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SI 249172

FEBRUARY 1, 1968

**TEST PLAN
FOR THE
FORMAL MAGNETIC EVALUATION TESTING
OF THE
MODEL NO. 10 SNAP-27
INTEGRATED POWER UNIT**

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ADVANCED NUCLEAR SYSTEMS OPERATION

**GENERAL ELECTRIC
MISSILE AND SPACE DIVISION
KING OF PRUSSIA PARK
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MISSILE AND SPACE DIVISION

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FORMAL MAGNETIC EVALUATION TESTING

OF THE

MODEL NO. 10 SNAP-27

INTEGRATED POWER UNIT

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TEST PLAN
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SECTION 1
INTRODUCTION

1.1 SCOPE

This document presents detailed instructions for performing formal magnetic evaluation qualification tests on the Model No. 10 Integrated Power Unit (IPU) of the SNAP-27 IPU System comprising a mated generator assembly and a nuclear fuel capsule assembly.

The IPU will be subjected to both natural and induced magnetic mission environments during these tests. These magnetic evaluation tests will be considered as a demonstration of the design capability of the SNAP-27 IPU. Data accumulated from these tests will be incorporated into the SNAP-27 IPU Qualification Test package.

Testing will be performed at the NASA-Goddard Space Flight Center in Greenbelt, Maryland.

1.2 OBJECTIVES

- a. Demonstrate that the total magnetic dipole field of the SNAP-27 IPU (at operating conditions) does not exceed a level of one-tenth gamma at a distance of fifty feet from its centerline.

- b. Determine the direction and magnitude of the magnetic dipole moment of the generator assembly and of the operating IPU at the following environmental conditions:
 - (1) As received in a null field environment.
 - (2) After perming in a 15 oersted field applied along cylindric axis of IPU.
 - (3) After deperming in a 50 oersted field applied along 3 axes of the IPU.
 - (4) After subjection to an induced field environment (.3 oersted DC field directed perpendicular to the cylindric axis).
- c. Determine higher order moments by detailed mapping to study the near field of the operating IPU and the performance of the generator's degaussing loops.
- d. Determine the effect of the operating temperature upon the magnetic field of the generator assembly.
- e. Evaluate the effect of generator assembly internal instrumentation by direct comparison of results obtained from the magnetic evaluation tests performed on the SNAP-27 Engineering Generator Assembly Model No. 8B.

1.3 APPLICABLE DRAWINGS AND SPECIFICATIONS

1.3.1 DRAWINGS

All applicable drawings are contained in Appendix B, other than those that are classified.

47D300774	GA Packaging Instructions
47A300922	GASC Servicing Unit Operating Instructions
47E300780	IPU Assembly Mod 10
47E300779	Generator Assembly Mod 10
47D300857	Ground Handling Tool
47D300613	Ground Shipping Cask
47D300400	Fuel Capsule Assembly (classified)
47D300855	SLA Handling Tool

47R301143
47E300965
47E300676G1

SLA Transfer Cask
GA Thermal Shroud Fixture
Qual Test Monitor Console (Q2) or (Q3)

1.3.2 SPECIFICATIONS

Document No. Prop. 67-1	SS Material Control Manual - Advanced Nuclear Systems Operation, Missile & Space Division, Valley Forge Space Technology Center, Valley Forge, Pennsylvania
NS 0020-05-01	Environmental and Test Requirements for the Integrated Power Unit System, SNAP-27 Program
NS 6115-30-01	Performance and Design Requirements for the Generator Assembly, SNAP-27 Program
ANSO 6300-006	Quality Control Procedures
NS 4470-01-01	Performance, Design, and Fabrication Requirements for the Fuel Capsule Assembly (FCA) - SNAP-27 Program
SI 249155B	Qualification Test Plan for the Integrated Power Unit Model No. 10 - SNAP-27 Program, Rev. B
SI 249176	Receipt and Storage of SNAP-27 Fuel Capsule Assembly at GE/VFSTC
ANSO 6300-206	SNAP-27 Radiological Protection Program
SI 249167	Test Plan for the Model No. 8B Engineering Generator Assembly Magnetic Evaluation Test - SNAP-27 Program
SI 249182	Shipment of SNAP-27 Fuel Capsule Assembly from GE/VFSTC
NASA-Goddard Space Flight Center Document	Health Physics Procedures for the Magnetic Moments Testing of SNAP-27 IPU at Goddard Space Flight Center (GSFC) Magnetic Test Facility (MTF)

1.4 TEST SPECIMEN

1.4.1 IPU SPECIMEN

The Model No. 10 Qualification Integrated Power Unit (IPU) for the SNAP-27 Program is the primary test specimen for this test plan. The qualification model IPU is composed of two components and will be tested by the Advanced Nuclear Systems Operation of the General Electric Company, Missile and Space Division (GE-MSD), located at Valley Forge, Pennsylvania, in conjunction with NASA-Goddard Magnetic Test personnel at the NASA-Goddard Space Flight Center in Greenbelt, Maryland. The combination of the Fuel Capsule Assembly with the Generator Assembly is defined as the Integrated Power Unit (IPU).

1.4.2 GENERATOR ASSEMBLY

The basic Generator Assembly (GA) is manufactured and assembled for GE by Solar and the 3M Company.

The GA is 18 inches high, 16 inches in diameter, and weighs about 28 pounds. It consists primarily of the hot frame, the thermoelectric couples, a heat sink, and internal insulation.

The thermoelectric couple assembly provides direct energy conversion within the Generator Assembly. The couples, each consisting of an N-leg and a P-leg, are sandwiched between the hot and cold frames.

Heat is transferred from the heat source to the hot frame, then from the hot frame to the hot shoes and elements, and finally to a heat sink. The heat sink consists of a cold frame, outer case, and eight fins. Heat from the outer case and fins is dissipated to the surroundings by thermal radiation.

Thermal insulation, Min-K-1301, is packed into the voids between the internal components of the GA. The GA is then back-filled with Argon gas to a pressure of 26 psia when at operating temperatures of 1085°F at the hot junction and 525°F at the cold junction. A one percent trace of Helium gas is included for leak testing by means of a combined helium mass spectrometer-vacuum system technique.

1.4.3 FUEL CAPSULE ASSEMBLY

The Fuel Capsule Assembly (FCA) is assembled and fueled at Mound Laboratories. The FCA consists basically of a plutonium-238 compound properly encapsulated in a cylindrical structure and a back plate assembly for integration into the generator assembly. The FCA

is approximately 16.6 inches long and approximately 2.5 inches in diameter (5.8 inches at the end plate assembly). The weight of the FCA is approximately 15.5 pounds. It shall be stored in a ground shipping cask at all times except when being used for a test.

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SECTION 2

TEST ORGANIZATION AND RESPONSIBILITIES

The following specific definitions of organization and personnel responsibilities in the area of test planning, integration, test conductance, technical support, test hardware, facilities and services, fixtures, instrumentation, data reduction and reporting are presented here to prevent potential sources of future confusion and delay to the test program. Appendix C lists the test hardware, test equipment and material that will be supplied by General Electric Company.

2.1 GENERAL ELECTRIC COMPANY

2.1.1 GENERAL RESPONSIBILITIES

- a. Provide the test integration effort relative to test planning and procedures preparation.
- b. Provide a test conductor for conductance of the tests.
- c. Provide the necessary test and technical support personnel.
- d. Provide the necessary data reduction personnel for magnetic evaluation data and IPU operating test data.
- e. Provide the test reporting covering the results of the test.
- f. Provide the SNAP-27 Model No. 10 Generator Assembly, the SNAP-27 Fuel Capsule Assembly, the IPU test console, the Ground Shipping Cask, the SLA Transfer Cask, the Ground Handling Tool, the SLA Handling Tool and the thermal shroud test fixture.
- g. Provide all necessary instrumentation on the generator assembly.
- h. Provide personnel to handle the fuel capsule assembly, the generator assembly, IPU console and all other GE-operated equipment.

2.1.2 SPECIFIC RESPONSIBILITIES

Personnel from GE organization shown in Table 2-1 will provide testing support as outlined in the following paragraphs.

ALL HANDLING OF THE FUEL CAPSULE ASSEMBLY, GENERATOR ASSEMBLY, THE IPU CONSOLE AND ALL OTHER GE TEST EQUIPMENT AND HARDWARE SHALL BE PERFORMED BY GE TEST PERSONNEL.

2.1.2.1 Test Conductor

- a. Direct and integrate the efforts of design, quality control, manufacturing and support operations.
- b. Expedite test program consistent with funding limitations and schedules.
- c. Inform Program Office and Systems Engineering of test status and/or directed changes in the test program.
- d. Coordinate preparation of the final test report.
- e. Maintain a daily log of all test activities, problem developments and tests conducted.
- f. Maintain surveillance of tests being conducted to ensure performance is in accordance with test objectives.
- g. Be the single point contact for all participation during the test.
- h. Maintain overall responsibility for carrying out operations in a safe manner.

2.1.2.2 System Requirements Engineer

- a. Prepare the test specification in accordance with objectives delineated by the requirements specification.
- b. Provide test conductor with test requirements.
- c. Provide test conductor with latest changes in system requirements.

TABLE 2-1. GENERAL ELECTRIC ORGANIZATION RESPONSIBILITIES

FUNCTION	ADVANCED NUCLEAR SYSTEMS OPERATION				SAFETY AND FIRE PROTECTION	SPACE SCIENCES
	NUCLEAR SYSTEMS TEST	SYSTEMS ENGINEERING	QUALITY CONTROL ENGINEERING	NUCLEAR SAFETY		
TEST CONDUCTOR	X					
SYSTEM REQUIREMENTS ENGINEER		X				
TEST FIXTURE AND EQUIPMENT DESIGN ENGINEER	X					
TEST ENGINEER	X					
QUALITY CONTROL ENGINEER			X			
NUCLEAR SAFETY ENGINEER				X		
HEALTH PHYSICIST					X	
PHYSICIST						X

2.1.2.3 Test Fixture and Equipment Design Engineer

- a. Design and provide test fixtures.
- b. Design and provide test equipment and instrumentation.

2.1.2.4 Test Engineer

- a. Set up test equipment, fixtures and instrumentation.
- b. Prepare detailed procedures required for test equipment installation and operation.
- c. Responsible for test operations under supervision of test conductor.

2.1.2.5 Engineering Section

2.1.2.5.1 Reliability and Technical Requirements Operation

- a. Prepare the requirements specification for qualification and requalification, for inclusion in the Program Plan.
- b. Appoint a Chairman for the Program's ITPB.

2.1.2.5.2 ITPB Chairman

- a. Satisfy the items set forth in department instruction 3.13 and provide leadership for the ITPB for the establishment of qualification status of equipment.
- b. Issue official ITPB minutes, qualification and requalification status reports, and Qualification Compliance Reports.
- c. Set the dates for board meetings and invite participants.
- d. Review and integrate all qualification test plans for inclusion in the Program Plan.
- e. Review all failure reports, failure analyses and design changes (AN's) for their effect on the qualification status of equipment.
- f. Issue official Qualification Compliance Reports.

2.1.2.5.3 Integrated Test Program Board

- a. Review the qualification and requalification test plans and/or specifications to assure that the testing requirements are in consonance with the program requirements, and approve such documents by signature of the Chairman, as valid basis for qualification.
- b. Review and determine the status of all requests for waivers of, or deviations from, specification test requirements.
- c. Review all data obtained in the qualification or requalification tests, failure reports, flight test reports, and other pertinent data available, and confer or withhold qualification based on that review.
- d. Remove qualified status on equipment when necessary.
- e. When a specification is not approved or when qualification or requalification is withheld or rescinded, define the deficiencies in writing and furnish definite requirements directed toward achieving qualification status.

2.1.2.5.4 Responsible Design Engineer

- a. Prepare the technical evaluation section of the equipment qualification test reports.
- b. Provide information to the Program Manager as to what corrective action is being taken when qualification is withheld.
- c. Provide appropriate Engineering representation on the ITPB.

2.1.2.5.5 Engineering Representative

- a. Attend board meetings.
- b. Provide the ITPB Chairman with copies of qualification reports and/or associated information at least 48 hours prior to the ITPB meeting.
- c. Accept ITPB action items and schedule them for accomplishment.

2.1.2.6 Program Manager

- a. Establish the scope of qualification and requalification in the Program Plan.
- b. Negotiate qualification requirements with the customer.
- c. Establish formal disposition of the physical equipment which has been subjected to qualification or requalification testing.
- d. Provide for Program Office representation on the ITPB.

2.1.2.7 Test Section

- a. Conduct qualification testing in accordance with the Test Plan, when designated as the testing agency by Engineering.
- b. Prepare and issue test results to Engineering.
- c. Conduct requalification testing in accordance with the equipment Test Plan.
- d. Prepare and issue the Requalification Test Results.
- e. Provide appropriate test representation on the ITPB.

2.1.2.7.1 Quality Control Representative

- a. Attend board meetings.
- b. Assure the qualification and requalification equipment conforms to drawings and specifications.
- c. Transmit a copy of data sheets to the engineer when requested.
- d. Accept ITPB action items and schedule them for accomplishment.
- e. Shall periodically monitor qual testing and validate test logs.
- f. Assure compliance with "SNAP-27 Quality Assurance Plan" No. 6300-006.

