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January 12, 1982

Mr. T. A. Ippolito, Chief
 Operating Reactors - Branch 2
 Division of Operating Reactors
 U.S. Nuclear Regulatory Commission
 Washington, DC 20555



Subject: Dresden Station Units 2 and 3
 Quad Cities Units 1 and 2
 RPS Power Supply Modifications
 NRC Docket Nos. 50-237/249 and
 50-254/265

Reference (a): R. F. Janecek letter to T. A.
 Ippolito dated December 11, 1980.

Dear Mr. Ippolito:

In Reference (a), Commonwealth Edison indicated that the Dresden Units 2 and 3 and Quad Cities Units 1 and 2 Reactor Protection System (RPS), and its power supply, would be modified to provide redundant Class 1E protection at the interface of the Non-class 1E power supply and the RPS.

The attachment to this letter provides the design information we committed to provide prior to the first modification installation.

The first installation will be made on Dresden Unit 3, during the current outage which is scheduled to end in May, 1982. We have determined that no Technical Specification changes are required for any of the affected units.

Please address any questions you may have concerning this matter to this office.

One (1) signed original and fifty-nine (59) copies of this transmittal are provided for your use.

Very truly yours,

Thomas J. Rausch

Thomas J. Rausch
 Nuclear Licensing Administrator
 Boiling Water Reactors

Attachment: NEDO-24317, Reactor Protection
 System Protective Circuit Upgrade
 Desemption

cc: Region III Inspector - Dresden
 Region III Inspector - Quad Cities

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81NED301
Class I
January 1981

REACTOR PROTECTION SYSTEM
PROTECTIVE CIRCUIT UPGRADE
DESCRIPTION

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1. INTRODUCTION

This report describes the Electrical Protection Assembly (EPA) for plants with Reactor Protection System (RPS) Motor Generator (MG) sets.

The EPA provides redundant protection to the RPS and other essential circuits against overvoltage, undervoltage, and underfrequency. The EPA consists of trip components which disconnect circuitry from input power whenever voltage or frequency exceeds their normal tolerances. The unit is Class 1E qualified to IEEE standards.

2. HISTORY

Prior to the issuance of the Edwin I. Hatch Unit 2 operating license, the Nuclear Regulatory Commission (NRC) identified a concern regarding the RPS instrument MG set. It was noted that the existing RPS MG protective circuitry was not Class 1E. This fact led to the conclusion that the system output voltage of 120 volts alternating current (Vac) could be varied sufficiently by a seismic event to cause a failure of the RPS.

Normally, the MG set's output voltage is maintained virtually constant by means of a voltage regulator (see Figure 2-1). Additionally, overvoltage and undervoltage protective devices isolate the MG's output from the RPS if the voltage exceeds $\pm 10\%$ of 120 Vac. Isolation also occurs if output voltage frequency drops by more than 5%.

The NRC's concern was that the overvoltage, undervoltage, and underfrequency devices were not seismically qualified and could become inoperable, along with the voltage regulator, as a result of a seismic event. The RPS could then receive an out-of-limits voltage supply and thereby sustain damage to the RPS which could prevent a required reactor scram.

The RPS instrument MG set concern applies to all plants where the RPS employs a relay system as opposed to the solid state RPS. The single exception to this rule is the Limerick plant which derives its RPS supply voltage from inverters. The design modification is generic for all affected plants, thus simplifying the review process and facilitating the procurement of the additional equipment.

