



**NORTEL**

Nortel Communication Server 1000

# Carrier Remote IPE Fundamentals

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## New in this release

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### New features

There are no added or changed features in Carrier Remote IPE Fundamentals (NN43021-555) for Communication Server 1000 Release 6.0.

### Other changes

There are no additional changes in Carrier Remote IPE Fundamentals (NN43021-555) for Communication Server 1000 Release 6.0.

### Revision History

#### May 2009

Standard 03.01. This document is up-issued to support Communication Server 1000 Release 6.0.

#### December 2007

Standard 02.01. This document is issued to support Communication Server 1000 Release 5.5. No new content has been added for Communication Server 1000 Release 5.5. All references to Communication Server 1000 Release 5.0 are applicable to Communication Server 1000 Release 5.5.

#### May 2007

Standard 01.01. This document is issued to support Communication Server Release 5.0. This document is renamed Carrier Remote IPE Fundamentals and contains information previously contained in the following legacy document, now retired: Fiber Remote IPE (553-3021-555). No new content has been added for Communication Server 1000 Release 5.0. All references to Communication Server 1000 Release 4.5 are applicable to Communication Server 1000 Release 5.0.

#### August 2005

Standard 3.00. This document is up-issued to support Communication Server 1000 Release 4.5.

### September 2004

Standard 2.00. This document is up-issued for Communication Server 1000 Release 4.0.

### October 2003

Standard 1.00. This document is a new document for Succession 3.0. It was created to support a restructuring of the Documentation Library. This document contains information previously contained in the following legacy document, now retired: Carrier Remote IPE: Description, Installation, and Maintenance (553-3001-021).

## Introduction

This document provides information specific to the implementation of the Carrier Remote Intelligent Peripheral Equipment (IPE) feature.

This document describes the operation of the carrier equipment and provides specific information on how to install and maintain this equipment as an integral part of the PBX systems and system options. Carrier Remote IPE equipment configuration is identical to the equivalent standard equipment. However, there are some additional carrier specific commands that can be executed using the Man Machine Interface (MMI) terminal to specifically control carrier equipment.

### Note on legacy products and releases

This document contains information about systems, components, and features that are compatible with Nortel Communication Server 1000 Release 5.5 software. For more information on legacy products and releases, go to the **Support & Training** menu and select **Technical Documentation** on the Nortel web site:

[www.nortel.com](http://www.nortel.com).

## Applicable systems

This document applies to the following systems:

- Communication Server 1000M Half Group (CS 1000M HG)
- Communication Server 1000M Single Group (CS 1000M SG)
- Communication Server 1000M Multi Group (CS 1000M MG)
- Meridian 1 PBX 51C
- Meridian 1 PBX 61C
- Meridian 1 PBX 81
- Meridian 1 PBX 81C

**Note:** When upgrading software, memory upgrades may be required on the Signaling Server, the Call Server, or both.

## System migration

When particular Meridian 1 systems are upgraded to run CS 1000 Release 4.5 software and configured to include a Signaling Server, they become CS 1000M systems. [Table 1 "Meridian 1 systems to CS 1000M systems" \(page 9\)](#) lists each Meridian 1 system that supports an upgrade path to a CS 1000M system.

For more information, see *Communication Server 1000M and Meridian 1 Large System Upgrades Overview (NN43021-458)* ().

**Table 1**  
**Meridian 1 systems to CS 1000M systems**

This Meridian 1 system...	Maps to this CS 1000M system
Meridian 1 PBX 51C	CS 1000M Half Group
Meridian 1 PBX 61C	CS 1000M Single Group
Meridian 1 PBX 81	CS 1000M Multi Group
Meridian 1 PBX 81C	CS 1000M Multi Group

## Intended audience

This document is intended for individuals who are responsible for planning, engineering, installing, and maintaining the Carrier Remote IPE as part of a CS 1000M Large System or Meridian 1 Large System.

## Conventions

### Terminology

The following systems are referred to generically as "Large System":

- Communication Server 1000M Half Group (CS 1000M HG)
- Communication Server 1000M Single Group (CS 1000M SG)
- Communication Server 1000M Multi Group (CS 1000M MG)
- Meridian 1 PBX 51C
- Meridian 1 PBX 61C
- Meridian 1 PBX 81
- Meridian 1 PBX 81C

## Related information

### Related Documents

This section lists information sources that relate to this document.

### Technical documents

The following technical documents are referenced in this document:

- *Circuit Card Reference (NN43001-311)* ()
- *Features and Services Fundamentals (NN43001-106)* ()
- *Software Input Output Administration (NN43001-611)* ()
- *Telephones and Consoles Fundamentals (NN43001-567)* ()
- *Communication Server 1000M and Meridian 1 Small System Installation and Commissioning (NN43011-310)* ()
- *Communication Server 1000M and Meridian 1 Large System Planning and Engineering (NN43021-220)* ()
- *Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43021-310)* ()
- *Communication Server 1000M and Meridian 1 Large System Upgrades Overview (NN43021-458)* ()
- *Communication Server 1000M and Meridian 1 Large System Maintenance (NN43021-700)* ()

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### CD-ROM

To obtain Nortel documentation on CD-ROM, contact your Nortel customer representative.

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# Carrier Remote IPE product description

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## Contents

This section contains information on the following topics:

- “Introduction” (page 11)
- “System overview” (page 11)
- “System description” (page 12)
- “Functional description” (page 25)
- “Engineering guidelines” (page 35)
- “System planning and ordering” (page 45)

## Introduction

This chapter describes Carrier Remote Intelligent Peripheral Equipment (IPE), architecture, and hardware options.

## System overview

CS 1000M Large Systems and Meridian 1 Large Systems are Private Branch Exchange (PBX) systems that support Carrier Remote IPE service.

In addition to supporting local subscribers, each system can be configured as a distributed system that supports remote subscribers using Carrier Remote IPE modules in a column or Carrier Remote IPE cabinets. They are connected to the PBX at long distances using T1 or E1 carrier facilities.

To support the Carrier Remote IPE, the system must be equipped with the Carrier Remote IPE (REM\_IPE) package 286.

Subscriber loops at the local system site (at the PBX) are the same as at the Carrier Remote IPE modules or Carrier Remote IPE cabinets. The subscriber functions and features at the local system site are also the same as at the Remote IPE site.

This document focuses on the equipment within the PBX and the Remote IPE that is specifically designed to provide T1 or E1 carrier links between the network functions in the system and the peripheral controller functions in the Remote IPE.

### System description

The Carrier Remote IPE provides PBX functionality by installing only IPE modules and IPE cards at a distant site. The Carrier Remote IPE shares the system common and network equipment to provide the same functions and features to remote subscribers that are available to local system subscribers.

To successfully implement Carrier Remote IPE functions, it is necessary to understand:

- Carrier Remote IPE physical architecture
- Carrier Remote IPE functional architecture

### Carrier Remote IPE physical architecture

To configure a system with Carrier Remote IPE, install an IPE column or Carrier Remote IPE cabinet at a remote site and connect it, using T1 or E1 carrier links or direct copper connection (if the distance is less or equal to 200 meters or 655 feet), to an existing system.

[Table 2 "Local site carrier hardware list" \(page 13\)](#) and [Table 3 "Remote Carrier IPE module hardware list" \(page 14\)](#) list specific equipment required to support the Carrier Remote IPE at the local site and at the remote site.

**Note:** The cards and the cable assemblies listed in [Table 2 "Local site carrier hardware list" \(page 13\)](#), [Table 3 "Remote Carrier IPE module hardware list" \(page 14\)](#), and [Table 4 "Carrier Remote IPE wall-mounted cabinet hardware list" \(page 16\)](#) are common to T1 and E1 carrier systems; however, if E1 carrier links are terminated with BNC connectors, an external adapter cable (not supplied with the equipment) is used to connect each 8-pin modular (RJ-48-type) jack on the system I/O panel assembly to the BNC connectors on each E1 carrier link.

[Table 2 "Local site carrier hardware list" \(page 13\)](#) lists all the hardware components required at the local system site to support Carrier Remote IPE service. Only one type of carrier can be supported by each Local

Carrier Interface card. The carrier type is switch-selected on the Local Carrier Interface card. [“Connection diagrams and external connectors pin assignment” \(page 197\)](#) provides connection diagrams and connector pin assignments for all external connectors on the I/O panel assemblies.

**Table 2**  
**Local site carrier hardware list**

Component	Description
NT7R51 Local Carrier Interface card	Local Carrier Interface card installed in a network card slot.
NT7R66AA SDI Cable Kit	This cable kit provides a DB-9 male to DB-25 male 10-foot cable and a DB-25F/DB-25F adapter. To connect the standard SDI card to the DB-9 female P2 connector of the NT7R67DA cable at the local site, you would use the entire kit except for the DB-25F/DB-25F adapter, which is used with the SDI Paddleboard.
NT7R66BA MMI Cable	This is a DB-9 female to DB-25 male (32 ft) cable. Connect the MMI terminal to the DB-9 male P3 connector of the NT7R67DA cable at the local site and directly to the MMI port of the Carrier Remote IPE site.
NT7R67BA Local Carrier/Monitor Cable Assy	This cable assembly connects the Local Carrier Interface to the network I/O panel. It consists of the NT7R67HA cable, the NT7R57AA Carrier Panel assembly, and the NT7R58AA Maintenance Panel assembly. The P1 DB-25 male connector plugs into the faceplate, the P2 DB-15HD male connector plugs into the NT7R58AA Maintenance Panel assembly, which provides two 6-pin modular system monitor jacks and one DB-9 female MMI maintenance connector. The P3 DB-15HD female connector plugs into the NT7R57AA Carrier Panel assembly, which provides three 8-pin modular carrier jacks. Refer to Appendix C, <a href="#">Figure 26 "Single LCI connection diagram (local site connections)" (page 198)</a> , <a href="#">Figure 27 "Multiple LCIs connection diagram (local site daisy-chain connection)" (page 199)</a> , and <a href="#">Figure 30 "Local site system monitor connection diagram (single and multiple LCI configuration)" (page 202)</a> .
NT7R67CA Local Daisy-chain Cable Assy	This cable provides P1 DB-9 male connector that plugs into the faceplate and P2 DB-9 male connector that plugs into the NT7R58AA Maintenance Panel assembly. This cable is used with multiple Local Carrier Interface cards in a daisy-chain configuration or in a single Local Carrier Interface configuration to connect the MMI terminal. Refer to Appendix C, <a href="#">Figure 26 "Single LCI connection diagram (local site connections)" (page 198)</a> , <a href="#">Figure 27 "Multiple LCIs connection diagram (local site daisy-chain connection)" (page 199)</a> , and <a href="#">Figure 30 "Local site system monitor connection diagram (single and multiple LCI configuration)" (page 202)</a> .

**Table 2**  
**Local site carrier hardware list (cont'd.)**

Component	Description
NT7R67DA Local External Maint. Cable Assy	Cable with the P1 DB-9 male connector that plugs into the NT7R58AA Maintenance Panel DB-9 female connector, the P3 DB-9 male connector that plugs into the MMI terminal or modem cable (or the preceding Local Carrier Interface connection in a daisy-chain), and the P2 DB-9 female connector that plugs into the SDI port (or the following Local Carrier Interface connection in the daisy-chain). Refer to Appendix C, <a href="#">Figure 26 "Single LCI connection diagram (local site connections)" (page 198)</a> and <a href="#">Figure 27 "Multiple LCIs connection diagram (local site daisy-chain connection)" (page 199)</a> .
NT7R67EA Coaxial Interface Adapter Cable	Cable with one 8-pin modular plug that plugs into the NT7R57AA Carrier Panel Assy 8-pin modular jack and two BNC connectors that plug into the carrier link BNC connectors.
NT7R87AA T1 CSU Cable Kit	This cable kit consists of a DB-15M/RJ-48 adapters and a 9.75 m (32 ft) RJ-48 to RJ-48 cable. The appropriate adapter is used to connect to a CSU and the cable is used to connect the adapter to the NT7R57AA Carrier Panel Assy RJ-48 connector.
NT8D46AL System Monitor Serial Link Cable	Connects the 6-pin modular jack J5 on the NT7R58AA Maintenance Panel assembly to the system monitor jack J6 in the pedestal.
NT8D93AJ XSDI I/O to DTE or DCE Cable	This is a DB-9 male to DB-25 male 4.8 m 16-foot cable used to connect the SDI Paddleboard to the NT7R67DA Local External Maintenance Cable P2 DB-9 female connector. The entire NT7R66AA SDI Cable Kit must also be used.
NT5D40AA Hybrid kit	Used to replace BTUs in some network modules. The replacement is necessary to be able to install the Local Carrier Interface card in that slot.

[Table 3 "Remote Carrier IPE module hardware list" \(page 14\)](#) lists the hardware required for the Carrier Remote IPE UEM column at the remote site. ["Connection diagrams and external connectors pin assignment" \(page 197\)](#) provides external connectors pin assignments.

**Table 3**  
**Remote Carrier IPE module hardware list**

Component	Description
NT7R52 Remote Carrier Interface card	Remote Carrier Interface card (installed in the Remote IPE module or the Remote IPE cabinet).
NT8D37 IPE Module	Carrier Remote IPE module.
NT7R66BA MMI Cable	This is a (32 ft) DB-9 female to DB-25 male cable. Connect the MMI terminal to the DB-9 male MMI connector on the NT7R61AA Maintenance Panel Assy.

**Table 3**  
**Remote Carrier IPE module hardware list (cont'd.)**

Component	Description
NT7R68AA Remote Carrier/Alarm Cable Assy	This cable assembly connects the Remote Carrier Interface to the I/O panel at the rear of the IPE module for T1/E1 and auxiliary customer alarm connections. Consists of the NT7R68HA cable with 24-pin block P1 connector that plugs into the IPE backplane connector, the NT7R59AA Carrier Panel assembly already connected to the cable with P2 DB-15HD male connector, and the NT7R60AA Carrier/ Alarm Panel assembly connected to the cable with P3 DB-9 female connector. The NT7R59AA Carrier Panel assembly provides two 8-pin modular carrier jacks and the NT7R60AA Carrier/Alarm Panel assembly provides one 8-pin modular carrier jack and one DB-15 female alarm connector. Refer to Appendix C, <a href="#">Figure 28 "Remote Carrier IPE module connection diagram (single RCI configuration)" (page 200)</a> .
NT7R68BA Remote Maintenance Cable Assy	This cable assembly connects the Remote Carrier Interface to the I/O panel at the rear of the IPE module for system monitor and MMI connections. Consists of the NT7R68GA cable with 24-pin block P1 connector that plugs into the IPE connector on the backplane, the NT7R61AA Maintenance Panel assembly already connected to the cable with P2 DB-15 male cable connector. The NT7R61AA Maintenance Panel assembly provides one 6-pin modular jack for system monitor and one DB-9 male MMI port connector. Refer to Appendix C, <a href="#">Figure 28 "Remote Carrier IPE module connection diagram (single RCI configuration)" (page 200)</a> .
NT7R67EA Coaxial Interface Adapter Cable	Cable with one 8-pin modular plug that plugs into the NT7R68AA Remote Carrier/Alarm Panel Assy 8-pin modular jack and two BNC connectors that plug into the carrier link BNC connectors.
NT7R86AA Auxiliary Alarm Cable Assy	Connects auxiliary alarms, such as customer external alarms, to the DB-15HD female Alarm connector on the NT7R60AA Carrier/Alarm Panel. The cable is 9.75 m 32 feet long.
NT7R87AA T1 CSU Cable Kit	This cable kit consists of a DB-15M/RJ-48 adapters and a 9.75 m (32 ft) RJ-48 to RJ-48 cable. The appropriate adapter is used to connect to a CSU and the cable is used to connect the adapter to the NT7R59AA Carrier Panel Assy and the NT7R60AA Carrier/Alarm Panel Assy RJ-48 connector.
NT8D46AL System Monitor Serial Link Cable	Connects the 6-pin modular jack J5 on the NT7R61AA Maintenance Panel assembly to the J6 system monitor jack in the pedestal.

[Table 4 "Carrier Remote IPE wall-mounted cabinet hardware list" \(page 16\)](#) lists the Carrier Remote IPE cabinet equipment. ["Connection diagrams and external connectors pin assignment" \(page 197\)](#) provides external connectors pin assignments.

**Table 4**  
**Carrier Remote IPE wall-mounted cabinet hardware list**

Component	Description
NT7R52 Remote Carrier Interface card	Remote Carrier Interface card (installed in the Remote IPE module or the Remote IPE cabinet).
NT1P70 Main Cabinet Assy	Main wall-mounted (or pedestal mounted) Carrier Remote IPE cabinet. The NT1P70 consists of the NT1P60 Main Cabinet and mounting hardware.
NTBK70 Expansion Cabinet	Expansion Carrier Remote IPE cabinet. Expands the capacity by six IPE cards. Requires the NTAK1204 Inter-Cabinet cable to connect to the main cabinet.
NTAK27 Pedestal for the Cabinet (optional)	This pedestal allows the Carrier Remote IPE cabinets to be floor-mounted.
NT7R66BA MMI Cable	This is a 9.75 m (32 ft) DB-9 female to DB-25 male cable. Connect the MMI terminal to the DB-9 male MMI connector on the NT7R61AA Maintenance Panel Assy.
NT7R67EA Coaxial Interface Adapter Cable	Cable with one 8-pin modular plug that plugs into the NT7R68CA Remote Carrier/Alarm Panel Assy 8-pin modular jack and two BNC connectors that plug into the carrier link BNC connectors.
NT7D68DA Remote Maintenance Cable Assy to Cabinet	This cable assembly connects the Remote Carrier Interface to the I/O bracket on the wall-mount IPE cabinet for system monitor and MMI connections. Consists of the NT7R68NA cable that connects with P1 DB-9 male connector to the TTY connector on the backplane and is already connected to the NT7R61AA Maintenance Panel assembly with the DB-15 male P2 cable connector. The DB-15 female P3 cable connector must be plugged into the NT7R60AA Carrier/Alarm Panel assembly connector during cable installation. The NT7R61AA Maintenance Panel assembly provides a DB-9 male MMI port connector. Refer to Appendix C, <a href="#">Figure 29 "Remote Carrier IPE cabinet connection diagram (single RCI configuration)" (page 201)</a> .
NT7R86AA Auxiliary Alarm Cable Assy	Connects auxiliary alarms, such as customer external alarms, to the DB-15HD female Alarm connector on the NT7R60AA Carrier/Alarm Panel. The cable is 9.75 m (32 ft) long.
NT7R87AA T1 CSU Cable Kit	This cable kit consists of a DB-15M/RJ-48 adapters and a 9.75 m (32 ft) RJ-48 to RJ-48 cable. The appropriate adapter is used to connect to a CSU and the cable is used to connect the adapter to the NT7R59AA Carrier Panel Assy and the NT7R60AA Carrier/Alarm Panel Assy RJ-48 connector.
NT7R94AA Remote Cabinet Cable Assy	This Remote Cabinet Cable Assembly consists of the NT7R68CA Remote Carrier/Alarm Cable Assy, the NT7R68DA Remote Maintenance Cable Assy, and the NT7R62AA Bracket. All components are preinstalled in the factory.

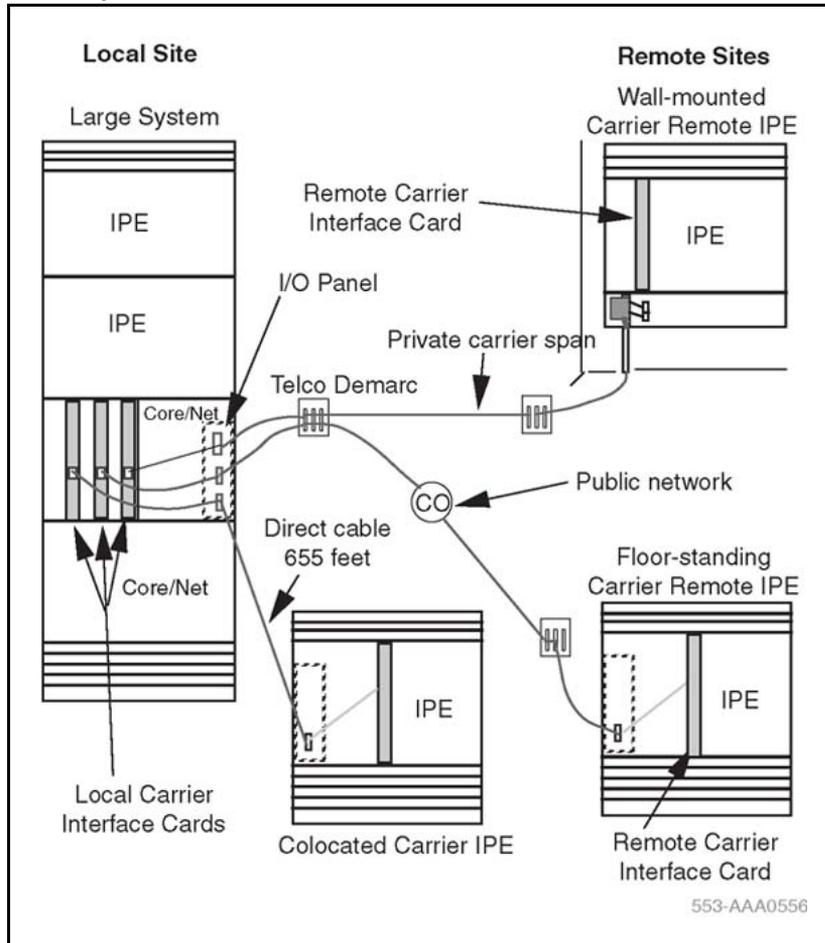
**Table 4**  
**Carrier Remote IPE wall-mounted cabinet hardware list (cont'd.)**

Component	Description
NT7D68CA Remote Carrier/Alarm Cable Assy to Cabinet	This cable assembly connects the Remote Carrier Interface to the I/O bracket of the wall-mount IPE cabinet for T1/E1 and auxiliary customer alarm connections. It consists of the NT7R68LA cable that connects with DB-15 male P1 to the Auxiliary Connector on the backplane, the NT7R59AA Carrier Panel assembly that connects to P2 DB-15 female cable connector, and the NT7R60AA Carrier/Alarm Panel assembly that connects to P3 DB-9 female cable connector. The NT7R59AA Carrier Panel (installed in slot 1 of the bracket) provides two 8-pin modular carrier jacks and the NT7R60AA Carrier/Alarm Panel (installed in slot 2 of the bracket) provides one 8-pin modular jack and one DB-15 female alarm connector. The two panels are already connected to the NT7R68LA cable. Refer to Appendix C, <a href="#">Figure 29 "Remote Carrier IPE cabinet connection diagram (single RCI configuration)"</a> (page 201).
NT7D68DA Remote Maintenance Cable Assy to Cabinet	This cable assembly connects the Remote Carrier Interface to the I/O bracket on the wall-mount IPE cabinet for system monitor and MMI connections. Consists of the NT7R68NA cable that connects with P1 DB-9 male connector to the TTY connector on the backplane and is already connected to the NT7R61AA Maintenance Panel assembly with the DB-15 male P2 cable connector. The DB-15 female P3 cable connector must be plugged into the NT7R60AA Carrier/Alarm Panel assembly connector during cable installation. The NT7R61AA Maintenance Panel assembly provides a DB-9 male MMI port connector. Refer to Appendix C, <a href="#">Figure 29 "Remote Carrier IPE cabinet connection diagram (single RCI configuration)"</a> (page 201).
NTAK04 AC/DC Power Supply for Cabinet	Used when the Carrier Remote IPE cabinet is AC-powered by the commercial power source or UPS.
NTAK05 DC Power Supply for Cabinet	Used when the Carrier Remote IPE cabinet is DC-powered by a –52VDC power source.
NTAK0410 Power Cable for DC Power Supply	Used to connect the cabinet to a reserve battery power supply or to a DC power source through the NTAK28 Junction Box.
NTAK1204 Inter-cabinet Cable	Used to connect the main to the expansion Carrier Remote IPE cabinet.

[Figure 1 "Local system to Remote IPE links"](#) (page 18) illustrates a Large System and Remote IPE equipment linked with T1 or E1 carriers over the private network, the public network, and for distances of 655 feet (200 m) or less direct copper cable connection to a collocated Carrier IPE column. The T1 and normally E1 carrier links use 120-ohm twisted-pair wires. However, if the E1 carrier links use coaxial cable, 75-ohm impedance must be selected using SW1, SW2, SW5, and SW8 on the Local and

Remote Carrier Interface cards (refer to [Figure 9 "Local Carrier Interface card DIP-switch positions and function"](#) (page 67) and [Figure 14 "Remote Carrier Interface card DIP-switch locations and functions"](#) (page 89)).

**Figure 1**  
**Local system to Remote IPE links**



The only equipment specifically designed to support this configuration are the types of cards, cables, and cabinets listed previously in [Table 2 "Local site carrier hardware list"](#) (page 13) and [Table 3 "Remote Carrier IPE module hardware list"](#) (page 14). All the other equipment is standard hardware.

At the local site, there are two cables that plug into the Local Carrier Interface card faceplate connectors. At the other end, the cable connectors connect to the I/O panel connectors at the rear of the local network module. At the remote site, two cables that plug into the backplane connectors behind the Remote Carrier Interface card contain connectors that are also plugged into the I/O panel connectors at the rear of the Carrier Remote IPE module.

All systems use the same carrier hardware. The cable routing and the location of the I/O panel assemblies is different.

For the Carrier Remote IPE cabinet, two cables connect P2 and P3 backplane connectors to the I/O panel connectors installed on a bracket at the lower left-hand side of the cabinet backplane as shown in [Figure 3 "Carrier Remote IPE cabinet" \(page 21\)](#).

Subscriber loops at the Remote IPE are connected to 50-pin connectors on the I/O panel at the rear of the module or at the bottom front of the cabinet as in standard hardware. For more details about subscriber connections to the local system and the Remote IPE, refer to *Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43021-310)* .

Select one of two options for the Remote IPE enclosure:

- Carrier Remote IPE column
- Carrier Remote IPE cabinet

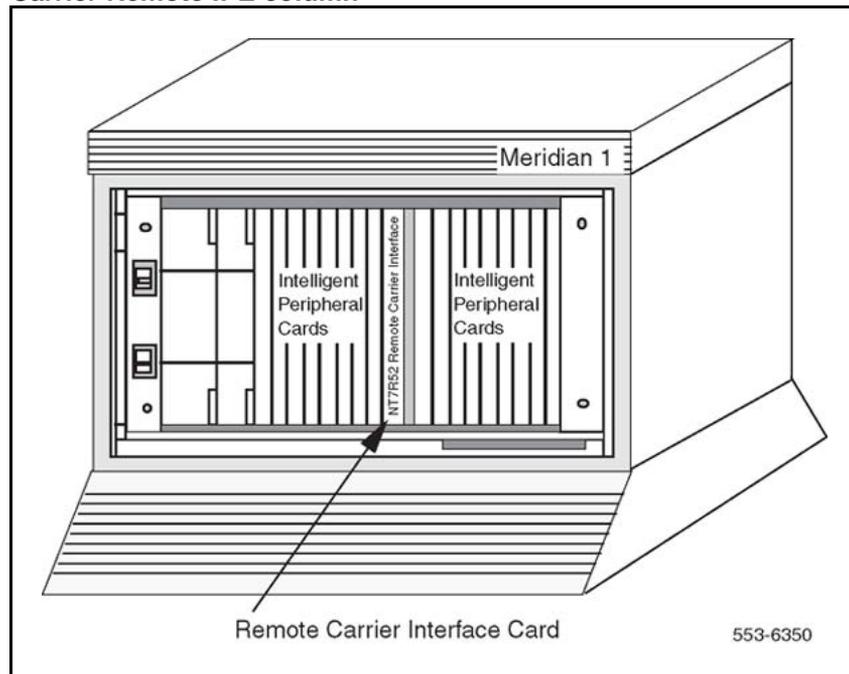
### **Carrier Remote IPE column**

Floor-standing Carrier Remote IPE column includes a pedestal, one or more standard NT8D37 IPE Modules, and a top cap. The IPE module houses a maximum of 16 line cards and a Remote Carrier Interface card. Each Remote Carrier Interface card supports IPE cards in only one IPE module. Therefore, each IPE module requires a Remote Carrier Interface card and one to three T1 or E1 carrier links.

The T1 or E1 carrier link is connected to the Remote Carrier Interface card through the carrier connectors located on the I/O panel at the rear of the IPE module. A cable connects the Remote Carrier Interface card through the backplane to the I/O panel at the rear of the IPE module to establish a connection to the carrier link.

[Figure 2 "Carrier Remote IPE column" \(page 20\)](#) illustrates the front view of the Carrier Remote IPE column with the Remote Carrier Interface card and the IPE cards already installed.

**Figure 2**  
**Carrier Remote IPE column**



### **Carrier Remote IPE cabinet**

Each Remote Carrier Interface card supports up to 16 IPE cards. The NT1P70/NT1P60 main Carrier Remote IPE cabinet houses an NT7R52 Remote Carrier Interface card and up to 10 IPE cards. This cabinet is the same as used in the Fiber Remote Carrier IPE application. The cabinet is then modified for the Carrier Remote IPE application by simply replacing the existing I/O bracket with NT7R94AA Remote Cabinet Cable Assembly.

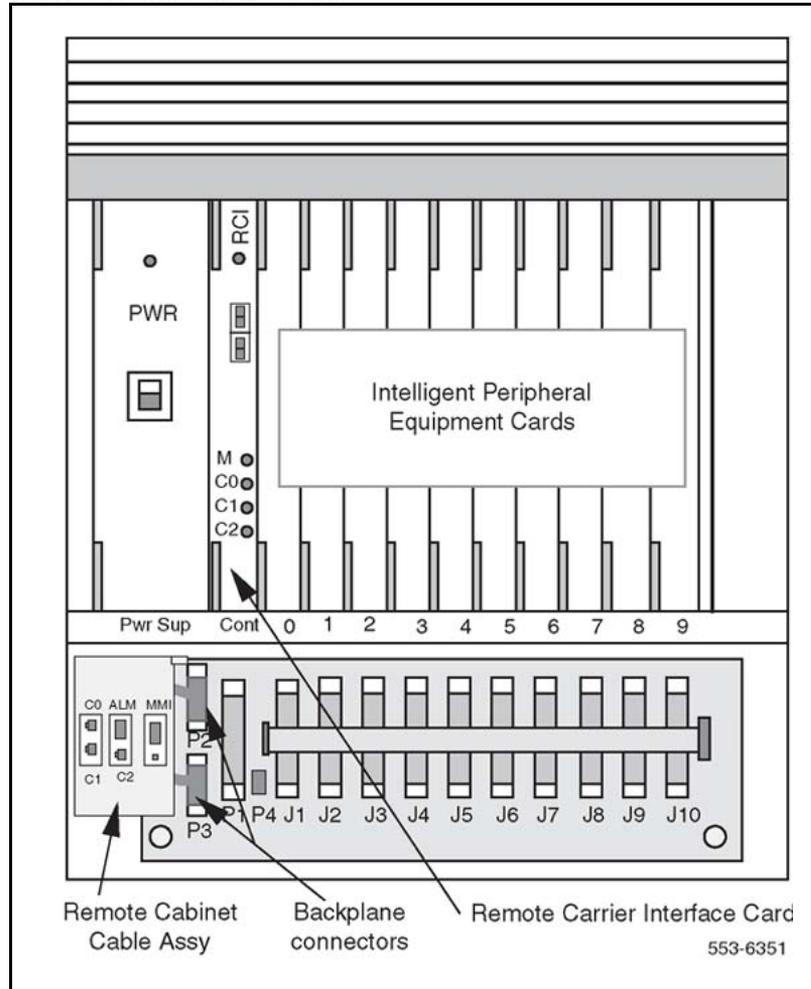
If additional IPE cards are required, use the NTBK70 expansion cabinet, which can house up to six additional cards in card slots 10 through 15. Card slots 16 through 19 in the expansion cabinet are not configurable and must not be used. The main and the expansion cabinets are interconnected by a cable that plugs into the P1 connector located in the lower left-hand corner of each cabinet's backplane.

The T1 or E1 carrier link is connected to the Remote Carrier Interface card through P2 and P3 backplane connectors. These backplane connectors are connected to the I/O panel, which is mounted on a bracket at the lower left-hand corner of the cabinet backplane.

Carrier Remote IPE main and expansion cabinets can be AC or DC-powered. The power source is directly connected to the shelf power supply for the AC-powered system and to the shelf power converter for the DC-powered system.

Figure 3 "Carrier Remote IPE cabinet" (page 21) illustrates the front view of the NT1P70/NT1P60 Carrier Remote IPE cabinet. It also shows the location of the NT7R52 Remote Carrier Interface card.

**Figure 3**  
**Carrier Remote IPE cabinet**



### Carrier Remote IPE functional architecture

Carrier Remote IPE functions are controlled by the system CPU and the firmware in the Local Carrier Interface and Remote Carrier Interface cards. The CPU uses software instructions to execute call processing, administration, and diagnostic functions. These functions can be divided into three basic categories:

- CPU functions
- Network functions
- IPE functions

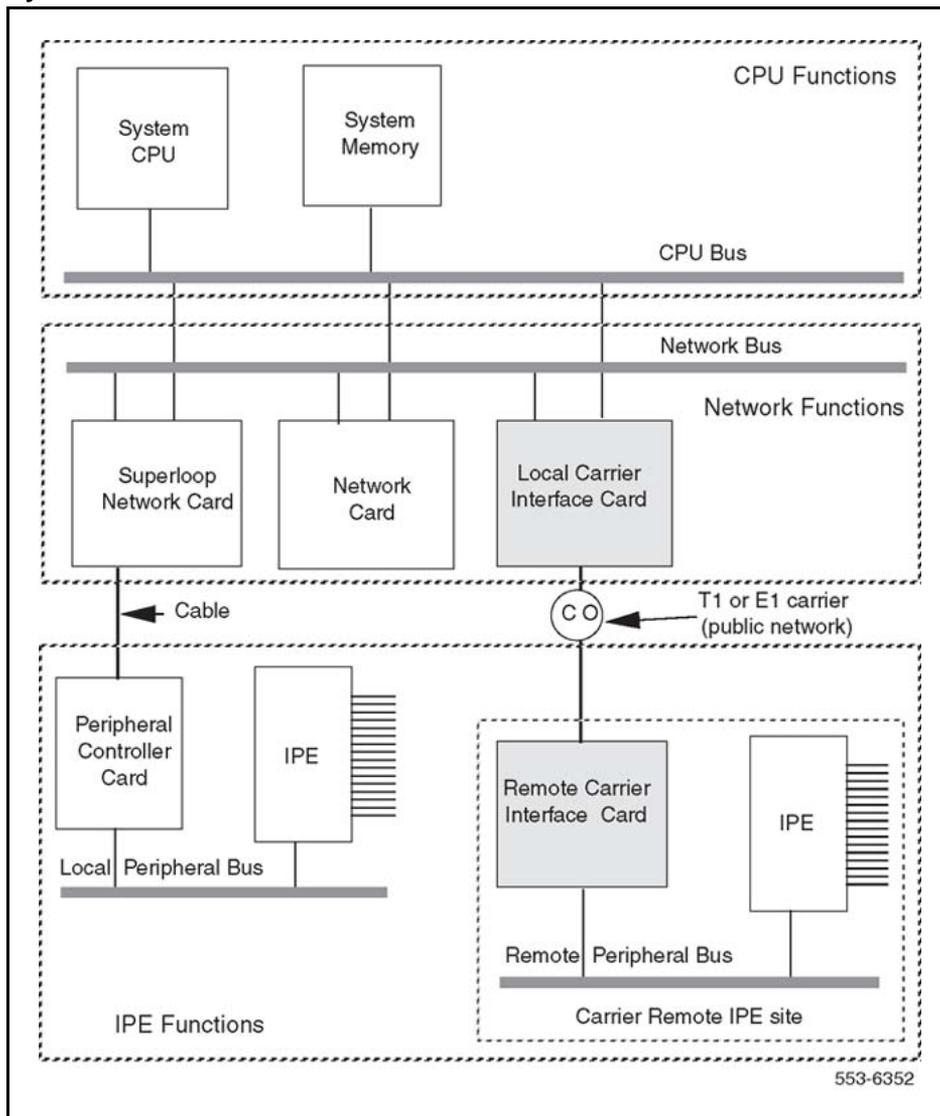
The communication and signaling between the system and the Carrier Remote IPE is performed over the first three timeslots of each T1 or E1 carrier link including the spare link. The other timeslots of each carrier link are used to transmit voice and data information originating and terminating at Remote IPE subscriber stations.

All three carriers transmit the same messages and signaling across the carrier link; however, the system selects only one carrier for signaling and message handling. Which carrier it uses depends on the past carrier link events, or when one carrier has a lower error rate than the other carriers in the link, the system selects the carrier with the lowest error rate for signaling and message extraction.

A T1 or an E1 carrier link between the Local Carrier Interface card and a Remote Carrier Interface card can be configured with one to three carrier links, where all three links carry traffic or where one of the two links can be assigned as a spare link that is standing by to take over traffic when an active link fails.

[Figure 4 "System functional architecture" \(page 23\)](#) illustrates the system functional architecture on a broad block diagram level to show the three basic types of functions.

**Figure 4**  
**System functional architecture**



To maintain optimum service during carrier failure and recovery, the system automatically enables the exact number of timeslots required for the number of active physical links between the system and the Carrier Remote IPE. All the other timeslots provided by the superloop are inhibited to prevent system assignment of too many timeslots for the number of active carriers in the link.

If the number of active links changes due to failure of one or more links, or if reactivation of a previously faulty link occurs, the system dynamically adjusts the number of available timeslots to support currently active carriers in the link.

### **CPU functions**

CPU functions are executed by the system software in the CPU module or shelf. The CPU responds to the interrupt requests from the network equipment and the IPE, and performs the following functions:

- controls originating calls, terminating calls, and feature operation for switched voice and data calls
- prevents establishing new data calls if CALS= 2
- executes system administration and configuration functions
- coordinates system diagnostic activities
- controls system utility functions such as software loading, initialization, data dumping, traffic logging, and system auditing

Even though the Remote IPE is removed from the system, the system CPU controls its functions the same way it controls functions of telephones and stations connected to line cards in local IPE modules.

### **Network functions**

Network switching functions are executed by the equipment housed in the system network card slots. The Local Carrier Interface card is installed in a network card slot and, through its T1 or E1 carrier links, connects to the Remote Carrier Interface card installed in the Carrier Remote IPE module or cabinet.

The system provides these network functions:

- performs hardware initialization and self-test upon power up
- establishes call connections between stations connected to Remote IPE line cards and stations local to the system or to trunks for long distance trunk calls over public or private networks
- communicates switching, peripheral signaling, and maintenance information to and from the CPU, the Local Carrier Interface card MPU, and the Remote Carrier Interface MPU
- manages timeslot assignment for active carrier links and timeslot blocking of the remaining timeslots on the superloop that are not required to support the existing active carrier links
- monitors T1 or E1 carrier link integrity and transmission quality and provides automatic link switching from the failed primary link to the spare link, if so configured
- optionally, if PRI/DTI/BRI cards are not installed in the system, provides clock to the Clock Controller card to synchronize the network bus to the T1 or E1 carrier clock
- provides local and remote loopback testing and fault isolation functions

## IPE functions

IPE functions are performed by the Remote Carrier Interface card and line cards in the Carrier Remote IPE module or Carrier Remote IPE cabinet.

The system provides these IPE functions:

- assigns timeslots to line cards to establish call connections
- communicates with the Local Carrier Interface card MPU to provide Remote IPE configuration and maintenance functions
- monitors the link integrity and transmission quality and notifies the Local Carrier Interface card, which provides automatic carrier switching from the failed primary carrier to the spare carrier 2 if the link is set up with the spare carrier option
- provides Card-LAN management by polling IPE cards and reporting their status
- controls local station ringing functions
- provides a serial port for local configuration and maintenance functions
- provides local and remote loopback testing and fault isolation functions

## Functional description

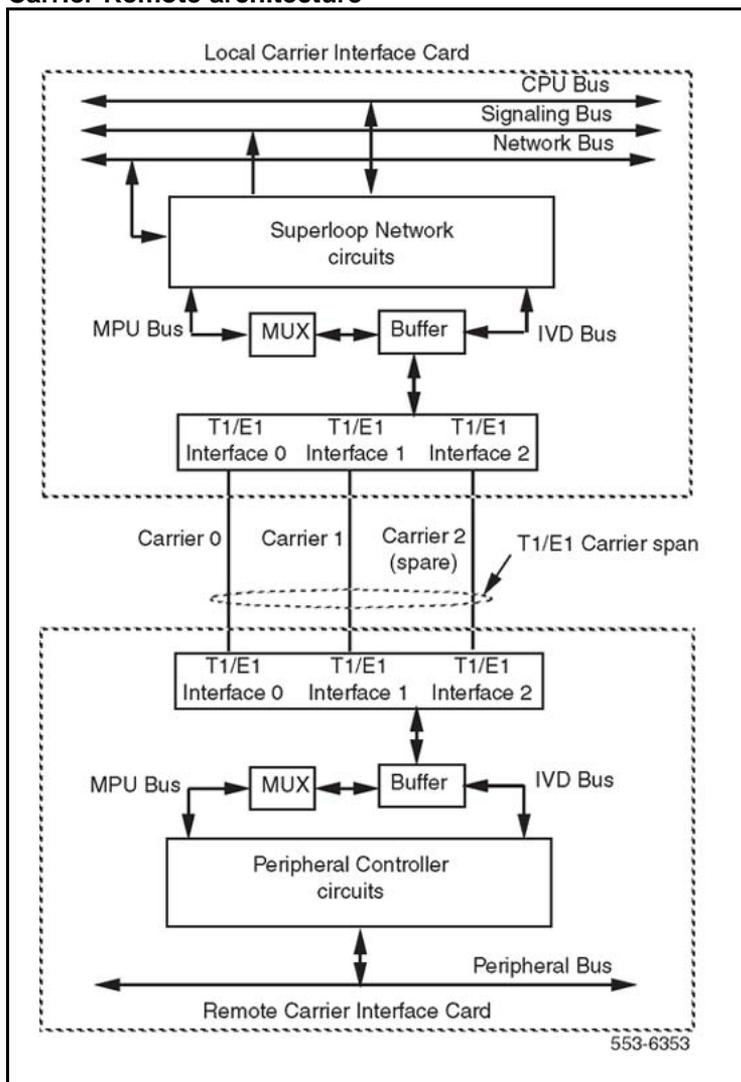
The system is controlled by the CPU. The CPU performs read/write functions on the network control and status registers and communicates with the network equipment over the CPU bus. Through these messages, the CPU monitors the system status, provides call connection sequences, monitors traffic activities, downloads application software and configuration data, and performs system administration and diagnostics.

Carrier Remote IPE utilizes T1 or E1 carrier links to provide the same subscriber functionality at the remote site as at the local site.

[Figure 5 "Carrier Remote architecture" \(page 26\)](#) illustrates the Carrier Remote architecture. It shows the Local Carrier Interface card, the Remote Carrier Interface card, and the internal bus structure that connects them to other system components.

[Figure 5 "Carrier Remote architecture" \(page 26\)](#) shows the carrier interface circuits to provide an understanding of the internal system communication and call processing activities through the T1 or E1 carrier link.

**Figure 5**  
**Carrier Remote architecture**



**Local Carrier Interface card**

The Local Carrier Interface card is a microprocessor-controlled network interface between the system CPU and the Remote Peripheral Equipment. To communicate with the CPU, the system uses the network, the signaling, and the CPU buses located in the system network module.

The Local Carrier Interface card occupies one network card slot and supports a maximum of 120 timeslots for voice and data transmission with the Remote Carrier Interface card.

A subset of these available timeslots are dynamically activated depending on T1 or E1 carrier and the number of active links in the carrier link. A maximum of 63 timeslots are used for a T1 link with three active carriers

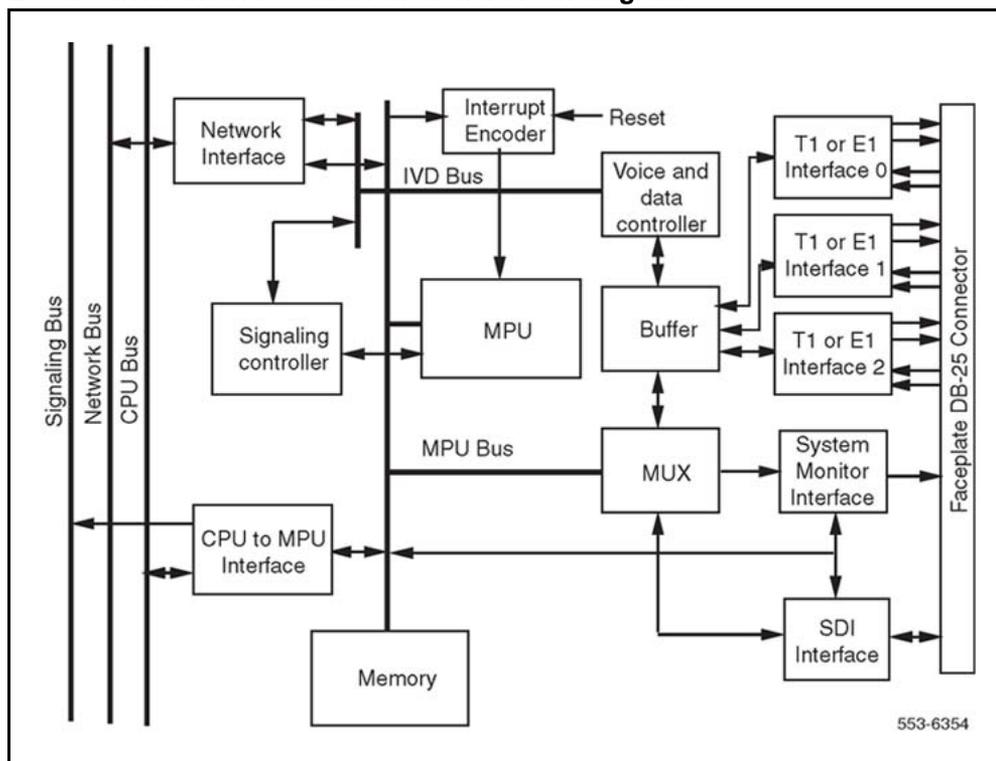
or a maximum of 81 timeslots are used for an E1 link with three active carriers. Timeslots that are not associated with physical T1 or E1 carriers are disabled. This prevents assigning carrier-inaccessible timeslots to the intelligent peripheral equipment.

