National Aeronautics and
Space Administration

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

STANDARD OPERATING PROCEDURE
FOR A VARIAC

ENVIRONMENTAL TEST FACILITY BRANCH
ENVIRONMENTAL AND STRUCTURAL TEST DIVISION
TEST LABORATORY
ENGINEERING DIRECTORATE

THIS PROCEDURE DOES NOT CONTAIN HAZARDOUS OPERATION

CHECK THE MASTER LIST—
VERIFY THIS IS THE CORRECT VERSION

STANDARD OPERATING PROCEDURE FOR A VARIAC

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CHECK THE MASTER LIST—VERIFY THIS IS THE CORRECT

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TABLE OF CONTENTS

SECTION		PAGE
1.0	**GENERAL INFORMATION**	**1**
1.1	PURPOSE	1
1.2	SCOPE	1
1.3	APPLICABLE DOCUMENTS	1
1.4	SAFETY	1
1.5	EMERGENCY TELEPHONE NUMBERS	2
1.6	ELECTRICAL SHOCK HAZARD	2
1.7	RESPONSIBILITIES	3
2.0	**GENERAL DESCRIPTION**	**4**
2.1	VARIAC APPLICATION	4
2.2	POWER CONNECTION	4
3.0	**VARIAC POWER FEED TEST SEQUENCE**	**4**
4.0	**EMERGENCY SHUTDOWN**	**5**
ATTACHMENT A		

1.0 GENERAL INFORMATION

1.1 PURPOSE

This document describes the procedures for the installation of a Variac used to control the power provided to infrared lamps in Environmental Test Facility (ETF) test chambers.

1.2 SCOPE

The procedures and practices outlined in this document are to be followed in the installation of Variacs. This document provides a record copy of Variac installation.

1.3 APPLICABLE DOCUMENTS

MPR 8715.1	Marshall Safety, Health, and Environmental (SHE) Program
MSOP-FA-ETF-413	Control of Hazardous Energy (Lockout/Tagout) Procedure for the Environmental Test Facility (soon to be superseded by ET24-LOTO-SOP-001)
ET24-ETF-OWI-001	Environmental Test Facility Test Operations
ED26 (02-01)	Memorandum for Record, Safety Assessment for the ETF (soon to be issued as an ET24 memo, number unknown)

1.4 SAFETY

All test personnel working in this facility shall be familiar with the safety documents listed above and shall report any safety hazards, unsafe practices, safety incident or near misses to the ETF Branch Chief or the 4619 Building Manager Assistant.

All personnel involved in facilities using cryogenics should be aware of possible freeze burns by contact with cold surfaces or liquids. In the event of a cryogenics spill, line ruptures, or similar emergencies, personnel must first ensure that there is no possibility of asphyxiation due to oxygen displacement. Use a portable oxygen monitor to verify oxygen is adequate before entering a spill area.

ET24 Safety Assessment, Memorandum of Record ED26 (02-01) (soon to be issued as an et24 memo, number unknown) listed procedures, personal protective equipment (PPE) requirements and job hazard analysis (JHAs) for hazards associated with operation at the ETF. The applicable JHAs for operations associated with Variac installation includes JHA Number 7 and may include JHA Number 30 and others. Implement the risk mitigation methods listed in the applicable JHAs and use the required PPE to minimize risk from potential hazards during Variac installation.

1.5 EMERGENCY TELEPHONE NUMBERS

Call **911** for all emergencies:

Medical	**911**
Ambulance	**911**
Fire	**911**
Security	**911**
Chemical Spills	**911**

Other numbers that can be used for emergency, security, safety, and system maintenance information are:

Medical Center	544-2390
Security	544-4357
Safety	544-0046
Utilities	544-3919
Other Assistance	544-4357 (4-HELP)

********** **WARNING**********

Maintenance or operating procedures, techniques, restrictions, etc., that may result in severe personnel injury, loss of life or major equipment damage if not followed exactly.

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1.6 ELECTRICAL SHOCK HAZARD

**********WARNING**********

Prior to performing maintenance on any equipment, lockout and tag the equipment in accordance with Lockout/Tagout Procedure MSOP-FA-ETF-413 (soon to be superseded by ET24-LOTO-SOP-001). Maintenance shall be performed by qualified technicians only.

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1.6. 1 All bare electrical parts with a potential to ground of 50 volts or greater should remain de-energized. If this is infeasible, then safety related work practices shall be employed to prevent electrical shock. The safety related work practices shall be documented and approved by a senior ETF electrical engineer. All work near energized bare electrical parts shall be performed by qualified persons.