2.1.2.8 Health Physicist

- a. Be present for the loading operation of the GSC onto the AEC van for shipment to NASA-Goddard. (See SI 249182.)
- b. Ensure that the FCA is not ruptured prior to shipment of the GSC to NASA-Goddard by evaluating the air and shot samples taken from the GSC.
- c. Maintain surveillance over all operations of a radiological nature to verify that test personnel are following all radiological safety regulations and advise management of any apparent violations.
- d. Prepare and maintain records and reports of radiological activities such as daily logs, periodic summary reports, unusual incident reports, radiological work permits, minor injury reports, decontamination records and records of radioactive materials receipt and shipment.
- e. Educate test personnel in the principles and hazards of radiation, contamination and decontamination, as well as various steps taken for their protection.
- f. Maintain personnel exposure records and notify individuals and their supervisors of the exposure status of each man who is occupationally exposed.
- g. Review and approve, from the standpoint of radiological safety, all test procedures involving the use of an FCA, and make the appropriate recommendations concerning the handling of the FCA.
- h. Be present for the unloading operation of the GSC from the AEC van upon arrival at GE/MSD from NASA/Goddard. (See SI 249176.)
- i. Coordinate all health and safety aspects of these tests with NASA/Goddard health and safety personnel and the GE test conductor.

2.1.2.9 Nuclear Safety Engineering

- a. Review and evaluate the nuclear safety aspects within the qualification test plan and recommend, together with the Health Physicist, any applicable changes to the test plan.

- b. Integrate test plans with the Health Physicist's safety procedures, such that the engineering test data obtained during the testing, as well as the radiological protection of test personnel and of the test area, are not compromised.
- c. Formulate, with the Health Physicist, standard operating and fuel capsule assembly handling procedures to be used by test personnel during testing utilizing a fuel capsule assembly.
- d. Formulate, with the Health Physicist, detailed procedures to be followed in the event of a radiological emergency.

2.1.2.10 Physicist

- a. Provide technical assistance for writing magnetic test procedures.
- b. Provide technical assistance during the magnetic evaluation testing.
- c. Ensure proper use of materials for fabrication of test fixtures.
- d. Review all test data during and after testing to ensure proper information is obtained.
- e. Prepare test report based on analysis of test data.
- f. Coordinate test plan and procedures with NASA/Goddard magnetic specialists.

2.1.2.11 SS Custodian (or his alternate) is responsible for:

- a. Physical accountability of all SS Material received at this SS Station.
- b. Compliance with instructions contained in the AEC Manual Volume 7000, Part 7400 titled "Control of SS Material".
- c. Approval of arrangements which will cause SS Material to be received by or shipped from this SS Station.
- d. Receipt and shipment of SS Material from and to other SS Stations.

- e. Reflecting all movements of SS Material to and from this SS Station by timely execution and distribution of Form AEC-101, Nuclear Material Transfer Document.
- f. Preparation and transmittal of AEC Form AL-713, Material Balance Report.
- g. Assuring that SS Material is identified as prescribed in Section VII of Document No. Prop. 67-1.
- h. Assuring that internal control systems and records are established and maintained as prescribed in Section VIII of Document No. Prop. 67-1.
- i. Assuring maintenance of measurement methods and practices as prescribed in Section IX of Document No. Prop. 67-1.
- j. Ensuring that controls are established to outline the disposition methods for known or easily estimated quantities of SS Material as waste. All such dispositions must be reported to the AEC by letter and assigned an Approved Normal Operation Loss (ANOL) number.
- k. Establishing and executing the taking and reporting of inventory as prescribed in Section XI of Document No. Prop. 67-1.

2.2 NASA-GODDARD

- a. Provide test facilities to perform the SNAP-27 IPU Magnetic Evaluation Testing.
- b. Provide magnetics test operating personnel to operate facilities, equipment and instrumentation.
- c. Provide health and safety personnel and equipment to monitor all phases of testing to eliminate any possible radiological hazards.
- d. Provide test data reduction equipment and personnel to operate such equipment.
- e. Provide test integration effort relative to integration of GE test equipment to NASA test equipment.
- f. Provide security protection for the SNAP-27 IPU.

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SECTION 3

TEST CONDITIONS, SCHEDULES AND FACILITIES

3.1 TEST SEQUENCE AND ELAPSED TIME TESTS

The testing sequence for the Magnetic Evaluation Qualification Test on the Model No. 10 IPU is shown in Figure 3-1.

3.2 NUCLEAR TESTING

Prior to handling and using the SNAP-27 fuel, all GE test personnel will be indoctrinated by way of a formal training course in the safe handling of radioactive materials. Fuel Capsule handling will be preceded by dry runs utilizing an Electric Fuel Capsule Simulator. Areas where the SNAP-27 fuel is being stored or in use during testing shall be designated as radiation controlled areas and access to those areas shall be controlled by the supervisor(s) of those areas in accordance with the Radiological Protective Program (ANSO Document No. 6300-206) or the NASA/Goddard Radiological Protective Program.

3.3 SECURITY

The classification of the test parameters and test data is unclassified. However, the Generator Assembly and Fuel Capsule Assembly must be under escort of a properly cleared individual or locked in AEC acceptable area. The internal configuration of the Generator Assembly and Fuel Capsule Assembly are restricted classified data.

3.4 HEALTH AND SAFETY HAZARDS

3.4.1 HEALTH HAZARDS

The health hazards associated with these tests are noted as follows:

- a. The outer case and fins of the GA are fabricated from beryllium. Personnel shall wear white nylon gloves at all times when handling the GA. This precaution will also protect the emissive coatings from possible contamination.
- b. The health hazards associated with testing, utilizing a fuel capsule assembly are radiation and contamination. The FCA is composed of fissionable material (plutonium) which contains radioisotopes which principally emit alpha, gamma and

Figure 3-1. Mod 10 IPU Test Sequence

neutron radiation. It therefore presents the following potential radiological hazards:

- . External Radiation Exposure - The gamma radiation emitted by the SNAP-27 fuel capsule originates from the fuel material isotopes and their decay products, fission products resulting from spontaneous fission of the fuel, radioactive impurities in the fuel and from the interaction of alpha particles with light elements. The gamma energy spectrum of pure fuel material is predominantly a low energy spectrum (0.04 to 0.50 MEV). Because of the long half lives and/or small quantities of other radioactive impurities, these isotopes do not contribute significantly to the gamma activity of a SNAP-27 fuel capsule.

The low penetrating power of the alpha particles emitted eliminates them from the potential sources of external radiation exposure. The neutron radiation emitted will consist principally of neutrons from the (α , n) reaction with light elements and from spontaneous and induced fission of the fuel material.

The combined neutron and gamma dose rates (millirem/hr) anticipated from the SNAP-27 fuel at different configurations are as follows:

	<u>Radially</u>	<u>Axially</u>
Bare Fuel Capsule	120	100
Generator	116	100
Ground Shipping Cask	10	10

All dose rates at one meter from the center of the component configuration.

- . Internal Radiation Exposure - The long biological half-life, the high energy and specific ionization in tissue of the emitted alpha particles, and the bodies selective localization of the fuel material in the bone combine to result in very low maximum permissible body burden (0.04 μ C) plutonium-238.

- c. Additional precautions may be imposed by General Electric's Health Physicist and the Nuclear Safety Engineer, as well as NASA-Goddard's Health Physicist.

3.5 TEST CONDITIONS

3.5.1 VISUAL EXAMINATION AND TEST CONDITIONS

Visual examination and tests shall be performed under the following standard conditions, unless otherwise specified:

Temperature	$77^{\circ} \pm 18^{\circ}\text{F}$
Relative Humidity	90% or less
Pressure (Barometric)	28 to 32 inches of mercury

The test conductor, or his designated representative, must enter the date, time, paragraph number and relative comments in the GA test log for test operation immediately upon their completion.

3.6 TEST AND FAILURE REPORTING

Test and failure reporting will be in accordance with paragraph 3.1.2 of SI 249155B.

3.7 TEST FACILITY

Magnetic Evaluation testing of the SNAP-27 IPU will be performed at NASA-Goddard's Attitude Control Laboratory in Greenbelt, Maryland. The laboratory provides a magnetic environment which cancels the earth's field (approximately 57,000 gamma) and facilitates measurements of the magnetic properties of a spacecraft or its components. The low field environment, 0 to 60,000 gamma on any or all three axes, is obtained by applying highly regulated and stabilized currents through the conductors of the 40-foot coil system. High fields on one axis for exposing and deperming the spacecraft are obtained using a 10-foot coil with only normal regulation and stability. The currents for both of these coils are delivered and controlled by electronic equipment in the Operations Building.

An earth's field magnetometer and its electronics, located in two shelters, provide automatic compensation of the daily variation of the earth's field. Electronic equipment for monitoring and recording the magnetic and rotational information is located in the Operations and Instrumentation Facility.

A communications system is provided such that personnel located in the Attitude Control Facility can be in direct communication with personnel in the Operations Facility during testing. A closed circuit television system is also provided such that personnel in the Attitude Control Facility can be observed during testing.

The above information was taken in part from a NASA memorandum #675-002 dated May 12, 1967.

3.8 TEST EQUIPMENT

All GE test instruments and equipment shall be under the control of a calibration plan and shall be properly calibrated in accordance with division and section instructions. This plan shall specify the frequency of calibration, the accuracy of the calibration standards, and maintenance of calibration records. Appendix C lists the test hardware, test equipment and materials that will be utilized by GE during the Magnetic Evaluation Testing of the IPU.

3.9 OVERNIGHT SURVEILLANCE

In the event that Magnetic Evaluation Testing must temporarily terminate for the day and the Fuel Capsule Assembly is located within the Generator Assembly, the FCA will not be removed from the Generator Assembly.

The IPU will be operated at a power level as designated by the GE Test Conductor and will be continuously monitored by GE test personnel.

AT NO TIME WILL THE OPERATING IPU BE LEFT UNATTENDED BY GE TEST PERSONNEL.

The IPU operating data will be recorded as designated by the GE Test Conductor.

Routine Health Physics surveys will be performed by Health Physics personnel as designated by the NASA-Goddard Health Physicist.

In the event that testing must temporarily terminate for the day and the Fuel Capsule Assembly is located within the Ground Shipping Cask, the FCA will remain in the GSC until testing can commence.

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SECTION 4

PRE-TEST REQUIREMENTS AND OPERATIONS

TO EXPEDITE SHIPMENT OF THE FUEL CAPSULE ASSEMBLY, THE SNAP-27 PROGRAM OFFICE SHALL NOTIFY THE GE/MSD/ANSO SS CUSTODIAN AT LEAST TWO WEEKS PRIOR TO SHIPMENT DATE.

THE SS CUSTODIAN SHALL MAKE ALL NECESSARY ARRANGEMENTS FOR THE SHIPMENT IN ACCORDANCE WITH THE SS MATERIAL CONTROL MANUAL DOCUMENTS NO. PROP. 67-1.

All equipment, instrumentation and test hardware with the exception of the fuel capsule assembly will be delivered to NASA-Goddard at least two days prior to delivery of the fuel capsule assembly to NASA-Goddard.

4.1 VISUAL EXAMINATION AND ELECTRICAL RESISTANCE CHECK OF THE GENERATOR ASSEMBLY

Step 1 Upon receipt of the generator assembly at the NASA-Goddard Test Facility, GE test personnel will make a visual inspection for obvious damage. The shipping and handling of the generator assembly shall be performed as specified in the ANSO "Quality Assurance Procedures" and Dwg. 47D300774.

Step 2 Measure the total dc resistance of the power circuitry with a Keithley Milliohmmeter as follows:

- a. Measure and record the resistance between Pins No. 1 and No. 3 and subtract the lead resistance of Pins 1 and 2.
- b. Measure and record the resistance between Pins No. 2 and No. 4 and subtract the lead resistance of Pins 3 and 4.

Step 3 Measure the resistance to ground (case) with a Hewlett Packard VTVM as follows:

- a. Measure and record the resistance between Pin No. 1

and the outer shell case.

- b. Measure and record the resistance between Pin No. 2 and the outer shell case.
- c. Measure and record the resistance between Pin No. 3 and the outer shell case.
- d. Measure and record the resistance between Pin No. 4 and the outer shell case.

Step 4 Compare the above resistance to that recorded in the Mod 10 GA log books.

Step 5 Measure and record RTD pin to pin and insulation resistance.

4.2 ASSEMBLY PREPARATION

The three major orthogonal axes of the Integrated Power Unit are defined in Figure 4-1.

Step 1 Place the GA thermal shroud test fixture (Dwg. 47E300965) on the facility dolly fixture and bolt in place. (See Figure 4-2.)

Step 2 Place the Mod 10 GA into the GA thermal shroud test fixture and bolt in place. (The GA will be secured to the fixture such that the GA axes are aligned to the coil axes as illustrated in Figures 4-3 and 4-4.)

CAUTION

ALL MOUNTING BOLTS MUST BE "BACKED OFF"
ONE TURN TO ALLOW THE GA FEET TO EXPAND
WITH TEMPERATURE.

Step 3 Roll the facility dolly into the center of the coil system.

4.3 MEASUREMENT DISTANCE

The maximum linear dimension (MLD) of the SNAP-27 IPU is 18.12 inches. The principal triaxial probes shall be placed such that the distances from the RTG center to the center of the triaxial probes is equal to 24 inches.

Figure 4-1. Definition of the Three Major Orthogonal Axes of the Integrated Power Unit

Figure 4-2. Magnetic Test Assembly Fixture and Setup

4.4 TESTING COORDINATE SYSTEM

The coordinate system that defines the Integrated Power Unit axes for testing purposes is defined in Figures 4-3, 4-4 and 4-5.

4.5 GIMBEL AZIMUTH AND ZENITH ANGLES

Figure 4-4 indicates the normal gimbel azimuth zero reference position for the test assembly. Figure 4-5 indicates the normal gimbel zenith zero reference position for the test assembly.

Figure 4-3. Integrated Power Unit Coordinate System

The prime coordinates are the coil system coordinates.
The azimuth indicator shall read 0 in this position

Figure 4-4. Gimbel Azimuth Angle Measurement

The prime coordinates are the coil system coordinates.
The zenith indicator shall read 0 in this position.

