SCOPE DOCUMENT
REACTOR PROTECTION SYSTEM
TRIP UNIT ASSEMBLY AND
RPS POWER SUPPLY ASSEMBLY
UPGRADE

Consumers Power Company
Palisades Nuclear Plant
Covert, Michigan

Revision 00
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FIGURES

1.0 BACKGROUND

1.1 The buyer of the equipment supplied under this specification will be Consumers Power Company (CPCo) and will be referred to as the Purchaser. The supplier of such equipment will be referred to as the Vendor.

1.2 The equipment is intended for use at Consumers Power Company's Palisades Nuclear Power generating station, a pressurized water reactor system located at Covert, Michigan.

1.3 The equipment specified herein will directly replace equipment in the Reactor Protection System (RPS). The RPS utilizes various input signals to determin the status of the reactor. If any of the monitored selected NSSS conditions deviates from a preselected operating range, the RPS initiates protective action in the form of a reactor trip.

1.4 This specification will involve the replacing of the existing RPS Power Supply Assembly and Trip Unit Assembly. It will also involve incorporating the Trip Tester functions into the RPS cabinet.

1.5 The RPS is a Safety Related Class 1E seismically and environmentally qualified system. The equipment to replace the items in Section 1.4 must be qualified to the requirements specified herein.

2.0 REFERENCES AND ABBREVIATIONS

2.1 ABBREVIATIONS

ANS	-	American Nuclear Society
ANSI	-	American National Standards Institute
ASME	-	American Society of Mechanical Engineering
AWG	-	American Wire Gauge
CPCo	-	Consumers Power Company
DBE	-	Design Basis Earthquake
FL	-	Full Load
FCP	-	Facility Change Package
Hz	-	Hertz or Cycles per Second
IEEE	-	Institute of Electrical and Electronic Engineers
ICEA	-	Insulated Cable Engineers Association
ISA	-	Instrument Society of America
NEMA	-	National Electrical Manufacturers Association
NC	-	Normally Closed
NO	-	Normally Open
NL	-	No Load
NSSS	-	Nuclear Steam Supply System
OBE	-	Operational Basis Earthquake
Psig	-	Pounds per Square Inch Gauge
RPS	-	Reactor Protection System
RRS	-	Required Respose Spectra
SSE	-	Safe Shutdown Earthquake
UL	-	Underwriters Laboratory
UPS	-	Uninterruptable Power Supply
VAC	-	Volts, Alternating Current
VDC	-	Volts, Direct Current

2.2 REFERENCES

2.2.1 IEEE 279-1971 "IEEE Standard Criteria for Protection Systems for Nuclear Power Generating Stations."

2.2.2 IEEE 308-1978 "IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations."

2.2.3 IEEE-323-1974 "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating System."

2.2.4 IEEE 344-1975 "IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations."

2.2.5 IEEE-383-1974 "IEEE Standard for Type Test of Class 1E Electrical Cables, Field Splices, and Connectors for Nuclear Power Generating Stations."

2.2.6 IEEE-384-1984 "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits."

2.2.7 ANSI 45.2.2-1978 "Packaging, Shipping, Receiving, Storage, and handling of Items for Nuclear Power Plants."

3.0 SCOPE

This specification covers the design, fabrication, inspection, testing, cleaning, packing, and shipment of a replacement RPS Power Supply Assembly, Trip Unit Assembly, and incoporation of the Trip Tester functions into the RPS cabinet. The technical requirements and detailed description of the equipment to be supplied under this specification are defined in Section 5.0.

3.1 COMPLIANCE TO SPECIFICATION

The supplier shall comply with all requirements of this specification and the project specification. There shall be no deviation from the requirements without prior written approval from the Purchaser. Any conflict in the specification shall be brought to the attention of the Purchaser prior to any action by the Vendor. Approval of the Vendor's drawings, procedures, tests and inspections by the purchaser does not relieve the Vendor of the responsibility of meeting the requirements of this specification.

4.0 QUALIFICATION

The equipment assemblies supplied under this specification may be qualified through analysis or by testing. If testing is performed, one assembly for each piece of equipment shall be chosen for all type tests. The assemblies shall be energized and subjected to the following tests to ensure proper operation under all rated conditions. Qualification testing shall be performed and documented in accordance with the requirements of Reference 2.2.3. The qualification testing shall be conducted in the following sequence:

1. Cycling of Relays
2. Environmental Test
3. Seismic Test

4.1 COMPONENT CYCLING

Relays to be subjected to environmental and seismic testing shall be cycled to 6,000 cycles prior to the performance of the other qualification tests.

4.2 ENVIRONMENTAL REQUIREMENTS

Each assembly to be qualified shall be placed in an environmental chamber and shall be qualified to the simultaneous environmental conditions of temperature and humidity as shown in Figure 1. Functional, drift, and accuracy tests shall be performed before, during, and after temperature and humidity tests to assure the assembly is operating within the design limits of this specification.

All equipment supplied shall be certified to the following environmental requirements:

	NORMAL	MINIMUM	MAXIMUM**
Temperature	80 ±10 °F	40°F	140°F
Humidity	50 ±10% RH	20% RH	90%RH*

* - Maximum moisture content is not to exceed a dewpoint of 77°F.

** - The equipment shall be operational to these conditions for a maximum of 8 Hours.

4.3 SEISMIC REQUIREMENTS

The equipment specified herein is Seismic Category I and shall be designed to withstand the effects of the Operational Basis Earthquake (OBE) and the Safe Shutdown Earthquake (SSE) without loss of function, accuracy or physical integrity. The assembly is to be subjected to five (5) OBE's and one (1) SSE and will be qualified in accordance with Reference 2.2.6. Figure 2 defines the Required Response Spectra (RRS) curves for Palisades Nuclear Plant that the RPS equipment specified herein is to meet.

5.0 TECHNICAL REQUIREMENTS

5.1 GENERAL

5.1.1 Work Included

5.1.1.1 The Vendor shall design, fabricate and deliver the RPS equipment specified herein that will replace existing RPS equipment assemblies. The RPS equipment supplied under this specifcation shall meet the requirements defined in Reference 2.2.1 and this specification.

5.1.1.2 The Vendor shall provide test procedures, installation drawings, detailed installation procedures, and other pertinent information required for the installation of the RPS assemblies.

5.1.1.3 All equipment supplied shall be new, unused and not previously sold and stored.

5.1.1.4 Engineering services for the preparation of a Facility Change Procedure (FCP) in accordance with CPCo procedure Admin 9.03 "Facility Change".

5.1.1.5 Field labor for the installation of the RPS equipment specified herein.

5.1.2 Work Not Included

The following items will be provided by CPCo or a designated contractor and are not to be included with this specification.

5.1.2.1 Receiving, unloading and unpacking the RPS equipment.

5.1.2.2 Supervision of the installation of the RPS equipment specified herein.

5.1.2.3 Technicians to perform the site Acceptance Test procedure after installation.

5.1.3 Painting

All surfaces shall be thoroughly cleaned with a solvent prior to the application of any paint or primer. The exterior surfaces of the assemblies shall have an application of a rust resistant primer coat followed by at least two (2) coats of paint. The color of the paint shall be specified by the Purchaser at a later date.

5.1.4 Wiring

All wire and cable used in the RPS equipment supplied under this specification shall be certified to meet the vertical flame test requirements of Reference 2.2.5.

5.1.4.1 Care shall be used in the removal of insulation from the wire so that the wire will not be cut or nicked. All wire connections to screw type terminations shall be made with Burndy Insulug type YAE crimp type ring lug connectors or equivalent.

