Fiber Remote Multi-IPE Interface Fundamentals
Avaya Communication Server 1000

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March 2013

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Contents

Chapter 1: New in this release

This section describes what’s new in this document for Avaya Communication Server 1000 Release 7.6.

Features

There are no updates to the feature descriptions in this document.

Other changes

There are no additional changes in *Avaya Fiber Remote Multi-IPE Interface Fundamentals* (NN43021-556).

Revision History

March 2013	Standard 06.01. This document is published to support Avaya Communication Server 1000 Release 7.6.
October 2011	Standard 05.03. This document is up-issued to remove legacy feature and hardware content that is no longer applicable to or supported by Communication Server 1000 systems.
November 2010	Standard 05.02. This document is published to support Avaya Communication Server 1000 Release 7.5.
November 2010	Standard 05.01. This document is issued to support Avaya Communication Server 1000 Release 7.5.
June 2010	Standard 04.01. This document is up-issued to support Avaya Communication Server 1000 Release 7.0.
May 2009	Standard 03.01. This document is up-issued to support Communication Server 1000 Release 6.0.
December 2007	Standard 02.01. Up-issued to support Communication Server 1000 Release 5.5.

May 2007	Standard 01.01. Up-issued to support Communication Server 1000 Release 5.0. This document contains information previously contained in the following legacy document, now retired: Fiber Remote Multi-IPE Interface (553-3021-556). No new content has been added for Communication Server 1000 Release 5.0. All references to Communication Server 1000 Release 4.5are applicable to Communication Server 1000 Release 5.0.
August 2005	Standard 3.00. Up-issued to support Communication Server 1000 Release 4.5.
September 2004	Standard 2.00. Up-issued to support Communication Server 1000 Release 4.0.
October 2003	Standard 1.00. This document is new for Succession 1000 Release 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: *Fiber Remote Multi-IPE Interface: Description, Installation, and Maintenance (553-3001-022)* .

Chapter 2: Introduction

This document is a global document. Contact your system supplier or your Avaya representative to verify that the hardware and software described are supported in your area.

Subject

This document provides information specific to the implementation of fiber-optic links that connect a local system to multiple Remote IPE modules using a pair of Fiber Remote Multi-IPE Interface units.

It describes the operation of the Fiber Remote Multi-IPE Interface equipment and provides specific information on how to install and maintain this equipment as an integral part of the local system. Fiber Remote Multi-IPE Interface configuration procedures are identical to the equivalent non-fiber equipment. However, there are some additional software commands that can be executed using the Man-Machine Interface (MMI) terminal to specifically control fiber-optic equipment.

Note on legacy products and releases

This document contains information about systems, components, and features that are compatible with Avaya Communication Server 1000 (Avaya CS 1000) software. For more information on legacy products and releases, click the **Technical Documentation** link under **Support & Training** on the Avaya home page:

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Applicable systems

This document applies to the following systems:

- Avaya Communication Server 1000M Single Group (Avaya CS 1000M SG)
- Avaya Communication Server 1000M Multi Group (Avaya CS 1000M MG)
- Avaya Communication Server 1000E (Avaya CS 1000E)

Intended audience

This document is intended for individuals who are responsible for installing and maintaining Fiber Remote Multi-IPE units as part of a CS 1000M Large System or Meridian 1 Large System.

Conventions

Terminology

In this document, the following systems are referred to generically as "system":

- CS 1000M
- CS 1000E
- Meridian 1

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

- CS 1000M SG
- CS 1000M MG
- Meridian 1 PBX 61C
- Meridian 1 PBX 81C

Related information

This section lists information sources that relate to this document.

Publications

The following publications are referenced in this document:

- *Avaya Circuit Card Reference (NN43001-311)*
- *Avaya Software Input Output Administration (NN43001-611)*
- *Avaya Traffic Measurement Format and Output Reference (NN43001-750)*
- *Avaya Communication Server 1000M and Meridian 1 Large System Planning and Engineering (NN43021-220)*
- *Avaya Communication Server 1000M and Meridian 1 Large System Maintenance (NN43021-700)*

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Chapter 3: Product description

Contents

This section contains information on the following topics:

Introduction

This section describes the Fiber Remote Multi-IPE Interface, its architecture, and its hardware options. It also describes how to plan and engineer a fiber-optic link that connects the local and the remote Fiber Remote Multi-IPE Interface units.

System overview

Avaya Communication Server 1000M (Avaya CS 1000M) Large Systems and Meridian 1 Large Systems are Private Branch Exchanges (PBXs) that link local subscribers to private and public networks and provide a large number of subscriber functions and features.

In addition to supporting local subscribers, a Large System can be configured using Remote IPE modules as a distributed system that supports remote subscribers. The Remote IPE modules are connected to the local system at long distances using fiber-optic links at a transmission speed of 45 Mbps.

Subscriber connections at local IPE modules are the same as the Remote IPE modules. The subscriber functions and features at the local site are also the same as for the Remote IPE site.

This document focuses on the Fiber Remote Multi-IPE Interface equipment specifically designed to provide fiber-optic links between the network functions in the local system and the peripheral controller functions in the Remote IPE. It also describes how and where to install and how to configure the Superloop Network and Peripheral Controller cards that support the Remote IPE application.

Figure 1: Local system to Remote IPE connection over the fiber-optic link on page 17 illustrates a Large System and the application of the Fiber Remote Multi-IPE Interface and the fiber-optic link to connect the Remote IPE site with the local site.

System description

The Fiber Remote Multi-IPE Interface links the local system with one or more Remote IPE sites to provide the same functionality to these Remote IPE sites. Each Remote IPE shares local common and network equipment to provide the same functions and features to remote subscribers that are available to local subscribers.

To explain the implementation of Fiber Remote Multi-IPE Interface functions, the following are described:

- Fiber Remote Multi-IPE Interface physical architecture
- Fiber Remote Multi-IPE Interface functional architecture

Fiber Remote Multi-IPE Interface physical architecture

To configure a system with one or more Remote IPEs, one or more IPE modules can be installed at a remote site and connected to an existing system using a pair of Fiber Remote Multi-IPE Interface units: one at the local site and another at the Remote IPE site. These two Fiber Remote Multi-IPE Interface units are connected by a fiber-optic link at a distance of up to 15 miles over a single-mode optical fiber.

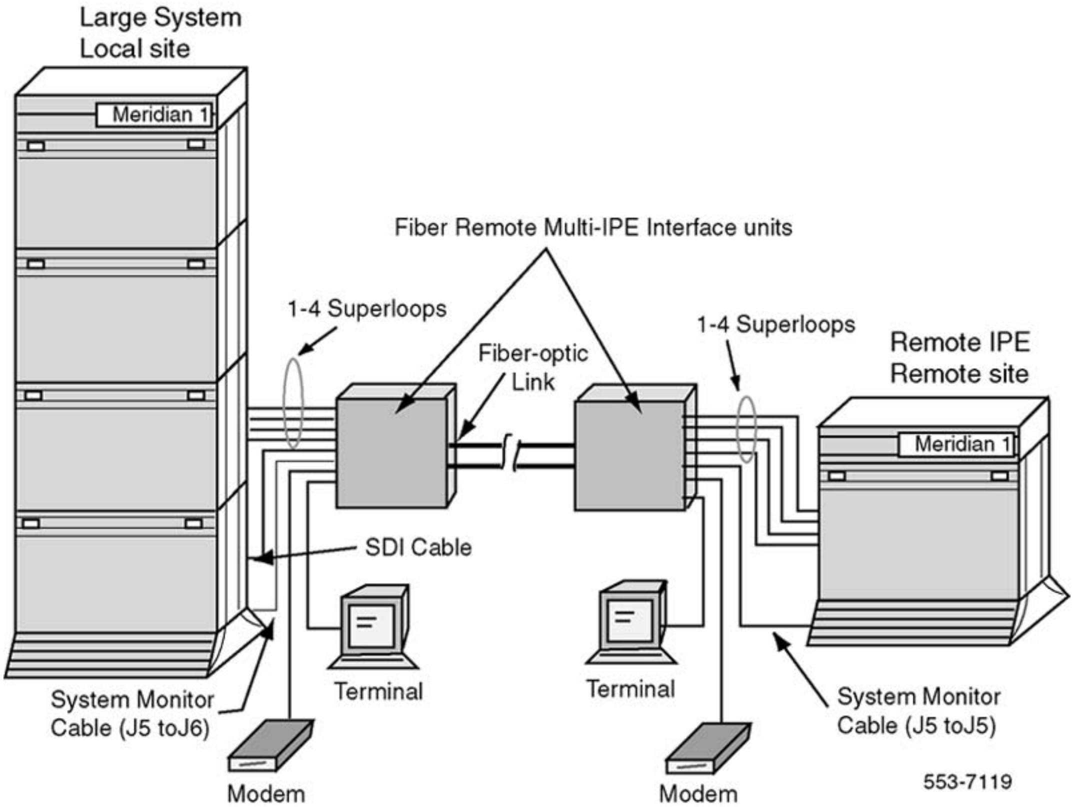

Figure 1: Local system to Remote IPE connection over the fiber-optic link

Fiber Remote Multi-IPE Interface options

The Fiber Remote Multi-IPE Interface is available in the following four different options:

- Single-mode fiber supporting four superloop
- Single-mode fiber supporting two superloops
- Multi-mode fiber supporting four superloops
- Multi-mode fiber supporting two superloops

These Fiber Remote Multi–IPE Interface options allow you to configure the superloop connections at the remote site the same way they are configured for the IPE modules at the local site. A Superloop Network card can be connected to support one to eight segments in an IPE module the same way it supports them in a local IPE module. A Superloop Network card can support a co-located IPE module with, for example, the superloop extended from the faceplate connector J1 and the Remote IPE site with the superloop extended from the faceplate connector J2 at the same time.

Table 1: Superloop connection configurations on page 18 shows how the superloop connections can be configured and which Fiber Remote Multi-IPE Interface should be used to connect to the Remote IPE site. The superloop configuration selected depends on the traffic requirements at the remote site. If non-blocking is required, three or four superloops for each

fully equipped Remote IPE module might be required. If call blocking is not an issue, a single superloop can be used for this application.

Note:

Up to four superloop links are supported by a pair of Fiber Remote Multi-IPE Interface units: one unit at each end of the fiber-optic link.

Table 1: Superloop connection configurations on page 18 lists various superloop-to-peripheral-controller connection combinations. It shows the connections from the Superloop Network card faceplate connectors J1 and J2 to the Remote IPE backplane connectors SL0 through SL3. Internal cables connect J1 and J2 to the network I/O panel at the local site and similarly, internal cables connect SL0-SL3 backplane connectors to the Remote IPE I/O panel. From these I/O panels, the external cables connect to the Fiber Remote Multi-IPE Interface units.

Table 1: Superloop connection configurations

Remote IPE Segments per Superloop (Max 4 segments per one IPE module)	Connecting from the local system		Connecting to Remote IPE	
	Superloop Network Card	Faceplate Connector	Controller Card	Backplane Connector
One segment per superloop	NT8D04 #1	J2	NT8D01BC #1	SL0
	NT8D04 #2	J2	NT8D01BC #1	SL1
	NT8D04 #3	J2	NT8D01BC #1	SL2
	NT8D04 #4	J2	NT8D01BC #1	SL3
Two segments per superloop	NT8D04 #1	J2	NT8D01BC #1	SL0
	NT8D04 #2	J2	NT8D01BC #1	SL1
Four segments per superloop	NT8D04 #1	J2	NT8D01BC #1	SL0
Eight segments per superloop	NT8D04 #1	J1	NT8D01BC #1	SL0
	NT8D04 #1	J2	NT8D01BC #2	SL0
One segment per one superloop/three segments per other superloop	NT8D04 #1	J2	NT8D01BC #1	SL0
	NT8D04 #2	J2	NT8D01BC #1	SL1
Two segments per superloop and six segments per another superloop	NT8D04 #1	J2	NT8D01BC #1	SL0
	NT8D04 #2	J2	NT8D01BC #1	SL1
	NT8D04 #2	J1	NT8D01BC #2	SL0

Remote IPE Segments per Superloop (Max 4 segments per one IPE module)	Connecting from the local system		Connecting to Remote IPE	
	Superloop Network Card	Faceplate Connector	Controller Card	Backplane Connector
Note: NT8D01BC Controller -4 replaces both NT8D01AC Controller-4 and NT8D01DC Controller-2 for new installations.				

From Table 1: Superloop connection configurations on page 18, the following can be concluded for each configuration:

- One segment per superloop. Requires transmission of four superloop links over the Fiber Remote Multi-IPE Interface and the fiber-optic link to a single Remote IPE module. Note that each Remote IPE module is divided into four segments. Call connections are not blocked.
- Two segments per superloop. Requires transmission of two superloop links over the Fiber Remote Multi-IPE Interface and the fiber-optic link to each Remote IPE module. Minimal to no call blocking.
- Four segments per superloop. Requires transmission of one superloop link over the Fiber Remote Multi-IPE Interface and the fiber-optic link to each Remote IPE module. Call blocking in high traffic conditions.
- Eight segments per superloop. Requires transmission of two superloop links over the Fiber Remote Multi-IPE Interface and the fiber-optic link to two Remote IPE modules. Call blocking in high traffic conditions.
- One segment for one superloop and three segments for the second superloop. Requires transmission of two superloops over the Fiber Remote Multi-IPE Interface and the fiber-optic link to a single Remote IPE module. No call blocking for one segment, blocking for the rest.
- Two segments for one superloop and six segments for another two superloops. Requires transmission of three superloops over the Fiber Remote Multi-IPE Interface and the fiber-optic link to two Remote IPE modules. Minimal blocking for the first four segments in one IPE module and blocking for the last four segments in the second IPE module.

Note:

Each segment example in Table 1: Superloop connection configurations on page 18 is configured over a pair of Remote Multi-IPE Interface units as shown in Figure 1: Local system to Remote IPE connection over the fiber-optic link on page 17.

Table 2: Equipment required to link local system to Remote IPE sites on page 20 lists the equipment required to link the local network equipment to the Remote IPE external to the local column and Remote IPE modules. All the equipment contained in the local column(s) as well as the equipment contained in Remote IPE modules is standard equipment not specifically designed to support the Fiber Remote Multi-IPE Interface and the fiber-optic link.

Table 2: Equipment required to link local system to Remote IPE sites

Component	Description
Fiber Remote Multi–IPE Interface Unit	Supports single-mode fiber-optic link for four superloops at connector positions SUPERLOOP-1 through SUPERLOOP-4.
Fiber Remote Multi–IPE Interface Unit	Supports single-mode fiber-optic link for two superloops at connector positions SUPERLOOP-1 and SUPERLOOP-2.
Fiber Remote Multi–IPE Interface Unit	Supports multi-mode fiber-optic link for four superloops at connector positions SUPERLOOP-1 through SUPERLOOP-4.
Fiber Remote Multi–IPE Interface Unit	Supports multi-mode fiber-optic link for two superloops at connector positions SUPERLOOP-1 and SUPERLOOP-2.
Fiber Remote Multi–IPE Interface Redundant Option	A daughterboard with fiber-optic connectors that is installed onto the motherboard to support single-mode redundant fiber-optic link operation.
Fiber Remote Multi–IPE Interface Redundant Option	A daughterboard with fiber-optic connectors that is installed onto the motherboard to support multi-mode redundant fiber-optic link operation.
Fiber Remote Multi–IPE Rack-Mounted Shelf	Supports up to six Fiber Remote Multi-IPE Interface units per shelf. Used where several units are co-located to save space. Usually at the local site (Optional).
Local Fiber Remote Multi-IPE Interface Cable	A 30 foot shielded cable connects the local network I/O panel 24-pin Centronics connector to a Fiber Remote Multi-IPE Interface unit SUPERLOOP 37-pin D Shell connector.
Remote Fiber Remote Multi-IPE Interface Cable	A 30-foot shielded cable connects the Remote IPE I/O panel 24-pin Centronics connector to a Fiber Remote Multi-IPE Interface unit SUPERLOOP 37-pin D Shell connector.
Maintenance Interface Cable	A 2-foot DB-9 male to DB-9 female cable daisy-chains multiple co-located Fiber Remote Multi-IPE Interface units to share a common maintenance terminal. The male cable connector plugs into the SDI connector and the female cable connector plugs into the MAINT connector in the I/O panel at the rear of the Fiber Remote Multi-IPE Interface units.
AC/DC Power Converter	A wall-mounted -48 Volt DC power converter with a 25-foot power cable is provided with each Fiber Remote Multi-IPE Interface unit.
DC Power Cable	DC 25-foot power cable that is connected between a -48 V system power source and the Fiber Remote Multi-IPE Interface unit.
Attenuated Fiber Loopback Cable	Fiber-optic cable used to loopback at the ST fiber-optic connectors on the faceplate.
NT7R66AA SDI Cable Kit	This cable kit provides a 10-foot DB-9 male to DB-25 male cable and a DB-25F/DB-25F compact adapter. To connect the standard SDI card to the DB-9 female SDI connector of the Fiber Remote Multi-IPE Interface unit, use the cable but not the DB-25F/DB-25F adapter. To connect the SDI Paddleboard use the entire kit including the

Component	Description
	adapter. This kit is used together with the NT8D93AJ cable for the Paddleboard.
NT7R66BA MMI Cable	This is a 32-foot DB-9 female to DB-25 male cable. Connect the MMI terminal to the DB-9 male MAINT port on the Fiber Remote Multi-IPE Interface unit.
NT8D46AL System Monitor daisy-chain cable (Similar cable may be purchased in any telephone equipment shop).	Connects RJ11 connectors XSM IN and XSM OUT daisy-chaining Fiber Remote Multi-IPE Interface units. This RJ11 phone cable has reverse leads: Black (2), Red (3), Green (4), Yellow(5) at one end of the cable and Yellow (2), Green (3), Red (4), Black (5) at the other end of the cable.
NT8D46AP System Monitor Serial Link Cable	Connects the 6-pin modular jack J5 on the Fiber Remote Multi-IPE I/O panel to the system monitor jack J6 in the pedestal.
NT8D88AD Network to I/O Panel Cable	A 6-foot cable that connects Superloop Network card J1 or J2 faceplate connectors to the network I/O panel.
NT8D92AD Controller to I/O Panel Cable	A 20-inch cable that connects one of the IPE backplane connectors SL0, SL1, SL2, or SL3 to the IPE I/O panel.
NT8D93AJ XSDI I/O to DTE or DCE Cable	Connects the Paddleboard DB-9 female connector to the adapter cable that connects to the Fiber Remote Multi-IPE Interface unit.

Figure 2: Local system to Remote IPE connection over fiber-optic links on page 22 illustrates a local system and Remote IPE equipment linked with fiber-optic cable over Fiber Remote Multi-IPE Interface units. Connections between the local system and Fiber Remote Multi-IPE Interface units depend on the number of superloops projected over the fiber-optic link to the Remote IPE modules at one or more remote sites. This figure shows two IPE Modules supported at the remote site. A maximum of four IPE Modules can be supported using a pair of Fiber Remote Multi-IPE Interface units.

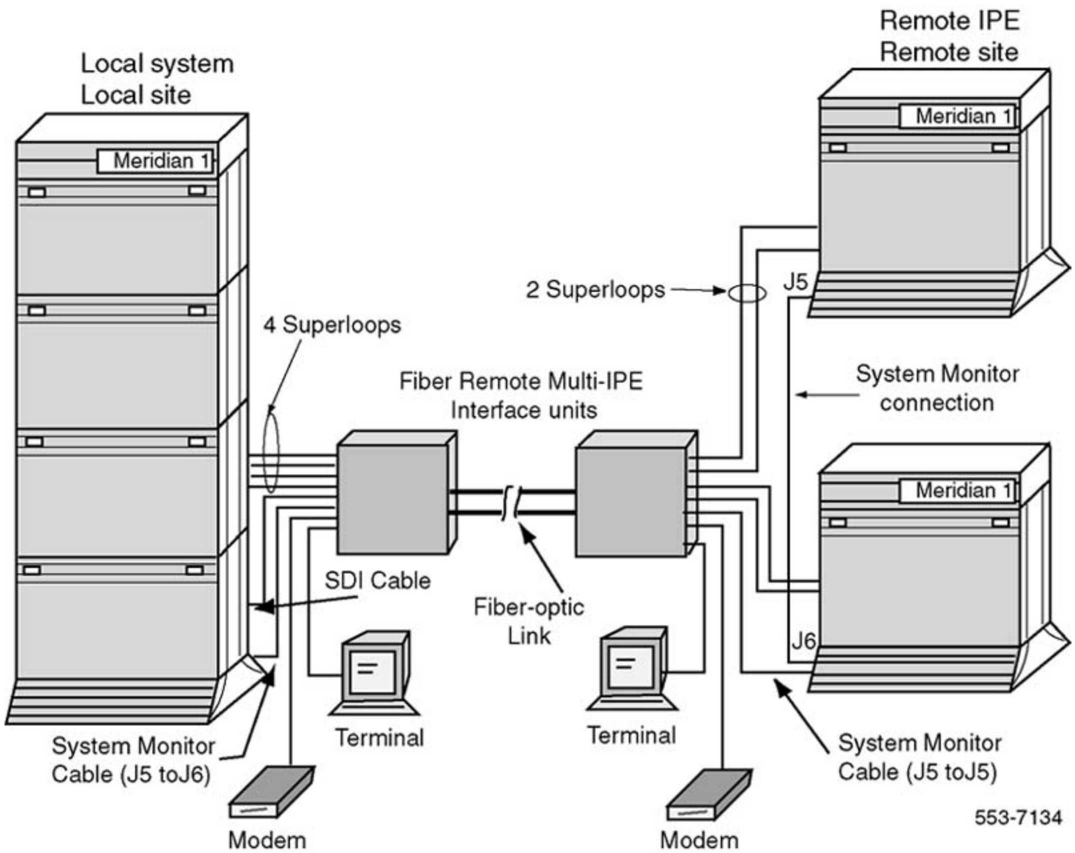

Figure 2: Local system to Remote IPE connection over fiber-optic links

A maximum number of four superloops can be supported by a Fiber Remote Multi-IPE Interface unit. The transmission of these four superloops is handled by a single transmit and a single receive fiber-optic link in a non-redundant configuration. The primary ST-type fiber-optic connectors on the Fiber Remote Multi-IPE Interface faceplate are labeled XMIT A and RCV A.

In the redundant configuration, an additional set of fiber-optic transmit and receive connectors are added to the Fiber Remote Multi-IPE Interface motherboard by installing a daughterboard into the unit. These redundant ST-type fiber-optic connectors on the Fiber Remote Multi-IPE Interface faceplate are labeled XMIT B and RCV B.

Fiber Remote Multi-IPE Interface unit

The Fiber Remote Multi-IPE Interface unit is housed in a metal enclosure measuring 10.5 in. high x 2.75 in. wide x 12 in. deep (26.67 cm. x 6.99 cm x 30.48 cm.). This enclosure can be mounted on the wall. Up to six of these enclosures can be installed in a 19-inch rack-mounted shelf. The shelf is normally used at the local site where there can be a number of Fiber Remote Multi-IPE Interface units supporting several Remote IPE sites.

The Fiber Remote Multi-IPE Interface unit has a faceplate that contains the ST-type fiber-optic connectors and the alarm and power LED indicators. At the rear of the unit an I/O panel contains connectors that connect the Fiber Remote Multi-IPE Interface unit to the local and the Remote IPE I/O panel connectors.

Figure 3: Fiber Remote Multi-IPE Interface faceplate on page 23 illustrates the front view of the Fiber Remote Multi-IPE Interface unit. It shows primary and redundant fiber-optic connectors to support a redundant fiber-optic link. It also shows the power and alarm indicator LEDs. The ejector tabs are used to eject the card. The motherboard can then be accessed to install the daughterboard or to set configuration switches.

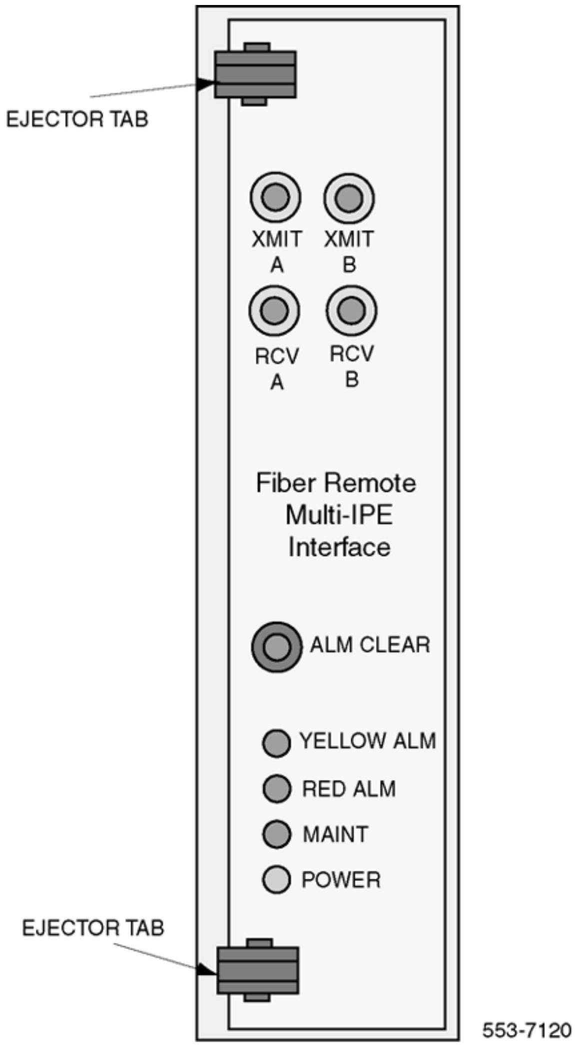

Figure 3: Fiber Remote Multi-IPE Interface faceplate

Figure 4: Fiber Remote Multi-IPE Interface unit I/O panel-rear view on page 24 illustrates the rear view of the Fiber Remote Multi-IPE Interface unit. It shows the Fiber Remote Multi-IPE Interface unit I/O panel. The I/O panel contains connectors for the superloop cables, the system monitor cables, the SDI port, the MMI terminal, the modem, the external alarms, and the power.

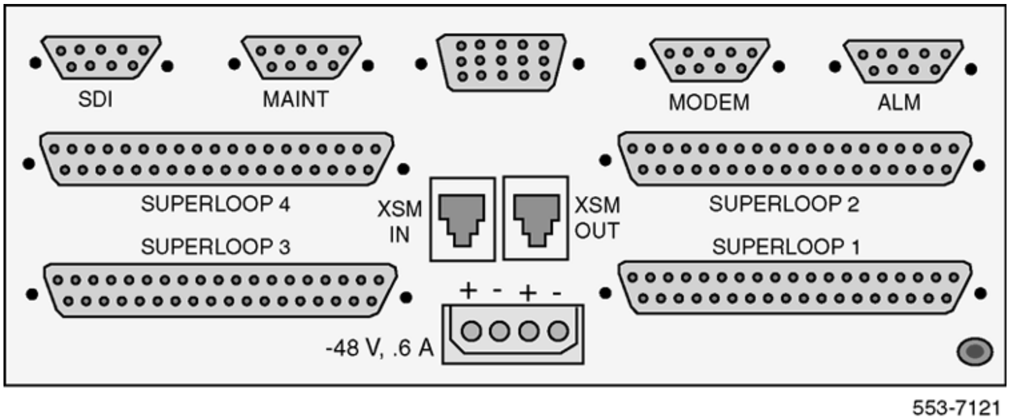

Figure 4: Fiber Remote Multi-IPE Interface unit I/O panel-rear view

The Fiber Remote Multi-IPE Interface I/O panel connectors interface with the local and Remote IPE equipment over copper cables. The SDI and the MAINT connectors can also be used to daisy-chain multiple Fiber Remote Multi-IPE Interface units to provide common MMI terminal and SDI connections for all Fiber Remote Multi-IPE Interface units in the chain.

Table 3: Fiber Remote Multi-IPE Interface I/O panel connectors on page 24 lists all the Fiber Remote Multi-IPE Interface I/O panel connectors and describes their functions.

Table 3: Fiber Remote Multi-IPE Interface I/O panel connectors

Connector name	Connector type	Connector function
SDI	DB-9 female	Connects to the SDI port in the local system or in a daisy-chain, to the MAINT connector of the preceding Fiber Remote Multi-IPE Interface unit.
MAINT	DB-9 male	Connects to the MMI terminal or in a daisy-chain to the SDI connector of the following Fiber Remote Multi-IPE Interface unit.
MODEM	DB-9 female	Connects to a modem for remote maintenance access to the Remote IPE. It can be connected at the local and at the remote site.
ALM	DB-9 male	Connects to external alarm devices.
XSM IN (J5)	6-pin modular jack	Connects to the XSM OUT (J6) jack on the upstream Fiber Remote Multi-IPE Interface unit, or Remote IPE system monitor.
XSM OUT (J6)	6-pin modular jack	Connects to the master system monitor J6 modular jack located in the local pedestal or the XSM IN (J5) jack or the downstream Fiber Remote Multi-IPE Interface unit.

