Honeywell

High-Performance Process Manager Checkout

HP20-510

Total Plant

Implementation

High-Performance Process Manager - 3

High-Performance Process Manager Checkout

HP20-510

Release 500
CE Compliant
3/96

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About This Publication

This publication provides instructions for use by the High-Performance Process Manager (HPM) subsystem hardware installation and checkout personnel. It will help you determine if the subsystem hardware is properly installed and ready for on-line operation. Use this manual whenever the High-Performance Process Manager subsystem is shut down for major repairs, upgrades (expansions), or major moves (relocation of equipment).

The user of this manual should be familiar with the contents of the *High-Performance Process Manager Planning* and *High-Performance Process Manager Installation* manuals.

This publication supports software Release 500.

This publication supports CE Compliant equipment. Any equipment designated as "CE Compliant" complies with the European Union EMC and its health and safety directives. All equipment entering the European countries after January 1, 1996 require this type of compliance, denoted by the "CE Mark."

TECHNICAL ASSISTANCE

If you need assistance	If you need technical assistance, contact your local Honeywell Service Organization, as explained in the following paragraphs.
International customers	Outside of the United States, contact your local Honeywell Service Organization. If you are not sure of the location or telephone number, call your Honeywell representative for information.
Customers inside the United States	Within the United States, call the Technical Assistance Center (TAC) at the toll free number 1-800-822-7673.
Arizona customers	Within Arizona, the local number for TAC is 602-313-5558.
Services provided	Calls to TAC are answered by a dispatcher from 7:00 A.M. to 5:00 P.M., Mountain Standard Time (6:00 A.M. to 4:00 P.M. when daylight saving time is in effect). Outside of these hours, emergency calls—those which affect your ability to control or view a process—will be received by an answering service, and returned within one hour. TAC maintains its own TDC 3000^X system, and frequently can duplicate equipment problems.
Time saving tip	It is a good idea to make specific notes about the problem before making the call. This will help to reduce delays and expedite answers.

Standard Symbols

Scope

The standard symbols used in this publication are defined as follows.

ATTENTION

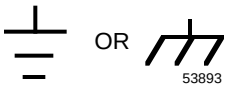
Notes inform the reader about information that is required, but not immediately evident.

CAUTION

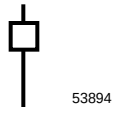
Cautions tell the user that damage may occur to equipment if proper care is not exercised.

WARNING

Warnings tell the reader that potential personal harm or serious economic loss may happen if instructions are not followed.

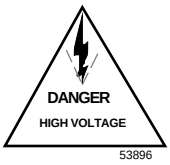


Ground connection to building Safety Ground

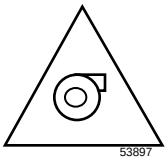


Ground stake for building Safety Ground

Electrical Shock Hazard—can be lethal



Electrical Shock Hazard—can be lethal



Rotating Fan—can cause personal injury

Caution—refer to the appropriate installation document.

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Acronyms

APM..... Advanced Process Manager
FTA..... Field Termination Assembly
HPMM..... High-Performance Process Manager Module
HPM..... High-Performance Process Manager
IOP ..... Input/Output Processor
LCN .....Local Control Network
MRG.....Master Reference Ground
NIM ..... Network Interface Module
PM..... Process Manager
UCN.....Universal Control Network
US ..... Universal Station
ZBG .....Zener Barrier Ground

References

Publication Title	Publication Number	Binder Title	Binder Number
High-Performance Process Manager Specification and Technical Data	HP03-500	System Summary – 2	TDC 3010-2
High-Performance Process Manager Planning	HP02-500	System Site Planning – 2	TDC 3020-2
High-Performance Process Manager Installation	HP20-500	Implementation/ High-Performance Process Manager - 3	TDC 3066-3
High-Performance Process Manager Checkout	HP20-510	Implementation/ High-Performance Process Manager - 3	TDC 3066-3
High-Performance Process Manager Service	HP13-500	PM/APM/HPM Service – 1	TDC 3061-1
Process Manager I/O Specification and Technical Data	IO03-500	System Summary – 2	TDC 3010-2
Process Manager I/O Installation	PM20-520	Implementation/ High-Performance Process Manager - 3	TDC 3066-3
TDC 3000X System Site Planning	SW02-550	System Site Planning – 1	TDC 3020-1
Universal Control Network Specification and Technical Data	UN03-500	System Summary – 2	TDC 3010-2
Universal Control Network Planning	UN02-501	System Site Planning – 1	TDC 3020-1
Universal Control Network Installation	UN20-500	Installation/Universal Control Network	TDC 3041
Universal Control Network Guidelines	UN12-510	Installation/Universal Control Network	TDC 3041
Local Control Network Planning	SW02-501	System Site Planning – 1	TDC 3020-1
LCN System Installation	SW20-500	LCN Installation	TDC 3025
LCN System Checkout	SW20-510	LCN Installation	TDC 3025
LCN Guidelines - Implementation, Troubleshooting, and Service	LC09-510	LCN Installation	TDC 3025

Section 1 – Introduction

1.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
1.1	Overview	1
1.2	Tools and Test Equipment	2

Purpose of manual

The *High-Performance Process Manager Checkout* manual provides instructions and references, as needed, for the initial checkout of High-Performance Process Manager equipment cabinets, modules, and their interface to the Network Interface Module (NIM). It is intended to be used by trained Honeywell or customer service technicians. The checkout procedures determine if the system components have been properly installed and are ready for system startup. This guide also serves to check out system expansions or significant modifications.

Checklist form

The *HPM Post-Installation Checklist*, Form A-1 in Appendix A, should be used to measure the progress and completeness of the checkout effort.

Please scan reference documentation

Please read this manual completely and scan the documents that were previously referenced before proceeding with the subsystem checkout.

1.2 Tools and Test Equipment

Recommended tools and test equipment

It is recommended that the following tools and test equipment be available for hardware checkout.

- Digital Voltmeter
- Standard tool kit
- ESD ground strap
- Earth Tester – Biddle Megger® models 250200, 250220 or 250241, or equivalent test equipment

  TDC 3000^X system test devices should be available as needed. You can choose equipment equivalent to that specified, but test procedures and results may vary.
- Accessories, such as test leads, grounding rods, etc.

ATTENTION

ATTENTION—The Biddle model 250260 is not acceptable.

Section 2 – Subsystem Hardware Checkout

2.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
2.1	Overview	3
2.2	Site Preparation Checklist	4
2.3	Prepower Connection Checks	4
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Introduction

This section references the major hardware items that should be checked and the procedures to follow.

2.2 Site Preparation Checklist

Introduction

Sections 3 and 4 of the *High-Performance Process Manager Installation* manual contain detailed site preparation information. At this point in the installation of the High-Performance Process Manager (HPM), determine the thoroughness of site preparation by being sure that:

- All equipment has been properly located, placed in its operating position, and structural requirements are adequate.
- All equipment has been leveled, and if required, bolted down.
- All protective wrappings, shipping bands, cables, turnbuckles, masking tape, angle iron, and other shipping materials have been removed from the area.
- Lighting is adequate in all work areas.
- Adequate power, grounding, and cabling is connected.

2.3 Prepower Connection Checks

Introduction

The following prepower checks can be performed after ac wiring has been installed, and either before or after the High-Performance Process Manager has been connected to ac power.

