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ARGONNE CODE CENTER:
COMPILATION OF PROGRAM ABSTRACTS

by

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55-58	55-58	ACC Abstract 50 revised
76.1-76.2	76.1-76.2	ACC Abstract R80 revised
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377-378.2	377-378.2	ACC Abstract 262 revised
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455-458	455-458	ACC Abstract R299 revised
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599-603.1	599-603.1	ACC Abstracts 368 and 369 revised
639-640.2	639-640.2	ACC Abstract 387 revised
649-652	649-652	ACC Abstract 392 revised
673-674	673-674	ACC Abstract R403 revised
735-742	735-742	ACC Abstracts 433 and 435 revised
765-771.1	765-771.1	ACC Abstracts R448 and 450 revised
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853-854	853-854	ACC Abstract 487 revised
859-860	859-860	ACC Abstract 490 revised
877-878	877-878	ACC Abstract 498 revised
955-958	955-958	ACC Abstract 534 revised
971-974	971-974	ACC Abstract 541 revised
1091-1096	1091-1096	ACC Abstracts 592 and 593 revised
1127-1128	1127-1128	ACC Abstracts 608 revised
1133-1446	1133-1349	ACC Abstracts 611 through 646 added; Section VI Library Pro- grams by Classification revised; Section VII KWIC Index revised; References replaced

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7	FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LLL	709	F2	RS	C	23
9	PIPE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEP	360	F4	RS L T	C	24
14	HAFFEVER, 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	AI	7090	F2	RS P 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	PC	625	F4	RS	T C	30
29	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS PL T	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	CSUC	37J	F4	RS PL CT	C	32
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	BHSC	360	F4	RS P	C	34
30	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	7090	F2	RS	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	CRNL	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	360J	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	CRNL	7090	F2	RS P T	C	40
40	ZUGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	1604	F63	RS P T	C	42
40	ZUGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CRNL	7090	F2	RS P T	C	42
41	ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB	T A	44
42	TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB	T A	46
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	CDC	1604	F63	RS P	G	52
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	FP	360	F4	RS P	G	52
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS P	G	52
48	FUGUF, STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090	F2	RS	I	54
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	1604	F63	RS PL T	B	56
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	360	F4	RS PI 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	CDC	1604	F63	RS PL T	B	58
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	F2	RS PL T	B	58
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CSUC	37J	F4	RS PLXCT	B	58
52	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	F2	RS P	B	60
52	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	F63	RS P	B	60
53	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090	F2	PS	B	62
53	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P	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	AI	7090	F2	RS L T	D	68
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	F63	RS L T	D	68
59	MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PRCO	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	BNK	7090	FLOCO	RSBP	T C	74
R 80	SOP3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	F4	RS P T	I	76.1
87	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CRNL	7090	F2	RS P T	C	77

NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	
87	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CDC	16J4	F63	RS P	T	C 77
89	AFES2, RESONANCE INTEGRAL X-SECTION CALC	AI	7090	F2	RS PL	T	A 79
89	AFES2, RESONANCE INTEGRAL X-SECTION CALC	CDC	1604	F63	RS PL	T	A 79
91	FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	7090	F2	RS		J 81
99	0DB, 2-D FEW-GP DIFFUSION BURNUP RZ GFCMETRY	GGA	7090	F+FAP	RSBP	T	D 83
102	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	36J0	F63	RSBP		F 85
103	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAFC	36J	F+HAL	RS P	T	C 87
103	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-W	7090	F+FAP	RSBPL	T	C 87
108	HAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS P		B 90
109	4RFSTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	F+FAP	RS	T	I 92
110	SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	AI	7090	F2	RS		J 93
111	SCAR1, SCATTER FROM A RING SNAP GEOMETRY	AI	7090	F2	RS		J 95
112	CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	PS		I 97
113	ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	7090	FLOCO	RS P		B 98
114	SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS		I 100
117	FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	F2	RSB	T	D 101
118	ULCEP, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L	T	C 103
119	QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS L	T	B 105
120	FATM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PLX	T	C 107
120	FATMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	RMSC	36C	F4	RS P	T	C 107
120	FATM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L	T	C 107
121	ATREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AFP	360	F4	RS P		E 110
121	ATREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	16J4	F63	RS P		E 110
121	ATREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090	F2	RS		E 110
122	SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	7090	F2	RS		E 112
123	LIPRECAN1, MC NEUTRON PENETRATION CALCULATION	MAC	7090	F2	RSBP		J 114
129	CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LLL	7090	F2	RS P		F 116
132	W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	7090	F2	RS P	T	C 118
133	WED, W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W	7090	F2	RS		N 120
134	NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	CRNL	7090	F2	RSBP		D 122
135	TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL	3600	F63	RSBP	T	E 124
136	HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION	DP	360B	F4	RSBP	CT	C 126
141	RATPAP, DOSE RATE CALCULATION SNAP GFCMETRY	AI	7090	F2	RS P		J 128
142	MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090	F2	RS		J 130
143	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	F63	RSBPL	T	J 132
143	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	RNW	7090	F2	RSBPL	T	J 132
144	DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	UNC	1604	F63	RS PL	T	C 135
145	WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APIA	7094	F2	RS P		F 137
146	NPRFCOP, FUEL CYCLE COSTS PERFORMANCE DATA	ANL	360	F4	RS P		D 139
146	NPRFCOP, FUEL CYCLE COSTS PERFORMANCE DATA	UEC	6600	F4	RS P		O 139
147	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	36J	F4	RS PLX	T	B 141
147	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	F+FAP	RS PL	T	B 141
148	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	F4	RS P	T	C 144
148	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS P	T	C 144
149	TYCHF3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	F+FAP	RS PL	T	B 146
150	GANCOFF JR, MODERATOR SPACE CHORD LIST FUNCT	AEG	7090	F2	RS		B 148
151	DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	7090	F2	RS PLX	T	C 150
151	ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	F4	RSBPLX	T	C 150
152	ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	36J	F63	RSBP	T	H 153
153	HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	7090	F2	RSB		F 155
154	CROCO90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS P		O 157
155	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	7094	F2	RSBP	T	H 159
156	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	RC	625	F4	RS	T	C 161
156	EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	CRNL	7090	F+FAP	RS P	T	C 161
156	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CRNL	360	F4	RS P	T	C 161
156	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CE	6600	F4	RS P	T	C 161
159	MJMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	7094	F+FAP	RS L	T	M 165
160	SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LLL	7090	F+FAP	RS P	T	B 167
161	FORTTRAN TOC, 2-D MULTI-GP SN APPROXIMATION RZ	PW	1604	F63	RS P	T	C 169
162	GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	7094	F+FAP	RS PL	T	B 172
163	AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7094	F+MAP	RS P	T	E 174
164	BURP1, DETECTOR EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB		O 177
165	BURP2, DETECTOR EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB		O 179
166	BURP3, DETECTOR EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB		O 182
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	36J	F63	RSBP	T	C 185
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NEC	635	F4	RS P	T	C 185
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360	F4	RS P	CT	C 185
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	F4	RS		E 187
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	360	F4	RS P		E 187
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	36J	F63	RSBP		E 187
169	BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	MTS	7090	MAD	RSB		O 190
170	BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	MTS	7090	MAD	RSB		O 192
171	NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	F63	RSBP		A 194

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172	R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	3600	F63	RSBP	T G	196
172	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	360	F4	RS P	T G	196
173	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	F63	RS	C	198
173	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GGA	1108	F5	RS P	T C	198
174	FORE2, FAST REACTOR EXCURSION CALCULATIONS	NEC	635	F4	RS P X T	F	200
174	FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360	F4	RS P X T	F	200
174	FORE, FAST REACTOR EXCURSION CALCULATIONS	NEC	2000	F4	RS P	T F	200
176	RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NEC	2000	F2	RS P	A	203
177	DOPIE, RESOLVED RESONANCE X-SECTION CALC	NEC	2000	F2	RS P	A	205
178	SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NEC	2000	F2	RS P	B	207
179	ISCTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	CRNL	1604	F63	RS P	D	209
180	ISCCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	1604	F63	RS P	D	211
180	ISCCRUNCH, REACTION DECAY CHAIN ANALYSIS	CRNL	7090	F2	RSBP	D	211
181	XLBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	3600	F63	RSBP	T M	213
182	AXFLU, HEAT TRANSFER MULTEN FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H	215
183	AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H	217
184	THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	3600	F63	RSBP XCT	B	219
184	BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	1108	F5	RS PLX T	B	219
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVA	6400	F4	RS PLX T	B	221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS PLX T	B	221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	F+FAP	RS PL T	B	221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	PNW	1107	F4	RS PL T	B	221
186	LAG, ASSEMBLER FOR FLGCO2 INSTRUCTION SET	PW	1604	F+CDP	RS P	T P	223
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188	CMPXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	F63	RS P	E	227
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195	FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	GGA	7044	F4	RS P	T B	241
195	FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS P X T	B	241
196	CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	F+FAP	RS PL T	G	244
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199	TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT	PW	1604	F63	RS	C	250
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201	EPI THERMOS, SPECTRUM AND X-SECTION CALCULATION	NEC	7094	F+FAP	RS P	T B	254
202	MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	7090	FLOCO	RS P	B	256
203	COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	FPCC	7040	F+MAP	RS P	A	258
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205	BLODTS, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	F+MAP	RS P	T H	262
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207	CROSSPLCT, SC402 PLOTS FROM X-SECTION TAPES	GGA	7044	F+SPS	RSBP	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	LER	7094	F4	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	BC	625	F+MAP	RS P	T C	270
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	LASL	7030	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	PIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	F36	RSBP X T	B	279
214	MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	F36	RSBP	A	281
215	CHAD, LEGENDRE COEF CALC FCP ANGULAR DIST DATA	AI	7094	F+MAP	RS P	A	283
216	FSDP3, POINTWISE XSECS. FROM B-W PARAMETERS	GGA	1108	F5	RS P CT	A	285
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
219	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS P	T B	291
219	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LEP	7094	F+MAP	RS P	T B	291
220	GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	7044	F4	RS P	T C	293
221	RELQAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	GGA	7044	F4	RS P	T D	295
222	GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	F+MAP	RSBP	T C	297
222	GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	F+BAL	RS P	T C	297
223	REVISED-GAD, FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	F4	RS P	T D	299
224	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	D	301
224	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	6600	F4	RS P	D	301
225	TWFCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	GGA	7044	F4	RS P	T C	303
226	OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	7044	F+MAP	RS P	T D	305

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228	PRECON, HTCR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	F4	RS X T	G	309	
229	FLBCW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	F4	RS P T	G	311	
231	RAD2, HTGR FISSION PRODUCT ACTIVITY LIST STUDY	CGA	7044	F4	RS P	D	315	
232	GAZFLEF, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS P	I	317	
233	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	F4	RS	I	319	
234	OPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	F+FAP	RS P T	L	321	
235	GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	GFC	7094	F4	RS P	B	323	
236	DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	7090	F+FAP	RS P T	M	325	
237	ACUNCE, FLUX LIST IN MULTI-PIN FUEL ELEMENT	AGC	7090	F2	RS P	B	327	
238	FXT, X-SECTIONS FROM R-W RESONANCE PARAMETERS	WANL	7094	F2	RS P	A	329	
239	CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	F+FAP	RSBPL T	N	331	
240	ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	CRNL	7090	F+FAP	RS P T	D	333	
241	HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	RNL	1107	F4	RS P T	C	336	
242	RATH, 2-D OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7094	FAP	RS P T	H	338	
242	RATH, 2-D OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	F4	RS	T	H	338
243	AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	7090	F2	RS P T	B	340	
244	CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	7094	F2	RS PL T	I	342	
246	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094	F2	RS P	H	344	
246	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	F4	RS P	H	344	
247	FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	1108	F5	RS P	A	346	
248	COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	F63	RSBP	O	348	
249	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAPD	7094	F+MAP	RS PLX T	B	350	
249	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA	360	F4	RSBPLXCT	B	350	
250	SAFE-PLKS, STRESS ANALYSIS AXISYMMETRIC LOAD	CGA	7044	F4	RSBP CT	I	353	
251	SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RS P T	I	355	
252	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D RODS	RNL	6600	F4	RS P T	I	357	
252	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D RODS	CGA	1108	F4	RS P	I	357	
253	SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	CGA	1108	F4	RS P	I	359	
254	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	3600	F63	RSBP	T	A	361
254	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	7094	F2	RS P T	A	361	
255	R101, SPACE-INDEPENDENT KINETICS KFX OPTIONS	WANL	7094	F4	RS P	E	363	
255	R101, SPACE-INDEPENDENT KINETICS KFX OPTIONS	ANL	3600	F63	RSBP	E	363	
255	R101, SPACE-INDEPENDENT KINETICS KFX OPTIONS	ANL	360	F4	RS P	E	363	
256	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600	F4	RS P T	H	365	
256	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NEC	635	F4	RS P T	H	365	
257	REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NEC	635	F4	RS P T	B	367	
258	EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NEC	635	F4	RS P T	O	369	
259	MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY FROM	GGA	1108	F4	RS P T	J	371	
260	CARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	CGA	7044	F4	RS P T	D	373	
261	GADDSF, COSFT, HTCR ACCIDENT ANALYSIS DOSE CALC	CGA	1108	F4	RS	T	G	375
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	F36	RS P X T	C	377	
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	PURD	6500	F4	RS PLX T	C	377	
263	GASKET, THERMAL SCATTERING LAW CALCULATION	CGA	1108	F4	RS P	A	379	
264	VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	7094	F4	RS P X T	C	381	
265	PSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	360	F4	RSBP CT	G	383	
R266	CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT	BAFL	6600	F4	RS	T	I	385
R267	WATER, STEAM TABLES 14.5-14.500PSIA 32-472DFG	BAPL	6600	F4	RS	T	H	387
268	TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	F2	RS P T	G	389	
269	DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	LASL	7030	F4	RS P T	D	391	
270	CAFSAP4, LIBRST, 1-D MULTI-GP DIFFUSION + LIB	AI	360	F4	RSBPLX T	C	393	
271	CLIP, FORM OF THREDES LIBRARY UTILITY ROUTINE	AI	360	F4	RSB L T	M	396	
R272	FIGRO, LWR FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	F4	RS P T	H	398	
273	THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	360	F4	RSBP T	K	400	
R274	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P T	F	402	
R274	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P T	F	402	
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC	360	F+BAL	RS P XCT	D	405	
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BW	6600B	F+ASC	RS P T	D	405	
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600C	F+ASC	RS P T	D	405	
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BCS	6600D	F+ASC	P B T	D	405	
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600A	F+ASC	RS P T	D	405	
276	ANNULAP VOID X-SECTION CALCULATION	CEC	625	F4	RS P	B	407	
277	HAMMER, LITHE, HELP, CRITICAL ANALYSIS SYSTEM	IP	360	F+BAL	RS P XCT	B	409	
278	WATER-HAMMER, LIQUID PHASEDOWN ANALYSIS LEFT	UGA	360	F4	RS P	G	411	
278	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600B	F36	RSBP	G	411	
279	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	JNC	1108	F5	RS LX T	B	413	
279	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	360	F4	RS PLXCT	B	413	
279	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	AERI	6600		RSBPLX T	B	413	
R280	MOB07, 2-D DIFFUSION ABSORPTION REMOVAL X-SFCS	BAPL	6600	F4	RS	T	B	415
281	RARLE, WLIB, FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	RSBP X T	B	417	
R282	SEALSHLL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	F4	RS P T	I	419	
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R283	MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	F4	RS P	T I	421
R284	MO555,ACT1, LOSS-CF-CCOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P	T G	423
R285	RESQ2,RESQ0,DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS P X	T B	425
R286	HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	F4	RS P	T H	427
287	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NEC	1108	F4	RS P	T C	429
287	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NEC	635	F4	RS PL	T C	429
288	SNARG-10, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	3600	F36	RS P	T C	432
289	GAKER, INFLASTIC SCAT X-SECTION CALC MODERATOR	GGA	1108	F4	RS P	A	434
290	GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	F4	RS P	E	436
291	HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA	1108	F4	RS	B	438
292	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	ENEA	360	F4	RS P	A	440
292	PSFUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	F4	RS P	A	440
293	MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY	APCA	7094	F4	RS P	F	442
R294	MO899,H0H, STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P	H	444
R294	MO899,H0H, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P	T H	444
R295	FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P	T G	446
296	GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	1108	F4	RS P	L	448
298	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108	F4	RS FLX	T B	452
298	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600	F4	RS L	T B	452
R299	LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	F4	RS P	T H	456
R299	LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	6600	F+ASC	RS P	T H	456
300	SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA	1108	F4	RS P	I	458
301	FREVAP6, HTCR METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P	D	460
302	GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	F4	S	T D	462
303	BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	GGA	1108	F+BAL	RS P	T E	464
304	PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	1108	F4	RS P	C	466
305	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	F4	RS	A	468
306	FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW	1108	F4	RS P	T B	470
307	HMOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI	360	F+BAL	RS P X	T B	472
308	JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	360	F4	RS P CT	A	474
308	JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	CRNL	1604	F63	RS P	T A	474
309	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	F+MAP	RS P	T F	476
309	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	F4	RS P	T F	476
310	GAKIN2, 1D MULTIGROUP TIME-DEPENDENT DIFFUSION	MIT	370	F4	RS P	T F	478
311	BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	NEC	635	F4	RS P	T D	480
312	TDON, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	F+MAP	RS P	T C	482
313	CINDER,M0102, POINT DEPLETION FISSION PRODUCT	CP	360	F+BAL	RS P	T D	484
313	CINDER,M0102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P	D	484
314	NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBPLX	T D	486
315	WIREX, COMPUTER-PRODUCED WIRING LISTS UHTWEX	LASL	7090	F+FAP	RS P	I	488
316	GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	F4	RS P X	T B	490
317	GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	F4	RS P	E	493
318	FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108	F4	RS P	T D	495
319	GASPT, 1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	1108	F4	RS P	T C	497
320	TEMCO7, TEMPERATURE COEFFICIENT CALCULATION	GGA	1108	F4	RS P	T C	499
321	EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LLI	7094	F2	RS P	P	501
322	ISCSARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	CRNL	1604	F63	RS P	D	503
322	ISCSARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	CRNL	360	F+BAL	RS P	D	503
323	MUFFLE, FISSION NUCLIDE X-SECTION EVALUATION	CRNL	7090	F4	RSBP	A	505
324	FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	F2	RS P	P	507
325	ZDB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP	T D	509
325	ZDB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	F4	RS P	T D	509
325	ZDB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	F4	RS P	T D	509
326	AIROS2A, SIMULATION OF REACTOR DYNAMICS	AI	360	F+BAL	RS P	T E	511
R327	DAFT1, LEAST SQUARES FIT FISSION NUCLIDE DATA	BAPL	6600	F4	RS P	T P	514
328	NURLOC-1.0, LOSS-CF-CCOLANT THERMAL ANALYSIS	RCL	6400	F4	RS P	T G	516
R329	MO457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P	T I	518
330	ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL	6400	F4	RS P	T G	520
R331	FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T H	522
332	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	CRNL	360	F+BAL	RS P	T I	524
332	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	F4	RS F	T I	524
333	TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	F+BAL	RS P	T D	526
334	PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	CRNL	1604	F63	RS P	A	528
335	RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	CRNL	1604	F63	RS P	A	530
R336	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	360R	F+BAL	RSBP	T D	531
R336	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P	T D	531
R337	STEM, MATRIX GENERATION FOR A SYSTEM OF BFAMS	KAPL	6600	F4	RS P	I	533
R338	TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	T F	535
R338	TWIGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS P	F	535
339	GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS P	T D	538
340	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	CRNL	1604	F63	RS P	D	541
340	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	UEC	6600	F4	RS P	D	541

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R342	MC648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS P T C					546
R343	MO756, LETC, 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	RS 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	CODILL1, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	360	F4	RS P A					556
R348	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	F4	RS P T H					558
349	TODDEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCC	7044	F+MAP	RS P T H					560
350	ETOF, ENDF/B TO MC**2 DATA CONVERSION	ANL	360	F4	RS P CT M					562
350	ETOE, ENDF/B TO MC**2 DATA CONVERSION	APCA	3600	ASAF4	RS P T M					562
351	ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LLL	7094	F+FAP	RS PL T M					564
R352	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	F4	RS P F					567
353	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	F36	RSBP I					569
354	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P T D					571
354	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	360	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
358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ THETA	LASL	3600	F4	RSBP CT C					580
358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ THETA	LASL	6600	F4	RS P T C					580
358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ THETA	LASL	7600	F4	RS P T C					580
R359	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	PAPL	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	AEP	360	F4	RS P B					588
363	BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AFP	360	F4	RS P E					590
R364	SNFO, NONLINEAR ALGEBRAIC EON SOLA CURVE PLOT	KAPL	6600	F+ASC	RS P T P					592
365	BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	F36	RSBP I					594
366	CHFMCC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	F36	RSBP G					596
367	ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	1108	F5	RSPL T D					598
368	FLANGF2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	3600	F4	RS P XCT A					600
369	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	6600	F4	RS P T G					602
369	RELAP4, TRANSIENT THERMAL-HYDRAULIC ANALYSIS	ANC	3600	F+BAL	RSBPLXCT G					602
369	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	360	F4	RSBP XCT G					602
369	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	1108	F4	RS P T 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	NET	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	BNW	1108	F4	RS P X T B					613
375	SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI	360	F+BAL	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-Z MESH	CGA	1108	F4	RS P T C					625
381	LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	CRNL	7090	F2	PS A					627
R382	RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	6600	F4	RS P H					628
R383	MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P T I					630
384	CHECKER, CRECT, DAMMET, PLOTFR, ... ENDF/B VI PRGC	PNL	6600	F4	RS T M					632
385	COHBE, COHERENT INELASTIC SCATTERING LAW CALC	CGA	1108	F4	RS P X A					635
386	DATATRN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM	R T M					637
387	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	CRNL	3600	F4	RS P T K					639
388	ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR IDX	HECL	1108	F4	RS P X T B					641
R389	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS P F					644
390	CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSLN	360	F4	RS P O					646
R391	SCR508, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	F4	RS I					648
392	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	3600	F+BAL	RS P T B					650
393	XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	CRNL	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	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	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	SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	F4	RS P T F					666
400	SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	6600	F4	RS P T F					666
401	GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	RS P T C					668
R402	SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	360	F4	RS P T I					670
R403	TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	6600	F+ASC	RSB X T M					673

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R404	FINE1, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	F4	RS P X	I	675
405	NOAH, 1-D ONE-GR SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P	T F	677
406	DATATRA 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL	6600B	F+ASC	R	T L	679
407	DATATRA UTILITY MODULES, 2-D & 3-D PLOTTING	KAPL	6600B	F+ASC	R	T P	681
R407	DATATRA UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL	6600	F+ASC	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	MC661,MC657,MC626, POLYNOMIAL CURVE FITTING	BAFL	6600	F4	RS P	T P	689
R412	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAFL	6600B	F4	RS P	T I	691
413	ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA	CRNL	360	F4	RS P	O	693
414	TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	1108	F5	RS P	T H	695
415	CFXE,INCEXE, 1-GR 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P X	T F	697
416	PART1, OPTIMAL GROUP OR MESH COLLAPSING	TRW	6500	F4	RS P	B	699
417	ATHENA4, INELASTIC SCATTERING FORM FACTORS	CRNL	360	F4	RS 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	635	F+FAP	RSBP	T Q	705
420	GRGUSF, SPACE-DEPENDENT X-SECTION GENERATION	GEC	635	F4	RSBP	T B	707
421	MICHPD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	F4	RSBP	O	709
422	SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	7090	FAP	RSBP X	T Q	711
423	DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC	635	F4	RSBP	D	713
R424	GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAFL	6600	F4	RS P	T H	715
R425	REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAFL	6600	F4	RS P	T O	717
R426	PAXJ3, HARMONY-PDQ X-SECTION GENERATION CODE	BAFL	6600	F+COM	RS P X	T B	719
427	FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	FW	6630	F+CCM	RS P X	T D	721
R428	DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL	6600	F+ASC	RS P	T P	725
R429	ASPI5, GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAFL	6600	F+ASC	RS P	T J	727
430	GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	F+BAL	RS P	T C	729
431	SUPERTOC, ENDF/B FINE-CP CONSTANTS GENERATION	CRNL	360	F4	RS P	T B	731
432	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	6600C	F4	RS P	T H	733
432	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	1108C	F4	RS P	T H	733
432	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	360C	F4	RS P	T H	733
433	CONTEMP-LT/022, PRESSURE-TEMPERATURE RESPONSE	ANC	360B	F+BAL	RSBP	CT G	735
434	HEATMF5H, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	6600	F4	RS P	N	738
435	BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	FPCC	360	F4	RS P X	G	740
436	ETCM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6630	F4	RS P	T B	742
437	ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	6600	F4	RS PL	T B	744
438	BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA	1108	F+BAL	RS P	T D	747
439	BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	GGA	1108	F+BAL	RS P	T O	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	RS P	T C	753
R442	SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL	6600	F+ASC	RS	P	755
443	HAB3, COAGULATION OF HETEROGENEOUS AEROSOLS	AI	360	F4	RS 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	RS P	T P	761
R446	MCST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	F4	RS P	P	763
447	ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD	6600	BCD	R L	T Z	764
R448	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	BAFL	6600	F4	RS P	T G	766
R448	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	MA-G	360	F4	RSBP	CT G	766
R449	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	BAFL	6600	F4	RS P	T I	768
R449	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	TVA	360	F4	RS P	T I	768
450	KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	CP	360B	F+BAL	RSBP	CT C	770
450	KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFC	6630	F+CCM	RS PLX	T C	770
450	KENO, MCNTE CARLO MULTIGROUP CRITICALITY CODE	CRNL	360	F+BAL	RSBP	CT C	770
451	SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	GGA	1108	F5	RS P	T I	772
452	SHELL5, THIN SHELL 3-C STRUCTURAL ANALYSIS	GGA	1108	F5	RS P	T I	774
453	RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	CRNL	360	F4	RS P	T B	776
454	PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P	T D	778
455	DAC1, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	F4	RS P	N	781
456	DBUFIT1, LEAST SQUARES PERTURBATION ANALYSIS	BNW	1108	F5	RS P	T O	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	NEC	635	F4	RS P	T H	787
459	DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NEC	635	F4	RS P	T C	789
460	LIF1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	360	F4	RS P	T I	791
R461	EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAFL	6600	F4	RS P	T B	793
R462	SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	PAFL	6600B	F+ASC	RS P	T J	795
463	3DOT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS P	T C	799
R464	DYNC1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	F4	RS P	O	801
R464	DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	F4	RS P	O	801
465	RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES	BNL	6630B	F4	RS P	T A	803
466	APREF1, 99-GR DLC-2H LIBRARY GROUP COLLAPSING	APRF	6600	F4	RS	B	806
467	HPG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	1108	F4	RS PLX	T B	808
467	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	360	F4	RS PLX	T B	808

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R468	BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	6600	F4	RS P	T	I 810
469	PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCAD	360B	F+BAL	RS P		C 812
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, MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	360C	36F	RSBP	T	M 818
472	MERMC2, MC**2 PINARY LIBRARY TAPE MAINTENANCE	ANL	360	F4	RS		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	3600	36F	RS PL	CT	F 822
474	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	360	F4	RS PL	CT	F 822
475	CRECT,CHECKER,PICEL,PLGTFB,... ENDF/B V2 PROC	BNL	6600B	F4	RS		T M 825
475	CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	F4	RS P	T	M 825
476	CAGE,RID,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES	1108	F5	RS P	T	O 829
R477	3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	F4	RS P	T	D 831
478	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.3	CDC	6600C	F+COM	RS		T P 833
478	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE2.0	CEND	7600B	F4	RS		T P 833
478	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW	6600R	F+ASC	RS		T P 833
478	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	6600A	F+ASC	RS		T P 833
478	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.2	CDC	6600C	F+COM	RS		T P 833
479	FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NEC	635	F4	RS P	T	G 836
480	FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NEC	635	F4	RS P	T	O 839
R481	BUSHL, CYL SWELL 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	T	H 845
484	FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS		T P 847
R485	GASPAR, 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	EGEE	360P	F4	RS		T H 853
488	NCISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	PNW	1108	F5	RS P	X	T F 855
488	NCISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	PNW	7090	F4	RS P	T	F 855
489	TRIFIDU, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS P		E 857
490	JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	CP	360	F+BAL	S		T M 859
491	MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	APGS	360	F4	RS P	X	T E 861
492	PAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL	6600	F4	RS P		A 864
493	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NEC	635	F4	RS P	T	M 866
493	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NEC	1108	F5	RS P	T	M 866
494	ADEP, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	F4	RS P	T	F 868
495	SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NEC	635	F+GMP	RS P	T	D 870
R496	KAPLPL0T, KAPL CALCOMP PLOTTING ROUTINES	KAPL	6600	F+COM	RS		T P 873
R497	REL01, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	6600	F4	RS P		P 875
498	CNCEPT3, POWER PLANT CONCEPTUAL COST ESTIMATE	CRNL	360C	F4	RS P	X	T D 877
499	MIRAP,MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400	F4	RS P	X	G 879
500	FRCLP2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	F4	RS P		G 882
501	EXDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	GESV	635	F+GMP	RS P	X	T B 884
502	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	CRNL	6600	F4	RS P	T	M 887
502	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	CRNL	360B	F4	RS PL	CT	M 887
R503	DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	F+COM	RS P	T	I 889
504	THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600	F4	RS P		A 892
505	TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	635	F+GMP	RS P	X	T L 894
R506	JPIXR, 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	MUCHAL,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	F4	RS P	X	T G 900
509	ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPC	7600	F4	RS P	T	B 902
510	VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	360	F4	RSBP	CT	C 904
510	VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600	F4	RS PL	X	T C 904
511	VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	360	F4	RS P	X	T 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 SA TRANSPORT	ANL	3600	F36	RS P	X	T C 912
514	FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	CRNL	6600	F4	RS P		P 914
515	GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NEC	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	CRNL	360	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 PL	X	T B 928
521	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	F4	RS P		G 930
521	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	FFFL	1108	F4	RS P		G 930
522	ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	360	F+BAL	RS P	CT	M 932
523	FSP, MONTE CARLO REACTOR ANALYSIS CALCULATION	CRNL	360	F+BAL	RSBP	CT	C 934
524	BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600	F4	RS P		A 936
525	ORTHIS,CRTHAT, 2-DIMENSIONAL HEAT CONDUCTION	CRNL	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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527	HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	FECL	1108	F+SL	RS P XCT R	942
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	DUCC	635	F4	RS	G 946
530	GENPD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	6600	F4	RS P L	948
530	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	360	F4	RS P L	948
R531	CLFM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	66JC	F4	RS P A	950
532	LASL XSEC SFTS, SN 18- 24- AND 25-GROUP SETS	LASL	66J0	BCD	R LX T Z	952
533	ARC-NUI002, BCD INPUT DATA PROCESSING MODULE	ANL	360	F4	RSBP CT L	954
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	1108	F4	RS X T P	956
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	360	F4	RSB XCT P	956
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	66JC	F4	RS X T P	956
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	635	F4	RS X T P	956
R535	MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	6600	F4	RS 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	RAPL	6600	F4	RS P T I	963
538	ETOG3, ENDF/B TO MUFT, GAP, ANISN X-SEC FORMAT	WAPC	76J0	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	FECL	1108	F5	RS P X T O	970
541	WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	ANL	360	F+ASM	RSB CT P	972
541	WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	ANL	360P	F+ASM	RSB CT P	972
542	PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	360	F4	RS P CT I	974
543	THERMOS LIBRARY, 3L-GP ENDF/B SCAT KERNELS	DP	360	BCD	R LX T Z	976
544	PLOT-3D, 3-D PLOTS IN IBM2280 OR CALCOMP780	ANL	360	F4	RS P T N	978
R545	BETTY, ENTRAINED PARTICLES SAMPLING STUDY	RAPL	66J0	F4	RS P T C	980
546	FMFALD, PWP PLANT RADIATION RELEASE & DOSE	PGE	360	F4	RS P CT 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	76J0	F4	RS P T G	987
549	RIGDEAL, SPENT YANKFF-FUEL TEMPERATURE CALC	CRNL	1604	F2	RS P H	989
550	REXCO-H, 2-D HYDRODYNAMIC RESPONSE TO EXCURSION	ANL	360	F4	RS P CT F	991
551	MCXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	1108	F4	RS P T H	993
551	MCXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	360	F4	RSBP XCT H	993
552	PWR-PPM, BORATION-DILUTION TABLES FOR PWR CPN	CPPD	64J0	F4	S P H	995
553	U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI	360	F+BAL	RS P CT B	997
554	DISPER, AEOSOL PARTICLE TRANSPORT STUDY	RFC	3600	F36	RS P G	999
555	PAPET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	360	F+BAL	RSBP CT G	1001
556	KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	CRNL	360	F4	RS P P	1004
R557	SPLOG, DATA MANAGEMENT, FITTING, & ANALYSIS	BAPL	6600	F4	RS P T M	1006
558	TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	CRNL	360	F4	RS P XCT F	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	66J0	F+CCM	RS P H	1012
561	TCKMINA/TCKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	360	F4	RS F X	1014
562	AMOLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E	ANL	360	F+P+A	RS T P	1016
563	AMOLIFP, ARGONNE SUBROUTINE LIBRARY CAT. F	ANL	360	F+BAL	RS T P	1022
564	AMOLIRGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL	360	F+P+A	RS T P	1028
565	INACITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC	360	F4	RS FL CT B	1031
566	RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC	AI	360	F4	RS P T Q	1033
567	3DR, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P CT C	1035
567	3DR, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	FECL	1108	F4	RS P T D	1035
R568	BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	CESV	635	F4	RS P CT I	1038
569	VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	ANC	360	F4	RSBP CT J	1040
R570	STRIFE, FUEL ROD CLAD STRAIN & PELLET CRACKING	BAPL	6600	F4	RS P I	1042
571	CHECK3,RIGEL3, ENDF/B V3 PROCESSING CODES	RNL	66J0	F4	RS T M	1044
571	RIGEL, ENDF/B V3 DATA PROCESSING CODE	ANL	360	F4	RS T M	1044
572	XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	CRNL	360	F4	RSBP XCT B	1046
573	TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH	LASL	7600	F4	RS P T C	1049
574	MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	ANC	360	F4	RS P CT W	1051
575	MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	360	F4	RS P CT W	1056
576	GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS	360	F4	RS P CT D	1059
577	FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	6600	F4	RS P V	1061
R578	PLOTR, 2D CENTOUR PLCTS & AREA CALCULATION	SLA	66JC	F4	RS P P	1063
579	DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	F4	RSBP CT D	1065
580	ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	360	F4	RS P T H	1067
581	SLADF-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA	6600	F4	RS P T I	1069
582	MCNA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360	F4	RSPP CT C	1072
583	STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	CRNL	360	F4	RS P C G	1074
584	FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	F4	RSBP CT I	1076
585	TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	CESV	H600	F4	RS P CT C	1078
586	PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	CP	360	F4	RS P H	1080
587	AEC-ALO FAU, RADIO FREQUENCY MANAGEMENT SYSTEM	ALCC	360	CCBOL	RS P M	1082
588	ORCOST, POWER PLANT CAPITAL COST ESTIMATING	CRNL	360B	F4	RS P T D	1084
R589	BFCOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA	360	CCBOL	RSBP CT M	1086
R589	BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA	1108	CCBOL	RS P M	1086

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590	INTEG,INSPEC, MARKOV SIMULATION OF REACTOR CPN	CP	360	F4	RS P	G	1088
591	PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	ANL	GETS	F	R	R	1090
592	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	66J0B	F4	RS P	P	1092
592	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	ANL	360B	F4	RS P C	P	1092
S593	TSO-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSO	ANL	360	F+BAL	R B L T	P	1094
594	ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION	ANL	360	F4	RSBPL CT	L	1096
595	MAPPER, PREDICTING MANUFACTURING REQUIREMENTS	CEPI	GETS	BASIC	R	M	1098
596	ENDF82,GAND2,GFE2, ENDF/B TC GAFGAP X-SECTIONS	GGA	1108	F5	RS P T	B	1100
R597	MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS	BAPL	660C	F+COM	RS P X T	I	1104
R598	PELEN, FUEL PELLETT TEMPERATURE & DEFORMATION	PAPL	6600	F4	RS P T	I	1107
599	TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HECL	1108	F5	RS P T	R	1109
600	EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	CP	360	F4	RS P	G	1111
601	ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS P	P	1113
602	LENSEDS, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	660C	F+COM	KS P T	P	1115
G603	RALCRPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMC	360	F+C+R	RSBP T	M	1117
R604	TCB01, CREEP-BUCKLING 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	W	1121
606	GAPER10, 1-D TRANSPORT PERTURBATION THEORY	GGA	1108	F4	RS P XCT	C	1123
R607	SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	1108	F+BAL	RSBP T	M	1125
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	760C	F4	KS P T	C	1127
609	INOX, XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	6600	F+COM	RS P T	Q	1129
610	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	6600	F4	RS P X T	P	1131
610	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	360	F4	KS P X T	P	1131
610	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	1108	F5	RS P X T	P	1131
611	CHILES, LINEAR ELASTIC SINGULARITY MODELING	SLA	660C	FTN	RS P T	I	1134
612	QMESH,RENUM, SELF-ORGANIZING MESH GENERATION	SLA	660C	F4	RS P T	L	1136
613	NRTS ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES	ANC	360	F+BAL	RS	T	1139
614	HISTOGRAMS, QUALITY CONTROL SAMPLE STATISTICS	BKC	360	F4	RSBP	P	1142
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R616	HAFMAT, SYSTEM STEADY-STATE FLOW DISTRIBUTION	KAPL	6600	F4	RS P T	H	1147
617	KEFF,MGBS,TGAN, NUCLEAR CRITICALITY SAFETY	DP	360	F4	RS P T	C	1149
618	GAPCON-THERMAL1, FUEL PIN GAP CONDUCTANCE CALC	BNW	1108	F4	RS P T	H	1151
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620	GROUP2, GROUP THEORY OF LATTICE DYNAMICS	ANL	360	F4	RS P T	Q	1155
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622	GAUSS6, BATCH ANALYSIS OF GAMMA-RAY SPECTRA	ANC	360	F+P+A	RSBP XCT	W	1160
623	SETS, SET EQUATION TRANSFORMATION SYSTEM	SLA	6600P	FTN	RS P T	P	1163
624	GRAPH, LINEAR REGRESSION W/CONFIDENCE LIMITS	BKC	360	F4	RSBP	P	1165
625	VARI-17, 1-D VARIATIONAL SENSITIVITY	ANL	360	F4	RSBP CT	C	1167
626	ARC-DIF10, 1-D MULTI-GP DIFFUSION & INVENTORY	ANL	360	F4	RSBP CT	C	1169
627	TOODY2, 2-D LAGRANGIAN EQNS OF MOTION SOLUTION	SLA	360C	F36	RS P T	S	1171
628	ETCT3, ENDF/B V3 DATA TO THERMAL LIBRARY FORM	WAFD	7600	F4	RS P T	B	1173
629	ORRIBLE, ROD BUNDLE FLOW & TEMPERATURE DIST.	CRNL	360	F4	RS P T	H	1176
630	LATIN SQ, NXN LATIN SQUARE EXPERIMENTAL DESIGN	MLMC	360	F4	RSBP C	P	1178
631	RAFFLE-ANC, MONTE CARLO NEUTRON TRANSPORT CODE	ANC	360	F4	RSBP CT	C	1180
632	MMM3, COORDINATE ANALYSES SEMI-RIGID MOLECULES	ANC	360	F4	RS P	W	1182
633	LASLIB, LOS ALAMOS SUBROUTINE LIBRARY ROUTINES	LASL	6600P	F+COM	RS T	P	1184
634	REBUS2, FUEL CYCLE ANALYSIS FOR FAST REACTORS	ANL	360	F+BAL	RSBP CT	O	1188
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636	6KILER, CORE HEATUP CODE FOR BWR/6 ANALYSIS	EI	360	F+BAL	RS P CT	H	1193
637	GAMTAB, RADIOACTIVE-DECAY GAMMA RAY CATALOG	OP	360P	EBDCD	R L T	Z	1195
638	RIGEL4,CHECK4,... ENDF/B V4 PROCESSING CODES	PNL	660CB	F4	RS T	M	1197
639	POLLA, CONVERTS R-MATRIX RESONANCE PARAMETERS	CRNL	360	F4	RS P	A	1199
640	DE/STEP,INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	660C	F4	RS P X T	P	1201
640	DE/STEP,INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	360	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	360	F+BAL	RS CT	P	1205
643	NUBOW, STRUCTURAL ANALYSIS BOWED REACTOR CORES	ANL	360P	F4	RS P	I	1207
644	GETCOR,FRECOR, FORTRAN DYNAMIC STORAGE ALLOC	CRNL	360	BAL+F	RS P CT	P	1209
645	DYNAMIC ANALYSIS OF GASES BY MASS SPECTROMETRY	RFC	360	F4	RS P	U	1211
646	COPYCAT, IBM OS SYSTEM CATALOG UTILITY ROUTINE	ANL	360B	BAL	PSB X T	P	1213

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ARGONNE CODE CENTER: COMPILATION OF PROGRAM ABSTRACTS

by

M. K. Butler, M. DeBruler, H. S. Edwards,
C. Harrison, Jr., Catherine E. Hughes, Marianne Legan,
T. Menozzi, L. Ranzini, and Anthony J. Strecok

PREFACE

As originally published ANL-7411 was the second complete revision of program abstracts undertaken by the Code Center since its inception in 1960. This revision eliminated from the collection those programs for machines of the 704 era and earlier. With the assistance of installation representatives and authors, existing program abstracts were revised and material added to the library to complete, whenever possible, the program package for each program in the Center's collection.

The table of contents lists in order of accession, the KWIC title of each program, the originating installation, the machine, the programming language, the package symbols, and the category. This title information is then used to provide the index which follows the abstracts. The package symbols included are defined as follows:

R = reference report or document,

S = source deck or tape,

B = binary or run deck or tape,

P = sample problem data,

L = library information, e.g., cross-section library,
random-number library,

X = auxiliary routines or information,

C = control or operating system language statements,

and

T = magnetic tape(s) required for transmittal of card and/or
tape material.

This collection includes programs in which the program number is preceded by the letter R, G, or S. The letter R denotes restricted, and U. S. citizens are required to file a release form with the Center for use of the program on either official U. S. government or commercial (nonmilitary) applications at a U. S. installation. The letter G designates programs which

are limited to use on U. S. government contracts only. In addition to the release form requirement, the contract identification, and the signature of the contracting officer must be furnished when requesting such programs. The Code Center is not authorized to distribute these programs outside the United States. The letter S is used to identify packages which are distributed to a special list of designated recipients only.

To best service the interests of ERDA contractors, university nuclear engineering departments, and the nuclear industry, the Center will, upon request, supply to an installation, a copy of any of the material listed as available under Item 16 of the abstract. Should that installation modify the program, convert it to a usable form on another computer, uncover an error, or have difficulty in using the program, they are asked to notify the Center so that their efforts in turn might benefit other recipients. The Center maintains records of the recipients of all library material so that if a correction or new version is prepared, all previous recipients of the program are notified promptly.

Program abstracts for the OECD Nuclear Energy Agency Computer Program Library programs in the Argonne Code Center collection have not been included in this compilation. Separate compilations are distributed regularly to our contributing installations.

I. HISTORY AND ACKNOWLEDGMENTS

In 1956, at the Second Annual Meeting of the American Nuclear Society, the initial meeting of an informal group called the Nuclear Codes Group was held. This group was composed of "persons interested in the development and use of computer programs for reactor design." The group held regular meetings in conjunction with the semiannual ANS meetings and published and distributed a Newsletter containing code abstracts submitted by members. These abstracts followed the format of the Atomic Energy Commission document AECU-3078, "A Bibliography of Available Digital Computer Codes for Nuclear Reactor Problems."¹

From September 1956 to December 1959, ten Newsletters were published and distributed through the auspices of the AEC Computing Facility at New York University.² In 1959, Ward Sangren and personnel at General Atomics edited and published 300 abstracts collected from Group members.³ A supplementary list of 100 abstracts was published the following year.⁴

In 1959 also, the Nuclear Codes Group became the nucleus of the American Nuclear Society's Mathematics and Computation Division. With stature came a desire for a central facility for the computer program library

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03/72

17. CATEGORY - I
KEYWORDS - COOLANTS, PRESSURE, TEMPERATURE, FLUID FLOW

1. NAME OR DESIGNATION OF PROGRAM - TEMPEST2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090, 360, CDC1604
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - 1 TO 2 MINUTES ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - SOFOCATE, KATE
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1962.
IBM7090 VERSION SUBMITTED MARCH 1962.
CDC1604 VERSION SUBMITTED MARCH 1964.
IBM360 VERSION SUBMITTED JUNE 1967, REPLACED BY EDITION B FEBRUARY 1974.
10. REFERENCES - R. H. SHUDDE, TEMPEST-II, NAA PROGRAM DESCRIPTION, 1960, AND THREE SUPPLEMENTS 1960, 61.
R. H. SHUDDE AND J. DYER, TEMPEST II - A NEUTRON THERMALIZATION CODE, AMTD-111, JUNE 1962.
R. H. SHUDDE, TEMPEST - CONVERSION OF A DECIMAL CROSS SECTION LIBRARY TO A BINARY CROSS SECTION LIBRARY, AMTD-112, NOVEMBER 1961.
R. H. SHUDDE, TEMPEST - A BINARY CROSS-SECTION LIBRARY READER, AMTD-113, NOVEMBER 1961.
R. H. SHUDDE, SOFOCATE LIBRARY TO TEMPEST LIBRARY CONVERTER, AMTD-114, NOVEMBER 1961.
R. H. SHUDDE, PREPARATION OF CROSS-SECTIONS FOR THE TEMPEST DECIMAL LIBRARY, AMTD-115, NOVEMBER 1961.
TEMPEST II, NOTES CONCERNING THE CONTROL DATA VERSION.
11. MACHINE REQUIREMENTS - 32K MEMORY
12. PROGRAMMING LANGUAGES USED - FORTRAN II AND FAP (IBM7090), FORTRAN 63 (CDC1604), AND FORTRAN IV (IBM360)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
IBSYS (7090) AND OS360 (360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
7090	R. H. SHUDDE AND J. DYER
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA
360	G. GEWINS
BOEING HUNTSVILLE SIMULATION CENTER
THE BOEING COMPANY
HUNTSVILLE, ALABAMA 35807
1604	S. ELKIN
NUCLEAR APPLICATIONS COMPUTATION CENTER
CONTROL DATA CORPORATION
COMPUTER DIVISION
3145 PORTER DRIVE
P. O. BOX 10111
PALO ALTO, CALIFORNIA 94303
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7090-2145 CARDS, 1604-1298 CARDS, AND 360-1280
CARDS)
SAMPLE PROBLEMS (7090-10 CARDS, 1604-11 CARDS, AND 360-21
CARDS)
LIBRARIES (7090-765 CARDS, 1604-741 CARDS, AND 360-764 CARDS)
SAMPLE PROBLEM OUTPUT (360-14 SELECTED PAGES)
REFERENCE REPORTS, NOTES
17. CATEGORY - B
KEYWORDS - THERMALIZATION, WIGNER-WILKINS MODEL LIGHT MODERATORS,
WILKINS EQUATION HEAVY MODERATORS, MAXWELL DISTRIBUTION,
THERMAL SPECTRA

1. NAME OR DESIGNATION OF PROGRAM - FORM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090,370, CDC1604
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - ABOUT 5 TO 6 SECONDS ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - MUFT, LIBRARY EDITING ROUTINES ARE INCLUDED AS AUXILIARY CODES. AITP1 PREPARES THE IBM370 VERSION BINARY LIBRARY TAPE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1962.
IBM7090 VERSION SUBMITTED MARCH 1962.
CDC1604 VERSION SUBMITTED MARCH 1964.
IBM370 VERSION SUBMITTED JULY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - D. J. MCGOFF, FORM, A FOURIER TRANSFORM FAST SPECTRUM CODE FOR THE IBM709, NAA-SR-MEMO-5766, 1960.
FORM, NOTES CONCERNING THE CONTROL DATA VERSION.
ATOMICS INTERNATIONAL FORM CPCSS-SECTION LIBRARY,
AI NOTE, NOVEMBER 1962.
P. KAZEMERSKY AND S. NAKAMURA, THE FORM CODE, OHIO STATE MODIFICATIONS TO NAA-SR-MEMO-5766, 1972.
11. MACHINE REQUIREMENTS - 32K WITH 2 TAPE UNITS
12. PROGRAMMING LANGUAGES USED - FORTRAN II (IBM7090), FORTRAN 63 (CDC1604), FORTRAN IV (IBM370)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - FORTRAN MONITOR SYSTEM (IBM7090), COOP (CDC1604), OS/370 (IBM370).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
7090 R. A. BLAINE AND D. J. MCGOFF
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

1. NAME OR DESIGNATION OF PROGRAM - SOR3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE NUMERICAL INTEGRATION OF THE GOVERNING DIFFERENTIAL EQUATIONS IS PERFORMED BY A VARIABLE INTERVAL SIZE ADAMS-MCULTON METHOD. THE PROBLEM IS FIRST CONVERTED FROM A TWO-POINT BOUNDARY VALUE PROBLEM TO AN INITIAL-VALUE PROBLEM. FIVE SEPARATE INTEGRATIONS WITH DIFFERENT SETS OF INITIAL CONDITIONS ARE REQUIRED. EACH INTEGRATION PROCEEDS WITH AUTOMATIC ADJUSTMENT OF INTERVAL SIZE FOR MAXIMUM SPEED WITHIN THE LIMITATION OF PRESET BOUNDS ON THE ASSOCIATED TRUNCATION ERROR.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
30 SHELLS INTO WHICH THE STRUCTURE IS DIVIDED
30 INPUT POINTS FOR THE SHELL
10 POINTS AT WHICH DETAILED STRESS PRINTOUT IS TO BE PROVIDED FOR BRITTLE FRACTURE PURPOSES
6. TYPICAL RUNNING TIME - AN AVERAGE TIME OF 10 SECONDS PER CASE IS REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM - SOR3 HAS A BRANCHED-SHELL OPTION WHICH AUTOMATICALLY PERFORMS THE CUT AND FIT OPERATIONS ASSOCIATED WITH THE ANALYSIS OF SUCH STRUCTURES AS A PRESSURE VESSEL CONNECTED TO A SUPPORT SKIRT. SPECIAL OUTPUT OPTIONS TAILORED TO THE NEEDS OF STRESS, FATIGUE AND BRITTLE FRACTURE DESIGN EVALUATIONS ARE AVAILABLE.
8. RELATED AND AUXILIARY PROGRAMS - SOR3 IS AN EXTENSION OF THE EARLIER SOR2 PROGRAM. ONE OF THE SOR3 OPTIONS PROVIDES FOR PUNCHED CARD OUTPUT WHICH CAN BE FED DIRECTLY TO SORSDB (ACC ABSTRACT 391), A KAPL PROGRAM WRITTEN TO FACILITATE THE CHECKING OF A GIVEN DESIGN AGAINST STRUCTURAL DESIGN BASIS CRITERIA.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
CDC6600 VERSION OF SOR2 SUBMITTED JUNE 1968, REPLACED BY REVISED EDITION JULY 1969, REPLACED BY SOR3 FEBRUARY 1973, CORRECTED JULY 1974.

10. REFERENCES - J. R. FITCH AND R. L. FAGAN, SOR-3, A PROGRAM FOR THE STRESS ANALYSIS OF SHELLS OF REVOLUTION, KAPL-M-7100(L), AUGUST 30, 1971.
J. A. MIRADAL AND D. G. DIGHT, SOR-II - A PROGRAM TO PERFORM STRESS ANALYSIS OF SHELLS OF REVOLUTION, KAPL-2292, SEPTEMBER 15, 1963.
F. C. CARLSON AND R. E. DOBSON, SORSDB, A COMPUTER PROGRAM FOR THE STRESS AND FATIGUE EVALUATION OF SHELLS OF REVOLUTION, KAPL-M-6729, APRIL 1969.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.0.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
J. R. FITCH AND R. L. FAGAN
KNOLLS ATOMIC POWER LABORATORY
GENERAL ELECTRIC COMPANY
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (3285 CARDS)
SAMPLE PROBLEM (351 CARDS)
SAMPLE PROBLEM OUTPUT (72 SELECTED PAGES)
REFERENCE REPORT, KAPL-M-7100(L)
17. CATEGORY - I
KEYWORDS - STRESSES, SHELLS, SPHERES, CYLINDERS, TEMPERATURE DISTRIBUTION, SOR2 CODES, SORSDB CODES

1. NAME OR DESIGNATION OF PROGRAM - NPRFCCP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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 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.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
MAXIMUM NUMBER OF REGIONS OR ZONES = 10
6. TYPICAL RUNNING TIME - 1 TO 2 MINUTES ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM - CERTAIN OF THE OPERATING AND ECONOMIC PARAMETERS WILL GENERALLY REMAIN CONSTANT FOR A WIDE RANGE OF REACTOR CORE DESIGNS. THEREFORE, THE PROGRAM INCLUDES A SET OF STANDARD VALUES FOR THESE PARAMETERS SO THAT THE AMOUNT OF BASIC INPUT DATA REQUIRED IS MINIMAL. THE USE OF THESE SO-CALLED STANDARD VALUES IS OPTIONAL WITH THE PROGRAM USER, AND ANY COMBINATION OF OR ALL OF THESE STANDARD VALUES MAY BE MODIFIED AS DESIRED. FUEL PROCESSING COSTS MAY BE COMPUTED FOR SPENT-FUEL MANAGEMENT PROGRAMS WHICH PROVIDE FOR THE REPROCESSING, SEPARATELY OR IN ANY COMBINATION, OF SINGLE OR MULTIPLE SPENT-FUEL BATCHES FROM ONE OR MORE REGIONS HAVING THE SAME OR DIFFERENT FINAL ENRICHMENTS. THUS, THE LOWEST COST SPENT-FUEL MANAGEMENT PROGRAM CAN BE READILY DETERMINED.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED NOVEMBER 1964.
IBM7090 VERSION SUBMITTED JUNE 1964, REPLACED BY IBM360
VERSION JULY 1974.
CDC6600 VERSION SUBMITTED APRIL 1973.

9. STATUS (CONTINUED)
IBM360 VERSION SUBMITTED JULY 1974, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCE - J. T. JACKMAN, GUIDE TO NUCLEAR POWER COST EVALUATION, TID-7025, APRIL 30, 1963.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCCP 3.3 (CDC6600), CS/360,370 (IBM360,370).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
709J	J. T. JACKMAN
KAISER ENGINEERS
KAISER INDUSTRIES CORPORATION
KAISER CENTER
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TECHNICAL COMPUTER SERVICES
UNITED ENGINEERS AND CONSTRUCTORS, INC.
1401 ARCH STREET
PHILADELPHIA, PENNSYLVANIA 19105
360	RICHARD L. PRICE
ARGONNE CODE CENTER
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ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE -
SOURCE DECKS (6600-1446 CARDS, 360-1353 CARDS)
SAMPLE PROBLEMS (6600-136 CARDS, 360-137 CARDS)
REFERENCE REPORT, APPENDIX A
17. CATEGORY - D
KEYWORDS - FUEL CYCLE ECONOMICS, PERFORMANCE

1. NAME OR DESIGNATION OF PROGRAM - MACH1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600,6500, IBM360,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE DIFFUSION EQUATION SOLUTION METHOD IS THE SAME AS THAT IN AIM6 (ACC ABSTRACT 29). PERTURBATION AND EFFECTIVE BETA ROUTINES HAVE BEEN ADAPTED FROM DEL AND 1188/RE. REMAINING COMPUTATIONS CONSIST OF STRAIGHTFORWARD DATA MANIPULATION.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 20 SPATIAL REGIONS
 - 150 MESH POINTS
 - 30 ENERGY GROUPS (3600 VERSION ONLY)
 - 28 ENERGY GROUPS (6500 AND IBM360 VERSIONS)
 - 5 MODAL SPECTRA (IBM 360 VERSION)
 - 15 DOWNSCATTER GROUPS
 - 20 ISOTOPES PER PROBLEM
 - 20 HOMOGENIZED MATERIALS
 - 20 ISOTOPES PER HOMOGENIZED MATERIALA SPECIAL SCATTER TREATMENT IS USED WHICH ALLOWS FULL DOWNSCATTER FOR HYDROGEN ISOTOPES.
6. TYPICAL RUNNING TIME - RUNNING TIME IS STRONGLY DEPENDENT ON THE TYPE OF PROBLEM AND QUALITY OF INITIAL GUESS. A K-CALCULATION OF A WATER-MODERATED SYSTEM WITH 16 GROUPS, 5 DOWNSCATTER GROUPS, 20 REGIONS, AND 130 MESH POINTS, WITH A CONSTANT INITIAL SOURCE GUESS CONVERGED IN 11 INNER ITERATIONS TO WITHIN $10^{-5}(\Delta K/K)$ IN 46.5 SECONDS. A COMPOSITION SEARCH ON A FAST REACTOR CORE USING 22 GROUPS, 12 DOWNSCATTERS, 9 REGIONS, 150 MESH POINTS, AND REGION-DEPENDENT INITIAL SOURCE GUESS, CONVERGED WITH A TOTAL OF 19 INNER ITERATIONS AND 3 TRIALS TO $10^{-6}(\Delta K/K)$, FOUND THE ADJOINT SOLUTION TO THE SAME ACCURACY AND RAN A SINGLE PERTURBATION PASS IN 144.9 SECONDS. THE IBM TEST WITHOUT OVERLAYS TOOK 6 SECONDS OF CPU TIME ON THE MODEL 195.
7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM WAS DESIGNED FOR USE ON FAST REACTOR SURVEY COMPUTATIONS AND AS A SUPPORTING UTILITY FOR MORE COMPLEX PROGRAMS. WIELANDT'S METHOD CAN BE USED IN CONJUNCTION WITH THE SPECTRAL SYNTHESIS OPTION TO GREATLY ACCELERATE EIGENVALUE CONVERGENCE. PROBLEMS CAN BE RUN IN SEQUENCE WITH ONLY REQUIRED DATA CHANGES AS INPUT FOR PROBLEMS AFTER THE FIRST. THE PROGRAM CONTAINS A CALL TO A NON-EXISTENT OVERLAY. THIS CAN PROVIDE A LINK TO ANY ROUTINE WRITTEN BY THE USER FOR MODIFICATION

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
OR MANIPULATION OF MACH1 OUTPUT DATA. THE ROUTINE HAS ACCESS TO INPUT DATA AND DATA GENERATED BY THE CODE, AND CAN CONTROL LATER PROBLEMS THROUGH OPTION SWITCHES. MICROSCOPIC CROSS SECTIONS MAY BE CALLED FROM A LIBRARY OR INPUT AT RUN TIME. INDIVIDUAL CROSS SECTION QUANTITIES MAY BE MODIFIED TEMPORARILY FOR A PROBLEM.
8. RELATED AND AUXILIARY PROGRAMS - AIM6, DEL, AND 1188/RE WERE ADAPTED AND MODIFIED TO MAKE UP THE MAJOR PORTIONS OF THE PROGRAM.
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
CDC3600 VERSION SUBMITTED DECEMBER 1966.
CDC6500 VERSION SUBMITTED MARCH 1969.
IBM360 VERSION SUBMITTED JANUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC ON IBM370/195.
10. REFERENCES - D. A. MENELEY, L. C. KVITEK, AND D. M. OSHEA, MACH 1, A ONE-DIMENSIONAL DIFFUSION THEORY PACKAGE, ANL-7223, JUNE 1966.
D. MENELEY, MACH1 GUIDE AND MACH1 DICTIONARY, ANL-RP MEMORANDA, JUNE 1967.
WILLIAM G. PRICE, MACH/360, UNIVERSITY OF MICHIGAN INFORMAL DOCUMENTATION, 1972.
H. P. FLATT AND D. C. BALLER, THE AIM-6 CODE, NAA PROGRAM DESCRIPTION, JANUARY 1961.
L. C. KVITEK, DEL, A PERTURBATION PROGRAM WRITTEN IN FORTRAN, ANL-7052, JUNE 1965.
L. C. KVITEK, MULTIGROUP CALCULATIONS OF EFFECTIVE DELAYED-NEUTRON FRACTIONS, PROMPT NEUTRON LIFETIME, AND RELATED KINETICS PARAMETERS, IBM-704 PROGRAM 1188/RE, ANL-6511, MARCH 1962.
11. MACHINE REQUIREMENTS - CDC 3600 WITH 64K CORE STORAGE AND 9 TAPE DRIVES (INCLUDING 5 SYSTEM TAPES). IBM360 WITH 5 TAPE DRIVES AND 1645K CORE STORAGE ASSUMING NO OVERLAY ORGANIZATION.
12. PROGRAMMING LANGUAGES USED - 3600 FORTRAN (CDC3600), FORTRAN IV (CDC6500, IBM360-98%), BAL (IBM360-2%)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CDC3600 SCOPF-SATCOPS II, IBM360 OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM CAN BE DIVIDED INTO SIX OVERLAYS WITH A TOTAL OF ELEVEN SEGMENTS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
3600 D. A. MENELEY
REACTOR PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

6500 K. C. OTT

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
NUCLEAR ENGINEERING DEPARTMENT
PURDUE UNIVERSITY
WEST LAFAYETTE, INDIANA 47906
- 360 WILLIAM G. PRICE, JR.
PLASMA PHYSICS LABORATORY
PRINCETON UNIVERSITY
P. O. BOX 451
PRINCETON, NEW JERSEY 08540
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (MACH1 3600-6980 CARDS, 650J-7105 CARDS,
360-7661 CARDS, RXMACH 3600-137 CARDS, MACHLIB3
6500-479 CARDS, 360-509 CARDS)
OBJECT DECKS (MACH1 360-410 CARDS)
SAMPLE PROBLEMS (MACH1 3600-95 CARDS, 6500-40 CARDS,
360-32 CARDS)
LIBRARY (MACHLIB3 6500-2145 CARDS, 360-2081 CARDS)
CONTROL INFORMATION (360 JCL-50 CARDS)
REFERENCE REPORT, ANL-7223, ANL-RP MEMORANDA, AND FOR THE
IBM360 VERSION, MACH 360 DOCUMENT
17. CATEGORY - C
KEYWORDS - DIFFUSION EQUATIONS, 1-DIMENSIONAL, MULTIGROUP, SLABS,
CYLINDERS, SPHERES, CRITICALITY SEARCHES, REACTION
RATES, AVERAGES, PERTURBATION THEORY

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 MAY BE USED TO ALSO 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. THE IBM360 AND VERSION CAN BE USED TO SOLVE THREE-DIMENSIONAL SYNTHESIS PROBLEMS.
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 150000. 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 VERSION OF PDQ7 USES THE NEW BETTIS ENVIRONMENTAL ROUTINES, WHICH HAVE NOT YET BEEN RELEASED. 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 UPDATED EDITION JUNE 1971.
IBM360 (IBM) VERSION SUBMITTED FEBRUARY 1969, DELETED NOVEMBER 1971.
CDC6600 (B&W) VERSION SUBMITTED FEBRUARY 1970.
IBM360 (AEROJET NUCLEAR) VERSION 3608 SUBMITTED APRIL 1970, REVISED (C) APRIL 1971, REPLACED BY THIRD REVISION (D) AUGUST 1972, REVISED (E) MARCH 1973, REVISED (F) MARCH 1974, SAMPLE PROBLEM EXECUTED BY ACC.
CDC6600 KRONOS (BOEING) VERSION SUBMITTED JULY 1973.
10. REFERENCES - W. R. CADWELL, PDQ-7 REFERENCE MANUAL, WAPD-TM-678, JANUARY 1967.
R. J. BREEN, C. J. MARLOWE, AND C. J. PFEIFER, HARMONY - SYSTEM FOR NUCLEAR REACTOR DEPLETION COMPUTATION, WAPD-TM-478, JANUARY 1965.
OUTPUT FOR THE BETTIS CDC-6600 REVISED VERSION OF PDQ7, 1971.
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.
INSTALLATION OF PDQ-7 ON THE CDC 6600 IN CONJUNCTION WITH MODEL, CDC NOTE, 1971.
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.
PDQ-7 TRANSMITTAL TAPE (ACC NO. 275.360C), ANC NOTE, 1972.
R. J. WAGNER, OPERATIONAL NOTES FOR PDQ-7/14, ACC NO. 275.360D, ANC NOTE, 1972.
UPD, A PROGRAM TO UPDATE SOURCE DECKS, ANC NOTE PU1750.
NRTS ENVIRONMENTAL SUBROUTINE MANUAL, ANC DOCUMENT, DECEMBER 1972.
PDQ7, ACC NO. P275.6600D, 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. ANY 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 P. O. BOX 79 WEST MIFFLIN, PENNSYLVANIA 15122
360	R. J. CREASY INTERNATIONAL BUSINESS MACHINES CORPORATION 2670 HANOVER STREET PALM ALTO, CALIFORNIA 94304
360	R. J. WAGNER AND A. W. BROWN COMPUTER SCIENCE BRANCH AEROJET NUCLEAR COMPANY P. O. BOX 1845 IDAHO FALLS, IDAHO 83401
360	J. A. MCCLURE ENERGY INCORPORATED P. O. BOX 736 IDAHO FALLS, IDAHO 83411
6600 B&W	M. L. DECH AND R. W. MCCRANEY CONTROL DATA CORPORATION G. P. POFTSCHAT AND G. L. RUSSELL POWER GENERATION DIVISION THE BABCOCK & WILCOX COMPANY P. O. BOX 1260 LYNCHBURG, VIRGINIA 24505
6600 KRONOS	F. M. KNCX 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)
SOURCE DECKS (BETTIS 6600-51,497 CARDS, B&W 6600-27,446 CARDS,
AEROJET 360-38,268 CARDS)
UPDATE FILES (BOEING UPDATE OLDPL OF PDQ7 6600-238 RECORDS,
UPDATE OLDPL OF BETTIS ENVIRONMENTAL ROUTINES
6600-130 RECORDS, MODIFY CPL OF PDC,MFN,CATLIST
6600-20 RECORDS)
IBM 2314 LOAD MODULE (AEROJET PDS PDQTRNMT 360-1856 BLOCKS)
SAMPLE PROBLEMS (BETTIS 6600-80 CARDS, AEROJET 360-761 CARDS,
B&W 6600-69 CARDS)
AUXILIARY PROGRAMS (AEROJET BUFR 246 CARDS, PDQCI 41 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
36J-89 PAGES)
REFERENCE REPORTS, WAPD-TM-678, WAPD-TM-668, WAPD-TM-947(L),
ANCR-1061, NRTS MANUAL, AND NOTES

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, UPC CODES, BUFR CODES, PDQCI CODES, PDQD
CODES, PDQR CODES, PDQTL CODES

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (4 TAPES)

SOURCE DECKS (GGC4 1108-11,567 CARDS, WTFG 1646 CARDS, MAKE
1033 CARDS, MST 463 CARDS, PRINT 765 CARDS, MIXER
500 CARDS, MGT3 251 CARDS, SPRINT 324 CARDS,
COMBIN 479 CARDS, DCP 927 CARDS, GGC4 6600-
11,504 CARDS)

SAMPLE PROBLEMS (GGC4 1108-38 CARDS, 6600-38 CARDS)

FAST DATA TAPE (6J NUCLIDES - TAPE 2 - 1108-2772 BINARY
RECORDS, 6600-1703 BINARY RECORDS)

FAST DATA TAPE (151 NUCLIDES - TAPE 3 - 1108-7362 BINARY
RECORDS, 6600-4436 BINARY RECORDS)

THERMAL DATA TAPE (222 NUCLIDES - TAPE 4 - 1108-2654 BINARY
RECORDS, 6600-1539 BINARY RECORDS)

REFERENCE REPORTS AND NOTES

17. CATEGORY - B

KEYWORDS - MULTIGROUP CROSS SECTIONS, AVERAGES, FAST, THERMAL,
SPECTRA, DOPPLER BROADENING, DANCORF CORRECTION, ANGU-
LAR DISTRIBUTION, RESONANCE PARAMETERS, MAKE CODES,
MST CODES, PRINT CODES, MIXER CODES, WTFG CODES, MGT3
CODES, SPRINT CODES, COMBIN CODES, DCP CODES

1. NAME OR DESIGNATION OF PROGRAM - LION4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, 7600, UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE MODELING IS BASED ON THE CONCEPT OF NODAL POINTS CONNECTED BY ONE-DIMENSIONAL THERMAL CONDUCTANCE EQUATIONS IN AS MANY AS SIX DIRECTIONS SIMULTANEOUSLY. THE EXPLICIT, OR FIRST FORWARD DIFFERENCE METHOD, IS THEN USED TO OBTAIN THE SOLUTIONS TO THESE EQUATIONS FOR THE THREE-DIMENSIONAL FIELD. THE TEMPERATURE CHANGE FOR A SURFACE NODE IS CALCULATED BY APPLYING THE OHM'S LAW ANALOGY FOR HEAT FLOW TO A NODE WITH NO CAPACITANCE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - DYNAMIC ALLOCATION
 $11*D1 + 26*D2 + 20*D3 + 3*D4 + 17*D5 + 3*D6 + S1 + S2 + S3 + S4$
 LESS THAN OR EQUAL TO 24500
 VARIABLE NUMBER OF EXTERNAL CONNECTIONS (D1)
 VARIABLE NUMBER OF INTERNAL NODES (D2)
 VARIABLE NUMBER OF SURFACE NODES (D3)
 VARIABLE NUMBER OF BOUNDARY NODES (D4)
 VARIABLE NUMBER OF COOLANT NODES (D5)
 VARIABLE NUMBER OF INTERFACE NODES (D6)
 S1=STORAGE FOR TEMPERATURE MEANS AND DIFFERENCES
 S2=STORAGE FOR HEAT FLOW SUBROUTINE
 S3=STORAGE FOR CONVECTIVE HEAT TRANSFER CALCULATION
 S4=STORAGE FOR VARIABLE LIBRARIES
 USING INCREASED NODAL CAPABILITY FEATURE WITH ADMITTANCE MATRIX IN FCS THIS ALGORITHM BECOMES--
 $11*D1 + 10*D2 + 4*D3 + 3*D4 + 17*D5 + 3*D6 + S1 + S2 + S3 + S4$
 15 MATERIALS
 7*D2 INTERNAL CONNECTIONS

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)
 - 12 COOLANT CHANNELS (EACH WITH 4 SIDES MAXIMUM)
 - 77 PRINTOUTS
 - 7 INTERNAL CONNECTIONS PER INTERNAL NODE
 - 6 SURFACE CONNECTIONS PER SURFACE NODE
 - 6 TYPES OF TEMPERATURE MEANS AND DIFFERENCES SETS
 - 10 GRAPHS (CDC6600, 7600 ONLY)
 - 12 CURVES PER GRAPH (CDC6600, 7600 ONLY)
 - 17 TYPES OF QUANTITIES GRAPHABLE (CDC6600, 7600 ONLY)
 - 4 SUB-COOLED NUCLEATE BOILING REGIONS
 - 5 TYPES OF HEAT FLOW RATE SETS
6. TYPICAL RUNNING TIME - THE RUNNING TIME ON THE CDC6600 IS STRONGLY DEPENDENT ON THE NUMBER OF NODES, THEIR RELATIVE AND ABSOLUTE SIZE, AND THE TIME RANGE CONSIDERED. THE SAMPLE PROBLEM EXECUTES IN ONLY A FEW SECONDS ON THE CDC6600. EXECUTION OF THE UNIVAC1108 SAMPLE PROBLEM REQUIRES 5 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM - SUBCOOLED NUCLEATE BOILING MAY BE CONSIDERED. HOWEVER, THIS CONSIDERATION IS LIMITED TO WATER.
8. RELATED AND AUXILIARY PROGRAMS - SUPPORT PROGRAMS INCLUDE THE PLI SERIES OF PREPROCESSORS FOR SELECTED GEOMETRIES, THE GRAPL GRADIENT PLOTTER, HCAL2, WHICH EVALUATES HEAT TRANSFER COEFFICIENT EQUATIONS FOR SELECTED CONDITIONS, AND CONLI, WHICH RENUMBERS INPUT DATA AND INSERTS SPARE NODE NUMBERS OF 3 DIFFERENT KINDS TO PERMIT CONSOLIDATION OF GEOMETRY INPUT FOR ENTRY INTO A LARGE PROBLEM. LION SUPERCEDES EARLIER IBM704 AND PHILCO 2000 PROGRAMS CALLED TIGER. LION USES THE PLOTTING ROUTINES IN KAPL PLOT (ACC ABSTRACT 496).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
CDC6600 VERSION SUBMITTED OCTOBER 1967, REPLACED BY FIRST REVISION AUGUST 1968, REPLACED BY SECOND REVISION JANUARY 1970, REPLACED BY LION4 JULY 1973, PLOTTING ROUTINES REPLACED SEPTEMBER 1974.
UNIVAC1108 VERSION SUBMITTED JUNE 1971.
10. REFERENCES - J. R. SCHMID, G. L. LECHLITER, AND W. W. FISCHER, LION TEMPERATURE DISTRIBUTIONS FOR ARBITRARY SHAPES AND COMPLICATED BOUNDARY CONDITIONS, KAPL-M-6532, JULY 27, 1966.
W. W. FISCHER, LION TAKES A USERS MANUAL FOR THE LION THERMAL-STRUCTURAL EVALUATION CODE, KAPL-M-6533, JULY 31, 1967.
E. J. BINNEY, ADDITIONS TO LION CODE, KAPL NOTE, SEPTEMBER 30, 1969.
E. J. BINNEY, ADDITIONS TO LION CODE EFFECTIVE WITH SEPTEMBER 1970 VERSION, KAPL NOTE, SEPTEMBER 22, 1970.
W. W. FISCHER AND M. N. GOLDSMITH, GRAPL A GRADIENT PLOTTER FOR LION, KAPL-M-7164(L), OCTOBER 13, 1970.
E. J. BINNEY, ADDITIONS TO LION CODE EFFECTIVE WITH THE DECEMBER 1970 VERSION, KAPL NOTE, DECEMBER 18, 1970.
E. J. BINNEY, ADDITIONS TO THE LION CODE EFFECTIVE FEBRUARY 26, 1971, KAPL NOTE, FEBRUARY 26, 1971.

10. REFERENCES (CONTINUED)

E. J. BINNEY, MODIFICATION TO THE LION CODE EFFECTIVE MARCH 31, 1971, KAPL NOTE, APRIL 8, 1971.

E. J. BINNEY, HEAT BALANCE CAPABILITY IN LION, KAPL NOTE, APRIL 30, 1971.

E. J. BINNEY, ADDITIONS TO THE LION CODE EFFECTIVE FEBRUARY 29, 1972, KAPL NOTE, FEBRUARY 29, 1972.

E. J. BINNEY, LION NEWSLETTER NO. 1, KAPL NOTE, JUNE 5, 1972.

E. J. BINNEY, LION4 NEWSLETTER NO. 2, KAPL NOTE, OCTOBER 5, 1972.

M. N. GLOSMITH AND W. W. FISCHER, THE FLI--SERIES OF PREPROCESSORS FOR THE LION CODE, KAPL-M-7289(L), JULY 6, 1972.

JPARAM SYSTEMS PROGRAMMING INFORMAL PROGRAM DESCRIPTION, EXCERPT FROM USERS GUIDE TO CDC SYSTEMS AT KAPL, JULY 27, 1972.

W. W. FISCHER, CONVECTIVE HEAT TRANSFER COEFFICIENT CALCULATIONAL SYSTEM FOR LION, KAPL-M-7301(L), DECEMBER 18, 1972.

KAPL INTERNAL CALCOMP SUBROUTINES, KAPL NOTE, MARCH 31, 1971.

11. MACHINE REQUIREMENTS - THE PLOTTER ROUTINE APPLE IS USED TO PRODUCE THE INPUT REQUIRED BY THE ASSOCIATED CALCOMP PLOTTER FOR GRAPHICAL OUTPUT.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT (CDC6600,7600), FORTRAN IV (UNIVAC1108)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC6600,7600) AND EXEC8 (UNIVAC1108).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - DATA SAVING ON TAPE AND OPTIONS TO PROVIDE PLOTTING OF A VARIETY OF PARAMETERS VERSUS TIME ARE INCLUDED IN LION4. BECAUSE OF THE LARGE SIZE OF LION4, IT WAS NECESSARY TO SEGMENT THE PROGRAM. THE UNIVAC1108 CCN VERSION IS BASED ON THE JANUARY 1970 VERSION AND DOES NOT INCLUDE THE ADDED FEATURES OF THE RECENT KAPL EDITION NOR DOES IT INCLUDE A PLOTTING CAPABILITY.
15. NAME AND ESTABLISHMENT OF AUTHORS -
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16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL

16. MATERIAL AVAILABLE (CONTINUED)
SOURCE DECKS (6600-6568 CARDS, 1108-2447 CARDS)
SAMPLE PROBLEMS (6600-161 CARDS, 1108-156 CARDS)
SAMPLE PROBLEM OUTPUT (6600-33 PAGES, 1108-22 PAGES)
REFERENCE REPORTS, NEWSLETTERS, AND NOTES
17. CATEGORY - H
KEYWORDS - TEMPERATURE DISTRIBUTION, FLUID FLOW, THERMAL, 3-DIMENSIONAL, HEAT TRANSFER, LIQUIDS, VAPORS, TIGER CODES

1. NAME OR DESIGNATION OF PROGRAM - SAFE-CREEP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - SAFE-CREEP PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE OR AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES WITH AGE- AND TEMPERATURE-DEPENDENT CREEP DATA.
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 METHOD OF SOLUTION IS ITERATIVE ON THE SPACE VARIABLE AND UTILIZES THE TRAPEZOIDAL RULE INTEGRATION FOR THE TIME VARIABLE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
350 NODES
750 ELEMENTS
60 TIME INCREMENTS
6. TYPICAL RUNNING TIME - 9. MINUTES ARE REQUIRED FOR A FULL-CAPACITY PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - GEDWRK (ACC ABSTRACT 296),
SAFE-PCRS (ACC ABSTRACT 251), SAFE-PLANE (ACC ABSTRACT 252),
SAFE-SHELL (ACC ABSTRACT 253)
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
UNIVAC1108 VERSION SUBMITTED OCTOBER 1967.
10. REFERENCES - Y. RASHID AND W. ROCKENHAUSER, PRESSURE VESSEL ANALYSIS BY FINITE ELEMENT TECHNIQUE, GA-7810, 1967.
R. D. BROWN, PROPERTIES OF CONCRETE IN REACTOR VESSELS, PAPER NO. 13, CONFERENCE ON PRESTRESSED CONCRETE PRESSURE VESSELS, LONDON, MARCH 13-17, 1967.
F. J. DE ARRIAGA AND Y. R. RASHID, SAFE-CREEP, A COMPUTER PROGRAM FOR THE VISCOELASTIC ANALYSIS OF AXISYMMETRIC AND PLANE CONCRETE STRUCTURES, A USERS MANUAL, GA-8111, JULY 31, 1967.
11. MACHINE REQUIREMENTS - 65K MEMORY AND 13 TAPES
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - CALL TICKER REFERS TO AN 1108 SYSTEM ROUTINE FOR LOGGING JOB TIME USED. A SUBSTITUTE ROUTINE WILL BE REQUIRED FOR USE OF THIS PROGRAM ON ANOTHER MACHINE.

10. REFERENCES (CONTINUED)

NOTES ON TSN FOR THE IBM S/360, AI NOTE.

R. A. BLAINE, ATOMICS INTERNATIONAL ENVIRONMENT REPORT, MAY 1967.

W. W. ENGLE, JR., A USERS MANUAL FOR ANISN, A ONE-DIMENSIONAL DISCRETE COORDINATES TRANSPORT CODE WITH ANISOTROPIC SCATTERING, K-1693, MARCH 30, 1967.

M. A. BOLING AND W. A. RHOADES, ANISN/DTF II, CONVERSION TO IBM SYSTEM/360, AI-66-MEMO-171, APRIL 1967.

J. F. JACKSON, W. A. RHOADES, AND L. I. MOSS, ANALYSIS OF SNAPTRAN-1 AND -2 REACTOR KINETICS EXPERIMENTS, NAA-SR-11850, JUNE 26, 1967.

B. G. CARLSON AND K. D. LATHROP, TRANSPORT THEORY - THE METHOD OF DISCRETE COORDINATES, LAMS-3251-MS, OCTOBER 22, 1965.

11. MACHINE REQUIREMENTS - 32K IBM7094 OR IBM360, MODEL 50H OR LARGER

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND MAP (IBM7094), FORTRAN IV (IBM360)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - FIP III (IBM7094) OR OS/360 (IBM360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - TSN USES THE AICRT3-3 ROUTINE (REFERENCE 2) AND THE NAA SC-4.2 PACKAGE AVAILABLE THROUGH -

UAIDE LIBRARIAN
C/C STROMPERG-CARLSON
P. O. BOX 2449
SAN DIEGO, CALIFORNIA

THE USER CAN DELETE THE CRT FEATURE BY SUPPLYING DUMMY SUBROUTINES.

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7094-2058 CARDS, 360-1904 CARDS)
SAMPLE PROBLEMS (7094-62 CARDS, 360-62 CARDS)
REFERENCE REPORT, NAA-SR-MEMO-12319, ENVIRONMENT REPORT,
AND AI NOTE

17. CATEGORY - F

KEYWORDS - 2-GROUP, SN METHOD, SPACE-TIME KINETICS, TEMPERATURE COEFFICIENTS, FUEL EXPANSION, FEEDBACK, GRAPHS, 1-DIMENSIONAL, SNAP REACTORS, ANISN CODES

1. NAME OR DESIGNATION OF PROGRAM - GAKIN2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM37.
3. DESCRIPTION OF PROBLEM OR FUNCTION - GAKIN2 SOLVES THE TIME-DEPENDENT MULTIGROUP NEUTRON DIFFUSION EQUATIONS IN ONE SPACE DIMENSION.
4. METHOD OF SOLUTION - THE SPACE DIMENSION IS TREATED USING THE CONVENTIONAL FINITE DIFFERENCE APPROXIMATION. TIME INTEGRATION IS ACCOMPLISHED USING AN EXPONENTIAL TRANSFORMATION AND SEMI-IMPLICIT DIFFERENCING. THE RESULTING EQUATIONS ARE SOLVED BY FIRST PREDICTING THE FREQUENCY FOR THE TIME TRANSFORMATION AND THEN CORRECTING THE SOLUTION BY SOLVING THE FULL SET OF EQUATIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VARIABLE DIMENSIONING PERMITS ACCOMMODATION OF ANY NUMBER OF ENERGY GROUPS, SPACE POINTS, AND MATERIAL REGIONS, WITHIN THE LIMITS OF STORAGE AVAILABLE. THE NUMBER OF DELAYED NEUTRON GROUPS IS LIMITED TO 6. THE NUMBER OF BYTES OF CORE STORAGE CAN BE APPROXIMATED BY

$$100,000 + 8(P(G+D) + 2GD + 9G + G(G+1) + 26R + 19RG + RG^2 + 11P + 4PG + 2N + 50)$$

WHERE
 R IS THE NUMBER OF REGIONS,
 G IS THE NUMBER OF NEUTRON GROUPS,
 D IS THE NUMBER OF DELAYED GROUPS,
 P IS THE NUMBER OF SPACE POINTS, AND
 N IS THE NUMBER OF TEST POINTS FOR TESTING CONVERGENCE AND PREDICTING TRANSFORMATION FREQUENCIES (RECOMMENDED VALUE IS ONE OR TWO TIMES THE NUMBER OF MATERIAL REGIONS, R).
6. TYPICAL RUNNING TIME - COMPUTATION TIME PER PROBLEM TIME-STEP IS ROUGHLY APPROXIMATED BY $(2 * 10^{(-4)}) * (P(G + .3D))$, WHERE P, G, AND D ARE DEFINED AS IN 5 ABOVE.
7. UNUSUAL FEATURES OF THE PROGRAM - GAKIN2 PERMITS AN ARBITRARILY LARGE NUMBER OF NEUTRON GROUPS.
8. RELATED AND AUXILIARY PROGRAMS - GAKIN2 IS A REVISION OF THE ORIGINAL GAKIN CODE WITH IMPROVED TEMPORAL TREATMENT.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
 UNIVAC1108 VERSION OF GAKIN SUBMITTED NOVEMBER 1967,
 DELETED DECEMBER 1974.
 IBM370 VERSION OF GAKIN2 SUBMITTED DECEMBER 1974, SAMPLE PROBLEMS EXECUTED BY ACC.
10. REFERENCES - J. H. MASON AND K. F. HANSEN, GAKIN II, A ONE-DIMENSIONAL MULTIGROUP DIFFUSION THEORY REACTOR KINETICS CODE, MITNE-151, AUGUST 1973.
 K. F. HANSEN AND S. R. JOHNSON, GAKIN, A ONE-DIMENSIONAL MULTIGROUP KINETICS CODE, GAMM-7543, AUGUST 1967.

ACC ABSTRACT 310

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11. MACHINE REQUIREMENTS - 184K BYTES OF CORE ON AN IBM370/165
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2563 CARDS)
SAMPLE PROBLEMS (122 CARDS)
REFERENCE REPORT, MITNE-151
17. CATEGORY - F
KEYWORDS - 1-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS, MULTI-GROUPS, SLABS, CYLINDERS, SPHERES, GAKIN CODES

1. NAME OR DESIGNATION OF PROGRAM - BURNUP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635
3. DESCRIPTION OF PROBLEM OR FUNCTION - BURNUP CORRELATES HEAVY ELEMENT ISOTOPIIC ANALYSIS WITH FISSION PRODUCT NEODYMIUM, URANIUM, AND PLUTONIUM CONCENTRATIONS IN AN IRRADIATED URANIUM FUEL FOR CALCULATION OF BURNUP (ATCM 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.
4. METHOD OF SOLUTION - AN ITERATIVE PROCESS IS UTILIZED WHEREBY A CORRECTION FOR TRACES OF URANIUM CONTAMINATION AS WELL AS CORRECTIONS BASED ON EXPOSURE AND DECAY FACTORS ARE OBTAINED ON AN INITIAL PASS THROUGH THE DATA. THE LAST ITERATION USING THE CORRECTIONS OBTAINED GIVES A FINAL VALUE FOR THE CALCULATIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 50 SAMPLES CAN BE RUN IN ANY ONE CASE. ALTHOUGH A SINGLE SAMPLE CAN BE PROCESSED, THE AVERAGING PROCEDURES FOR NUCLEAR CONSTANTS ARE MOST EFFECTIVE WHEN 5 TO 50 SAMPLES FROM THE SAME FUEL LOAD ARE POOLED IN A SINGLE CASE.
6. TYPICAL RUNNING TIME - 2 TO 3 SECONDS PER SAMPLE ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
GE635 VERSION SUBMITTED DECEMBER 1967.
10. REFERENCES - B. F. RIDER AND C. P. RUIZ, DETERMINATION OF ATCM PERCENT FISSION IN URANIUM FUEL, PROGRESS IN NUCLEAR ENERGY SERIES IX, ANALYTICAL CHEMISTRY 3, PART 2, C. E. CROUTHAMEL, ED., PERGAMON PRESS, 1962.
B. F. RIDER, J. PAUL PETERSON, JR., J. L. JAECH, C. P. RUIZ AND F. R. SMITH, ACCURATE NUCLEAR BURNUP ANALYSIS XV, GEAP-4950, SEPTEMBER 1965.
B. F. RIDER, C. P. RUIZ, J. P. PETERSON, JR., AND F. R. SMITH, BURNUP, A FLRTKAN IV CODE FOR COMPUTING U AND PU FUEL BURNUP FROM U, PU, AND ND MASS SPECTROMETRIC MEASUREMENTS, GEAP-5355, OCTOBER 31, 1967.

