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NUCLEAR POWER ENGINEERING DEPARTMENT

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STATUS REPORT
SM-1 IN-CORE FLOW
AND
TEMPERATURE MEASUREMENTS (TASK XIV)

By

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Approved by

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ABSTRACT

This report is a summary of the present status of a test program to obtain in-core measurements of coolant flow and fuel plate temperature in the SIF-1 reactor. Currently, all engineering, design, fabrication of test equipment, and writing of testing procedures and hazards reports have been completed; and the equipment is ready for installation. Government approval of the work done to date is required before the program can continue.

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1.0 SUMMARY

The following report summarizes the work completed to date on the original Task XIV, SM-1 In-Core Instrumentation Program and discusses the future work to be completed along with ultimate goals of the program.

2.0 OBJECTIVES

The objectives of Task XIV in-core instrumentation are: (1) to correlate SM-1 Core II actual coolant flow measurements and fuel-plate temperature measurements with design values, 2) to measure the core thermal and hydraulic performance under the effects of local boiling, and 3) to measure the thermal and hydraulic performance of the core elements during load transients and loss of coolant flow conditions. These objectives are to be met by a series of five tests. The following is a brief description of each test as presently written.

TP-600, LOSS OF FLOW ACCIDENT

The inherent safety of the reactor resulting from its ability to respond to a loss-of-pump and low-flow scram malfunction is demonstrated by this test. This test is performed by stopping the pump with a time delay inserted in the low-flow scram circuit. The reactor is operating at full power at the time the pump is de-energized.

TP-601, LOAD TRANSIENT TESTS

Test 601 is to measure the response of the primary system to abrupt changes in load. This is accomplished by removing design load from the reactor instantaneously and, at the same time, recording temperatures, pressures, and water levels in the primary system by means of Task XII and XIV instrumentation. A second run is made when design load is applied as rapidly as possible.

TP-605-I LOCAL BOILING BY REDUCTION IN SYSTEM PRESSURE

Local boiling is introduced in the SM-1 reactor by operating the reactor at design load and temperatures while decreasing the system pressure in 50 psi increments to a minimum of 800 psi. System parameters are measured at steady state and during partial load changes.

TP-605-II LOCAL BOILING BY REDUCTION OF FLOW

Local boiling is introduced into the specially instrumented control rod by throttling the flow in this rod. The remainder of the core is virtually unaffected. Measurements of parameters are again taken during steady-state and transient conditions.

3.0 DISCUSSION

In March 1961, Alco was asked several questions by New York Operations Office regarding the value of the program, the ability of the test equipment to meet the test objectives, the hazards involved, and the consequences of fuel element failure. The following are several of these questions and their answers as presented in a letter dated May 8, 1961, from Alco to Mr. I. M. Adler, New York Operations Office.

Question 1 - How does this project support the objectives of the PWR Support Program? What tests are to be run using this subassembly? How is the data to be used and why can it be obtained only through this project?

Answer - This project supports the objectives of the PWR Support Program by supplying in-core measurements of fuel element temperatures, coolant temperatures, and coolant velocities. The presence of these measuring instruments in the core means that PWR Program Tasks can be executed with increased confidence and value. The basic information expected to be gained through the installation of Task XIV and the tests to be performed are as follows:

- 1) The tests given provide in-core measurement of fuel plate temperatures, coolant temperatures, and velocities.
- 2) They demonstrate the feasibility of the Task XIV test technique as a means for instrumenting cores of other reactors.
- 3) They correlate SM-1 flow distribution with the design and with the air rig approach previously used.
- 4) They measure fuel-plate temperatures, coolant temperatures, and flow velocities during loss of pump power during decay-heat removal and during load transients.
- 5) They measure fuel-plate temperatures, coolant-temperatures and flow velocities during reduced pressure operation.
- 6) They provide means for reducing flow to the extent of safely inducing boiling, through an instrumented control-rod element to permit investigation of reduced-flow performance.

The tests summarized in Items 4, 5 and 6 above are of major importance to the accomplishment of the goals of the PWR Support Program.

A few examples of how this data will be used are as follows:

- 1) The measurement of fuel plate temperatures, coolant temperatures and flow velocities during reduced pressure operation will be used as a guide to establish the feasible limits of reduced pressure operation at SM-1.
- 2) The data obtained by measurements of reduced flow performance of the instrumented control-rod element will make possible the establishment of the lower limits of flow for SM-1 type cores.
- 3) The measurement of fuel-plate temperatures, coolant temperatures, and flow velocities during loss of pump, during decay-heat removal and load transients provide invaluable data towards the accurate definition of core thermal safety during such conditions. It is believed that this data on SM-1 type assemblies can only be gained through installation of Task XIV in the SM-1 Core II. There is in existence, only the SPERT III Core with characteristics anywhere near similar to those of the SM-1 type cores. The SPERT III core will be used principally for reactor excursion measurements, yet will not provide the basic information available through installation of Task XIV.

Question 2 - From an error analysis of the subassembly as now designed, how does the accuracy of the experimental data compare with that of calculated values and, if appropriate, what is the effect of this level of experimental error on the objectives of Task XIV?

Answer - The accuracy of the experimental measurement of fuel plate temperature is discussed in APAE Memo No. 276, "SM-1 Research and Development Quarterly Report," April 1 to June 30th, 1960. This reference shows that the accumulated errors inherent in measurement of the surface temperature of the instrumented plate are plus or minus 8 degrees F. The errors associated with the measurement of the bulk coolant temperature rise in the various channels should be less than this figure. The error associated with measurement of fuel element channel and element velocity should be based on laboratory experience, within plus or minus 5%. This figure is with a partially calibrated system. In the absence of mass flow calibration, an additional plus or minus 5% allowance is required by considerations involving velocity profile assumption across a flow passage. A comparison of the accuracy of the experimental measurements with that of the calculated flows can be seen by comparing the calculated plate-surface temperature for the hottest fuel plate in core position 47. In APAE Memo 273, "Summary of Reactor Design Information from 3 Years Operation of a Small PWR", the calculated surface temperature in both the hot and the nominal channel in core position 47 is presented in Figs. 10 and 11. Attached is a reproduction of these two figures showing the variation in plate-surface temperatures for the hottest plate in position 47 for both the nominal and hot channel. For illustration purposes, the axial location of the fuel plate thermocouples in Task XIV is shown. Also shown on these points are the errors associated with the measurement. It should be noted that the errors are maximum at the position of axial, maximum, power generation and are less in regions of lower power generation. Reference to the attached figure 1 indicates the difference between the calculated surface temperature in the nominal and hot channel is approximately 25 degrees. It is seen by reference to the indicated experimental measurements and their uncertainty that the measurements will increase the definition of fuel-plate surface temperature within the core. Also attached ** is a copy of Fig. 4 from WAPD-NRP 89, the technical progress report for the pressurized water reactor project for the period 10/24/60 to 12/23/60. This figure showing both temperatures illustrates the probably nature of the experimental results from Task XIV measurements. It should be noted that the instrumentation installation in the PWR had the benefit of the extensive Naval reactor experience in in-core instrumentation.

An indication of the effect of this level of experimental error on the objectives and uses of Task XIV is spelled out in the answer to Question 1 above as expanded in the following discussion:

a) Measurements of fuel-plate temperatures, coolant temperatures, and flow velocities during reduced pressure operation will be used as guides to establish feasible limits of reduced pressure to operation of SM-1. The errors mentioned above are for absolute measurements as discussed in APAE Memo 276. The errors in measurements of changes in fuel plate temperatures or coolant temperatures are significantly less than those for absolute measurements. To evaluate the effect of reduced pressure, there are significant changes effected in the fuel plate and coolant temperature with reduction in pressure.

* Figure 1 ** Figure 2

APAE Memo 284, "Progress Report, February 1961 SM-1 Research and Development Task and Army PWR Support and Development Program" illustrates in Fig. 4, Page 20, the expected variation in surface temperature with primary system pressure. The large variation expected illustrates that the errors associated with the instrumented element installation will not effect its usefulness in this area.

b) As discussed in the answer to Question 1, the data obtained by measurement of reduced flow performance of the instrumented control-fuel element will permit the establishment of the lowest limits of flow for SM-1 type cores. The changes expected in fuel plate surface temperature in this experiment are of the same order of magnitude as those given in the above answer. Therefore, the inherent errors in Task XIV installation will not effect the usefulness of the data obtained.

c) In the answer to Question 1, the measurement of fuel plate temperatures, coolant temperatures and flow velocities during loss of flow, during decay heat removal, and load transients will provide invaluable data towards the accurate definition of core thermal safety during such conditions. As discussed in APAE Memo No. 251, "SM-1 Research and Development Quarterly Report, October 1 to December 31, 1959" the time constant associated with the temperature measurement in the instrumented plate is 1.4 seconds. This time constant is used to find the elapsed time for thermocouple reading to reach 63.2 percent of a theoretical step increase in meat centerline temperature. For changes which are ramp-like, the effect of this time constant is significantly reduced. Reference to Figures 12, 13, 14, and 15 of APAE Memo 273 indicates that the shortest transient under discussion is that of the pump coast down. This transient is complete in the order of 8 seconds. The times associated with the decay-heat removal and load transients is in the order of minutes; therefore, only in the case of the loss of flow transient will the time lag associated with the blocked channel installation be of any significance. Even in this case, the error associated with the time lag will be small.

Question 3 - What metallurgical, irradiation, and ZPE tests will have been performed on the instrumented fuel element design, prior to its use in the SM-1 core?

Answer: The metallurgical and irradiation information presently available to Alco was summarized in APAE 84, "SM-1 Core II Hazards". The metallurgical development work is given in APAE Memo 301.

Question 4 - How will installation of this subassembly affect SM-1 stuck rod criteria?

Answer: The actual instrumented control-rod fuel element and stationary element were substituted in the SM-1 Core II experiment at the Alco Critical Facility. They were substituted in their correct lattice positions. The measured reactivity difference from substituting the instrumented stationary element (in position 67) for the standard SM-1 Core II stationary element was -8 cents. Substitution of the instrumented control-rod element (in position 33) resulted in a reactivity difference of -3 cents compared to an SM-1 Core II control rod element. These measurements indicate that the core reactivity is slightly decreased by insertion of the two instrumented elements in Core II. Since installation of Task XIV eliminated the absorber in position 33 (rod A) the stuck rod conditions are changed. This is discussed in APAE 79 for Core II without special components. The installation of the special components causes

a large reduction in core reactivity which offsets the loss of the absorber in position A. The results of the measurements are reported in APAE 84 and 85. These measurements show that in Core II with special components and the instrumented elements, any one rod (in addition to A) can be fully withdrawn without criticality. In addition, with control rod B at 19 inches the minimum withdrawal of another rod for criticality is 13 inches (rod 2). As discussed in APAE 79, SM-1 Core I goes critical on A and B out and rod C withdrawn 9.8 inches. Therefore, the stuck-rod condition for A and B fully withdrawn (or at 19 inches), the most probable case is safer for Core II with Task XIV and special components than was Core I.

