Meridian 1

Succession 1000M

Succession 3.0 Software

Fiber Remote IPE

Description, Installation, and Maintenance

Document Number: 553-3021-354
Document Release: Standard 1.00
Date: October 2003

Produced in Canada

Revision history

October 2003

Standard 1.00. This document is a new NTP for Succession 3.0. It was created to support a restructuring of the Documentation Library. This document contains information previously contained in the following legacy document, now retired: *Fiber Remote IPE: Description, Installation, and Maintenance* (553-3001-020).

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 are supported in your area.

Subject

This Nortel Networks technical publication (NTP) provides information specific to the implementation of the Fiber Remote Intelligent Peripheral Equipment (IPE) service.

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

Note on legacy products and releases

This NTP contains information about systems, components, and features that are compatible with Succession 3.0 Software. For more information on legacy products and releases, click the **Technical Documentation** link under **Support** on the Nortel Networks home page:

http://www.nortelnetworks.com/

Applicable systems

This document applies to the following systems:

- Meridian 1 Option 51C
- Meridian 1 Option 61
- Meridian 1 Option 61C
- Meridian 1 Option 61C CP PII
- Meridian 1 Option 81
- Meridian 1 Option 81C
- Meridian 1 Option 81C CP PII
- Succession 1000M Half Group
- Succession 1000M Single Group
- Succession 1000M Multi Group

Note that memory upgrades may be required to run Succession 3.0 Software on CP3 or CP4 systems (Options 51C, 61, 61C, 81, 81C).

System migration

When particular Meridian 1 systems are upgraded to run Succession 3.0 Software and configured to include a Succession Signaling Server, they become Succession 1000M systems. Table 1 lists each Meridian 1 Large System that supports an upgrade path to a Succession 1000M Large System.

Table 1
Meridian 1 systems to Succession 1000M systems (Part 1 of 2)

This Meridian 1 system...	Maps to this Succession 1000M system
Meridian 1 Option 51C	Succession 1000M Half Group
Meridian 1 Option 61	Succession 1000M Single Group
Meridian 1 Option 61C	Succession 1000M Single Group
Meridian 1 Option 61C CP PII	Succession 1000M Single Group

Table 1
Meridian 1 systems to Succession 1000M systems (Part 2 of 2)

This Meridian 1 system...	Maps to this Succession 1000M system
Meridian 1 Option 81	Succession 1000M Multi Group
Meridian 1 Option 81C	Succession 1000M Multi Group
Meridian 1 Option 81C CP PII	Succession 1000M Multi Group

For more information, see *Large System: Upgrade Procedures* (553-3021-258).

Intended audience

This document is intended for individuals who are responsible for installing and maintaining the Fiber Remote IPE service as part of a Succession 1000M Large System or Meridian 1 Large System.

Conventions

Terminology

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

- Meridian 1
- Succession 1000M

The following systems are referred to generically as “Large System”:

- Meridian 1 Option 51C
- Meridian 1 Option 61
- Meridian 1 Option 61C
- Meridian 1 Option 61C CP PII
- Meridian 1 Option 81
- Meridian 1 Option 81C
- Meridian 1 Option 81C CP PII
- Succession 1000M Half Group
- Succession 1000M Single Group
- Succession 1000M Multi Group

Related information

Related NTPs

This section lists information sources that relate to this document.

NTPs

The following NTPs are referenced in this document:

- *Circuit Card: Description and Installation* (553-3001-211)
- *Features and Services* (553-3001-306)
- *Software Input/Output: Administration* (553-3001-311)
- *Telephones and Consoles: Description* (553-3001-367)
- *Large System: Planning and Engineering* (553-3021-120)
- *Large System: Installation and Configuration* (553-3021-210)
- *Large System: Maintenance* (553-3021-500)

Online

To access Nortel Networks documentation online, click the **Technical Documentation** link under **Support** on the Nortel Networks home page:

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CD-ROM

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

Product description

Contents

This section contains information on the following topics:

Introduction

This section describes Fiber Remote Intelligent Peripheral Equipment (IPE), its architecture, and its hardware options. It also describes how to plan and engineer a fiber-optic link.

CAUTION

Use of controls or adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.

WARNING

When working with fiber-optic cables, you must adhere to standard precautions used for optical fibers. Before you can handle optical fibers, you must take necessary training and become certified in working with fiber-optic cables.

System overview

Succession 1000M Large Systems and Meridian 1 Large Systems are Private Branch Exchanges (PBX) that link local subscribers to private and public networks and provide many functions and features.

Large Systems can also support remote subscribers. To do this, these systems can be configured in a distributed system, using Remote IPE modules or small cabinets. Fiber-optic links are used to connect the Remote IPE modules and small cabinets to the PBXs.

In a distributed system, subscriber connections are the same at local IPE modules as they are at Remote IPE modules or small cabinets. Furthermore, because Remote IPE equipment uses common and network equipment from the local system, subscriber functions and features are the same at local and remote sites.

This document focuses on the system and Remote IPE equipment specifically designed to provide fiber-optic links between network functions in the local system and peripheral controller functions in the Remote IPE.

Physical architecture

To configure a system with Fiber Remote IPE, you must install a floor-standing column or wall-mounted cabinet at a remote site and connect it using fiber-optic links to an existing local system.

System equipment specifically designed to support the fiber-optics interface is as follows:

— an NT1P61 Fiber Superloop Network card, which is housed in a local system network card slot

— an NT1P62 Fiber Peripheral Controller card, which is housed in the Remote IPE module or cabinet

— NT1P63 Electro-optical interface packlets, installed onto the Fiber Superloop Network card and the Fiber Peripheral Controller card to provide a fiber-optic link between the local system and Remote IPE

— an optional NT1P63 Electro-optical interface packlet at each site to provide a redundant fiber-optic link

— an NT1P70 wall-mounted cabinet for the remote site

— NT1P75AA fiber-optic patchcords, one for each Electro-optical packlet

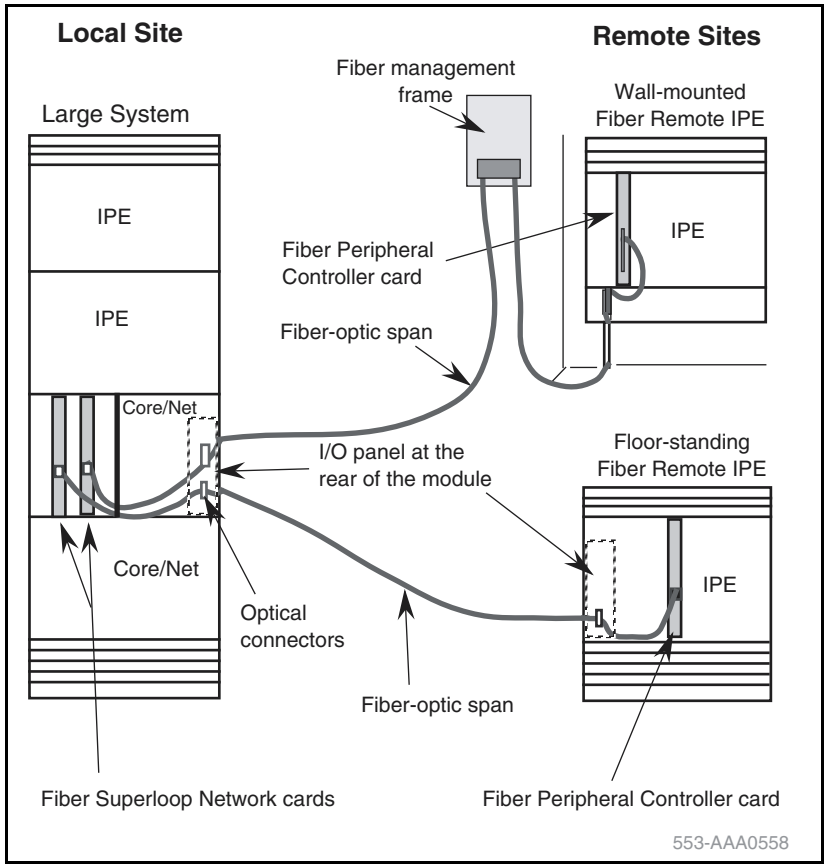
— NT1P79AA fiber-optic cable between the fiber management frame and the Fiber Peripheral Controller in the wall-mounted cabinet and the floor-standing column

— NT1P76AA cable connecting the Fiber Superloop Network card to the I/O panel and providing Serial Data Interface (SDI) and system monitor ports

— NT1P78AA cable connecting the Fiber Peripheral Controller card to the I/O panel and providing TTY and system monitor ports

Figure 1 illustrates a Large System and Remote IPE equipment linked with fiber-optic cables. The only equipment specifically designed to support this configuration are the cards and the cabinet listed above.

Figure 1
Local system to Remote IPE fiber-optic links



At the local site, fiber-optic cables contain fiber-optic connectors mounted on the I/O panel connector slots at the rear of the network module. At the remote site, fiber-optic cable connectors are also installed on the I/O panel connector slots at the rear of the floor-standing Remote IPE module. For the wall-mounted Remote IPE cabinet, the fiber-optic link cable from the fiber

management frame is connected directly to the FC/PC fiber-optic connectors of the Electro-optical packlets located on the Fiber Peripheral Controller card.

Subscriber loops at the Remote IPE are connected to 50-pin connectors on the I/O panel at the rear of the module or at the bottom front of the cabinet. For more details about subscriber connections to the local system and the Remote IPE, refer to *Large System: Installation and Configuration* (553-3021-210).

You can select one of two options for the Remote IPE enclosure:

— Floor-standing Remote IPE module

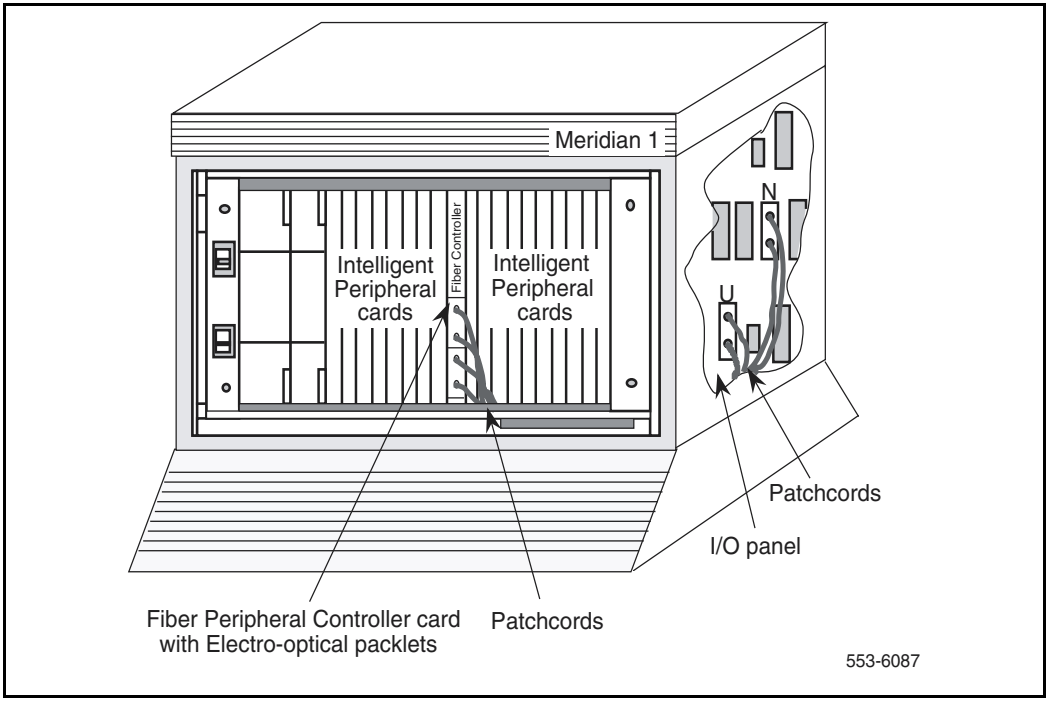
— Wall-mounted Remote IPE cabinet

Floor-standing Remote IPE

The floor-standing Remote IPE comprises a pedestal, one or more IPE modules, and a top cap. The IPE module houses a maximum of 16 line cards and a Fiber Peripheral Controller card. The communication and signaling between the local system central processing unit (CPU) and the Fiber Peripheral Controller card Micro Processing Unit (MPU) is performed over the fiber-optic link. The fiber-optic link also transmits voice and data information originating and terminating at Remote IPE subscriber stations.

Figure 2 illustrates the front view of the floor-standing Remote IPE column with the cross section of the rear of the module showing the I/O panel. The front view shows the location of the Fiber Peripheral Controller card and the fiber-optic cables that connect the fiber-optic interface on the Fiber Peripheral Controller to the optical I/O panel at the rear of the IPE module.

Figure 2
Floor-standing Fiber Remote IPE column



Wall-mounted Remote IPE cabinet

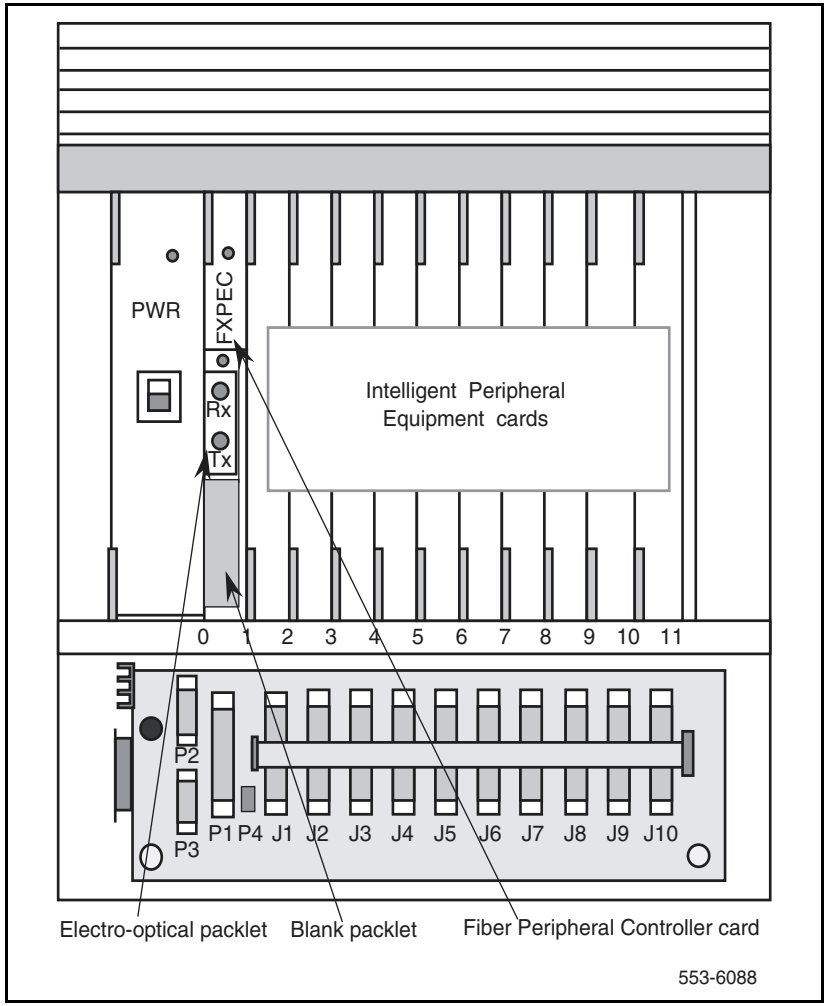
The NT1P70 main is a wall-mounted Remote IPE cabinet that houses a maximum of 10 line cards and a Fiber Peripheral Controller card. The communication and signaling between the local system CPU and the Fiber Peripheral Controller card MPU is performed over the fiber-optic link. The fiber-optic link also transmits voice and data information originating and terminating at the Remote IPE subscriber stations.

To expand the number of line cards from 10 to 16, use the first six card slots in the NTAK12 expansion cabinet. Card slots 7 through 12 in the expansion cabinet are not configurable and must not be used. The expansion cabinet is connected to the Fiber Peripheral Controller card housed in the main cabinet with a cable. This allows the Fiber Peripheral Controller card to control the line cards in both cabinets.

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

Figure 3 illustrates the front view of the NT1P70 wall-mounted Remote IPE cabinet. It shows the location of the Fiber Peripheral Controller card and the Electro-optical packlet on the Fiber Peripheral Controller card. A blank packlet is used in the lower packlet position of the Fiber Peripheral Controller faceplate for a nonredundant link configuration in both the floor-standing IPE module and the wall-mounted cabinet.

Figure 3
Wall-mounted Remote IPE cabinet



Functional architecture

Fiber Remote IPE functions are controlled by the local system CPU and the firmware in the Fiber Superloop Network and Fiber Peripheral Controller cards. The CPU uses software instructions to execute call processing, administration, and diagnostic functions. These functions can be divided into three basic categories:

— CPU functions

— Network functions

— IPE functions

Figure 4 on page 22 illustrates the system functional architecture in a broad block diagram to show the three basic types of functions and system modules supporting these functions.

CPU functions

CPU functions are executed by the system software in the CPU module, which is normally located at the bottom of the system column. The CPU responds to the interrupt requests from the network equipment and the IPE, and performs the following functions:

— controls call origination, call termination, and feature operation for switched voice and data calls

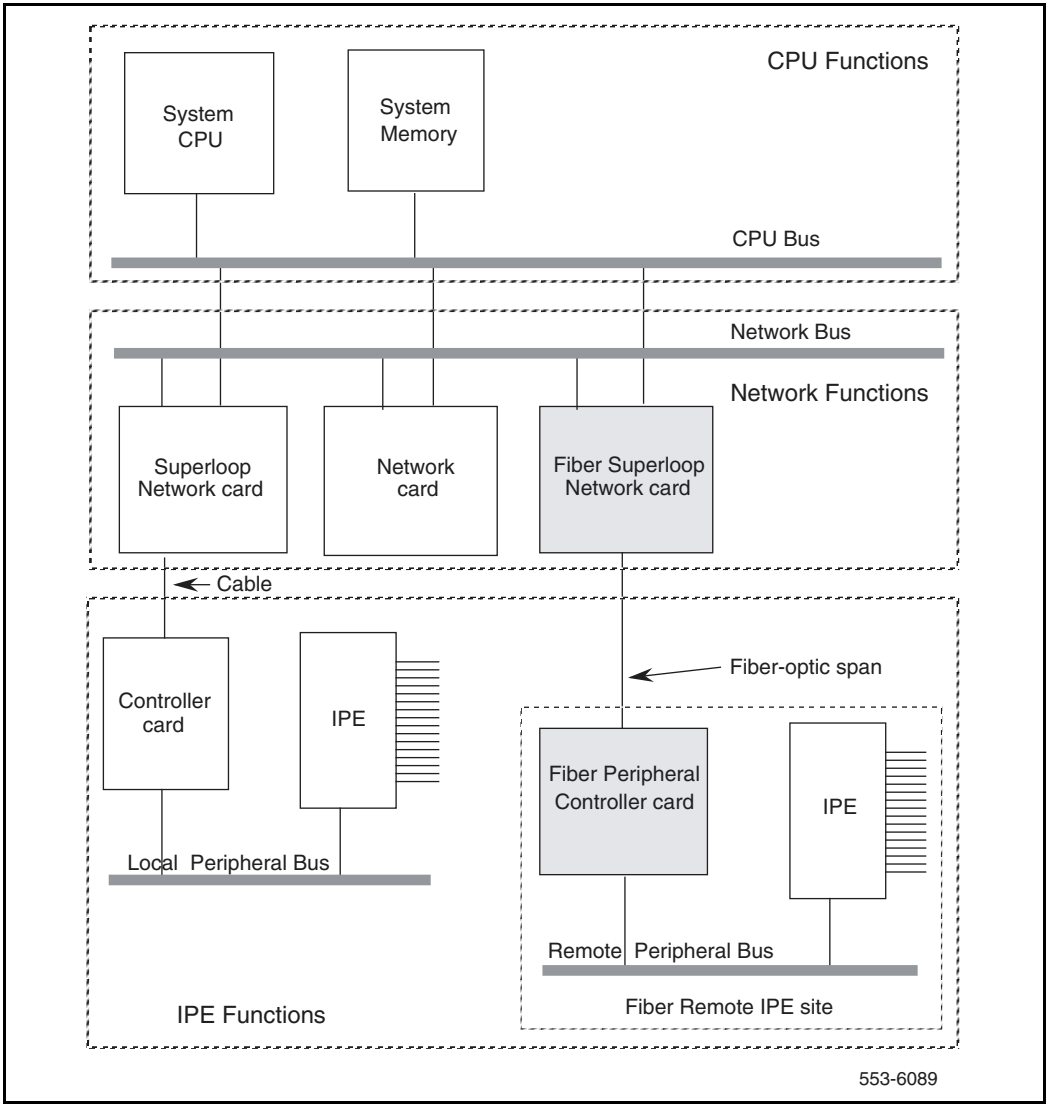
— executes system administration and configuration functions

— coordinates system diagnostic activities

— controls system utility functions such as software loading, initialization, data dumping, traffic logging, and system auditing

Even though the Remote IPE is removed from the local system, the local system CPU controls its functions the same way it controls functions of local IPE modules.

Figure 4
Functional architecture



Network functions

Network switching functions are executed by equipment housed in the local network card slots. The Fiber Superloop Network card is installed in a network card slot. Through its fiber-optic link, it connects to the Fiber Peripheral Controller card in the Remote IPE module or cabinet.

These network functions do the following:

— Perform hardware initialization and self-test upon power up.

— Establish call connections between the stations connected to Remote IPE line cards and stations local to the system or to trunks for long distance trunk calls over public or private networks.

— Communicate switching, peripheral signaling, and maintenance information to and from the CPU and the Peripheral Controller MPU.

— Monitor fiber-optic link integrity and transmission quality and provide automatic link switching from the failed primary link to the redundant link.

— Provide local and remote loopback testing and fault isolation functions.

IPE functions

Intelligent peripheral equipment functions are performed by the Fiber Peripheral Controller card and line cards in the Remote IPE module or cabinet.

These IPE functions do the following:

— Perform hardware initialization and self-test upon Fiber Peripheral Controller power-up.

— Assign timeslots to line cards to establish call connections.

— Communicate with the Fiber Superloop Network card MPU to provide Remote IPE configuration and maintenance functions.

— Monitor fiber-optic link integrity and transmission quality and provide automatic link switching from the failed primary link to the redundant link on the Remote IPE side.

— Provide Card-LAN management by polling IPE cards and reporting their status.

— Control local stations' ringing functions.

— Provide a serial port for local configuration and maintenance functions.

— Provide local and remote loopback testing and fault isolation functions.