5.1.4.2 Wiring shall be arranged in a manner that allows devices to be removed or serviced without unduly disturbing the wiring. No wire shall be routed across the face or rear of a device in a manner which will prevent the opening of covers or obstruct access to leads, terminals, or devices.

5.1.4.3 It is preferred that one external wire per terminal will be used on the field side of terminal blocks. However, CPCo procedures will allow up to 3 if properly configured.

5.1.4.4 It is preferred that no more than two wires be attached to the internal panel wiring side of terminal blocks. However, CPCo procedures will allow up to 3 if properly configured.

5.1.4.5 Insulated sleeving shall be provided on wires soldered to connectors.

5.1.4.6 All equipment wiring shall be tested by the Vendor for proper connection and continuity by means of a low voltage continuity testing device.

5.1.4.7 Wire markers shall be provided on all wires connected to terminal strips or any other screw termination. The wire marker shall be imprinted with permanent ink with a number which uniquely identifies that connection. Split sleeve type wire markers are not acceptable.

5.2 RPS POWER SUPPLY ASSEMBLY REPLACEMENT

5.2.1 General

5.2.1.1 The Vendor shall supply a total of Four (4) RPS Power Supply Assemblies,as defined below, to the Purchaser.

5.2.1.2 The Vendor shall supply the Purchaser with the following quantity of recommended spare parts:

QTY	DESCRIPTION
2	± 15 VDC Power Supplies
2	+ 28 VDC Power Supplies

5.2.3 Functional Description

5.2.3.1 The RPS has four (4) RPS Power Supply Assemblies, one for each protective channel A, B, C, and D, located in the RPS in locations AW8, BW8, CW8, and DW8. Figure 3 shows the location of the power supplies in the RPS.

5.2.3.2 The RPS Power Supply Assembly shall contain fifteen (15) individual power supplies that are independent from each other and are isolated from ground. Twelve (12) power supplies (±15 VDC) provide the power for the Bistable Trip Units and Auxiliary Trip Units, located in the Trip Unit Assembly, in the protective channel where the RPS Power Supply Assembly is located. As an alternative, two diode Auctioneered Power Supplies with isolated and individually fused outputs may be substituted for the twelve (12) ±15 VDC power supplies.

5.2.3.3 The RPS Power Supply Assembly also contains three (3) 28 VDC power supplies that provide power to the appropriate logic matrix. There are six (6) logic matrices in the RPS, AB, AC, AD, BC, BD, and CD. A 28 VDC power supply from one protective channel is diode auctioneered with a 28 VDC power supply from another channel to provide power to their common matrix (ie. 1 Channel A 28 VDC power supply is auctioneered with 1 Channel D 28 VDC power supply to provide power to the AD Logic Matrix).

5.2.4 Technical Data

The RPS Power Supply Assembly shall be a form fit replacement for the existing RPS Power Supply Assembly. The RPS Power Supply Assembly is to meet the following technical specifications:

5.2.4.1 Input:

120 VAC ±10% @ 60Hz ± 5%

Connector: Hubbell 7699 or equivalent

5.2.4.2 Output:

1. 12 modules each rated at +15 VDC, 750 ma and -15 VDC, 750 ma, minimum.
2. 3 modules each rated at +28 VDC, 1.0 A, minimum.

5.2.4.3 Protection:

Short Circuit Protection on each power supply.

5.2.4.4 Output Adjustment:

Each side of the ±15 VDC dual output power supplies shall be adjustable by ±5% of center voltage.

5.2.4.5 Regulation:

1. ±15 VDC modules: 0.5% line, 0.5% load.
2. +28 VDC modules: 10% NL to FL.

5.2.4.6 Ripple:

1. ±15 VDC modules: 50mV RMS.
2. +28 VDC modules: 2V RMS.

5.2.4.7 Floating Common:

The common terminals on each power supply shall be floating with no connections to ground.

5.2.4.8 Wire Size:

The power supplies are to be wired such that the minimum wire sizes are as follows:

AC wires - 16 AWG

DC wires - 22 AWG

5.2.4.9 Physical Size:

The 15 power supply modules that make up the RPS Power Supply Assembly shall be mounted in a standard 19" rack mount chassis with a height of 8 3/4" and a maximum chassis depth of 22". The mounting configuration shall be designed for adequate ventilation and spacing between modules.

The RPS Power Supply Assembly shall have chassis slides mounted to the side of the chassis to allow the chassis to be pulled out for maintenance.

5.2.4.10 Fuses:

The AC input to the RPS Power Supply Assembly shall be fused on both AC lines. Each output of the power supplies shall be fused on the voltage side. The fuseholders shall give a visible indication of a blown fuse.

5.2.4.11 Indicators:

Each of the 28 VDC power supplies shall have an indicator mounted to the front panel of the RPS Power Supply Assembly that will light when the power supply is functioning properly. These indicators will be labelled with the appropriate logic matrix (ie. AB, BC, etc) that is powered by the power supply.

5.2.4.12 Output Connectors:

The RPS Power Supply Assembly will need two (2) MS type connectors mounted to the rear of the chassis to interface with the existing wiring. The connectors are as follows:

±15 VDC Output Connector (J2): MS-3102A-28-21S

+28 VDC Output Connector (J3): MS-3102A-18-12S

5.2.4.13 Identification:

Each power supply module location i the RPS Power Supply Assembly shall be labelled and identified with a permanent type marking. The rear of the RPS Power Supply Assembly shall contain a label identifying its location in the cabinet (ie. AW8, BW8, CW8, or DW8).

The connectors and fuses shall contain labels on the outside of the RPS Power Supply Assembly that will provide visible identification of those components.

5.3 TRIP UNIT ASSEMBLY

5.3.1 General

5.3.1.1 The Trip Unit shown in Figure 4 consists of three parts, the Interconnection Module, the Trip Unit Bin Assembly, and the Bistable and Auxiliary Trip Units . The modification to the Trip Unit Assembly involves replacing the existing assembly with a new replacement Trip Unit Assembly.

5.3.1.2 The Vendor shall fabricate, design, and supply a total of four (4) Trip Unit Assemblies with each assembly containing the following:

1 Bin Assembly
1 Interconnection Module
7 Bistable Trip Units
4 Auxiliary Trip Units

5.3.1.3 The Vendor shall supply the Purchaser with the following spare parts as a minimum:

6 Bistable Trip Units
4 Auxiliary Trip Units
1 Trip Unit Extender Cord

5.3.2 Functional Description

5.3.2.1 The RPS monitors a selected number of NSSS parameters essential to reactor protection. Four measurement channels (A,B,C,D) that are completely independent and isolated from each other monitor each NSSS parameter. The measurement channels are input to their respective RPS Channel where they are compared to predefined setpoints to determine if the reactor requires protective action in the form of a trip. For any input parameter, two of the four input channels must indicate protective action is required before a trip occurs. Most of the measurement channels are directly input to the Trip Unit Assembly with the exception of the two power level inputs. Figure 5 shows the identification of the various inputs to each of the Trip Units in the Trip Unit Assembly.

5.3.2.2 The Bistable and Auxiliary Trip Units first compare the incoming signal to a predefined trip setpoint. The Bistable and Auxiliary Trip Units each have three relay contact outputs that open when their input has exceeded the setpoint. The relay outputs from each Trip Unit is arranged into logic ladder matrices. There are a total of six (6) logic ladder matrices designated as AB, AC, AD, BC, BD, and CD which represent all possible 2 out of 4 trip combinations for the four trip channels. When any two Trip Unit relay outputs for a particuliar parameter are opened, the RPS then generates a trip.

