	\$SLADE-D, DYNAMIC ANALYSIS OF THIN	581	
SHELLS MIT	360	F4	RS	P	T	I	\$SABOR4, DISCRETE-ELEMENT ANALYSIS THIN		R402	
SHELLS OF REVOLUTION	KAPL	6600C	F4	RS	P	T	I	\$SOR3, STRESS ANALYSIS	R 80	
SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	GGA	1108	F5	RS	P	T	I	\$	452	
SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	F63	RSBPL	T	J	\$MAC,		143	
SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	F2	RSBPL	T	J	\$MAC,		143	
SHIELD EVALUATION CODE	BAPL	6600B	F+ASC	RS	P	T	J	\$SPAN4, A POINT-KERNEL	R462	
SHIELD LEAKAGE	AI	7090	F2	RS	J	\$FARSE1A, DOSE RATE FROM SNAP			91	
SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	7094	F+FAP	RS	P	J	\$SHOE,		197	
SHIELDING CODE CAVITY GEOM	GGA	1108	F4	RS	P	T	J	\$MUSCAT, VIEW FACTOR	259	
SHIFT X-SEC & POLARIZATION CALC	KAPL	6600	F4	RS	P	T	A	\$PHASER, PHASE	R507	
SHIPPING CONTAINER IMPACT ANALYSIS	LASL	7600	F4	RS	P	I	\$IMPAC2, B		715	
SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	6600	F4	RS	P	T	M	\$	R557	
SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$			114	
SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	7094	F+FAP	RS	P	J	\$		197	
SI UNITS	RDYN	370B	F4	RS	P	T	P	\$METRICATION, CONVERSION TO OR FROM	G668	
SIEX, LMFBR FUEL PIN THERMAL PERFORMANCE MODEL	HEDL	6600	F	RS	P	T	H	\$	673	
SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	6600	F4	RS	P	A	\$		377	
SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL	6600	F+ASC	RS	P	\$			R442	
SIMULATION	BAPL	7600	F4	RS	P	T	G	\$FLASH6, FULLY-IMPLICIT TRANSIENT	R448	
SIMULATION	MA-G	360	F4	RSBP	CT	G	\$FLASH4, FULLY-IMPLICIT TRANSIENT		R448	
SIMULATION	ORNL	360B	F+BAL	RS	P	X	T	Q	\$MARLOWE, BINARY COLLISION CASCADE	680
SIMULATION	BAPL	6600	F4	RS	P	T	I	\$BUBL1, FUEL SWELLING & GAS RELEASE	R468	
SIMULATION	DP	360	F4	RS	P	U	\$SOLVEX, SOLVENT EXTRACTION PROCESS		662	
SIMULATION	ORNL	360	F4	RS	P	T	U	\$SEPHIS, SOLVENT EXTRACTION PROCESS	690	
SIMULATION CODE UNI	1108	F+SLE	RS	P	G	\$SAFTAC, MONTE CARLO FAULT TREE			674	
SIMULATION OF REACTOR DYNAMICS	AI	360	F+BAL	RS	P	T	E	\$AIROS2A,	326	
SIMULATION OF REACTOR OPN DP	360	F4	RS	P	G	\$INTEG, INSPEC, MARKOV			590	
SIMULATION PROGRAM	SLA	6600	F4	RS	PL	T	R	\$SOLSYS, SOLAR ENERGY SYSTEM	692	
SINGLE FAILURE MODE	BAPL	6600	F4	RS	P	P	\$RELO1, RELIABILITY FOR A		R497	
SINGLE SOURCE	ANL	GETS	F	R	\$PLETHS, ISOPLETH-AREA CALC FROM				591	
SINGLE-CHANNEL FLUX SYNTHESIS DIFFUSION	ANL	370	F+BAL	RS	PLXCT	C	\$SYN3D,		713	
SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS	P	F	\$STINT3,		R389	
SINGULARITY MODELING	SLA	6600	FTN	RS	P	T	I	\$CHILES, LINEAR ELASTIC	611	
SITE REQUIREMENT STUDY	ANL	3600	F63	RSBP	T	G	\$R153, PARAMETRIC		172	
SITE REQUIREMENT STUDY	AI	360	F4	RS	P	T	G	\$AISITE2, PARAMETRIC	172	
SITE REQUIREMENT STUDY	AI	7094	F+FAP	RS	P	T	G	\$AISITE2, PARAMETRIC	172	
SITE2, ENERGY FACILITY SITING ASSESSMENT	ANL	360	F4	RS	P	T	R	\$	687	
SITING ASSESSMENT	ANL	360	F4	RS	P	T	R	\$SITE2, ENERGY FACILITY	687	
SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	360	F4	RSBP	X	T	D	\$	58	
SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	7090	F2	RS	L	T	D	\$	58	
SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	F63	RS	L	T	D	\$	58	
SLA	360	COBOL	RSBP	CT	M	\$BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS			R589	
SLA	360D	F4	RS	P	X	T	P	\$DE/STEP, INTRP, SOLN OF ORDINARY DIFF EQUATIONS	640	
SLA	1108	COBOL	RS	P	M	\$BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS			R589	
SLA	1108	F+BAL	RSBP	T	M	\$SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL			R607	
SLA	1108	F+BAL	RSBP	T	T	\$ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT BOARDS			681	
SLA	3600	F36	RS	P	T	S	\$TOODY2, 2-D LAGRANGIAN EQNS OF MOTION SOLUTION		627	
SLA	6600	BIN	R	L	T	Z	\$SOLDATABQ62, ALBUQUERQUE 1962 SOLAR DATA		693	
SLA	6600	F	RS	P	T	P	\$STFODE, COLODE, COLLOCATION SOLN OF STIFF ODE'S		652	

SLA

SLA	6600	F+COM	RS	P	T	T	\$ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT BOARDS	68	
SLA	6600	FTN	RS	P	T	I	\$SCHILES, LINEAR ELASTIC SINGULARITY MODELING	61	
SLA	6600	F4	RS	P		P	\$ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	601	
SLA	6600	F4	RS	P		P	\$PLOTR, 2-D CONTOUR PLOTS & AREA CALCULATION	R578	
SLA	6600	F4	RS	P	T	I	\$SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	581	
SLA	6600	F4	RS	P	T	L	\$QMESH,RENUM, SELF-ORGANIZING MESH GENERATION	612	
SLA	6600	F4	RS	P	T	P	\$BESSEL FUNCTIONS, AIRY & LOG GAMMA SUBROUTINES	656	
SLA	6600	F4	RS	PL	T	R	\$SOLSYS, SOLAR ENERGY SYSTEM SIMULATION PROGRAM	692	
SLA	6600B	BCD	R	L	T	Z	\$SOLATABQ62, ALBUQUERQUE 1962 SOLAR DATA	693	
SLA	6600B	FTN	RS	P	T	P	\$SETS, SET EQUATION TRANSFORMATION SYSTEM	623	
SLA	6600B	F4	RS	P	T	I	\$MONDO, A DYNAMIC RESPONSE FINITE-ELEMENT CODE	672	
SLA	6600B	F4	RS	P	T	V	\$FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	577	
SLA	6600C	F+COM	RS	P	X	T	\$MATHLIB, SANDIA MATHEMATICAL SUBROUTINES	654	
SLA	6600D	F4	RS	P	X	T	\$DE/STEP,INTRP, SOLN OF ORDINARY DIFF EQUATIONS	640	
SLAB	CDC	1604	F63	RS	P	T	C \$EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER	87	
SLAB	ORNL	7090	F2	RS	P	T	C \$EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER	87	
SLAB	AND SPHERE	GEOM SN TRANSPORT					ANL 3600 F36 RS P XCT C \$TESS, 1-D	513	
SLAB	CYL	ORNL 7090	F2	RS	P	T	C \$EQUIPOISE3, 2-D 2-GROUP DIFFUSION	39	
SLAB	CYL SPHERE	BNW 1107	F4	RS	P	T	C \$HFN, 1-D MULTI-GP DIFFUSION	241	
SLAB	CYL SPHERE	AI 7090	F+FAP	RS	L	T	C \$FAIM, 1-D MULTI-GP DIFFUSION	120	
SLAB	CYL SPHERE	AI 7090	F+FAP	RS	PL	T	C \$AIM6, 1-D MULTI-GP DIFFUSION	29	
SLAB	CYL SPHERE	CDC 1604	F63	RS	PL	T	C \$AIM6, 1-D MULTI-GP DIFFUSION	29	
SLAB	CYL SPHERE	CDC 1604	F63	RS	PLX	T	C \$FAIM, 1-D MULTI-GP DIFFUSION	120	
SLAB	CYL SPHERE	OSUC 370	F4	RS	PL	CT	C \$AIM6, 1-D MULTI-GP DIFFUSION	29	
SLAB	CYL SPHERE	AI 7090	F+FAP	RS	L	T	C \$ULCER, 1-D MULTI-GP DIFFUSION	118	
SLAB	CYL SPHERE	ANL 3600	F36	RS	P	X	T	C \$MACH1, 1-D MULTI-GP DIFFUSION	262
SLAB	CYL SPHERE	MTS 360	F4	RSBPLXCT			C \$MACH1, 1-D MULTI-GP DIFFUSION	262	
SLAB	CYL SPHERE	PURD 6500	F4	RS	PLX	T	C \$MACH1, 1-D MULTI-GP DIFFUSION	262	
SLAB	CYL SPHERE	PW 1604	LAG1	RS	P		C \$MGDSN, 1-D MULTI-GP SN APPROX	211	
SLAB	CYL SPHERE	UK-W 7090	F2	RS	P	T	C \$W-DSN, 1-D MULTI-GP SN APPROX	132	
SLAB	CYL SPHERE	BHSC 360	F4	RS	P	T	C \$FAIMOS, 1-D MULTI-GP DIFFUSION	120	
SLAB	CYLINDER	CDC 1604	F63	RS	P	T	C \$20GRAND, 2-D FEW-GROUP DIFFUSION	40	
SLAB	CYLINDER	ORNL 7090	F2	RS	P	T	C \$20GRAND, 2-D FEW-GROUP DIFFUSION	40	
SLAB	CYLINDER SPHERE	AEB 360	F4	RS	L	T	C \$FIRE5, 1-D AGE-DIFFUSION	9	
SLAB	CYLINDER SPHERE	AI 7090	F2	RS	P	T	C \$FOG, 1-D FEW-GP DIFFUSION	28	
SLAB	CYLINDER SPHERE	BC 625	F4	RS		T	C \$FOG, 1-D FEW-GP DIFFUSION	28	
SLAB	CYLINDER SPHERE	CDC 1604	F63	RS	P	T	C \$FOG, 1-D FEW-GP DIFFUSION	28	
SLAB	GAMMA-RAY TRANSPORT	BAPL 6600	F4	RS	P	T	J \$M0756,LETO, 1-D	R343	
SLAB	GEOM PPCO	7090 F2	RS	P		C	\$MIST, 1-D FEW-GP SN DOUBLE SN APPROX	59	
SLAB	GEOMETRY	AI 7090	F2	RS	P		J \$GRACE1, GAMMA-RAY ATTENUATION	45	
SLAB	GEOMETRY	ANL 3600	F63	RSBPL	T	J	\$MAC, SHIELD DESIGN MULTIGROUP	143	
SLAB	GEOMETRY	BNW 7090	F2	RSBPL	T	J	\$MAC, SHIELD DESIGN MULTIGROUP	143	
SLAB	GEOMETRY	CDC 1604	F63	RS	P		J \$GRACE1, GAMMA-RAY ATTENUATION	45	
SLAB	GEOMETRY	AI 7090	F2	RS	P		B \$SAIL, 1-D 1-GP SN APPROXIMATION	52	
SLAB	GEOMETRY	BAPL 6600	F4	RS	P	T	C \$BE21, FEW-GP DISCRETE ORDINATES	R398	
SLAB	GEOMETRY	CDC 1604	F63	RS	P		B \$SAIL, 1-D 1-GP SN APPROXIMATION	52	
SLAB	TRANSPORT WITH SLOWING DOWN	BAPL 6600	F4	RS		T	C \$M0648, 1-D	R342	
SLAB	CYL, SPH	ANC 360	F4	RSBP	CT	C	\$MONA, 1-D MULTIGROUP DIFFUSION	582	
SLAB	SPH, CYL	GGA 1108	F+BAL	RS	P	T	C \$GAZE2, 1-D MULTIGROUP DIFFUSION	430	
SLAC	360	BAL	RS	CT	P		\$SLACMON 2.2, OS360 MVT/MFT PERFORMANCE MONITOR	635	
SLAC	360	F4	RSBP	XCT	P		\$MORTANZ, MACRO-BASED STRUCTURED FORTRAN	678	
SLAC	360B	F+BAL	RSB	CT	P		\$PROGLOOK, USER PROGRAM PERFORMANCE MONITOR	642	
SLAC	370	BAL	RSB	CT	P		\$SLACMON/370, VERSION 4.0 VS SOFTWARE MONITOR	635	
SLACMON 2.2, OS360 MVT/MFT PERFORMANCE MONITOR	SLAC	360	BAL	RS	CT	P	\$	635	
SLACMON/370, VERSION 4.0 VS SOFTWARE MONITOR	SLAC	370	BAL	RSB	CT	P	\$	635	
SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA	6600	F4	RS	P	T	I	\$	581
SLL 6600 F+COM RS P T I									682
SLL 6600 F4 RS P N									434
SLOP,CROSS, IBM360 FORTRAN H PROGRAM CHECKER	ANL	360B	PL1	S	P	CT	P	\$	647
SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	360	F4	RS	P	CT	W	\$MSCAT,	575
SLOWING DOWN BAPL 6600 F4 RS									R342
SLOWING-DOWN NPGS 360 F4 RS P X T E									491
SLOWING-DOWN DENSITY CALC AI 7094 F+FAP									149
SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	1108	F4	RS	PLX	T	B	\$HRG3,	467

SLOWING-DOWN

SOURCE

SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	360	F4	RS	PLX	T	B	\$HRG3,	467
SN APPROX	BNW	7090	FLOCO	RSBP	T	C		\$GE-HAPO-S13, 1-D MULTI-GP DOUBLE	75
SN APPROX SLAB CYL SPHERE	PW	1604	LAG1	RS	P	C		\$MGDSN, 1-D MULTI-GP	211
SN APPROX SLAB CYL SPHERE	UK-W	7090	F2	RS	P	T	C	\$W-DSN, 1-D MULTI-GP	132
SN APPROX SLAB GEOM PPCO	7090	F2	RS	P	C			\$MIST, 1-D FEW-GP SN DOUBLE	59
SN APPROXIMATION CYLINDER	PPCO	7040	F4	RS	P	T	C	\$TOPIC, 1-D FEW-GP	148
SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS	P	T	C	\$TOPIC, 1-D FEW-GP	148
SN APPROXIMATION RZ	PW	1604	F63	RS	P	T	C	\$FORTRAN TDC, 2-D MULTI-GP	161
SN APPROXIMATION SLAB GEOMETRY	AI	7090	F2	RS	P			B \$SAIL, 1-D 1-GP	52
SN APPROXIMATION SLAB GEOMETRY	CDC	1604	F63	RS	P			B \$SAIL, 1-D 1-GP	52
SN APPROXIMATION XY GEOM	AGC	7090	FLOCO	RSBP	C			\$2DXY, 2-D MULTI-GP	18
SN CONSTANTS FOR DSN TDC	PW	1604	F63	RS	P	L		\$SNC, CALCULATION OF	189
SN DOUBLE SN APPROX SLAB GEOM PPCO	7090	F2	RS	P	C			\$MIST, 1-D FEW-GP	59
SN PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	F4	RS	P	N		\$DAC1,	455
SN THEORY	NED	635	F4	RS	P	T	C	\$DOT2DB, 2-D MULTIGROUP DIFFUSION &	459
SN TRANSPORT	ANL	3600	F36	RS	P	XCT	C	\$TESS, 1-D SLAB AND SPHERE GEOM	513
SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS				L \$CSP1,	194
SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS				L \$CSP2A,	193
SN 18- 24- AND 25-GROUP SETS	LASL	6600	BCD	R	LX	T	Z	\$LASL XSEC SETS,	532
SNAP GEOM	AI	7090	F2	RS	J			\$SCARF2, SCATTER FROM RADIATOR FINS	110
SNAP GEOMETRY	AI	7090	F2	RS	J			\$SCAR1, SCATTER FROM A RING	111
SNAP GEOMETRY	AI	7090	F2	RS	P	J		\$RATRAP, DOSE RATE CALCULATION	141
SNAP GEOMETRY	AI	7090	F2	RS	E			\$SNAPKIN5/5A, 1-REGION KINETICS	122
SNAP GEOMETRY	AI	7090	F2	RS	J			\$MORTIMER, DOSE RATE CALCULATION	142
SNAP SHIELD LEAKAGE	AI	7090	F2	RS	J			\$FARSE1A, DOSE RATE FROM	91
SNAPKIN5/5A, 1-REGION KINETICS	SNAP GEOMETRY	AI	7090	F2	RS	E		\$	122
SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	3600	F36	RS	P	T	C	\$	288
SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC	PW	1604	F63	RS	P	L		\$	189
SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS	P	T	P	\$	R364
SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	F4	RS	P	G		\$	521
SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	HEDL	1108	F4	RS	P	G		\$	521
SODIUM	ANL	370	F+CSM	RS	P	G		\$SPOOL-FIRE, SPRAY-POOL BURNING OF	R714
SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	RS	P	T	G	\$SOFIRE2,	559
SODIUM SPRAY RELEASE SAFETY ANALYSIS	HEDL	7600	FTN	RS	P	G		\$SPRAY2,	716
SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	F4	RS	P	G		\$SOCOOL2,	521
SODIUM-FUEL INTERACTION ANALYSIS	HEDL	1108	F4	RS	P	G		\$SOCOOL2,	521
SODIUM-WATER REACTION	CEND	7600	F4	RS	P	T	G	\$CEBUG, STEAM GENERATOR	548
SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	RS	P	T	G	\$	559
SOFTWARE MONITOR	SLAC	370	BAL	RSB	CT	P		\$SLACMON/370, VERSION 4.0 VS-	635
SOLA-ICE, TRANSIENT COMPRESSIBLE FLUID FLOW	LASL	7600	F4	RS	P	H		\$	723
SOLA-SURF, TRANSIENT FLUID FLOW ALGORITHM	LASL	7600B	F	RS	P	H		\$SOLA,	651
SOLA,SOLA-SURF, TRANSIENT FLUID FLOW ALGORITHM	LASL	7600B	F	RS	P	H		\$	651
SOLAR DATA	SLA	6600	BIN	R	L	T	Z	\$SOLDATABQ62, ALBUQUERQUE 1962	693
SOLAR DATA	SLA	6600B	BCD	R	L	T	Z	\$SOLDATABQ62, ALBUQUERQUE 1962	693
SOLAR ENERGY SYSTEM SIMULATION PROGRAM	SLA	6600	F4	RS	PL	T	R	\$SOLSYS,	692
SOLDATABQ62, ALBUQUERQUE 1962 SOLAR DATA	SLA	6600	BIN	R	L	T	Z	\$	693
SOLDATABQ62, ALBUQUERQUE 1962 SOLAR DATA	SLA	6600B	BCD	R	L	T	Z	\$	693
SOLID CRYSTAL	MTS	7090	MAD	RSB	O			\$BURP4, GAMMA-RAY PHOTOFRACITION	169
SOLID FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H			\$AXTHRM, HEAT TRANSFER	183
SOLSYS, SOLAR ENERGY SYSTEM SIMULATION PROGRAM	SLA	6600	F4	RS	PL	T	R	\$	692
SOLVE ODE SYST WITH BANDED JACOBIAN	LLL	360	F4	RS	P	X	T	P \$EPISODEB,	705
SOLVE ODE SYSTEM WITH BANDED JACOBIAN	LLL	360C	F4	RS	P	X	T	P \$GEARB,	661
SOLVE ODE SYSTEM WITH BANDED JACOBIAN	LLL	6600C	F4	RS	P	X	T	P \$GEARB,	661
SOLVENT EXTRACTION PROCESS SIMULATION	DP	360	F4	RS	P	U		\$SOLVEX,	662
SOLVENT EXTRACTION PROCESS SIMULATION	ORNL	360	F4	RS	P	T	U	\$SEPHIS,	690
SOLVER	ANL	360C	F4	RS	P	X	P	\$GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM	592
SOLVER	LLL	360	F4	RS	P	X	T	P \$EPISODE, ORDINARY DIFF EQUATION SYSTEM	675
SOLVER	LLL	6600C	F4	RS	P	X	P	\$GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM	592
SOLVEX, SOLVENT EXTRACTION PROCESS SIMULATION	DP	360	F4	RS	P	U		\$	662
SOPHISTI2/5, MULTI-GP TRANSFER COEFFICIENTS	LLL	7090	F+FAP	RS	P	T	B	\$	160
SORSOB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	F4	RS		I		\$	R391
SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	F4	RS	P	T	I	\$	R 80
SOURCE	MTS	7090	MAD	RSB	O			\$BURP2, DETECTOR EFFICIENCY DISK	165
SOURCE	MTS	7090	MAD	RSB	O			\$BURP1, DETECTOR EFFICIENCY POINT	164