Figure 4-5. Gimbel Zenith Angle Measurement System

SECTION 5

TEST OPERATIONS

5.1 GENERATOR ASSEMBLY MAGNETIC EVALUATION TESTING

5.1.1 RADIAL FIELD MAGNITUDE DETERMINATION (AS RECEIVED IN A NULL FIELD ENVIRONMENT)

- Step 1 Assure that the facility coil system is energized to null out the earth's field and that magnetic data acquisition equipment is functioning properly prior to initiative testing.
- Step 2 With the magnetometer at a distance of 24 inches from the centerline of the GA and in a 0° zenith angle, the test package will be positioned in a 0° azimuth angle.
- Step 3 Remotely rotate the test package turntable 360° in azimuth (clockwise direction) and record magnetometer data.

CAUTION

THE IPU TEST CABLE WILL BE GUIDED BY
GE TEST PERSONNEL WHILE THE TEST
PACKAGE IS ROTATED.

- Step 4 Remotely rotate the test package turntable 360° in azimuth (counter-clockwise direction) and record data.
- Step 5 Position the magnetometer probe to a 10° zenith angle and repeat Steps 3 and 4.
- Step 6 Continue to increase the magnetometer probe in 10° zenith angle increments, repeating Steps 3 and 4 until a 90° zenith angle is obtained.

5.1.2 RADIAL COMPONENT MAGNITUDE DETERMINATION (AS RECEIVED AFTER 15 OERSTED PERM)

- Step 1 With the test package in a 0° zenith angle and the magnetometer in a 0° azimuth angle, perm the IPU in a DC field of 15 gauss.
- Step 2 Repeat paragraph 5.1.1.

5.1.3 RADIAL COMPONENT MAGNITUDE DETERMINATION (DEPERMED)

Step 1 With the test package in a 0° zenith angle and the magnetometer in a 0° azimuth angle, apply a 50-gauss, 60-cycle, AC field to the test package while rotating the turntable .5 to 1 rpm.

Step 2 Repeat paragraph 5.1.1.

5.1.4 RADIAL COMPONENT MAGNITUDE DETERMINATION (PERMED)

Step 1 Repeat paragraph 5.1.2.

5.1.5 RADIAL COMPONENT MAGNITUDE DETERMINATION (DEPERMED)

Step 1 Repeat paragraph 5.1.3.

5.1.6 RADIAL COMPONENT MAGNITUDE DETERMINATION (INDUCED FIELD)

Step 1 With the test package in a 0° zenith angle and the magnetometer in a 0° azimuth angle, apply a 30,000 gamma field along the Y-axis of the test package.

Step 2 Repeat paragraph 5.1.1.

5.2 RECEIPT OF THE SNAP-27 FUEL CAPSULE

Step 1 Upon arrival of the AEC transportation van carrying the SNAP-27 Fuel Capsule Assembly at the Magnetic Test Facility gate, the GE Test Conductor and the NASA-Goddard Health Physicist will meet the van and direct it to the unloading dock area of the Attitude Control Test Facility.

Step 2 A neutron-gamma dose rate survey of the vehicle's exterior, including the operator cab, will then be made by NASA-Goddard Health Physics personnel. An alpha contamination survey shall be performed at the rear door cracks and other areas where contamination may be suspected.

	Neutron mrem/hr	Gamma mrem/hr	Total mrem/hr
Background	_____	_____	_____
Surface of Van	_____	_____	_____
Background Count		_____ cpm/100cm ²	
Wire Sample Count			
Location		cpm/100cm ²	
1. _____		_____	
2. _____		_____	
3. _____		_____	
4. _____		_____	
5. _____		_____	

Step 3 The GE Test Conductor and the NASA-Goddard Health Physicist shall then examine the pertinent radiation survey records for the SNAP-27 Fuel Capsule Assembly.

Step 4 A rope barrier (if appropriate) shall then be erected about the van exterior in the vicinity of the rear doors to designate this as a controlled access area.

CAUTION

NO ONE MAY BE PERMITTED INTO THIS CONTROLLED AREA WITHOUT THE CONSENT OF THE NASA-GODDARD HEALTH PHYSICIST AND THE GE TEST CONDUCTOR.

CAUTION

STEP 5 MUST NOT BE PERFORMED WITHOUT FIRST RECEIVING CONSENT FROM THE NASA-GODDARD HEALTH PHYSICIST AND THE GE TEST CONDUCTOR.

Step 5 Open the rear door of the van a sufficient distance to allow the insertion of a sampling tube coupled to a constant air particulate alpha monitor into the van. The CAM must have been operating a long enough time to establish a background count prior to sampling the van's atmosphere. A five-minute air particulate sample of the transport vehicle interior shall be taken during which the constant air monitor readouts shall be observed to note a rise above normal background. If the count level rise exceeds twice the established normal background, the vehicle door shall be closed immediately and emergency procedures initiated as directed by the NASA-Goddard health physics personnel.

After the five-minute sample, the constant air monitor filter paper shall be removed and analyzed in a proportional counter for final analysis (only if a high count is observed). A new filter will then be installed in the constant air monitor. All indications will be logged by the GE Test Conductor.

Air Sample

Background Count _____

AEC Van Interior Count _____

Step 6 Health Physicist shall grant permission to open the van doors sufficiently to permit the performance of an alpha contamination survey with a portable alpha survey meter and a neutron-gamma radiation survey. The protective clothing to be worn by the surveyor during the above survey shall include a lab coat, shoe covers and gloves or as designated by the NASA-Goddard Health Physicist.

	Neutron mrem/hr	Gamma mrem/hr	Total mrem/hr
Background	_____	_____	_____
Surface of GSC	_____	_____	_____
1 meter from GSC	_____	_____	_____
Background Count	_____cpm/100cm ²		
Wipe Sample Count	_____		
Location	_____cpm/100cm ²		
1. _____	_____		

2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

A series of smears will then be taken from the van and from the SNAP-27 Ground Shipping Cask. The smears will be checked with a portable alpha survey meter and later given a count on a PC-3T gas flow proportional counter.

Step 7 If at any time during the alpha contamination survey performed in Step 6 alpha contamination is detectable on the portable alpha survey meter, the vehicle door shall be closed immediately and emergency procedures initiated, as designated by the NASA-Goddard Health Physicist. (Upon leaving the van, the surveyor will remove his protective clothing.)

Step 8 Upon taking the smear survey, each smear test sample shall be placed in individual, identified envelopes and taken to the gas flow counter for counting. The van door will be closed until the smear samples are counted.

Step 9 All smear samples will be alpha counted. If any smear sample is greater than 150 DPM for 100 cm² from the van or 150 DPM for 100 cm² from the Ground Shipping Cask, all operations shall cease and emergency action initiated by the NASA-Goddard Health Physicist as necessary.

Step 10 Permission granted from NASA-Goddard Health Physicist to proceed with SNAP-27 Fuel Capsule Assembly unloading operations.

NASA-Goddard Health Physicist

GE Test Conductor

5.3 FUEL CAPSULE REMOVAL

During this operation, GE test personnel will aid NASA-Goddard Health Physics personnel in obtaining air samples of the SNAP-27 Ground Shipping Cask prior to removal of the Fuel Capsule Assembly from the Ground Shipping Cask by GE test personnel.

During the Fuel Capsule removal operation, only those personnel directly involved in these operations will be permitted in the immediate area. These men will be properly dressed as directed by the NASA-Goddard Health Physicist. Each shall wear a wrist film badge and a lapel air monitor.

All Fuel Capsule removal operations will be monitored by the NASA-Goddard Health Physicist. The NASA-Goddard Health Physicist, as well as the GE Test Conductor, will immediately terminate any portion of this operation if safety of personnel is compromised.

Step 1 Assurance that the Fuel Capsule Assembly (FCA) has not been damaged during transit will be verified by utilization of air samples of the Ground Shipping Cask (GSC).

- (1) Throughout this procedure all internal surfaces of the GSC as well as the air sampling equipment are to be treated as contaminated, and proper contamination control maintained by the NASA-Goddard Health Physicist.
- (2) Remove the Ground Shipping Cask Log from the GSC tool box and assure Part I of the log has been completed. Complete Part II of the Ground Shipping Cask Log.
- (3) Inspect the Cask for damage.
- (4) Remove the cover from the valve housing on the top of the GSC.
- (5) Monitor the air in the vicinity of the street elbow with the AIM-3. All indications shall be evaluated by the Health Physicist.
- (6) Ensure that the shot fill line valve is closed.
- (7) Remove the cap from the street elbow (see Figure 5-1). Treat the cap and the street elbow as contaminated unless otherwise specified by the Health Physicist.

Figure 5-1. Ground Shipping Cask

- (8) Smear check the cap and street elbow internal surfaces. If the cap or street elbow is found to be contaminated, the cap will be reinstalled and the Health Physicist will make his recommendations to the GE Test Conductor whether or not to continue onward to obtain an air sample of the GSC.

Background Count	_____cpm/100cm ²
Wipe Sample	
Count of Cap	_____cpm/100cm ²

- (9) If the cap or street elbow has not been found to be contaminated, attach an AIM-3 Airborne (Alpha-Emitting) Particulate Scintillation Monitor to the street elbow. (See Figure 5-2.) (Insure that a background level has been established for the monitor - prior to connection.)
- (10) Turn on and operate the AIM-3 monitor until readout is stabilized.
- (11) Open the shot fill line valve and sample for five minutes.
- (12) Close the shot fill line valve.
- (13) Log the activity of the air sample from the shot fill line.

Limit for release	_____
Background Level	_____
Actual level	_____
NASA-Goddard Health Physicist	_____

- (14) If the activity of the atmosphere is found to be contaminated, prepare the GSC for shipment as directed by AEC-ALO in accordance with a-f below.
- (15) In the presence of health physics personnel, prepare the GSC for shipment as follows:
- (a) Ensure that the shot-fill line valve is closed.
 - (b) Carefully remove AIM-3 airborne alpha monitor.

Figure 5-2. GSC Air Sample from Shot Fill Line

- (c) Decontaminate street elbow and any other GSC surfaces as indicated by wipe samples.
 - (d) Install cap on street elbow.
 - (e) Install and wire seal the cover on shot-fill valve housing.
 - (f) Seal all valve cover housings and GSC cover with high temperature sealer.
 - (g) The GSC, when mounted on its skid, is ready for shipment.
- (16) Remove the AIM-3 airborne alpha activity monitor from the street elbow and install the absolute filter to the street elbow.
- (17) Monitor the air in the vicinity of the shot drain valve with the AIM-3. All indications shall be evaluated by the Health Physicist.
- (18) Remove the shot drain valve housing cover.

CAUTION

CONTAIN ANY RESIDUAL SHOT WHEN REMOVING SHOT DRAIN CAP AND MAINTAIN STRICT CONTAMINATION CONTROL IN THE DRAIN AREA AT THIS TIME.

- (19) Ensure that the shot drain valve is closed.

CAUTION

WHEN CONNECTING SHOT COLLECTION CONTAINER AND PINCH-OFF TUBE TO DRAIN VALVE, MAKE SURE FITTING SEATING SURFACES ARE FREE OF FOREIGN PARTICLES

- (20) Place a "breadpan" under the drain cap and remove the cap from the shot drain line and connect an empty shot container and copper pinch off tube to the shot drain valve observing proper radiation and contamination procedures. The cap and the shot drain line are to be considered contaminated.

NOTE

SHOT DRAIN BULB MUST BE CONNECTED SO THE AIR FLOW IS FROM THE SHOT CONTAINER TOWARD THE AIM-3 MONITOR.

- (21) Connect the shot drain bulb and an AIM-3 Airborne (Alpha-Emitting) Particulate Scintillation Monitor to the tubing outlet on the empty shot container (Figure 5-3.)

CAUTION

ASSURE THAT THE AIR FLOW THROUGH THE SHOT DRAIN BULB IS FROM THE GSC TO THE AIM-3.

- (22) Open the shot fill line valve.
- (23) Operate the shot-drain bulb several cycles, creating a partial vacuum in the shot collection container.
- (24) Open the shot-drain line valve.

CAUTION

AFTER OPENING THE SHOT-DRAIN VALVE, DO NOT OPERATE DRAIN VALVE WHILE SHOT IS FLOWING.

Continue to operate the shot-drain bulb during shot draining. Determine that shot is draining by feeling a sharp increase in temperature of the shot-collection employed to encourage shot flow.

After a sharp increase in temperature of the shot-collection container is noted, indicating shot draining, turn on and operate the AIM-3 monitor.

Allow at least 3 minutes of AIM-3 monitor operation and evaluate monitor reading. Log the activity of the air sample.

- (25) Log the activity of the air sample.

Limit for release

Background Level

Actual Level

Figure 5-3. GSC Shot Drain and Air Sample from Drain Line

(26) If the atmosphere surrounding the FCA is not found to be contaminated, proceed to (27) in this procedure. If the atmosphere surrounding the FCA is found to be contaminated, as indicated by the air monitor, the GSC will be prepared for shipment as directed by AEC ALO.

- . Evacuate the immediate area and don supplied air respiratory protective equipment.
- . Secure the AIM-3 monitor and the shot fill and shot drain valves.

CAUTION

THE DRAIN VALVE MUST BE CLOSED CAREFULLY. IF RESISTANCE IS FELT DURING CLOSING, TAP THE VALVE LIGHTLY TO DISCHARGE ANY ENTRAPPED SHOT. THEN ATTEMPT AGAIN TO CLOSE THE VALVE.

- . Prepare the shot fill line area for contamination control as recommended by the Health Physicist. (The shot fill line area will be enclosed within a polyethylene bag during shot fill operations.)
- . Select a sealed shot container.
- . Remove the shot-fill reservoir cap and insert special funnel in the reservoir.
- . Open the shot container and pour the contents through funnel into the GSC.
- . Install the reservoir cap.
- . Remove the absolute filter. Reinstall cap on the street elbow of the shot fill line. Remove polyethylene bag and its contents and secure as radioactive waste.
- . Place a "breadpan" under the shot drain line and then pinch off the copper tube between the drain valve and shot container, remove the full shot container from the shot drain line and bag. The AIM-3 monitor will be bagged with the container.