5.3.2.3 When only one Trip Unit's relay outputs for a particuliar parameter are opened, this is referred to as a channel trip.

5.3.3 Bistable Trip Unit Technical Data

Figure 6 shows a basic block diagram of the Bistable Trip Unit.

5.3.3.1 Input:

1 to 5 VDC input signal

The input signal shall be buffered to protect the circuit card from faults applied to the input of up to 50 Vdc without physical or electrical damage. The input signal is then compared to two setpoint signals one for a pretrip alarm and the other for a trip. The Bistable Trip Unit can operate in a number of modes as follows:

Increasing Trip

A trip or pretrip occurs when the sum of the process input signal and the setpoint is greater than or equal to zero. The input signal is a positive voltage and the setpoint is a negative voltage.

Decreasing Trip

A trip or pretrip occurs when the sum of the process input signal and the setpoint is greater than or equal to zero. The input signal is a negative voltage and the setpoint is a positive voltage.

The trip and pretrip conditions are cleared automatically when the input returns to non-trip or non-pretrip conditions. The indicaters will be cleared only upon manual action to reset when input returns to non-trip or non-pretrip condition.

5.3.3.2 Output:

1. Trip output - Three (3) double coil SPDT relays and one (1) Single coil DPDT relay
2. Pretrip output - One (1) Single Coil SPDT Relay.

The contact outputs for each of the relays must be rated for 2.0 amps max. The contacts shall be form C, break before make, with a maximum resistance of 30 milliohms. The relays shall contain diode suppression for each relay coil.

.3.3.3 Setpoint:

1. Variable - Continuously variable setpoint provided from an outside signal. The buffer circuit for this setpoint shall be accurate to ±2 mV with an input impedance of 10 Kilohms.

2. Fixed - Manually adjusted within .25% resolution. The setpoints shall be adjustable from two adjustment trim potentiometers, course and fine, accessible from the front panel that shall provide a manual adjustment to within .25% resolution. There will be a total of four potentiometers on the front panel for each Bistable, two for Trip setpoints the other two for the pretrip setpoints.

5.3.3.4 Setpoint Power:

The Trip Unit shall contain a precision ±10 VDC Reference supply output for the setpoint potentiometers which will be accurate to within ±1 mV with variations of ±700 mV in the ±15 VDC input power supply.

5.3.3.5 Hysteresis:

The untrip hysteresis shall be adjustable over the range of 50 mV to 2.00 V. Overall accuracy of the hysteresis value shall not exceeded ±50 mV.

5.3.3.6 Accuracy:

The worst case deviation between trip point and the setpoint shall not exceed ±25 mV for a period of 30 days.

5.3.3.7 Input Signal Open Circuit:

The Trip Unit shall contain circuitry to detect an open input signal. If the input signal is open, the Trip Unit shall automatically generate a trip.

5.3.3.8 Indicators:

The Trip Unit shall have three indicator lights that will be wired to the NC contacts on the Double Coil Relays. These indicators will light when the Trip Unit is in the trip condition, causing the Double Coil Relays to deenergize. A pushbutton switch shall be available on the front panel to test the lights.

5.3.3.9 Switch/Indicator:

The front panel of the Trip Unit shall contain a pushbutton switch with legends for identification of the function of that trip unit. The pushbutton switch shall have a split screen with one half to indicate a trip (backlit Red) and the other half to indicate a pretrip (backlit white). The bistable will contain a latching circuit to keep the pretrip and/or trip lights lit until the input returns to normal conditions and the trip unit is manual reset by the operator by pushing the switch.

5.3.3.10 Response Time:

The Trip Unit shall respond to a pretrip or trip condition in less than 150 milliseconds.

5.3.3.11 Power Requirements:

The RPS Power Supply assembly provides power for the Trip Units. The Trip Units shall be designed to operate on $\pm$15 Vdc.

5.3.3.12 Mechanical:

The Bistable Trip Unit shall be designed to fit into the Trip Unit Bin Assembly defined later in this specification.

5.3.3.13 Operating Tests:

The following tests are to be performed by the Vendor on each Bistable Trip Unit prior to shipment.

1) Insulation Test:

The insulation resistance shall be measured between the signal input and chassis ground; and between the floating signal ground and chassis. The insulation resistance shall have a minimum value of one (1) megohm.

2) Overrange Test:

An input signal of 50 VDC shall be applied to the input of the Bistable Trip Unit for 2 minutes without damage to any of the components. The trip setpoint voltage shall be set to 4.000 VDC during this test and shall return to this value ($\pm$.5 mV)upon removal of the fault.

3) Response Time Test:

A fast rise time step input voltage of approximately 6 VDC shall be applied to the input of the bistable Trip unit. The response time is defined as the time it takes to open the closed (NO) contact of each relay output after the step input has been applied. This test shall show that the response time to be between 70 to 130 Milliseconds.

4) Linearity Test:

A variable input between -10 VDC and + 10 VDC shall be applied to the input of the Trip Unit. The linearity is defined as the closeness to which a curve, representing the trip input voltage as a function of the setpoint voltage, approximates a straight line. It shall be measured for four values of the setpoint voltage -10, -4, +4, +10 volts. The maximum deviation between the trip point and the setpoint shall be less than 10 mV.

5) Hysteresis Test:

With the Bistable Trip Units set at 5 VDC and the hysteresis set to 1 VDC, the bistable will be repeatedly tripped and untripped to ensure that the hysteresis error for this test is less than $\pm$6 mV. This value shall be set to 100 mV ($\pm$2 mV) subsequent to this test.

6) Latching Circuit Test:

Vary an input signal until the Trip Unit pretrip alarm is actuated. Return the signal to normal and verify that that the pretrip indicator light remains lit until the pushbutton is depressed. Vary an input signal until a Trip Unit trip is indicated. Return the signal to normal and verify that that the trip indicator light remains lit until the pushbutton is depressed.

5.3.4 Auxiliary Trip Unit Technical Data

5.3.4.1 Input:

0 VDC - Trip Condition
+15 VDC - Normal Condition

5.3.4.2 Output:

1. Trip output - Three (3) double coil SPDT relays and one (1) Single coil DPDT relay
2. Pretrip output - One (1) Single Coil SPDT Relay.

The contact outputs for each of the relays must be rated for 2.0 amps max. The contacts shall be form C, break before make, with a maximum resistance of 30 milliohms. The relays shall contain diode suppression for each relay coil.

5.3.4.3 Operating Bypass Input:

The Auxiliary Trip Unit shall contain an input that will allow the trip signal output to be held in the untripped state in order to bypass a valid trip condition.

5.3.4.4 Indicators:

The Trip Unit shall have three indicator lights that will be wired to the NC contacts on the Double Coil Relays. These indicators will light when the Trip Unit is in the trip condition, causing the Double Coil Relays to deenergize. A pushbutton switch shall be available on the front panel to test the lights.

5.3.4.5 Switch/Indicator:

The front panel of the Trip Unit shall contain a pushbutton switch with legends for identification of the function of that trip unit. The pushbutton switch shall have a split screen with one half to indicate a trip (backlit Red) and the other half to indicate a pretrip (backlit white). The bistable will contain a latching circuit to keep the pretrip and/or trip lights lit until the input returns to normal conditions and the trip unit is manual reset by the operator by pushing the switch.

5.3.4.6 Response Time:

The Trip Unit shall respond to a pretrip or trip condition in less than 6.5 milliseconds.

5.3.4.7 Power Requirements:

The RPS Power Supply assembly provides power for the Trip Units. The Trip Units shall be designed to operate on $\pm$15 Vdc.

