Meridian 1

Fiber Remote Multi-IPE Interface
Description, installation, and maintenance

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Revision history

April 2000

Standard 3.00. This is a global document and is up-issued for X11 Release 25.0x. Document changes include removal of: redundant content; references to equipment types except Options 11C, 51C, 61C, and 81C; and references to previous software releases.

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Standard 2.00. Incorporated changes to text, cabling, and included connection diagrams.

April 1996

Standard 1.00.

Contents

About this document

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

This document is a supplement to Meridian 1 NTPs. It provides information specific to the Meridian 1 implementation of fiber-optic links that connect the Meridian 1 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 Meridian 1 system. Fiber Remote Multi-IPE Interface configuration procedures are identical to the equivalent non-fiber equipment in Meridian 1. However, there are some additional software commands that can be executed using the Man-Machine Interface (MMI) terminal to specifically control fiber-optic equipment.

The following describes what you will find in this document:

Product description describes the Fiber Remote Multi-IPE Interface functional and physical characteristics, general engineering guidelines, and planning and ordering information.

Installation and configuration explains how to prepare the site, how to install and connect the Fiber Remote Multi-IPE Interface equipment at Meridian 1 and Remote IPE sites, and how to configure the system using the Man-Machine Interface (MMI) terminal.

Acceptance testing describes how to perform functional tests to verify that the installed Fiber Remote Multi-IPE Interface units are operating correctly.

Maintenance describes how to perform routine administrative and maintenance functions and how to troubleshoot the Fiber Remote Multi-IPE Interface equipment and the fiber-optic link connections. It explains how to isolate problems, fix or replace defective equipment, and verify that the equipment is operating correctly after corrections or replacements have been made.

Appendix lists messages generated by the Peripheral Controller in the Remote IPE equipment. These messages indicate the status of the Peripheral Controller card. It also includes connection diagrams for local and remote sites.

This document provides detailed information on how to install, configure, and maintain the Fiber Remote Multi-IPE Interface equipment. However, it also refers to various Meridian 1 NTPs that contain additional information, which may be required when installing and maintaining the Fiber Remote Multi-IPE Interface and Remote IPE equipment as an integral part of the Meridian 1 system.

Reference

The following is a list of documents that are referred to in this document for additional information:

— *Meridian 1 installation planning (553-3001-120)*

— *Meridian 1 system engineering (553-3001-151)*

— *Meridian 1 power engineering (553-3001-152)*

— *Meridian 1 system installation procedures (553-3001-210)*

— *X11 features and services (553-3001-306)*

— *X11 input/output guide (553-3001-311)*

— *Traffic measurement formats and output (553-2001-450)*

Product description

This chapter describes 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

Meridian 1 is a Private Branch Exchange (PBX) that links local subscribers to private and public networks and provides a large number of subscriber functions and features.

In addition to supporting local subscribers, Meridian 1 can be configured using Remote IPE modules as a distributed system that supports remote subscribers. The Remote IPE modules are connected to Meridian 1 at long distances using fiber-optic links at transmission speed at 45 Mbps.

The Fiber Remote Multi-IPE Interface is compatible with Meridian 1 system Options 51C, 61C, and 81C.

Subscriber connections at local Meridian 1 IPE modules are the same as the Remote IPE modules. The subscriber functions and features at the Meridian 1 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 Meridian 1 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 illustrates the Meridian 1 system and the application of the Fiber Remote Multi-IPE Interface and the fiber-optic link to connect the Remote IPE site with the Meridian 1 local site.

Figure 1
Meridian 1 to Remote IPE connection over the fiber-optic link
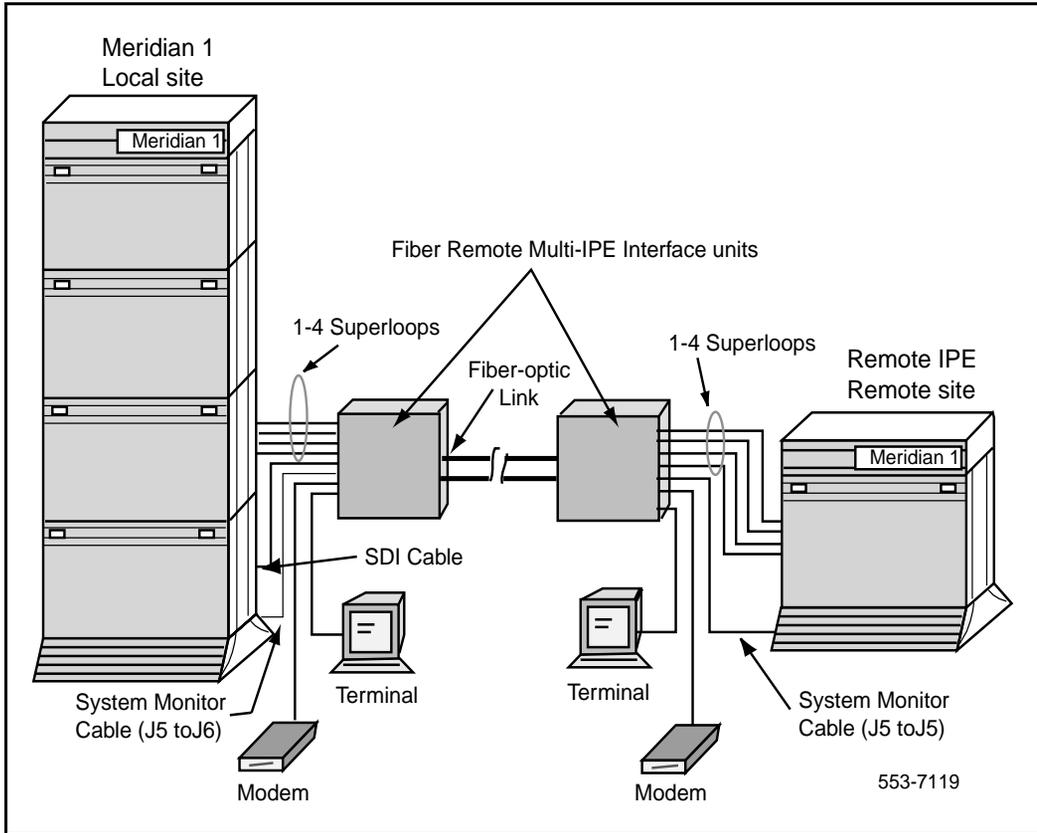
System description

The Fiber Remote Multi-IPE Interface links Meridian 1 with one or more Remote IPE sites to provide Meridian 1 functionality to these Remote IPE sites. Each Remote IPE shares Meridian 1 common and network equipment to provide the same functions and features to remote subscribers that are available to local Meridian 1 subscribers.

To explain the implementation of Fiber Remote Multi-IPE Interface functions, we will describe:

— Fiber Remote Multi-IPE Interface physical architecture

— Fiber Remote Multi-IPE Interface functional architecture

Fiber Remote Multi-IPE Interface physical architecture

To configure a Meridian 1 system with one or more Remote IPEs, you can install one or more IPE modules at a remote site and connect them to an existing Meridian 1 system using a pair of Fiber Remote Multi-IPE Interface units; one at the local Meridian 1 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.

Fiber Remote Multi-IPE Interface options

The Fiber Remote Multi-IPE Interface is available in four different options. These are:

— A0634488 Single-mode fiber supporting four superloop

— A0634489 Single-mode fiber supporting two superloops

— A0634490 Multi-mode fiber supporting four superloops

— A0634491 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 in the Meridian 1 column. Actually, 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 shows how the superloop connections can be configured and which option Fiber Remote Multi-IPE Interface should be used to connect Meridian 1 to the Remote IPE site. The superloop configuration you select will depend on the traffic requirements at the remote site. If non-blocking is required, three or four superloops for each fully equipped Remote IPE module may be required. If call blocking is not an issue, a single superloop may 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.

From Table 1 you can conclude that:

— **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 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 is configured over a pair of Remote Multi-IPE Interface units as shown in Figure 1.

Table 1 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 Meridian 1 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 Meridian 1		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 super-loop	NT8D04 #1	J1	NT8D01BC #1	SL0
	NT8D04 #1	J2	NT8D01BC #2	SL0
One segment per one super-loop/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

Note: NT8D01BC Controller -4 replaces both NT8D01AC Controller-4 and NT8D01DC Controller-2 for new installations.

Table 2 lists the equipment required to link the Meridian 1 network equipment to the Remote IPE peripheral equipment external to the Meridian 1 column and Remote IPE modules. All the equipment contained in the Meridian 1 column(s) as well as the equipment contained in Remote IPE modules is standard Meridian 1 equipment not specifically design to support the Fiber Remote Multi-IPE Interface and the fiber-optic link.

Table 2
Equipment required to link Meridian 1 to Remote IPE sites (Part 1 of 3)

Component	Description
A0634488 Fiber Remote Multi–IPE Interface Unit	Supports **single-mode** fiber-optic link for four superloops at connector positions **SUPERLOOP-1** through **SUPERLOOP-4**.
A0634489 Fiber Remote Multi–IPE Interface Unit	Supports **single-mode** fiber-optic link for two superloops at connector positions **SUPERLOOP-1** and **SUPERLOOP-2**.
A0634490 Fiber Remote Multi–IPE Interface Unit	Supports **multi-mode** fiber-optic link for four superloops at connector positions **SUPERLOOP-1** through **SUPERLOOP-4**.
A0634491 Fiber Remote Multi–IPE Interface Unit	Supports **multi-mode** fiber-optic link for two superloops at connector positions **SUPERLOOP-1** and **SUPERLOOP-2**.
A0634492 Fiber Remote Multi–IPE Interface Redundant Option	A daughterboard with fiber-optic connectors that is installed onto the motherboard to supports **single-mode** redundant fiber-optic link operation.
A0634493 Fiber Remote Multi–IPE Interface Redundant Option	A daughterboard with fiber-optic connectors that is installed onto the motherboard to supports **multi-mode** redundant fiber-optic link operation.
A0634494 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 Meridian 1 site (Optional).

Table 2
**Equipment required to link Meridian 1 to Remote IPE sites (Part 2 of 3)**

Component	Description
A0634495 Local Fiber Remote Multi-IPE Interface Cable	A 30 foot shielded cable connects the local Meridian 1 network I/O panel 24-pin Centronics connector to a Fiber Remote Multi-IPE Interface unit SUPERLOOP 37-pin D Shell connector.
A0634496 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.
A0634497 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.
A0634498 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.
A0654976 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
A0654977 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 adapter. This kit is used together with the NT8D93AJ cable for the Paddleboard.

Table 2
Equipment required to link Meridian 1 to Remote IPE sites (Part 3 of 3)

Component	Description
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 an adapter cable that ultimately connects to the Fiber Remote Multi-IPE Interface unit.

