Hitless System Alarm Messages

The following table lists alarm messages that may appear in the FibeAir alarm log file for Hitless systems, the trap issued to network management, and possible corrective actions.

Message	Trap Issued	Cause / Corrective Action
LOCAL RECEIVER NOT IN USE	None	Selective fading at the receiver.
LOCAL RECEIVER IN USE	None	Normal signal level at the receiver.
HITLESS FUNCTIONALITY PROBLEM RAISED	SYSTEM ALARM	Hitless cable problem, or Hitless (can be mate) module problem.
HITLESS FUNCTIONALITY PROBLEM CLEARED	SYSTEM ALARM	Hitless switching can be performed.
CONFIGURATION MISMATCH MATE / REMOTE HITLESS MODE RAISED	SYSTEM ALARM	The mate/remote unit was configured incorrectly. Check the mate/remote unit configuration.
CONFIGURATION MISMATCH MATE / REMOTE HITLESS MODE CLEARED	SYSTEM ALARM	The mate and remote units are both configured the same as the current unit.
HITLESS RADIO LOF RAISED	SDH ALARM	The local radio detected LOF. The problem may be caused by flat fading. Check your current alarm status. If the alarm appears continuously, contact your Ceragon dealer.
HITLESS CABLE DISCONNECT RAISED	SYSTEM ALARM	Hitless cable problem. Replace Hitless cable.
HITLESS CABLE PROBLEM CLEARED	SYSTEM ALARM	Hitless cable is OK.

Chapter 7
Protected (1+1) Configuration

FibeAir 1500/1528 Protection

The FibeAir 1500/1528 Hot Standby 1+1 protection configuration is designed to ensure data link robustness and survivability in case of hardware or software failures, and to enable maintenance and repair operations without affecting the live traffic.

Fast hardware-based switching (50ms) allows fast recovery from failures and minimizes the link downtime due to equipment failure.

Using the same hardware for the main and the back-up links minimizes inventory costs and simplifies equipment and operation flexibility.

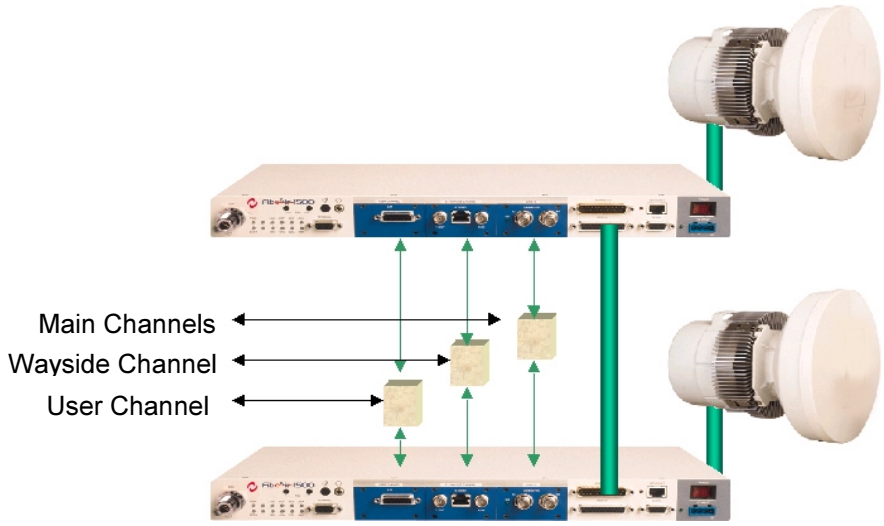


Figure 7-1 Hot Standby Protection Physical Configuration

The Hot-Standby configuration defines one unit on each side of the link as the active (**Master**) unit and the other as a standby (**Slave**) unit.

The Master transmits and receives data but the Slave only receives data. A single cable connects between the two IDU's protection ports and allows for negotiation and data exchange between the units.

Upon a failure in an active unit or a command from the remote side, the **Protection Switch** comes into effect and the standby unit becomes active.

Theory of Operation

The system protects the main link from an IDU or ODU unit failure on the local side, the remote side or both sides. However, simultaneous failures in both units on the same side cannot be protected.

A failure in the main data channel triggers the protection mechanism. After protection switching, all channels are transferred through a new active unit.

Four backup combinations are possible, as shown in the following figure.

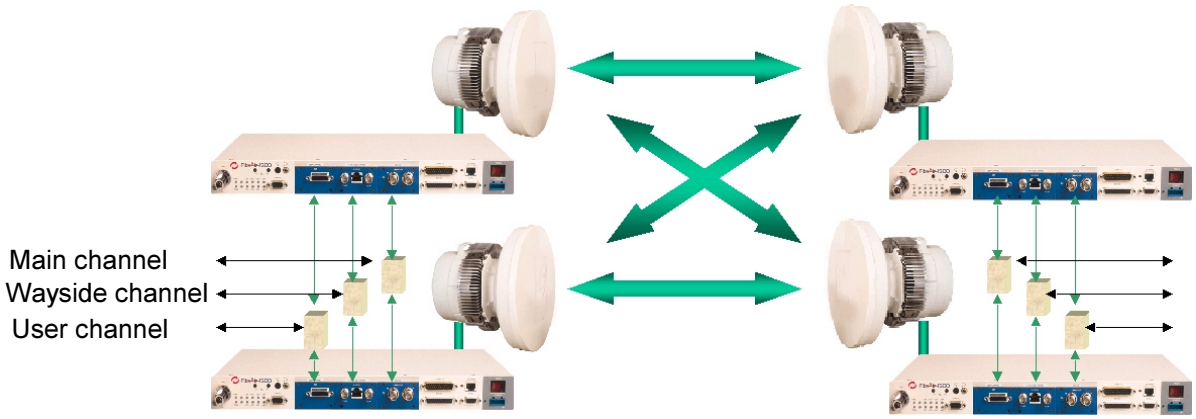


Figure 7-2 Hot Standby Backup Combinations

Configuration Options

The system provides two configuration options for protection: fully redundant link and shared antenna.

Fully Redundant Link

The fully redundant link consists of two complete links, as shown below.

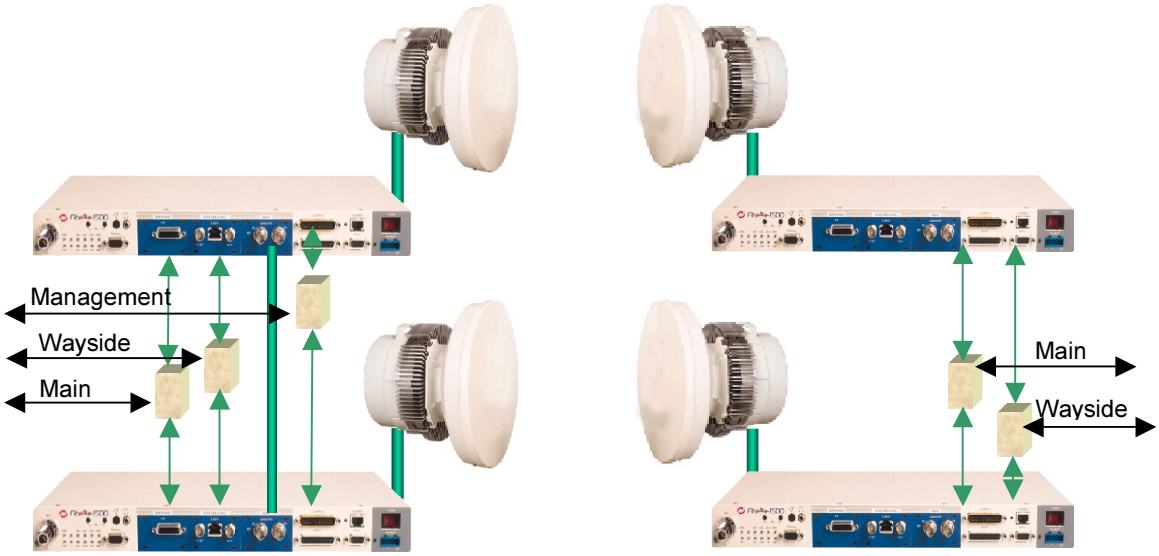


Figure 7-3 Fully Redundant Link Configuration

If no management connection exsts between the sides, the following configuration is recommended. This configuration enables all four units to be managed from a single connection on one side.

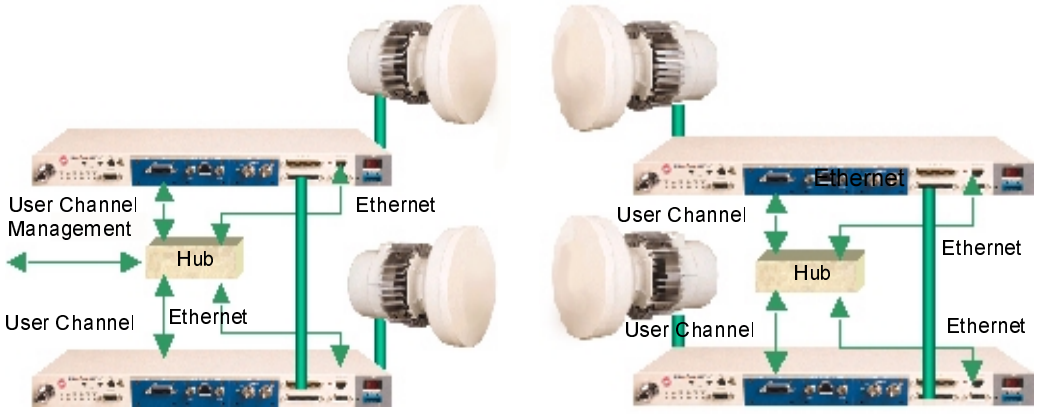


Figure 7-4 Single Side Management

Shared Antenna

In the shared antenna configuration, two ODUs share one antenna, as shown in the following figure.

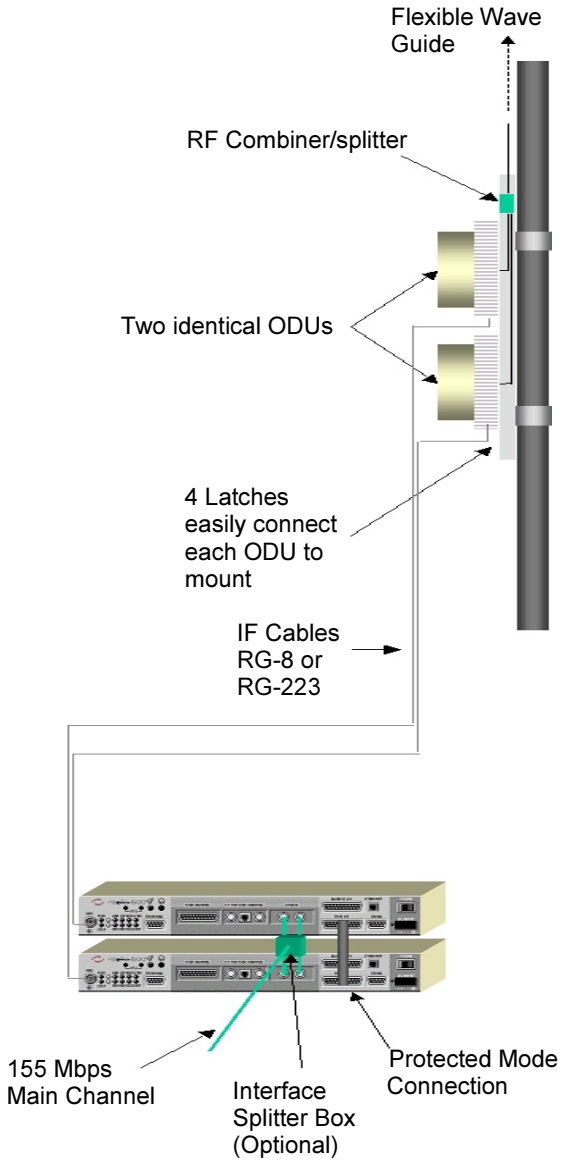


Figure 7-5 Shared Antenna Configuration

Master and Slave Port Status

The slave RS232 and Ethernet/SLIP management interfaces are active and the traffic interfaces (main channel, user channel and wayside channel) are in “receive only” mode. This configuration does not allow the slave to transmit any data.