1. NAME OR DESIGNATION OF PROGRAM - GANDY3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - GANDY3 EVALUATES TEMPERATURE-DEPENDENT EFFECTIVE NEUTRON CAPTURE, FISSION, AND SCATTERING CROSS SECTIONS IN THE UNRESOLVED RESONANCE REGION FROM AVERAGE RESONANCE PARAMETERS.
4. METHOD OF SOLUTION - EFFECTIVE CROSS SECTIONS ARE EVALUATED AT SPECIFIED ENERGIES AND TEMPERATURES USING THE NARROW RESONANCE APPROXIMATION AND ASSUMING ISOLATED RESONANCES. RESONANCE CROSS SECTIONS ARE TREATED ON A STATISTICAL BASIS, USING CHI-SQUARED DISTRIBUTIONS FOR THE PARTIAL WIDTHS. THE LINE SHAPE FUNCTIONS, PSI AND CHI, ARE EVALUATED IN A SUBROUTINE WRITTEN BY NALIBOFF WHICH IS BASED UPON A METHOD DEVELOPED BY ADLER AND NALIBOFF (SEE REFERENCE 3). THE STATISTICAL AVERAGING IS CARRIED OUT USING A QUADRATURE SCHEME INTRODUCED IN THE RAPTURE CODE (ACC ABSTRACT 176).
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - GANDY3 WILL HANDLE AS MANY TEMPERATURES AS DESIRED FOR A MAXIMUM OF 100 ENERGY POINTS. CONSIDERATION IS GIVEN TO NEUTRON ORBITAL ANGULAR MOMENTA THROUGH D-WAVE ($L=2$).
6. TYPICAL RUNNING TIME - FOR PU-239 WITH $L=0$ AND 1, THE DENOMINATOR EVALUATED, AND THE EXACT INTERFERENCE SCATTERING OPTION SELECTED, THE APPROXIMATE RUNNING TIME IS 2 SECONDS FOR ONE ENERGY POINT. NON-FISSIONABLE NUCLIDES, WHICH REQUIRE STATISTICAL AVERAGING ONLY FOR THE NEUTRON WIDTH DISTRIBUTION, ARE AN ORDER OF MAGNITUDE FASTER FOR THE SAME DEGREE OF APPROXIMATION. FOR REACTOR DESIGN CALCULATIONS IN WHICH UNRESOLVED RESONANCE CROSS SECTIONS ARE EVALUATED AT ONE-QUARTER LEARGY INTERVALS, THE EFFECTIVE CROSS SECTIONS IN THE UNRESOLVED RESONANCE REGION FOR U-235, PU-239, PU-240, PU-241, AND PU-242 ARE EVALUATED BY GANDY3 AS IMPLEMENTED IN THE GGC5 CODE IN APPROXIMATELY 45 SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM - GANDY3 INCORPORATES THE FOLLOWING FEATURES WHICH DISTINGUISH THE PRESENT TREATMENT FROM EARLIER UNRESOLVED RESONANCE CALCULATIONS -
 - (A) COMPUTATION OF THE UNRESOLVED RESONANCE SCATTERING CROSS SECTION AS WELL AS THE CAPTURE AND FISSION CROSS SECTIONS.
 - (B) CONSIDERATION OF S-, P-, AND D-WAVE ($L=0, 1$, AND 2) NEUTRON ORBITAL ANGULAR MOMENTA.
 - (C) CONSIDERATION OF ARBITRARY HALF-INTEGER VALUES OF THE TARGET SPIN IN ADDITION TO $I=0$.
 - (D) CALCULATION OF THE FISSION CROSS SECTIONS FOR CHI-SQUARED FISSION WIDTH DISTRIBUTIONS WITH ONE, TWO, THREE, OR FOUR DEGREES OF FREEDOM.
 - (E) CONSIDERATION OF INTERFERENCE SCATTERING.
 - (F) INCLUSION OF THE DENOMINATOR IN THE CALCULATION OF THE

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
EFFECTIVE CROSS SECTION.
 - (G) INCLUSION OF A MUCH FASTER J FUNCTION EVALUATION ALGORITHM THAN THE ORIGINAL VERSION OF GANDY.
 - (H) INCLUSION OF AN OPTIONAL PROCEDURE FOR THE COMPUTATION AND PRINTING OF THE DIFFERENCES BETWEEN CROSS SECTION CALCULATIONS AT DIFFERENT TEMPERATURES.
 - (I) ADOPTION OF THE ENDF/B FORMAT CONVENTIONS WITH RESPECT TO THE COMPUTATION OF THE REDUCED NEUTRON WAVE LENGTH AND THE NEUTRON PENETRABILITIES.
8. RELATED AND AUXILIARY CODES - GANDY3 IS AN EXTENSION OF THE GANDY CODE WHICH WAS BASED UPON THE RAPTURE CODE. GANDY3 IS INCORPORATED IN THE GAND2 AND GFE2 PORTIONS OF THE GULF GENERAL ATOMIC FAST CROSS SECTION PACKAGE, GAF/GAR/GAND (ACC ABSTRACT 596) AND IN THE FAST SECTION OF THE GGC5 CODE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1969.
UNIVAC1108 VERSION OF GANDY SUBMITTED JUNE 1968, REPLACED BY GANDY3 APRIL 1974.
10. REFERENCES - D. R. MATHEWS AND P. K. KOCH, GANDY3, A COMPUTER PROGRAM FOR THE EVALUATION OF EFFECTIVE CROSS SECTIONS IN THE UNRESOLVED RESONANCE REGION, GA-A12826, JANUARY 1974.
S. C. COHEN AND P. K. KOCH, GANDY, A COMPUTER PROGRAM FOR THE EVALUATION OF EFFECTIVE CROSS SECTIONS IN THE UNRESOLVED RESONANCE REGION, GA-8003, MAY 1967.
F. T. ADLER AND Y. D. NALIBOFF, A DIRECT METHOD FOR THE EVALUATION OF THE RESONANCE LINE SHAPE FUNCTIONS, JOURNAL OF NUCLEAR ENERGY, PARTS A/B, VOL. 14, PP. 209-211, 1961.
J. H. FERZIGER, P. GREEBLER, M. D. KELLEY, AND J. W. WALTON, RESONANCE INTEGRAL CALCULATIONS FOR EVALUATION OF DOPPLER COEFFICIENTS, THE RAPTURE CODE, GEAP-3923, JULY 1962.
R. J. ARCHIBALD AND D. R. MATHEWS, THE GAF/GAR/GAND FAST REACTOR CROSS SECTION PREPARATION SYSTEM, GAND2 AND GFE2 - COMPUTER PROGRAMS FOR PREPARING INPUT DATA FOR THE GAFGAR, GGC, AND MICROX CODES FROM AN ENDF/B FORMAT NUCLEAR DATA FILE, GA-7542, VOL. II, MARCH 1973.
D. R. MATHEWS, ET AL., GGC-5, A COMPUTER PROGRAM FOR CALCULATING NEUTRON SPECTRA AND GROUP CONSTANTS, GA-8871, SEPTEMBER 27, 1971.
11. MACHINE REQUIREMENTS - GANDY3 REQUIRES ABOUT 8300 LOCATIONS FOR INSTRUCTIONS AND 22,700 LOCATIONS FOR DATA. TWO I/O DEVICES ARE REQUIRED FOR READING AND PRINTING AND ONE ADDITIONAL I/O DEVICE IS NECESSARY IF THE PROGRAM IS LOADED FROM TAPE.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC8.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
ADAPTATION OF THE GANDY3 CODE TO A SMALLER MACHINE WITH A FORTRAN
IV COMPILER CAN BE MADE BY CHANGING ARRAY DIMENSIONS WHICH WILL
ALLOW FOR CALCULATIONS AT FEWER ENERGY POINTS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
P. K. KOCH AND D. MATHEWS
GENERAL ATOMIC COMPANY
P. O. BOX 81608
SAN DIEGO, CALIFORNIA 92138
16. MATERIAL AVAILABLE -
SOURCE DECK (1253 CARDS)
SAMPLE PROBLEM (23 CARDS)
REFERENCE REPORT, GA-A12826
17. CATEGORY - A
KEYWORDS - CAPTURE, FISSION, SCATTERING, RESONANCE CROSS SECTIONS,
UNRESOLVED REGION, GAFFAR CODES, GAND2 CODES, RAPTURE
CODES, GGC5 CODES, GFE2 CODES

1. NAME OR DESIGNATION OF PROGRAM - M0648
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - M0648 SOLVES THE ONE-DIMENSIONAL SLAB TRANSPORT PROBLEM WITH SLOWING DOWN FOR AN ARBITRARY SPATIAL EXTERNAL SOURCE AND ARBITRARY SCATTERING.
4. METHOD OF SOLUTION - THE DOUBLE LEGENDRE POLYNOMIAL EXPANSION OF THE FLUX IS UTILIZED TO OBTAIN A SYSTEM OF LINEAR DIFFERENTIAL EQUATIONS WHICH IS SOLVED WITH A ROUND-OFF FREE ANALYTIC TECHNIQUE (SEE REFERENCE 2). THE ENERGY GROUP CONCEPT IS UTILIZED AND THE SOLUTION IS REPEATED FOR EACH ENERGY GROUP IN CONNECTION WITH THE SLOWING DOWN MATRIX WHICH MUST BE PROVIDED AS INPUT.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 17 ENERGY GROUPS
 - 12 REGIONS
 - 8 LEGENDRE POLYNOMIAL EXPANSION COEFFICIENTS
 - 99 EQUALLY-SPACED MESH POINTS PER REGION
 - 440 MESH POINTS
 - 1. MATERIAL COMPOSITIONSNO COMPOSITION CAN CONSIST OF A MULTIPLYING MEDIUM OR OF A PURE ABSORBER. THE BOUNDARY CONDITIONS CAN BE ARBITRARY INCIDENT ON EITHER END OR SYMMETRY ON ONE OR BOTH ENDS OF THE SLAB.
6. TYPICAL RUNNING TIME - FOR A TYPICAL PROBLEM OF 7 ENERGY GROUPS, 350 MESH POINTS, AND 5 REGIONS, CENTRAL PROCESSOR TIME IS ABOUT 2 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM - M0648 IS PARTICULARLY SUITED FOR DEEP PENETRATION PROBLEMS AND FOR PROBLEMS WHERE THE ANGULAR DISTRIBUTION IS REQUIRED WITH GOOD ACCURACY.
8. RELATED AND AUXILIARY PROGRAMS - M0756 IS SIMILAR TO M0648 BUT FOR GAMMA RAYS ONLY.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1969.
CDC6600 VERSION SUBMITTED JUNE 1968.
10. REFERENCES - L. LOIS, A SOLUTION OF THE SLAB TRANSPORT PROBLEM, WAPD-TM-661, NOVEMBER 1967.
 - L. LOIS, NUMERICAL SOLUTION OF THE ONE VELOCITY BOLTZMANN NEUTRON TRANSPORT EQUATION IN SLAB GEOMETRY, THESIS, COLUMBIA UNIVERSITY, 1966.
 - C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1968.
11. MACHINE REQUIREMENTS - 154K OCTAL MEMORY AND 4 TAPE UNITS FOR SCRATCH STORAGE

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15. NAME AND ESTABLISHMENT OF AUTHOR -
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ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2230 CARDS)
SAMPLE PROBLEM (25 CARDS)
REFERENCE REPORT AND SUPPLEMENT
17. CATEGORY - I
KEYWORDS - STRUCTURAL ANALYSIS, STRESSES, DEFORMATION

1. NAME OR DESIGNATION OF PROGRAM - TWOTRAN2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600, 6600, IBM360/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - TWOTRAN2 SOLVES THE TWO-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.
4. METHOD OF SOLUTION - THE DISCRETE ORDINATES APPROXIMATION FOR THE ANGULAR VARIABLE IS USED IN FINITE DIFFERENCE FORM WHICH IS SOLVED WITH THE CENTRAL (DIAMOND) DIFFERENCE APPROXIMATION. NEGATIVE FLUXES ARE ELIMINATED BY A LOCAL SET-TO ZERO AND CORRECT ALGORITHM. STANDARD INNER (WITHIN-GROUP) AND OUTER ITERATIVE CYCLES ARE ACCELERATED BY A COARSE-MESH REBALANCING ON A COARSE MESH WHICH MAY BE INDEPENDENT OF THE MATERIAL MESH.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VARIABLE DIMENSIONING IS USED SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A CONTAINER ARRAY LESS THAN MAXLEN CAN BE ACCOMMODATED. ON IBM MACHINES, TWOTRAN2 WILL EXECUTE IN THE 4-BYTE MODE SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A CONTAINER ARRAY LESS THAN MAXLEN CAN BE ACCOMMODATED. MAXLEN CAN BE SEVERAL HUNDRED THOUSAND AND MOST PROBLEMS CAN BE CORE-CONTAINED. ON THE CDC MACHINES MAXLEN CAN BE SLIGHTLY GREATER THAN 40,000 WORDS AND PERIPHERAL STORAGE IS USED FOR MOST GROUP-DEPENDENT DATA.
6. TYPICAL RUNNING TIME - A SIX-GROUP, S4, 42 X 42 MESH POINT, KEFF CALCULATION OF AN EBR-II MODEL REQUIRES ABOUT 3.9 MINUTES OF CDC7600 TIME. THE SAMPLE PROBLEMS REQUIRE 6 MINUTES ON THE IBM360.
7. UNUSUAL FEATURES OF THE PROGRAM - PROVISION IS MADE FOR CREATION OF STANDARD INTERFACE OUTPUT FILES FOR SN CONSTANTS, ANGLE-INTEGRATED FLUXES AND ANGULAR FLUXES. STANDARD INTERFACE INPUT FILES FOR SOURCES, FLUXES, CROSS SECTIONS AND SN CONSTANTS MAY BE READ. ALL BINARY OPERATIONS ARE LOCALIZED IN SUBROUTINES CALLED REED AND RITE. DETAILED EDIT OPTIONS, INCLUDING ANGULAR FLUXES, DUMPS AND RESTART CAPABILITY ARE PROVIDED. OPTIONAL USE OF AN ARBITRARY REBALANCE MESH INDEPENDENT OF THE MATERIAL MESH IS ALLOWED.
8. RELATED AND AUXILIARY PROGRAMS - TWOTRAN2 IS AN IMPROVED VERSION OF THE TWOTRAN PROGRAM. MANY COMMENT CARDS WERE ADDED AND MUCH SIMPLIFYING PROGRAMMING WAS PERFORMED TO MAKE TWOTRAN2 AS EASY TO UNDERSTAND AS POSSIBLE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.
 UNIVAC1108 X-Y VERSION SUBMITTED DECEMBER 1968, REPLACED
 BY UPDATED EDITION JUNE 1973, DELETED JUNE 1973.
 UNIVAC1108 R-Z VERSION SUBMITTED OCTOBER 1969, DELETED
 JUNE 1973.
 IBM360 X-Y VERSION SUBMITTED APRIL 1969, REPLACED BY
 TWOTRAN2 JUNE 1973, REVISED VERSION B APRIL 1974,
 REVISED VERSION C DECEMBER 1974, REVISED VERSION D
 JANUARY 1975, SAMPLE PROBLEM EXECUTED BY ACC.
 CDC6600 GENERAL GEOMETRY VERSION SUBMITTED JULY 1970,
 REPLACED BY TWOTRAN2 JULY 1973, REVISED VERSION B
 APRIL 1974, REVISED VERSION C DECEMBER 1974, REVISED
 VERSION D JANUARY 1975.
 CDC7600 VERSION OF TWOTRAN2 SUBMITTED JUNE 1973, REVISED
 VERSION B APRIL 1974, REVISED VERSION C DECEMBER
 1974, REVISED VERSION D JANUARY 1975.
10. REFERENCES - K. D. LATHROP AND F. W. BRINKLEY, TWOTRAN-II, AN
 INTERFACED, EXPORTABLE VERSION OF THE TWOTRAN CODE FOR TWO-DIMEN-
 SIONAL TRANSPORT, LA-4848-MS, JULY 1973.
 K. D. LATHROP AND F. W. BRINKLEY, THEORY AND USE OF
 THE GENERAL-GEOMETRY TWOTRAN PROGRAM, LA-4432, APRIL 1970.
 K. D. LATHROP, F. W. BRINKLEY, AND P. REED, THEORY
 AND USE OF THE SPHERICAL HARMONICS, FIRST COLLISION SOURCE, AND
 VARIABLE WEIGHT VERSIONS OF THE TWOTRAN TRANSPORT PROGRAM,
 LA-4600, MARCH 1972.
11. MACHINE REQUIREMENTS - FIVE OUTPUT UNITS, FIVE INTERFACE UNITS
 (USE OF INTERFACE UNITS IS OPTIONAL) AND TWO SYSTEM INPUT/OUTPUT
 UNITS ARE REQUIRED. A LARGE BULK MEMORY IS DESIRABLE, BUT IT CAN
 BE REPLACED BY DISK, DRUM OR TAPE STORAGE.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
 K. D. LATHROP AND F. W. BRINKLEY
 LOS ALAMOS SCIENTIFIC LABORATORY
 BOX 1663
 LOS ALAMOS, NEW MEXICO 87544
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
 SOURCE DECKS (7600-7076 CARDS, 6600-7077 CARDS, 360-7495 CARDS)
 SAMPLE PROBLEMS (7600-1985 CARDS, 6600-685 CARDS, 360-1986
 CARDS)
 CONTROL INFORMATION (JCL 360-61 CARDS)
 IBM 2314 LOAD MODULE (360-330 BLOCKS)
 SAMPLE PROBLEM OUTPUT (360-50 SELECTED PAGES, 6600, 7600-51
 SELECTED PAGES)
 REFERENCE REPORT, LA-4848-MS

17. CATEGORY - C
KEYWORDS - 2-DIMENSIONAL, TRANSPORT THEORY, SN METHOD, X-Y, R-Z,
R-THETA, CRITICALITY SEARCHES, FLUX DISTRIBUTION,
ANISOTROPIC SCATTERING, 2DF CODES, TWOTRAN CODES

1. NAME OR DESIGNATION OF PROGRAM - PUN1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE $\Psi(\theta, X)$ FUNCTION IS EVALUATED ON THE INTERVAL $(0, 20/\theta)$ BY THE DFB ROUTINE DEVELOPED BY GELBARD (SEE REFERENCE 2). THE $J(\theta, \beta)$ FUNCTION IS OBTAINED FROM THE $\Psi(\theta, X)$ FUNCTION BY TWO TRAPEZOIDAL INTEGRATIONS, FOLLOWED BY RICHARDSON EXTRAPOLATION PLUS A WING CORRECTION FOR X GREATER THAN $20/\theta$. THE INTEGRAL INVOLVING CHI-SQUARE FLUCTUATION OF THE REDUCED NEUTRON WIDTH, $\gamma(N)$, IS EVALUATED BY GAUSSIAN QUADRATURE. THE INTEGRATION OVER THE NEUTRON WEIGHTING SPECTRUM IS APPROXIMATED BY GAUSS QUADRATURE FOR THE $1/E$ CASE AND TRAPEZOIDAL INTEGRATION FOR OTHER WEIGHTING SPECTRA.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - NO MORE THAN 20 SPIN STATES PER CASE AND 54 ENERGY GROUPS ARE ALLOWED. AN ARBITRARY ENERGY WEIGHTING SPECTRUM OF UP TO 498 POINTS MAY BE USED, BUT ALL POINTS MUST BE POSITIVE ($W(E)$ GREATER THAN 0).
6. TYPICAL RUNNING TIME - LESS THAN 1/4 SECOND PER SPIN STATE PER GROUP IS REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM -
 - (A) ANGULAR MOMENTUM QUANTUM NUMBER $L = 0, 1, 2, 3, 4$ PERMITTED.
 - (B) $\gamma(N)$ PERMITTED TO FLUCTUATE WITH A CHI-SQUARE DISTRIBUTION OF UP TO 8 DEGREES OF FREEDOM FOR EACH SPIN STATE.
 - (C) EVALUATION OF THE INTEGRAL CONTRIBUTION FROM LEVELS WITH $\gamma(N)$ LESS THAN SOME FRACTION OF THE AVERAGE PERMITTED.
 - (D) AN ARBITRARY CROSS ENERGY WEIGHTING SPECTRUM PERMITTED.
 - (E) DANCOFF CORRECTION IS COMPUTED INTERNALLY FOR EITHER HEXAGONAL OR SQUARE LATTICE ARRAYS OF CYLINDRICAL CLAD FUEL RODS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.
CDC6600 VERSION SUBMITTED APRIL 1969.
10. REFERENCES - N. M. STEEN, PUN-1 - A FORTRAN-IV PROGRAM FOR THE EVALUATION OF UNRESOLVED RESONANCE INTEGRALS AND RELATED MULTIGROUP CROSS SECTIONS (LWRP DEVELOPMENT PROGRAM), WAFD-TM-76P,

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13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
EXEC II.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
A CALL TO SETOF IS COMPLETELY UNNECESSARY BUT ELIMINATES AN UN-
NECESSARY DIAGNOSTIC ON THE 1108.
15. NAME AND ESTABLISHMENT OF AUTHOR -
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1175 CARDS)
BINARY DECK (535 CARDS)
SAMPLE PROBLEM (71 CARDS)
LIBRARY (1512 CARDS)
REFERENCE REPORT AND NOTE
17. CATEGORY - D
KEYWORDS - 2-GROUP, ISOTOPES, PRODUCTION, DECAY, FISSION PRODUCTS,
REACTION RATES

1. NAME OR DESIGNATION OF PROGRAM - FLANGE2(71-1)
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - DIRECT INTEGRATION OF THE SCATTERING LAW IS USED TO OBTAIN LEGENDRE MOMENTS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
MAXIMUM ENERGY GROUPS = 200
MAXIMUM LEGENDRE ORDER = 5
6. TYPICAL RUNNING TIME - A SMOOTH CROSS SECTION CALCULATION REQUIRES APPROXIMATELY 1 MINUTE, WHILE A FULL SCATTERING MATRIX PROBLEM (L=5) FOR 30 ENERGY GROUPS TAKES ABOUT 12 MINUTES ON THE IBM360/65.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - KERINT(71-1) GENERATES SCATTERING MATRICES AT TEMPERATURES INTERMEDIATE BETWEEN MATRICES GENERATED BY FLANGE2.
9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.
IBM360 VERSION OF FLANGE2 SUBMITTED JANUARY 1969,
REPLACED BY FLANGE2(71-1) MARCH 1972, LFIT SUBROUTINE
REPLACED NOVEMBER 1974, SAMPLE PROBLEM EXECUTED BY
ACC.
UNIVAC1108 VERSION OF FLANGE2 SUBMITTED MAY 1970, DELETED
MARCH 1972.
UNIVAC1108 VERSION OF FLANGE2/SC SUBMITTED DECEMBER 1970,
DELETED MARCH 1972.
10. REFERENCES - H. C. MCNECK AND D. R. FINCH, FLANGE-II (VERSION 71-1), A CODE TO PROCESS THERMAL NEUTRON DATA FROM AN ENDF/B TAPE, DP-1278 (ENDF-152), OCTOBER 1971, AND CORRECTION NOTICE.
11. MACHINE REQUIREMENTS - 40K SINGLE-PRECISION WORDS OF HIGH-SPEED CORE PLUS 3 TAPE (OR DISK) UNITS
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FLANGE2 REQUIRES FOR INPUT THE ENDF/B LIBRARY WHICH IS AVAILABLE

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
FROM THE NATIONAL NEUTRON CROSS SECTION CENTER AT BROOKHAVEN
NATIONAL LABORATORY.
15. NAME AND ESTABLISHMENT OF AUTHORS -
F. 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/MOD003
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
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. THIS VERSION OF RELAP4 DOES NOT PROVIDE ALL OF THE SUBROUTINES REQUIRED FOR COMPLIANCE WITH THE AEC'S FINAL RULING ON THE ACCEPTANCE CRITERIA FOR ECC 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 -
 - 9 MINOR EDIT VARIABLES
 - 20 TIME-STEP CARDS
 - 20 TRIP CONTROL CARDS
 - 100 JUNCTIONS (FLOW PATHS) BETWEEN VOLUMES
 - 5 PURBLE-PARAMETER SETS
 - 10 TIME-DEPENDENT VOLUME DESCRIPTIONS ON CARDS
 - 12 PUMPS
 - 75 CONTROL VOLUMES
 - 10 CHECK VALVE TYPES
 - 5 NORMALIZED-LEAK-AREA-VERSUS-TIME CURVES
 - 5 FILL SYSTEM CURVES
 - 50 HEAT SLABS
 - 20 HEAT SLAB GEOMETRIES
 - 7 HEAT SLAB MATERIALS
 - 25 CORE SECTIONS
 - 20 DATA SETS FOR HEAT EXCHANGERS WITHOUT CONDUCTION
6. TYPICAL RUNNING TIME - FOR A TYPICAL REACTOR SYSTEM MODELED WITH 40 VOLUMES, 50 JUNCTIONS, AND 45 HEAT SLABS 20 HOURS OF IBM360/75 TIME ARE REQUIRED FOR BLOWDOWN. ABOUT 2 MINUTES ARE REQUIRED TO EXECUTE THE SAMPLE PROBLEM ON AN IBM370/195.
7. UNUSUAL FEATURES OF THE PROGRAM - RELAP4 HAS THE FOLLOWING FEATURES: FULLY IMPLICIT INTEGRATION TECHNIQUE, STEAM TABLES THAT

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
CONTAIN DERIVATIVES, HEAT CONDUCTION BETWEEN FLUID VOLUMES, MOMENTUM FLUX TERMS IN HYDRAULIC EQUATIONS, PUMP MODEL WITH INERTIA AND FRICTION, NO AIR FLOW ALLOWED, SEPARATE HOT CHANNEL CALCULATION AVAILABLE, CORE CROSS FLOW ALLOWED.
8. RELATED AND AUXILIARY PROGRAMS - RELAP4 SUPERSEDES RELAP3 AND USES PLOT4 TO PLOT OUTPUT.
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1974.
IBM360 VERSION SUBMITTED MARCH 1974, 1ST REVISION EDITION B MAY 1974, 2ND REVISION SEPTEMBER 1974, 3RD REVISION EDITION C NOVEMBER 1974, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - K. V. MOORE AND W. H. PETTIG, RELAP4 - A COMPUTER PROGRAM FOR TRANSIENT THERMAL-HYDRAULIC ANALYSIS, ANCR-1127, DECEMBER 1973, REVISED AUGUST 16, 1974.
NRTS ENVIRONMENTAL SUBROUTINE MANUAL, ANCR DOCUMENT, DECEMBER 1972.
RELAP4, ACC NC. 369, TAPE CONTENTS DESCRIPTION, ACC PROGRAMMING NOTE 74-33, APRIL 22, 1974, REVISED APRIL 29, 1974, REVISED DECEMBER 1974.
RELAP4, ACC NC. 369, TAPE CONTENTS DESCRIPTION, 360 VERSION FOR NCN-360 REQUESTS, ACC PROGRAMMING NOTE 74-37, JUNE 11, 1974, REVISED DECEMBER 1974.
W. H. RETTIG, UPD - A PROGRAM OF UPDATE SOURCE DECKS, PO1751, AND ADDENDUM TO UPD BY R. C. YOUNG AND N. F. MARSHALL.
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.
11. MACHINE REQUIREMENTS - 670K BYTES, 3 TAPE DRIVES, AND A CALCOMP PLOTTER
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (95%)
BAL (5%)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360, OS/370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PLOT4 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, MODFSG, SETUPG, GRIDG, LABELG, LINESG, POINTG, ERRZZ, SETSMG, PAGEG, AND EXITG HAVE BEEN DUMMIED IN THE PLOT4 SOURCE FILE. HOWEVER, THE NON-DUMMIED ROUTINES ARE INCLUDED IN THE ENVIRONMENTAL SUBROUTINES FILE.
COMPILATION OF SUBROUTINE PREW WAS SUCCESSFUL WHEN COMPILER SIZE=450K WAS SPECIFIED AT SYSGEN. PREW OVERFLOWED A TABLE WHEN THE COMPILER WAS GENERATED WITH SIZE=240K.

15. NAME AND ESTABLISHMENT OF AUTHORS -

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL

(360 1 TAPE, NCN-360** 2 TAPES)
SOURCE DECKS (RELAP4 360 & NCN-360 26,578 CARDS)
AUXILIARY PROGRAM SOURCE DECKS (PLOTR4 360 & NCN-360 1364
CARDS)
2314 AND 3330 LOAD MODULES (RLP4 360 612 BLOCKS, ENVIRO 360 549
BLOCKS)
OBJECT DECKS (PLOTR4 360 52 CARDS)
SAMPLE PROBLEMS (RELAP4 360 & NCN-360 170 CARDS, PLOTR4 360 &
NCN-360 67 CARDS)
STEAM TABLE DATA (360 79 BLOCKS, NCN-360 2544 CARDS)
ENVIRONMENTAL SUBROUTINES (360 & NCN-360 21,692 CARDS)
CONTROL INFORMATION (JCL RELAP4 360 & NCN-360 86 CARDS)
SAMPLE PROBLEM OUTPUT (RELAP4 62 PAGES, PLOTR4 2 PAGES AND
12 PLOTS)
REFERENCE REPORTS, ANCR-1127 AND ANCR DOCUMENT, ACC NOTES, AND
PO1751 AND ADDENDUM
** 360 VERSION FOR NCN-360 USERS

17. CATEGORY - G

KEYWORDS - ACCIDENTS, BLOWDOWN, EXCURSIONS, HEAT TRANSFER, HYDRO-
DYNAMICS, POWER PLANTS, REACTOR SAFETY, TRANSIENTS

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, TETRA-R-Z, HEXAGONAL-Z, AND TRIANGONAL-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 0.3 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 OF 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 AS A 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.
10. REFERENCES - T. B. FOWLER, D. R. VONDY, AND G. W. CUNNINGHAM,
NUCLEAR REACTOR CORE ANALYSIS CODE CITATION, CRNL-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., XSDPM, A DISCRETE
ORDINATES SPECTRAL AVERAGING CODE, CRNL-TM-2500, JULY 1969.
D. R. VONDY AND T. B. FOWLER, JOB STREAM OF CASES
FOR THE COMPUTER CODE CITATION, CRNL-TM-3793, JULY 1972.
11. MACHINE REQUIREMENTS - IBM360/91 OR EQUIVALENT WITH AT LEAST
128,000 4-BYTE WORDS OF DIRECTLY-ADDRESSABLE CORE 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. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
NOW CITATION CONTAINS ABOUT 25,000 SOURCE STATEMENTS. WITHOUT
OVERLAY, STORAGE FOR THE CODE INSTRUCTIONS WOULD APPROACH 15,000
4-BYTE WORDS, BUT WITH OVERLAY THE 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
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P. O. BOX X
CAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (28,478 CARDS)
SAMPLE PROBLEM (850 CARDS)
REFERENCE REPORT, CRNL-TM-2496, REV. 2, SUPPLEMENTS 1, 2, AND 3
REFERENCE REPORT, CRNL-TM-3793, AVAILABLE UPON REQUEST

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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

ACC ABSTRACT 391

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03/72

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
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GENERAL ELECTRIC COMPANY
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16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (609 CARDS)
REFERENCE REPORT, KAPL-M-6729
17. CATEGORY - I
KEYWORDS - STRESSES, SHELLS, STRUCTURAL ANALYSIS, SCP CODES,
FATIGUE ANALYSIS

1. NAME OR DESIGNATION OF PROGRAM - RAFFLE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - EACH AXIAL SUBDIVISION OF EACH REGION AND ROD IS CHARACTERIZED BY A NUMBER WHICH DESIGNATES ITS MATERIAL, AND THEREBY THE NUCLEAR TOTAL CROSS SECTION. THE MONTE CARLO METHOD IS USED, IN WHICH NEUTRON HISTORIES ARE STARTED AT RANDOM WITHIN MATERIAL NUMBER 1 AND CONTINUED UNTIL A COLLISION OR ESCAPE OCCURS. IF DESIRED, SUCCESSIVE CASES MAY BE RUN IN WHICH THE HISTORIES ARE STARTED IN ANY MATERIAL OF THE CELL MERELY BY RENUMBERING THE MATERIALS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 20 REGIONS
 - 1) DIFFERENT TYPES OF RODS (DIFFERING IN EITHER GEOMETRY OR MATERIALS)
 - 50 RODS PER REGION
 - 2) SUBREGIONS PER ROD
 - 12 REGIONS WITH RODS (ONLY THE FIRST 12 REGIONS COUNTING FROM THE CELL CENTER)
 - 8 MATERIALS
6. TYPICAL RUNNING TIME - SIMPLE GEOMETRIES MAY REQUIRE 2 MINUTES FOR A CASE CONSISTING OF 25,000 HISTORIES ON THE IBM360. PROBLEMS IN WHICH THE SOURCE REGION IS A SMALL FRACTION OF THE TOTAL OR THE MEAN FREE PATHS ARE LONG COMPARED TO THE DIMENSIONS OF THE REGIONS MAY TAKE SEVERAL TIMES AS LONG.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - MUCH OF THE BASIC INFORMATION AND SOME PARTS OF THE CODE ITSELF ARE TAKEN FROM THE MORE GENERAL MONTE CARLO CODE, C5R.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1971.
IBM7090 VERSION SUBMITTED OCTOBER 1969, DELETED FEBRUARY 1975.
IBM360 VERSION SUBMITTED OCTOBER 1969, REPLACED BY REVISION B FEBRUARY 1975, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - D. W. HERMANN AND P. S. CARLSMITH, RAFFLE, A MONTE CARLO CODE FOR CALCULATION OF FIRST FLIGHT COLLISION PROBABILITIES, ORNL-TM-1699, DECEMBER 1966.
D. C. IRVING, F. M. FREESTONE, JR., AND F. B. K. KAM,

ACC ABSTRACT 392

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10. REFERENCES (CONTINUED)
O5R, A GENERAL-PURPOSE MONTE CARLO NEUTRON TRANSPORT CODE,
CRNL-3622, FEBRUARY 1965.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360, 370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
ASSEMBLY LANGUAGE IS USED FOR THE RANDOM NUMBER GENERATION ROUTINES.
15. NAME AND ESTABLISHMENT OF AUTHORS -
G. W. HERMANN AND R. S. CARLSMITH
HOLIFIELD NATIONAL LABORATORY
OAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (3442 CARDS)
SAMPLE PROBLEM (26 CARDS)
REFERENCE REPORT, CRNL-TM-1699
17. CATEGORY - R
KEYWORDS - CELL CALCULATION, LEAKAGE, MONTE CARLO METHOD, LATTICES, O5R CODES

1. NAME OR DESIGNATION OF PROGRAM - XSDRN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/65 OR HIGHER
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE PRINCIPAL CALCULATIONS PERFORMED BY XSDRN (RESONANCE CALCULATION AND FLUX CALCULATION) BOTH EMPLOY NUMERICAL FINITE-DIFFERENCE TECHNIQUES. FOR THE RESONANCE CALCULATION, THIS INVOLVES A SIMPSONS INTEGRATION TO SOLVE FOR THE COLLISION DENSITY IN THE RESONANCE RANGE. THE FLUX CALCULATIONS EMPLOY A MULTIGROUP ENERGY STRUCTURE, AN ARBITRARY SPATIAL STRUCTURE AND A MECHANICAL ANGULAR QUADRATURE, ALL OF WHICH MUST BE USED IN THE VARIOUS INTEGRATION AND DIFFERENCING SCHEMES IN THE CODE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PRINCIPAL RESTRICTION IS THE AVAILABILITY OF ADEQUATE CORE STORAGE TO BUILD REQUIRED ARRAYS. THE CODE IS FLEXIBLY DIMENSIONED WHICH MEANS THAT ARRAY SIZES ARE SET FOR THE PARTICULAR PROBLEM AT EXECUTION TIME. (PROVISIONS ARE ALSO AVAILABLE FOR STORING CERTAIN LARGE DATA ARRAYS OUT OF CORE, IF NEED BE.)
6. TYPICAL RUNNING TIME - TYPICAL RESONANCE CALCULATIONS HAVE BEEN RUN ON THE IBM360/75 IN FROM ONE-HALF TO ONE MINUTE PER NUCLIDE. A TYPICAL FLUX CALCULATION (S4 P3, 25 SPACE POINTS, 123 ENERGY GROUPS, CYLINDER, K-CALCULATION, REDUCE CROSS SECTIONS, 4 RESONANCE NUCLIDES) GENERALLY RUNS IN 10 TO 12 MINUTES. A FIXED SOURCE CALCULATION FOR THE SAME SYSTEM WOULD TAKE APPROXIMATELY THE SAME TIME.
7. UNUSUAL FEATURES OF THE PROGRAM - THE FLEXIBLE DIMENSIONING SCHEME EMPLOYED BY XSDRN ALLOWS ONE TO MAKE OPTIMAL USE OF CORE STORAGE. A UNIQUE METHOD OF STORING CROSS SECTIONS IS EMPLOYED TO ELIMINATE INPUT OF UNNECESSARY TRANSFER CROSS SECTIONS.
8. RELATED AND AUXILIARY PROGRAMS - THE MASTER LIBRARY TAPE FOR XSDRN IS PRODUCED BY XLACS. CROSS SECTION TAPES CAN BE GENERATED FOR ANISN (ACC ABSTRACT 151), DOT, CITATION (ACC ABSTRACT 387), ROD, OR THE EXTERMINATOR2 (ACC ABSTRACT 156) CODES.

1. NAME OR DESIGNATION OF PROGRAM - TIGIR2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - INFORMATION IS RETRIEVED ON A SELECTIVE BASIS. THE SELECTION PROCESS EMPLOYED IS ONE WHICH DETERMINES THE TRUTH VALUE OF A REQUEST FOR ANY GIVEN UNIT RECORD, WHERE A UNIT RECORD IS THE INFORMATION FILED FOR A DOCUMENT, AND THE REQUEST IS A BOOLEAN-LIKE EXPRESSION WRITTEN IN THE LANGUAGE USED TO DESCRIBE THE DOCUMENT.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - ONE MINUTE OF CENTRAL PROCESSOR TIME IS REQUIRED TO SEARCH ABOUT 6000 DOCUMENT RECORDS ON TAPE.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
CDC6600 VERSION SUBMITTED SEPTEMBER 1969, REPLACED BY A
NEW EDITION OCTOBER 1974.
10. REFERENCES - J. L. COPELAND, R. J. CULLEN, C. H. HUNTER, AND
A. E. ZACKRISON, TIGIR, A DOCUMENT RETRIEVAL PROGRAM FOR THE
CDC 6600 - USERS REFERENCE MANUAL, KAPL-M-6749(L), JULY 28, 1969.
B. A. BROWN, TIGIR, A DOCUMENT RETRIEVAL PROGRAM FOR
THE CDC 6600 AND TIGSCRIPT/EDITMRG, TWO TIGIR MODULES TO PROVIDE
SORT CAPABILITY FOR TIGIR FILES, KAPL-M-6749(L) ADDENDUM NO. 1
(REV.), AUGUST 1970.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN AND ASCENT
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCCPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
SOME NON-STANDARD OPERATIONS SUCH AS BUFFER ASSIGNMENT AT EXECUTE
TIME, RANDOM FILE GENERATION AND USE, AND SHIFTING, HAVE MADE
MACHINE LANGUAGE SUBPROGRAMS NECESSARY.

15. NAME AND ESTABLISHMENT OF AUTHORS -
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AND A. E. ZACKRISON
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SCHEMECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
FILE 1 - SOURCE DECK (14,854 CARDS)
FILE 2 - TIGIR2 SYSTEM ROUTINES (180 CARDS)
REFERENCE REPORT AND ADDENDUM
17. CATEGORY - M
KEYWORDS - LIBRARIES, MAINTENANCE, RETRIEVAL, DATA PROCESSING

1. NAME OR DESIGNATION OF PROGRAM - CONTEMP-LT/022
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE CONTEMP-LT PROGRAM PREDICTS THE PRESSURE-TEMPERATURE RESPONSE OF A DRY WELL OR A DRY WELL WITH VENTS AND PRESSURE SUPPRESSION SYSTEM TO A LOSS-OF-COOLANT ACCIDENT. AN ADDITIONAL DUAL CONTAINMENT COMPARTMENT MAY ALSO BE MODELED IF DESIRED. THE DRY WELL IS SEPARATED INTO A LIQUID REGION AND A VAPOR REGION. EACH REGION IS ASSUMED TO HAVE A UNIFORM TEMPERATURE BUT THE TEMPERATURES OF THE TWO REGIONS MAY BE DIFFERENT. THE CONTAINMENT BUILDING IS REPRESENTED AS CONSISTING OF SEVERAL HEAT CONDUCTING STRUCTURES WHOSE THERMAL BEHAVIOR CAN BE DESCRIBED BY THE ONE-DIMENSIONAL MULTI-REGION HEAT CONDUCTION EQUATIONS. WATER AND ENERGY RATES FROM DISCHARGE OF COOLANT, BOILING OF RESIDUAL WATER BY REACTOR DECAY HEAT, SUPERHEATING OF STEAM PASSING THROUGH THE CORE, AND METAL-WATER REACTIONS ARE ASSUMED AVAILABLE FROM PREVIOUS CALCULATIONS AND ARE INPUT DATA TO THE PROGRAM. PROGRAM OUTPUT INCLUDES CONTAINMENT VOLUME PRESSURE AND TEMPERATURE, TEMPERATURES THROUGH THE BUILDING STRUCTURES, AND THE AMOUNT OF WATER, VAPOR, AND ENERGY IN THE CONTAINMENT VOLUMES. THE PRESSURE SUPPRESSION CALCULATIONS INCLUDE VENT CLEARING AND FLOW OF A TWO-COMPONENT TWO-PHASE WATER-AIR MIXTURE THROUGH THE VENTS, AND A MASS-ENERGY BALANCE IN THE WET WELL. THERE ARE PROVISIONS FOR NORMAL BUILDING LEAKAGE, LEAKAGE FROM PENETRATIONS, A FAN COOLER SYSTEM, AND DRY AND WET WELL SPRAY SYSTEMS.
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 HEAT STRUCTURES
101 MESH POINTS PER STRUCTURE
SEVERAL METHODS FOR DESCRIBING NON-CONSTANT HEAT TRANSFER COEFFICIENTS ARE PROVIDED, BUT THE THERMAL CONDUCTIVITY AND HEAT CAPACITY ARE CONSTANT. WATER THERMODYNAMIC PROPERTIES ARE DETERMINED FROM TABLE LOOKUP AND INTERPOLATION PROCEDURES.
6. TYPICAL RUNNING TIME - ON THE IBM360/75, APPROXIMATELY .021 SECOND PER TIME ADVANCEMENT WITH 90 MESH POINTS FOR HEAT STRUCTURES WITHOUT PRESSURE SUPPRESSION IS REQUIRED. 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 REPLACES CONTEMPT (ACC ABSTRACT 297), CONTEMPT-CONPS, AND CONTEMPT-PS.
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, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - L. C. RICHARDSON, L. J. FINNEGAN, R. J. WAGNER, AND J. M. WAAGE, CONTEMPT, A COMPUTER PROGRAM FOR PREDICTING THE CONTAINMENT PRESSURE-TEMPERATURE RESPONSE TO A LOSS-OF-COOLANT ACCIDENT, IDO-17220, JUNE 1967.
C. F. CARMICHAEL AND S. A. MARKS, CONTEMPT-PS - A DIGITAL COMPUTER CODE FOR PREDICTING THE PRESSURE-TEMPERATURE HISTORY WITHIN A PRESSURE-SUPPRESSION CONTAINMENT VESSEL IN RESPONSE TO A LOSS-OF-COOLANT ACCIDENT, IDO-17252, APRIL 1969.
R. J. WAGNER, CONTEMPT MODIFICATIONS, PHILLIPS PETROLEUM MEMO WAG-24-68 AM, SEPTEMBER 23, 1968.
R. J. WAGNER, CONTEMPT-CONPS MODIFICATIONS, WAG-19-69A-M, MAY 14, 1969.
C. F. CARMICHAEL, MODIFICATIONS TO CONTEMPT/CONPS CODE, IDAHO NUCLEAR MEMO CARM-16-69, SEPTEMBER 17, 1969.
L. C. RICHARDSON, DATE SUBROUTINE S0000C10, PHILLIPS PETROLEUM NOTE, NOVEMBER 1968.
R. J. WAGNER, CVI INPUT SUBROUTINE, IDAHO NUCLEAR NOTE, MAY 1969.
R. L. MUELLER, 360/75 INTERVAL TIMER ROUTINE S00030, PHILLIPS PETROLEUM NOTE, OCTOBER 10, 1968.
K. D. RICHERT, BUFIO, A SUBROUTINE TO PERMIT FORTRAN ACCESS TO IDOP, PHILLIPS PETROLEUM NOTE, FEBRUARY 1966.
A. J. SMITH, CALCOMP PLOTTER SUBROUTINES, PHILLIPS PETROLEUM DESCRIPTION, FEBRUARY 1969.
NRTS ENVIRONMENTAL SUBROUTINE MANUAL, ANC DOCUMENT, DECEMBER 1972.
R. J. WAGNER AND L. L. WHEAT, CONTEMPT-LT USERS

10. REFERENCES (CONTINUED)
MANUAL, INTERIM REPORT I-214-74-12.1, AUGUST 1973.
L. L. WHEAT, CONTEMPT-LT/021 CONTAINMENT CODE - LLW-7-73, AEROCJET NOTE, SEPTEMBER 6, 1973.
L. L. WHEAT, CONTEMPT-LT/022 PROGRAM AVAILABILITY - LLW-12-73, AEROCJET NOTE, DECEMBER 17, 1973.
11. MACHINE REQUIREMENTS - 270K BYTES AND A CALCOMP PLOTTER USED FOR PLOTTING
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 MVT.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. J. WAGNER AND L. L. WHEAT
AEROCJET NUCLEAR COMPANY
550 SECOND STREET
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CONTEMPT 5182 CARDS, NRTS ENVIRONMENTAL SUBROUTINES 12,195 CARDS)
LOAD MODULE CONTEMPT (IBM 2314 35, BLOCKS)
SAMPLE PROBLEM (60 CARDS)
CONTROL INFORMATION (JCL 52 CARDS)
SAMPLE PROBLEM OUTPUT (31 PAGES, 4 PLOTS)
REFERENCE REPORTS, PROGRAM MODIFICATION MEMORANDA, SUBROUTINE DESCRIPTIONS, INTERIM REPORT, AND AEROCJET NOTES
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 1972.
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.

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14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
ALL SUBROUTINES CALLED WHICH ARE NOT INCLUDED REFER TO SANDIA
(LIVERMORE) PLOT PROGRAMS AND SHOULD BE EASILY CONVERTED TO OTHER
SYSTEMS.
15. NAME AND ESTABLISHMENT OF AUTHOR -
V. K. GABRIELSON
NUMERICAL APPLICATIONS
DIVISION 8321
SANDIA CORPORATION
LIVERMORE, CALIFORNIA 94550
16. MATERIAL AVAILABLE -
SOURCE DECK (1036 CARDS)
SAMPLE PROBLEM (36 CARDS)
REFERENCE REPORT AND ERRATA
17. CATEGORY - N
KEYWORDS - HEAT TRANSFER, GEOMETRIES, INPUT DATA, STRUCTURAL
ANALYSIS

1. NAME OR DESIGNATION OF PROGRAM - BURST1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - PARTIAL TIME DERIVATIVES FOR MASS VELOCITY, PRESSURE, AND ENTHALPY, OBTAINED FROM THE THREE CONSERVATION LAWS FOR MASS, MOMENTUM, AND ENERGY, ARE APPROXIMATED WITH DIFFERENCE EQUATIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
50 TOTAL CYLINDERS AND ADAPTERS
2000 SPACE STEPS IN THE WHOLE SYSTEM
5000 TIME-STEPS
ONLY SUBCOOLED, FRICTIONLESS, ADIABATIC CASES CAN BE CONSIDERED.
6. TYPICAL RUNNING TIME - WITH A LARGE PROBLEM ON THE IBM7044, THE PRODUCT OF THE NUMBER OF SPACE STEPS AND THE NUMBER OF TIME-STEPS RUN IN ONE MINUTE IS ABOUT 25,000.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE BLCT DECK IS USED TO PLOT DATA STORED BY BURST1.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
IBM360 VERSION SUBMITTED FEBRUARY 1970, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - RONALD P. ROSE, GEORGE H. HANSON, AND GERALD A. JAYNE, HYDRODYNAMICS DESCRIBING ACOUSTIC PHENOMENA DURING REACTOR COOLANT SYSTEM BLOWDOWN, IDO-17254, JULY 1967.
GERALD A. JAYNE, BURT 1 PROGRAM DESCRIPTION (PC0411), DECEMBER 1967.
11. MACHINE REQUIREMENTS - 32K MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

G. A. JAYNE AND G. H. HANSON
IDAHO NUCLEAR CORPORATION
P. O. BOX 1845
IDAHO FALLS, IDAHO, 83401
R. P. ROSE
WESTINGHOUSE ATOMIC NUCLEAR LABORATORY
P. O. BOX 1864
PITTSBURGH, PENNSYLVANIA 15236

16. MATERIAL AVAILABLE -

SOURCE DECKS (BUKST1 360-612 CARDS, BLCT 360-240 CARDS)
SAMPLE PROBLEMS (BUKST1 360-33 CARDS, BLCT 360-29 CARDS)
SAMPLE PROBLEM OUTPUT (8 PAGES)
REFERENCE REPORT AND PROGRAM DESCRIPTION

17. CATEGORY - G

KEYWORDS - CYLINDERS, PRESSURE DISTRIBUTION, 1-DIMENSIONAL,
ENTHALPY, BLOWDOWN, HYDRODYNAMICS, COOLANTS, BLCT CODES

1. NAME OR DESIGNATION OF PROGRAM - ETCM1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - ETCM1 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN THE ENDF/B FORMAT AND PRODUCES DATA DECKS FOR USE IN GENERATION OF MUFT4 AND MUFT5 LIBRARIES.
4. METHOD OF SOLUTION - BASICALLY, ETCM1 PERFORMS A STRAIGHTFORWARD GROUP AVERAGING OF THE VARIOUS CROSS SECTIONS USING THE INPUT WEIGHT AND THE MICROSCOPIC DATA FROM THE ENDF/B DATA FILES. THE BREIT-WIGNER SINGLE-LEVEL FORMULA IS ASSUMED TO YIELD RESONANCE CROSS SECTIONS WITH REASONABLE ACCURACY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
99 MULTICROUPS
250 RESOLVED RESONANCES
6. TYPICAL RUNNING TIME - EXECUTION TIMES FOR A STANDARD 54-GROUP MUFT PROBLEM USING ENDF/B DATA WHICH CONTAIN EXPLICIT RESONANCE PARAMETERS VARY FROM 1 TO 2 MINUTES. WHEN THE ENDF/B DATA FOR THE ISOTOPE DOES NOT CONTAIN EXPLICIT RESONANCE PARAMETERS, EXECUTION TIMES VARY FROM .5 TO 1 MINUTE.
7. UNUSUAL FEATURES OF THE PROGRAM - THE GENERAL PURPOSE RETRIEVAL SUBROUTINES ENABLE TWO TABULAR FUNCTIONS TO BE ACCURATELY COMBINED (TO WITHIN SOME INPUT EPSILON) AND THEY ALSO PROVIDE FOR EXACT (ACCORDING TO THE SPECIFIED INTERPOLATION SCHEMES) INTEGRATION OF THE FUNCTIONS. ANY DESIRED WEIGHTING SCHEME MAY BE USED. ETCM1 WILL ACCEPT ENDF/B DATA FROM A BINARY TAPE OR FROM A BCD CARD IMAGE TAPE OR JUST FROM BCD CARDS. ALL DATA IS ASSUMED TO BE IN THE STANDARD ENDF/B ARRANGEMENT. MANY OF THE SUBROUTINES USED BY THE PROGRAM MAY BE USEFUL IN OTHER (PRESENT AND FUTURE) CODES CONNECTED WITH THE ENDF/B SYSTEM.
8. RELATED AND AUXILIARY PROGRAMS - STORAGE AND RETRIEVAL OF THE ENDF/B MICROSCOPIC DATA AND COMBINATION OF TWO OR MORE TABULAR ARRAYS INTO ONE TABULAR ARRAY WITH ONE INTERPOLATION SCHEME IS ACCOMPLISHED IN LARGE PART BY THE GENERAL PURPOSE RETRIEVAL SUBROUTINES (ACC ABSTRACT 384).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
CDC6600 VERSION SUBMITTED FEBRUARY 1970.
10. REFERENCES - R. A. DANIELS AND D. E. KUSNER, ETCM-1 - A FORTRAN PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THE MUFT FORMAT, WCAP-3683-1, MAY 1966.
H. C. HONECK, ENDF/B - SPECIFICATIONS FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066, MAY 1966, REVISED JULY 1967.
H. BOHL, JR., E. M. GELBARD, AND G. H. RYAN, MUFT-4

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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 FTEG-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. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
S. KELLMAN AND D. E. KUSNER
WESTINGHOUSE ELECTRIC CORPORATION
PWR SYSTEMS DIVISION
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, TAPE2-23 FILES)
REFERENCE REPORT
17. CATEGORY - Z
KEYWORDS - CROSS SECTIONS, LIBRARIES, MUFT4 CODES, MUFT5 CODES,
GAM1 CODES, GAM2 CODES, FTEG CODES, CRECT CODES

1. NAME OR DESIGNATION OF PROGRAM - FLASH4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - FLASH4 IS USED TO DETERMINE THE TRANSIENT RESPONSE OF A WATER-COOLED REACTOR OR HYDRAULIC SYSTEM TO SEVERE VARIABLE PRESSURE OPERATION.
4. METHOD OF SOLUTION - THE NUMERICAL INTEGRATIONS OF THE COUPLED FLUID CONSERVATION EQUATIONS ARE DONE BY FULLY IMPLICIT DIFFERENCE EQUATIONS. FLUID PROPERTIES ARE GENERATED FROM STORED DATA.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
2) PRESSURE DETERMINING NODES
40 FLOW PATHS
THE PLANT AND CORE GEOMETRY ARE ASSUMED FIXED IN TIME, HENCE THE SOLUTION IS NOT APPLICABLE AFTER SIGNIFICANT DIMENSIONAL CHANGE.
6. TYPICAL RUNNING TIME - RUNNING TIME VARIES BETWEEN .001 TO 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 - FLASH4 IS AN EXTENSION OF FLASH AND FLASH2 (ACC ABSTRACT 295). FLASH4 USES THE INPUT PROCESSING SUBROUTINES FCHIP, CARDS, AND INPF (SEE REFERENCE 4 AND ACC ABSTRACT 478). THE IBM360 VERSION OF FLASH4 USES THE ENVIRONMENTAL ROUTINES WHICH WERE CONVERTED FOR THE IBM360 VERSION OF PDQ7 (ACC ABSTRACT 275).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
CDC6600 VERSION SUBMITTED JANUARY 1970.
IBM360 VERSION SUBMITTED AUGUST 1974, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - T. A. PORSCHING, J. H. MURPHY, J. A. REDFIELD, AND V. C. DAVIS, FLASH-4, 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

10. REFERENCES (CONTINUED)
ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
IBM360/370 FLASH4 REACTOR TRANSIENTS SIMULATION PROGRAM LISTING, MDC N2267-094, VOLUMES 1 AND 2, JULY 1974.
11. MACHINE REQUIREMENTS - 64K MEMORY (CDC6600), 25.6K BYTES (IBM360)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC6600), OS/360,370 (IBM360,370).
14. ANY 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.
15. NAME AND ESTABLISHMENT OF AUTHORS -
6600 T. A. PORSCHE, J. H. MURPHY, J. A. REDFIELD,
AND V. C. DAVIS
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

360 C. K. HERKSTROETER AND K. GEIP
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 (6600-11,598 CARDS, 360-15,907 CARDS)
SAMPLE PROBLEMS (6600-24 CARDS, 360-23 CARDS)
SAMPLE PROBLEM OUTPUT (6600-25 SELECTED PAGES)
CONTROL INFORMATION (JCL 360-78 CARDS)
2314 LOAD MODULE FLASH (360-320 BLOCKS)
REFERENCE REPORTS, WAPD-TM-840, WAPD-TM-666, WAPD-TM-668,
MDC N2267-094, VOLS. 1, 2 (360 VERSION ONLY)
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 - CYGRC3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - CYGRC3 IS AN EXTENSIVE MODIFICATION OF CYGRC1 AND CYGRC2 (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 CYGRC1 AND CYGRC2 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 - CYGRC1 AND CYGRC2. CYGRC3 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.
10. REFERENCES - F. DUNCOMBE AND C. M. FRIEDRICH, CYGRC-3 - A COMPUTER PROGRAM TO DETERMINE TEMPERATURES, STRESSES AND DEFORMATIONS IN OXIDE FUEL RODS (LWBR DEVELOPMENT PROGRAM), WAPD-TM-561, MARCH 1970.
C. J. PFEIFFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
ACC PROGRAMMING NOTE 73-4, AUGUST 28, 1972.

11. MACHINE REQUIREMENTS - 140,000 OCTAL WORDS
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
CYGRO3 CALLS A SUBROUTINE TICK WHICH IS NOT INCLUDED WITH THE PRO-
GRAM 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 -
F. LUNCOMBE AND C. M. FRIEDRICH
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5206 CARDS)
SAMPLE PROBLEM (95 CARDS)
SAMPLE PROBLEM OUTPUT (15 PAGES)
REFERENCE REPORTS
17. CATEGORY - I
KEYWORDS - STRESSES DISTRIBUTION, FUEL ELEMENTS, DEFORMATION,
TEMPERATURE, PRESSURE, CYGRO CODES

1. NAME OR DESIGNATION OF PROGRAM - KENO/KENO2
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 CURBIDS (RECTANGULAR PARALLELEPIPEDS) ARRANGED IN ANY ORDER WITH ONLY ONE RESTRICTION (EACH GEOMETRICAL REGION MUST BE DESCRIBED AS COMPLETELY ENCLOSED BY ALL REGIONS INTERIOR TO IT). FOR SYSTEMS NOT DESCRIBABLE USING THIS SPECIAL GEOMETRY PACKAGE, THE PROGRAM CAN USE THE GENERALIZED GEOMETRY PACKAGE (GEOG) 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 K_{EFF} 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 NEUTRONS 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 K_{EFF} FOR SYSTEMS WITH REGIONS OF WIDELY VARYING AVERAGE WEIGHTS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - THE FIRST KENO SAMPLE PROBLEM REQUIRES JUST OVER 2 MINUTES OF EXECUTION TIME ON THE IBM360/91 AND 6 MINUTES ON THE IBM360/75. TYPICAL 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.
7. UNUSUAL FEATURES OF THE PROGRAM - THE MIXED BOX FEATURE PERMITS THE CALCULATION OF MANY DIFFERENT TYPES OF UNITS. KENO2 (CDC6600)

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
INPUT IS EXTENSIVELY CHECKED FOR CONSISTENCY AND COMPLETENESS.
FOR THE IBM360 VERSION OF KENC2 A SIMPLIFIED GEOMETRY DESCRIPTION
IS PERMITTED WHEN NO SURFACES INTERSECT.
8. RELATED AND AUXILIARY PROGRAMS - ANISN (ACC ABSTRACT 151), DOT,
GFCM, MSR. THE 6600 VERSION INCLUDES AN AUXILIARY PROGRAM,
K2TAPE, TO READ THE CROSS SECTION LIBRARY DATA AND CREATE A
BINARY FILE TO BE READ BY KENC2.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION OF KENC SUBMITTED MAY 1970, REPLACED BY
SECOND EDITION SEPTEMBER 1971, SAMPLE PROBLEM EXE-
CUTED BY ACC.
CDC6600 VERSION OF KENC2 SUBMITTED JULY 1973, LIBRARY
AND AUXILIARY PROGRAM ADDED AUGUST 1974.
IBM360 VERSION OF KENC2 SUBMITTED AUGUST 1973, REVISED
APRIL 1974, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - G. E. WHITESIDES AND N. F. CROSS, KENC - A MULTIGROUP
MONTE CARLO CRITICALITY PROGRAM, CTC-5, SEPTEMBER 10, 1969.
KENC DATA GUIDE, CTC-5 ERRATA PP.21-32, SEPTEMBER
1971.
DESCRIPTION OF ALBEDO AND CROSS SECTION DATA, CRNL
NOTE, SEPTEMBER 1971.
ACC PROGRAMMING NOTE, KENC TAPE SETUP, JANUARY 1972.
DEANNE DICKINSON, ROCKY FLATS KENC II MANUAL, APRIL
1973.
ACC 450 KENC2 CDC6600 PROGRAMMING NOTES, JULY 1973.
KENC2, ACC NO. 450.360P, ARCCNE CODE CENTER PROGRAM-
MING NOTE 74-26, MARCH 6, 1974.
H. K. CLARK, KENC-II MEMORANDUM, DPST-7(-449
(REVISED), AUGUST 1, 1973.
KENC2, 450.6600, TAPE DESCRIPTION, ARCCNE CODE
CENTER PROGRAMMING NOTE 75-21, JANUARY 1975.
11. MACHINE REQUIREMENTS - CDC6600 PROGRAM REQUIRES 64K WORDS OF FAST
CORE, A DISK FACILITY OR ONE OR MORE TAPE UNITS. IBM360 VERSION
OF KENC2 REQUIRES APPROXIMATELY 150K OF CORE WITH LARGER PROBLEMS
REQUIRING MORE CORE.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASSEMBLY LANGUAGE
(IBM360), FTL FORTRAN WITH COMPASS SUBROUTINES (CDC6600).
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360 (IBM360) AND SCOPE 3.3 (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
IBM360 KENC SAMPLE PROBLEM CAN BE EXECUTED BY MOUNTING THE DISTRI-
BUTION TAPE AND USING THE JCL CARDS TO RETRIEVE THE OBJECT
PROGRAM AND ANY NEEDED CROSS SECTION OR ALBEDO DATA. THE ENCLOSED
CROSS SECTION AND ALBEDO DATA ARE INCLUDED FOR THE SAME PURPOSE
OF ALLOWING THE SAMPLE PROBLEMS TO BE RUN FOR INSTRUCTIONAL PUR-

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
POSES AND SHOULD NOT BE ASSUMED USEFUL FOR ANY OTHER PURPOSE WITHOUT CLOSE EXAMINATION AS TO THEIR APPLICABILITY.
THE ASSEMBLER LANGUAGE SUBROUTINES MENTIONED IN ITEM 12 INCLUDE A RANDOM NUMBER PACKAGE RANDNUM (ENTRIES FLTRN, AZIPN, EXPRN, AND GTISO), A TIMING SUBROUTINE PULL (ENTRIES PULL AND ITIME), AND MODEL, A SUBROUTINE USED AT OAK RIDGE TO IDENTIFY THE MACHINE ON WHICH A PROBLEM IS BEING RUN.
15. NAME AND ESTABLISHMENT OF AUTHORS -
- 360 KENC G. E. WHITESIDES AND N. F. CROSS
MATHEMATICS DIVISION
HOLIFIELD NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830
- 6600 KENC2 DEANNE DICKINSON
ROCKY FLATS DIVISION
DOW CHEMICAL USA
P. O. BOX 888
GOLDEN, COLORADO 80401
- 360 KENC2 F. K. CLARK
SAVANNAH RIVER LABORATORY
F. I. DU PONT DE NEMOURS AND COMPANY, INC.
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (KENC 360-5230 CARDS, KENC2 6600-5100 CARDS, 360-5408 CARDS)
AUXILIARY PROGRAM SOURCE DECK (K2TAPE 6600-77 CARDS)
OBJECT DECKS (KENC 360-3347 CARDS, KENC2 360-78 CARDS)
2314 LOAD MODULE (KENC2 360-312 BLOCKS)
SAMPLE PROBLEMS (KENC 360-1664 CARDS, KENC2 6600-369 CARDS, 360-569 CARDS)
LIBRARIES (KENC 360-CROSS SECTIONS 11 VARIABLE-SIZED BINARY RECORDS, ALBELGS 39 VARIABLE-SIZED BINARY RECORDS, KENC2 6600-7725 CARDS)
CONTROL INFORMATION (KENC 360-29 CARDS, KENC2 360-43 CARDS)
SAMPLE PROBLEM OUTPUT (360-110 SELECTED PAGES, 6600-58 PAGES)
REFERENCE REPORT, ERRATA, MANUAL, NOTES, AND MEMO
17. CATEGORY - C
KEYWORDS - MULTIGROUP, MONTE CARLO METHOD, CRITICALITY, LEAKAGE, ABSORPTION, FISSION, STATISTICS, ANISN CODES, DCT CODES, GEOM CODES, MSR CODES, K2TAPE CODES

1. NAME OR DESIGNATION OF PROGRAM - BETTIS ENVIRONMENTAL ROUTINES: MODEL 6/3.2, MODEL 6/3.3, MODEL 7/2.0
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC 6600, 7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE BETTIS ENVIRONMENTAL ROUTINES EXTEND THE FORTRAN LANGUAGE BY MODIFYING SOME OF THE STANDARD CDC 6600 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.
4. METHOD OF SOLUTION -
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 ROUTINES AND MODEL ARE USED BY MOST OF THE BETTIS PROGRAMS. HOWEVER, MODEL INCLUDES ONLY FILE HANDLING AND STORAGE ALLOCATION FACILITIES.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC 6600 BETTIS SCOPE 2 VERSION SUBMITTED JANUARY 1967.
CDC 6600 RABCOCK & WILCOX SCOPE 3.1 VERSION SUBMITTED FEBRUARY 1970, UPDATED SCOPE 3.3 SUBROUTINES ADDED OCTOBER 1971.
CDC 6600 MODEL SCOPE 3.1 VERSION SUBMITTED JUNE 1970, REPLACED BY SCOPE 3.2 VERSION NOVEMBER 1971.
CDC 6600 MODEL SCOPE 3.3 VERSION SUBMITTED DECEMBER 1971.
CDC 7600 MODEL SCOPE 2.0 VERSION SUBMITTED MAY 1972, REPLACED BY REVISED EDITION MARCH 1974.
10. REFERENCES - C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
R. S. HORECK, L. A. BCFLETTER, AND R. W. MORSTAD, MODEL - MODIFIED ENVIRONMENTAL LIBRARY, CDC-6600 FORTRAN PROGRAMMING GUIDE, CDC REPORT, SEPTEMBER 1971.
R. W. YEATTS, R. S. HORECK, L. A. BCFLETTER, AND R. W. MORSTAD, MODEL - MODIFIED ENVIRONMENTAL LIBRARY, VERSION 6/3.2 INSTALLATION GUIDE, CDC REPORT, NOVEMBER 1971.
R. W. YEATTS AND L. A. BCFLETTER, MODEL - MODIFIED ENVIRONMENTAL LIBRARY, VERSION 6/3.3 INSTALLATION GUIDE, CDC REPORT, DECEMBER 1971.

10. REFERENCES (CONTINUED)

L. A. BOELTER, MODEL - MODIFIED ENVIRONMENTAL LIBRARY, CDC-7600 FORTRAN PROGRAMMING GUIDE, CDC REPORT, MAY 1972.

L. A. BOELTER, MODEL - MODIFIED ENVIRONMENTAL LIBRARY, VERSION 7/2.0 INSTALLATION GUIDE, CDC REPORT, MAY 1972.

REVISED MODEL ROUTINES CDC7000, COMBUSTION ENGINEERING INTERNAL MEMORANDUM, MARCH 1974.

11. MACHINE REQUIREMENTS - FOR THE BETTIS VERSION 65,356 WORDS OF 60-BIT CORE STORAGE (MORE OR LESS CAN BE USED), A SYSTEM (6603) DISK, AT LEAST 2 MAGNETIC TAPES, AT LEAST 4 NON-SYSTEM DISKS, EACH ON ITS OWN CHANNEL, AND CDC-2PO PLOTTING HARDWARE.

FOR THE MODEL VERSIONS 65,356 WORDS OF 60-BIT CORE STORAGE (MORE CAN BE USED), 2 MAGNETIC TAPES, AND 4 MASS STORAGE DEVICES, EACH ON ITS OWN CHANNEL.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT (BETTIS AND B&W), FORTRAN IV AND COMPASS (MODEL 6/3.2 AND 3.3), FORTRAN IV (MODEL 7/2.0)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 2.0 (BETTIS), SCOPE 3.1 (B&W), SCOPE 3.2 (MODEL), SCOPE 3.3 (MODEL), SCOPE 2.0 (MODEL 7/2.0).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE OPERATING SYSTEMS TO BE ENHANCED BY MODEL 6/3.2, MODEL 6/3.3, AND MODEL 7/2.0 ARE CDC6600 SCOPE 3.2 AND SCOPE 3.3 AND CDC7600 SCOPE 2.0, RESPECTIVELY. THE USER MUST PROVIDE A SITE-CONFIGURED SCOPE 3.2, SCOPE 3.3, OR SCOPE 2.0 SOURCE CODE FILE, IN UPDATE PROGRAM LIBRARY FORMAT. UPDATE IS THE SCOPE SOURCE LANGUAGE LIBRARY MAINTENANCE PROGRAM, AS DOCUMENTED IN THE SCOPE REFERENCE MANUAL. AS A RESULT OF THE INSTALLATION PROCEDURE, A SCOPE 3.2, SCOPE 3.3, OR SCOPE 2.0 DEADSTART TAPE WITH MODEL ROUTINES AND A CORRESPONDING SOURCE CODE FILE WILL BE PRODUCED. THE MODEL 6/3.2 AND 3.3 FORTRAN-CODED ROUTINES MUST BE COMPILED USING THE RUN COMPILER OR VARIATIONS THEREOF (E.G., FUN-53), WHILE THE MODEL 7/2.0 FORTRAN-CODED ROUTINES USE THE FTN COMPILER. THE COMPASS-CODED ROUTINES MUST BE ASSEMBLED USING THE COMPASS 2.0 ASSEMBLER.

15. NAME AND ESTABLISHMENT OF AUTHORS -

BETTIS

C. J. PFEIFER
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

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

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
MODEL B. W. YEATTS, R. S. HORECK, L. A. PEHLER,
AND R. W. MERSTAD
CONTROL DATA CORPORATION
MINNEAPOLIS, MINNESOTA 55440
- MODEL 7C ROBERT KIRKMAN
REVISED COMBUSTION ENGINEERING, INC.
P. O. BOX 500
WINDSOR, CONNECTICUT 06095
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (BETTIS 21,123 CARDS, B&W 21,258 CARDS, H&W SCOPE
3.3 ROUTINES 444 CARDS, MODEL 6/3.2 1054 BCD
RECORDS, MODEL 6/3.3 1122 BCD RECORDS, REVISED
MODEL 7/2.0 18,889 CARDS)
REFERENCE REPORTS
17. CATEGORY - P
KEYWORDS - DATA PROCESSING OPERATION, LIBRARIES, MAINTENANCE

1. NAME OR DESIGNATION OF PROGRAM - FREADM1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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 (PCINT 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.
4. METHOD OF SOLUTION - TIME INTEGRATION OF THE EQUATIONS FOR THE DYNAMICS OF NUCLEAR KINETICS, HEAT TRANSFER AND PRIMARY LOOP COOLANT FLOW MAY BE PERFORMED IN A COUPLED MODE, OR INDEPENDENTLY. TRANSIENT TEMPERATURE CONDITIONS COMPUTED FOR SINGLE PINS, REPRESENTATIVE OF A NUMBER OF BUNDLE TYPES, MAY BE USED TO INITIATE PRESCRIBED ACCIDENT INITIATING AND/OR PROPAGATING ACTIVITIES. THE USER SUPPLIES CRITERIA FOR INITIATING THESE ACTIVITIES. REACTIVITY FEEDBACK FROM THE VARIOUS ACTIVITIES MAY BE COMPUTED USING MODELS IN THE CODE, OR INPUT FROM TABLES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - FREADM1 IS RESTRICTED TO ACCIDENTS WHICH INITIATE AND PROPAGATE UNIFORMLY WITHIN ANNULAR OR CYLINDRICAL COAXIAL CORE REGIONS.
HEAT TRANSFER CALCULATIONS FOR UP TO 12 RADIAL CORE REGIONS MAY BE PERFORMED SIMULTANEOUSLY WITH UP TO 12 SEPARATE BUNDLE TYPES SUBDIVIDED INTO 9 OR LESS AXIAL SECTIONS. RADIAL HEAT TRANSFER CALCULATIONS ARE DONE USING UP TO 10 RADIAL FUEL NODES, A CLAD NODE AND A COOLANT NODE FOR EACH AXIAL SECTION. LOOP FLOW MAY BE TREATED USING A MAXIMUM OF 2 INDEPENDENT PRIMARY COOLANT LOOPS (LOOPS MAY BE OF DIFFERENT SIZES TO SIMULATE MORE THAN 2 LOOPS). POINT KINETICS WITH UP TO 6 DELAYED NEUTRON PRECURSOR GROUPS IS USED TO COMPUTE THE TRANSIENT POWER LEVEL OF THE CORE.
6. TYPICAL RUNNING TIME - RUNNING TIME FOR FREADM1 IS STRONGLY DEPENDENT ON THE OPTIONS UTILIZED AND VALUES SUPPLIED FOR TIME-STEP CONTROL. 200 KINETICS TIME-STEPS WITH DOPPLER FEEDBACK FOR 12 BUNDLE TYPES, 9 AXIAL SECTIONS REQUIRE ABOUT .9 MINUTES OF GE635 PROCESSOR TIME. 37 COUPLED KINETICS AND HEAT TRANSFER TIME-STEPS USING 12 BUNDLE TYPES AND 9 AXIAL SECTIONS REQUIRE ABOUT 4.4 MINUTES OF GE635 PROCESSOR TIME. 32 COUPLED LOOP FLOW, KINETICS AND HEAT TRANSFER TIME-STEPS USING 12 BUNDLE TYPES AND 9 AXIAL SECTIONS REQUIRE ABOUT 5 MINUTES OF GE635 PROCESSOR TIME. COMPUTATION TIME PER TIME-STEP FOR HEAT TRANSFER CALCULATIONS IS PROPORTIONAL TO $NBT * NAX$ WHERE NBT = NUMBER OF BUNDLE TYPES AND NAX = NUMBER OF AXIAL SECTIONS. COMPUTATION TIME PER TIME-STEP FOR AN INDEPENDENT LOOP FLOW AND VOIDING CALCULATIONS IS ABOUT 15 SECONDS OF GE635 PROCESSOR TIME.

1. NAME OR DESIGNATION OF PROGRAM - STEAM-67
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - FOR THE USUAL CASE, WHERE PRESSURE AND/OR TEMPERATURE ARE KNOWN, THE VISCOSITY, SPECIFIC VOLUME, ENTHALPY OR ENTROPY MAY BE CALCULATED IN EITHER THE LIQUID OR VAPOR REGIONS. IN THE VAPOR REGION, QUALITY MAY BE CALCULATED AS A FUNCTION OF PRESSURE AND ENTROPY OR ENTHALPY.
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 JANUARY 1972.
IBM360 VERSION SUBMITTED JUNE 1970, REPLACED BY REVISED EDITION B JANUARY 1974.
10. REFERENCES - R. J. SPITZNAS, STEAM-67 TABLES, BALTIMORE GAS AND ELECTRIC NOTE, MAY 18, 1970.
C. A. MEYER, ET AL., THERMODYNAMIC AND TRANSPORT PROPERTIES OF STEAM, COMPRISING TABLES AND CHARTS FOR STEAM AND WATER, NEW YORK, 1967.
R. B. MCCLINTOCK AND G. J. SILVESTRI, SOME IMPROVED STEAM PROPERTY CALCULATION PROCEDURES, TRANSACTIONS OF THE ASME, VOL. 92, PP. 123-134, APRIL 1970.
R. B. MCCLINTOCK AND G. J. SILVESTRI, FORMULATIONS AND ITERATIVE PROCEDURES FOR THE CALCULATION OF PROPERTIES OF STEAM, ASME PUBLICATION (H-17), 1968.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV(G)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - DUE TO PRECISION REQUIREMENTS, ALL SUBPROGRAMS ARE WRITTEN IN

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
DOUBLE-PRECISION. HOWEVER, ARGUMENTS ARE TRANSMITTED TO AND FROM
CALLING PROGRAMS IN STANDARD PRECISION. BECAUSE OF THIS INTERFACE
BETWEEN STANDARD AND DOUBLE-PRECISION, THE USER IS CAUTIONED TO
ADHERE STRICTLY TO THE LISTED CALLS AND PARAMETERS AND NOT TO
USE ANY OTHER AVAILABLE ENTRY POINTS. AN ERROR-HANDLING ROUTINE
IS INCLUDED AS PART OF THE PACKAGE. IT WILL DOCUMENT NON-
CONVERGENCE OR ARGUMENTS OUT OF ACCEPTABLE RANGE, LISTING THE
CALLING ROUTINE AND ITS ARGUMENTS.
15. NAME AND ESTABLISHMENT OF AUTHOR -
RAYMOND J. SPITZNAS
BALTIMORE GAS AND ELECTRIC COMPANY
GAS AND ELECTRIC BUILDING
BALTIMORE, MARYLAND 21203
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2458 CARDS)
REFERENCE NOTE, TABLES AND CHARTS, AND ASME TRANSACTIONS PRE-
PRINT
17. CATEGORY - H
KEYWORDS - THERMODYNAMICS, WATER, PRESSURE, TEMPERATURE, LIQUIDS,
VAPORS

1. NAME OR DESIGNATION OF PROGRAM - JOSHUA OPERATING SYSTEM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE JOSHUA OPERATING SYSTEM FACILITATES THE EXECUTION OF PROBLEMS BY THE PRESERVATION OF CONVENIENTLY REUSABLE DATA AND PROGRAMS THAT ARE STORED ON-LINE. THE DATA MAY BE USED IN BATCH OPERATION BY COMPUTATIONAL PROGRAMS AND FROM IBM2260 TERMINALS FOR CREATION AND DISPLAY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - FEATURES INCLUDE NAMED DATA RECORDS WITH TREE-STRUCTURED CATALOGUES, DISPLAY FORMATTING, AND MODULE EXECUTION FACILITIES.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION SUBMITTED JUNE 1971, RETURNED AND REPLACED BY REVISION B SUBMITTED JULY 1974.
10. REFERENCES - THE JOSHUA SYSTEM, DPSTM-500
VOL. 1 GENERAL, NOVEMBER 1969.
VOL. 2,2.1 USER'S GUIDE, OCTOBER 1970, REVISED SEPTEMBER 1973, REVISED JANUARY 1974.
VOL. 3 DATA SET SPECS, DECEMBER 1969, REVISED MAY 1970, REVISED SEPTEMBER 1973.
VOL. 4,4.1 LATTICE PHYSICS, JUNE 1970.
VOL. 5 BASIC DATA PROCESSING, MAY 1971.
VOL. 6,6.1 STATIC REACTOR PHYSICS, MAY 1972.
VOL. 7 TRANSIENT REACTOR PHYSICS, NOVEMBER 1971.
VOL. 9,9.1,9.2,9.3 OPERATING SYSTEM, JANUARY 1971, REVISED OCTOBER 1973, REVISED DECEMBER 1973, REVISED JANUARY 1974, REVISED JUNE 1974.
TAPE DESCRIPTION AND LISTS OF PDS MEMBERS, ARGONNE CODE CENTER PROGRAMMING NOTE 75-30, 1975.
11. MACHINE REQUIREMENTS - 250K BYTES FOR 27-STATION TERMINAL MONITOR, 130K PLUS APPLICATION MODULE SIZE FOR BATCH OPERATION, IBM2260 DISPLAY STATION
12. PROGRAMMING LANGUAGES USED - FORTRAN IV (60%) AND ASSEMBLER LANGUAGE (40%)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE JOSHUA OPERATING SYSTEM IS TRANSMITTED AS SIX FILES. ONE IS DESIGNATED MODULES, SUBROUTINES, AND FUNCTIONS BY NAME, THE SECOND - ASSEMBLER SECTIONS BY NAME, THE THIRD - JOB CONTROL LANGUAGE, THE FOURTH - PROCEDURES NEEDED TO RUN THE JCL IN FILE 3, THE FIFTH - PROCEDURE-RELATED DATA, AND THE SIXTH IS THE JCL TO COPY FILES 1 THROUGH 4. THE FIRST FOUR FILES ARE 3330 PARTITIONED DATA SETS, WHILE THE FIFTH AND SIXTH FILES ARE SEQUENTIAL DATA SETS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
H. C. HONECK, ET AL.
SAVANNAH RIVER LABORATORY
E. I. DUPONT DE NEMOURS AND COMPANY, INC.
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PDS JCS.SOURCE 5890 BLOCKS, PDS JCS.COPYLIB 146 BLOCKS)
CONTROL INFORMATION (PDS JCS.JCLLIB 278 BLOCKS, PDS JCS.PROCLIB 51 BLOCKS, FILE 5 1 CARD, IEFMVCE DECK 20 CARDS)
REFERENCE REPORTS AVAILABLE FROM SAVANNAH RIVER LABORATORY
17. CATEGORY - M
KEYWORDS - DATA PROCESSING, OPERATING SYSTEMS, RETRIEVAL

1. NAME OR DESIGNATION OF PROGRAM - CONCEPT3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - CONCEPT3 GENERATES A CAPITAL COST ESTIMATE FOR A SELECTION OF SINGLE UNIT AND MULTIPLE UNIT PWR, RWP, CCAL, 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.
4. METHOD OF SOLUTION - CONCEPT3 IS SUPPORTED BY TWO AUXILIARY-GENERATED LIBRARIES - (1) CONTAC WHICH GENERATES A COST MODEL TAPE WHERE THE MODEL IS EXTRAPOLATED BY CONCEPT TO OTHER SIZES BY INTERNAL SCALING EQUATIONS, AND (2) CONLAM WHICH GENERATES A TAPE 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 - POWER LEVELS OF 500 TO 2000 MW(E) ARE ACCEPTABLE. 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 COST ESTIMATE IS GENERATED IN LESS THAN 1 MINUTE ON THE MODEL 65.
7. UNUSUAL FEATURES OF THE PROGRAM - CONCEPT3 UTILIZES EXECUTION-TIME NAMELIST VARIATIONS OF STORED CONSTANTS, PRINTER PLOTTING CASH FLOW CURVES, AND NUMERICAL OUTPUT AND SOLUTION OPTIONS.
8. RELATED AND AUXILIARY PROGRAMS - CONCEPT3 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 CONCEPT3.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION OF CONCEPT SUBMITTED SEPTEMBER 1971,
REPLACED BY CONCEPT2 MARCH 1973, REPLACED BY CONCEPT3
MARCH 1974, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - H. I. BOWERS, R. C. DELCZIER, L. D. REYNOLDS, AND
B. E. SPITE, CONCEPT - COMPUTERIZED CONCEPTUAL COST ESTIMATES FOR
STEAM-ELECTRIC POWER PLANTS - PHASE II USERS MANUAL, ORNL-4209,
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.

10. REFERENCES (CONTINUED)

P. J. BARNARD, CONCEPT USER'S MEMO #8, APRIL 30, 1974.

CONCEPT III SYSTEM (CONSYS) DISTRIBUTION SPECIFICATIONS, ARGONNE CODE CENTER PROGRAMMING NOTE 74-41, JUNE 27, 1974.

11. MACHINE REQUIREMENTS - 150K BYTES, ONE SCRATCH DISK OR TAPE, TWO SUPPORT TAPES, AND THE STANDARD I/O UNITS

12. PROGRAMMING LANGUAGE USED - FORTRAN IV(G)

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

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE MAIN PROGRAM USES THE IBM FORTRAN EXTENDED ERROR FEATURE (ERRSFT) TO PERMIT ZERO DIVISION AND EXPONENT OVERFLOW WHICH MAY REQUIRE LOCAL ALTERATIONS.

15. NAME AND ESTABLISHMENT OF AUTHORS -

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL

SOURCE DECKS (CONCEPT3 1656 CARDS, CONLAM3 498 CARDS, CONTAC3 650 CARDS)

SAMPLE PROBLEMS (CONCEPT3 8 CARDS, CONLAM3 3359 CARDS, CONTAC3 42 FILES 737 CARDS EACH)

CONTROL INFORMATION (CONCEPT3 18 CARDS, CONLAM3 20 CARDS, CONTAC3 66 CARDS)

SAMPLE PROBLEM OUTPUT (79 SELECTED PAGES)

REFERENCE REPORT, SUPPLEMENTAL USER'S INSTRUCTIONS, USER'S MEMOS, AND ACC NOTE

17. CATEGORY - D

KEYWORDS - ECONOMICS, POWER PLANTS, PWR REACTORS, CONCEPT CODES, CONLAM CODES, CONTAC CODES

ACC ABSTRACT 522

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12/72

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360 MVT.
14. ANY 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 -
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PLS 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
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6000-7000, UNIVAC1108, PCP10 AND H635
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 TRIDIAGONAL SYMMETRIC, COMPLEX GENERAL AND COMPLEX HERMITIAN MATRICES. THE INDIVIDUAL SUBROUTINES ARE -

IDENTIFICATION	DESCRIPTION
BALANC E2F269	BALANCE A REAL GENERAL MATRIX
BALBAK E2F270	BACK TRANSFORM VECTORS OF MATRIX FORMED BY BALANC
CBAL E2F271	BALANCE A COMPLEX GENERAL MATRIX
CBABK2 E2F272	BACK TRANSFORM VECTORS OF MATRIX FORMED BY CBAL
ELMHES E2F273	REDUCE REAL MATRIX TO REAL HESS. (ELEMENTARY)
ELMBAK E2F274	BACK TRANSFORM VECTORS OF MATRIX FORMED BY ELMHES
ORTHES E2F275	REDUCE REAL MATRIX TO REAL HESS. (ORTHOGONAL)
ORTBAK E2F276	BACK TRANSFORM VECTORS OF MATRIX FORMED BY ORTHES
TRED1 E2F277	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
TRED2 E2F278	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
TREBAK1 E2F279	BACK TRANSFORM VECTORS OF MATRIX FORMED BY TRED1
FIGI E2F280	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
BAKVEC E2F281	BACK TRANSFORM VECTORS OF MATRIX FORMED BY FIGI
COMHES E2F282	REDUCE COMPLEX MATRIX TO COMPLEX HESS.
COMBAK E2F283	BACK TRANSFORM VECTORS OF MATRIX FORMED BY COMHES
HTRIDI E2F284	REDUCE HERMITIAN MATRIX TO SYM. TRIDIAG.
HTRBAK E2F285	BACK TRANSFORM VECTORS OF MATRIX FORMED BY HTRIDI
HQR E2F286	FIND ALL VALUES OF REAL HESS. MATRIX
HQR2 E2F287	FIND ALL VALUES/VECTORS OF REAL HESS. MATRIX
INVIT E2F288	FIND SOME VECTORS OF REAL HESS. MATRIX
TQL1 E2F289	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
TQL2 E2F290	FIND ALL VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
IMTQL1 E2F291	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
IMTQL2 E2F292	FIND ALL VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
TSTURM E2F293	FIND SOME VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
BISECT E2F294	FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
COMLR E2F295	FIND ALL VALUES OF COMPLEX HESS. MATRIX
COMLR2 E2F296	FIND ALL VALUES/VECTORS OF COMPLEX HESS. MATRIX
CINVIT E2F297	FIND SOME VECTORS OF COMPLEX HESS. MATRIX
PATQP E2F298	FIND EXTREME VALUES OF SYM. TRIDIAG. MATRIX
ELTRAN E2F220	ACCUMULATE TRANSFORMATIONS FROM ELMHES (FOR HQR2)
ORTTRAN E2F221	ACCUMULATE TRANSFORMATIONS FROM ORTHES (FOR HQR2)
FIGI2 E2F222	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
TINVIT E2F223	FIND SOME VECTORS OF SYM. TRIDIAG. MATRIX
EISPAC E2F299	CONTROL PROGRAM FOR EISPACK

4. METHOD OF SOLUTION - QR, LR, QL, RATIONAL QR, BISECTION, AND INVERSE ITERATION METHODS ARE USED.
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 -
 FIELD TESTING OF THE CURRENT VERSIONS OF BISECT E2F294 AND TINVIT F2F223 IS NOT YET COMPLETE.
 THE NATS PROJECT FULLY SUPPORTS CERTIFIED ROUTINES IN THE SENSE THAT DETAILED INFORMATION ON THE TESTING PROCEDURES IS AVAILABLE AND REPORTS OF POOR OR INCORRECT PERFORMANCE ON AT LEAST THE MACHINES AND OPERATING SYSTEMS LISTED WILL GAIN IMMEDIATE ATTENTION FROM THE DEVELOPERS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
 IBM360 VERSION SUBMITTED MAY 1972.
 CDC6000-7000 VERSION SUBMITTED MAY 1972.
 UNIVAC1106 VERSION SUBMITTED MAY 1972.
 PDP10 AND H635 VERSION SUBMITTED MAY 1972.
10. REFERENCES - J. H. WILKINSON AND C. REINSCH, HANDBOOK FOR AUTOMATIC COMPUTATION, VOLUME II, LINEAR ALGEBRA, SPRINGER-VERLAG, NEW YORK, HEIDELBERG, BERLIN, 1971.
 THE EISPACK (ACC NO. 534) REFERENCE B. T. SMITH, J. M. ROYLE, B. S. GARROW, Y. IKERF, V. C. KLEMA, AND C. B. MÖLER, "MATRIX EIGENSYSTEM ROUTINES - EISPACK GUIDE" WAS PUBLISHED AS VOLUME 6 OF LECTURE NOTES IN COMPUTER SCIENCE EDITED BY G. GOOS AND J. HARTMANIS, SPRINGER-VERLAG (1974). IT MAY BE PURCHASED FOR APPROXIMATELY TEN (10) DOLLARS FROM SPRINGER-VERLAG, NEW YORK, NEW YORK.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN IV(G) AND (H) (IBM360/75 AND 370/165), FORTRAN IV(H) (IBM360/65,67), WATFIV (IBM360/67), FORTRAN RUN,FTN, AND FLN (CDC6000-7000), FORTRAN IV (H635), AND FORTRAN V (UNIVAC1108)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360/75,65 AND IBM370/165), MTS (IBM360/67), STAN (IBM360/67), PURD (CDC6500), LLL (CDC6600,7600), UTEX (CDC6600/6400), NCAR (CDC6600,7600), SCOPE 3.3 (CDC6400), GEOS III (H635), 503 MONITOR (PDP11), AND EXEC 8 (UNIVAC1108).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE IBM DISTRIBUTION INCLUDES ALL PROGRAMS LISTED UNDER ITEM 3. OTHER MACHINE VERSIONS DO NOT INCLUDE EISPACK E2F294.
 LOCATIONS AND MACHINES USED FOR EISPACK TESTING WERE -

MACHINE	TEST SITE
IBM360/75	ARGONNE NATIONAL LABORATORY

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)

IBM360/65	THE UNIVERSITY OF CHICAGO
IBM360/67	THE UNIVERSITY OF MICHIGAN
IBM360/65	AMES LABORATORY, IOWA STATE UNIVERSITY
IBM360/67	STANFORD UNIVERSITY (STAN)
IBM370/165	THE UNIVERSITY OF TORONTO
CDC6600,7600	LAWRENCE LIVERMORE LABORATORY (LLL)
CDC6600/6400	THE UNIVERSITY OF TEXAS AT AUSTIN (UTEX)
CDC6600,7600	NATIONAL CENTER FOR ATMOSPHERIC RESEARCH (NCAR)
CDC6400	NORTHWESTERN UNIVERSITY
CDC6500	PURDUE UNIVERSITY (PURD)
PDP-10	YALE UNIVERSITY
HONEYWELL(GE)635	UNIVERSITY OF KANSAS
UNIVAC1108	UNIVERSITY OF WISCONSIN

ADDITIONAL TESTING WAS CARRIED OUT BY OAK RIDGE NATIONAL LABORATORY AND THE NOTTINGHAM ALGORITHMS GROUP.

15. NAME AND ESTABLISHMENT OF AUTHOR -

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL

SOURCE DECKS (360 8100 CARDS, 6000-7000 5632 CARDS, 1108 5632 CARDS, PDP-HONEYWELL 5632 CARDS)
OBJECT DECKS (360 38 CARDS)
CONTROL INFORMATION (JCL 360-475 CARDS)
TAPE DOCUMENTATION (360 11,509 CARDS, OTHER MACHINE VERSIONS 10,349 CARDS)

17. CATEGORY - P

KEYWORDS - EIGENVALUE, EIGENVECTOR, MATRICES, NUMERICAL CALCULATION

10. REFERENCES (CONTINUED)

GROUP DIFFUSION CODE WITH AN EFFECTIVE FOUR-GROUP PURNUP,
BNWL-462, MAY 1971.

R. SALMON, EXCERPTED PAGES FROM CRNL-4116, AUGUST
1969.

D. R. HAFNER, OPERATION OF THE PACTOLUS/CLOTHO CODE,
HEDL MEMO, FEBRUARY 21, 1973.

SELECTED PAGES FROM CSCX RJE/CRJE REFERENCE, EOL 73-
02-00, VOL. 2.

NTRAN I/O ROUTINES DESCRIPTION, EXCERPT FROM LP-3569,
REV. 1.

11. MACHINE REQUIREMENTS - 65K MEMORY WITH DRUM STORAGE OF INPUT DATA
TO SPEED UP PROCESSING

12. PROGRAMMING LANGUAGE USED - FORTRAN V

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

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

D. R. HAFNER

HANFORD ENGINEERING DEVELOPMENT LABORATORY

WESTINGHOUSE HANFORD COMPANY

P. O. BOX 1970

RICHLAND, WASHINGTON 99352

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL

SOURCE DECKS (PACTOLUS 4793 CARDS, PDCC 782 CARDS)

SAMPLE PROBLEMS (PACTOLUS 16 CARDS, PDCC 40 CARDS, CLOTHO 311
CARDS)

SAMPLE PROBLEM OUTPUT (PACTOLUS 20 PAGES, CLOTHO 2 PAGES)

REFERENCE REPORTS, BNWL-77, AND BNWL-1169, EXCERPTS, AND MEMO

17. CATEGORY - D

KEYWORDS - DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, REACTOR
ECONOMICS, POWERCC CODES, ALTHAEA CODES

1. NAME OR DESIGNATION OF PROGRAM - WSP-HASP/DCS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE WSP (WORK STATION PACKAGE) IS A MODIFICATION OF THE STANDARD HASP/RMT360 PACKAGE SUPPLIED BY IBM AND RUNS ON A MULTIPROGRAMMED DCS SYSTEM/360/30 USING MULTI-LEAVING AND BINARY SYNCHRONOUS COMMUNICATIONS TO COMMUNICATE WITH A SYSTEM/360/195/ASP CENTRAL CPU.
4. METHOD OF SOLUTION - WSP IS A MODIFICATION OF A COMPONENT OF THE HASP II (360D-05.1.J14) VERSION 3, MODIFICATION LEVEL 1 IBM PROGRAM. WSP RUNS IN A FOREGROUND PARTITION OF A DCS MFT SYSTEM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - WSP NORMALLY RUNS CONTINUOUSLY IN THE FOREGROUND PARTITION.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - HASP/RMT360 PACKAGE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 DCS VERSION SUBMITTED SEPTEMBER 1973, REVISED
SEPTEMBER 1974.
10. REFERENCES - ROBERT J. MCMAHON, THE ARGONNE HASP/DCS WORKSTATION PACKAGE (WSP), ARGONNE NATIONAL LABORATORY MEMORANDUM, SEPTEMBER, 1973.
11. MACHINE REQUIREMENTS - WSP HAS BEEN DESIGNED FOR A SYSTEM/360/30 WITH AN IBM 2540 READER-PUNCH, TWO IBM 1403 PRINTERS, AN IBM 1052 PRINTER KEYCARD CONSOLE, AND AN IBM 2701 DATA ADAPTER UNIT.
12. PROGRAMMING LANGUAGE USED - DCS ASSEMBLER LANGUAGE
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - 360 DCS RELEASE 26.1. THE ANL SYSTEM/360/195 ASP CENTRAL CPU IS OPERATING WITH VERSION 2.6.5 OF ASP REQUIRING NO CHANGES.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PERSON RESPONSIBLE FOR WSP INSTALLATION AND OPERATION SHOULD BE WELL-VERSED IN HASP, DCS, AND ASP. DEVIATIONS FROM THE CONFIGURATION SPECIFIED IN 11, MAY REQUIRE ADDITIONAL PROGRAMMING.
15. NAME AND ESTABLISHMENT OF AUTHOR -
ROBERT J. MCMAHON
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
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ARGONNE, ILLINOIS 60439

ACC ABSTRACT 541

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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (610 CARDS)
OBJECT DECK (467 CARDS)
CONTROL INFORMATION (DRIVER AND JCL 42 CARDS)
REFERENCE MEMORANDUM
17. CATEGORY - P
KEYWORDS - OPERATING SYSTEMS, DATA PROCESSING, REMOTE JOB PROCESS-
ING, COMPUTER NETWORKS

1. NAME OR DESIGNATION OF PROGRAM - PSA2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE LINEAR EQUATIONS FOR THE STATICALLY INDETERMINATE PIPE SYSTEM ARE SET UP BY A GENERALIZATION OF BROCK'S MATRIX METHOD. BY A SYSTEMATIC USE OF LINEAR TRANSFORMS, THE MATRIX OF THE SYSTEM OF LINEAR EQUATIONS CAN BE OBTAINED BY INCIDENCE ALGEBRA IN THE FORM OF A SYMMETRIC Banded MATRIX.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF - 36 SECTIONS
6. TYPICAL RUNNING TIME - 1 TO 3 MINUTES ARE REQUIRED ON A MODEL 50.
7. UNUSUAL FEATURES OF THE PROGRAM - PSA2 TAKES INTO ACCOUNT -
 - (A) ELASTICITY OF THE ATTACHMENT OF THE PIPE TO THE FOUNDATION,
 - (B) RESTRAINTS ON PIPE DISPLACEMENTS BY ANCHORS AND INTERMEDIATE PARTIAL CONSTRAINTS OF LINEAR TYPE,
 - (C) GIVEN CONSTANT FORCES AND MOMENTS ACTING UPON THE PIPE SYSTEM,
 - (D) THERMAL EXPANSION,
 - (E) ANY GEOMETRICAL STRUCTURE OF THE PIPE SYSTEM,
 - (F) SEVERAL CASES OF STRESSING PER PIPE SYSTEM, AND
 - (G) BOTH METRIC AND ENGLISH UNITS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MAY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCE - B. H. BOCKSTRA, A. N. NICKOLS, W. J. HUGHES, AND W. D. GROSS, PIPE STRESS ANALYSIS CODE, PSA2, AI-64-MEMO-142, REVISION 1.
11. MACHINE REQUIREMENTS - 64K MEMORY
12. PROGRAMMING LANGUAGE USED - FORTRAN IV (H)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FUNCTION LOC MUST BE USER-SUPPLIED. IT RETURNS THE ADDRESS OF ITS ARGUMENT AS AN INTEGER TO THE CALLING PROGRAM.

11. MACHINE REQUIREMENTS - CODE LENGTHS ARE: SOURCE, ABOUT 22,500 BYTES, OBJECT, ABOUT 13,000 BYTES, 3-BYTES PER 24-BIT WORD.
12. PROGRAMMING LANGUAGES USED - GE-400 TIME-SHARING FORTRAN
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GSA TIME-SHARING SYSTEM.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
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ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE -
REFERENCE REPORT, ANL/ES-13, CONTAINING SOURCE LISTING, SAMPLE
PROBLEM INPUT AND OUTPUT INFORMATION
17. CATEGORY - P
KEYWORDS - TIME-SHARING, POLLUTANTS CONCENTRATION, PARTICLES,
ATMOSPHERE

1. NAME OR DESIGNATION OF PROGRAM - GEAR
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600, IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE BASIC METHODS USED ARE OF THE LINEAR MULTISTEP PREDICTOR-CORRECTOR TYPE. GEAR CONTAINS BOTH THE IMPLICIT ADAMS METHODS AND THE BACKWARD DIFFERENTIATION FORMULAE, OR THE METHODS OF C. W. GEAR, AS OPTIONS, AND IS BASED ON A PROGRAM WRITTEN BY GEAR.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CHOICE OF EITHER IMPLICIT ADAMS METHODS TO ORDER 12, OR THE BACKWARD DIFFERENTIATION FORMULA METHODS, ALSO CALLED GEAR'S STIFF METHODS, TO ORDER 5 IS ALLOWED. THE PROGRAM PRESENTLY IS DIMENSIONED TO ALLOW SOLUTION OF SYSTEMS OF UP TO 20 FIRST ORDER DIFFERENTIAL EQUATIONS.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600-7600 VERSION SUBMITTED JULY 1973, REPLACED BY EDITION B JANUARY 1975, SAMPLE PROBLEM EXECUTED BY ACC JANUARY 1975 ON CDC6600 AND ON CDC7600.
IBM360 VERSION SUBMITTED SEPTEMBER 1974, REPLACED BY EDITION B JANUARY 1975, SAMPLE PROBLEM EXECUTED BY ACC JANUARY 1975 ON IBM370/195.
10. REFERENCES - C. W. GEAR, NUMERICAL INITIAL VALUE PROBLEMS IN ORDINARY DIFFERENTIAL EQUATIONS, PRENTICE-HALL, 1971.
A. C. HINDMARSH, LINEAR MULTISTEP METHODS FOR ORDINARY DIFFERENTIAL EQUATIONS: METHOD FORMULATIONS, STABILITY, AND THE METHODS OF NORDSTROM AND GEAR, UCRL-51186, MARCH 1972.
A. C. HINDMARSH, THE CONTROL OF ERRORS IN THE GEAR PACKAGE FOR ORDINARY DIFFERENTIAL EQUATIONS, IN CONSTRUCTION OF MATHEMATICAL SOFTWARE, F. A. FRITSCH, ED., UCID-30050 PART 3, AUGUST 7, 1972.
A. C. HINDMARSH, GEAR: ORDINARY DIFFERENTIAL EQUATION SYSTEM SOLVER, UCID-30001 REV. 3, DECEMBER 1974.
11. MACHINE REQUIREMENTS - 14,000(OCTAL) WORDS TO EXECUTE THE TEST PROBLEM (CDC6600,7600), 60K BYTES (IBM360,370)
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
ORDER OR CHAT (CDC6600,7600), OS/360,370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
THE SUBROUTINES IN THE GEAR PACKAGE ARE HEAVILY AUGMENTED WITH
COMMENT CARDS. IF GEAR IS USED ON OTHER MACHINES, THE UNIT
RCUNDCFF ERROR, URCOND, MAY NEED TO BE RESET. IT IS SPECIFIED
IN A DATA STATEMENT IN SUBROUTINE DRIVE.
15. NAME AND ESTABLISHMENT OF AUTHOR -
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P. O. BOX 808
LIVERMORE, CALIFORNIA 94550
16. MATERIAL AVAILABLE -
SOURCE DECKS (6600-1133 CARDS, 360-1176 CARDS)
SAMPLE PROBLEMS (6600-74 CARDS, 360-81 CARDS)
SAMPLE PROBLEM OUTPUT (6600-9 PAGES, 360-9 PAGES)
REFERENCE REPORT, LCID-30001 REV. 3
17. CATEGORY - P
KEYWORDS - ORDINARY DIFFERENTIAL EQUATIONS, NUMERICAL
CALCULATIONS, PREDICTOR-CORRECTOR

1. NAME OR DESIGNATION OF PROGRAM - TSO-SPEAKEASY
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - SPEAKEASY IS A GENERAL-PURPOSE LANGUAGE PROCESSOR OPERATING AS A SUPER DESK CALCULATOR UNDER OS, TSO AND VM/CMS.
4. METHOD OF SOLUTION - THE LANGUAGE SYNTAX CLOSELY RESEMBLES THAT OF MATHEMATICS. USER-DEFINED VARIABLES ARE CLASSIFIED AS SCALARS, ARRAYS, VECTORS, OR MATRICES. CLASS-DIRECTED OPERATORS SIMPLIFY THE LANGUAGE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAJOR VERSIONS DEVELOPED WERE (1) AN IBM360/370 STANDARD JOB BATCH VERSION, (2) AN INTERACTIVE VERSION THAT RUNS UNDER TSO, AND (3) AN INTERACTIVE VERSION THAT RUNS UNDER VM370/CMS.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - SPEAKEASY IS AN EXTENSIBLE LIBRARY-DIRECTED PROCESSOR. AVAILABLE FACILITIES INCLUDE ARRAY ALGEBRA, COMPLETE MATRIX ALGEBRA, STATISTICAL PACKAGES, GRAPHICAL PACKAGES, AND ASSORTED SPECIAL FUNCTIONS. AN ACTIVE USER COMMUNITY EXISTS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 ICTA VERSION 3F SUBMITTED NOVEMBER 1973, REPLACED BY REVISED EDITION MARCH 1974, DELETED JANUARY 1975.
IBM360,370 KAPPA VERSION DISTRIBUTION IS LIMITED TO SPEAKEASY USERS GROUP MEMBERSHIP.
10. REFERENCES - S. COHEN, THE SPEAKEASY-3 REFERENCE MANUAL, ANL-8000, MAY 1973.
S. COHEN, S. C. PIEPER, AND M. STOB, THE KAPPA LEVEL OF SPEAKEASY, ANL-8137, NOVEMBER 1974.
S. COHEN, SPEAKEASY: "RAKUGO", FIRST USA-JAPAN COMPUTER CONFERENCE PROCEEDINGS REPRINT, OCTOBER 3-5, 1972.
S. COHEN, TSO-SPEAKEASY NEWSLETTERS, NOS. 1-12 (AUG. 7, 1972 TO DATE).
S. COHEN, SPEAKEASY, ANL MEMO, MAY 14, 1973.
JUDITH CARLSON, REPORT ON A REVISED AND EXTENDED TUTORIAL FOR SPEAKEASY AND A LINKULE, MODE, ANL MEMO, DECEMBER 1973.
S. COHEN, SPEAKEASY, AN EVOLUTIONARY SYSTEM, PROCEEDINGS OF THE SYMPOSIUM ON VERY HIGH LEVEL LANGUAGES, MARCH 28-30, 1974.
A SPEAKEASY SAMPLER, LEVEL (ICTA), SEPTEMBER 1973.
ACC PROGRAMMING NOTE 74-32, APRIL 9, 1974.