2.3.1 Facility Safety Ground Verification

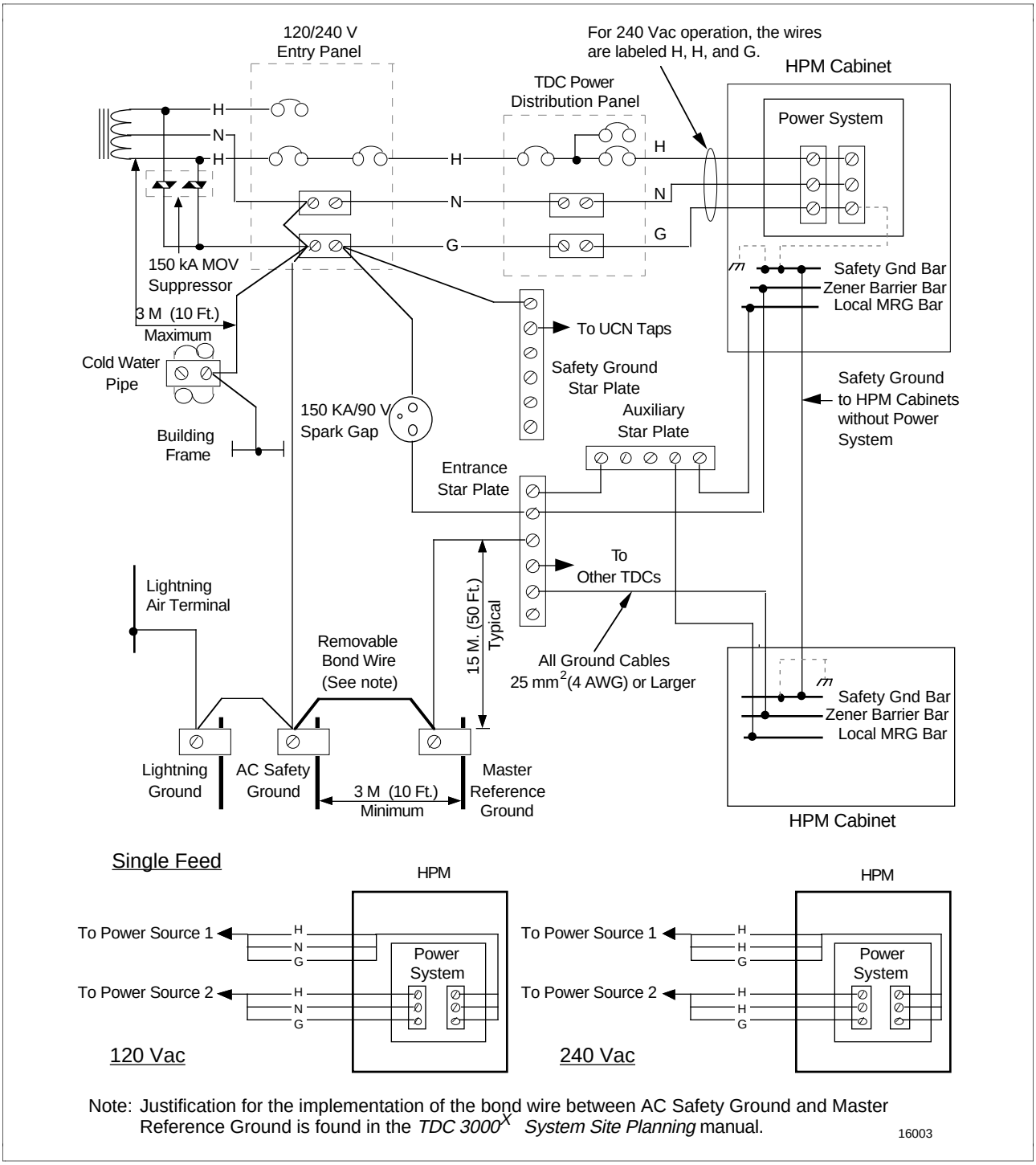
The facility's Safety Ground is a system of metallic water pipes or a metallic building structure chosen for that purpose. See Figures 2-1 or 2-2. Using the 3-terminal method and test leads that are 183 meters (600 feet) or more, verify that the facility's Safety Ground has less than 1 ohm of earth resistance. These measurements can be made with any of the Biddle Megger® Earth Testers listed in subsection 1.2 of this manual or equivalent test equipment. See the tester manuals for measurement details.

Continued on next page

Non-CE Compliant power and ground system

Figure 2-1 is a schematic of typical power and ground entry with internal connections for an HPM cabinet. The multi-ground system is non-CE Compliant.

Figure 2-1 HPM Cabinet Power and Ground Entry Schematic – Multi-Ground System



Note: Justification for the implementation of the bond wire between AC Safety Ground and Master Reference Ground is found in the *TDC 3000X System Site Planning* manual.

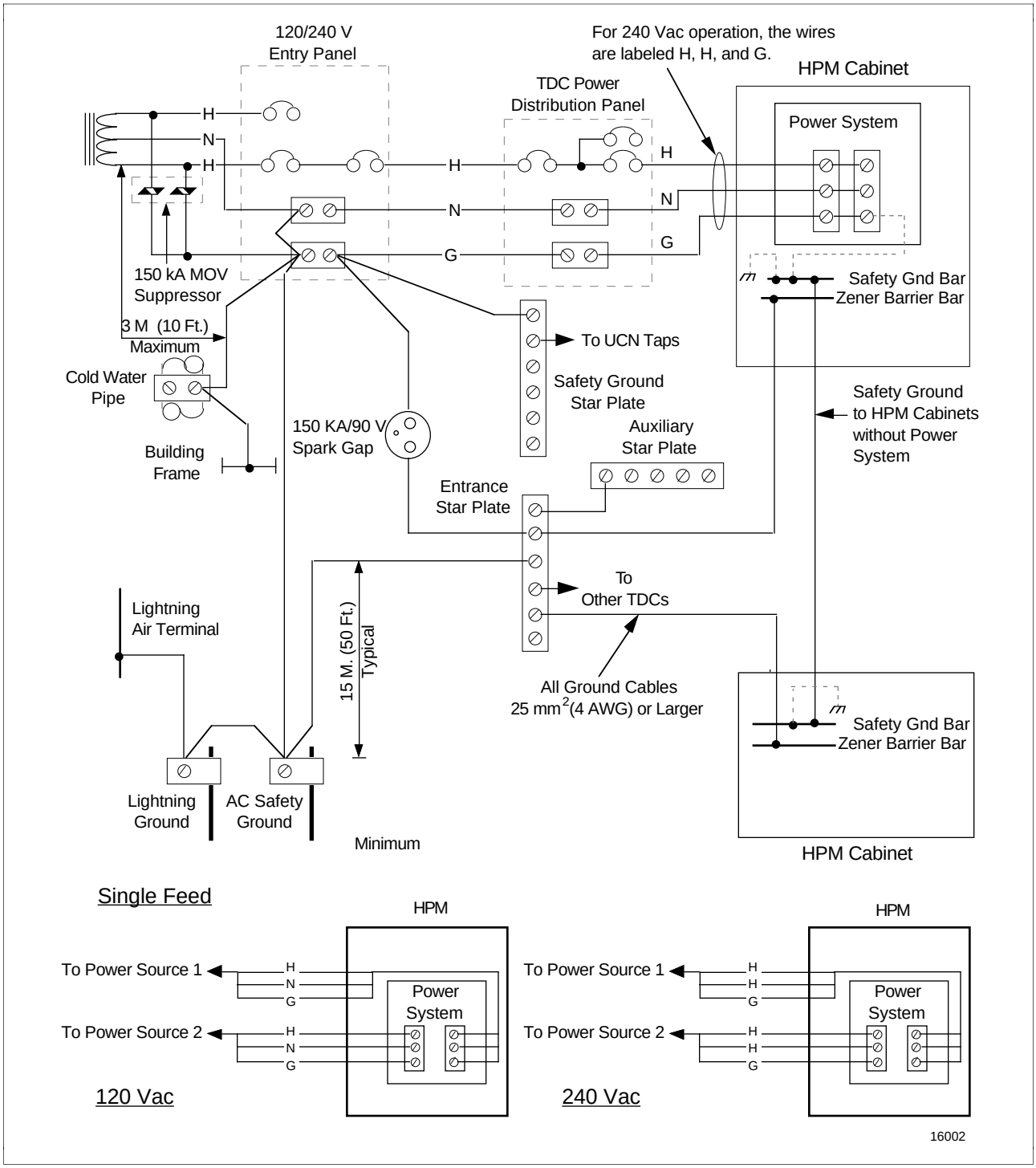
16003

Continued on next page

CE Compliant power and ground system

Figure 2-2 is a schematic of typical power and ground entry with internal connections for an HPM cabinet. The single-ground system is CE Compliant.

Figure 2-2 HPM Cabinet Power and Ground Entry Schematic – Single-Ground System



2.3.2 AC Power Verification

Voltage and frequency checks

Check that the HPM ac power is within the voltage range and frequency that is specified in Table 2-1.

Table 2-1 Acceptable Power Source Parameters

Power Source	Voltage Range	Frequency Range
120 Vac, 50 or 60 Hz	100 to 132 Vac	47 to 63 Hz
240 Vac, 50 or 60 Hz	187 to 264 Vac	47 to 63 Hz

Total Harmonic Distortion (THD):	8% maximum
Power Dropouts:	10 milliseconds
Impulse:	8 x 20 µs bursts (8 µs rise to peak, 20 µs decay to 50% amplitude) of 3 kV twice/minute, 2 x line for 10 milliseconds once/hour, maximum
Surge:	IEEE Standard 472-1976 and ANSI C37.90a-1974, full compliance IEC 801-5, severity level 2 kV

2.3.3 AC Line Stability Tests

Monitor ac power during operation

Prior to, or during the first month of operation, connect an ac line analyzer/recorder (Dranetz Universal Disturbance Analyzer Series 626) to the incoming power source as detailed in the procedure that follows. A historical record of power fluctuations is then recorded by the analyzer as plant equipment is turned on and off during normal operation. The stability of the power source must be within all the limits shown in Table 2-1. See the *High-Performance Process Manager Installation* manual for the full details.

10 milliseconds power dropouts

If you experience serious dropouts (greater than 10 milliseconds), low-line conditions, or if the power line exceeds impulse and surge limits, consider installing an AC Voltage Stabilizer in the ac line to the High-Performance Process Manager. This type of stabilizer overcomes short dropouts, as well as correcting low-line conditions. It also removes most impulses and surges. Consult an AC Voltage Stabilizer supplier for details.

50 milliseconds power dropouts

If dropouts are long (50 milliseconds or greater), consider using the battery backup version of the Power System or installing an uninterruptible power system (UPS) instead of the AC Voltage Stabilizer. The UPS overcomes any line problem because it completely regenerates the power sinusoidal wave.

Continued on next page

2.3.3 AC Line Stability Tests, Continued

AC line stability testing procedure

The Dranetz Series 626 Analyzer is designed to accept up to five plug-in monitor modules that can measure various physical disturbances. See subsection 1.2 for a list of plug-in modules that are recommended to be included with the analyzer. Use the following procedure to time monitor the ac line.