The main Local Carrier Interface card provides the following functions:

- provides from one to three dedicated T1 or E1 carrier links to connect the Carrier Remote IPE to the system
- assigns specific network timeslots to each T1 or E1 carrier link to communicate with the intelligent peripheral equipment
- synchronizes the system Clock Controller with the clock signal recover from the carrier link
- manages the carrier administration, maintenance, performance monitoring, and automatic carrier reconfiguration
- provides a miscellaneous timeslot (timeslot 2) in each T1 or E1 link to support multiplexed Card-LAN, SDI transport, system monitor, and carrier maintenance information
- supports two signaling timeslots (timeslots 0 and 1) in each carrier link to transmit signaling information across the link
- provides elastic store (two frames long) to compensate for delays between different carriers in the link and allow for proper alignment of all the timeslots on the Internal Voice/Data (IVD) bus
- provides an interface for system power and alarm monitoring
- provides an interface for a maintenance port
- provides continuity test pattern generation and detection for loopback testing
- performs diagnostic self-tests during power-up and also when requested by the CPU

[Figure 6 "Local Carrier Interface card functional block diagram" \(page 28\)](#) shows the Local Carrier Interface card block diagram illustrating major functional blocks.

**Figure 6**  
**Local Carrier Interface card functional block diagram**



### Micro Processing Unit

The Micro Processing Unit (MPU) coordinates and controls data transfer and addressing of the peripheral devices and communicates with the system CPU using a message channel on the CPU bus. The tasks that the MPU performs depend on the interrupts it receives. These interrupts are prioritized by the importance of the tasks they control.

The MPU is highly integrated and provides most of the decision-making logic on the chip. Functions of the MPU include controllers, timers, control and arbitration logic, address decoding, dual-port RAM and independent direct memory access, input/output ports, and independent full-duplex serial communication channels that support various protocols.

The MPU can be reset by:

- powering up the Local Carrier Interface card
- the watchdog timer
- the ENB/DIS switch
- the system CPU command

### **Memory**

The Local Carrier Interface memory stores the following programs and data:

- Boot code, self-test code, and operating firmware are stored in the EPROM.
- Data is stored in the RAM.
- Code that is downloaded by the local system CPU to the Local Carrier Interface card MPU and main function code is stored in the RAM.
- Data containing the Local Carrier Interface card identification and version is stored in the EEPROM.

### **CPU to MPU bus interface**

Information exchange between the system CPU and the Local Carrier Interface MPU is performed with packetized messages transmitted over the CPU bus.

This interface uses shared Static Random Access Memory (SRAM) as a communication exchange point between the CPU and the MPU. Both the CPU and the MPU can access this memory over the transmit and receive channels on the CPU bus.

### **Network bus interface**

The network bus interface performs two major functions:

- converts bit interleaved serial data received from the network bus into byte interleaved data for transmission over the timeslots used by the IVD bus
- accepts byte-interleaved data transmitted from the IVD bus and converts it into a bit-interleaved data stream for transmission over the network bus

### **Carrier interface**

Each Local Carrier Interface card has three T1/E1 interfaces to provide two primary links and a spare, or three primary T1 or E1 carrier links. Each T1 or E1 carrier interface is switch-selectable to a 1.5 Mbps T1 or a 2 Mbps E1 point-to-point transmission facility. A carrier interface card does not support a combination of T1 and E1 carrier links on a carrier link; it supports only T1 or E1 carriers.

The T1 or E1 carrier interface performs the following functions:

- connects the system to Remote IPE using one to three T1 or E1 carrier links.
- provides a communication channel between the Local Carrier Interface card MPU and the Remote Carrier Interface card MPU over timeslot 2 of each carrier. It also multiplexes the system monitor, Card-LAN, and the SDI port information and transmits it over timeslot 2 across the link.
- transmits signaling information across the carrier link by using timeslots 0 and 1 of each carrier
- provides a distance-selectable switch that selects the distance from the Local Carrier Interface card to the first signal regenerator such as a repeater, a CSU, or an LTU in the carrier link to be from 0 to 200 m (0 to 655 ft)
- uses elastic store buffers to store two frames of carrier data stream to compensate for possible information propagation delays between different carrier timeslots in the link. This allows for proper timeslot alignment of all the carriers on the IVD bus.
- identifies the card and firmware versions, which are stored in the EEPROM
- monitors transmission quality of the link. If the transmission is degraded or fails, the Local Carrier Interface card automatically transfers to the spare link, if equipped.

### **Remote Carrier Interface card**

The Remote Carrier Interface card is a microprocessor-controlled peripheral interface between the Local Carrier Interface card and the Remote IPE line cards. To communicate with the Local Carrier Interface card, the Remote Carrier Interface card uses one to three T1 or E1 carrier links. To communicate with the IPE, the Remote Carrier Interface uses 16 full-duplex serial loops, one for each line card in the Carrier Remote IPE module or Carrier Remote IPE cabinets.

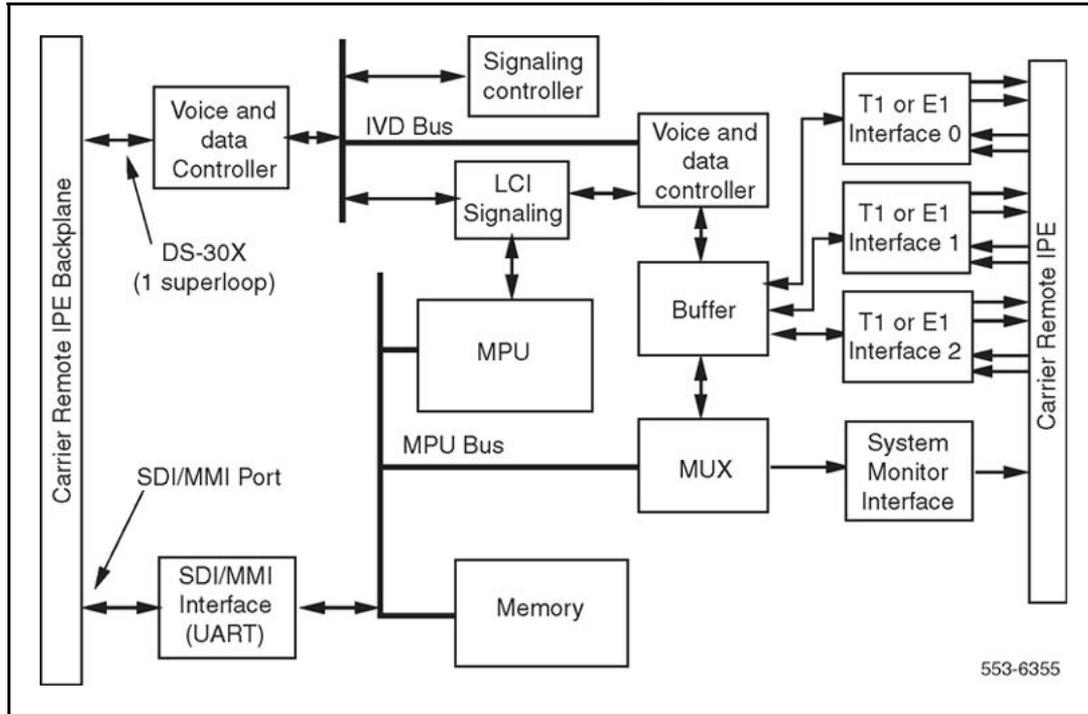
The Remote Carrier Interface card occupies one controller card slot in the IPE module. However, the adjacent card slot is not the full width and must remain empty. This narrower card slot is due to the fact that a standard peripheral controller card occupies two card slots in the IPE module, and the Remote Carrier Interface card that plugs into the same backplane connector, occupies only one card slot. The dummy faceplate can be used in the empty card slot in the Carrier Remote IPE module for aesthetic reasons, but is not needed in the Carrier Remote IPE cabinet.

The main Remote Carrier Interface card provides the following functions:

- Provides one to three T1 or E1 carrier links to connect the Carrier Remote IPE to the system.
- Assigns timeslots on the T1 or E1 carrier link to timeslots of the 16 full-duplex serial loops assigned to line cards in the IPE module.
- Provides a Remote Carrier Interface Microprocessor (RCIM) to execute administrative and MMI port commands and manage the carrier administration, maintenance, performance monitoring, and automatic carrier reconfiguration.
- Transmits signaling information across the carrier link by using timeslots 0 and 1 of each carrier.
- Provides a communication channel between the Local Carrier Interface card MPU and the Remote Carrier Interface card MPU over timeslot 2 of each carrier. It also multiplexes the system monitor, Card-LAN, and the MMI port information and transmits it over timeslot 2 across the carrier link.
- Uses elastic store buffers to store two frames of carrier data stream to compensate for possible information propagation delays between different carriers in the link. This allows for proper timeslot alignment of all carriers on the IVD bus.
- Provides a distance-selectable DIP switch that selects the distance from the Remote Carrier Interface card to the first signal regenerator such as a repeater, a CSU, or an LTU in the carrier link to be from 0 to 200 m (0 to 655 ft).
- Converts SSD-type signaling format received from the Local Carrier Interface card to the signaling format for digital telephones, and from the digital telephones format to SSD-type format.
- Polls telephones to determine the line type and its signaling protocol and transmits this information to the Local Carrier Interface card.
- Provides an interface for MMI administration and maintenance ports.
- Provides continuity test, line card polling, card enabling/disabling, and loopback testing functions.
- Accesses up to three external alarm inputs, which are multiplexed with maintenance and diagnostic messages sent to the Local Carrier Interface card MPU.
- Provides an interface for system power and alarm monitoring.
- Performs diagnostic self-tests during power-up and when requested by the CPU.

Figure 7 "Remote Carrier Interface card functional block diagram" (page 32) shows the Remote Carrier Interface card block diagram illustrating major functional blocks. Functions of these blocks are described in the following sections.

**Figure 7**  
**Remote Carrier Interface card functional block diagram**



### Micro Processing Unit

The Micro Processing Unit (MPU) coordinates and controls data transfer and addressing of the peripheral devices and communicates with the Local Carrier Interface card using serial communication channels over the carrier timeslot 2. Tasks that the MPU performs depend on the interrupts it receives. These interrupts are prioritized by the importance of the tasks they control.

The MPU is highly integrated and provides most of the decision making logic on the chip. Functions of the MPU include controllers, timers, control logic, address decoding, dual-port RAM and independent direct memory access, parallel input/output ports, and independent full-duplex serial communication channels that support various protocols.

The MPU can be reset by:

- powering up the Remote Carrier Interface card
- the watchdog timer

## Memory

The Remote Carrier Interface memory stores the following programs and data:

- Boot code and self-test code are stored in the EPROM.
- Data is stored in the RAM.
- Code that is downloaded by the system CPU to the Remote Carrier Interface card and main MPU function code are stored in the RAM.
- Data containing the Remote Carrier Interface card identification and version is stored in the EEPROM.

## Card-LAN interface

To implement the Card-LAN interface, the Remote Carrier Interface card uses a dual-Universal Asynchronous Receiver-Transmitter (UART) device. One UART channel is a serial communication interface to IPE cards. The other UART channel is the communication link between the Local Carrier Interface card and the Remote Interface card MPUs over the carrier link. Card-LAN function is performed in the system and it doesn't provide an external physical connection.

The Card-LAN is a 19.2 kbps asynchronous interface. It is used to poll and communicate with IPE cards through the Remote Carrier Interface card to transmit maintenance messages, which include:

- LED control of the IPE card enable/disable
- Peripheral card configuration
- Peripheral card type and version information

## IPE interface

The IPE interface links IPE cards to the Remote Carrier Interface MPU using sixteen DS-30X loops, one for each IPE card, and contains the following Remote Carrier Interface circuits:

- Dual formatter that transforms serial peripheral loop information into parallel Integrated Voice and Data (IVD) bus information and parallel IVD bus information to serial peripheral loop information.
- Message handler that performs channel associated signaling to and from the IPE cards. It receives signaling information from the IPE cards; then the MPU accesses this information, interprets it, and sends it to the Local Carrier Interface in the appropriate format. From the Local Carrier Interface, the signaling messages are received and interpreted by the Remote Carrier Interface MPU and sent to the serial peripheral loops in the appropriate format.

- Timeslot interchange that provides the correspondence between the voice and data timeslots on the T1 or E1 carrier link and the timeslots on the IVD bus. Timeslots on the IVD bus correspond directly to the peripheral line card loops.
- Signaling timeslots on each carrier link that handle the signaling to and from the Local Carrier Interface card. It receives signaling information from the Local Carrier Interface card and transmits it to the Remote Carrier Interface card MPU for processing. It also processes the signaling information in the opposite direction by receiving the signaling information from the Remote Carrier Interface card MPU and transmitting it to the Local Carrier Interface card MPU over the T1 or E1 carrier links.

### **Carrier interface**

Each Remote Carrier Interface card provides three T1 or E1 carrier interfaces. The Remote Carrier Interface card can have three primary links or two primary links and one spare. It provides a switch-selectable 1.5 Mbps T1 or a 2.0 Mbps E1 point-to-point transmission facility.

The T1 or E1 carrier interface performs the following functions:

- Connects the system to Remote IPE using one to three T1 or E1 carrier links.
- Provides a distance-selectable switch that selects the distance from the Remote Carrier Interface card to the first signal regenerator such as a repeater, a CSU, or an LTU in the carrier link to be from 0 to 200 m (0 to 655 ft).
- Transmits signaling information across the link by using timeslots 0 and 1 of each carrier.
- T1 line signal coding across the carrier link is B8ZS.
- Extended Superframe (ESF) is preferred (instead of D4) for T1 links because it provides CRC6 error monitoring, which provides end-to-end performance checking.
- E1 line signal coding across the carrier link is HDB3.
- Local system is used as the clock source to synchronize the communication between the local and remote sites over carrier links.
- Provides a communication channel between the Local Carrier Interface card MPU and the Remote Carrier Interface card MPU over timeslot 2 of each carrier link. It also multiplexes the system monitor and the SDI port information and transmits it over this carrier timeslot across the link.

- Uses elastic store buffers to store two frames of carrier data stream to compensate for possible information propagation delays between different carriers in the link. This allows for proper timeslot alignment of all the carrier links on the IVD bus.
- Identifies card and firmware versions, which are stored in the EEPROM.
- Monitors transmission quality of T1 or E1 carrier links. If the transmission is degraded or fails, the Remote Carrier Interface card automatically transfers to the spare link, if equipped.

## Engineering guidelines

General system engineering guidelines for CS 1000M and Meridian 1 Large Systems are described in *Communication Server 1000M and Meridian 1 Large System Planning and Engineering (NN43021-220)* ().

The following information deals specifically with engineering guidelines for the Carrier Remote IPE planning and implementation.

### Carrier Remote IPE capacity

The local system's physical capacity depends on the system configuration and size. Large Systems are designed to provide port capacities from tens of ports to thousands of ports. These ports are normally local; however, by implementing Carrier Remote IPE, some of these ports are located at one or more remote sites.

The overall system capacity does not change by installing Carrier Remote IPE. The difference between a system with Carrier Remote IPE and without Carrier Remote IPE is the distribution of line cards (that is, the subscriber loops). Carrier Remote IPE allows distribute the intelligent peripheral equipment to be distributed at long distances from the system and provide the same functions and features to remote subscribers as to local subscribers.

**Note:** System port capacity can be affected by the capacity of the Local Carrier Interface card, which supports only one IPE module instead of two IPE modules, as supported by the standard superloop network card. Call blocking grade of service for the remote voice and data terminals depends on the number of active carriers in the link.

The Carrier Remote IPE capacity can be tailored according to port capacity requirements at the remote site. When planning a Carrier Remote IPE site, determine the number of IPE cards that are required to support the existing traffic needs and future requirements. Based on these requirements and the equipment location preference, there are two Carrier Remote IPE hardware options available:

- Carrier Remote IPE column
- Carrier Remote IPE cabinet

### **Carrier Remote IPE column**

The Carrier Remote IPE column consists of a pedestal, IPE module, and a top cap. One IPE module supports up to 16 line cards, or 256 ports if each line card has 16 ports. If more ports are required, additional IPE modules can be added to the column. A column contains a maximum of four modules. Each IPE module requires one Remote Carrier Interface card located in the IPE module and a corresponding Local Carrier Interface card located in the system network card slot.

**Note:** A superloop network card can support up to two IPE modules. However, in a system with the Carrier Remote IPE configuration, a Local Carrier Interface card supports only one Remote IPE module. This is due to the dedicated carrier link configuration between the Local Carrier Interface card and the Remote Carrier Interface card. Since T1 or E1 carrier links are dedicated to one Remote Carrier Interface card, they cannot be shared between two different IPE modules at the remote site.

### **Carrier Remote IPE cabinet**

The Carrier Remote IPE cabinet consists of an NT1P70/NT1P60 main cabinet and an NTBK70 expansion cabinet. The main cabinet supports the Remote Carrier Interface card and up to ten IPE cards or 160 ports. If more ports are required, an expansion cabinet can be installed adjacent to the main cabinet.

These two cabinets are linked with an inter-cabinet cable that plugs into 50-pin connector P1 located at the bottom left-hand corner of each cabinet. This cable extends six peripheral bus DS-30X loops to the first six IPE card slots in the expansion cabinet. One Remote Carrier Interface card located in the main cabinet supports cards in both main and expansion cabinets as long as the expansion cabinet contains no more than six IPE cards installed in the first six IPE card slots. The remaining card slots from 17 through 20 must not be used.

### **Engineering the T1 carrier link**

A T1 carrier link is constructed using twisted-pair wire over the private or public network.

When engineering a carrier link, determine the number of links required to support the traffic at the remote site. Local and Remote Carrier Interface cards support from one to three T1 carrier links. These three links can be used as primary links without a spare, or two links can be used as primary

and the third link can be used as a spare link. The spare link is used when one of the primary links fails. In that case, the traffic from the failed link is automatically switched to the spare link.

The T1 carrier link used twisted-pair wire. The public network link construction is the responsibility of the local telephone company. The only cable routing that has to be done at the local and remote sites is from the telephone company's telco demarcation point or Line Terminating Unit (LTU) to the system and to the Carrier Remote IPE column or Carrier Remote IPE cabinet.

If a private T1 network is used, the same conditions as with the public network apply; that is, the only cable routing that has to be done at both sites is from the CSU or telco demarcation point to the system and to the Carrier Remote IPE column or Carrier Remote IPE cabinet, assuming that the carrier link already exists and does not have to be constructed.

The local carrier interface and the remote carrier interface to the carrier link are designed for in-house environment carrier protection. To protect the carrier link in the external environment, which is susceptible to lightning, external line protection circuits similar to trunk protection circuits are required before the carrier link exits the building.

The carrier link line coding is B8ZS. The source of the clock for the carrier links is the local system. The preferred framing for the T1 link is ESF (D4 is also supported).

### **Engineering the E1 carrier link**

An E1 carrier link can be constructed using coaxial cable or twisted-pair wire over the private or public network.

When engineering a carrier link, determine the number of links required to support the traffic at the remote site. Local and Remote Carrier Interface cards support from one to three E1 carrier links. These three links can be used as primary links without a spare, or two links can be used as primary and the third link can be used as a spare link. The spare link is used when one of the primary links fails. In that case, the traffic from the failed link is automatically switched to the spare link.

The E1 carrier link, in some applications, may use coaxial cable to span the distance between the system and the Carrier Remote IPE. The public network link construction is the responsibility of the local telephone company. The only cable routing that has to be done at the local and remote sites is from the telephone company's demarcation point or line terminating unit (LTU) to the system and to the Carrier Remote IPE column or Carrier Remote IPE Cabinet.

If the E1 link uses coaxial cables and BNC connectors, use the NT7R67EA Coaxial Interface Adapter Cable (one RJ -48 to BNC adapter cable for each carrier in the link) and the impedance must be set to 75 Ohm using SW1, SW2, SW5, and SW8 on the Local and Remote Carrier Interface cards (refer to [Figure 9 "Local Carrier Interface card DIP-switch positions and function"](#) (page 67) and [Figure 14 "Remote Carrier Interface card DIP-switch locations and functions"](#) (page 89)).

An Ex carrier link can use coaxial cable connection from the local system and the Carrier Remote IPE to the corresponding LTU or telco demarcation point, but from there on, the network can use twisted pairs, coaxial cable, microwave, and so on, as long as it meets the transmission quality required for E1 carrier communication.

If a private E1 network is used, the same conditions as with the public network apply; that is, the only cable routing that has to be done at both sites is from the LTU or telco demarcation point to the system and to the Carrier Remote IPE column or Carrier Remote IPE cabinet, assuming that the carrier link already exists and does not have to be constructed.

The local carrier interface and the remote carrier interface to the carrier link are designed for in-house environment carrier protection. To protect the carrier link in the external environment, which is susceptible to lightning, external line protection circuits similar to trunk protection circuits are required before the carrier link exits the building.

The T1 carrier link line coding is B8ZS. The E1 carrier link line coding is HDB3. The source of the clock for the carrier links is the local system.

### Traffic engineering

Network blocking-in can potentially occur at three stages:

1. the network loop or superloop associated with the originating port (line or trunk)
2. the loop or superloop where the call terminates
3. the inter-group junctors bridging the connection between two network groups in a multi-group system

**Note:** When carriers are configured with carrier 2 as spare, carrier 0 will always have the sparing priority over carrier 1. If carrier 1 is spared and carrier 0 becomes faulty, carrier 0 will be spared and carrier 1 will be released.

In order to meet the overall Grade Of Service (GOS) requirement of 0.01 network blocking requirement, each blocking component in the network should not be greater than one third of the total blocking. Therefore, the blocking for a call at the originating part of the connection should be

0.0033 or less. It is this blocking probability that yields 660 CCS capacity for a loop and 3500 CCS capacity for a superloop in the traffic engineering procedure.

The engineering of Carrier Remote IPE is equivalent to engineering a segment of the call connection; it should follow the procedure recommended in this document. The rest of the system engineering will not be impacted by this component.

### Traffic capacity

Traffic capacities of carriers meeting GOS requirements are summarized in [Table 5 "Carrier capacity calculations" \(page 39\)](#).

**Table 5**  
**Carrier capacity calculations**

Carrier Type	T1			E1		
	1	2	3	1	2	3
Number of Carriers	1	2	3	1	2	3
Number of Channels	21	42	63	27	54	81
Traffic in CCS	408	1016	1665	575	1384	2235

There are some general guidelines to be followed before you start to engineer a Carrier Remote IPE:

- Traffic engineering for a Carrier Remote IPE with or without Central Office between Local Carrier Interface card and Remote Carrier Interface card is the same. This implies that available channels for any specific configuration in the CO or CO network are at least equal to the channels on the carrier to provide the GOS required.
- One Local Carrier Interface card is connected to one Remote Carrier Interface card only. There is no concentration option on the Carrier Remote IPE.
- One carrier out of two, or one carrier out of three, equipped is allowed to be a spare which serves as a backup during active carrier failure but will not carry traffic under normal conditions.
- Capacity calculation of carriers (E1 or T1) should exclude the spare carrier. In other words, if a spare carrier is provided, the maximum number of channels available for traffic is 42 for T1 and 54 for E1.
- If the number of equipped ports (lines or trunks) is less than the number of channels (or time slots) in the carrier, there will be no blocking at the carrier or superloop. Traffic per port can be up to 36 CCS.
- Non-blocking on a carrier Carrier Remote IPE superloop is not sufficient to guarantee a non-blocking system. Other parts of the call connection need to be considered.

- Traffic requirements for lines or trunks are normally specified by a customer. When it is not specified, the default number of 6 CCS per line, 26 CCS per trunk, 30 CCS per ACD agent and 18 CCS per data port can be used.
- Current digital line card allows 16 voice ports and 16 data ports. Unused data ports can not be used for voice lines. In other words, an Integrated Voice and Data line card can support 16 voice lines or 16 integrated voice and data pairs. A port is the generic term for a line, trunk, or data terminal.
- A trunk card can provide eight trunk ports.
- An IPE module can accommodate 16 cards, of which any combination of cards are permitted.
- Digitone Receiver (DTR) cards should not be installed into the Carrier Remote IPE cabinet or the Carrier Remote IPE module due to the unnecessary use of carrier channels and remote IPE card slots.
- A Carrier Remote IPE cabinet version of the Carrier Remote IPE may consist of a 10-slot main cabinet and 6-slot expansion cabinet providing a maximum of 16 card IPE capacity. There may be cost advantages to equipping Carrier Remote IPE cabinets in a multi-shelf configuration, if a cabinet is equipped with no more than 10 cards.
- All line/trunk cards, card slot and carrier calculations are to be rounded up to the next higher integer number.
- Capacity calculations of lines and trunks allowed per carrier should be rounded down to the next lower number.
- When several IPE modules or Carrier Remote IPE cabinets are required in the configuration, it is preferable to fill up the first IPE module or cabinet card slots until either all slots are filled or the carrier traffic limit is reached before equipping the second one. This way, when adding traffic or cards to the partially filled enclosure, the first module or cabinet will not need re-engineering.
- When no growth is planned, even distribution of traffic among several IPE modules or Carrier Remote IPE cabinets is quite acceptable.
- Carrier Remote IPE cabinet installation guide: (1) 1–10 cards, use a Carrier Remote IPE cabinet. (2) 11–16 cards, use an IPE module. (3) 17–20 cards, use two Carrier Remote IPE cabinets. (4) 21–26 cards, use one IPE module and one Carrier Remote IPE cabinet. (5) 27–32 cards, use two IPE modules. Repeat the same rule for additional card slots required. Of course, the final configuration will also depend on traffic requirements.

## Engineering procedure

The following procedures determine the system terminal configuration for determining system traffic capacity.

**Given the number of carriers, calculate ports allowed** Follow the steps in [Procedure 1 "Calculating the number of ports allowed"](#) (page 41) to calculate the number of ports allowed.

### Procedure 1 Calculating the number of ports allowed

Step	Action
1	<p>Determine traffic capacity at the carriers.</p> <p>Read off the CCS number from <a href="#">Table 5 "Carrier capacity calculations"</a> (page 39) under the specified number of carriers as the maximum capacity allowed for that carrier size.</p>
2	<p>Determine the number of lines allowed.</p> <p>Divide the CCS number by 6 CCS for line or 26 CCS for trunk or any other numbers provided by the customer.</p>
3	<p>Determine the number of card slots required.</p> <p>The number of lines divided by 16, the number of trunks divided by 8 or the number of integrated voice and data lines divided by 32 to obtain the number of card slots required.</p> <p>An IPE module has 16 card slots. A Carrier Remote IPE cabinet has 10 card slots.</p> <p>If the number of card slots is less than or equal to 16 (or 10), the resulting configuration is within the traffic capacity of the carrier provided.</p> <p>If the number of card slots allowed is greater than 16 (or 10), it means that the carrier can handle more traffic than an IPE module or Carrier Remote IPE cabinet can generate. When all 16 (or 10) card slots are filled, the carrier may still have spare capacity for extra traffic.</p>
--End--	

**Given port CCS, determine the number of carriers required.** Follow the steps in [Procedure 2 "Determining the number of carriers required"](#) (page 42) to determine the number of carriers required.

**Procedure 2**  
**Determining the number of carriers required**

Step	Action
1	Multiply the number of lines by CCS per line, the number of trunk by CCS per trunk, and so on, and total them to obtain the total traffic offered to the carrier.
2	<p>Refer to <a href="#">Table 5 "Carrier capacity calculations" (page 39)</a> under the T1 or E1 column to find the CCS number greater than the calculated number, and find the corresponding carrier number to determine the number of carriers required.</p> <p>If no number in <a href="#">Table 5 "Carrier capacity calculations" (page 39)</a> is large enough to cover the calculated number, it means that the given configuration and traffic is too large for three carriers. Reduce the number of ports, or the CCS per port, or both. The resulting number has to be less than the entry from <a href="#">Table 5 "Carrier capacity calculations" (page 39)</a> in order for the carrier to handle the given configuration.</p> <p>If traffic and number of lines have to be maintained, multiple lines of carriers and cabinets will be needed.</p> <p>Use only columns with 1 or 2 carriers in <a href="#">Table 5 "Carrier capacity calculations" (page 39)</a>, if a spare carrier is to be used.</p> <p>The port counts in the final configuration should be within the slot limitation of the Carrier Remote IPE enclosure (16 for IPE module, 10 for the Main Carrier Remote IPE cabinet and 6 for the Expansion Carrier Remote IPE cabinet).</p>

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--End--

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**Engineering examples**

Engineering examples are developed to illustrate the procedure described above. They cover only traffic capacity issues specifically associated with Carrier Remote IPE engineering.

**Given the number of carriers, find allowed ports and required enclosures. Example 1:** Three T1 carriers are provided to serve a Carrier Remote IPE. All ports are lines with 6 CCS each.

Find the maximum number of lines three T1 carriers can support.

1. From [Table 5 "Carrier capacity calculations" \(page 39\)](#), the CCS that can be handled by three T1 carriers is 1665.
2. Divide CCS by 6:  $1665/6=277$ . Traffic generated by 277 lines at 6 CCS each can be supported by three T1 carriers.

3. Calculate card slots:  $277/16=17$ . This number is greater than the 16 slots available in an IPE module.
4. Calculate maximum allowed lines:  $16 \times 16=256$ , or  $16 \times 10=160$ . 256 lines (or 160 lines) with 6 CCS each are the maximum number of lines allowed for each Remote IPE module or Remote IPE cabinet for three T1 carriers.

**Configuration for Mixed Sets, Trunks and Data Terminals. Example**

**2:** A remote data processing center is connected to the main office through private E1 carriers. For reliability purposes, spare carriers are required as backups.

Find the configuration to support 80 integrated voice and data lines at 6 CCS for voice and 14 CCS for data, and 20 trunks at 26 CCS each.

1. From [Table 5 "Carrier capacity calculations" \(page 39\)](#) under E1 heading, two carriers can serve 1384 CCS (with spare, two carriers are the maximum link size per each Carrier Remote IPE module or Carrier Remote IPE cabinet).
2. Calculate total offered traffic:  $80 \times 6 + 80 \times 14 + 20 \times 26 = 1600 + 520 = 2120$  CCS. This number is larger than 1384 but less than 2768 ( $=2 \times 1384$ ). The offered traffic is too much for two carriers but within the capacity of four carriers (two lines of two carrier links). Note that the integrated lines alone generate more traffic (1600 CCS) than two carriers can handle, they need to be split between two IPE modules or Carrier Remote IPE cabinets.
3. Calculate card slots:  $(80+80)/32 + 20/8 = 5 + 3 = 8$ . There are sufficient card slots in one cabinet to handle the required ports. Even though the configuration exceeds the traffic capacity of one carrier group in Step 2, it is still a good idea to check physical constraints to determine whether traffic is the only constraining parameter.
4. Configuration Summary:  
IPE1 (Carrier Remote IPE cabinet): 3 32-port IVD cards, 1 trunk card, 3 E1 carriers including one spare.  
IPE2 (Carrier Remote IPE cabinet): 2 32-port IVD cards, 2 trunk cards, 3 E1 carriers including one spare.

**Given ports and traffic to find carriers and cabinets. Non-blocking Sets Only (two Carrier Remote IPE cabinets) Example 3:**

A Carrier Remote IPE is located in an airport fire station two miles from the main terminal building where the local system is installed. There are 80 lines in the Carrier Remote IPE where non-blocking network and a spare

carrier on the carrier group are required. What is the most cost effective configuration to serve this site?

1. To provide non-blocking to 80 lines, 80 channels are required at the carrier.
2. From [Table 5 "Carrier capacity calculations" \(page 39\)](#), two T1 carriers can provide 42 channels, which are just enough to serve half of the requirement.
3. Calculate card slots:  $80/16 = 5$ . Only five card slots are needed for this application. However, if three cards are fully equipped with lines in one IPE module or Carrier Remote IPE cabinet, the 48 lines will exceed the channel capacity of two-carriers at 42 for non-blocking. Three partially equipped cards are needed. The total ports should be 42 or less at any IPE module or Carrier Remote IPE cabinet.
4. Configuration Summary:  
IPE1 (Carrier Remote IPE cabinet): 42 non-blocking lines, 3 cards, 3 E1 carriers including one spare.  
IPE2 (Carrier Remote IPE cabinet): 38 non-blocking lines, 3 cards, 3 E1 carriers including one spare.

To split lines 40-40 in this application is also acceptable. However, future growth should be kept to 42 lines maximum at each cabinet.

#### **Blocking Network (one IPE module and one Carrier Remote IPE cabinet) Example 4:**

A university providing E1 carrier telephone services to 400 boarding students is located one mile away from the main administrative building where the local system is located.

Find the configuration required to serve this remote site, if the estimated busy hour per line is 6 CCS.

1. Calculate traffic:  $400 \times 6 = 2400$  CCS. This number is greater than the capacity of 3 E1 carriers (2235 CCS). From a traffic standpoint, two IPE modules are needed.
2. Calculate card slots:  $400/16 = 25$ . This also indicates that two IPE modules are needed. However, one IPE Module with 16 card slots and a Carrier Remote IPE cabinet with 10 card slots are sufficient to meet the need.
3. Calculate traffic, card slots and carriers for the first IPE module:  
 $2235/6 = 372$  lines.  
 $372/16 = 24$  cards. This number is  $> 16$ . Only 16 cards are allowed for the first IPE module.  
 $16 \times 16 = 256$ . 256 lines at 6 CCS each is equipped for the first IPE module

$256 \times 6 = 1536$  CCS. From Table 3, this number still requires three E1 carriers.

4. Calculate traffic, card slots and carriers for the second IPE module or Carrier Remote IPE cabinet:

Remaining lines:  $400 - 256 = 144$

Card slots:  $144 / 16 = 9$

Traffic:  $144 \times 6 = 864$  CCS

Carriers required: From Table 5 "Carrier capacity calculations" (page 39), 2 E1 carriers can handle 1384 CCS which should be enough to serve the 864 CCS from 144 lines (but one carrier at 575 CCS is not quite enough).

5. Configuration Summary:

IPE1 (IPE module): 6 CCS/line, 256 lines, 16 cards, three E1 carriers.

IPE2 (Carrier Remote IPE cabinet): 6 CCS/line, 144 lines, 9 cards, two E1 carriers.

## System planning and ordering

CS 1000M Large Systems and Meridian 1 Large Systems provide the user with a variety of system size and feature options. To select a system option that will best suit current and future communication needs, carefully plan the system. Contact the Nortel representative or Nortel distributor to help plan the system.

If installing a new system with Carrier Remote IPE, refer to *Communication Server 1000M and Meridian 1 Large System Planning and Engineering (NN43021-220)* () for overall system information. To obtain specific planning and ordering information for T1 and E1 carrier links interfacing with network and peripheral cards, see the following sections.

### System selection

Determine the type of Carrier Remote IPE enclosure. This selection may be dictated by the installation preference, blocking considerations, and the number of IPE cards required at the remote site.

If planning a floor-standing system, use the Carrier Remote IPE column or the pedestal mounted Carrier Remote IPE cabinet. If planning a wall-mounted system, use the Carrier Remote IPE cabinet.

In some applications where nonblocking or low-blocking traffic considerations are important, it is necessary to limit the number of peripheral cards supported by each Remote Carrier Interface card.

For a nonblocking condition, the 63 voice/data timeslots for three T1 carriers support four 16-port line cards; the 81 voice/data timeslots for three E1 carriers support five 16-port line cards. Each additional line

card in the IPE module or the Carrier Remote IPE cabinet increases call blocking under high traffic conditions. Refer to *Communication Server 1000M and Meridian 1 Large System Planning and Engineering (NN43021-220)* () for traffic calculations.

With a spare carrier for a nonblocking traffic condition, the number of stations is reduced by 21 for the T1 carrier and by 27 for the E1 carrier.

The system type can also be dictated by the number of ports required at the remote site. The modular column configuration supports 16 line cards and provides a maximum of 256 ports. This column can be expanded by adding a second IPE module to support an additional 256 ports. Each IPE module, however, requires a Remote Carrier Interface card at the remote site and a corresponding Local Carrier Interface card at the local site.

In addition to line cards, the Carrier Remote IPE supports all the cards that do not require external connection to the system common or network equipment.

The Carrier Remote IPE cabinet system configuration supports ten line cards. Select the Carrier Remote IPE cabinet system type if the system size requirement is less than ten IPE cards. To expand this type of system beyond ten IPE cards, add a Carrier Remote IPE expansion cabinet adjacent to the main and install up to six IPE cards into the first six IPE card slots of the expansion cabinet.

### **Carrier Remote IPE site planning**

When selecting a site for the Carrier Remote IPE, consider the number of ports currently required at the site and the possibility of expansion to meet future needs. Also consider the environmental, power, and cable routing requirements.

#### **Environmental requirements**

Carrier Remote IPE equipment conforms to the same environmental requirements as the system equipment. Temperature, humidity, and altitude for the system operation should not exceed the specifications shown in [Table 6 "Environmental requirements" \(page 47\)](#).

[Table 6 "Environmental requirements" \(page 47\)](#) shows the operating and storage environmental specifications. Ideally the system should operate in a stable environment at 22° C (72° F). However, the system is designed to operate in the temperature and humidity ranges specified in [Table 6 "Environmental requirements" \(page 47\)](#).

**Table 6**  
**Environmental requirements**

Condition	Environmental specifications
<b>Operating</b>	
Temperature	0° to 50° C (32° to 122° F)
Relative humidity	5% to 95% noncondensing
Altitude	3,048 meters (10,000 feet) max
<b>Storage</b>	
Temperature	-50° to 70° C (-58° to 158° F)
Relative humidity	5% to 95% noncondensing

### Power requirements

At the remote site, cards in the IPE module are powered by the power supply installed on the left-hand side of the IPE module. The power consumption of the Remote Carrier Interface card is not significantly different from power consumption of the standard Peripheral Controller card. This allows the standard IPE module's power supply to be used in the Carrier Remote IPE column.

Similarly, the Carrier Remote IPE main cabinet power supply, installed in the left-hand side of the cabinet shelf, provides power to the Remote Carrier Interface card and up to ten IPE cards. The expansion cabinet requires its own separate power supply to provide power to an additional six IPE cards. The Carrier Remote IPE cabinet can be powered with an AC power system using the NTAK04 AC/DC power supply.

It can also be powered with a DC power system using the NTAK05 DC power supply from a -52 V battery source through the NTAK28AA Junction box and the NTAK0410 power cable. For additional information refer to *Communication Server 1000M and Meridian 1 Small System Installation and Commissioning (NN43011-310)* ().

[Table 7 "LCI and RCI power requirements" \(page 47\)](#) shows the power supply DC output voltages and currents they supply to the Local Carrier Interface (LCI) and Remote Carrier Interface (RCI) cards. It also shows the corresponding total power consumption for each card.

**Table 7**  
**LCI and RCI power requirements**

Voltage source in VDC	LCI card	RCI card
+5V	4.0 A	3.7 A
+15V	70 mA	50 mA

**Table 7**  
**LCI and RCI power requirements (cont'd.)**

Voltage source in VDC	LCI card	RCI card
-15V	70 mA	50 mA
+12V	70 mA	50 mA
-12V	70 mA	50 mA
Total Power	23.8 W	21.2 W

### Carrier cable requirements

A link can include up to three carriers. In a Carrier Remote IPE column, the carrier link terminates into the I/O panel connectors at the rear of the IPE module. In a Carrier Remote IPE cabinet, the carrier link terminates into the I/O panel connectors mounted on a bracket at the lower left-hand side at the front of the Carrier Remote IPE cabinet.

The Carrier Remote IPE UEM column and the Carrier Remote IPE cabinet support T1 or E1 carrier links. These carrier links are terminated as follows:

- T1/E1 carrier links use twisted-pair wires (120-ohm impedance) and terminate into 8-pin modular jacks.
- E1 carrier links may in some cases use coaxial cables (75 ohm impedance) and terminate into BNC connectors, requiring an RJ-48 to BNC adapters (supplied with the equipment) to connect the link to the Carrier Panel assembly at the UEM I/O panel.

### Carrier equipment planning form

Table 8 "Planning form" (page 48) displays a planning form to use when ordering carrier equipment. Enter the part number and the quantity for each item required at the local and the remote site.

**Table 8**  
**Planning form**

Select one carrier type: T1 or E1 (circle the selected carrier type and enter only items required for that carrier type). Refer to <a href="#">Table 2 "Local site carrier hardware list" (page 13)</a> - <a href="#">Table 4 "Carrier Remote IPE wall-mounted cabinet hardware list" (page 16)</a> starting on <a href="#">Table 2 "Local site carrier hardware list" (page 13)</a> .			
Item	Part Number	Quantity at local site	Quantity at Remote IPE





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# Equipment installation and configuration

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## Contents

This section contains information on the following topics:

[“Introduction” \(page 51\)](#)

[“Quick reference to system installation and configuration” \(page 51\)](#)

[“Installation overview” \(page 54\)](#)

[“Pre-installation preparation” \(page 56\)](#)

[“Local equipment installation” \(page 63\)](#)

[“Carrier Remote IPE column installation” \(page 86\)](#)

[“Carrier Remote IPE cabinet installation” \(page 98\)](#)

[“Configuring the Carrier Remote IPE” \(page 114\)](#)

## Introduction

This chapter describes the installation of the Carrier Remote IPE as an integral part of a Large System.

## Quick reference to system installation and configuration

If familiar with the system operation and general installation practices, follow the steps below and refer to [“Connection diagrams and external connectors pin assignment” \(page 197\)](#) for connection diagrams, to speed up the installation of the Remote Carrier IPE at the local and remote sites:

1. Take inventory of the carrier equipment by comparing the received equipment against the shipping documents. Refer to [Table 2 "Local site carrier hardware list" \(page 13\)](#), [Table 3 "Remote Carrier IPE module hardware list" \(page 14\)](#), and [Table 4 "Carrier Remote IPE wall-mounted cabinet hardware list" \(page 16\)](#) in the “Carrier Remote

- IPE product description" (page 11) for carrier components part numbers and their description.
2. Identify empty network card slots. Refer to [Table 9 "Modules supporting Local Carrier Interface cards" \(page 59\)](#).
  3. Configure the NT7R51 Local Carrier Interface card DIP-switches to set the Local Carrier Interface card address and other parameters. Refer to:
    - [Figure 9 "Local Carrier Interface card DIP-switch positions and function" \(page 67\)](#) for switch settings.
    - [Table 11 "NT7R51 Local Carrier Interface card maintenance daisy-chain address" \(page 68\)](#).
  4. Install the NT7R51 Local Carrier Interface card into a network card slot. Refer to ["Installing the Local Carrier Interface card" \(page 64\)](#) for system options.
  5. Install the NT7R51 Local Carrier Interface card faceplate connector assemblies. Refer to:
    - ["Installing the Local Carrier Interface cable assemblies" \(page 69\)](#)
    - ["Connection diagrams and external connectors pin assignment" \(page 197\)](#)
    - [Figure 26 "Single LCI connection diagram \(local site connections\)" \(page 198\)](#)
    - [Figure 27 "Multiple LCIs connection diagram \(local site daisy-chain connection\)" \(page 199\)](#)
    - [Figure 10 "Local Carrier Interface card faceplate cable connections in Meridian 1 PBX 61C" \(page 70\)](#)
  6. Install the system monitor, local MMI terminal, and carrier link cables to the carrier and maintenance panel assembly connectors. Refer to:
    - ["Installing SDI and local MMI terminal cables" \(page 72\)](#)
    - ["Connection diagrams and external connectors pin assignment" \(page 197\)](#)
    - [Figure 30 "Local site system monitor connection diagram \(single and multiple LCI configuration\)" \(page 202\)](#)
    - ["Connecting the carrier link to the local system" \(page 84\)](#)
    - [Figure 11 "System monitor, local MMI terminal, and carrier links cable connections" \(page 73\)](#)
    - ["Connection diagrams and external connectors pin assignment" \(page 197\)](#) for connector pin assignments

7. At the remote site, install the Carrier Remote IPE column or wall-mounted (or pedestal mounted) Carrier Remote IPE cabinet. Refer to:
  - “Installing the Carrier Remote IPE column” (page 86)
  - or
  - “Installing the Carrier Remote IPE cabinet” (page 99)
8. Configure the NT7R52 Remote Carrier Interface card. Refer to:
  - Figure 14 "Remote Carrier Interface card DIP-switch locations and functions" (page 89) for switch settings
  - “Installing system monitor cables” (page 94)

**Note:** For the floor-standing Carrier Remote IPE column, select the system monitor address on the Remote Carrier Interface card and on the System Monitor card in the pedestal. The system monitor address in both places must be the same and a unique number from 0 to 31.

9. Install the NT7R52 Remote Carrier Interface card into the **Cont** card slot in the IPE Module or the Carrier Remote IPE cabinet. Also install the power supply and the IPE cards.
10. Install the internal cable assemblies. For the Carrier Remote IPE column, refer to:
  - “Installing the backplane cable assemblies” (page 91)
  - 
  - Figure 28 "Remote Carrier IPE module connection diagram (single RCI configuration)" (page 200)
  - Figure 15 "Backplane to I/O panel connections on the IPE module" (page 94)
  - or, for the Carrier Remote IPE cabinet
  - “Installing the NT7R94AA Remote Cabinet Cable Assembly” (page 103)
  - Figure 29 "Remote Carrier IPE cabinet connection diagram (single RCI configuration)" (page 201)
  - Figure 17 "Carrier cable routing for the Carrier Remote IPE cabinet" (page 104)
11. Install the external cables to the I/O panel. For the Carrier Remote IPE column, refer to:

- “Installing system monitor cables” (page 94)
  - Figure 28 "Remote Carrier IPE module connection diagram (single RCI configuration)" (page 200)
  - “Connecting the carrier link to the Remote IPE module” (page 96)  
or, for the Carrier Remote IPE cabinet, refer to
  - “Connecting carrier links to the Carrier Remote IPE cabinet” (page 106)
  - Figure 29 "Remote Carrier IPE cabinet connection diagram (single RCI configuration)" (page 201)
  - “Connecting remote MMI terminal and subscriber loop cables” (page 108)
  - “Verifying carrier link connections at the remote site” (page 128)
  - “Connection diagrams and external connectors pin assignment” (page 197) for connector pin assignments
12. Configure the Carrier Remote IPE local and remote sites. Refer to:
- “Configuring the carrier interface cards” (page 115)
  - “Configuring the remote MMI terminal port” (page 120)
  - “Configuring the carriers” (page 122)
13. Conduct system acceptance testing. Refer to:
- “Carrier Remote IPE acceptance testing” (page 133)

## Installation overview

Carrier Remote IPE service can be added to an existing system originally installed and operating without Carrier Remote IPE, or it can be an integral part of a newly-installed system.

In either case, the connection of the Carrier Remote IPE to the system over T1 or E1 carrier links should begin after a previously-installed system, or a newly-installed system operates correctly. The system must also be equipped with Carrier Remote IPE (REM\_IPE) package 286. The carrier service has been ordered, installed, and tested up to the telco demarcation point.