Functional description

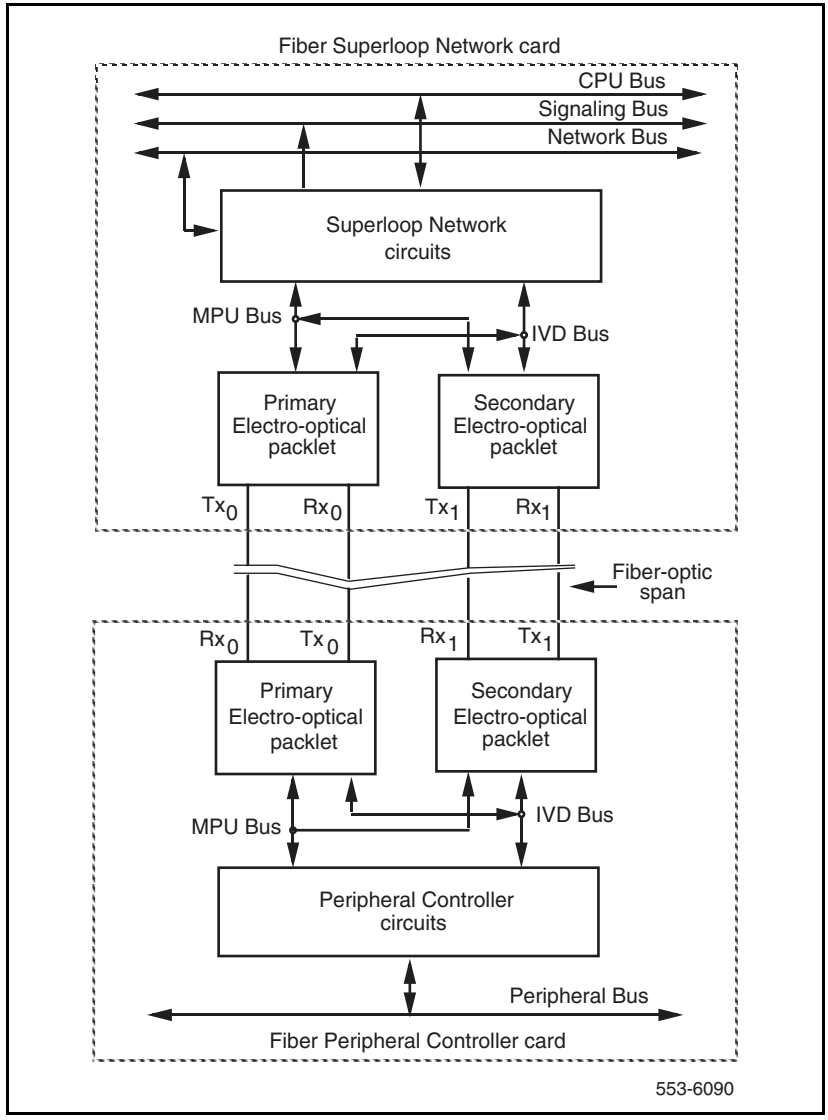
The local system is controlled by the CPU. The CPU performs read/write functions on the network control and status registers and communicates with the network equipment over the CPU bus. Through these messages, the CPU monitors the system's status, provides call connection sequences, monitors traffic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

Fiber Remote IPE utilizes fiber-optic links to provide the same subscriber functionality at the remote site as at the local site.

Figure 5 illustrates the Fiber Remote architecture. It shows the Fiber Superloop Network card, the Fiber Peripheral Controller card, and the internal bus structure that connects them to other system components.

Figure 5 also describes the Electro-optical packlet to provide an understanding of the internal system communication and call processing activities through the fiber-optic link.

Figure 5
Fiber Remote architecture



Fiber Superloop Network card

The NT1P61 Fiber Superloop Network card is a microprocessor-controlled network interface between the local system CPU and the remote peripheral equipment. To communicate with the CPU, it uses the network, the signaling, and the CPU buses located in the local network module.

The Fiber Superloop Network card occupies one network card slot and supports 4 network loops or 128 timeslots; 8 for signaling and 120 for voice and data transmission with the Fiber Peripheral Controller card. The Electro-optical packlet mounted on the Fiber Superloop Network and Fiber Peripheral Controller cards provide a dedicated link between these two cards.

The main Fiber Superloop Network card performs the following functions:

— Provides a single or a redundant dedicated optical link to connect the Remote IPE to the local system.

— Assigns any network timeslot to any timeslot available on the fiber-optic link to support peripheral equipment timeslot assignments.

— Supports eight signaling channels for Common Channel Signaling (CCS) in servicing Scan and Signal Distributor (SSD) messages, card maintenance, and card enable messages.

— Provides an interface for system power and alarm monitoring.

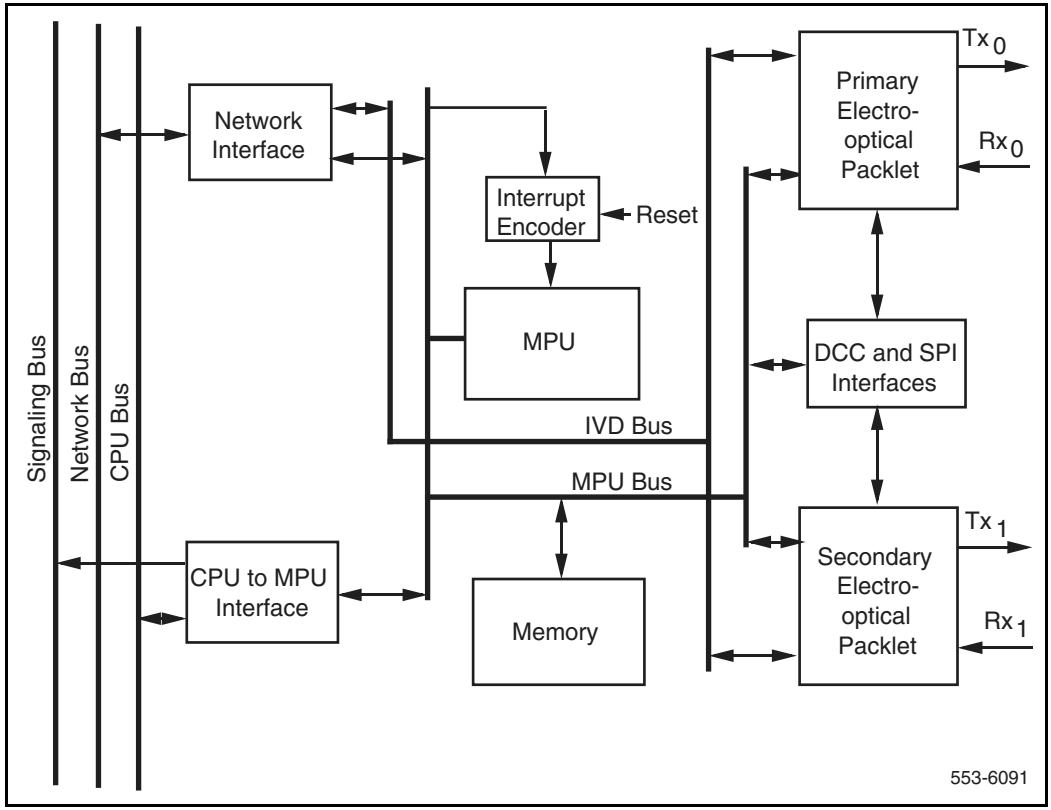
— Provides an interface for a maintenance port.

— Provides continuity test pattern generation and detection for loopback testing.

— Performs diagnostic self-tests during power-up and when requested by the CPU.

Figure 6 shows the Fiber Superloop Network card block diagram illustrating major functional blocks.

Figure 6
Fiber Superloop Network card functional block diagram



Micro Processing Unit (MPU)

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

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

The MPU can be reset by:

— powering up the Fiber Superloop Network card

— the watchdog timer

— the ENB/DIS switch

— the local system CPU command

Memory

The Fiber Superloop Network memory stores programs and data for the following functions in the following locations:

— Boot code and self-test code are stored in the EPROM.

— Data is stored in the RAM.

— The main function code is stored in the Fiber Superloop Network card FLASH memory.

— Data containing the Fiber Superloop Network card identification and version is stored in the EEPROM.

CPU to MPU bus interface

Information exchange between the local system CPU and the Fiber Superloop Network MPU is performed with packetized messages transmitted over the CPU bus.

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

Network bus interface

The network bus interface performs two major functions:

— Converts bit interleaved serial data received from the network bus into byte interleaved data for transmission over the 128 timeslots used by the IVD bus.

— Accepts byte-interleaved data transmitted from the IVD bus and converts it into a bit-interleaved data stream for transmission over the network bus.

Fiber-optic interface

Two NT1P63 Electro-optical packlets can be installed on each Fiber Superloop Network card to provide redundant fiber-optic interfaces, or the Fiber Superloop Network card can be equipped with only one Electro-optical packlet for a nonredundant link. The fiber-optic interface provides a 155.52 Mbps point-to-point transmission facility.

The fiber-optic interface performs the following functions:

— Connects the local system to Remote IPE using a dedicated single mode fiber-optic link.

— Provides a synchronous communication channel between the Fiber Superloop Network card MPU and the Fiber Peripheral Controller card MPU.

— Uses one or, optionally, two Electro-optical packlets installed on the Fiber Superloop Network card to provide redundant fiber-optic links.

— Uses buffers and transceivers to extend the MPU data, address, and control buses to the Electro-optical packlet.

— Provides Electro-optical packlet version identification, which is stored in the packlet's EEPROM.

— Monitors transmission quality of the fiber-optic link; if the transmission is degraded or fails, the Fiber Superloop Network card automatically transfers to the redundant link, if equipped.

Fiber Peripheral Controller card

The NT1P62 Fiber Peripheral Controller card is a microprocessor controlled peripheral interface between the Fiber Superloop Network card and the Remote IPE line cards. To communicate with the Fiber Superloop Network card, the Fiber Peripheral Controller card uses the Electro-optical interface and the fiber-optic link. To communicate with the peripheral equipment, the Fiber Peripheral Controller uses 16 full duplex serial loops, one for each line card in the IPE module.

The Fiber Peripheral Controller card occupies one card slot in the IPE module. The adjacent card slot is not the full width and must remain empty; however, a dummy faceplate should be installed in this empty card slot to provide a better air flow between cards. This is necessary because a non-fiber Peripheral Controller card occupies two card slots in the IPE module and the Fiber Peripheral Controller card that plugs into the same card slot occupies only one card slot. The dummy faceplate is used in the floor-standing IPE module but is not necessary in the wall-mounted IPE cabinet.

The main Fiber Peripheral Controller card performs the following functions:

— Provides a single or redundant dedicated optical link to connect the Remote IPE to the local system.

— Assigns any of the 120 timeslots on the fiber-optic link to any timeslot of the 16 full duplex serial loops assigned to line cards in the IPE module.

— Converts the SSD-type signaling format received from the Fiber Superloop Network card to the signaling format for digital telephone sets, and from digital telephone sets format to SSD-type format.

— Polls telephone sets to determine the set type and its signaling protocol and transmits this information to the Fiber Superloop Network card.

— Supports CCS protocol between the Fiber Superloop Network and the Fiber Peripheral Controller cards.

— Provides an interface for a maintenance port.

— Provides a Card-LAN port.

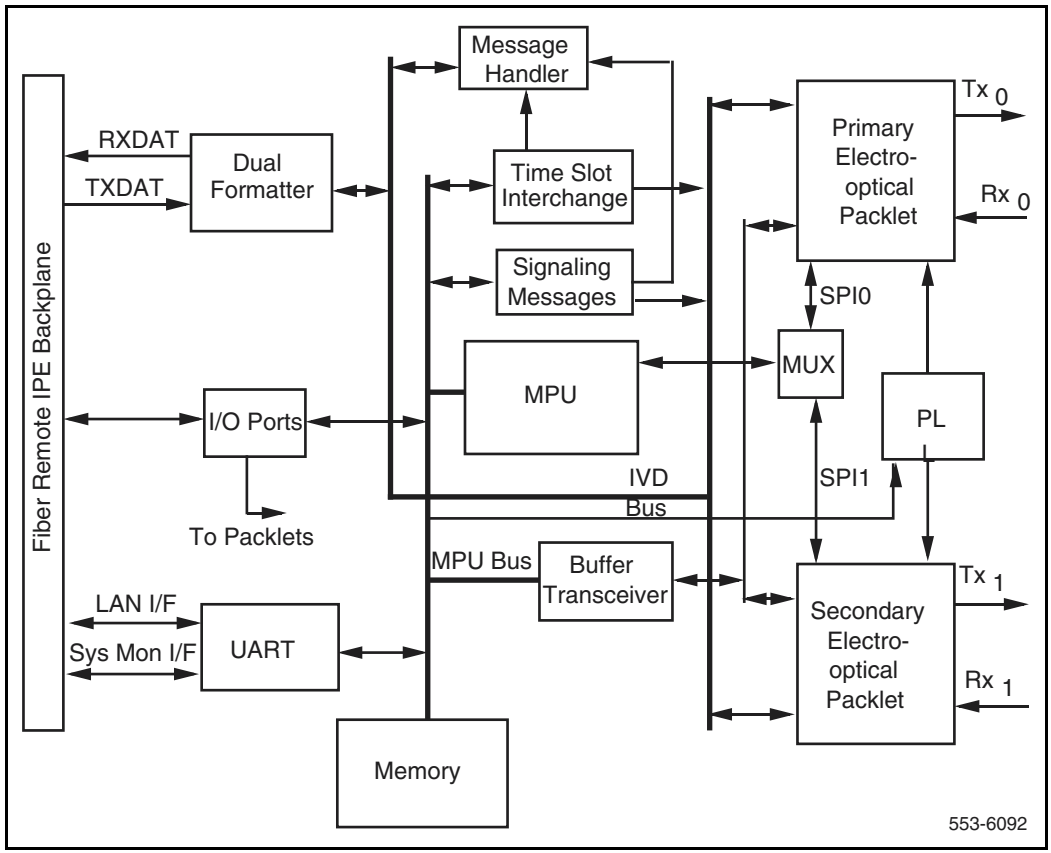
— Provides continuity test and line card polling, enabling, and disabling.

— Provides an interface for system power and alarm monitoring.

— Performs diagnostic self-tests during power-up and when requested by the CPU.

Figure 7 shows the block diagram of the Fiber Peripheral Controller card which illustrates major functional blocks. Functions of these blocks are described below.

Figure 7
Fiber Peripheral Controller card functional block diagram



Micro Processing Unit (MPU)

The MPU coordinates and controls data transfer and the addressing of peripheral devices and communicates with the Fiber Superloop Network card using serial communication channels. In addition, the MPU has a special communication channel used to communicate with the microcontroller on one Electro-optical packlet at a time. The tasks the MPU performs depend on the interrupts it receives. These interrupts are prioritized by the importance of tasks they control.

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

The MPU can be reset by:

— powering up the Fiber Peripheral Controller card

— the watchdog timer

Memory

The Fiber Peripheral Controller memory stores programs and data for the following functions in the following locations:

— Boot code and self-test code are stored in the EPROM.

— Data is stored in the RAM.

— The main MPU function code is stored in the Fiber Peripheral Controller card FLASH memory.

— Data containing the Fiber Peripheral Controller card identification and version is stored in the EEPROM.

Card-LAN interface

To implement the Card-LAN interface, the Fiber Peripheral Controller card uses a dual UART device. One UART channel provides a serial communication interface to IPE cards.

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

— LED control of the IPE card enable/disable

— peripheral card configuration

— peripheral card type and version information

IPE interface

The IPE interface links IPE cards to the Fiber Peripheral Controller MPU using sixteen DS-30X loops, one for each IPE card. It contains the following Fiber Peripheral Controller circuits:

— Dual formatter that transforms serial peripheral loop information into parallel Integrated Voice and Data (IVD) bus information and parallel IVD bus information to serial peripheral loop information.

— Message handler that performs channel associated signaling to and from the IPE cards. It receives signaling information from the IPE cards, and then the MPU accesses this information, interprets it, and sends it to the Fiber Superloop Network in the appropriate format. From the Fiber Superloop Network, the signaling messages are received and interpreted by the Fiber Peripheral Controller MPU and sent to the serial peripheral loops in the appropriate format.

— Timeslot interchange that provides the correspondence between the 120 voice and data timeslots on the fiber-optic link and the 640 timeslots on the IVD bus. The timeslots on the IVD bus correspond directly to the peripheral line card loops.

— Common channel signaling that handles the SSD signaling to and from the Fiber Superloop Network card. It receives signaling packets from Fiber Superloop Network, checks for CRC errors, strips start/stop bits and sends the rest of data to the Fiber Peripheral Controller MPU for processing. It also processes the signaling information in the opposite direction by receiving the messages from the MPU, adds CRC and start/stop bits, and transmits these as SSD messages to the Fiber Superloop Network over the fiber-optic link.

Fiber-optic interface

Two NT1P63 Electro-optical packlets can be installed on each Fiber Peripheral Controller card to provide redundant fiber-optic interfaces. The Fiber Peripheral Controller card can be equipped with only one Electro-optical packlet for a nonredundant link operation. The fiber-optic interface provides a 155.52 Mbps point-to-point transmission facility.

The fiber-optic interface performs the following functions:

— Connects the local system to Remote IPE using a dedicated single mode fiber-optic link.

— Provides a synchronous communication channel between the Fiber Superloop Network card MPU and the Fiber Peripheral Controller card MPU.

— Uses buffers and transceivers to extend the MPU data, address, and control buses to the Electro-optical packlet.

— Uses one or, optionally, two Electro-optical packlets installed on the Fiber Peripheral Controller card to provide redundant fiber-optic links.

— Provides Electro-optical packlet version identification, which is stored in the packlet's EEPROM.

— Monitors transmission quality of the fiber-optic link; if the transmission is degraded or fails, the Fiber Peripheral Controller card automatically transfers to the redundant link, if equipped.

Engineering guidelines

General system engineering guidelines for Large Systems are described in *Large System: Planning and Engineering* (553-3021-120). The following information deals specifically with engineering guidelines for the Fiber Remote IPE planning and implementation. It also describes the fiber-optic interface specifications and fiber-optic link characteristics.

Fiber Remote IPE capacity

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

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

> ***Note:*** System capacity may be affected by the capacity of the Fiber Superloop Network card, which supports only one IPE module instead of the two IPE modules supported by the Superloop Network card.

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

— Floor-standing Remote IPE column

— Wall-mounted Remote IPE cabinet

Floor-standing Fiber Remote IPE

The floor-standing Fiber Remote IPE consists of a pedestal, IPE module, and a top cap. One IPE module supports up to 16 line cards, or 256 ports if each line card has 16 ports. If more ports are required, additional IPE modules can be added to the column. A column contains a maximum of four modules.

Each IPE module requires one Fiber Peripheral Controller card located in the IPE module and a corresponding Fiber Superloop Network card located in a local network card slot.

> ***Note:*** In a standard column, a Superloop Network card can support up to two IPE modules. However, in a system with the Fiber Remote IPE configuration, a Fiber Superloop Network card supports only one Remote IPE module. This is due to the dedicated fiber-optic link configuration between the Fiber Superloop Network card and the Fiber Peripheral Controller card. Since fiber-optic links are dedicated, they cannot be shared between two different IPE modules at the remote site.

Wall-mounted Fiber Remote IPE

The wall-mounted Fiber Remote IPE consists of NT1P70 main and NTAK12 expansion cabinets. The main cabinet supports the Fiber Peripheral Controller card and up to 10 IPE cards or 160 ports. If more ports are required, an expansion cabinet can be installed adjacent to the main cabinet.

These two cabinets are linked with an inter-cabinet cable that plugs into P1 50-pin connectors located at the bottom left-hand corner of each cabinet. This cable extends six peripheral bus DS-30X loops to the first six IPE card slots in the expansion cabinet. One Fiber Peripheral Controller card located in the main cabinet supports cards in both main and expansion cabinets as long as the expansion cabinet contains no more than 6 IPE cards installed in the first six IPE card slots.

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 the local system and the Fiber Remote IPE site

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

— cost and availability

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 Fiber Remote IPE application.

Fiber-optic bandwidth

When using a single-mode fiber, the optical link transmission distance is strictly loss-limited and not dispersion-limited. When using multi-mode fiber, the transmission distance will be loss and dispersion limited. Appropriate calculations must be made to determine the maximum link distance. The data rate over the multi-mode fiber is limited by the optical bandwidth of this multi-mode fiber. The bandwidth is defined as the frequency at which a sinusoidal signal is attenuated by 3 dB relative to a DC signal.

For the Fiber Remote IPE, the bandwidth is defined to be 1310 nanometers. The bandwidth-length product for single-mode is 5 GHz km and for the graded index multi-mode is 800 MHz km.

When you engineer a fiber-optic link, you must make sure that the total signal attenuation between the Fiber Superloop Network and the Fiber Peripheral Controller Electro-optical interfaces does not exceed 13 dB loss.

> ***Note:*** If the fiber-optic link already exists, check the link's characteristics and end-to-end loss to determine if it can support a Fiber Remote IPE and, if it can, at what distance between the local system and the Fiber Remote IPE.

Bandwidth engineering rules

The eye closure due to dispersion must not exceed 0.5 dB to ensure reliable operation of the Electro-optical packlets. Based on this, the normalized bandwidth (B_N) must not be less than 0.71.

The maximum fiber length for a link can be calculated by the following equation, where **L** is the fiber-optic link length, $\mathbf{B_L}$ is the bandwidth-length product, $\mathbf{B_T}$ is the NRZ bit rate of 155.52 MHz, and $\mathbf{B_N}$ is the maximum allowable optical bandwidth of 0.71 when normalized to the above bit rate.

$$L = \frac{B_L}{B_T x B_N}$$

To engineer a multi-mode fiber link, use the following steps:

1 Obtain bandwidth-length product of the fiber from the manufacturers' data sheet.

2 Calculate the maximum link length using the above equation.

3 Measure the eye closure of the fiber. When measured at 155.52 MHz and 1310 nanometers it should be less than 0.5 dB.

4 Measure the attenuation of the fiber link. When measured at 1310 nanometers the attenuation should not exceed 10 dB.

Example: A maximum link length of a multi-mode fiber link with bandwidth-length product of 500NHz km would be:

$$L = \frac{500 MHz km}{155.52 MHz x 0.71} = 4.53 km$$

This multi-mode fiber link should not exceed 4.53 kilometers in length. A 3 dB safety margin should be allowed when engineering a multi-mode link to compensate for additional attenuation as a result of core size variations in fibers. The single-mode fiber core size varies between 8 and 9 microns and the multi-mode fiber core size varies between 50 and 62.5 microns.

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 1 shows the transmit and receive signal power level at the signal source and the signal destination. In the table, for simplicity use **FXNET** for Fiber Superloop Network and **FXPEC** for Fiber Peripheral Controller cards. The receive circuit on the Electro-optical packlet must be able to detect a signal at a level as low as –28 dBm.

Table 1
Fiber-optic transmit and receive signal levels

Signal source	Transmitted power		Received power	
	Min	Max	Min	Max
FXNET Card	–15 dBm	–8 dBm	–28 dBm	–8 dBm
FXPEC Card	–15 dBm	–8 dBm	–28 dBm	–8 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 necessary 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 2 shows an example of different fiber-optic link components and the total signal attenuation for a 10 km link of 11.2 dB.

Table 2
Example of fiber-optic link components and their attenuation factors

Component	Quantity	Attenuation in (dB)	Total attenuation in (dB)
Fiber (10 km)	1	0.6/km	6.0
Splices	10	0.2/splice	2.0
FC/PC Connectors	4	0.8/connector	3.2

Maximum calculated signal attenuation across the link is 12 dB, which allows 1dB safety margin.

> ***Note:*** Actual attenuation must be determined from specific manufacturer's data sheets for each link component.

Fiber-optic cable handling considerations

Fiber-optic cable selection, installation, and routing require special considerations. Splices and connector contacts represent discontinuities that contribute to the attenuation of the signal as it propagates through the link.

Routing the fiber-optic cable must be considered with care. The most critical routing areas are tight spots where the cable must be bent. When bending a cable you must make sure that the minimum bending radius of 1.4 inches (3.5 cm) is not exceeded. If the cable is bent tighter than the minimum radius, the attenuation increases and the cable may break or become damaged.

Before you start routing and splicing fiber-optic cables, read the cable specification sheet and adhere to the specified installation rules.When handling optical fibers, follow the safety recommendations at all times. Keep all connectors capped while the cables are disconnected.

WARNING

When handling optical fibers, follow the recommended safety procedures at all times.

Before you can handle optical fibers, you must take necessary training and become certified in working with fiber-optic cables.

Cable types and their terminations

Single-mode fibers and fiber-optic connectors allow only one path for light to propagate because of the small diameter of the fiber. These are used for high speed transmission and longer transmission distances. Multi-mode fibers and fiber-optic connectors allow more than one mode of propagation for a specific wavelength. These cause dispersion of light and limit the effective bandwidth and distance of communication. For the Fiber Remote IPE, Nortel Networks recommends single-mode fiber-optic cables.