Under the present schedule, the Task XIV elements will not be inserted until late 1961. At this time, the maximum reactivity to be controlled will be reduced from that at 0 MWYRS. Therefore, the stuck-rod positions will be safer than at core startup. In addition, the stuck rod conditions for SM-1 Core II, with special components installed, will be considerably safer than for SM-1 Core II.

APAE 85 "Experiments and Analysis for SM-1 Core II," issued on April 28, 1961, presents a complete report on the above measurements.

Question 5 - What will be the effect on this project should an element in Core II fail and have to be replaced?

Answer: The most direct answer to this question is based on the primary assumption that all Task XIV experiments and all other experiments utilizing Task XIV instrumented components will be completed in a "period of least probability of element failure." This appears a fair and reasonable assumption since Core II will have experienced a two or three month "shake down" prior to the installation of Task XIV. (After this shake down the probability of failure in the core will be at its minimum. This will occur about October 1961, which is the probable TASK XIV installation period.) From there on, the degree of probable element failure will increase with time. This is one of the apparent reasons for Captain Dowler's instructions that insertion be deferred until after such a shake down period for Core II.

In the event that an element should fail after completion of Task XIV experiments, there would be no serious effect on the program. It would necessitate only an unscheduled transfer removal of the Task XIV core components, which would have served their purpose. The design of Task XIV is such that it allows for disposal of all components. Task XIV components should, if possible, be kept in the reactor until it is determined that they will serve no further purpose. The advantage of early disposal should be kept in mind because it may mean handling pieces with lesser activity due to shorter exposure time.

The above sentence identifies the importance of coordinating all experiments utilizing the Task XIV components, including boiling experiments not part of XIV, to early completion. This will help assure that they will be out of the way in the event that SM-1 should be confronted with a failed Core II element.

Secondary assumptions and their effects are as follows:

Case A: Assume that the failed element is Task XIV's instrumented control-rod element (33) and that failure occurs prior to completion of Task XIV experiments.

The replacement of this element with a standard Core II control rod, so

that the rod would become fully operative again, would follow normal procedures. Such replacement and change over could be made without disturbing or handling any of the other reactor components. This would constitute a partial (approximately 35 percent) loss of original instrumentation for continued running of Task XIV experiments. If any data were accumulated just prior to element failure it would mean that the loss of these instruments would have lesser significance on total test results. If the proposed boiling experiments, not part of XIV, were not completed, they would have to be cancelled; and other plans, made for their running. Again this stresses the importance of running and completion of such experiments as presently indicated.

Replacing element 33 with a new instrumented replacement is questionable (but possible). The instrumented replacement would require a new connector half attached to it which would have to mate with the lower half remaining with the instrument table inside the reactor. The mating halves of the original connector assemblies were made up as matched pairs. Exact dimensional records and possibly face templates will be made of these pieces in case we have to make additional connector halves at a later date.

Case B: Assume that the failed element is Task XIV's Instrumented stationary element (67) and that failure occurs prior to completion of Task XIV experiments.

Replacement of this element with a new instrumented replacement element can be made as explained in "Case A". The replacement element would have a new connector half attached to it that would have to mate with the lower half remaining with the instrument table inside the reactor.

Removal of this element for replacement with an uninstrumented Core II element and continued running of experiments with reduced instrumentation is possible. Proper handling of all components is very important in this case. The instrument connectors will have to be disconnected, the instrumented control rod assembly removed and temporarily stored by hanging against the inside wall of the shield tank. The instrumented table assembly and attached penetrated gasket ring will have to be temporarily removed from the reactor. They will have to be completely removed from the shield tank to allow accessibility for manipulation of core covers and handling of the faulty element. Complete withdrawal of these pieces out of the shield water is on the basis that element failure occurs early and that the duration of radiation exposure of these pieces will be relatively short. The level of activity would have to be low enough to allow withdrawal.

After substituting for the failed element, the Task XIV components would be reinserted into the reactor, less the instrumented element at position 57. Prior to reinsertion, a new set of hollow stainless steel "O" rings will be placed in the accessible connector assembly while the table is up.

Continued running of Task XIV would be with reduced instrumentation (approximately 35 percent less); but, the proposed boiling experiment, not part of Task XIV, could still be run.

discussed in case B above would be required.

If all testing and experiments are completed prior to the discovery of an element failure, then the Task XIV components can be removed and disposed of with no effect on the program objectives.

Question 6: What manpower, skills, and time schedule will be required to install the subassembly? How can the installation program be organized to minimize plant down time?

Answer: Manpower, skills, and time schedule requirements for installing Task XIV subassembly (assumed to mean Task XIV internal reactor components only) are:

- a) A four man team consisting of three trained and competent installation technicians (Alco personnel preferred) plus one supervising Alco engineer (The task engineer or his engineer assistant). The time required for this installation, including closing of the vessel, should be about one week of elapsed time.
- b) Immediately following installation and closing of the vessel, a three man crew consisting of two instrument and one mechanical technician will be required for about one week duration to make instrument tube and lead connections at the top of the shield tank. The purge system check out, instrument check out and calibration, plus final preparation for testing will be made during this period.

4.0 PRESENT STATUS

All necessary test equipment has been purchased and pre-assembled to the maximum extent possible. This equipment is presently in the process of being shipped to the SM-1 site at Fort Belvoir, Virginia. One exception is a set of replacement studs for the pressure-vessel closure. These are at the manufacturer's (Standard Pressed Steel Co., Jenkintown, Pa.) for re-work.

Installation, operation, and test procedures have been written and are contained in AP Note 349, Rev. 1 (1), and APAE 79, Supplement 2 (4). A hazards evaluation of the test program has been made and is contained in APAE 79 (2), APAE 79 Supplement 1 (3) and APAE 79, Supplement 2 (4). None of these instructions or procedures has been approved by the customer to date.

Several technical areas remain unresolved pending Army approval of the tests. These are: 1) a question as to the soundness of the braze fillets in the penetrated gasket sub-assembly. Alco has prepared a report (3) evaluating this problem and concludes that no hazard exists, (2) out-of-core calibration of the flow measuring instrumentation in the fuel elements was deleted from the program due to insufficient funding and should be performed prior to the installation of the test equipment in the reactor and 3) future changes in core loading which increase reactivity will require a re-evaluation of the one stuck rod criteria at the time the equipment is installed.

5.0 FUTURE WORK

Work yet to be done on the program includes; 1) customer approval of test procedures and hazards evaluations, 2) installation of all test equipment, 3) instrument calibration, 4) testing, 5) procurement of shear tool for disassembly and 6) data reduction and reporting. A work plan titled "Task XIV Package" covering the remaining effort has been prepared and was submitted to New York Operations Office in a letter to Mr. Ira M. Adler dated July 27, 1961. It contains a time schedule and manpower requirements for installation and conducting the test program.

Figure 1. Calculated Surface Temperature in Nominal and Hot Channels at Beginning of Core Life

GROUP II RODS AT 21 INCHES
 REACTOR POWER 105% FOUR LOOP FLOW
 AVERAGE TEMPERATURE 500°F, INLET TEMPERATURE 488°F
 MEASUREMENTS TAKEN AT 1800 EQUIVALENT FULL POWER HOURS

FIGURE 2 A COMPARISON OF CALCULATED AND MEASURED SURFACE TEMPERATURES OF PWR SEED FUEL ELEMENTS

6.0 BIBLIOGRAPHY

- 1) Gebhardt, F.G., "SM-1 R and D Task XIV, Temperature and Flow Measurements= Installation Operation, and Test Procedure-Test No. A-610" AP Note 349, Revision 1, November 15, 1961.
- 2) Coombe, J. R. "Hazards Summary Report for the SM-1 Core Temperature and Flow Instrumentation (Task XIV), APAE No. 79, March 30, 1961.
- 3) Coombe, J. R., F. G. Gebhardt, B. James, "Hazards Evaluation of the SM-1 Penetrated Gasket," APAE No. 79, Supplement No. 1, September 8, 1961.
- 4) Bradley, P. L., J. R. Coombe "Hazards Report for SM-1 Core Temperature and Flow Instrumentation (Task XIV) Covering Special Test Procedures, "APAE No. 79 Supplement 2, February 28, 1962.
- 5) Richards, W.M.S. "Design Analysis for Flow and Temperature Measurement Program-Task V", APAE No. 37, September 26, 1958.
- 6) Gebhardt, F.G. "SM-1 Reactor Vessel Penetrated Gasket Design and Test Report, Revision 1" APAE Memo No. 254, January 9, 1961.
- 7) Brown, W.S. and M.H. Dixon "Work Program-Engineering Support and Development of Army Pressurized Water Reactor Power Plants", AP Note 378, September 6, 1961.
- 8) Battelle Memorial Institute, "Process Development for Making SM-1 Instrumented Fuel Plates by Gas-Pressure Bonding", APAE Memo No. 301 October 31, 1961.

7.0 APPENDIX - PARTS LISTS

The following are parts lists itemizing all equipment and material necessary for the installation and performance of this test program with the exception of those items available at Fort Belvoir or supplied as a part of another test program (Task XII). A copy of each of the following parts lists is included in this Appendix.

