



Coral IPx 4000

Installation Procedure and Hardware Reference Manual

Document Edition 7.4



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Record of Changes

Edition No.	Issue Date	Brief Description
7.4	Apr-21-2015	<ul style="list-style-type: none"> • New front/back cover with the new Tadiran logo • Corrected figure 2-16 on page 2-38 • Corrected figure 6-9 on page 6-12
7.3	Dec-23-2014	<ul style="list-style-type: none"> • Added a Record-of-Changes page • Added notes in chapter 8. Such as: “CLA-ATS requires MCP-ATS/A or MCP-ATS (Tadiran Telecom branded) catalogue number 72449163100, issue R09000017 or higher & CLA version 09.02.08 or higher.” on page 84
7.2	Sep-9-2013	Corrected pages 8-19, 8-84 MCP-ATS/A and CLA-ATS/S require Coral 16.04.07
7.1	Sep-27-2012	New cards MCP-CAT/A and CLA-ATS/A (Tadiran Telecom)
7.0	Aug-2-2012	New card CLA-ATS (Tadiran Telecom)
6.5	Oct-3-2011	"The 4,8,16SH/S cards are not for use with the PS19 DC-D" - pages 5.4-19, 7-24, 7-25: deleted 16SH/S-LL card
6.4	Sep-04-2011	8DRCM-2 card was added
6.3	Jan-19-2011	Safety Compliance Statements TUV/CB/CE, update with 2nd Edition
6.2	June-7-2010	IPx 4000XE slots 1-2 PB-ATS only, no more service card in slot 2, Added CAUTION notes for SH/S cards with PS19 DC-D
6.1	July-7-2009	MCP-ATS (CPU-ATS) replaced by MCP-ATS (Tadiran Telecom type)
6.0	Mar-16-2009	Added CPU-ATS card and new Peripheral cards 2DT, 8/24SA

Federal Communications Commission

Rules Part 68 Compliance Statement

This equipment complies with Part 68 of the FCC rules. On this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, this information must be provided to the telephone company.

The REN is used to determine the quantity of devices which may be connected to the telephone line. Excessive REN's on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the REN's should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total REN's contact the telephone company to determine the maximum REN for the calling area.

An FCC compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant.

This equipment cannot be used on telephone company-provided coin service. Connection to Party Line Service is subject to state tariffs.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. If advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.

If trouble is experienced with this equipment, please contact the supplier at (516)-632-7200 for repair and/or warranty information. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.

The following repairs can be done by the customer: No repairs allowed.

This equipment is hearing-aid compatible.

It is recommended that the customer install an AC surge arrestor in the AC outlet to which this device is connected. This is to avoid damaging the equipment caused by local lightning strikes and other electrical surges.

This equipment is capable of providing user's access to interstate providers of operator services through the use of equal access codes. Modifications by aggregators to alter these capabilities may be a violation of the telephone operator consumer services improvement act of 1990 and part 68 of the FCC Rules.

Canadian DOT Compliance Statement

NOTICE: The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

NOTICE: The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

TUV Safety of Information Technology Equipment Compliance

Equipment certified according to TUV has been tested and complies with the following:

UL 60950-1 :2007

CAN / CSA-C22.2 No.60950-1-07

TUV Rheinland of North America is a Nationally Recognized Testing Laboratory (NRTL) in the United States and is accredited by the Standards Council of Canada to test and certify products to Canadian National Standards. Clients can demonstrate compliance for both U.S. and Canadian markets through a single mark (TUV) on their product(s) which denotes compliance to U.S. and Canadian National Standards.

CB SCHEME Compliance Statement

Equipment certified according to the CB SCHEME has been tested and complies with the following:

IEC60950-1 (Ed. 2, 2005), AM. 1 (2009)

CE Compliance Statement (R & TTE)

Equipment certified according to CE has been tested and complies with the following:

EN 60950-1 :2006, 2nd Edition + A11 :2009, A1: 2010, and A12: 2011

EN 55022 CISPR 22

EN 55024 CISPR 24

Australia and New Zealand Compliance Statement

Equipment certified for Australia and New Zealand has been tested and complies with the following:

AS/NZS 4117

AS/NZS 60950.1-2011

ACA TS002 TS003 TS004

AS/NZS CISPR22

Federal Communications Commission

Part 15

The FCC Wants you to Know

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- a) Reorient or relocate the receiving antenna.
- b) Increase the separation between the equipment and the receiver.
- c) Connect the equipment on an outlet on a circuit different from that to which the receiver is connected.
- d) Consult with the dealer or an experienced radio/TV technician.

To ensure continued compliance with specified radio energy emissions limits of FCC Rules, the following precautions must be observed while installing and operating the equipment:

1. Install the equipment in strict accordance with the manufacturer's instructions.
2. Verify that the power supply and associated A.C. powered equipment are connected to a properly grounded electrical supply, and that power cords, if used, are unmodified.
3. Verify that the system grounding, including Master Ground, D.C. power system, and equipment cabinets, is in accordance with the manufacturer's instructions and connected to an approved earth ground source.
4. Always replace the factory-supplied cover or keep the cabinet doors closed when not servicing the equipment.
5. Make no modification to the equipment that would affect its compliance with the specified limits of FCC Rules.
6. Maintain the equipment in a satisfactory state of repair.
7. Verify that emissions limiting devices, such as ferrite blocks and radio frequency interference modules, are properly installed and functional.
8. If necessary the operator should consult their supplier, or an experienced radio/television engineer for additional suggestions. The following booklet prepared by the Federal Communications Commission (FCC) may be of assistance: "How to Identify and Resolve Radio-TV Interference Problems."

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4.

FCC Warning

Modifications not expressly approved by the manufacturer could void the user authority to operate the equipment under FCC rules.

Waste of Electrical and Electronic Equipment

(WEEE)

Directive 2002/96/EC of the European Parliament

It is the responsibility of the Distributor to fully comply with Directive 2002/96/EC dated 27 January 2003 of the European Parliament and of the Council on Waste of Electrical and Electronic Equipment (WEEE) and with any applicable law and regulation promulgated in its respective Member State in connection with such Directive. Accordingly, the Distributor is responsible for, and shall bear all costs related to, the collection, treatment, recovery, reporting and environmentally sound disposal of all electronic waste related to the products. For the purpose of this paragraph, the term "Distributor" shall mean the person and/or entity engaged in the importation, distribution, sales, support or any other activity carried out in the applicable jurisdiction in connection with products supplied by Tadiran Telecom (TTL) L.P.

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Introduction

Coral

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1.1 Document Description

1 Document Contents

The *Coral IPx 4000 System Installation Guide and Hardware Reference Manual*, is designed for field use by Coral system installation and service personnel. All of the components and issues relevant to the installation of the Coral IPx 4000 system design are detailed in this document.

The Coral IPx 4000 system design incorporates a fully redundant backup system. See [System Description on page 1-5](#) for a basic description of the Coral IPx 4000 system.

The document is divided into two major functional areas:

- a systematic installation procedure
- a complete hardware reference

Installation Procedure Guide

Chapters 2, 3, 4 and 5 comprise the Installation Procedure, which describes the Hardware Installation, Initial Power-Up Test, Software Installation, and External connections. The chapters listed below, outline the step-by-step process for installing a new complete Coral system. Peripheral devices can be installed at any time after system installation. For peripheral device installation, refer to *The Coral Terminal Equipment Installation Manual*. Chapters 2, 3, 4, 5, and 6 include all installation procedures. These chapters listed below, outline the step-by-step process of performing a complete, new Coral IPx Office system installation. Peripheral devices can be installed at any time after system installation. For peripheral device installation, refer to the *Coral Terminal Equipment Installation Manual*.

Chapter	Topic	Description
Chapter 1	<i>Introduction</i>	To learn about this manual
Chapter 2	<i>Hardware Installation Procedure</i>	Start the installation process with this chapter. Follow its instructions to ensure that the Coral IPx 4000 System will be properly unpacked, installed and ready for operation.
Chapter 3	<i>Initial Power-Up Tests</i>	After completing installation, use this chapter to enable the Coral IPx 4000 system to process calls.
Chapter 4	<i>Software Installation Procedure</i>	Use this chapter to upgrade the Coral IPx 4000 software and save the database.
Chapter 5	<i>External Connections</i>	The pinout tables for peripheral card connections are found here. The tables are used during the installation procedure performed in chapter 2. Also, surge arrestors are installed here.

Hardware Reference

The Hardware Reference Manual consists of Chapters 6 through 8. These chapters, as listed below, offer detailed technical information about Coral IPx 4000 system hardware, including cabinet specifications, internal power supplies, and control card circuitry:.

Chapter	Topic	Description
Chapter 6	<i>Cabinet Descriptions</i>	To learn about the main cabinet and expansion cabinets
Chapter 7	<i>Power Supplies</i>	Whenever reference information about power supplies is required, or whenever adding or re-installing a power supply item
Chapter 8	<i>Common Control Cards</i>	For general information, installation procedures and card handling advice regarding the common control card set

2 Related Documentation

For information about Coral cards, voice terminals, IP devices, etc., not detailed in this document, consult the following documentation.

<i>Item</i>	<i>Subject</i>	<i>Manual</i>
Coral systems	General description and specifications for marketing	Coral IPx and FlexiCom Product Description
Coral Database	Programming	1) PI - Program Interface and Database Reference Manual 2) CVA -CoralVIEW Administrator User Manual 3) CVD -CoralVIEW Designer Guide
	Backup	1) PI - Program Interface and Database Reference Manual, Chapter 21 2) Database Binary Backup PC Utility
Coral IPx 3000 systems	Descriptions and Installation Procedure Chapter 5 - External Connections	Coral IPx 3000 Installation and Hardware Reference Manual
Coral Software	Installation and Upgrade	FMprog PC-Utility Reference Manual
Coral FlexAIR (Wireless)	Descriptions and Installation Procedure	Coral FlexAIR (Wireless Systems) Installation Manual
IP device (VoIP)	Installation	Coral VoIP Installation Manual
Peripheral cards	Descriptions and Installation Procedure	Coral Service and Peripheral Cards Installation Manual
Shared Service cards		

<i>Item</i>	<i>Subject</i>	<i>Manual</i>
Voice Terminal Equipment/ Peripheral Device	Description	Coral IPx and FlexiCom Product Description, Chapter 3
	Installation, Administration Procedure, Troubleshooting and Hardware Reference	T207M, T208M, T207M/NP and T208M/BL IP station Installation Manual
		T207S, T208S, T207S/NP and T208S/BL IP station Installation Manual
		FlexSet-IP 280S IP station Installation Manual
		FlexSet (120, 120D, 120L, 120S, 121S, 280, 280D, 280D-Z, 280S, 281S, APDL, PEX, APA and CPA) Digital Station Terminal Equipment Installation Manual
		DKT, DST, and VDM Digital Station Terminal Equipment Installation Manual
		FlexIP SoftPhone User Guide
		SeaBeam Installation and Administration Manual

1.2 System Description

1 System Overview

Coral System General Features

The Coral IPx 4000 is a digital, hot standby, redundant, communications switching system. The Coral system is based on Pulse Coded Modulation (PCM) switching technology. The active circuitry of the system is contained on removable printed circuit assemblies, or cards, nearly all of which may be used in any system in the family.

The active circuitry of the Coral system is divided into two major functions: Common Control and Peripheral. The Common Control circuitry directs call traffic through the system, establishing audio connections between Peripheral ports.

The Peripheral circuitry provides the hardware necessary to establish those connections. Instructions from the Common Control circuitry to the Peripheral circuitry, and status information from the Peripheral circuitry to the Common Control circuitry are passed through the Group Controller, which provides driver and time slot interchange functions for the PCM highways and the HDLC channels. The peripheral circuitry is further divided into Shared Service and Peripheral Interface functions. The Shared Service circuitry provides the equipment necessary to establish calls between Peripheral interfaces. The Peripheral Interface circuitry provides standardized electrical connections to external telephone station equipment and network facilities.

Coral IPx 4000 Redundancy

The Coral IPx 4000 system is a non-stop, non-blocking operation. The system's Hot Standby dual control option includes two complete sets of control hardware, each able to fully and independently control the operations of the entire system. The two sets function interchangeably, making it possible for either set to take over control functions automatically in the event of malfunction to any portion of the control system. Administrators can manually intervene as needed and activate the switch over from one control system set to the other to carry out routine maintenance, as well as

reinstate the second control set in **Standby** mode. At all times, one control system is the **Active** side, constantly providing active control operations.

The changeover from the **Active** control system to the **Standby** control system is virtually undetectable by the users. Each control system set is able to take over from the other at any time, as needed without interrupting calls.

The Coral IPx 4000 control design includes two independent power supplies units (PS-ATS). They share the power needs of the complete control system while each Unit is able to provide power independently to the entire control system in the event that one malfunctions. An inoperative power supply unit may be replaced while the system is operational.

The operating software, stored in the Compact Flash memory Disk (CFD) of both control system sets, provides complete long-term stability. The Database program is stored in a battery-protected SRAM in the appropriate components of both control system sets. All generated data stored in the memory of the **Active** control system is automatically recreated in the corresponding component of the **Standby** control system.

The Coral IPx 4000 /R (Redundant) Hot Standby dual control system provides complete battery protected backup coverage.

The Coral IPx 4000 system may also be used in a single control set configuration without using the redundancy option.

Details about the *system configurations* can be found in [Table 1-1](#) below.

The Coral Generic software provided with the Coral IPx 4000 system is used to update and configure the Dual control system or single IPx 4000 system via the Program Interface.

Table 1-1 Coral IPx 4000 System Configurations

Specifications	IPx 4000	IPx 4000/R*
Quantity Of Common Control Sets	1	2
Group Controller Type	32GC	32GC
Max. Number of Peripheral Sets	8	8
Max. Number of Peripheral Shelves per System	16	16
Max. Combined Trunk and Station Ports per System	6,000 †	6,000
Max. Ports in use Simultaneously per System	2944	2944
Max. Ports in use Simultaneously per Peripheral Unit	384	384
Quantity of PB-ATS‡ Cards per Even Peripheral Shelf	2 or 1	2 or 1
Quantity of Shared Service Card Slots per Peripheral Shelf	0	0
Quantity of Peripheral Card Slots per Peripheral Unit	22	22

* Redundancy

† The Coral IPx 4000 uses modular growth concepts of Coral. As growth continues, matching expansion cabinets are added in building block fashion. Accommodating growth as needed, the Coral IPx 4000 supports configurations of up to 176 card slots, giving the system capacity for growth to 4,224 wired ports, 1500 trunks, 4000 SLTs and 3400 keysets. The Coral IPx 4000 easily supports applications of up to 6,000 ports, including wired, FlexAir wireless and IP ports.

‡ Two PB-ATS cards (for redundant peripheral buffer functions) are installed side by side in slots 1 and 2 of the even Peripheral Shelves. A single PB-ATS configuration provides high call traffic throughout the system, without using the PB-ATS redundancy option. The single PB-ATS card occupies slot 1 of the even peripheral shelves while slot 2 remains empty.

2 Hardware Design

The Coral IPx 4000 system is built on a free standing, floor mount Main cabinet, serving as the system's foundation. Each system includes one main cabinet, which contains the Control Shelf with either one control card or two control cards, depending on whether it is a single or dual control system. The Main cabinet also includes 2 or 3 peripheral shelves which house the Power Supplies, the Universal I/O card slots and the Shared Service Card Slots. One or more Expansion cabinets may be connected to house additional Shared Service and I/O Card slots.

The Control Shelf includes one Control Card, the 32GC for a single system. The dual system, IPx 4000/R includes two 32GC cards, placed side by side on the same control shelf. Other control accommodating cards also reside on the control shelf as well.

See [Chapter 6](#) for further cabinet and card details.

1.3 Special Symbols

Used in this Document

This manual includes information that requires special attention, or is distinguished from the main texts in some significant way. These are indicated by the use of symbols and text formatting. This is illustrated in the following examples:

WARNING!

There is a risk of danger to **life** or personal **injury**.

CAUTION!

There is a risk of **damage** to the Coral System.



NOTE:

Indicates important information demanding special attention.



Points out a special procedure or a definition that is relevant but not central to the text.



Tip:

Advice that makes it easier to follow the steps of a procedure.

NOTES:

A page that is intentionally left blank, and may be used for reader information.

NOTES:

This manual includes information for the Coral configurations in all geographic market areas. Much of the information is relevant for all hardware configurations and all market areas.

NOTES:

1.4 Recommended Tools

In order to properly install and maintain a Coral system, the installation and service crafts person must be equipped with many common tools, as well as several tools which are specialized for the telecommunications industry. In addition, there are many tools which, although not required to install or maintain a Coral system, are nevertheless valuable in assisting personnel in the performance of their duties. The manufacturer recommends that the installation or service personnel have the following list of tools, as a minimum, at their immediate disposal for any Coral installation site.

Required Tools:

- $3/16$ " , $1/4$ " , and $5/16$ " straight-blade Screwdriver
- #1 and #2 Phillips-blade Screwdriver
- Diagonal Wire Cutters
- Long-Nosed Pliers
- Electrician's Pliers
- Slip-Joint Pliers
- Adjustable Wrench
- Telephone Cable Cutters
- Telephone Cable Insulation Strippers
- Standard Crimping Tool
- 16 foot (5m) Measuring Tape
- Punch Tool matching all telephone cable terminal blocks used at the installation site
- Digital Volt/Ohm/Milliammeter (DMM)
- Telephone Line Test set capable of pulse and DTMF dialing
- Portable (laptop) personal computer capable of emulating an asynchronous ASCII data terminal and approved by the manufacturer to run the Binary

Database Save and Restore utility, portable asynchronous ASCII data terminal, or permanently installed on-site personal computer or ASCII data terminal

Optional Tools:

- Modular Line Polarity Tester
- Flashlight
- Tone/Continuity/Talk Battery Generator
- Tone Detector/Amplifier Probe
- Telephone Line Test set with MF tone signaling capability
- Alligator Clip Leads
- AMPTM Champ™ Installation Tool
- Soldering Iron and high quality, rosin-core solder
- $\frac{3}{16}$ " and $\frac{1}{2}$ " Cable Staple Gun
- Analog Line Transmission Analyzer
- Portable DS1/E1 Analyzer, Bit Error Rate Tester, and channel demultiplexer

Related Documentation:

- See [Related Documentation, page 1-3](#)

Hardware Installation Procedure

Coral

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2.1 Site Inspection

1 Space Requirements

The Coral must be installed in a room with adequate space requirements as well as in the correct environment. The Coral system requirements are described below.

1. Verify that there is sufficient space for the Coral system cabinet(s). The cabinet(s) require 3 feet (1 meter) clear space in front and in back of the cabinet. The cabinets (main and expansion) are sold as 3 shelf units or 4 shelf units. [Table 2-1](#) describes the Cabinet Dimensions and Clear space requirements for the different cabinet types.

WARNING!

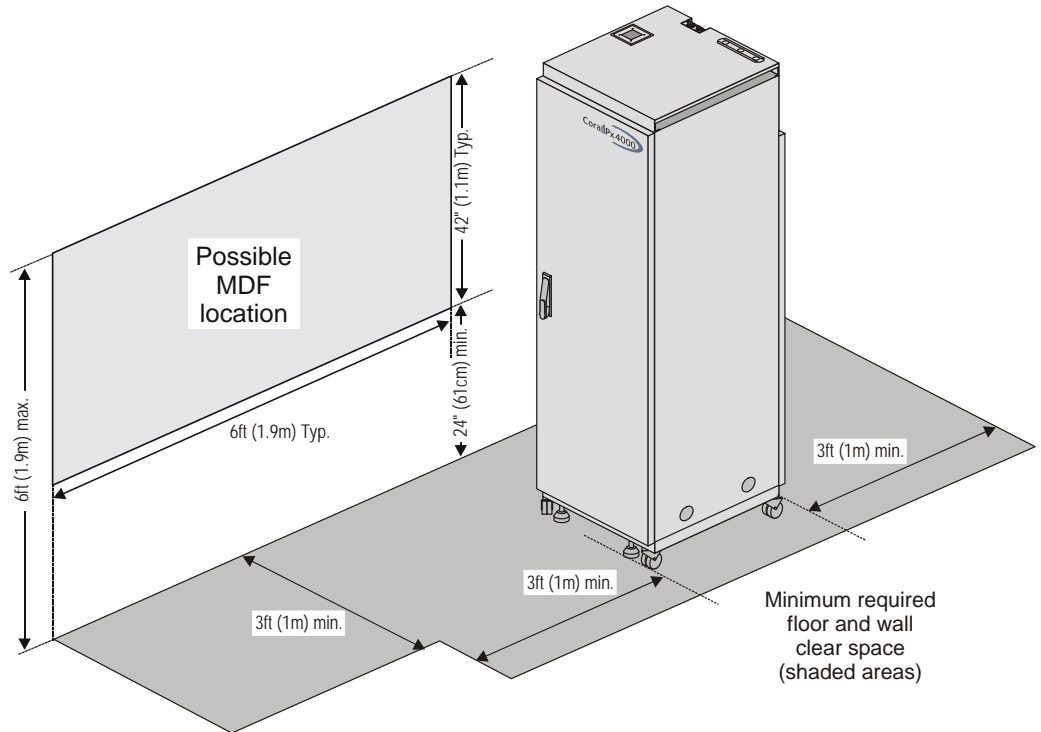
See [DC Electrical Requirements on page 2-5](#).

Table 2-1 Cabinet Dimensions and Clear Space

Coral System Cabinet	Cabinet Dimensions			Clear Space Requirements	
	Width	Height	Depth	Left, Right & Top	Front & Rear
4 Shelf Cabinet	23.7 in. (60 cm)	76.6 in. (194.5cm)	23.7 in. (60 cm)	6 in. (16 cm)	36 in. (100 cm)

2. Verify that there is sufficient space for the Main Distribution Frame (MDF) in addition to the space required by the cabinet. The MDF should be located immediately adjacent to the Coral cabinet. The bottom of the MDF should be no lower than 2 feet (61cm) and the top should be no higher than 6 feet (1.9 m) from the floor. The floor space in front of the MDF must be clear for a minimum of 3 feet (1m) because of the variety of cable termination hardware at the MDF. [Figure 2-1](#) illustrates the space requirements for the MDF arrangement with this Coral system.

**Figure 2-1 Coral MDF
Space Requirements**



3. Verify that there is sufficient space for any additional equipment related to the Coral system such as the Program Interface terminal or a PC, Voice Mail system, External Public Address system, etc.
4. Verify that there is sufficient space for a technician's desk or work table, if one is provided as part of the installation.
5. Verify that there is sufficient space for Power Backup equipment, if it is provided as part of the installation. No specific requirements can be detailed in this procedure, because of the great variety of Power Backup Equipment that is available.

2 Installation Environment

Follow this detailed procedure to ensure a proper Installation Environment:

1. Verify that the installation area is clean, dry, and protected from weather extremes.
2. Verify that the floor of the installation area is finished with linoleum, vinyl, ceramic, wooden flooring, or polished sealed concrete.



NOTE:

Carpeting is not acceptable.

3. Verify that the ceiling of the installation area is finished or treated to prevent particle discharge and water damage.
4. Verify that the installation area is well lit, and that the light source is uniformly diffused without shadows. Adequate lighting should provide a comfortable reading level and allow the identification of wire insulator colors without undue eye fatigue.

Lighting should be comparable to an office work environment, with a minimum level of 70 foot-candles at each work surface. As a general rule, in a room with an eight foot (2.5m) ceiling, one 48 inch fluorescent tube provides sufficient illumination for 20-25 sq. ft. (1.9-2.4m²).

5. Verify that ventilation of the installation area is capable of maintaining an ambient temperature of 32-104° F (0-40° C), and a relative humidity of 20-80% non-condensing, while the system is operating as listed in [Table 2-2](#).

These figures are for each cabinet only, and do not take into account heat generated by other equipment. In particular, charging fully-discharged batteries may generate a considerable amount of heat, depending on battery capacity and rate of charge. Refer to the equipment manufacturer data for more information.

6. Verify that the installation area is free of caustic or corrosive liquids, substances, or materials. If batteries are installed as part of the system, ensure that adequate precautions are taken (such as special ventilation) to prevent corrosive emissions from the batteries. Check local building codes for additional requirements.

7. Verify that the installation area is located no closer than 20 feet (6.1m) from electric devices which produce large electro-magnetic fields or high levels of radio frequency energy. Possible sources are radio transmitters, electric arc welding machines, copying machines, electric motors, elevators, refrigeration units, power transformers, electric load centers, and main circuit breaker panels.
8. Verify that the installation area provides reasonable security to the system. Room construction should include solid, reinforced walls and a locking door. The Coral system, and the service it provides to users, represents a substantial investment. During an emergency, reliable service may be crucial in protecting lives and property. Access to the system should be limited and controlled to prevent unauthorized tampering. The system uses hazardous working voltages and extremely high short circuit currents, and the area must be protected against damage by, and injury to, unqualified personnel.

Table 2-2 Coral System Cabinet Heat Dissipation

Coral System Cabinet	Heat Dissipation (BTU/hr.)
IPx 4000C Main Cabinet	660
IPx 4000XE/XO Expansion Cabinet	1070

3 Electrical Requirements

General Requirements

1. Verify that electrical service is sufficient and located in close proximity to the system. The installation requires one dedicated branch circuit for the Coral system; and one additional branch circuit minimum for ancillary equipment such as data terminals or personal computers, external paging equipment, test instruments, etc.
2. Each branch circuit must be independently protected by fuse or circuit breaker, and must not be controlled by a switch. C-type fuses should be used where required by local authorities.
3. The receptacle for the Coral system branch circuit must be located within 4 feet (1.2m) of the 48 volt power supply for DC operated.
4. Auxiliary branch circuit receptacles should be located conveniently for ancillary equipment; and allow data terminals, personal computers, or test instruments to be operated near the system.
5. [Table 2-3](#) lists the voltages and current requirements for each cabinet.

DC Electrical Requirements

DC powered units must comply with the following instructions:

1. **Restricted Access Area:** The DC powered equipment should only be installed in a Restricted Access Area.
2. **Installation Codes:** The equipment must be installed according to country national electrical codes. For North America, equipment must be installed in accordance to the US National Electrical Code, Articles 110-16, 110-17 and 110-18 and the Canadian Electrical Code, Section 12.
3. **Overcurrent Protection:** A readily accessible listed branch circuit overcurrent protective device must be incorporated in the building wiring. [Table 2-3](#) lists the current requirements for each cabinet.
4. **CAUTION!** This equipment is designed to permit connection between the earthed conductor of the DC supply circuit and the earthing conductor at the equipment. See installation instructions below.
5. The equipment shall be connected to a properly earthed supply system.

6. All equipment in the immediate vicinity shall be earthed the same way, and shall not be earthed elsewhere.
7. The DC supply system is to be local, i.e. within the same premises as the equipment.
8. A disconnect device is not allowed in the earthed circuit between the DC supply source and the frame/earthed circuit connection.

Table 2-3 Coral System Power Requirements

Cabinet Type	Branch Circuit for Coral		Auxiliary Branch Circuit		-48VDC
	115 VAC	230 VAC	115 VAC	230 VAC	
Main with 2 Peripheral Shelves	20A	10A	15A	10A	12A
Main with 3 Peripheral Shelves	20A	15A	15A	10A	18A
2 Shelf Expansion	Add 10A	Add 5A	N/A	N/A	Add 12A
3 Shelf Expansion	Add 15A	Add 10A	N/A	N/A	Add 18A
4 Shelf Expansion	Add 20A	Add 10A	N/A	N/A	Add 24A

2.2 Equipment Installation

1 Unpacking the Shipping Container

Unpacking

1. Inspect the shipping carton for evidence of physical damage or mishandling. Report any damage to the carrier immediately.
2. If it is necessary to make a damage claim to the carrier, do not move the shipping carton until it has been examined by a representative of the carrier. Otherwise, move the shipping carton as near as possible to the installation area before opening.
3. Use a utility knife or pair of shears to cut the three plastic bands around the shipping carton.

WARNING!

The plastic bands are under tension. The ends may snap unpredictably when cut. Wear suitable eye and hand protection while cutting the plastic bands.

4. Lift the top of the shipping carton.
5. Remove the front and rear nameplates from the depressions in the top foam inserts and carefully place them aside. Remove any other items on top of the foam insert and place aside.
6. Remove the top foam inserts and set aside.
7. Remove any circuit card boxes laying on top of the Coral system cabinet.
8. Remove the plastic bag containing extra cabinet hardware and cabinet placement instructions, and place it aside.
9. Lift and remove the wrap-around side panel of the shipping carton and set aside.

- 10.** Have two assistants each grasp one of the front casters at the bottom end of the cabinet. The assistants should place their feet under the bottom edge of the shipping pallet. Keeping arms and backs straight and lifting with their legs, have the assistants carefully pull upward on the casters to lift the bottom of the cabinet approximately 8 inches (20cm) off the shipping carton. Quickly pull the bottom foam insert out from under the raised cabinet, while the assistants lower the cabinet back onto the shipping pallet.
- 11.** Move to the top end of the cabinet and with the two assistants (three persons total) grasp the bottom of the shipping carton between the boards of the pallet. Keeping arms and backs straight and lifting with your legs, lift the shipping pallet, pivoting the pallet on the bottom edge. Continue lifting slowly until the cabinet begins to slide down the inclined shipping carton. Allow the cabinet casters to come to rest against the inside bottom of the shipping carton, then continue to raise the pallet until its weight begins to balance on the bottom edge.
- 12.** Have one assistant move to the open side of the shipping carton and push gently on the cabinet to prevent the cabinet from tilting out of the shipping carton. Continue to raise the shipping pallet until the cabinet is vertical. Have the second assistant move to the open side of the shipping carton. Have the two assistants reach around the cabinet and tilt it toward them, while you pull the bottom of the shipping carton out from under the cabinet casters. Have the assistants return the cabinet to vertical so that it rests on all four casters.
- 13.** Carefully remove the plastic dust wrap from the cabinet.
- 14.** Inspect the cabinet exterior for hidden shipping damage. Verify that the cabinet doors open and close properly. Inspect the cabinet interior and contents for shipping damage.
- 15.** Verify that the leveling feet are retracted so that they are well clear of the floor. If any of the leveling feet are extended, use a 17mm wrench to turn the locking nut above the leveling foot clockwise, so that it comes down to rest at the top of the leveling foot. Then spin the leveling foot anti-clockwise to retract it away from the floor.

2 Cabinet Mounting and Placement

To Mount and Place the Cabinet:

1. Carefully roll the cabinet to the location where it is to be installed. When the cabinet is rolled over carpeted floors — particularly hallways, check ahead of the cabinet to be sure the weight of the cabinet does not create a wave or ripple in the carpet. If a wave starts to form, stop rolling the cabinet and push the excess carpet under the cabinet until the carpet is flat. As the cabinet approaches floor-to-carpet transitions or expansion gaps in cement floors, roll the cabinet slowly and ease the casters over the obstruction to prevent undue stress.



NOTE:

The cabinet leveling procedure below immobilizes the cabinet, and should not be performed until the cabinet is stationary. If the installation environment requires moving the cabinet during installation to gain access to the rear, complete all communications and power wiring to the rear of the cabinet before performing the leveling procedure.

2. Once the cabinet is in position, use a 17mm wrench to loosen the locking nut above each leveling foot, by turning it clockwise, if necessary. Spin each of the four leveling feet to the left, extending them to the floor. With the help of an assistant, tilt the front top of the cabinet back slightly, and turn the front two leveling feet one or two additional turns, so that the weight of the cabinet rests on the leveling feet instead of the casters. Repeat this procedure for the rear two leveling feet.

Place a carpenter's level on the top of the cabinet and check the pitch left-to-right and front-to-back. Adjust the leveling feet accordingly, and continue to check the pitch until the cabinet is level. Turn the locking nut above each leveling foot to the right until it comes to rest against the base of the cabinet. Tighten the locking nut by using a 17mm wrench until snug.

3. Cut and remove the tie wraps holding the wooden retaining bars across the front of the Common Control shelf. These bars will not be used again, and may be discarded.
4. Check the alignment of all four doors on the cabinet to verify that the doors open and close smoothly. Proper door alignment is essential to maintain shielding of the cabinet from radio frequency interference (RFI).

The plastic bag containing extra cabinet hardware and cabinet placement instruction includes 15 flat washers which may be placed over the hinge pin at

the bottom of each door. If a door does not align properly with the cabinet, push down on the upper hinge pin release lever inside the door, tilt the top of the door away from the cabinet, and lift the door off the bottom hinge pin. Several flat washers already may have been placed over the bottom hinge pin to raise the door. Add or remove flat washers as necessary to align the door. Re-install the door.

5. Check the force required to close each door. The fit of each door is determined by alignment to the opening and by the pressure applied by contact springs around the door. The contact springs bond the door electrically with the cabinet, forming a complete shield against electromagnetic and radio frequency signals. Each door should fit snugly into the cabinet opening, however undue force should not be required to open or close any door.

The edges of the doors are perforated at the corners to allow the edge to be bent with relatively light hand force. Bending an edge of a door inward or outward controls the pressure applied by the contact spring against the edge, and thus contributes to the force required to open or close the door. To adjust the fit of a cabinet door, grasp an edge of the door and bend it gently inward or outward as necessary. Check the door fit and adjust the bend of each edge if required.

6. Check the interior of the shipping carton and remove any other remaining items.
7. Reassemble the shipping carton components and set the shipping carton aside. Once the system is completely installed and operating, it is no longer necessary to keep the shipping carton.

3 Ground and Power Wiring

WARNING!

*Electrical Hazard! Connect only a Protective Earth (PE) to the Coral system. **DO NOT** connect a separate Telecommunications Reference Conductor (TRC). Resistance from the master ground to the building electrical ground should never exceed 1.0 ohm. The master ground bar should be located in the switching room as close as possible to the Coral. Any ground connection of equipment related to the switching Coral system should ultimately connect to the master ground.*



NOTE:

The manufacturer strongly recommends using a stranded three conductor cable for the earth ground and DC power wiring, to minimize the inductance of the current path. This cable should be jacketed or enclosed in a wire conduit which meets local building, electrical, and/or fire codes.

Figure 2-2 illustrates a typical power wiring diagram for a single-cabinet. *Figure 2-3* illustrates a typical power wiring diagram for two cabinets. Although two cabinets are shown, the wiring is similar. Internal Power Supplies operate from 48VDC input. MPS Main External Power Supply/Battery Chargers operate from 115/230VAC input and supply 48VDC nominal output to the Coral system and optional stationary battery plant. Stationary battery plants are highly recommended.

Wiring Procedure

1. Power cables may be routed from above the Coral cabinet through a cable entry point in the left rear corner of the cabinet top, or from below through a similar entry point in the rear left corner of the cabinet bottom. Determine whether cables should be routed from the top or bottom of the cabinet. *Figure 2-4* illustrates the possible power cable routing through the cabinet.
2. Release the two locking screws from the power input cavity and remove the cover and retain it. Also remove the cable clamps and retain them, see *Figure 2-5*.

3. If the power cable is routed from the bottom of the cabinet, remove the two circular covers through which the cables are to be routed. One is located on the cabinet front-left bottom and the other on the cabinet top, behind the cable clamps. Forcibly push up the covers, releasing them from their spring fixings and discard.

Figure 2-2 Coral IPx 4000 with an External Power Supply

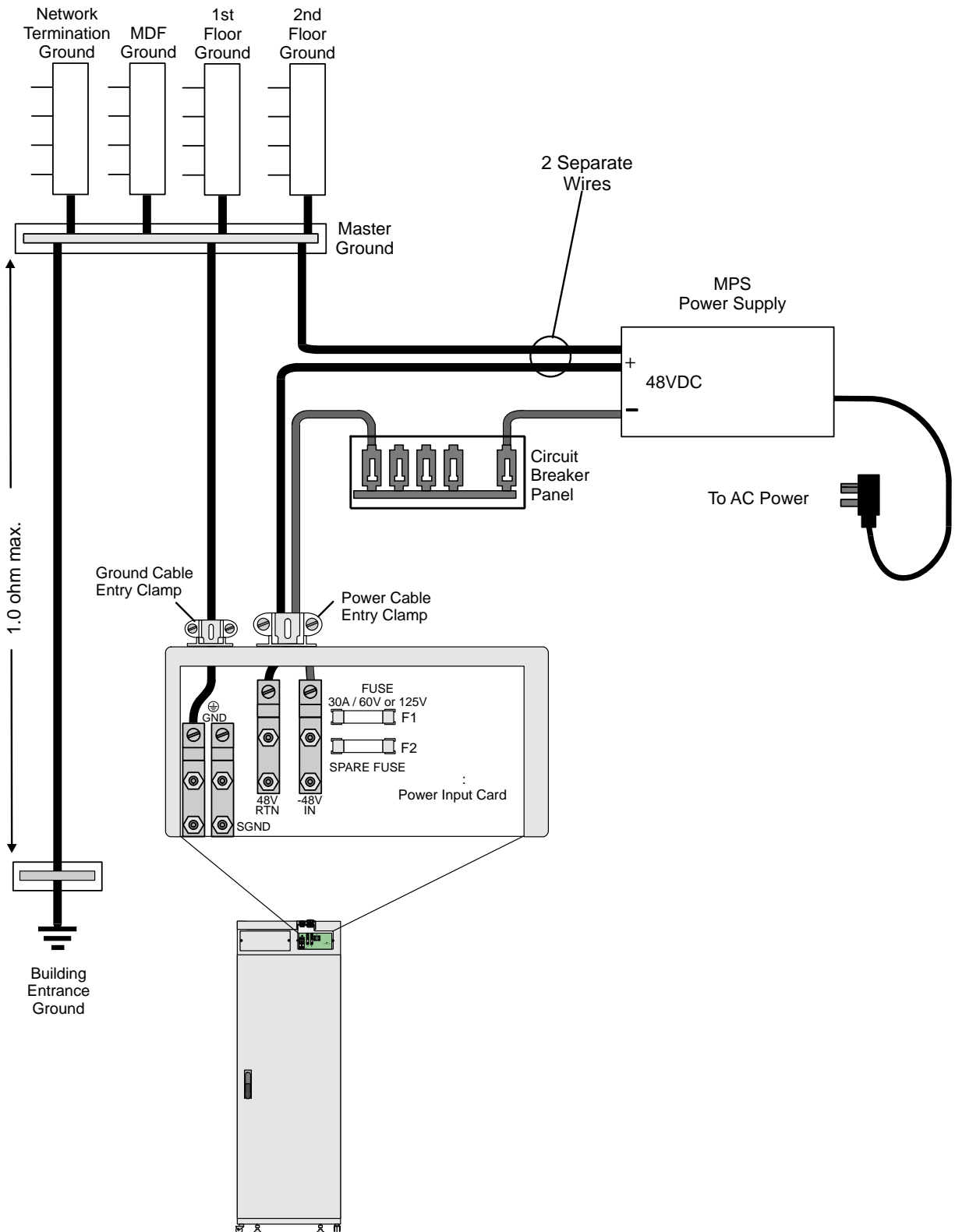
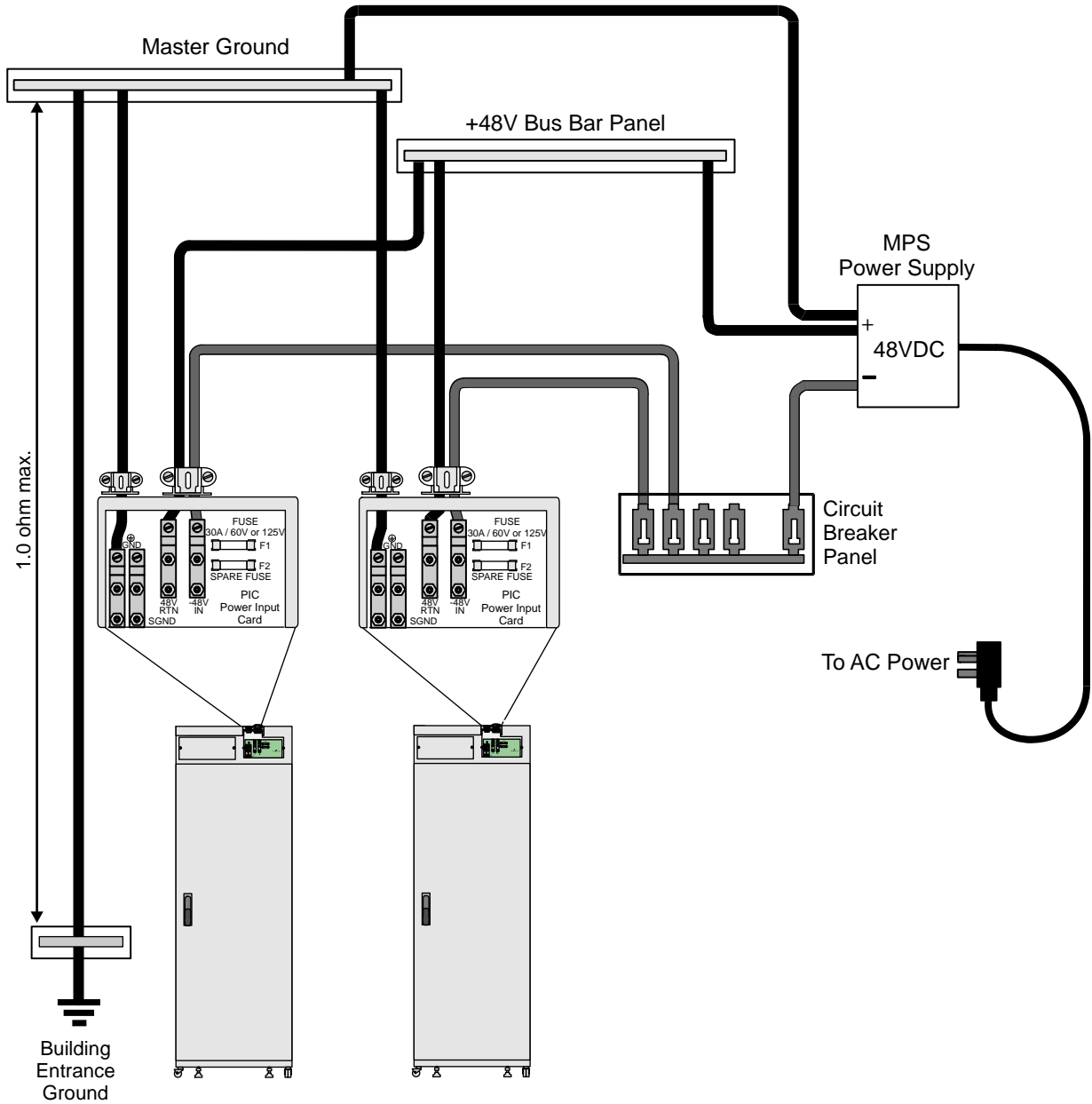
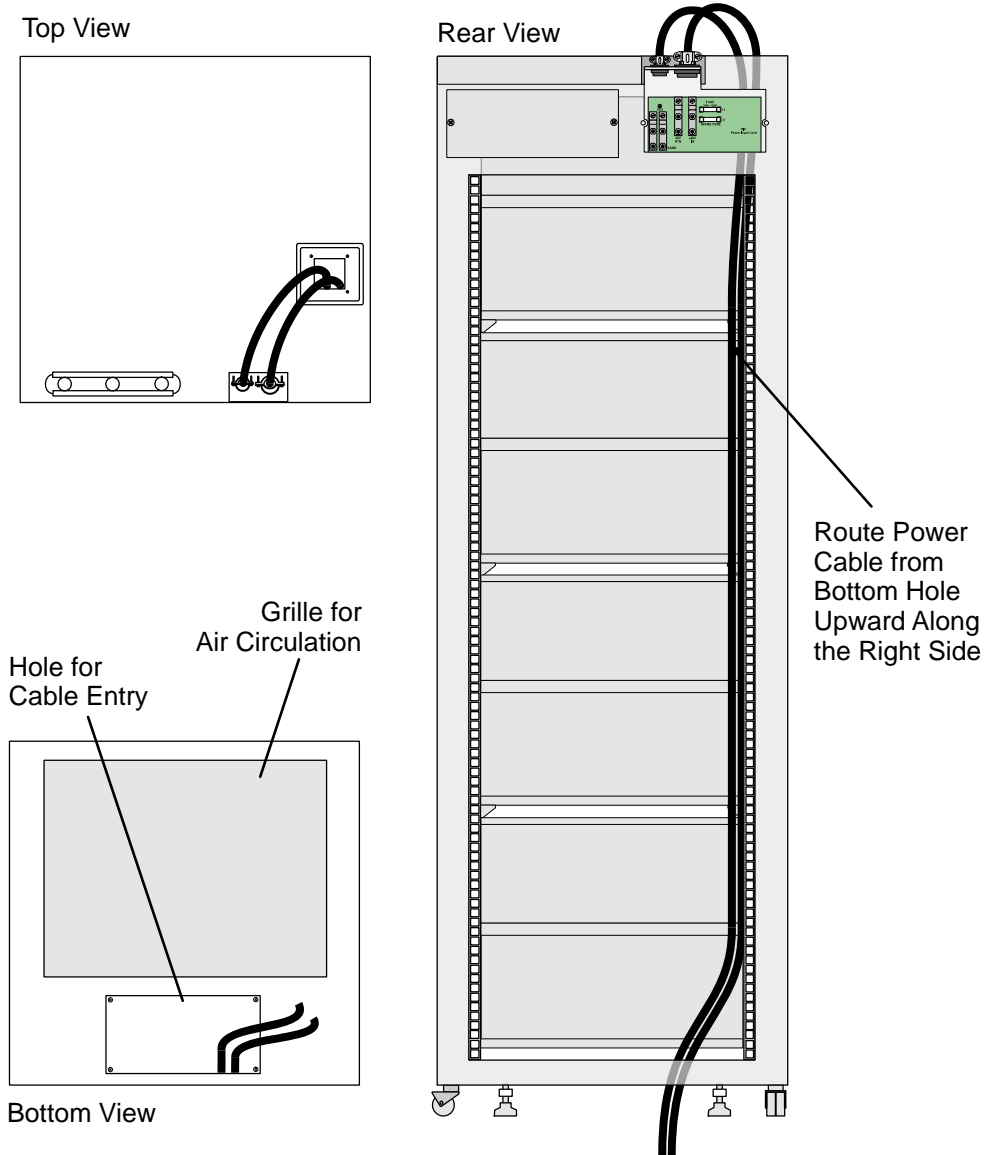


Figure 2-3 Two Coral Cabinets with Battery Chargers Layout



Equipment Installation

Figure 2-4 IPx 4000 DC Power Cable Routes (top, bottom and rear views)



CAUTION!

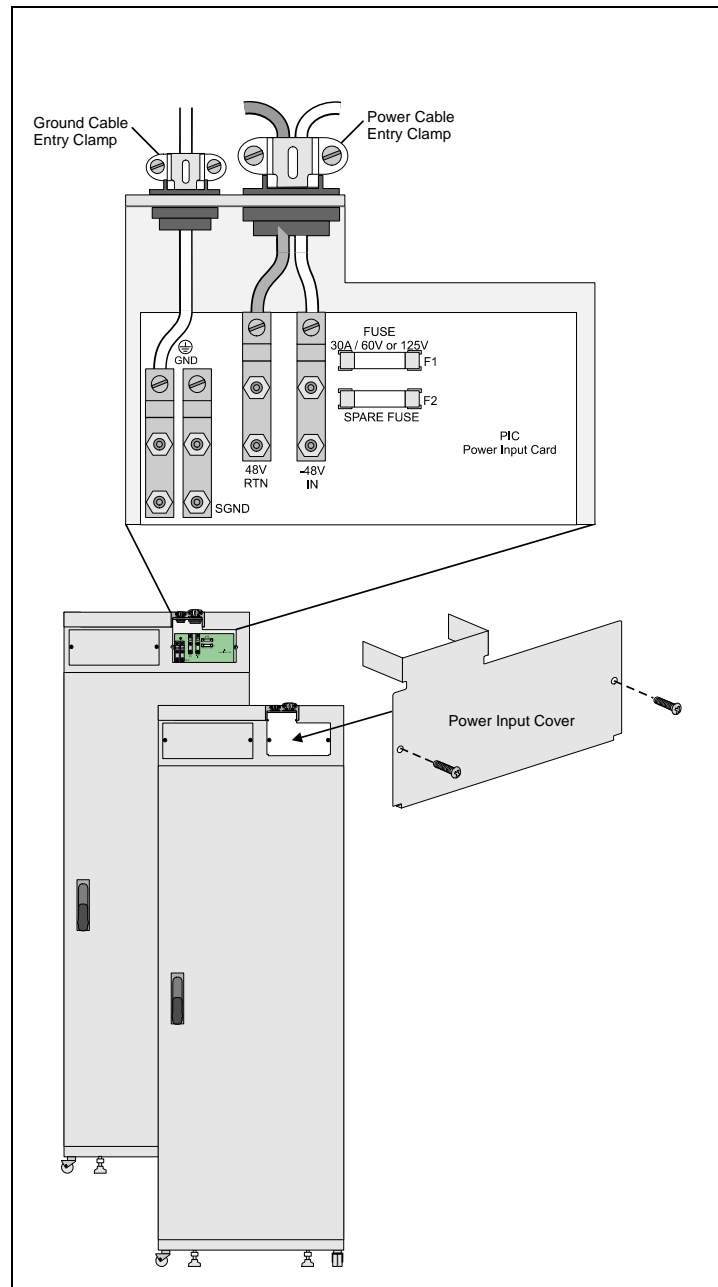
Verify that the positive and negative power conductors are NOT connected to the -48VDC power source or energized in any way. Route the power cable through the left cable entry (as viewed from the rear) at either top or bottom, taking care not to let the free end of the cable cause damage by swinging loose, making contact with another electrical power connection, or striking the card connector pins on the cabinet backplane.

4. If the cable enters the cabinet from above, leave approximately 18 inches (45cm) of power cable at the top of the cabinet to reach the DC power terminals.

If the power cable enters the cabinet from below, route the cable through the bottom port entry, and up along the left frame member of the backplane, using cable ties through tie slots along the frame to secure the cable. Route the cable through the port on the top of the cabinet behind the cable clamps. *Figure 2-5* illustrates the power input cavity area. Let approximately 18 inches (45cm) of power cable exit the top of the cabinet to reach the DC power terminals.

5. Carefully remove approximately 12 inches (30cm) of jacket from the power cable to expose the insulated power and earth ground conductors.
6. Route the **yellow/green** earth ground conductor through the left (smaller) cable clamp in the Cable Guide above the two SGND terminal lugs on the left side of the Power Input Card in the power input cavity. The Cable Guide may be removed to ease the insertion of the conductors into the power input cavity. see *Figure 2-5*.
7. Route the **red** positive conductor through the right (larger) cable clamp in the Cable Guide above the 48V RTN IN terminal lug on the Power Input Card in the power input cavity.
8. Route the **black** negative conductor through the right (larger) cable clamp in the Cable Guide above the -48V IN terminal lug on the Power Input Card in the power input cavity.
9. Use a #1 (1/4" or 8mm) straight-blade screwdriver to tighten the three cables.
10. Use cable ties to secure each of the conductors to the Cable Tie-Off Bracket on the top of the cabinet, leaving sufficient slack in each conductor to prevent strain.
11. Replace the Power Input Cavity Cover and screw into place.
12. Install the front and rear cabinet nameplates at the top of the cabinet front and rear, respectively.
13. Continue with *Input/Output (I/O) Cables beginning on page 2-18*.

Figure 2-5 Coral DC Power Input Terminals



4 Input/Output (I/O) Cables

Champ Connections

1. Input/Output (I/O) cables may be routed from above the Coral cabinet through a cable entry point in the right rear corner (as viewed from the rear) of the cabinet top, or from below, through a similar entry point in the right rear corner of the cabinet bottom. Determine whether I/O cables should be routed from the top or bottom of the cabinet.

If the top entry point is used, release the locking screw, remove the cover plate and discard it.

If the bottom entry point is used, forcibly remove the cover plate and discard.

2. Determine the route of I/O cables from the MDF to the connectors on the rear backplane of the cabinet. Measure the longest distance from an I/O connector on the backplane to the corresponding cable punch block on the MDF.
3. Fabricate cables of the length determined above with a male 25 pair connector on one end, for each I/O connector on the backplane. Twenty two 25 pair cables are required for a Coral cabinet with 2 peripheral shelves and 32 cables are required for a Coral cabinet with 3 peripheral shelves.
4. Carefully route the connector end of each I/O cable through the right cable entry point at the top or bottom of the cabinet, threading the cable through the guide rings along the right side of the backplane to each I/O connector, as shown in

Figure 2-8: Coral I/O Champ Cable Routes from Bottom of Cabinet (rear view)
and *Figure 2-9: Coral I/O Champ Cable Routes from Top of Cabinet (rear view).*

If I/O cables enter the cabinet from the top, route the first cable to the upper right connector on the upper peripheral shelf. Insert the cable connector firmly into the Coral I/O connector. Carefully pull the hook-and-loop fastener strap tight and press the strap back onto itself, securing the cable connector into the Coral I/O connector. Route the other end of the cable to the appropriate cable punch block on the MDF. Repeat this procedure for each I/O cable, moving from right to left across the upper I/O connectors, and then from right to left across the lower I/O connectors. When all the I/O cables are installed on the upper peripheral shelf, move down to the peripheral shelf below, until all the required I/O cables are in place.

If the I/O cables enter the cabinet from the bottom, route the first cable to the lower right connector on the lower peripheral shelf. Insert the cable connector

firmly into the Coral I/O connector. Carefully pull the hook-and-loop fastener strap tight and press the strap back onto itself, securing the cable connector into the Coral I/O connector. Route the other end of the cable to the appropriate cable punch block on the MDF. Repeat this procedure for each I/O cable, moving from right to left across the lower I/O connectors, and then from right to left across the upper I/O connectors. When all the I/O cables are installed on the lower peripheral shelf, move up to the peripheral shelf above, until all the required I/O cables are in place.

Table 2-4 I/O Champ Connector to Card Slot Relationships for an Even Expansion Shelf (IPx 4000XE)

Coral I/O Champ Connectors	Associated Card Slots
J5, J6	3, 4
J7, J8	5, 6
J9, J10	7, 8
J11, J12	9, 10
J13, J14	11, 12

Figure 2-6 Rear Panel of Even Expansion Shelf: Champ Connectors vs. Card Slot

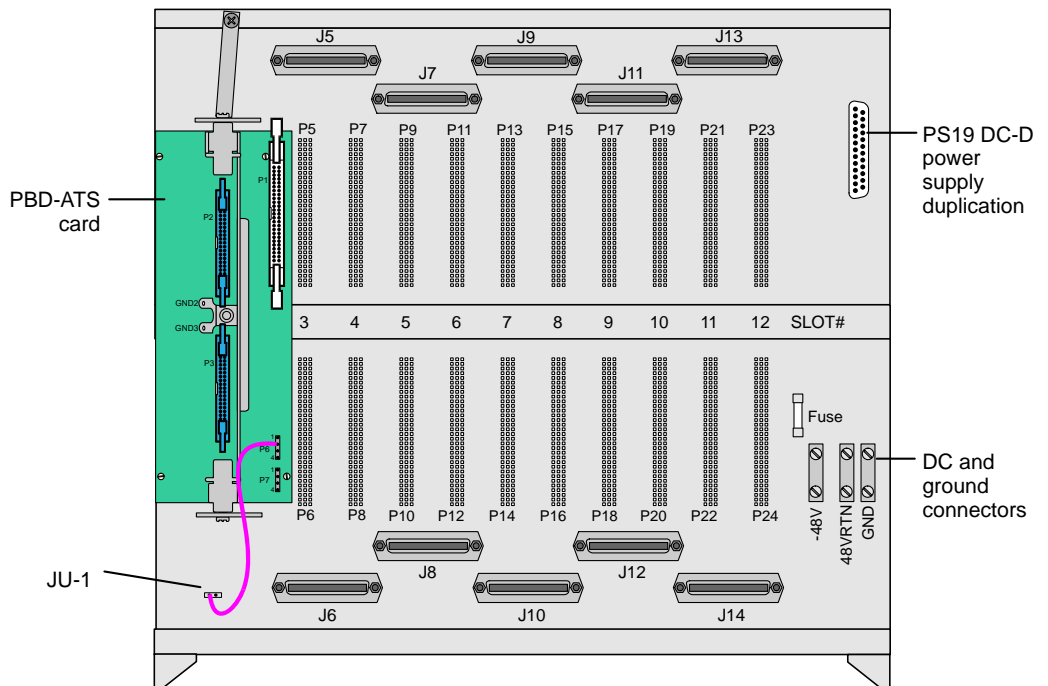
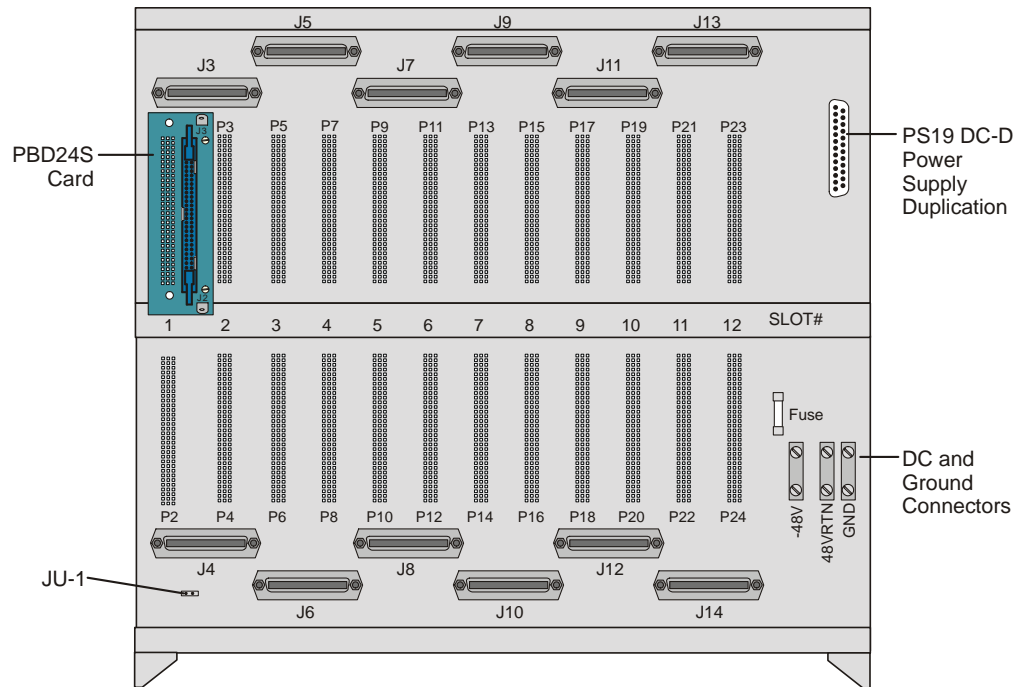


Table 2-5 I/O Champ Connector to Card Slot Relationships for an Odd Expansion Shelf (IPx 4000XO)

Coral I/O Champ Connectors	Associated Card Slots
J3, J4	1, 2
J5, J6	3, 4
J7, J8	5, 6
J9, J10	7, 8
J11, J12	9, 10
J13, J14	11, 12

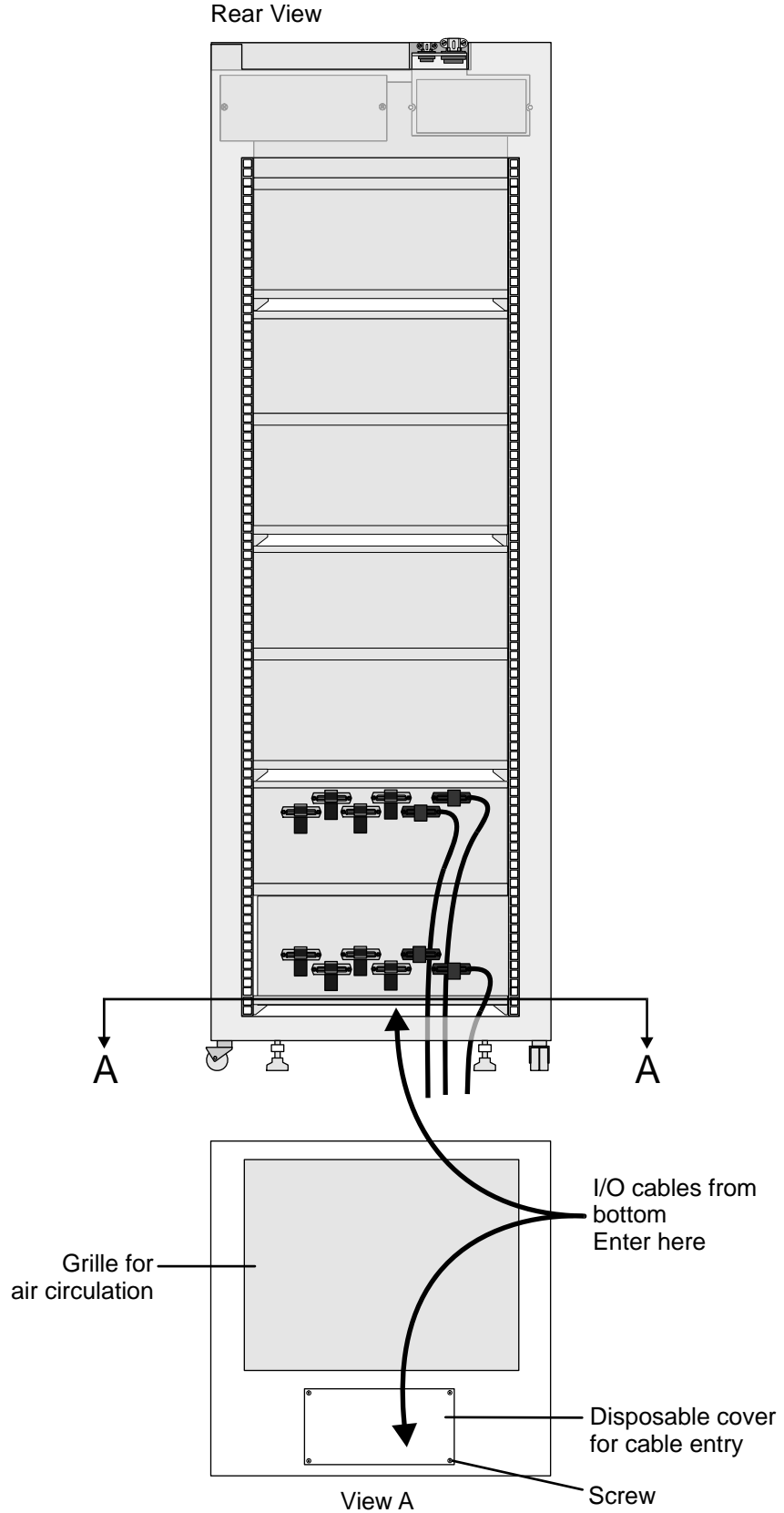
Figure 2-7 Rear Panel of Odd Expansion Shelf: Champ Connectors vs. Card Slot



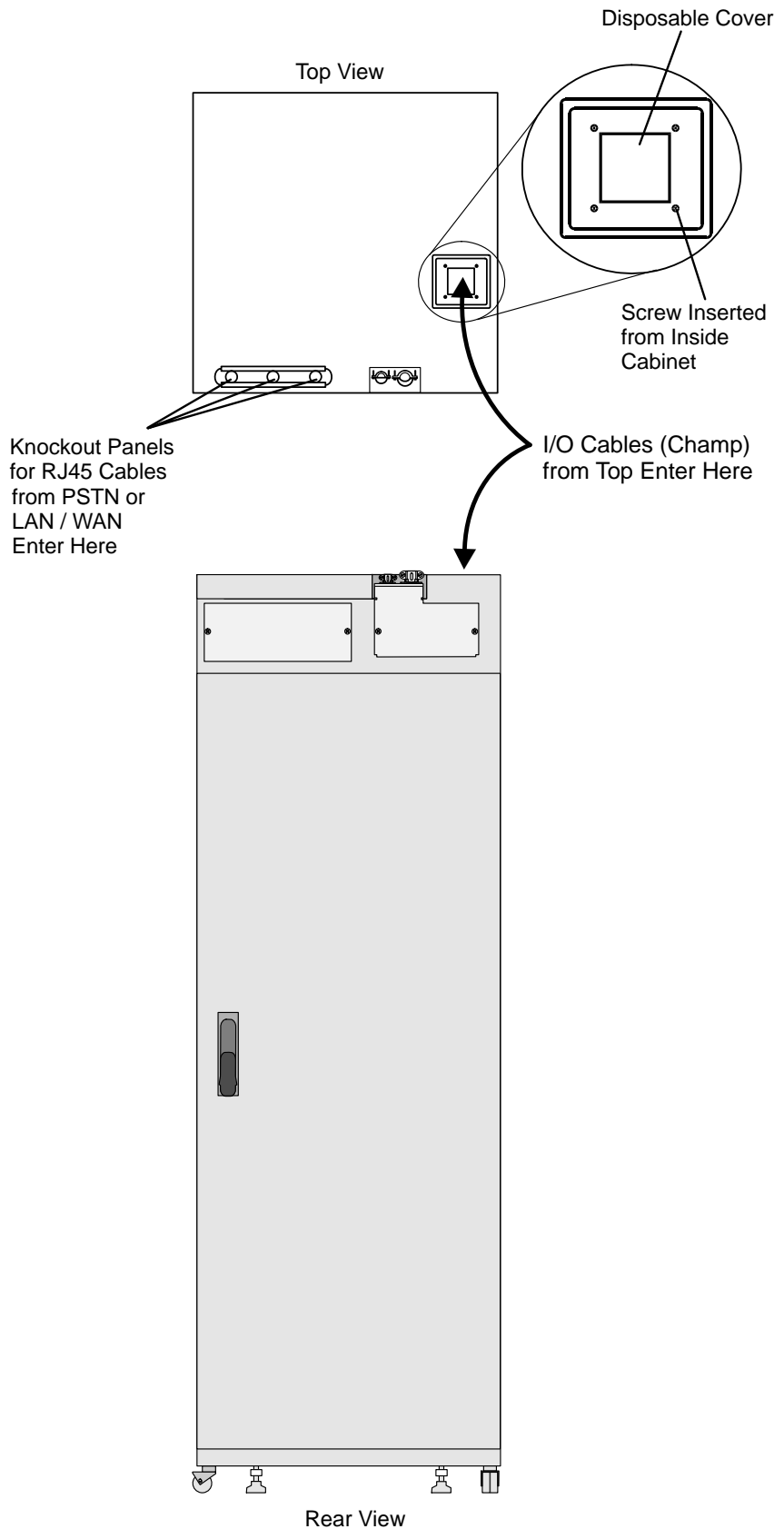
CAUTION!

Never route RJ-45 cables through the bottom, as this may cause RFI disturbances within the system. For further information, see [RJ-45 I/O Cable Connections \(LDF and UDF\)](#), page 2-24.

Figure 2-8 Coral I/O
Champ Cable Routes
from Bottom of Cabinet
(rear view)

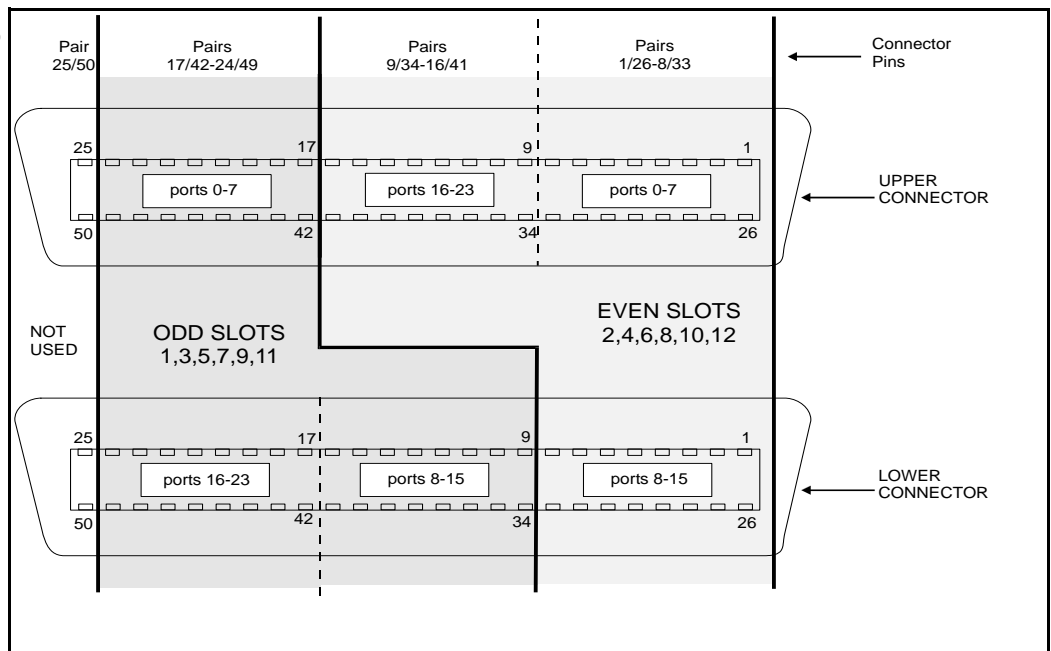


**Figure 2-9 Coral I/O
Champ Cable Routes
from Top of Cabinet
(rear view)**



5. Mark each I/O cable near the connector on the backplane with the corresponding peripheral shelf and I/O connector number on the Coral system.
6. Terminate each of the cables on their respective cable punch blocks on the MDF.
7. Mark each cable punch block with the corresponding I/O connector number on the Coral system. Optionally mark every eighth pair on the block, starting with the first pair, with the number of the two card slots associated with the I/O cable, according to [Table 2-4](#) and [Table 2-5](#) and.
8. Attach the front, decorative panel nameplate at the top of the cabinet front and lock into place.

Figure 2-10 Coral Card Slot Position to I/O Cable Pair Relationship



NOTE:

Ensure that each I/O cable is secured with its own hook-and-loop fastener strap on the Coral cabinet rear, so that the cables do not accidentally pop out of place.

RJ-45 I/O Cable Connections (LDF and UDF)

Input/Output (I/O) RJ-45 cables for LAN/WAN/PSTN/router/LTU/CSU/etc. are routed from above the Coral cabinet through three cable entry points in the rear upper section of the cabinet. See [Figures 2-11](#) and [2-12](#).

RJ-45 cables routed from the front panel of the peripheral interface cards must be connected via the LDF or UDF panels. Verify that the RJ-45 cables are not connected directly from the LAN/WAN/PSTN to the connectors on the front panel of Coral peripheral cards. Route the cables through the I/O RJ-45 cable entry opening at the rear top panel of the cabinet.



NOTE:

The LDF (LAN Data Filter) and the UDF (Universal Digital trunk Filter) incorporate improved RFI immunity. These filters enable the Coral and all relevant peripheral interface circuits to be fully protected against radio-frequency interference (RFI) and meet or exceed all requirements and specifications of telecommunications and electrical safety authorities world-wide.

1. Route the crossover cable (Catalog Number 7244-8000624) from the front panel of the peripheral cards to the lower connections of the LDF or UDF panel as shown in [Figure 2-11](#) and [Figure 2-12](#).

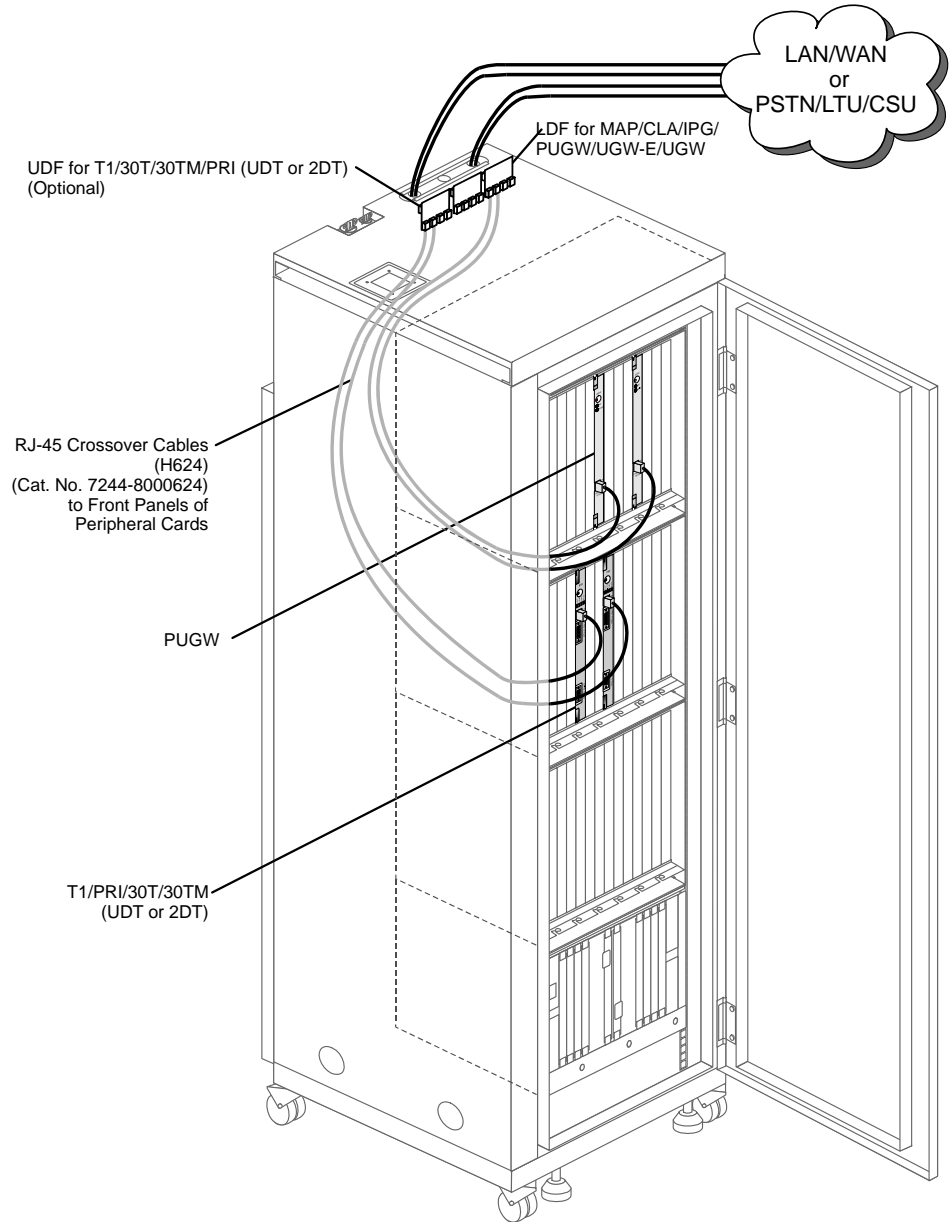
CAUTION!

A crossover cable (Catalog Number 7244-8000624) should be used to make this connection. Otherwise, if an ordinary cable is used, the cards will not be integrated into the system.

2. Connect one side of the crossover cable routed in [Step 1](#) to the RJ-45 jack on the front panel of the relevant peripheral card.
3. Connect the other side of the crossover cable routed in [Step 1](#) to the lower RJ-45 jack (as shown in [Figure 2-11](#)) on either the LDF panel or UDF panel, as follows:
 - LDF for CLA, PUGW, UGW, UGW-E or IPG peripheral cards
 - UDF for PRI-23, PRI-30, T1, 30T, or 30TM peripheral cards (layout UDT or 2DT).

4. Determine the route of the RJ-45 cable (as shown in *Figure 2-12*) from the LAN/WAN/PSTN/router/LTU/CSU to the LDF/UDF panel on the rear section of the cabinet. Measure the longest distance from the LDF/UDF panel to the corresponding LAN/WAN/PSTN/router/LTU/CSU connector.
5. Fabricate a cable of the length determined in *Step 4* with a male 4 pair RJ-45 connector on each end. For information on the pinout connection, see Chapter 5.9 of the *Coral FlexiCom 300, 400, 5000 Installation Procedure and Hardware Reference Manual*.
6. Connect one side of the RJ-45 cable routed in *Step 4* to the LAN/WAN/PSTN/router/LTU/CSU/etc.
7. Carefully route the other side of the RJ-45 cable routed in *Step 4* through one of the three cable entry points in the top rear of the Coral cabinet, as shown in *Figure 2-12*. Connect the RJ-45 connector to the respective RJ-45 jack on the LDF/UDF panel.
8. Repeat *Step 1* to *Step 7* for each peripheral card with an RJ-45 connector. Install an additional LDF (Catalog Number 7244-9043100) or UDF (Catalog Number 7244-9044100) panel as required.
9. Install the rear cabinet nameplates at the top rear section of the cabinet. See *Figure 2-13*.

Figure 2-11 Coral Cabinet I/O RJ-45 Crossover Cable Routing



**Figure 2-12 Coral I/O
RJ-45 Cables Routing**

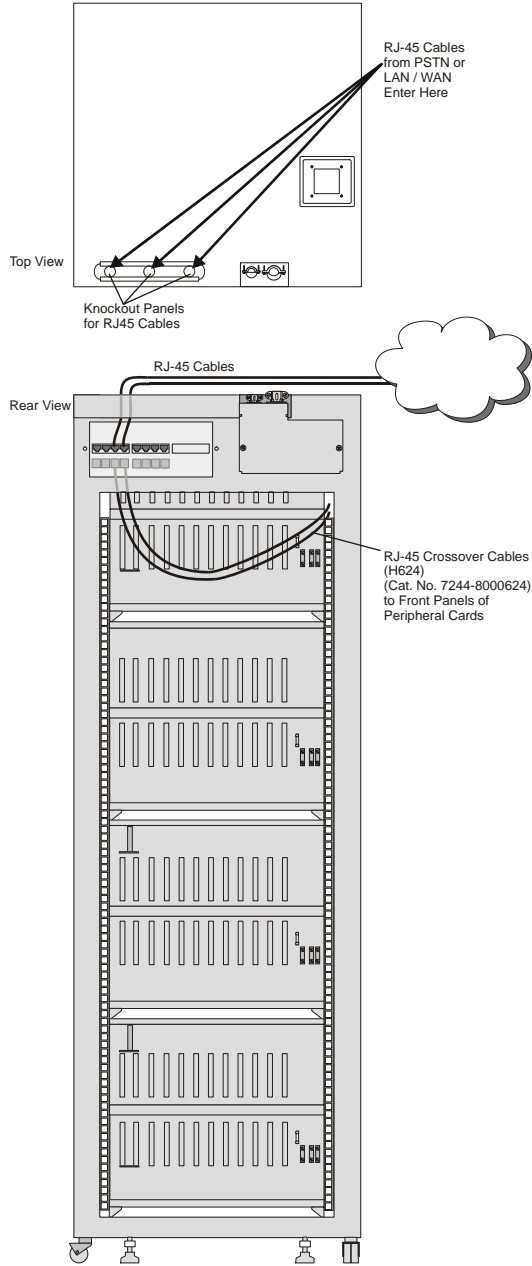
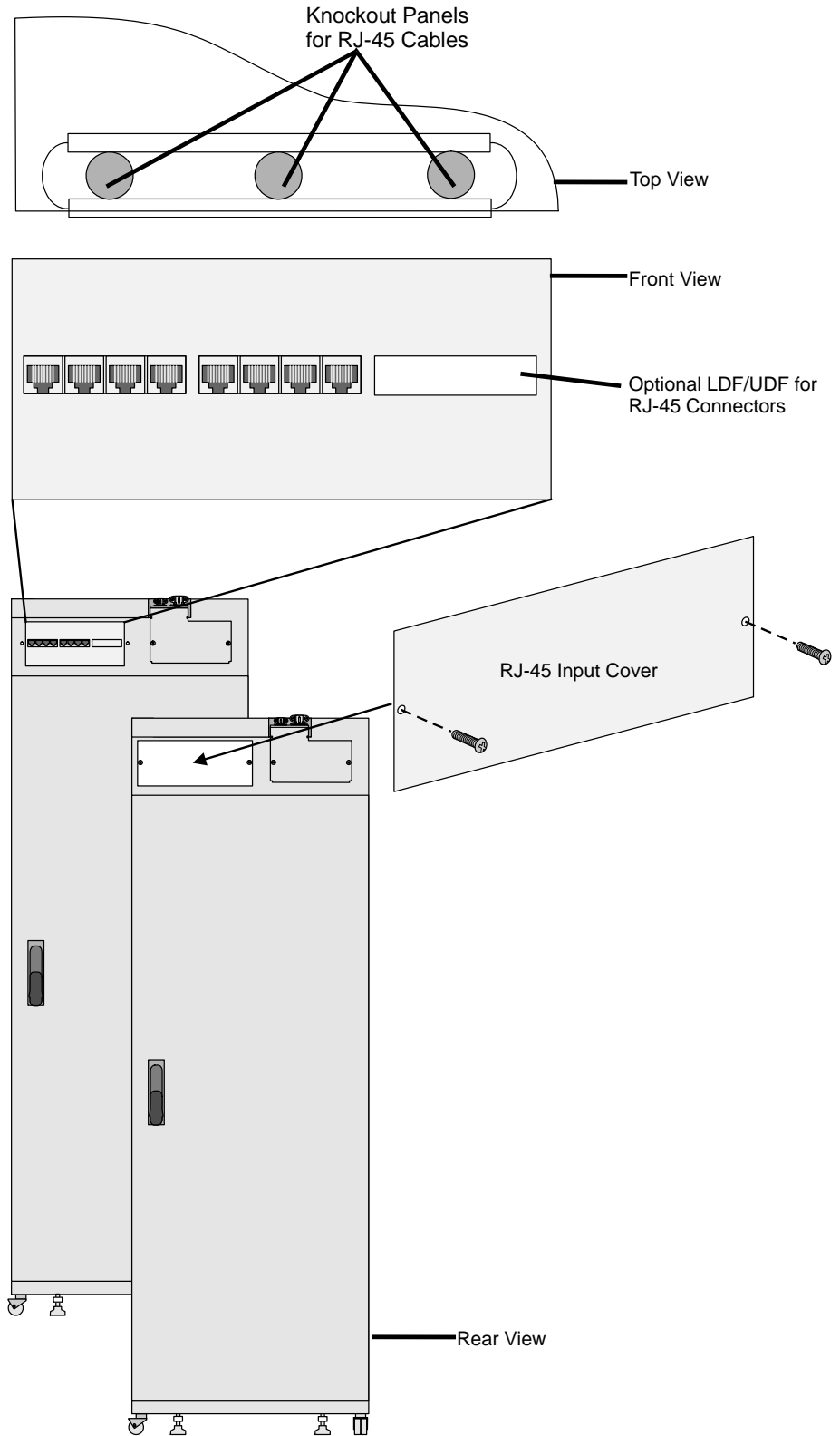


Figure 2-13 Coral LDF/UDF RJ-45 Connectors



5 Power Supplies

CAUTION!

Coral power supply units (PS-ATS, PS19 DC and PS19 DC-D) are heavy. Handle with care and do not drop.

CAUTION!

Verify that the Power Switch on the front panel of all the power supply units (PS19 DC and PS19 DC-D) is in the OFF position, prior to insertion.

The Dual Hot Standby system for the Coral system is supported by two redundant PS-ATS power supply units supplying power for the control system. Each individual PS-ATS unit can supply the power for the dual system. One PS-ATS can be removed, replaced and inserted while leaving the other PS-ATS unit to supply the full power on its own. This is referred to as “Hot Insertion”.

NOTE:

The power supplies used in the Coral system operate from a –48VDC source. The power supplies consist of one or two PS-ATS units in the Common Control shelf, and a PS19 DC or PS19 DC-D in each peripheral shelf. Refer to [Figure 2-16](#) and [Figure 2-14](#) for power supply placement in the Common Control shelf and Peripheral Shelves, respectively.

See [Chapter 7, Power Supplies](#) for further details on the PS-ATS units.

Installing the Power Supply Units

Two Power Supply units are normally shipped in the Common Control Shelf of the system already fastened into place. Verify that the two power supplies are installed in slots PS2 and PS1 on the bottom corners of the control shelf. There is an empty third power supply slot in the upper right hand corner (slot PS3). This slot is for future Coral Configurations. Install the PS19 DC or PS19 DC-D units in their slots on the peripheral shelves, if not installed already.

To Insert the Power Supplies:

1. *For the PS-ATS units*, if not already installed, grasp its handle with one hand.
For the PS19 DC or PS19DC-D, grasp the power supply with both hands, fingers on the top and bottom of the power supply near the front panel, and thumbs against the extractor levers at the top and bottom of the front panel.
2. Verify that the power supply is oriented correctly:
 - When installing the PS-ATS in either slot *on the right side* (slots PS2 and PS3), ensure that the Fail and Power LEDs are located at the top of the unit.
 - When installing the PS-ATS *on the left side* of the control shelf (slot PS1), ensure that the Fail and Power LEDs are at the bottom of the unit (i.e. install the unit upside down).
3. Align the circuit card edges with the card edge guides in the card cage or shelf, and gently slide the power supply straight into the card slot. A slight resistance is felt as the multi-pin connectors on the power supply meet the mating connectors on the backplane and engage.
4. Push the power supply into its slot (*for the PS19 DC or PS19DC-D*, push against the extractor levers) until the front panel of the power supply is flush with the front frame of the card cage. Force the power supply into the slot. If increased resistance is encountered, remove the power supply and examine the connectors for bent pins or interfering debris.
5. Fasten the four captive screws on each corner of the PS-ATS unit.

Before the first initialization of the system, before the power-up tests are administered ([Power Supply Test beginning on page 3-1](#)), these units should be partially extracted from their slots so that they protrude by approximately 1 inch (2.5cm). Only after verifying the external power should they be reinserted properly and fastened.

6 Circuit Card Installation

CAUTION!

Circuit cards contain static-sensitive circuitry and may be damaged or destroyed by electro-static discharge (ESD). Always wear the static dissipating wrist strap connected to the system cabinet or card cage while handling circuit cards. Hold circuit cards by their edges and avoid touching contact surfaces. Handle with care and do not drop. Failure to observe safe handling procedures for static sensitive circuitry may result in permanent damage to a card.



Inserting a Coral Circuit Card

To insert a circuit card into a card slot, grasp the card with both hands, fingers on the edge of the card near the front panel and thumbs against the extractor levers at the top and bottom of the front panel. Verify that the card is oriented correctly. Align the edges of the circuit card with the card edge guides in the card cage or shelf and gently slide the card straight into the card slot. A slight resistance is felt as the multi-pin connectors on the circuit card meet mating connectors on the backplane and engage. Push against the extractor levers until the front panel of the card is flush with the front frame of the card cage. Do not force the circuit card into the slot. If more than slight resistance is encountered, remove the circuit card and examine the connectors for bent pins or interfering debris.

Shared Service and Peripheral Interface Card Installation

The Peripheral Cards are shipped separately from the cabinets. Remove them from their packaging and design the card placement as described below. Gently slide the cards into their slots while allowing them to protrude by about one inch (2.5cm) from the card cage. These cards are inserted completely after the Power-Up tests performed in Chapter 3.



NOTE:

*Some Shared Service and Peripheral Interface cards may require changes to option straps on the card which determine the electrical characteristics or operation of each interface circuit. Refer to specific card descriptions in the **Coral Service and Peripheral Cards Installation Manual**, for details.*

Peripheral Card Placement

There are two types of Peripheral Cage types:

- IPx 4000XE (Even numbered peripheral shelf)
- IPx 4000XO (Odd numbered peripheral shelf)

The even numbered shelves house either one or two PB-ATS units in Slots 1 and 2. Peripheral Interface cards may be installed in any universal I/O slot of the Coral system. However the following considerations must be taken into account to ensure the efficient and smooth operation of the Coral system.



NOTE:

PB-ATS:

To prevent inserting a PB-ATS card in the wrong slot, the PB-ATS card is contoured differently than the other peripheral shelf cards. It has rounded corners similar to the control cards of other Coral systems.

The PB-ATS card slides into matching groves in slots 1 and 2.

Card slots 3 through 12 are Universal I/O slots, accepting any Shared Service or Peripheral Interface card type.

- Determine the position of Shared Service and Peripheral Interface cards that are to be inserted into card slots 1 through 12. Observe any order previously directed by a System Designer or any established convention of the distributor. The Card Placement Diagram, [Figure 2-14](#) for Even Numbered Shelves and [Figure 2-15](#) for Odd Numbered Shelves, may be used as a worksheet by the System Designer to establish card placement prior to installation. Refer to [Table 2-6](#) to determine Shared Service and Peripheral Interface card types.
 - Up to two PB-ATS cards are installed in Slots 1 and 2 of every even peripheral shelf, see [Odd or Even Shelves on page 6-29](#).
 - Shared Service cards, see [Table 2-6](#), can be installed in Slots 1 and 2 of every odd numbered peripheral shelf.
 - Distribute trunk interface cards (4ALS, 8ALS, 8BID, 8DID, 4GID, 4T, 8T, 4/8T-C, 4/8T-CID, 4TEM, 4TMR, 4TPF, 8TPF, DPC, 4TBR, 8TBR, 30T, 30TM, 30T/x, PRI23, PRI30, 2DT, UDT and T1) evenly among all peripheral shelves in the system, rather than concentrate trunk interface cards in one or two shelves. This practice ensures that the failure of a single peripheral shelf has minimal impact to trunk service.

If no other convention exists, plan the card placements as follows:

- Insert PB-ATS cards in card slots 1 and 2 of each even numbered peripheral shelf.
- If synchronization is required, the first two Digital Trunk Interface cards must be placed in card slot 4 of two even numbered peripheral shelves in the Main cabinet. The cards inserted in these slots are used to synchronize the Coral system clock with a network clock signal via a Digital Trunk Circuit, as they are wired as the primary and secondary external clock source, respectively. Refer to the *Coral Synchronization via Digital Trunks* section in the *Coral Service and Peripheral Cards Installation Manual*, for more information on synchronization.
- *For even numbered shelves*, place Peripheral Station Interface cards starting at slot 3 and moving to the left (omitting slot 4 if synchronization is required).
- *For odd numbered shelves*, place Peripheral Station Interface cards starting at slot 1 and moving to the left.
- Place Peripheral Analog Trunk Interface and remaining Auxiliary and Digital Trunk Interface cards starting at card slot 12 and moving to the right.
- Distribute *heavy consumer* cards (cards with a large number of ports) among the slot sets as evenly as possible, based on their PCM highway distribution, see [Time Slot Distribution among the Peripheral Units on page 6-24](#). The Peripheral Shelf **Unit** (Unit=2 shelves comprised of an odd and even or only 1 even shelf) timeslots are divided into four groups of 128 timeslots among its combined I/O slots. These cards are least blocking when placed in Peripheral Shelf Units that contain only an even numbered shelf.



*For a completely non-blocking system, the technician should avoid installing the following cards in **slots 1-8 of peripheral shelves 6 and 7**: 30T/x, T1, PRI24, PRI 30, IPG, UGW, UGW-E and PUGW.*

Table 2-6 Shared Service and Peripheral Interface Cards

Card Type	Card Names
Shared Service	8DTMF, 8DTR, 16MFR, CNF, 4VSN, iDSP, iCMC, iVMF, IPC/SFC, IPC/uCMC, IPC/WiCMC
Peripheral Analog trunk Interface	4/8T*, 4/8T-C*, 4/8T-CID*, 4TMR*, 4/8TPF*, 4TEM*, 4TEM-P, 4/8T/S, 4/8ALS*, 4/8ALS/M*, 8DID, 8BID, 4GID, 4TWL
Peripheral Digital Trunk Interface	PRI-23, PRI-30*, T1, 30T, 30TE, 30TM, 30T/x, 2DT*, UDT*, 4/8TBR, 8TBRP, DPC*, SS7
Peripheral Station Interface	8/16/24SFT, 8SM, 8/24SA, 8/16/24SLS*, 8/16SKK*
VoIP Interface	PUGW*, UGW, UGW-E, IPG, FlexiGate-BRI, FlexiGate-E&M
Peripheral Auxiliary Interface	8DRCF*, 8DRCM*, 8DRCM-2*, RMI*

* These cards require changes to option straps which affect interface characteristics or operation.

CAUTION!

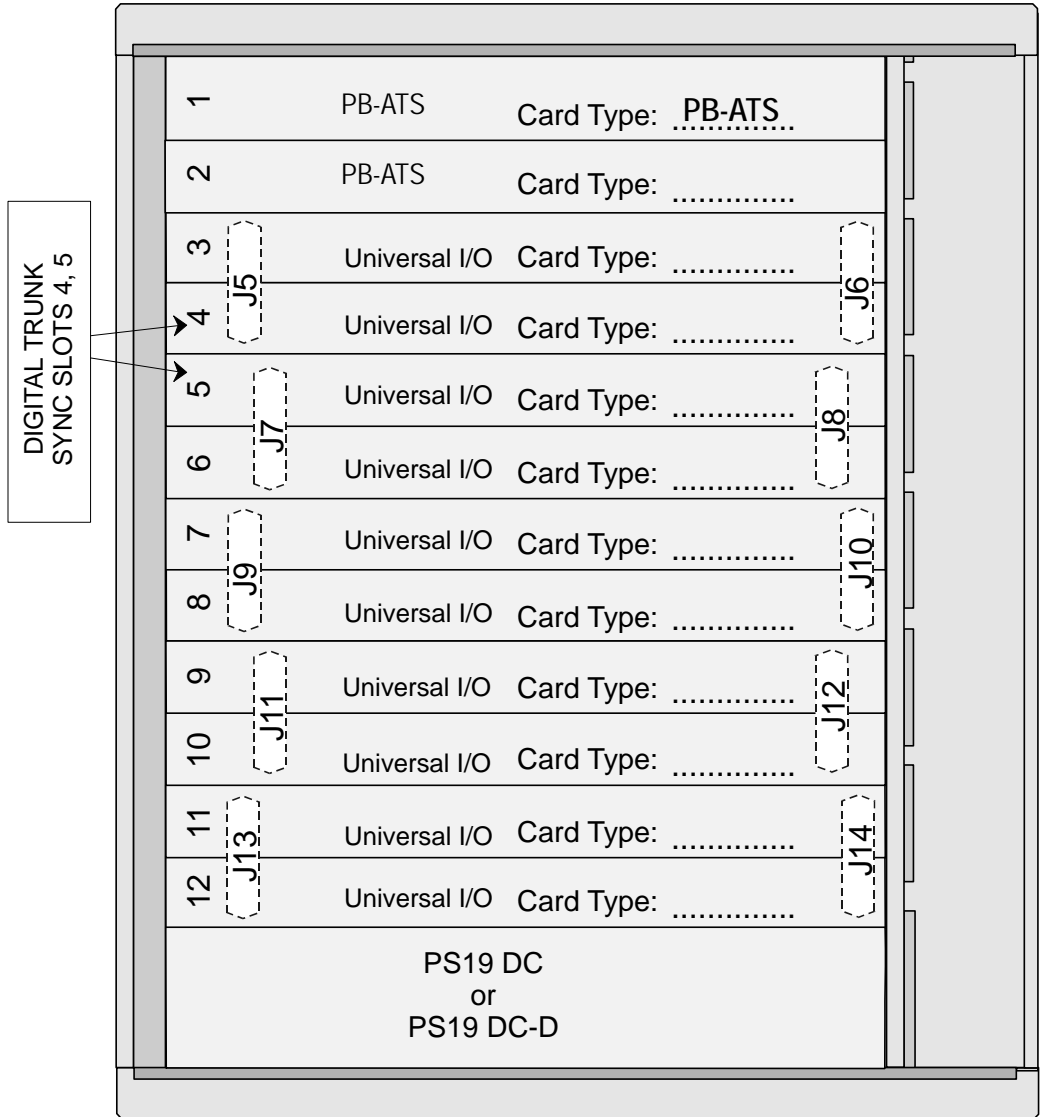
Due to a power issue, the 4,8,16 (SH, S/SH, SH/S, SH/S-LL) cards with message waiting are not for use in the Coral IPx 4000 cages. Installing these cards in the Coral IPx 4000 cages may cause Power Supply failure.

These cards are used in the Coral FlexiCom and Coral I,II,III systems only.

Figure 2-14 **Even Numbered Shelf - Peripheral Card Placement**

Coral IPx 4000XE

Even Shelf Number (0/2/4/6/8/10/12/14):

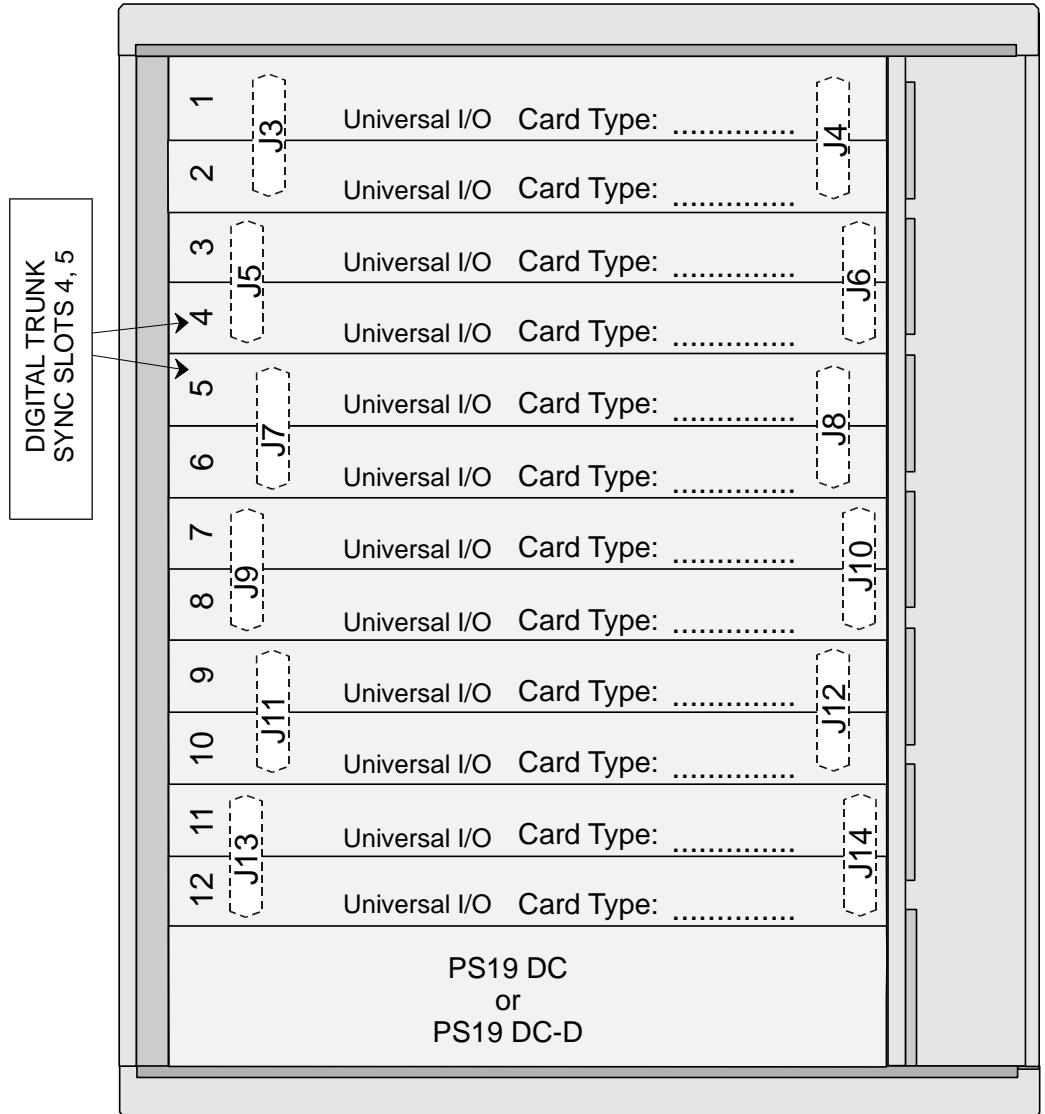


: This figure can be duplicated for multi shelves

Figure 2-15 Odd Numbered Shelf - Peripheral Card Placement

Coral IPx 4000XO

Odd Shelf Number (1/3/5/7/9/11/13/15):



: This figure can be duplicated for multi shelves

Common Control Card Installation

The Coral IPx 4000 includes a single set of common control cards, always located on the right side of the shelf, while the IPx 4000/R includes two redundant sets of control cards.

The IPx 4000/R includes two sets of control cards that stand side by side on the same shelf. Each control set has seven slots. The control cards on the right side are duplicated on the left side in reverse and upside down order. Each side consists of the following card slots placed in this order from the middle outward:

- 32GC (with the SAU interface)
- CLA-ATS (Optional)
- empty slot
- MCP-ATS
- empty slot

The cards installed on the right side of the shelf are inserted with the card LED at the top. The cards installed on the left side of the shelf are inserted up-side down, with the card LED at the bottom.

Preparing the Control Cards for Installation

1. The standard IPx 4000 Common Control cards are normally shipped already inserted in their respective card slots. Upon removing the packaging of the Control cage, verify that these cards are indeed inserted into their respective card slots as shown in [Figure 2-16](#).
2. Partially extract each card from its card slot, so that the cards protrude from the card cage approximately 1 inch (2.5cm). See [Extracting Control Circuit Cards](#) below. The cards are inserted into place after the Power-Up tests described in [Chapter 3](#) are successfully completed.

Extracting Control Circuit Cards

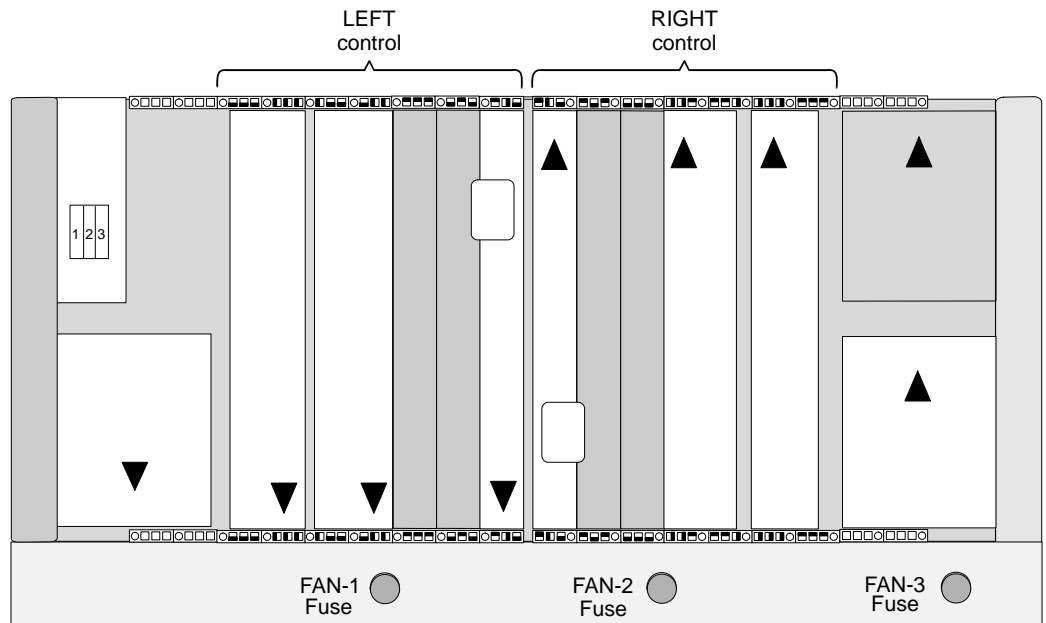
To extract a circuit card from its card slot:

1. If there are screws in place at the top and bottom of each card, release the screws.
2. Grasp the injector/ejector levers on the top and bottom of the card's front panel, with one hand on the top lever and the other hand on the bottom lever.

3. Gently press the levers outward toward the top and bottom of the card. The card is released from the connections to the backplane.
4. Extract the card from its slot.

For initial installation, partially extract each card from its card slot, so that the cards protrude from the card cage approximately 1 inch (2.5cm).

Figure 2-16 Control Card Slots for a redundant system



NOTE:

Never force the insertion of a Common Control card in a slot other than the one designated for that card. Irreparable damage may occur if a Common Control card is placed in an incorrect slot with power applied.

Inserting Control Cards

The Control shelf is shipped with the 32GC(s), the MCP-ATS (s), and the Power Supply Unit(s) already set in their appropriate slots and fastened into place. The CLA-ATS is shipped separately and must be installed separately, see [Inserting the CLA-ATS Card on page 8-104](#) for the installation procedure for the CLA-ATS card.



NOTE:

All the control shelf cards must be partially extracted from the Control Cage before system initialization.