Connector name	Connector type	Connector function
SUPERLOOP-1 through SUPERLOOP-4	37-pin D Shell, male	Connect to the local network I/O panel or Remote IPE I/O panel 24-pin connectors.

Fiber Remote Multi-IPE functional architecture

The Fiber Remote Multi-IPE Interface converts a superloop format into a fiber-optic format and the fiber-optic format to the superloop format. Since this is a bidirectional link, the communication and signaling information flows from the local site to the Remote IPE site and from the Remote IPE site to the local site.

To enhance the transmission reliability, the Fiber Remote Multi-IPE Interface can be equipped with a redundant fiber-optic link, which is automatically selected to carry traffic if the primary fiber-optic link fails.

The Fiber Remote Multi-IPE Interface performs the following main functions:

- supports a fiber-optic link between the local system and the Remote IPE over a pair of single-mode or multi-mode fibers
- monitors link performance and automatically switches from the primary to the redundant link if the primary link fails, if equipped
- provides system maintenance over the fiber-optic link in both directions
- performs diagnostic testing of the fiber-optic link and the superloops
- reports system monitor information from the Remote IPE sites to the local system

Fiber-optic interface

The Fiber Remote Multi-IPE Interface links multiple Remote IPE sites with the local system over single-mode or multi-mode optical fibers. With a multi-mode fiber-optic link, the maximum distance between the local system and the Remote IPE site is approximately 6 miles. With a singe-mode fiber-optic link, the maximum distance is approximately 15 miles. The actual distance depends on the quality of the fiber-optic cable and cable splices.

The Fiber Remote Multi-IPE Interface provides ST-type optical connectors, which are compatible with multi-mode fibers at 62.5um/125 um (micrometer) or with the single-mode fibers at 8.3 um/125 um.

A redundant fiber-optic link is optionally available on the Fiber Remote Multi-IPE Interface to provide greater transmission reliability between the local system and the Remote IPE sites. The Fiber Remote Multi-IPE Interface automatically transfers the communication to the redundant link when the primary link fails. When the primary link problem is corrected, it becomes the spare link and the transmission does not switch to it until the currently active link fails.

The Fiber Remote Multi-IPE Interface optical interface performs the following functions:

- provides a single or a redundant dedicated optical link to connect the Remote IPE to the local system
- monitors fiber-optic link integrity and transmission quality and provides automatic link switching from the failed primary link to the redundant link, if equipped
- provides local and remote loopback testing of the fiber-optic link by using a fiber-optic cable to loop the fiber-optic interface at either end of the fiber-optic link

Superloop interface

The Fiber Remote Multi-IPE Interface is equipped with four superloop network connectors. These are 37-pin D Shell connectors that are used to directly connect the Fiber Remote Multi-IPE Interface to the local network I/O panel or to the Remote IPE I/O panel 24-pin Centronics connectors. The Fiber Remote Multi-IPE Interface can accommodate from one to four superloops depending on the type selected. For types of Fiber Remote Multi-IPE Interface, refer to Table 2: Equipment required to link local system to Remote IPE sites on page 20.

Each superloop supports 120 timeslots for voice and data. Eight additional timeslots are used to carry out-of-band signaling and messaging information across the fiber-optic link.

Table 1: Superloop connection configurations on page 18 lists various combinations of superloop connections to the Fiber Remote Multi-IPE Interface. The flexibility of superloop use allows for system optimization, which depends on the specific system configuration and traffic requirements.

Maintenance functions

The Fiber Remote Multi-IPE Interface provides a DB-9 female (MAINT) connector at the rear of the unit on the I/O panel. This connector is used as the MMI terminal port at both the local and the remote sites.

This MMI terminal is used to perform the following functions:

- configuration of the fiber-optic link performance criteria, such as bit error rate threshold
- on-line and off-line diagnostic testing of the fiber-optic link and superloops
- retrieval of performance statistics, such as alarm log, error log, and current performance statistics
- clearing error log files and alarms
- setting time and date
- setting the name of the site and of the superloop links

The SDI connector, also located on the Fiber Remote Multi-IPE Interface I/O panel, is used to connect the Fiber Remote Multi-IPE Interface to an SDI card in the local system. An MMI terminal at the local site or at a Remote IPE site can access the system through this SDI port at the local site and perform configuration, maintenance, and test functions of the system.

A modem port (MODEM) is also provided on the I/O panel. This DB-9 female connector connects a modem to the Fiber Remote Multi-IPE Interface. The modem is used to connect an MMI terminal, which may be located at a maintenance center. This maintenance center may be located in a different city, but by using a modem and public or private telephone facilities, it is able to access the Fiber Remote Multi-IPE Interface equipment at the local and the remote sites. It can also access the local SDI port for local system maintenance. This access is allowed only to the system TTY and the MMI terminals directly connected to the Fiber Remote Multi-IPE Interface MAINT port.

A Fiber Remote Multi-IPE Interface in a multiple unit configuration can be accessed by logging in on an MMI terminal. An MMI terminal can then access the local system for system maintenance or access a Fiber Remote Multi-IPE Interface at the local or remote sites for maintenance and diagnostic testing and reporting. Only one Fiber Remote Multi-IPE Interface can be accessed at a time. To access another Fiber Remote Multi-IPE Interface, the current session has to be terminated and a different Fiber Remote Multi-IPE Interface unit can then be accessed by logging in again.

The Fiber Remote Multi-IPE Interface supports the maintenance port transmission speed of 2400 baud.

If multiple Fiber Remote Multi-IPE Interface units are co-located at a site, usually at the local site, Fiber Remote Multi-IPE Interface units can be daisy-chained to allow a single MMI terminal to access any Fiber Remote Multi-IPE Interface unit in the chain. This is accomplished by daisy-chaining the MAINT and the SDI ports on each Fiber Remote Multi-IPE Interface unit.

The SDI port of the first Fiber Remote Multi-IPE Interface in the daisy-chain can be optionally connected to an SDI port on the SDI card in the local system. The MAINT port in the last Fiber Remote Multi-IPE Interface in the daisy-chain is connected to the MMI terminal.

Fiber Remote Multi-IPE Interface units in a daisy-chain have unique addresses, which are set by a dip-switch setting on the motherboard. This allows a specific Fiber Remote Multi-IPE Interface in the chain to be selected when logging in on the MMI terminal to perform configuration, maintenance, or testing of that Fiber Remote Multi-IPE Interface unit.

System monitor interface

The system monitor cards reside in the local and Remote IPE pedestals. They monitor the power and the temperature in all modules in the local column and in the Remote IPE column. The master system monitor is located in the local common equipment pedestal. It receives the information from modules in its own column, from the slave system monitors located in other co-located columns, and from each Remote IPE system monitor over the fiber-optic link.

The Fiber Remote Multi-IPE Interface I/O panel provides two 6-pin modular jacks, which are used to connect the system monitor to the Fiber Remote Multi-IPE Interface for transmission of power and temperature status from the Remote IPE to the local system over the fiber-optic link.

If multiple Fiber Remote Multi-IPE Interface units are co-located at the local site, these units are daisy-chained by connecting the XSM OUT modular jack of one Fiber Remote Multi-IPE Interface unit to the XSM IN modular jack of the other unit in the chain. Only one Fiber Remote Multi-IPE Interface unit 6-pin XSM IN (J5) modular jack is connected to the J6 of the master system monitor or a slave system monitor that is hierarchically higher than the highest Fiber Remote Multi-IPE Interface unit connected to it.

At the Remote IPE site, the system monitor J5 modular jack is connected to the J5 XSM IN modular jack of the corresponding Fiber Remote Multi-IPE Interface unit. The information from the system monitor is transmitted over the fiber-optic link to the local site Fiber Remote Multi-IPE Interface unit. If multiple Fiber Remote Multi-IPE Interface units are co-located at the local site, they are daisy-chained and only one Fiber Remote Multi-IPE Interface unit is connected to the local master system monitor or to a slave system monitor hierarchically higher than the highest Fiber Remote Multi-IPE Interface unit.

Diagnostic functions

The Fiber Remote Multi-IPE Interface provides diagnostic functions to monitor the equipment performance and to automatically issue an alarm that corresponds to the type of fault detected. The alarm may be issued in the form of a lit LED, a message displayed on the MMI terminal or system maintenance terminal, a printed error report, or a combination of these fault indicators.

The Fiber Remote Multi-IPE Interface system diagnostics consist of:

- background diagnostics
- on-line diagnostics
- off-line diagnostics

Background diagnostics continuously monitor the fiber-optic link and the superloop timeslots for error conditions, loss of clock, loss of signal, and loss of frame.

When the fiber-optic link fails or the superloop shows an error condition, a normally open alarm relay contact closes, activating an alarm. An LED is lit at each end of the fiber-optic link, an error report is displayed on the maintenance terminal at each end of the link, and an entry is made in the Fiber Remote Multi-IPE Interface system alarm log indicating time, date, location, and type of alarm. A RED ALARM indicates that an error was detected at this side of the fiber-optic link and a YELLOW ALARM indicates that the error condition was detected at the opposite side of the fiber-optic link.

The Fiber Remote Multi-IPE Interface can be configured to automatically clear the alarm condition when the problem clears; otherwise, it can be configured to continue to indicate the alarm condition until it is cleared by a command over the MMI terminal or by pressing the ALM

CLEAR button on the Fiber Remote Multi-IPE Interface unit faceplate at the local or the remote site.

On-line diagnostics do not interfere with normal system operation and are performed on an active link.

Off-line diagnostics can interfere with normal system operation and are performed on an idle or faulty fiber-optic link or a disabled superloop. To minimize the impact of off-line testing, a superloop should first be software disabled and then tested while the other superloops are carrying traffic.

The off-line diagnostic testing can perform loopback tests of the superloop data, clock and frame signals, and on the fiber-optic link.

Commands can be issued over the MMI terminal to specify the superloop that should be tested and the duration of the test. Multiple superloops can be simultaneously tested, if so desired.

To perform loopback testing of the fiber-optic link, an attenuated loopback fiber-optic cable must be used at the end of the link that is being looped back. This test is used to verify the performance of the fiber-optic link and the Fiber Remote Multi-IPE Interface unit fiber-optic interface circuits.

Card-LAN interface

The Card-LAN is a 19.2 kbps asynchronous interface. It is used to poll intelligent peripheral equipment lines and communicate over the fiber-optic link to transmit maintenance messages between the Superloop Network card and the Peripheral Controller. These messages include:

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

Alarms and LED indicators

The Fiber Remote Multi-IPE Interface provides LED indicators and external alarm connections to enable error detecting and external alarm reporting.

External alarm indicators. The Fiber Remote Multi-IPE Interface unit I/O panel contains the DB-9 female ALM connector which connects the external alarms to the Fiber Remote Multi-IPE Interface unit.

The connector provides:

- three external alarm outputs on each local Fiber Remote Multi-IPE Interface unit
- two external alarm inputs and one external alarm output on each remote Fiber Remote Multi-IPE Interface unit

The two external alarm inputs (alarm inputs #1 and #2), when activated, are transmitted from a remote Fiber Remote Multi-IPE Interface over the fiber-optic link to the local Fiber Remote Multi-IPE Interface to activate two out of three external alarm outputs (alarm outputs #1 and #2) on the local Fiber Remote Multi-IPE Interface unit. At the local site, the alarm output #3 is activated when the fiber-optic link detects an alarm condition.

The single alarm output at the remote Fiber Remote Multi-IPE Interface will be activated if an external alarm is activated or if the fiber-optic link detects an alarm condition.

Figure 5: External alarm inputs and outputs on page 30 illustrates the external alarm inputs at the remote Fiber Remote Multi-IPE Interface location and the corresponding alarm outputs at the local Fiber Remote Multi-IPE Interface.

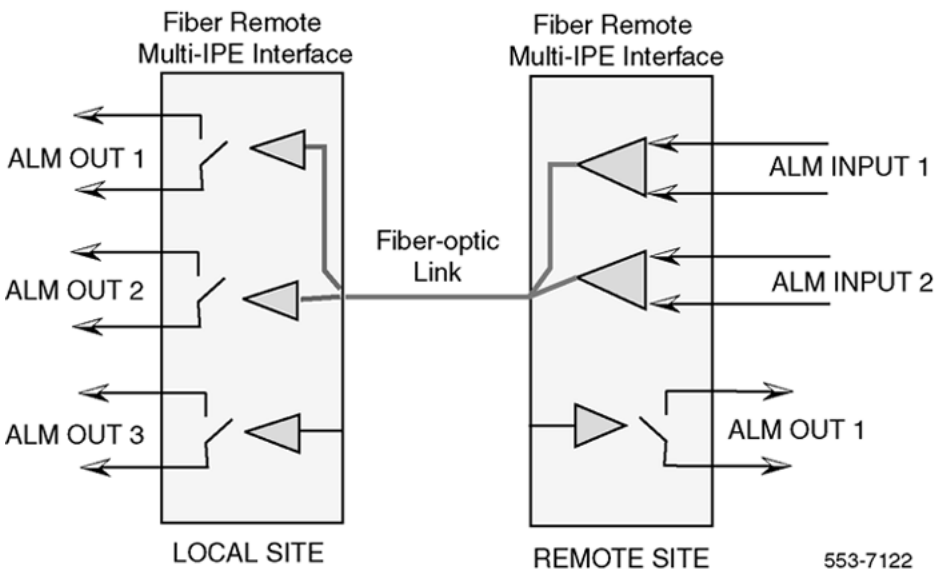

Figure 5: External alarm inputs and outputs

LED indicators. The LED indicators are located on the faceplate of each Fiber Remote Multi-IPE Interface unit. These LEDs are:

- Power LED. Indicates that the Fiber Remote Multi-IPE Interface passed self-test and the AC/DC power converter powering the Fiber Remote Multi-IPE Interface is operating correctly.
- Red Alarm LED. Indicates a near-end fault condition. This near-end fault condition activates the Yellow Alarm LED at the far-end Fiber Remote Multi-IPE Interface.
- Yellow Alarm LED. Indicates a far-end alarm condition. This alarm LED is activated by a far-end fault condition (when the Red Alarm LED is activated at the far-end).
- Maintenance In Progress LED. Indicates that a function in the fiber-optic link or one or more superloops have been disabled using maintenance commands. The LED will also be lit if a service-effecting off-line diagnostic test is in progress.

Engineering guidelines

General system engineering guidelines for Large Systems are described in *Avaya Communication Server 1000M and Meridian 1 Large System Planning and Engineering (NN43021-220)*. The following information deals specifically with engineering guidelines for the Fiber Remote Multi-IPE Interface planning and implementation. It also describes the fiber-optic interface specifications and fiber-optic link characteristics.

Remote IPE capacity

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

The overall maximum system capacity does not change by installing Fiber Remote Multi-IPE Interface units to support distributed intelligent peripheral equipment (subscriber loops) at Remote IPE sites. Fiber Remote Multi-IPE Interface allows you to distribute the intelligent peripheral equipment at long distances from the local system and provide the same functions and features to remote subscribers as to local subscribers.

The Fiber Remote IPE capacity can be tailored according to port capacity requirements at the remote site. When planning a Remote IPE site, you must determine the number of IPE cards required to support the existing and future traffic needs and the call blocking tolerance.

A Remote IPE column consists of a pedestal, from one to four IPE modules, and a top cap. One IPE module supports up to 16 line cards, or 256 ports if each line card has 16 ports (other IPE cards may have a different number of ports). If more ports are required, additional IPE modules can be added to the column. A column contains a maximum of four IPE modules providing a maximum of 1024 subscriber loops. Each IPE module requires one Peripheral Controller card located in the IPE module Cont card slot and a corresponding one to four superloops provided in the local system by the Superloop Network card(s).

Depending on the number of superloops required, the type of optical fiber used in the link, the appropriate Fiber Remote Multi-IPE Interface unit must be selected from Table 2: Equipment required to link local system to Remote IPE sites on page 20.

The number of superloops required to support a Remote IPE module depends on the traffic requirements. If a non-blocking traffic condition is required, the Remote IPE module requires a minimum of three superloops. Each superloop supports 120 timeslots or 7 line cards. To support 16 line cards, three or fours superloops should be used. If traffic blocking is not an issue, one superloop will be sufficient to support one Remote IPE module.

Engineering the fiber-optic link

A fiber-optic link can be constructed using single-mode or multi-mode fiber-optic cables. The type of fibers you select depends on various factors:

- distance between the local system and the Remote IPE site
- pre-existing fiber-optic link that can be used for this application
- cost and availability of fiber-optic cables

Single-mode Fiber Remote Multi-IPE Interface units are compatible with multi-mode fiber-optic link at the appropriately calculated attenuation limits. However, multi-mode Fiber Remote Multi-IPE Interface units are not compatible with the single-mode fiber-optic link.

When engineering a fiber-optic link, you must consult the component manufacturer's data sheets to determine whether the cable, connectors, and other components meet the transmission characteristics and the signal loss plan for the transmission distance required for your specific Remote IPE application.

Fiber-optic interface specification

When planning a fiber-optic link, you must consider the transmit and receive signal power and the signal attenuation of each component in the link to determine total signal attenuation.

Table 4: Fiber-optic transmit and receive signal levels on page 32 shows the transmit and receive signal power level at the signal source and the signal destination. The receive circuit on the electro-optical interface will detect a signal at a level as low as –30 dBm.

Table 4: Fiber-optic transmit and receive signal levels

	Transmitted power	Received power
Signal source	**Min**	**Min**
Fiber Remote Multi-IPE Interface	–15 dBm	–30 dBm

Fiber-optic link loss characteristics

The fiber-optic link components add to the total end-to-end link signal attenuation. The fiber-optic cable attenuation depends on the type of cable selected. The manufacturer's data sheet provides parameter values, which must be considered when engineering the link. In addition, the signal attenuation is also affected by the number of splices in the link and the signal loss in the link terminating the fiber-optic connectors.

Table 5: Example of fiber-optic link components and their attenuation factors on page 33 shows an example of different fiber-optic link components and the total signal attenuation for a 10 km link of 10.2 dB for a high quality single-mode fiber.

Table 5: Example of fiber-optic link components and their attenuation factors

Component	Quantity	Attenuation in (dB)	Total attenuation in (dB)
High quality single-mode fiber (10 km)	1	0.5/km	5.0
Medium quality splices	10	0.2/splice	2.0
ST connector pairs	4	0.8/connector pair	3.2
Note: XMIT A and RCV A connector pairs on the faceplate do not count when calculating the attenuation across the link.			

Maximum calculated signal attenuation across the link is 10.2 dB, which allows 4.8 dB safety margin for a single-mode fiber.

Note:

Actual attenuation must be determined by measuring the end-to-end signal loss. Because of the 45 Mbps data rate, dispersion loss is not a factor with either single-mode or multi-mode fibers. With good quality cable and splices, the Remote IPE modules can be located up to 15 miles from the network module for single-mode fibers and up to 6 miles for the multi-mode fibers. A safety margin for the attenuation loss is designed into the Fiber Remote Multi-IPE Interface unit over the specified usable power budget.

Fiber-optic cable types

If a fiber-optic link already exists, it must be evaluated to determine if it will support the Fiber Remote Multi-IPE Interface and, if it will, at what distance from the local system. The distance of the link can be determined by finding a point of the fiber-optic link where the signal loss is less than 15 dB for a given transmission rate over a single-mode fiber and less than 10 dB for the multi-mode fiber.

To evaluate an existing link, measure the end-to-end attenuation to determine the link's suitability for the Fiber Remote Multi-IPE Interface application.

A fiber-optic link may be composed of single-mode or multi-mode fibers, splices, and fiber-optic connectors. ST-type fiber-optic connectors have to be installed onto fibers of the fiber-optic link cables so that the link can be directly connected to the ST-type fiber-optic connectors on the Fiber Remote Multi-IPE Interface unit faceplate.

Fiber-optic link calculation examples

The following fiber-optic link calculations for both single-mode and multi-mode fibers illustrate how to evaluate the distance of a link based on the type of fiber and attenuation of the fiber and splices.

Example 1 - Medium quality multi-mode fiber-optic cable and splices

Medium quality multi-mode fiber-optic cable has a loss of 1.5 dB per km. Medium quality splices have 0.5 dB loss per splice.

Assumptions:

- dB loss allowed over multi-mode fiber by the Fiber Remote Multi-IPE Interface: 10 dB
- dB loss per km of fiber: 1.5 dB
- dB loss per splice: 0.5 dB

Assume a 5 km length of fiber link made from five 1 km lengths of fiber-optic cable with four splices in the cable (one splice every 1 km).

Calculations:

dB loss = (5km) x (1.5 dB per km) + (4 splices) x (0.5 dB per splice)

dB loss = 7.5 dB + 2.0 dB = 9.5 dB

Safety margin = 10 dB - 9.5 dB = 0.5 dB

Example 2 - High quality multi-mode fiber-optic cable and splices

High quality multi-mode fiber-optic cable provides a loss of 1.0 dB per km. High quality splices provide 0.1 dB loss per splice.

Assumptions:

- dB loss allowed over multi-mode fiber by the Fiber Remote Multi-IPE Interface: 10 dB
- dB loss per km of fiber: 1.0 dB
- dB loss per splice: 0.1 dB

Assume a 9 km length of fiber made from nine 1 km lengths of cable with eight splices in the cable (one splice every 1 km).

Calculations:

dB loss = (9km) x (1.0 dB per km) + (8 splices) x (0.1 dB per splice)

dB loss = 9.0dB + 0.8 dB = 9.8 dB

Safety margin = 10 dB - 9.8 dB = 0.2 dB

Example 3 - Medium quality single-mode cable and splices

Medium quality single-mode cable provides a loss of 1.0 dB per km. Medium quality splices provide 0.2 dB loss per splice.

- Assumptions:
- dB loss allowed over single-mode fiber by the Fiber Remote Multi-IPE Interface: 15 dB
- dB loss per km of fiber: 1.0 dB
- dB loss per splice: 0.2 dB

Assume a 12 km length of fiber made from twelve 1 km lengths of cable with eleven splices in the cable (one splice every 1 km).

Calculations:

dB loss = (12km) x (1.0 dB per km) + (11 splices) x (0.2 dB per splice)

dB loss = 12.0dB + 2.2 dB = 14.2 dB

Safety margin = 15 dB - 14.2 dB = 0.8 dB

Example 4 - High quality single-mode cable and splices

High quality single-mode cable provides a loss of 0.5 dB per km. High quality splices provide 0.1 dB loss per splice.

Assumptions:

- dB loss allowed over single-mode fiber by the Fiber Remote Multi-IPE Interface: 15 dB
- dB loss per km of fiber: 0.5 dB
- dB loss per splice: 0.1 dB

Assume a 25 km length of fiber made from twenty-five 1 km lengths of cable with twenty-four splices in the cable (one splice every 1 km).

Calculations:

dB loss = (25km) x (0.5 dB per km) + (24 splices) x (0.1 dB per splice)

dB loss = 12.5dB + 2.4 dB = 14.9 dB

Safety margin = 15 dB - 14.9 dB = 0.1 dB

System selection

In some applications where non-blocking or low blocking traffic considerations are important, you have to limit the number of peripheral cards supported by each superloop. For a non-blocking condition, the 120 voice/data timeslots (one superloop) support seven or eight 16-port line cards. Each additional line card in the IPE module increases call blocking under high traffic conditions. Refer to *Avaya Communication Server 1000M and Meridian 1 Large System Planning and Engineering (NN43021-220)* to calculate traffic.

A Remote IPE module supports 16 line cards and provides a maximum of 256 ports (different IPE cards provide different number of ports). This column can be expanded by adding more IPE modules to support additional ports. Each IPE module requires a Peripheral Controller card at the remote site and a corresponding one to four Superloop Network cards at the local site.

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

Remote IPE site planning

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

Environmental requirements

The Fiber Remote Multi-IPE Interface conforms to the same environmental requirements as the rest of the system equipment. Temperature, humidity, and altitude for equipment operation should not exceed the specifications shown in Table 6: Environmental requirements on page 36.

Table 6: Environmental requirements on page 36 shows the operating and storage environmental specifications. Ideally equipment 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 the table.

Table 6: Environmental requirements

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

Power requirements

Power for the Remote IPE modules is provided by the power converter in each module.

The Fiber Remote Multi-IPE Interface requires -48 V DC at 0.6 Amps. An AC/DC power converter is optionally shipped with each Fiber Remote Multi-IPE Interface unit to provide the required power for the Fiber Remote Multi-IPE Interface unit. This power converter is wall-mounted next to the Fiber Remote Multi-IPE Interface unit.

A DC power source for the Fiber Remote Multi-IPE Interface unit is a -48 V also used by the local system or the Remote IPE column. This source is usually available if the system is DC-powered or has a DC backup power source.

Chapter 4: Installation and configuration

Contents

This section contains information on the following topics:

Introduction

This section describes the installation of the Fiber Remote Multi-IPE Interface unit as a part of a fiber-optic link connecting the local system to its Remote IPE modules at distances of up to 15 kilometers. It explains how to prepare the site and check the equipment before installing it and how to configure it to the specific traffic requirements.

Quick reference to system installation and configuration

If familiar with the system operation and general system installation practices, follow the steps below to speed up the installation of the Fiber Remote Multi-IPE Interface and the Remote IPE:

1. Take inventory of the equipment by comparing the received equipment against the shipping documents. Refer to Table 2 in the Product Description section for Remote IPE components part numbers and their description.
2. Plan the superloop and fiber-optic link configuration based on the traffic requirements (blocking or non-blocking traffic) at the Remote IPE site. Refer to the following:
   - Engineering guidelines on page 31
   - Table 1: Superloop connection configurations on page 18 to specify the number of superloops required
   - Table 2: Equipment required to link local system to Remote IPE sites on page 20 to select the appropriate Fiber Remote Multi-IPE Interface type based on the number of superloops and the fiber-optic cable type
3. Install the NT8D04 Superloop Network card into a network card slot and connect the internal superloop cables to the network I/O panel. To identify an empty network card slot, refer to the following:
   - Table 7: Modules supporting Superloop Network cards on page 46
   - Installing the Superloop Network card on page 46 to install the card into its designated card slot
   - Installing cables between the Superloop Network card and the network I/O panel on page 47 to install cables between J1 and J2 faceplate connectors and the network I/O panel
4. Configure and install the Fiber Remote Multi-IPE Interface unit. Refer to the following:
   - Setting S1 and S2 switches at the local site on page 48 to set the dip-switches S1 and S2, to install the redundant optical connectors, if required, and to install the unit onto the wall or into the shelf
   - Installing local superloop cables on page 57 to connect the cables between the network I/O panel and the SUPERLOOP connectors on the Fiber Remote Multi-IPE Interface unit
5. Connect the system monitor, local MMI terminal, and fiber-optic link cables to the Fiber Remote Multi-IPE Interface unit connectors. Refer to the following:
   - Connecting local system monitor cables on page 58
   - Connecting the SDI card and the MMI terminal to multiple Fiber Remote Multi-IPE Interface units on page 61
   - Connecting the fiber-optic link on page 63
6. At the remote site, install the Remote IPE equipment. Refer to the following:
   - Installing the internal cables to the Remote IPE module on page 70
   - Setting S1 and S2 switches at the remote site on page 70

7. Connect the external cables to the I/O panel. Refer to the following:
    - Installing superloop cables on page 74
    - Connecting the system monitor cable on page 74
    - Connecting the MMI terminal on page 75
    - Connecting the fiber-optic link to the Remote IPE Module on page 77
8. Configure the Remote IPE local and remote sites. Refer to the following:
    - Configuring the cards on page 80
    - Selecting the MMI terminal modes on page 83
    - Configuring the MMI modem on page 85
    - Configuring the Fiber Remote Multi-IPE Interface on page 87
9. Conduct system acceptance testing. Refer to Remote IPE acceptance testing on page 93.

Installation overview

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

To install a new system or expand an existing one, refer to *Avaya Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43011-310)*. It provides the information on how to install, verify, and maintain Large Systems.

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

To complete the installation of a Remote IPE site, do the following:

- perform the preinstallation procedures to prepare the site
- install the Fiber Remote Multi-IPE Interface and fiber-optic link
- install the copper cables between the Fiber Remote Multi-IPE Interface units and the local system and between remote Fiber Remote Multi-IPE Interface units and the Remote IPEs.