The master management and traffic interfaces are all active; the unit receives and transmits data.

Protection Switch Triggers

The following triggers cause protection switching:

- LOF line
- LOF radio
- ODU cable disconnection
- Manual command via SNMP
- Power off in on-line system
- Excessive BER radio (not line) threshold passed (configurable between 10^{-3} to 10^{-6})
- External alarm input 8 present (after config)

The master switch is only activated if the Slave is fully operational. When operational, the Slave is immediately fully initialized and thus has no radio or line frames loss.

"Change Remote Transmitter" Conditions

The Master will send a “Change Remote Transmitter” command to the remote side using the SDH overhead in the following circumstances:

- Both local units detect radio frame loss for 1 msec. In this case the “CHANGE REMOTE TRANSMITTER” message is added to the local Master event list.
- If the problem persists, the command will be sent once a second.

"Change Local Master" Conditions

The Slave will initiate “Change Master” command in the following circumstances:

- The Slave receives a “Change Transmitter” radio message as described in paragraph 7.4.1.
- The “Mate OK” indication (via the communication cable) from the Master is missing, while the Slave does not have any errors on its line and radio interfaces and it recognizes a cable connection to its “Protected” port.

Initialization Process

At the initialization process, the first unit that activates will be set as Master.

- If two units become Masters on the same side (before on inter-mate cable connection has been made), they will negotiate via the inter-mate cable which one will take control.
- If both units are OK or both have LOF, the unit with the higher MAC address will be set as the Master.

If the inter-mate cable is disconnected when the units are in the Protected Mode:

- The Master will stay active and the Slave will stay in stand-by (Mute) mode.

- The protection option will not be operational for that side of the link.

Management

To provide separate remote management, configuration, maintenance, and monitoring for all four units in the link, each unit has its own IP address.

Both Master and Slave may be accessed via a TCP/IP-based network management system (SNMP, CeraView) since their Ethernet/SLIP ports are always active.

Manual changes of **IP address** and **Tx Mute** are performed separately for Master and Slave.

Other parameters may be changed as follows. This allows for configuring the two units with different parameters, if necessary:

- Any manual change in the Master will update the Slave (frequency, E1 wayside transparency, antenna size, Tx level, etc.)
- Any manual change in the Slave is unit specific and does not update the Master.

The Master and the Slave units report the following parameters separately to the network management system:

- Configuration data.
- Traps on “Master Switch” events and “Change Transmitter” messages.
- Performance monitoring data.

Event Log

The following messages can be written to the Event Log list for protection configuration management and monitoring:

- “Change remote transmitter” (if sent to the remote side)
- “Change to master”
- “Change to slave”
- “Protection cable disconnect”
- “Protection cable error”
- “Protection cable Ok”
- “Master slave disconnect”

LEDs

In the normal alarm state, the LEDs display the following colors:

Master

All LEDs are green

Figure 7-6 Master LEDs

Slave

STBY - yellow

RMT - gray

Others - green

Figure 7-7 Slave LEDs

Protected System (1+1) Installation

1. Install one link according to the instructions in chapters 3&4. Set the frequency, transmit power, and align the antennas.
2. Shut down the power to the link.
3. Install the second link, set all parameters and align antennas.
4. Turn on each pair of terminals (IDU and ODU), confirm antenna alignment for all four possibilities (the other pair must be shut down), as shown in the following figure.

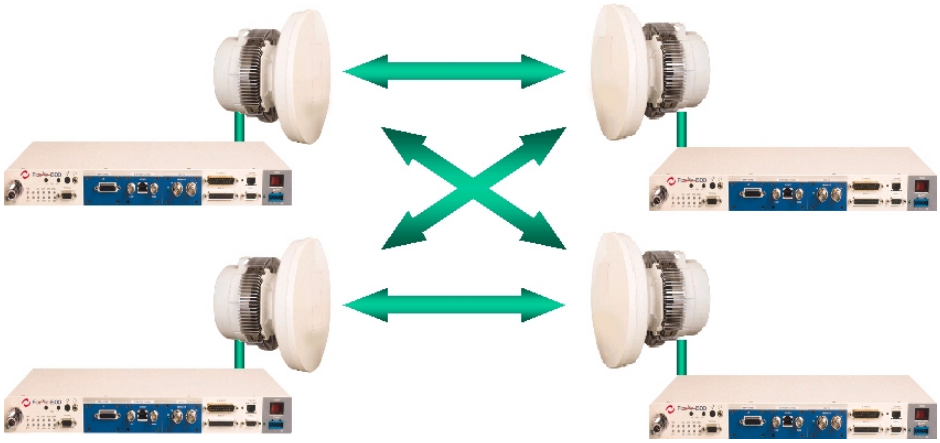


Figure 7-8 Redundant Configuration Possibilities

5. Connect the "protection cable" between the two IDU's. The protection cable will connect to "protection" ports (RJ-45 or 25 Pin D-type connector). This depends on the type of FibeAir system in use.
6. Connect the interfaces through the interface splitters. In some cases, the CPE equipment has two ports, and therefore splitters are not required.

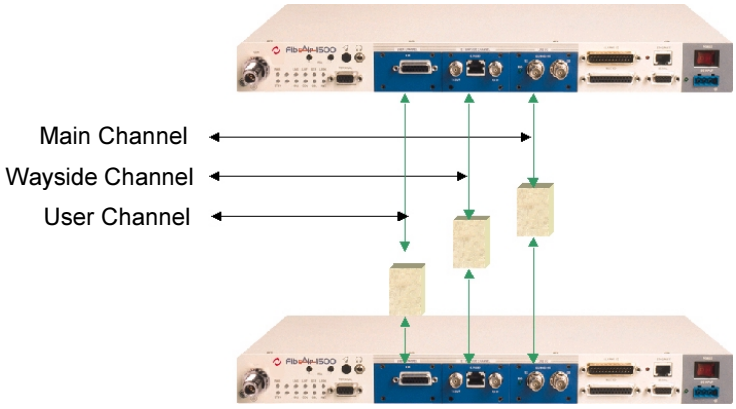


Figure 7-9 Splitter Connection

7. Turn the remaining two units (one on each side). By now, you should have all four units working, and the slave units should have yellow "STBY" LEDs lit.
8. Connect management interface to each one of the IDU's. If Ethernet port is used, a small "hub" is required to connect the two IDU's. If the remote side is managed via the user channel of the radio link (as described in figure 7-4), connect both User Channel and Ethernet ports on both sides of the link to respective hub. One of the hubs will be connected to a PC/LAN to provide management access.

FibeAir 1500A/1528A System Protection

The FibeAir 1500A/1528A Hot Standby 1+1 protection configuration is designed to ensure data link robustness and survivability in case of hardware or software failures, and to enable maintenance and repair operations without affecting the live traffic.

Fast hardware-based switching (50 ms) allows fast recovery from failures and minimizes the link downtime due to equipment failure.

Using the same hardware for the main and backup links minimizes inventory costs and simplifies equipment and operation flexibility.

The Hot Standby configuration defines one unit as the active (**Master**) unit and the other as a standby (**Slave**) unit.

The Master transmits and receives data, while the Slave only receives data. A single cable connects between the two IDU protection ports and allows for negotiation and data exchange between the units.

Upon a failure in an active unit, the **Protection Switch** takes effect and the standby unit becomes active.

Two protection configurations are available for the FibeAir 1500A/1528A: the Y Splitter configuration, and the H Splitter configuration.

Y Splitter Configuration

The Y Splitter configuration is used if the FibeAir 1500A/1528A protected system is the start (or end) system in the communication chain.

The following diagram shows the FibeAir 1500A/1528A Y Splitter configuration.

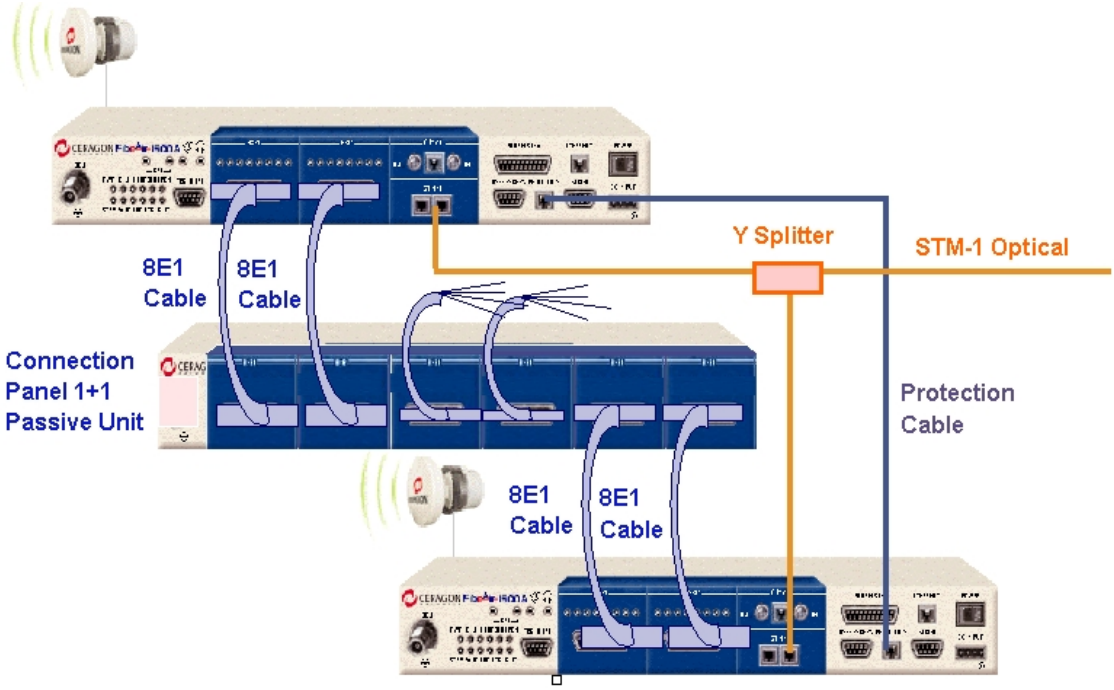


Figure 7-10 FibeAir 1500A/1528A Protected Configuration using Y Splitter

The FibeAir 1500A/1528A Y Splitter configuration includes the following connection components:

8 E1 Cable Four 0.5 meter cables used to connect the 8E1 IDU interface to the Connection Panel.

Y Splitter Used to split the optical STM-1 line input to the IDUs. Note that the optical line includes two fiber lines, one for Tx and one for Rx. Therefore, in a standard Hot Standby system, 6 optical patches and 2 Y Splitters are used.

