



TRITON™
NETWORK SYSTEMS, INC.

Invisible Fiber™ Unit Operations Manual

for 38 GHz Fast Ethernet Applications

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Contents

List of Figures	vii
List of Tables	ix
About This Book	xi
Purpose of This Book	xi
Intended Audience	xi
Format of This Book	xii
Conventions Used in This Book	xiii
Contacting Triton Network Systems, Inc.	xiii
Warnings and Safety Guidelines	xv
Conventions	xv
Risk of Personal Injury from Electrical Shock	xvi
Risk of Personal Injury from Fiber Optics	xvi
Risk of Personal Injury from Radio Frequency Energy Exposure	xvi
Other Risks of Personal Injury	xvii
Risk of Service Interruption	xviii
Other Precautions	xix
Avertissements et consignes de sécurité	xxi
Conventions	xxi
Risque de lésions corporelles provoquées par la décharge électrique	xxii
Risque de lésions corporelles provoquées par les câbles à fibres optiques	xxii

Risque de lésions corporelles provoquées par l'exposition de l'énergie radiofréquences	xxiii
Autres risques des lésions corporelles	xxiii
Risque d'interruption de service	xxiv
Autres mises en garde	xxv

Chapter 1 — Working with a Windows-based Application 1-1

Terminology	1-1
Looking at Windows	1-3
Window Components	1-4
Display-Only Components	1-6
Working with Windows	1-6
Moving a Window	1-6
Bringing a Window Forward	1-7
Resizing a Window	1-7

Chapter 2 — IFU Link Manager Overview 2-1

What Is IFU Link Manager?	2-1
Using a Local On-Site Connection	2-2
Using a Network Connection	2-3
System Requirements	2-4
Looking at IFU Link Manager	2-4
Looking at the NetworkMonitor Window	2-6
Feature Overview	2-7
Security Management	2-7
IFU Configuration Management	2-8
Fault Management	2-8
Alarms	2-9
RF Performance Management	2-11
IFU Network Management	2-11
You can use HP OpenView to assist with your net management function.	2-12
Automatic Transmit Power Control	2-12
Transmitter Power	2-12
Manual Reboot	2-12

Chapter 3 — IFU System Basics	3-1
Software Installation	3-1
Configuring Software for Remote Access	3-1
Connecting the Equipment	3-1
Connecting Locally	3-2
Connecting via a NOC	3-4
Accessing IFU Link Manager	3-5
Additional IFU Link Manager Functions	3-6
Online Help	3-7
 Invisible Fiber™ Product Glossary	 glossary-1
 Index	 index-1

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List of Figures

Figure 1-1.	Computer Desktop	1-1
Figure 1-2.	Sample Window	1-2
Figure 1-3.	Typical Mouse	1-2
Figure 1-4.	Sample Frame Window	1-4
Figure 1-5.	Sample Multiple Document Interface Window	1-4
Figure 2-1.	IFU Link Manager On-Site Connection	2-2
Figure 2-2.	Internet Network Management System Using IFU Link Manager	2-3
Figure 2-3.	IFU Link Manager Main Window	2-4
Figure 2-4.	IFU Link Manager Workspace	2-5
Figure 2-5.	IFU NetworkMonitor Window	2-6
Figure 3-1.	Connecting the PC to the IFU	3-2
Figure 3-2.	OAM&P Connectivity from NOC	3-4
Figure 3-3.	IFU Link Manager Main Window	3-5
Figure 3-4.	IFU Link Manager Online Help	3-8

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List of Tables

Table 1-1.	Window Components	1-5
Table 1-2.	Additional Window Components	1-5
Table 2-1.	Alarms	2-9
Table 3-1.	Network Tasks	3-5

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About This Book

The Triton Network Systems' 38 GHz Invisible Fiber™ unit (IFU) delivers high bandwidth, high-speed traffic through a wireless transport. IFUs are configured at the factory to work with Fast Ethernet or SONET applications. This book describes the Fast Ethernet application for the IFU.

Purpose of This Book

This book provides a basic overview for navigating on a computer. Used with the IFU Link Manager online help, this book provides instructions for operating IFU Link Manager, the application that provides on-site support and network management tools for IFUs.

Intended Audience

This book is written for installation, network management, and engineering personnel who are required to operate the IFU. All personnel should have a basic knowledge of operating a personal computer and their operating systems' navigation tools. (Basic computer navigation information is provided in Chapter 1, *Working with a Windows- based Application*.)

Format of This Book

This book contains:

Book Unit	Description
<i>Warnings and Safety Guidelines</i> on page xv	Provides a list of all warning, danger, and caution messages related to working with IFUs.
Chapter 1, <i>Working with a Windows-based Application</i>	Provides basic information about a working with a windows-based application, including: ■ Terminology ■ Working with a graphical user interface.
Chapter 2, <i>IFU Link Manager Overview</i>	Provides general information about the IFU Link Manager application, including: ■ System requirements ■ Sample screens ■ Feature overview.
Chapter 3, <i>IFU System Basics</i>	Provides the following procedures: ■ Installing IFU Link Manager ■ Connecting to the IFU for OAM&P ■ Accessing IFU Link Manager ■ Accessing IFU Link Manager online help.
<i>Invisible Fiber™ Product Glossary</i>	Provides descriptions of product terminology.
<i>Index</i>	Provides an alphabetical list with the page location of information included in this book.

Conventions Used in This Book

This book uses the following conventions:

- *Italic* - to indicate:
 - A book title
 - A heading or chapter title reference (for example, See *Conventions Used in This Book*)
 - Word emphasis (for example, *Do not* turn on the power)
- A *Note*: label to identify an informational note. For example:

NOTE: Refer to the previous chapter for more information.

- Character designations for field parameters:
 - N = number
 - C = alphanumeric character
- After the first introduction of a button icon, the icon graphic is used in text to identify the button. For example:
Click  tells you to *click the Exit button*.

For warning and safety precaution conventions, see *Conventions* on page xv (English version) or *Conventions* on page xxi (French version).

Contacting Triton Network Systems, Inc.

Direct any questions to your project liaison or:

Triton Network Systems, Inc.
Technical Assistance Center (TAC)
8529 SouthPark Circle
Orlando, FL 32819
Telephone - Domestic, Toll-free: 1-877-6TRITON (1-877-687-4866)
Telephone - International: +1-407-903-2070
E-Mail: support@triton-network.com
FAX: +1-407-903-0995

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Warnings and Safety Guidelines

Conventions

The following list identifies the warning and caution graphic symbols used in this guide:



Risk of Personal Injury from Electrical Shock

This symbol indicates a risk of personal injury due to an electrical shock.



Risk of Personal Injury from Fiber Optics

This symbol indicates a risk of personal injury from fiber optic cable laser radiation.



Risk of Personal Injury from Radio Frequency Energy Exposure

This symbol indicates a risk of personal injury due to radio frequency energy exposure.



Other Risks of Personal Injury

This symbol indicates a risk of personal injury from a source other than electrical shock, laser radiation, or radio frequency energy exposure.



Risk of Service Interruption

This symbol indicates a risk of service interruption or equipment damage.

Risk of Personal Injury from Electrical Shock



DANGER – HIGH CURRENT HAZARD: Do not turn on power before reading the Triton Network Systems’ product documentation. This device has a – 48 Vdc (4 amps operating peak per feed) direct current input.

DANGER – HIGH CURRENT HAZARD: Ensure that the – 48 Vdc power source is set to the OFF position before beginning the installation procedures for the Invisible Fiber™ unit.

DANGER – HIGH VOLTAGE HAZARD: Do not work on the system or connect or disconnect cables during periods of lightning activity, rainy weather, or both.

WARNING: Instructions for installing cables are intended for licensed contractors or building maintenance personnel.

Risk of Personal Injury from Fiber Optics



DANGER: Invisible laser radiation. Avoid direct eye exposure to the end of a fiber, fiber cord, or fiber pigtail. The infrared light used in fiber optics systems is invisible, but can cause serious injury to the eye.

WARNING: Never touch exposed fiber with any part of your body. Fiber fragments can enter the skin and are difficult to detect and remove.

Risk of Personal Injury from Radio Frequency Energy Exposure



WARNING: Beware! Radio transmitter is ON when the red light indicator on back side of Invisible Fiber™ unit is illuminated. Observe all radio frequency energy exposure and service interruption cautions.

WARNING – RF EXPOSURE HAZARD: Ensure the safety of all personnel. Do not stand in front of the Invisible Fiber™ unit (antenna) in order to avoid possible harmful radio frequency energy exposure.

Other Risks of Personal Injury

NOTE: The following warning and cautions are for risk of injury from sources other than electrical shock, fiber optics, or radio frequency energy exposure.



WARNING: This Invisible Fiber™ unit is designed to permit the connection of the earthed conductor from the DC source circuit to the earthing conductor at the Invisible Fiber™ unit. Do not switch or disconnect devices in the earthed circuit conductor between the DC source and point of connection of the earthing electrode conductor.

WARNING: Failure to follow operating instructions could result in death or serious injury.

CAUTION: Instructions for installing cables are intended for licensed contractors or building maintenance personnel.

CAUTION: Lifting hazard: Two people are required to lift the Invisible Fiber™ unit. Grasp the Invisible Fiber™ unit underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the Invisible Fiber™ unit and components, never attempt to lift the radio by the attached cables.

CAUTION: Keep tools and parts away from walkways. When carrying large, heavy equipment (such as the Invisible Fiber™ unit), obstacles (such as hand tools, cables or components) may not be easily visible and can cause accidents.

Risk of Service Interruption



CAUTION: Handle the Invisible Fiber™ unit with care to avoid equipment damage.

CAUTION: Ensure the outside optical fiber connectors are environmentally protected. Failure to do so may cause contamination of the fiber surfaces.

CAUTION: The Invisible Fiber™ unit contains no owner or user serviceable parts. Opening the radio unit or tampering with any of its seals voids all warranties.

CAUTION: Prior to installing an Invisible Fiber™ unit, the installation site must be surveyed to assess its appropriateness or adequacy, system requirements, path analysis, signal path, and power requirements.

CAUTION: Instructions for installing cables are intended for licensed contractors or building maintenance personnel.

CAUTION: *DO NOT* lift the Invisible Fiber™ unit by the Radome (front) Cover to avoid damaging the antenna.

CAUTION: Ensure the mounting bracket and Invisible Fiber™ unit are installed properly according to the instructions in the Triton Network Systems' product documentation.

CAUTION: Ensure that the – 48 Vdc power source is set to the OFF position before attaching power cables to the Invisible Fiber™ unit.

CAUTION: Do not block the front of the Invisible Fiber™ unit to avoid possible radio service interruption.

CAUTION: To reduce the risk of fiber optic cable damage, use the following bend radius guidelines for indoor/outdoor fiber optic cable:

- Long-term (installed): bend radius is equal to 10 times the diameter of the cable.
- Short-term (during installation): bend radius is equal to 20 times the diameter of the cable.