SOURCE

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SOURCE	MTS	7090	MAD	RSB	O	\$BURP3, DETECTOR EFFICIENCY POINT	166
SOURCE	ANL	GETS	F	R	R	\$PLETHS, ISOPLETH-AREA CALC FROM SINGLE	591
SOURCE BUILDUP	FACTOR	CALC	BAPL	6600	F+ASC	RS P T J \$ASPIS, GAMMA-RAY	R429
SOURCE DATA	NED	635	F4	RS P	T O	\$EXPN, ANALYSIS OF PULSED NEUTRON	258
SOURCE DATA ANALYSIS	CNEA	360	F4	RS P	E	\$TRIFIDO, PULSED NEUTRON	489
SPACE CHORD DIST FUNCT	AEG	7090	F2	RS	B	\$DANCOFF JR, MODERATOR	150
SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$CROCK,	112
SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$SHOCK,	114
SPACE-DEPENDENT X-SECTION GENERATION	GEC	635	F4	RSBP	T B	\$GROUSE,	420
SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	360	F4	RS P	E	\$R102,	168
SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	F63	RSBP	E	\$R102,	168
SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	F4	RS	E	\$R102,	168
SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	360	F4	RS P	E	\$R101,	255
SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	3600	F63	RSBP	E	\$R101,	255
SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094	F4	RS P	E	\$R101,	255
SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7094	F+MAP	RS P	T E	\$AIROS,	163
SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	360	F4	RS P	E	\$AIREK3,	121
SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090	F2	RS	E	\$AIREK3,	121
SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	1604	F63	RS P	E	\$AIREK3,	121
SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	F4	RS P	E	\$GAPOTKIN,	317
SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	F4	RS P	T E	\$ANCON,	486
SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	6600	F4	RS P	T E	\$ANCON,	486
SPACE-TIME DIFFUSION	ANL	360	F4	RS P	F	\$TWIGGLE, 2-D 2-GP	R338
SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	T F	\$TWIGL, 2-D 2-GP	R338
SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P	T F	\$NOAH, 1-D ONE-GP	405
SPACE-TIME DIFFUSION W/FEEDBACK	BAPL	6600	F4	RS P	T F	\$WIGL3, 1-D	R708
SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P	T F	\$WIGL2, 1-D 2-GP	R274
SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P	T F	\$WIGL2, 1-D 2-GP	R274
SPACE-TIME KINETICS	BCL	6400	F4	RS P	T F	\$ADEP, 1-D & 2-D FEW-GROUP	494
SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS P	F	\$STINT3, SINGLE-CHANNEL	R389
SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	BAPL	6600B	F+ASC	RS P	T J	\$	R462
SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NED	2000	F2	RS P	B	\$	178
SPATIAL & COMPOSITION-DEPENDENT X-SECS	FBRD	635	F+GMP	RS P	XCT B	\$TDOWN,	505
SPATIAL REACTOR KINETICS CODE	ANL	360	F4	RS PL	CT F	\$QX1, QUASISTATIC	474
SPATIAL REACTOR KINETICS CODE	ANL	3600	36F	RS PL	CT F	\$QX1, QUASISTATIC	474
SPATIALLY-AVERAGED DOPPLER EFFECTS	NED	2000	F2	RS P	B	\$SPARTA,	178
SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	F4	RS P	T F	\$TSN,	309
SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	F+MAP	RS P	T F	\$TSN,	309
SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GGA	1108	F5	RS P	T O	\$CAGE,BIRD,	476
SPECIAL FUNCTION ROUTINES	ANL	370B	F4	S P	X T P	\$FUNPACK2,	610
SPECIAL FUNCTION ROUTINES	ANL	1108B	F5	S P	X T P	\$FUNPACK2,	610
SPECIAL FUNCTION ROUTINES	ANL	6600B	F	S P	X T P	\$FUNPACK2,	610
SPECTRA	ORNL	360	F4	RS P	O	\$ALPHA-M, RESOLUTION OF GAMMA-RAY	413
SPECTRA	ANC	360	F+P+A	RSBP	XCT W	\$GAUSS6, BATCH ANALYSIS OF GAMMA-RAY	622
SPECTRA	GGA	1108	F+BAL	RS P	T O	\$TOAD, PROCESSING OF ANALYZER GAMMA-RAY	333
SPECTRA	GGA	1108B	F4	RS PL	XCT B	\$GGC4, MULTI-GP X-SECTIONS FAST THERMAL	298
SPECTRA	KSUN	360	F4	RS P	O	\$CORGM, UNFOLDING OF COMPLEX GAMMA-RAY	390
SPECTRA	WANL	6600	F4	RS L	T B	\$GGC4, MULTI-GP X-SECTIONS FAST THERMAL	298
SPECTRA & MULTI-GP CONSTANTS	ANC	360	F4	RS PL	CT B	\$INCITE, THERMAL	565
SPECTRA ANALYSIS	KAPL	6600	F4	RS	T O	\$GASPAN, COMPLEX GAMMA-RAY	R485
SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	F4	RS P	X T B	\$GAF,GAR,	316
SPECTRA CALC	ANC	360	F4	RS PL	XCT B	\$PHROG, MULTI-GP CONSTANT & FAST	520
SPECTRA CODE	BNW	1108	F+BAL	RS P	T O	\$GSSLRN1B, LEAST SQUARES PHOTOPEAK	457
SPECTRA ENDF/B DATA	ORNL	360	F4	RS P	T B	\$RICE, PRIMARY RECOIL ATOM	453
SPECTRA GE(LI)	ANC	360	F4	RSBP	XCT U	\$GAUSS5, ANALYSIS OF GAMMA-RAY	605
SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	7090	FAP	RSBP	X T Q	\$	422
SPECTROMETRY	RFD	360	F4	RS P	U	\$DYNAMIC ANALYSIS OF GASES BY MASS	645
SPECTRUM AND X-SECTION CALCULATION	NED	7094	F+MAP	RS P	T B	\$EPITHERMOS,	201
SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA	360B	F4	RSBP	PLXCT B	\$LASER,	249
SPECTRUM CALC WITH DEPLETION	JNC	1108B	F5	RS PL	X T B	\$LEOPARD,SPOTS,	279
SPECTRUM CALC WITH DEPLETION	WAPD	360C	F4	RS PL	XCT B	\$LEOPARD,SPOTS,	279
SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	F+MAP	RSBP	PLX T B	\$AGN-GAM, FAST	204
SPECTRUM X-SECTION CALC	BNW	1108	F5	RS PL	X T B	\$BRT1, THERMAL	184
SPECTRUM X-SECTION CALC	AI	7090	F2	RS PL	T B	\$FORM, FAST NEUTRON	

SPECTRUM

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SPECTRUM X-SECTION CALC	ANL	3600	F63	RS	LX	T	B	\$GAM1, FAST NEUTRON	33	
SPECTRUM X-SECTION CALC	CDC	1604	F63	RS	PL	T	B	\$FORM, FAST NEUTRON	51	
SPECTRUM X-SECTION CALC	CDC	1604	F63	RS	PLX	T	B	\$GAM1, FAST NEUTRON	33	
SPECTRUM X-SECTION CALC	GGA	7090	F2	RS	PLX	T	B	\$GAM1, FAST NEUTRON	33	
SPECTRUM X-SECTION CALC	OSUC	370	F4	RS	PLXCT	B		\$FORM, FAST NEUTRON	51	
SPECTRUM X-SECTION CALC	ANL	3600	F63	RSBP	XCT	B		\$THERMOS(ANL), THERMAL	184	
SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS	L	T	B	\$QUICKIE, INFINITE MEDIUM	119	
SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS	PL	T	B	\$TEMPEST2, THERMAL NEUTRON	50	
SPECTRUM X-SECTIONS	BHSC	360	F4	RS	PL	T	B	\$TEMPEST2, THERMAL NEUTRON	50	
SPECTRUM X-SECTIONS	CDC	1604	F63	RS	PL	T	B	\$TEMPEST2, THERMAL NEUTRON	50	
SPECTRUM, MULTIGP CONSTANTS	BNW	1108	F4	RS	PLX	T	B	\$HRG3, SLOWING-DOWN	467	
SPECTRUM, MULTIGP CONSTANTS	TVA	360	F4	RS	PLX	T	B	\$HRG3, SLOWING-DOWN	467	
SPENT YANKEE-FUEL TEMPERATURE CALC.	ORNL	1604	F2	RS	P		Q	\$BIGDEAL,	549	
SPH PW 1604 F63 RS P F								\$AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS	191	
SPH ANC 360 F4 RSBP CT C								\$MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL,	582	
SPH, CYL GGA 1108 F+BAL RS P T C								\$GAZE2, 1-D MULTIGROUP DIFFUSION SLAB,	430	
SPHERE BNW 1107 F4 RS P T C								\$HFN, 1-D MULTI-GP DIFFUSION SLAB CYL	241	
SPHERE AI 7090 F+FAP RS L T C								\$FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL	120	
SPHERE AI 7090 F+FAP RS PL T C								\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL	29	
SPHERE CDC 1604 F63 RS PL T C								\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL	29	
SPHERE CDC 1604 F63 RS PLX T C								\$FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL	120	
SPHERE CDC 3600 F63 RSBP F								\$AX1, COUPLED NEUTRONICS-HYDRODYNAMICS	102	
SPHERE OSUC 370 F4 RS PL CT C								\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL	29	
SPHERE AEB 360 F4 RS L T C								\$FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER	9	
SPHERE AI 7090 F+FAP RS L T C								\$ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL	118	
SPHERE ANL 3600 F36 RS P X T C								\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL	262	
SPHERE MTS 360 F4 RSBPLXCT C								\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL	262	
SPHERE PURD 6500 F4 RS PLX T C								\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL	262	
SPHERE PW 1604 LAG1 RS P C								\$MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL	211	
SPHERE UK-W 7090 F2 RS P T C								\$W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL	132	
SPHERE AI 7090 F2 RS P T C								\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER	28	
SPHERE BC 625 F4 RS T C								\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER	28	
SPHERE BHSC 360 F4 RS P T C								\$FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL	120	
SPHERE CDC 1604 F63 RS P T C								\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER	28	
SPHERE LLL 7090 F2 RS P F								\$CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS	129	
SPHERE GEOM AI 7090 F2 RS P J								\$GRACE2, GAMMA-RAY ATTENUATION CYL	46	
SPHERE GEOM CDC 1604 F63 RS P J								\$GRACE2, GAMMA-RAY ATTENUATION CYL	46	
SPHERE GEOM SN TRANSPORT	ANL	3600	F36	RS	P	XCT	C	\$TESS, 1-D SLAB AND	513	
SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	1108	F+BAL	RSBP	T	M	\$		R607	
SPOOL-FIRE, SPRAY-POOL BURNING OF SODIUM	ANL	370	F+CSM	RS	P	G	\$		R714	
SPOTS, SPECTRUM CALC WITH DEPLETION	JNC	1108B	F5	RS	PLX	T	B	\$LEOPARD,	279	
SPOTS, SPECTRUM CALC WITH DEPLETION	WAPD	360C	F4	RS	PLXCT	B		\$LEOPARD,	279	
SPRAY RELEASE SAFETY ANALYSIS	HEDL	7600	FTN	RS	P	G		\$SPRAY2, SODIUM	716	
SPRAY-POOL BURNING OF SODIUM	ANL	370	F+CSM	RS	P	G		\$SPOOL-FIRE,	R714	
SPRAY2, SODIUM SPRAY RELEASE SAFETY ANALYSIS	HEDL	7600	FTN	RS	P	G	\$		716	
SQ LENS DESIGN SYSTEM	LASL	6600	F+COM	RS	P	T	P	\$LENSEDES, NONLINEAR LEAST	602	
SQ, NXN LATIN SQUARE EXPERIMENTAL DESIGN	MLMO	360	F4	RSBP	C	P		\$LATIN	630	
SQUARE CELL COLLISION PROBABILITY CALC	ANL	360	F4	RS	P	T	B	\$CLUP77,	526	
SQUARE CELL COLLISION PROBABILITY CALC	JAER	230	F4	RS	P	T	B	\$CLUP77,	526	
SQUARE EXPERIMENTAL DESIGN	MLMO	360	F4	RSBP	C	P		\$LATIN SQ, NXN LATIN	630	
SR 360 F4 RS P T I								\$SEALSHL2, SHELL STRESS ANALYSIS AXISYM LOAD	R282	
SSDC 370 F4 RS P H								\$HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	198	
STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	F4	RS	P	E		\$GASA,	290	
STANDARD INTERFACE FILE PROCESSOR	LASL	360	F4	RS	P	CT	M	\$LASIP3, CCCC	691	
STATE ANALYSIS OXIDE FUEL RODS	ANC	360	F+BAL	RS	P	X	T	H	\$FRAP-S1, STEADY	694
STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	360	F4	RSBP	CT	I		\$STRAP,	539	
STATION ELECTRICITY COSTS	ORNL	1604	F63	RS	P	D		\$POWERCO, NUCLEAR	340	
STATION ELECTRICITY COSTS	UEC	6600	F4	RS	P	D		\$POWERCO, NUCLEAR	340	
STATISTICAL MODEL REACTION X-SECTION	ENEA	360	F4	RS	P	A		\$THRES2,	504	
STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600B	F4	RS	P	A		\$THRES2,	504	
STATISTICAL RESONANCE PARAMETER CALC	ENEA	360	F4	RS	P	A		\$PSEUDO,	292	
STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	F4	RS	P	A		\$PSEUDO,	292	
STATISTICS BKC 360 F4 RSBP P								\$HISTOGRAMS, QUALITY CONTROL SAMPLE	614	
STEADY STATE ANALYSIS OXIDE FUEL RODS	ANC	360	F+BAL	RS	P	X	T	H	\$FRAP-S1,	694

STEADY-STATE

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STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	F5	RS P	T H	\$TAC2D,	408
STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	F4	RSBP	CT G	\$FPFM,	584
STEADY-STATE FLOW DISTRIBUTION	KAPL	6600	F4	RS P	T H	\$SHAFMAT, SYSTEM	R616
STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	1108	F5	RS P	H	\$FLAC,	395
STEADY-STATE HEAT TRANSFER	SSDC	370	F4	RS P	H	\$HEATING2, TRANSIENT	198
STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090	F2	RS	I	\$FUGUE,	48
STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	635	F4	RS P	T H	\$MANTA,	256
STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600	F4	RS P	T H	\$MANTA,	256
STEAM	GGA	1108	F4	RS P	T H	\$DYNAM, DYNAMIC ANALYSIS BOILING FLOW	440
STEAM	ANC	360	F4	RS P	T H	\$ASTEM, THERMODYNAMIC PROPERTIES WATER &	580
STEAM	BCAC	6600	F4	RS P	T H	\$ASTEM, THERMODYNAMIC PROPERTIES WATER &	580
STEAM AND WATER PROPERTIES	BG&E	360C	F4	RS	T H	\$STEAM-67, 1967 ASME	487
STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	7044	F4	RS P	T D	\$STMGEN,	227
STEAM GENERATOR SODIUM-WATER REACTION	CEND	7600	F4	RS P	T G	\$CEBUG,	548
STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	F4	RS	T H	\$WATER,	R267
STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P	H	\$M0899,HOH,	R294
STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P	T H	\$M0899,HOH,	R294
STEAM TURBINE CYCLE ANALYSIS	ORNL	360	F4	RS P	T H	\$ORCENT, NUCLEAR	703
STEAM-WATER MIX	KAPL	6600	F4	RS P	H	\$RAPP, HIGH-VELOCITY FLOW STUDY	R382
STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BG&E	360C	F4	RS	T H	\$	487
STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	ORNL	360	F4	RS P	C G	\$	583
STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	6600	F4	RS P	I	\$	R337
STFODE,COLODE, COLLOCATION SOLN OF STIFF ODE'S	ANL	360	F	RSBP	T P	\$	652
STFODE,COLODE, COLLOCATION SOLN OF STIFF ODE'S	SLA	6600	F	RS P	T P	\$	652
STIFF ODE'S	ANL	360	F	RSBP	T P	\$STFODE,COLODE, COLLOCATION SOLN OF	652
STIFF ODE'S	SLA	6600	F	RS P	T P	\$STFODE,COLODE, COLLOCATION SOLN OF	652
STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS P	F	\$	R389
STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	7044	F4	RS P	T D	\$	227
STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360	F4	RS P	X T E	\$MOD5,	491
STORAGE ALLOC	ORNL	360	BAL+F	RS P	CT P	\$GETCOR,FRECOR, FORTRAN DYNAMIC	644
STORAGE, RETRIEVAL, AND DISPLAY	CP	360	F+BAL	S	T M	\$JOSHUA, DATA	490
STORAGE, SEARCH & RETRIEVAL	SLA	1108	F+BAL	RSBP	T M	\$SPIRAL, FULL-TEXT	R607
STRAIN & PELLET CRACKING	BAPL	6600	F4	RS P	I	\$STRIPE, FUEL ROD CLAD	R570
STRAIN-GAGE DATA	ORNL	360	F+BAL	RS P	T I	\$LINDA, EVALUATION OF	657
STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	360	F4	RSBP	CT I	\$	539
STRESS & DEFORMATION	AN-T	360B	F4	RSBP	CT I	\$CYGR03, OXIDE FUEL ROD	R449
STRESS & DEFORMATION	BAPL	6600	F4	RS P	T I	\$CYGR03, OXIDE FUEL ROD	R449
STRESS & FLEXIBILITY CALC	ORNL	360	F+BAL	RS P	I	\$ELBOW-ORNL, PIPE	650
STRESS ANALYSIS	KAPL	6600	F4	RS P	I	\$TUBE, U-TUBE HEAT EXCHANGER	R378
STRESS ANALYSIS	ANL	3600	F36	RS P	T I	\$SUPORAN, REACTOR CORE SUPPORT	357
STRESS ANALYSIS	GGA	1108	F4	RS P	I	\$SAFE-2D, PLANE & AXISYMMETRIC	379
STRESS ANALYSIS AXISYM LOAD	BAPL	6600	F4	RS P	T I	\$SEALSHELL2, SHELL	R282
STRESS ANALYSIS AXISYM LOAD	SR	360	F4	RS P	T I	\$SEALSHELL2, SHELL	R282
STRESS ANALYSIS AXISYM LOAD	WTSC	6600B	F4	RS P	T I	\$SEAL SHELL, SHELL	R282
STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RSBP	CT I	\$SAFE-PCRS,	250
STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RS P	T I	\$SAFE-AXISYM,	251
STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	F4	RS	T I	\$CYGR02,	R266
STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	360	F4	RS P	CT I	\$PSA2,	542
STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	F4	RS P	T I	\$SOR3,	R 80
STRESS ANALYSIS STUDY	GGA	7044	F4	RS P	T G	\$ELBOW, FUEL ELEMENT	229
STRESS ANALYSIS THIN SHELLS	GGA	1108	F4	RS P	I	\$SAFE-SHELL,	253
STRESS ANALYSIS, 2-D BODIES	BNL	6600	F4	RS P	T I	\$SAFE-PLANE, PLANE	252
STRESS ANALYSIS, 2-D BODIES	GGA	1108	F4	RS P	I	\$SAFE-PLANE, PLANE	252
STRESS AND FATIGUE	KAPL	6600	F4	RS	I	\$SORSDB, PRESSURE VESSEL	R391
STRESS FOR INTEGRAL ATTACHMENTS TO PIPE	ORNL	360	F4	RS P	I	\$LUGS,	648
STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P	T I	\$M0457,PIPE, ELASTIC	R329
STRESS STUDY	GGA	1108	F4	RS P	T I	\$SAFE-3D, 3-D COMPOSITE STRUCTURE	332
STRESS STUDY	ORNL	360	F+BAL	RS P	T I	\$SAFE-3D, 3-D COMPOSITE STRUCTURE	332
STRESS STUDY	BAPL	6600	F+COM	RS P	T I	\$GAPL3, INELASTIC LARGE DEFLECTION	R397
STRESS, MAXIMUM MOMENT CALC	AI	7090	F+FAP	RS	T I	\$4RESTRAINT PIPE	109
STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	F4	RS	A	\$	305
STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING	BAPL	6600	F4	RS P	I	\$	R570
STRUCTURAL ANALYSIS	GGA	1108	F5	RS P	T I	\$SHELL5, THIN SHELL 3-D	452
STRUCTURAL ANALYSIS	ANC	360	F4	RSBP	CT I	\$STRAP, STATIC & DYNAMIC	53