- . Install cap on the shot drain valve.
 - . Decontaminate the entire GSC as necessary and replace valve housing covers about the shot fill valve and shot drain valve.
 - . Wire seal valve housing covers and seal both valve cover housings and GSC cover with high temperature sealer.
 - . Disposition of the GSC shall be under the direction of the Health Physicist.
- (27) Determine that the shot has drained into the shot container by feeling the increased temperature of the container. Allow at least 3 minutes for the shot to drain. During this time, do not operate drain valve.
 - (28) Close the shot drain valve carefully. If resistance is felt, tap the valve lightly to discharge any entrapped shot. Then attempt again to close the valve.
 - (29) Disconnect the shot container from the shot drain valve, maintaining the shot container as a closed system for contamination control.
 - (30) The Health Physicist will monitor the shot and/or drain line for contamination.
 - (31) If the shot and/or drain line is not contaminated, seal the container and tag it "USED SHOT". If the shot or drain line is contaminated, disposition of the GSC shall be under the direction of the Health Physicist and Test Conductor.
 - (32) Install the cap on the shot drain line. Ensure that seating surfaces are free of foreign particles.
 - (33) Log shot and/or drain line contamination level.

Background Count _____cpm/100cm²

Wipe Sample Count of Drain Line _____cpm/100cm²

Step 2 The FCA is now ready to be transferred from the GSC to the SLA Transfer Cask. (This will be performed within the AEC van.)

- (1) All personnel not directly involved in the actual transfer of the FCA from the GSC to the SLA transfer cask (Dwg. 47R301143) will move away from the area. The Health Physicist will stand by with the two test operators who will be involved with the transfer.
- (2) The test operators who are to transfer the FCA are to be trained to perform the desired tasks in such a manner that the FCA is transferred as quickly as safety permits, to minimize radiation exposure. These men will also be properly dressed as directed by the Health Physicist and shall have immediately available to them respiratory protection. They will also wear a lapel air monitor and wrist film badges. Capsule recovery tongs will also be immediately available.
- (3) Remove the 20 nuts from the GSC cover.
- (4) Remove the cover plate from the cover lifting ring.

CAUTION

MINIMIZE RADIATION EXPOSURE FROM END
STREAMING DURING AND SUBSEQUENT TO
COVER REMOVAL.

- (5) Remove the cask cavity cover (wt. 45 lbs.) from the GSC (treat as contaminated) and place on a clean surface. Check for contamination on the underside of the cover plate will be made by the Health Physicist prior to initiating the next step. The AIM-3 Airborne Particulate Scintillation Monitor will be used to monitor the air in the vicinity of the FCA during transfer. Neutron and gamma dose rate measurements shall be taken of the GSC prior to transfer of the FCA to the SLA Transfer Cask.

	Neutron mrem/hr	Gamma mrem/hr	Total mrem/hr
Background	_____	_____	_____
Surface	_____	_____	_____
1 meter from center of GSC	_____	_____	_____

CAUTION

THE TEST OPERATOR IS TO KEEP THE FCA AS FAR AWAY AS POSSIBLE FROM HIS BODY DURING TRANSFER AND THE FCA IS TO BE MOVED AS QUICKLY AS SAFETY PERMITS.

- (6) Engage the Ground Handling Tool (47D300857) onto the Fuel Capsule removable back plate at the three points provided in the back plate and marked on the GSC top with arrows. Remove the Fuel Capsule Assembly from the GSC vertically and promptly install the Fuel Capsule into the SLA Transfer Cask. Neutron and gamma dose rate measurements shall be taken while the FCA is within the SLA Transfer Cask.

	Neutron mrem/hr	Gamma mrem/hr	Total mrem/hr
Background	_____	_____	_____
Surface	_____	_____	_____
1 meter from center of SLA Transfer Cask	_____	_____	_____

5.4 INTEGRATED POWER UNIT WARM-UP

- Step 1 Ensure that the Generator Assembly is under a load condition of 4.7 ohms and the Qual Test Console is operating per Appendix A.

CAUTION

A CLEAR, UNOBSTRUCTED PATH FROM THE VAN TO THE GENERATOR ASSEMBLY WHICH IS LOCATED WITHIN THE GA THERMAL SHROUD TEST FIXTURE (47E300965) WILL BE ESTABLISHED.

NO ONE WILL BE PERMITTED INTO THIS CONTROLLED AREA WITHOUT THE CONSENT OF THE NASA-GODDARD HEALTH PHYSICIST AND THE GE TEST CONDUCTOR

Step 2 Hand carry the SLA Transfer Cask containing the FCA from the transportation van into the Attitude Control Test Facility.

Step 3 Utilizing the SLA Handling Tool, remove the FCA and place into the Generator Assembly.

	Neutron mrem/hr	Gamma mrem/hr	Total mrem/hr
Background	_____	_____	_____
Surface	_____	_____	_____
1 meter from center of IPU	_____	_____	_____

ALL ACCESS TO WITHIN THE CONTROLLED AREA ABOUT THE INTEGRATED POWER UNIT WILL BE CONTROLLED BY THE HEALTH PHYSICIST AND ESTIMATES WILL BE MADE OF THE DOSE RATE RECEIVED BY ALL PER- SONNEL ENTERING THAT AREA.
--

Step 4 Allow the IPU to stabilize at 4.5 amperes steady state condition. Steady state is defined as the point at which the hot junction, cold junction, hot frame and outer case temperatures do not deviate more than $\pm 4^{\circ}\text{F}$ for one hour. The data will be plotted on a time vs. temperature basis to indicate trends. Record all data as designated by the Test Conductor.

Step 5 Smear check the SLA Transfer Cask, the SLA Handling Tool, the Ground Handling Tool and the Ground Shipping Cask.

Step 6 Inspect and prepare the GSC for insertion of the FCA in the following manner:

- (1) Throughout this procedure, all internal surfaces of the GSC are to be treated as contaminated, and proper contamination control maintained, unless directed otherwise by the Health Physicist.
- (2) Inspect the cask for damage, especially if the cask has been in conveyance. Complete Part II of the Ground Shipping Cask Log.

NOTES

ITEM (3) NEED BE PERFORMED ONLY IF GSC HAS BEEN IN CONVEYANCE OR IF THERE IS SUSPICION OF SOME LOSS OF SHIELD WATER.

IF ITEM (3) IS PERFORMED, IT MUST BE PERFORMED IN AN AMBIENT TEMPERATURE OF 60 TO 80°F

- (3) Remove the fill valve housing cover and shield water fill plug. If the liquid level is greater than 5 inches below the top surface of the top plate of the GSC, add water - 30 percent (volume) ethylene glycol to raise the liquid to a level not less than 4 inches below the top plate of the GSC. Replace the shield water fill plug and housing cover.

Remove the shield water fill and safety plug from the GSC cover assembly. If the liquid level is greater than 1-3/4 inches below the top surface of the top plate of the cover assembly, add - 30 percent (volume) ethylene glycol to raise the liquid to a level not less than 1-1/4 inches below the top surface of the top plate of the cover assembly. Install the shield water fill and safety plug into the cover assembly.
- (4) Remove cover plate from cover lifting ring.
- (5) Remove the cask cavity cover. Assure that the cover O-ring is in its groove and that the O-ring seating surface is free of foreign particles.
- (6) Inspect the cask's fuel capsule cavity for condensation and presence of foreign particles; remove any foreign particles, but treat as contaminated. Smear check the cavity.
- (7) Test the six roller guides at the top of the cavity for free rotation.
- (8) Replace the cask cavity cover on the GSC. Do not bolt.
- (9) Remove the shot fill valve housing cover.
- (10) Remove the shot-fill reservoir cap and inspect the line

for condensation and foreign material. Remove any foreign particle contamination; treat for condensation as outlined in (12).

CAUTION

CONTAIN ANY RESIDUAL SHOT WHEN
REMOVING THE DRAIN LINE CAP, AND
MAINTAIN STRICT CONTAMINATION
CONTROL IN THE DRAIN AREA AT THIS
TIME.

- (11) Remove center from shot drain valve housing, remove drain line cap, open shot drain valve, and inspect drain line for foreign materials or condensation. Remove any foreign materials; treat for condensation as outlined in (12).
- (12) Check for internal contamination. If there is no contamination, eliminate condensation from any part of the GSC cavity by replacing the cover and purging with dry nitrogen or other dry gas except for helium through the shot fill tube. Purge all gas through the AIM-3 until all moisture has been expelled. If contaminated, perform decontamination operations as directed by the Health Physicist. (Purge until the FCA is ready for reinsertion then remove purge.)
- (13) Assure shot drain valve is opened, with the drain cap installed finger tight.
- (14) Assure reservoir cap is installed and the vent valve is closed.

5.5 INTEGRATED POWER UNIT DEPERM

- Step 1 After it has been established by the GE Test Conductor that the Mod 10 IPU has reached steady state at 4.5 amps, Magnetic Testing shall commence.
- Step 2 Assure that the facility coil system is energized to null out the earth's field.
- Step 3 With the manetometer at a distance of 24 inches from the centerline of the IPU and in a 0° zenith angle, the test package will be positioned in a 0° azimuth angle.

- Step 4 Apply a 50 gauss 60 cycle AC field to this test package while rotating the turntable at .5 to 1 rpm.

CAUTION

THE IPU TEST CABLE WILL BE GUIDED BY GE
TEST PERSONNEL WHILE THE TEST PACKAGE
IS ROTATED.

- Step 5 Rotate the test package turntable 360° in azimuth (counter-clockwise direction) to a 0° azimuth angle position.
- Step 6 Check 0° azimuth, 0° zenith position to insure proper deperm.

5.6 RADIAL COMPONENT MAGNITUDE DETERMINATION (AFTER 15 OERSTED PERM)

- Step 1 With the test package in a 0° zenith angle and the magnetometer in a 0° azimuth angle, perm the IPU in a DC field of 15 gauss.
- Step 2 Rotate the test package turntable 360° in azimuth (clockwise direction) and record magnetometer data.

CAUTION

THE IPU TEST CABLE WILL BE GUIDED BY GE
TEST PERSONNEL WHILE THE TEST PACKAGE
IS ROTATED.

- Step 3 Rotate the test package turntable 360° in azimuth (counter-clockwise direction) and record magnetometer data.
- Step 4 Position the magnetometer probe to a 10° zenith angle and repeat Steps 2 and 3.
- Step 5 Continue to increase the magnetometer probe in 10° zenith angle increments, repeating Steps 2 and 3 until a 90° zenith angle is obtained.

5.7 RADIAL COMPONENT MAGNITUDE DETERMINATION (DEPERMED)

- Step 1 With the test package in a 0° zenith angle and the magnetometer in a 0° azimuth angle, apply a 50 gauss, 60 cycle, AC field to the test package while rotating the turntable at .5 to 1 rpm. Then position the test package at a 0° zenith and 0° azimuth position.

Step 2 Repeat Paragraph 5.6, Steps 2 thru 5.

5.8 RADIAL COMPONENT MAGNITUDE DETERMINATION (INDUCED FIELD)

Step 1 With the test package in a 0° zenith angle and the magnetometer in a 0° azimuth angle, apply a 30,000 gamma field along the Y-axis of the test package and record magnetometer data.

Step 2 Position the magnetometer probe to a 10° zenith angle and apply 30,000 gamma field to the 10° zenith angle and record magnetometer data.

Step 3 Continue to increase the magnetometer probe and induced field in 10° zenith angle increments to 90° zenith and record magnetometer data.

Step 4 Rotate the IPU turntable 180° and repeat Steps 1 thru 3.

5.9 IPU POWER ADJUSTMENT

After satisfactory completion of Paragraphs 5.5, 5.6, 5.7 and 5.8 as determined by the GE Test Conductor, the IPU Test Console will be adjusted to subject the IPU to its maximum load (10 ohms) and allowed to reach steady state consistent with the following caution note.

CAUTION

AT NO TIME WILL THE GENERATOR ASSEMBLY
HOT JUNCTION TEMPERATURE BE PERMITTED TO
EXCEED 1115°F .

Steady state is defined as the point at which the hot junction, cold junction, hot frame and outer case temperatures do not deviate more than $\pm 4^{\circ}\text{F}$ for one hour.

The data will be plotted on a time vs. temperature basis to indicate trends. Record all data as designated by the Test Conductor.

Magnetic Evaluation Testing will be terminated for the day at a convenient time as determined by the NASA-Goddard Magnetic Test personnel and the GE Test Conductor.

The IPU will remain fueled and operating during this temporary overnight Magnetic Evaluation test termination. IPU operation will be at a minimum load condition.

CAUTION

AT NO TIME WILL THE OPERATING IPU BE
LEFT UNATTENDED BY GE TEST PERSONNEL.

IPU operating data will be recorded as designated by the GE Test Conductor. Routine Health Physics surveys will be performed by Health Physics personnel as designated by the NASA-Goddard Health Physicist.

5.10 MAXIMUM LOAD MAGNETIC EVALUATION TESTING

Step 1 After it has been established by the GE Test Conductor that the Mod 10 IPU has reached steady state with a maximum load condition, Magnetic Evaluation Testing will again commence.

Step 2 Repeat Paragraphs 5.5, 5.6, 5.7 and 5.8.

5.11 FCA REMOVAL FROM GENERATOR ASSEMBLY

During the fuel capsule assembly removal operations, only those personnel directly involved in these operations will be permitted in the immediate area. These men will be properly dressed as directed by the Health Physicist and shall wear a wrist film badge and a lapel air monitor.

A clear, unobstructed path from the IPU test fixture to the AEC van will be established.

No one will be permitted into this controlled area without the consent of the NASA-Goddard Health Physicist and the GE Test Conductor.

A smear survey of the IPU and/or test fixture shall be made prior to FCA removal.