Other Precautions

Failure to follow the installation procedure described in the Triton Network Systems' product documentation may result in damage to the Invisible Fiber™ unit and render the unit unusable. If you have any questions, contact your Triton Network Systems' project liaison or the Technical Assistance Center at:

Triton Network Systems, Inc.
8529 SouthPark Circle
Orlando, FL 32819

Telephone - Domestic, Toll-free: 1-877-6TRITON (1-877-687-4866)
Telephone - International: +1-407-903-2070
E-Mail: support@triton-network.com
FAX: +1-407-903-0995

The Invisible Fiber™ unit must be installed in accordance with wall-mount or pole-mount specifications described in the Triton Network Systems' product documentation.

Observe all federal and local laws, regulations, electrical codes, building codes, fire codes, and licensing agreements.

Ensure the safety of all personnel and bystanders from potential radio frequency energy exposure hazards. Observe FCC 47 CFR 1.1307 for environmental assessments, FCC 47 CFR 1.1310 for radio frequency exposure limits, Health Canada Safety Code 6 for limits to exposure to RF fields, and other relevant regulatory and safety compliance rules for proper safety procedures, training, and assessment.

Ensure that appropriate warning signs are properly placed and posted at the equipment site or access entry.

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

one or more of the following measures on the radio or television antenna that is affected by interference:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a different circuit than the circuit the receiver is connected to.
- Consult the dealer or an experienced radio or TV technician for help.

This device complies with RSS-191 of Industry Canada. Operation is subject to the following two conditions:

- This device may not cause interference
- This device must accept any interference, including interference that may cause undesired operation of the device.

This Class B digital apparatus complies with Canadian ICES-003.



Avertissements et consignes de sécurité

Conventions

La liste suivante explique les symboles d'avertissement et de mise en garde utilisés dans ce guide:



Risque de lésions corporelles provoquées par la décharge électrique

Ce symbole indique un risque de lésions corporelles provoquées par la décharge électrique.



Risque de lésions corporelles provoquées par les câbles à fibres optiques

Ce symbole indique un risque de lésions corporelles provoquées par les câbles à fibres optiques.



Risque de lésions corporelles provoquées par l'exposition de l'énergie radiofréquences

Ce symbole indique un risque de lésions corporelles provoquées par l'exposition de l'énergie radiofréquences.



Autres risques de lésions corporelles

Ce symbole indique d'un risque de lésions corporelles (à part celles provoquées par la décharge électrique, par la radiation du laser, ou par l'exposition de l'énergie radiofréquences).



Risque d'interruption de service

Ce symbole indique un risque d'interruption de service ou de dommage aux équipements.

Risque de lésions corporelles provoquées par la décharge électrique



DANGER – L'HASARD DU COURANT ÉLEVÉ : Ne pas mettre la tension avant de lire la documentation du produit fournie par la société Triton Network Systems. Cet appareil a une alimentation directe de – 48 V CC (courant de pointe de 4 ampères par ligne d'alimentation).

DANGER – L'HASARD DU COURANT ÉLEVÉ : S'assurer que le bloc d'alimentation – 48 V CC est en position HORS TENSION avant d'aborder les procédures pour l'installation de l'unité Invisible Fiber^{MD}.

DANGER – L'HASARD DU TENSION ÉLEVÉ : Ne pas travailler sur le système ni brancher ni débrancher les câbles durant l'activité de la foudre, par de temps pluvieux, ou tous le deux.

AVERTISSEMENT : Les instructions pour l'installation des câbles sont destinées exclusivement aux entrepreneurs agréés et aux préposés à l'entretien de l'immeuble.

Risque de lésions corporelles provoquées par les câbles à fibres optiques



DANGER : Rayonnement laser invisible. Éviter l'exposition directe des yeux à l'extrémité d'une fibre, d'un cordon à fibres ou d'une fibre amorce. La lumière infrarouge utilisée dans les systèmes à fibres optiques est invisible, mais peut provoquer des lésions graves aux yeux.

AVERTISSEMENT : Ne jamais laisser une fibre nue entrer en contact avec une partie quelconque du corps. Des fragments de fibre peuvent entrer dans la peau, et sont difficiles à déceler et à enlever.

Risque de lésions corporelles provoquées par l'exposition de l'énergie radiofréquences



MISE EN GARDE : Attention ! Le poste émetteur est EN MARCHÉ lorsque le témoin rouge sur le dos de l'unité Invisible Fiber^{MD} est allumé. Respecter toutes les mises en garde concernant l'exposition aux radiofréquences et l'interruption de service.

MISE EN GARDE – RF EXPOSURE HAZARD : Assurer la sécurité de tout le personnel. Ne pas rester debout devant l'unité Invisible Fiber^{MD} (l'antenne) afin d'éviter toute exposition dangereuse aux radiofréquences. Les lésions corporelles sérieux s'ensuivre.

Autres risques des lésions corporelles

Les mises en garde suivantes concernent les risques de lésions corporelles attribuables à des causes autres que la décharge électrique, la radiation du laser, ou l'exposition de l'énergie radiofréquences).



AVERTISSEMENT : Cette unité Invisible Fiber^{MD} permet la connexion entre le conducteur de mise à la terre du circuit d'alimentation CC et le conducteur de mise à la terre de l'unité Invisible Fiber^{MD}. Ne pas changer ni débrancher les dispositifs qui se trouvent dans le conducteur du circuit mis à la terre entre la source de l'énergie CC et le point de connexion au conducteur de l'électrode de prise de terre.

AVERTISSEMENT : Ne pas suivre les instructions d'utilisation peut causer de sérieuses blessures et même la mort.

MISE EN GARDE : Les instructions pour l'installation des câbles sont destinées exclusivement aux entrepreneurs agréés et aux préposés à l'entretien de l'immeuble.

MISE EN GARDE : Danger de levage. Il faut deux personnes pour soulever l'unité Invisible Fiber^{MD}. Saisir l'unité Invisible Fiber^{MD} au-dessous du rebord inférieur, puis soulever l'unité avec les deux mains. Pour éviter les lésions corporelles, garder le dos en position verticale et soulever l'unité en utilisant les jambes et non pas les reins. Pour éviter l'endommagement de l'unité Invisible Fiber^{MD} et de ses composants, ne jamais essayer de soulever la radio en tirant sur les câbles qui y sont attachés.



MISE EN GARDE : Garder les outils et les pièces loin des allées. Lorsqu'on transporte des équipements lourds et à grandes dimensions (tels que l'unité Invisible Fiber^{MD}), les obstacles (tels que les outils à main, les câbles ou les composants) sont parfois difficiles à voir et peuvent causer des accidents.

Risque d'interruption de service



MISE EN GARDE : Manipuler l'unité Invisible Fiber^{MD} avec soin pour éviter des dommages aux équipements.

MISE EN GARDE : S'assurer que les raccords extérieurs fibre optique sont protégés contre l'environnement. L'absence d'une telle protection peut entraîner la contamination des surfaces des fibres.

MISE EN GARDE : L'unité Invisible Fiber^{MD} contient pas de parts utilisés par le propriétaire ou l'utilisateur. Ouverture de l'unité de la radio ou toucher aux scelles rend toute garantie nulle et non avenue.

MISE EN GARDE : Avant d'installer une unité Invisible Fiber^{MD}, il faut vérifier que les lieux de l'installation sont convenables et adéquats, déterminer les besoins du système, analyser les trajets, préciser le parcours du signal et déterminer les exigences en matière d'énergie.

MISE EN GARDE : Les instructions pour l'installation des câbles sont destinées exclusivement aux entrepreneurs agréés et aux préposés à l'entretien de l'immeuble.

MISE EN GARDE : *NE PAS* soulever l'unité Invisible Fiber^{MD} par le couvercle du radôme (couvercle avant), afin d'éviter l'endommagement de l'antenne.

MISE EN GARDE : S'assurer que le support de montage et l'unité Invisible Fiber^{MD} sont installés convenablement, selon les instructions figurant dans la documentation du produit fournie par la société Triton Network Systems.

MISE EN GARDE : S'assurer que le bloc d'alimentation – 48 V CC est en position HORS TENSION avant d'attacher les câbles d'alimentation à l'unité Invisible Fiber^{MD}.

MISE EN GARDE : Ne pas bloquer le devant de l'unité Invisible Fiber^{MD}, pour éviter toute interruption éventuelle du service de transmission radio.



MISE EN GARDE : Pour réduire le risque de dommage aux câbles à fibres optiques, suivre les consignes suivantes en matière de rayon de courbure des câbles à fibres optiques extérieurs ou intérieurs :

- Corbure à long terme (installée). Le rayon de courbure ne doit pas dépasser 10 fois le diamètre du câble.
- Courbure à court terme (pendant l'installation). Le rayon de courbure ne doit pas dépasser 20 fois le diamètre du câble.

Autres mises en garde

L'inobservation de la procédure d'installation décrite dans la documentation du produit fournie par la société Triton Network Systems peut endommager l'unité Invisible Fiber^{MD} et la rendre inutilisable. Si vous avez des questions à poser, veuillez communiquer avec votre agent de liaison des projets chez Triton Network Systems, ou bien joindre notre Centre d'assistance technique à l'adresse suivante :

Triton Network Systems, Inc.
8529 SouthPark Circle
Orlando, FL 32819
Téléphone - Aux États-Unis, sans frais : 1-877-6TRITON (1-877-687-4866)
Téléphone - Dans d'autres pays : +1-407-903-2070
Internet : support@triton-network.com
Télécopieur : +1-407-903-0995

Il faut installer l'unité Invisible Fiber^{MD} selon la spécification pour le montage mural ou sur poteau, telle que précisée dans la documentation du produit fournie par la société Triton Network Systems.

Il faut respecter l'ensemble des lois, règlements, codes d'électricité, codes du bâtiment et codes des incendies du gouvernement fédéral et des municipalités ainsi que tous les contrats de licence.

Assurez la sécurité de toute les personnels et les autres autour, contre l'hasard d'exposition de l'énergie des radiofréquences. Observez FCC 47 CFR 1.1307 pour l'appréciation de l'environnement, FCC 47 CFR 1.1310 pour les limitations d'exposition des radiofréquences, Code 6 de Sécurité de Santé Canada pour la limite d'exposition aux champs RF, et les autre règlements alliés et de complaisance de la sécurité pour les procédures appropriées de la sécurité, de l'apprentissage, et de l'appréciation.

Assurez que le signaux d'avertissement appropriés soient placés appropriatement et affichés dans la location d'équipement ou l'accès d'y entrer.

Cet appareil est conforme au RSS-191 de Industrie Canada. L'utilisation dépend des deux conditions suivantes:

- Cet appareil ne devrait pas causer d'interférence.
- Cet appareil doit accepter toute interférence, y compris une interférence pouvant causer une opération indésirable de l'appareil.

Cet appareil numérique de la classe B est conforme avec la norme NMB-003 du Canada.

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Working with a Windows-based Application

This chapter provides an overview of how to use any windows-based application. If you are familiar with using a windows-based application, you can skip this chapter.

Terminology

The following terminology is used throughout this book:

Desktop

The screen (Figure 1-1) that displays after you turn on the computer and the power-on and login processes are complete.