11. MACHINE REQUIREMENTS - A 130K OR LARGER TSO REGION IS REQUIRED FOR THE TSO VERSION, 1 MECABYTE VIRTUAL MACHINE FOR THE CMS VERSION.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV AND ASSEMBLER LANGUAGE
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360, RELEASE 21.6, VS1, AND VS2, VM/370 CMS.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
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ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - SPECIAL DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
17. CATEGORY - P
KEYWORDS - PROGRAMMING LANGUAGES, NUMERICAL CALCULATIONS,
LIBRARIES

1. NAME OR DESIGNATION OF PROGRAM - ARC-XSEC1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - ARC-XSEC1 PROVIDES THE CAPABILITY OF MANIPULATING MULTIGROUP MICROSCOPIC CROSS SECTION DATA IN THE XS.ISC 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.
4. METHOD OF SOLUTION - ARC-XSEC1 CONSISTS OF FOUR RELATED MODULES - AJC007, NUI006, NUI001, AND NUC001. THE MODULE AJC007 PROVIDES A GROUP COLLAPSE OF THE MULTIGROUP XS.ISC DATA INTO A USER-SPECIFIED GROUP STRUCTURE AND WRITES THE BINARY INTERFACE DATA SET XS.ISC2. NUI006 PRODUCES RUN-TIME MODIFICATIONS OF ISOTOPIC CROSS SECTION COMPONENTS OF THE CARD IMAGE DATA SET A.NIP. THE MODULE NUI001 PROCESSES THE MATERIAL AND COMPOSITION LEVEL MIXING DATA SPECIFIED IN A.NIP AND PRODUCES MIX TABLES AS THE BINARY INTERFACE DATA SET B.HOMCG. NUC001 USES THE MIX TABLES OF B.HOMCG TO PRODUCE HOMOGENIZED MATERIAL AND COMPOSITION LEVEL CROSS SECTION DATA SETS IN THE BINARY INTERFACE DATA SET FORMATS XS.M.MIN, XS.M.ANI, XS.M.AUX, XS.C.MIN, XS.C.ANI, XS.C.AUX, RESPECTIVELY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM PROVIDED WHICH CONSISTS OF MULTIPLE OPERATIONS, REQUIRES ABOUT 71 SECONDS ON AN IBM360/195.
7. UNUSUAL FEATURES OF THE PROGRAM - THE MODULAR DESIGN ALLOWS THE USE OF ANY OR ALL OF THE MODULES IN THIS PACKAGE WITH OTHER DESIRED MODULES. THE HOMOGENIZATION CAPABILITY, NUI001 AND NUC001, IS USED TO PROVIDE CROSS SECTION DATA FOR EACH OF THE NEUTRONICS MODULES WITH COMMUNICATION VIA INTERFACE DATA SETS.
8. RELATED AND AUXILIARY PROGRAMS - THE NEUTRONICS PATHS OF THE ARC SYSTEM UTILIZE THE CAPABILITIES PROVIDED BY THESE MODULES. THE ARC SYSTEM ENVIRONMENT IS PROVIDED BY ARC-SYSTEM (ACC ABSTRACT 522). THE BCD INPUT PROCESSOR MODULE FOR THE ARC-SYSTEM IS ARC-NUI002 (ACC ABSTRACT 533).
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED APRIL 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - E. A. KOVALSKY, J. ZAPATKA, H. HENRYSON, II, J. HOOVER, AND P. M. WALKER, THE APC SYSTEM CROSS SECTION HOMOGENIZATION AND MODIFICATION CAPABILITIES, ANL-7714, JUNE 1971.
L. C. JUST, F. HENRYSON, II, A. S. KENNEDY, S. C.

1. NAME OR DESIGNATION OF PROGRAM - TRIPLET
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600, 6600, IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - TRIPLET SOLVES THE TWO-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN PLANAR GEOMETRIES USING A REGULAR TRIANGULAR MESH. REGULAR AND ADJACENT, INHOMOGENEOUS AND HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO VACUUM, REFLECTIVE OR SOURCE BOUNDARY CONDITIONS ARE SOLVED. GENERAL ANISOTROPIC SCATTERING IS ALLOWED AND ANISOTROPIC DISTRIBUTED SOURCES ARE PERMITTED.
4. METHOD OF SOLUTION - THE DISCRETE ORDINATES APPROXIMATION IS USED FOR THE ANGULAR VARIABLES. A FINITE ELEMENT METHOD IN WHICH THE ANGULAR FLUX IS ASSUMED TO BE GIVEN BY A LOW-ORDER POLYNOMIAL IN EACH TRIANGLE IS USED TO SOLVE THE DISCRETE ORDINATES EQUATIONS. ANGULAR FLUXES ARE ALLOWED TO BE DISCONTINUOUS ACROSS TRIANGLE BOUNDARIES, AND THE ORDER OF THE POLYNOMIAL IS INPUT DATA TO THE CODE. BOTH INNER (WITHIN-GROUP) AND OUTER ITERATION CYCLES ARE ACCELERATED BY EITHER SYSTEM OR FINE MESH REBALANCE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VARIABLE DIMENSIONING IS USED SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A CONTAINER ARRAY LESS THAN MAXLEN CAN BE ACCOMMODATED. ON CDC MACHINES MAXLEN CAN BE ABOUT 40,000 WORDS AND PERIPHERAL STORAGE IS USED FOR MOST GROUP-DEPENDENT DATA. ON IBM MACHINES TRIPLET WILL EXECUTE IN SINGLE-PRECISION (4 BYTES PER WORD) SO THAT MAXLEN CAN BE SEVERAL HUNDRED THOUSAND AND MOST PROBLEMS CAN BE CORE-CONTAINING.
6. TYPICAL RUNNING TIME - A SIX-GROUP, S2, 1700 TRIANGLE, KEFF CALCULATION OF AN EBP-II CORE REQUIRES ABOUT 4.4 MINUTES OF CDC7600 TIME. RUNNING TIMES VARY ALMOST LINEARLY WITH THE TOTAL NUMBER OF UNKNOWN.
7. UNUSUAL FEATURES OF THE PROGRAM - SOURCES, FLUXES, SN CONSTANTS, AND CROSS SECTIONS MAY BE INPUT FROM STANDARD INTERFACE FILES. CREATION OF STANDARD INTERFACE OUTPUT FILES FOR SN CONSTANTS AND SCALAR AND ANGULAR FLUXES IS OPTIONAL. ALL BINARY DATA TRANSFERS ARE LOCALIZED IN SUBROUTINES CALLED REED AND RITE. FLEXIBLE EDIT OPTIONS, INCLUDING DUMPS AND RESTART CAPABILITY, ARE PROVIDED.
8. RELATED AND AUXILIARY PROGRAMS - TRIPLET IS BASED IN LARGE PART ON THE TWO-DIMENSIONAL ORTHOGONAL MESH CODE TWOTRAN2 (ACC ABSTRACT 358), WHICH IS AN IMPROVED VERSION OF THE TWOTRAN PROGRAM.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED AUGUST 1973, REPLACED BY
REVISED EDITION FEBRUARY 1974.
CDC6600 VERSION SUBMITTED AUGUST 1973, REPLACED BY
REVISED EDITION FEBRUARY 1974.

9. STATUS (CONTINUED)
IBM360 VERSION SUBMITTED AUGUST 1973, REPLACED BY REVISED EDITION FEBRUARY 1974, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - WM. H. REED, T. R. HILL, F. W. BRINKLEY, AND K. D. LATHROP, TRIPLET: A TWO-DIMENSIONAL, MULTIGROUP, TRIANGULAR MESH, PLANAR GEOMETRY, EXPLICIT TRANSPORT CODE, LA-5428-MS, OCTOBER 1973.
11. MACHINE REQUIREMENTS - SIX OUTPUT (SCRATCH) UNITS AND TWO SYSTEM I/O UNITS ARE REQUIRED. USE OF FIVE INTERFACE UNITS IS OPTIONAL. ON THE CDC MACHINES A LARGE BULK MEMORY IS REQUIRED.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE CODE IS WRITTEN TO READ THE CASE INPUT DATA FROM FSET10 (7600) OR TAPE10 (6600) AND TO WRITE THE OUTPUT INFORMATION ON FSET9 (7600) OR TAPE9 (6600), WHICH ARE NOT EQUIVALENT TO THE SYSTEM INPUT AND OUTPUT UNITS.
15. NAME AND ESTABLISHMENT OF AUTHOR -
T. R. HILL
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7600-8261 CARDS, 6600-8262 CARDS, 360-8646 CARDS)
SAMPLE PROBLEMS (7600-661 CARDS, 6600-661 CARDS, 360-661 CARDS)
CONTROL INFORMATION (JCL 360-31 CARDS)
IBM 2314 LOAD MODULE (360-TRIPLET 306 BLOCKS)
SAMPLE PROBLEM OUTPUT (7600, 6600-50 SELECTED PAGES, 360-45 SELECTED PAGES)
REFERENCE REPORT
17. CATEGORY - C
KEYWORDS - 2-DIMENSIONAL, MULTIGROUP, TRANSPORT THEORY, TRIANGULAR MESH, ANISOTROPIC SCATTERING, FINITE-ELEMENT, TWOTRAN2 CODES

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (IBM360,370 1831 CARDS, CDC6600,7600 1374 CARDS,
UNIVAC1108 1377 CARDS)
DEMONSTRATION PROGRAM SOURCE DECKS (IBM360,370 987 CARDS,
CDC6600,7600 632 CARDS, UNIVAC1108 652 CARDS)
MACHINE READABLE DOCUMENTATION (IBM360,370 ABOUT 2137 CARDS,
OTHER MACHINES ABOUT 1573 CARDS)
17. CATEGORY - P
KEYWORDS - SPECIAL FUNCTIONS, EXPONENTIAL INTEGRALS, COMPLETE
ELLIPTIC INTEGRALS, DAWSON'S INTEGRAL, BESSEL FUNCTIONS

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 SUBROUTINES 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 ARE REQUIRED FOR A TYPICAL PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - A PRECREATED MESH MAY BE READ FROM AN EXTERNAL FILE AND COMPUTED RESULTS ARE OUTPUT 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. REISINGER, 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 IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3 USING FORTRAN EXTENDED.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

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15. NAME AND ESTABLISHMENT OF AUTHORS -
S. E. BENZLEY AND Z. F. BEISINGER
ANALYTICAL DEVELOPMENT DIVISION 1541
SANDIA LABORATORIES
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1688 CARDS)
SAMPLE PROBLEM (218 CARDS)
REFERENCE REPORT, SLA-73-0894
17. CATEGORY - I
KEYWORDS - 2-DIMENSIONAL, ELASTIC, FINITE-ELEMENT, NUMERICAL CALCULATIONS, SOLIDS, STRUCTURAL ANALYSIS, FRACTURE MECHANICS

1. NAME OF DESIGNATION OF PROGRAM - QMESH, RENUM
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - QMESH GENERATES MESHES HAVING QUADRILATERAL ELEMENTS ON ARBITRARILY SHAPED TWO-DIMENSIONAL (PLANAR OR AXI-SYMMETRIC) BODIES. THE MAIN INTENDED APPLICATION IS IN FINITE ELEMENT ANALYSIS. A FLEXIBLE HIERARCHICAL 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.
4. METHOD OF SOLUTION - THE MESH GENERATING PROCESS FOR EACH INDIVIDUAL REGION BEGINS WITH THE INSTALLATION OF AN INITIAL MESH WHICH IS A TRANSFORMATION OF A REGULAR GRID ON THE UNIT SQUARE. THE DIMENSIONS AND ORIENTATION OF THE INITIAL MESH MAY BE DEFINED BY THE USER OR, OPTIONALLY, MAY BE CHOSEN BY QMESH. VARIOUS SMOOTHING ALGORITHMS (SOME OF WHICH ARE NEW) MAY BE APPLIED TO THE INITIAL MESH IF DESIRED. THEN, THE MESH MAY BE "RESTRUCTURED" USING AN ITERATIVE SCHEME INVOLVING "ELEMENT PAIR RESTRUCTURING", "ACUTE ELEMENT DELETION", AND SMOOTHING. IN ELEMENT PAIR RESTRUCTURING, THE INTERFACE SIDE BETWEEN TWO ELEMENTS IS REMOVED AND REPLACED BETWEEN TWO DIFFERENT NODES BELONGING TO THE PAIR OF ELEMENTS, PROVIDED THAT THE CHANGE PRODUCES AN OVER-ALL IMPROVEMENT IN THE SHAPES OF THE TWO ELEMENTS. IN ACUTE ELEMENT DELETION, AN ELEMENT HAVING ONE DIAGONAL MUCH SHORTER THAN THE OTHER IS DELETED BY COLLAPSING THE SHORT DIAGONAL TO ZERO LENGTH. THE EXACT ORDER IN WHICH RESTRUCTURING, ELEMENT DELETION, AND SMOOTHING ARE PERFORMED MAY BE CONTROLLED BY USE OF A "SCHEME" INPUT CARD. THE SCHEME CARD ALSO ALLOWS THE USER TO CONTROL PLOTTING AND PRINTING. THE RESULTING MESH DESCRIPTIONS FOR INDIVIDUAL REGIONS ARE WELDED INTO AN INTEGRATED MESH BY THE COMPANION PROGRAM, RENUM, WHICH ALSO PERFORMS BANDWIDTH MINIMIZATION USING A MODIFIED CUTHILL-MCKEE ALGORITHM. THE RESULTING TAPE FILE IS COMPLETE WITH FLAGS FOR USE IN APPLYING BOUNDARY CONDITIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - QMESH CAN PROCESS UP TO 25 REGIONS, EACH HAVING AS MANY AS 600 NODES. THE MAXIMUM NUMBER OF REGIONS MAY EASILY BE INCREASED WITH LITTLE INCREASE IN PROGRAM SIZE, BUT INCREASING THE MAXIMUM NUMBER OF NODES PER REGION IS MORE COSTLY. RENUM CAN PROCESS MESHES HAVING UP TO 2000 ELEMENTS.
6. TYPICAL RUNNING TIME - MESHES OF UP TO SEVERAL HUNDRED ELEMENTS WHICH DO NOT REQUIRE RESTRUCTURING ARE HANDLED BY QMESH IN A FEW SECONDS. LARGE MESHES INVOLVING MUCH RESTRUCTURING AND SMOOTHING MAY REQUIRE SEVERAL MINUTES OF EXECUTION TIME. RENUM REQUIRES A FEW SECONDS AT MOST.

7. UNUSUAL FEATURES OF THE PROGRAM - THE HIERARCHAL INPUT SYSTEM USED IN QMESH IS QUITE NATURAL AND ALLOWS INCLUSION OF SUCH STRUCTURES AS CRACKS AND SLIDING INTERFACES. A VARIETY OF MESH-SMOOTHING TECHNIQUES, SOME NEW, ARE AVAILABLE IN QMESH. THE APPLICATION OF RESTRUCTURING TECHNIQUES TO AUTOMATICALLY IMPROVE THE SHAPES OF THE ELEMENTS IS A POWERFUL NEW CAPABILITY. AN UNUSUAL DEGREE OF USER CONTROL OVER THE PROGRAM OPERATION IS MADE POSSIBLE BY THE USE OF THE SCHEME CARD.
8. RELATED AND AUXILIARY PROGRAMS - QMESH IS A STAND-ALONE MESH GENERATION PROGRAM INTENDED FOR USE WITH A VARIETY OF TWO-DIMENSIONAL FINITE ELEMENT ANALYSIS PROGRAMS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1974.
CDC6600 VERSION SUBMITTED AUGUST 1974.
10. REFERENCES - R. E. JONES, QMESH: A SELF-ORGANIZING MESH GENERATION PROGRAM, SLA-73-1088, JULY 1974.
R. E. JONES, USER'S MANUAL FOR QMESH, A SELF ORGANIZING MESH GENERATION PROGRAM, SLA-74-0239, JULY 1974.
R. E. JONES, COMMENTS ON CONVERTING QMESH AND RENUM TO VARIOUS COMPUTER SYSTEMS, AUGUST 1974.
ACC PROGRAMMING NOTE 75-15, DECEMBER 1974.
ACC PROGRAMMING NOTE 75-26, FEBRUARY 17, 1975.
11. MACHINE REQUIREMENTS - QMESH REQUIRES 4200 (DECIMAL) WORDS OF STORAGE, AND RENUM, 32000. THE CURRENT PROGRAM USES AN SD 4020 PLOTTER.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE SCORS PLOTTING PACKAGE IS ASSUMED TO BE AVAILABLE. ENCODE AND DECODE STATEMENTS ARE USED IN QMESH, BUT THEY CAN BE ELIMINATED IF NECESSARY. SUGGESTIONS TO AID IN CONVERSION TO OTHER SYSTEMS ARE SUPPLIED WITH THE PROGRAM. THE TEST PROBLEM WAS NOT EXECUTED BY ACC BECAUSE THE SCORS PACKAGE WAS NOT AVAILABLE.
15. NAME AND ESTABLISHMENT OF AUTHOR -
R. E. JONES, DIVISION 2642
SANCIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (QMESH 5616 CARDS, RENUM 994 CARDS)
SAMPLE PROBLEM (QMESH 33 CARDS)
SAMPLE PROBLEM OUTPUT (7 PAGES AND 5 PLCTS)
REFERENCE REPORTS AND NOTES

17. CATEGORY - L
KEYWORDS - MESH GENERATION, FINITE ELEMENT METHOD, BANDWIDTH
MINIMIZATION

1. NAME OR DESIGNATION OF PROGRAM - NRTS ENVIRONMENTAL SUBROUTINES

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370

3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.

UMPG 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 IBCCM# 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 SYSCUT 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 IBCCM# 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.

JRIDZZ 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

3. DESCRIPTION OF PROBLEM OR FUNCTION (CONTINUED)

DOUBLE-WORD FORM FROM ONE ARRAY TO A SECOND ARRAY.

RUNCUT CAN BE USED TO OBTAIN A SECOND COPY OF THE PRINTED OUTPUT.

ISI, 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.

TIME WILL RETURN THE TIME OF DAY AS THE SECOND ARGUMENT.

VOLSER 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 FICSET ROUTINE IS USED TO OVERRIDE THE FORTRAN CONVENTION FOR NAMING DC 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.

4. METHOD OF SOLUTION -

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 NOVEMBER 1974.

IBM360 VERSION SUBMITTED AUGUST 1974, REPLACED BY REVISION B FEBRUARY 1975.

10. REFERENCES - NRTS ENVIRONMENTAL SUBROUTINE MANUAL, DECEMBER 1972.

R. J. WAGNER, L. C. RICHARDSON, AND N. F. MARSHALL, FORTRAN CALLABLE SUBROUTINES THAT FACILITATE MODULAR PROGRAMMING, ANCR NOTE, MARCH 1973.

G. J. MCCRE, TIME REMAINING (REMTYM), ANCR NOTE, FEBRUARY 1973.

A. J. SMITH, STANDARD PACKAGE DESCRIPTION, CALCOMP PLOTTER SUBROUTINES (S0010.0), APPENDIX D, JANUARY 1971.

G. D. BROWN, C. H. BUSH, AND R. A. BERMAN, THE INTEGRATED GRAPHICS SYSTEM FOR THE SC-4060: I. USER'S MANUAL, MEMORANDUM RM-5660-PR, DECEMBER 1968.

10. REFERENCES (CONTINUED)

W. H. RETTIG, R. C. YOUNG, AND N. H. MARSHALL, UPC -
A PROGRAM OF UPDATE SOURCE DECKS, P01751, AND ADDENDUM.

K. V. MCORE, ASTEM - A COLLECTION OF FORTRAN SUBROUTINES TO EVALUATE THE 1967 ASME EQUATIONS OF STATE FOR WATER/STEAM AND DERIVATIVES OF THESE EQUATIONS, ANCR-1526, OCTOBER 1971.

NPTS ENVIRONMENTAL SUBROUTINES, ACC PROGRAMMING NOTE 75-6, NOVEMBER 1974.

R. J. WAGNER, STEAM, A SUBROUTINE PACKAGE TO COMPUTE THE THERMODYNAMIC PROPERTIES OF WATER, ANCR NOTE, 1975.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASSEMBLY LANGUAGE

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - BECAUSE SEVERAL OF THE ROUTINES IN THE ENVIRONMENTAL PACKAGE HAVE THE SAME NAME AS SIMILAR ROUTINES IN THE AUTOMATIC CALL LIBRARY, CARE MUST BE TAKEN IN THE LINK-EDIT STEP TO ENSURE THAT THE CORRECT ROUTINE IS LOADED.

15. NAME AND ESTABLISHMENT OF AUTHOR -

R. J. WAGNER
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550 SECOND STREET
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (22,099 CARDS)
REFERENCE REPORTS, NOTES, AND MEMORANDUM

17. CATEGORY - P

KEYWORDS - DATA PROCESSING, INPUT DATA, OUTPUT DATA, OPERATING
SYSTEMS

1. NAME OR DESIGNATION OF PROGRAM - HISTOGRAMS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 22 CELLS CAN BE PLOTTED.
6. TYPICAL RUNNING TIME - LESS THAN 1 SECOND IS REQUIRED FOR A TYPICAL PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS THE ALO-00187 PROGRAM TRANSFERRED FROM THE ALC-COSMIC COLLECTION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1974.
IBM360 PROGRAM SUBMITTED SEPTEMBER 1974, SAMPLE PROBLEM
EXECUTED BY ACC ON IBM370/195.
10. REFERENCES - ANALYSIS OF DATA - HISTOGRAMS, BENDIX CORPORATION
COMPUTER PROGRAM REPORT QC6A, JULY 25, 1966.
11. MACHINE REQUIREMENTS - 17,928 BYTES FOR PROGRAM, 26,200 BYTES FOR
LOAD MODULE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360,370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
L. A. ELROD AND G. C. HYNES

ACC ABSTRACT 614

-2-

04/75

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
BENDIX CORPORATION
KANSAS CITY DIVISION
P. C. BOX 1159
KANSAS CITY, MISSOURI 64141
16. MATERIAL AVAILABLE -
SOURCE DECK (235 CARDS)
OBJECT DECK (78 CARDS)
SAMPLE PROBLEM (85 CARDS)
SAMPLE PROBLEM OUTPUT (8 PAGES)
REFERENCE REPORT
17. CATEGORY - P
KEYWORDS - STATISTICS, GRAPHS, SKEWNESS, KURTOSIS, STANDARD
DEVIATION

1. NAME OR DESIGNATION OF PROGRAM - REXCO-F (RELEASE 2)
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - REXCO-H CALCULATES THE TWO-DIMENSIONAL HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT TO A HIGH-ENERGY EXCURSION.
4. METHOD OF SOLUTION - THE EQUATIONS OF HYDRODYNAMICS AND THE EQUATIONS OF STATE OF REACTOR MATERIALS ARE EXPRESSED IN LAGRANGIAN FORM AND SET INTO FINITE DIFFERENCE EQUATIONS. SHOCK DISCONTINUITIES ARE ELIMINATED BY THE USE OF THE VON NEUMANN-RICHTMEYER PSEUDOVISCOSITY FACTOR, Q. PROPAGATION OF SHOCK WAVES, LOADS IMPOSED ON DIFFERENT PARTS OF THE REACTOR COMPONENTS, AND THE RESULTING DAMAGE ARE DETERMINED AT EVERY TIME-STEP, UNTIL THE VESSEL RUPTURES OR THE FORCE ACTING ON THE SHIELD PLUG EXCEEDS THE STRENGTH OF THE PLUG HOLDOWN DEVICE. CALCULATED DISPLACEMENTS AND PRESSURES AT ALL SPATIAL POINTS AT ANY INSTANT OF TIME ALSO ARE GIVEN IN PICTORIAL FORM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
3000 GRID ZONES
1000 CYCLES IF CALCOMP DISPLAY IS REQUIRED
20 MATERIALS
20 SECTIONS
1, REACTOR VESSELS
50 POINTS FOR STRESS-STRAIN TABLE FOR REACTOR MATERIAL
6. TYPICAL RUNNING TIME - ABOUT 1 MINUTE IS REQUIRED FOR 200 CYCLES FOR THE SAMPLE PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - THE REACTOR VESSELS IN THIS PROGRAM ARE TREATED AS THIN SHELL STRUCTURES.
8. RELATED AND AUXILIARY PROGRAMS - PLOT3D (ACC ABSTRACT 544) AND REXCO-H, RELEASE 1 (ACC ABSTRACT 550). RELEASE 2 IS AN IMPROVED VERSION OF REXCO-F. IT PROVIDES 3-D CALCOMP OUTPUT, ADDITIONAL EQUATIONS OF STATE FOR REACTOR MATERIALS, AND USE OF 2-D STRESSES IN TREATMENT OF REACTOR VESSELS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED OCTOBER 1973, SAMPLE PROBLEM EXECUTED BY ACC NOVEMBER 1973.
10. REFERENCES - Y. W. CHANG, J. GVILDYS, AND S. H. FISTEDIS, TWO-DIMENSIONAL HYDRODYNAMICS ANALYSIS FOR PRIMARY CONTAINMENT, ANL-7498, NOVEMBER 1969.
REXCO-H (RELEASE 2) INPUT INFORMATION REQUIRED, ANL-RAS MEMORANDUM, OCTOBER 26, 1971.
Y. W. CHANG, J. GVILDYS AND S. H. FISTEDIS, HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT TO HIGH-

10. REFERENCES (CONTINUED)

ENERGY EXCURSION, NUCLEAR ENGINEERING AND DESIGN, VOL. 12, PP. 344-360, 1970.

Y. W. CHANG AND J. GVILDYS, DYNAMIC RESPONSE OF REACTOR CONTAINMENT TO HIGH-ENERGY EXCURSION, PROCEEDINGS OF THE 1ST INTL. CONF. ON STRUCTURAL MECHANICS IN REACTOR TECHNOLOGY, BERLIN, GERMANY, 1971.

D. BASINGER AND J. GVILDYS, THREE DIMENSIONAL REPRESENTATION OF SURFACES BY COMPUTER, ANL-7633, NOVEMBER 1971.

J. VON NEUMANN AND R. D. RICHTMYER, A METHOD OF THE NUMERICAL CALCULATION OF HYDRODYNAMIC SHOCKS, JOURNAL OF APPLIED PHYSICS, VOL. 21, PP. 232-237, 1950.

J. E. ASH AND R. T. JULKE, COMPARISON OF A TWO-DIMENSIONAL HYDRODYNAMICS CODE (REXCC) TO EXCURSION REACTOR CONTAINMENT, ANL-7911, JANUARY 1972.

J. E. ASH, Y. W. CHANG, AND R. T. JULKE, COMPARISON OF A TWO-DIMENSIONAL HYDRODYNAMIC CODE (REXCC) TO EXCURSION EXPERIMENTS FOR FAST REACTOR CONTAINMENT, ANL-9711, SUPPL. 1, JULY 1972.

11. MACHINE REQUIREMENTS - 700K BYTES OF CORE, TWO 9-TRACK TAPE UNITS, ONE 7-TRACK TAPE UNIT, IBM 2280 FILM RECORDER, CALCOMP 780 PLOTTER

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

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

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - TO EXECUTE THE PICTORIAL DISPLAY, THE PROGRAM USES THE ANL ENVIRONMENTAL ROUTINES DESCRIBED IN ANL-AMD TECHNICAL MEMORANDUM NO. 167, A FILM-PLOTTING SUBROUTINE PACKAGE (FSP) FOR THE 2280 FILM RECORDER, BY D. CARSEN, JUNE 17, 1968, AND TO EXECUTE THE CALCOMP PLOTS, THE PROGRAM USES THE ROUTINES DESCRIBED IN ANL-AMD TECHNICAL MEMORANDUM NO. 130, S/360 PROGRAMMING TECHNIQUES FOR THE CALCOMP 780, BY R. F. KRUPP, JANUARY 6, 1967.

15. NAME AND ESTABLISHMENT OF AUTHORS -

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ARGONNE NATIONAL LABORATORY
9700 S. CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION

MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (3951 CARDS)
SAMPLE PROBLEM (46 CARDS)
CONTROL INFORMATION (JCL 57 CARDS)
SAMPLE PROBLEM OUTPUT (57 SELECTED PAGES, 3 SELECTED PLOTS)
REFERENCE REPORT, ANL-7498, AND ANL-RAS MEMORANDUM

17. CATEGORY - F
KEYWORDS - 2-DIMENSIONAL, CONTAINMENT, EXCURSIONS, HYDRODYNAMICS,
REACTOR SAFETY, FAST REACTORS

1. NAME OR DESIGNATION OF PROGRAM - HAFMAT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - TO CALCULATE THE DISTRIBUTION OF FLOW WITHIN A GIVEN SYSTEM THE INTERNAL FLOW GEOMETRY MUST BE DESCRIBED AND A REFERENCE PRESSURE AND ENTHALPY MUST BE SPECIFIED FOR AT LEAST ONE NODE IN THE NETWORK. THE FLOW GEOMETRY IS REPRESENTED BY A FINITE NUMBER OF FLOW PATHS WHICH ACCOUNT FOR ALL OF THE FLUID VOLUME. THESE FLOW PATHS, JOINED AT A NUMBER OF POINTS, FORM A SINGLE FLOW NETWORK. THE JUNCTIONS OF THE NETWORKS, OR NODES, DO NOT HAVE ANY CAPACITY FOR HEAT OR FLOW. AN INITIAL FLOW DISTRIBUTION IS SPECIFIED BY THE USER OR CALCULATED BY THE PROGRAM. FOR THE GIVEN GEOMETRY, HEAT ADDITION, AND INLET ENTHALPY, A PRESSURE DROP IS CALCULATED FOR EACH BRANCH OF FLOW PATH. BY A MATRIX TECHNIQUE, THE STATIC PRESSURE AT EACH NODE IS CALCULATED AND A SELF-CONSISTENT NEW FLOW DISTRIBUTION IS OBTAINED. THE PROGRAM THEN ITERATES THROUGH NEW FLOW DISTRIBUTIONS, NEW VALUES OF ENTHALPY, AND RECALCULATION OF PRESSURE DROPS UNTIL CONVERGENCE IS ACHIEVED OR THE ITERATION LIMIT IS REACHED. THE USER MAY SUPPLY HIS OWN PRESSURE DROP EQUATIONS IF THE PRE-PROGRAMMED ONES ARE NOT APPROPRIATE.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - HAFMAT HAS THE CAPACITY TO TREAT NETWORKS COMPOSED OF UP TO 90 NODES AND 200 BRANCHES. OTHER MAXIMUM VALUES WHICH MUST NOT BE EXCEEDED ARE:
 - 20 EXTERNAL BRANCHES
 - 20 EXTERNAL NODES
 - 100 HEATED BRANCHES
 - 40 TYPES OF HEATED BRANCHESBASIC ASSUMPTIONS EMPLOYED ARE THAT COMPLETE AND INSTANTANEOUS MIXING OF FLUID OCCURS AT ALL NODES AND ALL FLOWS WHICH JOIN AT A NODE SEE THE SAME STATIC PRESSURE AT THAT NODE.
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM USED APPROXIMATELY 5 SECONDS OF CPU TIME.
7. UNUSUAL FEATURES OF THE PROGRAM - AN OPTIONAL SPECIAL CONVERGENCE TECHNIQUE IS SUPPLIED. IT SHOULD BE USED WITH CAUTION; BUT IT HAS BEEN FOUND USEFUL, FOR EXAMPLE, WHEN A FEW HIGH-RESISTANCE FLOW PATHS HAVE OTHERWISE RETARDED CONVERGENCE.
8. RELATED AND AUXILIARY PROGRAMS - FLIPSY-I, AN EARLIER PROGRAM, TREATED ONLY ISOTHERMAL FLOW PROBLEMS. THE ORIGINAL VERSION OF HAFMAT.

9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1975.
CDC66JJ VERSION SUBMITTED OCTOBER 1974, SAMPLE PROBLEM
EXECUTED BY ACC ON CDC66JJ AND CDC7601, JANUARY 1975.
10. REFERENCES - L. H. WUNDERLICH AND D. R. DOLK, HAFMAT - STEADY-
STATE FLOW DISTRIBUTION PROGRAM, KAPL-M-7128(LXW-2), JULY 6, 1971.
11. MACHINE REQUIREMENTS - 76000(CCTAL) WORDS OF CORE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.2.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
INCREASED FLOW IN ANY BRANCH MUST LEAD TO AN INCREASED PRESSURE
DROP IN THAT BRANCH. OTHERWISE, IT IS POSSIBLE THAT NO SOLUTION
CAN BE OBTAINED. IN PREPARING INPUT DECKS, FOLLOW THE INPUT
SHEETS ON PAGES 20-22 OF THE REFERENCE REPORT. THE INPUT DECKS
WHICH ARE LISTED IN SECTION VI OF THE REPORT WERE PUNCHED FOR A
SYSTEM WHICH WILL ACCEPT LEFT-JUSTIFIED INTEGER INPUT. THIS IS
NOT A STANDARD CDC PRACTICE AND WILL LEAD TO INPUT ERRORS AT MANY
INSTALLATIONS. ALSO, SOME VARIABLES IN HAFMAT ARE NOT INITIAL-
IZED. IT IS ASSUMED THAT THE OPERATING SYSTEM WILL ZERO THE
MEMORY AT LOAD TIME.
15. NAME AND ESTABLISHMENT OF AUTHORS -
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KNOLLS ATOMIC POWER LABORATORY
GENERAL ELECTRIC COMPANY
P. O. BOX 1072
SCHENECTADY, NEW YORK 12301
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2212 CARDS)
SAMPLE PROBLEM (29 CARDS)
SAMPLE PROBLEM OUTPUT (17 PAGES)
REFERENCE REPORT
17. CATEGORY - H
KEYWORDS - FLOW DISTRIBUTION, STEADY-STATE, HEAT TRANSFER,
FLOPSY-1 CODES

1. NAME OR DESIGNATION OF PROGRAM - KEFF, MGBS, TGAN
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - KEFF BASES ITS CALCULATION ON
$$KEFF = (1 + (M^{*2}) * BM^{*2}) / (1 + (M^{*2}) * BG^{*2}),$$
WHERE BM^{*2} AND BG^{*2} ARE MATERIAL AND GEOMETRIC BUCKLINGS, RESPECTIVELY.

MGBS SOLVES 80 EQUATIONS IN 12 GROUPS AND ITERATES TO DETERMINE BUCKLING. FOR HETEROGENEOUS SYSTEMS MGBS PERFORMS A P3 CYLINDER CALCULATION FOR THE THERMAL GROUP AND MAKES USE OF THE HELLSTRAND OR WEITMAN RESONANCE INTEGRAL WHERE APPROPRIATE FOR THE RESONANCE GROUP. OTHERWISE, THE SYSTEM IS HOMOGENIZED. MGBS ADJUSTS TWO-GROUP CONSTANTS TO ACCOUNT FOR THE DIFFERENT LEAKAGE EXPRESSION IN DIFFUSION THEORY.

TGAN SOLVES TWO-GROUP EQUATIONS ANALYTICALLY BY VARYING A DIMENSION OR THE TRANSVERSE BUCKLING FOR CRITICALITY. TGAN PERMITS SOME REGIONS (E.G. THIN AND HIGHLY ABSORBING) TO BE CHARACTERIZED BY TRANSMISSION AND ESCAPE PROBABILITIES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MGBS ALLOWS A MAXIMUM OF 23 REGIONS AND 9 TYPES OF MATERIAL. TGAN IS LIMITED TO 6 DIFFUSION REGIONS AND 6 TRANSMISSION REGIONS.
6. TYPICAL RUNNING TIME - EACH PROGRAM REQUIRES ONLY A FEW SECONDS.
7. UNUSUAL FEATURES OF THE PROGRAM - SPEED, CONVENIENCE, AND MANY CORRELATIONS (IN CONJUNCTION WITH TWO-GROUP DIFFUSION THEORY) WITH CRITICAL EXPERIMENTS MAKE MGBS PARTICULARLY SUITABLE FOR CRITICALITY SAFETY PROBLEMS.

IN A CRITICALITY SEARCH TGAN RECOGNIZES TERMS IN MATRIX PRODUCTS THAT ARE IDENTICALLY ZERO. LESS CARE IS TAKEN WITH SEPARATE CALCULATION OF FLUXES, WHICH MAY BE GROSSLY IN ERROR. SPEED, CONVENIENCE, AND MANY CORRELATIONS (IN CONJUNCTION WITH MGBS) WITH CRITICAL EXPERIMENTS MAKE TGAN PARTICULARLY SUITABLE FOR CRITICALITY SAFETY PROBLEMS.
8. RELATED AND AUXILIARY PROGRAMS - TGAN PUNCHES KEFF INPUT FOR DIMENSION SEARCH FOR SLABS, CYLINDERS, AND SPHERES. MGBS PUNCHES TWO-GROUP CROSS SECTIONS FOR TGAN.

9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1974.
IBM360 VERSION SUBMITTED SEPTEMBER 1973, SAMPLE PROBLEMS
EXECUTED BY ACC.
10. REFERENCES - H. K. CLARK, COMPUTER CODES FOR NUCLEAR CRITICALITY
SAFETY CALCULATIONS, CP-1121, NOVEMBER 1967.
H. K. CLARK, CORRELATIONS OF COMPUTATIONAL TECHNIQUES
AND EXPERIMENTS, DPST-71-300, MARCH 30, 1971.
11. MACHINE REQUIREMENTS - 100K BYTES OF CORE ARE REQUIRED FOR KEFF,
150K BYTES OF CORE FOR MGBS, AND 135K BYTES OF CORE FOR TGAN.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
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SAVANNAH RIVER LABORATORY
E. I. DUPONT DE NEMOURS AND COMPANY, INC.
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (KEFF 259 CARDS, MGBS 2545 CARDS, TGAN 2466 CARDS)
SAMPLE PROBLEMS (KEFF 2 CARDS, MGBS 26 CARDS, TGAN 102 CARDS)
SAMPLE PROBLEM OUTPUT (KEFF 1 PAGE, MGBS 3 PAGES, TGAN 7 PAGES)
REFERENCE REPORTS, CP-1121 AND DPST-71-300
17. CATEGORY - C
KEYWORDS - CRITICALITY, PO EQUATIONS, GROUP CONSTANTS, CELL CALCU-
LATION, 1-DIMENSIONAL, 2-CPCUP

1. NAME OR DESIGNATION OF PROGRAM - GAPCON-THERMAL1
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE GAPCON-THERMAL1 PROGRAM PROVIDES A METHOD FOR CALCULATING THE GAP CONDUCTANCE IN OXIDE FUEL PINS. FUEL AND CLADDING TEMPERATURES, AND INTERNAL PRESSURES ARE CALCULATED AS A FUNCTION OF BURNUP FROM INPUT COOLANT CONDITIONS, POWER SHAPES, AND ROD GEOMETRIES.
4. METHOD OF SOLUTION - THE MATHEMATICAL MODEL OF THE FUEL ROD IS BASED ON A SERIES OF CONCENTRIC CYLINDERS AND ONE-DIMENSIONAL HEAT TRANSFER. THE CALCULATION OF FUEL TEMPERATURES FOR A SPECIFIED BURNUP IS INITIATED BY USING AN ESTIMATED GAP CONDUCTANCE. THE SOLUTION CONVERGES BY THE COMPARISON OF A CALCULATED GAP CONDUCTANCE WITH THE PREVIOUS ESTIMATE. THE CALCULATED GAP CONDUCTANCE DEPENDS ON THE HOT GAP SIZE AND THE COMPOSITION OF THE GAS IN THE GAP. FACTORS CONSIDERED IN THE CALCULATION INCLUDE POROSITY-DEPENDENT THERMAL CONDUCTIVITY, FLUX DEPRESSION, DIFFERENTIAL THERMAL EXPANSION OF THE PELLET AND CLADDING, ELASTIC AND CREEP DEFORMATION OF THE CLADDING, FISSION PRODUCT EXPANSION OF THE PELLET, FILL GAS COMPOSITION, AND CHANGES TO THE GAS COMPOSITION ASSOCIATED WITH THE RELEASE OF FISSION GAS AND VOLATILE IMPURITIES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE CODE IS UNDER DEVELOPMENT AND SHOULD BE LIMITED TO ZIRCONIUM CLAD OXIDE FUEL. BEGINNING OF LIFE CALCULATIONS SHOW GOOD AGREEMENT WITH DATA. HOWEVER, EXPOSURE-DEPENDENT CALCULATIONS CAN BE UNRELIABLE UNDER CERTAIN CONDITIONS OF POWER, ROD GEOMETRY, AND BURNUP. WORK IS CONTINUING TO IMPROVE LIMITATIONS IN THE CODE ASSOCIATED WITH FUEL BURNUP. UP TO 20 AXIAL NODES MAY BE SPECIFIED TO MODEL AXIAL POWER SHAPE EFFECTS.
6. TYPICAL RUNNING TIME - A TYPICAL CASE WITH POWER AND TIME INCREMENTS MAY REQUIRE ABOUT 45 SECONDS. HOWEVER, SOME USER OPTIONS MAY INCREASE RUNNING TIME.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - GAPCON
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1974.
UNIVAC1108 VERSION SUBMITTED OCTOBER 1973.
10. REFERENCES - C. R. HARR, C. E. REYER, AND L. J. PARCHEM, GAPCON-THERMAL-1, A COMPUTER PROGRAM FOR CALCULATING THE GAP CONDUCTANCE IN OXIDE FUEL PINS, BNWL-1778, SEPTEMBER 1973.
G. R. HORN AND F. E. PANISKO, USERS GUIDE FOR GAPCON, A COMPUTER PROGRAM TO PREDICT FUEL-TO-CLADDING HEAT TRANSFER COEFFICIENTS IN OXIDE FUEL PINS, HDL-TME-72-128, SEPTEMBER 1972.

11. MACHINE REQUIREMENTS - 35K ADDRESSABLE CORE STORAGE
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
CSCX.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
THERE ARE 12 ROUTINES AND THE EXECUTABLE MAIN PROGRAM GAPAXL.
15. NAME AND ESTABLISHMENT OF AUTHORS -
C. R. HANN, C. E. BEYER, AND L. J. PARCHEN
PACIFIC NORTHWEST LABORATORY
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RICHLAND, WASHINGTON 99352
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1706 CARDS)
SAMPLE PROBLEM (21 CARDS)
REFERENCE REPORT, BNWL-1778
17. CATEGORY - H
KEYWORDS - GAP CONDUCTANCE, TEMPERATURE, FISSION GAS, THERMAL
EXPANSION, FUEL ELEMENTS, CLADDING

1. NAME OR DESIGNATION OF PROGRAM - ISCTAB
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/50
3. DESCRIPTION OF PROBLEM OR FUNCTION - ISCTAB COMPUTES POWER OUTPUT OF A SAMPLE OF MIXED ISOTOPES (PU238, PU239, PU240, PU241, PU242, AM241) AT ANY DESIRED DATE GIVEN THE MEASURED CALORIMETER VALUES, ISOTOPIIC RATIOS AND CORRESPONDING DATES.
4. METHOD OF SOLUTION - STANDARD STATISTICAL ANALYSIS IS USED. THE PROGRAM TAKES AS INPUT THE ISOTOPIIC RATIOS, SPECIFIC POWERS, THE TIME FROM AMERICIUM SEPARATION TO MASS SPECTRAL DETERMINATION (WHICH CAN BE DETERMINED FROM THE RATIO OF PU241 TO AM241 FOUND BY CHEMICAL ANALYSIS) AND THE TIME FROM MASS SPECTROMETRIC ANALYSIS TO CALORIMETRIC DETERMINATIONS. THE TOTAL QUANTITY OF PLUTONIUM IN GRAMS AT THE DATE OF THE CALORIMETRIC ANALYSIS, AND THE TOTAL SAMPLE POWER BY DAY FOR ANY PERIOD OF TIME DESIRED ARE CALCULATED AND PRINTED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - 5 TO 6 MINUTES ARE REQUIRED FOR A SAMPLE PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1974.
IBM360 VERSION SUBMITTED SEPTEMBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - M. BASTON, ISCTAB, PLU167RC PROGRAM DOCUMENTATION, OCTOBER 17, 1972.
F. A. O'HARA, J. D. NUTTER, W. W. RODENBURG AND M. L. DINSMORE, CALORIMETRY FOR SAFEGUARDS PURPOSES DETERMINATION OF PLUTONIUM IN REACTOR FEED MATERIAL, MLM-1798, JANUARY 5, 1972.
11. MACHINE REQUIREMENTS - 41K CORE, A CARD READER AND A PRINTER
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (MVT), RELEASE 21.6.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
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15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
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MIAMISBURG, OHIO 45342
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (711 CARDS)
OBJECT DECK (368 CARDS)
SAMPLE PROBLEM (11 CARDS)
CONTROL INFORMATION (JCL 34 CARDS)
REFERENCE REPORT AND PROGRAM DOCUMENTATION
17. CATEGORY - C
KEYWORDS - CALORIMETRY, REACTOR FUEL ELEMENTS, PLUTONIUM,
AMERICIUM

1. NAME OR DESIGNATION OF PROGRAM - GROUP2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370/195, CDC6600,7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE INVARIANCE OF THE DYNAMICAL MATRIX UNDER UNITARY TRANSFORMATIONS BY MATRICES IN A REDUCIBLE MULTIPLIER REPRESENTATION OF THE TIME REVERSAL INVARIANT POINT GROUP OF THE WAVEVECTOR LEADS TO A FORMULA FOR THE SYMMETRY-REDUCTION OF THE DYNAMICAL MATRIX. THE PROJECTION OPERATOR METHOD IS USED TO CONSTRUCT THE SYMMETRY COORDINATES. THE PROJECTION OPERATOR IS DEPENDENT ON THE REDUCIBLE MULTIPLIER REPRESENTATION USED AND THE IMR'S OF THE GROUP OF THE WAVEVECTOR. THESE IMR'S ARE GENERATED IN THE PROGRAM BY THE METHOD OF ORBITALS FROM THE REPRESENTATIONS OF CYCLIC SUBGROUPS OF THE GROUP OF THE WAVEVECTOR WHICH IN TURN ARE CONSTRUCTED FROM THE ROOTS OF UNITY. THE SYMMETRY COORDINATE VECTORS FORM A MATRIX, WHICH TRANSFORMS THE SYMMETRY-REDUCED DYNAMICAL MATRIX INTO BLOCK-DIAGONALIZED FORM.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PROGRAM IS DIMENSIONED FOR UP TO 30 DEGREES OF FREEDOM PER UNIT CELL. THIS MAY BE 10 ATOMS OR 5 MOLECULAR UNITS PER UNIT CELL OR SOME COMBINATION OF ATOMS AND MOLECULAR UNITS. EACH ATOM HAS 3 DEGREES OF FREEDOM, AND EACH MOLECULAR UNIT HAS 6. BY CHANGING A DIMENSION STATEMENT, UP TO 60 DEGREES OF FREEDOM PER UNIT CELL MAY BE CONSIDERED. BECAUSE OF THE USE OF RANDOM NUMBERS INSTEAD OF ALGEBRAIC TECHNIQUES, THE SYMMETRY REDUCTION WILL BE INCOMPLETE FOR CRYSTALS OF THE D3 OR C3 POINT GROUPS. THIS SAME PROBLEM SOMETIMES OCCURS FOR OTHER CRYSTALS WITH A LARGE NUMBER OF ATOMS PER UNIT CELL.
6. TYPICAL RUNNING TIME - 10 SECONDS ARE REQUIRED FOR ALL WAVE VECTORS OF A CRYSTAL WITH TWO ATOMS PER UNIT CELL.
7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM REQUIRES ONLY THE THREE LATTICE VECTORS, THE ATOMIC POSITIONS, AND THE DESIRED WAVE VECTORS AS INPUT. IT DETERMINES ALL OF THE SYMMETRY PROPERTIES IN ONE PASS. IT WILL ALSO CALCULATE EXTERNAL MODES OF MOLECULAR CRYSTALS. TIME REVERSAL IS CONSIDERED IN ALL CALCULATIONS.
8. RELATED AND AUXILIARY PROGRAMS - ACMI/EM/IMR WAS AN EARLIER VERSION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED NOVEMBER 1974.
IBM360 VERSION SUBMITTED OCTOBER 1974, SAMPLE PROBLEM

9. STATUS (CONTINUED)

EXECUTED BY ACC OCTOBER 1974 ON IBM370/195.
CDC6600 VERSION SUBMITTED OCTOBER 1974, SAMPLE PROBLEM
EXECUTED BY ACC OCTOBER 1974 ON CDC7600.

10. REFERENCES - T. G. WORLTON AND J. L. WARREN, GROUP THEORETICAL ANALYSIS OF LATTICE VIBRATIONS, COMPUTER PHYSICS COMMUNICATIONS, VOL. 3, PP. 88-117, 1972.
T. G. WORLTON AND J. L. WARREN, ERRATUM, IBID., VOL. 4, PP. 382-383, 1972.
T. G. WORLTON, EXTERNAL MODES OF MOLECULAR CRYSTALS, IBID., VOL. 4, PP. 249-256, 1972.
T. G. WORLTON, IRREPRODUCIBLE MULTIPLIER REPRESENTATIONS, IBID., VOL. 6, PP. 149-155, 1973.
J. L. WARREN AND T. G. WORLTON, IMPROVED VERSION OF GROUP-THEORETICAL ANALYSIS OF LATTICE DYNAMICS, IBID., IN PRESS (OCTOBER 1974).
J. L. WARREN AND T. G. WORLTON, SYMMETRY PROPERTIES OF THE LATTICE DYNAMICS OF TWENTY-THREE CRYSTALS, ANL-8053 AND LA-5465-MS, DECEMBER 1973.
11. MACHINE EQUIPMENTS - THE IBM360 REQUIRES 240K BYTES TO COMPILE AND 230K BYTES TO EXECUTE. THE CDC6600 VERSION REQUIRES 55000 (OCTAL) WORDS TO COMPILE, 125000 (OCTAL) WORDS TO EXECUTE.
12. PROGRAMMING LANGUAGE(S) USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360) AND SCOPE 3.1 (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE INPUT DECK STRUCTURE IS INDICATED ON COMMENT CARDS IN THE MAIN PROGRAM. THE SYSTEM LIBRARY OR USER MUST SUPPLY THE FUNCTION RANF(N) WHICH PRODUCES A UNIFORMLY-DISTRIBUTED SEQUENCE OF REAL RANDOM NUMBERS. IN THE IBM VERSION, N=-1; IN THE CDC, N=0. IN SOME CASES, THE PHASE ANGLE MATRIX AND THE BLOCK-DIAGONALIZED DYNAMICAL MATRIX ARE NOT FIXED BY SYMMETRY CONSIDERATIONS AND MAY DIFFER FROM THE SAMPLE OUTPUT. ALSO, OTHER VECTORS MAY HAVE DIFFERENT REPRESENTATIONS, DEPENDING ON THE SPECIFIC IMPLEMENTATION OF THE ATAN FUNCTION.
15. NAME AND ESTABLISHMENT OF AUTHORS -
6600	JOHN L. WARREN
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544
360	THOMAS G. WORLTON
SOLID STATE SCIENCE DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (360-22PP CARDS, 6600-2290 CARDS)
SAMPLE PROBLEMS (360-35 CARDS, 6600-35 CARDS)
SAMPLE PROBLEM OUTPUT (360-7 PAGES, 6600-7 PAGES)
REFERENCE PREPRINT: IMPROVED VERSION OF GROUP-THEORETICAL
ANALYSIS OF LATTICE DYNAMICS
17. CATEGORY - Q
KEYWORDS - SOLID STATE, LATTICE DYNAMICS, GROUP THEORY, PHONONS

1. NAME OR DESIGNATION OF PROGRAM - BH99
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - BH99 IS USED FOR THE STATISTICAL ANALYSIS OF DATA BASED ON THE EXTREME VALUE DISTRIBUTION.
4. METHOD OF SOLUTION - THE DISTRIBUTION FUNCTION
$$F(X) = \exp(-\exp(-(X-\mu)/\beta)),$$
 CALLED THE EXTREME VALUE DISTRIBUTION IS USED TO DESCRIBE A POPULATION EACH OF WHOSE ELEMENTS MAY BE LOOKED UPON AS THE MAXIMUM OF A SET OF POSSIBLE VALUES. THE DENSITY FUNCTION IS POSITIVELY SKEWED. μ IS A LOCATION PARAMETER, THE MODE, WHILE β IS A SCALE PARAMETER. THE ESTIMATION PROBLEM IS SOLVED USING TWO METHODS. ONE IS WHERE MAXIMUM LIKELIHOOD ESTIMATES OF μ AND β ARE COMPUTED USING AN ITERATIVE SCHEME TO SOLVE THE NONLINEAR NORMAL EQUATIONS. THE OTHER IS BY A METHOD DEVELOPED BY LIEBLEIN (REFERENCE 3) USING THE ORDER STATISTICS. THE RESULTS OF THE FIT USING THE METHOD OF MAXIMUM LIKELIHOOD ARE PRINTED AND, FOR SAMPLES OF SIZES N LESS THAN 26, THE RESULTS USING ORDER STATISTICS ARE ALSO GIVEN. THIS IS FOLLOWED BY A FREQUENCY DISTRIBUTION OF THE OBSERVATIONS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - WHEN FITTING THE DISTRIBUTION USING ORDER STATISTICS, SAMPLES OF SIZES UP TO $N=35$ MAY BE COMPUTED.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - FOR EITHER METHOD USED, THE ESTIMATES OF μ AND β ARE PRINTED FOLLOWED BY ESTIMATES OF SEVERAL PERCENTILES OF THE DISTRIBUTION TOGETHER WITH THEIR APPROXIMATE 68 PERCENT CONFIDENCE INTERVALS.
8. RELATED AND AUXILIARY PROGRAMS - BH99 USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1974.
CDC6600 VERSION SUBMITTED JANUARY 1974.
10. REFERENCES - T. SHIMAMOTO, BH99 - A PROGRAM FOR THE STATISTICAL ANALYSIS OF DATA BASED ON THE EXTREME VALUE DISTRIBUTION, WAPD-TM-1137, AUGUST 1973.
C. J. PFEIFFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
J. LIEBLEIN, A NEW METHOD OF ANALYZING EXTREME-VALUE DATA, NASA TECHNICAL NOTE 3053, JANUARY 1954.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - FORTRAN IV

ACC ABSTRACT 621

-2-

03/74

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
T. SHIMAMOTO
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
PITTSBURGH, PENNSYLVANIA 15122
16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (890 CARDS)
SAMPLE PROBLEM (6 CARDS)
REFERENCE REPORT, WAPD-TM-1137
17. CATEGORY - P
KEYWORDS - ORDER STATISTICS, EXTREME VALUE DISTRIBUTION, MAXIMUM
LIKELIHOOD ESTIMATES

1. NAME OR DESIGNATION OF PROGRAM - GAUSS6
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS DEPENDENT - IBM360/75
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - GAUSS6 CARRIES OUT THE FOLLOWING STEPS -
 - (A) SORTS MASTER NUCLIDE LIBRARY TO OBTAIN A SUBSET INCLUDING ONLY THE NUCLIDES OF INTEREST.
 - (B) AUTOMATICALLY LOCATES PEAKS BY MEANS OF AN AUTO-CORRELATION ROUTINE.
 - (C) FITS EACH PEAK WITH A GAUSSIAN FUNCTION PLUS A LINEAR FUNCTION REPRESENTING THE SPECTRAL BACKGROUND. ONLY THE THREE GAUSSIAN PARAMETERS (HEIGHT, WIDTH, AND POSITION) ARE ALLOWED TO VARY. THE FIT EXTENDS DOWN TO 1.5 TIMES THE WIDTH OF THE GAUSSIAN (FWHM). FITS THAT FAIL TO CONVERGE ARE REPEATED WITH A FIXED WIDTH.
 - (D) DETERMINES PEAK WIDTH AND ENERGY CALIBRATION FUNCTIONS FROM A TH228 SPECTRUM. THESE FUNCTIONS AS WELL AS THE ENERGY CALIBRATION FROM ANY SPECTRUM CAN BE TRANSFERRED TO SUBSEQUENT SPECTRA.
 - (E) ATTEMPTS ISOTOPIC ASSIGNMENTS FOR ALL PEAKS. DECAY CORRECTIONS ARE MADE.
 - (F) FOR SPECTRA FROM THE SAME SAMPLE, EDITS AND AVERAGES THE RESULTS TO OBTAIN THE ISOTOPIC DECAY RATES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - GAUSS6 WILL HANDLE ANY NUMBER OF SPECTRA OF UP TO 4096 CHANNELS WITH UP TO 300 PEAKS AND 20 ENERGY CALIBRATION LINES. THE SUBSET OF THE ISOTOPIC LIBRARY IS LIMITED TO 1000 GAMMA RAYS.
6. TYPICAL RUNNING TIME - TYPICAL SPECTRA CAN BE ANALYZED AT A RATE OF ABOUT 5 PER MINUTE.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE PROGRAM PACKAGE INCLUDES THE FOLLOWING AUXILIARY PROGRAMS -
 - (A) LCTAPE FOR PUTTING NONLINEARITY CORRECTION AND EFFICIENCY TABLES ON DISK.
 - (B) UPDATE FOR UPDATING THE MASTER NUCLIDE LIBRARY.
 - (C) RASLIB FOR PRODUCING A SUBSET OF THE MASTER NUCLIDE LIBRARY (NORMALLY RUN AS PART OF THE ANALYSIS RUN).
 - (D) MERGE FOR COMBINING THE OUTPUT TAPES FROM SEVERAL GAUSS6 ANALYSES.

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
 - (F) CORLAT FOR CARRYING OUT THE COMPARISON AND AVERAGING OF THE SEVERAL MEASUREMENTS FOR EACH SAMPLE.
 - (F) LIBRER FOR GENERATING A NUCLIDE LIBRARY DATA SET FROM CARDS.
 - (G) SECLIB FOR GENERATING A SECONDARY LIBRARY SUBSET FOR CORLAT.

GAUSS6 IS BASED ON GAUSS5 (ACC ABSTRACT 605), BUT IS WRITTEN TO ANALYZE LARGE GROUPS OF SPECTRA EFFICIENTLY AND INCLUDES CALCULATIONS BEYOND THE GAMMA-RAY ENERGIES AND INTENSITIES AND CAN COMPARE RESULTS FROM DIFFERENT GAMMA-RAYS AND DIFFERENT SPECTRA TO VERIFY NUCLIDE ASSIGNMENTS FOR INDIVIDUAL PEAKS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1974.
IBM360 VERSION SUBMITTED OCTOBER 1973, SAMPLE PROBLEM EXECUTED BY ACC FEBRUARY 1974.
10. REFERENCES - J. E. CLINE, M. F. PUTNAM, AND R. G. HELMER, GAUSS VI, A COMPUTER PROGRAM FOR THE AUTOMATIC BATCH ANALYSIS OF GAMMA-RAY SPECTRA FROM GE(LI) SPECTROMETERS, ANCR-1113, JUNE 1973.
GAUSS6, ACC NO. 622, ARGONNE CODE CENTER PROGRAMMING NOTE 74-29, MARCH 29, 1974.
11. MACHINE REQUIREMENTS - GAUSS6 REQUIRES STORAGE DEVICES FOR THE SPECTRAL LIBRARY, NUCLIDE LIBRARY SUBSET, AND THE CORRELATION DATA IN ADDITION TO THREE SCRATCH DEVICES AND THE CARD READER AND PRINTER. CORLAT REQUIRES STORAGE DEVICES FOR THE SECONDARY LIBRARY SUBSET AND THE CORRELATION DATA PLUS FOUR SCRATCH DEVICES AND THE CARD READER AND PRINTER.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV, BAL, PL/I
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 MVT.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE CORLAT PROGRAM REQUIRES THE IBM360 SORT PACKAGE.
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. G. HELMER, J. E. CLINE, AND M. F. PUTNAM
AERCJET NUCLEAR COMPANY
550 SECOND STREET
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (GAUSS6 6636 CARDS, RASLIB 461 CARDS, LCTAPE 164 CARDS, LIBRER 182 CARDS, CORLAT 1824 CARDS, MERGE 248 CARDS, UPDATE 518 CARDS)
LOAD MODULES (GAUSS6 149 BLOCKS, SECLIB 59 BLOCKS, CORLAT 96 BLOCKS)
OBJECT DECK (MERGE 14 CARDS)
SAMPLE PROBLEMS (GAUSS6 2533 CARDS, RASLIB 5 CARDS, LCTAPE 59 CARDS, LIBRER 10 CARDS, MERGE 1 CARD)

16. MATERIAL AVAILABLE (CONTINUED)

CONTROL INFORMATION-JCL (GAUSS6 28 CARDS, RASLIB 11 CARDS,
LCTAPE 8 CARDS, LIBRER 10 CARDS,
CCRLAT 130 CARDS, MERGE 14 CARDS,
UPDATE 9 CARDS)

REFERENCE REPORT AND ACC NOTE

17. CATEGORY - W

KEYWORDS - GAMMA-RAY SPECTRA, GE(LI) DETECTORS, ISCTCPES IDENTI-
FICATION, LIBRER CODES, CCRLAT CODES, RASLIB CODES,
MERGE CODES, UPDATE CODES, SECLIB CODES

1. NAME OR DESIGNATION OF PROGRAM - SETS
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - THE SETS PROGRAM IS USED TO READ, INTERPRET, AND EXECUTE THE STATEMENTS OF A SETS USER PROGRAM WHICH IS AN ALGORITHM THAT SPECIFIES THE PARTICULAR MANIPULATIONS TO BE PERFORMED AND THE ORDER IN WHICH THEY ARE TO OCCUR.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - ANY PROPERLY FORMED SET EQUATION INVOLVING THE SET OPERATIONS OF UNION, INTERSECTION, AND COMPLEMENT IS ACCEPTABLE FOR PROCESSING BY THE SETS PROGRAM. RESTRICTIONS ON THE SIZE OF A SET EQUATION THAT CAN BE PROCESSED ARE NOT ABSOLUTE BUT RATHER ARE RELATED TO THE NUMBER OF TERMS IN THE DISJUNCTIVE NORMAL FORM OF THE EQUATION, THE NUMBER OF LITERALS IN THE EQUATION, ETC. NEVERTHELESS, SET EQUATIONS INVOLVING THOUSANDS AND EVEN HUNDREDS OF THOUSANDS OF TERMS CAN BE PROCESSED SUCCESSFULLY.
6. TYPICAL RUNNING TIME - RUNNING TIME VARIES WITH RESPECT TO THE PARTICULAR SET EQUATIONS BEING PROCESSED AND THE SYMBOLIC MANIPULATIONS BEING PERFORMED. ALTHOUGH NO GENERAL RULE FOR PREDICTING RUN TIME IS KNOWN, THE REDUCTION (EXPANSION, SIMPLIFICATION, AND FACTORIZATION) OF A SET EQUATION USUALLY REQUIRES MORE RUN TIME THAN OTHER MANIPULATIONS, AND THIS TIME TENDS TO INCREASE AS THE NUMBER OF TERMS IN THE DISJUNCTIVE NORMAL FORM OF THE SET EQUATION INCREASES. THE SAMPLE PROBLEM REQUIRES LESS THAN 7 SECONDS OF CENTRAL PROCESSOR TIME.
7. UNUSUAL FEATURES OF THE PROGRAM - THE SETS PROGRAM IS AN INTERPRETIVE PROGRAM USED TO EXECUTE THE STATEMENTS OF A SETS USER PROGRAM. THE SETS USER PROGRAM PROVIDES THE USER WITH A FLEXIBLE CAPABILITY FOR ACHIEVING THE SYMBOLIC MANIPULATION OF SET EQUATIONS.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1974.
CDC6600 RESTRICTED DISTRIBUTION VERSION SUBMITTED OCTOBER 1973, REPLACED BY CDC6600R UNRESTRICTED VERSION DECEMBER 1974.
10. REFERENCES - R. B. WORRELL AND B. I. HULME, EFFICIENT ORDERING OF SET EXPRESSIONS FOR SYMBOLIC EXPANSION, JOURNAL OF THE ACM, VOL. 26, JULY 1973.
M. D. OLMAN AND R. B. WORRELL, A FAULT TREE REPRESENTATION

10. REFERENCES (CONTINUED)
TATION DESIGNED FOR COMPUTER ANALYSIS, SC-RR-71 0615A, JULY 1972.
R. B. WORRELL, SET EQUATION TRANSFORMATION SYSTEM (SETS), SLA-73-0028A, MAY 1974, AND ADDENDUM, NOVEMBER 1974.
R. B. WORRELL, INSTRUCTIONS FOR USING THE SETS PROGRAM, SLA-73-0908A, OCTOBER 1974, AND ERRATA, NOVEMBER 1974.
B. L. HULME AND R. B. WORRELL, A PRIME IMPLICANT ALGORITHM WITH FACTORING, SLA-74-0218, MAY 1974.
R. B. WORRELL, USING THE SET EQUATION TRANSFORMATION SYSTEM IN FAULT TREE ANALYSIS, SAND74-0240, SEPTEMBER 1974.
11. MACHINE REQUIREMENTS - CDC6600 WITH EXTENDED CORE STORAGE (ECS)
12. PROGRAMMING LANGUAGE USED - FORTRAN EXTENDED
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
A SPECIAL ROUTINE WITH THE CALLING SEQUENCE CALL SETEP(I), WHERE I IS AN INTEGER OR AN INTEGER VARIABLE REPRESENTING A LOGICAL FILE NUMBER, IS USED TO ENABLE PARITY CHECKING WITHIN THE SETS PROGRAM FOR IRRECOVERABLE PARITY ERRORS. OTHERWISE, IRRECOVERABLE PARITY ERRORS WILL BE HANDLED BY SCOPE.
A SUBSTANTIAL REPROGRAMMING EFFORT WOULD BE REQUIRED TO CONVERT THE SETS PROGRAM TO A MACHINE THAT IS NOT COMPATIBLE WITH THE CDC6600 DUE TO THE EXTENSIVE USE OF MASKING INSTRUCTIONS AND THE PACKING OF DATA WITHIN THE 60-BIT WORD STRUCTURE.
15. NAME AND ESTABLISHMENT OF AUTHOR -
R. B. WORRELL
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (4149 CARDS)
SAMPLE PROBLEM (205 CARDS)
SAMPLE PROBLEM OUTPUT
REFERENCE REPORTS, SC-RR-71 0615A, SLA-73-0028A AND ADDENDUM, SLA-73-0908A AND ERRATA
17. CATEGORY - P
KEYWORDS - BOOLEAN ALGEBRA, SWITCHING THEORY, NETWORK THEORY, EVENT MODELS, FAULT TREE ANALYSIS

1. NAME OR DESIGNATION OF PROGRAM - GRAPH
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PROGRAM CALCULATES AND GRAPHS STATISTICAL RESULTS OF EXPERIMENTAL DATA. IT CALCULATES THE LINEAR REGRESSION, CORRELATION COEFFICIENTS, THE CONFIDENCE INTERVALS FOR 90-95-99 PERCENT CONFIDENCE THAT THE NEXT SAMPLE WILL BE WITHIN THE PRINTED INTERVAL, THE 90 PERCENT CONFIDENCE INTERVAL THAT 95 PERCENT OF THE REMAINING POPULATION WILL BE WITHIN, AND THE MEAN AND STANDARD DEVIATION OF EACH PARAMETER. THE PROGRAM GRAPHS THESE CONFIDENCE INTERVALS, THE REGRESSION LINE AND THE EXPERIMENTAL DATA TO OBTAIN A VISUAL INDICATION OF CORRELATION. INPUT DATA IS PRINTED IN TABULAR FORM AND ALL DEPENDENT DATA ARE DISPLAYED AGAINST ALL INDEPENDENT DATA, ONE PARAMETER AT A TIME.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - LESS THAN 1 SECOND IS REQUIRED FOR A TYPICAL PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - ROUTINE GRAPH CAN BE OVERLAYED BY GRAPH2 TO SAVE ABOUT 10000 BYTES.
8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS THE ALO-JC189 PROGRAM TRANSFERRED FROM THE ALO-CCSMIC COLLECTION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1974.
IBM360 PROGRAM SUBMITTED SEPTEMBER 1974, SAMPLE PROBLEM
EXECUTED BY ACC ON IBM370/195.
10. REFERENCES - HERMAN F. FALCETTE AND W. J. KIRK, GRAPH - REGRESSION CONFID GRAPH, BENDIX CORPORATION COMPUTER PROGRAM REPORT, APRIL 19, 1967.
11. MACHINE REQUIREMENTS - 19,880 BYTES FOR PROGRAM
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
D. L. WANTOCH AND W. J. KIRK
BENDIX CORPORATION
KANSAS CITY DIVISION

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

P. C. BOX 1159
KANSAS CITY, MISSOURI 64141

16. MATERIAL AVAILABLE -

SOURCE DECK (818 CARDS)
OBJECT DECK (402 CARDS)
SAMPLE PROBLEM (837 CARDS)
SAMPLE PROBLEM OUTPUT (41 PAGES)
REFERENCE REPORT

17. CATEGORY - P

KEYWORDS - STATISTICS, GRAPHS, REGRESSION, CORRELATION, CONFIDENCE
INTERVALS

1. NAME OR DESIGNATION OF PROGRAM - VARI-1D
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM36C,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE VARI-1D CODE CALCULATES ESTIMATES OF CHANGES IN REACTIVITY WORTHS, KFFF, REACTION RATES, POWER FRACTIONS, PROMPT-NEUTRON GENERATION TIME, DELAYED NEUTRON EFFECTIVENESS, AND FLUX INTEGRAL RATIOS DUE TO CHANGES IN NUCLEAR DATA OR COMPOSITION BY USE OF A VARIATIONAL FORMALISM. THE CODE IS APPLICABLE TO A WIDE RANGE OF REACTOR OR CRITICAL EXPERIMENT DESIGN PROBLEMS AND SENSITIVITY STUDIES.
4. METHOD OF SOLUTION - VARI-1D FIRST CALCULATES THE DIFFUSION THEORY FLUX AND ADJOINT IN THE REFERENCE ONE-DIMENSIONAL SYSTEM USING A STANDARD POWER ITERATION ALGORITHM WITH CHEBYSHEV EXTRAPOLATION. NEXT, THE GENERALIZED FUNCTIONS GAMMA* AND GAMMA ARE CALCULATED USING A SUCCESSIVE APPROXIMATION METHOD WITH THE SOURCE TERM APPROPRIATE TO THE TYPE OF ESTIMATE. THESE GENERALIZED FUNCTIONS ARE THEN USED TO CALCULATE THE INTEGRALS REQUIRED TO OBTAIN VARIATIONAL AND FIRST-ORDER PERTURBATION THEORY ESTIMATES OF THE EFFECT OF DIFFERENT SYSTEM ALTERATIONS ON THE GIVEN REACTIVITY PERTURBATION, REACTION RATE RATIO, ETC.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
 - 50 SPATIAL MESH POINTS
 - 10 MATERIAL REGIONS
 - 15 ISOTOPES
 - 10 FISSIONABLE ISOTOPES
 - 27 ENERGY GROUPS
 - 15 DOWNSCATTER GROUPSTHE GEOMETRY IS ONE-DIMENSIONAL SLAB, CYLINDER, OR SPHERE. THE BOUNDARY CONDITIONS ARE $\Phi = 0$ AND/OR $\Phi' = 0$. CROSS SECTION DATA MAY BE INPUT FROM CARDS OR ARC SYSTEM XS.ISC FILE (ACC ABSTRACT 594) OR CCCC ISOTXS.
6. TYPICAL RUNNING TIME- THE CENTRAL PROCESSOR TIME FOR A SAMPLE PROBLEM WITH ONE REACTIVITY ESTIMATE AND 9 SYSTEM ALTERATIONS IS LESS THAN 30 SECONDS ON AN IBM36C/195.
7. UNUSUAL FEATURES OF THE PROGRAM - VARI-1D ALLOWS THE ESTIMATION OF THE EFFECT ON REACTIVITY WORTH, ETC., OF MANY ALTERATIONS IN TEMPERATURE, COMPOSITION, OR NUCLEAR DATA TO BE MADE WITH A SINGLE SET OF FLUX, ADJOINT, AND GENERALIZED FUNCTIONS CALCULATED FOR A REFERENCE CONDITION. BOTH THE ARC SYSTEM XS.ISC AND CCCC FORMAT ISOTXS CROSS SECTION FILES ARE PROCESSED.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1974.
IBM36C VERSION SUBMITTED FEBRUARY 1974, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - W. M. STACEY, JR. AND J. P. REGIS, VARI-1D: A ONE-DIMENSIONAL VARIATIONAL SENSITIVITY CODE, ARGONNE APPLIED PHYSICS DIVISION REPORT, AUGUST 1973.
W. M. STACEY, JR., VARIATIONAL ESTIMATES OF REACTIVITY WORTHS AND REACTION RATE RATIOS IN CRITICAL NUCLEAR REACTORS, NUCLEAR SCIENCE AND ENGINEERING, VOL. 48, P. 444, 1972.
W. M. STACEY, JR., AN IMPROVED REACTIVITY TABLE MODEL FOR LIQUID METAL FAST BREEDER REACTOR DYNAMICS, NUCLEAR SCIENCE AND ENGINEERING, VOL. 49, P. 213, 1972.
L. C. JUST, H. HENRYSON, II, A. S. KENNEDY, S. D. SPARCK, B. J. TOPPEL, AND P. M. WALKER, THE SYSTEMS ASPECTS AND INTERFACE DATA SETS OF THE ARGONNE REACTOR COMPIATION (ARC) SYSTEM, ANL-7711, APRIL 1971.
B. M. CARMICHAEL, D. A. MENFLEY, AND C. VONCY, REPORT OF THE SUBCOMMITTEE ON STANDARD INTERFACE FILES, LA-5324-MS, JULY 1973.
11. MACHINE REQUIREMENTS - A TYPICAL EXECUTION REQUIRES ABOUT 450K BYTES. ONE PERIPHERAL I/O DEVICE IS REQUIRED FOR A CROSS SECTION INPUT FILE.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV IS USED EXCEPT FOR SUBROUTINE SQUEEZE WHICH IS IN ASSEMBLY LANGUAGE.
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
AUTHORS W. M. STACEY, JR. AND J. P. REGIS

CONTACT W. M. STACEY, JR.
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ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (4688 CARDS)
LOAD MODULES (2314-270 BLOCKS, 3330-270 BLOCKS)
SAMPLE PROBLEM (350 CARDS)
SAMPLE PROBLEM OUTPUT (45 SELECTED PAGES)
LIBRARY (ISOTXS FORMAT 6 BLOCKS)
CONTROL INFORMATION (JCL 49 CARDS)
REFERENCE REPORT, APPLIED PHYSICS DIVISION REPORT
17. CATEGORY - C
KEYWORDS - REACTIVITY, REACTION RATES, 1-DIMENSIONAL

1. NAME OR DESIGNATION OF PROGRAM - ARC-DIF1D
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE ARC 1D-DIFFUSION CAPABILITY PROVIDES COMPLETE ONE-DIMENSIONAL SOLUTIONS OF THE MULTIGROUP DIFFUSION EQUATIONS WITH EDITS AND A NEUTRON INVENTORY OPTION.
4. METHOD OF SOLUTION - THIS PACKAGE CONSISTS OF FOUR MODULES THAT ARE INVOKED BY THE PATH STP001. THE MODULE NUCJ02 SOLVES THE MULTIGROUP DIFFUSION EQUATIONS. THE MODULE NUCJ04 HANDLES SEARCHES. THE MODULE NUC001 PROVIDES MORE DETAILED EDITS, IF DESIRED. THE PATH INVOKES OTHER MODULES TO PROVIDE FOR CROSS SECTION HOMOGENIZATION AND THE PROCESSING OF INPUT DATA.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM PROVIDED REQUIRES ABOUT 66 SECONDS ON AN IBM360/195.
7. UNUSUAL FEATURES OF THE PROGRAM - THE MODULAR DESIGN ALLOWS THE USE OF ANY OR ALL OF THE MODULES IN THIS PACKAGE WITH OTHER DESIRED MODULES WITH DATA COMMUNICATED VIA INTERFACE DATA SETS.
8. RELATED AND AUXILIARY PROGRAMS - THE PATH STP001 IS INVOKED BY EXECUTING THE CATALOGUED PROCEDURE ARCSPO01. THE ARC SYSTEM ENVIRONMENT IS PROVIDED BY ARC-SYSTEM (ACC ABSTRACT 522). THE RCD INPUT IS PROCESSED BY ARC-NUIC02 (ACC ABSTRACT 533). THE CROSS SECTION HOMOGENIZATION IS PROVIDED BY ARC-XSEC1 (ACC ABSTRACT 594). CROSS SECTION DATA FOR THE SAMPLE PROBLEM ARE PROVIDED IN THE ACC 594 PACKAGE.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1974.
IBM360 VERSION SUBMITTED FEBRUARY 1974, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - D. E. NEAL, G. K. LEAF, AND A. S. KENNEDY, THE ARC SYSTEM ONE-DIMENSIONAL DIFFUSION THEORY CAPABILITY, CARC10, ANL-7715, MAY 1971.
D. E. NEAL, T. A. DALY, D. A. SCHENGOLD, G. JENSEN MAIN, E. A. KOVALSKY, AND G. K. LEAF, THE ARC SYSTEM ONE-DIMENSIONAL ADJUNCT CALCULATIONS AND EDITS, ANL-7719, MARCH 1972.
W. L. WOODRUFF, T. A. DALY, H. HENRYSON, II, P. H. KIER, J. P. REGIS, C. G. STENBERG, AND B. J. TOPPEL, THE ARC SYSTEM STANDARD PATHS AND CATALOGUED PROCEDURES, ANL-7712, DECEMBER 1971.
L. C. JUST, H. HENRYSON, II, A. S. KENNEDY, S. C. 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.

10. REFERENCES (CONTINUED)

SUPPLEMENTAL INFORMATION FOR ARC-DIF10, ANL-AP NOTE,
FEBRUARY 1974.

11. MACHINE REQUIREMENTS - 260K BYTES OF CORE AND AT LEAST 2 PERI-
PHERAL I/O DEVICES FOR SCRATCH FILES IN ADDITION TO FILES FOR THE
LOAD MODULE LIBRARY AND CROSS SECTION DATA.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

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

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

AUTHORS D. E. NEAL, G. K. LEAF, AND A. S. KENNEDY

CONTACT B. J. TOPPEL
APPLIED PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (PDS DIF10.SOURCE 1597 RECCRDS)
OBJECT MODULE (PDS DIF10.SEGLIB 651 RECCRDS)
LOAD MODULE (2314 PDS DIF10.MODLIB 968 RECCRDS)
SAMPLE PROBLEM (162 CARDS)
SAMPLE PROBLEM OUTPUT (87 SELECTED PAGES)
LINKAGE EDITOR CONTROL STATEMENTS (PDS DIF10.OVERLAY 6 RECCRDS)
CONTROL INFORMATION (JCL 54 CARDS)
REFERENCE REPORTS AND SUPPLEMENTAL INFORMATION NOTE

17. CATEGORY - C

KEYWORDS - MODULAR, MULTIGROUP, 1-DIMENSIONAL, DIFFUSION THEORY,
ARC CODES

1. NAME OR DESIGNATION OF PROGRAM - TCCDY2
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600
3. DESCRIPTION OF PROBLEM OR FUNCTION - TCCDY2 IS USED TO COMPUTE WAVE PROPAGATION IN TWO DIMENSIONS IN RECTANGULAR OR CYLINDRICAL COORDINATES.
4. METHOD OF SOLUTION - TCCDY2 IS BASED ON THE CONVENTIONAL FINITE DIFFERENCE ANALOGS TO THE LAGRANGIAN EQUATIONS OF MOTION. THE FINITE DIFFERENCE TECHNIQUE IS AN APPROXIMATE METHOD OF SOLVING THE NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS DESCRIBING TWO-DIMENSIONAL MOTION. THE DEGREE OF APPROXIMATION DEPENDS ON THE MESH SIZES, MESH SHAPE, AND ARTIFICIAL VISCOSITY COEFFICIENTS WHICH ARE USED. FOUR TYPES OF BOUNDARY CONDITIONS ARE CONSIDERED. THESE ARE (1) A FREE SURFACE, (2) A SURFACE WITH AN APPLIED STRESS ACTING ON IT, (3) A SYMMETRY PLANE, AND (4) A RIGID NON-SLIDING BOUNDARY.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF - 19 DIFFERENT MATERIALS PER PROBLEM
6. TYPICAL RUNNING TIME - TCCDY2 CAN CALCULATE $3.3 \times 10^{**5}$ MESH CYCLES PER HOUR.
7. UNUSUAL FEATURES OF THE PROGRAM - TCCDY2 FEATURES INCLUDE -
 - (1) INTERMEDIATE TAPE STORAGE IS USED. THE VALUES OF PROPERTIES COMPUTED ARE WRITTEN ON THESE TAPES AFTER THEY HAVE BEEN COMPUTED. AFTER THE COMPUTATION HAS PROCEEDED AND THESE VALUES ARE AGAIN REQUIRED, THEY ARE READ FROM THESE TAPES. THIS ALLOWS VALUES TO BE STORED OUTSIDE OF THE COMPUTER MEMORY WHEN THEY ARE NOT BEING USED IN THE CALCULATIONS.
 - (2) A SLIDING INTERFACE OPTION IS INCLUDED. THIS OPTION YIELDS A MORE ACCURATE DESCRIPTION OF THE PROBLEM WHEN THE MOTION OF TWO ADJACENT MESHES IS VERY DIFFERENT. FURTHER, THIS ALLOWS MORE CONVENIENT ZONING WHEN MORE THAN ONE MATERIAL IS INVOLVED. EIGHT SLIDING INTERFACES CAN BE USED PER PROBLEM AND THE INTERFACE FRICTION CAN BE SPECIFIED AS ZERO, INFINITE, OR FINITE.
8. RELATED AND AUXILIARY PROGRAMS - TCCDY2 IS ALO-008 TRANSFERRED FROM THE ALO-COSMIC COLLECTION. IT IS AN IMPROVED VERSION OF TCCDY.
9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1974.
CDC3600 VERSION SUBMITTED FEBRUARY 1974.
10. REFERENCES - L. D. HERTHOLF AND S. E. BENZLEY, TCCDY II, A COMPUTER PROGRAM FOR TWO-DIMENSIONAL WAVE PROPAGATION, SC-RK-68-41, NOVEMBER 1968.

11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - 360J FORTRAN
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 6.2.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
L. D. BERTHOLF AND S. E. BENZLEY
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (4036 CARDS)
SAMPLE PROBLEM (42 CARDS)
SAMPLE PROBLEM OUTPUT (14 PAGES)
REFERENCE REPORT
17. CATEGORY - X
KEYWORDS - 2-DIMENSIONAL, WAVE PROPAGATION, STRESSES, HYDRO-
DYNAMICS

1. NAME OR DESIGNATION OF PROGRAM - ETOT-3
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600
3. DESCRIPTION OF PROBLEM OR FUNCTION - ETOT-3 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN THE ENDF/B FORMAT (REFERENCE 3) AND PRODUCES DATA DECKS FOR USE IN GENERATION OF KATF, THERMCS, TEMPEST AND LASER LIBRARIES.
4. METHOD OF SOLUTION - ETOT-3 PERFORMS A STRAIGHT-FORWARD GROUP AVERAGE USING AN INPUT WEIGHTING FUNCTION OR TAKES POINT VALUES OF THE MICROSCOPIC DATA FROM THE ENDF/B FILES. THE REIT-WIGNER SINGLE-LEVEL AND MULTI-LEVEL FORMULAE ARE AVAILABLE. THE REICH-MOORE AND ADLER-ADLER FORMULAE ARE NOT INCLUDED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - IN ADDITION TO THE RESTRICTIONS ON THE ENDF/B DATA ITSELF, ETOT-3 HAS THE FOLLOWING RESTRICTIONS: MAXIMA OF -
309 GROUPS OF POINTS
500 RESOLVED RESONANCES
ETOT-3 WILL PROCESS ENDF/B-III DATA. A PREDIGESTED FILE CALLED THE UNIVERSAL SUPERGROUP SYSTEM (SEE ETOT-3 DOCUMENT) IS ALSO ACCEPTABLE.
6. TYPICAL RUNNING TIME - ABOUT 5 SECONDS PER ISOTOPE ARE REQUIRED ON THE 7600 WITH ADDITIONAL TIME DEPENDENT ON THE NUMBER OF RESONANCE PARAMETERS AND RESONANCE ENERGY REGIONS.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - IN THE PROGRAM, USE IS MADE OF THE GENERAL PURPOSE PROCESSOR AND RETRIEVAL SUBROUTINES (REFERENCE 12) WRITTEN AT BROOKHAVEN FOR HANDLING ENDF/B DATA FILES. THIS PROGRAM IS RELATED TO ETOT-3 (ACC ABSTRACT 538) WHICH GENERATES EPITHERMAL CROSS SECTIONS.
9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1974.
CDC7600 VERSION SUBMITTED FEBRUARY 1974.
10. REFERENCES - M. RAYMOND, SUPPLEMENT TO WCAP-7363, ETOT, A FORTRAN-IV PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THERMAL LIBRARY FORMAT, WCAP-7363 (ENDF-146) SUPPLEMENT, NOVEMBER 1973.
C. L. BEARD AND R. A. DANIELS, ETOT, A FORTRAN-IV PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THERMAL LIBRARY FORMAT, WCAP-7363 (ENDF-146), MARCH 1971.
M. K. DRAKE, ED., DATA FORMATS AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50274 (ENDF-102), VOL. 1, OCTOBER 1970.
D. E. KUSNER, R. A. DANIELS AND S. KELLMAN, ETOT-1, A FORTRAN-IV PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THE MUFT, GAM, AND ANISN FORMATS, WCAP-3845-1 (ENDF-114), DECEMBER

10. REFERENCES (CONTINUED)
1969.

M. RAYMUND, SUPPLEMENT TO WCAP-3845-1, ETCG-1, A FORTRAN-IV PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THE MUFT, GAM AND ANISN FORMATS, WCAP-3845-1 SUPPLEMENT, AUGUST 1973.

C. G. PONCELET, LASER--A DEPLETION PROGRAM FOR LATTICE CALCULATIONS BASED ON MUFT AND THERMOS, WCAP-6073, APRIL 1966.

H. AMSTER AND R. SUAREZ, THE CALCULATION OF THERMAL CONSTANTS AVERAGED OVER A WIGNER-WILKINS FLUX SPECTRUM: DESCRIPTION OF THE SOFOCAT CODE, WAPD-TM-39, JANUARY 1957.

R. H. SHUDDE AND J. DYER, TEMPEST II, A NEUTRON THERMALIZATION CODE, AMTD-111, JUNE 1962.

H. J. AMSTER AND J. B. CALLAGHAN, KATE-1, A PROGRAM FOR CALCULATING WIGNER-WILKINS AND MAXWELLIAN AVERAGED THERMAL CONSTANTS ON THE PHILCC-2000, WAPD-TM-232, OCTOBER 1960.

P. H. SHUDDE, PREPARATION OF SQUARE ROOT OF E SIGMA CROSS SECTIONS FOR THE TEMPEST DECIMAL LIBRARY, AMTC-115, NOVEMBER 1961.

H. C. HONECK, THERMOS--A THERMALIZATION TRANSPORT THEORY CODE FOR REACTOR LATTICE CALCULATIONS, BNL-5826, SEPTEMBER 1961.

D. OZER, ED., DESCRIPTION OF THE ENDF/B PROCESSING CODES AND RETRIEVAL SUBROUTINES, ENDF-110, NATIONAL NEUTRON CROSS SECTION CENTER, BROOKHAVEN NATIONAL LABORATORY, REVISED JUNE 1971.

11. MACHINE REQUIREMENTS - CORE STORAGE REQUIRED BY THE PROGRAM, ASSOCIATED SYSTEM LIBRARY FUNCTIONS, AND SCOPE 2.0 OPERATING SYSTEM IS 50,000 LOCATIONS. THE PROGRAM USES ONE SCRATCH TAPE IN ADDITION TO THE LIBRARY TAPE AND STANDARD INPUT, OUTPUT AND PUNCH UNITS.
12. PROGRAMMING LANGUAGE USED - ANSI STANDARD FORTRAN (FORTRAN IV)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 2.0.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PLEASE NOTE THAT THE GRAPH OPTION IS NOT OPERATIONAL, AND BINARY TAPE MODE HAS NOT BEEN TESTED ON THE CDC7600.
15. NAME AND ESTABLISHMENT OF AUTHORS -
C. L. BEARD, R. A. CANNELS, AND M. RAYMUND
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS
P. O. BOX 355
PITTSBURGH, PENNSYLVANIA 15230
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5842 CARDS)
SAMPLE PROBLEM (5 CARDS)
CDC UPDATE SOURCE DECK (5883 CARDS)
REFERENCE REPORTS, WCAP-7363 (ENDF-146) AND SUPPLEMENT TO
WCAP-7363 (ENDF-146)

ACC ABSTRACT 628

-3-

03/75

17. CATEGORY - B
KEYWORDS - ENDF/B, CROSS SECTIONS, LIBRARIES, KATE CODES, THERMOS
CODES, TEMPEST CODES, LASER CODES

1. NAME OR DESIGNATION OF PROGRAM - CRRIBLE
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, 370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - ORRIBLE IS A GROUP OF PROGRAMS USED TO PREDICT FLOW AND TEMPERATURE DISTRIBUTION FOR STEADY SINGLE-PHASE FLOW THROUGH BUNDLES OF HEATED RODS SEPARATED BY HELICAL WIRE-WRAP SPACERS. ANY COMBINATION OF FLOW SUBCHANNELS CAN BE BLOCKED AT THE INLET. TURBULENT INTERACTION, SWEEPING CROSS FLOW DUE TO THE WIRE WRAP, AND TRANSVERSE THERMAL CONDUCTION ARE CONSIDERED. THE ELEVEN CRRIBLE PROGRAMS IN THE PACKAGE ARE FOR THREE DUCT CONFIGURATIONS OF 19-ROD BUNDLES, AND FOR 37-, 91-, AND 217-ROD BUNDLES IN HEXAGONAL DUCTS. IN THREE VERSIONS, PERIODIC CHANNEL AREA VARIATIONS DUE TO THE WIRE WRAPS MOVING THROUGH CHANNELS AND THE POSSIBILITY OF THE ROD BUNDLE FORMING A HELIX IN THE DUCT ARE CONSIDERED.
4. METHOD OF SOLUTION - AN APPROXIMATE RELATIONSHIP FOR PRESSURE-DIVERSION CROSS FLOW IN TERMS OF LOCAL AXIAL MASS VELOCITIES IS USED TO ELIMINATE PRESSURE AS A VARIABLE; HENCE THE COMPUTATIONAL PROCEDURE DOES NOT REQUIRE ITERATIVE TECHNIQUES. EACH FLOW CHANNEL IS ASSUMED TO BE DIVIDED INTO A FIXED NUMBER OF LENGTH INCREMENTS, DX . IF, FOR A GIVEN VALUE OF X , VALUES OF THE CHANNEL AXIAL MASS VELOCITY AND TEMPERATURE ARE KNOWN, THE CROSS FLOWS AT X CAN BE CALCULATED AND THEN THE AXIAL MASS VELOCITY AND TEMPERATURE AT $X+DX$. SINCE THE INLET CONDITIONS ARE SPECIFIED, THE CONDITIONS AT EACH SUCCESSIVE INCREMENT CAN BE CALCULATED UNTIL THE OUTLET IS REACHED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - FOR EACH PROGRAM, THE COMPONENT DIMENSIONS, FLOW PARAMETERS, THERMAL PARAMETERS, ETC. MAY BE VARIED WITHIN REASONABLE LIMITS. A NEW PROGRAM MUST BE WRITTEN IN ORDER TO STUDY THE EFFECT OF A DIFFERENT DUCT CROSS-SECTION SHAPE OR A DIFFERENT ROD ARRANGEMENT.
6. TYPICAL RUNNING TIME - 0.5 TO 2 MINUTES ARE REQUIRED.
7. UNUSUAL FEATURES OF THE PROGRAM - AN APPROXIMATE RELATIONSHIP FOR PRESSURE-DIVERSION CROSS FLOW IN TERMS OF LOCAL AXIAL MASS VELOCITIES IS USED TO ELIMINATE PRESSURE AS A VARIABLE; HENCE THE COMPUTATION DOES NOT REQUIRE ITERATIVE PROCEDURES.
8. RELATED AND AUXILIARY PROGRAMS - COBRA3C (ACC ABSTRACT 432)
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1975.
IBM360 VERSION SUBMITTED AUGUST 1974, SAMPLE PROBLEMS
EXECUTED BY ACC ON IBM370/195, DECEMBER 1974.
10. REFERENCES - J. L. WANTLAND, ORRIBLE - A SERIES OF COMPUTER PROGRAMS FOR FLOW AND TEMPERATURE DISTRIBUTION IN LMFBR FUEL ROD BUNDLES OF DIFFERENT SIZES AND CONFIGURATIONS, ORNL-TM-4384, MARCH 1974.