Preinstallation

Preinstallation procedures include:

- preparing the site
- unpacking, inspecting, and taking inventory of the equipment
- routing and splicing fiber-optic cables to create a fiber-optic link between two sites, if it does not already exist
- connecting the fiber-optic link to the Fiber Remote Multi-IPE Interface at the local site and the Remote IPE site
- selecting the local Superloop Network cards for connection to the Fiber Remote Multi-IPE Interface

Installation

Installation procedures include:

- installing the Superloop Network cards in the selected network card slot, if not already installed
- installing the cables between the J1 and J2 faceplate connectors on the Superloop Network cards and the network I/O panel connectors at the rear of the network module
- installing the cables between the SL0 through SL3 backplane connectors on the Remote IPE module and the I/O panel connectors at the rear of the module
- configuring the Fiber Remote Multi-IPE Interface dip-switches and installing the Fiber Remote Multi-IPE Interface unit onto the wall or in the shelf
- connecting the fiber-optic link to the Fiber Remote Multi-IPE Interface fiber-optic ST-type connectors
- connecting the external copper cables between the Fiber Remote Multi-IPE Interface unit and local network I/O panel connectors.
- connecting the master system monitor and MMI terminal cables at the local site
- connecting the external copper cables between the Fiber Remote Multi-IPE Interface unit and the Remote IPE module I/O panel connectors
- connecting the slave system monitor and MMI terminal cables at the remote site
- connecting the fiber-optic link to the Fiber Remote Multi-IPE Interface at the Remote IPE site

Preinstallation preparation

Preinstallation preparation consists of the following:

- preparing the site
- unpacking and inspecting components
- taking inventory
- installing or selecting already installed Superloop Network cards which will support Remote IPE sites
- installing the fiber-optic link
- preparing the Remote IPE column for connection to the Fiber Remote Multi-IPE Interface

Preparing the site

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

To prepare the site for Fiber Remote Multi-IPE Interface installation:

1. Install and verify the operation of the local system without linking to the Remote IPE site(s). Refer to *Avaya Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43011-310)*.
2. Install the Remote IPE column at the remote site, if not already installed. Also refer to *Avaya Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43011-310)*.
3. Route and splice the fiber-optic cable between the local site and Remote IPE site(s).

Unpacking and inspection

Unpack and inspect the equipment for damage. When unpacking, follow the 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.
- Observe grounding precautions before handling any equipment.

- Remove equipment carefully from its packaging.
- Visually inspect the equipment for obvious faults or damage. Any damaged component must be reported to the sales representative and the carrier who delivered the equipment.
- Do not bend and twist the fiber-optic cables excessively. Make sure that the cable is not bent beyond the specified minimum-bending radius of 1.4 inches (3.5 cm) when handled or installed.

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.

Installing the fiber-optic link

If the fiber-optic link already exists, check its fiber-optic link characteristics and the end-to-end loss to determine if the link can support a Fiber Remote Multi-IPE Interface units and, if it can, at what distance between the local system and the Remote IPE.

Consult the Avaya distributor to learn how to verify that the existing fiber-optic link is suitable for the Fiber Remote IPE application and what equipment to use to do so.

To connect the fiber-optic link to the Fiber Remote Multi-IPE Interface ST optical connectors at the local site and the Remote IPE site, the link fibers must be terminated with ST-type optical connectors.

⚠ Caution:

If changing a fiber-optic system to the Fiber Remote Multi-IPE Interface, make sure that the fiber-optic link connectors are changed to the appropriate ST-type. The ST-type optical connector must correspond to the type of fibers used in the fiber-optic link (that is, single-mode or multi-mode). A fiber-optic adapter cable can also be used to adapt the existing connector type to the ST- type if the total link attenuation, including the adapter, does not exceed the maximum acceptable link loss.

Keep the optical connectors absolutely clean. Use pure isopropyl alcohol-treated lint-free wipes to clean the ferrule part of the optical connector and an aerosol duster to blow out dust particles from the adapter part of the optical connector.

Make sure that the ferrules in the optical connectors are properly installed and aligned in their respective adapters. This is particularly critical for the single-mode fibers where tolerances are tighter.

When routing the fiber-optic cables to the Fiber Remote Multi-IPE Interface units, take the following precautions:

- Do not bend the fiber-optic cable or individual fibers beyond the minimum bending radius specified by the cable manufacturer.
- Protect the exposed parts of the cable and fibers with plastic conduit.
- Terminate each selected fiber with an ST optical connector (a fiber-optic cable may contain more fibers than required by the single or redundant link design). At the fiber management frame, the type of optical connectors used depends on the available frame optical connectors.
- Label optical fibers with XMIT A (transmit) and RCV A (receive) designator behind the ST optical connector for the primary link and XMIT B and RCV B for the redundant link to identify the function of each fiber in the link.

Handle fibers with extreme care. Observe a minimum bending radius at all times. Optical connections to the optical units should be finger-tightened only.

The link fiber labeled XMIT A at the remote site must be labeled RCV A at the local site, and the link fiber labeled RCV A at the remote site must be labeled XMIT A at the local site. For a redundant link, label XMIT B at the remote site as RCV B at the local site, and RCV B at the remote site as XMIT B at the local site as shown in Figure 6: Fiber-optic link on page 45.

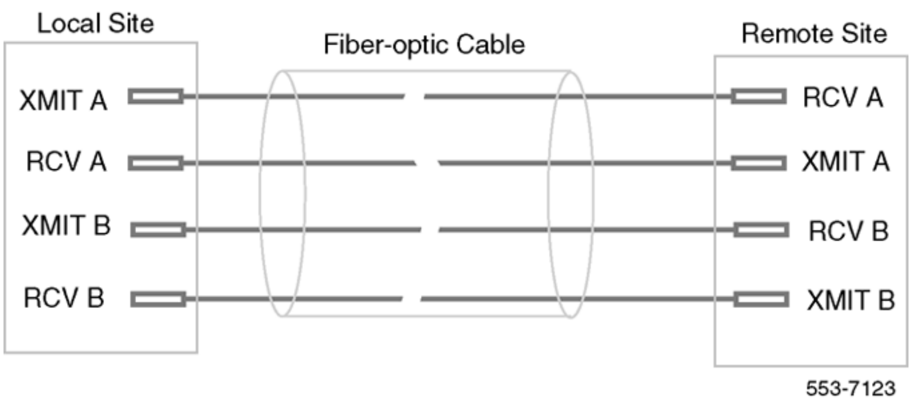

Figure 6: Fiber-optic link

Selecting the Superloop Network card slot

To install the Superloop Network card that supports the Remote IPE application, first determine its card slot. The position of the Superloop Network card in the local system depends on the system type installed at the local site. The system type determines in what type of module the card will be housed.

Table 7: Modules supporting Superloop Network cards on page 46 lists modules that provide network card slots, system options where these modules are used, and card slots where Superloop Network cards can be installed.

Table 7: Modules supporting Superloop Network cards

Modules	System	Network card slot
NT5D21 Core/Network Module	Large Systems	0-7
NT4N41 Core/Network Module	Large Systems	0-7

Fiber-optic equipment installation

To complete the installation of the Fiber Remote Multi-IPE Interface that links the local system to the Remote IPE equipment:

- install and verify the operation of the local system, if it is not already installed and operating correctly
- identify the network card slots and install the Superloop Network cards in these local network card slots, if these cards are not already installed
- install the Fiber Remote Multi-IPE Interface units
- connect the Fiber Remote Multi-IPE Interface units to the local I/O panel connectors
- connect the fiber-optic link to the Fiber Remote Multi-IPE Interface faceplate ST optical connectors

Installing and verifying system operation

The Remote IPE facilities can be added to an existing system by installing the appropriate electro-optical equipment in the link, installing one or more Remote IPE sites, and linking the local system with remote sites using single or redundant fiber-optic links.

To install a new system, follow the instructions in *Avaya Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43011-310)*. It describes how to install a complete Large System and how to connect the power, the internal and external communication cables, and subscriber loops.

If a new system is configured with Remote IPE facilities, the system is normally assembled at the factory with cards already installed including the Superloop Network cards selected to support the Remote IPE sites over a fiber-optic link. All that is necessary is to connect the Fiber Remote Multi-IPE Interface to the local system and the Remote IPE and connect the fiber-optic link between the local and remote Fiber Remote Multi-IPE Interface units. However, if the Superloop Network card is not installed, install it now.

Installing the Superloop Network card

The purpose of the following steps is to describe how and where to install the Superloop Network card(s). In a new system, the cards would have been installed in network card slots at the factory; however, it may be necessary to install additional Superloop Network cards to expand the number of remote sites or replace a defective card.

To install the Superloop Network card(s), follow the steps in Installing the Superloop Network card on page 47.

Installing the Superloop Network card

1. Set the ENB/DIS switch on the Superloop Network card to DIS.
2. Pull the Superloop Network card's upper and lower locking device away from the faceplate.

   While holding the card by these locking devices, insert it into the card guides of the selected network card slot.
3. Slide the card into the module until it engages the backplane connector.
4. Carefully push the upper and lower locking device levers towards the faceplate to insert the card connector into the backplane connector and lock the card in place.
5. Set the ENB/DIS switch on the Superloop Network card to ENB and observe the LED on the card as it performs self-tests.

   The LED should blink three times and then stay ON until enabled by software.

   When enabled by software, the LED turns OFF permanently, if operational.

Installing cables between the Superloop Network card and the network I/O panel

To connect local superloops to the Fiber Remote Multi-IPE Interface and the fiber-optic span, first install the internal cables connecting J1 and J2 Superloop Network card faceplate connectors to the network I/O panel.

In a new system with Remote IPE, these cables are normally installed in the factory; however, for an existing system that is being expanded using the Remote IPE, these cables must be installed at the site. To do this, follow the steps in Installing cables between the Superloop Network card and the network I/O panel on page 47.

Installing cables between the Superloop Network card and the network I/O panel

1. Remove the back cover from the network module where the Superloop Network cards are installed.
2. Plug the 24-pin connector of the NT8D88AD cable into the Superloop Network card J1 or J2 faceplate connector.

   Note:

   To determine which faceplate connectors to use and how many superloops are required for the specific application, refer to Table 1: Superloop connection configurations on page 18.

3. Route the cable to the back of the module to the network I/O panel.
4. Install the 24-pin Centronics NT8D88AD cable connector into the network module I/O panel connector cutouts.

   Use longer screws supplied in the kit with the cable assembly.
5. Repeat steps 2 through 4 for each superloop connection required in your application.

Setting S1 and S2 switches at the local site

Before installing a Fiber Remote Multi-IPE Interface unit:

- configure the Fiber Remote Multi-IPE Interface using S1 and S2 dip-switches
- install redundant fiber-optic connectors, if required

Table 8: Fiber Remote Multi-IPE Interface configuration on page 48 lists functions controlled by dip-switches S1 and S2. It also shows how to set these switches to configure the Fiber Remote Multi-IPE Interface.

Table 8: Fiber Remote Multi-IPE Interface configuration

Function selection	Switch and Position	Switch setting
For single Fiber Remote Multi-IPE Interface unit	S1 Position 1 and Position 2	ON (at local and remote sites)
Fiber Remote Multi-IPE Interface at the MMI terminal or modem end of the daisy-chain	S1 Position 1 Position 2	ON OFF
Fiber Remote Multi-IPE Interface at the SDI port end of the daisy-chain	S1 Position 1 Position 2	OFF ON
Fiber Remote Multi-IPE Interface in the middle of the daisy-chain	S1 Position 1 Position 2	OFF OFF
Fiber Remote Multi-IPE Interface address in a daisy-chain and system monitor address	S1 Positions 3–8	Refer to Table 9: Fiber Remote Multi-IPE Interface and system monitor address selection table on page 49
Physical location of the Fiber Remote Multi-IPE Interface	S2 Position 1	ON-Remote site OFF-Local site
Reserved for future use	S2 Positions 3–8	OFF
Note: Switch position: ON= Up and OFF= Down for S1 and S2 switches.		

Table 9: Fiber Remote Multi-IPE Interface and system monitor address selection table on page 49 lists the available addresses for each Fiber Remote Multi-IPE Interface unit in a

daisy-chain and the system monitor address. Each Fiber Remote Multi-IPE Interface must have a unique address from 0 to 63.

Table 9: Fiber Remote Multi-IPE Interface and system monitor address selection table

Address	S1 Pos 3	S1 Pos 4	S1 Pos 5	S1 Pos 6	S1 Pos 7	S1 Pos 8
00	OFF	OFF	OFF	OFF	OFF	OFF
01	ON	OFF	OFF	OFF	OFF	OFF
02	OFF	ON	OFF	OFF	OFF	OFF
03	ON	ON	OFF	OFF	OFF	OFF
04	OFF	OFF	ON	OFF	OFF	OFF
05	ON	OFF	ON	OFF	OFF	OFF
06	OFF	ON	ON	OFF	OFF	OFF
07	ON	ON	ON	OFF	OFF	OFF
08	OFF	OFF	OFF	ON	OFF	OFF
09	ON	OFF	OFF	ON	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF
11	ON	ON	OFF	ON	OFF	OFF
12	OFF	OFF	ON	ON	OFF	OFF
13	ON	OFF	ON	ON	OFF	OFF
14	OFF	ON	ON	ON	OFF	OFF
15	ON	ON	ON	ON	OFF	OFF
16	OFF	OFF	OFF	OFF	ON	OFF
17	ON	OFF	OFF	OFF	ON	OFF
18	OFF	ON	OFF	OFF	ON	OFF
19	ON	ON	OFF	OFF	ON	OFF
20	OFF	OFF	ON	OFF	ON	OFF
21	ON	OFF	ON	OFF	ON	OFF
22	OFF	ON	ON	OFF	ON	OFF
23	ON	ON	ON	OFF	ON	OFF
24	OFF	OFF	OFF	ON	ON	OFF
25	ON	OFF	OFF	ON	ON	OFF
26	OFF	ON	OFF	ON	ON	OFF
27	ON	ON	OFF	ON	ON	OFF
28	OFF	OFF	ON	ON	ON	OFF
29	ON	OFF	ON	ON	ON	OFF
30	OFF	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON	OFF
32	OFF	OFF	OFF	OFF	OFF	ON
33	ON	OFF	OFF	OFF	OFF	ON
34	OFF	ON	OFF	OFF	OFF	ON
35	ON	ON	OFF	OFF	OFF	ON
36	OFF	OFF	ON	OFF	OFF	ON
37	ON	OFF	ON	OFF	OFF	ON
38	OFF	ON	ON	OFF	OFF	ON
39	ON	ON	ON	OFF	OFF	ON
40	OFF	OFF	OFF	ON	OFF	ON
41	ON	OFF	OFF	ON	OFF	ON
42	OFF	ON	OFF	ON	OFF	ON
43	ON	ON	OFF	ON	OFF	ON

Address	S1 Pos 3	S1 Pos 4	S1 Pos 5	S1 Pos 6	S1 Pos 7	S1 Pos 8
44	OFF	OFF	ON	ON	OFF	ON
45	ON	OFF	ON	ON	OFF	ON
46	OFF	ON	ON	ON	OFF	ON
47	ON	ON	ON	ON	OFF	ON
48	OFF	OFF	OFF	OFF	ON	ON
49	ON	OFF	OFF	OFF	ON	ON
50	OFF	ON	OFF	OFF	ON	ON
51	ON	ON	OFF	OFF	ON	ON
52	OFF	OFF	ON	OFF	ON	ON
53	ON	OFF	ON	OFF	ON	ON
54	OFF	ON	ON	OFF	ON	ON
55	ON	ON	ON	OFF	ON	ON
56	OFF	OFF	OFF	ON	ON	ON
57	ON	OFF	OFF	ON	ON	ON
58	OFF	ON	OFF	ON	ON	ON
59	ON	ON	OFF	ON	ON	ON
60	OFF	OFF	ON	ON	ON	ON
61	ON	OFF	ON	ON	ON	ON
62	OFF	ON	ON	ON	ON	ON
63	ON	ON	ON	ON	ON	ON

Setting the S1 dip-switch

Dip-switch S1 defines the connection of the Fiber Remote Multi-IPE Interface to the MMI terminal, the SDI port, and the daisy-chain address of each Fiber Remote Multi-IPE Interface unit. Refer to Figure 11: Daisy-chaining of multiple Fiber Remote Multi-IPE Interface units on page 63. It also defines the system monitor address at the remote site.

To configure the S1 dip-switch, refer to Figure 7: Installing the redundant fiber-optic link option on page 53 and follow the steps in Setting the S1 dip-switch on page 50.

Setting the S1 dip-switch

1. Eject the motherboard from the metal enclosure by pushing the ejector tabs outward away from the Fiber Remote Multi-IPE Interface faceplate.
2. Configure the Fiber Remote Multi-IPE Interface using the S1 dip-switch.

   Refer to Table 8: Fiber Remote Multi-IPE Interface configuration on page 48 and Table 9: Fiber Remote Multi-IPE Interface and system monitor address selection table on page 49 for instructions.

   - For a single unit. If the Fiber Remote Multi-IPE Interface units are not daisy-chained, set dip-switch S1 positions 1 and 2 to ON.
   - First unit in the chain. For the first Fiber Remote Multi-IPE Interface in the daisy-chain, the SDI connector connects to the MAINT connector of the following Fiber Remote Multi-IPE Interface and its MAINT connector connects to the MMI terminal through the MMI Adapter. Set dip-switch S1 position 1 to ON and

position 2 to OFF, as shown in Table 8: Fiber Remote Multi-IPE Interface configuration on page 48.

- Unit in the middle of the chain. For Fiber Remote Multi-IPE Interface units in the middle of the daisy-chain, set dip-switch S1 position 1 and 2 to OFF.
- Last unit in a daisy-chain. For the Fiber Remote Multi-IPE Interface at the end of the daisy-chain, the SDI connector connects to the SDI port in the local system and the MAINT connector connects to the SDI connector on the next Fiber Remote Multi-IPE Interface in the daisy-chain. Set dip-switch S1 position 1 to OFF and position 2 to ON, as shown in Table 8: Fiber Remote Multi-IPE Interface configuration on page 48.

Note:

To assign a unique address to each Fiber Remote Multi-IPE Interface in a daisy-chain at the local site, set S1 positions 3-8 as shown in Table 9: Fiber Remote Multi-IPE Interface and system monitor address selection table on page 49. At the Remote IPE site, use this table to assign a unique system monitor address of the Fiber Remote Multi-IPE Interface, which is connected to the system monitor card in the pedestal of the Remote IPE column. The system monitor address must be the same as the address of the Fiber Remote Multi-IPE Interface connected to the system monitor card in the pedestal.

Setting the S2 dip-switch

Dip-switch S2 defines the physical location of the Fiber Remote Multi-IPE Interface unit in the fiber-optic link.

To specify the physical location of the Fiber Remote Multi-IPE Interface units, follow the steps in Setting the S2 dip-switch on page 51.

Setting the S2 dip-switch

1. For the local Fiber Remote Multi-IPE Interface units, set dip-switch S2 position 1 to OFF.
2. For the remote Fiber Remote Multi-IPE Interface units, set dip-switch S2 position 1 to ON, as shown in Table 8: Fiber Remote Multi-IPE Interface configuration on page 48.

Installing redundant fiber-optic link option

The redundant fiber-optic link is optional. Unless the system configuration requires a redundant fiber-optic link, it is not necessary to install the following hardware.

To install the redundant fiber-optic link connectors, install the daughterboard that corresponds to the type of fiber used in the link. Refer to Figure 7: Installing the redundant fiber-optic link option on page 53 for installation details.

The daughterboard types are:

- Redundant Option for single-mode fiber
- Redundant Option for multi-mode fiber

To install the daughterboard, follow the steps in Installing the daughterboard for the fiber-optic link on page 52.

Installing the daughterboard for the fiber-optic link

1. Remove the two filler plugs on the Fiber Remote Multi-IPE Interface faceplate labeled XMIT B and RCV B.

   Note:

   The Fiber Remote Multi-IPE Interface mother board has already been exposed during switch setting procedure.
2. Locate four screw holes near the top left-hand corner of the motherboard.
3. Insert the fiber-optic ST-type connectors into the openings on the faceplate and install the daughterboard onto the four standoffs.

   Tighten the four screws into the standoffs to secure the daughterboard.
4. Hand tighten the nuts onto the ST connectors. Do not overtighten.
5. Plug the ribbon cable from the daughterboard to the connector on the motherboard.
6. Close the Fiber Remote Multi-IPE Interface unit by pushing faceplate in until is flush with the front of the enclosure and no slack is in the ejector tabs.
7. Install the Fiber Remote Multi-IPE Interface unit into the rack-mounted shelf or onto the wall, as shown in Figure 8: The Fiber Remote Multi-IPE Interface unit installation methods on page 55 and Figure 9: Wall-mounting the Fiber Remote Multi-IPE Interface unit on page 57.

   Figure 7: Installing the redundant fiber-optic link option on page 53 shows the installation of the daughterboard onto the motherboard of the Fiber Remote Multi-IPE Interface unit.

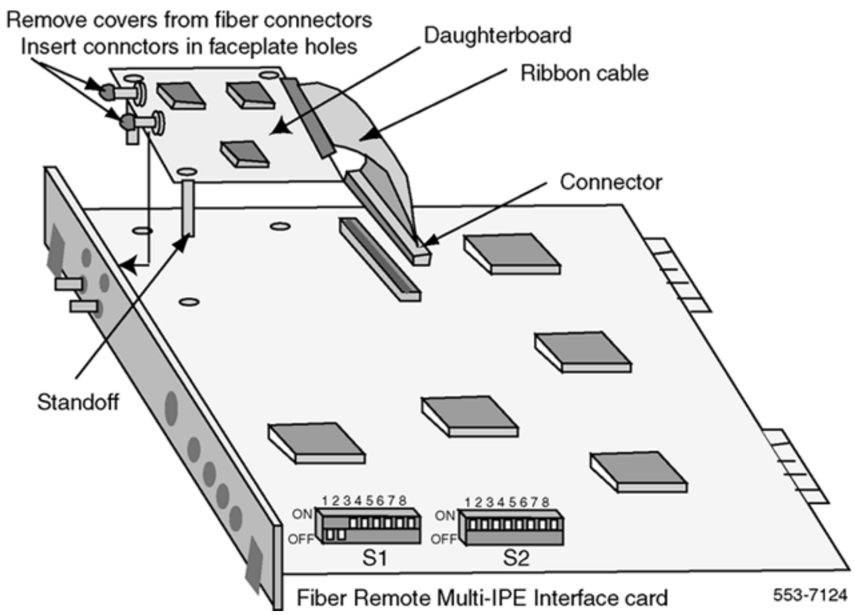

Figure 7: Installing the redundant fiber-optic link option

Mounting the Fiber Remote Multi-IPE Interface units

The Fiber Remote Multi-IPE Interface unit can be installed onto a wall or into a rack-mounted shelf that accommodates up to six Fiber Remote Multi-IPE Interface units. These units must be installed within 30 feet from the local system and the Remote IPE, because the cables connecting the Fiber Remote Multi-IPE Interface units to the local equipment are 30 feet long. The power cable between the Fiber Remote Multi-IPE Interface unit and its AC/DC Power Converter is only 25 feet long.

Two slotted holes are provided at the back of the enclosure to mount the Fiber Remote Multi-IPE Interface unit on the wall such that the faceplate is located on the left-hand-side and the I/O panel at the right-hand-side of the unit.

For multiple Fiber Remote Multi-IPE Interface units, a rack-mounted shelf is provided to house up to six units. This is normally used at the local site, where the possibility of having multiple units is much greater.

Installing multiple Fiber Remote Multi-IPE Interface units into the shelf

The Fiber Remote Multi-IPE Interface units can also be installed into a rack-mounted shelf. This is practical if there are multiple Fiber Remote Multi-IPE Interface units at the local site.

The shelf supports up to six Fiber Remote Multi-IPE Interface units and mounts onto a 19-inch rack using standard 10x32 pan head screws. Refer to Figure 8: The Fiber Remote Multi-IPE Interface unit installation methods on page 55 for installation illustration.

To install the shelf and the units into the shelf, follow the steps in Installing multiple Fiber Remote Multi-IPE Interface units into the shelf on page 54.

Installing multiple Fiber Remote Multi-IPE Interface units into the shelf

1. Place the shelf onto a 19-inch rack and use 10x32 pan screws (not included with the shelf) to secure the shelf in place.

   Note:

   If a solid panel is positioned above the shelf, make sure that there is at least four inches of empty space above the shelf. However, if the panel or shelf above has at least 50% airflow capacity, no empty space above the shelf is required.

2. Install the Fiber Remote Multi-IPE Interface units into the shelf slots by sliding them in from the front of the shelf.

3. Allow adequate space in front and the back of the shelf to be able to install the fiber-optic links in the front and the superloop cables in the back.

   Note:

   When installing the fiber-optic cables, make sure that the minimum bending radius does not exceed cable manufacturer's specification. If the bending radius is smaller than recommended, the fiber could be damaged.

Figure 8: The Fiber Remote Multi-IPE Interface unit installation methods on page 55 illustrates the installation of the Fiber Remote Multi-IPE Interface units on the wall and into a rack-mounted shelf.

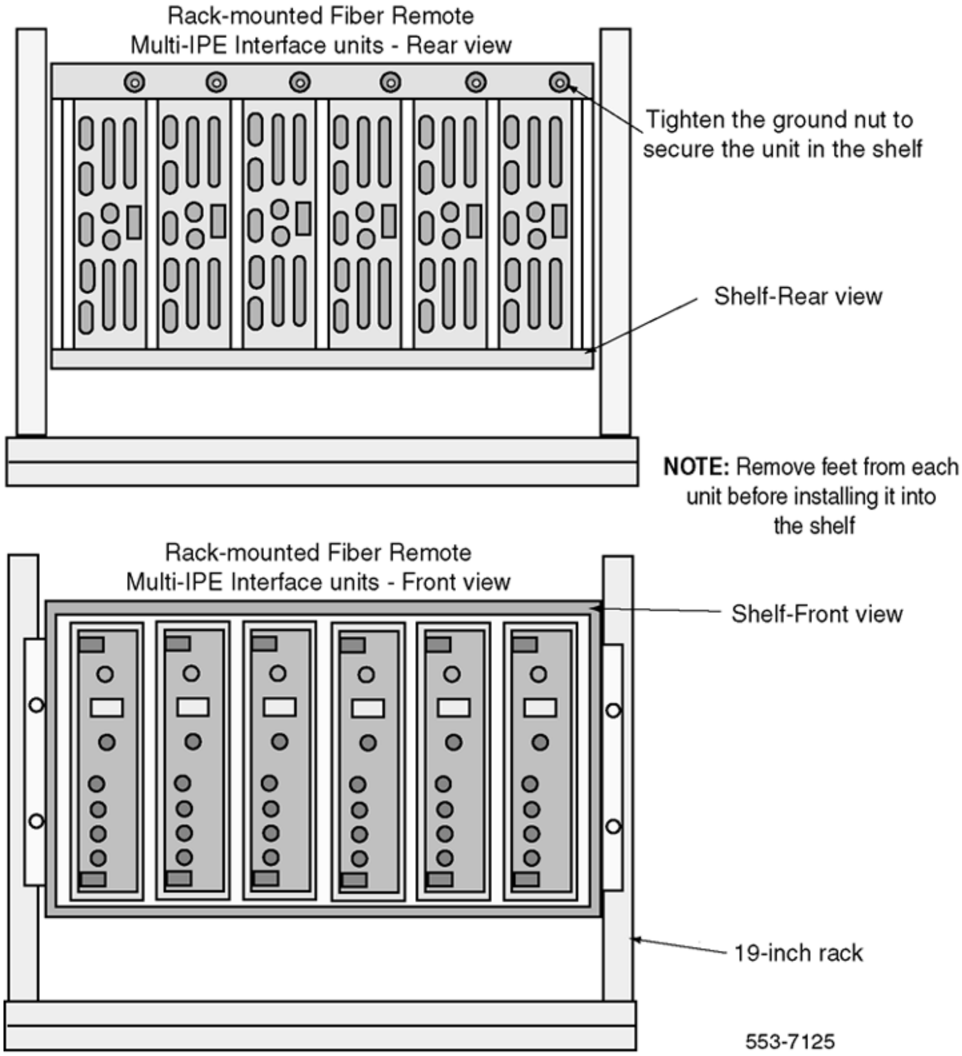

Figure 8: The Fiber Remote Multi-IPE Interface unit installation methods

Installing the Fiber Remote Multi-IPE Interface unit onto the wall

To mount the Fiber Remote Multi-IPE Interface unit on the wall refer to Figure 9: Wall-mounting the Fiber Remote Multi-IPE Interface unit on page 57 and follow the steps in Installing the Fiber Remote Multi-IPE Interface unit onto the wall on page 55.

Installing the Fiber Remote Multi-IPE Interface unit onto the wall

1. Find a location on the wall to give the Fiber Remote Multi-IPE Interface unit enough clearance to install the fiber-optic cables in the front and superloop cables in the back of the unit.