Connection Panel Connects the 8 E1 interfaces of both IDUs for identical data flow. It is also used to connect the Impedance Adaptation panel which balances 75 ohm E1 inputs.

Protection Cable Used to transfer protection switching controls between the units.

Y Splitter Configuration for Unbalanced E1s

When the E1s are unbalanced (75 ohm), an Impedance Adaptation panel is required to balance them (120 ohm). In this case, the Hot Standby Connection Panel also connects the Impedance Adaptation panel to the IDUs, as shown in the following diagram.

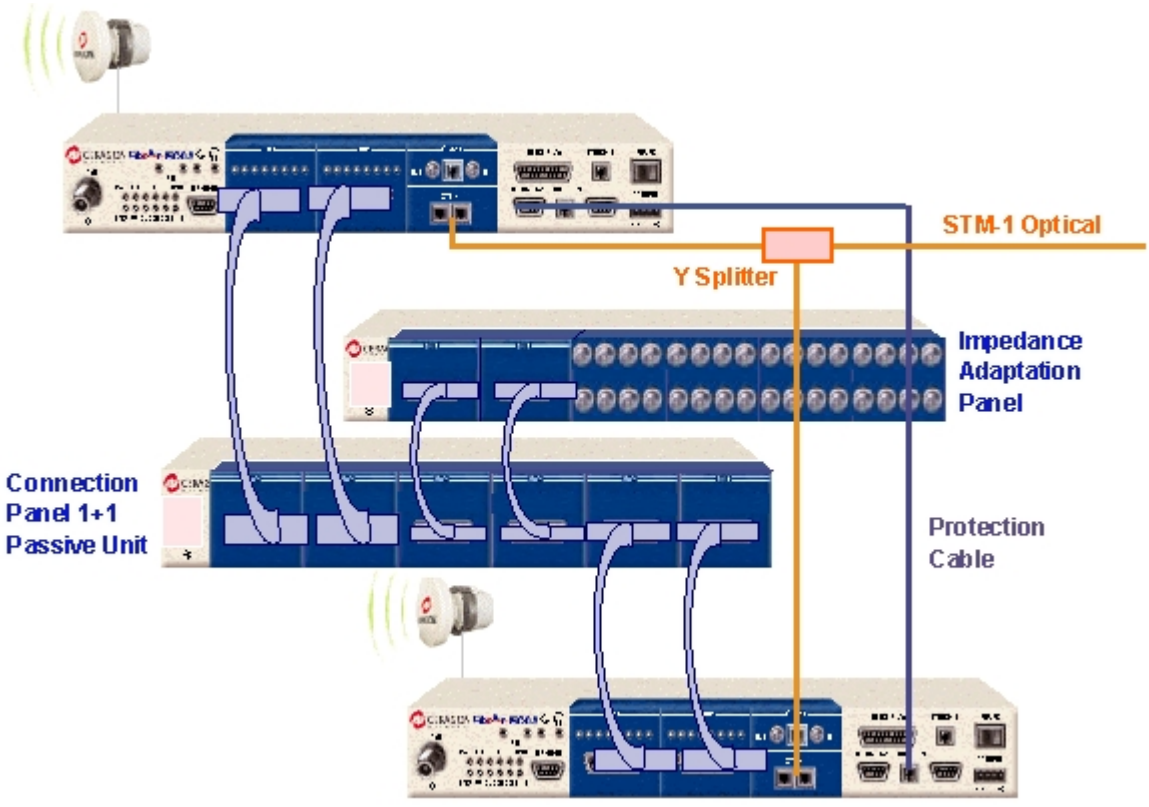


Figure 7-11 Protected Y Spiltter Configuration for Unbalanced E1s

H Splitter Configuration

The H Splitter configuration is used if the FibeAir 1500A/1528A protected system is linked to another FibeAir 1500A/1528A protected system in the communication chain.

The following diagram shows the FibeAir 1500A/1528A H Splitter configuration.

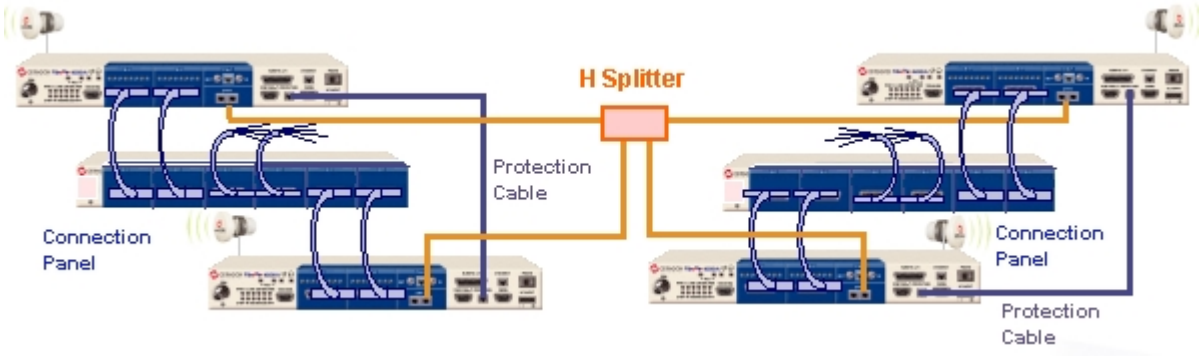


Figure 7-12 FibeAir 1500A/1528A Protected Configuration using H Splitter

Note that since the optical line includes Tx and Rx fibers, this configuration will consist of eight optical patches and two H Splitters.

Protection Switch Triggers

This section specifies the triggers that cause FibeAir 1500A/1528A protection switching.

Note that no switching will occur upon individual E1 line failure, in order not to interrupt the STM-1 stream in the protected chain.

STM-1 Fiber Fault

Fiber LOS/LOF - At the local side, if STM-1 fiber LOS/LOF is detected by the master IDU, protection switching will occur.

Remote Optical Transmitter Fault - If a remote optical transmitter fault occurs, a proprietary message with a switching command is sent to the remote slave. Protection switching will then occur.

Fiber EXBER - At the local side, if STM-1 Fiber EXBER is detected by the master IDU, protection switching will occur.

STM-1 Radio Fault

Radio LOF - At the local side, if STM-1 Radio LOF is detected by the master IDU, protection switching will occur.

Master & Slave Radio LOF - At the local side, if STM-1 Radio LOF is detected by the master IDU and slave IDU at the same time, protection switching will occur.

Radio EXBER - At the local side, if STM-1 Radio EXBER is detected by the master IDU, protection switching will occur.

CLU Fault

Interface Card LOC - At the local side, if LOC (Loss of Clock) is detected by the master IDU, protection switching will occur. (Applicable for E1 interfaces only).

Loss of ADD Clock - At the local side, if Loss of ADD clock is detected by the master IDU, protection switching will occur.

Loss of DROP Clock - At the local side, if Loss of DROP clock is detected by the master IDU, protection switching will occur.

Tributary Fault

Trib LOS - At the local side, if Trib LOS is detected by the Master IDU (and there is no Trib LOS at the local slave IDU), protection switching will occur. If, however, Trib LOS is detected by both the master and slave, a report will be generated and sent to the current alarm destination.

Driver Failure Monitor - At the local side, if any of the tributary port transmitters is shorted, protection switching will occur. (Applicable for T1 interfaces only).

Other Switch Criteria

Force Switch Local - When a *Force Switch* command is generated, protection switching will occur.

Software Reset - Upon software reset by the master IDU, protection switching will occur.

Power Fault - If a power failure is detected by the master IDU, protection switching will occur.

External Alarm #8 - If external alarm #8 is detected by the master IDU, protection switching will occur.

FibeAir 1500A/1528A Traffic Protection

The protection scheme for FibeAir 1500A/1528A SDH traffic is *Path Protection (1+1)*, which is applicable for ring topologies.

All traffic in the ring is fully protected.

Path protection guarantees end-to-end protection down to the tributary level.

The Path Protection mechanism can operate on either the HO (High Order) or LO (Low Order) level. The same TU signal is transmitted in both directions of the ring (east and west) to the receiver on the tributary interface. The tributary interface normally receives both signals and chooses the signal from the main path defined in the NMS.

In case of fiber or radio link disconnection, failure, or individual trail failure, a switch to the protected path will occur in **less than 50 msec**.

The criteria for automatic switch to the protection path incudes the following:

AIS (AU/MS/TU)	**Alarm Indication Signal (all signals)**
LOS	**Loss of Signal**
LOP (AU/TU)	**Loss of Pointer**
LOF	**Loss of Frame**
LOM (TU)	**Loss of Multiframe**
UNEQU (HP/LP)	Unequipped Signal
PLM (HP/LP)	Path Label Mismatch
TIM (HP/LP)	trace ID mismatch
EXC (MS/HP/LP)	Excessive Bit Error Rate

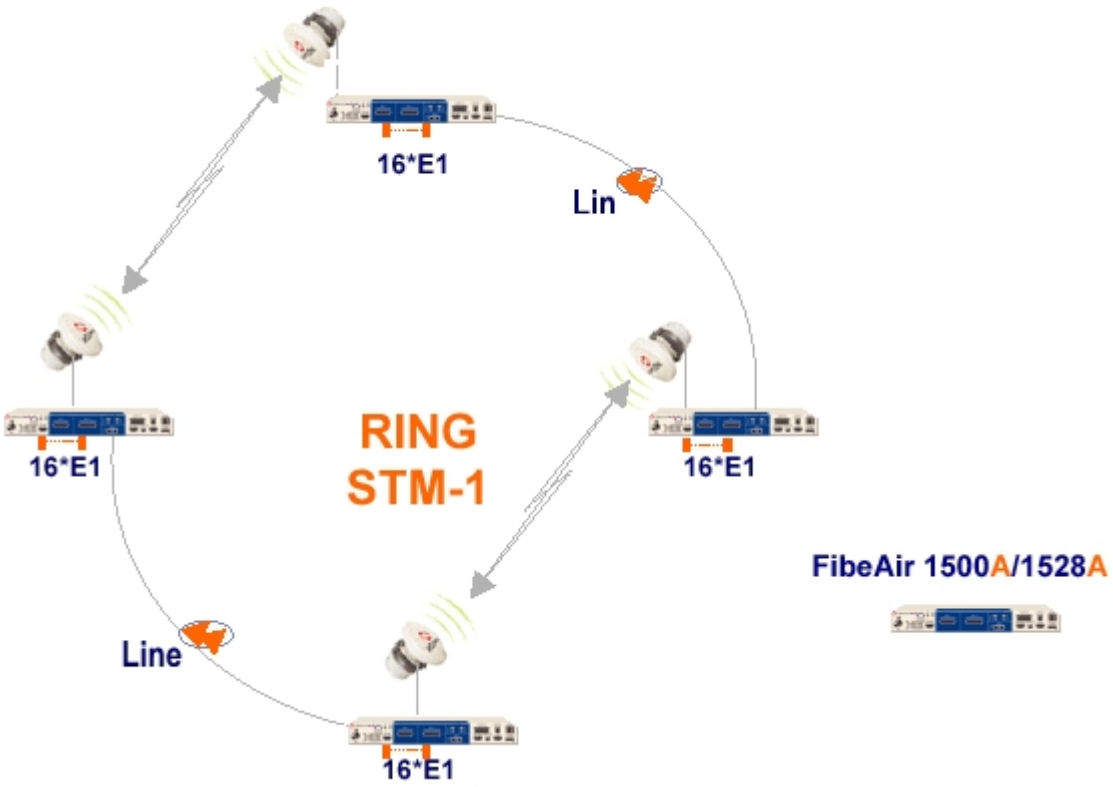
Note: High priority events appear in bold.