Figure 2 illustrates Meridian 1 and Remote IPE equipment linked with fiber-optic cable over Fiber Remote Multi-IPE Interface units. Connections between Meridian 1 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
Meridian 1 to Remote IPE connection over fiber-optic links
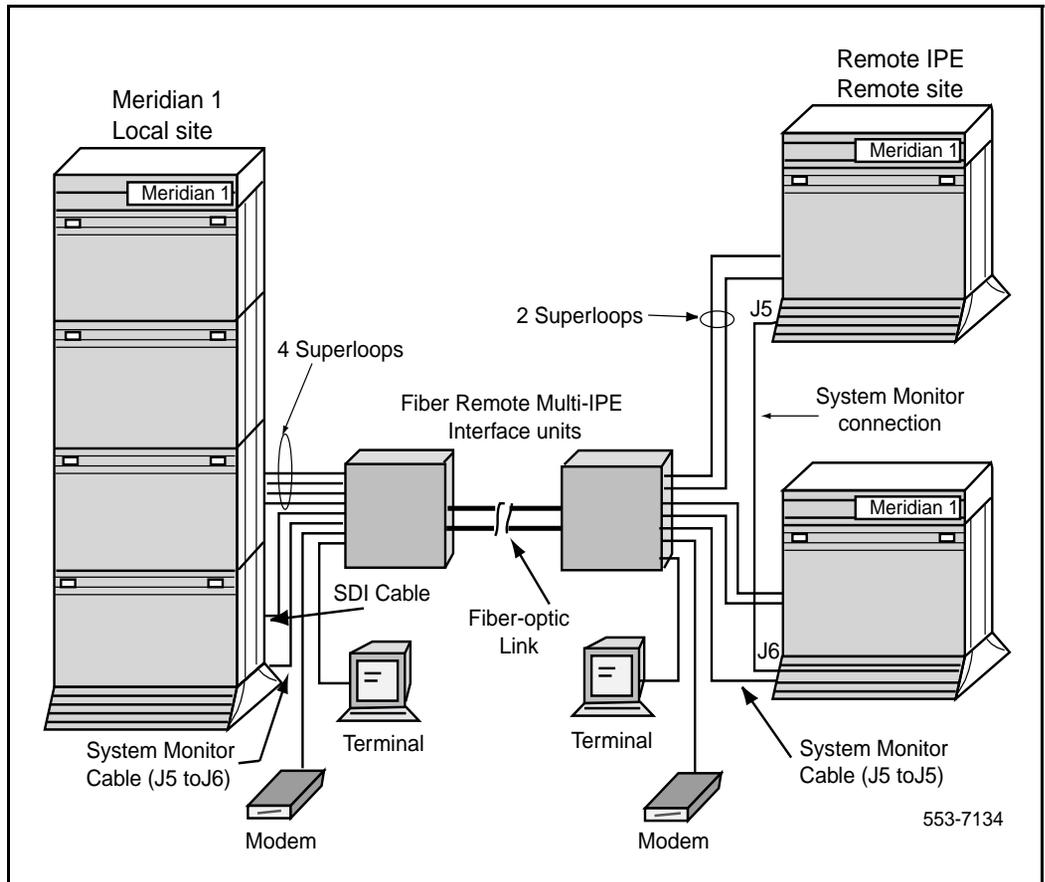
A maximum number of four superloops can be supported by a Fiber Remote Multi-IPE Interface unit. The transmission of these four superloops is handled by a single transmit and a single receive fiber-optic link in a non-redundant configuration. The primary ST-type fiber-optic connectors on the Fiber Remote 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 10.4x12x12 inches or (26.42x38.48x38.48 centimeters). This enclosure can be mounted on the wall or up to six of these enclosures can be installed into a 19-inch rack-mounted shelf. The shelf is normally used at the local site where there may 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 Meridian 1 and the Remote IPE I/O panel connectors.

Figure 3 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. You can then access the motherboard to install the daughterboard or to set configuration switches.

Figure 3
Fiber Remote Multi-IPE Interface faceplate
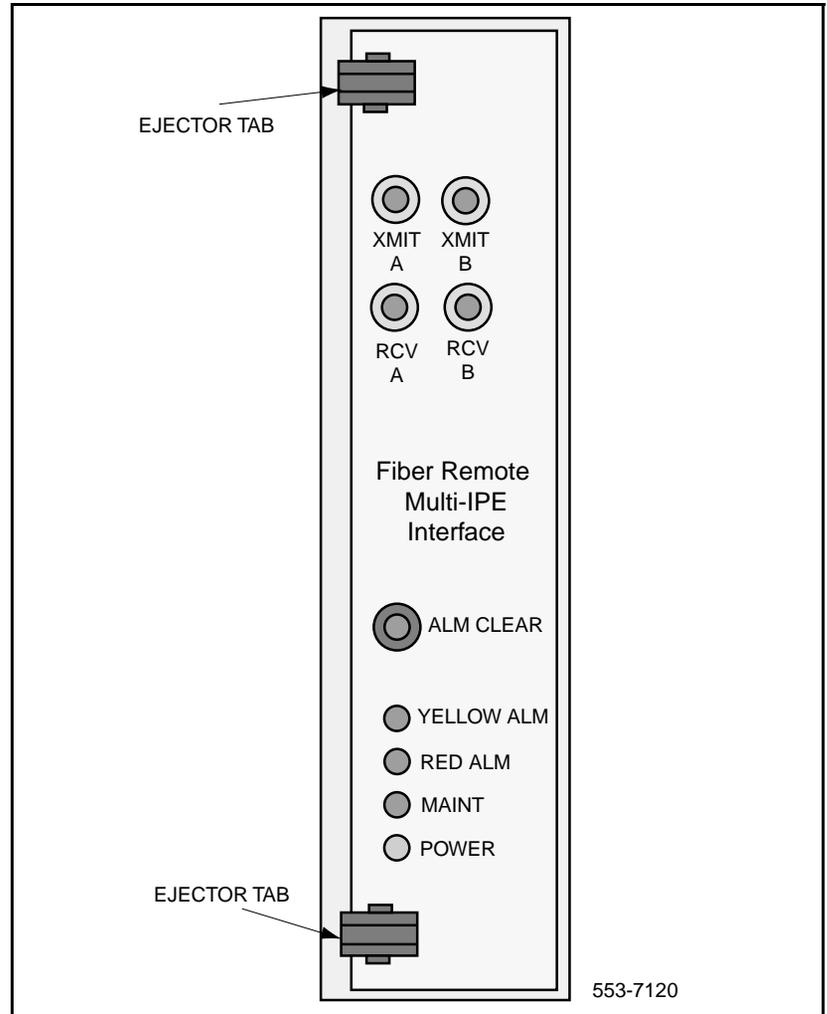
Figure 4 illustrates the rear view of the Fiber Remote Multi-IPE Interface unit. It shows the Fiber Remote Multi-IPE Interface unit I/O panel. The I/O panel contains connectors to connect the superloop cables, the system monitor cables, the SDI port, the MMI terminal, the modem, the external alarms, and the power.

Figure 4
Fiber Remote Multi-IPE Interface unit I/O panel-rear view
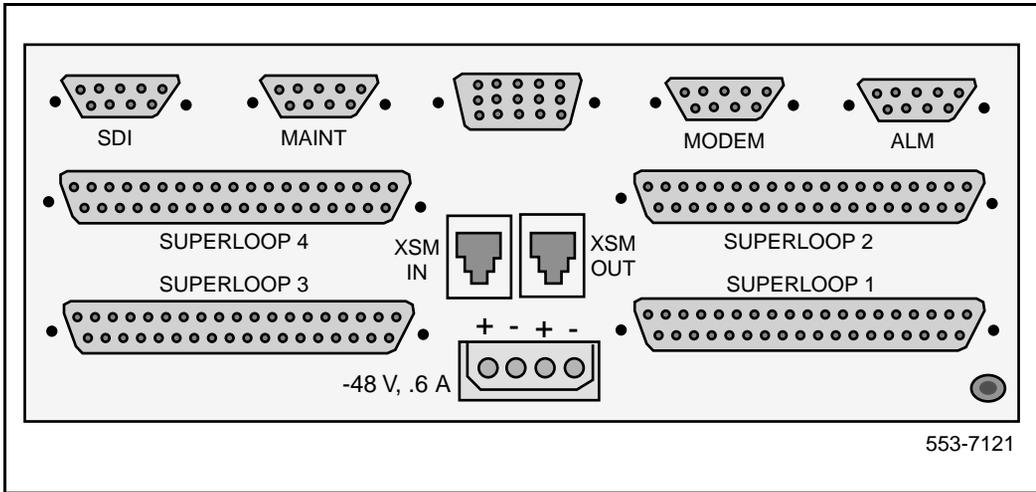
The Fiber Remote Multi-IPE Interface I/O panel connectors interface with the Meridian 1 and Remote IPE equipment over copper cables. The SDI and the MAINT connectors can also be used to daisy-chain multiple Fiber Remote Multi-IPE Interface units to provide common MMI terminal and SDI connections for all Fiber Remote Multi-IPE Interface units in the chain.

Table 3 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 Meridian 1 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 Meridian 1 pedestal or the XSM IN (J5) jack or the downstream Fiber Remote Multi-IPE Interface unit.
SUPERLOOP-1 through SUPERLOOP-4	37-pin D Shell, male	Connect to the Meridian 1 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 Meridian 1 to the Remote IPE site and form the Remote IPE site to Meridian 1.

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 main functions of the Fiber Remote Multi-IPE Interface:

— Supports a fiber-optic link between the Meridian 1 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 Meridian 1.

Fiber-optic interface

The Fiber Remote Multi-IPE Interface links multiple Remote IPE sites with the Meridian 1 system over a single-mode or multi-mode optical fibers. With multi-mode fiber-optic link, the maximum distance between Meridian 1 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 Meridian 1 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 functions:

— Provides a single or a redundant dedicated optical link to connect the Remote IPE to Meridian 1.

— Monitors fiber-optic link integrity and transmission quality and provide 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 Meridian 1 network I/O panel or 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 Meridian 1 to Remote IPE sites" on page 14.

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

Table 1 "Superloop connection configurations" on page 13 list various combination 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

— Clear error log files and alarms

— Set time, date, and also sets 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 Meridian 1 system. An MMI terminal at the Meridian 1 local site or at a Remote IPE site can access the system through this SDI port at the Meridian 1 site and perform configuration, maintenance, and test functions of the Meridian 1 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 Meridian 1 SDI port for Meridian 1 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 Meridian 1 for system maintenance or 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 an other 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 Meridian 1 site, you can daisy-chain Fiber Remote Multi-IPE Interface units 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 Meridian 1. 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 you to select a specific Fiber Remote Multi-IPE Interface in the chain when you log 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 card resides in the Meridian 1 and Remote IPE pedestals. It monitors the power and the temperature in all modules in the Meridian 1 column and in the Remote IPE column. The master system monitor is located in the Meridian 1 common equipment pedestal. It receives the information from modules in its own column, from the slaves 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 Meridian 1 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 an 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 diagnostic routine continuously monitors 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 will close 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, or it can be configured to continue to indicate the alarm condition until 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 does not interfere with the normal system operation and is performed on an active link.

Off-line diagnostics may interfere with the normal system operation and is 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 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 to connect 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 input #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 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 connected to Meridian 1.

Figure 5
External alarm inputs and outputs
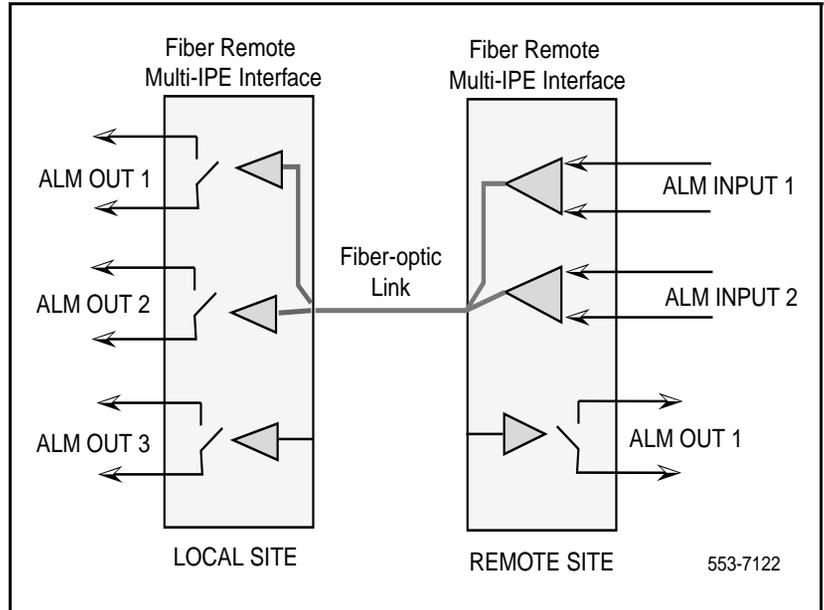
LED indicators. The LED indicators are located on the faceplate of each Fiber Remote Multi-IPE Interface unit. These LEDs are:

— 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

Meridian 1 general system engineering guidelines are described in *Meridian 1 system engineering (553-3001-151).* 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

Meridian 1 physical capacity depends on the system's configuration and size. System options 51C, 61C, and 81C are designed to provide port capacities from tens to thousands of ports. These ports are normally local to Meridian 1, 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 peripheral equipment (subscriber loops) at Remote IPE sites. Fiber Remote Multi-IPE Interface allows you to distribute the peripheral equipment at long distances from Meridian 1 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 the Meridian 1 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 Meridian 1 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 Meridian 1 to Remote IPE sites" on page 14.

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 time slots 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 will depend on various factors:

— distance between Meridian 1 and the Remote IPE site

— possible existence of a fiber-optic link you wish to use 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 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

Signal source	Transmitted power	Received power
	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 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 Meridian 1. 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 illustrates 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 time slots (one superloop) will 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 *Meridian 1 system engineering (553-3001-151)* 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 may be expanded by adding more IPE modules to support an 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 Meridian 1 site.

In addition to line cards, the Remote IPE supports all the cards that do not require external connection to Meridian 1 common or network equipment.