To install a new system or expand an existing one, refer to *Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43021-310)* (). It provides the information on how to install, verify, and maintain Large Systems.

Adding one or more Carrier Remote IPE sites to a system is treated as a straightforward system expansion; that is, the system should be fully operational before the Carrier Remote IPE equipment is installed and connected to the system. This simplifies installation and fault isolation during installation.

Carrier Remote IPE is offered in two versions to provide flexibility in line size and equipment location. These are:

- Carrier Remote IPE column
- Carrier Remote IPE cabinet

**Note:** The Carrier Remote IPE column consists of a pedestal, an IPE module that houses up to 16 IPE cards, and a top cap. The Carrier Remote IPE cabinet can consist of only the main cabinet when 10 or fewer IPE cards are required, or the main and the expansion cabinets when up to 16 IPE cards are required.

To complete the installation of a Carrier Remote IPE site, perform the pre-installation procedures to prepare the site before installing and connecting the equipment. The general preinstallation and installation points are listed below. The actual installation procedure steps start in [“Local equipment installation” \(page 63\)](#).

Preinstallation procedures include:

- ordering carrier service from telco
- preparing the site
- unpacking and inspecting the equipment
- taking an inventory of Carrier Remote IPE and system carrier equipment
- selecting a network slot for the Local Carrier Interface card

Local site installation procedures include:

- installing the Local Carrier Interface card into the selected network card slot
- installing cables between the Local Carrier Interface faceplate connectors and the I/O panel assembly at the rear of the module housing the Local Carrier Interface card
- connecting the system monitor daisy-chain, the host SDI, and the MMI terminal cables at the local system site

- connecting the Local Carrier Interface maintenance cables in a daisy-chain for multiple Local Carrier Interface cards
- connecting the carrier link to the I/O panel assembly

Remote site installation procedures include:

- installing the Carrier Remote IPE column or cabinet
- installing the Remote Carrier Interface card into the Remote IPE module or cabinet controller card slot
- installing cables between the backplane connectors behind the Remote Carrier Interface card and the I/O panel assembly at the rear of the module or the bottom of the Carrier Remote IPE cabinet
- connecting the slave system monitor and MMI terminal cables at the Carrier Remote IPE site
- connecting the carrier link to the Carrier Remote IPE

## Pre-installation preparation

Pre-installation preparation consists of the following:

- preparing the site
- unpacking and inspection
- taking inventory
- selecting the network slot for the Local Carrier Interface card
- installing the card, selecting the T1 or E1 carrier link
- preparing the remote site cables, grounding, power source, and the space for the Remote IPE column or cabinets

### Preparing the site

When preparing a site, consider environmental, structural, and electrical factors. These factors must be considered for the entire system; that is, local and Carrier Remote IPE sites. This information is available in *Communication Server 1000M and Meridian 1 Large System Planning and Engineering (NN43021-220)* ().

To prepare the site for Carrier Remote IPE installation:

- Install and verify the operation of the local system, without linking to the Carrier Remote IPE sites. Refer to *Communication Server*

*1000M and Meridian 1 Large System Installation and Commissioning (NN43021-310) ()* .

- Install the Carrier Remote IPE column. Refer to *Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43021-310) ()*

or

- Install the cabinet version of Carrier Remote IPE as described in [“Installing the Carrier Remote IPE cabinet” \(page 99\)](#).

## Unpacking and inspection

Unpack and inspect the equipment for damage. When unpacking, follow general precautions recommended by computer and telephone equipment manufacturers:

- Remove items that generate static charge from the installation site.
- Use antistatic spray if the site is carpeted.
- Wear an anti-static wrist strap and use an antistatic mat before handling any equipment.
- Remove equipment carefully from its packaging.
- Visually inspect the equipment for obvious faults or damage. Report any damaged component to the sales representative and the carrier who delivered the equipment.
- Hold the plug-in cards by their nonconductor edges and keep them in their antistatic bags until ready to install them.
- Do not stack the plug-in cards on top of each other.

## Taking inventory

After the equipment has been unpacked and visually inspected, verify that all the equipment is at the site before the installation begins. Equipment received must be checked against the shipping documents. Any shortages must be noted and reported to the sales representative.

Refer to [Table 2 "Local site carrier hardware list" \(page 13\)](#), [Table 3 "Remote Carrier IPE module hardware list" \(page 14\)](#), and [Table 4 "Carrier Remote IPE wall-mounted cabinet hardware list" \(page 16\)](#) in the [“Carrier Remote IPE product description” \(page 11\)](#) for carrier equipment description.

### **Routing carrier links to the Carrier Remote IPE site**

A carrier link connecting the system to the Carrier Remote IPE can use a private or a public T1 or E1 network. The carrier link can consist of one to three T1 or E1 carriers.

A carrier link terminates in a telco demarcation point and from the telco demarcation point; carrier links are routed to the intended telecommunications equipment. The distance between the system or Carrier Remote IPE and the first T1 or E1 repeater, the CSU, or the LTU should not exceed 200 m (655 ft). Therefore, the system and the Carrier Remote IPE should be located within 200 m from their respective telco demarcation points and the first repeater boxes. The actual distance is DIP-switch selectable on the Local and Remote Carrier Interface cards.

**Note:** The NT7R87AA T1 CSU Cable Kit provided with the Carrier Remote IPE equipment is used to connect the Local and Remote Carrier Interface cards to CSUs at a distance of 32 ft (9.75 m). Install this cable kit, if applicable, between the telco demarcation point (CSU) and the Local Carrier Interface card at the local site and the Remote Carrier Interface card at the remote site as a preinstallation procedure.

Route twisted pairs for T1 or E1 carrier links from the telco demarcation point to the carrier equipment. Use standard cable routing procedures to prevent cable exposure to possible damage from contact with machine and human traffic. Terminate the twisted-pair wires with 8-pin modular plug. If coaxial cables are used, they must be terminated with BNC-type connectors.

**Note:** For an E1 carrier system that uses coaxial cable, the impedance must be set on the Local and Remote Carrier Interface card to 75 Ohms. Refer to [Figure 9 "Local Carrier Interface card DIP-switch positions and function" \(page 67\)](#) and [Figure 14 "Remote Carrier Interface card DIP-switch locations and functions" \(page 89\)](#) to set SW1, SW2, SW5, and SW8 for E1 carrier impedance of 75 Ohms.

### **Selecting the Local Carrier Interface card slot**

The position of the Local Carrier Interface card depends on the type of system installed at the local site. The system determines in what type of module the card will be housed.

**CAUTION**

Check if the module is equipped with BTUs that protrude between card slot connectors in the network shelf. Do not attempt to install the Local Carrier Interface card in the card slot immediately to the left of a BTU. If Network Hybrid Kit NT5D40AA is used instead of BTUs, the Local Carrier Interface card can be installed into any superloop network card slot with the network hybrid

Table 9 "Modules supporting Local Carrier Interface cards" (page 59) lists modules that provide network card slots, the system options where these modules are used, and card slots where network cards can be installed. Card slots that might be physically restricted by BTUs are identified by a Note in Table 9 "Modules supporting Local Carrier Interface cards" (page 59). The right-hand superloop card slots can be used if the slot does not have a BTU.

**Table 9**  
**Modules supporting Local Carrier Interface cards**

Modules	System	Network card slot
NT4N41 Core/Network module	CS 1000M MG, Meridian 1 PBX 81C, CS 1000M SG, Meridian 1 PBX 61C,	Card slots 0–7
NT5D21 Core/Network Module	CS 1000M SG, Meridian 1 Option 61C, Meridian 1 Option 51C	0-7
NT8D35 Network Module	CS 1000M MG, Meridian 1 PBX 81C, Meridian 1 Option 81C, Meridian 1 Option 81	5-10, 11&12 (See Note)
NT9D11 Core/Network Module	CS 1000M SG, Meridian 1 Option 61C	0&1 (See Note), 2-7
NT6D39 CPU/Network Module	Meridian 1 Option 61C	1&2 (See Note), 3-8
<p><b>Note:</b> Card slot 11 and 12 can be used with NT8D35BA and NT8D35EA vintage Network Modules or Network Modules with NT8D3507 backplane, which are equipped with network Hybrid Kit NT5D40AA instead of BTUs. In older vintage NT8D35 Network Modules, NT9D11 Core/Network Modules, and NT6D39 CPU/Network Modules, a BTU upgrade kit can be used to replace the BTUs to be able to use the card slots identified with the <b>Note</b> for the installation of the Local Carrier Interface card.</p>		

The NT5D40AA Hybrids Kit includes four network hybrids required to replace two BTUs in a single network shelf or module. The kit also includes the extraction tool that must be used if a network hybrid has to be removed.

Network card slots in the modules listed house other network-type cards that are contending with the Local Carrier Interface card for space in the module. If one or more network card slots are empty, the choice of where to install the Local Carrier Interface card is shown in the following section.

**Note:** Each network card slot supports two network loops. Although an NT8D04 Superloop Network card physically occupies only one card slot, it occupies four network loops.

### Selecting the I/O Panel connector cutouts to install the Carrier I/O panel assemblies

Large Systems contain Network Modules and modules that contain network card slots among card slots for common and sometimes intelligent peripheral equipment. Each module type has a different I/O panel and might or might not have connector cutouts suitable for installation of the carrier remote panel assemblies.

Before installing the carrier panel assemblies into the I/O panel connector cutouts, carefully select the appropriate connector cutouts, identify their connector number, and use the Carrier Remote IPE Connection Record label below to record the installation characteristics for each Local Carrier Interface card.

### Network Module I/O Panel connector cutouts selection

When installing the carrier remote panel assemblies for each Local Carrier Interface card, use the following recommendations:

- Use Local Carrier Interface card I/O extension cables, NT7R69AA and NT7R69BA, if it is necessary to reach available I/O panel connector cutouts in other network modules or Core/IF modules.
- When installing multiple Local Carrier Interface cards and their respective carrier panel assemblies into a Network Module, use the following recommendations for the P0745716 Universal I/O panel:
  - Left I/O Panel:  
**For the first Local Carrier Interface card**, install the NT7R57AA Carrier Panel Assembly into the I/O panel connector cutout J22 and the NT7R58AA Maintenance Panel Assembly into the connector cutout J26.
  - Right I/O Panel:  
**For the second Local Carrier Interface card**, install the NT7R57AA Carrier Panel Assembly into the I/O panel connector cutout J2 and the NT7R58AA Maintenance Panel Assembly into the connector cutout J6.

### Carrier Remote IPE Module I/O panel connector selection

When installing the carrier remote panel assemblies for the Remote Carrier Interface card at the rear of the IPE Module, use the recommendations listed below:

- **Left I/O Panel:**  
Install the NT7R59AA Carrier Panel Assembly into the J4 connector cutout.  
Install the NT7R60AA Carrier/Alarm Panel Assembly into the J5 connector cutout.
- **Right I/O Panel:**  
Install the NT7R61AA Maintenance Panel Assembly into the J2 connector cutout.
- Locate connector cutouts that are 2.25 inches high on the I/O panel at the rear of the module containing the Local Carrier Interface card.

**Note:** Some old network modules have 2.00-inch connector cutouts, which are not suitable for carrier panel assembly installation. To be able to install these carrier panel assemblies, you must replace the module's I/O panels with the latest version that have 2.25-inch connector cutouts.

- Use the left-hand-side I/O panel connector cutouts for the Local Carrier Interface card carrier panel assemblies installation to avoid cable congestion on the right-hand side, if possible.
- Use side-by-side connector cutouts for the Local Carrier Interface card panel assemblies starting at the top of the I/O panel. This avoids obstruction of internal cable-way and associates the carrier panel assemblies with their respective Local Carrier Interface cards.

**Note:** The current left-hand I/O panel for the Network Module has the highest numbered connector position (J38) in the lower left-hand corner. Older left-hand-side I/O panels on the Network Modules have the highest numbered connector position (J28) in the lower left-hand corner.

- This older Network Module Universal I/O panel such as P075058 can accommodate only one set of carrier panel assemblies, which correspond to one Local Carrier Interface card. Side-by-side connector cutouts suitable for carrier panel assembly installation are:
- **Left I/O Panel:**  
**For the first Local Carrier Interface card**, install the NT7R57AA Carrier Panel Assembly into the I/O panel connector cutout J17 and

the NT7R58AA Maintenance Panel Assembly into the connector cutout J16.

- Right I/O Panel:  
**For the second Local Carrier Interface card**, install the NT7R57AA Carrier Panel Assembly into the I/O panel connector cutout J2 and the NT7R58AA Maintenance Panel Assembly into the connector cutout J1.

### Carrier Remote IPE connection record label

Affix the connection record label ([Figure 8 "Carrier Remote IPE Connection Record label" \(page 62\)](#)) at the rear of the module housing the Local Carrier Interface card(s). Place the label at the same level as the corresponding I/O panel connector cutouts used to install its Carrier and Maintenance Panel Assemblies for that specific Local Carrier Interface card. If the label is not available, make a label and paste it on the module.

**Figure 8**  
**Carrier Remote IPE Connection Record label**

<b>Carrier Remote IPE Connection Record</b>	
Remote Site: _____	
Local Carrier Interface Superloop (SUPC): _____	
Carrier I/O Panel Connector Position: <u>  J  </u> _____	
Maint. I/O Panel Connector Position: <u>  J  </u> _____	
Maint. Daisy-chain	Sys. Mon. Daisy-chain
P2: _____	J5: _____
P3: _____	J6: _____
Telco Circuit ID:	
C0: _____	
C1: _____	
C2: _____	
553-7488	

Label entries description:

**Remote Site** – Name of the Remote Carrier IPE site associated with this Local Carrier Interface card superloop number (SUPC)

**Local Carrier Interface Superloop (SUPC)** – Enter here the designated superloop number for this specific Local Carrier Interface card.

**Carrier I/O Panel Connector Position** – Enter the number of the selected connector cutout on the I/O panel where the Carrier Panel Assembly is installed, for example J22.

**Maint. I/O Panel Connector Position** – Enter the number of the selected connector cutout on the I/O panel where the Maintenance Panel Assembly is installed, for example J26.

**Maint. Daisy-chain** – Enter the appropriate information for P2 and P3 connectors of the NT7R67DA Local External Maintenance Cable Assembly to identify what they are connected to. They can be connected as follows (refer to [Figure 12 "Daisy-chaining multiple Local Carrier Interface cards" \(page 80\)](#)):

P3 can be connected to the; **MMI terminal** or to **P2 of SUPCxxx**. P2 can be connected to the; **Host SDI port x**, or **P3 of SUPCxxx**. where **xxx** in SUPCxxx is the superloop number of the Local Carrier Interface card in the daisy-chain.

**Sys. Mon. Daisy-chain** – Enter the appropriate information for J5 and J6 modular jacks to identify what they are connected to. They can be connected as follows (refer to [Figure 13 "System monitor connections at the local site and the Carrier Remote IPE" \(page 84\)](#)):

**J5** can be connected to; **J6 of Master Sys. Mon.** or to the next **slave system monitor** in the direction of the **master system monitor**, or to the next **LCI SUPCxxx J6** in the direction of the **master system monitor**.

**J6** can be connected to; **J5 of the next system monitor** in the direction away from the **master system monitor**, or to **J5 of the next LCI SUPCxxx** in the direction away from the **master system monitor**, where **xxx** in SUPCxxx is the superloop number of the Local Carrier Interface card in the daisy-chain.

**Telco Circuit ID** – Enter the telco circuit ID number for each carrier link coming from the telco demarcation point.

For a collocated installation, where telco network is not used, specify the cable pairs used for each carrier link.

## Local equipment installation

To complete the installation of the T1 or E1 carrier interface that links the system to the Carrier Remote IPE equipment:

- install and verify the operation of the system, if not already installed and operating correctly
- identify the network card slot and install the Local Carrier Interface card in the system
- install the faceplate cables
- connect the cable to the SDI, the system monitor, and the TTY ports
- connect the carrier link to the I/O panel assembly

## Installing and verifying system operation

The Carrier Remote IPE facilities can be added to an existing system running on carrier software (REM\_IPE package 286) by installing the appropriate carrier equipment into the system, installing one or more Carrier Remote IPEs at different remote sites, and linking the local system with remote sites using T1 or E1 links.

To install a new system, follow the instructions in *Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43021-310)* (). It describes how to install a complete Large System.

If a new system is configured with Carrier Remote IPE facilities, the system is normally assembled at the factory with the Local Carrier Interface and the associated cards already installed and internal cables connected between the Local Carrier Interface card faceplate and the I/O panel assembly at the rear of the module housing this card.

After the system is installed, it is necessary to connect the T1 or E1 carrier links to the local system and the Carrier Remote IPE I/O panel assembly T1 or E1 connectors. However, if the Local Carrier Interface card is not installed, follow the steps in the next section.

## Installing the Local Carrier Interface card

[Procedure 3 "Installing the Local Carrier Interface card" \(page 64\)](#) describes how and where to install the Local Carrier Interface cards. In a new system, the card is shipped installed in a network card slot from the factory. However, it can be necessary to install additional Local Carrier Interface cards to expand the number of remote sites or replace a defective card. The card can be installed when the system is powered up and running.

[Table 12 "Remote Carrier Interface standard \(default\) switch settings" \(page 88\)](#) lists the default (factory provided switch settings) on the Local Carrier Interface card. Verify the switch settings before installation.

Follow the steps in [Procedure 3 "Installing the Local Carrier Interface card" \(page 64\)](#) to install the Local Carrier Interface cards:

### Procedure 3 Installing the Local Carrier Interface card

---

Step	Action
1	Set the ENB/DIS switch on the NT7R51 Local Carrier Interface card to DIS.
2	Set the DIP switches to specify the carrier type (T1 or E1), the distance to the first signal regenerator (repeater, CSU, or LTU),

---

the MMI terminal baud rate, the card site (local), and the card address in a daisy-chain, as shown in [Figure 9 "Local Carrier Interface card DIP-switch positions and function"](#) (page 67).

The DIP switch setting will depend on the physical system configuration. [Figure 9 "Local Carrier Interface card DIP-switch positions and function"](#) (page 67) shows that carriers are selected for T1 transmission because all the switches from SW2 through SW10 are pointing towards T1 positions. Also SW1 position 8 selects T1 or E1 in firmware.

- 3 Pull the NT7R51 Local Carrier Interface card locking devices away from the faceplate.

Holding the card by these locking devices, insert it into the card guides of the selected network card slot. Make sure the card slot does not have a BTU installed in that position.

Verify that there is no BTU obstructing the card slot.

- 4 Slide the card into the module until it engages in the backplane connector.

- 5 Carefully push the locking device levers toward the faceplate to insert the card connector into the backplane connector and lock the card in place.

- 6 Set the ENB/DIS switch on the NT7R51 Local Carrier Interface card to ENB and observe the card LED at the top of the faceplate as the Local Carrier Interface card performs self-tests.

The card LED should blink three times and then stay lit until enabled by software. When enabled by software, the card LED turns off permanently, as long as the card is operational.

Refer to ["LED indicators"](#) (page 145) for more information about the Local Carrier Interface card carrier and maintenance LEDs.

**Note:** When the ENB/DIS switch is switched to ENB, it also enables the carrier clocking. This allows the T1 carrier links to be tested even before the Local Carrier Interface card is software enabled.

---

--End--

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**Table 10**  
**Local Carrier Interface standard (default) switch settings**

Switch	Switch positions							
	1	2	3	4	5	6	7	8
SW1	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
SW11	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

**Table 10**  
**Local Carrier Interface standard (default) switch settings (cont'd.)**

Switch	Switch positions							
	1	2	3	4	5	6	7	8
SW2	OFF	ON	OFF	ON	-	-	-	-
SW3	ON	OFF	ON	ON	-	-	-	-
SW4	ON	ON	OFF	OFF	-	-	-	-
SW5	OFF	ON	OFF	ON	-	-	-	-
SW6	ON	OFF	ON	ON	-	-	-	-
SW7	ON	ON	OFF	OFF	-	-	-	-
SW8	OFF	ON	OFF	ON	-	-	-	-
SW9	ON	OFF	ON	ON	-	-	-	-
SW10	ON	ON	OFF	OFF	-	-	-	-

Figure 9 "Local Carrier Interface card DIP-switch positions and function" (page 67) shows the Local Carrier Interface card DIP switches, SW1 through SW11, and their functions.

**Figure 9**  
Local Carrier Interface card DIP-switch positions and function

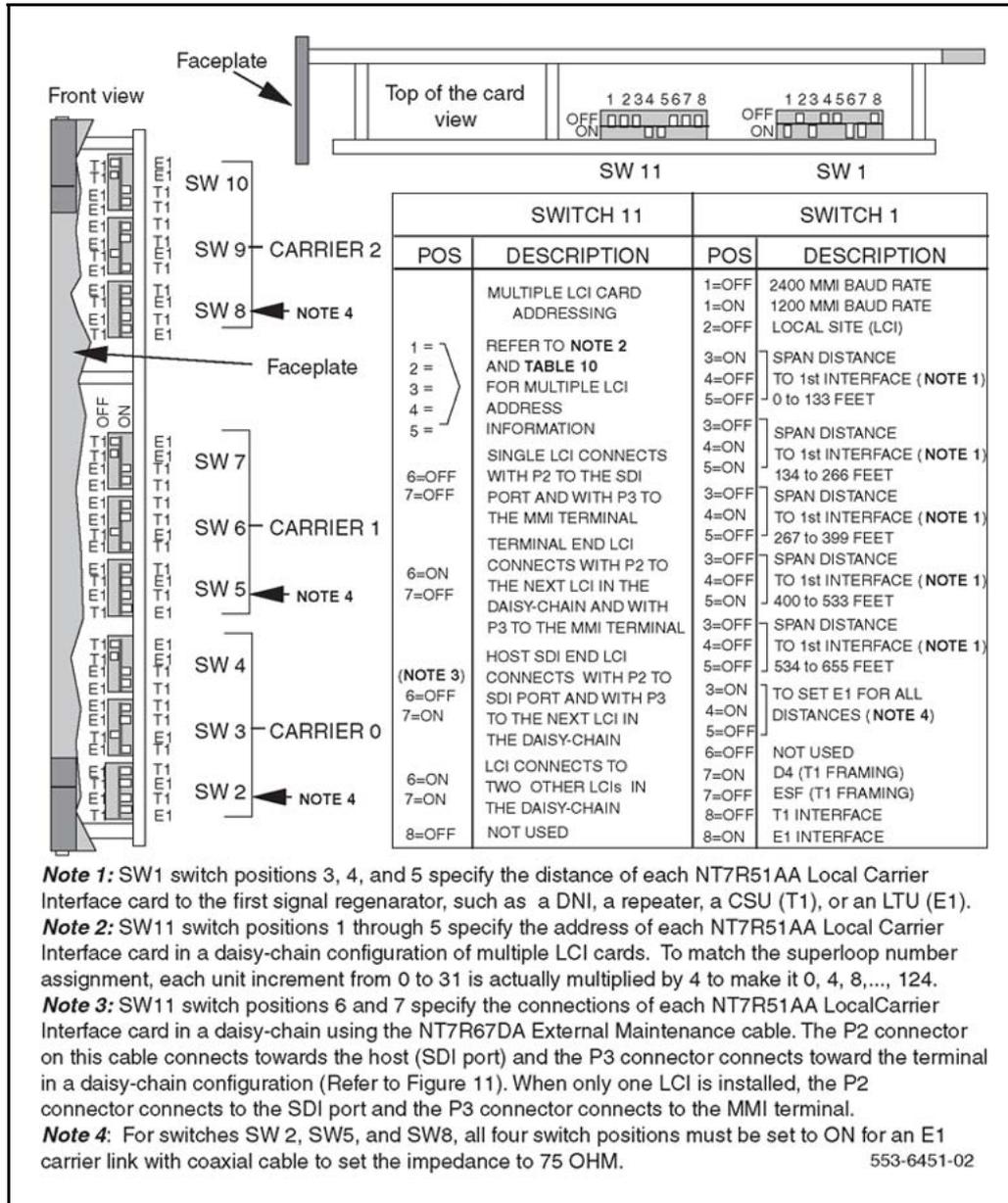


Table 11 "NT7R51 Local Carrier Interface card maintenance daisy-chain address" (page 68) lists all possible addresses for an NT7R51 Local Carrier Interface card, which are selected on the card with switch SW11 switch positions 1 through 5 (refer to Figure 9 "Local Carrier Interface card DIP-switch positions and function" (page 67) for the SW11 switch position). The address is used to address a specific Local Carrier Interface card in a daisy-chain configuration.

**Table 11**  
**NT7R51 Local Carrier Interface card maintenance daisy-chain address**

LCI Address	SW11 Positions 1–5 (1 = ON, 0 = OFF)				
	1 (bin 16)	2 (bin 8)	3 (bin 4)	4 (bin 2)	5 (bin 1)
0	0	0	0	0	0
4	0	0	0	0	1
8	0	0	0	1	0
12	0	0	0	1	1
16	0	0	1	0	0
20	0	0	1	0	1
24	0	0	1	1	0
28	0	0	1	1	1
32	0	1	0	0	0
36	0	1	0	0	1
40	0	1	0	1	0
44	0	1	0	1	1
48	0	1	1	0	0
52	0	1	1	0	1
56	0	1	1	1	0
60	0	1	1	1	1
64	1	0	0	0	0
68	1	0	0	0	1
72	1	0	0	1	0
76	1	0	0	1	1
80	1	0	1	0	0
84	1	0	1	0	1
88	1	0	1	1	0
92	1	0	1	1	1
96	1	1	0	0	0
100	1	1	0	0	1
104	1	1	0	1	0
108	1	1	0	1	1
112	1	1	1	0	0
116	1	1	1	0	1
120	1	1	1	1	0
124	1	1	1	1	1

For SUPC 0-124 the Local Carrier Interface card MMI address (SW 11, POS 1-5) should match the superloop number. For SUPC 128-156, where the Local Carrier Interface card is installed in Network Group 4, the Local Carrier Interface card address cannot match the superloop number but the address must be unique within the MMI maintenance daisy-chain.

Document on the LCI Connection Record card any Local Carrier Interface card MMI address that does not match the SUPC superloop number.

## Installing the Local Carrier Interface cable assemblies

The Local Carrier Interface card has two connectors located on the faceplate. These connectors provide:

- connection to the NT7R58AA Maintenance Panel assembly for daisy-chaining the Local Carrier Interface cards and the system monitor
- connection to the NT7R57AA Carrier Panel assembly for the carrier links

A DB-9 female connector on the faceplate of the NT7R51 Local Carrier Interface card connects to the NT7R58AA Maintenance Panel when more than one Local Carrier Interface card is equipped in the system. This allows daisy-chaining of these Local Carrier Interface cards to provide access to any of the Local Carrier Interface cards using the local MMI terminal at local SDI port as Host.

A DB-25 connector on the Local Carrier Interface card faceplate connects the Local Carrier Interface card to the NT7R57AA Carrier Panel assembly for connection to the local system monitor and the carrier links. The carrier connectors on the NT7R57AA Carrier Panel assembly are 8-pin modular jacks, which connect directly to the carrier link 8-pin modular plugs. It also connects to the NT7R58AA Maintenance Panel assembly to provide the SDI port and the MMI terminal connections.

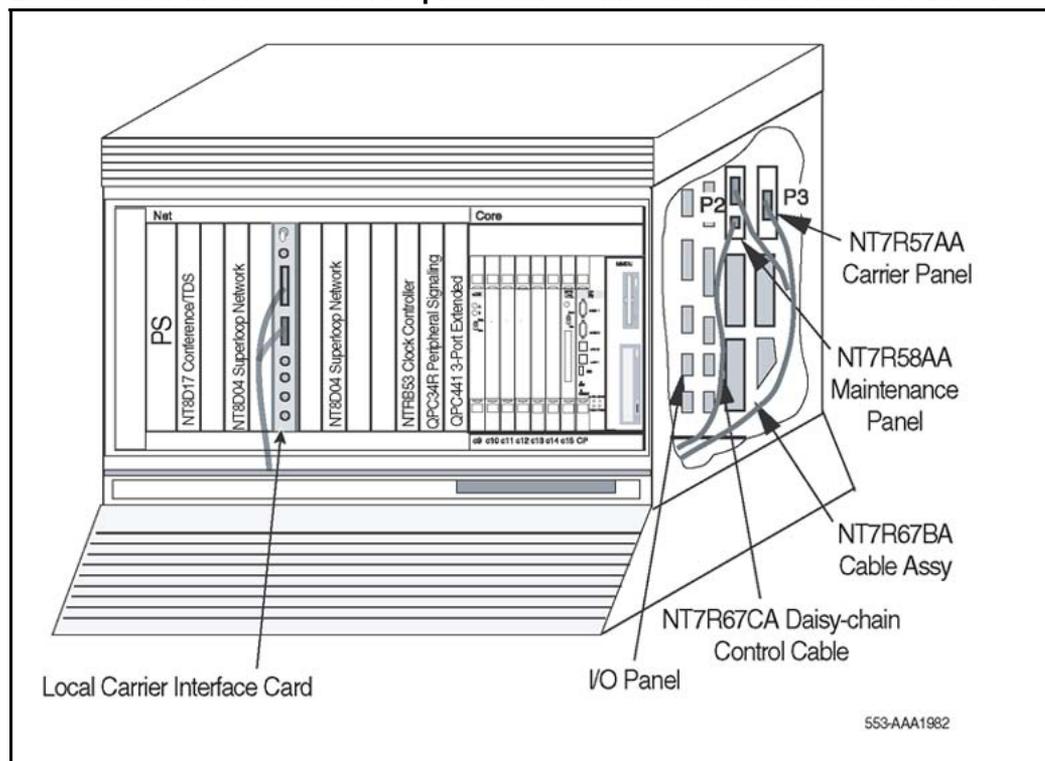
If an E1 carrier link is a coaxial cable terminated with BNC connectors, the NT7R67EA Coaxial Interface Adapter cable (8-pin modular plug to BNC) is used to connect the 8-pin modular jacks at the NT7R57AA Carrier Panel assembly to the BNC carrier link connectors.

Refer to [Figure 9 "Local Carrier Interface card DIP-switch positions and function" \(page 67\)](#) and [Figure 14 "Remote Carrier Interface card DIP-switch locations and functions" \(page 89\)](#) to set SW1, SW2, SW5, and SW8 for E1 operation and carrier impedance of 75 Ohms.

**Note:** For multiple Local Carrier Interface cards connected in a daisy-chain, it might not always be possible to find empty network card slots and or suitable I/O panel connector cutouts to accommodate two or more Local Carrier Interface cards. In that case, it can be necessary to use suitable network card slots in a different module or column. If the cable assemblies are not long enough to span between the faceplates and the I/O panels, use extension cables.

[Figure 10 "Local Carrier Interface card faceplate cable connections in Meridian 1 PBX 61C" \(page 70\)](#) shows a Meridian 1 PBX 61C with the Local Carrier Interface card and faceplate cable already installed to the NT7R57AA Carrier and NT7R58AA Maintenance Panel assemblies.

**Figure 10**  
**Local Carrier Interface card faceplate cable connections in Meridian 1 PBX 61C**



### Installing the NT7R67BA Local Carrier/Monitor Cable Assembly into a module

Before plugging the NT7R67BA Local Carrier/Monitor Cable Assembly P1 connector into the faceplate DB-25 female connector, install the NT7R57AA Carrier Panel and the NT7R58AA Maintenance Panel assemblies.

These assemblies are installed into the empty connector slots on the I/O panel at the rear of the network module where the NT7R51 Local Carrier Interface card(s) is installed. Refer to [“Network Module I/O Panel connector cutouts selection”](#) (page 60) recommendations.

**Note:** The NT7R57AA Carrier and the NT7R58AA Maintenance Panel assemblies together with the NT7R67HA cable are integral parts of the NT7R67BA Local Carrier/Monitor Cable Assembly. To assist you in connecting the cable assemblies, refer to Appendix C, [Figure 26 "Single LCI connection diagram \(local site connections\)"](#) (page 198).

To install the NT7R57AA Carrier and the NT7R58AA Maintenance Panel assemblies and to plug the cable P1 connector into the faceplate connector, follow the steps in [Procedure 4 “Installing the NT7R57AA Carrier and the NT7R58AA Maintenance Panel assemblies”](#) (page 71).

**Procedure 4**  
**Installing the NT7R57AA Carrier and the NT7R58AA Maintenance Panel assemblies**

Step	Action
1	Remove the back panel at the rear of the module to access the I/O panel connector slots and later to route the NT7R67HA cable P1 connector to the front of the module.
2	Identify a pair of empty connector cutouts that are the appropriate size for the panel assemblies mounting holes.  These cutouts must be vertically or horizontally adjacent on the same I/O panel.
3	From the rear of the module, route the DB-25 female P1 connector of the NT7R67BA cable assembly through the module's cable channel to the front of the module.  Ensure that the cable connectors with attached panel assemblies remain at the rear of the module next to the module's I/O panel connector cutouts.
4	Install the NT7R57AA Carrier Panel assembly already connected to the P3 DB-15 HD female connector of the NT7R67BA cable assembly.  Mount it into the selected I/O panel connector cutout so that the 8-pin modular jack tabs are to the left.  Refer to <a href="#">Figure 11 "System monitor, local MMI terminal, and carrier links cable connections"</a> (page 73) for connector orientation.  Fasten the panel to the cutout by using the screw at the top of the cutout.
5	Install the NT7R58AA Maintenance Panel assembly already connected to the P2 DB-15 HD male connector of the NT7R67BA cable assembly.  Mount it into the selected I/O panel connector cutout by using the screw at the top of the cutout.
6	Plug the DB-25 male P1 connector of the NT7R67BA cable assembly into the DB-25 female connector located on the faceplate of the NT7R51 Local Carrier Interface card.

--End--

### Installing the NT7R67CA Local daisy-chain cable

This cable is installed only when multiple NT7R51 Local Carrier Interface cards are equipped and are connected in a daisy-chain. The daisy-chain configuration provides an easy access to each Local Carrier Interface card from the local MMI terminal and allows the remote MMI terminal access to the local SDI port as host.

To install the cable between the Local Carrier Interface card and the NT7R58AA Maintenance Panel, refer to [Figure 27 "Multiple LCIs connection diagram \(local site daisy-chain connection\)"](#) (page 199) and follow the steps in [Procedure 5 "Installing the NT7R67CA Local daisy-chain cable"](#) (page 72).

#### Procedure 5 Installing the NT7R67CA Local daisy-chain cable

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Step	Action
1	Pull the NT7R67CA Daisy-chain Cable assembly P1 connector through the cable channel to the front of the module.
2	Plug the DB-9 male P1 connector of the NT7R67CA cable assembly into the DB-9 female connector located on the faceplate of the Local Carrier Interface card.
3	Plug the DB-9 male P2 connector at the other end of the NT7R67CA cable assembly into the DB-9 female connector on the NT7R58AA Maintenance Panel.

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--End--

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### Installing SDI and local MMI terminal cables

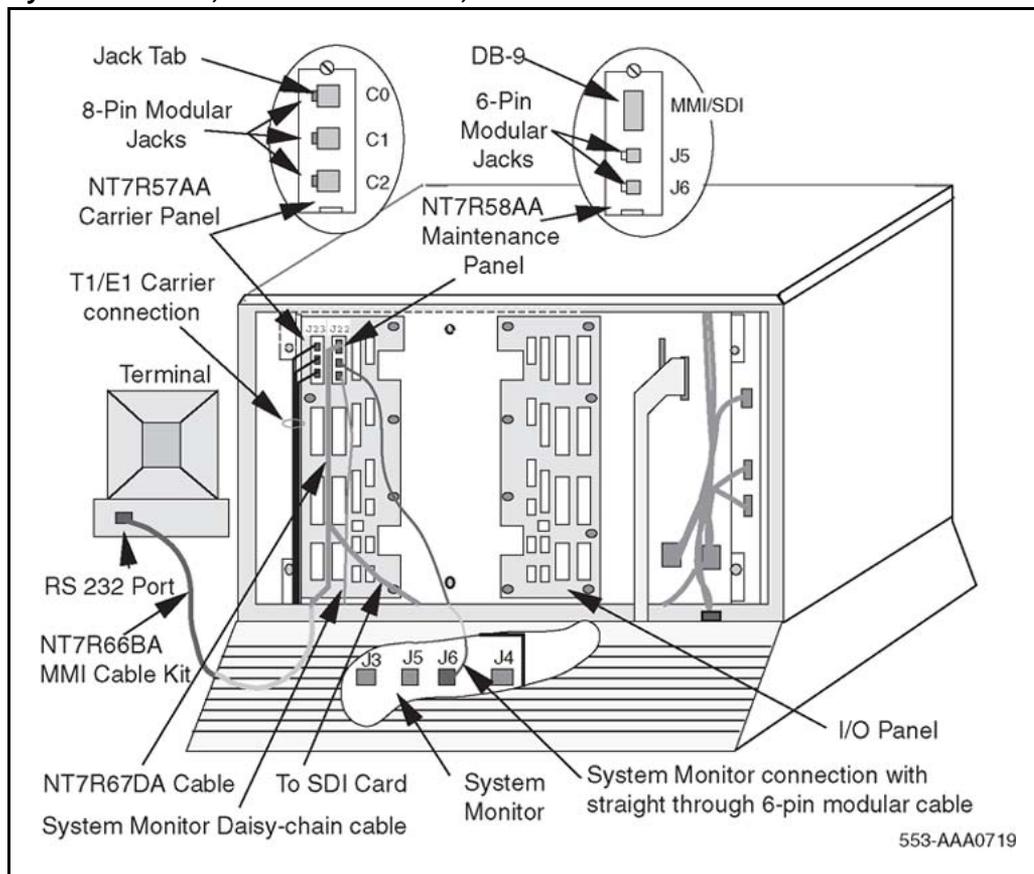
The NT7R67DA External Maintenance Cable Assembly connects the SDI card and the TTY terminal to the DB-9 connector on the NT7R58AA Maintenance Panel assembly located at the rear of the module that houses the NT7R51 Local Carrier Interface card.

For a single Local Carrier Interface card equipped in the local system, the P3 DB-9 male DCE connector on the NT7R67DA cable assembly is used to connect to the local MMI terminal. The P2 DB-9 female DTE connector is used to connect to an SDI port on an SDI card, which allows the MMI terminal to access the local system as a host. Refer to [Figure 11 "System monitor, local MMI terminal, and carrier links cable connections"](#) (page 73) and [Figure 26 "Single LCI connection diagram \(local site connections\)"](#) (page 198).

For multiple Local Carrier Interface cards, refer to [Figure 12 "Daisy-chaining multiple Local Carrier Interface cards" \(page 80\)](#) and [Figure 27 "Multiple LCIs connection diagram \(local site daisy-chain connection\)" \(page 199\)](#) that shows how to connect multiple Local Carrier Interface cards to multiple I/O panel assemblies to provide MMI and SDI connections for all Local Carrier Interface cards. To facilitate equipment maintenance, follow the same order as for the system monitor daisy-chain in descending order from the MMI terminal to the SDI port.

[Figure 11 "System monitor, local MMI terminal, and carrier links cable connections" \(page 73\)](#) shows the NT7R57AA Carrier Panel and NT7R58AA Maintenance Panel assemblies with the system monitor, the SDI/TTY, and the carrier connections. The NT7R58AA Maintenance panel assembly connector is used to connect the SDI port and the local MMI terminal. The NT7R57AA Carrier panel assembly is used to connect the three carriers.

**Figure 11**  
**System monitor, local MMI terminal, and carrier links cable connections**



## Connecting a single Local Carrier Interface card to the MMI terminal

Follow the steps in [Procedure 6 "Connecting a single Local Carrier Interface card to the MMI terminal"](#) (page 74) to connect a Local Carrier Interface card to the MMI terminal.

### Procedure 6 Connecting a single Local Carrier Interface card to the MMI terminal

Step	Action
1	<p>To connect a single NT7R51 Local Carrier Interface card to the MMI terminal:</p> <p><b>Note:</b> "Connection diagrams and external connectors pin assignment" (page 197) provides connection diagrams (Figure 26 "Single LCI connection diagram (local site connections)" (page 198)) and pin assignment information for all external connectors that connect to the SDI port, the MMI terminal, the system monitor card, the external alarms, and the carrier links.</p> <ul style="list-style-type: none"><li>• Plug the DB-9 male P1 connector at the common end of the NT7R67DA Local External Maintenance Cable assembly into the DB-9 female connector on the NT7R58AA Maintenance Panel assembly.</li><li>• Plug the DB-9 male P3 connector of the NT7R67DA cable assembly into the DB-9 female connector of the NT7R66BA MMI Cable.</li><li>• Plug the DB-25 male end of the NT7R66BA MMI Cable into the MMI terminal RS-232 connector. If it is necessary to change the gender at the terminal, use the appropriate compact gender changer.</li><li>• To connect P3 DB-9 male connector of the NT7R67DA Local External Maintenance Cable directly to the DB-9 male RS-232 serial communication port of a laptop computer, use an NT7R66BA MMI Cable and the appropriate compact adapter.</li></ul>
2	<p>Make a MMI terminal connection using a modem:</p> <ul style="list-style-type: none"><li>• If a modem is required to connect a distant MMI terminal to the MMI port on the local I/O panel, plug the DB-9 female</li></ul>

connector of the NT7R66BA MMI Cable into the P3 DB-9 male connector of the NT7R67DA cable.

- Plug the DB-25 male connector of the NT7R66BA MMI Cable into a DB-25F/DB-25M nullmodem.
- Connect the nullmodem DB-25 male connector to the modem DB-25 female connector. Use the appropriate gender changer, if required.

**3** Make a MMI terminal connection using an A/B switch box:

- Connect the P3 of the NT7R67DA Local External Maintenance Cable assembly DB-9 male connector into the DB-9 female connector of the NT7R66BA MMI Cable.
- Plug the DB-25 male and of the NT7R66BA MMI Cable into the A/B switch box DB-25 female C connector.
- From the switch box, connect a local MMI terminal directly to the A position on the switch box using a standard DB-25M/DB-25M straight-through cable. Alternatively, connect a distant MMI terminal over a standard DB-25M/DB-25M straight-through cable, a nullmodem, and a modem to the switch box B position.

**4** Terminal/Modem connections over the MSDL Single Terminal Access:

- To avoid using the A/B switch box, use three ports on the MSDL card.
- Connect one MSDL port to the local MMI terminal.
- Connect the second MSDL port to a modem.
- Connect the third MSDL port to the P3 DB-9 male connector of the NT7R67DA Local External Maintenance Cable assembly by using the NT7R66BA MMI Cable.

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--End--

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### **Connecting a Local Carrier Interface card to the SDI card**

Follow the steps in [Procedure 7 "Connecting a Local Carrier Interface card to the SDI card"](#) (page 76) to connect a Local Carrier Interface card to the SDI card.

Refer to [Figure 26 "Single LCI connection diagram \(local site connections\)"](#) (page 198) to see the SDI connection diagram.

**Procedure 7**  
**Connecting a Local Carrier Interface card to the SDI card**

Step	Action
1	<p>To connect a single NT7R51 Local Carrier Interface card to the QPC 841 or other SDI cards:</p> <ul style="list-style-type: none"><li>• Route the DB-9 female P2 connector of the NT7R67DA cable assembly to an available SDI port on an SDI card.</li><li>• Plug the DB-9 male connector of the NT8D93AJ XSDI I/O cable into the DB-9 female SDI connector on the I/O panel.</li><li>• Plug the DB-25 male connector of the NT8D93AJ XSDI I/O cable into the DB-25 female connector on the NT7R66AA SDI Cable Kit.</li><li>• Plug the DB-9 male connector of the NT7R66AA SDI Cable Kit into the DB-9 female connector into the NT7R67DA cable P2 connector.</li></ul>
2	<p>To connect other SDI cards:</p> <ul style="list-style-type: none"><li>• Route and install the DB-9 female P2 connector of the NT7R67DA cable assembly to an available SDI port on an SDI card.</li><li>• Plug the DB-25 male connector of the NT7R66AA SDI Cable Kit to connect the DB-25 female SDI connector at the I/O panel. (The DB-25F/DB-25F adapter is not used).</li><li>• Plug the DB-9 male connector on the NT7R66AA SDI Cable Kit into the P2 connector on the NT7R67DA cable.</li></ul>
3	<p>To test the MMI and Host SDI login, refer to <a href="#">“MMI mode” (page 120)</a> and <a href="#">“Host SDI mode” (page 121)</a> for login instructions.</p> <p><b>Note:</b> For additional information about types of SDI cards, their SDI ports, and special cables required to connect these ports, refer to <i>Circuit Card Reference (NN43001-311)</i> ( ) .</p>

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--End--

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**Connecting multiple Local Carrier Interface cards to the MMI terminal**

Make sure that all the NT7R51 Local Carrier Interface cards are properly configured for the daisy-chain card addressing as shown in [Figure 9 "Local Carrier Interface card DIP-switch positions and function" \(page 67\)](#) Figure

9 "Local Carrier Interface card DIP-switch positions and function" (page 67) and Figure 27 "Multiple LCIs connection diagram (local site daisy-chain connection)" (page 199).

**Note:** For maintenance convenience, use the daisy-chain addressing in descending order from the MMI terminal side to the host SDI side.

Make sure the NT7R67CA Local Daisy-chain Cable Assembly is installed for all Local Carrier Interface cards in the daisy-chain. Refer to "Installing the NT7R67CA Local daisy-chain cable" (page 72).

Follow the steps in Procedure 8 "Connecting multiple Local Carrier Interface cards to the MMI terminal" (page 77) to connect multiple Local Carrier Interface cards to the MMI terminal.

**Procedure 8**  
**Connecting multiple Local Carrier Interface cards to the MMI terminal**

Step	Action
1	<p>To connect multiple NT7R51 Local Carrier Interface cards in a daisy-chain configuration and to the MMI terminal, connect the cables as shown in Figure 12 "Daisy-chaining multiple Local Carrier Interface cards" (page 80) and Figure 27 "Multiple LCIs connection diagram (local site daisy-chain connection)" (page 199):</p> <ul style="list-style-type: none"> <li>• Plug the DB-9 male P1 connector at the common end of the NT7R67DA cable into the DB-9 female connector on the NT7R58AA Maintenance Panel assembly that corresponds to Local Carrier Interface card #1.</li> <li>• Install the NT7R67DA cable assembly #2, as in step 1, for the Local Carrier Interface card #2.</li> <li>• Connect the DB-9 male P3 connector from the cable in position #1 with the DB-9 female P2 connector of the NT7R67DA cable assembly in position #2.</li> <li>• Install the NT7R67DA cable assembly #3, as in step 1, for the Local Carrier Interface card #3.</li> <li>• Connect the DB-9 male P3 connector from the cable in position #2 with the DB-9 female P2 connector of the NT7R67DA cable assembly in position #3.</li> <li>• Plug the DB-9 male P3 connector of the NT7R67DA cable assembly in position #3 into the DB-9 female connector of the NT7R66BA MMI Cable.</li> <li>• Plug the DB-25 male end of the NT7R66BA MMI Cable into the DB-25 female connector of the MMI terminal RS-232</li> </ul>

connector. If it is necessary to change the gender at the terminal, use the appropriate compact gender changer.