If a multi-mode fiber-optic link already exists, it must be evaluated to determine if it will support the Fiber Remote IPE application and, if it will, at what distance from the local system. The distance of the link can be determined by finding a point of the fiber-optic link where the signal loss is less than 13 dB for a given transmission rate.

To evaluate an existing link, contact your Nortel Networks distributor to learn the method and instrumentation required to test the link's suitability for the Fiber Remote IPE application.

A fiber-optic link may be composed of single-mode or multi-mode fibers, splices, and fiber-optic connectors. In a floor-standing Fiber Remote IPE, the fiber-optic link terminates at the optical I/O panel FC/PC fiber-optic connectors. In a wall-mounted Fiber Remote IPE cabinet, the fiber-optic link terminates at the fiber management frame and continues from the fiber management frame to the Electro-optical packlet FC/PC fiber-optic connectors installed on the Fiber Peripheral Controller card. In both cases, FC/PC fiber-optic connectors have to be installed onto fibers of the link so that the link can be directly connected to the FC/PC fiber-optic connectors of the Fiber Remote IPE.

System planning and ordering

Succession 1000M Large Systems and Meridian 1 Large Systems provide the user with a variety of system sizes and features. To select a system that will best suit your current and future communication needs, you must plan carefully. Contact your Nortel Networks representative or your Nortel Networks distributor to help you plan the system.

If you are installing a new system with Fiber Remote IPE, refer to *Large System: Planning and Engineering* (553-3021-120) for overall system information. To obtain specific planning and ordering information for the fiber-optic link and network and peripheral cards interfacing with this link, follow the information below.

If you have an existing fiber-optic link, you must evaluate it to determine if the link characteristics such as loss, fiber-optic mode, and so on, can support a Fiber Remote IPE. You also must evaluate the distance between the local system and the Fiber Remote IPE—the link loss should not exceed 13 dBs.

System selection

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

If you plan a floor-standing system, you must select the modular column. If you plan a wall-mounted system, you must select the cabinet.

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 Fiber Peripheral Controller card. For a non-blocking condition, the 120 voice/data timeslots will support seven or eight 16-port line cards. Each additional line card in the IPE module or the wall-mounted cabinet increases call blocking under high traffic conditions. Refer to *Large System: Planning and Engineering* (553-3021-120) to calculate traffic.

The system type may also be dictated by the number of ports required at the remote site. The modular column configuration supports 16 line cards and provides a maximum of 256 ports. This column may be expanded by adding a second IPE module to support an additional 256 ports. Each IPE module requires a Fiber Peripheral Controller card at the remote site and a corresponding Fiber Superloop Network card at the local site.

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

The wall-mounted configuration supports 10 line cards. You may want to select the wall-mounted system if your system size requirement is less then ten IPE cards. To expand this type of system beyond ten IPE cards, you must add an expansion cabinet adjacent to the main cabinet and install up to six IPE cards into the first six IPE card slots of the expansion cabinet.

Fiber Remote IPE site planning

When you select a site for your Fiber 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

Fiber Remote IPE equipment conforms to the same environmental requirements as the rest of the system equipment. Temperature, humidity, and altitude for equipment operation should not exceed the specifications shown in Table 3.

Table 3 shows the operating and storage environmental specifications. Ideally equipment should operate in a stable environment at 22° C (72° F); however, the system is designed to operate in the temperature and humidity ranges specified in the table.

Table 3
Environmental requirements

Condition	Environmental specifications
Operating	
Temperature	0° to 60° C (32° to 140° 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

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

Similarly, the wall-mounted cabinet power supply, which is installed in the left-hand side of the cabinet shelf, provides power to the Fiber Peripheral Controller card and up to 10 IPE cards. The expansion cabinet requires its own power supply to provide power to an additional six IPE cards.

Table 4 shows the power supply DC output voltages and the current they supply to the Fiber Superloop Network and Fiber Peripheral Controller cards in a redundant and nonredundant fiber-optic link configuration. It also shows the corresponding total power consumption for each card.

Table 4
FXNET and FXPEC with single and dual Electro-optical packlets power requirements

Voltage source in VDC	Nonredundant link		Redundant link	
	FXNET card	FXPEC card	FXNET card	FXPEC card
+5 V	2100 mA	1700 mA	2300 mA	1900 mA
–4.5 V	650 mA	650 mA	1300 mA	1300 mA
+15 V		50 mA		50 mA
–15 V		50 mA		50 mA
+12 V	50 mA		50 mA	
–12 V	50 mA		50 mA	
Total Power	14.6 W	13 W	20 W	18.5 W

Fiber-optic cable requirements

A fiber-optic link may be composed of single-mode or multi-mode fibers, splices, and fiber-optic connectors. In a floor-standing Fiber Remote IPE, the fiber-optic link terminates the optical I/O panel FC/PC fiber-optic connectors.

In a wall-mounted Fiber Remote IPE cabinet, the fiber-optic link terminates at the fiber management frame. The fiber-optic link continues from the fiber management frame to the Electro-optical packlet, FC/PC fiber-optic connectors installed on the Fiber Peripheral Controller card. In both cases, FC/PC fiber-optic connectors have to be installed onto fibers of the link so that the link can be directly connected to the FC/PC fiber-optic connectors of the Fiber Remote IPE.

> ***Note:*** Single-mode fibers and fiber-optic connectors allow only one path for light to propagate because of the small diameter of the fiber. These are used for high speed transmission and longer distances. Multi-mode fibers and fiber-optic connectors allow more than one mode of propagation for a specific wavelength. These cause dispersion of light and limit the effective bandwidth and distance of communication. For the Fiber Remote IPE, Nortel Networks recommends single-mode fiber-optic cables.

To connect the Electro-optical packlet from the Fiber Superloop Network and Fiber Peripheral Controller card faceplate to the optical I/O panel, two optical patchcords are used. For a redundant configuration, four optical patchcords are used, two for transmit sides and two for receive sides.

Electro-optical equipment planning form—example

Table 5 shows a sample planning form. It lists components required to construct a fiber-optic link.

Table 5
Example of the planning form for a wall-mounted Fiber Remote IPE

Item	Part Number	Quantity at local system	Quantity at Remote IPE
FXNET card		1	
FXPEC card			1
EOI packlet		1 or optionally 2	1 or optionally 2
EOI packlet blank		1 for a non-redundant link	1 for a non-redundant link
I/O panel		1	1
I/O to faceplate cords		2	2
FP/CP connectors		2	2
Fiber-optic cable (if 1 km lengths)			10 (10 km link)
Splicing			

Electro-optical equipment planning form

Enter the part number and the quantity for each item required at the local system, for the fiber-optic link, and at the Fiber Remote IPE.

Table 6
Ordering form

Item	Part Number	Quantity at local system	Quantity at Remote IPE

Software requirements

To configure a system with Fiber Remote superloops in LD 96, you must equip your local system with the REMOTE_IPE package 286.

Equipment installation and configuration

Contents

This section contains information on the following topics:

Introduction

This section describes the installation of the Fiber Remote IPE as an integral part of a Succession 1000M Large System or Meridian 1 Large System. It explains how to prepare the site and check the equipment before installing it.

System overview

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

To install a new system or expand an existing one, refer to *Large System: Installation and Configuration* (553-3021-210) or *Large System: Upgrade Procedures* (553-3021-258).

Adding one or more Fiber Remote IPE sites to a local system is treated as a straightforward system expansion, that is, the system should be fully operational before the Fiber Remote IPE equipment is installed and

connected. This simplifies installation and fault isolation during installation. To complete the installation of a Fiber Remote IPE site, you should perform the preinstallation procedures to prepare the site, install the fiber-optic link, and install and connect the equipment.

Preinstallation procedures include:

— Preparing the site.

— Unpacking and inspecting the equipment.

— Routing and splicing fiber-optic cables to create a fiber-optic link between two sites.

— Connecting the fiber-optic link FC/PC optical connector to the Fiber Remote IPE.

— Taking an inventory of Fiber Remote IPE equipment.

— Selecting the local network slot for the NT1P61 Fiber Superloop Network card.

Installation procedures include:

— Installing the NT1P61 Fiber Superloop Network card in the selected network card slot.

— Installing the NT1P63 Electro-optical packlets into the NT1P61 Fiber Superloop Network card.

— Installing the fiber-optic patchcords between the Fiber Superloop Network faceplate FC/PC optical connectors and the optical I/O panel at the rear of the local module housing the NT1P61 Fiber Superloop Network card.

— Connecting the fiber-optic link FC/PC optical connector to the optical I/O panel at the rear of the local module housing the NT1P61 Fiber Superloop Network card.

— Connecting the master system monitor and TTY terminal cables at the local site.

— Connecting the fiber-optic link to the I/O panel.

— Installing the Fiber Remote IPE column or cabinet.

— Installing the NT1P62 Fiber Peripheral Controller card in Remote IPE module or cabinet controller card slot.

— Installing the NT1P63 Electro-optical packlet(s) on the NT1P62 Fiber Peripheral Controller card.

— Installing the fiber-optic patchcords between the Fiber Peripheral Controller faceplate FC/PC optical connectors and the optical I/O panel at the rear of the module.

— Connecting the slave system monitor and TTY terminal cables at the remote site.

— Connecting the fiber-optic link to the Fiber Remote IPE.

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

— Floor-standing column

— Wall-mounted cabinet

Note: The floor-standing column consists of one IPE module and houses up to 16 IPE cards. The wall-mounted cabinet may consist of only the main cabinet when 10 or fewer IPE cards are required, or the main and expansion cabinets when up to 16 IPE cards are required.

Preinstallation preparation

Preinstallation preparation consists of preparing the site, unpacking and inspecting components, taking inventory, selecting the network slot for the NT1P61 Fiber Superloop Network card, installing the card, installing the fiber-optic link, and preparing the remote site cables, grounding, power source, and the location of the Remote IPE column or cabinets.

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, local and Fiber Remote IPE sites. This information is available in *Large System: Planning and Engineering* (553-3021-120).

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

1 Install and verify the operation of the local system without linking to the Fiber Remote IPE site(s). Refer to *Large System: Installation and Configuration* (553-3021-210).

2 Install the Fiber Remote IPE column. Also refer to *Large System: Installation and Configuration* (553-3021-210), or

Install the cabinet version of Fiber Remote IPE as described in "Installing the wall-mounted cabinet" on page 78.

3 Route and splice the fiber-optic cable between the local site and Fiber Remote IPE site(s) as described in "Connecting the fiber-optic link to the Remote IPE module" on page 77.

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.

— Hold the plug-in cards by their nonconducting edges and keep them in their antistatic bags until you are ready to install them.

— Do not stack the plug-in cards on top of each other.

Taking inventory

After the equipment has been unpacked and visually inspected, verify that all the equipment is at the site before the installation begins. Equipment received

must be checked against the shipping documents. Any shortages must be noted and reported to your sales representative.

Installing the fiber-optic link

If the fiber-optic link already exists, check the fiber-optic link characteristics and the end-to-end loss to determine if the link can support a Fiber Remote IPE and, if it can, at what distance between the local system and the Fiber 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 install the fiber-optic link to the Fiber Remote IPE, the link fibers must be terminated with FC/PC optical connectors at the local site. At the Fiber Remote IPE, the link fibers are also terminated with FC/PC optical connectors for the floor-standing modular system. For the wall-mounted cabinet system, however, the link fibers are terminated into a fiber management frame and continue from the fiber management frame to the Electro-optical packlet FC/PC optical connectors on the Fiber Peripheral Controller faceplate.

When routing the cables to the local column, the floor-standing Fiber Remote IPE column, or wall-mounted Fiber Remote IPE cabinet, take the following precautions:

— Do not bend the fiber-optic cable or individual fibers beyond the minimum bending radius of 1.4 inches (3.5 centimeters).

— Protect the exposed parts of the cable and fibers with plastic conduit.

— Terminate each selected fiber with an FC/PC 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.

Mark each fiber with Tx (transmitting) or Rx (receiving) designator behind the FC/PC optical connector to identify its function in the link.

WARNING

When handling optical fibers, follow the recommended safety procedures at all times.

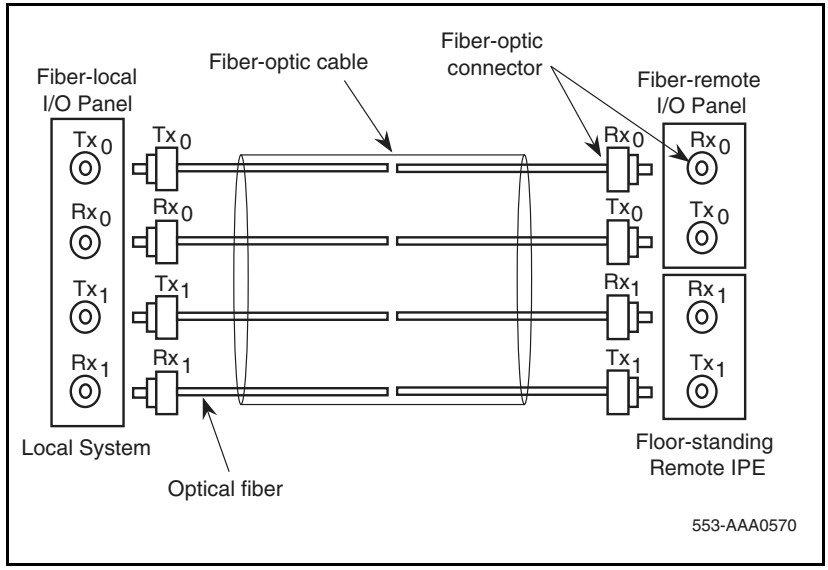
Before you can handle optical fibers, you must take necessary training and become certified in working with fiber-optic cables.

If possible, shut off power to all external transmission equipment so light beams will not be present at the exposed ends of the fiber cables. Keep all connectors capped while the cables are disconnected.

Handle fibers with extreme care. Observe a minimum bending radius of 1.4 inches (3.5 cm) at all times. Optical connections to the optical units should be finger-tightened only.

The link fiber marked Tx_0 at the remote site must be marked Rx_0 at the local site, and the link fiber marked Rx_0 at the remote site must be marked Tx_0 at the local site. For a redundant link, in addition to Tx_0 and Rx_0, Tx_1 at the remote site must be marked Rx_1 at the local site, and Rx_1 at the remote site must be marked Tx_1 at the local site as shown in Figure 8.

Figure 8
Fiber-optic link



Selecting the Fiber Superloop Network card slot

The position of the NT1P61 Fiber Superloop Network card in the local system depends on the system type installed at the local site. The system type determines what type of module will house the card.

Table 7 lists modules that provide network card slots, the system options where these modules are used, and card slots where network cards can be housed.

Table 7
Modules supporting a Fiber Superloop Network card

Modules	System	Network card slot
NT4N41 Core/Network module	Meridian 1 Option 61C CP PII, Meridian 1 Option 81C CP PII, Succession 1000M Single Group, Succession 1000M Multi Group	Card slots 0–7
NT5D21 Core/Network module	Meridian 1 Option 51C, Meridian 1 Option 61C, Meridian 1 Option 81C, Succession 1000M Single Group, Succession 1000M Multi Group	Card slots 0–7
NT8D35 Network module	Meridian 1 Option 81, Meridian 1 Option 81C, Meridian 1 Option 81C CP PII, Succession 1000M Multi Group,	Card slots 5–12
NT9D11 Core/Network module	Meridian 1 Option 61C, Succession 1000M Single Group	Card slots 0–7
NT6D39 CPU/Network module	Meridian 1 Option 51, Meridian 1 Option 61	Card slots 1–8

Network card slots in modules listed in Table 7 house other network-type cards that contend with the NT1P61 Fiber Superloop Network card for space in the module. If one or more network card slots are empty, where to install the NT1P61 Fiber Superloop Network card is determined as follows:

1 Check all network cards in the module and see if there are any NT8D04 Superloop Network cards.

2 If no NT8D04 Superloop Network cards are installed, you can use any empty network card slot to install an NT1P61 Fiber Superloop Network card.

3 If the module contains one or more NT8D04 Superloop Network cards, you must install the NT1P61 Fiber Superloop Network card at least one network card slot away from the NT8D04 Superloop Network card. Otherwise, refer to *Large System: Planning and Engineering* (553-3021-120) for a detailed explanation of where to install the NT1P61 Fiber Superloop Network card when only slots adjacent to NT8D04 Superloop Network cards are available.

Note: Each network card slot supports two network loops. Although an NT8D04 Superloop Network card physically occupies only one card slot, it nevertheless occupies four network loops. That means that two network loops of an adjacent network card slot are also occupied by the NT8D04 Superloop Network card. Therefore, only a network card not requiring network loop access can be installed in the empty card slot whose network loops are being used by the NT8D04 Superloop Network card.

Fiber-optic equipment installation

To complete the installation of the fiber-optic interface that links the local system to the Fiber Remote IPE equipment, you must:

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

— Identify the network card slot and install the NT1P61 Fiber Superloop Network card in the local system.

— Install the NT1P75 fiber-optic patchcords.

— Connect the fiber-optic link to the optical I/O panel.

Installing and verifying system operation

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

If a new system is configured with Fiber Remote IPE facilities, the system will normally be assembled at the factory with cards already installed and NT1P75 fiber-optic patchcords connected between the NT1P61 Fiber Superloop Network card faceplate and the optical I/O panel at the rear of the module housing this card. All you would have to do is connect the fiber-optic link to the local system and the Fiber Remote IPE optical I/O panels to complete the link. However, if the card is not installed, follow the steps on page 60.

Installing the Fiber 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 system, the cards would have been installed in a network card slot at the factory; however, you may have to install additional NT1P61 Fiber Superloop Network cards to expand the number of remote sites or replace a defective card.

NT1P63 Electro-optical packlets, which are installed on the NT1P61 Fiber Superloop Network card, are normally installed in the factory, however, you may have to install an additional NT1P63 Electro-optical packlet on the NT1P61 Fiber Superloop Network card when you want to make a single fiber-optic link into a redundant link. The packlet and the card can be installed when the system is powered up and running.

To install these cards:

1 Set the ENB/DIS switch on the Fiber Superloop Network card to DIS.

2 Pull the NT1P61 Fiber Superloop Network card's upper locking device away from the faceplate and press the lower locking device downwards. 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 locking device lever towards the faceplate and the lower locking device upwards to insert the card connector into the backplane connector and lock the card in place.

5 If not already installed, install the NT1P63 Electro-optical packlet(s) onto the NT1P61 Fiber Superloop Network card by inserting the NT1P63 Electro-optical packlet, connector first, through the NT1P61 Fiber Superloop Network card faceplate opening and plugging it into the connector on the NT1P61 Fiber Superloop Network card. For consistency, install the NT1P63 Electro-optical packlet into the top connector location if only one NT1P63 Electro-optical packlet is required (for nonredundant link operation). Install the blank packlet into the bottom connector location. For a redundant link, install both NT1P63 Electro-optical packlets.

6 Install the optical I/O patch-panel, which is a part of the NT1P76AA cable assembly, in the empty connector slot of the module's I/O panel by screwing its top and the bottom screws into the slot screw holes on the I/O panel. Use one connector slot for the FC/PC optical connectors that link the NT1P61 Fiber Superloop Network card and the NT1P63 Electro-optical packlets to the fiber-optic link, as shown in Figure 9 on page 63.

7 Use another empty connector slot in the I/O panel for the System Monitor/TTY ports I/O patch-panel, also part of the NT1P76AA cable assembly, as shown in Figure 10 on page 65. Screw the top and the bottom screws of the cable's connector bracket into the connector slot screw holes on the I/O panel.

8 Set the ENB/DIS switch on the Fiber 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 fiber-optic patchcords

NT1P75 fiber-optic patchcords connect NT1P63 Electro-optical packlets to fiber-optic connectors on the I/O panel at the rear of the network module housing the NT1P61 Fiber Superloop Network card. Figure 9 illustrates NT1P63 Electro-optical packlet FC/PC fiber-optic connectors on the NT1P61 Fiber Superloop Network card and the I/O panel at the rear of the module. To install patchcords:

1. Carefully push each patchcord through the cable channel from the front of the module to the back. For a single fiber-optic link, use one patchcord that contains two fibers, one for the receive side and one for the transmit side. For a redundant link, you need two patchcords. When handling fiber-optic cables, do not bend them more than their minimum allowed bending radius of 1.4 inches (3.5 cm).

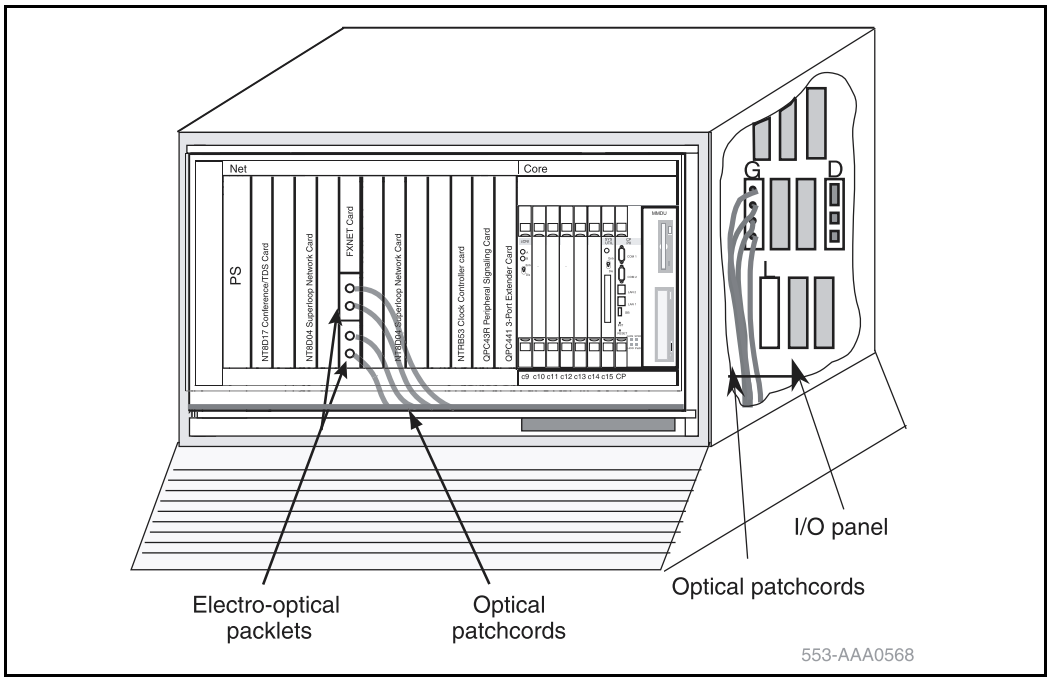
2. Install the optical I/O patch-panel in the empty connector slot of the module's I/O panel. Find an empty connector slot that matches the size of the patch-panel bracket and use two screws and two washers to install it on the I/O panel. The optical I/O patch-panel can contain up to four FC/PC fiber-optic connectors, which are used for a redundant link configuration.

3. Plug the NT1P75 fiber-optic patchcord FC/PC optical connectors into the appropriate NT1P63 Electro-optical packlet FC/PC optical connectors on the NT1P61 Fiber Superloop Network card faceplate. The receive (Rx) is the top connector on each packlet and transmit (Tx) is the bottom connector.

4. Plug the other NT1P75 fiber-optic patchcord FC/PC optical connectors into connectors at the optical I/O patch-panel at the rear of the module. Use Tx and Rx designators to identify transmit and receive patchcord connectors. Repeat this step for all patchcords.

Figure 9 shows the Core/Net module of a Meridian 1 Option 81C CP PII with the NT1P61 Fiber Superloop Network card and patchcords installed.

Figure 9
Fiber Superloop Network card patchcord connections in Meridian 1 Option 81C CP PII



Installing system monitor and TTY cables

The system monitor cable is normally installed in the factory and does not have to be installed at the site. The cable that has to be installed at the site is the cable connecting the terminal or TTY to the RJ45 connector on the I/O panel located at the rear of the module that contains the NT1P61 Fiber Superloop Network card.