Allow for a minimum of six inches of clearance in the front for the fiber-optic cables. Provide a minimum of 13 inches of clearance at the back.

2. Position the wall mount template on the wall and use a level to ensure horizontal positioning of the Fiber Remote Multi-IPE Interface unit.
3. Mark the three screw holes and the two alignment marks. Drill the screw holes.
4. Screw two number 8 screws into the wall board or plywood.

   The screw heads should be 1/16 inch away from the wall surface to allow insertion of the screw heads into the slotted holes on the bottom of the Fiber Remote Multi-IPE Interface unit.

   Refer to Figure 9: Wall-mounting the Fiber Remote Multi-IPE Interface unit on page 57 to see the hole location templet.
5. Place the wall mount bracket in the upper rear corner of the Fiber Remote Multi-IPE Interface unit and fasten it to the Ground lug with the attached nut and lock washer.
6. Position the Fiber Remote Multi-IPE Interface unit's holes over the two screws on the wall, insert the screws into the holes, and push the Fiber Remote Multi-IPE Interface unit to the left to engage the screws into the narrow of the slots.
7. Fasten the top of the wall mount bracket to the wall with the provided screw.

Figure 9: Wall-mounting the Fiber Remote Multi-IPE Interface unit on page 57 illustrates the installation of the Fiber Remote Multi-IPE Interface unit onto the wall.

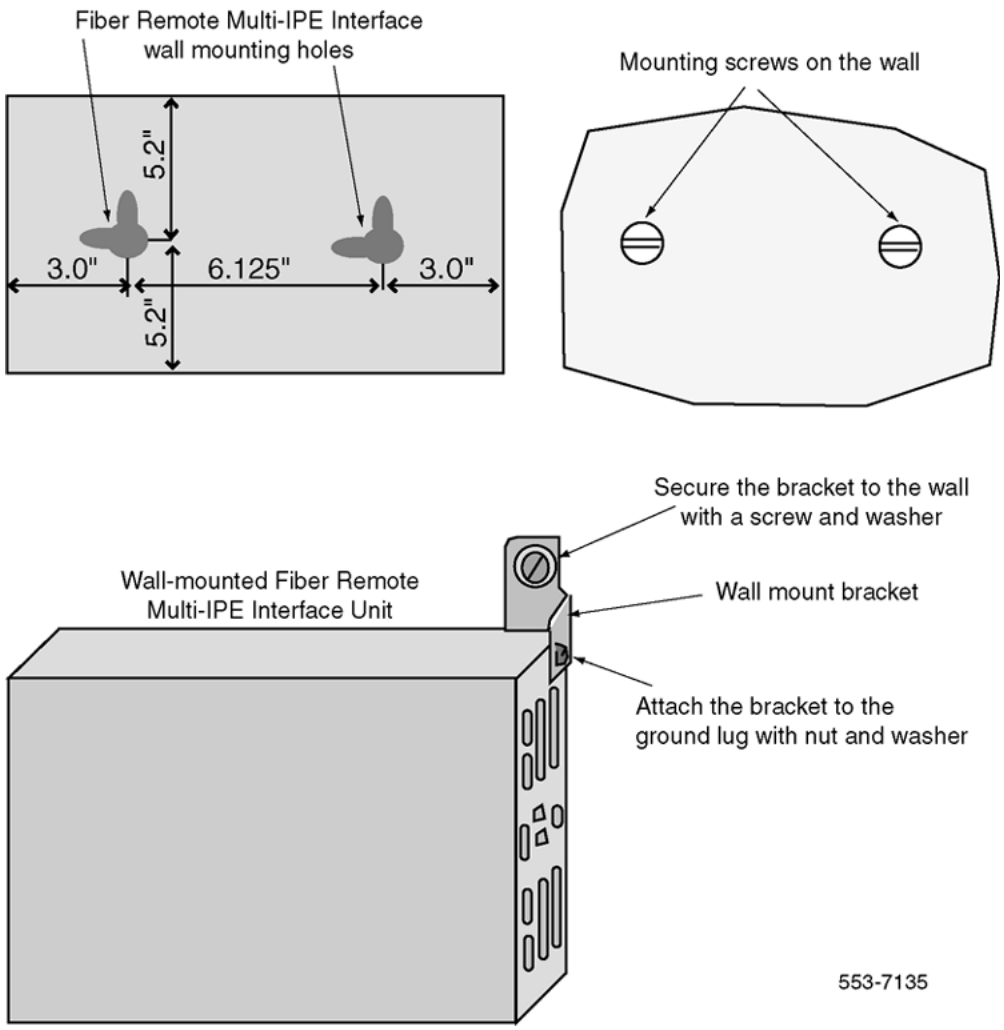

Figure 9: Wall-mounting the Fiber Remote Multi-IPE Interface unit

Installing local superloop cables

The number of A0634495 Local Superloop cables required to connect the network I/O panel 24-pin Centronics connectors to the 37-pin D Shell SUPERLOOP connectors on the Fiber Remote Multi-IPE Interface I/O panel depends on the number of superloops required to support the Remote IPE site(s) configuration. Refer to Figure 15: Local site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 134 for the connection diagram.

Note:

Use the superloop connection plan that you completed based on the traffic blocking criteria for Remote IPE segments and Table 1: Superloop connection configurations on page 18.

To install these cables, follow the steps in Installing local superloop cables on page 58.

Installing local superloop cables

1. Locate all the superloop connectors on the network I/O panel designated to support Remote IPE sites over the fiber-optic link.
2. Verify the appropriate version of the Fiber Remote Multi-IPE Interface unit (number of superloops and type of fiber supported) has been installed and configured.

   Refer to Table 2: Equipment required to link local system to Remote IPE sites on page 20.
3. Plug the 24-pin Centronics A0634495 Local Superloop cable connector into the designated 24-pin I/O panel connector.

   Fasten the balelocks.
4. Plug the 37-pin D Shell connector into the appropriate SUPERLOOP connector on the Fiber Remote Multi-IPE Interface unit I/O panel. Tighten screws.
5. Repeat steps 3 and 4 for each superloop to be connected.

Connecting local system monitor cables

The Fiber Remote Multi-IPE Interface unit can be directly connected to a system monitor, or it can be daisy-chained with multiple Fiber Remote Multi-IPE Interface units with only one unit in the daisy-chain directly connected to the system monitor card in the pedestal. Refer to Figure 15: Local site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 134 for the connection diagram.

Connecting a single Fiber Remote Multi-IPE Interface to the system monitor

To connect the system monitor cable from the Fiber Remote Multi-IPE Interface unit to the system monitor at the local site, follow the steps in Connecting a single Fiber Remote Multi-IPE Interface to the system monitor on page 58.

Connecting a single Fiber Remote Multi-IPE Interface to the system monitor

1. Plug one end of the NT8D46AP cable 6-pin modular plug into the J6 jack of the system monitor in the pedestal.

   This system monitor can be the master or an upstream system monitor towards the master system monitor.
2. Plug the other end of the NT8D46AP cable 6-pin modular plug into the XSM IN (J5) modular jack on the Fiber Remote Multi-IPE Interface unit.

Connecting multiple Fiber Remote Multi-IPE Interface units to the system monitor

To daisy-chain the system monitor cables to multiple Fiber Remote Multi-IPE Interface units, refer to Figure 10: System monitor daisy-chain connections at the local site on page 60 and follow the steps in Connecting multiple Fiber Remote Multi-IPE Interface units to the system monitor on page 59.

Connecting multiple Fiber Remote Multi-IPE Interface units to the system monitor

1. Plug one end of the NT8D46AP cable 6-pin modular plug into the 6-pin modular jack J6 on the system monitor card in the local pedestal.
2. Plug the other end of the NT8D46AP cable 6-pin modular plug into the first Fiber Remote Multi-IPE Interface unit 6-pin modular jack XSM IN (J5).
3. Plug one end of the NT8D46AL (or an equivalent cable) cable 6-pin modular plug into the first Fiber Remote Multi-IPE Interface unit 6-pin modular jack XSM OUT (J6).
4. Plug the other end of the NT8D46AL cable 6-pin modular plug into the second Fiber Remote Multi-IPE Interface unit 6-pin modular jack XSM IN (J5).
5. Plug one end of the NT8D46AL cable 6-pin modular plug into the second Fiber Remote Multi-IPE Interface unit 6-pin modular jack XSM OUT (J6).
6. Plug the other end of the NT8D46AL cable 6-pin modular plug into the third Fiber Remote Multi-IPE Interface unit 6-pin modular jack XSM IN (J5).
7. Repeat steps 5 and 6 for any additional Fiber Remote Multi-IPE Interface unit.
8. The XSM OUT (J6) in the last Fiber Remote Multi-IPE Interface unit in the daisy-chain connects to the J5 of the slave system monitor in the co-located IPE Module when this system monitor is outbound from the last Fiber Remote Multi-IPE Interface unit in the chain, as shown in Figure 10: System monitor daisy-chain connections at the local site on page 60.

Figure 10: System monitor daisy-chain connections at the local site on page 60 illustrates the system monitor daisy-chain connections for multiple Fiber Remote Multi-IPE Interface units at the local site.

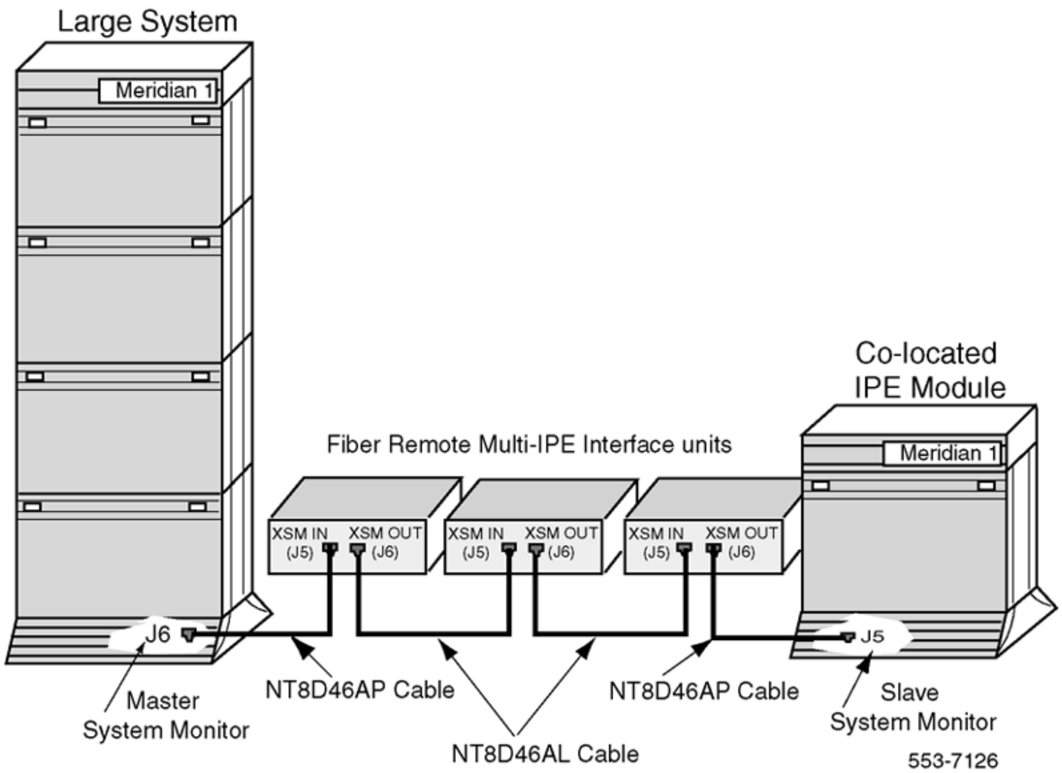

Figure 10: System monitor daisy-chain connections at the local site

Connecting the MMI terminal to a single Fiber Remote Multi-IPE Interface unit

Refer to Figure 15: Local site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 134 for the connection diagram to connect the MMI terminal to the MAINT port and follow the steps in Connecting the MMI terminal to a single Fiber Remote Multi-IPE Interface unit on page 60.

Connecting the MMI terminal to a single Fiber Remote Multi-IPE Interface unit

1. To connect the MMI terminal to the Fiber Remote Multi-IPE Interface I/O panel MAINT DB-9 male connector, use the NT7R66BA MMI Cable.
2. Plug the NT7R66BA MMI Cable DB-9 female connector into the DB-9 male MAINT connector on the Fiber Remote Multi-IPE Interface unit.
3. Plug the DB-25 male connector end of the NT7R66BA MMI Cable into the MMI terminal RS-232 port. If it is necessary to change the gender at the terminal, use the appropriate compact gender changer.

Connecting the MMI terminal using a modem

1. Use the NT7R66AA SDI Cable Kit to connect the DB-9 female MODEM connector on the Fiber Remote Multi-IPE Interface unit to the modem connector.
2. Plug the DB-9 male connector of the NT7R66AA SDI Cable Kit into the Fiber Remote Multi-IPE Interface unit DB-9 female MODEM connector.
3. Plug the other end of the NT7R66AA SDI Cable Kit into the modem connector.

   Use the enclosed adapter gender changer, if required.

Connecting the SDI port to a single Fiber Remote Multi-IPE Interface unit

A single Fiber Remote Multi-IPE Interface unit can be connected directly to the SDI port in the local system over the SDI connector on a single Fiber Remote Multi-IPE Interface unit I/O panel. Refer to Figure 15: Local site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 134 for the connection diagram.

Connect a single Fiber Remote Multi-IPE Interface unit to SDI cards.

Connecting an SDI card

1. To connect SDI cards to the Fiber Remote Multi-IPE Interface SDI DB-9 male connector, use the NT7R66AA SDI Cable Kit without the DB-25F/DB-25F adapter.
2. Plug the DB-25 male connector of the NT7R66AA SDI Cable Kit into the DB-25 female SDI connector on the I/O panel.
3. Plug the DB-9 male connector of the NT7R66AA SDI Cable Kit into the DB-9 female connector on the Fiber Remote Multi-IPE Interface unit I/O panel.

   Note:

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

Connecting the SDI card and the MMI terminal to multiple Fiber Remote Multi-IPE Interface units

Make sure that all the Fiber Remote Multi-IPE Interface units are properly configured for the daisy-chain addressing as shown in Table 8: Fiber Remote Multi-IPE Interface configuration on page 48. Refer to Figure 16: Local site multiple Fiber Remote Multi-IPE Interface units cable connection diagram on page 135 for the connection diagram.

Note:

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

To connect multiple (this example has 3 units) Fiber Remote Multi-IPE Interface units in a daisy-chain configuration, connect the cables, as shown in Figure 11: Daisy-chaining of multiple Fiber Remote Multi-IPE Interface units on page 63

Connecting the SDI card and the MMI terminal to multiple Fiber Remote Multi-IPE Interface units

1. Plug the DB-9 male connector of the NT7R66AA SDI Cable Kit into the SDI port DB-9 female connector on the Fiber Remote Multi-IPE Interface unit #1.
2. Connect the Fiber Remote Multi-IPE Interface unit #1 to the SDI card in the local system as explained in Connecting the SDI port to a single Fiber Remote Multi-IPE Interface unit on page 61.
3. Plug the A0634497 Maintenance Interface cable into the DB-9 male MAINT connector on the Fiber Remote Multi-IPE Interface unit #1.
4. Plug the other end of the A0634497 Maintenance Interface cable into the DB-9 female SDI connector on the Fiber Remote Multi-IPE Interface unit #2.
5. Plug a second A0634497 Maintenance Interface cable into the MAINT connector on the Fiber Remote Multi-IPE Interface unit #2.
6. Plug the other end of the second A0634497 Maintenance Interface cable into the SDI connector on the Fiber Remote Multi-IPE Interface unit #3.
7. Plug the DB-9 female connector of the NT7R66BA MMI Cable into the MAINT port DB-9 male connector on the Fiber Remote Multi-IPE Interface unit #3 (last in the chain).
8. Plug the DB-25 male connector of the NT7R66BA MMI Cable into the MMI terminal RS-232 port. If the MMI terminal has other than DB-25 connector, use an appropriate compact adapter.
9. If you wish to connect a distant MMI terminal over a modem, connect the NT7R66AA SDI Cable Kit between the DB-9 female MODEM connector on the Fiber Remote Multi-IPE Interface unit #3 and the modem.
10. Secure cables with tie-wraps as appropriate.

Figure 11: Daisy-chaining of multiple Fiber Remote Multi-IPE Interface units on page 63 shows how to connect multiple Fiber Remote Multi-IPE Interface units in a daisy-chain to provide MMI and SDI connections for all Fiber Remote Multi-IPE Interface units and through them to their respective Remote IPE sites.

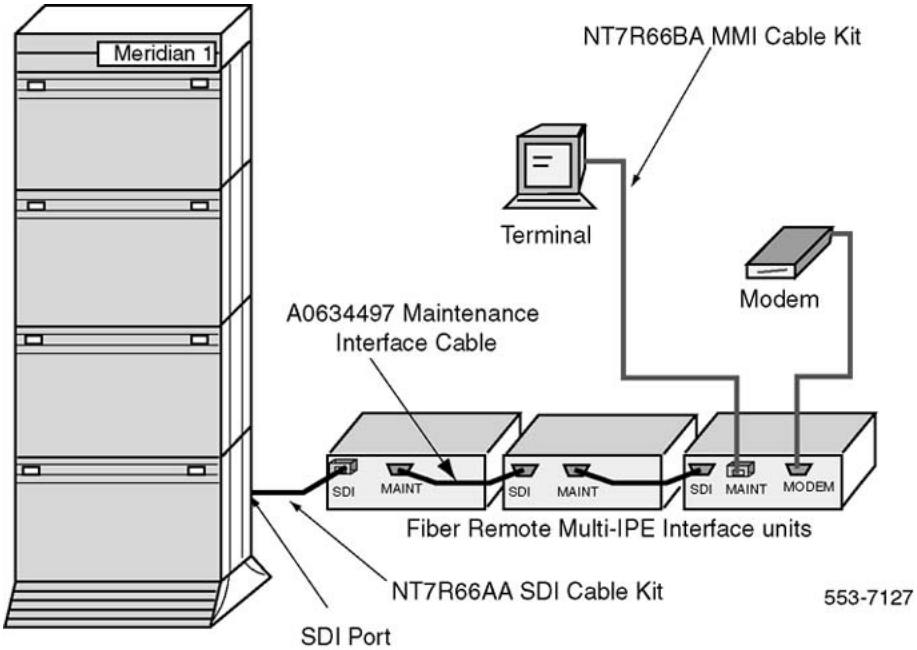

Figure 11: Daisy-chaining of multiple Fiber Remote Multi-IPE Interface units

Connecting the fiber-optic link

The fiber-optic link connects the local Fiber Remote Multi-IPE Interface with the remote Fiber Remote Multi-IPE Interface. Each Fiber Remote Multi-IPE Interface unit provides a transmit and a receive optical connector for a non-redundant fiber-optic link or two transmit and two receive optical connectors for a redundant fiber-optic link.

The fiber-optic cable fibers, at each end of the link, must be terminated with ST optical connectors. Each connector plugs into the ST optical connector on the Fiber Remote Multi-IPE Interface faceplate. For details on how to engineer and handle the fiber-optic link and the fiber-optic connectors, refer to Engineering the fiber-optic link on page 32.

For a single link, it is necessary to install connectors on only two fibers at each end of the link, one for the transmit side and one for the receive side. For a redundant link, four fibers must have connectors installed at each end.

Note:

Label optical fibers in the fiber-optic cable next to the ST optical connectors. Label one fiber XMIT A and its pair RCV A at one end of the link. Label these two fibers at the other end of the link with opposite labels; that is, the XMIT A at one end should be labeled RCV A at the other end of the link and the RCV A at one end should be labeled XMIT A at the other end of the link. Repeat the same procedure for the redundant link with XMIT B and RCV B. For an illustration of the link fibers labelling, refer to Figure 6: Fiber-optic link on page 45 in the Product description section of this document.

To connect the link to the Fiber Remote Multi-IPE Interface at either side of the link, refer to Figure 15: Local site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 134 for the connection diagram and follow the steps in Connect the link to the Fiber Remote Multi-IPE Interface on page 64.

Connect the link to the Fiber Remote Multi-IPE Interface

1. Identify the link ST optical connectors labeled XMIT A and RCV A for a single link, or labeled XMIT A, RCV A, XMIT B, and RCV B for a redundant link.
2. Plug the link ST optical connector labeled XMIT A into the Fiber Remote Multi-IPE Interface faceplate ST optical connector labeled XMIT A.
3. Plug the link ST optical connector labeled RCV A into the Fiber Remote Multi-IPE Interface faceplate ST optical connector labeled RCV A.
4. Repeat steps 2 and 3 for the XMIT B and RCV B if there is a redundant link.
5. Route and secure the fiber-optic cable to prevent excessive bending and other physical damage.

Connecting the external alarm cable at the local site

The Fiber Remote Multi-IPE Interface unit provides an external alarm output connector (ALM), which is connected to external alarm indicators at the local site. These alarm outputs indicate external alarm contact closures at the Remote IPE site and the failure of the fiber-optic link.

Use a cable with a DB-9 male connector at one end and open wires at the other end. The open-wire end can be customized with connector(s) to match your external alarm indicator devices. The length of the cable depends on the distance between the Fiber Remote Multi-IPE Interface unit and the external alarm devices.

Table 10: The DB-9 female ALM connector pinouts (local site) on page 64 lists the Fiber Remote Multi-IPE Interface unit DB-9 female ALM connector pinouts for each external output alarm indicator.

Table 10: The DB-9 female ALM connector pinouts (local site)

External Alarm Output Contact Closure	Connector Pin
Output alarm #1 (activated by remote external alarm #1)	7
Output alarm #2 (activated by remote external alarm #2)	2
Output alarm #3 (activated by a fault in the fiber-optic link)	6
Output alarm return	1

To install the external alarm cable, follow the steps in Connecting the external alarm cable at the local site on page 65.

Connecting the external alarm cable at the local site

1. Plug the cable DB-9 male connector into the DB-9 female ALM connector on the Fiber Remote Multi-IPE Interface unit.

   This cable is not supplied.

2. Connect the other end of the cable to the external alarm indicator devices. Observe the wire color codes and their corresponding pin assignments at the connector when wiring the external alarm devices to the cable.

Connecting the power source

A Fiber Remote Multi-IPE Interface unit can be powered by one of the following:

- DC system power source
- AC/DC Power Converter

Note:
A DC system power source is fused with a 1.3 A fuse at the PDU.

Connecting the DC power source

If the local system is DC-powered or has a DC power backup, utilize this -48 V source instead of using an AC/DC power converter.

To install the A0654976 DC Power Cable between the system -48 V DC power source and the power connector on the Fiber Remote Multi-IPE Interface unit, refer to Figure 12: DC power connection of the Fiber Remote Multi-IPE Interface unit on page 67 and follow the steps in Connecting the DC power source on page 65.

Connecting the DC power source

1. Install lugs onto the open end of the A0654976 DC Power Cable suitable for the power terminals at the DC power source.
2. Connect the black wire at the open end of the A0654976 DC Power Cable to the -48V DC terminal on the local DC power system PDU.
3. Connect the red wire at the open end of the cable to the Return terminal on the local DC power system PDU.
4. Connect the white wire at the open end of the cable to the Ground terminal on the local DC power system Chassis Ground lug.

5. Plug the 4-pin connector at the other end of the A0654976 DC Power Cable into the power connector on the Fiber Remote Multi-IPE Interface unit located on the I/O panel at the rear of the unit.
6. Connect the white wire at the connector end of the A0654976 DC Power Cable to the Ground lug at the Fiber Remote Multi-IPE Interface unit I/O panel, as shown in Figure 12: DC power connection of the Fiber Remote Multi-IPE Interface unit on page 67.
7. Observe the POWER LED on the Fiber Remote Multi-IPE Interface unit faceplate.

   This green LED should turn ON and stay lit as long as the unit is powered.
8. Push the ALARM CLEAR button to clear the alarms.

   The alarms clear only if both the local and the remote Fiber Remote Multi-IPE Interface units are connected to the fiber-optic link and are communicating.
9. If POWER LED does not light, check the connection to the DC power source, the power source, and the Fiber Remote Multi-IPE Interface unit POWER connector.

   Correct the problem.

Figure 12: DC power connection of the Fiber Remote Multi-IPE Interface unit on page 67 shows the power connection of the Fiber Remote Multi-IPE Interface unit to the local DC power source.

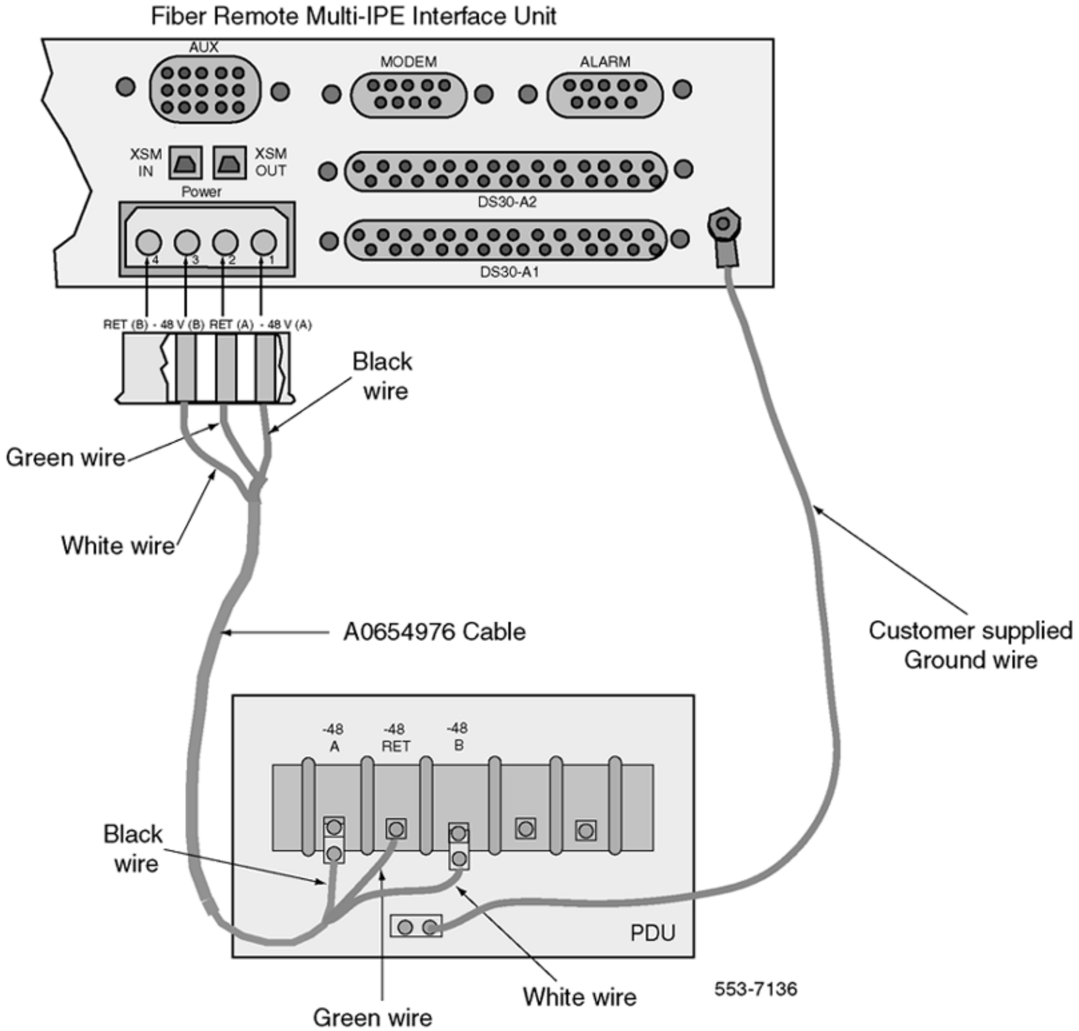

Figure 12: DC power connection of the Fiber Remote Multi-IPE Interface unit

Connecting the AC/DC Power Converter

A Fiber Remote Multi-IPE Interface unit is optionally supplied with an AC/DC Power Converter to supply power to one Fiber Remote Multi-IPE Interface unit.

The AC/DC Power Converter plugs directly into a 110 V AC wall outlet. The DC power cord extends from the Power Converter to the -48 V DC power connector on the Fiber Remote Multi-IPE Interface unit I/O panel. Refer to Figure 13: DC system power source connection to the Fiber Remote Multi-IPE Interface unit on page 69 for an illustration of this power source connection.

To install the AC/DC Power Converter, follow the steps in Connecting the AC/DC Power Converter on page 68.