Background Count	_____cpm/100cm ²
Wipe Sample Count	
Location	cpm/100cm ²
1. _____	_____
2. _____	_____
3. _____	_____

<p style="text-align: center;"><u>NOTE</u></p> <p>GA OPERATING DATA SHALL BE MONITORED AFTER FCA REMOVAL UNTIL IT HAS REACHED AMBIENT CONDITIONS.</p>

- Step 1 Engage the FCA with the SLA Handling Tool and remove the FCA from the generator assembly and place into the SLA Transfer Cask.
- Step 2 Hand carry the SLA Transfer Cask from the Attitude Control Test Facility to the AEC van.
- Step 3 Remove the cask cavity cover and place on a clean surface. Remove the shot drain line cap. Assure shot drain valve is opened. Assure shot-fill reservoir cap is installed and vent valve is closed.
- Step 4 Utilizing the Ground Handling Tool, engage the FCA and remove the FCA from the SLA Transfer Cask and place in the Ground Shipping Cask. (Align the three locking arms of the tool with the arrows of the GSC top for correct insertion orientation.)

A smear survey of the SLA Transfer Cask shall be made after the FCA has been removed.

Background Count	_____cpm/100cm ²
Wipe Sample Count	

Location	cpm/100cm ²
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

- Step 5 Lower the GSC cover into position. DO NOT BOLT. Close the shot drain valve and install the shot drain line cap.
- Step 6 Select a sealed shot container.
- Step 7 Remove reservoir cap and insert special fill funnel in reservoir.

NOTE

CARE MUST BE TAKEN WHEN OPENING THE NICKEL SHOT CONTAINER. ALL TAPE MUST BE CAREFULLY REMOVED SO THAT NO TAPE OR OTHER FOREIGN MATERIALS ENTER THE SHOT CONTAINER AND SUBSEQUENTLY ENTER THE GSC.

- Step 8 Open the nickel shot container and pour the nickel shot into the cask through the funnel, taking care not to let the shot overflow the reservoir. The last amount of shot will settle in the reservoir very slowly. Sporadic settling of the remaining shot will be noticed as the fuel capsule is thermally contracting. Jarring of the cask will speed the entrance of this final amount of shot.
- Step 9 Replace the shot-fill reservoir cap snugly, but DO NOT apply a large torque to it.
- Step 10 Replace the valve housing cover.
- Step 11 Close the empty shot container and tag it "EMPTY".
- Step 12 Secure the shot container in its storage position on the shipping skid.
- Step 13 Attach the 20 nuts to the GSC cover and torque each to 40 ± 2 foot-pounds.
- Step 14 Install cover plate over cover lifting ring.
- Step 15 Install the fill valve and drain valve housing covers.
- Step 16 Record the GSC exterior surface temperature and the shield water pressure upon reaching thermal equilibrium. This will normally take 8 to 12 hours after inserting the FCA into the GSC.
- Step 17 Complete Part III of Ground Shipping Cask Log before shipment and place the log in the tool box. Wire seal all cover openings.
- Step 18 Perform neutron and gamma dose rate measurements of the GSC and a contamination survey of the van interior and the GSC surface.

	Neutron mrem/hr	Gamma mrem/hr	Total mrem/hr
Background	_____	_____	_____
Surface	_____	_____	_____
1 meter from center of IPU	_____	_____	_____
Background Count	_____ cpm/100cm ²		
Wipe Sample Count	_____		

Location

1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____

Perform neutron and gamma dose rate measurements of the AEC van exterior.

	Neutron mrem/hr	Gamma mrem/hr	Total mrem/hr
Background	_____	_____	_____
Surface	_____	_____	_____

Close the van doors and secure the van for shipment to GE-MSD.

Step 19 Smear check the Magnetic Test Facility, Handling Tools and associated equipment.

Background Count _____ cpm/100cm²
Wipe Sample Count

Location cpm/100cm²

1. _____

2. _____

3. _____

4. _____

5. _____

Step 20 When the Generator Assembly has cooled to ambient temperatures measure thermopile resistance and resistance to ground of the GA as described in Paragraph 4.1.

Step 21 The Generator Assembly will be removed from the GA thermal shroud test fixture and placed in its shipping container per Dwg. 47C300774.

Step 22 When the AEC van is ready to depart to GE/MSD, a copy of the Health Physics data shall be given to the AEC courier. The AEC van shall then be escorted to the Magnetic Test Facility gate.

Step 23 All air samples shall be given a final evaluation by Health Physics personnel including personnel exposure.

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APPENDIX A
OPERATING INSTRUCTIONS FOR THE GROUND
SUPPORT EQUIPMENT
SECTION 1.0
INTRODUCTION

The operating instructions which follow are written for normal operation of an Qual Test Monitor Console (QTMC) after system test acceptance checkout and calibration have been completed. The following procedures are for general console operation and are not to be used as specific test instructions or to replace Quality Control Standing Instructions (S.I.'s). During operation and maintenance of an QTMC, care must be taken to prevent damaging the Weston Wattmeter located on the EFCS Control Panel. There is a "lock" located to the right of this meter which must be engaged (pushed in) whenever the console is not in use. Equally important, the lock must be disengaged (pulled out) prior to energizing the main power circuit breaker on the console. The console should never be moved with power on and without the lock engaged.

Qual Test Monitor Console

SECTION 2.0

GENERAL OPERATION

FOR QUAL TEST MONITOR CONSOLE

2.1 POWER TURN ON

Before connecting the ac power connector to 3Ø 208 vac 60 cycles, connect all other cables and de-energize the main power circuit breaker located on the ac power control panel. The shipping jumper between Pins 7 and 8 in the EFCS panel must be removed.

Connect the power connector and check that the three red indicator lights located on the left hand side of the ac power control panel, are energized.

Turn the power select pot on the EFCS control panel full counter clockwise. (Zero output). Check that the "red line" indicator on the Over Temperature Meter, located on the EFCS control panel, is set at 1150°F.

Pull out the "lock" level on the Weston Wattmeter and level the meter with the level adjustments if required.

Energize the main power circuit breaker on the ac power control panel. The console blower should now be operating. The extreme right amber indicator should be energized on the ac power control panel. Various indicator lights and meter lights will now be on depending upon the condition of the console when last operated prior to de-energizing the main power breaker.

2.2 CONSOLE OPERATING INSTRUCTIONS

After energizing main power as directed in Paragraph 2.1 check the console and energize the appropriate switches if necessary to obtain the following indicator illumination:

1. EFCS ac power off
2. EFCS power off
3. Performance map panel power on

4. DC mode/GPC mode in dc mode
5. IPU load on/open circuit in On position (Read Paragraph 2.6 before continuing)
6. 0 to 20 volts/20 to 40 volts indicator in 0 to 20 volts
7. 0 to 10 ohms/10 to 20 ohms indicator in 0 to 10 position.

Check and be sure that the EFCS power select pot is full counter-clockwise.

NOTE: A 30 minute warmup period is required for accurate operation of the console. The Weston Model 1483 Wattmeter unit will not operate to design accuracy levels with less than the 30 minute warmup period.

Check the "red line" marker on the Over Temperature Meter located in the EFCS control panel. It should be set at 1150°F.

Take the readings on the IPU Elapsed Timer and on the EFCS Timer and record them in the test logbook. Reset the meters, if desired, only after both readings have been recorded.

Energize EFCS ac power on. The corresponding indicator should light.

Energize EFCS power on. The corresponding indicator should light and also the two remaining amber indicators on the ac power control panel. The ac line voltmeter on the EFCS control panel should now read 208 volts. If EFCS power does not turn on, repeat turn on procedure as an interlock will not allow power turn on unless previous directions are followed exactly.

Energize RTD select buttons R1-2 and R3-2. Set the IPU load select pot at full clock-wise position to the mechanical stop (stop will be located somewhere between 4 to 6 ohms).

Increase the EFCS power select pot slowly clockwise to the desired power level as read on the Weston Model 1483 Wattmeter (0 to 1800 watts).

The increase in temperature at the EFCS should be visible after a short time on the R3-2 RTD Meter. The Over Temperature Meter on the EFCS control panel should also indicate an increasing temperature. Correlation between the R1-2 RTD Meter and the Over Temperature Meter should exist between 600° and 1300° temperatures.

Generator output may be observed on the Performance Map panel. Do not change switch settings or IPU load resistance unless specifically directed to do so by the Cognizant Test Director or Test Conductor.

2.3 AUTOMATIC OVER TEMPERATURE SHUTDOWN

If the "black line" over temperature reading reaches the "red line" temperature setting, an over temperature condition will result and the over temperature indicator on the EFCS control panel will light. Approximately ten seconds after an over temperature condition occurs, should the temperature remain at or over the "red line" settings, EFCS power will automatically shut off. The over temperature indicator will remain energized and EFCS power will remain off until the "black line" temperature readout falls below the "red line" level. At this time, if the console has gone unattended and the EFCS power select pot has not been reduced, the over temperature indicator will go out and the EFCS power will again be applied at the original level. The system will continue to cycle automatically, if the over temperature problem continues, to prevent exceeding the selected "red line" temperature level. The Over Temperature Meter and associated circuitry will operate with or without RTD monitoring selected at the Performance Map Panel.

2.4 TURN OFF PROCEDURE

Reduce the EFCS power select pot to zero (Full counter-clockwise).
Turn EFCS power off then EFCS ac power off.

Turn Performance Map Panel power off.

De-energize the main power circuit breaker on the ac power control panel.

Disconnect the ac power cable from the ac power outlet to prevent accidental turn on of GSE equipment.

Engage the "lock" located on the EFCS control panel for the Weston Model 1483 Wattmeter.

CAUTION

DAMAGE TO THE IPU GENERATOR MAY RESULT BY SWITCHING INTO GPC MODE WITHOUT A GPC UNIT OPERATING IN THE QTMC. SWITCHING INTO GPC MODE WITHOUT THE GPC UNIT WILL OPEN CIRCUIT THE GENERATOR OUTPUT.

2.5 IPU LOAD ON/OPEN CIRCUIT SWITCH

This switch, located on the Performance Map Panel, should remain in the load on condition unless the Cognizant Test Conductor directs actuation of the switch to open circuit mode. Open circuit mode (no load on the generator output) cannot be attained by just actuating the switch. In addition to this a "short" (contact closure) is required from the Data Acquisition system across prior to pins p and r on QTMC rear panel connector J3. An open circuit condition exists only if the red light indicator on the switch lights when the switch is actuated. If the red indicator does not light with actuation of the switch, this indicates that prior to pins p and r connector J3) have not been shorted by the Data Acquisition system and the IPU load is still on even though the green indicator is no longer lit.

SECTION 3.0

DESCRIPTION

Qual Test Monitor Console (Figure 3-1, Serial No. 6307001 for Model No. 10)

The console is composed of four panels: a performance map panel, EFCS control panel, AC control panel, a rear connector panel, and an EFCS power supply. This console shall control the power input to the EFCS and shall provide analog monitoring of the IPU test functions.

- a. Performance Map Panel - The 19 in. x 30 in. x 14 in. Performance Map Panel consists of a resistance thermometer readout section, a performance map section and test data connectors.

"The resistance thermometer readout section (RTD)" provides means for manual selection and analog display of three T_H and three T_C temperature sensors in degrees Fahrenheit. These sensors have a T_H range of 600° to 1200°F, and a T_C range of 0° to 600°F.

The "Performance Map Section" provides means for monitoring and visually displaying the potential in vdc, current in amperes, power in watts, variable load resistances in ohms and also measures the elapsed time of these monitored functions:

- 1) Voltage Monitor and Display - The voltage monitor and display shall provide capability to monitor dc voltage over the range of 0 to 40 vdc in two ranges and shall provide analog display of the voltage to an accuracy of $\pm 1\%$ of full scale. The indicator units shall be vdc.
- 2) Current Monitor and Display - The current monitor and display shall provide capability to monitor direct current over the range of 0 - 10 amperes and shall provide analog display of the current to an accuracy of $\pm 1\%$ of full scale. The indicator units shall be amperes.
- 3) Test Data Connector - A test data connector shall be provided.

Figure 3-1. Qual Test Monitor Console

- b. Electric Fuel Capsule Simulator (EFCS) Power Control Panel - The EFCS Control Panel shall consist of the following sections with the capability of providing the performance specified:

1) EFCS Control Circuit Section

- (a) Power Controller - The power controller shall utilize power sensing techniques, shall be adjustable from 1200 to 1700 watts and shall maintain a particular power setting in this region to $\pm 1\%$.
- (b) Power Indicator - The power indicator shall sense EFCS power and shall provide display of this power in watts to an accuracy of $\pm 1\%$.
- (c) AC Line Voltage Indicator - The ac line voltage indicator shall sense a potential of 208 vac 60 cps and shall provide display of this voltage to an accuracy of $\pm 1\%$.
- (d) DC Power Supply for EFCS Heaters - The power supply shall have a remotely programmable output from 85 to 115 vdc, 20 amps maximum.
- (e) Elapsed Time Indicator and Display - The elapsed time indicator and display shall provide capability to measure elapsed time of monitored functions and shall provide digital display of elapsed time in hours and tenths of hours to an accuracy of $\pm 2\%$.
- (f) Current Indicator - The current indicator shall sense the current supplied to the EFCS and shall provide display of the current in amperes over a range of 0 - 20 amps dc to an accuracy of $\pm 1\%$.
- (g) Voltage Indicator - The voltage indicator shall sense the potential across the EFCS lead pigtail and shall provide display over a range of 0 - 150 volts to an accuracy of $\pm 1\%$ in the 25 - 115 v region.
- (h) Test Data Connector - A test data connector or individual test jacks shall be provided. The available test monitor shall include:

. Line Voltage (E line)

- . Current (I_{EFCS})
- . Voltage (E_{EFCS})
- . Power (P_{EFCS})

- (2) Safety Monitor Section - The safety monitor section shall monitor one selected T_H sensor and shall de-energize the electric fuel capsule simulator (EFCS) power source should a predetermined T_H level be exceeded. The panel shall include an over temperature monitor device. The level set shall be variable from 1100°F to 1175°F.
- c. AC Control Panel - The ac control panel shall accept the required ac input power to this console, control the application of said line power via ac controllers and distribute said power to the console power distribution system.
 - d. Rear Connector Panel - The rear connector panel shall be mounted near the bottom of the console and shall contain a connector which will accommodate the prime cables as delineated in Bendix Document ATM 273, a connector which will accommodate the EFCS power cable, a connector which will accommodate the cable that interconnects the qual monitor test console with the readout console (if used), and a connector to accommodate connection to the permanent record patch panel.
 - e. EFCS Power Supply - An 18 in. x 18 in. x 7 in. panel shall provide the primary input power, which shall be 120 vac $\pm$ 5%, 1 $\emptyset$, 60 cycle, 3 wire (2 power leads, 1 facility ground) and 208 vac $\pm$ 5%, line to line, 60 cycle, 3 wire (2 power leads, 1 facility ground).