1.6. 2 All Variac installations, repairs and modifications shall be performed by electrical technicians to minimize the electrical shock hazard.

1.6. 3 Personnel shall remove all conductive apparel before working near energized bare electrical parts, including jewelry, watches, key chains, metalized aprons, and metal head gear.

1.6. 4 Personnel may not perform housekeeping duties at close distances to energized bare electrical parts unless adequate safeguards are provided. Only non-conductive cleaning materials shall be used.

1.6. 5 Personnel working near bare electrical parts energized at 50 volts or greater shall be provided protective equipment adequate to insulate the potential shock hazard. Personnel shall use insulating tools near energized bare electrical parts.

1.6. 6 Safety signs or tags shall be used to warn personnel that electrical shock hazard is present when there are bare electrical parts energized at 50 volts or greater.

1.6. 7 Barricade shall be used in conjunction with signs or tags to limit personnel access.

1.6. 8 Any de-energized electrical parts that are not locked-out, tagged-out, or unplugged will be considered energized. Any bare electrical part that is energized at less than 50 volts to ground need not be locked-out or tagged-out provided there is no risk of burns or arcing.

1.6. 9 All live electrical parts located outside the chamber and energized at 50 volts or greater must be guarded against accidental contact. Guarding methods include approved enclosures or permanent partitions or screens that restrict access by non-qualified personnel.

1.6. 10 Personnel shall not handle, energize or de-energize, plug-in or unplug any electrical device when the device is wet, the employee is wet, or the floor is wet.

1.6. 11 Locking type connectors shall be properly secured after connection.

1.6. 12 After a circuit has been de-energized by the opening of a protective device, an ETF electrical technician shall inspect that circuit before it is re-energized.

1.6. 13 Over-current protective devices shall not be modified.

1.7 RESPONSIBILITY

ETF personnel will be responsible for the installation of the Variac. The designated operator that installs the Variac will be responsible for it's safe operation. This responsible includes safety for personnel and equipment.

Other task assignments and responsibilities at the ETF will be in accordance with ET24-ETF-OWI-001.

2.0 GENERAL DESCRIPTION

2.1 VARIAC APPLICATION

A Variac is suitable for use with heat lamps where the total load amperage is not more than 20 amps.

2.2 POWER CONNECTION

2.2.1 The power connection to the Variac may be hardwired to a source or an outlet plug may be used, but in either case the power must be routed through a double-pole-single-throw switch breaking both conductors to provide complete isolation from the power source when turned off.

2.2.2 Upon completing the power feed connections and prior to load connections being made, the Variac must be tested to ensure the power feed is connected correctly.

**********WARNING**********

An incorrectly wired Variac power feed will put full source voltage potential on the load circuit with respect to ground even when the Variac is set for zero volts output.

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NOTE
Maintenance or operating procedures, techniques, restrictions, etc., that requires emphasis for safe operation.

3.0 VARIAC POWER FEED TEST SEQUENCE

Complete the Variac As-run Buy-off Sheet when installing the Variac. This sheet may be provided with a TPS. If none is provided, use a copy of Attachment A.

3.1 Connect the power feed cabling to the appropriate terminals to allow the maximum output to only equal the power feed voltage. This means no voltage increase allowed. Consult the particular Variac diagram for details concerning these connections.

3.2 Ensure the Variac power feed is connected to the power source.

3.3 Turn on the double-pole-single-throw disconnect switch.

3.4 Set the Variac for zero volts output.

3.5 Measure the voltage from the Variac load output terminals to ground. **If this voltage measurement equals the power feed voltage, the power feed connections are incorrectly wired so proceed to step 3.6. If this voltage measurement is less than one (1) volt, the power feed connections are wired correctly so proceed to step 3.10.**

3.6 Turn off the double-pole-single-throw disconnect switch.

3.7 Disconnect the power feed from the power source.

3.8 Reverse the power feed connections on the Variac.

3.9 **Return to step 3.2 and repeat test.**

3.10 Turn off the double-pole-single-throw disconnect switch.

3.11 Disconnect the power feed from the power source.

3.12 Connect the load circuit connections.

3.13 Connect the power feed to the power source. The Variac is now ready for use as needed.

4.0 EMERGENCY SHUTDOWN

_____ 4.1 Switch **OFF** the Variac at the double-pole-single-throw switch.

Variac As-run Buy-off Sheet

Start Time & Date _____ End Time & Date _____

3.1 _____

3.2_____

3.3 _____

3.4 _____

3.5 _____

3.6 _____

3.7 _____

3.8 _____

3.9 _____

3.10 _____

3.11 _____

3.12 _____

3.13_____