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STRUCTURAL ANALYSIS	ORNL	360	F4	RS P	T I	\$CREEP-PLAST, 2-D INELASTIC	R707	
STRUCTURAL ANALYSIS BOWED REACTOR CORES	ANL	360B	F4	RS P	I	\$NUBOW,	643	
STRUCTURAL ANALYSIS OF LINEAR SYSTEMS	ANL	360B	F4	RS P	CT I	\$SAP4,	641	
STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P	T I	\$M0266, LINEAR ELASTIC	R383	
STRUCTURE STRESS STUDY	GGA	1108	F4	RS P	T I	\$SAFE-3D, 3-D COMPOSITE	332	
STRUCTURE STRESS STUDY	ORNL	360	F+BAL	RS P	T I	\$SAFE-3D, 3-D COMPOSITE	332	
STRUCTURED FORTRAN	SLAC	360	F4	RSBP	XCT P	\$MORTAN2, MACRO-BASED	678	
STRUCTURES	BAPL	6600	F4	RS P	T L	\$BL47, DRAFTING TOOL TO PLOT PLANE	R373	
STRUCTURES	KAPL	6600	F4	RS P	X I	\$FINEL, FINITE-ELEMENT STUDY 2,3-D	R404	
STRUCTURES	BAPL	6600	F4	RS P	T I	\$FUGIT, DYNAMIC RESPONSE OF ELASTIC	R537	
SUBPROGRAMS AND MODULES	ANL	360	F+BAL	RSBP	CT M	\$ARC-SYSTEM, SYSTEM	522	
SUBROUTINE LIB.	NED	635	F+GMP	RS	T P	\$GENED ENVIRONMENTAL ROUTINES,	515	
SUBROUTINE LIB.	BAPL	6600A	F+ASC	RS	T P	\$BETTIS ENVIRONMENTAL ROUTINES,	478	
SUBROUTINE LIB.	BW	6600B	F+ASC	RS	T P	\$BETTIS ENVIRONMENTAL ROUTINES,	478	
SUBROUTINE LIBRARY CAT. A-E	ANL	360	F+P+A	RS	T P	\$AMDLIBAE, ARGONNE	562	
SUBROUTINE LIBRARY CAT. F	ANL	360	F+BAL	RS	T P	\$AMDLIBF, ARGONNE	563	
SUBROUTINE LIBRARY CAT. G-Z	ANL	360	F+P+A	RS	T P	\$AMDLIBGZ, ARGONNE	564	
SUBROUTINE LIBRARY ROUTINES	LASL	6600C	F+COM	RS	T P	\$LASLIB, LOS ALAMOS	633	
SUBROUTINES	SLA	6600C	F+COM	RS P	X T P	\$MATHLIB, SANDIA MATHEMATICAL	654	
SUBROUTINES	AI	360	F+BAL	RS	T P	\$FIGS, IBM360&2250 FORTRAN GRAPHICS	484	
SUBROUTINES	SLA	6600	F4	RS P	T P	\$BESSEL FUNCTIONS, AIRY & LOG GAMMA	656	
SUM OF EXPONENTIALS	MIT	7090	F2	RS P	P	\$FRANTIC, LEAST SQUARES FIT	324	
SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA	7090	F2	RS	T A	\$	56	
SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	F4	RS P	T A	\$	R399	
SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	ORNL	360	F4	RS P	T B	\$	431	
SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	3600	F36	RS P	T I	\$	357	
SUPPORT STRESS ANALYSIS	ANL	3600	F36	RS P	T I	\$SUPORAN, REACTOR CORE	357	
SURVEY STUDY	BW	6600	F+COM	RS P	X T D	\$FARED, 1-D FAST REACTOR DESIGN &	427	
SWELLING & GAS RELEASE SIMULATION	BAPL	6600	F4	RS P	T I	\$BUB11, FUEL	R468	
SWELLING TEMPERATURE STUDY	BAPL	6600	F4	RS P	T H	\$FIGRO, LWBR FUEL	R272	
SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	F36	RSBP	I	\$	353	
SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NED	635	F+GMP	RS P	T D	\$	495	
SYNTHESIS	KAPL	6600	F4	RS P	F	\$STINT3, SINGLE-CHANNEL SPACE-TIME	R389	
SYNTHESIS	ANL	3600	F63	RSBP	T E	\$TRAFICORPORATION, TRANSFER FUNCTION	135	
SYNTHESIS CALC	NED	635	F4	RS PL	T C	\$BISYN, 2-D MULTI-GP DIFFUSION	287	
SYNTHESIS CALC	NED	1108	F4	RS P	T C	\$BISYN, 2-D MULTI-GP DIFFUSION	287	
SYNTHESIS DIFFUSION	ANL	370	F+BAL	RS PLXCT	C	\$SYN3D, SINGLE-CHANNEL FLUX	713	
SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NED	635	F+GMP	RS P	T D	\$SYN, 2D	495	
SYNTHESIS PROGRAM	CYL	PW	1604	F63	RS	T C	\$2DXYL, 3-D MULTI-GP FLUX	192
SYN3D, SINGLE-CHANNEL FLUX SYNTHESIS DIFFUSION	ANL	370	F+BAL	RS PLXCT	C	\$	713	
SYST WITH BANDED JACOBIAN	LLL	360	F4	RS P	X T P	\$EPISODE8, SOLVE ODE	705	
S4 APPROXIMATION	AI	7090	F2	RS	B	\$S4 CYL CELL CODE, 1-D 1-GP	53	
S4 APPROXIMATION	CDC	1604	F63	RS P	B	\$S4 CYL CELL CODE, 1-D 1-GP	53	
S4 APPROXIMATION RZ GEOMETRY	LLL	709	F2	RS	C	\$FIRN, 2-D FEW-GP	7	
S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS P	B	\$BAM,	108	
S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS	B	\$	53	
S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P	B	\$	53	
TABLE, FOR NON-BIAS ORDERING	MLMO	360	F+COB	RSBP	XC P	\$RANDOM SAMPLING	679	
TABLES	AI	360	F+BAL	RS P	CT A	\$U3R, UNRESOL RESONANCE XSEC PROBABILITY	553	
TABLES FOR PWR OPN	OPPD	6400	F4	S P	H	\$PWR-PPM, BORATION-DILUTION	552	
TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	F4	RS	T H	\$WATER, STEAM	R267	
TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P	H	\$M0899,HOH, STEAM	R294	
TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P	T H	\$M0899,HOH, STEAM	R294	
TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	1108	F4	RS P	T A	\$	410	
TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	F5	RS P	T H	\$	408	
TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	1108	F5	RS P	T H	\$	414	
TAPE	GGA	7044	F+MAP	RSBP	M	\$UNPACK, RETRIEVAL FROM SCISRS X-SECTION	206	
TAPE EDIT REACTION RATES	UK-W	7090	F2	RS	N	\$WED, W-DSN OUTPUT	133	
TAPE MAINTENANCE	ANL	360	F4	RS	M	\$MERM2, MC**2 BINARY LIBRARY	472	
TAPE PREPARATION	PW	1604	F63	RS	L	\$CSP1, SN X-SECTION LIBRARY	194	
TAPE PREPARATION	PW	1604	F63	RS	L	\$CSP2A, SN X-SECTION LIBRARY	193	
TAPE PROCESSING AND EDITING	ORNL	360B	F4	RS PL	CT M	\$EDITOR, ENDF/B	502	
TAPE PROCESSING AND EDITING	ORNL	6600	F4	RS P	T M	\$EDITOR, ENDF/B	502	
TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	ORNL	360	F4	RS P	XCT E	\$	558	

TCB01

THERMAL-HYDRAULIC

TCB01, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	6600	F4	RS	P	I	\$	R60.
TDC PW 1604 F63 RS P L \$SNC, CALCULATION OF SN CONSTANTS FOR DSN								189
TDC OR 2DXY FLUX INPUT PW 1604 F63 RS C \$TDP, 2-D PERTURBATION								199
TDC, 2-D MULTI-GP SN APPROXIMATION RZ PW 1604 F63 RS P T C \$FORTAN								161
TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS FBRD 635 F+GMP RS P XCT B \$								505
TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT PW 1604 F63 RS C \$								199
TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM LER 7090 F+MAP RS P T C \$								312
TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC GGA 7044 F4 RS P T C \$								225
TEMCO7, TEMPERATURE COEFFICIENT CALCULATION GGA 1108 F4 RS P T C \$								320
TEMP CALC GGA 1108 F5 RS P T H \$TAC2D, STEADY-STATE AND TRANSIENT								408
TEMP COEF CALC GGA 7044 F4 RS P T C \$TEMCO, 1-D FEW-GP DIFFUSION								225
TEMP FEEDBACK GGA 1108 F4 RS P T F \$GAKIT, 1-D MULTIGP KINETICS WITH								370
TEMPERATURE & DEFORMATION BAPL 6600 F4 RS P T I \$PELEN, FUEL PELLET								R598
TEMPERATURE CALC CYLINDER ANL 3600 F63 RSBP T H \$ARGUS, TRANSIENT								152
TEMPERATURE CALC. ORNL 1604 F2 RS P Q \$BIGDEAL, SPENT YANKEE-FUEL								549
TEMPERATURE CODE GGA 7044 F4 RS I \$SCORE, CORE CONFIGURATION FUEL								233
TEMPERATURE COEFFICIENT CALCULATION GGA 1108 F4 RS P T C \$TEMCO7,								320
TEMPERATURE DIST STUDY AEB 360 F4 RS P E \$BLAST, REACTOR KINETICS								363
TEMPERATURE DIST. ORNL 360 F4 RS P T H \$SORRIBLE, ROD BUNDLE FLOW &								629
TEMPERATURE DISTRIBUTION PROGRAM CHI 1108A F4 RS P T H \$LION4, 3-D								R299
TEMPERATURE DISTRIBUTION PROGRAM FW 360 F4 RS P CT H \$LION4, 3-D								R299
TEMPERATURE DISTRIBUTION PROGRAM FW 1108B F4 RS P T H \$LION4, 3-D								R299
TEMPERATURE DISTRIBUTION PROGRAM KAPL 6600 F+ASC RS P T H \$LION4, 3-D								R299
TEMPERATURE FEEDBACK BAPL 6600 F4 RS P T F \$NOWIG, 1-D 2-GP KINETICS								R371
TEMPERATURE HISTORY KECS 7094 F2 RSBP T H \$PTH1, BLOWDOWN PRESSURE								155
TEMPERATURE LMFBR FUEL PIN ANL 360 F4 RS P H \$MARGE/SLUMP, MAXIMUM								677
TEMPERATURE PREDICTION MIT 370 F4 RS P T H \$ENERGY, LMFBR COOLANT								696
TEMPERATURE STUDY BAPL 6600 F4 RS P T H \$FIGRO, LWBR FUEL SWELLING								R272
TEMPERATURE VOID FRACTION AI 7090 F2 RS I \$FUGUE, STEADY-STATE								48
TEMPEST COMBINATION AI 7090 F2 RS P B \$BAM, S4 CYL CELL CODE AND								108
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS AI 7090 F+FAP RS PL T B \$								50
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS BHSC 360 F4 RS PL T B \$								50
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS CDC 1604 F63 RS PL T B \$								50
TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT ANL 3600 F36 RS P XCT C \$								513
TGAN, NUCLEAR CRITICALITY SAFETY DP 360 F4 RS P T C \$KEFF, MGBS,								617
THEORY GGA 1108 F4 RS P XCT C \$GAPER1D, 1-D TRANSPORT PERTURBATION								606
THEORY NED 635 F4 RS P T C \$DOT2DB, 2-D MULTIGROUP DIFFUSION & SN								459
THEORY OF LATTICE DYNAMICS ANL 360 F4 RS P T Q \$GROUP2, GROUP								620
THEORY OF LATTICE DYNAMICS LASL 6600 F4 RS P T Q \$GROUP2, GROUP								620
THEORY XSEC CALC KAPL 6600 F4 RS P A \$MULTI, MULTI-LEVEL RESONANCE								R535
THERMAL ANALYSIS BCL 6400 F4 RS P T G \$NURLOC-1.0, LOSS-OF-COOLANT								328
THERMAL DESIGN STUDY GGA 7044 F4 RS P I \$GAZELLE5, GAS-COOLED CORE								232
THERMAL DISCHARGE STUDY HEDL 1108 F5 RS P T R \$STOPLYR2, POWER PLANT								599
THERMAL LIBRARIES FROM ENDF/B DATA WAPD 7600 F4 RS P T B \$ETOT2,								509
THERMAL LIBRARY FORM WAPD 7600 F4 RS P T B \$ETOT3, ENDF/B V3 DATA TO								628
THERMAL NEUTRON SPECTRUM X-SECTIONS AI 7090 F+FAP RS PL T B \$TEMPEST2,								50
THERMAL NEUTRON SPECTRUM X-SECTIONS BHSC 360 F4 RS PL T B \$TEMPEST2,								50
THERMAL NEUTRON SPECTRUM X-SECTIONS CDC 1604 F63 RS PL T B \$TEMPEST2,								50
THERMAL PERFORMANCE MODEL HEDL 6600 F RS P T H \$SIEX, LMFBR FUEL PIN								673
THERMAL RESPONSE LOCA ANC 360 F4 RSBP X T G \$THETA1-B, FUEL ROD								512
THERMAL SCATTERING CRYSTALLINE MATERIALS LASL 6600 F4 RS P T A \$TOR,								360
THERMAL SCATTERING DATA DP 360B F4 RS P XCT B \$FLANGE2(71-1), ENDF/B								368
THERMAL SCATTERING LAW CALCULATION GGA 1108 F4 RS P A \$GASKET,								263
THERMAL SPECTRA GGA 1108B F4 RS PLXCT B \$GGC4, MULTI-GP X-SECTIONS FAST								298
THERMAL SPECTRA WANL 6600 F4 RS L T B \$GGC4, MULTI-GP X-SECTIONS FAST								298
THERMAL SPECTRA & MULTI-GP CONSTANTS ANC 360 F4 RS PL CT B \$INCITE,								565
THERMAL SPECTRUM X-SECTION CALC BNW 1108 F5 RS PLX T B \$BRT1,								184
THERMAL SPECTRUM X-SECTION CALC ANL 3600 F63 RSBP XCT B \$THERMOS(ANL),								184
THERMAL-HYDRAULIC ANALYSIS ANL 360B F4 RSBP CT H \$COBRA3M, FUEL PIN								659
THERMAL-HYDRAULIC ANALYSIS NED 635 F4 RS P T H \$MANTA, STEADY-STATE								256
THERMAL-HYDRAULIC ANALYSIS WARC 6600 F4 RS P T H \$MANTA, STEADY-STATE								256
THERMAL-HYDRAULIC MULTICHANNEL ANALYSIS ANL 370 F4 RS P CT H \$THI3D,								706
THERMAL-HYDRAULIC STUDY ANC 360E F+BAL RSBPLXCT G \$RELAP4/MOD5, TRANSIENT								369
THERMAL-HYDRAULIC STUDY ANC 7600B F+COM RS PLXCT G \$RELAP4/MOD5, TRANSIENT								3

THERMAL-HYDRAULIC

TRANSIENT

THERMAL-HYDRAULIC STUDY	ANC	7600C	F+COM	RS	PLXCT	G	\$RELAP4/MOD5, T	TRANSIENT	369
THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW	1108	F5	RS	P	CT	H	\$REPP,	483
THERMAL-HYDRAULICS	BNW	7600	F4	RS	P	XCT	H	\$COBRA4I, ROD BUNDLE & CORE	432
THERMODYNAMIC CYCLE ANALYSIS	AI	7094	F2	RS	PL	T	I	\$CYCLOPS1,	244
THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	360	F4	RS	P	T	H	\$ASTEM,	580
THERMODYNAMIC PROPERTIES WATER & STEAM	BCAC	6600	F4	RS	P	T	H	\$ASTEM,	580
THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	F4	RS	P	T	H	\$TOPS, TRANSIENT	R348
THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS	DP	360	BCD	R	LX	T	Z	\$	543
THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	3600	F63	RSBP	XCT	B	\$	184	
THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC	360	F4	RSBP	X	T	G	\$	512
THIN SHELL 3-D STRUCTURAL ANALYSIS	GGA	1108	F5	RS	P	T	I	\$SHELL5,	452
THIN SHELLS	GGA	1108	F4	RS	P	I	\$SAFE-SHELL, STRESS ANALYSIS	253	
THIN SHELLS	SLA	6600	F4	RS	P	T	I	\$SLADE-D, DYNAMIC ANALYSIS OF	581
THIN SHELLS	MIT	360	F4	RS	P	T	I	\$SABOR4, DISCRETE-ELEMENT ANALYSIS	R402
THI3D, THERMAL-HYDRAULIC MULTICHANNEL ANALYSIS	ANL	370	F4	RS	P	CT	H	\$	706
THREDES LIBRARY UTILITY ROUTINE	AI	360	F4	RSB	L	T	M	\$CLIP, FORM OR	271
THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	360	F4	RSBP	T	K	\$	273	
THRES2, STATISTICAL MODEL REACTION X-SECTION	ENEA	360	F4	RS	P	A	\$	504	
THRES2, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600B	F4	RS	P	A	\$	504	
THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP	T	H	\$	346	
THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	F+FAP	RS	PL	T	G	\$CURIE,DOSE,	196
TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	6600B	F+ASC	RSB	X	T	M	\$	R403
TIME-DEP FUEL ELEM STUDY	NRC	370	F4	RSBP	CT	G	\$WREM-TOODEE2/MOD3, 2D	712	
TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	360	F4	RS	P	T	C	\$VARI-QUIR,	212
TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	6600	F4	RS	P	T	C	\$VARI-QUIR,	212
TIME-DEPENDENT DIFFUSION	MIT	370	F4	RS	P	T	F	\$GAKIN2, 1D MULTIGROUP	310
TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	F4	RS	P	F	\$RAUMZEIT, 1-D	R352	
TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS	P	T	H	\$TOODEE, 2-D	349
TIME-OF-FLIGHT DATA ANALYSIS	GGA	1108	F5	RS	P	T	O	\$CAGE,BIRD,SPEC,	476
TIME-SHARING PROGRAMMING LANGUAGE	KAPL	6600	F+ASC	RS	P	\$SIMPLE1,	R442		
TLD CORRECTION CALC	AI	360	F4	RS	P	T	Q	\$RESPOND, DISSIMILAR MEDIA	566
TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	F+BAL	RS	P	T	O	\$	333
TOKAMAK FUSION REACTOR STUDY	ANL	360	F4	RS	P	X	\$TOKMINA/TOKMINA2,	561	
TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	360	F4	RS	P	X	\$	561	
TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS	P	T	H	\$	349
TOODY2, 2-D LAGRANGIAN EQNS OF MOTION SOLUTION	SLA	3600	F36	RS	P	T	S	\$	627
TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	F4	RS	P	T	L	\$BL47, DRAFTING	R373
TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	F4	RS	P	T	C	\$	148
TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS	P	T	C	\$	148
TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HEDL	1108	F5	RS	P	T	R	\$	599
TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	F4	RS	P	T	H	\$	R348
TOR OUTPUT DATA	LASL	6600	F4	RS	P	T	B	\$GLEN, GROUP CONSTANT CALC FROM	361
TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	6600	F4	RS	P	T	A	\$	360
TPT01, 2-D FEW-GROUP TRANSPORT WITH DEPLETION	BAPL	7600	F+COM	RS	P	T	D	\$	R669
TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL	3600	F63	RSBP	T	E	\$	135	
TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	F2	RS	P	T	G	\$	268
TRANSFER	GGA	1108	F+BAL	RS	P	T	E	\$BLOOST6, COMBINED KINETICS 2-D HEAT	303
TRANSFER	AI	7094	F2	RS	P	T	G	\$TRANS-FUGUE1, TRANSIENT FLOW AND HEAT	268
TRANSFER	GGA	7044	F+MAP	RS	P	T	H	\$BLOOST5, POINT-KINETICS WITH 2-D HEAT	205
TRANSFER	SSDC	370	F4	RS	P	H	\$HEATING2, TRANSIENT STEADY-STATE HEAT	198	
TRANSFER CODE	ANC	360B	F4	RSBP	XCT	H	\$MOXY/MOD032, BWR CORE HEAT	551	
TRANSFER COEFFICIENTS	LLL	7090	F+FAP	RS	P	T	B	\$SOPHIST1/2/5, MULTI-GP	160
TRANSFER FUNCTION EVALUATION	PW	1604	F63	RS	P	E	\$CMPXMAT,	188	
TRANSFER FUNCTION SYNTHESIS	ANL	3600	F63	RSBP	T	E	\$TRAFICORPORATION,	135	
TRANSFER MATRICES	AGC	7090	F2	RS	P	T	B	\$AGN-SIGMA, CALC OF MULTI-GP	243
TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H	\$AXFLU, HEAT	182		
TRANSFER PROGRAM	GEC	635	F+GMP	RSBP	T	H	\$THTE, 3-D TRANSIENT HEAT	346	
TRANSFER PROGRAM	GGA	1108	F5	RS	P	T	H	\$TAC3D, TRANSIENT 3-D HEAT	414
TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H	\$AXTHRM, HEAT	183		
TRANSFER STUDY	SLL	6600	F4	RS	P	N	\$HEATMESH, GEOMETRICAL DATA HEAT	434	
TRANSFORMATION SYSTEM	SLA	6600B	FTN	RS	P	T	P	\$SETS, SET EQUATION	623
TRANSIENT & DEPLETION	KAPL	6600	F4	RS	P	T	D	\$3DXT,DEP3, 3-D XENON	R477
TRANSIENT ANALYSIS	BAPL	6600	F4	RS	P	T	H	\$FLOT1,M0219, PWR FLOW	R331
TRANSIENT ANALYSIS	ANC	360	F+BAL	RSBP	CT	G	\$PARET, WATER-COOLED CORE	555	