- 2 MMI terminal connection using a modem:
  - If using a modem to connect a distant MMI terminal to the MMI port on the local I/O panel, plug the DB-9 female connector of the NT7R66BA MMI Cable into the P3 DB-9 male connector of the NT7R67DA cable.
  - Plug the DB-25 male end of the NT7R66BA MMI Cable into a DB-25F/DB-25M nullmodem.
  - Connect the nullmodem DB-25 male connector to the modem DB-25 female connector.
  
- 3 MMI terminal connection using an A/B switch box:
  - Connect the P3 of the NT7R67DA Local External Maintenance Cable assembly DB-9 male connector into the DB-9 female connector of the NT7R66BA MMI Cable.
  - Plug the DB-25 male end of the NT7R66BA MMI Cable into the A/B switch box DB-25 female C connector.
  - From the switch box, a local MMI terminal can be connected directly to the A position on the switch box using a standard DB-25M/DB-25M straight-through cable.
  - As well, a distant MMI terminal can be connected over a standard DB-25M/DB-25M straight-through cable, a nullmodem, and a modem to the switch box B position.
  
- 4 Terminal/Modem connections over the MSDL Single Terminal Access:
  - To avoid using the A/B switch box, use three ports on the MSDL card.
  - Connect one MSDL port to the local MMI terminal.
  - Connect the second MSDL port to a modem.
  - Connect the third MSDL port to the P3 DB-9 male connector of the NT7R67DA Local External Maintenance Cable assembly by using the NT7R66BA MMI Cable.

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--End--

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### **Connecting multiple Local Carrier Interface cards to the SDI card**

Refer to [Figure 27 "Multiple LCIs connection diagram \(local site daisy-chain connection\)"](#) (page 199) to see the SDI connection diagram.

Follow the steps in [Procedure 9 “Connecting multiple Local Carrier Interface cards to the SDI card”](#) (page 79) to connect multiple Local Carrier Interface cards to the SDI card.

**Procedure 9**  
**Connecting multiple Local Carrier Interface cards to the SDI card**

Step	Action
1	<p>To connect a single NT7R51 Local Carrier Interface card to the QPC 841 or other SDI cards:</p> <ul style="list-style-type: none"> <li>• Route the DB-9 female P2 connector of the NT7R67DA cable assembly of the Local Carrier Interface card #1 to an available SDI port on an SDI card.</li> <li>• Plug the DB-9 male connector of the NT8D93AJ XSDI I/O cable into the DB-9 female SDI connector on the I/O panel.</li> <li>• Plug the DB-25 male connector of the NT8D93AJ XSDI I/O cable into the DB-25 female connector on the NT7R66AA SDI Cable Kit.</li> <li>• Plug the DB-9 male connector of the NT7R66AA SDI Cable Kit into the DB-9 female connector into the NT7R67DA cable P2 connector.</li> </ul>
2	<p>To connect other SDI cards:</p> <ul style="list-style-type: none"> <li>• Route and install the DB-9 female P2 connector of the NT7R67DA cable assembly of the Local Carrier Interface card #1 to an available SDI port on an SDI card.</li> <li>• Plug the DB-25 male connector of the NT7R66AA SDI Cable Kit to connect the DB-25 female SDI connector at the I/O panel. (The DB-25F/DB-25F adapter is not used).</li> <li>• Plug the DB-9 male connector on the NT7R66AA SDI Cable Kit into the P2 connector on the NT7R67DA cable.</li> </ul>
3	Secure cables with tie-wraps as appropriate.

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--End--

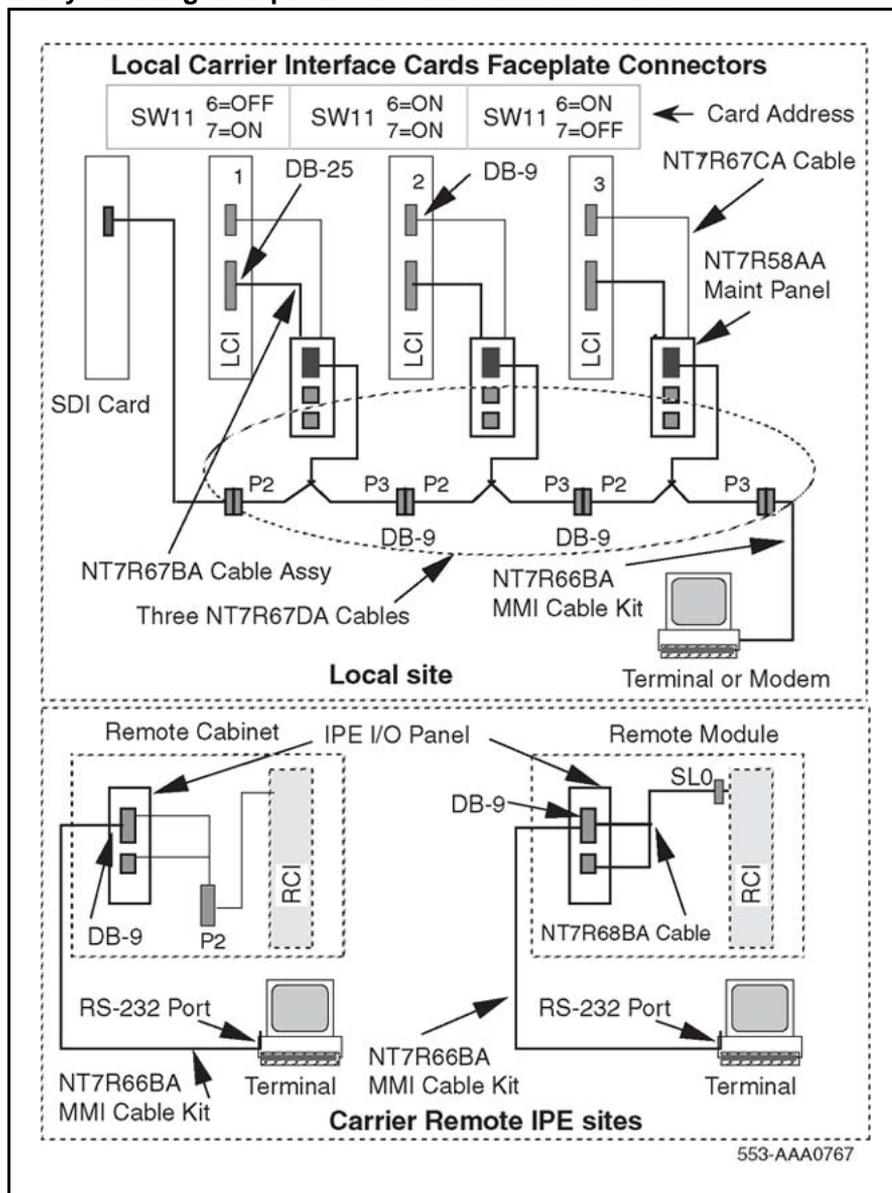
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To test the MMI and Host SDI login, refer to [“MMI mode”](#) (page 120) and [“Host SDI mode”](#) (page 121) for login instructions.

**Note:** For additional information about types of SDI cards, their SDI ports, and special cables required to connect these ports, refer to *Circuit Card Reference (NN43001-311)* ().

Figure 12 "Daisy-chaining multiple Local Carrier Interface cards" (page 80) shows daisy-chaining of multiple Local Carrier Interface cards to allow sharing of an SDI port and a terminal or TTY.

**Figure 12**  
**Daisy-chaining multiple Local Carrier Interface cards**



**Connecting the system monitor cables**

The NT7R58AA Maintenance Panel assembly provides two 6-pin modular jacks to connect to the system monitor located in the pedestal and one DB-9 SDI/TTY connector. The 6-pin modular jack J5 is used to connect to the system monitor J6 jack in the pedestal, as shown in Figure 11 "System

monitor, local MMI terminal, and carrier links cable connections" (page 73). The J6 jack on the NT7R58AA Maintenance Panel is used to connect to a slave system monitor daisy-chain as shown in Figure 12 "Daisy-chaining multiple Local Carrier Interface cards" (page 80).

In the local column, the pedestal contains a master system monitor that monitors system alarms. Alarms from a Carrier Remote IPE site are reported over the carrier link and the Local Carrier Interface card to the local master system monitor and from there to the CPU. The CPU sends alarm messages to the system terminal or TTY identifying the problem.

### Connecting a single Local Carrier Interface card to the system monitor

To connect the system monitor cable from the NT7R58AA Maintenance Panel assembly to the system monitor in the same column, refer to Figure 11 "System monitor, local MMI terminal, and carrier links cable connections" (page 73) and Appendix C, Figure 30 "Local site system monitor connection diagram (single and multiple LCI configuration)" (page 202), and follow the steps in Procedure 10 "Connecting a single Local Carrier Interface card to the system monitor" (page 81).

#### Procedure 10

#### Connecting a single Local Carrier Interface card to the system monitor

Step	Action
1	Verify existing system monitor daisy-chain first by executing the <code>STAT XSM</code> command in LD 37.
2	Determine the system monitor addresses for new Carrier Remote IPE column or wall-mount cabinet.
3	Set master system monitor slave polling address range to cover the new system monitor addresses.
4	Set the Remote Carrier Interface card (SW11 positions 1-5) for the new system monitor address.
5	Connect the system monitor daisy-chain to include new Local Carrier Interface cards by following instructions in steps 6 and 7.
6	Plug the 6-pin modular plug at one end of the NT8D46AL cable into the 6-pin modular jack J5 on the NT7R58AA Maintenance Panel assembly to provide an RS-422 interface to the system monitor.
7	Plug the other end of the NT8D46AL cable 6-pin modular plug into the J6 jack on the next system monitor in the direction of the master system monitor.
8	Plug the next NT8D46AL cable jack into the J6 of the NT7R58AA Maintenance Panel assembly.

- 9 Plug the other jack of the NT8D46AL cable into the J5 of the next slave system monitor in the direction away from the master system monitor.
- 10 Test the system monitor daisy-chain by executing the STAT XSM command in LD 37.

Ensure that every local and remote system monitor responds to the master system monitor after the remote site is properly installed and configured.

**Note:** If a system with the Carrier Remote IPE is shipped to a site, steps 6 and 7 are completed in the factory.

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--End--

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### Connecting multiple Local Carrier Interface cards to the system monitor

Connect the Local Carrier Interface cards for system monitor daisy-chain in the same sequence as the maintenance cables were daisy-chained for the local MMI terminal and the local host SDI access for multiple Local Carrier Interface cards.

To daisy-chain the system monitor cables to multiple columns and multiple NT7R51 Local Carrier Interface cards, refer to [Figure 13 "System monitor connections at the local site and the Carrier Remote IPE" \(page 84\)](#) and Appendix C, [Figure 30 "Local site system monitor connection diagram \(single and multiple LCI configuration\)" \(page 202\)](#), and follow the steps in [Procedure 11 "Connecting multiple Local Carrier Interface cards to the system monitor" \(page 82\)](#)

#### Procedure 11

#### Connecting multiple Local Carrier Interface cards to the system monitor

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Step	Action
1	Starting from the top, as shown in <a href="#">Figure 13 "System monitor connections at the local site and the Carrier Remote IPE" (page 84)</a> , plug the NT8D46AL cable 6-pin modular plug from one NT7R58AA Maintenance Panel assembly 6-pin modular jack J6 into the 6-pin modular jack J5 on the next NT7R58AA Maintenance Panel assembly.  <b>Note:</b> Each NT7R58AA Maintenance Panel assembly belongs to a different NT7R51 Local Carrier Interface card.
2	Repeat step 1 for all NT7R58AA Maintenance Panel assemblies.

---

- 3 Connect J5 modular jack of the top NT7R58AA Maintenance Panel assembly in [Figure 13 "System monitor connections at the local site and the Carrier Remote IPE" \(page 84\)](#) to the J6 modular jack of the next system monitor towards master system monitor using the NT8D46AL modular cable.
- 4 Connect J6 modular jack in the bottom NT7R58AA Maintenance Panel assembly to the J5 modular jack of the next slave system monitor away from the master system monitor using the NT8D46AL cable.
- 5 Connect J6 modular jack of the slave system monitor to the J5 modular jack of the next slave system monitor outbound (away) from the master system monitor using the NT8D46AL cable.

**Note:** The columns do not have to be daisy-chained in the sequence according to the system monitor address. The system monitor daisy-chain is broken when a Local Carrier Interface card is unplugged from the network card slot. This causes PWR error messages for polling failure on all slave system monitors that follow the removed Local Carrier Interface card in the chain. If possible, connect Local Carrier Interface cards at the end of the system monitor daisy-chain after all the local slave system monitors.

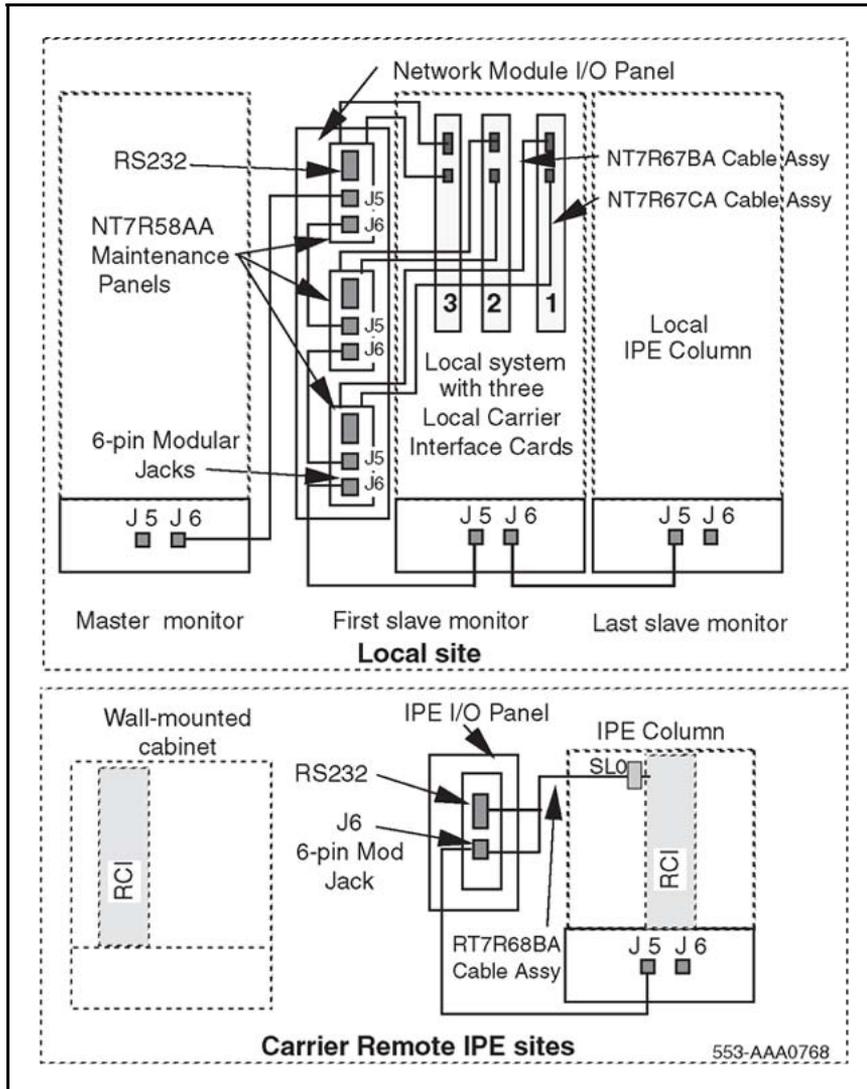
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--End--

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[Figure 13 "System monitor connections at the local site and the Carrier Remote IPE" \(page 84\)](#) shows system monitor daisy-chain connections at local and Carrier Remote IPE sites. The alarm information is sent over the carrier link from the Remote Carrier IPE to the local system CPU.

**Figure 13**  
**System monitor connections at the local site and the Carrier Remote IPE**



### Connecting the carrier link to the local system

T1 or E1 carrier links are connected to the NT7R57AA Carrier Panel assembly connectors at the rear of the module housing the Local Carrier Interface card. Carrier links are routed from the telco demarcation point to the local column for connection to the NT7R57AA Carrier Panel assembly containing three 8-pin modular jacks, as shown in [Figure 11 "System monitor, local MMI terminal, and carrier links cable connections"](#) (page 73).

**Note 1:** Before connecting the carrier link to the system, ensure the connection between the telco demarcation point, such as CSU, is completed using the NT7R87AA T1 CSU Cable Kit.

**Note 2:** To connect an E1 carrier terminated with BNC connectors, use the NT7R67EA Coaxial Interface Adapter Cable to connect the 8-pin modular jacks at the I/O panel to the BNC connector on each E1 carrier link coming from the telco demarcation point. Also refer to [Figure 9 "Local Carrier Interface card DIP-switch positions and function"](#) (page 67) and [Figure 14 "Remote Carrier Interface card DIP-switch locations and functions"](#) (page 89) to set SW1, SW2, SW5, and SW8 for E1 operation and carrier impedance of 75 Ohms.

To connect the carrier link to the network I/O panel at the local site, follow the steps in [Procedure 12 "Connecting the carrier link to the network I/O panel at the local site"](#) (page 85).

**Procedure 12**  
**Connecting the carrier link to the network I/O panel at the local site**

Step	Action
1	Route carrier links to the rear of the column housing the Local Carrier Interface card.
2	Identify carrier 0, 1, and 2 connectors and the corresponding NT7R57AA Carrier Panel assembly connectors.
3	Plug each carrier cable 8-pin modular plug into the corresponding NT7R57AA Carrier Panel assembly 8-pin modular jack for each T1 carrier link.
4	Record the telco carrier circuit ID for each carrier link (link 0, 1, and 2).  <b>Note:</b> These carrier circuit IDs will be used at the remote site to identify the links that correspond to carrier 0, 1, and 2 at the local site. This prevents mismatch of carrier links between the Local Carrier Interface card and the Remote Carrier Interface card. Enter the carrier connection information into the Carrier Remote IPE Connection Record label. Refer to <a href="#">Figure 8 "Carrier Remote IPE Connection Record label"</a> (page 62).
5	If an E1 coaxial carrier link is terminated with BNC connectors, use one NT7R67EA Coaxial Interface Adapter cable to connect each 8-pin modular jack on the NT7R57AA Carrier Panel assembly to BNC carrier link connectors.
6	If the NT7R67EA Coaxial Interface Adapter cable is used for each E1 carrier link, identify BNC connectors on each Adapter cable that correspond to the appropriate carrier (carrier 0, carrier 1, and carrier 2) at the NT7R57AA Carrier Panel Assembly 8-pin jack.
7	Connect each NT7R67EA Coaxial Interface Adapter BNC connector to the appropriate BNC connector on the carrier link.

- 8 Secure the carrier link cables with tie-wraps as appropriate.

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--End--

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## Carrier Remote IPE column installation

To complete the installation of the Carrier Remote IPE column equipment:

- install the Carrier Remote IPE column
- install the cards into the IPE module
- install the cable assemblies from the I/O panel to the backplane
- connect carrier links to the carrier panel assembly
- configure the carrier equipment using overlays and MMI commands

**Note:** All Carrier Remote IPE modules or cabinets are pre-installed in the factory with cards already in their respective card slots. The only exception is the power supply, which is packaged separately and must be installed at the site.

### Installing the Carrier Remote IPE column

The column is normally assembled in the factory with cards already installed and the cable already connected between the backplane connector and the I/O panel at the rear of the IPE module.

If the column is not assembled in the factory, it is necessary to install the modular column (floor-standing column) at the remote site. To do this, follow the instructions in *Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43021-310)* (). It describes how to install the pedestal, the IPE module, and the top cap, and how to connect the power, the internal and external communication cables, and subscriber loops.

To install the Power Fail Transfer Unit (PFTU) to the Carrier Remote IPE column, follow the instructions in *Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43021-310)* ().

### Installing cards into the Remote IPE module

The following steps describe how and where to install the NT7R52 Remote Carrier Interface card and other IPE cards in the Remote IPE module. Although the cards usually are shipped installed from the factory, this document provides step-by-step card installation, which should be followed when additional IPE cards are installed or defective cards are replaced.

To install cards in the Remote IPE Module, follow the steps in [Procedure 13 "Installing cards into the Remote IPE module" \(page 87\)](#).

**Procedure 13**  
**Installing cards into the Remote IPE module**

Step	Action
1	<p>Set the DIP switches on the NT7R52 Remote Carrier Interface card to specify the carrier type (T1 or E1), the distance to the first repeater, the MMI terminal baud rate, and the system monitor address.</p> <p>The DIP switch setting depends on the physical system configuration.</p>
2	<p>Verify that SW1 position 2 is set to <b>ON</b> to specify the remote site.</p> <p><b>Note:</b> <a href="#">Figure 14 "Remote Carrier Interface card DIP-switch locations and functions" (page 89)</a> shows the location of the DIP switches and their functions. Switches 2, 3, and 4 determine if carrier 0 is a T1 or an E1 link, switches 4, 6, and 7 determine if carrier 1 is a T1 or an E1 link, and switches 8, 9, and 10 determine if carrier 2 is a T1 or an E1 link. All three carrier links must be of the same type, for example, T1 or E1. DIP switches S 1 and SW11 define parameter listed in the table in <a href="#">Figure 14 "Remote Carrier Interface card DIP-switch locations and functions" (page 89)</a>. Correspondingly, <a href="#">Figure 9 "Local Carrier Interface card DIP-switch positions and function" (page 67)</a>, shows the Local Carrier Interface card DIP switches SW1 through SW11 and their functions. Refer to <a href="#">Figure 9 "Local Carrier Interface card DIP-switch positions and function" (page 67)</a> for DIP switch settings for the Local Carrier Interface card.</p>
3	<p>Determine the system monitor address for each remote site by setting SW11 positions 1-5 on the Remote Carrier Interface card.</p> <p>Before selecting the address, determine the available system monitor addresses, as follows:</p> <ul style="list-style-type: none"> <li>• Execute the <b>STAT xSM</b> command in <b>LD 37</b> to poll all system monitors. Correct any problems.</li> <li>• Determine available system monitor addresses to be assigned to the Remote IPE module or the wall-mounted Carrier Remote IPE cabinet.</li> <li>• Set master system monitor slave polling address range to cover the new Carrier Remote IPE system monitor address.</li> <li>• Set Remote Carrier Interface card <b>SW 11</b> positions <b>1-5</b> for the new system monitor address.</li> </ul>

- Re-connect the system monitor daisy-chain to include new Local Carrier Interface cards.
- Test the system monitor daisy-chain by executing the **STAT xSM** command in **LD 37** to ensure that every local and remote system monitor or Remote Carrier Interface card system monitor emulation in the remote cabinet is responding to the master system monitor.

Table 12 "Remote Carrier Interface standard (default) switch settings" (page 88) lists the default (factory-provided switch settings) for the Remote Carrier Interface card. These settings are used in the majority of applications; however, if different settings are required, change the switch settings before installing the Remote Carrier Interface card.

**Table 12**  
**Remote Carrier Interface standard (default) switch settings**

Switch	Switch positions							
	1	2	3	4	5	6	7	8
SW1	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
SW11	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
SW2	OFF	ON	OFF	ON	-	-	-	-
SW3	ON	OFF	ON	ON	-	-	-	-
SW4	ON	ON	OFF	OFF	-	-	-	-
SW5	OFF	ON	OFF	ON	-	-	-	-
SW6	ON	OFF	ON	ON	-	-	-	-
SW7	ON	ON	OFF	OFF	-	-	-	-
SW8	OFF	ON	OFF	ON	-	-	-	-
SW9	ON	OFF	ON	ON	-	-	-	-
SW10	ON	ON	OFF	OFF	-	-	-	-

Figure 14 "Remote Carrier Interface card DIP-switch locations and functions" (page 89) shows the NT7R52AA Remote Carrier Interface card DIP switches. SW2 through SW10 select the carrier characteristic. SW1 and SW11 define repeater distance, baud rate, and system monitor address.

**Figure 14**  
**Remote Carrier Interface card DIP-switch locations and functions**

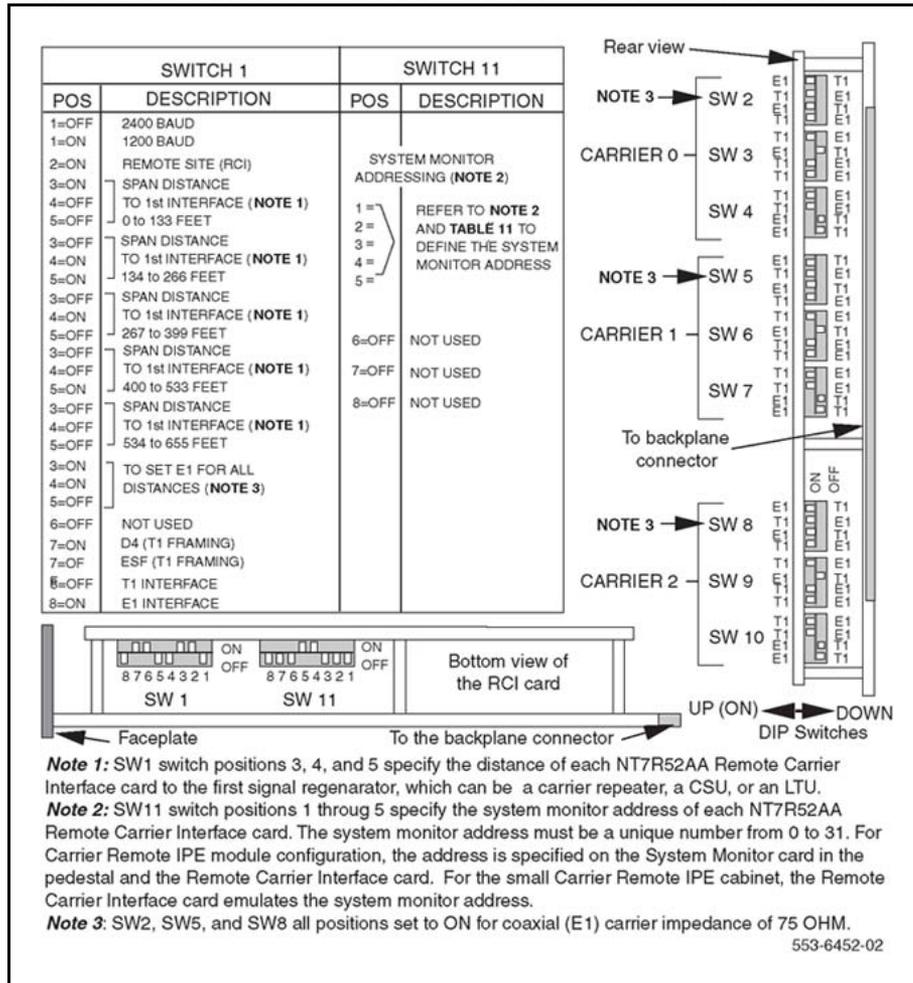


Table 13 "NT7R52 Remote Carrier Interface card system monitor address selection" (page 90) lists system monitor addresses for the Remote Carrier Interface card, which are selected using switch SW11 switch positions 1 through 5. A unique address is selected for each Remote Carrier Interface card.

Refer to Figure 14 "Remote Carrier Interface card DIP-switch locations and functions" (page 89) for the SW11 switch location on the card.

**Table 13**  
**NT7R52 Remote Carrier Interface card system monitor address selection**

RCI System Monitor Address	SW11 Positions 1–5 (1 = ON, 0 = OFF)				
	1	2	3	4	5
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
10	0	1	0	1	0
11	0	1	0	1	1
12	0	1	1	0	0
13	0	1	1	0	1
14	0	1	1	1	0
15	0	1	1	1	1
16	1	0	0	0	0
17	1	0	0	0	1
18	1	0	0	1	0
19	1	0	0	1	1
20	1	0	1	0	0
21	1	0	1	0	1
22	1	0	1	1	0
23	1	0	1	1	1
24	1	1	0	0	0
25	1	1	0	0	1
26	1	1	0	1	0
27	1	1	0	1	1
28	1	1	1	0	0
29	1	1	1	0	1
30	1	1	1	1	0
31	1	1	1	1	1

- 4 Pull the NT7R52AA Remote Carrier Interface card locking devices away from the faceplate.  
 Holding the card by these locking devices, insert it into the card guides in the card slot marked *Cont.*, which is located to the right of slot 7. Make sure to use the card guides immediately to the right of slot 7.
- 5 Slide the card into the module until it engages the backplane connector.

- 6 Push the locking device levers towards the faceplate to insert the card connector into the backplane connector and lock the card in place.
- 7 Observe the LED on the card as it performs self-tests.  
The LED should blink three times and then stay lit until enabled by software. When enabled by software, the LED turns off permanently, if operational.
- 8 Install IPE cards in slots 0 through 7 and 8 through 15 by pulling the card locking devices away from the faceplate and inserting the card into the card guides of an IPE card slot.
- 9 Slide the card into the module until it engages the backplane connector and then push the locking device levers toward the faceplate to insert the card connector into the backplane connector and lock the card in place.
- 10 Repeat for each IPE card.

---

--End--

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### Installing the backplane cable assemblies

The Remote Carrier Interface card backplane connectors provide access to:

- three carrier links
- system monitor
- external alarms
- MMI maintenance port

The NT7R68AA Remote Carrier/Alarm Cable assembly is routed from the Remote Carrier Interface card to the I/O panel connectors that support carrier link and auxiliary or external alarm connections. The NT7R68BA Remote Maintenance Cable assembly connects the upper backplane connector SL0 to the I/O panel connectors that support the system monitor and the SDI/MMI terminal connections.

### Installing the NT7R68AA Remote Carrier/Alarm Cable Assembly

The NT7R68AA Remote Carrier/Alarm Cable assembly consists of the NT7R68HA cable, the NT7R59AA Carrier Panel, and NT7R60AA Carrier/Alarm Panel assemblies.

Before plugging the cables into the IPE module backplane, install the NT7R59AA Carrier Panel and NT7R60AA Carrier/Alarm Panel assemblies into the connector cutouts on the I/O panel at the rear of the IPE module. Refer to [Figure 15 "Backplane to I/O panel connections on the IPE module"](#) (page 94) and [Figure 28 "Remote Carrier IPE module connection"](#)

diagram (single RCI configuration)" (page 200) for details. To install the panel assemblies, follow the steps in Procedure 14 "Installing the NT7R68AA Remote Carrier/Alarm Cable Assembly" (page 92).

**Procedure 14**  
**Installing the NT7R68AA Remote Carrier/Alarm Cable Assembly**

Step	Action
1	Remove the back panel at the rear of the IPE module to be able to access the I/O panel connector cutouts.
2	Identify the empty connector cutouts that are the appropriate size for the panel assemblies.  Refer to "Carrier Remote IPE Module I/O panel connector selection" (page 61) for connector cutouts selection recommendation.
3	Install the NT7R59AA Carrier Panel assembly into the recommended connector cutout in the I/O panel.  Install it so that 8-pin modular jack tabs are positioned to the left of the connectors, placing carrier 0 at the top of the NT7R59AA Carrier Panel assembly and carrier 1 at the bottom.  Tighten the retaining screw.
4	Install the NT7R60AA Carrier/Alarm Panel assembly into the recommended J5 empty connector cutout in the I/O panel.  Tighten the retaining screw. This panel contains an 8-pin modular jack for carrier 2 at the bottom and a DB-15 HD female auxiliary alarm (external alarm) connector at the top of the panel assembly.
5	Plug the P1 24-pin block connector of the NT7R68AA Remote Carrier/Alarm Cable assembly into the connector on the IPE Module's backplane.
--End--	

**Installing the NT7R68BA Remote Maintenance Cable Assembly**

The NT7R68BA Remote Maintenance Cable Assembly consists of the NT7R68GA cable and NT7R61AA Maintenance Panel assembly.

Before plugging the cable into the IPE module backplane, install the NT7R61AA Maintenance Panel assembly into the connector cutout on the I/O panel at the rear of the IPE module. Refer to Figure 15 "Backplane to I/O panel connections on the IPE module" (page 94) and Figure 28 "Remote Carrier IPE module connection diagram (single RCI

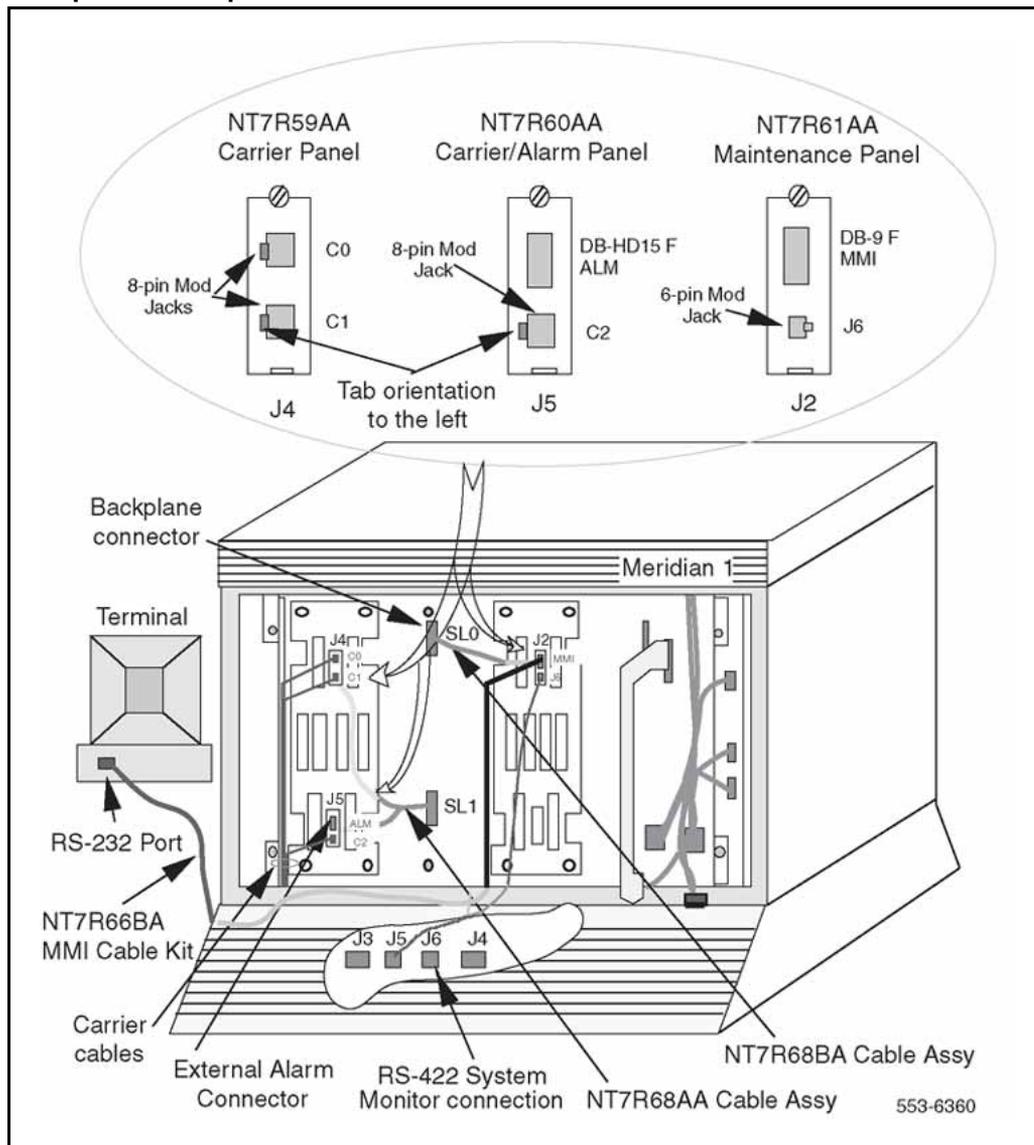
configuration)" (page 200). To install the panel assembly, follow the steps in Procedure 15 "Installing the NT7R68BA Remote Maintenance Cable Assembly" (page 93).

**Procedure 15**  
**Installing the NT7R68BA Remote Maintenance Cable Assembly**

Step	Action
1	Identify the empty connector cutout that is the appropriate size for the NT7R61AA Maintenance Panel assembly.  Refer to " <a href="#">Carrier Remote IPE Module I/O panel connector selection</a> " (page 61) or connector cutouts selection recommendation.
2	Install the NT7R61AA Maintenance Panel assembly into the recommended J2 connector cutout on the I/O panel. Tighten the retaining screw.
3	Plug the P1 24-pin connector of the NT7R68BA Remote Maintenance Cable assembly into the SL0 connector on the IPE Module's backplane.
--End--	

shows the rear of the Carrier Remote IPE module and cables connecting the backplane connectors to the module's I/O panel assembly connectors installed into the recommended connector cutouts.

**Figure 15**  
**Backplane to I/O panel connections on the IPE module**



**Installing system monitor cables**

The NT8D46AL system monitor cable is normally installed in the factory and does not have to be installed at the site.

In the remote floor-standing column, the pedestal contains a slave system monitor used to monitor Carrier Remote IPE system alarms. These alarms are reported over the carrier link and the Local Carrier Interface card to the local master system monitor and from there to the CPU. The CPU sends PWR alarm messages to the system maintenance TTY identifying the problem.

Figure 15 "Backplane to I/O panel connections on the IPE module" (page 94) shows the system monitor cable connections for a Carrier Remote IPE column. To connect the slave system monitor in the pedestal, follow the steps in Procedure 16 "Connecting the slave system monitor in the pedestal" (page 95).

**Procedure 16**  
**Connecting the slave system monitor in the pedestal**

Step	Action
1	<p>Plug the 6-pin modular plug at one end of the NT8D46AL cable into the J6 6-pin modular jack on the IPE module NT7R61AA Remote Maintenance Panel assembly.</p> <p>This cable provides an RS-422 interface to the system monitor.</p>
2	<p>Plug the other end of the NT8D46AL cable 6-pin modular plug into the J5 modular jack on the system monitor in the pedestal.</p>
3	<p>Check the NT8D22 System Monitor factory switch settings for the slave system monitor.</p> <p>Refer to "Option settings" in <i>Circuit Card Reference (NN43001-311)</i> ().</p> <p><b>Note:</b> Set the system monitor address on the system monitor card in the pedestal to be identical to the system monitor address set on the Remote Carrier Interface card using SW11 switch positions 1 through 5. Set the slave system monitor to the same address that corresponds to the master system monitor at the local site.</p>
4	<p>For multiple Carrier Remote IPE modules on a single pedestal, connect only one Remote Carrier Interface card to the system monitor in the pedestal.</p> <p>However, set the system monitor address on all Remote Carrier Interface cards to be the same as the system monitor address in the pedestal. This allows any Remote Carrier Interface card to be connected to the system monitor in the pedestal.</p>
--End--	

**Installing remote MMI terminal cables**

The cable that has to be installed at the site is the terminal cable connecting the terminal or TTY to the DB-9 female connector on the NT7R61AA Remote Maintenance Panel assembly.

Figure 15 "Backplane to I/O panel connections on the IPE module" (page 94) shows the MMI terminal cable connections for a Carrier Remote IPE column. Also, refer to Figure 28 "Remote Carrier IPE module connection diagram (single RCI configuration)" (page 200).

To connect the MMI terminal, follow the steps in Procedure 17 "Installing remote MMI terminal cables" (page 96).

**Procedure 17**  
**Installing remote MMI terminal cables**

Step	Action
1	Plug the DB-9 female connector of the NT7R66BA MMI Cable into the MMI DB-9 male connector on the IPE module NT7R61AA Remote Maintenance Panel assembly.
2	Plug the other end of the NT7R66BA MMI Cable DB-25 male connector into the MMI terminal RS-232 connector. If the MMI terminal has a male connector, use a compact gender changer to connect the MMI terminal.
3	If an distant MMI terminal is connected to the MMI connector on the Maintenance Panel Assembly over a modem, use the NT7R66BA MMI Cable and a nullmodem to connect the modem to the MMI D-9 male connector on the NT7R61AA Remote Maintenance Panel Assembly.
4	For multiple Carrier Remote IPE modules at a single site, use an A/B/C switch box to connect each MMI DB-9 male connector on the Maintenance Panel assembly to a single MMI terminal.  To do this, use the NT7R66BA MMI Cable between the A/B switch box connector C and the MMI connector on each IPE module. Use a DB-25M/ DB-25M straight through cable to connect the A/B switch box connector A to the MMI terminal.

**Note:** "Connection diagrams and external connectors pin assignment" (page 197) provides the external connectors pin assignment for the SDI port, the MMI terminal, the carrier links, and the external alarms.

--End--

### Connecting the carrier link to the Remote IPE module

The T1 or E1 carrier links are connected to the I/O panel assembly at the rear of the IPE module housing the Remote Carrier Interface card. Carrier links are routed from the telco demarcation point to the Carrier Remote IPE column for connection to the NT7R59AA Carrier Panel and the NT7R60AA Carrier/Alarm Panel assembly.

The NT7R59AA Carrier Panel assembly contains two 8-pin modular jacks and the NT7R60AA Carrier/Alarm Panel assembly contains one 8-pin modular jack, which are used to connect carrier links. [Figure 15 "Backplane to I/O panel connections on the IPE module"](#) (page 94) shows the carrier connectors and the carrier link cable routing.

**Note 1:** Before connecting the carrier link to the system, the connection between the telco demarcation point such as CSU, should be completed using the NT7R87AA T1 CSU Cable Kit.

**Note 2:** To connect an E1 carrier terminated with BNC connectors, use the NT7R67EA Coaxial Interface Adapter Cable to connect the 8-pin modular jacks at the I/O panel to the BNC connector on each E1 carrier link coming from the telco demarcation point. Also refer to [Figure 9 "Local Carrier Interface card DIP-switch positions and function"](#) (page 67) and [Figure 14 "Remote Carrier Interface card DIP-switch locations and functions"](#) (page 89) to set SW1, SW2, SW5, and SW8 for E1 operation and carrier impedance of 75 Ohm.

To connect carrier links to the IPE module's NT7R59AA Carrier Panel and NT7R60AA Carrier/Alarm Panel assemblies at the remote site, follow the steps in [Procedure 18 "Connecting the carrier link to the Remote IPE module"](#) (page 97).

#### **Procedure 18** **Connecting the carrier link to the Remote IPE module**

Step	Action
1	Route all three carrier links to the rear of the Carrier Remote IPE column housing the Remote Carrier Interface card.
2	Identify carrier 0 (primary), carrier 1 (primary), and carrier 2 (primary or spare) and the corresponding connectors on the NT7R59AA Carrier Panel and the NT7R60AA Carrier/Alarm Panel assemblies.

**Note:** Compare carrier circuit ID numbers of carrier links at the local site (that were recorded during the installation of the carrier links at the local site) with the carrier circuit ID numbers of the carrier links at the remote site. Make sure they match so that the circuit ID of carrier 0 at the local site matches with circuit ID of carrier 0 at the remote site. Repeat this matching for carrier 1 and carrier 2. This eliminates cross-connection of carrier links, which causes transmission problems. Refer to ["Verifying carrier link connections at the remote site"](#) (page 128).

3 Plug each carrier cable 8-pin modular plug into the corresponding 8-pin modular jack on the NT7R59AA Carrier

- Panel and the NT7R60AA Carrier/Alarm Panel assemblies for each T1 carrier.
- 4 If an E1 coaxial carrier link is terminated with BNC connectors, use one NT7R67EA Coaxial Interface Adapter cable to connect each 8-pin modular jack on the NT7R59AA Carrier Panel and NT7R60AA Carrier/Alarm Panel assemblies to BNC carrier link connectors.
  - 5 Identify BNC connectors on each NT7R67EA Coaxial Interface Adapter cable that corresponds to the appropriate carrier (carrier 0, carrier 1, and carrier 2) at the NT7R57AA Carrier Panel Assembly 8-pin jack.
  - 6 Connect each NT7R67EA Coaxial Interface Adapter BNC connector to the appropriate BNC connector on the carrier link.  
  
These carrier link connections are verified at the end of hardware installation by executing appropriate MMI commands on the MMI terminal. Refer to [“Verifying carrier link connections at the remote site” \(page 128\)](#).
  - 7 Secure the carrier link cables with tie-wraps as appropriate.

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--End--

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The NT7R60AA Maintenance Panel assembly that contains one 8-pin modular jack for carrier 2, also contains the DB-15HD female external alarm input connector. This DB-15HD connector connects the NT7R86AA Auxiliary Alarm Cable assembly to auxiliary alarm (external alarm) indicators at the MDF or directly to the auxiliary alarm devices. These alarm devices report alarm conditions through relay contact closures.

## Carrier Remote IPE cabinet installation

To complete the installation of Carrier Remote IPE cabinet equipment:

- install the Carrier Remote IPE cabinet(s)
- install cards into the cabinet(s)
- install the Remote Cabinet Cable assembly and connect to the backplane
- connect the carrier links

## Installing the Carrier Remote IPE cabinet

To install NT1P70/NT1P60 main and NTBK70 expansion Carrier Remote IPE cabinets that house the Carrier Remote IPE, follow the instructions in this section.

**Note:** The NT1P70 is the Main Cabinet Assembly consisting of the NT1P60 Main Cabinet and cabinet mounting hardware.

The NT1P70/NT1P60 Remote Carrier IPE main cabinet is shipped from the factory installed; that is, all IPE cards and the Remote Carrier Interface card are already installed. The exceptions are the NT7R94AA Remote Cabinet Cable Assembly and the power supply, which are shipped separately. The NTBK70 Carrier Remote IPE expansion cabinet is optional and is ordered only if more than 10 IPE cards are required at the remote site.

The Carrier Remote IPE cabinet can be powered with an AC power system using the NTA04 AC/DC power supply. It can also be powered with a DC power system using the NTA05 DC power supply from a –52 V battery source through the NTA28AA Junction box and the NTA0410 power cable. Before installing the power supply into the cabinet, set switches SW1 through SW 4 as shown in [Table 14 "NTA04 AC/DC and NTA05 DC power supply switch settings"](#) (page 99):

**Table 14**  
**NTA04 AC/DC and NTA05 DC power supply switch settings**

Voltage	SW1	SW2	SW3	SW4
Message Waiting; -150 V	ON			
Message Waiting; -120 V	OFF			
Ringling; 86 Vrms		OFF	OFF	OFF
Ringling; 80 Vrms		ON	OFF	OFF
Ringling; 75 Vrms		OFF	ON	OFF
Ringling; 70 Vrms		OFF	OFF	ON
<b>Note:</b> Ringling frequency selection is made with a three-way switch located to the left of the 4-position DIP switch at the top of the power supply. Typical North American setting is -150 V, 86 Vrms, and 20 Hz.				