Refer to Figure 10 on page 65 to see the I/O panel and the top connector. The top connector is used to connect the terminal or TTY to the Fiber Superloop Network card when the MMI port is in the MMI mode, or to connect the Fiber Superloop Network card to an SDI port when the MMI port is in the SL-1 mode.

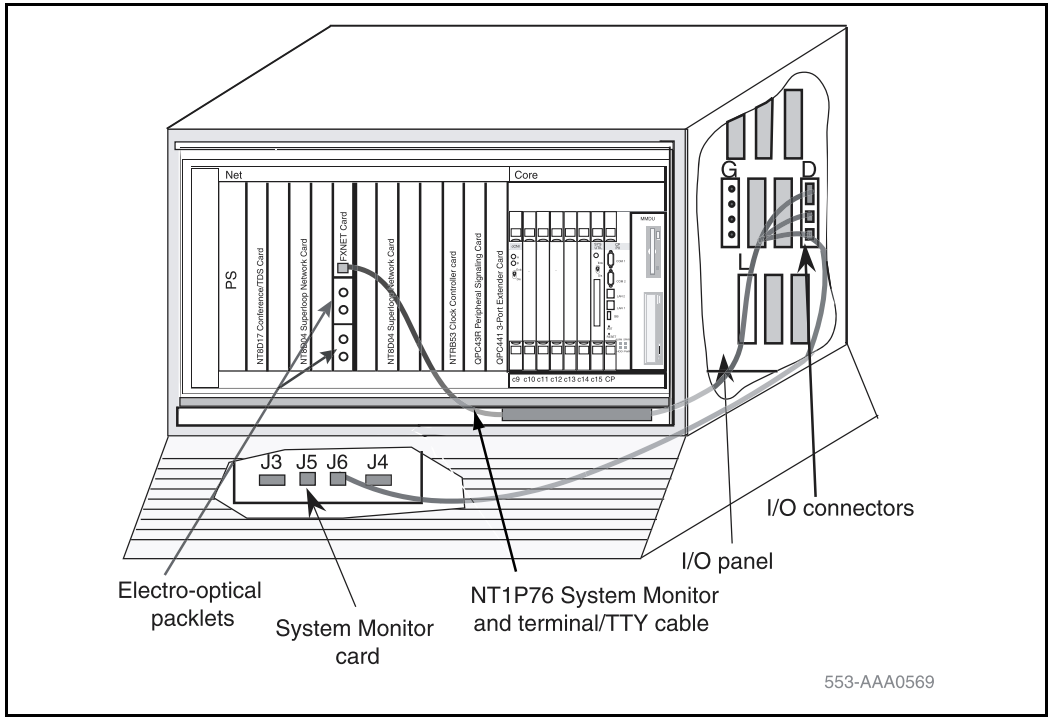
> ***Note:*** To connect the Fiber Superloop Network card to an SDI port of the SDI cards such as NTND02BA, QPC841C, or QPC139B, you must connect the RJ45 connector on the I/O panel to the RS-232 port on the front panel of the SDI card. The cable must be a null modem type with pin 2 (TD) and pin 3 (RD) swapped and provide DSR and CTS pins high (+12 V). To connect to an NT8D41AA SDI Paddle Board to the Fiber Superloop Network card, use NT8D84 AA and NT8D93AJ cables between the SDI port and the I/O panel at the rear of the module. For switch setting on individual SDI cards, refer to *Circuit Card: Description and Installation* (553-3001-211).

In the local column, the pedestal contains a master system monitor that monitors system alarms. Alarms from a Fiber Remote IPE site are reported over the fiber-optic link and the NT1P61 Fiber Superloop Network card to the master system monitor and from there to the CPU. The CPU sends alarm messages to the system terminal or TTY identifying the problem.

Figure 10 shows NT1P61 Fiber Superloop Network card connections to the I/O panel to provide an MMI, a slave system monitor, and master system monitor port.

Figure 10 also shows the connection between the system monitor card and the master monitor port on the I/O panel.

Figure 10
System monitor and TTY cable connections



To connect the NT1P61 Fiber Superloop Network card to the system monitor in the pedestal, to the slave system monitor in an adjacent column, and to the terminal or TTY:

1 Plug the 15-pin D-type connector at the one end of the NT1P76AA cable into the 15-pin D-type connector located on the faceplate of the NT1P61 Fiber Superloop Network card.

2 Route the other end of the cable through the cable channel to the I/O panel at the back of the module with the NT1P61 Fiber Superloop Network card.

3 Install the electrical I/O patch-panel into an empty I/O panel connector slot by screwing the top and bottom screws of the cable connector bracket to the connector slot on the I/O panel. The electrical I/O patch-panel (bracket) is part of the NT1P76AA cable.

4 Plug the RJ11 connector at one end of the cable into the RJ11 receptacle on the I/O panel to provide an RS422 interface to the system monitor.

5 Plug the other end of the cable RJ11 connector into J6 receptacle on the system monitor in the pedestal.

6 Connect an RJ11 cable between the second RJ11 receptacle on the I/O panel and daisy-chain the I/O patch-panel connectors to other Fiber Superloop Network cards as shown in Figure 9 on page 63, if required.

7 Plug the RJ45 connector at the one end of the A0361365 terminal cable into an empty connector slot on the I/O panel.

8 Plug the other end of the A0361365 terminal cable into the RJ45/RS232 adapter, and then plug this adapter into the terminal or TTY RS232 connector. An RJ45 to DB25 adapter can be used to connect a terminal that has a DB25 type connector for its RS232 interface.

9 If a Fiber Superloop Network card is connected to an SDI card, connect a null modem cable (DB-25 male to DB-25 female with DSR and CTS pulled high +12 volts) to the SDI port in the module. Refer to *Circuit Card: Description and Installation* (553-3001-211) for switch setting for the specific SDI card.

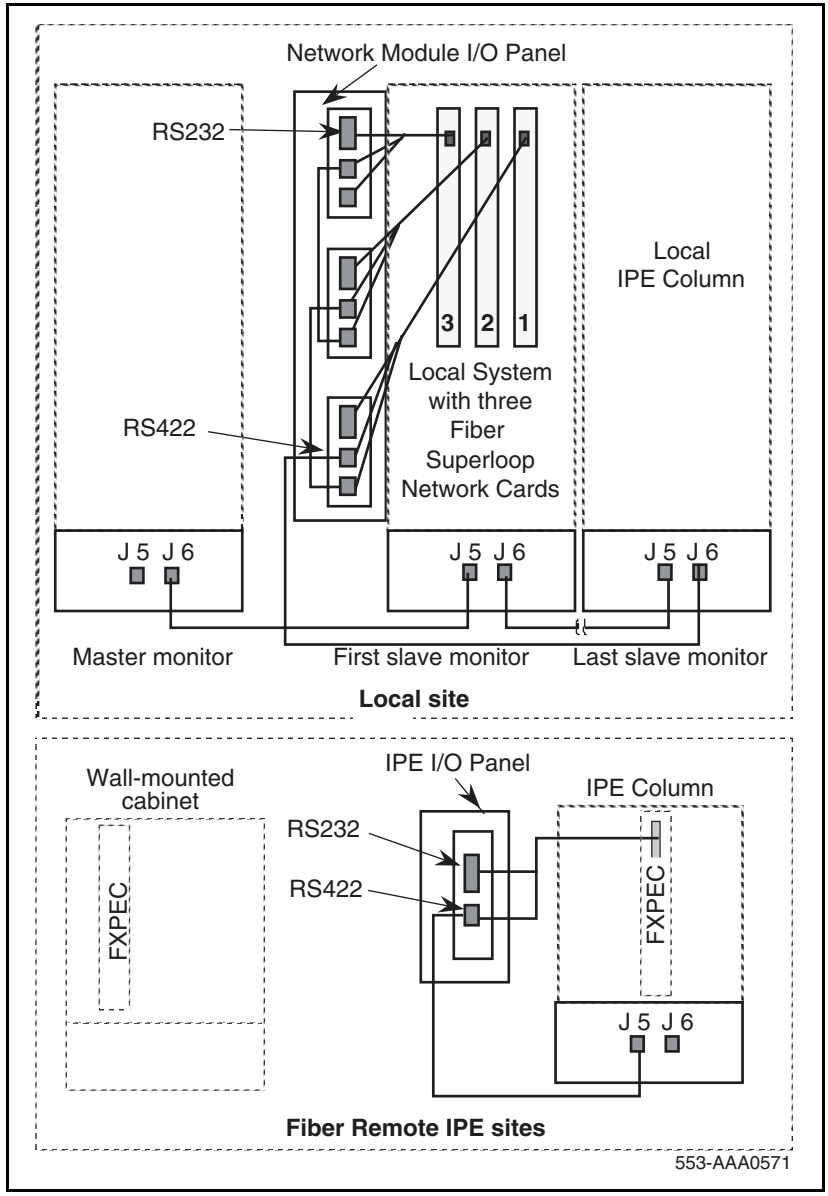
10 Plug the other end of the null modem cable into a DB-9 to DB-25 adapter and plug the DB-9 adapter connector into the DB-9 connector on the I/O patch-panel.

Figure 11 shows local columns and three NT1P61 Fiber Superloop Network cards that support three remote sites. Cable connected to the NT1P61 Fiber Superloop Network card faceplate connector provides an RS232 SDI/MMI port and two RS422 system monitor ports. Figure 11 also shows system monitor connections between multiple Fiber Superloop Network cards and the master system monitor residing in the pedestal. It shows the connection between the master and slave system monitors when multiple adjacent columns exist. At the remote site, the system monitor connects only to the module on top of the pedestal, as shown in the figure.

From Fiber Superloop Network #1, you can extend an RJ11 cable to the lowest slave system monitor J6 connector in the pedestal. This connection makes the three Fiber Superloop Network cards the lowest slave system monitors in the chain where Fiber Superloop Network card #3 is the lowest.

The Fiber Remote IPE alarms are received over the link and through the Fiber Superloop Network cards to the system monitor J6 connector.

Figure 11
System monitor connections at the local site and the Fiber Remote IPE



Connecting the fiber-optic link to the local system

Each required fiber of the fiber-optic cable, at each end of the link, must be terminated with an FC/PC optical connector. This connector plugs into the FC/PC optical connector on the I/O panel.

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.

To connect the link to the network optical I/O panel at the local system site:

1 Identify the link FC/PC optical connector marked Tx_0 and Rx_0 for a single link, or marked Tx_0, Rx_0, Tx_1, and Rx_1 for a redundant link.

2 Identify the transmit and receive connectors on the optical I/O panel (bracket) installed in an empty network I/O panel connector slot at the local site.

3 Plug the link FC/PC optical connector marked Tx_0 into the I/O panel FC/PC optical connector marked Tx_0.

4 Plug the link FC/PC optical connector marked Rx_0 into the I/O panel FC/PC optical connector marked Rx_0.

5 Repeat steps 3 and 4 for the Tx_1 and Rx_1 if you have a redundant link.

Floor-standing column Fiber Remote IPE installation

To complete the installation of floor-standing Fiber Remote IPE equipment, you must:

— Install the floor-standing column.

— Install the cards in the IPE module.

— Install the NT1P75 fiber-optic patchcords.

— Connect the fiber-optic link to the optical I/O panel.

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

Installing the floor-standing column

The column is normally assembled in the factory with cards already installed and NT1P75 fiber-optic patchcords connected between the NT1P62 Fiber Peripheral Controller card faceplate and the optical I/O panel at the rear of the IPE module.

If the column is not assembled in the factory, to install the modular column (floor-standing column) at the remote site, follow the instructions in *Large System: Installation and Configuration* (553-3021-210). It describes how to install the pedestal, the IPE module, and the top cap and how to connect the power, the internal and external communication cables, and subscriber loops.

To install the PFTU to the floor-standing Fiber Remote IPE, follow the instructions in *Large System: Installation and Configuration* (553-3021-210).

Installing cards in the Remote IPE module

The purpose of the following steps is to instruct you how and where to install the cards in the Remote IPE module. Even though the cards might have been shipped installed from the factory, we provide step-by-step instructions for card installation, which should be followed when additional IPE cards are installed or defective cards are replaced.

NT1P63 Electro-optical packlets, which are installed on the NT1P62 Fiber Peripheral Controller card, are normally installed in the factory; however, you may have to install an additional NT1P63 Electro-optical packlet onto the NT1P62 Fiber Peripheral Controller card when you want to make a single fiber-optic link into a redundant link.

To install these cards:

1 Pull the NT1P62 Fiber Peripheral Controller card's upper locking device away from the faceplate and press the lower locking device downwards. Which holding the card by these locking devices, insert it into the card guides into the Controller slot left-hand card guide, which is located immediately to the right of slot 7.

2 Slide the card into the cabinet until it engages the backplane connector.

3 Push the upper locking device lever towards the faceplate and the lower locking device upwards to insert the card connector into the backplane connector and lock the card in place.

4 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.

5 Install the NT1P63 Electro-optical packlet onto the NT1P62 Fiber Peripheral Controller card by inserting the NT1P63 Electro-optical packlet, connector first, through the NT1P62 Fiber Peripheral Controller card faceplate opening and plugging it into the connector on the NT1P62 Fiber Peripheral Controller card. For consistency, install the NT1P63 Electro-optical packlet into the top connector if only one Electro-optical packlet is required (for single link operation). Install a blank packlet in place of the second NT1P63 Electro-optical packlet.

6 Install IPE cards in slots 0 through 7 and 8 through 15 by pulling the card locking devices away from the faceplate and inserting the cards into the card guides of an IPE card slot.

7 Slide the card into the module until it engages the backplane connector, and then push the locking device levers towards the faceplate to insert the card connector into the backplane connector and lock the card in place.

8 Repeat steps 6 and 7 for each IPE card.

9 Remove the back panel to access the I/O panel connector slots.

10 Install the optical I/O patch-panel in the empty connector slots of the IPE module's I/O panel by using two screws and two washers for each connector. Use connector slots J2 and J3 for the FC/PC optical connectors that link the NT1P62 Fiber Peripheral Controller card and NT1P63 Electro-optical packlets, using patchcords, to the fiber-optic link, as shown in Figure 12 on page 73. Use the empty J4 and J5 connector slots in the I/O Panel for the System Monitor and TTY I/O patch-panels, as shown in Figure 13 on page 75.

Installing fiber-optic patchcords

NT1P75 fiber-optic patchcords connect NT1P63 Electro-optical packlets to FC/PC fiber-optic connectors on the I/O panel at the rear of the IPE module. Figure 12 illustrates NT1P63 Electro-optical packlets FC/PC fiber-optic connectors and FC/PC fiber-optic connectors on the I/O panel at the rear of the module. To install the patchcords:

1 Carefully push each NT1P75 fiber-optic patchcord through the cable channel from the front of the module to the back. For a single fiber-optic link, use one patchcord that contains two fibers, one for the receive side and one for the transmit side. For a redundant link you need two patchcords. When handling fiber-optic cables, do not bend them more than their minimum allowed bending radius of 1.4 inches (3.5 cm).

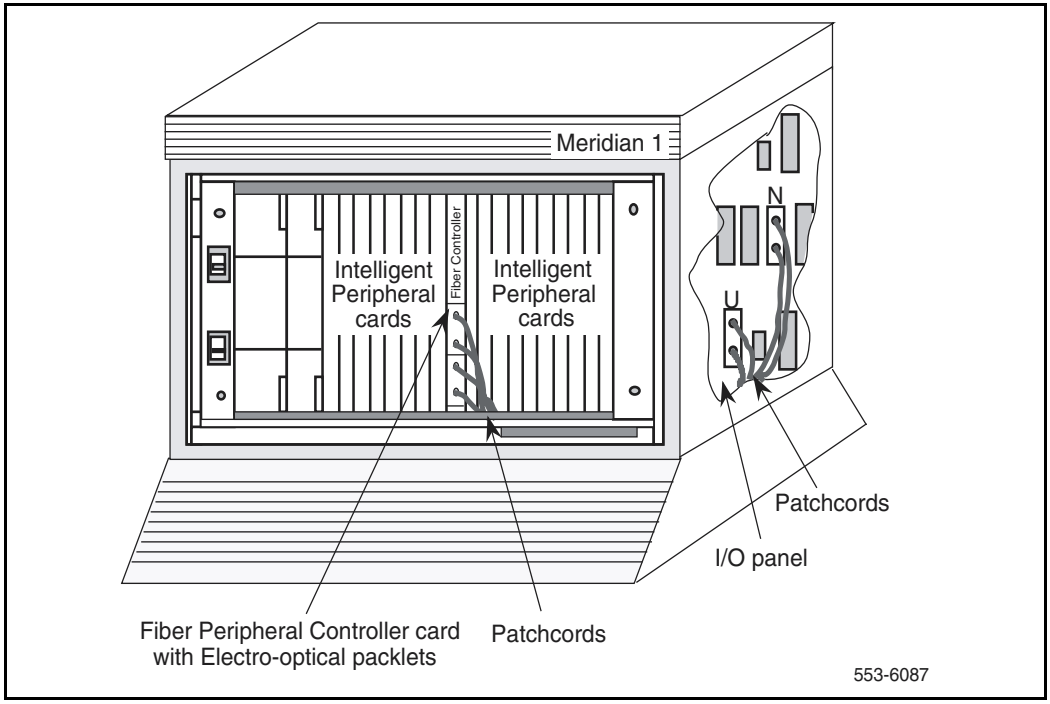
2 Plug NT1P75 fiber-optic patchcord FC/PC optical connectors into the appropriate NT1P63 Electro-optical packlet FC/PC optical connectors on the NT1P62 Fiber Peripheral Controller faceplate.

3 Plug the other NT1P75 fiber-optic patchcord FC/PC optical connectors to the FC/PC fiber-optic connectors on the I/O panel.

4 Repeat steps 2 and 3 for all patchcords.

Figure 12 shows the Fiber Remote IPE module with IPE cards and the NT1P62 Fiber Peripheral Controller card already installed. It also shows the NT1P75 fiber-optic patchcords routing from the NT1P62 Fiber Peripheral Controller card faceplate to the module's FC/PC optical connectors on the I/O panel.

Figure 12
Patchcord connections on the IPE module



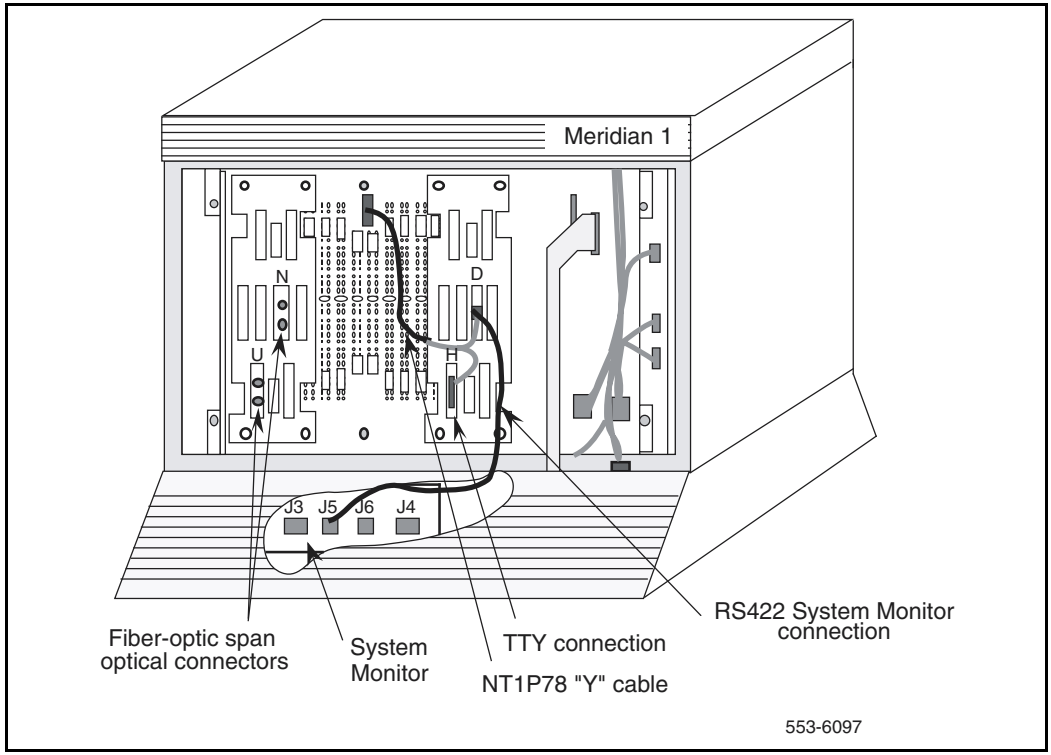
Installing system monitor and TTY cables

The system monitor cable is normally installed in the factory and does not have to be installed at the site. The cable that has to be installed at the site is the cable connecting the terminal or TTY to the 9-pin D-type connector on the IPE module I/O panel (the MMI port).

In the remote floor-standing column, the pedestal contains a slave system monitor used to monitor Fiber Remote IPE system alarms. These alarms are reported over the fiber-optic link and through the NT1P61 Fiber Superloop Network card to the master system monitor and from there to the CPU. The CPU sends alarm messages to the system terminal or TTY identifying the problem.

These alarms are also displayed or printed on the remote site terminal or TTY. Figure 13 shows the system monitor and TTY cable connections for a floor-standing column.

Figure 13
System monitor and TTY cable connections



To connect the NT1P62 Fiber Peripheral Controller card to the terminal or TTY and the slave system monitor in the pedestal; you must follow these steps to install NT1P78AA Y cable between the backplane and the I/O panel:

1 Plug the NT1P78AA cable 24-pin connector into the 24-pin connector (SL0 position) located at the top center of the backplane behind the NT1P62 Fiber Peripheral Controller card.

2 Install the NT1P78AA I/O D-type patch-panel into the empty connector slot of the IPE module I/O panel.

3 Install the NT1P78AA cable RJ11 I/O patch-panel on the empty connector slot of the IPE module I/O panel.

4 Plug the RJ11 connector at one end of the cable into the RJ11 receptacle on the IPE module I/O panel. This cable provides an RS422 interface to the system monitor.

5 Plug the other end of the cable RJ11 connector into the J6 receptacle on the system monitor in the pedestal. Refer to Figure 11 on page 68 for connecting system monitoring cables for a column with the IPE module.

6 Check the NT8D22 System Monitor factory switch settings for the slave system monitor. Refer to *Option settings, Circuit Card: Description and Installation* (553-3001-211).

7 Plug the NTAK1108 9-pin D-type connector into the 9-pin D-type connector on the IPE module I/O panel.

8 Plug the other end of the NTAK1108 cable into the terminal or TTY RS232 connector.

Connecting the fiber-optic link to the Remote IPE module

The fiber-optic link connects the optical I/O panel connector at the rear of the Remote IPE module to the optical I/O panel at the rear of the module housing the NT1P61 Fiber Superloop Network card in the local system. The routing and splicing of fiber-optic cables along the link should have been completed before the Fiber Remote IPE site installation.

Each fiber of the fiber-optic cable, at each end of the link, must be terminated with an FC/PC optical connector. This connector plugs into the FC/PC optical connector on the I/O panel.

For a single link, you need to connect only two fibers at the end of the cable, one for the transmit side and one for the receive side. For a redundant link, four fibers must be connected.

To connect the link to the Remote IPE I/O panel:

1 Identify one link fiber as Tx_0 and another as Rx_0 for a single link, or identify four fibers as Tx_0, Rx_0, Tx_1, and Rx_1 respectively for a redundant link.

2 Identify the transmit and receive connectors on the optical I/O panel at the rear of the Remote IPE module.

3 Plug the link FC/PC optical connector marked Tx_0 into the I/O panel FC/PC optical connector marked Tx_0.

4 Plug the link FC/PC optical connector marked Rx_0 into the I/O panel FC/PC optical connector marked Rx_0.

5 Repeat steps 3 and 4 for the Tx_1 and Rx_1 if you have a redundant link.

Wall-mounted Fiber Remote IPE installation

To complete the installation of wall-mounted Fiber Remote IPE equipment, you must:

— Install the wall-mounted cabinet.