Step	Action
1	Select the proper AC Power Line Monitor module. Use a Series 626-PA-6001-T single-phase AC Power Line Monitor if measuring a single-phase power source. Use a Series 626-PA-6003-T three-phase AC Power Line Monitor if measuring a three-phase power source.
2	Connect the High-Performance Process Manager's power lines to the measurement terminal strip at the rear of the AC Power Line Monitor module as directed in the Dranetz manual. Be sure to measure the same power lines you intend to connect to the cabinet (120 Vac or 240 Vac, single-phase or three-phase).
3	Plug the line cord of the Dranetz Series 626 Analyzer into a proper source of power. Its power plug can be connected to the same power source as that being measured if the voltages are compatible.
4	Refer to the Dranetz manual and program the monitor for one of the following power source parameters in Table 2-2.
5	Before leaving the analyzer for long term monitoring, be sure the Dranetz real-time clock is properly set and the Dranetz battery backup is operational. See the Dranetz manual.

Power source parameters

Table 2-2 Power Source Parameters

Program Function	Power Source Parameter		
	120 Vac	**200 Vac**	**240 Vac**
RANGE	200 V F.S.	400 V F.S.	400 V F.S.
HI LIMIT	132 V *	264 V *	264 V *
LO LIMIT	100 V *	187 V *	187 V *
SENS	10 V	10 V	10 V
F SENS	0.5 Hz	0.5 Hz	0.5 Hz
IMP SENS	60 V	60 V	60 V
* These are the limits of the HPM Power System. However, you may want to "tighten" your test measurements somewhat.			

Other Power Analyzers

For Power Analyzers made by other manufacturers, follow the manufacturer's procedure and use the parameters in Table 2-2.

2.3.4 Radio-Frequency Interference Tests

RFI Recording

Use the Dranetz Series 626 Universal Disturbance Analyzer and its Series 626-PA-6020 Radio Frequency Interference Monitor plug-in to record RFI disturbances in the vicinity of the High-Performance Process Manager.

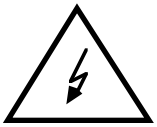
Monitor RFI impulses

Set the monitor to record RFI impulses in excess of ten volts. If interference exceeds this value, consult your Honeywell technical representative.

Set real-time clock

Before leaving the analyzer for long term monitoring, be sure the Dranetz real-time clock is properly set and the Dranetz battery backup is operational. See the Dranetz manual.

2.4 Power-Off Checks



CAUTION, RISK OF ELECTRIC SHOCK

Introduction

Power-off checks are to be performed after ac wiring has been installed and after the High-Performance Process Manager's power, ground, and field wiring have been connected. The circuit breaker at the HPM power distribution panel must be off and tagged. See Figure 2-1 or 2-2.power-off checks

CAUTION

CAUTION—Do not apply power to the High-Performance Process Manager until you have reached subsection 2.6, *Power-On Checks,* in this manual. Failure to do so may permanently damage components in the High-Performance Process Manager.

ATTENTION

ATTENTION—The ground tests that follow use one of the Biddle Megger Earth Testers listed in subsection 1.2. See the tester manual for measurement details.

2.4.1 Safety Ground

Inspection	Inspect each HPM cabinet to verify the proper connection of the green or green-yellow Safety Ground wire to the HPM. This Safety Ground is factory installed at the input power terminal strips at the left side of the Standard Power System backplane and is marked **GND**. The Safety Ground is connected to terminal strips on the AC/DC Distribution Assembly in the AC Only Power System. Check that any single HPM cabinet or bolted together complex of cabinets without an installed Power System has its Safety Ground connected to a nearby cabinet or the system power distribution panel.
Use an earth tester	Using an earth tester, test for less than 1/2 ohm between the High-Performance Process Manager cabinet's Safety Ground connection and the facility's Safety Ground.

2.4.2 Master Reference Ground

Introduction

Installations with a Master Reference Ground (MRG) are not acceptable in countries governed by CE standards. These CE standards generally apply for, but are not exclusive for all European countries. An installations with MRG is generally acceptable in the United States and many North American and South American countries.

The instructions in this subsection and subsection 2.4.3 apply for those installations that have a Master Reference Ground.

Inspection

Visually inspect each HPM cabinet to verify that its local Master Reference Ground is connected to the nearest MRG star plate using a 25 mm^2 (4 AWG) cable as shown in Figure 2-1.

MRG to Safety Ground check

If the HPM cabinet does not contain intrinsic safety equipment, use an earth tester to verify that there is less than 5 ohms between the cabinet's MRG and the facility's Safety Ground. If the cabinet contains intrinsic safety devices, use an earth tester to test for less than 1 ohm between its local MRG and the facility's Safety Ground.

ATTENTION

ATTENTION—In the event that there are concerns about the grounding system not meeting a regulating body's requirements, such as NEC, OSHA, or local codes, it is permissible to add a direct wire, 25 mm^2 (4 AWG) or larger, between the Safety Ground and the Master Reference Ground at their grounding electrodes according to codes. Before the connection is made, the Safety Ground connection point must be prior tested, as detailed in the *TDC 3000X System Site Planning* manual, not to exceed 10 volts peak noise. The *TDC 3000X System Site Planning* manual details the implementation of this bonding connection.

2.4.3 MRG Noise Testing

Introduction

The description in subsection 2.4.2 assumes the existence of a firmly established isolated MRG that is installed according to the *TDC 3000^X System Site Planning* manual. Circumstances, such as on an oil drilling platform, an extremely large indoor facility, or meeting a regulating body's requirements, such as NEC, OSHA, or local codes, may prevent having an isolated MRG. Under these circumstances only, the *TDC 3000^X System Site Planning* manual suggests that noise tests be made for the Safety Ground connection point.

Install a Noise-Test Reference Ground

The tests are to be made between the Safety Ground connection point and a Noise-Test Reference Ground that must be installed for the tests. Use the following procedure to install a Noise-Test Reference Ground.

Step	Action
1	Obtain a galvanized steel rod, 2.5 meters (8 feet) long by 16 mm (5/8 inches) in diameter, and a suitable grounding clamp. This is your Noise-Test Reference Ground stake.
2	Drive the stake into the ground 3 meters (10 feet) from any grounded steel structure. The stake can be placed immediately beside a building, providing it does not contact any grounding structure or grounded rebar in the footing. This Noise-Test Reference Ground should be no more than 15 meters (50 feet) from the ground connection point being tested.
3	Check the Noise-Test Reference Ground with an earth tester to determine if it has an earth resistance of less than 100 ohms (it is probably significantly less).

Continued on next page

2.4.3 MRG Noise Testing, Continued

Safety Ground noise test procedure

Testing of noise at the Safety Ground connection point should take place for at least a week with normal plant activity before the ground connection point can be considered suitable for the system. At no time should the measured impulse noise exceed 10 volts peak. Use the Dranetz Series 626 Universal Analyzer to record impulse noise with the following procedure.

Step	Action
1	Using the Dranetz Series 626-PA-6002A-T DC monitor, connect the monitor rear-panel voltage-measuring terminals between the Safety Ground connection point and the Noise-Test Reference Ground with leads no longer than 15 meters (50 feet).
2	Plug the line cord of the Dranetz Series 626 Universal Analyzer into a proper source of ac power.
3	Refer to the Dranetz manual and program the monitor for the following parameters.

Program Function	Parameter
RANGE	20.0
HI LIMIT	10.0
LO LIMIT	00.6
SENS	10.0
IMP SENS	10.0

Step	Action
4	Before leaving the analyzer for long term monitoring, be sure the Dranetz real-time clock is properly set, and the Dranetz battery backup is operational. See the Dranetz manual.

2.4.4 Zener Barrier Ground

Inspection

If zener barriers are installed, visually inspect the local Zener Barrier Grounds (ZBGs) in each HPM cabinet to verify that they are connected to the MRG entrance star plate, usually using redundant 25 mm^2 (4 AWG) wires. See Figure 2-1.

Earth Tester

Using an earth tester, test for less than 1 ohm between the cabinet's Zener Barrier Ground and the local Safety Ground.