Connecting the AC/DC Power Converter

1. Plug the DC power cord extending from the Power Converter into the -48 V, 0.6 A POWER connector on the Fiber Remote Multi-IPE Interface unit I/O panel.
2. Install the white wire onto the Ground lug at the Fiber Remote Multi-IPE Interface unit I/O panel, as shown in Figure 13: DC system power source connection to the Fiber Remote Multi-IPE Interface unit on page 69.
3. Plug the AC/DC Power Converter into the AC wall outlet.
4. Observe the POWER LED on the Fiber Remote Multi-IPE Interface unit faceplate.

   This green LED should turn ON and stay lit as long as the unit is powered.
5. Push the ALARM CLEAR button to clear the alarms.

   The alarms clear only if both the local and the remote Fiber Remote Multi-IPE Interface units are connected to the fiber-optic link and are properly powered.
6. If POWER LED does not light, check the Power Converter, the AC outlet, and the Fiber Remote Multi-IPE Interface unit POWER connector.

   Correct the problem.

Figure 13: DC system power source connection to the Fiber Remote Multi-IPE Interface unit on page 69 illustrates the POWER connector on the I/O panel of the Fiber Remote Multi-IPE Interface unit.

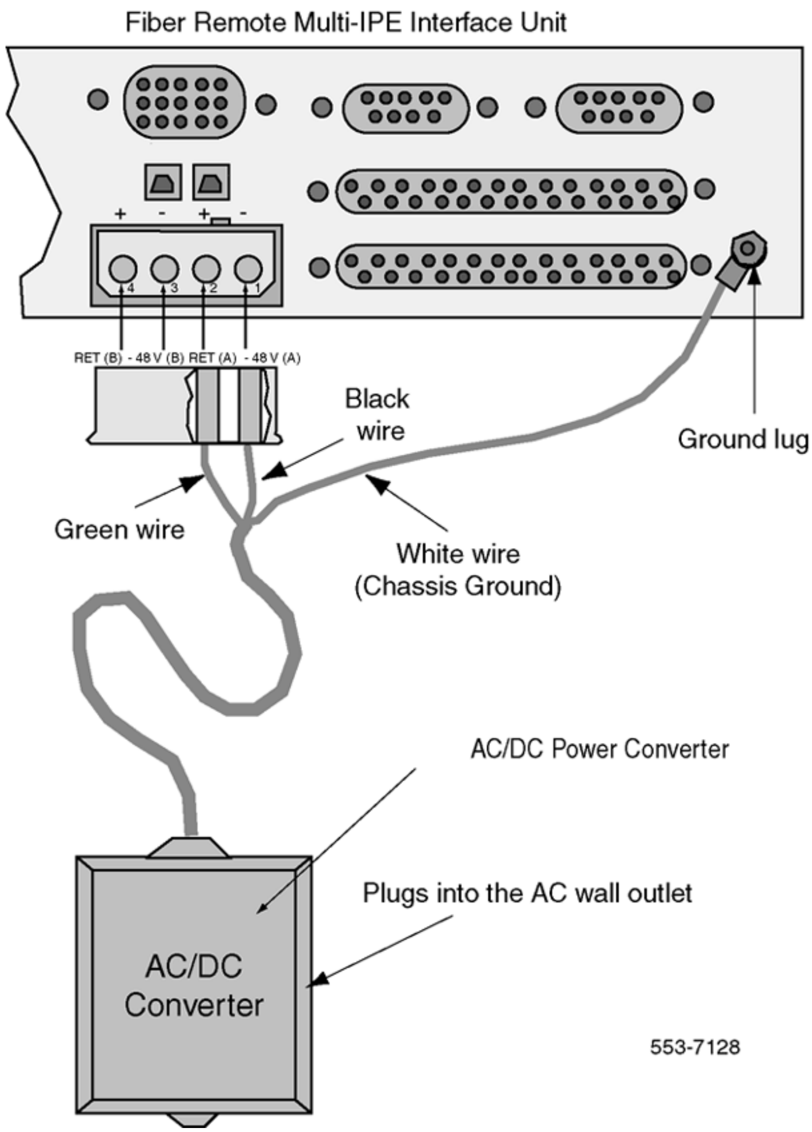

Figure 13: DC system power source connection to the Fiber Remote Multi-IPE Interface unit

Remote IPE installation

The Remote IPE column is normally assembled in the factory with cards already installed.

If the Remote IPE column is not assembled in the factory, follow the instructions in *Avaya Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43011-310)*. It describes how to install the pedestal, the IPE Module, the top cap, the cards, and how to connect the power, the internal and external communication cables, and subscriber loops.

To install the PFTU to the Remote IPE, also follow the instructions in *Avaya Communication Server 1000M and Meridian 1 Large System Installation and Commissioning (NN43011-310)*.

Installing the internal cables to the Remote IPE module

In a standard IPE module installed in a local column, the connection between the IPE module backplane connectors SL0-SL3 and the Superloop Network card J1 and J2 faceplate connectors are made directly without routing the cables to their respective I/O panels.

In the Remote IPE column, the SL0-SL3 connectors are connected to the I/O panel using the NT8D92AB Controller to I/O panel cables. The number of cables required is equal to the number of superloops required to support the traffic conditions in the Remote IPE. A Remote IPE shipped from the factory will probably have these cables already installed. However, you can modify any standard IPE Module in the Remote IPE by installing these NT8D92AB Controller to I/O panel cables into an IPE module.

To install these cables, refer to Figure 17: Remote site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 136 for the connection diagram and follow the steps in Installing the internal cables to the Remote IPE module on page 70.

Installing the internal cables to the Remote IPE module

1. Remove the back cover at the rear of the Remote IPE module to expose the backplane and the I/O panel connector cutouts.
2. Plug the NT8D92AB cable 24-pin block connector into the 24-pin block connector SL0 on the Remote IPE module backplane.
3. Install the NT8D92AB cable 24-pin Centronics connector into the I/O panel of the Remote IPE module.

   Find a connector cutout to fit the cable connector mounting screw holes.
4. Repeat steps 2 and 3 for each NT8D92AB cable connecting SL1, SL2, and SL3 backplane connectors, if these are required.
5. Replace the back cover on the Remote IPE module.

Setting S1 and S2 switches at the remote site

Before installing a Fiber Remote Multi-IPE Interface unit:

- configure the Fiber Remote Multi-IPE Interface using S1 and S2 dip-switches
- install redundant fiber-optic connectors, if required

Table 11: Switch S1 and S2 settings on page 71 lists switches S1 and S2 and their settings based on the Fiber Remote Multi-IPE Interface position in the system.

Table 11: Switch S1 and S2 settings

Function selection	Switch and Position	Switch setting
For single Fiber Remote Multi-IPE Interface unit	S1 Position 1 and Position 2	ON (at local and remote sites)
Fiber Remote Multi-IPE Interface at the MMI terminal or modem end of the daisy-chain	S1 Position 1 Position 2	ON OFF
Fiber Remote Multi-IPE Interface in the middle of the daisy-chain	S1 Position 1 Position 2	OFF OFF
Fiber Remote Multi-IPE Interface system monitor address	S1 Positions 3-8	Refer to Table 9: Fiber Remote Multi-IPE Interface and system monitor address selection table on page 49
Physical location of the Fiber Remote Multi-IPE Interface	S2 Position 1	ON-Remote site
Reserved for future use	S2 Positions 3-8	OFF

Note:

Switch position: ON= Up and OFF= Down for S1 and S2 switches.

Table 12: System monitor address selection on page 71 shows S1 switch position 3-5 that represent the system monitor address numbers from 0 to 63 at the remote site.

Table 12: System monitor address selection

Address	S1 Pos 3	S1 Pos 4	S1 Pos 5	S1 Pos 6	S1 Pos 7	S1 Pos 8
00	OFF	OFF	OFF	OFF	OFF	OFF
01	ON	OFF	OFF	OFF	OFF	OFF
02	OFF	ON	OFF	OFF	OFF	OFF
03	ON	ON	OFF	OFF	OFF	OFF
04	OFF	OFF	ON	OFF	OFF	OFF
05	ON	OFF	ON	OFF	OFF	OFF
06	OFF	ON	ON	OFF	OFF	OFF
07	ON	ON	ON	OFF	OFF	OFF
08	OFF	OFF	OFF	ON	OFF	OFF
09	ON	OFF	OFF	ON	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF
11	ON	ON	OFF	ON	OFF	OFF
12	OFF	OFF	ON	ON	OFF	OFF
13	ON	OFF	ON	ON	OFF	OFF
14	OFF	ON	ON	ON	OFF	OFF
15	ON	ON	ON	ON	OFF	OFF
16	OFF	OFF	OFF	OFF	ON	OFF
17	ON	OFF	OFF	OFF	ON	OFF

Address	S1 Pos 3	S1 Pos 4	S1 Pos 5	S1 Pos 6	S1 Pos 7	S1 Pos 8
18	OFF	ON	OFF	OFF	ON	OFF
19	ON	ON	OFF	OFF	ON	OFF
20	OFF	OFF	ON	OFF	ON	OFF
21	ON	OFF	ON	OFF	ON	OFF
22	OFF	ON	ON	OFF	ON	OFF
23	ON	ON	ON	OFF	ON	OFF
24	OFF	OFF	OFF	ON	ON	OFF
25	ON	OFF	OFF	ON	ON	OFF
26	OFF	ON	OFF	ON	ON	OFF
27	ON	ON	OFF	ON	ON	OFF
28	OFF	OFF	ON	ON	ON	OFF
29	ON	OFF	ON	ON	ON	OFF
30	OFF	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON	OFF
32	OFF	OFF	OFF	OFF	OFF	ON
33	ON	OFF	OFF	OFF	OFF	ON
34	OFF	ON	OFF	OFF	OFF	ON
35	ON	ON	OFF	OFF	OFF	ON
36	OFF	OFF	ON	OFF	OFF	ON
37	ON	OFF	ON	OFF	OFF	ON
38	OFF	ON	ON	OFF	OFF	ON
39	ON	ON	ON	OFF	OFF	ON
40	OFF	OFF	OFF	ON	OFF	ON
41	ON	OFF	OFF	ON	OFF	ON
42	OFF	ON	OFF	ON	OFF	ON
43	ON	ON	OFF	ON	OFF	ON
44	OFF	OFF	ON	ON	OFF	ON
45	ON	OFF	ON	ON	OFF	ON
46	OFF	ON	ON	ON	OFF	ON
47	ON	ON	ON	ON	OFF	ON
48	OFF	OFF	OFF	OFF	ON	ON
49	ON	OFF	OFF	OFF	ON	ON
50	OFF	ON	OFF	OFF	ON	ON
51	ON	ON	OFF	OFF	ON	ON
52	OFF	OFF	ON	OFF	ON	ON
53	ON	OFF	ON	OFF	ON	ON
54	OFF	ON	ON	OFF	ON	ON
55	ON	ON	ON	OFF	ON	ON
56	OFF	OFF	OFF	ON	ON	ON
57	ON	OFF	OFF	ON	ON	ON
58	OFF	ON	OFF	ON	ON	ON
59	ON	ON	OFF	ON	ON	ON
60	OFF	OFF	ON	ON	ON	ON
61	ON	OFF	ON	ON	ON	ON
62	OFF	ON	ON	ON	ON	ON
63	ON	ON	ON	ON	ON	ON

Installing the Fiber Remote Multi-IPE Interface unit

The Fiber Remote Multi-IPE Interface unit can be installed onto a wall or into a rack-mounted shelf that accommodates up to six Fiber Remote Multi-IPE Interface units. These units must be installed within 30 feet from the Remote IPE and no further than 25 feet from the power source, because the cables connecting the Fiber Remote Multi-IPE Interface units to the local equipment are 30 feet long and the power cable is 25 feet long.

In some instances, a remote site may have multiple Fiber Remote Multi-IPE Interface units, which can be installed into the rack-mounted shelf. To perform this installation, refer to Installing multiple Fiber Remote Multi-IPE Interface units into the shelf on page 53.

Installing the unit onto the wall

Two slotted holes are provided at the back of the Fiber Remote Multi-IPE Interface unit enclosure to mount the Fiber Remote Multi-IPE Interface unit on the wall such that the faceplate is located on the left-hand side and the I/O panel at the right-hand side of the unit.

To mount the Fiber Remote Multi-IPE Interface unit on the wall, refer to Figure 9: Wall-mounting the Fiber Remote Multi-IPE Interface unit on page 57 and follow the steps in Mounting the Fiber Remote Multi-IPE Interface unit on the wall on page 73.

Mounting the Fiber Remote Multi-IPE Interface unit on the wall

1. Find a location on the wall to give the Fiber Remote Multi-IPE Interface unit enough clearance to install the fiber-optic cables in the front and superloop cables in the back of the unit.

   Allow for a minimum of six inches of clearance in the front for the fiber-optic cables. Provide a minimum of 13 inches of clearance at the back.
2. Position the wall mount template on the wall and use a level to ensure horizontal positioning of the Fiber Remote Multi-IPE Interface unit.
3. Mark the three screw holes and the two alignment marks.

   Drill the screw holes.
4. Screw two number 8 screws into the wall board or plywood.

   The screw heads should be 1/16 inch away from the wall surface to allow insertion of the screw heads into the slotted holes on the bottom of the Fiber Remote Multi-IPE Interface unit as shown in Figure 9: Wall-mounting the Fiber Remote Multi-IPE Interface unit on page 57.
5. Place the wall mount bracket in the upper rear corner of the Fiber Remote Multi-IPE Interface unit and fasten it to the Ground lug with the attached nut and lock washer.

6. Position the Fiber Remote Multi-IPE Interface unit's holes over the two screws on the wall, insert the screws into the holes, and push the Fiber Remote Multi-IPE Interface unit to the left to engage the screws into the narrow of the slots.
7. Fasten the top of the wall mount bracket to the wall with the provided screw.

Installing superloop cables

The number of A0634496 Remote Superloop cables required to connect the Remote IPE I/O panel 24-pin Centurions connectors to the 37-pin D Shell SUPERLOOP connectors on the Fiber Remote Multi-IPE Interface I/O panel depends on the number of superloops required to support the Remote IPE site configuration.

Note:

Use the superloop connection plan that was completed based on the traffic blocking criteria for Remote IPE segments and Table 1: Superloop connection configurations on page 18.

To install these cables, use longer screws to install them into the I/O panel cutouts and follow the steps in Installing superloop cables on page 74.

Installing superloop cables

1. Locate all the superloop connectors on the Remote IPE I/O panel designated to support Remote IPE sites over fiber-optic links.
2. Verify that the appropriate version of the Fiber Remote Multi-IPE Interface unit (number of superloops and type of fiber supported) have been configured and installed.

   Refer to Table 2: Equipment required to link local system to Remote IPE sites on page 20.
3. Plug the 24-pin Centronics A0634496 Remote Superloop cable connector into the designated 24-pin I/O panel connector on the Remote IPE module.

   Refer to Figure 17: Remote site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 136 for the connection diagram.
4. Plug the 37-pin D Shell connector into the appropriate SUPERLOOP connector on the Fiber Remote Multi-IPE Interface unit I/O panel.
5. Repeat steps 3 and 4 for each superloop to be connected.

Connecting the system monitor cable

The Fiber Remote Multi-IPE Interface unit is directly connected to a system monitor in the pedestal. Refer to Figure 17: Remote site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 136 for the connection diagram.

To connect the system monitor cable from the Fiber Remote Multi-IPE Interface unit at the remote site, follow the steps in Connecting the system monitor cable on page 75.

Connecting the system monitor cable

1. Plug one end of the NT8D46AP cable 6-pin modular plug into the J5 jack on the system monitor in the pedestal.
2. Plug the other end of the NT8D46AP cable 6-pin modular plug into the XSM IN (J5) modular jack on the Fiber Remote Multi-IPE Interface unit.

   Note:

   At the remote site the connection is made from the J5 of the system monitor to the XSM IN (J5) on the Fiber Remote Multi-IPE Interface unit.
3. Determine the system monitor address for each remote site by setting S1 positions 3-8 on the Fiber Remote Multi-IPE Interface unit.

   Before selecting the address, determine which are the available system monitor addresses using the system TTY, as follows:

   a. Execute the **STAT XSM** command in LD 37 to poll all system monitors. Correct any problems.
   b. Determine available system monitor addresses to be assigned to the Remote IPE module.
   c. Set master system monitor slave polling address range to cover the new Remote IPE system monitor address.
   d. Set Fiber Remote Multi-IPE Interface unit S1 positions 3-8 for the new system monitor address at the remote site, refer to Table 12: System monitor address selection on page 71 for address selection.
   e. Re-connect the system monitor daisy-chain to include new Fiber Remote Multi-IPE Interface units, if any.
   f. Test the system monitor daisy-chain by executing the **STAT XSM** command in LD 37 to ensure that every local and remote system monitor is responding to the master system monitor.

   Note:

   If Fiber Remote Multi-IPE Interface units are daisy-chained at the remote site, the system monitor address also becomes the daisy-chain address.

Connecting the MMI terminal

An MMI terminal can be directly connected to the Fiber Remote Multi-IPE Interface unit at the remote site. Refer to Figure 17: Remote site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 136 for the connection diagram.

Multiple Fiber Remote Multi-IPE Interface units at the remote site can be daisy-chained to allow sharing of the MMI terminal among all the Fiber Remote Multi-IPE Interface units in the chain.

Connecting the MMI terminal to a single Fiber Remote Multi-IPE Interface unit

An MMI terminal can be directly connected to the remote site Fiber Remote Multi-IPE Interface unit to provide a maintenance and testing facility for the Remote IPE and across the fiber-optic link for the local system and the Fiber Remote Multi-IPE Interface units connected to the local system. One of the main functions of the MMI terminal at the remote site is to access the system remotely using the Host SDI mode.

Connecting the MMI terminal:

1. To connect the MMI terminal to the Fiber Remote Multi-IPE Interface I/O panel MAINT DB-9 male connector, use the NT7R66BA MMI Cable.
2. Plug the DB-9 female connector of the NT7R66BA MMI Cable into the DB-9 male MAINT connector on the Fiber Remote Multi-IPE Interface unit.
3. Plug the DB-25 male connector of the NT7R66BA MMI Cable into the DB-25 female connector on the MMI terminal. If the MMI terminal does not have a DB-25 connector or is a different gender, use an appropriate adapter.

Connecting the MMI terminal using a modem:

1. Use the NT7R66AA SDI Cable Kit to connect the DB-9 female MODEM connector on the Fiber Remote Multi-IPE Interface unit to the modem connector.
2. Plug the DB-9 male connector of the NT7R66AA SDI Cable Kit into the Fiber Remote Multi-IPE Interface DB-9 female MODEM connector.
3. Plug the other end of the cable into the modem connector.

Connecting the MMI terminal to multiple Fiber Remote Multi-IPE Interface units

Make sure that all the Fiber Remote Multi-IPE Interface units are properly configured for the daisy-chain addressing, as shown in Table 8: Fiber Remote Multi-IPE Interface configuration on page 48.

To connect multiple (in this example we have 3 units) Fiber Remote Multi-IPE Interface units in a daisy-chain configuration, refer to Figure 11: Daisy-chaining of multiple Fiber Remote Multi-IPE Interface units on page 63 (ignore the SDI connection). Follow the steps in Connecting multiple Fiber Remote Multi-IPE Interface units in a daisy-chain configuration on page 77.

Connecting multiple Fiber Remote Multi-IPE Interface units in a daisy-chain configuration

1. Plug the DB-9 female connector on the A0634497 Maintenance Interface cable into the DB-9 male MAINT connector on the Fiber Remote Multi-IPE Interface unit #1.
2. Plug the other end of the A0634497 Maintenance Interface cable into the SDI connector on the Fiber Remote Multi-IPE Interface unit #2.
3. Plug a second A0634497 Maintenance Interface cable into the MAINT connector on the Fiber Remote Multi-IPE Interface unit #2.
4. Plug the other end of the second A0634497 Maintenance Interface cable into the SDI connector on the Fiber Remote Multi-IPE Interface unit #3.
5. Plug the NT7R66BA MMI Cable DB-9 female connector into the DB-9 male MAINT connector of the Fiber Remote Multi-IPE Interface unit #3.
6. Plug the DB-25 male connector on the NT7R66BA MMI Cable into the RS-232 MMI terminal port.

   If the MMI terminal does not have a DB-25 connector, use an appropriate adapter or gender changer.
7. To connect a distant MMI terminal over a modem, install the NT7R66AA SDI Cable Kit between the MODEM connector on the Fiber Remote Multi-IPE Interface unit #3 and the modem.
8. Secure cables with tie-wraps as appropriate.

Connecting the fiber-optic link to the Remote IPE Module

The fiber-optic link connects the local Fiber Remote Multi-IPE Interface with the remote Fiber Remote Multi-IPE Interface.

The fiber-optic cable fibers, at each end of the link, must be terminated with an ST optical connector. This connector plugs into the ST optical connector on the Fiber Remote Multi-IPE Interface faceplate at the Remote IPE site.

For a single link, install connectors on only two fibers at each end of the link, one for the transmit side and one for the receive side. For a redundant link, four fibers must have connectors installed at each end. For details on how to engineer and handle the fiber-optic link and the fiber-optic connectors, refer to Engineering the fiber-optic link on page 32. Also, refer to Figure 17: Remote site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 136 for the connection diagram.

Note:

Label optical fibers in the fiber-optic cable next to the ST optical connectors. Label one fiber XMIT A and its pair RCV A at one end of the link. Label these two fibers at the other end of the link with opposite labels; that is, the XMIT A at one end should be labeled RCV A at the other end of the link and the RCV A at one end should be labeled XMIT A at the other end of the link. Repeat the same procedure for the redundant link with XMIT B and RCV B. At the cross-connect, typical designation is: Pos A for receive fiber and Pos B for the transmit fiber. For illustration of the link fibers labelling, refer to Figure 6: Fiber-optic link on page 45 in the Product description section of this document.

Label one fiber XMIT A and its pair RCV A at one end of the link. Label these two fibers at the other end of the link with the opposite label; that is, the XMIT A at one end should be labeled RCV A at the other end of the link and the RCV A at one end should be labeled XMIT A at the other end of the link. Repeat the same procedure for the redundant link with XMIT B and RCV B. For an illustration of the link fibers labelling, refer to Figure 6: Fiber-optic link on page 45.

To connect the fiber-optic link to the Fiber Remote Multi-IPE Interface at the Remote IPE site, follow the steps in Connecting the fiber-optic link to the Fiber Remote Multi-IPE Interface at the Remote IPE site on page 78.

Connecting the fiber-optic link to the Fiber Remote Multi-IPE Interface at the Remote IPE site

1. Identify the link ST optical connectors labeled XMIT A and RCV A for a single link, or labeled XMIT A, RCV A, XMIT B, and RCV B for a redundant link.
2. Plug the link ST optical connector labeled XMIT A into the Fiber Remote Multi-IPE Interface faceplate ST optical connector labeled XMIT A.
3. Plug the link ST optical connector labeled RCV A into the Fiber Remote Multi-IPE Interface faceplate ST optical connector labeled RCV A.
4. Repeat steps 2 and 3 for the XMIT B and RCV B if there is a redundant link.
5. Route and secure the fiber-optic cable to prevent excessive bending and other physical damage.

Connecting the external alarm cable at the remote site

The Fiber Remote Multi-IPE Interface unit provides an external alarm input/output connector (ALM), which is connected to two external alarm inputs and one external alarm output at the Remote IPE site. Alarm inputs indicate external alarm contact closures at the Remote IPE site and the external alarm output indicates failure of the fiber-optic link.

Use a cable with a DB-9 male connector at one end and open wire at the other end. The other end can be customized with connector(s) to match the two external alarm input devices and one external alarm output device. The length of the cable depends on the distance between the Fiber Remote Multi-IPE Interface unit and the external alarm devices.

Table 13: Remote IPE site DB-9 female ALM connector pinouts (remote site) on page 79 lists the Fiber Remote Multi-IPE Interface unit ALM connector pin assignment at the Remote IPE site. This connector connects external alarms to the Fiber Remote Multi-IPE Interface unit. These alarms are reported over the fiber-optic link to the local site.

Table 13: Remote IPE site DB-9 female ALM connector pinouts (remote site)

External Alarm Connection	Connector Pin
External alarm input #1 (activated by external contact closure)	9
External alarm input #2 (activated by external contact closure)	4
External alarm input return	5
External alarm output (activated by fiber-optic link failure)	6
External alarm output return	1

To install the external alarm cable, follow the steps in Connecting the external alarm cable at the remote site on page 79.

Connecting the external alarm cable at the remote site

1. Plug the cable DB-9 male connector into the DB-9 female ALM connector on the Fiber Remote Multi-IPE Interface unit.
2. Connect the other end of the cable open wires to two external alarm input devices and one external alarm output device.

   Observe the wire color codes and their corresponding pin assignments at the DB-9 connector to correctly connect alarm devices to the Fiber Remote Multi-IPE Interface unit.

Connecting the power source at the remote site

To install the DC power source to the Fiber Remote Multi-IPE Interface unit at the remote site, refer to Connecting the DC power source on page 65. To install and connect the Power Converter to the Fiber Remote Multi-IPE Interface unit at the remote site, refer to Connecting the AC/DC Power Converter on page 67.

Configuring the equipment

The configuration and administration of Remote IPE at one or more remote sites and at the local site are identical to the standard system configuration and administration and do not require special considerations.

However, there are some Fiber Remote Multi-IPE Interface initial setup functions that must be considered at either local or the remote site. These functions are administered over aman machine interface (MMI) port connected to a terminal at the local and the remote sites.

When configuring Remote IPE functions at the local and the remote sites you can configure the Superloop Network cards and the Peripheral Controller cards dedicated to the Remote IPE exactly the same way any other standard Superloop Network cards and Peripheral Controller cards are configured by using:

- Configuration Record programs LD 17 and LD 97
- MMI commands to configure the Fiber Remote Multi-IPE Interface parameters

Factory default parameter settings

The Fiber Remote Multi-IPE Interface units are set in the factory as listed in Table 14: Factory default parameter settings on page 80:

Table 14: Factory default parameter settings

Parameter	Default setting
Time	Central Standard Time
Date	Current
Name	Fiber
Alarm Enable/Disable	Enable
Alarm Self-Clearing Enable/Disable	Enable
Bit Error Alarm Threshold	10^{-10}

Configuring the cards

When the Remote IPE equipment is first installed, it is necessary to define the NT8D01 Peripheral Controller cards dedicated to Remote IPE support.

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 superloop that is not dedicated to the Remote IPE

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. You can also move data blocks of one superloop to a different superloop number using Move Data Blocks Program LD 25.

- configure a superloop data block to correspond to the Superloop Network card dedicated to the Remote IPE
- configure a peripheral controller data block to correspond to the Peripheral Controller card in the Remote IPE

Before defining a superloop for Remote IPE, it is necessary to find available superloops in the system. To do this, logon and print system configuration data using Print Program LD 22.

Table 15: Request CFN printout

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

From the report find unused superloops, which can be used for the Fiber Remote Multi-IPE Interface application.

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)
SUPL	xxx xxx xxx...	Lists all local Superloop Network card superloop numbers

To change the system configuration record and to configure the Peripheral Controller card at the Remote IPE 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
CEQU	YES	Change equipment

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

REQ	CHG	Change definition
TYPE	XPE	Remote Peripheral Controller ID
XPEC	2	Card position
LOC	SCLARA	Remote site location example. Use any 6 alphanumeric characters to identify the remote site

MED		
RGTP	(8) 16	Default number of concurrent ringers. Change to a maximum of 16 ringers capacity for all ringers except the old DC version

After the new Peripheral Controller is defined, define the superloop for the Superloop Network card designated to support the Remote IPE.

Table 19: To define a carrier superloop

Prompt	Response	Description
REQ	CHG	Adding a new Superloop Network card
TYPE	SUPL	Adding a superloop for the Superloop Network card.
SUPL	0–156	Superloop number
SLOT	(L) R	Superloop card side for the Superloop Network card, where L (left) is default position.
XPEC	1–95	Peripheral Controller card previously equipped.

To configure new Host SDI maintenance and service change, load Configuration Record Program LD 17 and Configuration Record Program LD 97.

Table 20: Configuring the SDI port for the Superloop Network 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, load Maintenance and Diagnostic Program LD 32 and execute the **`ENLL sl`** command.

Table 21: To enable the superloop sl

Command	Response	Comment
ENLL sl	OK = operation is successful.	Enables specified superloop sl

To remove the configuration of the Remote IPE superloop, load Maintenance and Diagnostic Program LD 32 and execute the DISL sl command to disable the superloop. Then, load

Configuration Record Program LD 97 to delete the configuration records of the superloop for the Superloop Network card and the Peripheral Controller card.

Table 22: To delete the configuration record for the superloop

Prompt	Response	Description
REQ	CHG	Deleting the Superloop Network card configuration record
TYPE	SUPL	Superloop
SUPL	X8	Remove record for superloop number 8

Table 23: To delete the configuration record for the Remote IPE module

REQ	CHG	Change configuration record
TYPE	XPE	Remote IPE
XPEC	X2	Delete configuration record for the Peripheral Controller 2

To check the status of the specified superloop, load the LD 32 and execute the **`STAT sl`**, where **`sl`** is the superloop number.