Automatic switching will occur if the selected path failed and Protection Lockout (inhibit function) is not active.

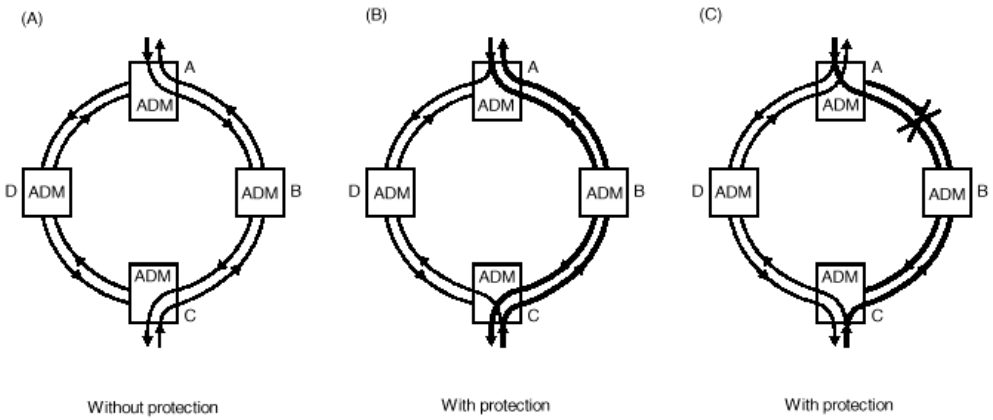
If the current active path reports one of the events listed above, but the protection path does not report any of the events, or some events with lower priority, switching will occur.

Manual switching is possible via the management system.

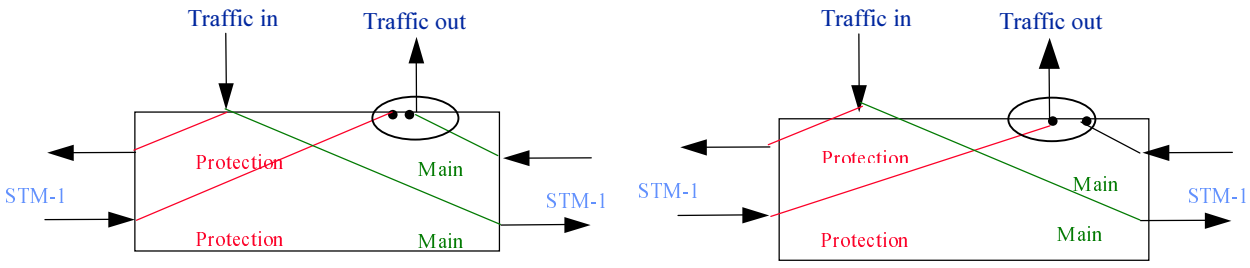
Traffic-protected ring is based on a uniformly routed (bi-directional) self-healing path protection mechanism, as shown in the following figures.



Typical Network



Uniformly Routed Self-Healing Path Protection Ring



Normal Operation **After Switching to Protection**

Trail Protection Mechanism

Revertive and Non-Revertive Switching

Path protection switching can be configured as Revertive (the default) or Non-Revertive.

In the Revertive mode, normal traffic on the protection path is switched back to the original path after it is recovered from the fault.

Revertive mode may be required to support specific services, whereby the shortest physical route offers better performance. For example, for synchronization of another network using protected E1. The main path will generally be shorter, and the protection path will be longer.

In the Non-Revertive mode, no switching to the original fault-cleared path is performed, to prevent unnecessary traffic hits and management event reports.

Traffic Protection Parameters

General traffic protection parameters for FibeAir 1500A/1528A include the following:

Holdoff Period	The delay between fault detection and subsequent switching. The purpose of this timer is to ensure that protection switching is not overly sensitive to transient variations in signal quality.
Wait To Restore Time	(Revertive mode only) A fixed period of time between switching to the protection path and back to the main path. During this time, no switching will occur.
Oscillation Guard Time	A period of time the inactive channel must be free of faults before it can carry traffic.

6-15 GHz FibeAir System Protection

6-15 GHz systems are affected more by multipath propagation, and less by rain, than higher frequencies.

There are two primary types of multipath impairments: *flat fading* and *selective fading*. Flat fading occurs when the entire spectrum of a channel is attenuated. Selective fading occurs when notches appear in the channel's spectrum.

Protecting 6-15 GHz systems from the impairments mentioned above requires diversity and a proper digital equalizer.

One of the following methods can be used for diversity:

- Space diversity
- Frequency diversity
- A combination of space and frequency diversity

Space Diversity

The Space Diversity method uses two FibeAir links with one active transmitter, and two active receivers on each side of the link. Each receiver is connected to a different antenna and the two antennas are vertically separated from each other.

When more than one path from transmitter to receiver exists due to atmospheric and surface conditions, time delays may result in degraded signal levels. Vertical separation reduces the probability that the receivers will receive the same signal degradation level caused by multipath conditions.

When two different paths are used for transmission, the best of the two can be selected for data transfer at any given time. The FibeAir *Hitless Switch* (described below) determines which path is delivering the best quality data.

An important advantage of the Space Diversity method is that it uses only one frequency channel.

Frequency Diversity

The Frequency Diversity method uses two FibeAir links, with two active transmitters and receivers on each side of the link connected to one or two antennas. The two transmitters on either side of the link operate at different frequencies, and the FibeAir *Hitless Switch* (described below) determines which receiver is receiving the best quality data.

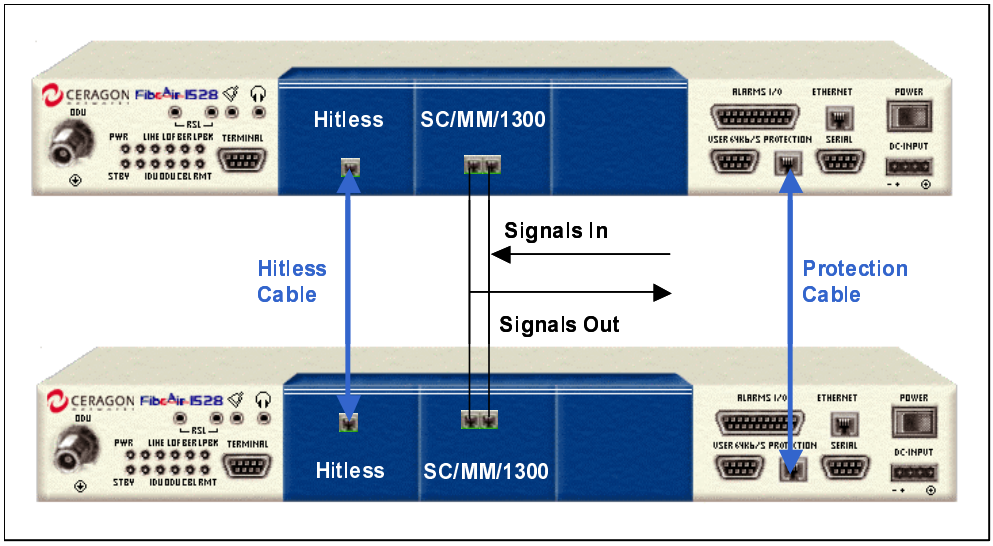
Frequency diversity allows the system to automatically select a frequency for which the channel performance is better than the other frequency.

FibeAir's Hitless System

FibeAir's Protected Hitless System consists of two FibeAir 1528 links connected via a protection cable, hitless switches, and a hitless cable.

The Hitless system allows fast switching between FibeAir units without corrupting the data delivered to the user.

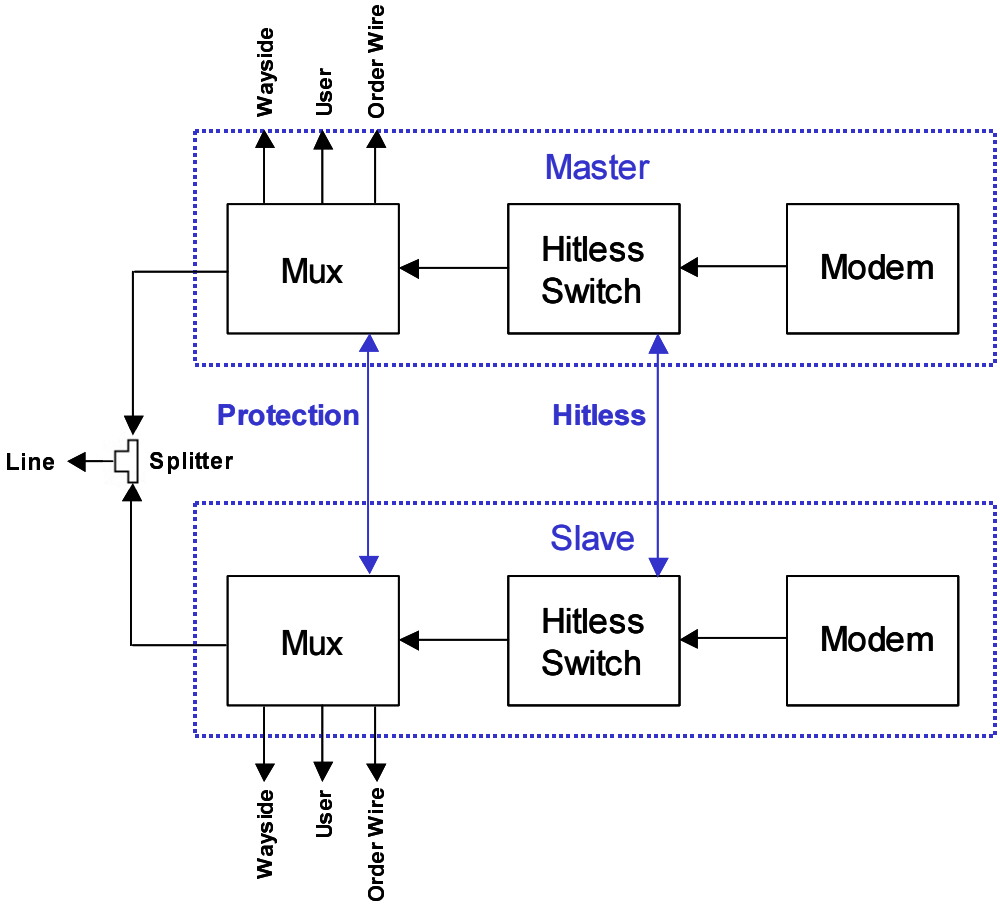
The following illustration shows how the system is connected.



The hitless system offers the following advantages:

- Maintains data integrity during severe link outages.
- Errorless during switching.
- Supports space and frequency diversity.