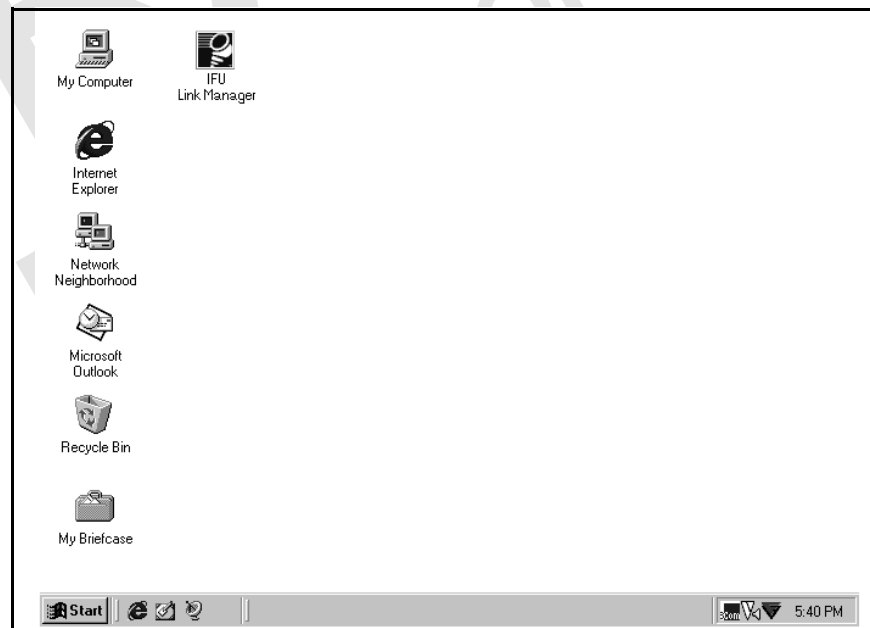


Figure 1-1. Computer Desktop

Window

A work area that displays on top of the desktop. This work area enables you to run and display several applications simultaneously. You can usually size a window to cover only a portion of the desktop or fill the entire screen.

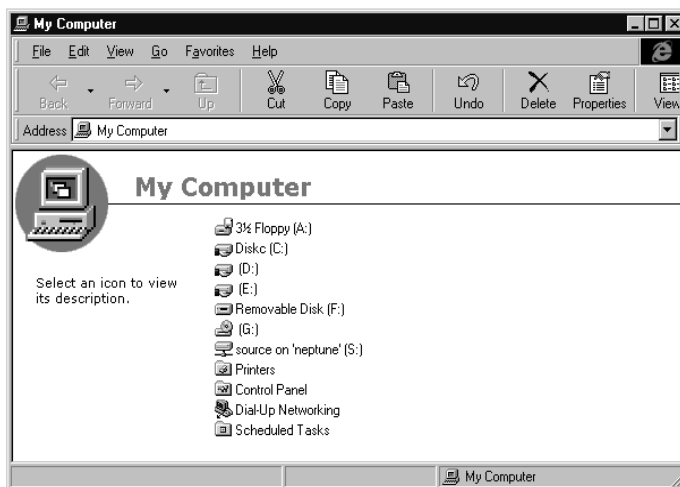


Figure 1-2. Sample Window

Mouse

A hand-held pointing device that enables you to select items in the window. Your computer may have another form of pointing device such as a trackball or pointing stick.

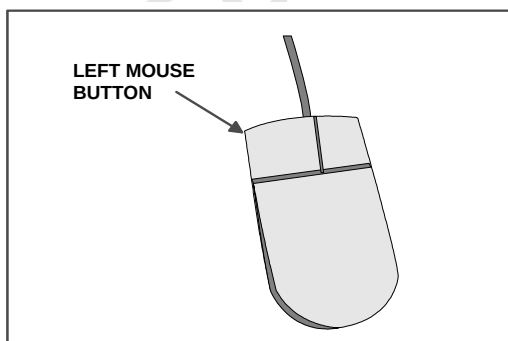


Figure 1-3. Typical Mouse

Graphical User Interface (GUI)

An interface that enables you to interact with a software application through graphical elements, such as icons. A GUI can:

- Provide immediate feedback on actions taken
- Provide lists of valid values
- Enable you to make selections (instead of type responses)
- Display informational, error, and warning messages.

Looking at Windows

Each window is a GUI that is designed to guide you through a task as you perform it. This section describes the items that appear in a GUI, enabling you to enter data, make a selection, or initiate a system process.

NOTE: Depending on the type of system you are using (such as PC, HP-Unix™, Solaris™), the GUIs you see may look slightly different from the illustrations shown in this manual, which were captured from a PC-based system.

IFU Link Manager uses two types of windows:

Frame

Top-level window that contains maximize, minimize, and close buttons, and a title bar that you can click and drag to move the window anywhere on your desktop. You can resize a frame window as required.

Multiple Document Interface

Second-level window that displays only within the boundaries of a top-level window. You can move or resize a multiple document interface window only within those boundaries.

NOTE: Within the IFU Link Manager application, a multiple document interface window displays only within the boundaries of the WorkSpace window.

Window Components

Figure 1-4 and Figure 1-5 show the components that are commonly available on IFU Link Manager windows.

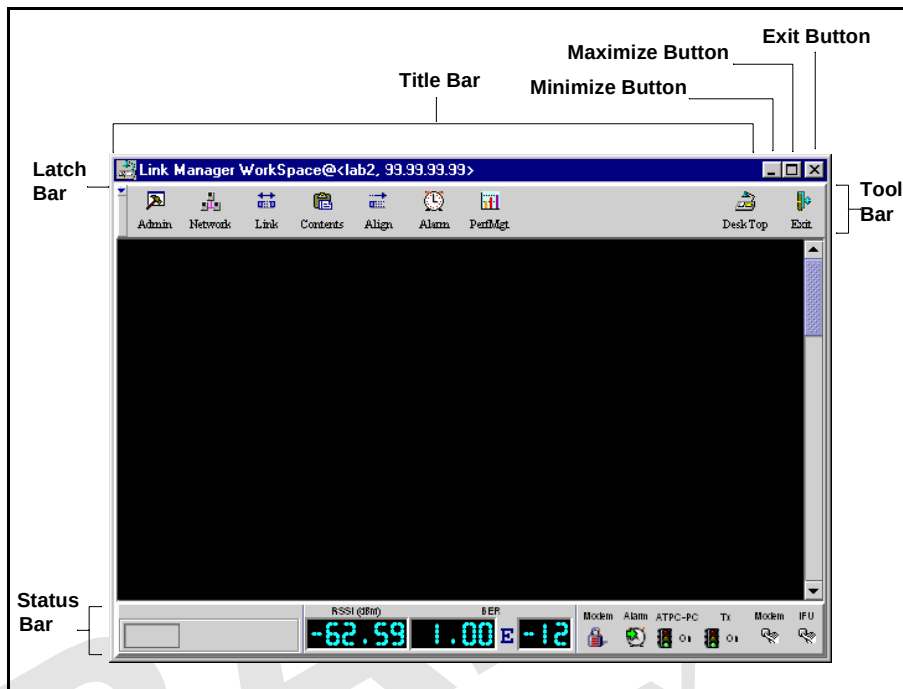


Figure 1-4. Sample Frame Window

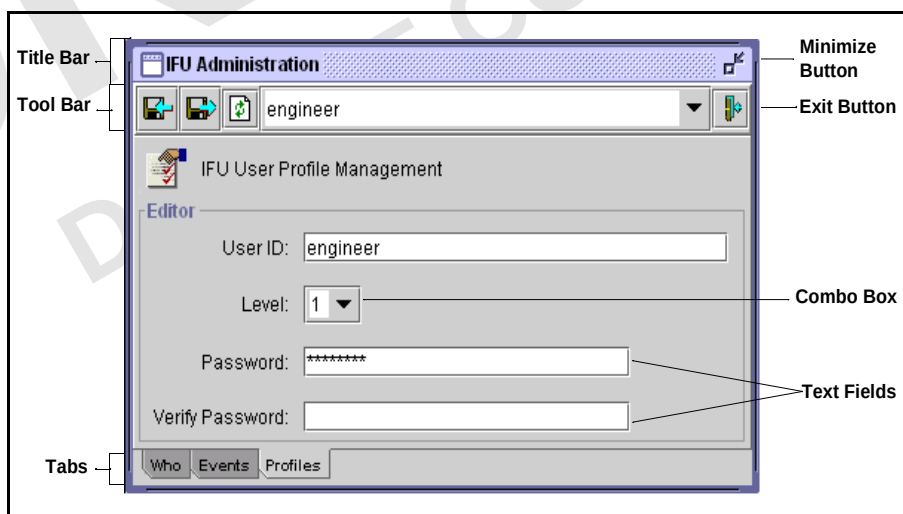


Figure 1-5. Sample Multiple Document Interface Window

Table 1-1 provides a description of the window components called out in Figure 1-4 and Figure 1-5.

Table 1-1. Window Components

Component	Description
Combo Box	Text box that enables you to select from a list of valid values or options. The process to display the values depends on the GUI. If the field shows a down arrow, click the arrow to display the list; otherwise, click in the box to display the list. With the list displayed, use the scroll bar or click to select the required value or option.
Exit Button	Closes the window and removes it from the screen.
Latch Bar	Enables you to hide the tool bar. To redisplay the toolbar, click the latch bar again.
Maximize Button	Enlarges the window to fill your desktop. After maximizing the window, the button display changes to show two windows. Click the button again to return to the original window size.
Minimize Button	Reduces the size of the window to an icon on your desktop.
Status Bar	(Frame window only) Indicates whether alarms are on or off.
Tab	Shows an individual “page” within a window. Click a tab to view its page.
Text Field	Area in which you type information. Text fields can be programmed to accept letters, numbers, or a combination of both.
Title Bar	Displays the name of the window.
Tool Bar	Contains buttons that enable you to initiate system processes such as closing a window, saving a record, and printing.

Table 1-2 describes components you may find in applications that are not specifically called out in Figure 1-4 or Figure 1-5.

Table 1-2. Additional Window Components

Component	Description
Button	Small box that provides a shortcut for a command. A button can contain an icon and/or text to represent the shortcut.

Table 1-2. Additional Window Components

Component	Description
Check Box	Open box that provides the ability to enable or disable a function. When a check box is deselected, no mark displays in it. When it is selected, a check mark displays in the box.
Icon	Pictorial representation of a window, menu, or system process such as closing a window, saving a record, or printing. A button can contain an icon to symbolize a system process.
Save Button	Saves information you typed in the window.
Window Pull-Down Menu Button	(Frame window only) Displays a list of options. These options enable you to perform actions such as closing the window, resizing the window, and minimizing the window.

Display-Only Components

Display-only components appear dimmed or “grayed-out.” You cannot select or type information in a display-only component. Components are display-only when they are not necessary for performing a task or because they access function that are not available.

Working with Windows

This section describes the basics of using Windows including:

- Moving windows
- Bringing a window forward
- Resizing windows

Moving a Window

You can move windows on your desktop to better accommodate your work area. To move a window, click the title bar and drag the window to where you want it to display on your desktop. When the window is positioned appropriately, release the mouse button.