TRANSIENT

TUBE

TRANSIENT ANALYSIS	WARD	7600	F4	RS P	T K	\$DEMO4, CRBR REACTOR & PLANT	R676	
TRANSIENT ANALYSIS OF OXIDE FUEL RODS	ANC	360		F+BAL	RSBP XCT G	\$FRAP-T,	658	
TRANSIENT COMPRESSIBLE FLUID FLOW	LASL	7600	F4	RS P	H	\$SOLA-ICE,	723	
TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	F2	RS P	T G	\$TRANS-FUGUE1,	268	
TRANSIENT FLOW IN VENTED FLUID SYSTEM	LASL	7600	F4	RS P	T H	\$COMPARE,	702	
TRANSIENT FLOW IN VENTED FLUID SYSTEM	NRC	370	F4	RS P	T H	\$COMPARE,	702	
TRANSIENT FLUID FLOW ALGORITHM	LASL	7600B	F	RS P	H	\$SOLA, SOLA-SURF,	651	
TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	F4	RS P	T H	\$HOT2, 2-D	R286	
TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP	T H	\$THTE, 3-D	346	
TRANSIENT OVERPOWER STUDY	HEDL	6600	F4	RS P	CT F	\$MELT3, FAST REACTOR	700	
TRANSIENT SIMULATION	BAPL	7600	F4	RS P	T G	\$FLASH6, FULLY-IMPLICIT	R448	
TRANSIENT SIMULATION	MA-G	360	F4	RSBP	CT G	\$FLASH4, FULLY-IMPLICIT	R448	
TRANSIENT STEADY-STATE HEAT TRANSFER	SSDC	370	F4	RS P	H	\$HEATING2,	198	
TRANSIENT TEMP CALC	GGA	1108	F5	RS P	T H	\$TAC2D, STEADY-STATE AND	408	
TRANSIENT TEMPERATURE CALC CYLINDER	ANL	3600	F63	RSBP	T H	\$ARGUS,	152	
TRANSIENT THERMAL-HYDRAULIC STUDY	ANC	360E	F+BAL	RSBPLXCT	G	\$RELAP4/MOD5,	369	
TRANSIENT THERMAL-HYDRAULIC STUDY	ANC	7600B	F+COM	RS PLXCT	G	\$RELAP4/MOD5,	369	
TRANSIENT THERMAL-HYDRAULIC STUDY	ANC	7600C	F+COM	RS PLXCT	G	\$RELAP4/MOD5,	369	
TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	F4	RS P	T H	\$STOPS,	R348	
TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	1108	F5	RS P	T H	\$TAC3D,	414	
TRANSIENTS	ANL	360	F4	RS P	T F	\$SASIA, FAST REACTOR POWER AND FLOW	400	
TRANSIENTS	ANL	6600	F4	RS P	T F	\$SASIA, FAST REACTOR POWER AND FLOW	400	
TRANSIENTS	BAPL	6600	F4	RS P	T H	\$CHIC-KIN, FAST + INTERMEDIATE POWER	R473	
TRANSMUTATION ANALYSIS	BNW	1108	F5	RS P	T D	\$DBUFIT1, LEAST SQUARES	456	
TRANSPORT	BAPL	6600	F4	RS P	T J	\$M0756, LETO, 1-D SLAB GAMMA-RAY	R343	
TRANSPORT	ANC	360	F+BAL	RSBPL CT	B	\$RAFFLE2/MOD2, MONTE CARLO NEUTRON	631	
TRANSPORT	ANL	3600	F36	RS P	XCT C	\$TESS, 1-D SLAB AND SPHERE GEOM SN	513	
TRANSPORT CODES	WANL	6600	F4	RS L	T B	\$GAMBIT, X-SEC GENERATION FOR	547	
TRANSPORT PERTURBATION THEORY	GGA	1108	F4	RS P	XCT C	\$GAPERID, 1-D	606	
TRANSPORT PROGRAM	LASL	360	F4	RSBP	CT C	\$TRIPLT, 2-D TRIANGULAR MESH	608	
TRANSPORT PROGRAM	LASL	6600	F4	RS P	T C	\$TRIPLT, 2-D TRIANGULAR MESH	608	
TRANSPORT PROGRAM	LASL	7600	F4	RS P	T C	\$TRIPLT, 2-D TRIANGULAR MESH	608	
TRANSPORT STUDY	RFD	3600	F36	RS P	G	\$DISPER, AEROSOL PARTICLE	554	
TRANSPORT WITH DEPLETION	BAPL	7600	F+COM	RS P	T D	\$TPT01, 2-D FEW-GROUP	R669	
TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS	T C	\$M0648, 1-D SLAB	R342	
TRANSPORT XY RZ RTH	LASL	7600	F4	RS P	T C	\$TWOTRAN-PNVW, 2-D PARTICLE	573	
TRANSPORT XY RZ RTHETA	LASL	360D	F4	RSBP	CT C	\$TWOTRAN2, 2-D MULTI-GP	358	
TRANSPORT XY RZ RTHETA	LASL	6600D	F4	RS P	T C	\$TWOTRAN2, 2-D MULTI-GP	358	
TRANSPORT XY RZ RTHETA	LASL	7600D	F4	RS P	T C	\$TWOTRAN2, 2-D MULTI-GP	358	
TRAPPING	DP	360	F4	RSBP	Q	\$XDTRAP, HYDROGEN PERMEATION WITH	655	
TREE ANALYSIS SYSTEM				ARHC	6600	F+COM RS P CT G	\$FTA, FAULT	666
TREE EVALUATION CODES	ANC	360	F4	RSBP	CT G	\$PREP, KITT, SYSTEM FAULT	528	
TREE EVALUATION CODES	ANC	1108	F4	RS P	T G	\$PREP, KITT, SYSTEM FAULT	528	
TREE SIMULATION CODE	UNI	1108	F+SLE	RS P	G	\$SAFTAC, MONTE CARLO FAULT	674	
TREES	ANC	360	F4	RSBP	CT G	\$MOCUS, MINIMAL SETS FROM FAULT	653	
TRI-MESH	GGA	1108	F+BAL	RS P	T D	\$BUGTRI, 2D MULTIGP DIFFUSION & BURNUP	439	
TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	FBRD	H600	F4	RS P	CT C	\$	585	
TRIANGULAR MESH	GGA	1108	F+BAL	RS P	T C	\$GAMTRI, 2-D MULTI-GP DIFFUSION	401	
TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	F4	RSBP	CT C	\$TRIPLT, 2-D	608	
TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	F4	RS P	T C	\$TRIPLT, 2-D	608	
TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	F4	RS P	T C	\$TRIPLT, 2-D	608	
TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS P	E	\$	489	
TRIPLT, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	F4	RSBP	CT C	\$	608	
TRIPLT, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	F4	RS P	T C	\$	608	
TRIPLT, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	F4	RS P	T C	\$	608	
TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	7094	F+MAP	RS PLX	T A	\$	208	
TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	635	F4	RS P	T M	\$	493	
TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	F5	RS P	T M	\$	493	
TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	F4	RS P	T F	\$	309	
TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	F+MAP	RS P	T F	\$	309	
TUBE	BNW	6600C	F4	RS P	I	\$BUCKLE, CREEP BUCKLING OF INITIALLY OVAL	667	
TUBE BUNDLES	LASL	7094	F2	RSBP	H	\$AXFLU, HEAT TRANSFER MOLTEN FUEL	182	
TUBE BUNDLES	LASL	7094	F2	RSBP	H	\$AXTHRM, HEAT TRANSFER SOLID FUEL	183	
TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS P	I	\$	R378	

TUBES

VELVET2

TUBES UNDER PRESSURE	BAPL	6600	F4	RS P	I	\$TCB01, CREEP-BUCKLING OF	R604
TURBINE CYCLE ANALYSIS	ORNL	360	F4	RS P	T H	\$ORCENT, NUCLEAR STEAM	703
TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	635	F4	RS P	T H	\$VELVET2,	458
TUZ, UNRESOLVED REGION RESONANCE	INTEGRAL CALC	GGA	7090	F+FAP	RSB	T A	\$
TVA	360	F4	RS PLX T B	\$HRG3, SLOWING-DOWN SPECTRUM,	MULTIGP	CONSTANTS	467
TVA	360B	F4	RSBPLXCT B	\$LASER, SPECTRUM CALC WITH BURNUP	CYL	LATTICE	249
TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS P	F	\$	R338
TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	T F	\$	R338
TWO-PHASE FLOW	BAPL	7600B	F4	RS P	T H	\$FLOW3, NETWORK ANALYSIS OF 3-D	R664
TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH	LASL	7600	F4	RS P	T C	\$	573
TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	3600	F4	RSBP	CT C	\$	358
TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	6600D	F4	RS P	T C	\$	358
TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600D	F4	RS P	T C	\$	358
TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	F+FAP	RS PL	T B	\$	149
U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS P	I	\$TUBE,	R378
UCND	360B	F+BAL	RS P	O	\$PMS1, FAST NEUTRON POLARIZATION EXPERIMENT		469
UCND	370	COBOL	RS	CT	M	\$NMMSS, NUCLEAR MATERIALS MANAGEMENT SYSTEM	695
UEC	6600	F4	RS P	D	\$NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA		146
UEC	6600	F4	RS P	D	\$POWERCO, NUCLEAR STATION ELECTRICITY COSTS		340
UEC	6600	F4	RS P	D	\$SWAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY		224
UHTREX	LASL	7090	F+FAP	RS P	I	\$WIREX, COMPUTER-PRODUCED WIRING LISTS	315
UICS	360	F4	RS P	A	\$CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA		347
UICS	360	F4	RS P	CT	D	\$GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	576
UK-R	7090	F+FAP	RSBPL	T	C	\$GRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	103
UK-W	7090	F2	RS	N	\$WED, W-DSN OUTPUT TAPE EDIT REACTION RATES		133
UK-W	7090	F2	RS P	T	C	\$W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	132
ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L	T C	\$	118
UMCC	360	F4	RS P	T	C	\$VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	212
UNC	1604	F63	RS	C	\$2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE		173
UNC	1604	F63	RS PL	T	C	\$DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	144
UNDER PRESSURE	BAPL	6600	F4	RS P	I	\$TCB01, CREEP-BUCKLING OF TUBES	R604
UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	360	F4	RS P	O	\$CORGRAM,	390
UNI	1108	F+SLE	RS P	G	\$SAFTAC, MONTE CARLO FAULT TREE SIMULATION CODE		674
UNITS	RDYN	370B	F4	RS P	T P	\$METRICATION, CONVERSION TO OR FROM SI	G668
UNITS	DUCC	635	F4	RS	G	\$ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE	529
UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	7044	F+MAP	RSBP	M	\$	206
UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI	360	F+BAL	RS P	CT	A	\$U3R,
UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	6600	F4	RS P	A	\$AVERAGE,	376
UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	7094	F4	RS P	A	\$AVERAGE,	376
UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB	T A	\$TUZ,	42
UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	F4	RS P	T A	\$PUNI,	R359
UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108B	F4	RS P	T A	\$GANDY3,	341
UNRESOLVED RESONANCES	BAPL	6600	F4	RS P	A	\$GRAMP, R-M PARAMETERS OF	R470
URANIUM FUEL CYCLE COST ANALYSIS	AI	7090	F2	RS P	D	\$AIMFIRE,	55
USER PROGRAM PERFORMANCE MONITOR	SLAC	360B	F+BAL	RSB	CT	P	\$PROGLOOK,
USER-ORIENTED MEMORY DUMP UTILITY	BKY	7600	F+COM	RS P	T P	\$DUMP,	698
USING DTF4 FLUXES	LASL	6600	F4	RS P	N	\$DAC1, SN PERTURBATION CODE	455
UTILITIES	ANC	360B	F+BAL	RSB	T P	\$NRTS ENVIRONMENTAL ROUTINES, FORTRAN	613
UTILITY	BKY	7600	F+COM	RS P	T P	\$DUMP, USER-ORIENTED MEMORY DUMP	698
UTILITY GENERATION PLANNING	ORNL	360	F+BAL	RS P	X T D	\$ORSIM, OPTIMIZING	699
UTILITY PLOT MODULES, F(X) & F(X,Y)	KAPL	6600	F+C+D	RS P	T P	\$DATATRAN2,	407
UTILITY PROGRAM	AI	7094	F+FAP	RS L	T M	\$MOMUS, X-SECTION LIBRARY	159
UTILITY ROUTINE	ANL	360C	F63	RSBP	T M	\$XLIBIT, X-SECTION LIBRARY	181
UTILITY ROUTINE	AI	360	F4	RSB L	T M	\$CLIP, FORM OR THREDES LIBRARY	271
UTILITY ROUTINE	ANL	360D	BAL	RS	X T P	\$COPYCAT, IBM OS SYSTEM CATALOG	646
UVAC	6400	F4	RS PLX T B	\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV			185
U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI	360	F+BAL	RS P	CT	A	\$
VALUE DISTRIBUTION DATA ANALYSIS	BAPL	6600	F4	RS P	P	\$BH99, EXTREME	R621
VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	360	F4	RS P	T C	\$	212
VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	6600	F4	RS P	T C	\$	212
VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	7094	F4	RS P	X T C	\$	264
VARI-1D, 1-D VARIATIONAL SENSITIVITY	ANL	360	F4	RSBP	CT	C	\$
VARIATIONAL SENSITIVITY	ANL	360	F4	RSBP	CT	C	\$
VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	635	F4	RS P	T H	\$	458

VENTED

WEIGHT

VENTED FLUID SYSTEM	LASL	7600	F4	RS	P	T	H	\$COMPARE, TRANSIENT FLOW IN	702
VENTED FLUID SYSTEM	NRC	370	F4	RS	P	T	H	\$COMPARE, TRANSIENT FLOW IN	702
VENTURE, 1, 2, OR 3-D MULTIGROUP DIFFUSION	ORNL	360	F+BAL	RS	P	CT	C	\$	686
VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	360	F4	RS	P	XCT	F	\$	511
VERSION 4.0 VS SOFTWARE MONITOR	SLAC	370	BAL	RSB	CT	P	\$SLACMON/370,		635
VERSUS LEASE ANALYSIS	SLA	360	COBOL	RSBP	CT	M	\$BECOM, AEC DP PURCHASE		R589
VERSUS LEASE ANALYSIS	SLA	1108	COBOL	RS	P	M	\$BECOM, AEC DP PURCHASE		R589
VESSEL STRESS AND FATIGUE	KAPL	6600	F4	RS		I	\$SORSDB, PRESSURE		R391
VIBRATING SYSTEMS	KAPL	6600	F+ASC	RS	P	T	I	\$GEM, EIGENVALUE PROBLEM FOR	R344
VIBRATION NEUTRON SCATTERING CODES	ANC	360	F4	RS	P	CT	W	\$MACS LATTICE	574
VIEW FACTOR CALC FOR CYLINDRICAL PINS	ANC	360	F4	RSBP	CT	J	\$VIEWPIN,		569
VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	F4	RS	P	T	J	\$MUSCAT,	259
VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	ANC	360	F4	RSBP	CT	J	\$		569
VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600	F4	RS	PLX	T	C	\$	510
VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	360	F4	RSBPLXCT	C	\$			510
VISCOELASTIC ANALYSIS CONCRETE	GGA	1108	F4	RS	P	I	\$SAFE-CREEP,		300
VISCOELASTIC ANALYSIS OF CONCRETE	GGA	1108	F5	RS	P	T	I	\$SAFE-CRACK,	451
VOID FRACTION	AI	7090	F2	RS		I	\$FUGUE, STEADY-STATE TEMPERATURE		48
VOID X-SECTION CALCULATION	GEC	625	F4	RS	P	B	\$AVOID, ANNULAR		276
VS SOFTWARE MONITOR	SLAC	370	BAL	RSB	CT	P	\$SLACMON/370, VERSION 4.0		635
V1 PROC	BNL	6600B	F4	RS	T	M	\$CHECKER, CRECT, DAMMET, PLOTFB,...	ENDF/B	384
V2 PROC	BNL	6600B	F4	RS	T	M	\$CRECT, CHECKER, RIGEL, PLOTFB,...	ENDF/B	475
V2 PROCESSING CODES	ANL	360	F4	RS	P	T	M	\$CRECT, CHECKER, ENDF/B	475
V3 DATA PROCESSING CODE	ANL	360	F4	RS	T	M	\$RIGEL, ENDF/B		571
V3 DATA TO THERMAL LIBRARY FORM	WAPD	7600	F4	RS	P	T	B	\$ETOT3, ENDF/B	628
V3 PROCESSING CODES	BNL	6600	F4	RS	T	M	\$CHECK3, RIGEL3, ENDF/B		571
V4 PROCESSING CODES	BNL	6600B	F4	RS	T	M	\$RIGEL4, CHECK4,...	ENDF/B	638
W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W	7090	F2	RS		N	\$WED,		133
W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	7090	F2	RS	P	T	C	\$	132
W/CONFIDENCE LIMITS	BKC	360	F4	RSBP	P	\$GRAPH, LINEAR REGRESSION			624
WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS	P	D	\$		224
WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	6600	F4	RS	P	D	\$		224
WANL 6600	F4	RS	L	T	B	\$GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES			547
WANL 6600	F4	RS	L	T	B	\$GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA			298
WANL 6600	F4	RS	P	T	C	\$VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION			212
WANL 7094	F+PAP	RSBPL	T	N	\$CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES				239
WANL 7094	F2	RS	P	A	\$EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS				238
WANL 7094	F4	RS		E	\$R102, SPACE-INDEPENDENT INVERSE KINETICS CALC				168
WANL 7094	F4	RS	P	E	\$R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS				255
WANL 7094	F4	RS	P	X	T	C	\$VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH		264
WAPD 360C	F4	RS	PLXCT	B	\$LEOPARD, SPOTS, SPECTRUM CALC WITH DEPLETION				279
WAPD 6600	BCD	R	L	T	Z	\$ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2			447
WAPD 6600	F4	RS	P	T	B	\$ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS			436
WAPD 6600	F4	RS	P	T	D	\$CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS			354
WAPD 6600	F4	RS	PL	T	B	\$ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT			437
WAPD 7600	F4	RS	P	T	B	\$ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT			538
WAPD 7600	F4	RS	P	T	B	\$ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA			509
WAPD 7600	F4	RS	P	T	B	\$ETOT3, ENDF/B V3 DATA TO THERMAL LIBRARY FORM			628
WARD 6600	F4	RS	P	T	H	\$MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS			256
WARD 7600	F4	RS	P	T	K	\$DEMO4, CRBR REACTOR & PLANT TRANSIENT ANALYSIS			R676
WASP2, WATER PROPERTIES FOR SAFETY ANALYSIS	BAPL	7600	F4	RS	P	T	H	\$	R396
WATER & STEAM	ANC	360	F4	RS	P	T	H	\$ASTEM, THERMODYNAMIC PROPERTIES	580
WATER & STEAM	BCAC	6600	F4	RS	P	T	H	\$ASTEM, THERMODYNAMIC PROPERTIES	580
WATER PROPERTIES BG&E	360C	F4	RS	T	H	\$STEAM-67, 1967 ASME STEAM AND			487
WATER PROPERTIES FOR SAFETY ANALYSIS	BAPL	7600	F4	RS	P	T	H	\$WASP2,	R396
WATER REACTOR DESIGN	BNW	1108	F5	RS	P	CT	H	\$REPP, THERMAL-HYDRAULIC	483
WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	360	F+BAL	RSBPL	CT	G	\$SPARET,		555
WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	6600	F4	RS	P	T	H	\$GLUB1,	R424
WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	F4	RS		T	H	\$	R267
WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	F63	RS	P	A	\$RAMES, PARTICLE		335
WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	F2	RS	P	F	\$		145
WED, W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W	7090	F2	RS		N	\$		133
WEIGHT OPTIMIZATION DOSE CALC	AI	7094	F+PAP	RS	P	J	\$SHOE, SHIELD		197
WEIGHT OPTIMIZATION STUDY	PW	1604	F63	RS		I	\$WOEXPT, REACTOR		190

WELL

X-SECTION

WELL CRYSTAL	MTS	7090	MAD	RSB	O	\$BURP5, GAMMA-RAY PHOTOFRACTION	170
WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360	F4	RS P	B	\$	362
WFLLL2B, WIRE CONFIGURATION FREQUENCY DOMAIN	LLL	7600	F4	RS P	T T	\$	721
WHAM6, LIQUID-FILLED PIPING SYSTEM ANALYSIS	ANC	360B	F+BAL	RS P	T G	\$	278
WHAM6, LIQUID-FILLED PIPING SYSTEM ANALYSIS	ANL	7600B	F4	RS P	T G	\$	278
WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	1604	F63	RS P	T C	\$	32
WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	F2	RS P	T C	\$	32
WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P	T F	\$	R274
WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P	T F	\$	R274
WIGL3, 1-D SPACE-TIME DIFFUSION W/FEEDBACK	BAPL	6600	F4	RS P	T F	\$	R708
WIRE CONFIGURATION FREQUENCY DOMAIN	LLL	7600	F4	RS P	T T	\$WFLLL2B,	721
WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	7090	F+FAP	RS P	I	\$	315
WIRING LISTS UHTREX	LASL	7090	F+FAP	RS P	I	\$WIREX, COMPUTER-PRODUCED	315
WLIB, FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	RSBP X T	B	\$RABBLE,	281
WOODS-SAXON POTENTIAL SHAPE CALCULATION	ORNL	7090	F2	RS	A	\$LYNNE,	381
WOPEXPT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	1604	F63	RS	I	\$	190
WORKSTATION PKG	ANL	360B	F+ASM	RSB	CT P	\$WSP-HASP/DOS, DOS-MFT REMOTE	541
WREM-TOODEE2/MOD3, 2D TIME-DEP FUEL ELEM STUDY	NRC	370	F4	RSBP	CT G	\$	712
WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	ANL	360B	F+ASM	RSB	CT P	\$	541
WTSC 6600B F4	RS P	T I	\$SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD				R282
X-SEC	BNL	6600	F4	RS P	A	\$BESFIT, DIFFRACTION MODEL ELASTIC SCAT	524
X-SEC & POLARIZATION CALC	KAPL	6600	F4	RS P	T A	\$PHASER, PHASE SHIFT	R507
X-SEC CALC	BNL	6600	F4	RS P	A	\$SIGPLOT, RESOLVED MULTILEVEL B-W	377
X-SEC CALC	KAPL	6600	F4	RS P	T A	\$JPIXR, COUPLED-CHANNEL SCATTERING	R506
X-SEC CALC	BNL	6600	F4	RS P	A	\$AVERAGE, UNRESOLVED REGION AVERAGE	376
X-SEC CALC	BNL	7094	F4	RS P	A	\$AVERAGE, UNRESOLVED REGION AVERAGE	376
X-SEC CALC	BNW	1108	F4	RS P	T B	\$FCC4, FUNDAMENTAL MODE FAST REACTOR	306
X-SEC CALC	GGA	1108	F4	RS P X T	B	\$GAF,GAR, SPECTRA AND GROUP-AVERAGED	316
X-SEC CALC	ORNL	360	F+BAL	RS P	D	\$ISOSEARCH, ISOTOPE PRODUCTION FLUX,	322
X-SEC CALC	ORNL	1604	F63	RS P	D	\$ISOSEARCH, ISOTOPE PRODUCTION FLUX,	322
X-SEC EVALUATION	ENEA	360	F4	RS P	CT A	\$JUPITOR1, COUPLED CHANNEL	308
X-SEC EVALUATION	ORNL	1604	F63	RS P	T A	\$JUPITOR1, COUPLED-CHANNEL	308
X-SEC EVALUATION	AI	360	F+BAL	RSB	L CT	M \$SCORE3, SCISRS ENDF/B. GRAPHIC	375
X-SEC FORMAT WAPD	6600	F4	RS PL	T B	\$ETOG1, ENDF/B TO MUFT, GAM, ANISN		437
X-SEC FORMAT WAPD	7600	F4	RS P	T B	\$ETOG3, ENDF/B TO MUFT, GAM, ANISN		538
X-SEC GENERATION FOR TRANSPORT CODES	WANL	6600	F4	RS	L T B	\$GAMBIT,	547
X-SECS	BAPL	6600	F4	RS P	T A	\$PUN1, UNRESOLVED RESONANCE INTEGRALS	R359
X-SECS	FBRD	635	F+GMP	RS P	XCT B	\$TDOWN, SPATIAL & COMPOSITION-DEPENDENT	505
X-SECS	BAPL	6600	F4	RS	T B	\$M0807, 2-D DIFFUSION ABSORPTION REMOVAL	R280
X-SECTION	ENEA	360	F4	RS P	A	\$THRES2, STATISTICAL MODEL REACTION	504
X-SECTION AVERAGING	GGA	7044	F4	RS P	L	\$GAVER, ENERGY INTERVAL	218
X-SECTION CALC	BNW	1108	F5	RS PLX	T B	\$BRT1, THERMAL SPECTRUM	184
X-SECTION CALC	AI	7090	F2	RS PL	T A	\$ARES2, RESONANCE INTEGRAL	89
X-SECTION CALC	AI	7094	F+MAP	RS PLX	T A	\$TRIX1, RESONANCE INTEGRAL	208
X-SECTION CALC	ANL	3600	F63	RSBP	A	\$NEARREX, COMPOUND NUCLEUS	171
X-SECTION CALC	CDC	1604	F63	RS PL	T A	\$ARES2, RESONANCE INTEGRAL	89
X-SECTION CALC	NED	2000	F2	RS P	A	\$DOPIE, RESOLVED RESONANCE	177
X-SECTION CALC	AI	7090	F2	RS PL	T B	\$FORM, FAST NEUTRON SPECTRUM	51
X-SECTION CALC	ANL	3600	F63	RS	LX T B	\$GAM1, FAST NEUTRON SPECTRUM	33
X-SECTION CALC	CDC	1604	F63	RS PL	T B	\$FORM, FAST NEUTRON SPECTRUM	51
X-SECTION CALC	CDC	1604	F63	RS PLX	T B	\$GAM1, FAST NEUTRON SPECTRUM	33
X-SECTION CALC	GGA	7090	F2	RS PLX	T B	\$GAM1, FAST NEUTRON SPECTRUM	33
X-SECTION CALC	NED	2000	F2	RS P	A	\$RAPTURE, RESONANCE INTEGRAL	176
X-SECTION CALC	OSUC	370	F4	RS PLXCT	B	\$FORM, FAST NEUTRON SPECTRUM	51
X-SECTION CALC	GGA	1108B	F4	RS P	T A	\$GANDY3, UNRESOLVED RESONANCE	341
X-SECTION CALC	ANL	3600	F63	RSBP	XCT B	\$THERMOS(ANL), THERMAL SPECTRUM	184
X-SECTION CALC ELASTIC SCAT RESONANCES	AI	360	F4	RS PLX	T B	\$AILMOE,	147
X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	F+MAP	RS PL	T B	\$AILMOE,	147
X-SECTION CALC FROM DSN OUTPUT	PW	1604	LAG1	RS P	N	\$DTX, EFFECTIVE	210
X-SECTION CALC MODERATOR	GGA	1108	F4	RS P	A	\$GAKER, INELASTIC SCAT	289
X-SECTION CALCULATION	GEC	625	F4	RS P	B	\$SAVOID, ANNULAR VOID	276
X-SECTION CALCULATION	BAPL	6600	F4	RS P	T A	\$SUMOR, S-WAVE NEUTRON	R399
X-SECTION CALCULATION	ANL	360	F4	RS P	CT B	\$MC**2, ENDF MULTIGROUP	355
X-SECTION CALCULATION	ANL	3600	F36	RS P	T B	\$MC**2, ENDF MULTIGROUP	355