Remote IPE site planning

When you select a site for your Remote IPE, you must consider the number of ports currently required at the site and the possibility of expansion to meet future needs. You also must 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 Meridian 1 equipment. Temperature, humidity, and altitude for Meridian 1 equipment operation should not exceed the specifications shown in Table 6.

Table 6 shows the operating and storage environmental specifications. Ideally Meridian 1 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 Meridian 1 system or the Remote IPE column. This source is usually available if the system is DC-powered or has a DC backup power source.

Installation and configuration

This chapter describes the installation of the Fiber Remote Multi-IPE Interface unit as a part of a fiber-optic link connecting Meridian 1 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 you are familiar with the system operation and general Meridian 1 installation practices, follow the steps below to speed up the installation of the Fiber Remote Multi-IPE Interface and the Remote IPE at the local and remote sites:

1   Take inventory of the equipment by comparing the received equipment against the shipping documents. Refer to Table 2 in the Product Description chapter 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:

   •   "Engineering guidelines" on page 31,

   •   Table 1, "Superloop connection configurations," on page 13 to specified the number of superloops required, and

   •   Table 2, "Equipment required to link Meridian 1 to Remote IPE sites," on page 14 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 connecting the internal superloop cables to the network I/O panel. To identify an empty network card slot, refer to:

- Table 7, "Meridian 1 modules supporting Superloop Network cards," on page 49,

- "Installing the Superloop Network card" on page 50 to install the card into its designated card slot, and

- "Installing cables between the Superloop Network card and the network I/O panel" on page 50 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:

- "Setting S1 and S2 switches at the local site" on page 51 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 and

- "Installing local superloop cables" on page 65 to connect the cables between the network I/O panel and the SUPERLOOP connectors on the Fiber Remote Multi-IPE Interface unit.

5   Install the system monitor, local MMI terminal, and fiber-optic link cables to the Fiber Remote Multi-IPE Interface unit connectors. Refer to:

- "Connecting local system monitor cables" on page 65,

- "Connecting the SDI card and the MMI terminal to multiple Fiber Remote Multi-IPE Interface units" on page 70, and

- "Connecting the fiber-optic link" on page 72.

6   At the remote site, install the Remote IPE equipment. Refer to:

- "Installing the internal cables to the Remote IPE module" on page 80 and

- "Setting S1 and S2 switches at the remote site" on page 81.

7 Install the external cables to the I/O panel. Refer to:

- "Installing superloop cables" on page 86,

- "Connecting the system monitor cable" on page 87,

- "Connecting the MMI terminal" on page 88, and

- "Connecting the fiber-optic link to the Remote IPE Module" on page 90

8 Configure the Remote IPE local and remote sites. Refer to:

- "Configuring the cards" on page 94,

- "Selecting the MMI terminal modes" on page 98,

- "Configuring the MMI modem" on page 101, and

- "Configuring the Fiber Remote Multi-IPE Interface" on page 104

9 Conduct system acceptance testing. Refer to "Remote IPE acceptance testing" chapter in this manual.

Installation overview

The Remote IPE service over a fiber-optic link can be added to existing Meridian 1 system Options 51C, 61C, and 81C originally installed and operating without Remote IPE, or it can be an integral part of a newly installed Meridian 1 system.

To install a new Meridian 1 system or expand an existing one, refer to *Meridian 1 system installation procedures (553-3001-210)*. It provides the information on how to install, verify, and maintain the Meridian 1 system.

Adding one or more Remote IPE sites to a Meridian 1 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 to Meridian 1. This simplifies installation and fault isolation during installation. To complete the installation of a Remote IPE site, you should perform the preinstallation procedures to prepare the site, install the Fiber Remote Multi-IPE Interface, the fiber-optic link, and install the copper cables between the Fiber Remote Multi-IPE Interface units and Meridian 1 and between remote Fiber Remote Multi-IPE Interface units and the Remote IPEs.

Preinstallation procedures include:

— Preparing the site

— Unpacking and 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 Meridian 1 site and the Remote IPE site

— Selecting the Meridian 1 Superloop Network cards for connection to the Fiber Remote Multi-IPE Interface

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 Meridian 1 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 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, and preparing the Remote IPE column for connection to the Fiber Remote Multi-IPE Interface.

Preparing the site

When preparing a site, you must address environmental, structural, and electrical factors. These factors must be considered for the entire system, that is, Meridian 1 and Remote IPE sites. This information is available in:

— *Meridian 1 installation planning (553-3001-120)*

— *Meridian 1 system engineering (553-3001-151)*

— *Meridian 1 power engineering (553-3001-152)*

To prepare the site for Fiber Remote Multi-IPE Interface installation, you must first:

1   Install and verify the operation of Meridian 1 without linking Meridian 1 to the Remote IPE site(s). Refer to *Meridian 1 system installation procedures (553-3001-210)*.

2   Install the Remote IPE column at the remote site, if not already installed. Also refer to *Meridian 1 system installation procedures (553-3001-210)*.

3   Route and splice the fiber-optic cable between the Meridian 1 site and Remote IPE site(s).

Unpacking and inspection

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

— Remove items that generate static charge from the installation site.

— Use antistatic spray if the site is carpeted.

— Ground yourself 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 your 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 your 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 Meridian 1 and the Remote IPE.

Consult your Nortel Networks 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 Meridian 1 (local) site and the Remote IPE (remote) site, the link fibers must be terminated with ST-type optical connectors.

CAUTION

If you are changing a fiber-optic system to the Fiber Remote Multi-IPE Interface, make sure that you change the fiber-optic link connectors to the appropriate ST-type. The ST-type optical connector must correspond to the type of fibers used in the fiber-optic link i.e. (single-mode or multi-mode). You may also use a fiber-optic adapter cable 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.

Figure 6
Fiber-optic link
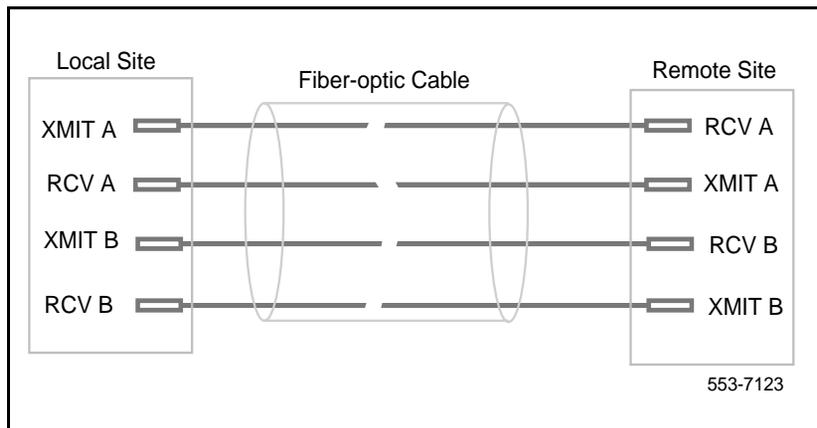
Selecting the Superloop Network card slot

To install the Superloop Network card that supports the Remote IPE application, you must first determine its card slot. The position of the Superloop Network card in Meridian 1 depends on the Meridian 1 system option installed at the local site. The system option determines in what type of module the card will be housed.

Table 7 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
Meridian 1 modules supporting Superloop Network cards

Modules	System option	Network card slot
NT5D21 Core/Network Module	51C, 61C, 81C	0-7

Meridian 1 and fiber-optic equipment installation

To complete the installation of the Fiber Remote Multi-IPE Interface that links Meridian 1 to the Remote IPE equipment, you must:

— Install and verify the operation of the Meridian 1 system, if it is not already installed and operating correctly.

— Identify the network card slots and install the Superloop Network cards in these Meridian 1 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 Meridian 1 I/O panel connectors.

— Connect the fiber-optic link to the Fiber Remote Multi-IPE Interface faceplate ST optical connectors.

Installing and verifying Meridian 1 operation

The Remote IPE facilities can be added to an existing Meridian 1 system by installing the appropriate electro-optical equipment in the link, installing one or more Remote IPE sites, and linking Meridian 1 with remote sites using single or redundant fiber-optic links.

To install a new Meridian 1 system, follow the instructions in *Meridian 1 system installation procedures (553-3001-210)*. It describes how to install a complete Meridian 1 system and how to connect the power, the internal and external communication cables, and subscriber loops.

If a new Meridian 1 system is configured with Remote IPE facilities, the system will normally be 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 you would have to do is to connect the Fiber Remote Multi-IPE Interface to the Meridian 1 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 instruct you how and where to install the Superloop Network card(s). In a new Meridian 1 system, the cards would have been installed in network card slots at the factory; however, you may have to install additional Superloop Network cards to expand the number of remote sites or replace a defective card.

To install these cards:

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 Meridian 1 superloops to the Fiber Remote Multi-IPE Interface and the fiber-optic span, you must first install the internal cables connecting J1 and J2 Superloop Network card faceplate connectors to the network I/O panel.

In a new Meridian 1 system with Remote IPE, these cables are normally installed in the factory, however, for an existing Meridian 1 system that is being expanded using the Remote IPE, these cables must be installed at the site. To do this:

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 your specific application, consult Table 1 "Superloop connection configurations" on page 13.

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.

6 To install the internal cables between the Superloop Network card in an NT or XT system shelf and the I/O connector housing at the top of the cabinet:

   • Plug the 24-pin connector of the NT8D88AD cable into the Superloop Network card J1 or J2 faceplate connector.

   • Route the other end of the cable to the top of the cabinet.

   • Install the 24-pin Centronics NT8D88AD cable connector into the I/O connector housing cutouts at the top of the cabinet. Use extender cable if the NT8D88AD cable is too short.

   • Repeat the above three steps for each internal superloop cable.

Setting S1 and S2 switches at the local site

Before you can install a Fiber Remote Multi-IPE Interface unit, you must:

— Configure the Fiber Remote Multi-IPE Interface using S1 and S2 dip-switches

— Install redundant fiber-optic connectors, if required

Table 8 lists functions controlled by dip-switches S1 and S2. It also shows how to set these switched 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
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= Down** and **OFF= Up** for S1 and S2 switches.		

Table 9 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 (Part 1 of 3)

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

Table 9
Fiber Remote Multi-IPE Interface and system monitor address selection table (Part 2 of 3)

Address	S1 Pos 3	S1 Pos 4	S1 Pos 5	S1 Pos 6	S1 Pos 7	S1 Pos 8
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

Table 9
Fiber Remote Multi-IPE Interface and system monitor address selection table (Part 3 of 3)

Address	S1 Pos 3	S1 Pos 4	S1 Pos 5	S1 Pos 6	S1 Pos 7	S1 Pos 8
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 72. It also defines the system monitor address at the remote site.

To configure the S1 dip-switch, refer to Figure 7 and follow the steps below:

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 S1 dip-switch, refer to Table 8 and Table 9 for instructions.

  •   **For a single unit**. If 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 A0656212 MMI Adapter. For the first Fiber Remote Multi-IPE Interface in the daisy-chain must be set dip-switch S1 position 1 to ON and position 2 to OFF, as shown in Table 8.

  •   **Unit in the middle of the chain**. For Fiber Remote Multi-IPE Interface units in the middle of the daisy-chain, dip-switch S1 positions 1 and 2 must be set to OFF.

  •   **Last unit in a daisy-chain**. For the Fiber Remote Multi-IPE Interface at the end of the daisy-chain, where it connects the SDI connector to the SDI port in Meridian 1 and the MAINT connector to the SDI connector on the next Fiber Remote Multi-IPE Interface in the daisy-chain. For the last Fiber Remote Multi-IPE Interface in the daisy-chain that connects to the SDI port, dip-switch S1 position 1 must be set to OFF and position 2 must be set to ON, as shown in Table 8.

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. 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:

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.

Installing redundant fiber-optic link option

The redundant fiber-optic link is optional. Unless your system configuration requires a redundant fiber-optic link, you do not have to install the following hardware.

To install the redundant fiber-optic link connectors, you must install the daughterboard that corresponds to the type of fiber used in the link. Refer to Figure 7 for installation details.

The daughterboard types are:

— A0634492 Redundant Option for single-mode fiber

— A0634493 Redundant Option for multi-mode fiber

To install the daughterboard:

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 and Figure 9.