The following block diagram shows the protected hitless switch configuration components and how they interact.



A special proprietary algorithm determines which ODU is transmitting error-free data. The error-free data is then passed on by the master switch in the IDU to the network.

Chapter 8
Line Interfaces

General

This chapter provides a description of the FibeAir main channel and wayside channel line interfaces.

The interfaces are located on the FibeAir front panel.

Main Channel Interfaces

Main channel interfaces include the following:

Optical

MM/SC/13

Multi Mode 155 Mbps, SC Optical Connector:

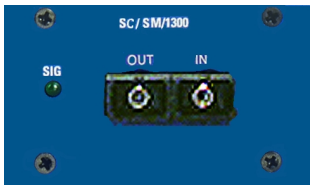
Wavelength: 1300 nm

Connector:	SC
Used with:	Multi mode fiber
Protocols supported:	STS-3c, STM-1, OC-3, STS-1, FDDI, TAXI, and Fast Ethernet
Timing mode:	Retimed
Coding method:	4B/5B, NRZ
Optical output to 62.5/125 fiber:	-18 dBm
Receiver sensitivity:	-31 dBm
Maximum input power:	-14 dBm

MM/ST/13

Multi Mode 155 Mbps, ST Optical Connector:

Wavelength:	1300 nm
Connector:	ST
Used with:	Multi mode fiber
Protocols supported:	STS-3c, STM-1, OC-3, STS-1, FDDI, TAXI, and Fast Ethernet
Timing mode:	Retimed
Coding method:	4B/5B, NRZ
Optical output to 62.5/125 fiber:	-18 dBm
Receiver sensitivity:	-31 dBm
Maximum input power:	-14 dBm



SM/SC/13

Single Mode 155 Mbps, SC Optical Connector:

Wavelength:	1300 nm
Connector:	SC
Used with:	Single mode fiber
Protocols supported:	STS-3c, STM-1, OC-3, STS-1, FDDI, TAXI, and Fast Ethernet
Timing mode:	Retimed
Coding method:	4B/5B, NRZ
Maximum output to 9/125 fiber:	-8 dBm
Receiver sensitivity:	-31 dBm
Maximum input power:	-8 dBm

SM/ST/13

Single Mode 155 Mbps, ST Optical Connector:

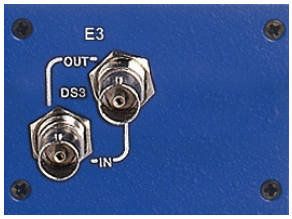
Wavelength:	1300 nm
Connector:	ST
Used with:	Single mode fiber
Protocols supported:	STS-3c, STM-1, OC-3, STS-1, FDDI, TAXI, and Fast Ethernet
Timing mode:	Retimed
Coding method:	4B/5B, NRZ
Maximum output to 9/125 fiber:	-8 dBm
Receiver sensitivity:	-31 dBm
Maximum input overload:	-8 dBm

Electrical

CX/BNC

Electrical 155 Mbps Connector:

Connector:	BNC
Used with:	Coax cable
Protocols supported:	STS-3c, STM-1, OC-3
Line coding:	CMI
Timing mode:	Retimed
Range calculation:	12.7 dB at 78 MHz according to square root of frequency law 150 m is attainable using RG-59 B/U cables (cable length varies in accordance with type)
Impedance:	75 Ω



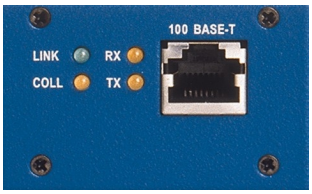
DS-3/E3

Connector:	BNC
Used with:	Coax cable
Protocols supported:	DS-3, E3
Line coding:	DS-3: B3ZS E3: HDB3
Timing mode:	Retimed
Range calculation:	12.7 dB at 78 MHz according to square root of frequency law 150 m is attainable using RG-59 B/U cables (cable length varies in accordance with type)
Impedance:	75 Ω

8xE1/T1

Connector:	DB-44
Used with:	Twisted Pair
Protocols supported:	E1/T1
Timing mode:	Retimed
Range:	100 m
Impedance:	120 Ω/100 Ω

Receive Cable		
Twisted Pairs	**RX Signals**	**D-Type 44 Pin No.**
Twisted Pair	R-RING0	2
	R-TIP0	1
Twisted Pair	R-RING1	17
	R-TIP1	16
Twisted Pair	R-RING2	32
	R-TIP2	31
Twisted Pair	R-RING3	4
	R-TIP3	3
Twisted Pair	R-RING4	19
	R-TIP4	18
Twisted Pair	R-RING5	34
	R-TIP5	33
Twisted Pair	R-RING6	5
	R-TIP6	20
Twisted Pair	R-RING7	21
	R-TIP7	35
Shield	CGND (1)	22



100Base-T (Fast Ethernet)

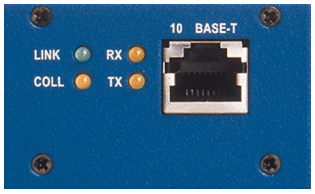
Connector:	Shielded RJ-45
Used with:	UTP Cat 5
Protocols supported:	Fast Ethernet (100Base-T), full duplex
Timing mode:	Retimed
Range:	80 m
Impedance:	100 Ω

100Base-T LED Indicators		
LED	**Color**	**Indication**
LINK	Green	Normal operation
FULL	Yellow	ON - operating at 100 Mbps OFF - operating at 10 Mbps
RX	Yellow	LAN receiving data
TX	Yellow	LAN transmitting data

100Base-T Connector Pinout	
Pin	**Function**
1	Tx+
2	Tx-
3	Rx+
4	
5	
6	Rx-
7	
8	

Wayside Channel Interfaces

The Wayside channel delivers 1.544/2.048 Mbps via the following interfaces:

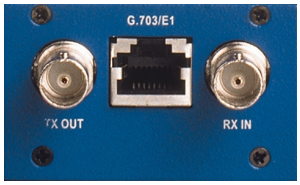


10Base-T (Ethernet)

Connector:	Shielded RJ-45
Used with:	UTP Cat 5
Protocols supported:	Ethernet (10Base-T), half or full duplex
Timing mode:	Retimed
Range:	100 m
Impedance:	100 Ω

10Base-T LED Indicators		
LED	**Color**	**Indication**
LINK	Green	Normal operation
COLL	Yellow	Collision occurred
RX	Yellow	LAN receiving data
TX	Yellow	LAN transmitting data

10Base-T Connector Pin-Out	
Pin	**Function**
Pin 1	Tx+
Pin 2	Tx-
Pin 3	Rx+
Pin 4	
Pin 5	
Pin 6	Rx-
Pin 7	
Pin 8	



E1/G.703

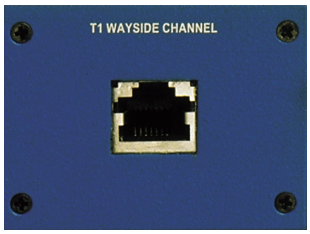
Option 1:

Connector:	BNC
Used with:	Coax cable
Protocols supported:	E1/G.703
Timing mode:	Retimed
Range calculation:	12.7 dB at 78 MHz according to square root of frequency law 150 m is attainable when using RG-59 B/U cables (cable length varies in accordance with type)
Impedance	75 Ω

Option 2:

Connector:	Shielded RJ-45
Used with:	UTP Cat 5
Protocols supported:	E1
Timing mode:	Retimed
Range:	100 m
Impedance:	120 Ω

G.703/E1 Connector Pinout	
Pin	**Function**
Pin 1	Tx +
Pin 2	Tx -
Pin 4	Rx +
Pin 5	Rx -



T1

Connector:	RJ-45
Used with:	UTP Cat 5
Impedance Type:	Balanced
Impedance:	100 Ω

T1 Connector Pinout	
Pin	**Function**
Pin 1	Tx +
Pin 2	Tx -
Pin 4	Rx +
Pin 5	Rx -

User Channel Interface

The user channel, (also known as the engineering order wire, CVSD audio channel) delivers 64 Kbps.

The user channel specifications are as follows:

Termination type:	Headset stereo plug
Frequency band (KHz):	0,3-3,4
Input/output impedance (ohms):	600, symmetrical
Input/output backside signal attenuation (dB) out of frequency band:	For 300-600 KHz, not less than 16 For 600-3400 KHz, not less than 20
Input signal level (dBm):	+1
Output signal level (dBm):	+1
Signal level vs frequency (dB):	In accordance with ITU-T G.712
Output noise (input short circuit) (dB):	-60
Perfect idle channel noise (dB):	-63
Single tone interference level (dBm):	Up to -50

Appendix A
PPP/SLIP Driver Installation

Installation for Windows 95/98

PPP/SLIP driver installation for Windows 95/98 requires the CeraView installation CD.

The installation procedure involves the following steps:

- Installing the nullmdm file.
- Configuring the TCP dial-up adapter.
- Adding the SLIP protocol to the dial-up adapter (only for SLIP users).
- Configuring PPP

Insert your CeraView CD in the CD drive and perform the procedures described in the following sections.

Installing nullmdm

1. Click **Start** on the desktop, and select **Settings**, **Control Panel**, **Modems**.
2. Click **Add**, and choose **Other** for modem type.
3. Click **Next**.

***Note**: If a modem was not installed in your system, Windows will skip automatically to step 4.*

4. In the Install New Modem window, mark **Don't detect my modem**, and click **Next**.
5. Click **Have Disk**.
6. Click **Browse**, and choose your CD drive.
7. Double-click the **SLIP95** directory.
7. Select **nullmdm.inf**.
8. Click **OK**, and **OK** again. **Direct Connection** appears.
9. Click **Next**.
10. Select **Communication Port (COM1 or COM2)**, and click **Next**.

    The message "Your modem has been set-up successfully" appears.