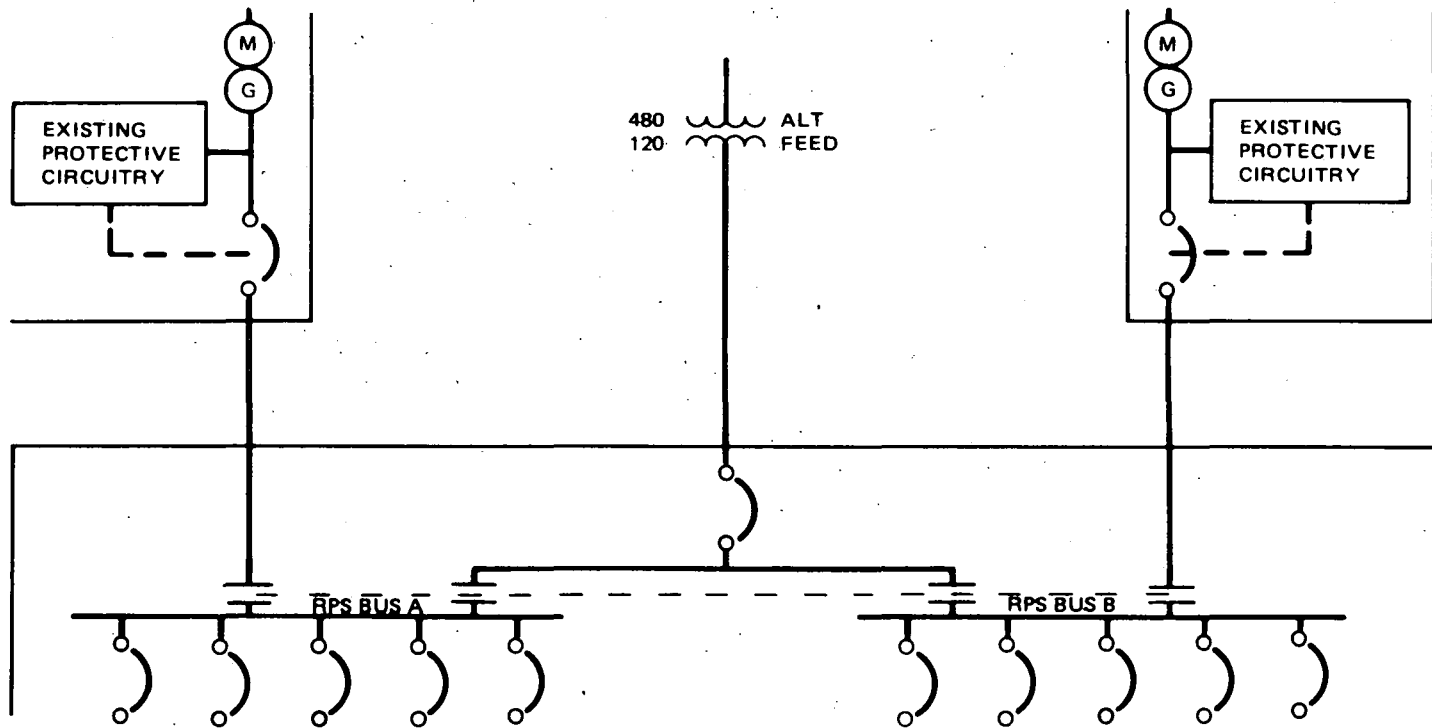


Figure 2-1. Existing RPS Protective Circuitry

3. HARDWARE QUALIFICATIONS

Seismically qualified protective circuits for undervoltage, overvoltage, and underfrequency are packaged in an enclosure designed to be wall mounted. Two of these assemblies will be connected in series, between the power source and the RPS. The enclosures will be mounted separately from the MG sets, and separate from each other. The circuits and enclosures are designed and manufactured to General Electric Company specifications.

The enclosures will be located in an area where the ambient temperature will be 40°F to 122°F. The circuits within the enclosures are qualified to operate up to 137°F at 95% relative humidity. The assemblies are seismically qualified per IEEE-344, 1975, to the Safe Shutdown Earthquake (SSE) and Operating Base Earthquake (OBE). The units are environmentally qualified to the requirements of IEEE-323, 1974.

Enclosure dimensions are 20 inches by 16 inches by 8 inches.