X-SECTION

XYZ

X-SECTION CALCULATION	GGA	1108	F5	RS P	A	\$FLANGE1, SCATTERING LAW	247
X-SECTION CALCULATION	NED	7094	F+FAP	RS P	T B	\$EPITHERMOS, SPECTRUM AND	201
X-SECTION EVALUATION	ORNL	7090	F4	RSBP	A	\$MUFFLE, FISSIONUCLIDE	323
X-SECTION GENERATION	ANL	360	F+BAL	RSBP XCT	B	\$1DX, 1-D DIFFUSION FAST	374
X-SECTION GENERATION	BNW	1108	F4	RS P X T	B	\$1DX, 1-D DIFFUSION FAST	374
X-SECTION GENERATION	GEC	635	F4	RSBP	T B	\$GROUSE, SPACE-DEPENDENT	420
X-SECTION GENERATION CODE	BAPL	6600	F+COM	RS P X T	B	\$PAX03, HARMONY-PDQ	R426
X-SECTION LIBRARY GENERATION	BAPL	6600	F+COM	RS P	T B	\$RECAP-0, RECAP-12	R671
X-SECTION LIBRARY PREPARATION	GGA	1108	F4	RS P X T	L	\$GAND, GAFGAR	345
X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L	\$CSP1, SN	194
X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L	\$CSP2A, SN	193
X-SECTION LIBRARY UTILITY PROGRAM	AI	7094	F+FAP	RS	L T M	\$MOMUS,	159
X-SECTION LIBRARY UTILITY ROUTINE	ANL	3600	F63	RSBP	T M	\$XLIBIT,	181
X-SECTION MANIPULATION	ANL	360	F4	RSBPL	CT L	\$ARC-XSEC1, MICROSCOPIC	594
X-SECTION TAPE	GGA	7044	F+MAP	RSBP	M	\$UNPACK, RETRIEVAL FROM SCISRS	206
X-SECTION TAPES	GGA	7044	F+SPS	RSBP	T N	\$CROSSPLOT, SC4020 PLOTS FROM	207
X-SECTION TAPES	WANL	7094	F+FAP	RSBPL	T N	\$CPS, SC4020 PLOTS FROM SCISRS	239
X-SECTIONS	AI	7090	F+FAP	RS	L T B	\$QUICKIE, INFINITE MEDIUM SPECTRUM	119
X-SECTIONS	LASL	7090	FLOCO	RS P	B	\$ZOT, GROUP-COLLAPSING OF MULTI-GP	113
X-SECTIONS	AI	7090	F+FAP	RS PL	T B	\$TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS	AI	7094	F2	RS P	T A	\$2PLUS, NON-SPHERICAL OPTICAL MODEL	254
X-SECTIONS	ANL	3600	F63	RSBP	T A	\$2PLUS, NON-SPHERICAL OPTICAL MODEL	254
X-SECTIONS	BHSC	360	F4	RS PL	T B	\$TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS	BNL	6600	F4	RS P	A	\$RAMPL, REICH-MOORE RESOLVED REGION	492
X-SECTIONS	BNL	6600B	F4	RS P	A	\$THRES2, STATISTICAL MODEL REACTION	504
X-SECTIONS	CDC	1604	F63	RS PL	T B	\$TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS	GGA	1108	F5	RS P	T B	\$ENDFB2, GAND2, GFE2, ENDF/B TO GAFGAR	596
X-SECTIONS	NED	635	F4	RS P	T B	\$REAX, RESOLVED RESONANCE EPITHERMAL	257
X-SECTIONS	WAPD	6600	F4	RS P	T B	\$ETOM1, ENDF/B FORMAT TO MUFT FORMAT	436
X-SECTIONS FAST THERMAL SPECTRA	GGA	1108B	F4	RS PLXCT	B	\$GGC4, MULTI-GP	298
X-SECTIONS FAST THERMAL SPECTRA	WANL	6600	F4	RS	L T B	\$GGC4, MULTI-GP	298
X-SECTIONS FOR GAMMA-RAYS	GEC	7094	F4	RS P	B	\$GAMMA-P, PRODUCTION	235
X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL	7094	F4	RS P	A	\$EXT,	238
X-SECTIONS HEX LATTICE	GGA	1108	F4	RS	B	\$HEXSCAT, ELASTIC SCAT	291
X-SECTIONS PARAMETERS	AI	7094	F+FAP	RS PL	T B	\$GRAVE, GROUP-AVERAGING	162
XDTRAP, HYDROGEN PERMEATION WITH TRAPPING	DP	360	F4	RSBP	Q	\$	655
XENON OSCILLATION	CEND	360	F4	RS P X T	F	\$CEXE, INCXE, 1-GP 3-D XYZ	415
XENON TRANSIENT & DEPLETION	KAPL	6600	F4	RS P	T D	\$3DXT, DEP3, 3-D	R477
XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	ORNL	360	F4	RSBP XCT	B	\$	572
XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	3600	F63	RSBP	T M	\$	181
XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	6600	F+COM	RS P	T Q	\$INDX,	609
XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	ORNL	360	F4	RSBP XCT	B	\$XLACS,	572
XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	360	F4	RS PLX	T B	\$	393
XSEC CALC	KAPL	6600	F4	RS P	A	\$MULTI, MULTI-LEVEL RESONANCE THEORY	R535
XSEC LIBRARY MAINTENANCE	NED	635	F4	RS P	T M	\$TROUT, MUG MULTIGROUP	493
XSEC LIBRARY MAINTENANCE	NED	1108	F5	RS P	T M	\$TROUT, MUG MULTIGROUP	493
XSEC PROBABILITY TABLES	AI	360	F+BAL	RS P	CT A	\$U3R, UNRESOL RESONANCE	553
XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL	6600	BCD	R	LX T Z	\$LASL	532
XSECS. FROM B-W PARAMETERS	GGA	1108	F5	RS P	CT A	\$FSDP3, POINTWISE	216
XSECTION CODES	BNL	6600B	F4	RS P	T A	\$RESEND, ADLER, ENDF/B RESONANCE	465
XY GEOM	AGC	7090	FLOCO	RSBP	C	\$2DXY, 2-D MULTI-GP SN APPROXIMATION	18
XY RZ GEOMETRY	GGA	1108	F+BAL	RS P	T C	\$GAMBLE5, 2-D MULTI-GP DIFFUSION	222
XY RZ GEOMETRY	GGA	7044	F+MAP	RSBP	T C	\$GAMBLE4, 2-D MULTI-GP DIFFUSION	222
XY RZ RTH	WANL	7094	F4	RS P X T	C	\$VARI-QUIR3, 2-D MULTI-GP DIFFUSION	264
XY RZ RTH	LASL	7600	F4	RS P	T C	\$TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT	573
XY RZ RTHETA	LASL	3600	F4	RSBP	CT C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT	358
XY RZ RTHETA	LASL	6600D	F4	RS P	T C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT	358
XY RZ RTHETA	LASL	7600D	F4	RS P	T C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT	358
XY RZ RTHETA GEOMETRY	BNW	1108	F4	RS P	C	\$PERT4, 2-D PERTURBATION	304
XY, RZ	GGA	1108	F+BAL	RS P	T D	\$BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP	438
XYZ GEOMETRY	CDC	1604	F63	RS P	T C	\$WHIRLAWAY, 3-D 2-GROUP DIFFUSION	32
XYZ GEOMETRY	ORNL	7090	F2	RS P	T C	\$WHIRLAWAY, 3-D 2-GROUP DIFFUSION	32
XYZ R-THETA-Z	LASL	6600	F4	RS P	T D	\$3DDT, 3-D MULTIGROUP DIFFUSION	463
XYZ XENON OSCILLATION	CEND	360	F4	RS P X T	F	\$CEXE, INCXE, 1-GP 3-D	415

Y)

1-D

1) KAPL 6600 F+C+D RS P T P \$DATATRAN2, UTILITY PLOT MODULES, F(X) & F(X),	407
JANKEE-FUEL TEMPERATURE CALC. ORNL 1604 F2 RS P Q \$BIGDEAL, SPENT	549
YIELD FROM REACTION OR DECAY ORNL 1604 F63 RS P D \$ISOTOPES, MAXIMUM	179
ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS LASL 7090 FLOCO RS P B \$	113
ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES GGA 1108 BIN R L T Z \$	356
ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC GGA 7090 F+FAP RSB T A \$	41
1- & 2-CELL ANALYSIS AI 360 F4 RS P T G \$SOFIRE2, SODIUM POOL FIRE	559
1-D & 2-D FEW-GROUP SPACE-TIME KINETICS BCL 6400 F4 RS P T F \$ADEP,	494
1-D AGE-DIFFUSION SLAB CYLINDER SPHERE AEB 360 F4 RS L T C \$FIRE5,	9
1-D AND 2-D MULTI-GP DIFFUSION PROGRAM AAEC 360 F+BAL RS P T C \$GRAM,	103
1-D AND 2-D MULTI-GP DIFFUSION PROGRAM UK-R 7090 F+FAP RSBPL T C \$GRAM,	103
1-D BURNUP POWER DISTRIBUTION SEARCH GGA 1108 F4 RS P T C \$GASP7,	319
1-D DIFFUSION FAST X-SECTION GENERATION ANL 360 F+BAL RSBP XCT B \$IDX,	374
1-D DIFFUSION FAST X-SECTION GENERATION BNW 1108 F4 RS P X T B \$IDX,	374
1-D FAST REACTOR DESIGN & SURVEY STUDY BW 6600 F+COM RS P X T D \$FARED,	427
1-D FEW-GP DIFFUSION DEPLETION GGA 7044 F4 RS P T D \$RELOAD-FEVER,	221
1-D FEW-GP DIFFUSION DEPLETION PROGRAM ANC 360 F4 RSBP CT D \$OWARF,	579
1-D FEW-GP DIFFUSION DEPLETION PROGRAM GGA 7090 F2 RSB T D \$FEVER,	117
1-D FEW-GP DIFFUSION DESIGN SYSTEM AI 360 F4 RSBP T K \$THREDES,	273
1-D FEW-GP DIFFUSION POWER DIST SEARCH GGA 7044 F4 RS P T C \$GASP2,	220
1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE AI 7090 F2 RS P T C \$FOG,	28
1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE BC 625 F4 RS T C \$FOG,	28
1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE CDC 1604 F63 RS P T C \$FOG,	28
1-D FEW-GP DIFFUSION TEMP COEF CALC GGA 7044 F4 RS P T C \$TEMCO,	225
1-D FEW-GP SN APPROXIMATION CYLINDER PPCO 7040 F4 RS P T C \$TOPIC,	148
1-D FEW-GP SN APPROXIMATION CYLINDER PPCO 7090 F2 RS P T C \$TOPIC,	148
1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM PPCO 7090 F2 RS P C \$MIST,	59
1-D MULTI-GP DIFFUSION & INVENTORY ANL 360 F4 RSBP CT C \$ARC-DIFID,	626
1-D MULTI-GP DIFFUSION & LIB. AI 360 F4 RSBPLX T C \$CAESAR4,LIBLST,	270
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE BNW 1107 F4 RS P T C \$HFN,	241
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE AI 7090 F+FAP RS L T C \$FAIM,	120
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE AI 7090 F+FAP RS PL T C \$AIM6,	29
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE CDC 1604 F63 RS PL T C \$AIM6,	29
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE CDC 1604 F63 RS PLX T C \$FAIM,	120
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE OSUC 370 F4 RS PL CT C \$AIM6,	29
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE AI 7090 F+FAP RS L T C \$ULCER,	118
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE ANL 3600 F36 RS P X T C \$MACH1,	262
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE MTS 360 F4 RSBPLXCT C \$MACH1,	262
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE PURD 6500 F4 RS PLX T C \$MACH1,	262
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE BHSC 360 F4 RS P T C \$FAIMOS,	120
1-D MULTI-GP DISCRETE ORDINATE CALC AI 7090 F2 RS PLX T C \$DTF2,	151
1-D MULTI-GP DISCRETE ORDINATE CALC AI 360 F4 RSBPLX T C \$ANISN,	151
1-D MULTI-GP DISCRETE ORDINATE CALC ANL 3600 F36 RS P T C \$SNARG-1D,	288
1-D MULTI-GP DISCRETE ORDINATE PROGRAM ANL 360 F+BAL RS P T C \$DTF4,	209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM BC 625 F+MAP RS P T C \$DTF4,	209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM LASL 6600 F4 RS P T C \$DTF4,	209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM LASL 7030 F4 RS P T C \$DTF4,	209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM LER 7094 F4 RS P T C \$DTF4,	209
1-D MULTI-GP DOUBLE SN APPROX BNW 7090 FLOCO RSBP T C \$GE-HAPO-S13,	75
1-D MULTI-GP DTF4 WITH DEPLETION LASL 7030 F4 RS P T D \$DTF-BURN,	269
1-D MULTI-GP SN APPROX SLAB CYL SPHERE PW 1604 LAG1 RS P C \$MGDSN,	211
1-D MULTI-GP SN APPROX SLAB CYL SPHERE UK-W 7090 F2 RS P T C \$W-DSN,	132
1-D MULTIGP KINETICS WITH TEMP FEEDBACK GGA 1108 F4 RS P T F \$GAKIT,	370
1-D MULTIGROUP DIFFUSION AND DEPLETION GGA 1108 F4 RS P T D \$FEVER7,	318
1-D MULTIGROUP DIFFUSION DEPLETION AI 360 F4 RSBP X T D \$SIZZLE,	58
1-D MULTIGROUP DIFFUSION DEPLETION AI 7090 F2 RS L T D \$SIZZLE,	58
1-D MULTIGROUP DIFFUSION DEPLETION CDC 1604 F63 RS L T D \$SIZZLE,	58
1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH ANC 360 F4 RSBP CT C \$MONA,	582
1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL GGA 1108 F+BAL RS P T C \$GAZE2,	430
1-D MULTIGROUP DISCRETE ORDINATE CALC UNC 1604 F63 RS PL T C \$DTF,	144
1-D MULTIGROUP REACTOR KINETICS PROGRAM ORNL 360 F4 RS P XCT E \$TASK,	558
1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK BNL 6600 F4 RS P T F \$NOAH,	405
1-D PERTURBATION FOR AIM AND FOG CODES AI 7090 F2 RS C \$PERT,	30
1-D PERTURBATION FOR AIM AND FOG CODES BHSC 360 F4 RS P C \$PERT,	30

1-D PERTURBATION FOR AIM AND FCG CODES	CDC	1604	F63	RS	C	\$PERT,	30
1-D PIPING ANL 360 F4 RS P	G	\$NATTRANSIENT,	FLUID HAMMER ANALYSIS				718
1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	3600	F36	RS P	XCT C	\$TESS,	513
1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P	T J	\$M0756,LETO,	R343
1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS	T C	\$M0648,	R342
1-D SPACE-TIME DIFFUSION W/FEEDBACK	BAPL	6600	F4	RS P	T F	\$WIGL3,	R708
1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	F4	RS P	F	\$RAUMZEIT,	R352
1-D TRANSPORT PERTURBATION THEORY	GGA	1108	F4	RS P	XCT C	\$CAPFRID,	606
1-D VARIATIONAL SENSITIVITY	ANL	360	F4	RSBPL	CT C	\$VARI-1D,	625
1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	F2	RS P	B	\$SAIL,	52
1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	F63	RS P	B	\$SAIL,	52
1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS	B	\$S4 CYL CELL CODE,	53
1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P	B	\$S4 CYL CELL CODE,	53
1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS P	T F	\$NOWIG,	R371
1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P	T F	\$WIGL2,	R274
1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P	T F	\$WIGL2,	R274
1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	F2	RS P	B	\$SAIL, 1-D	52
1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	F63	RS P	B	\$SAIL, 1-D	52
1-GP S4 APPROXIMATION	AI	7090	F2	FS	B	\$S4 CYL CELL CODE, 1-D	53
1-GP S4 APPROXIMATION	CDC	1604	F63	RS P	B	\$S4 CYL CELL CODE, 1-D	53
1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P	X T F	\$CEXE,INCEXE,	415
1-REGION KINETICS SNAP GEOMETRY	AI	7090	F2	RS	E	\$SNAPKIN5/5A,	122
1D & 2D SYSTEMS ANL 360 F4 RS P T G						\$NATRAN2, FLUID HAMMER ANALYSIS	719
1D MULTIGROUP TIME-DEPENDENT DIFFUSION	MIT	370	F4	RS P	T F	\$GAKIN2,	310
1DX HEDL 360 F4 RSBP XCT B						\$ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR	388
1DX HEDL 1108B F4 RS P X T B						\$ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR	388
1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	ANL	360	F+BAL	RSBP	XCT B	\$	374
1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	F4	RS P	X T B	\$	374
1GP DEPLETION NED 635 F+GMP RS P T D						\$SYN, 2D SYNTHESIS MULTIGP DIFF &	495
1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	360B	F+BAL	RS P	T B	\$PAFFLE,	392
10 MEV BC 625 F4 RS PLX T B						\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO	185
10 MEV BNW 1107 F4 RS PL T B						\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO	185
10 MEV BNW 7090 F+FAP RS PL T B						\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO	185
10 MEV UVAC 6400 F4 RS PLX T B						\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO	185
1107 F4 RS P T C						\$HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	241
1107 F4 RS PL T B						\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	185
1108 BIN R L T Z						\$ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES	356
1108 COROL RS P M						\$HECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	P589
1108 F+BAL RS P T C						\$GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	222
1108 F+BAL RS P T C						\$GAMTRI, 2-D MULTI-GP DIFFUSION TRIANGULAR MESH	401
1108 F+BAL RS P T C						\$GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	430
1108 F+BAL RS P T D						\$BUGTRI, 2D MULTIGP DIFFUSION & BURNUP TRI-MESH	439
1108 F+BAL RS P T D						\$BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	438
1108 F+BAL RS P T E						\$BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	303
1108 F+BAL RS P T D						\$GSSLRN18, LEAST SQUARES PHOTOPEAK SPECTRA CODE	BNW 457
1108 F+BAL RS P T U						\$LOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA 333
1108 F+BAL RSBP T M						\$SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA R607
1108 F+BAL RSBP T T						\$ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT BOARDS	SLA 681
1108 F+SLE RS P G						\$SAFTAC, MONTE CARLO FAULT TREE SIMULATION CODE	UNI 674
1108 F+SLE RS P XCT R						\$HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	HEDL 527
1108 F4 S T D						\$GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA 302
1108 F4 RS B						\$HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA 291
1108 F4 RS T G						\$GADOSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA 261
1108 F4 RS P A						\$GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	GGA 289
1108 F4 RS P A						\$GASKET, THERMAL SCATTERING LAW CALCULATION	GGA 263
1108 F4 RS P A						\$PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA 292
1108 F4 RS P C						\$PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW 304
1108 F4 RS P D						\$FREVP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA 301
1108 F4 RS P E						\$GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA 317
1108 F4 RS P E						\$GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA 290
1108 F4 RS P G						\$SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	HEDL 521
1108 F4 RS P I						\$SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA 300
1108 F4 RS P I						\$SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	GGA 252
1108 F4 RS P I						\$SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	GGA 253