Figure 7 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

Remove covers from fiber connectors
Insert connctors in faceplate holes

Daughterboard

Ribbon cable

Connector

Standoff

1 2 3 4 5 6 7 8

OFF
ON
S1

1 2 3 4 5 6 7 8

OFF
ON
S2

Fiber Remote Multi-IPE Interface card

553-7124
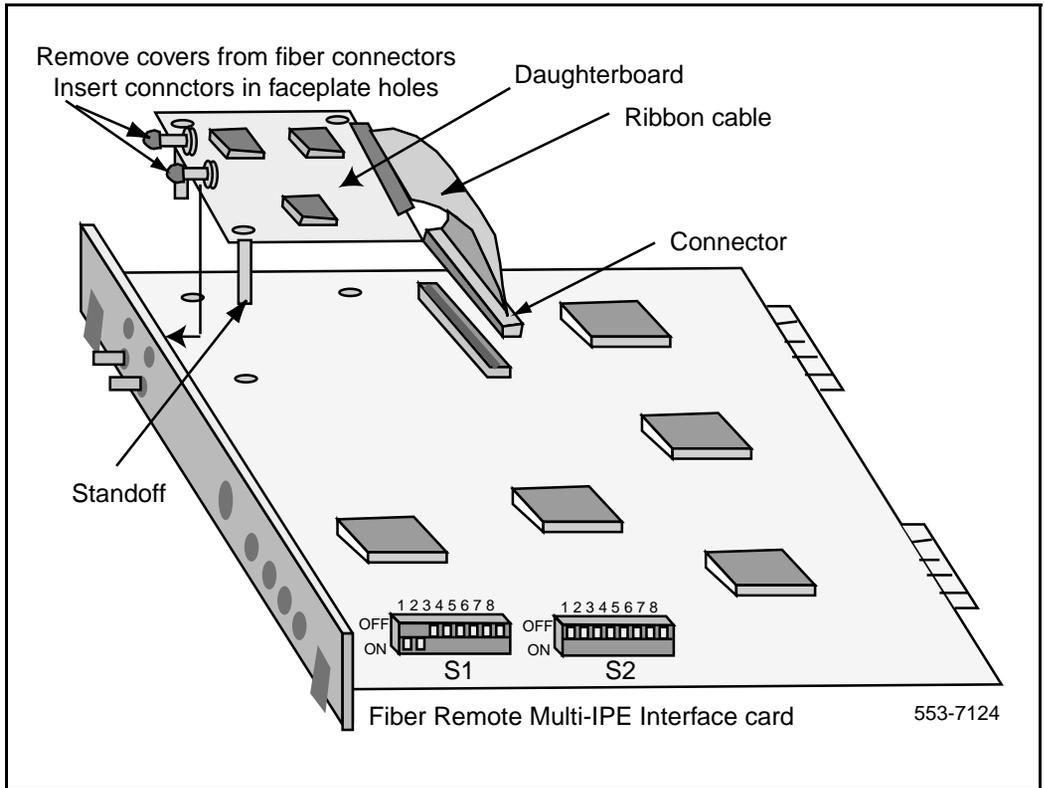
Mounting the Fiber Remote Multi-IPE Interface units

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 install within 30 feet from the Meridian 1 and the Remote IPE, because the cables connecting the Fiber Remote Multi-IPE Interface units to the Meridian 1 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 the A0634494 Rack Mounted Shelf. This is practical if you have 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 for installation illustration.

To install the shelf and the 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 may be damaged.

Figure 8 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
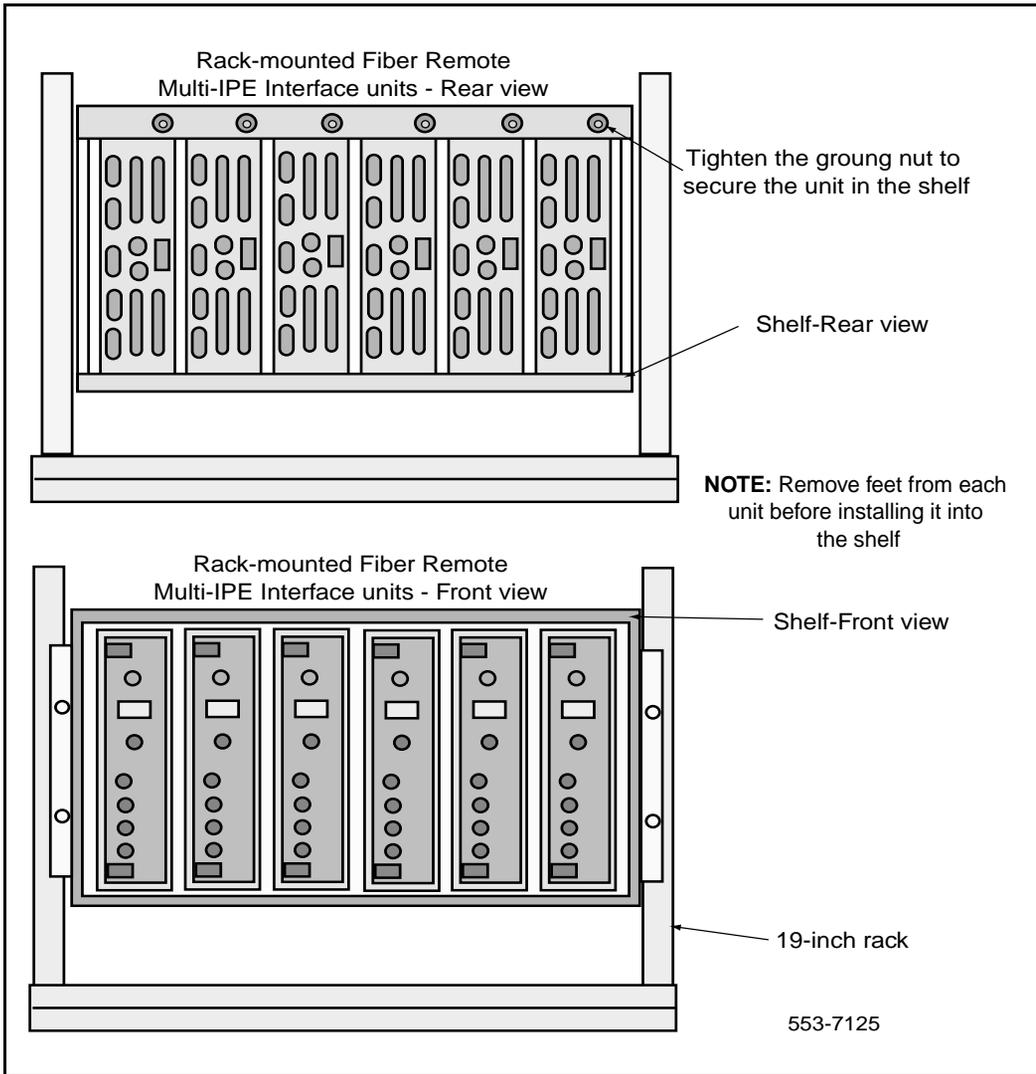
Installing the Fiber Remote Multi-IPE Interface unit onto the wall

To mount the Fiber Remote Multi-IPE Interface unit on the wall refer to
Figure 9 and follow these steps:

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 in the front.

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 you to
     insert the screw heads into the slotted holes on the bottom of the Fiber
     Remote Multi-IPE Interface unit. Refer to Figure 8 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 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
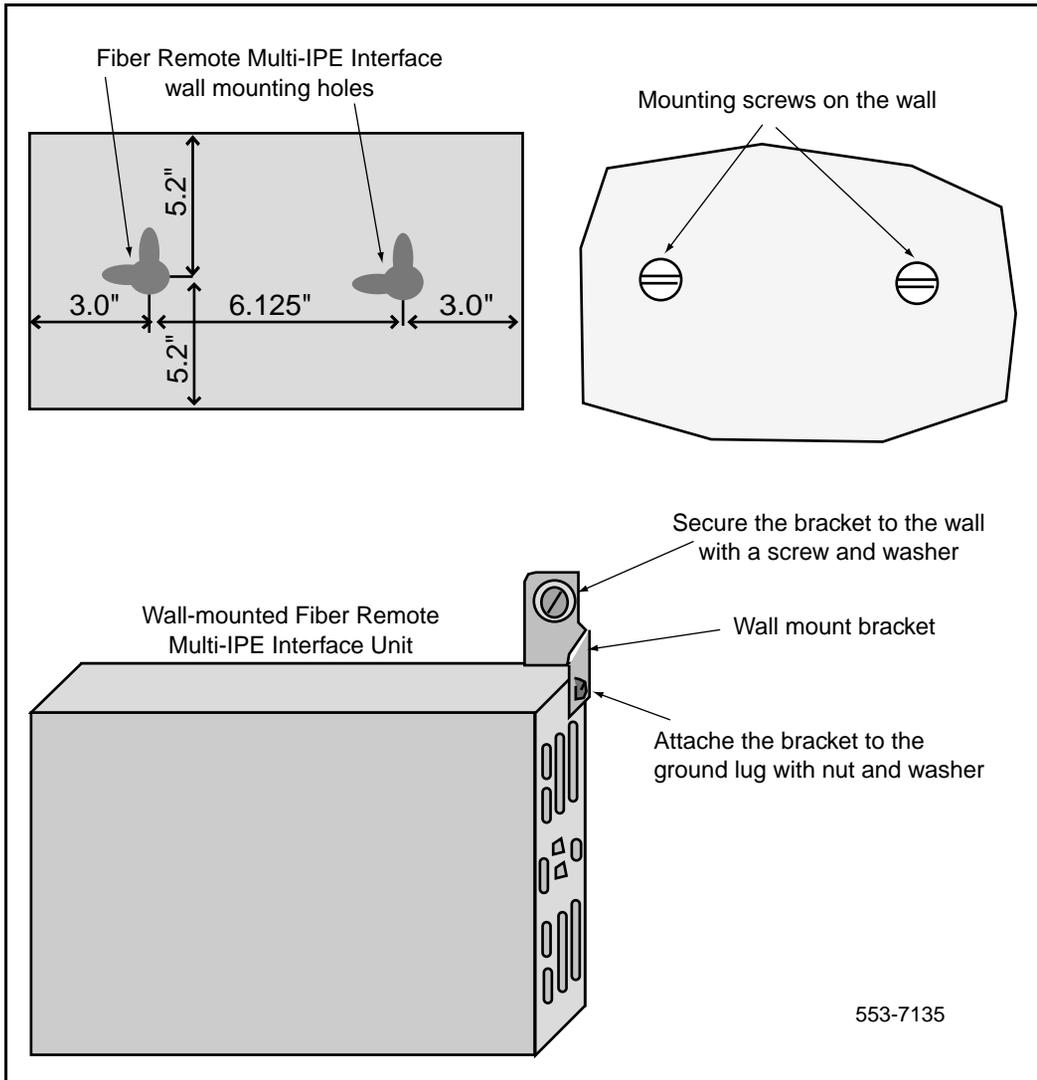
Installing local superloop cables

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 Appendix, Figure 15 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 13.

To install these 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 that you have configured and installed the appropriate version of
the Fiber Remote Multi-IPE Interface unit (number of superloops and
type of fiber supported). Refer to Table 2 "Equipment required to link
Meridian 1 to Remote IPE sites" on page 14.

3   Plug the 24-pin Centronics A0634495 Local Superloop cable connector
into the designated 24-pin I/O panel connector in Meridian 1. Fasten
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 you have to connect.

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 and only one unit in the daisy-chain is directly
connected to the system monitor card in the pedestal. Refer to Appendix,
Figure 15 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 Meridian 1 local site:

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 and perform these steps:

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

Figure 10 illustrates the daisy-chaining of the system monitor connections for multiple Fiber Remote Multi-IPE Interface units at the local site.