SECTION 4.0

PRE-TEST CHECKOUT PROCEDURE

FOR THE Q2 OR Q3 QUAL TEST MONITOR CONSOLE

- Step 1 After arrival of the QTMC, it shall be positioned and set up in the location in which it will be used during the magnetic test. All wheels shall be locked in place.
- Step 2 Remove the shipping jumpers between pins 7 and 8 from the EFCS control panel.
- Step 3 Ensure that the main power circuit breaker located on the AC power control panel is de-energized.
- Step 4 Turn the power select pot on the EFCS control panel full counter-clockwise (zero output).
- Step 5 Turn the EFCS power supply course and fine voltage adjustment pots to full counter-clockwise.
- Step 6 Check that the "red line" indicator on the over temperature meter, located on the EFCS control panel, is set at 1300°F.
- Step 7 Set the over temperature bypass switch inside the console at rear of the EFCS control panel in the "ON" position. It does not matter where the "red line" indicator is set in this mode since the over temperature meter will not indicate RTD R1-2 temperature.
- Step 8 Pull out the "LOCK" lever on the Weston wattmeter and level the meter with the level adjustments.
- Step 9 Adjust the IPU load selector to 3.9 ohms, which will give approximately 16.0 volt output on the GA.
- Step 10 Connect the EFCS cabling to the QTMC, consisting of a short lead, a mating feedthrough connector, and the 70-foot long cable.
- Step 11 Remove the Type "A" EFCS from its shipping container and mount it into the GA simulator. Attach the EFCS cabling to the connector.

- Step 12 Connect the 70-foot long GA extension cable to the console.
- Step 13 Place a jumper lead across pins 52 and 53 at the J3 connector at the back of the QTMC. This shall remain installed throughout the test to facilitate open circuit voltage readings.
- Step 14 Connect the AC power connector on W17 cable and check that the three red indicator lights located on the left-hand side of the AC power control panel are energized.
- Step 15 Energize the main power circuit breaker on the AC power control panel.
- Step 16 Various lights and meters will now be on, depending upon the condition of the console when last operated prior to de-energizing the main power breaker. The console blower should not be operating. The extreme right amber indicator on the AC power control panel should be energized.

The pre-test check off sheets for the qual test monitor console shall be filled out to verify its operability after shipment.

- Step 17 Check the console and energize the appropriate switches if necessary to obtain the following indicator illumination:

- . EFCS AC power off
- . EFCS power off
- . Performance map panel power on
- . DC Mode/GPC mode in DC mode
- . IPU load on/open circuit in on position
- . 0 to 20 volts/20 to 40 volts indicator in 0 to 20 volts position
- . 0 to 10 ohms/10 to 20 ohms indicator in 0 to 10 ohms position
- . Over temperature indicator should be off
(should indicate 0°F temperature)

Check off on the pre-test check off sheet - Table 1.

- Step 18 If necessary, reset the IPU elapsed timer and EFCS timer to zero.

TABLE 1

PRE-TEST CHECK OFF SHEET
FOR QUAL TEST MONITOR CONSOLE

CONSOLE ENERGIZED PRIOR TO TEST	S/N
Three red indicators on AC power control panel are energized.	_____
Console blower is operating.	_____
Amber indicator on AC power control panel is energized.	_____
EFCS AC power in OFF position.	_____
EFCS power in OFF position.	_____
Performance map panel power is ON.	_____
DC mode/GPC mode in the DC MODE.	_____
IPU load on/open circuit in the ON position.	_____
0 to 20 volts/20 to 40 volts indicator in the <u>0 to 20 volt position.</u>	_____
0 to 10 ohms/10 to 20 ohms indicator in the <u>0 to 10 ohm position.</u>	_____
Over temperature indicator is off (bypass switch in EFCS control panel must be in ON POSITION).	_____
Reset IPU elapsed timer to zero.	_____
Reset EFCS elapsed timer to zero.	_____

APPROVED: _____
TEST CONDUCTOR

QUALITY CONTROL ENGINEER

Step 19 Operation of the EFCS control panel shall be checked out in the following sequence. Functional capability shall be recorded on Table 2 of the pre-test check off sheets.

Energize EFCS AC power to the ON position. The corresponding indicator should light.

Energize EFCS power to the ON position. The corresponding indicator should light and also the two remaining amber indicators on the AC power control panel. The AC line voltmeter on the EFCS control panel should now read 208 volts.

Slowly increase the EFCS power select pot clockwise to read out 1505 ± 15 watts on the Weston Model 1483 wattmeter in the EFCS control panel.

Check the operation of the voltmeter and ammeter and then de-energize the EFCS back to zero input.

Step 20 Operation of the performance map panel shall be checked out in the following sequence. Functional capability shall be recorded on Table 3 of the pre-test check off sheets.

A decade resistance box shall be used to simulate an RTD resistance to check out the RTD meter readouts. The meter readouts shall have previously been calibrated to the Mod 10 RTD values, or it shall be accomplished at this time.

Each set of RTD pins in the connector at the end of the 70 foot GA cable shall have the following resistance placed across them:

<u>RTD Readout No.</u>	<u>70' Cable Connector Pin No.</u>	<u>Decade Resis. Input</u>	<u>Eqv. Temp.</u>
R1-1	5 & 6	3176	1125 ⁰ F
R1-2	4 & 12	3184	1125 ⁰ F
R1-3	10 & 11	3180	1125 ⁰ F
R3-1	8 & 9	1882	450 ⁰ F
R3-2	18 & 19	1890	450 ⁰ F
R3-3	16 & 17	1875	450 ⁰ F

TABLE 2

EFCS CONTROL PANEL OPERATION	S/N
EFCS AC power in ON position.	_____
EFCS power in ON position.	_____
Remaining amber indicators on the AC power control panel are ENERGIZED.	_____
AC line indicator reads 208 volts.	_____
Weston wattmeter indicates power input.	_____
EFCS ammeter operates.	_____
EFCS voltmeter operates.	_____

TABLE 3

PERFORMANCE PANEL READOUTS			S/N
	<u>Temp. Input</u>	<u>Console Readout °F</u>	
R1-1 RTD meter reads out.	1125	_____	_____
R1-2 RTD meter reads out.	1125	_____	_____
R1-3 RTD meter reads out.	1125	_____	_____
R3-1 RTD meter reads out.	450	_____	_____
R3-2 RTD meter reads out.	450	_____	_____
R3-3 RTD meter reads out.	450	_____	_____
GA open circuit switch operates. (If not, check jumper at J3 connector on console.)			_____

While the above resistances are across the required pins, the corresponding RTD readout switch shall be depressed and the resulting meter readout recorded on Table 3.

The GA open circuit switch shall be depressed and verification made that it functions.

Step 21 After the completion of the functional check out of the QTMC the 70-foot GA cable shall be fitted with the feedthrough connector and connected to the end of the GA cable. A mechanical clamp shall be installed to prevent the connector from coming apart during the 360° rotation of the GA during testing.

APPENDIX B

DRAWINGS

47D300774	GA Packaging Instructions
47A300922	GASC Servicing Unit Operating Instructions (5 Sheets)
47E300780	IPU Assembly Mod 10
47E300779	Generator Assembly Mod 10
47D300857	Ground Handling Tool
47D300613	Ground Shipping Cask
47D300855	SLA Handling Tool
47R301143	SLA Transfer Cask
47E300965	GA Thermal Shroud Fixture
47E300676G1	Qual Test Monitor Console (Q2) or (Q3)

BLANK

- 10 LOCATE CONNECTOR CLAMP IN A POSITION ADJACENT TO THE CONNECTOR ATTACH THE CLAMP TO THE BOTTOM OF THE PLATE ATTACH THE UPPER TANG OF THE CLAMP TO THE TOP OF THE PLATE AND FASTEN WITH SCREWS PROVIDED
- 11 PIERCE CAP (DET 6) AND PLACE OVER END OF CONNECTOR
- 12 PLACE THE CONNECTOR IN THE CLAMP AND PLACE THE CAP OVER THE CONNECTOR TIGHTEN THE CAP SCREWS
- 13 DRAPE OPAQUE WRAP (DET 3) OVER GENERATOR AND FASTEN WRAP TO CONTAINER USING TAPE (DET 4)
- 14 MARK WRAP FOUR (4) PLACES 90° APART AT APPROXIMATE E
- 14a DRAPE OPAQUE WRAP (DET 3) OVER GENERATOR AND FASTEN WRAP TO CONTAINER USING TAPE (DET 4)
- 15 CAREFULLY PLACE UPPER HALF ON CONTAINER IN PROPER ORIENTATION
- 16 REPLACE THE CLOSURE BOLTS AND WASHERS TIGHTEN THE BOLTS IN THE SEQUENCE SHOWN TO A TORQUE OF 200 TO 250 INCH-POUNDS
- 17 CONNECT VACUUM PUMP TO PNEUMATIC FITTING THROUGH SUITABLE PIPING AND EVACUATE THE CONTAINER TO AN INTERNAL PRESSURE OF 5 INCHES OF MERCURY OR LESS
- 18 CHARGE THE CONTAINER TO 1 ± 1 PSIG WITH A GAS MIXTURE OF 99% ARGON 1% HELIUM HAVING A DEW POINT OF -65 DEG FAHR OR LESS
- 19 REPEAT PROCEDURE A17 ABOVE
- 20 CHARGE THE CONTAINER TO 6 ± 1 PSIG WITH GAS MIXTURE AS IN PROCEDURE A18 ABOVE AND CLOSE CONTAINER VALVE
- 21 WRAP LOCKWIRE (DET 2) TWICE AROUND VALVE HANDLE ADJACENT TO KNOB AND RUN THROUGH HOLE PROVIDED IN COVER
- 22 AFFIX 2 WIRE SEALS (DET 5) THROUGH HOLES PROVIDED IN THE FLANGE
- 23 PLACE DOCUMENTS IN RECORDS TUBE AS REQUIRED
- 24 AFFIX WIRE SEAL THROUGH HOLES PROVIDED IN RECORDS TUBE
- 25 MARK FOR SHIPMENT AS REQUIRED
- B UNPACKAGING PROCEDURE
- 1 OPEN CONTAINER VALVE AND ALLOW INTERNAL PRESSURE TO EQUALIZE WITH AMBIENT AS INDICATED BY ZERO READING ON GAGE AND CESSATION OF FLOW
- 1a REMOVE TWO (2) WIRE SEALS (DET-5)
- 2 OPEN CONTAINER BY REMOVING 12 BOLTS FROM CLOSURE FLANGE CAREFULLY LIFT UPPER HALF STRAIGHT UP FROM CONTAINER SO AS TO CLEAR GENERATOR SET UPPER HALF ASIDE ON ANY CLEAN SURFACE
- 3 REMOVE OPAQUE WRAP AND TAPE
- 4 EXAMINE GENERATOR ASSEMBLY FOR EVIDENCE OF DAMAGE AND NOTE CONDITION OF SHOCK INDICATOR EITHER OR BOTH SETS OF BALLS BEING DISLODGED FROM THEIR NESTS INDICATES THAT A SHOCK OVERLOAD HAS BEEN EXPERIENCED IMMEDIATELY CALL THE ATTENTION OF COGNIZANT QUALITY CONTROL PERSONNEL TO ANY DISCREPANCIES OBSERVED
- 5a UNFASTEN VELCRO HOOK TAPE FROM CABLE ASSEMBLY
- 5b REMOVE DRIVER FROM STORAGE TUBE
- 7 USE THE DRIVER TO TURN EACH STUD ASSEMBLY COUNTER-CLOCKWISE APPROXIMATELY ONE-QUARTER TURN AND REMOVE THE STUD ASSEMBLIES REMOVE THE GENERATOR ASSEMBLY
- 8 REPLACE DRIVER IN STORAGE TUBE AND SECURE COVER FASTEN STUD ASSEMBLIES TO SUPPORT PLATE USING "VELCRO" HOOK TAPE
- 9 REPLACE UPPER HALF ON CONTAINER AND REFASTEN CLOSURE BOLTS
- 10 CLOSE CONTAINER VALVE
- C STORAGE PACKAGING PROCEDURE
- 1 PROCEDURE IDENTICAL TO PROCEDURES A 1 THROUGH A 24. NOTE GAGE READING.
- 2 EXAMINE CONTAINER GAGE AFTER APPROXIMATELY 24 HRS AND COMPARE WITH INITIAL READING ADJUST READINGS FOR CHANGES IN AMBIENT BAROMETRIC PRESSURE AND TEMPERATURE
- 3 IF A PRESSURE LOSS IS OBSERVED OPEN CONTAINER AND REPEAT PROCEDURES C1 & C2
- 4 EXAMINE CONTAINER GAGE ONE WEEK AFTER CLOSING AND COMPARE WITH INITIAL READING ADJUST READINGS FOR CHANGES IN AMBIENT BAROMETRIC PRESSURE AND TEMPERATURE
- 5 IF A PRESSURE LOSS OF MORE THAN 1 PSI IS OBSERVED OPEN CONTAINER AND REPEAT PROCEDURES C1 THROUGH C4
- 6 IF A PRESSURE LOSS OF LESS THAN 1 PSI IS OBSERVED AT ONE WEEK (C4 ABOVE) EXAMINE THE CONTAINER AND GAGE EVERY 3 MONTHS THEREAFTER
- D STORAGE UNPACKAGING PROCEDURE
- 1 PROCEDURE IDENTICAL TO PROCEDURES B1 THROUGH B1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
A		GENERAL CHANGES PER AN-1	12/67	R. Jordan
B		1. (47E300754G1, G2 OR G3) WAS (47E300754G1) IN LM - AN-2	7/2/67	R. Jordan
C		10C AN-3	12/67	R. Jordan
D		10C AN-4	12/67	R. Jordan