1108

1604

1108	F4	RS	P	I	\$SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS	GGA	379		
1108	F4	RS	P	L	\$GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	296		
1108	F4	RS	P	T A	\$TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	410		
1108	F4	RS	P	T B	\$FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW	306		
1108	F4	RS	P	T C	\$BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	287		
1108	F4	RS	P	T C	\$GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	319		
1108	F4	RS	P	T C	\$GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	380		
1108	F4	RS	P	T C	\$TEMCO7, TEMPERATURE COEFFICIENT CALCULATION	GGA	320		
1108	F4	RS	P	T D	\$FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	318		
1108	F4	RS	P	T D	\$GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	339		
1108	F4	RS	P	T D	\$PWCGST, REACTOR FUEL CYCLE COST CALCULATION	GGA	441		
1108	F4	RS	P	T D	\$2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	325		
1108	F4	RS	P	T D	\$3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEDL	567		
1108	F4	RS	P	T F	\$GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	370		
1108	F4	RS	P	T F	\$WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	R274		
1108	F4	RS	P	T G	\$PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	528		
1108	F4	RS	P	T H	\$DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	440		
1108	F4	RS	P	T I	\$SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	332		
1108	F4	RS	P	T J	\$MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	259		
1108	F4	RS	P	CT D	\$OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	226		
1108	F4	RS	P	X A	\$COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	385		
1108	F4	RS	P	X T B	\$GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	316		
1108	F4	RS	P	X T B	\$IDX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	374		
1108	F4	RS	P	X T L	\$GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GGA	345		
1108	F4	RS	P	XCT C	\$GAPER1D, 1-D TRANSPORT PERTURBATION THEORY	GGA	606		
1108	F4	RS	P	XCT D	\$CONCEPT3, POWER PLANT CONCEPTUAL COST ESTIMATE	GGA	498		
1108	F4	RS	PLX	T B	\$HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	467		
1108	F5	RS	P	A	\$FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	247		
1108	F5	RS	P	H	\$FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	395		
1108	F5	RS	P	T B	\$ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS	GGA	596		
1108	F5	RS	P	T C	\$2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GGA	173		
1108	F5	RS	P	T D	\$DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNW	456		
1108	F5	RS	P	T H	\$TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	408		
1108	F5	RS	P	T H	\$TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	414		
1108	F5	RS	P	T I	\$SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	GGA	451		
1108	F5	RS	P	T I	\$SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	GGA	452		
1108	F5	RS	P	T M	\$TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	493		
1108	F5	RS	P	T N	\$GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT	GGA	471		
1108	F5	RS	P	T O	\$CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GGA	476		
1108	F5	RS	P	T R	\$TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HEDL	599		
1108	F5	RS	P	CT A	\$FSDP3, POINTWISE XSECS. FROM B-W PARAMETERS	GGA	216		
1108	F5	RS	P	CT H	\$REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW	483		
1108	F5	RS	P	X T D	\$PACTOLUS,CLOTHO, NUCLEAR POWER PLANT COST CODE	HEDL	540		
1108	F5	RS	P	X T F	\$NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	488		
1108	F5	RS	PLX	T B	\$BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	184		
1108	F5	RSBPL	T	D	\$ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	367		
1108A	F4	RS	P	T H	\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	R299		
1108B	F4	RS	P	T A	\$GANDY3, UNRESOLVED RESONANCE X-SECTION CALC	GGA	341		
1108B	F4	RS	P	T H	\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	FW	R299		
1108B	F4	RS	P	X T B	\$ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR IDX	HEDL	388		
1108B	F4	RS	PLXCT	B	\$GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	298		
1108B	F5	S	P	X T P	\$FUNPACK2, SPECIAL FUNCTION ROUTINES	ANL	610		
1108B	F5	RS	PLX	T B	\$LEOPARD,SPOTS, SPECTRUM CALC WITH DEPLETION	JNC	279		
1110B	F4	RS	P	X T P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	534		
14.5-14,500PSIA	32-472DEGF	BAPL	6600	F4	RS	T H	\$WATER, STEAM TABLES	R267	
14.5-2538 PSIA		ANL	1604	F63	RS	P	H	\$M0899,HOH, STEAM TABLES	R294
14.5-2538 PSIA		BAPL	6600	F4	RS	P	T H	\$M0899,HOH, STEAM TABLES	R294
1604	F+CDP	RS	P	T	P	\$LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET	PW	186	
1604	F+CDP	RS	P	X T	B	\$FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	195	
1604	F2	RS	P		Q	\$BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC.	ORNL	549	
1604	F63	RS			C	\$PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	30	
1604	F63	RS			C	\$TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT	PW	199	
1604	F63	RS			C	\$2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	173	
1604	F63	RS			I	\$WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	190	

1604	F63	RS	L	\$CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	19
1604	F63	RS	L	\$CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW	195
1604	F63	RS	T C	\$2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW	192
1604	F63	RS L T	D	\$SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	58
1604	F63	RS P	A	\$HAFEVER, HAUSER-FESHBACH INELASTIC SCATTERING	CDC	14
1604	F63	RS P	A	\$PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL	334
1604	F63	RS P	A	\$RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL	335
1604	F63	RS P	B	\$SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	52
1604	F63	RS P	B	\$S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	53
1604	F63	RS P	D	\$ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	180
1604	F63	RS P	D	\$ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	322
1604	F63	RS P	D	\$ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	179
1604	F63	RS P	D	\$POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL	340
1604	F63	RS P	E	\$AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	121
1604	F63	RS P	E	\$CMPXMAT, TRANSFER FUNCTION EVALUATION	PW	188
1604	F63	RS P	F	\$AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH	PW	191
1604	F63	RS P	G	\$CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	47
1604	F63	RS P	H	\$M0899, HOH, STEAM TABLES 14.5-2538 PSIA	ANL	R294
1604	F63	RS P	J	\$GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	45
1604	F63	RS P	J	\$GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	46
1604	F63	RS P	L	\$SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC	PW	189
1604	F63	RS P T	A	\$JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	ORNL	308
1604	F63	RS P T	C	\$EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CDC	87
1604	F63	RS P T	C	\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	28
1604	F63	RS P T	C	\$FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ	PW	161
1604	F63	RS P T	C	\$WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	32
1604	F63	RS P T	C	\$20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	40
1604	F63	RS P T	I	\$PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	187
1604	F63	RS PL T	A	\$ARES2, RESONANCE INTEGRAL X-SECTION CALC	CDC	89
1604	F63	RS PL T	B	\$FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	51
1604	F63	RS PL T	B	\$STEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	50
1604	F63	RS PL T	C	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	29
1604	F63	RS PL T	C	\$DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	UNC	144
1604	F63	RS PLX T	B	\$GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	33
1604	F63	RS PLX T	C	\$FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	120
1604	LAG1	RS P	C	\$MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW	211
1604	LAG1	RS P	N	\$DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW	210
18- 24- AND 25-GROUP SETS	LASL	6600	BCD R	LX T Z \$LASL XSEC SETS, SN		532
1962 SOLAR DATA	SLA	6600	BIN R	L T Z \$SOLATABQ62, ALBUQUERQUE		693
1962 SOLAR DATA	SLA	6600B	BCD R	L T Z \$SOLATABQ62, ALBUQUERQUE		693
1967 ASME STEAM AND WATER PROPERTIES	BG&E	360C	F4	RS T H \$STEAM-67,		487
2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	F4	RS T H \$RATH,		242
2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7094	F4P	RS P T H \$RATH,		242
2-CELL ANALYSIS AI	360	F4	RS P T	G \$SOFIRE2, SODIUM POOL FIRE 1- &		559
2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	F+CCM	RS P T I \$DUZ2,		R503
2-D BODIES BNL	6600	F4	RS P T	I \$SAFE-PLANE, PLANE STRESS ANALYSIS,		252
2-D BODIES GGA	1108	F4	RS P	I \$SAFE-PLANE, PLANE STRESS ANALYSIS,		252
2-D CONTOUR PLOTS & AREA CALCULATION	SLA	6600	F4	RS P P \$PLOTR,		R578
2-D DESIGN PROGRAMS	LASL	7090	F+FAP	RS P T L \$DPC, DATA PREPARATION FOR		234
2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS T B \$M0807,		R280
2-D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P T D \$PHENIX,		454
2-D EXCURSION CALCULATION RZ GEOMETRY	APDA	7094	F4	RS P F \$MARS,		293
2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP	RSBP T D \$DOB,		99
2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS P T D \$GAUGE,		339
2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LLL	709	F2	RS C \$FIRN,		7
2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P T D \$PDQ5,		R336
2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	360B	F+BAL	RSBP T D \$PDQ5,		R336
2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	1604	F63	RS P T C \$20GRAND,		40
2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	F2	RS P T C \$20GRAND,		40
2-D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	F4	RS P T F \$ADEP, 1-D &		494
2-D FEW-GROUP TRANSPORT WITH DEPLETION	BAPL	7600	F+COM	RS P T D \$TPT01,		R669
2-D FLUX SETS	FBRD	H600	F4	RS P CT C \$TRIAL, 3-D REACTION RATES FROM		585
2-D HEAT TRANSFER	GGA	1108	F+BAL	RS P T E \$BLOOST6, COMBINED KINETICS		303
2-D HEAT TRANSFER	GGA	7044	F+MAP	RS P T H \$BLOOST5, POINT-KINETICS WITH		205

2-D

2-GROUP

2-D HETEROGENEOUS REACTOR CALCULATION	DP	3608	F4	RSBP	CT	C	\$PERESY3,	136
2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	F4	RS	P	CT	F \$REXCO-H,	550
2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	F4	RS	P	CT	F \$REXCO-H2,	R615
2-D INELASTIC STRUCTURAL ANALYSIS	ORNL	360	F4	RS	P	T	I \$CREEP-PLAST,	R707
2-D INPUT GEN KAPL 6600 F+C+D	RS	P	T	L	\$DATATRAN2,	RADI	GEOMETRY	MODULES
2-D LAGRANGIAN EQNS OF MOTION SOLUTION	SLA	3600	F36	RS	P	T	S \$TOODY2,	627
2-D LMFBF POWER EXCURSION DISASSEMBLY	ANL	360	F4	RS	P	XCT	F \$VENUS,	511
2-D MONTE CARLO CELL CALCULATION	AI	360	F+BAL	RS	P	X	T B \$HWOCR-SAFE,	307
2-D MULTI-GP DIFFUSION	UMCC	360	F4	RS	P	T	C \$VARI-QUIR, TIME-DEP	212
2-D MULTI-GP DIFFUSION	WANL	6600	F4	RS	P	T	C \$VARI-QUIR, TIME-DEP	212
2-D MULTI-GP DIFFUSION DEPLETION CODE	ORNL	7090	F+FAP	RS	P	T	D \$ASSAULT,	240
2-D MULTI-GP DIFFUSION PROGRAM	AAEC	360	F+BAL	RS	P	T	C \$GRAM, 1-D AND	103
2-D MULTI-GP DIFFUSION PROGRAM	ORNL	7090	F+FAP	RS	P	T	C \$EXTERMINATOR,	156
2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7090	F+FAP	RSBP	T	C	\$GRAM, 1-D AND	103
2-D MULTI-GP DIFFUSION PROGRAM	BC	625	F4	RS	T	C	\$EXTERMINATOR2,	156
2-D MULTI-GP DIFFUSION PROGRAM	CEND	6600	F4	RS	P	T	C \$EXTERMINATOR2,	156
2-D MULTI-GP DIFFUSION PROGRAM	ORNL	360	F4	RS	P	T	C \$EXTERMINATOR2,	156
2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	635	F4	RS	PL	T	C \$BISYN,	287
2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	1108	F4	RS	P	T	C \$BISYN,	287
2-D MULTI-GP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	RS	P	T	C \$GAMTRI,	401
2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	F+BAL	RS	P	T	C \$GAMBLE5,	222
2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	F+MAP	RSBP	T	C	\$GAMBLE4,	222
2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	7094	F4	RS	P	X	T C \$VARI-QUIR3,	264
2-D MULTI-GP DISCRETE ORDINATE CODE	GGA	1108	F5	RS	P	T	C \$2DF,	173
2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	F63	RS			C \$2DF,	173
2-D MULTI-GP SN APPROXIMATION RZ	PW	1604	F63	RS	P	T	C \$FORTRAN TDC,	161
2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090	FLOCO	RSBP			C \$2DXY,	18
2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	3600	F4	RSBP	CT	C	\$TWOTRAN2,	358
2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	6600	F4	RS	P	T	C \$TWOTRAN2,	358
2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600	F4	RS	P	T	C \$TWOTRAN2,	358
2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA	1108	F+BAL	RS	P	T	D \$BUG2,	438
2-D MULTIGROUP DIFFUSION & SN THEORY	NED	635	F4	RS	P	T	C \$DOT2DB,	459
2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP	T	D	\$2DB,	325
2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	F4	RS	P	T	D \$2DB,	325
2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	F4	RS	P	T	D \$2DB,	325
2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	F+MAP	RS	P	T	C \$TDSN,	312
2-D NONLINEAR ANALYSIS	SLL	6600	F+COM	RS	P	T	I \$GNATS,MESH2,GPRINT,	682
2-D PARTICLE TRANSPORT XY RZ RTH	LASL	7600	F4	RS	P	T	C \$TWOTRAN-PNVW,	573
2-D PERTURBATION CALC FROM 2DF OUTPUT	GGA	1108	F5	RS	P	T	N \$GAPER2D,	471
2-D PERTURBATION TDC OR 2DXY FLUX INPUT	PW	1604	F63	RS			C \$TDP,	199
2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	1108	F4	RS	P		C \$PERT4,	304
2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS	P	T	H \$TOODEE,	349
2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	F4	RS	P	T	H \$HOT2,	R286
2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	F4	RSBP	CT	C	\$TRIPLET,	608
2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	F4	RS	P	T	C \$TRIPLET,	608
2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	F4	RS	P	T	C \$TRIPLET,	608
2-D 2-GP DIFFUSION CYLINDER SLAB	CDC	1604	F63	RS	P	T	C \$EQUIPOISE3A,	87
2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	7090	F2	RS	P	T	C \$EQUIPOISE3A,	87
2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS	P		F \$TWIGGLE,	R338
2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS	P	T	F \$TWIGL,	R338
2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	7090	F2	RS	P	T	C \$EQUIPOISE3,	39
2-D 2-PHASE FLOW	AI	7094	F2	RS	P		H \$FLOW-MODEL, MULTI-CHANNEL	246
2-D 2-PHASE FLOW	MSS	360	F4	RS	P		H \$FLOW-MODEL, MULTI-CHANNEL	246
2-DIMENSIONAL HEAT CONDUCTION	ORNL	360	F4	RS	P	X	T H \$ORTHIS,ORTHAT,	525
2-GP DIFFUSION CYLINDER SLAB	CDC	1604	F63	RS	P	T	C \$EQUIPOISE3A, 2-D	87
2-GP DIFFUSION CYLINDER SLAB	ORNL	7090	F2	RS	P	T	C \$EQUIPOISE3A, 2-D	87
2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS	P	T	F \$NOWIG, 1-D	R371
2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS	P		F \$TWIGGLE, 2-D	R338
2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS	P	T	F \$TWIGL, 2-D	R338
2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS	P	T	F \$WIGL2, 1-D	R274
2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS	P	T	F \$WIGL2, 1-D	R274
2-GROUP DIFFUSION SLAB CYL	ORNL	7090	F2	RS	P	T	C \$EQUIPOISE3, 2-D	39
2-GROUP DIFFUSION XYZ GEOMETRY	CDC	1604	F63	RS	P	T	C \$WHIRLAWAY, 3-D	32
2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	F2	RS	P	T	C \$WHIRLAWAY, 3-D	32

2-PASS ASSEMBLER FOR THE PDP-11 ON 360	ANC	360	PL1	RS	P	T	P	\$PTAC11,	5.		
2-PHASE FLOW	AI	7094	F2	RS	P			H \$FLOW-MODEL, MULTI-CHANNEL 2-D	246		
2-PHASE FLOW	MSS	360	F4	RS	P			H \$FLOW-MODEL, MULTI-CHANNEL 2-D	246		
2-REG CELL	ANL	3600	F36	RSBP	X	T	B	\$RIFF-RAFF, RESONANCE INTEGRAL CALC	213		
2D MULTIGP DIFFUSION & BURNUP TRI-MESH	GGA	1108	F+BAL	RS	P	T	D	\$BUGTRI,	439		
2D SYNTHESIS MULTIGP DIFF & IGP DEPLETION	NED	635	F+GMP	RS	P	T	D	\$SYN,	495		
2D SYSTEMS	ANL	360	F4	RS	P	T	G	\$NATRAN2, FLUID HAMMER ANALYSIS 1D &	719		
2D TIME-DEP FUEL ELEM STUDY	NRC	370	F4	RSBP	CT	G		\$WREM-TOODEE2/MOD3,	712		
2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION		ANL	3600	F4	RSBP	T	D	\$	325		
2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION		BNW	1108	F4	RS	P	T	D	\$	325	
2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION		LASL	6600	F4	RS	P	T	D	\$	325	
2DF OUTPUT	GGA	1108	F5	RS	P	T	N	\$GAPER2D, 2-D PERTURBATION CALC FROM	471		
2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE		GGA	1108	F5	RS	P	T	C	\$	173	
2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE		UNC	1604	F63	RS			C	\$	173	
2DXY FLUX INPUT	PW	1604	F63	RS				C	\$	199	
2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM		AGC	7090	FLOCD	RSBP			C	\$	18	
2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL		PW	1604	F63	RS			T	C	\$	192
2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS		AI	7094	F2	RS	P	T	A	\$	254	
2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS		ANL	3600	F63	RSBP	T	A	\$	254		
20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER		CDC	1604	F63	RS	P	T	C	\$	40	
20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER		ORNL	7090	F2	RS	P	T	C	\$	40	
2000 F2	RS	P	A	\$DGP1E, RESOLVED RESONANCE X-SECTION CALC				NED	177		
2000 F2	RS	P	A	\$RAPTURE, RESONANCE INTEGRAL X-SECTION CALC				NED	176		
2000 F2	RS	P	B	\$SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS				NED	178		
2000 F4	RS		A	\$STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION				BW	305		
2000 F4	RS	P	T	F	\$FORE, FAST REACTOR EXCURSION CALCULATIONS			NED	174		
230 F4	RS	P	T	B	\$CLUP77, SQUARE CELL COLLISION PROBABILITY CALC			JAER	526		
24- AND 25-GROUP SETS	LASL	6600	BCD	R	LX	T	Z	\$LASL XSEC SETS, SN 18-	532		
25-GROUP SETS	LASL	6600	BCD	R	LX	T	Z	\$LASL XSEC SETS, SN 18- 24- AND	532		
3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	F4	RS	P	T	I	\$SAFE-3D,	332		
3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL	360	F+BAL	RS	P	T	I	\$SAFE-3D,	332		
3-D DIFFUSION DEPLETION MULTI-GP	ORNL	3601	F4	RS	P	T	K	\$CITATION, 1,2,	387		
3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS	P	T	C	\$GATT,	380		
3-D FEW-GP DIFFUSION DEPLETION	ANC	360G	F+BAL	RS	P	XCT	D	\$PDQ7, 1,2 OR	R275		
3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600A	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR	R275		
3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600C	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR	R275		
3-D FEW-GP DIFFUSION DEPLETION	BCSS	6600D	F+ASC	R	B	T	D	\$PDQ7, 1,2 OR	R275		
3-D FEW-GP DIFFUSION DEPLETION	BW	6600B	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR	R275		
3-D FINITE-ELEMENT ELASTIC ANALYSIS	BAPL	6600	F+CCM	RS	P	X	T	I	\$MATUS,	R597	
3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	F4	RS		T	H	\$RATH, 2- OR	242		
3-D HEAT CONDUCTION LUMPED MASS	LASL	7094	FAP	RS	P	T	H	\$RATH, 2- OR	242		
3-D HEAT CONDUCTION PROGRAM	ORNL	360B	F4	RS	P	T	H	\$HEATING3, 1,2, OR	517		
3-D HEAT TRANSFER PROGRAM	GGA	1108	F5	RS	P	T	H	\$TAC3D, TRANSIENT	414		
3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW	1604	F63	RS		T	C	\$2DXYL,	192		
3-D MULTIGROUP DIFFUSION	ORNL	360	F+BAL	RS	P	CT	C	\$VENTURE, 1, 2, OR	686		
3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS	P	CT	D	\$3DB,	567		
3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEDL	1108	F4	RS	P	T	D	\$3DB,	567		
3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS	P	T	D	\$3DDT,	463		
3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	360	F4	RS	P	T	N	\$PLOT-3D,	544		
3-D REACTION RATES FROM 2-D FLUX SETS	FBRD	H600	F4	RS	P	CT	C	\$TRIAL,	585		
3-D REACTIVITY AND POWER DISTRIBUTION	CDC	3600	F63	RSBP	T	C		\$FLARE,	167		
3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360	F4	RS	P	CT	C	\$FLARE,	167		
3-D REACTIVITY AND POWER DISTRIBUTION	NED	635	F4	RS	P	T	C	\$FLARE,	167		
3-D STRUCTURAL ANALYSIS	GGA	1108	F5	RS	P	T	I	\$SHELL5, THIN SHELL	452		
3-D STRUCTURES	KAPL	6600	F4	RS	P	X	I	\$FINEL, FINITE-ELEMENT STUDY 2,	R404		
3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108A	F4	RS	P	T	H	\$LION4,	R299		
3-D TEMPERATURE DISTRIBUTION PROGRAM	FW	360	F4	RS	P	CT	H	\$LION4,	R299		
3-D TEMPERATURE DISTRIBUTION PROGRAM	FW	1108B	F4	RS	P	T	H	\$LION4,	R299		
3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	6600	F+ASC	RS	P	T	H	\$LION4,	R299		
3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP	T	H		\$THTE,	346		
3-D TWO-PHASE FLOW	BAPL	7600B	F4	RS	P	T	H	\$FLOW3, NETWORK ANALYSIS OF	R664		
3-D XENON TRANSIENT & DEPLETION	KAPL	6600	F4	RS	P	T	D	\$3DXT,DEP3,	R477		
3-D XYZ XENON OSCILLATION	CEND	360	F4	RS	P	X	T	F	\$CEXE,INCEXE, 1-GP	415	
3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	1604	F63	RS	P	T	C	\$WHIRLAWAY,			