2.4.5 AC Voltage Source Selection

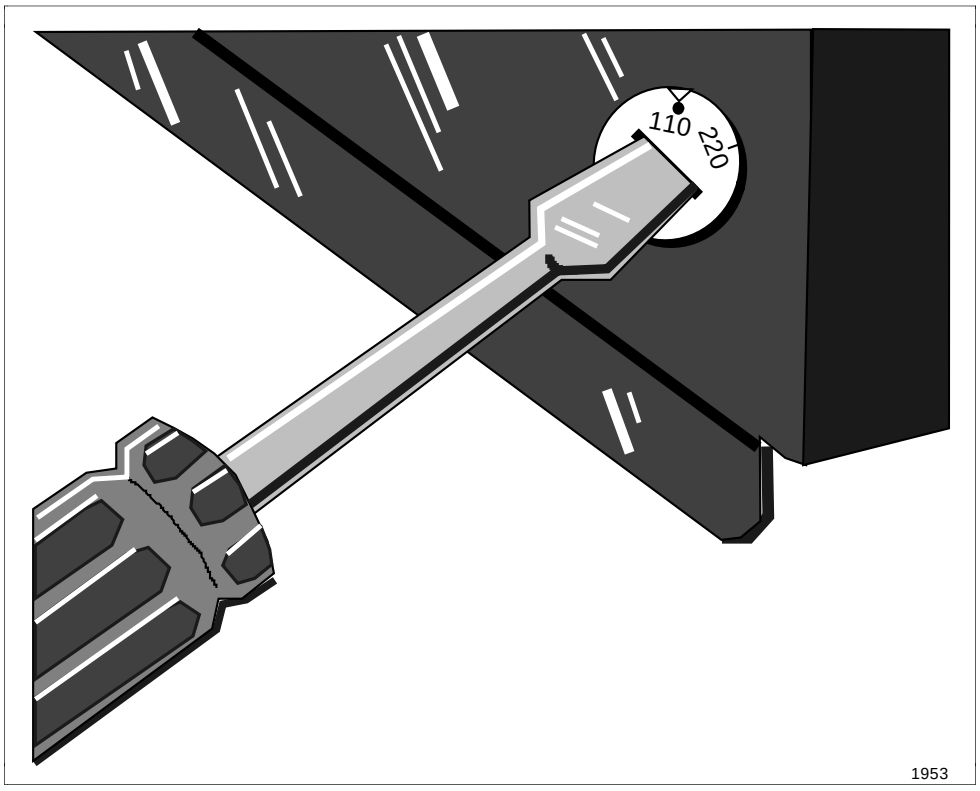
Standard Power System

Locate the Standard Power System in the HPM cabinet(s) and remove the plastic cover panel by pulling it towards you, using the hand-holds at the sides of the cover panel. This exposes two Power Supply Modules (one is optional) in the center of the Power System chassis.

Early production Power Supply Module

If the Power System contains early production Power Supply Module(s), use a screwdriver to set the Voltage Selection switch on each Power Supply Module to correspond with the input voltage, 110 or 220 Vac, supplied to the cabinet. The adjustment is illustrated in Figure 2-3.

Figure 2-3 Standard Power Supply Module AC Voltage Selection



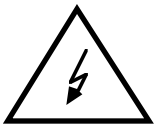
Later production Power Supply Module

If the Power System contains later production Power Supply Module(s), no voltage selection is necessary, since the Power Supply Module automatically adjusts to the input ac voltage.

AC Only Power System

The AC Only Power System has Power Supply Modules that accommodate only a specific voltage. The installed Power Supply Modules must have the proper voltage rating for the voltage application. Be sure the rating is correct for your application.

2.5 Cabling and Wiring Checks



CAUTION, RISK OF ELECTRIC SHOCK

Introduction

Wiring and cabling checks are to be performed after the High-Performance Process Manager has been wired and cabled according to instructions in the *High-Performance Process Manager Installation* and *Process Manager I/O Installation* manuals. The circuit breaker at the HPM power distribution panel must be off. See Figure 2-1 or 2-2 for proper power and ground connections.

2.5.1 Field Wiring

Field wiring verification

Verify that the field wiring to the Field Termination Assemblies (FTAs) meets your requirements and is in accordance with instructions in the *Process Manager I/O Installation* manual.

2.5.2 UCN Cabling

UCN cabling verification

Verify that the UCN cabling to the NIM(s) and HPMM(s) are in accordance with instructions in the *High-Performance Process Manager Installation* manual. The drop cables from the UCN trunk cable taps must meet the connection requirements of the manual.

HPMM card file pinning

Verify that each HPMM card file is properly pinned for the HPM's designated node address on the UCN.

NIM pinning

Verify that the NIM(s) is properly pinned for the NIM's designated node address on the UCN.

2.5.3 Annunciator Wiring

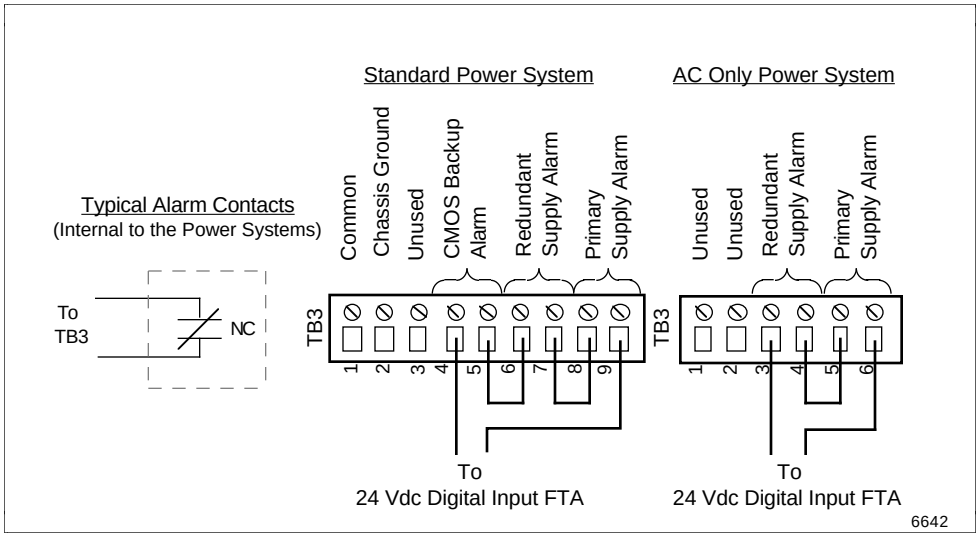
Standard Power System

Terminals for the Power System annunciator contacts are provided on the Standard Power System backplane of the High-Performance Process Manager as shown in Figure 2-4. The contacts open when an alarm indicates:

- the CMOS Memory Battery Backup system has failed.
- the primary Power Supply Module or the 48 V Backup Battery system has failed.
- the redundant Power Supply Module or the 48 V Backup Battery system has failed.

If the Power Supply Module annunciator contacts open, ac power to one or both of the Power Supply Modules may have failed, or the batteries may have degraded or have been removed.

Figure 2-4 Power System Annunciator Contact Connections



AC Only Power System

The AC Only Power System has two pairs of contacts, a pair for each Power Supply Module which open when the respective primary or redundant Power Supply Module fails or loses its power source. The terminals for the contacts are located on the AC/DC Distribution Assembly as shown in Figure 2-4.

CMOS Memory Battery Backup

The CMOS Memory Battery Backup feature has charger/monitor circuitry, and each individual Power Supply Module has charger/monitor circuitry for the 48 V Battery Backup system. In addition to charging the batteries, each monitor system periodically checks the batteries to determine if they are capable of handling an operational load.

Continued on next page

2.5.3 Annunciator Wiring, Continued

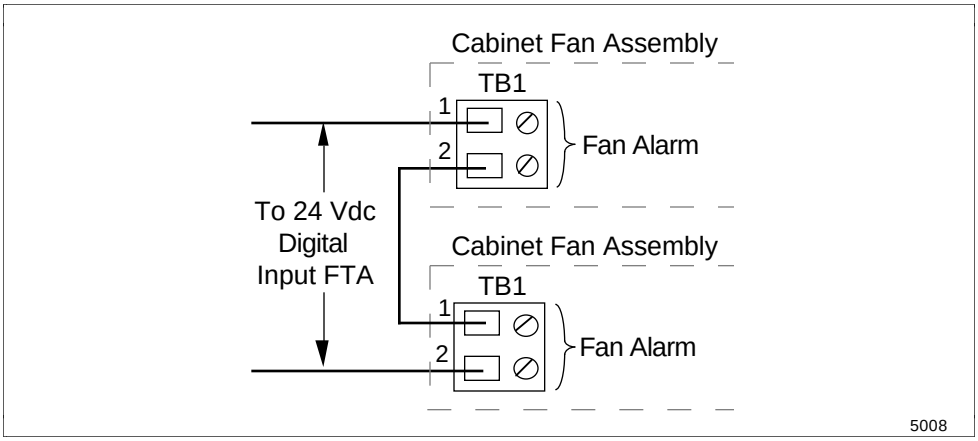
Your requirements

Be sure that the annunciator wiring that is connected to the alarm contacts terminals meets your requirements.

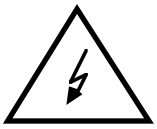
Cabinet Fan Assembly

The High-Performance Process Manager cabinet contains one or two dual fan assemblies that are installed at the top of the cabinet. The assembly(ies) has an optional operation indicator (LED) and a normally open set of alarm contacts that can be wired in series to alarm monitoring circuitry. The contacts are closed when the fans are operating properly. Figure 2-5 illustrates the wiring of two cabinet dual fan assemblies. The alarm contacts are shown wired to a 24 Vdc Digital Input Field Termination Assembly (FTA) for subsystem monitoring.

Figure 2-5 Typical Cabinet Fan Alarm Wiring



2.6 Power-On Checks



CAUTION, RISK OF ELECTRIC SHOCK

Introduction

Before power is applied to the High-Performance Process Manager, remove the Power System's cover panel and verify that all switches are in the **OFF** position and the batteries are properly installed.

2.6.1 Preparation

Standard Power System

To remove the Standard Power System's cover panel, grasp the hand-holds at the sides of the cover, and pull the cover toward you. This exposes the upper portion of the Standard Power System's backplane and the two Power Supply Modules (one is optional) at the center of the chassis. Fan Assembly fuse holders, power and alarm terminal strips, NiCad battery holders, and card file power connectors are an integral part of the backplane.