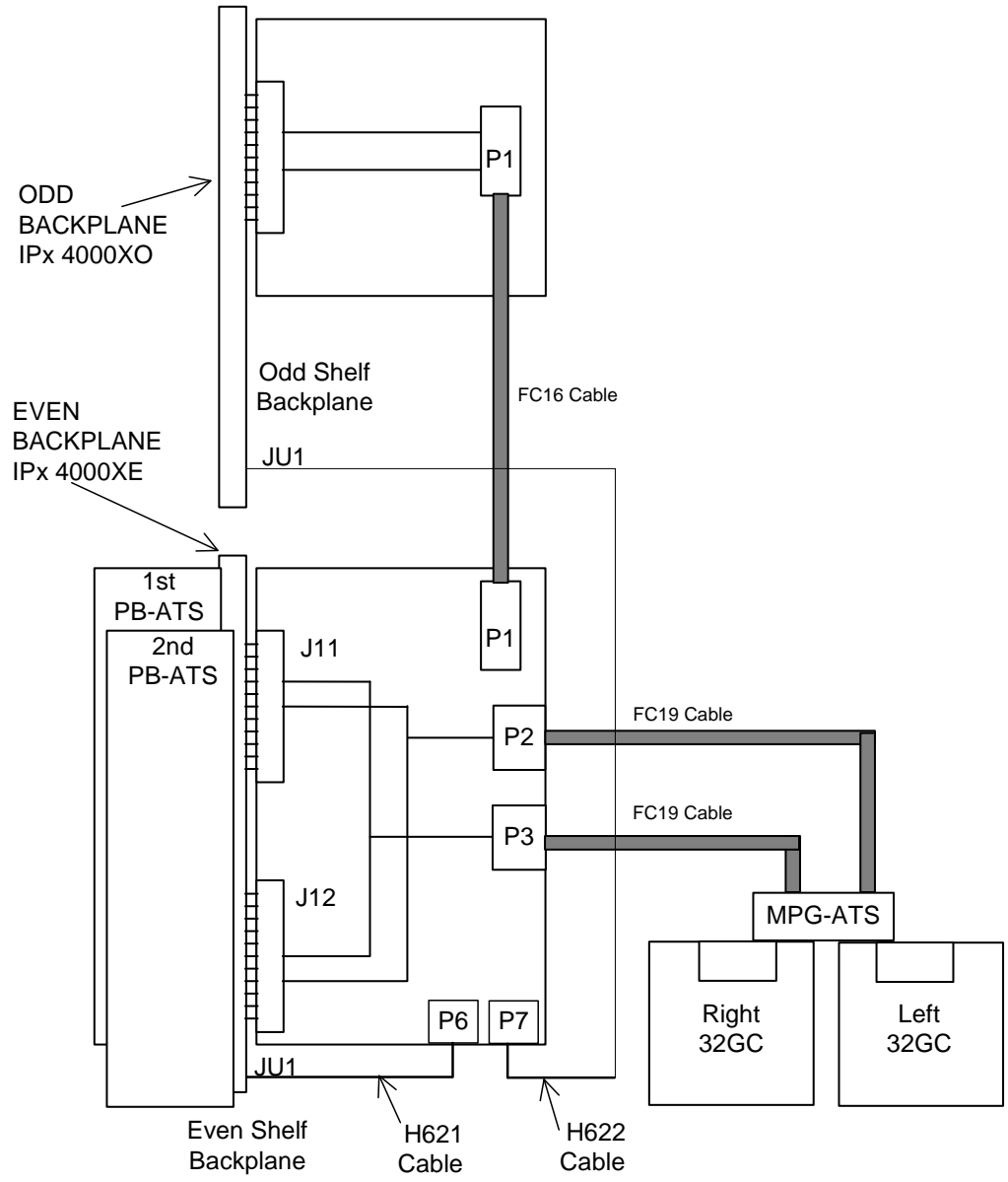
7 Cabling between the Control and Peripheral Shelves

The 32GC is the heart of the Coral IPx 4000 system. A physical connection must be constructed between the single 32GC or both 32GC cards and each peripheral shelf, odd or even. The even peripheral shelves must have a hard-wire connection between the PB-ATS cards and each 32GC card. These connections are implemented via FC19 cables between the 32GCs piggybacked backplane card, the MPG-ATS and the PB-ATSs backplane card, the PBD-ATS. The odd shelves make their connection to the MPG-ATS via a PBD24S (located on the backplane of the odd shelf) connected to their related PBD-ATSs on the even shelf via FC16 (100cm) or FC18 (50cm discontinued) cables. See [Figure 2-17](#) for a wiring schematic.

The arrangement of these connections define the shelf numbering mainly used for the Programming Interface Updates and Displays. See [Peripheral Shelf Numbering beginning on page 6-29](#) for shelf numbering descriptions.

Main Cabinets (i.e., cabinets containing a Control Shelf) are shipped with factory installed cabling between the main cabinet peripheral shelves and the Control Shelf. The technician is required to wire the peripheral shelves from the other cabinets to the Control Shelf. The hard wire connections are described below.

Figure 2-17 Backplane Wiring Schematic for Peripheral Shelves to Control Shelf



MPG-ATS to PBD-ATS Connections

The MPG-ATS piggyback card on the Control Shelf backplane provides two sets of connectors for each of the peripheral shelf units. Each set contains connectors marked:

- **P1 to P8** corresponding to the 32GC installed on the right side of the Control Shelf. These are wired to P3 of each PBD-ATS.
- **P9 to P16** corresponding to the 32GC installed on the left side of the Control Shelf. These are wired to P2 of each PBD-ATS.

Wiring between the MPG-ATS and PBD-ATS

1. Locate the even shelves that have not yet been connected to the MPG-ATS by searching for unconnected PBD-ATS cards on the system backplane. At least one FC19 cable is required for each even shelf.

For Redundant systems (i.e. two 32GCs installed on the Control Shelf), two FC19 cables are required for each even shelf not yet connected.

2. Connect one side of a FC19 cable to the next free MPG-ATS P1, P2, ..., P8 connector by pushing it onto the pins until the connector *locks* onto the pins.

*For Redundant systems, connect another FC19 cable to its **Pn** pair (between P9 and P15) with the same Unit number as the first.*

The MPG-ATS connectors are paired as follows:

P1 and P9: Unit 0	P5 and P13: Unit 4
P2 and P10: Unit 1	P6 and P14: Unit 5
P3 and P11: Unit 2	P7 and P15: Unit 6
P4 and P12: Unit 3	P8 and P16: Unit 7



NOTE:

*For a completely non-blocking system, the manufacturer recommends connecting Unit 3 (P4 and P12) **only** for systems with more than 14 shelves. Additionally, the technician should avoid installing the following cards in **slots 1-4 of Peripheral Unit 3 (shelves #6 and 7)** in the Coral IPx 4000: 24SA, 24SLS, 24SDT, 24SFT, 30T/x, T1, PRI-24, PRI-30, IPG, UGW, UGW-E, and PUGW.*

3. The MPG-ATS card is surrounded by ground leads for each **Pn** connector. Connect the FC19 ground wire to the closest GNDn lead, see [Figure 2-19](#).
4. Connect the other side of the first FC19 cable to the next available PBD-ATS **P3** connector until locked into place.

*For Redundant systems, connect the other side of the second FC19 cable to the same PBD-ATSs **P2** connector.*

5. The PBD-ATS has ground leads for the FC19 cables. Connect the ground wire to the closest GNDn lead on the PBD-ATS for each **P2** and **P3** connection, see [Figure 2-20](#).

**NOTE:**

When connecting the MPG-ATS or PBD-ATS **Pn** cables, always ensure that each Pn connector has its ground wire attached to the closest available ground lead, **GNDn**, see [Figures 2-19](#) and [2-20](#).

PBD-ATS to PBD24S Connections

The odd peripheral shelves (those containing no PB-ATSs) are connected to the 32GC via their respective even shelves (those containing a PB-ATS). The odd shelf is connected to the even shelf via a FC16 cable on the shelves backplanes, see [Odd or Even Shelves on page 6-29](#) for determining odd and even shelves.

1. Locate the PBD24S cards not already connected to an even shelf. One FC16 cable is required for each card.
2. Connect one side of the FC16 cable to **J1** on the PBD24S by “locking” it onto the card pins.
3. Connect the other side of the FC16 cable to **P1** on the even shelf above or below this shelf, see [Figure 2-18](#).
4. Repeat this procedure for each “unconnected” odd shelf.

Figure 2-18 **PBD24S to PBD-ATS Cabling**

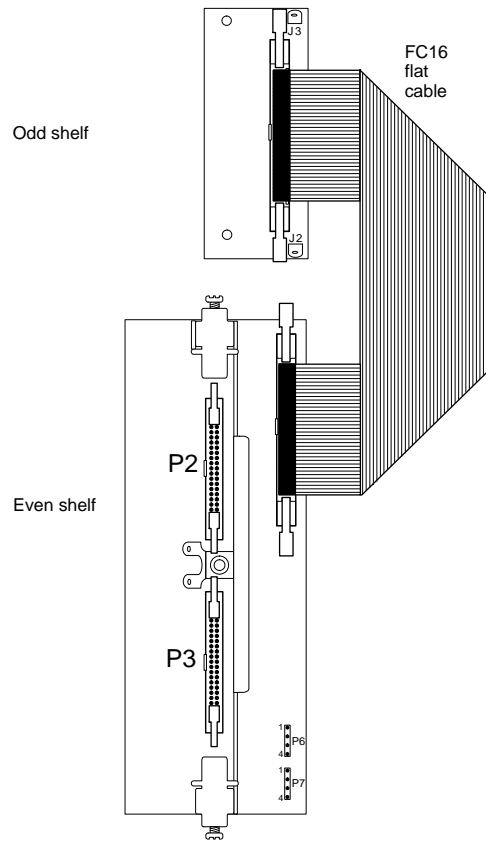


Figure 2-19 MPG-ATS with Ground Connections

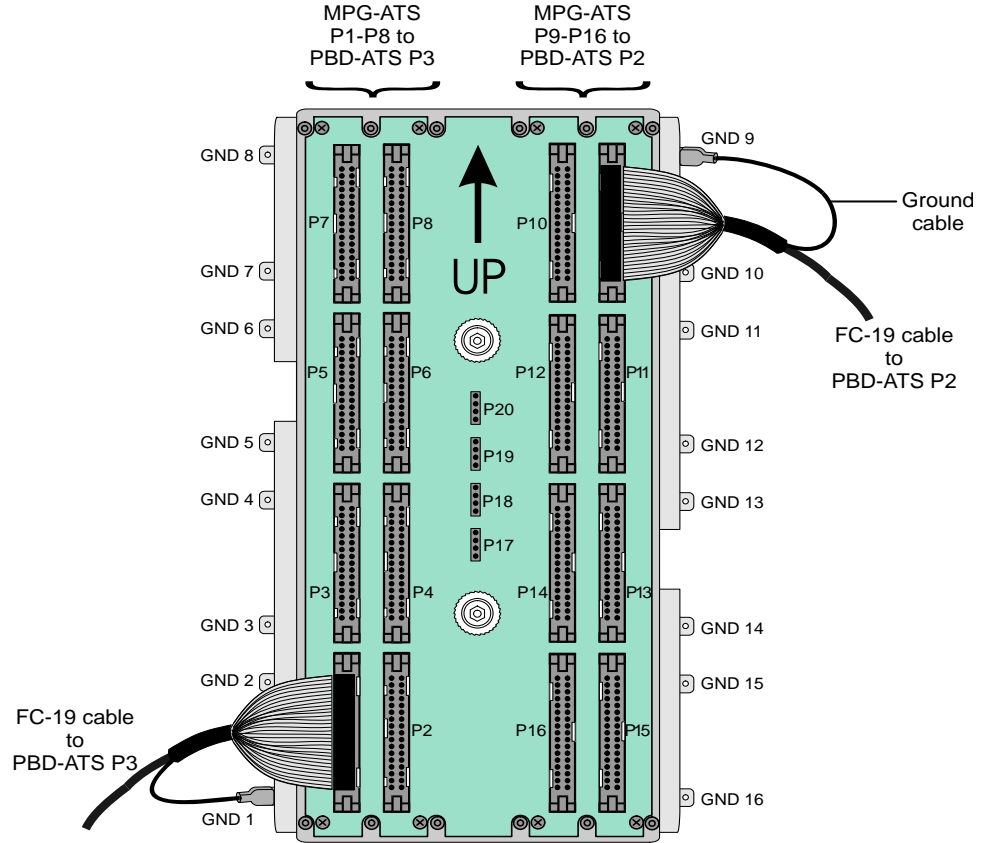
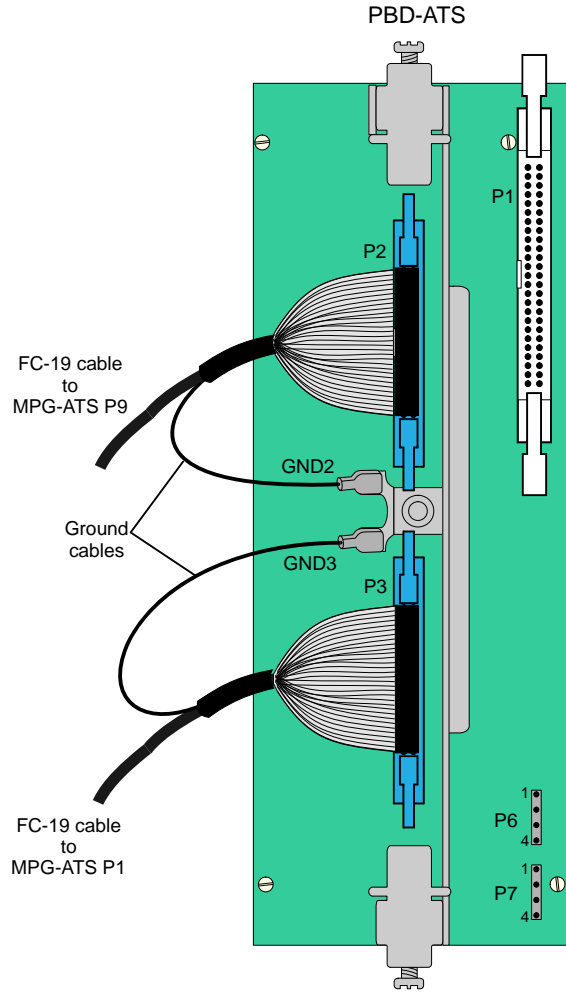


Figure 2-20 **PBD-ATS**
Ground Connections





2.3 Program Interface Device Connection

1 Device Connection

The Program Interface (PI) is a detailed, menu-driven, interface system for programming the Coral system. It also provides access to the diagnostic facilities contained within the system software.

The PI can be accessed through any of the following types of connecting devices:

- video display data terminal
- keyboard send/receive (KSR) printer data terminal
- a data terminal and modem
- PC with VT emulator
- PC with CoralVIEW Designer (CVD)
- PC with CoralVIEW Administrator (CVA)

The Program Interface (PI) menu driven interface enables the technician to update the system software backup and restore the system database and view system components as needed.

The data terminal or personal computer used as the Program Interface (PI) device must meet the following requirements:

- RS-232E asynchronous serial interface with data rate capabilities of 19200, 9600, 4800, 1200, or 300 bps, or 8 data bits, 1 stop bit, and no parity bit or EVEN, ODD, mark, space, and parity.
- ASCII character set compatibility
- Ground connected to the same the same building entrance ground as the Coral system.

Installing the PI Device

1. If the system is to have a dedicated PI device left on-site permanently, unpack this device and prepare it for operation. Set the interface for a data rate of 9600 bits per second, 8 data bits, 1 stop bit, and no parity bit. (These are the default settings for all serial programming ports of the Coral system.) The data rate of the KB0 programming interface is set automatically by the PI at 9600 bps.
2. Determine the connector type and pin assignments for the data interface of the PI device. Most data terminals use a 25 pin DB-25P (male) or DB-25S (female) connector, with pin assignments as shown in [Figure 2-21](#). Most personal computers use a DB-25P or DA-9P connector for the serial interface, with pin assignments as shown in [Figure 2-21](#) or [Figure 2-22](#).
3. Obtain or prepare a serial data cable to connect the PI device to the KB0 serial programming port on the front panel of each MCP-ATS card. The KB0 port end of the serial programming cable requires a male DB-25P style connector, wired as shown in either [Figure 2-21](#) or [Figure 2-22](#).

If the PI device uses a DB-25P or DB-25S connector, wire the connectors according to the diagram in [Figure 2-21](#). If the PI device is a personal computer equipped with a DA-9P connector, wire the connectors according to the diagram in [Figure 2-22](#).

WARNING!

Electrical Hazard. Grounding interconnected equipment to different building entrance grounds could cause shock, burn, or death. Before connecting the PI device and the Coral system, verify that they are both connected to the same building entrance ground.

4. Route the serial data cable from the PI device to one of the cable entry ports in the top or bottom left rear of the cabinet. Lace the serial data cable together with other cables entering the cabinet. Pass the end of the serial data cable from the rear of the cabinet to the front by placing the connector on the rear of the sloped reinforcement bar between the cabinet side panel and the card cages, and letting the end of the cable slide down the incline to the front. Leave approximately 24 inches (60cm) of cable on the front side of the cabinet to reach the front panel of the MCP-ATS card installed on the Common Control shelf without interfering with the insertion or removal of any circuit cards or power supplies.

Figure 2-21 PI DB9 Terminal to KB0 Connection

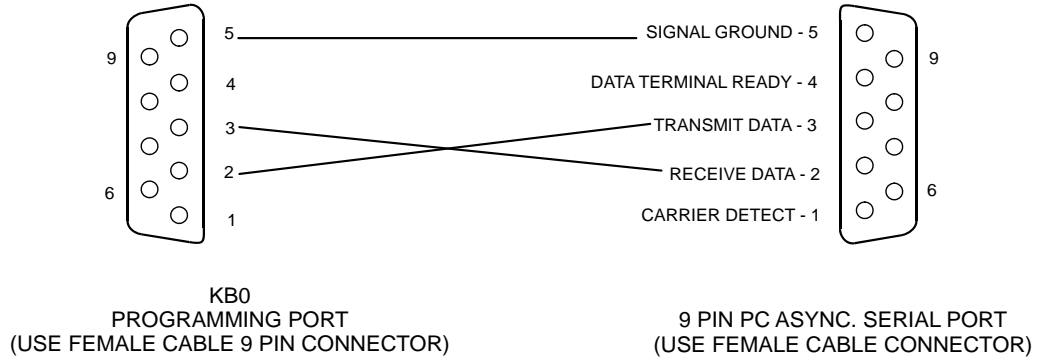
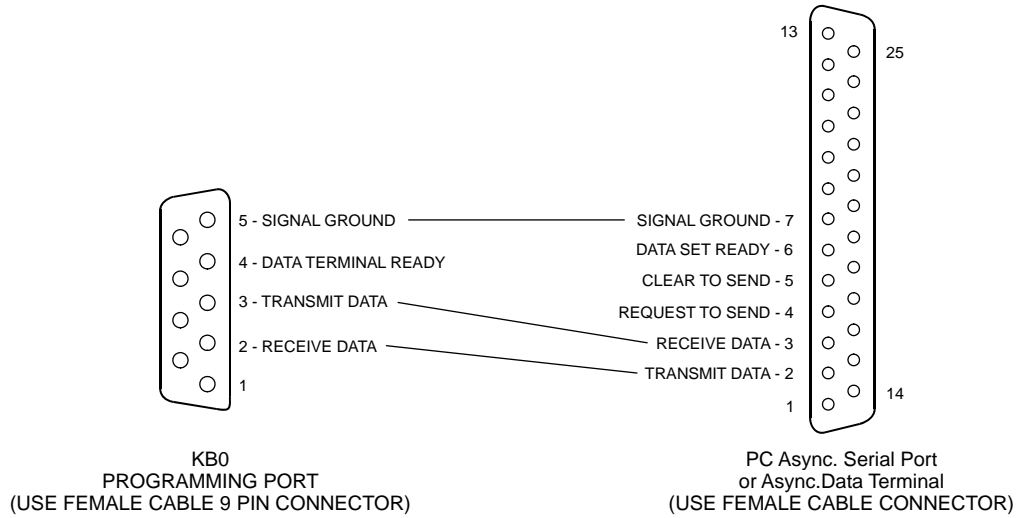


Figure 2-22 PI DB25 Terminal to KB0 Connection



NOTES:

Chapter 3

Initial Power-Up Tests

Coral

3.1	<i>Power Supply Test</i>	3-1
3.2	<i>Common Control Test</i>	3-9
3.3	<i>Shared Service & Peripheral Interface Card Test</i>	3-21

3.1 Power Supply Test

1 General

This chapter provides information about initial tests that must be performed when first installing a Coral system.

Use a Digital Multi-Meter (DMM) to perform the following voltage measurements.



NOTE:

In the following tests, no measured voltages should be zero. If a zero (0) voltage reading is shown, check the meter settings and verify that the leads are connected properly. If, after checking the meter and connections, a zero voltage reading remains, the associated power supply is faulty and must be replaced.

CAUTION!

Before proceeding, verify that all internal power supplies (PS19 DC, PS19 DC-D and PS-ATSS) and circuit cards in the Coral system are only partially inserted into their respective card slots, with the front panels protruding approximately 1 inch (2.5cm) from the front of the card cage.

*Also, turn off **ALL** peripheral power supplies: PS19 DC and PS19 DC-D units. These are to be switched on only after at least one Control Shelf PS-ATS is powered.*

2 Power Input

Connecting the External Power Supply

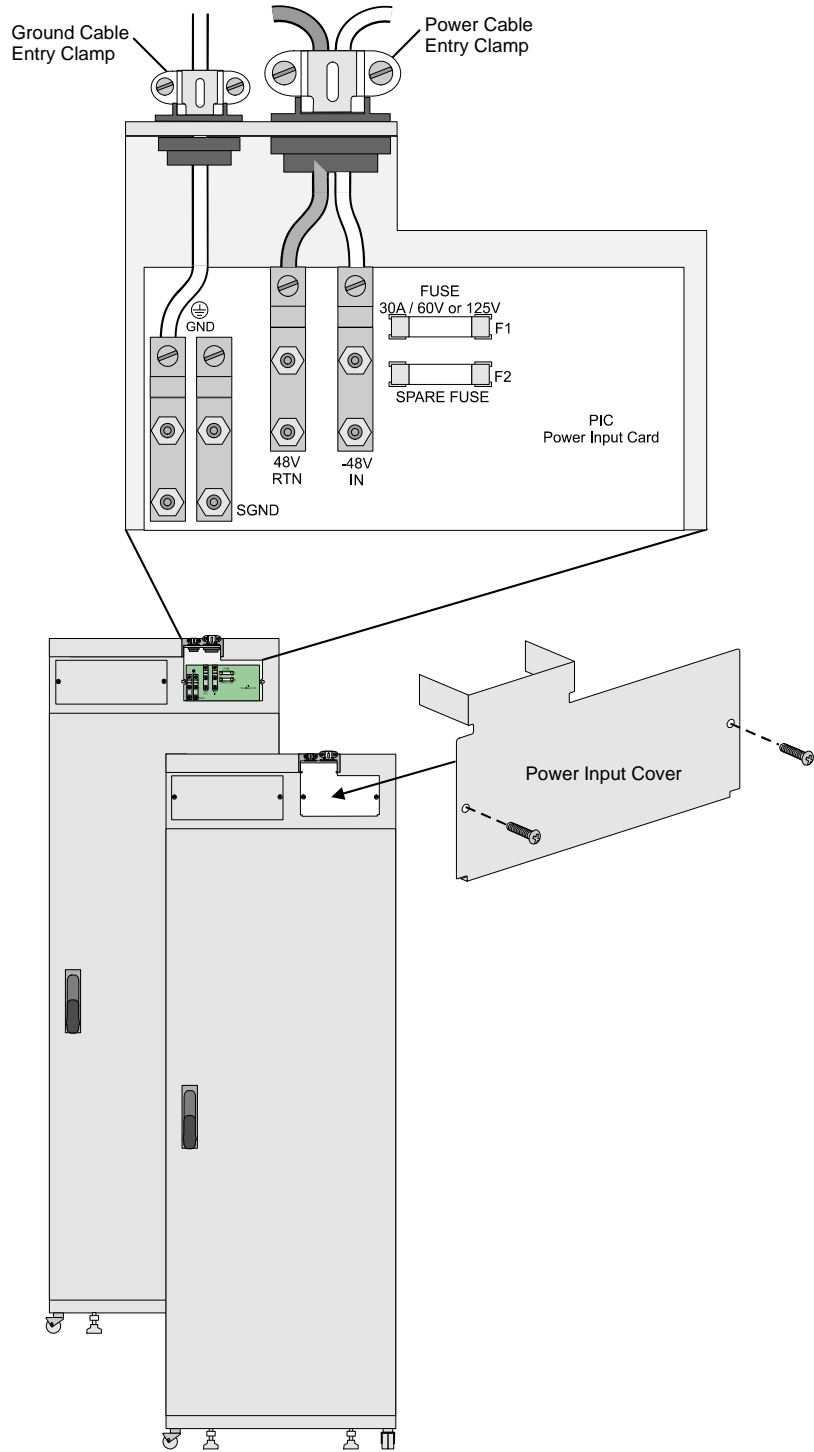
1. Turn ON the external 48VDC or battery charger and close any fuse or circuit breaker required to supply 48VDC to the Coral cabinet.
2. Measure the voltage entering the Power Input terminals located in the upper left corner of the rear of the cabinet. Connect the positive lead of the DMM to the 48V RTN IN terminal and the negative lead to the -48V IN terminal. The reading must be approximately +48 volts DC. Refer to [Figure 3-1](#).

CAUTION!

If a minus sign (–) appears in the meter display, the polarity of the 48VDC power to the cabinet is reversed. Verify the meter settings and connections. If the meter is properly set and connected, carefully examine the wiring between the external 48VDC power supply and/or batteries, determine the location of the polarity reversal, and correct the wiring error before continuing.

3. Place the power input cover over the power input cavity. Refer to [Figure 3-1](#).
4. Insert the two screws into the power input cover and tighten them.
5. Push the front and rear decorative panels into place.
6. Repeat the above steps for each Coral cabinet in the system.

Figure 3-1 Power Input Terminals



3 Common Control Power Supply Test

PS-ATS Power-Up Verification

The PS-ATS units, see [Figure 3-2](#), installed on the control shelf are completely independent from each other. One unit is sufficient to power the entire control shelf. There is no test to verify the power output.

1. Forcibly push each PS-ATS unit back into its slot. See [PS-ATS beginning on page 7-39](#) for more information on the PS-ATS units.
2. The technician must only verify that the green POWER indicator on each PS-ATS front panel is illuminated and that the red FAIL indicator is off *after* power is applied to the Control Shelf.
3. Fasten the four captive screws on each corner of each PS-ATS to secure it into place.

Figure 3-2 **PS-ATS**
Front Panel: Upright
Position



4 Peripheral Shelves Test

The PS19 DC and PS19 DC-D units, shown in [Figure 3-3](#), power the Coral peripheral shelves/cages. The PS19 DC-D can power two adjacent cages when an H719 DC-D cable is connected from the rear of the power supply to the Power Supply Duplication connector on the rear backplane of the adjacent cage, see [PS19 DC-D Duplication Check on page 3-5](#).

PS19 DC and PS19 DC-D Verification

Verify the PS19 power output by verifying that the green power LED is lit when the power supply is turned on, by following the procedure listed below:

1. Verify that the PS19 power switch is turned OFF.

CAUTION!

Inserting the PS19 into its slot when its power switch is ON can result in a sudden surge voltage that could damage the Coral system.

2. Slide the power supply gently, but firmly, until fully inserted into the card cage. A slight resistance should be felt as the multi-pin connectors engage at the rear of the power supply and backplane.
3. Secure the PS19 unit to the cage. The secured screws ground the PS19 to the cage.
4. Turn ON the PS19.
5. Verify that the green POWER indicator on the front panel is illuminated and that the red ALARM indicator is off.
6. Turn OFF the power switch on the front panel of the PS19.

5 PS19 DC-D Duplication Check

The purpose of this procedure is to check that the PS19 DC-D card is capable of supplying power to another cage via a H719 DC-D cable (Catalog Number 7244-8001907).

The PS19 DC-D card may be arranged in either of the following manners.

- Economical PS19 DC-D

If the system includes one PS19 DC-D card for every two cages, insert at least one peripheral card into the cage that does NOT include the PS19 DC-D card. Verify that the shared service card or peripheral card initializes after the PS19 DC-D is turned on following the general procedure described in [PS19 DC and PS19 DC-D Verification on page 3-5](#).

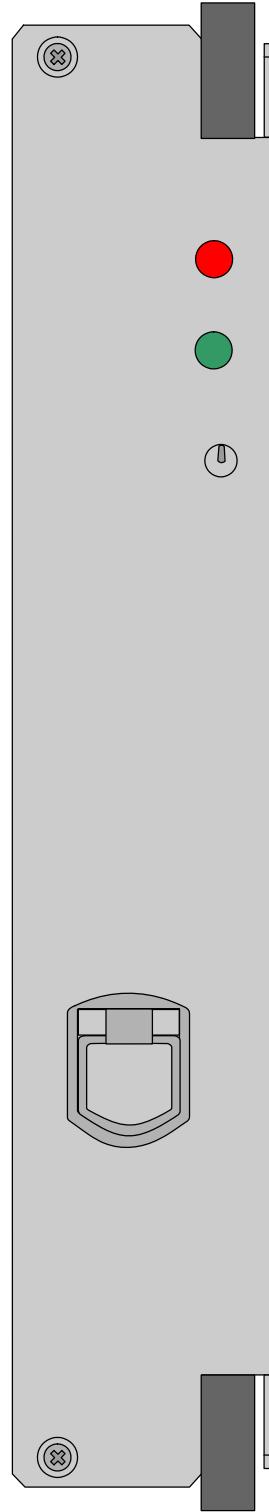
- Redundant PS19 DC-D

If the system includes a PS19 DC-D for every cage (for redundancy), remove the H719 cable from the rear panel of one of the cages, and insert at least one peripheral card or shared service card into a cage slot. Reconnect the H719 cable. Verify that the card initializes after the PS19 DC-D is turned on following the general procedure described in [PS19 DC and PS19 DC-D Verification on page 3-5](#).

Figure 3-3 **PS19 DC**
and **PS19 DC-D** -
Peripheral Power
Supplies



PS19 DC



PS19 DC-D

NOTES:

3.2 Common Control Test

CAUTION!

Circuit cards contain static-sensitive circuitry and may be damaged or destroyed by electro-static discharge (ESD). Before handling circuit cards attach the static dissipating wrist strap to the system ground terminal pole and tighten with the wing nut.

1 Card Initialization

Follow the procedure below to initialize the system cards:

1. Remove power from the Coral system.
 - For Systems without external batteries —
Disconnect AC power from external 48V power supply.
 - For Systems with external batteries —
Turn off the circuit breaker or remove the fuse supplying 48VDC to the cabinet.
2. Verify that all the Peripheral Power Supply Units (PS19 DC-D and PS19 DC-D) are turned off.

- Prepare 32GC
3. Carefully extract the 32GC card from its slot, see [Extracting Control Circuit Cards on page 2-37](#).

Locate a desk or table upon which to place the card. If the top surface might be damaged by sharp objects, place a protective sheet of cardboard or similar material over the top surface. Next, place an anti-static sheet (the card's plastic shipping bag will suffice) over the desk or tabletop.

4. Place the 32GC card on the anti-static sheet.
5. Carefully remove the plastic insulation from under the bottom of the lithium battery on the 32GC card.

- Attach XMM* **6.** A 4/8XMM card is required when installing CLA-ATS card in the system or when the system requires more RAM memory. When a 4/8XMM card is required, attach the XMM card as described in [Attaching the 4/8XMM Card on page 8-76](#).
- Insert 32GC* **7.** Reinsert the 32GC card fully into its slot by following steps [8](#) to [17](#).

**NOTE:**

Repeat Steps [3](#) to [7](#) for the second 32GC located on the Control Shelf.

- 8.** Verify that the slot in the control cage chassis matches the card to be installed. Card types are marked under and above each of the card slots. On the top and bottom of each card slot there are coded keys to match corresponding coded keys on the top and bottom of each card so that an incorrect card may not be inserted.
- 9.** Verify that the card is oriented correctly:
- For the right side of the control shelf, insert cards up-right.
 - For the left side of the control shelf, insert cards upside down.
- 10.** Grasp the injector/ejector levers on the top and bottom of the card's front panel, with one hand on the top lever and the other hand on the bottom lever.
- 11.** Align the edges of the circuit card with the card edge guides in the card cage.
- 12.** Gently slide the card straight into the card slot. Resistance is felt as the multi-pin connectors on the circuit card meet mating connectors on the backplane and engage.
- 13.** Push the injector/ejector levers inward until the front panel of the card is flush with the front frame of the card cage. Do not force the circuit card into the slot. If increased resistance is encountered, remove the circuit card and examine the connectors for bent pins or interfering debris.
- 14.** Verify that the card is sitting properly in its slot.
- 15.** Secure the card to the control cage chassis, by fastening the screws in the appropriate holes located above the upper lever and below the lower lever.
- Verify 32GC Dip Switch Position* **16.** Verify the positions of the DIP switches on the front panel of the 32GC card. They all should be pointing away from the numbers.
- Attach SAU* **17.** The SAU device and its corresponding CFD memory card are shipped in their own Coral Software box. Two separate Coral Software boxes are provided for HSB systems, one for the right side of the Control Shelf, and one for the left side.

18. Verify that the serial number of the SAU matches the serial number on the CFD card inserted in the MCP-ATS on *this* side of the control shelf. The numbers must match exactly, otherwise the system will automatically shut down after two weeks. Contact your Coral manufacturer's representative if the numbers do not match.

Attach the SAU to its connector on the front panel of the 32GC. Use a #2 (1/8" or 4mm) straight-blade screwdriver to tighten the two screws securing the SAU until just snug.

- Prepare MCP-ATS* 19. Carefully extract the MCP-ATS card(s) from the slot, see [Extracting Control Circuit Cards on page 2-37](#).



NOTE:

Repeat this procedure for the second MCP-ATS located on the control shelf.

Locate a desk or table upon which to place the card. If the top surface might be damaged by sharp objects, place a protective sheet of cardboard or similar material over the top surface. Next, place an anti-static sheet (such as the card's plastic shipping bag) over the desk or tabletop.

20. Place the MCP-ATS on the anti-static sheet.
21. Insert the appropriate compact flash memory (CFD) disk into the drive on the MCP-ATS card. The Serial number printed on the front of this CFD must match the serial number for the SAU that was attached to the front panel of the 32GC on this side of the Control Shelf, see step 17.

- Reinsert MCP-ATS* 22. Reinsert each MCP-ATS fully into its card slot by following steps 8 to 15.

- CLA-ATS (Optional)* 23. Certain system configurations require a CLA-ATS card. Remove the CLA-ATS from its packaging.



NOTE:

Repeat this procedure for the second CLA-ATS to be inserted on the control shelf.

Locate a desk or table upon which to place the card. If the top surface might be damaged by sharp objects, place a protective sheet of cardboard or similar material over the top surface. Next, place an anti-static sheet (such as the cards' plastic shipping bag) over the desk or tabletop.

24. Place the cards on the anti-static sheet.
25. If not already installed, insert the appropriate compact flash memory (CFD) disk into the drive on the CLA-ATS card side (see [CFD - Compact Flash Memory Disk on CLA-ATS Card, page 8-96](#)).

26. Verify that the jumpers straps on the CLA-ATS card are connected as required (see [Card Layout, page 8-88](#))

27. Insert each CLA-ATS card fully into its slot by following steps 8 to 15.

Connect PI 28. Attach a Program Interface (PI) device cable to the KB0 programming port connector on front panel of each MCP-ATS. Verify that the PI device is configured to match the data rate, word length, parity, and stop bits of KB0. Default settings for KB0 are 9600bps, 8 data bit, no parity, and 1 stop bit, respectively.

Supply System Power 29. Supply power to the Coral system by reversing Step 1 above.

Power OK? 30. Verify that the PS-ATS units are functioning properly, i.e., the green POWER indicator on each PS-ATS front panel is illuminated **and** the red FAIL indicator is off.

Fans OK? 31. Verify that the fans are working properly. Otherwise, if the fan cage or one of the fan fuses must be replaced, see [Fan Tray beginning on page 8-15](#).

PI Messages 32. Verify that the following messages appear on the PI device during system start-up.

Two separate PI devices are required for the IPx 4000/R - Hot Standby system. The PI device connected to the MCP-ATS on the right side of the control shelf is, by default, the **Active** side while the PI Device connected to the MCP-ATS on the left side of the control shelf is, by default, the **Standby** side. Each side's messages are received simultaneously and are presented below.

The version number of the generic feature software is indicated where the x's appear in the line that reads "CCS xx.xx.xx."

If the version number shown on the PI device does not match the version number printed on the CFD disks supplied with the system, perform the procedure described in [Generic Feature Software beginning on page 4-1](#), to install a new generic software version on the CFD card.

Loading ...

OMF 80286/80386 LOADER V2.01

Copyright 1992, Tadiran Corporation

Loading /work/k.om8

Loading /work/d.om8

Loading /work/au.om8

Loading /work/p.om8

End Loading File...!

Start Build Checksum
End Build Checksum
Start Set CC
END Set CC
CHECKING SAU #
END CHECKING SAU #
CHECKING ATS CONTROLS
END CHECKING ATS CONTROLS
Check Patch Flag...!
Patch Loaded...!
Start Set CC
END Set CC
CHECKING SAU #
END CHECKING SAU #
CHECKING ATS CONTROLS
END CHECKING ATS CONTROLS
CHECK CHECKSUM...
END CHECK CHECKSUM
Attaching Device.....
Attaching Files.....
This is a HOT STAND BY SYSTEM
Initializing CCS ...
First Initialization starting
First Configuration phase completed
Partial initialization phase starting
HSB SYSTEM CONFIGURATION ESTABLISHED
This is the ACTIVE side
32/16GC BROADCAST RESET ...
System configuration identified
Initializing CLA card
CCS is on the air
(ROOT)
CCS xx.xx.xx (ACTIVE)
Copyright (c) 2001-yyyy
NAME - (site name)
SAU # -
(date and time)
Join process began

Join process succeeded

The Standby side loads first as a FAULTY system and after a few seconds switches to Standby mode. The following messages reflect this situation.

```
Loading ...
OMF 80286/80386 LOADER V2.01
Copyright 1992, Tadiran Corporation
Loading /work/k.om8
Loading /work/d.om8
Loading /work/au.om8
Loading /work/p.om8
End Loading File...!
Start Build Checksum
End Build Checksum
Start Set CC
END Set CC
CHECKING SAU #
END CHECKING SAU #
CHECKING ATS CONTROLS
END CHECKING ATS CONTROLS
Check Patch Flag...!
Patch Loaded...!
Start Set CC
END Set CC
CHECKING SAU #
END CHECKING SAU #
CHECKING ATS CONTROLS
END CHECKING ATS CONTROLS
CHECK CHECKSUM...
END CHECK CHECKSUM
Attaching Device.....
Attaching Files.....
This is a HOT STAND BY SYSTEM
Initializing CCS ...
First Initialization starting .....
First Configuration phase completed .....
Partial initialization phase starting
```

HSB SYSTEM CONFIGURATION ESTABLISHED

This is the INACTIVE side

System configuration identified

CCS is on the air

(ROOT)

CCSxx.xx.xx (FAULTY)

Copyright (c) 2001-yyyy

NAME - (site name)

SAU # -

Join process began

(date and time)

Changing configuration to STANDBY

(ROOT)

CCS xx.xx.xx (STANDBY)

Copyright (c) 2001-yyyy

NAME - (site name)

SAU # -

Join process succeeded



2 32GC Card Lithium Battery Test

If the start-up tests detect that the voltage level of a lithium back-up battery on the 32GC or the 4/8XMM card is insufficient to reliably maintain the memory contents in the event of power failure, the following messages are displayed on the PI terminal.

Battery Alarm Message	Message Description	Action:
LOW BATTERY ON 32GC	The 32GC Card Battery holds an insufficient voltage level.	These cards continue to function even with the low battery voltage. However, if the system voltage drops, the battery will not support system backup. Therefore, when any of these batteries is low, the technician should create a backup copy of the database until which time the low functioning battery can be replaced.
LOW BATTERY ON XMM UP	4/8XMM Card Battery, for the upper (the second) 4/8XMM, holds an insufficient voltage level.	
LOW BATTERY ON XMM DOWN	4/8XMM Card Battery, for the 4/8XMM installed directly upon the 32GC, holds an insufficient voltage level.	

A *Low Battery* message indicates that the database should be saved and the batteries replaced at the first possible opportunity.

CAUTION!

If any of the above messages appear at any time, the system database is in jeopardy of being lost during a power failure to the Coral system.

To ensure that the system database is not lost, copy the system database to the CFD card, via the Database Controls (*Route: ROOT,0,10,2,0,0*) branch of the system database. See [Saving the System Database on page 4-4](#). The database copying process takes up to one minutes to complete. Should the system lose power or reset for any reason and the database be lost from memory, the system will copy the database from the CFD into the system database memory as the system restarts.

Once the system database is safely stored on the CFD, power to the Coral system may be turned off at a time that will provide the minimum interruption of service to the user. At that time the card battery (or batteries) may be replaced, and the system

restarted. Verify that the CFD is installed in the MCP-ATS as the system starts, so that the system can read the database from the diskette back into database memory.



NOTE:

When replacing the lithium battery, insert the new battery with the + (positive) symbol appearing on top.

WARNING!

Explosion and Environmental Hazards.

There is a danger of explosion if the battery is replaced incorrectly.

Replace the battery only with the same or equivalent type recommended by the manufacturer.

Dispose of used batteries according to requirements specified by the battery manufacturer and/or local regulatory agencies.

NOTES:



3.3 Shared Service & Peripheral Interface Card Test

CAUTION!

Handling Procedures - Each card contains circuitry which is sensitive to electrostatic discharge (ESD). Failure to observe safe handling procedures for static-sensitive circuitry may result in permanent damage to a card.

Note that there is an anti-static wrist strap at the top of the cabinet above the card cage. This wrist strap should be worn while inserting, removing, or handling any card in the system.

CAUTION!

Before proceeding, verify that all the Peripheral Power Supply Units (PS19 DC and PS19 DC-D) are turned off!

After the software has been installed and initialized:

1. Check the position of Shared Service and Peripheral Interface cards that will be inserted into the system card cage. Observe any order previously directed by a System Designer or any established convention of the distributor. Use the Card Placement Diagram, as described in [Peripheral Card Placement beginning on page 2-32](#).
2. Fully insert the Peripheral Power Supply units into their slots if this has not already been done, and turn them on.

CAUTION!

Turn on the PS19 DC and PS19 DC-D units only after powering the Control Shelf and verifying that the Control Shelf has initialized properly, otherwise the cards in the peripheral shelves may not initialize.

3. If there are PS19 DC-D peripheral power supply units that are to support two adjacent cages, connect the H719 DC-D cable between the rear of the PS19 DC-D unit and the Power Supply Duplication connector located on the rear backplane of the adjacent shelf to be supported. See *Figure 7-8*.
4. Insert the cards fully, one by one, similar cards in adjacent card slots, so that the installation takes a logical appearance with a uniform Numbering Plan (i.e., the first line card fully inserted is assigned the first available line numbers by the Numbering Plan).

Gently slide the card straight into the card slot. A slight resistance is felt as the multi-pin connectors on the circuit card meet mating connectors on the backplane and engage. Push against the extractor levers until the front panel of the card is flush with the front frame of the card cage. Do not force the circuit card into the slot. If more than slight resistance is encountered, remove the circuit card and examine the connectors for bent pins or interfering debris.

5. The red diagnostic LED on the front panel (near the top of the card) should illuminate on all cards. The LED remains illuminated steadily until the card receives a card database from the system. After a few seconds, the LED should extinguish. The extinguished diagnostic LED indicates that the card has been properly initialized.

If the LED remains on steadily for more than two or three minutes, either there is a conflict with the system database or the card may be faulty. Refer to the *Coral Service and Peripheral Cards Installation Manual* for further details on LED indication.

6. Attach the Program Interface (PI) device cable to the KB0 programming port connector on front panel of MCP-ATS if not already attached. The installation of Shared Service and Peripheral Interface cards into a Coral system has considerable impact on the system database. Refer to the *Program Interface & Database Reference Manual* for more information. Using the PI, verify that each of the parameters detailed below contain the appropriate information.
7. Verify that the cards are identified properly in the Card List (*Route: CLIS*) branch of the system database. Both **i_type** and **p_type** fields should show the required card name. In addition, an ACTIVE message in the **status** field indicates that the card has been properly initialized. If the **i_type** field lists a different card type or a CARD REPLACED message appears in the status field, then the card slot has been previously initialized by a different card type. That card must be relocated to a clear card slot (**i_type** field shows

NO_CARD) or the current card slot assignment must be cleared. To clear the card slot assignment, remove the card from its slot, enter NO_CARD in the **i_type** field, then reinsert the card and verify that it initializes as described above.

A **status** field display of NO_RESOURCES indicates that the system Sizes are insufficient to support the card.

A **status** field of UNAUTHORIZED indicates that there are not enough SAU ports.

The different card slot messages are described below in *Table 3-1*. For a complete list of card slot status messages, see Chapter 6 in the *Program Interface & Database Reference Manual*.

Table 3-1 Card Slot Status Messages

Displayed Message	Description	Technical Recommendations
ACTIVE	Initialization was successfully completed.	None
ACTIVE/P	Card is partially active because there are not enough resources to support the other sub circuits on an 8DRCF, 8DRCM, 8DRCM-2 card or not all tone generators are being used on the iDSP card.	Readjust SIZES to support unsupported sub circuits for 8DRCF, 8DRCM, 8DRCM-2 card. Partial Active for the iDSP card is not critical. Readjust the parameter value only when needed.
REPLACED	P_TYPE and I_TYPE are not compatible.	Install proper card or enter NO_CARD in the I_TYPE option.
WAIT_DB	Card has not received database, or has not reported initialization.	Continue waiting
NO_RESOURCES	Insufficient system memory to initialize card.	Check SIZES
FAULT	HDLC problem	Check HDLC wiring
UNAUTHORIZED	The SAU ports are limited and therefore the card is not authorized for use in this system.	Install an updated version of the SAU with the appropriate amount of ports added. Ask your dealer for an authorized upgrade.

Software Installation Procedure

Coral

4.1	Generic Feature Software.....	4-1
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4.1 Generic Feature Software

1 Introduction

The Coral system is delivered to the site with factory-loaded software on the Compact Flash Disk(s) located on the MCP-ATS card(s).

The generic software database for the Coral IPx 4000 is saved on a battery backed up RAM located on the 32GC card. The Compact Flash Disk (CFD) installed in the MCP-ATS (two identical CFDs are stored in both MCP-ATSs for the Hot Standby system) holds the non-volatile copy of the database.

For preparing or upgrading generic Coral software, CFD disks can be loaded with appropriate software and authorizations using the FMprog Utility. For more information about the FMprog Utility, see the *FMprog Utility Reference Manual*.

The software initialization procedure is described in [Common Control Test beginning on page 3-9](#).

The CFD is a 64MB (or more) Flash Memory card that contains three types of data:

- Generic Feature Software Version and Boot Code
- Authorization
- Database Backup

The CFD card can be inserted into a PC slot using any PCMCIA application adapter for loading a new Coral software version.

Whenever an updated version of the Coral IPx 4000 software is released, the upgrade is delivered to the sites either on a disk, e-mail, or via other electronic media file transfer. The upgrade is contained in a self-extracting compressed file, specific for the site.

The upgraded generic feature software must be extracted by a PC using the FMprog tool, and then written from the PC hard disk into the CFD card. The FMprog is a tool for Coral dealers who install, upgrade and maintain Coral systems using flash memory cards. For FMprog application, see the *FMprog PC-Utility Reference Manual*. This reference manual describes how to install and operate the FMprog-Utility.

Upgrading the Coral generic feature software involves three main steps:

1. Installing the FMprog-Utility (version 6 and later) on a PC.



NOTE:

Use FMprog version 6 and later. Otherwise, the Coral will not initialize.

2. Extracting the new Coral generic feature software file into the PC hard disk.
3. Saving the new generic software upgrade from the PC to the CFD card.

The FMprog-utility is used to backup the Coral's software into a PCMCIA CFD type card. The backup file is written in a binary format and includes all the software components of the specific Coral system from which it was copied, i.e. the Coral generic software version, the switch authorization and the database. The manufacturer highly recommends storing a copy of the current files located at each customer site. Copies should be made per customer site since each site has its unique set of software configurations, such as its main software version, switch authorization and database, as well as specific Software Authorization Unit (SAU) information. Should it be necessary to reinstate or copy system files, copies of all the system's files exist and are available for use via the FMprog-Utility.

Use the FMprog-Utility to:

- Manage the new database versions
- Load Coral Generic Versions, Authorization, and Database information onto the CFD
- Extract Version, Authorization and Database information from source files.

Upgrading the Coral Generic Version

After a CFD has been programmed with a new or upgraded software version, the Coral Generic Version may be upgraded.

To upgrade the Coral generic version, the CFD must be installed when the power to the system is shut down. For Hot Standby systems, identical CFDs must be installed in each side of the Control Shelf in each MCP-ATS, after which power may be returned to the system. See [Upgrading the Coral Version on page 4-21](#) for details.

Creating a Binary Backup of the Database

Before installing a CFD card with a new generic software version, it is strongly recommended to create a binary backup of the database. The binary backup must be done by a PC using the Binary Backup PC-Utility. The Binary Backup is a tool for Coral technicians who install, upgrade and maintain Coral systems. See the *Database Binary Backup PC Utility Reference Manual* for further details.

4.2 System Database Control

The generic software database for the Coral IPx 4000 is saved on a battery backed up RAM located on the 32GC card. The Compact Flash Disk (CFD) installed in the MCP-ATS (two identical CFDs are stored in both MCP-ATSs for the Hot Standby system) holds the non-volatile copy of the system database, the generic software and feature authorization. Therefore, when a database system restore is needed, it is restored from the CFD to the system RAM on the 32GC card.

During normal system operation, the configuration database may be saved to a file on the CFD for permanent storage. The system also may be programmed to save the database to the CFD automatically on a daily basis, at a particular time. The CFD is capable of storing up to 64MB (or more) of information.

A saved database file may be loaded at any time into the system's database memory. This is a good way to copy the database of one system into another, to change the system configuration, or restore the database into the RAM of a new 32GC memory card.

The Database Control Branch of the PI allows the technician to manipulate the DB0/DB1 files stored on the CFD as well as to define the automatic backup time and frequency.

4. Establish a PI programming session by entering a PI password.
5. Select the Database Disk menu (*Route: ROOT, 0, 10, 2, 0*) branch:

```
DISK-MENU
0-SAVE DATABASE
1-EXCHANGE DB0/DB1 (Not Used)
2-LOAD DBS
3-COPY FILES
4-SHOW DIR
5-UPDATE VERSION (Not Used)
6-AUTO BACKUP

*.
```

For more detailed information, consult Chapter 21 of the *Program Interface & Database Reference Manual*.

1 Saving the System Database

Use the *0-Save Database* Option to copy the current system database (from the 32GC RAM), at any time, to the CFD card for backup or restore purposes. For Hot Standby systems, this option may only be requested from the Active side. The database is copied to both flash memories simultaneously. After a successful Save, each PI Terminal reports which database was saved successfully. If the database was not saved successfully, a PI Alarm message is displayed on the PI terminal(s).



NOTE:

The SAVE procedure is only possible from the Active side of a Hot Standby system. However, messages indicating a successful copy appear on both system sides.

1. Verify that the system time and date are correct (press Control-T to check). Update through the Time and Date branch (*Route: TIME*) of the system database, if necessary.
2. From the Database Control Branch: Disk Menu (*Route: 0, 10, 2, 0*), press **0** to save the database to the CFD(s). The system prompts for the selection of a destination file number, either DB0.DEF or DB1.DEF, with:

DEST FILE #(0,1) -

The DB0.DEF file is used for automatic saves at a preset time each day (see [Automatic Daily Database Back-Up on page 4-10](#)), and is usually a more updated file than the DB1.DEF file. The DB1.DEF file is referred to as the *technician copy* of the database, and should be saved each time installation or maintenance personnel make changes to the database.

3. Press **0** or **1**, according to [Table 4-1](#) below, to choose to which file to save, DB0.DEF or DB1.DEF. The default entry is 0 (DB0.DEF).

Table 4-1 **CFD File Descriptions**

Database File Name	PI Entry	File Description
DB0.DEF	0	Daily back-up automatically at a preset time.
DB1.DEF	1	Technician copy for manual back-up.

At the system prompt the following parameter is displayed:

EXECUTE (Y/N) -

4. Press Y to execute the Save Database command.

In a Hot Standby system, messages for both system sides appear on the Active side's PI terminal, when the database process is completed. The same message is displayed on the Standby side:

- Active Side Message: **DBS stored to DB1.DEF.**
- Standby Side Message: **DBS stored to DB1.DEF.**

Executing a Save Command may take from a few seconds to a few minutes. Therefore, changes to the system configuration (such as changing the system to Night Service) cannot be completed during the save operation until the database save process is completed.

Press N to cancel and return to the Database Disk menu. The PI command prompt (*:) immediately returns, however the system processes the command as a background (low priority) task.

2 Loading (Restoring) the Database from the CFD

A system database stored as a file on the CFD can be loaded into the database RAM memory of the Coral system (on the 32GC card) at any time, with a system restart. For Hot Standby systems, this procedure is executed only from the Active side, however, the *Load* is performed on both system sides.

Loading a database stored on the CFD can be useful for installing the database of an existing system into the database memory of another system that has a substantially similar configuration. Similarly, a database can be created by programming a system off-line at another location — perhaps at the distributor’s facilities, then loaded at a convenient time at the intended site.

CAUTION!

Loading a database from a CFD file into the database memory destroys the original database information stored in the database memory and overwrites it with information from the CFD database file. Once overwritten, the original database cannot be recovered.

1. From the PI Database Control Branch: Disk Menu (*Route: 0, 10, 2, 0*), press **2** to load the new database. The system prompts to select a source disk file number, either DB0.DEF or DB1.DEF with:

FILE # -

2. Press **0** or **1**, according to [Table 4-1](#) above, to choose which file to load.

The system prompts:

EXECUTE (Y/N) -

3. Press **Y** to begin loading the database from the CFD, or press **N** to return to the Database Disk menu. Loading the database from the CFD file generally takes a few seconds to a few minutes depending on the system size.

After the database is loaded, the system performs a Partial Initialization and begins processing calls.

3 Copying Files on the CFD

The Copy Files option copies one database file to the other, in effect, copies DB0.DEF to DB1.DEF, or vice versa. This may be desirable after making substantial changes to the system configuration, so that the technician copy and the daily back-up copy of the database are identical.

Copying the file from one to the other is preferable to saving the database twice, since making changes to the system database are not prohibited during the copy process.

Note that the copy process cannot be used to copy a database file from one Flash card to another - only from one file to another on the same Flash card.



The copying procedure is only possible from the Active side of a Hot Standby system. However, messages indicating a successful copy appear on both system sides.

1. From the Database Control Branch: Disk Menu (*Route: 0, 10, 2, 0*), press **3** to copy one database file to the other.

The system prompts for the selection of the method used to identify files to be copied, by database file number (**0** or **1**) or by file name, with:

*0-DATABASE
1-SELECT FILE*

**:*

While either method may be used, using the database file number method is highly recommended and is the only method discussed here.

2. Press **0** to select the database file number method.

The system prompts for a source file number and destination file number, with:

SRC FILE # -

and

DST FILE # -

3. Enter **0** for the source file and **1** for the destination file to copy DB0.DEF to DB1.DEF; or **1** and **0**, respectively, to copy DB1.DEF to DB0.DEF.

At the system prompt:

EXECUTE (Y/N) -

CAUTION!

Copying one database file to another destroys the original contents of the destination file by overwriting it with the contents of the source file. The original destination file cannot be recovered once it is overwritten.

4. Press **Y** to begin the database file copy process, or press **N** to return to the Database Disk menu. The PI command prompt (*:) returns immediately, however the system processes the command as a background (low priority) task.

Copying a database file generally takes a few seconds to a few minutes depending on the system size, provided no other priority tasks are required of the Main Processor. When the copy process is completed, the system reports:

DB0.DEF COPIED TO DB1.DEF (or vice versa)

4 Viewing CFD Directory Details

A list, or *directory*, of the files stored on the CFD may be displayed to determine its contents. The CFD contains several files, including a system configuration database and other files unique to the particular installation. For a Hot Standby system, each system side may request to view its own directory.

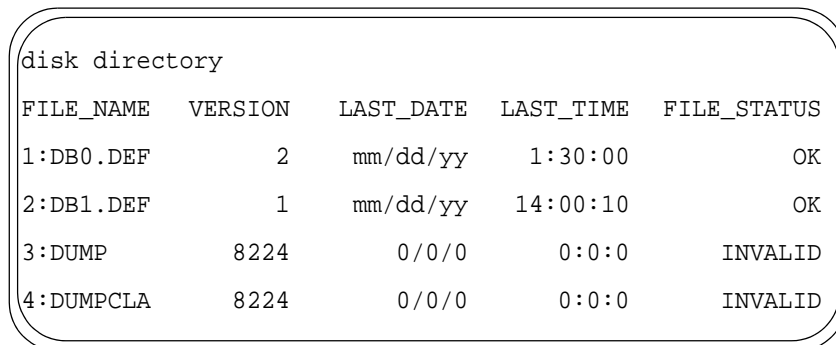
1. From the Database Control Branch: Disk Menu (*Route: 0, 10, 2, 0*), press **4** to display the CFD file directory. The system prompts:

EXECUTE (Y/N) -

2. Press **Y** to display the list of files contained on the CFD, or press **N** to return to the Database Disk menu. The PI command prompt (*) returns immediately, however the system processes the command as a background (low priority) task.

Reading the directory generally takes only a few seconds, provided no other priority tasks are required of the Main Processor. *Figure 4-1* illustrates a typical CFD directory.

Figure 4-1 CFD Directory Display



FILE_NAME	VERSION	LAST_DATE	LAST_TIME	FILE_STATUS
1:DB0.DEF	2	mm/dd/yy	1:30:00	OK
2:DB1.DEF	1	mm/dd/yy	14:00:10	OK
3:DUMP	8224	0/0/0	0:0:0	INVALID
4:DUMPCLA	8224	0/0/0	0:0:0	INVALID

The directory display lists each file on the CFD. The FILE_NAME field identifies each file. The VERSION field is a “store count” and indicates the relative age compared to other files of the same type. The lowest version number indicates the most recent, or the latest database file. The LAST_DATE and LAST_TIME fields indicate the last date (in MM/DD/YY format) and time (in HH:MM:SS format) that the file was written on the CFD. The FILE_STATUS field is valid only for database files, and indicates whether or not the file was written successfully.

5 Automatic Daily Database Back-Up

The system configuration database can be automatically saved to the CFD file at a preset time each day. Auto Backup is used to set the time of day that the system will automatically save the database to the CFD each day. During automatic daily back-up, the database is saved to DB0.DEF.



NOTE:

The Backup procedure can be requested only from the Active side of a Hot Standby system. However, the Backup will be performed on both system sides.

1. From the Database Control Branch: Disk Menu (*Route: 0, 10, 2, 0*), press **6** to set the Auto Backup time. The system prompts with the following parameter:

NUMBER OF DAYS BETWEEN BACKUPS

2. Enter the number of days between automatic backups. For example, entering 1 causes the system to automatically backup the database every day. Entering 2 causes the system to automatically backup the database every other day.

The default is set to backup every week (every 7 days).

Enter **N** to disable the automatic backups and thus enable manual backups.

3. The next parameter prompts for the time of day to perform the backup:

SET AUTO BACKUP TIME:

Enter the time of day to automatically save the system database in 24-hour format. Use 00:00 or 24:00 for midnight and 00:01 (or 24:01) to 00:59 (or 24:59) for times between midnight and 1:00 a.m. The default time is 01:30, or 1:30 a.m.



NOTE:

The technician should choose a time when call traffic is lowest.

4. The system returns to the Database Backup menu. Press **0** to return to the Database Disk menu.

6 Error Messages

In the event the system is unable to perform a particular software installation or database control function, the system generates an error message at the PI Terminal, indicating the nature of the problem. [Table 4-2](#) lists the error messages generated by failed software installation and database control functions and a brief description of the problem's cause and possible resolution.

Table 4-2 Software Installation and Database Control Error Messages

<i>Error Message</i>	<i>Cause</i>
ATTACH DB0.DEF FAILED STATUS = xx OPEN DB0.DEF FAILED STATUS = xx DETACH DB0.DEF FAILED STATUS = xx (may also specify <i>DB1.DEF</i>)	Save Database — The CFD does not have Database information.
ATTACH DB0.DEF FAILED STATUS = xx (may also specify <i>DB1.DEF</i>)	Copy Files—Copying process failed
DB0.DEF NOT OK (may also specify <i>DB1.DEF</i>)	Copy Files — The Database CFD disk does not contain a valid source database file. It is likely that the disk has never had a database saved to the source file.

NOTES:

4.3 Hot Standby Configuration Modes

1 Hot Standby System Side Definitions

The Hot Standby (HSB) Coral IPx 4000/R system is a redundant dual control system. One control is Active while the second remains in Standby mode. If the first system fails for any reason, the second, Standby system, automatically becomes Active so that there is no interruption of calls with this redundant system. The originally Active side is transferred to FAULTY mode. The faulty system continues automatic diagnostics and will automatically recover if possible.

Both the Active and Standby controls are connected to the peripheral shelves while only one connection is active (supplying all signals, e.g.: PCM, HDLC, Clock, and Sync). This mechanism is driven by redundant 32GC cards with mirrored memory connected to an ATS-BUS providing communication between the two MCP-ATS cards.

Inactive Control System

A control system becomes Inactive when the Active or Standby system either fails (Faulty mode) or is manually transferred to the Maintenance mode. In Maintenance mode, the system continues diagnostics tests, alarm activation for service calls, and reports faults to the Active system.

An Active Control system is automatically transferred to Fault mode when diagnostics determines the control system to be faulty. In this mode, the system continues performing tests and might automatically return to Hot Standby operation when normal results are observed.

The control system in Inactive Mode does not participate in the system operations and is not in Standby mode if the Active system fails.

The Coral IPx 4000 configurations shown in [Table 4-3](#) are available for HSB systems (i.e., systems with redundant 32GC cards). The technician may use the PI parameters in the HSB Branch to switch the system side modes to conform with any of these configurations. See the *HSB* branch in Chapter 21 of the relevant *Program Interface & Database Reference Manual* for further details.

Table 4-3 **HSB Configurations**

Hot Standby Configurations				
Condition	Config	Control Shelf Description	Config	Control Shelf Description
Normal	H	The Active control system is on the right and the Standby system is on the left.	H'	The Active control system is on the left and the Standby system is on the right.
Abnormal	I	The Active control system is on the right while the Inactive system (Maintenance or Faulty) is on the left.	I'	The Active control system is on the left while the Inactive (Maintenance or Faulty) system is on the right.
Single Control No Redundancy	I	An Active system Control system is on the right side of the control shelf. No system is installed on the left side.	N/A	Single Control systems are not permissible from the left side.

2 Switching between System Sides

The Active side may be on the left or right side of the Control Shelf, as displayed in the above table. All updates to the HSB system must be performed from the Active side. This may be easily determined by viewing the screen of Root Menu on the PI Terminal. The PI states which system side it is monitoring by displaying either ACTIVE, STANDBY, MAINTENANCE or FAULTY. The physical Active system side is readily viewed from the 32GC card front panel indicators for Active, Standby, Faulty or Maintenance, see [32GC Front Panel on page 8-62](#). This information can also be viewed from the HSB branch of the PI.

Determining the Physical Active System Side:

1. From either PI terminal of the HSB system, access the HSB branch by typing **HSB** from anywhere in the PI or enter **0,11** from the Root Menu.
2. The PI prompts:

0-Update

1-Display

Enter **1** to display the parameters and their current values.

3. The PI immediately displays all the parameters describing the HSB setup. [Table 4-4](#) includes a list of all the PI parameters for the HSB branch with a short description of each parameter.
4. View the following read-only parameter,

CONTROL (0,1) -

If the value for Control is **0**, the current Active side is located on the right side of the Control Shelf. If the value is **1**, it is located on the left side.

The full list of HSB PI parameters is presented in [Table 4-4](#) below.

Table 4-4 HSB - PI Parameters

<i>Parameter Name</i>	<i>Range</i>	<i>Description</i>
<i>HSB</i>	Yes/No Read-Only	Displays whether this is a Hot Standby system (Yes) or single control system (No). If this displays No, then the following parameters are not displayed.
<i>OTHER MCP EXISTS</i>	Yes/No Read-Only	Displays whether the MCP-ATS is installed on the other system side.

Parameter Name	Range	Description
<i>OTHER 32GC EXISTS</i>	Yes/No Read-Only	Displays whether the 32GC card is installed on the other system side.
<i>CONTROL SIDE</i>	0-Right 1-Left Read-Only	Shows which side is currently the Active (Control) side of the redundant system.
<i>Main Peripheral Switch Connected</i>	Yes/No Read-Only	Shows whether the peripheral cards are connected to this side of the redundant system.
<i>Last Swap</i>	Date & Time Read-Only	Displays the Date and Time of the last system swap between the Active and Standby side.
<i>Auto Hot Swap</i>	Yes/No Default: No	Defines whether or not the right and left sides should be automatically swapped by the system. Enter Yes for Auto Swap.
<i>Number of Days between Hot Swaps</i>	1 to 255; Default: 1	Defines the number of days between the swaps.
<i>Set Auto Swap Time</i>	00:00–23:59; Default: 1:00	Defines the time to perform the automatic hot swaps.
<i>Auto Maintenance Termination</i>	Yes/No Default: No	If the Standby side was manually switched to Maintenance mode, setting this parameter to Yes safeguards the system by automatically reverting the system back to Standby mode after a predetermined number of hours.
<i>Auto Maintenance Termination Time</i>	1 to 255 Hours; Default: 24	Defines the time period before the system automatically returns the Maintenance side to Standby mode.
<i>Status</i>	0-Active 1-Standby 3-Maintenance	Choose the control status for this side of the system. If Standby (1) or Maintenance (3) is chosen, the other side must be in Active mode (0).
<i>Other Control Status</i>	0-Active 1-Standby 3-Maintenance NO_COMM	Choose the control status for the other side of the system. If Standby (1) or Maintenance (3) is chosen, the other side must be in Active mode (0). NO_COMM indicates that this is currently not a redundant system.
<i>Update Status</i>	Yes/No	Choose Yes to change the system status as chosen in the previous parameters. Choose No to retract.

Changing the Active Side to either Standby or Maintenance

1. From the PI terminal of the Active side, access the HSB branch by typing **HSB** from anywhere in the PI or enter **0, 11** from the Root Menu.
2. The PI prompts:
0-Update
1-Display
Enter **0** to enable updating the system parameters.
3. The PI first displays the read-only parameters describing the HSB setup. Continue pressing **Enter**, being careful not to change any of the other parameters, until reaching the STATUS parameter.
4. Determine to which System mode this Active side is to be switched:
Type **1** to switch this system side to Standby (the other side must be transferred to Active mode in the next parameter).
Type **3** to switch this system side to Maintenance (the other side must be transferred to Active mode in the next parameter).
Press **Enter**.
5. The PI prompts:
OTHER CONTROL STATUS -
Press **0** to transfer this system side to Active mode.
If NO_COMM is displayed, then this is currently not a redundant system.
6. The PI prompts:
UPDATE STATUS (Y/N):
Enter Yes to update the change requests. Enter No to retract.

Switching the Standby Side to Maintenance Mode

The system enables switching the Standby side to Maintenance mode for diagnostics or any other reason. It also requests a time period after which it will automatically revert that system side back to standby mode.

1. From the PI terminal of the Active side, access the HSB branch by typing **HSB** from anywhere in the PI or by entering **0,11** from the Root Menu.

2. The PI prompts:

0-Update

1-Display

Enter **0** to enable updating the system parameters.

3. The PI first displays the read-only parameters describing the HSB setup. Continue pressing **Enter** until reaching the AUTO MAINTENANCE TERMINATION parameter.

- Set this parameter to *Yes* to safeguard the system by having the system automatically revert the Standby side back to Maintenance mode after a finite number of hours defined in the next parameter.
- When this parameter is set *No*, the technician must manually restore this system side to Standby when appropriate (and skip the next step).

4. Press **Enter** to continue to the next parameter,

AUTO MAINTENANCE TERMINATION TIME.

Determine the number of hours after which the system should switch this side back to Standby mode.

The default set for this parameter is 24 hours, however, the technician may change this default to any number of hours between 1 and 255.

Enter a number between 1 and 255.

5. Continue pressing **Enter** to reach the parameter.

OTHER CONTROL STATUS -

This parameter defines the Control side mode for the non-Active side. Set this parameter to **3**, to transfer the Standby side to Maintenance mode.

6. The system is now in I or I' mode, with a stand-alone Active side (no redundancy).

7. Continue pressing Enter without changing any of the other parameters until you reach the last parameter to update the changes:

UPDATE STATUS (Y/N):

8. Enter Yes to update the change requests. Enter No to retract.

CAUTION!

*If AUTO MAINTENANCE TERMINATION was set to **No**, the technician must remember to manually return the system to Standby, when appropriate. This is done from the PI terminal of the Active side.*

Determining the Frequency of System Side Swaps

There is an option of setting up the HSB system to swap system sides between Active and Standby at a set frequency. This is accomplished by setting the relevant PI parameters in the HSB branch from the Active side.

1. From the PI terminal of the Active side, access the HSB branch by typing **HSB** or by entering **0,11** from the Root Menu.

2. The PI prompts:

0-Update

1-Display

Enter **0** to enable updating the system parameters.

3. The PI first displays the read-only parameters describing the HSB setup, immediately followed by the first updatable parameter:

AUTO HOT SWAP (Y/N) -

This parameter determines whether to automatically swap system sides. The next two parameters determine the swap time and frequency.

Enter **Yes** to activate automatic Hot Swaps.

4. The PI prompts with the next parameter:

NUMBER OF DAYS BETWEEN HOT SWAPS - 1

5. Enter a number between 1 and 255. The default is set to **1** so that Hot Swaps are performed daily at a set time.

6. The PI prompts with the next parameter

SET AUTO SWAP TIME - 1:00

7. Enter the time at which the auto Hot Swaps are to be performed. The default is set to 1:00 AM when call traffic is presumably low. If the system is usually busy at that time, any other time may be entered. Use the 24-hour format to enter time, for instance, 3:15 PM is entered as 15:15. (Time Format Examples: 0:00 or 24:00 is midnight, 0:30 or 24:30 is 12:30AM, 23:59 is 11:59PM).

8. Continue pressing Enter without changing any of the other parameters until you reach the last parameter to update the changes:

UPDATE STATUS (Y/N):

9. Enter Yes to update the change requests. Enter No to retract.

4.4 Upgrading the Coral Version

Upgrading the Coral Version halts all call processing. Therefore, only perform an upgrade when call traffic and importance is lowest (usually during the late night or evening hours).

To Upgrade the Coral Version:

1. Save the system database to a file on the Compact Flash Disk (CFD), see [Saving the System Database on page 4-4](#), above.
2. Turn off the main power to the switch for all the cabinets.

CAUTION!

Do not remove power when the HD LED on the MCP-ATS card is flashing, indicating CFD or Hard Drive activity.

3. Turn off all the PS19 DC and PS19 DC-D units in each peripheral shelf.
4. For MCP-ATS (Tadiran Telecom) card skip to [Step 6](#).
5. Remove the MCP-ATS (for Coral IPx 4000/R (HSB) systems, remove both MCP-ATSs) by unscrewing and pulling them out, see [Removing a Control Card on page 8-12](#).
6. Replace the new CFDs in each MCP-ATS.
*For HSB systems, ensure that exactly the same Coral generic version is loaded on both CFDs. **Additionally**, ensure that the number on the SAU device exactly matches the number on the CFD installed on the same system side. The SAU numbers for the two system sides are *not* identical, therefore it is important to verify that each side has its own set of identical SAU numbers.*
7. For MCP-ATS (Tadiran Telecom) card skip to [Step 9](#).
8. Return the MCP-ATSs to their appropriate slots and screw into place, see [Inserting a Control Card on page 8-9](#).

9. Connect the corresponding SAU device to the front panel of the 32GC on the *same side* of the Control Shelf.

For HSB systems, repeat this step for both SAU devices.

CAUTION!

The generic feature software contained in the CFD is coded to function with one unique SAU, which must be installed on the front panel of the CORRESPONDING 32GC card.

10. Return Power to the system, by first supplying the main power to the cabinet and *then* turning on the peripheral power supply units (PS19 DC and PS19 DC-Ds) in each of the peripheral shelves.
11. Verify that the Coral is loaded properly by viewing the **CCS on the air** message with the new Version number, see [Messages for a Properly Loading Active Side beginning on page 3-12](#) and [Messages for a Properly Loading Standby Side beginning on page 3-15](#) when the Standby side exists.

Verify that no SAU fault messages appear during the loading process, see [SAU System Faults on page 8-72](#).

WARNING!

The Coral system automatically ceases call processing after 14 days for any of the following reasons:

- *The SAU serial number does not match the corresponding CFD SAU serial number.*
- *The Coral generic version contained in the CFD is higher than is authorized by the SAU.*
- *An SAU is removed from the 32GC front panel.*

Relevant system messages appear on the PI automatically warning that the system will not operate without the proper SAU.

12. The new CFD card(s) do not include a backup of the current database. To make a backup of the database, perform the procedure described in [Saving the System Database on page 4-4](#).
13. In order for the Coral IPx 4000/R system to function as a Hot Standby system, both MCP-ATSS must have the same Coral generic version loaded on their CFD cards. Otherwise, the system is not in Hot Standby mode and automatically reverts to a single sided system, where one side is **Active**, while the other side is **Faulty** and does not operate.

WARNING!

Hot Standby systems require the same Coral generic version loaded on both system sides. Otherwise, the system functions as a single sided system with no redundancy!

NOTES:

4.5 System Diagnostics

1 Peripheral Units Diagnostics

The PI enables checking the status of the PB-ATS, PS19 DC and PS19 DC-D cards located on the Peripheral Shelves for any and all of the Peripheral Shelf Units. If any of the cards are found to be faulty, the PI describes the card and the card location so that it may be removed. Certain card faults invoke alarm messages that are immediately displayed on the PI screen regardless of whether an inquiry was made.

To View the Peripheral Shelf Card Status

1. Access the Peripheral Shelf UNITS branch by typing **SYSGEN, 5** from anywhere in the PI or enter **0,0,0,5** from the Root Menu.

2. The PI prompts:

0-Update

1-Display

Enter **1** to display the parameters and their current values.

3. Enter the range of Units to be viewed from the lowest Unit to the highest Unit.

FROM UNIT# -

TO UNIT# -

The default range is 0 to 7 representing Peripheral Shelf Units 0 to 7.

Enter the required number.

4. The technician may specify a single parameter to view, by entering the parameter name or its field number.

Press Enter to enable the default, which displays all the related parameters and their values.

Table 4-5 displays the UNITS parameters below with a brief description of each parameter. Field numbers are displayed in brackets.

See *Chapter 4 — UNITS*, of the *Coral Program Interface & Database Reference Manual* for details on the parameter definitions.

Table 4-5 **Peripheral Shelf Unit: PI Parameters**

Parameter	Range	Description
<i>SHELVES</i> [0]	(0,1) to (14,15) Read-Only	Displays the number of the system shelves that define this Peripheral Shelf Unit.
<i>ACTIVE_UNIT</i> [1]	Yes/No Read-Only	If the UNIT is installed (i.e. a PB-ATS card is installed on the even shelf), then the system sets this parameter to Yes, defining this Peripheral Shelf Unit as an Active Unit.
(The following parameters are displayed only if the Unit is physically installed)		
<i>PB_STATUS#1</i> [2] Slot 2	Exists No Card No Clock PCM Fault Read-Only	Displays the status of the PB-ATS card installed in Slot 1/2. Both PB-ATS cards are located on the even shelf.
<i>PB_STATUS#2</i> [3] Slot 1	Read-Only	If no PB-ATS card is installed, then the parameter displays No Card . If the card exists and is not functioning properly, then the parameter displays either No Clock or PCM Fault depending on the fault.
<i>PB_SELECT</i> [4]	1 - Slot 1 2 - Slot 2	Describes which PB-ATS card is Active for this unit. The technician may change this value. <i>This parameter is used when the technician must remove a faulty card. Before removing the faulty card, a working PB-ATS card must be defined in this parameter.</i>
<i>POWER_SUPPLY_STATUS #1</i> [5]	OK Faulty Read-Only	Displays the status of the displayed item.
<i>POWER_SUPPLY_STATUS#2</i> [6]		
<i>RING_POWER_SUPPLY_STATUS #1</i> [7]		
<i>RING_POWER_SUPPLY_STATUS #2</i> [8]		
<i>NUMBER_OF_TIME_SLOTS</i> [9]	512 Read-Only	Defines the number of time slots for this Unit. The number of time slots is factory set and cannot be changed. This number can also be viewed on the PB-ATS front panel.
<i>UNIT_TYPE</i> [10]	0-Normal 1-Remote	Define this Unit as a Normal (Local Unit) or a Remote Coral FlexLITE unit.
<i>Send To 32GC Card?</i> [11]	Yes/No	Loads the modified UNIT information. When No is entered, updates are ignored and the system remains at its pre-programmed definitions.

2 PB-ATS Fault Messages

If a PB-ATS card is removed, or becomes faulty, the following type of message is automatically displayed on the PI screen:

```
***PB1_FAULT_SHELF#0 2 JAN 03 8:15AM
```

This messages is comprised of the following components:

- PB1 (slot 2) or PB2 (slot 1) indicates which PB-ATS unit is faulty
- Shelf #0 to #15 indicates which Peripheral Shelf holds the faulty PB-ATS unit
- The fault date
- The fault time

PCM Stream, Highway, Time Slot Fault Messages

The following errors may occur at any time. An immediate alarm message is posted on the PI screen describing the error and the time it occurred. The faulty equipment should be removed as soon as possible.

For Hot Standby systems, where duplicate cards exist for all system cards, the standby card may sometimes need to be activated manually (such as for the PB-ATS). The Control Shelf cards automatically switch to standby mode as needed.

The following messages appear for PCM Stream, Highway or Time Slot faults:

stream error:

```
**PCM STREAM FAULT ** date SHELF #x
```

highway error:

```
**PCM HIGHWAY FAULT ** date SHELF #x HW# y
```

(only when there is no PB-ATS switching)

time slot error:

```
**PCM TIME SLOT FAULT ** date SHELF #x HW# y TS# z
```

These messages are comprised of the following components:

- The fault name
- The fault date
- Shelf #0 to #15 indicates which Peripheral Shelf holds the faulty PB-ATS
- The highway number in which unit the fault is occurring (as applicable)
- The time slot number in which unit the fault is occurring (as applicable)

Diagnostic Tests

The PI test options can be obtained from the *Root, 1, 0* branch. See Chapter 22 of the relevant *Program Interface and Data Reference Manual* for further details. Selecting a test not relevant for the Coral IPx 4000 systems, results in the following message:

ERROR, Not Available on ATS, Try Again

Faulty Object Alarms

Alarms are transmitted to the PI from the various relevant parts of the system. The Coral's Faulty Object Alarms menu *Root, 0, 1, 1* contains many categories, only the items relevant to the Coral IPx 4000 systems are listed below:

Faulty Objects Alarms	PI Alarm Text and Description	Major or Minor Alarm
6-PCM HW	Details the failed PCM highway# and date and time of fault.	Major
7-PCM LINKS	T = Transmit/ R = Receive Details the failed PCM highway#, as well as the failed time slot# and date and time of fault	Minor
8-PB AND POWER SUPPLY	Details the faulty PB-ATS 1(slot 2) or 2(slot 1) and its system shelf#. Details whether a PB-ATS was removed from service, and from which shelf. Details the faulty PS19 DC or PS19 DC-D and its respective peripheral shelf#. Note: Shelf #'s range from 0 to 15, but only even numbered shelves house PB-ATS units.	Major

Faulty Objects Alarms	PI Alarm Text and Description	Major or Minor Alarm
10-HSB	<p>The above four message result in a single sided system because one or more of the main processors are faulty.</p> <p>The other system side reverted to Faulty mode</p> <p>The other system side was put in or automatically achieved Maintenance Mode. This situation can resolve itself automatically</p>	Minor
13-OTHER SIDE	<p>These messages indicate a faulty item for the Standby system side of a Hot Standby system and is not relevant for single sided systems.</p>	Not Applicable-For Display Only

Faulty Objects Alarms	PI Alarm Text and Description	Major or Minor Alarm
15-CONTROLS	These messages indicate a problem with the SAU device, either the SAU is physically missing, or the software is incompatible with the defined system or the SAUs on both systems sides are not identical.	
	Indicates that one of the fans or fan fuses is faulty and must be replaced, see Determining the Fan Fault and Replacing the Fan Fuses on page 8-15 .	Minor
	Details which PS-ATS is faulty. Either one of the PS-ATS fuses must be replaced or the unit itself, see PS-ATS Troubleshooting on page 7-45 .	Minor
	Details which battery needs replacement, see 32GC Card Lithium Battery Test on page 3-17 .	Minor
	The CNT1 clock mechanism located on the active 32GC is faulty. Replace the 32GC card.	Minor

The technician may request a display of the current Faulty Objects Alarms for any of the above fields by entering its field number from this branch. See **Diagnostic Alarms** in Chapter 22 of the relevant *Program Interface & Database Reference Manual* for further details.

If the system contains no alarms when the technician requested an alarm report, the **No Active Alarms** message is displayed.

Operator's Console Indicators

The following malfunction indicators, specific to the Coral IPx 4000, appear on the Central Switchboard of the Telephone Attendant. Activation of alarms are signaled by a flashing light on the operator's console and the stated Attendant message.

Faulty Object	Attendant Station Display	Major or Minor Alarm
PCM Highway	31h/Highway#	Major
PCM Links Highway/Time Slot	32h/Highway#/TS#	Minor
PB-ATS	50h/Shelf#/PB#	Major
PS19	50h/Shelf#/PS#	Major
32GC Battery	11/0	Minor
Battery for first (lower) XMM installed	11/1	Minor
Battery for top XMM (if a second XMM is installed)	11/2	Minor
Fan Fault	A2	Minor
Power Supply 1 (PS-ATS 1)	A4/0	Minor
Power Supply 1 (PS-ATS 2)	A4/1	Minor
Power Supply 1 (PS-ATS 3)	A4/2	Minor
CFD Disk Fault	A5	Major
CNT1 (Clock mechanism on 32GC)	A3	Minor
Other Side: MCP-ATS & 32GC Failure	90/5	Minor
Other Side: 32GC Failure	90/4	Minor
Other Side: MCP-ATS Failure	90/3	Minor
No Communication with Other Side	90/6	Minor
Other side is in Faulty Mode	90/7	Minor
Other side is in Maintenance Mode	90/8	Minor

Switching a Faulty PB-ATS Unit



NOTE:

The second Standby PB-ATS must be activated for a shelf, before removing the faulty PB-ATS card.

To manually switch a PB-ATS unit between Active and Standby mode, select the Update option.

1. Access the Peripheral Shelf Units branch by typing **SYSGEN, 5** from anywhere in the PI or enter **0,0,0,5** from the Root Menu.

2. The PI prompts:

*0-Update
1-Display*

Enter **0** to enable changing the active PB-ATS card.

3. Enter the Unit number for the faulty PB-ATS in both parameters:

*FROM UNIT# -
TO UNIT# -*

4. The PI prompts for the requested parameter. Enter **4** or **PB_Select** to display the parameter:

PB_SELECT(1/2)

Enter the slot number for the other (or currently Standby) PB-ATS.

If a faulty PB-ATS is chosen or does not exist, the following error message appears:

SELECTED PB IS NOT ACCESSABLE, CHECK PB STATUS



NOTE:

When choosing the same PB-ATS, the PB-ATS is reset while maintaining all calls.

5. Press Enter. The PI prompts:

SEND TO 32GC (Y/N) -N

Enter Yes to send the updated information to the card and complete the requested changes. Enter No to retract.

External Connections

CORAL

5.1 Main Distribution Frame	5-1
5.2 External Equipment	5-5
5.3 Protection Devices	5-11
5.4 Power Fail (PF) Transfer Circuits	5-17
5.5 Terminal Data Communication Ports	5-21
5.6 I/O Connections Via Front Panel	5-25
5.7 I/O Connections Via Champ Connectors	5-53

5.1 Main Distribution Frame

1 General

.....
This chapter describes the MDF and the pinout connections to the IPx 4000 cage and external equipment. The main distribution frame (MDF) is the wiring interface for the Coral IPx system and associated peripheral equipment.

The MDF is often located adjacent to other signaling systems, such as:

- Paging and public address systems
- Voice messaging systems
- Alarm and monitoring systems
- Closed circuit television
- Property management systems
- Building and energy management systems

Therefore, care should be taken to plan the MDF layout before fastening components to the wall or mounting surface, such as:

- Trunk circuits
- Wired and wireless station equipment
- Database programming terminals
- Report printers
- Music and/or audio sources
- External public address or paging equipment
- Recording devices

I/O Connections in the Coral

Most connections to the Coral cabinet are made using standard, 25-wire pair, I/O (input/output) connectors to the Coral IPx 4000 rear panel. Cables from the Coral rear panel are connected to the MDF and from there to “punch blocks”. Individual trunk and station interface circuits can then be cross-connected from Coral I/O punch blocks

to other punch blocks that terminate trunk circuits, station wiring, and other external equipment. See *Figure 5-1*.

In some cases, connections are made via RJ-45 or DA-15S connectors on the front panel of a Coral circuit card. For example, the 2DT, UDT, UGW, IPG, PRI, T1, and 30T digital trunk interfaces. See *page 5-25, I/O Connections Via Front Panel on page 5-25*. In addition, the optical fiber connectors on the FLMS and FLMM cards for the FlexLITE Remote shelves are located on the cards' front panels. Similarly, the KB0 database Programming Interface (PI) port appears on a DB9 connector on the MEX-IP2 Common Control cards. Plan for permanent wiring to these card types accordingly.

In some cases, connections are performed via a crossover cable (Catalog Number 7244-8000624) with an RJ-45 connector at each end, connects the RJ-45 jack on the front panel of the card and the RJ-45 jack on the LDF or UDT panels.

- LDF (LAN Data Filter) panel is used for: PUGW and IPG cards.
- UDF (Universal digital trunk Data Filter) panel is used for 2DT and layout UDT of: 30T, T1, PRI-23 and PRI-30 cards.



Tip:

It is recommended to terminate all the I/O connectors available in the system on punch blocks at the MDF even if some cables are not initially used. This saves time and effort when the system expands.

MDF Size and Location Considerations

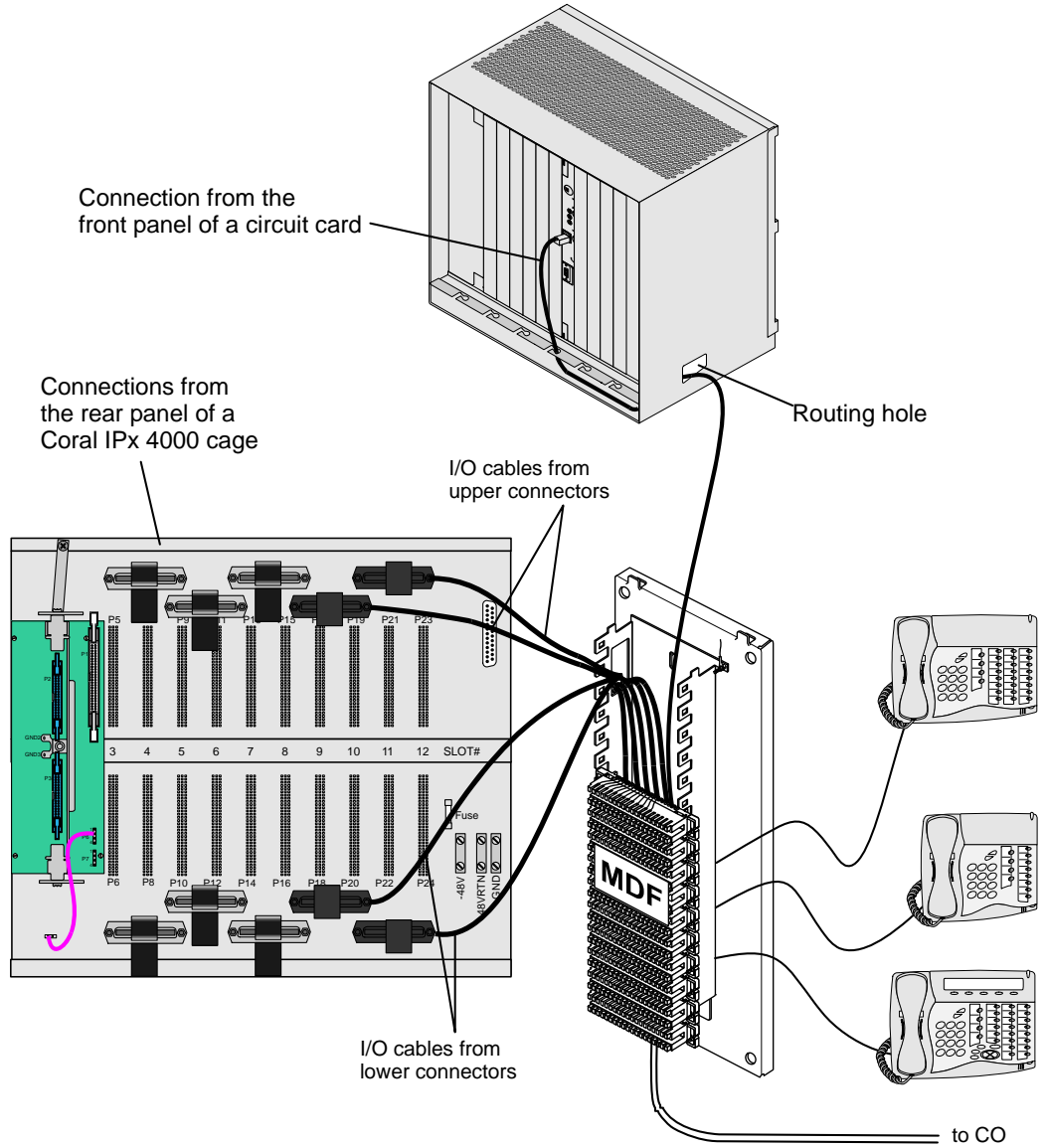
In standard MDF wiring convention, ancillary equipment wiring (key systems, paging, etc.) is placed to the **left** of the MDF. Coral I/O cables are placed next to them (on the left). Next left are protection devices (if any). The outermost cables (on the left) are the Building Entrance cables (UG, underground, demarcation point cables). Station and other internal building wiring is placed on the **right** side of the MDF. This order ensures the shortest path for block to block cross connect wiring and minimizes overlap.



Tip:

Anticipated expansion should be taken into consideration (external and internal cables, protective devices, station wiring, etc.) when planning the MDF. If a system is installed at near capacity, the MDF should be laid out so that a move to a larger Coral cabinet can be made easily.

Figure 5-1 **MDF**
Connections



Improper TIP and Ring Wiring

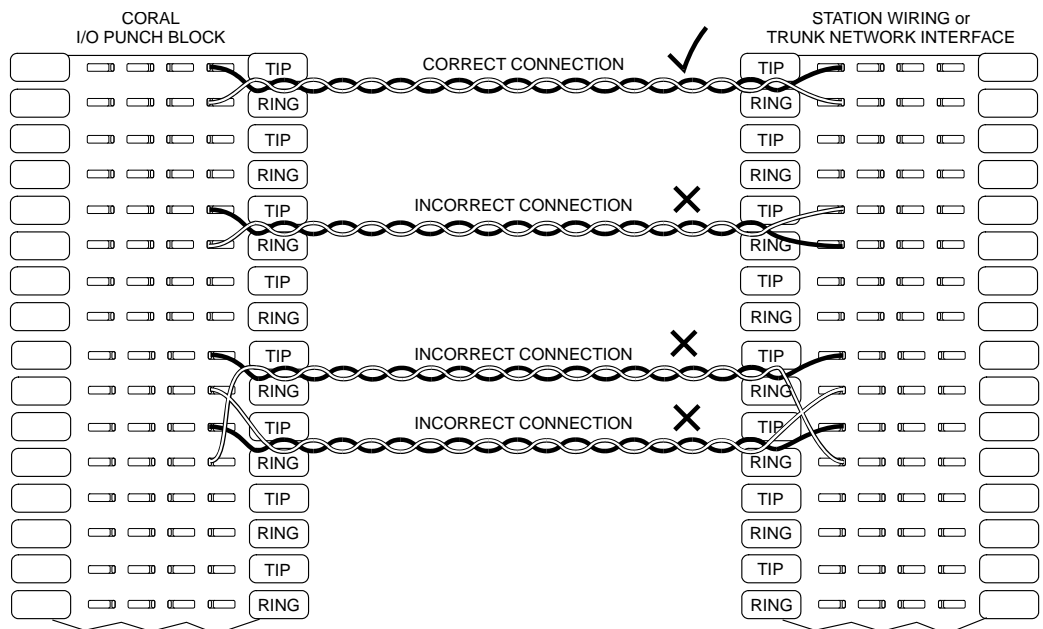
Due to the high speed digital signaling over the wire pair, it is important to verify that the wiring is free of potential problems. The wire pair feeding the terminals must be low capacitance, continuously twisted wire.

The wire gage and type should be consistent for the entire loop length. More than one type or gage of wire spliced together in the same loop will reduce the maximum possible loop length of the station or trunk.

Always match the twisted pair of a loop to corresponding tip and ring connections. Do not connect the wires of the same twisted pair to different tip and ring connections.

See [Figure 5-2](#).

Figure 5-2 Twisted Pair TIP and Ring Wiring Detail



5.2 External Equipment

1 Station Equipment

Wired Stations

Connections to Coral IPx 4000 system station equipment are established by cross-connecting the station circuit from the appropriate Coral IPx 4000 I/O cable punch block to the corresponding station wiring punch block.

Table 5-1 lists the various station interface cards available for the Coral system, the type of station equipment that the card supports, and the number of wire pairs required by the station interface.

Station wiring between the Coral IPx 4000 system MDF and the station equipment should contain at least 2, and preferably 4 wire pairs to ensure adequate wiring capacity. At the station location, the station wiring should be terminated with a modular, six position, telephone jack, containing at least 4 conductors (pins 2, 3, 4, and 5).

Figure 5-3 illustrates typical jack configurations with wire designations for four station types:

- 2-wire SLT single-line telephones and digital station sets (FlexSet, APDL, CPA, GKT, DKT, DST, 2-wire DIM, and VDM) need only connect Tip [T] and Ring [R] or <UpA> and <UpB> as shown.
- FlexSet 280/281 series or FlexSet APDL units with PEX or PEX+APA, DKT 2000 sets with PEX or APA, or VDM need an extra 2 wires when power is supplied through the line connector. The polarity of this connection is irrelevant. When using the TPS (single unit Telephone Power Supply), no additional wires are required. EKT designations are listed under the wire color in plain text, VDK, 4W-DIM, and TIM designations are listed in parentheses ().

For peripheral device installation, refer to the *Coral Terminal Equipment Installation Manual*.

To prevent a potential shock hazard to station users and damage to the system, make sure that station circuits extended over cables that exit the building are adequately protected from lightning and surge currents. See *Protection Devices on page 5-11* for protective device specifications.

Table 5-1 Station Interface Wire Pair Requirements

Station Interface Card Type	Supported Station Equipment	Pairs Required
8SM,	Standard Magneto (Field) Telephone Sets	1
8SA, 8SLS, 16SLS, 24SA, 24SLS	Standard Single-Line Telephone (SLT) Sets, SLT Sets with Message Waiting Lamp	1
8SFT, , 16SFT, 24SFT, 8SKD*, 8SVD*, 8SDT*, 16SKD*, 16SDT*, 24SDT*	FlexSet, APDL, CPA, GKT, DKT, DST, APA, PEX, PEX/APA	1
	FlexSet 280/281 series with PEX, FlexSet 280S/APDL with PEX or PEX/APA, DKT 2000/APDL with PEX or APA, CPA; For optional external power via line connector pins 2 and 5 (see <i>Coral Terminal Equipment Installation Manual</i>).	2
2SK*, 4SK*, 8SK**	EKT*, VIC* (Vision Impaired Console), KSI*, EIS*, ACC, ACC-R, SDU, QLD, QND Special Application Devices	2
2SD*, 8SD*	VDK*, 4W-DIM*, TIM*, CoraLAN*.	2
8SKK, 16SKK	RBS (Radio Base Station) for FlexAir wireless handset	1
SKW/x*	RBS for CoralAIR wireless handset	2
FlexSet-IP 280S, T200M series, T300 series, P-Series, Coral Sentinel, 3rd party SIP terminal	LAN connection	2
	With power over LAN type-A	4

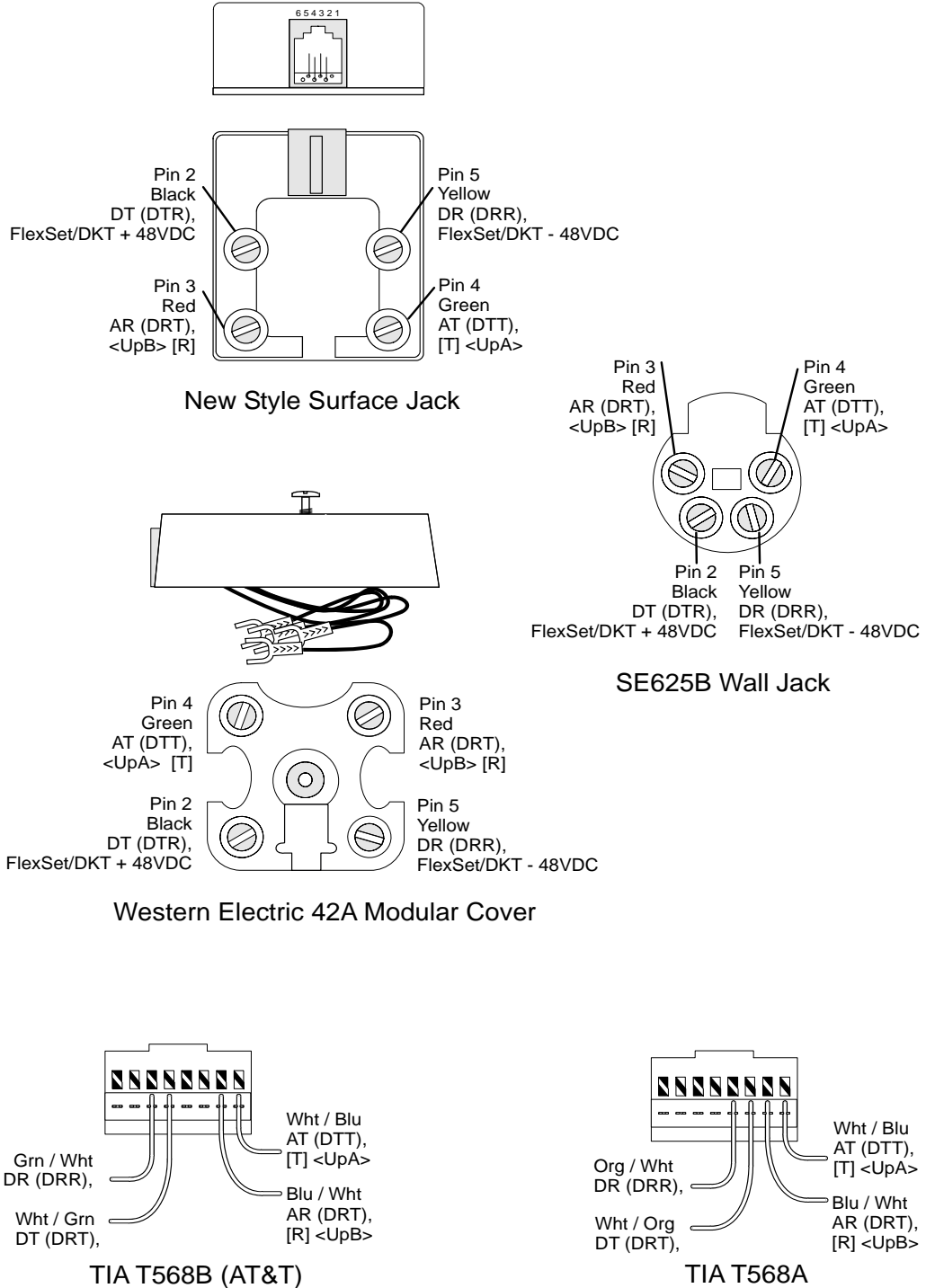
* discontinued, no longer available

CAUTION!

The 4,8,16 (SH, S/SH, SH/S, SH/S-LL) cards with message waiting are not for use in the Coral IPx 4000 cages. Installing these cards, **with message waiting**, in the Coral IPx 4000 cages may cause Power Supply failure.

These cards are used in the Coral FlexiCom and Coral I,II,III systems only.

**Figure 5-3 Modular
Wired Station Jack
Wiring Diagram**



Wireless and VoIP Stations

The following terminals are not connected via the MDF:

FlexAir handset, FlexSet-IP 280S, T207S, T208S, T207S/NP, T208S/BL, T207M, T208M, T207M/NP, T208M/BL, and other 3rd party SIP terminals.

Related Documentation

For further information about Coral voice terminals not covered by this section, consult the documentation as listed in *Chapter 1, Related Documentation*.

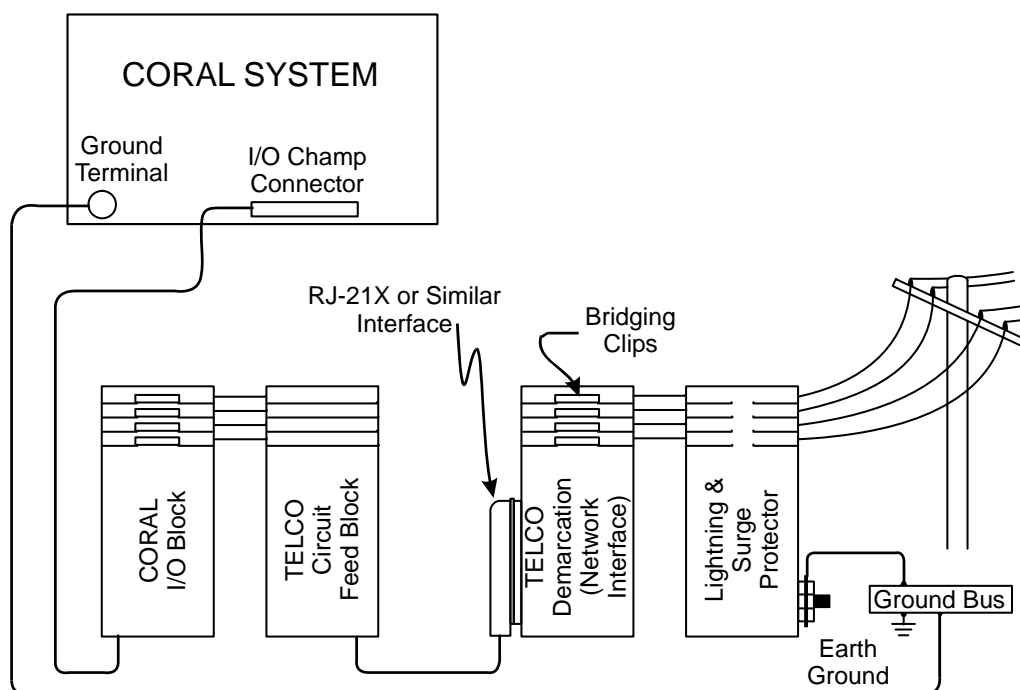
2 Trunk Circuits

Generally, trunk circuits are connected to the Coral IPx 4000 system simply by cross-connecting the trunk interface circuit of a Coral trunk card to the point of demarcation where the trunk circuits appear from the telephone utility company (telco). For more specific data regarding all trunk types supported by the Coral IPx 4000 system, refer to the *Coral Service and Peripheral Cards Installation Manual*.

Protective devices are regularly provided by the telecommunication connections on circuits originating outside the building. Determine if the telecommunication connection protective devices meet the specifications described in the following section: *Protection Devices on page 5-11*. If not, install secondary protector devices that meet these specifications. To be effective, the protective devices, whether telco or customer provided, must be grounded to the same ground point as the Coral system.

Figure 5-4 illustrates typical trunk circuit wiring from building entrance to the Coral IPx 4000 system.

Figure 5-4 Typical Trunk Circuit Wiring Diagram



3 Auxiliary Connections

Connections to the auxiliary (KB1, KB2, KB3, Music, Page, and Relays) are made with a standard 25-wire pair, I/O (input/output) Champ™ connectors to the Coral IPx 4000 rear panel. Cables from the Coral rear panel are connected to the MDF and from there to “punch blocks”. Individual auxiliary interface circuits can then be cross-connected from Coral IPx 4000 I/O punch blocks to other punch blocks that terminate music circuits, relay wiring, and other external equipment.

For more specific data regarding all auxiliary interface circuits (8DRCF, 8DRCM, 8DRCM-2 and RMI) supported by the Coral IPx 4000 system, refer to the ***Coral Service and Peripheral Cards Installation Manual***.

Auxiliary Cards I/O Connections

8DRCF, 8DRCM, 8DRCM-2 cards..... 5-102

RMI, ASU cards 5-104

5.3 Protection Devices

1 Introduction to Primary and Secondary Protection Devices

WARNING!

Any circuit connected to the Coral system that is exposed to lightning or electrical hazards must be protected with approved lightning and surge protection devices to avoid potentially lethal hazards to all users.

CAUTION!

Secondary protection devices should be installed on any circuit requiring primary lightning protection, which connects electrically to an interface of the Coral system.

Lightning and over-voltage arrestors are used to protect the user and the system from lightning and other electrical hazards that may occur on external circuits connected to the system.

Any cable that passes through open air, under open ground (i.e.: across parking lots, fields, road beds, etc.), across a bridge, or along the exterior or under the non-metallic roof of a building, is exposed to lightning and electrical hazards.

Telephone circuit protection devices fall into two distinct design categories:

- Primary (lightning) protection devices which limit voltages on a telephone circuit below levels which do not present a hazard to the user. (*Table 5-2* lists minimum specifications)
- Secondary (surge and impulse) protectors that further limit voltages on a telephone circuit to prevent damage to electronic equipment. (*Table 5-3* lists minimum specifications)

Primary protection absorbs the major impact of infrequent, but dangerous, catastrophic surges; while secondary protection suppresses constantly occurring impulses which, while not dangerous, can cripple valuable, and in many cases, essential communications facilities.

Generally, leased or switched circuit facilities provided by the local telephone utility company are equipped with primary protection devices installed with the circuit. However, privately owned aerial or buried cable feeding from one building to another may not be equipped with protection devices. Always consult with whomever provided the circuits to determine whether protection devices are present, and if so, what type. Never assume that protection devices have been provided by another party, or that existing protection devices are adequate.