NOTE: You cannot move a multiple document interface window outside the boundaries of the WorkSpace window.

Bringing a Window Forward

As you move windows, you may find you are laying them on top of each other, hiding information you need to see. To bring a window into the foreground to work in it, click on any exposed part of the window.

NOTE: You may have to move overlaying windows before you can click on the window you want in the foreground.

Resizing a Window

You can also change the size of windows by performing one of the following tasks:

- Move the mouse pointer to the upper left or right corner of the window (until the pointer becomes a double arrow) and then drag the corner of the window until it is the desired size.
- Use the window pull-down menu and select to resize the window.
- Click the maximize button or the minimize button in the upper right corner of the window.

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IFU Link Manager Overview

This chapter provides:

- A description of IFU Link Manager
- System requirements
- Sample illustrations of some of the basic windows within IFU Link Manager
- An overview of the IFU Link Manager features

What Is IFU Link Manager?

IFU Link Manager is a software application that enables a crafts person to set up, configure, and maintain IFUs in a network. The IFU Link Manager application can be run locally (that is, at the installation site on a PC connected directly to the IFU), or it can be operated remotely, from any point in the IFU network including the Network Operations Center (NOC).

Using a Local On-Site Connection

The on-site local connection method is shown in Figure 2-1. When connected locally, IFU Link Manager works on either a single IFU or a single link at a time.

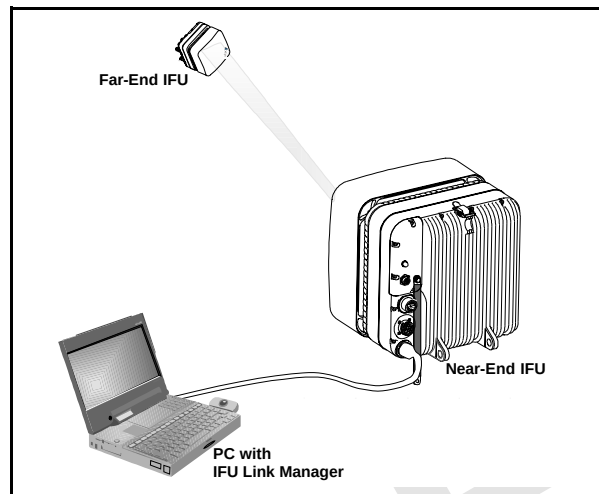


Figure 2-1. IFU Link Manager On-Site Connection

IFU Link Manager enables you to perform local configuration monitoring and limited network management operation of a radio link between two IFUs (one near IFU and one far IFU). Using IFU Link Manager, you can monitor IFU configuration parameters, provisioning and inventory information, security and administration data, and alarms/faults.

Using a Network Connection

IFU Link Manager enables you to perform continuous monitoring of IFUs in your network without actually logging in to each IFU. By remotely connecting a network management system to the managed elements, you can monitor the status of the IFUs in your network. Figure 2-2 shows a typical Internet network management system that uses IFU Link Manager.

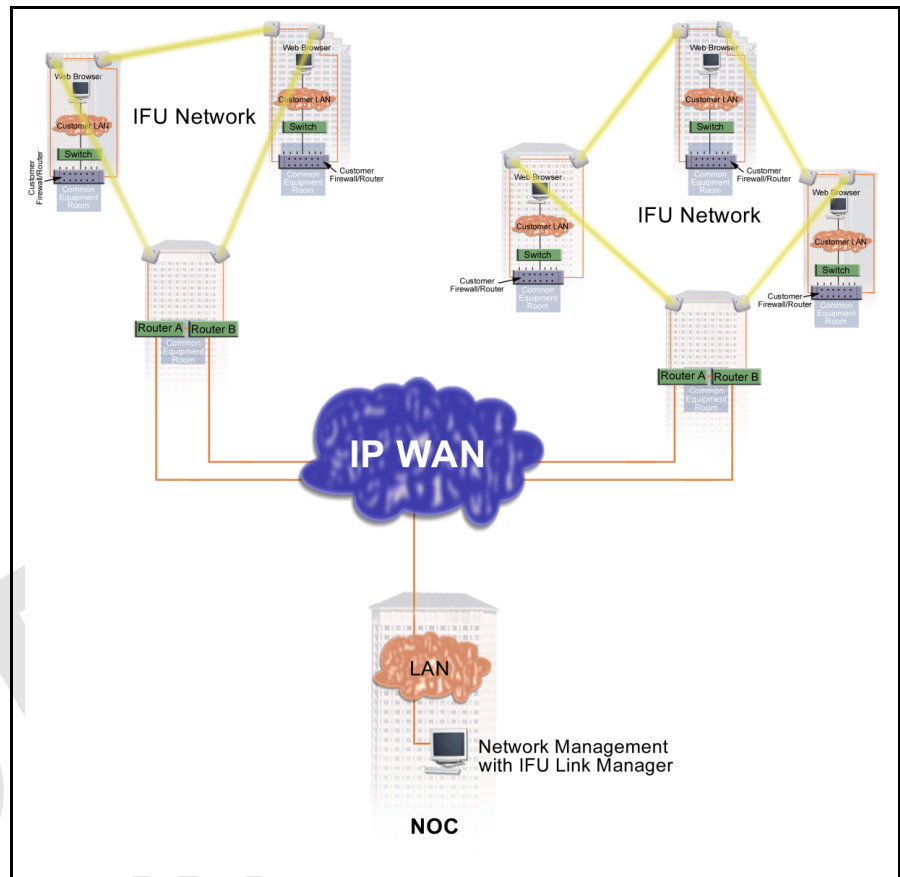


Figure 2-2. Internet Network Management System Using IFU Link Manager

System Requirements

Install the IFU Link Manager software on a UNIX workstation or a personal computer (PC), preferably a laptop (for connecting on-site).

Operating System requirements

The IFU Link Manager application runs on any OS that supports Sun Microsystems Java™ Runtime Environment (JRE) version 1.1.6.

The following operating systems have been tested:

- Microsoft Windows 95, 98, and NT 4.0 (JRE is not supported on Windows 3.5.1 or below.)
- Sun Solaris 2.5.1 and 2.7

Hardware requirements

To run IFU Link Manager, your PC must have the following minimum features:

- 200 MHz processor
- 128 MB RAM
- 1 GB of free hard disk space
- SVGA monitor
- 10BaseT Ethernet network interface card

Looking at IFU Link Manager

When you access IFU Link Manager from the desktop, the first window that displays is the IFU Link Manager main window (Figure 2-3), which is your link to the IFUs in the network.

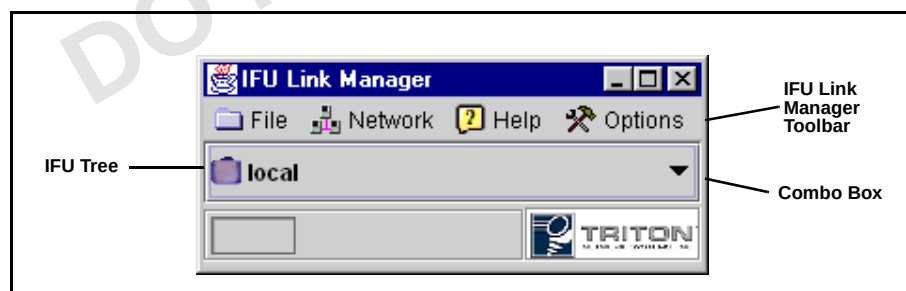


Figure 2-3. IFU Link Manager Main Window

When you connect to an IFU from the main window, the IFU Link Manager WorkSpace (Figure 2-4) opens. Other windows display as you perform operations on an IFU in the network.

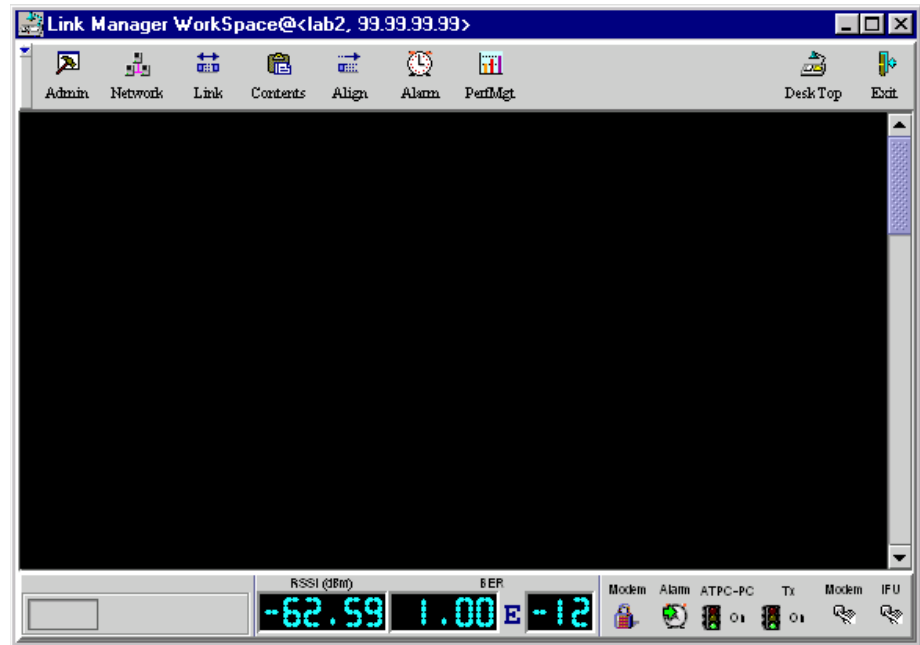


Figure 2-4. IFU Link Manager WorkSpace

NOTE: Refer to the online help for information about using IFU Link Manager.

Looking at the NetworkMonitor Window

The IFU NetworkMonitor window enables the operator to view a network of IFUs and quickly identify any problems in the network using IP masks (defined subset of IFUs). You open a new NetworkMonitor window for each IP mask you want to monitor.