Configuring the Fiber Remote Multi-IPE Interface unit

The configuration and administration of the Fiber Remote Multi-IPE Interface at the local or the remote site consists of the following:

- selecting the MMI terminal modes
- setting modem parameters
- configuring fiber-optic link performance criteria
- performing maintenance functions
- conducting test and diagnostic functions

Selecting the MMI terminal modes

The MMI terminal can be set in the Host SDI or the MMI mode. When the MMI terminal is in the SDI mode, system administration can be performed tasks from the local or the remote site. When the MMI terminal is in the MMI mode, the following tasks can be performed:

- perform Fiber Remote Multi-IPE Interface functions such as display status, logs, performance information, history, and messages
- enable or disable alarms

- clear errors and logs
- set performance parameters
- specify tests

Selecting the MMI mode

In the MMI mode, one terminal is connected to the MMI port at the local Fiber Remote Multi-IPE Interface unit. Another terminal is connected to the MMI port at the Fiber Remote Multi-IPE Interface unit at the remote site. Each terminal can control MMI functions at the local site and at the distant site (across the fiber-optic link). In a daisy-chain configuration, an MMI terminal can access any Fiber Remote Multi-IPE Interface unit in the chain at the local or remote site.

The default MMI interface characteristics are configured in the Fiber Remote Multi-IPE Interface unit as follows:

- speed: 2400 bps
- character width: 7 bits
- parity bit: mark
- stop bit: 1

Note:

This is a single user system. That is, only one terminal can be active on the system at the time.

Logging in. The MMI mode is accessed from the initial (INIT) mode by entering **`L or LOGIN`** on the terminal to log in. For multiple Fiber Remote Multi-IPE Interface units connected in a daisy-chain, to log in to the specified Fiber Remote Multi-IPE Interface, enter **`L <xx>`**, where **`xx`** is the address of a specific Fiber Remote Multi-IPE Interface unit in the chain. Refer to Table 9: Fiber Remote Multi-IPE Interface and system monitor address selection table on page 49.

Entering password. After logging in, the password is prompted. The password is FIBER and it must be entered in all capital (upper-case) letters.

Exiting the MMI mode. To exit the MMI mode and return to the INIT mode, enter Q at the MMI terminal.

Selecting Host SDI mode

In the Host SDI mode, a terminal is connected to the MAINT port or to the MODEM port (through a modem) at the Fiber Remote Multi-IPE Interface unit. This terminal becomes the local maintenance and service change TTY. At the local site, a single Fiber Remote Multi-IPE Interface unit connects a terminal to its MAINT port and an SDI card to its SDI port. In a daisy-chain configuration, the MMI terminal is connected to the MAINT port of the first unit in the chain and the SDI card is connected to the last unit in the chain.

Note:

When a terminal is in the Host SDI mode and is active over the fiber-optic link, other MMI terminals can not execute the MMI (DISTANT) commands (for example, the D S D command) until the Host SDI mode stops communication over the link or the mode is changed into the MMI mode.

For the MAINT port, at the Remote IPE site, to be able to communicate over the SDI port at the local site, the interface characteristics must be configured the same at both sites:

- speed: 2400 bps
- character width: 7 bits
- parity bit: mark
- stop bit: 1

In this mode, the remote MMI 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 in to the host for SDI operation, first log in using the MMI terminal in the MMI mode, then log in to the terminal as host:

`FII:: >L`	Login command
Enter Password > **`FIBER`**	Type in the password in capital letters.
FII::> **`HO`**	To access the Host SDI mode
Enter Password > **`HOST`**	Enter the password **`HOST`**
Host Busy. Barge In (Y or N) Y	May want to barge in but the connection may be denied if another terminal is active in the Host SDI mode.

The Host SDI mode is accessed from the MMI mode by entering **`HOST`** at the terminal or TTY. In this mode it is possible to configure and maintain the entire system. Figure 14: TTY or terminal modes at the local and the remote sites on page 87 shows that, for example, LD 32 can be activated to perform loopback testing.

To exit this mode, enter `@@@`.

Configuring the MMI modem

To connect a distant MMI terminal to a Fiber Remote Multi-IPE Interface unit at either the local or the remote site, the Fiber Remote Multi-IPE Interface provides the MODEM DB-9 female connector with a DTE interface. This connector connects a Hayes-compatible auto-answering modem to the Fiber Remote Multi-IPE Interface unit allowing an MMI terminal to perform local maintenance and through the fiber-optic link to perform the far-end maintenance. For proper operation, the modem must be configured as follows:

- speed - 2400 baud
- auto-answer - ON
- carrier loss delay - 5/10 second or less
- local echo - OFF
- result codes - disabled
- character width - 7 bits
- parity bit - mark
- stop bit - one

Table 24: Fiber Remote Multi-IPE Interface MODEM connector pin assignment on page 86 lists the pin assignment of the MODEM DB-9 female connector that connects the Fiber Remote Multi-IPE Interface unit to the modem.

Table 24: Fiber Remote Multi-IPE Interface MODEM connector pin assignment

Pin number	Function
2	Receive data from modem
3	Transmit data to modem
5	Signal ground

Use a terminal or put the computer into the terminal mode and connect it to the modem to be able to configure the modem.

To configure the modem parameters using a character string or a dip-switch, where applicable, follow the steps in Configuring the modem parameters on page 86.

Configuring the modem parameters

1. Set baud rate by sending the **AT**<cr> command to the modem at the desired baud rate.

   This sets the modem baud rate. If the modem is already set with no echo or result codes, the modem does not reply back to the terminal the result of the command action.

2. Set auto-answer to ON.

   If the modem has a dip-switch, set switch position #5 to the UP position, otherwise type **ATS0=1&W0&Y0<cr>**.

3. Set carrier loss delay to 5/10 second or less.

   Type **ATS10=5<cr>**. This sets a hang-up time of 1/2 second upon loss of carrier.

4. Disable local echo.

   If the modem has a dip-switch, set switch position #4 to the DOWN position. Otherwise, type **ATE0&W0&Y0<cr>**.

5. Disable result codes.

   If the modem has a dip-switch, set switch position #3 to the UP position. Otherwise, type **ATQ1&W0&Y0<cr>**.

Figure 14: TTY or terminal modes at the local and the remote sites on page 87 shows modes that a terminal can be in and paths taken to transition from one mode to the next. The three modes are Initial, MMI, and SDI. The words shown along the paths must be entered on the terminal to go from one mode to the next.

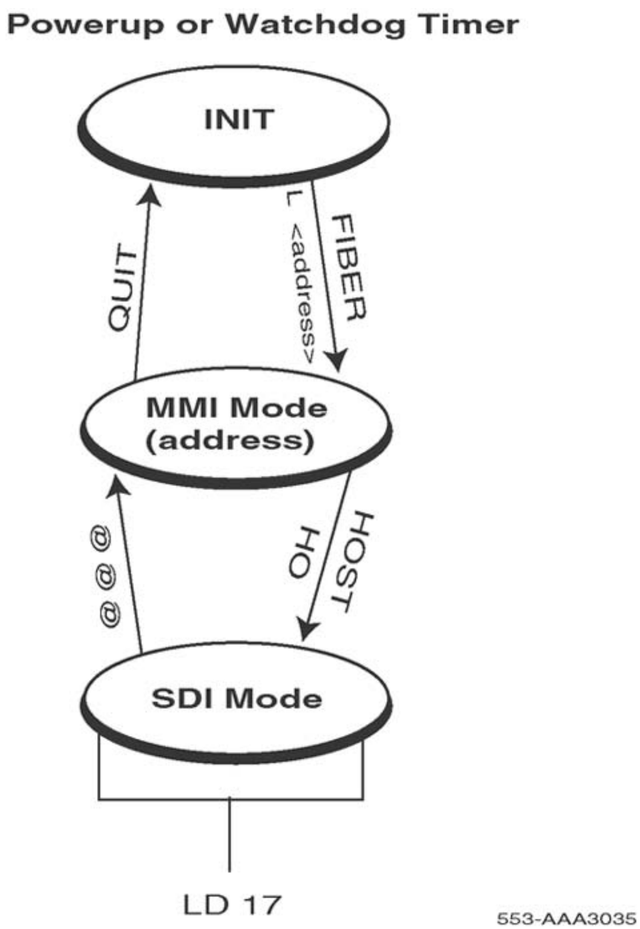

Figure 14: TTY or terminal modes at the local and the remote sites

Configuring the Fiber Remote Multi-IPE Interface

To configure the Fiber Remote Multi-IPE Interface using the MMI terminal, log on, 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 letters.

Before configuring the Fiber Remote Multi-IPE Interface, make sure that the communication is established with the distant end; otherwise, the MMI commands will not have effect at the far-end. Commands affecting the far-end can be executed only when the far-end is communicating and the Microlink is up.

To verify that the communication is established, display the status at each end of the fiber-optic link by executing the **D S** and **D S D** commands on the MMI terminal to display the superloop and the fiber-optic link status at the near-end and the far-end of the link. If the Alarm Level is 0 for at least one link at both ends, the communication is established.

To display near-end (local)link status:

FII:: > D S Fiber Remote IPE S/N 2502-R3 Software Version 3.11 5/15/96 10:45 Local Site In Alarm Status: NO Fiber A Threshold Alarm Active: NO Error Rate: E-99 Todays Max: 5/15/96 11:58 Error Rate: E-7 Super Loop 1 NORMAL Super Loop 21 INACTIVE

To display far-end (distant) link status:

FII::> D S D Distant End Ready Distant Status Enter 'S' to Cancel Function D S Fiber Remote IPE S/N 2502-R3 Software Version 3.11 5/15/96 10:45 Remote Site In Alarm Status: NO Fiber A Threshold Alarm Active: NO Error Rate: E-99 Today's Max: 5/15/96 11:58 Error Rate: E-10 Super Loop 1 NORMAL Super Loop 21 INACTIVE

After the communication with the distant site has been verified, the current Fiber Remote Multi-IPE Interface configuration parameters can be displayed to decide which parameters should be changed to meet the system requirements.

To display the near-end current Fiber Remote Multi-IPE Interface configuration:

FII::> D C Fiber Remote IPE S/N 2502-R3 Software Version 3.11 5/15/96 10:45 Local Site Alarm Enabled: YES Self Clearing Enabled: YES Remote XSM Address 0X00 Current Fiber Alarm Threshold Value E-9

Current Dip Switch Settings (S1...S8) ON ON OFF OFF OFF OFF OFF OFF 2400 Baud Single Terminal Mode Multidrop Address 0

To display the far-end (distant) current Fiber Remote Multi-IPE Interface configuration:

FII::> D C D Distant End Ready Distant Configuration Enter 'S' to Cancel Function D C Fiber Remote IPE S/N 2502-R3 Software Version 3.11 5/15/96 10:45 Remote Site Alarm Enabled: YES Self Clearing Enabled: YES Remote XSM Address 0X00 Current Fiber Alarm Threshold Value E-9

Current Dip Switch Settings (S1...S8) ON ON OFF OFF OFF OFF OFF OFF 2400 Baud
Single Terminal Mode Multidrop Address 0

To change the fiber-optic link alarm threshold, execute the S A command on the MMI terminal. This sets the bit error per minute alarm threshold for the link.

To configure the fiber-opticlink alarm thresholds:

`FII::> S A` Alarm Threshold: Current Value E-9 New Value E-10

Alarm Threshold – Number of bit errors per minute. E-6 represents 10-6 or 1 error in 1 million bits or 3000 error bits/min, E-7 represents 10-7 or 1 error in 10,000,000 bits or 300 error bits/min, E-8 represents 10-8 or 1 error in 100,000,000 bits or 30 error bits/min, E-9 represents 10-9 or 1 error in 1,000,000,000 bits or 3 error bits/min, and E-10 represents 10-10 or 1 error in 10,000,000,000 bits or 1error bits/min.

To configure site name, time, and date:

FII:: >	Prompt requesting an MMI command
`FII::> S N`	Set name
Change Site Name (YES or NO) Y	To change the site name
Enter Site Name = SC	New site name
Change Link Identifiers (YES or NO) Y	To change link IDs
ID for Superloop 1 004 1	Superloop and shelf number
ID for Superloop 2 008 1	Superloop and shelf number
ID for Superloop 3012 2	Superloop and shelf number
ID for Superloop 4016 2	Superloop and shelf number
`FII::> 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.
`FII::> S D`	To set date
Current Date 8/10/9518/11/95 Current Date 8/11/95	Enter correct date at the cursor, if required.

Note:

Time and date should be set correctly to allow correlation of the Remote IPE Alarm Log with error messages in the local History File.

Table 25: MMI commands used in displaying, checking, and setting the fiber-optic parameters on page 90 lists MMI commands used to display and configure carrier

parameters such as setting alarm thresholds, setting time and date, configuring fiber-optic links, connecting to the SDI port, and testing the fiber-optic link and interfaces to the link.

Table 25: MMI commands used in displaying, checking, and setting the fiber-optic parameters

Command	Description
A D	Alarm disable. Disables all alarms.
A E	Alarm enable. Enables all alarms.
C A	Clear alarm. Clears all alarms and resets the fiber-optic link bit error rate counters.
D C [P]	Display configuration [Pause]. Displays current near-end configuration such as time, date, name, and link bit error threshold.
D C D	Display configuration distant. Displays current far-end configuration such as time, date, name, and link bit error threshold.
D S [P]	Display status [Pause]. Displays near-end superloop and fiber-optic link status.
D S D	Display status distant. Displays far-end superloop and fiber-optic link status.
H or ?	Help. Displays the Help screen.
HOST or HO	Connect the terminal to the SDI port. The password is **HOST**. Enter password in all capital letters.
L	Log in to the MMI terminal for one Fiber Remote Multi-IPE Interface. The password is **FIBER**.
L xx	Log in to a specific superloop when the system has more than one Fiber Remote Multi-IPE Interface connected in a daisy-chain, where xx is the Fiber Remote Multi-IPE Interface address in the chain. The password is also **FIBER**. Enter password in all capital letters.
Q	Logs the terminal user out.
S A	Set link bit error per minute alarm threshold.
S C	Set alarm self-clearing function to either "enable" or "disable".
S D	Set date or verify current date.
S L	Sets link. Configures which fiber-optic link (A or B) is selected to transmit data.
S N	Set name. Sets the name for the site and superloop number and shelf number. The site name can be 9 characters long and the superloop number can be 3 characters long and shelf can be one to two characters long.

Command	Description
S T	Set time or verify current time.
T A	Test all. Initiates a series of pre-programmed tests on the near-end and far-end superloops and fiber-optic links. Test duration can be set from 1 to 98 minutes. By entering 0, the tests run one time. To stop testing, enter **STOP**.
T FI	Test fiber. Initiates a series of pre-programmed tests on the fiber-optic links. Test duration can be set from 1 to 98 minutes. By entering 0, the tests run one time. To stop testing, enter **STOP**.
T SL	Test near-end superloop. Initiates a series of pre-programmed tests on the near-end superloops. Test duration can be set from 1 to 98 minutes. By entering 0, the tests run one time. To stop testing, enter **STOP**.
T SL D	Test far-end superloop. Initiates a series of pre-programmed tests on the far-end superloops. Test duration can be set from 1 to 98 minutes. By entering 0, the tests run one time. To stop testing, enter **STOP**.
@@@	Terminates the terminal connection.

Chapter 5: Remote IPE acceptance testing

Contents

This section contains information on the following topics:

Introduction

This section describes the acceptance testing of the Remote IPE and the fiber-optic link connecting the local system to the Remote IPE at distances of up to 15 miles for single-mode fibers. The purpose of acceptance testing is to verify that the functions and features of the Remote IPE are operating correctly and that the link is operating as intended.

Acceptance testing overview

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

- a previously installed system is upgraded with Remote IPE equipment and operates correctly without Fiber Remote Multi-IPE Interface connection to local and Remote IPE equipment
- a newly installed system with Remote IPE equipment appears to operate correctly

Acceptance testing verifies the operation of local system functions and features at the remote site equipped with Fiber Remote Multi-IPE Interface units and the Remote IPE.

Acceptance testing consists of:

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

Checking the system

After the Remote IPE has been installed and configured, visually inspect the Remote IPE cards and observe their LEDs to make sure they are operating correctly :

- On the Superloop Network card at the local site, check the card LED located at the top of the faceplate. If the LED on the Superloop Network card is Off, the card is enabled and operating correctly. If the card LED is Off and the Fiber Remote Multi-IPE Interface alarm LEDs are On, the card is enabled and operating but the Fiber Remote Multi-IPE Interface or the fiber-optic link is faulty. If the card LED is lit, the card is disabled or faulty. To enable the Superloop Network card or to correct a problem, go to Remote IPE fault isolation and correction on page 113.
- On the Peripheral Controller card at the remote site, check the card LED located at the top of the faceplate. If the LED on the Peripheral Controller card is Off, and the Fiber Remote Multi-IPE Interface alarm LEDs are also Off, the card and Fiber Remote Multi-IPE Interface are operating correctly. If the card LED is Off and the Fiber Remote Multi-IPE Interface alarm LEDs are On, the card is enabled and operating but the Fiber Remote Multi-IPE Interface or the fiber-optic link is faulty. If the card LED is On, the card is disabled or faulty. To enable the Peripheral Controller card or to correct a problem, go to Remote IPE fault isolation and correction on page 113 in the Maintenance section of this manual.
- Check the hexadecimal display on the Peripheral Controller card. Refer to Appendix A to identify hexadecimal codes displayed by the Peripheral Controller card during self-test.

If the display and all indicator LEDs on the Remote IPE equipment indicate good operating conditions, the equipment is functional. Proceed with setting up the necessary equipment for this test.

Setting up test conditions

To conduct acceptance testing, a setup is needed that can verify basic functions and features initiated and terminated at the Remote IPE site.

It may be able 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.

To conduct the acceptance testing, make sure that the Remote IPE at the remote site contains at least one IPE (line) card with at least two telephones connected to its subscriber loops. If possible, use some analog (500/2500-type) to check the ringing generator and some digital sets to check the dual tone multifrequency (DTMF) operation.

Also, make sure that an MMI terminal is connected to the MMI port through the Fiber Remote Multi-IPE Interface unit.

Performing acceptance testing

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

- performing basic voice calls
- using the MMI terminal to configure and maintain Remote IPE and Fiber Remote Multi-IPE Interface equipment
- checking the protection switching of the fiber-optic link

Voice calls

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

Acceptance testing of 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

To perform a call test, follow the steps in Performing a call test on page 95.

Performing a call test

1. From a telephone at the local site, dial a telephone at the Remote IPE site and establish an active call connection.

   Note:

   The local system treats Remote IPE subscriber loops as local loops; therefore, it is only necessary to dial the extension number to access that station.

2. Verify voice transmission 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 basic calling features such as call hold/call retrieve.
4. Terminate the call.

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.

To perform a call hold/call retrieve test, follow the steps in Performing a call hold/call retrieve test on page 96.

Performing a call hold/call retrieve test

1. From a telephone at the local site, dial a telephone at the Remote IPE site and establish an active call connection.
2. Verify voice transmission 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.

   Note:

   To find out how to use the feature keys on different telephones, consult the user manual supplied with the telephone.
4. Now, place an outgoing call from the telephone at the remote site by dialing an idle telephone located at the local site.
5. Complete this outgoing call by first checking the voice clarity in both directions, and hang up.
6. Have another telephone call 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.

Repeat this test for telephones connected to different subscriber loops on the same line card or for different subscriber loops on different line cards in the Remote IPE module. Making these calls generates traffic, which will be shown in the traffic report.

Checking the MMI terminal operation

Connect an MMI terminal to the Fiber Remote Multi-IPE Interface unit at the local site and another MMI terminal to the Fiber Remote Multi-IPE Interface at the Remote IPE site. To check the MMI terminal operation, follow the steps in Checking the MMI terminal operation on page 97.

Checking the MMI terminal operation

1. Set the current mode of the MMI terminal to MMI mode by logging on and by entering **`L`** or **`L xx`**, where xx is the Fiber Remote Multi-IPE Interface address in a multiple unit daisy-chain configuration.
2. Enter the password **`FIBER`** in solid caps.
3. Check the status of near-end superloops and the fiber-optic link by executing the **`D S [P]`** command.
4. Check the status of the superloops and the fiber-optic link at the far-end by executing the **`D S D`** command.

   This command is sent over the fiber-optic link to the Peripheral Controller card for execution.
5. Check the response to this command for the local and remote sites.
6. Check the log file content by executing the D A [P] to print near-end log messages from the file starting with the oldest message.

   Examine the messages.
7. Check the log file content by executing the **`D A D`** to print far-end log messages from the file starting with the oldest message. Examine the messages.

Additional exercise of the MMI terminal is conducted when testing the fiber-optic link protection switching.

Checking link protection switching

To verify that the fiber-optic link protection switching is operating correctly, conduct the following tests with the span:

- manual switch-over
- forced switch-over

Note:
These tests can be conducted only with a redundant link configuration.

Manual switch-over

This is a bidirectional switch-over. To conduct this test, follow the steps in Performing a manual switch-over on page 98.

Performing a manual switch-over

1. Check the status of the fiber-optic link by executing the **D S** command from the MMI terminal.

   Make sure that both the primary and the redundant links are functional without an alarm condition on the Fiber Remote Multi-IPE Interface faceplate.
2. Establish a call from the Remote IPE to the local site.

   Refer to Voice calls on page 95 to establish the call.
3. Assuming that the traffic is carried by the primary link, switch the link to the secondary by unplugging the primary link connector from the Fiber Remote Multi-IPE Interface faceplate XMIT A connector.
4. Verify that the call is still established over the secondary link.
5. Reconnect the link ST optical connector into the XMIT A connector on the Fiber Remote Multi-IPE Interface faceplate.
6. Switch the link back to the primary by unplugging the secondary link connector from the Fiber Remote Multi-IPE Interface faceplate XMIT B connector.
7. Verify that the call is still established over the primary link.
8. Reconnect the link ST optical connector into the XMIT B connector on the Fiber Remote Multi-IPE Interface faceplate.

Forced switch-over

This is a bidirectional switch-over. To conduct this test, follow the steps in Performing a forced switch-over on page 98.

Performing a forced switch-over

1. Check the status of the fiber-optic link by executing the **D S** command from the MMI terminal.

   Make sure that both the primary and the redundant links are functional without an alarm condition on the Fiber Remote Multi-IPE Interface faceplate.
2. Establish a call from the Remote IPE to the local site.

   Refer to Voice calls on page 95 to establish the call.
3. Assuming that the traffic is carried by the primary link, switch the link to the secondary by executing the Set Link command **S L B** to select the redundant link **B** using the MMI terminal.
4. Verify that the call is still established over the secondary link.
5. Execute the Set Link command **S L A** to select the primary link **A** using the MMI terminal.
6. Verify that the call is still established over the primary link.

Fault recovery test

This test verifies the recovery of the fiber-optic link and the Fiber Remote Multi-IPE Interface units after the loss of power at one end. To perform this test, follow the steps in Perform a fault recovery test on page 99.

Perform a fault recovery test

1. Unplug the power connector on the Fiber Remote Multi-IPE Interface unit I/O panel.
2. Observe that all LEDs on the unit are OFF.
3. Reinstall the power source connector into the Fiber Remote Multi-IPE Interface unit I/O panel power connector.

   Observe the LEDs.
4. The Power LED on the Fiber Remote Multi-IPE Interface should come ON and stay ON upon completion of a successful self-test.
5. Press the Reset button to turn OFF the alarm LEDs.

   They should turn OFF and stay OFF if the fiber-optic link recovered from the power failure.
6. Place a call across the link to verify its operation.
7. Place the MMI terminal in the Host SDI mode and load the LD 60 overlay to switch the system clock controller from 0 to 1.
8. Alternatively, place the MMI terminal in the Host SDI mode and use LD 60 to switch the system clock controller from 1 to 0.
9. Switch system clock from active to standby by executing the **`SWCK`** command.
10. Get the status of the system clock 0 or 1 by executing the **`SSCK 0, 1`** command.
11. Check the established call(s) and make sure they have not been dropped.

    If the call(s) are not established, the Phase-Lock-Loop (PLL) is out of lock due to clock switching. The status message can be XM1000 to indicate a problem and PLL is unlocked.

    Find the problem and reestablish the PLL lock.

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

To verify traffic generated during acceptance testing, use the following command to print the report:

`TOPS r r`

The parameters for this command are:

`r r` are report options. This must be one or more of the following numbers:

1 = Network traffic report

2 = Service loops traffic report

5 = Selected terminals traffic report

For more information on traffic reports, refer to the Traffic control program LD 02 in *Avaya Software Input Output Administration (NN43001-611)* and *Avaya Traffic Measurement Format and Output Reference (NN43001-750*.

Chapter 6: Remote IPE maintenance

Contents

This section contains information on the following topics:

Introduction

This section describes maintenance tools and procedures for identifying Fiber Remote Multi-IPE Interface, superloop, fiber-optic link, and Remote IPE faults, locating defective equipment, correcting problems by fixing or replacing defective equipment, and verifying the operation of the Remote IPE after corrections or replacements have been made.

Maintenance overview

Remote IPE maintenance deals with two types of problems:

- installation
- operation

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

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

In either case, identifying the problem should be approached systematically. A problem may have more than one cause. To isolate the cause, a knowledge of Remote IPE operation is required. This information can be found in Product description on page 15.

Once the cause is identified, correct the problem by replacing the defective card or Fiber Remote Multi-IPE Interface unit, connecting accidentally disconnected cables, or correcting the system software problem.

Large Systems provide 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 Fiber Remote Multi-IPE Interface units at both sides of the fiber-optic link. The system installation and maintenance guide sections of *Avaya Communication Server 1000M and Meridian 1 Large System Maintenance (NN43021-700)* describe how to maintain the entire system.

This section describes how to maintain the Fiber Remote Multi-IPE Interface unit as an integral part of the local system.

It also describes how to maintain and troubleshoot the Superloop Network and the Peripheral Controller cards dedicated to the Remote IPE operation.

Diagnostic tools

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

Hardware diagnostic tools

Recommended test equipment:

- optical power meter (Fotec Model M712A or equivalent)
- fiber-optic tracer (low power visible light source)
- adjustable optical attenuator
- fiber-optic patchcords and adapters (matching type of fiber and connectors for the single-mode and multi-mode fibers)
- inspection microscope
- pure isopropyl alcohol lint-free wipes
- aerosol duster

Optional equipment:

- 1300 nm light source (LED or laser)
- visual fault locator (high power visible light source)
- OTDR (Optical Time Domain Reflectometer), rent for occasional use
- fiber identifier receiver

Hardware diagnostic tools consist of:

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

Test equipment

To facilitate the troubleshooting of the Fiber Remote Multi-IPE Interface and the fiber-optic link, it is recommended to have on-hand an optical power meter (Fotec Model M712A or equivalent) to test the signal level of the optical transmitter and the signal level received over the fiber-optic link.

Receiver sensitivity limit of -30 dBm can be measured. An adjustable fiber-optic attenuator can be used to test the sensitivity of the optical receiver. The patchcords are used to connect the meter, the light source, and to loopback the link or the Fiber Remote Multi-IPE Interface while performing the tests. The loopback patchcords (provided with equipment) should be attenuated by 15 dB for the single-mode and 10 dB for the multi-mode fibers.

Troubleshooting the fiber-optic link

To identify the problem with the fiber-optic link, check the attenuation across the entire link, the signal level at the receiver and the signal level at the transmitter, as described in Troubleshooting the fiber-optic link on page 103.

Troubleshooting the fiber-optic link

1. Unplug the connector at the receiver and using the power meter measure the received power on the link and compare it with the receiver signal level specification.

   If the received power is low, test the optical patch panel jumper. If the received power level is still too low, measure the transmitter. Refer to Table 4: Fiber-optic transmit and receive signal levels on page 32.
2. Measure the transmitter power level using a good patch cable and the power meter.

If the power is low, the problem is in the transmitter. If the transmitter output power level is within specifications, the fiber-optic link has too much signal attenuation.

3. Check the optical patch panel. If attenuation in the patch panel is high, check the connections or splices in the patch panel.

    a. To check the fiber-optic link, start a visual continuity check of the cable using a visual fault locator. This is usually the task of the fiber-optic link provider. Problems with the fiber-optic link can be caused by:

        - cable cut or cable stress
        - broken or damaged connectors
        - bad splices

    b. If the cable is more than 500 meters long, OTDR can be used to locate the fault in the fiber-optic link.

    c. If an optical connector is suspected, use a microscope to inspect the fibers and the ferrules in the connector.