The secondary protection has to include a leakage current protector in series of every wire, tip and ring, on every port that is either connected to the public telephone network or to an out of the building cable. The requirement is in accordance with UL® Specification 60950, Third Edition or CSA C22.2 No. 60950. The required protectors can be mounted directly on a 66 block in the MDF.

Table 5-2 Telephone Circuit Primary Lightning / Surge Arrestor Device Specifications

<i>Specification</i>	<i>Measurement</i>
Construction Primary Element Fail-safe Metallic Shunt Vent Safe Spark Gap Heat Coil (recommended)	3 Electrode Gas Tube 1.0Ω to Ground Max. Per UL 497 1.0A 100 Sec. Max.
Clamp Points (per REA PE-80) DC. 2kV/S. 100V/μS 10kV/μS Vent Safe @ 100V/μS	350VDC Max. 400VDC Max. 500VDC Max. 800VDC Max. 1600VDC Max.
DC Impulse Current (8x20μS wave)	10KA Nom.
AC Discharge Current (60Hz/1S)	10A Nom.
DC Holdover (per IEEE 465.1)	160VDC Max.

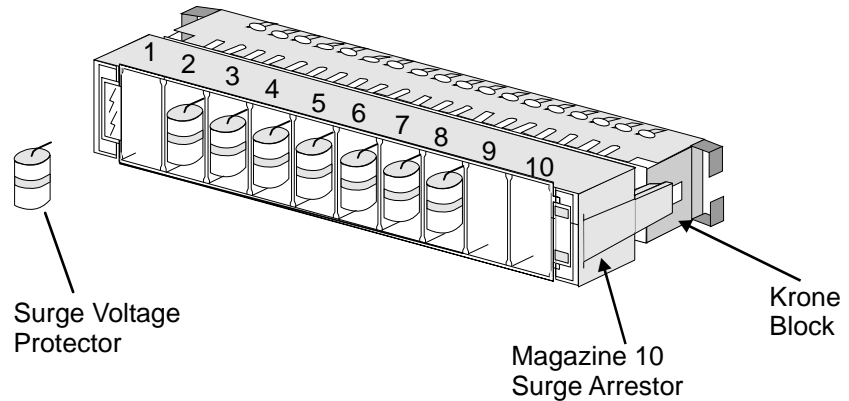
**Table 5-3 Telephone
Circuit Secondary
Protection Device
Specifications**

<i>Device Type</i>	<i>Specification</i>	<i>Measurement</i>
Surge/Impulse Protector	Clamp Points DC. 2kV/S 100V/μS 10kV/μS	230VDC Max. 230VDC Max. 100VDC Max 30VDC Max.
	Response Time	5nS Max.
	Series Resistance	15Ω Max.
Sneak Current Protector	Acceptance	UL Listed
	Voltage Rating	600VDC Min.
	Current Rating	350mA Max.
	Fusing Time Characteristics 100% of Rating 150% of Rating	4 Hr. Min. 10 Sec. Nom., 210 Sec. Max.

2 Surge Arrester Magazine Mounting

To prevent serious damage to the Coral system, the analog trunk and station circuits, whose cables are laid outside the building, must be protected from the electrical peaks caused by lightning. Lightning Arrestors must be mounted on the MDF where telephone circuits are cross-connected.

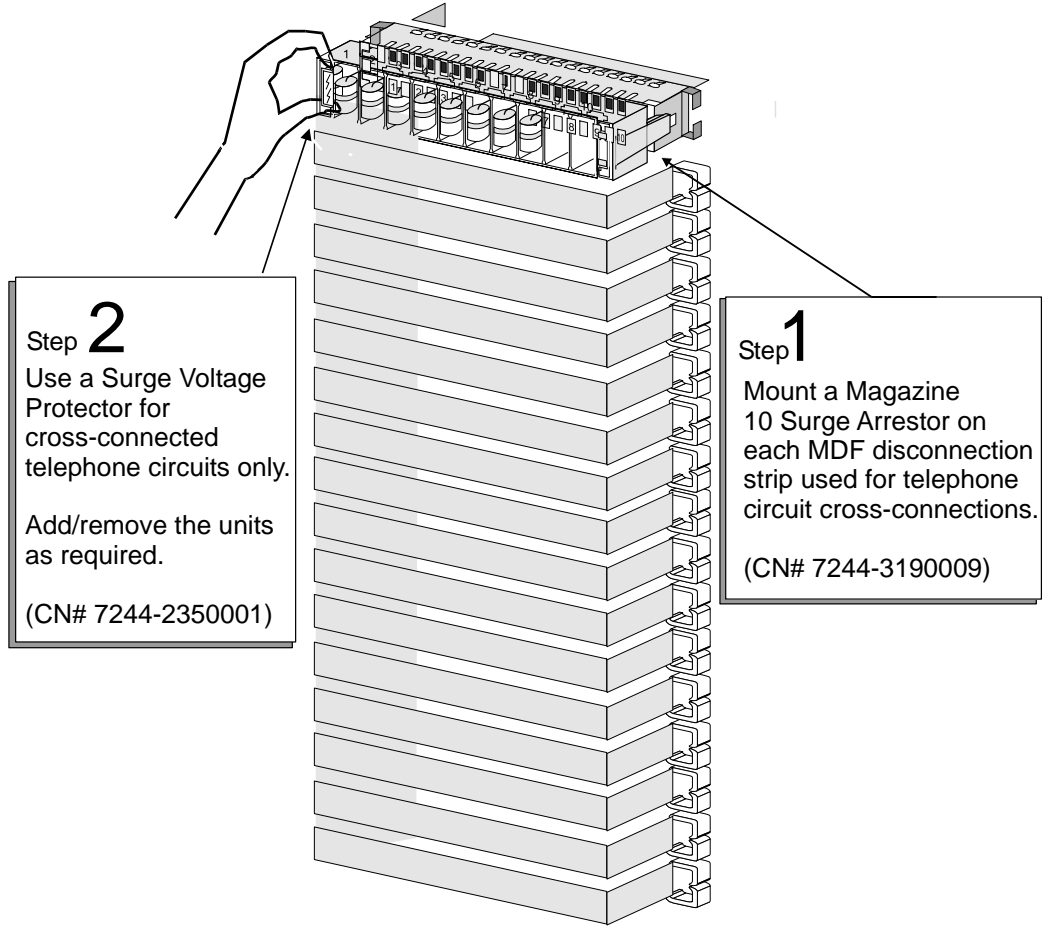
Figure 5-5 Magazine 10 Surge Arrester and Voltage Protectors



The mounting procedure is as follows:

1. Identify the MDF disconnecting strips used for telephone connections.
2. Place a Magazine 10 Surge Arrester (CN# 7244-3190009) on each MDF strip used for telephone. See **Step 1** in [Figure 5-6](#).
3. Use the relevant tables from [page 5-53, I/O Connections Via Champ Connectors](#) to identify the MDF cross connection points that are used for each telephone. (The connecting cables will be visible).
4. Insert a Surge Voltage Protector (CN# 7244-2350001) in the magazine 10 surge arrester where a telephone is connected. See **Step 2** in [Figure 5-6](#).

Figure 5-6 Connecting Surge arrester to MDF



NOTES:

5.4 Power Fail (PF) Transfer Circuits

With the installation of trunk cards that support the PF (Power Fail) transfer option, four trunks per trunk card may be directed to station sets if power to the Coral system is interrupted. This arrangement, referred to as power failure transfer, completely bypasses the system, allowing specific stations to originate outgoing calls and/or continue answering incoming calls.

0

1 Physical Connection

Stations

Both SLT (single line telephone) sets, and special EKT-PF¹ telephones may be used as power failure stations. [Figure 5-7](#) and [Figure 5-8](#) illustrate wiring interconnections between the trunk card, station card, and an SLT and EKT-PF station set, respectively.



NOTE:

Coral FlexSet, GKT, DKT and DST cannot be used as power failure stations.

Trunks

The following Analog Trunk Peripheral cards support Power Fail Transfer:

- The following four-trunk cards, each provides four (4) ports with PF transfer:
4T-C, 4T-CID, 4TPF, 4T/S PF-G, 4T/S PF-ES, 4TMR-PF, 4TMR-PF-G,
4TMR/S-12PF-ES, 4TMR/S PF-G, 4TMR/S-50/16PF-G, 4TMR/S-12/16PF,
4TMR-12/16PF, 4ALS, 4ALS/M
- The following eight-trunk cards, each provides four (4) ports with PF transfer:
8T-C, 8T-CID, 8TPF, 8T/S-PF, 8T/S-PF-G, 8ALS, 8ALS/M,
NOTE: only circuits 2, 3, 4 and 5 support power failure transfer.

For further information on these trunk interface cards see ***Coral Service and Peripheral Cards Manual***.

1. discontinued, no longer available

2 Database Programming

To use the power failure transfer features of the Coral system, the station dial numbers to which power fail trunks transfer should be entered in the system database. Refer to **Power Fail Trunk Definition** in **Chapter 8 - Program Interface Reference Manual**, for more information.

Power Failure Trunk Definition (Route: TRK,4)

FROM/TO DIAL#

Enter the required range of Loop Start/Ground Start analog trunks.

DEST

Set this parameter to determine the power fail station system dial number to be connected to the trunk during power failure.

Figure 5-7 Power Fail Wiring To Single-Line (500/2500) Telephone Set

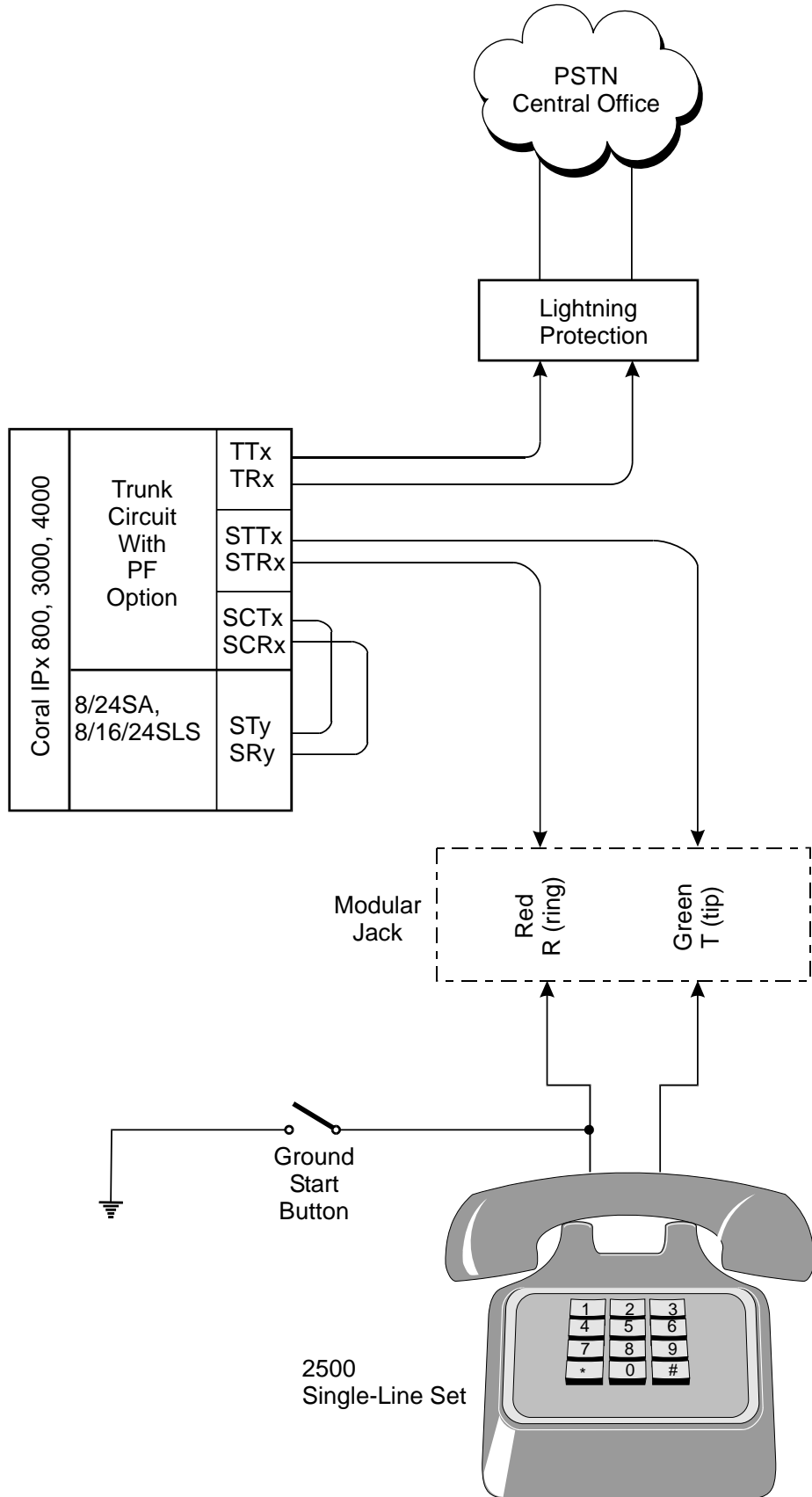
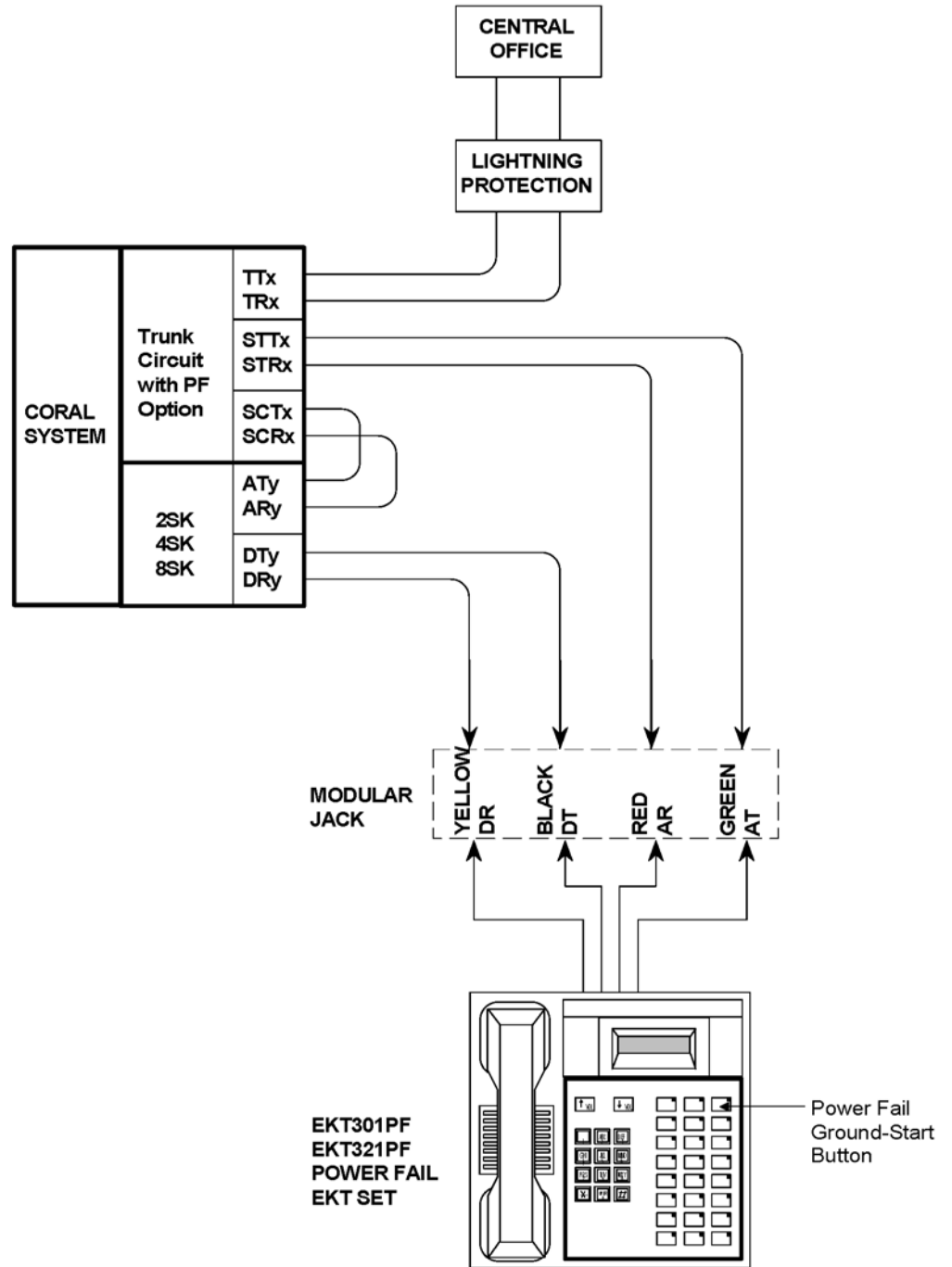


Figure 5-8 Power Fail Wiring To EKT-PF¹ Set (Discontinued)



1. discontinued, no longer available

5.5 Terminal Data Communication Ports

RS-232E

The Coral switching system is capable of switching digital data information as well as voice signals. Coral system data communications devices are available for packet switched data for low volume applications. The packet data communications are provided using the APA (Application Processor Adapter), PEX+APA or APDL (Applications Processor Data Link). The data communication devices provide a serial interface wired as Data Communications Equipment (DCE). That is, they transmit data to the APA/APDL, and receive data from the device.

The APA provides a proprietary data link to an external Applications Processor. The link uses an asynchronous RS-232E (V.24) serial data interface, operating at a data rate of up to 19.2Kbps. The interface appears as:

- DB-25S connector on the rear panel of the APDL and DKT2000 with an APA
- RJ-45 jack connector on the rear panel of the FlexSet 80, GKT, FlexSet APDL, FlexSet APA or FlexSet PEX+APA.

Through the link, a proprietary signaling protocol allows the Coral system Master Processor to send call status messages to the Applications Processor, and the Applications Processor to send call control instructions to the APA / APDL. Application processors available for the Coral system include the Computerized Attendant Position (CAP), the ACD Group Supervisor and Management position, Coral CallMaster (CCM), Coral World Wide Office (WWO), TAPIdriver, GKT PC-Utility, or any other application that complies with proprietary API products.

Use the following RS-232 cables:

- CN#7244-8001195 for DKT2000 with APA or APDL
- CN#7244-6914055 for FlexSet 80, GKT, FlexSet APDL, FlexSet APA or FlexSet PEX+APA.

Tables below lists the pin designations for the RS-232 interface module of the various Coral terminals.

FlexSet APA, PEX+APA and APDL RS-232E Port

The serial interface of the FlexSet APA port via the provided RS-232 cable (CN# 7244-6914055) conforms to the EIA RS-232E specification, and is wired as a Data Communications Equipment (DCE) device, using a D-type (female) connector. The interface allows connection of a common, asynchronous CTI products such as the CCM, CAP, FlexCT PathFinder, etc.

Figure 5-9 shows use of the pin number and function assignments on the FlexSet APA cable.

Figure 5-9 Coral FlexSet APA/APDL RS-232E Cable Connections

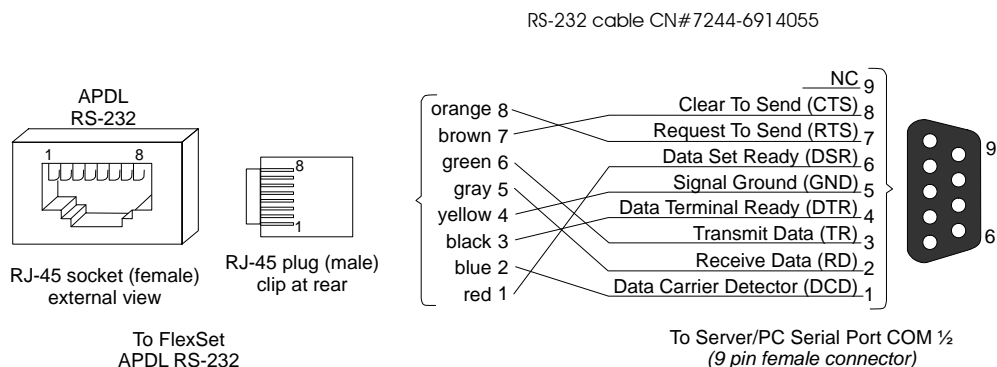
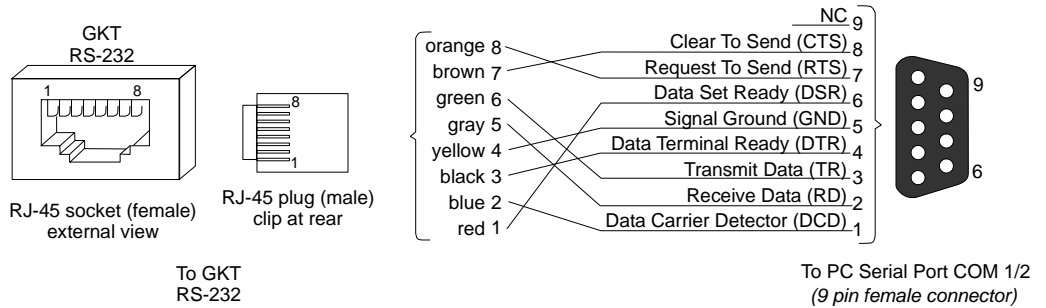


Table 5-4 Coral FlexSet APA/APDL RS-232E Interface Pin Functions

Pin Designation	Pin Number		Function
	RJ-45 Connector	9-Pin D-Type	
Data Carrier Detector (DCD)	2	1	
Receive Data (RD)	5	2	Output from APA
Transmit Data (TR)	6	3	Input to APA
Data Terminal Ready (DTR)	3	4	Input to APA
Signal Ground (GND)	4	5	Signal Return
Data Set Ready (DSR)	1	6	Output from APA
Request to Send (RTS)	8	7	Input to APA
Clear to Send (CTS)	7	8	Output from APA
Not Connected (NC)		9	Not used

FlexSet 80 (GKT) RS-232E Port

Figure 5-10 FlexSet 80 or GKT RS-232E (v.24) Pin Functions



DKT2000 with APA/APDL RS-232E Port

Table 5-5 DKT2000 with APA/APDL RS-232E (V.24) Interface Module Pin Functions

Pin Designation	Pin #	Function
Transmit Data	2	Input to APA/APDL
Receive Data	3	Output from APA/APDL
Request to Send	4	Input to APA/APDL
Clear to Send	5	Output from APA/APDL
Data Set Ready	6	Output from APA/APDL
Signal Ground	7	
Carrier Detect	8	Output from APA/APDL
Data Terminal Ready	20	Input to APA/APDL

NOTES:

5.6 I/O Connections Via Front Panel

For Coral Interface and Control Cards

1 General

The I/O connections of the following interface cards are performed via cables connected to their front panel:

■ 2DT Card (PRI-23, PRI-30, T1, 30T, or 30TM Configuration)	on page 5-27
■ PRI-23, PRI-30 Card	on page 5-30
■ T1, 30T/x, 30T/E Card	on page 5-35
■ DPC Card (Discontinued)	on page 5-40
■ PUGW Card	on page 5-41
■ UGW, UGW-E Card	on page 5-45
■ IPG Card	on page 5-49

NOTE:

PUGW, UGW-E and UGW cards include front panel and rear panel I/O options. However, there are various factors involved. Therefore, their description is not included in this section. For details, see the Coral VoIP Installation Procedure and Hardware Reference Manual.

NOTE:

8SKK and 16SKK cards include front panel I/O options. However, there are various factors involved. Therefore, their description is not included in this section. For details, see the FlexAir Installation Procedure and Hardware Reference Manual.

NOTE:

2SKW and 4SKW cards include front panel I/O options. However, there are various factors involved. Therefore, their description is not included in this section. For details, see the CoralAIR Installation Procedure and Hardware Reference Manual.

2 Connections on the Cabinet Rear Panel

In the Coral IPx 4000 external connections are performed via a crossover cable (Catalog Number 7244-8000624) with an RJ-45 connector at each end, connects the RJ-45 jack on the front panel of the card and the RJ-45 jack on the LDF or UDF panels.

- LDF (LAN Data Filter) panel is used for: PUGW and IPG cards.
- UDF (Universal digital trunk Data Filter) panel is used for 2DT and layout UDT of: 30T, T1, PRI-23 and PRI-30 cards.

Figures for the following cards describe the connection from the front panel to the LAN/WAN/PSTN/LTU/CSU/etc. via the LDF/UDF panels.

- 2DT..... page 5-29
- PRI (layout UDT)..... page 5-34
- T1, 30T (layout UDT)..... page 5-39
- PUGW..... page 5-44
- UGW, UGW-E..... page 5-48
- IPG..... page 5-51

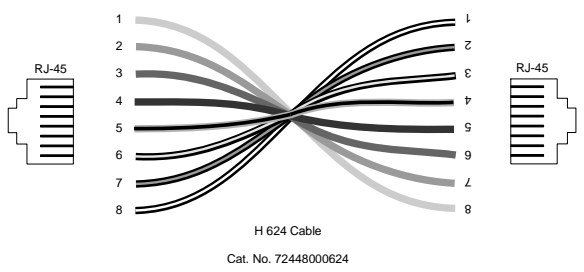
Interface Connections

The connection from the front panel RJ-45 connector to the LDF/UDF lower connector is facilitated by a crossover cable (Catalog Number 7244-8000624). See [Figure 5-11](#).

CAUTION!

It is imperative that a crossover cable be used to make this connection. If an ordinary cable is used the cards will not be integrated into the system.

Figure 5-11 H624 Crossover Cable for Coral IPx 4000 system



NOTE:

For further information on how to make the connection, see Chapter 2 in this manual.

3 2DT Card (PRI-23, PRI-30, T1, 30T, or 30TM Configuration)



NOTE:

Due to logistical requirements, the card is labelled: "**PRI-2DT**", on the front panel and on attached shipping documentation.

The external network connections to the 2DT digital circuit can be made via the RJ-45 telephony connectors on the front panel. This section describes the connections to the front panel. See [Table 5-6](#), [Figure 5-12](#), and [Figure 5-13](#). For further information on fabricating the network interface connection, refer to the ***Coral Service and Peripheral Cards Installation Manual***.

2DT RJ-45 Network Connector Pinout

Table 5-6 2DT Network Interface Connections

RJ-45 Pin #	Nomination	Functions
Pin 1	RxB	Receive Data (ring) from Network
Pin 2	RxA	Receive Data (tip) from Network
Pin 3	Shield	Cable Shield, GND
Pin 4	TxB	Transmit Data (ring) to Network
Pin 5	TxA	Transmit Data (tip) to Network.
Pin 6	—	Not Used
Pin 7	—	Not Used
Pin 8	—	Not Used

Figure 5-12 2DT RJ-45 Interface Connector PIN Assignment

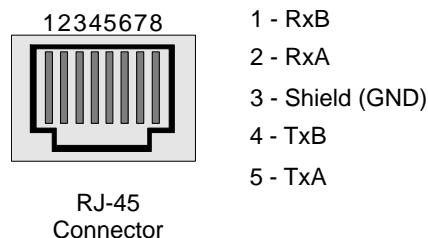
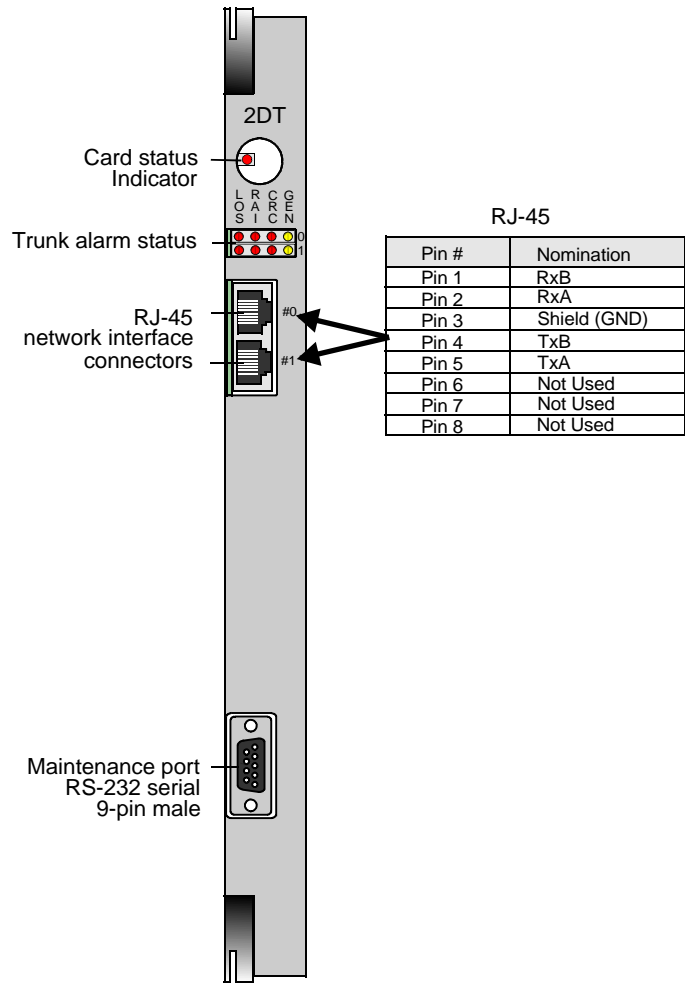
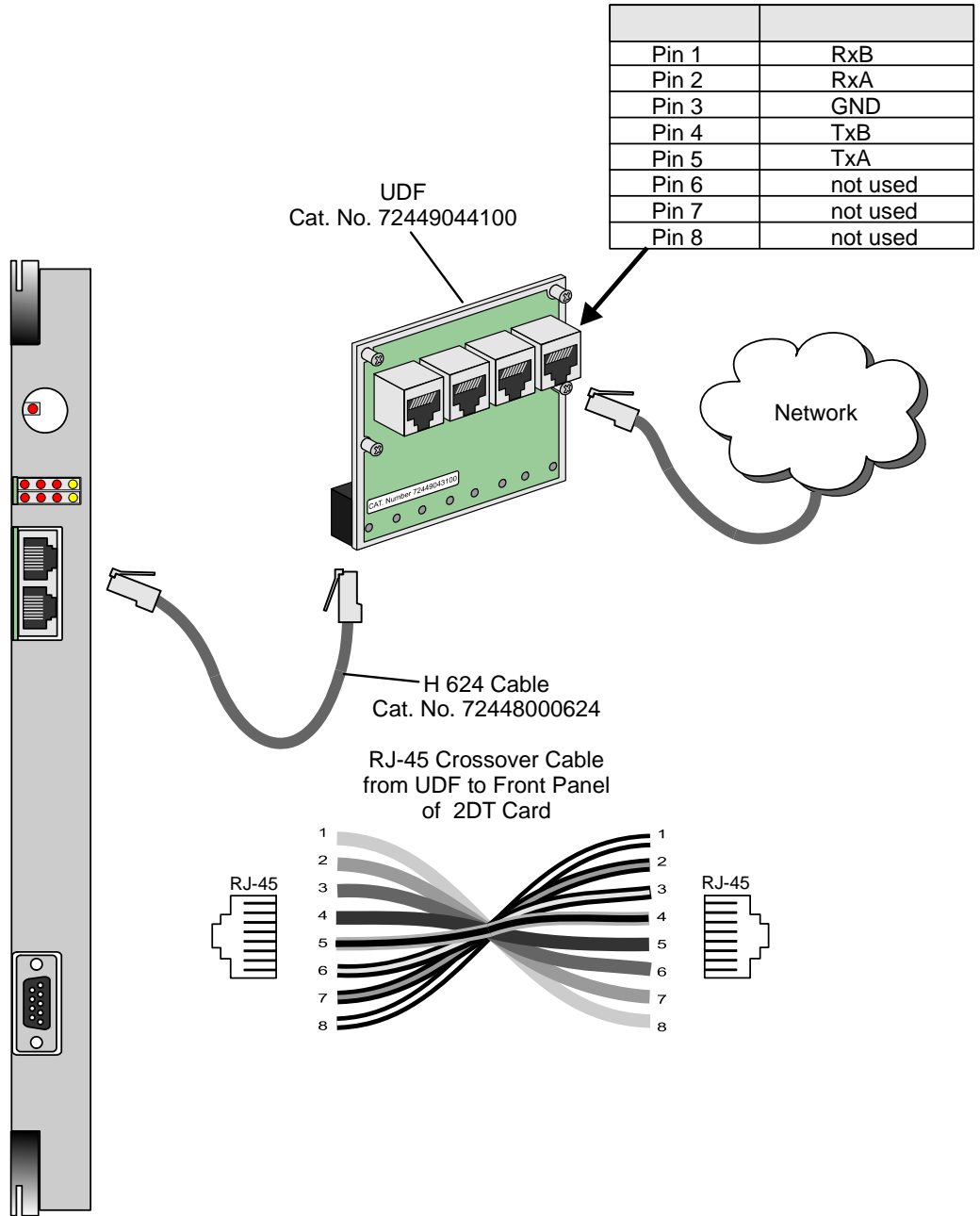


Figure 5-13 2DT Interface Connections to the PSTN/LTU/CSU



NOTE: Due to logistical requirements, the card is labelled: "**PRI-2DT**", on the front panel and on attached shipping documentation.

Figure 5-14 2DT Card Connection to the PSTN/LTU/CSU via UDF



NOTE: Due to logistical requirements, the card is labelled: "PRI-2DT", on the front panel and on attached shipping documentation.

4 PRI-23, PRI-30 Card

The I/O connections of the following PRI options are described below:

- PRI (Layout A&B)..... page 5-30
- PRI (Layout UDT)..... page 5-31
- PRI (Layout UDT) via UDF.. page 5-34



NOTE:

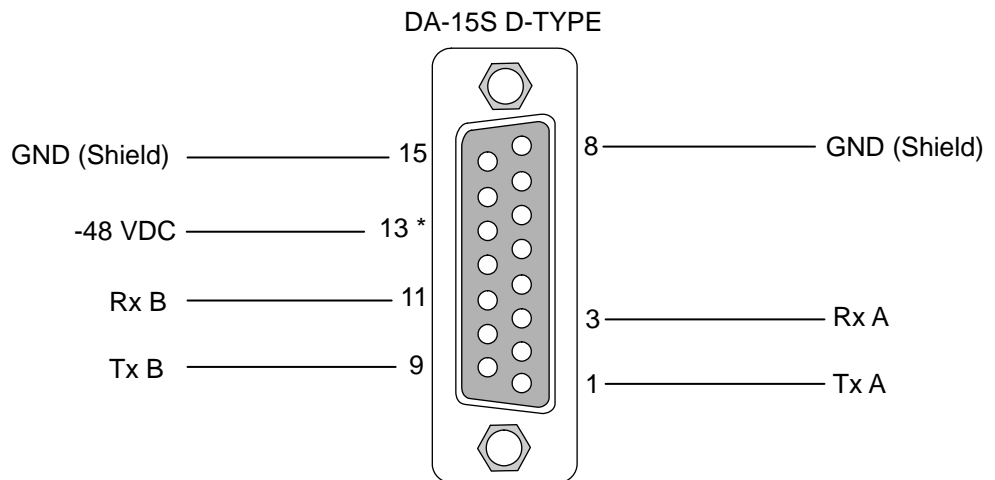
For further information, on how to make the connection, refer also to the Coral Service and Peripheral Cards Installation Manual.

PRI (Layout A & B)

Table 5-7 **PRI-23, PRI-30 (layout A&B) Network Interface Connections**

DA-15S Pin #	Nomination	Function
Pin 1	Tx A	Transmit Data (tip) to Network.
Pin 9	Tx B	Transmit Data (ring) to Network
Pin 3	Rx A	Receive Data (tip) from Network
Pin 11	Rx B	Receive Data (ring) from Network
Pin 8, 15	GND	Cable Shield, 48VDC Return
Pin 13	-48VDC	Power for CSU/LTU from Layout B and later

Figure 5-15 **PRI-23, PRI-30 (layout A&B) DA-15S Interface Connector PIN Assignment**



* From Layout B and Later

PRI (Layout UDT)

The external network connections to the PRI-23 and PRI-30 (layout UDT B & C) digital circuit are made via one of the two connectors available at the front panel:

- DA-15S, 15 pin female D-type connector ([Table 5-8](#) and [Figure 5-16](#)).
- RJ-45 telephony connector ([Table 5-8](#) and [Figure 5-17](#)).

CAUTION!

Do not use both connectors at the same time.

[Figure 5-18](#) describes the optional connection cable (H-UDT) from the front panel to the LTU/CSU, towards PSTN, CN# 7244-6914040.

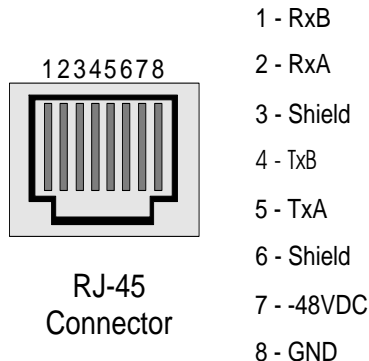
[Figure 5-19](#) describes the connection from the front panel.

[Figure 5-20](#) describes the connection from the front panel to the PSTN/LTU/CSU via the UDF panel in the Coral IPx 4000.

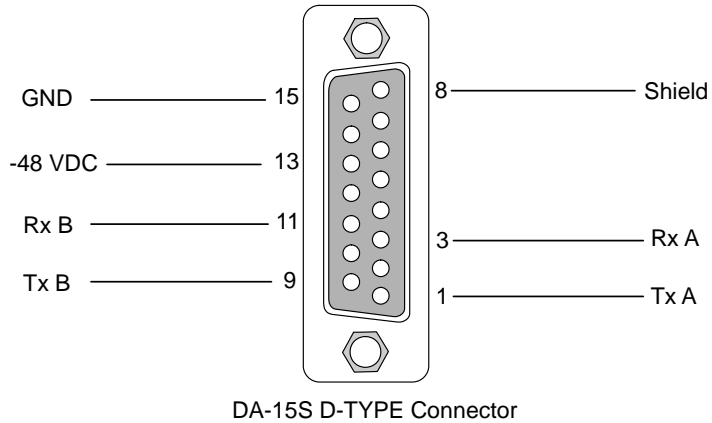
Table 5-8 PRI-23, PRI-30 (layout UDT) Network Interface Connections

DA-15S Pin #	RJ-45 Pin #	Nomination	Functions
Pin 11	Pin 1	RxB	Receive Data (ring) from Network
Pin 3	Pin 2	RxA	Receive Data (tip) from Network
Pin 8	Pin 3,6	Shield	Cable Shield, 48VDC Return
Pin 9	Pin 4	TxB	Transmit Data (ring) to Network
Pin 1	Pin 5	TxA	Transmit Data (tip) to Network.
Pin 13	Pin 7	-48VDC	Power for CSU/LTU
Pin 15	Pin 8	GND	Cable Shield, 48VDC Return
2,4,5,6,7,10,12,14		Not Used	Not Used

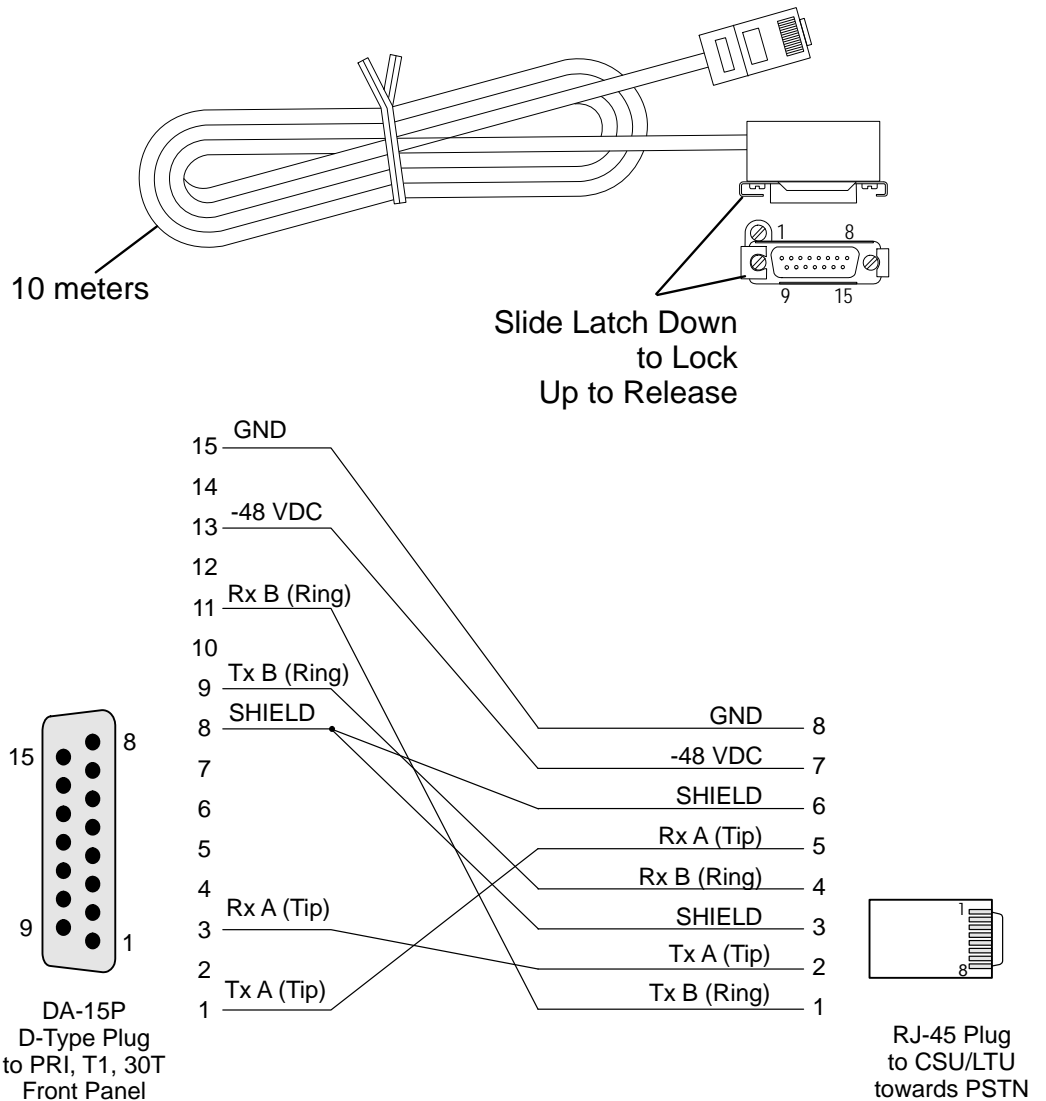
Figure 5-16 PRI-23, PRI-30 (layout UDT) RJ-45 Interface Connector PIN Assignment



**Figure 5-17 PRI-23,
PRI-30 (layout UDT)
DA-15S Interface
Connector PIN
Assignment**



**Figure 5-18 PRI-23,
PRI-30 (layout UDT)
DA-15S to LTU/CSU
Connection Cable**



I/O Connections Via Front Panel For Coral Interface and Control Cards

Figure 5-19 PRI-23, PRI-30 (layout UDT) Interface Connections

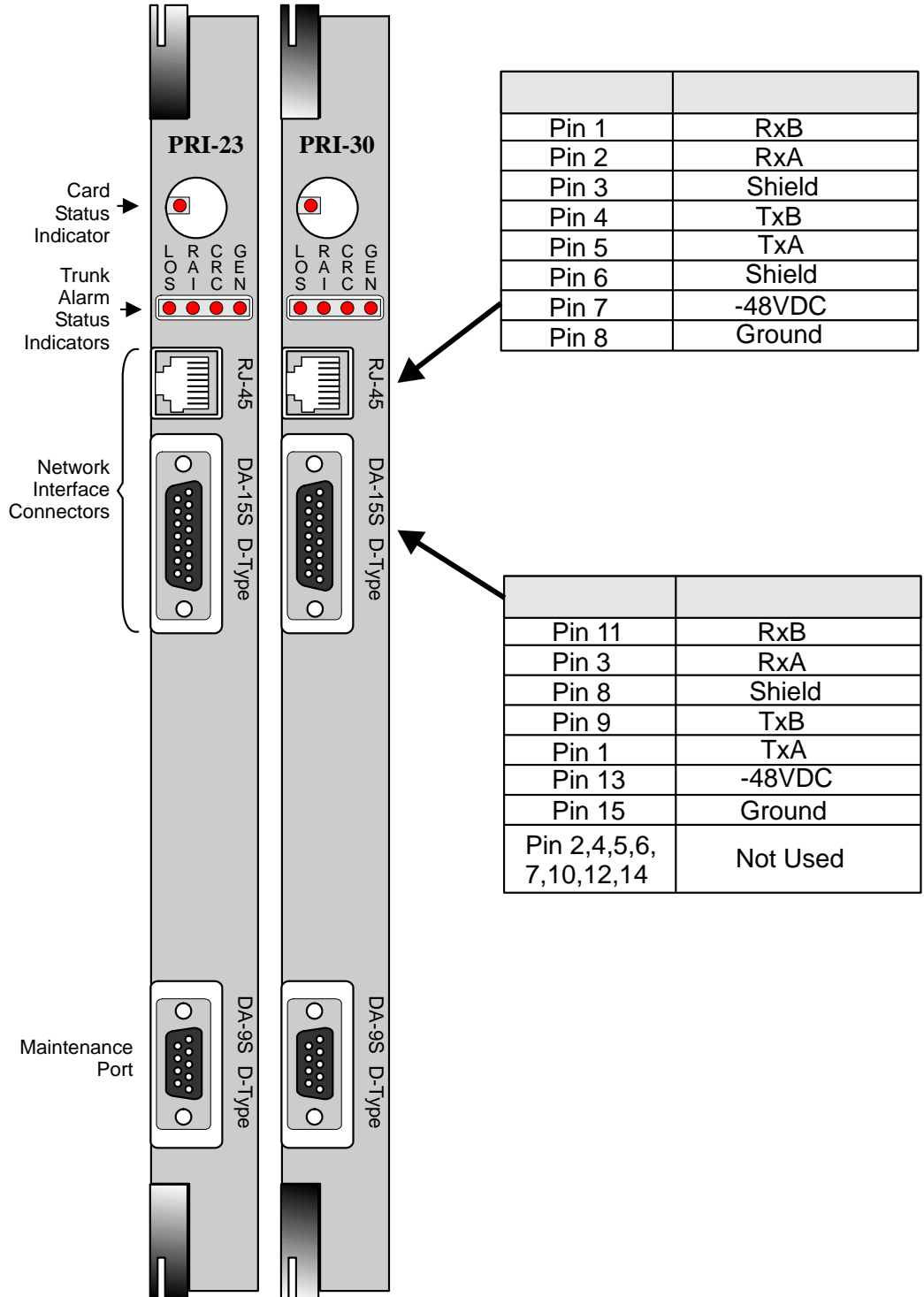
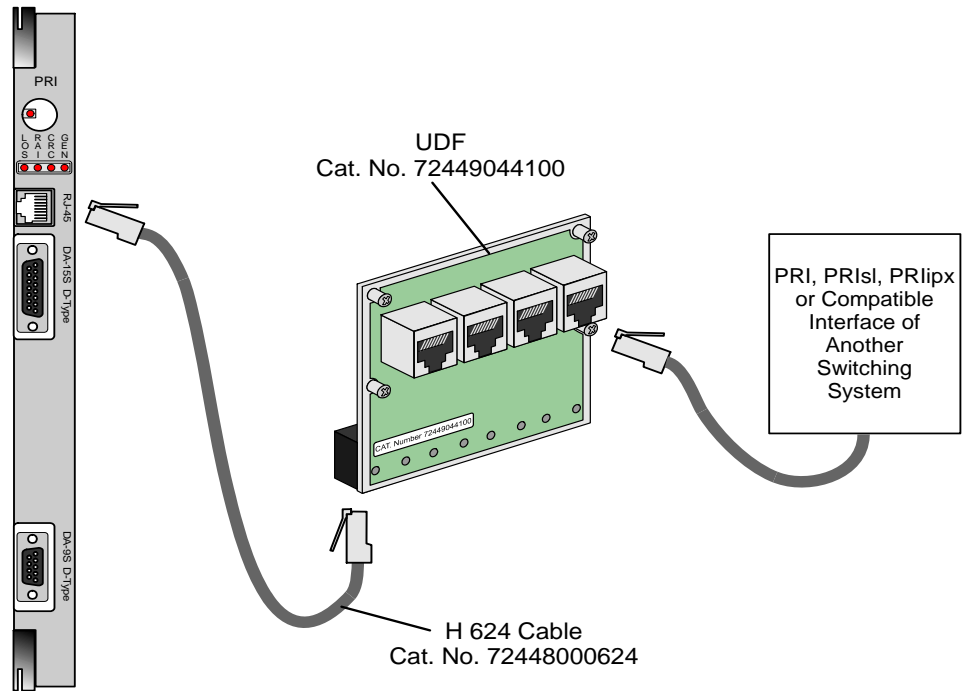
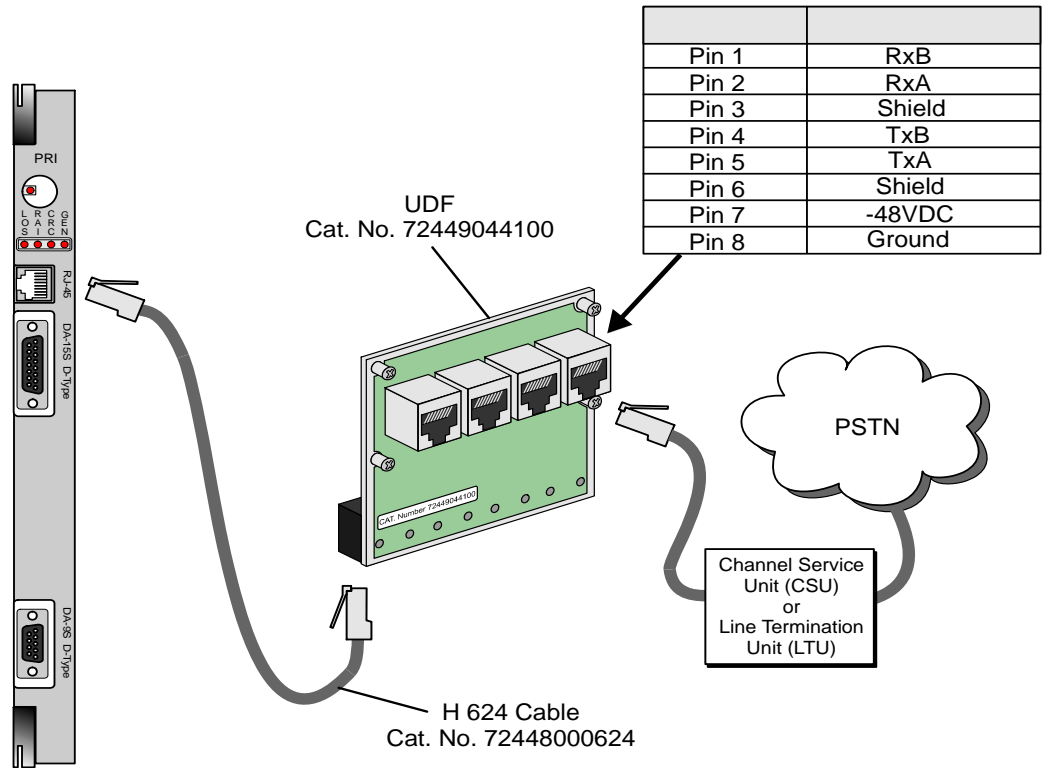


Figure 5-20 PRI-23, PRI-30 (layout UDT) RJ-45 Card Connection to the PSTN/LTU/CSU via UDF



I/O Connections Via Front Panel For Coral Interface and Control Cards

5 T1, 30T/x, 30T/E Card

The I/O connections of the following T1 and 30T options are described below:

- T1 and 30T (Layout A&B)..... page 5-35
- T1 and 30T (Layout UDT)..... page 5-36
- T1 and 30T (Layout UDT) via UDF.. page 5-39



NOTE:

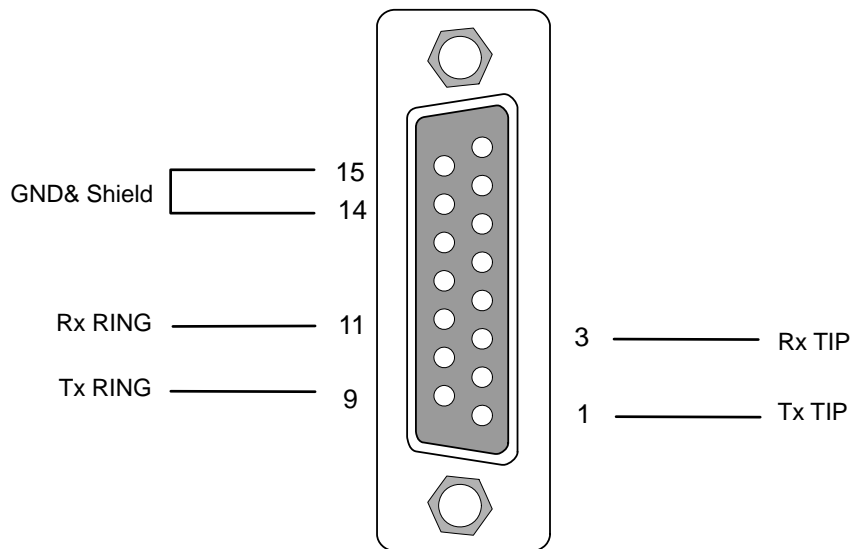
For further information, on how to make the connection, refer also to the Coral Service and Peripheral Cards Installation Manual.

T1, 30T/x, 30T (Layout A & B) [discontinued]

Table 5-9 T1, 30T (layout A&B) Network Interface Connections

Pin No	Name	Signal
Pin 1	Tx Tip	Send Data
Pin 9	Tx Ring	Send Data
Pin 3	Rx Tip	Receive Data
Pin 11	Rx Ring	Receive Data
Pin 14,15	Ground	Cable Shield

Figure 5-21 T1, 30T (layout A&B) RJ-45 Interface Connector PIN Assignment



DA-15S D-TYPE

T1, 30T/x, 30T (Layout UDT)

The external network connections to the T1 and 30T digital circuit are made via one of the two connectors available at the front panel:

- DA-15S, 15 pin female D-type connector ([Table 5-10](#) and [Figure 5-22](#)).
- RJ-45 telephony connector ([Table 5-10](#) and [Figure 5-23](#)).

CAUTION!

Do not use both connectors at the same time.

[Figure 5-24](#) describes the optional connection cable (H-UDT) from the front panel to the LTU/CSU, towards PSTN, CN# 7244-6914040.

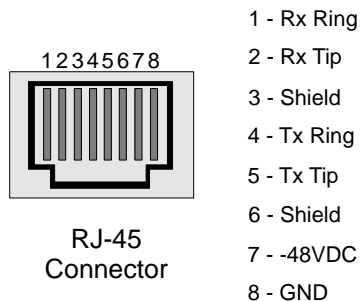
[Figure 5-25](#) describes the connection from the front panel.

[Figure 5-26](#) describes the connection from the front panel to the PSTN/LTU/CSU via the UDF panel in the Coral IPx 4000.

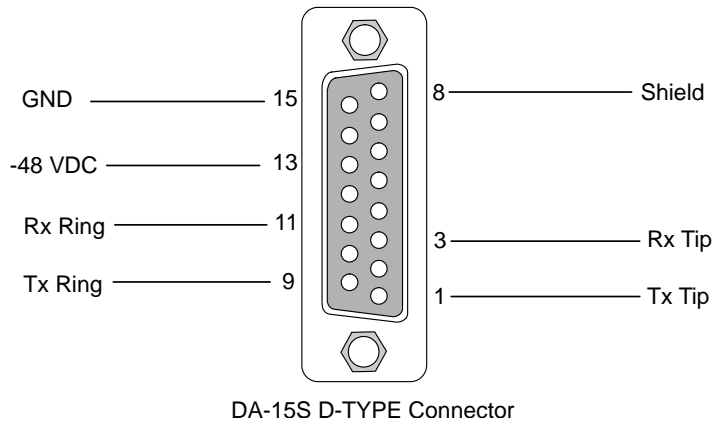
Table 5-10 T1, 30T (layout UDT) Network Interface Connections

DA-15S Pin #	RJ-45 Pin #	Nomination	Functions
Pin 11	Pin 1	Rx Ring	Receive Data from Network
Pin 3	Pin 2	Rx Tip	Receive Data from Network
Pin 8	Pin 3,6	Shield	Cable Shield, 48VDC Return
Pin 9	Pin 4	Tx Ring	Transmit Data to Network
Pin 1	Pin 5	Tx Tip	Transmit Data to Network.
Pin 13	Pin 7	-48VDC	Power for CSU/LTU
Pin 15	Pin 8	GND	Cable Shield, 48VDC Return
2,4,5,6,7,10,12,14		Not Used	Not Used

Figure 5-22 T1, 30T (layout UDT) RJ-45 Interface Connector PIN Assignment



**Figure 5-23 T1, 30T
(layout UDT) DA-15S
Interface Connector PIN
Assignment**



**Figure 5-24 T1, 30T
(layout UDT) DA-15S to
LTU/CSU Connection
Cable**

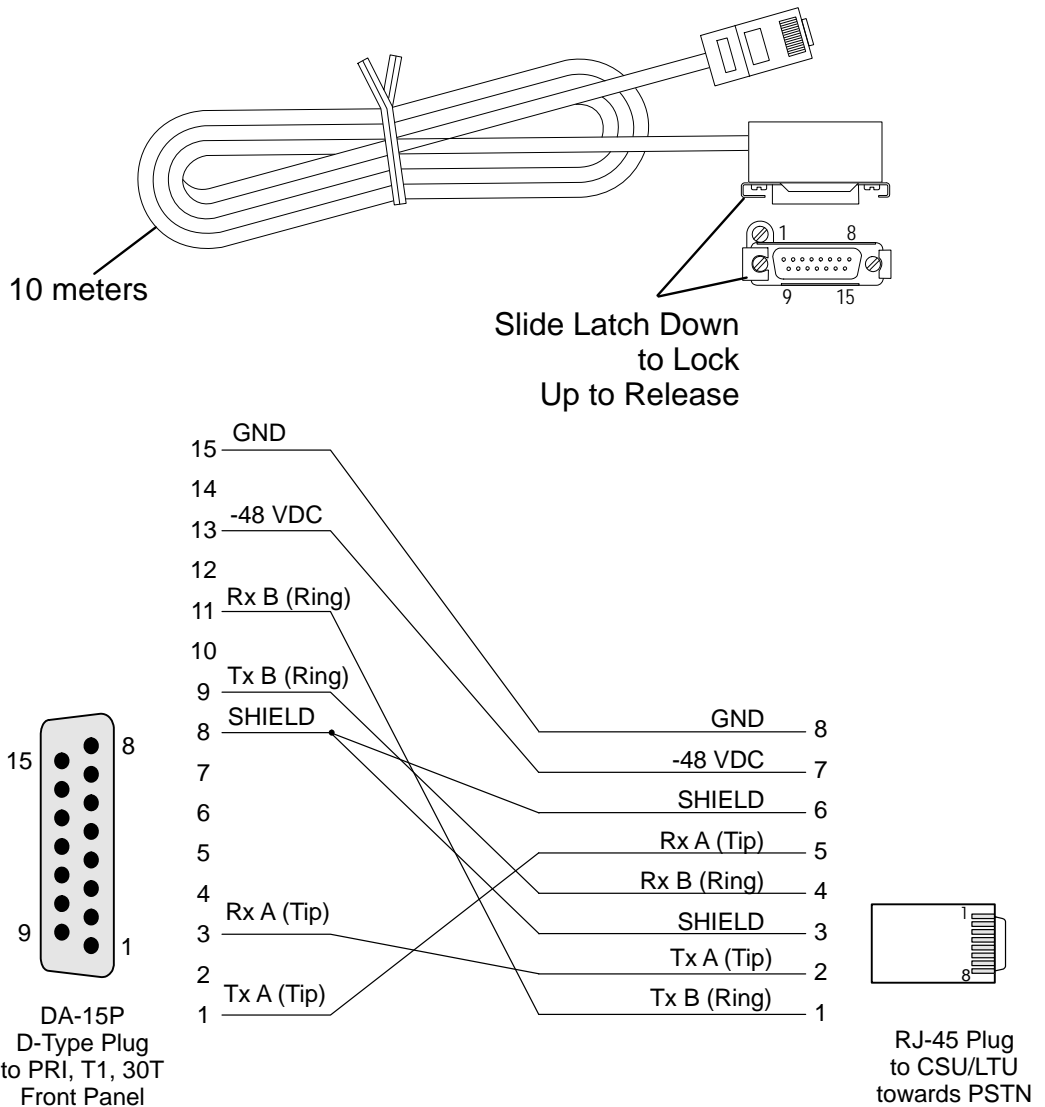


Figure 5-25 T1, 30T/x, 30T/E (layout UDT) Interface Connections

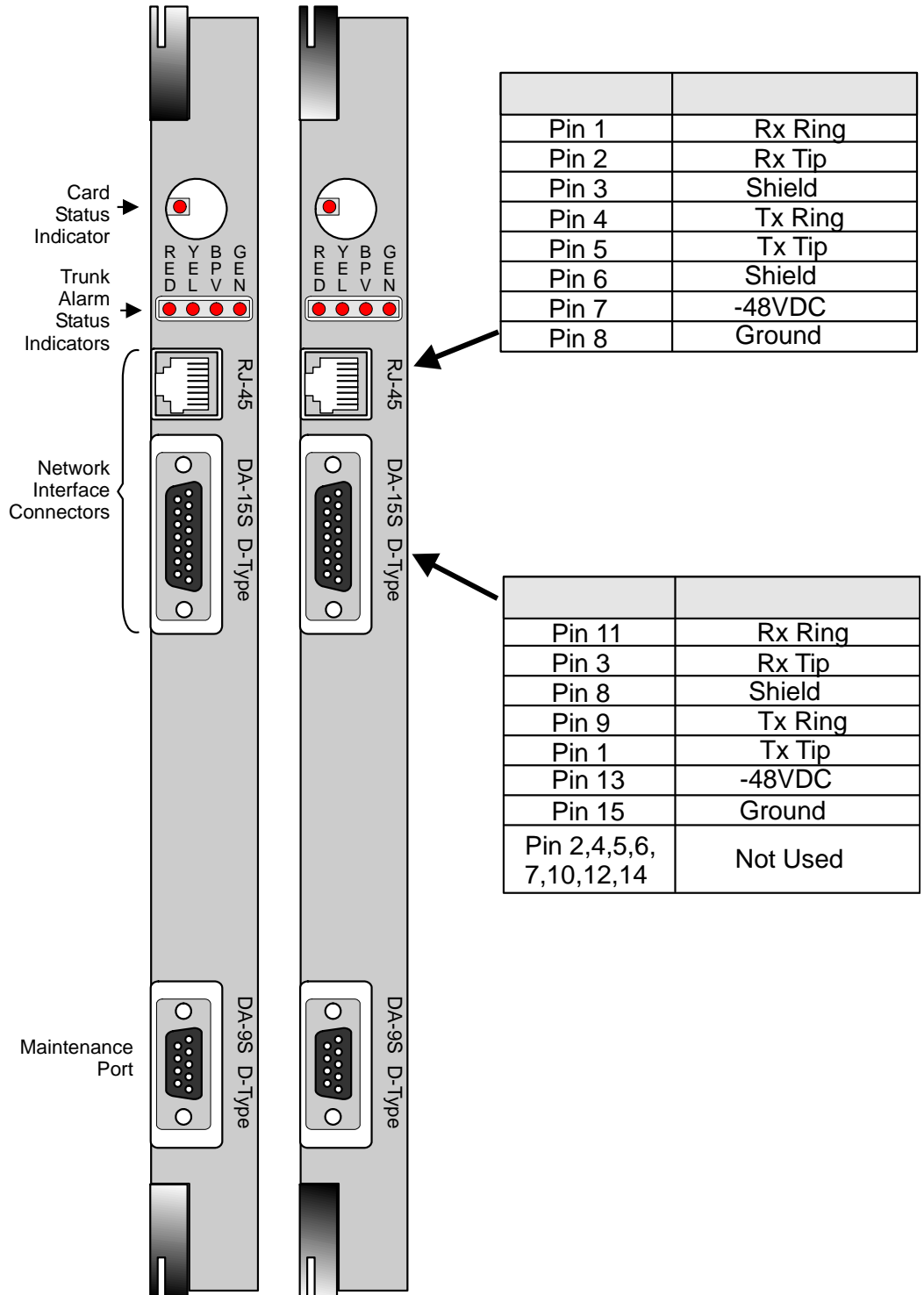
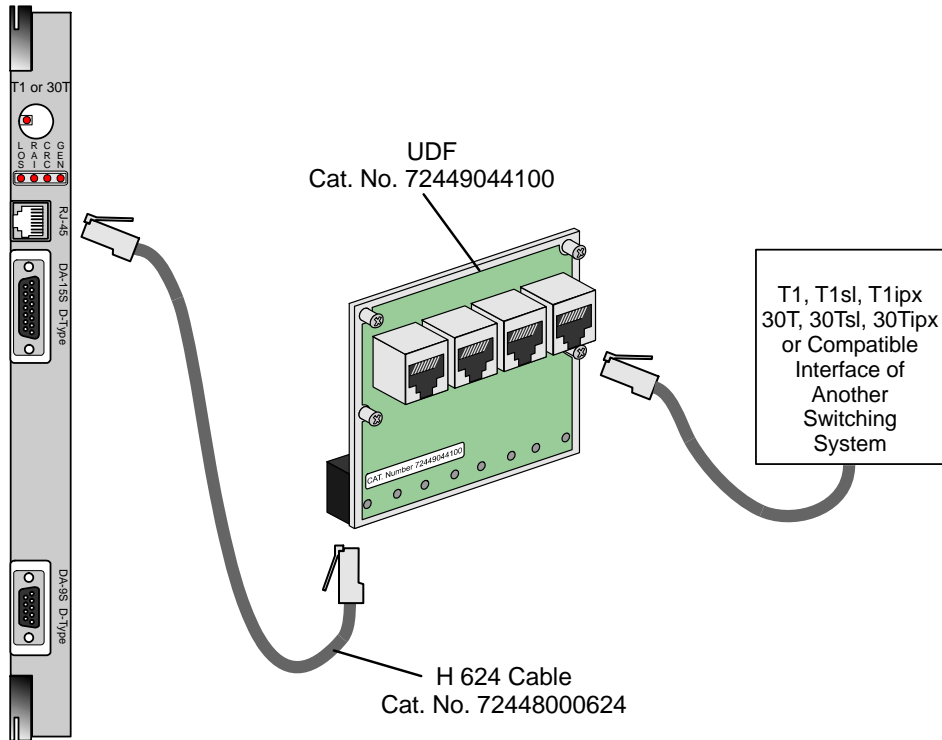
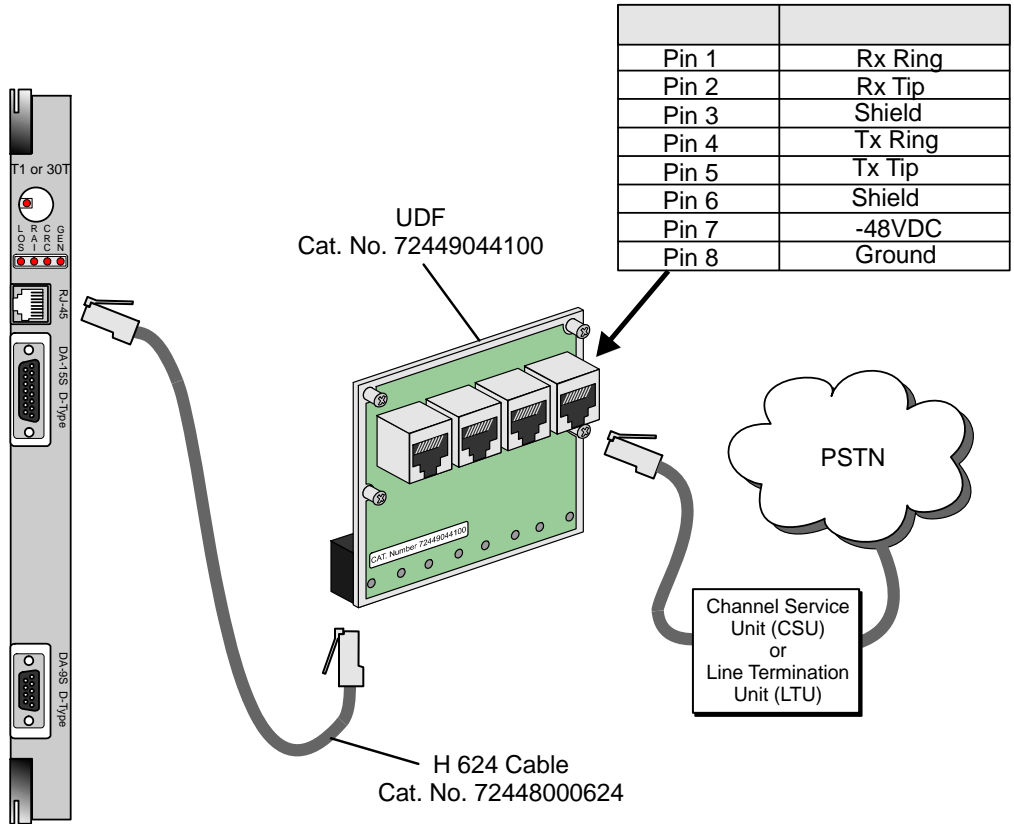


Figure 5-26 T1, 30T (layout UDT) RJ-45 Card Connection to the PSTN/LTU/CSU via UDF

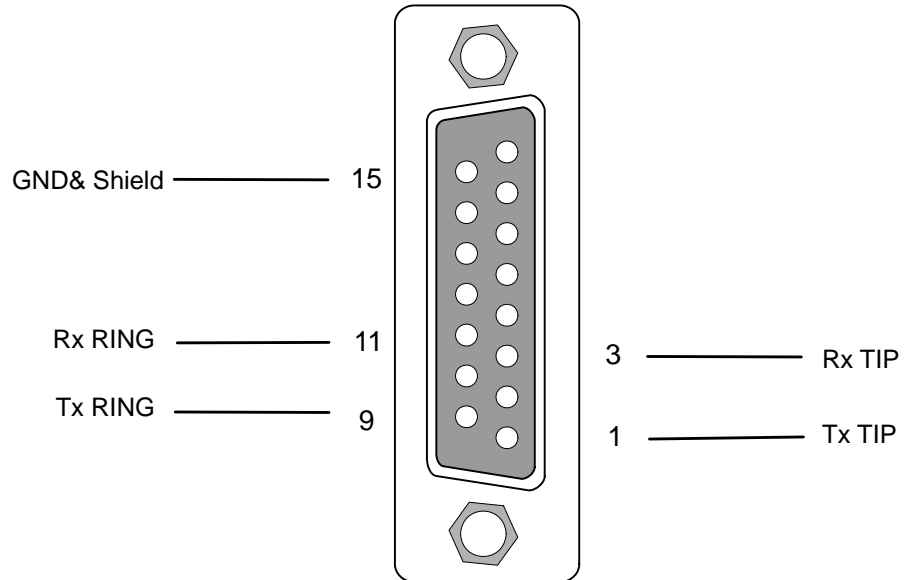


6 DPC Card (Discontinued)

Table 5-11 DA-15S D-Type connector for DPC card

Pin No	Nomination	Function
Pin 1	Tx Tip	Send Data
Pin 9	Tx Ring	Send Data
Pin 3	Rx Tip	Receive Data
Pin 11	Rx Ring	Receive Data
Pin 15	Ground	Shield

Figure 5-27 DPC TO:CO & TO:CORAL Connector Pin Assignments



DA-15S D-TYPE

7 PUGW Card

The PUGW card communicates via the RJ-45 connection on the:

- cage front or rear panel for Coral IPx 800, 3000
- card front panel for Coral IPx 4000 via LDF.

Figure 5-28 PUGW Card

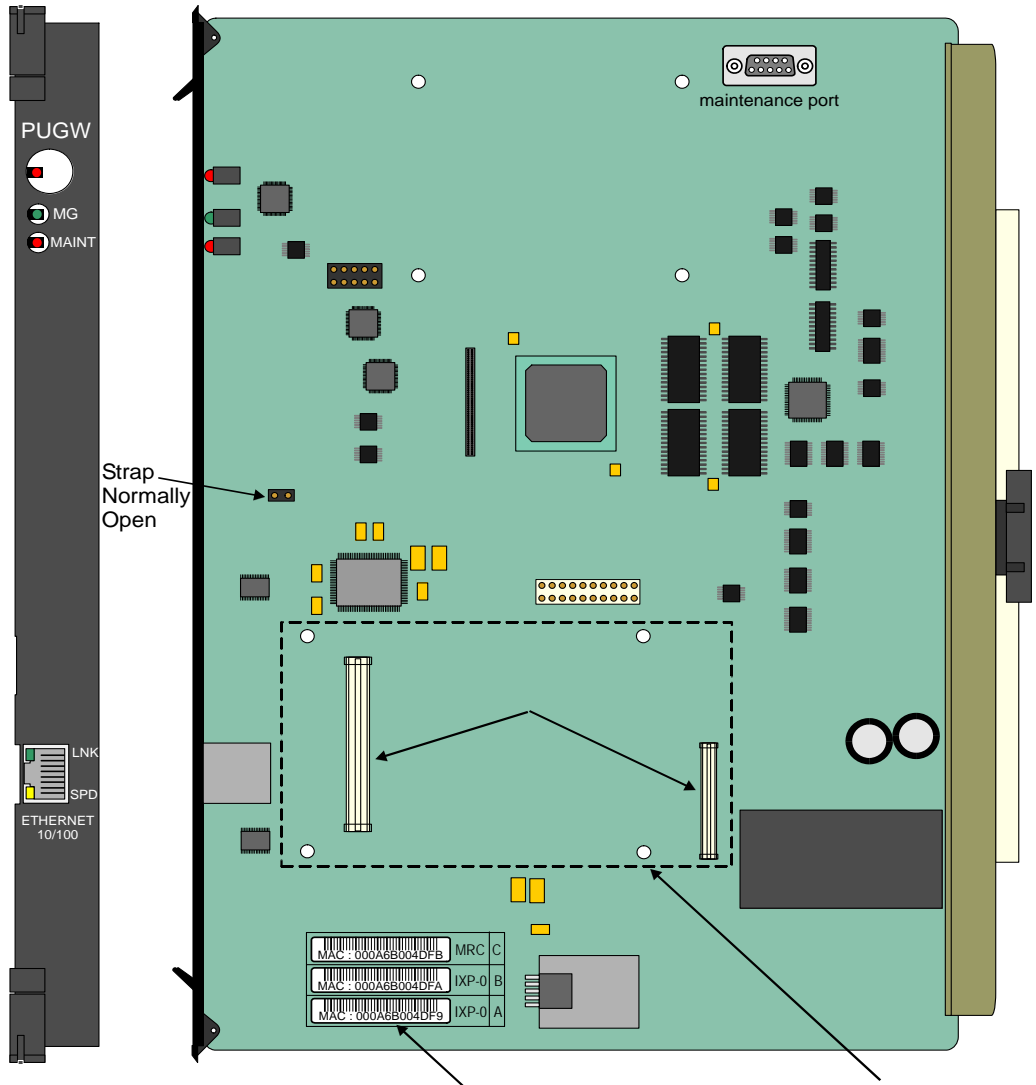


Table 5-12 and Figure 5-29 show the interface connections of the pins on the PUGW RJ-45 connector. The interface connections are the same for the front and rear panels.

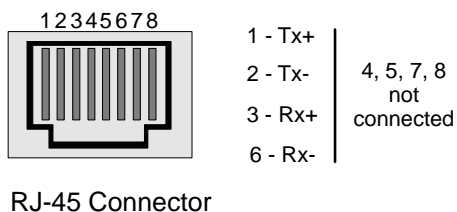
Figure 5-30 describes the connection from the front panel.

Figure 5-31 describes the connection from the front panel to the LAN/WAN via the LDF panel in the Coral IPx 4000.

Table 5-12 **PUGW Network Interface Connections**

Pin #	Nomination	Function
Pin 1	Tx(+)	Transmit Data (+) to Network
Pin 2	Tx(-)	Transmit Data (-) to Network
Pin 3	Rx(+)	Receive Data (+) from Network
Pin 4	not used	not connected
Pin 5	not used	not connected
Pin 6	Rx(-)	Receive Data (-) from Network
Pin 7	not used	not connected
Pin 8	not used	not connected

Figure 5-29 **PUGW Network Interface Connector PIN Assignment**



NOTE:

For further information on how to make the connection, refer also to the "Coral Voice Over IP Installation Manual".

Figure 5-30 PUGW Card Connection

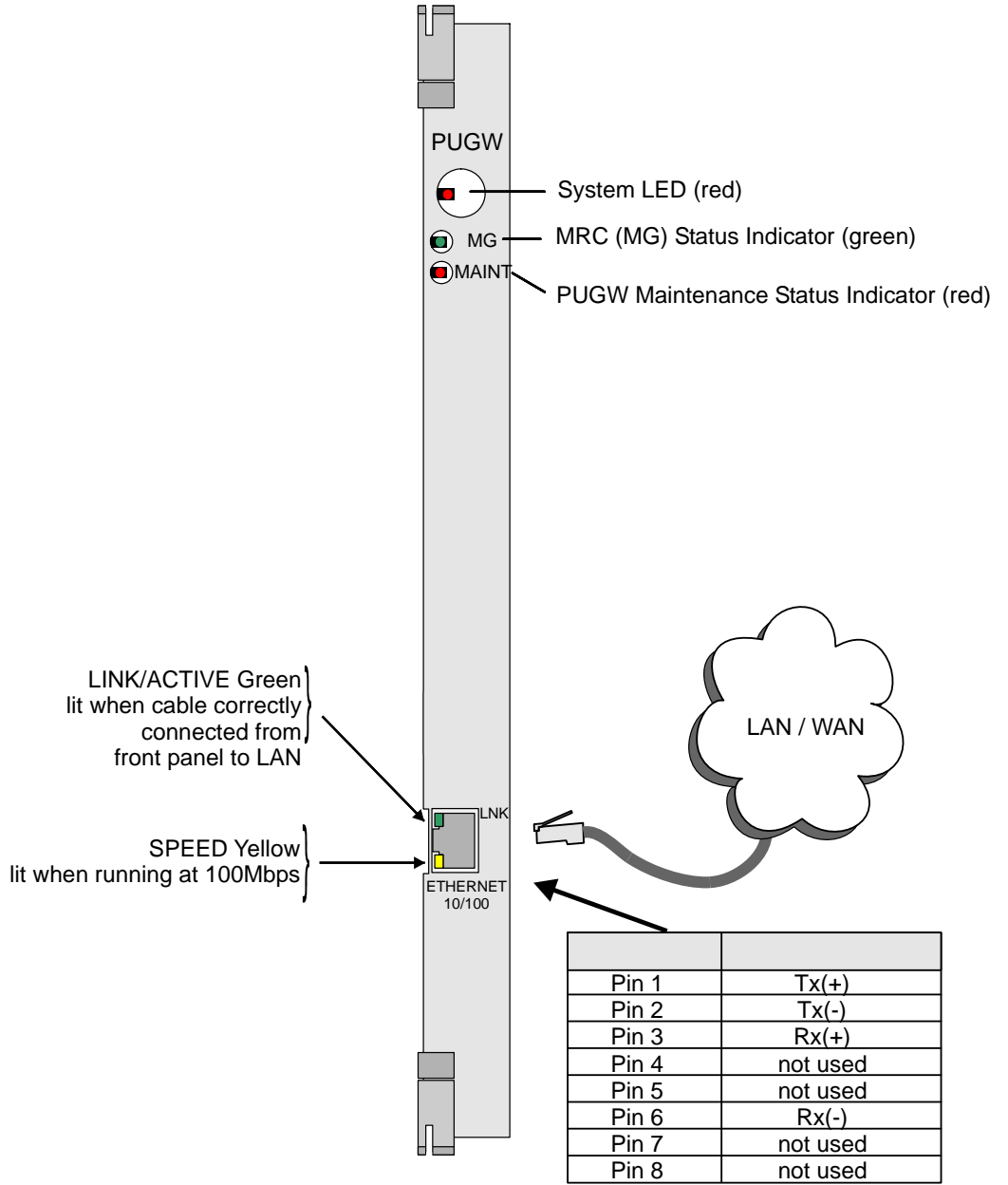
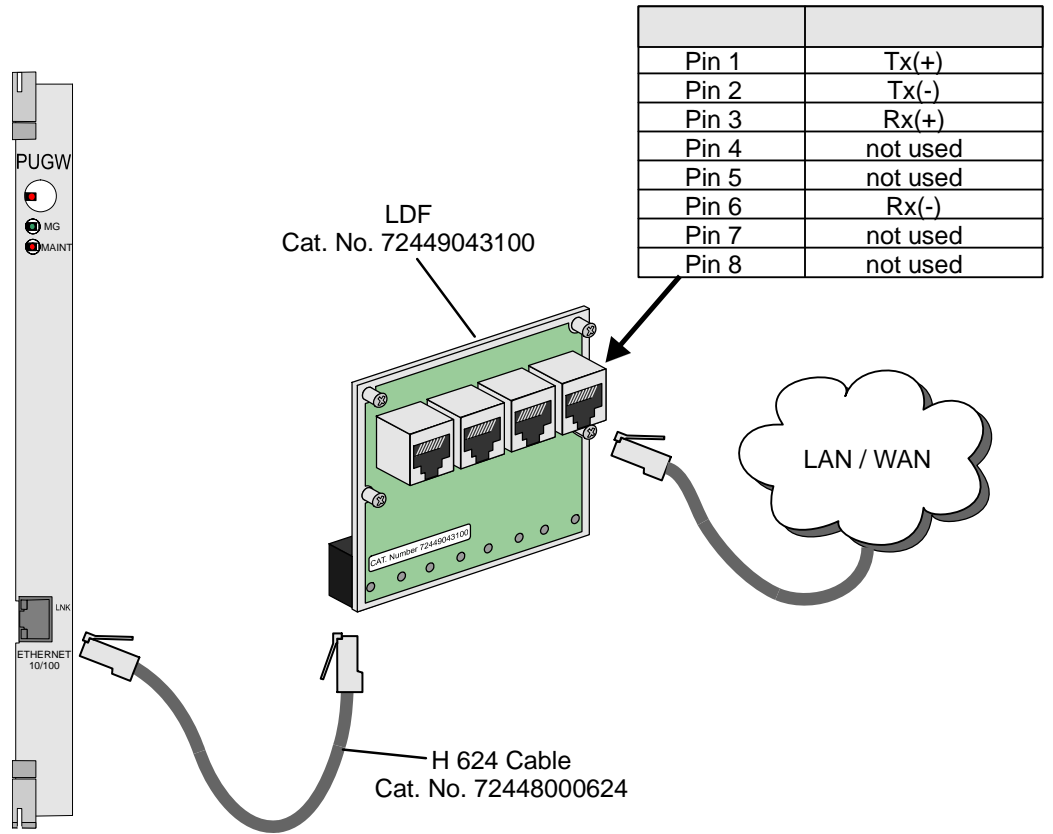


Figure 5-31 PUGW Card Connection to the LAN/WAN via LDF



8 UGW, UGW-E Card

The UGW and UGW-E (herein referred to as the "UGW") card communicates via the RJ-45 connection on the:

- cage front or rear panel for Coral IPx 800, 3000
- card front panel for Coral IPx 4000 via LDF.

The ULI-1 daughterboard is attached to the UGW board before shipment as shown in [Figure 5-32](#) to facilitate RJ-45 connection from the front panel as required in the Coral IPx 4000 system.

Figure 5-32 UGW Card

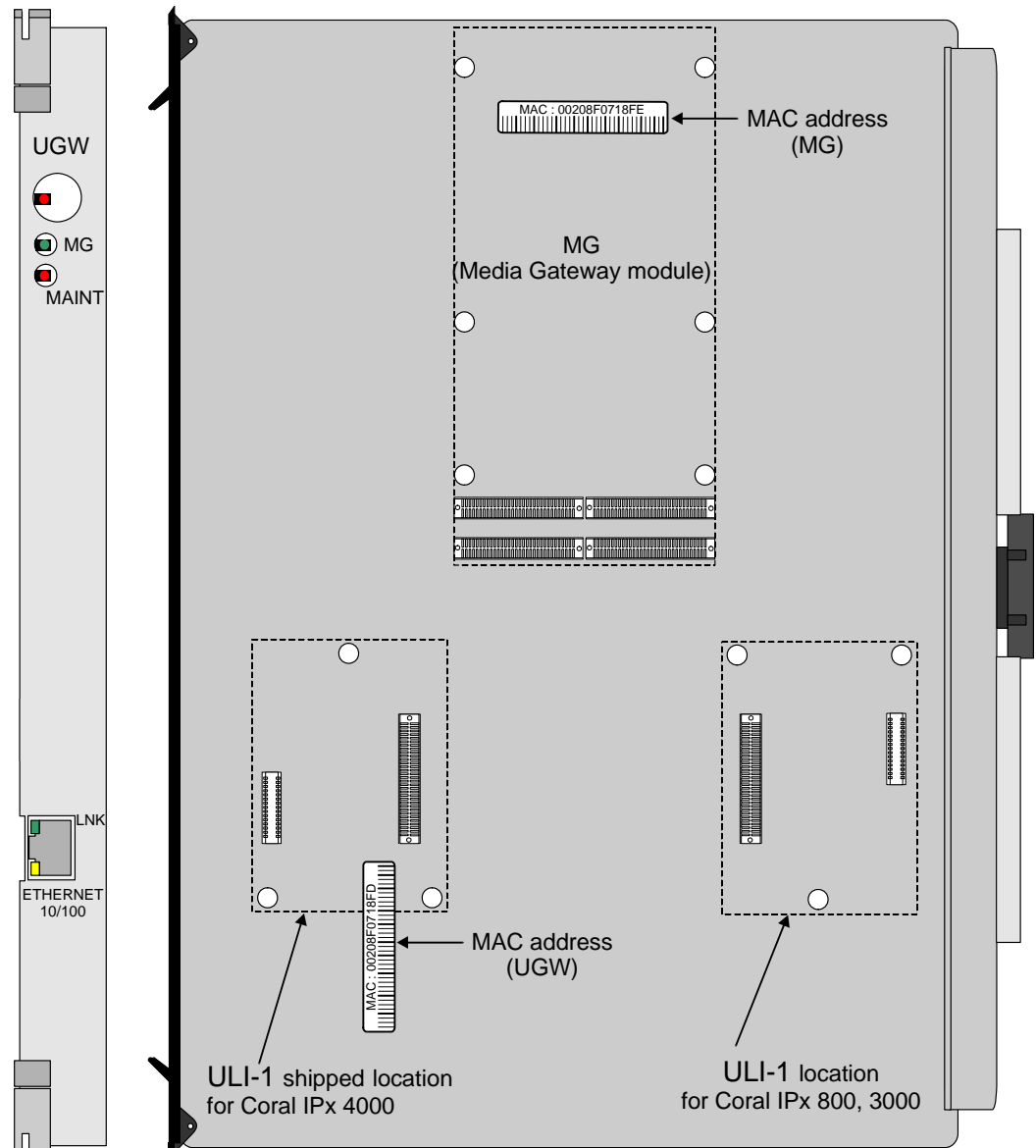


Table 5-13 and Figure 5-33 show the interface connections of the pins on the UGW RJ-45 connector. The interface connections are the same for the front and rear panels.

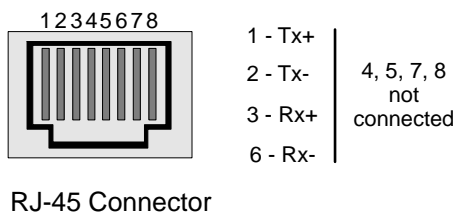
Figure 5-34 describes the connection from the front panel.

Figure 5-35 describes the connection from the front panel to the LAN/WAN via the LDF panel in the Coral IPx 4000.

Table 5-13 **UGW Network Interface Connections**

Pin #	Nomination	Function
Pin 1	Tx(+)	Transmit Data (+) to Network
Pin 2	Tx(-)	Transmit Data (-) to Network
Pin 3	Rx(+)	Receive Data (+) from Network
Pin 4	not used	not connected
Pin 5	not used	not connected
Pin 6	Rx(-)	Receive Data (-) from Network
Pin 7	not used	not connected
Pin 8	not used	not connected

Figure 5-33 **UGW Network Interface Connector PIN Assignment**



NOTE:

For further information on how to make the connection, refer also to the “Coral Voice Over IP Installation Manual”.

Figure 5-34 UGW Card Connection

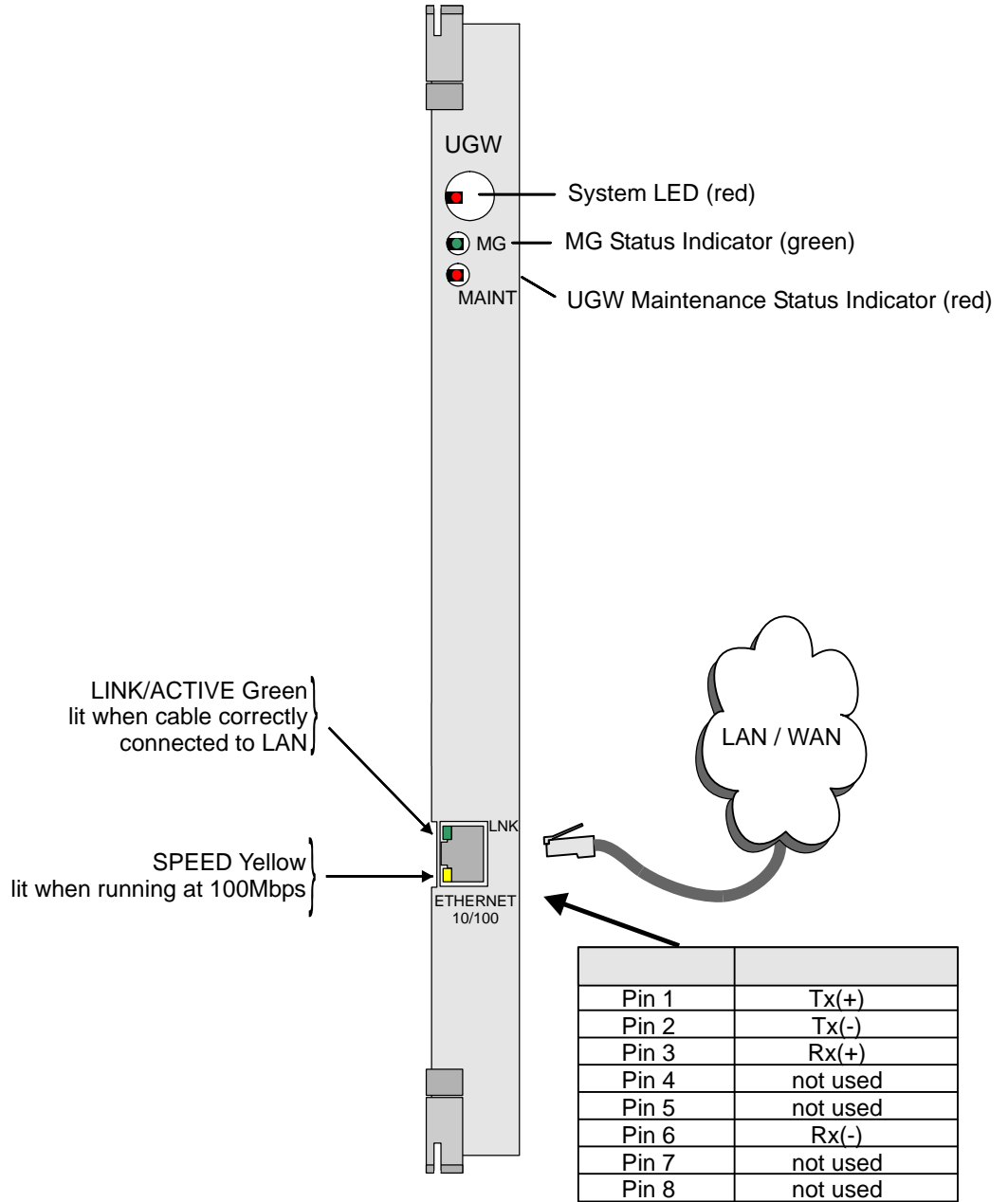
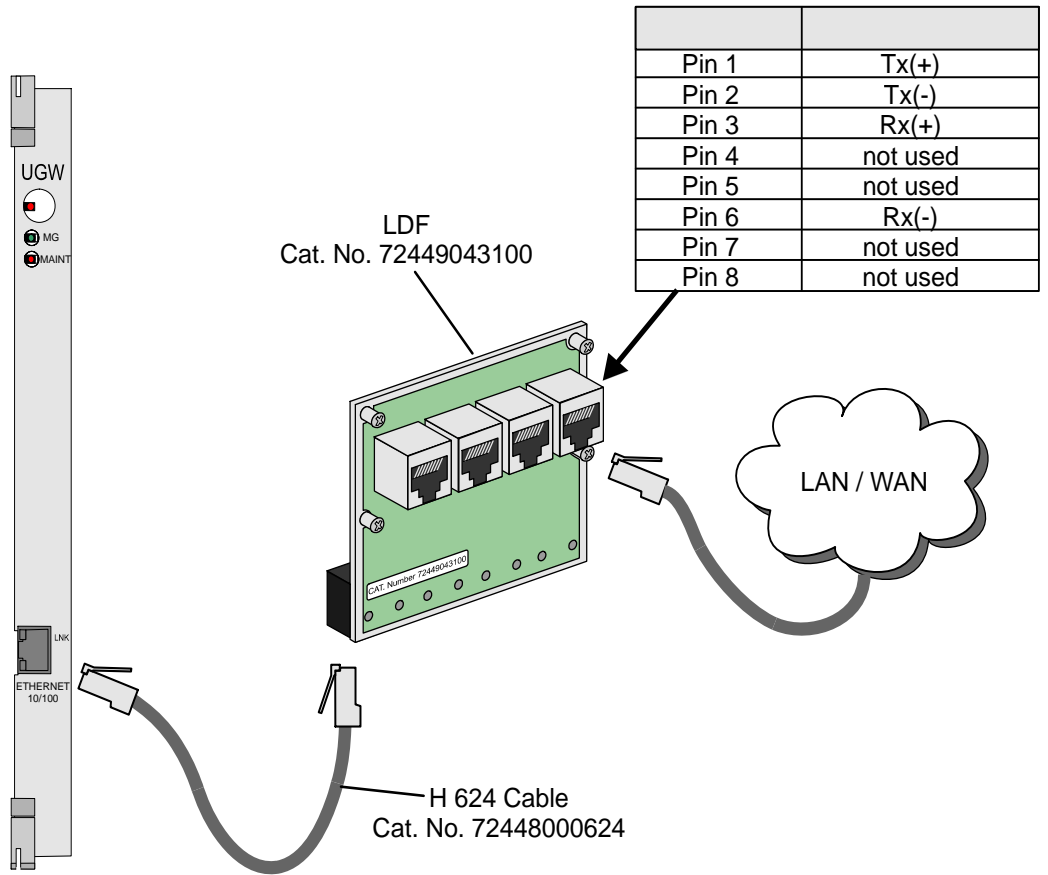


Figure 5-35 UGW Card Connection to the LAN/WAN via LDF



9 IPG Card

Table 5-14 and Figure 5-36 show the interface connections of the pins on the IPG RJ-45 connector.

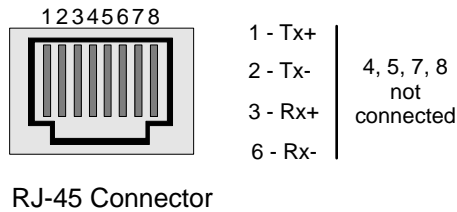
Figure 5-37 describes the connection from the front panel.

Figure 5-38 describes the connection from the front panel to the LAN/WAN via the LDF panel in the Coral IPx 4000.

Table 5-14 IPG Interface Connections

Pin #	Nomination	Connection
Pin 1	Tx(+)	Transmit Data (+) to Network.
Pin 2	Tx(-)	Transmit Data (-) to Network
Pin 3	Rx(+)	Receive Data (+) from Network
Pin 4	not used	not connected
Pin 5	not used	not connected
Pin 6	Rx(-)	Receive Data (-) from Network
Pin 7	not used	not connected
Pin 8	not used	not connected

Figure 5-36 IPG Network Interface Connector PIN Assignment



NOTE:

For further information, see the “VoIP Gateway (IPG) Card” Installation Manual.

Figure 5-37 IPG Card Connection

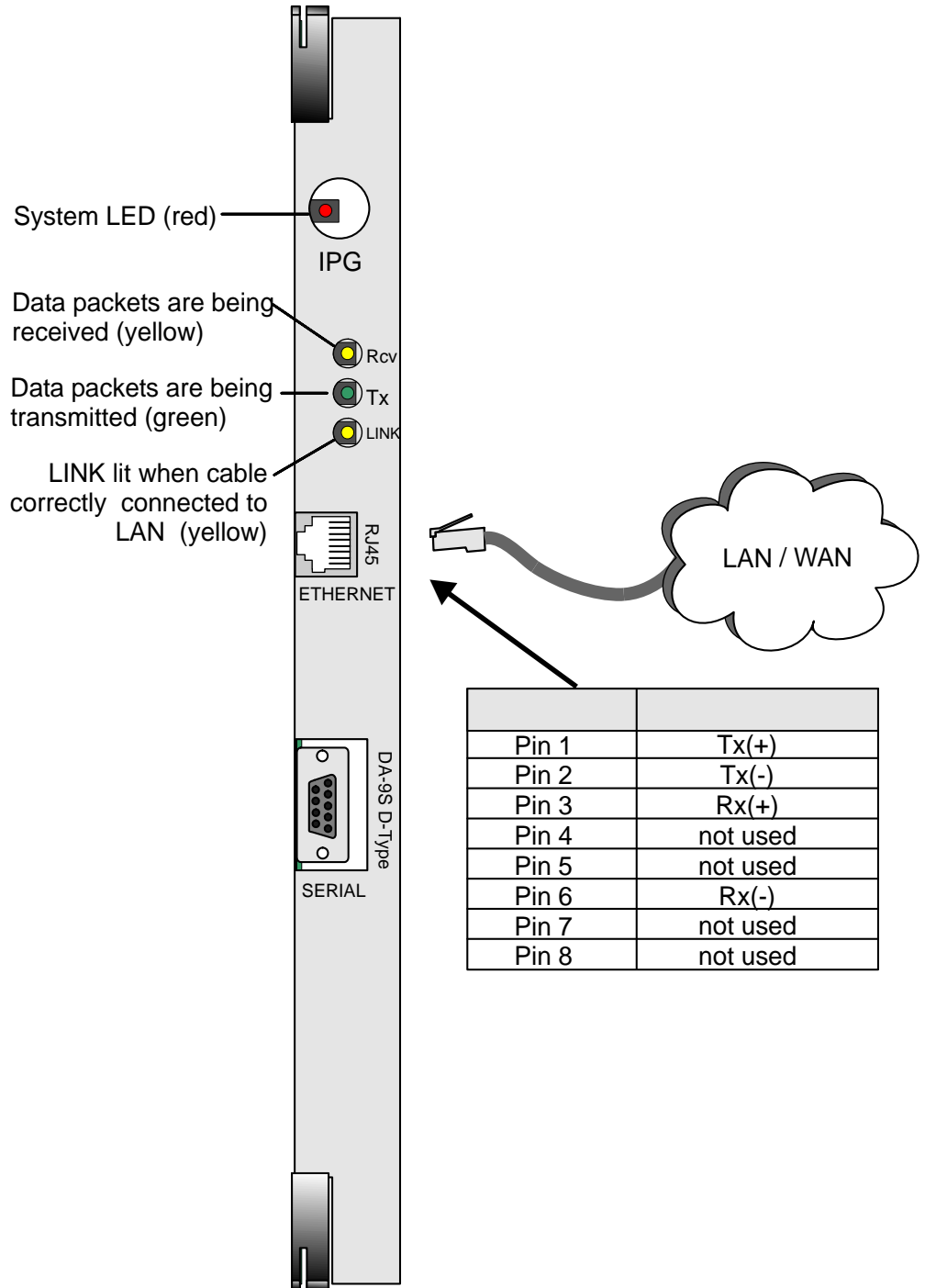
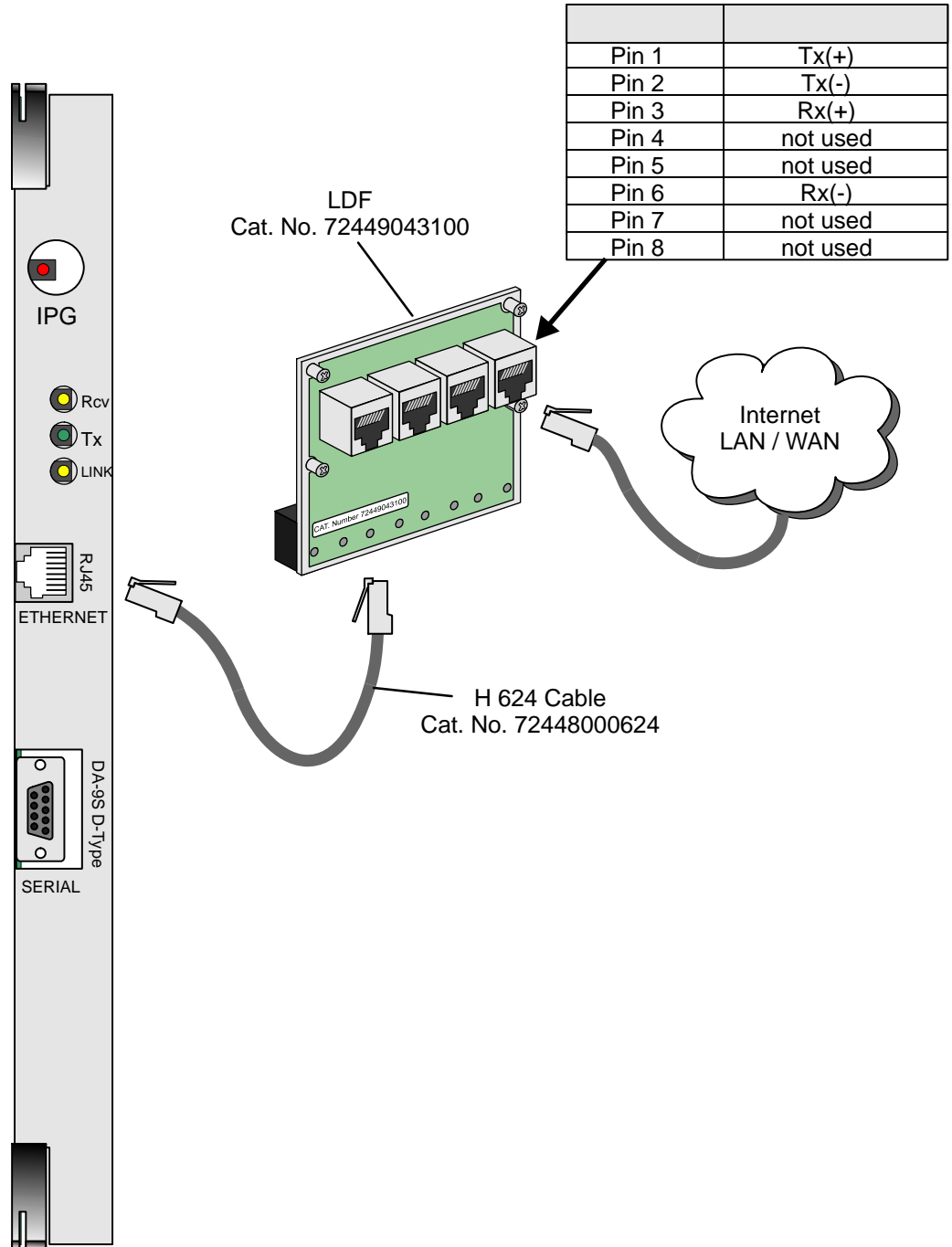


Figure 5-38 IPG Card Connection to the LAN/WAN via LDF





5.7 I/O Connections Via Champ Connectors For Coral Interface Cards

1 General

The following section contains the I/O Connector Pin Designation tables for all the peripheral cards currently available for the Coral IPx 4000 cabinets.

The respective tables for the front panel connections are shown in [Section 5.6, I/O Connections Via Front Panel on page 5-25](#).

Table Presentation

Each I/O connector services two universal I/O slots.

There are two I/O connection tables for each peripheral card:

- Connector - to - Peripheral Card tables
- Peripheral Card - to - Connector tables

Connector - to - Peripheral Card tables (see [Table 5-15](#))

The Connector-to-Peripheral Card tables, located on the left-hand pages, display the pin-to-port designations from the connector's point of view.



Tip:

These tables can be very helpful for a first-time installation.



Tip:

These tables can be used for Block 66 MDF connections as their terminals follow the same numbering pattern.

Peripheral Card - to - Connector tables (see Table 5-16)

The Card-to-Connector tables, located on the right hand pages, indicate the port-to-pin designations from the card's point of view.



Tip:

These tables can help when changing, adding, or removing specific ports in an existing structure.

Table Legend

[Table 5-15](#) illustrates the Connector-to-Peripheral Card relationship tables.

The table is divided into two major columns. The first applies when the card is inserted in the even-numbered slots; the second is for cards inserted into the odd-numbered slots. Each column then divides for the upper or lower connector pins. The possible connections for each card are marked by the shaded areas.

If the card is inserted in the even-numbered slots, the upper left area will apply.

If the card is inserted in the odd-numbered slots, the lower right area will apply.

[Table 5-16](#) illustrates the Peripheral Card-to-Connector relationship tables.

The possible connections for each cards are highlighted by the shaded areas. The table is divided in two sections: The upper section represent the connections for cards inserted in even-numbered slots, while the lower section stands for the connections of cards inserted into the odd-numbered slots.