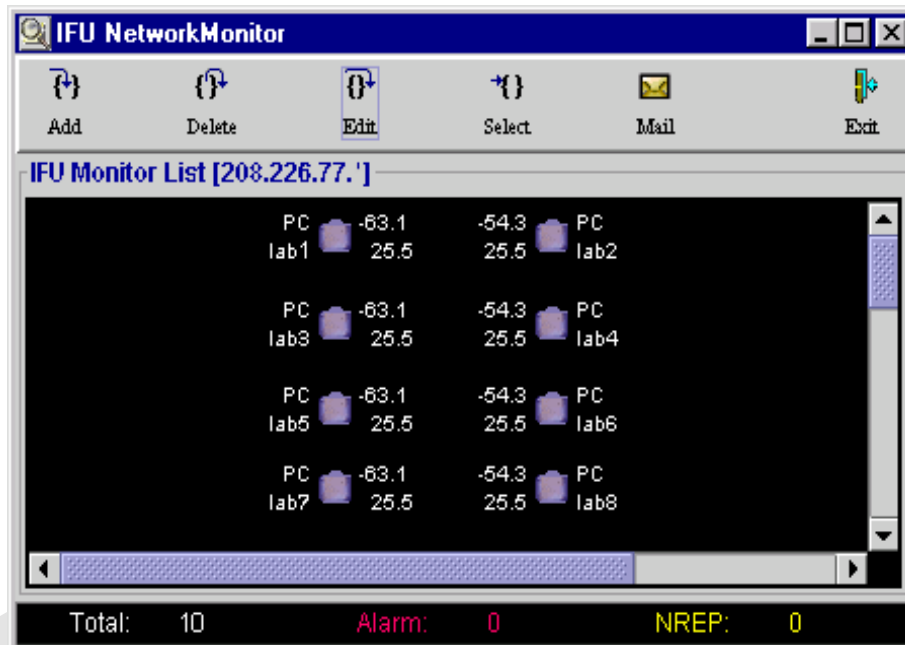


Figure 2-5. IFU NetworkMonitor Window

The IFU NetworkMonitor window consists of multiple rows of linked IFU pairs. The following information displays for each IFU:

- Power control status
- IP address or alias
- Alarm status

NOTE: If an alias is defined for the IFU, the alias displays; otherwise, the IP address displays.

- Received Signal Strength Indicator, RSSI
- Signal Quality Metric, SQM

Additionally, the status bar at the bottom of the window shows:

- Total number of IFUs being monitored
- Number of IFUs with active alarms
- Number of IFUs that are not currently reporting

Feature Overview

IFU Link Manager features include:

- Security Management
- IFU Configuration Management
- Fault Management
- RF Performance Management
- IFU Network Management
- Automatic Transmit Power Control
- Transmitter Power
- Manual Reboot

NOTE: Refer to the online help for detailed information about fields on each screen.

Security Management

The Security Management feature enables you to:

- Restrict access to the IFU to authorized users only. The security access levels are:

Level 1

Full read and write access
Password administration capability
Network administration capability

Level 2

Full read and write access
No network or password administration capability

Level 3

Read only access

- Define up to 10 user login profiles by a user with Level 1 access
- Control access to the Configuration, Fault, and Performance Management functions based on the user's login security level
- Administer access passwords only by a user with Level 1 access
- View the following information via IFU Link Manager:
 - All users currently connected to an IFU
 - A log of the last 10 user events for an IFU

Each IFU allows up to two simultaneous login sessions.

NOTE: For more information about this feature, refer to “Security Management” in the online help.

IFU Configuration Management

Depending on your level of access (see *For more information about this feature, refer to “General Procedures” in the online help. on page 2-13*), the Configuration Management feature enables you to *enter* or *review* the following characteristics of the IFU:

- Site name, IP addresses of IFU pairs

NOTE: To monitor the status of an IFU with IFU Link Manager, you must enter the correct addresses for each IFU in a linked pair.

- Assigned channel, rain region, grade of service, latitude and longitude of IFU pairs
- Installation, in-service, and last change dates

IFU configuration monitoring enables you to *review* the following characteristics of the IFU:

- Inventory information (IFU serial number, IFU product type, IFU Link Manager software version)
- Link selection, antenna orientation, and type of network interface

NOTE: For a list of the specific parameters that can be changed or viewed, refer to “IFU Provisioning” in the online help.

Fault Management

The Fault Management feature provides the following functions:

- Enables the user to view an IFU’s active alarms with time stamps as they are stored on each IFU
- Enables the user to tag a note to each alarm type
- Enables the user to view the Alarm History Log that includes the previous 300 time stamped events (set, event, and clear) as they are stored on each IFU
- Enables the user to mask and unmask all alarms
- Enables the user to change the threshold setting for modem power, SQM, and internal temperature

- Displays the modem lock status on the Workspace window

Alarms

The operator can program the system to automatically send an e-mail message to a programmable valid destination when the status of an IFU status changes to not reporting (NREP), alarmed, or when the alarm clears.

Table 2-1 lists the alarms that can display in IFU Link Manager and identifies possible problem areas that may have caused each alarm. You also can view the list of alarms on the Discrete tab of the Alarms window.

NOTE: *Critical* severity indicates that the IFU cannot be used; *major* severity indicates that the IFU may still be functioning.

Table 2-1. Alarms

Alarm	Default Severity	Affected Subassembly	Description
EXCITER UNLOCK	Critical	Exciter and/or Reference Oscillator	Exciter reports loss-of-lock condition, which means that the IFU lost its ability to transmit valid payload <i>and</i> OAM&P data across the RF link.
LOL SONET CLOCK	Critical	Modem and/or NIC	The modem cannot identify a locked SONET clock (loss of lock) from the data received from the modem. Therefore, any data received via the RF link is no longer valid. NOTE: This alarm displays only on the Discrete tab of the Alarms window.
MODEM UNLOCK	Critical	Modem	The demodulation functional components of the modem have lost lock to the incoming signal. The data received through the RF link is not valid. NOTE: This condition can be due to a heavy rain interruption, in which case it will correct itself when the rain subsides.
PAYLOAD OFFLINE	Critical	Modem and/or NIC	IFU stopped transmitting and transporting payload data because it is receiving too many errors for the modem to correct.
POWER TX RAIL	Critical	Power Supply Unit	Power supply to the transmitter failed. The IFU is not transmitting data across the RF link to its paired IFU.

Table 2-1. Alarms

Alarm	Default Severity	Affected Subassembly	Description
POWER UNSWITCH RAIL	Critical	Power Supply Unit	Power failed to at least one of the IFU major subassemblies other than the transmitter.
TX FAIL	Critical	Transmitter	The RF transmitter failed. The IFU cannot transmit valid data across the IFU link to its paired IFU.
CARRIER FREQUENCY OFFSET	Major	Modem	The carrier frequency is approaching the modem lock limit.
GPI 1	Major	External	External equipment reports an event.
GPI 2	Major	External	External equipment reports an event.
IF TUNING FAIL	Major	Modem	The required Invisible Fiber™ compensation is outside of the allowable range.
INTERNAL COMM FAIL	Major	Modem, NIC, and/or Power Supply Unit	Communication between the CPU and at least one of the internal subcomponents failed.
INTERNAL TEMPERATURE HIGH	Major	IFU	Internal temperature of the IFU is approaching the upper operational limit of the IFU as set during configuration.
INTERNAL TEMPERATURE LOW	Major	IFU	Internal temperature of the IFU is approaching the lower operational limit of the IFU as set during configuration.
LOS SONET FIBER	Major	NIC	Loss of Signal (LOS) is detected from the user data optical fiber input port. NOTE: This alarm displays only on the Discrete tab of the Alarms window.
MODEM POWER LOW	Major	Modem	Modem power is approaching the minimum operational level of the IFU as set during configuration.
POWER +12V RAIL	Major	Power Supply Unit	The +12 V rail of the power supply unit is operating outside of its specification.
POWER – 48V RAIL	Major	Power Supply Unit	The – 48 V rail of the power supply unit is operating outside of its specification.
POWER MNGMT TIMEOUT	Major	CPU	A timeout occurred before the power control logic received a message across the RF link from the paired IFU.

Table 2-1. Alarms

Alarm	Default Severity	Affected Subassembly	Description
SQM Low	Major	Modem	The received (SQM) level is approaching the minimum operational level of the IFU as set during configuration.
Tx ID MISMATCH	Major	IFU	The IFU received a transmission across the RF link from a source other than its paired IFU.
Tx POWER MAX	Major	IFU	The transmitter is currently transmitting at the maximum level. A rain interruption or link block can cause this situation.

NOTE: For more information about this feature, refer to “Fault Management” in the online help.

RF Performance Management

The RF Performance Management feature enables IFU Link Manager to display the following data for each IFU:

- RSSI
- SQM
- Bit Error Rate (BER)
- Internal temperature of the IFU

Additionally, IFU Link Manager displays the following types of Performance Management data in a graphical format:

- RF: SQM and modem power
- IFU: Block errors, modem lock status, and internal temperature

NOTE: For more information about this feature, refer to “Performance Management” in the online help.

IFU Network Management

IFU Link Manager can be used to monitor your IFU network provided the IFUs are configured to enable network management from this workstation. Using this feature, you can monitor the IFUs in a network without logging in to each IFU.

Use HP OpenView to monitor the network and perform standard network management functions. Use IFU Link Manager to perform the following IFU specific management functions on IFUs:

- Security
- Configuration
- Fault
- Performance

You can launch multiple Network Monitor windows (Figure 2-5 on page 2-6) with each window monitoring multiple IFU links (partitioned by IP address filtering).

You can use HP OpenView to assist with your net management function.

Automatic Transmit Power Control

Automatic Transmit Power Control (ATPC) enables the IFU to maintain a constant receive signal at the lowest appropriate power. The IFU operates between -30 and -70 dBm.

The ATPC feature allows the user to enable or disable the ATPC and displays the status on the WorkSpace window. When power control is enabled, the display shows a green light on the ATPC icon. Conversely, when power control is disabled the display shows a red light on the ATPC icon.

NOTE: Generally, you will want to disable ATPC only when you are aligning the antennas. For more information about using this feature, refer to? in the online help.

Transmitter Power

The Transmitter Power feature enables the user to power the transmitter ON and OFF. The transmitter status displays on the workspace.

NOTE: For more information about this feature, refer to “General Procedures” in the online help.

Manual Reboot

The Manual Reboot feature enables the user to reboot the modem or the IFU.

NOTE: For more information about this feature, refer to “General Procedures” in the online help.

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IFU System Basics

This chapter provides the following information:

- Procedure for loading the IFU Link Manager software
- IFU OAM&P network connectivity description
- Procedure for accessing IFU Link Manager
- Procedure for accessing online help from within IFU Link Manager

Software Installation

The IFU Link Manager can be installed on a UNIX workstation, PC, or laptop for local or remote access to IFUs. Triton Network Systems, Inc., personnel install software on your computers as required.

Configuring Software for Remote Access

You can access an IFU remotely via IFU Link Manager. Refer to “General Procedures” the online help for information about configuring IFU Link Manager to receive information from a remote IFU.

Connecting the Equipment

You can connect the IFU locally to the PC at the site or via a LAN connection to the Network Operations Center (NOC).

Connecting Locally

You use the IFU test cable to connect the PC's 10BaseT Ethernet network interface card to the IFU's Local Ethernet (test) connector, as shown in Figure 3-1.