Self-test

A self-test is automatically performed by each Superloop Network card and Peripheral Controller card connected to the Fiber Remote Multi-IPE Interface unit when it is inserted into an operating system module, when enabling the card, or when powering up or resetting the system. Alternatively, perform a self-test on these cards using software commands.

The Fiber Remote Multi-IPE Interface unit also performs self-test upon power up.

This self-test checks general card functions and determines if they are operating correctly. Upon insertion, the card automatically starts self-test and it gives an immediate indication of its operating status.

LED indicators

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 and power supply.

The Fiber Remote Multi-IPE Interface unit provides LED indicators to show the power status and the alarm status of the Fiber Remote Multi-IPE Interface unit and the fiber-optic link.

The Fiber Remote Multi-IPE Interface unit activates a red alarm LED when a fault occurs at the near-end and at the same time it activates the yellow alarm LED on the corresponding Fiber Remote Multi-IPE Interface unit at the far-end. It also provides an amber LED to indicate the test and maintenance activity on the fiber-optic link. This amber LED will also light if the system alarms are disabled.

Display codes

The Peripheral Controller card in the Remote IPE is equipped with an alphanumeric display on the faceplate. The display is used to automatically display the card status and identify possible faults with the card by displaying specific codes that correspond to the card status.

These codes are displayed in hexadecimal notation and are listed and interpreted in Peripheral Controller HEX codes and cable connection diagrams on page 131 of this document and in *Avaya Software Input Output Administration (NN43001-611)*.

The display also performs the following functions:

- It identifies the IPE controller, if the PSDL is successful.
- It indicates the current clock source or clock failure on superloops (on the controller card display).

The codes are also 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 Peripheral Controller card are stored in memory and can be reviewed and then cleared by using Network and Signaling Diagnostic Program LD 30.

Enable/disable switch

The Superloop Network card is equipped with an ENL/DIS switch. This ENL/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, put it back in service by setting the switch to the ENL position.

System monitors and alarms

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

The system monitor issues alarms when:

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

Alarms are based on the type and severity of faults reported by the system monitors and indicators. These alarms are divided into:

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

The Fiber Remote Multi-IPE Interface unit issues a red alarm when a fault occurs at the near-end and at the same time it activates a yellow alarm on the corresponding Fiber Remote Multi-IPE Interface unit at the far-end.

Software diagnostic tools

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

- resident diagnostic programs
- interactive nonresident diagnostic programs

Resident programs

Resident programs are diagnostic and administration programs that continuously monitor system operation, report faults, and generate system messages. These system messages are displayed on the system terminal or printed on a system printer.

System messages include:

- maintenance display codes listed under HEX that indicate status and error conditions in the system
- maintenance messages listed under XMI that are reported to the TTY and indicate status and faults with the Remote IPE equipment
- error messages listed under ERR that indicate hardware faults and under BUG that indicate software faults
- overload messages that indicate faulty peripheral cards listed under OVD
- error messages listed under PWR that indicate power faults
- fault history files that can be printed and reviewed to identify fault events leading to the present status

For a list of system messages, refer to *Avaya Software Input Output Administration (NN43001-611)*.

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

- overlay loader program that finds, loads, and executes all nonresident programs selected to run as midnight and background routines
- system loader program that downloads the call processing programs and starts checking main memory when executing sysload
- system initialization program that automatically starts after the system loader program completes the downloading process and outputs the initialization messages listed under INI in *Avaya Software Input Output Administration (NN43001-611)*

Nonresident programs

Nonresident programs can be interactive or automatically executed programs. These programs are stored on the system hard disk or floppy disks and are loaded by the overlay loader program into 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. These programs are used to:

- test the equipment and place lines and trunks in and out of service when testing or faulty
- verify the status of a fault
- verify that a fault has been corrected and the equipment is operating correctly

A number of nonresident 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 the test results.

Alternatively, manually select continuity tests that check continuity between the Superloop Network card in the local system and the Peripheral Controller card in the Remote IPE module, as well as other network and peripheral cards. Specify these tests in Background Signaling and Switching program LD 45. BSD messages indicate the status of the network continuity tests and other network problems.

Superloop and Controller cards maintenance commands

The maintenance commands for the Superloop Network card and Peripheral Controller cards 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 MMI terminal used in the Host SDI mode.

Table 26: Network superloop maintenance commands on page 108 lists superloop maintenance commands provided by Network and IPE Replacement Diagnostic LD 32. NPR000 are diagnostic messages displayed to indicate the status of the equipment.

Table 26: Network superloop maintenance commands

Maintenance command	Maintenance command description
DISL loop	Disables network loop
ENLL loop	Enables network loop
DISS l s	Disables a shelf or module
ENLS l s	Enables a shelf or module
DSXP x	Disables Peripheral Controller and all IPE cards
ENXP x	Enables Peripheral Controller and all IPE cards
ENXP XPEC x	Enables Peripheral Controller but not IPE cards
STAT loop	Displays status for one or all network loops
SUPL loop	Prints data for one or all superloops. Maps from superloop number to IPE controller number.
XNTT loop	Self-test on a Network card for a specific loop
XPCT x	Self-test on Peripheral Controller x
XPEC x	Prints data for Peripheral Controller x. Maps from IPE controller number to superloop number.
IDC	Test Card-LAN operation and queries superloop, peripheral controller, and IPE cards. Returns part numbers and serial numbers of cards.

Remote IPE MMI maintenance commands

The Fiber Remote Multi-IPE Interface unit provide a man-machine interface (MMI) port to connect a configuration and maintenance terminal. Through this terminal, commands can be issued directly to the Fiber Remote Multi-IPE Interface to test the Fiber Remote Multi-IPE Interface unit, the superloops connected to the unit, and the fiber-optic link.

The MMI terminal can also be used to configure, maintain, and test the local system when placed in the Host SDI mode.

Table 27: MMI commands on page 109 lists all MMI commands that are used to configure, maintain, and test the Fiber Remote Multi-IPE Interface associated superloops and the fiber-optic link.

Table 27: MMI commands

Command	Description
A D	Alarm disable. Disables all alarms.
A E	Alarm enable. Enables all alarms.
C A	Clear alarm. Clears all alarms and resets the fiber-optic link bit error rate counters.
C A L	Clear alarm log. Clears near-end fiber link alarm log.
C A L D	Clear alarm log. Clears far-end fiber link alarm log.
C E	Clear error log. Clears near-end fiber link error log.
C E D	Clear error log. Clears far-end fiber link error log.
D A [P]	Display alarms [Pause]. Displays the alarm log for the near-end. It contains the previous minute and the most recent 100 alarms logged with time and date stamp.
D A D	Display alarms distant. Displays the alarm log for the far-end. It contains the previous minute and the most recent 100 alarms logged with time and date stamp.
D C [P]	Display configuration [Pause]. Displays current near-end configuration such as time, date, name, and link bit error threshold.
D C D	Display configuration distant. Displays current far-end configuration such as time, date, name, and link bit error threshold.
D E [P]	Display error [Pause]. Displays near-end error log, which contains the previous minute and the last 30 days of the fiber-optic link error statistics.
D E D	Display error distant. Displays far-end error log, which contains the previous minute and the last 30 days of the fiber-optic link error statistics.
D S [P]	Display status [Pause]. Displays near-end superloop and fiber-optic link status.
D S D	Display status distant. Displays far-end superloop and fiber-optic link status.
H or ?	Help. Displays the Help screen.
HOST or HO	Connects the MMI terminal to the SDI port. The password is **`HOST`**.
L	Logs in to the MMI terminal for one Fiber Remote Multi-IPE Interface. The password is **`FIBER`**.
L xx	Logs in to a specific superloop when the system has more than one Fiber Remote Multi-IPE Interface connected in a daisy-

Command	Description
	chain, where xx is the Fiber Remote Multi-IPE Interface address in the chain. The password is also **FIBER**.
Q	Logs the terminal user out.
S A	Sets the fiber-optic link bit errors per minute alarm threshold in the range from 10-10 to 10-6.
S C	Sets alarm self-clearing function to either "enable" or "disable".
S D	Sets date or verifies current date.
S L	Set link. Configures which fiber-optic link (A or B) is selected to transmit data, for a redundant link.
S N	Set name. Sets the name for the site and superloops. The site name can be 9 characters long and the superloop name can be 5 characters long. These names are shown in the Display Status screen.
S T	Sets time or verifies current time.
T A	Test all. Initiates a series of pre-programmed tests on the near-end and far-end superloops and fiber-optic links. Test duration can be set from 1 to 98 minutes. By entering 0, the tests run one time. To stop testing enter **STOP**.
T FI	Test fiber. Initiates a series of pre-programmed tests on the fiber-optic links. Test duration can be set from 1 to 98 minutes. By entering 0, the tests run one time. To stop testing enter **STOP**.
T SL	Test near-end superloop. Initiates a series of pre-programmed tests on the near-end superloops. Test duration can be set from 1 to 98 minutes. By entering 0, the tests run one time. To stop testing enter **STOP**.
T SL D	Test far-end superloop. Initiates a series of pre-programmed tests on the far-end superloops. Test duration can be set from 1 to 98 minutes. By entering 0, the tests run one time. To stop testing enter STOP.
@@@	Terminates the Host SDI mode and returns the terminal to the MMI mode.

Background diagnostics

The Fiber Remote Multi-IPE Interface MPU continuously monitors the Fiber Remote Multi-IPE Interface functions, the fiber-optic link performance, and the superloop status.

If the Fiber Remote Multi-IPE Interface MPU detects loss of clock, loss of frame, loss of signal, or excessive bit error rate, the following alarm conditions are exhibited:

- The normally open alarm contacts are closed at both ends of the link. The red alarm LED is lit at the near-end of the fault and a yellow alarm LED is simultaneously lit at the far-end of the fiber-optic link.
- The MMI maintenance terminal displays the error report and the printer, if equipped, prints the error report.
- The alarm log file is updated with the latest error condition.
- The system monitor reporting is interrupted for one second.

Off-line and on-line diagnostics

Off-line diagnostic tests are potentially traffic affecting if they are performed on an active superloop that has to be disabled or an active superloop is tested by mistake. Normally the tests are performed on disabled superloops. Therefore, before you can test a superloop, you must disable that superloop using overlay program LD 32. These tests are more extensive than background tests, even though they also test for loss of clock, loss of frame, loss of signal, and excessive bit error rate on the fiber-optic link.

On-line diagnostic test are performed with the Microlink up and are not traffic affecting. If the Microlink is down, the system assumes that there is a loopback condition.

The off-line commands are:

- TEST SUPERLOOP (T SL). Tests a specified near-end superloop.
- TEST SUPERLOOP DISTANT (T SL D). Tests a specified far-end superloop.
- TEST FIBER (T FI). Tests near-end Fiber Remote Multi-IPE Interface, the fiber-optic link, and the far-end Fiber Remote Multi-IPE Interface.
- TEST ALL (T A). Tests all the functions tested by the above two test commands.

On-line diagnostic tests:

The on-line diagnostic tests are conducted with the Microlink up and are not traffic affecting. Such a test is TEST FIBER (T FI). It tests near-end Fiber Remote Multi-IPE Interface, the fiber-optic link, and the far-end Fiber Remote Multi-IPE Interface. This test may become traffic affecting if during the test the redundant fiber-optic link fails.

Isolating and correcting faults

Based on whether Remote IPE equipment has just been installed and is not yet operational or has been operating correctly and is now faulty, the most probable cause of failure can be determined.

Types of faults

Problems can occur in the following areas:

- hardware
- configuration
- software

The types of faults to isolate and correct depend on when the faults occur during installation or 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 steps in isolating Remote IPE faults on page 112 describe how to isolate Remote IPE faults using the diagnostic tools described in this section.

isolating Remote IPE faults

1. Observe and list the problem symptoms the system is exhibiting.

   Typical symptoms can include: Superloop Network card or Peripheral Controller cards LEDs are ON, the Peripheral Controller card faceplate display showing a fault code, or the Fiber Remote Multi-IPE Interface LEDs indicating no transmission on the fiber-optic link.

2. Note whether 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 Remote IPE on page 113 or Previously operating Remote IPE on page 113 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 the Remote IPE still does not operate correctly, contact the field service representative.

Newly installed Remote IPE

Problems that occur during the installation of an entire system, including the Remote IPE, are usually caused by:

- improperly installed cards
- loose or improperly connected external communication cables, or fiber-optic link cables
- incorrect Remote IPE configuration (local versus remote)

These types of problems can also occur when:

- installing additional Remote IPE equipment into an already operating system
- installing a new software version or changing Remote IPE configuration

Check the symptoms listed in Table 28: Remote IPE equipment problems on page 114 that are related to problems with a newly installed Remote IPE.

Previously operating Remote IPE

Problems that occur during the normal operation of Remote IPE are usually caused by:

- faulty equipment
- accidental disconnection of cables
- improper environmental conditions

Check the symptoms also listed in Table 28: Remote IPE equipment problems on page 114 that are related to problems with a previously operating Remote IPE.

Remote IPE fault isolation and correction

Fault isolation and correction of Remote IPE equipment encompasses the Superloop Network cards and Peripheral Controller cards that support the fiber-optic link, and the Fiber Remote Multi-IPE Interface units at each end of the link.

Table 28: Remote IPE equipment problems on page 114 refers to the test procedures in this manual that are most likely able to resolve the problem based on the symptoms observed.

Table 28: Remote IPE equipment problems

Symptoms	Diagnosis	Solution
Red LED on the Superloop Network card or Peripheral Controller card permanently on.	Card is disabled or faulty.	Go to Checking the status of the Superloop Network card on page 115 and Performing the Superloop Network card self-test on page 116 or 3 and 4 in this section to check the card status and perform self-test.
Power LED on the Fiber Remote Multi-IPE Interface unit is off.	Power is not supplied to the Fiber Remote Multi-IPE Interface unit or the unit failed self-test upon power up.	Check the AC/DC converter and the connections to the Fiber Remote Multi-IPE Interface unit and the AC outlet on the wall. If powered directly from a DC source, check the source and the connection to the unit. If the power is present, the Fiber Remote Multi-IPE Interface unit is faulty. Replace it.
Yellow Alarm LED on the Fiber Remote Multi-IPE Interface on.	Far-end is in red alarm state and there is no communication over the link.	Check fiber-optic link connections and go to Checking the superloop and the fiber-optic link status on page 120 to display the status. Then go to Testing the superloops and the fiber-optic link on page 121 to test the superloop and the fiber-optic link.
Red Alarm LEDs on the Fiber Remote Multi-IPE Interface on.	Near-end Fiber Remote Multi-IPE Interface unit or fiber-optic link is faulty.	Check fiber-optic link connections and go to Checking the superloop and the fiber-optic link status on page 120 to display the status. Then go to Testing the superloops and the fiber-optic link on page 121 and Testing the superloop on page 122 to test the equipment.
Both red and yellow Alarm LEDs are on the Fiber Remote Multi-IPE Interface.	Fiber-optic link is faulty.	Check the link cable connections to the Fiber Remote Multi-IPE Interface unit. Go to Testing the superloops and the fiber-optic link on page 121 and Testing the fiber-optic link on page 123 to test the fiber-optic link.
Amber Maintenance LED is on.	Alarms are disabled or off-line diagnostic test is in progress.	Enable the alarms, if disabled. Wait for the test to complete and analyze the results of the test. Otherwise terminate the off-line test by entering **S** (stop) command at the MMI terminal.
Link is OK but no communication with the system monitor.	System monitor address is incorrect.	Define a unique address correctly. Observe the XMI messages on the MMI terminal and check the description of these messages listed in *Avaya Software Input Output Administration (NN43001-611)*. Use this information to locate and correct the fault.

Symptoms	Diagnosis	Solution
Display on the Peripheral Controller card shows fault codes.	Card is faulty. Failed self-test or problem communicating with intelligent peripheral equipment.	Go to Checking the Peripheral Controller card tracking status on page 117, 4 and 8 to check tracking and loopback. Also refer to Peripheral Controller HEX codes and cable connection diagrams on page 131 for a list of codes. Based on the test results and maintenance display codes description, take the appropriate action and resolve the problem.
Error messages displayed on the MMI terminal or printed on the TTY.	Hardware or software problems with the Remote IPE.	Note various error messages. Refer to *Avaya Software Input Output Administration (NN43001-611)* for a list of these messages and their description. Based on the code's description, take the appropriate action to resolve the problem.

If the problem cannot be resolved after exhausting all available diagnostic tools and test procedures, make a list of the symptoms and contact the field service representative.

Superloop Network card fault isolation and correction

The Superloop Network card provides a communication interface between the CPU in the local system and the Peripheral Controller card in the Remote IPE.

The Superloop Network card processes signaling information and data received from the Peripheral Controller card over the fiber-optic link.

Problems with the Superloop Network card may be caused by hardware faults, incorrect configuration, a disabled Superloop Network card, or continuity problems between the card and other network cards connected to the network bus. To isolate and correct problems with the Superloop Network card, follow the procedures below.

Checking the status of the Superloop Network card

The diagnosis inTable 28: Remote IPE equipment problems on page 114 indicates that the Superloop Network card may be faulty or disabled. The first step in identifying the problem is to verify the status of the Superloop Network card. The status of a Superloop Network card is obtained by executing the STAT sl command in Network and Signaling Diagnostic Program LD 30. If the Superloop Network card appears faulty, conduct the self-test to verify that it is actually faulty before you replace it. This test verifies the basic Superloop Network card functions and outputs a fail or pass message after the test is completed. To obtain the Superloop Network card status:

1. Log in on the MMI maintenance terminal, first as **`FIBER`** to get into the MMI mode, and then login as HOST to get into the **`Host`** SDI mode.

Note:

If you entered the **HO** command while someone else is active in the Host SDI mode, the system does not permit login and it displays on the terminal "CONN DENIED".

2. At the > prompt, type **LD 30** and press the `Enter` key to access the Network and Signaling Diagnostic Program LD 30.
3. Type **STAT** sl and press the `Enter` key, where **sl** is the superloop number of the Superloop Network card being tested.
4. If the response is UNEQ = then the superloop is not equipped (the Superloop Network card is not installed).
5. If the Superloop Network card is manually disabled using LD 30, the response can be:

   DSBL: NOT RESPONDING = the loop is disabled and the card is not responding (the card is missing, disabled by the ENL/DIS switch, or faulty).

   DSBL: RESPONDING = the loop is disabled and the card is responding (the card is disabled with DISL command, the Peripheral Signaling card is disabled, or an overload condition exists).

   Note:

   Overload conditions are indicated by OVDxxx messages. Refer to *Avaya Software Input Output Administration (NN43001-611)* for the message description and indication of the problem.

   x BUSY, y DSBL = the loop is enabled with x channels busy and y channels disabled.

   CTYF L1 L2É = loop specified in STAT command cannot receive speech from one or more loops or there is a possible continuity test failure due to a faulty network card such as the Superloop Network card.
6. Type **ENLL sl** and press the Enter key to enable the superloop, where sl is the Superloop Network card superloop number. A message indicating that the Superloop Network card is enabled and working is displayed on the console. Also observe the red LED on the Superloop Network card. If it turns off, the Superloop Network card is functioning correctly. If the LED continues to stay on, the Superloop Network card probably failed self-test and a message should be displayed on the maintenance terminal to that effect.

   If the message indicates that the Superloop Network card is faulty, replace the card.

Performing the Superloop Network card self-test

To perform the self-test, follow the steps below:

1. Log in on the maintenance terminal as Host SDI.
2. At the **>** prompt, type **LD 32** and press the `Enter` key to access the Network and IPE Diagnostic Program LD 32.

3. Type **DISL sl** and press the Enter key to disable the Superloop Network card, where sl is the Superloop Network card loop number to be disabled.
4. Type **XNTT sl** and press the Enter key to start the self-test, where **sl** is the Superloop Network superloop number specified for self-test.

   If the response is:

   TEST PASSED

   The Superloop Network card passed the self-test and is functional; it must be enabled to turn off the red LED and to start processing calls.

   If the Superloop Network card passed the self-test, but the problem persists, the loop or other cards that interface with the Superloop Network card can be faulty. To verify the integrity of the network bus and connections between the Superloop Network card and other network and intelligent peripheral equipment cards interfacing with the Superloop Network card, go to Checking the Peripheral Controller card tracking status on page 117.

   If the response is

   TEST FAILED REASON: xxxx

   XPEC NOT CONNECTED

   The Superloop Network 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 Superloop Network card as described in Replacing Remote IPE equipment on page 125. NPRxxx message may be displayed as a result of a command activated self-test if the Superloop Network card is missing, not configured, and so on.
5. Exit LD 32 by typing **** at the prompt.

Peripheral Controller card fault isolation and correction

The Peripheral Controller card provides a communication interface between the Superloop Network card and the IPE cards housed in the Remote IPE module.

Problems with the Peripheral Controller card can be caused by hardware faults, incorrect configuration, a disabled Peripheral Controller card, or continuity problems between the card and IPE cards connected to the peripheral bus. To isolate and correct problems related to the Peripheral Controller card, follow the procedures below.

Checking the Peripheral Controller card tracking status

The Peripheral Controller card can display tracking information, which shows the status of the Peripheral Controller card phase-lock loop and to what clock source it is locked. To obtain this information, execute the RPED l s command in Network and Signaling Diagnostic Program LD 30. To obtain the Peripheral Controller card tracking status:

1. Log in on the maintenance terminal as Host SDI.
2. At the **>** prompt, type **LD 30** and press the Enter key to access the Network and Signaling Diagnostic Program LD 30.
3. Type **RPED l s** and press the Enter key, where **l** is the loop number of the Superloop Network card and **s** is the shelf or module being tested.

   The Peripheral Controller card may return one of the following codes:

   C0—Controller is locked on the network superloop connected to SL0

   C1—Controller is locked on the network superloop connected to SL1

   C2—Controller is locked on the network superloop connected to SL2

   C3—Controller is locked on the network superloop connected to SL3

   CF—Controller is not locked on any network superloop
4. Exit LD 30 by typing **** at the prompt.
5. Check the incoming signal. If present, replace the Controller; otherwise, find the problem on the link or the Fiber Remote Multi-IPE Interface unit.

Performing the Peripheral Controller card self-test

If the Peripheral Controller card appears faulty, conduct the self-test to verify that it is actually faulty before replacing it. This test verifies the basic Peripheral Controller card functions and outputs a fail or pass message after the test is completed. During self-test the Peripheral Controller card displays HEX messages indicating the test performed. To identify the codes displayed, refer to Table 29: Peripheral Controller self-test HEX codes on page 131. To perform the self-test, follow the steps below:

1. Log in on the maintenance terminal as Host SDI by entering the password **HOST** from the MMI mode.

   Note:

   If the **HO** command was entered while someone else is active in the Host SDI mode, the system does not permit a login. The terminal displays "CONN DENIED".
2. At the **>** prompt, type **LD 32** and press the Enter key to access the Network and IPE Diagnostic Program in LD 32.
3. Type **DSXP x** and press the Enter key to disable the Peripheral Controller card, where **x** is the Peripheral Controller card you are disabling.
4. Type **XPCT x** and press the Enter key to start the self-test, where x is the Peripheral Controller card specified for self-test.

   If the response is:

   TEST PASSED

   The Peripheral Controller card passed the self-test and is functional. It must be enabled to turn off the red LED and start processing calls.

Type **ENXP x** and press the `Enter` key to enable the card.

If the Peripheral Controller card passed the self-test, but the problem persists, the Fiber Remote Multi-IPE Interface, the fiber-optic link, or other cards that interface with the Peripheral Controller card can be faulty.

If the response is:

TEST FAILED REASON: xxxx

The Peripheral Controller card failed the self-test and is faulty, where **xxxx** specifies the cause of the fault. An NPRxxx message may be displayed as a result of a command activated self-test if the Peripheral Controller card is missing or not configured.

5. Exit LD 32 by typing **** at the prompt.

Fault isolation and correction using MMI maintenance commands

Testing and troubleshooting of the Fiber Remote Multi-IPE Interface units and Remote IPEs can be performed from a local or a remote MMI terminal by typing MMI commands on the terminal without loading system diagnostic programs (overlays).

These commands provide current equipment status, perform superloop and link testing, check equipment performance, print messages from log files, and clear alarm and error logs.

Displaying alarm and error logs to check the performance history

Display alarm:

This procedure uses MMI commands to display the superloop and the fiber-optic link performance history.

1. Log in on the MMI maintenance terminal:

`FII:: >L`	Login command
Enter Password **> FIBER**	Type in the password.

2. Type **D A [P]** (DISPLAY ALARM) to display near-end superloop and fiber-optic link alarm history. Type **D A D** (DISPLAY ALARM DISTANT) to display far-end superloop and link alarm history. The **[P]** or pause, allows a display of a full screen of events at the time.

   The response is displayed on the screen and shows the time and date, of each alarm or error event.

   Example:

   FII::>D A Fiber Remote IPE S/N 2502-R3 Software Version 3.11 5/15/96 10:45 Local Site In Alarm State: NO (superloops are not in the alarm state)

   01/22/96 09:26 No Activity Superloop 1 01/22/96 09:26 Activity On Superloop 1 01/22/96 09:25 No Activity Superloop 1 01/22/96 09:25 Activity On Superloop 1 01/22/96 09:24 No Activity Superloop 4 01/22/96 09:20 No Activity Superloop 3

01/22/96 09:17 Activity On Superloop 4 01/22/96 09:17 Activity On Superloop 3 01/22/96 09:17 Activity On Superloop 2 01/22/96 09:17 Fiber Link Up 01/22/96 09:16 Fiber A Threshold Exceeded 01/22/96 09:16 Fiber Link Down 01/22/96 09:15 Performed a Power Up Reset 01/22/96 09:15 Initialized Memory 01/22/96 09:10 Log Cleared

3. Clear the near-end (local) alarm log by executing the **C AL** (CLEAR ALARM) and the far-end (remote) by executing the **C AL D** (CLEAR ALARM DISTANT) command.
4. Type **D E [P]** (DISPLAY ERROR) to display near-end superloop and fiber-optic link error history. Type **D E D** (DISPLAY ERROR DISTANT) to display far-end superloop and fiber-optic link error history. The [P] or pause, allows you to display a full screen of events at the time.

   The log file contains 30 days of error statistics. During each midnight routine, the file stores the highest error rate minute detected in the last 24 hours and the time and date when it occurred. If the redundant link is present, the error statistics of both links is displayed. The response is displayed on the screen as follows:

   Example:

   FII::>D E Fiber Remote IPE S/N 2502 Software Version 3.11 5/15/96 10:45 Local Site In Alarm State: NO (superloops are not in the alarm state)

   Clear the near-end (local) error log by executing the **C E** (CLEAR ERROR) and the far-end (remote) by executing the **C E D** (CLEAR ERROR DISTANT) command.

Checking the superloop and the fiber-optic link status

This procedure uses MMI commands to display the superloop and the fiber-optic link status. To obtain the superloop and link status:

1. Log in on the MMI maintenance terminal:

`FII:: >L`	Login command
Enter Password **> FIBER**	Type in the password.

2. Type **D S** (DISPLAY STATUS) to display near-end superloop and fiber-optic link status.

   Type **D S D** (DISPLAY STATUS DISTANT) to display far-end status.

   The response is displayed on the screen and shows the software version, present time and date, alarm status, error rate, and the superloop link status.

   Example:

   FII::>D S Fiber Remote IPE S/N 25002-R3 Software Version 2.05 04/15/96 9:25 Local Site In Alarm State: NO (superloops are not in the alarm state)

   Fiber A Threshold Alarm Active: NO Error Rate: E-99 Today's Max: 04/15/96 9:25 Error Rate: E-6

Superloop Link 1 ALARM MODE Superloop Link 2 NORMAL Superloop Link 3 INACTIVE Superloop Link 4 NORMAL

The Error Rate: E-99 indicates no errors have been detected The Error Rate: E-0 indicates that no signal has been detected

The superloop can be in:

- Alarm mode when a fault is detected
- Inactive mode when the superloop cable is not installed
- Normal (active) mode when the superloop is operating correctly

3. Analyze the response and determine where the problem may be, if any.

   If the near-end superloop is faulty, the problem can be in the superloop cables, the Superloop Network card, or the Fiber Remote Multi-IPE Interface unit. Visually check each component and correct the problem. Otherwise go to Testing the superloop on page 122.

4. If the D S D command shows problem with far-end communication, the problem may be in the fiber-optic link, link connectors, or the far-end Fiber Remote Multi-IPE Interface. Go to Procedure 7 "Testing the superloops and the fiber-optic link" below.

Testing the superloops and the fiber-optic link on page 121 uses the MMI commands to test all superloops and fiber-optic links. To perform these tests, execute the (TEST ALL) T A command. This test interferes with normal traffic; therefore all superloops should be disabled.