- NOTES —
- A PACKAGING PROCEDURE
- 1 OPEN CONTAINER VALVE AND ALLOW CONTAINER INTERNAL PRESSURE TO EQUALIZE WITH AMBIENT AS INDICATED BY ZERO READING ON GAGE AND CESSATION OF FLOW THROUGH PNEUMATIC FITTING
- 2 OPEN CONTAINER BY REMOVING 12 BOLTS FROM CLOSURE FLANGE AND LIFTING OFF UPPER HALF SET UPPER HALF ASIDE ON ANY CLEAN SURFACE
- 3 EXAMINE INTERIOR OF CONTAINER FOR DIRT AND CLEAN IF NECESSARY
- 4 RESET SHOCK INDICATOR
- A UNSCREW THREADED PLASTIC COVER OF INDICATOR HOUSING AND EXTRACT DISLODGED SPRING AND BALLS
- B COMPRESS BLACK COLOR-CODED SPRING BETWEEN TWO BALLS AND RETAIN WITH TWEEZERS
- C SEAT BLACK SPRING AND BALLS SET IN THE LOWER (BLACK) RETAINING NESTS INSIDE THE INDICATOR RELEASE AND WITHDRAW THE TWEEZERS
- D COMPRESS RED COLOR-CODED SPRING BETWEEN TWO BALLS AND RETAIN WITH TWEEZERS
- E SEAT RED-SPRING AND BALLS SET IN THE UPPER (RED) RETAINING NESTS INSIDE THE INDICATOR RELEASE AND WITHDRAW THE TWEEZERS
- F REPLACE COVER ON INDICATOR
- 5 PLACE GENERATOR ASSEMBLY IN CONTAINER AS SHOWN SO THAT THE HOLES IN THE GENERATOR FEET ARE ALIGNED WITH THE HOLES IN THE CONTAINER SUPPORT PLATE
- 6 REMOVE DRIVER FROM STORAGE TUBE
- 7 INSERT A STUD ASSEMBLY IN EACH OF EIGHT HOLES IN THE GENERATOR FEET SECURE STUD ASSEMBLIES BY TURNING EACH CLOCKWISE APPROXIMATELY ONE-QUARTER TURN USING THE DRIVER PROVIDED
- 8 REPLACE DRIVER IN STORAGE TUBE AND SECURE COVER
- 9 LAY THE GENERATOR CABLE AROUND THE RIM OF THE SUPPORT PLATE APPROXIMATELY AS SHOWN AND SECURELY FASTEN USING "VELCRO" HOOK TAPE PROVIDED AS SHOWN IN DELINEATION.

DET	REQD	DESCRIPTION
6	1	CAP, UG, #EP22
5	3	SECURITY SEAL, TWISTED WIRE
4	AR	TAPE, MASKING
3	AR	WRAP, POLYETHYLENE-OPAQUE
2	AR	LOCKWIRE (MS20995-C32)
1	1	CONTAINER, SHIPPING-GEN. ASSY (47E300754G1, G2 OR G3)

15 E SUBS	47E300779G6
MODEL	IDENT NO.
USED ON	
APPROX OUTSIDE DIMS (L X W X D)	40 X 40 X 40 1/2
APPROX GROSS WEIGHT	325 LBS

SIGNATURES		DATE	NO	VER
E. Jordan		12/67	2	67
R. Jordan		7/2/67	3	67
R. Jordan		12/67	4	67
R. Jordan		12/67	5	67
R. Jordan		12/67	6	67
R. Jordan		12/67	7	67
R. Jordan		12/67	8	67
R. Jordan		12/67	9	67
R. Jordan		12/67	10	67
R. Jordan		12/67	11	67
R. Jordan		12/67	12	67
R. Jordan		12/67	13	67
R. Jordan		12/67	14	67
R. Jordan		12/67	15	67
R. Jordan		12/67	16	67
R. Jordan		12/67	17	67
R. Jordan		12/67	18	67
R. Jordan		12/67	19	67
R. Jordan		12/67	20	67
R. Jordan		12/67	21	67
R. Jordan		12/67	22	67
R. Jordan		12/67	23	67
R. Jordan		12/67	24	67
R. Jordan		12/67	25	67
R. Jordan		12/67	26	67
R. Jordan		12/67	27	67
R. Jordan		12/67	28	67
R. Jordan		12/67	29	67
R. Jordan		12/67	30	67
R. Jordan		12/67	31	67
R. Jordan		12/67	32	67
R. Jordan		12/67	33	67
R. Jordan		12/67	34	67
R. Jordan		12/67	35	67
R. Jordan		12/67	36	67
R. Jordan		12/67	37	67
R. Jordan		12/67	38	67
R. Jordan		12/67	39	67
R. Jordan		12/67	40	67
R. Jordan		12/67	41	67
R. Jordan		12/67	42	67
R. Jordan		12/67	43	67
R. Jordan		12/67	44	67
R. Jordan		12/67	45	67
R. Jordan		12/67	46	67
R. Jordan		12/67	47	67
R. Jordan		12/67	48	67
R. Jordan		12/67	49	67
R. Jordan		12/67	50	67
R. Jordan		12/67	51	67
R. Jordan		12/67	52	67
R. Jordan		12/67	53	67
R. Jordan		12/67	54	67
R. Jordan		12/67	55	67
R. Jordan		12/67	56	67
R. Jordan		12/67	57	67
R. Jordan		12/67	58	67
R. Jordan		12/67	59	67
R. Jordan		12/67	60	67
R. Jordan		12/67	61	67
R. Jordan		12/67	62	67
R. Jordan		12/67	63	67
R. Jordan		12/67	64	67
R. Jordan		12/67	65	67
R. Jordan		12/67	66	67
R. Jordan		12/67	67	67
R. Jordan		12/67	68	67
R. Jordan		12/67	69	67
R. Jordan		12/67	70	67
R. Jordan		12/67	71	67
R. Jordan		12/67	72	67
R. Jordan		12/67	73	67
R. Jordan		12/67	74	67
R. Jordan		12/67	75	67
R. Jordan		12/67	76	67
R. Jordan		12/67	77	67
R. Jordan		12/67	78	67
R. Jordan		12/67	79	67
R. Jordan		12/67	80	67
R. Jordan		12/67	81	67
R. Jordan		12/67	82	67
R. Jordan		12/67	83	67
R. Jordan		12/67	84	67
R. Jordan		12/67	85	67
R. Jordan		12/67	86	67
R. Jordan		12/67	87	67
R. Jordan		12/67	88	67
R. Jordan		12/67	89	67
R. Jordan		12/67	90	67
R. Jordan		12/67	91	67
R. Jordan		12/67	92	67
R. Jordan		12/67	93	67
R. Jordan		12/67	94	67
R. Jordan		12/67	95	67
R. Jordan		12/67	96	67
R. Jordan		12/67	97	67
R. Jordan		12/67	98	67
R. Jordan		12/67	99	67
R. Jordan		12/67	100	67

47D300774

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REV NO
47A300922

TITLE
OPERATING INSTRUCTIONS , GASC SERVICING UNIT

CONT ON SHEET 2 SH NO 1

CONT ON SHEET 2 SH NO 1

FIRST MADE FOR GASC

HIGH PRESSURE GAGE

LOW PRESSURE GAGE

REGULATOR

CYLINDER VALVE

HOSE

CONTAINER

VENT

VACUUM

POWER CORD

SWITCH

REF: { 47E300770
47D300769

GASC SERVICING UNIT
PIPING INSTALLATION

CAUTION

MAXIMUM RATED OPERATING PRESSURE IS 150 PSIG

CONTENTS

PROCEDURE A. CONTAINER CHARGING SHEET 2 & 3
PROCEDURE B. CONTAINER REPLENISHMENT SHEET 5

UNCLASSIFIED

BY D. E. Biddleman
(AUTHORIZED CLASSIFIER)

DATE 4-21-67

C8

PRINTS TO

MADE BY R. TORDAL 4-20-67

APPROVALS
W. H. L. Corp

ARPO / AGE (21)

DIV OR
DEPT

47A300922

ISSUED
W. H. L. Corp 4-21-67

STC / PHILA, PA

LOCATION

CONT ON SHEET 2

SH NO 1

FF 803 WF (5-65) REV
PRINTED IN U S A

CODE IDENT NO

15227

GENERAL ELECTRIC

47A300922

REV NO.	TITLE	CONT ON SHEET	SH NO.
47A300922	OPERATING INSTRUCTIONS, GASC SERVICING UNIT	3	2
CONT ON SHEET	FIRST MADE FOR		
3	GASC		

A. TO CHARGE CONTAINER -

1. CLOSE ALL VALVES.
2. OPEN CYLINDER VALVE, AND READ CYLINDER PRESSURE ON HIGH PRESSURE GAGE. REPLACE CYLINDER IF LESS THAN 200 PSIG PRESSURE REMAINS.
3. CLOSE CYLINDER VALVE.
4. POSITION SERVICING UNIT ADJACENT TO CONTAINER VENT PORT.
5. CONNECT HOSE TO CONTAINER VENT PORT FITTING.
6. OPEN CONTAINER VENT VALVE.
7. OPEN VALVE C.
8. NOTE CONTAINER GAGE READING AND OR BAROMETRIC PRESSURE.
9. CONNECT VACUUM PUMP POWER CORD TO 120 VOLT, 60 CYCLE, AC POWER SOURCE.
10. CLOSE VALVE C.
11. TURN VACUUM PUMP ON.
12. OPEN VALVE D.
13. OPEN VALVE B.
14. OPEN VALVE A.
15. EVACUATE SYSTEM TO AN INTERNAL PRESSURE OF .5 INCH OF MERCURY OR LESS, SEE TABLE 1 FOR GAGE INDICATIONS.
16. CLOSE VALVE D.
17. CLOSE VALVE B.
18. OPEN CYLINDER VALVE.
19. SET REGULATOR AT APPROXIMATELY 40 PSIG AS INDICATED BY LOW PRESSURE GAGE.
20. OPEN VALVE B REPRESSURIZING CONTAINER TO 1 ± 1 PSIG AS INDICATED BY CONTAINER GAGE.
21. CLOSE VALVE B.
22. OPEN VALVE D.
23. EVACUATE SYSTEM TO AN INTERNAL PRESSURE OF .5 INCH OF MERCURY OR LESS, SEE TABLE 1 FOR GAGE INDICATIONS.
24. CLOSE VALVE D.
25. TURN VACUUM PUMP OFF.
26. OPEN VALVE B PRESSURIZING CONTAINER TO -
 - 9 ± 1 PSIG IF CONTAINER IS TO BE SHIPPED WITHIN 7 DAYS
 - 12 ± 1 PSIG IF CONTAINER IS GOING INTO STORAGE
 - AS INDICATED BY CONTAINER GAGE.
27. CLOSE VALVE B.
28. CLOSE CONTAINER VENT VALVE.
29. CLOSE VALVE A.
30. OPEN VALVE C.
31. CLOSE CYLINDER VALVE.
32. REMOVE HOSE FROM CONTAINER VENT PORT FITTING.

REVISIONS

C8

PRINTS TO

MADE BY	APPROVALS	DIV OR DEPT.	47A300922
R. JORDAN 4-20-67	W. L. L. 4-21-67	ARPD/AGE (27)	
ISSUED	LOCATION	CONT ON SHEET	SH NO.
W. L. L. 4-21-67	STC/PHILA, PA	3	2

FF803-WF (2-66)
PRINTED IN U S A

CODE IDENT NO.

15227

GENERAL ELECTRIC

47A300922

REV. NO.	TITLE	CONT ON SHEET 4	SH NO. 3
47A300922	OPERATING INSTRUCTIONS, GASC SERVICING UNIT		
CONT ON SHEET 4	FIRST MADE FOR GASC		

- 33. OPEN VALVE A.
- 34. OPEN VALVE B.
- 35. OPEN VALVE D.
- 36. CLOSE VALVE C.
- 37. CLOSE VALVE A.