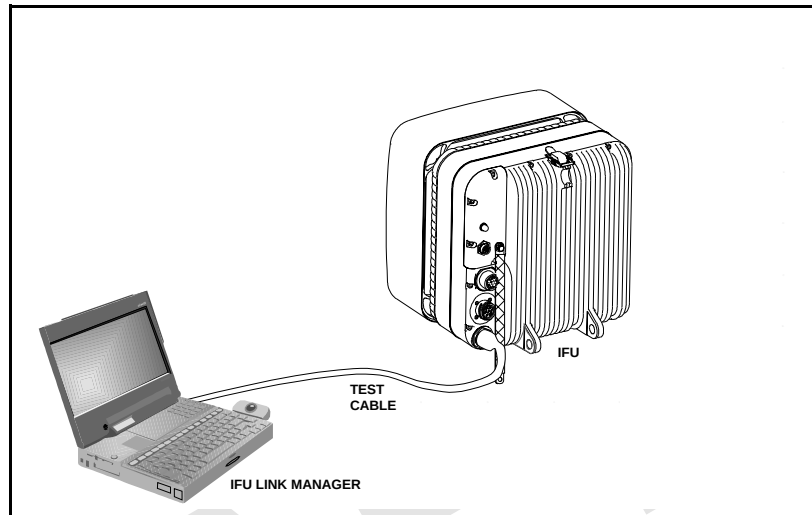


Figure 3-1. Connecting the PC to the IFU

► 1 To connect the PC to the IFU:



DANGER – HIGH VOLTAGE HAZARD: Do not work on the system or connect or disconnect cables during periods of lightning activity, rainy weather, or both.

DANGER – L'HASARD DU TENSION ÉLEVÉ : Ne pas travailler sur le système ni brancher ni débrancher les câbles durant l'activité de la foudre, par de temps pluvieux, ou tous le deux.



DANGER – HIGH CURRENT HAZARD: Do not turn on power before reading the Triton Network Systems' product documentation. This device has a – 48 Vdc (4 amps operating peak per feed) direct current input.

DANGER – L'HASARD DU COURANT ÉLEVÉ : Ne pas mettre la tension avant de lire la documentation du produit fournie par la société Triton Network Systems. Cet appareil a une alimentation directe de – 48 V CC (courant de pointe de 4 ampères par ligne d'alimentation).



CAUTION: Beware! Radio transmitter is ON when the red light indicator on back side of Invisible Fiber™ Unit is illuminated. Observe all radio frequency energy exposure and service interruption cautions.

MISE EN GARDE : Attention ! Le poste émetteur est EN MARCHE lorsque le témoin rouge sur le dos de l'unité Invisible Fiber^{MD} est allumé. Respecter toutes les mises en garde concernant l'exposition aux radiofréquences et l'interruption de service.



WARNING – RF EXPOSURE HAZARD: Ensure the safety of all personnel. Do not stand in front of the Invisible Fiber™ unit (antenna) in order to avoid possible harmful radio frequency energy exposure. Serious bodily injury may result.

MISE EN GARDE – RF EXPOSURE HAZARD : Assurer la sécurité de tout le personnel. Ne pas rester debout devant l'unité Invisible Fiber^{MD} (l'antenne) afin d'éviter toute exposition dangereuse aux radiofréquences. Les lésions corporelles sérieux s'ensuivre.

- 1 Connect the IFU test cable to the test port of the IFU.
- 2 Connect the RJ-45 plug of the test cable to the laptop
- 3 Turn the power switch on the PC to the ON position.

Connecting via a NOC

IFU Link Manager can perform OAM&P functions from a remote location such as a NOC. You connect a PC with IFU Link Manager from the NOC to an IFU network via an IP WAN network set as illustrated in Figure 3-2.

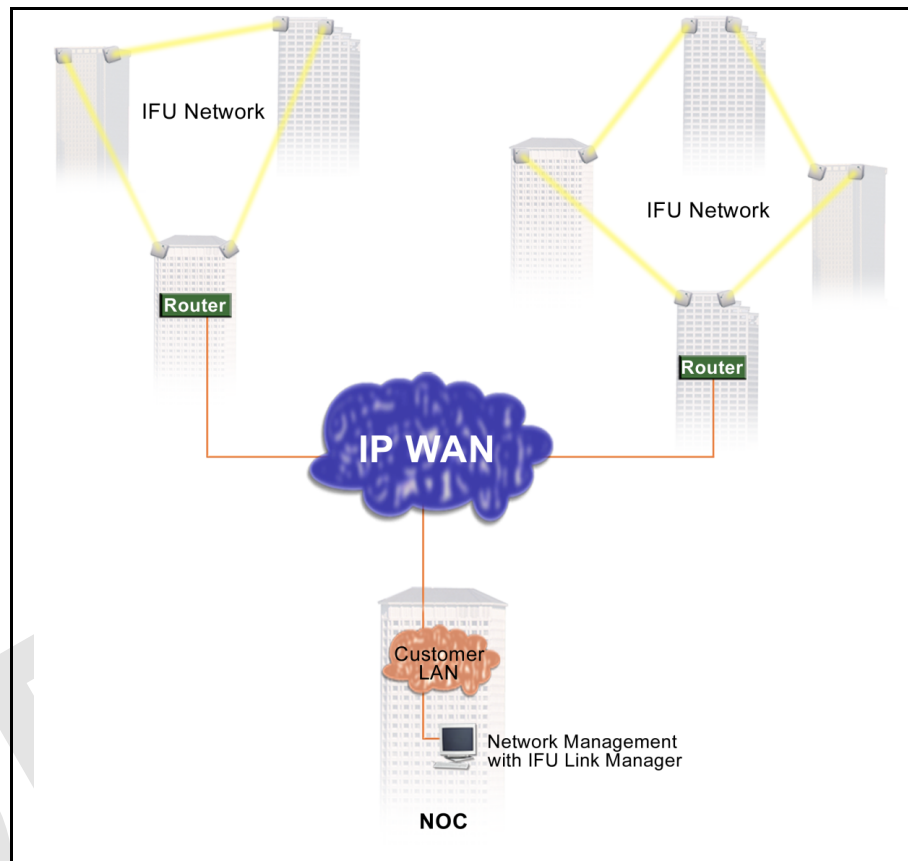


Figure 3-2. OAM&P Connectivity from NOC

Accessing IFU Link Manager

You access the IFU Link Manager to set up your network view, to work on a specific IFU, or to monitor a network of IFUs.

► **To access the IFU Link Manager application:**

Double-click the IFU Link Manager icon () on the PC desktop or the icon assigned to an IFU from HP OpenView™.

Result: The IFU Link Manager main window (Figure 3-3) opens on the desktop.

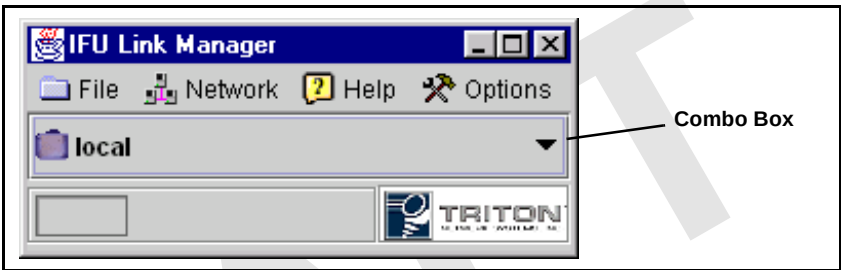


Figure 3-3. IFU Link Manager Main Window

IFU Link Manager provides a graphical representation of your IFU network containment hierarchy in a tree structure showing clusters of IFUs as branches (represented by ) and single IFUs as leaves (represented by ). You can set up a unique view on your PC to see only the elements you need to work on. When the window first opens, the tree is collapsed, but you can expand it by clicking the drop-down selection button.

Table 3-1 identifies the tasks you can perform from the Network drop-down menu.

Table 3-1. Network Tasks

To...	Refer to...
Add a network element	“Adding a Network Element” in the online help
Delete a network element	“Deleting a Network Element” in the online help
Edit a network element	“Editing a Network Element” in the online help

Table 3-1. Network Tasks

To...	Refer to...
Connect to a network element to configure the IFU or monitor the network in which it resides	“Connecting to an IFU” in the online help
Monitor the status of IFUs in a network	“Monitoring Your Network” in the online help

Additional IFU Link Manager Functions

The IFU Link Manager incorporates five separate tools:

IFU Navigation

This tool allows an operator to navigate through the network to the IFU of interest, and then invoke a network management session with the IFU. Once a session connection occurs, a workspace is created within the GUI, along with a toolbar with the four tools for IFU management.

IFU Administration

This tool enables the operator to:

- List users currently logged into the IFU
- Log users that have been logged into the IFU since it was initialized
- Administer IFU access passwords

IFU Attributes

This tool allows the operator to manage all pertinent information related to the IFU in four categories:

- General: site name, IFU address, EMS address, installation date.
- As-built factory settings: A or B radio, antenna polarization (Tx horizontal or vertical), link type (SONET OC-3 or Fast Ethernet).
- Link: RF channel number, rain region of operation, desired grade of service, link end-point latitude and longitude coordinates.
After these parameters are entered, the tool calculates whether the desired grade of service can be achieved, and what the expected fair weather modem power signal level should be.
- Inventory: serial, model, and version numbers for the IFU, and serial numbers for internal components.

Alarm Count and Navigation

This tool provides three different functions:

- Alarm Level: current status of the IFU and its internally configured alarms
- Alarm Log: history of alarms (occurrence, when cleared)
- GPI: status, configuration, and log of GPI inputs and outputs

Performance Management

This tool enables the operator to see how the system is performing by offering a series of strip charts (showing current data as IFU Link Manager collects it) and historical plots.

Using the performance management tool, the operator can view the following strip charts:

- Modem power and signal quality metric (SQM) data
- Block errors, modem lock status, and temperature
- IFU temperature plus the Tx, +12 V and -48 V statuses

Additionally, the performance management tool enables the operator to plot the following data:

- Modem power defined by Received Signal Strength Indicator (RSSI) in dB
- SQM in dB
- Reed-Solomon block errors from the modem
- Modem lock status in discrete values
- Internal temperature of the IFU

NOTE: Refer to the online help for more information about performing these tasks.

Online Help

Two types of online help are available:

- Tool tips – Short explanation of an icon or button.
- Procedure – Information that provides instructions for using the IFU Link Manager to configure, administer, and maintain an IFU

► **To access online help:**

- 1 Locate the IFU Link Manager help file, (IFU LM Help).
- 2 Open the file. The online help table of contents displays as shown in Figure 3-4.

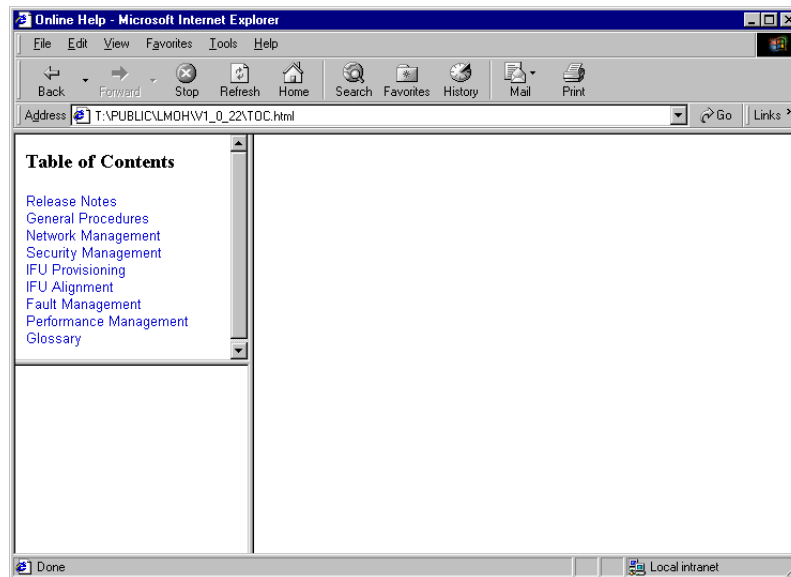


Figure 3-4. IFU Link Manager Online Help



Invisible Fiber™ Product Glossary

10BaseFL

Part of the IEEE 802.1j standard for 10 Mbps Ethernet fiber.