Each section shows the pins associated with a specific port - group. Given that some of the peripheral cards can support up to 24 ports, the ports are divided into groups of eight (for connection purposes only). Thus, each group is associated with either the upper or lower connector (see sub-columns) and with the 1st, 2nd, or 3rd group of pins (see rows).

The pins associated with the first two port columns are listed in the right column while the pins for the last group of ports (left column) are listed in the adjacent column on their left.

Finding a Specific Peripheral Card's Table

To help identify the peripheral cards, they are listed below in two indexes. The first index is grouped according to the functional type of each card, the second is in alpha-numeric order.

For [Card Index: Listed by Function Category on page 5-57](#).

For [Card Index: Listed by Alpha-Numerically Order on page 5-60](#).

**Table 5-15 Connector -
to - Peripheral Card
tables**

26 Wh/Bl 1 Bl/Wh	1st Port Group	2nd Port Group		
27 Wh/Or 2 Or/Wh				
28 Wh/Gn 3 Gn/Wh				
29 Wh/Br 4 Br/Wh				
30 Wh/SI 5 SI/Wh				
31 Rd/Bl 6 Bl/Rd				
32 Rd/Or 7 Or/Rd				
33 Rd/Gn 8 Gn/Rd				
34 Rd/Br 9 Br/Rd	3rd Port Group			2nd Port Group
35 Rd/SI 10 SI/Rd				
36 Bk/Bl 11 Bl/Bk				
37 Bk/Or 12 Or/Bk				
38 Bk/Gn 13 Gn/Bk				
39 Bk/Br 14 Br/Bk				
40 Bk/SI 15 SI/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw			1st Port Group	3rd Port Group
43 Yw/Gn 18 Gn/Yw				
44 Yw/Br 19 Br/Yw				
45 Yw/SI 20 SI/Yw				
46 Vi/Bl 21 Bl/Vi				
47 Vi/Or 22 Or/Vi				
48 Vi/Gn 23 Gn/Vi				
49 Vi/Br 24 Br/Vi				
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

Table 5-16 Peripheral Card - to - Connector tables

26 Wh/Bl 1 Bl/Wh	1st Port Group	2nd Port Group	34 Rd/Br 9 Br/Rd	3rd Port Group
27 Wh/Or 2 Or/Wh			35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh			36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh			37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh			38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd			39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd			40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd			41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	1st Port Group	3rd Port Group	34 Rd/Br 9 Br/Rd	2nd Port Group
43 Yw/Gn 18 Gn/Yw			35 Rd/Sl 10 Sl/Rd	
44 Yw/Br 19 Br/Yw			36 Bk/Bl 11 Bl/Bk	
45 Yw/Sl 20 Sl/Yw			37 Bk/Or 12 Or/Bk	
46 Vi/Bl 21 Bl/Vi			38 Bk/Gn 13 Gn/Bk	
47 Vi/Or 22 Or/Vi			39 Bk/Br 14 Br/Bk	
48 Vi/Gn 23 Gn/Vi			40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi			41 Yw/Bl 16 Bl/Yw	

2 Card Index: Listed by Function Category

Key Set Telephone

2SK cards..... 5-80

4SK, 8SK cards..... 5-82

2SD, 8SD cards 5-84

8SKD, 16SKD cards 5-86

8SVD cards..... 5-88

8SFT, 16SFT, 24SFT, 8SDT, 16SDT, 24SDT cards...5-90

Table 5-17 Possible Terminal/Card combinations

<i>Terminals</i>	<i>8/16/24SFT</i>	<i>8/16/24SDT</i>	<i>8/16SKD</i>	<i>8SVD</i>
FlexSet	Yes	No	No	No
DKT/DST (Ver. 5.xx or higher)	Yes	Yes	Yes	Yes
DKT/DST (Ver. 2.xx-4.xx)	No	No	Yes	Yes
DKT2000 + VDM	No	No	No	Yes
CPA	Yes	Yes	Yes	Yes
GKT	Yes	Yes	Yes	No

Single Line Telephone

4S/SH, 4SH/S(-LL) cards	5-92
8SA, 8SLS, 8SH/S(-LL), 8S, 8S/SH cards	5-94
16SLS, 16SH/S(-LL), 16S, 16SH cards	5-96
8SM cards	5-100
24SA, 16SLS, 24SLS cards.....	5-98
. ?	

CAUTION!

The 4,8,16 (SH, S/SH, SH/S, SH/S-LL) cards with message waiting are not for use in the Coral IPx 4000 cages. Installing these cards, **with message waiting**, in the Coral IPx 4000 cages may cause Power Supply failure.

These cards are used in the Coral FlexiCom and Coral I,II,III systems only.

Digital Trunks

4TBR, 8TBR, 4TBRP, 8TBRP cards	5-62
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Analog Trunks

4TEM, 4TEM/S, 4TEMP cards	5-78
4T-C, 4T-CID cards	5-64
4TMR - PF (/S) (12/16) <G> <ES> cards	5-64
4TPF	5-64
4TWL	5-76
8T-C, 8T-CID cards	5-66
8TPE, 8T/S - PF <G> <ES> cards	5-66
I/O Connections: 4ALS, 4ALS/M cards	5-68
8ALS, 8ALS/M cards	5-70
8DID, 8DID/S, 8DID/S-Z cards	5-72
8BID cards	5-74
4GID, 4TWL cards	5-76

Auxiliary Cards

8DRCF, 8DRCM, 8DRCM-2 cards 5-102
RMI, ASU cards..... 5-104

Wireless (Radio Base Station) Cards

SKW/x cards (Issue 4 and later)..... 5-106
*8SKK card for Wireless FlexAir (Radio Base Station)*5-108
*16SKK card for Wireless FlexAir (Radio Base Station)*5-110

Card Index: Listed by Alpha-Numerically Order

<i>RMI, ASU cards</i>	5-104
<i>SKW/x cards (Issue 4 and later)</i>	5-106
16S, 16S/SH, 16SH/S(-LL), 16SLS cards	5-96
16SDT cards	5-90
16SKD	5-86
16SKK	5-110
16SLS cards	5-96
24SA cards	5-98
2SD cards	5-84
<i>2SK cards</i>	5-80
24SDT cards	5-90
24SLS cards	5-98
<i>I/O Connections: 4ALS, 4ALS/M cards</i>	5-68
<i>4GID, 4TWL cards</i>	5-76
4S/SH, 4SH/S(-LL)	5-92
<i>4SK, 8SK cards</i>	5-82
4T-C, 4T-CID cards	5-64
4T, 4TPE, /S (12/16) <G> <ES> cards	5-64
4TBR, 4TBRP cards	5-62
<i>4TEM, 4TEM/S, 4TEMP cards</i>	5-78
4TMR, 4TMR - PF /S (12/16) <G> <ES> cards	5-64
4TWL	5-76
4T/S, 4TMR/S (12/16) (PF) <G> <ES> cards	5-64
<i>8ALS, 8ALS/M cards</i>	5-70
<i>8BID cards</i>	5-74
<i>8DID, 8DID/S, 8DID/S-Z cards</i>	5-72
8S, 8S/SH, 8SH/S, (-LL)	5-92

8SA	5-92
8SD	5-84
8SDT	5-90
8SK	5-82
8SKD, 16SKD	5-86
8SKK	5-108
8SLS	5-92
8SM cards.....	5-100
8SVD cards.....	5-88
8T-C, 8T-CID cards	5-66
8T, 8TPE, 8T/S, 8T/S - PF cards	5-66
8T/S-G, 8T/S PF-G cards	5-66
8TBR, 8TBRP cards	5-62
8DRCF, 8DRCM, 8DRCM-2 cards.....	5-102

**Table 5-18 4TBR, 8TBR,
4TBRP, 8TBRP cards**

26 Wh/Bl 1 Bl/Wh	T(+) 0 T(-) 0	T(+) 4 T(-) 4		
27 Wh/Or 2 Or/Wh	R(+) 0 R(-) 0	R(+) 4 R(-) 4		
28 Wh/Gn 3 Gn/Wh	T(+) 1 T(-) 1	T(+) 5 T(-) 5		
29 Wh/Br 4 Br/Wh	R(+) 1 R(-) 1	R(+) 5 R(-) 5		
30 Wh/SI 5 SI/Wh	T(+) 2 T(-) 2	T(+) 6 T(-) 6		
31 Rd/Bl 6 Bl/Rd	R(+) 2 R(-) 2	R(+) 6 R(-) 6		
32 Rd/Or 7 Or/Rd	T(+) 3 T(-) 3	T(+) 7 T(-) 7		
33 Rd/Gn 8 Gn/Rd	R(+) 3 R(-) 3	R(+) 7 R(-) 7		
34 Rd/Br 9 Br/Rd				T(+) 4 T(-) 4
35 Rd/SI 10 SI/Rd				R(+) 4 R(-) 4
36 Bk/Bl 11 Bl/Bk				T(+) 5 T(-) 5
37 Bk/Or 12 Or/Bk				R(+) 5 R(-) 5
38 Bk/Gn 13 Gn/Bk				T(+) 6 T(-) 6
39 Bk/Br 14 Br/Bk				R(+) 6 R(-) 6
40 Bk/SI 15 SI/Bk				T(+) 7 T(-) 7
41 Yw/Bl 16 Bl/Yw				R(+) 7 R(-) 7
42 Yw/Or 17 Or/Yw			T(+) 0 T(-) 0	
43 Yw/Gn 18 Gn/Yw			R(+) 0 R(-) 0	
44 Yw/Br 19 Br/Yw			T(+) 1 T(-) 1	
45 Yw/SI 20 SI/Yw			R(+) 1 R(-) 1	
46 Vi/Bl 21 Bl/Vi			T(+) 2 T(-) 2	
47 Vi/Or 22 Or/Vi			R(+) 2 R(-) 2	
48 Vi/Gn 23 Gn/Vi			T(+) 3 T(-) 3	
49 Vi/Br 24 Br/Vi			R(+) 3 R(-) 3	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

* Trunk Circuits 4,5,6 and 7 are present only on 8TBR and 8TBR-P cards.

**Table 5-19 I/O Connections:
4TBR, 8TBR, 4TBRP,
8TBRP cards**

26 Wh/Bl 1 Bl/Wh	T(+) 0 T(-) 0	T(+) 4 T(-) 4	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	R(+) 0 R(-) 0	R(+) 4 R(-) 4	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	T(+) 1 T(-) 1	T(+) 5 T(-) 5	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	R(+) 1 R(-) 1	R(+) 5 R(-) 5	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	T(+) 2 T(-) 2	T(+) 6 T(-) 6	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	R(+) 2 R(-) 2	R(+) 6 R(-) 6	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	T(+) 3 T(-) 3	T(+) 7 T(-) 7	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	R(+) 3 R(-) 3	R(+) 7 R(-) 7	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	T(+) 0 T(-) 0		34 Rd/Br 9 Br/Rd	T(+) 4 T(-) 4
43 Yw/Gn 18 Gn/Yw	R(+) 0 R(-) 0		35 Rd/Sl 10 Sl/Rd	R(+) 4 R(-) 4
44 Yw/Br 19 Br/Yw	T(+) 1 T(-) 1		36 Bk/Bl 11 Bl/Bk	T(+) 5 T(-) 5
45 Yw/Sl 20 Sl/Yw	R(+) 1 R(-) 1		37 Bk/Or 12 Or/Bk	R(+) 5 R(-) 5
46 Vi/Bl 21 Bl/Vi	T(+) 2 T(-) 2		38 Bk/Gn 13 Gn/Bk	T(+) 6 T(-) 6
47 Vi/Or 22 Or/Vi	R(+) 2 R(-) 2		39 Bk/Br 14 Br/Bk	R(+) 6 R(-) 6
48 Vi/Gn 23 Gn/Vi	T(+) 3 T(-) 3		40 Bk/Sl 15 Sl/Bk	T(+) 7 T(-) 7
49 Vi/Br 24 Br/Vi	R(+) 3 R(-) 3		41 Yw/Bl 16 Bl/Yw	R(+) 7 R(-) 7

* Trunk Circuits 4,5,6 and 7 are present only on 8TBR and 8TBR-P cards.

Table 5-20 I/O

Connections:
4T-C, 4T-CID, 4T, 4TMR,
4TPF, 4TMR-PF (/S)
(12/16) (PF) <G> <ES>
cards

26 Wh/Bl 1 Bl/Wh		TT2 TR2		
27 Wh/Or 2 Or/Wh		STT2* STR2*		
28 Wh/Gn 3 Gn/Wh	TT0 TR0	SCT2* SCR2*		
29 Wh/Br 4 Br/Wh	STT0* STR0*	TT3 TR3		
30 Wh/SI 5 SI/Wh	SCT0* SCR0*	STT3* STR3*		
31 Rd/Bl 6 Bl/Rd	TT1 TR1	SCT3* SCR3*		
32 Rd/Or 7 Or/Rd	STT1* STR1*			
33 Rd/Gn 8 Gn/Rd	SCT1* SCR1*			
34 Rd/Br 9 Br/Rd				TT2 TR2
35 Rd/SI 10 SI/Rd				STT2* STR2*
36 Bk/Bl 11 Bl/Bk				SCT2* SCR2*
37 Bk/Or 12 Or/Bk				TT3 TR3
38 Bk/Gn 13 Gn/Bk				STT3* STR3*
39 Bk/Br 14 Br/Bk				SCT3* SCR3*
40 Bk/SI 15 SI/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw				
43 Yw/Gn 18 Gn/Yw				
44 Yw/Br 19 Br/Yw			TT0 TR0	
45 Yw/SI 20 SI/Yw			STT0* STR0*	
46 Vi/Bl 21 Bl/Vi			SCT0* SCR0*	
47 Vi/Or 22 Or/Vi			TT1 TR1	
48 Vi/Gn 23 Gn/Vi			STT1* STR1*	
49 Vi/Br 24 Br/Vi			SCT1* SCR1*	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

* STT, STR, SCT and SCR are power failure transfer connections which are provided only on 4T-C, 4T-CID cards and cards with the suffix PF. See page 5-17, Power Fail (PF) Transfer Circuits for Power Failure Transfer wiring interconnections diagram and database programming.

Table 5-21 I/O

Connections:
4T-C, 4T-CID, 4T, 4TMR,
4TPF, 4TMR-PF (/S)
(12/16) (PF) <G> <ES>
cards

26 Wh/Bl 1 Bl/Wh		TT2 TR2	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh		STT2* STR2*	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	TT0 TR0	SCT2* SCR2*	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	STT0* STR0*	TT3 TR3	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	SCT0* SCR0*	STT3* STR3*	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	TT1 TR1	SCT3* SCR3*	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	STT1* STR1*		40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	SCT1* SCR1*		41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw			34 Rd/Br 9 Br/Rd	TT2 TR2
43 Yw/Gn 18 Gn/Yw			35 Rd/Sl 10 Sl/Rd	STT2* STR2*
44 Yw/Br 19 Br/Yw	TT0 TR0		36 Bk/Bl 11 Bl/Bk	SCT2* SCR2*
45 Yw/Sl 20 Sl/Yw	STT0* STR0*		37 Bk/Or 12 Or/Bk	TT3 TR3
46 Vi/Bl 21 Bl/Vi	SCT0* SCR0*		38 Bk/Gn 13 Gn/Bk	STT3* STR3*
47 Vi/Or 22 Or/Vi	TT1 TR1		39 Bk/Br 14 Br/Bk	SCT3* SCR3*
48 Vi/Gn 23 Gn/Vi	STT1* STR1*		40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi	SCT1* SCR1*		41 Yw/Bl 16 Bl/Yw	

* STT, STR, SCT and SCR are power failure transfer connections which are provided only on 4T-C, 4T-CID cards and cards with the suffix PF. See [page 5-17, Power Fail \(PF\) Transfer Circuits](#) for Power Failure Transfer wiring interconnections diagram and database programming.

Table 5-22 I/O

Connections:
8T-C, 8T-CID, 8T, 8TPF,
8T/S, 8T/S-PF (/S) (PF)
<G> <ES> cards

26 Wh/Bl 1 Bl/Wh	TT0 TR0	TT4 TR4		
27 Wh/Or 2 Or/Wh	TT1 TR1	STT4* STR4*		
28 Wh/Gn 3 Gn/Wh	TT2 TR2	SCT4* SCR4*		
29 Wh/Br 4 Br/Wh	STT2* STR2*	TT5 TR5		
30 Wh/SI 5 SI/Wh	SCT2* SCR2*	STT5* STR5*		
31 Rd/Bl 6 Bl/Rd	TT3 TR3	SCT5* SCR5*		
32 Rd/Or 7 Or/Rd	STT3* STR3*	TT6 TR6		
33 Rd/Gn 8 Gn/Rd	SCT3* SCR3*	TT7 TR7		
34 Rd/Br 9 Br/Rd				TT4 TR4
35 Rd/SI 10 SI/Rd				STT4* STR4*
36 Bk/Bl 11 Bl/Bk				SCT4* SCR4*
37 Bk/Or 12 Or/Bk				TT5 TR5
38 Bk/Gn 13 Gn/Bk				STT5* STR5*
39 Bk/Br 14 Br/Bk				SCT5* SCR5*
40 Bk/SI 15 SI/Bk				TT6 TR6
41 Yw/Bl 16 Bl/Yw				TT7 TR7
42 Yw/Or 17 Or/Yw			TT0 TR0	
43 Yw/Gn 18 Gn/Yw			TT1 TR1	
44 Yw/Br 19 Br/Yw			TT2 TR2	
45 Yw/SI 20 SI/Yw			STT2* STR2*	
46 Vi/Bl 21 Bl/Vi			SCT2* SCR2*	
47 Vi/Or 22 Or/Vi			TT3 TR3	
48 Vi/Gn 23 Gn/Vi			STT3* STR3*	
49 Vi/Br 24 Br/Vi			SCT3* SCR3*	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

* STT, STR, SCT and SCR are power failure transfer connections which are provided only on 8T-C, 8T-CID cards and cards with the suffix PF. See page 5-17, *Power Fail (PF) Transfer Circuits* for Power Failure Transfer wiring interconnections diagram and database programming.

Table 5-23 I/O

Connections:

8T-C, 8T-CID, 8T, 8TPF, 8T/S, 8T/S-PF (/S) (PF) <G> <ES> cards

26 Wh/Bl 1 Bl/Wh	TT0 TR0	TT4 TR4	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	TT1 TR1	STT4* STR4*	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	TT2 TR2	SCT4* SCR4*	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	STT2* STR2*	TT5 TR5	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	SCT2* SCR2*	STT5* STR5*	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	TT3 TR3	SCT5* SCR5*	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	STT3* STR3*	TT6 TR6	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	SCT3* SCR3*	TT7 TR7	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	TT0 TR0		34 Rd/Br 9 Br/Rd	TT4 TR4
43 Yw/Gn 18 Gn/Yw	TT1 TR1		35 Rd/Sl 10 Sl/Rd	STT4* STR4*
44 Yw/Br 19 Br/Yw	TT2 TR2		36 Bk/Bl 11 Bl/Bk	SCT4* SCR4*
45 Yw/Sl 20 Sl/Yw	STT2* STR2*		37 Bk/Or 12 Or/Bk	TT5 TR5
46 Vi/Bl 21 Bl/Vi	SCT2* SCR2*		38 Bk/Gn 13 Gn/Bk	STT5* STR5*
47 Vi/Or 22 Or/Vi	TT3 TR3		39 Bk/Br 14 Br/Bk	SCT5* SCR5*
48 Vi/Gn 23 Gn/Vi	STT3* STR3*		40 Bk/Sl 15 Sl/Bk	TT6 TR6
49 Vi/Br 24 Br/Vi	SCT3* SCR3*		41 Yw/Bl 16 Bl/Yw	TT7 TR7

* STT, STR, SCT and SCR are power failure transfer connections which are provided only on 8T-C, 8T-CID cards and cards with the suffix PF. See [page 5-17, Power Fail \(PF\) Transfer Circuits](#) for Power Failure Transfer wiring interconnections diagram and database programming.

**Table 5-24 I/O Connections:
4ALS, 4ALS/M cards**

26 Wh/Bl 1 Bl/Wh		TT2 TR2		
27 Wh/Or 2 Or/Wh		STT2* STR2*		
28 Wh/Gn 3 Gn/Wh	TT0 TR0	SCT2* SCR2*		
29 Wh/Br 4 Br/Wh	STT0* STR0*	TT3 TR3		
30 Wh/Sl 5 Sl/Wh	SCT0* SCR0*	STT3* STR3*		
31 Rd/Bl 6 Bl/Rd	TT1 TR1	SCT3* SCR3*		
32 Rd/Or 7 Or/Rd	STT1* STR1*			
33 Rd/Gn 8 Gn/Rd	SCT1* SCR1*			
34 Rd/Br 9 Br/Rd				TT2 TR2
35 Rd/Sl 10 Sl/Rd				STT2* STR2*
36 Bk/Bl 11 Bl/Bk				SCT2* SCR2*
37 Bk/Or 12 Or/Bk				TT3 TR3
38 Bk/Gn 13 Gn/Bk				STT3* STR3*
39 Bk/Br 14 Br/Bk				SCT3* SCR3*
40 Bk/Sl 15 Sl/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw				
43 Yw/Gn 18 Gn/Yw				
44 Yw/Br 19 Br/Yw			TT0 TR0	
45 Yw/Sl 20 Sl/Yw			STT0* STR0*	
46 Vi/Bl 21 Bl/Vi			SCT0* SCR0*	
47 Vi/Or 22 Or/Vi			TT1 TR1	
48 Vi/Gn 23 Gn/Vi			STT1* STR1*	
49 Vi/Br 24 Br/Vi			SCT1* SCR1*	
50 Vi/Sl 25 Sl/Vi	Not Used	Not Used	Not Used	Not Used

* STT, STR, SCT and SCR are power failure transfer connections which are provided only on cards with the suffix PF. See page 5-17, Power Fail (PF) Transfer Circuits for Power Failure Transfer wiring interconnections diagram and database programming.

Table 5-25 I/O
Connections:
4ALS, 4ALS/M cards

26 Wh/Bl 1 Bl/Wh		TT2 TR2	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh		STT2* STR2*	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	TT0 TR0	SCT2* SCR2*	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	STT0* STR0*	TT3 TR3	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	SCT0* SCR0*	STT3* STR3*	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	TT1 TR1	SCT3* SCR3*	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	STT1* STR1*		40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	SCT1* SCR1*		41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw			34 Rd/Br 9 Br/Rd	TT2 TR2
43 Yw/Gn 18 Gn/Yw			35 Rd/Sl 10 Sl/Rd	STT2* STR2*
44 Yw/Br 19 Br/Yw	TT0 TR0		36 Bk/Bl 11 Bl/Bk	SCT2* SCR2*
45 Yw/Sl 20 Sl/Yw	STT0* STR0*		37 Bk/Or 12 Or/Bk	TT3 TR3
46 Vi/Bl 21 Bl/Vi	SCT0* SCR0*		38 Bk/Gn 13 Gn/Bk	STT3* STR3*
47 Vi/Or 22 Or/Vi	TT1 TR1		39 Bk/Br 14 Br/Bk	SCT3* SCR3*
48 Vi/Gn 23 Gn/Vi	STT1* STR1*		40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi	SCT1* SCR1*		41 Yw/Bl 16 Bl/Yw	

* STT, STR, SCT and SCR are power failure transfer connections which are provided only on cards with the suffix PF. See page 5-17, Power Fail (PF) Transfer Circuits for Power Failure Transfer wiring interconnections diagram and database programming.

Table 5-26 **8ALS,**
8ALS/M cards

26 Wh/Bl 1 Bl/Wh	TT0 TR0	TT4 TR4		
27 Wh/Or 2 Or/Wh	TT1 TR1	STT4* STR4*		
28 Wh/Gn 3 Gn/Wh	TT2 TR2	SCT4* SCR4*		
29 Wh/Br 4 Br/Wh	STT2* STR2*	TT5 TR5		
30 Wh/SI 5 SI/Wh	SCT2* SCR2*	STT5* STR5*		
31 Rd/Bl 6 Bl/Rd	TT3 TR3	SCT5* SCR5*		
32 Rd/Or 7 Or/Rd	STT3* STR3*	TT6 TR6		
33 Rd/Gn 8 Gn/Rd	SCT3* SCR3*	TT7 TR7		
34 Rd/Br 9 Br/Rd				TT4 TR4
35 Rd/SI 10 SI/Rd				STT4* STR4*
36 Bk/Bl 11 Bl/Bk				SCT4* SCR4*
37 Bk/Or 12 Or/Bk				TT5 TR5
38 Bk/Gn 13 Gn/Bk				STT5* STR5*
39 Bk/Br 14 Br/Bk				SCT5* SCR5*
40 Bk/SI 15 SI/Bk				TT6 TR6
41 Yw/Bl 16 Bl/Yw				TT7 TR7
42 Yw/Or 17 Or/Yw			TT0 TR0	
43 Yw/Gn 18 Gn/Yw			TT1 TR1	
44 Yw/Br 19 Br/Yw			TT2 TR2	
45 Yw/SI 20 SI/Yw			STT2* STR2*	
46 Vi/Bl 21 Bl/Vi			SCT2* SCR2*	
47 Vi/Or 22 Or/Vi			TT3 TR3	
48 Vi/Gn 23 Gn/Vi			STT3* STR3*	
49 Vi/Br 24 Br/Vi			SCT3* SCR3*	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

* STT, STR, SCT and SCR are power failure transfer connections which are provided only on cards with the suffix PF. See [Section 5.4, Power Fail \(PF\) Transfer Circuits for Power Failure Transfer wiring interconnections diagram and database programming.](#)

Table 5-27 8ALS,
8ALS/M cards

26 Wh/Bl 1 Bl/Wh	TT0 TR0	TT4 TR4	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	TT1 TR1	STT4* STR4*	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	TT2 TR2	SCT4* SCR4*	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	STT2* STR2*	TT5 TR5	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	SCT2* SCR2*	STT5* STR5*	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	TT3 TR3	SCT5* SCR5*	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	STT3* STR3*	TT6 TR6	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	SCT3* SCR3*	TT7 TR7	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	TT0 TR0		34 Rd/Br 9 Br/Rd	TT4 TR4
43 Yw/Gn 18 Gn/Yw	TT1 TR1		35 Rd/Sl 10 Sl/Rd	STT4* STR4*
44 Yw/Br 19 Br/Yw	TT2 TR2		36 Bk/Bl 11 Bl/Bk	SCT4* SCR4*
45 Yw/Sl 20 Sl/Yw	STT2* STR2*		37 Bk/Or 12 Or/Bk	TT5 TR5
46 Vi/Bl 21 Bl/Vi	SCT2* SCR2*		38 Bk/Gn 13 Gn/Bk	STT5* STR5*
47 Vi/Or 22 Or/Vi	TT3 TR3		39 Bk/Br 14 Br/Bk	SCT5* SCR5*
48 Vi/Gn 23 Gn/Vi	STT3* STR3*		40 Bk/Sl 15 Sl/Bk	TT6 TR6
49 Vi/Br 24 Br/Vi	SCT3* SCR3*		41 Yw/Bl 16 Bl/Yw	TT7 TR7

* STT, STR, SCT and SCR are power failure transfer connections which are provided only on cards with the suffix PF. See [page 5-17, Power Fail \(PF\) Transfer Circuits](#) for Power Failure Transfer wiring interconnections diagram and database programming.

Table 5-28 8DID, 8DID/S,
8DID/S-Z cards

26 Wh/Bl 1 Bl/Wh	TT0 TR0	TT4 TR4		
27 Wh/Or 2 Or/Wh	TT1 TR1	TT5 TR5		
28 Wh/Gn 3 Gn/Wh	TT2 TR2	TT6 TR6		
29 Wh/Br 4 Br/Wh	TT3 TR3	TT7 TR7		
30 Wh/Sl 5 Sl/Wh				
31 Rd/Bl 6 Bl/Rd				
32 Rd/Or 7 Or/Rd				
33 Rd/Gn 8 Gn/Rd				
34 Rd/Br 9 Br/Rd				TT4 TR4
35 Rd/Sl 10 Sl/Rd				TT5 TR5
36 Bk/Bl 11 Bl/Bk				TT6 TR6
37 Bk/Or 12 Or/Bk				TT7 TR7
38 Bk/Gn 13 Gn/Bk				
39 Bk/Br 14 Br/Bk				
40 Bk/Sl 15 Sl/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw			TT0 TR0	
43 Yw/Gn 18 Gn/Yw			TT1 TR1	
44 Yw/Br 19 Br/Yw			TT2 TR2	
45 Yw/Sl 20 Sl/Yw			TT3 TR3	
46 Vi/Bl 21 Bl/Vi				
47 Vi/Or 22 Or/Vi				
48 Vi/Gn 23 Gn/Vi				
49 Vi/Br 24 Br/Vi				
50 Vi/Sl 25 Sl/Vi	Not Used	Not Used	Not Used	Not Used

Table 5-29 8DID, 8DID/S,
8DID/S-Z cards

26 Wh/Bl 1 Bl/Wh	TT0 TR0	TT4 TR4	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	TT1 TR1	TT5 TR5	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	TT2 TR2	TT6 TR6	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	TT3 TR3	TT7 TR7	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh			38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd			39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd			40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd			41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	TT0 TR0		34 Rd/Br 9 Br/Rd	TT4 TR4
43 Yw/Gn 18 Gn/Yw	TT1 TR1		35 Rd/Sl 10 Sl/Rd	TT5 TR5
44 Yw/Br 19 Br/Yw	TT2 TR2		36 Bk/Bl 11 Bl/Bk	TT6 TR6
45 Yw/Sl 20 Sl/Yw	TT3 TR3		37 Bk/Or 12 Or/Bk	TT7 TR7
46 Vi/Bl 21 Bl/Vi			38 Bk/Gn 13 Gn/Bk	
47 Vi/Or 22 Or/Vi			39 Bk/Br 14 Br/Bk	
48 Vi/Gn 23 Gn/Vi			40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi			41 Yw/Bl 16 Bl/Yw	

Table 5-30 8BID cards

26 Wh/Bl 1 Bl/Wh	TT0 TR0	TT4 TR4		
27 Wh/Or 2 Or/Wh	TT1 TR1			
28 Wh/Gn 3 Gn/Wh	TT2 TR2			
29 Wh/Br 4 Br/Wh		TT5 TR5		
30 Wh/Sl 5 Sl/Wh				
31 Rd/Bl 6 Bl/Rd	TT3 TR3			
32 Rd/Or 7 Or/Rd		TT6 TR6		
33 Rd/Gn 8 Gn/Rd		TT7 TR7		
34 Rd/Br 9 Br/Rd				TT4 TR4
35 Rd/Sl 10 Sl/Rd				
36 Bk/Bl 11 Bl/Bk				
37 Bk/Or 12 Or/Bk				TT5 TR5
38 Bk/Gn 13 Gn/Bk				
39 Bk/Br 14 Br/Bk				
40 Bk/Sl 15 Sl/Bk				TT6 TR6
41 Yw/Bl 16 Bl/Yw				TT7 TR7
42 Yw/Or 17 Or/Yw			TT0 TR0	
43 Yw/Gn 18 Gn/Yw			TT1 TR1	
44 Yw/Br 19 Br/Yw			TT2 TR2	
45 Yw/Sl 20 Sl/Yw				
46 Vi/Bl 21 Bl/Vi				
47 Vi/Or 22 Or/Vi			TT3 TR3	
48 Vi/Gn 23 Gn/Vi				
49 Vi/Br 24 Br/Vi				
50 Vi/Sl 25 Sl/Vi	Not Used	Not Used	Not Used	Not Used

Table 5-31 8BID cards

26 Wh/Bl 1 Bl/Wh	TT0 TR0	TT4 TR4	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	TT1 TR1		35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	TT2 TR2		36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh		TT5 TR5	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh			38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	TT3 TR3		39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd		TT6 TR6	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd		TT7 TR7	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	TT0 TR0		34 Rd/Br 9 Br/Rd	TT4 TR4
43 Yw/Gn 18 Gn/Yw	TT1 TR1		35 Rd/Sl 10 Sl/Rd	
44 Yw/Br 19 Br/Yw	TT2 TR2		36 Bk/Bl 11 Bl/Bk	
45 Yw/Sl 20 Sl/Yw			37 Bk/Or 12 Or/Bk	TT5 TR5
46 Vi/Bl 21 Bl/Vi			38 Bk/Gn 13 Gn/Bk	
47 Vi/Or 22 Or/Vi	TT3 TR3		39 Bk/Br 14 Br/Bk	
48 Vi/Gn 23 Gn/Vi			40 Bk/Sl 15 Sl/Bk	TT6 TR6
49 Vi/Br 24 Br/Vi			41 Yw/Bl 16 Bl/Yw	TT7 TR7

Table 5-32 4GID, 4TWL cards

26 Wh/Bl 1 Bl/Wh		TT2 TR2		
27 Wh/Or 2 Or/Wh				
28 Wh/Gn 3 Gn/Wh	TT0 TR0			
29 Wh/Br 4 Br/Wh		TT3 TR3		
30 Wh/Sl 5 Sl/Wh				
31 Rd/Bl 6 Bl/Rd	TT1 TR1			
32 Rd/Or 7 Or/Rd				
33 Rd/Gn 8 Gn/Rd				
34 Rd/Br 9 Br/Rd				TT2 TR2
35 Rd/Sl 10 Sl/Rd				
36 Bk/Bl 11 Bl/Bk				
37 Bk/Or 12 Or/Bk				TT3 TR3
38 Bk/Gn 13 Gn/Bk				
39 Bk/Br 14 Br/Bk				
40 Bk/Sl 15 Sl/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw				
43 Yw/Gn 18 Gn/Yw				
44 Yw/Br 19 Br/Yw			TT0 TR0	
45 Yw/Sl 20 Sl/Yw				
46 Vi/Bl 21 Bl/Vi				
47 Vi/Or 22 Or/Vi			TT1 TR1	
48 Vi/Gn 23 Gn/Vi				
49 Vi/Br 24 Br/Vi				
50 Vi/Sl 25 Sl/Vi	Not Used	Not Used	Not Used	Not Used

Table 5-33 4GID cards

26 Wh/Bl 1 Bl/Wh		TT2 TR2	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh			35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	TT0 TR0		36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh		TT3 TR3	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh			38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	TT1 TR1		39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd			40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd			41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw			34 Rd/Br 9 Br/Rd	TT2 TR2
43 Yw/Gn 18 Gn/Yw			35 Rd/Sl 10 Sl/Rd	
44 Yw/Br 19 Br/Yw	TT0 TR0		36 Bk/Bl 11 Bl/Bk	
45 Yw/Sl 20 Sl/Yw			37 Bk/Or 12 Or/Bk	TT3 TR3
46 Vi/Bl 21 Bl/Vi			38 Bk/Gn 13 Gn/Bk	
47 Vi/Or 22 Or/Vi	TT1 TR1		39 Bk/Br 14 Br/Bk	
48 Vi/Gn 23 Gn/Vi			40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi			41 Yw/Bl 16 Bl/Yw	

Table 5-34 4TEM,
4TEM/S, 4TEMP cards

26 Wh/Bl 1 Bl/Wh	ETT0 ETR0	ETT2 ETR2		
27 Wh/Or 2 Or/Wh	ERT0 ERR0	ERT2 ERR2		
28 Wh/Gn 3 Gn/Wh	E0 SG0	E2 SG2		
29 Wh/Br 4 Br/Wh	M0 SB0	M2 SB2		
30 Wh/SI 5 SI/Wh	ETT1 ETR1	ETT3 ETR3		
31 Rd/Bl 6 Bl/Rd	ERT1 ERR1	ERT3 ERR3		
32 Rd/Or 7 Or/Rd	E1 SG1	E3 SG3		
33 Rd/Gn 8 Gn/Rd	M1 SB1	M3 SB3		
34 Rd/Br 9 Br/Rd				ETT2 ETR2
35 Rd/SI 10 SI/Rd				ERT2 ERR2
36 Bk/Bl 11 Bl/Bk				E2 SG2
37 Bk/Or 12 Or/Bk				M2 SB2
38 Bk/Gn 13 Gn/Bk				ETT3 ETR3
39 Bk/Br 14 Br/Bk				ERT3 ERR3
40 Bk/SI 15 SI/Bk				E3 SG3
41 Yw/Bl 16 Bl/Yw				M3 SB3
42 Yw/Or 17 Or/Yw			ETT0 ETR0	
43 Yw/Gn 18 Gn/Yw			ERT0 ERR0	
44 Yw/Br 19 Br/Yw			E0 SG0	
45 Yw/SI 20 SI/Yw			M0 SB0	
46 Vi/Bl 21 Bl/Vi			ETT1 ETR1	
47 Vi/Or 22 Or/Vi			ERT1 ERR1	
48 Vi/Gn 23 Gn/Vi			E1 SG1	
49 Vi/Br 24 Br/Vi			M1 SB1	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

NOTE: The ERR, ERT pairs are used only when a port is strapped for 4-wire operation.

Table 5-35 4TEM,
4TEM/S, 4TEMP cards

26 Wh/Bl 1 Bl/Wh	ETT0 ETR0	ETT2 ETR2	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	ERT0 ERR0	ERT2 ERR2	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	E0 SG0	E2 SG2	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	M0 SB0	M2 SB2	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	ETT1 ETR1	ETT3 ETR3	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	ERT1 ERR1	ERT3 ERR3	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	E1 SG1	E3 SG3	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	M1 SB1	M3 SB3	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	ETT0 ETR0		34 Rd/Br 9 Br/Rd	ETT2 ETR2
43 Yw/Gn 18 Gn/Yw	ERT0 ERR0		35 Rd/Sl 10 Sl/Rd	ERT2 ERR2
44 Yw/Br 19 Br/Yw	E0 SG0		36 Bk/Bl 11 Bl/Bk	E2 SG2
45 Yw/Sl 20 Sl/Yw	M0 SB0		37 Bk/Or 12 Or/Bk	M2 SB2
46 Vi/Bl 21 Bl/Vi	ETT1 ETR1		38 Bk/Gn 13 Gn/Bk	ETT3 ETR3
47 Vi/Or 22 Or/Vi	ERT1 ERR1		39 Bk/Br 14 Br/Bk	ERT3 ERR3
48 Vi/Gn 23 Gn/Vi	E1 SG1		40 Bk/Sl 15 Sl/Bk	E3 SG3
49 Vi/Br 24 Br/Vi	M1 SB1		41 Yw/Bl 16 Bl/Yw	M3 SB3

NOTE: The ERR, ERT pairs are used only when a port is strapped for 4-wire operation.

Table 5-36 2SK cards

26 Wh/Bl 1 Bl/Wh				
27 Wh/Or 2 Or/Wh				
28 Wh/Gn 3 Gn/Wh				
29 Wh/Br 4 Br/Wh				
30 Wh/SI 5 SI/Wh		AT0 AR0		
31 Rd/Bl 6 Bl/Rd		DT0 DR0		
32 Rd/Or 7 Or/Rd		AT1 AR1		
33 Rd/Gn 8 Gn/Rd		DT1 DR1		
34 Rd/Br 9 Br/Rd				
35 Rd/SI 10 SI/Rd				
36 Bk/Bl 11 Bl/Bk				
37 Bk/Or 12 Or/Bk				
38 Bk/Gn 13 Gn/Bk				AT0 AR0
39 Bk/Br 14 Br/Bk				DT0 DR0
40 Bk/SI 15 SI/Bk				AT1 AR1
41 Yw/Bl 16 Bl/Yw				DT1 DR1
42 Yw/Or 17 Or/Yw				
43 Yw/Gn 18 Gn/Yw				
44 Yw/Br 19 Br/Yw				
45 Yw/SI 20 SI/Yw				
46 Vi/Bl 21 Bl/Vi				
47 Vi/Or 22 Or/Vi				
48 Vi/Gn 23 Gn/Vi				
49 Vi/Br 24 Br/Vi				
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

NOTE: AT, AR are the Audio Duplex pairs to/from the station set.
DT, DR are the Data Duplex pairs to/from the station set.

Table 5-37 2SK cards

26 Wh/Bl 1 Bl/Wh			34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh			35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh			36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh			37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh		AT0 AR0	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd		DT0 DR0	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd		AT1 AR1	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd		DT1 DR1	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw			34 Rd/Br 9 Br/Rd	
43 Yw/Gn 18 Gn/Yw			35 Rd/Sl 10 Sl/Rd	
44 Yw/Br 19 Br/Yw			36 Bk/Bl 11 Bl/Bk	
45 Yw/Sl 20 Sl/Yw			37 Bk/Or 12 Or/Bk	
46 Vi/Bl 21 Bl/Vi			38 Bk/Gn 13 Gn/Bk	AT0 AR0
47 Vi/Or 22 Or/Vi			39 Bk/Br 14 Br/Bk	DT0 DR0
48 Vi/Gn 23 Gn/Vi			40 Bk/Sl 15 Sl/Bk	AT1 AR1
49 Vi/Br 24 Br/Vi			41 Yw/Bl 16 Bl/Yw	DT1 DR1

*NOTE: AT, AR are the Audio Duplex pairs to/from the station set.
DT, DR are the Data Duplex pairs t/from the station set.*

Table 5-38 4SK, 8SK cards

26 Wh/Bl 1 Bl/Wh	AT0 AR0	AT4 AR4		
27 Wh/Or 2 Or/Wh	DT0 DR0	DT4 DR4		
28 Wh/Gn 3 Gn/Wh	AT1 AR1	AT5 AR5		
29 Wh/Br 4 Br/Wh	DT1 DR1	DT5 DR5		
30 Wh/SI 5 SI/Wh	AT2 AR2	AT6 AR6		
31 Rd/Bl 6 Bl/Rd	DT2 DR2	DT6 DR6		
32 Rd/Or 7 Or/Rd	AT3 AR3	AT7 AR7		
33 Rd/Gn 8 Gn/Rd	DT3 DR3	DT7 DR7		
34 Rd/Br 9 Br/Rd				AT4 AR4
35 Rd/SI 10 SI/Rd				DT4 DR4
36 Bk/Bl 11 Bl/Bk				AT5 AR5
37 Bk/Or 12 Or/Bk				DT5 DR5
38 Bk/Gn 13 Gn/Bk				AT6 AR6
39 Bk/Br 14 Br/Bk				DT6 DR6
40 Bk/SI 15 SI/Bk				AT7 AR7
41 Yw/Bl 16 Bl/Yw				DT7 DR7
42 Yw/Or 17 Or/Yw			AT0 AR0	
43 Yw/Gn 18 Gn/Yw			DT0 DR0	
44 Yw/Br 19 Br/Yw			AT1 AR1	
45 Yw/SI 20 SI/Yw			DT1 DR1	
46 Vi/Bl 21 Bl/Vi			AT2 AR2	
47 Vi/Or 22 Or/Vi			DT2 DR2	
48 Vi/Gn 23 Gn/Vi			AT3 AR3	
49 Vi/Br 24 Br/Vi			DT3 DR3	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

* Station Interface Circuits 4,5,6 and 7 are present only on 8SK cards

NOTE: AT, AR are the Audio Duplex pairs to/from the station set.
DT, DR are the Data Duplex pairs t/from the station set.

Table 5-39 **4SK, 8SK**
cards

26 Wh/Bl 1 Bl/Wh	AT0 AR0	AT4 AR4	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	DT0 DR0	DT4 DR4	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	AT1 AR1	AT5 AR5	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	DT1 DR1	DT5 DR5	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	AT2 AR2	AT6 AR6	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	DT2 DR2	DT6 DR6	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	AT3 AR3	AT7 AR7	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	DT3 DR3	DT7 DR7	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	AT0 AR0		34 Rd/Br 9 Br/Rd	AT4 AR4
43 Yw/Gn 18 Gn/Yw	DT0 DR0		35 Rd/Sl 10 Sl/Rd	DT4 DR4
44 Yw/Br 19 Br/Yw	AT1 AR1		36 Bk/Bl 11 Bl/Bk	AT5 AR5
45 Yw/Sl 20 Sl/Yw	DT1 DR1		37 Bk/Or 12 Or/Bk	DT5 DR5
46 Vi/Bl 21 Bl/Vi	AT2 AR2		38 Bk/Gn 13 Gn/Bk	AT6 AR6
47 Vi/Or 22 Or/Vi	DT2 DR2		39 Bk/Br 14 Br/Bk	DT6 DR6
48 Vi/Gn 23 Gn/Vi	AT3 AR3		40 Bk/Sl 15 Sl/Bk	AT7 AR7
49 Vi/Br 24 Br/Vi	DT3 DR3		41 Yw/Bl 16 Bl/Yw	DT7 DR7

* Station Interface Circuits 4,5,6 and 7 are present only on 8SK cards

NOTE: AT, AR are the Audio Duplex pairs t/from the station set.
DT, DR are the Data Duplex pairs t/from the station set.

Table 5-40 2SD, 8SD cards

26 Wh/Bl 1 Bl/Wh	DTT0* DRT0*	DTT4 DRT4		
27 Wh/Or 2 Or/Wh	DTR0* DRR0*	DTR4 DRR4		
28 Wh/Gn 3 Gn/Wh	DTT1* DRT1*	DTT5 DRT5		
29 Wh/Br 4 Br/Wh	DTR1* DRR1*	DTR5 DRR5		
30 Wh/SI 5 SI/Wh	DTT2 DRT2	DTT6 DTR6		
31 Rd/Bl 6 Bl/Rd	DTR2 DRR2	DTR6 DRR6		
32 Rd/Or 7 Or/Rd	DTT3 DRT3	DTT7 DRT7		
33 Rd/Gn 8 Gn/Rd	DTR3 DRR3	DTR7 DRR7		
34 Rd/Br 9 Br/Rd				DTT4 DRT4
35 Rd/SI 10 SI/Rd				DTR4 DRR4
36 Bk/Bl 11 Bl/Bk				DTT5 DRT5
37 Bk/Or 12 Or/Bk				DTR5 DRR5
38 Bk/Gn 13 Gn/Bk				DTT6 DTR6
39 Bk/Br 14 Br/Bk				DTR6 DRR6
40 Bk/SI 15 SI/Bk				DTT7 DRT7
41 Yw/Bl 16 Bl/Yw				DTR7 DRR7
42 Yw/Or 17 Or/Yw			DTT0* DRT0*	
43 Yw/Gn 18 Gn/Yw			DTR0* DRR0*	
44 Yw/Br 19 Br/Yw			DTT1* DRT1*	
45 Yw/SI 20 SI/Yw			DTR1* DRR1*	
46 Vi/Bl 21 Bl/Vi			DTT2 DRT2	
47 Vi/Or 22 Or/Vi			DTR2 DRR2	
48 Vi/Gn 23 Gn/Vi			DTT3 DRT3	
49 Vi/Br 24 Br/Vi			DTR3 DRR3	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

* 2SD cards only provide station interface circuits 0 and 1

NOTE: DTT, DRT are the Transmit Data pairs to the station set.
DTR, DRR are the Receive Data pairs from the station set.

Table 5-41 2SD, 8SD cards

26 Wh/Bl 1 Bl/Wh	DTT0* DRT0*	DTT4 DRT4	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	DTR0* DRR0*	DTR4 DRR4	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	DTT1* DRT1*	DTT5 DRT5	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	DTR1* DRR1*	DTR5 DRR5	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	DTT2 DRT2	DTT6 DTR6	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	DTR2 DRR2	DTR6 DRR6	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	DTT3 DRT3	DTT7 DRT7	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	DTR3 DRR3	DTR7 DRR7	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	DTT0* DRT0*		34 Rd/Br 9 Br/Rd	DTT4 DRT4
43 Yw/Gn 18 Gn/Yw	DTR0* DRR0*		35 Rd/Sl 10 Sl/Rd	DTR4 DRR4
44 Yw/Br 19 Br/Yw	DTT1* DRT1*		36 Bk/Bl 11 Bl/Bk	DTT5 DRT5
45 Yw/Sl 20 Sl/Yw	DTR1* DRR1*		37 Bk/Or 12 Or/Bk	DTR5 DRR5
46 Vi/Bl 21 Bl/Vi	DTT2 DRT2		38 Bk/Gn 13 Gn/Bk	DTT6 DTR6
47 Vi/Or 22 Or/Vi	DTR2 DRR2		39 Bk/Br 14 Br/Bk	DTR6 DRR6
48 Vi/Gn 23 Gn/Vi	DTT3 DRT3		40 Bk/Sl 15 Sl/Bk	DTT7 DRT7
49 Vi/Br 24 Br/Vi	DTR3 DRR3		41 Yw/Bl 16 Bl/Yw	DTR7 DRR7

* 2SD cards only provide station interface circuits 0 and 1

NOTE: DTT, DRT are the Transmit Data pairs to the station set.
DTR, DRR are the Receive Data pairs from the station set.

Table 5-42 **8SKD,
16SKD cards**

26 Wh/Bl 1 Bl/Wh	B0 A0	B8 A8		
27 Wh/Or 2 Or/Wh	B1 A1	B9 A9		
28 Wh/Gn 3 Gn/Wh	B2 A2	B10 A10		
29 Wh/Br 4 Br/Wh	B3 A3	B11 A11		
30 Wh/Sl 5 Sl/Wh	B4 A4	B12 A12		
31 Rd/Bl 6 Bl/Rd	B5 A5	B13 A13		
32 Rd/Or 7 Or/Rd	B6 A6	B14 A14		
33 Rd/Gn 8 Gn/Rd	B7 A7	B15 A15		
34 Rd/Br 9 Br/Rd				B8 A8
35 Rd/Sl 10 Sl/Rd				B9 A9
36 Bk/Bl 11 Bl/Bk				B10 A10
37 Bk/Or 12 Or/Bk				B11 A11
38 Bk/Gn 13 Gn/Bk				B12 A12
39 Bk/Br 14 Br/Bk				B13 A13
40 Bk/Sl 15 Sl/Bk				B14 A14
41 Yw/Bl 16 Bl/Yw				B15 A15
42 Yw/Or 17 Or/Yw			B0 A0	
43 Yw/Gn 18 Gn/Yw			B1 A1	
44 Yw/Br 19 Br/Yw			B2 A2	
45 Yw/Sl 20 Sl/Yw			B3 A3	
46 Vi/Bl 21 Bl/Vi			B4 A4	
47 Vi/Or 22 Or/Vi			B5 A5	
48 Vi/Gn 23 Gn/Vi			B6 A6	
49 Vi/Br 24 Br/Vi			B7 A7	
50 Vi/Sl 25 Sl/Vi	Not Used	Not Used	Not Used	Not Used

* Circuits 8 through 15 are present only on 16SKD cards.

Table 5-43 8SKD,
16SKD cards

26 Wh/Bl 1 Bl/Wh	B0 A0	B8 A8	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	B1 A1	B9 A9	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	B2 A2	B10 A10	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	B3 A3	B11 A11	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	B4 A4	B12 A12	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	B5 A5	B13 A13	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	B6 A6	B14 A14	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	B7 A7	B15 A15	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	B0 A0		34 Rd/Br 9 Br/Rd	B8 A8
43 Yw/Gn 18 Gn/Yw	B1 A1		35 Rd/Sl 10 Sl/Rd	B9 A9
44 Yw/Br 19 Br/Yw	B2 A2		36 Bk/Bl 11 Bl/Bk	B10 A10
45 Yw/Sl 20 Sl/Yw	B3 A3		37 Bk/Or 12 Or/Bk	B11 A11
46 Vi/Bl 21 Bl/Vi	B4 A4		38 Bk/Gn 13 Gn/Bk	B12 A12
47 Vi/Or 22 Or/Vi	B5 A5		39 Bk/Br 14 Br/Bk	B13 A13
48 Vi/Gn 23 Gn/Vi	B6 A6		40 Bk/Sl 15 Sl/Bk	B14 A14
49 Vi/Br 24 Br/Vi	B7 A7		41 Yw/Bl 16 Bl/Yw	B15 A15

* Circuits 8 through 15 are present only on 16SKD cards.



See [Table 5-17](#) on page 5-57 for possible card combinations.

Table 5-44 8SVD cards

26 Wh/Bl 1 Bl/Wh	B0 A0			
27 Wh/Or 2 Or/Wh	B1 A1			
28 Wh/Gn 3 Gn/Wh	B2 A2			
29 Wh/Br 4 Br/Wh	B3 A3			
30 Wh/SI 5 SI/Wh	B4 A4			
31 Rd/Bl 6 Bl/Rd	B5 A5			
32 Rd/Or 7 Or/Rd	B6 A6			
33 Rd/Gn 8 Gn/Rd	B7 A7			
34 Rd/Br 9 Br/Rd				
35 Rd/SI 10 SI/Rd				
36 Bk/Bl 11 Bl/Bk				
37 Bk/Or 12 Or/Bk				
38 Bk/Gn 13 Gn/Bk				
39 Bk/Br 14 Br/Bk				
40 Bk/SI 15 SI/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw			B0 A0	
43 Yw/Gn 18 Gn/Yw			B1 A1	
44 Yw/Br 19 Br/Yw			B2 A2	
45 Yw/SI 20 SI/Yw			B3 A3	
46 Vi/Bl 21 Bl/Vi			B4 A4	
47 Vi/Or 22 Or/Vi			B5 A5	
48 Vi/Gn 23 Gn/Vi			B6 A6	
49 Vi/Br 24 Br/Vi			B7 A7	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

Table 5-45 8SVD cards

26 Wh/Bl 1 Bl/Wh	B0 A0		34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	B1 A1		35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	B2 A2		36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	B3 A3		37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	B4 A4		38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	B5 A5		39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	B6 A6		40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	B7 A7		41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	B0 A0		34 Rd/Br 9 Br/Rd	
43 Yw/Gn 18 Gn/Yw	B1 A1		35 Rd/Sl 10 Sl/Rd	
44 Yw/Br 19 Br/Yw	B2 A2		36 Bk/Bl 11 Bl/Bk	
45 Yw/Sl 20 Sl/Yw	B3 A3		37 Bk/Or 12 Or/Bk	
46 Vi/Bl 21 Bl/Vi	B4 A4		38 Bk/Gn 13 Gn/Bk	
47 Vi/Or 22 Or/Vi	B5 A5		39 Bk/Br 14 Br/Bk	
48 Vi/Gn 23 Gn/Vi	B6 A6		40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi	B7 A7		41 Yw/Bl 16 Bl/Yw	



NOTE:

See [Table 5-17](#) on page 5-57 for possible card combinations.

Table 5-46 8SFT, 16SFT, 24SFT, 8SDT, 16SDT, 24SDT cards

26 Wh/Bl 1 Bl/Wh	B0 A0	B8 * A8 *		
27 Wh/Or 2 Or/Wh	B1 A1	B9 * A9 *		
28 Wh/Gn 3 Gn/Wh	B2 A2	B10 * A10 *		
29 Wh/Br 4 Br/Wh	B3 A3	B11 * A11 *		
30 Wh/SI 5 SI/Wh	B4 A4	B12 * A12 *		
31 Rd/Bl 6 Bl/Rd	B5 A5	B13 * A13 *		
32 Rd/Or 7 Or/Rd	B6 A6	B14 * A14 *		
33 Rd/Gn 8 Gn/Rd	B7 A7	B15 * A15 *		
34 Rd/Br 9 Br/Rd	B16 ** A16 **			B8 * A8 *
35 Rd/SI 10 SI/Rd	B17 ** A17 **			B9 * A9 *
36 Bk/Bl 11 Bl/Bk	B18 ** A18 **			B10 * A10 *
37 Bk/Or 12 Or/Bk	B19 ** A19 **			B11 * A11 *
38 Bk/Gn 13 Gn/Bk	B20 ** A20 **			B12 * A12 *
39 Bk/Br 14 Br/Bk	B21 ** A21 **			B13 * A13 *
40 Bk/SI 15 SI/Bk	B22 ** A22 **			B14 * A14 *
41 Yw/Bl 16 Bl/Yw	B23 ** A23 **			B15 * A15 *
42 Yw/Or 17 Or/Yw			B0 A0	B16 ** A16 **
43 Yw/Gn 18 Gn/Yw			B1 A1	B17 ** A17 **
44 Yw/Br 19 Br/Yw			B2 A2	B18 ** A18 **
45 Yw/SI 20 SI/Yw			B3 A3	B19 ** A19 **
46 Vi/Bl 21 Bl/Vi			B4 A4	B20 ** A20 **
47 Vi/Or 22 Or/Vi			B5 A5	B21 ** A21 **
48 Vi/Gn 23 Gn/Vi			B6 A6	B22 ** A22 **
49 Vi/Br 24 Br/Vi			B7 A7	B23 ** A23 **
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

* Circuits 8 through 15 are not present on 8SFT and 8SDT cards.

** Circuits 16 through 23 are present only on 24SFT and 24SDT cards.

*** See [Table 5-17](#) on page 5-57 for possible card combinations.

Table 5-47 8SFT, 16SFT, 24SFT, 8SDT, 16SDT, 24SDT cards

26 Wh/Bl 1 Bl/Wh	B0 A0	B8 A8	34 Rd/Br 9 Br/Rd	B16 A16
27 Wh/Or 2 Or/Wh	B1 A1	B9 A9	35 Rd/Sl 10 Sl/Rd	B17 A17
28 Wh/Gn 3 Gn/Wh	B2 A2	B10 A10	36 Bk/Bl 11 Bl/Bk	B18 A18
29 Wh/Br 4 Br/Wh	B3 A3	B11 A11	37 Bk/Or 12 Or/Bk	B19 A19
30 Wh/Sl 5 Sl/Wh	B4 A4	B12 A12	38 Bk/Gn 13 Gn/Bk	B20 A20
31 Rd/Bl 6 Bl/Rd	B5 A5	B13 A13	39 Bk/Br 14 Br/Bk	B21 A21
32 Rd/Or 7 Or/Rd	B6 A6	B14 A14	40 Bk/Sl 15 Sl/Bk	B22 A22
33 Rd/Gn 8 Gn/Rd	B7 A7	B15 A15	41 Yw/Bl 16 Bl/Yw	B23 A23

42 Yw/Or 17 Or/Yw	B0 A0	B16 A16	34 Rd/Br 9 Br/Rd	B8 A8
43 Yw/Gn 18 Gn/Yw	B1 A1	B17 A17	35 Rd/Sl 10 Sl/Rd	B9 A9
44 Yw/Br 19 Br/Yw	B2 A2	B18 A18	36 Bk/Bl 11 Bl/Bk	B10 A10
45 Yw/Sl 20 Sl/Yw	B3 A3	B19 A19	37 Bk/Or 12 Or/Bk	B11 A11
46 Vi/Bl 21 Bl/Vi	B4 A4	B20 A20	38 Bk/Gn 13 Gn/Bk	B12 A12
47 Vi/Or 22 Or/Vi	B5 A5	B21 A21	39 Bk/Br 14 Br/Bk	B13 A13
48 Vi/Gn 23 Gn/Vi	B6 A6	B22 A22	40 Bk/Sl 15 Sl/Bk	B14 A14
49 Vi/Br 24 Br/Vi	B7 A7	B23 A23	41 Yw/Bl 16 Bl/Yw	B15 A15

* Circuits 8 through 15 are not present on 8SFT and 8SDT cards.

** Circuits 16 through 23 are present only on 24SFT and 24SDT cards.



See [Table 5-17](#) on page 5-57 for possible card combinations.

Table 5-48 4S/SH,
4SH/S(-LL) cards

26 Wh/Bl 1 Bl/Wh	ST0 SR0			
27 Wh/Or 2 Or/Wh	ST1 SR1			
28 Wh/Gn 3 Gn/Wh	ST2 SR2			
29 Wh/Br 4 Br/Wh	ST3 SR3			
30 Wh/SI 5 SI/Wh				
31 Rd/Bl 6 Bl/Rd				
32 Rd/Or 7 Or/Rd				
33 Rd/Gn 8 Gn/Rd				
34 Rd/Br 9 Br/Rd				
35 Rd/SI 10 SI/Rd				
36 Bk/Bl 11 Bl/Bk				
37 Bk/Or 12 Or/Bk				
38 Bk/Gn 13 Gn/Bk				
39 Bk/Br 14 Br/Bk				
40 Bk/SI 15 SI/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw			ST0 SR0	
43 Yw/Gn 18 Gn/Yw			ST1 SR1	
44 Yw/Br 19 Br/Yw			ST2 SR2	
45 Yw/SI 20 SI/Yw			ST3 SR3	
46 Vi/Bl 21 Bl/Vi				
47 Vi/Or 22 Or/Vi				
48 Vi/Gn 23 Gn/Vi				
49 Vi/Br 24 Br/Vi				
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

See CAUTION note for 4,8,16 (SH, S/SH, SH/S, SH/S-LL) cards, on page 5-58.

Table 5-49 4S/SH,
4SH/S(-LL) cards

26 Wh/Bl 1 Bl/Wh	ST0 SR0		34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	ST1 SR1		35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	ST2 SR2		36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	ST3 SR3		37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh			38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd			39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd			40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd			41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	ST0 SR0		34 Rd/Br 9 Br/Rd	
43 Yw/Gn 18 Gn/Yw	ST1 SR1		35 Rd/Sl 10 Sl/Rd	
44 Yw/Br 19 Br/Yw	ST2 SR2		36 Bk/Bl 11 Bl/Bk	
45 Yw/Sl 20 Sl/Yw	ST3 SR3		37 Bk/Or 12 Or/Bk	
46 Vi/Bl 21 Bl/Vi			38 Bk/Gn 13 Gn/Bk	
47 Vi/Or 22 Or/Vi			39 Bk/Br 14 Br/Bk	
48 Vi/Gn 23 Gn/Vi			40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi			41 Yw/Bl 16 Bl/Yw	

See CAUTION note for 4,8,16 (SH, S/SH, SH/S, SH/S-LL) cards, on page 5-58.

Table 5-50 8SA, 8SLS, 8S, 8S/SH, 8SH/S(-LL) cards

26 Wh/Bl 1 Bl/Wh	ST0 SR0	ST4 SR4		
27 Wh/Or 2 Or/Wh	ST1 SR1	ST5 SR5		
28 Wh/Gn 3 Gn/Wh	ST2 SR2	ST6 SR6		
29 Wh/Br 4 Br/Wh	ST3 SR3	ST7 SR7		
30 Wh/SI 5 SI/Wh				
31 Rd/Bl 6 Bl/Rd				
32 Rd/Or 7 Or/Rd				
33 Rd/Gn 8 Gn/Rd				
34 Rd/Br 9 Br/Rd				ST4 SR4
35 Rd/SI 10 SI/Rd				ST5 SR5
36 Bk/Bl 11 Bl/Bk				ST6 SR6
37 Bk/Or 12 Or/Bk				ST7 SR7
38 Bk/Gn 13 Gn/Bk				
39 Bk/Br 14 Br/Bk				
40 Bk/SI 15 SI/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw			ST0 SR0	
43 Yw/Gn 18 Gn/Yw			ST1 SR1	
44 Yw/Br 19 Br/Yw			ST2 SR2	
45 Yw/SI 20 SI/Yw			ST3 SR3	
46 Vi/Bl 21 Bl/Vi				
47 Vi/Or 22 Or/Vi				
48 Vi/Gn 23 Gn/Vi				
49 Vi/Br 24 Br/Vi				
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

NOTE: Cards 8S, 8SA and 8SLS are interchangeable.

See **CAUTION** note for 4,8,16 (SH, S/SH, SH/S, SH/S-LL) cards, on page 5-58.

Table 5-51 8SA, 8SLS, 8S, 8S/SH(-LL), 8SH/S cards

26 Wh/Bl 1 Bl/Wh	ST0 SR0	ST4 SR4	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	ST1 SR1	ST5 SR5	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	ST2 SR2	ST6 SR6	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	ST3 SR3	ST7 SR7	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh			38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd			39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd			40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd			41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	ST0 SR0		34 Rd/Br 9 Br/Rd	ST4 SR4
43 Yw/Gn 18 Gn/Yw	ST1 SR1		35 Rd/Sl 10 Sl/Rd	ST5 SR5
44 Yw/Br 19 Br/Yw	ST2 SR2		36 Bk/Bl 11 Bl/Bk	ST6 SR6
45 Yw/Sl 20 Sl/Yw	ST3 SR3		37 Bk/Or 12 Or/Bk	ST7 SR7
46 Vi/Bl 21 Bl/Vi			38 Bk/Gn 13 Gn/Bk	
47 Vi/Or 22 Or/Vi			39 Bk/Br 14 Br/Bk	
48 Vi/Gn 23 Gn/Vi			40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi			41 Yw/Bl 16 Bl/Yw	

NOTE: Cards 8S, 8SA and 8SLS are interchangeable.

See CAUTION note for 4,8,16 (SH, S/SH, SH/S, SH/S-LL) cards, on page 5-58.

**Table 5-52 16SLS,
16SH/S(-LL), 16S, 16S/SH
cards**

26 Wh/Bl 1 Bl/Wh	ST0 SR0	ST8 SR8		
27 Wh/Or 2 Or/Wh	ST1 SR1	ST9 SR9		
28 Wh/Gn 3 Gn/Wh	ST2 SR2	ST10 SR10		
29 Wh/Br 4 Br/Wh	ST3 SR3	ST11 SR11		
30 Wh/SI 5 SI/Wh	ST4 SR4	ST12 SR12		
31 Rd/Bl 6 Bl/Rd	ST5 SR5	ST13 SR13		
32 Rd/Or 7 Or/Rd	ST6 SR6	ST14 SR14		
33 Rd/Gn 8 Gn/Rd	ST7 SR7	ST15 SR15		
34 Rd/Br 9 Br/Rd				ST8 SR8
35 Rd/SI 10 SI/Rd				ST9 SR9
36 Bk/Bl 11 Bl/Bk				ST10 SR10
37 Bk/Or 12 Or/Bk				ST11 SR11
38 Bk/Gn 13 Gn/Bk				ST12 SR12
39 Bk/Br 14 Br/Bk				ST13 SR13
40 Bk/SI 15 SI/Bk				ST14 SR14
41 Yw/Bl 16 Bl/Yw				ST15 SR15
42 Yw/Or 17 Or/Yw			ST0 SR0	
43 Yw/Gn 18 Gn/Yw			ST1 SR1	
44 Yw/Br 19 Br/Yw			ST2 SR2	
45 Yw/SI 20 SI/Yw			ST3 SR3	
46 Vi/Bl 21 Bl/Vi			ST4 SR4	
47 Vi/Or 22 Or/Vi			ST5 SR5	
48 Vi/Gn 23 Gn/Vi			ST6 SR6	
49 Vi/Br 24 Br/Vi			ST7 SR7	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

NOTE: Cards 16S and 16SLS listed above are interchangeable.

See **CAUTION** note for 4,8,16 (SH, S/SH, SH/S, SH/S-LL) cards, on page 5-58.

Table 5-53 16SLS,
16SH/S(-LL), 16S, 16SH,
16S/SH cards

26 Wh/Bl 1 Bl/Wh	ST0 SR0	ST8 SR8	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	ST1 SR1	ST9 SR9	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	ST2 SR2	ST10 SR10	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	ST3 SR3	ST11 SR11	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	ST4 SR4	ST12 SR12	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	ST5 SR5	ST13 SR13	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	ST6 SR6	ST14 SR14	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	ST7 SR7	ST15 SR15	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	ST0 SR0		34 Rd/Br 9 Br/Rd	ST8 SR8
43 Yw/Gn 18 Gn/Yw	ST1 SR1		35 Rd/Sl 10 Sl/Rd	ST9 SR9
44 Yw/Br 19 Br/Yw	ST2 SR2		36 Bk/Bl 11 Bl/Bk	ST10 SR10
45 Yw/Sl 20 Sl/Yw	ST3 SR3		37 Bk/Or 12 Or/Bk	ST11 SR11
46 Vi/Bl 21 Bl/Vi	ST4 SR4		38 Bk/Gn 13 Gn/Bk	ST12 SR12
47 Vi/Or 22 Or/Vi	ST5 SR5		39 Bk/Br 14 Br/Bk	ST13 SR13
48 Vi/Gn 23 Gn/Vi	ST6 SR6		40 Bk/Sl 15 Sl/Bk	ST14 SR14
49 Vi/Br 24 Br/Vi	ST7 SR7		41 Yw/Bl 16 Bl/Yw	ST15 SR15

NOTE: Cards 16S and 16SLS listed above are interchangeable.

See CAUTION note for 4,8,16 (SH, S/SH, SH/S, SH/S-LL) cards, on page 5-58.

Table 5-54 24SA,
16SLS, 24SLS cards

26 Wh/Bl 1 Bl/Wh	ST0 SR0	ST8 SR8		
27 Wh/Or 2 Or/Wh	ST1 SR1	ST9 SR9		
28 Wh/Gn 3 Gn/Wh	ST2 SR2	ST10 SR10		
29 Wh/Br 4 Br/Wh	ST3 SR3	ST11 SR11		
30 Wh/Sl 5 Sl/Wh	ST4 SR4	ST12 SR12		
31 Rd/Bl 6 Bl/Rd	ST5 SR5	ST13 SR13		
32 Rd/Or 7 Or/Rd	ST6 SR6	ST14 SR14		
33 Rd/Gn 8 Gn/Rd	ST7 SR7	ST15 SR15		
34 Rd/Br 9 Br/Rd	ST16 * SR16 *			ST8 SR8
35 Rd/Sl 10 Sl/Rd	ST17 * SR17 *			ST9 SR9
36 Bk/Bl 11 Bl/Bk	ST18 * SR18 *			ST10 SR10
37 Bk/Or 12 Or/Bk	ST19 * SR19 *			ST11 SR11
38 Bk/Gn 13 Gn/Bk	ST20 * SR20 *			ST12 SR12
39 Bk/Br 14 Br/Bk	ST21 * SR21 *			ST13 SR13
40 Bk/Sl 15 Sl/Bk	ST22 * SR22 *			ST14 SR14
41 Yw/Bl 16 Bl/Yw	ST23 * SR23 *			ST15 SR15
42 Yw/Or 17 Or/Yw			ST0 SR0	ST16 * SR16 *
43 Yw/Gn 18 Gn/Yw			ST1 SR1	ST17 * SR17 *
44 Yw/Br 19 Br/Yw			ST2 SR2	ST18 * SR18 *
45 Yw/Sl 20 Sl/Yw			ST3 SR3	ST19 * SR19 *
46 Vi/Bl 21 Bl/Vi			ST4 SR4	ST20 * SR20 *
47 Vi/Or 22 Or/Vi			ST5 SR5	ST21 * SR21 *
48 Vi/Gn 23 Gn/Vi			ST6 SR6	ST22 * SR22 *
49 Vi/Br 24 Br/Vi			ST7 SR7	ST23 * SR23 *
50 Vi/Sl 25 Sl/Vi	Not Used	Not Used	Not Used	Not Used

* Circuits 16 through 23 are present only on 24SA and 24SLS cards.

Table 5-55 **24SA,
16SLS, 24SLScards**

26 Wh/Bl 1 Bl/Wh	ST0 SR0	ST8 SR8	34 Rd/Br 9 Br/Rd	ST16 SR16
27 Wh/Or 2 Or/Wh	ST1 SR1	ST9 SR9	35 Rd/Sl 10 Sl/Rd	ST17 SR17
28 Wh/Gn 3 Gn/Wh	ST2 SR2	ST10 SR10	36 Bk/Bl 11 Bl/Bk	ST18 SR18
29 Wh/Br 4 Br/Wh	ST3 SR3	ST11 SR11	37 Bk/Or 12 Or/Bk	ST19 SR19
30 Wh/Sl 5 Sl/Wh	ST4 SR4	ST12 SR12	38 Bk/Gn 13 Gn/Bk	ST20 SR20
31 Rd/Bl 6 Bl/Rd	ST5 SR5	ST13 SR13	39 Bk/Br 14 Br/Bk	ST21 SR21
32 Rd/Or 7 Or/Rd	ST6 SR6	ST14 SR14	40 Bk/Sl 15 Sl/Bk	ST22 SR22
33 Rd/Gn 8 Gn/Rd	ST7 SR7	ST15 SR15	41 Yw/Bl 16 Bl/Yw	ST23 SR23

42 Yw/Or 17 Or/Yw	ST0 SR0	ST16 SR16	34 Rd/Br 9 Br/Rd	ST8 SR8
43 Yw/Gn 18 Gn/Yw	ST1 SR1	ST17 SR17	35 Rd/Sl 10 Sl/Rd	ST9 SR9
44 Yw/Br 19 Br/Yw	ST2 SR2	ST18 SR18	36 Bk/Bl 11 Bl/Bk	ST10 SR10
45 Yw/Sl 20 Sl/Yw	ST3 SR3	ST19 SR19	37 Bk/Or 12 Or/Bk	ST11 SR11
46 Vi/Bl 21 Bl/Vi	ST4 SR4	ST20 SR20	38 Bk/Gn 13 Gn/Bk	ST12 SR12
47 Vi/Or 22 Or/Vi	ST5 SR5	ST21 SR21	39 Bk/Br 14 Br/Bk	ST13 SR13
48 Vi/Gn 23 Gn/Vi	ST6 SR6	ST22 SR22	40 Bk/Sl 15 Sl/Bk	ST14 SR14
49 Vi/Br 24 Br/Vi	ST7 SR7	ST23 SR23	41 Yw/Bl 16 Bl/Yw	ST15 SR15

* Circuits 16 through 23 are present only on 24SA and 24SLS cards.

Table 5-56 8SM cards

26 Wh/Bl 1 Bl/Wh	ST0 SR0	ST4 SR4		
27 Wh/Or 2 Or/Wh	ST1 SR1	ST5 SR5		
28 Wh/Gn 3 Gn/Wh	ST2 SR2	ST6 SR6		
29 Wh/Br 4 Br/Wh	ST3 SR3	ST7 SR7		
30 Wh/SI 5 SI/Wh				
31 Rd/Bl 6 Bl/Rd				
32 Rd/Or 7 Or/Rd				
33 Rd/Gn 8 Gn/Rd				
34 Rd/Br 9 Br/Rd				ST4 SR4
35 Rd/SI 10 SI/Rd				ST5 SR5
36 Bk/Bl 11 Bl/Bk				ST6 SR6
37 Bk/Or 12 Or/Bk				ST7 SR7
38 Bk/Gn 13 Gn/Bk				
39 Bk/Br 14 Br/Bk				
40 Bk/SI 15 SI/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw			ST0 SR0	
43 Yw/Gn 18 Gn/Yw			ST1 SR1	
44 Yw/Br 19 Br/Yw			ST2 SR2	
45 Yw/SI 20 SI/Yw			ST3 SR3	
46 Vi/Bl 21 Bl/Vi				
47 Vi/Or 22 Or/Vi				
48 Vi/Gn 23 Gn/Vi				
49 Vi/Br 24 Br/Vi				
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

Table 5-57 8SM cards

26 Wh/Bl 1 Bl/Wh	ST0 SR0	ST4 SR4	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	ST1 SR1	ST5 SR5	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	ST2 SR2	ST6 SR6	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	ST3 SR3	ST7 SR7	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh			38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd			39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd			40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd			41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	ST0 SR0		34 Rd/Br 9 Br/Rd	ST4 SR4
43 Yw/Gn 18 Gn/Yw	ST1 SR1		35 Rd/Sl 10 Sl/Rd	ST5 SR5
44 Yw/Br 19 Br/Yw	ST2 SR2		36 Bk/Bl 11 Bl/Bk	ST6 SR6
45 Yw/Sl 20 Sl/Yw	ST3 SR3		37 Bk/Or 12 Or/Bk	ST7 SR7
46 Vi/Bl 21 Bl/Vi			38 Bk/Gn 13 Gn/Bk	
47 Vi/Or 22 Or/Vi			39 Bk/Br 14 Br/Bk	
48 Vi/Gn 23 Gn/Vi			40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi			41 Yw/Bl 16 Bl/Yw	

Table 5-58 8DRCF,
8DRCM, 8DRCM-2 cards

26 Wh/Bl 1 Bl/Wh	TXD1 RXD1	TXD3 RXD3		
27 Wh/Or 2 Or/Wh	RTS1 CTS1	RTS3 CTS3		
28 Wh/Gn 3 Gn/Wh	DTR1 DSR1	DTR3 DSR3		
29 Wh/Br 4 Br/Wh	TXD2 RXD2	RLY1 RLY1		
30 Wh/SI 5 SI/Wh	RTS2 CTS2	RLY2 RLY2		
31 Rd/Bl 6 Bl/Rd	DTR2 DSR2	RLY3 RLY3		
32 Rd/Or 7 Or/Rd	M1 M1	PAGE * PAGE *		
33 Rd/Gn 8 Gn/Rd	M2 M2	Not Used SGRND		
34 Rd/Br 9 Br/Rd				TXD3 RXD3
35 Rd/SI 10 SI/Rd				RTS3 CTS3
36 Bk/Bl 11 Bl/Bk				DTR3 DSR3
37 Bk/Or 12 Or/Bk				RLY1 RLY1
38 Bk/Gn 13 Gn/Bk				RLY2 RLY2
39 Bk/Br 14 Br/Bk				RLY3 RLY3
40 Bk/SI 15 SI/Bk				PAGE * PAGE *
41 Yw/Bl 16 Bl/Yw				Not Used SGRND
42 Yw/Or 17 Or/Yw			TXD1 RXD1	
43 Yw/Gn 18 Gn/Yw			RTS1 CTS1	
44 Yw/Br 19 Br/Yw			DTR1 DSR1	
45 Yw/SI 20 SI/Yw			TXD2 RXD2	
46 Vi/Bl 21 Bl/Vi			RTS2 CTS2	
47 Vi/Or 22 Or/Vi			DTR2 DSR2	
48 Vi/Gn 23 Gn/Vi			M1 M1	
49 Vi/Br 24 Br/Vi			M2 M2	
50 Vi/SI 25 SI/Vi	Not Used Not Used	Not Used Not Used	Not Used Not Used	Not Used Not Used

* When replacing RMI with 8DRCF, 8DRCM or 8DRCM-2, mind the PAGE I/O connections, since their MDF location may vary.

NOTE: M1 - Audio Music Input (Internal/External); M2 - Audio Music Input (External only)
 RLY1 - External Paging Contact; RLY2 - UNA Bell Contact
 RLY3 - System Alarm or Dial-Operated Contact
 RXD, TXD, CTS, RTS, DSR, DTR, SGRND - RS232E Data Ports

Table 5-59 **8DRCF, 8DRCM, 8DRCM-2 cards**

26 Wh/Bl 1 Bl/Wh	TXD1 RXD1	TXD3 RXD3	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	RTS1 CTS1	RTS3 CTS3	35 Rd/SI 10 SI/Rd	
28 Wh/Gn 3 Gn/Wh	DTR1 DSR1	DTR3 DSR3	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	TXD2 RXD2	RLY1 RLY1	37 Bk/Or 12 Or/Bk	
30 Wh/SI 5 SI/Wh	RTS2 CTS2	RLY2 RLY2	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	DTR2 DSR2	RLY3 RLY3	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	M1 M1	PAGE * PAGE *	40 Bk/SI 15 SI/Bk	
33 Rd/Gn 8 Gn/Rd	M2 M2	Not Used SGRND	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	TXD1 RXD1		34 Rd/Br 9 Br/Rd	TXD3 RXD3
43 Yw/Gn 18 Gn/Yw	RTS1 CTS1		35 Rd/SI 10 SI/Rd	RTS3 CTS3
44 Yw/Br 19 Br/Yw	DTR1 DSR1		36 Bk/Bl 11 Bl/Bk	DTR3 DSR3
45 Yw/SI 20 SI/Yw	TXD2 RXD2		37 Bk/Or 12 Or/Bk	RLY1 RLY1
46 Vi/Bl 21 Bl/Vi	RTS2 CTS2		38 Bk/Gn 13 Gn/Bk	RLY2 RLY2
47 Vi/Or 22 Or/Vi	DTR2 DSR2		39 Bk/Br 14 Br/Bk	RLY3 RLY3
48 Vi/Gn 23 Gn/Vi	M1 M1		40 Bk/SI 15 SI/Bk	PAGE * PAGE *
49 Vi/Br 24 Br/Vi	M2 M2		41 Yw/Bl 16 Bl/Yw	Not Used SGRND

* When replacing RMI with 8DRCF, 8DRCM or 8DRCM-2, mind the PAGE I/O connections, since their MDF location may vary.

NOTE: M1 - Audio Music Input (Internal/External);
M2 - Audio Music Input (External only)
RLY1 - External Paging Contact;
RLY2 - UNA Bell Contact
RLY3 - System Alarm or Dial-Operated Contact
RXD, TXD, CTS, RTS, DSR, DTR, SGRND - RS232E Data Ports

Table 5-60 RMI, ASU cards

26 Wh/Bl 1 Bl/Wh	TXD1 * RXD1 *	TXD3 * RXD3 *		
27 Wh/Or 2 Or/Wh	RTS1 * CTS1 *	RTS3 * CTS3 *		
28 Wh/Gn 3 Gn/Wh	DTR1 * DSR1 *	DTR3 * DSR3 *		
29 Wh/Br 4 Br/Wh	TXD2 * RXD2 *	RLY1 RLY1		
30 Wh/Sl 5 Sl/Wh	RTS2 * CTS2 *	RLY2 RLY2		
31 Rd/Bl 6 Bl/Rd	DTR2 * DSR2 *	RLY3 RLY3		
32 Rd/Or 7 Or/Rd	M/P1 M/P1			
33 Rd/Gn 8 Gn/Rd	M/P2 M/P2	Not Used SGRND *		
34 Rd/Br 9 Br/Rd				TXD3 * RXD3 *
35 Rd/Sl 10 Sl/Rd				RTS3 * CTS3 *
36 Bk/Bl 11 Bl/Bk				DTR3 * DSR3 *
37 Bk/Or 12 Or/Bk				RLY1 RLY1
38 Bk/Gn 13 Gn/Bk				RLY2 RLY2
39 Bk/Br 14 Br/Bk				RLY3 RLY3
40 Bk/Sl 15 Sl/Bk				
41 Yw/Bl 16 Bl/Yw				Not Used SGRND *
42 Yw/Or 17 Or/Yw			TXD1 * RXD1 *	
43 Yw/Gn 18 Gn/Yw			RTS1 * CTS1 *	
44 Yw/Br 19 Br/Yw			DTR1 * DSR1 *	
45 Yw/Sl 20 Sl/Yw			TXD2 * RXD2 *	
46 Vi/Bl 21 Bl/Vi			RTS2 * CTS2 *	
47 Vi/Or 22 Or/Vi			DTR2 * DSR2 *	
48 Vi/Gn 23 Gn/Vi			M/P1 M/P1	
49 Vi/Br 24 Br/Vi			M/P2 M/P2	
50 Vi/Sl 25 Sl/Vi	Not Used Not Used	Not Used Not Used	Not Used Not Used	Not Used Not Used

* RXD, TXD, CTS, RTS, DSR, DTR, SGRND - RS232C Data Ports, are present only on RMI cards.

NOTE: M/P1 - Audio Input (MOH, Background Music)
M/P2 - 2nd Audio Input or External Paging Audio Output
RLY1 - External Paging Contact
RLY2 - UNA Bell Contact
RLY3 - System Alarm or Dial-Operated Contact

Table 5-61 RMI, ASU cards

26 Wh/Bl 1 Bl/Wh	TXD1 * RXD1 *	TXD3 * RXD3 *	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	RTS1 * CTS1 *	RTS3 * CTS3 *	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	DTR1 * DSR1 *	DTR3 * DSR3 *	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	TXD2 * RXD2 *	RLY1 RLY1	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	RTS2 * CTS2 *	RLY2 RLY2	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	DTR2 * DSR2 *	RLY3 RLY3	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	M/P1 M/P1		40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	M/P2 M/P2	Not Used SGRND *	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	TXD1 * RXD1 *		34 Rd/Br 9 Br/Rd	TXD3 * RXD3 *
43 Yw/Gn 18 Gn/Yw	RTS1 * CTS1 *		35 Rd/Sl 10 Sl/Rd	RTS3 * CTS3 *
44 Yw/Br 19 Br/Yw	DTR1 * DSR1 *		36 Bk/Bl 11 Bl/Bk	DTR3 * DSR3 *
45 Yw/Sl 20 Sl/Yw	TXD2 * RXD2 *		37 Bk/Or 12 Or/Bk	RLY1 RLY1
46 Vi/Bl 21 Bl/Vi	RTS2 * CTS2 *		38 Bk/Gn 13 Gn/Bk	RLY2 RLY2
47 Vi/Or 22 Or/Vi	DTR2 * DSR2 *		39 Bk/Br 14 Br/Bk	RLY3 RLY3
48 Vi/Gn 23 Gn/Vi	M/P1 M/P1		40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi	M/P2 M/P2		41 Yw/Bl 16 Bl/Yw	Not Used SGRND *

* RXD, TXD, CTS, RTS, DSR, DTR, SGRND - RS232C Data Ports, are present only on RMI cards.

NOTE: M/P1 - Audio Input (MOH, Background Music)
M/P2 - 2nd Audio Input or External Paging Audio Output
RLY1 - External Paging Contact
RLY2 - UNA Bell Contact
RLY3 - System Alarm or Dial-Operated Contact

**Table 5-62 SKW/x cards
(Issue 4 and later)**

26 Wh/Bl 1 Bl/Wh	TT BS1 * TR BS1 *			
27 Wh/Or 2 Or/Wh	RT BS1 * RR BS1 *			
28 Wh/Gn 3 Gn/Wh	TT BS2 * TR BS2 *			
29 Wh/Br 4 Br/Wh	RT BS2 * RR BS2 *			
30 Wh/SI 5 SI/Wh	CLK 2M (-) CLK 2M (+)			
31 Rd/Bl 6 Bl/Rd	CLK 8K (-) CLK 8K (+)			
32 Rd/Or 7 Or/Rd	PLS 320 ms (-) PLS 320 ms (+)			
33 Rd/Gn 8 Gn/Rd	RS 485 (-) RS 485 (+)			
34 Rd/Br 9 Br/Rd				
35 Rd/SI 10 SI/Rd				
36 Bk/Bl 11 Bl/Bk				
37 Bk/Or 12 Or/Bk				
38 Bk/Gn 13 Gn/Bk				
39 Bk/Br 14 Br/Bk				
40 Bk/SI 15 SI/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw			TT BS1 * TR BS1 *	
43 Yw/Gn 18 Gn/Yw			RT BS1 * RR BS1 *	
44 Yw/Br 19 Br/Yw			TT BS2 * TR BS2 *	
45 Yw/SI 20 SI/Yw			RT BS2 * RR BS2 *	
46 Vi/Bl 21 Bl/Vi			CLK 2M (-) CLK 2M (+)	
47 Vi/Or 22 Or/Vi			CLK 8K (-) CLK 8K (+)	
48 Vi/Gn 23 Gn/Vi			PLS 320 ms (-) PLS 320 ms (+)	
49 Vi/Br 24 Br/Vi			RS 485 (-) RS 485 (+)	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

* TR BS and TT BS pairs are connected to pins 3,4 of base stations Rx plug.

RR BS and RT BS pairs are connected to pins 3,4 of base stations Tx plug.

**Table 5-63 SKW/x cards
(Issue 4 and later)**

26 Wh/Bl 1 Bl/Wh	TT BS1 * TR BS1 *		34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	RT BS1 * RR BS1 *		35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	TT BS2 * TR BS2 *		36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	RT BS2 * RR BS2 *		37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	CLK 2M (-) CLK 2M (+)		38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	CLK 8K (-) CLK 8K (+)		39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	PLS 320 ms (-) PLS 320 ms (+)		40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	RS 485 (-) RS 485 (+)		41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	TT BS1 * TR BS1 *		34 Rd/Br 9 Br/Rd	
43 Yw/Gn 18 Gn/Yw	RT BS1 * RR BS1 *		35 Rd/Sl 10 Sl/Rd	
44 Yw/Br 19 Br/Yw	TT BS2 * TR BS2 *		36 Bk/Bl 11 Bl/Bk	
45 Yw/Sl 20 Sl/Yw	RT BS2 * RR BS2 *		37 Bk/Or 12 Or/Bk	
46 Vi/Bl 21 Bl/Vi	CLK 2M (-) CLK 2M (+)		38 Bk/Gn 13 Gn/Bk	
47 Vi/Or 22 Or/Vi	CLK 8K (-) CLK 8K (+)		39 Bk/Br 14 Br/Bk	
48 Vi/Gn 23 Gn/Vi	PLS 320 ms (-) PLS 320 ms (+)		40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi	RS 485 (-) RS 485 (+)		41 Yw/Bl 16 Bl/Yw	

* TR BS and TT BS pairs are connected to pins 3,4 of base stations Rx plug
RR BS and RT BS pairs are connected to pins 3,4 of base stations Tx plug.

**Table 5-64 8SKK card
for Wireless FlexAir
(Radio Base Station)**

26 Wh/Bl 1 Bl/Wh	B0 A0			
27 Wh/Or 2 Or/Wh	B1 A1			
28 Wh/Gn 3 Gn/Wh	B2 A2			
29 Wh/Br 4 Br/Wh	B3 A3			
30 Wh/SI 5 SI/Wh	B4 A4			
31 Rd/Bl 6 Bl/Rd	B5 A5			
32 Rd/Or 7 Or/Rd	B6 A6			
33 Rd/Gn 8 Gn/Rd	B7 A7			
34 Rd/Br 9 Br/Rd				
35 Rd/SI 10 SI/Rd				
36 Bk/Bl 11 Bl/Bk				
37 Bk/Or 12 Or/Bk				
38 Bk/Gn 13 Gn/Bk				
39 Bk/Br 14 Br/Bk				
40 Bk/SI 15 SI/Bk				
41 Yw/Bl 16 Bl/Yw				
42 Yw/Or 17 Or/Yw			B0 A0	
43 Yw/Gn 18 Gn/Yw			B1 A1	
44 Yw/Br 19 Br/Yw			B2 A2	
45 Yw/SI 20 SI/Yw			B3 A3	
46 Vi/Bl 21 Bl/Vi			B4 A4	
47 Vi/Or 22 Or/Vi			B5 A5	
48 Vi/Gn 23 Gn/Vi			B6 A6	
49 Vi/Br 24 Br/Vi			B7 A7	
50 Vi/SI 25 SI/Vi	Not Used	Not Used	Not Used	Not Used

NOTE: For 16SKK cards see [Table 5-66](#) below.

**Table 5-65 8SKK card
for Wireless FlexAir
(Radio Base Station)**

26 Wh/Bl 1 Bl/Wh	B0 A0		34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	B1 A1		35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	B2 A2		36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	B3 A3		37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	B4 A4		38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	B5 A5		39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	B6 A6		40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	B7 A7		41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	B0 A0		34 Rd/Br 9 Br/Rd	
43 Yw/Gn 18 Gn/Yw	B1 A1		35 Rd/Sl 10 Sl/Rd	
44 Yw/Br 19 Br/Yw	B2 A2		36 Bk/Bl 11 Bl/Bk	
45 Yw/Sl 20 Sl/Yw	B3 A3		37 Bk/Or 12 Or/Bk	
46 Vi/Bl 21 Bl/Vi	B4 A4		38 Bk/Gn 13 Gn/Bk	
47 Vi/Or 22 Or/Vi	B5 A5		39 Bk/Br 14 Br/Bk	
48 Vi/Gn 23 Gn/Vi	B6 A6		40 Bk/Sl 15 Sl/Bk	
49 Vi/Br 24 Br/Vi	B7 A7		41 Yw/Bl 16 Bl/Yw	

NOTE: For 16SKK cards see [Table 5-67](#) below.

**Table 5-66 16SKK card
for Wireless FlexAir
(Radio Base Station)**

26 Wh/Bl 1 Bl/Wh	B0 A0	B8 A8		
27 Wh/Or 2 Or/Wh	B1 A1	B9 A9		
28 Wh/Gn 3 Gn/Wh	B2 A2	B10 A10		
29 Wh/Br 4 Br/Wh	B3 A3	B11 A11		
30 Wh/Sl 5 Sl/Wh	B4 A4	B12 A12		
31 Rd/Bl 6 Bl/Rd	B5 A5	B13 A13		
32 Rd/Or 7 Or/Rd	B6 A6	B14 A14		
33 Rd/Gn 8 Gn/Rd	B7 A7	B15 A15		
34 Rd/Br 9 Br/Rd				B8 A8
35 Rd/Sl 10 Sl/Rd				B9 A9
36 Bk/Bl 11 Bl/Bk				B10 A10
37 Bk/Or 12 Or/Bk				B11 A11
38 Bk/Gn 13 Gn/Bk				B12 A12
39 Bk/Br 14 Br/Bk				B13 A13
40 Bk/Sl 15 Sl/Bk				B14 A14
41 Yw/Bl 16 Bl/Yw				B15 A15
42 Yw/Or 17 Or/Yw			B0 A0	
43 Yw/Gn 18 Gn/Yw			B1 A1	
44 Yw/Br 19 Br/Yw			B2 A2	
45 Yw/Sl 20 Sl/Yw			B3 A3	
46 Vi/Bl 21 Bl/Vi			B4 A4	
47 Vi/Or 22 Or/Vi			B5 A5	
48 Vi/Gn 23 Gn/Vi			B6 A6	
49 Vi/Br 24 Br/Vi			B7 A7	
50 Vi/Sl 25 Sl/Vi	Not Used	Not Used	Not Used	Not Used

NOTE: Radio Base Station ports 8 through 15 are not present only on 8SKK cards.

**Table 5-67 16SKK card
for Wireless FlexAir
(Radio Base Station)**

26 Wh/Bl 1 Bl/Wh	B0 A0	B8 A8	34 Rd/Br 9 Br/Rd	
27 Wh/Or 2 Or/Wh	B1 A1	B9 A9	35 Rd/Sl 10 Sl/Rd	
28 Wh/Gn 3 Gn/Wh	B2 A2	B10 A10	36 Bk/Bl 11 Bl/Bk	
29 Wh/Br 4 Br/Wh	B3 A3	B11 A11	37 Bk/Or 12 Or/Bk	
30 Wh/Sl 5 Sl/Wh	B4 A4	B12 A12	38 Bk/Gn 13 Gn/Bk	
31 Rd/Bl 6 Bl/Rd	B5 A5	B13 A13	39 Bk/Br 14 Br/Bk	
32 Rd/Or 7 Or/Rd	B6 A6	B14 A14	40 Bk/Sl 15 Sl/Bk	
33 Rd/Gn 8 Gn/Rd	B7 A7	B15 A15	41 Yw/Bl 16 Bl/Yw	

42 Yw/Or 17 Or/Yw	B0 A0		34 Rd/Br 9 Br/Rd	B8 A8
43 Yw/Gn 18 Gn/Yw	B1 A1		35 Rd/Sl 10 Sl/Rd	B9 A9
44 Yw/Br 19 Br/Yw	B2 A2		36 Bk/Bl 11 Bl/Bk	B10 A10
45 Yw/Sl 20 Sl/Yw	B3 A3		37 Bk/Or 12 Or/Bk	B11 A11
46 Vi/Bl 21 Bl/Vi	B4 A4		38 Bk/Gn 13 Gn/Bk	B12 A12
47 Vi/Or 22 Or/Vi	B5 A5		39 Bk/Br 14 Br/Bk	B13 A13
48 Vi/Gn 23 Gn/Vi	B6 A6		40 Bk/Sl 15 Sl/Bk	B14 A14
49 Vi/Br 24 Br/Vi	B7 A7		41 Yw/Bl 16 Bl/Yw	B15 A15

NOTE: Radio Base Station ports 8 through 15 are not present only on 8SKK cards.



Cabinet Descriptions

Coral

6.1 *Cabinet Descriptions*.....6-1

6.1 Cabinet Descriptions

1 Cabinet Structure

The Coral IPx 4000 is housed in one or more free-standing, floor mounted main cabinet, serving as the system's foundation.

This system is a modular Coral system which can be built from a minimum of one IPx 4000C control cage and one IPx 4000XE even numbered peripheral cage. A maximum of eight "Even" (IPx 4000XE) and eight "Odd" (IPx 4000XO) shelves/cages may be added to create a system with a maximum of 16 peripheral shelves housed in Expansion cabinets. Each Coral Expansion cabinet can hold up to 4 cages of any type. Each IPx 4000XO cage must be accompanied by an adjacent IPx 4000XE cage.

Figure 6-1 displays an empty Coral IPx 4000 Cabinet which may be used to house a maximum of four cages, one or no Control cages and/or up to four Expansion cages.

Figure 6-2 shows the Coral IPx 4000 system's Main Cabinet Structure.

Figure 6-3 shows a typical Coral IPx 4000 Expansion Cabinet Structure.

Figure 6-1 **Empty Coral
IPx 4000 Cabinet**

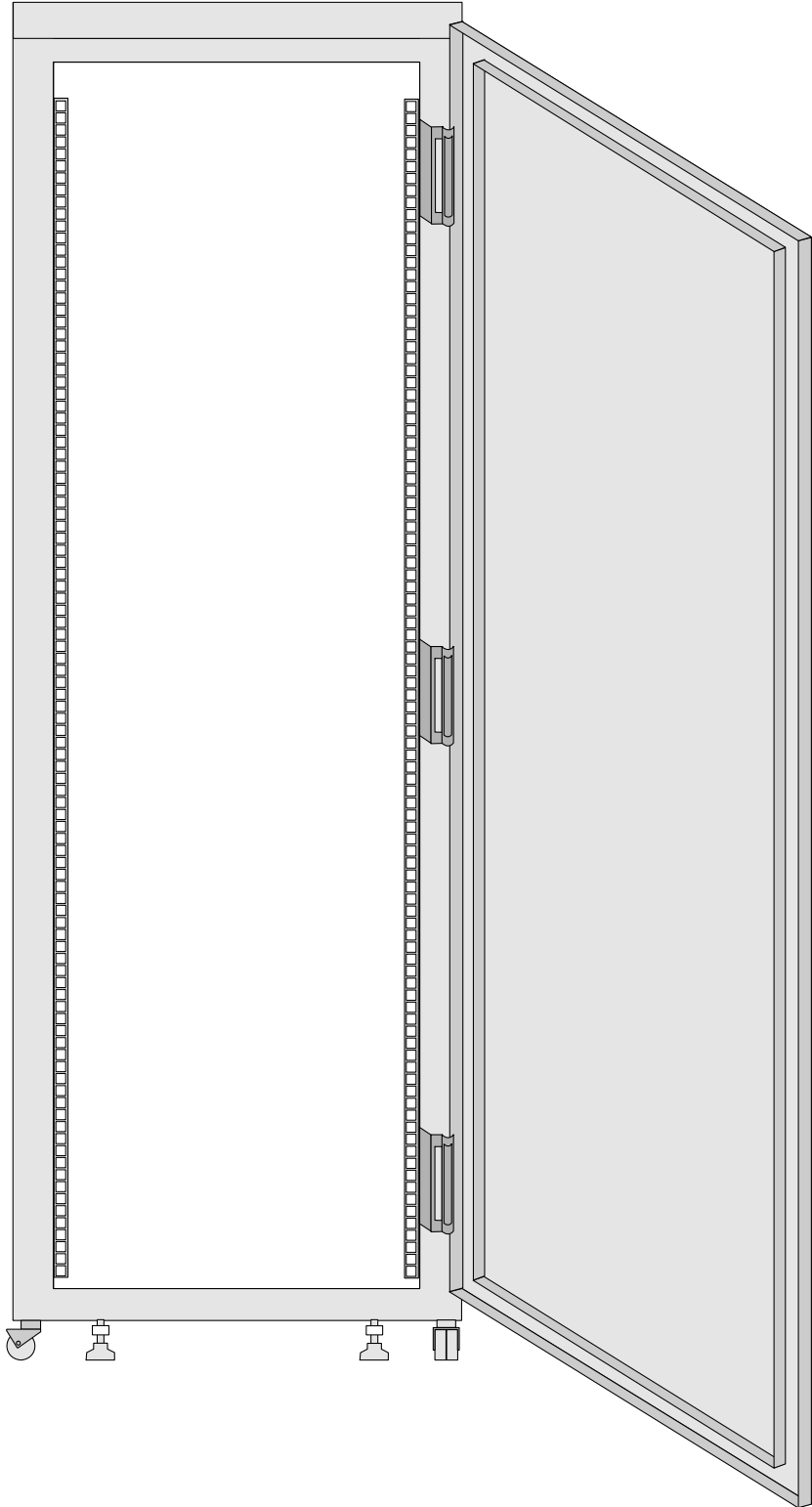


Figure 6-2 **Coral**
IPx 4000
Main Cabinet Structure

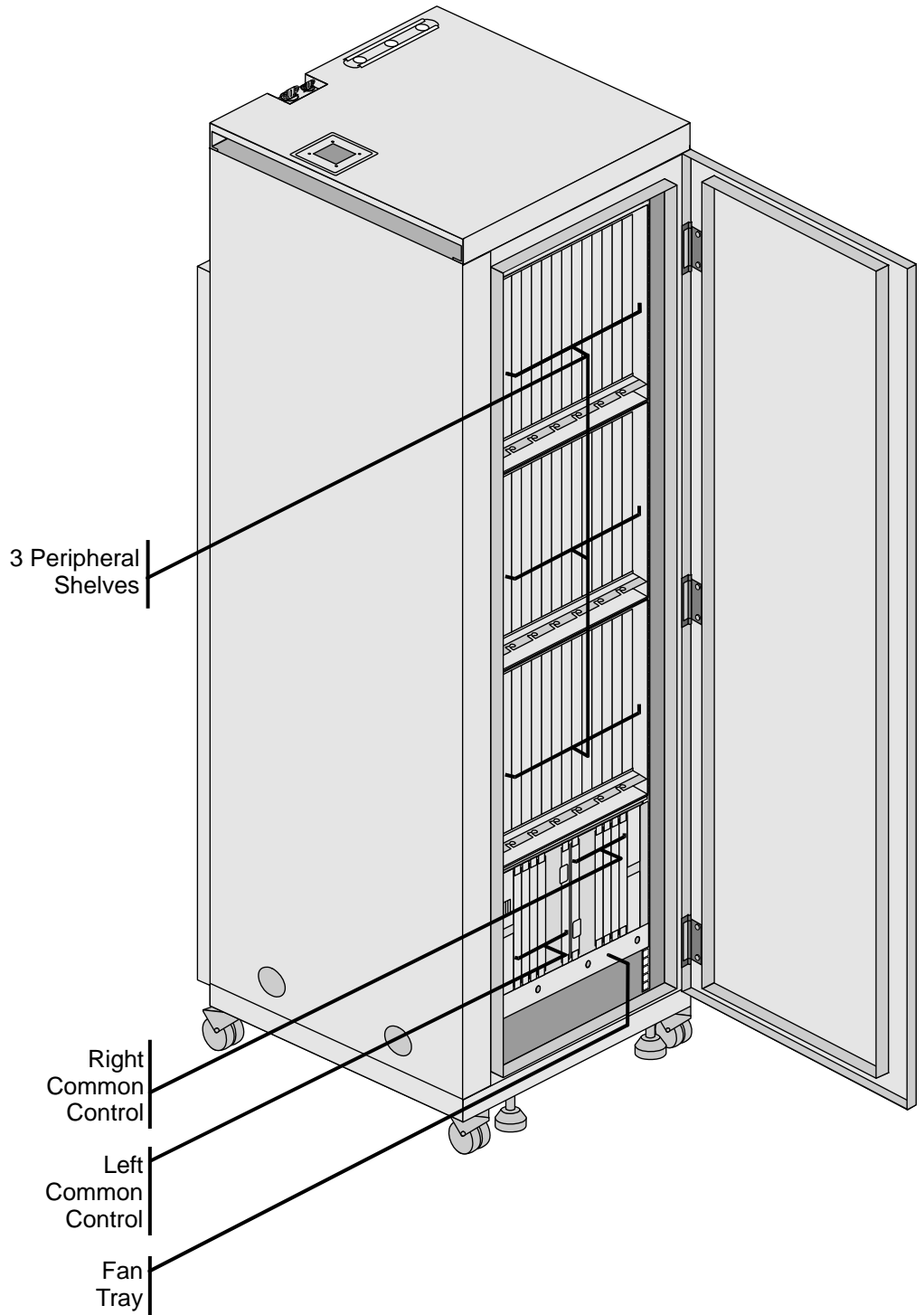
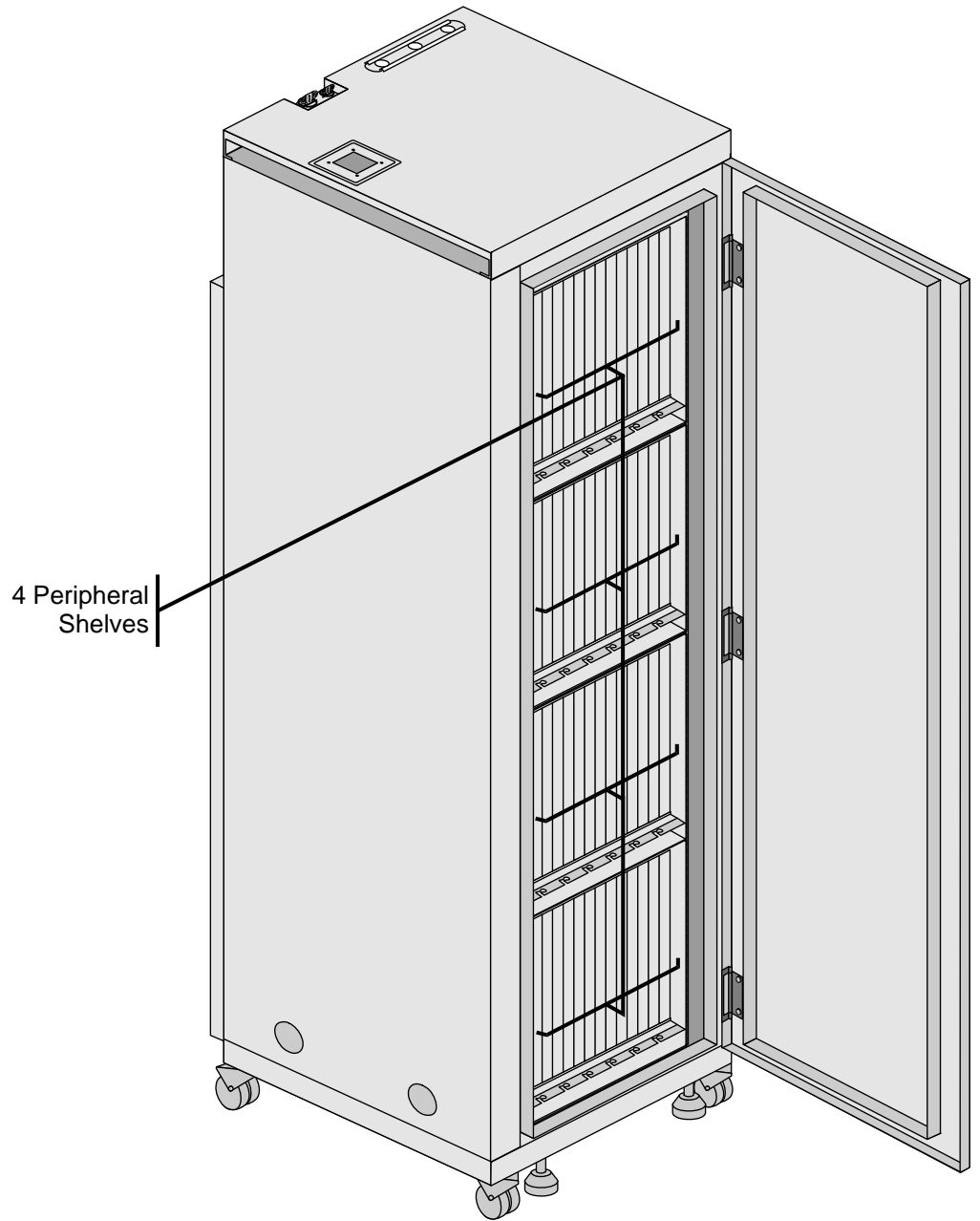


Figure 6-3 Coral
IPx 4000 Expansion
Cabinet Structure



Cabinet Components

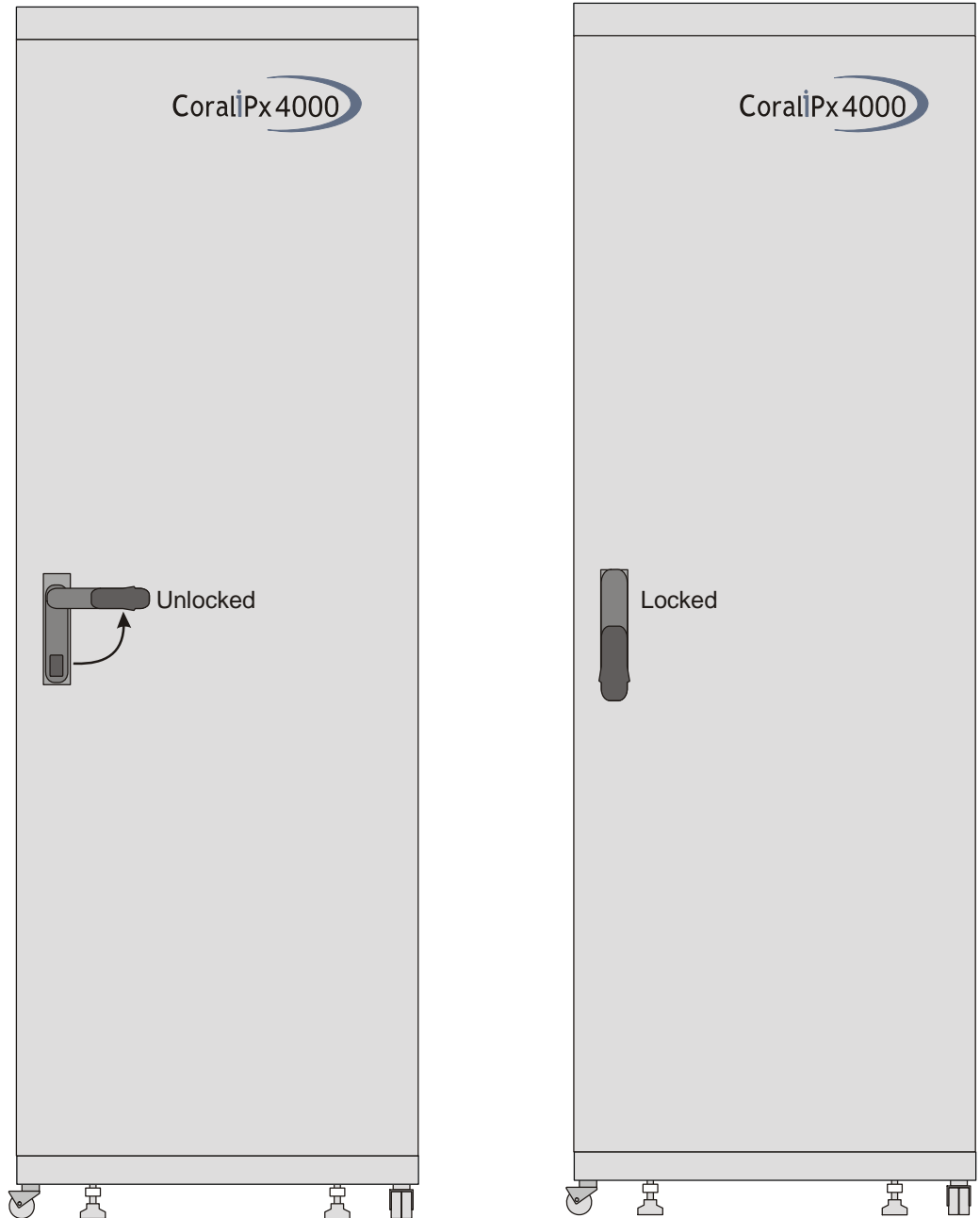
Card Cages/Shelves

The Coral IPx 4000 slot cabinet contain up to 4 card cages, also referred to as shelves. These cabinets are designed to provide a simple, reliable method for installing and removing the printed circuit cards and assemblies, which contain the active circuitry of the system.