5.3.4.8 Mechanical:

The Auxiliary Trip Unit shall be designed to fit into the Trip Unit Bin Assembly defined later in this specification.

5.3.4.9 Operating Tests:

The following tests are to be performed by the Vendor on each Auxiliary Trip Unit prior to shipment.

1) Insulation Test:

The insulation resistance shall be measured between the signal input and chassis ground; and between the floating signal ground and chassis. The insulation resistance shall have a minimum value of one (1) megohm.

3) Response Time Test:

A step input voltage of approximately 15 VDC shall be applied to the input of the Auxiliary Trip unit. The response time is defined as the time it takes to open the closed (NO) contact of each relay output after the step input has been applied. This test shall show that the response time to be less than 6.5 Milliseconds.

4) Latching Circuit Test:

Vary an input signal until the Trip Unit pretrip alarm is actuated. Return the signal to normal and verify that that the pretrip indicator light remains lit until the pushbutton is depressed. Vary an input signal until a Trip Unit trip is indicated. Return the signal to normal and verify that that the trip indicator light remains lit until the pushbutton is depressed.

5.3.5 Interconnection Module Technical Data

5.3.5.1 The Interconnection Module attaches to the rear of the Bin assembly. The Interconnection module contains the mating connector to the Trip Units on one side and MS type connectors on the other side which interface with other equipment in the RPS. The module contains the necessary connections to form one half of the logic ladder shown in Figure 7. The four Interconnection modules inside the RPS are interconnected through MS connectors on the rear of the assembly.

5.3.5.2 The Interconnection Module must interface with the existing MS connectors in the RPS. Figure 8 shows and defines the various connectors located on the present Interconnection Module that would be required on the new Interconnection Module.

5.3.5.3 The Interconnection Module shall contain barrier terminal strips on the rear. The input signals from the field would be terminated to these terminal strips and from the terminal strips the signals would be input to the Trip Units for processing.

5.3.5.4 Size:

Maximum size is 8 3/4"H x 18"W x 10"D

5.3.6 Trip Unit Bin Assembly Technical Data

The Trip Unit Bin Assembly is a standard 19" rackmount Nuclear Instrument Module (AEC-TID-20893) 8 3/4"H x 9 3/4"D able to accomodate 12 Bistable and/or Auxiliary Trip Units. The front of the assemly shall be painted to specifications defined by the purchaser at a later date.

5.3.7 Trip Tester Function Technical Data

This section will describe the purpose of the Trip Tester and the functions that it must perform. These functions are to be incorporated into the RPS cabinet. Figure 9 shows the existing schematic diagram for the Trip Tester. A possible location for the functions of the Trip Tester is on the front of the RPS Power Supply.

5.3.7.1 The Trip Tester is a testing device used for testing of the RPS. Trip Tester Functions to be incorporate into the RPS Cabinet be able to provide the following capabilities:

a. Test Jacks for a DVM.
b. Readout of a Pretrip Setpoint
c. Readout of a Trip Setpoint
d. Readout of an Input Signal
e. Ability to inject a test signal for testing the Trip Unit.
f. Readout of the ±15 VDC Power Supply for each Trip Unit.

5.3.7.2 The Trip Tester functions can be incorporated into any place in the RPS cabinet. The location of the Trip Tester Functions are subject to final approval of the Purchaser.

5.3.7.3 The Trip Tester Functions will consist of the following items as a minimum:

1) A set of test jacks for the connection of a DVM to be used to monitor and read the various items listed above.
2) A selector switch to chose which trip unit is to be monitored.
3) A second selector switch to chose which of the following parameters on the selected Trip Unit that the operator wants to monitor.
   - +15 VDC Power Supply Voltage
   - -15 VDC Power Supply Voltage
   - Trip Setpoint
   - Pretrip Setpoint
   - Input Signal

4) A switch to activate the Trip Test Function. The Trip Test Function involves injecting a voltage signal into the Trip Unit and adjusting the voltage to cause the Trip Unit to trip or untrip.

5) A separate 12 VDC power supply must be mounted near the Trip Test Functions to provide the source for the inject input test voltage.

6) Coarse and Fine Potentiometers to be used for adjusting the input test voltage being injected into the Trip Unit.

7) A Variable Setpoint Trip Unit switch to enable the testing of a Trip Unit with a variable setpoint.

6.0 QUALITY ASSURANCE

6.1 RIGHT OF ACCESS

The Purchaser or its designated representative shall have access to the Vendor's manufacturing facilities or the Vendor's subcontractor's manufacturing facilities at all times during the fabrication, inspection, and testing of the equipment. The Vendor shall make the necessary arrangements to provide access to his plant.

6.2 RESPONSIBILTY FOR INSPECTION

Unless otherwise specified in the contract, purchase order, or this specification the Vendor is responsible for the performance of all inspection requirements of this specification. The Purchaser reserves the right to witness any of the inspections and tests set forth in this specification or in addition to those set forth in this specfication where such inspections or tests are deemed necessary to assure equipment and services meet the requirements of this specification.

6.3 INSPECTION

Production inspection shall be performed by the Vendor on every equipment specified. This inspection shall comprise such examination and testing as will prove the workmanship and reveal the omissions and errors of the production process such as functional and performance tests, tests which detect deviations from design, and tests of adjustments.
Unless otherwise specified in this specification, production inspection shall consist of the following:

6.3.1 Surface Examination

Equipment shall be examined as a minimum for the following:

a. Workmanship, assembly and fit, mechanical safety, marking and engraving, and painting.
b. Materials, parts, and finish.
c. Treatment for prevention of corrosion.
d. Treatment for protection against high humidity.

6.3.2 Continuity Test

All equipment wiring shall be tested by the Vendor for proper connection and continuity by means of a low voltage continuity testing device.

7.0 CLEANING, INSPECTION, PACKAGING, AND SHIPPING

The equipment defined by this specification shall conform to "Level B" requirements of Reference 2.2.7 as indicated below:

7.1 CLEANING

Prior to packing, the equipment shall be cleaned to remove all dirt and waste material left from fabrication.

7.2 IDENTIFICATION

The boxes, crates, or packages containing the equipment specified herein shall contain the following:

1. Shipping destination
2. Shipping origin
3. Component Name
4. Purchaser's Purchase Order Number
5. Package number if more than one package is involved (ie. 1 of 6, etc.) .
6. Weight of package if over 50 lbs.
7. Special Handling instructions, if applicable.
8. Packing list identifying each separate item in the package.
9. The packing list must reference the Purchaser's Purchase Order Number and list the package number.
10. A Certificate of Conformance for the equipment to be supplied.

7.3 SHIPPING AND STORAGE

Shipping date and delivery instructions will be provided by the Purchaser at a later date.

Storage requirements shall be provided by the Vendor prior to shipment of the equipment.

8.0 DOCUMENTATION

All documentation and drawings as defined below shall be forwarded to the following address:

B. D. Meredith
Consumers Power Company
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, Michigan 49043-9530

8.1 DRAWINGS

The following drawings shall be submitted to the Purchaser for review approval:

1. Assembly Drawings
2. Block Diagrams
3. Schematic Drawings
4. Wiring Diagrams

All drawings submitted for approval will normally be returned within fifteen (15) working days with one of the following notations:

1. Approved
2. Approved as Noted
3. Returned for correction

Drawings in categories 1 and 2 authorize the Vendor to proceed with work. One (1) Reproducible and three (3) full size copy of all final "As-Built" drawings are to be provided to the Purchaser upon shipment of the equipment.