***Note:** If a modem was not installed in your system, Windows asks for additional area code information.*

11. Click **Finish**, and then **OK**.

Configuring TCP Dial-Up Adapter

1. In the Control Panel window, double-click **Add/Remove Programs**.
2. Click the **Windows Setup** tab, and select **Communications**.
3. Click **Details**, and mark **Dial-up Networking**.
4. Click **OK**, and **OK** again.
5. Windows may automatically restart and ask for the Win98/95 installation CD. If this does not happen, restart your PC.
6. After the PC restarts, click **Start** on the desktop, and select **Settings**, **Control Panel**, **Network**.
7. In the **Configuration** tab, make sure that the Dial-up Adapter and TCP/IP - Dial-up Adapter components appear in the list. If these components are not in the list, you need to install them manually.
   To install the components, select **Add**, **Adapter**, **Add**, **Manufacturer**, **Microsoft**, **Dial-up Adapter**. Then click **OK**.
8. Select **TCP/IP Dialup adapter**, **Properties**, **Specify an IP address**.
9. Enter the dialer IP address (on the same subnet as the IDU serial address). For example 192.168.0.*xx* when using the default IDU address (where *xx* may be any number between 3 to 255).
10. Enter a Subnet Mask (identical to the IDU subnet mask). For example, 255.255.255.0, when using the default IDU subnet mask,

Note: *The subnet mask must be the same as the Indoor Subnet Mask.*

11. Click **OK**, and **OK** again.
12. Resart the PC.

Adding the SLIP Protocol to the Dial-Up Adapter

1. Click **Start** on the desktop, and select **Programs**, **Windows Explorer**.
2. In the CD, right-click the **Rnaplus.inf** file in the **Slip95** folder, and and select **Install**. If a window appears, click **Yes**.
3. Double-click **My Computer**, **Dial-up Networking**, **Make New Connection**.
4. Enter a connection name (required for reference in the following steps).
5. In the **Select a Device** list, select **Direct Connection**, and click **Next**.
6. Enter the following values:

   Area code - 1
   Telephone number - 1
   Country code - leave as is

7. Click **Next**.

   The following message is displayed: "You have successfully created *connection name*"

8. Click **Finish**.
9. Right-click the **Connection Name** icon, and select **Properties**.

10. In the **Dialing properties** area, unmark **Use country area code** and **Area Code**.
11. In the **Configure** area, select the appropriate maximum speed (the default is 19200 bps).
12. In the **Connection** tab, unmark **Wait for Dial Tone before Dialing**, and set **Cancel the call if not connected within** to 1 sec.
13. In the **Advanced** area, unmark **Use Error Control** and **Use Flow Control**.
14. Click **OK**, and **OK** again.
15. Select the **Server Type** tab.
16. In **Dial-up server**, select the **SLIP Unix/PPP** connection. If it is not listed, return to step 2 and start the installation again.
17. Make sure **TCP/IP** is marked, and unmark all other options.
18. Select **TCP/IP**, and mark **Specify an IP Address**.
19. Enter the IP address. This is the SLIP interface IP address (not LAN address) you entered in step 7 in the section *Configuring the TCP Dial-Up Adapter*.

***Note**: Your computer **must** be connected to the same subnet as the IDU.*

17. Unmark **Use IP Header Compression** and **Use Default Gateway** or **Remote Network**.
18. Click **OK**, and **OK** again.
19. In the **Configure** area, select the appropriate maximum speed (the default is 19200 Bps).
20. In the **Connection** tab, unmark **Wait for Dial Tone before Dialing**, and set **Cancel the call if not connected within** to 1 sec.
21. In the **Advanced** area, unmark **Use Error Control** and **Use Flow Control**.
22. Click **OK**, **OK** again, and **OK** again.

Configuring PPP

1. Configure the dial-up modem by clicking **Start** on the desktop, and selecting **Control Panel**, **Modems**.
2. After you configure the modem, in the **Control Panel**, click **Add/Remove Programs**.
3. In the **Windows Setup** tab, select **Communications**.
4. Click **Details**, and mark **Dial-up Networking**.
5. Select the modem you are using.
6. Click **Configure**, set the baud rate to 38,400, and select the COM port.
7. Click **Connection**, and configure the connection settings as follows:

   Data bits - 8
   Parity - NONE
   Stop bit - 1

8. Click **OK**.

9. Click **Next**, and enter the phone number.
10. Click **Next**, and then **Finish**.
11. In the **Properties** of the dial-up connection that you defined, select **Server Type**.
12. In the **Type of Dial-Up Server** list, select **PPP**.
13. Unmark **Log on to network**, **Require data encryption**, and **Record a log file for this connection**.
14. Unmark **NetBEUI** and **IPX/SPX**.
15. Mark **TCP/IP**.
16. In **TCP/IP settings**, mark **Specify IP Address**, and enter the IP address of the PC dial-up connection.

Note*: The IP address of the serial line on the IDU should be different, but should have the same subnet.*

17. Click **OK**, and **OK** again.
18. To connect, double-click the desired dial-up connection.

Installation for Windows NT

Before you install the PPP/SLIP driver for Windows NT, make sure that TCP/IP and DIAL UP NETWORKING are installed.

PPP/SLIP driver installation for Windows NT requires the CeraView installation CD.

The installation procedure involves the following steps:

- Installing the nullmdm file.
- Configuring the TCP dial-up adapter.

Insert your CeraView CD in the CD drive and perform the procedures described in the following sections.

Installing nullmdm

1. Click Start on the desktop, and select **Settings**, **Control Panel**, **Modems**.
2. Click **Add**.
3. Mark **Don't detect my modem**.
4. Click **Next**.
5. Click **Have disk**, and in the **CeraViewCD/SLIPNT** folder, select **nullmdm.inf**.
6. Click **OK**.

   The message "NT Direct Connection" appears.
7. Click **Next**.
8. Select **Communication port (COM1 or COM2)**, and click **Next**.

   The message "You will need to restart the system before you can use the modem" appears.
9. Click **Finish**.
10. In the window that appears, select the required port.
11. Select **Properties**, and set the **Maximum speed rate** to the rate of the FibeAir serial port (default is 19200).
12. Select **Connection**, and set the following parameter values:

    Data bits - 8
    Parity - NONE
    Stop bit - 1
13. Mark **Cancel the call if not connected within 1 sec**.
14. In the **Advanced** area, unmark **Use error control** and **Use flow control**.
15. Click **OK**, and **OK** again.
16. Click **Close**.
17. Click **Yes**, and restart the computer.

18. Click **Start** on the desktop, and select **Settings**, **Control Panel**, **Network**, **Services**.
19. Click **Add**.
20. Select **Remote Access Server**.
21. Click **OK**.
22. Click **Continue**.

    RAS drivers are installed., and the Remote Access Setup window appears.
23. Click **Add**.
24. In the window that appears, click **OK**.
25. Click **Network**.
26. Verify that only **TCP/IP dial out protocol** is marked.
27. Click **OK**.
28. Click **Configure**.
29. In **Port Usage**, verify that **DIAL OUT ONLY** is marked.
30. Click **OK**.
31. Click **Continue**.
32. Click **Close**.
33. Click **Yes** to restart your computer.

Configuring the TCP Dial-Up Adapter

1. Double-click **My Computer**, and then **Dial-up Networking**.
2. Enter a new name.
3. In the **Dial using** area, select the required COM.
4. Unmark **Use another port if busy**.
5. Click **Configure**, and set the speed to 19200 bps. Then click **OK**.
6. Select **Server Type**. For **Type of Dial-up server**, select **SLIP INTERNET**.
7. Select **TCP/IP setting**, and enter the IP address. This is the computer SLIP interface IP address (not the Device IP address).

   SLIP interface IP address - 192.168.0.*xx* (where *xx* may be any number between 3 and 30.

   Device IP address - default is 192.114.37.5.
8. Unmark **Force IP header compression**, and mark **Use default gateway or remote network**.
9. Click **OK**, and **OK** again.
10. Click **Close**.
11. Restart the PC.

Installation for Windows 2000

1. Click **Start**, **Setting**, **Network and Dialup**, **Make New Connection**.
2. Click **Next**.
3. Mark **Connect directly to another computer.**
4. Click **Next**.
5. Mark **Guest**.
6. Click **Next**.
7. Select **Communication cable between two computers**.
8. Click **Next**.
9. Select **For all user**.
10. Click **Next**.
11. Type **The connection Name**.
12. Click **Finish**.

Configuring PPP

1. Click **START** , **Setting**, **Network and Dialup**.
2. Select **The connection Name**.
3. In the **General** tab click **Configure**, and set the speed to 38400.
4. Check **Enable Hardware flow control**.
5. Uncheck **Modem Error control**, **Modem Compression**.
6. Select **Network** tab.
7. Select **Type PPP**.
8. Select **Internet protocol** (**TCP/IP**) and click **Properties**.
9. Uncheck all options except TCP/IP.
10. Check **Use the following IP**.
11. Insert **IP Address** (the same subnet as the Indoor).
12. Click **OK**.
13. Click **OK**.

Appendix B
Connector Pin-Outs

- Alarm I/O Connector
- User Channel Cable
- Modem-PPP Cross Cable
- Protected System Cables
- DB-44 Connector for E1s/T1s
- 16xDS1 100 ohm / 16xE1 120 ohm Cable
- RJ-45 10-Pin Connector for Hitless Systems
- Wayside Channel Connectors

Alarm I/O Connector Pin-Out

Pin #	Signal Name	Signal Description
1	EXT IN1	Input 1 (normally open)
2	EXT IN3	Input 3 (normally open)
3	EXT IN5	Input 5 (normally open)
4	EXT IN7	Input 7 (normally open)
5	RELAY 1NC	Relay Output 1 (normally closed contact)
6	RELAY 1C	Relay Output 1 (common contact)
7	RELAY 2NO	Relay Output 2 (normally open contact)
8	RELAY 3NC	Relay Output 3 (normally closed contact)
9	RELAY 3C	Relay Output 3 (common contact)
10	RELAY 4NO	Relay Output 4 (normally open contact)
11	RELAY 5NC	Relay Output 5 (normally closed contact)
12	RELAY 5C	Relay Output 5 (common contact)
13	GND	Ground
14	EXT IN2	Input 2 (normally open)
15	EXT IN4	Input 4 (normally open)
16	EXT IN6	Input 6 (normally open)
17	EXT IN8	Input 8 (normally open)
18	RELAY 1NO	Relay Output 1 (normally open contact)
19	REALY 2NC	Relay Output 2 (normally closed contact)
20	REALY 2C	Relay Output 2 (common contact)
21	RELAY 3NO	Relay Output 3 (normally open contact)
22	RELAY 4NC	Relay Output 4 (normally closed contact)
23	RELAY 4C	Relay Output 4 (common contact)
24	RELAY 5NO	Relay Output 5 (normally open contact)
25	-	Not Connected

User Channel Cable Pin-Out

The following table lists the pin-out of the DB9 user channel cable.

User Channel DB9	
----	**1**
TX	**2**
RX	**3**
---	**4**
GND	**5**
RXC	**6**
---	**7**
---	**8**
TXC	**9**

Modem-PPP Cross Cable Pin-Outs

This section provides pin-outs for the cross cable installed between the dial-up modem and the FibeAir PPP interface.