Testing the superloops and the fiber-optic link

1. To disable all superloops to be tested, place the MMI terminal into the Host SDI mode:

   `FII::>HO Enter Password:> HOST` (all caps)

2. At the prompt, type **`LD 32`** and press the Enter key to access the overlay. Then execute the **`DISL sl`** command for each superloop, where **`sl`** is the superloop number.

3. Place the MMI terminal into the MMI mode by entering @@@.

4. To test the disabled superloop and the fiber-optic link, execute the **`T A`** command at the MMI terminal.

   Run the test once by typing 0 or run the test for a number of minutes from **`1`** to **`98`** by typing the number of minutes. By typing **`99`**, the test runs continuously until stopped.

   Stop the test by typing S.

   Example:

   `FII::>T A Enter Duration of Test (1-98 Mins, 0= Once, 99= Forever) Verify Super Loops are Disabled. Hit Q to quit or any Key to Cont`

Link 1 PASSED Link 2 PASSED Link 3 PASSED Link 4 PASSED Link 5 PASSED Link 6 PASSED Link 7 PASSED Link 8 PASSED DS-30 Link Test Completed

DS-30A Frame 1 PASSED DS-30A Frame 2 PASSED DS-30A Frame Test Completed

DS-30A Clock 1 PASSED DS-30A Clock 2 PASSED DS-30A Clock Test Completed

Test Fiber A Micro Link Up. Test Using Distant Loopback Fiber Message Test Passed Fiber Test Completed All Tests Completed. All Tests Passed.

5. Analyze the response and determine where the problem may be, if any.

   If the superloop is faulty, the problem can be in the superloop cables, the local system card (Superloop Network or Peripheral Controller card), or the Fiber Remote Multi-IPE Interface unit.

   Go to Testing the superloop on page 122 to troubleshoot the superloop problems. Go to Testing the fiber-optic link on page 123 to troubleshoot the fiber-optic link problems.

6. After the test has been completed, return the terminal in the Host SDI mode and enable each disabled superloop by executing the **`ENLL sl`** command in LD 32.

Testing the superloop on page 122 uses the MMI commands to test a superloop connected to the near-end or the far-end Fiber Remote Multi-IPE Interface units.

To test a near-end superloop, execute the (TEST SUPERLOOP) T SL command.

To test a far-end superloop, execute the (TEST SUPERLOOP DISTANT) T SL D command.

Testing the superloop

1. Before starting the test, disable the superloop to be tested by placing the MMI terminal into the Host SDI mode:

   FII::>HO Enter Password:> HOST)

2. At the prompt type, LD 32 and press the `Enter` key to access the overlay. Then execute the **`DISL sl`** command to disable the superloop **`sl`**.

3. Place the MMI terminal into the MMI mode by entering @@@.

4. To test the disabled near-end superloop, execute the **`T SL`** command at the MMI terminal.

5. To test the disabled far-end superloop, execute the **`T SL D`** command at the MMI terminal.

   Run the test once by typing **`0`** or run the test for a number of minutes from **`1`** to **`98`** by typing a number that represents minutes. By typing **`99`**, the test runs continuously until stopped.

   Stop the test by typing **`S`**.

   Example:

   FII::>T SL Enter Super Loops to Test (1-4) 1 Enter Duration of Test (1-98 Mins, 0= Once, 99= Forever) Verify Super Loops are Disabled. Hit Q to quit or any Key to

Cont Testing Super Loop 1 Link 1 PASSED Link 2 PASSED Link 3 PASSED Link 4 PASSED DS-30 Link Test Completed DS-30A Frame 1 PASSED DS-30A Frame Test Completed

DS-30A Clock 1 PASSED DS-30A Clock Test Completed Super Loop 1 PASSED Test Summary Super Loop 1 PASSED)

6. If the test shows problems with superloops, check the superloop cable connections, the Fiber Remote Multi-IPE Interface, and the local system cards (Superloop Network and Peripheral Controller card).

   Check each component and replace the faulty one. Execute the **`T SL`** and **`T SL D`** commands until the status shows problem free operation.

7. After the test has been completed, return the terminal in the Host SDI mode and execute the ENLL sl command in LD 32.

Testing the fiber-optic link on page 123 tests the Fiber Remote Multi-IPE Interface at both ends of the link and the fiber-optic link itself. If a redundant link is configured, this test checks both links.

This test interferes with normal traffic; therefore, all superloops should be disabled.

Testing the fiber-optic link

1. To disable all superloops, place the MMI terminal into the Host SDI mode:

   FII::>HO Enter Password:> HOST)

2. At the prompt type, **`LD 32`** and press the `Enter` key to access the overlay.

   Then execute the **`DISL sl`** command for each superloop, where **`sl`** is the superloop number to be disabled.

3. Place the MMI terminal into the MMI mode by entering @@@.

4. To test the fiber-optic link, execute the (TEST FIBER) **`T FI`** command at the MMI terminal.

   Run the test once by typing **`0`** or run the test for a number of minutes from **`1`** to **`98`** by typing the number of minutes. By typing **`99`**, the test runs continuously until stopped.

   Stop the test by typing S.

   Example:

   FII::>T FI Enter Duration of Test (1-98 Mins, 0= Once, 99= Forever) Test May Interfere with XSM Traffic. Hit Q to quit or any Key to Cont Test Fiber A Micro Link Up. Test Using Distant Loopback Fiber Message Test Passed Fiber Test Completed

   (after introducing a fault in the link) Fiber A Threshold Exceeded Fiber Link Down Distant-Fiber A Threshold Exceeded Fiber Link Restored (after correcting the fault) Distant-No Activity Super Loop 1 Distant-Activity On Super Loop 1

5. If the test results show a problem with communication across the fiber-optic link, the problem can be in the fiber-optic link, link connectors, or the far-end Fiber Remote Multi-IPE Interface.

6. Check the fiber-optic cables and optical connectors to verify that they are properly connected.
7. Execute the **T FI** command again to check if the problem still exists.
8. If the problem persists, disconnect the fiber-optic link from the Fiber Remote Multi-IPE Interface optical connectors and install the appropriate attenuated fiber-optic patchcord into the RCV and XMIT optical connectors on the faceplate to create a loopback.
9. Execute the **T FI** command again to check if the problem still exists.

   If the problem still exists, replace the Fiber Remote Multi-IPE Interface unit.
10. If the problem is not detected, the problem must be in the fiber-optic link.
11. Connect an optical power meter to the RCV connector on the link and measure the received signal power.

    If the power is between -30dBm and -8 dBm, the signal is being received from the far-end.
12. If no signal is detected, check the fiber-optic link and ST optical connectors. Check the splices and clean the connectors.

    ⚠ Caution:

    Keep the optical connectors absolutely clean. Use pure isopropyl lint-free wipes to clean the ferrule part of the optical connector and an aerosol duster to blow out dust particles from the adapter part of the optical connector.

    Make sure that the ferrules in the optical connectors are properly installed and aligned in their respective adapters. This is particularly critical for the single-mode fibers where tolerances are tighter.
13. To verify the integrity of the fiber-optic link, use a light source at one end of the link and the power meter at the other to measure the attenuation in the link, determining if each branch of the link is meeting the expected signal attenuation.

    If not, the link problem has to be corrected.
14. If the problem with the fiber-optic link has been corrected, reinstall the link connectors into the Fiber Remote Multi-IPE Interface ST faceplate connectors and execute the **T FI** command again.
15. If the problem still exists, repeat steps 8 and 9 at the far-end.
16. If the problem is finally corrected, execute the **T A** command as described in Testing the superloops and the fiber-optic link on page 121 to test the link and superloops again and verify that all the problems have been corrected.
17. After the test has been completed, return the terminal in the Host SDI mode and enable each disabled superloops by executing the **ENLL sl** command in LD 32.

Replacing Remote IPE equipment

If after completing troubleshooting it is determined that one or more Remote IPE cards or the Fiber Remote Multi-IPE Interfaces are defective, remove them and replace them with spares. When inserting a spare Superloop Network card or Peripheral Controller card in the module, observe the card LED to determine if the card passed self-test. Package and ship the defective cards to an authorized repair center.

Unpacking replacement equipment

Unpack and visually inspect replacement equipment as described in Unpacking replacement equipment on page 125:

Unpacking replacement equipment

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 shipping the defective card.
3. Visually inspect the replacement equipment 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 nonconducting edges to prevent damage caused by static discharge.

Removing and replacing a card

A Remote IPE card can be removed from and inserted into a local module or the Remote IPE module without turning off the power to the module. This feature allows the system to continue normal operation when replacing a Superloop Network card in the local module or a Peripheral Controller card in the Remote IPE module.

Follow the steps in Removing and replacing a Superloop Network card on page 126 to remove and replace a superloop card.

Removing and replacing a Superloop Network card

1. Disable the Superloop Network card by logging in to the system terminal, loading the Network and Intelligent Peripheral Equipment Diagnostic Program LD 32.

   Execute **`DIS sl`**, where **`sl`** is the actual loop number of the Superloop Network card.

2. Set the ENL/DIS switch to DIS.
3. Disconnect the card faceplate cables.
4. Unlatch the card's locking devices by squeezing the tabs and pulling the upper locking device away from the card and pressing the lower locking device downward.
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 ENL/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 device away from the faceplate and insert the card firmly into the backplane connector. Press the upper and lower locking devices firmly against the faceplate to latch the card inside the module.
9. Set the ENL/DIS switch on the Superloop Network card to ENL. The Superloop Network card automatically starts the self-test.
10. Observe the red LED on the front panel during self-test.

    If the red LED flashes three times and stays on, it has passed the test. Go to step 12.

    If the red LED 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 Superloop Network card.

11. Connect the I/O panel cables to the J1 and J2 faceplate connectors of Superloop Network card.
12. Set the ENL/DIS switch to ENL.

    If the red LED on the Superloop Network card faceplate turns off, the card is functioning correctly and is enabled. The outcome of the self-test is also indicated on the system terminal or TTY (or the MMI terminal connected to the Fiber Remote Multi-IPE Interface MAINT connector). If the LED stays on, go to Isolating and correcting faults on page 112 in this document.

13. Tag the defective card(s) with a description of the problem and prepare them for shipment to the equipment supplier's repair depot.

Removing and replacing a Peripheral Controller card

To remove and replace a Peripheral Controller card, follow the steps in Removing and replacing a Peripheral Controller card on page 127.

Removing and replacing a Peripheral Controller card

1. Log in on the TTY or the MMI maintenance terminal.
2. At the > prompt, type LD 32 and press the `Enter` key to access the program.
3. Type **`DSXP x`**, where **`x`** is the Peripheral Controller card, and press the Enter key to disable the card.

   The Peripheral Controller card is now disabled and can be removed.
4. Unlatch the card's locking devices by squeezing the tabs and pulling the upper and lower locking devices away from the card.
5. Pull the card out of the Remote IPE module and place it in 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 locking devices firmly against the faceplate to latch the card inside the module. The Peripheral Controller card automatically starts the self-test.
8. Observe the red LED on the front panel during self-test.

   If the red LED flashes three times and stays on, it has passed the test. 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 Peripheral Controller card.
9. At the prompt in the LD 32 program, type **`ENXP x`**, where **`x`** is the Peripheral Controller card, and press the `Enter` key to enable the card.

   If the red LED on the Peripheral Controller card faceplate turns off, the card is functioning correctly and is enabled. The outcome of the self-test is also indicated by LD 32 on the MMI terminal connected to the Peripheral Controller card. If the LED stays on, replace the card.
10. Tag the defective card(s) with a description of the problem and prepare them for shipment to the equipment supplier's repair depot.

Removing and replacing a complete Fiber Remote Multi-IPE Interface unit

Note:

Replace only the card, unless the Fiber Remote Multi-IPE Interface unit enclosure is also faulty, then replace the entire unit.

When replacing the Fiber Remote Multi-IPE Interface, the entire unit can be replaced or just the card (motherboard with faceplate combination). Follow the steps in Removing and replacing a complete Fiber Remote Multi-IPE Interface unit on page 128 to replace the entire unit:

Removing and replacing a complete Fiber Remote Multi-IPE Interface unit

1. Log in on the TTY or the MMI maintenance terminal.
2. Disable the Superloop Network card by loading the Network and Intelligent Peripheral Equipment Diagnostic Program LD 32, and executing **`DIS sl`**, where **`sl`** is the actual superloop number of the Superloop Network card.
3. Disconnect the AC/DC converter AC power cord from the wall outlet.
4. Disconnect the power cable from the Fiber Remote Multi-IPE Interface unit -48 V POWER connector.
5. Disconnect the superloop cables from SUPERLOOP connectors on the Fiber Remote Multi-IPE Interface unit.
6. Disconnect the fiber-optic ST connectors from the Fiber Remote Multi-IPE Interface unit faceplate XMIT A and RCV A optical connectors.

   If the link is redundant, also disconnect the link from the faceplate connectors XMIT B and RCV B.
7. Remove the unit from the wall or the rack-mounted shelf, as applicable.
8. Reinstall a replacement Fiber Remote Multi-IPE Interface unit in reverse order by setting the S1 and S2 dip-switches, installing the unit onto the wall or into the shelf, connecting the link, connecting the superloop cables, and installing the power cable from the AC/DC converter.
9. Plug the AC/DC converter AC power cord into the wall outlet.
10. Check the power LED on the Fiber Remote Multi-IPE Interface unit.

    It should be lit permanently if the unit passed self-test upon power up.
11. Enable all superloops by executing the **`ENLL sl`** command.
12. Press the Reset button to turn off the alarm LEDs.
13. Tag the defective Fiber Remote Multi-IPE Interface unit(s) with a description of the problem and prepare them for shipment to the equipment supplier's repair depot.

Removing and replacing the card in the Fiber Remote Multi-IPE Interface unit

Removing and replacing the card in the Fiber Remote Multi-IPE Interface unit on page 129 replaces just the motherboard and faceplate combination. The enclosure remains installed and connected.

Removing and replacing the card in the Fiber Remote Multi-IPE Interface unit

1. Log in on the TTY or the MMI maintenance terminal.
2. Disable the Superloop Network card by loading the Network and Intelligent Peripheral Equipment Diagnostic Program LD 32, and executing **`DIS sl`**, where **`sl`** is the actual superloop number of the Superloop Network card.
3. Disconnect the fiber-optic ST connectors from the Fiber Remote Multi-IPE Interface unit faceplate XMIT A and RCV A optical connectors.

   If the link is redundant, also disconnect the link from the faceplate connectors XMIT B and RCV B.
4. Remove the card from the Fiber Remote Multi-IPE Interface unit by pulling the extractors away from the enclosure.
5. Reinstall a replacement Fiber Remote Multi-IPE Interface card into the enclosure in reverse order by setting the S1 and S2 dip-switches, installing the card into the enclosure, and connecting the fiber-optic link to the faceplate optical connectors.
6. Check the power LED on the Fiber Remote Multi-IPE Interface unit.

   It should be lit permanently if the unit passed self-test upon power up.
7. Enable all superloops by executing the **`ENLL sl`** command.
8. Press the Reset button to turn off the alarm LEDs.
9. Tag the defective Fiber Remote Multi-IPE Interface card(s) with a description of the problem and prepare them for shipment to the equipment supplier's repair depot.

Reinstalling covers

When it is determined that the Remote IPE is operating correctly, follow the steps in Reinstalling covers on page 129.

Reinstalling covers

1. Reinstall the covers on the local module.
2. Reinstall the cover on the Remote IPE module.
3. Terminate the session by logging out on the maintenance terminal.

Type Q at the : prompt and press the `Enter` key.

If using the MMI terminal, log out to complete the test and troubleshooting session.

Packing and shipping defective cards

To ship a defective card to an Avaya repair center, follow the steps in Packing and shipping defective cards on page 130.

Packing and shipping defective cards

1. Tag the defective equipment with the description of the problem.
2. Package the defective equipment for shipment using the packing material from the replacement equipment.

   Place cards in an antistatic bag, put in the box, and securely close the box with tape.
3. Obtain shipping and cost information from Avaya and mail the package to an authorized repair center.

Appendix A: Peripheral Controller HEX codes and cable connection diagrams

This appendix lists Peripheral Controller card HEX messages displayed during self-test on the two-character display located on the Peripheral Controller faceplate. It also illustrates the connection diagrams of the Fiber Remote Multi-IPE Interface units at the local and the remote sites.

Peripheral Controller hexadecimal codes

Table 29: Peripheral Controller self-test HEX codes on page 131 lists the Peripheral Controller hexadecimal codes displayed on the faceplate display.

Table 29: Peripheral Controller self-test HEX codes

HEX code	Test description
01	MPU confidence test
02	MPU internal RAM
03	Boot EPROM test
04	RAM test
05	MPU addressing mode test
06	ID EPROM test
07	FLASH EPROM test (the programmable part)
08	Watchdog timer test
09	MPU timers test
0A	DUART port A
0B	DUART port B
0C	A31 #1 external buffer
0D	A31 #1 internal context memory (phase A)
0E	A31 #1 internal context memory (phase B)
0F	A31 #1 internal TXVM memory

HEX code	Test description
10	A31 #1 configuration memory
11	A31 #1 external FIFO
12	A31 #2 external buffer
13	A31 #2 internal context memory (phase A)
14	A31 #2 internal context memory (phase B)
15	A31 #2 internal TXVM memory
16	A31 #2 configuration memory
17	A31 #2 external FIFO
18	R72 N-P switching control memory
19	R72 320x8 NIVD buffer
1A	R72 N-P Quiet code register
1B	R72 P-N switching control memory
1C	R72 640-8 XIVD buffer
1D	R72 640-8 XIVD loopback buffer test
1E	R72 P-N Quiet code register
1F	R71 register test
20	R71 continuity test, peripheral side
21	R71 continuity test, network side
22	R71 packet transmission test
23	Interrupt test
24	R71 continuity test, peripheral side DS30X

Fiber Remote Multi-IPE Interface units connection diagrams

The following figures illustrate the connection of the local system to the Fiber Remote Multi-IPE Interface units and the fiber-optic link at the local and the remote sites.

The following three figures represent examples of connections at the local and corresponding remote site. These connections represent the following:

- Figure 15: Local site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 134 shows a network of Superloop Network cards, including:
  - a co-located IPE Module indicated by the Controller Card, the backplane, and the I/O panel
  - three SUPERLOOP connections to the Fiber Remote Multi-IPE Interface unit
  - connections to the SDI Paddleboard and other SDI cards as an alternative
  - the system monitor, the fiber-optic link, and the MMI terminal
- Figure 16: Local site multiple Fiber Remote Multi-IPE Interface units cable connection diagram on page 135 shows multiple Fiber Remote Multi-IPE Interface unit connections, including:
  - connections to the SDI Paddleboard and other SDI cards as an alternative
  - system monitor connection
  - MMI terminal connection
- Figure 17: Remote site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 136 shows the Remote IPE site with two Remote IPE Modules:
  - Each Remote IPE Module is designated with a Controller Card, the backplane connectors, and the I/O panel connectors.
  - Shows three SUPERLOOPS, which are extended from the local site. Refer to Figure 15: Local site single Fiber Remote Multi-IPE Interface unit cable connection diagram on page 134, where SUPERLOOP #1 supports one entire IPE Module, SUPERLOOP # 2 and SUPERLOOP #3 support the second IPE Module. SUPERLOOP #4 is not equipped in this example.
  - Shows the MMI terminal connection, the system monitor connection, and the fiber-optic link connection.

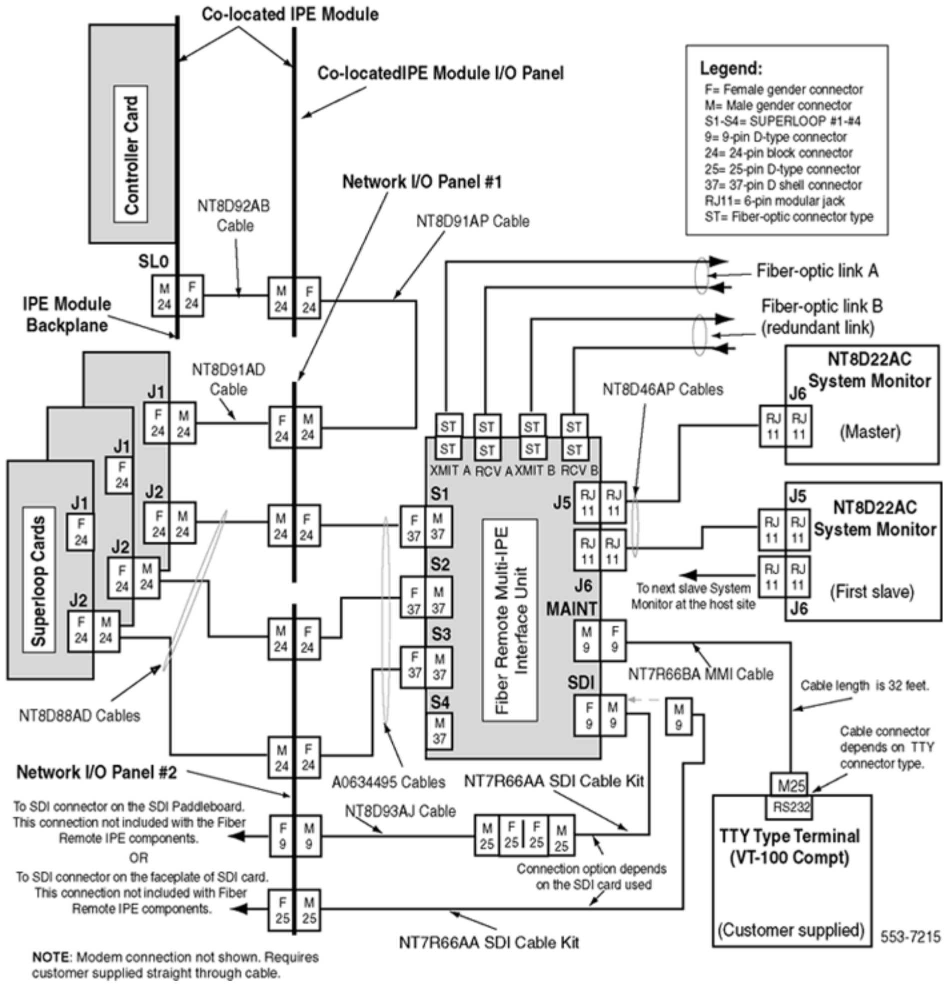

Figure 15: Local site single Fiber Remote Multi-IPE Interface unit cable connection diagram

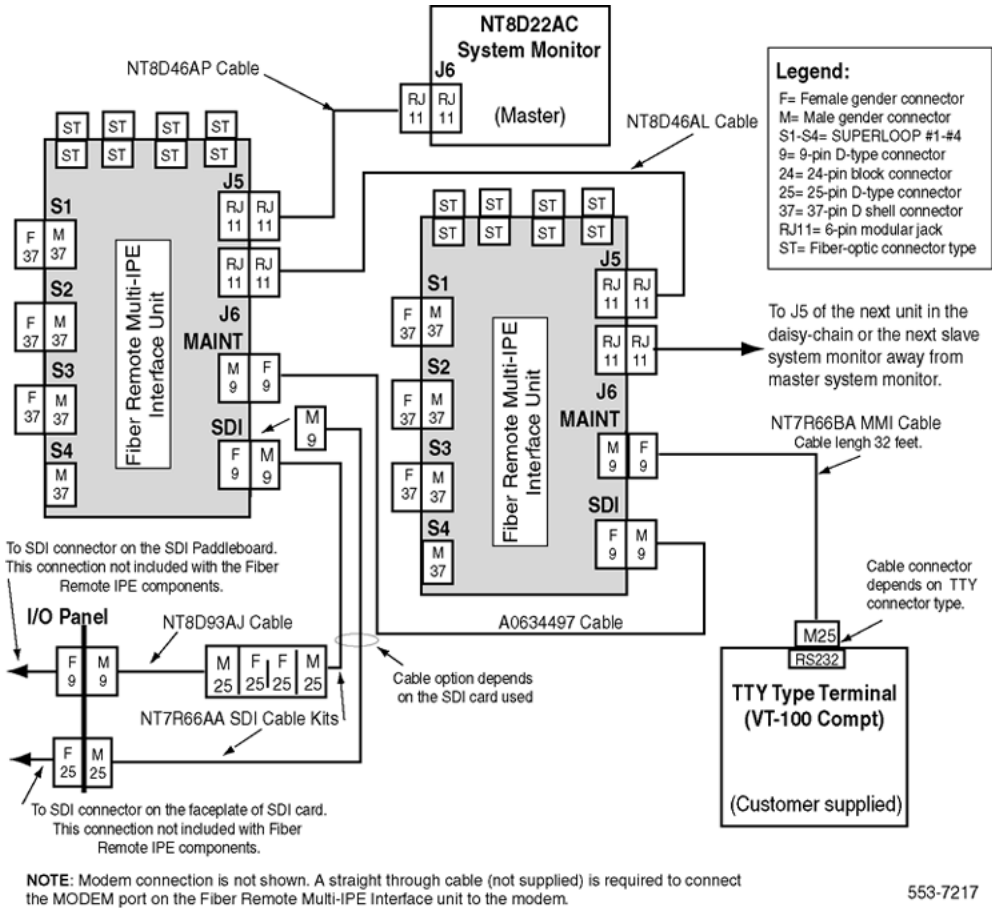

Figure 16: Local site multiple Fiber Remote Multi-IPE Interface units cable connection diagram

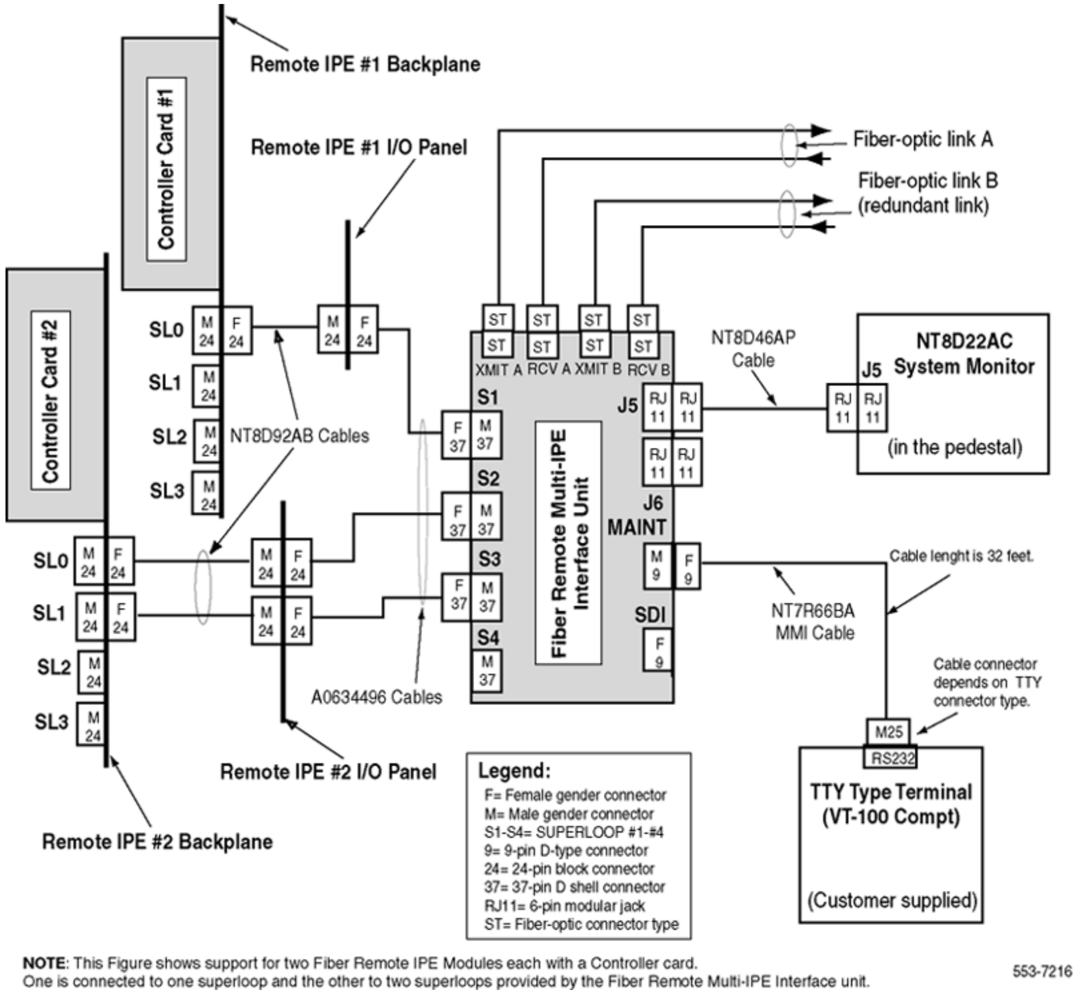

Figure 17: Remote site single Fiber Remote Multi-IPE Interface unit cable connection diagram

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