— Install the cards in the cabinet.

— Connect the fiber-optic link to the fiber management frame and the Fiber Peripheral Controller card.

Installing the wall-mounted cabinet

To install NT1P70 main and NTAK12 expansion wall-mounted cabinets that house the Fiber Remote IPE, follow the instructions below.

The NT1P70 main wall-mounted cabinet is shipped from the factory completely installed, that is, all IPE cards and the NT1P62 Fiber Peripheral Controller card are already installed. The power supply is shipped separately. The NTAK12 expansion cabinet is optional and is ordered only if you require more than 10 IPE cards at the remote site.

To install wall-mounted Remote IPE cabinets, locate and prepare the wall area, install cabinets, connect the ground wires, and connect the power. When selecting the wall area for the cabinet installation, make sure you provide for convenient fiber-optic and subscriber loop cable routing.

To complete these tasks, follow the steps below:

1 Unpack and inspect the cabinet.

2 Level and install the mounting bracket on the wall as shown in Figure 14 on page 80. If you are installing the expansion cabinet next to the main cabinet, line up the two brackets and use the provided spacer between brackets.

3 Remove the front cover and all cards from the cabinet to make the cabinet lighter and to prevent card damage in case the cabinet drops when being installed on the wall.

4 Position the cabinet over the mounting bracket so that the bracket hook engages the slot at the rear of the cabinet. The slot is located at the top center of the cabinet as shown in Figure 14.

5 Bolt the cabinet down by using two wood screws at the lower front of the cabinet. See Figure 14 for the location of the screw holes.

6 Install the 6 AWG copper ground wire between the approved building ground and the ground lug at the bottom of the cabinet.

7 Repeat steps 3 through 6 for the expansion cabinet, if required.

Figure 14 shows the Fiber Remote IPE cabinet with the mounting bracket and the mounting holes. It also shows the ground lug for ground connection.

8 Install the power supply in slot 0 in the NT1P70 main cabinet shelf and turn the power switch to OFF.

9 At the building ground end of the wire, use two fastening clamps to connect the wire to the building ground, insulate the connection with electric tape, and post a DO NOT DISCONNECT tag.

10 Measure the ground resistance between the ground lug at the bottom of the NT1P70 main cabinet and the ground prong on the cabinet power cord. It should measure 0 Ohms. If the resistance is greater then 0 Ohms, check the ground terminal on the power supply power connector continuity to the cabinet chassis.

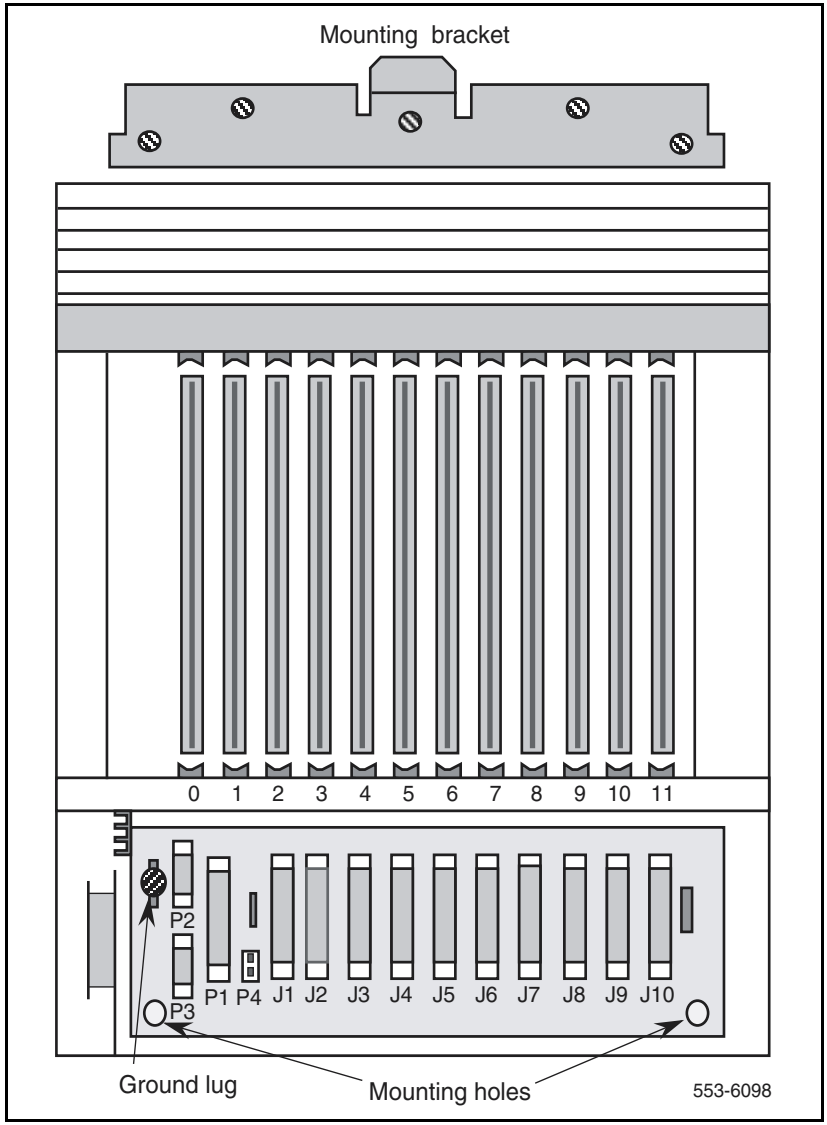
11 Connect the power cord from the IPE shelf power supply to the commercial AC power outlet for an AC system. For a DC system, connect the IPE shelf power converter cord to the DC power source.

12 Disconnect the building ground wire from the ground lug on the NT1P70 main cabinet and measure the resistance between the tip of the disconnected ground wire and the ground lug on the cabinet. If the resistance is more than 5 Ohms, check the building ground and the ground terminal at the AC wall outlet where the cabinet power cord is connected.

13 Disconnect the power cord from the wall outlet for the AC system or the DC power source for the DC system and reconnect the 6 AWG ground wire to the cabinet ground lug.

14 Reconnect the supply power cord to the AC power outlet for an AC system or to the DC source for a DC system.

Figure 14
Fiber Remote IPE cabinet



15 If the Fiber Remote IPE requires an expansion cabinet to accommodate up to 16 IPE cards, repeat steps 1 through 14 for the NTAK12 expansion cabinet.

16 Connect the NT1P70 main cabinet to the NTAK12 expansion cabinet by installing the cable between connector P1 of the main cabinet and P1 of the expansion cabinet.

This completes the cabinet installation and system ground test. You can now install the plug-in cards.

Installing cards in the wall-mounted cabinet

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

NT1P63 Electro-optical packlets, which are installed on the NT1P62 Fiber Peripheral Controller card, are normally installed in the factory; however, you may have to install an additional NT1P63 Electro-optical packlet on the NT1P62 Fiber Peripheral Controller card when you want to make a single fiber-optic link into a redundant link.

To install these cards:

1 Pull the NT1P62 Fiber Peripheral Controller card's locking devices away from the faceplate. While holding the card by these devices, insert the card into the card guides in slot 1. Refer to Figure 16 on page 85 for card positions in the shelf.

2 Slide the card into the cabinet until it engages the backplane connector, and then push the locking device levers towards the faceplate to insert the card connector into the backplane connector and lock the card in place.

3 If not already installed, install the NT1P63 Electro-optical packlet on the NT1P62 Fiber Peripheral Controller card by inserting the NT1P63 Electro-optical packlet, connector first, through the NT1P62 Fiber Peripheral Controller card faceplate opening and plugging it into the connector on the NT1P62 Fiber Peripheral Controller card. If only one NT1P63 Electro-optical packlet is required (for single link operation), for consistency, insert the NT1P63 Electro-optical packlet into the top connector and install the blank packlet into the bottom connector.

4 Install IPE cards in slots 2 through 11 by pulling the card locking devices away from the faceplate and inserting the cards into the card guides, engaging the backplane connector, and locking the card in place by pressing the locking devices against the card faceplate.

Connecting fiber-optic link to the wall-mounted cabinet

In the wall-mounted cabinet configuration, the fiber-optic link connects to the fiber management frame located within 100 feet of the cabinet. From the fiber management frame, the optical cable is routed to the cabinet and connected directly to the NT1P63 Electro-optical packlet FC/PC optical connectors located on the NT1P62 Fiber Peripheral Controller card faceplate. Figure 15 shows a fiber-optic link connected to the NT1P63 Electro-optical packlets.

To connect the link:

1 Install optical connectors on the link fibers and connect the link to the fiber management frame optical connectors.

2 Install the optical connectors at the end of each fiber of the NT1P79 optical cable, and insert each connector into the fiber management frame connector where the corresponding link fiber is connected. Repeat this for each NT1P79 optical cable coming from the wall-mounted Fiber Remote IPE cabinet.

3 At the Remote IPE cabinet, carefully push the cable end(s) through the protective tubing to guide, support, and protect the cable under the cabinet, as shown in Figure 15.

Note: When handling fiber-optic cables, do not bend them more than their minimum allowed bending radius of 1.4 inches (3.5 cm).

4 Wrap each cable around a plastic drum located at the bottom left-hand side of the cabinet as viewed from the front. Extend it through the hole at the bottom of the cabinet as shown in Figure 15. For a redundant link, repeat this step for the second cable.

5 At the wall-mounted cabinet, plug the fiber-optic cable with FC/PC optical connectors at one end (as supplied with the cabinet) into the Fiber Peripheral Controller card Electro-optical packlet(s) in the cabinet.

- Identify the transmit and receive FC/PC optical connectors on the cable and the transmit and receive FC/PC optical connectors on the NT1P62 Fiber Peripheral Controller faceplate.
- Plug the cable FC/PC optical connector marked Tx_0 into the lower FC/PC fiber-optic connector on the Electro-optical packlet marked Tx_0 located on the Fiber Peripheral Controller faceplate.
- Plug the link's FC/PC optical connector marked Rx_0 into the upper FC/PC fiber-optic connector on the Electro-optical packlet marked Rx_0 located on the Fiber Peripheral Controller faceplate.
- Repeat the previous two steps for the link's FC/PC optical connectors Tx_1 and $Rx_{1,}$ for a redundant link.

Figure 15 shows the tube that protects the fiber-optic link cable from damage. It also shows the routing of the fiber-optic link to the FC/PC optical connectors on the NT1P63 Electro-optical packlets installed in the NT1P62 Fiber Peripheral Controller card.

Figure 15
Optical cable routing for the wall-mounted cabinet

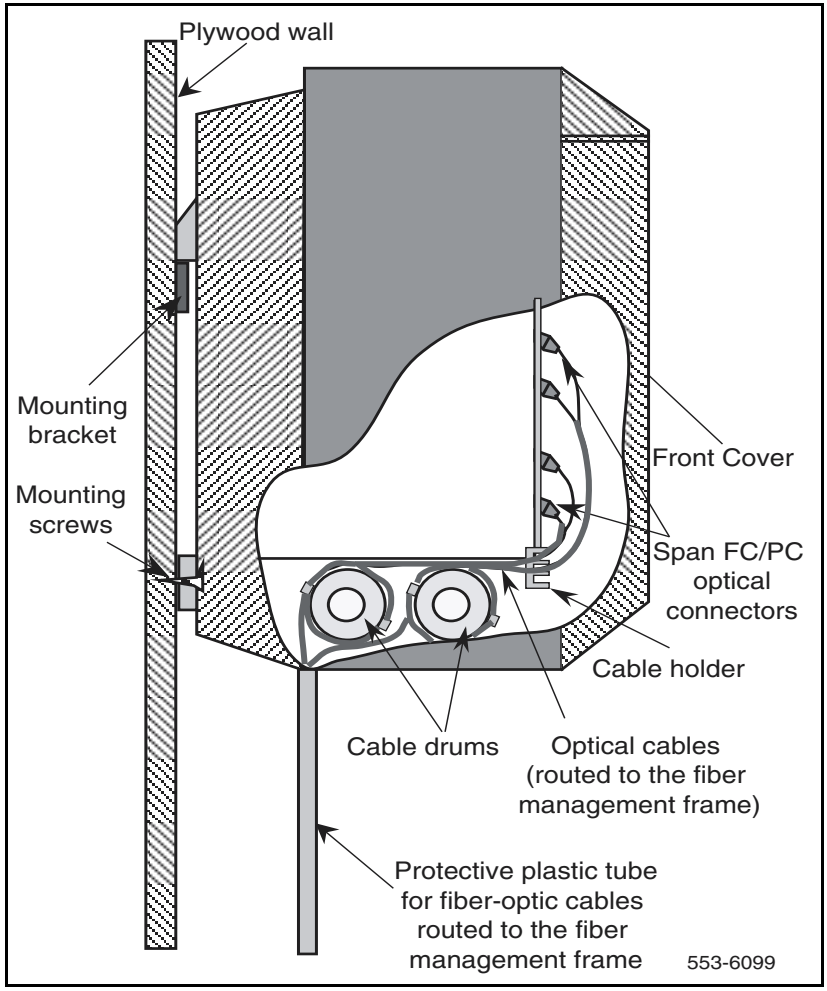
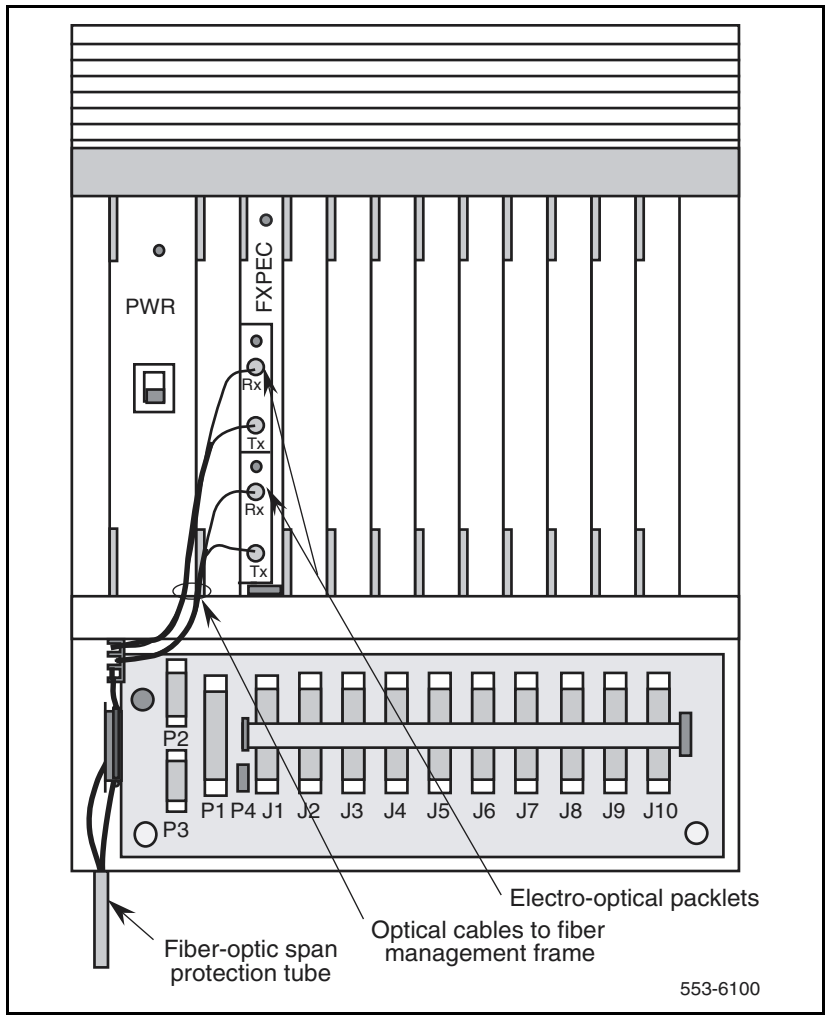


Figure 16 shows the Fiber Remote IPE cabinet with IPE cards, the NT1P62 Fiber Peripheral Controller card, and link connectors already installed.

Figure 16
Link connections on the IPE cabinet



Connecting TTY and subscriber loop cables

In the cabinet option, the monitoring is performed by the NT1P62 Fiber Peripheral Controller card, which receives power fail signals from the power supply through the backplane and sends the information to the NT1P61 Fiber Superloop Network card for processing by the local system CPU.

A terminal or a TTY connection to the MMI port and subscriber loop connections at the bottom of the cabinet should be made as shown in Figure 17. The terminal or the TTY is used for configuration and maintenance of the remote site. The terminal or TTY transmission characteristics are 9600 bps, 8 bits, no parity.

> ***Note:*** To set the TTY interface characteristics on an SDI card, refer to switch settings in *Circuit Card: Description and Installation* (553-3001-211).

To connect a terminal or TTY to the MMI port:

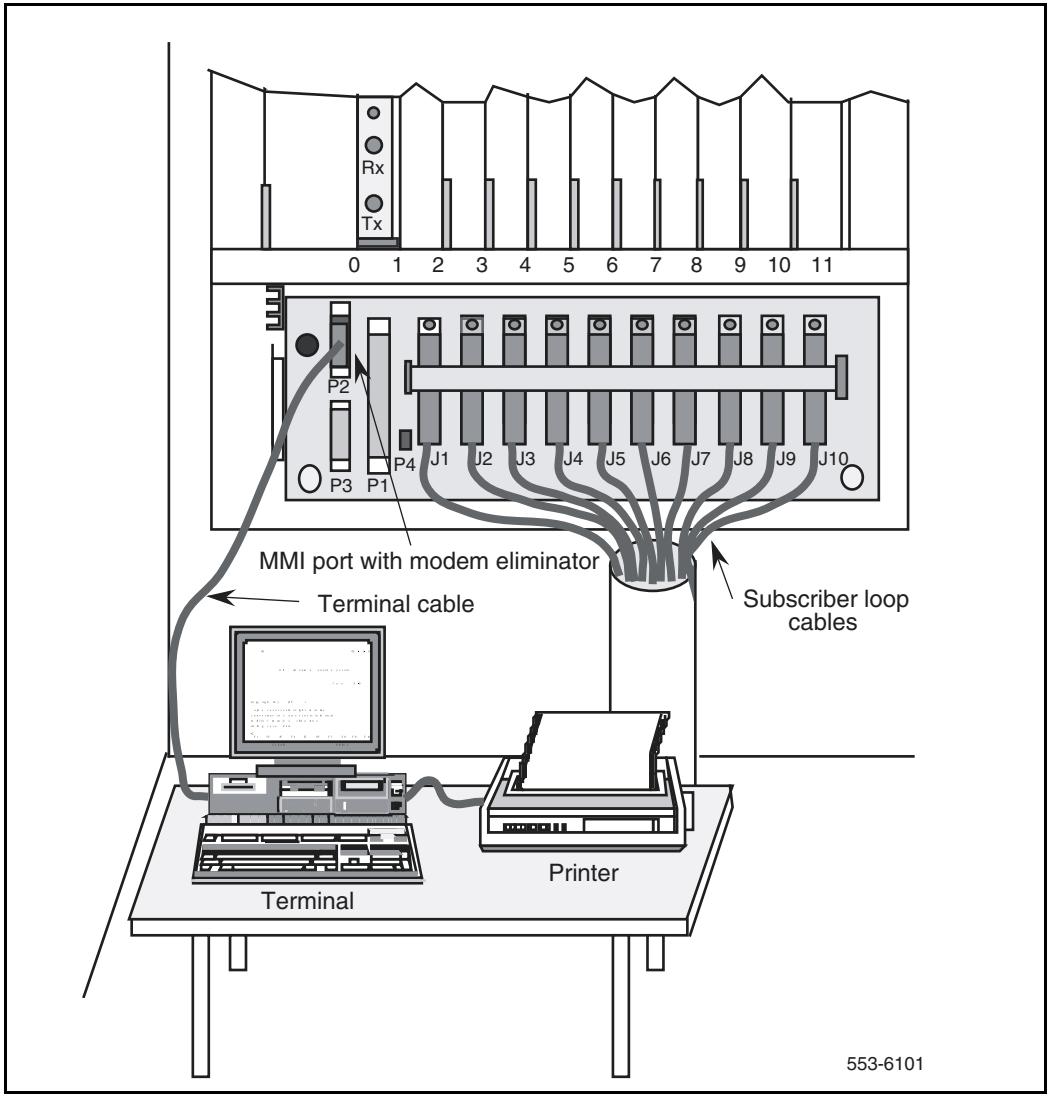
1. Plug the 9-pin D-type connector at the one end of the NT8D46AG cable into the P2 connector located at the lower left-hand side of the backplane, when viewed from the front or the cabinet.
2. Plug the other end of the NT8D46AG cable into the terminal or TTY RS232 connector.

To connect subscriber loop (tip and ring) cables to the cabinet's 50-pin connectors J1 through J10, refer to Figure 17. These cables have already been connected to the Main Distribution Frame (MDF) in the preinstallation preparation phase according to the instructions in *Cabling lines and trunks*, *Large System: Installation and Configuration* (553-3021-210):

1. Remove the locking bar from connectors J1 through J10.
2. Install the 50-pin connector terminating the cable designated J1 and plug it into the connector at the bottom of the cabinet also designated J1.
3. Repeat step 2 for the remaining tip and ring cables from J2 through J10.
4. Replace the locking bar over the cable connectors you just installed.

Figure 17 shows the subscriber loop (tip and ring) connectors that link line cards to the MDF and the terminal connection.

Figure 17
TTY and subscriber loop cable connections



Connecting attendant console power cord to the wall-mounted Fiber Remote IPE

The wall-mounted cabinet backplane contains P4, a two-pin power connector that provides +15 V and –15 V power source for the attendant console.

To make this connection:

1. Connect the attendant console power cord to P4 on the wall-mounted cabinet backplane.
2. Install and configure the attendant console. Refer to *Telephones and Consoles: Description* (553-3001-367).

Connecting PFTU to the wall-mounted Fiber Remote IPE

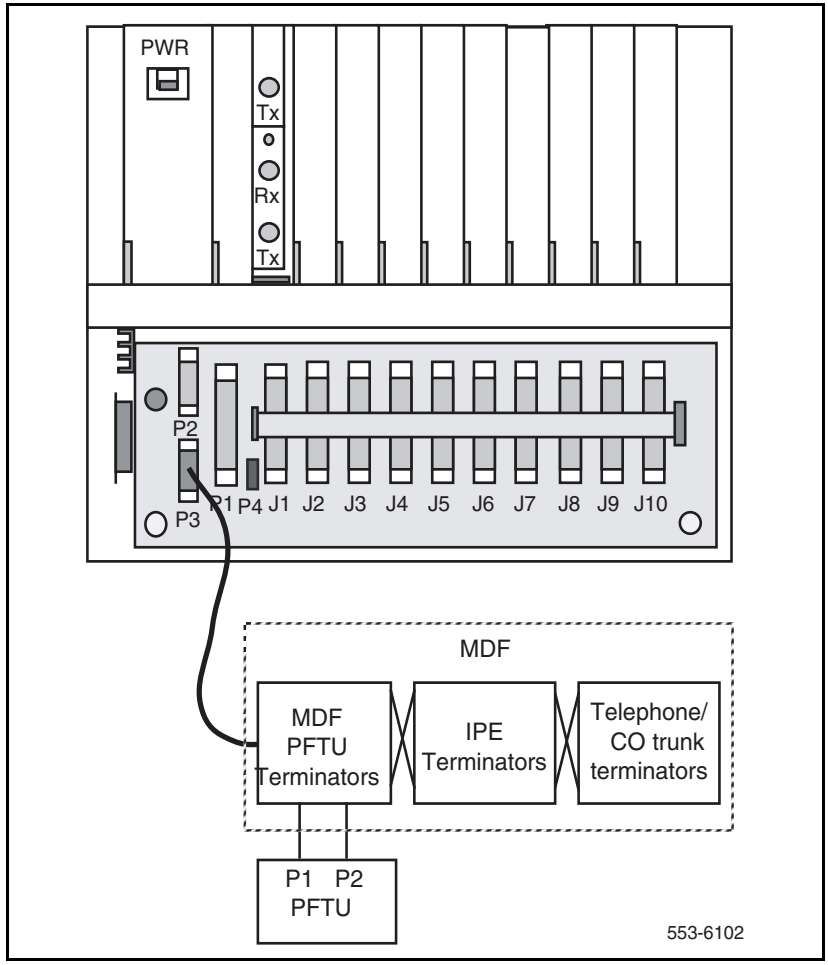
In the wall-mounted cabinet option, the Power Fail Transfer Unit (PFTU) is connected as shown in Figure 18.