The power terminal strips on the model MU-PSRB04 Standard Power System are behind the left Power Supply Module. The Power Supply Module must be removed for access.

Figure 2-6 is an illustration of the model MU-PSRB03 Standard Power System and Figure 2-7 is an illustration of the model MU-PSRB04 Standard Power System.

Battery Backup system

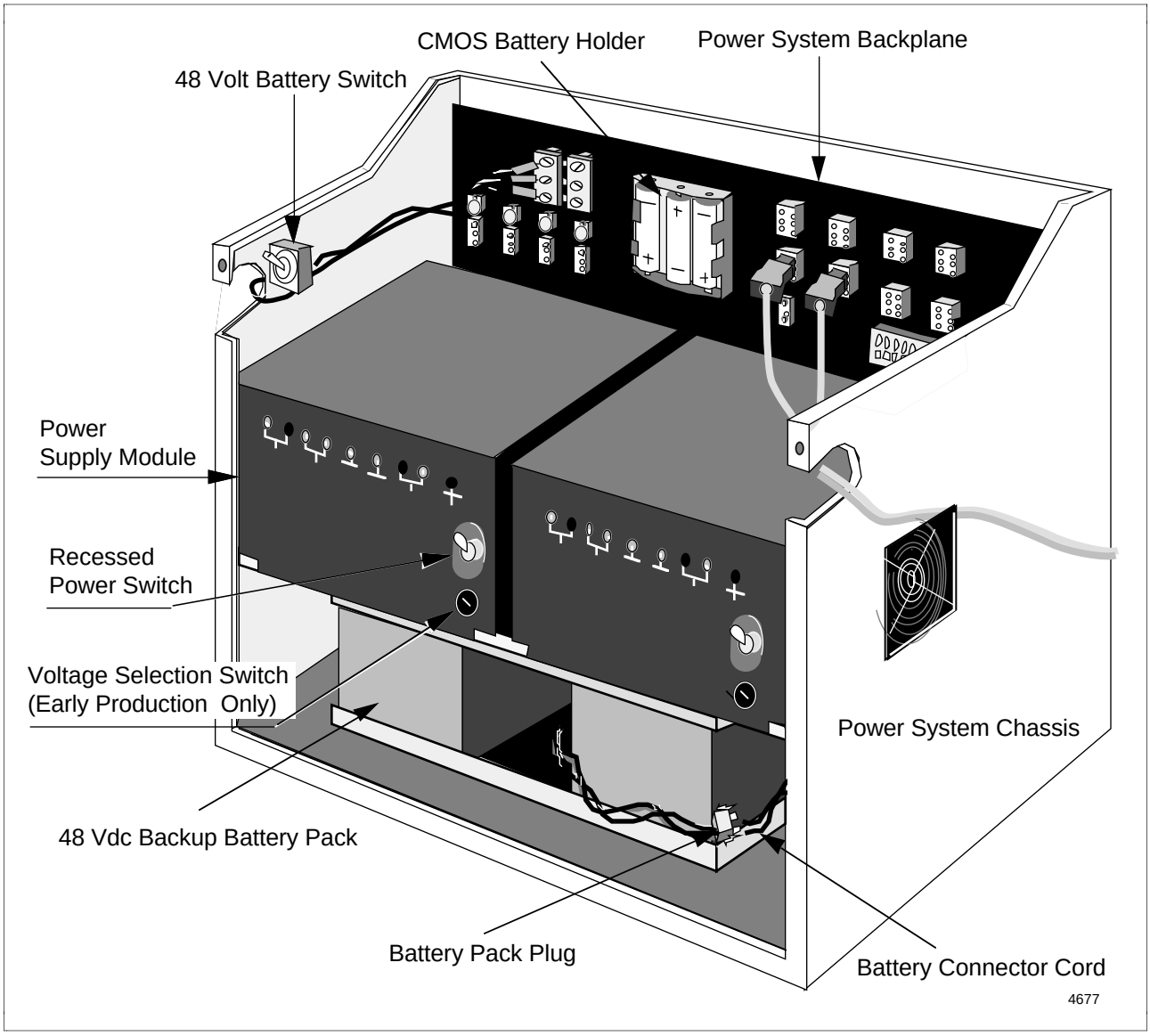
Two screws that can be turned by a coin or flat blade screwdriver permit removal of the Standard Power System's bottom cover to provide access to the 48 V Backup Battery Pack at the bottom of the housing. The AC Only Power System has no 48 V Battery Backup Pack.

Continued on next page

Model MU-PSRB03 Standard Power System

Figure 2-6 illustrates the Standard Power System with its battery backup feature.

Figure 2-6 Model MU-PSRB03 Standard Power System with Battery Backup

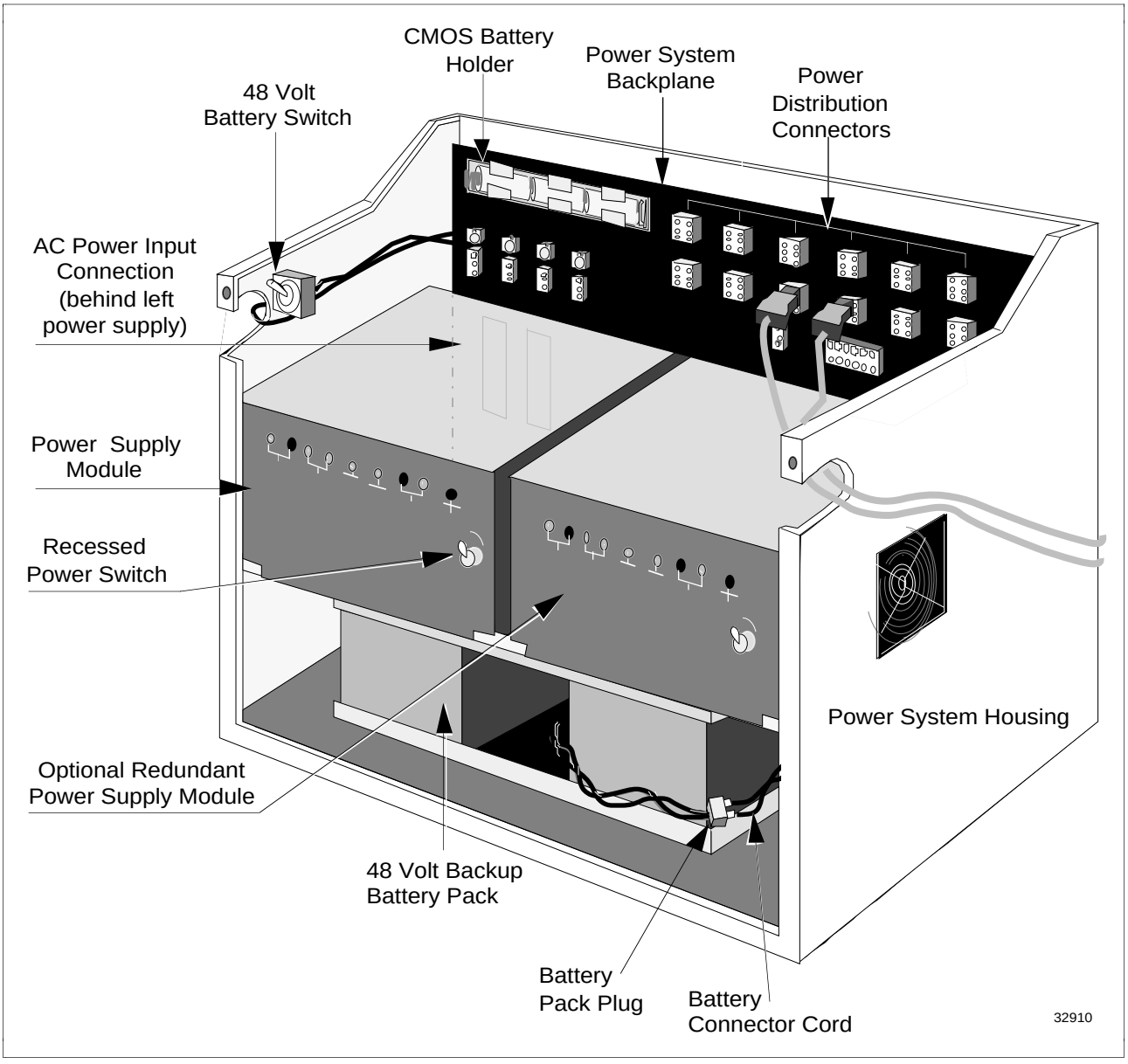


Continued on next page

Model MU-PSRB04 Standard Power System

Figure 2-7 illustrates the Standard Power System with its battery backup feature.