Cabinet Doors

Locking doors on the front and back of the cabinet provide physical protection to internal equipment while still allowing access to the interior. There are door latches on the front and rear cabinet doors. The latch is moved from the locked to the unlocked position pulling and turning the appropriate direction until the latch is opened or closed.

Figure 6-4 Coral
IPx 4000 Cabinet Door
Latch Operation Detail



Card Slots

Each card cage consists primarily of a metallic frame assembly and a printed circuit board, referred to as a motherboard or backplane. Guides at the top and bottom of the card cage align the cards and assemblies, during their insertion, with multi-pin connectors mounted on the backplane. The guides and associated connectors comprise a card slot.

The connectors provide metallic paths from the cards to the various power and signal busses of the system and in the peripheral shelves, to the Input/Output (I/O) connectors.

Control Shelf

The Control Shelf is always located on the bottom shelf of the Main Cabinet and houses all the control cards as well as the system Power Supply Units (PS-ATS) and their fuses. A fan tray with three fans, is located at the bottom of the shelf. Fuses for each fan are easily accessible from the front panel of the shelf.

The Control Shelf may house either one or two specific sets of Control Cards, side by side. One set of Control Cards, always on the right side, indicates a stand-alone system as illustrated in [Figure 6-8](#).

Two sets of Control Cards indicate a IPx 4000/R Hot Standby - Redundant system where one set is usually designated as the ACTIVE (the right side), while the other set is usually designated as the STANDBY side (the left side) as illustrated in [Figure 6-9](#). The Coral system automatically switches the sides between *Active* and *Standby* as needed.

Each Control Card has its own designated slot where no other card may be physically inserted. Special coded keys are placed on the top and bottom slot guides to prevent the insertion of the wrong card in the wrong slot. The coded keys may be viewed in the illustration shown in [Figure 6-7](#). See [Control Shelf Slots on page 6-10](#) for further details on the Control Shelf Slots.

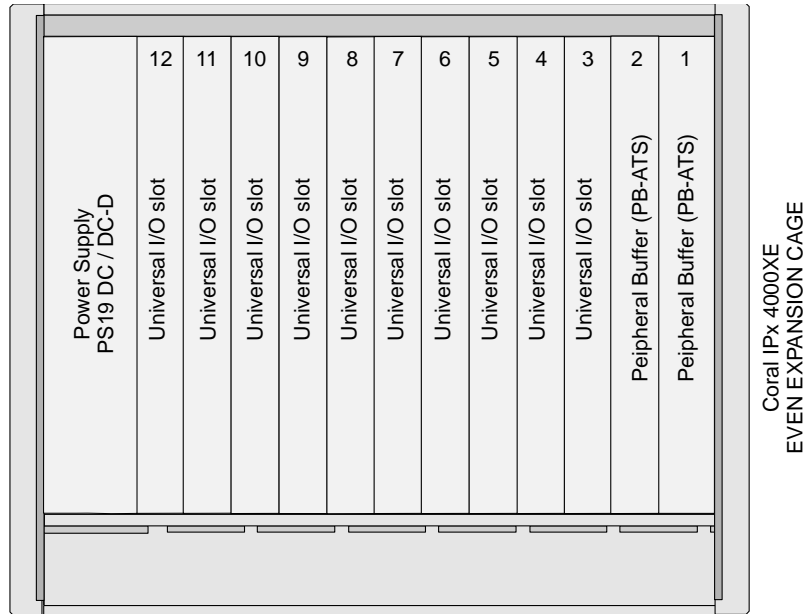
Peripheral Shelves/Cages

The Peripheral Shelves (or card cages) house the peripheral and power supplies, shared service cards, peripheral interface cards and PB-ATS cards. The main cabinet may house a maximum of 3 peripheral shelves. Each expansion cabinet can house a maximum of 4 peripheral shelves. These peripheral cages can be field mounted. The Coral IPx 4000 system employs two different types of Peripheral Cages which are both convection cooled and include rack mounted brackets:

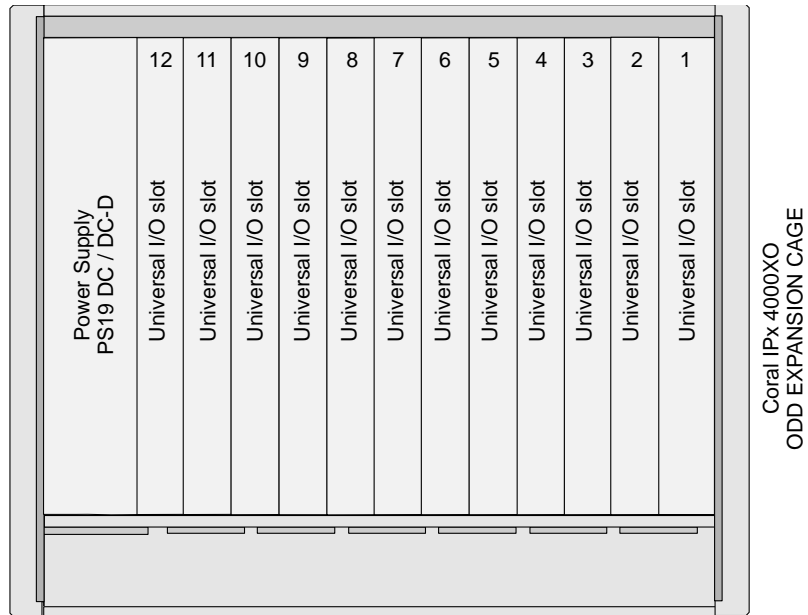
- IPx 4000XE — Even number peripheral shelf
- IPx 4000XO — Odd numbered peripheral shelf

The possible card slot assignments for each type of shelf are shown in [Figures 6-5](#) and [6-6](#).

**Figure 6-5 IPx 4000XE
Even Expansion Shelf
Card Assignments**



**Figure 6-6 IPx 4000XO
Odd Expansion Shelf
Card Assignments**



Shelf Positions

The shelf positions are denoted as the first, second, third or fourth cabinet shelves from the bottom up. Therefore, the bottommost shelf is the first shelf, which, in the main cabinet, is the Control Shelf, see [Figure 6-10](#).

Peripheral Shelf UNIT Definition

The Coral IPx 4000 system may be composed of up to eight peripheral Shelf UNITS (with regard to system time slots). Each Unit is always includes an Even numbered shelf (IPx 4000XE). It may also include one odd numbered, adjacent, shelf

(IPx 4000XO). The Even numbered shelves include at least one PB-ATS card which supplies 384 time slots to the UNIT (either one shelf or two shelves). See [Figures 6-12](#) and [6-13](#) for Peripheral Unit Card Slot Assignments.

2 Card Slot Assignments

Control Shelf Slots

The Control Shelf houses the control cards. Each slot labels the specific card that must be installed in that slot. The cards on the left side are installed upside down.

Each side consists of the following card slots labeled from the middle outward (see [Figures 6-8](#) and [6-9](#)):

- 32GC (with the SAU interface)
- CLA-ATS (Optional)
- Empty Slot
- MCP-ATS
- Empty Slot

The Common Control Cards on either side are each allocated their own individual slots. These cards can only be inserted in their designated slots. Each slot track is equipped with three *keys* each on the top and bottom slot tracks, which define the unique slot, see [Figure 6-7](#). These keys prevent the insertion of the wrong card in a control shelf slot.

Power Supply Unit Slots

Three slots are provided for Power Supply units (PS-ATS), indicated in [Figures 6-8](#) and [6-9](#) as PS1, PS2 and PS3. Two PS-ATS units are installed. While each of the two PS-ATS units is independently capable of supplying the full power needs of the Control Shelf, the two PS-ATS units share the supply of +5 volts power exclusively to that shelf.

The third power supply slot is in place for future configurations.

Power Supply fuses are located in the upper left corner. An extra fuse is supplied on the side of the Control Shelf. The Fan tray and three fan fuses are located at the bottom of the Control Shelf. See [Chapter 7](#) for further details about the Power Supply Units. See [Chapter 8](#) for details about the Common Control Shelf cards.

Figure 6-7 **Control Shelf with Coded "Keys" Placement**

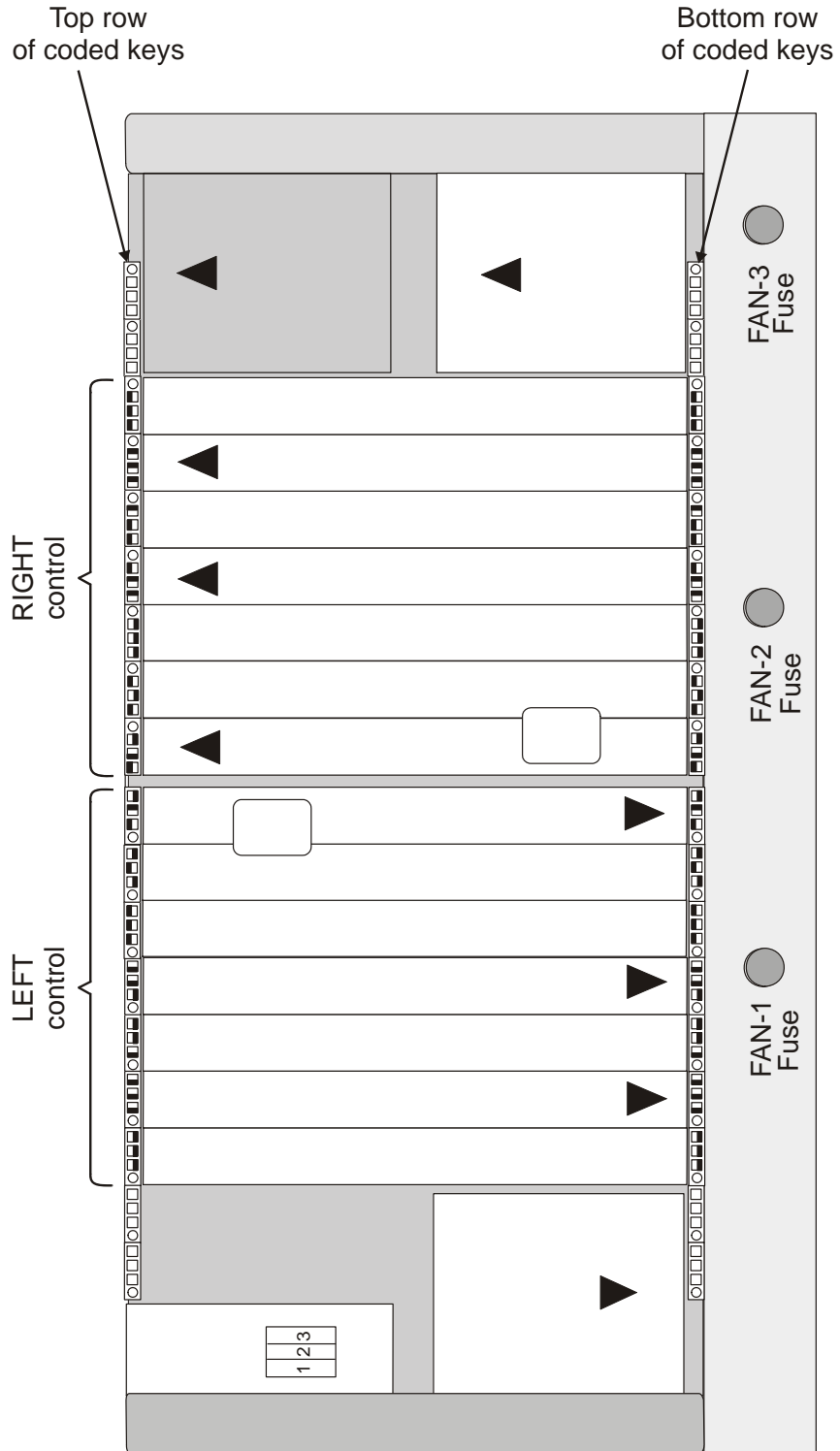


Figure 6-8 **Single Control Shelf - Front View**

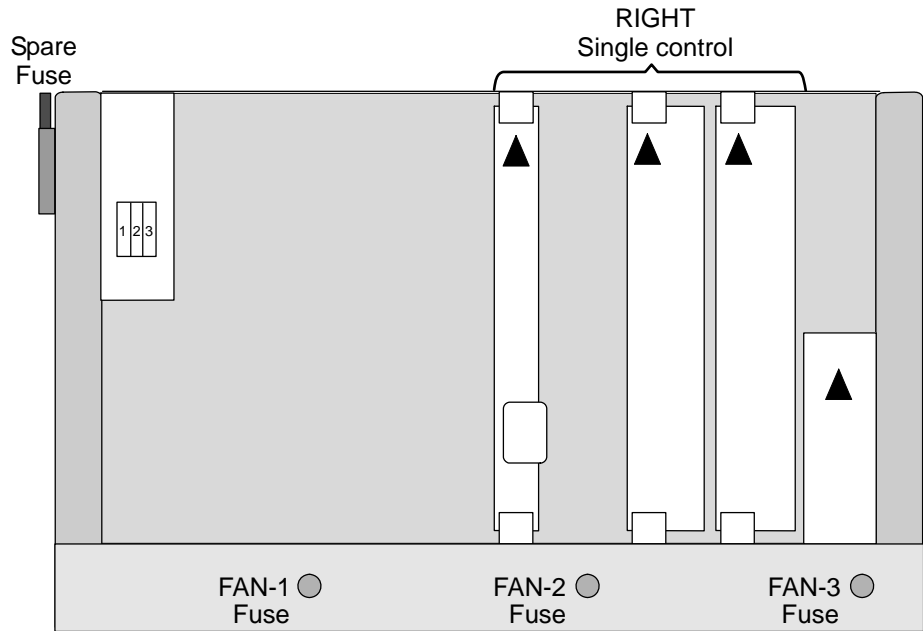
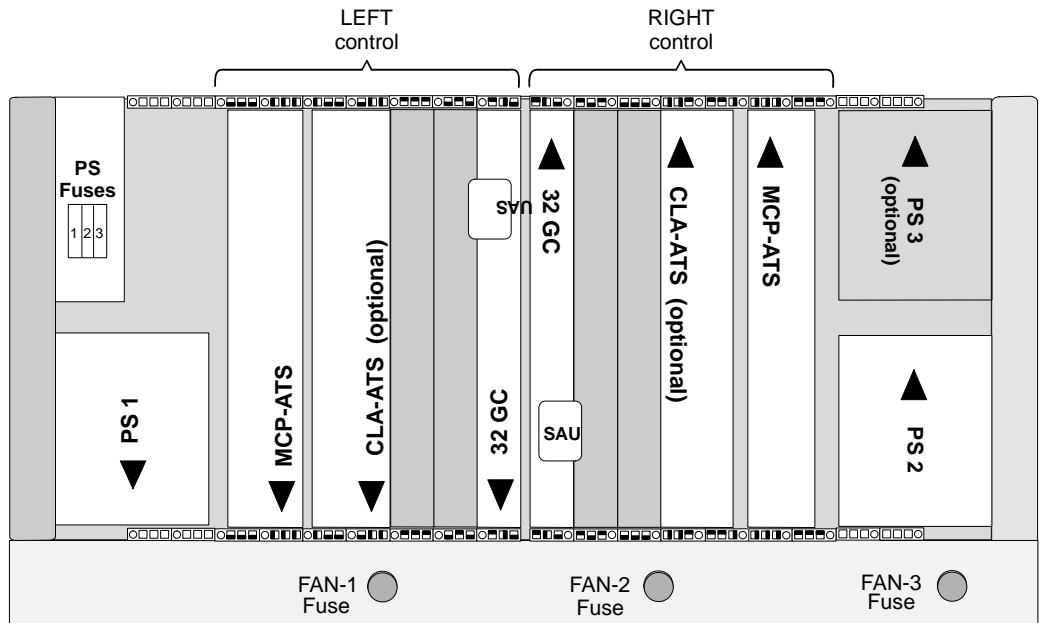


Figure 6-9 **Redundant (Dual) Control Shelf - Front View**



Peripheral Shelf Slots

The peripheral shelf contains 12 card slots, designated 1-12. [Table 6-1](#), below, identifies the card types that may be inserted into card slots 1-12 on **Even** Peripheral Shelves (IPx 4000XE). Note that Slot1 1-2 are reserved for the PB-ATS.

The odd ([Table 6-2](#)) peripheral shelves (IPx 4000XO) accept any shared service or peripheral interface card in any of the 12 slots.



Slots 1 and 2 are reserved for the PB-ATS cards on **EVEN** peripheral shelves in the IPx 4000XE. The backs of the two PB-ATS cards are shaped to match the inserting track of its appropriate slot to prevent inserting it into the wrong slot.

**Table 6-1 EVEN
Peripheral Shelf
(IPx 4000XE) Card Slot
Assignments**

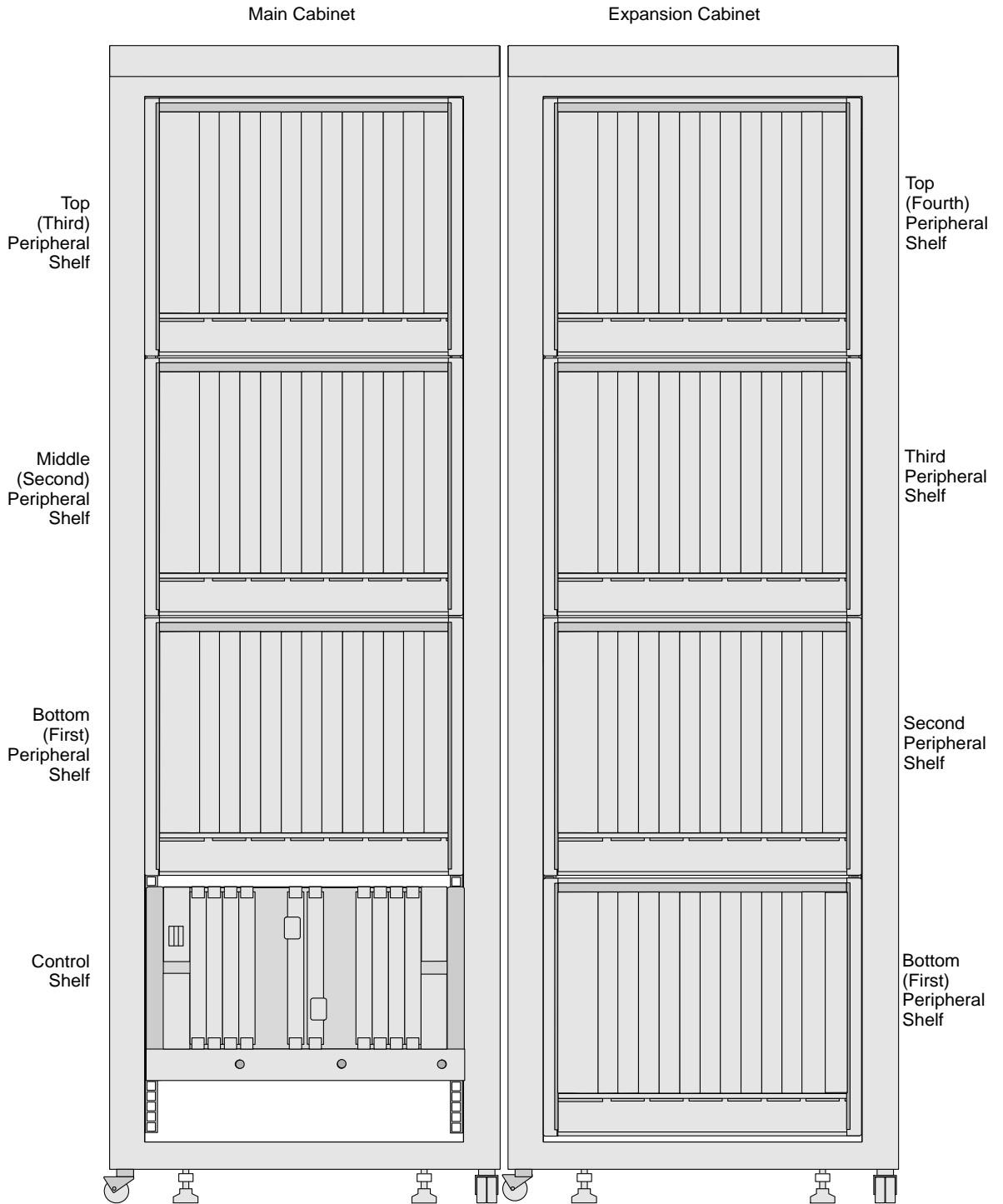
Card Slot	May Contain Card Type
1 - 2	PB-ATS only
3 - 12	Any Shared Service card or any Peripheral Interface card

**Table 6-2 ODD
Peripheral Shelf
(IPx 4000XO) Card Slot
Assignments**

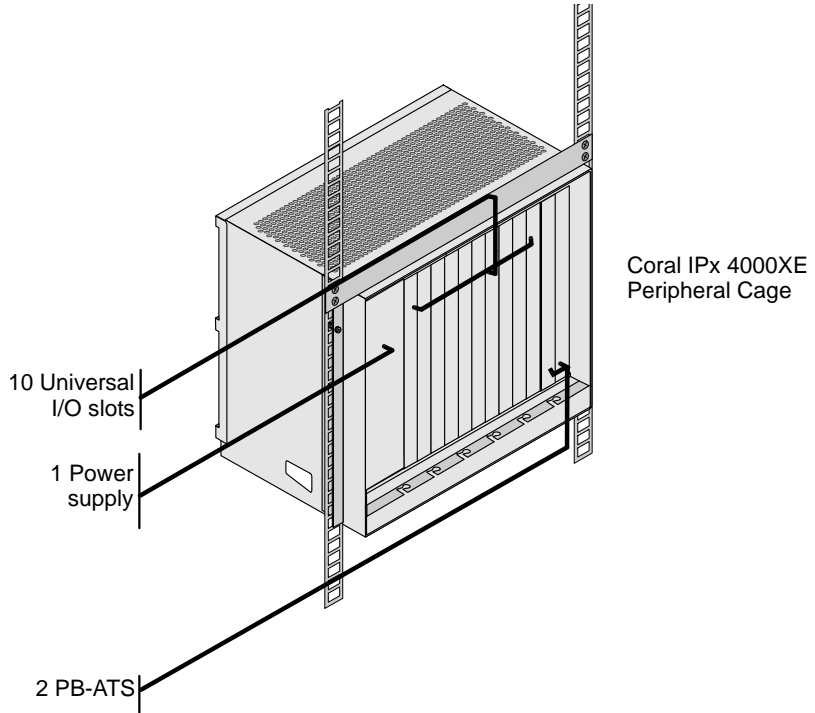
Card Slot	May Contain Card Type
1 - 2	Any Shared Service card or any Peripheral Interface card
3 - 12	Any Shared Service card or any Peripheral Interface card

The PBD-ATS backplane card, located behind the PB-ATS, provides two sets of connectors for the redundant cabling coming from the Control Shelf backplane. For more information about the PBD-ATS, see [PBD-ATS beginning on page 8-115](#).

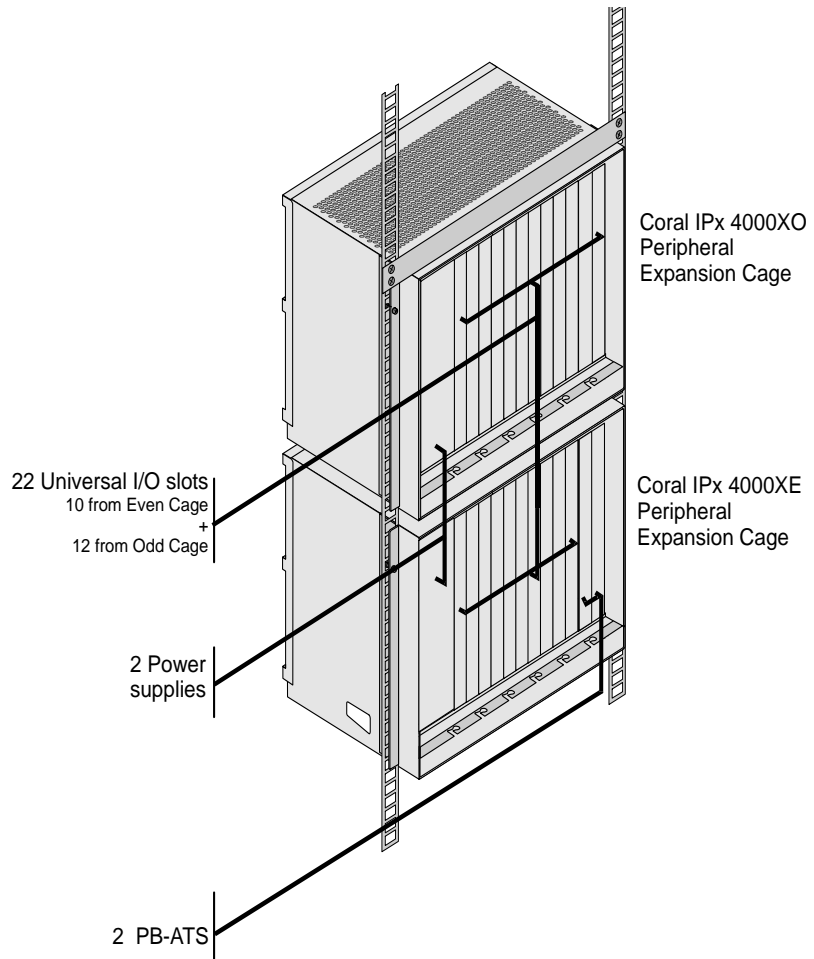
Figure 6-10 Main and Expansion Cabinet /Cage Locations



**Figure 6-11 IPx 4000
Peripheral Unit with one
Cage - Card Slot
Assignments**



**Figure 6-12 IPx 4000
Peripheral Unit with two
Cages - Card Slot
Assignments**



3 Input/Output Champ Connections

I/O connections to the system are established via pair connectors on the rear of the motherboard on each peripheral shelf via:

- 10 female, 25 pair AMP Champ™ or Amphenol Microribbon type connectors located at the rear of the IPx 4000XE cage.
- 12 female, 25 pair AMP Champ™ or Amphenol Microribbon type connectors located at the rear of the IPx 4000XO cage.

Figures 6-13 and *6-14* illustrate the Coral IPx 4000 slot cabinets as viewed from the rear. I/O connections are only provided for Universal I/O slots (slots 3 to 12 for IPx4000XE and 1 to 12 for IPx 4000XO). Mating male plugs should be industry standard, Amphenol®, AMP™ or equivalent.

Upper and Lower Connectors

For each peripheral cage, half of the I/O connectors are mounted at the top of the rear backplane of the card cage and are referred to as the *upper* connectors. The other half of the connectors are mounted on the bottom of the cage's rear backplane and are referred to as the *lower* connectors.

Odd and Even Slots

Each Universal I/O slot is referred to as an odd or even slot corresponding to the location of its wire pairs in the associated upper and lower I/O connectors. Card slot to cable pair relationships are identified in *Table 6-3*.

Card Slot to I/O Connector Relationship

The I/O connections for each card slot are divided between two I/O connectors, one upper and one lower. There are a total of twenty four wire pairs for each card slot. Each card in an slot is allotted 16 wire pairs on its corresponding *upper* I/O connector and 8 wire paris on its corresponding *lower* I/O connector.

Each card in an slot is allotted eight wire pairs on its corresponding *upper* I/O connector and 16 wire pairs on its corresponding *lower* I/O connector.

Thus, each I/O connector provides half of the I/O connections for two card slots. Pair 25 on each I/O connector is not used. See *Figure 6-15* for the *Connector Pair Allocation*. *Tables 6-4* and *6-5* identifies the card slot to I/O connector relationships.

Figure 6-16 illustrates the layout of the I/O connection for any pair of odd and even Universal I/O slots as they appear on industry standard 66 type punch blocks. Refer to the specific card tables in **Chapter 5-External Connections** in the *Coral IPx 3000 Installation Manual* for I/O connector pin assignments. There are no I/O connector pin assignments for the power supplies, Common Control cards or Shared Service cards.

Figure 6-13 Coral IPx 4000XE (Even Shelf)-Backplane Slot Diagram - Rear View

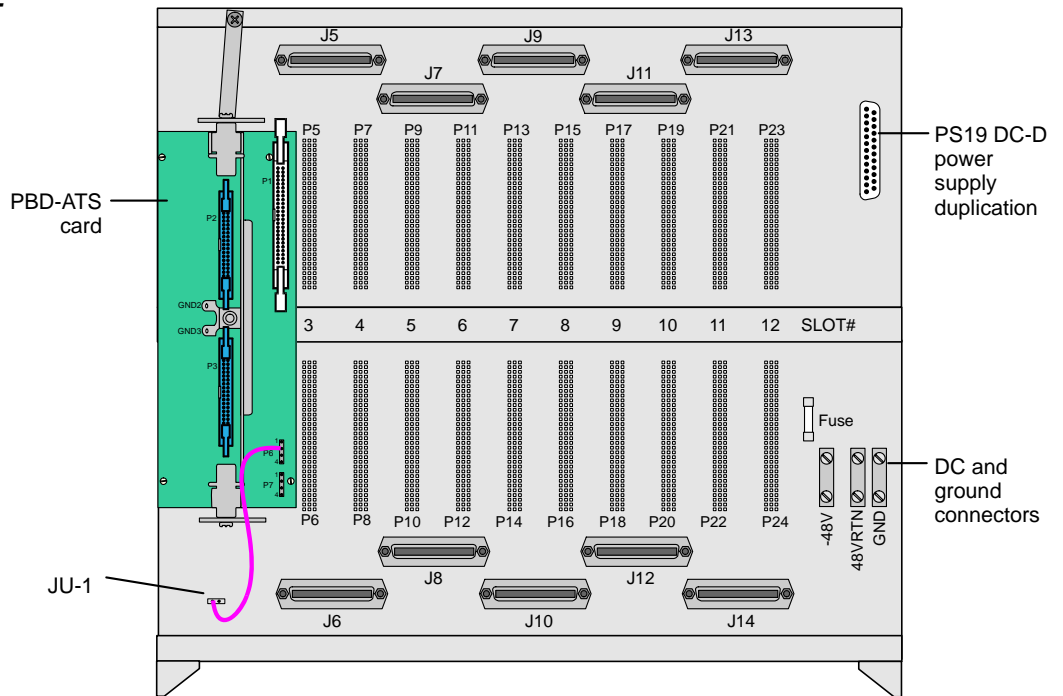


Figure 6-14 Coral IPx 4000XO (Odd Shelf)-Backplane Slot Diagram - Rear View

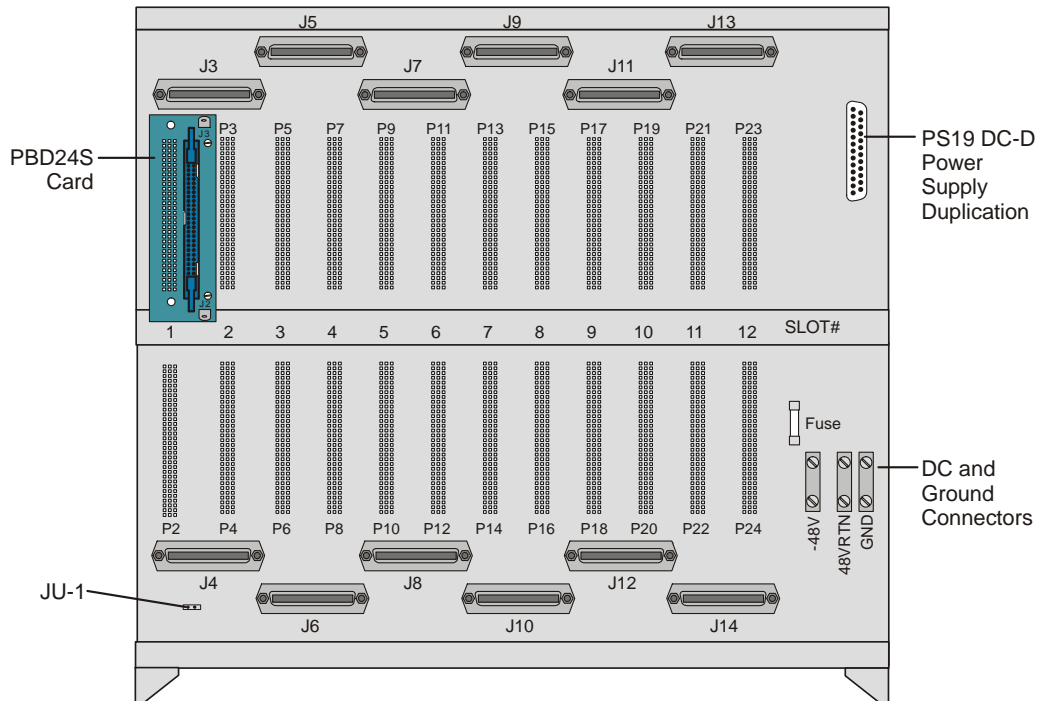


Table 6-3 Card Slot to I/O Pair Relationship

Cable Pairs	Card Slots	Slot
1-8 upper 1-8 lower 9-16 upper	3,5,7,9,11	
9-16 lower 17-24 upper 17-24 lower	4,6,8,10,12	
25	Not Used	—

Table 6-4 Card Slot to I/O Champ Connector Relationships for an Even Expansion Shelf (IPx 4000XE)

Associated Card Slots	Upper Connector	Lower Connector
3, 4	J5	J6
5, 6	J7	J8
7, 8	J9	J10
9, 10	J11	J12
11, 12	J13	J14

Table 6-5 Card Slot to I/O Champ Connector Relationships for an Odd Expansion Shelf (IPx 4000XO)

Associated Card Slots	Upper Connector	Lower Connector
1, 2	J3	J4
3, 4	J5	J6
5, 6	J7	J8
7, 8	J9	J10
9, 10	J11	J12
11, 12	J13	J14

Figure 6-15 Connector Pair Allocation

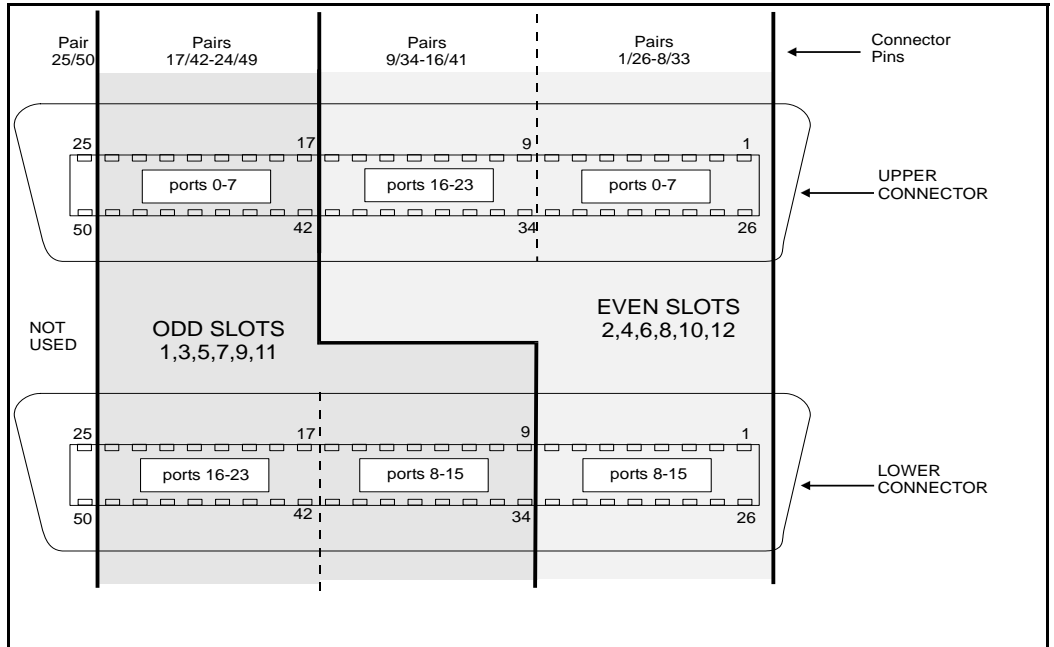
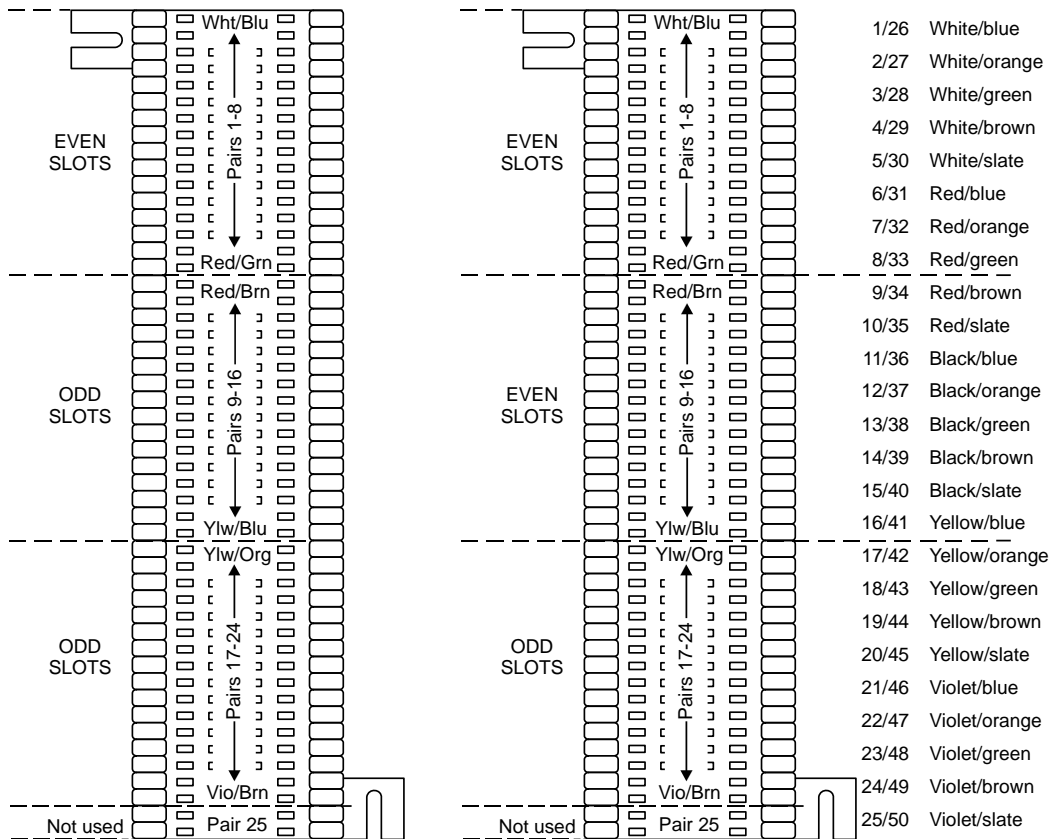


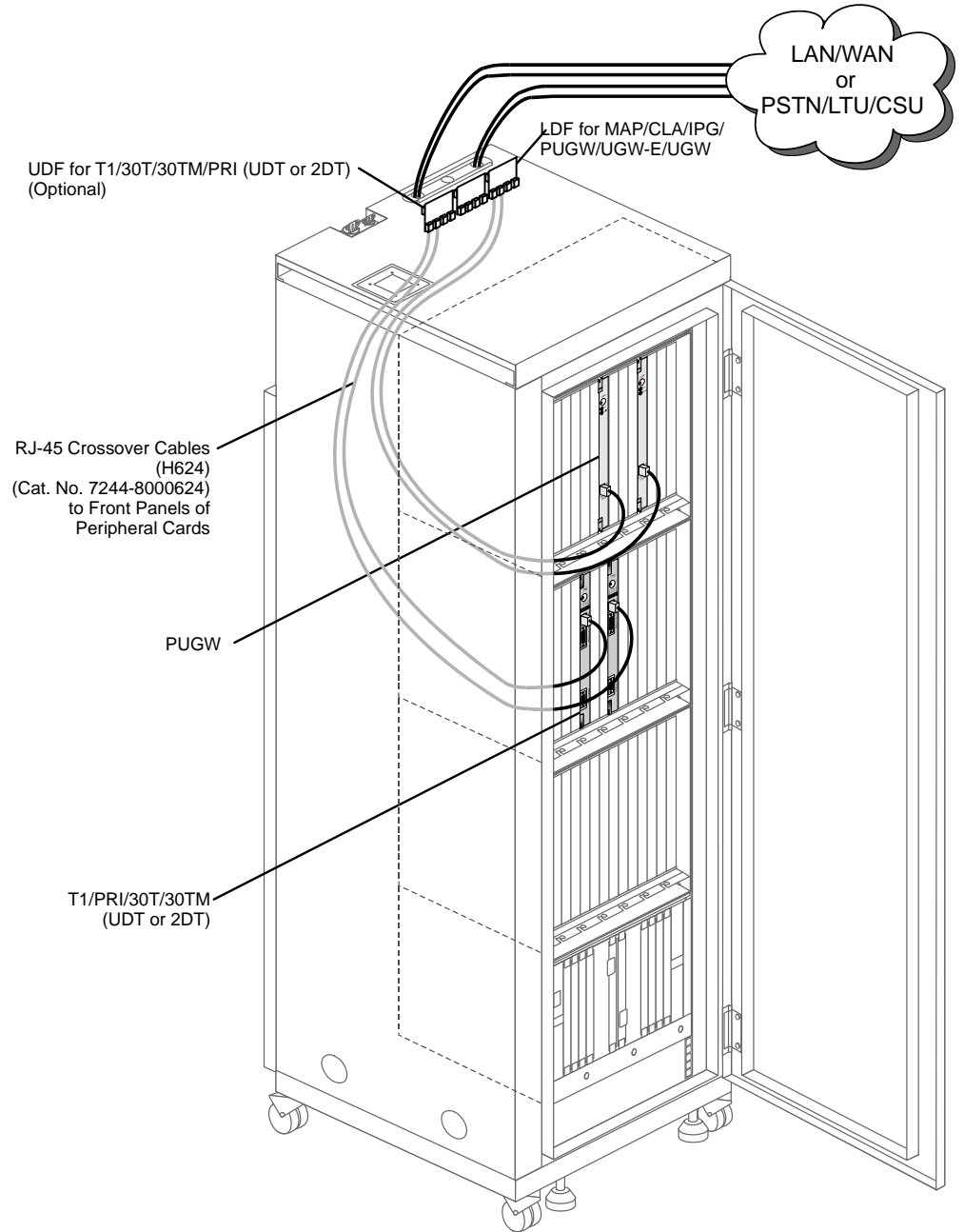
Figure 6-16 Connection Layout for 66 Type Punch Blocks



4 Input/Output RJ-45 Connections

I/O connections to PUGW, UGW-E, UGW, IPG, or 30T/30TM/T1/PRI-23/PRI-30 (layout UDT or 2DT) peripheral cards are established via RJ-45 connectors mounted on LDF or UDF panels. Four connectors per each LDF or UDF. The connection is made from an RJ-45 connector on the front panel of a peripheral card via a crossover cable that is routed to the LDF or UDF panel on the rear side of the Coral IPx 4000 cabinet. See [Figure 6-17](#).

Figure 6-17 Coral IPx 4000 RJ-45 I/O Connections from Front Panel to Rear Panel

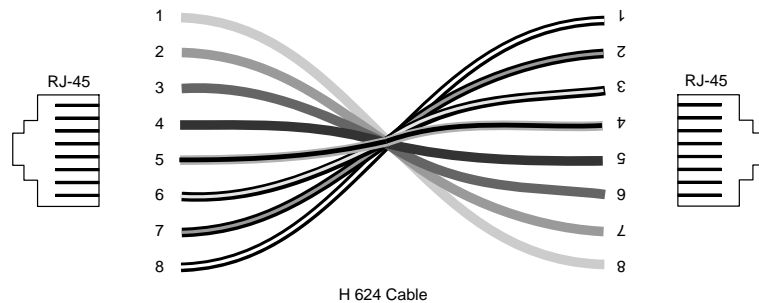


The connections between the RJ-45 jack on the front panel of the PUGW, UGW-E, UGW, IPG, or 30T/30TM/T1/PRI-23/PRI-30 (layout UDT or 2DT) peripheral cards and the RJ-45 jacks on the LDF and UDF panels at the rear side of the cabinet are to be made by a H624 crossover cable. The crossover cable ensures that the pinout order from the peripheral cards remain constant from the front panel to the LAN/WAN/PSTN/CSU/LTU connection, see [Figure 6-18](#).

CAUTION!

It is imperative that a crossover cable (Catalog Number 7244-8000624) be used to make this connection. If an ordinary cable is used the cards will not be integrated into the system.

Figure 6-18 H624
Crossover Cable



The I/O connection is made via LDF or UDF as follows:

- LDF panel (Catalog Number 7244-9043100) is used for PUGW, UGW-E, PUGW, MAP, CLA and IPG cards.
- UDF panel (Catalog Number 7244-9044100) is used for 30T/30TM/T1/PRI-23/PRI-30 (layout UDT or 2DT) cards.



NOTE:

The LDF (LAN Data Filter) and the UDF (Universal Digital trunk Filter) incorporate improved RFI immunity. These filters enable the Coral and all relevant peripheral interface circuits to be fully protected against radio-frequency interference (RFI) and meet or exceed all requirements and specifications of telecommunications and electrical safety authorities world-wide.

The Coral IPx 4000 cabinet is supplied with:

- 1 (one) LDF panel (four RJ-45 connectors for UGW, UGW-E, PUGW and IPG cards)
- 4 (four) H624 crossover cables

Additional H624 cables and three LDF/UDF panels may be field installed as required.

For further information on:

- How to make the connection, see *Chapter 2* in this manual.
- Pinout connection, see *Chapter 5.6* of the *Coral IPx 3000 Installation Procedure and Hardware Reference Manual*.

5 Peripheral Highway Cabling

The Peripheral Bus of the Coral IPx 4000 system is extended from the MPG-ATS backplane card in back of the Common Control Shelf to the PBD-ATS card on the backplane of the *even* numbered Peripheral Shelves (see [Odd or Even Shelves on page 6-29](#)) via one or two redundant multi-conductor FC19 cables. The redundant cables serve the Hot Standby dual control system. Each cable provides the connection for one of the control card sets.

The MPG-ATS card and PBD-ATS cards are daughter boards installed on each respective backplane to facilitate the interconnections. The MPG-ATS is located behind the 32GC card slots of the two control system sets positioned in the middle of the Common Control Shelf backplane. The PBD-ATS is installed on each even peripheral shelf behind the PB-ATS cards. The PBD24S is installed behind slot 1 of each odd peripheral shelf. The odd shelf is connected to the even shelf via a FC16 cable connection, this indirectly connects the odd shelf to Control Shelf.

Two redundant FC19 cables carry the system's high-level data link control (HDLC) highways, the pulse code modulation (PCM) streams and all the Clock and Sync signals from the control card to the PB-ATS cards for the Peripheral Shelf Unit.

The Clock signal is used to identify the bit period of the HDLC and PCM highways. The Sync signal is used to identify the beginning of time slot 0 on the PCM highways.

Time Slot Distribution among the Peripheral Units

The 32GC card supports eight HDLC highways and thirty-two PCM streams where each stream supports 128 time slots (64 for highway A and 64 for highway B), see [Figure 6-19](#). The number of streams allows the 32GC to support up to 8 Peripheral Shelf Units which can house a maximum of 16 peripheral shelves/cages. The time slots are supported via the PBD-ATS which feeds off the PB-ATS card (2 PB-ATS cards for the Hot Standby system are redundant — only one card broadcasts the 384 time slots).

Connectors for cabling to support both control card sets appear on the MPG-ATS, at connectors P1 to P16. MPG-ATS connectors **P1** to **P8** carry the signals from the first 32GC. MPG-ATS connectors **P9** to **P16** support the redundant cabling for the second 32GC card, when installed. Each Peripheral Shelf Unit (an even, or even and odd shelf) is allotted 384 time slots divided into groups of 128 time slots. [Figure 6-19](#) illustrates the PCM highway distribution for a Peripheral Shelf Unit consisting of two shelves. The same PCM highways support the odd and even peripheral shelf of the *same* Unit.

Example:

*PCM highway A3 supports cards 9 to 12 in both even and odd shelves. If only one shelf existed, the 384 time slots would be divided only among the even shelf thereby **enhancing** call traffic.*

6 Tips for Peripheral Card Distribution

When installing a new Coral IPx 4000 system, it is recommended that the time slot (PCM highway) distribution among the peripheral shelf slots be taken into account when planning the peripheral interface cards location.

Each Peripheral Shelf Unit (even and corresponding odd shelf, or only even shelf) is supplied with a total of 384 time slots between a maximum of 24 card slots. The time slots from the PB-ATS card, are evenly divided to 3 groups of 128 time slots and distributed between *slot sets* of each Peripheral Shelf Unit. The time slot (PCM) distribution per slot set can be seen in [Figure 6-19](#).

To ensure efficient use of time slots, it is recommended to distribute *heavy consumer* cards (cards with a large number of ports: 30T/x, T1, PRI-30, PRI-24, IPG, PUGW, UGW-E or UGW with MG-30 or MG-60 units) evenly among the slot sets, i.e. one heavy consumer card per card slot set. The least blocking sets are the slot sets that have the highest ratio of **Number of Time Slots** to **Number of Peripheral Card Slots** in [Table 6-6](#).

Table 6-6 Coral IPx 4000 - Time Slot Distribution

Set	Peripheral Shelf Unit	*Peripheral Shelf #	Card Slots	# of Peripheral Card Slots	Number of Time Slots
1	Unit 0	0 and 1	1 - 4	6 slots†	128
2	Unit 0	0 and 1	5-8	8 slots	128
3	Unit 0	0 and 1	9-12	8 slots	128
4	Unit 1	2 and 3	1 - 4	6 slots†	128
5	Unit 1	2 and 3	5-8	8 slots	128
6	Unit 1	2 and 3	9-12	8 slots	128
7	Unit 2	4 and 5	1 - 4	6 slots†	128
8	Unit 2	4 and 5	5-8	8 slots	128
9	Unit 2	4 and 5	9-12	8 slots	128
10	Unit 3	6 and 7	1 - 4	6 slots†	64 (see Note below)
11	Unit 3	6 and 7	5-8	8 slots	64 (see Note below)
12	Unit 3	6 and 7	9-12	8 slots	128
13	Unit 4	8 and 9	1 - 4	6 slots†	128
14	Unit 4	8 and 9	5-8	8 slots	128
15	Unit 4	8 and 9	9-12	8 slots	128
16	Unit 5	10 and 11	1 - 4	6 slots†	128
17	Unit 5	10 and 11	5-8	8 slots	128

Set	Peripheral Shelf Unit	*Peripheral Shelf #	Card Slots	# of Peripheral Card Slots	Number of Time Slots
18	Unit 5	10 and 11	9-12	8 slots	128
19	Unit 6	12 and 13	1 - 4	6 slots†	128
20	Unit 6	12 and 13	5-8	8 slots	128
21	Unit 6	12 and 13	9-12	8 slots	128
22	Unit 7	14 and 15	1 - 4	6 slots†	128
23	Unit 7	14 and 15	5-8	8 slots	128
24	Unit 7	14 and 15	9-12	8 slots	128

* The odd numbered shelf may not exist in some Peripheral Shelf Units.

† Slots 1 and 2 of the even shelf contain PB-ATS cards and do not use the Time Slots.

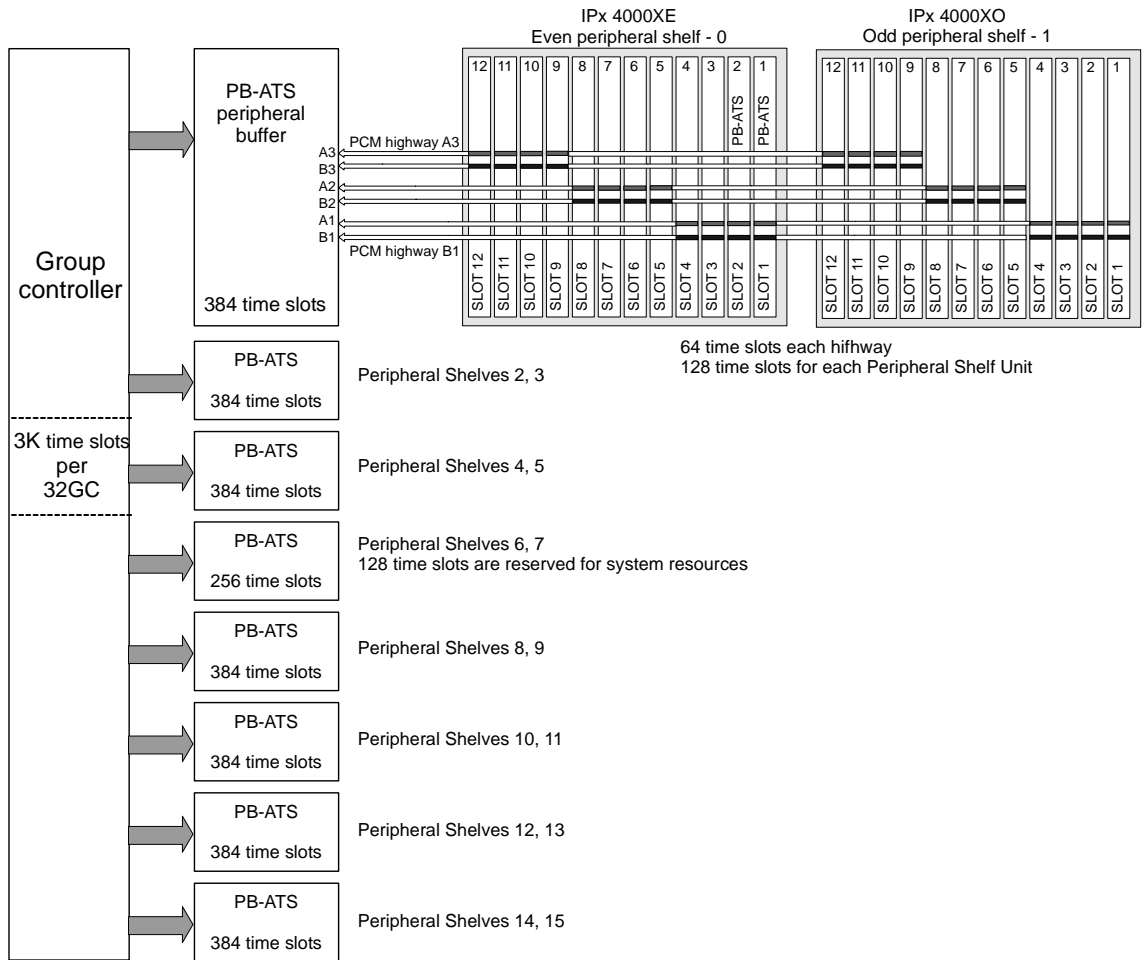
 **NOTE:**

For a completely non-blocking system, the technician should avoid installing the following cards in **slots 1-8 of peripheral shelves 6 and 7**:
 30T/x, T1, PRI24, PRI 30, IPG, PUGW, UGW-E and UGW.

 **Tip:**

If a number of **heavy consumer** cards are to be installed in Peripheral Shelf Units, determine which slot sets are least blocking by referring to [Table 6-6](#). Insert the first heavy consumer card in one of the slot sets, the next card in the next least blocking slot set, etc.
 When possible, avoid installing more than one heavy consumer card in a single slot set.

Figure 6-19 PCM Highway Distribution



7 Peripheral Shelf Numbering

All Coral peripheral shelves are identical in terms of function. They each support the same types of shared service and peripheral cards. Each peripheral card must be able to identify itself to the control shelf. Therefore, the shelf number must be determined. The peripheral shelves in the Coral IPx 4000 are divided into Peripheral Shelf Units where each Unit consists of one or two peripheral shelves that share at least one PB-ATS card. Each Unit always includes an even numbered shelf, the shelf that houses the PB-ATS card(s). The other shelf in the Unit, does not house any PB-ATS cards and is given an odd shelf number.

Odd or Even Shelves

Peripheral Shelves are defined as odd or even, based on whether a PB-ATS card is installed on the shelf. The Z5 and Z6 jumpers, are set to reflect this even or odd shelf definition (see [Figure 6-20](#), for the Z5 and Z6 jumper definitions). The Coral IPx 4000 system is configured and delivered as per customer request. Therefore, these jumpers are factory set and there is no need to change them.

[Figure 6-21](#) illustrates the Z5 and Z6 location on the *front backplane* located behind the PB-ATS in slot 1, for the IPx 4000XE even peripheral shelf.

Z5 and Z6 for the IPx 4000XO odd peripheral shelf are located on the *front backplane* behind the card installed in slot 1.

Figure 6-20 Peripheral Shelf ID-Jumper Settings

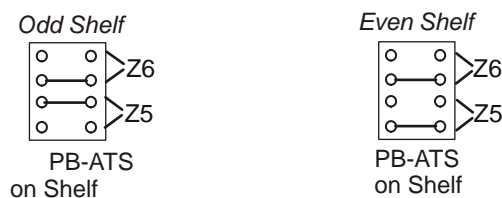
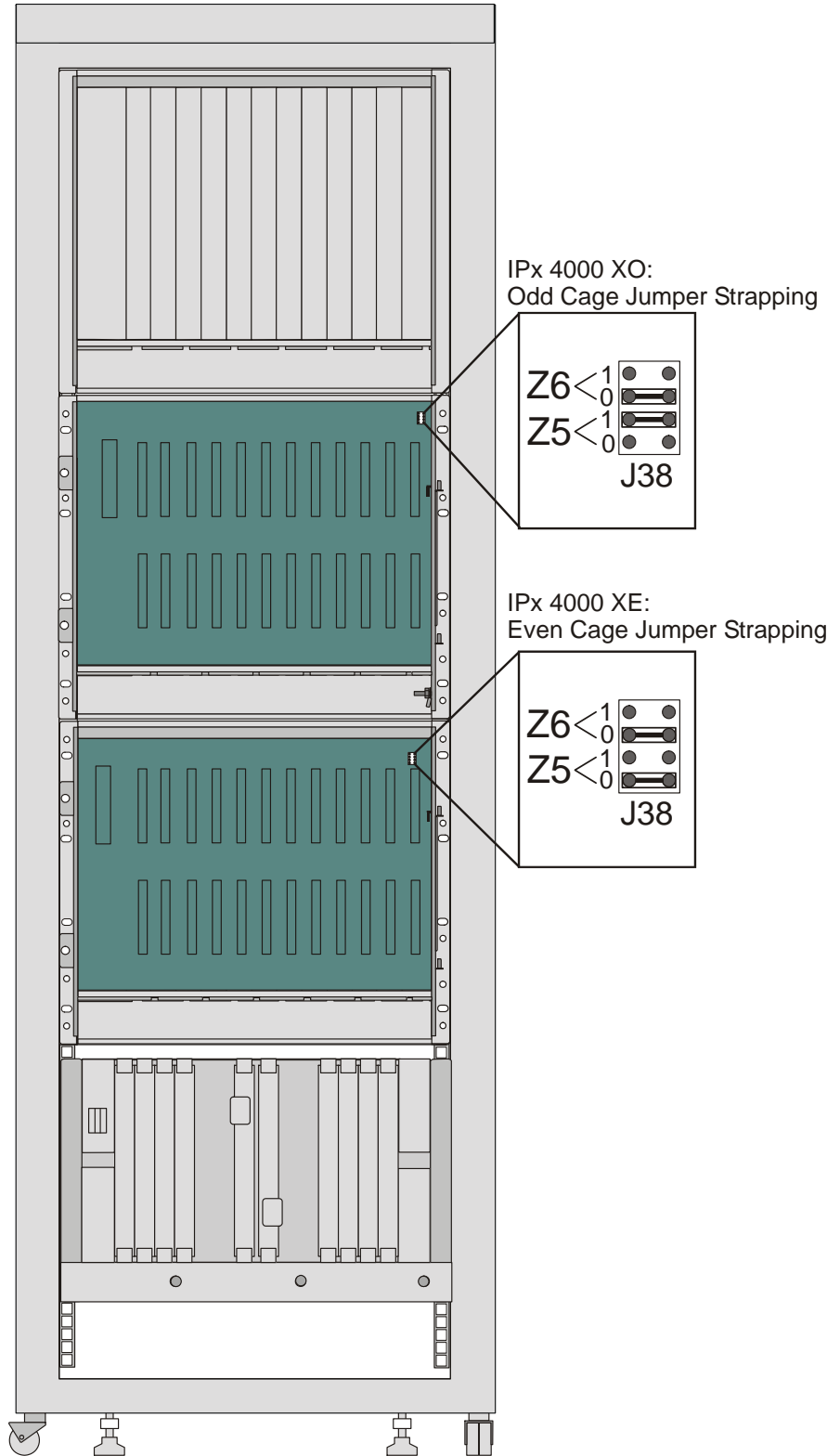


Figure 6-21 IPx 4000 -Motherboard (front Backplane) with Shelf ID Jumper Locations and Strapping



Shelf Numbering

The peripheral shelves also have a logical even or odd address, i.e. Shelf #0, Shelf #1 up to Shelf #15. These shelf numbers are used when updating Coral system information in the Program Interface, Coral View Designer (CVD) or Coral View Administrator (CVA).

Even Shelf Numbering

The even shelf number is defined based on its connection to the MPG-ATS card via the FC19 cable from P3 (and P2 for a redundant system) of the PBD-ATS. The peripheral shelf is defined as Shelf #0, 2, 4, 6, or 8 based on which P-connector the FC19 cable is fastened to on the MPG-ATS card, see [Figure 6-22](#) and [Table 6-7](#) to determine the shelf number.

For Example:

The shelf to which MPG-ATS: P1 (and P9 for redundant systems) connects, is numbered Shelf #0:

- P1 (MPG-ATS) connects to P3 on the PBD-ATS while P9 (MPG-ATS) connects to P2 on the same PBD-ATS.

**Figure 6-22 Even Shelf
Cabling: PBD-ATS to
MPG-ATS**

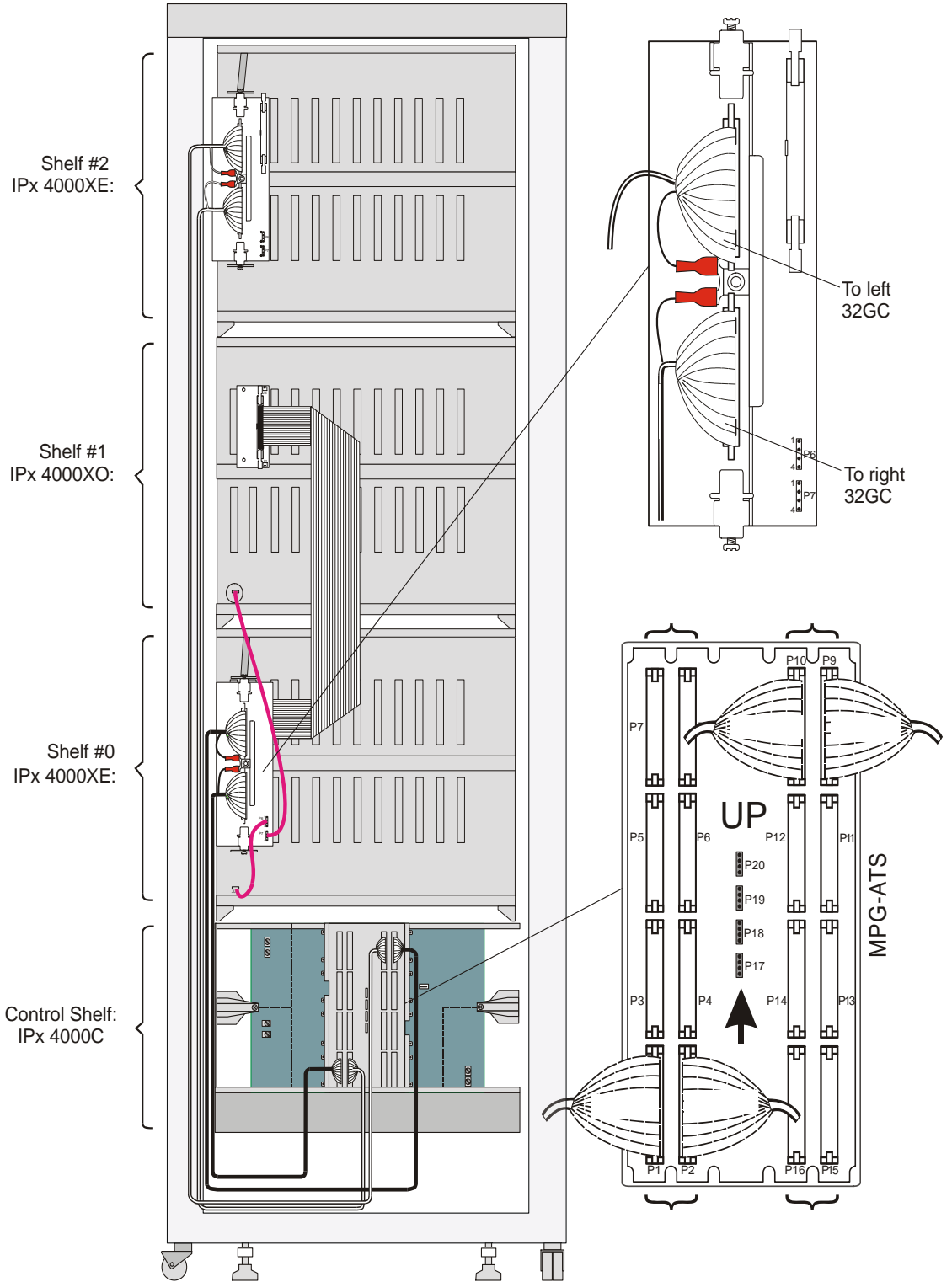


Table 6-7 **MPG-ATS - Cable Connections define Peripheral Shelf Unit & Even Peripheral Shelf #**

Peripheral Shelf UNIT	Even Peripheral Shelf Number	MPG-ATS Pn for FC19 Cable A Between P3 of PBD-ATS and right 32GC	MPG-ATS Pn for FC19 Cable B Between P2 of PBD-ATS and left 32GC
0	0	P1	P9
1	2	P2	P10
2	4	P3	P11
3	6	P4	P12
4	8	P5	P13
5	10	P6	P14
6	12	P7	P15
7	14	P8	P16

Figure 6-23 **Even Shelves 0 to 6: MPG-ATS to PBD-ATS Cabling Defining the Even Shelf Numbers**

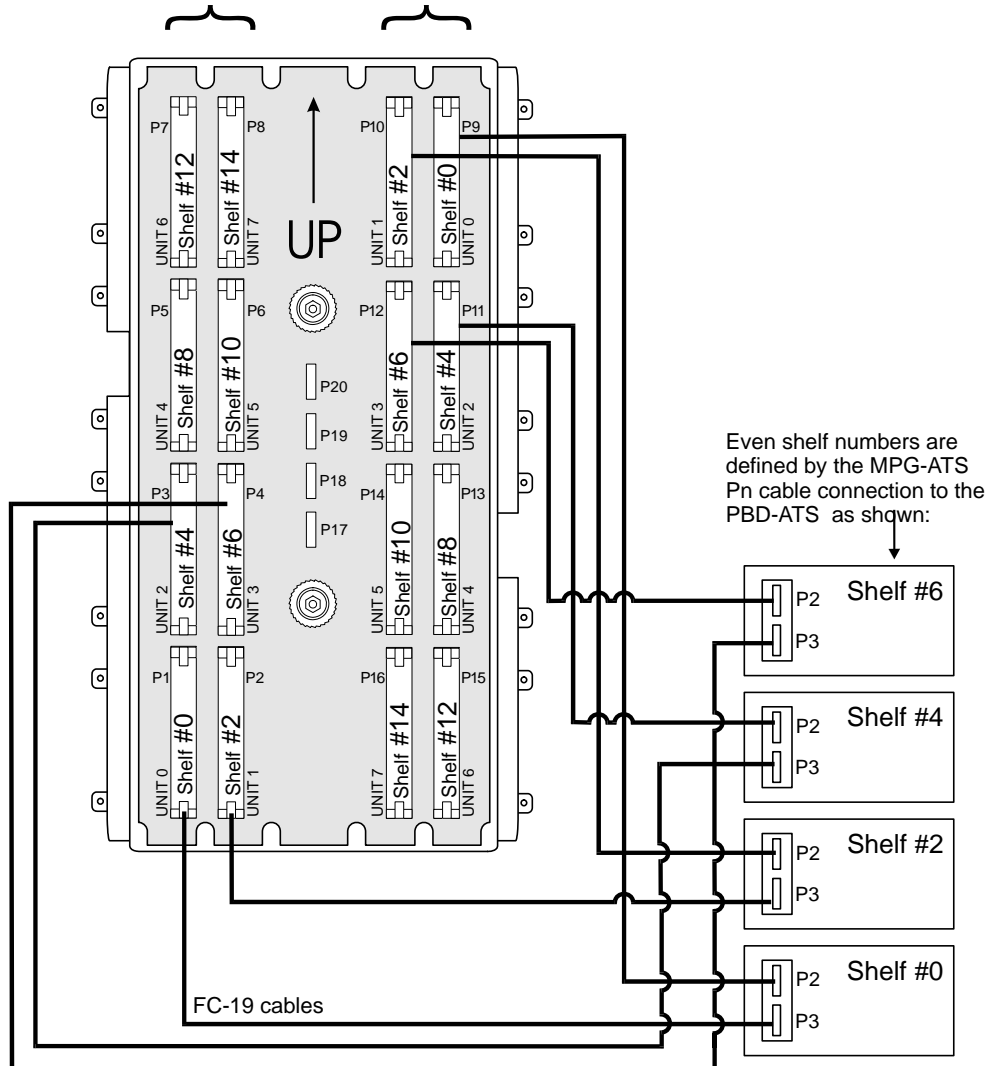
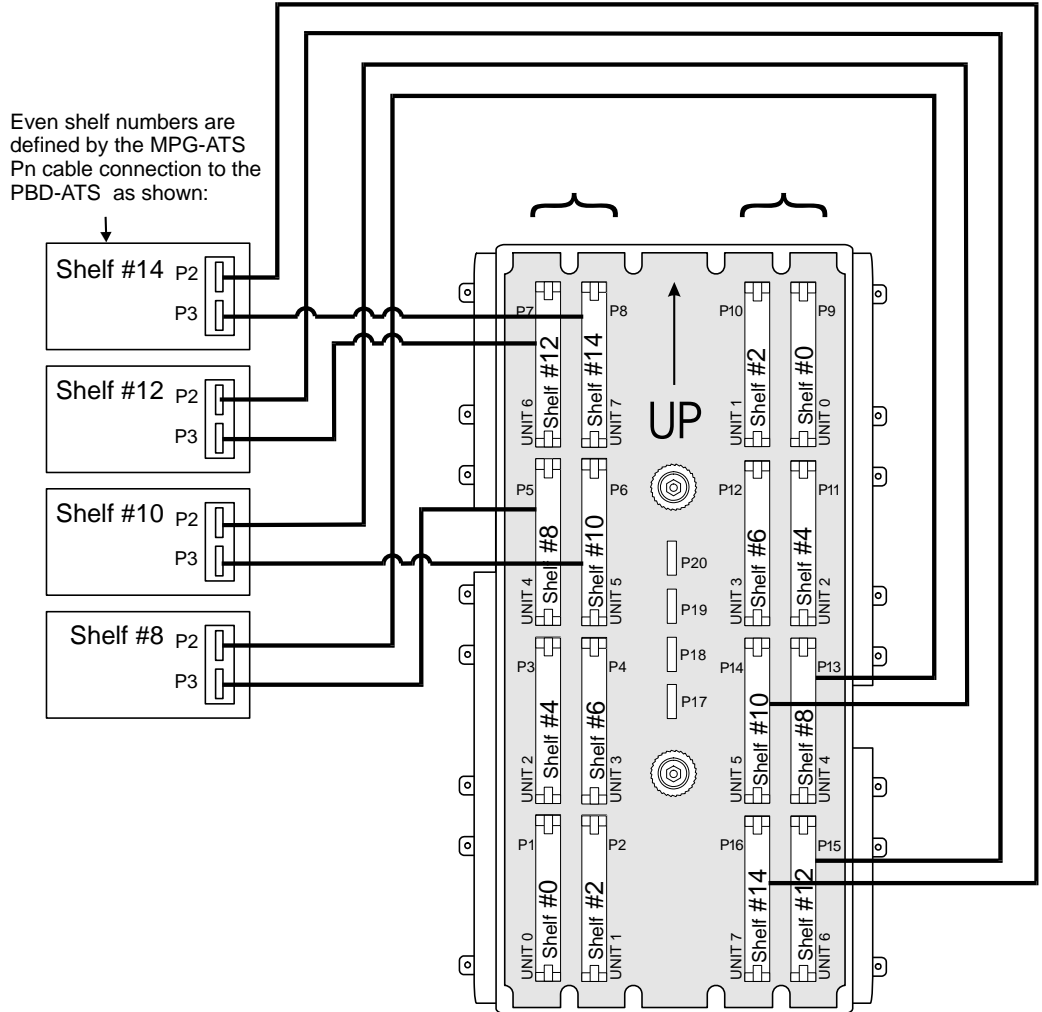


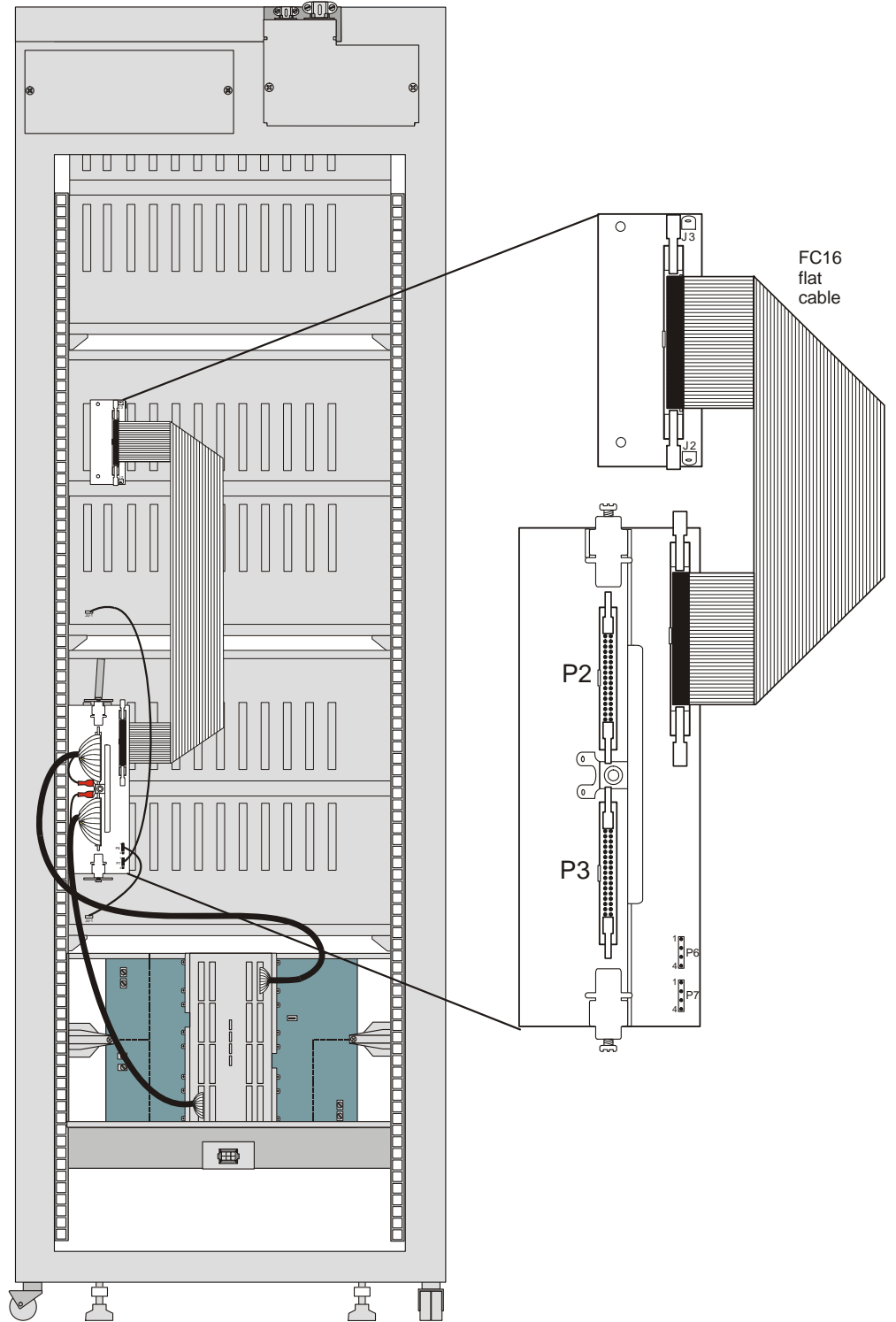
Figure 6-24 Even Shelves 8 to 14: MPG-ATS to PBD-ATS Cabling Defining the Even Shelf Numbers



Odd Shelf Numbering

The shelves with no PB-ATS cards installed on them, are defined as odd shelves and must be connected to an even shelf (above or below) via an FC16 cable, see [Figure 6-25](#). The FC16 cable is connected between the PBD24S (located on the backplane of the odd shelf) and P1 on the PBD-ATS of the related even shelf. Its shelf number is defined as the even shelf number +1. Therefore, the odd shelf connected to Shelf #0 is defined as Shelf #1, the odd shelf connected to Shelf #2 is defined as Shelf #3, etc.

Figure 6-25 PBD24S to PBD-ATS cabling



8 Digital Trunk Synchronization

The Coral system uses two digital trunk cards as primary and secondary synchronization sources. The system synchronization signals are carried through two H-43 cables. The Coral IPx 4000 system provides two additional synchronization connections, Third and External which are not used.

Primary Synchronization Source Connection

The primary synchronization signal cable is connected between the P20 connector on the MPG-ATS and the digital trunk card that has been chosen to be the Primary Synchronization source via an H-43 cable. Conventionally, this Primary Synchronization Source is a digital card located in Slot 4 labeled PRM SYNC of the peripheral shelf, however, any digital trunk slot card is acceptable. P20 is connected to PIN 9 of the digital trunk card's backplane J-connector (i.e., behind the slot) which is J7 for slot 4, see [Figure 6-26](#).

Secondary Synchronization Source Connection

The secondary synchronization signal cable is connected between the P19 connector on the MPG-ATS and the digital trunk card that has been chosen to be the Secondary Synchronization source via an H-43 cable. Conventionally, this Secondary Synchronization Source is a digital card located in Slot 4 labeled SEC SYNC of the peripheral shelf, however, any digital trunk slot card is acceptable. P19 is connected to PIN 9 of the digital trunk card's backplane J-connector (i.e. behind the slot) which is J7 for slot 4, see [Figure 6-26](#).

Refer to ***Coral Synchronization***, in the *Coral Service & Peripheral Cards Installation Manual* for further details.

Third and External Synchronization Source Connection

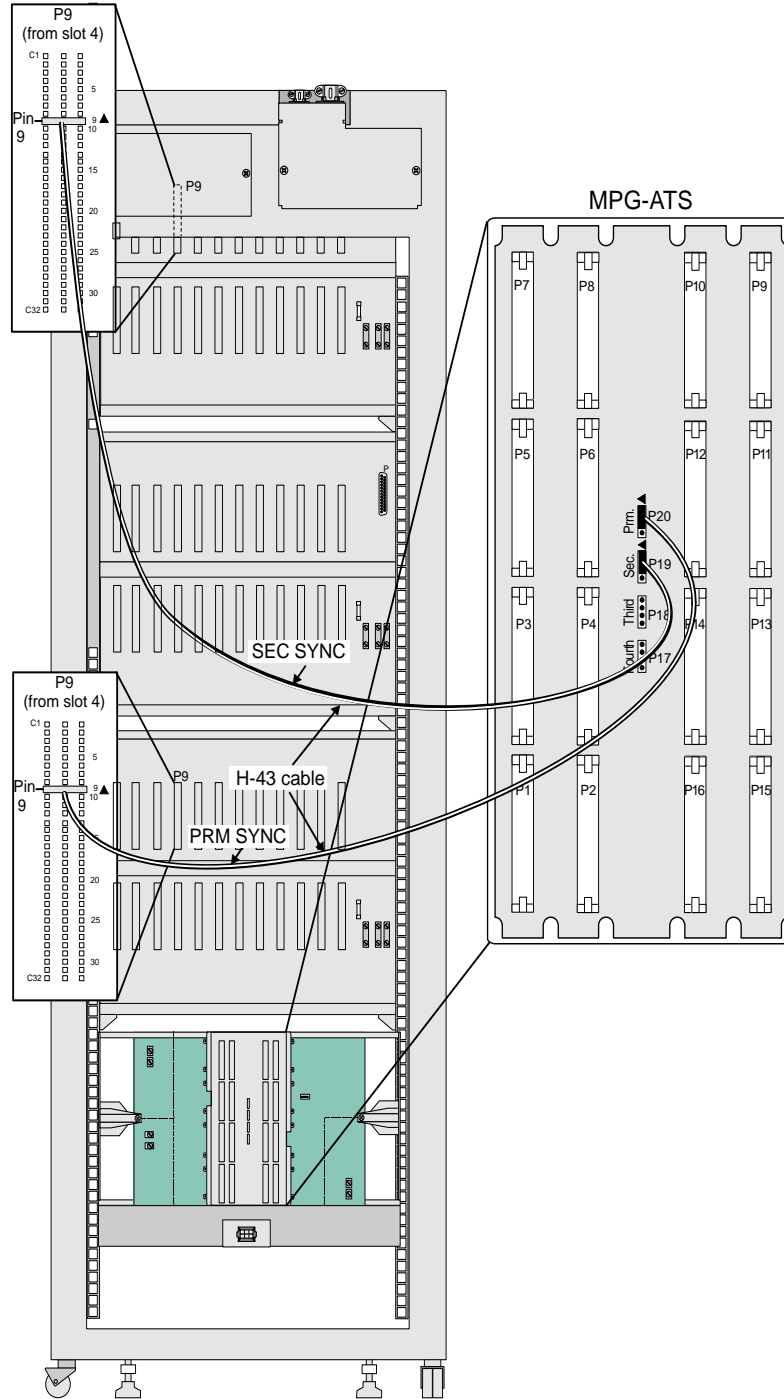
The *Third* and *External* synchronization source connections expand the system synchronization capabilities. They are the P18 and P17 connectors, respectively. The External P17 connector also may be connected to an external clock source.

These connectors are not currently used.

Synchronization Connection Pins

The pin connections for each of the synchronization connections are especially designed for longer life. Each pin connection is made up of four actual pins, divided functionally into two pairs. The cable attaches to either the first and the third pins or the second and fourth pins. If one of these delicate pins is damaged, the other pair remains functional.

Figure 6-26
Synchronization Cabling



9 Alarm Cabling

Alarm signals are passed from the power supply slot on the motherboard to the PBD-ATS card that services the Peripheral Shelf Unit in which the Supplie(s) reside. The alarm cabling is connected on the backplane of the even numbered peripheral shelves as follows: (JU-1 is located behind slots 1 and 2 on the bottom left corner on the backplane of the motherboard.)

- *When the Peripheral Shelf Unit **does not** include an odd shelf:*
P6 on the PBD-ATS is connected to JU-1 on the even shelf.
- *When the Peripheral Unit includes an odd shelf:*
 - P6 on the PBD-ATS is connected to JU-1 on the even shelf.
 - P7 on the PBD-ATS is connected to JU-1 on the shelf.

An H-621 connector (1-wire) cable is used to connect between P6 and JU-1 on the even shelf.

An H-622 (1-wire) cable is used to connect between P7 and JU-1 on the odd shelf.

The three pin connector can be attached to the upper 3 pins or lower 3 pins of P6/P7, so that if one of the pins break, there is always an alternative wiring option.

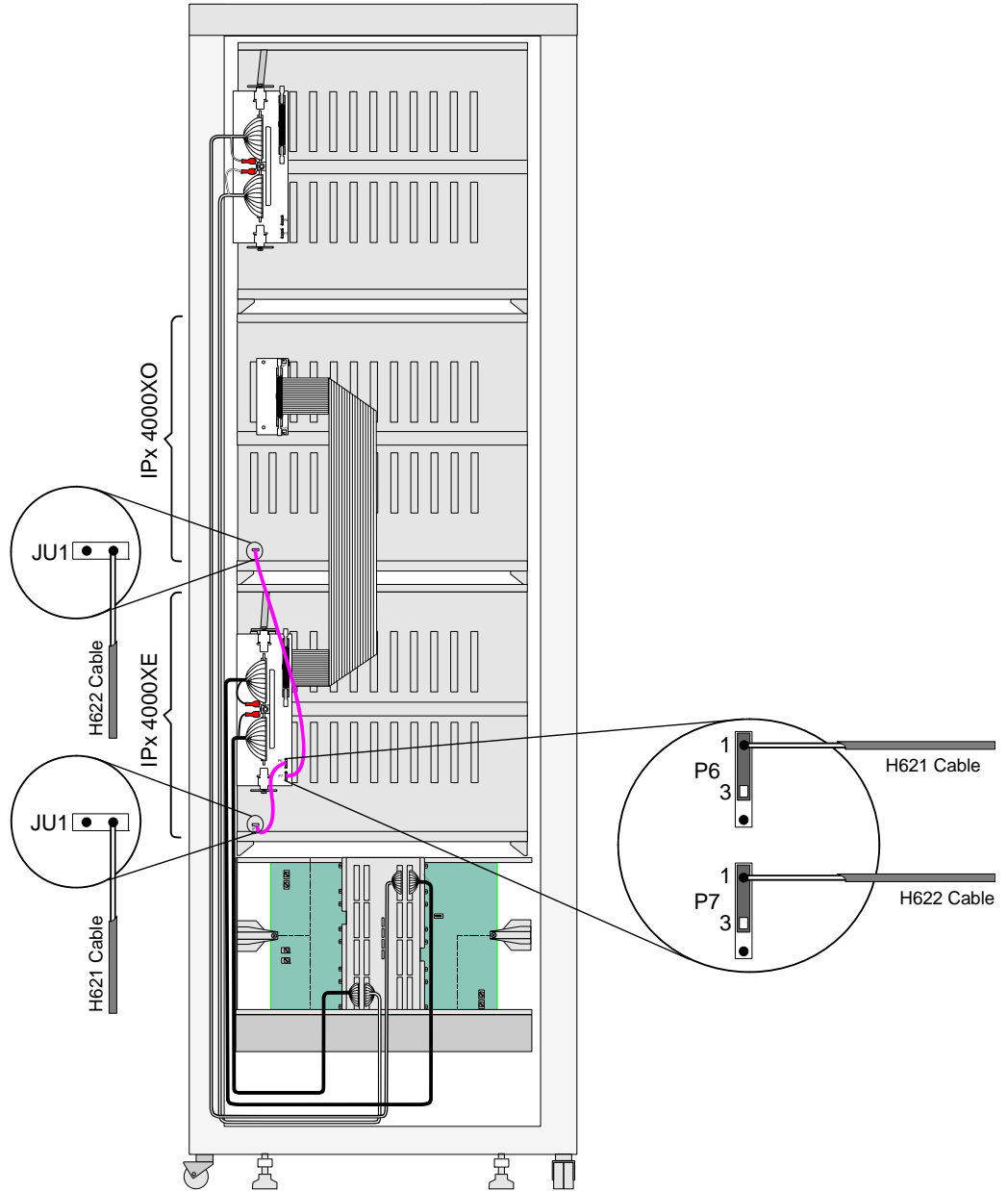


NOTE:

The H41 cable orientation is significant. Verify that the white colored wire is connected between the lowest of the three pins in P6/P7 to the right pin of Pin 27 / Pin 29.

Figure 6-27 illustrates the alarm cabling with polarity. The H-622 carries the signals and outputs between the odd and even peripheral shelves. The H-621 cable carries alarm signals to the PBD-ATS servicing the Peripheral Unit.

Figure 6-27 Alarm
Cabling Detail



10 Power Distribution

Power enters the cabinet from a battery eliminator power supply, or from a power distribution board; to the SGND, –48V IN, and 48V RTN IN power terminals located in the power input cavity, in the upper right corner of the cabinet rear. See *Ground and Power Wiring beginning on page 2-11* for details.

The SGND terminal connects to the metallic frame of the cabinet. Note that the –48V IN, or –48 volt supply is protected by a fuse located near the input terminal. The –48V IN, and 48V RTN IN are then routed from the power input cavity two DC cables down to the IPx 4000 cages.

red cable is the 48V RTN IN, or positive side of the 48 volt power supply. The black cable is the –48V IN, or negative side of the power supply.

The 48V RTN IN cable is the signal common, or ground for all internal supply voltages and signals; as well as for telephony signaling purposes, including Ground-Start and E&M trunks, and RS-232 serial data ports. The positive output of the power supply or power distribution board must be connected to an approved earth ground via the master ground for proper system operation.

The SGND terminal also must be connected to the master ground through a separate path (separate wire).

11 Configuration Options

This subsection describes the various factory set configuration options for the Coral IPx 4000 system up to a maximum of 16 peripheral shelves. Each Peripheral Shelf Unit (even and odd shelf) receives 384 time slots, see *Figure 6-19*. The system is configured with the least possible blocking.

Possible Cabinet Configurations

The different combinations of cabinet configurations preassembled by the manufacturer are summarized in *Tables 6-8* and *6-9*. These tables define the cabinet structure for each type of Coral cabinet code.

Alternatively, the customer may request to be supplied with any number and type of cage (odd, even or control). The customer may assemble the cages independently of the manufacturer, in any unique configuration conforming to his/her needs. The shelves, however, may support a *maximum* of 16 peripheral shelves (8 odd, 8 even) and 1 control shelf — where one odd shelf is *always* supported by one even shelf.



NOTE:

Each Coral IPx 4000 system must include at least one main control cabinet with up to 4 shelves, where the bottom shelf is always the control shelf. The system may also include a maximum of 4 Expansion cabinets.

Cabinet Code Configurations

The Cabinet Code configuration is printed on the label inside of the Coral cabinet and can be decoded as follows:

IPx ABCDEF:

A	B	C	D	E	F
# of Shelves per Cabinet	Quantity of Control Sets	Quantity of Peripheral Shelves in Cabinet	Quantity of Even Peripheral Shelves (IPx 4000XE)	Quantity of PB-ATS per even Peripheral Shelf (IPx 4000XE)	Group Controller Type
4	0: Expansion Cabinet 1: One Control 2: Dual Control (R)	0 1 2 3 4	1 2 3 4	1 2	0: Expansion Cabinet 1: Not Used 2: 32GC

The cabinets are described with the amount of shelves and the number and location of the relevant PB-ATS cards, as well as the maximum number of ports it supports and

the number of time slots the system supports. The total number of PB-ATs installed ultimately define the number of time slots for the entire system.

Table 6-8 Coral IPx 4000 Cabinet Code Descriptions

Cabinet Type	Cabinet Code	Dual Control?	First Shelf (bottom)	Second Shelf	Third Shelf	Fourth Shelf (top)
Main	412222	No	Control	Shelf #0 2 X PB	Shelf #2 2 X PB	Empty
	422222	Yes	Control			
	413322	No	Control	Shelf #0 2 X PB	Shelf #2 2 X PB	Shelf #4 2 X PB
	423322	Yes	Control			
	413222	No	Control	Shelf #0 2 X PB	Shelf #1 0 X PB	Shelf #2 2 X PB
	423222	Yes	Control			
	420002	Yes	Control	Empty	Empty	Empty
Expansion	403320	NA	Even 2 x PB	Even 2 x PB	Even 2 x PB	Empty
	403220	NA	Even 2 x PB	Odd 0 x PB	Even 2 x PB	Empty
	404220	NA	Even 2 x PB	Odd 0 x PB	Even 2 x PB	Odd 0 x PB
	404420	NA	Even 2 x PB	Even 2 x PB	Even 2 x PB	Even 2 x PB

Table 6-9 Coral IPx 4000: Expansion Cabinet Codes

Control Cabinet	Second Cabinet	Third Cabinet	Fourth Cabinet	Fifth Cabinet	Total # of Peripheral Shelves
422222 or 412222	403320	403320	None	None	8
	402220	402220	402220	None	8
	403220	403220	403220	None	11
423322 or 413322	404420	None	None	None	7
423222 or 413222	404220	404220	404220	None	15
420002	404220	404220	404220	404220	16

Hot Standby Configurations

The Coral IPx 4000 system can be configured as a stand alone system with only one set of control cards or a Hot Standby redundant system with two sets of control cards. The redundant system defines an Active and Standby side. The left or right side of the control shelf is defined as the Active, Standby or Inactive (Maintenance or Faulty) control side depending on the current system status.

The different Hot Standby configurations are denoted as follows (see below for switching configurations):

Hot Standby Configurations				
Condition	Config	Control Shelf Description	Config	Control Shelf Description
Normal	H	The Active control system is on the right and the Standby system is on the left.	H'	The Active control system is on the left and the Standby system is on the right.
Abnormal	I	The Active control system is on the right while the Inactive system (Maintenance or Faulty) is on the left.	I'	The Active control system is on the left while the Inactive (Maintenance or Faulty) system is on the right.
Single Control No Redundancy	I	An Active system Control system is on the right side of the control shelf. No system is installed on the left side.	N/A	Single Control systems are not permissible from the left side.

NOTES:

Chapter 7

Power Supplies

Coral

7.1	PS19 DC.....	7-1
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7.3	PS-ATS.....	7-39

7.1 PS19 DC

Peripheral Power Supply Unit

1 General Description



NOTE:

This card has been discontinued and is replaced by PS19 DC-D.

The DC Power Supply (PS19 DC) provides internal operating voltages for IPx 4000XE and IPx 4000XO peripheral cages and for Coral IPx 800, 3000 systems. The PS19 DC operates from a nominal input of -48VDC , typically supplied by an external 48VDC rectifier or stationary battery plant. Actual input may vary from -40 to -60 volts allowing operation:

- From an external power source while the batteries are charged at an equal rate
- During a power failure, until the batteries are completely discharged

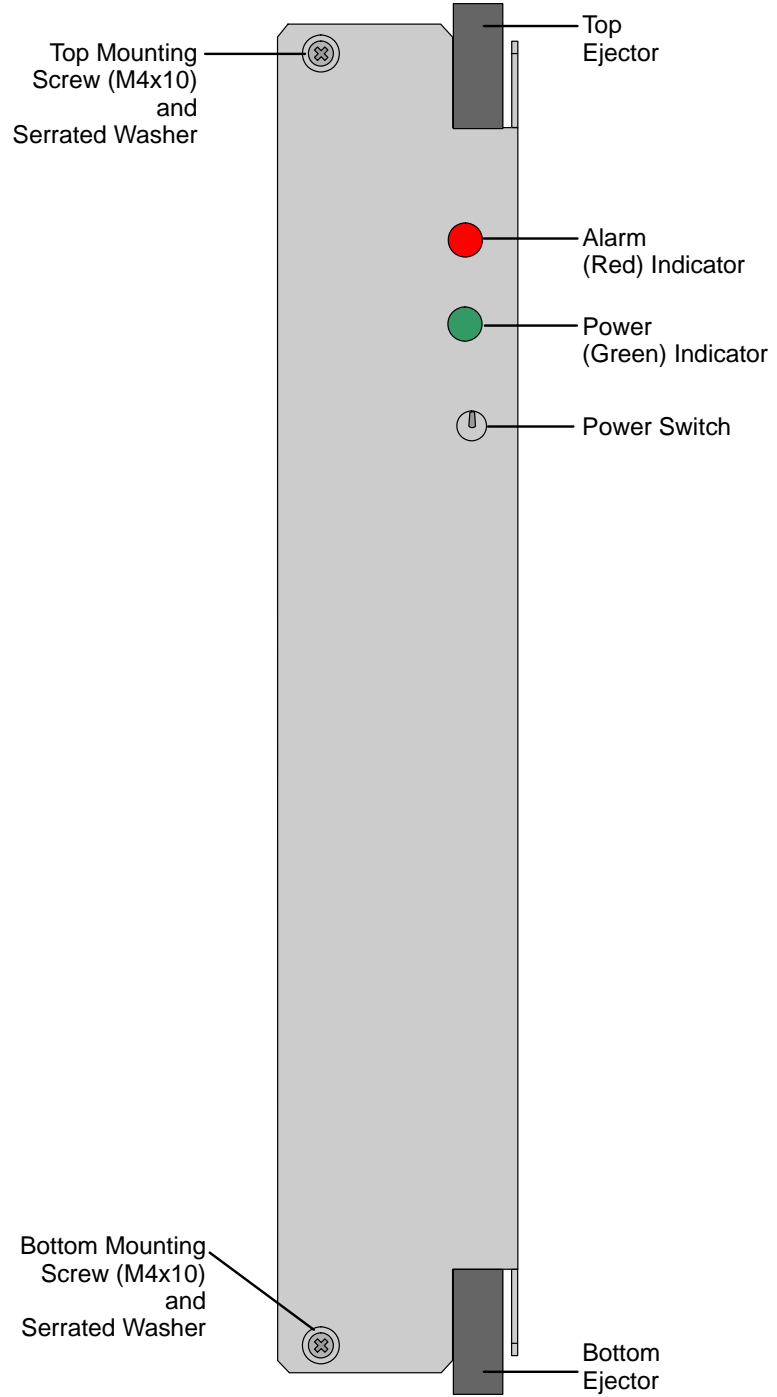
PS19 DC Front Panel

Figure 7-1 illustrates the front panel of the PS19 DC. The following items located on the front panel are described in the following table:

<i>Feature</i>	<i>Description</i>
Alarm (red) Indicator	Lights when there is any failure within the PS19 DC
Power (green) Indicator	Lights when the power switch is turned on

<i>Feature</i>	<i>Description</i>
ON/OFF Power Switch	Turns the unit On or Off. <i>Do not insert or remove the PS19 DC-D unit from the cage when switched ON. Sudden power surges could damage system components. Before inserting or extracting the PS19 DC-D unit, verify that the power switch is turned OFF.</i>
Top and Bottom Ejectors	Used to release the unit from the cage backplane.
Top and Bottom Fastener Holes	Used to insert the screws (M4x10) that secure the unit to the cage, ground the unit and safeguard against malfunction.