To make this connection:

1. Install the PFTU near the MDF and connect it to the MDF according to the instructions in the PFTU user manual.
2. Install the required cable between the PFTU and the P3 15-pin D-type connector on the wall-mounted cabinet. For more information on how to install the PFTU, refer to *Large System: Installation and Configuration* (553-3021-210).

Figure 18 illustrates the front view of the wall-mounted Remote IPE cabinet. It shows the connection of the P3 Auxiliary 15-pin D-type connector on the Fiber Remote IPE wall-mounted cabinet linking the cabinet to the PFTU and the MDF.

Figure 18
Connecting PFTU to the wall-mounted Remote IPE cabinet



Configuring the Fiber Remote IPE

The configuration and administration of the Fiber Remote IPE and the corresponding fiber-optic equipment at the local site is identical to the standard system configuration and administration and does not require special considerations.

However, some initial setup functions must be considered at the remote site to identify the remote site system monitor functions of the wall-mounted cabinet to the local system CPU. These functions are administered over a Man-Machine Interface (MMI) port connected to a terminal or a TTY at the remote site. These are:

— Configuring fiber-optic cards

— Configuring the system monitor address

— Defining the loadware

— Configuring the MMI port

Configuring fiber-optic cards

When the Fiber Remote IPE equipment is first installed, you must specify the following functions:

— Define the NT1P61 Fiber Superloop Network and NT1P62 Fiber Peripheral Controller cards as standard NT8D04 Superloop Network and NT8D01 Peripheral Controller cards.

— Load Configuration Record Program LD 97 to configure the Fiber Remote and superloop parameter data blocks.

Prompt	Response	Comment
Fiber Remote Parameters Data Block		
REQ	CHG	Change the Fiber Remote parameters
TYPE	FIRP	Fiber Remote parameters
SUPL	0-156	Superloop number associated with the Remote IPE shelf
NNDC	5-(7)-8	No-New-Data-Calls condition threshold
XSMN	(0)–63	System monitor address on the Remote IPE shelf
Superloop Parameters Data Block		
REQ	CHG	Change superloop data block

TYPE	SUPL	Superloop type
SUPL	0-156	Superloop number in multiples of 4
SLOT	(L) R	Network slot default (left) or right
SUPT	FIBR	Superloop type (Fiber)
XPE0	x 0 3	x= Fiber Peripheral Controller card, 0= starting segment, 3= ending segment
XPE1	<cr>	Fiber Peripheral Controller card 1. Usually not equipped in Fiber Remote IPE.
XPEC	1-95	Fiber Peripheral Controller card number. The superloop block is built with default parameters.

Configuring the system monitor address

Configure the system monitor address and Fiber Peripheral Controller card parameters:

— Set switches on the system monitor card to specify a unique number from 1 to 63 and the slave mode for the floor-standing Fiber Remote IPE.

— Define the system monitor address using the MMI port to identify the system monitoring functions for a wall-mounted Fiber Remote IPE cabinet, which does not contain an actual system monitor card. Specify a unique number from 1 to 63 for this system monitoring function.

— Enter time-and-date using the terminal or TTY connected to the MMI port of the Fiber Peripheral Controller or NT1P61 Fiber Superloop Network card.

Defining the loadware

Define the loadware version being downloaded using the terminal or TTY connected to the MMI port as follows:

— Load Print Program LD 22 on the system TTY and print the PSDL directory by executing

Prompt	Response	Comment
REQ	PRT	Request printing of peripheral software versions
TYPE	.PSWV	Peripheral software versions downloaded to the Fiber Superloop Network and Fiber Peripheral Controller cards

— Through the MMI port, enter the QVER command to check the firmware and loadware version on the Fiber Superloop Network card and the Fiber Peripheral Controller card.

— Compare the loadware version obtained by printing the PSDL directory using Print Program LD 22 with the version obtained using the QVER command over the MMI terminal. The two versions must be identical. If not identical, use the SVER command at the MMI terminal to set the PSDL number of the card equal to the number obtained by Print Program LD 22.

— Parameters configured with default values, such as MMI default mode, should not be changed unless default values are not acceptable.

Command	Comment
HELP	Displays a list of commands
<ESC>L	Changes the Fiber Superloop Network or Fiber Peripheral Controller card to MMI mode.
<ESC>R	Changes the Fiber Superloop Network or Fiber Peripheral Controller card to SL-1 mode.
SDEF L/R	Sets default mode to **L**ocal or **R**emote.
QDEF	Queries the MMI port default mode. Response can be **Local** or **Remote.**

STAD <d/m/y/h/m/s>	Sets the time-and-date.
SXSM n	Wall-mounted Fiber Remote IPE cabinet does not have a system monitor card. **n** specifies a slave system monitor number (1–63), which is identified by the local system CPU as a slave system monitor.

Configuring the MMI port

The MMI port may be configured in the local (or MMI) mode or the remote (or SL-1 mode).

MMI (local) mode

In the MMI mode, a terminal or TTY is connected to the local MMI port at the Fiber Superloop Network card and another terminal or TTY is connected to the local MMI port at the Fiber Peripheral Controller card. Each terminal is controlling the local MMI functions of the card it is connected to.

MMI commands can be issued at each terminal to control local functions or a submit (SUBM) command and a string can be issued from a terminal or TTY to control the functions of the card at the opposite end of the fiber-optic link.

Note: When entering MMI commands, use solid caps.

The default MMI interface characteristics are set in the Fiber Peripheral Controller card EEPROM as follows:

— Speed—1200 bps

— Character width—8 bits

— Parity bit—none

— 1 stop bit

Note 1: If an SDI port is to be connected to this for remote TTY access, then this port should be configured also for the above settings.

Note 2: A null modem may or may not be required depending on SDI port setup for DTE or DCE.

SL-1 (remote) mode

In the SL-1 mode, a terminal or TTY is connected to the MMI port at the Fiber Peripheral Controller card. This terminal or TTY becomes the local system TTY. At the Fiber Superloop Network card, the MMI port is connected to an SDI port and not to a terminal or a TTY.

For the MMI port at the Fiber Peripheral Controller card to be able to communicate with the SDI port connected to the Fiber Superloop Network card MMI port, the interface characteristics must be as follows:

— Speed—9600 bps

— Character width—7 bits

— Parity bit—space

Note: A null modem connector is required in the terminal cable.

Using Fiber Peripheral Controller card MMI terminal, place the Fiber Superloop Network card in the remote mode by executing **>SUBM R <cr>** and place the Fiber Peripheral Controller card in the remote mode by executing **>(esc) R <cr>**.

Therefore, no interface configuration steps are required whether the MMI port at the Fiber Remote IPE is configured in the MMI mode or the SL-1 mode.

Acceptance testing

Contents

This section contains information on the following topics:

Overview

This section describes the acceptance testing of the Fiber Remote IPE. The purpose of acceptance testing is to verify that the functions and features of the Fiber Remote IPE are operating correctly.

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 Fiber Remote IPE acceptance testing should be conducted after:

— a previously installed system is upgraded with Fiber Remote IPE equipment and operates correctly without Fiber Remote IPE equipment

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

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

Acceptance testing consists of:

— checking the system

— preparing the system for testing

— testing local system functions at the Fiber Remote IPE site

Checking the system

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

— On the Fiber Superloop Network card, check the card LED located at the top of the faceplate. If the LED on the Fiber Superloop Network card is off, and the Electro-optical packlet(s) LED is also off, the card and packlets are enabled and operating correctly. If the card LED is off and the Electro-optical packlet(s) LED is on, the card is enabled and operating but the packlet is faulty. If the card LED is on, the card is disabled or faulty. To enable the Fiber Superloop Network card or to correct a problem, go to "Fiber Remote IPE fault isolation and correction" on page 123 in the Maintenance section of this manual.

— On the Fiber Peripheral Controller card, check the card LED located at the top of the faceplate. If the LED on the Fiber Peripheral Controller card is off, and the Electro-optical packlet(s) LED is also off, the card and packlets are enabled and operating correctly. If the card LED is off and the Electro-optical packlet(s) LED is on, the card is enabled and operating but the packlet is faulty. If the card LED is on, the card is disabled or faulty. To enable the Fiber Peripheral Controller card or to correct a problem, go to "Fiber Remote IPE fault isolation and correction" on page 123 in the Maintenance section of this manual.

— Check the hexadecimal display on the Fiber Peripheral Controller card. Refer to Appendix A to identify hexadecimal codes displayed by the Fiber Peripheral Controller card during self-test.

If the display and all indicator LEDs on Fiber 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 local system functions and features initiated and terminated at the Fiber 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 Fiber 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 a terminal or a TTY is connected to the MMI port through the Fiber Peripheral Controller card backplane connector.

If you have a wall-mounted main and extension cabinets, install at least one line card in each cabinet and connect at least one telephone to each line card subscriber loop.

Performing acceptance testing

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

— performing basic voice calls

— using the MMI terminal to configure and maintain Fiber Remote IPE 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 Fiber 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 site, place a call to a Fiber Remote IPE site by dialing a remote station directory number (extension number).

> ***Note:*** The local system treats Fiber 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 site, dial a terminal at the Fiber 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. For the wall-mounted main and expansion cabinets, you establish calls from stations connected to the subscriber loops in the main and expansion cabinets to verify the inter-cabinet cable connection.

To perform a call hold/call retrieve test:

1 From a terminal at the local site, dial a terminal at the Fiber 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 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 card or for different subscriber loops on different line cards in the Fiber Remote IPE module or cabinet. 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 Superloop Network card at the local site and another MMI terminal at the Fiber Remote IPE site.

1. Set the current mode of the MMI terminal to MMI mode by executing the **<esc>L** command on the MMI terminal at the local site. Enter MMI commands in solid caps.
2. Check the status of the Fiber Superloop Network card by executing the **STAT** command.
3. Check the status of the Fiber Peripheral Controller card by executing the **SUMB STAT** command. This command is sent over the fiber-optic link to the Fiber Peripheral Controller card for execution.
4. Check the response to the STAT command for the local and remote sites.
5. Check the log file content by executing the **PLOG 5** to print five 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 link protection switching.

Checking link protection switching

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

— manual switch-over

— forced switch-over

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

Manual switch-over

This is a unidirectional switch-over. To conduct this test:

1. Check the status of the fiber-optic link by executing the **QFIB** command from the MMI terminal. Make sure that both the PRIM and the SEC links are functional without an alarm condition.
2. Establish a call from the Fiber Remote IPE to the local site. Refer to “Voice calls” on page 98 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 packlet by executing the **MANS SEC** command from the MMI terminal.

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

6 Unplug the Tx_1 FC/PC optical connector from the secondary packlet at the local or remote site. The transmit path should automatically switch to the primary packlet.

7 The call should continue to be established.

8 Reconnect the Tx_1 FC/PC optical connector.

Forced switch-over

Forced switch-over is used when replacing an Electro-optical packlet. To conduct this test:

1 Check the status of the fiber-optic link by executing the **QFIB** command from the MMI terminal. Make sure that both the PRIM and the SEC links are functional without an alarm condition.

2 Establish a call from the Fiber Remote IPE to the local site. Refer to “Voice calls” on page 98 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 packlets by executing the **FORC SEC** command from the MMI terminal.

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

6 Clear forced switch-over by executing the **MCLR** command from the MMI terminal to enable automatic switch-over capability.

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 Fiber Remote IPE site and to the Fiber 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 *Software Input/Output: Administration* (553-3001-311).

Maintenance

Contents

This section contains information on the following topics:

Overview

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

Fiber Remote IPE maintenance deals with two types of problems:

— Installation

— Operation

Installation problems are created during the installation of an entire system with the Fiber Remote IPE or during the addition of the Fiber 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 Fiber Remote IPE operation is required. This information can be found in "Product description" on page 13. Once the cause is identified, the problem can be corrected by replacing the defective card, connecting accidentally disconnected cables, or correcting the software problem.

Succession 1000M Large Systems and Meridian 1 Large Systems provide built-in self-diagnostic indicators and software and hardware tools. These diagnostic facilities simplify system troubleshooting and reduce mean-time-to-repair (MTTR).

This document focuses on the maintenance of Fiber Remote IPE equipment at the remote site and in the local system. It requires that local non-Fiber Remote IPE functions operate correctly before you start diagnosing Fiber Remote IPE problems. System installation and maintenance guide sections of *Large System: Maintenance* (553-3021-500) describe how to maintain your entire system. This section describes how to maintain the Fiber Remote IPE equipment as an integral part of your local system.

Diagnostic tools

Diagnostic tools are used to troubleshoot problems in the system, including problems with the Fiber Remote IPE. When diagnosing Fiber Remote IPE problems, you may have to use more than one tool.

Hardware diagnostic tools

Hardware diagnostic tools consist of:

— card self-tests

— LED indicators

— display codes

— enable/disable switches

Self-test

A self-test is automatically performed by each Fiber Remote IPE card when you insert it in 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 a card using software commands.

This test checks general card functions and determines if they are operating correctly. It is very useful when you first install the cards; on insertion, the card automatically starts self-test and it gives you an immediate indication of its operating status.

LED indicators

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

Figure 19 on page 106 shows the NT1P61 Fiber Superloop Network card. It also shows the LED that indicates the status of the Fiber Superloop Network card and one LED on each Electro-optical packlet that indicates the status of the link.

Display codes

Some cards, such as the NT1P62 Fiber Peripheral Controller card, are equipped with an alphanumeric display on the faceplate. Figure 20 on page 107 shows two seven-segment displays on the faceplate of the Fiber Peripheral Controller card. They are used to automatically display the card status and identify possible faults with the card. These codes are displayed in hexadecimal notation and are listed and interpreted in Appendix A of this manual and in section (HEX) in *Software Input/Output: Administration* (553-3001-311).

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

Figure 20 shows the NT1P62 Fiber Peripheral Controller card with two hexadecimal displays that display the status of the card. It shows the card LED that also indicates the state of the Fiber Peripheral Controller card and one LED on each Electro-optical packlet that shows the status of the link.

Figure 19
Fiber Superloop Network card

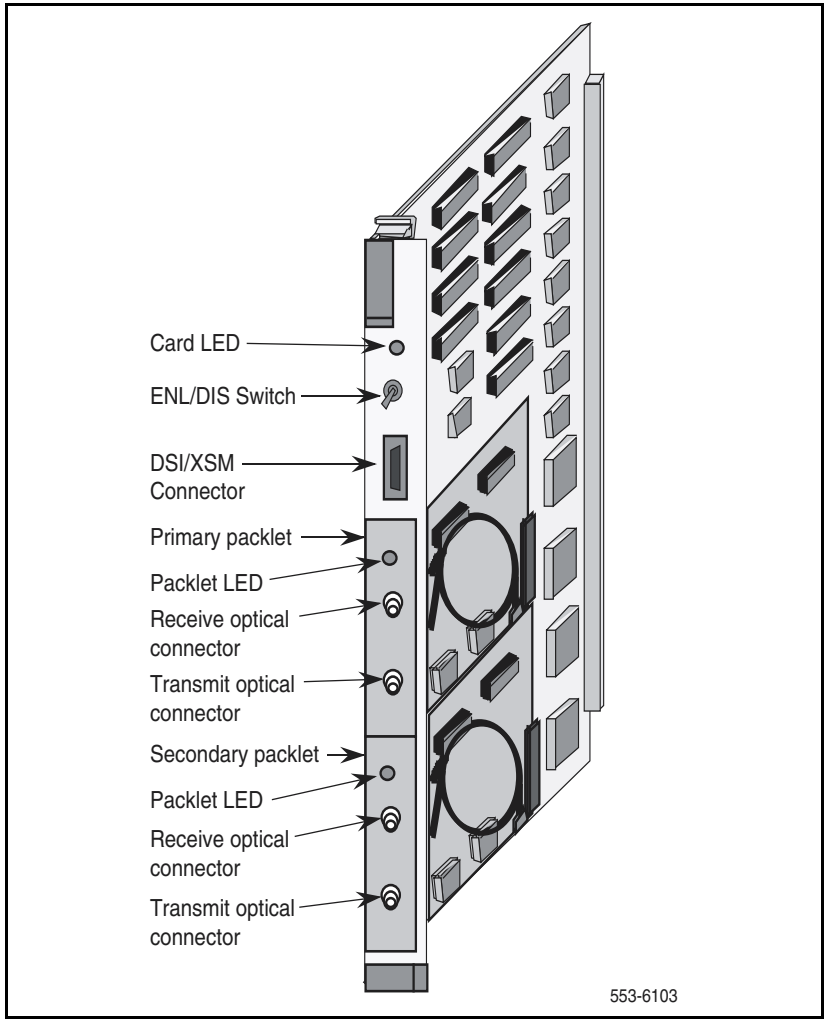
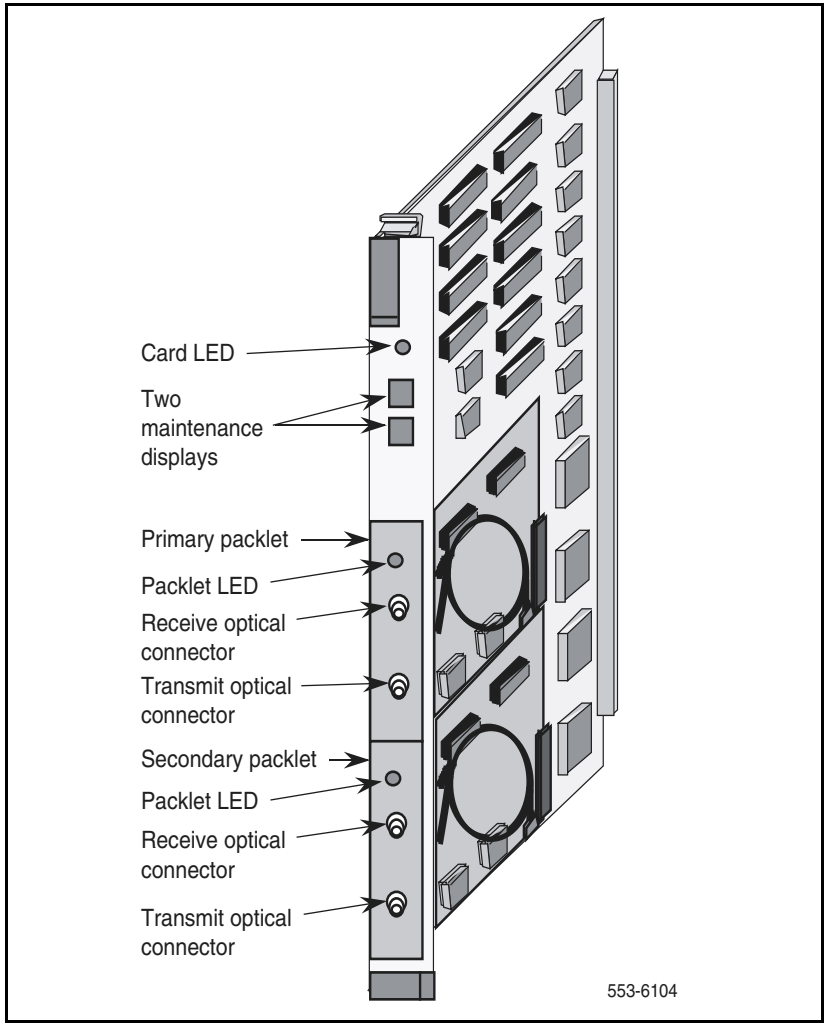


Figure 20
Fiber Peripheral Controller card



Enable/disable switch

Some cards, such as the Fiber Superloop Network card shown in Figure 19, are 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 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 enable position.

System monitors and alarms

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

The system monitor issues alarms when:

— CPU fails or system reloads

— main power source is lost

— power supply in the modules fails

— system temperature exceeds limits because of blower or fan failure

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

— major alarms, which indicate serious problems that require your immediate attention

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

Fiber Remote IPE issues a red alarm when a major alarm occurs at the local site and a yellow alarm when a major alarm occurs at the Fiber Remote IPE site.

Software diagnostic tools

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

— History File

— user reports

Resident programs

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 *Software Input/Output: Administration* (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 in Appendix A and reported to the terminal over the MMI port that indicate status and faults with Fiber 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 *Software Input/Output: Administration* (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 downloaded by the overlay loader program to system memory on demand or at a predetermined time of day such as for midnight and background routines testing.

You can access interactive programs through a maintenance terminal or a maintenance telephone, as described in this section. 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 Fiber Superloop Network card and the Fiber Peripheral Controller card, as well as other network and peripheral controller cards. You can specify these tests in Background Signaling and Switching Diagnostics LD 45.

Superloop and Controller cards maintenance commands

The maintenance commands of the NT1P61 Fiber Superloop Network card and NT1P62 Fiber Peripheral Controller card are identical to those of the standard NT8D04 Superloop Network and NT8D01 Peripheral Controller cards. These commands are used to manipulate the operational status and perform diagnostic tests on these cards. These commands are located in Network and PE Diagnostic LD 32, which can be accessed using the administration terminal or the maintenance telephone.

Table 8 lists superloop maintenance commands provided by Network and PE Diagnostic LD 32.

Table 8
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
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

Fiber Remote IPE MMI maintenance commands

Fiber Superloop Network card and Fiber Peripheral Controller card provide a man-machine interface (MMI) port to connect a configuration and

maintenance terminal. Through this terminal, you can directly issue commands to these cards to test and maintain fiber-optic equipment including the fiber-optic link.

Table 9 list these commands. However, for a detailed description of these commands, refer to Appendix A in this document, where they are listed in alphabetical order.

Table 9 lists MMI commands directly issued to the system over the MMI terminal. They can be connected to the Fiber Superloop Network card and the Fiber Peripheral Controller card MMI port.

Table 9
MMI maintenance commands (Part 1 of 2)

Maintenance command	Maintenance command description
HELP	Displays the list of MMI commands
<esc>L	Changes the MMI terminal to Local mode
<esc>R	Changes the MMI terminal to Remote mode
SUBM R	Places the Fiber Superloop Network card in Remote mode
SU R	Sets Fiber Superloop Network card in Remote mode when the MMI port is connected to an SDI port
SDEF L/R	Sets the default mode to Local or Remote
QDEF	Checks the default mode of the MMI port
STAD dd mm yy hh mm ss	Sets time and data
TTAD	Checks time and date
SUBM string	Sends a command to the other side of the link, where string = actual command
PLOG{n}	Prints n messages from a log file
NLOG {n}	Prints the next n messages from a log file
CLOG	Clears the log file

Table 9
MMI maintenance commands (Part 2 of 2)

Maintenance command	Maintenance command description
STAT	Checks the card status
IDC M/P/S	Checks the card ID for the main board, the primary packlet, or the secondary packlet
SXSM n	Sets system monitor port number for the wall-mounted Fiber Remote IPE
QXSM	Checks the system monitor port number
TEST P/S	Tests the main card if a parameter is not specified (card must be disabled).Test idle primary packlet if P is specified, or test idle secondary packlet if S is specified. When testing a packlet, the packlet must be idle but the card can be enabled and active.
SVER version	Sets PSDL version that matches the card version. It should also match the loadware version of the standard Superloop Network or Peripheral Controller card.
QVER	Checks the firmware and loadware version
QFIB	Checks the status of fiber-optic links
MANS PRI/SEC	Manual switch to primary or secondary link
FORC PRI/SEC	Forced switch to primary or secondary link
MCLR	Clears manual switch, resumes automatic backup

History File

Large Systems can be equipped with the History File feature, which allows the system to store events such as:

— service changes

— maintenance messages

— software errors

— initialization and system download messages

— traffic messages

These messages can be printed and analyzed to identify the events that led to the status. You can select the type of messages you wish to store. For information on how to select messages to be logged into the History File, refer to *Features and Services* (553-3001-306).