Figure 10
System monitor daisy-chain connections at the local Meridian 1 site
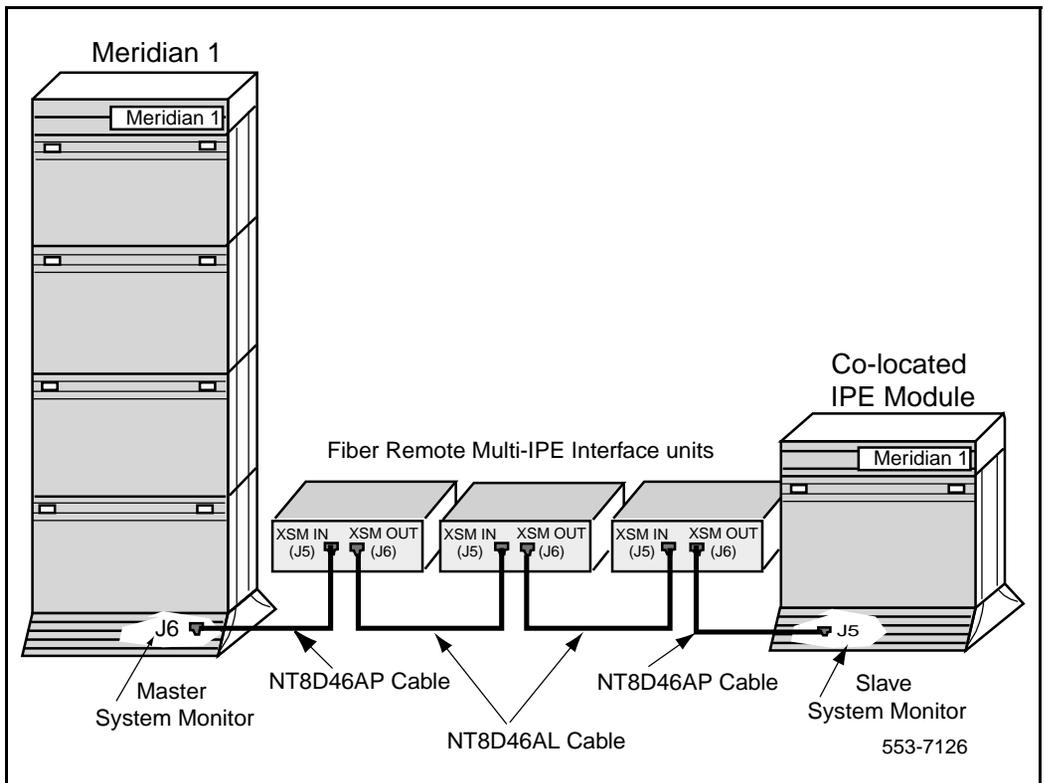
Connecting the MMI terminal to a single Fiber Remote Multi-IPE Interface unit

Refer to Appendix, Figure 15 for the connection diagram to connect the MMI terminal to the MAINT port and follow these steps:

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 you have 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 Meridian 1 over the SDI connector on a single Fiber Remote Multi-IPE Interface unit I/O panel. Refer to Appendix, Figure 15 for the connection diagram.

Connect a single Fiber Remote Multi-IPE Interface unit to the QPC841 or other SDI cards.

Connecting an NT8D41 SDI Paddleboard:

1   To connect NT8D41 SDI Paddleboard to the Fiber Remote Multi-IPE Interface SDI DB-9 male connector, use the NT8D93AJ XSDI I/O cable and NT7R66AA SDI Cable Kit, which consists of a 10-foot DB-9 male to DB-25 male cable and a DB-25F/DB-25F adapter.

2   Combine the cable and the adapter of the NT7R66AA SDI Cable Kit and tighten the retaining screws.

3   Plug the NT8D93AJ cable DB-9 male connector into the Paddleboard DB-9 female connector.

4   Plug the NT8D93AJ cable DB-25 male connector into the DB-25 female connector of the NT7R66AA SDI Cable Kit.

5   Plug the NT7R66AA SDI Cable Kit DB-9 male connector into the DB-9 female SDI connector on the Fiber Remote Multi-IPE Interface I/O panel.

Connecting any other SDI card:

1   To connect other 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 *Meridian 1 serial data interface cards description (553-3001-107)*.

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 unit are properly configured for the daisy-chain addressing as shown in Table 8 "Fiber Remote Multi-IPE Interface configuration" on page 52. Refer to Appendix, Figure 16 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 unit in a daisy-chain configuration, connect the cables as shown in Figure 11:

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 Meridian 1 as explained in "Connecting the SDI port to a single Fiber Remote Multi-IPE Interface unit" on page 69.

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 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
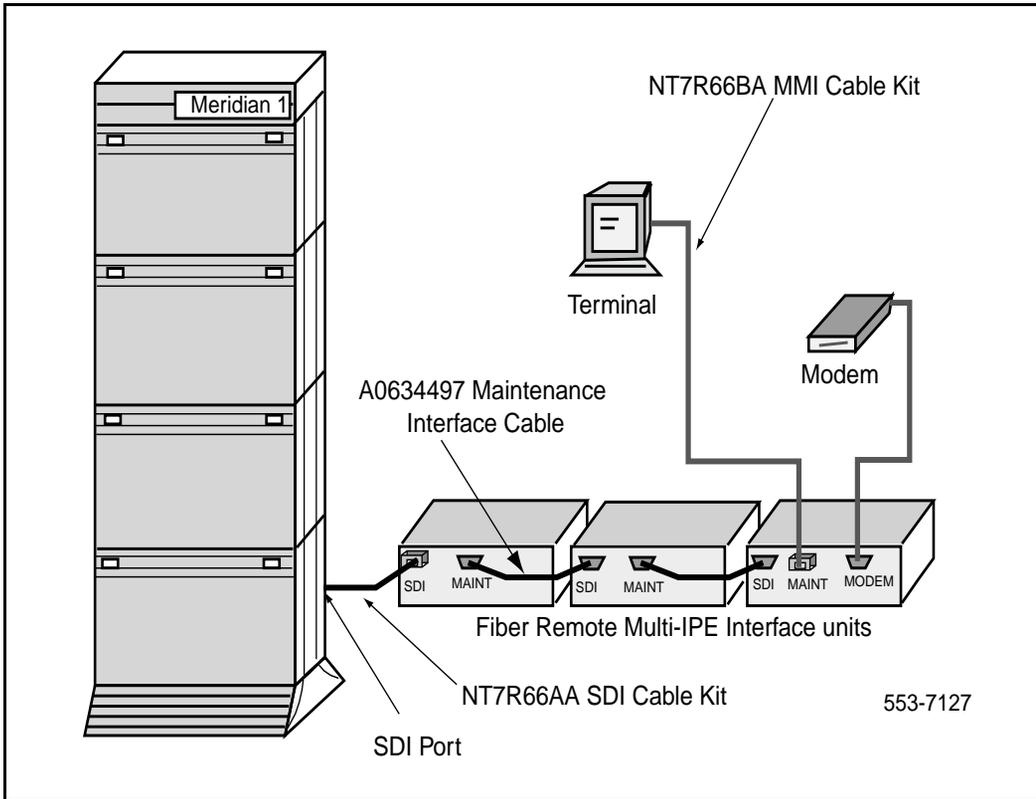
Connecting the fiber-optic link

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 of how to engineer and handle the fiber-optic link and the fiber-optic connectors, refer to See "Engineering the fiber-optic link" on page 32.

For a single link, you need 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 label, i. e. 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 illustration of the link fibers labelling, refer to Figure 6 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 Appendix, Figure 15 for the connection diagram and follow these steps:

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 you have 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 Meridian 1 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 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 male 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:

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 wires color code as related to the pin assignment 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 a either:

— DC system power source, or

— 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 Meridian 1 system is DC-powered or has a DC power backup, you can utilize this -48 V source instead of using the A0634498 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 and the following steps:

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 Meridian 1 DC power system PDU.

3   Connect the red wire at the open end of the cable to the Return terminal on the Meridian 1 DC power system PDU.

4   Connect the white wire at the open end of the cable to the Ground terminal on the Meridian 1 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.

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 will 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 shows the power connection of the Fiber Remote Multi-IPE Interface unit to the Meridian 1 DC power source.

Figure 12
DC power connection of the Fiber Remote Multi-IPE Interface unit
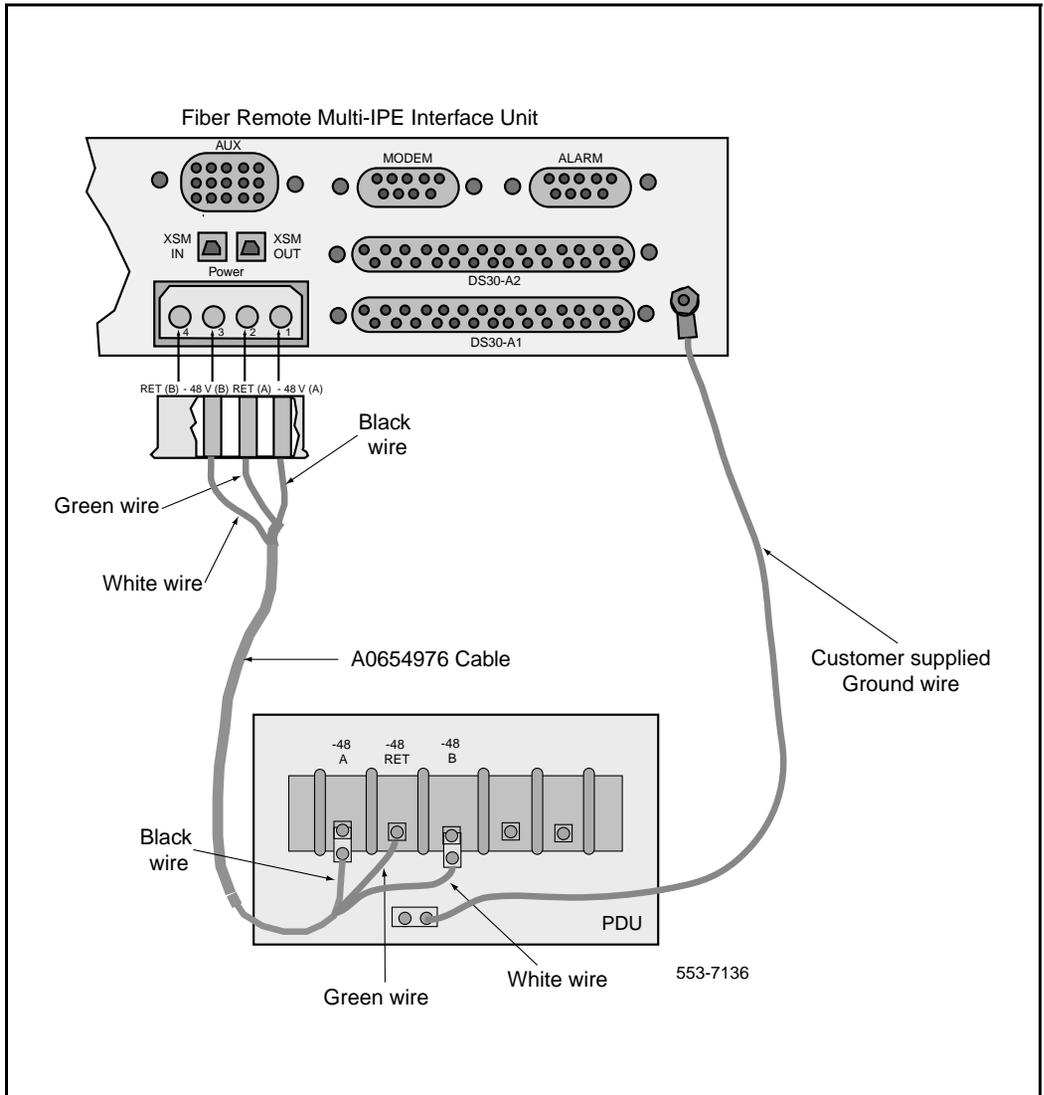
Connecting the AC/DC Power Converter

A Fiber Remote Multi-IPE Interface unit is optionally supplied with an A0634498 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 for illustration of this power source connection.

To install the A0634498 AC/DC Power Converter:

1   Plug the DC power cord extending from the Power Converter into the -48 V, .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.