Figure 7-1 PS19 DC
Front Panel Layout



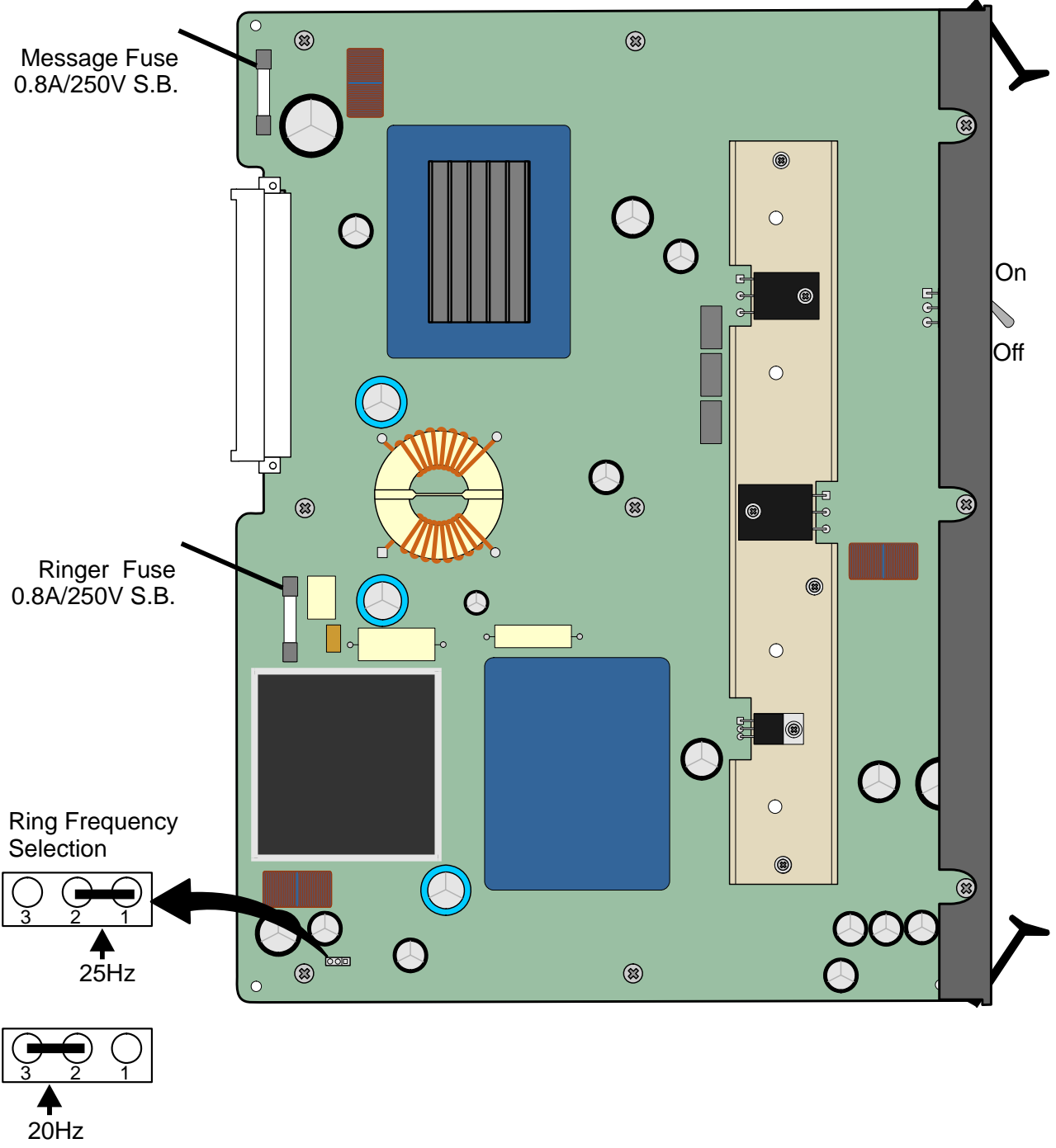
PS19 DC Card Layout

The PS19 DC card's component side layout is shown in [Figure 7-2](#). Three components are described in the following table:

<i>Feature</i>	<i>Description</i>
Message Fuse	A 0.8A / 250V, slow blow fuse, protects the unit's message circuitry voltage. See PS19 DC Fuses on page 7-14 .
Ringer Fuse	A 0.8A / 250V, slow blow fuse, protects the unit's ring generator circuitry voltage. See PS19 DC Fuses on page 7-14 .
Ring Frequency Selection Jumper	Configured as per customer specification providing 20Hz (North American systems) or 25Hz depending on the JU1 configuration. See Ringer Frequency Adjustment on page 7-9 .

The entire IPx 4000XO/XE cage 48VDC input circuitry, including the power supply, is protected by a slow blow 30A/125V fuse on the rear panel of the cage. See [Figure 7-3, PS19 DC Block Diagram](#).

Figure 7-2 PS19 DC Card Layout



2 Circuit Description

[Figure 7-3](#) presents a block diagram of the PS19 DC power supply.

Power Input Section

The DC input consists of: passive filter, inrush current, and an on/off switch. The DC input is protected against reverse polarity.

DC Output Power

DC-to-DC converters convert the -48VDC input power to the following outputs:

- +5VDC
- +12VDC
- -5VDC
- -12VDC

Message and Ring Circuits

The -120VDC and 85V_{RMS} voltages are provided for ringers to drive the ringers and message waiting lamps of single line telephones connected to SLT ports of the system.

- -120 VDC for SLT message waiting lamps
- 85V_{RMS} for SLT ringers

Ring Generator

The ring generator is capable of generating ringing for up to 20 ports simultaneously at 20Hz or at 25Hz. The ringing frequency is selected with the JU1 configuration jumper on the PS19 DC circuit board. See [Ringer Frequency Adjustment on page 7-9](#).

The current is used for ringing on industry standard, SLT, and magneto telephone station ports. The ring generator provides high voltage (85V_{RMS}) ring generator current required by SLT station ports of the 8SLS, 16SLS, 24SLS, or 8SM cards.

Messaging

The messaging generator is capable of generating -120VDC for message lamps. It is used to light neon lamps on SLT ports of the 8SLS, 16SLS, or 24SLS cards.



NOTE:

For 8SA and 24SA cards, the ringer and message generators are provided by the 8/24SA card.

-48VDC Output Power

The PS19 DC also filters and limits the –48VDC input to feed the peripheral card slots.

Ripple and Noise

Filtering circuitry minimizes ripple and noise on the –48VDC feed to the peripheral cards. The filtering circuitry produces an output voltage approximately 1.5V to 2.0V lower than the input voltage to the PS19 DC.

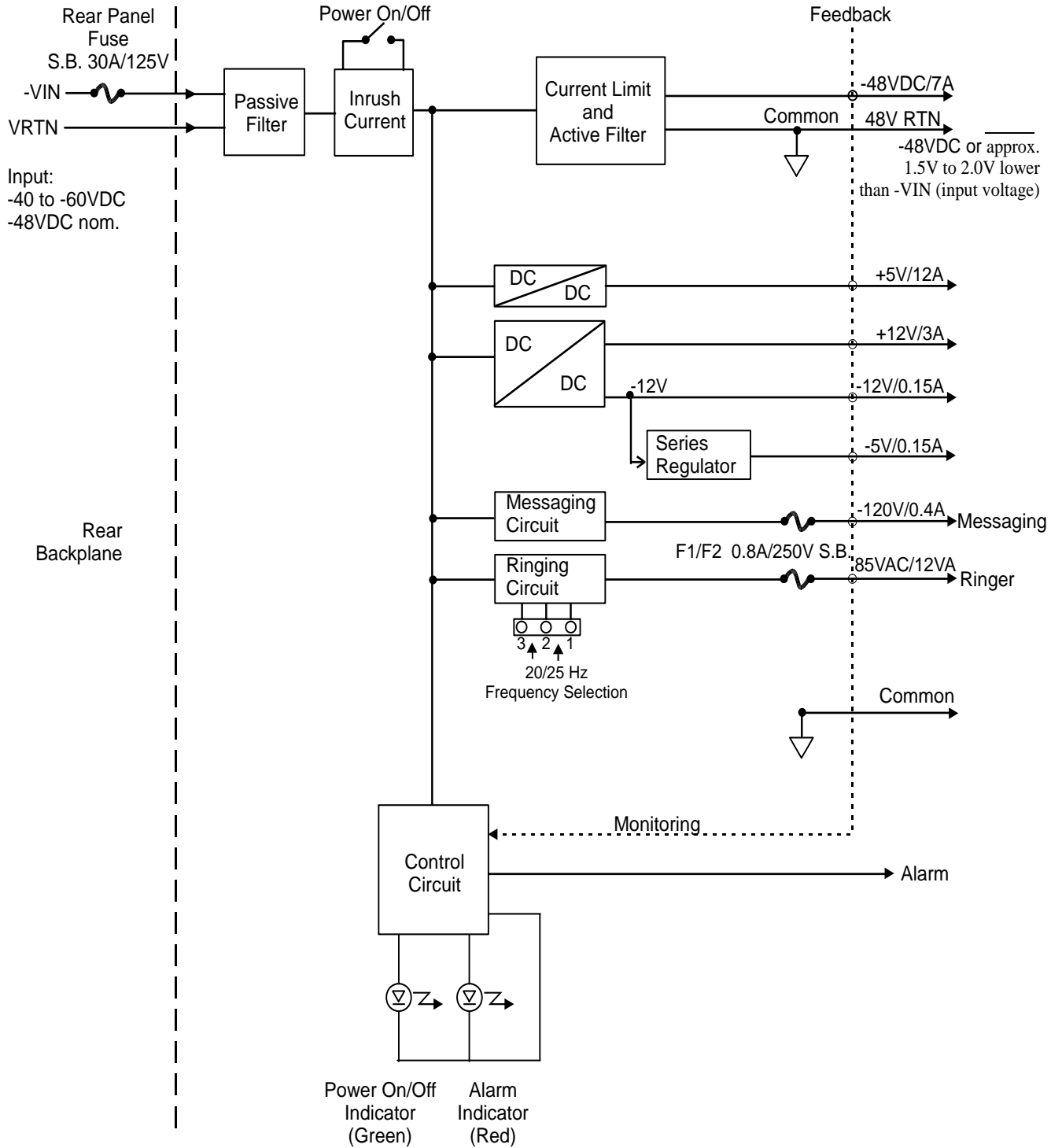
Monitoring Circuitry

All outputs, with the exception of the –48VDC output, are regulated. Voltage and current level monitoring circuitry check each output of the PS19 DC (including message and ring generator currents), and produce an alarm signal to the Coral system main processor in the event of malfunction.

Monitoring circuitry verifies that each voltage output (with the exception of the –48VDC output) is within specification. If any of the voltage outputs drop below specification, the monitoring circuitry produces an alarm signal to the Coral system processor, causing the red **Alarm** indicator to illuminate. Note that the green **Power** indicator of the PS19 DC remains illuminated at the same time as the red **Alarm** indicator.

If the Input voltage drops below 36.5 ± 1 VDC, the unit shuts down and returns to power only when the voltage increases above 38.5 ± 1 VDC again. Additionally, if the voltage is greater than 62 ± 1 VDC, then the unit shuts down until the input voltage drops below 58 ± 1 VDC.

Figure 7-3 PS19 DC Block Diagram



PS19 DC Peripheral Power Supply Unit

3 Ringer Frequency Adjustment

The PS19 DC can supply either 20Hz or 25Hz ringing frequency by configuring Jumper JU1 located on the bottom component side card. See [Figure 7-2](#). This jumper is factory configured according to local requirements. However, it can be configured in the field. The procedure is as follows:

1. Remove the power supply unit from its slot and place it over the anti-static material with the component side facing upwards, as described in [Removing the Power Supply, page 7-11](#).

CAUTION!

Do not insert or remove the power supply unit from the cage when turned ON. Sudden power surges could damage system components.

2. Configure jumper JU1 as described below for the following frequencies:

<i>Frequency</i>	<i>JU1 shorting plug over pins</i>
20Hz	2 and 3
25Hz	1 and 2

3. Reinstall the power supply unit as described in [Installing the Power Supply, page 7-10](#).

4 Installation

The PS19 DC power supply is inserted in the extreme left slot of the card cage. Before installing the power supply, verify that the ring frequency configuration jumper, JU1, is set to the correct frequency (20 or 25Hz). See [Ringer Frequency Adjustment on page 7-9](#).

Installing the Power Supply

1. Verify on the cage rear panel that the POWER SUPPLY DUPLICATION connector is **not** in use.

CAUTION!

*Connecting the POWER SUPPLY DUPLICATION connector (located on the cage rear panel) for PS19 DC power supplies will result in damage to the system. This connector is only used with the PS19 DC-D power supply, see [Connection Cable between Two Expansion Cages, page 7-27](#). **Do not** use this connector when the PS19 DC power supply is installed.*

2. Verify that the PS19 DC power switch is turned OFF.

CAUTION!

Do not insert or remove the power supply unit from the cage when turned ON. Sudden power surges could damage system components.

3. Position the two guide ridges (located on the right panel of the power supply, at top and bottom) into the card edge guides corresponding to the **POWER SUPPLY** slot (labeled on the bottom of the card cage).
4. Slide the PS19 DC gently but firmly, until fully inserted into the card cage. A slight resistance should be felt as the multi-pin connectors engage at the rear of the power supply and backplane.

Do not force the power supply into the card cage. Irreparable damage may occur if the multi-pin connectors misalign while attempting to insert the unit into the card cage. If more than slight resistance is encountered, partially slide out the card from the cage and verify the alignment of the guide ridges with the card edge guides. If alignment appears to be correct, remove the card from

the slot and inspect the multi-pin connectors for bent pins and debris in the pin holes.

5. Secure the power supply to the card cage by fastening the two M4X10 screws, located at the top and bottom of the unit's front panel to the cage, thus securing the card to the cage as well as grounding the unit.
6. Turn the PS19 DC power switch ON, and verify that the green **Power** indicator is lit, while the red **Alarm** indicator is not lit.

CAUTION!

Turn ON the PS19 DC units only after powering the Main Control Shelf (IPx 4000C) and verifying that the Main Control Shelf has initialized properly and the alarm indicator does not illuminate. Otherwise the cards in the peripheral shelves/cages (IPx 4000XE, 4000XO) might not initialize.

Removing the Power Supply

1. Locate a desk or table top that can support 50 lb (23kg). If the surface can be damaged by sharp objects, place a protective sheet of cardboard or similar material over the top surface.
7. Place an anti-static sheet (the card's plastic shipping bag will suffice) over a desk or a table top.
8. Turn the PS19 DC power switch OFF (turn the switch downwards).

CAUTION!

Do not remove the PS19 DC unit from the cage when turned ON. Sudden power surges could damage system components. Before extracting the PS19 DC unit, verify that the power switch is turned OFF.

9. Unfasten the two M4x10 screws located at the top and bottom of the unit's front panel and set aside.
10. Carefully remove the PS19 DC from its slot.
11. Place the PS19 DC over the anti-static material with the component side facing upwards.

5 Ringer Database Programming

Max Ringers (Route: SFE,2)

The maximum number of SLTs that can be fed ringing simultaneously from each PS19 DC is 20, by default. This value can be altered via the Coral database's System Features (*Route: SFE,2*) branch, by changing the MAX_RING parameter value.

See *Chapter 6 of the Program Interface and Database Reference Manual* for details.

6 Troubleshooting

Power supply failure generally results in the loss of one or more output voltages. However, protection circuitry in the power supply regulator circuitry may shut down a regulator due to a current overload caused by an external fault.

The red **Alarm** indicator on the front panel of the PS19 DC lights when any of the output voltages are below specification and/or when either the F1 or F2 fuse blows.



*The red **Alarm** indicator illuminates if any voltage supplied by the power supply is outside of specification. This could be caused by an internal or external fault. If the alarm indicator illuminates in a replaced power supply, the fault is not within the unit.*

All maintenance activities are to be carried out by a qualified service technician.

The red **Alarm** indicator can be activated by malfunctions in the backplane, the power supply, in any of the cards inserted into the cage, or in any of the above in a connected cage.

Power Supply Switched to ON - Green Power Indicator is OFF

Check the following:

1. DC power supply interruption. (Range: -40 to -60 VDC)
1. Blown main or circuit fuse/breaker in the building electrical panel.
2. Blown fuse in the cage rear panel.
3. Faulty PS19 DC.

(Insert a different PS19 DC unit as described in [Installation, page 7-10.](#))

PS19 DC Fuses

The PS19 DC employs two fuses, F1 and F2, to protect the message and ringing circuitry respectively.

- If the F1 fuse blows, the message lamps for the SLT units connected via this cage do not light.
- If the F2 fuse blows, none of the SLT units connected via this cage can ring.
- If the cage rear panel fuse blows, the PS19 DC **Power** green indicator and **Alarm** red indicator do not illuminate.

To replace a fuse within the PS19 DC

1. Remove the power supply unit from its slot and place it over the anti-static material with the component side facing upwards, as described in [Removing the Power Supply, page 7-11](#).

CAUTION!

Do not insert or remove the power supply unit from the cage when turned ON. Sudden power surges could damage system components.

1. Replace only with the same type and rating of fuse.
See the PS19 DC card layout shown in [Figure 7-2](#).
2. Reinstall the power supply unit as described in [Installing the Power Supply, page 7-10](#).

Determining the Cause of the Alarm Indicator

1. Turn the PS19 DC power switch OFF (turn the switch downwards).
1. Disconnect the expansion cable(s) connected to the relevant cage.
2. Remove all cards from the relevant cage so that they protrude from the cage by approximately 1 inch (2.5 cm).
3. Switch ON the PS19 DC and check the red **Alarm** indicator.
 - If the **Alarm** indicator is lit, either the PS19 DC is malfunctioning or the problem is caused by the motherboard. Replace the PS19 DC unit.
 - If the **Alarm** indicator is not lit, the unit is functioning properly and the alarm is being caused by one of the cards.
4. For cages that include common control cards (see table below).

<i>Cage</i>	<i>Control Cards</i>
IPx 3000XE FlexLITE	FLMS
IPx 4000XE	PB-ATS, FLMM
IPx 4000XO	FLMM

To determine which control card is causing the problem, turn the PS19 DC power switch OFF again (turn the switch downwards) and re-insert the PB-ATS card. Then turn the PS19 DC power switch ON and check the red **Alarm** indicator. Continue this process, adding one common control card at a time, and turning OFF the PS19 DC power switch before inserting each card. Turn the PS19 DC power switch ON and check the red **Alarm** indicator after inserting each card. If the red **Alarm** indicator is lit, the last card inserted is causing the problem and should be replaced.

Turn the PS19 DC power switch OFF, insert the common control cards (PB-ATS or FLMx). Then turn the PS19 DC power switch ON and check the red **Alarm** indicator once again. If the red **Alarm** indicator OFF, the problem is caused by one of the cards that was removed.

5. To determine which shared service and peripheral card is causing the problem, insert the cards into their appropriate slots, one at a time, beginning from the right side of the cage. Ensure that the card's rear panel connectors engage properly with the backplane and that they initialize properly.
 - If the Alarm indicator lights when one of the cards is inserted, then that card is faulty.

7 Specifications

PS19 DC (DC Power Supply)

- Coral systems:.....IPx 800, 3000, 4000
- Input:.....-40VDC to -60VDC, 12A max.
- Power Consumption:Continues 575W
- DC Outputs:+5VDC Nom. regulated 12.0A max.
-5VDC Nom. regulated 0.15A max.
+12VDC Nom. regulated 3.0A max.
-12VDC Nom. regulated 0.15A max.
-48VDC unregulated (or approx.1.5V to
2.0V lower than input voltage) 7.0A max.
- Message Output (for SLTs):.....-120VDC, 0.4A max.
- Ringer Outputs (for SLTs):
Voltage:85V_{RMS}
Frequency.....20 or 25Hz (jumper selectable)
Capacity12VA max.
- Alarm:Signaling malfunction
Front panel LED indicator (red)
- Indicators:Power ON/OFF (green)
ALARM (red)
- Fuses:
Input (-48VDC).....None (Protected by a fuse on the rear
panel of the cage)
Output (Message).....F1: 0.8A/250V S.B
Output (Ringer).....F2: 0.8A/250V S.B.
- Controls and Adjustments:ON/OFF power switch
Output ring frequency
- Weight:.....1.4 kg

7.2 PS19 DC-D

Peripheral Supply Unit with Duplication

1 General Description

The Peripheral DC Duplication Power Supply (PS19 DC-D) provides internal operating voltages for the Coral IPx 4000XE and 4000XO peripheral shelves/cages and for the Coral IPx 800, 3000 systems.

The PS19 DC-D operates from a nominal input of –48VDC, typically supplied by an external 48VDC rectifier or stationary battery plant. Actual input may vary from –40 to –60 volts, allowing operation;

- From external battery power source while the batteries are charged at an equalized charge rate
- During a power failure, until the batteries are completely discharged.

Each PS19 DC-D is designed with the capacity to support two fully populated peripheral cages with average mix of port types. The PS19 DC-D employs automatic switching circuitry to *share* the output between two peripheral cages for redundancy purposes. The PS19 DC-D may be used in any one of the following three configurations supporting the cards in the peripheral cages:

Configuration	Description
Economical	One power supply supporting two adjacent cages via the H719 DC-D connection cable. See Figure 7-7 .
Redundant	Two power supplies supporting two adjacent cages, providing redundancy for both cages via the H719 DC-D connection cable between the two cages. See Figure 7-8 .
Double Power	One power supply for each cage, powering only its own cage (no cable). Installing one PS19 DC-D in each cage enables greater power support among the cards of the same cage. See Figure 7-9 .

See [Connection Cable between Two Expansion Cages on page 7-27](#) for H719 DC-D wiring details.

PS19 DC-D Front Panel

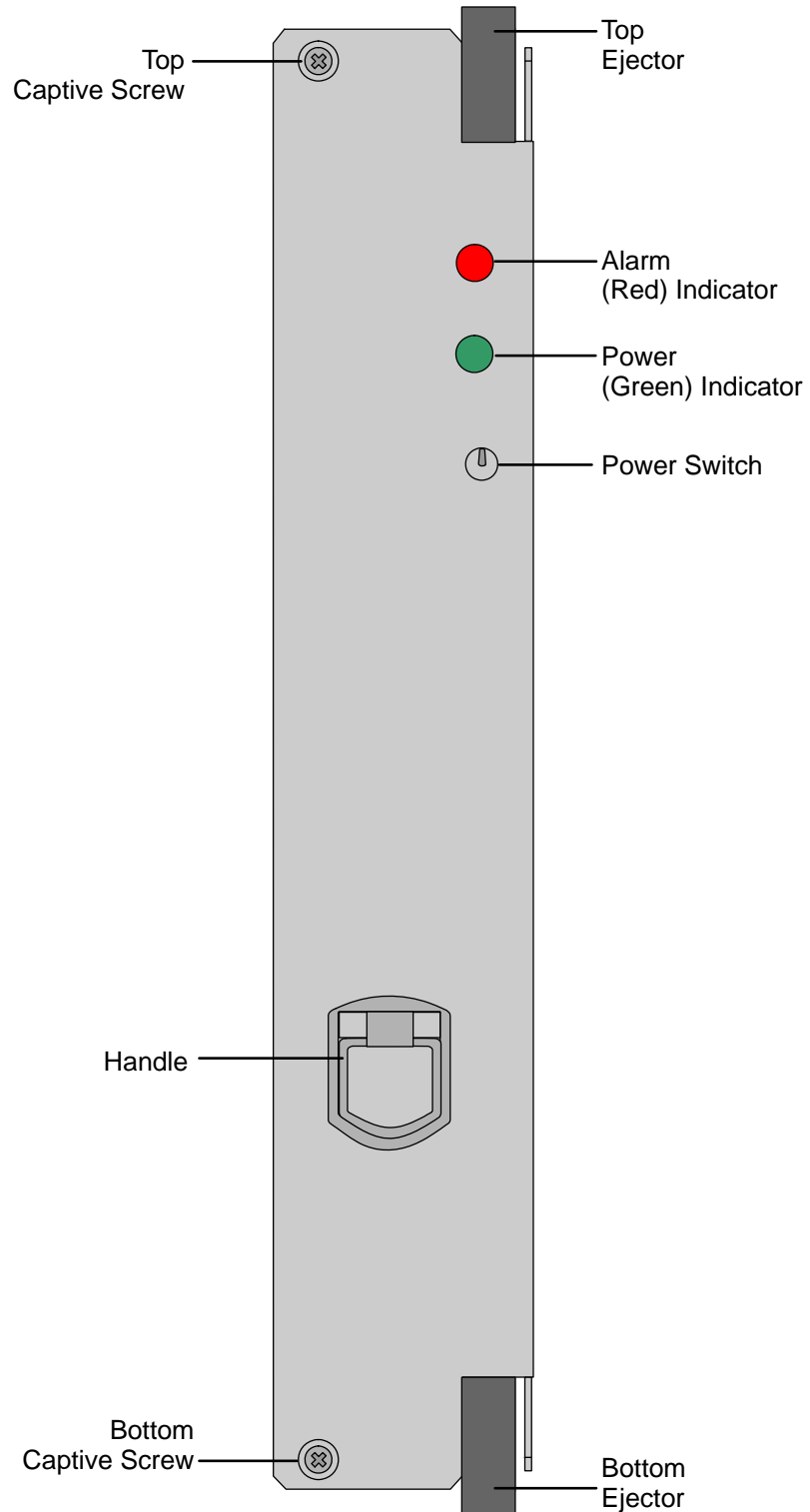
Figure 7-4 displays the front panel of the PS19 DC-D. The following items located on the front panel are described in the following table:

<i>Feature</i>	<i>Description</i>
Alarm (red) Indicator	Lights when there is any failure within the PS19 DC
Power (green) Indicator	Lights when the power switch is turned on
ON/OFF Power Switch	Turns the unit On or Off. <i>Do not insert or remove the PS19 DC-D unit from the cage when switched ON. Sudden power surges could damage system components. Before inserting or extracting the PS19 DC-D unit, verify that the power switch is turned OFF.</i>
Handle	Used to pull the unit out of the card cage
Top and Bottom Ejectors	Used to release the unit from the cage backplane.
Top and bottom captive screws	Used to secure the unit to the cage. These screws also ground the unit to the cage and safeguard the unit against malfunction.

CAUTION!

Turning one PS19 DC-D to OFF does not remove power from the peripheral cage if a shared PS19 DC-D is turned ON. Shared power supplies must both be turned off to remove all power from both cages.

Figure 7-4 PS19 DC-D
Front Panel

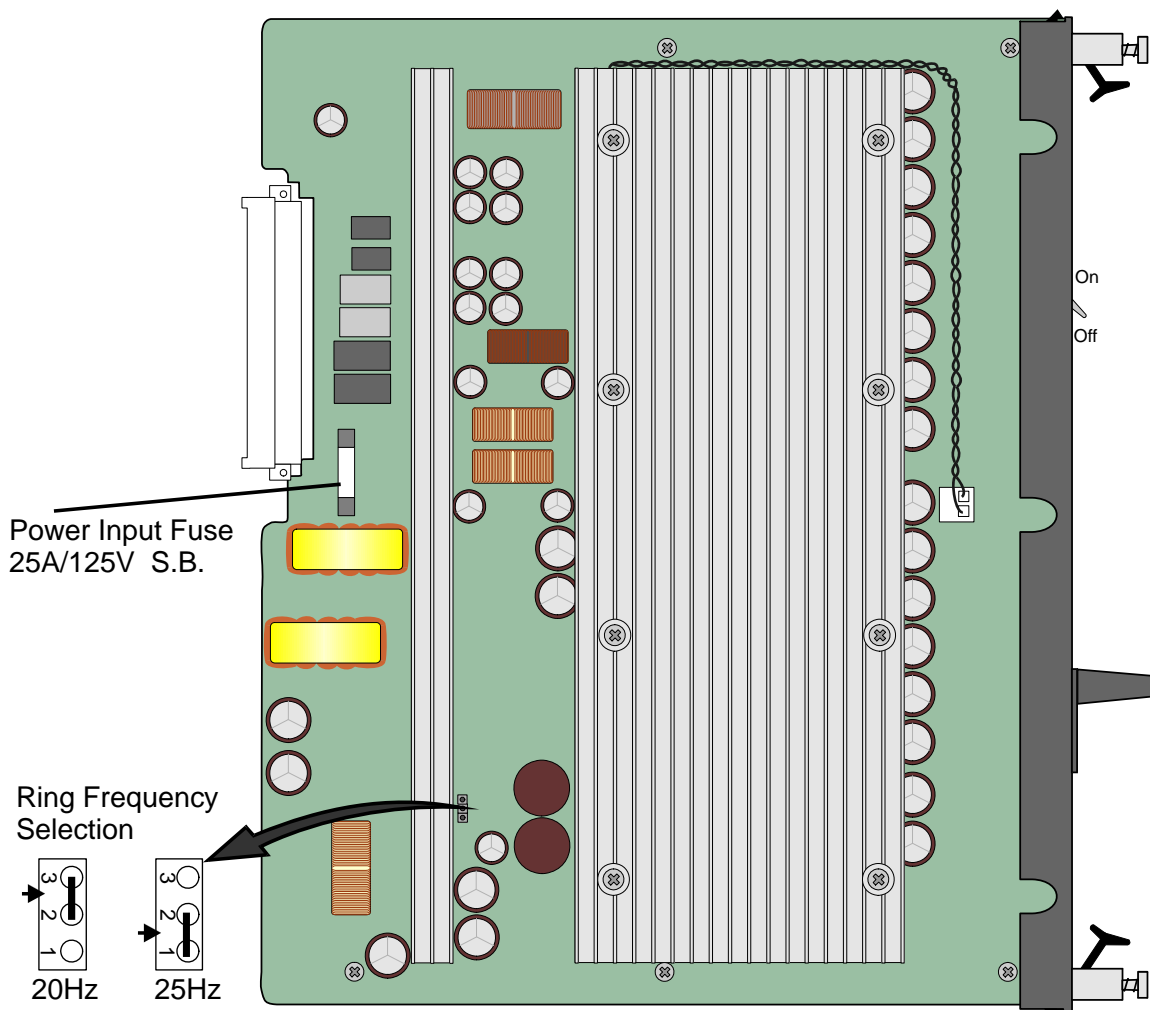


PS19 DC-D Card Layout

The PS19 DC-D card layout is shown in [Figure 7-5](#). Two components are described in the following table:

Feature	Description
Input Fuse	25A/125V, slow blow, protects the input voltage. See PS19 DC-D Fuses on page 7-33 . The entire cage 48VDC input circuitry, including the power supply, is protected by a slow blow 30A/125V fuse on the rear panel of the cage wired in series to the F1 fuse, see Figure 7-6, PS19 DC-D Block Diagram .
Ring Frequency Selection Jumper	Configured as per customer specification providing 20Hz (North American systems) or 25Hz depending on the J3 configuration, see Frequency Adjustment on page 7-24 .

Figure 7-5 PS19 DC-D Card Layout



2 Circuit Description

Figure 7-6 presents a block diagram of the PS19 DC-D power supply.

Power Input Section

The DC input consists of: passive filter, inrush current, and an on/off switch. The DC input is protected against reverse polarity.

DC Output Power

The PS19 DC-D includes two switch-mode DC-DC converters that convert -48VDC input power to:

- +5VDC
- -5VDC
- +12VDC
- -12VDC

Message and Ring Circuits

The -120VDC and 85V_{RMS} voltages are provided for ringers to drive the ringers and message waiting lamps of single line telephones connected to SLT ports of the system.

- -120VDC for SLT (Single Line Telephone) message waiting lamps
- 85V_{RMS} for SLT ringers

Ring Generator

The ring generator is capable of generating ringing up to 33 ports simultaneously at 20Hz or at 25Hz. The ringing frequency is configured by setting jumper J3 on the PS19 DC-D circuit board, see [Frequency Adjustment on page 7-24](#).

The current is used for ringing on industry standard, single-line telephones (SLT), and magneto telephone station ports and provides the high voltage (85V_{RMS}) ring generator current required by SLT station ports of the 8SLS, 16SLS, 24SLS, or 8SM cards.

Messaging

The messaging generator is capable of generating -120VDC for message lamps. It is used to light neon lamps on SLT ports of the 8SLS, 16SLS, or 24SLS cards.



NOTE:

For 8SA and 24SA cards, the ringer and message generators are provided by the 8/24SA card.

-48VDC Output Power

The PS19 DC-D also filters and limits the –48VDC input to feed the peripheral card slots.

Ripple and Noise

Filtering circuitry minimizes ripple and noise on the –48VDC feed to the peripheral cards. The filtering circuitry produces an output voltage approximately 1.5V to 2V lower than the input voltage to the PS19 DC-D.

Hot Swap Circuitry (Redundant Configuration)

The PS19 DC-D contains Hot Swap circuitry for redundancy purposes, so that if one among two connected PS19 DC-D units fails, the second unit may “take over” the power supply production.

Monitoring Circuitry

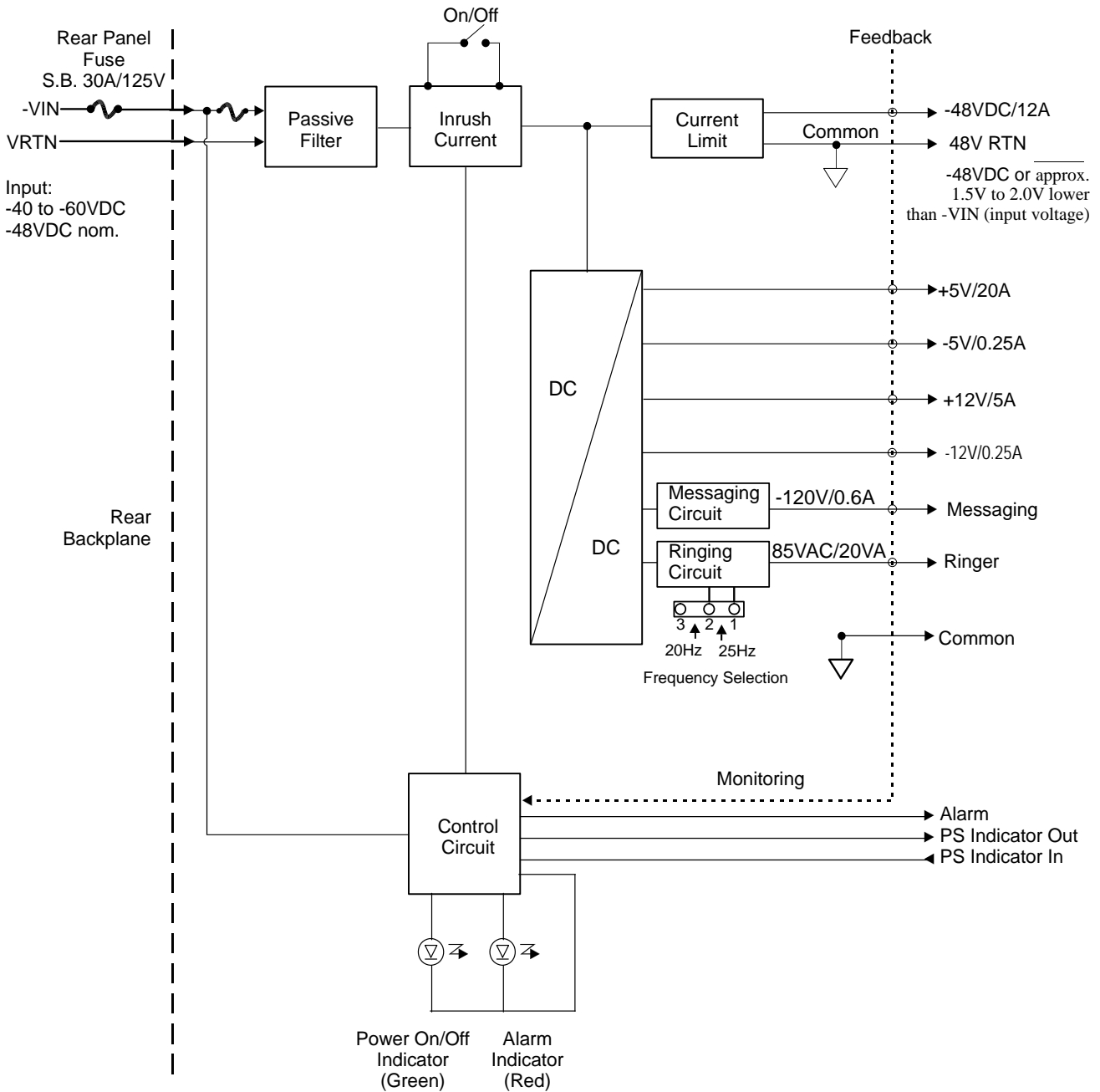
All outputs, with the exception of the –48VDC output, are regulated.

Voltage and current level monitoring circuitry check each output of the PS19 DC-D (including message and ring generator currents), and produce an alarm signal to the Coral system main processor in the event of malfunction.

Monitoring circuitry verifies that each voltage output (with the exception of the –48VDC output) is within specification. If any voltage deviates from specification, the monitoring circuitry produces an alarm signal to the Coral system processor, causing the red **Alarm** indicator to light. Note that the green **Power** indicator of a PS19 DC-D remains lit at the same time as the red alarm indicator.

If the voltage input drops below 36.5 ± 1 VDC the unit shuts down and returns to power only when the voltage raises above 38.5 ± 1 VDC again. Additionally, if the voltage is greater than 62 ± 0.5 VDC, then the unit shuts down until the input voltage drops below 58 ± 0.5 VDC.

Figure 7-6 **PS19 DC-D**
Block Diagram



3 Frequency Adjustment

The PS19 DC-D can supply either 20Hz or 25Hz ringing frequency by configuring Jumper J3 located on the left side card panel, see [Figure 7-5](#). This jumper is configured by the manufacturer according to local requirements. However, it can be configured at the field. The procedure is as follows:

1. Remove the power supply unit from its slot and place it over the anti-static material with the component side facing upwards, as described in [Removing the power supply, page 7-26](#).

CAUTION!

Do not insert or remove the power supply unit from the cage when turned ON. Sudden power surges could damage system components.

2. Configure jumper J3 as described below for the following frequencies:

Frequency	J3 shorting plug over pins
20Hz	2 and 3
25Hz	1 and 2

3. Reinstall the power supply unit as described in [Installing the PS19 DC-D, page 7-25](#).

4 Installation

The PS19 DC-D is installed in the extreme left slot of the peripheral card cage.

The system may be configured for power redundancy with two PS19 DC-D units (one in each cage) supporting two adjacent cages.

The Hot Standby system is designed to allow hot insertion and hot swaps of a PS19 DC-D unit, such that, if one of the PS19 DC-D units malfunctions, system operation is not interrupted because the second unit alone can continue powering either cage.

Installing the PS19 DC-D

1. Verify that the PS19 DC-D power switch is turned OFF.

CAUTION!

Do not insert or remove the power supply unit from the cage when turned ON. Sudden power surges could damage system components.

1. Position the two guide ridges (located on the right panel of the power supply, at top and bottom) into the card edge guides corresponding to the **POWER SUPPLY** label on the bottom of the cage slot.
2. Slide the PS19 DC-D power supply gently but firmly, until fully inserted into the card cage. A slight resistance should be felt as the multi-pin connectors engage at the rear of the power supply and backplane.

Do not force the unit into the slot. Irreparable damage may occur if the multi-pin connectors misalign while attempting to insert the unit. If more than slight resistance is encountered, partially slide the unit out of the card cage and verify the alignment of the guide ridges with the unit edge guides. If alignment appears to be correct, remove the unit from the slot and inspect the multi-pin connectors for bent pins and debris in the pin holes.

3. Secure the power supply to the card cage by fastening the two captive screws, located at the top and bottom of the unit to the cage.
4. Turn the power switch ON, and verify that the green **Power** indicator is lit while the red **Alarm** indicator is not lit.

CAUTION!

Turn ON the PS19 DC-D units only after powering the Main Control Shelf (IPx 4000C) and verifying that the Main Control Shelf has initialized properly and the alarm indicator does not illuminate. Otherwise the cards in the peripheral shelves/cages (IPx 4000XE, 4000XO) may not initialize.

Removing the power supply

1. Locate a desk or table top that can support 50 lb (23kg). If the surface can be damaged by sharp objects, place a protective sheet of cardboard or similar material over the top surface.
1. Place an anti-static sheet (the card's plastic shipping bag will suffice) over a desk or a table top.
2. Turn the PS19 DC-D power switch OFF (turn the switch downwards).

CAUTION!

Do not remove the power supply unit from the cage when switched ON. Sudden power surges could damage system components. Before extracting the power supply card, verify that the power switch is turned OFF.

3. Unfasten the two captive screws on the front panel of the PS19 DC-D.
4. Carefully remove the PS19 DC-D from its slot.
5. Place the PS19 DC-D over the anti-static material with the component side facing upwards.

Connection Cable between Two Expansion Cages

An H719 DC-D connection cable enables the PS19 DC-D to supply power to two adjacent cages with or without redundancy.

The following two configurations are possible when the connection cable is used:

Configuration	Description
Economical	One PS19 DC-D can supply power to two adjacent cages by connecting an H719 DC-D cable from the backplane of the one cage to the POWER SUPPLY DUPLICATION connector on the adjacent cage. See Figure 7-7 .
Redundant	One PS19 DC-D can be installed on each of two adjacent cages to provide power supply redundancy. An H719 DC-D cable is connected between both cages, in the same manner as above. In this type of configuration, if one of the power supplies fail, the other unit supplies power to both shelves and no calls are lost. This configuration is depicted in Figure 7-8 .

CAUTION!

Connecting the POWER SUPPLY DUPLICATION connector (located on the cage rear panel) for PS19 DC power supplies will result in damage to the system. This connector is only used with the PS19 DC-D power supply, see [Connection Cable between Two Expansion Cages, page 7-27](#). **Do not** use this connector when the PS19 DC power supply is installed.



Tip:

Using H719 cable requires 30A/125V slow blow fuse on the cage rear panel. In old versions of the Coral IPx systems, replace the 15A/125V S.B. fuse with a 30A/125V S.B. fuse.

Figure 7-7 PS19 DC-D
Economical Mode
Cabling

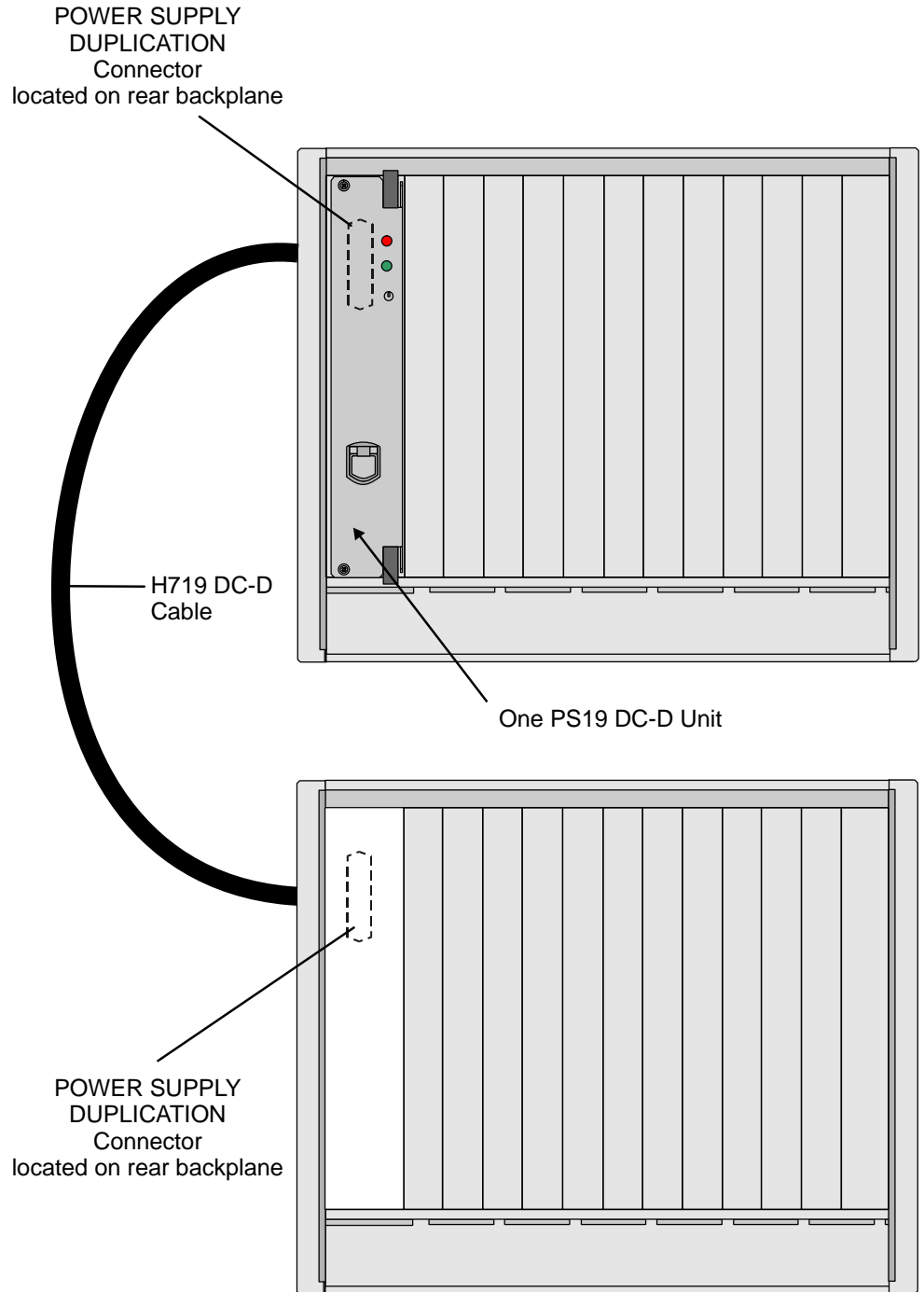


Figure 7-8 **PS19 DC-D Redundancy Cabling**

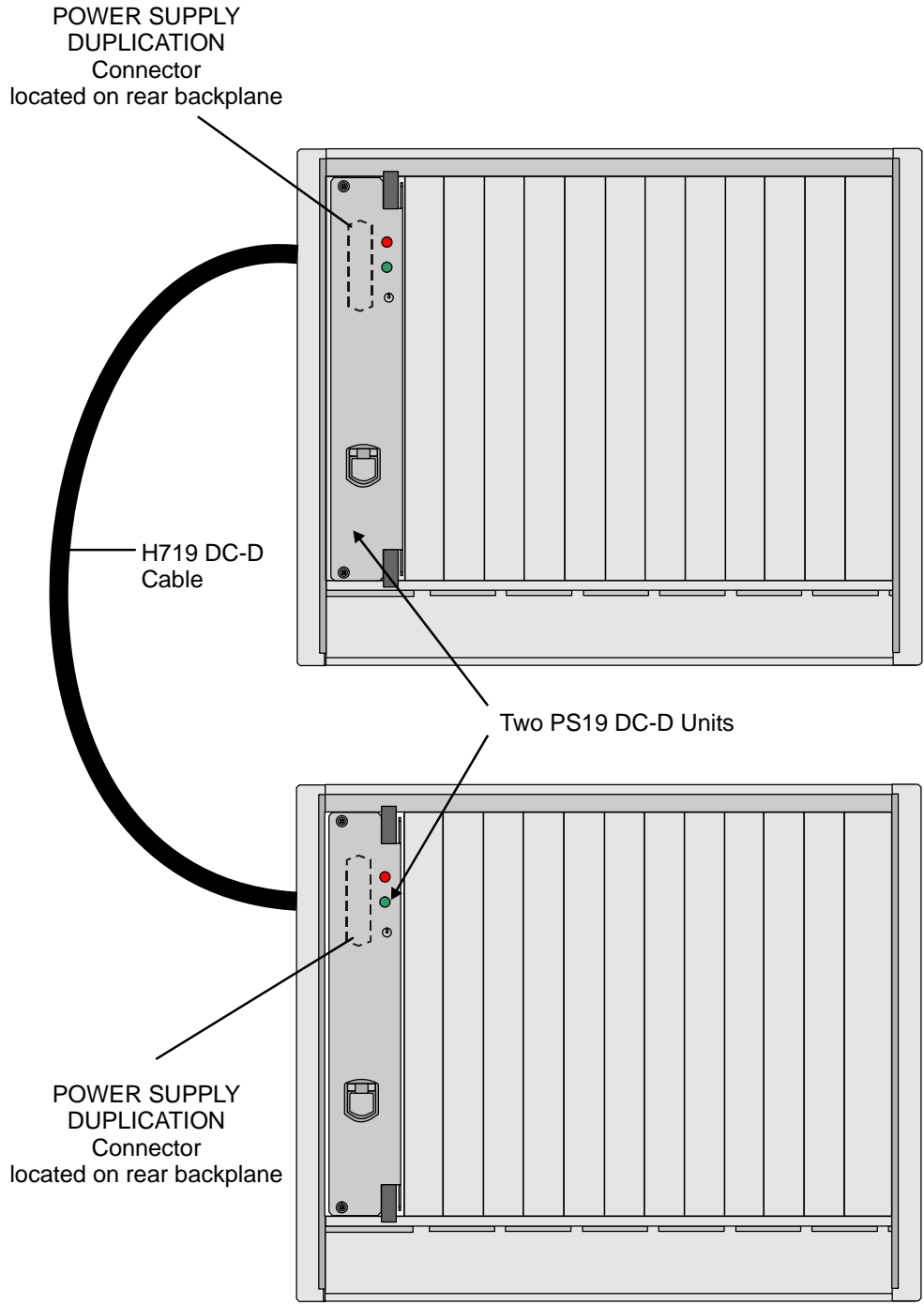
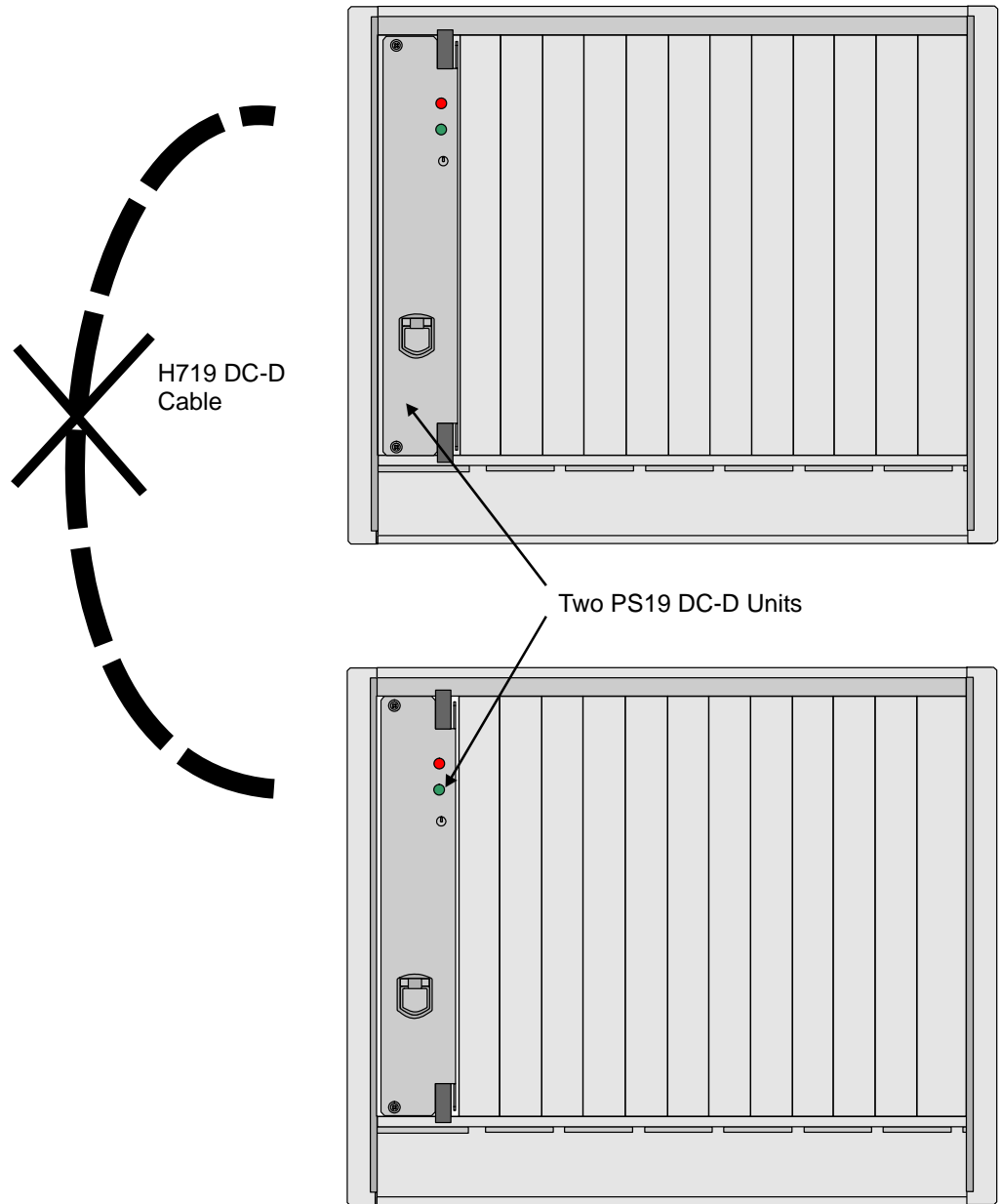


Figure 7-9 PS19 DC-D
Double Power (No Cable)



5 Ringer Database Programming

Max Ringers (Route: SFE,2)

The maximum number of SLTs which can be fed ring generators simultaneously from each PS19 DC-D is 33. By default, however, its value in the Coral database is set to 20. This default value can be altered via the Coral PI database's System Features (*Route: SFE,2*) branch, by changing the system-wide MAX_RING parameter value. See *Chapter 6 of the Program Interface and Database Reference Manual* for further details.

Defining Ringer Shelf Number (Route: RPS)

The Ringer Power Supply (RINGER PS) definition in the PI database of the RPS branch must be defined to reflect the actual peripheral power supply hardware setup per peripheral shelf. The (RINGER PS) default definitions are set up for *Double Power Modes*. For the *Economical* and *Redundant* Power Configurations, the RINGER PS definition per shelf must be updated to reflect the actual system setup, *especially* when increasing MAX_RING.

When a PS19 DC-D supplies power to SLT ringers located on two adjacent cages (*Redundant* or *Economical* Configurations), the two adjacent cages must share the same RINGER PS definition, via the Coral database (*Route: RPS*).

See *Chapter 6 — Ringers*, of the *Coral Program Interface & Database Reference Manual* for details on the parameter definitions.

6 Troubleshooting

Power supply failure generally results in the loss of one or more output voltages. However, protection circuitry in the power supply regulator circuitry may shut down a regulator because of a current overload caused by an external fault.

The red **Alarm** indicator on the front panel of the PS19 DC-D lights when any of the output voltages are outside of specification. This may be caused by internal or external faults. The technician must isolate the problem and replace the faulty unit when necessary, see below.



NOTE:

*The red **Alarm** indicator illuminates if any voltage supplied by the power supply is outside of specification. This could be caused by an internal or external fault. If the alarm indicator illuminates in a replaced power supply, the fault is not within the unit.*

All maintenance activities are to be carried out by a qualified service technician. The red **Alarm** indicator can be activated by malfunctions in the backplane, the power supply, in any of the cards inserted into the cage, or in any of the above in a connected cage.

For Redundant Peripheral Power Supply Units

(i.e. one PS19 DC-D installed on each of two adjacent shelves **and** connected via a cable on the backplane, see [Figure 7-8](#)):

- If one of the units is faulty, while the second unit is functioning properly, then the “red (ALARM) lit” unit is at fault and should be replaced.
- If both units have the red **ALARM** indicator lit, then both shelves are not functioning properly and the problem must be isolated to either both the units or one of the peripheral shelf cards.

Alternatively, the PS19 DC-D unit may not light any **Power** or **Alarm** indicator and shut down. Following the shutdown of a P19 DC-D unit, the F1 fuse within the PS19 DC-D or the fuse on the rear panel cage should be replaced. If this does not restore the unit, then the unit should be replaced.

Power Supply Switched to ON - Green Power Indicator is OFF

Check the following:

1. DC power supply interruption. (Range: -40 to -60 VDC)

Blown main or circuit fuse/breaker in the building electrical panel.

1. Blown fuse in the cage rear panel.
2. Blown fuse, F1, within the PS19 DC-D.
(Replace fuse as described in [PS19 DC-D Fuses, page 7-33.](#))
3. Faulty PS19 DC-D.
(Insert a different PS19 DC-D unit as described in [Installation, page 7-25.](#))

PS19 DC-D Fuses

The PS19 DC-D employs one fuse, F1, to protect the DC mains input.

- If the F1 fuse blows, the PS19 DC-D **Power** green indicator and **Alarm** red indicator do not illuminate.
- If the cage rear panel fuse blows, the PS19 DC **Power** green indicator and **Alarm** red indicator do not illuminate.

To replace the fuse within the PS19 DC-D

1. Remove the power supply unit from its slot and place it over the anti-static material with the component side facing upwards, as described on [Removing the power supply, page 7-26.](#)

CAUTION!

Do not insert or remove the PS19 DC-D unit from the cage when switched ON. Sudden power surges could damage system components.

1. Replace only with the same type and rating of fuse.
The PS19 DC-D card layout is shown in [PS19 DC-D Card Layout, page 7-20.](#)
2. Reinstall the power supply unit as described in [Installing the PS19 DC-D, page 7-25.](#)

Determining the Cause of the Alarm Indicator

The red **Alarm** indicator can be activated by malfunctions in the PS19 DC-D or one of the peripheral shelf cards. The Troubleshooting procedures for a lit Alarm indicator are described below, depending on the PS19 DC-D usage: Redundant, Double Power or Economical.

Double Power PS19 DC-D Case

For a single PS19 DC-D supplying power **only** to its own shelf/cage the peripheral cards must be individually examined.

1. Turn the PS19 DC-D power switch OFF (turn the switch downwards).
1. Disconnect the expansion cable(s) connected to the relevant cage.
2. Remove all cards from the relevant cage so that they protrude from the cage by approximately 1 inch (2.5 cm).
3. Switch ON the PS19 DC-D and check the red **Alarm** indicator.
 - If the **Alarm** indicator is lit, either the PS19 DC-D is malfunctioning or the problem is caused by the motherboard. Replace the PS19 DC-D unit.
 - If the **Power** indicator lights but the **Alarm** indicator is not lit, the unit is functioning properly and the alarm is being caused by one of the cards.
4. For cages that include common control cards (see table below).

Cage	Control Cards
IPx 3000XE FlexLITE	FLMS
IPx 4000XE	PB-ATS, or FLMM
IPx 4000XO	FLMM

To determine which control card is causing the problem, turn the PS19 DC-D power switch OFF again (turn the switch downwards) and re-insert the control card. Then turn the PS19 DC-D power switch ON and check the red **Alarm** indicator. Continue this process, adding one common control card at a time, and turning OFF the PS19 DC-D power switch before inserting each card. Turn the PS19 DC-D power switch ON and check the red **Alarm** indicator after inserting each card. If the red **Alarm** indicator is lit, the last card inserted is causing the problem and should be replaced.

Turn the PS19 DC-D power switch OFF, insert the common control cards (PB-ATS or FLMM). Then turn the PS19 DC-D power switch ON and check

the red **Alarm** indicator once again. If the the red **Alarm** indicator OFF, the problem is caused by one of the cards that was removed.

5. To determine which shared service and peripheral card is causing the problem, insert the cards into their appropriate slots, one by one, beginning from the right side of the cage. Ensure that the card's rear panel connectors engage properly with the backplane and that they initialize properly.
If the Alarm indicator lights when one of the cards is inserted, then that card is faulty.

Redundant PS19 DC-D Configuration

1. In the relevant cages turn the PS19 DC-D power switch OFF (turn the switch downwards).
1. Remove the H719 DC-D connector cable from the backplane to isolate the power supplies.
2. In the relevant cages turn ON the PS19 DC-D and check the red **Alarm** indicators.
3. Continue checking each cage separately in the manner described above. See [Double Power PS19 DC-D Case, page 7-34](#).

Economical PS19 DC-D Configuration

For a single PS19 DC-D supplying power to two shelves:

1. Turn the PS19 DC-D power switch OFF (turn the switch downwards).
1. Remove the H719 DC-D connector cable from the backplane to isolate the cage causing the Alarm.
2. Switch ON the PS19 DC-D and check the red **Alarm** indicator.
 - If the **Alarm** indicator is lit, continue checking the cage with the power supply, in the manner described above for the Double Power Case, skip to [Double Power PS19 DC-D Case, page 7-34](#).
 - If the **Power** indicator lights but the **Alarm** indicator is not lit, the unit is functioning properly and the alarm is being caused by the adjacent cage with no power supply or by the H719 cable.
3. Turn the PS19 DC-D power switch OFF (turn the switch downwards).
4. Remove the PS19 DC-D and install it on the adjacent cage (See [Installation, page 7-25](#)).
5. Switch ON the PS19 DC-D and check the red **Alarm** indicator.

- If the **Alarm** indicator is lit, continue checking the cage with the power supply, in the manner described above. See [Double Power PS19 DC-D Case, page 7-34](#).
 - If the **Power** indicator lights but the **Alarm** indicator is not lit, the unit is functioning properly and the alarm is being caused by the H719 cable.
6. Turn the PS19 DC-D power switch OFF (turn the switch downwards).
 7. Replace the H719 cable.

7 Specifications

PS19 DC-D (DC Power Supply-Duplication)

Coral systems:	IPx 800, 3000, 4000 (requires 30A/125V fuse on the cage rear panel)
Input:	-40VDC to -60VDC, 25A max.
Power Consumption:	Continues 575W per cage
DC Outputs:	+5VDC nom. regulated 20A max. -5VDC nom. regulated 0.25A max. +12VDC nom. regulated 5A max. -12VDC nom. regulated 0.25A max. -48VDC unregulated (or approx. 1.5V to 2.0V lower than input voltage) 12.0A max.
Message Output (for SLTs):	-120VDC, 0.4A max.
Ringer Outputs (for SLTs): Voltage: 85V _{RMS} Frequency..... 20Hz or 25Hz (jumper selectable) Capacity 20VA Max.
Alarm:	Signaling malfunction Front panel LED indicator (red)
Indicators:	Power ON/OFF (green) ALARM (red)
Fuses: Input (-48VDC)..... 25A/125V S.B. Output None
Controls and Adjustments:	ON/OFF power switch Output ring frequency
Weight:	3.0 kg



7.3 PS-ATS

Control Power Supply Unit

1 General Description

The Control DC Power Supply (PS-ATS) provides internal operating voltages for the Coral IPx 4000 and FlexiCom 6000 systems control shelf.

The PS-ATS operates from a nominal input of -48VDC , typically supplied by an external 48VDC rectifier or stationary battery plant. Actual input may vary from -40 to -60 VDC allowing operation:

- From a battery power source while the batteries are charged at an equalize charge rate
- Under power failure, until the batteries are completely discharged.

PS-ATS Front Panel

Figure 7-10 illustrates the front panel of the PS-ATS unit. The following items located on the front panel are described in the following table:

<i>Feature</i>	<i>Description</i>
Power (green) Indicator	Lights when power is supplied to the system.
Fail (red) Indicator	Lights when the PS-ATS is faulty. It lights up when one of the voltage outputs (+5V, +3.3V, +12V, -12V) exceeds its specified range.
Handle	Enable the insertion and extraction of the unit into its card slot.
Top and bottom captive screws	Four mounting screws (two at the top and two at the bottom) used to secure the unit to the cage. These screws also ground the unit to the cage.

Figure 7-10 PS-ATS
Front Panel



Dual Power Supply

Supplying power is shared between two PS-ATS units. Either of the units is capable of providing the full power supply needs of the entire control system, when one of the PS-ATS units malfunctions. Alarms indicate the fault and inform the administrator via the various alarm indication facilities. The faulty PS-ATS unit can be replaced while the system is live and operating (Hot Standby), without the need to shutdown any part of the system.

2 Circuit Description

Figure 7-11 presents a block diagram of the PS-ATS power supply circuits and voltage inputs and outputs.

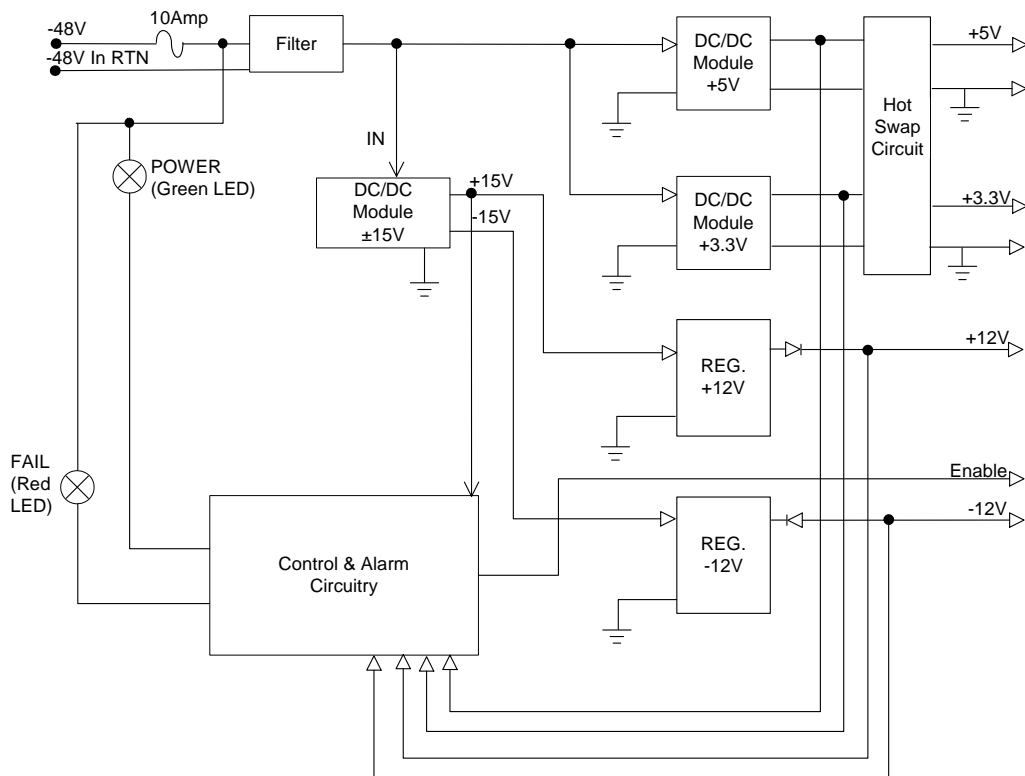
The PS-ATS includes two separate switch mode, DC-to-DC converters that convert the -48VDC input power to the $+5\text{V}$ and $+3.3\text{V}$ outputs. Another switch mode, DC-to-DC converter, along with two regulators provide the $+12\text{V}$ and -12V output. Filtering circuitry minimizes ripple and noise on the -48VDC feed to the Control cards.

The PS-ATS also contains Hot Swap circuitry for redundancy purposes.

The Control and Alarm (monitoring) circuitry verifies that each voltage output (with the exception of the -48VDC output) is within specification. Should an output voltage deviate from specification, the monitoring circuitry produces an alarm signal to the system processor (displayed on the PI terminal), causing the red **Fail** indicator to illuminate. Additionally, the green **Power** indicator remains illuminated when power is supplied to the system.

If the Voltage input drops below -40VDC , then the PS-ATS shuts down.

*Figure 7-11 PS-ATS
Circuitry Block Diagram*



3 PS-ATS Orientation and Installation

The system may include up to three PS-ATS units for redundancy.

The Hot Standby system is designed to allow *hot insertion* and *hot swaps* of a PS-ATS unit, such that, if one of the PS-ATS units malfunctions, system operation — call processing and maintenance is not interrupted because the second unit alone can continue to power the control shelf.

A PS-ATS unit is installed on the right side of the control shelf (two slots, PS2 and PS3 are provided for the units on the right side, see [Figure 6-9](#)) in an upright position.

The PS-ATS unit on the left side is installed upside down in slot PS1.

Installing the Power Supply Units

Two Power Supply Units are normally shipped in the Common Control Shelf already fastened into place. Verify that the two power supplies are installed in slots PS2 and PS1 on the bottom corners of the Control shelf. There is an empty third power supply slot in the upper right hand corner (slot PS3). This slot is for future Coral Configurations.

1. To insert the PS-ATS unit(s), grasp its handle with one hand.
1. Verify that the power supply is oriented correctly:
 - When installing the PS-ATS in either slot *on the right side*, in slots PS2 and PS3, ensure that the Fail and Power LEDs are located at the top of the unit, see [Figure 7-12](#) for correct card orientation.
 - When installing the PS-ATS *on the left side* of the control shelf, in slot PS1, ensure that the Fail and Power LEDs are at the bottom of the unit (i.e. install the unit upside down), see [Figure 7-13](#) for correct card orientation.
2. Align the unit with the card slot guides and forcibly push the power supply straight into the card slot. Resistance is felt as the multi-pin connectors on the power supply meet the mating connectors on the backplane and engage.
3. Force the PS-ATS completely into its slot until the front panel of the power supply is flush with the front frame of the card cage. If more than considerable resistance is encountered, remove the power supply and examine the connectors for bent pins or interfering debris.

CAUTION!

Irreparable damage may occur if the multi-pin connectors are misaligned during unit installation.

4. When the PS-ATS unit is flush with the front of the control shelf, fasten the four captive mounting screws on each corner of the unit.
5. After power is supplied to the system, verify that the green **Power** indicator illuminates.

Figure 7-12 **PS-ATS Orientation for Installation in Slots PS2 and PS3**

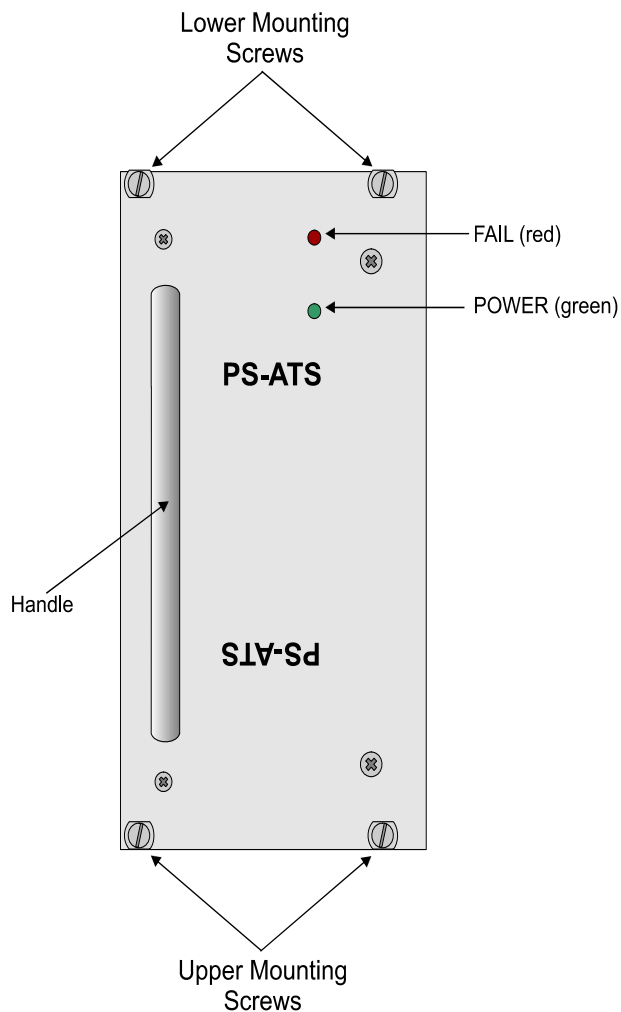
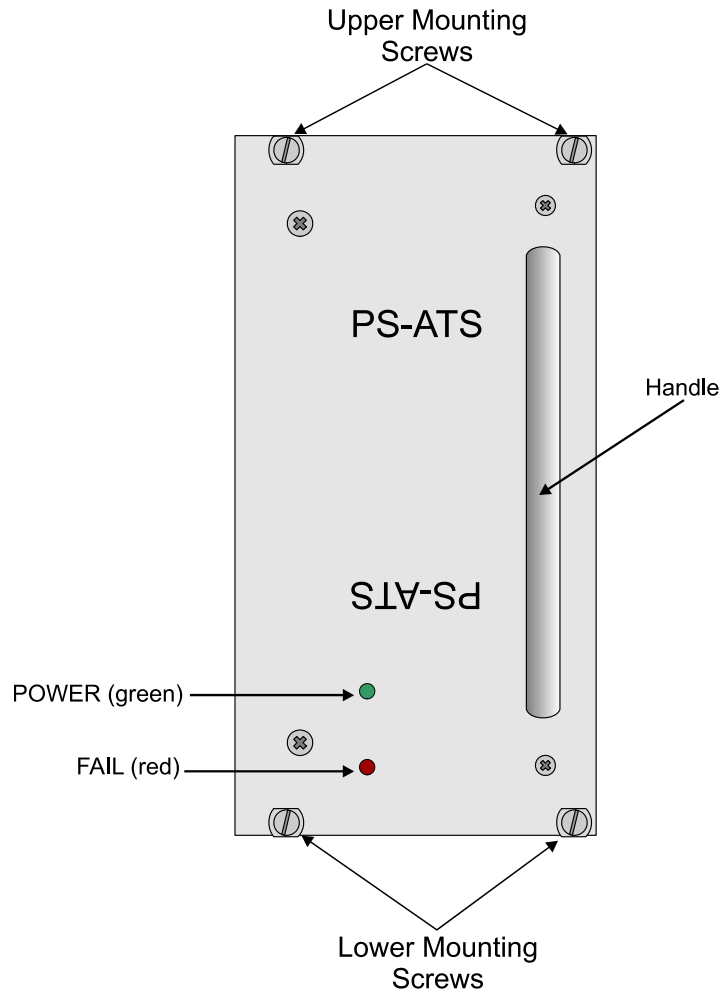


Figure 7-13 PS-ATS
Orientation for
Installation in Slot PS1



4 Troubleshooting

Power supply failure generally results in the loss of one or more output voltages. However, protection circuitry in the power supply regulator circuitry may shut down a regulator because of a current overload caused by an external fault.

The red **Fail** indicator on the front panel of the PS-ATS illuminates when any of the output voltages are outside of specification. This may be caused by internal or external faults, the technician must isolate the problem and replace the faulty PS-ATS when necessary.

In a Hot Standby system, if one PS-ATS is faulty, while the second PS-ATS is functioning properly, then the “red lit” PS-ATS is at fault and should be replaced.

If both PS-ATS units have the red **Fail** indicator illuminated, then the Coral system is not functioning properly and the problem must be isolated to either both the PS-ATS units or one of the Control Cards or the backplane unit.

Following the shutdown of a PS-ATS unit, the fuse should be changed. If this does not restore the unit, then the PS-ATS unit should be replaced.

Determining the Cause of the Fail Indicator

The red **Fail** indicator can be activated by malfunctions in the PS-ATS, the control shelf cards or the backplane.

1. Turn off the Main Power to the Coral System.
1. Turn off all the Peripheral Power Supply units (PS19 DC and PS19 DC-D) units in each Coral cabinet.
2. Extract each control card from the control shelf so that it protrudes at least by one inch (2.5 cm).
3. Unscrew the 4 screws on the front panel of each PS-ATS unit.
4. Forcibly pull out the PS-ATS units from their slots so that they also protrude from the card cage.
5. Turn on the Main Power to the Coral System.
6. Insert only one PS-ATS unit.
 - If the red FAIL indicator lights, then this PS-ATS is faulty and should be replaced. Repeat this procedure for the other PS-ATS unit.
 - If the green Power indicator lights but the red FAIL indicator does not light, then the PS-ATS is functioning properly. Continue with the next step.

7. Begin checking the other units and determine the faulty unit by process of elimination. Continue with the next step.
8. Begin checking all the Control Cards on one side, one at a time, and then the Control Cards on the other side by inserting the cards one by one beginning from the middle of the control shelf with each side. Ensure that the card's rear panel connectors engage properly with the backplane and that they initialize properly.
 - If one of these cards is faulty, it must be replaced.
 - If all the Control Cards are functioning properly, continue with the next step.
9. If all the Control cards and PS-ATS units are functioning properly, then the control shelf backplane and MPG-ATS unit must be checked for faults and replaced if needed.
10. After the faulty unit has been located and replaced, and *after* returning power to the Coral, thus powering the PS-ATS unit(s), turn on all the Peripheral Power Supply units in each peripheral cage of the Main and Expansion cabinets.

PS-ATS Fuses

The PS-ATS units are wired in series with fuses located on the front panel (top left-hand corner) of the control shelf (PS1, PS2, & PS3), see [Figure 6-9](#). Each of these fuses is wired in series with the labeled PS-ATS unit. Additionally, each PS-ATS unit, includes a 10A S.B. fuse, F1, (see [Figure 7-16](#)) within the PS-ATS unit.

Additionally, a Power Input Fuse (30A/F 60VDC) is located in the Power Input Cavity, (in the rear of the main cabinet at the top left-hand corner, see [Figure 2-4](#)) protecting the circuitry in the entire cabinet.

Refer to [Figure 7-14](#) and [Figure 7-15](#) for a DC wiring diagram of the Power Cabling and Fuse series.

Figure 7-14 Coral
IPx 4000C Control Shelf
DC Power Cabling
Connections

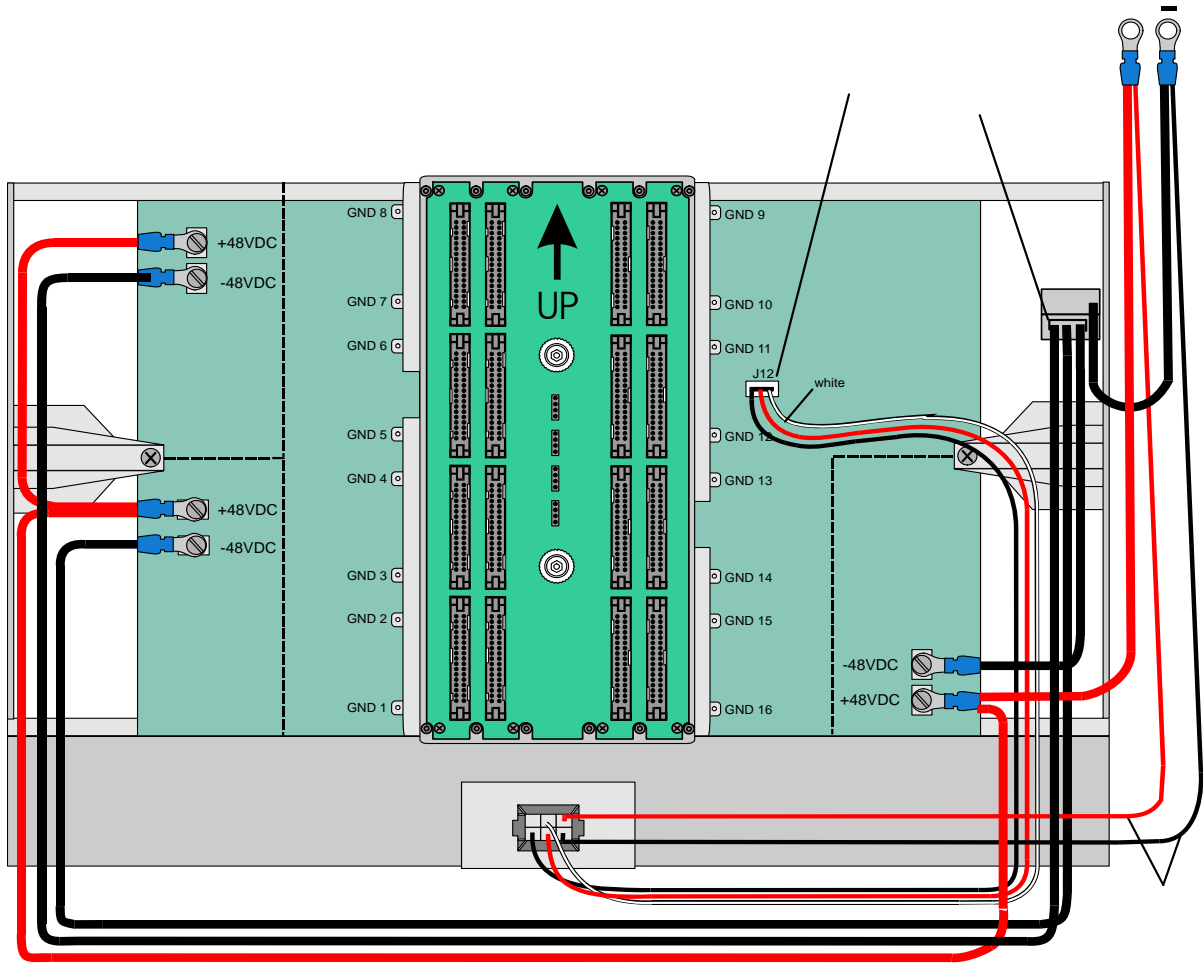
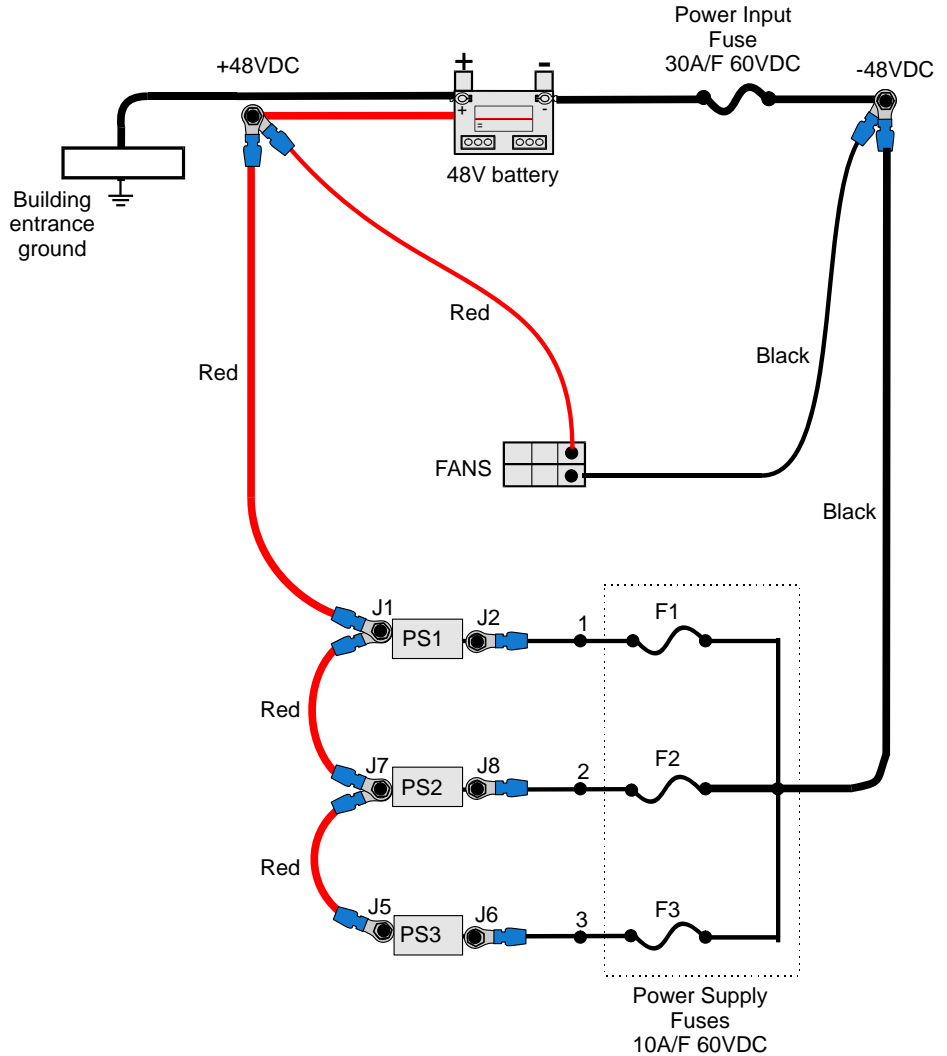


Figure 7-15 Coral IPx
4000C Control Shelf
Power Cabling and Fuses



Locating the Blown Fuse

In case any one of these fuses blows (except for the Power Input Fuse), a system alarm is immediately displayed on the PI screen indicating which PS-ATS unit has failed (PS1, PS2 or PS3). The technician must determine which of the three PS1, 2, or 3 fuses has blown. The fuses located on the front panel of the control shelf have a red indicator which can be clearly viewed at the top of the fuse case once it has blown. If none of those fuses has a red *tip*, then the F1 fuse inside the indicated PS1, 2, or 3 has blown and must be changed.

Replacing the PS1, PS2 or PS3 Slot Fuses

The PS1, PS2 and PS3 Front Panel fuses have a spare fuse located on the left side of the control shelf.

1. Remove the PS-ATS from its card slot.
2. Remove the clear plastic fuse case.
3. Forcibly remove the blown PS-*n* fuse by pulling it directly outwards.
4. Replace the burnt fuse with the fuse located on the left side of the control shelf.

Replacing the PS-ATS F1 Fuse

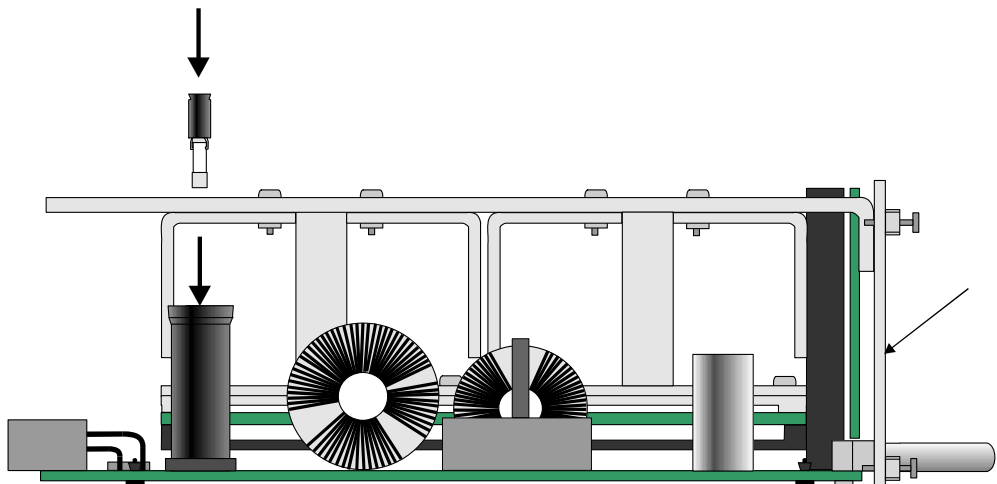
1. Unscrew the mounting screws at the top and bottom of the faulty PS-ATS.
2. Remove the PS-ATS by gripping the handle and pulling with slight force.
3. Place the PS-ATS on its side, such that the handle is closest to the table.
4. Insert a flat head screwdriver in the F1 position, see [Figure 7-16](#). Turn the screw driver counterclockwise until the fuse pops up and remove it.
5. Replace with a new 10A/250V S.B. fuse.
6. Replace the PS-ATS unit.
7. Fasten the mounting screws to secure the PS-ATS into place.



NOTE:

Removing one Power Supply Unit in a Hot Standby system does not affect call traffic in any way.

Figure 7-16 PS-ATS Side View



5 Specifications

PS-ATS

Coral systems:.....	IPx 4000 FlexiCom 6000
Input:	-40VDC to -60VDC, 6A Max.
Output:	+5.2VDC, 20A Max. +3.3V, 20A Max. +12V, 1A Max. -12V, 0.5A Max.
Indicators:	Power ON (green) ALARM/FAIL (red)
Fuses:	Input 10A/250V S.B.
Controls and Adjustments:	None

Common Control Cards

Coral

8.1	Common Control Shelf (IPx 4000C)	8-1
8.2	MCP-ATS	8-17
8.3	32GC	8-61
8.4	4/8XMM	8-75
8.5	CLA-ATS	8-81
8.6	PB-ATS	8-107
8.7	PBD-ATS	8-115
8.8	PBD24S	8-119

8.1 Common Control Shelf (IPx 4000C)

General Description

1 General Information



NOTE:

Various types of MCP and CLA cards may be utilized in the Coral IPx 4000 system. [Table 8-1](#) and [Table 8-13](#) lists the different MCP and CLA cards used in the Coral IPx 4000 system.

In this document all MCP cards are referred to as the MCP-ATS and all CLA cards are referred to as the CLA-ATS, except for the discussion of the card layout and BIOS settings.

The Coral IPx 4000 system provides a Hot Standby Dual Control System which offers a significant measure of system reliability and protection by assuring non-stop operations despite the possible failure of any control component. The redundant Coral IPx 4000/R includes two complete sets of control hardware, each able to perform the control operations of the entire system. Independently, the two sets function interchangeably making it possible for either set to take over control functions automatically in the event of malfunction to any portion of the control system. Similarly, the readily available second control system facilitates maintenance needs so that when periodic routine maintenance procedures are carried out, there is no interference to the continuity of the system operations.

The Common Control portion of the Coral system provides the control mechanism for establishing audio and data connections or calls via the PCM bus between Peripheral I/O ports in the system.

Common Control is divided into five different functions:

- Main Processor
- Generic Feature Memory
- Database Memory
- Mirrored Memory and Switching Matrix
- Peripheral Bus Interface or Group Controller

Each standard Coral Common Control card set includes an MCP-ATS Main Processor, a 32GC card, and an SAU unit. Some Coral systems may also include dual CLA-ATS card(s) and/or 4/8XMM expanded memory card(s) which are provided in separate packaging and require installation in the control shelf.

The MCP-ATS card is the main control processor of the system. The 32GC card serves as a communication link in the system, between the control cards and the PB-ATS cards located in peripheral shelves. The 32GC card contains the clock circuitry to synchronize the peripheral section of the system, digital tone generators (dial, busy, ringing, ringback, DTMF, MFC, and test), High-Level Data Link Control (HDLC) bus interface circuitry, and Pulse Code Modulation (PCM) bus interface circuitry.

The optional CLA-ATS card incorporates the applications processor and Ethernet interface circuitry for the FlexCT CoraLINK computer-telephony integration (CTI) link.

The MCP-ATS, CLA-ATS, and 32GC card reside in designated card slots in the card cage. The 4/8XMM card is a daughter card that is mounted on the 32GC card to increase the Coral database when needed. The 4/8XMM is also a required shared memory card for the CLA-ATS card.

The card slot designation appears below each common control card slot on the front of the card cage.

An SAU device is attached to the SAU port on the front panel of each 32GC card.



NOTE:

All Coral systems that include the optional CLA-ATS card, require a 4XMM or 8XMM expanded memory daughter card installed on the 32GC, as the CLA-ATS card retrieves its memory from the XMM.

Tadiran Telecom branded cards: CLA-ATS/A or CLA-ATS requires MCP-ATS/A or MCP-ATS (Tadiran Telecom branded) catalogue number 72449163100, issue R09000017 or higher & CLA version 09.02.08 or higher.

IPx 4000C Common Control Shelf

The Common Control Shelf is positioned at the bottom of the main control cabinet. It is built to provide two sets of slots for the components required for the redundant control sides of a Coral IPx 4000R Hot Standby (HSB) system. The corresponding slots appear on the left and right sides beginning from the middle outwards, for each set of control system cards. A single motherboard, the MBC-ATS, behind which the MPG-ATS resides, serves as the backplane for both sets of control systems.

2 Control Shelf Backplane Connections

The MPG-ATS card is the main cable connection card attached to the center of the rear backplane of the control shelf. Two sets of cables are attached from the MPG-ATS card to each of the even numbered peripheral shelves.

Figure 8-1 shows the rear backplane of the Control Shelf where the MPG-ATS card is installed in the center. The MPG-ATS card is factory installed.

Replacing an MPG-ATS

The MPG-ATS card is designed for durable and long term use. However, if the need to replace one arises, follow these directions:



The MPG-ATS card can only be replaced on a system which is shut down.

1. Unfasten the 14 mounting screws (4 on each side of the MPG-ATS, 3 on the top and 3 on the bottom).
2. Unfasten the two Hex socket screws on the middle of the MPG-ATS card.
3. Grasp both knobs and unfasten them simultaneously by turning them counter-clockwise.
4. Pull on the knobs. The MPG-ATS card pulls off.
5. Grasp the knobs of the replacement MPG-ATS card, align the connectors with their complements on the Control Shelf backplane, noting the **UP** indication for the top of the MPG-ATS card.
6. Push the MPG-ATS knobs toward the backplane studs to secure the connections.
7. Turn the knobs until they are tight.
8. Fasten the 12 mounting screws on the sides of the card.
9. Connect the required cables.

Figure 8-1 Control Shelf: Rear Backplane

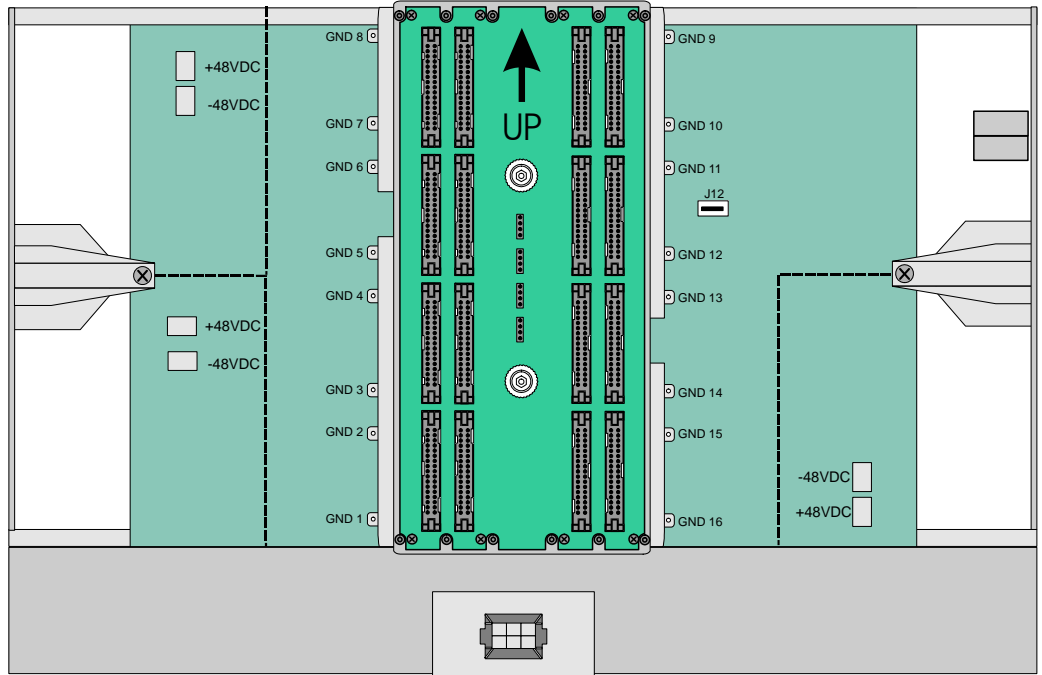
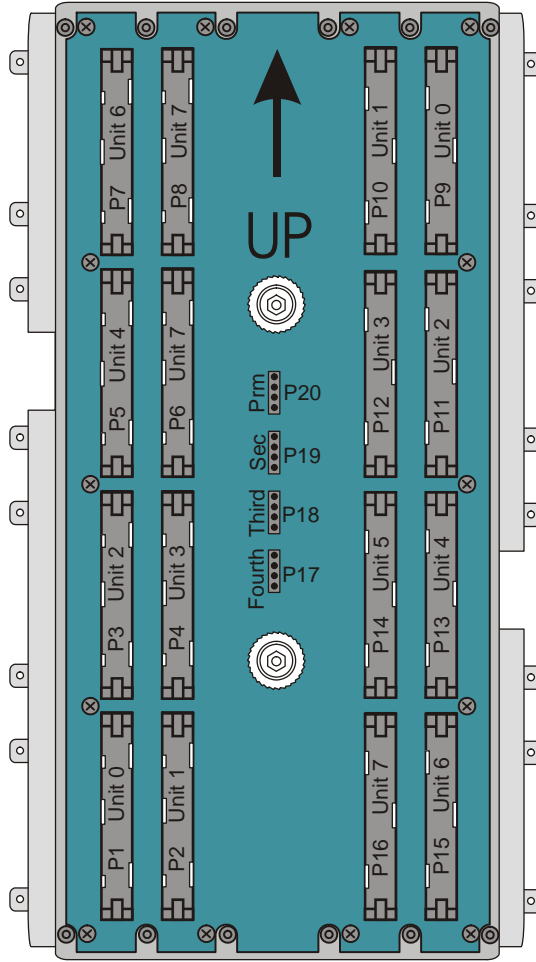


Figure 8-2 **MPG-ATS**
Interface Card Layout



3 Control Card Assignments

The Control Shelf is divided in half to provide corresponding slots for each set of control cards. The Control Shelf contains two sets of control cards standing side by side. Each set has seven slots. The component cards on the right side are duplicated on the left side in reverse and upside down order.

Figure 8-3 illustrates the front view of physical structure of the Control Shelf. Each Control system side consists of the following slots placed in the order from the middle outward:

- 32GC Control Card
- Spare 1 (Unused Slot)
- Spare 2 (Unused Slot)
- CLA-ATS (Optional)
- **NOT USED**
- MCP-ATS
- **NOT USED**

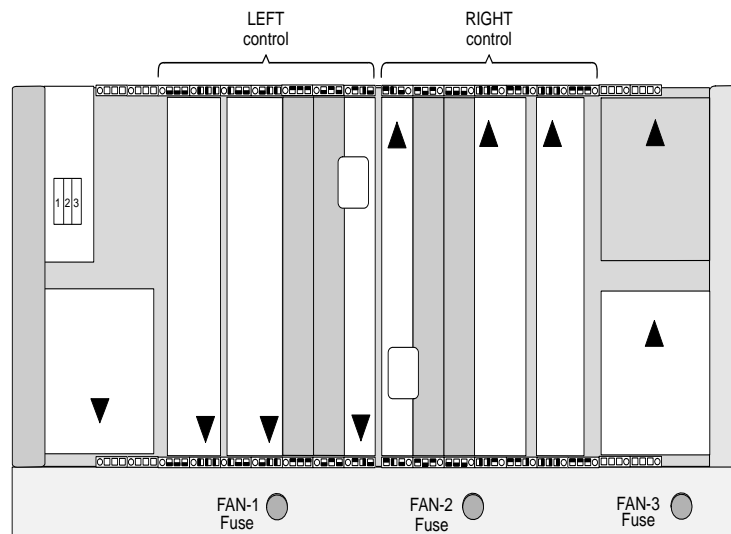
In addition to these cards, the Coral system includes:

- 4/8XMM optional expandible memory daughter card installed on the 32GC card
- SAU unit which attaches to the 32GC card front panel (one for each 32GC)

Three slots are provided for Power Supply PS-ATS units, indicated in the figure as PS1, PS2 and PS3. Power Supply alarm fuses are located in the upper left corner. The Power Supply units and fuses are described in *Chapter 7, Power Supplies*.

The Fan tray is located at the bottom of the Control Shelf and is described below in *Fan Tray on page 8-15*.

Figure 8-3 Coral Control Shelf - Front View



4 Card Handling Procedures



Each of the Common Control cards contain circuitry, which is sensitive to electrostatic discharge (ESD). Failure to observe safe handling procedures for static sensitive circuitry may result in permanent damage to a card.

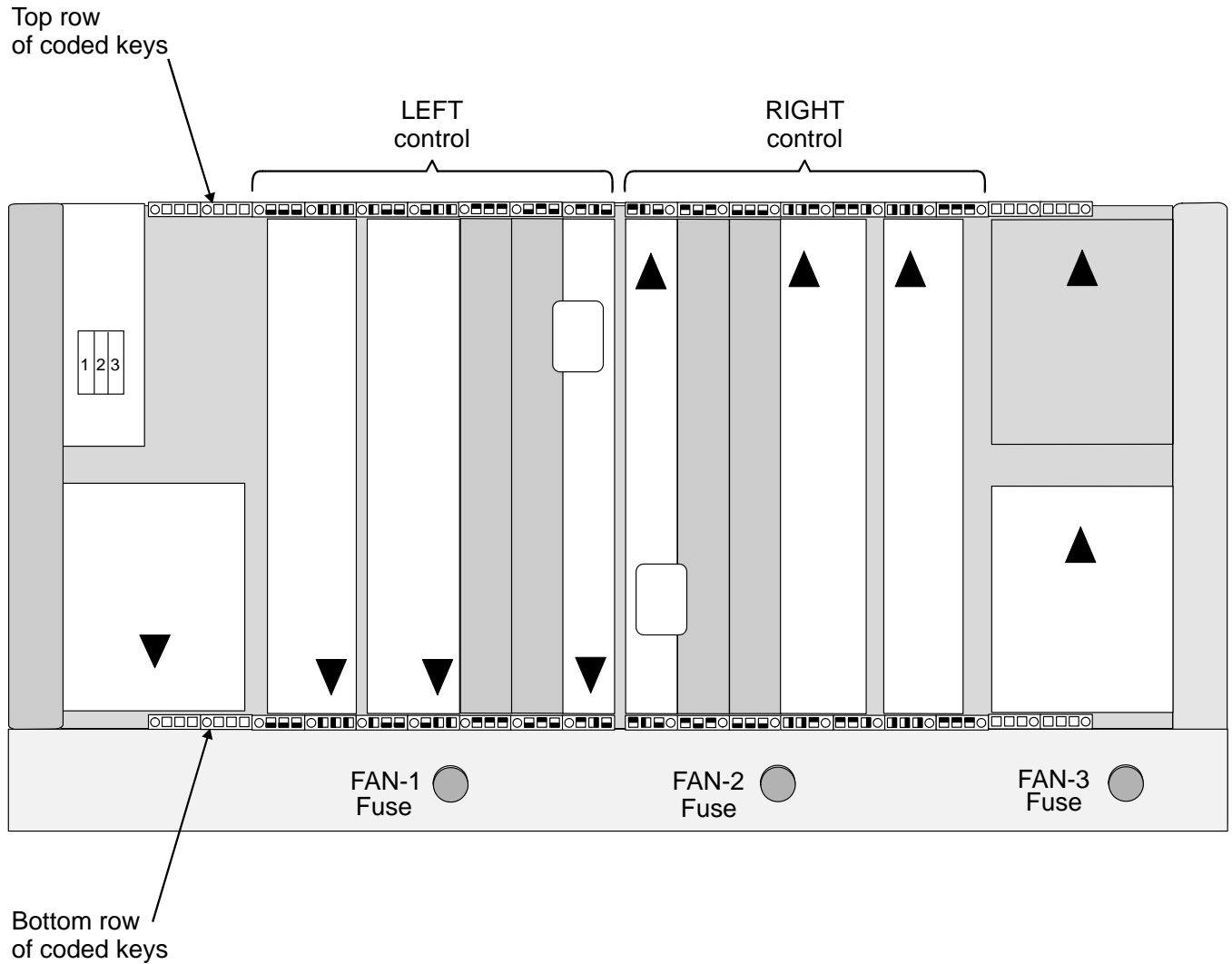
The system cabinet is equipped with an anti-static wrist strap attached to the top above the card cage. This wrist strap should be worn while inserting removing or handling any card in the system.

Slot Coded Keys

Each Control Shelf slot is equipped with physical coded keys, a mechanical feature, designed to compel correct card placement and to prevent the possibility of placing any circuit card in the wrong position. Three coded keys are placed at the front of each slot. Corresponding matching coded keys are placed the top and bottom of each control card. The physical coded keys on the Control cards are positioned such that when the card is inserted, the shelf and card coded keys must match for the card to insert fully into the slot.

The coded keys prevent inserting the wrong card into a slot. *Figure 8-4* illustrates the control shelf slot's coded keys.

Figure 8-4 Control Card Slots and Coded Keys



NOTE:

Never force the insertion of a Common Control card in a slot other than the one designated for that card. Irreparable damage may occur if a Common Control card is placed in an incorrect slot with power applied.

5 Inserting and Removing a Control Card

This section describes how to insert and remove a control card from the main control card cage. For specific information pertaining to the following cards, see the following:

- For 32GC control card, see [Inserting a 32GC Card, page 8-73](#)
- For CLA-ATS control card, see [Inserting the CLA-ATS Card, page 8-104](#).

Inserting a Control Card

1. Connect the ESD wrist strap connector to the cage and put on the strap.

CAUTION!

Circuit cards contain static-sensitive circuitry and might be damaged or destroyed by electro-static discharge (ESD). Always wear the static dissipating wrist strap connected to the system cabinet or card cage while handling circuit cards. Hold circuit cards by their edges and avoid touching contact surfaces. Handle with care and do not drop. Failure to observe safe handling procedures for static sensitive circuitry may result in permanent damage to a card.

2. If applicable, remove the battery protection insulator strip from underneath the battery. See [Lithium Backup Batteries, page 8-14](#).
3. If applicable, verify that the daughterboard has been assembled onto the control card.
4. Verify that jumper P10 (when installed) is set to the MASTER (2-3) position.
5. Locate the correct card slot and orient the card as follows:
 - If this card is to be inserted on the right side of the control cage, insert the card right side up (the component side of the card is facing right). See Figures [8-17](#) through [8-14](#) and [8-20](#) for upright cards.
 - If the card is to be inserted on the left side of the control cage, insert the card upside down (the component side of the card is facing left).
6. Align the card top and bottom edge of the card on the slot guides.

7. Do one of the following:
 - If the card ejectors include safety latches, simultaneously grasp both ejectors with your thumbs pressing on the latches and then push the ejectors in the direction of the arrows. See [Figure 8-5](#).
 - If the card ejectors do not include safety latches, simultaneously push the ejectors in the direction of the arrows. See [Figure 8-5](#).
8. Push against the front panel of the card until it clicks into place and it is flush with the unit frame. The connecting pins on the backplane should engage with the card's connecting pins. A slight resistance is felt as the multi-pin connectors on the card mate with connectors on the backplane.

CAUTION!

Do not force the card into the slot. If more than slight resistance is encountered, remove the card and examine the connectors for bent pins or interfering debris.