4. SYSTEM DESCRIPTION AND APPLICATION

The block diagram shown in Figure 4-1 functionally depicts the addition of the new assemblies to the RPS power supplies. Two assemblies will be connected in series to each RPS's power source, including auxiliary power. The protective circuit trip setpoints are plus and minus 10 percent of nominal alternating current (ac) voltage and minus 5 percent of nominal frequency.

At installation, voltage measurements will be taken to determine ac line losses between the motor generator set, protective circuits, and downstream components. The motor generator voltage regulators and the protective circuit trip points will be adjusted to voltage levels that reflect optimal operating conditions for the Reactor Protection System and associated system components.

Protecting the EPA from tripping due to low frequency, overvoltage or under-voltage transients is accomplished by three independent time delays. These variable time delays (from 0.1 to 3.0 seconds) prevent the EPA from immediately tripping with the occurrence of a transient. Thus, if the transient dissipates prior to tripping the EPA, the EPA remains untripped.

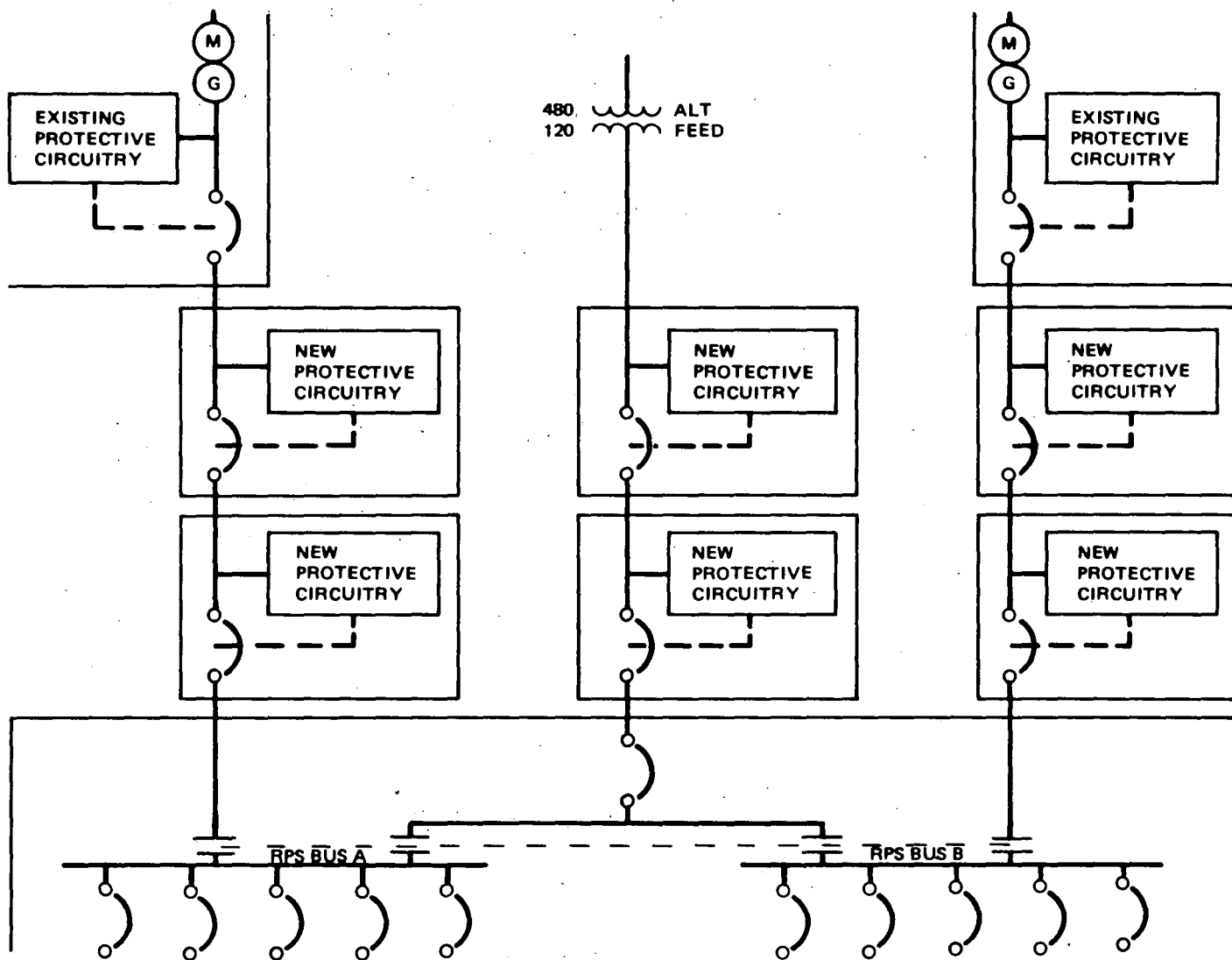


Figure 4-1. New RPS Protective Circuitry

5. SPECIFICATIONS

5.1 FRONT PANEL CONTROL/INDICATORS (see Figure 5-1)