3   Plug the A0634498 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 will 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 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
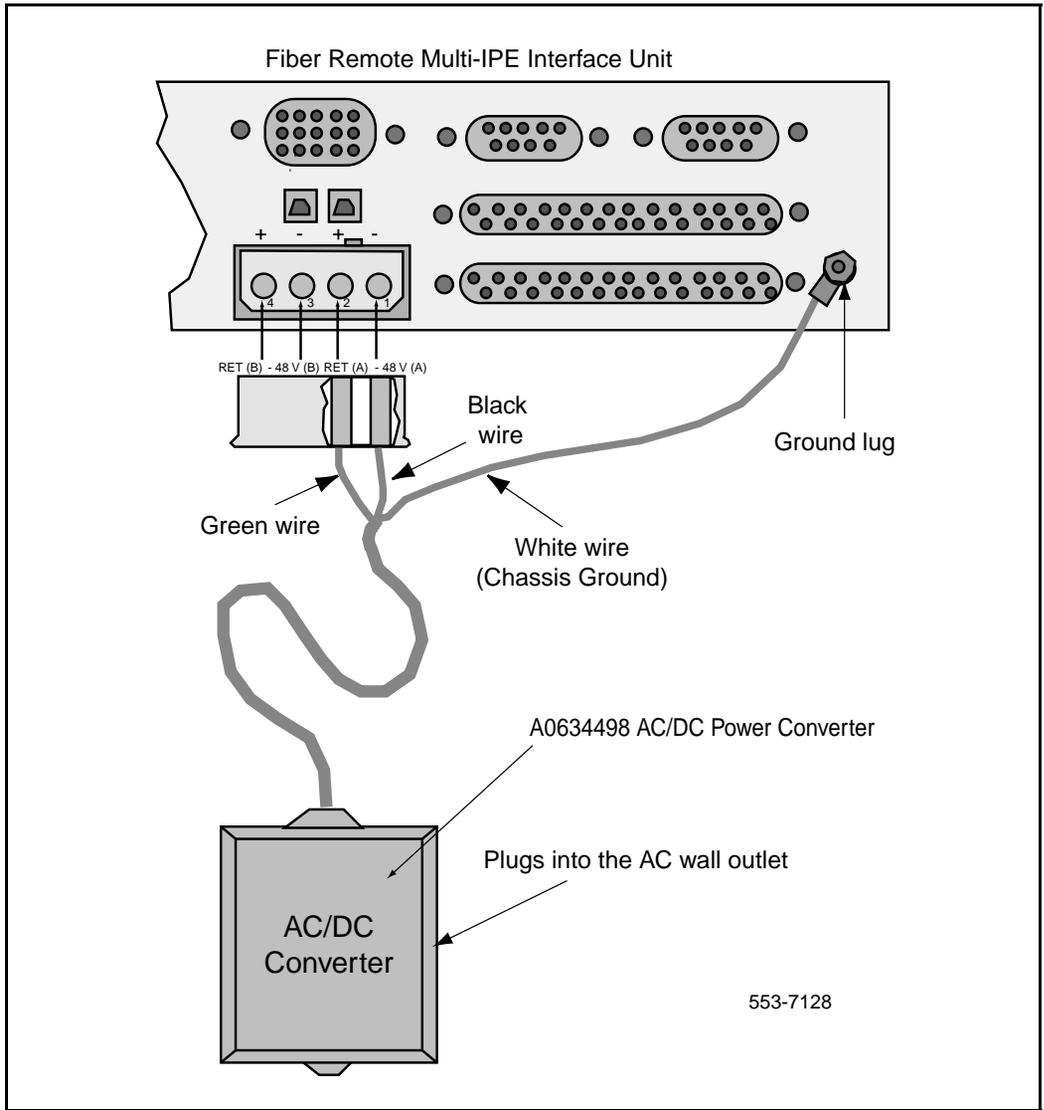
Remote IPE installation

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 *Meridian 1 system installation procedures (553-3001-210)*. 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 *Meridian 1 system installation procedures (553-3001-210)*.

Installing the internal cables to the Remote IPE module

In a standard IPE module installed in a Meridian 1 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 into the Remote IPE by installing these NT8D92AB Controller to I/O panel cables into an IPE module.

To install these cables, refer to Appendix, Figure 17 for the connection diagram and follow these steps:

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 onto 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 you can install a Fiber Remote Multi-IPE Interface unit, you must:

— Configure the Fiber Remote Multi-IPE Interface using S1 and S2 dip-switches

— Install redundant fiber-optic connectors, if required

Table 11 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
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= Down** and **OFF= Up** for S1 and S2 switches.		

Table 12 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 (Part 1 of 3)

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

Table 12
System monitor address selection (Part 2 of 3)

Address	S1 Pos 3	S1 Pos 4	S1 Pos 5	S1 Pos 6	S1 Pos 7	S1 Pos 8
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

Table 12
System monitor address selection (Part 3 of 3)

Address	S1 Pos 3	S1 Pos 4	S1 Pos 5	S1 Pos 6	S1 Pos 7	S1 Pos 8
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 install 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 Meridian 1 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 may 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 60

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 64 and follow these steps:

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 in the front.

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 you to insert the screw heads into the slotted holes on the bottom of the Fiber Remote Multi-IPE Interface unit as shown in Figure 9.

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 you completed based on the traffic blocking criteria for Remote IPE segments and Table 1 "Superloop connection configurations" on page 13.

To install these cables and use longer screws to install them into the I/O panel cutouts:

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 you have configured and installed the appropriate version of the Fiber Remote Multi-IPE Interface unit (number of superloops and type of fiber supported). Refer to Table 2 "Equipment required to link Meridian 1 to Remote IPE sites" on page 14.

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 Appendix, Figure 17 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 you have to connect.

Connecting the system monitor cable

The Fiber Remote Multi-IPE Interface unit is directly connected to a system monitor in the pedestal. Refer to Appendix, Figure 17 for the connection diagram.

To connect the system monitor cable from the Fiber Remote Multi-IPE Interface unit at the remote site:

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 you select the address, you must determine which are the available system monitor addresses using the system TTY, as follows:

- Execute the **STAT XSM** command in **LD 37** to poll all system monitors. Correct any problems.

- Determine available system monitor addresses to be assigned to the Remote IPE module.

- Set master system monitor slave polling address range to cover the new Remote IPE system monitor address.

- 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 for address selection.

- Re-connect the system monitor daisy-chain to include new Fiber Remote Multi-IPE Interface units, if any.

- 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: In Fiber Remote Multi-IPE Interface units are daisy-chained at the remote site, the system monitor address becomes also 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 Appendix, Figure 17 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 Meridian 1 and the Fiber Remote Multi-IPE Interface units connected to Meridian 1. One of the main functions of the MMI terminal at the remote site is to access the system remotely using the Host SDI mode.

To connect 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 has other than DB-25 connector or 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 52.

To connect multiple (in this example we have 3 units) Fiber Remote Multi-IPE Interface unit in a daisy-chain configuration, refer to Figure 11 "Daisy-chaining of multiple Fiber Remote Multi-IPE Interface units" on page 72, except ignore the SDI connection. Follow the steps below:

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 has other than DB-25 connector, use an appropriate adapter or gender changer.

7   If you wish 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, you need 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.For details of how to engineer and handle the fiber-optic link and the fiber-optic connectors, refer to See "Engineering the fiber-optic link" on page 32. Also, refer to Appendix, Figure 17 for the connection diagram.

Note: Label optical fibers in the fiber-optic cable next to the ST optical connectors. Fibers labeled XMIT A and its pair RCV A at the local end of the link must be labeled RCV A and its pair XMIT A at remote end. Repeat the same procedure for the redundant link with XMIT B and RCV B. At the cross-connect typical designation is; Post A for receive fiber and Pos B for the transmit fiber. For illustration of the link fibers labelling, refer to Figure 6 in the *Product description* section of this document.

To connect 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 you have 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 your 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 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 Meridian 1 site.

Table 13
Remote IPE site DB-9 male 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:

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 75. 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 78.

Configuring the equipment

The configuration and administration of Remote IPE at one or more remote sites and the Meridian 1 at the local site are identical to the standard Meridian 1 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 a man 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 you configure any other standard Superloop Network cards and Peripheral Controller cards 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:

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, you must define the NT8D04 Superloop Network and NT8D01 Peripheral Controller cards dedicated to Remote IPE support.

To do this you must:

— 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 you can define a superloop for Remote IPE, you must find available superloops in the system. To do this, logon and print system configuration data using Print Program LD 22.

Request CFN printout

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

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

CFN configuration data print format- find unused superloop

CEQU		
MPED	SD/DD/4D/8D	Prints maximum peripheral density for the system (use 8D for systems with IPE)
TERM	xxx xxx xxx...	Prints all terminal loops
REMO	xxx xxx xxx...	Prints remote EPE loop numbers configured in LD 17
SUPL	xxx xxx xxx...	Lists all local Superloop Network card superloop numbers

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.

To change the system configuration record (LD 17)

Prompt	Response	Comment
REQ	CHG	Change the configuration record
TYPE	CFN	Configuration record
CEQU	YES	Change equipment
MPED	8D	Peripheral density

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 umber of concurrent ringers. Change to a maximum of16 ringers capacity for all ringers except the old DC version

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

To define a carrier superloop

Prompt	Response	Comment
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.

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.

To enable the superloop sl

Command	Response	Comment
ENLL sl	ok & prompt	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, and 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.

To delete the configuration record for the superloop

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

To delete the configuration record for the Remote IPE module

Prompt	Response	Comment
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, you can perform system administration tasks from the local or the remote site. When the MMI terminal is in the MMI mode you can:

— perform 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, a terminal is connected to the MMI port at the local Fiber Remote Multi-IPE Interface unit and 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 and across the fiber-optic link at the distant site. 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 set 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 singe user system, i.e. 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 53.

Entering password. After you logged in, you will be prompted to enter the password. The password is **FIBER** and it must be entered in all capital 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 Meridian 1 maintenance and service change TTY. At the Meridian 1 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; 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 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 Meridian 1 system TTY that can access overlays and perform system configuration, maintenance, and diagnostics, which are the same functions performed by the local Meridian 1 system TTY.

To log into the host for SDI operation, you should first log in using the MMI terminal in the MMI mode, then you should log into 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 an other 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 you can configure and maintain the entire Meridian 1 system. Figure 14 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 15 lists the pin assignment of the MODEM DB-9 female connector that connects the Fiber Remote Multi-IPE Interface unit to the modem.

Table 15
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 set 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:

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 will 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 the 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 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 in quotation marks 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
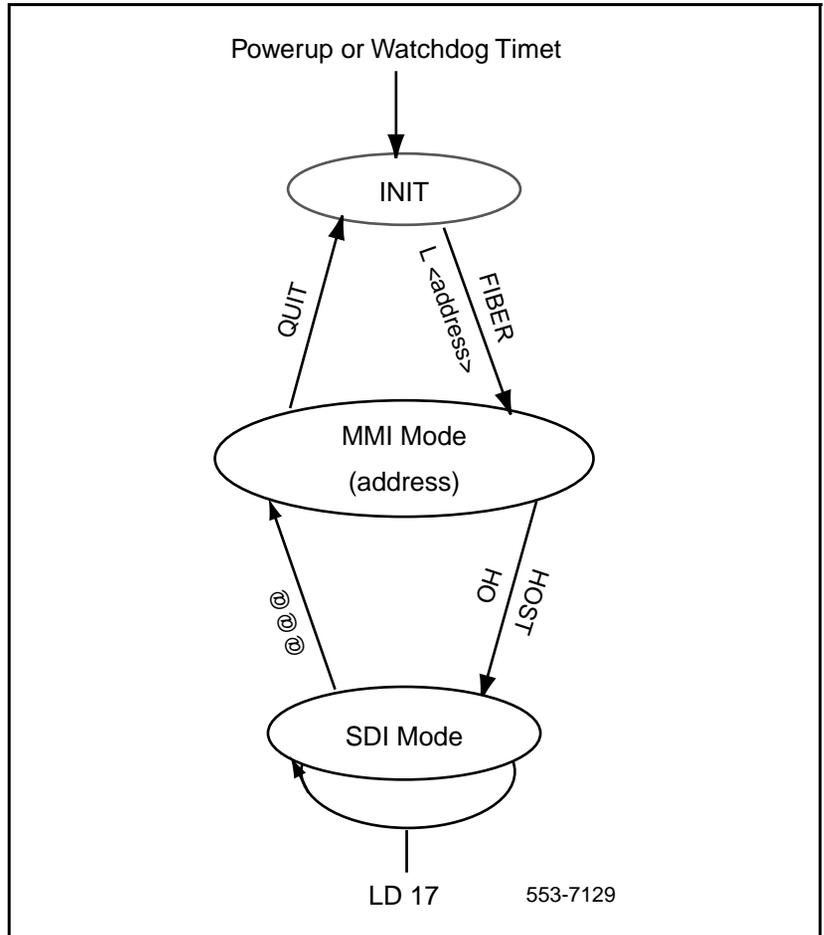
Configuring the Fiber Remote Multi-IPE Interface

To configure the Fiber Remote Multi-IPE Interface using the MMI terminal, you must logon, enter the password, and use appropriate MMI commands.

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

Before you start configuring the Fiber Remote Multi-IPE Interface, you must 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 distant 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 et 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, you can display the current Fiber Remote Multi-IPE Interface configuration parameters 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-optic link 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*	Enter correct time at the cursor, if required.
Current Time 10:15:25	
FII::> S D	To set date
Current Date 8/10/95*18/11/95*	Enter correct date at the cursor, if required.
Current Date 8/11/95	

Note: Time and date should be set correctly to allow correlation of the Remote IPE Alarm Log with error messages in the Meridian 1 History File.