To install Carrier Remote IPE Cabinets, locate and prepare the wall area for the wall-mounted installation or use the pedestal for the floor installation, install cabinets, connect the ground wires, and connect the power. When selecting the wall area for the cabinet installation, provide for convenient carrier and subscriber loop cable routing.

To complete these tasks, follow the steps in [Procedure 19 "Installing Carrier Remote IPE Cabinets"](#) (page 100).

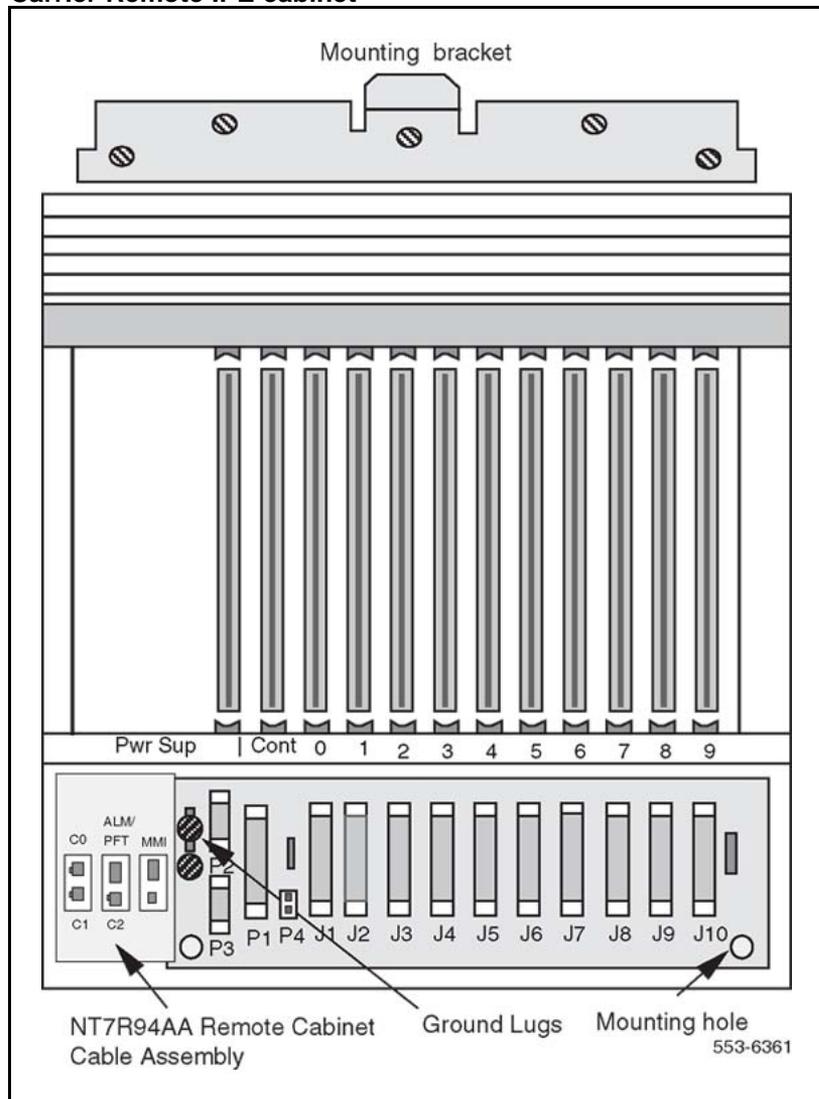
**Procedure 19**  
**Installing Carrier Remote IPE Cabinets**

Step	Action
1	Unpack and inspect the cabinet.
2	Level and install the mounting bracket on the wall as shown in <a href="#">Figure 16 "Carrier Remote IPE cabinet" (page 101)</a> .  If installing the expansion cabinet next to the main cabinet, line up the two brackets and use the provided spacer between brackets.
3	Remove the front cover and all cards from the cabinet to make the cabinet lighter and to prevent card damage in case the cabinet drops when being installed onto the wall.
4	Position the cabinet over the mounting bracket so that the bracket hook engages the slot at the rear of the cabinet.  The slot is located at the top center of the cabinet as shown in <a href="#">Figure 16 "Carrier Remote IPE cabinet" (page 101)</a> .
5	Bolt the cabinet to the wall by using two wood screws at the lower front of the cabinet.  See <a href="#">Figure 16 "Carrier Remote IPE cabinet" (page 101)</a> for screw hole locations.
6	Install the 6 AWG copper ground wire between the approved building ground and the ground lug at the bottom of the cabinet.
7	Repeat steps 3 through 6 for the expansion cabinet, if required.
8	Install the power supply in the <i>Pwr Sup</i> slot in the NT1P70/NT1P60 main cabinet shelf and turn the power switch to OFF.
9	At the building ground end of the wire, use two fastening clamps to connect the wire to the building ground, insulate the connection with electric tape, and post a DO NOT DISCONNECT tag.
10	Disconnect the building ground wire at the ground lug on the NT1P70/NT1P60 main cabinet and measure the resistance between the tip of the disconnected ground wire and the ground lug on the cabinet.  If the resistance is more than 5 ohms, check the building ground and the ground terminal at the AC wall outlet where the cabinet power cord is connected.
11	For an AC system, connect the NTAK98AA Power Cord from the IPE shelf NTAK04 AC/DC power supply to the commercial AC power outlet.

- 12 For a DC system, connect the IPE shelf NTA05 DC power converter cord to the DC power source over the NTA28AA Junction Box and the NTA0410 power cable.
- 12 Measure the ground resistance between the ground lug at the bottom of the NT1P70/NT1P60 main cabinet and the ground prong on the cabinet power cord.
- It should measure 0 ohms. If the resistance is greater than 0 ohms, check the ground terminal on the power supply power connector for continuity to the chassis.

Figure 16 "Carrier Remote IPE cabinet" (page 101) shows the Carrier Remote IPE cabinet with the mounting bracket and the mounting holes. It also shows the ground lugs for ground connections.

**Figure 16**  
**Carrier Remote IPE cabinet**



- 13 Disconnect the power cord from the wall outlet for the AC system or the DC power source for the DC system and reconnect the 6 AWG ground wire to the cabinet ground lug.
- 14 Reconnect the NTA98AA supply power cord to the AC power outlet for an AC system or to the DC source for a DC system.
- 15 If the Carrier Remote IPE requires an expansion cabinet to accommodate up to 16 IPE cards, repeat steps 1 through 14 for the NTB70 expansion cabinet.
- 16 Connect the NT1P70/NT1P60 main cabinet to the NTB70 expansion cabinet by installing the cable between connector P1 of the main cabinet and P1 of the expansion cabinet. Install the cabinets side-by-side or above each other keeping in mind that the inter-cabinet cable is 7 ft (21 m) long.
- 17 Install the adhesive label strip to the expansion cabinet designating the card slots from 10 to 15.

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--End--

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This completes the cabinet installation and system ground test.

### Removing the fiber I/O bracket assembly

The NT1P70/NT1P60 main Carrier Remote IPE cabinet is equipped with a I/O bracket assembly used in Fiber Remote IPE. This bracket must be removed and the NT7R94AA Remote Cabinet Cable Assembly must be installed in its place. Refer to [Figure 17 "Carrier cable routing for the Carrier Remote IPE cabinet"](#) (page 104).

To remove this bracket, follow the steps in [Procedure 20 "Removing the fiber I/O bracket assembly"](#) (page 102).

#### Procedure 20 Removing the fiber I/O bracket assembly

Step	Action
1	Unscrew the retaining screw holding the bracket in place. The screw is located at the upper front of the bracket.
2	Remove the retaining screw and swing the front of the bracket to the left by 45 degrees.
3	Slide the entire bracket forward to clear the hinge tabs at the rear of the bracket.

Remove the bracket.

---

--End--

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### Installing the NT7R94AA Remote Cabinet Cable Assembly

The NT7R94AA consists of the NT7R62AA Bracket, the NT7R68CA Remote Carrier/Alarm Cable Assembly, and the NT7R68DA Remote Maintenance Cable Assembly. These components are pre-assembled in the factory to become the NT7R94AA Remote Cabinet Cable Assembly.

To install the NT7R94AA Remote Cabinet Cable Assembly into the cabinet, follow the steps in [Procedure 21 "Installing the NT7R94AA Remote Cabinet Cable Assembly"](#) (page 103).

#### Procedure 21 Installing the NT7R94AA Remote Cabinet Cable Assembly

Step	Action
1	Align the two bracket holes with the two hinge tabs as shown in <a href="#">Figure 17 "Carrier cable routing for the Carrier Remote IPE cabinet"</a> (page 104).
2	Swing the front of the assembly by 45 degrees to the left with respect to the hinge tabs.
3	Slide the entire assembly backwards and insert the hinge tabs into the two holes on the bracket.
4	Move the front of the assembly by 45 degrees to the right to be at the right angle to the backplane and install the retaining screw.
5	Plug the DB-15 male P1 connector at the common end of the NT7R68CA cable assembly into the P3 (auxiliary) DB-15 female connector located on the backplane.
6	Plug the DB-9 male P1 connector at the common end of the NT7R68DA cable assembly into the P2 (TTY) DB-9 female connector located on the backplane.

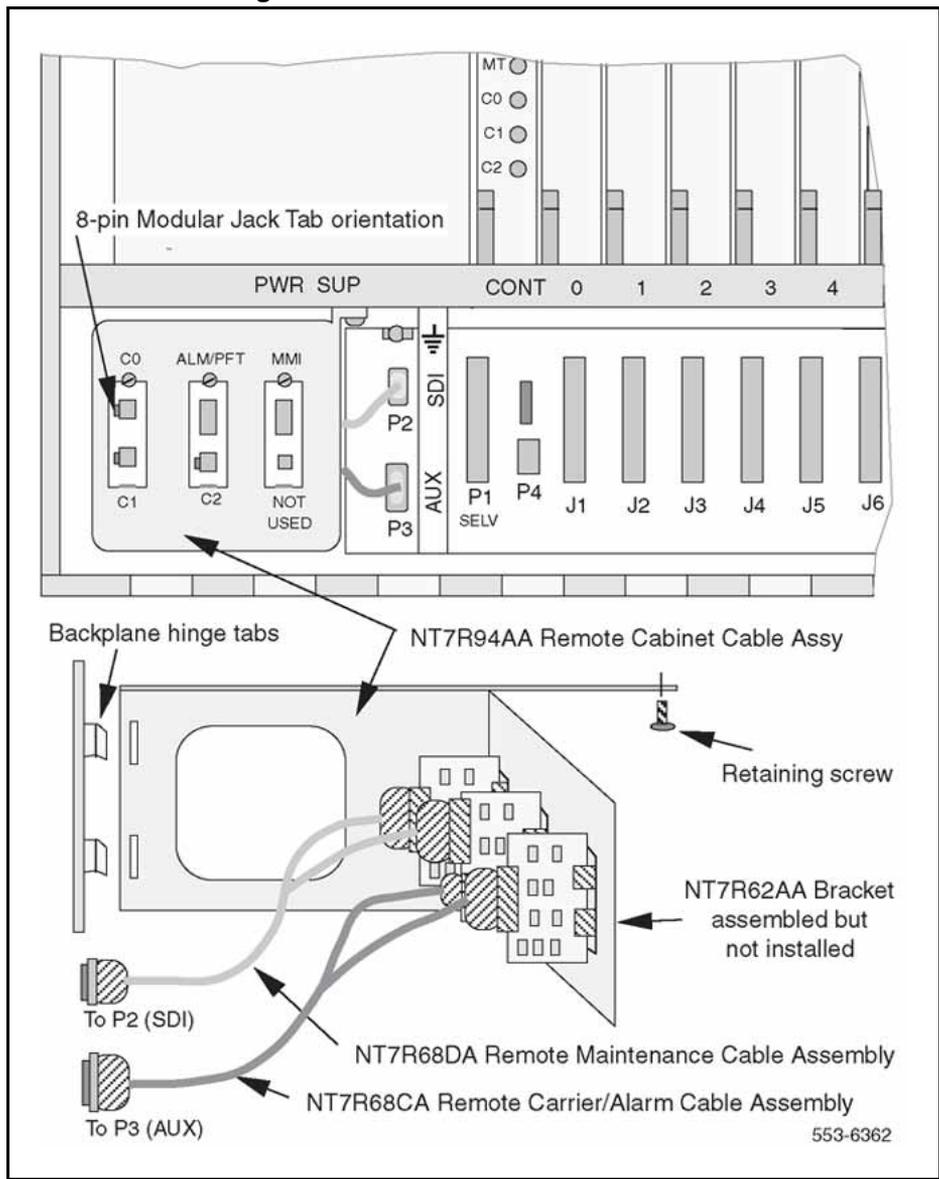
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[Figure 17 "Carrier cable routing for the Carrier Remote IPE cabinet"](#) (page 104) shows an installed and connected Remote Cabinet Cable Assembly. The cables are connected to P2 and P3 located on the cabinet backplane to provide connections to carrier links, the SDI/MMI terminal or TTY, the PFTU, and the customer external alarms (alarms 1 and alarm 2 only).

**Figure 17**  
**Carrier cable routing for the Carrier Remote IPE cabinet**



**Installing cards into the Carrier Remote IPE cabinet**

The following steps show you how and where to install the cards in the Carrier Remote IPE cabinet. Even though the cards are shipped in the cabinet from the factory, for safety and ease of installation, these cards should have been removed from the cabinet before it was installed it onto the wall.

To install these cards, follow the steps in [Procedure 22 “Installing cards into the Carrier Remote IPE cabinet”](#) (page 105).

**Procedure 22**  
**Installing cards into the Carrier Remote IPE cabinet**

Step	Action
1	<p>Set the DIP switches on the NT7R52 Remote Carrier Interface card to specify the carrier type (T1 or E1), the distance to the first repeater, the terminal characteristics, and the system monitor address emulation.</p> <p>The DIP switch setting depends on the physical system configuration.</p> <p><b>Note:</b> <a href="#">Figure 14 "Remote Carrier Interface card DIP-switch locations and functions" (page 89)</a>, shows the location of the DIP switches and their functions. Switches 2, 3, and 4 determine if carrier 0 is a T1 or an E1 link, switches 4, 6, and 7 determine if carrier 1 is a T1 or an E1 link, and switches 8, 9, and 10 determine if carrier 2 (spare carrier) is a T1 or an E1 link. All three carrier links must be of the same type, that is, T1 or E1. Switches 2 through 10 are not read by firmware. Switches 1 and 11 define parameter listed in the table of <a href="#">Figure 14 "Remote Carrier Interface card DIP-switch locations and functions" (page 89)</a>. Verify that SW1 position 2 is set to <b>ON</b> to indicate remote site. Switches 1 and 11 are read by firmware.</p>
2	<p>Pull the Remote Carrier Interface card locking devices away from the faceplate and, holding the card by these devices, insert the card into the card guides in slot <i>Cont</i>.</p> <p>Refer to <a href="#">Figure 16 "Carrier Remote IPE cabinet" (page 101)</a> for card slot positions in the shelf.</p>
3	<p>Slide the card into the cabinet until it engages the backplane connector and then push the locking device levers toward the faceplate to insert the card connector into the backplane connector and lock the card in place.</p>
4	<p>Observe the LED on the card as it performs self-tests.</p> <p>The LED should blink three times and then stay lit until the Remote Carrier Interface card is enabled by software. When enabled by software, the LED turns off permanently, if the card is operational.</p>
5	<p>Install IPE cards in slots 0 through 9 by pulling the card locking devices away from the faceplate, inserting the cards into the card guides, engaging the backplane connector, and locking the card in place by pressing the locking devices against the card faceplate.</p>

- 6 Repeat step 5 for card slots 10 through 15 in the expansion cabinet.

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--End--

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### Connecting carrier links to the Carrier Remote IPE cabinet

In the Carrier Remote IPE cabinet configuration, the carrier link connects to the telco demarcation point. From the telco demarcation point, the carrier link cables are routed to the cabinet and connected to the Remote Carrier Interface card through the NT7R59AA Carrier Panel and the NT7R60AA Carrier/Alarm Panel assemblies.

See [Figure 17 "Carrier cable routing for the Carrier Remote IPE cabinet" \(page 104\)](#) and [Figure 18 "Carrier cable routing for the Carrier Remote IPE cabinet" \(page 108\)](#).

**Note 1:** Before connecting the carrier link to the system, the connection between the telco demarcation point such as CSU, should have been completed using the NT7R87AA T1 CSU Cable Kit.

**Note 2:** To connect an E1 carrier terminated with BNC connectors, use the NT7R67EA Coaxial Interface Adapter Cable to connect the 8-pin modular jacks at the I/O panel to the BNC connector on each E1 carrier link coming from the telco demarcation point. Also refer to [Figure 9 "Local Carrier Interface card DIP-switch positions and function" \(page 67\)](#) and [Figure 14 "Remote Carrier Interface card DIP-switch locations and functions" \(page 89\)](#) to set SW1, SW2, SW5, and SW8 for E1 operation and carrier impedance of 75 Ohm.

To connect the carrier link to the carrier panel assemblies, follow the steps in [Procedure 23 "Connecting carrier links to the Carrier Remote IPE cabinet" \(page 106\)](#).

#### Procedure 23

#### Connecting carrier links to the Carrier Remote IPE cabinet

Step	Action
1	Route the T1 or E1 carrier 0, carrier 1, and carrier 2 (spare carrier) pair wires from the telco demarcation point to the Carrier Remote IPE cabinet I/O bracket.
2	Identify carrier 0, 1, and 2 connectors and the corresponding NT7R59AA Carrier Panel and the NT7R60AA Carrier/Alarm Panel assemblies connectors.

Refer to [“Verifying carrier link connections at the remote site” \(page 128\)](#).

**Note:** Compare carrier circuit ID numbers of carrier links at the local site (that were recorded during the installation of the carrier links at the local site) with the carrier circuit ID numbers of the carrier links at the remote site. Make sure they match so that the circuit ID of carrier 0 at the local site matches with circuit ID of carrier 0 at the remote site. Repeat this matching for carrier 1 and carrier 2. This eliminates the mismatched connection of carrier links, which causes time slot connection problems indicated by no talk-path or cross-talk. To avoid this problem, refer to [“Verifying carrier link connections at the remote site” \(page 128\)](#).

- 3 Plug the carrier link 8-pin modular plug into the corresponding NT7R59AA Carrier Panel and the NT7R60AA Carrier/Alarm Panel assemblies 8-pin modular jack for each carrier.
- 4 If an E1 coaxial carrier link is terminated with BNC connectors, use one NT7R67EA Coaxial Interface Adapter cable to connect each 8-pin modular jack on the NT7R59AA Carrier Panel and NT7R60AA Carrier/Alarm Panel assemblies to BNC carrier link connectors.
- 5 Identify BNC connectors on each NT7R67EA Coaxial Interface Adapter cable that corresponds to the appropriate carrier (carrier 0, carrier 1, and carrier 2) at the NT7R57AA Carrier Panel Assembly 8-pin jack.
- 6 Connect each NT7R67EA Coaxial Interface Adapter BNC connector to the appropriate BNC connector on the carrier link.  
  
**Note:** These carrier link connections will be verified at the end of hardware installation by executing appropriate MMI commands on the MMI terminal. Refer to [“Verifying carrier link connections at the remote site” \(page 128\)](#).
- 7 Secure the carrier link cables with tie-wraps at the exit from the cabinet as appropriate.

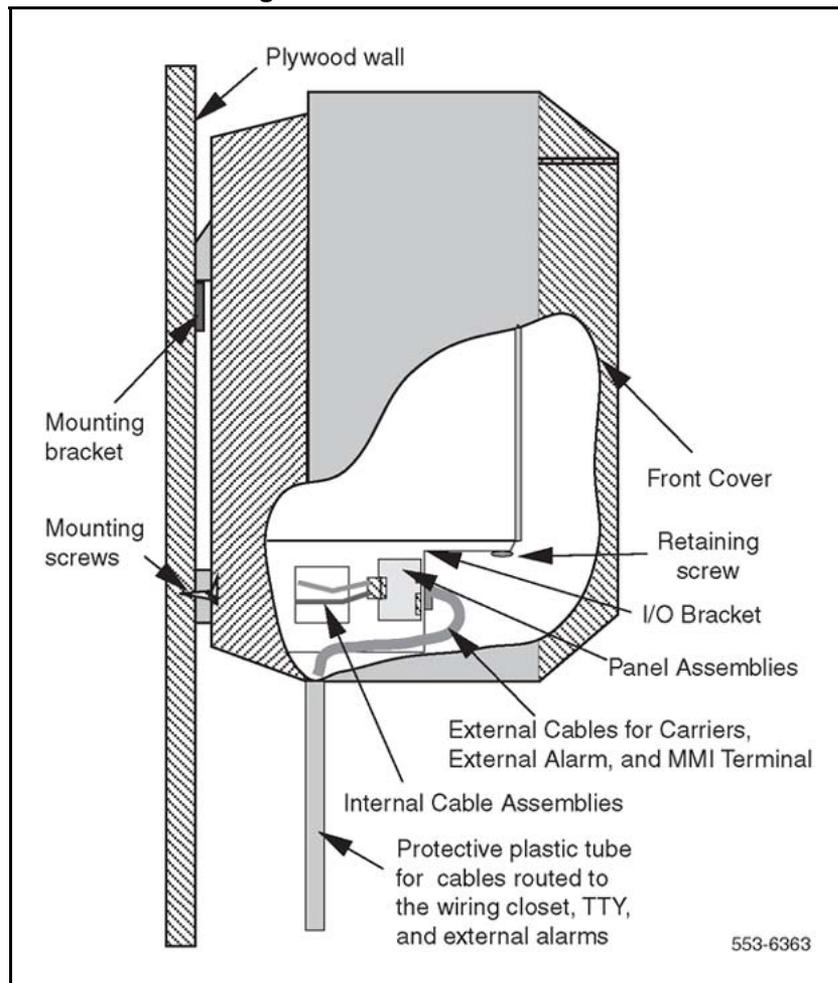
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--End--

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Figure 18 [“Carrier cable routing for the Carrier Remote IPE cabinet” \(page 108\)](#) shows the Carrier Remote IPE cabinet and the carrier cable connecting carrier links to the cabinet.

**Figure 18**  
**Carrier cable routing for the Carrier Remote IPE cabinet**



### **Connecting remote MMI terminal and subscriber loop cables**

In the Carrier Remote IPE cabinet option, the alarm monitoring is performed by the Remote Carrier Interface card, which receives power fail signals from the power supply through the backplane and sends the information over carrier links to the Local Carrier Interface card for processing by the local system CPU.

Refer to Appendix C, [Figure 29 "Remote Carrier IPE cabinet connection diagram \(single RCI configuration\)"](#) (page 201) for the connection diagram.

### MMI terminal connection

A terminal connection to the MMI port should be made as shown in [Figure 19 "Subscriber loop \(tip and ring\) connectors" \(page 112\)](#). The MMI terminal is used for configuration and maintenance of the remote site. The MMI terminal transmission characteristics are 2400 bps, 8 bits, no parity (or emulate the VT100 dumb terminal).

To connect the MMI terminal to the MMI port, follow the steps in [Procedure 24 "Connecting the MMI terminal to the MMI port" \(page 109\)](#).

#### Procedure 24 Connecting the MMI terminal to the MMI port

Step	Action
1	Plug the DB-9 female connector at one end of the NT7R66BA MMI Cable into the MMI DB-9 male connector on the NT7R61AA Maintenance Panel assembly.
2	Plug the DB-25 male connector end of the NT7R66BA MMI Cable into the MMI terminal RS-232 connector.  If the MMI terminal requires a different gender connector use a compact gender changer.
3	If a distant MMI terminal is connected to the MMI connector on the Maintenance Panel Assembly over a modem, use the NT7R66BA MMI Cable and a DB-25F/DB-25M nullmodem to connect the modem to the MMI D-9 male connector on the NT7R61AA Maintenance Panel Assembly.
4	For multiple Carrier Remote IPE modules at a single site, use an A/B/C switch box to connect each MMI DB-9 male connector on the Maintenance Panel assembly to a single MMI terminal.  To do this, use the NT7R66BA MMI Cable between the A/B switch box connector C and the MMI connector on the NT7R61AA Maintenance Panel Assembly and use DB-25M/DB-25M straight through cable between the A/B switch box connector A and the MMI terminal.

--End--

### Main Distribution Frame connections

To connect subscriber loop (tip and ring) cables to the cabinet 50-pin connectors J1 through J10, refer to [Figure 19 "Subscriber loop \(tip and ring\) connectors" \(page 112\)](#). If an expansion cabinet is also used, connect subscriber loop (tip and ring) cables to the cabinet 50-pin connectors J11 through J16.

These cables have already been connected to the MDF in the preinstallation preparation phase according to the instructions in "Cabling lines and trunks" in *Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43021-310)* () .

**Procedure 25**

**Connecting subscriber loop (tip and ring) cables to the cabinet 50-pin connectors**

Step	Action
1	Remove the locking bar from connectors designated J1 through J10.
2	Install the 50-pin connector terminating the MDF cable marked J1 and plug it into the connector at the bottom of the cabinet also designated J1.
3	Repeat step 2 for the remaining MDF cables from J2 through J10 for card slot 1 through 9.
4	If the expansion cabinet is also installed, identify the 50-pin connectors terminating the MDF cable designated J11 through J16 and plug them into their respective connectors at the bottom of the cabinet also designated J11 through J16 for card slots 10 through 15.
5	Replace the locking bar(s) in the cabinet(s) over the cable connectors.
--End--	

**Auxiliary alarm connections**

To connect the auxiliary or external alarm indicators to the NT7R60AA Carrier/Alarm Panel assembly connector, use the NT7R86AA Auxiliary Alarm Cable assembly. Follow the steps in [Procedure 26 "Connecting the auxiliary or external alarm indicators"](#) (page 110).

**Procedure 26**

**Connecting the auxiliary or external alarm indicators**

Step	Action
1	<p>Plug the NT7R86AA Auxiliary Alarm Cable assembly DB-15HD male cable connector into the DB-15HD female connector on the NT7R60AA Carrier/Alarm Panel assembly.</p> <p>The DB-15HD connector pin assignment is shown in Appendix C, <a href="#">Table 38 "NT7R60AA Carrier/Alarm Panel DB-15 HD alarm connector pin assignment for Carrier Remote IPE module"</a> (page 205).</p>

- 2 Connect the other end of the NT7R86AA Auxiliary Alarm Cable assembly bare wires to the external alarm device terminals.

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--End--

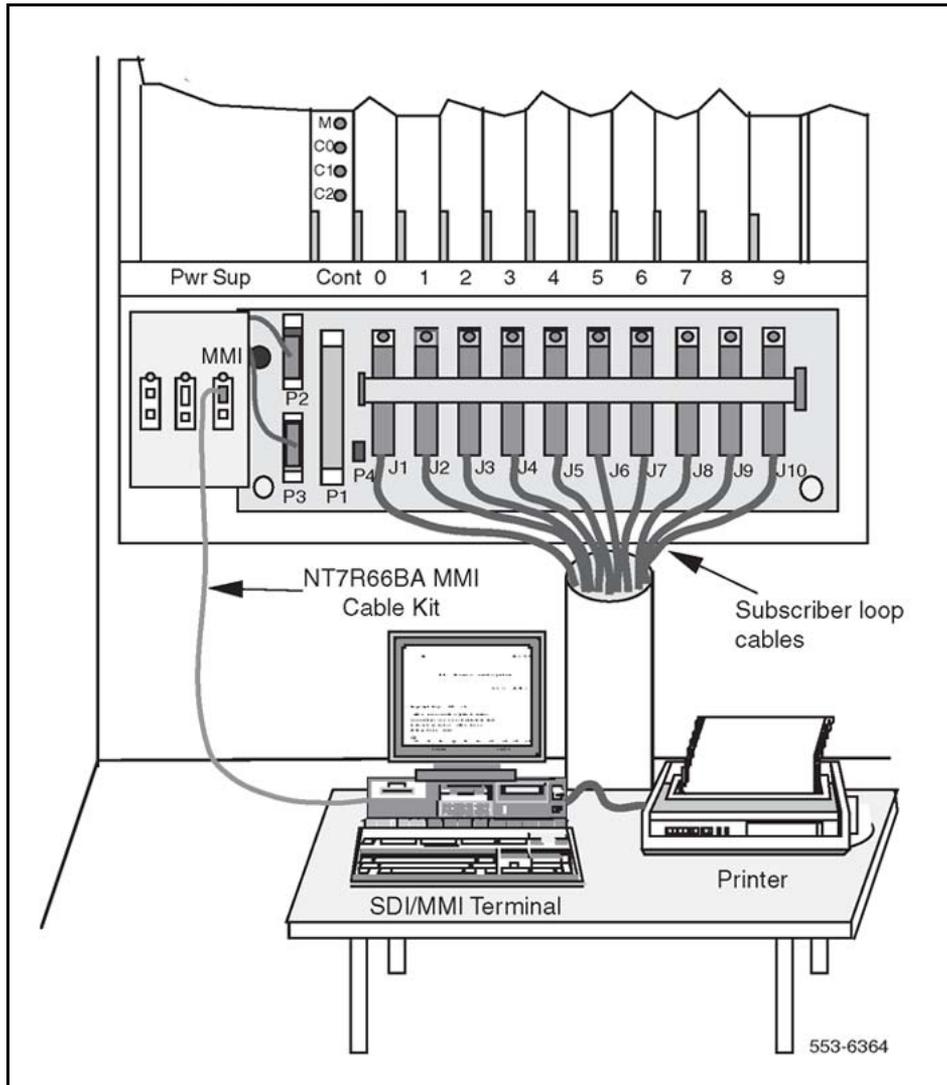
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The customer auxiliary (external) alarms 1 and 2 are input only alarms that produce CRI33n1 and CRIn2 alarm messages when activated. These should be connected across open relay contacts. No external voltage should be present across the contacts.

The customer auxiliary alarm feature can be used for any premise alarm application where an alarm condition activates a relay contact closure.

[Figure 19 "Subscriber loop \(tip and ring\) connectors" \(page 112\)](#) shows the subscriber loop (tip and ring) connectors that link line cards to the MDF and the terminal connection. It also shows the MMI terminal connection to the NT7R61AA Maintenance Panel DB-9 connector.

**Figure 19**  
**Subscriber loop (tip and ring) connectors**



### Connecting the attendant to the Carrier Remote IPE cabinet

The Carrier Remote IPE cabinet backplane contains P4, a 2-pin power connector which provides a +15 V and -15 V power source for the attendant console.

To make this connection, follow the steps in [Procedure 27](#) “Connecting the attendant to the Carrier Remote IPE cabinet” (page 113).

**Procedure 27**  
**Connecting the attendant to the Carrier Remote IPE cabinet**

Step	Action
1	Connect the attendant console power cord to P4 connector ( $\pm 15$ V power pins) on the Carrier Remote IPE cabinet backplane.
2	Install and configure the attendant console.  Refer to <i>Telephones and Consoles Fundamentals (NN43001-567)</i> ().
--End--	

**Connecting the PFTU to the Carrier Remote IPE cabinet**

In the Carrier Remote IPE cabinet option, the Power Fail Transfer Unit (PFTU) is connected as shown in [Figure 20 "Connecting the PFTU to the Carrier Remote IPE cabinet" \(page 114\)](#).

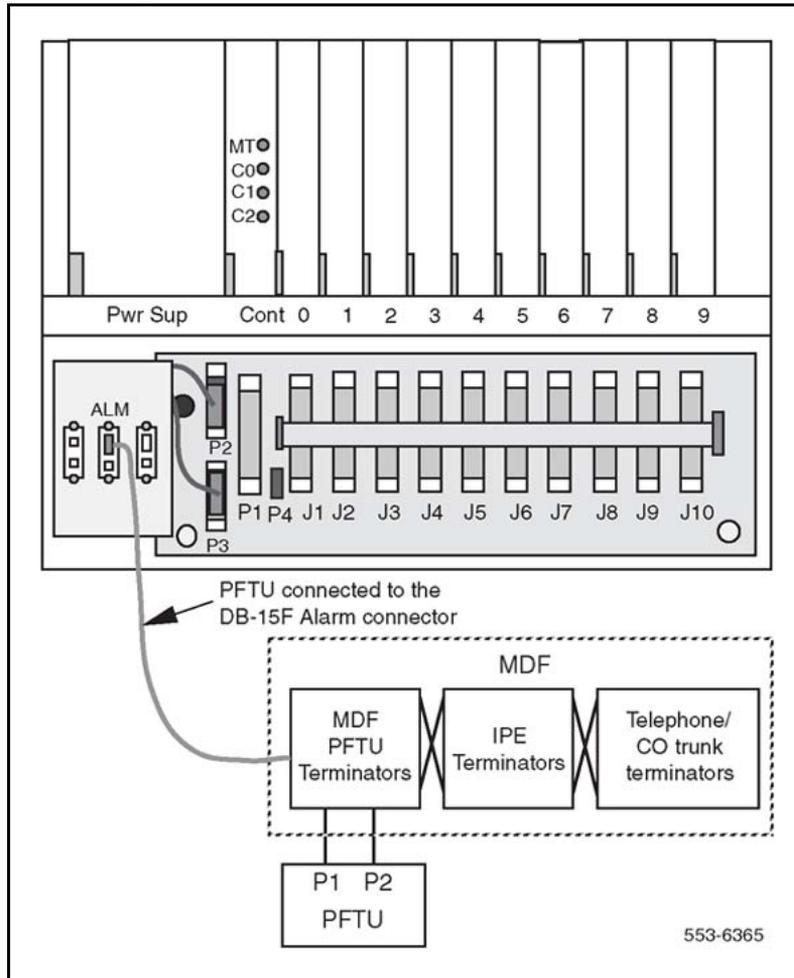
To make this connection, follow the steps in [Procedure 28 "Connecting the PFTU to the Carrier Remote IPE cabinet" \(page 113\)](#).

**Procedure 28**  
**Connecting the PFTU to the Carrier Remote IPE cabinet**

Step	Action
1	Install the PFTU near the MDF and connect it to the MDF according to the instructions in the PFTU user manual.
2	Install the NT7R86AA cable between the PFTU and the NT7R60AA Carrier/Alarm Panel assembly connector DB-15 female (Alarm) connector on the Carrier Remote IPE cabinet.  For more information on how to install the PFTU, refer to <i>Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43021-310)</i> ().
--End--	

[Figure 20 "Connecting the PFTU to the Carrier Remote IPE cabinet" \(page 114\)](#) illustrates the front view of the Carrier Remote IPE cabinet. It shows the connection of the NT7R60AA Carrier/Alarm Panel assembly DB-15 female (Alarm) connector on the Carrier Remote IPE cabinet linking the cabinet to the PFTU and the MDF.

**Figure 20**  
**Connecting the PFTU to the Carrier Remote IPE cabinet**



## Configuring the Carrier Remote IPE

The configuration and administration of the Carrier Remote IPE and the corresponding carrier equipment at the local site are identical to the standard system configuration and administration and do not require special considerations.

However, there are some initial setup functions that must be considered at the local and the remote sites. These functions are administered over a Man Machine Interface (MMI) port connected to a terminal or a TTY at the local and the remote site.

When configuring Carrier Remote IPE functions at the local and the remote sites, the following can be configured:

- Local and Remote Carrier Interface cards using Configuration Record programs LD 17 and LD 97
- Carrier parameters using the MMI commands

### Configuring the carrier interface cards

When the Carrier Remote IPE equipment is first installed, define the Local Carrier Interface and Remote Carrier Interface cards as standard NT8D04 Superloop Network and NT8D01 Peripheral Controller cards.

To do this:

- Print the current system configuration record to identify possible available superloops.
- Remove an existing superloop data block if it already exists for a non-carrier superloop.

**Note:** To remove superloop data blocks, remove all terminal numbers (TNs) associated with the peripheral controller, disable the superloop, and remove the data block associated with the peripheral controller. Data blocks of one superloop can be moved to a different superloop number using Move Data Blocks Program LD 25.

- Configure a superloop data block to correspond to the Local Carrier Interface card.
- Configure a peripheral controller data block to correspond to the Remote Carrier Interface card.

Before defining a carrier superloop, it is necessary to find available superloops in the system. To do this, logon and print system configuration data using Print Program LD 22. Refer to [“Logging in on the maintenance terminal” \(page 154\)](#) for instructions on how to log on.

**Table 15**  
**Request CFN printout**

Prompt	Response	Description
REQ	PRT	Print request
TYPE	CEQU PKG, PSWV	Configuration data

**Table 16**  
**CFN configuration data print format- find unused superloop**

CEQU		
MPED	SD/DD/4D/8D	Prints maximum peripheral density for the system (use 8D for systems with IPE)
TERM	xxx xxx xxx...	Prints all terminal loops
REMO	xxx xxx xxx...	Prints remote EPE loop numbers configured in LD 17
SUPL	xxx xxx xxx...	Lists all local Superloop Network card superloop numbers
SUPC	xxx xxx xxx	Lists all carrier remote superloops when REM_IPE 286 software package is installed
PKG		
REM_IPE	286	Software package for Carrier Remote IPE
PSWV		
XPEC:	XX	Software version number
LCRI:	XX	Software version number downloaded to Local Carrier Interface cards. A forced PSDL is initiated upon execution of the ENLL and ENXP commands (Note).

**Note:** Parameter Software Download (PSDL) ensures that the latest loadware is downloaded into the Local and Remote Carrier Interface cards. PSDL is initiated upon:

Initialization (INIT).

ENXP after power reset or the Local or Remote Interface card.

ENXP of the Remote Carrier Interface card by adding peripheral software version parameter after the Peripheral Controller ID.

ENLL of the Local Carrier Interface card by adding the PSW version parameter after the SUPC number.

To change the system configuration record and to configure the Remote Carrier Interface at the Carrier Remote IPE column or cabinet site, load Configuration Record Program LD 17 and Configuration Record Program LD 97.

**Table 17**  
**To change the system configuration record (LD 17)**

Prompt	Response	Description
REQ	CHG	Change the configuration record
TYPE	CFN	Configuration record

**Table 17**  
**To change the system configuration record (LD 17) (cont'd.)**

Prompt	Response	Description
CEQU	YES	Change equipment
MPED	8D	Peripheral density

**Table 18**  
**To configure the Remote Carrier IPE site (LD 97)**

REQ	CHG	Remote Carrier Interface definition
TYPE	XPE	Remote Peripheral Controller (RCI) ID
SUPL	0-252	Prints superloop type and number
XPEC	2	Controller ID number.
LOC	SCLARA	remote site location example. Use any six alphanumeric characters to identify the remote site.
RGTP	(8) 16	Number of concurrent ringers. Change to 16 unless ringing generator is an older type.

After defining the new Peripheral Controller (RCI), define the superloop for the Local Carrier Interface card.

**Table 19**  
**To define a carrier superloop**

Prompt	Response	Description
REQ	CHG	Adding a new Local Carrier Interface card
TYPE	SUPL	Adding a superloop for the Local Carrier Interface card.
SUPL	0–252	Superloop number
SLOT	(L) R	Superloop card side for the Local Carrier Interface card, where L (left) is default position.
SUPT	CARR	Carrier superloop type. Prompted when REM_IPE 286 software package is installed.
XPEC	1–99	Remote Carrier Interface card (Controller ID number) previously equipped. Defaults to shelf 0 segment 0-3 for SUPT = CARR

To configure the Carrier Remote IPE superloop and the Carrier Remote IPE column or cabinet site, load Configuration Record Program LD 17 and Configuration Record Program LD 97.

**Table 20**  
**Configuring the SDI port for the Local Carrier Interface card connection (LD 17)**

REQ	CHG	Change the SDI record
TYPE	CFN	Configuration record
IOTB	YES	
HIST		I/O terminal history file buffer length
ADAN	NEW TTY 0–15	Add, change, or remove an I/O device, type aaa, or port x
USER	BUG MTC SCH	Enter one of the output message types that will be the message of this port
XSM	(NO)	SDI port for the system monitor

To enable the superloop for the Local Carrier Interface card and the Remote Carrier Interface card, load Maintenance and Diagnostic Program LD 32 and execute the **ENLL x** command.

**Table 21**  
**To enable the carrier superloop x**

Command	Response	Description
ENLL x	ok & prompt	Enables specified superloop x

To remove the configuration of the Remote IPE superloop, load Maintenance and Diagnostic Program LD 32 and execute the **DISL x** command to disable the superloop, and then load Configuration Record Program LD 97 to delete the configuration records of the superloop for the Local Carrier Interface card and the Remote Carrier Interface card.

**Table 22**  
**To delete the configuration record for the carrier superloop**

Prompt	Response	Description
REQ	CHG	Deleting the Local Carrier Interface card configuration record
TYPE	SUPL	Carrier superloop
SUPL	X8	Remove record for superloop number 8

**Table 23**  
**To delete the configuration record for the Carrier Remote IPE module (shelf)**

REQ	CHG	Change configuration record
TYPE	XPE	Remote Carrier IPE
XPEC	X2	Delete configuration record for peripheral controller 2, i.e., the Remote Carrier Interface card

To check the carrier status, loading the LD 32 and executing the **STAT** <SUPC>, where <SUPC> is the Local Carrier Interface superloop number. For additional examples of carrier status, refer to the Maintenance section, [Procedure 43 "Checking the carrier performance status" \(page 176\)](#)

**LD 32**  
**NPR000**  
**STAT sl**

CARR	CALS	TTSA	NND	SPARED
0	0	21/21	NO	NOT SPARED
1	0	21/21	NO	NOT SPARED
2	0	N/A	N/A	AVAIL

Parameter description:

CARR—Carriers 0, 1, and 2 (carrier 0 has priority over carrier 1 when sparing carrier links)

CALS—Carrier Alarm Status (0 indicates Alarm Level 0 indicates no alarm)

TTSA—Timeslots currently available for voice and data (n/21 for T1 and n/27 for E1)

NND—Indicates if No New Data is disallowed (NO = not disallowed)

SPARED Indicates if a carrier is spared (in the example none are spared) and N/A indicates that carrier 2 is primary not spare

### Configuring the remote MMI terminal port

The MMI port can be configured in the SDI or the MMI mode. When the MMI terminal is in the SDI mode, you can perform system administration tasks from the local or the remote site. When the MMI terminal is in the MMI mode you can:

- perform carrier functions such as display status, logs, performance information, history, and messages
- enable or disable alarms
- clear errors and logs
- set performance parameters
- specify tests

### MMI mode

In the MMI mode, a terminal or TTY is connected to the local MMI port at the Local Carrier Interface card and another terminal or TTY is connected to the MMI port at the Carrier Remote IPE as described in *Installing SDI and TTY cables* in this chapter. Each terminal controls the local MMI functions of the card it is connected to and some display functions at the distant site.

The default MMI interface characteristics are set in the Local and Remote Carrier Interface card EEPROM as follows:

- Speed: 2400 bps (speed is an exception, it is selected using DIP SW1 position 1 where OFF = 2400 bps and ON = 1200 bps)
- Character width: 7
- Parity bit: mark
- Stop bit: 1

The MMI mode is accessed from the initial (INIT) mode by entering **L** on the MMI terminal or TTY to log in. For multiple Local Carrier Interface cards connected in a daisy-chain, to log in to the specified Local Carrier Interface card, enter **L <sl>**, where **sl** is the address and the superloop number of the specified superloop, as shown in and .

Password is **M1LINK**

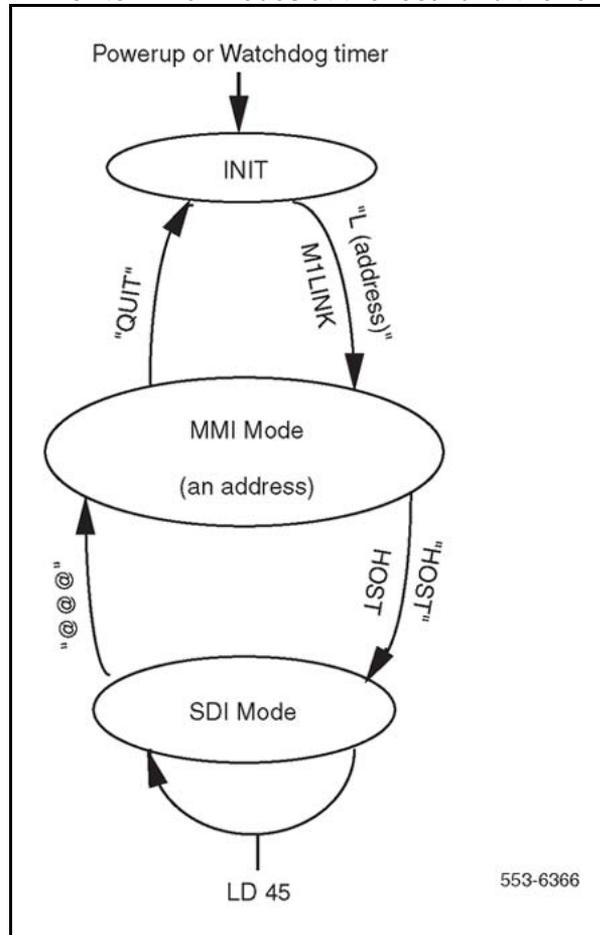
The MMI command line prompt in the initial mode is: **CRI>**, but after logging in, the prompt changes to: **CRI::>**

The prompt in a Maint/SDI daisy-chain configuration is **CRI: nnn>**, where nnn is the address of the LCI in the chain.

To exit the MMI mode and return to the INIT mode, enter **q** at the terminal or TTY.

shows modes that a terminal or a TTY can be in and paths taken to transition from one mode to the next. The three modes are Initial, MMI, and SDI. The words in quotation marks shown along the paths must be entered on the terminal to go from one mode to the next.

**Figure 21**  
TTY or terminal modes at the local and the remote sites



**Host SDI mode**

In the Host SDI mode, a terminal is connected to the MMI port at the Carrier Remote IPE. This terminal becomes the local maintenance and service change TTY. At the local site, the Local Carrier Interface card connects to the MMI port and to an SDI port of an SDI card.

For the MMI port at the Remote Carrier Interface card to be able to communicate over the SDI port connected to the Local Carrier Interface card, the interface characteristics must be the same:

- Speed: 2400 bps or 1200 bps (Set by SW1 position 1)
- Character width: 7 bits
- Parity bit: mark
- Stop bit: 1

In this mode, the remote TTY or terminal becomes a local system TTY that can access overlays and perform system configuration, maintenance, and diagnostics, which are the same functions performed by the local system TTY.