<u>Parts List No.</u>	<u>Description</u>
103 B	Fuel Element Assembly, (Control Rod)
105	Half Bridge Circuit
106 B	Fuel Element, Stationary
112	Instrument Table Assembly
127	Connector Assembly
135	Control Rod Assembly
146	Sling, Instrumented Table
156	Instrumentation, Stationary Fuel Element
157	Instrumentation, Control Rod
173	Purge System, Piping and Control System
174	Purge System, Electrical Schematic
175	Thermocouple Reference Junction Installation and Shield Tank Penetration
176	Transducer Panel Installation in Vapor Container
177-182	Vapor Container Penetrations Handling Equipment

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 103 B
SHEET 1 OF 1
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10-IPER
CONTRACT #AT(30-3)326

GENERAL ORDER 690783 PAGE 10

NUMBER OF UNITS NA WRITTEN BY EWL DATE 5/26/60 CHECKED BY ECP DATE 5/26/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	2			Fuel Element Assy	D9 50 1137-2	B	Option B	Consisting of	Sheet 1 and 2 Instruction on Page 9 & 9 A	
3	4	2		Fuel Plate End	B9 50 2354				Clad Type 304 L SS Frame Type 304 L SS	Core as specified except minimum length to be 21"
4	1	5		Extension Plate	B9 50 2405-3				Type 304 st. stl. annealed	
5	4	7		Side Plate	B9 50 2357	A			Type 304 st. stl. low	
6	4	8		Side Plate	B9 50 2428				Cobalt annealed	
7	8	9		Clips	B9 50 2356-4	A			St.Stl. type 304 L	
8	2	10		Handle Assy	A9 50 1162		Consisting of lines	9 & 10	Low Cobalt Annealed	
9	4	1		Sides	A9 50 2405-2	A			Type 304 SS Annealed	
10	2	2		Top	A9 50 2405-1	A			" " SS "	
11	4	11		Support	B9 50 2356-3	A			" " SS "	
12	2	12		Pin					" " SS "	3/8" Dia. x 2 5/32
13	8	13		Guide	B9 50 2356-2	A			" " SS "	
14	4	14		Guide					St.Stl. Type 304 Annealed	5/64 x 3/8 x 5/8
15	8	15		Guide					St.Stl. Type 304 Annealed	1/32" x 3/8 x 5/8
16	18	17		Fuel Plate - Short	B9 50 2355				Clad Type 304 L St.Stl. Frame Type	Core as specified except minimum length to be 21"
17	2	18		Comb. Lower	D9 50 2402-2	A			304 SS-Low Cobalt Annealed	
18	4	19		Fuel Plate	D9 50 2353-2	B			St. Stl. Type 304 L	
19	4	20		Side Plate	D9 50 2352-2	B			Low Cobalt Annealed	
20	2	21		Comb. Upper	D9 50 2352-4	B			Clad Type 304 L SS-Frame Type	
21	4	22		Fuel Plate	B9 50 2413				304 L SS Low Cobalt Annealed	

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	6/6/60	2	1	Line 1 Rev.A added ECO #0162	6/28/60	3,16,21	3	was included spares
	6/6/60	17	1	was dwg. C9-50-2402-2 ECO #0162		2	3	added & 9A
	6/6/60	2,6	2	Line 2 was Rev.A, Line 6 dwg.B9-50-2428 added ECO #0175	6/30/60		3	PP added 4,5,6,7,8,11,12,13,14,15,17,18,19,20
	6/6/60	5,19, 20	2	Rev. A added ECO #0175	8/2/60		4	Line 2 Rev.C added, Line 7,9,10,11,13,18 Rev.A added.
	6/28/60	2,4,15,17	3	Doubled the Qty.	9/1/60	2	5	Rev D Added ECO 0217
		20			9/26/60	18	6	Rev.B Added ECO 0240

Rework

Fabrication

ECO 0217

ECO 0240

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 105
SHEET 1 OF 1
PROJECT NUMBER SMI - Task XIV
JOB NUMBER AE-10
CONTRACT AT(30-3)-326

NUMBER OF UNITS NA WRITTEN BY EWE DATE 9/20/60 CHECKED BY FCP DATE 9/23/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	18			For Task XIV (Includes) Half Bridge Circuit (3 spares)	B9 51 1116		Consisting of this page Instructions Page 44			
3	18	1		(includes 3 spares) Trimpot Potentiometer			Bourns Model 200S	Allied Radio # 31 MM 383		100 OHMS
4	18	2		(includes 3 spares) Metal Utility Cabinet			Bud Metal Products AU 1083	88 P 543		
5	19	3		Connectors (includes 4 spare)			Cannon MSE 3102E-14S-6S	32 H 159		
6	18	4		Connectors (includes 3 spares)			Cannon MSE 3106E-14S-6P	32 H 096		
7	36	5		(includes 6 spares) Resistor (wire wound)			Ohmite 5W Brown Devil	1MM 730		700 OHMS
8	4	6		(each makes 5, total 20) Terminal Board (includes 5 spares)			Cambridge X 1401 B	72 H 410		
9	19	7		Connector (includes 4 spare)			Cannon MSE 3102E-14S-6P	32 H 158		
10	18	8		Connector (includes 3 spares)			Cannon MSE 3106E-14S-6S	32 H 097		
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										

REVISIONS	DATE	LINE	REV.	WAS	ECO	DATE	LINE	REV.	WAS
	10/19/60	2	1	Added Includes 3 Spares	ECO 0248				
		3,4,6,7,10	1	Note includes spares added	" "				
		5	1	Was includes 1 Spare	" "				
		8	1	" " 2 Spares	" "				
		9	1	" " 1 Spare	" "				

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 106 B Rev.2
SHEET 1 OF 1
PROJECT NUMBER XIV - SM-1
JOB NUMBER AE - 10 - IPER
CONTRACT AT(30-3)-326

GENERAL ORDER 690783 PAGE 13

NUMBER OF UNITS NA WRITTEN BY EWE DATE 5/16/60 CHECKED BY RCP DATE 5/26/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	2			Fuel Element, Stationary (includes 1 spare)	R9 50 1129-2	D	(Option B) Consisting of Sheet 1	Instructions on Page 12, 12A & 12B		
3	3	1		End Box (Outlet)	C9 13 2079	Ref C	Fabricate to Sylcor	Dwg.C-31116	St.Stl. Casting 304 L Low Cobalt Desired Annealed	
4	4	2		Side, Fuel Plate	D9 13 2007	B			Clad Type 304 L St.Stl. Frame Type 304 L St.Stl. Core as specified	
5	4	3		Channel Block Fuel Plates (Stationary)	C9 50 2340-2	B			Clad Type 304 L St.Stl. Frame Type 304 L St.Stl. Low Cobalt Annealed Core as specified	Rework
6	26	5		Fuel Plate	A9 13 2010		See D9-13-2007 Rev.B		Clad Type 304 L St.Stl. Frame Type 304 L St.Stl. Core as Specified	
7	4	7		Side Plates & Comb (includes 1 spare)	D9 50 2339-2	B A			St.Stl. Type 304 L Low Cobalt Annealed	Fabrication
8	3	9		End Box Inlet	C9 50 2401	Ref A	Fabricate to Sylcor	Dwg.C-31115	St.Stl. Casting Type 304 L Low Cobalt. Desired Annealed	
9	4	10		Side Plate & Comb (includes 1 spare)	D9 50 2339-4	B A			St.Stl. Type 304 L Low Cobalt Annealed	
10	3	11		Dowels	A9 13 2024	A			St.Stl. 304 L Low Cobalt Annealed	
11										
12										
13										
14										
15	Cross Reference: For Instrumentation of Line(2), to drawing D9-50-1208, see Parts List #156 sheet 1 of 1(GO Page 33)									
16										
17										
18										
19										
20										
21										

REVISIONS	WAS				DATE				WAS Data			
	DATE	LINE	REV.		DATE	LINE	REV.		DATE	LINE	REV.	
	5/16/60	3	1	added Rev. A to drg.	ECO #0140	6/27/60	2, 5, 7 & 9	4	Doubled the Quantity	6/30/60	2	5
	6/9/60	top of Sht 2	2	was Parts List #106 (addition of "B" designates Option B)		"	3, 8, 10	4	was "Includes 2 Spares"	6/30/60	7 & 9	5
	6/9/60	2	2	Rev. "A" added	ECO #0184	"	6	4	was "Includes 13 Spares"	6/30/60	3 & 8	5
	6/14/60	3	3	was C9-13-2079 Rev. A; added fabricate to Sylcor Dwg.C-31116		"	4	4	was "Includes 2 Spares"	9/20/60	2	6
		8	3	was C9-50-2401 added fabricate to Sylcor Dwg.C-31115		"	5, 7 & 9	4	PP added	"	"	6

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 112

GENERAL ORDER 690783 Page 17

SHEET 1 OF 5

PROJECT NUMBER SM-1 Task XIV

JOB NUMBER AE-10-IPER

CONTRACT # AT(30-3)326

NUMBER OF UNITS 1 WRITTEN BY EWE DATE 5/27/60 CHECKED BY F.C.P. DATE 6/2/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.			REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
											TYPE	SIZE
1												
2	1			Instrument Table Assy.	R9	50	1111	E	Consisting of Sheet 1 Thru 5	Instructions on Page 16		
3	1	1		Table Top Assy.	D9	50	1113	B	Consisting of lines 4,7 thru 10			
4	1	1		Top							Stainless Steel 304 L Annealed	1/4" x 27 3/8" Dia.
5	1	2		Side								3/16" x 3/4" x 85-13/32"
6	7	3		Base								1-3/4" Dia. x 5/8"
7	4	7		Support	A9	50	2479		Consisting of lines 8 & 9		Stainless Steel 304 Annealed	7/8" Dia. x 6" Lg.
8	4	8		Cap Screw Hex. Hd.							Stainless Steel 304 L Annealed	1/2-13 UN2A, 1 1/2" Lg.
9	12	9		Nut							Stainless Steel Type 304	3/8" #16. UNC
10	3	10		U Bolt	A9	50	2478				St.Stl. Type 304 annealed	3/8" Dia. x 11" Lg.
11	4	6		Pedestal								1/8" x 7/8" x 2/8"
12	4	2		Gasket Support	G9	50	2328-1				St.Stl. Type 304 annealed	1/8" Dia. x 21" Lg.
13	4	3		Pilot Tube	G9	50	2328-3				" " " " "	2" Dia. Sch 80 x 18 3/8" Lg.
14	4	4		Bar							St.Stl. Type 304 Cold Drawn	1/4" Dia. x 2 1/2" Lg.
15	8	5		Nut, Hex							St.Stl. Type 303	#5 - 40
16	4	6		Nut	G9	50	2328-4				St.Stl. Type 304 annealed	3/9/16" x 3 11/16" x 1 1/4" Lg.
17	4	7		Bolt	G9	50	2328-5				" " " " "	2" Dia. x 3" Lg.
18	4	8		Bar							St.Stl. Type 304	1/2" Dia. x 9/16"
19	7	9		Tube							" " " "	3/4" Dia. (11 ga.) x 15 1/2" Lg.
20	7	10		Tube							" " " "	1/2" Dia. (14 ga.) x 9" Lg.
21	7	11		Tube							" " " " Flat Bar	3/16" Dia. (18 ga) x 6 3/8" Lg.