8.2 DOCUMENTS

The following documents shall be submitted to the Purchaser for review and approval:

1. Installation Procedures
2. Interface Specifications
3. Technical Manual Inserts

All documents submitted for approval will normally be returned within ten (10) working days with one of the following notations:

1. Approved
2. Approved as Noted
3. Returned for correction

Documents in categories 1 and 2 authorize the Vendor to proceed with work. One copy of all final documents are to be provided to the Purchaser upon shipment of the equipment.

8.2.1 Technical Manual Inserts

The Purchase shall provide the Vendor with one copy of the current RPS Technical Manual. The Vendor is to revise the pages affected by this upgrade and provide 10 copies of the revised page inserts to the Purchaser. The Vendor shall include detailed descriptions, schematics diagrams, and assembly diagrams for the new equipment. The Vendor shall include in the manual a list of the recommended spare parts and any catalog literature available on the major components of the assemblies.

9.0 WARRANTY

The Vendor shall warrant that the the RPS equipment supplied under this specification shall be free of defects in material and workmanship, and will be functionally capable of operating in the manner described in this specification for a period of one (1) year from the date of the commencement of service of each assembly.

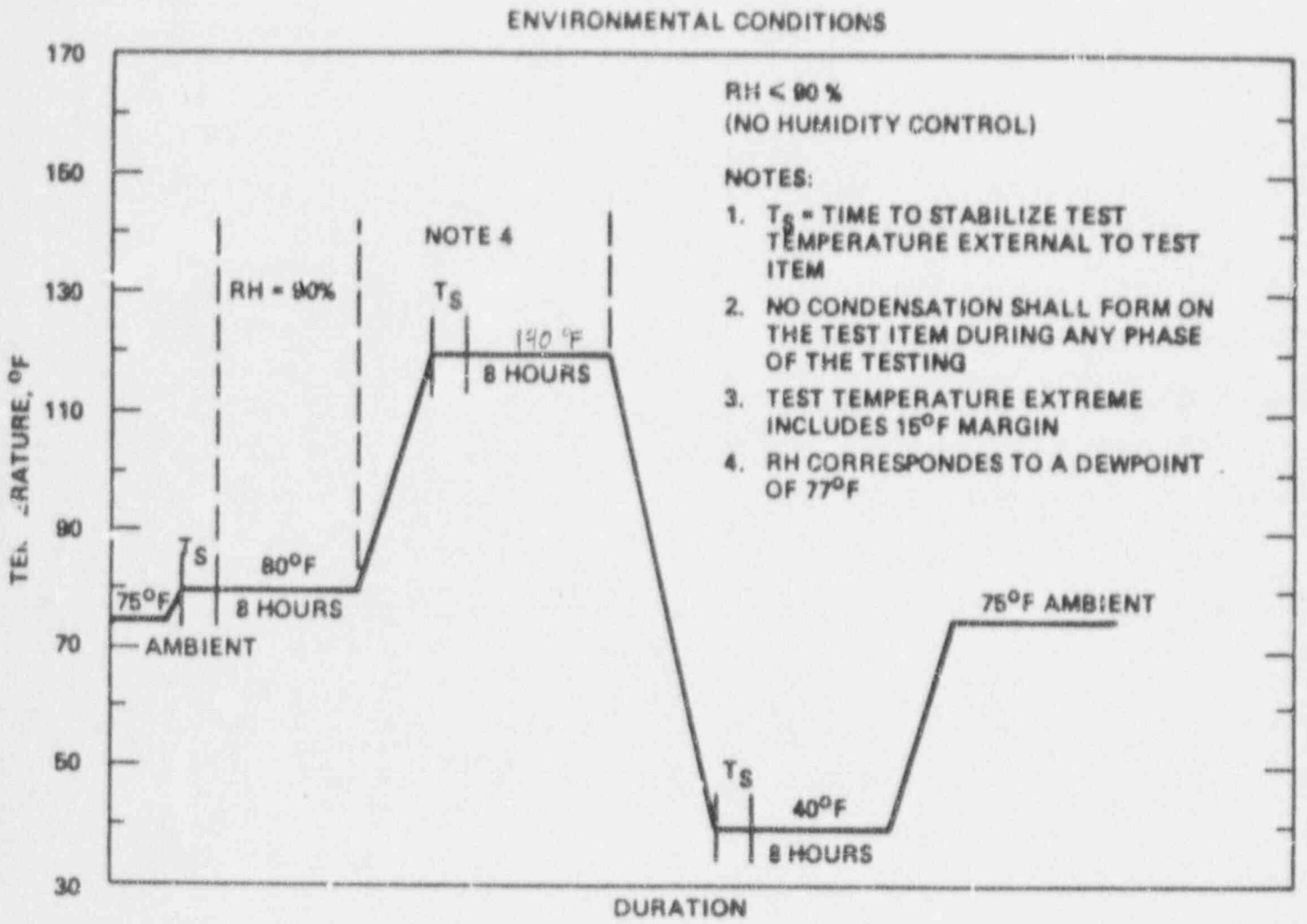
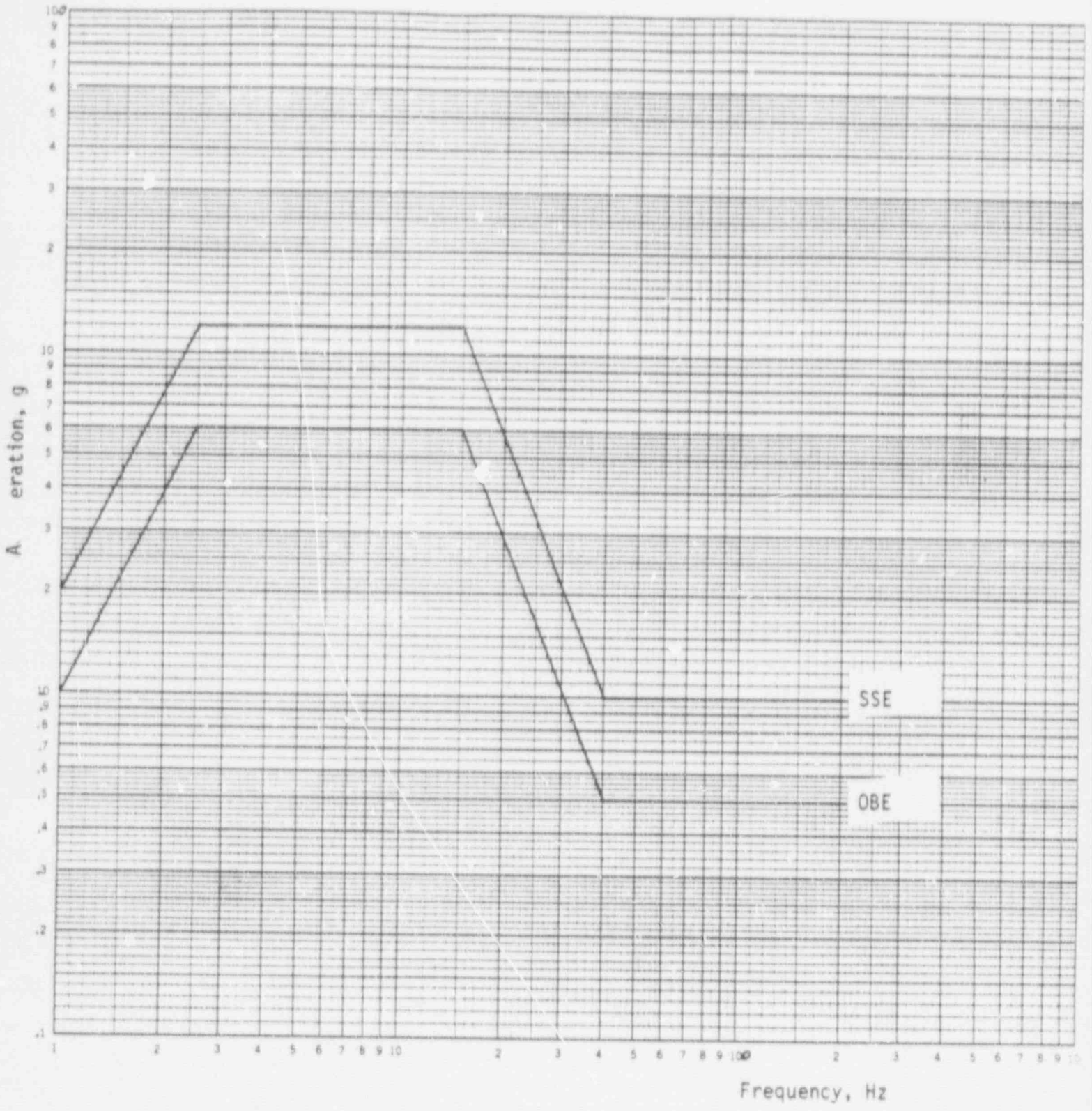