11. MACHINE REQUIREMENTS - NO SAMPLE PROBLEM REQUIRED MORE THAN 120K BYTES DURING EXECUTION. THE THREE PROGRAMS FOR 217-ROD BUNDLES REQUIRED 400K BYTES FOR COMPILATION.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
J. L. WANTLAND
HOLIFIELD NATIONAL LABORATORY
P. O. BOX Y
CAK RIDGE, TENNESSEE 37830
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (4719 CARDS)
SAMPLE PROBLEMS (181 CARDS)
SAMPLE PROBLEM OUTPUT (41 SELECTED PAGES AND 1 MICROFICHE)
REFERENCE REPORT
17. CATEGORY - H
KEYWORDS - TEMPERATURE DISTRIBUTION, FLOW DISTRIBUTION, FLOW
BLOCKAGE, LMFBR REACTORS

1. NAME OR DESIGNATION OF PROGRAM - LATIN SQ
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS FOR WHICH IT IS OPERABLE - IBM360/50
3. DESCRIPTION OF PROBLEM OR FUNCTION - LATIN SQ IS USED FOR THE STATISTICAL ANALYSIS OF DATA GENERATED FROM AN $N \times N$ LATIN SQUARE EXPERIMENTAL DESIGN. THE PROGRAM OUTPUT INCLUDES AN ANALYSIS OF VARIANCE TABLE FOR TESTING THE SIGNIFICANCE OF THE ROW, COLUMN AND TREATMENT MAIN EFFECTS. THE ANALYSIS OF VARIANCE TABLE ALSO INCLUDES INFORMATION FOR TESTING THE LINEAR AND HIGHER ORDER CURVILINEAR COMPONENTS FOR EACH MAIN EFFECT. A SUBROUTINE IS PROVIDED FOR PERFORMING DUNCAN'S NEW MULTIPLE RANGE TEST FOR MAKING ALL PAIR-WISE COMPARISONS AMONG THE FACTOR LEVEL MEAN VALUES.
4. METHOD OF SOLUTION - LATIN SQ EMPLOYS THE STANDARD METHOD OF ANALYSIS OF VARIANCE IN CALCULATING THE VARIOUS SUMS OF SQUARES, DEGREES OF FREEDOM, AND MEAN SQUARES FOR THE ANALYSIS OF VARIANCE TABLE (SEE REFERENCE 8). THE PARTITIONING OF THE MAIN EFFECTS INTO LINEAR AND HIGHER ORDER CURVILINEAR COMPONENTS IS ACCOMPLISHED BY THE USE OF ORTHOGONAL POLYNOMIAL COEFFICIENTS. THE COMPARISONS AMONG MEAN VALUES IS PERFORMED BY THE METHOD OF DAVID B. DUNCAN (SEE REFERENCE 2).
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PROGRAM IS DESIGNED TO HANDLE LATIN SQUARES OF SIZE 3×3 , 4×4 , ..., 10×10 . AN ERROR MESSAGE WILL RESULT IF THIS RESTRICTION IS VIOLATED.
6. TYPICAL RUNNING TIME - EXECUTION OF THREE SAMPLE LATIN SQUARE PROBLEMS OF SIZE 3×3 , 4×4 , AND 5×5 REQUIRES APPROXIMATELY 2 MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1975.
IBM360 VERSION SUBMITTED JANUARY 1975, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - ANTHONY D. GRANDILLO, ANALYSIS OF VARIANCE OF AN $N \times N$ LATIN SQUARE, WITH A SUBROUTINE FOR DUNCAN'S NEW MULTIPLE RANGE TEST, MONSANTO RESEARCH CORPORATION.
D. B. DUNCAN, MULTIPLE RANGE AND MULTIPLE F TESTS, BIOMETRICS, VOL.II, PP.1-42, MARCH 1955.
J. I. JAECH, THE LATIN SQUARE, JOURNAL OF QUALITY TECHNOLOGY, VOL.1, PP.242-255, OCTOBER 1969.
C. A. BENNETT AND N. L. FRANKLIN, STATISTICAL ANALYSIS IN CHEMISTRY AND THE CHEMICAL INDUSTRY, JOHN WILEY AND SONS, INC., NEW YORK, N. Y., 1961.
G. L. DAVIS, THE DESIGN AND ANALYSIS OF INDUSTRIAL EXPERIMENTS, HAFNER PUBLISHING COMPANY, NEW YORK, 1956.

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. HARTEP, ORDER STATISTICS AND THEIR USE IN TESTING AND ESTIMATION, VOL. 1, AFROSPACE 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. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

A. D. GRANDILLO AND T. C. BISHOP
MCNSANTO RESEARCH CORPORATION
MOUND LABORATORY
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, MCNSANTO RESEARCH CORPORATION DOCUMENT

17. CATEGORY - P

KEYWORDS - ANALYSIS OF VARIANCE, STATISTICS, LATIN SQUARE

1. NAME OR DESIGNATION OF PROGRAM - RAFFLE-ANC
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.
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 WHEN RUNNING ON AN IBM370/195 USING THE LOAD MODULE.
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 VERSION SUBMITTED OCTOBER 1974, SAMPLE PROBLEM EXECUTED BY ACC.
10. REFERENCES - W. E. VESELY, F. J. WHEELER, AND R. S. MARSDEN, THE RAFFLE GENERAL PURPOSE MONTE CARLO CODE, ANCR-1022, APRIL 1973.
RAFFLE NOTES, AEROJET MEMORANDUM, OCTOBER 1974, REVISED BY ACC.
11. MACHINE REQUIREMENTS - 570K BYTES OF CORE
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASSEMBLY LANGUAGE

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360, 370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
W. E. VESELY*, F. J. WHEELER, AND P. S. MARSDEN
AEROCJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

* NOW AT THE NATIONAL REGULATORY COMMISSION
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (12,988 CARDS)
2314 LOAD MODULE (301 PLOCKS)
SAMPLE PROBLEM (11) CARDS)
SAMPLE PROBLEM OUTPUT (16 PAGES)
CONTROL INFORMATION (JCL 72 CARDS)
LIBRARIES (FAST 4288 CARDS, THERMAL 784 CARDS, MASTER FAST 5316
CARDS)
REFERENCE REPORT AND MEMORANDUM
17. CATEGORY - C
KEYWORDS - MONTE CARLO METHOD, TRANSPORT THEORY, REACTIVITY, FLUX
DISTRIBUTION, REACTION RATES, INCIDENT CCCES

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.
10. REFERENCES - D. H. SPEAS, MATRIX ROUTINE FOR CALCULATING NORMAL MODES, FREQUENCIES, AND ATOM DISPLACEMENTS IN MOLECULES, AERCOJET NUCLEAR COMPANY PROGRAM DESCRIPTION NO. PDJ320, 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(S) USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
IF A DEGENERACY EXISTS, THE EIGENVALUES ARE CALCULATED CORRECTLY,
BUT THE EIGENVECTORS MAY BE WRONG UNLESS SPECIAL PRECAUTIONS ARE
EMPLOYED IN FORMULATING THE PROBLEM. THE PROCEDURE TO BE FOLLOWED
IN SUCH CASES IS GIVEN IN THE PROGRAM INSTRUCTIONS.
15. NAME AND ESTABLISHMENT OF AUTHORS -
H. L. MCMURRY AND P. H. SPEAS
AEROGJET NUCLEAR COMPANY
550 SECOND STREET
IDAHO FALLS, IDAHO 83401
16. MATERIAL AVAILABLE -
SOURCE DECK (527 CARDS)
SAMPLE PROBLEM (258 CARDS)
SAMPLE PROBLEM OUTPUT (22 PAGES)
REFERENCE DOCUMENTS
17. CATEGORY - ψ
KEYWORDS - EIGENSYSTEMS, COORDINATE ANALYSES, MOLECULES, SLOW
NEUTRON SCATTERING

3. DESCRIPTION OF PROBLEM OR FUNCTION (CONTINUED)

J541A F4	PLOT	PLOT N POINTS
J542A CCM	WLCH	WRITE LARGE CHARACTERS HORIZNT. OR VERT.
J562A F4	PLOJB	STANDARDIZED PLOT ON FILM
J565A CCM	BS4J2J	DOUBLE BUFFER FILM OUTPLT
J567A F4	DLCH	DRAW LARGE CHARACTERS
J569A F4	COLOR	COLOR
J592A F4,CCM	PICTURE	PICT-PERSPEC PLOTS, HIGN LINES REMVD, CCLOR
K2.3A CCM	ECR	ECR READS ONE WORD FROM ECS
K204A CCM	ECW	ECW WRITES ONE WORD TO ECS
M101A F4	SORT1	EXTENDED SORT ROUTINE
M117A F4	SOPT2	TWO LEVEL EXTENDED SORT ROUTINE
M118A F4	SEARCH	RAPID SEARCH OF A FLOATING POINT TABLE
M119A F4,CCM	ESEARCH	BINARY SEARCH THROUGH EXTENDED CORE STORAGE
M401A CCM	SHIFT	SHIFT WORD W/C ZERO END AROUND OR SIGN EXT.
M403A CCM	PUTFCH	PUTS & FETCHES CHARACTERS
N1.3A F4	LABRT	LOS ALAMOS ABCRTER & MESSAGE PRINTER
Q408A CCM	RWPRU	READ/WRITE BINARY PRU (PHYSICAL RECCRD)
Q409A F4	ECSBUFC	DATA TRANSFER FROM ECS TO FILE & VICE VERSA
W113A CCM	CPEN	OPEN & CLOSE FILES

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - THIS PACKAGE INCLUDES REVISIONS AND LATER VERSIONS OF ROUTINES INCLUDED IN THE ALC-CCSMIC COLLECTION.

9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1974.
CDC660. VERSION SUBMITTED AUGUST 1973, REPLACED BY
VERSION R MARCH 1975.

10. REFERENCES - LOS ALAMOS SCIENTIFIC LABORATORY PROGRAMMER'S INFORMATION MANUAL, VOLUME 2, PROGRAM LIBRARY ABSTRACTS AND USAGE, FEBRUARY 1973, WITH REVISIONS THROUGH SEPTEMBER 1974.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS EACH INDICATED BY F4 AND CCM IN THE IDENTIFICATION GIVEN IN ITEM 3 ABOVE.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
SCOPE 3.1.14. ANY 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 ANN SOLEM
GROUP C-4
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16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (10,139 CARDS)
SUBROUTINE DESCRIPTIONS
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, 370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - REBUS WAS DEVELOPED TO PERFORM FUEL CYCLE ANALYSIS OF LMFBR REACTORS. GIVEN ONE OR MORE SPECIFIED FUEL SUPPLIES FROM OUTSIDE THE SYSTEM, WITH OR WITHOUT FUEL RECYCLE, REBUS2 COMPUTES THE EQUILIBRIUM OPERATING CONDITIONS OF A FAST REACTOR WITH OR WITHOUT BURN TIME ADJUSTMENT TO A GIVEN DISCHARGE BURNUP, WITH OR WITHOUT FRESH CHARGE ENRICHMENT ADJUSTMENT TO MAINTAIN CRITICALITY, AND WITH OR WITHOUT CONTROL ADJUSTMENT AT EACH FLUX TIME NODE. THE NON-EQUILIBRIUM PROBLEM IS ALSO HANDLED, ALTHOUGH FUEL RECYCLE IS NOT ALLOWED.
4. METHOD OF SOLUTION - THE NUMERICAL METHOD EMPLOYS DIFFUSION THEORY NEUTRONICS SOLUTIONS AS USED IN THE CODES DIF2D AND C2DSCH (ANL-7716).
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 - 3 TO 20 MINUTES ARE REQUIRED ON THE IBM 360/195 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 FUEL CYCLE ANALYSIS CODE REBUS2. IT UTILIZES THE ARC SYSTEM TWO-DIMENSIONAL DIFFUSION THEORY CAPABILITY, AN IMPROVED VERSION OF THE CROSS SECTION HOMOGENIZATION CODE NUCJ1, THE NEUTRONIC INPUT PROCESSOR, NUI002, AND THE HEXAGONAL MESH INPUT PROCESSOR, NUI004.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1974.
IBM360 VERSION SUBMITTED APRIL 1974, REPLACED BY REVISED EDITION NOVEMBER 1974, SAMPLE PROBLEM EXECUTED BY ACC ON IBM370/195.
10. REFERENCES - A. P. OLSON, A USER'S MANUAL FOR THE REACTOR BURNUP SYSTEM, REBUS-2, FRA-TM-62, MARCH 1974.
R. P. HOSTENY AND A. P. OLSON, AN IBM/360 STAND-ALONE VERSION OF REBUS-2, SUPPLEMENT TO FRA-TM-62, 1974.
R. P. HOSTENY, DESCRIPTION AND EDIT OF CROSS SECTION LIBRARIES USED BY REBUS2, ANL-APPLIED PHYSICS NOTE, JANUARY 6, 1975.
#634 REBUS2 LIST OF SUBROUTINES AND OVERLAY STRUCTURE, JANUARY 1975.

10. REFERENCES (CONTINUED)

T. A. DALY, G. K. LEAF, AND A. S. KENNEDY, THE ARC SYSTEM TWO-DIMENSIONAL THEORY CAPABILITY, DARC20, ANL-7716, MAY 1972.

L. C. JUST, F. HENRYSON, II, A. S. KENNEDY, S. C. SPARCK, R. 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, F. HENRYSON, II, J. HCCVER, AND P. M. WALKER, THE ARC SYSTEM CROSS-SECTION HOMOGENIZATION AND MODIFICATION CAPABILITIES, ANL-7714, JUNE 1971.

J. HCCVER, G. K. LEAF, D. A. MENELEY, AND P. M. WALKER, THE FUEL CYCLE ANALYSIS SYSTEM, REBUS, NUCLEAR SCIENCE AND ENGINEERING, VOL. 45, P. 52, 1971.

11. MACHINE REQUIREMENTS - AT LEAST 400K CORE STORAGE (620K FOR THE SUPPLIED SAMPLE PROBLEM)

12. PROGRAMMING LANGUAGES USED - FORTRAN IV (99.9%) AND ASSEMBLY LANGUAGE (0.1%)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360, 270.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - CREATION OF A LOAD MODULE REQUIRES A TOTAL OF APPROXIMATELY 8.6M BYTES OF DIRECT-ACCESS STORAGE.

15. NAME AND ESTABLISHMENT OF AUTHORS -

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477 DIVISION STREET
CAMPELL, CALIFORNIA 95008

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL FOR 360 USERS:

SOURCE DECK (3330 PDS REPSPC 4845 BLOCKS)
OBJECT MODULE (333J PDS REBOBJ 3588 BLOCKS)
LOAD MODULE (333J PDS REBMOD 1745 BLOCKS)
SAMPLE PROBLEM (613 CARDS)
CONTROL INFORMATION (JCL 147 CARDS)

16. MATERIAL AVAILABLE (CONTINUED)
LIBRARIES (XSIS01 1 BLOCK, 6447 BYTES, XSIS02 1 BLOCK,
6447 BYTES)
REFERENCE REPORT, FRA-TM-62, AND SUPPLEMENT
REFERENCE REPORTS ANL-7711, ANL-7714, AND ANL-7716 ARE
AVAILABLE AS MICROFICHE COPIES UPON REQUEST
FOR NON-360 USERS:
SOURCE DECK (47,160 CARDS)
CONTROL INFORMATION (147 OVERLAY CARDS)
SAMPLE PROBLEM (613 CARDS)
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 - SLACMON
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - SLACMON, OPERATING AS A SYSTEM'S TASK OR JOB UNDER OS/360 MVT, IS DESIGNED TO MONITOR HARDWARE AND SOFTWARE PERFORMANCE OVER A GIVEN PERIOD OF TIME. INPUT TO SLACMON IS THE PARAMETER FIELD ON THE EXECUTE CARD COUPLED WITH THE CORRESPONDING OPERAND IN THE OPERATOR'S START COMMAND TO ALLOW SELECTED FUNCTIONS TO BE PERFORMED. FIVE DATA SETS OPTIONALLY PROVIDE NAMES OF QUEUES, I/O DEVICES, OR MODULES THAT SLACMON WILL MONITOR. OUTPUT CONSISTS OF UP TO 12 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.
4. METHOD OF SOLUTION - MONITORING IS PERFORMED BY COUNTING VARIOUS EVENTS (SVC CALLS, I/O INTERRUPTS) AND BY SAMPLING OTHERS (THE CHANGING OF CONTROL BLOCKS). BECAUSE AS THE NUMBER OF SAMPLES INCREASES THE SAMPLING RESULTS BECOME MORE ACCURATE, USE OF THIS SAMPLING TECHNIQUE MAKES IT POSSIBLE TO OBTAIN A SIGNIFICANT AMOUNT OF PERFORMANCE DATA WITH VERY LITTLE ADDITIONAL SYSTEMS OVERHEAD.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MEANINGFUL REPORTS ARE PREPARED FOR THE DISKS, DRUMS, TAPES, PRINTERS AND READERS IN USE AT THE TIME (1969) THE PROGRAM WAS DEVELOPED. STATISTICS ON NEWER DEVICES SUCH AS BLOCK MULTIPLEXER CHANNELS, RPS FACILITIES, MAY NOT BE MEANINGFUL.
6. TYPICAL RUNNING TIME - SLACMON MAY BE RUN FOR A GIVEN AMOUNT OF TIME OR INDEFINITELY UNTIL STOPPED.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THIS IS VERSION 2.2 OF THE EARLIER SLACMON VERSION 1.2, ALSO KNOWN AS SUPERMON. IT CONTAINS TWO NEW FUNCTIONS -
 - (1) THE ABILITY TO RUN IN AN MFT (WITH SUBTASKING) SYSTEM, AND
 - (2) THE MEASUREMENT OF CERTAIN SYSTEM QUEUE AREA STATISTICS.THESE CHANGES ARE CONTRIBUTIONS FROM THE BANK OF MONTREAL.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1975.
IBM360 VERSION SUBMITTED NOVEMBER 1974.
10. REFERENCE - G. T. SCHARF, SLACMON VERSION 2.2, SLAC MVT SOFTWARE MONITOR, STANFORD CENTER FOR INFORMATION PROCESSING PUBLICATION, SEPTEMBER 1, 1973.
11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - ASSEMBLY LANGUAGE
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 MVT OR MFT.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SLACMCN CONSISTS OF THREE SEPARATE MODULES WHOSE STRUCTURE AND FUNCTIONS ARE OFTEN HIGHLY-DEPENDENT UPON VARIOUS SERVICES PROVIDED BY THE OS SUPERVISOR. MULTITASKING IS USED TO OBTAIN WAIT TIME AND TO PERFORM THE SAMPLING TECHNIQUE. THUS, THE PROGRAM MUST BE RUN UNDER MVT OR MFT WITH SUBTASKING.
15. NAME AND ESTABLISHMENT OF AUTHORS -
AUTHORS: V. ANDROSCIANI, G. MINSHALL,
R. LENERGAN, AND G. T. SCHARF

CONTACT: T. J. BUTLER
STANFORD CENTER FOR INFORMATION PROCESSING
STANFORD LINEAR ACCELERATOR CENTER
STANFORD UNIVERSITY
P. O. BOX 4349
STANFORD, CALIFORNIA 94305
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (6677 CARDS)
CONTROL INFORMATION (JCL 336 CARDS)
REFERENCE REPORT
17. CATEGORY - P
KEYWORDS - PERFORMANCE EVALUATION, SYSTEM CONFIGURATION

1. NAME OR DESIGNATION OF PROGRAM - 6KILER
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - 6KILER WAS DEVELOPED FOR PREDICTIVE AND POST-TEST ANALYSES OF CORE HEAT TRANSFER DURING A LOSS-OF-COOLANT ACCIDENT FOR A GENERAL ELECTRIC BWR/6 TYPE NUCLEAR REACTOR PLANT.
4. METHOD OF SOLUTION - A PSEUDO-TWO-DIMENSIONAL MODEL IN WHICH RADIATION AND CONDUCTION IN THE AXIAL DIRECTION ARE ASSUMED TO BE NEGLIGIBLE IS USED. THE MODEL TREATS INTERCHANGE OF THERMAL RADIATION AMONG SURFACES USING THE NETWORK METHOD OF SPARROW AND CESS. HEAT CONDUCTION IN THE FUEL RODS IS COMPUTED BY NUMERICAL INTEGRATION OF THE ONE-DIMENSIONAL FOURIER HEAT CONDUCTION EQUATION ASSUMING THE TEMPERATURE IS INDEPENDENT OF AXIAL AND ANGULAR POSITION AND THE HEAT GENERATION IN THE HEATED REGIONS IS INDEPENDENT OF POSITION AND TEMPERATURE. TIME-DEPENDENT DECAY HEAT SOURCES ARE CALCULATED BY LINEAR INTERPOLATION FROM A TABLE OF VALUES. THE ZIRCONIUM-STEAM REACTION RATE FOLLOWS THE PARABOLIC RATE LAW. CONVECTION HEAT TRANSFER COEFFICIENTS ARE SUPPLIED BY THE USER.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PROGRAM APPLIES ONLY TO THE GEOMETRY AND MATERIALS OF THE GENERAL ELECTRIC BWR/6 REACTOR CORE.
6. TYPICAL RUNNING TIME - 2 MINUTES ARE REQUIRED TO COMPILE THE PROGRAM AND EXECUTE THE SAMPLE PROBLEM ON AN IBM370/195.
7. UNUSUAL FEATURES OF THE PROGRAM - THIS PROGRAM IS SPECIALIZED TO THE ANALYSIS OF HEAT TRANSFER IN THE GENERAL ELECTRIC BWR/6 TYPE PLANT. HOWEVER, IT IS COMPOSED OF MODULAR SUBROUTINES, EACH WITH A DISTINCT FUNCTION, SUCH AS COMPUTING RADIANT HEAT TRANSFER. SUCH SUBROUTINES MAY BE ADAPTABLE FOR USE IN SOLVING A WIDER RANGE OF PROBLEMS. 6KILER MAINTAINS THE SAME ONE-DIMENSIONAL HEAT CONDUCTION SOLUTION TECHNIQUE FOR THE FUEL PINS AND UTILIZES THE SAME TECHNIQUES AS THE MOXY CODE. HOWEVER, 6KILER GENERATES ITS OWN VIEWFACTOR MATRIX INTERNAL TO THE CODE BASED ON AN 8 X 8 ARRAY OF FUEL RODS, MODIFIES THE RADIATION HEAT TRANSFER MATRIX EACH TIME AN EMISSIVITY CHANGE OCCURS ON FUEL RODS, WATER ROD, OR CANISTER, AND CONSIDERS ROD NUMBER 37, WHICH IS DESIGNATED THE "WATER ROD", TO BE A PASSIVE ELEMENT.
8. RELATED AND AUXILIARY PROGRAMS - MOXY/MOD1 (ACC ABSTRACT 551) IS A PREDECESSOR OF 6KILER.
9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1974.
IBM360 VERSION SUBMITTED APRIL 1974, SAMPLE PROBLEM
EXECUTED BY ACC ON IBM370/195, JUNE 1974.

10. REFERENCES - R. W. GRIEBE, K. D. RICHERT, M. E. RADD, AND C. M. MCSER, 6KILEP, VER 001, A DIGITAL COMPUTER CODE FOR BWR/6 CORE HEAT TRANSFER ANALYSIS, EI 74-5, FEBRUARY 1974.
6KILER ORGANIZATION OF THE CODE AND CODE INPUT, EI MEMORANDUM, APRIL 1974.
11. MACHINE REQUIREMENTS - 240K BYTES OF CORE TO COMPILE, 210K BYTES TO EXECUTE
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL
13. OPERATING SYSTEM CP MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. W. GRIEBE, K. D. RICHERT, M. E. RADD,
AND C. M. MCSER
ENERGY INCORPORATED
P. O. BOX 736
IDAHO FALLS, IDAHO 84501
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1287 CARDS)
SAMPLE PROBLEM (52 CARDS)
CONTROL INFORMATION (JCL 81 CARDS)
SAMPLE PROBLEM OUTPUT (40 SELECTED PAGES)
REFERENCE REPORT AND MEMORANDUM
17. CATEGORY - H
KEYWORDS - HEAT TRANSFER, BWR/6 REACTORS, FUEL ELEMENTS, ZIRCALOY, LOCA, MOXY/MOLU CODES

1. NAME OR DESIGNATION OF PROGRAM - GAMTAB
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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 5% 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.
4. METHOD OF SOLUTION - THE GAMMA RAY DATA IS ARRANGED IN INCREASING ENERGY IN PART 1 AND IN ASCENDING MASS NUMBER OF THE NUCLIDE IN PART 2.
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 JUNE 1974.
IBM36. VERSION SUBMITTED MAY 1974, CORRECTED TO VERSION B JANUARY 1975.
10. REFERENCES - W. W. BOWMAN AND K. W. MACMURDO, RADIOACTIVE DECAY GAMMAS (ORDERED BY ENERGY AND NUCLIDE, ATOMIC DATA AND NUCLEAR DATA TABLES, VOL. 13, NO. 2-3, FEBRUARY 1974.
W. W. BOWMAN AND K. W. MACMURDO, RADIOACTIVE-DECAY GAMMAS, SAVANNAH RIVER LABORATORY MEMORANDUM, MAY 1974.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED -
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
W. W. BOWMAN AND K. W. MACMURDO

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
E. I. DUPONT DE NEMOURS & CO.
SAVANNAH RIVER LABORATORY
AIKEN, SOUTH CAROLINA 29801
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL*
ENERGY DATA (FILE 1 19,416 CARDS)
NUCLIDE DATA (FILE 2 6905 CARDS)
REFERENCES (FILE 3 550 CARDS)
REFERENCE MEMORANDUM
* 2 TAPES IF CARD IMAGE RECORDS, 1 TAPE BLOCKED
17. CATEGORY - Z
KEYWORDS - GAMMA RADIATION, RADIOACTIVITY, ISOTOPES

1. NAME OR DESIGNATION OF PROGRAM - RIGFL4,CHECK4,SUMUP4,LISTF4, PLOTF4,RESEND,CRECT,DICT4,CAREN4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600
3. DESCRIPTION OF PROBLEM OR FUNCTION - THESE PROGRAMS ARE UPDATED VERSIONS OF ENDF/B CHECKING, RETRIEVAL, AND DISPLAY CODES CAPABLE OF PROCESSING THE VERSION-IV DATA FILES.
RIGFL4 RETRIEVES ENDF/B DATA AND CHANGES MODE (PCD-BIN) OR ARRANGEMENT. UPDATED VERSION PROCESSES DECAY DATA (MF=1, MT=457) 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.
4. METHOD OF SOLUTION -
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 OCTOBER 1974.
CDC6600 VERSION SUBMITTED MAY 1974, REPLACED BY REVISED EDITION OCTOBER 1974.
10. REFERENCES - NATIONAL NEUTRON CROSS SECTION CENTER, DESCRIPTION OF THE ENDF/B PROCESSING CODES AND RETRIEVAL SUBROUTINES, BNL-50300 (ENDF-11), SEPTEMBER 1967, REVISED APRIL 1969, REVISED APRIL 1970, REVISED JUNE 1971.

10. REFERENCES (CONTINUED)

H. C. HONECK, SPECIFICATIONS FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066, MAY 1966, REVISED JULY 1967.

M. K. DRAKE, DATA FORMAT AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50274, OCTOBER 1970.

D. OZER AND E. SAPIENZA, DISTRIBUTION OF ENDF/B CHECKING, RETRIEVAL AND DISPLAY CODES, BNL MEMORANDUM, APRIL 8, 1974.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

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

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

NATIONAL NEUTRON CROSS SECTION CENTER
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL

SOURCE DECKS (RIGEL4 2174 CARDS, CHECK4 3707 CARDS, SUMUP4 575 CARDS, LISTF4 3413 CARDS, PLCTF4 4802 CARDS, RESEND 2504 CARDS, CPECT 259 CARDS, DICT4 203 CARDS, CAREN4 1529 CARDS)

REFERENCE REPORT, BNL-50300, AND MEMORANDUM

17. CATEGORY - M

KEYWORDS - DATA PROCESSING, CROSS SECTIONS, GRAPHS, INPUT DATA, LIBRARIES, MAINTENANCE, RETRIEVAL

1. NAME OR DESIGNATION OF PROGRAM - POLLA
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE PROGRAM TRANSFORMS A SET OF R-MATRIX NUCLEAR RESONANCE PARAMETERS INTO A SET OF EQUIVALENT S-MATRIX (OR KAPUR-PEIERLS) RESONANCE PARAMETERS.
4. METHOD OF SOLUTION - THE PROGRAM UTILIZES THE MULTILEVEL FORMALISM OF REICH AND MOORE AND AVOIDS DIAGONALIZATION OF THE LEVEL MATRIX. THE PARAMETERS ARE OBTAINED BY A DIRECT PARTIAL FRACTION EXPANSION OF THE REICH-MOORE EXPRESSION OF THE COLLISION MATRIX. THIS APPROACH APPEARS SIMPLER AND FASTER WHEN THE NUMBER OF FISSION CHANNELS IS KNOWN AND SMALL. THE METHOD IS PARTICULARLY USEFUL WHEN A LARGE NUMBER OF LEVELS MUST BE CONSIDERED BECAUSE IT DOES NOT REQUIRE DIAGONALIZATION OF A LARGE LEVEL MATRIX.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - BY DIMENSION STATEMENTS, THE PROGRAM IS LIMITED TO MAXIMA OF 100 LEVELS AND 5 CHANNELS.
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES LESS THAN ONE MINUTE ON THE IBM360/91.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED NOVEMBER 1974.
IBM360 VERSION SUBMITTED AUGUST 1974, SAMPLE PROBLEM EXECUTED BY ACC OCTOBER 1974 ON IBM370/195.
10. REFERENCES - G. DE SAUSSURE AND R. B. PEREZ, POLLA, A FORTRAN PROGRAM TO CONVERT R-MATRIX-TYPE MULTILEVEL RESONANCE PARAMETERS FOR FISSION NUCLEI INTO EQUIVALENT KAPUR-PEIERLS-TYPE PARAMETERS, ORNL-TM-2590, JUNE 1969.
11. MACHINE REQUIREMENTS - THE PROGRAM REQUIRES 240K BYTES TO COMPILE, 62K BYTES TO EXECUTE.
12. PROGRAMMING LANGUAGE(S) USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE RUNNING TIME INCREASES AS THE RATIO OF AVERAGE WIDTH TO SPACING INCREASES.

15. NAME AND ESTABLISHMENT OF AUTHORS -
G. DE SAUSSURE AND R. B. PEREZ
HCLIFIELD NATIONAL LABORATORY
P. O. BOX X
CAK RIDGE, TENNESSEE 37831
16. MATERIAL AVAILABLE -
SOURCE DECK (232 CARDS)
SAMPLE PROBLEM (107 CARDS)
SAMPLE PROBLEM OUTPUT (4 PAGES)
REFERENCE REPORT
17. CATEGORY - A
KEYWORDS - RESONANCE PARAMETERS, R-MATRIX, KAPUR-PEIERLS,
FORMALISM

1. NAME OR DESIGNATION OF PROGRAM - DE/STEP,INTRP
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6000-7000 (SEE ITEM 14)
3. DESCRIPTION OF PROBLEM OR FUNCTION - DE/STEP,INTRP PERFORMS THE SOLUTION OF AN INITIAL VALUE PROBLEM FOR A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS.
4. METHOD OF SOLUTION - THE NUMERICAL ALGORITHM IS A VARIABLE-ORDER, VARIABLE-STEP ADAMS METHOD WHICH USES A MODIFIED DIVIDED DIFFERENCE REPRESENTATION OF THE PECE FORMULAS AND LOCAL EXTRAPOLATION. (PECE STANDS FOR PREDICT-EVALUATE-CORRECT-EVALUATE). FOUR CODES ARE PROVIDED: THE CORE INTEGRATOR STEP WHICH ADVANCES THE NUMERICAL SOLUTION OF AN EQUATION ONE STEP, AN INTERPOLATION ROUTINE INTRP TO INTERPOLATE THE SOLUTION AND ITS DERIVATIVE AT OUTPUT POINTS, A DRIVER DE WHICH SIMPLIFIES USING THE OTHER CODES FOR ROUTINE PROBLEMS, AND A SUBROUTINE MACHIN FOR CALCULATING THE UNIT ROUNDOFF OF THE MACHINE BEING USED.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE BASIC VERSION IS LIMITED TO THE INTEGRATION OF A MAXIMUM OF 20 EQUATIONS, BUT THE LIMIT CAN BE CHANGED EASILY. THE EXTENDED VERSION USES VARIABLE DIMENSIONING AND HAS NO FIXED LIMIT.
6. TYPICAL RUNNING TIME - LESS THAN 1 MINUTE IS REQUIRED TO COMPILE AND EXECUTE THE SAMPLE PROBLEM.
7. UNUSUAL FEATURES OF THE PROGRAM - THE CODES EMPHASIZE EFFICIENCY IN TERMS OF FUNCTION EVALUATIONS, FLEXIBILITY IN THE INTEGRATION, AND EASE OF USE. THEY DETECT AND DEAL WITH DISCONTINUITIES AND MODERATE STIFFNESS, WARN THE USER OF SEVERE STIFFNESS, DETECT REQUESTS FOR TOO MUCH ACCURACY AND ARE ESSENTIALLY INDEPENDENT OF THE NUMBER AND PLACEMENT OF OUTPUT POINTS. THE CODES ARE WRITTEN IN SINGLE-PRECISION; INSTRUCTIONS FOR CONVERTING THEM TO DOUBLE-PRECISION ARE INCLUDED IN THE REFERENCE REPORT.
8. RELATED AND AUXILIARY PROGRAMS - SUBROUTINE MACHIN, USED TO DETERMINE THE MACHINE-DEPENDENT ROUNDOFF ERROR, IS INCLUDED.
9. STATUS - ABSTRACT FIRST DISTRIBUTED AUGUST 1974.
AUTHOR'S VERSION SUBMITTED MAY 1974, SAMPLE PROBLEM EXECUTED ON IBM370/195 AND ON CDC7600 BY ACC JULY 1974.
10. REFERENCES - L. F. SHAMPINE AND M. K. GORDON, USING DE/STEP,INTRP TO SOLVE ORDINARY DIFFERENTIAL EQUATIONS, REPORT, JULY 1974.
L. F. SHAMPINE AND M. K. GORDON, COMPUTER SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS: THE INITIAL VALUE PROBLEM, W. H. FREEMAN AND COMPANY, SAN FRANCISCO, (IN PRESS).
DE/STEP,INTRP, ACC NO. 640.6600, ACC PROGRAMMING NOTE 75-8, NOVEMBER 19, 1974.

10. REFERENCES (CONTINUED)
OF/STEP, INTRP, ACC NO. 640.360, ACC PROGRAMMING NOTE
75-9, NOVEMBER 19, 1974.
11. MACHINE REQUIREMENTS - FOR EXECUTION OF THE BASIC VERSION: 44K
BYTES (IBM360), 12000 (OCTAL) WORDS (CDC6600).
12. PROGRAMMING LANGUAGE USED - ANSI STANDARD FORTRAN
13. OPERATING SYSTEM OF MONITOR UNDER WHICH PROGRAM IS EXECUTED -
OS/360 (IBM360), SCOPE 3.3 (CDC6600).
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
THE PROGRAMS ARE EXPECTED TO BE MACHINE-INDEPENDENT. HOWEVER,
SUBROUTINES DO AND STEP STORE SEVERAL VARIABLES INTERNALLY BETWEEN
CALLS; THIS ABILITY IS NOT GUARANTEED IN STANDARD FORTRAN. THE
EXTENDED VERSION DOES NOT ASSUME INTERNAL STORAGE, BUT IT IS
UNACCEPTABLE TO THE WATFOR COMPILER (AND POSSIBLY TO OTHERS).
15. NAME AND ESTABLISHMENT OF AUTHORS -
L. F. SHAMPINE AND M. K. GORDON
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (360-1579 CARDS, 6600-1579 CARDS)
SAMPLE PROBLEMS (360-58 CARDS, 6600-60 CARDS)
AUXILIARY PROGRAMS (360-24 CARDS, 6600-25 CARDS)
SAMPLE PROBLEM OUTPUT (1 PAGE)
REFERENCE REPORT AND ACC NOTES
17. CATEGORY - P
KEYWORDS - DIFFERENTIAL EQUATIONS, NUMERICAL CALCULATIONS,
PREDICTOR-CORRECTOR, ADAMS METHODS, INITIAL-VALUE
PROBLEMS

1. NAME OR DESIGNATION OF PROGRAM - SAP4
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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. PRESENTLY, THE PROGRAM CONTAINS THE FOLLOWING ELEMENT TYPES -
 - (A) THREE-DIMENSIONAL TRUSS ELEMENT,
 - (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).
4. METHOD OF SOLUTION - THE FORMATION OF THE STRUCTURE MATRICES IS CARRIED OUT IN THE SAME WAY IN A STATIC OR DYNAMIC ANALYSIS. THE STATIC ANALYSIS IS CONTINUED BY SOLVING THE EQUATIONS OF EQUILIBRIUM FOLLOWED BY THE COMPUTATION OF ELEMENT STRESSES. IN A DYNAMIC ANALYSIS THE CHOICE IS BETWEEN FREQUENCY CALCULATIONS ONLY, FREQUENCY CALCULATIONS FOLLOWED BY RESPONSE HISTORY ANALYSIS, FREQUENCY CALCULATIONS FOLLOWED BY RESPONSE SPECTRUM ANALYSIS, OR RESPONSE HISTORY ANALYSIS BY DIRECT INTEGRATION. TO OBTAIN THE FREQUENCIES AND VIBRATION MODE SHAPES, SOLUTION ROUTINES ARE USED WHICH CALCULATE THE REQUIRED EIGENVALUES AND EIGENVECTORS DIRECTLY WITHOUT A TRANSFORMATION OF THE STRUCTURE STIFFNESS MATRIX AND MASS MATRIX TO A REDUCED FORM. IN THE DIRECT INTEGRATION AN UNCONDITIONALLY STABLE INTEGRATION SCHEME IS USED, WHICH ALSO OPERATES ON THE ORIGINAL STRUCTURE STIFFNESS MATRIX AND MASS MATRIX. IN THIS MANNER THE PROGRAM OPERATION AND NECESSARY INPUT DATA FOR A DYNAMIC ANALYSIS IS A SIMPLE ADDITION TO WHAT IS NEEDED FOR A STATIC ANALYSIS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE CAPACITY OF THE PROGRAM DEPENDS MAINLY ON THE TOTAL NUMBER OF NODAL POINTS IN THE SYSTEM, THE NUMBER OF EIGENVALUES NEEDED IN THE DYNAMIC ANALYSIS AND THE COMPUTER USED. THERE IS PRACTICALLY NO RESTRICTION ON THE NUMBER OF ELEMENTS USED, THE NUMBER OF LOAD CASES OR THE ORDER AND BANDWIDTH OF THE STIFFNESS MATRIX. EACH NODAL POINT IN THE SYSTEM CAN HAVE FROM ZERO TO SIX DISPLACEMENT DEGREES OF FREEDOM. THE ELEMENT STIFFNESS AND MASS MATRICES ARE ASSEMBLED IN CONDENSED FORM. THEREFORE, THE PROGRAM IS EQUALLY EFFICIENT IN THE ANALYSIS OF ONE-, TWO- OR THREE-DIMENSIONAL SYSTEMS.
6. TYPICAL RUNNING TIME - ABOUT 4 MINUTES ARE REQUIRED TO COMPILE THE PROGRAM AND EXECUTE THE SAMPLE PROBLEM ON AN IBM370/195.

7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - SAP4 IS THE LATEST EDITION OF THE SAP SERIES OF PROGRAMS. EARLIER EDITIONS WERE DESIGNATED SAP2 OR SCILDSAP AND SAP3. THIS SAP4 EDITION HAS AVAILABLE A NEW VARIABLE-NUMBER-NODES THICK SHELL AND THREE-DIMENSIONAL ELEMENT, AND OUT-OF-CORE DIRECT INTEGRATION FOR TIME HISTORY ANALYSIS. THE ORIGINAL SAP4 PROGRAM, A CDC VERSION, WAS OBTAINED FROM THE EARTH-QUAKE ENGINEERING RESEARCH CENTER.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1974.
IBM360 VERSION SUBMITTED OCTOBER 1974, REPLACED BY REVISION 8 MARCH 1975, SAMPLE PROBLEMS EXECUTED BY ACC ON IBM370/195.
10. REFERENCES - KLAUS-JURGEN BATHE, EDWARD L. WILSON, AND FRED E. PETERSON, SAP IV, A STRUCTURAL ANALYSIS PROGRAM FOR STATIC AND DYNAMIC RESPONSE OF LINEAR SYSTEMS, EERC 73-11, JUNE 1973, REVISED APRIL 1974.
11. MACHINE REQUIREMENTS - 650K BYTES AND 8 DIRECT ACCESS DEVICES BESIDES THE STANDARD I/O UNITS
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360, OS/370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
STANLEY ZAWADZKI
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (13,700 CARDS)
SAMPLE PROBLEMS (359 CARDS)
SAMPLE PROBLEM OUTPUT (75 SELECTED PAGES)
CONTROL INFORMATION (JCL 25 CARDS)
REFERENCE REPORT
17. CATEGORY - I
KEYWORDS - STRUCTURAL ANALYSIS, 3-DIMENSIONAL, BEAMS, SHELLS, PIPES, MASS MATRICES

1. NAME OR DESIGNATION OF PROGRAM - PROGLOCK
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - PROGLOCK MAKES IT POSSIBLE TO MONITOR THE EXECUTION OF VIRTUALLY ANY OS/MVT, OS/MFT, OR VS2 RELEASE 1.6 LOAD MODULE. THE MAIN REASON FOR USING PROGLOCK 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 - PROGLOCK 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 POST-PROCESSOR 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 PROGLOCK TERMINATES, PRODUCING NO HISTOGRAMS.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM - PROGLOCK CAN BE USED TO MONITOR SOMETHING AS SIMPLE AS A FORTRAN MAIN PROGRAM OR AS COMPLEX AS THE PL/1 COMPILER OR FASP.
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1975.
IBM360 VERSION SUBMITTED NOVEMBER 1974.
10. REFERENCE - R. JOHNSON AND T. JOHNSTON, PROGLOCK USERS GUIDE, USER NOTE 33, SCC007, MARCH 1974, REVISION 4.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASSEMBLY LANGUAGE
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PROGLOCK MONITORING OVERHEAD IS ON THE ORDER OF 6 PERCENT. PROGLOCK CONSISTS OF TWO PROGRAMS PROGTIME AND PROGLOCK. PROGTIME IS AN ASSEMBLER LANGUAGE PROGRAM WHICH USES THE INTERVAL TIMER TO

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
CATCH A PICTURE OF ANY PROGRAM RUNNING UNDER IT AND RECORDS THIS
INFORMATION IN A DATA SET. PROGLOCK 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. P. JOHNSON* AND T. JOHASTON
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 (PROGLOCK 925 CARDS, PROGTIME (MVT & VS2) 823
CARDS, (MFT) 1079 CARDS)
CONTROL INFORMATION (PROGLOCK 27 CARDS, PROGTIME 22 CARDS)
REFERENCE REPORT
17. CATEGORY - P
KEYWORDS - DATA PROCESSING PERFORMANCE

1. NAME OR DESIGNATION OF PROGRAM - NUBOW
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION - A RELAXATION PROCEDURE IS USED TO FIND EQUILIBRIUM POSITIONS OF CONTACTING NODES. REACTOR DUCTS ARE MODELED AS ELASTIC BEAMS WITH LOCAL FLEXIBILITY TREATED BY LINEAR SPRINGS. CONTACT FORCES ARE SET TO ZERO FOR NON-INTERACTING NODES. THE RELAXATION PROCEDURE ADJUSTS THE POSITIONS OF NODES, BOTH INDIVIDUALLY AND IN BLOCKS, UNTIL MECHANICAL EQUILIBRIUM IS ACHIEVED TO WITHIN A SPECIFIED ERROR ON FORCES.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - AN AXISYMMETRIC MODEL IS ASSUMED. FRICTION FORCES ARE NOT INCLUDED. POSSIBLE CONTACT IS ALLOWED ONLY AT SPECIFIED AXIAL LOCATIONS ON THE ASSEMBLIES. THE PROGRAM CURRENTLY IS DIMENSIONED FOR MAXIMA OF 16 ROWS OF BEAMS AND 25 NODES PER BEAM.
6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM, CONSISTING OF TWO COMPLETE RUNS OF SIMILAR SYSTEMS, WAS COMPILED AND EXECUTED ON THE IBM370/195 AS A 1-MINUTE JOB.
7. UNUSUAL FEATURES OF THE PROGRAM - A BUILT-IN PROCEDURE FOR ESTABLISHING RELAXATION BLOCKS USES A RANDOM NUMBER PROCESS TO AVOID RELAXATION DIFFICULTIES ENCOUNTERED AS CONTACT GAPS OPEN AND CLOSE.
8. RELATED AND AUXILIARY PROGRAMS - BOW-V TREATS SIMILAR SYSTEMS, BUT WITH LESS GENERALITY. PARABOW EXTENDS NUBOW TO ALLOW ARBITRARILY MULTI-LINEAR STIFFNESS PARAMETERS FOR SEMI-EMPIRICAL MODELING OF THREE-DIMENSIONAL EFFECTS SUCH AS MIS-ALIGNMENT, CIRCUMFERENTIAL BOW, AND FRICTION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1974.
IBM360 VERSION SUBMITTED SEPTEMBER 1974, REVISED EDITION B SUBMITTED JANUARY 1975, SAMPLE PROBLEM EXECUTED BY ACC JANUARY 1975 ON AN IBM370/195.
10. REFERENCES - G. A. MCLENNAN, NUBOW: A FORTRAN IV PROGRAM FOR THE STATIC ELASTIC ANALYSIS OF BOWED REACTOR CORES, ANL-8068, APRIL 1974.

11. MACHINE REQUIREMENTS - 240K WORDS OF MEMORY ARE REQUIRED TO COMPILE, 130K TO EXECUTE.
12. PROGRAMMING LANGUAGE USED - FORTRAN IV
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360, 270.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHOR -
G. A. MCLENNAN
COMPONENTS TECHNOLOGY DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE -
SOURCE DECK (727 CARDS)
SAMPLE PROBLEM (28 CARDS)
REFERENCE REPORT WITH ERRATA
17. CATEGORY - I
KEYWORDS - REACTORS, 2-DIMENSIONAL ELASTIC STRUCTURAL ANALYSIS

1. NAME OR DESIGNATION OF PROGRAM - GETCCR,FRECCR
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UFN WHICH IT IS OPERABLE - IBM360,370/195
3. DESCRIPTION OF PROBLEM OR FUNCTION - GETCCR AND FRECCR 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.
4. METHOD OF SOLUTION - GETCCR CHECKS TO DETERMINE IF THE DYNAMIC ALLOCATION REQUEST IS REASONABLE, WRITES ANY WARNING OR ERROR MESSAGES, AND CALLS SUBROUTINE ERROR IF THE REQUEST CANNOT BE HONORED. OTHERWISE, IT PROVIDES THE REQUESTED SPACE THROUGH THE GETMAIN MACRO, ALTERS THE TABLES OF THE CALLING PROGRAM AS NECESSARY, AND RETURNS CONTROL TO THE CALLING PROGRAM. FRECCR RELEASES SPACE IN THE SAME GENERAL MANNER BY USE OF THE FREEMAIN MACRO.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - BEFORE THE FORTRAN SUBROUTINE CAN RETURN TO ITS CALLER IT MUST RELEASE ALL CORE STORAGE ALLOCATED TO ANY OF ITS ARGUMENTS.
6. TYPICAL RUNNING TIME - LESS THAN ONE MILLISECOND IS REQUIRED TO ALLOCATE OR RELEASE STORAGE FOR ONE ARRAY.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1974.
IBM360 VERSION SUBMITTED SEPTEMBER 1974. SAMPLE PROBLEM
EXECUTED BY ACC NOVEMBER 1974 ON AN IBM 370/195.
10. REFERENCES - R. C. DUFFEE, FORTRAN DYNAMIC STORAGE ALLOCATION, ORNL-TM-3892, JULY 17, 1972.
11. MACHINE REQUIREMENTS - GETCCR OCCUPIES 1440 (DECIMAL) BYTES OF STORAGE AND FRECCR, 1328 BYTES.
12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASSEMBLY LANGUAGE
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360,370.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE TEST PROGRAM AS CODED OCCUPIES A 240K REGION.

15. NAME AND ESTABLISHMENT OF AUTHOR -
R. C. DURFEE
HOLIFIELD NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 3783J
16. MATERIAL AVAILABLE -
SOURCE DECKS (896 CARDS)
SAMPLE PROBLEM (98 CARDS)
CONTROL INFORMATION (JCL 86 CARDS)
SAMPLE PROBLEM OUTPUT (6 SELECTED PAGES)
REFERENCE REPORT
17. CATEGORY - P
KEYWORDS - DYNAMIC STORAGE ALLOCATION

1. NAME OR DESIGNATION OF PROGRAM - DYNAMIC ANALYSIS OF GASES
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360
3. DESCRIPTION OF PROBLEM OR FUNCTION - THE PROGRAM PROCESSES MASS SPECTRAL DATA TO DETERMINE THE RATE AT WHICH GASES EVOLVE FROM A SOLID SAMPLE AND THE TOTAL QUANTITY OF GAS EVOLVED. CALIBRATION DATA AND MASS-PEAK MEASUREMENTS ARE DESCRIBED AS INPUT DATA. GAS FLOW RATE AND GAS QUANTITY ARE DESCRIBED AS OUTPUT DATA. IT IS USED FOR THE DYNAMIC ANALYSIS OF GASES BY FAST SCANNING MASS SPECTROMETRY. ALTHOUGH WRITTEN FOR DATA OBTAINED FROM A BENDIX MODEL 12-107 TIME-OF-FLIGHT (TOF) MASS SPECTROMETER, IT MAY BE APPLIED TO ANY TYPE OF MASS SPECTROMETER. THE BENDIX MASS SPECTROMETER IS USED TO CONTINUALLY MONITOR GASES EVOLVED DURING VACUUM BAKEOUT OF SOLID SAMPLES. THE TECHNIQUE IS USED TO DETERMINE SURFACE CONTAMINANTS ADSORBED AND TRAPPED GASES AND OTHER VOLATILE OUTGAS PRODUCTS.
4. METHOD OF SOLUTION - THE RATE AT WHICH A GAS EVOLVES FROM A SOLID SAMPLE IS DETERMINED FROM A PEAK-HEIGHT MEASUREMENT AND A FLOW RATE FACTOR. THE ARITHMETIC EXPRESSION FOR GAS FLOW RATE WILL CONTAIN AS MANY CRACKING PATTERN COEFFICIENTS AS NEEDED TO CORRECT THE PARENT PEAK-HEIGHT MEASUREMENT OF THE SAMPLE GAS ANALYZED. THE QUANTITY OF GAS ANALYZED IN MILLIMOLES AND MOLECULES IS DETERMINED BY INTEGRATING THE GAS FLOW RATE OVER THE ELAPSED TIME OF ANALYSIS.
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A TOTAL OF 12 GASES ARE USED IN THE PRESENT STUDY.
6. TYPICAL RUNNING TIME - THE SAMPLE PROGRAM EXECUTES IN A FEW MINUTES.
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS - THE PROGRAM WAS ORIGINALLY WRITTEN FOR USE WITH THE GENERAL ELECTRIC MARK 1 TIME SHARING SERVICE. THIS VERSION IS A MODIFICATION OF ALC-00229 TRANSFERRED FROM THE ALC-COSMIC COLLECTION.
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1974.
GE4.2 MODIFIED VERSION SUBMITTED MAY 1975, REVISED TO RUN ON IBM360 AUGUST 1974, SAMPLE PROGRAM EXECUTED BY ACC.
10. REFERENCES - ROBERT W. LOSER, CARLY A. CHAMBER, EVAIN D. RUBY, A TIME-SHARING FORTRAN PROGRAM FOR THE DYNAMIC ANALYSIS OF GASES BY TIME-OF-FLIGHT MASS SPECTROMETRY, RFP-1455, NOVEMBER 7, 1969.
11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV(G)
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -
IBM360 TSO.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -
15. NAME AND ESTABLISHMENT OF AUTHORS -
R. W. LOSEP, C. A. CHAMBERS, AND F. D. RUPY
THE DCW CHEMICAL COMPANY
ROCKY FLATS DIVISION
P. O. BOX 888
GOLDEN, COLORADO 80401
16. MATERIAL AVAILABLE -
SOURCE DECK (179 CARDS)
SAMPLE PROBLEM (18 CARDS)
REFERENCE REPORT
17. CATEGORY - U
KEYWORDS - GASES, MASS SPECTROMETRY, FLOW RATE

1. NAME OR DESIGNATION OF PROGRAM - COPYCAT
2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370
3. DESCRIPTION OF PROBLEM OR FUNCTION - 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.
4. METHOD OF SOLUTION -
5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF - 32 CATALOGS DEFINED AS INPUT
COPYCAT HAS BEEN DESIGNED FOR A CATALOG SYSTEM WHERE A HIGH LEVEL INDEX NAME, OTHER THAN A CVOL POINTER, MAY ONLY APPEAR IN ONE CATALOG. WHEN A CONFLICT IS FOUND, THE ENTRY FROM THE FIRST DEFINED INPUT CATALOG IS USED. WHEN MORE THAN ONE OUTPUT CATALOG IS PRODUCED, ONE IS DEFINED AS THE MASTER CATALOG AND THE OTHERS AS SECONDARY CATALOGS. COPYCAT MUST BE RUN ONCE TO PRODUCE THE MASTER CATALOG IN MASTER MODE, AND IF THERE ARE SECONDARY CATALOGS, ONCE IN SECONDARY MODE.
6. TYPICAL RUNNING TIME -
7. UNUSUAL FEATURES OF THE PROGRAM -
8. RELATED AND AUXILIARY PROGRAMS -
9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1974.
IBM360 VERSION SUBMITTED AUGUST 1974, REPLACED BY REVISED EDITION B DECEMBER 1974.
10. REFERENCES - DOUGLAS E. ENGERT, COPYCAT - OS CATALOG UTILITY PROGRAM, ANL-8103, MAY 1974.
11. MACHINE REQUIREMENTS -
12. PROGRAMMING LANGUAGE USED - ASSEMBLY LANGUAGE
13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/MVT, OS/MFT, OS/VS1 AND OS/VS2 RELEASE 1.
14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
D. F. ENGERT
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2093 CARDS)
OBJECT DECK (216 CARDS)
DOCUMENTATION (TAPE DESCRIPTION FILE 1, 27 CARDS, REPORT TEXT
FILES 4 AND 5, 112 RECORDS)
REFERENCE REPORT, ANL-8103
17. CATEGORY - P
KEYWORDS - OPERATING SYSTEMS, DATA PROCESSING, UTILITY ROUTINE

VI. LIBRARY PROGRAMS BY PROBLEM CLASSIFICATION

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

4/75

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 APRES2 APRES2 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

4/75

176 RAPTURE **THIS CODE COMPLETES**
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 DCPIE
THE EFFECTS OF -

DCPIE 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.

DDPTE 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 CCMBCC (40.0279) THE PROGRAM PERMITS COMPUTING
AND CONVOLUTING A COMBINATION CROSS SECTION CURVE CCPOSED OF THE
CROSS SECTION CURVES OF A SAMPLE AND UP TO FOUR CONTAMINANTS.

208 TRIX1 TRIX1 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. FISSION 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 BREIT-WIGNER LINE SHAPE IS USED.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

4/75

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 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/XD 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 $1.0/\sqrt{E}$ FOR LEVELS NOT EXPLICITLY CONSIDERED. ALSO THE CROSS SECTION IN THE WINGS OF A NEGATIVE ENERGY RESONANCE, $\text{CONSTANT}/(\sqrt{E}*(E-E_0)^2)$ MAY BE ADDED.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

4/75

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.

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 ANISOTROPIC 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.

4/75

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

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

4/75

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 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 TCR THE TCR 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 1 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.

4175

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.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

4/75

476 GRAMP GRAMP RANDOMLY GENERATES REICH AND MCCREY PARAMETERS FOR MULTILEVEL UNRESOLVED RESONANCES OF FISSILE 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.

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 THRESH THRESH CALCULATES NEUTRON-INDUCED REACTION CROSS SECTIONS FROM 0 TO 20 MEV AND FISSION SPECTRUM AVERAGES FOR NUCLIDES HAVING 21 TO 50 PROTONS. REACTION PRODUCTS CONSIDERED ARE $2n$, $3n$, p , d , t , $He-3$, α , np , nd , nt , $nHe-3$, $n-\alpha$, pn , $2p$, $p-\alpha$, $\alpha-n$, $\alpha-p$, AND dn .

506 JPIXR PIXR COMPUTES SCATTERING CROSS SECTIONS AND RELATED QUANTITIES FOR THE SCATTERING OF NUCLEONS OR COMPOSITE PARTICLES FROM ANY COLLECTIVE NUCLEUS, EVEN OF 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 NUCLEI - 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.

A. CROSS SECTION AND RESONANCE INTEGRAL CALCULATIONS

4/75

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

639 PCLLA 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,
LATTICE AND CELL PROBLEMS

4/75

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 PICCATI EQUATION. THE PROGRAM PROVIDES MICROSCOPIC AND MACROSCOPIC CROSS SECTION AVERAGES OVER THE THERMAL NEUTRON SPECTRUM.

51 FORM THE FORM, OR FORTRAN-MULT, 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 ZCT ZCT 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.

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

4/75

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 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 ELMCE 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 DANCORF 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 DANCORF 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.

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

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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 FL, 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 FL, NU*SIGMA F, MUPAR*SIGMA EL, AND SIGMA R. THE SPECTRUM IS CONSTRUCTED FROM A COMBINATION OF FISSION, F**N, POWER SERIES, MAXWELLIAN OR INPUT SPECTRA.

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. MCNECK 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 MCENERGETIC 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-1 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 OTF (SN TRANSPORT CODE) FORMATS.

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

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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 CON-
FIGURATION. 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
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.

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

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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, PINMAN 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 GARCL 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 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-F (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.

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

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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 $\Sigma_{L,G \rightarrow G+N}$ 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 RECCIL 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 SEARCH (CRITICALITY SEARCH) ARE PROVIDED AS OPTIONS. OUTPUT INCLUDES EDITS IN THE ENERGY RANGE ZERO LESS THAN OR EQUAL TO E LESS THAN OR EQUAL TO 0.625 EV.

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.

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

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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-SOFUCATE) 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/RESQJ/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 P0 THROUGH P3 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.

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

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298 GGC4 THE GGC4 PROGRAM SOLVES THE MULTIGROUP SPECTRUM EQUATIONS WITH SPATIAL DEPENDENCE REPRESENTED BY A SINGLE POSITIVE 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 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 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 OFF 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 P₁, B₁, B₂, OR B₃ 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 P₃, B₀, P₁, OR B₁ 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 2.

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.

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

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307 HWOCC-SAFE HWOCC-SAFE IS A MONTE CARLO THERMAL REACTOR ANALYSIS PROGRAM DESIGNED FOR USE WITH PROPOSED HWOCC 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.

316 GAFGAR/P3T/PROC/TAPCCP 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 FLANGF2(71-1) FLANGF2 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.

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

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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
- (C) COMPUTE K_{EFF} 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, 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 (ACNDARENKO) 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.

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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 EN-
ERGY DETAIL FROM PARAMETRIC FLUX TRAVERSES SUPPLIED AS INPUT AS A
FUNCTION OF THE CORE ABSORPTION AND SCATTER CROSS SECTIONS.

426 PAX03 PAX03 PERFORMS INFINITE MEDIUM, TIME-DEPENDENT CALCULATIONS OF NEUTRON FLUX SPECTRA IN HOMOGENEOUS, HOMOGENEOUS MEDIA. A HARMONY FILE CONTAINING FEW-GROUP MICROSCOPIC AND/OR MACROSCOPIC CROSS SECTIONS FOR P007 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 DCT PROGRAMS.

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

437 ETOG1 TCG1 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 LIBRAR-
IES.

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

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453 RICE THE PROGRAM CALCULATES AN ENERGY EXCHANGE MATRIX WHICH DESCRIBES THE PROBABILITY THAT A NEUTRON WITH ENERGY E WILL PRODUCE A RECCIL ATOM WITH ENERGY T IN A GIVEN MATERIAL. IN ADDITION, THE PROGRAM CAN CALCULATE THE PRIMARY RECCIL 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 SUPERTCG (ACC ABSTRACT 431).

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 COMPLETES 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.

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

4/75

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-REGIONAL TWO-DIMENSIONAL REACTOR DESCRIPTION WITH SEVERAL 0- OR 1-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 LEARGY GROUPS OF CROSS SECTION, SOURCE, AND LEAKAGE DATA OVER AN ENERGY RANGE EXTENDING FROM 10 MEV TO .414 EV. THESE DATA ARE THEN COALESCE INTO BROAD GROUP FORM USING THE FLUXES AND CURRENTS AS WEIGHTING FUNCTIONS.

521 SCCOOL2 SCCOOL2 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.

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.

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

4/75

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 FTOG3 ETCG3 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN ENDF/B VERSION III FORMAT PRODUCING DATA DECKS FOR USE IN GENERATION OF MUFT4, 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 MULTIGROUP CROSS SECTIONS USING ARBITRARY SCATTERING KERNELS. THE PHYSICAL MODEL IS A HOMOGENEOUS, CRITICAL, ONE-DIMENSIONAL BASE SLAB CORE.

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.

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

4/75

596 FNDFB2/GAND2/GFE2 FNDFB2 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 COMPUTA-
TIONS 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/F OR FISSION-SPECTRUM WEIGHTED, ZERO TEMPERA-
TURE, INFINITE DILUTION GROUP-AVERAGED CROSS SECTIONS AND SCATTER-
ING 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 VER-
SION II OR III FORMATS (THE ENDF/B VERSION I FORMAT CAPABILITY OF
THE ORIGINAL GFE CODE IS ALSO RETAINED).

605 GAUSS5 GAUSS5 IS USED TO DETERMINE
GAMMA-RAY ENERGIES AND INTENSITIES FROM SPECTRA OBTAINED WITH A
GE(LI) DETECTOR AND A MULTICHANNEL PULSE-HEIGHT ANALYSIS SYSTEM.

628 ETCT-3 ETCT-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.

C. STATIC DESIGN STUDIES

4/75

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 16 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 HOMOGENEIZED 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 FCG THE FCG 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 HUCKLING 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.

C. STATIC DESIGN STUDIES

4/75

30 PERT PERT IS A PERTURBATION PROGRAM DESIGNED FOR USE WITH THE AIM6 AND FCG PROGRAMS. PUNCHED CARD OUTPUT FROM THESE CODES IS USED AS INPUT TO PERT. USING CROSS SECTION DATA, FLUXES, AND ADJOINT FLUXES, THE RELATIVE 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 EQUIPCISE3 EQUIPCISE3 SOLVES THE TWO-GROUP, TWO-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY.

40 ZOGRAND ZOGRAND SOLVES THE TWO-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 COUPLE 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 $L_{max} = 9$, 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-HAPC-S13 PROGRAM S CONSTRUCTS BILINEARLY COUPLED TIME-VARIANT MULTIENERGY NEUTRON-AND-PROTON 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.

C. STATIC DESIGN STUDIES

4/75

87 EQUIPCISE-3A EQUIPCISE-3A SOLVES THE TWO-DIMENSIONAL TWO-GROUP DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY. IT IS A SLIGHTLY REVISED VERSION OF EQUIPCISE3 (ACC ABSTRACT 39). IN ADDITION TO THE STANDARD OUTPUT, A PICTURE IS 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 FAIR (ACC ABSTRACT 120). ULCER DIFFERS FROM FAIR 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 COMPLETION AND GRAPHICAL DISPLAY.

C. STATIC DESIGN STUDIES

4/75

120 FAIM/FAIMOS FAIM IS A MULTICORP, 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 RADII, 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.

132 W-DSN W-DSN SOLVES THE DISCRETE SN EQUATIONS IN CYLINDRICAL GEOMETRY. THE EIGENVALUE OPTION IS REACTIVITY (KEFF) ONLY. VOLUME DISTRIBUTED SOURCES ARE ALLOWED, BUT NO SURFACE SOURCES.

136 HERFSY3 HERFSY3 SOLVES THE TWO-DIMENSIONAL FEW-GROUP STATIC REACTOR EIGENVALUE PROBLEM USING THE HETEROGENEOUS (SOURCE-SINK OR PFENBURG-GALANIN) FORMALISM. THE SOLUTION YIELDS THE REACTOR K EFFECTIVE AND ABSORPTION REACTION RATES FOR EACH ROD NORMALIZED TO THE MOST ABSORPTIVE ROD IN THE THERMAL LEVEL. EPITHERMAL FISSIONS ARE ALLOWED AT EACH RESONANCE LEVEL, AND LATTICE AVERAGED VALUES OF THERMAL UTILIZATION, RESONANCE ESCAPE PROBABILITY, THERMAL AND RESONANCE ETA VALUES, AND THE FAST FISSION FACTOR ARE CALCULATED. KERNELS IN THE CALCULATION ARE BASED ON AGE DIFFUSION THEORY. BOTH FINITE REACTOR LATTICES AND INFINITELY REPEATING REACTOR SUPERCELLS MAY BE CALCULATED. ROD PARAMETERS MAY BE CALCULATED BY SEVERAL INTERNAL OPTIONS, AND A DIRECT INTERFACE IS PROVIDED TO A HAMMER SYSTEM (ACC ABSTRACT 277) LATTICE LIBRARY TAPE TO OBTAIN CELL PARAMETERS. CRITICALITY SEARCHES ARE PROVIDED ON THERMAL UTILIZATION, THERMAL ETA, AND AXIAL LEAKAGE BUCKLING.

C. STATIC DESIGN STUDIES

4/75

144 DTF THE DTF PROGRAM IS A ONE-DIMENSIONAL MULTIGROUP PROGRAM FOR SOLVING THE NEUTRON TRANSPORT EQUATION. THE PROGRAM CAN DETERMINE THE REGULAR OR ADJOINT SOLUTION FOR SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY. ISOTROPIC OR A FORM OF LINEAR ANISOTROPIC SCATTERING MAY BE CONSIDERED. VARIOUS BOUNDARY CONDITIONS ARE ALLOWED SO THAT CELLS OR TIME-DEPENDENT SOLUTIONS MAY BE OBTAINED USING FINITE AS WELL AS INFINITE CONFIGURATIONS IN THE CASE OF SLABS OR CYLINDERS. THE PROGRAM ALSO CONTAINS A NUMBER OF SEARCH OPTIONS WHEREBY ONE CAN VARY DIMENSIONS OR CONCENTRATIONS TO ARRIVE AT A PREDETERMINED EIGENVALUE. DISTRIBUTED OR SHELL SOURCES MAY BE SPECIFIED AT ANY POSITION WITHIN THE CONFIGURATION. AS OUTPUT THE PROGRAM SUPPLIES THE EIGENVALUE, ANGULAR FLUXES, TOTAL FLUXES, FISSION DISTRIBUTIONS, AND OTHER QUANTITIES. A LIBRARY OF CROSS SECTIONS IS AVAILABLE ON MAGNETIC TAPE. CROSS SECTIONS MAY BE READ FROM THIS LIBRARY TAPE AND/OR FROM CARDS.

148 TOPIC TOPIC SOLVES THE ONE-DIMENSIONAL BOLTZMANN EQUATION IN CYLINDRICAL GEOMETRY WITH UP TO SIX ENERGY GROUPS, 240 SPACE POINTS, 40 REGIONS, AND ANISOTROPIC (P1) SCATTERING.

THE BOUNDARY CONDITIONS FOR EACH GROUP CAN BE INDEPENDENTLY SPECIFIED AND THE FLEXIBILITY OF THE SPECIFICATIONS PERMIT A

- (A) PERFECT MIRROR REFLECTION OR SYMMETRY,
- (B) ISOTROPIC REFLECTION (LAMBERT SURFACE REFLECTION), AND
- (C) ANISOTROPIC DIFFUSE SOURCES BY MEANS OF EITHER
A P1 LEGENDRE SERIES OR A SHORT TABLE OF POINT VALUES FOR
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.

C. STATIC DESIGN STUDIES

4/75

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 2CF 2DF IS A TWO-DIMENSIONAL MULTIGROUP PROGRAM WRITTEN IN FORTRAN FOR SOLVING THE NEUTRON TRANSPORT EQUATION USING THE SN METHOD. THE PROGRAM CAN 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 (P-Z) OR
RECTANGULAR (X-Y) GEOMETRY.

C. STATIC DESIGN STUDIES

4/75

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-CUIP 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 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/GAMBLES5 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.

C. STATIC DESIGN STUDIES

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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 IPM VERSION.

264 VARI-QLIR3 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 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.

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 $KEFF$ OR α , INVERSE PERIOD, VALUE MAY BE SPECIFIED RATHER THAN THE CRITICALITY VALUE, $KEFF = 1$. 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.

C. STATIC DESIGN STUDIES

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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 FISSILE AND FERTILE MATERIALS IN A NUCLEAR REACTOR WHICH WILL YIELD ANY DESIRED POWER DISTRIBUTION DURING THE BURNUP HISTORY OF THE REACTOR CORE. A PCISON AND PCISON DISTRIBUTION SEARCH FOR A DESIRED MULTIPLICATION AND MINIMUM POWER DISTRIBUTION PERTURBATION CAN ALSO BE PERFORMED.

320 TEMCC7 TEMCC7 COMPUTES REACTOR TEMPERATURE COEFFICIENTS.

342 M0648 M0648 SOLVES THE ONE-DIMENSIONAL SLAB TRANSPORT PROBLEM WITH SLOWING DOWN FOR AN ARBITRARY SPATIAL EXTERNAL SOURCE AND ARBITRARY SCATTERING.

358 TWOTRAN2 TWOTRAN2 SOLVES THE TWO-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.

C. STATIC DESIGN STUDIES

4/75

380 GATT GATT IS A THREE-DIMENSIONAL 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 TRIANGULAR MESH IN THE HORIZONTAL MESH PLANES AND ASSUMES A RELATIVELY 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.

398 BE21 BE21 SOLVES THE FEW-GROUP DISCRETE ORDINATES EQUATIONS IN SLAB GEOMETRY. EITHER HOMOGENEOUS OR INHOMOGENEOUS PROBLEMS CAN BE SOLVED.

401 GAMTRI THE HOMOGENEOUS TWO-DIMENSIONAL 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.

430 GAZE2 GAZE2 IS A ONE-DIMENSIONAL, 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 IDENTICAL TO SLAB GEOMETRY EXCEPT WHEN THE ZERO ALBEDO-TYPE TRANSVERSE BOUNDARY CONDITION IS USED.

450 KENO/KENO2 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 USR 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.

C. STATIC DESIGN STUDIES

4/75

459 DCT2DB DCT2DB 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/VIM1X 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.

C. STATIC DESIGN STUDIES

4/75

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-PNVH TWOTRAN-PNVH 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.

608 TRIPLET TRIPLET SOLVES THE TWO-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN PLANAR GEOMETRIES USING A REGULAR TRIANGULAR MESH. REGULAR AND ADJOINT, INHOMOGENEOUS AND HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO VACUUM, REFLECTIVE OR SOURCE BOUNDARY CONDITIONS ARE SOLVED. GENERAL ANISOTROPIC SCATTERING IS ALLOWED AND ANISOTROPIC DISTRIBUTED SOURCES ARE PERMITTED.

C. STATIC DESIGN STUDIES

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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.

625 VARI-1D THE VARI-1D CODE CALCULATES ESTIMATES OF CHANGES IN REACTIVITY WORTHS, KEFF, REACTION RATES, POWER FRACTIONS, PROMPT-NEUTRON GENERATION TIME, DELAYED NEUTRON EFFECTIVENESS, AND FLUX INTEGRAL RATIOS DUE TO CHANGES IN NUCLEAR DATA OR COMPOSITION BY USE OF A VARIATIONAL FORMALISM. THE CODE IS APPLICABLE TO A WIDE RANGE OF REACTOR OR CRITICAL EXPERIMENT DESIGN PROBLEMS AND SENSITIVITY STUDIES.

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

631 RAFFLE-ANC 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.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
REACTOR ECONOMICS

4/75

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 ^{232}Th , ^{238}U , AND A FISSION PRODUCT POISON CHAIN.

99 DDO DIMENSIONAL BURNOUT (DOB) 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.

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 INPLT 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.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND
REACTOR ECONOMICS

4/75

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.

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.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS

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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, 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 MAY BE USED TO ALSO 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. THE IBM360 AND VERSION CAN BE USED TO SOLVE THREE-DIMENSIONAL SYNTHESIS PROBLEMS.

D. DEPLETION, FUEL MANAGEMENT, CCST ANALYSIS, AND
REACTOR ECONOMICS

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301 FREVAP6 THE FREVAP 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 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 PERMITS COMPLETE OR PARTIAL RECYCLING OF MATERIALS. THE SEQUESTERED 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 BARN/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.

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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 ZDB ZDB 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 ABSCISSA (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 EXTRANEEOUS SOURCE.

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.

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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 AVAILABLE 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.

423 DCS DCS 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.

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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 ADJUNCT 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. 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 PWCCST PWCCST 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.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS

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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 DBUFT11 DBUFT11 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 SEARCHES CAN BE PERFORMED DURING BURNUP TO COMPENSATE FOR FUEL DEPLETION AND FISSION PRODUCT GROWTH.

477 3EXT/DEP3 THESE TWO CODES WERE DEVELOPED FOR USE WITH DETAILED REACTOR PHYSICS CALCULATIONS TO OBTAIN 3-DIMENSIONAL XENON TRANSIENT (3EXT) 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.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS

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483 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.

498 CONCEPT3 CONCEPT3 GENERATES A CAPITAL COST ESTIMATE FOR A SELECTION OF SINGLE UNIT AND MULTIPLE UNIT PWR, BWR, CCAL, 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.

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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.

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.

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 K_{EFF} 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 EXTRANEAL SOURCE.

576 GEM GEM IS USED TO PREDICT FUEL CYCLE COSTS FOR ANY TYPE NUCLEAR SYSTEM (I.E., BWR, FTGR, PWR, LMFR, CCFR, . . .). 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 ORCOST ORCOST ESTIMATES DIRECT AND
INDIRECT CAPITAL COSTS OF NUCLEAR AND FOSSIL-FUELED STEAM-ELECTRIC
POWER PLANTS. THE COSTS ARE CALCULATED USING BASE CCST MODELS
WHICH ARE INCLUDED IN THE PROGRAM FOR EACH OF THE FOLLOWING TYPES
OF PLANTS - PWR, BWR, COAL, GAS, AND OIL.

634 REBUS2 REBUS WAS DEVELOPED TO PER-
FORM FUEL CYCLE ANALYSIS OF LMFBR REACTORS. GIVEN ONE OR MORE
SPECIFIED FUEL SUPPLIES FROM OUTSIDE THE SYSTEM, WITH OR WITHOUT
FUEL RECYCLE, REBUS2 COMPUTES THE EQUILIBRIUM OPERATING CONDITIONS
OF A FAST REACTOR WITH OR WITHOUT BURN TIME ADJUSTMENT TO A GIVEN
DISCHARGE BURNUP, WITH OR WITHOUT FRESH CHARGE ENRICHMENT ADJUST-
MENT TO MAINTAIN CRITICALITY, AND WITH OR WITHOUT CONTROL ADJUST-
MENT AT EACH FLUX TIME NODE. THE NON-EQUILIBRIUM PROBLEM IS ALSO
HANDLED, ALTHOUGH FUEL RECYCLE IS NOT ALLOWED.

E. SPACE-INDEPENDENT KINETICS

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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. INPLT AND OUTPUT ARE SIMPLIFIED AND THE POWER, INVERSE PERIOD, FEEDBACKS, AND PRECURSORS 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, WEIGHS POWER, HEAT CAPACITY, AND REACTIVITY IMPORTANCE FOR TWENTY-FIVE OR FEWER REGIONS.

135 TRAFICCORPORATION, COMPLEX TRAN 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 PREVISION 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 (RI02) 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.

E. SPACE-INDEPENDENT KINETICS

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255 RIJ1 RIJ1 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 (GENERAL ATOMIC STABILITY) 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 BLOCST6 BLOCST6 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 GAPCTKIN GAPCTKIN 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 PHENOMENA 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 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 CITTUS-BEELER EQUATION.

363 BLAST BLAST HAS BEEN DEVELOPED TO STUDY ACCIDENT CONDITIONS IN CRITICAL AND SUBCRITICAL THERMAL MULTIPLYING SYSTEMS. THE PROGRAMME 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.

E. SPACE-INDEPENDENT KINETICS

4/75

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 $(K*\beta)/\lambda$ AND REACTIVITY BY MEANS OF THE GARELIS-RUSSELL METHOD, AND REACTIVITIES USING THE GOZANI AND SJOSTRAND METHODS.

491 MCD5 MCD5 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 GREENS 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} .

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.

4/75

102 AX1 AX1 PERFORMS A COUPLED NEU-
TRONICS-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 CONFC 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, CONFC 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 AXI 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.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS

4/75

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, 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.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS

4/75

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.

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.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-
THERMODYNAMICS AND EXCURSION SIMULATIONS

4/75

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 MIGHT 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 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 PRECURSOR 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 (EIGENVALUE) 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.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS

4/75

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 CFXE/INCFXE CFXE 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 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 NCISY1 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.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-
THERMODYNAMICS AND EXCURSION SIMULATIONS

4/75

494 ADFP 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 TEMP-
ERATURE, 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 REXCC-H (RELEASE 1) REXCC-H CALCULATES THE TWO-
DIMENSIONAL HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT
TO A HIGH-ENERGY EXCURSION.

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

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

4/75

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 TIC-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 BLOWDOWN? 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.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

4/75

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 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-FUGUE1 TRANS-FUGUE1 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 WHAM WHAM IS USED TO CALCULATE PRESSURE, VELOCITY, AND FORCE TRANSIENTS IN THE LIQUID-FILLED PIPING NETWORKS. IT CAN BE APPLIED TO MULTI-LOOP, COMPLEX PIPING NETWORKS CONSISTING OF ANY NUMBER OF DEAD ENDS, ELBOWS, ORIFICES, MULTIPLE BRANCH TEES, CHANGES OF FLOW PASSAGE CROSS SECTIONS, CHECK VALVES, PUMPS, PRESSURIZERS OR TANKS, AND EXIT VALVES. HYDRAULIC LOSSES ARE CONSIDERED. TRANSIENTS CAN BE INITIATED EITHER, BY CLOSURE OR BY OPENING OF ONE OR MORE EXIT VALVES (OR BY THE SYSTEM RUPTURE AT ONE OR MORE PLACES), OR BY A PRESCRIBED CHANGE IN THE TANK (OR PRESSURIZER) PRESSURE, OR BY THE PUMP POWER FAILURE. WHAM IS AN EXTENSION OF THE PROGRAM WATER-HAMMER.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

4/75

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 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.

297 CONTEMPT THE CONTEMPT COMPUTER PROGRAM PREDICTS THE PRESSURE-TEMPERATURE RESPONSE OF A DRY WELL CONTAINMENT BUILDING TO A LOSS-OF-COOLANT ACCIDENT. THE CONTAINMENT VOLUME IS SEPARATED INTO A LIQUID REGION AND A VAPOR REGION. EACH REGION IS ASSUMED TO HAVE A UNIFORM TEMPERATURE BUT THE TEMPERATURE OF THE TWO REGIONS MAY BE DIFFERENT. THE CONTAINMENT BUILDING IS REPRESENTED AS CONSISTING OF SEVERAL HEAT CONDUCTING STRUCTURES WHOSE THERMAL BEHAVIOR CAN BE DESCRIBED BY THE ONE-DIMENSIONAL MULTIREGION HEAT CONDUCTION EQUATION. WATER AND ENERGY RATES FROM DISCHARGE OF COOLANT, THE BOILING OF RESIDUAL WATER BY REACTOR DECAY HEAT, THE SUPERHEATING OF STEAM PASSING THROUGH THE CORE, AND METAL-WATER REACTIONS ARE ASSUMED AVAILABLE FROM PREVIOUS CALCULATIONS AND ARE INPUT DATA TO CONTEMPT. PROGRAM OUTPUT INCLUDES CONTAINMENT VOLUME PRESSURE AND TEMPERATURES, TEMPERATURE THROUGH BUILDING STRUCTURES, AND THE AMOUNT OF WATER, VAPOR, AND ENERGY IN THE CONTAINMENT VOLUMES. THE PROGRAM ALSO CALCULATES BUILDING LEAKAGE AND THE EFFECTS OF ENGINEERED SAFEGUARD DEVICES SUCH AS WATER SPRAY AND FAN COOLER SYSTEMS.

328 NURLCC-1.0 NURLCC-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 CHEMLCC2 CHEMLCC2 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/MOD003 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. THIS VERSION OF RELAP4 DOES NOT PROVIDE ALL OF THE SUBROUTINES REQUIRED FOR COMPLIANCE WITH THE AEC'S FINAL RULING ON THE ACCEPTANCE CRITERIA FOR ECC SYSTEMS.

433 CONTEMPT-LT/022 THE CONTEMPT-LT PROGRAM PREDICTS THE PRESSURE-TEMPERATURE RESPONSE OF A DRY WELL OR A DRY WELL WITH VENTS AND PRESSURE SUPPRESSION SYSTEM TO A LOSS-OF-COOLANT ACCIDENT. AN ADDITIONAL DUAL CONTAINMENT COMPARTMENT MAY ALSO BE MODELED IF DESIRED. THE DRY WELL IS SEPARATED INTO A LIQUID REGION AND A VAPOR REGION. EACH REGION IS ASSUMED TO HAVE A UNIFORM TEMPERATURE BUT THE TEMPERATURES OF THE TWO REGIONS MAY BE DIFFERENT. THE CONTAINMENT BUILDING IS REPRESENTED AS CONSISTING OF SEVERAL HEAT CONDUCTING STRUCTURES WHOSE THERMAL BEHAVIOR CAN BE DESCRIBED BY THE ONE-DIMENSIONAL MULTI-REGION HEAT CONDUCTION EQUATIONS. WATER AND ENERGY RATES FROM DISCHARGE OF COOLANT, BOILING OF RESIDUAL WATER BY REACTOR DECAY HEAT, SUPERHEATING OF STEAM PASSING THROUGH THE CORE, AND METAL-WATER REACTIONS ARE ASSUMED AVAILABLE FROM PREVIOUS CALCULATIONS AND ARE INPUT DATA TO THE PROGRAM. PROGRAM OUTPUT INCLUDES CONTAINMENT VOLUME PRESSURE AND TEMPERATURE, TEMPERATURES THROUGH THE BUILDING STRUCTURES, AND THE AMOUNT OF WATER, VAPOR, AND ENERGY IN THE CONTAINMENT VOLUMES. THE PRESSURE SUPPRESSION CALCULATIONS INCLUDE VENT CLEARING AND FLOW OF A TWO-COMPONENT TWO-PHASE WATER-AIR MIXTURE THROUGH THE VENTS, AND A MASS-ENERGY BALANCE IN THE WET WELL. THERE ARE PROVISIONS FOR NORMAL BUILDING LEAKAGE, LEAKAGE FROM PENETRATIONS, A FAN COOLER SYSTEM, AND DRY AND WET WELL SPRAY SYSTEMS.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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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 HAA3 HAA3 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 LOG-NORMAL. THE TIME-DEPENDENT PHYSICAL QUANTITIES COMPUTED ARE (1) PLATED, SETTLED, SUSPENDED, AND LEAKED VOLUME FRACTIONS, (2) GEOMETRIC MEAN DEVIATION, NUMBER CONCENTRATION, AND GEOMETRIC MEAN RADIUS FOR THE LOG-NORMAL DISTRIBUTION OF THE SUSPENDED MATERIAL, (3) THE 50 PERCENT RADIUS (BY MASS) FOR THE SUSPENDED MATERIAL, (4) THE NUMBER AND VOLUME DISTRIBUTIONS (FUNCTIONS OF RADIUS) FOR THE SETTLED, PLATED, AND LEAKED MATERIAL, (5) THE EFFECTIVE RADIUS FOR THE SUSPENDED, SETTLED, AND PLATED MATERIAL.

448 FLASH4 FLASH4 IS USED TO DETERMINE THE TRANSIENT RESPONSE OF A WATER-COOLED REACTOR OR HYDRAULIC SYSTEM TO SEVERE VARIABLE PRESSURE OPERATION.

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.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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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.

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

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

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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.

546 EMERALD THE EMERALD PROGRAM IS DESIGNED FOR THE CALCULATION OF RADIATION RELEASES AND EXPOSURES RESULTING FROM NORMAL AND ABNORMAL OPERATION OF A LARGE PRESSURIZED WATER REACTOR. 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, INCLUDING 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.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

4/75

559 SCFIRE2 1- AND 2-CELL SCFIRE2 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 TEMPERATURE. SCFIRE2 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.

G. RADIOLOGICAL SAFETY, HAZARD AND ACCIDENT ANALYSIS

4/75

600 EGAD FGAD CALCULATES GAMMA DOSE INTEGRALS TO A GROUND LEVEL RECEPTOR, FOR INCREMENTAL VALUES OF THE VERTICAL DISPERSION PARAMETER σ_z , 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.

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 AXTHPM AXTHPM 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.

H. HEAT TRANSFER AND FLUID FLOW

4/75

205 BLOCST5 BLOCST5 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.

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.

H. HEAT TRANSFER AND FLUID FLOW

4/75

272 FIGRC FIGRC CALCULATES THE ONE-DIMENSIONAL STEADY-STATE TEMPERATURE DISTRIBUTION AND TOTAL FUEL SWELLING FOR METAL-CLAD, AXISYMMETRIC, BULK-OXIDE CYLINDRICAL FUEL ELEMENTS. THE FUEL PELLETT 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 FISSIONING RATE. FUEL-CLAD GAP CONDUCTANCE IS A FUNCTION OF GAS COMPOSITION, TEMPERATURE, AND GAP THICKNESS AT OPERATING CONDITIONS. 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 HCT2 HCT2 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/HCH BY MAKING CALLS ON A SUBROUTINE CALLED H0H, 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 BOUNDARY 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 TERMINATED 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 PICOPIC'S 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 TCODEE THE TCODEE 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 PRESSURIZED 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 WASP WASP USES A UNIQUE METHOD TO QUICKLY CALCULATE VARIOUS WATER AND STEAM PHYSICAL PROPERTIES OVER AN EXTREMELY WIDE RANGE.

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 CCBPA3C CCBPA3C CALCULATES THE STEADY-STATE AND TRANSIENT FLOW, ENTHALPY AND PRESSURE DROP IN THE SUBCHANNELS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS DURING BOTH BOILING AND NONBOILING CONDITIONS. THE PROGRAM USES A MATHEMATICAL MODEL THAT INCLUDES THE EFFECTS OF TURBULENT AND DIVERSION CROSSFLOW MIXING BETWEEN THE SUBCHANNELS. A THERMAL MODEL OPTION IS INCLUDED TO CALCULATE RADIAL FUEL TEMPERATURE DISTRIBUTION AS A FUNCTION OF USER-SPECIFIED POWER GENERATION AND HEAT TRANSFER CORRELATIONS. CRITICAL HEAT FLUX CALCULATIONS CAN ALSO BE PERFORMED BY USER OPTION. FORCED CROSSFLOW MIXING DUE TO DIVERTER VANES OR WIRE WRAPS CAN BE CONSIDERED.

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.

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 FLFL 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.

525 CRTHIS/ORTHAT CRTHIS 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.

H. HEAT TRANSFER AND FLUID FLOW

4/75

551 MOXY/MOD1 MOXY COMPUTES HEAT TRANSFER IN A BOILING WATER REACTOR FUEL ELEMENT. CONDUCTION, CONVECTION, AND RADIATION MODES OF HEAT TRANSFER ARE CONSIDERED, AS WELL AS HEAT ADDITION BY METAL-WATER REACTION. CONVECTION HEAT TRANSFER COEFFICIENTS ARE INPUT AS TABULAR FUNCTIONS OF TIME.

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 NCMCGRAPHS 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.

586 PLENUM BULK FLOW DISTRIBUTION IN A CYLINDRICAL REACTOR COOLANT INLET PLENUM IS CALCULATED USING POTENTIAL FLOW THEORY.

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.

H. HEAT TRANSFER AND FLUID FLOW

4/75

618 GAPCON-THERMAL1 THE GAPCON-THERMAL1 PROGRAM PROVIDES A METHOD FOR CALCULATING THE GAP CONDUCTANCE IN OXIDE FUEL PINS. FUEL AND CLADDING TEMPERATURES, AND INTERNAL PRESSURES ARE CALCULATED AS A FUNCTION OF BURNUP FROM INPUT COOLANT CONDITIONS, POWER SHAPES, AND ROD GEOMETRIES.

629 ORRIBLE ORRIBLE IS A GROUP OF PROGRAMS USED TO PREDICT FLOW AND TEMPERATURE DISTRIBUTION FOR STEADY SINGLE-PHASE FLOW THROUGH BUNDLES OF HEATED RODS SEPARATED BY HELICAL WIRE-WRAP SPACERS. ANY COMBINATION OF FLOW SUBCHANNELS CAN BE BLOCKED AT THE INLET. TURBULENT INTERACTION, SWEEPING CROSS FLOW DUE TO THE WIRE WRAP, AND TRANSVERSE THERMAL CONDUCTION ARE CONSIDERED. THE ELEVEN ORRIBLE PROGRAMS IN THE PACKAGE ARE FOR THREE DUCT CONFIGURATIONS OF 19-ROD BUNDLES, AND FOR 37-, 91-, AND 217-ROD BUNDLES IN HEXAGONAL DUCTS. IN THREE VERSIONS, PERIODIC CHANNEL AREA VARIATIONS DUE TO THE WIRE WRAPS MOVING THROUGH CHANNELS AND THE POSSIBILITY OF THE ROD BUNDLE FORMING A HELIX IN THE DUCT ARE CONSIDERED.

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

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES

4/75

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.

87 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, METEORIC 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 DESI 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.

4175

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

329 M0457(PIPE) PIPE PERFORMS AN ELASTIC
STRESS ANALYSIS OF A 3-DIMENSIONAL PIPING STRUCTURE WITH THERMAL
STRESSES, REDUNDANT LCCPS, 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 SEG-
MENTS. 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.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES

4/75

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. 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 BCW2 BCW2 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.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES

4/75

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 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.

402 SABCR4 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.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS,
STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES

4/75

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.

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 LIFE1 LIFE1 IS DESIGNED TO PREDICT THE IN-PILE BEHAVIOR OF CYLINDRICAL FAST REACTOR FUEL ELEMENTS. ASSUMING AXIAL SYMMETRY, THE GENERALIZED PLANE-STRAIN ANALYSIS COMBINES MODELS FOR FUEL RESTRUCTURING, MIGRATION OF FUEL CONSTITUENTS, FUEL SWELLING DUE TO ACCUMULATION OF FISSION PRODUCTS, FISSION GAS RELEASE, FCT PRESSING OF THE FUEL, AND CLAD SWELLING DUE TO VOID NUCLEATION AND GROWTH. AN ITERATIVE PROCEDURE ALLOWS THE CODE TO COMPUTE THE DETAILED THERMAL AND MECHANICAL RESPONSE OF THE FUEL ELEMENT DURING ANY SPECIFIED HISTORY OF NORMAL REACTOR POWER CYCLING. UP TO 10 AXIAL SECTIONS ARE ALLOWED TO ACCOUNT FOR VARIATIONS IN POWER AND COOLANT TEMPERATURE, AND AN OPTION IS INCLUDED FOR TREATMENT OF ENCAPSULATED ELEMENTS.

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.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS,
STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES

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.

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.

1. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS,
STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES

4/75

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.

597 MATUS MATUS PERFORMS SMALL-STRAIN ELASTIC ANALYSIS OF THREE-DIMENSIONAL SOLIDS.

598 PELEN PELEN SOLVES A TWO-DIMENSIONAL, AXISYMMETRICAL MODEL OF A FUEL PELLET AND CLAD ELEMENT FOR THE TEMPERATURE, STRESS, AND DEFORMATION THROUGHOUT A TIME HISTORY. 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 CONFIGURATION, (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 GEOMETRICAL 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 ADJACENT FUEL PELLETS AND/OR THE FUEL AND CLAD.

604 TCB01 A TUBE UNDER EXTERNAL PRESSURE, 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 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 SUBROUTINES IN THE PROGRAM.

J. GAMMA HEATING AND SHIELD DESIGN

4/75

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 LIPRECANI LIPRECANI 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 OPTICN TO THE EXTENT THAT AN INFINITE SLAB MAY BE APPROXIMATED BY A CYLINDER OF LARGE RADIUS). THE CODE MAY BE USED WITH A MCNC-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,
- (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 SHOF THE SHOF 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.

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 -

$$S = S0 + S1(A) * S2(B) * S3(C) + S4(A, B) * S3(C) + S5(A, C) * S2(B) + S6(B, C) * S1(A) + S7(A, B, C)$$

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.

4

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 TRIANGULAR-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.

L. DATA PREPARATION

4/75

189 SNC
FOR DSN AND TDC.

CALCULATION OF SN CONSTANTS

193 CSP2A THIS CODE PREPARES 100 GROUP FORWARD AND ADJOINT MACROSCOPIC MIXTURE CROSS SECTIONS FOR SN TYPE CODES. THE 100 GROUP MICROSCOPIC CROSS SECTIONS ARE TAKEN FROM THE CROSS SECTION TAPE WRITTEN BY THE CODE CSP1. THE OUTPUT OF CSP2A IS IN THE FORM OF TWO TAPES, ONE CONTAINING THE FORWARD AND THE OTHER THE ADJOINT MACROSCOPIC CROSS SECTIONS. THE CROSS SECTIONS ARE ALSO PRINTED, IF DESIRED.

194 CSP1 THIS CODE PREPARES 100 GROUP MICROSCOPIC CROSS SECTIONS FOR SN TYPE REACTOR CODES, USING THE GAM2 NUCLEAP DATA TAPE FOR THE CROSS SECTION DATA FOR THE FIRST 99 GROUPS. THE DATA FOR GROUP 100 IS PART OF THE PUNCHED CARD INPUT. THE 100 GROUP SN CROSS SECTIONS, PREPARED BY THE CODE, ARE WRITTEN ON TAPE AND PRINTED, IF DESIRED. THE CROSS SECTIONS ARE FOR THE ISOTROPIC OPTION OF THE SN CODES. THE DIAGONAL TRANSPORT APPROXIMATION HAS BEEN USED IN CALCULATING THE TRANSPORT AND IN-GROUP SCATTERING CROSS SECTIONS. THE CORRECTION TERM USED TO CALCULATE THESE TWO CROSS SECTIONS IS SIMPLY $1/3$ OF THE P_1 SCATTERING CROSS SECTION. THE NUMBER OF OUT-OF-GROUP SCATTERING TERMS IS OPTIONAL. WHEN LESS THAN THE NUMBER APPEARING ON THE GAM2 TAPE ARE REQUESTED, THE REMAINING TERMS, FOR A GIVEN SOURCE GROUP, ARE SUMMED AND ADDED TO THE LAST DOWN-SCATTERING TERM SAVED. WHEN CROSS SECTIONS ARE LISTED IN THE SN FORMAT, IT IS POSSIBLE THAT ONE OR MORE INTERMEDIATE DOWN-SCATTERING TERMS WILL BE ZERO. WHEN THIS SITUATION ARISES, THE CODE WILL REPLACE THESE INTERMEDIATE ZEROS WITH THE QUANTITY $1.0 \times 10^{-(20)}$.

218 GAVER GAVER CALCULATES GROUP AVERAGED CROSS SECTIONS FROM POINTWISE CROSS SECTION DATA FOR THE GAM2 99 FINE-GROUP LIBRARY. THE INPUT DATA ARE USED TO OBTAIN A SET OF INTERPOLATED CROSS SECTIONS, WHERE 20 INTERPOLATED CROSS SECTIONS ARE OBTAINED FOR EACH FINE GROUP. WHERE INPUT DATA DO NOT COVER THE FULL RANGE OF A FINE GROUP, THE GROUP-AVERAGED CROSS SECTION IS SET TO ZERO.

234 OPC OPC 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

4/75

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 SEALSHLL2 (ACC ABSTRACT 282) INPUT DATA.

406 DATATRAN 2-D GEOMETRY INPUT THIS SERIES OF DATATRAN MODULES IS DESIGNED TO FACILITATE THE PREPARATION OF GEOMETRIC INPUT TO 2-DIMENSIONAL FINITE DIFFERENCE PROGRAMS FROM DATA READILY TRANSCRIBED FROM ENGINEERING DRAWINGS AND TO CHECK AND EDIT THE INPUT DATA GENERATED.