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	6/21/60	14 & 18	1	was PP	10/5/60	43	3	was Sheet 1 of 2, Line 3 was PP, AF1863 JPS Products, R
	7/6/60	2	2	Rev A added; was lines 4 thru 9	ECO #0196	4-11	3	Line 4,7,10 PM Added; Line 8,9: PP Added; 1 added
	7/6/60		2	Lines 10 thru 19 become 12 thru 21		2,4,5,6	3	Line 2 Rev.C added; line 4 was 3/16; lines 5 & 6 canceled
	7/6/60		2	Added new lines 10 & 11		7,8,9	3	Line 7 was Lifting Lug A -50-1114; Line 8 was Side C9-
	9/27/60	2	3	Rev. B added; was sheet 1 and 2	ECO #0227	10,11	3	Line 10 was Pedestal, line 11 canceled

Continued

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 112
SHEET 2 OF 5 *
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10-IPER
CONTRACT # AT(30-3)326

GENERAL ORDER 690783 Page 18

NUMBER OF UNITS 1 WRITTEN BY EWE DATE 5/27/60 CHECKED BY ECP DATE 6/7/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL
									TYPE SIZE
1	7	12		Swagelok Male Connector			Crawford Fitting Co. 1210-1-16-316		Stainless Steel Type 316 3/4" Tubing Fitting to 1" with Blank Ends
2	7	12		Swagelok Male Connector			Crawford Fitting Co. 1210-1-16-316		Stainless Steel Type 316 3/4" Tubing Fitting to 1" Left Hand Pipe Thread
3	16	13	13	Block Gasket Penetration	A9 50 2407				Stainless Steel Type 304 Vendor to supply Material and Fabrication
4	1	14	14	Gasket, Octagonal Ring	B9 50 2281				Dead Soft Annealed BHN Max. Stainless Steel Type 304
5				Modification of Line 4	to Drawing R9- 50-1111				
6	16	15	15	Stud	C9 50 2320	A			
7									
8	16	16	16	Gasket Tab Assy	A9 50 1193		Consisting of Lines 9 and 10		
9	16		1	Tab	A9 50 2422-2			Annealed	Stainless Steel Type 304 1/8" x 1" x 5 3/16"
10	16		2	Tube	A9 50 2422-1				Stainless Steel Type 304 Tubing 7/8" O.D. x .065 wall x 1"
11	7	17	17	Plug	R9 50 1111	Ref			Stainless Steel Type 304 Bar 3/16" Dia x 3/16" lg.
12	8	18	18	Pitot Static Probe	AES 501	Ref			Stainless Steel Type 304 .130 O.D. x 24" with 2 leads 1/16" O.D. x 10" lg.
13	30	19	19	Swagelok to Air Adapter			Crawford Fitting Co. 200-4-1-316		
14	30	20	20	Swagelok Reducing Union			Crawford Fitting Co. 200-4-1-316		
15	1	21		Control Rod Assy.	R9 50 1176	B	See Part List #135	(Sheet 1)	
16	4	22		Bolt, Pedestal	A9 50 2446				Centerless Ground St. Stl. Type 304 Annealed Round 1-3/4" Dia. x 3"
17	2	23		Connector Assy.	R9 50 1214	A	See Parts List #127	(Sheets 1 & 2)	
18	7	24		Thermocouple Iron Constantan					AL ₂ O ₃ Insulation St. Stl. Sheath Type .0625 OD x .009 x 37" lg.
19	30	25		Tube, Pressure					St. Stl. Type 304 Tubing .065 OD x .009 Wall x 34" lg.
20	4	26		Tube, Purge & Drain					St. Stl. Type 304 Tubing .065 OD x .009 Wall x 34" lg.
21	15	27		Tube					" " " " " .065 OD x .009 Wall x 12" lg.

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	6/21/60	2, 11, 13, 14	1	AP No. added	10/5/60	13	3	Transferred as shown ECO 0238
	6/24/60	8	2	Was PP	10/5/60	15	3	Added Revision A ECO 0238
	"	9 & 10	2	added PM & Purchase Information	10/5/60	19	3	Was static and input ECO 0238
	"	12	2	was .0130 O.D.	10/5/60	18	3	Qty. was 31, length was 3/4 Ft. ECO 0238
	9/27/60	*	3	Added Lines 15 thru 21, * was 2 of 2	10/5/60	14	3	Canceled entire line return to Vendor for full credit

Continued

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 112
SHEET 3 OF 5
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10-IPER
Contract #AT(30-3) 326

NUMBER OF UNITS 1 WRITTEN BY EWE DATE 10/7/60 CHECKED BY FCP DATE 10/10/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	1	28		-Stationary Fuel Ass'y. Element Instrumentation	D9 50 1250	B	Consisting of lines 3, 4, 5, 6 & Pc.#5	on Page 19B line 19		
3	60 In.	1		Hose, (includes 18 in Spare)			American Flexible Type SL Unpacked		St.Stl. Type 302	.432 OD x 5/16" ID
4	1	2		Bracket					St.Stl. Type 304	Strip 1/8" x 5/8" x 1-1/4"
5	1	3		Bracket					St.Stl. Type 304	Strip 1/8" x 5/8" x 1-1/4"
6	1	4		Fuel Element Stationary	R9 50 1129-2	D	(Option B) See Parts List 106B (Sheet 1)			
7	24	29		External Lead { Iron Thermocouple { Constantan	R9 50 1111	Ref			AL ₂ O ₃ Insulation St.Stl. Sheath Type 347	.0625 OD x .34" lg. lg.
8	1	30		Pressure Transducer Valving Manifold #1	C9 50 1263		Consisting of lines 9 thru 20			
9	1	1		Mounting Panel					Aluminum	1/4" x 10" x 3'-7"
10	20	2		Valve, Panel Mounting			Hoke D-334			
11	15	3		Tee, All Tube (Swagelok)			Crawford Fitting Co. 200-3-316			1/8"
12	30	4		Male Conn., Swagelok			Crawford Fitting Co. 200-1-2-316			1/8" Tube x 1/8" Pipe
13	10	5		Male Conn., Swagelok			Crawford Fitting Co. 100-1-2-316			1/16" Tube x 1/8" Pipe
14	4	6		Pressure Transducer			Ultra Dyne Model S-40 RH-0.1-D			
15	10	7		Adapter Swagelok			Crawford Fitting Co. 200-A-4 ANF-316			1/8" Tube x 1/4" AN Tube
16	5	8		Receptacle Box Mounting			Cannon Electric 3102 E 1/4S-6P			
17	5	9		Plug, Straight			Cannon Electric 3106E-1/4S-6S			
18	10 Ft.	10		Tubing					St.Stl. Type 304 Annealed Tubing	1/8" Dia. x .028 Wall, #22 Ga.
19	1	11		Pressure Transducer			Ultradyne Model S-40RH-0.2			
20	20 Ft.	12		Wire					Standard with Flexible Insulation	#24 AWG
21										

REVISIONS	DATE	LINE	REV.	WAS		DATE	LINE	REV.	WAS	
	9/29/60	2-5	1	Added in entirety		ECO 0227	12/15/60	3	3	Added:unpacked; type 302
	10/5/60	6-20	2	" " "		ECO 0238	5/8/61	2	4	Name was Shield;Dwg. was Rev.A
	12/15/60	3	3	Was PP; added GO 691261 Page 3		"	2	4	Added 6 & Pc.#5 on page 19B line 19	
	"		3	Lines 9 thru 13,16 thru 18 &20 was PP or PM; Added		"	6	4	Was Dwg. Rev.C	
	"		3	GO 691261 Page 2						

Continued

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 112
SHEET 5 OF 5
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10-IPER
Contract #AT(30-3) 326

NUMBER OF UNITS 1 WRITTEN BY EWE DATE 10/10/60 CHECKED BY FCP DATE 10/10/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.			REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
											TYPE	SIZE
1												
2	1	32		Pressure Transducer Valving Manifold #3	C9	50	1265		Consisting of lines 3 thru 16			
3	1	1		Mounting Panel							Aluminum	1/4" x 10" x 3'-7"
4	20	2		Valve, Panel Mounting					Hoke D-33A			
5	15	3		Tee (All Tube) Swagelok					Crawford Fitting Co. 200-3-316			1/8"
6	30	4		Male Conn. "					Crawford Fitting Co. 200-1-2-316			1/8" Tube x 1/8" Pipe
7	10	5		Male Conn. "					Crawford Fitting Co. 100-1-2-316			1/16" Tube x 1/8" Pipe
8	1	6		Pressure Transducer					Ultradyne Model S40RH-0.3 D			
9	10	7		Adapter, Swagelok					Crawford Fitting Co. 200-A-4ANF-316			1/8" Tube x 1/4" AN Tube
10	5	8		Receptacle, Box Mounting					Cannon Electric 3102# 14 S-6P			
11	5	9		Plug, Straight					Cannon Electric 3106 E 14S-6S			
12	10 Ft.	10		Tubing							St. Stl. Type 304 Annealed Tubing	1/8" Dia. x .028 Wall x #22 Ga.
13	2	11		Pressure Transducer					Ultradyne Model S-40 RH-1.0D			
14	1	12		" "					Ultradyne Model S-40 RH-1.5D			
15	1	13		" "					Ultradyne Model S-40 RH-0.5 D			
16	20 Ft.	14		Wire							Standard with Flexible Insulation #24 AWG	
17	4	33		Gasket Lugs							St. Steel type 304 Strip	1/8" x 1/2" x 1"
18												
19	1	28	5	Upper Connector Assy- Half	Part of R9	50	1214	A	(continued from Page 19 line 2 as per #5 of Assy-Stationary Fuel Element (Instrumentation)-Dwg. D9-50-12)			
20												
21												

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS		
	10/5/60	2-16		Added in entirety	ECO 0238	5/8/61	17	2	entire line added	ECO #0303
	12/15/60	3 & 16	1	Was PM added GO 691261 Page 2						
	12/15/60	4-7	1	Was PP added GO 691261 Page 2						
	12/15/60	10- 12	1	Was PP added GO 691261 Page 2						
	5/8/61	13	2	Cat.# was S-40 RH-0.1D						

Completed

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 127
SHEET 1 OF 2
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10-IPER
CONTRACT AT(30-3)-326