REVISIONS

C8

PRINTS TO

MADE BY R. JORDAL 4-20-67	APPROVALS	ARPD/AGE (27)	DIV OR DEPT.	47A300922
ISSUED	WAT	STC/PHILA., PA.	LOCATION	CONT ON SHEET 4 SH NO. 3

FF803-WF (2-66)
PRINTED IN U S A

15227

GENERAL ELECTRIC

47A300922

CONT ON SHEET 5 SH NO. 4

REV NO.
47A300922
CONT ON SHEET 5 SH NO. 4

TITLE
OPERATING INSTRUCTIONS, GASC SERVICING UNIT
FIRST MADE FOR GASC

WHEN AMBIENT BAROMETRIC PRESSURE IS :	AND/OR THE CONTAINER GAGE WHEN OPEN TO AMBIENT INDICATES:	THEN WHEN THE CONTAINER IS EVACUATED TO .5 INCH OF MERCURY THE CONTAINER GAGE WILL INDICATE:	REVISIONS
28.0 IN HG 28.2 28.4 28.6 28.8 29.0 29.2 29.4 29.6 29.8 29.92 30.0 30.2 30.4 30.6 30.8 31.0 31.2 31.4 31.6 31.8 32.0 IN HG	1.9 INCHES VACUUM 1.7 1.5 1.3 1.1 .9 .7 .5 .3 .1 INCHES VACUUM 0 .02 PSIG .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 PSIG	27.6 INCHES VACUUM 27.8 28.0 28.2 28.4 28.6 28.8 29.0 29.2 29.4 29.5 29.6 29.8 30.0 INCHES VACUUM OFF SCALE OFF SCALE	

TABLE I

CONTAINER GAGE INDICATIONS DURING PURGING, STEPS A 15 AND A 23

MADE BY R. JORDAL 9-20-67 APPROVALS WR/... ARPD / AGE (27) DIV OR DEPT. 47A300922
ISSUED 1-1-67 STC / PHILA, PA, LOCATION CONT ON SHEET 5 SH NO. 4

FF803 W/ 2 66)
PRINTED IN U.S.A.

CODE IDENT NO.

15227

GENERAL ELECTRIC

47A300922

REV NO.	TITLE	CONT ON SHEET	FIN	SH NO.
47A300922	OPERATING INSTRUCTIONS, GASC SERVICING UNIT	CONT ON SHEET	FIN	SH NO. 5
FIRST MADE FOR		GASC		

B. TO REPLENISH CONTAINER -

1. CLOSE ALL VALVES.
2. OPEN CYLINDER VALVE, AND READ CYLINDER PRESSURE ON HIGH PRESSURE GAGE. REPLACE CYLINDER IF LESS THAN 50 PSIG PRESSURE REMAINS.
3. CLOSE CYLINDER VALVE.
4. POSITION SERVICING UNIT ADJACENT TO CONTAINER VENT PORT.
5. CONNECT HOSE TO CONTAINER VENT PORT FITTING.
6. CONNECT VACUUM PUMP POWER CORD TO 120 VOLT, 60 CYCLE, AC POWER SOURCE.
7. TURN VACUUM PUMP ON
8. OPEN VALVE D
9. OPEN VALVE B
10. OPEN VALVE A
11. EVACUATE SYSTEM FROM REGULATOR TO CONTAINER VENT VALVE FOR 15 SECONDS.
12. CLOSE VALVE D
13. TURN VACUUM PUMP OFF
14. CLOSE VALVE B
15. OPEN CYLINDER VALVE
16. SET REGULATOR AT APPROXIMATELY 40 PSIG AS INDICATED BY LOW PRESSURE GAGE.
17. OPEN CONTAINER VENT VALVE
18. OPEN VALVE B PRESSURIZING CONTAINER TO -
 - 9 $\pm$ 1 PSIG IF CONTAINER IS TO BE SHIPPED WITHIN 7 DAYS
 - 12 $\pm$ 1 PSIG IF CONTAINER IS GOING INTO STORAGE
 - AS INDICATED BY CONTAINER GAGE.
19. CLOSE VALVE B
20. CLOSE CONTAINER VENT VALVE
21. CLOSE VALVE A
22. OPEN VALVE C
23. CLOSE CYLINDER VALVE
24. REMOVE HOSE FROM CONTAINER VENT PORT FITTING.
25. OPEN VALVE A
26. OPEN VALVE B
27. OPEN VALVE D
28. CLOSE VALVE C
29. CLOSE VALVE A

REVISIONS

C8

PRINTS TO

MADE BY	R. JORDAL 4-20-67	APPROVALS	ARPO/AGE (27)	DIV OR DEPT.	47A300922
ISSUED	W. L. 4-21-67	W. L. 4-21-67	STC/PHILA., PA.	LOCATION	CONT ON SHEET FIN SH NO. 5

FFBOS-WF (2-66)
PRINTED IN U.S.A.

CODE IDENT NO.

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REVISIONS			
ZONE	DATE	DESCRIPTION	APPROVED
A	4/3/67	CHANGE IDENT NO OF ITEM 2 USE PER AN-1	PJK
A	4/3/67	ADD G1	PJK
B	4/3/67	GENERAL CHANGE CTR FL USE PER AN-1	PJK
B	4/3/67	ADD G8	PJK
C	4/3/67	CHANGED IDENT NO OF ITEM 2 ON G3 & 8	PJK
D	4/3/67	REVISED NOTE 2 USE PER AN-5	PJK
E	4/3/67	ADD G9	PJK
F	4/3/67	USE AN-7	PJK

NOTES
1 ALL DWG TERMS AND TOLERANCES PER GE SPEC 171A4286
2 MARK 'GE47E300779 G-' AND APPLICABLE SERIAL NUMBER AS FOLLOWS
CLEAN AREA TO BE MARKED PER GE SPEC 171A4200 PARA 3.3.1
3 MARK WITH RUBBER STAMP USING 12 LETTERS AND GE SPEC 171A8241 TYPE I PAINT
CURE 2 HRS MIN AT ROOM TEMPERATURE POST CURE DURING IV MAPPING CYCLE
IN AIR

MODEL NO	SERIAL NO
5	6320001
6	6320002
7	6320003
8	6320004
10	6320005
13	6320006
14	6320007
15	6320008
19	6320009
20	6320010
21	6320011
22	6320012
23	6320013

3. PLACE CLAMPS (1) 47E300861 PL (ITEM 3) IN BAG AND SHIP WITH
GENERATOR ASSEMBLY CLAMPS TO BE INSTALLED BY BENDIX PER
GE DWG 47E30012 (1P INTERFACE) NOTE 4 (G3655 ONLY)
4. TAG CABLE PROTECTIVE SLEEVING IN A CONSPICUOUS PLACE AT
THE CABLE CONNECTOR END TAG TO READ:
"REMOVE VAREGLASS SLEEVING PRIOR TO FLIGHT"

GROUP STATUS BLOCK							
D	D	D	D	D	F	D	F
G1	G2	G3	G4	G5	G6	G7	G8/G9

UNCLASSIFIED
BY *[Signature]*
DATE 11-12-88

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON PLACE DECIMALS ± .02 PLACE DECIMALS ± .01 ANGLES ± FUNCTIONS ± MATERIAL		REVISED BY <i>[Signature]</i> DATE 11-12-88	SEE SEPARATE PL GENERAL ELECTRIC APPO-HSD-MPT LOC. PHILA, PA/STC GENERATOR ASSEMBLY CONTRACT NO AT (30-1) 3535 REV (00000000) E 15227 47E300779 SCALE 1/1
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REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	1	ADDED NOTE 4 INC PER AN-1	3/1/67	P.S.K
	2	INC- AN-2	4/14/67	P.S.K. DSK
	A	INC AN-3 WALL THK P2 WAS .020	4/14/67	P.S.K. DSK
	B	ADDED: G2 INC PER AN-4	4/2/67	L.T. P.S.K.
	C	DELETED 303 TYPE & CHANGED MAT'L SPEC FROM AMS 5738 TO AMS 5438 FOR P2	8-3-67	P.S.K

NOTES:

1. DRAWING TERMS & TOLERANCES PER 171A4286
2. MARK "GE47D300857P_ORG_" AS APPLICABLE PER 118A1526 CLASS 21or17
3. APPLY LIQUID SEALANT PER 171A829, GRADE AA.
4. MARK "GE47D300857 G_ REV_ SERIAL NO_" PER 118A1526 CLASS 4. SERIAL NO'S TO BE 6285001 THRU 6285009. LOCATE ON SU :FACE SHOWN.

UNCLASSIFIED

BY R. E. Dancy
(AUTHORIZED CLERK)
DATE 1-23-67

(PI) MAT'L - CRES
PER AMS 5638
PASSIVATE PER MIL-S-5002

GROUP STATUS	
G-NO	REV
G1	C
G2	C

SEE SEPARATE P/L

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES— TOLERANCES ON: 2-PLACE DECIMALS $\pm .02$ ALL SURF. 3-PLACE DECIMALS $\pm .010$ ANGLES $\pm 0' 30''$ FRACTIONS $\pm$ MATERIAL—	SIGNATURES		DATE	NO.	VS.
	DESIGNED	<i>Richard</i>	18	1	6
	CHECKED	<i>S. J. Vining</i>	23	1	6
	SERIALIZED	<i>E. J. Ridenour, Jr.</i>	24	1	6
	FILED	<i>W. J. Ridenour</i>	23	1	6
	DATE				
TITLE					

67 ARPO MSD DEPT LOC PHILA. PA. /STC.

67 GROUND HANDLING TOOL

CONTRACT NO. - AT(30-1)3535

SIZE	CODE IDENT NO.	47D300857
D	15227	

SCALE 1/1	SHEET 1 OF FIN
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SOURCE OF SUPPLY				
DIM	PART NO	VENDOR	VENDOR	GE SPE. NO
"A"				
280 MIN	1	SN0001 REV G	BATTELLE MEMORIAL INSTITUTE 505 KING AVE COLUMBUS 1, OHIO	MSD110 07 02
600 MIN	2	LATER	SAME AS ABOVE	MSD100-0-02

ZONE		LTR		REVISIONS		DATE		APPROVED	
A	N	I	N	ALL	E	2	8	1	1
S	A	V	2						
C	A

APPROX WT OF CASK — 1250 POUNDS
(WITH WATER)
APPROX WT OF SKID — 250 POUNDS
APPROX TOTAL WT — 1500 POUNDS

NOTES

2. PART TO INCLUDE MANUFACTURER'S IDENTIFICATION
MARK "GE47D300613P" PART NUMBER AS APPLICABLE.
SERIAL NUMBER SUPPLIED BY PRODUCTION CONTROL

SOURCE CONTROL DRAWING ONLY THE ITEMS LISTED ON THIS
DRAWING AND IDENTIFIED BY VENDOR'S NAMES, ADDRESSES
AND PART NUMBERS HAVE BEEN TESTED AND APPROVED BY MSD
FOR USE ON ARPO EQUIPMENTS. A SUBSTITUTE ITEM SHALL
NOT BE USED WITHOUT PRIOR TESTING AND APPROVAL BY MSD

NO CHANGES SHALL BE MADE TO THE DESIGN CONFIGURATION
MATERIAL PARTS OR MANUFACTURING PROCESS WITHOUT
PRIOR WRITTEN APPROVAL OF PURCHASING DEPT MSD

UNCLASSIFIED
BY *RE*
DATE 2-22-51

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		SIGNATURES		DATE	NO
TOLERANCES ON 2 PLACE DECIMALS ± 3 PLACE DECIMALS ± ANGLES ± FRACTIONS ±		CHECKED <i>8-2-67</i>		8-2-67	
MATERIAL		DESIGNED <i>1-3-61</i>		1-3-61	
		DRAWN <i>2-2-67</i>		2-2-67	
		MAILED			
		GENERAL ELECTRIC MSD-ARPO DEPT. LOC VE/57C CONTRACT NO AT(30-1) 3335			
		GROUND SHIPPING CASK			
		SIZE CODE IDENT NO D 15227 47D300613			
		SCALE 1/4		SHEET 1 OF 1	

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- NOTES:
- 1 DIM. TERMS & TOLERANCES PER 171A4286
 - 2 INSPECTION STAMPS & IDENTIFICATION MARK "GE47R301145G1" PER 110A1525, CLASS 1B
 - 3 SURFACES NOTED TO BE COATED WITH PYROMARK OR EQUIV. HIGH TEMP BLACK SPRAY PAINT (FN 31 ON PL) SURFACES MUST BE FREE OF OIL OR DIRT PRIOR TO PAINTING
 - 4 WELD PER GE SPEC 146A3614, CLASS II
 - 5 TIE RODS (FN 15 & 16) SHALL BE IDENTIFIED BY SETS FOR EACH CASE. INTERCHANGING OF THE RODS BETWEEN ASSEMBLY NOT PERMITTED UNLESS THE POWER RODS MEET THE REQUIREMENTS ON 47B300872

(4) ASM

UNCLASSIFIED
BY: P. C. C. / J. C. C.
DATE: 11-31-01

SEE SEPARATE PL

PLANS CHECKED DESIGNED BY: J. C. C. DRAWN BY: J. C. C. CHECKED BY: J. C. C. DATE: 11-31-01		15227 47R301145
GENERAL ELECTRIC MSD-ARPO CONTRACT NO. AT-100-1135-35 SLA TRANSFER CASE		15227 47R301145

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APPENDIX C

TEST HARDWARE, TEST EQUIPMENT AND MATERIALS

Model No. 10 Generator Assembly
Fuel Capsule Assembly
Ground Shipping Cask (2)
Generator Assembly Shipping Container
Qual Test Monitor Console
Ground Handling Tool (2)
SLA Handling Tool
SLA Transfer Cask
Electric Fuel Capsule Simulator "A" Type and Cable
Keithley Milliohmmeter or equivalent
GA Thermal Shroud Fixture
Vacuum Tube Voltmeter
DC Power Supply - 0-30 volt, 0-5 amp
Simpson Volt/ohmmeter
50-volt Megger
W17 Power Cable
Leeds Northrup AC and DC Decade Resistance Box
GA Resistance Measurement Box
70' IPU to IPU Console Cable with Feed Through and Cable
Extension W21E
Torque Wrench, 0-300 inch-pounds
Torque Wrench, 0-50 foot-pounds
GASC Pressurizing Equipment
Vacuum Grease
One Bottle Gaseous Nitrogen
Thermometers
White Nylon Gloves
Shoe Covers
Lab Coats
GA Hold-down Bolts
Clip Leads
#16 awg pins, 6 male, 6 female
#20 awg pins, 6 male, 6 females
Soldering Iron
Ethylene Glycol Mixture
Airborne Particulate Scintillation Monitor
Miscellaneous Tools
Friden Desk Calculator
GA Simulator
Bread pans

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