DB9 to DB9 Cross Cable

	DB9 Male		DB9 Male	
TX	**2**	→	**2**	**RX**
RX	**3**	←	**3**	**TX**
DTR	**4**	←	**1**	**DCD**
CTS	**8**	→	**7**	**RTS**
RTS	**7**	←	**8**	**CTS**
DCD	**1**	→	**4**	**DTR**
GND	**5**	→	**5**	**GND**

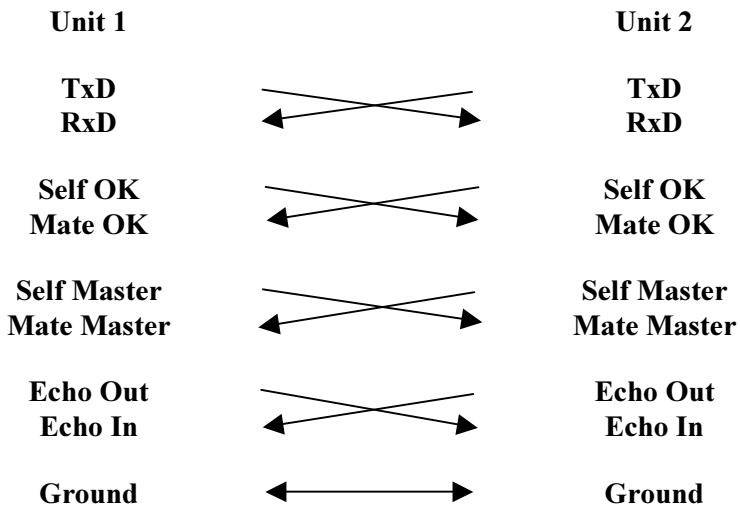
DB9 to DB25 Cross Cable

DB9	DB25
1	20
2	2
3	3
4	8
5	7
7	5
8	4

Protected System Cables

Protected System Cable Connection

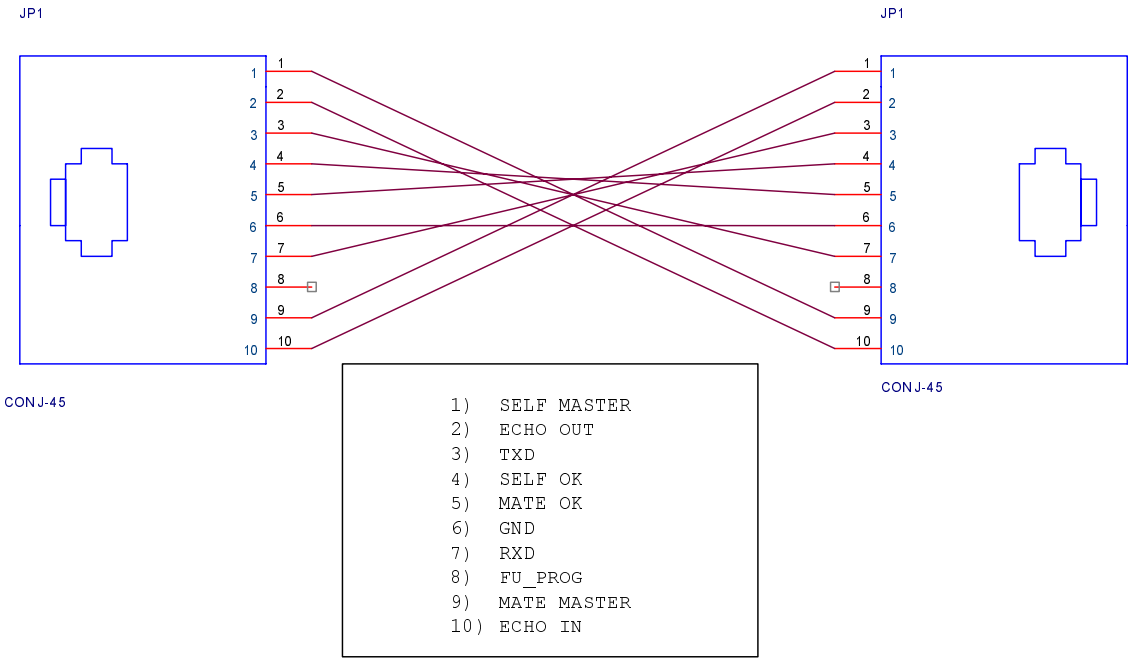
The protected system cable is connected as follows:



RJ-45 Cable Pin-Out for Protected Systems

Use a 20 cm cable with RJ-45 connectors at both ends.

The connectors have the following pin-outs:



DB-44 Connector Pin-Out for 8 E1s/T1s

The DB-44 connectors provide balanced 120 Ohm impedance for E1s, and 100 Ohm balanced impedance for T1s.

Note that it is not recommended to connect the cable-shield to the chassis GND of the **other** side unless there is no chassis GND on the other side.

Receive Cable			
Twisted Pairs	**RX Signals**	**D-Type 44 Pin No.**	**Color**
Twisted Pair	R-RING0	2	White
	R-TIP0	1	Blue
Twisted Pair	R-RING1	17	White
	R-TIP1	16	Orange
Twisted Pair	R-RING2	32	White
	R-TIP2	31	Green
Twisted Pair	R-RING3	4	White
	R-TIP3	3	Brown
Twisted Pair	R-RING4	19	White
	R-TIP4	18	Grey
Twisted Pair	R-RING5	34	White
	R-TIP5	33	Blue/White
Twisted Pair	R-RING6	5	White
	R-TIP6	20	Blue/Orange
Twisted Pair	R-RING7	21	White
	R-TIP7	35	Blue/Green
Shield	CGND (1)	22	----

Transmit Cable			
Twisted Pairs	**RX Signals**	**D-Type 44 Pin No.**	**Color**
Twisted Pair	T-RING0	10	White
	T-TIP0	25	Blue/Brown
Twisted Pair	T-RING1	26	White
	T-TIP1	40	Blue/Grey
Twisted Pair	T-RING2	12	White
	T-TIP2	11	Orange/White
Twisted Pair	T-RING3	28	White
	T-TIP3	27	Orange/Green
Twisted Pair	T-RING4	42	White
	T-TIP4	41	Orange/Brown
Twisted Pair	T-RING5	14	White
	T-TIP5	13	Orange/Grey
Twisted Pair	T-RING6	30	White
	T-TIP6	29	White/Green
Twisted Pair	T-RING7	44	White
	T-TIP7	43	Green/Brown
Shield	CGND (1)	24	----

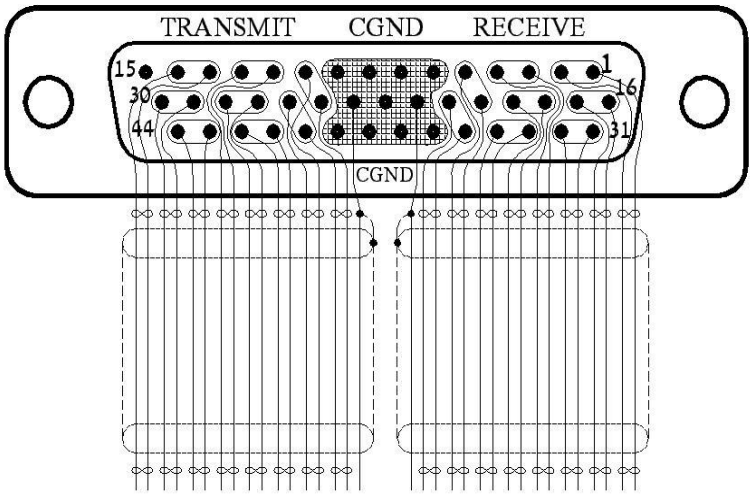
Notes:

1. CGND = IDU chassis GND
2. The following D-Type 44 connector pins are **not** connected: 6, 7, 8, 9, 15, 23, 36, 37, 38, 39.
3. For E1 interfaces:

   TX = output from IDU

   RX = input to IDU

The following illustration shows the DB-44 pin connections.



16xDS1 100 ohm Impedance & 16xE1 120 ohm Impedance Cable Pin-Out

Twisted Pairs	Signals		
Twisted Pair	IN - RING 1	2	Blue/White
	IN - TIP 1	1	White/Blue
Twisted Pair	IN - RING 2	17	Orange/White
	IN - TIP 2	16	White/Orange
Twisted Pair	IN - RING 3	32	White/Green
	IN - TIP 3	31	Green/White
Twisted Pair	IN - RING 4	4	Brown/White
	IN - TIP 4	3	White/Brown
Twisted Pair	IN - RING 5	19	Grey/White
	IN - TIP 5	18	White/Grey
Twisted Pair	IN - RING 6	34	Blue/Red
	IN - TIP 6	33	Red/Blue
Twisted Pair	IN - RING 7	5	Orange/Red
	IN - TIP 7	20	Red/Orange
Twisted Pair	IN - RING 8	21	Green/Red
	IN - TIP 8	35	Red/Green
Twisted Pair	OUT - RING 1	10	Brown/Red
	OUT - TIP 1	25	Red/Brown
Twisted Pair	OUT - RING 2	26	Grey/Red
	OUT - TIP 2	40	Red/Grey
Twisted Pair	OUT - RING 3	12	Blue/Black
	OUT - TIP 3	11	Black/Blue
Twisted Pair	OUT - RING 4	28	Orange/Black
	OUT - TIP 4	27	Black/Orange
Twisted Pair	OUT - RING 5	42	Green/Black
	OUT - TIP 5	41	Black/Green
Twisted Pair	OUT - RING 6	14	Brown/Black
	OUT - TIP 6	13	Black/Brown
Twisted Pair	OUT - RING 7	30	Grey/Black
	OUT - TIP 7	29	Black/Grey
Twisted Pair	OUT - RING 8	44	Blue/Yellow
	OUT - TIP 8	43	Yellow/Blue
Shield	Shell (1)	22,24	

Notes:

1. Shell is connected to IDU chassis GND.

2. The following D-Type 44 connector pins are **not** connected:
   6, 7, 8, 9, 15, 23, 36, 37, 38, 39.

RJ-45 10-Pin Connector for Hitless Systems

For hitless systems, the IDUs at each side are connected using an RJ-45 10-pin connector with the following pin-out:

RJ-45 10-Pin Connector Pin-Out	
1	Sync
2	Not Connected
3	Transmit Data +
4	Transmit Data -
5	Receive Data -
6	GND
7	Receive Data +
8	Not Connected
9	Lock
10	Not Connected

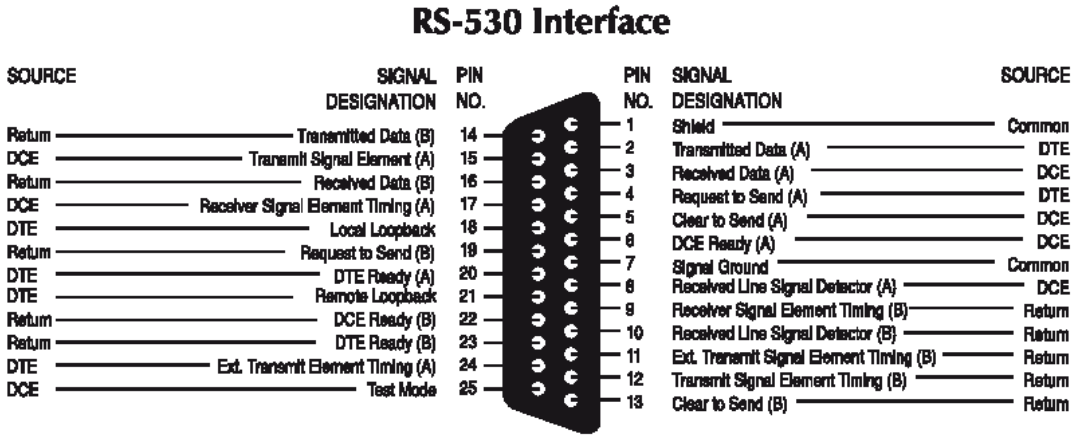
Wayside Channel Connector Pin-Outs

This section provides pin-outs for Wayside channel interfaces.