NUMBER OF UNITS 2 WRITTEN BY GH DATE 6/22/60 CHECKED BY FCP DATE 6/23/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	1			Connector Assy. and Details	R9 50 1214	A	Consisting of Sheets 1 & 2		Instructions on page 23 Vendor to furnish items marked O Only	Mech.
3	25	1		Terminals(includes 1 spare)	AES 454		Ceramaseal Inc. Drg.#804A3855			
4	25	2		Terminals(includes 1 spare)	AES 454		Ceramaseal Inc. Drg.#804A3854			
5	1	3		Block, Lower				St.Stl.Type 304		4-5/8" Dia. x2-5/16"
6	1	4		Block, Upper				St.Stl.Type 304		4-5/8" Dia. x2-5/16"
7	3	5		Dowel				St.Stl.Type 304		3/8" Dia. x1-3/4"
8	1	6		Pin				" " " "		3/8" Dia. x2-1/4"
9	1	7		Plate, Bottom				" " " "		7/8" x6"x8-1/16"
10	1	8		Plate, Top				" " " "		7/8"x6"x8-1/16"
11	3	9		Bolt				" " " "		1-3/4" Dia. x7-7/8"
12	4	10		Tube				" " " " Seamless		53/64"OD x41/64"IDx7/8"lg.
13	8	11		Tube (Sleeve)				" " " " "		.125 ODx.040"wall x3/4"lg.
14	10	12		Tube (Sleeve)				" " " " "		.125 OD x.028"wall x3/4"lg.
15	Ref.	13		(Static & Impact Tube (to Control Rod Element)	R9 50 1175		(see page 26 Line 9) Pc.#1 & 2(for balance)		(See Parts List #157	
16	Ref.	14		(Static & Impact Tube (to lower block)	R9 50 1111		Pc.#25 (See Parts List #112)			
17	Ref.	15		Thermocouple	R9 50 1111		Pc.#24 (" " " ")			
18	Ref.	16		Thermocouple--(Fuel & Channel)	R9 50 1175		Pc.#3 & 4(See Parts List #157)			
19	1	17		Plug				St.Stl.Type 304		1" Dia. x5/8" } Material suppli
20	1	18		Plug				" " " "		5/8" Dia. x1/4" } to vendor
21								" " " "		1" Dia.x5/8" } by AE Lab
										5/8" Dia. x1/4"

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	7/23/60	2	1	Added:Vendor to furnish items marked"O"Only ; PP	5/8/61	19&20	2	was 5/8"Dia.x1/4";was O; was part of AP 1922
	7/23/60	3	1	AES 454 added Vendors No. was 804A3854	"	"	2	J.C.Bruno Co.
	"	4	1	" " " " " " 804A3855				
	"	5 thru 20	1	Lines added in their entirety.				
	5/8/61	2	2	Added Rev.A to drawing				

EUC #0303

Continued

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 127
SHEET 2 OF 2
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10-IPER
CONTRACT #AT(30-3)-326

GENERAL ORDER 690783 Page 25

NUMBER OF UNITS 2 WRITTEN BY GH DATE 7/22/60 CHECKED BY ECP DATE 7/23/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	1	19		Plate					St.Stl. Type 304	3/16" x 3/4" x 1"
3	1	20		Plate					" " " "	3/16" x 1" x 1"
4	1	21		Plug					" " " "	1" Dia. x 5/8"
5	1	22		Plug					" " " "	5/8" Dia. x 1/4"
6	1	23		Ring					" " " "	3-1/4" O.D. x 1/8" wall x 1" lg.
7	5	24		"O" Ring (Includes 4 Spares)			United Aircraft Prod. U-7212-04125-NPA		St.Stl. Type 304	
8	Ref	25		Tube (Purge & Drain) (To stationary element)	R9	50	1111	Pc.#26	P1 #112	
9	Ref	26		" (Static & Impact)	D9	50	1208	Pc. 1 & 2	(See Page 24) (Line 15 for Ref) (See Parts List # 156)	
10	Ref	27		Thermocouple (Fuel & Channel)	D9	50	1208	Pc. 3 & 4	(See Parts List #156)	
11	50	28		"O" Ring (Includes 42 Spares)			United Aircraft Prod. U-7212-00500-NPA		St.Stl. Type 304	
12	1	29		Retainer Plate-Inner	AES-519				" " " "	0.45" Thk. x 3-1/4" Dia.
13	1	30		" " Outer	AES-520				" " " "	0.45" Thk. x 4-5/8" Dia.
14	6	31		(Includes 2 spares) Capscrew, Hex. Soc. Hd.					" " " "	1/4" - 40 x 1/4"
15	1	32		Skirt To Drawing	D9	50	1261	Except see lines 16 thru 18 THIS ORDER ONLY	" " " "	#22 Ga. x 6" x 24"
16				EXCEPTIONS: 1. All dimensional tolerances - 1/16 2. Crimp to suit 3. 2 Dimensions 1-3/8 changed to 1-7/16						
17				4. 2 Dimensions 5-23/32 changed to 5-11/16 5. Dimension 1-15/32 changed to 1-1/2 6. Dimension 1-25/32 changed to 1-13/16						
18				7. Remove all oil, dirt, grease, crayon etc.						
19	1	33		Guide Disc					St. Steel Type 304	1" Dia. x 1/8" {Material Supplied to Vendor by A.E. Lab.
20	1	34		" "					" " " "	1" Dia. x 1/8"
21	1	35		" "					" " " "	1" Dia. x 1/8"
22	1	36		" "					" " " "	1" Dia. x 1/8"

REVISIONS	WAS				WAS			
	DATE	LINE	REV.		DATE	LINE	REV.	
	7/22/60		1	Added Lines 2 thru 15 in their entirety.	5/8/61	19 thru 22	3	entire lines added
	1/10/61	13	2	Was Retainer Plate - Inner				
	"	15	2	Was PM; Lab Stock; Added GO 691261 Page 10				
	1/10/61	15 thru 18	2	added exceptions to drawing for THIS ORDER ONLY				
	5/8/61	4 & 5	3	was 5/8" Dia. x 1/4"; was 0; was AP 1922, J.C. Bruno Co.				

Completed

ECO #030

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 135
SHEET 1 OF 1
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10
CONTRACT #AT(30-3)-326

GENERAL ORDER 690783 Page 31

NUMBER OF UNITS 1 WRITTEN BY FGP DATE 7/12/60 CHECKED BY FGP DATE 7/13/60

LINE	UNIT QUAN.	ITEM SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	TYPE	SIZE
1										
2	1		Control Rod Assy.-SM-1 Task XIV	R9	50	1176	B	Consisting of this Sheet	Instructions on page 30	
3	1	1	Instrumented Control Fuel Element Assy. - Rod	D9	50	1137-2	B	(Option B) See Parts List # 103B	Sheet 1	
4	1	2	Instrumented Control Dummy Absorber - Rod	C9	50	1138	B	Consisting of lines 5 thru 7		
5	2	1	Absorber Plate	C9	50	2358-1	B		St.Stl.Type 304 annealed-Strip	1/8" x 2.399" x 24 1/8" lg.
6	2	2	Absorber Plate	C9	50	2358-2	B		" " " " " Strip	1/8" x 2.494" ± .002 x 24 1/8" lg.
7	2	3	(Dowel)	C9	50	1138	B		St.Stl.Type 304 annealed Bar	3/8" Dia x 1" lg.
8	1	3	Pedestal Top-Instrument Table	A9	50	1226	A	Consisting of lines 9 & 10		
9	1	1							St.Stl.Type 304 annealed Flat Bar	5/8" x 2 1/2" x 2 1/2" lg.
10	4	2							" " " " " Flat Bar	5/8" x 1" x 2 1/4" lg.
11	1	4	Belt (Control Rod)	A9	50	1247	A		" " " " "	3/4" Dia. x 23-9/16"
12	1	5	Handling Instrumented Tool- Control Rod	A9	50	1247	A	Consisting of lines 13 and 14		Also fab.modified existing piece to Rev.A
13	1	1						(This order)	Carbon Steel(only) Bar	1/8" Dia. -16 ft.Rod Long.
14	1	2						" " "	" " "	5/8" Dia. .065 Wall x 4" lg.
15	1	6	Control Rod Instrumentation	R9	50	1175		See Parts List 157	Sheet 1	
16	1	7	Instrumented Control Universal Joint-Rod Installation	AES	555					
17										
18										
19										
20										
21										

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	8/2/60		1	Line 3 was Rev.B; Lines 5,6,7 was 304 L	ECO 0205	9/1/60	2	Rev. A Added
	8/2/60	4,5,6	1	Rev.A added	ECO 0205	12/13/60	2	Added
	8/2/60	7	1	Added Dwg. C9-50-1138 Rev. A (for Ref.)		10/5/60	3	Rev A Added
	9/1/60	4,5,6,7	2	Rev."B" Added	ECO 0217	10/5/60	3	Entire line added
	9/1/60	11	2	Added Type and Size Material & PP		12/15/60	4	Was PP; AF-1863 -JPS Products; added GO 691261 Page 4

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 156
SHEET 1 OF 1
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10-IPER
Contract AT(30-3) 326

NUMBER OF UNITS 1 WRITTEN BY EWE DATE 9/28/60 CHECKED BY FCP DATE 10/5/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2				Stationary Fuel Instrumentation, Element	D9 50 1208		Consisting of Sheet 1,	Instructions Page 32		
3	5	1		Tube(Static)Includes 1 Spare					St.Stl.Sheath Type 347	.040 OD x.0075 Wall x8 Ft.
4	5	2		Tube(Impact)Includes 1 Spare					" " " " "	.040 OD x.0075 Wall x8 Ft.
5	8	3		Thermocouple,Iron Constantan					" " " " "	.040 OD x.0075 x 8 Ft.
6	4	4		Thermocouple,Iron Constantan					" " " " "	.040 OD x.0075 x 8 Ft.
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	10/16/60	3 & 4	1	P.O. date was 8/15/60				
	"	5 & 6	1	P.O. date was 5/31/60				

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 157
SHEET 1 OF 1
PROJECT NUMBER SM-1 - Task XIV
JOB NUMBER AE-10-IPER
Contract AT(30-3)-326

NUMBER OF UNITS 1 WRITTEN BY EME DATE 9/30/60 CHECKED BY FCF DATE 10/3/60

[illegible]

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	10/16/60	6	1	Was GO 690783 Page 22				

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 146
SHEET 1 OF 2
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10
Contract #AT(30-3) 326

NUMBER OF UNITS 1 WRITTEN BY EWE DATE 9/21/60 CHECKED BY FCP DATE 9/21/60

[illegible][illegible]

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 146
SHEET 2 OF 2
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10
Contract AT(30-3) 326NUMBER OF UNITS 1 WRITTEN BY EWE DATE 9/7/60 CHECKED BY FCP DATE 9/21/60