3-D

360

3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	F2	FS P	T C	\$WHIRLAWAY,	32
3-GEOM BAPL 6600 F4 RS P T F \$WIGL2,	1-D 2-GP SPACE-TIME DIFFUSION						R274
3-GEOM GGA 1108 F4 RS P T F \$WIGL2,	1-D 2-GP SPACE-TIME DIFFUSION						R274
3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P	CT D	\$	567
3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEOL	1108	F4	RS P	T D	\$	567
3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	FS P	T D	\$	463
3DXT, DEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	F4	RS P	T D	\$	R477
30-GP ENDF/B SCAT KERNELS	DP	360	BCD	R	LX T Z	\$THERMOS LIBRARY,	543
32-472DEGF BAPL 6600 F4 RS T H \$WATER,	STEAM TABLES 14.5-14,500PSIA						R267
36F RS PL CT F \$QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	3600					474
36F RSBP T M \$MERMC2, MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	3600					472
360 BAL RS CT P \$SLACMON 2.2, OS360 MVT/MFT PERFORMANCE MONITOR	SLAC						635
360 BAL RSB T P \$NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC						519
360 BAL+F RS P CT P \$GETCOR, FRECOR, FORTRAN DYNAMIC STORAGE ALLOC	ORNL						644
360 BCD R LX T Z \$THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS	DP						543
360 C+BAL RS PL CT M \$JOURNAL CONTROL, LIBRARY JOURNAL MANAGEMENT	ORNL						660
360 COROL RS P M \$AEC-ALO FAU, RADIO FREQUENCY MANAGEMENT SYSTEM	ALOD						587
360 COBOL RSBP CT M \$BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA						R589
360 F RSBP T P \$STFODE, COLODE, COLLOCATION SOLN OF STIFF ODE'S	ANL						652
360 F+BAL S T M \$JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP						490
360 F+BAL S X T B \$BRAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP						536
360 F+BAL RS T P \$AMOLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F	ANL						563
360 F+BAL RS T P \$FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	AI						484
360 F+BAL RS P D \$ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL						322
360 F+BAL RS P D \$OMCST, POWER PLANT NON-FUEL O & M COST STUDY	ORNL						688
360 F+BAL RS P I \$ELBOW-ORNL, PIPE STRESS & FLEXIBILITY CALC	ORNL						650
360 F+BAL RS P T A \$COMNUC, CASCADE, COMPOUND NUCLEUS REACTION	AI						482
360 F+BAL RS P T C \$CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC						103
360 F+BAL RS P T C \$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL						209
360 F+BAL RS P T D \$CINDER, MO102, POINT DEPLETION FISSION PRODUCT	DP						313
360 F+BAL RS P T D \$ORCOST2, POWER PLANT CAPITAL COST ESTIMATING	OPNL						588
360 F+BAL RS P T E \$AIRQS2A, SIMULATION OF REACTOR DYNAMICS	AI						326
360 F+BAL RS P T G \$COMCAN, SYSTEM SAFETY COMMON CAUSE ANALYSIS	ANC						704
360 F+BAL RS P T I \$LINDA, EVALUATION OF STRAIN-GAGE DATA	OPNL						657
360 F+BAL RS P T J \$SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL						332
360 F+BAL RS P CT A \$U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI						553
360 F+BAL RS P CT C \$VENTURE, 1, 2, OR 3-D MULTIGROUP DIFFUSION	ORNL						686
360 F+BAL RS P CT H \$6KILER, CORE HEATUP CODE FOR BWR/6 ANALYSIS	EI						636
360 F+BAL RS P X T B \$HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI						307
360 F+BAL RS P X T D \$ORSIM, OPTIMIZING UTILITY GENERATION PLANNING	OPNL						699
360 F+BAL RS P X T H \$FRAP-S1, STEADY STATE ANALYSIS OXIDE FUEL RODS	ANC						694
360 F+BAL RS P XCT B \$HAMMER, LITHE, HELP, CRITICAL ANALYSIS SYSTEM	DP						277
360 F+BAL RSB L CT M \$SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI						375
360 F+BAL RSBP CT M \$ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL						522
360 F+BAL RSBP XCT B \$1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	ANL						374
360 F+BAL RSBP XCT G \$FRAP-T, TRANSIENT ANALYSIS OF OXIDE FUEL RODS	ANC						658
360 F+BAL RSBPL CT B \$RAFFLE2/MOD2, MONTE CARLO NEUTRON TRANSPORT	ANC						631
360 F+BAL RSBPL CT C \$ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL						523
360 F+BAL RSBPL CT G \$SPARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC						555
360 F+BAL RSBPLXCT G \$CONTEMPT-LT/026, PRESSURE-TEMPERATURE RESPONSE	ANC						433
360 F+C+R RSBP T M \$RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMO						G603
360 F+COB RSBP XC P \$RANDOM SAMPLING TABLE, FOR NON-BIAS ORDERING	MLMO						679
360 F+P+A RS T P \$AMOLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E	ANL						562
360 F+P+A RS T P \$AMOLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL						564
360 F+P+A RSBP XCT W \$GAUSS6, BATCH ANALYSIS OF GAMMA-RAY SPECTRA	ANC						622
360 F4 RS M \$MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL						472
360 F4 RS T M \$RIGEL, ENDF/B V3 DATA PROCESSING CODE	ANL						571
360 F4 RS L T C \$FIRES, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB						9
360 F4 RS P A \$CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UICS						347
360 F4 RS P A \$POLLA, CONVERTS R-MATRIX RESONANCE PARAMETERS	ORNL						639
360 F4 RS P A \$PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	ENEA						292
360 F4 RS P A \$THRES2, STATISTICAL MODEL REACTION X-SECTION	ENEA						504
360 F4 RS P B \$WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB						362
360 F4 RS P C \$PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC						30

360	F4	RS	P	D	\$NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	ANL	146
360	F4	RS	P	E	\$AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	121
360	F4	RS	P	E	\$BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB	363
360	F4	RS	P	E	\$R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	255
360	F4	RS	P	E	\$R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	168
360	F4	RS	P	E	\$TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	489
360	F4	RS	P	F	\$TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	R338
360	F4	RS	P	G	\$CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	47
360	F4	RS	P	G	\$EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	DP	600
360	F4	RS	P	G	\$INTEG,INSPEC, MARKOV SIMULATION OF REACTOR OPN	DP	590
360	F4	RS	P	G	\$NAHAMMER, FLUID HAMMER ANALYSIS PIPING SYSTEM	ANL	717
360	F4	RS	P	G	\$NATRANSIENT, FLUID HAMMER ANALYSIS 1-D PIPING	ANL	718
360	F4	RS	P	G	\$SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	521
360	F4	RS	P	H	\$FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	246
360	F4	RS	P	H	\$MARGE/SLUMP, MAXIMUM TEMPERATURE LMFBR FUEL PIN	ANL	677
360	F4	RS	P	H	\$PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	DP	586
360	F4	RS	P	I	\$LUGS, STRESS FOR INTEGRAL ATTACHMENTS TO PIPE	ORNL	648
360	F4	RS	P	L	\$GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	530
360	F4	RS	P	O	\$ALPHA-M, RESOLUTION OF GAMMA-RAY SPECTRA	ORNL	413
360	F4	RS	P	O	\$CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	390
360	F4	RS	P	O	\$DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	R464
360	F4	RS	P	P	\$COMQC, QUALITY CONTROL DATA ANALYSIS ROUTINES	BKC	649
360	F4	RS	P	P	\$KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	ORNL	556
360	F4	RS	P	P	\$NIXLIN, LEAST SQUARES FIT TO NONLINEAR FORMS	DP	709
360	F4	RS	P	T	\$F0355, SHAPER CUTTER CONTOUR GENERATOR	ANL	697
360	F4	RS	P	U	\$DYNAMIC ANALYSIS OF GASES BY MASS SPECTROMETRY	RFD	645
360	F4	RS	P	U	\$SOLVEX, SOLVENT EXTRACTION PROCESS SIMULATION	DP	662
360	F4	RS	P	W	\$MMM3, COORDINATE ANALYSES SEMI-RIGID MOLECULES	ANC	632
360	F4	RS	P	X	\$TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	561
360	F4	RS	P	T A	\$ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL	417
360	F4	RS	P	T B	\$CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	526
360	F4	RS	P	T B	\$PRICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	453
360	F4	RS	P	T B	\$SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	ORNL	431
360	F4	RS	P	T C	\$EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	156
360	F4	RS	P	T C	\$FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BHSC	120
360	F4	RS	P	T C	\$KEFF,MGBS,TGAN, NUCLEAR CRITICALITY SAFETY	DP	617
360	F4	RS	P	T C	\$VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	212
360	F4	RS	P	T D	\$CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	354
360	F4	RS	P	T E	\$ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	486
360	F4	RS	P	T F	\$SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	400
360	F4	RS	P	T F	\$TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	309
360	F4	RS	P	T G	\$AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	172
360	F4	RS	P	T G	\$EMERALD REV. 1, PWR ACCIDENT ACTIVITY RELEASE	PGE	546
360	F4	RS	P	T G	\$EMERALD-NORMAL, PWR ACTIVITY RELEASE AND DOSE	PGE	685
360	F4	RS	P	T G	\$NATRAN2, FLUID HAMMER ANALYSIS 1D & 2D SYSTEMS	ANL	719
360	F4	RS	P	T G	\$SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	559
360	F4	RS	P	T H	\$ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	580
360	F4	RS	P	T H	\$ORCENT, NUCLEAR STEAM TURBINE CYCLE ANALYSIS	ORNL	703
360	F4	RS	P	T H	\$ORRIBLE, ROD BUNDLE FLOW & TEMPERATURE DIST.	ORNL	629
360	F4	RS	P	T I	\$CREEP-PLAST, 2-D INELASTIC STRUCTURAL ANALYSIS	ORNL	R707
360	F4	RS	P	T I	\$FLANGE-ORNL, ANALYSIS OF FLANGED JOINTS	ORNL	689
360	F4	RS	P	T I	\$SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	R402
360	F4	RS	P	T I	\$SEALSHL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	R282
360	F4	RS	P	T M	\$RECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	475
360	F4	RS	P	T N	\$PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	544
360	F4	RS	P	T Q	\$GROUP2, GROUP THEORY OF LATTICE DYNAMICS	ANL	620
360	F4	RS	P	T Q	\$RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC	AI	566
360	F4	RS	P	T R	\$SITE2, ENERGY FACILITY SITING ASSESSMENT	ANL	687
360	F4	RS	P	T U	\$SEPHIS, SOLVENT EXTRACTION PROCESS SIMULATION	ORNL	690
360	F4	RS	P	C G	\$STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	ORNL	583
360	F4	RS	P	CT A	\$JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	308
360	F4	RS	P	CT B	\$MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	355
360	F4	RS	P	CT C	\$FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	167
360	F4	RS	P	CT D	\$GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS	57

360

360B

360	F4	RS P CT D	\$30B, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	567
360	F4	RS P CT F	\$REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	550
360	F4	RS P CT F	\$REXCO-H2, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	R615
360	F4	RS P CT H	\$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	FW	R299
360	F4	RS P CT I	\$PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	542
360	F4	RS P CT L	\$QMESH, RENUM, SELF-ORGANIZING MESH GENERATION	ANL	612
360	F4	RS P CT M	\$ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	350
360	F4	RS P CT M	\$LASIP3, CCCC STANDARD INTERFACE FILE PROCESSOR	LASL	691
360	F4	RS P CT V	\$FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	ANL	577
360	F4	RS P CT W	\$MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	ANC	574
360	F4	RS P CT W	\$MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	575
360	F4	RS P X G	\$BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	435
360	F4	RS P X T E	\$MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGR	491
360	F4	RS P X T F	\$CEXE, INCEXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	415
360	F4	RS P X T F	\$FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	174
360	F4	RS P X T H	\$ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	525
360	F4	RS P X T P	\$EPISODE, ORDINARY DIFF EQUATION SYSTEM SOLVER	LLL	675
360	F4	RS P X T P	\$EPISODEB, SOLVE ODE SYST WITH BANDED JACOBIAN	LLL	705
360	F4	RS P XCT E	\$TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	ORNL	558
360	F4	RS P XCT F	\$VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	511
360	F4	RS PL T B	\$TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	50
360	F4	RS PL CT B	\$INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC	565
360	F4	RS PL CT F	\$QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	474
360	F4	RS PL CT M	\$ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC	518
360	F4	RS PLX T B	\$AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	147
360	F4	RS PLX T B	\$HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	467
360	F4	RS PLX T B	\$XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	393
360	F4	RS PLXCT B	\$PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	520
360	F4	RSB L T M	\$CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	271
360	F4	RSBP P	\$GRAPH, LINEAR REGRESSION W/CONFIDENCE LIMITS	BKC	624
360	F4	RSBP P	\$HISTOGRAMS, QUALITY CONTROL SAMPLE STATISTICS	BKC	614
360	F4	RSBP Q	\$XDTRAP, HYDROGEN PERMEATION WITH TRAPPING	DP	655
360	F4	RSBP T K	\$THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	273
360	F4	RSBP C P	\$LATIN SQ, NXN LATIN SQUARE EXPERIMENTAL DESIGN	MLMO	630
360	F4	RSBP CT C	\$ARC-DIFID, 1-D MULTI-GP DIFFUSION & INVENTORY	ANL	626
360	F4	RSBP CT C	\$MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	582
360	F4	RSBP CT C	\$TRIPOLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	608
360	F4	RSBP CT D	\$DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	579
360	F4	RSBP CT G	\$FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	MA-G	R448
360	F4	RSBP CT G	\$FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	584
360	F4	RSBP CT G	\$MOCUS, MINIMAL SETS FROM FAULT TREES	ANC	653
360	F4	RSBP CT G	\$PREP, KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	528
360	F4	RSBP CT I	\$STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	539
360	F4	RSBP CT J	\$VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	ANC	569
360	F4	RSBP CT L	\$ARC-NU1002, BCD INPUT DATA PROCESSING MODULE	ANL	533
360	F4	RSBP CT Q	\$ISOTAB, PU POWER OUTPUT FROM MIXED ISOTOPES	MLMO	R619
360	F4	RSBP X T D	\$SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	58
360	F4	RSBP X T G	\$THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC	512
360	F4	RSBP XCT B	\$ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX	HEDL	388
360	F4	RSBP XCT B	\$XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	ORNL	572
360	F4	RSBP XCT P	\$MORTAN2, MACRO-BASED STRUCTURED FORTRAN	SLAC	678
360	F4	RSBP XCT U	\$GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)	ANC	605
360	F4	RSBPL CT C	\$VARI-1D, 1-D VARIATIONAL SENSITIVITY	ANL	625
360	F4	RSBPL CT L	\$ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION	ANL	594
360	F4	RSBPLX T C	\$ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	151
360	F4	RSBPLX T C	\$CAESAR4, LIBLST, 1-D MULTI-GP DIFFUSION & LIB.	AI	270
360	F4	RSBPLXCT C	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	MTS	262
360	F4	RSBPLXCT C	\$VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	510
360	PL1	RS P T P	\$PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360	ANC	516
360	ANC	360 PL1	RS P T P \$PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON	ANC	516
360A	F+BAL	RS P T D	\$PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	R336
360B	EBCDC	R L T Z	\$GAMTAB, RADIOACTIVE-DECAY GAMMA-RAY CATALOG	DP	637
360B	F+ASM	RSB CT P	\$WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	ANL	541
360B	F+BAL	RS P O	\$PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCND	469

360B

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360B	F+BAL	RS P	T	B	\$RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	392
360B	F+BAL	RS P	T	G	\$WHAM6, LIQUID-FILLED PIPING SYSTEM ANALYSIS	ANC	278
360B	F+BAL	RS P	X	T	\$MARLOWE, BINARY COLLISION CASCADE SIMULATION	ORNL	680
360B	F+BAL	RSB	T	P	\$NRTS ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES	ANC	613
360B	F+BAL	RSB	CT	P	\$PROGLOCK, USER PROGRAM PERFORMANCE MONITOR	SLAC	642
360B	F+BAL	RSBP	T	D	\$PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	R 336
360B	F+BAL	RSBP	CT	C	\$KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	CP	450
360B	F+BAL	RSBP	CT	D	\$REBUS2, FUEL CYCLE ANALYSIS FOR FAST REACTORS	ANL	634
360B	F4	RS P		I	\$NUBOW, STRUCTURAL ANALYSIS BOWED REACTOR CORES	ANL	643
360B	F4	RS P	T	F	\$HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	ORNL	517
360B	F4	RS P	CT	I	\$SAP4, STRUCTURAL ANALYSIS OF LINEAR SYSTEMS	ANL	641
360B	F4	RS P	X	T	\$CONCEPT4, POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL	498
360B	F4	RS P	XCT	R	\$FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	368
360B	F4	RS PL	CT	M	\$EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	502
360B	F4	RSBP	CT	C	\$HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION	DP	136
360B	F4	RSBP	CT	G	\$RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	265
360B	F4	RSBP	CT	H	\$COBRA3M, FUEL PIN THERMAL-HYDRAULIC ANALYSIS	ANL	659
360B	F4	RSBP	CT	I	\$CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION	AN-T	R 449
360B	F4	RSBP	XCT	H	\$MOXY/MOD032, BWR CORE HEAT TRANSFER CODE	ANC	551
360B	F4	RSBP	XCT	P	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	534
360B	F4	RSBP	XCT	B	\$LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA	249
360B	PL1	S P	CT	P	\$SLOP,CROSS, IBM360 FORTRAN H PROGRAM CHECKER	ANL	647
360C	F+BAL	RSBP	XCT	C	\$KENO4, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	450
360C	F4	RS	T	H	\$STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	RG&E	487
360C	F4	RS P	X	P	\$GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	ANL	592
360C	F4	RS P	X	T	\$GEARB, SOLVE CDE SYSTEM WITH BANDED JACOBIAN	LLL	661
360C	F4	RS PL	XCT	B	\$LEOPARD, SPOTS, SPECTRUM CALC WITH DEPLETION	WAPD	279
360D	BAL	RS	X	T	\$COPYCAT, IBM OS SYSTEM CATALOG UTILITY ROUTINE	ANL	646
360D	F4	RS P	X	T	\$DE/STEP, INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	640
360D	F4	RSBP	CT	C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ THETA	LASL	358
360E	F+BAL	RSBP	XCT	G	\$RELAP4/MOD5, TRANSIENT THERMAL-HYDRAULIC STUDY	ANC	369
360G	F+BAL	RS P	XCT	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC	R 275
360I	F4	RS P	T	K	\$CITATION, 1,2,3-D DIFFUSION DEPLETION MULTI-GP	CPNL	387
3600	ASAF4	RS P	T	M	\$ETOE, ENDF/B TO MC**2 DATA CONVERSION	APDA	350
3600	F36	SBP		I	\$BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	365
3600	F36	RS P		G	\$DISPER, AEROSOL PARTICLE TRANSPORT STUDY	FFD	554
3600	F36	RS P	T	B	\$MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	355
3600	F36	RS P	T	C	\$SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	288
3600	F36	RS P	T	I	\$SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	357
3600	F36	RS P	T	S	\$TOODY2, 2-D LAGRANGIAN EQNS OF MOTION SOLUTION	SLA	627
3600	F36	RS P	X	T	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	262
3600	F36	RS P	XCT	C	\$TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	513
3600	F36	RSBP		A	\$MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	214
3600	F36	RSBP		G	\$CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	366
3600	F36	RSBP		I	\$SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	353
3600	F36	RSBP	X	T	\$RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL	ANL	281
3600	F36	RSBP	X	T	\$RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	213
3600	F4	RSBP	T	D	\$2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	325
3600	F63	RS	LX	T	\$GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	33
3600	F63	RSBP		A	\$NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	171
3600	F63	RSBP		E	\$R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	255
3600	F63	RSBP		E	\$R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	168
3600	F63	RSBP		F	\$AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	102
3600	F63	RSBP		O	\$COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	248
3600	F63	RSBP	T	A	\$2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	254
3600	F63	RSBP	T	C	\$FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	167
3600	F63	RSBP	T	E	\$TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL	135
3600	F63	RSBP	T	G	\$R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	172
3600	F63	RSBP	T	H	\$ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	152
3600	F63	RSBP	T	M	\$XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	181
3600	F63	RSBP	XCT	B	\$THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	184
3600	F63	RSBP	T	J	\$MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	143
3600	36F	RS PL	CT	F	\$QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	474
3600	36F	RSBP	T	M	\$MERMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	47

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370	BAL	RSB	CT	P	\$SLACMON/370, VERSION 4.0 VS SOFTWARE MONITOR	SLAC	635			
370	COBOL	RS	CT	M	\$NMMSS, NUCLEAR MATERIALS MANAGEMENT SYSTEM	UCND	695			
370	F	RS	P	T	G	\$HAA3B, AEROSOL BEHAVIOR LOGNORMAL MODEL	AI	443		
370	F+BAL	RS	PLXCT	C	\$SYN3D, SINGLE-CHANNEL FLUX SYNTHESIS DIFFUSION	ANL	713			
370	F+CSM	RS	P	G	\$SPOOL-FIRE, SPRAY-POOL BURNING OF SODIUM	ANL	R714			
370	F4	RS	P	H	\$HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	SSDC	198			
370	F4	RS	P	T	F	\$GAKIN2, 1D MULTIGROUP TIME-DEPENDENT DIFFUSION	MIT	310		
370	F4	RS	P	T	H	\$COMPARE, TRANSIENT FLOW IN VENTED FLUID SYSTEM	NRC	702		
370	F4	RS	P	T	H	\$ENERGY, LMFBR COOLANT TEMPERATURE PREDICTION	MIT	696		
370	F4	RS	P	CT	G	\$COMRADEX3, RADIOLOGICAL DOSE ACCIDENT STUDY	AI	663		
370	F4	RS	P	CT	H	\$THI3D, THERMAL-HYDRAULIC MULTICHANNEL ANALYSIS	ANL	706		
370	F4	RS	P	CT	I	\$LIFE3, MIXED-OXIDE FUEL ELEMENT PERFORMANCE	ANL	R460		
370	F4	RS	PL	CT	C	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	OSUC	29		
370	F4	RS	PLX	T	G	\$CRAC, CALC OF REACTOR ACCIDENT CONSEQUENCES	NRC	722		
370	F4	RS	PLXCT	B	\$FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	OSUC	51			
370	F4	RSBP	CT	G	\$WREM-TGCODE2/MOD3, 2D TIME-DEP FUEL ELEM STUDY	NRC	712			
370B	F4	S	P	X	T	\$FUNPACK2, SPECIAL FUNCTION ROUTINES	ANL	610		
370B	F4	RS	P	T	P	\$METRICATION, CONVERSION TO OR FROM SI UNITS	ROYN	G668		
370B	F4	RS	P	CT	D	\$NUFUEL, NUCLEAR FUEL CYCLE REQUIREMENTS	ERDA	683		
4	RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	F+FAP	RS	T	I	\$	109	
48	GAFGAR ENDF/B DATA TAPES	GGA	1108	BIN	R	L	T	Z	\$ZPR-III ASSEMBLY	356
500PSIA	32-472DEGF	6APL	6600	F4	RS	T	H	\$WATER, STEAM TABLES 14.5-14,	R267	
6	KILER, CORE HEATUP CODE FOR BWR/6 ANALYSIS	EI	360	F+BAL	RS	P	CT	H	\$	636
625	F+MAP	RS	P	T	C	\$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC		209	
625	F4	RS	T	C	\$EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC		156		
625	F4	RS	T	C	\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC		28		
625	F4	RS	P	B	\$AVOID, ANNULAR VOID X-SECTION CALCULATION	GEC		276		
625	F4	RS	PLX	T	B	\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC		185	
635	F+GMP	RS	T	P	\$GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED		515		
635	F+GMP	RS	P	T	D	\$SYN, 2D SYNTHESIS MULTIGP DIFF & IGP DEPLETION	NED		495	
635	F+GMP	RS	P	XCT	B	\$ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	FBRD		501	
635	F+GMP	RS	P	XCT	B	\$TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	FBRD		505	
635	F+GMP	RSBP	T	H	\$THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC		346		
635	F4	RS	G	\$ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCCO		529			
635	F4	RS	P	D	\$RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	NED		372		
635	F4	RS	P	T	B	\$REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NED		257	
635	F4	RS	P	T	C	\$DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NED		459	
635	F4	RS	P	T	C	\$FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED		167	
635	F4	RS	P	T	D	\$FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NED		480	
635	F4	RS	P	T	G	\$FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NED		479	
635	F4	RS	P	T	H	\$MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED		256	
635	F4	RS	P	T	H	\$VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NED		458	
635	F4	RS	P	T	M	\$TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED		493	
635	F4	RS	P	T	O	\$BURNUP, HEAVY ELEMENT ISOTOPIIC BURNUP ANALYSIS	NED		311	
635	F4	RS	P	T	O	\$EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED		258	
635	F4	RS	P	CT	I	\$BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	FBRD		R568	
635	F4	RS	P	X	T	F	\$FORE2, FAST REACTOR EXCURSION CALCULATIONS	NED		174
635	F4	RS	PL	T	C	\$BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED		287	
635	F4	RSBP	D	\$CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GEC		418			
635	F4	RSBP	D	\$DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC		423			
635	F4	RSBP	O	\$MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC		421			
635	F4	RSBP	T	B	\$GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	GEC		420		
6400	F4	S	P	H	\$PWR-PPM, BORATION-DILUTION TABLES FOR PWR OPN	OPPD		552		
6400	F4	RS	P	G	\$FRCRL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL		500		
6400	F4	RS	P	T	F	\$ADEP, 1-D & 2-D FEW-GROUP SPACE-TIME KINETICS	BCL		494	
6400	F4	RS	P	T	G	\$ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL		330	
6400	F4	RS	P	T	G	\$NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL		328	
6400	F4	RS	P	X	T	G	\$MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL		508
6400	F4	RS	PLX	T	B	\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVAC		185	
6400B	F4	RS	P	X	G	\$MIRAB,MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL		499	
6500	F4	RS	P	B	\$PARTI, OPTIMAL GROUP OR MESH COLLAPSING	RW		416		
6500	F4	RS	PLX	T	C	\$MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD		262	
6600	BCD	R	L	T	Z	\$ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD		447	
6600	BCD	R	LX	T	Z	\$LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL		532	