FIGURE 1

Environmental Test Profile

FIGURE 2

HORIZONTAL AND VERTICAL REQUIRED RESPONSE SPECTRUM
OBE & SSE, 1% DAMPING



Figure

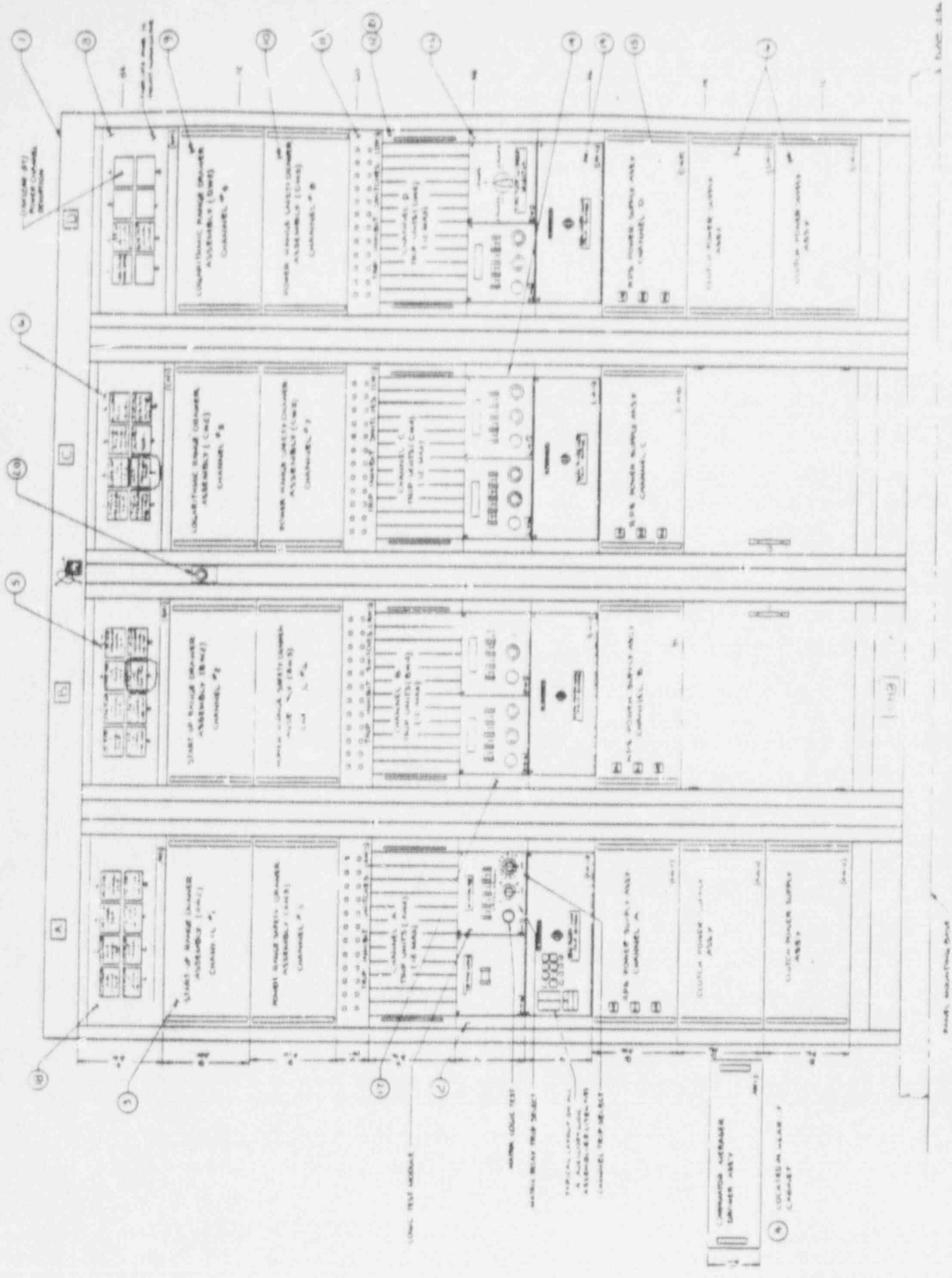


FIGURE 3 - RPS Cabinets Front View

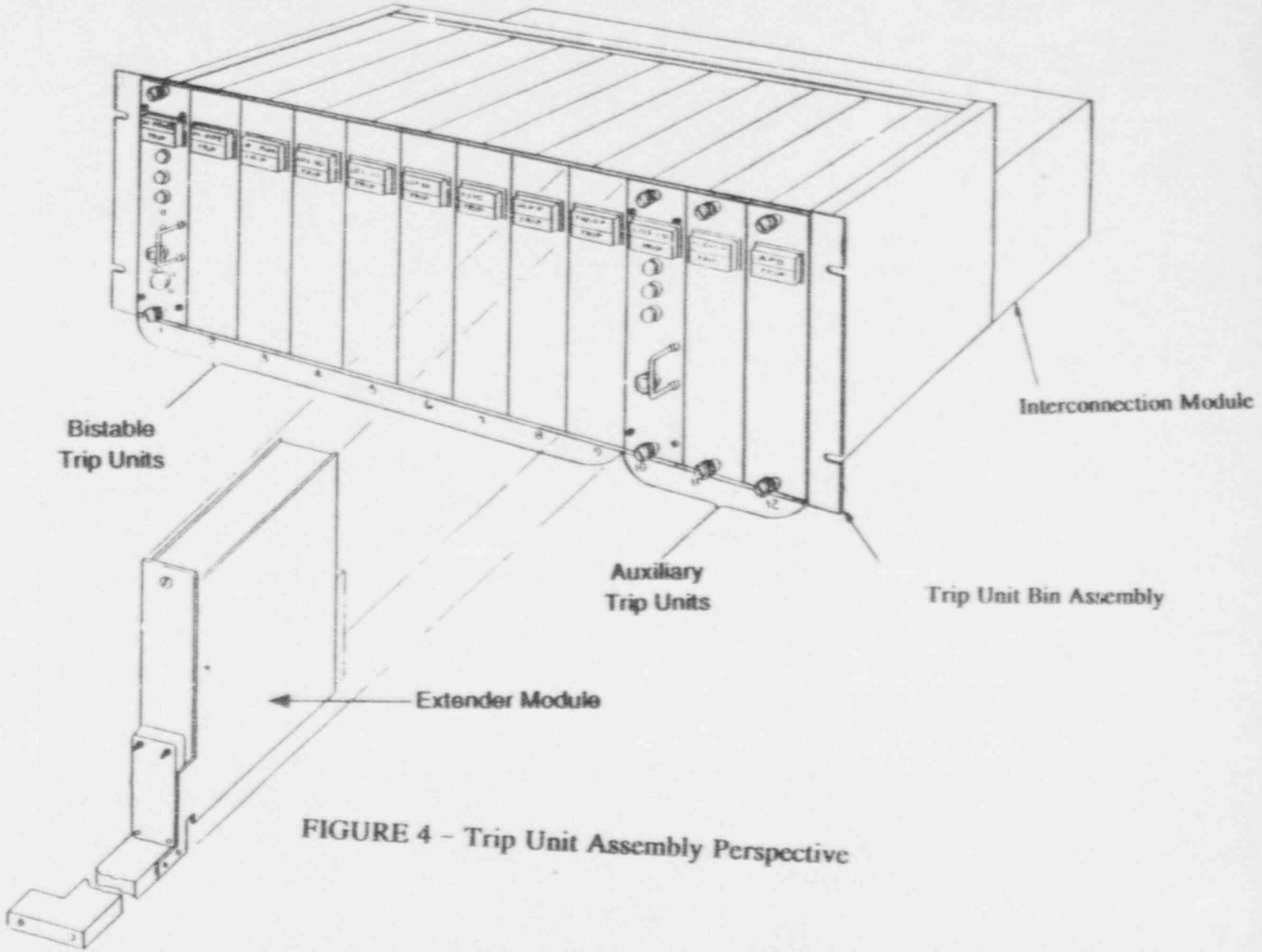


FIGURE 4 – Trip Unit Assembly Perspective

TRIP UNIT IDENTIFICATION AND FUNCTION

NO.	TYPE	REACTOR TRIP	LEGEND	TRIPS ON:
1	Auxiliary	High Power Level	Hi Power	(+) Logic Voltage by Contacts from N.I. Channel
2	Auxiliary	High Power Rate of Change	Hi Rate	(+) Logic Voltage by Contacts from N.I. Channel
3	Bistable	Low Flow Reactor Coolant	Lo Flow	Analog Signal Falling Below Fixed Setpoint Voltage
4	Bistable	Low Water Level Steam Generator 1	Lo Level SG 1	Analog Signal Falling Below Fixed Setpoint Voltage
5	Bistable	Low Water Level Steam Generator 2	Lo Level SG 2	Analog Signal Falling Below Fixed Setpoint Voltage