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	1	2		Tool Sling	B9 50 1221	A	Consisting of lines 3 thru 7			
3	1	1		Tube					Aluminum 6061-T6	Tube 1/2" O.D. x .083 Wall 6'-4" Lg.
4	1	2		Rod					" " "	Bar 1/4" Dia. x 7'-4" Lg.
5	1	3		"					" " "	Bar 1/8" Dia. x 1"
6	1	4		Tube					" " "	Tube 5/8" O.D. x .058 Wall x 4 1/2" Lg.
7	1	5		Rod					" " "	Bar 1/8" Dia. x 1/4" Lg.
8	3	3		Turnbuckle			Bethlehem Stl. Co. or Equal			1/4" Jaw and Jaw End Fitting
9	1	4		Triangular Master Link	A9 50 2454				Carbon Steel	3/8" Dia. x 10-7/16" Lg.
10	1	6		Tube					Aluminum 6061-T6	Tube 5/8" OD x .058 Wall - 10' - 1/2" Lg.
11	1	7		Tube					" " "	Tube 3/8" OD x .058 Wall - 9' - 1" Lg.
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										

REVISIONS	WAS				DATE	LINE	REV.	WAS			
	DATE	LINE	REV.								
	10/12/60	2	1	Rev. A Added				ECO 0251			
	10/12/60	3, 4	1	Line 3 length was 16'-2-1/4" Lg. Line 4 was 16' 2-5/8" Lg.				ECO 0251			
	10/12/60	6, 10, 11	1	Ln. 6 was 1/2" O.D. x .083" Wall, Lines 10 & 11 added				ECO 0251			
	12/15/60	*	2	Was G O 690783 Page 42							

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 173
SHEET 1 OF 3-4
PROJECT NUMBER Task XIV (SM-1)
JOB NUMBER AE-10
Contract AT(30-3)-326GENERAL ORDER 691261 PAGE 17
Authority L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 5/25/61 CHECKED BY FCP DATE 5/25/61

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	1			Purge System, Piping & Control System	AES 562	A	Consisting of Material on Pages 17 thru 19A			• Instructions on Page 16
3	1	1		Chain					Wallace Armer Bulldog Chain	#2/0 x 8 ft. lg.
4	2	2		Latch, Double Ended					Wallace Armer #163	7/8"
5	3	3		Valve, Needle			Hoke #1189		St.Stl.type 303	1/4" Swagelok ends
6	40 ft.	4		Tubing					St.Stl.type 304 annealed	1/4" O.D.x.083"wall
7	2	5		Angle				SAE 1020	Steel	1/4" x1" x1"x6'-7"lg.approx.
8	3	6		Swagelok Female Connector (SGA #580)			Crawford Fitting Co 400-7-4-316		St.Stl.type 316	1/4"tube x1/4"pipe
9	3	7		Gas Cylinder Connection			Hoke 170N		Brass	1/4"NPT on opposite end
10	3	8		Valve, Ball Check			Hoke 1257		St.Stl.type 303	1/4"Swagelok ends
11	1	9		(Protective Guard)				SAE 1020	Steel	1/8"x3"x18"lg. approx.
12	150 ft.	10		Tubing					Copper, annealed	1/4"O.D.x.028"wall
13	1	11		(Brace)				SAE 1020	Steel	1/8"x3"x6" approx.
14	3	12		Swagelok All Tube Tee			Crawford Fitting Co 400-3-316		St.Steel Type 316	1/4" Tube
15	1	13		(Brace)				SAE 1020	Steel	1/8" x3" x8" approx.
16	1	14		(Protective Guard)				SAE 1020	Steel	1/8" x16" x16"
17	1	15		Purge System-Control Panel	AES 564	A	Purchased as an Ass'y. consisting of vendor supplied items & Alco Consisting of material on lines 18 thru 21, all of Page 18, & Page 19 lines 2 thru 11			Furnished * items, all of Page 19A
18	1-8	1		Swagelok Male Connector			Crawford Fitting Co 400-1-4		Brass	1/4"Tube x 1/4" pipe
19	1	2		Swagelok Female Connector			Crawford Fitting Co 400-7-4		Brass	1/4"Tube x1/4"Pipe
20	1	3		Regulator, high pressure			Hoke 512 N	GGA #500	Brass	
21	1-2	4		Valve, Needle			Hoke 1193		Brass	1/4"Swagelok ends

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	6/28/61	6	1	Was .078" Wall	10/26/61	2	3	Was thru 19
	"	14	1	Quantity was 2	"	17	3	Added & all of page 19A
	10/26/61	Top of Sheet	2	Was Sheet 1 of 3	"	17	3	" Note: Page 19A Portion assembled by Mech. Lab.
	"	2 & 17	2	Added Rev. A to Dwg.				
	"	18 & 21	2	Quantity was 1				

ECO #0352

ECO #0352

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 173
SHEET 2 OF 3-4
PROJECT NUMBER Task XIV (SM-1)
JOB NUMBER AE-10
CONTRACT AT(30-3)-326GENERAL ORDER 691261 PAGE 18
Authority L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 5/25/61 CHECKED BY FCP DATE 5/25/61

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	4		5	Machine Screw, head round					St. Steel type 304	#10-24x3/4"lg.
3	1		6	Detection Device						
				Purge System Leak /	AES 565			Consisting of material on Lines 4 thru 16		
4	2		1	Pressure Switch			Pamar PSG-475-4		115 Volts A C	
5	1		2	Valve, needle			Hoke 1193		Brass	1/4" Swagelok ends
6	1		3	Tubing					Copper	1/4" O.D. x .030" wall x 4" lg.
7	3		4	Connector Swagelok Male /			Crawford Fitting Co. 400-1-2		Brass	1/4" Tube x 1/8" pipe
8	2		5	Gasket					Butyl-N Rubber	1/16" min. thick x 4" Dia.
9	1		6	Tube					Plexiglass	3" I.D. x 3/8" wall x 10" lg.
10	2		7	(Bracket)					St. Stl. type 304	1/8" x 5/8" x 6" lg.
11	2		8	Plate					" " " "	3/8" x 4-1/4" x 4-1/4"
12	8		9	Nut, Hex.					" " " "	1/4"-20
13	8		10	Plain Washer					" " " "	1/4"
14	4		11	Rod					" " " "	x 3/4" lg. ea. end Thru 1/4" Dia. x 11-1/2" lg; 1/4"-20
15	1		12	Plug, Pipe					" " " "	1/8" NPT
16	4		13	Machine Screw, Head Flat					" " " "	#8-32x7/16" lg.
17	4		7	Nut, Hex.					" " " "	#10-24
18	1		8	Swagelok, TTM Tee			Crawford Fitting Co. 400-3-4TTM		Brass	1/4" tubex 1/4" tubex 1/4" pipe
19	1		9	Reducing Bushing, Hex.			Hoke #5025		St. Stl. type 303	3/8" x 1/4"
20	1		10	Safety Head Ass'y.			Autoclave Engineers 10S-4600		" " " "	
21	3		11	Rupture Disc (for Pc#10)			Autoclave Engineers Monel, 1350 Psi			

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	10/26/61	Top of Sheet 1	1	Was Sheet 2 of 3				

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 173
SHEET 3 OF 4
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10
CONTRACT AT(30-3)-326GENERAL ORDER 691261 PAGE 19
AUTHORITY L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 5/25/61 CHECKED BY FCP DATE 5/25/61

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1	-1-	-12		Swagelok Union			Crawford Fitting Co.	400-6-2-316	Note: (To be modified to an orifice by inserting a plug drilled to a smaller diameter)	
2	2	13		Valve, Needle			Hoke 1189		" " " 303	1/4" Swagelok ends
3	-1-	14		Swagelok TTM Tee			Crawford Fitting Co.	400-3TTM-316	" " " " 316	1/4" tube x 1/4" tube x 1/8" pipe
4	1	15		Valve, metering			Hoke 2PY280		" " " "	1/8" NPT ends 1/16" orifice
5	-1-	16		Swagelok Male Elbow			Crawford Fitting Co.	400-2-2	Brass	1/4" tube x 1/8" pipe
6	1	17		(Panel)					Aluminum 3S	Plate 1/4" x 24" x 36"
7	2	18		Alarm			Lafayette EL-85			
8	-6-	19		Machine Screw Round Head					St. Steel Type 304	1/4" - 20 x 1" lg.
9	-6-	20		Nut, Hex.					" " " "	1/4" - 20
10	2' ft.	21		Tubing					Copper	1/4" OD x .028" wall
11	4 ft	22		Tubing					St. Steel type 304 annealed	1/4" OD x .078" wall
12	1	16		Valve Arrg't. Purge System Solenoid/	AES 563		Consisting of material on lines 13 thru 21			
13	250 ft	1		Tubing					St. Steel type 304 annealed	1/8" OD x .028" Min. wall length cut to suit at ass'y
14	2	2		Swagelok Reducer			Crawford Fitting Co.	200-R-4-316	" " " 316	1/8" x 1/4"
15	2	3		Swagelok Male Connector			Crawford Fitting Co.	200-1-2-316	" " " "	1/8" tube x 1/8" pipe
16	2	4		Valve, ball check			Hoke 1257		" " " 303	1/4" Swagelok ends
17	2	5		Solenoid Valve-Closed			Hoke S90D120	110 Volts DC	" " " "	1/8" female NPT ends Orifice 1/32
18	10	6		Swagelok Male Connector			Crawford Fitting Co.	400-1-2-316	" " " 316	1/4" tube x 1/8" pipe
19	4	7		Valve, Needle			Hoke 1189		" " " 303	1/4" Swagelok ends
20	2	8		Swagelok All Tube Tee			Crawford Fitting Co.	400-3-316	" " " 316	1/4" tube
21	2	9		Solenoid Valve, Closed			Hoke S 90A120	115 Volts AC	" " " 303	1/8" female NPT ends; orifice 1/32

REVISIONS	WAS				WAS			
	DATE	LINE	REV.		DATE	LINE	REV.	
	6/28/61	1	1	was Swagelok special orifice fitting; deleted (E.0135) from Cat. #; added all of Note.	10/26/61	Top of Sheet 2	2	was sheet 3 of 3
	6/28/61	2	1	Quantity was 1	"	1,3,5,8,9	2	Deleted lines 1,3,5,8 & 9 in their entirety ECO #0352
	"	17	1	Was 125 Volt AC				Reference Note: See Sheet 4; G.O. Page 19A for added item
	"	21	1	Was 125 Volts				piece #'s 23 thru 38 of Dwg. AES-564

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 173
SHEET 4 OF 4
PROJECT NUMBER Task XIV (SM-1)
JOB NUMBER AE-10
Contract AT(30-3)-326

GENERAL ORDER 691261 PAGE 19A
Authority L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 10/26/61 CHECKED BY FCP DATE 10/26/61