Table 16 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 16
MMI commands used in displaying, checking, and setting the fiber-optic parameters (Part 1 of 3)

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.

Table 16
MMI commands used in displaying, checking, and setting the fiber-optic parameters (Part 2 of 3)

Command	Description
D C [P]	Display configuration. Displays current near-end configuration such as time, date, name, and link bit error threshold.
D C D	Display configuration [Pause]. 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 into the MMI terminal for one Fiber Remote Multi-IPE Interface. The password is **FIBER**.
L xx	Log into 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.

Table 16
MMI commands used in displaying, checking, and setting the fiber-optic parameters (Part 3 of 3)

Command	Description
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.
S T	Set time or verify current time.
T A	Test all. Initiates a series of pre-programmed tests on the near 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

Remote IPE acceptance testing

This section describes the acceptance testing of the Meridian 1 Remote IPE and the fiber-optic link connecting Meridian 1 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 Meridian 1 system is upgraded with Remote IPE equipment and operates correctly without Fiber Remote Multi-IPE Interface connection to Meridian 1 and Remote IPE equipment

— A newly installed system with Remote IPE equipment appears to operate correctly

Acceptance testing verifies the operation of Meridian 1 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 Meridian 1 functions at the Remote IPE site

Checking the system

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

— 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 On, 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 136 in the Maintenance section of this manual.

— 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 136 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 and you may proceed with setting up the necessary equipment for this test.

Setting up test conditions

To conduct acceptance testing, you must have a setup that can verify basic Meridian 1 functions and features initiated and terminated at the Remote IPE site. You may be able 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 2500 telephones to check the ringing generator and some digital telephones 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 Meridian 1 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 across a network, between two terminals on the same PBX, and even between two terminals on the same line card.

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

— placing a call to the remote site

— placing a call in call hold/call retrieve

Placing a call to the remote site

From the local Meridian 1 site, place a call to a Remote IPE site by dialing a remote station directory number (extension number).

> *Note:* Meridian 1 treats Remote IPE subscriber loops as local loops; thus, you need to dial only the extension number to access that station.

To perform a call test:

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

2   Verify voice transmission by talking with the person at the other terminal. 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, you can retrieve the call on hold.

To perform a call hold/call retrieve test:

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

2   Verify voice transmission by talking with the person at the other terminal.

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 terminals, consult the user manual supplied with the terminal.

4   Now, place an outgoing call from the terminal at the remote site by dialing an idle terminal located at the local Meridian 1 site.

5   Complete this outgoing call by first checking the voice clarity in both directions, and hang up.

6   Have another terminal call you while the first call is still on hold.

7   Answer the incoming call and place it on hold.

8   Retrieve the call first held.

9   Complete the call and hang up.

10   Retrieve the second call on hold.

11   Complete the call and hang up.

You may repeat this test for terminals connected to different subscriber loops on the same line card or for different subscriber loops on different line cards in the Remote IPE module. By making these calls, you generate 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.

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. Enter the password **FIBER** in solid caps.

2   Check the status of near-end superloops and the fiber-optic link by executing the **D S [P]** command.

3   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.

4   Check the response to this command for the local and remote sites.

5   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.

6   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 will be 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:

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 Meridian 1 site. Refer to "Voice calls" on page 114 to establish the call.

3   Assuming that the traffic is carried by the primary link, perform the following step.

4   Switch the link to the secondary by unplugging the primary link connector from the Fiber Remote Multi-IPE Interface faceplate XMIT A connector.

5   Verify that the call is still established over the secondary link.

6   Reconnect the link ST optical connector into the XMIT A connector on the Fiber Remote Multi-IPE Interface faceplate.

7   Switch the link back to the primary by unplugging the secondary link connector from the Fiber Remote Multi-IPE Interface faceplate XMIT B connector.

8   Verify that the call is still established over the primary link.

9   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:

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 Meridian 1 site. Refer to "Voice calls" on page 114 to establish the call.

3 Assuming that the traffic is carried by the primary link, perform the following step.

4 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.

5 Verify that the call is still established over the secondary link.

6 Executing the Set Link command **S L A** to select the primary link **A** using the MMI terminal.

7 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:

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 or vice versa.

8   Switch system clock from active to standby by executing the **SWCK** command.

9   Get status of system clock 0 or 1 by executing the **SSCK 0, 1** command.

10 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 may be XM1000 to indicate a glitch 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, you should remove the setup you used to conduct the testing and restore equipment according to the customer configuration.

If you used the actual customer configuration to perform these tests, you do not have to change or remove the setup.

Generating traffic reports

Use 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 *X11 input/output guide (553-3001-311)* and *Traffic measurement formats and output (553-2001-450)*.

Remote IPE maintenance

This section describes Meridian 1 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 are created during the installation of an entire Meridian 1 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 Meridian 1 Remote IPE operation is required. This information can be found in "Product description" on page 9 in this manual. Once the cause is identified, the problem can be corrected by replacing the defective card or Fiber Remote Multi-IPE Interface unit, connecting accidentally disconnected cables, or correcting the system software problem.

Meridian 1 provides built-in self-diagnostic indicators and software and hardware tools. These diagnostic facilities simplify system troubleshooting and reduce mean-time-to-repair (MTTR).

This document focuses on the maintenance of Fiber Remote Multi-IPE Interface units at both sides of the fiber-optic link. System installation and maintenance guide sections of *Meridian 1 general maintenance information (553-3001-500)*, *Meridian 1 fault clearing (553-3001-510)*, and *Meridian 1 hardware replacement (553-3001-520)* describe how to maintain the entire Meridian 1 system. This chapter describes how to maintain the Fiber Remote Multi-IPE Interface unit as an integral part of Meridian 1.

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

Diagnostic tools

Diagnostic tools are used to troubleshoot problems in Meridian 1 including problems with the Fiber Remote Multi-IPE Interface unit. When diagnosing Fiber Remote Multi-IPE Interface unit and Remote IPE problems, you may have 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

Meridian 1 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, you must check the attenuation across the entire link, the signal level at the receiver and the signal level at the transmitter, as follows:

— 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 33.

— 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 to much signal attenuation.

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

— To check the fiber-optic link, you can start 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 may be caused by:

   • cable cut or cable stress

   • broken or damaged connectors

   • bad splices

— If the cable is more than 500 meters long, you can use the OTDR to locate the fault in the fiber-optic link.

— 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 you insert it into an operating system module, when you enable the card, or when you power up or reset the system. You can also 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 you an immediate indication of its operating status.

LED indicators

Meridian 1 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 Appendix A of this manual and in section (HEX) in *X11 input/output guide (553-3001-311)*.

The display also indicates:

— It identifies the IPE controller, if the PSDL is successful

— Indicates current clock source or clock failure on superloops (on the controller card display)

These 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 you remove it from an operating Meridian 1 system without disrupting other system functions. After you repair or replace the card, you can place it back in service by setting the switch to the ENL position.

System monitors and alarms

Meridian 1 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

Meridian 1 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

Meridian 1 software diagnostic tools are used to monitor the system status, provide the ability to test various system functions and equipment suspected of being faulty, and log and display system fault history. These are:

— resident diagnostic programs

— interactive nonresident diagnostic programs

Resident programs

Meridian 1 resident programs are diagnostic and administration programs that continuously monitor system operation and report faults and generate system messages, which are displayed on the system terminal or printed on a system printer. These system messages are listed in *X11 input/output guide (553-3001-311)*.

These messages are:

— maintenance display codes listed under HEX that indicate status and error conditions in the system

— maintenance messages listed under XMI are reported to the TTY that 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 file that can be printed and reviewed to identify fault events leading to the present status

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

These 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 *X11 input/output guide (553-3001-311)*

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.

You can access interactive programs through a maintenance terminal. These programs are used to:

— test the equipment and place lines and trunks out of service when testing or faulty and back into service when testing is completed or the line or trunk has been repaired or replaced

— verify the status of a fault

— verify that a fault has been corrected and the equipment is operating correctly

You can select a number of nonresident diagnostic programs 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.

You can also manually select continuity tests that check continuity between the Superloop Network card in Meridian 1 and the Peripheral Controller card in the Remote IPE module, as well as other network and peripheral cards. You can 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 PE Diagnostic LD 32, which can be accessed using the administration terminal or the MMI terminal used in the Host SDI mode.

Table 17 lists superloop maintenance commands provided by Network and PE Replacement Diagnostic LD 32. NPR000 are diagnostic messages displayed to indicate the status of the equipment.

Table 17
Meridian 1 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, you can directly issue commands 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 Meridian 1 system when placed in the Host SDI mode.

Table 18 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 18
MMI commands (Part 1 of 3)

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. 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.

Table 18
MMI commands (Part 2 of 3)

Command	Description
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. 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. 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 into the MMI terminal for one Fiber Remote Multi-IPE Interface. The password is **FIBER**.
L xx	Logs into 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**.
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}.

Table 18
MMI commands (Part 3 of 3)

Command	Description
S C	Sets alarm self-clearing function to either "enable" or "disable".
S D	Sets date or verify 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 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 programs 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 test 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

Now that you are familiar with the troubleshooting tools, you can begin troubleshooting the Fiber Remote Multi-IPE Interface units and Remote IPE equipment. Based on whether Remote IPE equipment has just been installed and is not yet operational or it had been operating correctly and is now faulty, you can determine what may be the most probable cause of failure.

Types of faults

Problems can occur in the following areas:

— Hardware

— Configuration

— Software

The types of faults you must 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 may be in any or all of the three areas; however, in a previously operating system, the fault will probably be in the hardware.

Fault isolation steps

The following steps show you how to isolate Remote IPE faults using the diagnostic tools described in this chapter:

1   Observe and list the problem symptoms the system is exhibiting. Typical symptoms can include the: 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 135 or "Previously operating Remote IPE" on page 136 for lists of the most common problems.

3   Take the action recommended by the fault isolation and correction tables, which will guide you 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 your 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 may 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 19 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 19 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 19 refers you to the test procedures in this manual that will most likely be able to resolve the problem based on the symptoms you observe.

Table 19
Meridian 1 Remote IPE equipment problems (Part 1 of 2)

Symptoms	Diagnosis	Solution
Red LED on the Superloop Network card or Peripheral Controller card permanently on.	Card is disabled or faulty.	Go to *Procedures 1, 2, or 3* and *4* in this chapter 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.

Table 19
Meridian 1 Remote IPE equipment problems (Part 2 of 2)

Symptoms	Diagnosis	Solution
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 *Procedure 6* to display the status. Then go to *Procedure 7* 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 faulty.	Check fiber-optic link connections and go to *Procedure 6* to display the status. Then go to *Procedure 7* and *Procedure 8* 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 *Procedure 7* and *Procedure 9* 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 incorrect.	Define a unique address correctly. Observe the XMI messages on the MMI terminal and check the description of these messages listed in Also refer to *X11 input/output guide (553-3001-311)* Use this information to locate and correct the fault.
Display on the Peripheral Controller card shows fault codes.	Card faulty. Failed self-test or problem communicating with peripheral equipment.	Go to *Procedures 3*, *4* and *8* to check tracking and loopback. Also refer to *Appendix A.* 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 Meridian 1 TTY.	Hardware or software problems with the Remote IPE.	Note various error messages. Refer to *X11 input/output guide (553-3001-311)* for a list of these messages and their description. Based on the code's description, take the appropriate action to resolve the problem.

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

Superloop Network card fault isolation and correction

The Superloop Network card provides a communication interface between the CPU in Meridian 1 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.

Procedure 1
Checking the status of the Superloop Network card

The diagnosis in Table 19 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.

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 will not allow you to log in and it will display on your 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 you are testing.

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 EBL/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 *X11 input/output guide (553-3001-311)* 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 L2… = 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.

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.

Procedure 2
Performing the Superloop Network card self-test

If the Superloop Network card appears faulty, you should 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 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 PE 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 you are disabling.

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 may be faulty. To verify the integrity of the network bus and connections between the Superloop Network card and other network and peripheral equipment cards interfacing with the Superloop Network card, go to Procedure 3.

   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 Replacement procedures. 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 may 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.

Procedure 3:
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 you are testing.

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.