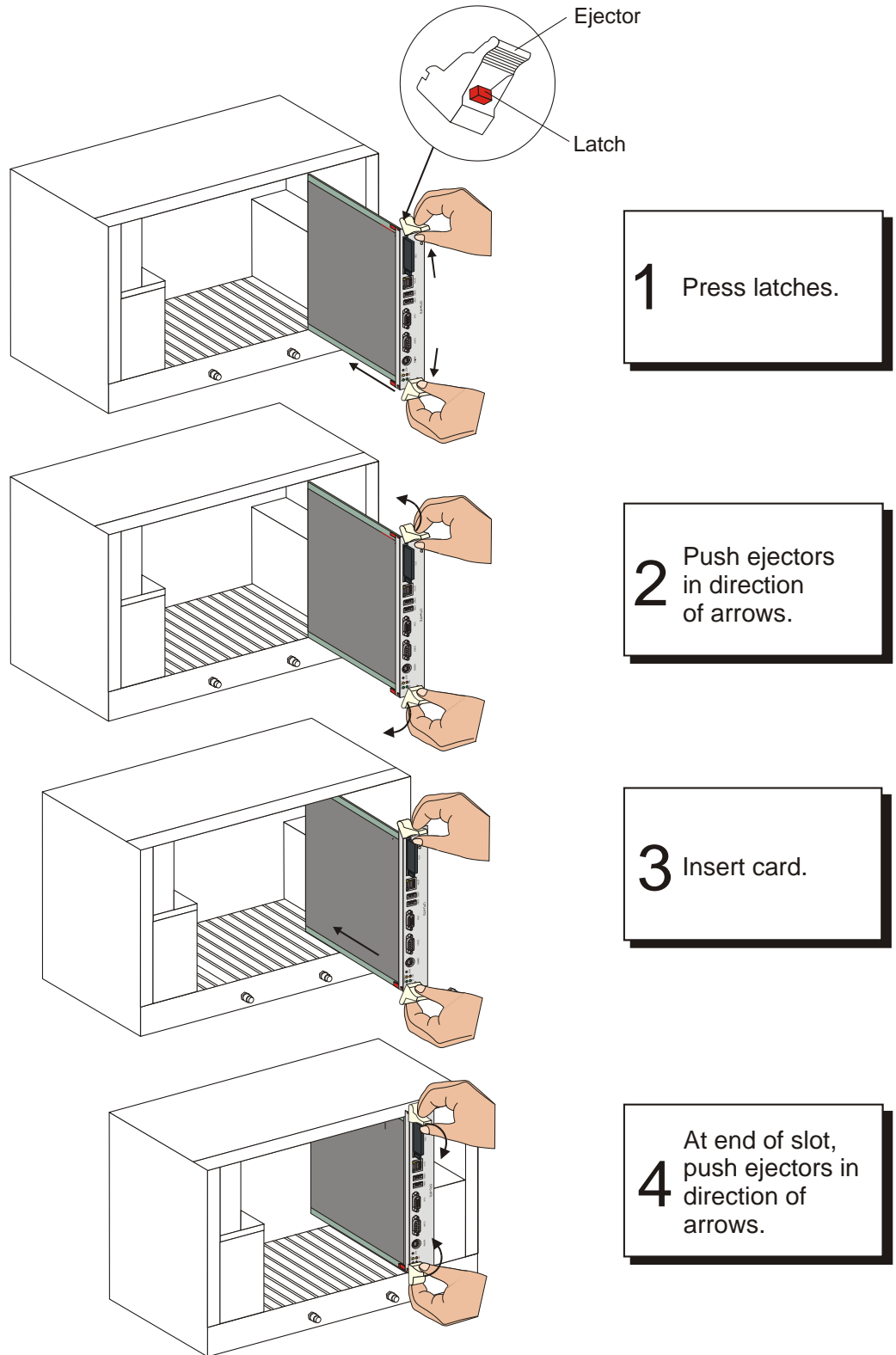
9. Verify that the card is flush with the card cage.
10. Verify that the card front panel LEDs indicate that the card is functional. See the front panel description of the relevant card:
 - [Table 8-5, MCP-ATS Front Panel LED Indicators, page 8-30](#)
 - [Table 8-12, 32GC Front Panel Components, page 8-62](#)
 - [Table 8-17 CLA-ATS Front Panel LED Indicators, on page 8-95](#)

CAUTION!

Do not fasten the card to the cage with screws. A card that is fastened to the cage with screws might be damaged if the screws are not unfastened before card removal.

11. Connect any front panel cables, if necessary.

Figure 8-5 **Inserting the Control Card**



Removing a Control Card

1. Connect the ESD wrist strap connector to the cage and put on the strap.

CAUTION!

Circuit cards contain static-sensitive circuitry and might be damaged or destroyed by electro-static discharge (ESD). Always wear the static dissipating wrist strap connected to the system cabinet or card cage while handling circuit cards. Hold circuit cards by their edges and avoid touching contact surfaces. Handle with care and do not drop. Failure to observe safe handling procedures for static sensitive circuitry may result in permanent damage to a card.

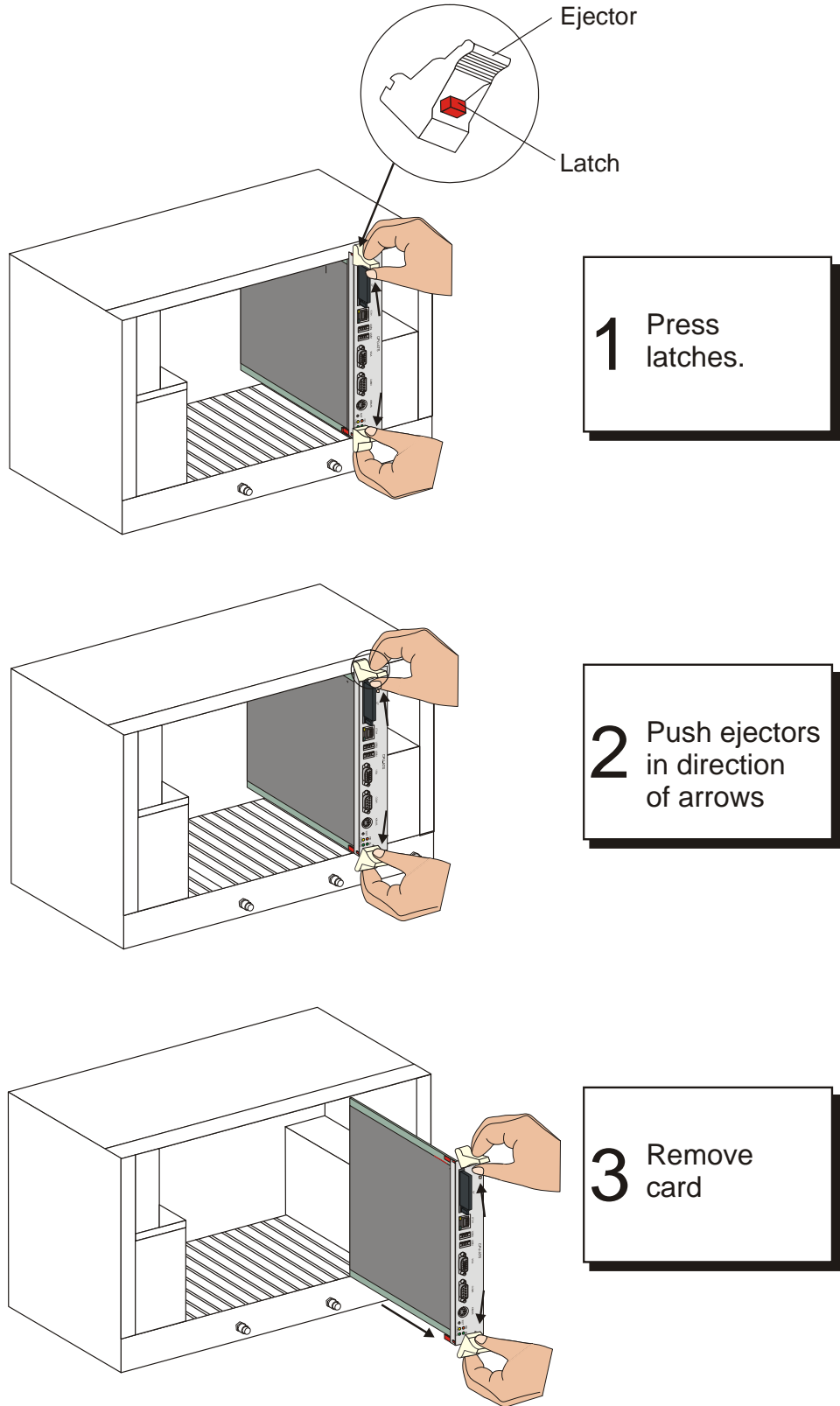
2. Disconnect any front panel cables.
3. Unfasten any screws that might be securing the card to the cage (positioned behind the ejectors).
4. Do one of the following:
 - If the card ejectors include safety latches, simultaneously grasp both ejectors with your thumbs pressing on the latches and then push the ejectors in the direction of the arrows. See [Figure 8-6](#).
 - If the card ejectors do not include safety latches, simultaneously push the ejectors in the direction of the arrows. See [Figure 8-6](#).

CAUTION!

Do not remove the card from its slot when the HD LED or IDE LED is flashing, indicating CFD or Hard Drive activity.

5. Remove the card from the cage or shelf.

Figure 8-6 **Removing the MCP-ATS Card**



6 Lithium Backup Batteries

A new lithium battery can maintain power to memory circuitry and real-time clock for approximately 90 days. The battery is *not* recharged by the system power. Therefore, if the battery is nearly depleted, the contents of the memory must be backed up and the battery replaced. The backup battery includes an insulator that is removed before inserting the card into its slot. Refer to the layout drawing of every control card for the location of the battery insulator position and the direction of removal. For 32GC cards, an alarm message is displayed on the PI terminal. See [32GC Card Lithium Battery Test on page 3-17](#).

Testing the Lithium Battery

The battery voltage, tested under load, can be used to determine its state of charge. Voltage measured across an unused battery connected to the memory circuitry must be between 3.30 and 3.35 volts. If the voltage is less than 2.50 volts, replace the battery. For first time use, remove the protective battery insulator. See the layout drawing of the relevant control card.

Replacing the Lithium Battery

1. Carefully lift the battery with your thumbnail.

CAUTION!

Do not use any metal tool to release or insert the battery. Doing so could result in a short circuit and damage the battery.

2. Insert the new battery with the + (positive) symbol appearing on top.

WARNING!

Explosion and Environmental Hazards.

There is a danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to requirements specified by the battery manufacturer and/or local regulatory agencies.

7 Fan Tray

The Fan tray is located at the bottom of the Control Shelf and provides the cooling system for the components located in the Control Shelf. The Fan Tray contains three fans, each fuse protected. The fans force air through a filter to cool the control cards and power supply units.

The size of each fan is 120x120x80mm and supplies a minimum of 77 CFM at the rated voltage. The fans operate from the main -48V power supply.

On the back of the fan tray is a connector through which the power and signaling are connected.

Each fan has a fuse providing electric fault protection. Should a fan malfunction, an alarm message is immediately displayed on the PI terminal: **FAN FAULT**. The faulty fan component should be changed as soon as possible.

The technician must determine the faulty component, either one of the fuses has blown and must be replaced, or one of the fans is not functioning. The fan tray should be replaced only when the main power to the system is turned **off**.

The alarm signals from the fan to the 32GC card are isolated from the 48V power source by an opto-coupler device.

Determining the Fan Fault and Replacing the Fan Fuses

When a FAN FAULT alarm has been sent to the PI terminal, the technician must check the fan tray and isolate the problem to either a faulty fuse or one of the fans.

1. Remove the Fan Tray fuses one at a time to locate the blown fuse by twisting the fuse counter-clockwise and removing.
2. Inspect the fuse. If it is blown, replace with new fuse, by reinserting a new 0.5Amp/250V fuse.
3. Twist back into place.
4. If none of the fuses are blown then one of the fans is not functioning (this may be obvious by simple inspection) and continue with [Replacing the Fan Tray](#), below. Otherwise, the FAN FAULT repair terminates with the repaired fuse.

Replacing the Fan Tray

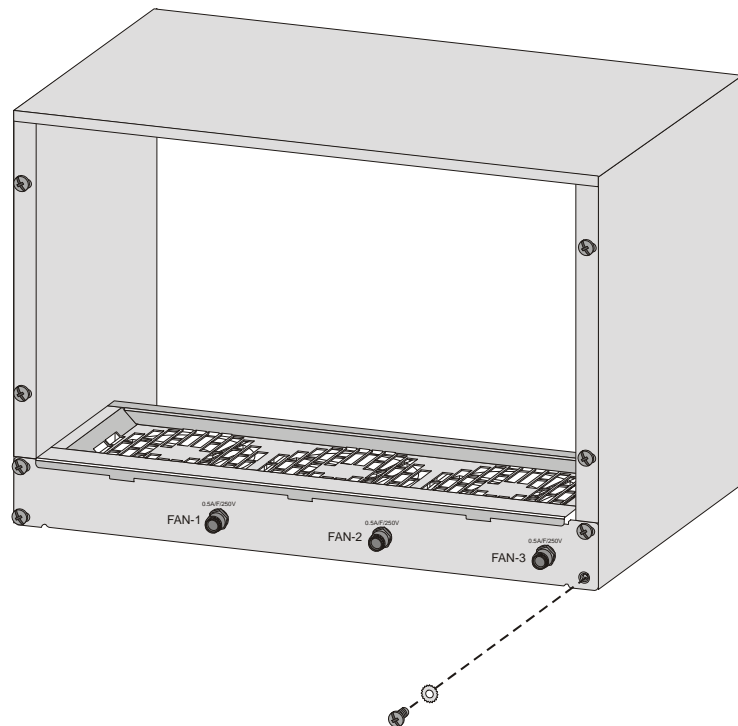


NOTE:

Main Power should only be turned off when call traffic is lowest to avoid interrupting an operative Coral system.

1. Firmly pull out the fan tray.
2. Insert the new fan tray and gently push it back completely into its slots so as to assure the backplane connections are secure.
3. Fasten the screws, attaching the fan tray to the chassis.
4. Return Power to the system and check that all the fans are functioning properly.

Figure 8-7 **Control Shelf Fan Tray**



8.2 MCP-ATS

Main Processor Card for IPx 4000C

1 General Description

Various types of MCP cards may be utilized in the Coral IPx 4000 system. [Table 8-1](#) lists the different MCP cards used in the Coral IPx 4000 system and lists the Figure number depicting its card layout in this manual. These MCP cards are functionally identical, the only difference between the cards is the minimum requirement of Coral Software Version, covered in detail in [Table 8-2](#). In this document all MCP cards are referred to as the MCP-ATS except for the discussion of the card layout and BIOS settings.

The MCP-ATS is the main control processor for the Coral IPx 4000 system. The MCP-ATS card supervises overall system operation.

The MCP-ATS card contains the main control processor circuitry and utilizes a powerful microprocessor with PC architecture, which connects to the backplane with Compact PCI.

The front panel of the MCP-ATS card includes a communication serial COM (PC port) for programming and maintenance interface. The main processor receives status messages from the system ports and determines the appropriate response based on programming entries contained in the system database.

The MCP-ATS is a “hot insertion” card which allows the technician to remove the card from its powered up slot while the MCP-ATS from the other side takes control.

Program Interface Connection

The Program Interface (PI) provides a menu driven program facility for viewing and updating the Coral system database, and for performing and monitoring diagnostic routines, from a simple data terminal or personal computer. The PI terminal is connected to the COM1 (9 pin RS-232 connector) data terminal port provided on the MCP-ATS front panel, otherwise known as the KB0 connection. [Table 8-6 on page 8-32](#) describes the KB0 RS-232 pin connections to the PI terminal.

Hot Standby systems require each MCP-ATS to be connected to its own PI device, where one is always Active, while the other is in Standby mode, see [Program Interface Device Connection beginning on page 2-47](#) for further PI connection details.

2 MCP-ATS Card Types

Various types of MCP-ATS cards may be utilized in the Coral IPx 4000 system. The following table lists the different MCP-ATS cards used in the Coral IPx 4000 system and lists the Figure number depicting its card layout in this manual.

Table 8-1 MCP-ATS Card Types

Manufacturer	Card Type Name	Figure Number	
		Front Panel	Layout
Tadiran Telecom branded	MCP-ATS/A	Figure 8-13 on page 8-33	Figure 8-8 on page 8-22
	MCP-ATS	Figure 8-14 on page 8-34	
SBS	SBS-CT7	Figure 8-15 on page 8-35	Figure 8-9 on page 8-23
	SBS-CT9	Figure 8-16 on page 8-36	Figure 8-10 on page 8-24
Motorola	CPV5350-500	Figure 8-17 on page 8-37	Figure 8-11 on page 8-25
	CPV5370	Figure 8-18 on page 8-38	Figure 8-12 on page 8-26

3 Coral Versions Compatibility with MCP-ATS Card Type

The following table defines the Coral software versions compatible with MCP-ATS card model.

Table 8-2 MCP-ATS Card Types Compatibility with Coral Versions

Coral Software	Card Compatible					
	MCP-ATS/A	MCP-ATS	SBS-CT7	SBS-CT9	CPV5350-500	CPV5370
Versions 16.04.07 or higher	Yes	Yes	Yes	Yes	Yes	Yes
Versions 15.68.12 - 16.04.06	No	Yes	Yes	Yes	Yes	Yes
Versions 15.00.00 - 15.68.11	No	No	Yes	No	Yes	Yes
Versions 14.67.83 - 14.99.99	No	Yes	Yes	Yes	Yes	Yes
Versions 14.00.00 - 14.67.82	No	No	Yes	No	Yes	Yes
Versions 12.00.00 - 12.99.99 *	No	No	Yes	No	Yes	Yes

* Version 13 was never released

4 CFD - Compact Flash Memory Disk

The CFD disk has an erasable memory that contains the generic feature software and database backup files. The appropriate memory capacity is dependent on the Coral system configuration.

The CFD slot is housed on the MCP-ATS card component side or front panel.

Both MCP-ATSs required the same version CFD, therefore, if one is updated the other must be updated at the same time, see [Upgrading the Coral Generic Version on page 4-2](#).

When replacing a CFD card with another card that contains upgraded software, the new card might not contain an updated database. If the new card does not contain a database, it is important to make a binary backup of the existing database before removing the card. See [Upgrading the Coral Generic Version on page 4-2](#) for further details.

CAUTION!

Before removing a memory card from the Coral system, do the following:

1. Perform the Database Binary Backup procedure.
1. Verify that the database is not being backed up: check that the MCP-ATS card HD LED does not flashing. Data will be lost if power is removed from the system when HD LED is flashing.
2. Turn the Coral power supply OFF. The CFD card could be damaged if removed when the system is powered.

Removing the CFD Flash Memory Card

1. When required, save the Coral database to the flash card and wait while the data is being written to the flash card. See [Saving the System Database, page 4-4](#).

CAUTION!

Do not remove the CFD or MCP-ATS card from its slot when the HD LED is flashing, indicating CFD or Hard Drive activity.

2. Remove the MCP-ATS card from the cage. See [Removing a Control Card, page 8-12](#).
3. Remove the CFD flash memory card.

Inserting the CFD



NOTE:

When the CFD slot is housed on the MCP-ATS card component side, the MCP-ATS card must be removed from the Control Shelf slot to access the CFD slot causing the system to shut down while the CFD is replaced.

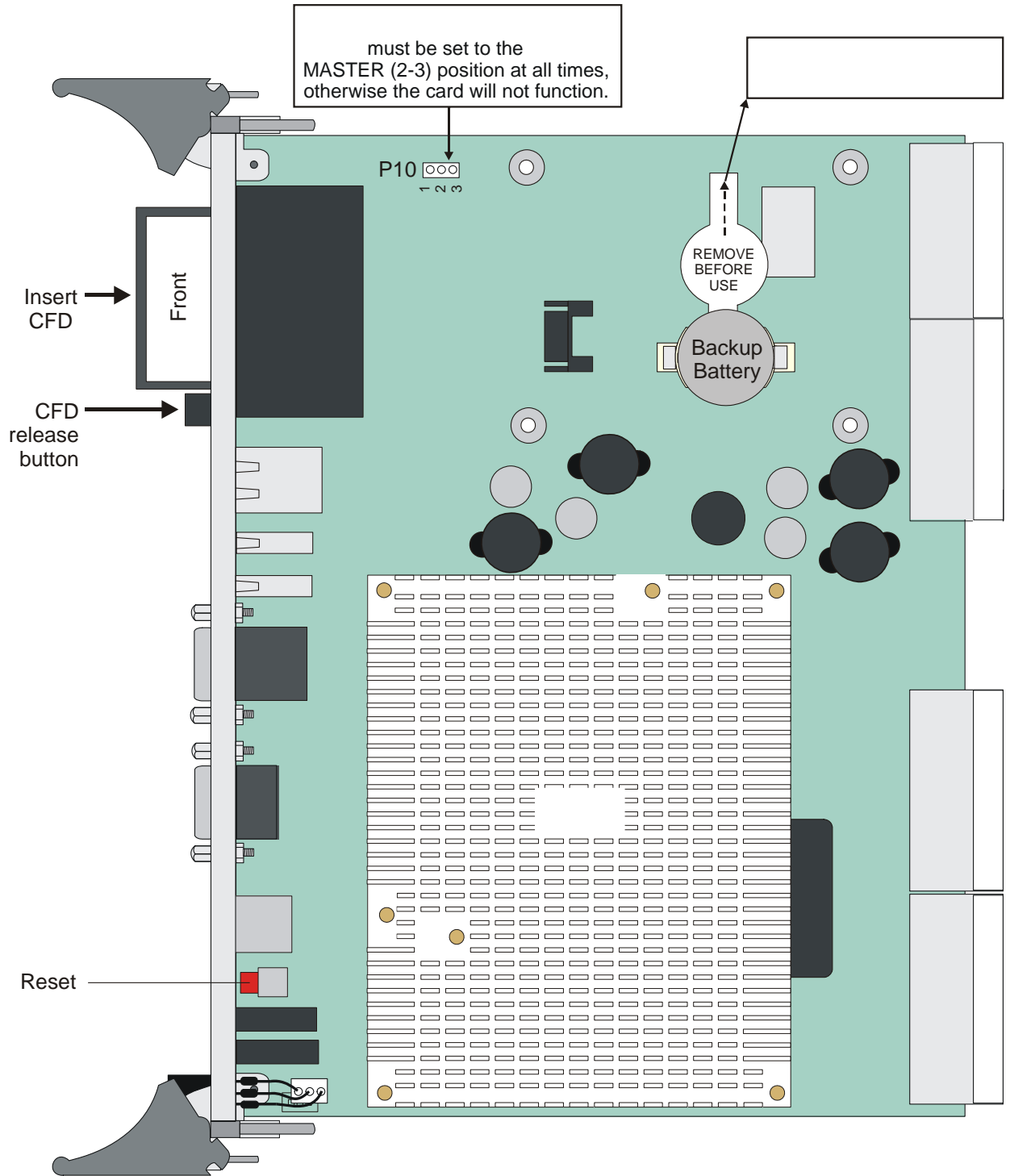
The CFD card edge is contoured such that it may only be inserted either face left or face right (depending on the MCP-ATS CFD connector/drive).

- 1 Remove the old CFD memory card, as described in [Removing the CFD Flash Memory Card, page 8-20](#).
- 2 Insert the CFD to its slot on the MCP-ATS card.
3. Insert the MCP-ATS card to the cage. See [Inserting a Control Card, page 8-9](#).

CFD Label Description

The CFD label describes the CFD contents, its Catalog number, the loaded Software version, and the SAU number that must correspond to the SAU device attached on the front panel of the 32GC on the same side of the MCP-ATS, see also [Software Authorization Unit \(SAU\) on page 8-70](#).

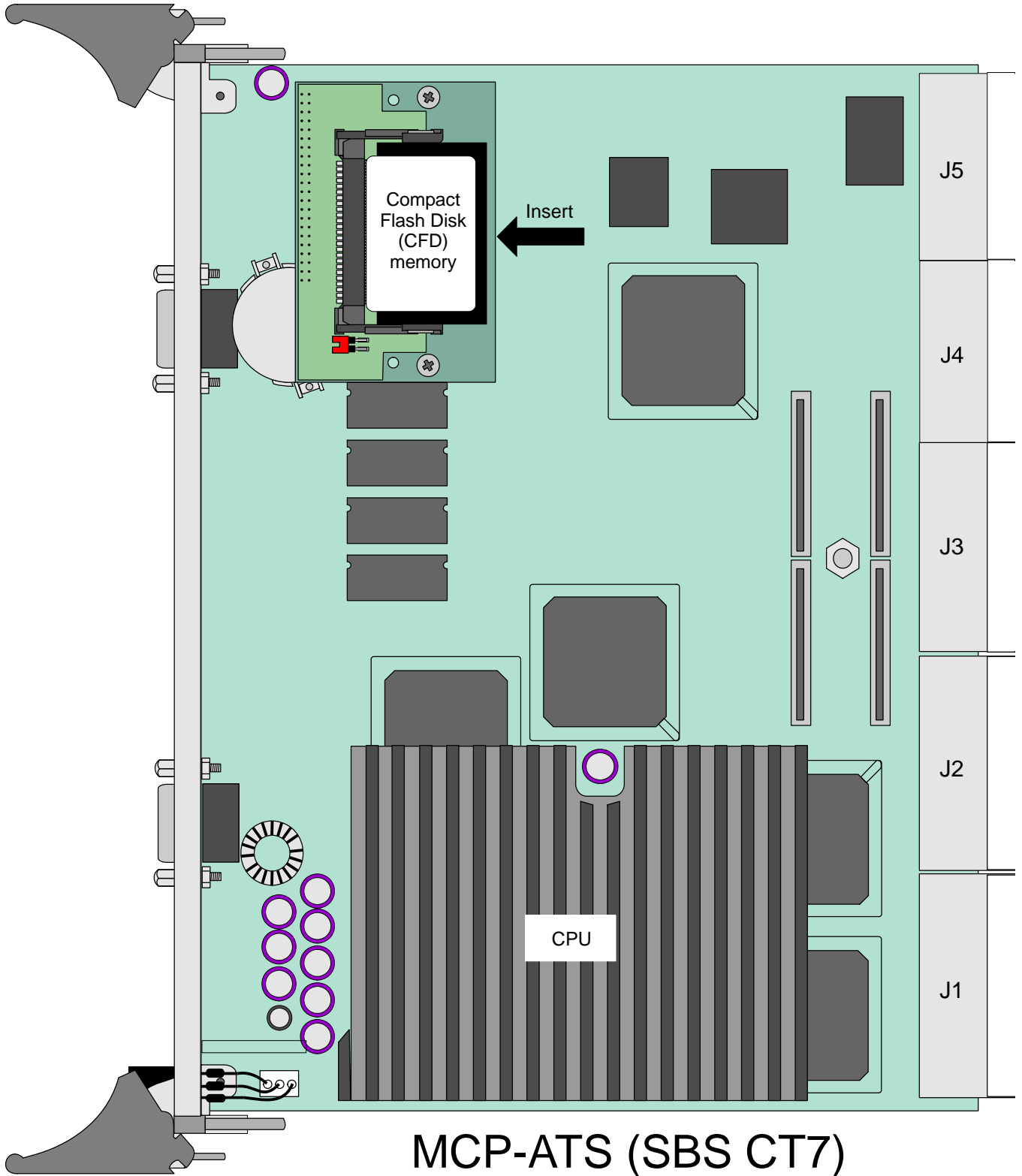
Figure 8-8 MCP-ATS/A and MCP-ATS (Tadiran Telecom) Layout



NOTE:

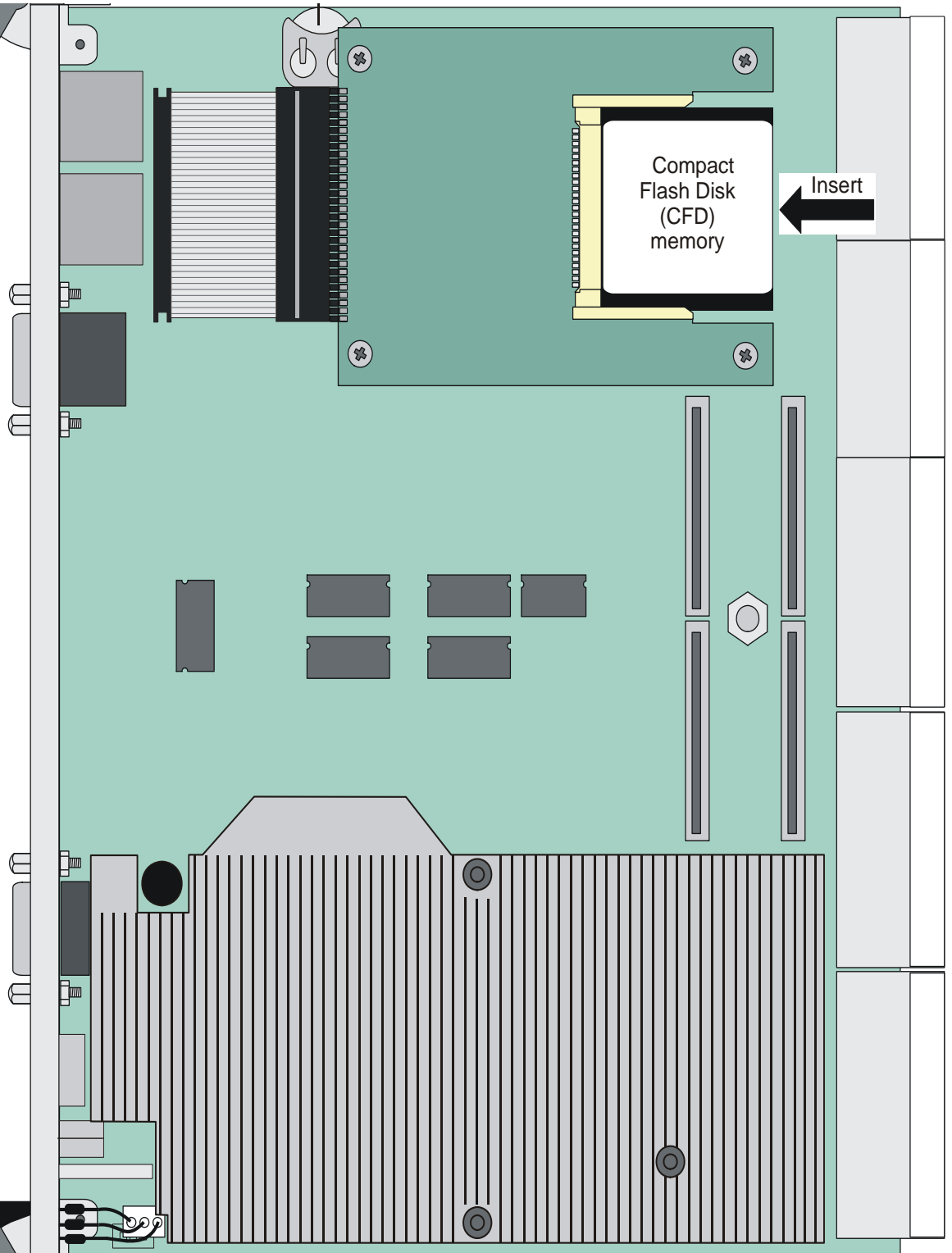
Jumper P10 (when installed) must be set to the MASTER (2-3) position at all times, otherwise the card will not function.

Figure 8-9 MCP-ATS
(SBS-CT7) Layout



MCP-ATS Main Processor Card for IPx 4000C

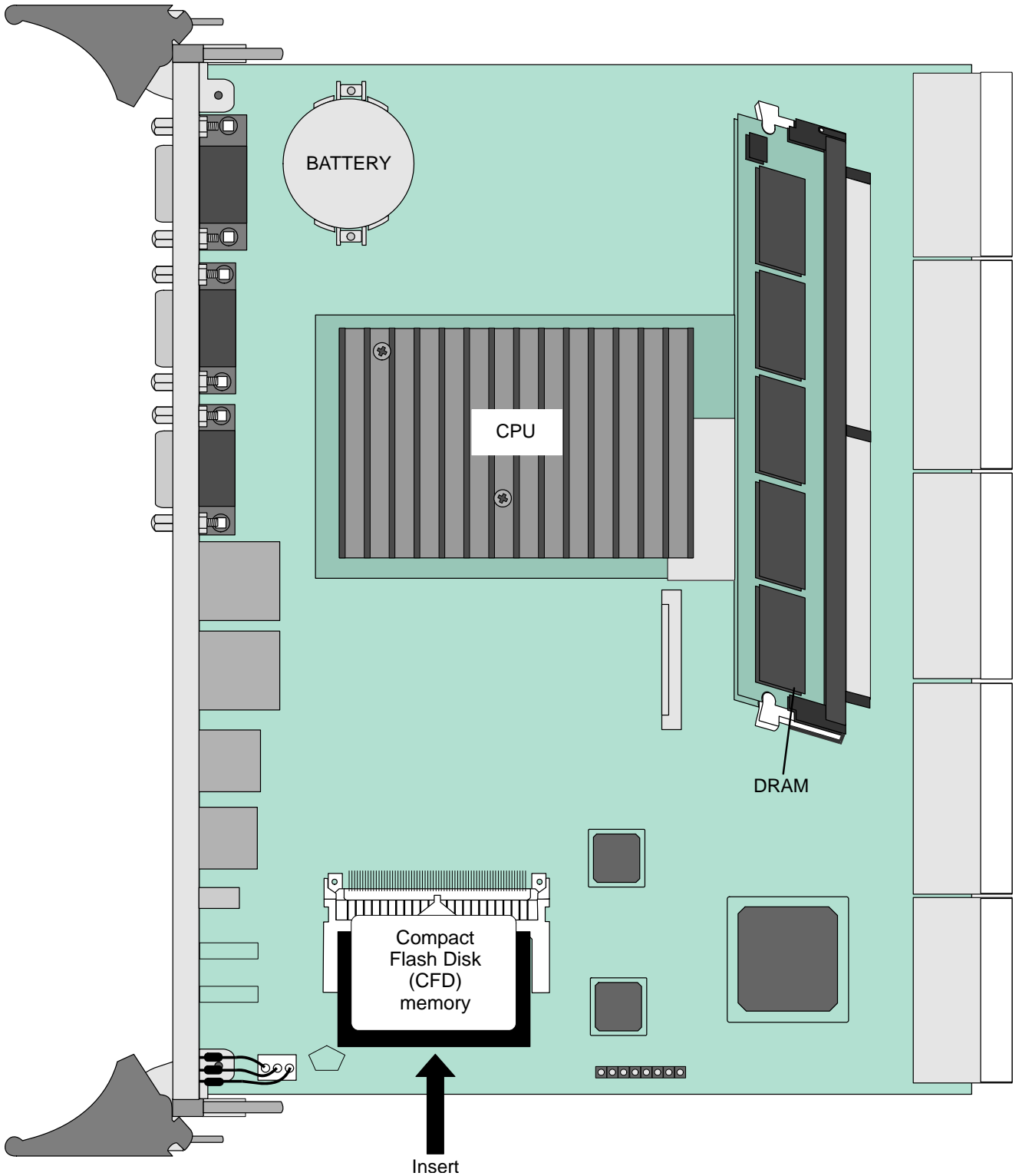
Figure 8-10 MCP-ATS
(SBS-CT9) Layout



MCP-ATS Main Processor Card for IPx 4000C

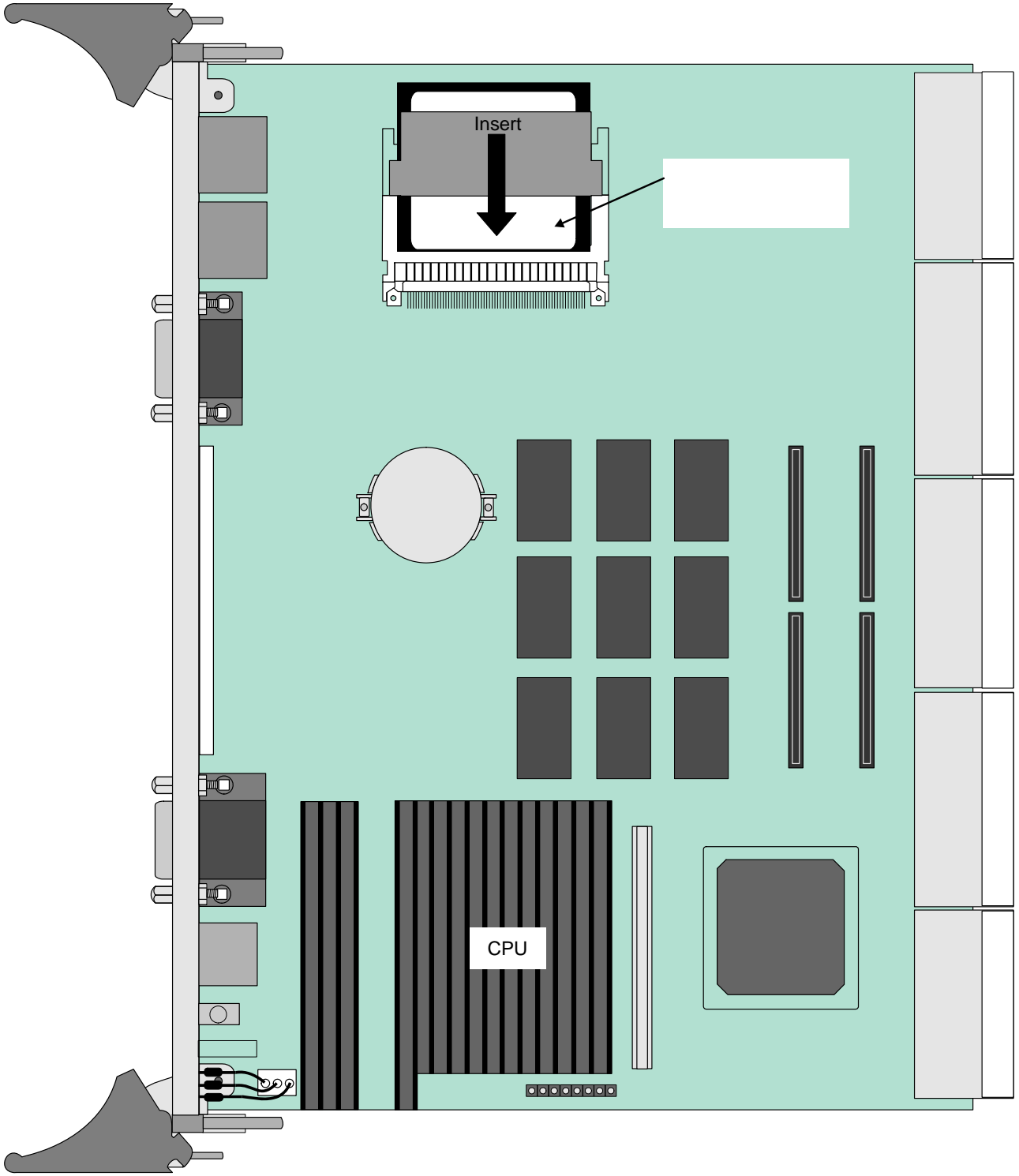
MCP-ATS (SBS CT9)

Figure 8-11 MCP-ATS
(Motorola CPV 5350)
Layout



MCP-ATS Main Processor Card for IPx 4000C

Figure 8-12 MCP-ATS
(Motorola CPV 5370)
Layout



MCP-ATS Main Processor Card for IPx 4000C

5 Card Front Panel

The following figures illustrate the front panels for the different MCP-ATS cards used in the Coral IPx 4000 system. Note that the card is shown in its upright position for insertion on the right side of the control shelf.

Table 8-3 MCP-ATS Front Panel Figures

<i>Manufacturer</i>	<i>Card Type Name</i>	<i>Figure Number</i>
Tadiran Telecom	MCP-ATS/A	<i>Figure 8-13 on page 8-33</i>
	MCP-ATS	<i>Figure 8-14 on page 8-34</i>
SBS	SBS-CT7	<i>Figure 8-15 on page 8-35</i>
	SBS-CT9	<i>Figure 8-16 on page 8-36</i>
Motorola	CPV5350-500	<i>Figure 8-17 on page 8-37</i>
	CPV5370	<i>Figure 8-18 on page 8-38</i>

The following components, found on MCP-ATS front panels, are used in all Coral IPx 4000 systems.

The following tables describe various card front panel components:

Table 8-4 *MCP-ATS Front Panel Connectors and Pushbuttons, page 8-28*

Table 8-5 *MCP-ATS Front Panel LED Indicators, page 8-30*

Table 8-6 *MCP-ATS KB0 RS-232 (COM1) Interface Pin Functions, page 8-32*

**Table 8-4 MCP-ATS
Front Panel Connectors
and Pushbuttons**

Component	Card Type Name					Function
	MCP-ATS/A, MCP-ATS	SBS-CT7	SBS-CT9	CPV-5350	CPV-5370	
CFD	•					See CFD - Compact Flash Memory Disk, page 8-20
ETH1	•	•	•	•	•	Ethernet RJ-45 connector, not used
ETH2		•	•	•	•	Ethernet RJ-45 connector, not used
USB1/2	•					USB ports, general purpose (keyboard or mouse, etc.)
USB		•	•	•		USB port, not used
VGA	•	•	•	•	•	Video port (15-pin high density female D-sub connector), used to connect the card to a video monitor terminal when reviewing the BIOS* settings.
COM 1	•	•	•	•	•	Asynchronous RS-232 serial port (9-pin D-sub connector), used for the PI device (KB0 port) connection. See Table 8-6, MCP-ATS KB0 RS-232 (COM1) Interface Pin Functions on page 8-32 and Program Interface Connection, page 8-17 .
COM 2				•		Not used
KB/MS	•	•	•	•	•	Keyboard and PS/2 Mouse (circular 6-pin mini-DIN connector), used to connect a keyboard or mouse when reviewing the BIOS settings. Also a PS/2 mouse can be connected directly or via an external cable splitter. Two terminal connections are for communication between the keyboard and the keyboard interface port. Two similar connections are for communication between the mouse and the mouse interface port. All four of these signals are CMOS compatible. The two remaining connections provide power for mouse and keyboard operation.

Component	Card Type Name						Function
	MCP-ATS/A, MCP-ATS	SBS-CT7	SBS-CT9	CPV-5350	CPV-5370		
RST	•	•	•	•	•		Reset (push button switch), used to restart this side of the Coral system (MCP-ATS and 32GC) without causing system interruption for Hot Standby systems, or causing the system to default to initial sizes. <i>NOTE: If the system is not a Hot Standby system, all calls in progress during Reset, are disconnected.</i>

* BIOS (Basic Input Output System) program which is permanently located in a computer's (MCP-ATS) memory and is activated at startup

Table 8-5 MCP-ATS
Front Panel LED
Indicators

Component	Card Type Name						Function
	MCP-ATS/A, MCP-ATS	SBS-CT7	SBS-CT9	CPV-5350	CPV-5370		
PWR	•	•		•	•		Power on indicator (green), used to indicate that Power is supplied to the card
HS	•						Hot insertion indicator (blue). Lights continuously to indicate that card is not inserted properly. See Inserting a Control Card, page 8-9 .
HD	•						Hard Disk drive indicator (yellow). Flashes to indicate CFD and Hard Drive activity, reading and writing to hard disk. Caution: Do not remove the CFD nor the MCP-ATS card from its slot when this LED is flashing. See Removing a Control Card, page 8-12 .
AL	•			•	•		Alarm indicator (red). Lights continuously to indicate one or more of the following: <ul style="list-style-type: none"> • CPU is overheated • Battery voltage output is not within spec. See Lithium Backup Batteries, page 8-14 .
EXT PWR STAT		•					<ul style="list-style-type: none"> • Blue Hot Swap LED • Red Fail • Green run In Reset State, red LED is on state. The green LED is off. During power up, BIOS turns both LED's off to indicate the CT7 has started. Before entering the OS boot sequence, the green LED is turned on. While in the OS, user software is free to use both LED's for their own purpose.

Component	Card Type Name						Function
	MCP-ATS/A, MCP-ATS	SBS-CT7	SBS-CT9	CPV-5350	CPV-5370		
ST			•				<p>Status LED is a green/red bi-color for BIOS power-up status indication, after boot loading the user software is free to use this LED for it's own purpose.</p> <ul style="list-style-type: none"> • Red on - Power-up, still Reset state (also the HS blue LED is on) • Blink red 1Hz - BIOS early init • Blink amber 1Hz - BIOS start POST • Blink green 1Hz up to 4Hz - BIOS POSTA init • Green on - OS boot • Red on - System halted or reset
HS			•				Hot Swap (blue), working according the hot swap specification.
PWR/Alarm				•	•		Power (green)/Alarm (red)
HDD				•	•		<p>Hard Disk Drive (green) indicates hard drive activity on the primary IDE channel.</p> <p>Caution: Do not remove the card from its slot when this LED is flashing.</p> <p>See Removing a Control Card, page 8-12.</p>

**Table 8-6 MCP-ATS
KB0 RS-232 (COM1)
Interface Pin Functions**

Pin #*	Signal Mnemonic	Function
1	N/A	---
2	RX (Receive)	Receives serial data input fro communications link
3	Tx (Transmit)	Sends serial output to communications link
4	DTR	Data set is ready to establish a communications link
5	GND	Ground
6	DSR	Data set is ready
7	RTS	Indicates to data set that UART is ready to exchange data
8	CTS	Data set is ready to exchange data
9	N/A	---

* To connect the Coral system, pins 2, 3 and 5 are sufficient.

Figure 8-13 MCP-ATS/A
(Tadiran Telecom) Front
Panel Upright Position

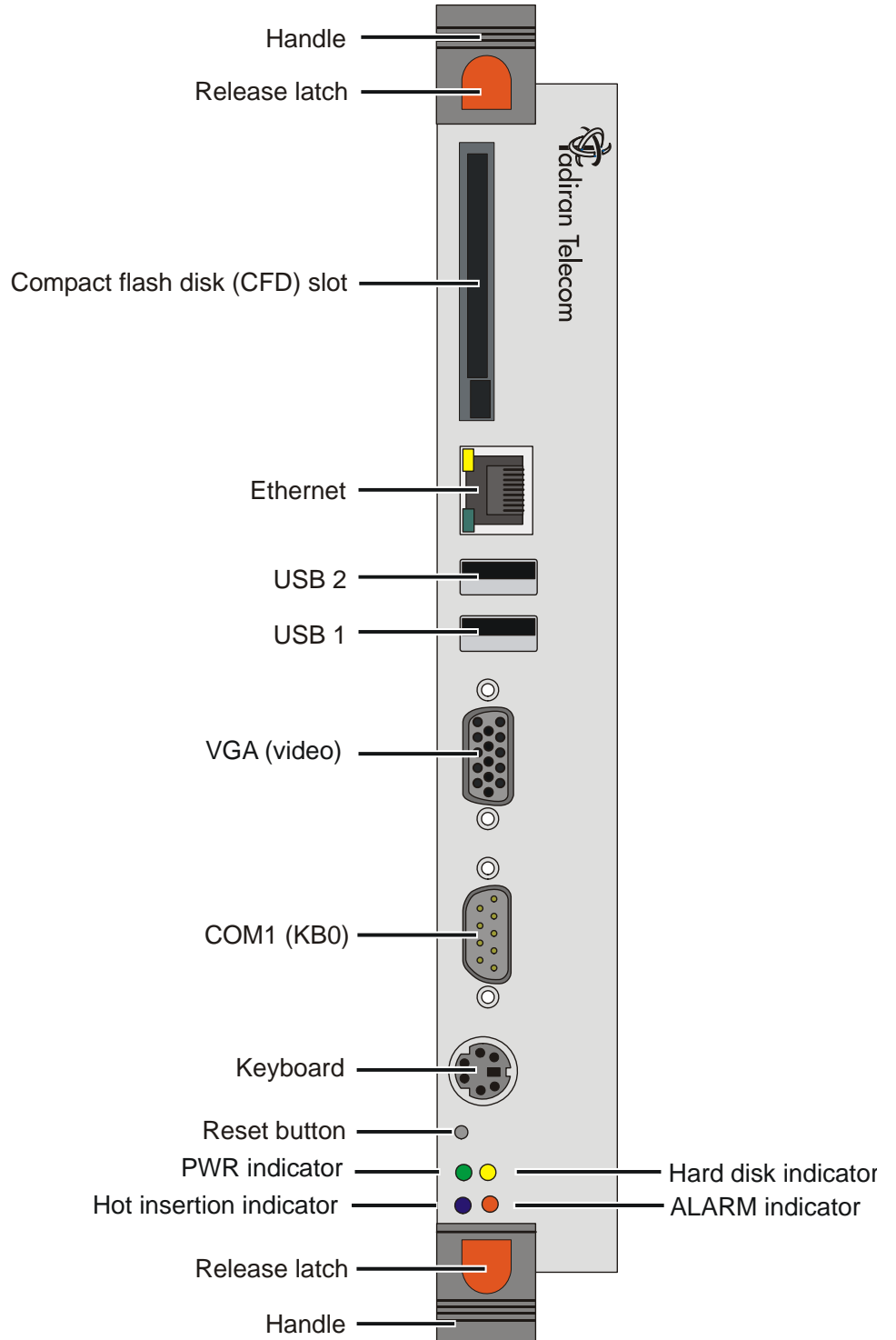
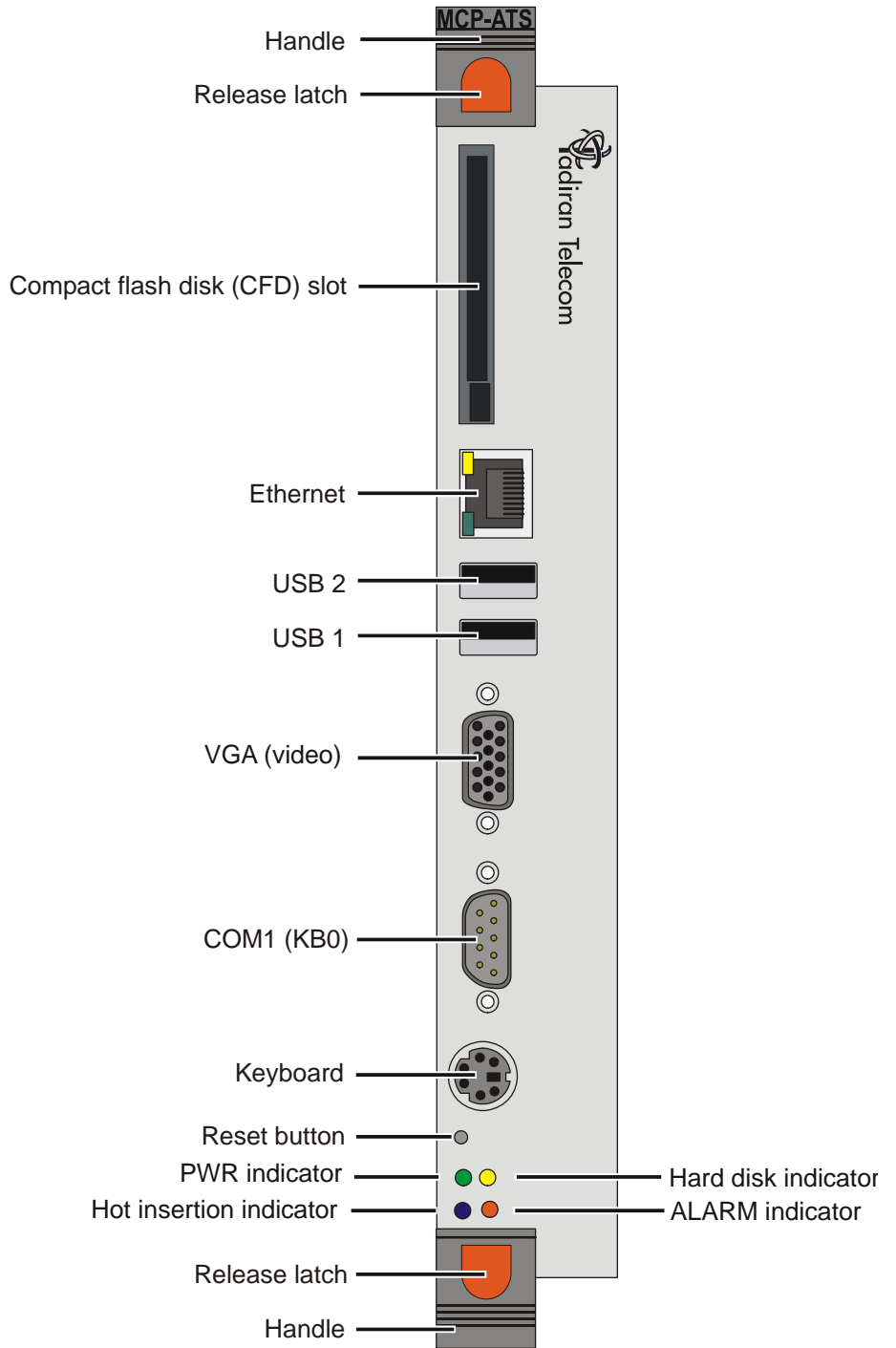


Figure 8-14 MCP-ATS (Tadiran Telecom) Front Panel Upright Position



MCP-ATS Main Processor Card for IPx 4000C

Figure 8-15 MCP-ATS (SBS-CT7) Front Panel Upright Position

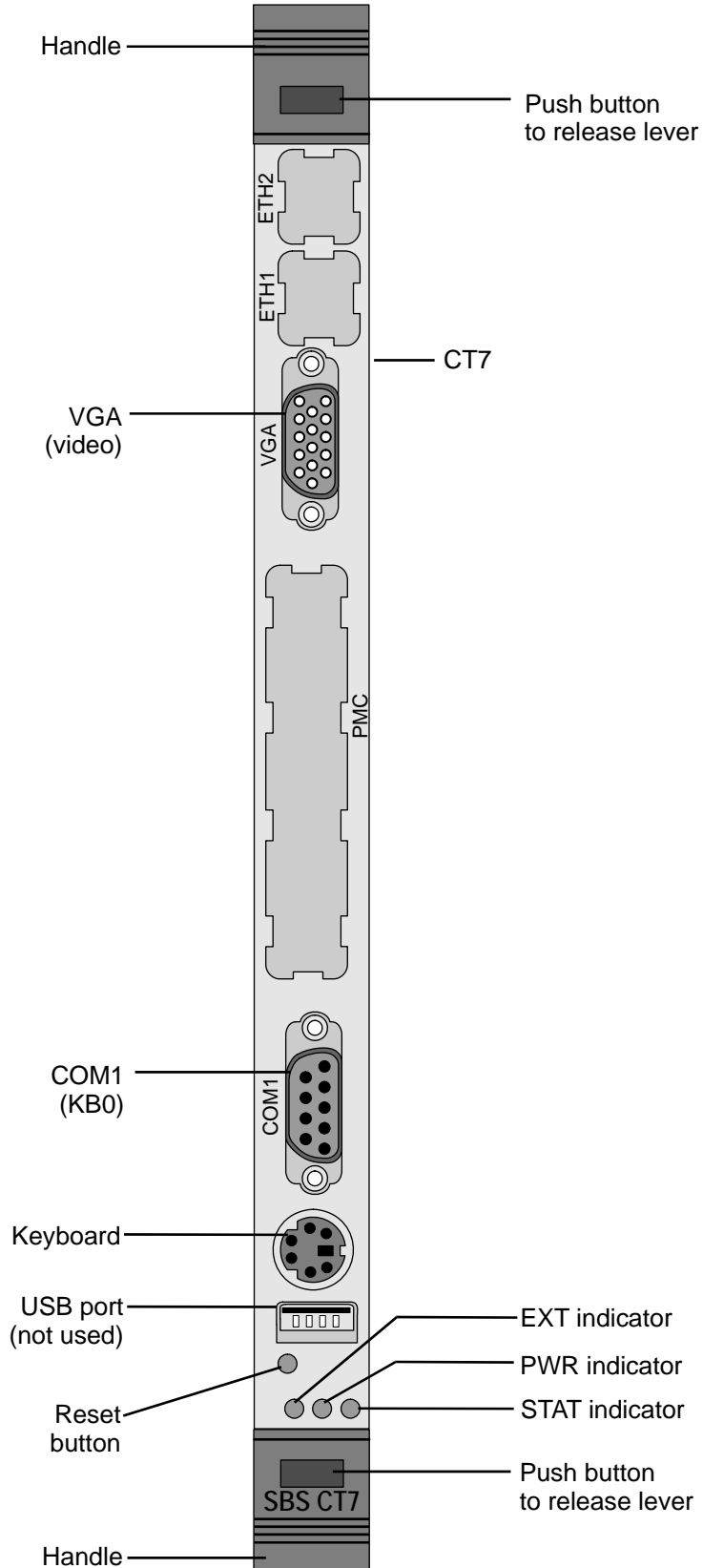


Figure 8-16 MCP-ATS (SBS-CT9) Front Panel Upright Position

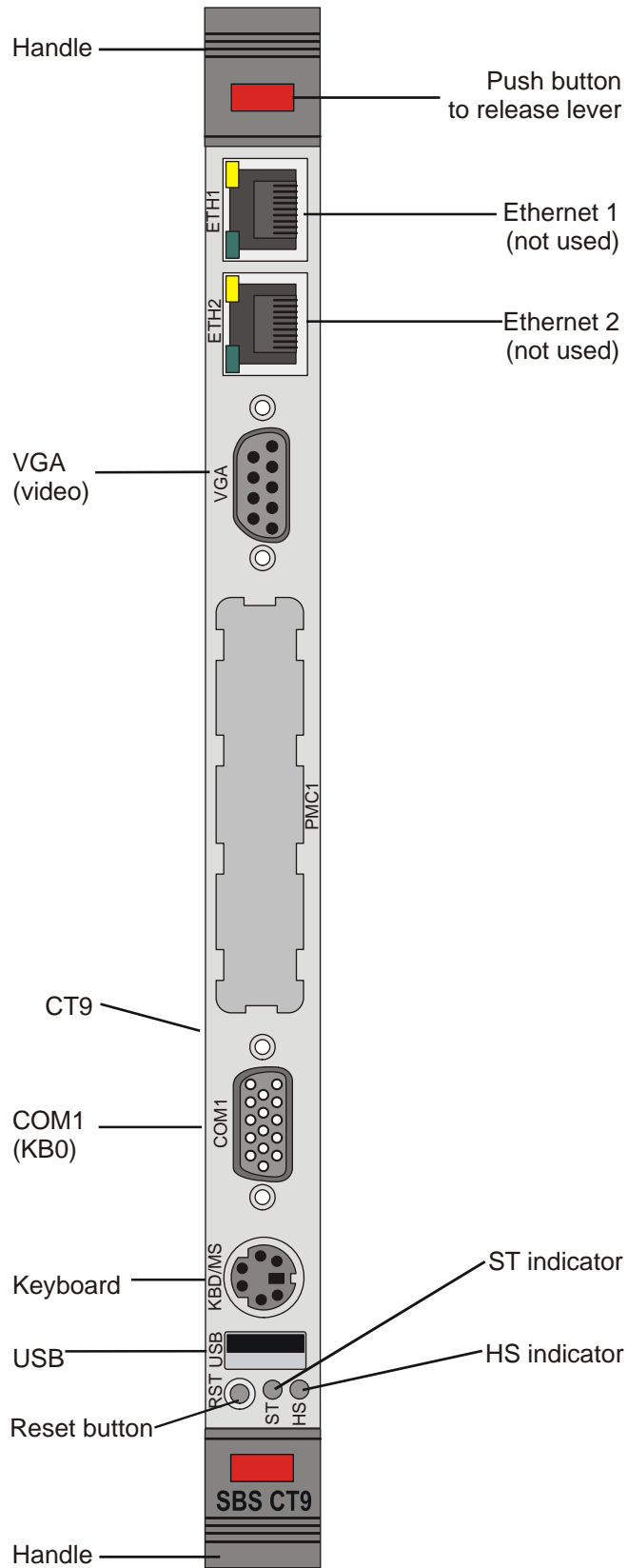


Figure 8-17 **MCP-ATS**
(Motorola CPV 5350)
Front Panel Upright
Position

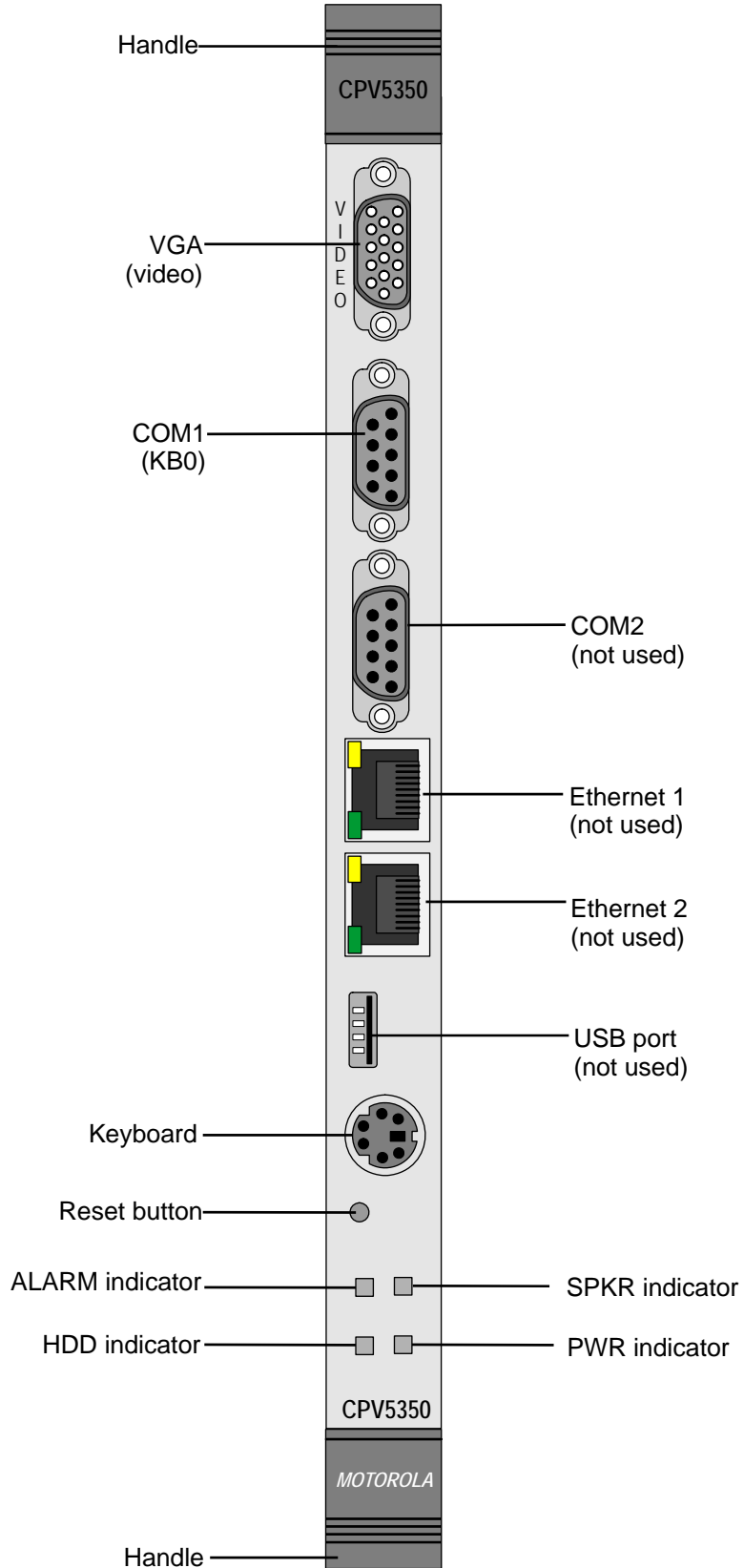
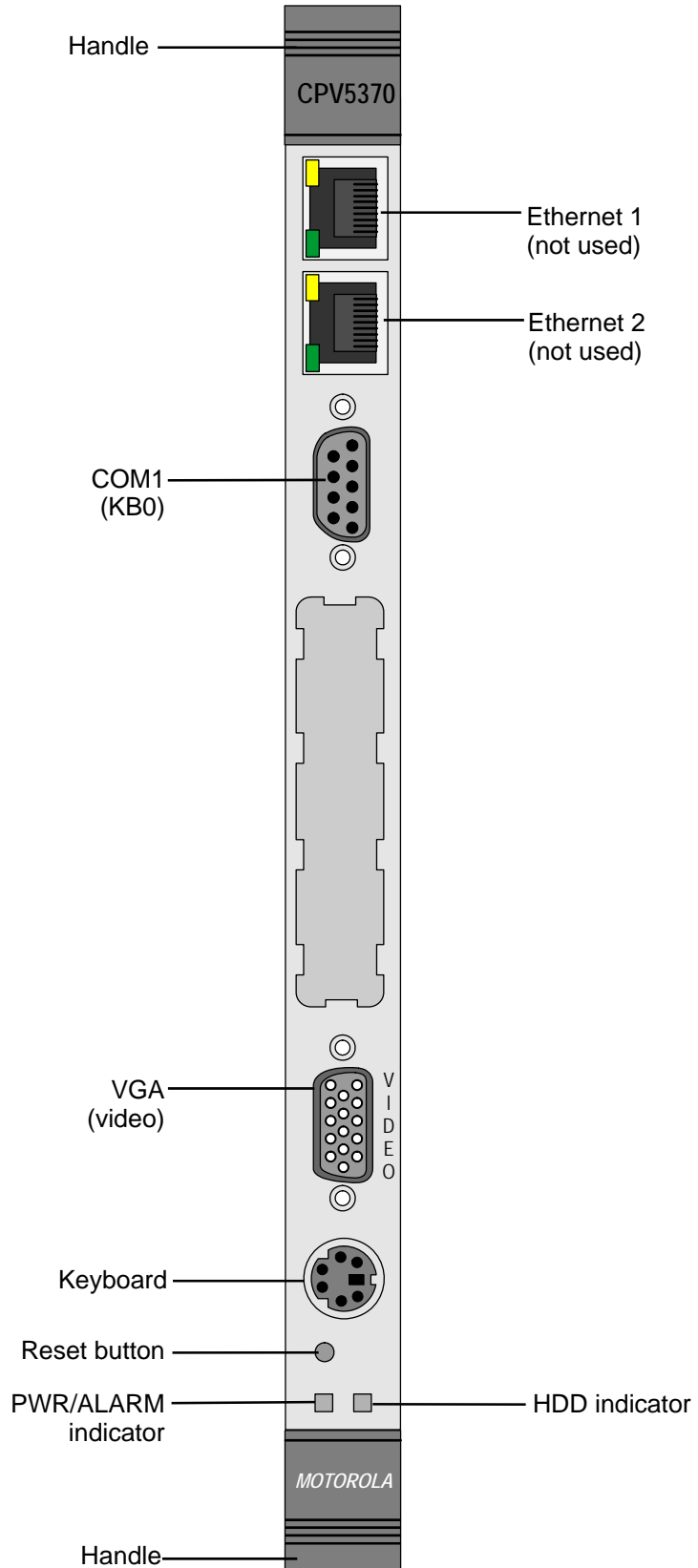


Figure 8-18 MCP-ATS
(Motorola CPV 5370)
Front Panel Upright
Position



6 Verifying the BIOS Settings

The Coral system arrives at the site ready to use. However, in the event that the system fails to complete the start-up cycle, it is possible to enter the MCP-ATS BIOS and verify that the settings are correct by using a temporarily attached keyboard and terminal. The BIOS type and settings vary depending on the MCP-ATS model. The procedure for viewing and setting the BIOS for each MCP-ATS type is displayed below.

- To move among the Main menu screen options, use the navigation keys.
- To move among the list of parameters, use the navigation arrow keys.

Verify that the values set for the parameters are correct.

Manu- facturer	Card Type Name	BIOS* Settings Procedure
Tadiran Telecom	MCP-ATS/A	<i>BIOS Settings for the MCP-ATS and MCP-ATS/A Tadiran Telecom cards, page 8-40</i>
	MCP-ATS	
SBS	SBS-CT7	<ul style="list-style-type: none"> ■ <i>BIOS Settings for the SBS-CT7, page 8-41 &</i> ■ <i>BIOS Settings for the SBS-CT7 P70500470CW24 V4.D, page 8-47</i>
	SBS-CT9	<i>BIOS Settings for the SBS-CT9, page 8-48</i>
Motorola	CPV5350-500	<i>BIOS Settings for the Motorola CPV5350 Models, page 8-50</i>
	CPV5370	<i>BIOS Settings for Motorola CPV5370, page 8-60</i>

* BIOS (Basic Input Output System) program which is permanently located in a computer's memory and is activated at startup



If the BIOS Setup Configuration procedure for your card type is not described below, refer to the manufacturer's website as follows:

1. From your workstation, open the Web browser and access the manufacturer's web site at <http://www.tadirantele.com>.
2. Go to **Partners login**, type your username and password.
3. Click **Enter**. The Main Partners page is displayed.
4. Go to **Support**.
5. Refer to the list of card models supplied for the MCP-ATS and execute its corresponding BIOS Setup procedure.

BIOS Settings for the MCP-ATS and MCP-ATS/A Tadiran Telecom cards

The card BIOS settings are factory-configured to match the MCP-ATS card requirements.

Use the following procedure to verify the correct BIOS settings for the MCP-ATS card model: Tadiran Telecom.

1. Connect a video terminal and keyboard to the front panel of the card.
2. Install the MCP-ATS card in to the slot labeled MCP-ATS in the control cage (see [Inserting a Control Card, page 8-9](#)).
3. Turn on the main power to the Coral system.
4. Press the Reset button on the front panel of the card.
5. Press the keyboard **Delete** key (repeatedly) several times while the card is loading until the **Phoenix Award BIOS CMOS Setup Utility** main screen is displayed.
6. Using the arrow keys, navigate to the **Load Optimized Defaults (Y/N)** screen, type **Y**, and then press **Enter**; the optimized defaults are loaded and the main **Phoenix Award BIOS CMOS Setup Utility** screen is displayed.
7. Press **F10**; the **SAVE to CMOS AND EXIT (Y/N)** prompt is displayed; select **Y** and then press **Enter**; the **Phoenix Award BIOS CMOS Setup Utility** closes.
8. Remove the keyboard and video connections and re-initialize the Coral system by pressing the Reset button on the MCP-ATS front panel.
9. Check to see that the Coral initializes properly, see [Messages for a Properly Loading Active Side on page 3-12](#) or [Messages for a Properly Loading Standby Side on page 3-15](#).

BIOS Settings for the SBS-CT7

There are two different models for the SBS-CT7 card. The procedure described immediately below is for most SBS-CT7 models.

- For the SBS-CT7 P70500470CW24 V4.D, see [BIOS Settings for the SBS-CT7 P70500470CW24 V4.D on page 8-47](#).

To insert CFD Flash on
MCP-ATS

1. Remove the MCP-ATS card from its slot (see [Removing a Control Card, page 8-12](#)).
2. Insert the CFD if not already inserted on the card's side panel.
3. Install the card into the slot labeled MCP-ATS in the Control Cage (see [Inserting a Control Card, page 8-9](#)).

Connect video terminal

4. Connect a video terminal and keyboard to the card's front panel.
5. Turn on the main Power to the Coral system.

Enter BIOS

6. Press the Keyboard **F2** or **Delete** key while the card is loading.
7. Ensure that the BIOS settings match the values displayed in the Tables listed in [BIOS Values for SBS-CT7](#) below.
8. After verifying the correct values, choose the SAVE CURRENT SETTINGS AND OPTIONS option and type **Y** to save the BIOS updates.
9. Remove the Keyboard and video connections and re initialize the Coral system by pressing the Reset button on the MCP-ATS front panel.
10. Check to see that the Coral initializes properly, see [Messages for a Properly Loading Active Side on page 3-12](#) or [Messages for a Properly Loading Standby Side on page 3-15](#).

Table 8-7 BIOS Values for SBS-CT7

MAIN Screen Options

BIOS Option
Standard CMOS Setup
Advanced CMOS Setup
Advanced Chipset Setup
Power Management Setup
PCI/Plug and Play Setup
Auto-Detect Hard Disks
Change User Password
Change Supervisor Password
Auto Configuration with Optimal Settings
Auto Configuration with Fail Safe Settings
Save Settings and Exit
Exit without Saving

Standard CMOS Setup Screen

BIOS Option	Value
Date	[mm/dd/yyyy]
Time	[hh/mm/ss]
Floppy Drive A:	Not Installed
Floppy Drive B:	Not Installed
	Type
Pri Master	Auto
Pri Slave	Not Installed
Sec Master	Auto
Sec Slave	Not Installed
Boot Sector Virus Protection	Disabled

Advanced CMOS Setup Screen

BIOS Option	Value
Quick Boot	Enabled
Pri Master ARMD Emulated as	Auto
Pri Slave ARMD Emulated as	Auto
Sec Master ARMD Emulated as	Auto
Sec Slave ARMD Emulated as	Auto
1st Boot Device	1st IDE-HDD
2nd Boot Device	Floppy
3rd Boot Device	ATAPI CDROM
Try other Boot Devices	Yes
Initialize I20 Devices	Yes
Floppy Access Control	Read-Write
Hard Disk Access Control	Read-Write
SMART for Hard Disks	Enabled
BootUp Num-Lock	On
PS/2 Mouse Support	Enabled
System Keyboard	Present
Primary Display	Absent
Password Check	Setup
Boot to OS/2	No
Wait for "F1" If Error	Enabled
Internal Cache	WriteBack
System BIOS Cacheable	Enabled
Onboard VGA	Enabled
Display Mode	CRT+DFP
Digital Flat Panel Type	640x480 T16
Stretch Text Modes	Yes
Stretch Graphics Mode	No
Symbios SCSI BIOS	Enabled

Advanced Chip Setup

BIOS Option	Value
USB Function	Enabled
USB KB/Mouse Legacy Support	Auto
Port 64/60 Emulation	Disabled
SERR#	Enabled

BIOS Option	Value
PERR#	Enabled
USWC Write Post	Enabled
BX Master Latency Time (Clks)	64
DRAM Integrity Mode	ECC Hardware
Power Down SDRAM	Enabled
PIIX4 SERR#	Enabled
TypeF DMA Buffer 1 Channel	Disabled
TypeF DMA Buffer 2 Channel	Disabled
DMA - 0 Type	Normal ISA
DMA - 1 Type	Normal ISA
DMA - 2 Type	Normal ISA
DMA - 3 Type	Normal ISA
DMA - 4 Type	Normal ISA
DMA - 5 Type	Normal ISA
DMA - 6 Type	Normal ISA
DMA - 7 Type	Normal ISA
PCI Downstream Window 1 Type	Disabled
DMA-2 Type	Normal ISA
DMA-3 Type	Normal ISA
DMA-5 Type	Normal ISA
DMA-6 Type	Normal ISA
DMA-7 Type	Normal ISA
PCI Downstream Window 1 Type	Disabled
PCI Downstream Window 1 Size	N/A
PCI Downstream Window 2 Type	Disabled
PCI Downstream Window 2 Size	N/A
PCI Downstream Window 3 Type	Disabled
PCI Downstream Window 3 Size	N/A
PCI Upstream Window 0 Type	Disabled
PCI Upstream Window 0 Size	N/A
PCI Upstream Window 1 Type	Disabled
PCI Upstream Window 1 Size	N/A
PCI Upstream Window 2 Page Size	Disabled
VMEbus System Controller State	Auto
VMEbus Access Window Size	512MB
Spread Spectrum Clock Modulation	Low

Power Management Setup

BIOS Option	Value
Power Management/APM	Disabled
Green PC Monitor Power State	Suspend
Video Power Down Mode	Stand By
Hard Disk Power Down Mode	Suspend
Hard Disk Time Out (Minute)	Disabled
Standby/Suspend Timer Unit	4 min
Standby Time Out	Disabled
Suspend Time Out	Disabled
Slow Clock Ratio	50%-62.5%
Display Activity	Ignore
Device 6 (Serial Port 1)	Ignore
Device 7 (Serial Port 2)	Ignore
Device 8 (Parallel port)	Ignore
Device 5 (Floppy disk)	Ignore
Device 6 (Primary Master IDE)	Monitor
Device 1 (Primary Slave IDE)	Ignore
Device 2 (Secondary Master IDE)	Ignore
Device 3 (Secondary Slave IDE)	Ignore
Processor Thermal Protection	Enabled
Thermal Duty Cycle	87.5%

Plug and Play Setup

BIOS Option	Value
Plug and Play Aware O/S	No
PCI Latency Timer (PCI Clocks)	64
PCI VGA Palette Snoop	Disabled
DMA Channel 0	PnP
DMA Channel 1	PnP
DMA Channel 3	PnP
DMA Channel 5	PnP
DMA Channel 6	PnP
DMA Channel 7	PnP
IRQ3	PCI/PnP
IRQ4	PCI/PnP
IRQ5	PCI/PnP

BIOS Option	Value
IRQ7	PCI/PnP
IRQ10	PCI/PnP
IRQ11	PCI/PnP
IRQ14	PCI/PnP
IRQ153	PCI/PnP

Peripheral Setup

BIOS Option	Value
OnBoard FDC	Auto
Drive and Port Drives	A:FDC, B:FDC
Swap Floppy Drives	No
Parallel Port ECP DMA Channel	Auto
OnBoard IDE	Both
Compact PCI sideband INTP IRQ	Disabled
OnBoard IMPI controller	N/A
OnBoard High-Res Timer IRQ	Disabled
Swap Floppy Drives	No
OnBoard Ethernet #1 connector	Front
OnBoard Ethernet #2 connector	Front



BIOS Settings for the SBS-CT7 P70500470CW24 V4.D

This is the procedure for setting up the correct BIOS for the MCP-ATS Card, Model: SBS-CT7 P70500470CW24 V4.D.

1. Remove the MCP-ATS card from its slot (see [Removing a Control Card, page 8-12](#)).
2. Insert the CFD if not already inserted on the card's side panel.
3. Connect a video terminal and keyboard to the front panel of the SBS-CT7.
4. Install the SBS-CT7 in to the slot labeled MCP-ATS in the Control Cage (see [Inserting a Control Card, page 8-9](#)).
5. Turn on the main Power to the Coral system.
6. Press the keyboard **Delete** key while the card is loading, to enter the CMOS BIOS settings.
7. Set **Auto Configuration with Optimal Settings** to **Yes**.
8. Enter the **Advanced CMOS Setup** screen.
9. Select the **1ST BOOT DEVICE** option and set to **1ST IDE-HDD**.
10. Enter the **Peripheral Setup** screen.
11. Set the **Onboard Serial Port1** option to **3F8H**.
12. Set the **Onboard Serial Port2** option to **2F8H**.
13. Return to the Main BIOS screen and choose the **SAVE SETTING AND EXIT** option and choose **Yes** to save and exit.
14. Remove the keyboard and video connections and re initialize the Coral system by pressing the Reset button on the MCP-ATS front panel.
15. Check to see that the Coral initializes properly, see [Messages for a Properly Loading Active Side on page 3-12](#) or [Messages for a Properly Loading Standby Side on page 3-15](#).

BIOS Settings for the SBS-CT9

The following table defines the Coral software versions compatible with this MCP-ATS card model.

The card's BIOS settings are factory configured to match the MCP-ATS card requirements.

Use the following procedure to verify the correct BIOS settings for the MCP-ATS card model: SBS-CT9.

1. Ensure that the following procedures have been performed prior to entering the card BIOS:

- a. **Insert the CFD**

If the CFD has not yet been inserted into the card, remove the MCP-ATS, SBS-CT9 model, from its slot and insert the CFD into its slot on the card's side panel. Re-insert the MCP-ATS into its slot.

- b. **Extract the 32GC**

Extract the 32GC, for this system side, from its slot, in order to disable the MCP-ATS watchdog reset mechanism.

- c. **Connect Video and Keyboard**

Connect a video terminal (VGA connector) and keyboard to the card front panel.

To enter card BIOS:

2. Reset the MCP-ATS and press DELETE (repeatedly) while the card is loading.
3. The *BIOS Setup Utility* screen is displayed. The window is divided into seven different tabs: **Main**, **Advanced**, **PCIPnP**, **Boot**, **Security**, **Chipset**, and **Exit**.



NOTE:

*Before continuing with this procedure, check the BIOS values for the items listed in [Table 8-8](#). If these values have already been set, then there is no need to continue with this procedure. Exit BIOS **without** saving.*

4. Use your keyboard's right arrow to select the **Exit** tab.
5. Use the up/down arrows to select: **Load Optimal Defaults** and press **Enter**.
6. Select **OK** to load optimal defaults.

7. Continue to configure the custom defaults as described in the following table:
 - Press **Esc** to leave tab window.
 - Press the right/left arrow keys to switch between tabs.
 - Press **Enter** or the +/- keys to select option value.

Table 8-8 BIOS values for MCP-ATS model SBS-CT9

Tab Name	Option	Sub Option	Set Option Value to:
Advanced	IDE Configuration	Secondary IDE Master	Hard Disk*
	Floppy Configuration	Floppy A	Disabled
	Remote Access Configuration	Remote Access	Disabled
	USB Configuration	USB Function	Disabled
Boot	Boot Settings Configuration	Wait for 'F1' if Error	Disabled
	1st Boot Device	--	[CFD name]
Chipset	Onboard Compact PCI Bridge Configuration	Downstream 64 bit Conversion	Disabled
Chipset	Intel PCI-64 Hub 2 Configuration	PCI Bus Frequency	33 MHz

* Read-only value. If this does not show, then the card is not reading information from the CFD flash disk. Check to see that it is installed properly.

8. After verifying these changes, **Enter** the Exit tab and save your changes.
9. Select **Save Changes and Exit** and press **OK** to save.

BIOS Settings for the Motorola CPV5350 Models

1. Remove the MCP-ATS card from its slot (see [Removing a Control Card, page 8-12](#)).
2. Insert the CFD if not already inserted on the card component side panel.
3. Install the CPV5350 into the slot labeled MCP-ATS in the Control Cage (see [Inserting a Control Card, page 8-9](#)).
4. Connect a video terminal and keyboard to the front panel of the CPV5350.
5. Turn on the main Power to the Coral system.
6. Press **F2** while the card is loading to enter the BIOS. Ensure that the BIOS settings match the values displayed in the tables below.

[Table 8-9](#) for Motorola CPV5350-Model 01-W3573F04B, Version 1.1

[Table 8-10](#) for the Motorola CPV 5350, V2.2 RM02

[Table 8-11](#) for the Motorola CPV 5350, V3.0 RM02.

7. *After* verifying the correct values, choose the EXIT AND SAVE option and type **Y** to save the BIOS updates.
8. Remove the keyboard and video connections and re initialize the Coral system by pressing the Reset button on the MCP-ATS front panel.
9. Check to see that the Coral initializes properly, see [Messages for a Properly Loading Active Side on page 3-12](#) or [Messages for a Properly Loading Standby Side on page 3-15](#).

Table 8-9 **BIOS Settings for MCP-ATS Motorola CPV5350, Model 01-W3573F04B, Version 1.1**

MAIN SCREEN PARAMETERS

BIOS Option	Value
Primary Master	None
Primary Slave	IDE Removable
Secondary Master	IDE Removable
Secondary Slave	None

ADVANCED SCREEN PARAMETERS

BIOS Option	Value
Plug and Play	NO
Reset Configuration Data	NO
L2 Cache ECC	ENABLE
ECC Memory Config	DISABLE
PCI Configuration	
Default Primary Video Adapter	APG
On Board Ethernet	
On Board Ethernet 1	ENABLE
Ethernet 1 Connection	FRONT
Ethernet 1 Option Rom	DISABLE
On Card Ethernet 2	ENABLE
Ethernet 2 Connection	FRONT
Ethernet 2 Option Rom	DISABLE
USB	FRONT
HA Config	ENABLE
Domain A	ENABLE
Domain B	ENABLE
PCI/PNP IRQ	
IRQ 9:	Reserved
IRQ 11	Reserved
PCI IRQ Line 1	Auto Select
PCI IRQ Line 2	Auto Select
PCI IRQ Line 3	Auto Select
PCI IRQ Line 4	Auto Select
I/O Device Configuration	
Serial Port A	ENABLE
Base I/O address	3F8

BIOS Option	Value
Interrupt	IRQ 4
Serial Port B	ENABLE
Base I/O address	2F8
Interrupt	IRQ 3
Parallel Port	ENABLE
Mode	Bi-directional
Base I/O Address	378
Interrupt	IRQ 7
Floppy Disk controller	ENABLE
Base I/O Address	Primary
Local Bus IDE Adapter	BOTH
Large Disk Access Mode	DOS
Legacy USB Support	DISABLE
Remote control	
COM Port	DISABLE
Embedded FLASH	
BIOS Image Source	DISKETTE Drive
Load BIOS Image	Enter
Clear CMOS	Yes
Program Flash	Enter
Other parameters are Not Applicable	

SECURITY SCREEN PARAMETERS

Parameter	Value
User Password is	[CLEAR]
Supervisor Password is	[CLEAR]
Set User Password	ENTER
Set Supervisor Password	ENTER
Password On Boot	DISABLE
STATUS	Not Changeable N/A

BOOT SCREEN PARAMETERS

Parameter	Value
Floppy Check:	DISABLE
Quick Boot Mode:	ENABLE
Summary Screen:	CLEAR
SET UP Prompt:	ENABLE
Numlock:	Auto
Boot Device Priority	
1.	+Hard Drive Bootable Add-in Cards Compact Flash Disk (Manufacturer Name)
2.	Removable Device
3.	ATAPI CD-ROM DRIVE
4.	Legacy Network Boot
Hard Drive	
1.	Compact Flash Disk (Manufacturer Name)
2.	Bootable Add-in Cards

**Table 8-10 BIOS Setting
for MCP-ATS Motorola
5350, V2.2 RM02**

Main Screen Settings

BIOS Option	Value
CPU Type	Pentium II
CPU Speed	333MHz
Cache RAM	256Kb
System Memory	64MB
Board Serial No.	4823181
BIOS Version	CPV5350 BIOS V2.2 RM02
System Time	[hh:mm:ss]
System Date	[mm:dd:yy]
Diskette A	Disabled
Diskette B	Disabled
Primary Master	None
Primary Slave	IDE Removable
Secondary Master	IDE Removable
Secondary Slave	None

Primary Slave [IDE Removable]

BIOS Option	Value
Type	Auto
Cylinders	734
Heads	4
Sectors	32
Maximum Capacity	48Mb
Multi-Sector Transfers	Disabled
LBA Mode Control	Disabled
32 Bit I/O	Disabled
Transfer Mode	Fast PIO 1
SMART Monitoring	Disabled
Ultra DMA Mode	Disabled

Advanced Screen

BIOS Option	Value
Plug and Play O/S	No
Reset Configuration Data	No
L2 Cache ECC	Enabled
ECC Memory Config	Disabled
Memory Bank 0	64Mb SDRAM
PCI Configuration	
I/O Device Configuration	
Local Bus IDE adapter	Both
Large Disk Access Mode	DOS
ECC Memory Config	Disabled
PCI Configuration	
I/O Device Configuration	
Local Bus IDE adapter	Both
Large Disk Access Mode	DOS
SMART Device Monitoring	Disabled
Legacy USB Support	Disabled
Remote Console	
Embedded Flash	

I/O Device Configuration

BIOS Option	Value
Serial Port A	Enabled
Base I/O Address	3F8
Interrupt	IRQ 4
Serial Port B	Enabled
Base I/O Address	2F8
Interrupt	IRQ3
Parallel Port	Enabled
Mode	Bi-Directional
Base I/O Address	378
Interrupt	IRQ7
Floppy disk controller	Enabled
Base I/O Address	Primary

Remote Console Screen

BIOS Option	Value
COM Port	Disabled
Baud Rate	19.2K
Console Type	VT100
Flow Control	CTS/RTS
Scan Lines	24
Active After POST	Off

Boot Screen

BIOS Option	Value
Floppy Check	Disabled
QuickBoot Mode	Enabled
Summary Screen	Disabled
SETUP Prompt	Enabled
NumLock	Auto
	Hard Drive Compact Flash Disk (Manufacturer Name) Removable Devices ATAPI CD-ROM Drive



Table 8-11 BIOS Setting for MCP-ATS Motorola 5350, V3.02 RM02

Main Screen Settings

BIOS Option	Value
BIOS Version	CPV5350 BIOS V3.0 RM02
Board Serial No.	5119880
CPU Type	Pentium II
CPU Speed	333MHz
Host Bus Frequency	66MHz
Cache RAM	256Kb
Total Memory	64MB
System Time	[hh:mm:ss]
System Date	[mm:dd:yy]

Memory Page Screen

BIOS Option	Value
Cache RAM	256Kb
Total Memory	64Kb
Memory Bank 0	64MB SDRAM
L2 Cache	Enabled
L2 Cache ECC Support	Enabled
ECC Memory Config	Disabled

Advanced Screen

BIOS Option	Value
Plug and Play O/S	No
Reset Configuration Data	No
Legacy USB Support	Enabled
Floppy Configuration	
IDE Configuration	
I/O Configuration	
PCI Configuration	
Remote Console	
Embedded Flash	

Floppy Controller

BIOS Option	Value
Floppy Controller	Disabled
Diskette a	Disabled
Diskette b	Disabled
Floppy Check	Disabled

IDE Configuration Screen

BIOS Option	Value
Local Bus IDE Adapter	Both
Large Disk Access Mode	DOS
Smart Device Monitoring	Disabled
Primary Master	None
Primary Slave	IDE Removable
Secondary Master	None
Secondary Slave	None

I/O Device Configuration Screen

BIOS Option	Value
P/S Mouse	Auto Detect
Serial Port A	Enabled
Base I/O Address	3F8
Interrupt	IRQ4
Serial Port B	Enabled
Base I/O Address	2F8
Interrupt	IRQ3
Parallel Port	Enabled
Mode	Bi-Directional
Base I/O Address	378
Interrupt	IRQ7

Remote Console Parameters

BIOS Option	Value
COM Port	Disabled
Baud Rate	19.2K
Console Type	VT100
Flow Control	CTS/RTS
Screen Lines	24
Active After POST	Off

Boot Screen

BIOS Option	Value
Quick Boot	Enabled
Summary Screen	Disabled
SETUP Prompt	Disabled
NumLock	Auto
Boot Retry	Enabled
Boot Device Priority	
Hard Drive	
Compact Flash Disk (Manufacturer Name)	
Bootable Add-in Cards	
Removable Devices	
ATAPI CD-ROM Drive	

BIOS Settings for Motorola CPV5370

This is the procedure for setting up the correct BIOS for the MCP-ATS Card, Model: CPV5370-700.

1. Remove the MCP-ATS card from its slot (see [Removing a Control Card, page 8-12](#)).
2. Insert the CFD if not already inserted on the card's side panel.
3. Install the CPV5370 in to the slot labeled MCP-ATS in the Control Cage (see [Inserting a Control Card, page 8-9](#)).
4. Connect a video terminal and keyboard to the front panel of the CPV5370.
5. Turn on the main Power to the Coral system.
6. Press **F2** keyboard key to display the BIOS screen.
7. Press the right arrow key to display the ADVANCED screen.
8. Select the REMOTE CONSOLE position.
9. Set the COM-PORT parameter to **DISABLED**.
10. Press the right arrow key until reaching the BOOT screen.
11. Select the HARD DRIVE option.
12. Set the Compact Flash Disk at the top, as shown below, with the + key.

- HARD DRIVE

Compact Flash Disk
(Manufacturer Name)

Bootable Add - In Cards.

Removable device

13. Press **Esc** and the **right arrow** key to display the EXIT screen.
14. Press **Enter** to save your changes and exit from BIOS.
15. Remove the keyboard and video connections and re initialize the Coral system by pressing the Reset button on the MCP-ATS front panel.
16. Check to see that the Coral initializes properly, see [Messages for a Properly Loading Active Side on page 3-12](#) or [Messages for a Properly Loading Standby Side on page 3-15](#).

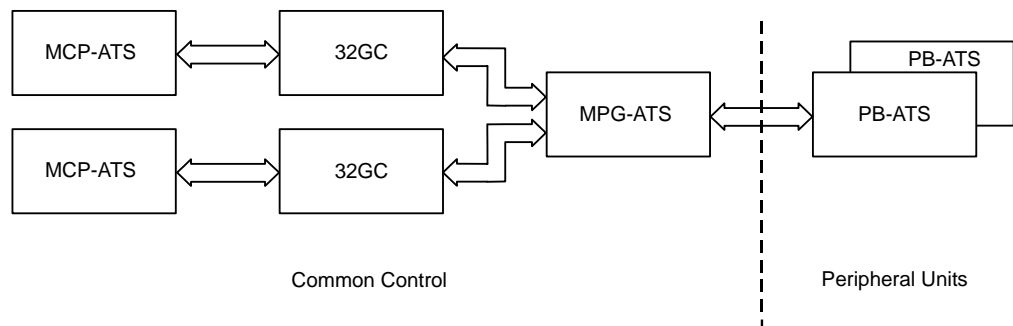
8.3 32GC

Group Controller Card for IPx 4000C

1 General Description

The 32GC card serves as the communication link in the Coral IPx 4000 system, between the MCP-ATS and the PB-ATS cards (located in peripheral shelves), or the FLMS cards (located in FlexLITE remote peripheral shelves); via the MPG-ATS located at the motherboard rear backplane. Each of the redundant 32GC cards interfaces with the same MPG-ATS which controls the bus signalling to the PB-ATSs, see [Figure 8-19](#).

Figure 8-19 32GC Communication Schematic



The 32GC card contains the High-Level Data Link Control (HDLC) bus interface circuitry, Pulse Code Modulation (PCM) bus interface circuitry, clock circuitry to synchronize the peripheral section of the system, and digital tone generators (dial, busy, ringing, ringback, DTMF, MFC, and test). Additionally, the 32GC card contains circuitry to synchronize the Coral peripheral clock to an external clock derived from a digital trunk interface. The 32GC card supports eight HDLC highways and thirty-two PCM streams, and up to sixteen peripheral shelves. It is capable of establishing a maximum of 1500 calls between ports on its maximum peripheral shelf capacity. This matrix allows for a constant frame delay operation mode.

The 32GC card also houses the proprietary Mirrored Memory and Switching Matrix essential for the Hot Standby control system. With this technology, the **Standby** control system set *snoops* relevant information from the **Active** control system set. With this information it readies its control card set for takeover of the control functions at any time it may become necessary.

The voice port for peripheral cards is supported only from the **Active** 32GC card. The base memory of the 32GC card contains a 2MB memory in which the system database is housed. The memory is SRAM and is protected by 3V battery backup, so that data is saved and maintained during power loss.

The Expanded Memory Module, 4XMM or 8XMM, daughter card, is installed on the side of the 32GC for large or complex Coral systems. It is also a required shared memory card for the optional CLA-ATS. See [4/8XMM beginning on page 8-75](#) for further details on the XMM card.

32GC Front Panel

The 32GC front panel includes diagnostic indicators, an SAU interface and a CLA Reset button as shown in [Figure 8-20](#). The items are described below.

Table 8-12 32GC Front Panel Components

Component	Function
Main (red) Indicator	<p>Lights during card initialization, is not lit when card is functioning properly. If this indicator is lit, the 32GC is faulty.</p> <ul style="list-style-type: none"> • Steadily Off - no problem, 32GC card operating normally • Steadily On - 32GC card has not initialized. It indicates a possible problem with the 32GC card • Flashing - diagnostic test failed by circuitry on 32GC card. It indicates one of the following diagnostic alarms: <ul style="list-style-type: none"> 5 - HDLC channel 6 - PCM Highway 7 - PCM Time slot 22 - E911 Compatibility <p>For further information on these diagnostic alarms, refer to Chapter 22 of the <i>Program Interface and Database Reference Manual</i>.</p>
A (flashing green) Indicator	Lights when this system side is in Active mode, the flashing is slower when the system is most active.
S (green) Indicator	Lights when this system side in Standby mode
M (red) Indicator	Lights when this system side is in Maintenance mode
F (red) Indicator	Lights when the this system side is in Faulty mode

Component	Function
SAU	COM1 port for the SAU unit, see Software Authorization Unit (SAU) on page 8-70
<p>The following 3 items are duplicated, one on the left and one on the right, and emanate from the lower (left items) and upper (right items) XMM cards when mounted on the 32GC (i.e. the LEDs and push button are physically located on the XMM card. The 32GC only provides an opening on its front panel for displaying them).</p> <ul style="list-style-type: none"> ■ The upper XMM is not used in this Coral Version. Therefore, the items on the right side, appear as empty holes on the 32GC front panel. ■ When no XMM is installed, all these items appear as empty holes on the front panel. 	
RUN (green) Indicator (CLA)	Lights when the CLA-ATS card is functioning.
CLA (green) Indicator	Lights indicating which XMM is supporting the CLA-ATS on this side of the control shelf (the left one lights when the lower XMM supports the CLA-ATS, the right one lights when the upper XMM supports the CLA-ATS).
RST CLA Button -	Used to reset the CLA-ATS card from the XMM mounted on the 32GC. The Reset button resets its XMM thus resetting the CLA card and drops all CTI calls during the process.

32GC Side Panel

The 32GC side panel, shown in [Figure 8-21](#), includes a 100 pin connector and three mounting holes, A, B and C, which aid in the piggyback installation of the XMM card. A Lithium battery resides on the side panel as well. The battery insulator must be removed before card installation.

Figure 8-20 32GC Front Panel Upright Position

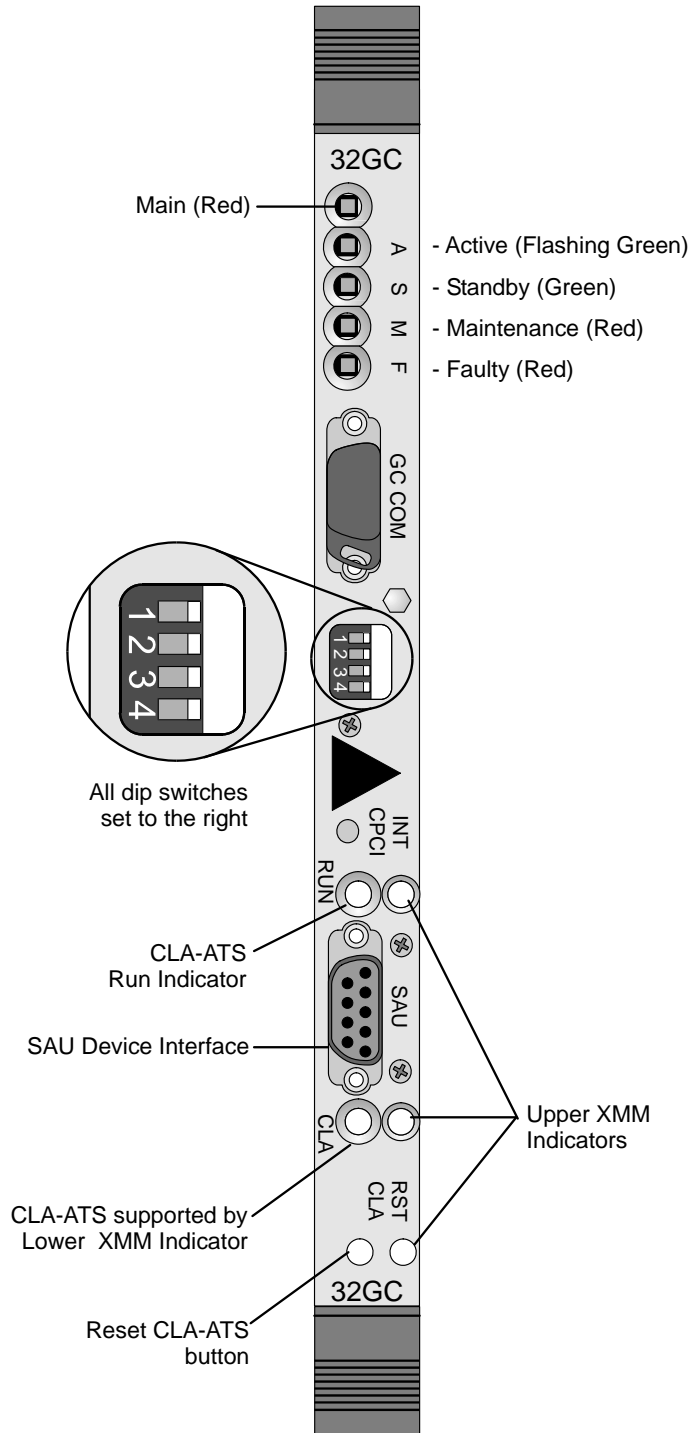
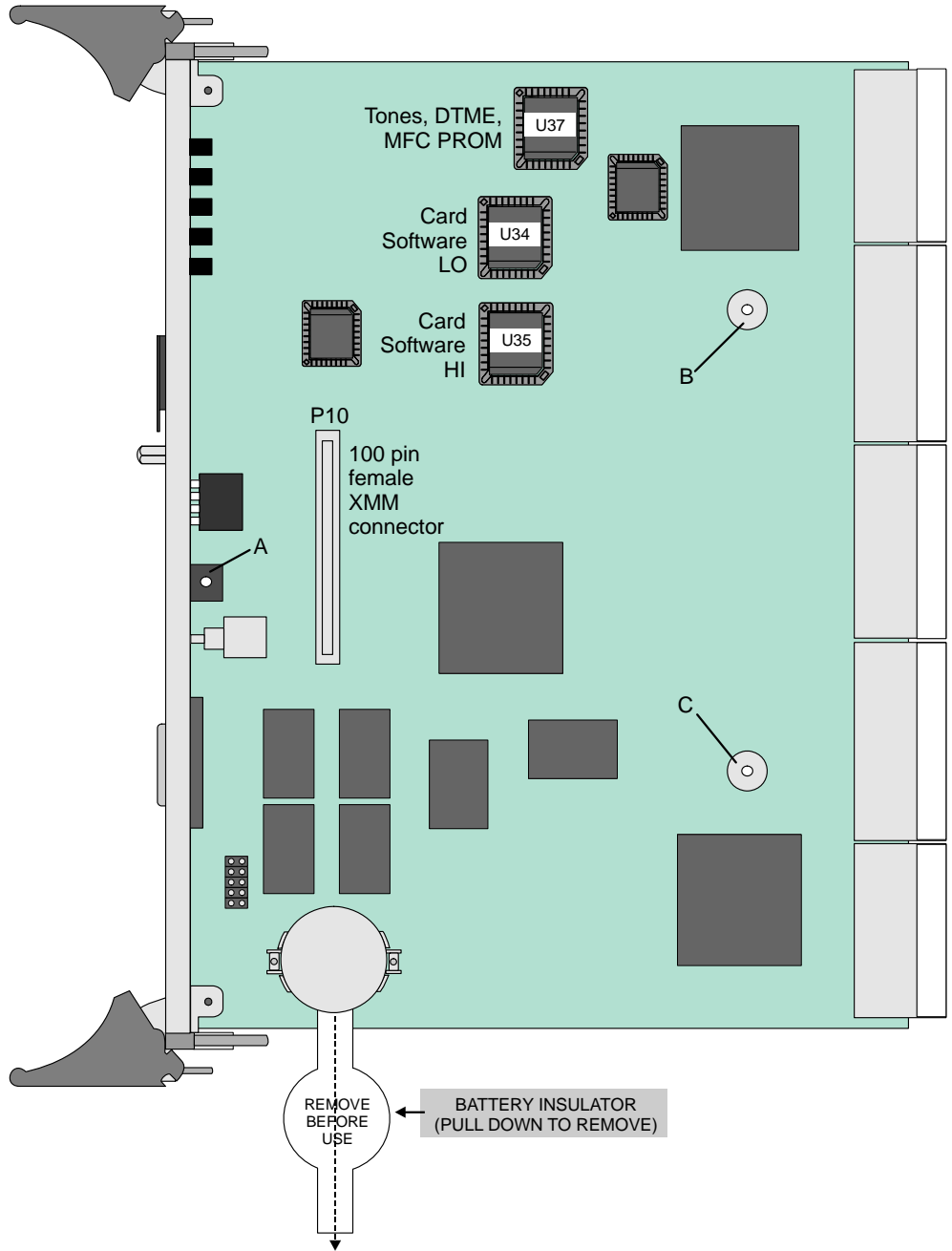


Figure 8-21 32GC Card Layout



2 Lithium Battery Handling Procedures

For a full description of control card lithium batteries, refer to [Lithium Backup Batteries, page 8-14](#)

3 Time Slot Configuration

The 32GC card supports up to eight HDLC highways and 64 PCM streams, and up to 8 peripheral shelf units (see [Figure 8-22](#)).

Each PCM stream includes 128 Time Slots. Each shelf unit (even and odd numbered peripheral shelf pairs) receives 384 Time Slots, divided into groups of 128 Time Slots (see [Figure 8-23](#)).

Each PB-ATS supports 512 PCM time slots to the Peripheral Shelf Unit backplane. See [PBD-ATS beginning on page 8-115](#) for more information. The Peripheral Shelves units require only 384 of the entire 512 time slots per Unit.