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1	1		23	Control Valve	A9 49 2166	A	Fisher Governor 530 "Gismo"			
2	1		24	Pressure Transducer	A9 49 2167	A	Moore Products Model 173 S			
3	1		25	Differential Computer - Pressure	A9 49 2168		Moore Products Model 68 WT 17			
4	1		26	Pressuretrol			Minn.Honeywell Model P4 28B	1/2" Male NPT Pressure Connection surface mounted		115 Volt 7.4 amp. 200 -2000 psi
5	1		27	Swagelok Female Elbow			Crawford Fitting Co. 400-8-4	Brass		1/4" tube x 1/4 NPT
6	2		28	Swagelok All Tube Tee			Crawford Fitting Co. 400-3-316	St.Steel Type 316		1/4" Tube
7	2		29	Swagelok Male Connector			Crawford Fitting Co. 400-1-4-316	" " " "		1/4" Tube x 1/4" NPT
8	1		30	Swagelok TMT Tee			Crawford Fitting Co. 400-3-4TMT-316	" " " "		1/4" tube x 1/4 Male pipe x 1/4" Tub
9	1		31	Swagelok All Tube Cross			Crawford Fitting Co. 400-4-316	" " " "		1/4" Tube
10	2		32	Swagelok All Tube Tee			Crawford Fitting Co. 400-3	Brass		1/4" Tube
11	9		33	Round Machine Screw- Head				St.Steel type 304		3/8"-16 x 1" lg.
12	9		34	Nut, Hex.				" " " "		3/8" -16
13	2		35	Swagelok Male Connector			Crawford Fitting Co. 400-1-2-316	" " " 316		1/4" Tube x 1/8" NPT
14	1		36	Swagelok Reducer			Crawford Fitting Co. 400-R-6-316	" " " "		1/4" Tube x 3/8" ID Hose
15	1		37	Swagelok Female Connector			Crawford Fitting Co. 600-7-8-316	" " " "		3/8" Tube x 1/2" Female NPT
16	1		38	Pressure Gage	A9 49 2169		Marsh Instrument Co. Type 9	Case CFFR		0 -2000 psi
17										
18										
19										
20										
21										

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	11/13/61	1	1	Added Rev.A to dwg.				
	11/16/61	2	2	Added Rev.A to Dwg.				

ECO #0364
ECO #0367

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 174
SHEET 2 OF 2
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10
CONTRACT AT (30-3)-326

GENERAL ORDER 691261 PAGE 22
AUTHORITY L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 5/25/61 CHECKED BY FCP DATE 5/25/61

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.			REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL		
											TYPE	SIZE	
1													
2	1			Electrical Schematic Connector Purge System	AES	561	Sheet 2		Consisting of material on lines 3 thru 9	Instructions on Page 20			
3	4	1		Switch, Push Button SPDT					Cat. # 1AH Allen Bradley	single unit heavy duty spring return			
4	2	2		Relay, Normally open					Potter Bromfield		5 amp. 125 volt D.C.		
5	2	3		Relay, Normally Closed					Potter Bromfield		5 amp. 125 volt D.C.		
6	4	4		Pilot Light, Amber					Dialight Corp. 803202-533	screw cap; torpedo lens; screw terminal			
7	8	5		Lamp, double contact					Dialight Corp. S-6 lamp 125V		Bayonet base		
8	2	6		Pilot Light, Red					Dialight Corp. 19901-531	screw cap; large torpedo lens; screw terminal			
9	4	7		Lamp					Dialight Corp. S-6 lamp 125V		Candelabra screw base		
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
REVISIONS	DATE	LINE	REV.	WAS						DATE	LINE	REV.	WAS

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 175
SHEET 1 OF 2
PROJECT NUMBER SM-1 TASK XIV
JOB NUMBER AE-10
CONTRACT AT(30-3)-326

GENERAL ORDER 691261 PAGE 24
AUTHORITY L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 5/31/61 CHECKED BY FCP DATE 5/31/61

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	1			T/C Ref.Junction Installation & Shield Tank Penetration	R9 50 1273	A		Consisting of material on Pages 24 & 25. Instructions on Page 23		
3	1	1		Cover Penetration(Weldment)				Consisting of material on lines 4 & 5		
4	1		1						St.Steel type 304	Bar 1" x3" x4-1/4"lg.
5	1		2						St.Steel type 304	Bar 1-1/4" x3-3/8" x5-5/8"
6	2	2		Gasket (Includes 1 Spare)				ASTM D-1056 49T SC-41	Neoprene Rubber Durometer 40 - 10	1/8" thick
7	1	3		Cable Support				1020	Hot Rolled Steel	3/16" x3/4" x8-3/4"
8	1	4		Angle Support,L.H.				1020	" " "	1/8" x1" x1" x14"
9	1	5		" " R.H.				1020	" " "	1/8" x1" x1" x14"
10	1	6		T/C Cover				1015	Steel	Tube 1-1/4" OD x.120 Wall x43-1/2"
11	8	7		Machine Screw Rd.Head					Steel,Cadmium Plated	#12 -24 x5/8"lg.
12	8	8		Plain Washer					" " "	#12
13	8	9		Nut,Hex.					" " "	#12-24
14	5	10		Capscrew,Hex,Hd.					St.Steel type 303	1/2"-13 UNC-2A x1-3/4"
15	2	11		" " "					Steel,Cadmium Plated	1/2"-13 UNC-2A x1-3/4"
16	1	12		Hook				1020	Hot Rolled Steel	Bar 3/16"Dia. x16"lg. Before Bending
17	1	13		Cable Grip			Pyle-National DB-15			
18	1	14		Transducer Tube Cover				1015	Steel	Tube 1-1/4" OD x.120"Wallx62-1/2"lg.
19	1	-		T/C Wire Support(Weldment)				Consisting of the material on lines 20 & 21 & Page 25 Line 2		
20	1	15		T/C Wire Support				1020	Hot Rolled Steel	1/8"x3/8"x30"length Before Bending
21	2	16						1020	" " "	Bar 1/8"x3/8"x9-15/32" Exact Length

REVISIONS	WAS				WAS			
	DATE	LINE	REV.		DATE	LINE	REV.	
	6/23/61	2	1	Added Rev.A to Dwg.				
	"	6	1	" includes 1 spare; Quantity was (1)				

ECO # 0324

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 175
SHEET 2 OF 2
PROJECT NUMBER SM-1 TASK XIV
JOB NUMBER AE-10
CONTRACT AT(30-3)-326

GENERAL ORDER 691261 PAGE 25
AUTHORITY L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 5/31/61 CHECKED BY FCP DATE 5/31/61

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	1	17		T/C Wire Support				1020	Hot Rolled Steel	Angle 1/8" x 3/4" x 1" x 9-15/32" Length
3	4	18		Cable Supports				1020	" " "	Bar 3/16" Dia. x 6" Length Before Bending
4	1	19		Cable Guide				1020	" " "	Bar 1/4" Dia. x 10" length Before Bending
5	2	20		Cable Bracket				1020	" " "	Bar 3/16" x 3/4" x 6" length Before Bending
6	5	21		" "				1020	" " "	Bar 3/16" x 3/4" x 8" Length Before Bending
7	5	22		Purge Line Cleat					Wood, Ash or equal	7/16" x 3/4" x 1-1/2" Finish Dimension
8	10	23		Machine Screw Rd. Head					Steel, Cadmium Plated	#6-32 x 5/8" lg.
9	10	24		Plain Washer					" " "	#6
10	1	25		Cable Support				1020	Hot Rolled Steel	Bar 3/16" x 3/4" x 8-3/4"
11	1	26		Transducer Tube Cover					Hot Rolled Steel	Sheet 1/8" x 12" x 40" length Before Bending
12	4	27		Machine Screw Rd. Head					Steel, Cadmium Plated	#6-32 x 3/8" lg.
13										
14										
15										
16										
17										
18										
19										
20										
21										

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
	6/23/61	3	1	Quantity was 2				

ECO #0324

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 176
SHEET 1 OF 2
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10
CONTRACT AT(30-3)-326GENERAL ORDER 691261 PAGE 27
AUTHORITY L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 6/1/61 CHECKED BY FCP DATE 6/1/61

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	1			Transducer Panel Installation in Vapor Container	R9 50 1275	A	Consisting of the material on Pages 27 & 28			Instructions on Page 26
3	1	1		Panel Support, L.H.				1020	Hot Rolled Steel	Angle 3/16"x1-1/2"x1-1/2"x45-3/4"lg.
4	1	2		" " , R.H.				↑	↑	3/16"x1-1/2"x1-1/2"x45-3/4"lg.
5	2	3		" "						3/16"x1-1/2"x1-1/2"x23"lg.
6	2	4		" "						3/16"x1-1/2"x1-1/2"x10-1/2"lg.
7	1	5		" " Brace, L.H.						3/16"x1-1/2"x1-1/2"x40-1/8"lg.
8	1	6		" " " , R.H.						3/16"x1-1/2"x1-1/2"x40-1/8"lg.
9	16	7		" " Lugs				↓	↓	Angle 3/16"x1-1/2"x1-1/2"x2-3/4"lg.
10	4	8		U-Bolt				1020	Hot Rolled Steel	Bar 1/2"Dia.x10-5/16"length before Bending
11	16	9		Nut, Hex.					Steel, Cadmium Plated	1/2"-13 UNC-2B
12	18	10		Machine Screw, Rd. Head					" " "	3/8"-16 UNC-2A x 1/2"lg.
13	1	11						1020	Hot Rolled Steel	Angle 3/16"x1-1/2"x1-1/2"x39-11/16"lg.
14	1	12		Purge Tube Support				1020	" " "	Bar 3/16"Dia.x28"length Before Bending
15	1	-		Tube Support(Weldment)			Consisting of material on lines 16 & 17			
16	1	13						1020	Hot Rolled Steel	Strip 1/8" x1/2"x39"
17	2	14						↑	↑	1/8" x1/2"x2-1/2"
18	3	15		Wire Support on Panel						1/8" x1/2"x41-1/2"lg.
19	2	16		" " " "						Before Bending
20	2	17		" " " "				↓	↓	Before Bending
21	2	18		" " " "				1020	Hot Rolled Steel	Strip 1/8"x1/2"x7"length Before Bending

REVISIONS	DATE	LINE	REV.	WAS
	6/23/61	2	1	Added Rev. A to drawing
				ECO #0324

DATE	LINE	REV.	WAS

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 176
SHEET 2 OF 2
PROJECT NUMBER SM-1 TASK XIV
JOB NUMBER AE-10
CONTRACT AT(30-3)-326

GENERAL ORDER 691261 PAGE 28
AUTHORITY 1-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 6/1/61 CHECKED BY FCP DATE 6/1/61