5.1.1 Indicators (Test Maintenance)

- a. Overvoltage
- b. Undervoltage
- c. Underfrequency
- d. Power IN
- e. Power OUT

5.1.2 Indicators (Operation)

- a. Power IN
- b. Power OUT

5.1.3 Controls

- a. Main circuit breaker ON/OFF
- b. Lockswitch for test maintenance use.

5.2 ELECTRICAL REQUIREMENTS

Nominal Voltage Range: 120 Vac (+2%)

Current Requirements:

Startup Current: 280 mA for one second

Running Current: 250 mA

Single Phase: Two Wire (plus ground)

Frequency: 50 hertz (Hz)/60 Hz

Time Delay: Continuously Adjustable 0.1 to 3.0 seconds

Circuit Breaker Max Load: 175 amperes ac

5.3 OPERATING REQUIREMENTS

Temperature: 40°F to 137°F

Humidity: Up to 95% Relative

Radiation: 2×10^4 RAD, Silicon Total Integrated Dose (TID) Group I
 2×10^5 RAD, Silicon Total Integrated Dose (TID) Group II

Altitude: 0 - 10,000 feet above sea level.

5.4 MECHANICAL

Weight: 60 pounds

Height: 20 inches

Depth: 8 inches

Width: 16 inches

A hasp and staple are provided for padlocking the EPA enclosure. External feet are furnished for mounting.

5.5 CABLES

Cable and conduit access openings to be provided by the user at time of installation.

5.6 SEISMIC QUALIFICATION

- a. Operating base earthquake (OBE) 5.0 gravity (G)
- b. Safe shutdown earthquake (SSE) 7.0 G
- c. Frequency Spectrum 1 to 33 Hz