To log into the host for SDI operation, first log in using the MMI terminal in the MMI mode, then log into the terminal as host:

CRI>L	Login command
CRI::>	Prompt after logging in
Enter Password > M1LINK	Type in the password.
CRI::> Ho	To access the Host SDI mode
Enter Password > HOST	Enter the password HOST

The Host SDI mode is accessed from the MMI mode by entering **HOST** at the terminal or TTY. In this mode, the entire local system can be configured and maintained. shows that, for example, LD 45 can be activated to perform loopback testing.

To exit this mode, enter

@@@

### Configuring the carriers

To configure the Carrier Remote IPE using the MMI terminal, you must logon, enter the password, and use appropriate MMI commands.

**Note:** The commands are not case sensitive (upper or lower case letters can be used). The exception is the password, which must always be entered in upper case.

### Default factory carrier configuration

Carrier 0 equipped  
Carrier 1 equipped  
Carrier 2 equipped (not a spare)  
Alarms enabled (automatic clearing of Carrier Alarm Indication)

Before configuring the Carrier Remote IPE, check the current (default) configuration and determine whether the communication is established with the distant end. The S A and the S C commands affect the distant end automatically only when the distant end is communicating.

To display the configuration parameters, execute the D C command on the MMI terminal. This is an example of what the MMI terminal might display:

```
CRI : :> D C
CRI Remote IPE S/N L1105-A4 Software Version 1.00 8/17/95 10:48

Local Site

Alarm Enabled: YES Self Clearing Enabled: YES

Sparing Enabled/Disabled: Enabled

All Link Maps Normal

Alarm Level 1 Threshold Value E-6 Threshold Duration (in seconds) 1
Alarm Level 2 Threshold Value E-5 Threshold Duration (in seconds) 1
Alarm Level 3 Threshold Value E-4 Threshold Duration (in seconds) 1
Frame Slip Alarm Level Threshold 100 Threshold Duration (in hours) 2

Current DIP Switch S1 Settings (s1-s8) OFF OFF ON ON OFF ON ON
OFF

Current DIP Switch S11 Settings (s1-s8) OFF OFF OFF ON ON OFF OFF
OFF
```

Unless there is a particular reason to change the default parameters, leave them unchanged.

Execute the **D C D** command for the distant site and compare the configuration settings at the local and the remote sites. If able to obtain the distant configuration report and they are both configured correctly, the MicroLink is up and the communication is established.

To also verify that the communication is established, display the status at each end of the carrier by executing the **D S** and **D S D** commands on the MMI terminal. If MicroLink is up (carrier is good end-to-end), the communication across the link is established.

**To display local carrier status:**

<b>CRI:: &gt; D S</b>	Display carrier status
CRI Remote IPE S/W L1105-A4 Software Version 1.00 8/11/95 10:45	
Local Site	Status at the local site
In Alarm Status: NO	No alarms detected
All Link Maps Normal	No link has been spared
Link 0 Alarm Level 0	Carrier 0 status
Link 1 Alarm Level 0	Carrier 1 status
Link 2 Alarm Level 0	Carrier 2 status

**To display remote carrier status:**

<b>CRI:: &gt; D S D</b>	Display distant carrier status
Distant End Ready	Distant end acknowledged
D S	Command received
CRI Remote IPE S/W R1105-B6 Software Version 1.00 8/11/95 10:45	
Remote Site	Status at the remote site
In Alarm Status: NO	No alarms detected
All Link Maps Normal	No link has been spared
Link 0 Alarm Level 0	Carrier 0 status
Link 1 Alarm Level 0	Carrier 1 status
Link 2 Alarm Level 0	Carrier 2 status

lists MMI commands used to display and configure carrier parameters such as setting alarm thresholds, setting time and date, configuring carrier links, connecting to the SDI port, and testing the carriers and interfaces to the carrier link.

**Table 24**  
**MMI commands used in setting the carrier parameters**

Command	Description
D C	Display configuration. Displays current configuration of the Local and Remote Carrier Interface cards.
D C D	Display configuration distant. Displays current configuration of distant Local and Remote Carrier Interface cards.
D S	Display status. Displays near-end carrier status.
D S D	Display status distant. Displays far-end carrier status.
L	Log into the MMI terminal when the system has one Local Carrier Interface card. The password is M1LINK.
L sl	Log into a specific superloop when the system has more than one Local Carrier Interface card daisy-chained in the network module. Refer to to see the path L (address). The password is M1LINK.
S A	Set carrier alarm threshold and duration parameters
S T	Set time or verify current time
S D	Set date or verify current date
S C	Set configuration
S N	Set site name and superloop
HOST or HO	Terminal in Host SDI mode. The password is HOST.
@ @ @	Terminates the Host SDI connection
T	Specifies a test from 1 to 5 to be run on the equipment
Q	Logs the terminal user out

**To configure the carriers and specify carrier 2 as a spare carrier:**

<b>CRI &gt; L</b>	To login to the MMI terminal
Enter Password > <b>M1LINK</b>	Password is <b>M1LINK</b>
<b>CRI:: &gt;</b>	Prompt requesting an MMI command
<b>CRI:: &gt; S C</b>	To set carrier parameters
Equipped carrier 0 (Yes or No) Y	Enable carrier 0. Enter Y to enable or N to disable.

Equipped carrier 1 (Yes or No) Y	Enable carrier 1.
Equipped carrier 2 (Yes or No) Y	To enable carrier 2
Enable #2 for Spare (Yes or No) Y	Defines carrier 2 as spare
Enable self clearing Alarms (Yes or No) Y	To enable/disable alarm clearing

**To configure the carrier alarm thresholds.** Defaults threshold values are set in the factory and should not be changed unless there is a good reason for doing so:

CRI:: >	Prompt requesting an MMI command
CRI:: > S A	To set carrier alarm parameters

Alarm 1 Threshold: Current value E-6 New value E-6  
Threshold Duration (in seconds) Min – 1 Max – 3600 Current value 1  
Alarm 2 Threshold: Current value E-5 New value E-5

Threshold Duration (in seconds) Min – 1 Max – 2148 Current value 1  
Alarm 3 Threshold: Current value E-4 New value E-4  
Threshold Duration (in seconds) Min – 1 Max – 218 Current value 1  
Frame Slip Threshold (Min – 1 Max – 255) Current Value 255  
Frame Slip Threshold Duration (in Hours) Min – 1 Max – 24 Current Value 1

**Note:** Threshold Duration parameter for BER thresholds should not be longer than 10 seconds to allow fast recovery of a faulty carrier when the bit error rate improves. For example, if the duration is set to one hour, a faulty carrier that starts operating correctly will wait one 1 hour before the alarm condition is cleared and the carrier becomes available for traffic again.

Parameter values explanation:

**Alarm 0** – No alarm, the carrier is operating without bit errors and without excessive out of frame. If carrier was previously spared it is automatically unspared.

**Alarm 1** – The alarm indicates a low bit error rate (BER maintenance threshold). The transmission continues without trying to spare this link. Carrier maintenance should be scheduled. The alarm LED comes ON.

**Alarm 2** – Bit error rate is high and the carrier is automatically spared if the spare carrier is available (BER No New Data Calls). Otherwise, the carrier continues to operate normally for voice calls but no new data calls are allowed on this carrier.

**Alarm 3** – Very high bit error rate (OOS: BER, LOF, LOS, Blue Alarm, Excessive Frame Slip). If the spare carrier is available, this faulty carrier will be spared. Otherwise, the carrier is placed out of service and all calls on this carrier are disconnected.

**Alarm Threshold** – Number of bipolar violation. E-6 represents  $10^{-6}$  or 1 error in 1 million bits, E-5 represents  $10^{-5}$  or 1 error in 100,000 bits, and E-4 represents  $10^{-4}$  or 1 error in 10,000 bits.

**Threshold duration** – Carrier signal monitoring duration (1 second to 3600 seconds) to detect bipolar violation errors. The error counter is updated every second for the length of the threshold duration.

**Frame Slip Threshold** – Number of controlled carrier frame slips allowed in a given time duration. Preferred threshold is 255.

**Frame Slip Threshold duration** – Carrier frame synchronization monitoring duration (1 hour to 24 hours) to detect the number of frame slips specified by the Frame Slip Threshold. Preferred duration is 1 hour.

The fewer the bipolar violations and/or frame slips, the better the carrier link performance. Based on the frequency of errors and frame slips, the specified thresholds determine the occurrence of Alarm 1, Alarm 2, and Alarm 3.

#### *Alarm Disable command*

If the Maintenance LED comes ON and stays ON, a possible cause can be that the Alarm Disable (A D) command has been executed, which causes this condition.

#### **To configure time and date:**

CRI:: >	Prompt requesting an MMI command
CRI::> S T	To set time
Current Time 10:06:14 10:15:25 Current Time 10:15:25	Enter correct time at the cursor, if required.
CRI::> S D	To set date

Current Date 8/10/95 18/11/95	Enter correct date at the cursor, if required.
Current Date 8/11/95	
CRI : : > S N	Set site name
Change Site Name (Yes or No) Y	Change name or add name if not previously entered.
Enter Site Name SFO	

**Note:** Time and date should be configured correctly to allow correlation of the Carrier Remote Interface Alarm Log with error messages in the local system History File.

### Verifying carrier link connections at the remote site

When all the carriers are connected and equipped, all carrier alarm LEDs might be turned OFF and the signaling across the link works even though there might be a mismatch in carrier link connection between the local and remote ends. However, the voice and data connections might not work due to the scrambling of the time slots, which are assigned to specific carriers and cannot be used by other carriers. Carrier Test 1 might not show any errors under these conditions.

**Note:** All carriers show Out of Frame alarm if the Local Carrier Interface card faceplate ENB/DIS switch is set to DIS. Carrier clocking is enabled when the switch is set to ENB. Carrier alarms can clear even while the Local Carrier Interface card is not software enabled when the switch is set to ENB.

All equipped carriers have been previously connected and configured at the local site and the carrier circuit ID recorded for each link 0-2. All carrier facilities (carrier links) should have been installed and tested by the carrier network provider up to the demarcation point at both ends.

To insure that all equipped carrier links are connected to their corresponding I/O panel connectors at the remote site, identify, test, and tag each carrier link individually as described in .

#### Procedure 29 Identifying, testing, and tagging carrier links

Step	Action
1	<p>Configure all equipped carrier links by executing the s c (Set Configuration) command.</p> <p>Any unused carrier links must be configured as "unequipped" to prevent the carrier alarm LED from being constantly ON. Configure carrier #2 as spare or primary (not spare). Default</p>

parameters should not be changed unless you have a good reason for changing them.

Execute the `D C` (Display Configuration) command to verify the configuration.

- 2 Identify the circuit ID for carrier #0 at the carrier network demarcation point and connect the corresponding patch cable to the I/O panel connector (8-pin modular jack) for carrier #0.
- 3 Observe the carrier alarm LEDs on the faceplate of the Remote Carrier Interface card.

Initially carrier alarm LEDs for all equipped carrier links should be ON due to Loss-of-Signal. The LED for carrier #0 should be turned OFF approximately 10 seconds after the patch cable for the selected carrier #0 is plugged into the Remote Carrier Interface card I/O panel connector for carrier #0.

If a good quality signal is received by both the Remote Carrier Interface card and the Local Carrier Interface card on carrier #0, the link is installed in the appropriate I/O panel connectors at both ends. If the connection is mismatched (carrier #0 at one end connects to carrier #1 or #2 connectors at the other end), the alarm LED remains ON.

The LED also remains ON if there is a carrier alarm on the Remote Carrier Interface card (near end); however, the LED is turned OFF if there is no carrier alarm on the Remote Carrier Interface card (near end) and communication cannot be established across the link due to alarm on the Local Carrier Interface card (distant end).

Distant end carrier alarms cause the near end LED to turn ON only if the Remote Carrier Interface card and Local Carrier Interface card can communicate.

- 4 Test the carrier 0 link by executing the carrier status commands (`D S`- display carrier status and `D S D`-display carrier status distant) using the MMI terminal.
 

Compare the carrier status on both the Remote Carrier Interface card (near end) and the Local Carrier Interface card (far end). Refer to ["Configuring the carriers" \(page 122\)](#) to see the displays of these two MMI commands. There are four possible conditions:

  - a If the LED for carrier #0 is OFF and the Remote Carrier Interface card and Local Carrier Interface card have establish signaling communication, both ends will show "No Alarm" for carrier #0 and "Loss of Signal" for carrier #1 and carrier #2. No mismatch.
  - b If the LED for carrier #0 stays ON due to a mismatch, the Local Carrier Interface card (far end) will show "Loss of Signal" for carrier #0 and "No Alarm" for carrier #1 and carrier #2.

- c If the LED for carrier #0 stays ON due to a carrier alarm condition on the Remote Carrier Interface card (near end), the `D S` command will show the type of carrier alarm on carrier #0, and the `D S D` command cannot retrieve the far end status.
  - d If the LED for carrier #0 Remote Carrier Interface card (near end) is OFF but the Remote Carrier Interface card and the Local Carrier Interface card cannot establish communication due to a carrier alarm condition on the Local Carrier Interface card (far end), the `D S` command shows "No Alarm" on the carrier #0 on the Remote Carrier Interface card (near end). The `D S D` command cannot retrieve the far end status.
- 5 Disconnect the patch cable from the I/O panel connector for the carrier #0 that was just tested.
- Repeat steps 1 through 5 for carrier #1 and carrier #2, as equipped, before proceeding to step 6.
- 6 Any carrier faults must be isolated and corrected. In case of mismatched carriers, the patch cables must be traced to the demarcation point at each end, and the carrier circuit IDs verified at both ends to determine which end of the carrier has been miswired or incorrectly identified.
- 7 After all carriers have been identified and labeled at the I/O panel connectors, they should all be plugged into the proper I/O panel connectors for the Remote Carrier Interface card and tested individually using the MMI Carrier Test 3 (Remote Loopback).
- Refer to [Procedure 45 "Testing the carriers" \(page 180\)](#).

---

--End--

---

The carrier links are now connected correctly. This is further established during acceptance testing when the actual calls are made to verify the voice and data transmission across the carrier links.

### **Display current carrier equipment configuration**

Before concluding the installation and configuration of the Carrier Remote IPE, re-verify the configuration parameters and make sure that they are set properly.

To display the configuration parameters, execute the `D C` command on the MMI terminal. This is an example of what the MMI terminal may display:

```
CRI : :> D C
```

```
CRI Remote IPE S/N L1105-A4 Software Version 1.00 8/17/95 10:48
```

```
Local Site (Note)
```

Alarm Enabled: YES Self Clearing Enabled: YES

Sparing Enabled/Disabled: Enabled

All Link Maps Normal

Alarm Level 1 Threshold Value E-6 Threshold Duration (in seconds) 1

Alarm Level 2 Threshold Value E-5 Threshold Duration (in seconds) 1

Alarm Level 3 Threshold Value E-4 Threshold Duration (in seconds) 1

Frame Slip Alarm Level Threshold 100 Threshold Duration (in hours) 2

Current DIP Switch S1 Settings (s1-s8) OFF OFF ON ON OFF ON ON  
OFF

Current DIP Switch S11 Settings (s1-s8) OFF OFF OFF ON ON OFF OFF  
OFF

**Note:** When the `D C` command is executed for the Carrier Remote IPE cabinet at the remote site, it displays "XSM Emulation Active".

Parameter values explanation:

**Alarm Enabled**—Alarm monitoring and logging is enabled. CRI messages are enabled.

**Self Clearing Enabled**—The alarm indicators (LED and external contact closure) will automatically clear when the operational alarm level is cleared.

**Sparing Enabled/Disabled**—Carrier 2 is enabled or disabled as a spare carrier.

**All Link Maps are Normal**—No link has been spared. This is always the case when carrier 2 is configured as a primary carrier link.

**Alarm Threshold**—Number of bipolar violations. E-6 represents  $10^{-6}$  or 1 error in 1 million bits, E-5 represents  $10^{-5}$  or 1 error in 100,000 bits, and E-4 represents  $10^{-4}$  or 1 error in 10,000 bits.

**Threshold duration**—Carrier signal monitoring duration (1 second to 3600 seconds) to detect bit error rate (CRC and BIPV) exceeding threshold. The error counter is updated every second for the length of the threshold duration.

**Frame Slip Threshold**—Number of carrier frame slips allowed in a given time duration.

**Frame Slip Threshold Duration**—Carrier frame synchronization monitoring duration (1 hour to 24 hours) to detect the number of frame slips specified by the Frame Slip Threshold.

**Current DIP Switch S1 and S11 Settings**—Shows the setting of switch positions 1 through 8 for both SW1 and SW11 of the Local Carrier Interface card if you are displaying the local site or SW1 and SW11 of the Remote Carrier Interface card if you are displaying the remote site.

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# Carrier Remote IPE acceptance testing

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## Contents

This section contains information on the following topics:

[“Introduction” \(page 133\)](#)

[“Overview” \(page 133\)](#)

[“Checking the system” \(page 134\)](#)

[“Setting up test conditions” \(page 135\)](#)

[“Performing acceptance testing” \(page 135\)](#)

## Introduction

This section describes Carrier Remote IPE functional testing to verify that functions and features associated with the Carrier Remote IPE are operating correctly.

## Overview

Acceptance testing is conducted after the system has been installed, is powered up, and appears to be functioning correctly; that is, all LEDs, displays, and system messages indicate that the system is operating correctly. The Carrier Remote IPE acceptance testing should be conducted after:

- a previously installed system is upgraded with Carrier Remote IPE equipment with REM\_IPE 286 carrier software or higher and operates correctly without Carrier Remote IPE equipment
- a newly installed system with Carrier Remote IPE equipment using REM\_IPE 286 carrier software or higher appears to operate correctly

Acceptance testing verifies the operation of system functions and features at the remote site equipped with the Carrier Remote IPE.

Acceptance testing consists of:

- checking the system
- preparing the system for testing
- testing system functions at the Carrier Remote IPE site

## Checking the system

After Carrier Remote IPE equipment has been installed, carrier connections verified, and configured, visually inspect Carrier Remote IPE cards to make sure they are operating correctly by observing their LEDs. To inspect Carrier Remote IPE cards, follow the steps in [Procedure 30 “Inspecting the Carrier Remote IPE cards” \(page 134\)](#).

### Procedure 30 Inspecting the Carrier Remote IPE cards

Step	Action
1	<p>Execute the <code>D S</code> and <code>D S D</code> commands to check carrier alarm levels for each carrier at both the local and remote site.</p> <p>If all alarm levels are 0 at both ends, carrier links are operating correctly.</p>
2	<p>Check the card LED located at the top of the Local Carrier Interface card faceplate.</p> <p>If the card LED on the Local Carrier Interface card is off, the card is operating correctly. If the card LED is on, the card is disabled or faulty. To enable the Local Carrier Interface card or to correct a problem, refer to <a href="#">“Carrier Remote IPE fault isolation and correction” (page 160)</a>.</p>
3	<p>Check carrier LEDs on the Local Carrier Interface card faceplate.</p> <p>If all LEDs are off, carriers are operating correctly. If one or more carrier LEDs are on, one or more carriers are faulty. If the amber LED is on, the card is in the maintenance state.</p>
4	<p>Check the card LED located at the top of the Remote Carrier Interface card faceplate.</p> <p>If the card LED on the Remote Carrier Interface card is off, the card is enabled and operating correctly. If the card LED is on, the card is disabled or faulty. To enable the Remote Carrier Interface card or to correct a problem, refer to <a href="#">“Carrier Remote IPE fault isolation and correction” (page 160)</a>.</p>
5	<p>Check carrier LEDs on the Remote Carrier Interface card faceplate.</p> <p>If all LEDs are off, carriers are operating correctly. If one or more carrier LEDs are on, one or more carriers are faulty. If the amber LED is on, the card is in the maintenance state.</p>

- 6 Check the hexadecimal display on the Remote Carrier Interface card.
- Refer to “[System messages](#)” (page 187) to identify hexadecimal codes displayed by the Remote Carrier Interface card during self-test.

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--End--

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If the display and all indicator LEDs on Carrier Remote IPE equipment indicate good operating condition, the equipment is functional and you can proceed with setting up the necessary equipment for acceptance testing.

## Setting up test conditions

To conduct acceptance testing, it is necessary to have a setup that can verify basic system functions and features initiated and terminated at the Carrier Remote IPE site. It may be possible to use the system as configured at the site according to the customer requirements and not have to modify the configuration to perform the acceptance testing.

Configure carrier links with a spare link so that the transfer of traffic from a primary link to the spare link can be tested.

To conduct the acceptance testing, make sure that each Carrier Remote IPE line card has at least one telephone connected to one of its subscriber loops. If possible, use several analog (500/2500-type) telephones to check the ringing generator and the DTMF operation. Also, make sure that a terminal is connected to the MMI port.

If there are Carrier Remote IPE main and expansion cabinets, install at least one line card in test card slots 0, 9, 10, and 15 of cabinets. Connect at least one telephone to each line card subscriber loop.

## Performing acceptance testing

Since functions and features at the Carrier Remote IPE site are identical to functions and features at the local system site, the main purpose of acceptance testing is to verify that the carrier equipment and the carrier links are functioning correctly. This can be accomplished by:

- performing basic voice calls
- using the MMI terminal to configure and maintain Carrier Remote IPE equipment
- checking the protection switching of carrier links when configured with one spare carrier link

## Voice calls

A voice call can be established between two voice terminals across a network, between two terminals on the same PBX, and even between two terminals on the same line card.

Acceptance testing of Carrier Remote IPE voice calls is conducted when testing the following basic system features supported by telephones connected to subscriber loops at the remote site:

- placing a call to the remote site
- placing a call in call hold/call retrieve

### Placing a call to the remote site

From the local system site, place a call to a Carrier Remote IPE site by dialing a remote station directory number (extension number).

**Note:** The system treats Carrier Remote IPE subscriber loops as local loops, so it is necessary to dial only the extension number to access that station.

To perform a call test, follow the steps in [Procedure 31 “Performing a call test”](#) (page 136).

#### Procedure 31 Performing a call test

Step	Action
1	From a telephone at the local system site, dial a telephone at the Carrier Remote IPE site and establish an active call connection.
2	Verify that voice transmission is established by talking with the person at the other telephone. Make sure the speech is clear in both directions.
3	Maintain the connection and ask the person at the remote site to test some basic calling features such as call hold/call retrieve.
4	Terminate the call.

--End--

### Call hold/call retrieve

Call hold is used to place an active call on hold in order to answer an incoming call or place an outgoing call. After releasing an incoming or an outgoing call, the call on hold can be retrieved. For the Carrier Remote

IPE main and expansion cabinets, establish calls from stations connected to the subscriber loops in the main and the expansion cabinets to verify the intercabinet cable connection.

To perform a call hold/call retrieve test, follow the steps in [Procedure 32 "Performing a call hold/call retrieve test"](#) (page 137).

**Procedure 32**  
**Performing a call hold/call retrieve test**

Step	Action
1	From a telephone at the local system site, dial a telephone at the Carrier Remote IPE site and establish an active call connection.
2	Verify that voice transmission is established by talking with the person at the other telephone.
3	Press the Hold key at the remote site to place the active call on hold.
	<b>Note:</b> To find out how to use the feature keys on different telephones, consult the user manual that is supplied with the telephone.
4	Place an outgoing call from the telephone at the remote site by dialing an idle telephone located at the local system site.
5	Complete this outgoing call by first checking the voice clarity in both directions and then hang up.
6	Have another telephone call you while the first call is still on hold.
7	Answer the incoming call and place it on hold.
8	Retrieve the call first held.
9	Complete the call and hang up.
10	Retrieve the second call on hold.
11	Complete the call and hang up.
12	Repeat this test for telephones connected to different subscriber loops on the same card and different subscriber loops on different line cards in the Carrier Remote IPE module or cabinet.
	Making these calls generates traffic, which will be shown in the traffic report.

--End--

**Data calls**

Use only one carrier link between the local and the remote sites. To verify that a call connection supports data calls and that when a carrier link is in Alarm Level 2 no new data calls will be allowed, follow the steps in [Procedure 33 "Testing data calls" \(page 138\)](#):

**Procedure 33  
Testing data calls**

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<b>Step</b>	<b>Action</b>
<b>1</b>	From a computer or a data terminal at the remote site, access a data terminal or computer at the local site.  Alternatively, from a computer or a data terminal at the local site, access a data terminal or computer at the remote site.
<b>2</b>	Transmit and receive data files in both directions.
<b>3</b>	Open a transmitted file to verify its integrity.
<b>4</b>	Use the BERT set to insert bit errors into the carrier link transmitting data so it exceeds Alarm Level 2 threshold.  Since the sparing feature is not available, the carrier continues to operate in Alarm Level 2 condition.
<b>5</b>	From a different data terminal, attempt to establish a data call to a computer or data terminal at the opposite side of the link.  The connection is not established and the No New Data (NND) parameter on the display shows YES (yes no new data) for the carrier used, when the <b>STAT</b> command in LD 32 is executed.
<b>6</b>	Remove the BERT set from the carrier link and retry the data call connection.  Wait a few minutes or use the MMI command <b>C A</b> before retrying so that the carrier bit error monitor determines that the cause of bit errors is no longer present. The data call is now established because the bit error source has been removed and the Alarm Level is back to 0.
<b>7</b>	Verify the integrity of this data connection by checking the transmitted files.
<b>8</b>	Disconnect the data calls.

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--End--

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## Checking the MMI terminal operation

Connect an MMI terminal to the Local Carrier Interface card at the local site and another MMI terminal at the Carrier Remote IPE site. To check the MMI terminal operation, follow the steps in [Procedure 34 "Checking the MMI terminal operation"](#) (page 139).

### Procedure 34 Checking the MMI terminal operation

Step	Action
1	Set the current mode of the MMI terminal to the MMI mode by executing the <code>L &lt;address&gt;</code> command on the MMI terminal at the local system site.  The Password is: <code>MLINK</code> .
2	Check the status of the Local Carrier Interface card by executing the <code>D S [P]</code> command.
3	Check the status of the Remote Carrier Interface card by executing the <code>D S D [P]</code> command.  This command is sent over the carrier link to the Remote Carrier Interface card for execution.
4	Check the log file content by executing the <code>D L [P]</code> command to display log messages from the file starting with the oldest message.  Examine the messages.
--End--	

## Checking carrier link protection switching

To verify that the carrier link protection switching is operating correctly, conduct the following tests with carrier links:

- forced carrier failure (disconnect carrier link at the I/O panel)
- forced switchover

**Note:** This test can be conducted only when carrier 2 is configured as a spare carrier link.

If both carrier 0 and carrier 1 are faulty, carrier 0 will always have sparring priority over carrier 1.

### Forced carrier failure and switchover

To test forced carrier failure and switchover, follow the steps in [Procedure 35 "Testing Forced carrier failure and switchover"](#) (page 140).

**Procedure 35**  
**Testing Forced carrier failure and switchover**

<b>Step</b>	<b>Action</b>
1	<p>Check the status of all three links by executing the <code>D S [P]</code> command from the MMI terminal.</p> <p>Make sure that the two primary and the spare links are functional without an alarm condition.</p>
2	<p>Establish a call from the Carrier Remote IPE to the local system site over carrier link 1.</p> <p>Refer to “Voice calls” (page 136) to establish the call.</p>
3	<p>Manually disable carrier link 1 by unplugging the link at the I/O panel.</p> <p>The call is transferred to carrier link 2 (spare).</p> <p>The call should continue to be established.</p>
4	<p>Manually disable carrier link 0 by unplugging the carrier cable at the I/O panel.</p> <p>The spare link 2 should release carrier link 1 and spare carrier link 0.</p> <p><b>Note:</b> Carrier 0 has sparing priority over carrier link 1; therefore, when carrier 0 was disabled, the spare carrier 2 terminated carrier 1 sparing and established sparing of carrier 0.</p>
5	<p>Verify that the call is no longer established over the spare link (link 2), since the call was established over carrier 1, which has been dropped and is no longer spared.</p> <p>Execute the <code>STAT</code> command in LD 32 to show the sparing status.</p>
6	<p>Reconnect carrier link 0.</p> <p>As soon as carrier link 0 recovers and becomes operational, the spare carrier 2 automatically spares carrier 1.</p>
7	<p>Reestablish the call over carrier link 1, which is now spared over carrier link 2.</p>
8	<p>Check and make sure that the call is established.</p>
9	<p>Reconnect carrier link 1 and wait until carrier 1 has reestablished communication.</p> <p>The established calls should continue to be connected over the carrier link 1.</p>

- 10 Disconnect the call by hanging up the receiver on the telephone.

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--End--

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### **Removing the test setup**

After acceptance testing has been completed and the results show that the system is operating correctly, remove the setup used to conduct the testing and restore equipment according to the customer configuration.

If the actual customer configuration was used to perform these tests, it is not necessary to change or remove the setup.

### **Generating traffic reports**

Use system traffic reports to identify calls made during acceptance testing to and from the Carrier Remote IPE site.

The system traffic network loop report TFS001 provides statistics on the number of timeslots used by each loop and the traffic over these loops as measured in CCS (hundred call-seconds).

For more information on traffic reports, refer to the Traffic control program LD 02 in *Software Input Output Administration (NN43001-611)* ().



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# Carrier Remote IPE maintenance

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## Contents

This section contains information on the following topics:

“Introduction” (page 143)

“Maintenance overview” (page 143)

“Diagnostic tools” (page 144)

“Using system maintenance programs” (page 154)

“Isolating and correcting faults” (page 157)

“System fault isolation and correction” (page 158)

“Carrier Remote IPE fault isolation and correction” (page 160)

“Replacing Carrier Remote IPE cards” (page 181)

## Introduction

This section describes system maintenance tools and procedures to guide you in identifying Carrier Remote IPE faults, locating defective equipment, correcting problems by fixing or replacing defective equipment, and verifying the operation of Carrier Remote IPE after corrections or replacements have been made.

## Maintenance overview

Carrier Remote IPE maintenance deals with two types of problems:

- installation
- operation

Installation problems are created during the installation of an entire system with the Carrier Remote IPE or during the addition of the Carrier Remote IPE to an existing system.

Operation problems occur when components fail or equipment is accidentally disconnected during normal system operation.

In either case, the problem identification should be approached systematically. A problem may have more than one cause. To isolate the cause, a knowledge of Carrier Remote IPE operation is required. This information can be found in the “[Carrier Remote IPE product description](#)” (page 11). Once the cause is identified, the problem can be corrected by replacing the defective card, connecting accidentally disconnected cables, or correcting the software problem.

The system provides built-in self-diagnostic indicators and software and hardware tools. These diagnostic facilities simplify system troubleshooting and reduce Mean-Time-To-Repair (MTTR).

This document focuses on the maintenance of Carrier Remote IPE equipment at the remote site and in the system. It requires that system non-Carrier Remote IPE functions operate correctly before diagnosing Carrier Remote IPE problems.

The system installation and maintenance guide, *Communication Server 1000M and Meridian 1 Large System Maintenance (NN43021-700)* (), describes how to maintain the entire system. This chapter describes how to maintain the Carrier Remote IPE equipment as an integral part of the system.

## Diagnostic tools

Diagnostic tools are used to troubleshoot problems in the system including problems with the Carrier Remote IPE. When diagnosing Carrier Remote IPE problems, it can be necessary to use more than one of these tools.

### Hardware diagnostic tools

System hardware diagnostic tools consist of:

- card self-tests
- LED indicators
- display codes
- enable/disable switches

### Self-test

A self-test is automatically performed by each Carrier Remote IPE card when it is inserted into an operating system module, when it is enabled, or when the system is powered up or reset. A self-test can also be performed on a card using software commands.

This test checks general card functions and determines if they are operating correctly. It is useful when first installing the cards because, upon insertion, the card automatically starts the self-test and provides an immediate indication of its operating status.

### LED indicators

System cards are equipped with red LED indicators and module power supplies are equipped with green LED indicators. These indicators show the status of each card or power supply.

**Carrier Remote IPE LED indicators** Both the Local Carrier Interface card and the Remote Carrier Interface card have LED indicators on the front panel. These are:

- Card LED – a red LED that indicates the status of the card. If the LED is ON, the card may be faulty or disabled. When the card is powered up, it blinks three times during self-test if functioning correctly, otherwise it turns ON and stays ON. The LED turns OFF when the card is software enabled.
- Carrier LEDs – each red carrier LED is OFF when the carrier is operating correctly or it is not equipped by the MMI command **S C** (Set Configuration). If the carrier is faulty at either end, the carrier LED turns ON and stays ON until faults are corrected at both ends.

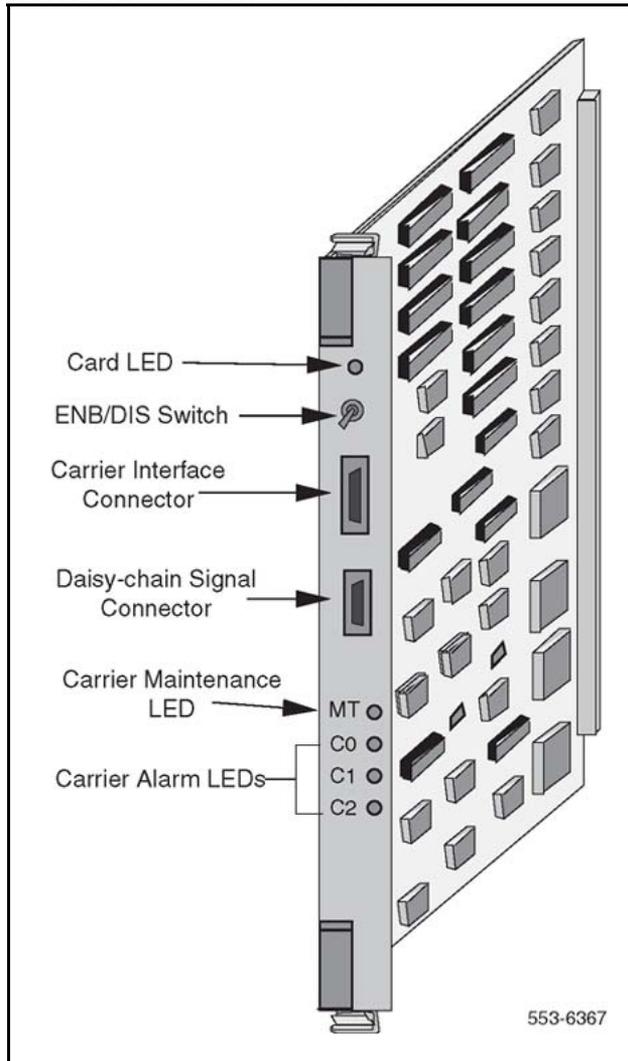
**Note:** Far-end alarms are communicated across the link if the MicroLink is up (that is, a carrier is good end-to-end in both directions).

- Maintenance LED – an amber LED that turns ON when the card is in the maintenance mode; that is, when carrier tests are running by the MMI command over a carrier, or when alarms are disabled by the MMI command **A D**, or when certain option DIP switches are set incorrectly (SW1, pos 2 that selects the LCI or RCI card).

Carrier Remote IPE issues a local alarm (CRI1nnn) when a major alarm occurs at the local system site and a remote alarm (CRI2nnn) when a major alarm occurs at the Carrier Remote IPE site. In either case, the LED indicating the alarm turns red. These alarms are printed on the TTY or displayed on the maintenance terminal.

Figure 22 "NT7R51 Local Carrier Interface card" (page 146) shows the Local Carrier Interface card. It also shows the card LED that indicates the status of the Local Carrier Interface card and each carrier link.

**Figure 22**  
**NT7R51 Local Carrier Interface card**



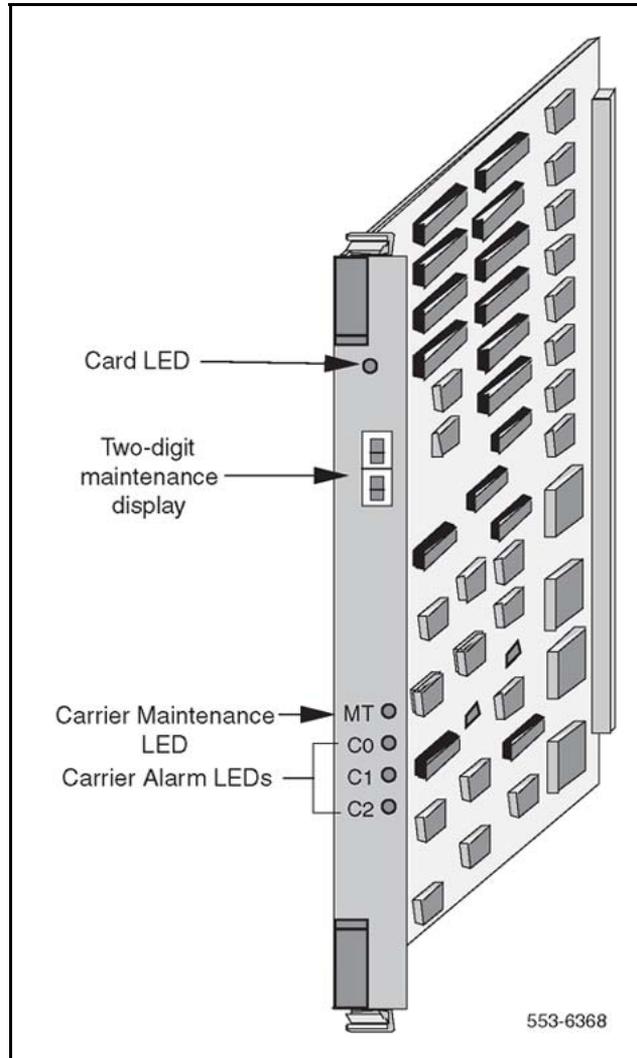
**Display codes**

Some system cards, such as the Remote Carrier Interface card, are equipped with an alphanumeric display on the faceplate.

Codes displayed on the common equipment cards are logged into a history file and can be printed and reviewed to analyze the sequence of events leading to the presently displayed status. The last 16 codes displayed by the Remote Carrier Interface card are stored in memory and can be reviewed and then cleared by using Network and Signaling Diagnostic Program LD 30.

Figure 23 "Remote Carrier Interface card" (page 147) shows two seven-segment displays on the faceplate of the Remote Carrier Interface card. They are used to automatically display the card status and identify possible faults with the card. These codes are displayed in hexadecimal notation and are listed and interpreted in "System messages" (page 187) and in the *Software Input Output Administration (NN43001-611)* ().

**Figure 23**  
**Remote Carrier Interface card**



### Enable/disable switch

Some system cards, such as the Local Carrier Interface card shown in Figure 22 "NT7R51 Local Carrier Interface card" (page 146), are equipped with an ENB/DIS switch. This ENB/DIS switch is located on the card's faceplate. It is used to disable the card before removing it from an operating system without disrupting other system functions. After repairing

or replacing the card, place it back in service by setting the switch to the enable position. This switch enables carrier clocking even if the Local Carrier Interface card is not software enabled.

### **System monitors and alarms**

System monitoring units continuously monitor the environmental and power status of the system and the individual system modules including the Carrier Remote IPE equipment.

The system monitor issues alarms when:

- CPU fails or the system reloads
- main power source is lost
- power supply in the modules fails
- system temperature exceeds limits due to blower or fan failure

System alarms are categorized for alerting and maintenance action on the type and severity of faults reported by the system monitors and indicators. These alarms are divided into:

- major alarms, which indicate serious system problems that require immediate attention
- minor alarms, which indicate isolated faults relative to a limited number of call connection problems that do not require immediate attention

### **Software diagnostic tools**

System software diagnostic tools are used to monitor the system status, provide the ability to test various system functions and equipment suspected of being faulty, and log and display system fault history. Diagnostic tools are:

- resident diagnostic programs
- interactive non-resident diagnostic programs
- history file
- user reports

### **Resident programs**

System resident programs are diagnostic and administration programs that continuously monitor system operation and report faults and generate system messages, which are displayed on the system terminal or printed on a system printer. These system messages are listed in the *Software Input Output Administration (NN43001-611) ()* .

These messages are:

- maintenance display codes listed under HEX that indicate status and error conditions in the system
- maintenance messages (CRInnnn) listed in “[System messages](#)” (page [187](#)) and reported to the terminal over the local maintenance TTY that indicate status and faults with Carrier Remote IPE equipment
- error messages listed under SCH and ERR that indicate hardware faults and under BUG that indicate software faults
- overload messages (OVDnnn) that indicate faulty peripheral cards listed under OVD
- error messages listed under PWR that indicate power faults detected by system monitors or Remote Carrier Interface cards at remote sites
- a fault history file that can be printed and reviewed to identify fault events leading to the present status

Resident administration programs provide automatic system administration routines that facilitate system initialization and fault recovery.

These programs are:

- an overlay loader program that finds, loads, and executes all non-resident programs selected to run as midnight and background routines
- a system loader program that downloads the call processing programs and starts main memory checking when executing sysload
- a system initialization program that automatically starts after the system loader program completes the downloading process and outputs the initialization messages listed under INI in the *Software Input Output Administration (NN43001-611)* ()
- a peripheral software download program that downloads loadware to the Local and Remote Carrier Interface cards

### **Non-resident programs**

Non-resident programs can be interactive or automatically executed programs. These programs are stored on the system hard disk or floppy disks and are downloaded by the overlay loader program to system memory on demand or at a predetermined time of day such as for midnight and background routines testing.

Access interactive programs through a maintenance terminal or a maintenance telephone, as described in this chapter. These programs are used to:

- test the equipment and place lines and trunks out of service when testing or faulty, and back in service when testing is completed or the line or trunk has been repaired or replaced
- verify the status of a fault
- verify that a fault has been corrected and the equipment is operating correctly

A number of non-resident diagnostic programs can be selected by using Configuration Record Program LD 17. This is a program that selects other diagnostic programs and executes them automatically as midnight and background routines. These programs test the entire system and print a report that lists all the test results.

Continuity tests can be selected that check continuity between the Local Carrier Interface card and the Remote Carrier Interface card, as well as other network and peripheral controller cards. Specify these tests in Background Signaling and Switching Diagnostics LD 45 and Network and IPE Diagnostic Program LD 32.

### **History file**

The system can be equipped with the history file feature, which allows the system to store events such as:

- service changes
- maintenance messages
- software errors
- initialization and system download messages
- traffic messages

These messages can be printed and analyzed to identify the events that led to the present status. The type of messages to store can be selected. For information on how to select messages to be logged into the history file, refer to *Features and Services Fundamentals (NN43001-106)* ().

### **User reports**

User-reported faults can provide an idea of what failed in the system. These are:

- major alarms reported by attendant
- no ringing or no dial tone
- trouble with calls in specific Carrier Remote IPE modules

- trouble with specific terminals
- cannot transfer calls

### Local and Remote Carrier Interface cards system maintenance commands

Local Carrier Interface card and Remote Carrier Interface card maintenance commands are identical to the standard NT8D04 Superloop Network and NT8D01 Peripheral Controller cards. These commands are used to manipulate the operational status and perform diagnostic tests on these cards. These commands are located in Network and IPE Diagnostic LD 32, which can be accessed using the administration terminal or the maintenance telephone.

Table 25 "System carrier superloop maintenance commands" (page 151) lists carrier-related superloop maintenance commands provided by Network and IPE Diagnostic LD 32. The full list of LD 32 commands is described in the *Software Input Output Administration (NN43001-611)* (). Detailed output of maintenance commands is explained in various maintenance procedures in this chapter.

**Table 25**  
**System carrier superloop maintenance commands**

Command	Response	Description
DISL sl	Prompt	Disables a specific superloop
ENLL sl	OK and prompt	Enables a specific superloop
STAT sl	listing and prompt	Displays status for one or all network loops. Shows carrier alarm status, number of idle time slots per carrier, type of carrier (T1/E1), No-New-Data status, and sparing status
IDC sl		Displays the Local Carrier Interface card ID, the superloop number, and the corresponding Remote Carrier Interface card ID
	LCRI VERS=xxx FW IS SANE aaaaaaaaaaa	Local Carrier Interface card xxx= loadware version Content of the LCI card ID in the EEPROM.
	XPEC VERS=xxx FW IS SANE aaaaaaaaaaa	Remote Carrier Interface card xxx= loadware version Content of the RCI card ID in the EEPROM
XPEC	nn	Maps RCI (Peripheral Controller) to LCI (carrier superloop) and shows software status of the RCI (Peripheral Controller)
SUPL	nnn	Maps LCI (carrier superloop) to RCI (Peripheral Controller)

Table 26 "System carrier test command in LD 45" (page 152) lists carrier-related test commands provided by Background Signaling and Switching Program LD 45. The full list of LD 45 commands is described in the *Software Input Output Administration (NN43001-611)* () .

**Table 26**  
**System carrier test command in LD 45**

Command	Response	Description
TEST		Enter the test number of the test you wish to run XCON 1 to 10.
	PATT	SL (superloop) or CR (carrier) to specify the entire superloop or just a carrier remote loop.
	TYPG	Pattern (0 to 7)
	SLOT	N or P, where N= Local Carrier Interface and P= Remote Carrier Interface, is the pattern generator.
		If TYPE SL was selected, the SLOT_STD prompt is automatically displayed. The user can then use the preexisting timeslot mapping or carriage return.
		If TYPE SL was selected to be a carrier, the SLOT_CARR is displayed.
		The user can use timeslot mapping as follows:
		For E1 carrier configuration use
		Timeslots 5 to 31 for Carrier 0
		Timeslots 37 to 63 for Carrier 1
		Timeslots 69 to 95 for Carrier 2
		For T1 carrier configuration use
		Timeslots 5 to 25 for Carrier 0
		Timeslots 37 to 57 for Carrier 1
		Timeslots 69 to 89 for Carrier 2
	TAG	Tag number from 0 to 15 is assigned by the system.

### Carrier Remote IPE MMI maintenance commands

The Local Carrier Interface card and Remote Carrier Interface card provide a man-machine interface (MMI) port to connect to a TTY or a configuration and maintenance terminal. Through this terminal you can directly issue commands to test and maintain system carrier equipment including the carrier links.

Table 27 "MMI commands" (page 153) lists MMI commands that are directly issued to the system over MMI terminals, which are connected to the Local Carrier Interface card MMI port and the Remote Carrier Interface card MMI port. When entering MMI commands, separate the command

letters with spaces (A space D) and [P] indicates a pause. Detailed output of maintenance commands is explained in various maintenance procedures in this chapter.