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	SIZE
1										
2	6	19		Machine Screw Rd.Head					Steel, Cadmium Plated	#12-24 UNC-2 x 5/16"lg.
3	1	20		Cleat Support				1020	Hot Rolled Steel	Strip 1/8"x7/8"x14"length Before Bending
4	2	21		Cleat					Wood, Ash or equal	3/4"x 7/8"x4-3/4" Finish Dimensions
5	4	22		Machine Screw R.H. Capscrew, Hex. Head					Steel, Cadmium Plated	#12-24 UNC-2 x 2-1/4"lg.
6	4	23		Nut, Hex.					" " "	#12-24
7	4	24		Plain Washer					" " "	#12
8	2	25		Cleat					Wood, Ash or eq.	1/2"x3/4"x2" Finish Dimensions
9	1	26						1020	Hot Rolled Steel	Angle 3/16"x1-1/2"x1-1/2"x42"lg.
10	2 Roll	27		Tubing, Flexible Plastic Swagelok Bulkhead Union			U.S. Stoneware Tygon B44-3			1/8"ID x1/4"OD x50 ft. roll
11	4	28		Purge Line Connector			Crawford Fitting Co. 200-61-316		St. Steel type 316	1/8" tube
12	1	29		Purge Line Connector Bracket				1020	Hot Rolled Steel	Strip 3/16" x3/4" x9"lg.
13										
14										
15										
16										
17										
18										
19										
20										
21										

REVISIONS	WAS				WAS			
	DATE	LINE	REV.		DATE	LINE	REV.	
	6/23/61	5	1	Was Capscrew, Hex. Head				
				ECO #0324				

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 177
SHEET 1 OF 1
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10
CONTRACT - AT(30-3)-326

GENERAL ORDER 691261 PAGE 30
AUTHORITY L-30

NUMBER OF UNITS 1 WRITTEN BY FS DATE 4/15/60 CHECKED BY FCP DATE 6/15/61

[illegible]

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 178
SHEET 1 OF 1
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10
Contract AT(30-3)-326

GENERAL ORDER 691261 PAGE 31
AUTHORITY L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 6/15/66 CHECKED BY FCP DATE 6/15/66

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.			REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
											TYPE	SIZE
1	1			Vapor Container Penetration	R9	51	1134-2	C	Consisting of Material on this Page.	Instructions on Page 29		
2	1	1		Cable Adaptor with Rubber Grommet & Washer					Pyle National Co. ZZM-2020-1453			
3	1	2		Connector Male					Pyle National Co. ZZM-W-1020-23S-02			
4	1	3		Connector Female					Pyle National Co. ZZM-W-1520-23SP-02			
5	1	4		Conduit Adaptor					Pyle National Co. ZZM-W-2820			
6	1	5		Conduit Union					Pyle National Co. VCC-5			1-1/2"
7	2	6		Pipe Nipple							Steel	1-1/2" Sch.80 x2" lg.
8	1	7		Pipe Coupling							Steel	1-1/2" Sch.80
9	1	8		Swagelok Male Connector					Crawford Fitting Co. 400-1-4		Brass	1/4" Tube x 1/4" pipe
10	1	9		Swagelok Plug					Crawford Fitting Co. 400-P		Brass	1/4"
11	1	13		Body					Pyle National Co. DB-1671-62A			
12	1	14		Nut					Pyle National Co. PX-13			
13	1	15		Washer					Pyle National Co. PX-13 CS			
14	1	16		Grommet					Pyle National Co. DB-13H			
15	1	17		Gasket							Neoprene	(Mark from) 1/16" Thick (PC-5)
16												
17												
18												
19												
20												
21												

REVISIONS	DATE				LINE				REV.				WAS			

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 179
SHEET 1 OF 1
PROJECT NUMBER SM-1 TASK XIV
JOB NUMBER AE-10
CONTRACT AT(30-3)-326

GENERAL ORDER 691261 PAGE 32
AUTHORITY L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 6/15/61 CHECKED BY FCP DATE 6/15/61

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.			REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
											TYPE	SIZE
1	1			Vapor Container Penetration	R9	51	1134-3	C	Consisting of Material on this Page.	Instructions on Page 29		
2	1	1		Cable Adaptor with Rubber Grommet Washer					Pyle National Co. ZZM-W-2020-1653			
3	1	2		Connector Male					Pyle National Co. ZZM-W-1020-23S-05			
4	1	3		Connector Female					Pyle National Co. ZZM-W-1520-23SP-05			
5	1	4		Conduit Adaptor					Pyle National Co. ZZM-W-2820			
6	1	5		Conduit Union					Pyle National Co. VCC-5			1-1/2"
7	2	6		Pipe Nipple							Steel	1-1/2" Sch. 80 x2" lg.
8	1	7		Pipe Coupling							Steel	1-1/2" Sch. 80
9	1	8		Swagelok Male Connector					Crawford Fitting Co. 400-1-4		Brass	1/4" Tube x 1/4" pipe
10	1	9		Swagelok Plug					Crawford Fitting Co. 400-P		Brass	1/4"
11	1	13		Body					Pyle National Co. DB-1671-62A			
12	1	14		Nut					Pyle National Co. PX-13			
13	1	15		Washer					Pyle National Co. PX-13 CS			
14	1	16		Grommet					Pyle National Co. DB-13M			
15	1	17		Gasket							Neoprene	(Mark from) 1/16" Thick (PC-5)
16												
17												
18												
19												
20												
21												

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 180
SHEET 1 OF 1
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE-10
CONTRACT AT(30-3)-326

GENERAL ORDER 691261 PAGE 33
AUTHORITY 1-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 6/15/63 CHECKED BY FCP DATE 6/15/63

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.			REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
											TYPE	SIZE
1	1			Vapor Container Penetration	R9	51	1134-4	C	Consisting of Material on this Page.	Instructions on Page 29		
2	1	1		Cable Adaptor with Rubber Grommet Washer					Pyle National Co. ZZM-W-2020-1653			
3	1	2		Connector Male					Pyle National Co. ZZM-W-1020-23S-04			
4	1	3		Connector Female					Pyle National Co. ZZM-W-1520-23SP-04			
5	1	4		Conduit Adaptor					Pyle National Co. ZZM-W-2820			
6	1	5		Conduit Union					Pyle National Co. VCC-5			1-1/2"
7	2	6		Pipe Nipple							Steel	1-1/2" Sch.80 x2"lg.
8	1	7		Pipe Coupling							Steel	1-1/2" Sch.80
9	1	8		Swagelok Male Connector					Crawford Fitting Co. 400-1-4		Brass	1/4" Tube x1/4" pipe
10	1	9		Swagelok Plug					Crawford Fitting Co 400-P		Brass	1/4"
11	1	13		Body					Pyle National Co. DB-1671-62A			
12	1	14		Nut					Pyle National Co. PX-13			
13	1	15		Washer					Pyle National Co. PX-13 CS			
14	1	16		Grommet					Pyle National Co. DB-13M			
15	1	17		Gasket							Neoprene	(Mark from) 1/16" Thick (PC-5)
16												
17												
18												
19												
20												
21												

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 181
SHEET 1 OF 1
PROJECT NUMBER SM-1 TASK XIV
JOB NUMBER AE 10
CONTRACT AT(30-3)-326

GENERAL ORDER 691261 PAGE 34
AUTHORITY L-30

NUMBER OF UNITS 1 WRITTEN BY FCP DATE 6/15/61 CHECKED BY FCP DATE 6/15/61

[illegible][illegible]

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 182
SHEET 1 OF 1
PROJECT NUMBER SM-1 TASK XIV
JOB NUMBER AE 10
CONTRACT AT(30-3)-326

GENERAL ORDER 691261 PAGE 35
AUTHORITY L-30

NUMBER OF UNITS 1 WRITTEN BY FS DATE 6/15/61 CHECKED BY FCP DATE 6/15/61

[illegible]

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENT

PARTS LIST NUMBER 201
SHEET 1 OF 2
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE 10
Contract AT(30-3)-326

HANDLING EQUIPMENT

NUMBER OF UNITS NA WRITTEN BY FS DATE 6/25/62 CHECKED BY FCP DATE 6/25/62

[illegible]

REVISIONS	DATE	LINE	REV.	WAS	DATE	LINE	REV.	WAS
								Continued

PARTS LIST

ALCO PRODUCTS, INCORPORATED
NUCLEAR POWER ENGINEERING DEPARTMENTPARTS LIST NUMBER 201
SHEET 2 OF 2
PROJECT NUMBER SM-1 Task XIV
JOB NUMBER AE 10
Contract AT(30-3)-326

HANDLING EQUIPMENT

NUMBER OF UNITS NA WRITTEN BY FS DATE 6/25/62 CHECKED BY PCP DATE 6/25/62

LINE	UNIT QUAN.	ITEM	SUB ITEM	NAME OF PART	DRAWING NO.	REV.	MANUFACTURER AND CATALOG NO.	SPECIFICATION	MATERIAL	
									TYPE	Finish SIZE
1										
2	1			Connector Assy. Handling Pedestal	AES	553		Consisting of Material on Lines 3 thru 10		
3	1		1	Connector Assy. Handling Cap	AES	543	" " "	" " 4 thru 6		
4	1		Pc# 1	Block					St. Steel Type 304	2-3/4" Dia. x1" Lg.
5	8		2	Capscrews					" "	#6-32 x 3/8 Lg.
6	4		3	Clip					" " Type 304	.040" x 1/4" x2-3/4" Lg.
7	1		2	Tube					" " " "	1/2" OD x.065 Wall x21-7/8" Lg.
8	2		3	Clip					" " " "	.040" x 1/4" x 1-15/16" Lg.
9	1		4	Dowel					" " " "	.350" - .002"Dia.x1-3/8" Lg.
10	1		5	Sheet					" " " "	1/8" x 2-3/4" x 2-3/4"
11										
12	1			Tool Runner 3/4"	B9 45	1089		Consisting of Material on Lines 13 thru 17		
13	1		1	Coupling	B9 45	2247	A	SAE 1020 or equal	Steel	3" Dia. x3-5/8" Lg.
14	1		2	Socket Tool Runner	A9 45	1090		Consisting of Material on Lines 15 & 16		
15	1		Pc# 1	Socket				SAE 1020 or equal	Steel	2-13/32" Dia. x2-1/4" Lg.
16	2		2	Ball Plunger			Vlier BH-58			
17	1		3	Steel Pin				SAE 1020 or equal	Steel	1/2" Dia. x2-3/4" Lg.
18										
19										
20										
21										

REVISIONS	DATE				LINE				REV.				WAS			

Completed