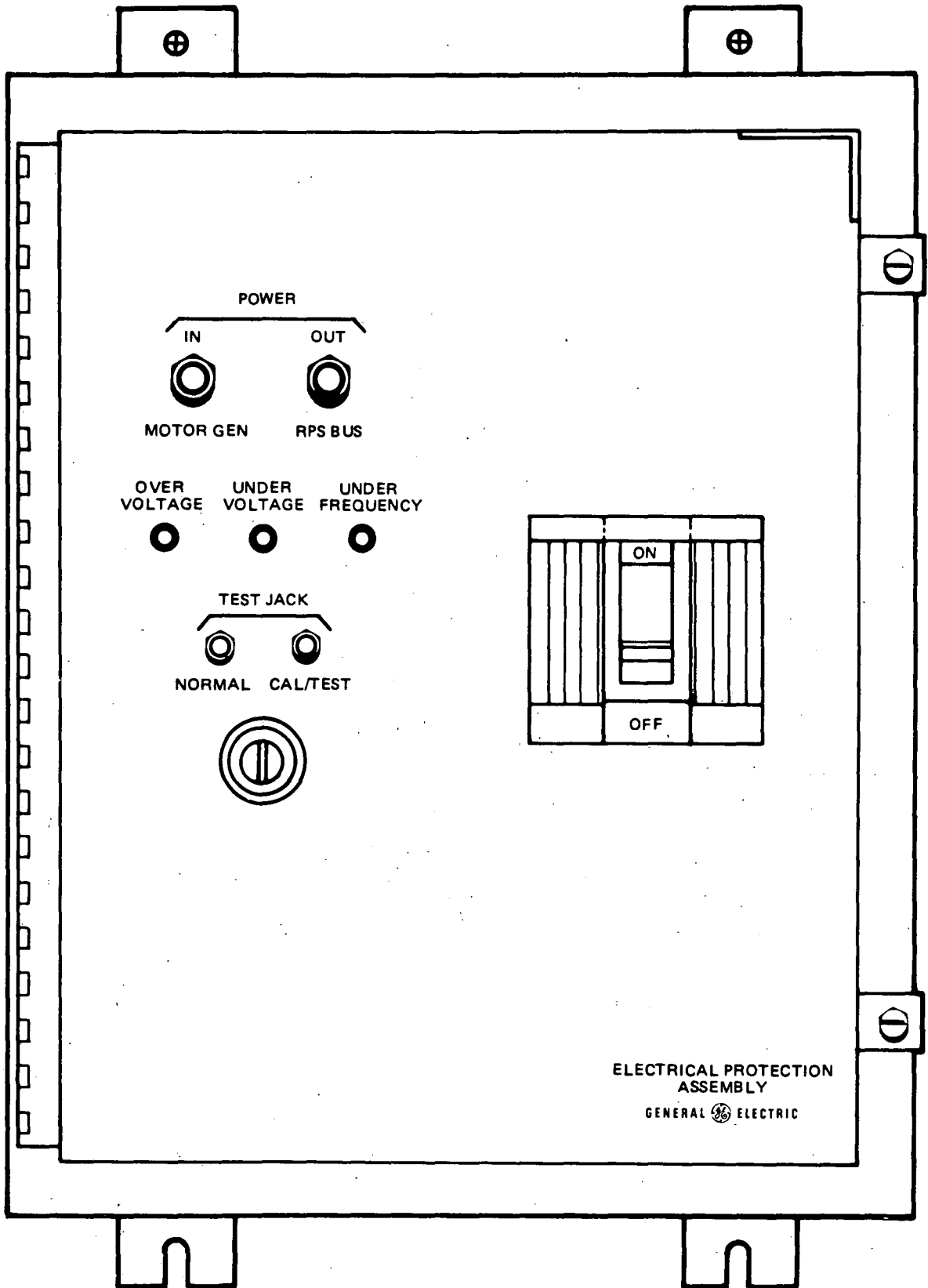


Figure 5-1. Front Panel Control/Indicators

6. REFERENCES

General Electric Company Instruction Manual for the Electrical Protection Assembly, Vendor Print File (VPF) 3830-83-6, December 1980.

DISTRIBUTION

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TECHNICAL INFORMATION EXCHANGE

TITLE PAGE

| | | |
|--|---|---------------------------------|
| AUTHOR R. S. DeVreugd | SUBJECT Nuclear Science and Technology | TIE NUMBER 81 NED 301 |
| | | DATE January 1981 |
| TITLE Reactor Protection System Protective Circuit Upgrade Description | | GE CLASS I |
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| REPRODUCIBLE COPY FILED AT TECHNICAL SUPPORT SERVICES, R&UO, SAN JOSE, CALIFORNIA 95125 (Mail Code 211) | | NUMBER OF PAGES 15 |
| SUMMARY A description of the Electrical Protection Assembly for plants with Reactor Protection System motor generator sets is presented. | | |

By cutting out this rectangle and folding in half, the above information can be fitted
into a standard card file.

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INFORMATION PREPARED FOR Nuclear Power Systems Division

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