Figure 8-22 Coral system Dual Control Highway Structure

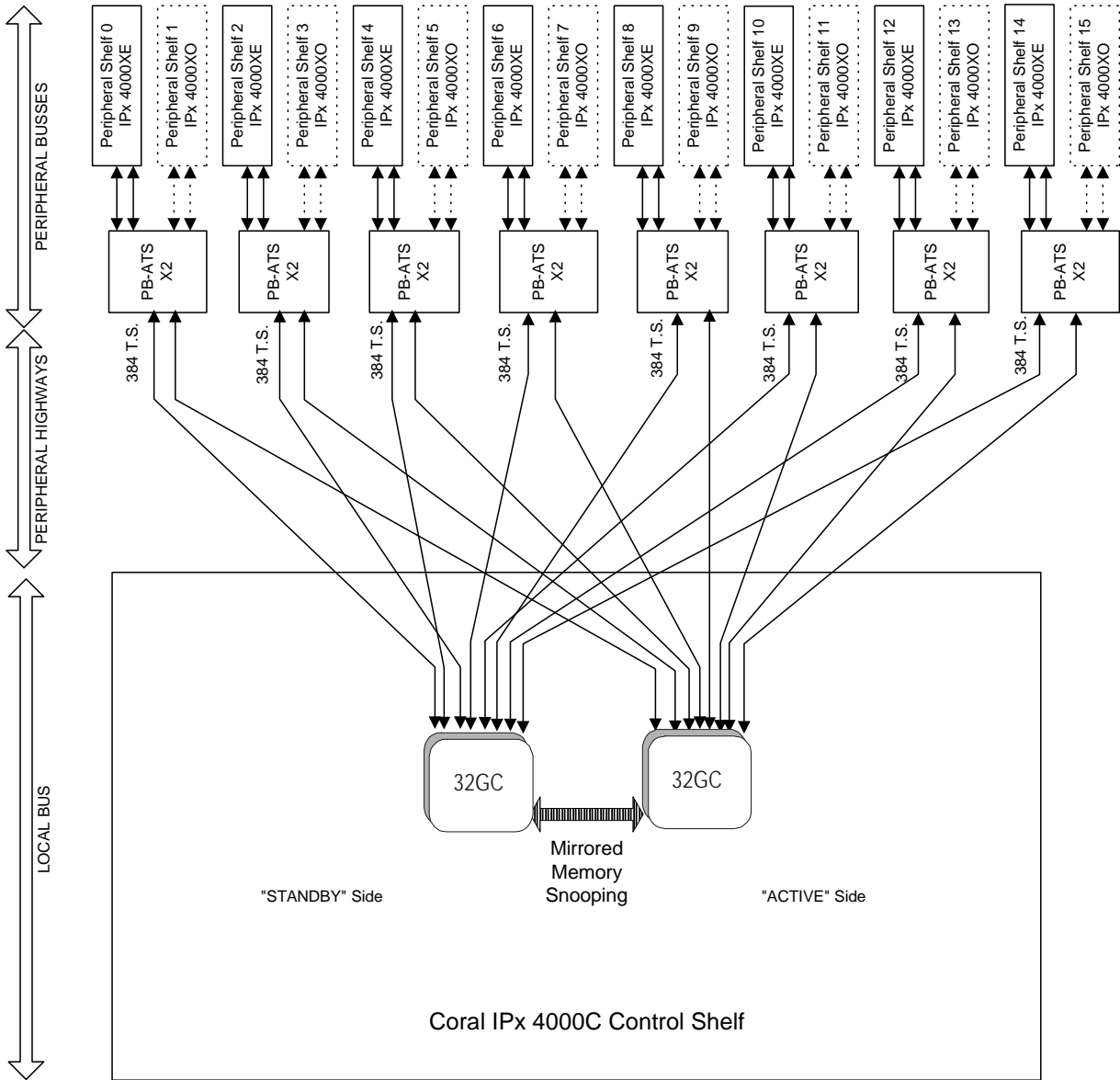
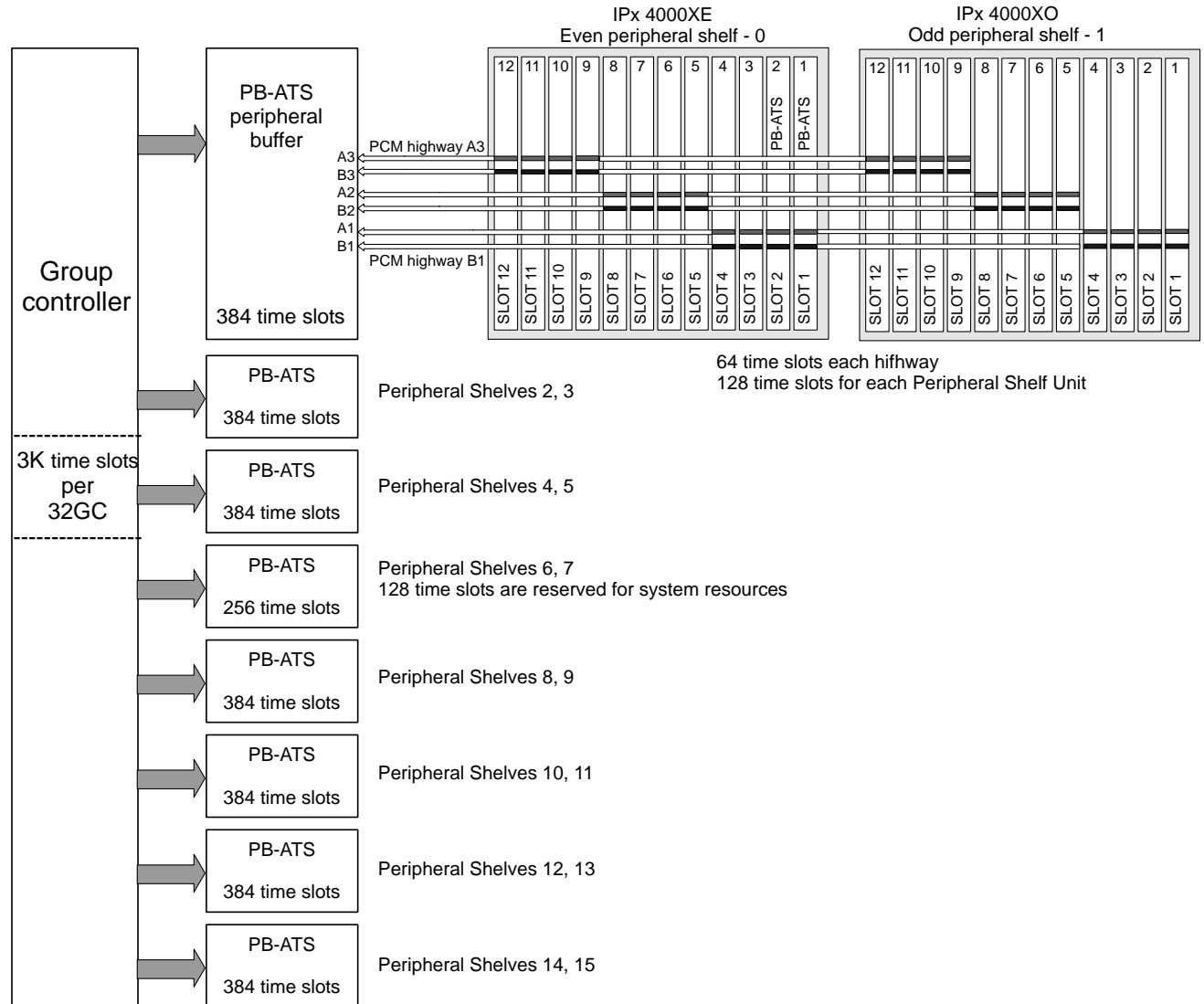


Figure 8-23 Coral system PCM Highway Distribution for 32GC



32GC Group Controller Card for IPx 4000C

4 Circuit Description

Clock Selection

The external clock synchronization selector monitors the 4 inputs (two are in current use while two more may be added in future configurations) for the presence of an 8.0 kHz clock signal which may be derived from a digital trunk card. A primary and secondary clock source may be defined in the system database, to synchronize the PCM clock of the 32GC card to the digital trunk. In the absence of an external clock source, the 32GC card always reverts to an internal clock. Clock failure is reported in the Program Interface.

Digital Tone Generator

The digital tone generator generates the audio call progress tones used to notify the caller of the status of the call. The stored tone patterns are output directly to the digital PCM bus when required.

The system automatically verifies, upon system initialization, that the tones are appropriate for the system as configured and overwrites the flash tone device on the 32GC card as appropriate.

PCM Streaming

Each PCM stream operates at a data rate of 8.192 Mbps. Each PCM stream consists of transmit and receive signals, each of which are divided into 128 time slots. Each time slot is eight bits wide, sampled every 125 μ s, or 8,000 times per second. This rate matches both A/ μ law PCM voice transmission rates to facilitate complete digital integration with the local telephone network.

The time switching matrix, acting on command by the system processor, is responsible for forwarding PCM voice samples from an incoming transmit time slot assigned to one port to a complementary outgoing receive time slot for the recipient port.

Using Time Slots

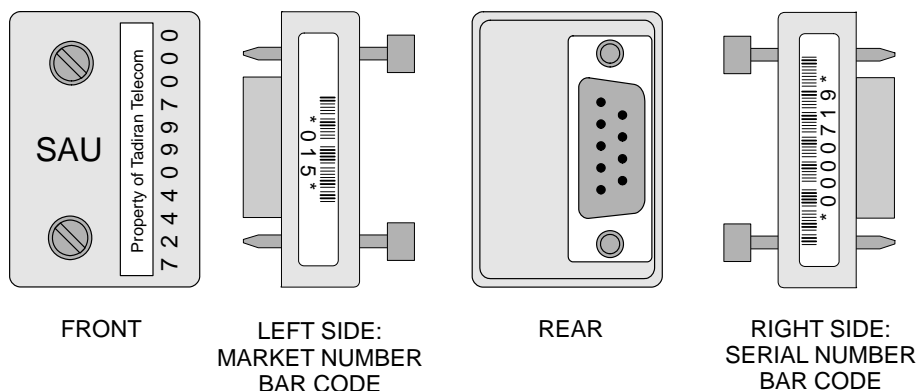
A call between two ports requires one transmit and one receive time slot on a single peripheral highway. Therefore, the 32GC card is capable of establishing calls between any 1.5K ports and any other 1.5K ports, on any of the 16 peripheral shelves, for a max

of 1.5K calls. This switching matrix allows for a Constant Frame Delay operation mode.

5 Software Authorization Unit (SAU)

The Software Authorization Unit (SAU) is a small, encapsulated device that plugs into its SAU port on the 32GC front panel, see [Figure 8-24](#). As for all Coral systems, each 32GC on the IPx 4000RControl Shelf must have its own unique SAU installed.

Figure 8-24 Software Authorization Unit (SAU) Detail



The SAU enables a set of permissions and feature authorizations associated with its unique identification number. The Coral software detects and verifies the permission settings of the SAU on the Control card (32GC) enabling the system to function properly.

During software installation, the SAU serial number is compared with the features authorization data, to verify the authorized use of enhanced Coral system features. During regular system operation, the SAU is checked to ensure it remains attached to the 32GC card. However, if necessary, the SAU can be removed for short periods (a maximum of two weeks) without interrupting system operation. If the SAU is removed for more than two weeks, the system ceases to process calls.

WARNING!

The Coral system automatically ceases call processing after 14 days for any of the following reasons:

- *The SAU serial number does not match the corresponding CFD SAU serial number.*
- *A SAU is removed from the 32GC front panel.*
- *The Coral generic version contained in the CFD is higher than is authorized by the SAU.*

Relevant system messages appear on the PI, warning that the system will not operate without the proper SAU.

Replacing a 32GC card requires removing the SAU from the old card and installing it on the replaced 32GC card.



NOTE:

When starting up the Coral system, ensure that there are no SAU Fault messages during start-up or SAU Alarms (PI Branch: Root, 1, 1, 15-Controls) due to any one of the following three reasons:

- ▣▣▣▣ a missing SAU device
- ▣▣▣▣ inappropriate software for this type of system
- ▣▣▣▣ mismatched SAU serial numbers on the CFD and SAU device

SAU Unique Serial Numbers

Each SAU is assigned a unique, factory set, system identification serial number which enables the feature authorizations and Coral generic software version for the Coral system. *Figure 8-24* illustrates the four side views of the SAU, including sample ID numbers. The left side includes the country code, while the right side includes the unique serial number. The last digit of the serial number is a verification digit. Any leading zeros, as well as the verification digit do not appear in the SAU number reported in the PI root menu.

SAUs for Redundant Systems (HSB)

For Redundant, Hot Standby systems, the software detects the information embedded on both SAU devices (one on each 32GC) and verifies that the same Coral version is loaded on both SAUs and set for the Hot Standby dual control configuration.

The SAU installed on the right side of the system control shelf is given a different serial number than the one installed on the left side. The technician must ensure that the SAU device serial number must match the CFD card serial number, installed on the side panel of the *corresponding* MCP-ATS.

WARNING!

Verify that the SAU device serial number (market number and serial number bar codes together) matches the SAU serial number on the corresponding CFD card label, inserted in the MCP-ATS on the same side of the control shelf.

Otherwise, the system will automatically shut down after 14 days.

SAU System Faults

If there is an SAU Fault, during the First Initialization, appropriate SAU error messages appear automatically with the other messages during loading. These error messages can also be viewed in the Active Alarms branch (Root, 1, 1, 15-Controls) of the PI.

Alarm Message	Error Message Description	Corrective Action	How the system sides are affected.
SAU Mismatch	The SAU device serial number does not match the SAU number embedded on the corresponding CFD.	Verify that the SAU serial numbers (on the CFD and SAU device) match on the same system side.	For a single sided system (IPx 4000): If the system receives any of these Alarm messages, then the Coral system will only function for a maximum of 14 days.
SAU Physical Check	The SAU device is either faulty or missing.	Replace the SAU device.	For a redundant (HSB) system (IPx 4000/R): If <i>only one</i> system side has an Alarm (SAU Fault), that system side will work for 14 days and then shut down, while the other side will remain in Active mode, resulting in a single sided configuration with no redundancy.
SAU Software Check	The Feature Authorization file on the CFD is invalid.	Replace the Feature Authorization file on the CFD, by either employing the FMprog Utility or receiving a new CFD.	If both system sides have any of these Alarm messages, then the entire Coral system will only function for a maximum of 14 days.

6 Inserting a 32GC Card

If applicable, the Coral system is shipped to the customer with the 32GC card(s) installed in the control shelf slot(s). However, there are instances where a card is removed and/or replaced.

For information on how to insert and remove a 32GC card from the cage, see [Inserting and Removing a Control Card, page 8-9](#).

After installing the 32GC card, perform the following:

1. Verify that DIP switches on the front panel of the 32GC card are positioned away from the numbers. See [Figure 8-20](#).
2. The SAU device and its corresponding CFD memory card are shipped in their own coral software box. Two separate coral software boxes are provided for redundant Coral IPx 4000/R HSB systems: one for the right side and one for the left side of the control shelf.
3. Verify that the serial number of the SAU matches the serial number on the CFD card inserted in the MCP-ATS on *this* side of the control shelf. The numbers must match *exactly*, otherwise the system will automatically shut down after 14 days.
4. Attach the SAU to the connector on the front panel of the 32GC. Use a #2 (1/8" or 4mm) straight-blade screwdriver to tighten the two screws securing the SAU until just snug.

Repeat this step for each 32GC in the system.

7 FlexLITE Remote Shelves

The Coral IPx 4000 has the ability to site peripheral shelves at a maximum distance of 35 km. (21 miles), from the main Coral cabinet using fiber-optic cables. The remote shelves can be:

- FlexLITE Coral FlexiCom 400 cabinet
- FlexLITE Coral IPx 3000XE/XO cages
- FlexLITE Coral FlexiCom 5000 cabinet Expansion cabinets;

in any combination up to a maximum of 16 Remote and Local Peripheral shelves total. Each FlexLITE Coral FlexiCom 400 cabinet counts as two shelves towards the allowed maximum number of shelves.

For FlexLITE operation, the 32GC card software Flash units (U34, U35) must be Version 1.07 and later. In redundant systems, both 32GC cards must be upgraded.

Refer to *Coral FlexLITE Remote Shelf Installation Manual* for more information about FlexLITE.

8 Specifications

Battery:	LF1/2W, 2430, 2430B
Voltage	3.0VDC Nom.
Capacity	250mAH
Width.....	0.118 in. (3 mm)
Diameter.....	0.965 in. (24.5 mm)
NEDA Equivalent	5011L

8.4 4/8XMM

Expanded Memory Module for 32GC

1 General Information



NOTE:

Coral Components Discontinuation Announcement:

8XMM cards replace the discontinued 4XMM cards, which are no longer produced.

The 4/8XMM daughterboard is an optional memory card that is mounted on the 32GC group controller card. It is an expansion memory module containing either 4 MB or 8MB and is required for added data storage capacity. It also contains the shared memory capacity utilized by the MCP-ATS and the optional CLA-ATS unit. The 4/8XMM includes 3V lithium battery backup for power protection.

The 4/8XMM card is installed as a piggyback card onto a memory interface connector on the 32GC and does not occupy its own card slot within the Coral IPx 4000 control shelf.

When is an XMM card required?

A 4/8XMM card is required:

- In large Coral Configurations with 5000 or more ports
- To use the Coral Directory, Traffic and Call Log features
- In Coral systems with a CLA-ATS card installed for CoraLINK. The CLA-ATS card uses 2MB of the 4/8XMM memory.

Refer to the [Program Interface Reference Manual](#) to display the database memory status. (Chapter-4 Size Definition, Route: SIZ, CHECK MEMORY?)

The required memory capacity 4MB or 8MB on the XMM card is determined by the configuration and size of the system.



NOTE:

When the system includes CoraLINK authorization and a 4/8XMM daughterboard, then 2MB of the 4/8XMM memory is allocated for the CoraLINK application, even when a CLA-ATS card is not installed.

4/8XMM Physical Features

Figure 8-25 illustrates the XMM card layout. The 4/8XMM card is a daughter board installed on the 32GC, therefore its LEDs and reset button show through the relevant holes in the 32GC front panel (see *32GC Front Panel on page 8-62*).

A 3 volt lithium battery provides power to maintain the card memory circuitry. When the battery does not hold sufficient power, a message is sent to the PI and the battery should be changed as soon as possible, see *Lithium Battery Handling Procedures, page 8-66* and *32GC Card Lithium Battery Test on page 3-17*.

A memory interface connector on the top side of the 4/8XMM and three holes of screws allows the optional installation of a second 4/8XMM card placed atop the first 4/8XMM card for future configurations.

The 4/8XMM dip switches are not used.

Attaching the 4/8XMM Card

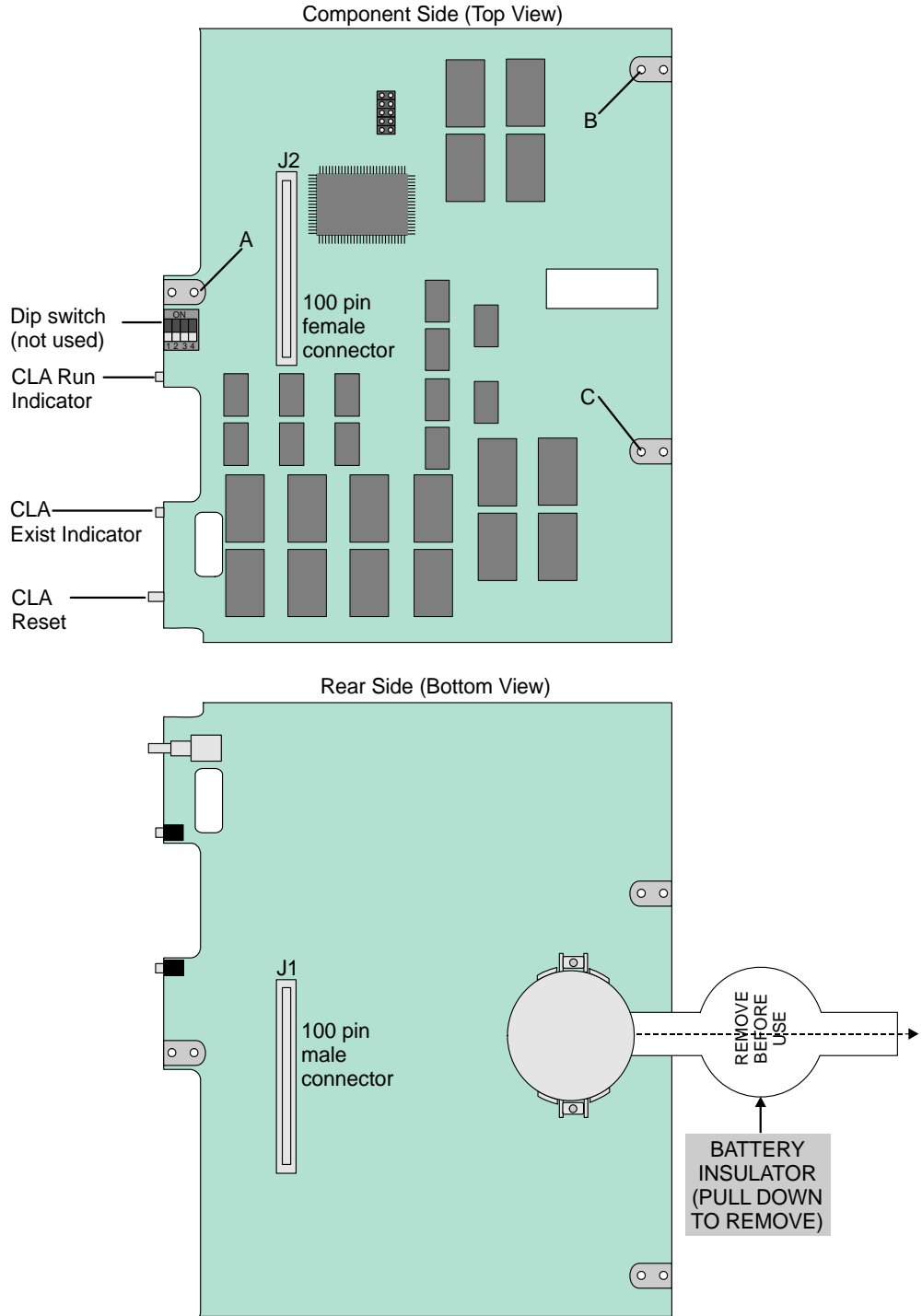
Each 4/8XMM card is equipped with two 100 pin connectors, a female connector on the top side of the card marked J2 (which is not used) and a male 100 pin connector on the bottom of the card marked J1.

J1 attaches to P10, the 100 pin interface connector, located on the 32GC card, see *Figure 8-21*.

The 4/8XMM card is supplied with the appropriate amount of screws and hex spacers required for its installation. The technician must provide a Phillips screwdriver to fasten and release the screws.

Figure 8-21 illustrates the 32GC card layout, while, *Figure 8-25* illustrates a 4 or 8XMM card. The holes, A, B and C, are provided for the connection screws, on both cards. They should be aligned exactly when attaching the XMM onto the 32GC, see *To attach the 4/8XMM onto a 32GC card: on page 8-78*.

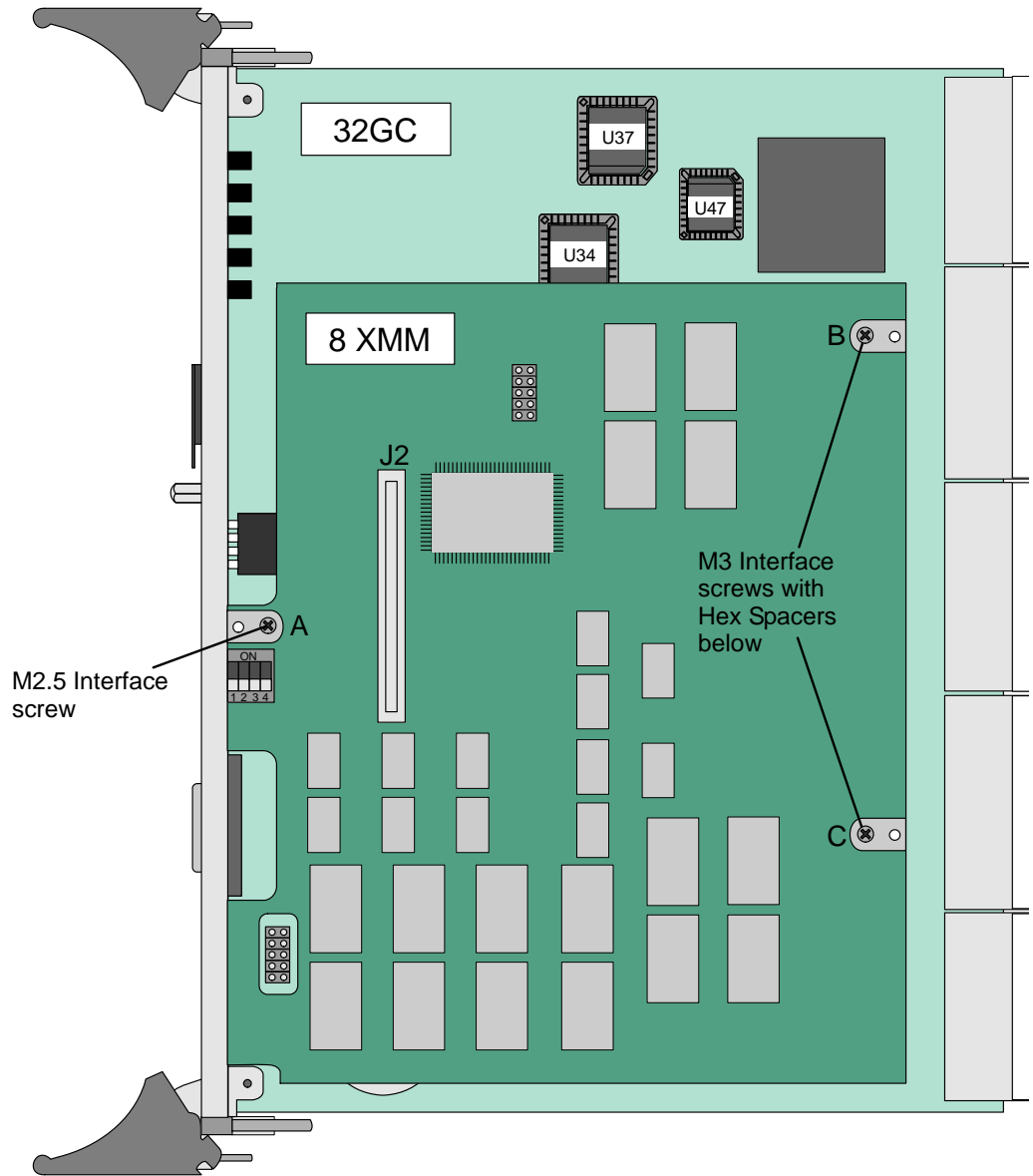
Figure 8-25 4/8XMM
Card Layout



To attach the 4/8XMM onto a 32GC card:

1. Remove the XMM battery insulation behind the battery by pulling out the insulation tab.
2. Attach the threaded hex spacers to holes **B** and **C** on the 32GC card by screwing them in from the back of the card using a Phillips screw driver and one M3 screw for each spacer.
3. Carefully align the **J2** multi-pin connector on the bottom side of the 4/8XMM card with the 100 pin memory interface connector, **P10**, on the 32GC, by aligning hole **A** on the XMM card with hole **A** on the 32GC card.
4. Gently but firmly press the 4/8XMM connector into the 32GC connector until the 4/8XMM card rests on the metal spacers. A slight resistance is felt as the connectors engage.
5. Fasten one M3 screw through each of the mounting holes **B** and **C** of the 4/8XMM card into the metal spacers until snug. Do not overtighten the screws, see [Figure 8-26](#).
6. Fasten one M2.5 screw through mounting hole **A** of the 4/8XMM card.
7. The LEDs from the XMM card should be visible from the front panel of the 32GC.

Figure 8-26 XMM installed on 32GC



2 Specifications

4/8XMM

Storage Capacity:	4 or 8MB
Memory Device:	4 or 8 MB SRAM
Battery:	LF1/2W, 2430, 2430B
Voltage	3.0VDC Nom.
Capacity	250mAH
Width	0.118 in. (3 mm)
Diameter	0.965 in. (24.5 mm)
NEDA Equivalent	5011L



NOTE:

Coral Components Discontinuation Announcement:

8XMM cards replace the discontinued 4XMM cards, which are no longer produced.

8.5 CLA-ATS

CoraLINK® Adapter Card for IPx 4000C

1 General Description

Various types of CLA cards may be utilized in the Coral IPx 4000 system. [Table 8-13](#) lists the different CLA cards used in the Coral IPx 4000 system and lists the Figure number depicting its card layout in this manual. These CLA cards are functionally identical, the only difference between the cards is the minimum requirement of Coral Software Version and MCP-ATS, covered in detail in [Table 8-14](#). In this document all CLA cards are referred to as the CLA-ATS except for the discussion of the card layout and BIOS settings.

The CoraLINK is a Computer Telephony Integration (CTI) Link for the Coral system that provides an Open Architecture Interface (OAI) to the call processing and management circuitry. CoraLINK enables external computer applications to monitor call activity, and establish, manipulate and disconnect calls through the Coral system. Coral systems installed with the CoraLINK Adapter (CLA-ATS) Card enable the system to function as a universal communications switching platform for specialized communications applications. The CLA-ATS interface enables connecting the Coral Control cards to an external Ethernet 10/100Base-T LAN computer network protocol. The CLA-ATS card incorporates the application processor and Ethernet interface circuitry for the CoraLINK computer-telephony integration (CTI) link and holds a PCMCIA drive to house the Compact Flash Disk (CFD). The CFD contains the CLA-ATS factory loaded software. The CLA-ATS shares the XMM memory expansion attached on the 32GC card. The Ethernet interface is a RJ-45 LAN connector on the front panel of the CLA-ATS card.



All Coral systems that include the optional CLA-ATS card, require a 4XMM or 8XMM expanded memory daughter card installed on the 32GC, as the CLA-ATS card retrieves its memory from the XMM, see [4/8XMM, page 8-75](#).

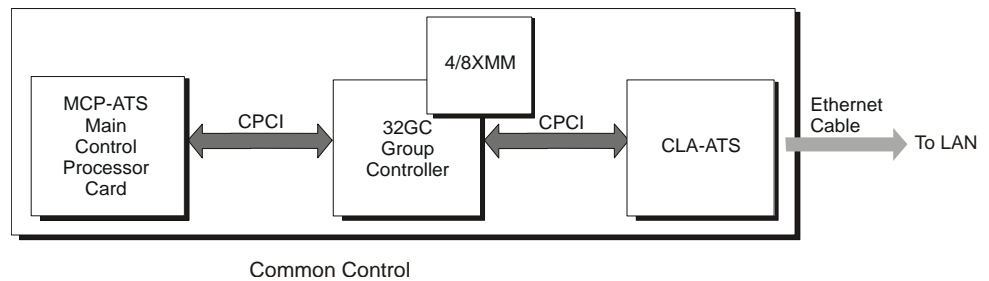
Tadiran Telecom branded cards: CLA-ATS/A or CLA-ATS requires MCP-ATS/A or MCP-ATS (Tadiran Telecom branded) catalogue number 72449163100, issue R09000017 or higher & CLA version 09.02.08 or higher.

Although the Coral IPx 4000R is a Hot Standby system, the twin CLA-ATS cards operate in a Standby/Duplicated mode, not offering CTI Hot Standby operation. Therefore, during common control swaps, the CTI application restarts without maintaining its current calls and functions and will disconnect active CTI calls. Additionally, if a CLA-ATS card fails the CTI application will fail and will not invoke a control changeover.

CLA-ATS Functional Block Diagram

The CLA-ATS communicates with the D-ATS which controls the Coral system via the XMM card located on the 32GC card. The XMM card stores a 2MB shared RAM for the MCP-ATS and the CLA-ATS, from which CTI data information may be retrieved. A CLA-ATS functional block diagram is shown in [Figure 8-27](#).

Figure 8-27 CLA-ATS-Functional Block Diagram



Applications

In Coral CTI applications, CoraLINK is connected to the Ethernet back-bone along with the telephony server.

The CoraLINK acts as an interface between the Coral system and any CTI server application for all the services (call, transfer, etc.) and events (monitoring functions) of the network. The CTI application together with the CTI telephony server manipulate numerous different call commands from the agent network and translate them into logical data. The CTI telephony server communicates with the CoraLINK through a single connection. The CoraLINK then translates that data into logical information for the Coral system, which processes the calls.

CoraLINK can support up to eight different multiple CTI applications on the network, any or all of which may be simultaneously directing service requests to, and receiving status events at any time.

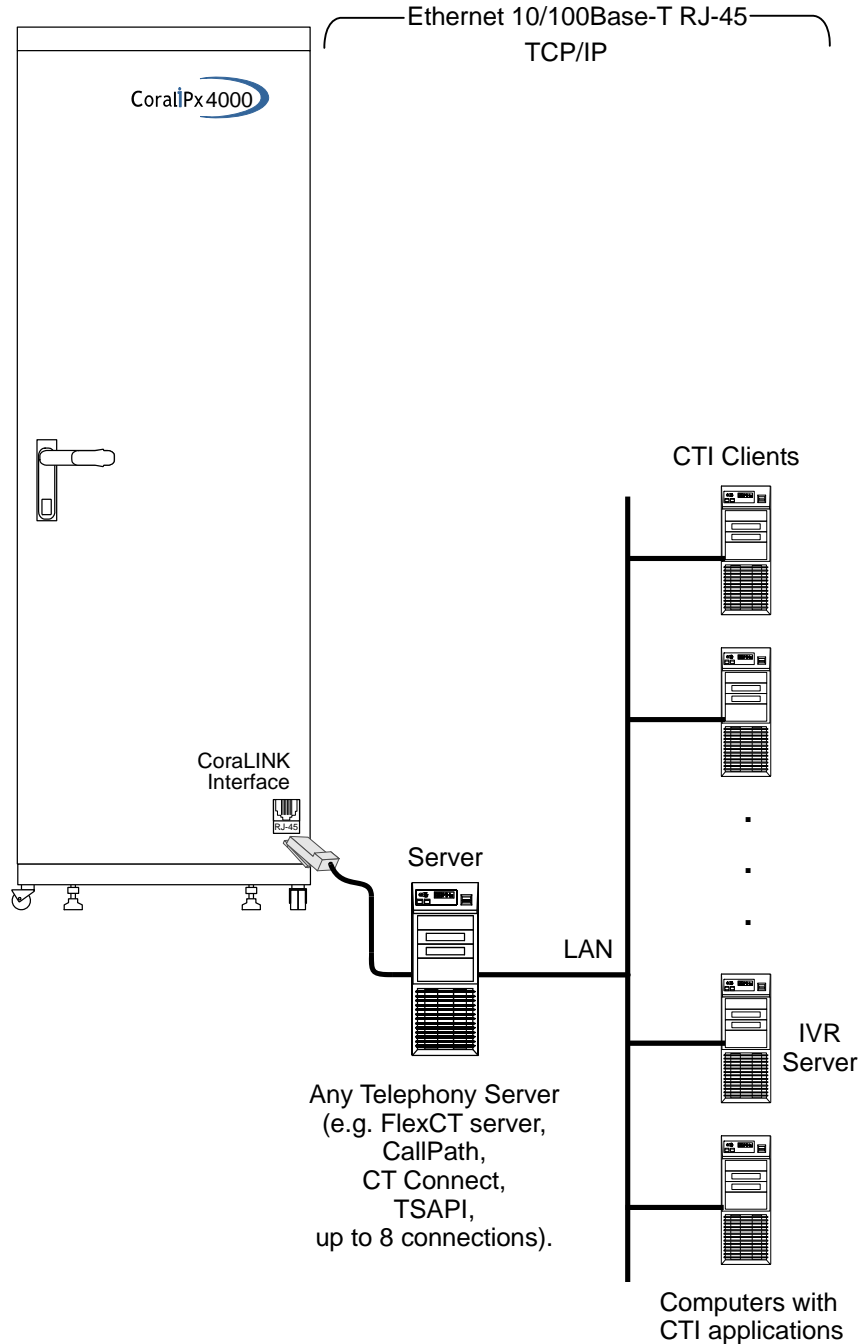
CoraLINK uses TCP/IP protocol and complies with the ECMA 179 and 180 standards. CoraLINK also supports the Novell TSAPI protocol, the Intel Dialogic CT-connect, and IBM's Callpath.

 **NOTE:**

Hot Standby system with Redundant (/R) common control, requires two CLA-ATS cards connected to the CTI server via HUB.

The CLA-ATS should be accompanied by the appropriate software application. Contact your manufacturer for the required CTI application and/or price list. See Chapter 2 in the **Coral FlexiCom & Coral IPx Product Description**, for more details.

Figure 8-28 **CoraLINK Application Telephony Server**



2 CLA-ATS Card Types

Various types of CLA-ATS cards may be utilized in the Coral IPx 4000 system. The following table lists the different CLA-ATS cards used in the Coral system and lists the Figure number depicting its card layout in this manual.

Table 8-13 CLA-ATS Card Types

Manufacturer	Card Type Name	Figure Number	
		Front Panel	Layout
Tadiran Telecom	CLA-ATS/A	Figure 8-32 on page 8-91	Figure 8-29 on page 8-85
	CLA-ATS	Figure 8-33 on page 8-92	
Kontron	teknor cPCI-MXP	Figure 8-34 on page 8-93	Figure 8-30 on page 8-86, Figure 8-31 on page 8-87

3 Coral Versions Compatibility with CLA-ATS Card Type

The following table defines the Coral software versions compatible with CLA-ATS card model.

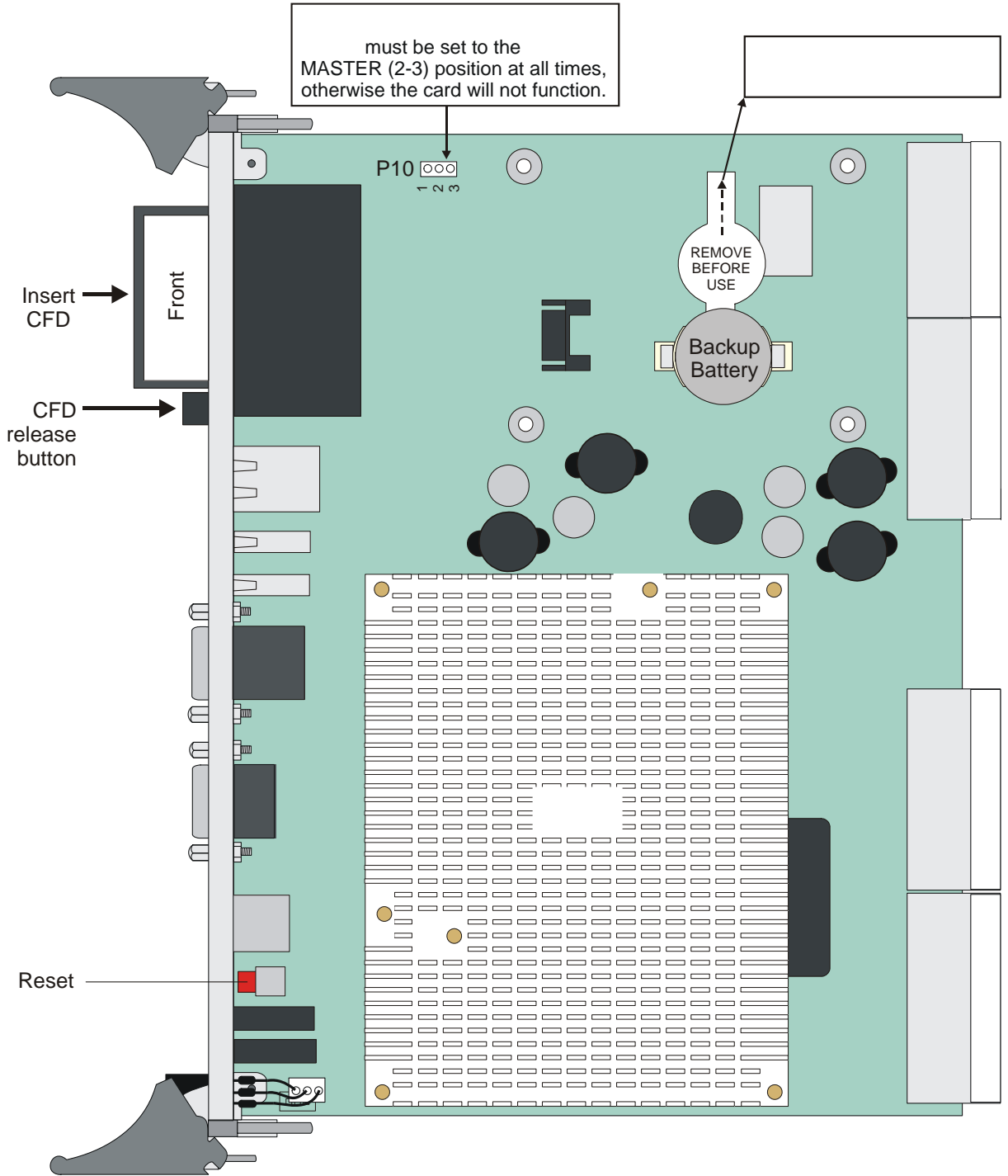
Table 8-14 CLA-ATS Card Types Compatibility with Coral Versions

Coral Software	Card Compatible		
	CLA-ATS/A	CLA-ATS	teknor cPCI-MXP
Versions 16.04.07 or higher	Yes (see note *)	Yes (see note †)	Yes
Versions 16.04.06 or lower	No	No	Yes

* CLA-ATS/A requires MCP-ATS/A or MCP-ATS (Tadiran Telecom branded) catalogue number 72449163100, issue R09000017 or higher & CLA version 09.02.08 or higher

† CLA-ATS requires MCP-ATS/A or MCP-ATS (Tadiran Telecom branded) catalogue number 72449163100, issue R08000015 or higher & CLA version 09.02.08 or higher

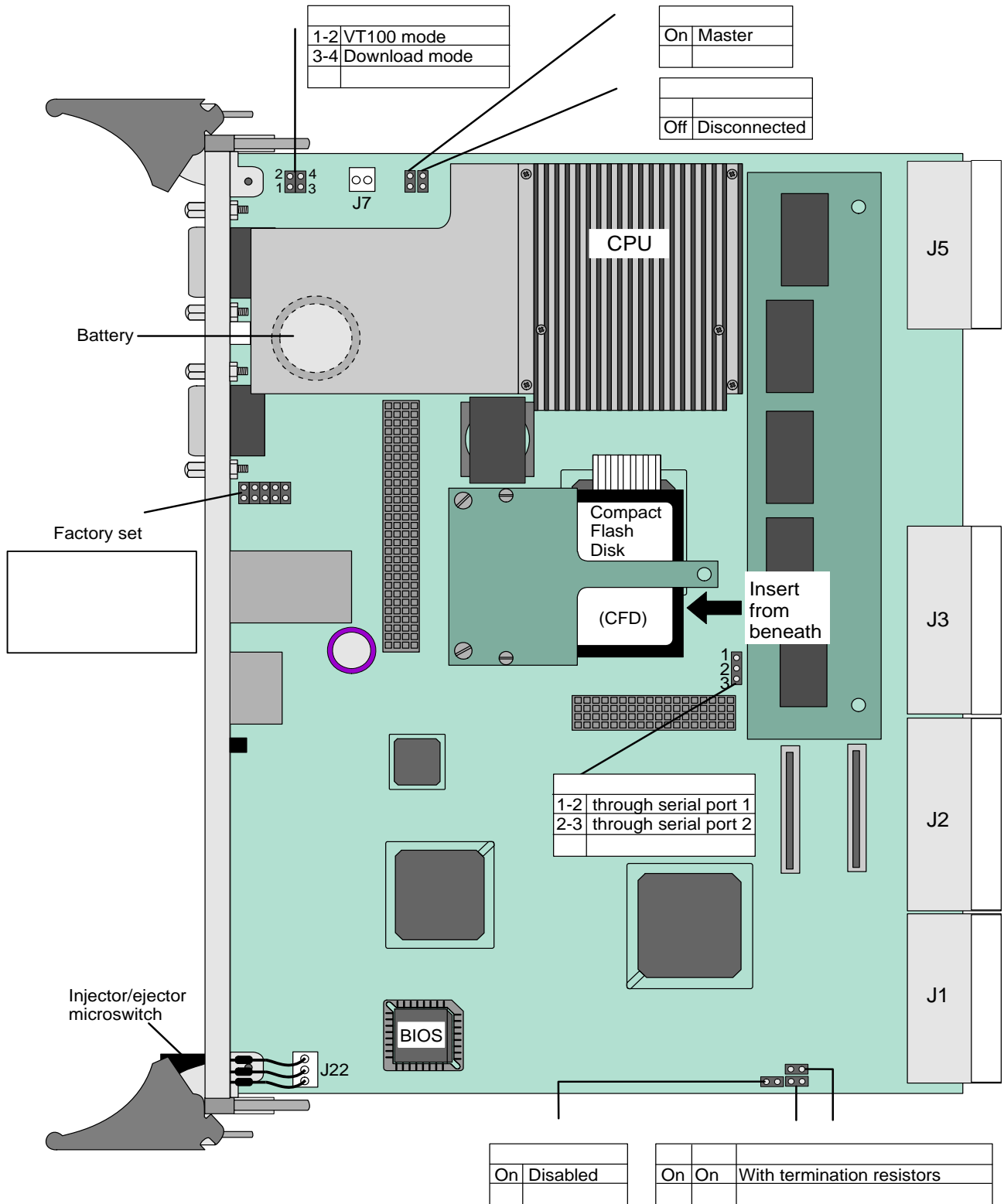
Figure 8-29 **CLA-ATS/A**
and CLA-ATS
(Tadiran Telecom)
Card Layout



NOTE:

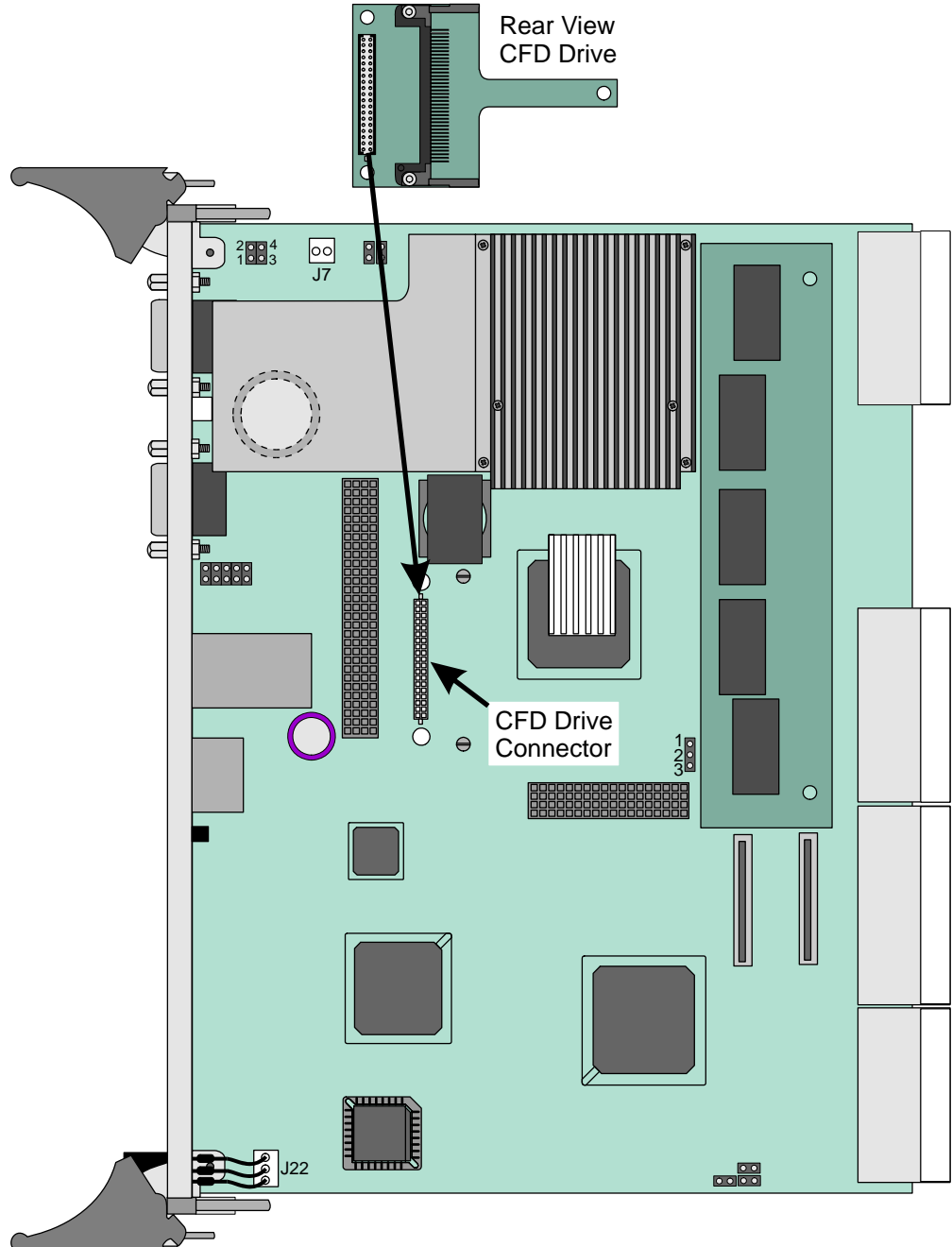
Jumper P10 (when installed) must be set to the MASTER (2-3) position at all times, otherwise the card will not function.

Figure 8-30 **CLA-ATS**
(teknor cPCI-MXP)
Card Layout



CLA-ATS (teknor cPCI-MXP)

Figure 8-31 CLA-ATS
(teknor cPCI-MXP) card
with CFD Drive removed



CLA-ATS (teknor cPCI-MXP)

CLA-ATS CoraLINK® Adapter Card for IPx 4000C

4 Card Layout

Lithium Backup Battery

For a full description of control card lithium batteries, refer to [Lithium Backup Batteries, page 8-14](#).

CLA-ATS and CLA-ATS/A (Tadiran telecom) Jumper settings

The CLA-ATS includes a number of jumpers that are factory set, defined by the manufacturer. The jumper settings should not be changed in anyway. The technician must only verify that Jumper P10 (when installed) is connected with a shorting plug on 2-3. A list of the jumper settings is provided below, however, the jumper configurations may differ from card to card. Refer to [Figure 8-29 on page 8-85](#).

Jumper	Coral Configuration
P10 Master/Slave	Connected with a shorting plug between 2-3 Master
P12	Connected with a shorting plug between 1-2
P13	Connected with a shorting plug between 1-2
P15	Connected with a shorting plug between 1-2



NOTE:

Jumper P10 (when installed) must be set to the MASTER (2-3) position at all times, otherwise the card will not function.

CLA (teknor cPCI-MXP) Jumper settings

The CLA-ATS includes a number of jumpers that are factory set, defined by the manufacturer. The jumper settings should not be changed in anyway. The technician must only verify that Jumper W4 is connected with a shorting plug. A list of the jumper settings is provided below, however, the jumper configurations may differ from card to card. . Refer to *Figure 8-30 on page 8-86*.

Jumper	Coral Configuration
W1-CPU Core Voltage- 1.6V when On	1-2 On 3-4 Off 5-6 On 7-8 Off 9-10 On
W2- Remote Reset	Disabled- Off
W4 - Onboard Battery	Connected- On
W6- VT100/Download Mode	Normal Mode - Off
W7- Onboard Video	Enabled - Off
W9, W10 COM2 Terminations	RS-422/485 modes only Without Termination resistors - off
W11- Compact Flash	Slave - Off
J7 - Fan Header	Off

5 Card Front Panel

The following figures illustrate the front panels for the different CLA-ATS cards used in the Coral IPx 4000 system. Note that the card is shown in its upright position for insertion on the right side of the control shelf.

Table 8-15 CLA-ATS Front Panel Figures

Manufacturer	Card Type Name	Figure Number
Tadiran Telecom	CLA-ATS/A	Figure 8-32 on page 8-91
	CLA-ATS	Figure 8-33 on page 8-92
Kontron	teknor cPCI-MXP	Figure 8-34 on page 8-93

The following components, found on CLA-ATS front panels, are used in all Coral IPx 4000 systems.

The following tables describe various card front panel components:

Table 8-16 [CLA-ATS Front Panel Connectors and Pushbuttons, page 8-94](#)

Table 8-17 [CLA-ATS Front Panel LED Indicators, page 8-95](#)

Figure 8-32 **CLA-ATS/A**
(Tadiran Telecom) Front
Panel Upright Position

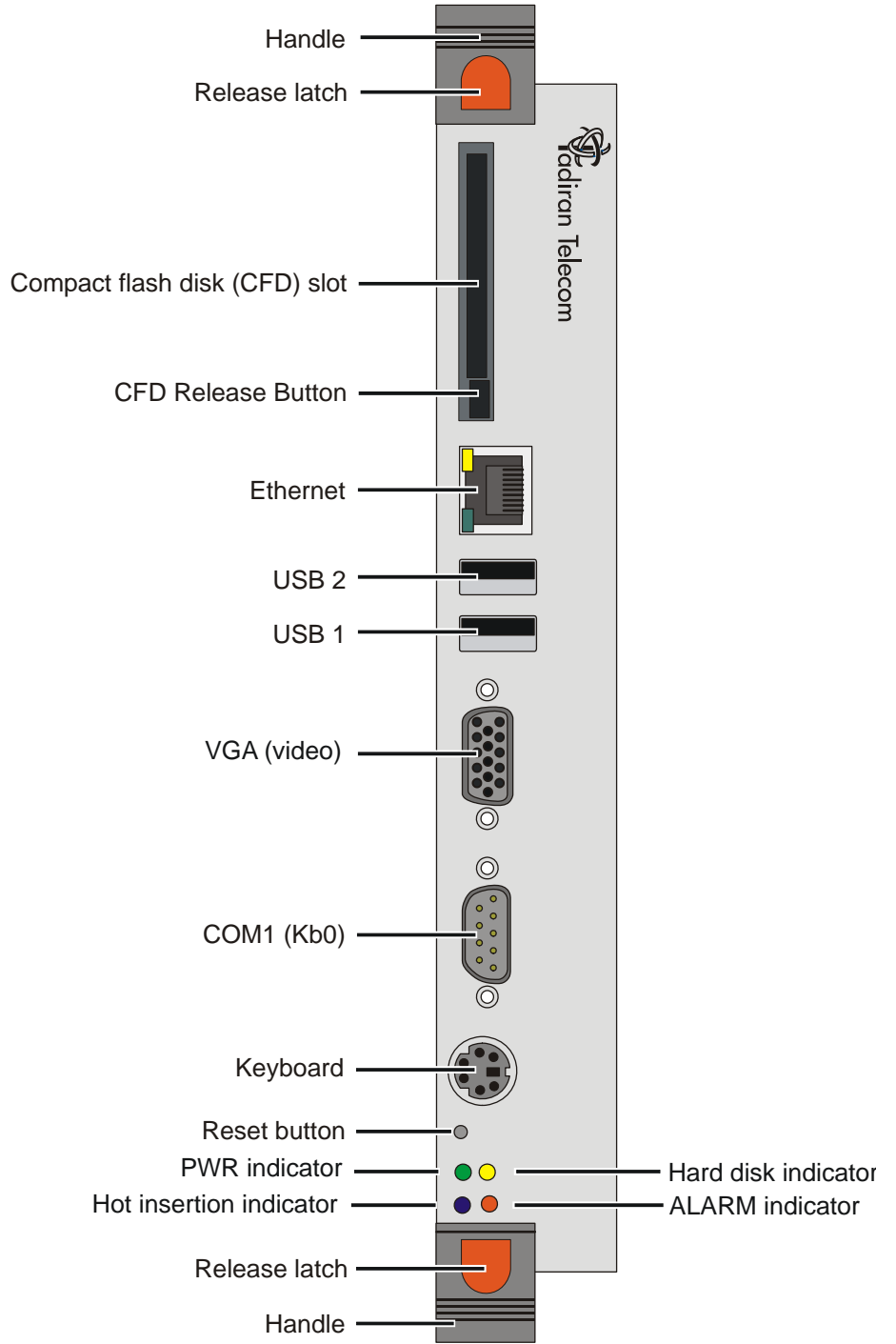


Figure 8-33 CLA-ATS
(Tadiran Telecom) Front
Panel Upright Position

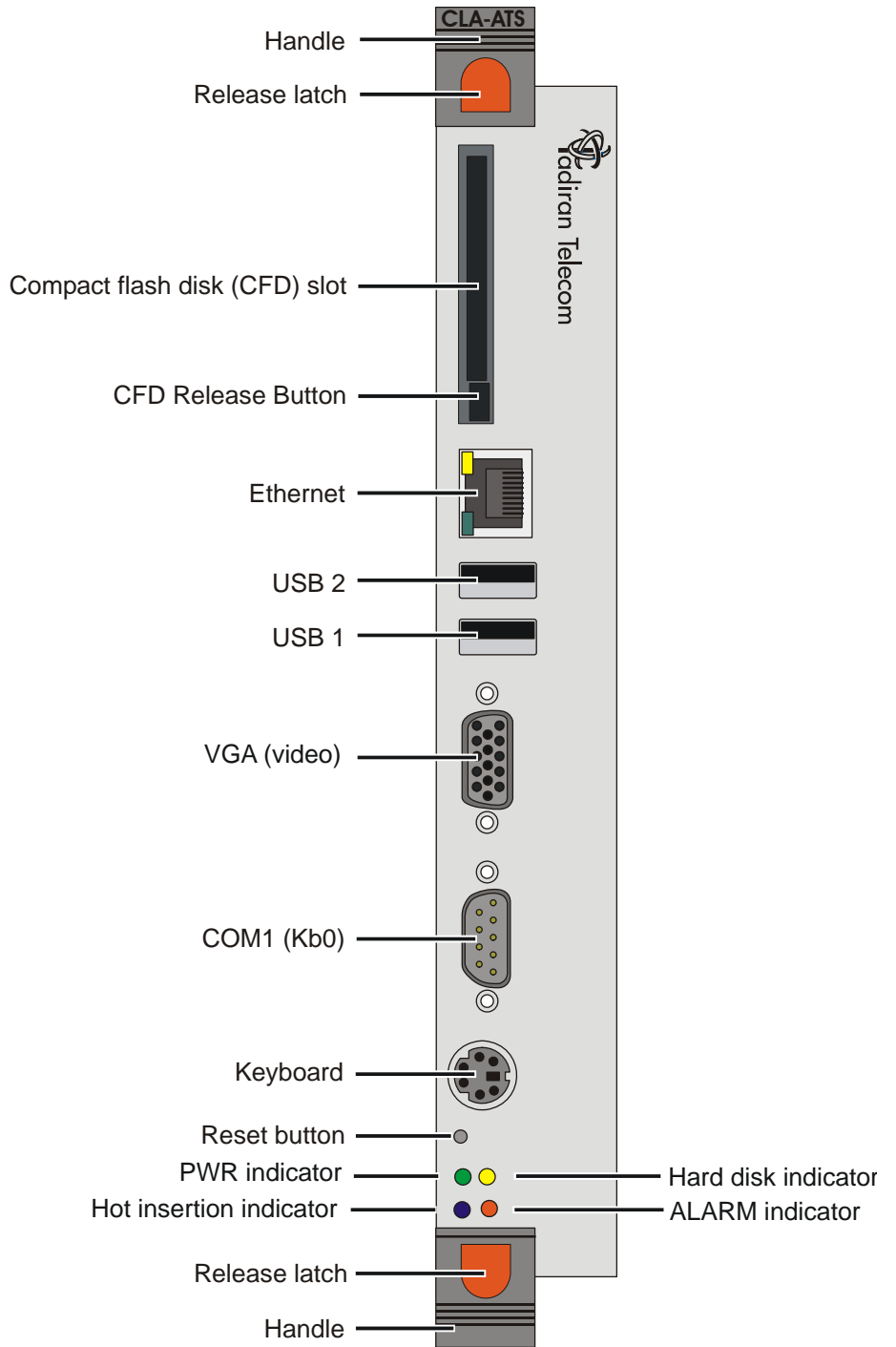
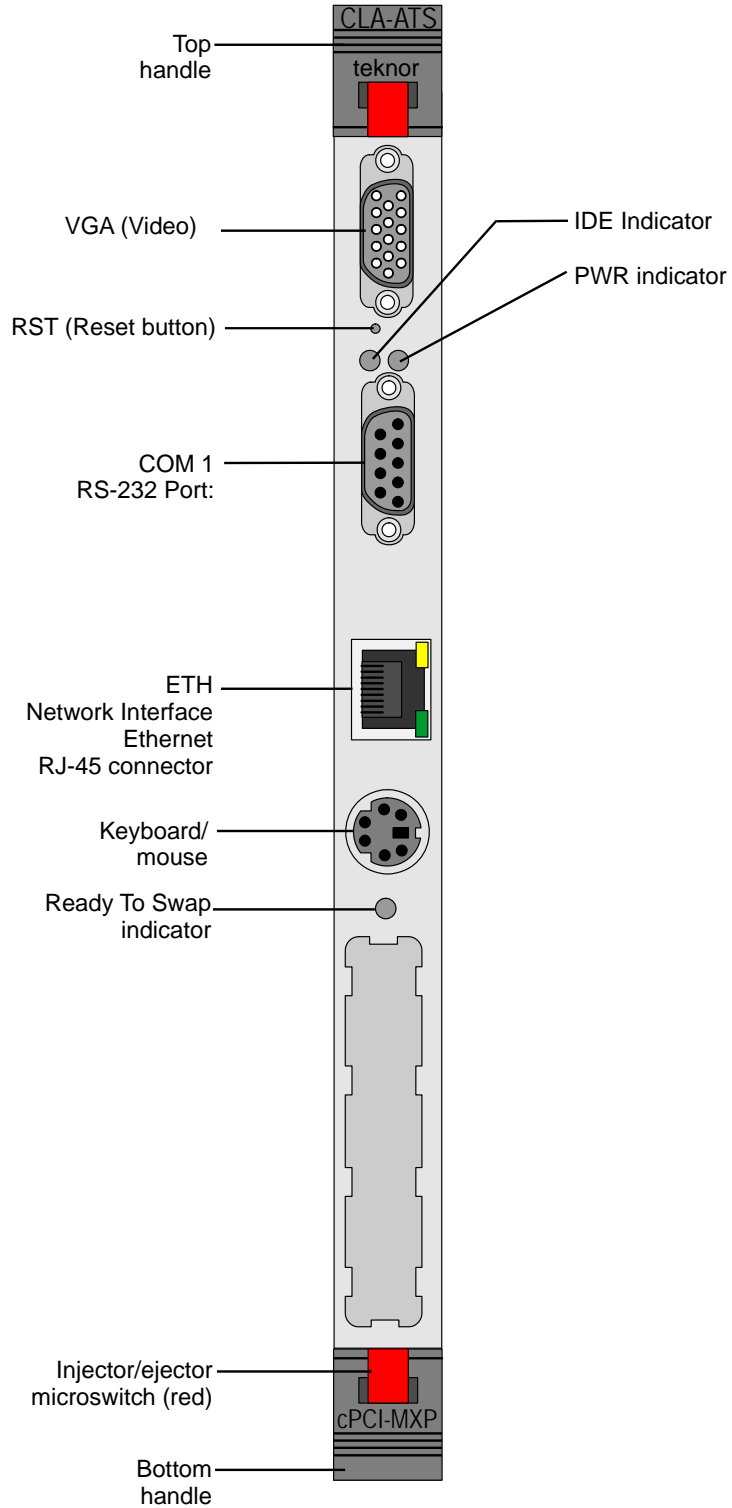


Figure 8-34 **CLA-ATS**
(teknor cPCI-MXP) Front
Panel - Upright Position



CLA-ATS (teknor cPCI-MXP)

Table 8-16 CLA-ATS Front Panel Connectors and Pushbuttons

Component	Card Type Name		Function
	CLA-ATS/A CLA-ATS	teknor cPCI-MXP	
CFD	•		See <i>CFD - Compact Flash Memory Disk, page 8-20</i>
ETH	•	•	Network Interface- Ethernet/LAN RJ-45 connection. See <i>Table 8-18, CLA-ATS Interface Connections (DTE) on page 8-105.</i>
USB1/2	•		USB ports, general purpose (keyboard or mouse, etc.)
VGA (Video)	•	•	Video port (15-pin high density female D-sub connector), used to connect the card to a video monitor terminal when reviewing the BIOS* settings. .
COM 1	•	•	Not used
KB/MS	•	•	Keyboard and PS/2 Mouse (circular 6-pin mini-DIN connector), used to connect a keyboard or mouse when reviewing the BIOS settings. Also a PS/2 mouse can be connected directly or via an external cable splitter. Two terminal connections are for communication between the keyboard and the keyboard interface port. Two similar connections are for communication between the mouse and the mouse interface port. All four of these signals are CMOS compatible. The two remaining connections provide power for mouse and keyboard operation.
RST	•	•	Reset button - causes the CLA-ATS to drop all CTI calls and resets the card. The card automatically reestablishes a network connection.

* BIOS (Basic Input Output System) program which is permanently located in a computer's (CLA-ATS) memory and is activated at startup

Table 8-17 CLA-ATS
Front Panel LED
Indicators

Component	Card Type Name		Function
	CLA-ATS/A CLA-ATS	teknor cPCI-MXP	
ETH	●	●	Network Interface- Ethernet/LAN connection
PWR	●	●	Power on indicator (green), used to indicate that Power is supplied to the CLA card
HS	●		Hot insertion indicator (blue). Lights continuously to indicate that card is not inserted properly. See Inserting a Control Card, page 8-9 .
HD	●		Hard Disk drive indicator (yellow). Flashes to indicate CFD and Hard Drive activity, reading and writing to hard disk. Caution: Do not remove the CFD nor the CLA-ATS card from its slot when this LED is flashing. See Removing a Control Card, page 8-12 .
AL	●		Alarm indicator (red). Lights continuously to indicate one or more of the following: <ul style="list-style-type: none"> • CPU is overheated • Battery voltage output is not within spec. See Lithium Backup Batteries, page 8-14 .
IDE		●	Hard Disk Drive (green) indicates hard drive activity on the primary IDE channel. Caution: Do not remove the card from its slot when this LED is flashing. See Removing a Control Card, page 8-12 .
RS		●	Ready to Swap indicator

6 CFD - Compact Flash Memory Disk on CLA-ATS Card

The Compact Flash memory Disk (CFD) contains the CLA-ATS card's software and programming code. The CFD slot is housed on the CLA-ATS card component side or front panel. It is shipped already installed in the drive, if however, a new CFD must be installed, the following steps describe its installation procedure. The CFD memory capacity size is dependent on the Coral system configuration.

In redundant Coral IPx 4000/R system, which includes two complete sets of control hardware, both CLA-ATS cards required the same CLA version on the CFD, therefore, if one is updated the other must be updated as well.

CFD Label Description

The CFD label describes the CFD contents, its Catalog number, the loaded Software version, and the SAU number that must correspond to the SAU device attached on the front panel of the 32GC on the same side of the CLA-ATS, see also [Software Authorization Unit \(SAU\)](#) on page 8-70.

Replacing a CFD in the Tadiran Telecom CLA-ATS/A and CLA-ATS Cards

CAUTION!

Do not remove the CFD or CLA-ATS card from its slot when the HD LED is flashing, indicating CFD or Hard Drive activity. Data will be lost if card is removed from the system when HD LED is flashing.

- 1 Verify that HD LED on the CLA-ATS card does not flash and remove the old CFD flash memory card.
- 2 Insert the new CFD to its slot on the CLA-ATS card.

Replacing a CFD in the Teknor cPCI-MXP CLA-ATS Card

CAUTION!

Do not remove the CLA-ATS card from its slot when the IDE LED is flashing, indicating CFD or Hard Drive activity. Data will be lost if card is removed from the system when HD LED is flashing.

1. Verify that HD LED on the CLA-ATS card does not flash and remove the CLA-ATS card from the cage. See [Removing a Control Card, page 8-12](#).
2. Unscrew the two screws located on the drive to remove the drive, see [Figure 8-30 on page 8-86](#).
3. Insert the new CFD. The CFD is inserted with its label face up. The CFD cannot be inserted upside down.
4. Reattach the drive to its connector on the CLA-ATS card, see [Figure 8-31 on page 8-87](#).
5. Fasten the two screws to secure the CFD in its place.
6. Insert the CLA-ATS card to the cage. See [Inserting a Control Card, page 8-9](#).

7 Verifying the BIOS Settings

The Coral system arrives at the site ready to use. However, in the event that the system fails to complete the start-up cycle, it is possible to enter the CLA-ATS BIOS and verify that the settings are correct by using a temporarily attached keyboard and terminal. The BIOS type and settings vary depending on the CLA-ATS model. The procedure for viewing and setting the BIOS for each CLA-ATS type is displayed below.

- To move among the Main menu screen options, follow the navigation keys on the screen.
- To move among the list of parameters, use the navigation arrow keys.

Verify that the values set for the parameters are correct.

Manufacturer	Card Type	BIOS* Settings Procedure
Tadiran Telecom	CLA-ATS/A	<i>BIOS Settings for the CLA-ATS and CLA-ATS/A Tadiran Telecom cards, page 8-99</i>
	CLA-ATS	<i>BIOS Settings for the CLA-ATS and CLA-ATS/A Tadiran Telecom cards, page 8-99</i>
Kontron	teknor cPCI-MXP	<i>BIOS Setup for CLA-ATS Teknor cPCI-MXP, Applicom T1005, Version 2.0, page 8-100</i>

* BIOS (Basic Input Output System) program which is permanently located in a computer's memory and is activated at startup



NOTE:

If the BIOS Setup Configuration procedure for your card type is not described below, refer to the manufacturer's website as follows:

7. From your workstation, open the Web browser and access the manufacturer's web site at <http://www.tadirantele.com>.
8. Go to **Partners login**, type your username and password.
9. Click **Enter**. The Main Partners page is displayed.
10. Go to **Support**.
11. Refer to the list of card models supplied for the CLA-ATS and execute its corresponding BIOS Setup procedure.

BIOS Settings for the CLA-ATS and CLA-ATS/A Tadiran Telecom cards

The card BIOS settings are factory-configured to match the CLA-ATS card requirements.

Use the following procedure to verify the correct BIOS settings for the CLA-ATS card model: Tadiran Telecom.

1. Connect a video terminal and keyboard to the front panel of the card.
2. Install the CLA-ATS card in to the slot labeled CLA-ATS in the control cage (see [Inserting a Control Card, page 8-9](#)).
3. Turn on the main power to the Coral system.
4. Press the Reset button on the front panel of the card.
5. Press the keyboard **Delete** key (repeatedly) several times while the card is loading until the **Phoenix Award BIOS CMOS Setup Utility** main screen is displayed.
6. Using the arrow keys, navigate to the **Load Optimized Defaults (Y/N)** screen, type **Y**, and then press **Enter**; the optimized defaults are loaded and the main **Phoenix Award BIOS CMOS Setup Utility** screen is displayed.
7. Press **F10**; the **SAVE to CMOS AND EXIT (Y/N)** prompt is displayed; select **Y** and then press **Enter**; the **Phoenix Award BIOS CMOS Setup Utility** closes.
8. Remove the keyboard and video connections and re-initialize the Coral system by pressing the Reset button on the CLA-ATS front panel.
9. Check to see that the Coral initializes properly, see [Messages for a Properly Loading Active Side on page 3-12](#) or [Messages for a Properly Loading Standby Side on page 3-15](#).

BIOS Setup for CLA-ATS Teknor cPCI-MXP, Applicom T1005, Version 2.0

1. Insert the CFD if not already inserted on the card component side panel.
2. Connect a video terminal and keyboard to the card front panel.
3. Insert the CLA-ATS back into its slot in the Control Shelf.
4. Press the CLA-ATS front panel reset button to re initialize the card.
5. Press the keyboard **Delete** or **F2** key while the CLA-ATS card is initializing.
6. Follow the on screen directions to select items.
7. Choose the **Standard CMOS SETUP** option.

Should it be necessary to update the date and time, this may be changed on this screen.

Primary Master, Primary Slave, Secondary Master and Secondary Slave should all be set to **AUTO**.

Drive A and Drive B should be set to **None**.

8. Choose the **BIOS FEATURES SETUP** from the Main menu and verify the following values for the items:

BIOS Option	Value
Virus Warning	Disabled
Quiet Post	Disabled
Quick Power On Self Test	Enabled
Full Screen LOGO Show	Disabled
Boot from LAN First	Disabled
Raid Card Boot First	Disabled
Boot Sequence	C,A,SCSI
Swap Floppy Drive	Disabled
Boot Up Floppy Seek	Disabled
Drive A Boot Permit	Enabled
Floppy Disk Access Control	R/W
Report No FDD For WIN95	No
Hard Disk Write Protect	Disabled
HDD S.M.A.R.T. capability	Enabled
Delay for HDD (Secs)	0
OS Select DRAM>64MB	Non-OS2
Gate A20 Option	Fast
Security Option	Setup

BIOS Option	Value
Diskette Access For	All
Boot Up NumLock Status	On
Typematic Rate Setting	Enabled
Typematic Rate (Chars/s)	30
Typematic Delay (Msec)	250
VT100 Setting:	
Comport	1
Speed	AUTO
Parity	None
Data	8
Stop	1

9. Return to the main screen and choose **CHIPSET FEATURES SETUP**.

Verify the following values for the items:

CPU Internal Cache	Enabled
External Cache	Enabled
CPU L2 Cache ECC Checking	Enabled
SDRAM RAS to CAS Delay	3
SDRAM RAS Precharge Time	3
SDRAM CAS latency Time	3
SDRAM Precharge Control	Disabled
DRAM Data Integrity Mode	ECC
Memory Hole at 15M-16M	Disabled
Video BIOS Cacheable	Enabled
Video RAM Cacheable	Enabled
8 Bit I/O Recovery Time	1
16 Bit I/O Recovery Time	1
PCI/VGA Palette Snoop	Disabled
Passive Release	Enabled
Delayed Transaction	Disabled
Supervisor I/O Base Addr.	190h
Power-Supply Type	AT
AGP Aperture Size (MB)	64
Video BIOS Shadow	Enabled
C8000-CBFFF Shadow	Enabled
CC000-CFFFF Shadow	Enabled
D0000-D3FFF Shadow	Enabled
D4000-D7FFF Shadow	Enabled

D8000-DBFFF Shadow	Enabled
DC000-DFFFF Shadow	Enabled

10. Return to the main screen and choose **CPU/BOARD FEATURES SETUP**.

Set **SAVE CMOS in FLASH** to Enable.

11. Return to the main screen and choose the **INTEGRATED PERIPHERALS** option. Verify the following values for the items:

On Chip Primary PCI IDE	Enabled
IDE Primary Master PIO	Auto
IDE Primary Slave PIO	Auto
IDE Primary Master UDMA	Auto
IDE Primary Slave UDMA	Auto
On Chip Secondary PCI IDE	Disabled
IDE HDD Block Made	Enabled
Ether Controller	Enabled
USB Key Board Support	OS
PS/2 mouse control	Auto
Onboard FDC Controller	Enabled
Onboard Serial Port 1	Auto
Onboard Serial Port 2	Auto
Serial port mode	RS-232

- Return to the main screen and choose the **IDE HDD AUTO DETECTION** option to verify the Primary Master and Primary Slave options.

HARD DISKS:

Primary Master

Select Primary Master Option (N-Skip): N

OPTIONS	SIZE	CYCS	HEAD	PRECOMP	LAND2	SECTOR	MODE
1 (Y)	0	0	0	0	0	0	Normal

The next screen should display the following:

HARD DISKS: TYPE SIZE CYLS HEAD PRECOMP LAND2 SECTOR
MODE

Primary Master:

Primary Slave:

Select Primary Slave Option (N-Skip): N

OPTIONS	SIZE	CYCS	HEAD	PRECOMP	LAND2	SECTOR	MODE
2 (Y)	32	31	32	0	489	63	LBA
1	32	490	4	65535	489	32	Normal

- Return to the main screen and choose the **SAVE & EXIT SETUP** option.
- Type *Y* to **SAVE to CMOS and EXIT**.

8 Inserting the CLA-ATS Card

If applicable, the Coral system is shipped to the customer with the CLA-ATS card(s) installed in the control shelf slot(s). However, there are instances where a card is removed and/or replaced.

Before inserting the CLA-ATS card:

Before Card Inserting

1. Place the card on the anti-static sheet.
1. Verify that the jumpers straps are connected as described in:
 - [CLA-ATS and CLA-ATS/A \(Tadiran telecom\) Jumper settings, page 8-88](#)
 - [CLA-ATS and CLA-ATS/A \(Tadiran telecom\) Jumper settings, page 8-88](#)
 - [CLA \(teknor cPCI-MXP\) Jumper settings, page 8-89.](#)

CAUTION!

Do not modify the jumper straps. All of the jumper straps are inserted by the manufacturer. Modifying the jumper straps might damage the card.

2. If not already inserted, insert the appropriate CLA compact flash memory disk (CFD) into the drive on the CLA-ATS card side (see [CFD - Compact Flash Memory Disk on CLA-ATS Card, page 8-96](#)).

For information on how to insert and remove a CLA card from the cage, see [Inserting and Removing a Control Card, page 8-9](#).

During system initialization, while the PI registers the display messages for a properly uploading system (see [Messages for a Properly Loading Active Side, page 3-12](#), and [Messages for a Properly Loading Standby Side](#)) the following message should be displayed among the startup messages, indicating that the CLA-ATS has initialized properly: **CLA is Active.**

Refer to Chapter 27 of the relevant *Program Interface & Database Reference Manual* for other CLA-ATS messages indicating a faulty CLA initialization along with technical recommendations.

9 Network Connections

The front panel of the CLA-ATS card contains a RJ-45 adapter for connection to the Ethernet computer network. The connection to the network is via a RJ-45 cable in accordance with the Ethernet 10/100Base-Tx standard. The CLA-ATS is designed to operate over Ethernet LAN with a connection of less than 100 meters to the local switch or computer network when using Category 5 UTP (unshielded twisted pair) in accordance with the 10/100Base-T protocol.

The computers are connected to the application via a hub terminal to the RJ-45 CLA-ATS adapter.

Interface Connections

The following table displays the CLA-ATS RJ-45 interface connector pin descriptions.

Table 8-18 CLA-ATS Interface Connections (DTE)

<i>Pin #</i>	<i>Function</i>
Pin 1	Tx(+)
Pin 2	Tx(-)
Pin 3	Rx(+)
Pin 4	not used
Pin 5	not used
Pin 6	Rx(-)
Pin 7	not used
Pin 8	not used

10 Database Programming Areas

The installation of a CLA-ATS card to a Coral system has considerable impact on the system database. For further information, refer to Chapter 27 of the relevant *Program Interface and Database Reference Manual*.

11 Specifications

CLA-ATS

Application Interface:	Complies with ECMA 179, 180 and CSTA III; Software Driver
Access Protocol:	ITU X.217/X.227 (ACSE), X.219/X.229 (ROSE)
Network Type:	IEEE 802.3 Ethernet
Network Topology:	10/100Base-Tx Ethernet
Network Interface Connector:	RJ-45
Network Transport Protocol:	TCP/IP
Coral Common Control	Coral IPx 4000/4000R

8.6 PB-ATS

Peripheral Buffer Unit for IPx 4000XE

1 General Description

The PB-ATS cards are installed in the IPx 4000XE even numbered peripheral shelves, in slot 1 and 2.

The PB-ATS cards are the Peripheral Buffer (PB) units, which function as the signal regenerator for the peripheral shelves since the peripheral shelves can be located in the same cabinet as the control shelf or physically further, in an expansion cabinet.

Two PB-ATS cards are provided for each Peripheral Shelf Unit in the Coral IPx 4000 system to provide redundant backup coverage even though one PB-ATS is enough to control the Peripheral Shelf Unit. The second PB-ATS unit acts as a **Standby** unit ready to take over the functions of the **Active** PB-ATS card.

The **Active** PB-ATS card provides buffers for the High-level Data Link Control (HDLC), Pulse Code Modulation (PCM), Clocking and Synchronization signals, exchanged between the 32GC card and the peripheral bus serving one or two peripheral shelves.

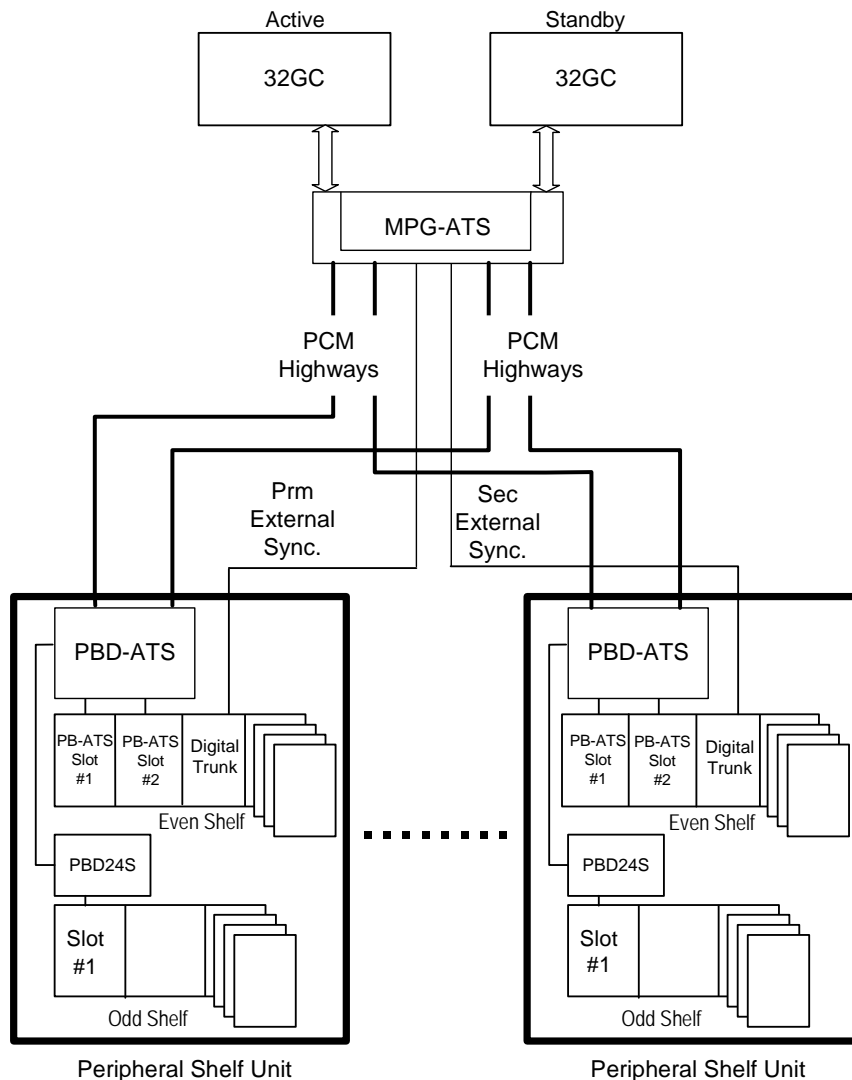
The PB-ATS card also includes circuitry to allow/inhibit the PCM lines to the peripheral cards, as well as a circuit for signal rate conversion from 8.192 Mbps to 4.096 Mbps for use in the peripheral shelves and vice versa. The PCM lines are allowed in the **Active** PB-ATS card and inhibited in the **Standby** PB-ATS card. The PB-ATS card transmits and receives HDLC messages using HDLC highway **A** or **B** in accordance with its location in the peripheral shelf.

A fault in the interface between the PB-ATS cards and the peripheral cards of the communication channel does not necessitate a switch-over on the control shelf between the **Active** and **Standby** control card sets. It only necessitates the seamless interchange between the two PB-ATS cards.

Figure 8-35 describes the interface between the control shelf and the peripheral shelves in configuration type **H** and **H'** (see *Hot Standby Configurations beginning on page 6-45* for configuration types). In this diagram, the peripheral shelves are shown to include two PB-ATS cards in slots# 1 and 2. A PBD-ATS card connects each pair of

PB-ATS cards, in which a connection exists between an even and an odd shelf, and between each 32GC card and a PBD-ATS card.

Figure 8-35 **32GC and Peripheral Shelf System Block Diagram**



Maximum of 8 Peripheral Shelf Units

In this configuration full duplication until the level of the PB-ATS card exists. The PB-ATS card in slot 1 supports the HDLC channel A of the peripheral shelf. The PB-ATS card in slot 2 supports the HDLC channel B. The voice port for peripheral cards is supported only from the **Active 32GC**. The **Active** PB-ATS card provides the HDLC and PCM signals for the odd shelf via the PBD24S card. A fault in the PB-ATS card is detected by the **Active 32GC**.

Recognizing Time Slot Configurations

Each PB-ATS supports 512 PCM time slots to the Peripheral Shelf Unit backplane. The Peripheral Shelves units require only 384 of the entire 512 time slots per Unit. The PB-ATS card defines its time slot operation automatically at 128 time slots or at 512 time slots according to the type of backplane installed on the peripheral shelf unit. The Coral IPx 4000 incorporates only backplanes which use all 512 time slots. The time slots arriving from the PB-ATS serve the entire peripheral shelf unit, i.e. the even as well as the connected odd shelf.

The existence of a PB-ATS card and its status are reported to the 32GC card via the FC19 redundant cabling to the MPG-ATS.

Time Slot Transmission

The PB-ATS card transmits 512 time slots PCM at the rate of 8.192 Mbps from the 32GC control card. A rate conversion circuit converts it to a rate of 4.096 Mbps, which is suitable for the peripheral cards. The conversion circuit also changes the 4.096 Mbps rate of the PCM arriving from the peripheral cards to a rate of 8.192 Mbps, which is the operating rate of the 32GC card.

Special Time Slot Cases

Peripheral Shelf Unit #3 is allotted a maximum of 256 time slots out of the 512 time slots for transmission. The first two quartets of slots for peripheral cards in each shelf of Unit #3 accepts 64 time slots each for transmission, instead of the 128 time slots, and similar to all other quartets of peripheral slots in the system accepts 128 time slots each for reception.

PB-ATS Peripheral Card Slots

Each pair of PB-ATS cards supports a Peripheral Unit consisting of one or two peripheral shelves. The PB-ATS cards are essentially Common Control cards residing in a peripheral shelf. To function properly, the two redundant PB-ATS or single PB-ATS card must be located in slots 1 and/or 2 of an even peripheral shelf fitted with a PBD-ATS at the rear of these slots.

To prevent inserting a PB-ATS card in the wrong slot, the PB-ATS card is contoured differently than the other peripheral shelf cards. It has rounded corners on the bottom, similar to the control cards of other Coral systems. The PB-ATS card slides into

matching grooves on the tracks in slots 1 and 2. The other peripheral cards have the rounded corner on the top.

2 Circuit Description

HDLC and PCM Highways

The PB-ATS card buffers all the signals necessary to provide HDLC highways and PCM highways for the 512 (384) configuration from the 32GC cards to one or two peripheral shelves.

- Each of the highways are separately buffered to the backplane with a driver for insulation between the channels.
- The HDLC (control) and PCM (voice) highways are bidirectional, with signals received from the 32GC card to the peripheral shelf, and similar signals transmitted from the peripheral shelf back to the 32GC card. The PCM highways are translated to/from the 4.096 Mbps rates of the peripheral cards and the 8.192 Mbps rates of the 32GC cards.

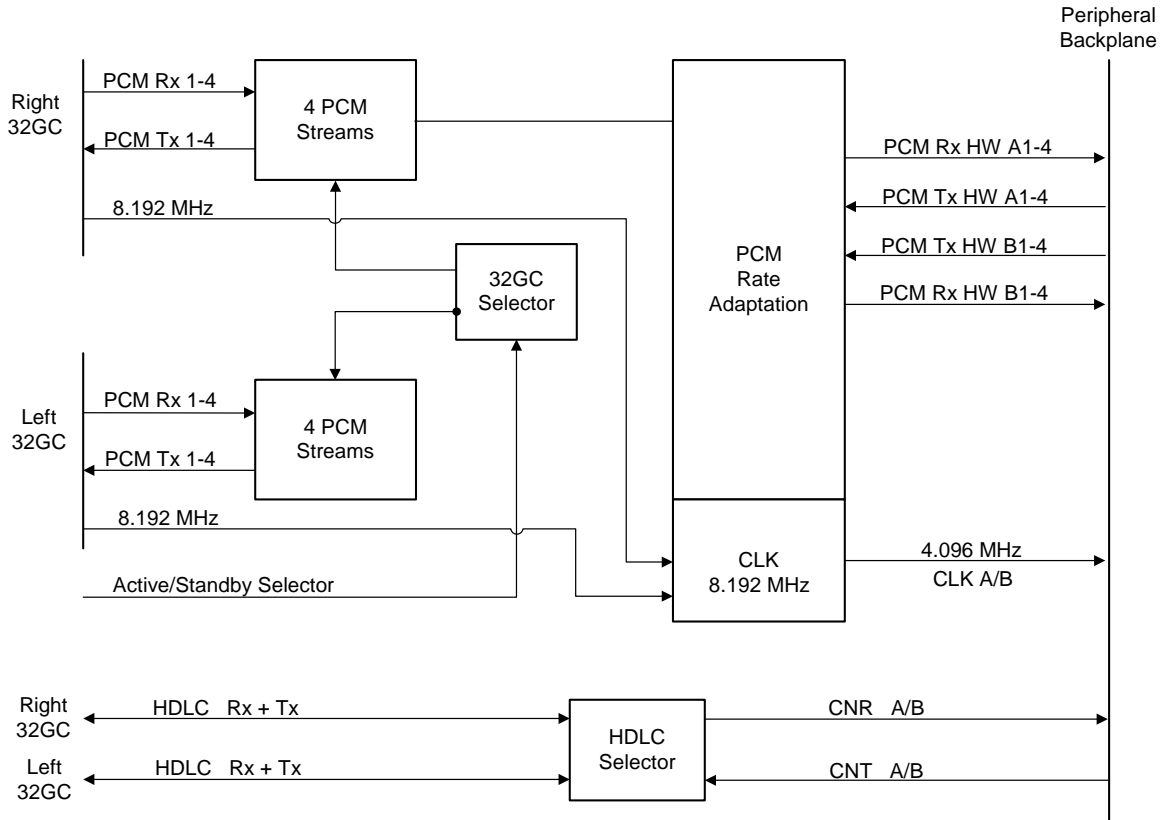
Clock and Synchronization Signals

Clock and Synchronization signals are provided by both channels A and B, however, the PB-ATS selects only one of the channels for a Clock and Sync source to the peripheral bus via the PB-ATS regardless of from which 32GC they arrive.

- A *PB Select line*, controlled by the 32GC card is connected to both of the PB-ATS cards. This line determines whether Clock and Synchronization for both peripheral busses are derived from channel A or B, regardless of which 32GC is **Active**. During power up, the PB-ATS in slot 1 is selected to be **Active**. The Active PB-ATS may be switched via the *UNITS (Sysgen,5)* branch in the PI, see Chapter 4 of the relevant *Program Interface & Database Reference Manual*.

Figure 8-36 illustrates the PB-ATS circuits in block diagram form.

Figure 8-36 **PB-ATS**
Circuit Block Diagram



PB-ATS Peripheral Buffer Unit for IPx 4000XE

3 Front Panel Indicators

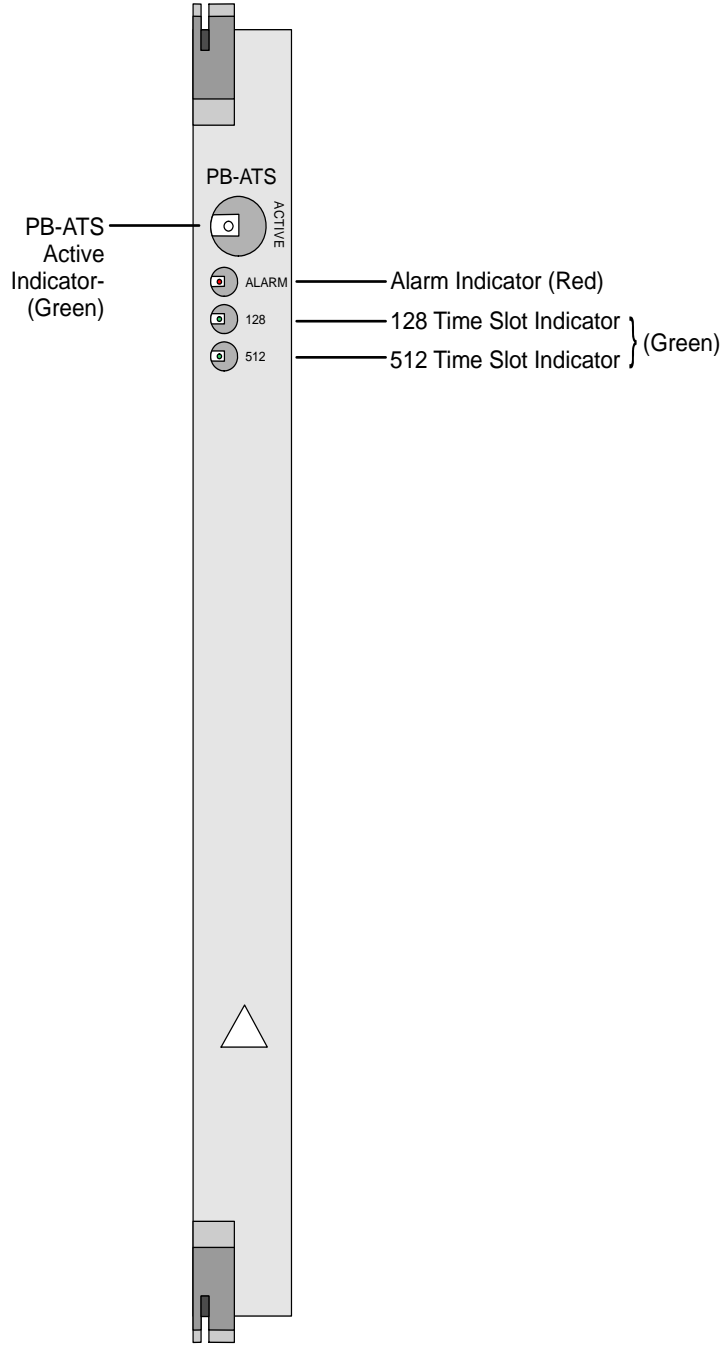
Figure 8-37 illustrates the PB-ATS card front panel.

The front of the PB-ATS card contains four LED indications:

- **Active:** Green - lights when this PB-ATS is active and indicates that it is controlling the Peripheral Shelf Unit
- **Alarm:** Red - lights when the clock signals are missing
- **128 T.S:** Green - Not relevant for the Coral IPx 4000 system.
- **512 T.S:** Green - Lights when this PB-ATS is active and indicates that the Peripheral Shelf Units are using 384 of the full 512 time slots offered by this PB-ATS

Alarm Faults are reported to the PI Terminal even if no indication is displayed on the panel itself.

Figure 8-37 PB-ATS
Front Panel



PB-ATS Peripheral Buffer Unit for IPx 4000XE

8.7 PBD-ATS

Backplane Card for IPx 4000XE

1 General Description

The PBD-ATS communicates mainly with the MPG-ATS card, so the HDLC, PCM Clock & Synchronization signals, as well as Power Supplies Alarm signals are transferred between these cards. Data and signaling communication is established via redundant streamlined FC19 cables that connect these cards.

The PBD-ATS resides in the rear panel of the IPx 4000XE peripheral cabinet backplane, on the back side of slot 1 and 2, of the even numbered peripheral shelves, where the PB-ATS card(s) are installed.

Card Time Slots Configurations

The PBD-ATS card is factory set to supply 512 or 128 time slots to the connected Peripheral Shelf Unit.

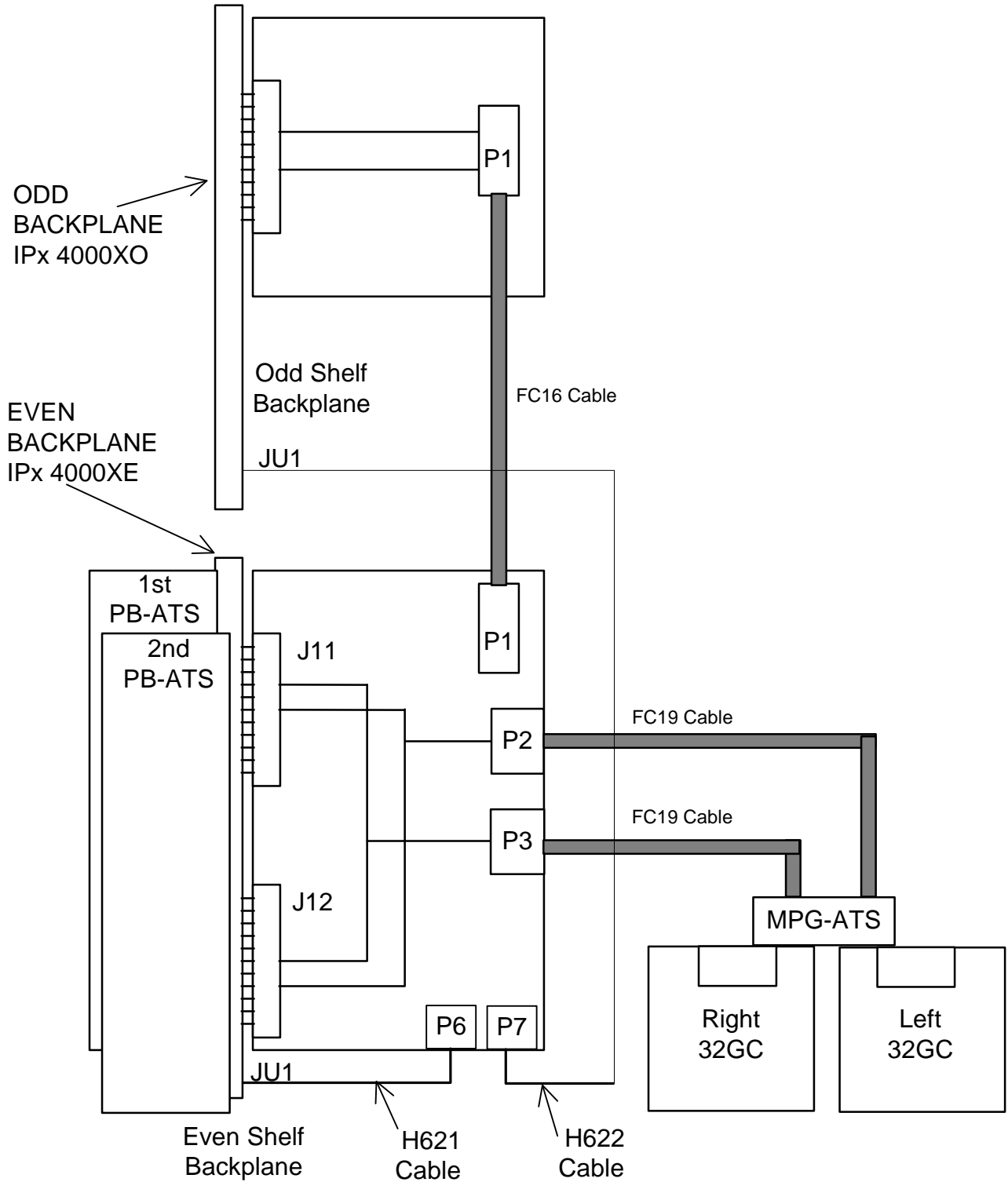
Peripheral shelves are factory set, configured to work with 512 time slots per shelf. This configuration is automatically identified by the system.

Communication between Common Control Cards

Card Relationship

The Coral system main processor, MCP-ATS, maintains a constant dialog with the peripheral devices. The MCP-ATS is interfaced by the 32GC card. The peripheral devices are interfaced by the PB-ATS cards. The 32GC card signaling is carried out by the MPG-ATS card, located on the backplane behind it, on the rear side of the Common Control shelf. The PB-ATS card communications are carried via the PBD-ATS card, connected to the backplane behind it, on the rear side of slot 1 and 2. [Figure 8-38](#) demonstrates this relationship.

Figure 8-38 32GC -
PB-ATS Card
Communications via
PBD-ATS



PBD-ATS Backplane Card for IPx 4000XE

2 Card Description

Figure 8-39 illustrates the PBD-ATS card layout.

The card contains the following elements:

Back view

- Two 96-pin connectors, J11 and J12, used to connect the card to the IPx 4000XE (backplane) for slot #1.
- Two 96-pin connectors, J21 and J22, used to connect the card to the IPx 4000XE (backplane) for slot #2.

Front view

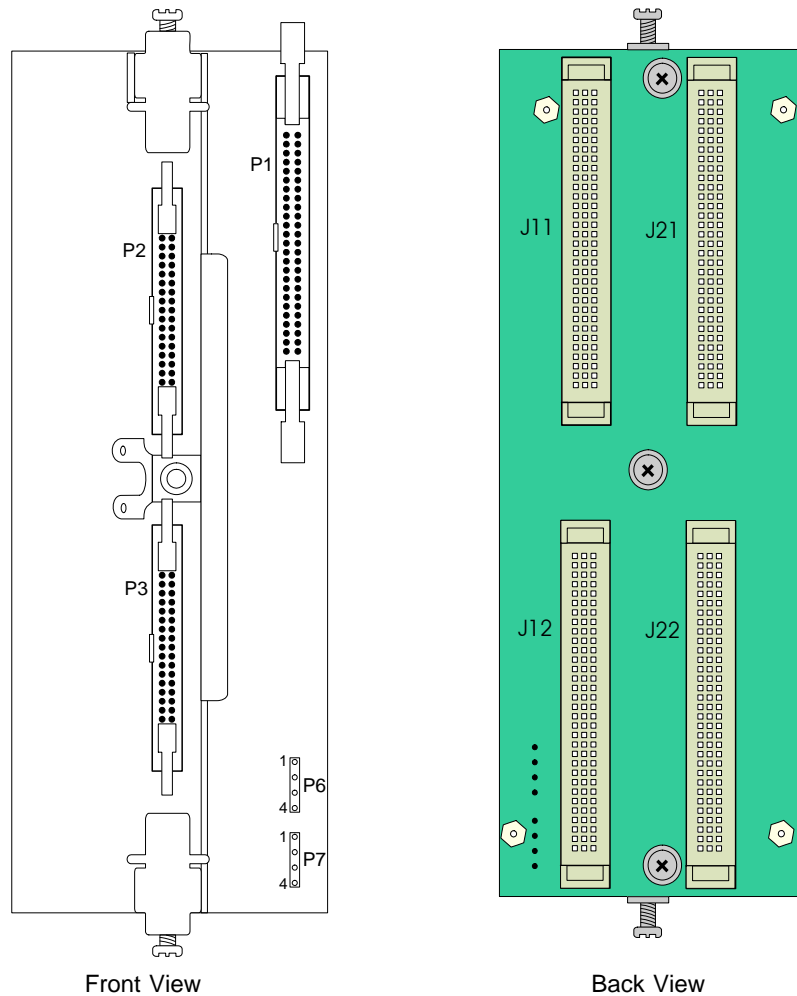
- Two 34-pin connectors, P2 and P3, used to connect the two FC19 cables that retrieve the PCM and HDLC signals and the Clock & Synchronization data from the MPG-ATS card.
See *Even Shelf Cabling: PBD-ATS to MPG-ATS, page 6-32*.
- One 50-pin connector, P1, used to connect the PBD-ATS cards to the PBD24S of the adjacent odd shelf, (if there is one) via an FC16 (100cm) or FC18 (50cm discontinued) flat cable.
See *PBD24S to PBD-ATS cabling, page 6-36*.
- Two 4-pin connectors, P6 and P7, for the Peripheral Shelf power supply alarms. See *Alarm Cabling, page 6-40*.
 - P6 is connected to JU-1 on the even shelf.
 - P7 is connected to JU-1 on the shelf.

3 Replacing a PBD-ATS Card

1. Power must be shut down to the Coral system when replacing any item on the rear backplane, such as the PBD-ATS.
2. Remove all cables connected to the PBD-ATS.
3. Remove screws on the top and bottom of the PBD-ATS.
4. Grasp the levers and push them outward to eject the card.
5. Verify that the shrouds between the backplane and the PBD-ATS card are in place on the backplane.

6. Grasp the replacement PBD-ATS by the handle and place the card so that it connects with the shows on the backplane. The levers should stand parallel to the backplane.
7. Refasten the screws.
8. Reconnect the cables.
9. Return power to the Coral System.

Figure 8-39 **PBD-ATS
Card Layout**



8.8 PBD24S

Backplane Card for IPx 4000XO

1 General Description

Card Function

The PBD24S resides in the rear panel of the IPx 4000XO peripheral cabinet backplane, on the back side of slot 1, of the odd numbered peripheral shelves, where the PB-ATS card(s) are not installed.

The Coral IPx 4000 system main processor, MCP-ATS, converses through the 32GC with the peripheral devices via the PB-ATS card(s).

The 32GC card communications are carried out via the MPG-ATS card located on the backplane behind it, on the rear side of the IPx 4000C Common Control shelf.

Both PB-ATS card communications are carried via the PBD-ATS card, connected to the even numbered shelves IPx 4000XE backplane behind it, on the rear side of slot 1 and slot 2.

The data and signaling communication between the MPG-ATS and the PBD-ATS is established via various cables that connect these cards, as described above in the [PB-ATS](#) and [PBD-ATS](#) sections above.

Each PB-ATS card can support one Peripheral Unit, composed of one or two peripheral shelves. When a PB-ATS card supports two peripheral shelves, the card(s) are installed in slot 1 and/or 2 of the first shelf (even numbered) of the Peripheral Unit, with one PBD-ATS on the rear side of both slots. The connected shelf (odd numbered) requires a PBD24S card installed on the rear side of slot 1 to complete the communications to the odd shelf from the PBD-ATS.

The physical connections between the cards is illustrated in [Figure 8-38](#) above.



NOTE:

Slot #1 with a PBD24S on its rear side, (where a PB-ATS is not installed) can be used to accommodate any Shared Service card, or any card that does not require I/O connections.

Shelf Identification

Peripheral shelves supported by a PBD24S card are assigned odd numbers by the Coral. The number assigned is the next consecutive number after the shelf ID# assigned to the shelf holding the PB-ATS that services this shelf. See [Peripheral Shelf Numbering beginning on page 6-29](#), for more information on shelf ID.

2 Card Description

The PBD24S front and back card layouts are illustrated in [Figure 8-40](#). The card contains the following items:

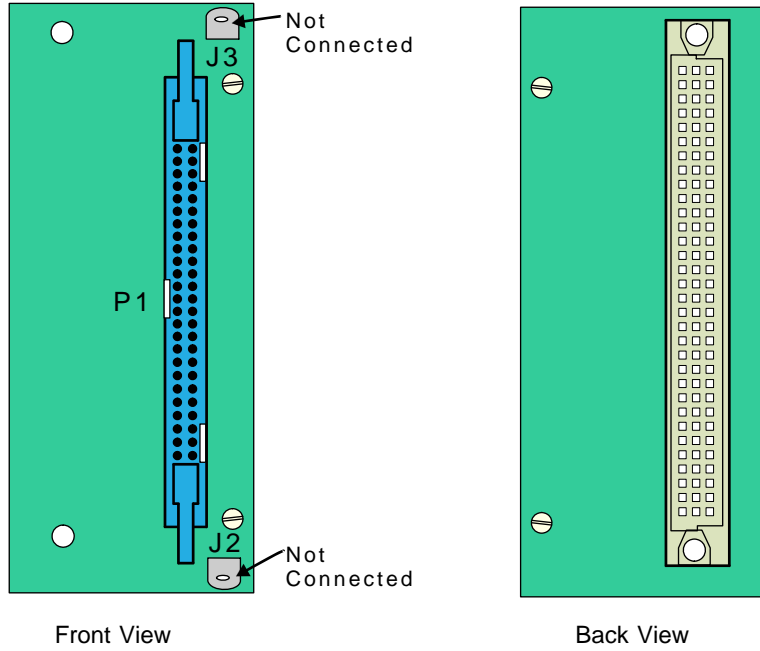
Back view

- One 96-pin connector, used to connect the card to the IPx 4000XO (backplane) for slot #1.

Front view

- One 50-pin connector, P1, used to connect the PBD24S to its associated PBD-ATS card via an FC16 (100cm) or FC18 (50cm discontinued) flat cable. See [PBD24S to PBD-ATS cabling, page 6-36](#).
- J2 is not used.
- J3 is not used.

Figure 8-40 **PBD24S**
Front and Back Card
Layout



NOTES:



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