Procedure 4
Performing the Peripheral Controller card self-test

If the Peripheral Controller card appears faulty, you should conduct the
self-test to verify that it is actually faulty before you replace 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 20, "Peripheral Controller self-test HEX
codes," on page 162.

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 you entered the **HO** command while someone else is active
        in the Host SDI mode, the system will not allow you to log in and it will
        display on your terminal "CONN DENIED".

2   At the **>** prompt, type **LD 32** and press the Enter key to access the
        Network and PE Diagnostic Program 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 may 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, not configured, and so on.

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

Fault isolation and correction using MMI maintenance commands

You can perform testing and troubleshooting of the Fiber Remote Multi-IPE Interface units and Remote IPEs 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.

Procedure 5
Display 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
you to display 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

You can 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.

3   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 time and date when it occurred. If the redundant link is present, the error statistics of both links will be 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)

You can 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.

Procedure 6
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 STAUTS) 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 error 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 may 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 Procedure 8 "Testing the superloop" on page 150.

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.

Procedure 7
Testing the superloops and the fiber-optic link

This procedure 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
will interfere with normal traffic, therefore all superloops should be disabled.

1   To disable all superloops, you wish to test, 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   Now you have to 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. You have the option of running the test
once by typing **0** or you can run the test for a number of minutes from **1** to
98 by typing the number of minutes**.** By typing **99**, the test will run
continuously until stopped**.** You can 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 may be in the superloop cables, the
Meridian 1 card (Superloop Network or Peripheral Controller card), or the
Fiber Remote Multi-IPE Interface unit.
Go to Procedure 8 to troubleshoot the superloop problems.
Go to Procedure 9 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.

Procedure 8
Testing the superloop

This procedure 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.

1   Before you can start the test, you must disable the superloop you wish to test 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   Now you have to 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. You have the option of running the test once by typing **0** or you can run the test for a number of minutes from **1** to **98** by typing a number that represents minutes. By typing **99**, the test will run continuously until stopped. You can 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 Meridian 1 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.

Procedure 9
Testing the fiber-optic link

This procedure 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 will check both links.

This test will interfere with normal traffic, therefore all superloops should be disabled.

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 you are disabling.

3   Now you have to 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.You have the option of running the test once by typing **0** or you can run the test for a number of minutes from **1** to **98** by typing the number of minutes**.** By typing **99**, the test will run continuously until stopped**.**You can 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 shows problem with communication across the fiber-optic link, the problem may 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 **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 **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 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.

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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 and thus determine 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 Procedure 7 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 you determine that one or more Remote IPE cards or the Fiber Remote Multi-IPE Interfaces are defective, you will have to remove them and replace them with spares. When you insert 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 follows:

1   Inspect the shipping container for damage. Notify your distributor if you find that 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 your sales representative.

4   Keep cards in their antistatic bags until you are 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 Meridian 1 module or the Remote IPE module without turning off the power to the module. This feature allows Meridianþ1 to continue normal operation when you are replacing a Superloop Network card in Meridian 1 or a Peripheral Controller card in the Remote IPE module.

Removing and replacing a Superloop Network card

1   Disable the Superloop Network card by logging in to the system terminal, loading the Network and Peripheral Equipment Diagnostic Program LD 32, and executing **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 it flashes three times and stays on, it has passed the test; go on to step 12. 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 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 self-test will also be 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 134 in this document.

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

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 you can remove it.

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 it 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 self-test will
also be 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 your 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 you should replace the entire
unit.

When replacing the Fiber Remote Multi-IPE Interface, you can replace the
entire unit or just the card (motherboard with faceplate combination). The
following procedure replaces the entire unit:

1   Log in on the TTY or the MMI maintenance terminal.

2   Disable the Superloop Network card by loading the Network and
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 your equipment supplier's repair depot.

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

This procedure replaces just the motherboard and faceplate combination and the enclosure remains installed and connected:

1   Log in on the TTY or the MMI maintenance terminal.

2   Disable the Superloop Network card by loading the Network and 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 your equipment supplier's repair depot.

Reinstalling covers

When you determine that the Remote IPE is operating correctly, do the following:

1   Reinstall the covers on Meridian 1 module.

2   Reinstall the cover on the Remote IPE module.

3   Terminate you session with Meridian 1 by logging out on your 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 a Nortel Networks repair center, you should:

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 Nortel Networks and mail the package to an authorized repair center.

Appendix: 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 21 lists the Peripheral Controller hexadecimal codes displayed on the faceplate display.

Table 20
Peripheral Controller self-test HEX codes (Part 1 of 2)

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 EEPROM 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
10	A31 #1 configuration memory
11	A31 #1 external FIFO
12	A31 #2 external buffer
13	A31 #2 internal context memory (phase A)

Table 20
Peripheral Controller self-test HEX codes (Part 2 of 2)

HEX code	Test description
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 Meridian 1 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 correspondingly at the remote site. These connections represent the following:

— **Figure 15** shows three Superloop Network cards connected to:

   • 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 connections.

— **Figure 16** shows multiple Fiber Remote Multi-IPE Interface unit connections:

   • Connections to the SDI Paddleboard and other SDI cards as an alternative.

   • System monitor connection.

   • MMI terminal connection.

— **Figure 17** 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, 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
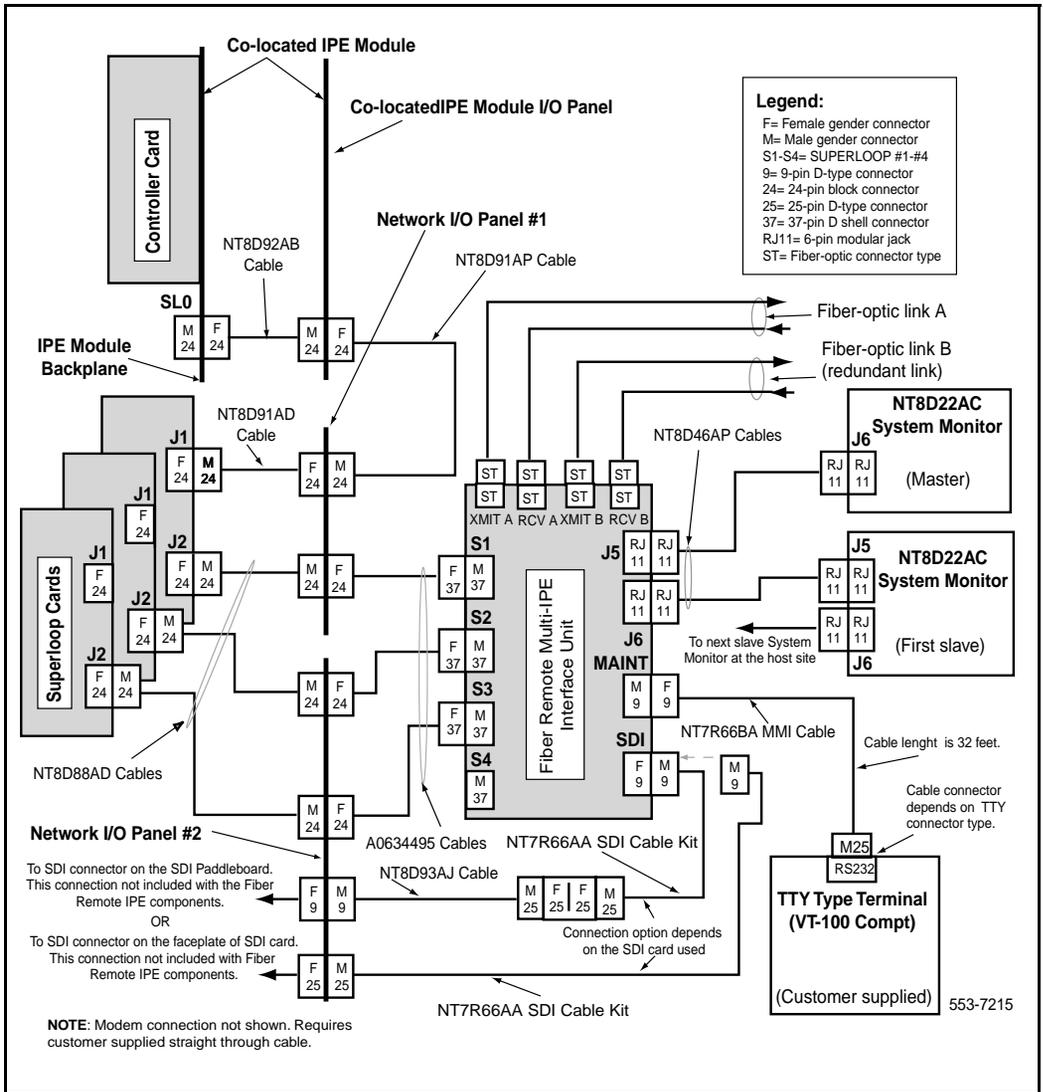
Figure 16
Local site multiple Fiber Remote Multi-IPE Interface units cable connection diagram

NOTE: Modem connection is not shown. A straight through cable (not supplied) is required to connect the MODEM port on the Fiber Remote Multi-IPE Interface unit to the modem.

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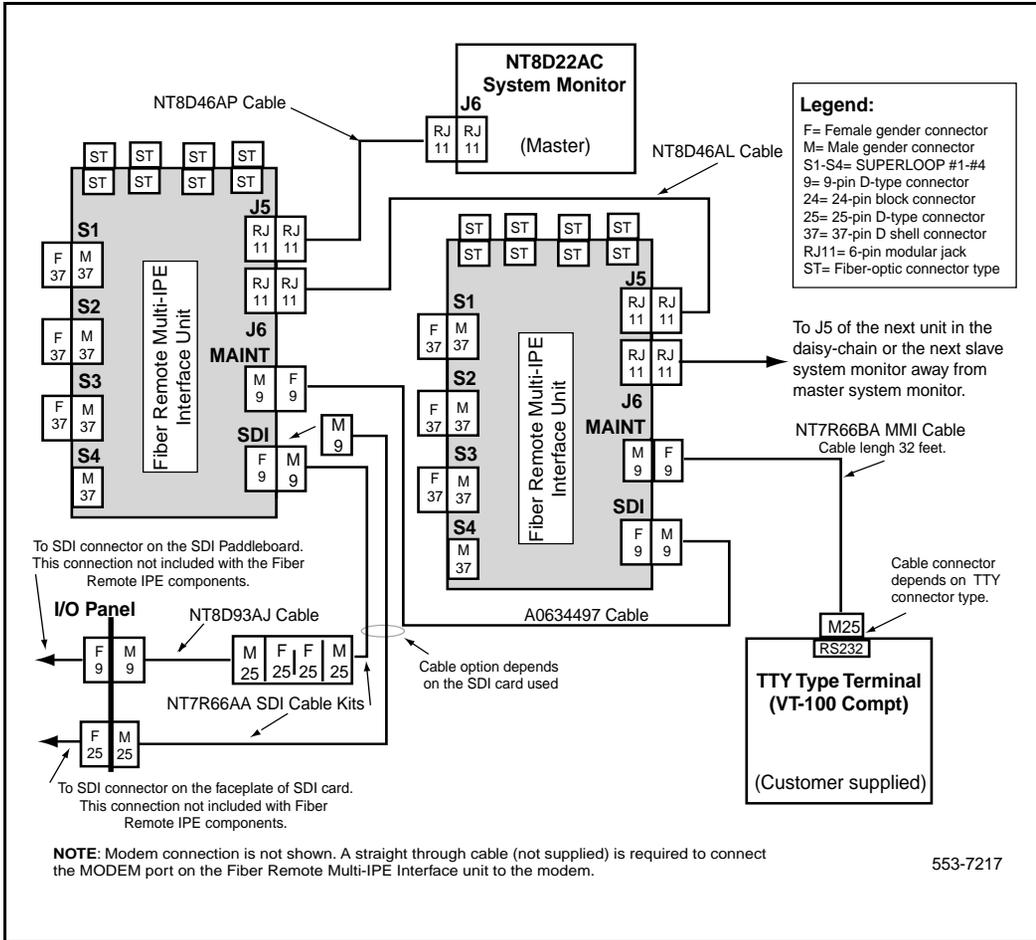
Figure 17
Remote site single Fiber Remote Multi-IPE Interface unit cable connection diagram

NOTE: This Figure shows support for two Fiber Remote IPE Modules each with a Controller card.
One is connected to one superloop and the other to two superloops provided by the Fiber Remote Multi-IPE Interface unit.

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Meridian 1

Fiber Remote Multi-IPE Interface

Description, installation, and maintenance

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