530 GENRD GENRD WILL READ AND PROCESS FREE-FORMAT NUMERIC AND HOLLERITH INPUT DATA FROM CARDS.

533 ARC(NUI002) BCD INPUT PROCESSOR THE MODULE ARC(NUI002) 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

4/75

612 QMESH,RENUM QMESH GENERATES MESHES HAVING QUADRILATERAL ELEMENTS ON ARBITRARILY SHAPED TWO-DIMENSIONAL (PLANAR OR AXI-SYMMETRIC) 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

4/75

159 MCMUS 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-863 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

4/75

271 CLIP CLIP IS THE CROSS SECTION LIBRARY PREPARATION AND MAINTENANCE PROGRAM FOR FORM AND THREDES.

350 ETOE ETCE (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.

351 ECSIL ECSIL (EXPERIMENTAL CROSS SECTION INFORMATION LIBRARY) IS A SYSTEM FOR THE STORAGE, RETRIEVAL, AND DISPLAY OF EXPERIMENTAL NEUTRON DATA. THE HEART OF THE ENTIRE SYSTEM IS THE COLLECTION OF DESIGNATORS USED TO IDENTIFY THE TYPE OF NEUTRON DATA, E.G., WHETHER THE MEASUREMENT IS A FISSILE CROSS SECTION, AN ANGULAR DISTRIBUTION FOR EMERGENT NON-ELASTIC NEUTRONS BETWEEN TWO NEUTRON ENERGIES, ETC. THERE ARE THREE DICTIONARIES USED FOR INPUT TO THE DATA FILE - ONE FOR THE REACTION-TYPE DESIGNATOR, ONE FOR THE STATUS OF THE DATA, AND ONE TO FLAG THE PROGRAM TO PERFORM CERTAIN CONVERSIONS. EXPERIMENTAL NEUTRON DATA ARE, IN GENERAL, COMPOSED OF TWO INTERDEPENDENT, BUT LOGICALLY SEPARABLE PARTS, THE BIBLIOGRAPHIC INFORMATION AND THE ACTUAL EXPERIMENTAL VALUES. THE REFERENCE ACCESSION NUMBER, WHICH IS ASSIGNED TO A REFERENCE AND ITS ASSOCIATED SET OF DATA AS THEY ARE ACQUIRED, SERVES AS A LINK BETWEEN THE BIBLIOGRAPHIC AND THE EXPERIMENTAL DATA FILES. AFTER A REFERENCE ACCESSION NUMBER IS ASSIGNED TO A NEW REFERENCE, THE FOLLOWING INFORMATION IS ENTERED INTO THE BIBLIOGRAPHIC FILE - THE COMPLETE BIBLIOGRAPHIC CITATION, THE LABORATORY WHERE THE MEASUREMENT WAS PERFORMED, A BRIEF DESCRIPTION OF THE EXPERIMENTAL TECHNIQUE, CORRECTIONS THAT HAVE BEEN MADE TO THE RESULTS, AND NORMALIZATIONS, IF ANY. IN ADDITION, ANY CHANGES MADE TO THE DATA (RENORMALIZATIONS TO BETTER STANDARDS, CORRECTIONS, ETC.) ARE RECORDED HERE. SUPPLEMENTARY REFERENCES ARE CARRIED ALONG AS SEE ALSO'S.

375 SCORE3 SCORE IS AN INTERACTIVE NEUTRON CROSS SECTION EVALUATION SYSTEM.

384 CHECKER/CRECT/DAMMET/PLCTFB/ THIS PACKAGE OF FIVE PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B (EVALUATED NUCLEAR DATA FILE VERSION B) VERSION 1 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 DATATRAN DATATRAN SUPPLIES A LINKAGE SYSTEM FOR MODULARIZED PROGRAMS, ENABLES A HIERARCHICAL NAMING TECHNIQUE, AND SIMPLIFIES HANDLING OF STRUCTURED DATA LISTS.

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.

M. DATA MANAGEMENT

4/75

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.

M. DATA MANAGEMENT

4/75

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 (BCC-BIN) OR ARRANGEMENT. UPDATED VERSION PROCESSES DECAY DATA (MF=1, MT=457) 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.

PLOT4 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.

4/75

207 CROSSPLOT/CROSSPLOT DATA TAPE AUTOMATIC PLOTS ARE GENERATED
FROM NEUTRON CROSS SECTION DATA.

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.

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.

N. SUBSIDIARY CALCULATIONS

4/75

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.

606 GAPER1D 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.

O. EXPERIMENTAL DATA PROCESSING

4/75

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.

D. EXPERIMENTAL DATA PROCESSING

4/75

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 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 (COMPUTER CODE FOR REDUC 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 LOSSES 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.

O. EXPERIMENTAL DATA PROCESSING

4/75

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 KNCLLS 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.

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 (ATCM PER CENT FISSION AND MW/D/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 TCAD 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.

D. EXPERIMENTAL DATA PROCESSING

4/75

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.

421 MICHRO 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 GSSLRN18 GSSLRN18 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.

O. EXPERIMENTAL DATA PROCESSING

4/75

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.

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 $Y = A * \text{EXP}(BX)$
- (3) COSINE $Y = A * \text{CCS}(B(X+C))$
- (4) SERIES OF CUBICS $Y = A(J) + B(J) * X + C(J) * (X^{**}2) + D(J) * (X^{**}3)$
- (5) FOURIER SERIES

62 LCS 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 FLOCC 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

$$Y(K) = \text{SUMMATION OVER } J \text{ OF } A(J) * \text{EXP}(-\text{LAMBDA}(J) * K).$$

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 FIS-SILE 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.

496 KAPLPLCT KAPLPLOT IS THE SET OF STANDARD CALCOMP SUBROUTINES WRITTEN AT KNOX 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.

SPLOT CAUSES THE PEN TO MOVE TO COORDINATES WHICH ARE OBTAINED BY APPLYING PSCALE SCALE FACTORS TO USER DATA.

XCPLLOT AND YCPLLOT CAUSE ALPHABETIC INFORMATION TO BE WRITTEN PARALLEL TO THE DIRECTION OF THE ABSCISSA AXIS, XCPLLOT, OR THE ORDINATE AXIS, YCPLLOT.

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 REL01 REL01 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 FOR THE CONTINUOUS TRANSIENT SOLUTION OF SYSTEMS OF ORDINARY 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 ERPCR 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. F4TRIC PROVIDES THE NAME OF THE PROGRAM WHICH CALLED ERRSYS.

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 .SPFC.

FSUP PERMITS THE USER TO SUPPRESS A FLOATING-POINT NUMBER OR BINARY CONFIGURATION WHEN PRINTING OR PUNCHING WITH FORTRAN I/C.

FSUPC IS CALLED TO DISABLE THE SUPPRESS FUNCTION PERFORMED BY FSUP AND RETURN TO NORMAL FORTRAN I/C 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/C.

ISUPC IS CALLED TO DISABLE THE SUPPRESS FUNCTION PERFORMED BY ISUP AND RETURN TO NORMAL FORTRAN I/C 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.

LOC4 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, PCSWDS, POSLIN, POSTMM, PCSASN, POSPOS, PRID, PWID, POSTSF, PCSTSB, PCSTRB, 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.

PLOTFC PROVIDES A SERIES OF CALCOMP PLOTTER ROUTINES. THESE INCLUDE PENSET, PSCALE, SPLOT, IPLOT, IDPLCT, XCPLCT, YCPLCT, PMARK, AND PENEND.

PRNTHD CAUSES A PRINTER OUTPUT HEADING TO BE WRITTEN AT THE TOP OF A NEW PAGE.

PEREAD ALLOWS THE USER TO RE-READ (RE-FORMAT) THE LAST BCD RECORD READ IN, UNDER A DIFFERENT FORMAT CONTROL. CCNVRT PERMITS 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, ROBT, WTBT, SBTF, SBTFB, 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.

FLGECF WHICH IS USED TO PROCESS END-OF-FILE CONDITIONS.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

4/75

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 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 TRIDIAGONAL SYMMETRIC, COMPLEX GENERAL AND COMPLEX HERMITIAN MATRICES. THE INDIVIDUAL SUBROUTINES ARE -

IDENTIFICATION	DESCRIPTION
BALANC E2F269	BALANCE A REAL GENERAL MATRIX
BALBAK E2F270	BACK TRANSFORM VECTORS OF MATRIX FORMED BY BALANC
CBAL E2F271	BALANCE A COMPLEX GENERAL MATRIX
CBABK2 E2F272	BACK TRANSFORM VECTORS OF MATRIX FORMED BY CBAL
ELMHES E2F273	REDUCE REAL MATRIX TO REAL HESS. (ELEMENTARY)
ELMBAK E2F274	BACK TRANSFORM VECTORS OF MATRIX FORMED BY ELMHES
ORTHES E2F275	REDUCE REAL MATRIX TO REAL HESS. (ORTHOGONAL)
ORTBAK E2F276	BACK TRANSFORM VECTORS OF MATRIX FORMED BY ORTHES
TRED1 E2F277	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
TRED2 E2F278	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
TRBAK1 E2F279	BACK TRANSFORM VECTORS OF MATRIX FORMED BY TRED1
FIG1 E2F280	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
BAKVEC E2F281	BACK TRANSFORM VECTORS OF MATRIX FORMED BY FIG1
COMHES E2F282	REDUCE COMPLEX MATRIX TO COMPLEX HESS.
CCMBAK E2F283	BACK TRANSFORM VECTORS OF MATRIX FORMED BY COMHES
HTRIDI E2F284	REDUCE HERMITIAN MATRIX TO SYM. TRIDIAG.
HTRIBK E2F285	BACK TRANSFORM VECTORS OF MATRIX FORMED BY HTRIDI
HQR E2F286	FIND ALL VALUES OF REAL HESS. MATRIX
HQR2 E2F287	FIND ALL VALUES/VECTORS OF REAL HESS. MATRIX
INVIT E2F288	FIND SOME VECTORS OF REAL HESS. MATRIX
TQL1 E2F289	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
TQL2 E2F290	FIND ALL VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
IMTQL1 E2F291	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
IMTQL2 E2F292	FIND ALL VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
TSTURM E2F293	FIND SOME VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
BISECT E2F294	FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
COMLR E2F295	FIND ALL VALUES OF COMPLEX HESS. MATRIX
COMLR2 E2F296	FIND ALL VALUES/VECTORS OF COMPLEX HESS. MATRIX
CINVIT E2F297	FIND SOME VECTORS OF COMPLEX HESS. MATRIX
RATOR E2F298	FIND EXTREME VALUES OF SYM. TRIDIAG. MATRIX
ELTRAN E2F220	ACCUMULATE TRANSFORMATIONS FROM ELMHES (FOR HQR2)
ORTRAN E2F221	ACCUMULATE TRANSFORMATIONS FROM ORTHES (FOR HQR2)
FIGI2 E2F222	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
TINVIT E2F223	FIND SOME VECTORS OF SYM. TRIDIAG. MATRIX
EISPAC E2F299	CONTROL PROGRAM FOR EISPACK

541 WSP-HASP/DCS THE WSP (WORK STATION PACKAGE) IS A MODIFICATION OF THE STANDARD HASP/RMT360 PACKAGE SUPPLIED BY IBM AND RUNS ON A MULTIPROGRAMMED DOS SYSTEM/360/3C USING MULTI-LEAVING AND BINARY SYNCHRONOUS COMMUNICATIONS TO COMMUNICATE WITH A SYSTEM/360/195/ASP CENTRAL CPL.

P. GENERAL MATHEMATICAL AND COMPUTING SYSTEM ROUTINES

4/75

556 KEELE KEELE IS A LINEARLY CON-
STRAINED 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.

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 TINVT	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 TRPAK3	BACKTRANSFORM VECTORS TRED3 FORMED MATRIX
F250S F FRANCI	EIGENVALUES OF A REAL MATRIX
F251S F FRANCC	EIGENVALUES OF COMPLEX MATRICES
F252S F GEIGFN	GENERALIZED SYMMETRIC EIGENPROBLEM
F255S F SDIAG	EIGENSYSTEM OF REAL SYM. CP 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 JACCB1	EIGENSYSTEM OF REAL MATRICES
F261S F EIGINV	INVERSE EIGENVALUE PROBLEM
F262S F VEC5	EIGENVECTORS OF PENTADIAG. SYM. MATRICES
F263S F BANDRC	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 CHAL	BALANCE A COMPLEX GENERAL MATRIX
F272S F1 C9ABK2	BACKTRANSFORM VECTORS CEAL FORMED MATRIX
F273S F1 ELMHES	REDUCE REAL MATRIX TO REAL HESS. (ELEM.)
F274S F1 ELMBAK	BACKTRANSFORM VECTORS ELMHES FORMED MAT.
F275S F1 ORTHES	REDUCE REAL MAT. TO REAL HESS. (ORTHOG.)
F276S F1 CRTBAK	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 HQP	FIND ALL VALUES OF REAL HESS. MATRIX

F287S F1 HQP2	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 RATCR	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 CHCLLU,CHOLEQ	SYM. DECOMP. OF POS. DEF. BAND MATRICES
F453S F MATINC	INVERSION OF COMPLEX MATRICES
F454S F CRCUT	SOLUTION OF SIMULTANEOUS LINEAR EQUATIONS
F455S F CROUTC	SOL. OF SIMULTANEOUS COMPLEX LINEAR EQNS.
F456S F1 DIAG	INTEGER PRESERVING GAUSSIAN ELIMINATION

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, ICR, AND OOR 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 SYSCUT 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.

INFILO 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 FIOSET ROUTINE IS USED TO OVERRIDE THE FORTRAN CONVENTION FOR NAMING DC CARDS.

RENTYM GIVES THE USER ACCESS TO HIS UNUSED CPU TIME.

THE STANDARD CALCCMP 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.

F222A F4	SMEVAL	EIGENVALUE ROUTINE--REAL SYMMETRIC MATRIX
F223A F4	SMHHTR	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--CMPLX HERMITIAN MTRX
F227A F4	HMHHTR	TRIDIAGONALIZE COMPLEX HERMITIAN MATRIX
F228A F4	HMEVEV	EIGENVAL/EIGENVEC ROUT. FOR HERMITIAN MTRX
F229A F4	PROHHH	CPUTE TRANSFORM TO TRIDIAG. HERMITIAN MTRX
F230A F4	BISFCT	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 CCM	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 CMPLX LIN. SYST. BY ITERATIVE REFINEMENT
F418A CCM	FACTTD	LU DECOMP. OF DIAG. DOM. TRIDIAG. MATRIX
F419A CCM	SOLDOM	SOLVE DIAG. DOMINANT TRIDIAG. LINEAR SYSTEM
G601A F4	SPCTRL	SPECTRAL ANALYSIS OF TIME SERIES
G602A F4	ACFCN	AUTOCOVARIANCE/AUTOCORRELATION FUNCTION
G603A F4	WINDOW	LAG-WINDOW GENERATOR
G604A F4	PWRSPCT	POWER SPECTRUM COMPUTATION
I401A F4	LOAD	LOAD FORTRAN IV FORMAT FREE INPUT
J506A CCM	ADV	ADVANCE FILM
J510A F4	ASCL	AUTOMATIC GRAPH SCALING
J516A CCM	PLT	PLOT A POINT
J517A CCM	PRV	DRAW VECTOR
J518A CCM	GXA	GENERATE X OR Y AXIS
J520A CCM	TSP	TYPE SPECIFIC POINT
J521A CCM	TCP	TYPE CURRENT POINT
J522A CCM	TSPV	TYPE SPECIFIED POINT VERTICALLY
J523A CCM	FRAME	DRAW FRAME
J524A CCM	STB	STORE WORD IN BUFFER
J526A F4	CONVRT	CONVERT TO 4020 COORDINATE
J527A F4	TCR	TEST COORDINATE FOR RANGE
J528A CCM	DGA	DEFINE GRAPH AREA
J529A F4	DLNIN	DRAW LINEAR-LINEAR GRID
J530A F4	DLNLG	DRAW COMBINATION OF LINEAR & LOG GRIDS
J533A F4	SILIN	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 CCM	WLCH	WRITE LARGE CHARACTERS HORIZONT. OR VERT.
J562A F4	PLQJB	STANDARDIZED PLOT ON FILM
J565A CCM	RS4020	DOUBLE BUFFER FILM OUTPUT
J567A F4	DLCH	DRAW LARGE CHARACTERS
J569A F4	COLOR	COLOR
J592A F4, CCM	PICTURE	PICT-PERSPEC PLOTS, HIDE LINES REMOVED, COLOR
K203A CCM	ECR	ECR READS ONE WORD FROM ECS
K204A CCM	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, CCM	SEARCH	BINARY SEARCH THROUGH EXTENDED CORE STORAGE
M401A CCM	SHIFT	SHIFT WORD W/C ZERO END AROUND OR SIGN EXT.
M403A CCM	PUTFCH	PUTS & FETCHES CHARACTERS
N103A F4	LAPRT	LOS ALAMOS ABCRTER & MESSAGE PRINTER

Q408A CCM	RWPPU	READ/WRITE BINARY PRU (PHYSICAL RECCRD)
Q409A F4	ECSBUFO	DATA TRANSFER FROM ECS TO FILE & VICE VERSA
W113A CCM	OPEN	OPEN & CLOSE FILES
N103A F4	LABRT	LOS ALAMOS ABORTER & MESSAGE PRINTER

635 SLACMON SLACMON, OPERATING AS A SYSTEM'S TASK OR JOB UNDER OS/360 MVT, IS DESIGNED TO MONITOR HARDWARE AND SOFTWARE PERFORMANCE OVER A GIVEN PERIOD OF TIME. INPUT TO SLACMON IS THE PARAMETER FIELD ON THE EXECUTE CARD COUPLED WITH THE CORRESPONDING OPERAND IN THE OPERATOR'S START COMMAND TO ALLOW SELECTED FUNCTIONS TO BE PERFORMED. FIVE DATA SETS OPTIONALLY PROVIDE NAMES OF QUEUES, I/O DEVICES, OR MODULES THAT SLACMON WILL MONITOR. OUTPUT CONSISTS OF UP TO 12 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 DE/STEP,INTRP PERFORMS THE SOLUTION OF AN INITIAL VALUE PROBLEM FOR A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS.

642 PROGLCK PROGLCK MAKES IT POSSIBLE TO MONITOR THE EXECUTION OF VIRTUALLY ANY OS/MVT, CS/MFT, OR VS2 RELEASE 1.6 LOAD MODULE. THE MAIN REASON FOR USING PROGLCK IS TO FIND OUT WHICH PORTIONS OF A CODE USE MOST OF THE CPL 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 CPL TIME BY 10 TO 30 PERCENT WITHOUT CHANGING THE PROGRAM'S FUNCTION.

644 GFTCOR,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 CS 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. MCEL 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.

Q. MATERIALS

4/75

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.

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.

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 TCPLYR2 TCPLYR2 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.

645 DYNAMIC ANALYSIS OF GASES THE PROGRAM PROCESSES MASS SPECTRAL DATA TO DETERMINE THE RATE AT WHICH GASES EVOLVE FROM A SOLID SAMPLE AND THE TOTAL QUANTITY OF GAS EVOLVED. CALIBRATION DATA AND MASS-PEAK MEASUREMENTS ARE DESCRIBED AS INPUT DATA. GAS FLOW RATE AND GAS QUANTITY ARE DESCRIBED AS OUTPUT DATA. IT IS USED FOR THE DYNAMIC ANALYSIS OF GASES BY FAST SCANNING MASS SPECTROMETRY. ALTHOUGH WRITTEN FOR DATA OBTAINED FROM A BENDIX MODEL 12-107 TIME-OF-FLIGHT (TOF) MASS SPECTROMETER, IT MAY BE APPLIED TO ANY TYPE OF MASS SPECTROMETER. THE BENDIX MASS SPECTROMETER IS USED TO CONTINUALLY MONITOR GASES EVOLVED DURING VACUUM BAKEOUT OF SOLID SAMPLES. THE TECHNIQUE IS USED TO DETERMINE SURFACE CONTAMINANTS ADSORBED AND TRAPPED GASES AND OTHER VOLATILE OUTGAS PRODUCTS.

V. PARTICLE ACCELERATORS AND HIGH VOLTAGE MACHINES

4/75

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-C 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 PRE-DUCTION 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.

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

4/75

561 TOKMINA/TOKMINA2 TOKMINA FINDS THE MINIMUM MAGNETIC FIELD, BM, REQUIRED AT THE TOROIDAL COIL OF A TOKAMAK TYPE FUSION REACTOR WHEN THE INPUT IS BETA(RATIO OF PLASMA PRESSURE TO MAGNETIC PRESSURE), Q(KRUSKAL-SHAFRANOV PLASMA STABILITY FACTOR), AND Y(RATIO OF PLASMA RADIUS TO VACUUM WALL RADIUS: RP/RW) AND ARRAYS OF PT(TOTAL THERMAL POWER FROM BOTH D-T AND TRITIUM BREEDING REACTIONS), PW(WALL LOADING OR POWER FLUX) AND TB(THICKNESS OF BLANKET), FOLLOWING THE METHOD OF GOLICVIN, ET AL. TOKMINA2 FINDS THE TOTAL POWER, PT, OF SUCH A FUSION REACTOR, GIVEN A SPECIFIED MAGNETIC FIELD, BM, AT THE TOROIDAL COIL.

627 TODDY2 TODDY2 IS USED TO COMPUTE WAVE PROPAGATION IN TWO DIMENSIONS IN RECTANGULAR OR CYLINDRICAL COORDINATES.

2. DATA

4/75

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 NEUTRON CROSS SECTION CENTER ENDF/B TAPES 114 THROUGH 117 BY THE ETOG1 PROGRAM (ACC ABSTRACT 437).

532 LOS ALAMOS GROUP-AVERAGED CROSS 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, F, K, LI6, MO, NA, NI, O, PL239, 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, 1000, 1200
H BOUND IN ZRHX	230.0	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

Z. DATA

4/75

637 GAMTAR

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.

VII. KWIC INDEX

A-E

AI

A-E	ANL	360	F+P+A	RS	T P \$	AMDLIBAE, ARGONNE SLBROUTINE LIBRARY CAT.	562
AAEC	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 \$ MC807, 2-D DIFFUSION	280
ABSORPTION, CELL	ANL	3600	F36	RSBP X T B \$	RABBLE,HLIB,FLAT, RESONANCE		281
ACCIDENT ANALYSIS		BAPL	6600	F4 RS P	T G \$ FLASH3, LOSS-OF-COOLANT		295
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, LCSS-OF-COOLANT		284
ACCIDENT ANALYSIS DOSE CALC	GGA	1108	F4 RS	T G \$	GADOSE,DOSET, HTGR		261
ACTIVITY DIST STUDY	GGA	7044	F4 RS P	D \$	RAD2, HTGR FISSION PRODUCT		231
ACTIVITY RELATION	GEC	635	F4 RSBP	D \$	DOS, NEUTRON FLUX-DCSIMETER		423
ACT1, LCSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4 RS P	T G \$	M0555,		284
ADEP, 1C AND 2D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	F4 RS P	T F \$			494
ADLER, ENDF/B RESONANCE XSECTION CODES	BNL	6600	F4 RS P	T A \$	RESEND,		465
AEB	360	F4 RS L	T C \$		FIRE5, 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 \$		AIRFK3, 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	COBCL	RSBP	CT M \$	BECCM,	589
AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA	1108	COBCL	RS P	M \$	BECOM,	589
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
AERI	6600	RSBPLX	T B \$		LEOPARD, SPECTRA CALCULATION WITH DEPLETION		279
AEROSOL PARTICLE TRANSPORT STUDY	RFD	3600	F36 RS P	G \$	DISPER,		554
AEROSOLS	AI	360	F4 RS P	T G \$	HAA3, COAGULATION OF HETEROGENEOUS		443
AGC	7090	F+FAP	RSBPLX	T B \$	AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC		204
AGC	7090	FLCCO	RSBP	C \$	2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM		18
AGC	7090	F2 RS P	B \$		BCUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT		237
AGC	7090	F2 RS P	D \$		CROCC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS		154
AGC	7090	F2 RS P	T B \$		ACN-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 E \$	EPOCH, NEUTRON		461
AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	360	F4 RS L	T C \$	FIRE5, 1-D		9
AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	F+FAP	RSBPLX	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, IBM36062250 FORTRAN GRAPHICS SUBROUTINES		484
AI	360	F+BAL	PS 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 B \$	U3R, UNPESOL RESONANCE XSEC PROBABILITY TABLES		553
AI	360	F+BAL	RS P	X T B \$	HWCCR-SAFE, 2-D MCNTE CARLC 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 \$		1SN, 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 \$		HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS		443
AI	360	F4 RS P	T G \$		SCFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS		559
AI	360	F4 RS P	T Q \$		RESPOND, DISSIMILAR MEDIA TLF 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 C \$		SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION		58
AI	360	F4 RSBPLX	T C \$		ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC		151
AI	360	F4 RSBPLX	T C \$		CAFSAR4,LIRLST, 1-D MULTI-GP DIFFUSION + LIB		270
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	PS PL	T B \$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS		50
AI	7090	F+FAP	RS PL	T C \$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE		29
AI	7090	F2 RS	B \$		S4 CYL CELL CODE, 1-D 1-CP S4 APPROXIMATION		53
AI	7090	F2 RS	C \$		PERT, 1-D PERTURBATION FOR AIM AND FOG CODES		30
I	7090	F2 RS	E \$		AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK		121
I	7090	F2 RS	F \$		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

ANC

AI	7090	F2	RS	I	\$	SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	114		
AI	7090	F2	RS	J	\$	FARSEIA, DCSE RATE FROM SNAP SHIELD LEAKAGE	91		
AI	7090	F2	RS	J	\$	MORTIMER, DCSE 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	PS	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 DCSE 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	\$ RATPAP, 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 \$ FCRM, FAST NEUTRON SPECTRUM X-SECTION CALC	51		
AI	7090	F2	RS	PLX	T	C \$ DTF2, 1-D MULTI-GP DISCRETE COORDINATE CALC	151		
AI	7094	F+FAP	RS	L	T	M \$ MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	159		
AI	7094	F+FAP	RS	P	J	\$ SHCE, SHIELD WEIGHT OPTIMIZATION DCSE CALC	197		
AI	7094	F+FAP	RS	P	T	G \$ AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	172		
AI	7094	F+FAP	RS	P	T	H \$ HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	198		
AI	7094	F+FAP	RS	PL	T	B \$ AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	147		
AI	7094	F+FAP	RS	PL	T	B \$ GPAVE, 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	\$ CHAP, 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	PS	PLX	T	C \$ VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	510		
AI-A	360	F4	RS	PL	T	C \$ VIM1X, 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	PS	PL	T	C \$	29	
AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CSUC	370	F4	RS	PL	CT	C \$	29	
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	360	F4	PS	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	
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 6600B	F+CQM	RS	T	P	\$	LASLIB, LOS		633	
ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS	P	T	P \$	SNEQ, NONLINEAR	364
ALLOC ORNL 360	BAL+F	RS	P	CT	P \$	GETCCR, FRECOR, FORTRAN DYNAMIC STORAGE		644	
ALLOCATION PROJECT PLANNING MLMC 360	F+C+R	RS	P	T	M \$	RALCRPH, RESURCF		603	
ALOD 360	COBOL	RS	P	M	\$	AEC-ALC FAU, RADIO FREQUENCY MANAGEMENT SYSTEM		587	
ALPHA-M, PFSOLUTION OF GAMMA RAY SPECTRA	ORNL	360	F4	RS	P	D	\$	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	RS	T	P	\$	563	
AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL	360	F+P+A	RS	T	P	\$	564	
ANALYSES SFMI-RIGID MOLECULES ANC 360	F4	PS	P	W	\$	MMM3, COORDINATE		632	
ANALYZER GAMMA-RAY SPECTRA GGA 1108	F+BAL	RS	P	T	D	\$	TCAD, PROCESSING OF	333	
ANC 360	BAL	PS	P	T	P \$	NRTS-RJF, CS/360 MVT REMOTE JOB ENTRY SYSTEM		519	
ANC 360	F+BAL	RS	T	P	\$	NRTS ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES		613	

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ANC	360	F+BAL	RSBPL	CT	G	\$	PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	555	
ANC	360	F+P+A	RSBP	XCT	W	\$	GAUSS6, BATCH ANALYSIS OF GAMMA-RAY SPECTRA	622	
ANC	360	F4	RS	P	W	\$	MMM3, COORDINATE ANALYSES SEMI-RIGID MOLECULES	632	
ANC	360	F4	RS	P	T H	\$	ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	580	
ANC	360	F4	RS	P	CT W	\$	MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	574	
ANC	360	F4	RS	PL	CT B	\$	INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	565	
ANC	360	F4	RS	PL	CT M	\$	ERRFST, LOCA ROD BUNDLE CHF DATA ANALYSIS	518	
ANC	360	F4	RS	PLXCT	P	\$	PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	520	
ANC	360	F4	RSBP	CT	C	\$	MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	582	
ANC	360	F4	RSBP	CT	D	\$	DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	579	
ANC	360	F4	RSBP	CT	G	\$	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	528	
ANC	360	F4	RSBP	CT	G	\$	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	265	
ANC	360	F4	RSBP	CT	I	\$	FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL	584	
ANC	360	F4	RSBP	CT	I	\$	STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	539	
ANC	360	F4	RSBP	CT	J	\$	VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	569	
ANC	360	F4	RSBP	X	T G	\$	THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	512	
ANC	360	F4	RSBP	XCT	G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	369	
ANC	360	F4	RSBP	XCT	H	\$	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	551	
ANC	360	F4	RSBP	XCT	W	\$	GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)	605	
ANC	360	F4	RSBPL	CT	C	\$	RAFFLE-ANC, MONTE CARLO NEUTRON TRANSPORT CODE	631	
ANC	360	PL1	RS	P	T P	\$	PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360	516	
ANC	360B	F+BAL	RSBP	CT	G	\$	CCNTEMPT-LT/J22, PRESSURE-TEMPERATURE RESPONSE	433	
ANC	360C	F+BAL	RSBPLXCT	G	\$	RELAP4, TRANSIENT THERMAL-HYDRAULIC ANALYSIS	369		
ANC	360F	F+BAL	RS	P	XCT D	\$	PQ07, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	275	
ANC	1108	F4	RS	P	T G	\$	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	528	
ANC	1108	F4	RS	P	T G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	369	
ANC	1108	F4	RS	P	T H	\$	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	551	
ANC	6600	F4	RS	P	T G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	369	
ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	F4	RS	P	T E	\$	486	
ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	6600	F4	RS	P	T E	\$	486	
ANGULAR DIST GGA 7044	F4	RS	P	X	A	\$	LEGCOEF3, LEGENDRE COEFF CALC FOR	217	
ANGULAR DIST DATA AI 7094	F+MAP	RS	P	A	\$	CHAD, LEGENDRE COEFF CALC FOR	215		
ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	6600	F4	RS	P	A	\$	CLEM,	
ANISN X-SEC FORMAT WAPD 6600	F4	RS	PL	T	B	\$	ETCG1, 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+ASM	RSB	CT	P	\$	WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	541	
ANL	360	F+BAL	R	B	L	T P	\$	TSC-SPEAKEASY, LANGUAGE PREPROCESSOR UNDER TSO	593
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	RS	P	CT M	\$	ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	522	
ANL	360	F+BAL	RSBPL	CT	D	\$	REBUS2, FUEL CYCLE ANALYSIS FOR FAST REACTORS	634	
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	\$	THIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	338	
ANL	360	F4	RS	P	G	\$	SCCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	521	
ANL	360	F4	RS	P	O	\$	DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	464	
ANL	360	F4	RS	P	X	\$	TCKMINA/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	\$	SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	400	
ANL	360	F4	RS	P	T I	\$	LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	460	
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	CT B	\$	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	355	
ANL	360	F4	RS	P	CT D	\$	3CB, 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	615	

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ANL	360	F4	RS P	CT M	\$	ETGE, ENDF/B TO MC**2 DATA CONVERSION	351	
ANL	360	F4	RS P	CT W	\$	MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	575	
ANL	360	F4	RS P	X T F	\$	FCRF2, FAST REACTOR EXCURSION CALCULATIONS	174	
ANL	360	F4	RS P	X T P	\$	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,F,....	610	
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	XCT P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	534	
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	\$	APC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION	594	
ANL	360B	BAL	RSB	X T P	\$	CCPYCAT, IBM OS SYSTEM CATALOG UTILITY ROUTINE	646	
ANL	360B	F+ASM	RSB	CT P	\$	WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	541	
ANL	360B	F4	RS P	I	\$	NUROW, STRUCTURAL ANALYSIS PCWFO REACTOR CCRES	643	
ANL	360B	F4	RS P	C P	\$	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	592	
ANL	360B	F4	RS P	CT I	\$	SAP4, STRUCTURAL ANALYSIS OF LINEAR SYSTEMS	641	
ANL	635	F4	RS	X T P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	534	
ANL	GETS	F	R	R	\$	PLFTHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	591	
ANL	1108	F4	RS	X T P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	534	
ANL	1108	F5	RS P	X T P	\$	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,F,....	610	
ANL	1604	F63	RS P	H	\$	MC899, HOH, STEAM TABLES 14.5-2538 PSIA	294	
ANL	3600	F36	SRP	I	\$	BCW2, 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	\$	SNAPG-1D, 1-D MULTI-GP DISCRETE COORDINATE 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 CGM SN TRANSPORT	513	
ANL	3600	F36	RSBP	A	\$	MISH-MASH, RESONANCE INTEGRAL CALC COMGENECUS	214	
ANL	3600	F36	RSBP	G	\$	CFEMLCC2, 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	\$	NEAPKEX, 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	168	
ANL	3600	F63	RSBP	C	\$	CCINC, COINCIDENCE COUNTING DATA REDUCTION	248	
ANL	3600	F63	RSBP	T A	\$	2PLUS, MCN-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	RSBP	XCT B	\$	THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	184	
ANL	3600	F63	RSBP	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	X T P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	534	
ANL	6600	F4	RS P	T F	\$	SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	400	
ANL	6600	F4	RS P	X T P	\$	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,F,....	610	
ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	3600	F63	RSBP	XCT B	\$	THERMOS(	184
ANNULAR VOID X-SECTION CALCULATION	GEC	625	F4	RS P	B	\$	AVOID,	276
ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS DUCO	635	F4	RS	G	\$		529	
APDA 3600 ASAF4	RS P	T M	\$	ETGE, 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 R-Z GEOMETRY			293	
APRF 6600 F4	RS	B	\$	APRFX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING			466	
APRFX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING	APRF	6600	F4	RS	B	\$		466
ARC-DIF1D, 1-D MULTI-GP DIFFUSION & INVENTORY	ANL	360	F4	RSBP	CT C	\$		626
ARC-NUI002, BCD INPUT DATA PROCESSING MODULE	ANL	360	F4	RSBP	CT L	\$		533
ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	360	F+BAL	RS P	CT M	\$		522
ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION	ANL	360	F4	RSBP	CT L	\$		594
AREA CALCULATION	SLA	6600	F4	RS P	P	\$	PLOT, 2D CONTOUR PLOTS &	578
ARES2, RESONANCE INTEGRAL X-SECTION CALC	AI	7090	F2	RS PL	T A	\$		89

ARES2

BAPL

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
ASAF4 RS P T M \$ ETOE, ENDF/B TO MC**2 DATA CONVERSION	APCA 3600	350
ASME STEAM AND WATER PROPERTIES EG&E 360B F4 RS	T H \$ STEAM-67, 1967	487
ASPI, GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAPL 6600 F+ASC RS P T J \$	429
ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	CRNL 7090 F+PAP RS P T C \$	240
ASSEMBLER FOR FLOCO2 INSTRUCTION SET	PW 1604 F+CDP RS P T P \$ LAG,	186
ASSEMBLER FOR THE PCP-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 RSBPL CT C \$ VIMIX, MONTE CARLO CRITICAL		510
ASSEMBLY 49 GAFGAR ENDF/B DATA TAPES	GGA 1108 BIN R L T Z \$ ZPR-III	356
ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC 360 F4 RS P T H \$	580
ATHENA4, INELASTIC SCATTERING FORM FACTORS	CRNL 360 F4 RS P T A \$	417
ATOM SPECTRA ENDF/B DATA CRNL 360 F4 RS P	T B \$ RICE, PRIMARY RECOIL	453
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
AUTC- 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, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL 7094 F2 RSBP H \$	182
AXISYM LOAD BAPL 6600 F4 RS P T I \$ SEALSHL2, SHELL STRESS ANALYSIS		282
AXISYM LOAD SR 360 F4 RS P T I \$ SEALSHL2, SHELL STRESS ANALYSIS		282
AXISYM LOAD WTSC 6600B F4 RS P T I \$ SEAL SHELL, SHELL STRESS ANALYSIS		282
AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL 6600 F+COM RS P T I \$ DUZ2, 2-D	503
AXISYMMETRIC LOAD GGA 7044 F4 RSBP CT I \$ SAFE-PCRS, STRESS ANALYSIS		250
AXISYMMETRIC LOAD GGA 7044 F4 RS P T I \$ SAFE-AXISYM, STRESS ANALYSIS		251
AXISYMMETRIC STRESS ANALYSIS GGA 1108 F4 RS P	I \$ SAFE-2D, PLANE &	379
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	203
B-W PARAMETERS GGA 1108 F5 RS P CT A \$ FSDP3, POINTWISE XSECS. FROM		216
B-W RESONANCE PARAMETERS WANL 7094 F2 RS P	A \$ EXT, X-SECTIONS FROM	238
B-W X-SEC CALC BNL 6600 F4 RS P	A \$ SIGPLOT, RESOLVED MULTILEVEL	377
BAL RS CT P \$ SLACMON 2.2, CS360 MVT/MFT PERFORMANCE MONITOR	SLAC 360	635
BAL RSB T P \$ NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC 360	519
BAL RSB X T P \$ COPYCAT, IBM OS SYSTEM CATALOG UTILITY ROUTINE	ANL 360B	646
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
BAPL 6600 F+ASC RS P T J \$ ASPI, GAMMA RAY SOURCE BUILDUP FACTOR CALC		429
BAPL 6600 F+ASC RS P X T B \$ RESQ2, RESQO, DBF1, RESONANCE INTEGRAL HEX CELL		285
BAPL 6600 F+COM RS P H \$ HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION		560
BAPL 6600 F+COM RS P T I \$ DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC		503
BAPL 6600 F+COM RS P T I \$ GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY		397
BAPL 6600 F+COM RS P X T B \$ PAXO3, HARMONY-PDQ X-SECTION GENERATION CODE		426
BAPL 6600 F+COM RS P X T I \$ MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS		597
BAPL 6600 F4 RS T B \$ M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS		280
BAPL 6600 F4 RS T C \$ M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN		342
BAPL 6600 F4 RS T H \$ WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF		267
BAPL 6600 F4 RS T I \$ CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT		266
BAPL 6600 F4 RS P A \$ GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES		470
BAPL 6600 F4 RS P D \$ CINDER, M0102, POINT DEPLETION FISSION PRODUCT		313
BAPL 6600 F4 RS P I \$ STRIPE, FUEL ROD CLAD STRAIN & PELLETT CRACKING		570
BAPL 6600 F4 RS P I \$ TCB01, CREEP-BUCKLING OF TUBES UNDER PRESSURE		604

BAPL

BEHAVE2

BAPL 6600	F4	RS P	P	\$ RH99, EXTREME VALUE DISTRIBUTION DATA ANALYSIS	621
BAPL 6600	F4	RS P	P	\$ REL11, RELIABILITY FOR A SINGLE FAILURE MODE	497
BAPL 6600	F4	RS P	T A	\$ PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	359
BAPL 6600	F4	RS P	T A	\$ SUMGR, S-WAVE NEUTRON X-SECTION CALCULATION	399
BAPL 6600	F4	RS P	T B	\$ EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	461
BAPL 6600	F4	RS P	T C	\$ BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	398
BAPL 6600	F4	RS P	T F	\$ NCWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	371
BAPL 6600	F4	RS P	T F	\$ TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	338
BAPL 6600	F4	RS P	T F	\$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	274
BAPL 6600	F4	RS P	T G	\$ FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	295
BAPL 6600	F4	RS P	T G	\$ FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	448
BAPL 6600	F4	RS P	T G	\$ M0555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	284
BAPL 6600	F4	RS P	T H	\$ CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	473
BAPL 6600	F4	RS P	T F	\$ FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY	272
BAPL 6600	F4	RS P	T H	\$ FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS	331
BAPL 6600	F4	RS P	T H	\$ GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	424
BAPL 6600	F4	RS P	T F	\$ HCT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	286
BAPL 6600	F4	RS P	T H	\$ M0899,HQH, STEAM TABLES 14.5-2538 PSIA	294
BAPL 6600	F4	RS P	T F	\$ TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	348
BAPL 6600	F4	RS P	T H	\$ WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	396
BAPL 6600	F4	RS P	T I	\$ BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION	468
BAPL 6600	F4	RS P	T I	\$ BUSH1, CYL SHELL BUCKLING COLLAPSE ANALYSIS	481
BAPL 6600	F4	RS P	T I	\$ CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION	449
BAPL 6600	F4	RS P	T I	\$ FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	537
BAPL 6600	F4	RS P	T I	\$ M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	383
BAPL 6600	F4	RS P	T I	\$ M0457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	329
BAPL 6600	F4	RS P	T I	\$ M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	283
BAPL 6600	F4	RS P	T I	\$ PELEN, FUEL PELLETT TEMPERATURE & DEFORMATION	598
BAPL 6600	F4	RS P	T I	\$ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LCAD	282
BAPL 6600	F4	RS P	T J	\$ M1756,LETO, 1-D SLAB GAMMA-RAY TRANSPORT	343
BAPL 6600	F4	RS P	T L	\$ BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	373
BAPL 6600	F4	RS P	T M	\$ SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS	557
BAPL 6600	F4	RS P	T O	\$ BETTY, ENTRAINED PARTICLES SAMPLING STUDY	545
BAPL 6600	F4	RS P	T O	\$ JITER, FLUCTUATION EXPERIMENT ANALYSIS	394
BAPL 6600	F4	RS P	T O	\$ REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	425
BAPL 6600	F4	RS P	T P	\$ DAFT1, LEAST SQUARES FIT FISSION NUCLEI DATA	327
BAPL 6600	F4	RS P	T P	\$ M0661,M0657,M0626, POLYNOMIAL CURVE FITTING	411
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	275
BAPL 6600B	F+ASC	RS P	T J	\$ SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	462
BAPL 6600B	F4	RS P	T I	\$ MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	412
BAPL 6600C	F+ASC	RS P	T D	\$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	275
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 COORDINATE 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
BCD R	L T Z	\$		ETOGL DATA LIBRARIES, MUFT4 OR 5, GAM1 CR 2 WAPD 6600	447
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-NUI002,	533
BCL 6400	F4	RS P	G	\$ FRCRL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	500
BCL 6400	F4	RS P	T F	\$ ADEP, 1D AND 2D 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	G	\$ MIRAB,MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	499
BCL 6400	F4	RS P X	T G	\$ MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	508
BCS 6600D	F+ASC	R B	T D	\$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	275
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	37
BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS		SLA 360	COBOL RSBP	CT M \$	51
BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS		SLA 1108	COBOL RS P	M \$	589
BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT GESV		635	F4	RS P CT I \$	568

BEHAVIOR

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BEHAVIOR	ANL	360	F4	RS	P	T	I	\$	LIFE1, FAST REACTOR FUEL ELEMENT	460
BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600	F4	RS	P		A	\$		524
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.	BNW	6600B	F+ASC	RS		T	P	\$		478
BETTY, ENTRAINED PARTICLES SAMPLING STUDY	BAPL	6600	F4	RS	P	T	C	\$		545
BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	6600	F4	RS	P	T	C	\$		398
BG&E 360B	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 360	F4	RS	PL	T	B	\$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS			50
BH99, EXTREME VALUE DISTRIBUTION DATA ANALYSIS	BAPL	6600	F4	RS	P		P	\$		621
BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC	CRNL	1604	F2	RS	P		T	\$		549
BIN R L T Z \$ ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES	GGA	1108								356
BINARY LIBRARY TAPE MAINTENANCE	ANL	360	F4	RS		M	\$	MERMC2, MC**2		472
BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GFES	1108	F5	RS	P	T	C	\$	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	RSBP		P	\$	GRAPH, LINEAR REGRESSION W/CONFIDENCE LIMITS				624
BKC 360	F4	RSBP		P	\$	HISTOGRAMS, QUALITY CONTROL SAMPLE STATISTICS				614
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 - EXCURSION ANALYSIS	ANC	360	F4	RSBP	XCT	G	\$	RELAP3, REACTOR		369
BLOWDOWN - EXCURSION ANALYSIS	ANC	1108	F4	RS	P	T	G	\$	RELAP3, REACTOR	369
BLOWDOWN - EXCURSION ANALYSIS	ANC	6600	F4	RS	P	T	G	\$	RELAP3, REACTOR	369
BLOWDOWN ANALYSIS LOFT KE 7094	F+MAP	RSBP		T	G	\$	SATURATED BLOWDOWN2,			200
BLOWDOWN ANALYSIS LOFT UCA 360	F4	RS	P		G	\$	WATER-HAMMER, LIQUID			278
BLOWDOWN PRESSURE TEMPERATURE HISTORY KE 7094	F2	RSBP		T	H	\$	PTH1,			155
BLOWDOWN2, BLOWDOWN ANALYSIS LOFT KE 7094	F+MAP	RSBP		T	G	\$	SATURATED			200
BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	F4	RS	P	T	L	\$		373
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	\$	RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS				492
BNL 6600	F4	RS	P	A	\$	SIGPLCT, RESOLVED MULTILEVEL B-W X-SEC CALC				377
BNL 6600	F4	RS	P	A	\$	THRESH, STATISTICAL MODEL REACTION X-SECTIONS				504
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,CAMMET,PLOTFH,... ENDF/B V1 PROC			384
BNL 6600B	F4	RS		T	M	\$	CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC			475
BNL 6600B	F4	RS		T	M	\$	RIGEL4,CHECK4,... ENDF/B V4 PROCESSING CODES			638
BNL 6600B	F4	RS	P	T	A	\$	RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES			465
BNL 7090	F+MAP	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 360C	F4	RS	P	T	H	\$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS			432
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	\$	GSSLRN1B, 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	\$	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION			325
BNW 1108	F4	RS	P	T	H	\$	GAPCCN-THERMAL1, FUEL PIN GAP CONDUCTANCE CALC			618
BNW 1108	F4	RS	P	X	T	B	\$	IDX, 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	C	\$	DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS			456
BNW 1108	F5	RS	P	T	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	RSBP		T	D	\$	ISOCFN, RADIONUCLIDE GENERATION AND DECAY			367
BNW 1108C	F4	RS	P	T	H	\$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS			432

BNW

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BNW 6600C F4	RS P	T H \$	CCBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	432	
BNW 7J90 F+FAP RS PL	T B \$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV		185	
BNW 7J90 FLCCO RSBP	T C \$	GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX		75	
BNW 7J90 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	
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 FLOW STEAM	GGA 11J8 F4	RS P	T H \$ DYNAM, DYNAMIC ANALYSIS	440	
BORATION-DILUTION TABLES FOR PWR GPN	OPPD 64JL F4	S P	H \$ PWR-PPM,	552	
BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC 7090 F2	RS P	B \$	237	
BOWED REACTOR CORES ANL 360B F4	PS 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 \$	468	
BUCKLING COLLAPSE ANALYSIS	BAPL 66J J F4	RS P	T I \$ RUSHL, CYL SHELL	481	
BUCKLING CYL FUEL ELEMENTS	AEB 36J F4	PS P	B \$ WELWING, MATERIAL	362	
BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	GGA 1108 F+BAL	RS P	T C \$	439	
BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA 1108 F+BAL	RS P	T C \$	438	
BUILDUP FACTOR CALC	BAPL 6600 F+ASC	RS P	T J \$ ASPIS, GAMMA RAY SOURCE	429	
BUNDLE	NED 635 F4	RS P	T H \$ VELVET2, TURBULENT FLOW IN LMFBR RCD	458	
BUNDLE CHF DATA ANALYSIS	ANC 36J F4	RS PL	CT M \$ ERREST, LOCA RCD	518	
BUNDLE FLOW & TEMPERATURE DIST.	CRNL 360 F4	RS P	T H \$ ORRIBLE, RCD	629	
BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW 360C F4	RS P	T H \$ COBRA3C, ROD	432	
BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW 1108C F4	RS P	T H \$ COBRA3C, ROD	432	
BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW 6600C F4	RS P	T H \$ COBRA3C, ROD	432	
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	
BURNUP & MANAGEMENT	NED 635 F4	RS P	T D \$ FUMBLE, FAST REACTOR FUEL	480	
BURNUP ANALYSIS	ANL 36J F4	RS P	CT D \$ 3CB, 3-D MULTIGROUP DIFFUSION	567	
BURNUP ANALYSIS	HEDL 1108 F4	RS P	T D \$ 3CB, 3-D MULTIGROUP DIFFUSION	567	
BURNUP ANALYSIS	NED 635 F4	RS P	T D \$ BURNUP, HEAVY ELEMENT ISOTOPIC	311	
BURNUP CYL LATTICE	TVA 36J F4	RSBPLXCT	B \$ LASER, SPECTRUM CALC WITH	249	
BURNUP CYL LATTICE	WAPD 7094 F+MAP	RS PLX	T B \$ LASER, 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, 2D DIFFUSION	454	
BURNUP RZ GEOMETRY	GGA 7J9J F+FAP	RSBP	T C \$ DOB, 2-D FEW-GP DIFFUSION	99	
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 C \$	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 7J9J	MAD	RSB	O \$	166
BURP4, GAMMA-RAY PHOTOFRACITION SOLID CRYSTAL	MTS 7J9J	MAD	RSB	C \$	169
BURP5, GAMMA-RAY PHOTOFRACITION WELL CRYSTAL	MTS 7090	MAD	RSB	O \$	170
BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PECO 360 F4	RS P	X G \$	435	
BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL 66J J F4	PS P	T I \$	481	
BW 2000 F4	RS	A \$	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	305	
BW 6600 F+COM	RS P	X T C \$	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	275	
BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC 36J F4	RSBP	XCT H \$ MCXY,	551	
BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC 1108 F4	RS P	T H \$ MOXY,	551	
BWR GASEOUS RELEASE	CRNL 360 F4	RS P	C G \$ STEFFG, ANALYSIS OF PWR &	583	
BWR/6 ANALYSIS	EI 36J F+BAL	RS P	CT H \$ 6KILER, CORE HEATUP CODE FOR	636	
CAESAR4, LIBLIST, 1-D MULTI-GP DIFFUSION + LIB	AI 360 F4	RSBPLX	T C \$	270	
CAGE, BIRD, SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES 11J8 F5	RS P	T C \$	476	
CALCCMP PLOTTING ROUTINES	KAPL 6600 F+COM	RS	T P \$ KAPLPLCT, KAPL	496	
CALCCMP780	ANL 360 F4	RS P	T N \$ PLOT-3C, 3-D PLOTS ON IBM2280 CR	544	
CAPITAL COST ESTIMATING	CRNL 36J B F4	RS P	T D \$ CRCCST, POWER PLANT	588	
CARD INPUT PROCESSOR	LASL 360 F4	PS P	L \$ CENRD, FREE-FORMAT	530	
CARD INPUT PROCESSOR	LASL 6600 F4	RS P	L \$ GENRD, FREE-FORMAT	530	
CASCADE, COMPOUND NUCLEUS REACTION	AI 36J F+BAL	RS P	T A \$ CCMNUC,	481	
CASCADE, CLUSTER, RADIATION DAMAGE IN METALS	GEC 635 F+FAP	RSBP	T C \$	419	
CAT. A-E	ANL 360 F+P+A	RS	T P \$ AMDLIBAE, ARGONNE SUBROUTINE LIBRARY	562	

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CAT. F	ANL	360	F+BAL	RS	T P \$	AMCLIBF, ARGONNE SUBROUTINE LIBRARY	563
CAT. G-Z	ANL	360	F+P+A	RS	T P \$	AMCLIBGZ, ARGONNE SUBROUTINE LIBRARY	564
CATALOG	DP	360B	EBCDC	R	L T Z \$	GAMTAB, RADIOACTIVE-DECAY GAMMA RAY	637
CATALOG UTILITY	ROUTINE	ANL	360B	BAL	RSB X T P \$	COPYCAT, IBM OS SYSTEM	646
CAVITY GEOM	GGA	1108	F4	RS P	T J \$	MUSCAT, VIFW FACTOR SHIELDING CODE	259
CDC 1604	F63	PS		C	\$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	30
CDC 1604	F63	RS L	T	U	\$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	58
CDC 1604	F63	RS P		A	\$	HAFEVER, 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		B	\$	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 CLCUC	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	\$	FCG, 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	\$	ZUGRAND, 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 ENVIRONMENTAL LIB SCOPE3.2	478
CDC 6600D	F+COM	RS		T	P \$	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.3	478
CE 6600	F4	RS P		T	C \$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	156
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 RAPL 6600	F+ASC	RS P X T B	\$	RESQ2, RESQ, DBF1, RESONANCE INTEGRAL HEX		285	
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 E \$	CLUP77, SQUARE	526
CELL COLLISION PROBABILITY CALC	JAER	230	F4	RS P	T E \$	CLUP77, SQUARE	526
CEND 360	F4	RS P X T F	\$	CEXE, INCXE, 1-GP 3-D XYZ XENON OSCILLATION		415	
CEND 7600	F4	RS P	T G \$	CEBUG, STEAM GENERATOR SODIUM-WATER REACTION		548	
CEND 7600B	F4	RS	T P \$	MODEL, MODIFIED BETTIS ENVIRONMENTAL 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 \$	ISOCRLACH, REACTION DECAY	180
CHAIN ANALYSIS	ORNL	709J	F2	RSBP	D \$	ISOCRLACH, 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	ENEAC	360	F4	RS P	CT A \$	JUPITOR1, COUPLED	308
CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	F4	RS P	T M \$	CRECT,	475
CHECKER, CRECT, DAMMET, PLOTB, ... ENDF/B V1 PROC	BNL	6600B	F4	RS	T M \$		384
CHECKER, RIGEL, PLOTB, ... 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
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 1108	F4	RS P	T H \$	LICN, 3-D TEMPERATURE DISTRIBUTION PROGRAM		299	
CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	F4	RS P	T H \$		473
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 C \$		354

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CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD 6600	F4	RS P	T C	\$	354	
CINDER, MO102, POINT DEPLETION FISSION PRODUCT	HAPL 6600	F4	RS P	C	\$	313	
CINDER, MO102, POINT DEPLETION FISSION PRODUCT	CP 360	F+BAL	RS P	T C	\$	313	
CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	CRNL 3600	F4	RS P	T K	\$	387	
CLAD STRAIN & PELLET PACKING	HAPL 6600	F4	RS P	I	\$ STRIPE, FUEL ROD	570	
CLADDING-STEAM REACTION ANL 3600	F36	RSBP	G	\$ CHEMLOC2, CORE HEATING		366	
CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL 6600	F4	PS P	A	\$	531	
CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI 360	F4	RSB L	T M	\$	271	
CLOTHO, NUCLEAR POWER PLANT COST CODE HEAD 1108	F5	RS P	X T C	\$ PACTCLUS,		540	
CLOUD	AI 7090	F2	RS P	G	\$ CLOUD, GAMMA-RAY DOSE RATE FROM A	47	
CLOUD	CDC 1604	F63	RS P	G	\$ CLOUD, GAMMA-RAY DOSE RATE FROM A	47	
CLOUD	CP 360	F4	RS P	G	\$ CLOUD, GAMMA-RAY DOSE RATE FROM A	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	CP 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	GFC 635	F+MAP	RSEP	T Q	\$ CASCADE,	419	
CMXMAT, TRANSFER FUNCTION EVALUATION	PW 164	F63	RS P	F	\$	188	
CNEA 360	F4	RS P	E	\$ TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS		489	
COAGULATION OF HETEROGENEOUS AEROSOLS	AI 360	F4	RS P	T C	\$ HAA3,	443	
COBOL RS P	M	\$ AFC-ALL FAY, RADIO FREQUENCY MANAGEMENT SYSTEM ALCC	360			587	
COBOL RS P	M	\$ BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA 1108			589	
COBOL RSBP	CT M	\$ BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA 360			589	
COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW 3600	F4	RS P	T F	\$	432	
COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW 11080	F4	RS P	T H	\$	432	
COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW 6600	F4	RS P	T F	\$	432	
CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA UILL	360	F4	RS P	A	\$	347	
COEF CALC	GGA 7044	F4	RS P	T C	\$ TEMCO, 1-D FEW-GP DIFFUSION TEMP	225	
COEF CALC FOR ANGULAR DIST	GGA 744	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	CGA 1108	F4	RS P	T C	\$ TEMCO7, TEMPERATURE	320	
COEFFICIENTS	LLL 7090	F+MAP	RS P	T B	\$ SCPHIST1/2/5, 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	C	\$	248	
COINCIDENCE COUNTING DATA REDUCTION	ANL 3600	F63	RSBP	O	\$ COINC,	248	
COLLAPSE ANALYSIS	HAPL 6600	F4	RS P	T I	\$ BUSHL, CYL SHELL BUCKLING	481	
COLLAPSING	TRW 6500	F4	RS P	B	\$ PARTI, OPTIMAL GROUP OF MESH	416	
COLLAPSING	APRF 6600	F4	RS	B	\$ APRFX1, 99-GP DLC-2B LIBRARY GROUP	466	
COLLISION PROBABILITIES MC	CRNL 3608	F+BAL	RS P	T B	\$ RAFFLE, 1ST FLIGHT	392	
COLLISION PROBABILITY CALC	ANL 360	F4	RS P	T F	\$ CLUP77, SQUARE CELL	526	
COLLISION PROBABILITY CALC	JAER 230	F4	RS P	T B	\$ CLUP77, SQUARE CELL	526	
COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO 7040	F+MAP	RS P	A	\$	203	
COMNUC, CASCADE, COMPOUND NUCLEUS REACTION	AI 360	F+BAL	RS P	T A	\$	482	
COMPLEMENTARY ERROR FUNCTION	SLA 6600	F4	RS P	P	\$ ERF, ERF, ERROR &	601	
COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL 6600	F4	RS	T C	\$ GASPAN,	485	
COMPLEX GAMMA-RAY SPECTRA	KSUN 360	F4	RS P	O	\$ CORGAM, UNFOLDING OF	390	
COMPOSITE STRUCTURE STRESS STUDY	GGA 1108	F4	RS P	T I	\$ SAFE-3D, 3-D	332	
COMPOSITE STRUCTURE STRESS STUDY	CRNL 360	F+BAL	RS P	T I	\$ SAFE-3D, 3-D	332	
COMPOSITION-DEPENDENT X-SECS	GESV 635	F+GMP	RS P	XCT L	\$ TDOWN, SPATIAL &	505	
COMPOUND NUCLEUS REACTION	AI 360	F+BAL	RS P	T A	\$ COMNUC, CASCADE,	482	
COMPOUND NUCLEUS X-SECTION CALC	ANL 3600	F63	RSBP	A	\$ NEARREX,	171	
COMPUTER-PRODUCED WIRING LISTS	LHTREX	LASL 7090	F+MAP	RS P	I	\$ WIREX,	315
CONCEPTUAL COST ESTIMATE	CRNL 3600	F4	RS P	XCT D	\$ CONCEPT3, POWER PLANT	498	
CONCEPT3, POWER PLANT CONCEPTUAL COST ESTIMATE	CRNL 3600	F4	RS P	XCT 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 1108	F4	RS P	T H	\$ GAPCON-THERMAL1, FUEL PIN GAP	618	
CONDUCTION	PPCO 7044	F+MAP	RS P	T H	\$ TOODEE, 2-D TIME-DEPENDENT HEAT	349	
CONDUCTION	CRNL 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	HAPL 6600	F4	RS P	T H	\$ HOT2, 2-D TRANSIENT HEAT	286	

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CONDUCTION PROGRAM ORNL 360 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 FUEL TEMPERATURE CODE GGA 7044 F4 RS I \$ CORE, CORE 233
 CONSTANT & FAST SPECTRA CALC ANC 360 F4 RS PLXCT B \$ PHRCG, MULTI-GP 520
 CONSTANT CALC AGC 7090 F+FAP RSBPLX T B \$ AGN-GAM, FAST SPECTRUM MULTI-GP 204
 CONSTANT CALC FROM TOR OUTPLT DATA 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+FAP RS PL T B \$ GAMTEC2, MULTI-GP 185
 CONSTANT CALC 0 TO 10 MEV UVA 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 FOR DSN TOC PW 1604 F63 RS P L \$ SNC, CALCULATION OF SA 189
 CONSTANTS FROM ENDF/B DATA GESV 635 F+GMP RS P XCT B \$ ENDRUN2, MULTIGROUP 501
 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 \$ SUPERTCG, ENDF/B FINE-GP 431
 CONSTANTS TVA 360 F4 RS PLX T B \$ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP 467
 CONTAINMENT PRESSURE POST RUPTURE GGA 7044 F4 RS X T G \$ PRECCN, HTGR 228
 CONTAINMENT SYSTEM IODINE REMOVAL BCL 6400 F4 RS P X G \$ MIRAB, MIRAP, 499
 CONTEMP-LT/022, PRESSURE-TEMPERATURE RESPONSE ANC 360B F+BAL RSBP CT G \$ 433
 CONTOUR PLOTS & AREA CALCULATION SLA 6600 F4 RS P P \$ PLOTR, 2D 578
 CONTROL SAMPLE STATISTICS BKC 360 F4 RSBP P \$ HISTOGRAMS, QUALITY 614
 CONVERSION ANL 360 F4 RS P CT M \$ ETOE, ENDF/B TC MC**2 DATA 350
 CONVERSION APDA 3600 ASAF4 RS P T M \$ ETOE, ENDF/B TC MC**2 DATA 350
 CONVERTS P-MATRIX RESONANCE PARAMETERS CPNL 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
 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 360B BAL RSB X T P \$ 646
 CORE ACCIDENT ANALYSIS NEL 635 F4 RS P T G \$ FREADM1, FAST REACTOR 479
 CORE CONFIGURATION FUEL TEMPERATURE CODE GGA 7044 F4 RS I \$ CORE, 233
 CORE HEATING CLADDING-STEAM REACTION ANL 3600 F36 RSBP G \$ CHEMLOC2, 366
 CORE HEATUP CODE FOR RWR/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 \$ GAZELLE5, GAS-COOLED 232
 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 CALC AI 360 F4 RS P T Q \$ RESPOND, DISSIMILAR MEDIA TLD 566
 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 \$ PWOCST, REACTOR FUEL CYCLE 441
 COST CODE HF01 1108 F5 RS P X T D \$ PACTOLUS, CLCTHC, NUCLEAR POWER PLANT 540
 COST ESTIMATE ORNL 3600 F4 RS P XCT D \$ CONCEPT3, POWER PLANT CONCEPTUAL 498
 COST ESTIMATING ORNL 360B F4 RS P T D \$ ORCOST, POWER PLANT CAPITAL 588
 COSTS ORNL 1604 F63 RS P D \$ POWERCC, NUCLEAR STATION ELECTRICITY 340
 COSTS UEC 6600 F4 RS P D \$ POWERCC, 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 C \$ WAMPUM, FUEL CYCLE 224
 COSTS PERFORMANCE STUDY UEC 6600 F4 RS P C \$ WAMPUM, FUEL CYCLE 224
 COUNTING DATA REDUCTION ANL 3600 F63 RSBP O \$ 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, 120
 COUPLED-CHANNEL SCATTERING X-SEC CALC KAPL 6600 F4 RS P T A \$ JPLXR, 506

COUPLED-CHANNEL

CYL

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	RSBPL	T N \$	239
CRACKING BAPL 6600 F4	RS P	I \$ STRIPE,	FUEL ROD CLAD STRAIN & PELLET		570
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	RSBPL	T C \$	103
CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL 36J	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	RNL 6600B	F4	RS	T M \$ CHECKER,	384
CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL 660J	F4	RS P	I \$ TCBJ1,	604
CRITERIA COSTS GGA 7044 F4	RS P	T D \$ STMGEN, STEAM GENERATOR DESIGN			227
CRITICAL ANALYSIS SYSTEM	CP 360	F+BAL	RS P	XCT B \$ HAMMER,LITHE,HELP,	277
CRITICAL ASSEMBLY ANALYSIS	AI 76J0	F4	RS PLX	T C \$ VIM1, MONTE CARLO	510
CRITICAL ASSEMBLY ANALYSIS	AI-A 36J	F4	RSBPL	CT C \$ VIM1X, MONTE CARLO	510
CRITICALITY CODE CRNL 360	F+BAL	RSBPL	CT C \$ KENC, MONTE CARLO MULTIGROUP		45L
CRITICALITY CODE DP 360B	F+BAL	RSBP	CT C \$ KENO2, MONTE CARLO MULTIGROUP		450
CRITICALITY CODE RFD 6600	F+COM	RS PLX	T C \$ KENO2, MONTE CARLO MULTIGROUP		450
CRITICALITY SAFETY	DP 36C	F4	RS P	T C \$ KEFF,MGBS,TGAN, NUCLEAR	617
CRNL 66J0 F4	RS P	P \$ FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS			514
CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI 7J9J	F2	RS	I \$	112
CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC 7090	F2	RS P	C \$	154
CROSS SECTIONS LASI 6600 F4	PS P	N \$ LARCA, FLLX-WEIGHTING OF DTF4			409
CROSS-SPECTRAL DENSITIES	BNW 11J8	F5	PS P	X T F \$ NOISY1, AUTO- AND	48F
CROSS-SPECTRAL DENSITIES	BNW 709J	F4	RS P	T F \$ NOISY1, AUTO- AND	48F
CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA 7044	F+SPS	RSBP	T N \$	217
CRYSTAL MTS 7191 MAD	RSB	Q \$ BURP5, GAMMA-RAY PHOTOFRACTION WELL			170
CRYSTAL MTS 7J9J MAD	RSB	Q \$ BURP4, GAMMA-RAY PHOTOFRACTION SOLID			169
CRYSTALLINE MATERIALS LASI 66J J	F4	RS P	T A \$ TCR, THERMAL SCATTERING		36L
CRYSTALLINE SCATTERING KERNEL CALC	GGA 7090	F2	RS	T A \$ SUMMIT,	56
CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW 16C4	F63	RS	I \$	194
CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW 1604	F63	RS	L \$	193
CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL 66CJ	F+ASC	RS P	T P \$	42
CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI 7J94	F+FAP	RS PL	T C \$	196
CURVE FITTING LASL 7094 F4	RS	T P \$ LASL LEAST SQUARES, GENERAL			62
CURVE FITTING	RAPL 66J0	F4	RS P	T P \$ M0661,M0657,M0626, POLYNOMIAL	411
CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL 66J J	F+ASC	FS P	T P \$ CURFIT,	43
CURVE PLCT	KAPL 660C	F+ASC	RS P	T P \$ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN	364
CURVES LLL 7094 F2	RS P	P \$ EXPALS, LEAST SQUARES EXPONENTIAL DECAY			321
CWE 36C F4	RS P	T I \$ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS			354
CYCLE ANALYSIS	AI 7J94	F2	RS PL	T I \$ CYCLOPS1, THERMODYNAMIC	244
CYCLE ANALYSIS FOR FAST REACTORS	ANL 36C	F+BAL	RSBPL	CT D \$ REBUS2, FUEL	634
CYCLE ANALYSIS PARTIAL REFUEL	GGA 7044	F4	RS P	T C \$ GARGUYLF, FUEL	26C
CYCLE ANALYSIS W/REFUELING	GGA 7044	F4	RS P	T D \$ REVISED-GAD, FUEL	223
CYCLE CALCULATION	GGA 11J8	F4	S	T C \$ GAFFE, EQUILIBRIUM FUEL	302
CYCLE COST ANALYSIS	AI 7J9J	F2	PS P	C \$ AIMFIRE, URANIUM FUEL	55
CYCLE COST AND ECONOMICS	CWE 36C	F4	PS P	T C \$ CINCAS, NUCLEAR FUEL	354
CYCLE COST AND ECONOMICS	WAPD 6600	F4	PS P	T C \$ CINCAS, NUCLEAR FUEL	354
CYCLE COST CALCULATION	CCA 11J8	F4	PS P	T C \$ FWCOST, REACTOR FUEL	441
CYCLE COSTS PERFORMANCE DATA	ANL 36J	F4	RS P	C \$ NPRFCCP, FUEL	146
CYCLE COSTS PERFORMANCE DATA	UFC 660C	F4	RS P	D \$ NPRFCCP, FUEL	146
CYCLE COSTS PERFORMANCE STUDY	GGA 7044	F4	PS P	D \$ WAMPUM, FUEL	224
CYCLE COSTS PERFORMANCE STUDY	UFC 660C	F4	RS P	C \$ WAMPUM, FUEL	224
CYCLE ECONOMICS UICS 36J F4	RS P	CT D \$ GEM, ANALYSIS OF NUCLEAR FUEL			576
CYCLE PARAMETERS FAST BREEDERS	NED 635	F4	RS P	D \$ RAPFU, FUEL	372
CYCLCP51, THERMODYNAMIC CYCLE ANALYSIS	AI 7094	F2	RS PL	T I \$	244
CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT	RAPL 66C0	F4	RS	T I \$	26C
CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION	RAPL 66J J	F4	RS P	T I \$	44C
CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION	TVA 36C	F4	RS P	T I \$	44C
CYL CRNL 7090 F2	RS P	T C \$ EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB			34
CYL CELL CODE AND TEMPEST COMBINATION	AI 7090	F2	PS P	B \$ BAM, S4	10F
CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI 7J9J	F2	RS	B \$ S4	53
CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC 16J4	F63	PS P	B \$ S4	53
CYL COULANT INLET PLENUM DP 36C	F4	RS P	F \$ PLENUM, FLOW DIST. IN		58C
CYL FUEL ELEMENT	RAPL 66J0	F4	RS	T I \$ CYGPC2, STRESS ANALYSIS	266
CYL FUEL ELEMENTS	AFB 36J	F4	RS P	B \$ WELWING, MATERIAL BUCKLING	362

CYL

DATA

CYL GGA 1108 F+RAL RS P T C \$ GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH,	430
CYL LATTICE TVA 360 F4 RSBPLXCT B \$ LASER, SPECTRUM CALC WITH BURNUP	249
CYL LATTICE WAPD 7094 F+MAP RS PLX T B \$ LASER, SPECTRUM CALC WITH BURNUP	249
CYL PW 1604 F63 RS T C \$ 2CXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM	192
CYL SHELL BUCKLING COLLAPSE ANALYSIS BAPL 6600 F4 RS P T I \$ BUSHL,	481
CYL SPHERE BNW 1107 F4 RS P T C \$ HFN, 1-D MULTI-GP DIFFUSION SLAB	241
CYL SPHERE AI 7090 F+MAP RS L T C \$ FAIM, 1-D MULTI-GP DIFFUSION SLAB	120
CYL SPHERE AI 7090 F+MAP 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 CSUC 370 F4 RS PL CT C \$ AIM6, 1-D MULTI-GP DIFFUSION SLAB	29
CYL SPHERE AI 7090 F+MAP 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 PS 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 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 \$ LIPRECAN1, 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 \$	327
DAMAGE IN METALS GEC 635 F+MAP RSBP T O \$ CASCADE, CLUSTER, RADIATION	419
DAMMET, PLOTFR, ... ENDF/B V1 PROC BNL 6600B F4 RS T M \$ CHECKER, CRECT,	384
DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT AEG 7090 F2 RS B \$	150
DATA WAPD 7600 F4 RS P T B \$ ETCT2, 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 NEO 635 F4 RS P T O \$ EXPN, ANALYSIS OF PULSED NEUTRON SOURCE	258
DATA BAPL 6600 F4 RS P T B \$ EPOCH, NEUTRON AGE CALCULATION OF ENDF/B	461
DATA BAPL 6600 F4 RS P T P \$ DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE	327
DATA DP 360B F4 RS P XCT A \$ FLANGE2(71-1), ENDF/B THERMAL SCATTERING	368
DATA ORNL 360 F4 RS P T B \$ RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B	453
DATA AI 7094 F+MAP RS P A \$ CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST	215
DATA ANALYSIS ANC 360 F4 RS PL CT M \$ ERREST, LCCA RCD BUNDLE CHF	518
DATA ANALYSIS CNEA 360 F4 RS P E \$ TRIFIDO, PULSED NEUTRON SOURCE	489
DATA ANALYSIS GEES 1108 F5 RS P T O \$ CAGE, BIRD, SPEC, TIME-OF-FLIGHT	476
DATA ANALYSIS BAPL 6600 F4 RS P P \$ BH99, EXTREME VALUE DISTRIBUTION	621
DATA CONVERSION ANL 360 F4 RS P CT M \$ ETCE, ENDF/B TO MC**2	350
DATA CONVERSION APCA 360C ASAF4 RS P T M \$ ETOE, ENDF/B TO MC**2	350
DATA FILE SERVICE ROUTINES ENDF TAPES BNL 7090 F+MAP RS P T M \$ DFSR,	236
DATA GESV 635 F+GMP RS P XCT E \$ ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B	501
DATA HEAT TRANSFER STUDY SLL 6600 F4 RS P N \$ HEATMESH, GEOMETRICAL	434
DATA LASL 6600 F4 RS P T B \$ GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT	361
DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2 WAPD 6600 BCD R L T Z \$ ETOG1	447
DATA LIBRARY LLL 7094 F+MAP RS PL T M \$ ECSIL, EXPERIMENTAL NEUTRON	351
DATA MANAGEMENT, EDITING, & ANALYSIS BAPL 6600 F4 RS P T M \$ SHLOG,	557
DATA POINTS KAPL 6600 F+ASC RS P T P \$ CURFIT, CURVE FITTING EXPERIMENTAL	43
DATA PREPARATION FOR 2-D DESIGN PROGRAMS LASL 7090 F+MAP RS P T L \$ OPC,	234
DATA PROCESSING CODE ANL 360 F4 RS T M \$ RIGEL, ENDF/B V3	571

DATA

DESIGN

DATA PROCESSING MODULE	ANL	360	F4	RSBP	CT L \$ ARC-NU1002, BCD INPUT	533	
DATA REDUCTION	ANL	3600	F63	RSBP	O \$ CCINC, CCINCIDENCE COUNTING	248	
DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S	T M \$ JOSHUA,	490	
DATA SYSTEM	KAPL	6600B	F+CCM	R	T M \$ DATATRAN, 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	
DATA UILL	360	F4	RS P	A	\$ CODILLI, LEAST SQUARES ANALYSIS RESONANCE	347	
DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL	6600	F+ASC	RS P	T P \$	407	
DATATRAN UTILITY MODULES, 2-D & 3-D PLOTTING	KAPL	6600B	F+ASC	R	T P \$	407	
DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL	6600E	F+ASC	R	T L \$	406	
DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600B	F+COM	R	T M \$	386	
DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS P	X T B \$ RESC2, RFSQO,	285	
DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNW	1108	F5	RS P	T D \$	456	
DDB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP	RSBP	T C \$	99	
DE/STEP, INTRP, SOLN CF ORDINARY DIFF EQUATIONS	SLA	360	F4	RS P	X T P \$	640	
DE/STEP, INTRP, SOLN CF ORDINARY DIFF EQUATIONS	SLA	6600	F4	RS P	X T P \$	640	
DECAY	BNW	1108	F5	RSBP	T D \$ ISOGEN, RADIONUCLIDE GENERATION AND	367	
DECAY CHAIN ANALYSIS	CRNL	1604	F63	RS P	D \$ ISOCRUNCH, REACTION	180	
DECAY CHAIN ANALYSIS	CRNL	7090	F2	RSBP	D \$ ISOCRUNCH, REACTION	180	
DECAY CHAINS	GEC	635	F4	RSBP	D \$ CHAINS, ANALYSIS OF RADIOACTIVE	418	
DECAY CURVES	LLL	7194	F2	RS P	P \$ EXPALS, LEAST SQUARES EXPONENTIAL	321	
DECAY CRNL	1604	F63	RS P	D	\$ ISOTOPES, MAXIMUM YIELD FROM REACTION OR	179	
DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	F36	SBP	I \$ BCW2,	365	
DEFLECTION STRESS STUDY	BAPL	6600	F4	F+COM	RS P	T I \$ GAPL3, INELASTIC LARGE	397
DEFORMATION	BAPL	6600	F4	RS P	T I \$ CYGR03, OXIDE FUEL ROD STRESS &	449	
DEFORMATION	TVA	360	F4	RS P	T I \$ CYGR03, OXIDE FUEL ROD STRESS &	449	
DEFORMATION	BAPL	6600	F4	RS P	T I \$ PFLEN, FUEL PELLETT TEMPERATURE &	598	
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 &	477	
DEPLETION	LASL	7030	F4	RS P	T D \$ DTF-BURN, 1-D MULTI-GP DTF4 WITH	269	
DEPLETION	AERI	6600		RSBP	PLX T B \$ LEOPARD, SPECTRA CALCULATION WITH	279	
DEPLETION	ANC	360F	F+BAL	RS P	XCT D \$ PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION	275	
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 CR 3-D FEW-GP DIFFUSION	275	
DEPLETION	BAPL	6600C	F+ASC	RS P	T D \$ PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION	275	
DEPLETION	BCS	6600D	F+ASC	R B	T D \$ PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION	275	
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 CR 3-D FEW-GP DIFFUSION	275	
DEPLETION	IBM	360A	F+BAL	RS P	T D \$ PDQ5, 2-D FEW-GROUP DIFFUSION AND	336	
DEPLETION	JNC	1108	F5	RS LX	T B \$ LEOPARD, SPECTRA CALCULATION 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	336	
DEPLETION	WAPD	360	F4	RS PLXCT	B \$ LEOPARD, SPECTRA CALCULATION WITH	279	
DEPLETION	GGA	7044	F4	RS P	T D \$ RELOAD-FEVER, 1-D FEW-GP DIFFUSION	221	
DEPLETION CODE	CRNL	7090	F+FAP	RS P	T D \$ ASSAULT, 2-D MULTI-GP DIFFUSION	240	
DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P	D \$ CINDER, MO102, POINT	313	
DEPLETION FISSION PRODUCT	CP	360	F+BAL	RS P	T D \$ CINDER, MO102, PCINT	313	
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 MULTIGP	ORNL	360F	F4	RS P	T K \$ CITATION, 1,2,3-D DIFFUSION	387	
DEPLETION NED	635	F+GMP	RS P	T D	\$ SYN, 2D SYNTHESIS MULTIGP DIFF & IGP	495	
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 C \$ 3DXT,	477	
DESIGN	BNW	1108	F5	PS P	T H \$ REPP, THERMAL-HYDRAULIC WATER REACTOR	483	
DESIGN & SURVEY STUDY	BW	6600	F+CCM	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 MLMO	360	F4	RSBP	C	P \$ LATIN SQ, NXN LATIN SQUARE EXPERIMENTAL	630	
DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	F63	RSBP	L T J \$ MAC, SHIELD	143	

DESIGN

DIFFUSION

DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	F2	RSBPL	T J \$ MAC, SHIELD	143
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+CCM	RS P	T P	\$ LENSDES, NONLINEAR LEAST SQ LENS	602
DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL	6600	F+ASC	RS P	T P \$ DOGGY,	428
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 SLA	6600	F4	RS P	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	6600	F4	RS P	P \$ FCRSIM, SOLN OF SYSTEM OF ORDINARY	514
DIFF EQUATIONS SLA	360	F4	RS P	X T P	\$ DE/STEP, INTRP, SOLN OF ORDINARY	640
DIFF EQUATIONS SLA	6600	F4	RS P	X T P	\$ DE/STEP, INTRP, SOLN OF ORDINARY	640
DIFFERENTIAL EQN SYSTEM SOLVER	ANL	360B	F4	RS P	C P \$ GEAR, ORDINARY	592
DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600B	F4	RS P	P \$ GEAR, ORDINARY	592
DIFFERENTIAL EQNS. SOLUTION	KAPL	6600	F+ASC	RS P	T P \$ LIZARD, NONLINEAR	445
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 W	\$ INDX, XRAY	609
DIFFUSION	ANL	360	F4	RS P	F \$ TWIGGLE, 2-D 2-GP SPACE-TIME	338
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 + LIB	AI	360	F4	RSBPLX	T C \$ CAESAR4, LIBLST, 1-D MULTI-GP	270
DIFFUSION & BURNUP XY, RZ GGA	1108	F+BAL	RS P	T D	\$ PUC2, 2-D MULTIGROUP	438
DIFFUSION & INVENTORY	ANL	360	F4	RSBP	CT C \$ ARC-DIF1D, 1-D MULTI-GP	626
DIFFUSION & SA THEORY	NED	635	F4	RS P	T C \$ DOT2CB, 2-D MULTIGROUP	459
DIFFUSION ABSORPTION REMOVAL X-SECS BAPL	6600	F4	RS	T R	\$ M0807, 2-D	280
DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP	T D \$ 2CB, 2-D MULTIGROUP	325
DIFFUSION AND DEPLETION	BNW	1108	F4	RS P	T D \$ 2CB, 2-D MULTIGROUP	325
DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P	T D \$ PDQ5, 2-D FEW-GROUP	336
DIFFUSION AND DEPLETION	LASL	6600	F4	RS P	T D \$ 2CB, 2-D MULTIGROUP	325
DIFFUSION AND DEPLETION	MIT	360B	F+BAL	RSBP	T D \$ PDQ5, 2-D FEW-GROUP	336
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 \$ 3CB, 3-D MULTIGROUP	567
DIFFUSION BURNUP ANALYSIS FEDI	1108	F4	RS P	T D	\$ 3CB, 3-D MULTIGROUP	567
DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P	T D \$ PHENIX, 2D	454
DIFFUSION BURNUP PZ GEOMETRY	GGA	7090	F+FAP	RSBP	T D \$ DDB, 2-D FEW-GP	99
DIFFUSION CALC	KAPL	6600	F4	RS P	F \$ RAUMZFIT, 1-D TIME-DEPENDENT	352
DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS P	T C \$ GATT, 3-D FEW-GP	380
DIFFUSION CYLINDER SLAB CDC	1604	F63	RS P	T C	\$ EQUIPOISE3A, 2-D 2-GP	87
DIFFUSION CYLINDER SLAB CRNL	7090	F2	RS P	T C	\$ EQUIPOISE3A, 2-D 2-GP	87
DIFFUSION DEPLETION	AI	360	F4	RSBP	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	36 F	F+BAL	RS P	XCT D \$ PDQ7, 1,2 CR 3-D FEW-GP	275
DIFFUSION DEPLETION	BAPL	6600A	F+ASC	RS P	T D \$ PDQ7, 1,2 CR 3-D FEW-GP	275
DIFFUSION DEPLETION	BAPL	6600C	F+ASC	RS P	T D \$ PDQ7, 1,2 CR 3-D FEW-GP	275
DIFFUSION DEPLETION	BCS	6600C	F+ASC	R B	T D \$ PDQ7, 1,2 CR 3-D FEW-GP	275
DIFFUSION DEPLETION	PW	6600B	F+ASC	RS P	T D \$ PDQ7, 1,2 CR 3-D FEW-GP	275
DIFFUSION DEPLETION	GGA	7044	F4	RS P	T D \$ RELOCAT-FEVER, 1-D FEW-GP	221
DIFFUSION DEPLETION CODE CRNL	7090	F+FAP	RS P	T D	\$ ASSAULT, 2-D MULTI-GP	240
DIFFUSION DEPLETION GGA	1108	F4	RS P	T D	\$ GAUGE, 2-D FEW-GP HEX GEOM	339
DIFFUSION DEPLETION MULTIGP	CRNL	360H	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	BNW	1108	F4	RS	F X T B \$ 10X, 1-D	374
DIFFUSION FEEDBACK	BAPL	6600	F4	RS P	T F \$ TWIGL, 2-D 2-GP SPACE-TIME	338
DIFFUSION FEEDBACK	BNL	6600	F4	RS P	T F \$ NCAH, 1-D ONE-GP SPACE-TIME	405
DIFFUSION	MIT	370	F4	RS P	T F \$ GAKIN2, 1D MULTIGROUP TIME-DEPENDENT	310

DIFFUSION

DOPIE

DIFFUSION POWER DIST SEARCH	GGA 7044 F4	RS P T C \$ GASP2, 1-D FEW-GP	220
DIFFUSION PROGRAM	AAEC 360 F+BAL RS P	T C \$ CRAM, 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 RSRPL	T C \$ CPAM, 1-D AND 2-D MULTI-GP	103
DIFFUSION PROGRAM	BC 625 F4 RS	T C \$ EXTERMINATOR2, 2-D MULTI-GP	156
DIFFUSION PROGRAM	CE 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 \$ EQUIPCISE3, 2-D 2-GROUP	39
DIFFUSION SLAB CYL SPHERE	BNK 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 SLAB CYL SPHERE	ANL 360 F36 RS P	X T C \$ MACH1, 1-D MULTI-GP	262
DIFFUSION SLAB CYL SPHERE	MTS 360 F4 RSBPLX	CT C \$ MACH1, 1-D MULTI-GP	262
DIFFUSION SLAB CYL SPHERE	PURD 6500 F4 RS PLX	T C \$ MACH1, 1-D MULTI-GP	262
DIFFUSION SLAB CYL SPHERE	BFSC 360 F4 RS P	T C \$ FAIMOS, 1-D MULTI-GP	120
DIFFUSION SLAB CYLINDER	CDC 1604 F63 RS P	T C \$ 20CPAND, 2-D FEW-GROUP	40
DIFFUSION SLAB CYLINDER	ORNL 7090 F2 RS P	T C \$ 2JGRAND, 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 \$ MCNA, 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 \$ PISYN, 2-D MULTI-GP	287
DIFFUSION SYNTHESIS CALC	NED 1108 F4 RS P	T C \$ PISYN, 2-D MULTI-GP	287
DIFFUSION TEMP COEF CALC	GGA 7044 F4 RS P	T C \$ TEMCC, 1-D FEW-GP	225
DIFFUSION TRIANGULAR MESH	GGA 1108 F+BAL RS P	T C \$ CAMTRI, 2-D MULTI-GP	401
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 RSBP	T C \$ GAMBLE4, 2-D MULTI-GP	222
DIFFUSION XY RZ PTH	WANL 7094 F4 RS P	X T C \$ VARI-CLIR3, 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 C \$ 20CT, 3-D MULTIGROUP	463
DIFFUSION 3-GEOM	BAPL 6600 F4 RS P	T F \$ WIGL2, 1-D 2-GP SPACE-TIME	274
DIFFUSION 3-GEOM	GGA 1108 F4 RS P	T F \$ WIGL2, 1-D 2-GP SPACE-TIME	274
DIFFUSION+BURNUP TRI-MESH	GGA 1108 F+BAL RS P	T D \$ RLGTRI, 2-D MULTIGP	439
DISASSEMBLY	ANL 360 F4 RS P	XCT F \$ VENUS, 2-D LMFBP POWER EXCURSION	511
DISCHARGE STUDY	HEDL 1108 F5 RS P	T R \$ TOPLYP2, POWER PLANT THERMAL	599
DISCRETE ORDINATE CALC	AI 7090 F2 RS PLX	T C \$ CTF2, 1-D MULTI-GP	151
DISCRETE ORDINATE CALC	AI 360 F4 RSRPLX	T C \$ ANISN, 1-D MULTI-GP	151
DISCRETE ORDINATE CALC	UNC 1604 F63 RS PL	T C \$ CTF, 1-D MULTIGROUP	144
DISCRETE ORDINATE CALC	ANL 360 F36 RS P	T C \$ SNAPC-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	I P \$ XSCRN,	393
DISCRETE ORDINATE PROGRAM	ANL 360 F+BAL RS P	T C \$ CTF4, 1-D MULTI-GP	209
DISCRETE ORDINATE PROGRAM	BC 625 F+MAP RS P	T C \$ CTF4, 1-D MULTI-GP	209
DISCRETE ORDINATE PROGRAM	LASL 6600 F4 RS P	T C \$ CTF4, 1-D MULTI-GP	209
DISCRETE ORDINATE PROGRAM	LASL 7030 F4 RS P	T C \$ CTF4, 1-D MULTI-GP	209
DISCRETE ORDINATE PROGRAM	LER 7094 F4 RS P	T C \$ CTF4, 1-D MULTI-GP	209
DISCRETE ORDINATE PROGRAM	LER 7090 F+MAP RS P	T C \$ TCSN, 2-D MULTIGROUP	312
DISCRETE ORDINATES SLAB GEOMETRY	BAPL 6600 F4 RS P	T C \$ BE21, FEW-GP	398
DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT 360 F4 RS P	T I \$ SABCR4,	402
DISK SOURCE	MTS 7090 MAD RSP	C \$ BURP2, DETECTOR EFFICIENCY	165
DISPER, AFROSCL PARTICLE TRANSPORT STUDY	REF 360 F36 RS P	G \$	554
DISPLAY	OP 360 F+BAL S	T M \$ JOSHUA, DATA STORAGE, RETRIEVAL, AND	490
DISSIMILAR MEDIA TLD CORRECTION CALC	AI 360 F4 RS P	T C \$ RESPND,	566
DOC-2B LIBRARY GROUP COLLAPSING	APR 6600 F4 RS	B \$ APRX1, 99-GP	466
DOCUMENT INFORMATION SYSTEM	KAPL 6600B F+ASC RSB	X T M \$ TIGIR2, MODULAR	403
DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL 6600 F+ASC RS P	T P \$	428
DOPIE, RESOLVED RESONANCE X-SECTION CALC	NED 2000 F2 RS P	A \$	177

DCPPLER

DYNAMIC

DCPPLER EFFECTS	NED 2000 F2	RS P	B \$ SPARTA, SPATIALLY-AVERAGED	178
DOS-MFT REMOTE WORKSTATION PKG	ANL 360 F+ASM RSB	CT P \$ WSP-HASP/CCS,		541
DOS-MFT REMOTE WORKSTATION PKG	ANL 360R F+ASM RSP	CT P \$ WSP-HASP/CCS,		541
DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC 635 F4	RSBP	D \$	423
DOSE PGE 360 F4	KS P	CT G \$ EMERALD, PWR PLANT RADIATION RELEASE &		546
DOSE AI 7094 F+FAP RS PL T G \$	CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL			196
DOSE CALC AI 7094 F+FAP RS P	J \$ SHOE, SHIELD WEIGHT OPTIMIZATION			197
DOSE CALC GGA 110P F4	RS T G \$ GADDOSE,DCSET, HTGR ACCIDENT ANALYSIS			261
DOSE INTEGRALS CP 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	J \$ 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	C \$ CLOUD, GAMMA-RAY	47
DOSE RATE FROM A CLOUD	DP 360 F4	RS P	C \$ CLOUD, GAMMA-RAY	47
DOSE RATE FROM SNAP SHIELD LEAKAGE	AI 7090 F2	RS	J \$ FARSEIA,	91
DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE AI	7094 F+FAP RS PL T C \$	CURIE,		196
DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC GGA 1108 F4	RS	T C \$ GADDOSE,		261
DOT2DB, 2-D MULTICROUP DIFFUSION & SN THEORY	NED 635 F4	RS P	T C \$	459
DOUBLE SN APPROX BNW 7090 FLECCO RSBP	T C \$ GE-HAFCS-S13, 1-D MULTI-GP			75
DOUBLE SN APPROX SLAB GEOM PPGC 7090 F2	RS P	C \$ MIST, 1-D FEW-GP SN		59
DP 360 BCD R LX T Z \$	THERMCS 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 PS P T D \$	CINDER,M0102, PCINT 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 \$ CLCUD, 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	F \$ PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM			586
DP 360 F4 RS P T C \$	KEFF,MGBS,TGAN, NUCLEAR CRITICALITY SAFETY			617
DP 360B EBCDC P 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 A \$	FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA			368
DP 360B F4 RSBP CT C \$	HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION			136
DP PACKAGE KAPL 6600 F+ASC RS P T P \$	DOGGY, DESK CALCULATOR FORM SHEET			428
DP PURCHASE VERSUS LEASE ANALYSIS SLA 360	COBOL RSBP CT M \$ BECOM, AEC			589
DP PURCHASE VERSUS LEASE ANALYSIS SLA 1108	COBOL RS P M \$ BECOM, AEC			589
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,	373
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
DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL 6600 F+COM RS P T I \$			503
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,		283
DYNAMIC ANALYSIS OF GASES BY MASS SPECTROMETRY	RFD 360 F4	RS P U \$		645
DYNAMIC ANALYSIS OF THIN SHELLS	SLA 6600 F4	RS P T I \$ SLADE-D,		581
DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL 6600 F4	RS P T I \$ FUGIT,		537
DYNAMIC STORAGE ALLOC ORNL 360	BAL+F RS P CT P \$ GETCCR,FRECOR, FORTRAN			644

DYNAMIC STRUCTURAL ANALYSIS	ANC	360	F4	RSBP	CT I \$ STRAP, STATIC &	539
DYNAMICS	AI	360	F+BAL	RS P	T F \$ AIRUS2A, SIMULATION OF REACTOR	326
DYNAMICS	ANL	360	F4	RS P	T C \$ GROUP2, GROUP THEORY OF LATTICE	62
DYNAMICS	LASI	6600	F4	RS P	T C \$ GROUP2, GROUP THEORY OF LATTICE	620
DYNAMICS	BAPL	6600	F4	RS P	T I \$ M0266, LINEAR ELASTIC STRUCTURAL	383
DYNCL, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	F4	RS P	C \$	464
DYNCL, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	F4	RS P	C \$	464
EBCDC R L T Z \$ GAMTAB, RADIOACTIVE-DECAY GAMMA RAY CATALOG	DP	360B				637
ECC BCL 6400 F4	RS P	X T G \$ MUCHA1, MUCHA2, MULTIPLE CHANNEL ANALYSIS				508
ECCSA4, LOSS-CF-COOLANT & EMERGENCY COOLING	BCL	6400	F4	RS P	T G \$	230
ECONOMICS CWF 360 F4	RS P	T C \$ CINCAS, NUCLEAR FUEL CYCLE COST AND				354
ECONOMICS UICS 360 F4	RS P	CT D \$ CEM, ANALYSIS OF NUCLEAR FUEL CYCLE				576
ECONOMICS WAPD 6600 F4	RS P	T D \$ CINCAS, NUCLEAR FUEL CYCLE COST AND				354
ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LLL	7094	F+AP	RS PL	T M \$	351
EDIT KAPL 6600B F+ASC P	T L \$ DATATRN 2-D GEOMETRY INPUT, PREPARATION,					406
EDIT REACTION RATES	UK-W	7090	F2	RS	N \$ WEC, W-DSN OUTPUT TAPE	133
EDITING	ORNL	360B	F4	RS PL	CT M \$ EDITCF, ENDF/R TAPE PROCESSING AND	502
EDITING	ORNL	6600	F4	RS P	T M \$ EDITCF, ENDF/R TAPE PROCESSING AND	502
EDITING, & ANALYSIS	PAPL	6600	F4	RS P	T M \$ SPLCG, DATA MANAGEMENT,	557
EDITOR, ENDF/R TAPE PROCESSING AND EDITING	ORNL	360B	F4	RS PL	CT M \$	502
EDITOR, ENDF/R 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 \$ DTX,	210
EFFICIENCY DISK SOURCE	MTS	7090	MAD	PSB	O \$ BURP2, DETECTOR	165
EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB	C \$ BURP1, DETECTOR	164
EFFICIENCY POINT SOURCE	MTS	7090	MAD	RSB	C \$ BURP3, DETECTOR	166
EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	DP	360	F4	RS P	G \$	600
EI 360 F+BAL RS P	CT H \$ GKILR, CORE HEATUP CODE FOR BWR/6 ANALYSIS					636
EIGENVALUE EIGENVECTOR PACKAGE	ANL	360	F4	RSB	XCT P \$ EISPACK, MATRIX	534
EIGENVALUE EIGENVECTOR PACKAGE	ANL	635	F4	RS	X T P \$ EISPACK, MATRIX	534
EIGENVALUE EIGENVECTOR PACKAGE	ANL	1108	F4	RS	X T P \$ EISPACK, MATRIX	534
EIGENVALUE EIGENVECTOR PACKAGE	ANL	6600	F4	RS	X T P \$ EISPACK, MATRIX	534
EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600	F+ASC	RS P	T I \$ GEM,	344
EIGENVECTOR PACKAGE	ANL	360	F4	RSB	XCT P \$ EISPACK, MATRIX EIGENVALUE	534
EIGENVECTOR PACKAGE	ANL	635	F4	RS	X T P \$ EISPACK, MATRIX EIGENVALUE	534
EIGENVECTOR PACKAGE	ANL	1108	F4	RS	X T P \$ EISPACK, MATRIX EIGENVALUE	534
EIGENVECTOR PACKAGE	ANL	6600	F4	RS	X T P \$ EISPACK, MATRIX EIGENVALUE	534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	360	F4	RSB	XCT P \$	534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	635	F4	RS	X T P \$	534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	1108	F4	RS	X T P \$	534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	6600	F4	RS	X T P \$	534
ELASTIC ANALYSIS	BAPL	6600	F+COM	RS P	X T I \$ MATLS, 3-D FINITE ELEMENT	597
ELASTIC SCAT RESONANCES	AI	360	F4	RS PLX	T B \$ AILMCF, X-SECTION CALC	147
ELASTIC SCAT RESONANCES	AI	7094	F+AP	RS PL	T B \$ AILMCE, 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 \$ PECGY,	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,	329
ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P	T I \$ M0266, LINEAR	383
ELASTIC STRUCTURES	BAPL	6600	F4	RS P	T I \$ FUGIT, DYNAMIC RESPONSE OF	537
ELASTIC SYSTEMS	BAPL	6600	F4	RS P	T I \$ M0552, DYNAMIC ANALYSIS LINEAR	283
ELASTIC-PLASTIC	BAPL	6600	F+COM	RS P	T I \$ DUZ2, 2-D AXISYMMETRIC & PLANE	503
ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	F4	RS P	T G \$	229
ELECTRICITY COSTS	ORNL	1604	F63	RS P	D \$ POWERCC, NUCLEAR STATION	340
ELECTRICITY COSTS	UFC	6600	F4	RS P	D \$ POWERCC, NUCLEAR STATION	340
ELECTRON DISTRIBUTION	ANL	360	F4	RS P	O \$ DYNCL, PHOTOMULTIPLIER	464
ELECTRON DISTRIBUTION	KAPL	6600	F4	RS P	O \$ DYNCL, PHOTOMULTIPLIER	464
EMERALD, PWR PLANT RADIATION RELEASE & DOSE	PGE	360	F4	RS P	CT G \$	546
EMERGENCY COOLING	BCL	6400	F4	RS P	T G \$ ECCSA4, LOSS-CF-COOLANT &	330
ENDF MULTIGROUP X-SECTION CALCULATION	ANL	360	F4	RS P	CT B \$ MC**2,	355
ENDF MULTIGROUP X-SECTION CALCULATION	ANL	360J	F36	RS P	T B \$ MC**2,	355
ENDF TAPES	BNL	7090	F+AP	RS P	T M \$ DFSR, DATA FILE SERVICE ROUTINES	230
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