Figure 2-7 Model MU-PSRB04 Standard Power System with Battery Backup



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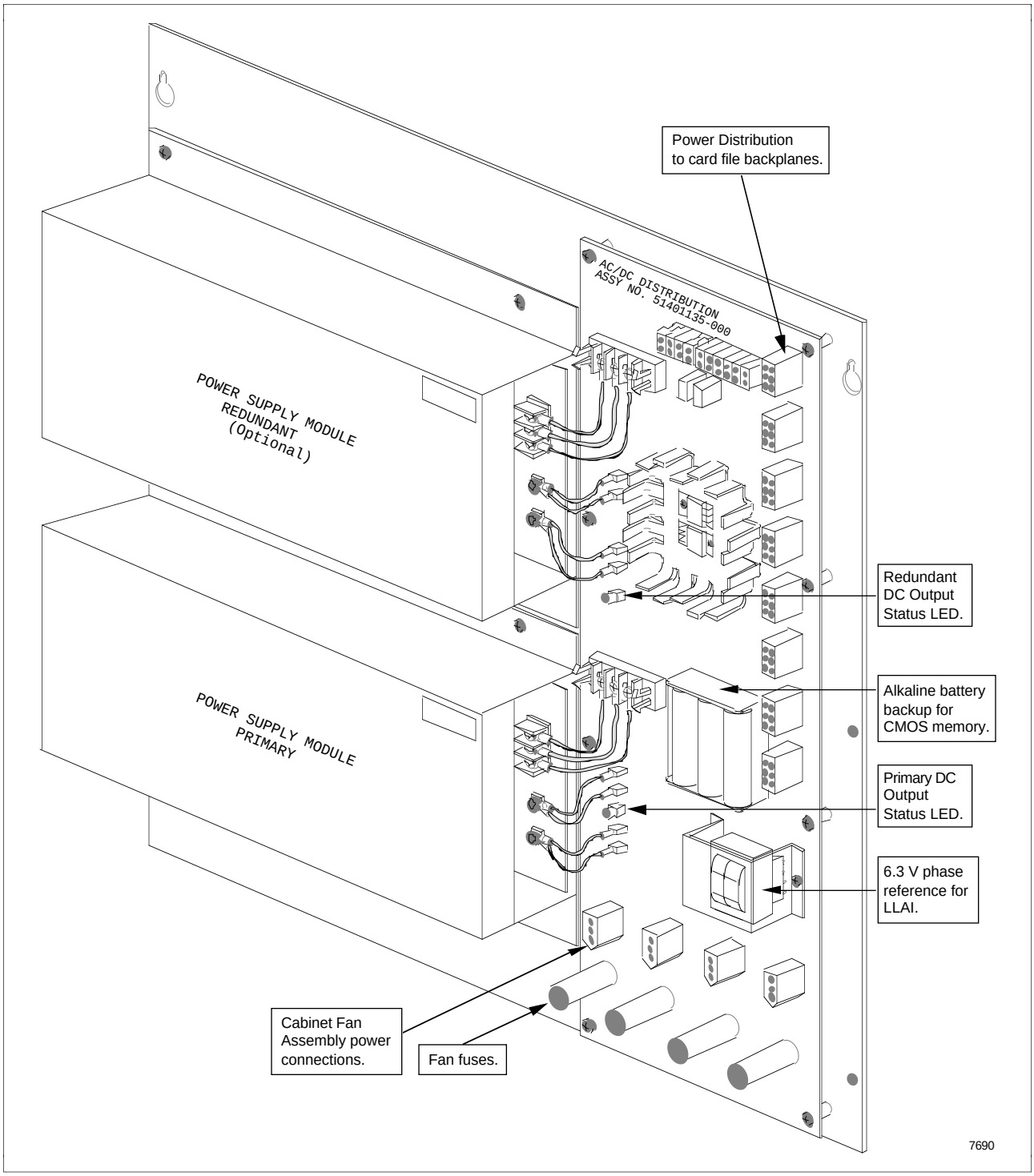
AC Only Power System The AC Only Power System can have an optional cover. The AC Only Power System is illustrated in Figure 2-8.

Figure 2-8 AC Only Power System



2.6.2 Battery Installation

CAUTION

CAUTION—Place the **48 Volt Battery** switch at the upper left side of the Standard Power System chassis in the **OFF** position. Damage to connectors or batteries could result if this warning is ignored.

Also, place the recessed toggle switch on each Power Supply Module in the **OFF** or down position. Damage to electrical circuits could result if this warning is ignored.

Do not install alkaline batteries in the Standard Power System.

Do not install NiCad batteries in the AC Only Power System.

Standard Power System

Two distinct rechargeable battery backup systems are used in the High-Performance Process Manager subsystem when a Standard Power System is present.

- A CMOS memory battery backup feature consisting of three AA-size, 1.2 volt NiCad cells (standard feature)
- A 48 V Battery Backup Pack consisting of a group of gelled lead-acid batteries contained in a battery pack (optional feature)

NiCad battery installation

Install the three AA-size NiCad batteries in the 3.6 V CMOS battery holder located at the upper center of the backplane in the Standard Power System. Observe the polarities marked on the battery holder and the individual batteries. Do do install Alkaline batteries in the Standard Power System.

48 V Battery Backup Pack installation

If the optional 48 V Battery Backup Pack is supplied, install it by carefully sliding it into the lower compartment of the Power System chassis. Use caution not to damage the battery pack connector cord in the compartment. Secure the pack with two screws placed through the front lip of the battery pack into the base of the housing.

Connect the pack to the system by inserting the polarized battery pack plug into the polarized connector cord in the compartment. Carefully dress the cord and connectors to prevent damage, then replace the metal cover.

AC Only Power System

The AC Only Power System has a CMOS memory battery backup feature, but the alkaline batteries used are not rechargeable. There is no 48 V Battery Backup feature.

Alkaline battery installation

The AC Only Power System's three alkaline batteries are installed in the battery holder located at the center of the AC/DC Distribution Assembly. Observe the polarities marked on the battery holder and the individual batteries. Do not install NiCad batteries in the AC Only Power System.

2.6.3 AC Power Application

Applying ac power

Apply power to the High-Performance Process Manager by closing the circuit breaker at the HPM power distribution panel. See Figure 2-1 or 2-2 for typical power distribution. Measure the voltage at the ac input terminals at the Standard Power System backplane and verify that it is in accordance with Table 2-1 in this manual. The power connections are on the AC/DC Distribution Assembly in the AC Only Power System. For 120 volt systems and 240 volt systems with neutral, the measurement from neutral to Safety Ground should be no more than 0.5 Vac.

Power Supply Modules

Apply power to the Power Supply Modules by placing the recessed toggle switch on each module in the **ON** or up position. Check that the Standard Power Supply Module fan moves air through the modules from the right of the Power System and exiting to the left.

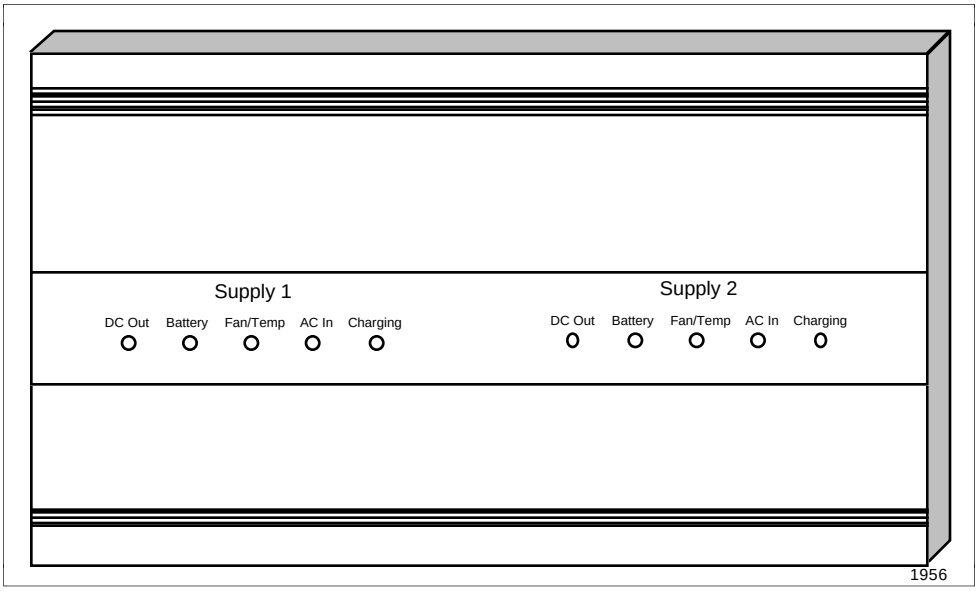
48 V Battery Backup Pack

If the 48 V Battery Backup Pack is installed, connect the batteries to the charging system by placing the **48 Volt Battery** switch in the **ON** position.

Standard Power System indicators

For the Standard Power System, note that the **DC Out**, **Battery**, **Fan/Temp**, **AC In**, and **Charging** indicators are all illuminated on both Power Supply Modules (provided both the optional Power Supply Module and optional 48 V Battery Backup Pack are installed). The Power System cover that is illustrated in Figure 2-9 identifies the LED indicators.

Figure 2-9 Standard Power System Cover



AC Only Power System indicators

The AC Only Power System has only two LED indicators to indicate proper operation, one for the primary Power Supply Module and the second for the optional redundant Power Supply Module.

2.6.4 Power System Alarm Checks

Introduction

Perform checks of the alarm contact operations as described below. The alarm wiring is connected to three pairs of terminals on the Standard Power System backplane and indicate problems with the primary Power Supply Module, the redundant Power Supply Module, or the CMOS memory backup batteries.

The AC Only Power System has a pair of terminals for each Power Supply Module that are located on the AC/DC Distribution Assembly.