10BaseT

IEEE 802.3 standard specifying Ethernet over unshielded twisted pair cables.

99.999% availability

(Also known as five 9s availability.) Amount of time the system is expected to be available. If the system is available 99.999% of the time, expected down time is approximately six minutes per year, derived as follows:

$$\begin{aligned} \text{Days per year} \times \text{hours per day} \times (100 - 99.999) \div 100 \times 60 &= \\ 365.25 \times 24 \times (100 - 99.999) \div 100 \times 60 &= 5.2 \text{ minutes} \end{aligned}$$

100BaseFX

Part of the IEEE 802.3u standard for 100 Mbps Ethernet over fiber.

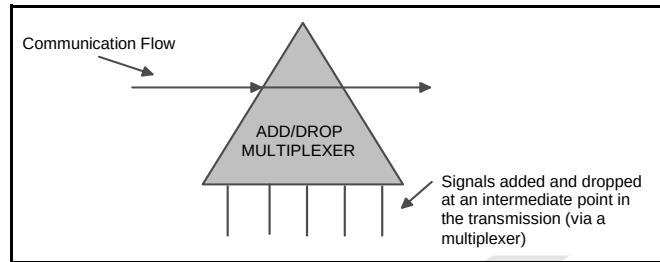
A

ABAM

A designation of Lucent Technologies for 22 gauge, 110 ohm, insulated, twisted-pair cable used to connect an ADM switch to a T1 distribution panel.

Add/Drop Multiplexer (ADM)

A device that provides an interface between the different signals in a digital T-carrier or SONET network. When an ADM is inserted in a transmission line, it enables lower rate signals to be extracted (dropped) and transported differently (electrical or optical). Similarly, a lower rate signal can be inserted (added) into a higher rate signal.



ADM

See *Add/Drop Multiplexer (ADM)*.

AIS

See *Alarm Indication Signal (AIS)*.

Alarm Indication Signal (AIS)

A special signal that is transmitted to downstream equipment for specific equipment fault conditions.

antenna

A mechanical device that can convert electrical signals to and from electromagnetic waves. An IFU contains an antenna.

Asynchronous Transfer Mode (ATM)

A cell-based protocol, developed by the ITU-T, for transmitting and switching voice, video, and data traffic. ATM technology does not use a fixed timing reference, hence the name asynchronous.

ATM

See *Asynchronous Transfer Mode (ATM)*.

atmospheric absorption

Amount of energy lost when radio waves are transmitted due to the presence of atmospheric gases.

attenuation

The reduction in the strength of a signal measured in dB. See also *propagation loss*.

azimuth

The horizontal angle the radiating lobe of an antenna makes. When you adjust an IFU by its azimuth, you move it on its horizontal plane (left to right or right to left).

B**backbone**

A backbone is the transport path that provides connectivity to other paths. On the Internet or a WAN, the backbone is a series of paths to which local, regional, or global networks connect.

backhaul

A transmission path used to move traffic to/from a remote location from/to a central location. (The verb form is *back haul*.)

bandwidth

The range of frequencies over which a signal is transmitted.

BER

See *Bit Error Rate (BER)*.

Bit Error Rate (BER)

The number of bit errors detected – displayed as the ratio of the average number of errored bits in a given number of bits sent. The BER is used to measure transmission quality. For example, a BER of 10^{-12} is equivalent to one error in a trillion bits, which means that for:

- SONET OC-3, one error bit is detected approximately every 1.8 hours
- Fast Ethernet, one error bit is detected approximately every 2.8 hours.

BNC connector

Bayonet Neil-Concelman connector. A bayonet type of connector for coaxial cables in an Ethernet network.

C**Central Office (CO)**

Location at which one or more switches reside for aggregating voice or data traffic.

Central Processing Unit (CPU)

Central controller that coordinates functions in the IFU.

channel

Physical medium through which signals are transmitted. In optical fiber transmissions, a channel is a separate wavelength of light within a combined multiplexed light stream. An RF channel is the portion of the RF spectrum used to carry data on a given frequency.

channelization

Logically subdividing a frequency (normally assigned by a regulatory agency for the delivery of broadband wireless services).

Competitive Local Exchange Carrier (CLEC)

Independent company that competes with the already established local telephone company by providing its own network and switching. CLEC distinguishes a new or potential competitor from an established local exchange carrier (LEC). The term originated from the Telecommunications Act of 1996, which was intended to promote competition among long-distance and local phone service providers.

CO

See *Central Office (CO)*.

cochannel interference

Interference between signals transmitted within one radio frequency channel.

colocation

Space set aside for a customer's telecommunications equipment on the service provider's premises. For example, a web site owner could place its computer server on the premises of an ISP, or an ISP could locate its network router at a company that supplies switching services to other ISPs.

Competitive Local Exchange Carrier

See *Competitive Local Exchange Carrier (CLEC)*.

commissioning

Tasks required to enable equipment to be placed in a live network. IFU commissioning tasks include configuration and antenna alignment.

configuration management

The process of setting equipment attributes that enables equipment to function as intended.

consecutive point

Network architecture implemented via a point-to-point-to-point design.

CPE

See *Customer Premise Equipment (CPE)*.

CPU

See *Central Processing Unit (CPU)*.

Crane rain model

System of formulas, charts, and maps developed by Dr. Robert K. Crane to depict a global prediction of attenuation caused by rain. See also *rain attenuation*.

Customer Premise Equipment (CPE)

Equipment (such as telephones and computers) installed at a customer's site.

customer site

Network equipment configuration for a location at which network access is provided in a carrier's consecutive point network.

D**dB**

Decibel. The unit of measurement for signal strength, usually the ratio between a transmitted signal and a standard signal source.

decibel (dB)

See *dB*.

demarcation point

Logical dividing point between equipment and a network.

E**Element Management System (EMS)**

Software application used to manage network equipment.

EMS

See *Element Management System (EMS)*.

Ethernet

Generic term for the IEEE 802.3 standard network transmission protocol.

exciter

An oscillator that enables a tuner to change its frequency.

F**fade margin**

Amount of signal reduction a receiver can tolerate and continue to maintain satisfactory performance.

far-end IFU

- a) IFU at the other end of the link in the network (during site evaluation).
 - b) Second IFU installed in a linked pair of IFUs.
- See also *near-end IFU*.

Fast Ethernet

Generic term for a IEEE standard network 100 Mbps transmission protocol.

fault management

Software that reports and identifies the source of network faults.

fiber optics

Technology in which information is transmitted as light impulses from one point to another through extremely thin glass or plastic wire or fiber.

fixed wireless system

Communication system that uses radio spectrum to provide services to locations that are not mobile.

forward error correction

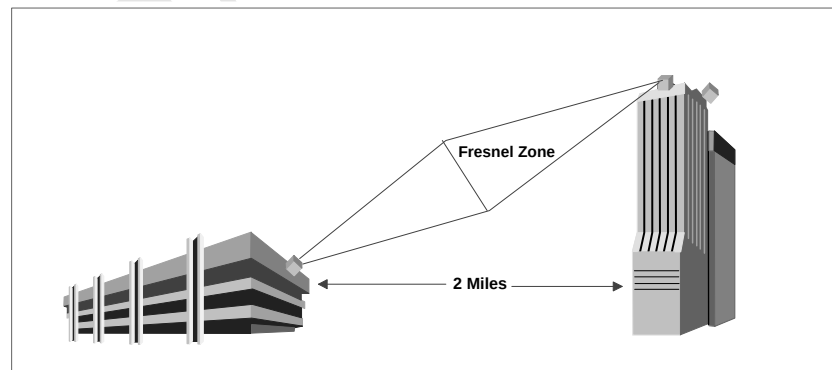
A system in which redundant information is generated at the transmitted end so that the receiving unit can detect, locate, and correct any errors before delivering the transmission.

free space propagation loss

Normal signal attenuation of radio waves transmitted through free space. Free space loss increases logarithmically with increased hop distance.

Fresnel zone

A defraction zone around the line-of-sight path between two points as shown in the following illustration.



The line-of-sight, including the Fresnel zone, must be clear of obstructions to ensure communication between the IFUs.

G

gateway

A network point that aggregates traffic and acts as an entrance to another network.

gateway site

Network equipment configuration for a location that aggregates customer traffic in a consecutive point network for access to and from the Internet.

general purpose input/output

See *GPIO*.

GPIO

General Purpose Input/Output. Input/output ports on the IFU that provide external control of equipment or detection and generation of external alarms. Each IFU contains four GPIO ports (two input-only and two output-only).

H

histogram

A graphical representation of the distribution of a performance parameter.

hop distance

The distance between two communicating IFUs. One objective in network design is to design link hop distances so that the RF path loss does not exceed the path loss allowance for the required availability or grade of service.

HP OpenView™

Hewlett Packard's network management product consisting of a suite of software tools that enable network operations staff to manage the elements in a network. HP OpenView Network Node Manager™ and the IFU Link Manager software provide complete element management functions for an IFU network.

hub

A location in a network where data is aggregated and forwarded to its destination. A hub contains a switch and a router.

I

IFU

Invisible Fiber™ unit. Outdoor fixed-wireless device, designed to fiber-optic specifications, that combines antenna, transceiver, modem, and controller modules to transport high-bandwidth network-grade broadband telephony and data services.

IFU Link Manager

Triton Network Systems' software application that provides fault, performance, configuration, and security management functions, enabling onsite technicians and network management staff to configure and monitor IFUs.

ILEC

Incumbent Local Exchange Carrier. Generic term for the Regional Bell Operating Company (RBOC) or local carrier that was providing local telephone service when the Telecommunications Act of 1996 was enacted.

Incumbent Local Exchange Carrier

See *ILEC*.

indoor repeater site

Location used to extend a consecutive point network to enable future customer access.

Internet Protocol

See *IP*.

Internet Service Provider (ISP)

An operator that provides its customers access to the Internet.

Invisible Fiber™ unit

See *IFU*.

IP

Internet Protocol. A connectionless network layer protocol used for forwarding individual packets from one intermediate destination (typically a router) to another on the way to their final destination.

ISP

See *Internet Service Provider (ISP)*.

ITU rain model

System of formulas, charts, and maps developed the International Telecommunication Union (ITU) to characterize rain attenuation.

J**Java™**

A C++-like, object-oriented programming language, created by Sun Microsystems and used to build client and server applications that run on any hardware platform where a Java virtual machine resides.

Java™ Runtime Environment

See *JRE*.

JRE

Java™ Runtime Environment. Software platform that enables Java applications to execute. The IFU Link Manager software requires JRE.