ETOT2

ENDF/B DATA BAPL 6600 F4	RS P	T B \$ EPOCH, NEUTRON AGE CALCULATION OF	461
ENDF/B DATA CRNL 360 F4	RS P	T B \$ RICE, PRIMARY RECOIL ATOM SPECTRA	453
ENDF/B DATA GESV 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 FINF-GP CONSTANTS GENERATION CRNL 360 F4	RS P	T B \$ SLPERTGG,	431
ENDF/B FOP IOX HECL 1108B F4	RS P	X T B \$ ETOX3, MULTI-GP CONSTANTS FROM	388
ENDF/B FCRMAT 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	375	
ENDF/B RESONANCE XSECTION CODES BNL 6600B F4	RS P	T A \$ RESEND,ADLER,	465
ENDF/B SCAT KERNELS DP 360 BCD R	LX T Z \$ THERMOS LIBRARY, 30-GP	543	
ENDF/B TAPE PROCESSING AND EDITING CRNL 360P F4	RS PL	CT M \$ EDITOR,	502
ENDF/B TAPE PROCESSING AND EDITING CRNL 660J F4	RS P	T M \$ EDITOR,	502
ENDF/B THERMAL SCATTERING DATA DP 360B F4	RS P	XCT A \$ FLANGE2(71-1),	368
ENDF/B TO GAFGAR X-SECTIONS GGA 1108 F5	PS P	T B \$ ENDFB2,GANC2,CFE2,	596
ENDF/B TO MC**2 DATA CONVERSION ANL 360 F4	RS P	CT M \$ ETCE,	350
ENDF/B TO MC**2 DATA CONVERSION APDA 360J 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,PLGTFB,...	384
ENDF/B V2 PROC BNL 6600B F4	RS	T M \$ CRECT,CHECKER,RIGEL,PLGTFB,...	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 660J F4	RS	T M \$ CHECK3,RIGEL3,	571
ENDF/B V4 PROCESSING CODES BNL 660J F4	RS	T M \$ RIGEL4,CHECK4,...	638
ENDFB2,GANC2,GFF2, ENDF/B TO GAFGAR X-SECTIONS GGA 1108 F5	RS P	T B \$	596
ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA GESV 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	CT A \$ JUPITER1, COUPLED CHANNEL X-SEC EVALUATION	308
ENERGY INTERVAL X-SECTION AVERAGING GGA 7044 F4	RS P	L \$ GAVER,	218
ENTRAINED PARTICLES SAMPLING STUDY BAPL 6600 F4	RS P	T C \$ BETTY,	545
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 66000 F+COM RS	T P \$ MODEL, MODIFIED BETTIS	478	
ENVIRNMNTL LIB SCOPE3.3 CDC 66000 F+COM RS	T P \$ MODEL, MODIFIED BETTIS	478	
ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES ANC 360 F+BAL RS	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	
EPITHERMAL X-SECTIONS NEL 635 F4	RS P	T B \$ PFAX, RESOLVED RESONANCE	257
EPITHERMCS, SPECTRUM AND X-SECTION CALCULATION NED 7,94 F+FAP RS P	T B \$	201	
EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA BAPL 6600 F4	RS P	T B \$	461
EQN SOLN CURVE PLOT KAPL 6600 F+ASC RS P	T P \$ SNEQ, NONLINEAR ALGEBRAIC	364	
EQN SYSTEM SOLVER ANL 360B F4	RS P	C P \$ GEAR, ORDINARY DIFFERENTIAL	592
EQN SYSTEM SOLVER LII 6600B F4	RS P	P \$ GFAP, ORDINARY DIFFERENTIAL	592
EQUILIBRIUM FUEL CYCLE CALCULATION GGA 1108 F4	S	T C \$ GAFFE,	302
EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL CRNL 7090 F2	RS P	T C \$	80
EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB CDC 1604 F63	RS P	T C \$	87
EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB CRNL 7090 F2	RS P	T C \$	87
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 PFACOR ANALYSIS CALCULATION CRNL 360 F+BAL RSBPL	CT C \$	523	
ESTIMATE CRNL 3600 F4	RS P	XCT C \$ CONCEPT, POWER PLANT CONCEPTUAL COST	498
ESTIMATING CRNL 360B F4	RS P	T C \$ ORCOST, POWER PLANT CAPITAL COST	588
ETOF, ENDF/B TO MC**2 DATA CONVERSION ANL 360 F4	RS P	CT M \$	350
ETOF, ENDF/B TO MC**2 DATA CONVERSION APDA 360 ASAF4	RS P	T M \$	350
ETCG1 DATA LIBRARIES, MUFT4 CP 5, GAM1 CR 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
ETOG3, 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 IDX HEOL 1108P F4	RS P	X T P \$	388
EXCHANGER STRESS ANALYSIS KAPL 660J F4	RS P	I \$ TUBE, U-TUBE HEAT	378
EXCURSION ANL 360 F4	RS P	CT F \$ REXCO-H, 2-D HYDRODYNAM RESPONSE TO	550
EXCURSION ANALYSIS ANC 360 F4	RSBP	XCT G \$ RELAP3, REACTOR BLOWDOWN -	369
EXCURSION ANALYSIS ANC 1108 F4	RS P	T G \$ RELAP3, REACTOR BLOWDOWN -	369
EXCURSION ANALYSIS ANC 660J F4	RS P	T G \$ RELAP3, REACTOR BLOWDOWN -	369
EXCURSION ANL 360 F4	RS P	CT F \$ RFXCO-H2, 2-D HYDRODYNAM RESPONSE TO	615
EXCURSION CALCULATION R-Z GEOMETRY APDA 7094 F4	RS P	F \$ MARS, 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 \$ FCRE2, FAST REACTOR	174
EXCURSION CALCULATIONS NED 635 F4	RS P	X T F \$ FCRE2, 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 660J F4	RS P	T C \$ JITER, FLUCTUATION	394
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	425
EXPERIMENTAL DATA POINTS KAPL 660J F+ASC RS P	T P \$	CURFIT, CURVE FITTING	43
EXPERIMENTAL DESIGN MLMC 360 F4	RSEP	C P \$ LATIN SQ, NXN LATIN SQUARE	630
EXPERIMENTAL NEUTRON DATA LIBRARY LLL 7094 F+FAP RS PL	T M \$	FCSIL,	351
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 C \$	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	RS P	A \$	238
EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM CRNL 709J F+FAP RS P	T C \$		156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM RC 625 F4	PS	T C \$	156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM CE 660C F4	RS P	T C \$	156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM CRNL 360 F4	RS P	T C \$	156
EXTERNAL GAMMA DOSE INTEGRALS CP 360 F4	RS P	G \$ ECAL, CALC OF	600
EXTERNAL+INTERNAL DOSE AI 7094 F+FAP RS PL	T G \$	CURIE, DOSE, THUNDERHEAD,	196
EXTREME VALUE DISTRIBUTION DATA ANALYSIS BAPL 660J F4	RS P	P \$ BH99,	621
F+ASC R T L \$ DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT KAPL 660CB			406
F+ASC R T P \$ DATATRAN UTILITY MODULES, 2-D & 3-D PLOTTING KAPL 6600B			407
F+ASC R P T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION BCS 6600C			275
F+ASC RS P \$ SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE KAPL 660J			442
F+ASC RS T P \$ BETTIS ENVIRONMENTAL ROUTINES, SUPRCUTINE LIB. BAPL 6600A			478
F+ASC RS T P \$ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. RW 6600B			478
F+ASC RS P T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION BAPL 6600A			275
F+ASC RS P T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION BAPL 6600C			275
F+ASC RS P T D \$ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION RW 660CB			275
F+ASC RS P T H \$ LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM KAPL 660J			299
F+ASC RS P T I \$ GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS KAPL 6600			344
F+ASC RS P T J \$ ASPIS, GAMMA RAY SOURCE BUILDUP FACTOR CALC BAPL 6600			429
F+ASC RS P T J \$ SPAN4, A POINT-KEPNE SHIELD EVALUATION CODE BAPL 6600B			462
F+ASC RS P T P \$ CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS KAPL 660J			43
F+ASC RS P T P \$ DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING KAPL 6600			407
F+ASC RS P T P \$ DOGGY, DESK CALCULATOR FORM SHEET CP PACKAGE KAPL 6600			428
F+ASC RS P T P \$ LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION KAPL 660C			445
F+ASC RS P T P \$ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT KAPL 660J			364
F+ASC RS P X T B \$ RESO2, RESO, DBF1, RESONANCE INTEGRAL HEX CELL BAPL 6600			285
F+ASC RSB X T M \$ TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM KAPL 6600B			403
F+ASM RSB CT P \$ WSP-HASP/DCS, DCS-MFT REMOTE WORKSTATION PKC ANL 360			541
F+ASM RSB CT P \$ WSP-HASP/DCS, DCS-MFT REMOTE WORKSTATION PKG ANL 360B			541
F+BAL S T M \$ JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY CP 360			490
F+BAL S X T B \$ RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES CP 360			536
F+BAL R R L T P \$ TSO-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSO ANL 360			593
F+BAL RS T P \$ AMDLIB, 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 T P \$ NETS ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES ANC 360			617
F+BAL RS CT P \$ PROGLOOK, USER PROGRAM PERFORMANCE MONITOR SLAC 360			647
F+BAL RS P O \$ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC CRNL 360			322
F+BAL PS P O \$ PMS1, FAST NEUTRON POLARIZATION EXPERIMENT UCND 360B			469

F+PAL

F+FAP

F+PAL	PS	P	T	A	\$	COMNUC, CASCADE, COMPOUND NUCLEUS REACTION	AI	360	482	
F+PAL	RS	P	T	B	\$	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	360B	392	
F+PAL	RS	P	T	C	\$	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC	360	102	
F+PAL	RS	P	T	C	\$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	360	209	
F+PAL	RS	P	T	C	\$	GAMBLES, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	222	
F+PAL	RS	P	T	C	\$	GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA	1108	401	
F+PAL	RS	P	T	C	\$	GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	430	
F+PAL	RS	P	T	D	\$	BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	GGA	1108	439	
F+PAL	RS	P	T	D	\$	BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA	1108	438	
F+PAL	RS	P	T	D	\$	CINDER, MO102, POINT DEPLETION FISSION PRODUCT	DP	360	313	
F+PAL	RS	P	T	D	\$	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	336	
F+PAL	RS	P	T	E	\$	AIRDS2A, SIMULATION OF REACTOR DYNAMICS	AI	360	326	
F+PAL	RS	P	T	E	\$	BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER	GGA	1108	303	
F+PAL	RS	P	T	I	\$	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL	360	332	
F+PAL	RS	P	T	O	\$	GSSLRN18, LEAST SQUARES PHOTOPEAK SPECTRA CODE	BNW	1108	457	
F+PAL	RS	P	T	O	\$	TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	333	
F+PAL	RS	P	CT	B	\$	U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI	360	553	
F+PAL	RS	P	CT	H	\$	6KILER, CORE HEATUP CODE FOR BWR/6 ANALYSIS	EI	360	636	
F+PAL	RS	P	CT	M	\$	ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	360	522	
F+PAL	RS	P	X	T	B	\$	HWOER-SAFF, 2-D MONTE CARLO CELL CALCULATION	AI	360	307
F+PAL	RS	P	X	CT	B	\$	HAMMER, LITHE, HELP, CRITICAL ANALYSIS SYSTEM	DP	360	277
F+PAL	RS	P	X	CT	D	\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC	360F	275
F+PAL	RSB	L	CT	M	\$	SCOPE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	AI	360	375	
F+PAL	RSBP		T	D	\$	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	360B	336	
F+PAL	RSBP		T	M	\$	SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	1108	607	
F+PAL	RSBP		CT	C	\$	KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	DP	360B	450	
F+PAL	RSBP		CT	G	\$	CONTEMPT-LT/022, PRESSURE-TEMPERATURE RESPONSE	ANC	360B	433	
F+PAL	RSBPL		CT	C	\$	ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	360	523	
F+PAL	RSBPL		CT	C	\$	KENO, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	360	450	
F+PAL	RSBPL		CT	D	\$	REBUS2, FUEL CYCLE ANALYSIS FOR FAST REACTORS	ANL	360	634	
F+PAL	RSBPL		CT	G	\$	PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	360	555	
F+PAL	RSBPLX		CT	G	\$	RELAP4, TRANSIENT THERMAL-HYDRAULIC ANALYSIS	ANC	360C	369	
F+C+R	RSBP		T	M	\$	RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMD	360	603	
F+CDP	RS	P	T	P	\$	LAG, ASSEMBLER FOR FLOCC2 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+COM	R		T	M	\$	DATATRA, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600B	386	
F+COM	RS		T	P	\$	KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES	KAPL	6600	496	
F+COM	RS		T	P	\$	LASLIB, LOS ALAMOS SUBROUTINE LIBRARY ROUTINES	LASL	6600B	633	
F+CCM	RS		T	P	\$	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.2	CDC	6600C	478	
F+COM	RS		T	P	\$	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.3	CDC	6600D	478	
F+COM	RS	P		H	\$	HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	6600	560	
F+COM	RS	P	T	I	\$	DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	503	
F+COM	RS	P	T	I	\$	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	397	
F+COM	RS	P	T	P	\$	LENODES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	6600	602	
F+COM	RS	P	T	Q	\$	INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	6600	609	
F+COM	RS	P	X	T	B	\$	PAX03, HARMONY-PDQ X-SECTION GENERATION CODE	BAPL	6600	426
F+COM	RS	P	X	T	D	\$	FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	BW	6600	427
F+COM	RS	P	X	T	I	\$	MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS	BAPL	6600	597
F+COM	RS	PLX	T	C	\$	KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFD	6600	450	
F+FAP	RS		T	I	\$	4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	109	
F+FAP	RS	L	T	B	\$	QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	7090	119	
F+FAP	RS	L	T	C	\$	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	120	
F+FAP	RS	L	T	C	\$	ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	118	
F+FAP	RS	L	T	M	\$	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	B	\$	EPITHERMCS, SPECTRUM AND X-SECTION CALCULATION	NEC	7094	201
F+FAP	RS	P		T	B	\$	SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LLL	709C	160
F+FAP	RS	P		T	C	\$	EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	7090	156
F+FAP	RS	P		T	D	\$	ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	ORNL	7090	240
F+FAP	RS	P		T	G	\$	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	7094	172
F+FAP	RS	P		T	H	\$	HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	AI	7094	198
F+FAP	RS	P		T	L	\$	DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	234
F+FAP	RS	P		T	M	\$	DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	7090	236

F+FAP

FAST

F+FAP RS PL T B	\$ AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	147
F+FAP RS PL T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	185
F+FAP RS PL T B	\$ GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	7.94	162
F+FAP RS PL T B	\$ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	7090	50
F+FAP RS PL T B	\$ TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7.94	149
F+FAP RS PL T C	\$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	29
F+FAP RS PL T G	\$ CURIE, DOSE, THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	196
F+FAP RS PL T M	\$ ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LLL	7094	351
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 C	\$ NDB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	90
F+FAP RSBP T Q	\$ CASCADE, CLUSTER, RADIATION DAMAGE IN METALS	GEC	635	419
F+FAP RSBPL T C	\$ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7.94	103
F+FAP RSBPL T N	\$ CPS, SC4020 PLCTS FROM SCISPS X-SECTION TAPES	WANL	7094	230
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.	NEC	635	515
F+GMP RS P T D	\$ SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NEC	635	495
F+GMP RS P XCT P	\$ ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	CESV	635	501
F+GMP RS P XCT L	\$ TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	635	505
F+GMP RSBP T H	\$ THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	CEC	635	346
F+MAP RS P A	\$ CHAD, LECENDRE COEF CALC FOR ANGULAR DIST DATA	AI	7.94	215
F+MAP RS P A	\$ COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCC	7040	203
F+MAP RS P T B	\$ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	219
F+MAP RS P T B	\$ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LEP	7.94	219
F+MAP RS P T C	\$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	RC	625	209
F+MAP RS P T C	\$ TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	312
F+MAP RS P T D	\$ OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	7044	226
F+MAP RS P T E	\$ AIROS, SPACE-INDEPENDENT KINETICS W/FEEBACK	AI	7094	163
F+MAP RS P T F	\$ TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	309
F+MAP RS P T H	\$ BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	205
F+MAP RS P T H	\$ TOODFF, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCC	7044	349
F+MAP RS PLX T A	\$ TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	7094	208
F+MAP RS PLX T B	\$ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAFD	7094	249
F+MAP RSBP M	\$ UNPACK, RETRIEVAL FROM SCISPS X-SECTION TAPE	GGA	7044	206
F+MAP RSBP T C	\$ GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	CGA	7044	222
F+MAP RSBP T G	\$ SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KE	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, PATCH ANALYSIS OF GAMMA-RAY SPECTRA	ANC	360	622
F+SL RS P XCT R	\$ HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	HECL	1108	527
F+SPS RSBP T N	\$ CROSSPLOT, SC4020 PLCTS FROM X-SECTION TAPES	CGA	7044	207
FACTOR CALC	BAPL 6600 F+ASC RS P T J \$ ASPIS, GAMMA RAY SOURCE BUILDUP			429
FACTOR CALC FOR CYLINDRICAL FINS	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 \$ REL01, RELIABILITY FOR A SINGLE			497
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 RHSC	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 C	\$ 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
FARSEIA, 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,			473
FAST BREEDERS	NEC 635 F4 RS P D \$ RAPFU, FUEL CYCLE PARAMETERS			372
FAST NEUTRON POLARIZATION EXPERIMENT	UCND 3608 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	NEC 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

FIRE

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 FUEL ELEMENT BEHAVIOR	ANL	360	F4	RS P	T I \$ LIFE1,	460
FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	F4	RS P	T F \$ SAS1A,	400
FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	6600	F4	RS P	T F \$ SAS1A,	400
FAST REACTOR X-SEC CALC BNW	1108	F4	RS P	T B \$ FCC4, FUNDAMENTAL MODE		306
FAST REACTORS	ANL	360	F+BAL RSBPL 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+FAF RSEPLX T B \$ AGN-GAM,			204
FAST THERMAL SPECTRA GGA	1108	F4	RS PLX T B \$ GGC4, MULTI-GP X-SECTIONS			298
FAST THERMAL SPECTRA GGA	6600	F4	RS L T B \$ GGC4, MULTI-GP X-SECTIONS			298
FAST X-SECTION GENERATION	BNW	1108	F4	RS P X T B \$ IDX, 1-D DIFFUSION		374
FATIGUE	KAPL 6600	F4	RS	I \$ SCRSDB, PRESSURE VESSEL STRESS AND		391
FAU, RADIO FREQUENCY MANAGEMENT SYSTEM	ALOC	360	COBCL RS P	M \$ AEC-ALC		587
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
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		371
FEEDBACK	BAPL 6600	F4	RS P	T F \$ TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION		338
FEEDBACK BNW	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+FAF RSBP	T L \$ CDB, 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	360	F+BAL RS P	XCT C \$ PDQ7, 1,2 OR 3-D		275
FEW-GP DIFFUSION DEPLETION	BAPL 6600	JA F+ASC RS P	T C \$ PDQ7, 1,2 OR 3-D			275
FEW-GP DIFFUSION DEPLETION	BAPL 6600	C F+ASC RS P	T C \$ PDQ7, 1,2 OR 3-D			275
FEW-GP DIFFUSION DEPLETION	BCS	6600	D F+ASC R B	T C \$ PDQ7, 1,2 OR 3-D		275
FEW-GP DIFFUSION DEPLETION	HW	6600	B F+ASC RS P	T C \$ PDQ7, 1,2 OR 3-D		275
FEW-GP DIFFUSION DEPLETION	GGA	7044	F4	RS P	T D \$ RFLCAD-FEVER, 1-D	221
FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	F4	RSBP CT C \$ DWARF, 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 \$ THREDFS, 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 \$ TEMCC, 1-D	225
FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL 6600	F4	RS P	T C \$ BE21,		398
FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS P	T D \$ GALGE, 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 \$ PCQ5, 2-D		336
FEW-GROUP DIFFUSION AND DEPLETION	MIT	360B	F+BAL RSRP	T D \$ PCQ5, 2-D		336
FEW-GROUP DIFFUSION SLAB CYLINDER CDC	1604	F63	PS 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, 1D AND 2D	494
FFEARs, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	6600	F4	RS P	V \$	577
FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY	BAPL 6600	F4	RS P	T H \$		272
FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL RS	T P \$		484
FILE SERVICE ROUTINES ENDF TAPES	BNL	7090	F+FAF RS P	T M \$ DFSR, DATA		236
FINDING ROOTS OF A POLYNOMIAL	KAPL 6600	F4	RS P	P \$ RCPE,		444
FINE-GP CONSTANTS GENERATION	CRNL	360	F4	RS P	T B \$ SUPERTQG, ENDF/B	431
FINE1, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL 6600	F4	RS P X	I \$		404
FINITE-ELEMENT ELASTIC ANALYSIS	BAPL 6600	F+CCM RS P X T I \$ MATUS, 3-D				597
FINITE-ELEMENT GESV	635	F4	RS P	CT I \$ BFHAVE2, CXIDE FUEL PERFORMANCE		568
FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL 6600	F4	RS P X	I \$ FINEL,		404
FINS SNAP GEOM	AI	7090	F2	RS	J \$ SCARF2, SCATTER FROM RADIATOR	110
FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	PS P	T G \$ SCFIRE2, SODIUM POOL	559

FIRES

FMC-N,FMC-G

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 66JJ	F4			RS	P	T	P	\$	DAFT1, LEAST SQUARES FIT
FISSILE NUCLIDE X-SECTION EVALUATION	ORNL	7090	F4	RSEP				A	\$
FISSION PRODUCT BAPL 6600	F4			RS	P			D	\$
FISSION PRODUCT CP	360	F+BAL	RS	P		T	D	\$	CINDER,M0102, POINT DEPLETION
FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	F4	RS	P			C	\$
FISSION PRODUCT FUEL MODEL	ANL	36J	F4	RSEP		CT	I	\$	FPFM, STEADY-STATE
FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	F4	RS	P			G	\$
FISSION PRODUCT RELEASE GGA	1108	F4		RS	P			D	\$
FIT FISSILE NUCLIDE DATA BAPL 66JJ	F4			RS	P	T	P	\$	DAFT1, LEAST SQUARES
FIT SUM OF EXPONENTIALS MIT	7090	F2		RS	P			P	\$
FITTING	LASL	7094	F4	RS		T	P	\$	LASL LEAST SQUARES, GENERAL CURVE
FITTING	BAPL	6600	F4	RS	P	T	P	\$	M0661,M0657,M0626, POLYNOMIAL CURVE
FITTING	KAPL	6600	F4	RS	P			A	\$
FITTING EXPERIMENTAL DATA POINTS	KAPL	66JJ	F+ASC	RS	P	T	P	\$	CURFIT, CURVE
FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	1108	F5	PS	P			H	\$
FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	1108	F5	PS	P			A	\$
FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	360B	F4	RS	P	XCT	A	\$	
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	3600	F63	PSRP		T	C	\$	
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	36J	F4	RS	P	CT	C	\$	
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	635	F4	RS	P	T	C	\$	
FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS	P	T	G	\$	
FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	66JJ	F4	RS	P	T	G	\$	
FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	MA-G	360	F4	RSEP		CT	G	\$	
FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	PSBP	X	T	B	\$	RABBLE,WLIB,
FLIGHT COLLISION PROBABILITIES MC	CRNL	360B	F+BAL	RS	P	T	B	\$	RAFFLE, 1ST
FLOCO RS P	B	\$	MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	7090				
FLOCO RS P	B	\$	ZCT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	7090				
FLOCO RSBP	C	\$	2DXY, 2-D MULTI-GP SN APPROXIMATION XY CEOM	AGC	7090				
FLOCO RSP	T	C	\$	GE-HAPU-S13, 1-D MULTI-GP DCUBLE SN APPROX	BNW	7090			
FLOCO2 INSTRUCTION SET	PW	16J4	F+CDP	RS	P	T	P	\$	LAG, ASSEMBLER FOR
FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	66JJ	F4	RS	P	T	H	\$	
FLOW	AI	7094	F2	RS	P	H	\$	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE	
FLOW	MSS	360	F4	RS	P	H	\$	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE	
FLOW & TEMPERATURE DIST.	CRNL	360	F4	RS	P	T	H	\$	CRIBLE, PCC BUNDLE
FLOW AND HEAT TRANSFER	AI	7094	F2	RS	P	T	G	\$	TRANS-FUGUE1, TRANSIENT
FLOW DIST. IN CYL COOLANT INLET PLENUM	DP	360	F4	RS	P	H	\$	PLENUM,	
FLOW DISTRIBUTION	KAPL	6600	F4	RS	P	T	H	\$	HAFMAT, SYSTEM STEADY-STATE
FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	PS	P	C	\$	CPOC90, ML-1 FLUID	
FLOW IN LMFR ROD BUNDLE	NED	635	F4	RS	P	T	H	\$	VELVET2, TURBULENT
FLOW STEAM	GGA	1108	F4	RS	P	T	H	\$	DYNAM, DYNAMIC ANALYSIS
FLOW STUDY STEAM-WATER MIX	KAPL	66JJ	F4	RS	P	H	\$	KAPP, HIGH-VELOCITY	
FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS	P	T	H	\$	FLCT1,M0219, PWR
FLOW TRANSIENTS	ANL	36J	F4	RS	P	T	F	\$	SAS1A, FAST REACTOR PCWR AND
FLOW TRANSIENTS	ANL	66JJ	F4	RS	P	T	F	\$	SAS1A, FAST REACTOR PCWR AND
FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094	F2	RS	P	H	\$		
FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	F4	RS	P	H	\$		
FLOW, PRESSURE DISTRIBUTION	GGA	1108	F5	PS	P	H	\$	FLAC, STEADY-STATE	
FLUCTUATION EXPERIMENT ANALYSIS	BAPL	66JJ	F4	RS	P	T	D	\$	JITER,
FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	F4	RS	P	T	C	\$	REUX, REACTOR
FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS	P	D	\$	CROC90, ML-1	
FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090	F2	RS	P	P	\$	BOUNCE,	
FLUX INPUT	PW	16J4	F63	RS		C	\$	TDP, 2-D PERTURBATION TCC CP 2DXY	
FLUX SETS	GESV	H6JJ	F4	RS	P	CT	C	\$	TPIAL, 3-D REACTION RATES FROM 2-D
FLUX SYNTHESIS PROGRAM CYL	PW	1604	F63	RS		T	C	\$	2CXYL, 3-D MULTI-GP
FLUX-DOSIMETER ACTIVITY RELATION	GEC	635	F4	RSEP		D	\$	DOS, NEUTRON	
FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	66JJ	F4	RS	P	N	\$	LAPCA,	
FLUX, X-SEC CALC	ORNL	36J	F+BAL	RS	P	D	\$	ISOSEARCH, ISOTOPE PRODUCTION	
FLUX, X-SEC CALC	ORNL	1604	F63	RS	P	D	\$	ISOSEARCH, ISOTOPE PRODUCTION	
FLUXES	LASL	66JJ	F4	RS	P	N	\$	CAC1, SN PERTURBATION CODE USING DTF4	
FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	16J4	F+CDP	RS	P	X	T	B	\$
FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	GGA	7044	F4	RS	P	T	B	\$	
FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS	P	X	T	B	\$

FOG

FUEL

FOG CODES	AI	7090	F2	RS	C \$ PERT, 1-D PERTUREATION FOR AIM AND	30
FOG CODES	BHSC	360	F4	RS P	C \$ PERT, 1-D PERTUREATION FOR AIM AND	30
FOG CODES	CDC	1604	F63	RS	C \$ PERT, 1-D PERTUREATION 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
FURE, 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 THREEDES LIBRARY UTILITY ROUTINE	AI	36J	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	RS 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	CSUC	370	F4	RS PL	XCT B \$	51
FORMAT TC MUFT FORMAT X-SECTIONS WAPD 6600	F4	RS P	T B \$	ETOM1, ENDF/B		436
FORMAT WAPD 6600 F4	RS PL	T P \$	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 X-SECTIONS WAPD 6600	F4	RS P	T B \$	ETCM1, ENDF/B FORMAT TO MUFT		436
FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	ORNL	6600	F4	RS P	P \$	514
FORTAN DYNAMIC STORAGE ALLCC	ORNL	360	BAL+F	RS P	CT P \$ GETCOR, FRECCR,	644
FORTAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS	T P \$ FIGS, IBM36082250	484
FORTAN TDC, 2-D MULTI-GP SN APPROXIMATION	RZ	PW	1604	F63	RS P	T C \$
FORTAN UTILITIES ANC	360	F+BAL	RS	T P \$	ARTS ENVIRONMENTAL ROUTINES,	613
FPPM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	F4	RSBP	CT I \$	584
FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	F2	RS P	P \$	324
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
FRECCR, FORTRAN DYNAMIC STORAGE ALLCC	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 MANAGEMENT SYSTEM ALOC	360	COBCL	RS P	M \$	AEC-ALC FAU, RADIC	587
FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P	D \$	301
FSDP3, PCINTWISE XSECS. FROM B-W PARAMETERS	GGA	1108	F5	RS P	CT A \$	216
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	360	F+BAL	RSEPL	CT C \$ 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 C \$ CAFFE, EQUILIBRIUM	302
FUEL CYCLE COST ANALYSIS	AI	7090	F2	RS P	C \$ 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 \$ PW COST, REACTOR	441
FUEL CYCLE COSTS PERFORMANCE DATA	ANL	360	F4	RS P	C \$ NPRFCCP,	146
FUEL CYCLE COSTS PERFORMANCE DATA	UEC	6600	F4	RS P	C \$ 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 CYCLE PARAMETERS FAST BRECCERS	NED	635	F4	RS P	D \$ RAPFU,	372
FUEL ELEMENT	BAPL	6600	F4	RS	T I \$ CYGRO2, STRESS ANALYSIS CYL	266
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 \$ CLUB1, WATER-LOGGED	424
FUEL ELEMENT BEHAVIOR	ANL	360	F4	RS P	T I \$ LIFE1, FAST REACTOR	460
FUEL ELEMENT HEAT TRANSFER CALC	ANC	360	F4	RSBP	XCT H \$ MCXY, BWR	551
FUEL ELEMENT HEAT TRANSFER CALC	ANC	1108	F4	RS P	T H \$ MCXY, BWR	551
FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	F36	RSEP	I \$ SWELL2,	353
FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	F4	RS P	T G \$ ELBOW,	229
FUEL ELEMENTS	AEB	360	F4	RS P	B \$ WEIWIN, MATERIAL BUCKLING CYL	362
FUEL MODEL	ANC	360	F4	RSBP	CT I \$ FPFM, STEADY-STATE FISSION PRODUCT	584
FUEL PELLET TEMPERATURE & DEFORMATION	BAPL	6600	F4	RS P	T I \$ PELEN,	598
FUEL PERFORMANCE FINITE-ELEMENT GESV	635	F4	RS P	CT I \$	BEHAVE2, OXIDE	568

FUEL

F2

FUEL PIN GAP CONDUCTANCE CALC BNW	1108	F4	RS P	T H \$ GAPCON-THERMAL1,	618
FUEL ROD CLAD STRAIN & PELLET CRACKING BAPL	6600	F4	RS P	I \$ STRIPE,	570
FUEL ROD STRESS & DEFORMATION	BAPL 6600	F4	RS P	T I \$ CYGRD3, OXIDE	449
FUEL ROD STRESS & DEFORMATION	TV4 360	F4	RS P	T I \$ CYGRD3, OXIDE	449
FUEL ROD THERMAL RESPONSE LCCA	ANC 360	F4	PSPP	X T G \$ THETA1-B,	512
FUEL SWELLING & GAS RELEASE SIMULATION BAPL	6600	F4	RS P	T I \$ BUB11,	466
FUEL SWELLING TEMPERATURE STUDY	BAPL 6600	F4	RS P	T H \$ FIGRC, LWBR	272
FUEL TEMPERATURE CODE GGA	7094	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	182
FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL 6600	F4	RS P	T I \$	537
FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI 7090	F2	RS	I \$	48
FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA 1108	F4	RSPP	T M \$ SPIRAL,	607
FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL 6600	F4	RS P	T G \$ FLASH4,	448
FULLY-IMPLICIT TRANSIENT SIMULATION	MA-G 360	F4	PSEP	CT G \$ FLASH4,	448
FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NEC 625	F4	RS P	T D \$	480
FUNDAMENTAL MODE FAST REACTOR X-SEC CALC BNW	1108	F4	RS P	T B \$ FCC4,	306
FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,F,....	ANL 360	F4	RS P	X T P \$	610
FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,F,....	ANL 1108	F5	RS P	X T P \$	610
FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL 6600	F4	RS P	X T P \$	610
FUSION REACTOR STUDY	ANL 360	F4	RS P	X \$ TCKMINA/TCKMINA2, TOKAMAK	561
F2 RS A \$	LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	CRNL 7090			381
F2 RS B \$	DANCOFF JP, MODERATOR SPACE CHORD DIST FUNCT	AEF 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 7090			7
F2 RS C \$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI 7090			30
F2 RS E \$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI 7090			121
F2 RS E \$	SNAPKIN5/5A, 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 \$	FARSF1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI 7090			91
F2 RS J \$	MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	AI 7090			142
F2 RS J \$	SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	AI 7090			111
F2 RS J \$	SCAR1, SCATTER FROM A RING SNAP GEOMETRY	AI 7090			111
F2 RS N \$	WEO, W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W 7090			133
F2 RS T A \$	SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA 7090			56
F2 RS L T C \$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI 7090			58
F2 RS P A \$	DOPIE, RESOLVED RESONANCE X-SECTION CALC	NEC 2000			177
F2 RS P A \$	FXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL 7094			238
F2 RS P A \$	RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NEC 2000			176
F2 RS P B \$	BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI 7090			108
F2 RS P B \$	BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC 7090			237
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	NEC 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 \$	BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC	CRNL 1604			549
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 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	CRNL 7090			39
F2 RS P T C \$	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CRNL 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

F4

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	\$	TRANS-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 COORDINATE CALC	AI	7090	151	
F2	RSB		F		\$	HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	7090	153	
F2	PSR		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		\$	AXTHPM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	183	
F2	RSBP		J		\$	LIPPECAN1, MC NEUTRON PENETRATION CALCULATION	DAC	7090	123	
F2	RSPP		T	H	\$	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	7094	155	
F2	RSRPL		T	J	\$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	143	
F36	SRP		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-10, 1-D MULTI-GP DISCRETE COORDINATE CALC	ANL	3600	288	
F36	RS	P	T	I	\$	SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	3600	357	
F36	RS	P	T	S	\$	TOODY2, 2-D LAGRANGIAN EQNS 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	X	T	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		\$	CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	366	
F36	RSBP		G		\$	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600B	278	
F36	RSPP		I		\$	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	353	
F36	RSBP	X	T	H	\$	RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	281	
F36	RSBP	X	T	B	\$	RIFF-KAFF, 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	CPFD	6400	552	
F4	RS		A		\$	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	305	
F4	RS		P		\$	APREFX1, 94-GP PLC-2B LIBRARY GROUP COLLAPSING	APRF	6600	466	
F4	RS		R		\$	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	LUCC	635	529	
F4	RS		I		\$	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	233	
F4	RS		I		\$	SORSDB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	391	
F4	RS		M		\$	MERM02, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	360	472	
F4	PS		T	B	\$	M08J7, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	280	
F4	RS		T	C	\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	625	156	
F4	PS		T	C	\$	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	26	
F4	RS		T	C	\$	M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	342	
F4	PS		T	G	\$	GADOSE,DCSET, HTGR ACCIDENT ANALYSIS CODE CALC	GGA	1108	261	
F4	PS		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	RG&E	360B	487	
F4	RS		T	H	\$	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	267	
F4	RS		T	I	\$	CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	266	
F4	RS		T	M	\$	CHECKER,CRECT,CAMMET,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	PS		T	M	\$	RIGEL4,CHECK4,... ENDF/B V4 PROCESSING CODES	BNL	6600B	638	
F4	PS		T	C	\$	GASPAR, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	485	
F4	RS		T	P	\$	LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094	67	
F4	RS		T	P	\$	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE2.0	CEND	7600B	478	
F4	RS	X	T	G	\$	PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	228	
F4	RS	X	T	P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	635	534	
F4	RS	X	T	P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	1108	534	
F4	RS	X	T	P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	6600	534	
F4	RS	L	T	B	\$	GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	6600	547	

F4

F4

F4	RS	L	T	B	\$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600	298
F4	RS	L	T	C	\$	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	\$	AVERAGE, 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	531
F4	RS	P		A	\$	CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	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	KAPL	6600	470
F4	RS	P		A	\$	MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	6600	535
F4	RS	P		A	\$	POLLA, CONVERTS R-MATRIX RESONANCE PARAMETERS	CRNL	360	639
F4	RS	P		A	\$	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	FNEA	360	292
F4	RS	P		A	\$	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	292
F4	RS	P		A	\$	RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL	6600	492
F4	RS	P		A	\$	SIGPLUT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	6600	377
F4	RS	P		A	\$	THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600	504
F4	RS	P		B	\$	AVOID, ANNULAR VOID X-SECTION CALCULATION	CEC	625	276
F4	RS	P		B	\$	GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	GFC	7094	235
F4	RS	P		B	\$	PARTI, OPTIMAL GROUP OR MESH COLLAPSING	TRW	6500	416
F4	RS	P		B	\$	WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEP	360	362
F4	RS	P		C	\$	PERT, 1-D PERTURBATION FOR AIM AND FCC CODES	PHSC	360	30
F4	RS	P		C	\$	PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	1108	304
F4	RS	P		C	\$	CINDER, MO102, POINT DEPLETION FISSION PRODUCT	BAFL	6600	313
F4	RS	P		D	\$	FREVAP6, 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	\$	RA02, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	231
F4	RS	P		D	\$	PAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	NFC	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	AEP	360	121
F4	RS	P		E	\$	PLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB	360	363
F4	RS	P		F	\$	GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	317
F4	RS	P		F	\$	GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	290
F4	RS	P		E	\$	PI01, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	360	255
F4	RS	P		F	\$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094	255
F4	RS	P		E	\$	R102, 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 R-Z GEOMETRY	APCA	7094	293
F4	RS	P		F	\$	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	352
F4	RS	P		F	\$	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	384
F4	RS	P		F	\$	TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	338
F4	RS	P		G	\$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	47
F4	RS	P		G	\$	EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	DP	360	600
F4	RS	P		G	\$	FRCP12, LOCA FISSION PRODUCT RELEASE ANALYSIS	RCL	6400	500
F4	RS	P		C	\$	INTEG, INSPEC, MARKOV SIMULATION OF REACTOR LFN	DP	360	590
F4	RS	P		G	\$	SODCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	521
F4	RS	P		G	\$	SODCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	HECL	1108	521
F4	RS	P		G	\$	WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	UGA	360	276
F4	RS	P		H	\$	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	246
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	382
F4	RS	P		I	\$	GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	232
F4	RS	P		I	\$	NUROW, STRUCTURAL ANALYSIS BOWED REACTOR CORES	ANL	3600	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	337
F4	RS	P		I	\$	STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING	BAFL	6600	570
F4	RS	P		I	\$	TC001, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAFL	6600	604
F4	RS	P		I	\$	TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	376

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F4	RS	P	L	\$	GAVEP, ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	218	
F4	RS	P	L	\$	GENPD, 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	\$	GPDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	110F	296	
F4	RS	P	N	\$	DACL, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	455	
F4	RS	P	N	\$	HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLI	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	G	\$	CONGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSLN	360	390	
F4	RS	P	G	\$	DYND1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	464	
F4	RS	P	O	\$	DYND1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	464	
F4	RS	P	P	\$	BH39, EXTREME VALUE DISTRIBUTION DATA ANALYSIS	BAPL	6600	621	
F4	RS	P	P	\$	ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	601	
F4	RS	P	P	\$	FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	ORNL	6600	514	
F4	RS	P	P	\$	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600B	592	
F4	RS	P	P	\$	KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	ORNL	360	556	
F4	RS	P	P	\$	MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	446	
F4	RS	P	P	\$	PLOTR, 2D CONTOUR PLOTS & AREA CALCULATION	SLA	6600	578	
F4	RS	P	P	\$	RELO1, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	6600	497	
F4	RS	P	P	\$	ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	6600	444	
F4	RS	P	U	\$	DYNAMIC ANALYSIS OF GASES BY MASS SPECTROMETRY	RFC	360	645	
F4	RS	P	V	\$	FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	6600	577	
F4	RS	P	W	\$	MMM3, COORDINATE ANALYSES SFMI-RIGID MOLECULES	ANC	360	632	
F4	RS	P	X	\$	TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	360	561	
F4	RS	P	T	A	\$	ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL	360	417
F4	RS	P	T	A	\$	GANDY3, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108B	341
F4	RS	P	T	A	\$	JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	6600	506
F4	RS	P	T	A	\$	PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	6600	507
F4	RS	P	T	A	\$	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	359
F4	RS	P	T	A	\$	RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES	BNL	6600B	465
F4	RS	P	T	A	\$	SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	399
F4	RS	P	T	A	\$	TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	1108	410
F4	RS	P	T	A	\$	TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	6600	360
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	\$	EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	6600	461
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	NEC	635	257
F4	RS	P	T	B	\$	RICE, 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	398
F4	RS	P	T	C	\$	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NEC	1108	287
F4	RS	P	T	C	\$	DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NEC	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	CE	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	BHSC	360	120
F4	RS	P	T	C	\$	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NEC	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-2 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

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F4	RS	P	T	C	\$	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	6	8
F4	RS	P	T	C	\$	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	608	
F4	RS	P	T	C	\$	TWOTRAN-FNVW, 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	6600	358	
F4	RS	P	T	C	\$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600	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	WAML	6600	212	
F4	RS	P	T	C	\$	3DOT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	463	
F4	RS	P	T	D	\$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWF	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	CGA	1108	318	
F4	RS	P	T	D	\$	FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NEC	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	\$	ORCOST, POWER PLANT CAPITAL COST ESTIMATING	CRNL	3608	588	
F4	RS	P	T	D	\$	PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	454	
F4	RS	P	T	D	\$	PWCOST, REACTOR FUEL CYCLE COST CALCULATION	CGA	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	CGA	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	FEEL	1108	567	
F4	RS	P	T	D	\$	3DXT, DEP2, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	477	
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, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	494	
F4	RS	P	T	F	\$	FORE, FAST REACTOR EXCURSION CALCULATIONS	NEC	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	
F4	RS	P	T	F	\$	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	7090	488	
F4	RS	P	T	F	\$	NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	371	
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	ANI	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	338	
F4	RS	P	T	F	\$	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-CEOM	BAPL	6600	274	
F4	RS	P	T	F	\$	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-CEOM	GGA	1108	274	
F4	RS	P	T	G	\$	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	360	172	
F4	RS	P	T	G	\$	CERUG, STEAM GENERATOR SODIUM-WATER REACTION	CEND	7600	548	
F4	RS	P	T	G	\$	ECCSA4, LCSS-OF-COOLANT & EMERGENCY COOLING	BCL	6400	330	
F4	RS	P	T	G	\$	ELROW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	229	
F4	RS	P	T	G	\$	FLASH3, LCSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	295	
F4	RS	P	T	G	\$	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	6600	448	
F4	RS	P	T	G	\$	FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NEC	635	479	
F4	RS	P	T	G	\$	HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS	AI	360	443	
F4	RS	P	T	G	\$	MJ555, ACT1, LCSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	284	
F4	RS	P	T	G	\$	NURLOC-1.0, LCSS-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	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	1108	369	
F4	RS	P	T	G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	6600	369	
F4	RS	P	T	G	\$	SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	559	
F4	RS	P	T	H	\$	ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	360	580	
F4	RS	P	T	H	\$	CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	473	
F4	RS	P	T	H	\$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	3600	432	
F4	RS	P	T	H	\$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	1108C	432	
F4	RS	P	T	H	\$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	6600C	432	
F4	RS	P	T	H	\$	DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	440	
F4	RS	P	T	H	\$	FIGRO, LWR FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	27	
F4	RS	P	T	H	\$	FLOT1, MO219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	33	
F4	RS	P	T	H	\$	GAPCON-THERMAL1, FUEL PIN GAP CONDUCTANCE CALC	BNW	1108	618	
F4	RS	P	T	H	\$	GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	6600	424	

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F4	RS	P	T H \$	HAFMAT, SYSTEM STEADY-STATE FLOW DISTRIBUTION	KAPL 6600	616
F4	RS	P	T H \$	HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	ORNL 360	517
F4	RS	P	T H \$	HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL 6600	286
F4	RS	P	T H \$	LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI 1108	299
F4	RS	P	T H \$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NEC 635	256
F4	RS	P	T H \$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD 6600	256
F4	RS	P	T H \$	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANL 1108	551
F4	RS	P	T H \$	MC899, HOH, STEAM TABLES 14.5-2538 PSIA	BAPL 6600	294
F4	RS	P	T H \$	ORRIBLE, ROD BUNDLE FLOW & TEMPERATURE DIST.	CRNL 360	629
F4	RS	P	T H \$	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL 6600	348
F4	RS	P	T H \$	VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NEC 635	458
F4	RS	P	T H \$	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL 6600	396
F4	RS	P	T I \$	BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL 6600	468
F4	RS	P	T I \$	RUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL 6600	481
F4	RS	P	T I \$	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL 6600	449
F4	RS	P	T I \$	CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION	TVA 360	449
F4	RS	P	T I \$	FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL 6600	537
F4	RS	P	T I \$	LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL 360	460
F4	RS	P	T I \$	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL 6600B	412
F4	RS	P	T I \$	M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL 6600	383
F4	RS	P	T I \$	M0457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL 6600	329
F4	RS	P	T I \$	M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL 6600	283
F4	RS	P	T I \$	PELEN, FUEL PELLET TEMPERATURE & DEFORMATION	BAPL 6600	598
F4	RS	P	T I \$	SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT 360	402
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	282
F4	RS	P	T I \$	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL 6600	282
F4	RS	P	T I \$	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR 360	282
F4	RS	P	T I \$	SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA 6600	581
F4	RS	P	T I \$	SCR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL 6600C	80
F4	RS	P	T J \$	MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA 1108	259
F4	RS	P	T J \$	MJ756, LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL 6600	343
F4	RS	P	T K \$	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	CRNL 360H	387
F4	RS	P	T L \$	BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL 6600	373
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	557
F4	RS	P	T M \$	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NEC 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	545
F4	RS	P	T O \$	BURNUP, HEAVY ELEMENT ISOTOPIIC BURNUP ANALYSIS	NEC 635	311
F4	RS	P	T O \$	EXPAN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NEC 635	258
F4	RS	P	T O \$	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL 6600	394
F4	RS	P	T O \$	RFDOUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL 6600	425
F4	RS	P	T P \$	CAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL 6600	327
F4	RS	P	T P \$	M0661, M0657, M0626, POLYNOMIAL CURVE FITTING	BAPL 6600	411
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	C G \$	STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	ORNL 360	583
F4	RS	P	C P \$	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	ANL 360B	592
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	GESV 6600	585
F4	RS	P	CT D \$	GFM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS 360	576
F4	RS	P	CT D \$	3DR, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL 360	567
F4	RS	P	CT F \$	REXCO-H, 2-D HYDRODYNAMIC RESPONSE TO EXCURSION	ANL 360	550
F4	RS	P	CT F \$	REXCO-H2, 2-D HYDRODYNAMIC RESPONSE TO EXCURSION	ANL 360	615
F4	RS	P	CT G \$	EMERALD, PWR PLANT RADIATION RELEASE & DOSE	PGF 360	546
F4	RS	P	CT I \$	BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	GESV 635	568

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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 M \$	ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	360	350
F4	RS P CT W \$	MACS LATTICE VIBRATION NEUTRON SCATTERING 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
F4	RS P X A \$	LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	7044	217
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	6400	499
F4	RS P X I \$	FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	404
F4	RS P X T B \$	ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX	HECL	11088	388
F4	RS P X T B \$	GAF, GAR, SPECTRA AND GROUP-AVERAGED X-SFC CALC	GGA	1108	316
F4	RS P X T B \$	1DX, 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 E \$	MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360	491
F4	RS P X T F \$	CEXE, INCXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	360	415
F4	RS P X T F \$	FORF2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360	174
F4	RS P X T F \$	FORF2, FAST REACTOR EXCURSION CALCULATIONS	NEC	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	CRNL	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	360	640
F4	RS P X T P \$	DE/STEP, INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	6600	640
F4	RS P X T P \$	FUNPACK, SPECIAL FUNCTION ROUTINES-EI, K, F,	ANL	360	611
F4	RS P X T P \$	FUNPACK, SPECIAL FUNCTION ROUTINES-EI, K, F,	ANL	6600	610
F4	RS P XCT A \$	FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	360B	368
F4	RS P XCT C \$	GAPFID, 1-D TRANSPORT PERTURBATION THEORY	GGA	1108	606
F4	RS P XCT D \$	CONCEPT3, POWER PLANT CONCEPTUAL COST ESTIMATE	LRNL	360C	498
F4	RS P XCT F \$	TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	CRNL	360	558
F4	RS P XCT F \$	VENUS, 2-D LMFRR POWER EXCURSION DISASSEMBLY	ANL	360	511
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	KHSC	360	50
F4	RS PL T C \$	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NEC	635	287
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	CSLC	370	29
F4	RS PL CT F \$	OX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	260	474
F4	RS PL CT M \$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	CRNL	360B	502
F4	RS PL CT M \$	FRREST, LCCA ROD BUNDLE CHF DATA ANALYSIS	ANC	360	518
F4	RS PLX T B \$	AILMCE, 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	UVA	6400	185
F4	RS PLX T B \$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108	294
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 \$	XSDPN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	CRNL	360	393
F4	RS PLX T C \$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PUFD	6500	262
F4	RS PLX T C \$	VIM1, MCNTF CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600	510
F4	RS PLXCT B \$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	OSLC	370	51
F4	RS PLXCT B \$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	360	279
F4	RS PLXCT B \$	PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	360	520
F4	RSB XCT P \$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	360	534
F4	RSB L T M \$	CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	360	271
F4	PSRP A \$	MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	CRNL	7090	323
F4	PSRP D \$	CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GEC	635	418
F4	PSRP D \$	DCS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC	635	423
F4	PSRP D \$	MICHRD, MICRORADIATION MEASUREMENT ANALYSIS	GEC	635	421
F4	PSRP P \$	GRAPH, LINEAR REGRESSION W/CONFIDENCE LIMITS	BKC	360	624
F4	PSRP P \$	HISTOGRAMS, QUALITY CONTROL SAMPLE STATISTICS	UKC	360	614
F4	PSRP T B \$	GROUPSE, SPACE-DEPENDENT X-SECTION GENERATION	GEC	635	420
F4	PSRP T D \$	208, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	325
F4	PSRP T K \$	THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	360	273
F4	PSRP C P \$	LATIN SQ, NXN LATIN SQUARE EXPERIMENTAL DESIGN	MLMD	360	630
F4	PSRP CT C \$	ARC-CLIP1, 1-D MULTI-GP DIFFUSION & INVENTORY	ANL	360	626

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F4	RSBP	CT C	\$	HFRESY3, 2-D HETEROGENEOUS REACTOR CALCULATION	DP	360P	136
F4	RSBP	CT C	\$	MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360	582
F4	RSBP	CT C	\$	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	608
F4	RSBP	CT C	\$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	360C	358
F4	RSBP	CT C	\$	DWAF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	579
F4	RSBP	CT G	\$	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	MA-G	360	448
F4	RSBP	CT G	\$	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	360	528
F4	RSBP	CT G	\$	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	360	265
F4	RSBP	CT I	\$	FPEM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	584
F4	RSBP	CT I	\$	SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAC	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	\$	ARC-NUCL2, BCD INPUT DATA PROCESSING MODULE	ANL	360	533
F4	RSBP	CT Q	\$	ISOTAB, PU POWER OUTPUT FROM MIXED ISOTOPIES	MLMO	360	619
F4	RSBP	X T D	\$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	360	58
F4	RSBP	X T G	\$	THEAT1-B, FUEL ROD THERMAL RESPONSE LCCA	ANC	360	512
F4	RSBP	XCT B	\$	XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	CRNL	360	572
F4	RSBP	XCT G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	360	369
F4	RSBP	XCT H	\$	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	360	551
F4	RSBP	XCT W	\$	GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA CF(LI)	ANC	360	605
F4	RSBPL	CT C	\$	RAFFLE-ANC, MONTE CARLO NEUTRON TRANSPORT CODE	ANC	360	631
F4	RSBPL	CT C	\$	VARI-10, 1-D VARIATIONAL SENSITIVITY	ANL	360	625
F4	RSBPL	CT C	\$	VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	360	510
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	360	249
F4	RSBPLXCT	C	\$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	MTS	360	262
F5	RS	LX T B	\$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	JNC	1108	279
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 GAFFAR 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	\$	DRUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNW	1108	456
F5	RS	P T H	\$	REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW	1108	483
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, MLC MULTIGROUP XSEC LIBRARY MAINTENANCE	NEC	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	GEES	1108	476
F5	RS	P T R	\$	TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HECL	1108	599
F5	RS	P CT A	\$	FSDP3, POINTWISE XSECS. FROM B-W PARAMETERS	GGA	1108	216
F5	RS	P X T D	\$	PACTOLUS,CLOTHC, NUCLEAR POWER PLANT COST CODE	HECL	1108	540
F5	RS	P X T F	\$	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	1108	488
F5	RS	P X T P	\$	FUNPACK, SPECIAL FUNCTION ROUTINES-FI,K,E,....	ANL	1108	610
F5	RS	PLX T B	\$	BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	1108	184
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
F63	RS	I	\$	WOPEXPRT, 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	CRNL	1604	334
F63	RS	P A	\$	RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	CRNL	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

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GAMMA-RAY

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	\$	ISOTOPE5, 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	\$	MJR99, HCH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	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	I	\$	SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC	PW	1604	189
F63	RS P	T A	\$	JUPITOP1, 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	\$	FDG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	1604	28
F63	RS P	T C	\$	FORTTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ	PW	1604	161
F63	RS P	T C	\$	WHIPLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	1604	32
F63	RS P	T C	\$	ZOGRAND, 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	\$	APES2, 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 R	\$	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	F	\$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	166
F63	RSBP	F	\$	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	102
F63	RSBP	O	\$	COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	248
F63	RSPP	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	RSPP	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 \$ ENDFR2,GANC2,GFE2, ENDF/B TC			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 WAPC 6600	F4			RS PL T B \$ ETCG1, ENDF/B TO MUFT,			437
GAM, ANISN X-SEC FORMAT WAPC 7600	F4			RS P T B \$ ETCG3, 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, 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 CF EXTERNAL			600
GAMMA RAY CATALOG	DP	360	ERCDC	R L T Z \$ GAMTAB, RADIOACTIVE-DECAY			637
GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAPL	6600	F+ASC	RS P T J \$ ASPIS,			429
GAMMA RAY SPECTRA	ORNL	360	F4	RS P O \$ ALPHA-M, RESOLUTION OF			413
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,			4
GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	F2	RS P J \$ GRACE1,			4
GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	F63	RS P J \$ GRACE1,			45
GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS P G \$ CLOUD,			47

GAMMA-RAY

GEC

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 D \$ MAP, NEUTRON-INDUCED		314
GAMMA-RAY SPECTRA ANC	260	F+P+A	RSBP	XCT W \$ GAUSS6, BATCH ANALYSIS OF		622
GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS	T O \$ GASPAR, COMPLEX	485
GAMMA-RAY SPECTRA CE(LI)	ANC	360	F4	PSBP	XCT W \$ GAUSS5, ANALYSIS OF	605
GAMMA-RAY SPECTRA CGA	1108	F+BAL	RS P	T O \$ TOAD, PREPROCESSING OF ANALYZER		333
GAMMA-RAY SPECTRA KSUN	360	F4	RS P	O \$ CORGAM, UNFOLDING OF COMPLEX		390
GAMMA-RAY TRANSPORT	RAPL	6600	F4	RS P	T J \$ MC756, LETC, 1-D SLAB	343
GAMMA-RAYS GEC	7094	F4	RS P	B \$ GAMMA-P, PRODUCTION X-SECTIONS FOR		235
GAMTAB, RADIOACTIVE-DECAY GAMMA RAY CATALOG	DP	3608	EBDC	R L T Z \$		637
GAMTEC2, MULTI-GP CONSTANT CALC O TO 10 MEV	BC	625	F4	RS PLX	T B \$	185
GAMTEC2, MULTI-GP CONSTANT CALC O TO 10 MEV	BNW	1107	F4	RS PL	T B \$	185
GAMTEC2, MULTI-GP CONSTANT CALC O TO 10 MEV	BNW	7090	F+PAP	RS PL	T B \$	185
GAMTEC2, MULTI-GP CONSTANT CALC J TO 10 MEV	UVA	6400	F4	RS PLX	T B \$	185
GAMTRI, 2-D MULTIGP 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, GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108	F4	RS P	X T L \$	345
GANDY3, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108E	F4	RS P	T A \$	341
GAND2, GFE2, ENDF/R TO GAFGAR X-SECTIONS	GGA	1108	F5	RS P	T B \$ ENDFB2,	596
GAP CONDUCTANCE CALC BNW	1108	F4	RS P	T H \$ GAPCON-THERMAL1, FUEL PIN		618
GAPCON-THERMAL1, FUEL PIN GAP CONDUCTANCE CALC	BNW	1108	F4	RS P	T H \$	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+CCM	RS P	T I \$	397
GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	F4	RS P	F \$	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
GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS P	T B \$	219
GAKCI, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	F+MAP	RS P	T B \$	219
GAS RELEASE SIMULATION BAPL	6600	F4	RS P	T I \$ BUPL1, FUEL SWELLING &		468
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
GASECUS RELEASE ORNL	360	F4	RS P	C G \$ STEFEG, ANALYSIS OF PWR & BWR		583
GASES BY MASS SPECTROMETRY REF	260	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 \$	485
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 W \$	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	CGA	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) ANC	360	F4	RSBP	XCT W \$ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA		605
GE-HAPF-S13, 1-D MULTI-GP DOUBLE SN APPROX	PAW	7090	FLECC	RSBP	T C \$	75
GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	ANL	3608	F4	RS P	C P \$	592
GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600P	F4	RS P	P \$	592
GEC	625	F4	RS P	P \$ AVOID, ANNUAL VOID X-SECTION CALCULATION		276
GEC	635	F+PAP	RSBP	T O \$ CASCADE, CLUSTER, RADIATION DAMAGE IN METALS		410
GEC	635	F+GMP	RSBP	T P \$ TITE, 3-D TRANSIENT HEAT TRANSFER PROGRAM		346
GEC	635	F4	RSBP	P \$ CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS		418
GEC	635	F4	RSBP	P \$ DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION		423
GEC	635	F4	RSBP	C \$ MICHKO, MICHARDNESS MEASUREMENT ANALYSIS		421
GEC	635	F4	RSBP	T B \$ GPCUSE, SPACE-DEPENDENT X-SECTION GENERATION		420
GEC	7090	FAP	RSBP	X T C \$ SPECTRA, MC CALCULATION IRRADIATED MATERIAL		422

GEC	7J94	F4	RS P	B	\$	GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	235		
GEES	1108	F5	PS P	T	\$	CAGE, BIRD, SPEC, TIME-OF-FLIGHT DATA ANALYSIS	476		
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 \$	344		
GENED	ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NEO	635	F+GMP	RS	T P \$	515		
GENERATOR	DESIGN CRITERIA COSTS	GGA	7J44	F4	RS P	T D \$	STNGEN, STEAM	227	
GENERATOR	SODIUM-WATER REACTION	CEND	7600	F4	RS P	T G \$	CEBUG, STEAM	548	
GENRD,	FREE-FORMAT CARD INPUT PROCESSOR	LASL	360	F4	RS P	L \$	530		
GENRD,	FREE-FORMAT CARD INPUT PROCESSOR	LASL	6600	F4	RS P	L \$	530		
GEOMETRICAL	DATA HEAT TRANSFER STUDY	SLL	6600	F4	RS P	N \$	HEATMESH,	434	
GEPI	GETS	BASIC	R	M	\$	MAPPER, PREDICTING MANUFACTURING REQUIREMENTS	595		
GESV	635	F+GMP	RS P	XCT	B	\$	ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	501	
GESV	635	F+GMP	PS P	XCT	L	\$	TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	505	
GESV	635	F4	RS P	CT	I	\$	BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	568	
GESV	H600	F4	RS P	CT	C	\$	TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	585	
GETCOR,	FRECOR, FORTRAN DYNAMIC STORAGE	ALLCC	CPNL	360	BAL+F	RS P	CT P \$	644	
GETS	BASIC	R	M	\$	MAPPER, PREDICTING MANUFACTURING REQUIREMENTS	GEPI	595		
GETS	F	R	R	\$	PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	ANL	591		
GFE2,	ENDF/B TO GAFGAR	X-SECTIONS	GGA	1108	F5	RS P	T B \$	ENDF2, GAND2,	596
GGA	1108	BIN	R	L	T	Z \$	ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES	356	
GGA	1108	F+BAL	PS P	T	C \$	GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ CERMETRY	222		
GGA	1108	F+PAL	RS P	T	C \$	GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	411		
GGA	1108	F+BAL	RS P	T	C \$	GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	430		
GGA	1108	F+PAL	RS P	T	D \$	RUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	439		
GGA	1108	F+BAL	RS P	T	D \$	BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	438		
GGA	1108	F+PAL	RS P	T	E \$	BLCOST6, COMBINED KINETICS 2-D HEAT TRANSFER	303		
GGA	1108	F+PAL	RS P	T	U \$	TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	333		
GGA	1108	F4	S	T	D \$	GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	302		
GGA	1108	F4	PS	B	\$	HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	291		
GGA	1108	F4	RS	T	C \$	GACCSE, 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	PS P	A	\$	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	292		
GGA	1108	F4	RS P	D	\$	FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	301		
GGA	1108	F4	PS P	E	\$	GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	317		
GGA	1108	F4	PS P	E	\$	GASA, STABILITY ANALYSIS REACTOR KINETICS ECNS	290		
GGA	1108	F4	PS 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	I	\$	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 \$	GASPT, 1-D BURNUP POWER DISTRIBUTION SEARCH	319		
GGA	1108	F4	PS P	T	C \$	GATT, 3-D FFW-GP DIFFUSION CALC HPX-Z MESH	380		
GGA	1108	F4	RS P	T	C \$	TEMCO7, 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	C \$	GAUCE, 2-D FFW-GP HEX GEOM DIFFUSION DEPLETION	335		
GGA	1108	F4	RS P	T	D \$	PWCOST, REACTOR FUEL CYCLE COST CALCULATION	441		
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	274		
GGA	1108	F4	RS P	T	H \$	DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	441		
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	PS P	X	A \$	CCHBC, COHERENT INELASTIC SCATTERING LAW CALC	385		
GGA	1108	F4	RS P	X	T	H \$	CAF, GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	316	
GGA	1108	F4	PS P	X	T	L \$	GAND, GAFGAR X-SECTION LIBRARY PREPARATION	345	
GGA	1108	F4	RS P	XCT	C \$	GAPER10, 1-D TRANSPORT PERTURBATION THEORY	606		
GGA	1108	F4	RS	PLX	T	B \$	GCC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	298	
GGA	1108	F5	RS P	A	\$	FLANCE1, SCATTERING LAW X-SECTION CALCULATION	247		
GGA	1108	F5	PS P	H	\$	FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	395		
GGA	1108	F5	RS P	T	P \$	ENDF2, GAND2, GFE2, ENDF/B TO GAFGAR X-SECTIONS	591		
GGA	1108	F5	RS P	T	C \$	2CF, 2-D MULTI-GP DISCRETE COORDINATE CODE	171		
GGA	1108	F5	RS P	T	F \$	TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	408		
GGA	1108	F5	RS P	T	H \$	TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	414		

GGA

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GGA	1108	F5	PS P	T I	\$	SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	451	
GGA	1108	F5	PS P	T I	\$	SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	452	
GGA	1108	F5	PS P	T N	\$	GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT	471	
GGA	1108	F5	PS P	CT A	\$	FSDP3, POINTWISE XSECS. FROM B-W PARAMETERS	216	
GGA	1108B	F4	RS P	T A	\$	GAMLY3, UNRESOLVED RESONANCE X-SECTION CALC	341	
GGA	6600	F4	RS L	T B	\$	CGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	298	
GGA	7044	F+MAP	RS P	T P	\$	GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	219	
GGA	7.44	F+MAP	RS P	T D	\$	OFUS, POWER PLANT PERFORMANCE AND PRICE STUDY	226	
GGA	7044	F+MAP	RS P	T H	\$	BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	205	
GGA	7.44	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	PSBP	T N	\$	CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	207	
GGA	7.44	F4	RS	I	\$	CORF, 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	7.44	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	PS 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	7.44	F4	PS P	T C	\$	TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	225	
GGA	7044	F4	PS P	T D	\$	GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	260	
GGA	7044	F4	RS P	T D	\$	RELCAD-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	PS P	T D	\$	STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	227	
GGA	7.44	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	7.44	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 C	\$	DCB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	99	
GGA	7090	F2	PS	T A	\$	SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	56	
GGA	7.90	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	
GGA	1108	F4	RS PLX	T B	\$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	298	
GGA	6600	F4	RS L	T B	\$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	298	
GGA	6600	F4	RS P	T B	\$	GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	361	
GGA	6600	F4	RS P	T H	\$	GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	424	
GGA	7090	F2	RS P	J	\$	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	45	
GGA	1604	F63	RS P	J	\$	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	45	
GGA	7090	F2	RS P	J	\$	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	46	
GGA	1604	F63	RS P	J	\$	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	46	
GGA	6600	F4	RS P	A	\$	GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	470	
GGA	360	F4	RSBP	P	\$	GRAPH, LINEAR REGRESSION W/CONFIDENCE LIMITS	624	
GGA	360	F+BAL	RSB L	CT M	\$	GRAPHIC X-SEC EVALUATION	375	
GGA	7094	F+FAP	RS PL	T B	\$	GRAPHICS SUBROUTINES	484	
GGA	1108	F4	RS P	L	\$	GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	162	
GGA	1108	F4	RS P	L	\$	GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	296	
GGA	1108	F4	RS P	L	\$	GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	296	
GGA	6600	F4	RS	B	\$	APRFX1, 99-GP DLC-2B LIBRARY	466	
GGA	6600	F4	RS P	T B	\$	GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	361	
GGA	6500	F4	RS P	E	\$	PARTI, OPTIMAL GROUP OR MESH COLLAPSING	416	
GGA	360	F4	RS P	T Q	\$	GROUP THEORY OF LATTICE DYNAMICS	620	
GGA	6600	F4	RS P	T Q	\$	GROUP THEORY OF LATTICE DYNAMICS	620	
GGA	1108	F4	RS P X	T B	\$	GAF, GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	316	
GGA	7094	F+FAP	RS PL	T B	\$	GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	162	
GGA	7090	FLOCC	RS P	B	\$	ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	113	
GGA	360	F4	RS P	T Q	\$	GROUP2, GROUP THEORY OF LATTICE DYNAMICS	620	
GGA	6600	F4	RS P	T Q	\$	GROUP2, GROUP THEORY OF LATTICE DYNAMICS	620	
GGA	635	F4	RSBP	T B	\$	GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	420	
GGA	1108	F+BAL	RS P	T O	\$	SLRN18, LEAST SQUARES PHOTOPEAK SPECTRA CODE	457	
GGA	360	F4	RS P	T G	\$	HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS	443	
GGA	1604	F63	RS P	A	\$	HAFFVER, HAUSER-FESHBACH INELASTIC SCATTERING	14	

HAFMAT, SYSTEM STEADY-STATE FLOW DISTRIBUTION KAPL 6600 F4 RS P T H \$ 616
 HAMMER, LITHE, HELP, CRITICAL ANALYSIS SYSTEM DP 360 F+BAL RS P XCT B \$ 277
 HARMONY-PDQ X-SECTION GENERATION CODE BAPL 6600 F+CCM RS P X T B \$ PAX03, 426
 HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE ACC 7090 F2 RSB F \$ 153
 HAUSER-FESHBACH INELASTIC SCATTERING CDC 1604 F63 RS P A \$ FAFEVER, 14
 HEAT CONDUCTION PPOD 7.44 F+MAP RS P T H \$ TCODE, 2-D TIME-DEPENDENT 349
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 HEAT CONDUCTION LUMPED MASS LASL 7030 F4 RS T H \$ RATH, 2- CR 3-D 242
 HEAT CONDUCTION LUMPED MASS LASL 7.94 FAP RS P T H \$ RATH, 2- CR 3-D 242
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 HEAT EXCHANGER STRESS ANALYSIS KAPL 6600 F4 RS P I \$ TUBE, U-TUBE 378
 HEAT TRANSFER GGA 1108 F+BAL RS P T H \$ BLOST6, COMBINED KINETICS 2-C 303
 HEAT TRANSFER AI 7094 F+MAP RS P T H \$ HEATING2, TRANSIENT STEADY-STATE 198
 HEAT TRANSFER AI 7094 F2 RS P T G \$ TRANS-FUGUE1, TRANSIENT FLOW AND 268
 HEAT TRANSFER CALC ANC 360 F4 RSBP XCT H \$ MOXY, BWR FUEL ELEMENT 551
 HEAT TRANSFER CALC ANC 11.8 F4 RS P T H \$ MOXY, BWR FUEL ELEMENT 551
 HEAT TRANSFER GGA 7044 F+MAP RS P T H \$ BLOST5, POINT-KINETICS WITH 2-C 205
 HEAT TRANSFER MOLTEEN FUEL TUBE BUNDLES LASL 7.94 F2 RSBP F \$ AXFLU, 182
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 HEAT TRANSFER PROGRAM GGA 1108 F5 RS P T H \$ TAC3D, TRANSIENT 3-D 414
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 HEATING CLADDING-STEAM REACTION ANL 3600 F36 RSBP G \$ CHEMOC2, COFF 366
 HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER AI 7.94 F+MAP RS P T H \$ 198
 HEATING3, 1,2, CR 3-D HEAT CONDUCTION PROGRAM ORNL 360 F4 RS P T H \$ 517
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 HEDL 1108 F4 RS P T D \$ 3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS 567
 HEDL 1108 F5 RS P T R \$ TOLYR2, POWER PLANT THERMAL DISCHARGE STUDY 569
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 HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS HEDL 1108 F+SL RS P XCT R \$ 527
 HETEROGENEOUS AEROSOLS AI 360 F4 RS P T G \$ FAA3, COAGULATION OF 443
 HETEROGENEOUS REACTOR CALCULATION DP 3608 F4 RSBP CT C \$ HERESY3, 2-D 136
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 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
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 HISTORIES PW 1604 F+CDP RS P X T B \$ FMC-N, FMC-G, MC NEUTRON, GAMMA-RAY 195
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 HOH, STEAM TABLES 14.5-2538 PSIA BAPL 6600 F4 RS P T H \$ M0899, 294
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 HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM BAPL 6600 F4 RS P T H \$ 286
 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 \$ GADCE, 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 C \$ FREVAP6, 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 \$ REXCC-H, 2-D 550

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HYDRODYNAM RESPONSE TO EXCURSION ANL	360 F4	RS P	CT F \$ REXCO-H2, 2-D	615
HYDRODYNAMIC ANALYSIS DUKING BLOWDOWN	PPCC 36J F4	RS P X	G \$ BURST1,	435
HYDRODYNAMIC MASS MATRIX GENERATION	BAPL 6600	F+CCM RS P	H \$ HYMAS,	560
HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL 6600	F+COM RS P	H \$	560
H6JL F4	RS P	CT C \$ TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	GESV	585
IBM 360A F+BAL RS P	T D \$ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION			336
IBM OS SYSTEM CATALOG UTILITY PCUTINF ANL	360B BAL	RSB X T P \$ COPYCAT,		646
IBM228J OR CALCCMP780 ANL	360 F4	RS P	T N \$ PLCT-3D, 3-D PLCTS ON	544
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IMPELLER DESIGN STUDY	PW 1604 F63	RS P	T I \$ PIP, CENTRIFUGAL PUMP	187
INCEXF, 1-GP 3-D XYZ XENON OSCILLATION	CFNC 360 F4	RS P X T F \$ CEXF,		415
INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC 360 F4	RS PL CT B \$		565
INDEXING LASL 66J0	F+COM RS P	T Q \$ INOX, XRAY DIFFRACTION POWDER PATTERN		609
INDEX, XRAY DIFFRACTION POWDER PATTERN INDEXING LASL 66JL	F+COM RS P	T Q \$		609
INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL 6600	F+CCM RS P	T I \$ GAPL3,	397
INELASTIC SCAT X-SECTION CALC MODERATOR GGA	1108 F4	RS P	A \$ GAKER,	289
INELASTIC SCATTERING CDC 16J4	F63 RS P	A \$ HAFEVER, 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 \$ COFFE, COHERENT	385
INFINITE MEDIUM SPECTRUM X-SECTIONS	AI 709C	F+FAP RS	L T B \$ QUICKIE,	119
INFORMATION SYSTEM	KAPL 66JJP	F+ASC RSB	X T M \$ TICIR2, MODULAR DOCUMENT	403
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INPUT	PW 1604 F63	RS	C \$ TDP, 2-D PERTURBATION TDC CR 2CXY FLUX	199
INPUT DATA PROCESSING MODULE	ANL 360 F4	RSBP	CT L \$ ARC-NUI002, BCD	533
INPUT PROCESSOR	LASL 36J F4	RS P	L \$ GENRC, FREE-FORMAT CAPC	530
INPUT PROCESSOR	LASL 66JJ F4	RS P	L \$ GENRC, FREE-FORMAT CARC	530
INPUT, PREPARATION, EDIT	KAPL 6600B	F+ASC R	T L \$ DATATRAN 2-D GEOMETRY	406
INSPEC, MARKOV SIMULATION OF REACTOR OPN DP	360 F4	RS P	G \$ INTEG,	590
INSTRUCTION SET	PW 16J4	F+CCP RS P	T P \$ LAG, ASSEMBLER FOR FLOCO2	186
INTEG, INSPEC, MARKOV SIMULATION OF REACTOR CPN DP	36J F4	RS P	G \$	59C
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INTERACTION ANALYSIS	HECL 1108 F4	RS P	G \$ SOCOOL2, SODIUM-FUEL	521
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INTERVAL X-SECTION AVERAGING	GGA 7044 F4	RS P	L \$ GAVER, ENERGY	218
INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SIA 360 F4	RS P X T P \$ DE/STEP,		64C
INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA 6600 F4	RS P X T P \$ DF/STEP,		640
INVENTORY	ANL 360 F4	RSBP	CT C \$ ARC-OTFID, 1-D MULTI-GP DIFFUSION &	626
INVERSE KINETICS CALC	ANL 36C F4	RS P	E \$ RIJ2, SPACE-INDEPENDENT	168
INVERSE KINETICS CALC	ANL 360C F63	RSBP	E \$ RI02, SPACE-INDEPENDENT	168
INVERSE KINETICS CALC	WANL 7094 F4	RS	E \$ RI02, SPACE-INDEPENDENT	168
IODINE REMOVAL	BCL 64J0 F4	RS P X	G \$ MIRAB, MIRAP, CONTAINMENT SYSTEM	499
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ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	CRNL 7090 F2	RSBP	C \$	180
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ISOPLETH-AREA CALC FROM SINGLE SOURCE	ANL GETS F	R	R \$ PLETHS,	591
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	CRNL 360	F+BAL RS P	C \$	322
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL 1604 F63	RS P	D \$	322
ISCTAB, PU POWER OUTPUT FROM MIXED ISOTOPE	MLMC 360 F4	RSBP	CT Q \$	619
ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL 360	F+BAL RS P	D \$ ISOSEARCH,	322
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ISOTOPE, MAXIMUM YIELD FROM REACTION OR DECAY	CRNL 1604 F63	RS P	D \$	179
ISOTOPIC BURNUP ANALYSIS	NEC 635 F4	RS P	T O \$ BURNUP, HEAVY ELEMENT	311
ISOTROPIC DIELECTRICS	SLA 6600 F4	RS P	V \$ FFFAPS, LAPLACE EQUATION	577
JAER 230 F4	RS P	T B \$ CLUP77, SQUARE CELL COLLISION PROBABILITY CALC		526
JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL 6600 F4	RS P	T C \$	394
JNC 1108 F5	RS	LX T R \$ LECPAR2, SPECTRA CALCULATION WITH DEPLETION		279
JOB ENTRY SYSTEM	ANC 36	BAL RSB	T P \$ NRTS-RJE, OS/36C MVT REMOTE	519
JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP 360	F+BAL S	X T B \$ RAHAB,	536
JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	CP 360	F+BAL S	T M \$	490
JPIXR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL 66JL F4	RS P	T A \$	506
JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA 360 F4	RS P	CT A \$	308

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JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	CRNL 1604	F63	RS P	T A \$	308
KAPL CALCOMP PLOTTING ROUTINES	KAPL 6600	F+COM RS	T P \$	KAPLPLOT,	496
KAPL 6600 F+ASC RS	P \$	SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE			442
KAPL 6600 F+ASC RS P	T P \$	LICN4, 3-D TEMPERATURE DISTRIBUTION PROGRAM			299
KAPL 6600 F+ASC RS P	T I \$	GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS			344
KAPL 6600 F+ASC RS P	T P \$	CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS			43
KAPL 6600 F+ASC RS P	T P \$	DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING			407
KAPL 6600 F+ASC RS P	T P \$	DCCGY, DESK CALCULATOR FORM SHEET DP PACKAGE			428
KAPL 6600 F+ASC RS P	T P \$	LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION			445
KAPL 6600 F+ASC RS P	T P \$	SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT			364
KAPL 6600 F+COM RS	T P \$	KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES			496
KAPL 6600 F4 RS	I \$	SCRSD8, PRESSURE VESSEL STRESS AND FATIGUE			391
KAPL 6600 F4 RS	T O \$	GASPAN, COMPLEX GAMMA-RAY SPECTRA ANALYSIS			485
KAPL 6600 F4 RS P	A \$	CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING			531
KAPL 6600 F4 RS P	A \$	MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC			535
KAPL 6600 F4 RS P	F \$	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC			352
KAPL 6600 F4 RS P	F \$	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS			389
KAPL 6600 F4 RS P	H \$	RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX			382
KAPL 6600 F4 RS P	I \$	STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS			337
KAPL 6600 F4 RS P	I \$	TUBF, U-TUBE HEAT EXCHANGER STRESS ANALYSIS			378
KAPL 6600 F4 RS P	O \$	DYNOL, PHOTOMULTIPLIER ELECTRON DISTRIBUTION			464
KAPL 6600 F4 RS P	P \$	MCST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME			446
KAPL 6600 F4 RS P	P \$	RCPE, FINDING ROOTS OF A POLYNOMIAL			444
KAPL 6600 F4 RS P	T A \$	JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC			506
KAPL 6600 F4 RS P	T A \$	PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC			507
KAPL 6600 F4 RS P	T D \$	3CXT, DEP3, 3-D XENON TRANSIENT & DEPLETION			477
KAPL 6600 F4 RS P	T H \$	HAFMAT, SYSTEM STEADY-STATE FLOW DISTRIBUTION			616
KAPL 6600 F4 RS P X	I \$	FINEF, FINITE-ELEMENT STUDY 2,3-D STRUCTURES			404
KAPL 6600B F+ASC R	T L \$	DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT			406
KAPL 6600B F+ASC R	T P \$	DATATRAN UTILITY MODULES, 2-D & 3-D PLOTTING			407
KAPL 6600B F+ASC RSB	X T M \$	TIGR2, MODULAR DOCUMENT INFORMATION SYSTEM			403
KAPL 6600B F+COM R	T M \$	DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM			386
KAPL 6600C F4 RS P	T I \$	SCR3, STRESS ANALYSIS SHELLS OF REVOLUTION			80
KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES	KAPL 6600	F+COM RS	T P \$		496
KE 3600B F36 RSBP	G \$	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS			278
KE 7094 F+MAP RSBP	T G \$	SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LCFT			200
KE 7094 F2 RSBP	T H \$	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY			155
KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	CRNL 360	F4 RS P	P \$		556
KEFF, MGBS, TGAN, NUCLEAR CRITICALITY SAFETY	DP 360	F4 PS P	T C \$		617
KENC, MONTE CARLO MULTICROUP CRITICALITY CODE	CRNL 360	F+BAL RSBP	CT C \$		450
KEND2, MONTE CARLO MULTICROUP CRITICALITY CODE	DP 360	F+BAL RSBP	CT C \$		450
KEND2, MONTE CARLO MULTICROUP CRITICALITY CODE	REF 6600	F+COM RS	PLX T C \$		450
KERNEL CALC	GGA 7.9C	F2 F S	T A \$	SUMMIT, CRYSTALLINE SCATTERING	50
KERNELS	DP 360	BCL P	LX T Z \$	THERMCS LIBRARY, 3J-GP ENDF/B SCAT	543
KEX OPTIONS	ANL 360	F4 RS P	E \$	R101, SPACE-INDEPENDENT KINETICS	255
KEX OPTIONS	ANL 360	F63 RSBP	F \$	R101, SPACE-INDEPENDENT KINETICS	255
KFX OPTIONS	WANL 7094	F4 RS P	F \$	R101, SPACE-INDEPENDENT KINETICS	255
KINETICS	AI 360	F4 RS P	T F \$	TSN, SPATIALLY-DEPENDENT REACTOR	309
KINETICS	AI 7094	F+MAP PS P	T F \$	TSN, SPATIALLY-DEPENDENT REACTOR	309
KINETICS	GGA 1108	F4 RS P	F \$	GAPOTKIN, SPACE-INDEPENDENT REACTOR	317
KINETICS	BCL 6400	F4 RS P	T F \$	ACEP, 1D AND 2D FEW-GROUP SPACE-TIME	494
KINETICS CALC	ANL 360	F4 PS P	E \$	R102, SPACE-INDEPENDENT INVERSE	168
KINETICS CALC	ANL 3600	F63 RSBP	F \$	R102, SPACE-INDEPENDENT INVERSE	168
KINETICS CALC	WANL 7094	F4 PS	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	36F RS PL CT F	\$	QX1, QUASISTATIC SPATIAL REACTOR	474
KINETICS CODE	LASL 6600	F4 RS P	T E \$	ANCLN, SPACE-INDEPENDENT REACTOR	480
KINETICS EQNS	GGA 1108	F4 RS P	E \$	GASA, STABILITY ANALYSIS REACTOR	291
KINETICS KEX OPTIONS	ANL 360	F4 RS P	F \$	R101, SPACE-INDEPENDENT	255
KINETICS KEX OPTIONS	ANL 3600	F63 RSBP	E \$	R101, SPACE-INDEPENDENT	255
KINETICS KFX OPTIONS	WANL 7094	F4 PS P	E \$	R101, SPACE-INDEPENDENT	255
KINETICS PROGRAM	CRNL 360	F4 RS P	XCT F \$	TASK, 1-D MULTIGROUP REACTOR	558
KINETICS SNAP GEOMETRY	AI 7.9C	F2 RS	E \$	SNAPKIN5/FA, 1-PFICN	122

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KINETICS TEMPERATURE DIST STUDY AEB 360 F4	RS P	E \$ BLAST, REACTOR	363
KINETICS TEMPERATURE FEEDBACK BAPL 6600 F4	RS P	T F \$ NUWIG, 1-D 2-GP	371
KINETICS W/FEEDBACK AI 7094 F+MAP RS P	T F	\$ AIRCS, SPACE-INDEPENDENT	163
KINETICS W/FEEDBACK AEB 360 F4	RS P	E \$ AIREK3, SPACE-INDEPENDENT	121
KINETICS W/FEEDBACK AI 7094 F2	RS	E \$ AIREK3, SPACE-INDEPENDENT	121
KINETICS W/FEEDBACK CDC 1604 F63	RS P	E \$ AIREK3, SPACE-INDEPENDENT	121
KINETICS WITH TEMP FEEDBACK CGA 1109 F4	RS P	T F \$ GAKIT, 1-D MULTIGP	370
KINETICS 2-D HEAT TRANSFER GGA 1108 F+BAL	RS P	T F \$ BLOOST6, COMBINED	303
KITT, SYSTEM FAULT TREE EVALUATION CODES ANC 360 F4	PSBP	CT G \$ PREP,	528
KITT, SYSTEM FAULT TREE EVALUATION CODES ANC 1108 F4	RS P	T C \$ PRFP,	528
KSUN 360 F4	RS P	O \$ CCRGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	390
LAG, ASSEMBLER FOR FLOCC2 INSTRUCTION SET	PW	1604 F+CDP RS P	T P \$
LAGRANGIAN EQNS OF MOTION SOLUTION SLA 3600 F36	RS P	T S \$ TOODY2, 2-D	627
LAG1 RS P	C \$	MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW 1604
LAG1 RS P	N \$	DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW 1604
LANGUAGE KAPL 6600 F+ASC	RS	P \$ SIMPLE1, TIME-SHARING PROGRAMMING	442
LANGUAGE PROCESSOR UNDER ISC	ANL	360 F+BAL R B L	T F \$ TSC-SPEAKEASY,
LAPLACE EQUATION ISOTROPIC DIELECTRICS SLA 6600 F4	RS P	V \$ FFEARS,	577
LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL 6600 F4	RS P	N \$
LARGE DEFLECTION STRESS STUDY BAPL 6600 F+COM	RS P	T I \$ GAPL3, INELASTIC	397
LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA 360 F4	RSBPLXCT B \$	249
LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAPD 7094 F+MAP	RS PLX T B \$	249
LASL 360 F4	RS P	L \$ GENRD, FREE-FORMAT CARD INPUT PROCESSOR	530
LASL 360 F4	RSBP	CT C \$ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	608
LASL 3600 F4	FSPP	CT C \$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	358
LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL 7094 F4	RS	T P \$
LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL 6600	BCD	R LX T Z \$
LASL 6600 BCD	R	LX T Z \$	LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS
LASL 6600 F+COM	RS P	T P \$	LFNSDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM
LASL 6600 F+COM	RS P	T Q \$	INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING
LASL 6600 F4	RS P	L \$	GENRD, FREE-FORMAT CARD INPUT PROCESSOR
LASL 6600 F4	RS P	N \$	DAC1, SN PERTURBATION CODE USING DTF4 FLUXES
LASL 6600 F4	RS P	N \$	LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS
LASL 6600 F4	RS P	T A \$	TCR, THERMAL SCATTERING CRYSTALLINE MATERIALS
LASL 6600 F4	RS P	T B \$	GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA
LASL 6600 F4	RS P	T C \$	DTF4, 1-D MULTI-GP DISCRETE COORDINATE PROGRAM
LASL 6600 F4	RS P	T C \$	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM
LASL 6600 F4	RS P	T C \$	3DD1, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z
LASL 6600 F4	RS P	T D \$	PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY
LASL 6600 F4	RS P	T D \$	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION
LASL 6600 F4	RS P	T E \$	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE
LASL 6600 F4	RS P	T Q \$	GROUP2, GROUP THEORY OF LATTICE DYNAMICS
LASL 6600B F+COM	RS	T P \$	LASLIB, LOS ALAMOS SUBROUTINE LIBRARY ROUTINES
LASL 6600D F4	RS P	T C \$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA
LASL 7030 F4	RS	T H \$	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS
LASL 7030 F4	RS P	T C \$	DTF4, 1-D MULTI-GP DISCRETE COORDINATE PROGRAM
LASL 7030 F4	RS P	T D \$	DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION
LASL 7090 F+MAP	RS P	I \$	WIREX, COMPUTER-PRODUCED WIRING LISTS LHTREX
LASL 7090 F+MAP	RS P	T L \$	DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS
LASL 7090 FLCCO	RS P	B \$	MCS, MONTE CARLO NEUTRON PENETRATION STUDY
LASL 7090 FLCCO	RS P	B \$	ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS
LASL 7094 FAP	RS P	T H \$	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS
LASL 7094 F2	RSBP	H \$	AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES
LASL 7094 F2	RSBP	H \$	AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES
LASL 7094 F4	PS	T P \$	LASL LEAST SQUARES, GENERAL CURVE FITTING
LASL 7600 F4	RS P	T C \$	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM
LASL 7600 F4	RS P	T C \$	TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH
LASL 7600D F4	RS P	T C \$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA
LASLIB, LOS ALAMOS SUBROUTINE LIBRARY ROUTINES	LASL 6600B F+COM	RS	T P \$
LATIN SQ, NXN LATIN SQUARE EXPERIMENTAL DESIGN	MLMO 360 F4	RSBP	C P \$
LATIN SQUARE EXPERIMENTAL DESIGN	MLMO 360 F4	RSBP	C P \$
LATTICE	GGA 1108 F4	RS	B \$ HEXSCAT, ELASTIC SCAT X-SECTIONS HEX
LATTICE	TVA 360 F4	RSBPLXCT B \$	LASER, SPECTRUM CALC WITH BURNUP CYL
LATTICE	WAPD 7094 F+MAP	RS PLX T B \$	LASER, SPECTRUM CALC WITH BURNUP CYL

LATTICE

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LATTICE DYNAMICS	ANL	36	F4	RS P	T O \$ GROUP2, GROUP THEORY OF	62
LATTICE DYNAMICS	LASL	6600	F4	RS P	T Q \$ GROUP2, GROUP THEORY OF	620
LATTICE EFFECTS	CGA	7044	F+MAP	RS P	T R \$ GARCL, RESONANCE OVERLAP AND	219
LATTICE EFFECTS	LER	7094	F+MAP	PS P	T R \$ GARCL, RESONANCE OVERLAP AND	219
LATTICE PHYSICS MODULES	DP	360	F+RAL	S	X T B \$ KAFAB, JOSEPH SYSTEM	536
LATTICE VIBRATION NEUTRON SCATTERING CODES AND		36	F4	RS P	CT W \$ MACS	574
LEAKAGE	AI	709J	F2	RS	J \$ FARSE1A, DOSE RATE FROM SNAP SHIELD	91
LEASE ANALYSIS	SIA	360	COECL	RSBP	CT M \$ BECCM, AEC CP PURCHASE VERSUS	589
LEASE ANALYSIS	SIA	110P	COBCL	RS P	M \$ BECCM, AEC CP PURCHASE VERSUS	589
LEAST SQ LENS DESIGN SYSTEM	LASL	660J	F+CCM	RS P	T P \$ LENSDES, NONLINEAR	602
LEAST SQUARES ANALYSIS RESONANCE DATA WILL		36	F4	RS P	A \$ CODILLI,	347
LEAST SQUARES EXPONENTIAL DECAY CURVES LIL		7094	F2	RS P	P \$ EXPALS,	321
LEAST SQUARES FIT FISSION NUCLEI DATA	BAPL	6600	F4	RS P	T P \$ DAFT1,	327
LEAST SQUARES FIT SUM OF EXPONENTIALS MIT		709	F2	RS P	P \$ FRANTIC,	324
LEAST SQUARES PHOTOPeAK SPECTRA CODE BNW		1108	F+BAL	RS P	T C \$ GSSLRNIB,	457
LEAST SQUARES TRANSMUTATION ANALYSIS BNW		1108	F5	RS P	T C \$ CBUFFIT1,	456
LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094	F4	RS	T P \$ LASL	62
LEGCOEFF3, LEGENDRE COEFF CALC FOR ANGULAR DIST	CGA	7044	F4	RS P	X A \$	217
LEGENDRE COEFF CALC FOR ANGULAR DIST	GGA	7044	F4	RS P	X A \$ LEGCOEFF3,	217
LEGENDRE COEFF CALC FOR ANGULAR DIST DATA AI		7094	F+MAP	RS P	A \$ CHAL,	215
LEGENDRE FITTING	KAPL	6600	F4	RS P	A \$ CLEM, ANGULAR DISTRIBUTION	531
LENS DESIGN SYSTEM	LASL	660J	F+CCM	RS P	T P \$ LENSDES, NONLINEAR LEAST SQ	602
LENSDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	660J	F+CCM	RS P	T P \$	602
LEOPARD, SPECTRA CALCULATION WITH DEPLETION	AERI	66J		RSBPLX	T B \$	279
LEOPARD, SPECTRA CALCULATION WITH DEPLETION	JNC	1108	F5	RS	LX T B \$	279
LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	360	F4	RS	PLXCT P \$	279
LER 7090 F+MAP PS P				T C \$ TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM		312
LER 7094 F+MAP RS P				T B \$ GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS		219
LER 7094 F4				PS P	T C \$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	219
LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P	T J \$ MO756,	343
LII) ANC		360	F4	PSBP	XCT W \$ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE	605
LIR AI		360	F4	RSBPLX	T C \$ CAESAR4, LIBLST, 1-D MULTI-GP DIFFUSION +	270
LIB SCOPE2.0 CEND 7600R F4				RS	T P \$ MODEL, MODIFIED BETTIS ENVIRONMENTAL	478
LIB SCOPE3.2 CDC 6600C F+CCM RS				T P \$ MODEL, MODIFIED BETTIS ENVIRONMENTAL	478	
LIB SCOPE3.3 CDC 6600D F+CCM PS				T P \$ MODEL, MODIFIED BETTIS ENVIRONMENTAL	478	
LIB. NED		635	F+GMP	RS	T P \$ GENED ENVIRONMENTAL ROUTINES, SUBROUTINE	515
LIB. BAPL 6600A F+ASC RS				T P \$ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE	478	
LIB. BW		6600B	F+ASC	RS	T P \$ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE	478
LIBLST, 1-D MULTI-GP DIFFUSION + LIB	AI	360	F4	RSBPLX	T C \$ CAESAR4,	270
LIBRARIES FROM ENDF/B ORNL		360	F4	PSBP	XCT B \$ XLACS, XSDRN MULTIGROUP	572
LIBRARIES FROM ENDF/B DATA	WAPD	7600	F4	RS P	T E \$ ETCT2, THERMAL	509
LIBRARIES, MUFT4 OR 5, GAM1 CR 2	WAPD	6600	BCD	R	L T Z \$ ETCG1 DATA	447
LIBRARY	LLL	7094	F+MAP	PS PL	T M \$ ECSIL, EXPERIMENTAL NEUTRON DATA	351
LIBRARY CAT. A-E	ANL	360	F+P+A	RS	T P \$ AMCLIBAE, ARGONNE SUBROUTINE	562
LIBRARY CAT. F	ANL	360	F+BAL	RS	T P \$ AMCLIBF, ARGONNE SUBROUTINE	563
LIBRARY CAT. G-Z	ANL	360	F+P+A	RS	T P \$ AMCLIBGZ, ARGONNE SUBROUTINE	564
LIBRARY FORM	WAPD	7600	F4	RS P	T R \$ ETCT3, ENDF/P V3 DATA TO THERMAL	628
LIBRARY GROUP COLLAPSING	APRF	660J	F4	RS	B \$ APRFX1, 99-GP DLC-2B	466
LIBRARY MAINTENANCE NED		635	F4	RS P	T M \$ TROUT, MUG MULTIGROUP XSEC	493
LIBRARY MAINTENANCE NED		1108	F5	RS P	T M \$ TROUT, MUG MULTIGROUP XSEC	493
LIBRARY PREPARATION	GGA	1108	F4	RS P	X T L \$ GAND, GAFGAR X-SECTION	345
LIBRARY ROUTINES	LASL	6600B	F+CCM	RS	T P \$ LASLIB, LOS ALAMOS SUBROUTINE	633
LIBRARY SERVICE ROUTINES	ANL	3600	36F	RSBP	T M \$ MERMC2, MAGIC, MC**2	472
LIBRARY TAPE MAINTENANCE	ANL	360	F4	RS	M \$ MERMC2, MC**2 BINARY	472
LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L \$ CSP1, SN X-SECTION	194
LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L \$ CSP2A, SN X-SECTION	193
LIBRARY UTILITY PROGRAM	AI	7094	F+MAP	RS	L T M \$ MOMUS, X-SECTION	159
LIBRARY UTILITY ROUTINE	ANL	3600	F63	RSBP	T M \$ XLIBIT, X-SECTION	181
LIBRARY UTILITY ROUTINE	AI	360	F4	RSB	L T M \$ CLIP, FORM OR THREDES	271
LIBRARY, 30-GP ENDF/B SCAT KERNELS	DP	360	BCD	R	LX T Z \$ THERMOS	543
LIFETIME ANALYSIS	ANL	3600	F36	RSBP	I \$ SWELL2, FUEL ELEMENT	353
LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	360	F4	RS P	T I \$	460
LIMITS	BKC	360	F4	RSBP	P \$ GRAPH, LINEAR REGRESSION W/CONFIDENCE	624
LINEAR ELASTIC SINGULARITY MODELING	SLA	660J	FTN	RS P	T I \$ CHILES,	611