Single Power Supply Module

If only one Power Supply Module is present in the Standard Power System, check that the alarm contacts (measured at the **Primary Supply Alarm** terminals) are closed when power is applied to the Power Supply Module, and open when power is removed from the Power Supply Module.

ATTENTION

ATTENTION—If a Standard Power System is installed without the optional battery backup, it is necessary to defeat the battery alarm and the charger alarm that are provided in the Power Supply Modules; otherwise, the system will receive a constant alarm.

There are two jumpers, identified as **W1** and **W2**, located on the Power System's backplane that are next to the sockets that the Power Supply Modules install in. The jumpers must be removed (cut) to defeat the battery and charger alarms. In most cases, this will have been done at the factory. See the *High-Performance Process Manager Service* manual for the location of the jumpers.

The other alarm functions, such as power supply failure, over temperature or fan failure, ac power failure, and CMOS battery backup failure, will still operate.

Dual Power Supply Modules

For a Standard Power System that has both primary and redundant Power Supply Modules, but no battery backup, check that the alarm contacts (measured at the **Primary Supply Alarm** and **Redundant Supply Alarm** terminals) are closed when the Power Supply Module is turned on, and are open when it is turned off. See the above information.

Dual Power Supply Modules with 48 V Battery Backup Pack

Perform the same checks as those for Standard Power System with single and dual Power Supply Modules. In addition, check that the contacts for both Power Supply Modules open when the **48 Volt Battery** switch is placed in the **OFF** position, and closed when the switch is placed in the **ON** position. There may be a delay of 10 seconds before the contacts switch.

Continued on next page

2.6.4 Power System Alarm Checks, Continued

CMOS Memory battery backup alarm

Remove one of the NiCad batteries from the holder on the Standard Power System backplane. Check that the **CMOS Backup Alarm** contacts open within 10 seconds. The contacts should close within 10 seconds after the battery is replaced in the holder.

2.6.5 Battery Backup Checks

Introduction

The charging capability of the 48 V Battery Backup system or the CMOS Memory Battery Backup system in the Standard Power System cannot be verified until after an initial 16-hour charging period.

CMOS Memory Battery Backup system

After the initial charging period, remove the three NiCad battery cells and verify that each has a voltage greater than 1.24 volts. Replace any battery that measures a voltage of less than 1.24 volts.

48 V Battery Backup Pack

If a 48 V Battery Backup Pack is installed, disconnect the batteries from the system by placing the **48 Volt Battery** switch in the **OFF** position. Then, measure their combined series voltage at the battery pack plug. See Figure 2-7 or 2-8. If the measurement is less than 48 volts, the batteries should be replaced.

2.6.6 Card File Power Checks

Power System power connectors

Locate the 6-pin power connectors at the upper right area of the Standard Power System backplane. The AC Only Power System has 6-pin power connectors along the right side of the AC/DC Distribution Assembly. Generally, each pair of connectors provide power to an individual card file or Power Distribution assembly, and the cables are installed before the cabinet leaves the factory. Measure voltages at an unused 6-pin connector or temporarily remove a cable if all connectors are in use. The voltages should meet the specifications in Table 2-3.

Table 2-3 Card File Power

Power Source	Power Connector Pins	Limits
6 Vac Rectified	4(+) and 3(-)	Greater than 2 Vac
CMOS Batteries	5(+) and 6(-)	Greater than 3.6 Vdc
24 Vdc Regulated	2(+) and 1(-)	23 to 25 Vdc

WARNING

WARNING—The 48-volt batteries provide input power to the Power Supply Modules when ac line power is off. They do not provide the 24 volts directly.

In an early production Power System, if ac power is off at one Power Supply Module, it may draw power from the backup batteries even if there is a redundant Power Supply Module installed. This may discharge the batteries within 25 minutes. In a later production Power System, batteries are not discharged when ac power is removed from one Power Supply Module.

If one Power Supply Module is to be off for a significant period of time, it should be removed from the chassis.

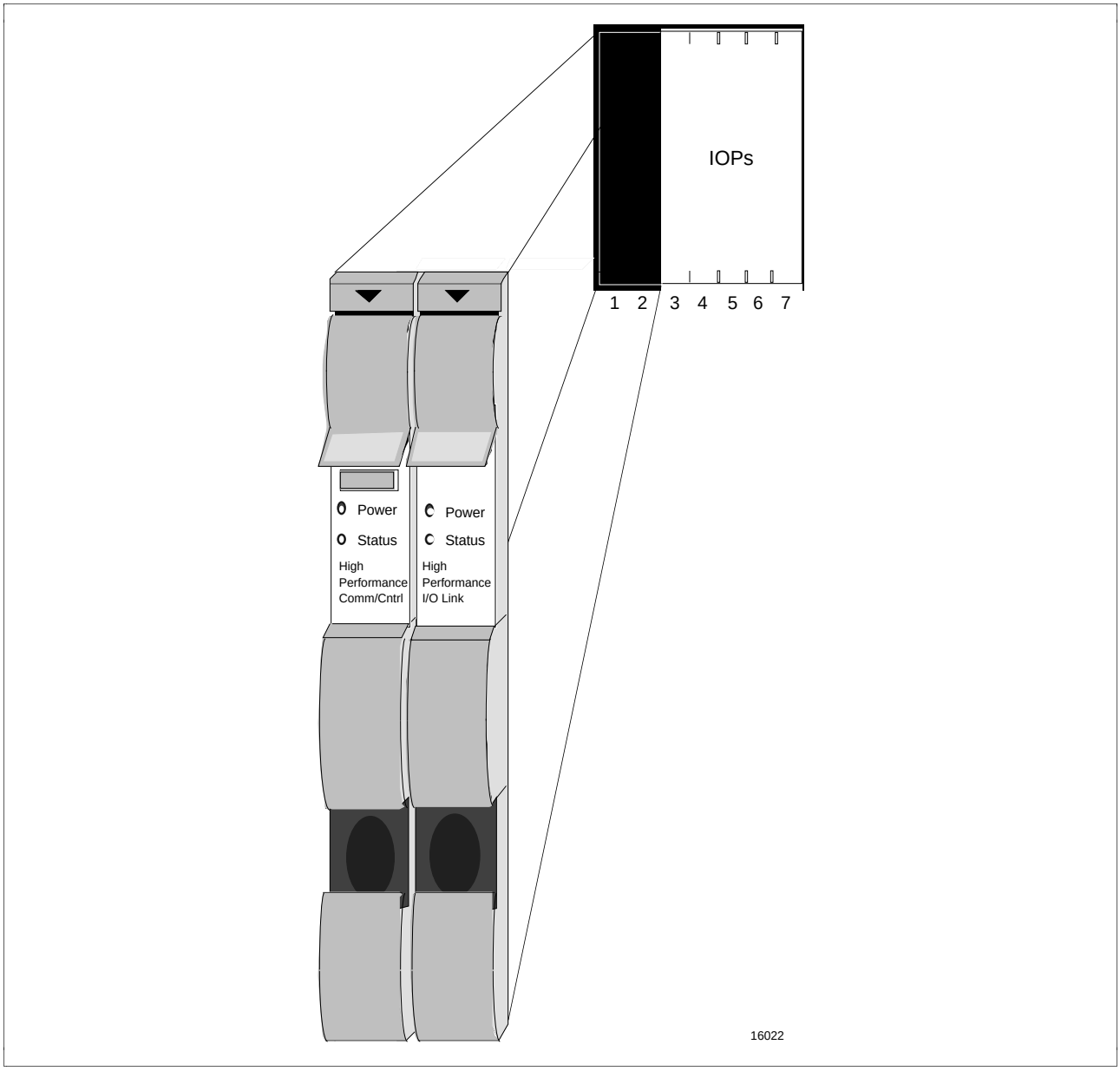
Do not remove both Power Supply Modules at the same time if the system is operational. The batteries will not power the HPM unless at least one Power Supply Module is installed.

2.7 HPMM Card Self-Test

HPMM Card File

Figure 2-10 is an illustration of a Left 7-Slot HPMM card file. The Right 7-Slot and 15-Slot HPMM card files are similar. The HPMM consists of two cards (High-Performance Comm/Control and High-Performance I/O Link) that are positioned in the first two slots starting at the left side of the card file, together with an associated HPM UCN Interface module that mounts in the connector under the High-Performance Comm/Control card. The other card slots accept I/O Processor (IOP) cards, their type determined by the user for his particular process application.

Figure 2-10 Left 7-Slot HPMM Card File



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2.7 HPMM Card Self-Test, Continued

HPMM or IOP self-test

The two cards and associated UCN Interface module that constitute the HPMM and each IOP card perform a self-test when power is applied to the card(s). If the upper card extractor on an HPMM card is unlocked and lifted slightly after cabinet power is applied, power is removed from both HPMM cards and the UCN Interface module. An IOP's upper card extractor removes power from only the individual IOP card. Power is reapplied when the extractor is released. Therefore, an upper card extractor can be used to "power-initialize" any IOP card or the HPMM cards after power has been initially applied to the cabinet.

HPMM and IOP Power and Status indicators

Check the **Power** and **Status** indicators on each card and the HPM UCN Interface module immediately after power has been applied. The **Power** indicator should illuminate whenever power is present. After approximately 1 second, the **Status** indicator should illuminate on the IOP and High-Performance Comm/Control cards if no diagnostic failures have been detected. The High-Performance I/O Interface card's **Status** indicator will not illuminate until the HPM personality has been downloaded into the HPMM.