**Table 27**  
**MMI commands**

Command	Description
A D	Alarm disable. Disables all local and remote carrier alarms. Maint LED lit.
A E	Alarm enable. Enables all local and remote carrier alarms.
C A	Clear alarm. Clears all local and remote carrier alarms.
C A L	Clear alarm log. Clears near-end alarm log.
C A L D	Clear alarm log distant. Clears far-end alarm log.
C E	Clear error. Clears local and remote error counters for a all carriers.
C E D	Clear error distant. Clears a far-end error counter for all carriers.
D A L [P]	Display alarm log [pause]. Displays near-end alarm log with pause at full screen.
D A D [P]	Display alarm log distant [pause]. Displays far-end alarm log with pause at full screen.
D C	Display configuration. Displays current configuration of the Local and Remote Carrier Interface cards.
D H [P]	Display history [pause]. Displays near-end performance counters for a specified carrier for the last 24 hours with full screen pause.
D H D [P]	Display history distant [pause]. Displays far-end performance counters for a specified carrier for the last 24 hours with full screen pause.
D P	Display performance. Displays near-end performance counters for a specified carrier for the current hour.
D P D	Display performance distant. Displays far-end performance counters for a specified carrier for the current hour.
D S	Display status. Displays near-end carrier status.
D S D	Display status distant. Displays far-end carrier status.
HE or ?	Help. Displays the help screen.
HOST	Connect the SDI port. Connects to the SDI port and @@@ terminates the connection. The password is <b>HOST</b> .
L	Log in. Logs into the MMI terminal when the system has one Local Carrier Interface card. The password is <b>MLINK</b> .
L sl	Log superloop. Logs into a specific superloop when the system has more than one Local Carrier Interface card daisy-chained in the network module. The password is <b>MLINK</b> .

**Table 27**  
**MMI commands (cont'd.)**

Command	Description
Q	Quit. Logs the terminal user out.
S A	Set alarms. Set carrier alarm threshold and duration parameters.
S C	Sets carrier configuration such as equipped/unequipped, automatic clearing of LED alarm indications, and carrier sparing.
S D	Set date. Set date or verify current date.
S T	Set time. Set time or verify current time.
@@@	Terminate the terminal connection.
T	Test. Specifies a test from 1 to 5 to be run on the specified carrier link.
T D	Test distant. A test from 1 through 5 conducted from the far-end.

## Using system maintenance programs

To use system maintenance programs, access the system using a maintenance terminal or maintenance telephone.

### Logging in on the maintenance terminal

To access the program, enter a valid password. To do this, type `LOGI` and press the **Enter** key. The following appears:

```
PASS?
```

Type the password and press the Enter key. Cursor will move without showing characters while typing. If the following is displayed:

```
OVL015
>
```

an invalid password was entered. Type the password again and press the **Enter** key. If a valid password was entered, the following is displayed:

```
>
```

Log-in has been achieved. Communication with the system is established and the program can be accessed.

### Accessing the program

To access any program on the system, type `LD` followed by a space and the program number after the `>` prompt and press the **Enter** key.

For example, to access Network and IPE Diagnostic Program LD 32, type `LD 32` after the `>` prompt and press the **Enter** key. At the prompt, type the command to execute.

If, for example, to enable network superloop #4 which is supported by a Local Carrier Interface card, at the prompt type the following:

```
.ENLL 4
```

This command attempts to enable the Local Carrier Interface card supporting network superloop 4.

### Responding to error messages

If incorrect information is entered after a prompt, the program displays a warning message or an error message. The prompt is displayed again below the error message so the correct information can be entered.

### Exiting the program

To exit the program, type **\*\*\*\*** and press the **Enter** key. The following is displayed:

This means the program is exited successfully. Now access another program or log out.

### Logging out

After exiting the program, Nortel recommends logging out. To do this, type **LOGO** at the **>** prompt and press the **Enter** key.

### Logging in and using a maintenance telephone

A telephone can be used as a maintenance terminal if its Class of Service is defined as MTA (Maintenance Set Allowed) in LD 11. This feature allows access to diagnostic programs in the system and execution of a limited set of maintenance commands to test system functions.

To enter commands on a maintenance telephone, use the telephone keypad. The numbers on the keypad represent numbers and letters normally used on a video display terminal keyboard.

[Table 28 "Keyboard to keypad translation table" \(page 155\)](#) shows the translation from a terminal keyboard to a telephone keypad.

**Table 28**  
**Keyboard to keypad translation table**

Terminal keyboard				Telephone key pad	
				1	1
	A	B	C	2	2
	D	E	F	3	3
	G	H	I	4	4
	J	K	L	5	5

**Table 28**  
**Keyboard to keypad translation table (cont'd.)**

Terminal keyboard				Telephone key pad	
	M	N	O	6	6
	P	R	S	7	7
	T	U	V	8	8
	W	X	Y	9	9
				0	0
				Space or #	#
				Return	##

To use a diagnostic program on the system, follow the steps in [Procedure 36 "Using a diagnostic program on the system" \(page 156\)](#).

**Procedure 36**  
**Using a diagnostic program on the system**

Step	Action
1	Press the prime DN key.
2	Place the telephone in the maintenance mode by entering <b>xxxx91</b> on the keypad, where <b>xxxx</b> is the customer's special prefix number (SPRE) as defined in LD 15.  Normally xxx is 1, therefore <b>191</b> would be entered.
3	Enter <b>**</b> to check if the communication link is idle. <ul style="list-style-type: none"> <li><b>a</b> If a busy tone is detected, the system is in session with another maintenance or administration terminal. Enter <b>****</b> to force the other terminal to log out.</li> <li><b>b</b> If a busy tone is not detected, the system is idle and the system is automatically accessed.</li> </ul>
4	Enter <b>53#xx##</b> to load a diagnostic program, where <b>xx</b> is the program number.  For example, to load Network and IPE Diagnostic Program LD 32, enter <b>53#32##</b> .
5	Perform the maintenance tasks by executing the maintenance commands resident in the loaded program.  For example, from Network and IPE Diagnostic Program LD 32, a network loop can be disabled by executing <b>DISL loop</b> , where loop is the Local Carrier Interface card loop; for example, 3. To execute this command enter <b>3475#3##</b> on the keypad.

- 6 Press the Release key to log out.

---

--End--

---

## Isolating and correcting faults

Once familiar with the troubleshooting tools, begin troubleshooting Carrier Remote IPE equipment. Based on whether Carrier Remote IPE equipment has just been installed and is not yet operational, or it had previously been operating correctly and is now faulty, it can be determined what might be the most probable cause of failure.

### Type of faults

Problems can occur in the following areas:

- hardware
- configuration
- software

The type of faults to isolate and correct depends on whether faults occur during installation or due to component failure in a previously operating system. For example, in a newly installed system the fault can be in any or all of the three areas. However, in a previously operating system the fault is probably in the hardware.

### Fault isolation steps

The following steps describe how to isolate system and Carrier Remote IPE faults using the diagnostic tools described in this chapter:

1. Observe and list the problem symptoms the system is exhibiting. Typical symptoms can be: the Local Carrier Interface card or Remote Carrier Interface card has its red LEDs turned on the Remote Carrier Interface card faceplate display shows a fault code, some common equipment or power supplies have their green LEDs turned off, some of the common equipment or network cards display codes that indicate faults.
2. Note if Carrier Remote IPE was just installed and has not been operating, or if it has been operating correctly and is now faulty. Based on this, refer to "[Newly installed Carrier Remote IPE](#)" (page 158)" below for lists of the most common problems.
3. Take the action recommended by the fault isolation and correction tables, which guide through fault isolation steps and recommend what test procedures to use.
4. If after following the diagnostic procedures Carrier Remote IPE still does not operate correctly, contact the field service representative.

### **Newly installed Carrier Remote IPE**

Problems that occur during the installation of an entire system including the Carrier Remote IPE are usually caused by:

- improperly installed cards
- loose or improperly connected external communication cables, internal cables, or carrier link cables
- incorrect software version
- incorrect Carrier Remote IPE configuration

These types of problems can also occur when:

- installing additional Carrier Remote IPE equipment into an already operating system
- installing a new software version or changing the Carrier Remote IPE configuration

Check the symptoms listed in [Table 30 "Carrier Remote IPE equipment problems" \(page 160\)](#) that are related to problems with a newly-installed Carrier Remote IPE.

### **Previously operating Carrier Remote IPE**

Problems that occur during the normal operation of Carrier Remote IPE are usually caused by:

- faulty equipment
- accidental disconnection of cables
- improper environmental conditions

Check the symptoms listed in [Table 30 "Carrier Remote IPE equipment problems" \(page 160\)](#) that are related to problems with a previously-operating Carrier Remote IPE.

## **System fault isolation and correction**

To isolate Carrier Remote IPE faults in the system, first isolate and correct the common, network, and power equipment faults to make the system non-Carrier Remote IPE functions operational. Then proceed with fault isolation and fault correction of Carrier Remote IPE functions.

To aid in isolating the problems in a systematic way, use the fault isolation and correction tables. These tables provide a guide through logical steps to determine the cause of the problem based on the visual fault indicators and system fault messages.

Table 29 "System common and network equipment problems" (page 159) lists system problem symptoms, diagnosis of the problem based on the observed symptoms, and a recommended solution to the problem.

**Table 29**  
**System common and network equipment problems**

Symptoms	Diagnosis	Solution
Green LED on the power equipment is off.	Power source lost, power defective, or disconnected power cables.	Check the power source, circuit breakers, and power cables. Refer to <i>Communication Server 1000M and Meridian 1 Large System Maintenance (NN43021-700)</i> () to correct the problem.
Maintenance terminal displays PWRxxxx messages.	Power supply, Power Distribution Unit, or Blower/Fan unit defective.	Refer to <i>Software Input Output Administration (NN43001-611)</i> () for a list of PWR messages. Based on the message, take the appropriate action to resolve the problem.
Some red LEDs on the common, network, and/or intelligent peripheral equipment are on and call processing has stopped.	Common or network equipment cards faulty.  IPE cards faulty.	Observe the error messages on the terminal and check for ERR and/or BUG messages listed in <i>Software Input Output Administration (NN43001-611)</i> (). Use this information to locate and correct the fault. Refer to <i>Communication Server 1000M and Meridian 1 Large System Maintenance (NN43021-700)</i> ().
Maintenance terminal displays OVDxxxx messages.	Excessive input messages from IPE cards, peripheral signaling card, network cards, and/or IPE cabling.	Observe the OVD messages on the terminal and check the description of these messages listed in <i>Software Input Output Administration (NN43001-611)</i> (). Use this information to locate and correct the fault. Refer to <i>Communication Server 1000M and Meridian 1 Large System Maintenance (NN43021-700)</i> ().
Maintenance display codes on the CPU cards and storage devices show fault codes.	Common equipment disk drive hardware faults, memory faults, or interrupt faults.	Refer to <i>Software Input Output Administration (NN43001-611)</i> () for a list of all the HEX codes. Based on the maintenance display codes description, take the appropriate action and resolve the problem.
Maintenance display codes on network cards show faults.	Indicates bus error or card problem.	Reinsert the card and observe the self-test codes. Refer to <i>Software Input Output Administration (NN43001-611)</i> () for a list of all self-test codes and their description. If the problem remains, replace the card.
Major or minor alarms.	Common, network, and/or intelligent peripheral equipment failure.	Refer to <i>Communication Server 1000M and Meridian 1 Large System Maintenance (NN43021-700)</i> () to identify the cause of alarm. Check the history file.

After isolating and correcting common equipment and network equipment faults, all the other system and card faults may clear and the system may start operating normally. If this does not occur, proceed with troubleshooting Carrier Remote IPE equipment as described in [“Remote Carrier Interface card fault isolation and correction” \(page 170\)](#).

If the problem cannot be resolved after exhausting all the available diagnostic tools and test procedures, make a list of all the symptoms observed and contact the field service representative.

### Carrier Remote IPE fault isolation and correction

After non-Carrier Remote IPE system functions are operating correctly, proceed with fault isolation and fault correction of Carrier Remote IPE equipment.

If the problem cannot be resolved after exhausting all available diagnostic tools and test procedures, make a list of all the symptoms observed and contact the field service representative.

Refer to [Table 31 “System error messages related to the CRI” \(page 187\)](#) in [“System messages” \(page 187\)](#) to identify the HEX codes that indicate possible problems with the Carrier Remote IPE.

[Table 30 “Carrier Remote IPE equipment problems” \(page 160\)](#) deals specifically with Carrier Remote IPE service problems. To diagnose these problems, the table refers to the test procedures in this manual that are most likely able to resolve these problems based on the symptoms these problems are exhibiting.

**Table 30**  
**Carrier Remote IPE equipment problems**

Symptoms	Diagnosis	Solution
Red card LED on the Local Carrier Interface or Remote Carrier Interface is permanently on.	Card is disabled or faulty.	Go to <a href="#">Procedure 37 “Checking the Local Carrier Interface card status” (page 163)</a> , <a href="#">Procedure 38 “Performing the Local Carrier Interface card self-test” (page 165)</a> , and <a href="#">Procedure 40 “Performing the Remote Carrier Interface card self-test” (page 171)</a> in this chapter to check the card status and perform self-test. Also go to <a href="#">Procedure 7</a> to check the carrier status using the MMI terminal commands.

**Table 30**  
**Carrier Remote IPE equipment problems (cont'd.)**

Symptoms	Diagnosis	Solution
Carrier LEDs show alarm condition.	One or more carrier alarm LEDs are on. No activity on the carrier.	Alarm Level 2 or 3. Alarm Level 2 allows voice calls but no new data calls on the carrier. Check carrier link connections and go to <a href="#">Procedure 39 "Performing the Local Carrier Interface system loopback tests"</a> (page 168) to test the link using the loopback test.
Carrier link is OK but remote TTY cannot access system.	Protocol not set properly or terminal not in SDI mode.	Check the protocol setup and make sure the MMI terminal is in the host SDI mode.
No communication with the system monitor.	System monitor address incorrect.	Observe the system messages on the MMI terminal and check the description of these messages listed in <a href="#">"System messages"</a> (page 187). Use this information to locate and correct the fault.
Display on the Remote Carrier Interface card shows fault codes.	Card faulty, failed self-test or problem communicating with intelligent peripheral equipment.	Go to <a href="#">Procedure 40 "Performing the Remote Carrier Interface card self-test"</a> (page 171) and <a href="#">Procedure 41 "Performing the Remote Carrier Interface card loopback test"</a> (page 173) to check tracking and loopback. Also refer to <i>Software Input Output Administration (NN43001-611)</i> () for a list of codes. Based on the maintenance display codes description, take the appropriate action and resolve the problem.
Error messages printed on the MMI terminal or the TTY.	Hardware or software problems with the Carrier Remote IPE.	Note various error messages. Refer to <a href="#">"System messages"</a> (page 187) and <i>Software Input Output Administration (NN43001-611)</i> () for a list of these messages and their description. Based on the code's description, take the appropriate action to resolve the problem.
Signaling works but no talk path.	Carriers are crossed over. External loopback left in place no end-to-end connection.	Check each carrier and make sure they are not crossed over. Refer to <a href="#">"Connecting the carrier link to the Remote IPE module"</a> (page 96).  Remove the external loopback.
Amber maintenance LED is on.	Test is performed over one or more carrier in the link. Alarms disabled. SW1 position 2 set wrong.	Wait until the test is completed and analyze the test data. Enable the alarms. Set SW1 position 2 correctly.

**Table 30**  
**Carrier Remote IPE equipment problems (cont'd.)**

Symptoms	Diagnosis	Solution
Near and far end Alarm Level 2 or Alarm Level 3.	Carrier network, and/or intelligent peripheral equipment failure.	Query the alarm status on carrier links by entering the <code>D A L [P]</code> command to display the near-end log file and <code>D A D [P]</code> to display the far-end log file. Check alarm settings with <code>D C</code> command.
Messages corrupted (ERR080).	Hardware problems.	Check <a href="#">Procedure 37 "Checking the Local Carrier Interface card status"</a> (page 163) through <a href="#">Procedure 41 "Performing the Remote Carrier Interface card loopback test"</a> (page 173).

### Local Carrier Interface card fault isolation and correction

The Local Carrier Interface card provides a communication interface between the CPU and the Remote Carrier Interface card.

The Local Carrier Interface card processes signaling information and data received from the Remote Carrier Interface card over the carrier link.

Problems with the Local Carrier Interface card can be caused by hardware faults, incorrect configuration, a disabled Local Carrier Interface card, or continuity problems between the card and other network cards connected to the network bus. To isolate and correct the Local Carrier Interface card-related problems, see [Procedure 37 "Checking the Local Carrier Interface card status"](#) (page 163), [Procedure 38 "Performing the Local Carrier Interface card self-test"](#) (page 165), and [Procedure 39 "Performing the Local Carrier Interface system loopback tests"](#) (page 168).

### Checking the Local Carrier Interface card status

The diagnosis in [Table 30 "Carrier Remote IPE equipment problems"](#) (page 160) indicates that the Local Carrier Interface card may be faulty or disabled. The first step in identifying the problem is to verify the status of the Local Carrier Interface card. The status of a Local Carrier Interface card is obtained by executing the `STAT s1` command in Maintenance and Diagnostic Program LD 32.

To obtain the Local Carrier Interface card status, follow the steps in [Procedure 37 "Checking the Local Carrier Interface card status"](#) (page 163).

**Procedure 37**  
**Checking the Local Carrier Interface card status**

Step	Action
1	Log in on the maintenance terminal as described in "Using system maintenance programs" (page 154).
2	At the > prompt, type <b>LD 32</b> and press the <b>Enter</b> key to access the Maintenance and Diagnostic Program LD 32.
3	Type <b>STAT s1</b> and press the <b>Enter</b> key, where <b>s1</b> is the superloop number.

It shows the highest alarm value of both cards being checked. The far-end alarm does not show at the near end.

**LD 32**

**NPR000**

**STAT s1**

CARR	CALS	TTSA	NND	SPARED
0	0	21/21	NO	N/A
1	0	21/21	NO	N/A
2	0	21/21	NO	N/A

**Note:** This example shows 3 primary carriers and no spare, all carriers without alarm, and are available for New Data Calls. No calls in progress.

**LD 32**

**NPR000**

**STAT s1**

CARR	CALS	TTSA	NND	SPARED
0	3	0/21	YES	N/A
1	0	21/21	NO	N/A
2	0	21/21	NO	N/A

**Note:** This example shows 3 primary carriers and no spare, carrier 0 in los-of-signal (LOS) fault status.

LD 32

NPR000

STAT sl

CARR	CALS	TTSA	NND	SPARED
0	0	21/21	NO	NOT SPA RED
1	0	21/21	NO	NOT SPA RED
2	0	N/A	N/A	AVAIL

**Note:** This example shows 3 carriers equipped, carrier 2 is spared and available, and are available for New Data Calls. No calls in progress.

LD 32

NPR000

STAT sl

CARR	CALS	TTSA	NND	SPARED
0	3	21/21	NO	SPARED
1	0	0/21	YES	NOR SPARED
2	0	N/A	N/A	SPARING FOR 0

**Note:** Carrier 1 unequipped and carrier 2 sparing for carrier 0.

**Parameter description:****CARR – Carriers 0, 1, and 2****CALS – Carrier alarm status (0 means that the Alarm Level is 0—no alarm)****TTSA—Timeslots currently available for voice and data**

Carrier 0 superloop timeslots (5 to 25) for T1 and (5 to 31) for E1

Carrier 1 superloop timeslots (37 to 57) for T1 and (37 to 63) for E1 carriers

Carrier 2 superloop timeslots (69 to 89) for T1 and (69 to 95) for E1 carriers

**NND – No New Data calls. (NO—indicates new data calls are not disallowed); that is, MCAs can originate or terminate new data calls SPARED – Indicates if a carrier is spared by carrier 2. N/A indicates that carrier 2 is equipped as a primary carrier, not a spare carrier.**

If carrier 2 is configured as a spare, the traffic is handled by carrier 0 and carrier 1 reducing the traffic capacity to 2/3; by providing a spare, established calls are protected if one of the primary carrier links fails.

**Note:** If overload conditions are indicated by OVDxxx messages, refer to *Software Input Output Administration (NN43001-611)* () for the message description and indication of the problem.

- 4 If the message indicates that the Local Carrier Interface card is faulty, replace the card.

---

--End--

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### Performing the Local Carrier Interface card self-test

If the Local Carrier Interface card is faulty, conduct the self-test to verify that it is actually faulty before replacing it. This test verifies the basic Local Carrier Interface card functions and outputs a fail or pass message after the test is completed.

To start the self-test, follow the steps in [Procedure 38 “Performing the Local Carrier Interface card self-test”](#) (page 165).

#### Procedure 38 Performing the Local Carrier Interface card self-test

Step	Action
1	Log in on the maintenance terminal as described in <a href="#">“Using system maintenance programs”</a> (page 154).
2	At the > prompt, type <code>LD 32</code> and press the <b>Enter</b> key to access the Network and IPE Diagnostic Program.
3	Type <code>DISL s1</code> and press the Enter key to disable the Local Carrier Interface card, where <code>s1</code> is the Local Carrier Interface card superloop number to be disabled.
4	Type <code>XNTT s1</code> and press the <b>Enter</b> key to start the self-test, where <code>s1</code> is the Local Carrier Interface card superloop number specified for the self-test.

If the response is:

TEST PASSED

the Local Carrier Interface card passed the self-test and is functional, but must be enabled to turn off the red LED and become active.

If the Local Carrier Interface card passed the self-test, but the problem persists, the carrier link or other cards that interface with the Local Carrier Interface card might be faulty. To verify the integrity of the network bus and connections between the Local Carrier Interface card and other network and intelligent peripheral equipment cards interfacing with the Local Carrier Interface card, go to [Procedure 39 “Performing the Local Carrier Interface system loopback tests” \(page 168\)](#).

If the response is:

TEST FAILED REASON: xxxx

XPEC NOT CONNECTED

the Local Carrier Interface card failed the self-test and is faulty, where **xxxx** can be one of the following values:

- 0–ROM checksum failed
- 1–FLASH checksum failed
- 2–A21 #1 faulty
- 3–A21 #2 faulty
- 4–R71 faulty

Replace the Local Carrier Interface card as described in [“Removing and replacing a Local Carrier Interface card” \(page 182\)](#). NPRxxx message may be displayed as a result of a command-activated self-test if the Local Carrier Interface card is missing, not configured, and so on.

- 5 Exit LD 32 by typing **\*\*\*\*** at the prompt.

---

--End--

---

### **Performing the Local Carrier Interface system loopback tests**

If the Local Carrier Interface card self-test indicates that the card is not faulty, conduct loopback tests to isolate the problem that might exist on network cards, network buses, or carrier link connections between the Local Carrier Interface card and the Remote Carrier Interface card.

The system loopback test is not service-interrupting. However, if carrier 2 is not a spare carrier but a primary carrier, the system can respond with error message BSD202 if the **TEST ALL** command is executed in LD 45. To avoid this problem, do not perform the **TEST** command manually on the system that has one or more Carrier Remote superloops with carrier #2 configured as an active carrier.

Loopback tests check the continuity between various interface points in the system. This is performed by sending a known signal pattern from the originating point to the destination and receiving it back at the originating point or a designated detecting point. If the pattern is detected, and it matches the transmitted pattern without errors, the test verifies that the tested equipment and their connections are operating correctly. However, if the pattern is not detected or it is detected with errors, the equipment or the connections between the equipment are faulty.

The difference between loopback tests for the Carrier Remote IPE and the Superloop Network and Peripheral Controller cards is the selection of specific timeslots that have to be assigned for the Carrier Remote IPE loopback testing.

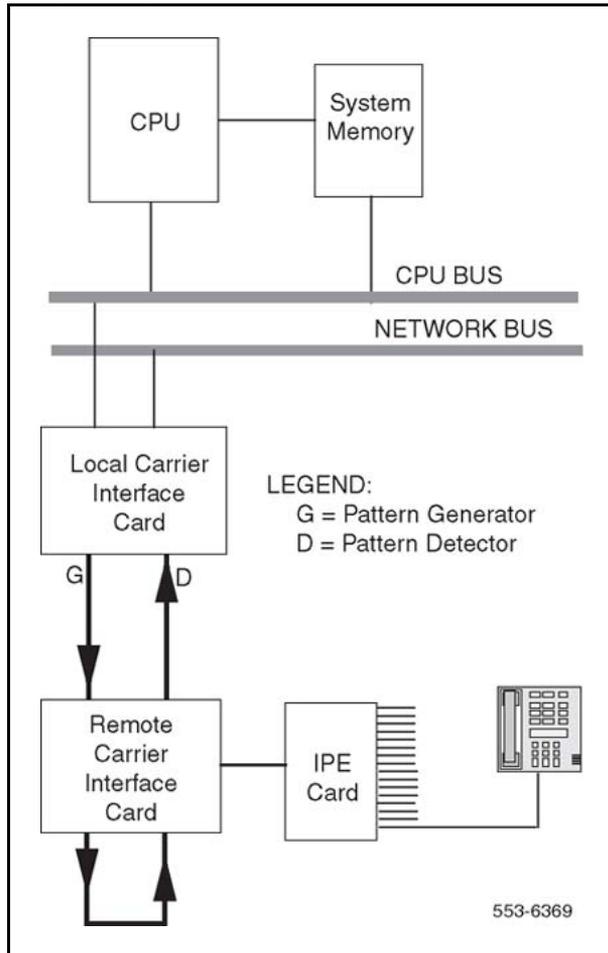
The system loopback test also tests the superloop network switching functions and the peripheral controller loopback functions on the Local Carrier Interface card and the Remote Carrier Interface motherboards respectively. The on-line test 1, using the MMI command, tests the loopback between the daughterboards of these two cards.

The loopback uses the Local Carrier Interface card as a pattern generator and detector. For example, the signal is transmitted by the Local Carrier Interface card to the Remote Carrier Interface card and looped back to the Local Carrier Interface card over the carrier links.

**Note:** For a Carrier Remote IPE with a spare link, the loopback is automatically routed over the functioning carrier link, not the faulty link. To identify the carrier that may be faulty, perform the carrier test at each end of the link by following the instructions in step 4 of [Procedure 38 "Performing the Local Carrier Interface card self-test"](#) (page 165).

[Figure 24 "Loopback path for XCON test 6"](#) (page 168) illustrates the loopback path and shows the Local Carrier Interface card as a test pattern generator and detector.

**Figure 24**  
**Loopback path for XCON test 6**



To start the loopback test, follow the steps in [Procedure 38](#) “Performing the Local Carrier Interface card self-test” (page 165).

**Procedure 39**  
**Performing the Local Carrier Interface system loopback tests**

Step	Action
1	Log in on the maintenance terminal as described in <a href="#">“Using system maintenance programs”</a> (page 154).
2	At the > prompt, type <b>LD 45</b> and press the <b>Enter</b> key to access the Background Signaling and Switching Program.
3	Select test condition:

- Enter XCON 0 and press the Enter key if you wish to perform only one loopback test.
- Enter one test period shown in XCON H 1-255, M 1-255, Sp1-255 and press the Enter key to select continuous loopback testing for a selected time span, where Hp1-255 is 1 to 255 hours, M 1-255 is 1 to 255 minutes, and S 1-255 is 1 to 255 seconds.  
Example: XCON M 5 specifies the duration of the test to be 5pminutes.

- 4 At the TEST prompt, type 6 and press the **Enter** key to test the loop from the Local Carrier Interface card through the carrier link and the Remote Carrier Interface card back to the Local Carrier Interface card.

Continue responding to the prompts to configure the loopback test as follows:

Command	Response	Description
TEST	6	XCON test number
PATT	0–7	Signal pattern
TYPE	CR	Carrier transmission type
TYPG	N	Local Carrier Interface card – generator
SUPL	0–252	Superloop in multiple of 4
SLOT_CAR R	xx	Carrier timeslots ranges:  E1 Carrier 0 (5–31)  E1 Carrier 1 (37–63)  E1 Carrier 2 (69–95)  T1 Carrier 0 (5–25)  T1 Carrier 1 (37–47)  T1 Carrier 2 (69–89)
TYPD	N	Local Carrier Interface card – detector
SUPL	0–252	Superloop in multiple of 4
LBTY	P	Loopback through Remote Carrier Interface card

Command	Response	Description
LBTN	l1 s 99	Special Remote Carrier Interface loopback channel
TAG x	0–15	Tag number assigned by the system

**5** Check the loopback test results.

The results are automatically displayed if XCON 0 test conditions were specified; otherwise, specify XSTA or XSTP with the test TAG number to check the status. XSTA obtains the status of the manual continuity test. XSTP stops the manual continuity test.

If the results show BSDxxx messages, refer to the list and description of these messages in *Software Input Output Administration (NN43001-611)* (). The BSDxxx messages indicate the possible causes of the problem, which should be checked to isolate the actual problem.

If the loopback continuity test passes, the problem may be somewhere in the IPE cards.

If the loopback continuity test fails, go to [Procedure 40 “Performing the Remote Carrier Interface card self-test”](#) (page 171).

---

--End--

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### **Remote Carrier Interface card fault isolation and correction**

The Remote Carrier Interface card provides a communication interface between the Local Carrier Interface card and the IPE cards housed in the Carrier Remote IPE module or cabinet.

Problems with the Remote Carrier Interface card can be caused by hardware faults, incorrect configuration, a disabled Remote Carrier Interface card, or continuity problems between the card and IPE cards connected to the peripheral bus. To isolate and correct the Remote Carrier Interface card-related problems, follow the steps in [Procedure 40 “Performing the Remote Carrier Interface card self-test”](#) (page 171) and [Procedure 41 “Performing the Remote Carrier Interface card loopback test”](#) (page 173).

#### **Performing the Remote Carrier Interface card self-test**

If the Remote Carrier Interface card is faulty, conduct the self-test to verify that it is actually faulty before replacing it. This test verifies the basic Remote Carrier Interface card functions and outputs a fail or pass message after the test is completed. During the self-test, the Remote Carrier Interface card displays HEX messages indicating the test performed. To identify the codes displayed, refer to Table 22 on page 221.

To start the self-test, follow the steps in [Procedure 40 “Performing the Remote Carrier Interface card self-test” \(page 171\)](#).

**Procedure 40**  
**Performing the Remote Carrier Interface card self-test**

Step	Action
1	Log in on the maintenance terminal as described in <a href="#">“Using system maintenance programs” (page 154)</a> .
2	At the > prompt, type <code>LD 32</code> and press the <b>Enter</b> key to access the Network and IPE Diagnostic Program.
3	Type <code>DSXP x</code> and press the <b>Enter</b> key to disable the Remote Carrier Interface card, where <code>x</code> is the number of the Remote Carrier Interface card to be disabled.
4	Type <code>XPCT x</code> and press the <b>Enter</b> key to start the self-test, where <code>x</code> is the Remote Carrier Interface card specified for self-test.
	<p>If the response is</p> <p style="text-align: center;">TEST PASSED</p> <p>the Remote Carrier Interface card passed the self-test and is functional but must be enabled to turn off the red LED and to start processing calls.</p> <p>Type <code>ENXP x (v)</code> and press the <b>Enter</b> key to enable the card and the associated IPE cards, where <code>x</code> is the Remote Carrier Interface card number and <code>(v)</code> is the optional download software version <code>v</code>.</p> <p>If the Remote Carrier Interface card passed the self-test, but the problem persists, the carrier link or other cards that interface with the Remote Carrier Interface card may be faulty. To verify the integrity of the peripheral bus and the Remote Carrier Interface card, go to <a href="#">Procedure 41 “Performing the Remote Carrier Interface card loopback test” (page 173)</a>.</p> <p>If the response is</p> <p style="text-align: center;">TEST FAILED    REASON: xxxx</p>

the Remote Carrier Interface card failed the self-test and is faulty, where **xxxx** specifies the cause of the fault. An NPRxxx message might be displayed as a result of a command-activated self-test if the Remote Carrier Interface card is missing or not configured.

- 5 Exit LD 32 by typing **\*\*\*\*** at the prompt.

---

--End--

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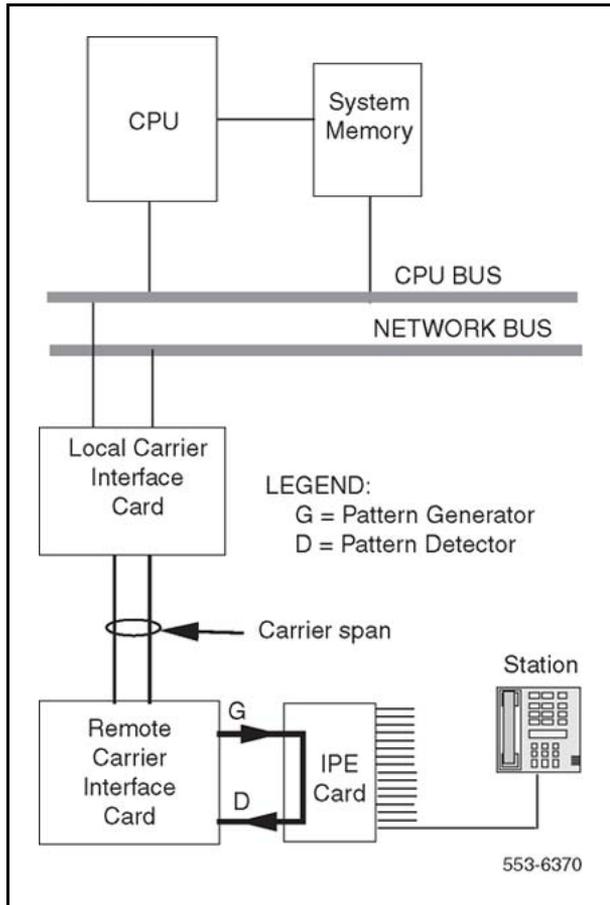
### **Performing the Remote Carrier Interface card loopback test**

The loopback uses the Remote Carrier Interface card as a pattern generator and detector. The signal is transmitted by the Remote Carrier Interface card back to the Remote Carrier Interface card over a timeslot of a specified carrier.

[Figure 25 "Loopback path for XCON test 7" \(page 173\)](#) illustrates the loopback path and shows the Remote Carrier Interface card as a test pattern generator and detector.

To perform the Remote Carrier Interface card loopback test, follow the steps in [Procedure 41 "Performing the Remote Carrier Interface card loopback test" \(page 173\)](#).

**Figure 25**  
**Loopback path for XCON test 7**



**Procedure 41**  
**Performing the Remote Carrier Interface card loopback test**

Step	Action
1	Log in on the maintenance terminal as described in <a href="#">“Using system maintenance programs”</a> (page 154).
2	At the > prompt, type <code>LD 45</code> and press the <b>Enter</b> key.
3	Select the test condition. Enter XCON 0 and press the <b>Enter</b> key to perform only one loopback test.  Enter one test period shown in XCON H 1-255, M 1-255, Sp1-255 and press the Enter key to select continuous loopback testing for a selected time span, where Hp1-255 is 1 to 255 hours, M 1-255 is 1 to 255 minutes, and S 1-255 is 1 to 255 seconds.  Example: XCON M 5 specifies the duration of the test to be 5pminutes.

- 4 At the TEST prompt, type 7 and press the **Enter** key to test Remote Carrier Interface to Remote Carrier Interface through a special loopback channel.

Continue responding to the prompts to configure the loopback test as follows:

Command	Range	Description
TEST	7	XCON test number
PATT	0–7	Signal pattern
TYPG	P	Remote Carrier Interface card—generator
TN	1 s 99 0	Special Remote Carrier Interface loopback channel
TAG x	0–15	Tag number assigned by the system

- 5 Check the loopback test results.

The results are automatically displayed if XCON 0 test conditions were specified; otherwise, specify XSTA or XSTP with the test TAG number to check the status. XSTA obtains the status of the manual continuity test. XSTP stops the manual continuity test.

If the results show BSDxxx messages, refer to the list and description of these messages in *Software Input Output Administration (NN43001-611)* (). The BSDxxx messages indicate the possible causes of the problem, which should be checked to isolate the actual problem.

If the loopback continuity test passes, the problem may be somewhere in the IPE cards.

- 6 If the loopback continuity test fails, replace the card.

---

--End--

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### **Fault isolation and correction using MMI maintenance commands**

Some testing and troubleshooting of the Carrier Remote IPE can be done from a local or a remote MMI terminal or TTY by typing MMI commands on the terminal without loading system diagnostic programs (overlays).

These commands:

- provide current equipment status
- invoke card testing
- check equipment performance
- print messages from log files

**Checking Carrier Remote IPE status using MMI commands**

Procedure 42 “Checking Carrier Remote IPE status using MMI commands” (page 175) uses MMI commands to maintain Carrier Remote IPE cards and carrier status.

In the MMI mode, the terminal issues direct commands to the system to display operational conditions, to set up carrier parameters, and to test individual carrier links.

To obtain the Local and Remote Carrier Interface card status, follow the steps in Procedure 42 “Checking Carrier Remote IPE status using MMI commands” (page 175).

**Procedure 42**  
**Checking Carrier Remote IPE status using MMI commands**

Step	Action
1	<p>Log in on the MMI maintenance terminal:</p> <pre>CRI:: &gt;L</pre> <p>Enter Password &gt; <b>M1LINK</b></p>
	<p>Login command</p> <p>Type in the password.</p>
2	<p>Type <b>D S</b> to display near-end carrier status.</p> <p>Type <b>D S D</b> to display far-end carrier status.</p> <p>The response is displayed on the screen and shows: the firmware version, present time and date, individual carrier fault threshold parameters, and the present status of each carrier link.</p> <p>Example:</p> <pre>CRI::&gt;D S CRI Remote IPE S/N Software Version x.xx mm/dd/yy hh:mm Remote Site In Alarm State: NO (carriers are not in the alarm state)  All Link Maps Normal  Link 0 Alarm Level 0 Link 1 Alarm Level 0 Link 2 Alarm Level 0</pre>

If carrier links mismatch exists, the status displays unequal alarm levels across a mismatched link. To verify that carrier links are connected correctly at both ends perform the tests in “Verifying carrier link connections at the remote site” (page 128) in the Installation section.

- 3 Display the alarm log by executing the **D A** and the **D A D** commands to see the list of the most recent 100 alarms with the date and time they occurred.

---

--End--

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### Checking the carrier performance status

The Remote Carrier Interface card can display carrier performance information for the current hour and for the last 24 hours. The data and total errors are shown separately in the report for both the local and the remote site. The report displays the bit error rate, loss of frame count, loss of signal, alarm indication count, and frame slip count.

To obtain the information for the current hour, execute command **D P** (Display Performance) for near-end or **D P D** (Display Performance Distant) for the far-end carrier performance status using the MMI terminal.

To obtain the carrier link performance status, follow the steps in [Procedure 43 "Checking the carrier performance status" \(page 176\)](#).

#### Procedure 43 Checking the carrier performance status

---

Step	Action
1	Log in on the maintenance terminal as described in <a href="#">"Using system maintenance programs" (page 154)</a> .
2	At the <b>&gt;</b> prompt, type <b>D P</b> and press the <b>Enter</b> key.  The report displays the following carrier error counts monitored for 45 minutes for carrier 1

CRI::> D P

Which Carrier (0, 1, or 2): 1

IPE Interface Performance Log

For Carrier Number 1

8/15/95 9:45

Data for the first 45 Minutes

Errored Seconds	Bursty Seconds	Severely Eroded Seconds	Unavailable Seconds	Loss Frame Seconds	Frame Slip Seconds	Error Counter
0	0	0	0	0	0	1

**Note:** These performance measurements indicate the service quality of the carrier link selected (carrier 1 in this example). Ideally, all errored second categories should be 0. If a number other than 0 appears in one or more columns, it indicates momentary or continuous problem on the link.

If the numbers are small and the carrier is not in alarm state, the errors may have been temporary and the link can continue to operate within the specified thresholds.

Clear the cumulative error counter by executing the `C E` and `C E D` commands. This error clearing does not affect the errored second counters.

- To display a similar report for the 24 hour period listed in 1 hour increments execute the `D H` (Display History) for the near-end or `D H D` (Display History Distant) for the far-end.

CRI::> D H

Which Carrier (0, 1, or 2): 1

#### IPE Interface History Performance Log

For Carrier Number 1

8/15/95 9:45

Hour Ending	Errored Seconds	Bursty Seconds	Unavailable Seconds	Loss Frame Seconds	Frame Slip Seconds	Error Counter
9:00	0	0	0	0	0	0
8:00	1	0	0	0	0	1
7:00	0	0	0	0	0	0
0:00	0	0	0	0	0	0
23:00	1	1	0	0	0	1
22:00	0	0	0	0	0	0
21:00	0	0	0	0	0	0

11:00	1	1	1	1	1	1
10:00	0	0	0	0	0	0

**Note:** This report lists the 24-hour performance history for this carrier. Ideally all the parameters should show 0 for optimum performance. However, if the carrier is not in alarm state, it can continue to perform within the specified threshold limits.

---

--End--

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### Disabling a carrier when idle

Follow the steps in [Procedure 44 “Disabling a carrier when idle to check the carrier sparing function or to perform off-line carrier tests”](#) (page 178) to disable a carrier when idle to check the carrier sparing function or to perform off-line carrier tests.

#### Procedure 44

#### Disabling a carrier when idle to check the carrier sparing function or to perform off-line carrier tests

Step	Action												
1	<p>Execute the <code>s c</code> command to disable the desired primary carrier. This command allows the calls in progress to complete before the carrier can be disabled. The MMI terminal displays the following screen to enable a change in carrier status:</p> <p style="text-align: center;"><b>To disable carrier 1</b> (set Equipped carrier 1 parameter to N):</p> <table border="0" style="width: 100%;"> <tr> <td style="padding-left: 40px;"><b>CRI::&gt; S C</b></td> <td>To set carrier parameters</td> </tr> <tr> <td style="padding-left: 40px;">Equipped carrier 0 (Yes or No) Y</td> <td>Enable carrier 0. Enter Y to enable or N to disable.</td> </tr> <tr> <td style="padding-left: 40px;">Equipped carrier 1 (Yes or No) N</td> <td>Disable carrier 1.</td> </tr> <tr> <td style="padding-left: 40px;">Equipped carrier 2 (Yes or No) Y</td> <td>To enable carrier 2</td> </tr> <tr> <td style="padding-left: 40px;">Enable #2 for Spare (Yes or No) Y</td> <td>Defines carrier 2 as spare</td> </tr> <tr> <td style="padding-left: 40px;">Enable self clearing Alarms (Yes or No) N</td> <td>To enable/disable alarm clearing</td> </tr> </table>	<b>CRI::&gt; S C</b>	To set carrier parameters	Equipped carrier 0 (Yes or No) Y	Enable carrier 0. Enter Y to enable or N to disable.	Equipped carrier 1 (Yes or No) N	Disable carrier 1.	Equipped carrier 2 (Yes or No) Y	To enable carrier 2	Enable #2 for Spare (Yes or No) Y	Defines carrier 2 as spare	Enable self clearing Alarms (Yes or No) N	To enable/disable alarm clearing
<b>CRI::&gt; S C</b>	To set carrier parameters												
Equipped carrier 0 (Yes or No) Y	Enable carrier 0. Enter Y to enable or N to disable.												
Equipped carrier 1 (Yes or No) N	Disable carrier 1.												
Equipped carrier 2 (Yes or No) Y	To enable carrier 2												
Enable #2 for Spare (Yes or No) Y	Defines carrier 2 as spare												
Enable self clearing Alarms (Yes or No) N	To enable/disable alarm clearing												
2	<p>Track the number of calls still active on carrier 1 by executing the <code>STAT</code> command:</p> <p><b>LD 32</b></p> <p><b>NPR000</b></p> <p><b>STAT sl</b></p>												

CARR	CALS	TTSA	NND	SPARED
0	0	19/21	NO	NOT spar ed
1	1	18/21	YES	NOT spar ed
2	0	21/21	NO	NOT spar ed

**Note:** In the CALS column for carrier 1, it shows that carrier alarm status has alarm level 1 and no new data is allowed.

---

--End--

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### Testing the carriers using the T command

After checking the carrier status report and performance log, if one or more carriers are faulty, isolate the cause by testing the carriers using the  $\mathcal{T}$  (test) command.

There are two types of tests that can be performed using the  $\mathcal{T}$  command. These are on-line tests and off-line tests.

**On-line carrier test** The on-line carrier test (Test #1) is end-to-end carrier test performed without affecting the system performance and determines that a failure exists but cannot pinpoint the faulty component. Perform Test #1 on a known good carrier to switch signaling communication over this carrier. Don't test a carrier in alarm condition using Test #1, it may disrupt traffic for the duration of the test. A better approach is to disable the carrier you wish to test and perform one of the other tests to determine where the problem lies.

Disabling a carrier will prevent any new calls being placed over that carrier; however, it will not effect calls in progress over the disabled carrier. Performing Test #2 or #3 on a carrier will interrupt any calls in progress over that carrier for the duration of the test.

**Off-line carrier tests** The off-line carrier tests (Tests #2, #3, #4, and #5) isolate the failure to a field-replaceable unit. These tests are usually performed on carriers that are not carrying traffic. The user must specify the carrier to be tested and the duration of the test.

Test #2 tests the near-end card by looping back the carrier link side and verifies if the card is good.

Test #3 tests the far-end card by looping back the carrier link side on the distant card and verifies if that card is good.

Test #4 tests the carrier link side by looping back at the near-end or far-end CSU to test the link from the telco demarcation point to the local system or Carrier Remote IPE or from the far-end CSU to test the carrier link.

Test #5 provides a near-end loopback on the card to allow the distant testing of the near-end card across the carrier link.

Test #2 and #3 can occasionally show false failure indication when a false bit error is detected by the test logic, falsely indicating a test failure. If only one or two errors are shown out of 15 tests, try the test again. If the test passes on the second or third attempt, the carrier is probably performing correctly.

To verify the performance, execute **C A** and **C A D** to clear errors. Then display performance by executing the **D P** and **D P D** commands. The carrier is operational if no additional errors are detected.

The **STOP** command terminates a test prematurely; however, it does not terminate the remote loopback during carrier Test #3 and can interrupt the traffic for several seconds. If the **STOP** command causes a problem, execute Test #3 again with 0 duration to undo the far-end loopback or do not use the **STOP** command on Test #3.

Test 5 places the carrier in the loopback and test 4 works only if an external loopback is established first at the network or at the far-end.

Split pairs in the twisted pair patch cable between the telco network interface and the Local and Remote Carrier Interface cards can cause repetitive loss of frame errors despite passing loopback tests on both ends of the cable.

Follow the steps in [Procedure 45 "Testing the carriers" \(page 180\)](#) to test the carriers.

**Procedure 45**  
**Testing the carriers**

---

<b>Step</b>	<b>Action</b>
1	Logon and type <b>T</b> and press the <b>Enter</b> key to display the selection of tests.
2	Select the appropriate test number and press the <b>Enter</b> key:

---

```
CRI:>L
Enter Password: M1LINK

CRI:>L
CRI:>T
Test 1: Online Test
Test 2: Near End Loopback Test
Test 3: Remote Loopback
Test 4: Network Loopback
Test 5: Loop only
(1, 2, 3, 4, 5, or S to cancel): 1
Which carrier (0, 1, or 2): 2
Carrier Currently ENABLED
Enter Duration of Test (1-98 minutes, 0= once,
99= forever): _ Test will not interfere with calls in
progress
Hit Q to quit or any key to continue
```

#### Near End Testing

**Carrier 2 Test 1 Completed. Total Test 1 Total Errors 0.**

If an off-line test is selected, the user is prompted with:

**This test will interfere with calls currently in progress, continue ? : (Y or N): \_**

- 3 Check the results of the test and correct the identified fault.
- 4 Replace the faulty card or fix the problem in the carrier link if this is indicated in the test report.