User reports

User reported faults may give you a clue of what failed in the system. These are:

— major alarms reported by attendant

— calls with no ringing or no dial tone

— trouble with calls in specific Fiber Remote IPE modules

— trouble with specific terminals

— calls that cannot be transferred, and so on

Using maintenance programs

To use maintenance programs, you must access the system using a maintenance terminal or maintenance telephone.

Logging in on the maintenance terminal

To access the program, you must enter a valid password. To do this, type **LOGI** and press the Enter key. The following appears:

```
PASS?
```

Type your password and press the Enter key. Blanks will appear on the screen as you type your password. If you see:

```
OVL015
>
```

you entered an invalid password. Type your password again and press the Enter key. If you entered a valid password, you will see:

```
>
```

This means you are logged in. You are now communicating with the system and can access the program.

Accessing the program

To access any program on the system, type LD followed by a space and the program number after the > prompt and press the Enter key.

For example, to access Network and PE Diagnostic Program LD 32, type **LD 32** after the **>** prompt and press the Enter key. At the prompt, type the command you wish to execute.

If for example, you wish to enable network loop 3 that is supported by a Fiber Superloop Network card, at the prompt type:

```
.ENLL 3
```

This will attempt to enable the Fiber Superloop Network card supporting network loop 3.

Responding to error messages

If you enter incorrect information after a prompt, the program displays a warning message or an error message. The prompt is displayed again below the error message so you can enter the correct information.

Exiting the program

To exit the program, type ******** and press the Enter key. You see

```
>
```

This means that you have successfully exited the program. Now, you can either access another program or log out.

Logging out

After you exit the program, you should log out. To do this, type **LOGO** at the **>** prompt and press the Enter key.

Logging in and using a maintenance telephone

You can use a telephone as a maintenance terminal if you define its class-of-service as MTA (maintenance set allowed) in Overlay 11. This

feature allows you to access diagnostic programs in the system and execute a limited set of maintenance commands to test system functions.

To enter commands on a maintenance telephone you have to use its key pad. The numbers on the key pad represent numbers and letters that you normally use on a video display terminal keyboard.

Table 10 shows the translation from a terminal keyboard to a telephone key pad.

Table 10
Keyboard to key pad translation table

Terminal keyboard				Telephone key pad
			1	1
A	B	C	2	2
D	E	F	3	3
G	H	I	4	4
J	K	L	5	5
M	N	O	6	6
P	R	S	7	7
T	U	V	8	8
W	X	Y	9	9
			0	0
			Space or #	#
			Return	##

To use a diagnostic program:

1 Press the prime DN key.

2 Place the telephone in maintenance mode by entering **xxxx91** on the key pad, where **xxxx** is the customer's Special Prefix number (SPRE) as defined in LD 15. Normally xxxx is 1, thus, you would enter **191**.

3 Enter ** to check if the communication link is idle.

4 If you detect a busy tone, the system is in session with another maintenance or administration terminal. Enter ******** to force the other terminal to log out. If you do not detect a busy tone, the system is idle and you can automatically access it.

5 Enter **53#xx##** to load a diagnostic program, where **xx** is the program number. For example, to load Network and PE Diagnostic Program LD 32, you would enter **53#32##**.

6 Perform the maintenance tasks by executing the maintenance commands resident in the program you loaded. For example, from Network and PE Diagnostic Program LD 32 you can disable a fiber network loop by executing (**DISL loop**), where loop is the Fiber Superloop Network card loop, say 3. To execute this command, enter on the key pad **3475#3##**.

7 Press the Release key to log out.

Isolating and correcting faults

Now that you are familiar with the troubleshooting tools, you can begin troubleshooting Fiber Remote IPE equipment. Based on whether Fiber 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 system and Fiber Remote IPE faults using the diagnostic tools described in this section:

1 Observe and list the problem symptoms the system is exhibiting. Typical symptoms can include the: Fiber Superloop Network card or Fiber Peripheral Controller cards lighting their red LEDs on, the Fiber Peripheral Controller card faceplate display showing a fault code, or the Electro-optical interface LEDs indicating no transmission on the fiber-optic link. Others include common equipment or power supplies having their green LEDs turned off, maintenance codes being displayed on some of the common equipment, network cards displaying codes that indicate faults, and so on.

2 Note whether Fiber 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 Fiber Remote IPE” on page 120 or “Previously operating Fiber Remote IPE” on page 120 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 Fiber Remote IPE still does not operate correctly, contact your field service representative.

Newly installed Fiber Remote IPE

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

— improperly installed cards

— loose or improperly connected external communication cables, fiber-optic patchcords, or fiber-optic link cables

— incorrect software version

— incorrect Fiber Remote IPE configuration

These types of problems may also occur when:

— installing additional Fiber Remote IPE equipment into an already operating system

— installing a new software version or changing Fiber Remote IPE configuration

Check Table 12, "Fiber Remote IPE equipment problems," on page 123 for the symptoms that are related to problems with a newly installed Fiber Remote IPE.

Previously operating Fiber Remote IPE

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

— faulty equipment

— accidental disconnection of cables

— improper environmental conditions

Check the symptoms listed in Table 12 that are related to problems with a previously operating Fiber Remote IPE.

Fault isolation and correction

To isolate Fiber Remote IPE faults, you must first isolate and correct the common, the network, and the power equipment faults to make non-Fiber Remote IPE functions operational. You can then proceed with fault isolation and fault correction of Fiber Remote IPE functions.

To aid you in isolating the problems in a systematic way, use the fault isolation and correction tables. These tables guide you through logical steps to determine the cause of the problem based on the visual fault indicators and system fault messages you see.

Table 11 lists problem symptoms, a diagnosis of the problem based on the observed symptoms, and the recommended solution to the problem.

Table 11
Common and network equipment problems (Part 1 of 2)

Symptoms	Diagnosis	Solution
Green LEDs on the power equipment are off.	Power source lost, power defective, or disconnected power cables.	Check the power source, circuit breakers, and power cables. Refer to *Large System: Maintenance* (553-3021-500) to correct the problem.
Maintenance terminal displays PWRxxxx messages.	Power supply, Power Distribution Unit, or Blower/Fan unit defective.	Refer to *Software Input/Output: Administration* (553-3001-311) for a list of PWR messages. Also refer to Appendix A for wall mounted cabinet PWRxxxx HW SM UEM U message format. Based on the message, take the appropriate action to resolve the problem.
Some red LEDs on the common, network, and/or peripheral equipment are on and call processing has stopped.	Common or network equipment cards faulty. Peripheral equipment cards faulty.	Observe the error messages on the terminal and check for ERR and/or BUG messages listed in *Software Input/Output: Administration* (553-3001-311). Use this information to locate and correct the fault. Refer to *Large System: Maintenance* (553-3021-500).

Table 11
Common and network equipment problems (Part 2 of 2)

Symptoms	Diagnosis	Solution
Maintenance terminal displays OVDxxxx messages.	Superloop Network Card, Network Card, and/or Peripheral Signaling Card are disabled.	Observe the OVD messages on the terminal and check the description of these messages listed in *Software Input/Output: Administration* (553-3001-311). Use this information to locate and correct the fault. Refer to *Large System: Maintenance* (553-3021-500).
Maintenance display codes on the CPU cards and storage devices show fault codes.	Common equipment disk drives hardware faults, memory faults, or interrupt faults.	Refer to *Software Input/Output: Administration* (553-3001-311) for a list of all the HEX codes. Based on the maintenance display codes description, take the appropriate action and resolve the problem.
Maintenance display codes on network cards show faults.	Indicates bus error or card problem.	Reinsert the card and observe the self-test codes. Refer to *Software Input/Output: Administration* (553-3001-311) for a list of all self-test codes and their description. If the problem remains, replace the card.
Major or minor alarms.	Common, network, and/or peripheral equipment failure.	Refer to *Large System: Maintenance* (553-3021-500) to identify the cause of alarm. Check the history file.

After you isolate and correct common equipment and network equipment faults, all the other system and card faults may clear and the system may start operating normally. If this does not occur, you must proceed with troubleshooting Fiber Remote IPE equipment as described in "Fiber Remote IPE fault isolation and correction" on page 123.

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

Fiber Remote IPE fault isolation and correction

After non-Fiber Remote IPE system functions are operating correctly, you can proceed with fault isolation and fault correction of Fiber Remote IPE equipment.

Table 12 deals specifically with Fiber Remote IPE service problems. To diagnose these problems, the table refers you to the test procedures in this manual that will most likely be able to resolve them.

Table 12
Fiber Remote IPE equipment problems (Part 1 of 2)

Symptoms	Diagnosis	Solution
Red LED on the Fiber Superloop Network card or Fiber Peripheral Controller card permanently on.	Card is disabled or faulty.	Go to *Procedures 1, 2,* and *5* in this section to check the card status and perform self-test. Also enter the **STAT** command on the MMI terminal to check the card status.
LED on the Electro-optical packlet is on.	Fiber-optic link is in red alarm state and there is no communication over the link.	Check fiber-optic link connections and go to *Procedure 3* to test the link using the loopback test.
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 *Appendix A*. Use this information to locate and correct the fault.
Display on the Fiber Peripheral Controller card shows fault codes.	Card faulty: failed self-test or problem communicating with peripheral equipment.	Go to *Procedures 4* and *6* to check tracking and loopback. Also refer to *Software Input/Output: Administration* (553-3001-311) for a list of codes. Based on the maintenance display codes description, take the appropriate action and resolve the problem.

Table 12
Fiber Remote IPE equipment problems (Part 2 of 2)

Symptoms	Diagnosis	Solution
Error messages printed on the MMI terminal or the TTY.	Hardware or software problems with the Fiber Remote IPE.	Note various error messages. Refer to *Appendix A* in this manual and *Software Input/Output: Administration* (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.
Red alarm is displayed on the TTY.	Fiber network and/or peripheral equipment failure.	Query the status on the fiber-optic links by entering the **QFIB** command at the MMI terminal.

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.

Fiber Superloop Network card fault isolation and correction

The NT1P61 Fiber Superloop Network card provides a communication interface between the CPU and the Fiber Peripheral Controller card.

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

Problems with the Fiber Superloop Network card may be caused by hardware faults, incorrect configuration, a disabled Fiber 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 Fiber Superloop Network card, follow the procedures below.

Procedure 1
Checking the status of Fiber Superloop Network card

The diagnosis in Table 12 indicates that the Fiber Superloop Network card may be faulty or disabled. The first step in identifying the problem is to verify the status of the Fiber Superloop Network card. The status of a Fiber Superloop Network card is obtained by executing the **STAT loop** command in Network and Signaling Diagnostic Program LD 30.

To obtain the Fiber Superloop Network card status:

1 Log in on the maintenance terminal as described in “Using maintenance programs” on page 115 in this document.

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 loop** and press the Enter key, where **loop** is the loop number of the Fiber Superloop Network card you are testing.

4 If the response is UNEQ = then the loop is not equipped (the Fiber Superloop Network card is not installed).

5 If the Fiber 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 *Software Input/Output: Administration* (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 Fiber Superloop Network card.

Type **ENLL loop** and press the Enter key to enable the loop, where **loop** is the Fiber Superloop Network card loop number. A message indicating that the Fiber Superloop Network card is enabled and working is displayed on the console. Also observe the red LED on the Fiber Superloop Network card. If it turns off, the Fiber Superloop Network card is functioning correctly. If the LED continues to stay on, the Fiber 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 Fiber Superloop Network card is faulty, replace the card.

Procedure 2
Performing the Fiber Superloop Network card self-test

If the NT1P61 Fiber 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 Fiber 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 described in “Using maintenance programs” on page 115 in this document.

2 At the **>** prompt, type **LD 32** and press the Enter key to access the Network and PE Diagnostic Program.

3 Type **DISL loop** and press the Enter key to disable the Fiber Superloop Network card, where **loop** is the Fiber Superloop Network card loop number you are disabling.

4 Type **XNTT loop** and press the Enter key to start the self-test, where **loop** is the Fiber Superloop Network loop number specified for self-test.

If the response is:

TEST PASSED

The Fiber 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 Fiber Superloop Network card passed the self-test, but the problem persists, the loop or other cards that interface with the Fiber Superloop Network card may be faulty. To verify the integrity of the network bus and connections between the Fiber Superloop Network card and other network and peripheral equipment cards interfacing with the Fiber Superloop Network card, go to Procedure 3.

If the response is

TEST FAILED REASON: xxxx

XPE0 {NOT} CONNECTED

XPE1 NOT CONNECTED

The Fiber 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 Fiber Superloop Network card as described in Replacement procedures. NPRxxx message may be displayed as a result of a command activated self-test if the Fiber Superloop Network card is missing, not configured, and so on.

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

Procedure 3
Performing the Fiber Superloop Network loopback tests

If the NT1P61 Fiber Superloop Network card self-test indicates that the card is not faulty, you should conduct loopback tests to isolate the problem that may exist on network cards, network buses, or fiber-optic link connections between the Fiber Superloop Network card and the Fiber Peripheral Controller card.

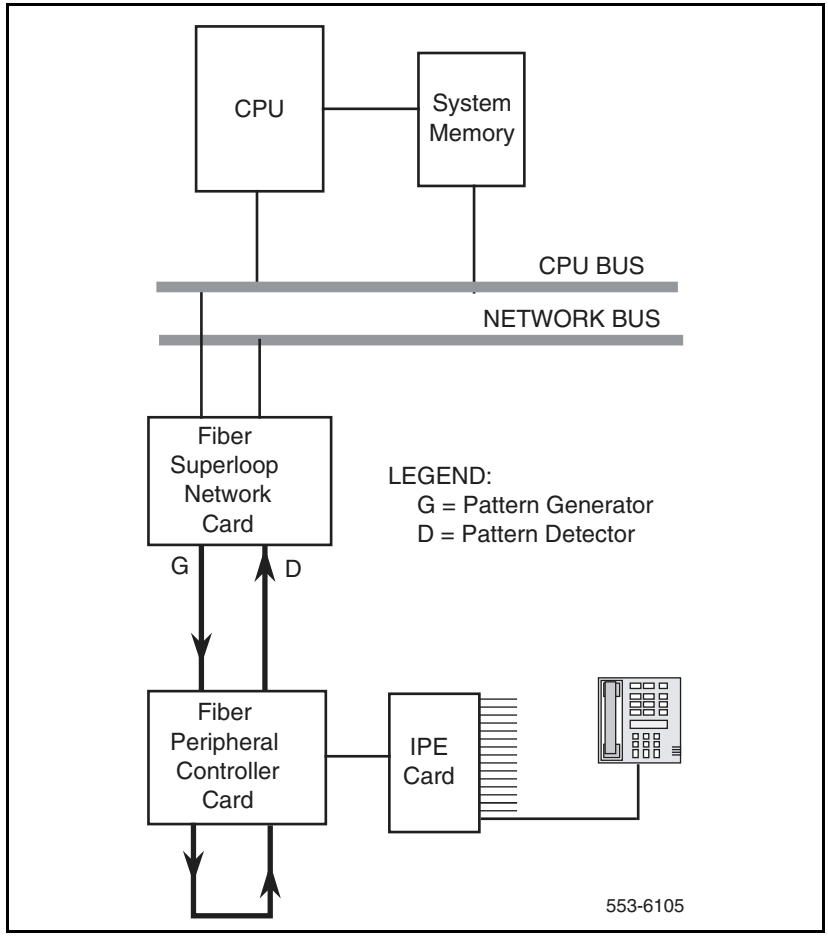
Loopback tests check the continuity between various interface points in the system. This is performed by sending a known signal pattern from the originating point to the destination and receiving it back at the originating point or a designated detecting point. If the pattern is detected and it matches the transmitted pattern without errors, the test verifies that the tested equipment and their connections are operating correctly. However, if the pattern is not detected or it is detected with errors, the equipment or the connections between the equipment are faulty.

The loopback uses the Fiber Superloop Network card as a pattern generator and detector. The signal is transmitted by the Fiber Superloop Network card to the Fiber Peripheral Controller card and looped back to the Fiber Superloop Network card over the fiber-optic link.

Note: For a Fiber Remote IPE with the redundant fiber-optic link, the loopback is automatically routed over the functioning link, not the faulty link. To identify the Electro-optical packlet that may be faulty, you can perform the packlet test at each end of the link by following the instructions in step 6 of this Procedure.

Figure 21 illustrates the loopback path and shows the Fiber Superloop Network card as a test pattern generator and detector.

Figure 21
Loopback path for XCON test 6



To start the loopback test:

1 Log in on the maintenance terminal as described in "Using maintenance programs" on page 115 in this document.

2 At the **>** prompt, type **LD 45** and press the Enter key to access the Background Signaling and Switching Program.

3 Select test condition:

— Enter XCON 0 and press the Enter key if you wish to perform only one loopback test.

— Enter one test period shown in XCON H 1-255, M 1-255, Sþ1-255 and press the Enter key to select continuous loopback testing for a selected time link, where Hþ1-255 is 1 to 255 hours, M 1-255 is 1 to 255 minutes, and S 1-255 is 1 to 255 seconds.

Example: XCON M 5 specifies the duration of the test to be 5 minutes.

4 At the TEST prompt, type **6** and press the Enter key. Continue responding to the prompts to configure the loopback test as follows:

Command	Range	Description
TEST	6	XCON test number
PATT	0–7	Signal pattern
TYPG	N	Fiber Superloop Network card—generator
SUPL	0–156	Superloop in multiple of 4
SLOT	xx	Timeslots 2–31, 34–63, 66–95, 98–127
TYPD	N	Fiber Superloop Network card—detector
SUPL	0–156	Superloop in multiple of 4
LBTY	P	Loopback through Fiber Controller
LBTN	l1 s 99	Special Fiber Controller loopback channel
TAG x	0–15	Tag number assigned by the system

5 Check the loopback test results. The results are automatically displayed if you specified XCON 0 test conditions; otherwise, you must specify XSTA or XSTP with the test TAG number to check the status. XSTA gets the status of the manual continuity test and XSTP stops the manual continuity test. If the results show BSDxxx messages, refer to the list and description of these messages in *Software Input/Output: Administration* (553-3001-311). The BSDxxx messages indicate the possible causes of the problem, which you should check to isolate the actual problem.

— If the loopback continuity test passes, the problem may be somewhere in the IPE cards.

— If the loopback continuity fails, go to Procedure 3.

6 Perform the Electro-optical packlet test by using the MMI terminal or TTY at each end of the link:

— From the MMI terminal execute the **TEST P/S**, where **P** = primary packlet and **S** = secondary packlet.

— Connect the transmit port to the receive port with a short fiber-optic patchcord on the Electro-optical packlet being tested.

— The packlet is operating correctly if the red LED turns off and stays off during the test with the patchcord installed. Otherwise, the packlet is faulty and should be replaced.

— Repeat step 6 for the other end of the link.

Fiber Peripheral Controller card fault isolation and correction

The NT1P62 Fiber Peripheral Controller card provides a communication interface between the Fiber Superloop Network card and the IPE cards housed in the Fiber Remote IPE module or cabinet.

Problems with the Fiber Peripheral Controller card may be caused by hardware faults, incorrect configuration, a disabled Fiber 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 Fiber Peripheral Controller card, follow the procedures below.

Procedure 4
Checking the Fiber Peripheral Controller card tracking status

The Fiber Peripheral Controller card can display tracking information, which shows the status of the Fiber 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 Fiber Peripheral Controller card tracking status:

1. Log in on the maintenance terminal as described in “Using maintenance programs” on page 115 in this document.
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 Fiber Superloop Network card and **s** is the shelf or module you are testing.

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

   C0—clock is locked on the primary Electro-optical packlet

   C1—clock is locked on the secondary Electro-optical packlet
4. Exit LD 30 by typing ******** at the prompt.
5. Check the incoming signal. If present, replace the packlet; otherwise, find the problem on the link.

Procedure 5
Performing the Fiber Peripheral Controller card self-test

If the Fiber 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 Fiber Peripheral Controller card functions and outputs a fail or pass message after the test is completed. During self-test the Fiber Peripheral Controller card displays HEX messages indicating the test performed. To identify the codes displayed, refer to Table 14, “System messages displayed on the system terminal of TTY,” on page 147.

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

1 Log in on the maintenance terminal as described in “Using maintenance programs” on page 115 in this document.

2 At the **>** prompt, type **LD 32** and press the Enter key to access the Network and PE Diagnostic Program.

3 Type **DSXP x** and press the Enter key to disable the Fiber Peripheral Controller card, where **x** is the Fiber Peripheral Controller card you are disabling.

4 Type **XPCT x** and press the Enter key to start the self-test, where **x** is the Fiber Peripheral Controller card specified for self-test.

If the response is:

TEST PASSED

The Fiber 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 Fiber Peripheral Controller card passed the self-test, but the problem persists, the link or other cards that interface with the Fiber Peripheral Controller card may be faulty. To verify the integrity of the peripheral bus and the Fiber Peripheral Controller card, go to Procedure 6.

If the response is:

TEST FAILED REASON: xxxx

The Fiber 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 Fiber Peripheral Controller card is missing, not configured, and so on.

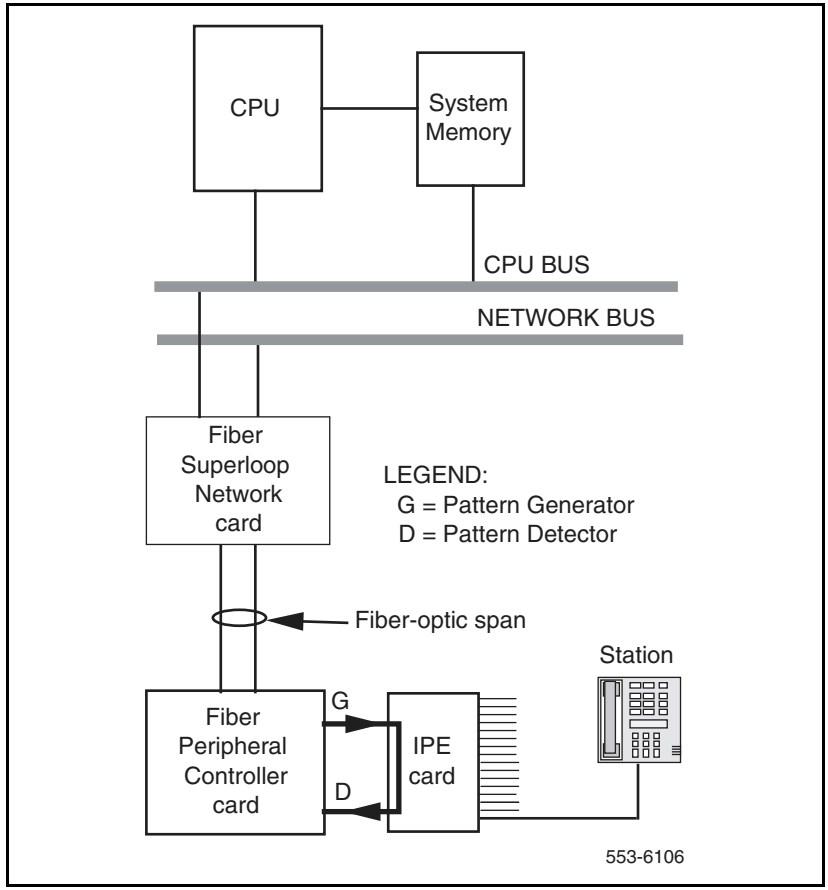
5 Exit LD 32 by typing **** at the prompt.