High-Performance Comm/Cntrl card

The High-Performance Comm/Control card has a four-character alphanumeric diagnostic display on its front panel. Initially, when power is applied to the card, the characters **STRT** will be displayed, indicating a power on (cold) boot of the HPMM is in process.

Approximately 10 seconds later, the four alphanumeric characters should indicate the Alive state of the HPMM. For the example, a display of **A107** indicates the HPMM is in the Alive state (**A**), the HPMM resides in card file number 1, represented by the number one (**1**), and is assigned UCN node number 7 (**07**).

HPM UCN Interface module

On the HPM UCN Interface module, the **Transmit** indicator should flicker when the module is transmitting data on the UCN. Before the HPMM is loaded with software, the HPM UCN Interface module is not a token passer on the UCN and the **Transmit** indicator will blink only when the HPM UCN Interface module transmits briefly, about once every few seconds in response to being polled for status.

Either the **Rx A** or **Rx B** indicator should be illuminated, indicating which UCN cable is active.

Extinguished Status indicator

If a card's **Status** indicator extinguishes, a hardware or software failure has been detected, and the problem should be analyzed and corrected before operating on-line or running software tests.

2.8 UCN Power-On Test

Introduction

The UCN power-on test checks the operational condition of the Network Interface Module (NIM). All devices on the UCN must be idle (not transmitting) after power is applied to the equipment before testing can begin.

Apply power to all UCN devices

The test is performed only after the Network Interface Module (NIM) and any High-Performance Process Managers (HPMs), Process Managers (PMs), or Advanced Process Managers (APMs) that are connected to the primary and redundant UCN trunk cables have power applied, but before software has been downloaded to the NIM through the Local Control Network (LCN).

Network idle test procedure

After power is applied to the devices, use the following procedure to ensure that no UCN device is transmitting on the network.

Step	Action
1	Observe the **Transmit** indicator on the **EPNI** board in the NIM continuously for approximately 20 seconds to determine if it is flashing. A flashing indicator indicates the device is transmitting. If the **Transmit** indicator is flashing, check the **Normal-Test** jumper on the **EPNI** board. Ensure that the jumper is in the **Normal** position.
2	Observe the **Transmit** indicator on the UCN HPM Interface module in each HPMM continuously for approximately 20 seconds to determine if it is flashing. The **Power** indicator should be constantly illuminated. A flashing **Transmit** indicator indicates the device is transmitting.
3	Check again that there is no software being downloaded to the NIM, or none has been downloaded previously. If software was downloaded to the NIM previously, cycle the **Power** switch on the NIM Power Supply to destroy the downloaded program.

Continued on next page

UCN trunk cable test procedure

Use the following procedure to check the operational condition of the Universal Control Network.

Step	Action
1	Go to a UCN trunk cable tap at one end of the network. Disconnect a drop cable or 75 ohm terminator from any drop connection and connect a Relcom CB Tester to the tap.
2	Set the tester switches to **NOISE** and **5 Mb/s**. Move the **RESET/PEAK** switch to **RESET** momentarily and then leave it in the **PEAK** position. Do not use the AC adapter provided with the Relcom tester while making noise measurements. Read the tester after 40 seconds. Verify and record a noise figure less than -10 dBmV (example: -11 dBmV is less than -10 dBmV, -9 dBmV is not). If the measurement is less than -25 dBmV, the tester will flash "-25." This is satisfactory.
3	Disconnect the CB tester, reconnect the cable or terminator to the tap, and move the tester to a tap on the redundant trunk cable. Repeat step 5 for the redundant trunk, then disconnect the tester and reconnect the cable or terminator.
4	Go to the other end of the trunks of the same UCN system and repeat steps 1 and 2.

2.9 HPMM Startup

HPMM personality download

When the HPMM's personality is downloaded into the HPM, the four-character alphanumeric diagnostic display on the front panel of the High-Performance Comm/Control card should display download activity and result in a final display of **I xx**, where **I** represents the Idle state of the HPMM and **xx** represents the HPMM's assigned UCN node number, such as **07** in the previous Alive state example.

HPMM startup

When the HPMM is started at the Universal Station (US), the alphanumeric display will change from **I xx** to **OKxx**, where **OK** represents the HPMM Run state and **xx** represents the HPMM's assigned UCN node number.

ATTENTION

ATTENTION—The HPM I/O Link Interface periodically monitors the integrity of each resident's driver circuit on the I/O Link Interface. This capability did not exist until the introduction of the HPM. There is a possibility that upgrading to an HPM from a PM or APM while retaining existing IOPs could uncover some marginal drivers. These marginal IOP drivers, although still able to function, will generate I/O Link Interface driver errors and the accompanying Soft failures.

Refer to the High-Performance Process Manager Service manual for additional information.

When upgrading to an HPM while retaining existing IOPs, the HPM's personality should be downloaded and then the HPMM I/O Link Information and IOM I/O Link Information displays should be checked for I/O Link Interface driver errors. The following conditions indicate HPMM or IOP I/O Link Interface driver errors.

- On the HPMM I/O Link Information display, the CABLE (A or B) ERRORS count contains non-zero values and the mnemonic IOLDRVER is displayed in the LAST COMMUNICATION ERROR field.
- On the IOM I/O Link Information display, the ERRORS count for faulted IOPs contain non-zero values and the string IOLDRVER is displayed according to the IOP's DSA under the column labeled LAST ERR.

The existence of I/O Link Interface driver errors will cause the normal cable swap algorithm to annunciate a Soft failure and disable cable swapping. Existing Soft failure codes (#16 – IO LINK CABLE A FAILURE and #17 – IO LINK CABLE B FAILURE) are used to report I/O Link Interface driver failures as well as other communications failures.

If no I/O Link Interface driver errors are reported, then the drivers on all I/O Link resident modules are operating properly. If I/O Link Interface driver errors exist, the offending IOP(s) should be replaced.

Appendix A – HPM Post-Installation Checklist

Customer_____ **Subsystem ID**_____ **Date (Delivery)**_____ **Date (Start-up)**_____

PRE-POWER CONNECTION TESTS	Use the procedures found in the *High-Performance Process Manager Planning* manual and subsection 2.3 in this manual.	
General Site-Preparation Checks	Check the facility's Safety Ground earth resistance with an Earth Tester. Check that the ac power is the proper voltage. Check the ac line stability with a Disturbance Analyzer. Do a RFI measurement where the HPM is to be installed.	☐
POWER-OFF CHECKS	Use the procedures found in the *High-Performance Process Manager Installation* manual and subsections 2.4 and 2.5 in this manual.	
Grounding Checks	Inspect visually and physically for completeness. Check that local Safety Ground is less than 1/2 ohm (also check the cabinets without ac power). Check the local Master Reference Ground (MRG). Do an MRG noise test if a substitute MRG is used. Check the local Zener Barrier Ground Bus connection. Check the UCN Safety Ground connections at all taps.	☐
UCN Cable Visual Checks	Ensure that primary cables connect to **A** connectors and redundant cables to **B** fittings at all taps. Verify that the terminators are installed on all unused tap connections.	☐
UCN Power-Off Cable Tests	See the *Universal Control Network Planning* manual. Check the completed UCN recorded Noise, Return Loss, and Signal Strength.	☐
General Pre-Power Checks	Check the AC Voltage Source Selection switch on the early production Power Supply Module(s).	☐
POWER-ON CHECKS	Use the procedures found in subsections 2.6 through 2.8 of this manual.	
AC Power Verification	Verify operation of Power Supply Module fans. If the system is 120 volt ac or 240 volts ac with neutral, check that the voltage is between 100 Vac and 132 Vac — check for a measurement of no more than a 0.5 volts between neutral and the cabinet frame. If the system is 240 volt ac, check that the voltage is between 187 Vac and 264 Vac.	☐
Backup Power Verification	Verify the Power System 48 V Battery Backup system (optional) is operational, and the CMOS battery backup voltage is proper.	☐
Power Supply Output Verification	Check for all green LED display on Power Supply Modules. Check that the 24 volt dc output is between 23 Vdc and 25 Vdc. Check that the 6 volt ac rms output is between 2 Vac and 7.2 Vac.	☐
Card Self-Test Verification	Check each HPMM and IOP card for proper green **Power** and **Status** indicator status.	☐
UCN Power-On Cable Tests	Check and record the UCN noise figure with all nodes powered and connected, but silent. Verify the UCN address pinning. See the *High-Performance Process Manager Installation* manual.	☐

Appendix B – UCN Cable Measurements

Customer_____________ **Subsystem ID**______ **Date (Delivery)**_______ **Date (Start-up)**_______

Network Name___________________ **Number**_______________ **Cable Segment**____________

Tap Number	Building Location	Drop Name or Usage	Noise Figure	Return Loss		Signal Strength	
				“A” Dir	“B” Dir	Expected	Measured
______	________	1.___________________ 2.___________________	______	______	______	_______	_______
______	________	1.___________________ 2.___________________	______	______	______	_______	_______
______	________	1.___________________ 2.___________________	______	______	______	_______	_______
______	________	1.___________________ 2.___________________	______	______	______	_______	_______
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