Java™ virtual machine

Software, created for specific hardware platforms (microprocessors), that interprets compiled Java code (bytecode) using the microprocessor's set of instructions. Java virtual machines enable any Java application (bytecode) to run on any platform without requiring the programmer to rewrite or recompile the application for each platform.

L

LAN

Local Area Network. Integrated data communication network (linking computers and peripheral devices) designed to provide services to a closed user community. See also *MAN* and *WAN*.

line-of-sight

Straight line of space between a transmitter and receiver. The space between a transmitter and receiver must be clear of obstructions because the transmission media (such as microwave, infrared, and laser) travel in a perfectly straight line.

link angles

GPS (Global Positioning System) coordinates of the angle for an IFU linked pair.

link budget

The sum of transmission gains and losses between transmitter and receiver. The total should be equal to or less than the system gain. The link budget is configured using the transmitted signal power, receiver sensitivity, and antenna gains.

link manager

See *IFU Link Manager*.

LMDS

See *Local Multipoint Distribution Service (LMDS)*.

Local Area Network (LAN)

See *LAN*.

Local Multipoint Distribution Service (LMDS)

Broadband wireless spectrum over which telephony and data services are delivered.

loop back

Directing signals back toward the transmitting device at some point along the communications path. Used as a method for troubleshooting.

M**MAN**

Metropolitan Area Network. Integrated data communication network within a city. See also *LAN* and *MAN*.

Management Information Base

See *MIB*.

MIB

Management Information Base. A collection of statistics and variables residing on an SNMP-managed device. The statistics allow collection of performance data and the variables allow configuration of the device.

microwave radio

Device that uses microwave frequencies (3–300 GHz) for consecutive point communication.

Millimeter Wave

See *MMW*.

MMIC

See *Monolithic Microwave Integrated Circuit*.

MMW

Millimeter Wave. The frequency range between 30 and 300 GHz.

modem

MODulator, DEModulator. A device that converts between analog and digital signaling.

modulation

Act of encoding information onto a carrier signal.

Monolithic Microwave Integrated Circuit

Integrated circuit technology that provides two-watt linear power at the Tx port of the RF power amplifier.

multimode fiber

Optical fiber designed to carry multiple carrier signals concurrently, each at a slightly different reflection angle within core of the optical fiber. See also *single-mode fiber*.

multiplexer

Device that aggregates traffic into a single medium.

N**NE**

Network Element. Single piece of equipment in the network.

near-end IFU

- a) IFU at the location being evaluated.
 - b) First IFU installed in a linked pair of IFUs.
- See also *far-end IFU*.

Network Element

See *NE*.

Network Interface Card

See *NIC*.

network management

The policies, procedures, and tools that enable an operator to monitor and manage network elements.

Network Management System (NMS)

Integrated, comprehensive system of equipment used for monitoring and managing network elements.

Network Operations Center (NOC)

Location at which monitoring and management of a network might take place.

network provisioning

Act of configuring IFU network hardware and software to make the network operational.

NIC

Network Interface Card. Interface between physical transmitter layer and modem.

NMS

See *Network Management System (NMS)*.

NOC

See *Network Operations Center (NOC)*.

NREP

Not REPorting. System status indicating the IFU is not reporting alarms because an operator has suspended alarm reporting.

O**OAM&P**

Operations, Administration, Maintenance, and Provisioning. Describes a piece of equipment or personnel required to manage a network.

OC-3

Optical Carrier level 3. Optical signal designed to receive and transmit SONET. A pure OC-3 SONET channel carries 155.52 Mbps.

OC-12

Optical Carrier level 12. Optical signal designed to receive and transmit SONET. A pure OC-12 SONET channel carries 622.08 Mbps.

OC-48

Optical Carrier level 48. Optical signal designed to receive and transmit SONET. A pure OC-48 SONET channel carries 2.4 Gbps.

operating system

See OS.

OS

Operating System. Program that loads when a computer is booted and manages all the other applications in the computer.

outdoor repeater site

Location used to extend a consecutive point network.

P**password**

A string of characters entered by a user, typically in a Login screen, to gain access to a computer system.

path loss allowance

The net amount of amplification given to the signal in an IFU link, including margins for adequate received SNR and channel fading. In other words, path loss allowance is equal to the system gain plus the antenna gains.

payload

User traffic transported over a network

Point Of Presence (POP)

Umbrella name referring to the location of the physical access point where user traffic is aggregated.

polarization

Directional orientation of a radio wave electric field. Some radio communication systems can exploit polarization differences to reduce interference from nearby links.

POP

See *Point Of Presence (POP)*.

power source

A separate unit or part of a circuit that supplies power to the rest of the circuit or to a system.

propagation loss

Signal attenuation that occurs during transmission.

provisioning

Act of configuring the gateway routers and the site equipment to enable a customer to receive service.

Q**QAM**

Quadrature Amplitude Modulation. Transmitted signal defined by amplitude and phase.

R**Radio Frequency (RF)**

An electromagnetic wave frequency from approximately 3 KHz to approximately 300 GHz. Includes the frequencies used for radio and television transmission.

radio overhead

IFU communication channel in addition to the payload.

rain attenuation

Transmit signal loss due to rain.

Received Signal Strength Indicator

See *RSSI*.

receiver

Telecommunication equipment device that captures and converts a transmitted signal to the required format.

reference oscillator

A device that generates a precise radio frequency signal to be used as a reference.

RF

See *Radio Frequency (RF)*.

RF spectrum

Range of available radio frequencies.

router

A layer-3 physical device that aggregates and directs network traffic based on TCP/IP.

RS-232

Recommended standard physical interface (connector) for electrical, functional, and mechanical communication interfaces between computers, terminals, and modems.

RSL

See *RSSI*.

RSSI

Received Signal Strength Indicator (also known as RSL, Received Signal Level). A measured value from a receiver describing the received signal level or strength.

S**security management**

System to protect a network from invalid access.

Signal Quality Metric (SQM)

Ratio of bit energy to noise power spectral density. The SQM value relates to transmission and receiver signal quality.

Simple Network Management Protocol

See *SNMP*.

single-mode fiber

Optical fiber that allows only a single ray of light to propagate as a carrier. See also *multimode fiber*.

site drawing

Graphic depiction, which shows the location of all IFU-related components drawn by a contractor and designee. A site drawing is a component of a site engineering folder.

site engineering folder

Documentation based on the information gathered during the site survey and product requirement specifications.

SNMP

Simple Network Management Protocol. An industry standard protocol used to communicate between elements and management systems in a network.

SONET

Synchronous Optical NETwork. Standard protocol that defines a group of fiber-optic transmission rates that can transmit various bit-rate signals inside a broadband synchronous signal. SONET was designed to allow for a multi-vendor environment.

SNR

Signal-to-Noise Ratio. The SNR measures the quality of the intended signal versus any background noise. Usually expressed in decibels (dB).

SQM

See *Signal Quality Metric (SQM)*.

staging

Installation phase during which equipment might be integrated and made ready for deployment.

switch

A network device that selects the path for sending traffic to its next destination.

Synchronous Optical NETwork

See *SONET*.

system gain

The ratio of transmit power to receiver sensitivity, usually expressed in dB. This ratio usually does not include antenna gain.

T

TCM

Trellis Coded Modulation. The goal of TCM is the same as other error correction schemes – to increase data rate by adding redundancy to reduce error. TCM uses redundancy to enhance the signal detection process.

TCP/IP

Transmission Control Protocol/Internet Protocol. Family of data communication protocols universally implemented on the Internet. TCP is a transport layer protocol used for reliable, connection-oriented communication between two applications.

transceiver

Abbreviation for a transmitter and receiver.

transmitter

Device that converts signals for transmission.

Trellis encoding rate

Rate of TCM. (See *TCM*.)

Tx

Transmitted signal or transmitter.

V

Virtual Private Network

See *VPN*.

VPN

Virtual Private Network. Private network that is built on top of a public network.

W

WAN

Wide Area Network. High-speed network that connects networks over a large geographical area. (See also *LAN* and *MAN*.)

Wide Area Network

See *WAN*.



Index

A

- alarm count 3-6
- alarm navigation 3-6
- automatic transmit power control 2-7

B

- bringing a window forward 1-7

C

- cautions
 - personal injury xvii
 - convention xv
 - service interruption xviii
 - convention xv
- contacting Triton Network Systems, Inc. xiii
- conventions
 - warnings and safety
 - English xv
 - fiber optic warning xv
 - French xxi
 - risk of electrical shock xv
 - risk of personal injury xv
 - risk of radio frequency energy exposure xv
 - risk of service interruption xv

D

- danger
 - fiber optics xvi
 - high current hazard xvi
 - high voltage hazard xvi
- desktop
 - navigating 2-4

E

- electrical shock warnings xvi
 - convention xv

F

- fault management 2-11
- features 2-7
 - automatic transmit power control 2-7
 - fault management 2-11
 - IFU configuration management 2-11
 - IFU network management 2-13
 - RF performance management
 - performance management, RF 2-11
 - security management 2-7
- fiber optic warnings xvi
 - convention xv

I

- IFU
 - administration 3-6
 - attributes 3-6
 - navigation 3-6
 - network management 2-13
- IFU configuration 2-8, 2-11
- IFU Link Manager
 - features 2-7
 - functions
 - alarm count 3-6
 - alarm navigation 3-6
 - IFU administration 3-6
 - IFU attributes 3-6
 - IFU navigation 3-6
 - hardware requirements 2-4
 - main window 2-4
 - network monitor window 2-6

- operating system requirements 2-4
- workspace 2-5
- installing software
 - IFU Link Manager 3-1

M

- mises en garde xxv
- moving a window 1-6

N

- navigating
 - desktop 2-4
- network management, IFU 2-13
- network monitor window 2-6

O

- operating system requirements 2-4

P

- personal injury
 - cautions xvii
 - electrical shock warnings xvi
 - fiber optics warnings xvi
- precautions xix

R

- radio frequency
 - energy exposure
 - convention xv
 - warnings xvi
- requirements
 - system 2-4
- resizing a window 1-7
- RF performance management 2-11
- risk
 - electrical shock
 - convention xv
 - warnings xvi
 - fiber optics
 - convention xv
 - warnings xvi
 - other precautions xix
 - personal injury
 - cautions xvii
 - convention xv

- radio frequency energy exposure
 - convention xv
 - warnings xvi
- service interruption
 - cautions xviii
 - convention xv

risque

- câbles à fibres optiques xxii
 - convention xxi
- d'interruption de service xxiv
 - convention xxi
- de lésions corporelles xxiii
 - convention xxi
- décharge électrique xxii
 - convention xxi
- l'exposition de l'énergie radiofréquences
 - xxiii
 - convention xxi

S

- security management 2-7
- system requirements
 - hardware 2-4
 - operating 2-4

W

- warnings
 - risk from fiber optics xvi
 - convention xv
 - risk of electrical shock xvi
 - convention xv
 - risk of radio frequency energy exposure xvi
 - convention xv
- window
 - bringing forward 1-7
 - moving 1-6
 - network monitor 2-6
 - resizing 1-7