LINEAR

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LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL 6600 F4	RS P	T I \$ MU266,	380
LINEAR ELASTIC SYSTEMS	BAPL 6600 F4	RS P	T I \$ M.552, DYNAMIC ANALYSIS	283
LINEAR REGRESSION W/CONFIDENCE LIMITS	BRC 360 F4	RSPP	P \$ GRAPH,	624
LINEAR SYSTEMS	ANL 360R F4	RS P	CT I \$ SAP4, STRUCTURAL ANALYSIS OF	641
LINEARLY-CONSTRAINED OPTIMIZATION	CPNL 360 F4	RS P	P \$ KEELE,	556
LION, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI 1108 F4	RS P	T H \$	299
LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL 6600 F+ASC	RS P	T H \$	299
LIPRECANI, MC NEUTRON PENETRATION CALCULATION	DAG 7090 F2	RSBP	J \$	123
LIQUID BLOWDOWN ANALYSIS LOFT	UGA 360 F4	RS P	G \$ WATER-HAMMER,	278
LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE 360R F36	RSBP	G \$ WHAM,	278
LISTS UHTREX	LASL 7090 F+AP	RS P	I \$ WIREX, COMPUTER-PRODUCED WIRING	315
LITHE,HELP, CRITICAL ANALYSIS SYSTEM	DP 360 F+AL	RS P	XCT B \$ HAMMER,	277
LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL 6600 F+ASC	RS P	T P \$	445
LLL 709 F2	RS		C \$ FIRM, 2-D FEW-GP S4 APPROXIMATION PZ GEOMETRY	7
LLL 6600R F4	RS P		P \$ GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	592
LLL 7090 F+AP	RS P		T H \$ SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	160
LLL 7090 F2	RS P		F \$ CONFC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	129
LLL 7094 F+AP	RS PL		T M \$ ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	351
LLL 7094 F2	RS P		P \$ EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	321
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 CGA 7044 F4	RSBP		CT I \$ SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC	250
LOAD BAPL 6600 F4	RS P		T I \$ SEALSHLL2, SHELL STRESS ANALYSIS AXISYM	282
LOAD SF 360 F4	RS P		T I \$ SEALSHLL2, SHELL STRESS ANALYSIS AXISYM	282
LOAD WTSC 6600R F4	RS P		T I \$ SEAL SHELL, SHELL STRESS ANALYSIS AXISYM	282
LOAD GGA 7044 F4	RS P		CT I \$ SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC	251
LOCA	ANL 360 F4	RSBP	X T G \$ THETA1-R, FUEL ROD THERMAL RESPONSE	512
LOCA ANALYSIS DUKE POWER MODULES UNITS	DUCD 635 F4	RS	G \$ ANVENT,	529
LOCA FISSION PRODUCT RELEASE ANALYSIS	ROL 6400 F4	RS P	G \$ FPCRI2,	500
LOCA ROD BUNDLE CHF DATA ANALYSIS	ANL 360 F4	RS PL	CT M \$ ERREST,	518
LOFT	KE 7094 F+AP	RSBP	T G \$ SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS	278
LOFT	UGA 360 F4	RS P	G \$ WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS	278
LOS ALAMOS SUBROUTINE LIBRARY ROUTINES	LASL 6600R F+CCM	RS	T P \$ LASLIB,	633
LOSS-OF-COOLANT & EMERGENCY COOLING	ROL 6400 F4	RS P	T G \$ ECCS4,	330
LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL 6600 F4	RS P	T G \$ FLASH3,	295
LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL 6600 F4	RS P	T G \$ M.555,ACT1,	284
LOSS-OF-COOLANT THERMAL ANALYSIS	ROL 6400 F4	RS P	T G \$ NUKLOD-1.0,	328
LUMPED MASS	LASL 7030 F4	RS	T H \$ PATH, 2- OR 3-D HEAT CONDUCTION	242
LUMPED MASS	LASL 7094 FAP	RS P	T H \$ PATH, 2- OR 3-D HEAT CONDUCTION	242
LWBR FUEL SKELLING TEMPERATURE STUDY	BAPL 6600 F4	RS P	T H \$ FIGRO,	272
LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	CRIL 7090 F2	RS	A \$	381
MA-G 360 F4	RSPP		CT G \$ FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	448
MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL 3600 F63	RSBPL	T J \$	143
MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW 7090 F2	RSBPL	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	RSBPL	XCT C \$	262
MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD 6500 F4	RS	PLX T C \$	262
MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	ANL 360 F4	RS P	CT W \$	574
MAD RSR			C \$ BURP1, DETECTOR EFFICIENCY POINT SOURCE	164
MAD RSR			C \$ BURP2, DETECTOR EFFICIENCY DISK SOURCE	165
MAD RSB			C \$ BURP3, DETECTOR EFFICIENCY POINT SOURCE	166
MAD RSR			C \$ BURP4, GAMMA-RAY PHOTOGRAPHIC SOLID CRYSTAL	169
MAD RSR			C \$ BURP5, GAMMA-RAY PHOTOGRAPHIC WELL CRYSTAL	170
MAGIC, MC*2 LIBRARY SERVICE ROUTINES	ANL 3600 F36	RSBP	T M \$ MERMC2,	472
MAGNETIC NETWORK SOLUTION	BAPL 6600R F4	RS P	T I \$ MANE1, RECTANGULAR	412
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 NED 635 F4	RS P		T D \$ FUMBLE, FAST REACTOR FUEL BURNUP &	480
MANAGEMENT SYSTEM ALDO 360	CORCL	RS P	M \$ AEC-ALC FAL, RADIO FREQUENCY	587
MANAGEMENT, EDITING, & ANALYSIS	BAPL 6600 F4	RS P	T M \$ SHLEG, DATA	557
MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL 6600R F4	RS P	T I \$	412
MANIPULATION	ANL 360 F4	RSBPL	CT L \$ ARC-XSEC1, MICROSCOPIC X-SECTION	594
MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED 635 F4	RS P	T H \$	256

MANTA

MIXED

MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS WARD 6600 F4 RS P T H \$ 256
 MANUFACTURING REQUIREMENTS CEPI GETS BASIC R M \$ MAPPER, PREDICTING 595
 MAPPER, PREDICTING MANUFACTURING REQUIREMENTS CEPI GETS BASIC R M \$ 595
 MARKCV SIMULATION OF REACTOR CPN DP 360 F4 RS P G \$ INTEG, INSPEC, 590
 MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY APDA 7094 F4 RS P F \$ 293
 MASS LASL 7730 F4 RS T H \$ RATH, 2- CR 3-D HEAT CONDUCTION LUMPED 242
 MASS LASL 7094 FAP RS P T H \$ RATH, 2- CR 3-D HEAT CONDUCTION LUMPED 242
 MASS MATRIX GENERATION BAPL 6600 F+COM RS P H \$ HYMAS, HYDRODYNAMIC 560
 MASS SPECTROMETRY RFD 360 F4 RS P U \$ DYNAMIC ANALYSIS OF CASES BY 645
 MATERIAL GEC 7390 FAP RSBP X T Q \$ SPECTRA, MC CALCULATION IRRADIATED 422
 MATERIAL BUCKLING CYL FUEL ELEMENTS AFB 360 F4 RS P B \$ WELWING, 362
 MATERIALS LASL 6600 F4 RS P T A \$ TOR, THERMAL SCATTERING CRYSTALLINE 360
 MATRICES AGC 7090 F2 RS P T B \$ AGN-SIGMA, CALC OF MULTI-GP TRANSFER 242
 MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 36 F4 RSBP X T P \$ EISPACK, 534
 MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 635 F4 RS X T P \$ EISPACK, 534
 MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 1108 F4 RS X T P \$ EISPACK, 534
 MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 6600 F4 RS X T P \$ EISPACK, 534
 MATRIX GENERATION BAPL 6600 F+COM RS P H \$ HYMAS, HYDRODYNAMIC MASS 560
 MATRIX GENERATION FOR A SYSTEM OF BEAMS KAPL 6600 F4 RS P I \$ STEM, 337
 MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS BAPL 6600 F+COM RS P X T I \$ 597
 MAXIMUM MOMENT CALC AI 7090 F+FAP RS T I \$ 4RESTRAINT PIPE STRESS, 109
 MAXIMUM YIELD FROM REACTION OR DECAY ORNL 1604 F63 RS P D \$ ISOTOPES, 179
 MC ORNL 3608 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 R \$ FMC-N, FMC-G, 195
 MC**2 BINARY LIBRARY TAPE MAINTENANCE ANL 36 F4 RS M \$ MERM2, 472
 MC**2 DATA CONVERSION ANL 360 F4 RS P CT M \$ ETCE, ENDF/B TO 350
 MC**2 DATA CONVERSION APDA 3600 ASAF4 RS P T M \$ ETCE, ENDF/B TO 350
 MC**2 LIBRARY SERVICE ROUTINES ANL 36 36F RSBP T M \$ MERM2, 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 360 F36 RS P T B \$ 356
 MCGUIRE UNITS DUCC 635 F4 RS G \$ ANVENT, LOCA ANALYSIS DUKE POWER 520
 MCS, MONTE CARLO NEUTRON PENETRATION STUDY LASL 7090 FLOCC RS P R \$ 202
 MEASUREMENT ANALYSIS GEC 635 F4 RSBP C \$ MICRD, MICROHARDNESS 421
 MEASUREMENTS GGA 1108 F4 RS P T A \$ TAGASI, ANALYSIS OF RESONANCE 410
 MEDIA TLD CORRECTION CALC AI 360 F4 RS P T C \$ RESPOND, DISSIMILAR 566
 MEDIUM SPECTRUM X-SECTIONS AI 719 F+FAP RS L T B \$ QUICKIE, INFINITE 119
 MERM2, MC**2 BINARY LIBRARY TAPE MAINTENANCE ANL 360 F4 RS M \$ 472
 MERM2, MAGIC, MC**2 LIBRARY SERVICE ROUTINES ANL 360 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 MULTIGP DIFFUSION TRIANGULAR 401
 MESH COLLAPSING TPW 650 F4 RS P B \$ PARTI, OPTIMAL GROUP OR 416
 MESH GENERATION SLA 6600 F4 RS P T L \$ CMESH, 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
 METALLIC FISSION PRODUCT RELEASE CGA 1108 F4 RS P D \$ FREVA6, HTGR 301
 METALS GEC 635 F+FAP RSBP T Q \$ CASCADE, CLUSTER, RADIATION DAMAGE IN 419
 MGRS, 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
 MICRD, MICROHARDNESS MEASUREMENT ANALYSIS GEC 635 F4 RSBP C \$ 421
 MICROHARDNESS MEASUREMENT ANALYSIS GEC 635 F4 RSBP C \$ MICRD, 421
 MICROSCOPIC X-SECTION MANIPULATION ANL 360 F4 RSBP CT L \$ ARC-XSEC1, 594
 MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL BCL 6400 F4 RS P X G \$ 499
 MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL BCL 6400 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 36 F4 RS P T I \$ SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS 402
 MIT 3608 F+BAL RSBP T D \$ PQQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION 336
 MIT 370 F4 RS P T F \$ GAKIN2, 1D MULTIGROUP TIME-DEPENDENT DIFFUSION 31
 MIT 790 F2 RS P P \$ FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS 324
 MIX KAPL 6600 F4 RS P H \$ FAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER 382
 MIXED ISOTOPES MLMD 36 F4 RSBP CT Q \$ ISCTAB, PU POWER OUTPUT FROM 619

ML-1

MULTI-CHANNEL

ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC 7090 F2	RS P	O \$ CROC90,	154
MLMC 360 F+C+P RSBP	T M \$ RALCRPH,		RESOURCE ALLOCATION PROJECT PLANNING	603
MLMC 360 F4	RSBP C P \$ LATIN SQ,		NNX LATIN SQUARE EXPERIMENTAL DESIGN	630
MLMC 360 F4	RSBP CT Q \$ ISCTAB,		PU POWER OUTPUT FROM MIXED ISOTOPES	619
MMM3, COORDINATE ANALYSES SEMI-RIGID MOLECULES ANC	360 F4	RS P	W \$	632
MODE RAPL 6600 F4	RS P	P \$ RELJ1,	RELIABILITY FOR A SINGLE FAILURE	497
MODE FAST REACTOR X-SEC CALC BNW 1108 F4	RS P	T B \$ FCC4,	FUNDAMENTAL	306
MODELING SLA 6600 FTM	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 (HCRC DIST FUNCT	AEG 7090 F2	RS	B \$ DANCORF JR,	150
MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0 CEND 7600R 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 RSE	X T M \$ TIGIR2,		403
MODULAR PROGRAMMING AND DATA SYSTEM	KAPL 6600B F+CCM R	T M \$ DATATRAN,		386
MODULE ANL 360 F4	RSBP CT L \$ ARC-NUI002,		BCD INPLT DATA PROCESSING	533
MODULES ANL 360 F+BAL RS P	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 + 3-D PLOTTING	KAPL 6600 F+ASC RS P	T P \$ DATATRAN UTILITY		407
MODULES, 2-D & 3-D PLOTTING	KAPL 6600B F+ASC R	T P \$ DATATRAN UTILITY		407
MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN NPGS	360 F4	RS P X T E \$		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 \$ 4RESTRAINT PIPE STRESS,		MAXIMUM	109
MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI 7094 F+FAP RS	L T M \$		159
MUNA, 1-D MULTIGROUP DIFFUSION SLAR, CYL, SPH ANC	360 F4	RSBP CT C \$		582
MONITOR SLAC 360 F+BAL RS	CT P \$ PROGLOCK,		USER PROGRAM PERFORMANCE	642
MONITOR SLAC 360 BAL RS	CT P \$ SLACMCN 2.2,		CS360 MVT/MFT PERFORMANCE	635
MONTE CARLO CALC NEUTRON HISTORIES	GCA 7044 F4	RS P	T B \$ FMC-N,	195
MONTE CARLO CELL CALCULATION AI 360 F+BAL RS P X T E		\$ 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	RSBPL CT C \$ VIM1X,			510
MONTE CARLO MULTIGROUP CRITICALITY CODE CRNL 360 F+BAL RSBPL CT C \$		KENO,		450
MONTE CARLO MULTIGROUP CRITICALITY CODE DP 360B F+BAL RSBP	CT C \$ KENO2,			450
MONTE CARLO MULTIGROUP CRITICALITY CODE RFD 6600 F+CCM RS PLX T C \$		KENO2,		450
MONTE CARLO NEUTRON PENETRATION STUDY LASL 7090 FLOCC RS P		B \$ MCS,		202
MONTE CARLO NEUTRON TRANSPORT CODE ANC 360 F4	RSBPL CT C \$ RAFFLE-ANC,			631
MONTE CARLO REACTOR ANALYSIS CALCULATION CRNL 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
MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME KAPL 6600 F4	RS P	P \$		446
MOTION SOLUTION SLA 3600 F36 RS P	T S \$ TOODY2,		2-D LAGRANGIAN EQNS OF	627
MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC ANC 360 F4	RSBP XCT H \$			551
MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC ANC 1108 F4	PS P	T H \$		551
MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC ANL 360 F4	RS P	CT W \$		575
MSS 360 F4	RS P	H \$ FLCW-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	O \$ BURP1,		DETECTOR EFFICIENCY PCINT SOURCE	164
MTS 7090 MAD RSB	O \$ BURP2,		DETECTOR EFFICIENCY DISK SOURCE	165
MTS 7090 MAD RSB	O \$ BURP3,		DETECTOR EFFICIENCY PCINT SOURCE	166
MTS 7090 MAD RSB	O \$ BURP4,		GAMMA-RAY PHOTOFRACTION SOLID CRYSTAL	169
MTS 7090 MAD RSB	O \$ BURP5,		GAMMA-RAY PHOTOFRACTION 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	RS P X T G \$ MUCHA1,			508
MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION CRNL 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 E \$ ETGG1,	ENDF/B TO	437
MUFT, GAM, ANISN X-SEC FORMAT WAPD 7600 F4	RS P	T B \$ ETGG3,	ENDF/B TC	538
MUFT4 OR 5, GAM1 OR 2 WAPD 6600 BCD R	L T Z \$ ETCC1		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 FLCW MSS 360 F4	RS P	H \$ FLCW-MODEL,		246

MULTI GP

MULTI

MULTI-GP CONSTANT & FAST SPECTRA CALC AND 760 F4 PS FLX T F \$ PERPG, 520
 MULTI-GP CONSTANT CALC CC 709 F+MAP PS FLX T F \$ AGN 1/2, FAST SPECTRUM 204
 MULTI-GP CONSTANT CALC TL 1 MEV PC 725 F4 PS FLX T F \$ CAMTEC2, 185
 MULTI-GP CONSTANT CALC UT 10 MEV BNW 1107 F4 PS FLX T F \$ CAMTEC2, 185
 MULTI-GP CONSTANT CALC JT 10 MEV BNW 7090 F+MAP PS FLX T F \$ CAMTEC2, 185
 MULTI-GP CONSTANT CALC TL 1 MEV UVA 64 F4 PS FLX T F \$ CAMTEC2, 185
 MULTI-GP CONSTANTS AND 360 F4 PS FLX T F \$ INCHTE, THERMAL SPECTRA & 565
 MULTI-GP CONSTANTS FROM REFERENCE FOR 1 X 1100 F4 PS P X T R \$ FLUX3, 388
 MULTI-GP DIFFUSION JMC 360 F4 PS P T C \$ VARI QUIP, TIME-SEP 2-D 212
 MULTI-GP DIFFUSION WALL 6600 F4 PS P T C \$ VARI QUIP, TIME-SEP 2-D 212
 MULTI-GP DIFFUSION + LIB AI 36 F4 PS PLX T C \$ CASAF4, LIBIST, 1-D 27
 MULTI-GP DIFFUSION & INVENTORY AND 360 F4 PS FLX T C \$ ARC-LIFID, 1-D 626
 MULTI-GP DIFFUSION DEPLETION CASE CRIL 7090 F+MAP PS P T C \$ ASSAULT, 2-D 240
 MULTI-GP DIFFUSION PROGRAM VAE 36 F+MAP PS P T C \$ CRAM, 1-D AND 2-D 13
 MULTI-GP DIFFUSION PROGRAM ORNL 7090 F+MAP PS P T C \$ EXTERMINATOR, 2-D 156
 MULTI-GP DIFFUSION PROGRAM UKR 7090 F+MAP PS P T C \$ CRAM, 1-D AND 2-D 13
 MULTI-GP DIFFUSION PROGRAM UKR 7090 F+MAP PS P T C \$ EXTERMINATOR2, 2-D 156
 MULTI-GP DIFFUSION PROGRAM C 7600 F4 PS P T C \$ EXTERMINATOR2, 2-D 156
 MULTI-GP DIFFUSION PROGRAM ORNL 36 F4 PS P T C \$ EXTERMINATOR2, 2-D 156
 MULTI-GP DIFFUSION SLAB CYL SPHERE BNW 1107 F4 PS P T C \$ FEN, 1-D 241
 MULTI-GP DIFFUSION SLAB CYL SPHERE AI 7090 F+MAP PS P T C \$ FAIM, 1-D 12
 MULTI-GP DIFFUSION SLAB CYL SPHERE AI 7090 F+MAP PS FLX T C \$ AIM6, 1-D 29
 MULTI-GP DIFFUSION SLAB CYL SPHERE CIL 1604 F63 PS FLX T C \$ AIM6, 1-D 29
 MULTI-GP DIFFUSION SLAB CYL SPHERE CIL 1604 F63 PS PLX T C \$ FAIM, 1-D 12
 MULTI-GP DIFFUSION SLAB CYL SPHERE CIL 370 F4 PS FLX T C \$ AIM6, 1-D 29
 MULTI-GP DIFFUSION SLAB CYL SPHERE AI 7090 F+MAP PS P T C \$ ULCER, 1-D 118
 MULTI-GP DIFFUSION SLAB CYL SPHERE AND 36 F36 PS FLX T C \$ MACH1, 1-D 262
 MULTI-GP DIFFUSION SLAB CYL SPHERE MTS 36 F4 PS FLX T C \$ MACH1, 1-D 262
 MULTI-GP DIFFUSION SLAB CYL SPHERE F2 65 F4 PS PLX T C \$ MACH1, 1-D 262
 MULTI-GP DIFFUSION SLAB CYL SPHERE PHF 360 F4 PS P T C \$ FAIMUS, 1-D 120
 MULTI-GP DIFFUSION SYNTHESE CALC GGA 1108 F4 PS FLX T C \$ RISYN, 2-D 287
 MULTI-GP DIFFUSION SYNTHESE CALC GGA 1108 F4 PS P T C \$ RISYN, 2-D 287
 MULTI-GP DIFFUSION XY PZ COORDINATE GGA 1108 F4 PS FLX T C \$ CAMBLE4, 2-D 222
 MULTI-GP DIFFUSION XY PZ COORDINATE GGA 1108 F4 PS FLX T C \$ CAMBLE4, 2-D 222
 MULTI-GP DIFFUSION XY PZ COORDINATE GGA 1108 F4 PS FLX T C \$ VARI QUIP3, 2-D 264
 MULTI-GP DISCRETE COORDINATE CALC AI 7090 F4 PS FLX T C \$ DIF2, 1-D 151
 MULTI-GP DISCRETE COORDINATE CALC AND 36 F36 PS P T C \$ ANTSN, 1-D 151
 MULTI-GP DISCRETE COORDINATE CALC AND 36 F36 PS P T C \$ SNARG-1D, 1-D 288
 MULTI-GP DISCRETE COORDINATE CODE GGA 1108 F4 PS P T C \$ 2DF, 2-D 173
 MULTI-GP DISCRETE COORDINATE CODE JMC 1604 F63 PS P T C \$ 2DF, 2-D 173
 MULTI-GP DISCRETE COORDINATE PROGRAM AND 360 F63 PS P T C \$ IF4, 1-D 209
 MULTI-GP DISCRETE COORDINATE PROGRAM JMC 1604 F63 PS P T C \$ IF4, 1-D 209
 MULTI-GP DISCRETE COORDINATE PROGRAM LASL 6600 F4 PS P T C \$ IF4, 1-D 209
 MULTI-GP DISCRETE COORDINATE PROGRAM LASL 7090 F4 PS P T C \$ IF4, 1-D 209
 MULTI-GP DISCRETE COORDINATE PROGRAM LASL 7090 F4 PS P T C \$ IF4, 1-D 209
 MULTI-GP DOUBLE SN APPROX BNW 7090 F63 PS P T C \$ CE LAPC S13, 1-D 75
 MULTI-GP DIF4 WITH DEPLETION LASL 7090 F4 PS P T C \$ DIF-BURN, 1-D 269
 MULTI-GP FLUX SYNTHESIS PROGRAM CYL FW 1604 F63 PS P T C \$ 2LYYL, 1-D 192
 MULTI-GP SN APPROX SLAB CYL SPHERE PW 1604 LAG1 PS P T C \$ NGCSN, 1-D 211
 MULTI-GP SN APPROX SLAB CYL SPHERE UKR 7090 F2 PS P T C \$ W-LSN, 1-D 132
 MULTI-GP SN APPROXIMATION RZ PW 1604 F63 PS P T C \$ FORTRAN TDC, 2-D 161
 MULTI-GP SN APPROXIMATION XY GEOM AGC 7090 F63 PS P T C \$ 2EXY, 2-D 18
 MULTI-GP TRANSFER COEFFICIENTS LLI 7090 F+MAP PS P T B \$ SCHEST1/2/5, 160
 MULTI-GP TRANSFER MATRICES AGC 7090 F2 PS P T B \$ AGN-SICMA, CALC OF 243
 MULTI-GP TRANSPORT XY PZ RTHETA LASL 3600 F4 PS P T C \$ TWOTRAN2, 2-D 358
 MULTI-GP TRANSPORT XY RZ RTHETA LASL 6600 F4 PS P T C \$ TWOTRAN2, 2-D 358
 MULTI-GP TRANSPORT XY PZ RTHETA LASL 7600 F4 PS P T C \$ TWOTRAN2, 2-D 358
 MULTI-GP X SECTIONS LASL 7090 F63 PS P T B \$ ZOT, GROUP-COLLAPSING OF 113
 MULTI-GP FAST THERMAL SPECTRA GGA 1108 F4 PS PLX T B \$ GGA4, 298
 MULTI-GP FAST THERMAL SPECTRA GGA 6600 F4 PS L T B \$ CGC4, 298
 MULTI-GP FAST THERMAL SPECTRA 7090 F+MAP PS P A \$ COMBCE, COMBINED B-W 20
 MULTI-GP FAST THERMAL SPECTRA KAPL 6600 F4 PS P A \$ MULTI, 53
 MULTI-GP FAST THERMAL SPECTRA KAPL 6600 F4 PS P B \$ PCUNCE, FLUX DIST IN 237
 MULTI-GP FAST THERMAL SPECTRA KAPL 6600 F4 PS P A \$ 535

MULTIANCHOR

NED

MULTIANCHOR PIPE SYSTEM	AI	360	F4	RS P	CT I \$ PSA2, STRESS ANALYSIS	542
MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	F4	RS P	P \$ MOST, A	446
MULTIGP ORNL	360F	F4	RS P	T K \$ CITATION, 1,2,3-D DIFFUSION DEPLETION		387
MULTIGP CONSTANTS PNW	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 TRIANGULAR MESH	GGA	1108	F+BAL	RS P	T C \$ GAMTRI, 2-D	461
MULTIGP DIFFUSION+BURNUP TRI-MESH	GGA	1108	F+BAL	RS P	T D \$ BUGTRI, 2-D	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 GESV	635	F+GMP	RS P	XCT B \$ ENDRUN2,		501
MULTIGROUP CRITICALITY CODE ORNL	36J	F+BAL	RSBP	CT C \$ KENC, MONTE CARLO		450
MULTIGROUP CRITICALITY CODE DP	36JB	F+BAL	RSBP	CT C \$ KENO2, MONTE CARLO		450
MULTIGROUP CRITICALITY CODE RFD	6600	F+CCM	RS PLX T C \$ KENO2, MONTE CARLO		450	
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	36J	F4	RSBP	T C \$ 2DB, 2-D	325
MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	F4	RS P	T C \$ 2DB, 2-D	325
MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	F4	RS P	T C \$ 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 C \$ 3DB, 3-D	567
MULTIGROUP DIFFUSION BURNUP ANALYSIS	HECL	1108	F4	RS P	T C \$ 3DB, 3-D	567
MULTIGROUP DIFFUSION DEPLETION	AI	360	F4	RSPP	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	RSPP	CT C \$ MCNA, 1-D	582
MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	F+BAL	RS P	T C \$ GAZE2, 1-D	430
MULTIGROUP DIFFUSION XYZ P-THEFT-A-Z	LASL	6600	F4	RS P	T C \$ 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 \$ TCSN, 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 F \$ 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 \$ TRCUT, MUG		493
MULTIGROUP XSEC LIBRARY MAINTENANCE NED	1108	F5	RS P	T M \$ TRCUT, MUG		493
MULTILEVEL B-W X-SEC CALC	ANL	6600	F4	RS P	A \$ SIGPLCT, 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	36	BAL	RSB	T F \$ NRTS-RJE, OS/360	519
MVT/MET PERFORMANCE MONITOR SLAC	360	BAL	RS	CT P \$ SLACMCN 2.2, OS360		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, PWP FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T H \$ FLCT1,	331
MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P	T I \$	383
MO457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P	T I \$	329
MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	F4	RS P	T I \$	283
MO555, ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P	T G \$	284
MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P	T P \$ MU661, MU657,	411
MO648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS	T C \$	342
MO657, MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P	T P \$ MO661,	411
MO661, MO657, MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P	T P \$	411
MO756, LFTR, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P	T J \$	343
MO807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS	T B \$	280
MO899, HCH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P	H \$	294
MO899, HCH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P	T H \$	294
NAP, NEUTRON-INDUCED GAMMA-RAY REACTIVITY	IIIR	7094	F4	RSPLX	T C \$	314
NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	F63	RSBP	A \$	171
NED 635 F+GMP RS				T P \$ GFNED ENVIRONMENTAL ROUTINES, SUPROUTINE LIB.		515
NED 635 F+GMP RS				T D \$ SYN, 2D SYNTHESIS MULTIGP DIFF & IGP DEPLETION		495

NED

NPTS

NED	635	F4	RS P	D	\$ RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	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	PS P	T C	\$ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	167
NED	635	F4	PS 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	PS P	T H	\$ VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	458
NED	635	F4	RS P	T M	\$ TRCUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	493
NED	635	F4	RS P	T C	\$ BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	311
NED	635	F4	RS P	T D	\$ EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	258
NED	635	F4	RS P X	T F	\$ FDR2, FAST REACTOR EXCURSION CALCULATIONS	174
NED	635	F4	RS PL	T C	\$ BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	287
NED	1108	F4	PS P	T C	\$ BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	287
NED	1108	F5	RS P	T M	\$ TRCUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	493
NED	2000	F2	PS P	A	\$ DCPLE, RESOLVED RESONANCE X-SECTION CALC	177
NED	2000	F2	RS P	A	\$ RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	176
NED	2000	F2	PS P	B	\$ SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	178
NED	2000	F4	RS P	T F	\$ FCRE, FAST REACTOR EXCURSION CALCULATIONS	174
NED	7094	F+FAP	RS P	T B	\$ EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	201
NETWORK SOLUTION	BAPL	6600	F4	RS P	T I \$ MANE1, RECTANGULAR MAGNETIC	412
NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	6600	F4	RS P	T B \$ EPOCH,	461
NEUTRON DATA LIBRARY	LLL	7094	F+FAP	RS PL	T M \$ ECSIL, EXPERIMENTAL	351
NEUTRON FLUX-COSIMETER ACTIVITY RELATION	CFC	635	F4	RSBP	C \$ DCS,	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	CAC	7090	F2	RSBP	J \$ LIPRECAN1, MC	123
NEUTRON PENETRATION STUDY	LASL	7090	FLECC	RS P	P \$ MCS, MONTE CARLO	202
NEUTRON POLARIZATION EXPERIMENT	UCND	360	F+BAL	RS P	O \$ PMS1, FAST	469
NEUTRON SCATTERING CODES AND	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 G \$ EXPN, ANALYSIS OF PULSED	258
NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS P	F \$ TRIFIDC, PULSED	489
NEUTRON SPECTRUM X-SECTION CALC	AI	7090	F2	RS PL	T B \$ FCRM, FAST	51
NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS LX	T B \$ CAM1, FAST	33
NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PL	T B \$ FCRM, FAST	51
NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PLX	T B \$ CAM1, FAST	33
NEUTRON SPECTRUM X-SECTION CALC	GGA	7070	F2	RS FLX	T B \$ GAM1, FAST	33
NEUTRON SPECTRUM X-SECTION CALC	GSUC	370	F4	RS PLXCT	B \$ FCRM, 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	5
NEUTRON TRANSPORT CODE AND	360	F4	RSBP	CT C	\$ RAFFLE-ANC, MONTE CARLO	631
NEUTRON X-SECTION CALCULATION	BAPL	6600	F4	RS P	T A \$ SLUR, S-WAVE	399
NEUTRON-HYDRODYNAMICS	APLA	7094	F2	RS P	F \$ WEAK EXPLOSION, COUPLED	145
NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBP	LX T C \$ 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	RSBP	F \$ HATCHET, COUPLED	153
NEUTRONICS-HYDRODYNAMICS SPH	PW	1604	F63	RS P	F \$ AX-TNT, COUPLED	191
NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	F63	RSBP	F \$ AX1, COUPLED	122
NEUTRONICS-HYDRODYNAMICS SPHERE	LLL	7090	F2	RS P	F \$ CONEC, COUPLED	122
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	PNW	7090	F4	RS P	T F \$	488
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 \$ SNEO,	364
NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	6600	F+ASC	RS P	T P \$ LIZARD,	445
NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	6600	F+CCM	RS P	T P \$ LENSDES,	602
NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS P	T F \$	371
NPGS	360	F4	RS P X	T E	\$ MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	491
NPRECCP, FUEL CYCLE COSTS PERFORMANCE DATA	ANL	360	F4	RS P	D \$	146
NPRECCP, FUEL CYCLE COSTS PERFORMANCE DATA	UEC	6600	F4	RS P	D \$	146
NPTS ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES AND	360	F+BAL	RS	T P	\$	613

NRTS-RJE

CRNL

NRTS-RJE, CS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC	360	BAL	RSR	T P \$	519
NUBOW, STRUCTURAL ANALYSIS BEWED REACTOR CORES	ANL	360B	F4	RS P	I \$	643
NUCLEAR CRITICALITY SAFETY	CP	360	F4	RS P	T C \$ KEFF, MGBS, TGAN,	617
NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWF	360	F4	PS 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 POWER PLANT COST CODE	HECL	1108	F5	RS P	X T C \$ PACTOLUS, CLGTHO,	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
NUCLEUS REACTION	AI	360	F+BAL	RS P	T A \$ COMNLC, CASCADE, COMPOUND	482
NUCLEUS X-SECTION CALC	ANL	3600	F63	RSBP	A \$ NEAPREX, 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	327
NUCLIDE X-SECTION EVALUATION	CRNL	7090	F4	RSBP	A \$ MUFFLE, FISSILE	323
NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	CRNL	7090	F2	RSBP	D \$	134
NURLC-1.0, LCSS-OF-COOLANT THERMAL ANALYSIS	BCL	6400	F4	RS P	T G \$	328
NXN LATIN SQUARE EXPERIMENTAL DESIGN	MLMD	360	F4	RSPP	C P \$ LATIN SQ,	630
ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P	T F \$ NCAH, 1-D	405
OPN OPD 6400	F4	S P	F \$ PWR-PPM, BORATION-DILUTION TABLES FOR PWR			552
OPN DP	360	F4	RS P	G \$ INTEG, INSPEC, MARKOV SIMULATION OF REACTOR		590
OPD 6400	F4	S P	H \$ PWR-PPM, BORATION-DILUTION TABLES FOR PWR			552
OPTICAL MODEL X-SECTIONS	AI	7094	F2	RS P	T A \$ 2PLUS, NCN-SPHERICAL	254
OPTICAL MODEL X-SECTIONS	ANL	3600	F63	RSBP	T A \$ 2PLUS, NCN-SPHERICAL	254
OPTIMAL GROUP OR MESH COLLAPSE	TRW	6500	F4	RS P	B \$ PARTI,	416
OPTIMIZATION	ORNL	360	F4	RS P	P \$ KEELF, 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 \$ MCST, A MULTIDIMENSIONAL	446
OPTIMIZATION STUDY	PW	1604	F63	RS	I \$ WOEXPT, REACTOR WEIGHT	190
OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	7044	F+MAP	RS P	T D \$	226
ORCCST, POWER PLANT CAPITAL COST ESTIMATING	CRNL	360B	F4	RS P	T C \$	588
ORDINARY DIFF EQNS	CRNL	6600	F4	RS P	P \$ FORSIM, SOLN OF SYSTEM OF	514
ORDINARY DIFF EQUATIONS	SLA	360	F4	RS P	X T P \$ DE/STEP, INTRP, SOLN OF	640
ORDINARY DIFF EQUATIONS	SLA	6600	F4	RS P	X T P \$ DE/STEP, INTRP, SOLN OF	640
ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	ANL	360B	F4	RS P	C P \$ GEAR,	592
ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600B	F4	RS P	P \$ GEAR,	592
ORDINATE CALC	AI	7090	F2	RS	PLX T C \$ DTF2, 1-D MULTI-GP DISCRETE	151
ORDINATE CALC	AI	360	F4	RSBP	PLX 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	CRNL	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, FFW-GP DISCRETE	398
ORNL	360	BAL+F	RS P	CT P	\$ GETCCR, FRECCR, FORTRAN DYNAMIC STORAGE ALLCC	644
ORNL	360	F+BAL	RS P	D	\$ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	322
ORNL	360	F+BAL	RS P	T I	\$ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	332
ORNL	360	F+BAL	RSBP	CT C	\$ ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	523
ORNL	360	F+BAL	RSBP	CT C	\$ KENC, MONTE CARLO MULTIGROUP CRITICALITY CODE	450
ORNL	360	F4	RS P	A	\$ POLLA, CONVERTS R-MATRIX RESONANCE PARAMETERS	639
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	\$ HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	517

ORNL	36J	F4	FS P	T H	\$	ORRIBLE, ROD BUNDLE FLOW & TEMPERATURE DIST.	629
ORNL	36J	F4	RS P	C G	\$	STEFFG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	583
ORNL	36J	F4	PS P	X T F	\$	ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	525
ORNL	360	F4	RS P	XCT F	\$	TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	559
ORNL	360	F4	RS PLX	T B	\$	XSCFN, DISCRETE COORDINATE MULTIGROUP CONSTANTS	393
ORNL	36J	F4	RSBP	XCT B	\$	XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	572
ORNL	360B	F+PAL	RS P	T B	\$	PAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	392
ORNL	360B	F4	FS P	T C	\$	URCST, POWER PLANT CAPITAL COST ESTIMATING	588
ORNL	360F	F4	RS PL	CT M	\$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	502
ORNL	360C	F4	RS P	XCT D	\$	CONCEPTS, POWER PLANT CONCEPTUAL COST ESTIMATE	498
ORNL	360H	F4	RS P	T K	\$	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	387
ORNL	1604	F2	PS P	F	\$	BIGITAL, SPENT YANKEE-FUEL TEMPERATURE CALC	549
ORNL	1604	F63	PS P	A	\$	PECGY, 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	\$	ISCRUNCH, REACTION DECAY CHAIN ANALYSIS	180
ORNL	1604	F63	RS P	C	\$	ISCFARCH, ISOTOPIC 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	C	\$	POWERCU, NUCLEAR STATION ELECTRICITY COSTS	34
ORNL	1604	F63	RS P	T A	\$	JUPITER1, COUPLED-CHANNEL X-SEC EVALUATION	309
ORNL	6600	F4	FS P	T M	\$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	502
ORNL	7090	F+PAP	RS P	T C	\$	EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	156
ORNL	7090	F+PAP	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	\$	EQUIPCISEF3, 2-D 2-GROUP DIFFUSION SLAB CYL	39
ORNL	7090	F2	RS P	T C	\$	EQUIPCISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	87
ORNL	7090	F2	PS P	T C	\$	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	32
ORNL	7090	F2	PS P	T C	\$	2.GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	40
ORNL	7090	F2	RSBP	D	\$	ISCRUNCH, REACTION DECAY CHAIN ANALYSIS	180
ORNL	7090	F2	RSBP	C	\$	NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	134
ORNL	7090	F4	RSBP	A	\$	MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	222
ORRIBLE, ROD BUNDLE FLOW & TEMPERATURE DIST. ORNL 360 F4 RS P T H \$							629
ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION ORNL 36J F4 RS P X T F \$ ORTHIS,							525
ORTHIS, ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION ORNL 360 F4 RS P X T F \$							525
OS SYSTEM CATALOG UTILITY ROUTINE AND 360B BAL RSR X T P \$ COPYCAT, IBM							646
OS/360 MVT REMOTE JOB ENTRY SYSTEM ANC 360 BAL RSR T P \$ NRTS-RJE,							519
OSCILLATION CEAD 360 F4 RS P X T F \$ CEXE, INCXE, 1-GP 3-D XYZ XENON							415
OSUC 370 F4 RS PL CT C \$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE							29
OSUC 370 F4 RS PLXCT B \$ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC							51
OS360 MVT/MFT PERFORMANCE MONITOR SLAC 360 BAL RS CT P \$ SLACMON 2.2,							635
OUTPUT PW 1604 LAG1 RS P N \$ DTX, EFFECTIVE X-SECTION CALC FROM CSN							210
OUTPUT DATA LASL 6600 F4 RS P T B \$ GLEN, GROUP CONSTANT CALC FROM TOR							361
OUTPUT FROM MIXED ISOTOPES MLMC 360 F4 RSBP CT C \$ ISOTAB, PU POWER							619
OUTPUT GGA 110R F5 RS P T N \$ GAPER2D, 2-D PERTURBATION CALC FROM 2DF							471
OUTPUT TAPE EDIT REACTION RATES UK-W 7090 F2 RS N \$ WEC, W-CSN							133
OVERLAP AND LATTICE EFFECTS GCA 7044 F+MAP RS P T P \$ GARCL, RESONANCE							219
OVERLAP AND LATTICE EFFECTS LFR 7094 F+MAP RS P T B \$ GAPCL, RESONANCE							219
OXIDE FUEL PERFORMANCE FINITE-ELEMENT GESV 635 F4 RS P CT I \$ BEHAVE2,							568
OXIDE FUEL ROD STRESS & DEFORMATION BAPL 6600 F4 RS P T I \$ CYGR03,							449
OXIDE FUEL ROD STRESS & DEFORMATION TVA 360 F4 RS P T I \$ CYGR03,							449
PACTOLUS, CLOTHO, NUCLEAR POWER PLANT COST CODE HFDL 1108 F5 RS P X T D \$							54.
PARALLEL BEAMS ANL 3600 F36 SBP I \$ BOW2, DEFLECTION CALCULATION							365
PARET, WATER-COOLED CORE TRANSIENT ANALYSIS ANC 360 F+BAL RSBPL CT G \$							555
PARTI, OPTIMAL GROUP OR MESH COLLAPSING TRW 6500 F4 RS P B \$							416
PARTIAL REFUEL GGA 7044 F4 RS P T C \$ CARGOYLE, FUEL CYCLE ANALYSIS							260
PARTICLE TRANSPORT STUDY RFD 3600 F36 RS P C \$ DISPER, AEROSOL							554
PARTICLE TRANSPORT XY RZ RTP LASL 7600 F4 RS P T C \$ TWOTRAN-PARVW, 2-D							573
PARTICLE WAVE FUNCTION RADIAL INTEGRALS ORNL 1604 F63 RS P A \$ RAMES,							335
PARTICLES SAMPLING STUDY BAPL 6600 F4 RS P T C \$ BETTY, ENTRAINE							545
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 \$							426
PDP-11 CN 36J ANC 360 PL1 RS P T P \$ PTAC11, 2-PASS ASSEMBLER FOR THE							51
PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION IBM 360A F+BAL RS P T D \$							31
PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION MIT 360B F+BAL RSBP T D \$							336
PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION DEPLETION ANC 360F F+BAL RS P XCT D \$							275

PDQ7

PLANT

PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600A F+ASC RS P	T D \$	275
PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600C F+ASC RS P	T D \$	275
PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION DEPLETION	BCS 6600D F+ASC R B	T D \$	275
PDQ7, 1,2 CR 3-D FEW-GP DIFFUSION DEPLETION	BW 6600B F+ASC RS P	T D \$	275
PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	CRNL 1604 F63 RS P	A \$	334
PELEN, FUEL PELLET TEMPERATURE & DEFORMATION	BAPL 6600 F4 RS P	T I \$	598
PELLET CRACKING BAPL 6600 F4 RS P	I \$ STRIPE, FUEL ROD CLAD STRAIN &		570
PELLET TEMPERATURE & DEFORMATION	BAPL 6600 F4 RS P	T I \$ PELEN, FUEL	598
PENETRATION CALCULATION DAC 7090 F2 RSBP	J \$ LIPRECANI, MC NEUTRON		123
PENETRATION STUDY LASL 7090 FLCCC RS P	B \$ MCS, MONTE CARLO NEUTRON		202
PERFORMANCE AND PRICE STUDY GGA 7044 F+MAP RS P	T D \$ QPUS, 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 GFSV 635 F4 RS P	CT I \$ BEHAVE2, OXIDE FUEL		568
PERFORMANCE MONITOR SLAC 360 F+BAL RS	CT P \$ PRGLOCK, USER PROGRAM		642
PERFORMANCE MONITOR SLAC 360 BAL 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
PERT, 1-D PERTURBATION FOR AIM AND FCG CODES	AI 7090 F2 RS	C \$	30
PERT, 1-D PERTURBATION FOR AIM AND FCG CODES	BHSC 360 F4 RS P	C \$	30
PERT, 1-D PERTURBATION FOR AIM AND FCG 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 \$ DAC1, SN		455
PERTURBATION FOR AIM AND FCG CODES	AI 7090 F2 RS	C \$ PERT, 1-D	30
PERTURBATION FOR AIM AND FCG CODES	BHSC 360 F4 RS P	C \$ PERT, 1-D	30
PERTURBATION FOR AIM AND FCG CODES	CDC 1604 F63 RS	C \$ PERT, 1-D	30
PERTURBATION TDC OF 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	CT G \$ EMERALD, PWR PLANT RADIATION RELEASE & DOSE		546
PHASE SHIFT X-SEC & POLARIZATION CALC KAPL 6600 F4 RS P	T A \$ PHASER,		507
PHASE-SHIFT ANALYSIS CRNL 1604 F63 RS P	A \$ PEGGY, ELASTIC SCATTERING		334
PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL 6600 F4 RS P	T A \$	507
PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL 6600 F4 RS P	T D \$	454
PHOTOFRACTION SOLID CRYSTAL MTS 7090 MAD RSB	C \$ BURP4, GAMMA-RAY		169
PHOTOFRACTION WELL CRYSTAL MTS 7090 MAD RSB	C \$ BURP5, GAMMA-RAY		170
PHOTOMULTIPLIER ELECTRON DISTRIBUTION ANL 360 F4 RS P	C \$ DYN01,		464
PHOTOMULTIPLIER ELECTRON DISTRIBUTION KAPL 6600 F4 RS P	U \$ DYN01,		464
PHOTOPEAK SPECTRA CODE BNW 1108 F+BAL RS P	T D \$ 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 GAP CONDUCTANCE CALC BNW 1108 F4 RS P	T H \$ GAPCON-THERMAL1, FUEL		618
PINS AND 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 STRESS, MAXIMUM MOMENT CALC	AI 7090 F+MAP 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,	329
PIPING SYSTEM BAPL 6600 F4 RS P	T I \$ M0457, PIPE, ELASTIC STRESS OF		329
PIPING SYSTEM ANALYSIS KE 3600B F36 RSPP	G \$ WHAM, LIQUID-FILLED		278
PKG ANL 360 F+ASM RSB	CT P \$ WSP-HASP/DCS, DCS-MFT REMOTE WORKSTATION		541
PKG ANL 360P F+ASM RSB	CT P \$ WSP-HASP/DCS, DCS-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 &		503
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		373
PLANNING MLMC 360 F+C+R RSBP	T M \$ KALORIPH, RESOURCE ALLOCATION PROJECT		603
PLANT CAPITAL COST ESTIMATING CRNL 360B F4 RS P	T D \$ GRCCST, POWER		588
PLANT CONCEPTUAL COST ESTIMATE CRNL 360C F4 RS P	XCT C \$ CONCEPT3, POWER		498
PLANT COST CODE HEDL 1108 F5 RS P	X T D \$ PACTOLUS, CLOTHC, 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 PERFORMANCE AND PRICE STUDY GGA 7044 F+MAP RS P	T D \$ QPUS, POWER		226

PLANT

PRECCN

PLANT RADIATION RELEASE & CCSE	PCE	360	F4	RS P	CT G \$ EMERALD, PWP	546
PLANT THERMAL DISCHARGE STUDY	HEDL	1108	F5	RS P	T R \$ TCPLYR2, POWER	599
PLENUM DP	360	F4	RS P	H \$ PLENUM, FLOW DIST. IN CYL	CCGLANT INLET	586
PLENUM, FLOW DIST. IN CYL	CCGLANT INLET	PLENUM DP	360	F4	RS P	H \$
PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	ANL	GETS	F	R	R \$	591
PLOT KAPL 6600	F+ASC	RS P	T P \$ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN	CURVE		364
PLOT PLANE STRUCTURES	BAPL	6600	F4	RS P	T L \$ PL47, DRAFTING TOOL	373
PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	360	F4	RS P	T N \$	544
PLOTFB,...	ENDF/R V1 PROC	BNL	6600B	F4	KS	T M \$ CFECKER, CRECT, DAMMET,
PLOTFB,...	ENDF/R V2 PRCC	BNL	6600B	F4	RS	T M \$ CRECT, CFECKER, RIGEL,
PLOTR, 2D CONTOUR PLOTS & AREA CALCULATION	SLA	6600	F4	RS P	P \$	578
PLOTS & AREA CALCULATION	SLA	6600	F4	RS P	P \$ PLOTR, 2D CONTOUR	578
PLOTS FROM SCISRS X-SECTION TAPES	KANL	7094	F+MAP	RSRPL	T N \$ CPS, SC4020	239
PLOTS FROM X-SECTION TAPES	GGA	7044	F+SPS	RSRP	T N \$ CROSSPLOT, SC4020	207
PLOTS ON IBM2280 OR CALCOMP780	ANL	360	F4	RS P	T N \$ FLCT-3D, 3-C	544
PLOTTING	KAPL	6600	F+ASC	RS P	T P \$ DATATRAN UTILITY MODULES, 2-D + 3-D	407
PLOTTING	KAPL	6600B	F+ASC	R	T P \$ DATATRAN UTILITY MODULES, 2-D & 3-D	407
PLOTTING ROUTINES	KAPL	6600	F+COM	RS	T P \$ KAPL PLOT, KAPL CALCOMP	496
PL1	RS P	T P \$ PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360	ANL	360		516
PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCND	360B	F+BAL	RS P	D \$	469
POINT DEPLETION FISSION PRODUCT	RAPL	6600	F4	RS P	D \$ CINDER, M102,	313
POINT DEPLETION FISSION PRODUCT	DP	360	F+BAL	RS P	T D \$ CINDER, M0102,	313
POINT SOURCE	MTS	7090	MAD	RSB	C \$ BURP1, DETECTOR EFFICIENCY	164
POINT SOURCE	MTS	7090	MAD	RSB	C \$ BURP3, DETECTOR EFFICIENCY	166
POINT-KERNEL SHIELD EVALUATION CODE	BAPL	6600B	F+ASC	RS P	T J \$ SPAN4, A	462
POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	F+MAP	RS P	T H \$ BLCOST5,	205
POINTS KAPL 6600	F+ASC	RS P	T F \$ CURFIT, CURVE FITTING EXPERIMENTAL DATA			43
POINTWISE XSECS. FROM R-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 &	507
POLARIZATION EXPERIMENT	UCND	360B	F+BAL	RS P	C \$ PMS1, FAST NEUTRON	469
POLLA, CONVERTS R-MATRIX RESONANCE PARAMETERS	CRNL	360	F4	RS P	A \$	639
POLYNOMIAL	KAPL	6600	F4	RS P	P \$ PCPE, FINDING ROOTS OF A	444
POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P	T P \$ M0661, M0657, M0626,	411
POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	PS P	T C \$ SCFIRE2, SODIUM	559
POST RUPTURE	GGA	7044	F4	RS	X T C \$ PRECCN, FTGR CONTAINMENT PRESSURE	228
POTENTIAL SHAPE CALCULATION	CRNL	7090	F2	RS	A \$ LYNNE, WOODS-SAXON	381
POWDER PATTERN INDEXING	LASL	6600	F+COM	RS P	T Q \$ INCX, 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 FFW-GP DIFFUSION	220
POWER DISTRIBUTION	CDC	3600	F63	RSRP	T C \$ FLARE, 3-D REACTIVITY AND	167
POWER DISTRIBUTION	MSS	360	F4	RS P	CT C \$ FLARE, 3-D REACTIVITY AND	167
POWER DISTRIBUTION	NED	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	EUCC	635	F4	RS	G \$ ANVENT, LCCA ANALYSIS DUKE	529
POWER OUTPUT FROM MIXED ISOTOPES	MLMC	360	F4	RSB	CT Q \$ ISCTAB, PU	619
POWER PLANT CAPITAL COST ESTIMATING	CRNL	360B	F4	RS P	T D \$ GRCOST,	588
POWER PLANT CONCEPTUAL COST ESTIMATE	CRNL	360C	F4	RS P	XCT C \$ CONCEPT,	498
POWER PLANT COST CODE	HEDL	1108	F5	RS P	X T C \$ PACTCLUS, CLETHC, NUCLEAR	54
POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I \$ CROCK, SPACE	112
POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I \$ SPOCK, SPACE	114
POWER PLANT PERFORMANCE AND PRICE STUDY	CCA	7044	F+MAP	RS P	T D \$ OPUS,	226
POWER PLANT THERMAL DISCHARGE STUDY	HEDL	1108	F5	RS P	T R \$ TCPLYR2,	599
POWER TRANSIENTS	BAPL	6600	F4	RS P	T H \$ CHIC-KIN, FAST + INTERMEDIATE	473
POWERCO, NUCLEAR STATION ELECTRICITY COSTS	CRNL	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 \$ COMBCC, COMBINED R-W MULTI-LEVEL CONVOLUTION		203
PPCO	7040	F4	PS P	T C \$ TOPIC, 1-D FFW-GP SN APPROXIMATION CYLINDER		148
PPCO	7044	F+MAP	PS P	T H \$ TOCEE, 2-D TIME-DEPENDENT HEAT CONDUCTION		34
PPCO	7090	F2	RS P	C \$ MIST, 1-D FFW-GP SN COUPLE SN APPROX SLAB GEOM		5
PPCO	7090	F2	RS P	T C \$ TOPIC, 1-D FFW-GP SN APPROXIMATION CYLINDER		148
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FW

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 PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES ANC 1108 F4 RS P T G \$ 528
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 PSEUDO, STATISTICAL RESONANCE PARAMETER CALC GGA 1108 F4 RS P A \$ 292
 PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360 ANC 360 PL1 RS P T P \$ 516
 PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY KE 7094 F2 RSBP T H \$ 155
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 PURCHASE VERSUS LEASE ANALYSIS SLA 1108 CORCL RS P M \$ BECOM, AEC DP 589
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PW 1604 LAC1 RS P N \$	LTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	211	
PWCON, REACTOR FUEL CYCLE COST CALCULATION	GGA 1108 F4 RS P T C \$	441	
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PWR FLOW TRANSIENT ANALYSIS	RAPL 6600 F4 RS P T H \$	FLCT1, M214,	551
PWR OPN CPPD 6400 F4 S P H \$	PWP-PPM, BORATION-DILUTION TABLES FOR	552	
PWR PLANT RADIATION RELEASE & DOSE	PGF 360 F4 RS P CT C \$	EMERALD,	546
PWR-PPM, BORATION-DILUTION TABLES FOR PWR FIN CPPD 6400 F4 S P H \$		552	
QWESH, RENUM, SELF-ORGANIZING MESH GENERATION	SLA 6600 F4 RS P T L \$	612	
QUALITY CONTROL SAMPLE STATISTICS	PKC 360 F4 RSHP P \$	HISTGRAMS,	614
QUASISTATIC SPATIAL REACTOR KINETICS CODE ANL 360 F4 RS PL CT F \$	QX1,	474	
QUASISTATIC SPATIAL REACTOR KINETICS CODE ANL 360 36F RS PL CT F \$	QX1,	474	
QUICKIF, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI 7090 F+FAP RS 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	RAPL 6600 F4 RS P A \$	GRAMP,	470
R-MATRIX RESONANCE PARAMETERS CRNL 360 F4 RS P A \$	FOLLA, CONVERTS	631	
R-THETA-Z LASL 6600 F4 RS P T C \$	RDT, 3-D MULTICRUP DIFFUSION XYZ	463	
R-Z GEOMETRY APDA 7094 F4 RS P F \$	MARS, 2-D EXCURSION CALCULATION	293	
RATTLE, WLIP, FLAT, RESONANCE ABSORPTION, CELL ANL 3600 F36 PSBP X T B \$		291	
RADIAL INTEGRALS CRNL 1604 F63 RS P A \$	RAMES, PARTICLE WAVE FUNCTION	335	
RADIATION DAMAGE IN METALS	GFC 635 F+FAP RSBP T C \$	CASCADE, CLUSTER,	419
RADIATION RELEASE & DOSE	PGF 360 F4 RS P CT C \$	EMERALD, PWR PLANT	546
RADIATOR FINS SNAP GEOM AI 7090 F2 RS J \$	SCAPE2, SCATTER FROM	110	
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RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES	MC CRNL 360P F+BAL RS P T P \$		392
RAHAB, JOCHUA SYSTEM LATTICE PHYSICS MODULES	DP 360 F+BAL S X T B \$		536
RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMO 360 F+C+R RSBP T M \$		633
RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	CRNL 1604 F63 RS P A \$		335
RAMP1, REICH-MOCRE RESOLVED REGION X-SECTIONS	PAL 6600 F4 RS P A \$		492
RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	NED 635 F4 RS P D \$		372
RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL 6600 F4 RS P I \$		382
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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 \$		352
RAY CATALOG	DP 3600 EBCDC R L T Z \$	GAMTAB, RADIOACTIVE-DECAY GAMMA	637
RAY SOURCE BUILDUP FACTOR CALC	BAPL 6600 F+ASC RS P T J \$	ASPIS, GAMMA	429
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REACTION	AI 360 F+BAL RS P T A \$	COMNUC, CASCADE, COMPOUND NUCLEUS	482
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REACTION ANL 3600 F36 RSBP G \$	CHEMLOC2, CORE HEATING CLADDING-STEAM		366
REACTION DECAY CHAIN ANALYSIS	CRNL 1604 F63 RS P D \$	ISCCRUNCH,	180
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RECTANGULAR MAGNETIC NETWORK SOLUTION BAPL 6600B F4 RS P T I \$ MANE1,	412
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REFUELING HISTORY LASL 6600 F4 RS P T D \$ PHENIX, 2D DIFFUSION BURNUP	454
REGIONAL RADIOLOGICAL EFFECTS ANALYSIS HEDL 1108 F+SL RS P XCT R \$ HERMES,	527
REGRESSION W/CONFIDENCE LIMITS BKC 360 F4 RSBP P \$ CRAPH, LINEAR	624
REICH-MOORE RESOLVED REGION X-SECTIONS BNL 6600 F4 RS P A \$ RAMP1,	492
RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC 360 F4 RSBP XCT G \$	369
RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC 1108 F4 RS P T G \$	369
RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC 6600 F4 RS P T G \$	360
RELAP4, TRANSIENT THERMAL-HYDRAULIC ANALYSIS ANC 360C F+BAL RSBPLXCT G \$	360
RELATION GEC 635 F4 RSBP D \$ DOS, NEUTRON FLUX-DOSIMETER ACTIVITY	423
RELEASE CRNL 360 F4 RS P C C \$ STEFEG, ANALYSIS CF PWR & BWR GASECUS	583
RELEASE & DOSF PGE 360 F4 RS P CT G \$ EMERALD, FWR PLANT RADIATION	546
RELEASE ANALYSIS ECL 6400 F4 RS P G \$ FRCPL2, LCCA FISSION PRODUCT	501
RELEASE GGA 1108 F4 RS P F \$ FREVAP6, HTGR METALLIC FISSION PRODUCT	301
RELEASE SIMULATION BAPL 6600 F4 RS P T I \$ BUBL1, FUEL SWELLING & GAS	468
RELIABILITY FOR A SINGLE FAILURE MODE BAPL 6600 F4 RS P P \$ RELO1,	497
RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION GGA 7044 F4 RS P T D \$	221
RELO1, RELIABILITY FOR A SINGLE FAILURE MODE BAPL 6600 F4 RS P P \$	497
REMOTE JOB ENTRY SYSTEM ANC 360 BAL RSB T P \$ ARTS-RJE, OS/360 MVT	510
REMOTE WORKSTATION PKG ANL 360 F+ASM RSB CT P \$ WSP-HASP/CCS, DOS-MFT	541
REMOTE WORKSTATION PKG ANL 360 F+ASM RSB CT P \$ WSP-HASP/CCS, DOS-MFT	541
REMOVAL BCL 6400 F4 RS P X G \$ MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE	499
REMOVAL X-SECS BAPL 6600 F4 RS T B \$ MORO7, 2-D DIFFUSION ABSORPTION	280
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 T F \$	483
RESEND, ADLER, ENDF/B RESONANCE XSECTION CODES BNL 6600B F4 RS P T A \$	465
RESOLUTION OF GAMMA RAY SPECTRA CRNL 360 F4 RS P C \$ ALPHA-M,	413
RESOLVED MULTILEVEL P-W X-SEC CALC BNL 6600 F4 RS P A \$ SIGPLCT,	377
RESOLVED REGION RESONANCE INTEGRAL CALC GGA 7090 F+MAP RSB T A \$ ZUT,	41
RESOLVED REGION X-SECTIONS BNL 6600 F4 RS P A \$ RAMP1, REICH-MOORE	492
RESOLVED RESONANCE EPITHERMAL X-SECTIONS NED 635 F4 RS P T B \$ REAX,	257
RESOLVED RESONANCE INTEGRAL CALCULATION BW 2000 F4 PS A \$ STRIP,	305
RESOLVED RESONANCE X-SECTION CALC NED 2000 F2 RS P A \$ DOPIE,	177
RESONANCE ABSORPTION, CELL ANL 360 F36 RSBP X T B \$ RABBLE, WLBI, FLAT,	281
RESONANCE DATA UTIL 360 F4 RS P A \$ COILLI, LEAST SQUARES ANALYSIS	347
RESONANCE EPITHERMAL X-SECTIONS NED 635 F4 RS P T F \$ REAX, RESOLVED	257
RESONANCE INTEGRAL CALC GGA 7090 F+MAP RSB T A \$ ZUT, RESOLVED REGION	41
RESONANCE INTEGRAL CALC GGA 7090 F+MAP RSB T A \$ TUZ, UNRESOLVED REGION	42
RESONANCE INTEGRAL CALC HOMOCENEUS ANL 360 F36 RSBP A \$ MISH-MASH,	214
RESONANCE INTEGRAL CALC 2-REG CELL ANL 3600 F36 RSBP X T B \$ RIFF-RAFF,	213
RESONANCE INTEGRAL CALCULATION PW 2000 F4 RS A \$ STRIP, RESOLVED	305
RESONANCE INTEGRAL HEX CELL BAPL 6600 F+ASC RS P X T B \$ RESQ2, RESQ3, DBF1,	285
RESONANCE INTEGRAL X-SECTION CALC AI 7090 F2 RS PL T A \$ ARFS2,	89
RESONANCE INTEGRAL X-SECTION CALC AI 7094 F+MAP RS PLX T A \$ TRIX1,	208
RESONANCE INTEGRAL X-SECTION CALC CPC 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	359
RESONANCE MEASUREMENTS CGA 1108 F4 RS P T A \$ TACASI, ANALYSIS OF	410
RESONANCE OVERLAP AND LATTICE EFFECTS GGA 7044 F+MAP RS P T B \$ CAROL,	219
RESONANCE OVERLAP AND LATTICE EFFECTS LER 7094 F+MAP RS P T B \$ GARGL,	219
RESONANCE PARAMETER CALC FNEA 360 F4 RS P A \$ PSFUDC, STATISTICAL	292
RESONANCE PARAMETER CALC CGA 1108 F4 RS P A \$ PSEUDC, STATISTICAL	292
RESONANCE PARAMETERS CRNL 360 F4 RS P A \$ POLLA, CONVERTS R-MATRIX	639
RESONANCE PARAMETERS WANL 7094 F2 RS P A \$ EXT, X-SECTIONS FROM P-W	238
RESONANCE THEORY XSEC CALC KAPL 6600 F4 RS P A \$ MULTI, MULTI-LEVEL	535
RESONANCE X-SECTION CALC NED 2000 F2 RS P A \$ DOPIE, RESOLVED	177
RESONANCE X-SECTION CALC CGA 1108B F4 RS P T A \$ CANDY3, UNRESOLVED	341

SEARCH	GGA	1108	F4	RS	P	T	C	\$	GASP7, 1-D PURNUP POWER DISTRIBUTION	319	
SEARCH	GGA	7044	F4	RS	P	T	C	\$	GASP2, 1-D FFW-GP DIFFUSION POWER DIST	220	
SEARCH & RETRIEVAL	SLA	1108	F+BAL	RSBP	T	M	\$	SPIRAL, FULL-TEXT STORAGE,	607		
SECTIONS	LASL	6600	F4	RS	P	N	\$	IAPCA, FLUX-WEIGHTING OF CTF4 CROSS	409		
SELF-ORGANIZING MESH GENERATION	SLA	6600	F4	RS	P	T	L	\$	QMESH,RENUM,	612	
SEMI-PIGIC MOLECULES AND	360	F4	RS	P	W	\$	MM3, COORDINATE ANALYSES		632		
SENSITIVITY	ANL	360	F4	PSRPL	CT	C	\$	VARI-10, 1-D VARIATIONAL	625		
SERVICE ROUTINES	ANL	3600	36F	RSRP	T	M	\$	MERMC2,MACIC, MC**2 LIBRARY	472		
SERVICE ROUTINES ENCF TAPES	BNL	7090	F+AP	RS	P	T	M	\$	DFSR, DATA FILE	236	
SFTS	GESV	H030	F4	RS	P	CT	C	\$	TRIAL, 3-D REACTION RATES FROM 2-D FLUX	585	
SFTS	LASL	6600	BCD	R	LX	T	Z	\$	LASL XSEC SETS, SN 18- 24- AND 25-GRUP	532	
SETS, SET EQUATION TRANSFORMATION SYSTEM	SLA	6600	FTN	RS	P	T	P	\$		622	
SETS, SN 18- 24- AND 25-GRUP SETS	LASL	6600	BCD	R	LX	T	Z	\$	LASL XSEC	532	
SHAPE CALCULATION CRNL	7090	F2	RS	A	\$	LYNNE, WCCDS-SAXON POTENTIAL			381		
SHEET DP PACKAGE	KAPL	6600	F+ASC	RS	P	T	P	\$	DOCGY, DESK CALCULATOR FORM	428	
SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	F4	RS	P	T	I	\$	BUSHL, CYL	481	
SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	F4	RS	P	T	I	\$	SEALSHLL2,	282	
SHELL STRESS ANALYSIS AXISYM LOAD	SR	360	F4	RS	P	T	I	\$	SEALSHLL2,	282	
SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	6600	CB	F4	RS	P	T	I	\$	SEAL SHELL,	282
SHELL 3-D STRUCTURAL ANALYSIS	CCA	1108	F5	RS	P	T	I	\$	SHELL5, THIN	452	
SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	6600	CB	F4	RS	P	T	I	\$	SEAL	282
SHELLS	GGA	1108	F4	RS	P	I	\$	SAFE-SHELL, STRESS ANALYSIS THIN		252	
SHELLS	SLA	6600	F4	RS	P	T	I	\$	SLADE-D, DYNAMIC ANALYSIS OF THIN	581	
SHELLS	MIT	360	F4	RS	P	T	I	\$	SABCP4, DISCRETE-ELEMENT ANALYSIS THIN	412	
SHELLS OF REVOLUTION	KAPL	6600	F4	RS	P	T	I	\$	SCR3, STRESS ANALYSIS	80	
SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	GGA	1108	F5	RS	P	T	I	\$		452	
SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	F63	RSRPL	T	J	\$	MAC,		143	
SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	RNW	7090	F2	RSRPL	T	J	\$	MAC,		143	
SHIELD EVALUATION CODE	BAPL	6600	F+ASC	RS	P	T	J	\$	SPAN4, A POINT-KERNEL	462	
SHIELD LEAKAGE	AI	7090	F2	RS	J	\$	FARFIA, DCSE RATE FROM SNAP		91		
SHIELD WEIGHT OPTIMIZATION DCSE CALC	AI	7094	F+AP	RS	P	J	\$	SHCF,		197	
SHIELDING CODE CAVITY GEOM	CCA	1108	F4	RS	P	T	J	\$	MUSCAT, VIEW FACTOR	250	
SHIFT X-SEC & POLARIZATION CALC	KAPL	6600	F4	RS	P	T	A	\$	PHASER, PHASE	507	
SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	6600	F4	RS	P	T	M	\$		557	
SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS	I	\$				114	
SHOF, SHIELD WEIGHT OPTIMIZATION DCSE CALC	AI	7094	F+AP	RS	P	J	\$			197	
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	\$				442	
SIMULATION	BAPL	6600	F4	RS	P	T	G	\$	FLASH4, FULLY-IMPLICIT TRANSIENT	448	
SIMULATION	MA-C	360	F4	RSRP	CT	G	\$	FLASH4, FULLY-IMPLICIT TRANSIENT		448	
SIMULATION	BAPL	6600	F4	RS	P	T	I	\$	BUBL1, FUEL SWELLING & GAS RELEASE	468	
SIMULATION OF REACTOR DYNAMICS	AI	360	F+BAL	RS	P	T	E	\$	AIRUS2A,	326	
SIMULATION OF REACTOR OPN DP	360	F4	RS	P	G	\$	INTEG, INSPEC, MARKOV		590		
SINGLE FAILURE MODE	BAPL	6600	F4	RS	P	P	\$	RELO1, RELIABILITY FOR A		497	
SINGLE SOURCE	ANL	GETS	F	R	P	\$	PLETHS, ISOPLETH-AREA CALC FROM		591		
SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS	P	F	\$	STINT3,		389	
SINGULARITY MODELING	SLA	6600	FTN	RS	P	T	I	\$	CHILES, LINEAR ELASTIC	611	
SITE REQUIREMENT STUDY	ANL	3600	F63	RSBP	T	C	\$	R153, PARAMETRIC		172	
SITE REQUIREMENT STUDY	AI	360	F4	RS	P	T	G	\$	AISITE2, PARAMETRIC	172	
SITE REQUIREMENT STUDY	AI	7094	F+AP	RS	P	T	G	\$	AISITE2, PARAMETRIC	172	
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	\$	BECON, AEC DP PURCHASE VERSUS LEASE ANALYSIS		589		
SLA	360	F4	RS	P	X	T	P	\$	DE/STEP, INTRP, SOLN OF ORDINARY DIFF EQUATIONS	640	
SLA	1108	COBOL	RS	P	M	\$	BECON, AEC DP PURCHASE VERSUS LEASE ANALYSIS		589		
SLA	1108	F+BAL	RSBP	T	M	\$	SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL		607		
SLA	3600	F30	RS	P	T	S	\$	TOCDY2, 2-D LAGRANGIAN ECNS OF MOTION SOLUTION		627	
SLA	6600	FTN	RS	P	T	I	\$	CHILES, LINEAR ELASTIC SINGULARITY MODELING		611	
SLA	6600	F4	RS	P	P	\$	ERF,FRFC, ERROR & COMPLEMENTARY ERROR FUNCTION		601		
SLA	6600	F4	RS	P	P	\$	PLCTR, 2D CONTOUR PLOTS & AREA CALCULATION		578		
SLA	6600	F4	RS	P	V	\$	FFEARS, LAPLACE EQUATION ISCTROPIC DIELECTRICS		577		
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

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SLA 6600 F4	RS P X T P	\$ DE/STEP, INTRP, SCLN CF CRDINARY DIFF EQUATIONS	64C
SLA 660CB FTM	RS P T P	\$ SETS, SET EQUATION TRANSFORMATION SYSTEM	623
SLAB CDC 1604 F63	RS P T C	\$ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER	87
SLAB ORNL 7.9J 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 11C7 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 7J9C 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 CSUC 37J F4	RS PL CT C	\$ AIM6, 1-D MULTI-GP DIFFUSION	29
SLAB CYL SPHERE AI 709J 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 PUPD 650J 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 36J F4	RS P T C	\$ FAIMOS, 1-D MULTI-GP DIFFUSION	120
SLAB CYLINDER CDC 16J4 F63	RS P T C	\$ 2JGRAND, 2-D FEW-GROUP DIFFUSION	40
SLAB CYLINDER ORNL 7J9J F2	RS P T C	\$ 2OGRAND, 2-D FEW-GROUP DIFFUSION	40
SLAB CYLINDER SPHERE AFB 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 RC 625 F4	RS T C	\$ FOG, 1-D FEW-GP DIFFUSION	28
SLAB CYLINDER SPHERE CDC 16.4 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	343
SLAB GEOM PPCC 7090 F2	RS P C	\$ MIST, 1-D FEW-GP SN DOUBLE SN APPROX	59
SLAB GFCMETRY AI 7.9J F2	RS P J	\$ GRACE1, GAMMA-RAY ATTENUATION	45
SLAB GFCMETRY ANL 360J F63	RSBPL T J	\$ MAC, SHIELD DESIGN MULTIGROUP	143
SLAB GFCMETRY BNW 7090 F2	RSBPL T J	\$ MAC, SHIELD DESIGN MULTIGROUP	143
SLAB GFCMETRY CDC 1604 F63	RS P J	\$ GRACE1, GAMMA-RAY ATTENUATION	45
SLAB GFCMETRY AI 7J9J F2	RS P B	\$ SAIL, 1-D 1-GP SN APPROXIMATION	52
SLAB GFCMETRY BAPL 66J F4	RS P T C	\$ BE21, FEW-GP DISCRETE ORDINATES	398
SLAB GFCMETRY CDC 16J4 F63	RS P B	\$ SAIL, 1-D 1-GP SN APPROXIMATION	52
SLAB TRANSPORT WITH SLOWING DOWN	BAPL 66J F4	RS T C \$ MJ648, 1-D	342
SLAB, CYL, SPH ANC 360 F4	RSBP CT C	\$ MONA, 1-D MULTIGROUP DIFFUSION	582
SLAB, SPH, CYL GGA 11J8 F+BAL	RS P T C	\$ GAZE2, 1-D MULTIGROUP DIFFUSION	430
SLAC 36J BAL RS	CT P	\$ SLACMCN 2.2, CS36J MVT/MFT PERFORMANCE MONITOR	635
SLAC 360 F+BAL PS	CT P	\$ PRGGLCOK, USER PROGRAM PERFORMANCE MONITOR	642
SLACMCN 2.2, CS360 MVT/MFT PERFORMANCE MONITOR	SLAC 360 BAL RS	CT P \$	635
SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA 6600 F4	RS P T I \$	581
SLL 660J F4	RS P N	\$ HEATFESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	434
SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL 360 F4	RS P CT W \$ MSCAT,	575
SLOWING DOWN BAPL 6600 F4	RS T C	\$ M0648, 1-D SLAB TRANSPORT WITH	342
SLOWING-DOWN DENSITY CALC AI 7J94 F+FAP	RS PL T B	\$ TYCHE3, MCNTE CALC	149
SLOWING-DOWN APGS 36J F4	RS P X T E	\$ MCD5, STOCHASTIC MODEL OF NEUTRON	491
SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS BNW 11J8 F4	RS PLX T B	\$ HRG3,	467
SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS TVA 360 F4	RS PLX T B	\$ HRG3,	467
SN APPROX BNW 7.9J FLECC	RSBP T C	\$ GE-HAPC-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 7.9J F2	RS P T C	\$ W-DSN, 1-D MULTI-GP	132
SN APPROX SLAB GEOM PPCC 7090 F2	RS P C	\$ MIST, 1-D FEW-GP SN DOUBLE	59
SN APPROXIMATION CYLINDER PPCC 7040 F4	RS P T C	\$ TOPIC, 1-D FEW-GP	148
SN APPROXIMATION CYLINDER PPCC 7J9J F2	RS P T C	\$ TOPIC, 1-D FEW-GP	148
SN APPROXIMATION RZ PW 1604 F63	RS P T C	\$ FORTRAN TCC, 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 16.4 F63	RS P B	\$ SAIL, 1-D 1-GP	52
SN APPROXIMATION XY GEOM AGC 7J9J FLECC	RSBP C	\$ 2DXY, 2-D MULTI-GP	18
SN CONSTANTS FOR DSM TCC PW 16.4 F63	RS P L	\$ SNC, CALCULATION OF	189
SN DOUBLE SN APPROX SLAB GEOM PPCC 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	\$ DOT2CP, 2-D MULTIGROUP DIFFUSION &	459
SN TRANSPORT ANL 36J F36	RS P XCT C	\$ TFSS, 1-D SLAB AND SPHERE GEOM	513
SN X-SECTION LIBRARY TAPE PREPARATION	PW 1604 F63	RS L \$ CSPI,	194

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SPATIALLY-DEPENDENT

SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L \$ CSP2A,	193
SN 18- 24- AND 25-GROUP SETS	LASL	6600	PCD	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,	DCSE RATE CALCULATION				141
SNAP GEOMETRY AI 7090 F2 RS	E \$ SNAPKIN5/5A,	1-REGION KINETICS				122
SNAP GEOMETRY AI 7090 F2 RS	J \$ MORTIMER,	DCSE RATE CALCULATION				142
SNAP SHIELD LEAKAGE AI 7090 F2 RS	J \$ FAPSE1A,	DCSE 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 DSA TDC	PW	1604	F63	RS P	L \$	180
SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS P	T P \$	364
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 POOL FIRE 1- & 2-CELL ANALYSIS AI	360	F4	RS P	T C \$	SOFIRE2,	559
SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	F4	RS P	G \$	SOCOOL2,
SODIUM-FUEL INTERACTION ANALYSIS	HEDL	1108	F4	RS P	C \$	SOCOOL2,
SODIUM-WATER REACTION CEND 7600 F4	RS P	T G \$	CERUG,	STEAM GENERATOR		546
SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS AI	360	F4	RS P	T G \$		559
SOLID CRYSTAL MTS 7090 MAD RSB	O \$ BURP4,	GAMMA-RAY PHOTOFRACITION				169
SOLID FUEL TUBE BUNDLES LASL 7094 F2	RSBP	F \$ AXTERM,	HEAT TRANSFER			183
SOLVER ANL 3600 F4 RS P C P \$	GEAR,	ORDINARY DIFFERENTIAL EQN SYSTEM				592
SOLVER LLL 6600 F4 RS P P \$	GEAR,	ORDINARY DIFFERENTIAL EQN SYSTEM				592
SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LLL	7090	F+AP	RS P	T B \$	160
SORSPB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600	F4	RS	I \$	391
SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600	F4	RS P	T I \$	80
SOURCE MTS 7090 MAD RSP	O \$ BURP2,	DETECTOR EFFICIENCY DISK				165
SOURCE MTS 7090 MAD RSB	O \$ BURP1,	DETECTOR EFFICIENCY POINT				164
SOURCE MTS 7090 MAD RSB	O \$ BURP3,	DETECTOR EFFICIENCY POINT				166
SOURCE ANL CETS F K	R \$ PLETHS,	ISOPLETH-AREA CALC FROM SINGLE				591
SOURCE BUILDUP FACTOR CALC	KAPL	6600	F+ASC	RS P	T J \$	ASPI3,
SOURCE DATA NEQ 635 F4 RS P T O \$	EXPN,	ANALYSIS OF PULSED NEUTRON				258
SOURCE DATA ANALYSIS CNFA 360 F4 RS P	F \$ TPIFIC,	PULSED NEUTRON				489
SPACE CHORD DIST FUNCT AEC 7090 F2 RS	B \$ DANCFF 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 G-C	635	F4	RSBP	T B \$	GEORSE,	42
SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	360	F4	RS P	F \$	R102,
SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	F63	RSBP	E \$	P102,
SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	F4	RS	F \$	R102,
SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	360	F4	RS P	F \$	R101,
SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	360	F63	RSBP	E \$	P101,
SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094	F4	RS P	F \$	R101,
SPACE-INDEPENDENT KINETICS W/FEEDBACK AI	7094	F+MAP	RS P	T E \$	AIRCS,	163
SPACE-INDEPENDENT KINETICS W/FEEDBACK AEB	360	F4	RS P	F \$	AIREK3,	121
SPACE-INDEPENDENT KINETICS W/FEEDBACK AI	7090	F2	RS	E \$	AIPEK3,	121
SPACE-INDEPENDENT KINETICS W/FEEDBACK CMC	1604	F63	RS P	E \$	AIREK3,	121
SPACE-INDEPENDENT REACTOR KINETICS GGA	1108	F4	RS P	E \$	GAPUTKIN,	317
SPACE-INDEPENDENT REACTOR KINETICS CODE ANL	360	F4	RS P	T E \$	ANCCN,	486
SPACE-INDEPENDENT REACTOR KINETICS CODE LASL	660	F4	RS P	T E \$	ANCCN,	486
SPACE-TIME DIFFUSION ANL	360	F4	RS P	F \$	TWIGLE,	2-D 2-GP
SPACE-TIME DIFFUSION FEEDBACK KAPL	6600	F4	RS P	T F \$	TWIGL,	2-D 2-GP
SPACE-TIME DIFFUSION FEEDBACK ANL	6600	F4	RS P	T F \$	NOAH,	1-D ONE-GP
SPACE-TIME DIFFUSION 3-GP KAPL	6600	F4	RS P	T F \$	WIGL2,	1-D 2-GP
SPACE-TIME DIFFUSION 3-GP GCA	1108	F4	RS P	T F \$	WIGL2,	1-D 2-GP
SPACE-TIME KINETICS RCL	6400	F4	RS P	T F \$	AIEF,	1D AND 2D FEW-GROUP
SPACE-TIME SYNTHESIS KAPL	6600	F4	RS P	F \$	STINT3,	SINGLE-CHANNEL
SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	KAPL	6600	F+ASC	RS P	T J \$	
SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NEQ	2000	F2	RS P	B \$	
SPATIAL & COMPOSITION-DEPENDENT X-SECS GFSV	635	F+GMP	RS P	XCT L \$	TOWAN,	505
SPATIAL REACTOR KINETICS CODE ANL	360	F4	RS PL	T F \$	QX1,	QUASISTATIC
SPATIAL REACTOR KINETICS CODE ANL	3600	F63	RS PL	T F \$	QX1,	QUASISTATIC
SPATIALLY-AVERAGED DOPPLER EFFECTS	NEQ	2000	F2	RS P	R \$	SPARTA,
SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	F4	RS P	T F \$	TSN,

SPATIALLY-DEPENDENT

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SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	F+MAP	RS P	T F	\$ TSN,	306
SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES	1108	F5	PS P	T O	\$ CAGE, BIRD,	476
SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	360	F4	RS P	X T P	\$ FUNPACK,	610
SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	1108	F5	RS P	X T P	\$ FUNPACK,	610
SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	6600	F4	RS P	X T P	\$ FUNPACK,	610
SPECTRA ORNL 360 F4 RS P						\$ ALPHA-M, RESOLUTION OF GAMMA RAY	413
SPECTRA ANC 26, F+P+A RSBP XCT W	\$ GAUSS6,	BATCH ANALYSIS OF GAMMA-RAY					622
SPECTRA & MULTI-GP CONSTANTS ANC 360 F4	RS PL	CT F	\$ INCITE, THERMAL				565
SPECTRA ANALYSIS KAPL 6600 F4 RS	T C	\$ GASFAN, COMPLEX GAMMA-RAY					485
SPECTRA AND GROUP-AVERAGED X-SEC CALC GGA 1108 F4	RS P	X T B	\$ CAF, GAR,				316
SPECTRA CALC ANC 360 F4 RS PLXCT B	\$ PHECO, MULTI-GP CONSTANT & FAST						520
SPECTRA CALCULATION WITH DEPLETION AEPI 6600	RSPLX	T B	\$ LEOPARD,				279
SPECTRA CALCULATION WITH DEPLETION JNC 1108 F5	RS	LX T B	\$ LEOPARD,				279
SPECTRA CALCULATION WITH DEPLETION WAPD 360 F4	RS	FLXCT B	\$ LEOPARD,				279
SPECTRA CODE BNW 1108 F+BAL RS P	T C	\$ GSSIRN1B, LEAST SQUARES PHOTOPEAK					457
SPECTRA ENDF/B DATA ORNL 360 F4 RS P	T R	\$ RICE, PRIMARY RECCIL ATOM					453
SPECTRA GF(LI) ANC 360 F4 RSBP XCT W	\$ GAUSS5, ANALYSIS OF GAMMA-RAY						605
SPECTRA GGA 1108 F+BAL RS P	T O	\$ TOAD, PROCESSING OF ANALYZER GAMMA-RAY					333
SPECTRA GGA 1108 F4 RS PLX T B	\$ GGC4, MULTI-GP X-SECTIONS FAST THERMAL						298
SPECTRA GGA 6600 F4 RS L T B	\$ GGC4, MULTI-GP X-SECTIONS FAST THERMAL						298
SPECTRA KSUN 360 F4 RS P	\$ CCFGAM, UNFOLDING OF COMPLEX GAMMA-RAY						390
SPECTRA, MC CALCULATION IRRADIATED MATERIAL GFC 7090 FAP	RSBP	X T C	\$				422
SPECTROMETRY REF 360 F4 RS P	U	\$ DYNAMIC ANALYSIS OF GASES BY MASS					645
SPECTRUM AND X-SECTION CALCULATION NED 7094 F+PAP RS P	T R	\$ EPITHERMCS,					201
SPECTRUM CALC WITH BURNUP CYL LATTICE TVA 360 F4	RSBPLXCT	B	\$ LASER,				249
SPECTRUM CALC WITH BURNUP CYL LATTICE WAPD 7094 F+MAP	RS PLX	T B	\$ LASER,				249
SPECTRUM MULTI-GP CONSTANT CALC AGC 7090 F+PAP	RSBPLX	T B	\$ AGN-GAM, FAST				204
SPECTRUM X-SECTION CALC BNW 1108 F5	RS	PLX	T B	\$ BRT1, THERMAL			184
SPECTRUM X-SECTION CALC AI 7090 F2	RS	PL	T B	\$ FORM, FAST NEUTRON			51
SPECTRUM X-SECTION CALC ANL 3600 F63	RS	LX	T B	\$ CAM1, 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	\$ CAM1, FAST NEUTRON			33
SPECTRUM X-SECTION CALC CGA 7090 F2	RS	PLX	T B	\$ CAM1, FAST NEUTRON			33
SPECTRUM X-SECTION CALC CSUC 370 F4	RS	PLXCT	B	\$ FORM, FAST NEUTRON			51
SPECTRUM X-SECTION CALC ANL 3600 F63 RSBP XCT B	\$ THERMCS(ANL), THERMAL						184
SPECTRUM X-SECTIONS AI 7090 F+PAP RS L	T B	\$ QUICKIE, INFINITE MEDIUM					110
SPECTRUM X-SECTIONS AI 7090 F+PAP 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 PNW 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	F	\$ BIGDEAL,					540
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+PAP RS L	T C	\$ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL					120
SPHERE AI 7090 F+PAP 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 CSUC 370 F4 RS PL	CT C	\$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL					29
SPHERE AEB 360 F4 RS L	T C	\$ FIPE5, 1-D AGE-DIFFUSION SLAB CYLINDER					9
SPHERE AI 7090 F+PAP 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 GEOM AI 7090 F2 RS P	J	\$ GRACE2, GAMMA-RAY ATTENUATION CYL					46

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SPHERE GEOM CDC 1604 F63 PS P J \$ GRACE2, GAMMA-RAY ATTENUATION CYL	46
SPHERE GEOM SA TRANSPORT ANL 3600 F36 RS P XCT C \$ TESS, 1-D SLAB AND	513
SPHERE LLL 7090 F2 FS P F \$ CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS	179
SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL SLA 1108 F+BAL RSBP T M \$	607
SQ LENS DESIGN SYSTEM LASL 66J F+COM RS P T P \$ LENSES, NONLINEAR LEAST	672
SQ, NXN LATIN SQUARE EXPERIMENTAL DESIGN MLMC 360 F4 RSBP C P \$ LATIN	63J
SQUARE CELL COLLISION PROBABILITY CALC ANL 360 F4 RS P T B \$ CLUP77,	526
SQUARE CELL COLLISION PROBABILITY CALC JAER 23J F4 RS P T B \$ CLUP77,	526
SQUARE EXPERIMENTAL DESIGN MLMC 360 F4 RSEP C P \$ LATIN SQ, NXN LATIN	63J
SR 360 F4 RS P T I \$ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	282
STABILITY ANALYSIS REACTOR KINETICS EQNS GGA 1108 F4 RS P E \$ GASA,	290
STATIC & DYNAMIC STRUCTURAL ANALYSIS ANC 360 F4 RSBP CT I \$ STRAP,	539
STATION ELECTRICITY COSTS CRNL 16J F63 RS P C \$ POWERCO, NUCLEAR	34J
STATION ELECTRICITY COSTS UFC 6600 F4 RS P C \$ POWERCO, NUCLEAR	34J
STATISTICAL MODEL REACTION X-SECTIONS BNL 6600 F4 RS P A \$ THRESH,	504
STATISTICAL RESONANCE PARAMETER CALC ENFA 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 AND TRANSIENT TEMP CALC GGA 1108 F5 RS P T H \$ TAC2D,	408
STEADY-STATE FISSION PRODUCT FUEL MODEL ANC 360 F4 RSBP CT I \$ FPFM,	584
STEADY-STATE FLOW DISTRIBUTION KAPL 66J F4 RS P T F \$ HAFMAT, SYSTEM	616
STEADY-STATE FLOW, PRESSURE DISTRIBUTION GGA 1108 F5 RS P H \$ FLAG,	295
STEADY-STATE HEAT TRANSFER AI 7094 F+AP RS P T H \$ HEATING2, TRANSIENT	198
STEADY-STATE TEMPERATURE VOID FRACTION AI 709J 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	44J
STEAM ANC 360 F4 RS P T H \$ ASTEM, THERMODYNAMIC PROPERTIES WATER &	580
STEAM AND WATER PROPERTIES BC&E 36JB F4 PS T H \$ STEAM-67, 1967 ASME	487
STEAM GENERATOR DESIGN CRITERIA COSTS CGA 7044 F4 RS P T D \$ STMGEN,	227
STEAM GENERATOR SODIUM-WATER REACTION CFND 7600 F4 RS P T G \$ CFBUG,	548
STEAM TABLES 14.5-14.5JPSIA 32-472DECF BAPL 6600 F4 RS T H \$ WATER,	267
STEAM TABLES 14.5-2538 PSIA ANL 1604 F63 RS P H \$ M0899,H0H,	294
STEAM TABLES 14.5-2538 PSIA BAPL 66J F4 RS P T H \$ M0899,H0H,	294
STEAM THERMODYNAMIC PROPERTIES BAPL 6600 F4 RS P T F \$ WASP, WATER AND	396
STEAM-WATER MIX KAPL 660J F4 RS P H \$ RAPP, HIGH-VELOCITY FLOW STUDY	382
STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES BG&E 36JF F4 RS T F \$	487
STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE CRNL 360 F4 PS P C G \$	583
STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS KAPL 66J F4 RS P I \$	337
STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS KAPL 660J F4 RS P F \$	389
STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS GGA 7044 F4 RS P T D \$	227
STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN NPGS 36J F4 RS P X T E \$ M0D5,	491
STORAGE ALLCC CRNL 36J BAL+F RS P CT P \$ GFTCOR,FRECCR,FCRTRAN DYNAMIC	644
STORAGE, RETRIEVAL, AND DISPLAY DP 360 F+BAL S T M \$ JOSHUA, DATA	49J
STORAGE, SEARCH & RETRIEVAL SLA 1108 F+BAL RSBP T M \$ SPIRAL, FULL-TEXT-	607
STRAIN & PELLET CRACKING BAPL 6600 F4 RS P I \$ STRIPE, FUEL ROD CLAD	570
STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS ANC 360 F4 RSBP CT I \$	539
STRESS & DEFORMATION BAPL 6600 F4 RS P T I \$ CYCRC3, OXIDE FUEL ROD	449
STRESS & DEFORMATION TVA 360 F4 RS P T I \$ CYGRO3, OXIDE FUEL ROD	449
STRESS ANALYSIS KAPL 66J F4 RS P I \$ TUBE, U-TUBE HEAT EXCHANGER	378
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	282
STRESS ANALYSIS AXISYM LOAD SR 360 F4 RS P T I \$ SEALSHELL2, SHELL	282
STRESS ANALYSIS AXISYM LOAD WTSC 66JJB F4 RS P T I \$ SEAL SHELL, SHELL	282
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 660C F4 RS T I \$ CYGRC2,	266
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,	80
STRESS ANALYSIS STUDY GGA 7044 F4 RS P T G \$ ELBOW, FUEL ELEMENT	22J
STRESS ANALYSIS THIN SHELLS GGA 1108 F4 RS P I \$ SAFE-SHELL,	25J
STRESS ANALYSIS, 2-D BODIES BNL 66J F4 RS P T I \$ SAFE-PLANE, PLANE	252
STRESS ANALYSIS, 2-D BODIES GGA 1108 F4 RS P I \$ SAFE-PLANE, PLANE	252

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STRESS AND FATIGUE	KAPL 6600	F4	RS	I \$	SCRSCB, PRESSURE VESSEL	391
STRESS OF PIPING SYSTEM	BAPL 6600	F4	RS P	T I \$	M0457, PIPE, ELASTIC	329
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+CCM	RS P	T I \$	CAPL3, INFLASTIC LARGE DEFLECTION	397
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 & PELLETT CRACKING	BAPL 6600	F4	RS P	I \$		570
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	539
STRUCTURAL ANALYSIS BOWED REACTOR CORES	ANL 360B	F4	RS P	I \$	NUBCW,	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	383
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
STRUCTURES	BAPL 6600	F4	RS P	T L \$	BL47, DRAFTING TOOL TO PLCT PLANE	373
STRUCTURES	KAPL 6600	F4	RS P	X I \$	FINEL, FINITE-ELEMENT STUDY 2,3-D	404
STRUCTURES	BAPL 6600	F4	RS P	T I \$	FUGIT, DYNAMIC RESPONSE OF ELASTIC	537
SUBPROGRAMS AND MODULES	ANL 360	F+PAL	RS P	CT M \$	ARC-SYSTEM, SYSTEM	522
SUBROUTINE LIB. AFD 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+PAL	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 6600B	F+CCM	RS	T P \$	LASLIR, LOS ALAMOS	633
SUBROUTINES	AI 360	F+PAL	RS	T P \$	FIGS, IBM3608225C FORTRAN GRAPHICS	484
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 \$		399
SUPERLOC, ENDF/B FINE-GR 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 360	F36	RS P	T I \$	SUPORAN, REACTOR CORE	357
SURVEY STUDY	BW 6600	F+CCM	RS P	X T D \$	FAFED, 1-D FAST REACTOR DESIGN &	427
SWELLING & GAS RELEASE SIMULATION	BAPL 6600	F4	RS P	T I \$	BUBLI, FUEL	468
SWELLING TEMPERATURE STUDY	BAPL 6600	F4	RS P	T F \$	FIGRC, LWR FUEL	272
SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL 3600	F36	RSBP	I \$		353
SYN, 2D SYNTHESIS MULTIGP LIFE & ICP DEPLETION	NED 635	F+GMP	RS P	T D \$		495
SYNTHESIS	KAPL 6600	F4	RS P	F \$	STINT3, SINGLE-CHANNEL SPACE-TIME	389
SYNTHESIS	ANL 3600	F63	RSBP	T F \$	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 MULTIGP DIFF & ICP 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
S4 APPROXIMATION	AI 7090	F2	RS	P \$	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 7090	F2	RS	C \$	FIPN, 2-D FEW-GP	7
S4 CYL CELL CODE AND TEMPEST COMBINATION	AI 7090	F2	RS P	P \$	BAM,	18
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	E \$		53
TABLES	AI 360	F+BAL	RS P	CT E \$	U3R, UNRESOLVED RESONANCE XSEC PROBABILITY	553
TABLES FOR PWR (PN CPPD 6400	F4	S P	H \$	PWR-FPM, BORATION-DILUTION		552
TABLES 14.5-14.500PSIA 32-4720EGF	BAPL 6600	F4	RS	T H \$	WATER, STEAM	267
TABLES 14.5-2538 PSIA	ANL 1604	F63	RS P	F \$	M0899, HCH, STEAM	294
TABLES 14.5-2538 PSIA	BAPL 6600	F4	RS P	T F \$	M0899, HCH, STEAM	294
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-6 7090	F2	RS	N \$	WED, W-PSA OUTPUT	133
TAPE MAINTENANCE	ANL 360	F4	RS	M \$	MERM2, MC**2 BINARY LIBRARY	472
TAPE PREPARATION	PW 1604	F63	RS	L \$	CSP1, SA X-SECTION LIBRARY	194
TAPE PREPARATION	PW 1604	F63	RS	L \$	CSP2A, SA X-SECTION LIBRARY	193
TAPE PROCESSING AND EDITING	ORNL 360F	F4	RS PL	CT M \$	EDITER, ENDF/P	502