---

--End--

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## Replacing Carrier Remote IPE cards

If after completing troubleshooting, it is determined that one or more Carrier Remote IPE cards are defective, remove the defective cards and replace them with spares.

When inserting a spare Local Carrier Interface card or a Remote Carrier Interface card into the module or Carrier Remote IPE cabinet, observe the card LED (the uppermost LED on the faceplate) to determine if the card passed the self-test. Package and ship the defective cards to an authorized repair center.

### Unpacking replacement cards

Unpack and visually inspect replacement cards as follows:

1. Inspect the shipping container for damage. Notify the distributor if the container is damaged.
2. Remove the unit carefully from the container. Do not puncture or tear the container; use a utility knife to open it. Save the container and the packing material for shipment of the defective card.
3. Visually inspect the replacement card for obvious faults or damage. Report the damage to the sales representative.
4. Keep cards in their antistatic bags until ready to install them. Do not stack them on top of each other.
5. Install cards. When handling the cards, hold them by their nonconductor edges to prevent damage due to static discharge.

### Removing and replacing a card

A Carrier Remote IPE card can be removed from and inserted into a local module or the Remote IPE module or Carrier Remote IPE cabinet without turning off the power to the module or cabinet. This feature allows the system to continue normal operation when replacing a Local Carrier Interface card in the system or a Remote Carrier Interface card in the Remote IPE module or cabinet.

#### Removing and replacing a Local Carrier Interface card

To remove and replace a Local Carrier Interface card, follow the steps in [Procedure 46 "Removing and replacing a Local Carrier Interface card" \(page 182\)](#).

#### Procedure 46

#### Removing and replacing a Local Carrier Interface card

Step	Action
1	Disable the Local Carrier Interface card by logging into the system terminal, loading the Network and Intelligent Peripheral Equipment Diagnostic Program LD 32, and executing <code>DISL s1</code> , where <code>s1</code> is the actual loop number of the Local Carrier Interface card.
2	Set the ENB/DIS switch to DIS.
3	Disconnect the cable from the Local Carrier Interface card faceplate.
4	Unlatch the card locking devices by squeezing the tabs and pulling the locking devices away from the card.

- 5 Pull the card out of the network module and place it into an antistatic bag away from the work area.
- 6 Set the replacement card ENB/DIS switch to **DIS**.
- 7 Hold the replacement card by the card locking devices and insert it partially into the card guides in the module.
- 8 Pull the upper and lower locking devices away from the faceplate on the card and insert the card firmly into the backplane connector.  
  
Press the card locking devices firmly against the faceplate to latch the card inside the module.  
  
Upon insertion, the Local Carrier Interface card automatically starts the self-test.
- 9 Observe the red LED on the front panel during self-test. If it flashes three times and stays on, it has passed the test. Go to step 10.  
  
If the red LED does not flash three times and then stay lit, it has failed the test. Pull the card partially out of the module and reinsert it firmly into the module. If the problem persists, troubleshoot or replace the Local Carrier Interface card.
- 10 Connect the cable to the Local Carrier Interface card faceplate connector.
- 11 Set the ENB/DIS switch to **ENL**.  
  
If the uppermost red LED on the Local Carrier Interface card faceplate turns off, the card is functioning correctly and is enabled. The outcome of the self-test is indicated on the system terminal or TTY (or the MMI terminal connected to the SDI/System Monitor connector on the Local Carrier Interface card faceplate).  
  
If the LED stays on, go to [“Isolating and correcting faults” \(page 157\)](#) in this chapter.
- 12 Tag the defective cards with a description of the problem and prepare them for shipment to the equipment supplier’s repair depot.

---

--End--

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### Removing and replacing a Remote Carrier Interface card

To remove and replace a Remote Carrier Interface card, follow the steps in [Procedure 47 “Removing and replacing a Remote Carrier Interface card” \(page 184\)](#).

**Procedure 47**  
**Removing and replacing a Remote Carrier Interface card**

Step	Action
1	Log in on the maintenance terminal as described in <a href="#">“Using system maintenance programs”</a> (page 154).
2	At the > prompt, type LD 32 and press the <b>Enter</b> key to access the program.
3	Type DSXP x, where x is the Remote Carrier Interface card number, and press the <b>Enter</b> key to disable the card.  The Remote Carrier Interface card is now disabled and can be removed.
4	Unlatch the card locking devices by squeezing the tabs and pulling them away from the card.
5	Pull the card out of the IPE module or cabinet and place it into an antistatic bag away from the work area.
6	Hold the replacement card by the card locking devices and insert it partially into the card guides in the module.
7	Pull the upper and lower locking devices away from the faceplate on the card and insert the card firmly into the backplane connector.  Press the card locking devices firmly against the faceplate to latch the card inside the module. The Remote Carrier Interface card automatically starts the self-test.
8	Observe the red LED on the front panel during the self-test.  If it flashes three times and stays on, it has passed the test. Go to step 9.  If it does not flash three times and then stays on, it has failed the test. Pull the card partially out of the module and reinsert it firmly into the module.  If the problem persists, troubleshoot or replace the Remote Carrier Interface card.
9	At the . prompt (dot prompt) in the LD 32 program, type ENXP x (v), where x is the Remote Carrier Interface card number and v is the loadware version that can be optionally downloaded after the enabling process, and press the Enter key to enable the card.  If the uppermost red LED on the Remote Carrier Interface card faceplate turns off, the card is functioning correctly and is enabled. The outcome of the self-test is indicated by LD 32 on the MMI terminal connected to the Remote Carrier Interface card.

If the LED stays on, go to [“Isolating and correcting faults”](#) (page 157) in this chapter or replace the card.

- 10 Tag the defective cards with a description of the problem and prepare them for shipment to the equipment supplier’s repair depot.

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--End--

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### Reinstalling covers

When it is determined that the Carrier Remote IPE is operating correctly, follow the steps in [Procedure 48 “Reinstalling the covers”](#) (page 185) to reinstall the covers.

#### Procedure 48 Reinstalling the covers

Step	Action
1	Reinstall covers on the system module.
2	Reinstall the cover on the Remote IPE floor-standing module or the wall-mounted (or pedestal-mounted) Carrier Remote IPE cabinet.
3	Terminate your session with the system by logging out on your maintenance terminal by typing <code>LOGO</code> at the <code>.</code> prompt (dot prompt) and pressing the <b>Enter</b> key.  If using the MMI terminal, log out to complete the test and troubleshooting session.

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--End--

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### Packing and shipping defective cards

To ship a defective card to a Nortel repair center, follow the steps in [Procedure 49 “Packing and shipping defective cards”](#) (page 185).

#### Procedure 49 Packing and shipping defective cards

Step	Action
1	Tag the defective card with the description of the problem.
2	Package the defective card for shipment using the packing material from the replacement card.  Place the card in an antistatic bag, into the box, and securely close the box with tape.

- 3 Obtain shipping and cost information from Nortel and mail the package to an authorized repair center.

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--End--

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## Appendix

# System messages

Table 31 "System error messages related to the CRI" (page 187) lists CRI-related system messages displayed or printed on the system and MMI terminal or TTY.

**Note:** CRInnnn messages are suppressed for a given superloop if alarms are disabled by the MMI command **A D** (Alarm Disable). CRInnnn messages are suppressed for a given carrier link if it is UNEQUIPPED by the MMI command **S C** (Set Configuration).

Table 32 "Remote Carrier Interface HEX error codes for self-test" (page 190) lists HEX codes displayed by the alphanumeric display on the Remote Carrier Interface card faceplate.

**Table 31**  
**System error messages related to the CRI**

Error Code	Message description
BSD805/806	Superloop timeslot not available. Check the timeslot allocation for each T1/E1 carrier.
NPR0019	LCI did not respond to the request of disable/enable the RTE superloop. Ensure that the LCI is installed and that the ENL/DIS switch is in ENL position.
NWS0019	LCI did not respond to the request of disable/enable the superloop. Ensure that the LCI is installed and that the ENL/DIS switch is in ENL position.
PWRxxxx	Carrier Remote IPE cabinet system monitor emulation.
SCH6575	REM_IPE package is not equipped.
SCH6576	Missing LCI software from disk.
SCH6577	Cannot change SUPT in the defined superloop. Superloop is not disabled.
CRIabcd	Where a=1 for local and 2 for remote, 3 for external, b= carrier 0, 1, or 2, c= alarm lever 1, 2, or 3, and d= 0 for bit error, 1 for frame slip, 2 for loss of signal, 3 for blue alarm, 4 for out-of-frame, 5 for within threshold, and 6 for MMI enabled. That is, carrier equipped using MMI configuration commands. This is shown in subsequent system error messages.

**Table 31**  
**System error messages related to the CRI (cont'd.)**

<b>Error Code</b>	<b>Message description</b>
<b>Bit error rate error code description</b>	
CRI1010	Local Carrier 0 Alarm Level 1. Bit error rate exceeded.
CRI1020	Local Carrier 0 Alarm Level 2. Bit error rate exceeded.
CRI1030	Local Carrier 0 Alarm Level 3. Bit error rate exceeded.
CRI1110	Local Carrier 1 Alarm Level 1. Bit error rate exceeded.
CRI1120	Local Carrier 1 Alarm Level 2. Bit error rate exceeded.
CRI1130	Local Carrier 1 Alarm Level 3. Bit error rate exceeded.
CRI1210	Local Carrier 2 Alarm Level 1. Bit error rate exceeded.
CRI1220	Local Carrier 2 Alarm Level 2. Bit error rate exceeded.
CRI1230	Local Carrier 2 Alarm Level 3. Bit error rate exceeded.
CRI2010	Remote Carrier 0 Alarm Level 1. Bit error rate exceeded.
CRI2020	Remote Carrier 0 Alarm Level 2. Bit error rate exceeded.
CRI2030	Remote Carrier 0 Alarm Level 3. Bit error rate exceeded.
CRI2110	Remote Carrier 1 Alarm Level 1. Bit error rate exceeded.
CRI2120	Remote Carrier 1 Alarm Level 2. Bit error rate exceeded.
CRI2130	Remote Carrier 1 Alarm Level 3. Bit error rate exceeded.
CRI2210	Remote Carrier 2 Alarm Level 1. Bit error rate exceeded.
CRI2220	Remote Carrier 2 Alarm Level 2. Bit error rate exceeded.
CRI2230	Remote Carrier 2 Alarm Level 3. Bit error rate exceeded.
<b>Frame slip error code description</b>	
CRI1031	Local Carrier 0 Alarm Level 3. Frame slip threshold exceeded.
CRI1131	Local Carrier 1 Alarm Level 3. Frame slip threshold exceeded.
CRI1231	Local Carrier 2 Alarm Level 3. Frame slip threshold exceeded.
CRI2031	Remote Carrier 0 Alarm Level 3. Frame slip threshold exceeded.
CRI2131	Remote Carrier 1 Alarm Level 3. Frame slip threshold exceeded.
CRI2231	Remote Carrier 2 Alarm Level 3. Frame slip threshold exceeded.
<b>Loss of signal error code description</b>	
CRI1032	Local Carrier 0 Alarm Level 3. Loss of signal.
CRI1132	Local Carrier 1 Alarm Level 3. Loss of signal.
CRI1232	Local Carrier 2 Alarm Level 3. Loss of signal.
CRI2032	Remote Carrier 0 Alarm Level 3. Loss of signal.
CRI2132	Remote Carrier 1 Alarm Level 3. Loss of signal.

**Table 31**  
**System error messages related to the CRI (cont'd.)**

<b>Error Code</b>	<b>Message description</b>
CRI2232	Remote Carrier 2 Alarm Level 3. Loss of signal.
<b>Blue alarm error code description</b>	
CRI1033	Local Carrier 0 Alarm Level 3. Blue alarm.
CRI1133	Local Carrier 1 Alarm Level 3. Blue alarm.
CRI1233	Local Carrier 2 Alarm Level 3. Blue alarm.
CRI2033	Remote Carrier 0 Alarm Level 3. Blue alarm.
CRI2133	Remote Carrier 1 Alarm Level 3. Blue alarm.
CRI2233	Remote Carrier 2 Alarm Level 3. Blue alarm.
<b>Out of frame error code description</b>	
CRI1034	Local Carrier 0 Alarm Level 3. Out of frame.
CRI1134	Local Carrier 1 Alarm Level 3. Out of frame.
CRI1234	Local Carrier 2 Alarm Level 3. Out of frame.
CRI2034	Remote Carrier 0 Alarm Level 3. Out of frame.
CRI2134	Remote Carrier 1 Alarm Level 3. Out of frame.
CRI2234	Remote Carrier 2 Alarm Level 3. Out of frame.
<b>Operation within threshold message description</b>	
CRI1005	Local Carrier 0 Alarm Level 0. Within threshold.
CRI1105	Local Carrier 1 Alarm Level 0. Within threshold.
CRI1205	Local Carrier 2 Alarm Level 0. Within threshold.
CRI2005	Remote Carrier 0 Alarm Level 0. Within threshold.
CRI2105	Remote Carrier 1 Alarm Level 0. Within threshold.
CRI2205	Remote Carrier 2 Alarm Level 0. Within threshold.
<b>Disabled/unequipped error code description</b>	
CRI1036	Carrier 0 MMI disabled/unequipped.
CRI1136	Carrier 1 MMI disabled/unequipped.
CRI1236	Carrier 2 MMI disabled/unequipped.
CRI1006	Carrier 0 MMI enabled/equipped.
CRI1106	Carrier 1 MMI enabled/equipped.
CRI1206	Carrier 2 MMI enabled/equipped.
<b>External alarm error code description</b>	
CRI3311	RCI external alarm closure. Alarm contact 1 closed.
CRI3312	RCI external alarm closure. Alarm contact 2 closed.

**Table 31**  
**System error messages related to the CRI (cont'd.)**

Error Code	Message description
CRI3313	RCI external alarm closure. Alarm contact 3 closed.
CRI3301	RCI external alarm closure. Alarm contact 1 open.
CRI3302	RCI external alarm closure. Alarm contact 2 open.
CRI3303	RCI external alarm closure. Alarm contact 3 open.

**Table 32**  
**Remote Carrier Interface HEX error codes for self-test**

HEX code	Test description
00	Peripheral Controller ID while waiting for PSDL.
01	RAM test
02	A31 #1 external buffer
03	A31 #1 internal context memory (phase A)
04	A31 #1 internal context memory (phase B)
05	A31 #1 internal TXVM memory
06	A31 #1 configuration memory
07	A31 #1 external FIFO
08	A31 #2 external buffer
09	A31 #2 internal context memory (phase A)
0A	A31 #2 internal context memory (phase B)
0B	A31 #2 internal TXVM memory
0C	A31 #2 configuration memory
0D	A31 #2 external FIFO
0E	A31 #1 Peripheral side W72 loopback test
0F	A31 #2 Peripheral side W72 loopback test
10	R72 N-P switching control memory
11	R72 320x8 NIVD buffer
12	R72 N-P Quiet code register
13	R72 P-N switching control memory
14	R72 640-8 XIVD buffer
15	R72 640-8 XIVD loopback buffer test
16	R72 P-N Quiet code register
17	R71 register test
18	R71 continuity test, peripheral side

**Table 32**  
**Remote Carrier Interface HEX error codes for self-test (cont'd.)**

HEX code	Test description
19	R71 continuity test, network side
1A	R71 packet transmission test
1B	DUART port A
1C	DUART port B
1D	RCIM shelf test
1E	End of test
1F	R72 #2 N-P quiet-code register test
EE	Bus error, exception errors, etc.

**Note:** After PSDL, the display on the Carrier Remote Interface card alternates between Peripheral Controller ID and the carrier 0 indicating that the clock reference is being received from carrier 0.



---

## Appendix

# Regulatory approvals

---

This appendix provides the general information that is supplied to the user as required by the FCC.

The general information that should be provided is as follows:

- FCC registration number and a list of all ports that connect to the network
- Explanation and use of the ringer equivalence number
- Rights of the telephone company
- What happens in case of telephone company equipment modification and in case of equipment trouble
- Location of a repair center in the U. S. A.
- List of repairs a user or customer may be allowed to make
- Rules about the coin service and state tariffs

## Regulatory notices

### Notice for United States installations

Carrier Remote IPE equipment complies with Part 68 of the United States Federal Communication Commission (FCC) rules. On the rear of the pedestal unit of the switching equipment cabinet is a label that contains, among other information, the FCC registration numbers and ringer equivalence number (REN) for this equipment. If required, this information must be provided to the telephone company.

CS 1000M and Meridian 1 regulatory labels include:

- FCC registration: AB6982-14234-MF-E
- FCC registration: AB6982-62937-PF-E
- FCC registration: AB6USA-18923-KF-E

- FCC registration: AB6CAN-18924-KF-E
- FCC registration: AB6CAN-61116-PF-E
- FCC registration: AB6CAN-61117-MF-E
- Service Code: 9.0F, Ringer equivalent: 1.1B (1.0A)

If the Carrier Remote IPE equipment causes harm to the telephone network, the telephone company will notify in advance that service may be discontinued temporarily. But if advance notice is not possible, the telephone company will notify the customer as soon as possible. You will also 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 proper operation of your equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications to maintain uninterrupted service.

If you experience trouble with Carrier Remote IPE equipment, please contact your authorized distributor or service center in the U.S. A. for repair/warranty information. If you do not know how to contact your distributor, please call Nortel Inc., 2221 Lakeside Drive, Richardson, TX 75082 at 1-800-328-8800. If the trouble is causing harm to the telephone network, the telephone company may request you to remove the equipment from the network until the problem is resolved. There is no user repair involved with this equipment.

The equipment cannot be used on public coin service provided by the telephone company. Connection to Party Line Service is subject to state tariffs. Contact the state public utility commission, public service commission, or corporation commission for information.

Allowing Carrier Remote IPE equipment to operate without proper answer supervision signals is a violation of FCC Rules, Part 68. Therefore:

- This equipment returns proper answer supervision signals to the Public Switched Telephone Network (PSTN) when:
  - answered by the called station
  - answered by the attendant
  - routed to a recorded announcement device that can be administered by the CPE user
  - routed to a dial prompt
- This equipment returns answer supervision on all DID calls forwarded back to the PSTN. Permissible exceptions are:

- a call is unanswered
- a busy tone is received
- a reorder tone is received

This equipment is capable of providing users access to interstate providers of operator services through the use of equal access codes. Failure to provide equal access capabilities is a violation of the Telephone Operator Consumer Services Improvement Act of 1990 and Part 68 of the FCC Rules.

### Network connection information

Listed in [Table 33 "Carrier Remote IPE network interfaces"](#) (page 195) are the Carrier Remote IPE network interfaces (Manufacturers Port ID) – one located at the local system site and the other at the remote site.

**Table 33**  
**Carrier Remote IPE network interfaces**

Reg. Status	Digital Interfaces (FIC)	Manufacture Port ID	Service Order Code	Network Jacks
M	04DU9-BN	NT7R51 NT7R52	6.0P	N/A
M	04DU9-DN	NT7R51 NT7R52	6.0P	N/A
M	04DU9-1KN	NT7R51 NT7R52	6.0P	N/A
M	04DU9-1SN	NT7R51 NT7R52	6.0P	N/A

**Note:** Digital Interfaces represent the Facility Interface Codes (FIC)

### Notice for Canadian installations

CS 1000M and Meridian 1 regulatory labels include:  
Department of Communication (CS03): 332 404 A

The Canadian Department of Communication label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. The Department does not guarantee that 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. In some cases, the company's inside wiring associated with

a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). 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 made by an authorized Canadian maintenance facility 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 use 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.



**DANGER**  
**DANGER OF ELECTRIC SHOCK**

Users should not attempt to make electrical ground connections, but should contact the appropriate electrical inspection authority or an electrician, as appropriate.

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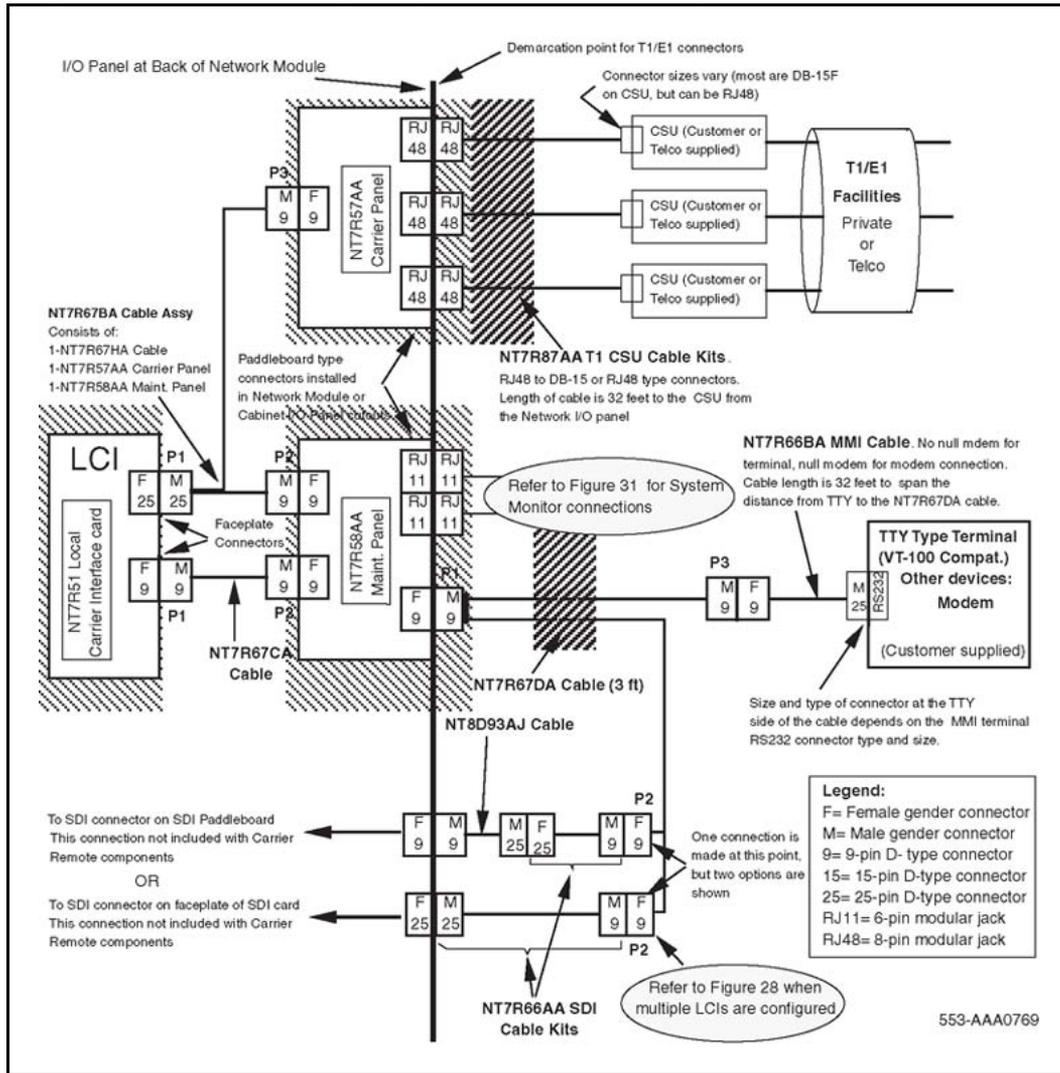
## Appendix

# Connection diagrams and external connectors pin assignment

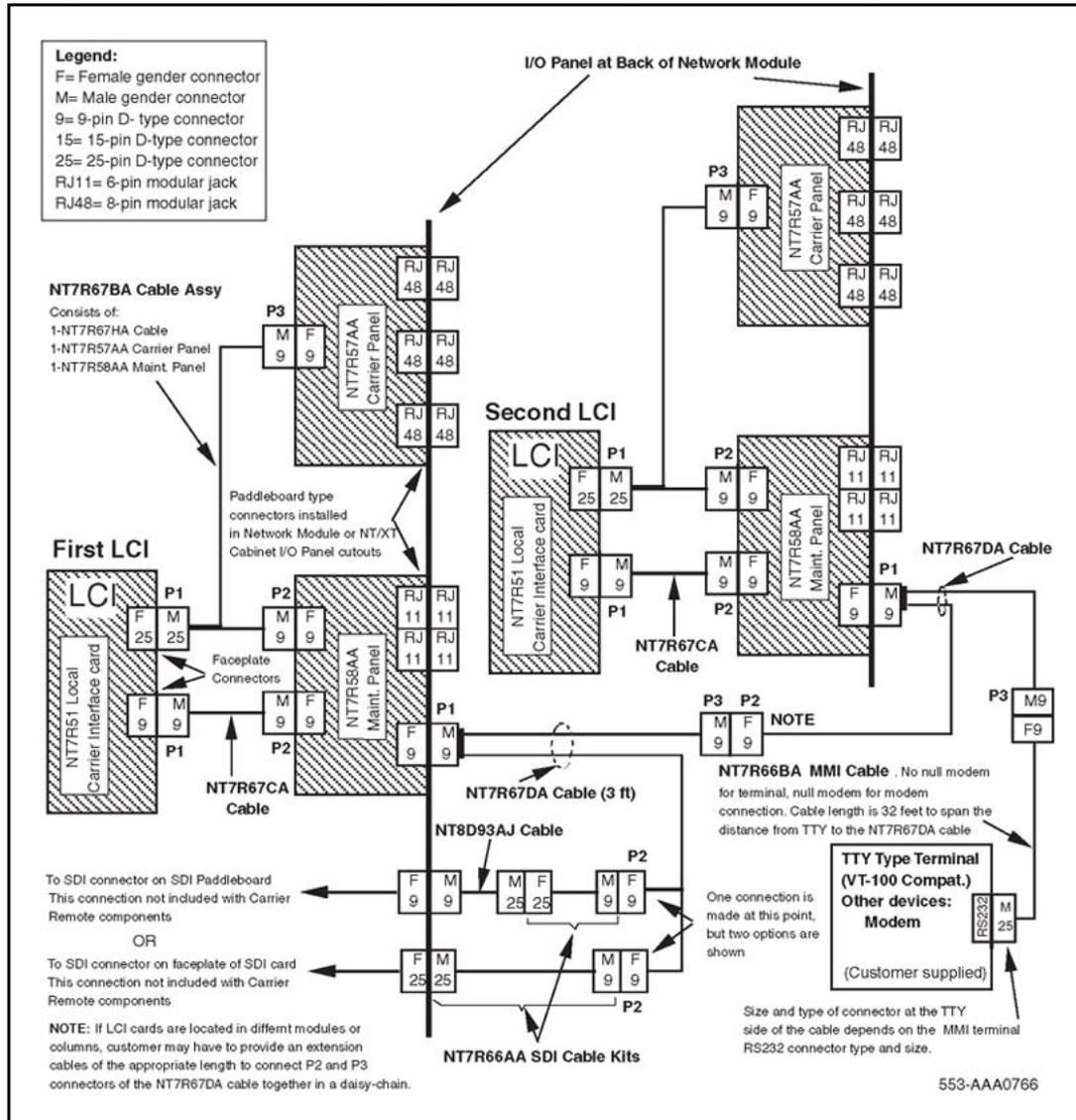
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This appendix provides connection diagrams and pin assignment information for all connectors interfacing with external equipment.

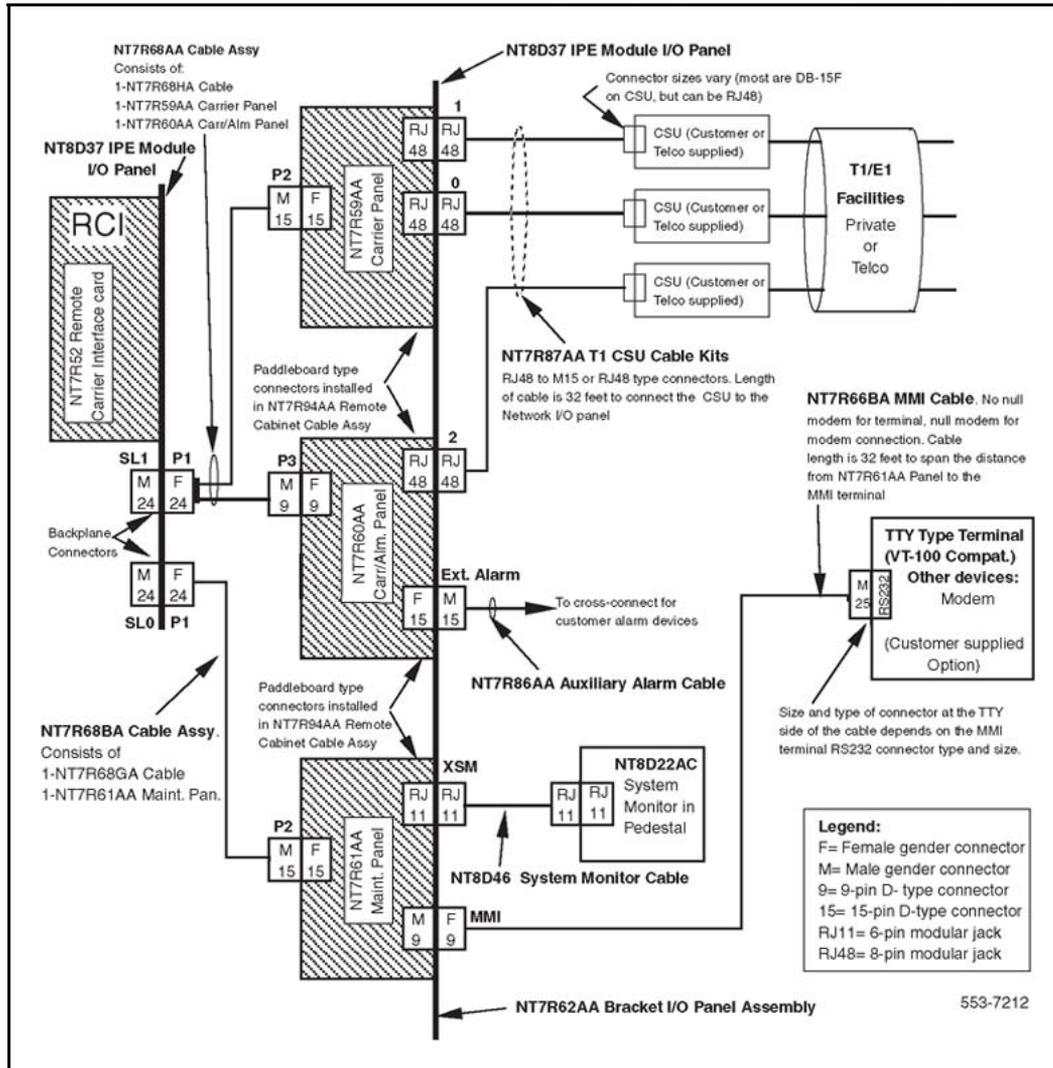
**Figure 26**  
**Single LCI connection diagram (local site connections)**



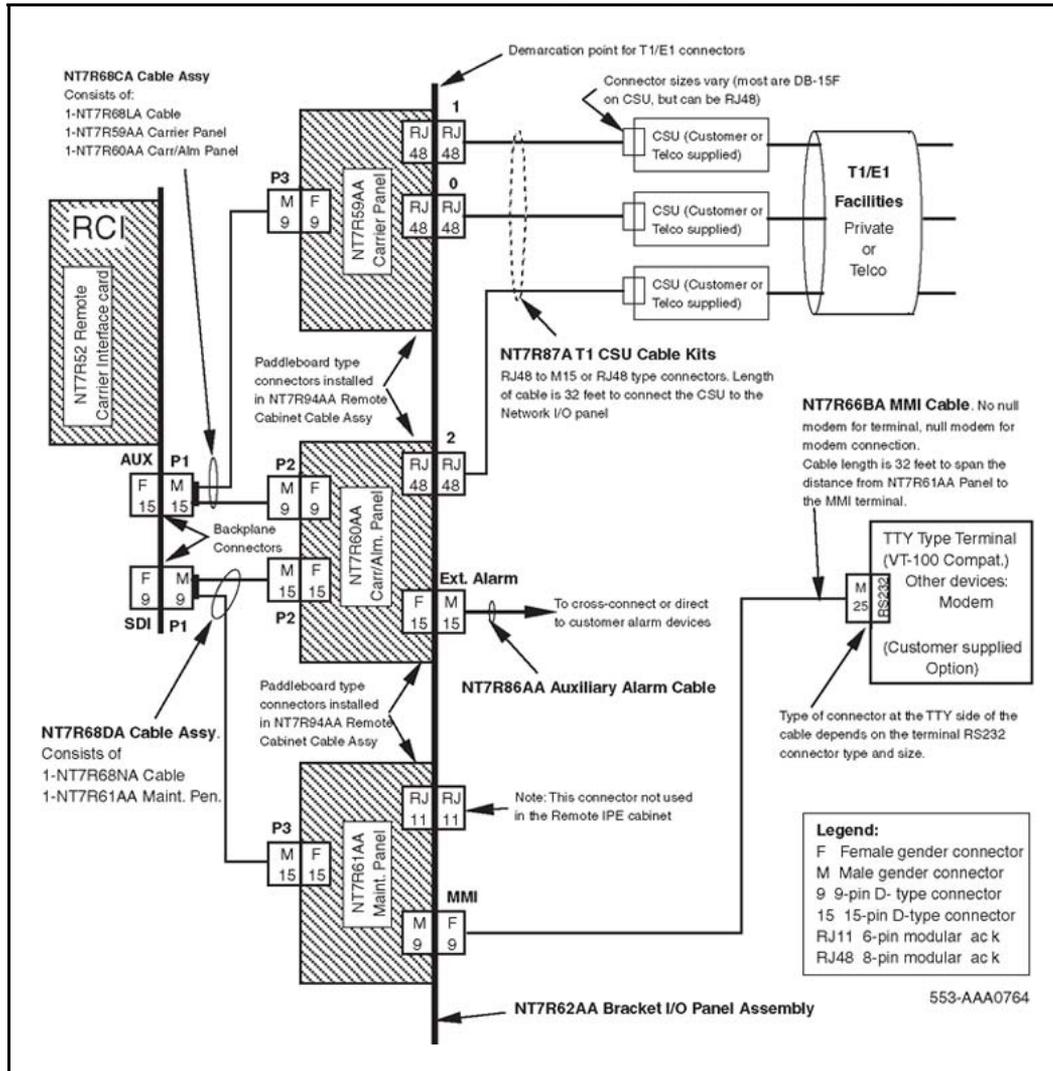
**Figure 27**  
**Multiple LCIs connection diagram (local site daisy-chain connection)**



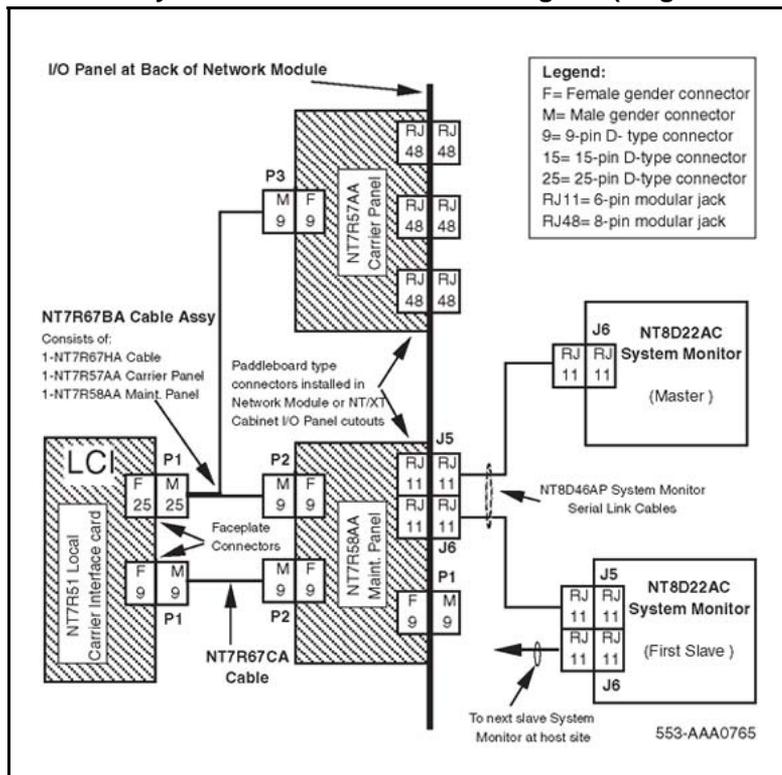
**Figure 28**  
**Remote Carrier IPE module connection diagram (single RCI configuration)**



**Figure 29**  
**Remote Carrier IPE cabinet connection diagram (single RCI configuration)**



**Figure 30**  
Local site system monitor connection diagram (single and multiple LCI configuration)



This Appendix provides the pin assignment for the NT7R57DA External Maintenance Cable assembly, which connects the Maintenance port on the I/O panel to the SDI port and the MMI terminal.

**Table 34**  
8-pin modular jack pin assignment for all carrier connections

T1/E1 Carrier Link 8-Pin Modular Jack Pinouts		
8-Pin Modular Jack	Signal Name	Signal Description
1	RTIPx	T1/E1 Carrier Receive Tip (from net)
2	RRINGx	T1/E1 Carrier Receive Ring (from net)
3	N/C	No connection
4	TRINGx	T1/E1 Carrier Transmit Ring (to net)
5	TTIPx	T1/E1 Carrier Transmit Tip (to net)

**Note:** The cable that connects to this connector is provided in the NT7T87AA T1 CSU Cable Kit. The cable is a straight through cables between the Carrier Remote IPE 8-pin modular jack and the Telco demarcation point. If the carrier links are just hardwired without using Telco network, pins 1 and 2 must be turned over (swapped) with pins 5 and 4 respectively at one end of the cable.

**Table 34**  
**8-pin modular jack pin assignment for all carrier connections (cont'd.)**

<b>T1/E1 Carrier Link 8-Pin Modular Jack Pinouts</b>		
<b>8-Pin Modular Jack</b>	<b>Signal Name</b>	<b>Signal Description</b>
6	N/C	No connection
7	N/C	No connection
8	N/C	No connection
<p><b>Note:</b> The cable that connects to this connector is provided in the NT7T87AA T1 CSU Cable Kit. The cable is a straight through cables between the Carrier Remote IPE 8-pin modular jack and the Telco demarcation point. If the carrier links are just hardwired without using Telco network, pins 1 and 2 must be turned over (swapped) with pins 5 and 4 respectively at one end of the cable.</p>		

**Table 35**  
**NT7R58AA Maintenance Panel 6-pin modular jack system monitor pin assignment for J5 and J6 connectors**

<b>System Monitor 6-Pin Modular Jack Pinouts</b>		
<b>8-Pin Modular Jack</b>	<b>Signal Name</b>	<b>Signal Description</b>
J5-1	N/C	No connection
J5-2	XSTXB	Transmit (NEGATIVE)
J5-3	XSTXA	Transmit (POSITIVE)
J5-4	XSRXB	Receive (NEGATIVE)
J5-5	XSRXA	Receive (POSITIVE)
J5-6	N/C	No connection
J6-1	N/C	No connection
J6-2	XMTXB	Transmit (NEGATIVE)
J6-3	XMTXA	Transmit (POSITIVE)
J6-4	XMRXB	Receive (NEGATIVE)
J6-5	XMRXA	Receive (POSITIVE)
J6-6	N/C	No connection
<p><b>Note:</b> J5 modular jack provides signals towards the Master system monitor and J6 modular jack provides signals away from the Master system monitor.</p>		

**Table 36**  
**DB-9 Local Maintenance Port and NT7R67DA Cable Connector Pinouts**

DB-9 Local Maintenance Port and NT7R67DA Cable Connector Pinouts				
DB-9 Pins	NT7R67DA Cable Connectors Pins		Signal Name	Signal Description
1	P1-1	P3-2	MNTX	MMI Transmit
2	P1-2	P3-3	MNRX	MMI Receive
3	P1-3	P2-3	SDITX	SDI Transmit
4	P1-4	P2-2	SDIRX	SDI Receive
5	P1-5	P2/P3 Pin 5	GND	Signal Ground (RS-232)
6	P1-6	P2/P3 Pin 7	REQA	Request from MMI Port
7	P1-7	P2/P3 Pin 9	REQB	Request from SDI Port
8	N/C	N/C	N/C	No connection
9	N/C	N/C	N/C	No connection
—	—	P2-4 to P2-6	DTR/DSR	Pins connected with 30 AWG wire

**Table 37**  
**NT7R61 Remote Maintenance Panel maintenance port DB-9 male connector pin assignment**

DB-9 Remote Maintenance Connector Pinouts		
DB-9 Connector Pins	Signal Name	Signal Description
1	N/C	No connection
2	SDITX	SDI Transmit
3	SDIRX	SDI Receive
4	N/C	No connection
5	GND	Signal Ground (RS-232)
6	N/C	No connection
7	N/C	No connection
8	N/C	No connection
9	N/C	No connection

**Table 38**  
**NT7R60AA Carrier/Alarm Panel DB-15 HD alarm connector pin assignment**  
**for Carrier Remote IPE module**

High Density DB-15 Alarm Connector Pinouts			
DB-15 Alarm Connector Pins	Signal Name	Signal Description	Wire Color Code
P1-1	N/C	No connection	N/C
P1-2	N/C	No connection	N/C
P1-3	N/C	No connection	N/C
P1-4	N/C	No connection	N/C
P1-5	N/C	No connection	N/C
P1-6	GND	Ground Return	Green
P1-7	ALM2	Customer External Alarm Input 2	Brown
P1-8	N/C	No connection	N/C
P1-9	N/C	No connection	N/C
P1-10	GND	Ground Return	See Note
P1-11	ALM1	Customer External Alarm Input 1	Blue
P1-12	ALM3	Customer External Alarm Input 3	White/Blue
P1-13	N/C	No connection	N/C
P1-14	N/C	No connection	N/C
P1-15	N/C	No connection	N/C
<b>Note:</b> This connection is jumpered to pin 6 inside the P1 DB-15 connector hood. No external voltage should be placed across the alarm inputs.			

**Table 39**  
**NT7R60AA Carrier/Alarm Panel DB-15 HD alarm connector pin assignment**  
**for Carrier Remote IPE cabinet**

High Density DB-15 Alarm Connector Pinouts			
DB-15 Alarm Connector Pins	Signal Name	Signal Description	Wire Color Code
P1-1	N/C	No connection	N/C
P1-2	N/C	No connection	N/C
P1-3	N/C	No connection	N/C
P1-4	N/C	No connection	N/C
P1-5	N/C	No connection	N/C
P1-6	GND	Ground Return	Green
P1-7	ALM2	Customer External Alarm Input 2 (5 V)	Brown
P1-8	-48 V	-48 V for PFTU	White/Brown
P1-9	PFTS	Power Fail Transfer Signal	White/Green
P1-10	GND	Ground Return	See Note 1
P1-11	ALM1	Customer External Alarm Input 1 (5 V)	Blue
P1-12	ALM3	Customer External Alarm Input 3 (5 V)	White/Blue
P1-13	BTRN	Battery Return for PFTU	Orange
P1-14	N/C	No connection	N/C
P1-15	N/C	No connection	N/C

**Note:** This connection is jumpered to pin 6 inside the P1 DB-15 connector hood. This connector is used to connect the NT7R87AA T1 CSU Cable Kit.

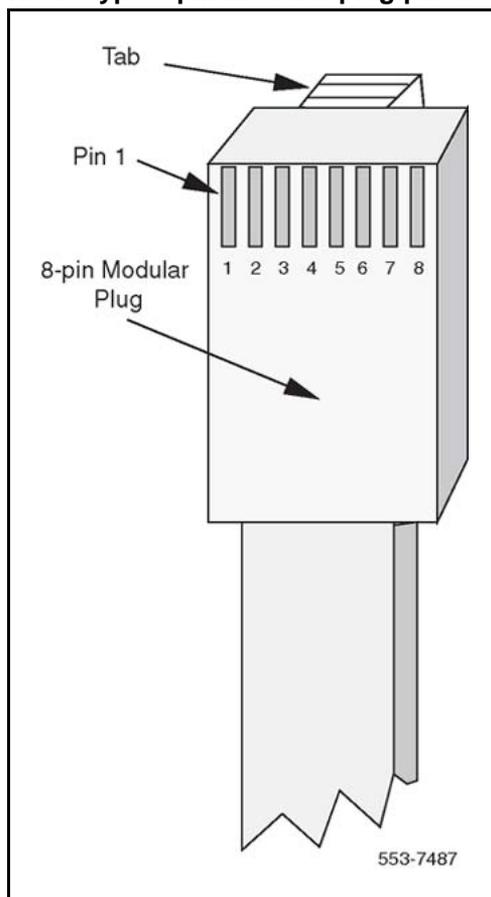
Table 40 "Local and Remote Carrier IPE to CSU cable (NT7R87AA) pin assignment" (page 207) provides the pin assignment relationship between the 8-pin modular jack and the DB-15 connectors to provide a connection between the Local Carrier Interface and Remote Carrier Interface to the CSU.

**Table 40**  
**Local and Remote Carrier IPE to CSU cable (NT7R87AA) pin assignment**

Carrier Panel 8-pin Modular Jack to CSU DB-15 Pin Assignment			
8-pin jack Pins	DB-15 Pins	Signal Name	Signal Description
1	11	RTIPx	Carrier Receive Tip (from network)
2	3	RRINGx	Carrier Receive Ring (from network)
4	9	TRINGx	Carrier Transmit Ring (to network)
5	1	TTIPx	Carrier Transmit Tip (to network)
<p><b>Note:</b> If the carrier links are just hardwired without using Telco T1 or E1 carrier links, the 8-pin modular plug pins 2 and 1 must be turned over (swapped) with pins 4 and 5 at one end. However, if using a T1 or an E1 Telco network, the network provides that turnover.</p>			

Figure 31 "RJ-48-type 8-pin modular plug pin assignments" (page 208) shows the 8-pin modular plug pin positions from left to right when the tab is in the back.

**Figure 31**  
**RJ-48-type 8-pin modular plug pin assignments**



**Note:** If wires are color-coded, hold modular plugs at both ends in the same orientation and verify that the cable is straight through wired when the color-coded wires are in the same pin position for both 8-pin modular plugs. For flat silver satin cable, verify straight through wiring when plug at one end faces up and at the other end faces down. Also verify that pins 1, 2, 4, and 5 are wired at both ends.

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Nortel Communication Server 1000

## Carrier Remote IPE Fundamentals

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