6600

6600 BIN R L T Z
 6600 F RS P T H
 6600 F RS P T P
 6600 F+ASC RS P
 6600 F+ASC RS P T H
 6600 F+ASC RS P T I
 6600 F+ASC RS P T J
 6600 F+ASC RS P T P
 6600 F+ASC RS P T P
 6600 F+ASC RS P T P
 6600 F+ASC RS P T P
 6600 F+ASC RS P X T B
 6600 F+C+D RS P T L
 6600 F+C+D RS P T P
 6600 F+COM RS T P
 6600 F+COM RS T P
 6600 F+COM RS P H
 6600 F+COM RS P T B
 6600 F+COM RS P T I
 6600 F+COM RS P T I
 6600 F+COM RS P T I
 6600 F+COM RS P T M
 6600 F+COM RS P T P
 6600 F+COM RS P T Q
 6600 F+COM RS P T T
 6600 F+COM RS P CT G
 6600 F+COM RS P X T B
 6600 F+COM RS P X T D
 6600 F+COM RS P X T I
 6600 FTN RS P T I
 6600 F4 RS B
 6600 F4 RS I
 6600 F4 RS T B
 6600 F4 RS T C
 6600 F4 RS T H
 6600 F4 RS T I
 6600 F4 RS T M
 6600 F4 RS T O
 6600 F4 RS L T B
 6600 F4 RS L T B
 6600 F4 RS P A
 6600 F4 RS P A
 6600 F4 RS P A
 6600 F4 RS P A
 6600 F4 RS P A
 6600 F4 RS P A
 6600 F4 RS P A
 6600 F4 RS P A
 6600 F4 RS P D
 6600 F4 RS P D
 6600 F4 RS P D
 6600 F4 RS P D
 6600 F4 RS P F
 6600 F4 RS P F
 6600 F4 RS P H
 6600 F4 RS P I
 6600 F4 RS P I
 6600 F4 RS P I
 6600 F4 RS P I
 6600 F4 RS P I
 6600 F4 RS P L
 6600 F4 RS P N
 6600 F4 RS P N
 6600 F4 RS P N
 6600 F4 RS P O
 6600 F4 RS P P

\$SOLDATABQ62, ALBUQUERQUE 1962 SOLAR DATA
 \$STEX, LMFBR FUEL PIN THERMAL PERFORMANCE MODEL
 \$STFODE, COLODE, COLLOCATION SOLN OF STIFF ODE'S
 \$SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE
 \$LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM
 \$GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS
 \$ASPI, GAMMA-RAY SOURCE BUILDUP FACTOR CALC
 \$CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS
 \$DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE
 \$LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION
 \$SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT
 \$RESQ2, RESQ0, DBF1, RESONANCE INTEGRAL HEX CELL
 \$DATATRAN2, RAD1 GEOMETRY MODULES 2-D INPUT GEN
 \$DATATRAN2, UTILITY PLOT MODULES, F(X) & F(X,Y)
 \$BETTIS PROGRAMMING ENVIRONMENT LIBRARY
 \$KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES
 \$HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION
 \$RECAP-0, RECAP-12 X-SECTION LIBRARY GENERATION
 \$DOUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC
 \$GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY
 \$GNATS, MESH2, GPRINT, 2-D NONLINEAR ANALYSIS
 \$DATATRAN2, MODULAR PROGRAMMING AND DATA SYSTEM
 \$LENDOES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM
 \$INDEX, XRAY DIFFRACTION POWDER PATTERN INDEXING
 \$ACCEL(MOD2), DESIGN OF PRINTED-CIRCUIT BOARDS
 \$FTA, FAULT TREE ANALYSIS SYSTEM
 \$PAX03, HARMONY-PDQ X-SECTION GENERATION CODE
 \$FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY
 \$MATUS, 3-D FINITE-ELEMENT ELASTIC ANALYSIS
 \$CHILES, LINEAR ELASTIC SINGULARITY MODELING
 \$APRFX1, 99-GP DLC-28 LIBRARY GROUP-COLLAPSING
 \$SORSDB, PRESSURE VESSEL STRESS AND FATIGUE
 \$M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS
 \$M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN
 \$WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF
 \$CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT
 \$CHECK3, RIGEL3, ENDF/B V3 PROCESSING CODES
 \$GASPA, COMPLEX GAMMA-RAY SPECTRA ANALYSIS
 \$GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES
 \$GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA
 \$AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC
 \$BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC
 \$CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING
 \$GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES
 \$MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC
 \$RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS
 \$SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC
 \$CINDER, M0102, POINT DEPLETION FISSION PRODUCT
 \$NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA
 \$POWERCO, NUCLEAR STATION ELECTRICITY COSTS
 \$WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY
 \$RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC
 \$STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS
 \$RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX
 \$STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS
 \$STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING
 \$TCB01, CREEP-BUCKLING OF TUBES UNDER PRESSURE
 \$TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS
 \$GENRD, FREE-FORMAT CARD INPUT PROCESSOR
 \$DAC1, SN PERTURBATION CODE USING DTF4 FLUXES
 \$HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY
 \$LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS
 \$DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION
 \$BH99, EXTREME VALUE DISTRIBUTION DATA ANALYSIS

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SLA 693
 HEDL 673
 SLA 652
 KAPL R442
 KAPL R299
 KAPL R344
 BAPL R429
 KAPL R 43
 KAPL R428
 KAPL R445
 KAPL R364
 BAPL R285
 KAPL 406
 KAPL 407
 BAPL R665
 KAPL R496
 BAPL R560
 BAPL R671
 BAPL R503
 BAPL R397
 SLL 682
 KAPL 386
 LASL 602
 LASL 609
 SLA 681
 ARHC 666
 BAPL R426
 BW 427
 BAPL R597
 SLA 611
 APG 466
 KAPL R391
 BAPL R280
 BAPL R342
 BAPL R267
 BAPL R266
 BNL 571
 KAPL R485
 WANL 547
 WANL 298
 BNL 376
 BNL 524
 KAPL R531
 BAPL R470
 KAPL R535
 BNL 492
 BNL 377
 BAPL 313
 UEC 146
 UEC 340
 UEC 224
 KAPL R352
 KAPL R389
 KAPL R382
 KAPL R337
 BAPL R570
 BAPL R604
 KAPL R378
 LASL 530
 LASL 455
 SLL 434
 LASL 409
 KAPL R464
 BAPL R621

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6600	F4	RS	P	P	\$SERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	601
6600	F4	RS	P	P	\$MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	R446
6600	F4	RS	P	P	\$PLOT, 2-D CONTOUR PLOTS & AREA CALCULATION	SLA	R578
6600	F4	RS	P	P	\$RELO1, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	R497
6600	F4	RS	P	P	\$ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	R444
6600	F4	RS	P	T	\$FO355, SHAPER CUTTER CONTOUR GENERATOR	BKC	697
6600	F4	RS	P	T	\$JPIXR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	R506
6600	F4	RS	P	T	\$PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	R507
6600	F4	RS	P	T	\$PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	R359
6600	F4	RS	P	T	\$SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	R399
6600	F4	RS	P	T	\$TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	360
6600	F4	RS	P	T	\$EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	R461
6600	F4	RS	P	T	\$ETGM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	436
6600	F4	RS	P	T	\$GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	LASL	361
6600	F4	RS	P	T	\$BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	R398
6600	F4	RS	P	T	\$DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	209
6600	F4	RS	P	T	\$EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CEND	156
6600	F4	RS	P	T	\$TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	608
6600	F4	RS	P	T	\$VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	212
6600	F4	RS	P	T	\$CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	354
6600	F4	RS	P	T	\$GEOCOST-BC, BINARY CYCLE GEOTHERMAL COST STUDY	BNW	711
6600	F4	RS	P	T	\$GEOCOST, GEOTHERMAL ENERGY COST ANALYSIS	BNW	684
6600	F4	RS	P	T	\$PHENIX, 2-D DIFFUSION BURNUP REFUELING HISTORY	LASL	454
6600	F4	RS	P	T	\$2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	325
6600	F4	RS	P	T	\$3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	463
6600	F4	RS	P	T	\$3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	R477
6600	F4	RS	P	T	\$ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	486
6600	F4	RS	P	T	\$NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	405
6600	F4	RS	P	T	\$NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	R371
6600	F4	RS	P	T	\$SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	400
6600	F4	RS	P	T	\$TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	R338
6600	F4	RS	P	T	\$WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	R274
6600	F4	RS	P	T	\$WIGL3, 1-D SPACE-TIME DIFFUSION W/FEEDBACK	BAPL	R708
6600	F4	RS	P	T	\$FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	R295
6600	F4	RS	P	T	\$HAMOC, FLUID HAMMER ANALYSIS OF PIPING SYSTEM	HEDL	710
6600	F4	RS	P	T	\$MO555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	R284
6600	F4	RS	P	T	\$ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	BCAC	580
6600	F4	RS	P	T	\$CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	R473
6600	F4	RS	P	T	\$FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY	BAPL	R272
6600	F4	RS	P	T	\$FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	R331
6600	F4	RS	P	T	\$GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	R424
6600	F4	RS	P	T	\$HAFMAT, SYSTEM STEADY-STATE FLOW DISTRIBUTION	KAPL	R616
6600	F4	RS	P	T	\$HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	R286
6600	F4	RS	P	T	\$MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	256
6600	F4	RS	P	T	\$M0899,H0H, STEAM TABLES 14.5-2538 PSIA	BAPL	R294
6600	F4	RS	P	T	\$TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	R348
6600	F4	RS	P	T	\$BEAMCRP, FINITE-ELEMENT BEAM CREEP ANALYSIS	HEDL	R701
6600	F4	RS	P	T	\$BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	R468
6600	F4	RS	P	T	\$BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	R481
6600	F4	RS	P	T	\$CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	R449
6600	F4	RS	P	T	\$FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	R537
6600	F4	RS	P	T	\$GAPCON-THERMAL2, FUELPIN GAP CONDUCTANCE CALC	BNW	618
6600	F4	RS	P	T	\$M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	R383
6600	F4	RS	P	T	\$M0457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	R329
6600	F4	RS	P	T	\$M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	R283
6600	F4	RS	P	T	\$PELEN, FUEL PELLETT TEMPERATURE & DEFORMATION	BAPL	R598
6600	F4	RS	P	T	\$SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	BNL	252
6600	F4	RS	P	T	\$SEALSHL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	R282
6600	F4	RS	P	T	\$SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA	581
6600	F4	RS	P	T	\$M0756,LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	R343
6600	F4	RS	P	T	\$BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	R373
6600	F4	RS	P	T	\$QMESH,RENUM, SELF-ORGANIZING MESH GENERATION	SLA	612
6600	F4	RS	P	T	\$EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	502
6600	F4	RS	P	T	\$SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	R557

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6600	F4	RS	P	T	O	\$BETTY, ENTRAINED PARTICLES SAMPLING STUDY	BAPL	R545
6600	F4	RS	P	T	O	\$JITEP, FLUCTUATION EXPERIMENT ANALYSIS	PAPL	R394
6600	F4	RS	P	T	O	\$REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	R425
6600	F4	RS	P	T	P	\$BESSEL FUNCTIONS, AIRY & LOG GAMMA SUBROUTINES	SLA	656
6600	F4	RS	P	T	P	\$DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	R327
6600	F4	RS	P	T	P	\$M0661,M0657,M0626, POLYNOMIAL CURVE FITTING	BAPL	R411
6600	F4	RS	P	T	O	\$GROUP2, GROUP THEORY OF LATTICE DYNAMICS	LASL	620
6600	F4	RS	P	T	U	\$RICE-LASL, CHEMICALLY REACTIVE MIXTURE FLOW	LASL	720
6600	F4	RS	P	CT	F	\$MELT3, FAST REACTOR TRANSIENT OVERPOWER STUDY	HEDL	700
6600	F4	RS	P	X	I	\$FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	R404
6600	F4	RS	PL	T	B	\$ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	437
6600	F4	RS	PL	T	R	\$SOLSYS, SOLAR ENERGY SYSTEM SIMULATION PROGRAM	SLA	692
6600A	F+ASC	RS		T	P	\$BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	478
6600A	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	PAPL	R275
6600B	BCD	R	L	T	Z	\$SOLATABQ62, ALBUQUERQUE 1962 SOLAR DATA	SLA	693
6600B	F	S	P	X	T	\$FUNPACK2, SPECIAL FUNCTION ROUTINES	ANL	610
6600B	F+ASC	RS		T	P	\$BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW	478
6600B	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BW	R275
6600B	F+ASC	RS	P	T	J	\$SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	BAPL	R462
6600B	F+ASC	RSB	X	T	M	\$TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	R403
6600B	F+COM	RS	PLX	T	C	\$KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFD	450
6600B	FTN	RS	P	T	P	\$SETS, SET EQUATION TRANSFORMATION SYSTEM	SLA	623
6600B	F4	RS		T	M	\$CHECKER,CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC	BNL	384
6600B	F4	RS		T	M	\$CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC	BNL	475
6600B	F4	RS		T	M	\$RIGEL4,CHECK4,... ENDF/B V4 PROCESSING CODES	BNL	638
6600B	F4	RS	P		A	\$THRES2, STATISTICAL MODEL REACTION X-SECTIONS	BNL	504
6600B	F4	RS	P	T	A	\$RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES	BNL	465
6600B	F4	RS	P	T	I	\$HONDO, A DYNAMIC RESPONSE FINITE-ELEMENT CODE	SLA	672
6600B	F4	RS	P	T	I	\$MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	R412
6600B	F4	RS	P	T	I	\$SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	R282
6600B	F4	RS	P	T	V	\$FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	577
6600B	F4	RS	P	CT	P	\$FORSIM, SOLN OF PARTIAL OR ORDINARY DIFF EQNS	CPNL	514
6600B	F4	RS	P	X	T	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	534
6600C	F+ASC	RS	P	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	R275
6600C	F+COM	RS		T	P	\$LASLIB, LOS ALAMOS SUBROUTINE LIBRARY ROUTINES	LASL	633
6600C	F+COM	RS		T	P	\$MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.2	CDC	478
6600C	F+COM	RS	P	X	T	\$MATHLIB, SANDIA MATHEMATICAL SUBROUTINES	SLA	654
6600C	F4	RS	P		I	\$BUCKLE, CREEP BUCKLING OF INITIALLY OVAL TUBE	BNW	667
6600C	F4	RS	P	T	I	\$SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	R 80
6600C	F4	RS	P	X	P	\$GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	592
6600C	F4	RS	P	X	T	\$GEARB, SOLVE CDE SYSTEM WITH BANDED JACOBIAN	LLL	661
6600D	F+ASC	R	B	T	D	\$PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BCSS	R275
6600D	F+COM	RS		T	P	\$MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.3	CDC	478
6600D	F4	RS	P	T	C	\$TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	358
6600D	F4	RS	P	X	T	\$DE/STEP,INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	640
6700B	F4	RS	P	X	T	\$EISPACK2, MATRIX EIGENVALUE/VECTOR PACKAGE	ANL	534
7030	F4	RS		T	H	\$RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	242
7030	F4	RS	P	T	C	\$DTF4, 1-D MULTI-GP DISCRETE COORDINATE PROGRAM	LASL	209
7030	F4	RS	P	T	D	\$DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	LASL	269
7040	F+MAP	RS	P		A	\$CCMBCC, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	203
7040	F4	RS	P	T	C	\$TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	148
7044	F+MAP	RS	P	T	B	\$GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	219
7044	F+MAP	RS	P	T	H	\$BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	205
7044	F+MAP	RS	P	T	H	\$TOODFE, 2-D TIME-DEPENDENT HEAT CONDUCTION	FPCO	349
7044	F+MAP	RSBP		T	M	\$UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	206
7044	F+MAP	RSBP		T	C	\$GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	222
7044	F+SPS	RSBP		T	N	\$CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	207
7044	F4	RS			I	\$CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	233
7044	F4	RS	X	T	G	\$PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	228
7044	F4	RS	P		D	\$RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	231
7044	F4	RS	P		D	\$WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	224
7044	F4	RS	P		I	\$GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	232
7044	F4	RS	P		L	\$GAVER, ENERGY INTERVAL X-SECTION AVERAGING	GGA	218
7044	F4	RS	P	T	B	\$FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	GGA	195

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044	F4	RS	P	T	C	\$GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	220
044	F4	RS	P	T	C	\$STEMCN, 1-D FEW-GP DIFFUSION TEMP COFF CALC	GGA	225
7044	F4	RS	P	T	D	\$GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	260
7044	F4	RS	P	T	D	\$RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	GGA	221
7044	F4	RS	P	T	D	\$REVISFC-GAD, FUEL CYCLE ANALYSIS W/REFUELING	GGA	223
7044	F4	RS	P	T	D	\$STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	227
7044	F4	RS	P	T	G	\$ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	229
7044	F4	RS	P	T	I	\$SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	251
7044	F4	RS	P	X	A	\$LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	217
7044	F4	RSBP	CT	I		\$SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	250
709	F2	RS			C	\$FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LLL	7
7090	F+FAP	RS		T	I	\$4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	109
7090	F+FAP	RS	L	T	B	\$QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	119
7090	F+FAP	RS	L	T	C	\$FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	120
7090	F+FAP	RS	L	T	C	\$ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	118
7090	F+FAP	RS	P		I	\$WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	315
7090	F+FAP	RS	P	T	B	\$SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LLL	160
7090	F+FAP	RS	P	T	C	\$EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	156
7090	F+FAP	RS	P	T	D	\$ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	ORNL	240
7090	F+FAP	RS	P	T	L	\$QPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	234
7090	F+FAP	RS	P	T	M	\$DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	236
7090	F+FAP	RS	PL	T	B	\$GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	185
7090	F+FAP	RS	PL	T	B	\$TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	50
7090	F+FAP	RS	PL	T	C	\$AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	29
7090	F+FAP	RSB		T	A	\$TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	42
7090	F+FAP	RSB		T	A	\$ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	41
7090	F+FAP	RSBP		T	D	\$QDB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	99
7090	F+FAP	RSBPL		T	C	\$GRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	103
7090	F+FAP	RSBPLX		T	B	\$AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	204
7090	F+MAP	RS	P	T	C	\$TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	312
7090	FAP	RSBP	X	T	Q	\$SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	422
7090	FLOCO	RS	P		B	\$MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	202
7090	FLOCO	RS	P		B	\$ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	113
7090	FLOCO	RSBP			C	\$ZQXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	18
7090	FLOCO	RSBP		T	C	\$GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW	75
7090	F2	RS			A	\$LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	ORNL	381
7090	F2	RS			B	\$DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	AEG	150
7090	F2	RS			B	\$S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	53
7090	F2	RS			C	\$PEFT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	30
7090	F2	RS			E	\$AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	121
7090	F2	RS			E	\$SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	122
7090	F2	RS			I	\$CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	112
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7090	F2	RS	P	T	C	\$FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	28
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REFERENCES

1. Radkowsky, A., and R. Brodsky, *A Bibliography of Available Digital Computer Codes for Nuclear Reactor Problems*, AECU-3078 (Oct 1955).
2. *Nuclear Codes Group Newsletters*, No. 1 (Sept 25, 1956); No. 2 (Dec 1, 1956); No. 3 (Mar 1, 1957); No. 4 (June 1, 1957); No. 5 (Sept 1, 1957); No. 6 (Dec 1, 1957); No. 7 (June 1, 1958); No. 8 (Dec 8, 1958); No. 9 (Sept 1, 1959); No. 10 (Dec 1, 1959); AEC Computing and Applied Mathematics Center, Institute of Mathematical Sciences, New York University, New York, N.Y.
3. Nather, V., and W. Sangren, *Reactor Code Abstracts*, Commun. Assoc. Computing Mach. 2(1) (Jan 1959).
4. Nather, V., and W. Sangren, *Reactor Code Abstracts*, Commun. Assoc. Computing Mach. 3(1) (Jan 1960).
5. Argonne Code Center, *Reactor Code Abstracts*, Distribution 1-12 (1961-April 24, 1967).
6. American National Standard ANSI N413-1974, *Guidelines for the Documentation of Digital Computer Programs*.
7. European Atomic Energy Community, *EURATOM-Thesaurus*, EUR 500.e (Second Edition) (1966).

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