Procedure 6
Performing the Fiber Peripheral Controller card loopback test

The loopback uses the Fiber Peripheral Controller card as a pattern generator and detector. The signal is transmitted by the Fiber Peripheral Controller card back to the Fiber Peripheral Controller card over a special loopback channel on the peripheral bus.

Figure 22 illustrates the loopback path and shows the Fiber Peripheral Controller card as a test pattern generator and detector.

Figure 22
Loopback path for XCON test 7



To perform the loopback test:

1 Log in on the maintenance terminal as described in "Using maintenance programs" on page 115 in this document.

2 At the **>** prompt, type **LD 45** and press the Enter key to access the Background Signaling and Switching Program.

3 Select test condition:

— Enter XCON 0 and press the Enter key if you wish to perform only one loopback test.

— Enter one test period shown in XCON H 1-255, M 1-255, S 1-255 and press the Enter key to select continuous loopback testing for a selected time link, where H 1-255 is 1 to 255 hours, M1-255 is 1 to 255 minutes, and S 1-255 is 1 to 255 seconds.

Example: XCON M 5 specifies the duration of the test to be 5 minutes.

4 At the TEST prompt, type **7** and press the Enter key. Continue responding to the prompts to configure the loopback test as follows:

Command	Range	Description
TEST	7	XCON test number
PATT	0–7	Signal pattern
TYPG	P	Fiber Peripheral Controller card—generator
TN	l s 99 0	Special Fiber Peripheral Controller loopback channel
TAG x	0–15	Tag number assigned by the system

5 Check the loopback test results. The results are automatically displayed if you specified XCON 0 test conditions; otherwise, you must specify XSTA or XSTP with the test TAG number to check the status. XSTA gets the status of the manual continuity test and XSTP stops the manual continuity test. If the results show BSDxxx messages, refer to the list and description of these messages in *Software Input/Output: Administration* (553-3001-311). The BSDxxx messages indicate the possible causes of the problem, which you should check to isolate the actual problem.

— If the loopback continuity test passes, the problem may be somewhere in the IPE cards.

— If the loopback continuity fails, replace the card.

Fault isolation and correction using MMI maintenance commands

You can perform some testing and troubleshooting of the Fiber Remote IPE from a local or a remote MMI terminal or TTY by typing MMI commands on the terminal without loading system diagnostic programs (overlays).

These commands provide current equipment status, invoke card testing, check equipment performance, print messages from log files, and so on.

Procedure 7
Checking Fiber Remote IPE using MMI commands

This procedure uses MMI commands to maintain Fiber Remote IPE cards, and fiber-optic link status.

You can send these commands from the local MMI terminal to be executed by the remote site MMI terminal and vice versa by executing the **SUBM string** command, where string is the actual command sent to the other side.

For example, **SUBM PLOG 10** entered at the local MMI terminal will request that the remote site prints 10 messages from the log file located in the Fiber Peripheral Controller card memory.

To obtain the Fiber Superloop Network and Fiber Peripheral Controller cards status:

1. Log in on the MMI maintenance terminal.
2. Type **STAT** to check the status or the card connected to the MMI terminal.

   The response:

   Enabled/Disabled PLL: lock/unlock prim/sec

   The card is enabled by the CPU, when enabled. The phase-lock loop can be locked to the incoming signal or not, and the PLL may be locked on the primary or secondary packlet.

3 Type **TEST P/S** and press the Enter key, where **P** tests the primary packlet and **S** tests the secondary packlet.

The response is one of the self-test messages listed in Appendix A.

4 Type **QFIB** and press the Enter key to query the status of the fiber-optic link.

The response:

PRIM physical/signal/direction
SEC physical/signal/direction

physical represents the status of the Electro-optical packlet, which can be **equipped, unequipped**, or **faulty**.

signal represents the status of the incoming signal, which can be **SF** (signal failed), **SD** (signal degrade not implemented in Rev 1 H/W), or **NA** (no alarm).

direction represents the direction of traffic on the link, which can be **incoming, outgoing, bothways**, or **none**.

5 Type **QALM** and press the Enter key to query the alarm status of the fiber-optic link.

The response:

PRIM alarm type
SEC alarm type

alarm on the Electro-optical packlet can be **red** (local alarm), **yellow** (remote alarm), or **clear** (no alarm).

type indicate one of the following types of alarm when it exists: **LOS**, **LOF**, **LOP**, or **FERF**.

6 Type PRPM {prim/sec} and press the Enter key to print the Performance Monitoring report for the primary and secondary fiber-optic links.

The format of the response is shown in Table 13.

Table 13 shows the format for the Performance Monitoring report. The report shows a matrix or fiber-optic link performance parameter values for different interval counters listed in the header and intervals listed in the first column.

Table 13
Performance Monitoring report form

link: prim/sec			**date: *mm/dd/yy***			**time: *hh/mm***		
Interval	**Section**				**Line**			
	SEFS	**CV**	**ES**	**SES**	**CV**	**ES**	**SES**	**PSC**
C	n	n	n	n	n	n	n	n
1	n	n	n	n	n	n	n	n
2	n	n	n	n	n	n	n	n
3	n	n	n	n	n	n	n	n
4	n	n	n	n	n	n	n	n
CD	n	n	n	n	n	n	n	n
PD	n	n	n	n	n	n	n	n

Section parameter description:

SEFS (Severely Errored Framing Seconds) indicates the number of seconds when at least one out-of-frame (OOF) or one change of frame alignment (COFA) occurred.

CV (Section Coding Violations) counts section BIP-8 violations in the STS-3 frame.

ES (Section Errored Seconds) indicates a second during which at least a coding violation (CV), an out-of-frame (OOF), or a change of frame alignment (COFA) occurred.

SES (Section Severely Errored Seconds) counts the number of seconds when at least 16 coding violations (CV), an out-of-frame (OOF), a change of frame alignment (COFA), or loss-of-signal (LOS) occurred.

Line parameter description:

CV (Line Coding Violations) counts all line BIP-8 violations over all STS-3 frames.

ES (Section Errored Seconds) indicates a second during which at least a coding violation (CV) or a line alarm indication signal (AIS) state was detected.

SES (Section Severely Errored Seconds) counts the number of seconds with at least 32 line coding violations (CV) when the line alarm indication signal (AIS) state was detected.

PSC (Protection Switching Counts) counts the number of times when link protection switching occurred due to signal fail (SF) or signal degrade (SD) condition.

Interval parameter description:

C (Current interval) is the status of section and line parameters at the time interval when the Performance Monitoring report is issued.

1 through **4** are subsequent four intervals.

CD is current day or the day the report was issued.

PD is previous day or the day before the report was issued.

Replacing Fiber Remote IPE cards

If after completing troubleshooting you determine that one or more Fiber Remote IPE cards are defective, you will have to remove them and replace them with spares. When you insert a spare Fiber Superloop Network card or Fiber Peripheral Controller card in the module or wall-mounted cabinet, observe the card LED (the uppermost LED on the faceplate) to determine if the card passed self-test. Package and ship the defective cards to an authorized repair center.

Unpacking replacement cards

Unpack and visually inspect replacement cards as follows:

1 Inspect the shipping container for damage. Notify 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 card 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 Fiber Remote IPE card can be removed from and inserted into a local module or the Remote IPE module or wall-mounted cabinet without turning off the power to the module or cabinet. This feature allows the system to continue normal operation when you are replacing a Fiber Superloop Network card in the local system or a Fiber Peripheral Controller card in the Remote IPE module or cabinet.

Removing and replacing a Fiber Superloop Network card

1. Disable the Fiber Superloop Network card by logging in to the system terminal, loading the Network and Peripheral Equipment Diagnostic Program LD 32, and executing **DIS loop**, where **loop** is the actual loop number of the Fiber Superloop Network card.
2. Set the ENL/DIS switch to DIS.
3. Disconnect all the fiber-optic patchcords and the SDI/System Monitor cable from the card faceplate.
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. Check the replacement card and make sure that the Electro-optical packlets are already installed. If not installed, install the new packlets or remove the packlets from the faulty Fiber Superloop Network card and install them on the replacement card if you are sure that the packlets are not faulty.
7. Set the replacement card ENL/DIS switch to DIS.
8. Hold the replacement card by the card locking devices and insert it partially into the card guides in the module.
9. Pull the upper locking device away from the faceplate on the card and press the lower locking device downward and insert the card firmly into the backplane connector. Press the upper locking device firmly against the faceplate and press the lower locking device upwards to latch the card inside the module.
10. Set the ENL/DIS switch on the Fiber Superloop Network card to ENL. The Fiber Superloop Network card automatically starts the self-test.

11 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 Fiber Superloop Network card.

12 Connect the SDI/System Monitor cable and the fiber-optic patchcords to the faceplate connectors of Fiber Superloop Network card.

13 Set the ENL/DIS switch to ENL. If the upper most red LED on the Fiber 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 SDI/System Monitor connector on the faceplate of the Fiber Superloop Network card). If the LED stays on, go to "Isolating and correcting faults" on page 119 in this document.

14 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 Fiber Peripheral Controller card

1 Log in on the maintenance terminal as described in "Using maintenance programs" on page 115 in this document.

2 At the > prompt, type LD 32 and press the Enter key to access the program.

3 Type **DSXP x**, where **x** is the Fiber Peripheral Controller card, and press the Enter key to disable the card. The Fiber Peripheral Controller card is now disabled and you can remove it.

4 Disconnect all the fiber-optic patchcords from the card faceplate.

5 Unlatch the card's locking devices by squeezing the tabs and pulling the upper locking device away from the card and the lower locking device downwards.

6 Pull the card out of the IPE module or cabinet and place it in an antistatic bag away from the work area.

7 Check the replacement card and make sure that the Electro-optical packlets are already installed. If not installed, install the new packlets or remove the packlets from the faulty Fiber Peripheral Controller card and install them on the replacement card if you are sure the packlets are not faulty.

8 Hold the replacement card by the card locking devices and insert it partially into the card guides in the module.

9 Pull the upper locking device away from the faceplate on the card and the lower locking device downwards and insert the card firmly into the backplane connector. Press the upper locking device firmly against the faceplate and the lower locking device upwards to latch the card inside the module. The Fiber Peripheral Controller 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 to step 11. 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 Fiber Peripheral Controller card.

11 Connect the fiber-optic patchcords to the optical connectors of the Fiber Peripheral Controller card faceplate. For a wall-mounted Fiber Remote IPE, plug the fiber-optic link FC/PC optical connectors into the FC/PC optical connectors on the Fiber Peripheral Controller card faceplate.

12 At the: prompt in the LD 32 program, type **ENXP x**, where **x** is the Fiber Peripheral Controller card, and press the Enter key to enable the card. If the uppermost red LED on the Fiber 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 Fiber Peripheral Controller card. If the LED stays on, go to “Isolating and correcting faults” on page 119 or replace the card.

13 Tag the defective 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 Fiber Remote IPE is operating correctly, do the following:

1 Reinstall the covers on the local module.

2 Reinstall the cover on the Remote IPE floor-standing module or the wall-mounted cabinet.

3 Terminate you session by logging out on your maintenance terminal: type LOGO 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 card with the description of the problem.

2 Package the defective card for shipment using the packing material from the replacement card. Place the card in an antistatic bag, 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 A: System messages and MMI commands description

This appendix lists system messages displayed or printed on the local system and MMI terminal or TTY and Fiber Peripheral Controller card HEX messages displayed during selftest on the two-character display located on the Fiber Peripheral Controller faceplate.

It also lists in alphabetical order MMI commands and describes the function of each command.

Table 14
System messages displayed on the system terminal of TTY (Part 1 of 6)

MMI port messages	
Chk_Thresh: B1 errors on primary/secondary	Transmission degrade: receiver signal contains occasional error at a low rate. If the message repeats, check optical cables, connectors, and optical packlets.
Chk_Thresh: R71 bad idle bytes	
Chk_Thresh: R71 crc error threshold exceeded	
Chk_Thresh: R71 End of Packet missing	
RSIG lost sync error: x	
Chk_Thresh: R71 message has been truncated	
R71 failure - Reinit	All these messages indicate problem with R71 (RSIG) signaling. If problem persists, do selftest.

Table 14
System messages displayed on the system terminal of TTY (Part 2 of 6)

TN read register unblocked, cnt= x	Problem with the Peripheral Signaling interface. Check to see if the Fiber Superloop Network card is seated correctly in its card slot.
FXNET Reset: Power-up/Watchdog/MSL-1 Boot version: xx	Reset caused by the CPU. **xx** is the boot code version. Multiple unassisted power-up resets indicate card, backplane, or supply failure. Watchdog reset may indicate firmware problem.
FXPEC Reset: Power-up/Watchdog/MSL-1 Boot version: xx	Reset caused by the MPU. **xx** is the boot code version. Multiple unassisted power-up resets indicate card, backplane, or supply failure. Watchdog reset may indicate firmware problem.
Card ID: string	Prints the card ID stored in the EEPROM.
FXNET/FXPEC Main code version: xx {+pROBE}	This message appears at the end of the boot process.
TSIC Memory Mismatch . . . Rebuild OK	
BRSC Local Switch Memory Mismatch, IVDch = x . . . Rebuild OK	Hardware or firmware fault (switching mechanism). Check to see if the Fiber Superloop Network card is seated correctly in its card slot.
Stuck RSIG	
R71 CRC. cnt = x	
R71 trunc. Cnt = x	
R71 misalign. Cnt = x	
R71 no resync. Cnt = x	All these messages indicate problem with R71 (RSIG) signaling. If problem persists, do selftest to identify the problem, which may be hardware.

Table 14
System messages displayed on the system terminal of TTY (Part 3 of 6)

Self-test messages
Card test started...PASSED! or FAILED! In case of selftest failure, the self-test is restarted and a message is printed to indicate the cause of failure. If the fault persists, replace the card. The system will output a message to identify the fault. Failed component messages and their description are listed as follows:
MPU confidence test failed The basic confidence test of the MPU of the tested card failed.
MPU int mem test failed: address=*addr* expected=*x* received =*y* MPU internal memory failed at address=**addr**; **x** is the test pattern when writing, and **y** is the read value.
EPROM test failed: calculated chksum=*checksum* The data in the boot EPROM is corrupt. The field ***checksum*** is calculated by the MPU. When the EPROM is good the checksum=0.
FLASH EPROM failed: calculated chksum=*checksum* The data in the FLASH EPROM is corrupt. The field ***checksum*** is calculated by the MPU. When the EPROM is good the checksum=0.
Shared RAM failed: address=*addr* expected=*x* received=*y* Shared memory failed at address=**addr**; **x** is the test pattern when writing, and **y** is the read value.
Main RAM failed: address=*addr* expected=*x* received=*y* Shared memory failed at address=**addr**; **x** is the test pattern when writing, and **y** is the read value.
MPU addressing failed The MPU addressing modes failed the test.

Table 14
System messages displayed on the system terminal of TTY (Part 4 of 6)

EEPROM failed: pattern/address/program	
	EEPROM cannot be reprogrammed. If the test passed, the card ID is printed.
Timer 1 failed	Internal timer in the card selftest failed.
Timer 2 failed	Internal timer in the card selftest failed.
Watchdog timer failed	
	One of the MPU internal timers failed. The timer ID is indicated in the message.
DUART failed	The system monitor port UART is faulty.
A21_1 failed	Network bus interface failed.
A21_2 failed	Network bus interface failed.
RSIG failed: *type*	
	RSIG is faulty. **type** is the type of failed test, which can be **reg** (register), **cont** (continuity), **xcvr** (receivers).
Interrupt failed: vect=*n*	
	MPU interrupt test failed, where **n** is the interrupt vector number that failed.
TSIC failed: *cause*	
	The FXPEC TSIC logic failed, where ***cause*** identifies the cause of failure.
A31 failed: *cause*	
	The FXPEC TSIC logic failed, where ***cause*** identifies the cause of failure.
Electro-optical packlet testing	
Packlet #n equipped! testing...PASSED! or **FAILED!**	
	If the test result is FAILED!, the additional information printed on the TTY can be one of the following:

Table 14
System messages displayed on the system terminal of TTY (Part 5 of 6)

EOI #n failed: *cause*	
	EOI packlet **n** failed and ***cause*** indicates the cause of the fault.
EOI #n loopback failed	
	The loopback test failed on the EOI #n.
P/EEPROM failed: pattern/address/program	
	EEPROM cannot be reprogrammed. If the test passed, the card ID is printed.
General card messages	
FXNET/FXPEC time: HH:MM dd/mm/yy	
	Time stamp is printed every 15 minutes, where HH:MM is hour and minute, dd/mm/yy is the day, month, and year.
Illegal command	Unrecognized command issued by the craftsperson.
Illegal parameter	Incorrect parameter entry.
MMI: string from remote: *string*	
	String is received from the FXPEC, but FXNET is in the MMI mode. ***string*** represents the actual command received from the other side.
MMI: switched to MSL-1 mode	
	SUBM R command was executed at the opposite site to place the MMI terminal in the MSL-1 mode.
PLL locked	FXNET PLL lock was successful.
PLL start bit not ready	
	Problem with PLL. Unplug the card and plug it back in. In the message reappears, replace the packlet.
PLL locked on prim/sec	
	FXPEC successfully locked on the signal from the Electro-optical packlet identified by **prim** or **sec**.
PLL lock lost	PLL is in the process of trying to lock.

Table 14
System messages displayed on the system terminal of TTY (Part 6 of 6)

PWR messages
PWRxxxx HW SM UEM U Where **HW**=**PWSP** (power supply), **DCSP** (DC battery), **SM**=System monitor address (**1-63**) defined by the FXPEC MMI port. **UEM**=**0** for the main wall-mounted cabinet and **1** for the expansion wall-mounted cabinet. **U**=unit (not used).
XMI000 *loop message* This is the general format of MMI messages printed on the system TTY. ***loop*** is the superloop number of the FXNET and ***message*** is the text sent by the card.
XMI000 *loop* OIF: switched to prim/sec Indication is that the span switched to primary or secondary link.
XMI000 11 RSIG link lost - Reinitialized
XMI000 11 R71 CRC Error threshold exceeded Failure of R71 (RSIG) communication to the Fiber Peripheral Controller card.

Table 15
Fiber Peripheral Controller selftest 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)
14	A31 #2 internal context memory (phase B)
15	A31 #2 internal TXVM memory
16	A31 #2 configuration memory

Table 15
Fiber Peripheral Controller selftest HEX codes (Part 2 of 2)

HEX code	Test description
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

Table 16
Alphabetical list of MMI commands (Part 1 of 4)

Command	Description
CLOG	Clears the log file and deletes all the messages.
CXSM	For remote floor-standing column. Checks the communication between the Fiber Peripheral Controller and the system monitor in the pedestal. The output is: **Wait...** during the test and after the test it displays: **XSM** responding or **XSM not responding**.
EOIA on/of	Default is off. Monitors EOI laser controller and reports the result: #n= 0 (primary), #n=1 (secondary) EOI #n ALARMS: Transmitter Fail EOI #n ALARMS: Transmitter is OK EOI #n ALARMS: Laser Fail EOI #n ALARMS: Laser is OK EOI #n ALARMS: Transmitter Input Clock Loss EOI #n ALARMS: Transmitter Input Clock is OK EOI #n ALARMS: Laser Degrade EOI #n ALARMS: Laser Degrade is OK EOI #n ALARMS: Laser ShutDown EOI #n ALARMS: Laser ShutDown is OK EOI #n ALARMS: Receiver Fail, alarm= x EOI #n ALARMS: Receiver is OK EOI #n ALARMS: Receiver Optical Input Fail, alarm= x EOI #n ALARMS: Receiver Optical Input is OK EOI #n ALARMS: Low Optical Input Power, alrm= x EOI #n ALARMS: Low Optical Input Power is OK EOI #n ALARMS: High Optical Input Power, alrm= x EOI #n ALARMS: High Optical Input Power is OK
<ESC>L	Changes the MMI port to local or MMI mode. ESC must be the first character in the command and must be preceded with 1.5 seconds of no-input.
<ESC>R	Changes the MMI port to remote or SL-1 mode. ESC must be the first character in the command and must be preceded with 1.5 seconds of no-input.

Table 16
Alphabetical list of MMI commands (Part 2 of 4)

Command	Description
FORC PRI/SEC	Performs forced switch of the active span to PRI=primary or SEC=secondary packlet.
HELP	Displays the list of commands.
IDC M/P/S	Query card ID information where M=main board (default setup), P=primary packlet, and S=secondary packlet.
MANS PRI/SEC	Performs manual switch to the primary or secondary link in a redundant link configuration.
MCLR	Clears manual link switching and restores the automatic link backup.
NLOG {n}	Prints the next n messages from a log file starting with the message following the last printed. If **n** is omitted, one message is printed.You can change the last message printed by executing **PLOG** command.
PLOG {n}	Prints **n** messages from the log file starting with the oldest message. If **n** is omitted, one record is printed. If **n** is larger than the file or if **n**=0, the entire file is printed.
QDEF	Query the default mode of the MMI port. The response can be: **Local** or **Remote.**
QFIB	Query the status of fiber-optic links. The response format is: **PRIM physical signal direction** **SEC physical signal direction** where **physical** can be: **equip, unequip**, or **faulty signal** can be: **SF** (failed), **SD** (degrade), or **NA** (no alarm) **direction** can be: **incoming**, **outgoing**, **both**, or **none**.

Table 16
Alphabetical list of MMI commands (Part 3 of 4)

Command	Description
QVER	Query version of the firmware and loadware.The response is: **Boot: xx Main: yy PSDL: zz** where **xx**= version of the boot firmware in EPROM **yy**= version of the main program, which is the last real download or the factory issue **zz**= version defined by the **SVER** command.
QXSM	Query the system monitor port number that can be from 1 to 63.
SCID M/P/S string	Sets card ID of: **M**=main board, **P**=primary packlet, or **S**=secondary packlet. The string is programmed on an EEPROM. A maximum of 32 characters can be contained in the string. A password is required to execute the command. The response to the command can be: **OK** if the command execution is successful or **FAILED** if the execution failed.
SDEF L/R	Sets the default mode to **L**ocal (MMI mode) or **R**emote (SL-1 mode).This command does not affect the current working mode, but it does affect the default mode after the reset or power-up.
STAD d m y h m s	Sets time and date with **day, month, year, hour, minute**, and **second.**
STAT	Query card status. The response can be: **Enabled/Disabled PLL: lock/unlock prim/sec** Enabled/Disabled indicates the status of the card. If Enabled, the CPU enabled it; otherwise, the response is Disabled. **PLL: lock/unlock** indicates the status of the PLL on the card. If locked, it indicates whether it is locked on the **primary** or **secondary** link. At the Fiber Superloop Network card an additional response is printed: **n busy** shows the number of timeslots busy.

Table 16
Alphabetical list of MMI commands (Part 4 of 4)

Command	Description
SUBM string	Submits a command to the other side of the span where **string** represents the actual command executed by the other side. The response, if any, is printed locally.
SVER version	Sets the PSDL version, which is presented to the CPU. The parameter **version** is a decimal number and it must match the actual version of the non-fiber superloop and peripheral controller card version. This command affects only the cards on which it is executed.
SXSM n	Defines the system monitoring address **n** for a wall-mounted cabinet Fiber Remote IPE. The address is also stored in the Fiber Peripheral Controller card EEPROM. The command is in effect immediately.
TEST {P/S}	Tests the entire card if **P/S** is omitted, tests only the primary packlet if **P** is specified, or tests only the secondary packlet if **S** is specified. To test the entire card, you must first disable the card. To test the packlet the card can be active but the packlet you are testing must be idle. Test results are printed on the MMI terminal. If any of the tests fail, refer to Table 15, “Fiber Peripheral Controller selftest HEX codes,” on page 153 for explanation.
TTAD	Query time and date.

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Meridian 1, Succession 1000M

Fiber Remote IPE

Description, Installation, and Maintenance

Information is subject to change without notice. Nortel Networks reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules, and the radio interference regulations of Industry Canada. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.
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Publication number: 553-3021-354
Document release: Standard 1.00
Date: October 2003
Produced in Canada

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