6	Bistable	Low Pressure Steam Generator 1	Lo Press SG 1	Analog Signal Falling Below Fixed Setpoint Voltage
7	Bistable	Low Pressure Steam Generator 2	Lo Press SG 2	Analog Signal Rising Above Fixed Setpoint Voltage
8	Bistable	Hi Pressure Pressurizer	Hi Press. Press.	Analog Signal Rising Above Fixed Setpoint Voltage
9	Bistable	Thermal Margin/Low Pressure	TM/Lo Press	Analog Signal Falling Below Variable Setpoint Voltage
10	Auxiliary	Loss of Load (Turbine Trip)	Loss Load	(+) Logic Volt by Contacts from Turbine Trip Circuit
11	Auxiliary	High Containment Building Pressure	CB Hi Press	(+) Logic Volt by Contacts from Containment Press Sensor
12	Spare			

Figure 5
Trip Unit Identification and Function

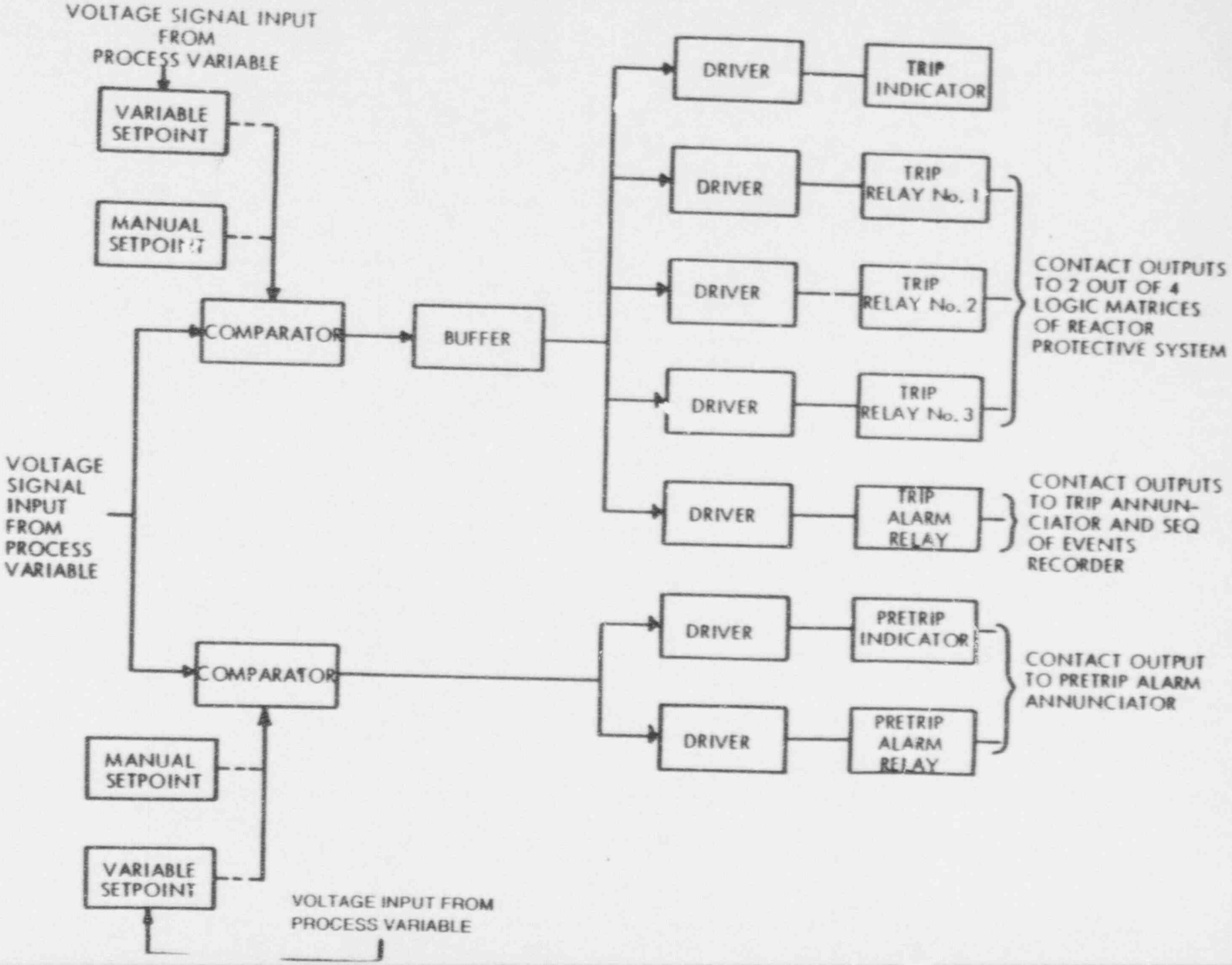
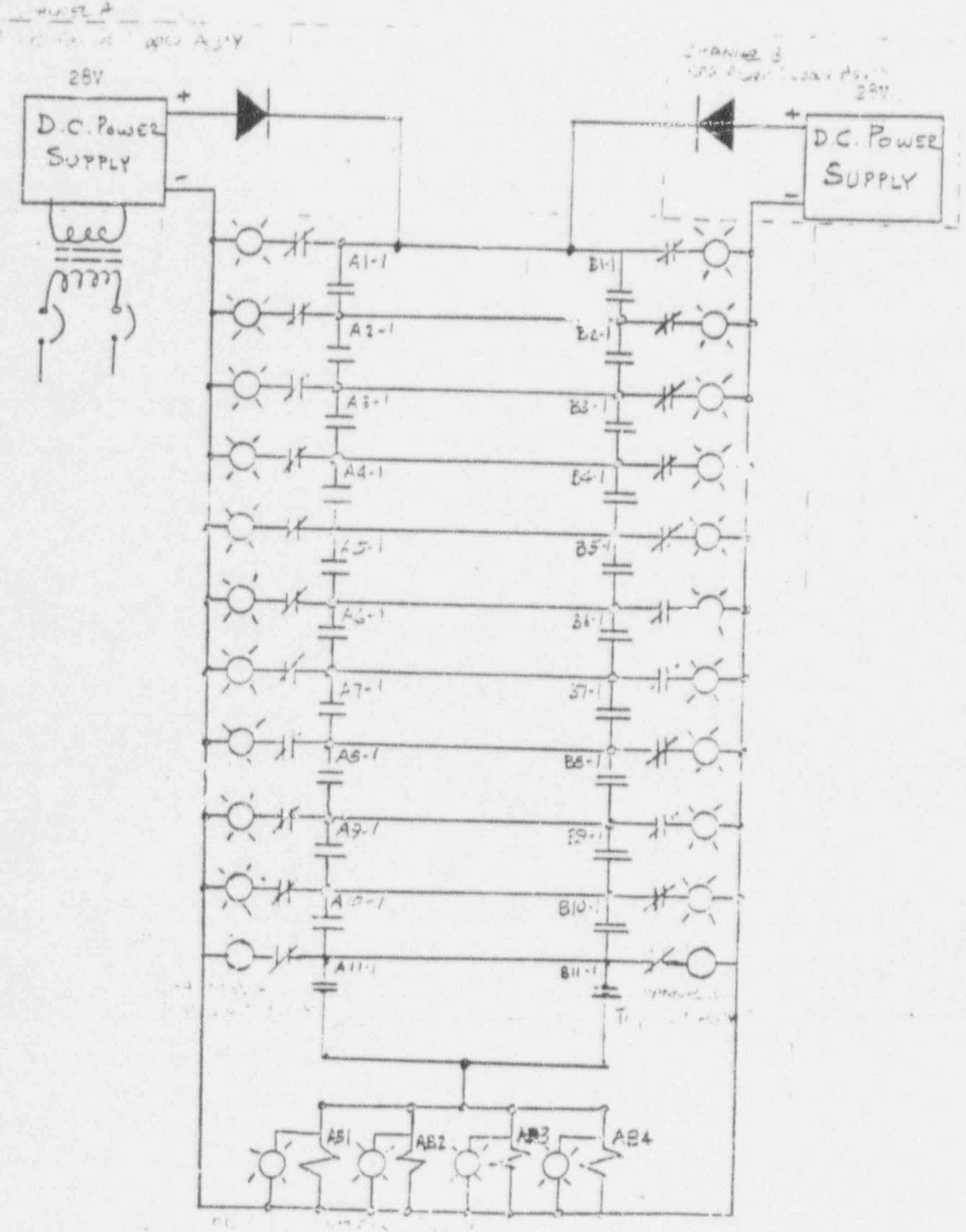