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TAPE PROCESSING AND EDITING	CRNL 6600 F4	RS P	T M \$	EDITOR, ENDF/B	502	
TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	CRNL 360 F4	RS P	XCT F \$		558	
TCB01, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL 6600 F4	RS P	I \$		604	
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 \$	TCP, 2-D PERTURBATION		199	
TDC, 2-D MULTI-GP SN APPROXIMATION RZ PW 1604 F63	RS P	T C \$	FORTTRAN		161	
TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV 635	F+GMP	RS P	XCT L \$	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-CP DIFFUSION TEMP COEFF 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 COEFF 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 PELLETS		598	
TEMPERATURE CALC CRNL 1604 F2	RS P	H \$	BIGDEAL, SPENT YANKEE-FUEL		549	
TEMPERATURE CALC CYLINDER ANL 3600 F63	RSRP	T F \$	ARGUS, TRANSIENT		152	
TEMPERATURE CODE CGA 7044 F4	RS	I \$	CORE, CORE CONFIGURATION FUEL		233	
TEMPERATURE COEFFICIENT CALCULATION	GGA 1108 F4	RS P	T C \$	TEMCO7,	320	
TEMPERATURE DIST STUDY AEB 360 F4	RS P	F \$	BLAST, REACTOR KINETICS		363	
TEMPERATURE DIST. CRNL 360 F4	RS P	T H \$	ORRIPLE, PCD BUNDLE FLOW &		629	
TEMPERATURE DISTRIBUTION PROGRAM	CHI 1108 F4	RS P	T H \$	LION, 3-D	294	
TEMPERATURE DISTRIBUTION PROGRAM	KAPL 6600	F+ASC	RS P	T H \$	LION4, 3-D	299
TEMPERATURE FEEDBACK BAPL 6600 F4	RS P	T F \$	NCWIC, 1-D 2-GP KINETICS		371	
TEMPERATURE HISTORY KE 7094 F2	RSRP	T H \$	PTH1, BLOWDOWN PRESSURE		155	
TEMPERATURE STUDY BAPL 6600 F4	RS P	T H \$	FIGRO, LWBR FUEL SWELLING		272	
TEMPERATURE VOID FRACTION AI 7090 F2	RS	I \$	FLGUE, STEADY-STATE		48	
TEMPEST COMBINATION AI 7090 F2	RS P	P \$	RAM, S4 CYL CELL CODE AND		108	
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI 7090	F+AP	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, MGRS,		617	
THEORY GGA 1108 F4	RS P	XCT C \$	GAPERID, 1-D TRANSPORT PERTURBATION		606	
THEORY NED 635 F4	RS P	T C \$	DOT2FB, 2-D MULTIGROUP DIFFUSION & SN		456	
THEORY OF LATTICE DYNAMICS ANL 360 F4	RS P	T Q \$	GROUP2, GROUP		620	
THEORY OF LATTICE DYNAMICS	IASL 6600 F4	RS P	T Q \$	GROUP2, GROUP	62	
THEORY XSEC CALC KAPL 6600 F4	RS P	A \$	MULTI, MULTI-LEVEL RESONANCE		535	
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 \$	GATFELF5, GAS-COOLED CORE		232	
THERMAL DISCHARGE STUDY HEDL 1108 F5	RS P	T R \$	TCFLYR2, POWER PLANT		596	
THERMAL LIBRARIES FROM ENDF/B DATA	WAPD 7600 F4	RS P	T B \$	ETC2,	50	
THERMAL LIBRARY FORM WAPD 7600 F4	RS P	T B \$	ETLT3, ENDF/B V3 DATA TC		628	
THERMAL NEUTRON SPECTRUM X-SECTIONS	AI 7090	F+AP	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 RESPONSE LOCA ANL 360 F4	RSPP	X T G \$	THETA1-8, FUEL ROD		512	
THERMAL SCATTERING CRYSTALLINE MATERIALS	IASL 6600 F4	RS P	T A \$	TOR,	360	
THERMAL SCATTERING DATA DP 3600 F4	RS P	XCT A \$	FLANGE2(71-1), ENDF/B		268	
THERMAL SCATTERING LAW CALCULATION	GGA 1108 F4	RS P	A \$	GASKET,	263	
THERMAL SPECTRA & MULTI-GP CONSTANTS	ANL 360 F4	RS PL	CT E \$	INCITE,	565	
THERMAL SPECTRA GGA 1108 F4	RS PL	T B \$	GGC4, MULTI-GP X-SECTIONS FAST		298	
THERMAL SPECTRA GGA 6600 F4	RS L	T R \$	CCC4, MULTI-GP X-SECTIONS FAST		298	
THERMAL SPECTRUM X-SECTION CALC	ANL 1108 F5	RS PL	T B \$	BRT1,	184	
THERMAL SPECTRUM X-SECTION CALC	ANL 360 F63	RSRP	XCT B \$	THERMCS(ANL),	184	
THERMAL-HYDRAULIC ANALYSIS	ANL 3600	F+RAL	RSBPLXCT	G \$	RELAP4, TRANSIENT	369
THERMAL-HYDRAULIC ANALYSIS PNW 3600 F4	RS P	T H \$	CORRAC, RCL BUNDLE		432	
THERMAL-HYDRAULIC ANALYSIS PNW 1108 F4	RS P	T H \$	CCBFA3C, RCL BUNDLE		432	
THERMAL-HYDRAULIC ANALYSIS PNW 6600 F4	RS P	T H \$	CORRAC, RCL BUNDLE		432	
THERMAL-HYDRAULIC ANALYSIS NED 635 F4	RS P	T H \$	MANTA, STEADY-STATE		256	
THERMAL-HYDRAULIC ANALYSIS WAPD 6600 F4	RS P	T H \$	MANTA, STEADY-STATE		256	
THERMAL-HYDRAULIC WATER REACTOR DESIGN	PNW 1108 F5	RS P	T H \$	REPP,	48	
THERMODYNAMIC CYCLE ANALYSIS	AI 7094 F2	RS PL	T I \$	CYCLOPS1,	244	
THERMODYNAMIC PROPERTIES BAPL 6600 F4	RS P	T F \$	WASP, WATER AND STEAM		396	

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THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	36J	F4	RS P	T H \$	ASTEM,	581
THERMODYNAMICS OF PRESSURIZERS BAPL	6600	F4	RS P	T H \$	TOPS, TRANSIENT		348
THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS	OP	360	F63	R	LX T Z \$		543
THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	360J	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	11J8	F4	RS P	I \$	SAFE-SHELL, STRESS ANALYSIS	253
THIN SHELLS	SLA	66J3	F4	RS P	T I \$	SLADE-C, DYNAMIC ANALYSIS OF	581
THIN SHELLS MIT	36J	F4	RS P	T I \$	SABOR4, DISCRETE-ELEMENT ANALYSIS		402
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
THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600	F4	RS P	A \$		504
THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP	T H \$		346
THUNDERHEAD, EXTERNAL+INTERNAL DESE	AI	7094	F+FAP	RS FL	T G \$	CURIE, DESE,	196
TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	6600B	F+ASC	RSB	X T M \$		403
TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	36J	F4	RS P	T C \$	VARI-QUIR,	212
TIME-DEP 2-D MULTI-GP DIFFUSION	WANI	66J	F4	RS P	T C \$	VARI-QUIR,	212
TIME-DEPENDENT DIFFUSION CALC	KAPL	6600	F4	RS P	F \$	RAUMZEIT, 1-D	352
TIME-DEPENDENT DIFFUSION MIT	370	F4	RS P	T F \$	GAKIN2, 1D MULTIGROUP		310
TIME-DEPENDENT HEAT CONDUCTION	PPCC	7.44	F+MAP	RS P	T H \$	TOODEE, 2-D	349
TIME-OF-FLIGHT DATA ANALYSIS	GEES	11J8	F5	RS P	T C \$	CACE, BIRD, SPEC,	476
TIME-SHARING PROGRAMMING LANGUAGE	KAPL	66J	F+ASC	RS	P \$	SIMPLE1,	442
TLD CORRECTION CALC	AI	360	F4	RS P	T Q \$	RESPOND, DISSIMILAR MEDIA	566
TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	CGA	1108	F+BAL	RS P	T O \$		333
TOKAMAK FUSION REACTOR STUDY	ANL	36J	F4	RS P	X \$	TOKMINA/TCKMINA2,	561
TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	36J	F4	RS P	X \$		561
TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCC	7044	F+MAP	RS P	T H \$		349
TUGDY2, 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	373
TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCC	7040	F4	RS P	T C \$		148
TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCC	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 \$		348
TOR OUTPUT DATA LASL	6600	F4	RS P	T B \$	GLEN, GRUP	CONSTANT CALC FROM	361
TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	6600	F4	RS P	T A \$		361
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 \$	BLOCST6, COMBINED KINETICS 2-D HEAT	303
TRANSFER	AI	7094	F+FAP	RS P	T F \$	HEATING2, TRANSIENT STEADY-STATE HEAT	198
TRANSFER	AI	7094	F2	RS P	T G \$	TRANS-FUGUE1, TRANSIENT FLOW AND HEAT	268
TRANSFER CALC	ANC	360	F4	RSBP	XCT H \$	MCXY, BWR FUEL ELEMENT HEAT	551
TRANSFER CALC	ANC	1108	F4	RS P	T H \$	MCXY, BWR FUEL ELEMENT 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	GGA	7044	F+MAP	RS P	T F \$	BLOCST5, POINT-KINETICS WITH 2-D HEAT	205
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	477
TRANSIENT ANALYSIS	BAPL	6600	F4	RS P	T H \$	FLCT1, MQ219, PWR FLOW	331
TRANSIENT ANALYSIS	ANC	360	F+BAL	RSBP	CT G \$	PARET, WATER-COOLED CORE	555
TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	F2	RS P	T G \$	TRANS-FUGUE1,	268
TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	F4	RS P	T H \$	HCT2, 2-D	286
TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP	T H \$	THTE, 3-D	346
TRANSIENT SIMULATION	BAPL	6600	F4	RS P	T G \$	FLASH4, FULLY-IMPLICIT	448
TRANSIENT SIMULATION	MA-G	360	F4	RSBP	CT G \$	FLASH4, FULLY-IMPLICIT	448
TRANSIENT STEADY-STATE HEAT TRANSFER	AI	7094	F+FAP	RS P	T 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

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TRANSIENT THERMAL-HYDRAULIC ANALYSIS	ANC	3600	F+BAL	RSPLXCT	G	\$	RELAP4,	264	
TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	F4	RS	P	T	H \$ TCPS,	344	
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	473	
TRANSMUTATION ANALYSIS	BNW	1108	F5	RS	P	T	D \$ DBLFIT1, LEAST SQUARES	456	
TRANSPORT	BAPL	6600	F4	RS	P	T	J \$ M0756, LETC, 1-D SLAB GAMMA-RAY	343	
TRANSPORT	ANL	3600	F36	RS	P	XCT	C \$ TESS, 1-D SLAB AND SPHERE GEOM SA	513	
TRANSPORT CODES	ANC	360	F4	RSBP	CT	C \$	RAFFLE-ANC, MONTE CARLO NEUTRON	631	
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 \$ GAPER10, 1-D	606	
TRANSPORT PROGRAM	LASL	360	F4	RSBP	CT	C \$	TRIPLET, 2-D TRIANGULAR MESH	608	
TRANSPORT PROGRAM	LASL	6600	F4	RS	P	T	C \$ TRIPLET, 2-D TRIANGULAR MESH	608	
TRANSPORT PROGRAM	LASL	7600	F4	RS	P	T	C \$ TRIPLET, 2-D TRIANGULAR MESH	608	
TRANSPORT STUDY	RFD	3600	F36	RS	P	G	\$ DISPER, AEROSOL PARTICLE	554	
TRANSPORT WITH SLOWING DOWN	PAPL	6600	F4	RS	P	T	C \$ M0648, 1-D SLAB	342	
TRANSPORT XY RZ RTH	LASL	7600	F4	RS	P	T	C \$ TWOTRAN-PNVW, 2-D PARTICLE	573	
TRANSPORT XY RZ RTHETA	LASL	3600	F4	RSBP	CT	C \$	TWOTRAN2, 2-D MULTI-GP	358	
TRANSPORT XY RZ RTHETA	LASL	6600	F4	RS	P	T	C \$ TWOTRAN2, 2-D MULTI-GP	358	
TRANSPORT XY RZ RTHETA	LASL	7600	F4	RS	P	T	C \$ TWOTRAN2, 2-D MULTI-GP	358	
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	
TRI-MESH	GGA	1108	F+BAL	RS	P	T	D \$ BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP	439	
TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	GESV	H600	F4	RS	P	CT	C \$	585	
TRIANGULAR MESH	GGA	1108	F+BAL	RS	P	T	C \$ GAMTRI, 2-D MULTIGP DIFFUSION	401	
TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	F4	RSBP	CT	C \$	TRIPLET, 2-D	608	
TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	F4	RS	P	T	C \$ TRIPLET, 2-D	608	
TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	F4	RS	P	T	C \$ TRIPLET, 2-D	608	
TRIFID0, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS	P	E	\$	489	
TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	F4	RSBP	CT	C \$		608	
TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	F4	RS	P	T	C \$	608	
TRIPLET, 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	
TRW	6500	F4	RS	P	B	\$	PARTI, OPTIMAL GROUP CR MESH COLLAPSING	416	
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	
TSD	ANL	360	F+BAL	R	B	L	T	P \$ TSC-SPEAKEASY, LANGUAGE PROCESSOR UNDER	593
TSD-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSC	ANL	360	F+BAL	R	B	L	T	P \$	593
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	\$	378	
TUBES UNDER PRESSURE	BAPL	6600	F4	RS	P	I	\$ TCP01, CREEP-BUCKLING OF	604	
TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	635	F4	RS	P	T	H \$ VELVET2,	458	
TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+MAP	RSB	T	A	\$	42	
TVA	360	F4	RS	P	T	I	\$ CYCRO3, OXIDE FUEL ROD STRESS & DEFORMATION	449	
TVA	360	F4	RS	PLX	T	B	\$ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	467	
TVA	360	F4	RSBP	PLXCT	B	\$	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	249	
TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS	P	F	\$	338	
TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS	P	T	F \$	338	
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	6600	F4	RS	P	T	C \$	358	
TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600	F4	RS	P	T	C \$	358	
TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	F+MAP	RS	PL	T	B \$	149	
U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS	P	I	\$ TUBE,	378	
UCND	3608	F+BAL	RS	P	D	\$	PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	469	
UEC	6600	F4	RS	P	D	\$	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	146	
UEC	6600	F4	RS	P	D	\$	PCWERO, NUCLEAR STATION ELECTRICITY COSTS	34	
UEC	6600	F4	RS	P	D	\$	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	22	
UGA	360	F4	RS	P	G	\$	WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	278	
UHTREX	LASL	7090	F+MAP	RS	P	I	\$ WIREX, COMPUTER-PRODUCED WIRING LISTS	315	

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UICS 360 F4	PS P	CT D	\$ GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	576
UILL 360 F4	RS P	A	\$ CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	347
UK-R 7090 F+FAP	RSRPL	T C	\$ GRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	103
UK-W 7090 F2	PS	N	\$ WEC, 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
ULGER, 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 COORDINATE CODE	173
UNC 1604 F63	RS PL	T C	\$ DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	144
UNDER PRESSURE	BAPL 660J	F4	RS P I \$ TCB01, CREEP-BUCKLING OF TUBES	604
UNDER TSC	ANL 360	F+BAL	R B L T P \$ TSC-SPEAKEASY, LANGUAGE PROCESSOR	593
UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN 360 F4	RS P	O \$ CORGAM,	390
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 B \$ U3R,	553
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 709J	F+FAP	RSB T A \$ TUZ,	42
UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL 6600	F4	RS P T A \$ PUN1,	359
UNRESOLVED RESONANCE X-SECTION CALC	GGA 1108B	F4	RS P T A \$ GANDY3,	341
UNRESOLVED RESONANCES	BAPL 660J	F4	RS P A \$ GRAMP, R-M PARAMETERS OF	470
URANIUM FUEL CYCLE COST ANALYSIS	AI 709J	F2	RS P D \$ AIMFIRE,	55
USER PROGRAM PERFORMANCE MONITOR	SLAC 360	F+BAL	RS CT P \$ PROGLCK,	642
USING DTF4 FLUXES	LASL 6600	F4	RS P N \$ DAC1, SN PERTURBATION CODE	455
UTILITIES AND 36	F+BAL	RS	T P \$ ARTS ENVIRONMENTAL ROUTINES, FORTRAN	613
UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL 660J	F+ASC	RS P T P \$ CATATRA	407
UTILITY MODULES, 2-D & 3-D PLOTTING	KAPL 6600B	F+ASC	R T P \$ CATATRA	407
UTILITY PROGRAM	AI 7094	F+FAP	RS L T M \$ MOMUS, X-SECTION LIBRARY	159
UTILITY ROUTINE	ANL 360J	F63	PSBP T M \$ XLIBIT, X-SECTION LIBRARY	181
UTILITY ROUTINE	AI 36L	F4	RSB L T M \$ CLIP, FORM CP THREDES LIBRARY	271
UTILITY ROUTINE	ANL 360B	EAL	RSB X T P \$ COPYCAT, IEM OS SYSTEM CATALOG	646
UVA 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 B \$	553
VALUE DISTRIBUTION DATA ANALYSIS	BAPL 660J	F4	RS P P \$ PH99, EXTREME	621
VARI-QUIP, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC 36L	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 36L	F4	RSBPL CT C \$	625
VARIATIONAL SENSITIVITY	ANL 360	F4	RSRPL CT C \$ VARI-1D, 1-D	625
VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NED 635	F4	RS P T H \$	458
VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL 360	F4	RS P XCT F \$	511
VERSUS LEASE ANALYSIS	SLA 360	COROL	RSBP CT M \$ BECCM, AEC DP PURCHASE	584
VERSUS LEASE ANALYSIS	SLA 1108	COROL	RS P M \$ BECCM, AEC DP PURCHASE	589
VESSEL STRESS AND FATIGUE	KAPL 6600	F4	RS I \$ SORSDH, PRESSURE	391
VIBRATING SYSTEMS	KAPL 6600	F+ASC	RS P T I \$ GEM, EIGENVALUE PROBLEM FOR	344
VIBRATION NEUTRON SCATTERING CODES AND 36L	F4	RS P	CT W \$ MACS LATTICE	574
VIEW FACTOR CALC FOR CYLINDRICAL PINS AND 36J	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 AND 360	F4	RSBP	CT J \$	569
VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI 760J	F4	RS PLX T C \$	510
VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A 360	F4	RSBPL CT C \$	511
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 7.9J	F2	PS I \$ FUGUE, STEADY-STATE TEMPERATURE	48
VOID X-SECTION CALCULATION	GEC 625	F4	RS P B \$ AVCID, ANNULAR	276
V1 PROC PNL 6600B	F4	RS	T M \$ CHECKER, CRECT, DAMMET, PLOTFB, ... ENDF/B	384
V2 PROC PNL 6600B	F4	PS	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 36	F4	RS T M \$ RIGEL, ENDF/B	571
V3 DATA TO THERMAL LIBRARY FORM	WAPD 760J	F4	RS P T B \$ ETOT3, ENDF/B	628
V3 PROCESSING CODES	BNL 6600	F4	RS T M \$ CHECK3, RICFL3, ENDF/B	571
V4 PROCESSING CODES	BNL 6600B	F4	PS T M \$ RIGEL4, CHECK4, ... ENDF/B	638
W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W 709J	F2	PS N \$ WEC,	133
W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W 709J	F2	RS P T C \$	132

W/CONFIDENCE LIMITS	BKC	36J	F4	RSBP	P	\$	GRAPH, LINEAR REGRESSION	624	
WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	C	\$		224	
WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	6600	F4	RS P	D	\$		224	
WANL 6600	F4	PS L	T B	\$	GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES			547	
WANL 6600	F4	RS P	T C	\$	VAPI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION			212	
WANL 7094	F+FAP	PSBPL	T N	\$	CPS, SC402J PLCTS 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-CP DIFFUSION XY RZ RTH				264	
WAPD 360	F4	RS PLXCT B	\$	LECPARD, SPECTRA CALCULATION WITH DEPLETION				279	
WAPD 6600	PCD	P	L	T Z	\$	ETOG1 DATA LIBRARIES, MUFT4 CR 5, CAM1 OR 2		447	
WAPD 6600	F4	RS P	T B	\$	ETCM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS			436	
WAPD 6600	F4	RS P	T C	\$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS			354	
WAPD 6600	F4	RS PL	T B	\$	ETCC1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT			437	
WAPD 7094	F+FAP	RS PLXCT B	\$	LASEP, SPECTRUM CALC WITH PURNUP CYL LATTICE				249	
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	\$	ETCT2, THERMAL LIBRARIES FROM ENDF/B DATA			509	
WAPD 7600	F4	RS P	T B	\$	ETCT3, ENDF/B V3 DATA TO THERMAL LIBRARY FORM			628	
WARD 6600	F4	RS P	T H	\$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS			256	
WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	F4	RS P	T H	\$		396	
WATER & STEAM AND	36J	F4	RS P	T H	\$	ASTEM, THERMODYNAMIC PROPERTIES		580	
WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	F4	RS P	T H	\$	WASP,	396	
WATER PROPERTIES BGEF	3608	F4	RS	T H	\$	STEAM-67, 1967 ASME STEAM AND		487	
WATER REACTOR DESIGN	BNW	11J8	F5	RS P	T H	\$	PEPF, THERMAL-HYDRAULIC	483	
WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	36J	F+FAP	RSBPL	CT G	\$	PARET,	555	
WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS	LOFT	UGA	360	F4	FS P	G	\$	278	
WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	6600	F4	RS P	T H	\$	GLUB1,	424	
WATER, STEAM TABLES 14.5-14,500PSIA	32-472	DEGF	BAPL	6600	F4	RS	T H	\$	267
WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	F63	RS P	A	\$	RAMES, PARTICLE	335	
WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APPA	7094	F2	FS P	F	\$		145	
WED, W-DSM OUTPUT TAPE EDIT REACTION RATES	UK-W	7090	F2	RS	N	\$		133	
WEIGHT OPTIMIZATION DISE CALC	AI	7094	F+FAP	RS P	J	\$	SHOE, SHIELD	197	
WEIGHT OPTIMIZATION STUDY	Pw	16J4	F63	PS	I	\$	WOPXPRT, REACTOR	190	
WELL CRYSTAL	MTS	7090	MAD	RSB	G	\$	BURP5, GAMMA-RAY FRACTURATION	170	
WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360	F4	RS P	B	\$		362	
WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KF	3600P	F36	RSRP	G	\$		278	
WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDG	16J4	F63	RS P	T C	\$		32	
WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CRNL	709J	F2	RS P	T C	\$		32	
WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P	T F	\$		274	
WIGL2, 1-D 2-CP SPACE-TIME DIFFUSION 3-GEOM	CGA	1108	F4	RS P	T F	\$		274	
WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	709J	F+FAP	RS P	I	\$		315	
WIRING LISTS UHTREX	LASL	709J	F+FAP	RS P	I	\$	WIREX, COMPUTER-PRODUCED	315	
WLIB, FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	RSRP	X T B	\$	FABBLE,	281	
WOODS-SAXON POTENTIAL SHAPE CALCULATION	CPNL	7090	F2	RS	A	\$	LYNNE,	381	
WOPXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	Pw	16J4	F63	RS	I	\$		190	
WORKSTATION PKG	ANL	36J	F+ASM	RSB	CT P	\$	WSP-HASP/DCS, DCS-MFT REMOTE	541	
WORKSTATION PKG	ANL	3608	F+ASM	RSB	CT P	\$	WSP-HASP/DCS, DCS-MFT REMOTE	541	
WSP-HASP/DCS, DCS-MFT REMOTE WORKSTATION PKG	ANL	360	F+ASM	RSB	CT P	\$		541	
WSP-HASP/DCS, DCS-MFT REMOTE WORKSTATION PKG	ANL	360P	F+ASM	RSB	CT P	\$		541	
WTSC 6600R	F4	RS P	T I	\$	SFAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD			282	
X-SEC	BNL	66J	F4	PS P	A	\$	RESFIT, DIFFRACTION MODEL ELASTIC SCAT	524	
X-SEC & POLARIZATION CALC	KAPL	6600	F4	RS P	T A	\$	PHASER, PHASE SHIFT	5J7	
X-SEC CALC	BNL	6600	F4	RS P	A	\$	SIGPLCT, RESOLVED MULTILEVEL B-W	377	
X-SEC CALC	KAPL	6600	F4	RS P	T A	\$	JPIXR, COUPLED-CHANNEL SCATTERING	506	
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 F	\$	FCC4, FUNDAMENTAL MODE FAST REACTOR	306	
X-SEC CALC	GGA	11J8	F4	RS P X T B	\$	CAF, GAR, SPECTRA AND GROUP-AVERAGED		316	
X-SEC CALC	ORNL	26	F+RAL	FS P	C	\$	ISOSEARCH, ISCTOPF PRODUCTION FLUX,	322	
X-SEC CALC	ORNL	1604	F63	RS P	C	\$	ISOSEARCH, ISCTOPF PRODUCTION FLUX,	322	
X-SEC EVALUATION	FNPA	360	F4	RS P	CT A	\$	JUPITER1, COUPLED CHANNEL	206	
X-SEC EVALUATION	ORNL	16J4	F63	RS P	T A	\$	JUPITER1, COUPLED-CHANNEL	308	
X-SEC EVALUATION	AI	36J	F+RAL	RSB	L CT M	\$	SCORE3, SCISRS ENDF/B GRAPHIC	375	

X-SEC

XENON

X-SEC FORMAT WAPD 6600	F4	RS PL T B \$ ETOG1, ENDF/B TC MUFT, GAM, ANIS	437
X-SEC FORMAT WAPD 7600	F4	RS P T B \$ ETOG3, ENDF/B TC MUFT, GAM, ANIS	538
X-SEC GENERATION FOR TRANSPORT CODES	WANL 6600	F4 RS L T B \$ GAMBIT,	547
X-SFCS	BAPL 6600	F4 RS P T A \$ PUN1, UNRESOLVED RESONANCE INTEGRALS	359
X-SECS GESV 635	F+GMP RS P XCT L \$ TDOWN, SPATIAL & COMPOSITION-DEPENDENT		505
X-SECS EAPL 6600	F4 RS	T R \$ MORO7, 2-D DIFFUSION ABSORPTION REMOVAL	280
X-SECTION AVERAGING	GGA 7044	F4 RS P L \$ GAVR, 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	84
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	84
X-SECTION CALC	NED 2000	F2 RS P A \$ COPIE, 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	CSUC 370	F4 RS PLXCT B \$ FORM, FAST NEUTRON SPECTRUM	51
X-SECTION CALC	GGA 1108	F4 RS P T A \$ GANDY3, UNRESOLVED RESONANCE	341
X-SECTION CALC	ANL 3600	F63 RSBP XCT B \$ THERMCS(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 PSN OUTPUT	PW 1604	LAG1 RS P A \$ DTX, EFFECTIVE	210
X-SECTION CALC MODERATOR	GGA 1108	F4 RS P A \$ GAKER, INELASTIC SCAT	289
X-SECTION CALCULATION	CEC 625	F4 RS P B \$ AVOID, ANNULAR VOID	276
X-SECTION CALCULATION	BAPL 6600	F4 RS P T A \$ SUMCR, S-WAVE NEUTRON	390
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 CALCULATION	GGA 1108	F5 RS P A \$ FLANCE1, SCATTERING LAW	247
X-SECTION CALCULATION	NED 7094	F+MAP RS P T B \$ EPITHERMOS, SPECTRUM AND	201
X-SECTION EVALUATION	CRNL 7090	F4 RSBP A \$ MUFFLE, FISSION NUCLEUS	323
X-SECTION GENERATION	PNW 1108	F4 RS P X T B \$ 10X, 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-PDC	426
X-SECTION LIBRARY PREPARATION	GGA 1108	F4 RS P X T L \$ GAND, GAFFAR	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+MAP RS L T M \$ MOMUS,	159
X-SECTION LIBRARY UTILITY ROUTINE	ANL 3600	F63 RSBP T M \$ XLBIT,	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+MAP RSBPL T N \$ CPS, SC4020 PLOTS FROM SCISRS	239
X-SECTIONS	AI 7090	F+MAP RS L T B \$ QUICKIE, INFINITE MEDIUM SPECTRUM	119
X-SECTIONS	LASL 7090	FLOCC RS P B \$ ZOT, GROUP-COLLAPSING OF MULTI-GP	113
X-SECTIONS	AI 7090	F+MAP 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 \$ RAMP1, REICH-MCCRE RESOLVED REGION	492
X-SECTIONS	BNL 6600	F4 RS P A \$ THRESH, STATISTICAL MODEL REACTION	504
X-SECTIONS	CDC 1604	F63 RS PL T B \$ TEMPEST2, THERMAL NEUTRON SPECTRUM	50
X-SECTIONS FAST THERMAL SPECTRA	GGA 1108	F4 RS PLX T B \$ GGC4, MULTI-GP	298
X-SECTIONS FAST THERMAL SPECTRA	GGA 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	F2 RS P A \$ EXT,	238
X-SECTIONS	GGA 1108	F5 RS P T B \$ ENDFB2, GAND2, GFE2, ENDF/B TC GAFFAR	596
X-SECTIONS HEX LATTICE	GGA 1108	F4 RS B \$ HEXSCAT, ELASTIC SCAT	291
X-SECTIONS	NED 635	F4 RS P T B \$ REAX, RESOLVED RESONANCE EPITHERMAL	257
X-SECTIONS PARAMETERS	AI 7094	F+MAP RS PL T B \$ GRAVE, GROUP-AVERAGING	162
X-SECTIONS WAPD 6600	F4 RS P	T B \$ ETOM1, ENDF/B FORMAT TC MUFT FORMAT	436
XENON OSCILLATION	CEND 360	F4 RS P X T F \$ CEKE, INCEKE, 1-GP 3-D XYZ	415

XENON TRANSFERT & DEPLETION	KAPL 6600	F4	RS P	T C \$	30XT,DEP3, 3-D	477
XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	CRNL 360	F4	RSBP	XCT B \$		572
XLBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL 3600	F63	RSPP	T M \$		181
XRAY DIFFRACTION POWDER PATTERN INDEXING LASL	6600	F+CCM	RS P	T C \$	INDX,	609
XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	CRNL 360	F4	RSBP	XCT P \$	XLACS,	572
XSDRN, DISCRETE ORIGINATE MULTIGROUP CONSTANTS	CRNL 360	F4	RS	PLX T B \$		393
XSEC CALC KAPL 6600	F4	RS P	A \$	MULTI, MULTI-LEVEL RESONANCE THEORY		535
XSEC LIBRARY MAINTENANCE NED	635	F4	RS P	T M \$	TRCUT, MUG MULTIGROUP	493
XSEC LIBRARY MAINTENANCE NED	1108	F5	RS P	T M \$	TRCUT, MUG MULTIGROUP	493
XSEC PROBABILITY TABLES AI	360	F+BAL	RS P	CT B \$	U3R, UNKESCL RESONANCE	553
XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL 6600	RCC	R	LX T Z \$	LASL	532
XSECS. FROM R-W PARAMETERS	GGA 1108	F5	RS P	CT A \$	FSOP3, POINTWISE	216
XSECTION CODES BNL 6600B	F4	RS P	T A \$	RESEND,ACLER, ENDF/B RESONANCE		465
XY GEOM AGC 7090	FLOCC	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-CUIR3, 2-D MULTI-GP DIFFUSION		264
XY RZ RTH LASL 7600	F4	RS P	T C \$	TWCTAN-PNVW, 2-D PARTICLE TRANSPORT		573
XY RZ RTHETA LASL 3600	F4	RSBP	CT C \$	TWCTAN2, 2-D MULTI-GP TRANSPORT		358
XY RZ RTHETA LASL 6600	F4	RS P	T C \$	TWCTAN2, 2-D MULTI-GP TRANSPORT		358
XY RZ RTHETA LASL 7600	F4	RS P	T C \$	TWCTAN2, 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 C \$	3DDT, 3-D MULTIGROUP DIFFUSION		463
XYZ XENON OSCILLATION CEND 360	F4	RS P	X T F \$	CXEX, INCXEX, 1-GP 3-D		415
YANKEE-FUEL TEMPERATURE CALC	CRNL 1604	F2	RS P	F \$	BIGDEAL, SPENT	549
YIELD FROM REACTION OR DECAY ORNL 1604	F63	RS P	D \$	ISCTCPES, MAXIMUM		179
ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL 7090	FLOCC	RS P	B \$		113
ZPR-III ASSEMBLY 4R GAFGAP ENDF/B DATA TAPES	CGA 1108	BIN	R	L T Z \$		356
ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA 7090	F+MAP	RSB	T A \$		41
1- & 2-CELL ANALYSIS AI	360	F4	RS P	T G \$	SOFIRE2, SODIUM POOL FIRE	559
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	AAFC 360	F+BAL	RS P	T C \$	CRAM,	103
1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R 7090	F+MAP	RSBPL	T C \$	CRAM,	103
1-D BURNUP POWER DISTRIBUTION SEARCH	GGA 1108	F4	RS P	T C \$	GASP7,	315
1-D DIFFUSION FAST X-SECTION GENERATION	BNW 1108	F4	RS P	X T B \$	IDX,	374
1-D FAST REACTOR DESIGN & SURVEY STUDY	BNW 6600	F+CCM	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 C \$	DWARF,	579
1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA 7090	F2	RSBP	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	PC 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 CCEF CALC	GGA 7044	F4	RS P	T C \$	TEMCO,	225
1-D FEW-GP SN APPROXIMATION CYLINDER	PPCC 7040	F4	RS P	T C \$	TOPIC,	148
1-D FEW-GP SN APPROXIMATION CYLINDER	PPCC 7090	F2	RS P	T C \$	TOPIC,	148
1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCC 7090	F2	RS P	C \$	MIST,	59
1-D MULTI-GP DIFFUSION + LIB	AI 360	F4	RSBPLX	T C \$	CAESAR4,LIBLST,	270
1-D MULTI-GP DIFFUSION & INVENTORY	ANL 360	F4	RSBP	CT C \$	ARC-DIF10,	626
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+MAP	RS	L T C \$	FAIM,	120
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI 7090	F+MAP	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+MAP	RS	L T C \$	ULCFR,	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

1108

1-D MULTI-GP DISCRETE ORDINATE CALC	AI	709J	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-ID,	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	660J	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	709J	FLCCO	RSBP T C \$ CE-HAPC-S13,	75
1-D MULTI-GP DTF4 WITH DEPLETION	LASL	7030	F4	RS P T C \$ 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 C \$ SIZZLE,	58
1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	F63	RS L T C \$ SIZZLE,	58
1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANL	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	CNRL	360	F4	RS P XCT F \$ TASK,	558
1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	RNL	660J	F4	RS P T F \$ NGAH,	405
1-D PERTURBATION FOR AIM AND FCC CODES	AI	7090	F2	RS C \$ PERT,	30
1-D PERTURBATION FOR AIM AND FCC CODES	BHSC	360	F4	RS P C \$ PERT,	30
1-D PERTURBATION FOR AIM AND FCC CODES	CDC	1604	F63	RS C \$ PERT,	30
1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	360J	F36	RS P XCT C \$ TESS,	513
1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P T J \$ M756,LETO,	343
1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS T C \$ M0648,	342
1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	660J	F4	RS P F \$ RAUMZEIT,	352
1-D TRANSPORT PERTURBATION THEORY	GGA	1108	F4	RS P XCT C \$ CAPERID,	636
1-D VARIATIONAL SENSITIVITY	ANL	360	F4	RSPL CT C \$ VARI-ID,	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	709J	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,	371
1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS P T F \$ WIGL2,	274
1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P T F \$ WIGL2,	274
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	709J	F2	RS B \$ S4 CYL CELL CODE, 1-D	53
1-GP S4 APPROXIMATION	CDC	1604	F63	RS P P \$ S4 CYL CELL CODE, 1-D	53
1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P X T F \$ CEXE,INCFE,	415
1-RFGIA KINETICS SNAP GEOMETRY	AI	7090	F2	RS E \$ SNAPKIN5/5A,	122
1D AND 2D FEW-GROUP SPACE-TIME KINETICS	RCL	6400	F4	RS P T F \$ ADEP,	494
1D MULTIGROUP TIME-DEPENDENT DIFFUSION	MIT	370	F4	RS P T F \$ GAKIN2,	310
10X HFCL 1108B F4	RS P X T R	\$ ETOX2,	MULTI-GP CONSTANTS FROM ENDF/B FOR	388	
10X, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	F4	RS P X T B \$	374
1GP DEPLETION NED	635	F+CMF	RS P T C \$ SYN, 2D SYNTHESIS	MULTIGP DIFF &	495
1ST FLIGHT COLLISION PROBABILITIES MC	CNRL	360R	F+BAL	RS P T B \$ PAFFLE,	392
10 MEV RC	625	F4	RS PLX T B \$ GAMTEC2,	MULTI-GP CONSTANT CALC 1 TO	185
10 MEV BNW	1107	F4	RS PL T B \$ GAMTEC2,	MULTI-GP CONSTANT CALC 0 TO	185
10 MEV BNW	7090	F+MAP	RS PL T B \$ GAMTEC2,	MULTI-GP CONSTANT CALC 0 TO	185
10 MEV UVA	64J	F4	RS PLX T B \$ GAMTEC2,	MULTI-GP CONSTANT CALC 3 TO	185
1107 F4	RS P T C \$ HFN,	1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BNW		241
1107 F4	RS PL T B \$ GAMTEC2,	MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW		185
1108 BIN	R L T Z \$ ZPR-III	ASSEMBLY 48 GA-FAR ENDF/B DATA TAPES	GGA		356
1108 COROL	RS P M \$ BECCM,	AFC DP PURCHASE VERSUS LEASE ANALYSIS	SLA		589
1108 F+BAL	RS P T C \$ GAMBLE5,	2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA		222
1108 F+BAL	RS P T C \$ GAMTR1,	2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA		401
1108 F+BAL	RS P T C \$ GAZE2,	1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA		43J
1108 F+BAL	RS P T D \$ BUCTRI,	2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	GGA		439
1108 F+BAL	RS P T D \$ BUC2,	2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA		438
1108 F+BAL	RS P T F \$ BLCOST6,	COMBINED KINETICS 2-D HEAT TRANSFER	GGA		3J3

1108

1108

1108	F+BAL	RS P	T O	\$	GSSLRN18, LEAST SQUARES PHOTOPEAK SPECTRA CCDE	BNW	457
1108	F+BAL	RS P	T O	\$	TCAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	333
1108	F+BAL	RSBP	T M	\$	SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	607
1108	F+SL	RS P	XCT R	\$	HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	HEDL	527
1108	F4	S	T D	\$	GAFF, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	352
1108	F4	RS	B	\$	HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	CGA	291
1108	F4	RS	T G	\$	GADOSE, DOSET, HTGR ACCIDENT ANALYSIS DCSF CALC	GCA	261
1108	F4	RS	X T P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	534
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	GCA	292
1108	F4	RS P	C	\$	PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	304
1108	F4	RS P	D	\$	FREVAR6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	321
1108	F4	RS P	E	\$	GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	CGA	317
1108	F4	RS P	E	\$	GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	291
1108	F4	RS P	G	\$	SODOL2, 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	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	CGA	319
1108	F4	RS P	T C	\$	GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	381
1108	F4	RS P	T C	\$	TENCO7, TEMPERATURE COEFFICIENT CALCULATION	CCA	320
1108	F4	RS P	T D	\$	FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	318
1108	F4	RS P	T D	\$	GALCE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	CCA	339
1108	F4	RS P	T D	\$	PWCOST, 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	\$	WICL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	274
1108	F4	RS P	T G	\$	PREP, KITT, SYSTEM FAULT TREE EVALUATION CCDES	ANC	528
1108	F4	RS P	T G	\$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	369
1108	F4	RS P	T H	\$	DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	440
1108	F4	RS P	T H	\$	GAFCON-THERMAL1, FUEL PIN GAP CONDUCTANCE CALC	BNW	618
1108	F4	RS P	T H	\$	LICN, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	299
1108	F4	RS P	T H	\$	MOXY, BWP FUEL ELEMENT HEAT TRANSFER CALC	ANC	551
1108	F4	RS P	T I	\$	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GCA	332
1108	F4	RS P	T J	\$	MUSCAT, VIEW FACTOR SHIELDING CCDE CAVITY GEOM	GGA	259
1108	F4	RS P	X A	\$	CCHE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	385
1108	F4	RS P	X T B	\$	GAF, GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	CGA	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, CAFGAR X-SECTION LIBRARY PREPARATION	GCA	345
1108	F4	RS P	XCT C	\$	GAPER1D, 1-D TRANSPORT PERTURBATION THEORY	GCA	626
1108	F4	RS PLX	T D	\$	GCC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	CGA	298
1108	F4	RS PLX	T B	\$	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	467
1108	F5	RS LX	T B	\$	LECPARD, SPECTRA CALCULATION WITH DEPLETION	JNC	279
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	\$	ENDEFB2, GAND2, GFE2, ENDEFB TO CAFGAR X-SECTIONS	GGA	596
1108	F5	RS P	T C	\$	ZCF, 2-D MULTI-GP DISCRETE ORCINATE CCDE	GGA	173
1108	F5	RS P	T D	\$	JBUFFIT1, LEAST SQUARES TRANSFORMATION ANALYSIS	BNW	456
1108	F5	RS P	T H	\$	REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW	483
1108	F5	RS P	T H	\$	TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GCA	408
1108	F5	RS P	T H	\$	TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	CGA	414
1108	F5	RS P	T I	\$	SAFE-CRACK, VISCOPLASTIC ANALYSIS OF CONCRETE	CCA	451
1108	F5	RS P	T I	\$	SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	CGA	452
1108	F5	RS P	T M	\$	TRCUT, MUC MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	453
1108	F5	RS P	T N	\$	GAPER2D, 2-D PERTURBATION CALC FROM ZCF OUTPUT	CGA	471
1108	F5	RS P	T O	\$	CACE, BIPD, SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES	476
1108	F5	RS P	T R	\$	TCFLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HEDL	599

110E

2-C

11J8	F5	RS P	CT A	\$ FSCP3, POINTWISE XSECS. FROM B-W PARAMETERS	CGA	216
1108	F5	RS P	X T D	\$ PACTULLS, CLOTHC, NUCLEAR POWER PLANT COST CODE	HEDL	540
11J8	F5	RS P	X T F	\$ NCISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	488
11J8	F5	RS P	X T P	\$ FUNPACK, SPECIAL FUNCTION ROUTINES-EI, K, E,	ANL	610
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
11J8B	F4	RS P	T A	\$ GANDY3, UNRESOLVED RESONANCE X-SECTION CALC	GGA	341
1108B	F4	RS P	X T B	\$ ETGX3, MULTI-GP CONSTANTS FROM ENCF/B FOR ICX	HEDL	388
11J8C	F4	RS P	T H	\$ CCBPA3C, RCD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	432
14.5-14.500PSIA	32-472	DEGF	BAPL 660J	F4 RS T H \$ WATER, STEAM TABLES		267
14.5-2538 PSIA		ANL	1604 F63	RS P H \$ M0899, H0H, STEAM TABLES		294
14.5-2538 PSIA		BAPL 66J	F4 RS P	T H \$ M0899, H0H, STEAM TABLES		294
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	H	\$ BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC	CRNL	549
1604	F63	RS	C	\$ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	30
16J4	F63	RS	C	\$ TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT	PW	199
1604	F63	RS	C	\$ 2DF, 2-D MULTI-GP DISCRETE COORDINATE CODE	UNC	173
1604	F63	RS	I	\$ WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	190
16J4	F63	RS	L	\$ CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	194
16J4	F63	RS	L	\$ CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW	193
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
16J4	F63	RS P	A	\$ PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	CRNL	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	CRNL	180
1604	F63	RS P	D	\$ ISCSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	322
1604	F63	RS P	D	\$ ISCTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	179
1604	F63	RS P	D	\$ POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL	340
16J4	F63	RS P	F	\$ 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
16J4	F63	RS P	G	\$ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	47
1604	F63	RS P	H	\$ M0899, H0H, STEAM TABLES 14.5-2538 PSIA	ANL	294
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
16J4	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
16J4	F63	RS P	T C	\$ 2JGRAND, 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
16J4	F63	RS PL	T B	\$ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	51
1604	F63	RS PL	T B	\$ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	50
1604	F63	RS PL	T C	\$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	29
16J4	F63	RS PL	T C	\$ DTF, 1-D MULTIGROUP DISCRETE COORDINATE 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
1967 ASME STEAM AND WATER PROPERTIES	BGE	360B	F4 RS	T H \$ STEAM-67,		487
2- OR 3-D HEAT CONDUCTION LUMPED MASS		LASL 703J	F4 RS	T H \$ RATH,		242
2- OR 3-D HEAT CONDUCTION LUMPED MASS		LASL 7094	FAP RS P	T H \$ RATH,		242
-CELL ANALYSIS	AI	360	F4 RS P	T G \$ SOFIRE2, SODIUM POOL FIRE 1- &		559
-D + 3-D PLOTTING	KAPL 660J	F+ASC	RS P	T P \$ DATATRAM UTILITY MODULES,		407
2-D & 3-D PLOTTING	KAPL 6600B	F+ASC	R	T P \$ DATATRAM UTILITY MODULES,		407
2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL 6600	F+COM	RS P	T I \$ DUZ2,		503

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 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 R \$ MOP07,	280
2-D EXCURSION CALCULATION R-Z GEOMETRY APDA 7094 F4 RS P F \$ MARS,	293
2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY GGA 7090 F+FAP RSBP T C \$ DDR,	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 7 9 F2 RS C \$ FIRN,	7
2-D FEW-GROUP DIFFUSION AND DEPLETION IBM 36JA F+BAL RS P T D \$ PDQ5,	336
2-D FEW-GROUP DIFFUSION AND DEPLETION MIT 3608 F+BAL RSBP T C \$ PDQ5,	336
2-D FEW-GROUP DIFFUSION SLAB CYLINDER CDC 1604 F63 RS P T C \$ ZOGRAND,	40
2-D FEW-GROUP DIFFUSION SLAB CYLINDER CRNL 7090 F2 RS P T C \$ ZOGRAND,	40
2-D FLUX SETS GESV H600 F4 RS P CT C \$ TRIAL, 3-D REACTION RATES FROM	585
2-D GEOMETRY INPUT, PREPARATION, EDIT KAPL 6600B F+ASC P T L \$ DATATRN	406
2-D HEAT TRANSFER GGA 1108 F+BAL RS P T E \$ BLOCST6, COMBINED KINETICS	303
2-D HEAT TRANSFER GGA 7044 F+MAP RS P T H \$ BLOCST5, POINT-KINETICS WITH	205
2-D HETEROGENEOUS REACTOR CALCULATION DP 360R F4 RSBP CT C \$ HERESY3,	126
2-D HYDRODYNAM RESPONSE TO EXCURSION ANL 361 F4 RS P CT F \$ REXCO-H,	550
2-D HYDRODYNAM RESPONSE TO EXCURSION ANL 360 F4 RS P CT F \$ REXCO-H2,	615
2-D LAGRANGIAN FCNS OF MOTION SOLUTION SLA 3600 F36 FS P T S \$ TDOOY2,	627
2-D LMFBR 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 \$ HWCCR-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 C \$ ASSAULT,	240
2-D MULTI-GP DIFFUSION PROGRAM AAEC 360 F+BAL RS P T C \$ CRAM, 1-D AND	173
2-D MULTI-GP DIFFUSION PROGRAM CRNL 7090 F+FAP RS P T C \$ EXTERMINATOR,	156
2-D MULTI-GP DIFFUSION PROGRAM UK-R 7090 F+FAP RSBP T C \$ CRAM, 1-D AND	103
2-D MULTI-GP DIFFUSION PROGRAM PC 625 F4 RS T C \$ EXTERMINATOR2,	156
2-D MULTI-GP DIFFUSION PROGRAM CE 6600 F4 RS P T C \$ EXTERMINATOR2,	156
2-D MULTI-GP DIFFUSION PROGRAM CRNL 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 XY RZ GEOMETRY GGA 1108 F+BAL RS P T C \$ CAMBLE5,	222
2-D MULTI-GP DIFFUSION XY RZ GEOMETRY GGA 7044 F+MAP RSBP T C \$ CAMBLE4,	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 PS 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 \$ FORTAN TDC,	161
2-D MULTI-GP SN APPROXIMATION XY GEOM AGC 7090 FLCCC 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 MULTIGP DIFFUSION TRIANGULAR MESH GGA 1108 F+BAL RS P T C \$ GAMTRI,	401
2-D MULTIGP DIFFUSION+BURNUP TRI-MESH GGA 1108 F+BAL RS P T D \$ BUGTRI,	439
2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ CGA 1108 F+BAL RS P T D \$ BUG2,	438
2-D MULTIGROUP DIFFUSION & SN THEORY NED 635 F4 RS P T C \$ DCT2DB,	459
2-D MULTIGROUP DIFFUSION AND DEPLETION ANL 3600 F4 RSBP T C \$ 2DB,	325
2-D MULTIGROUP DIFFUSION AND DEPLETION BNW 1108 F4 RS P T C \$ 2DB,	325
2-D MULTIGROUP DIFFUSION AND DEPLETION LASL 6600 F4 RS P T C \$ 2DB,	325
2-D MULTIGROUP DISCRETE ORDINATE PROGRAM LER 7090 F+MAP FS P T C \$ TDSN,	312
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 \$ CAPER2D,	471
2-D PERTURBATION TDC OR 2DXY FLUX INPUT PW 1604 F63 PS C \$ TCP,	199
2-D PERTURBATION XY RZ RTHETA GEOMETRY BNW 1108 F4 RS P C \$ PERT4,	304
2-D TIME-DEPENDENT HEAT CONDUCTION PPCC 7044 F+MAP RS P T H \$ TDOOEE,	349
2-D TRANSIENT HEAT CONDUCTION PROGRAM BAPL 6600 F4 RS P T H \$ HOT2,	286
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,	338
2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK BAPL 6600 F4 RS P T F \$ TWIGL,	338

2-D

3-D

2-D 2-GROUP DIFFUSION SLAB CYL	CRNL 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	CRNL 360	F4	RS P	X T F \$ ORTHIS, ORTHAT,	525
2-GP DIFFUSION CYLINDER SLAB	CCC 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	371
2-GP SPACE-TIME DIFFUSION	ANL 360	F4	RS P	F \$ TWIGGLE, 2-D	338
2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL 6600	F4	RS P	T F \$ TWIGL, 2-D	338
2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL 6600	F4	RS P	T F \$ WIGL2, 1-D	274
2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA 1108	F4	RS P	T F \$ WIGL2, 1-D	274
2-GROUP DIFFUSION SLAB CYL	CRNL 7090	F2	RS P	T C \$ EQUIPOISE3, 2-D	39
2-GROUP DIFFUSION XYZ GEOMETRY	CCC 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 AND	360	PL1	RS P	T P \$ PTAC11,	516
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 CONTOUR PLOTS & AREA CALCULATION	SLA 6600	F4	RS P	P \$ PLOTR,	578
2D DIFFUSION BURNUP REFUELING HISTORY	LASL 6600	F4	RS P	T D \$ PHENIX,	454
2D FEW-GROUP SPACE-TIME KINETICS	RCL 6400	F4	RS P	T F \$ ADEP, 1D AND	494
2D SYNTHESIS MULTICP DIFF & 1GP DEPLETION NED	635	F+GMP	RS P	T C \$ SYN,	495
2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL 3600	F4	RSBP	T C \$	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 COORDINATE CODE	GGA 1108	F5	RS P	T C \$	173
2DF, 2-D MULTI-GP DISCRETE COORDINATE CODE	UNC 1604	F63	RS	C \$	173
2DXY FLUX INPUT	PW 1604	F63	RS	C \$ TOP, 2-D PERTURBATION TDC OP	199
2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC 7090	FLOCC	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	CCC 1604	F63	RS P	T C \$	40
20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CRNL 7090	F2	RS P	T C \$	40
2000 F2	RS P	A \$ DOPIF, 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 DOPLER EFFECTS	NED	178	
2000 F4	PS	A \$ STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	NW	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 F	T I \$ SAFE-3D,	332
3-D DIFFUSION DEPLETION MULTIGP	CRNL 360	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 360	F+BAL	RS P	XCT D \$ PDQ7, 1,2 OR	275
3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600	F+ASC	RS P	T C \$ PDQ7, 1,2 OR	275
3-D FEW-GP DIFFUSION DEPLETION	BAPL 6600	F+ASC	RS P	T D \$ PDQ7, 1,2 OR	275
3-D FEW-GP DIFFUSION DEPLETION	BCS 6600	F+ASC	R B	T C \$ PDQ7, 1,2 OR	275
3-D FEW-GP DIFFUSION DEPLETION	BW 6600	F+ASC	RS P	T D \$ PDQ7, 1,2 OR	275
3-D FINITE ELEMENT ELASTIC ANALYSIS	BAPL 6600	F+CCM	RS P	X T I \$ MATUS,	597
3-D HEAT CONDUCTION LUMPED MASS	LASL 7090	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 360	F4	RS P	T H \$ HEATING3, 1,2, OR	517
3-D HEAT TRANSFER PROGRAM	GGA 1108	F5	RS P	T F \$ TAC3D, TRANSIENT	414
3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW 1604	F63	RS	T C \$ 2DXYL,	192
3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL 360	F4	RS P	CT C \$ 3DB,	567
3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	FEDL 1108	F4	RS P	T D \$ 3DB,	567
3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL 6600	F4	RS P	T C \$ 3DDT,	463
3-D PLOTS ON IBM2280 OR CALCOMP780	ANL 360	F4	RS P	T N \$ PLOT-3D,	544
3-D PLOTTING	KAPL 6600	F+ASC	RS P	T P \$ DATATRAM UTILITY MODULES, 2-D +	407
3-D PLOTTING	KAPL 6600	F+ASC	R	T P \$ DATATRAM UTILITY MODULES, 2-D &	407

3-D REACTION RATES FROM 2-D FLUX SETS	GESV	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	NFC	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,	404
3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	F4	RS P	T H	\$ LION,	299
3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	6600	F+ASC	RS P	T H	\$ LION4,	299
3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+CMF	RSBP	T H	\$ THTE,	346
3-D XENON TRANSIENT & DEPLETION	KAPL	6600	F4	RS P	T D	\$ 3DXT,DEP3,	477
3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P	X T F	\$ CEXF,INCEX, 1-GP	415
3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	1604	F63	RS P	T C	\$ WHIRLAWAY,	32
3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	F2	RS P	T C	\$ WHIRLAWAY,	32
3-GEOM	BAPL	6600	F4	RS P	T F	\$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION	274
3-GEOM	GGA	1108	F4	RS P	T F	\$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION	274
3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P	CT C	\$	567
3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEDL	1108	F4	RS P	T D	\$	567
3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS P	T C	\$	463
3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	F4	RS P	T D	\$	477
3D-GP ENDF/B SCAT KERNELS	DP	360	RCD	R	LX T Z	\$ THERMOS LIBRARY,	543
32-472DEGF BAPL 6600	F4	RS	T H	\$ WATER, STEAM TABLES 14.5-14.50	PSIA		267
36F	RS PL	CT F	\$ QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	3600		474
36F	PSBP	T M	\$ MERM2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	3600		472
36J	BAL	RS	CT P	\$ SLACON 2.2, OS360 MVT/MFT PERFORMANCE MONITOR	SLAC		635
360	BAL	RSB	T P	\$ NRTS-RJE, CS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC		519
360	BAL+F	RS P	CT P	\$ GETCCP,FRCCR, FORTRAN DYNAMIC STORAGE ALLOC	ORNL		644
360	RCD	R	LX T Z	\$ THERMOS LIBRARY, 3D-GP ENDF/B SCAT KERNELS	DP		543
36J	CORCL	RS P	M	\$ AEC-ALD FAU, RADIO FREQUENCY MANAGEMENT SYSTEM	ALCO		587
36J	CORCL	RSPP	CT M	\$ BECCM, AFC DP PURCHASE VERSUS LEASE ANALYSIS	SLA		589
360	F+ASM	RSE	CT P	\$ WSP-FASP/DCS, DCS-MFT REMOTE WORKSTATION PKG	ANL		541
360	F+PAL	S	T M	\$ JCSHA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP		490
36J	F+BAL	S	X T H	\$ RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP		536
360	F+PAL	R P L	T P	\$ TSC-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSC	ANL		593
360	F+BAL	RS	T P	\$ AMDLIB, ARGONNE SUBROUTINE LIBRARY CAT. F	ANL		563
36J	F+BAL	PS	T P	\$ FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES	AI		484
36J	F+PAL	RS	T P	\$ NRTS ENVIRONMENTAL ROUTINES, FORTRAN UTILITIES	ANC		613
360	F+PAL	RS	CT P	\$ PRUCLINK, USER PROGRAM PERFORMANCE MONITOR	SLAC		642
360	F+PAL	RS P	D	\$ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL		322
360	F+PAL	RS P	T A	\$ COMNUC,CASCADE, COMPOUND NUCLEUS REACTION	AI		482
36J	F+BAL	RS P	T C	\$ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	AAEC		103
36J	F+PAL	RS P	T C	\$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL		209
360	F+BAL	RS P	T D	\$ CINDER,MC1 2, POINT DEPLETION FISSION PRODUCT	DP		313
360	F+PAL	PS P	T E	\$ AIRS2A, SIMULATION OF REACTOR DYNAMICS	AI		326
36J	F+PAL	RS P	T I	\$ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL		332
36J	F+PAL	RS P	CT B	\$ U3R, UNRESOL RESONANCE XSFC PROBABILITY TABLES	AI		553
360	F+PAL	RS P	CT H	\$ 6KILFR, CORE HEATUP CODE FOR BWR/6 ANALYSIS	EI		636
360	F+PAL	RS P	CT M	\$ ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL		522
36J	F+PAL	RS P	X T B	\$ HWUOF-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI		307
360	F+PAL	RS P	XCT F	\$ HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM	DP		277
360	F+PAL	RSB I	CT M	\$ SCORE3, SCIRS ENDF/B GRAPHIC X-SEC EVALUATION	AI		375
360	F+BAL	RSBPL	CT C	\$ FSP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL		523
36J	F+PAL	RSBPL	CT C	\$ KENC, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL		450
36J	F+BAL	RSBPL	CT D	\$ REBUS2, FUEL CYCLE ANALYSIS FOR FAST REACTORS	ANL		634
360	F+BAL	RSBPL	CT G	\$ PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC		555
360	F+C+R	RSBP	T M	\$ RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMC		6.3
36J	F+P+A	RS	T P	\$ AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-F	ANL		562
36J	F+P+A	RS	T P	\$ AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL		564
360	F+P+A	RSBP	XCT W	\$ GAUSS6, BATCH ANALYSIS OF GAMMA-RAY SPECTRA	ANC		622
36C	F4	RS	M	\$ MERM2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL		472
360	F4	RS	T M	\$ RIGEL, ENDF/B V3 DATA PROCESSING CODE	ANL		571
36J	F4	RS	L	T C \$ FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB		9
360	F4	RS P	A	\$ CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL		347
360	F4	RS P	A	\$ POLLIA, CONVERTS P-MATRIX RESONANCE PARAMETERS	ORNL		639
360	F4	RS P	A	\$ PSFLOD, STATISTICAL RESONANCE PARAMETER CALC	ENEAC		292

360	F4	RS P	R \$ WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	362
36J	F4	RS P	C \$ PERT, 1-D PERTURBATION FOR AIM AND FCG CODES	BHSC	30
360	F4	RS P	I \$ NPRFCOP, FUEL CYCLE COSTS PERFORMANCE DATA	ANL	146
360	F4	RS P	F \$ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	121
36J	F4	RS P	F \$ BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB	363
360	F4	RS P	F \$ R101, SPACE-INDEPENDENT KINETICS KEX OPTICS	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	338
360	F4	RS P	G \$ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	47
360	F4	RS P	G \$ EGAC, 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 \$ SOCCOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	521
360	F4	RS P	G \$ WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LCFT	UGA	278
360	F4	RS P	H \$ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	246
360	F4	RS P	H \$ PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	DP	586
360	F4	RS P	L \$ GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	530
36J	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 \$ DYNOC1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	464
360	F4	RS P	P \$ KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	ORNL	556
360	F4	RS P	U \$ DYNAMIC ANALYSIS OF GASES BY MASS SPECTROMETRY	RFD	645
36J	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 P \$ RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	453
360	F4	RS P	T R \$ 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 \$ FAIMCS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BHSC	120
36J	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 \$ ANCCN, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	486
360	F4	RS P	T F \$ SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	400
36J	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 \$ HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS	AI	443
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 \$ HEATING3, 1,2, OP 3-D HEAT CONDUCTION PROGRAM	ORNL	517
360	F4	RS P	T H \$ ORRIBLE, ROD BUNDLE FLOW & TEMPERATURE DIST.	ORNL	629
360	F4	RS P	T I \$ CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION	TVA	449
360	F4	RS P	T I \$ LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	460
360	F4	RS P	T I \$ SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	402
360	F4	RS P	T I \$ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	282
360	F4	RS P	T M \$ CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	475
360	F4	RS P	T N \$ PLOT-3D, 3-D PLCTS CN IBM2280 CR CALCOMP780	ANL	544
36C	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	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	576
360	F4	RS P	CT D \$ 3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	567
360	F4	RS P	CT F \$ REXCG-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	550
360	F4	RS P	CT F \$ REXCO-H2, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	615
360	F4	RS P	CT G \$ EMERALD, PWR PLANT RADIATION RELEASE & DOSE	PGE	546
360	F4	RS P	CT I \$ PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	542
360	F4	RS P	CT M \$ ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	350
360	F4	RS P	CT W \$ MACS LATTICE VIBRATION NEUTRON SCATTERING CODES	ANC	574
360	F4	RS P	CT W \$ MACAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	575
360	F4	RS P	X G \$ BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	435

36J	F4	RS P X T F	\$ MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	491
360	F4	RS P X T F	\$ CEXL, INCFX, 1-GP 3-D XYZ XENON OSCILLATION	CEND	415
36J	F4	RS P X T F	\$ FLRE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	174
360	F4	RS P X T H	\$ ORTHIS, CRTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	525
360	F4	RS P X T P	\$ DF/STEP, INTRP, SOLN OF ORDINARY DIFF ECLATIONS	SLA	64
36J	F4	RS P X T P	\$ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	610
360	F4	RS P XCT F	\$ 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-CP CONSTANTS	ANC	565
36J	F4	RS PL CT F	\$ QX1, QUASISTATIC SPATIAL REACTOR KINETICS COEF	ANL	474
360	F4	RS PL CT M	\$ ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC	518
360	F4	RS PLX T B	\$ AILMCF, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	147
36J	F4	RS PLX T B	\$ HPG3, SLOWING-DOWN SPECTRUM, MULTICP CONSTANTS	TVA	467
360	F4	RS PLX T B	\$ XSDPN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	393
36J	F4	RS PLXCT B	\$ LECPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	279
360	F4	RS PLXCT B	\$ PHRCC, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	520
360	F4	RSP XCT P	\$ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	534
36J	F4	RSB L T M	\$ CLIP, FORM CR THREEES 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 T K	\$ THREEES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	273
360	F4	RSBP C P	\$ LATIN SQ, NXN LATIN SQUARE EXPERIMENTAL DESIGN	MLMO	630
36J	F4	RSBP CT C	\$ APC-DIFID, 1-D MULTI-GP DIFFUSION & INVENTORY	ANL	626
360	F4	RSBP CT C	\$ MONA, 1-D MULTIGROUP DIFFUSION SIAP, CYL, SPH	ANC	582
36J	F4	RSPB CT C	\$ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	608
36J	F4	RSBP CT D	\$ DWAPP, 1-D FEW-CP DIFFUSION DEPLETION PROGRAM	ANC	579
360	F4	RSBP CT G	\$ FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	MA-G	448
360	F4	RSPB CT G	\$ PREP,KITT, SYSTEM FAULT TPEE EVALUATION CODES	ANC	528
360	F4	RSBP CT G	\$ RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	265
36J	F4	RSEP CT I	\$ FPFM, STEADY-STATE FISSION PRODUCT FUFL MODEL	ANC	584
36J	F4	RSPB 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	RSEP CT L	\$ ARC-NUI002, BCD INPUT DATA PROCESSING MODULE	ANL	533
36J	F4	RSPB CT Q	\$ ISOTAB, PU POWER OUTPUT FROM MIXED ISOTOPES	MLMO	619
360	F4	RSBP X T D	\$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	58
360	F4	RSBP X T G	\$ THETA1-B, FUFL ROD THERMAL RESPONSE LOCA	ANC	512
360	F4	RSBP XCT B	\$ XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/P	ORNL	572
360	F4	RSPB XCT G	\$ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	369
360	F4	RSBP XCT H	\$ MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	551
360	F4	RSBP XCT H	\$ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)	ANC	605
360	F4	RSBPL CT C	\$ RAFFLE-ANC, MONTE CARLO NEUTRON TRANSPORT CODE	ANC	631
360	F4	RSBPL CT C	\$ VARI-1D, 1-D VARIATIONAL SENSITIVITY	ANL	625
360	F4	RSBPL CT C	\$ VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	510
360	F4	RSEPL CT L	\$ ARC-XSEC1, MICROCSCPIC 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 B	\$ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA	249
360	F4	RSBPLXCT C	\$ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHRE	MTS	262
360	PL1	RS P T P	\$ PTAC11, 2-PASS ASSEMBLER FOR THE PCP-11 CN	36J	516
360	ANC	360 PL1 RS P T P	\$ PTAC11, 2-PASS ASSEMBLER FOR THE PCP-11 ON		516
360A	F+PAL	RS P T D	\$ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	336
360B	BAL	RSB X T P	\$ COPYCAT, IBM OS SYSTEM CATALOG UTILITY ROUTINE	ANL	646
360B	ERCDC 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 D	\$ PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCND	469
360B	F+BAL	RS P T B	\$ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	392
360B	F+BAL	RSBP T D	\$ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	336
360B	F+BAL	RSBP CT C	\$ KENC2, MONTE CARLO MULTIGROUP CRITICALITY CODE	DP	450
360B	F+BAL	RSBP CT G	\$ CONTEMPT-LT/022, PRESSURE-TEMPERATURE RESPONSE	ANC	433
360B	F4	RS T H	\$ STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BG&E	487
360B	F4	RS P I	\$ NUBOW, STRUCTURAL ANALYSIS BOWED REACTOR CORES	ANL	64
360B	F4	RS P T D	\$ ORCOST, POWER PLANT CAPITAL COST ESTIMATING	ORNL	588
360B	F4	RS P C P	\$ GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	ANL	592

360B

635

360B	F4	RS P	CT I	\$	SAP4, STRUCTURAL ANALYSIS OF LINEAR SYSTEMS	ANL	641
360B	F4	RS P	XCT A	\$	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
36JC	F+PAL	RSBPLXCT	G	\$	RELAP4, TRANSIENT THERMAL-HYDRAULIC ANALYSIS	ANC	369
360C	F4	RS P	T H	\$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	432
360C	F4	RS P	XCT C	\$	CONCEPT3, POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL	496
360D	F4	RSBP	CT C	\$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ THETA	LASL	358
360F	F+PAL	RS P	XCT D	\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC	275
360H	F4	RS P	T K	\$	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL	387
3600	ASAF4	RS P	T M	\$	ETCE, ENDF/B TO MC**2 DATA CONVERSION	APDA	350
3600	F36	SBP	I	\$	BCW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	365
3600	F36	RS P	G	\$	DISPER, AEROSOL PARTICLE TRANSPORT STUDY	RFD	554
3600	F36	RS P	T B	\$	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	355
360J	F36	RS P	T C	\$	SNARG-1D, 1-D MULTI-GP DISCRETE COORDINATE CALC	ANL	288
3600	F36	RS P	T I	\$	SUPCRAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	357
3600	F36	RS P	T S	\$	TCCDY2, 2-D LAGRANGIAN EQNS OF MOTION SOLUTION	SLA	627
360L	F36	RS P	X T C	\$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	262
360J	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
360C	F36	RSBP	G	\$	CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	366
3600	F36	RSBP	I	\$	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	353
360J	F36	RSBP	X T B	\$	RABBLE, WLIB, FLAT, RESONANCE ABSORPTION, CELL	ANL	281
360J	F36	RSBP	X T B	\$	RIFR-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	213
3600	F4	RSBP	T D	\$	2DP, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	325
3600	F63	RS	LX T B	\$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	33
360J	F63	RSBP	A	\$	NEAPPEX, COMPOUND NUCLEUS X-SECTION CALC	ANL	171
3600	F63	RSBP	E	\$	RIC1, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	255
3600	F63	RSBP	E	\$	RIC2, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	168
360J	F63	RSBP	F	\$	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	102
360J	F63	PSBP	U	\$	CCINC, CCINCIDENCE COUNTING DATA REDUCTION	ANL	246
3600	F63	RSBP	T A	\$	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	254
3600	F63	PSBP	T C	\$	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	167
360C	F63	RSBP	T E	\$	TRAFICPROCRACTION, TRANSFER FUNCTION SYNTHESIS	ANL	135
360J	F63	PSBP	T G	\$	R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	172
360J	F63	RSBP	T H	\$	ARCUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	152
3600	F63	RSBP	T M	\$	XLIPIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	181
3600	F63	RSBP	XCT B	\$	THERMUS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	184
360J	F63	RSBPL	T J	\$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	143
360J	36F	PS PL	CT F	\$	QXJ, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	474
3600	36F	RSBP	T M	\$	MEPMC2, MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	472
360CB	F36	RSBP	G	\$	W-FAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	278
37J	F4	RS P	T F	\$	GAKIN2, 1D MULTIGROUP TIME-DEPENDENT DIFFUSION	MIT	310
37J	F4	RS PL	CT C	\$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CSUC	29
37J	F4	RS PLXCT	B	\$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	OSUC	51
4RE	STRAINT	PIPE	STRESS,		MAXIMUM MOMENT CALC	AI	7J9J F+PAL RS T I \$
48	GAFGAR	ENDF/B	LATA	TAPES	GCA 1108 BIN R L T 2 \$	ZPR-III	ASSEMBLY
500PSIA	32-472	EGF	PAPL	66J	F4 PS T H \$	WATER,	STEAM TABLES 14.5-14,
6KILER,	CORE	HEATUP	CODE	FOR	RWR/6	ANALYSIS	FI 36J F+PAL RS P CT H \$
625	F+MAP	RS P	T C	\$	DTF4, 1-D MULTI-GP DISCRETE COORDINATE PROGRAM	BC	209
625	F4	RS	T C	\$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	156
625	F4	PS	T C	\$	FUC, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	28
625	F4	PS P	P	\$	AVGIC, ANNULAR VOID X-SECTION CALCULATION	GFC	276
625	F4	RS PLX	T F	\$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	185
635	F+GAP	RSBP	T Q	\$	CASCADE, CLUSTER, RADIATION DAMAGE IN METALS	GFC	419
635	F+GMP	PS	T P	\$	GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NEC	515
635	F+GMP	RS P	T C	\$	SYN, 2D SYNTHESIS MULTIGP DIFF & IGP DEPLETION	NEC	495
635	F+GMP	RS P	XCT P	\$	ENDFUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	CESV	501
635	F+GMP	PS P	XCT L	\$	TUFAN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	505
635	F+GMP	RSBP	T H	\$	THTF, 3-D TRANSIENT HEAT TRANSFER PROGRAM	CEC	346
635	F4	PS	G	\$	ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCC	529
635	F4	RS	X T P	\$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	534
635	F4	RS P	D	\$	RAPFL, FUEL CYCLE PARAMETERS FAST BREEDERS	NED	372
635	F4	PS P	T P	\$	RFAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NEC	257

635	F4	RS P	T C	\$	DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NEC	450
635	F4	RS P	T C	\$	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NEC	167
635	F4	RS P	T D	\$	FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NEC	481
635	F4	RS P	T G	\$	FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NEC	479
635	F4	RS P	T H	\$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NEC	256
635	F4	RS P	T H	\$	VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NEC	458
635	F4	RS P	T M	\$	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NEC	493
635	F4	RS P	T O	\$	BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	NEC	311
635	F4	RS P	T O	\$	EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NEC	258
635	F4	RS P	CT I	\$	BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	GESV	568
635	F4	RS P	X T F	\$	FORE2, FAST REACTOR EXCURSION CALCULATIONS	NEC	174
635	F4	RS PL	T C	\$	EISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NEC	287
635	F4	RSRP	D	\$	CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	CFC	418
635	F4	PSRP	C	\$	DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GFC	423
635	F4	RSRP	C	\$	MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC	421
635	F4	RSRP	T R	\$	GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	GEC	421
6400	F4	S P	H	\$	PWR-PPM, PWR-PPM DILUTION TABLES FOR PWR OPN	CPPD	552
6400	F4	RS P	G	\$	FRCL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL	500
6400	F4	RS P	T F	\$	ADER, 1D AND 2D 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	\$	NUPLUC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	328
6400	F4	PS P	X G	\$	MIRAB, MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	499
6400	F4	RS P	X T G	\$	MUCHA1, MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	508
6400	F4	RS PLX	T R	\$	GAMTEC2, MULTI-GP CONSTANT CALC TO 1 ⁺ MEV	UVA	185
6500	F4	RS P	B	\$	PART1, OPTIMAL GROUP CP MESH COLLAPSING	TRW	416
6500	F4	RS PLX	T C	\$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURC	262
6600	F4	RSPLX	T B	\$	LECPAR, SPECTRA CALCULATION WITH DEPLETION	AFRI	270
6600	PCD	R	L	T	Z \$ ETIC1 DATA LIBRARIES, MUFT4 CR 5, GAM1 CR 2	WAPC	447
6600	RCD	R	LX	T	Z \$ LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL	532
6600	F+ASC	RS	P	\$	SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL	442
6600	F+ASC	RS P	T H	\$	LICN4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	299
6600	F+ASC	RS P	T I	\$	GFM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	344
6600	F+ASC	RS P	T J	\$	ASFIS, GAMMA RAY SOURCE BUILDUP FACTOR CALC	KAPL	479
6600	F+ASC	RS P	T P	\$	CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	43
6600	F+ASC	RS P	T P	\$	LATATRAP, UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL	407
6600	F+ASC	RS P	T P	\$	DOCCY, DSK CALCULATOR FORM SHEET PP PACKAGE	KAPL	428
6600	F+ASC	RS P	T P	\$	LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	445
6600	F+ASC	RS P	T P	\$	SNEC, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	364
6600	F+ASC	RS P	X T P	\$	RESQ2, RESQ3, RESQ1, RESONANCE INTEGRAL HFV CELL	BAPL	285
6600	F+COM	RS	T P	\$	KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES	KAPL	496
6600	F+COM	RS P	H	\$	HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	560
6600	F+COM	RS P	T I	\$	DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	503
6600	F+COM	RS P	T I	\$	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	PAPL	397
6600	F+COM	RS P	T P	\$	LENSDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	602
6600	F+COM	RS P	T Q	\$	INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	609
6600	F+COM	RS P	X T P	\$	PAXO3, HARMONY-PLQ X-SECTION GENERATION CODE	BAPL	426
6600	F+COM	RS P	X T Q	\$	FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	PK	427
6600	F+COM	RS P	X T I	\$	MATLS, 3-D FINITE ELEMENT ELASTIC ANALYSIS	PAPL	597
6600	F+COM	RS PLX	T C	\$	KENC2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFL	450
6600	FTN	RS P	T I	\$	CHILES, LINEAR ELASTIC SINGULARITY MODELING	SLA	611
6600	F4	RS	B	\$	APRFX1, 99-GP DLO-2H LIBRARY GROUP COLLAPSING	APRF	466
6600	F4	RS	I	\$	SORSD9, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	391
6600	F4	RS	T B	\$	MOR07, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	280
6600	F4	PS	T C	\$	MOF48, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	342
6600	F4	PS	T H	\$	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	267
6600	F4	RS	T I	\$	CYCRO2, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	266
6600	F4	RS	T M	\$	CHECK3, RIGEL3, ENDF/B V3 PROCESSING CODES	BNL	571
6600	F4	RS	T O	\$	GASPAR, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	485
6600	F4	RS	X T O	\$	FISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANI	534
6600	F4	RS	L T B	\$	GAMFIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	547
6600	F4	RS	L T B	\$	CGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	298
6600	F4	PS P	A	\$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	376
6600	F4	RS P	A	\$	BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	524
6600	F4	RS P	A	\$	CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	531

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6600	F4	RS P	A \$ GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	470
6600	F4	RS P	A \$ MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	535
6600	F4	RS P	A \$ RAMP1, REICH-MOCRF RESOLVED REGION X-SECTIONS	BNL	492
6600	F4	RS P	A \$ SICPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	377
6600	F4	RS P	A \$ THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	504
6600	F4	RS P	D \$ CINDER, MO102, POINT DEPLETION FISSION PRODUCT	BAPL	313
6600	F4	RS P	D \$ NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	UEC	146
6600	F4	RS P	D \$ POWERCC, NUCLEAR STATION ELECTRICITY COSTS	UEC	340
6600	F4	RS P	D \$ WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	224
6600	F4	RS P	F \$ RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	352
6600	F4	RS P	F \$ STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	389
6600	F4	RS P	H \$ RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	382
6600	F4	RS P	I \$ STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	337
6600	F4	RS P	I \$ STRIPE, FUEL ROD CLAD STRAIN & PELLETT CRACKING	BAPL	570
6600	F4	RS P	I \$ TCB1, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	604
6600	F4	RS P	I \$ TUBE, L-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	378
6600	F4	RS P	L \$ GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	530
6600	F4	RS P	N \$ DAC1, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	455
6600	F4	RS P	N \$ HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	434
6600	F4	RS P	N \$ LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	409
6600	F4	RS P	D \$ DYN01, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	464
6600	F4	RS P	P \$ BH99, EXTREME VALUE DISTRIBUTION DATA ANALYSIS	BAPL	621
6600	F4	RS P	P \$ ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	601
6600	F4	RS P	P \$ FOPSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	CRNL	514
6600	F4	RS P	P \$ MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	446
6600	F4	RS P	P \$ PLCTR, 2D CONTOUR PLOTS & AREA CALCULATION	SLA	578
6600	F4	RS P	P \$ REL01, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	497
6600	F4	RS P	P \$ ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	444
6600	F4	RS P	V \$ FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	577
6600	F4	RS P	T A \$ JPIXR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	506
6600	F4	RS P	T A \$ PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	507
6600	F4	RS P	T A \$ PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	KAPL	359
6600	F4	RS P	T A \$ SUMCR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	399
6600	F4	RS P	T A \$ TCR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	360
6600	F4	RS P	T B \$ EPCCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	461
6600	F4	RS P	T B \$ ETCM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	436
6600	F4	RS P	T B \$ GLEN, GROUP CONSTANT CALC FROM TOP OUTPUT DATA	LASL	361
6600	F4	RS P	T C \$ BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	398
6600	F4	RS P	T C \$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	209
6600	F4	RS P	T C \$ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CE	156
6600	F4	RS P	T C \$ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	608
6600	F4	RS P	T C \$ VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	212
6600	F4	RS P	T C \$ 3DCT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-2	LASL	463
6600	F4	RS P	T D \$ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	354
6600	F4	RS P	T D \$ PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL	454
6600	F4	RS P	T D \$ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	325
6600	F4	RS P	T D \$ 3DXT,DEP3, 3-D XEACN TRANSIENT & DEPLETION	KAPL	477
6600	F4	RS P	T E \$ ANCCN, SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	486
6600	F4	RS P	T F \$ NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	405
6600	F4	RS P	T F \$ NCWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	371
6600	F4	RS P	T F \$ SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	400
6600	F4	RS P	T F \$ TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	338
6600	F4	RS P	T F \$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	274
6600	F4	RS P	T G \$ FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	295
6600	F4	RS P	T G \$ FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	448
6600	F4	RS P	T G \$ M0555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	284
6600	F4	RS P	T G \$ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	369
6600	F4	RS P	T H \$ CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	473
6600	F4	RS P	T H \$ FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY	BAPL	272
6600	F4	RS P	T H \$ FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	331
6600	F4	RS P	T H \$ GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	424
6600	F4	RS P	T H \$ HAFMAT, SYSTEM STEADY-STATE FLOW DISTRIBUTION	KAPL	616
6600	F4	RS P	T H \$ HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	286
6600	F4	RS P	T H \$ MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	256

6600	F4	RS P	T H	\$	MOF59, FCH, STEAM TABLES 14.5-2538 PSIA	BAPL	294
6600	F4	RS P	T H	\$	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	348
6600	F4	RS P	T H	\$	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	396
6600	F4	RS P	T I	\$	BUE11, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	468
6600	F4	RS P	T I	\$	BUSFL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	481
6600	F4	RS P	T I	\$	CYCPOS, OXIDE FUEL POD STRESS & DEFORMATION	BAPL	449
6600	F4	RS P	T I	\$	FUCIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	537
6600	F4	RS P	T I	\$	MU266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	383
6600	F4	RS P	T I	\$	MJ457, PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	329
6600	F4	RS P	T I	\$	MC552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	283
6600	F4	RS P	T I	\$	PELEN, FUEL PELLET TEMPERATURE & DEFORMATION	BAPL	598
6600	F4	RS P	T I	\$	SAFF-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	BNL	252
6600	F4	RS P	T I	\$	SEALSHL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	282
6600	F4	RS P	T I	\$	SLADE-C, DYNAMIC ANALYSIS OF THIN SHELLS	SLA	581
6600	F4	RS P	T J	\$	MJ756, LFTC, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	343
6600	F4	RS P	T L	\$	BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	373
6600	F4	RS P	T L	\$	QWESH, RENUM, SELF-ORGANIZING MESH GENERATION	SLA	612
6600	F4	RS P	T M	\$	EDITOR, FNDF/B TAPE PROCESSING AND EDITING	CRNL	502
6600	F4	RS P	T M	\$	SPLDG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	557
6600	F4	RS P	T C	\$	BFTY, ENTRAINED PARTICLES SAMPLING STUDY	BAPL	545
6600	F4	RS P	T Q	\$	JITEP, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	394
6600	F4	RS P	T O	\$	REFUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	425
6600	F4	RS P	T P	\$	DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	327
6600	F4	RS P	T P	\$	MO661, MO657, MO626, POLYNOMIAL CURVE FITTING	BAPL	411
6600	F4	RS P	T Q	\$	GPLUP2, GROUP THEORY OF LATTICE DYNAMICS	LASL	620
6600	F4	RS P X	I	\$	FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	404
6600	F4	RS P X	T P	\$	DE/STEP, INTRP, SOLN OF ORDINARY DIFF EQUATIONS	SLA	641
6600	F4	RS P X	T P	\$	FUNPACK, SPECIAL FUNCTION ROUTINES-EI, K, F,	ANL	610
6600	F4	RS PL	T B	\$	ETCG1, FNDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPC	437
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	BAPL	275
6600B	F+ASC	R	T L	\$	DATATRA 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL	406
6600B	F+ASC	R	T P	\$	DATATRA UTILITY MODULES, 2-D & 3-D PLOTTING	KAPL	407
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	275
6600B	F+ASC	RS P	T J	\$	SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	BAPL	462
6600B	F+ASC	RSB X	T M	\$	TICIP2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	403
6600B	F+COM	R	T M	\$	DATATRA, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	386
6600B	F+COM	RS	T P	\$	LASLIB, LOS ALAMOS SUBROUTINE LIBRARY ROUTINES	LASL	633
6600B	FTN	RS P	T P	\$	SETS, SET EQUATION TRANSFORMATION SYSTEM	SLA	623
6600B	F4	PS	T M	\$	CHECKER, CRECT, CAMMET, PLOTFB, ... ENDF/P V1 PROC	BNL	384
6600B	F4	RS	T M	\$	CPECT, 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	P	\$	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	592
6600B	F4	RS P	T A	\$	RESFND, ADLEP, ENDF/B RESONANCE XSECTION CODES	BNL	465
6600B	F4	RS P	T I	\$	MANF1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	412
6600B	F4	RS P	T I	\$	SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	282
6600C	F+ASC	RS P	T D	\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	275
6600C	F+COM	RS	T P	\$	MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE3.2	CDC	478
6600C	F4	RS P	T H	\$	CORRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	432
6600C	F4	RS P	T I	\$	SCR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	80
6600D	F+ASC	R B	T D	\$	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BCS	275
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
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 ORDINATE PROGRAM	LASL	209
7030	F4	PS P	T D	\$	DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	LASL	269
7040	F+MAP	RS P	A	\$	COMBCC, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCC	203
7040	F4	RS P	T C	\$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCC	148
7044	F+MAP	RS P	T B	\$	GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	219
7044	F+MAP	RS P	T D	\$	OPLS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	220
7044	F+MAP	RS P	T H	\$	BLCCST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	200
7044	F+MAP	RS P	T H	\$	TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCC	349
7044	F+MAP	RSBP	M	\$	UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	206

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7044	F+MAP	RSBP	T C	\$ GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	222
7044	F+SPS	RSBP	T N	\$ CROSSPLCT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	207
7044	F4	RS	J	\$ CORE, CORE CONFIGURATION FUEL TEMPERATURE CCDE	GGA	233
7044	F4	RS	X T G	\$ PRECON, HTGR CONTAINMENT PRESSURE PCST 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
7044	F4	RS P	T C	\$ GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	225
7044	F4	RS P	T C	\$ TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF 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	\$ REVISED-GAD, FUEL CYCLE ANALYSIS W/REFUELING	GGA	223
7044	F4	RS P	T D	\$ STNGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	227
7044	F4	RS P	T G	\$ ELBCW, 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	PS	C	\$ FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LLL	7
7090	F+FAF	RS	T I	\$ 4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	100
7090	F+FAF	RS L	T B	\$ QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	119
7090	F+FAF	RS L	T C	\$ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	120
7090	F+FAF	RS L	T C	\$ ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	118
7090	F+FAF	RS P	I	\$ WIREX, COMPUTER-PRODUCED WIRING LISTS LITREX	LASL	315
7090	F+FAF	RS P	T B	\$ SCHEIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LLL	160
7090	F+FAF	RS P	T C	\$ EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	156
7090	F+FAF	RS P	T D	\$ ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CCDE	ORNL	240
7090	F+FAF	RS P	T L	\$ OPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	234
7090	F+FAF	RS P	T M	\$ DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	236
7090	F+FAF	RS PL	T B	\$ GAMTEC2, MULTI-GP CONSTANT CALC J TO 10 MEV	BNW	185
7090	F+FAF	RS PL	T B	\$ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	50
7090	F+FAF	RS PL	T C	\$ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	29
7090	F+FAF	RSB	T A	\$ TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	42
7090	F+FAF	RSB	T A	\$ ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	41
7090	F+FAF	RSBP	T D	\$ DCR, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	99
7090	F+FAF	RSBPL	T C	\$ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	103
7090	F+FAF	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 G	\$ SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	422
7090	FLCCO	RS P	P	\$ MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	202
7090	FLCCO	RS P	R	\$ ZCT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	113
7090	FLCCO	RSBP	C	\$ 2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	18
7090	FLCCO	RSBP	T C	\$ GE-FAPC-S13, 1-D MULTI-GP DCUBIE SN APPROX	BNW	75
7090	F2	RS	A	\$ LYMAN, WOODS-SAXON POTENTIAL SHAPE CALCULATION	ORNL	381
7090	F2	RS	R	\$ DANCOFF JP, MODERATOR SPACE CHORD DIST FUNCT	AEG	150
7090	F2	RS	R	\$ S4 CYL CELL CCDE, 1-D 1-GP S4 APPROXIMATION	AI	53
7090	F2	RS	C	\$ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	30
7090	F2	RS	E	\$ AIREKS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	121
7090	F2	RS	F	\$ SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	122
7090	F2	RS	I	\$ CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	112
7090	F2	RS	I	\$ FUCUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	48
7090	F2	RS	I	\$ SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	114
7090	F2	RS	J	\$ FARSEIA, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	91
7090	F2	RS	J	\$ MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	AI	142
7090	F2	RS	J	\$ SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	AI	110
7090	F2	RS	J	\$ SCAR1, SCATTER FROM A RING SNAP GEOMETRY	AI	111
7090	F2	RS	N	\$ WFD, W-DSN OUTPUT TAPE FOIT REACTION RATES	UK-w	133
7090	F2	RS	T A	\$ SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA	56
7090	F2	RS L	T D	\$ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	58
7090	F2	RS P	B	\$ PAM, S4 CYL CELL CCDE AND TEMPEST COMBINATION	AI	108
7090	F2	RS P	R	\$ BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	237
7090	F2	RS P	B	\$ SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	52
7090	F2	RS P	C	\$ MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCC	59

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7090	F2	RS P	D \$ AIMFIRE, URANIUM FUEL CYCLE CCST ANALYSIS	AI	55
7090	F2	RS P	F \$ CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LLL	129
7090	F2	RS P	G \$ CLOUD, GAMMA-RAY DCSE RATE FROM A CLOUD	AI	47
7090	F2	RS P	J \$ GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	45
7090	F2	RS P	J \$ GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	46
7090	F2	RS P	J \$ RATRAP, DCSE RATE CALCULATION SNAP GEOMETRY	AI	141
7090	F2	RS P	O \$ CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	154
7090	F2	RS P	P \$ FPANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	324
7090	F2	RS P	T B \$ AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	243
7090	F2	RS P	T C \$ EQLIPCE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	39
7090	F2	RS P	T C \$ EQLIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	87
7090	F2	RS P	T C \$ FCC, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	28
7090	F2	RS P	T C \$ TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCC	148
7090	F2	RS P	T C \$ W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	132
7090	F2	RS P	T C \$ WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	32
7090	F2	RS P	T C \$ ZOGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	40
7090	F2	RS PL	T A \$ APRES2, RESONANCE INTEGRAL X-SECTION CALC	AI	89
7090	F2	RS PL	T B \$ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	51
7090	F2	RS PLX	T B \$ GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GCA	33
7090	F2	RS PLX	T C \$ DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	151
7090	F2	RSB	F \$ HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	153
7090	F2	RSB	T D \$ FFVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	117
7090	F2	RSBP	D \$ ISCKLACH, REACTION DECAY CHAIN ANALYSIS	ORNL	180
7090	F2	RSBP	D \$ NUCY, SOLUTION OF NUCLEIDE CHAIN EQUATIONS	ORNL	134
7090	F2	RSBP	J \$ LIPRECAN1, MC NEUTRON PENETRATION CALCULATION	DAC	123
7090	F2	RSBPL	T J \$ MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	143
7090	F4	RS P	T F \$ NCISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	488
7090	F4	RSBP	A \$ MUFFLE, FISSILE NUCLEIDE X-SECTION EVALUATION	ORNL	323
7090	MAD	RSB	O \$ BURP1, DETECTOR EFFICIENCY POINT SOURCE	MTS	164
7090	MAD	RSB	O \$ BURP2, DETECTOR EFFICIENCY DISK SOURCE	MTS	165
7090	MAD	RSB	O \$ BURP3, DETECTOR EFFICIENCY POINT SOURCE	MTS	166
7090	MAD	RSB	O \$ BURP4, GAMMA-RAY PHOTOFRACTION SOLID CRYSTAL	MTS	169
7090	MAD	RSB	O \$ BURP5, GAMMA-RAY PHOTOFRACTION WELL CRYSTAL	MTS	170
7094	F+FAP	RS L	T M \$ MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	154
7094	F+FAP	RS P	J \$ SHCE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	197
7094	F+FAP	RS P	T B \$ EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	NED	201
7094	F+FAP	RS P	T G \$ AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	172
7094	F+FAP	RS P	T H \$ HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	AI	198
7094	F+FAP	RS PL	T B \$ AILMDF, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	147
7094	F+FAP	RS PL	T B \$ GRAVC, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	162
7094	F+FAP	RS PL	T B \$ TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	149
7094	F+FAP	RS PL	T G \$ CUPIE, DCSE, THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	196
7094	F+FAP	RS PL	T M \$ ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LLL	351
7094	F+FAP	RSBPL	T N \$ CPS, SC4020 PLOTS FROM SCISPS X-SECTION TAPES	WANL	239
7094	F+MAP	RS P	A \$ CHAD, LEGENDRE COEF CALC FOR ANNUAL DIST DATA	AI	215
7094	F+MAP	RS P	T B \$ GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS	LEF	219
7094	F+MAP	RS P	T F \$ AIPCS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	163
7094	F+MAP	RS P	T F \$ TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	309
7094	F+MAP	RS PLX	T A \$ TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	208
7094	F+MAP	RS PLX	T B \$ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAPC	249
7094	F+MAP	RSBP	T G \$ SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LGFT	KE	200
7094	FAP	RS P	T H \$ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	242
7094	F2	RS P	A \$ EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS	WANL	238
7094	F2	RS P	F \$ WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	145
7094	F2	RS P	H \$ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	246
7094	F2	RS P	P \$ EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LLL	321
7094	F2	RS P	T A \$ 2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	254
7094	F2	RS P	T G \$ TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	AI	268
7094	F2	RS PL	T I \$ CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	244
7094	F2	RSBP	H \$ AXFLU, HEAT TRANSFER MULTIFUEL TUBE BUNDLES	LASL	182
7094	F2	RSBP	H \$ AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	183
7094	F2	RSBP	T H \$ PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	155
7094	F4	RS	E \$ RIJ2, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	168
7094	F4	RS	T P \$ LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	62

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7094	F4	RS P	A \$ AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	376
7094	F4	RS P	F \$ MAPS, 2-D EXCURSION CALCULATION R-Z GEOMETRY	APDA	293
7094	F4	RS P X T C	\$ VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	264
71-11),	ENDF/B	THERMAL	SCATTERING DATA DP 3608 F4 RS P XCT A \$ FLANGE2(		368
7600	F4	RS P	T B \$ ETCG3, ENDF/B TO MUFT, GAM, ANIS X-SEC FORMAT WAPD		538
7600	F4	RS P	T B \$ ETC2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPD	509
7600	F4	RS P	T B \$ ETC3, ENDF/B V3 DATA TO THERMAL LIBRARY FORM WAPD		628
7600	F4	RS P	T C \$ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM LASL		608
7600	F4	RS P	T G \$ CEBUG, STEAM GENERATOR SODIUM-WATER REACTION	CEND	548
7600	F4	RS PLX	T C \$ VIN1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	511
7600B	F4	RS	T P \$ MODEL, MODIFIED BETTIS ENVIRONMENTAL LIB SCOPE2.0 CEND		478
7600D	F4	RS P	T C \$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	358
99-GP	DLC-2B	LIBRARY	GROUP COLLAPSING APRF 6600 F4 RS B \$ APRFX1,		466

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