FIGURE 6 – Bistable Trip Unit Block Diagram

FIGURE 7

Single RPS Ladder Logic Matrix



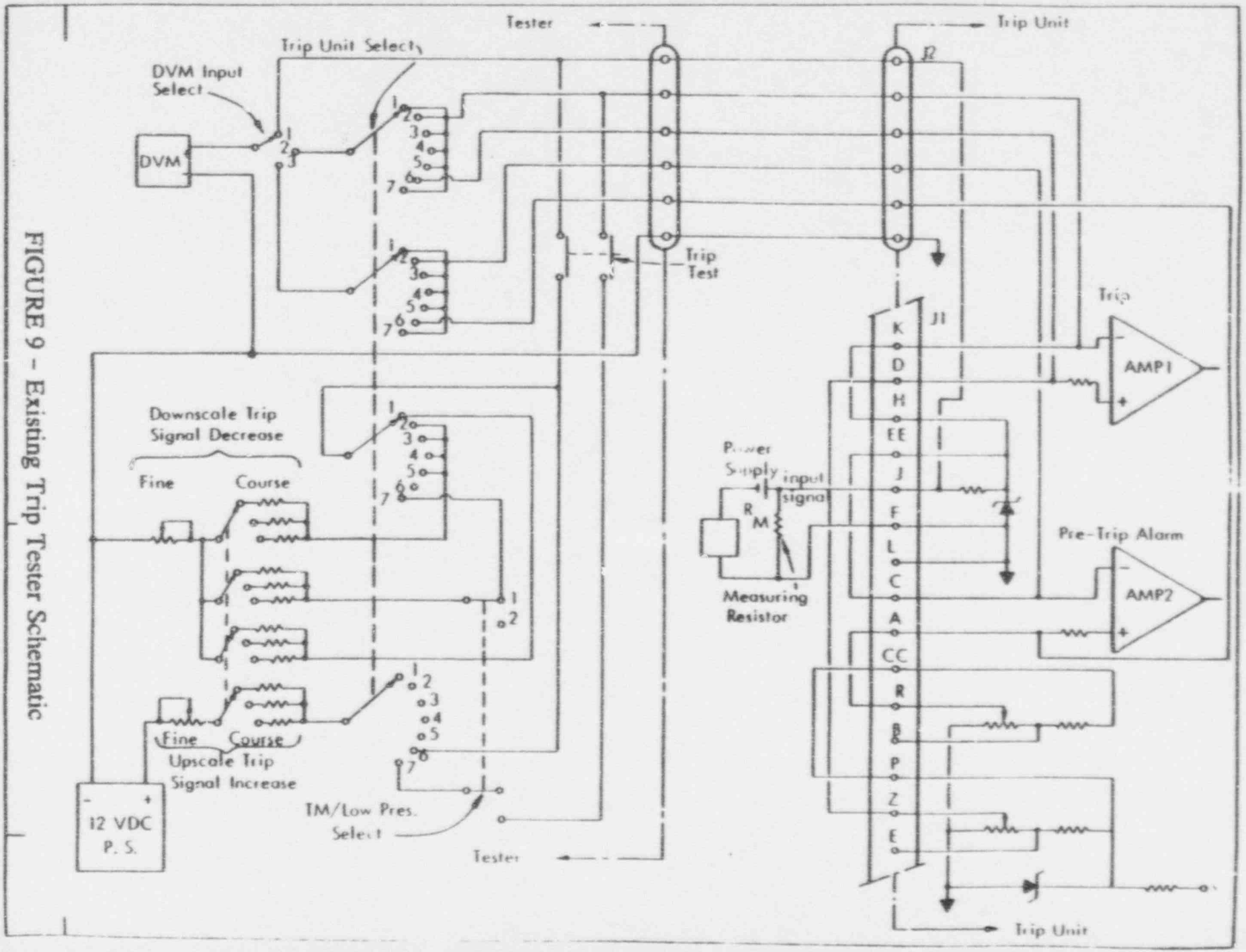


FIGURE 9 – Existing Trip Tester Schematic

ENCLOSURE 2

Consumers Power Company
Palisades Plant
Docket 50-255

INFORMATION ON RPS MODIFICATION

FUNCTIONAL DESCRIPTION

December 26, 1991