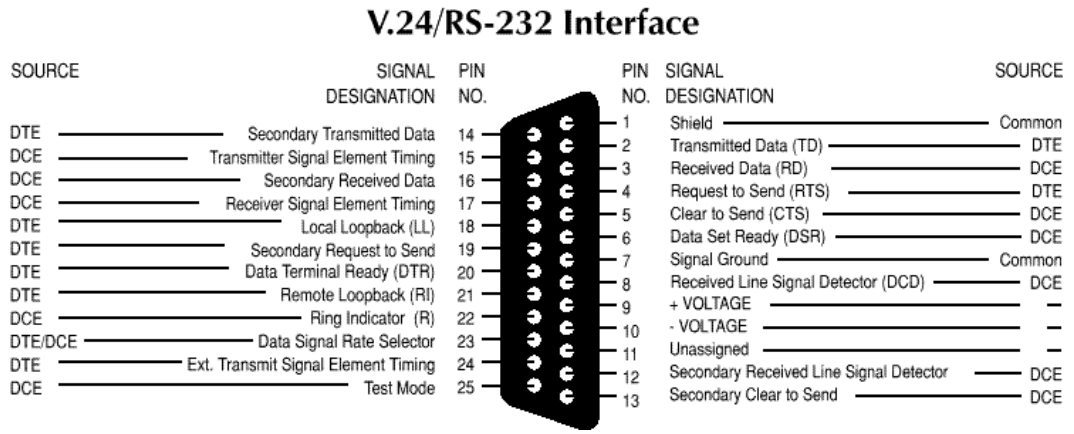
The pinouts provided include:

- RS-530
- V.24/RS-232
- X.21

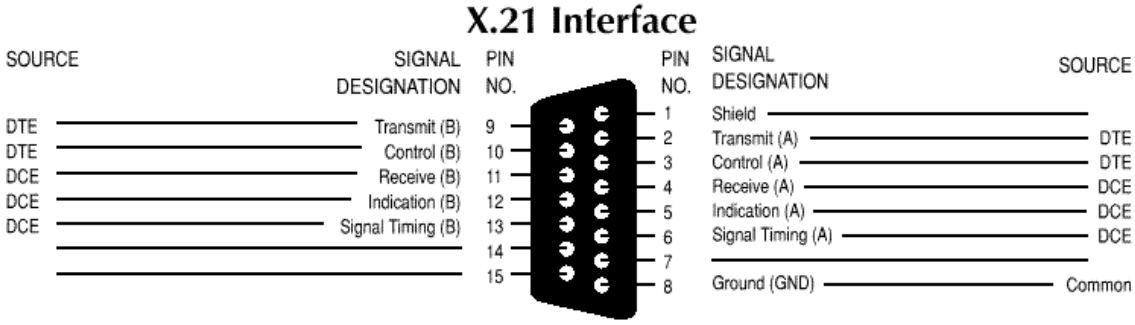
RS-530 Pin-Out



V.24/RS-232 Pin-Out



X.21 Pin-Out



Appendix C
Antenna Information

This appendix provides the following information:

- Instructions for mounting and installing antenna assemblies
- Radiation patterns envelopes

Installation Instructions

For Ceragon 1 ft & 2ft Antennas

AN-0017-0, AN-0018-0, AN-0028-0, AN-0031-0, AN-0032-0, AN-0034-0, AN-0035-0, AN-0036-0

CERAGON, Sept-2000

CERAGON Ltd.
24 Raul Valenberg Street, Tel-Aviv, 69710,
Israel Tel: +972-3-6455733 Fax: +972-3-6455499 Home Page: www.ceragon.com

Description

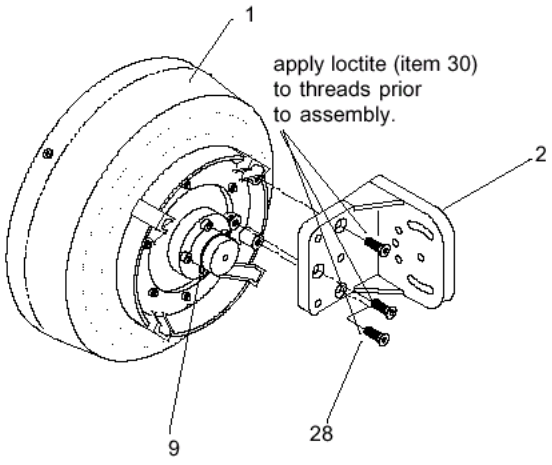
This antenna consists of a 0.3-metre (1-ft) / 0.6-metre (2ft) shielded reflector, radome, feed, and offset tower mount. The mount is designed to attach the antenna to a vertical tower pipe of diameter 48 to 115 mm (1.9 to 4.5"). The mount also provides adjustment ranges of±50° (±22° fine) elevation and±180° (±15° fine) azimuth.

Notice

The installation, maintenance, or removal of antenna systems requires qualified, experienced personnel. This installation instructions have been written for such personnel. Antenna systems should be inspected once a year by qualified personnel to verify proper installation, maintenance, and condition of equipment.

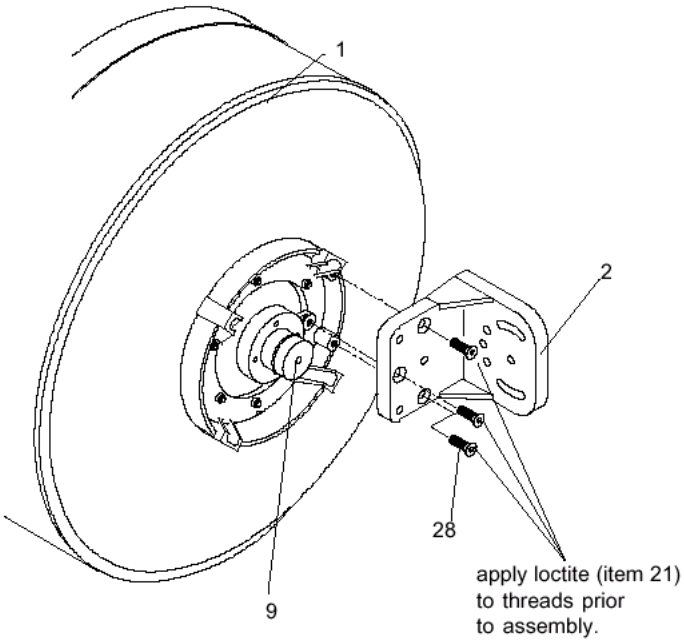
Ceragon disclaims any liability or responsibility for the results of improper or unsafe installation practices.

1a



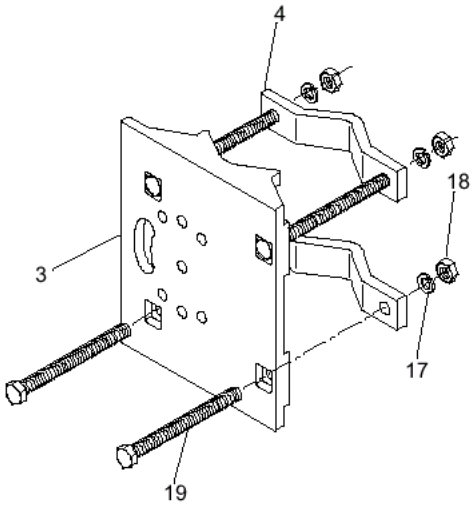
0.3m (1ft) Application

1b

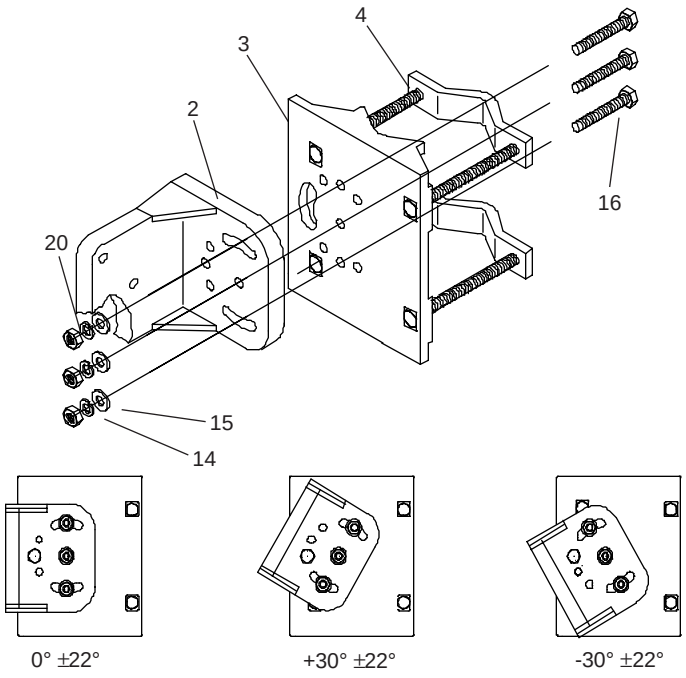


0.6m (2ft) Application

2

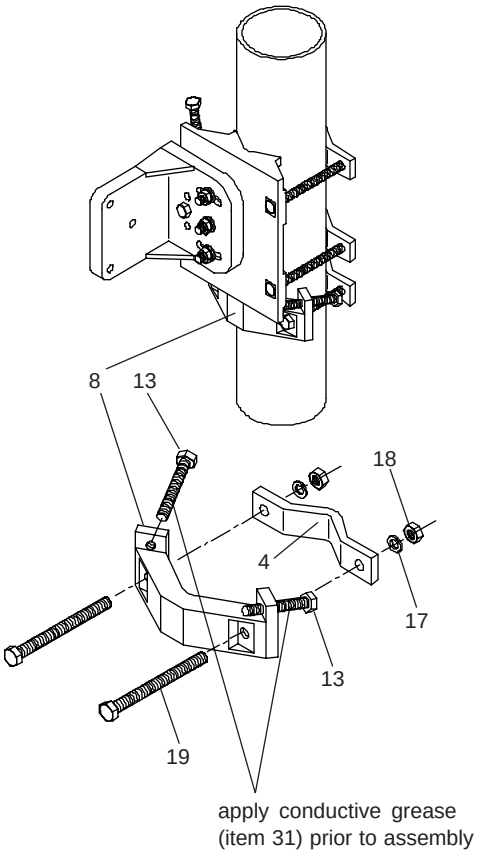


3

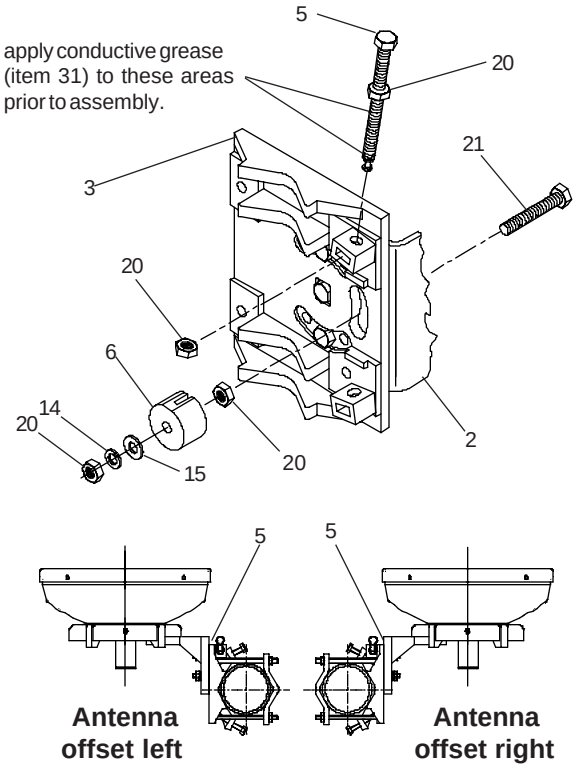


Elevation Adjustment Ranges

5

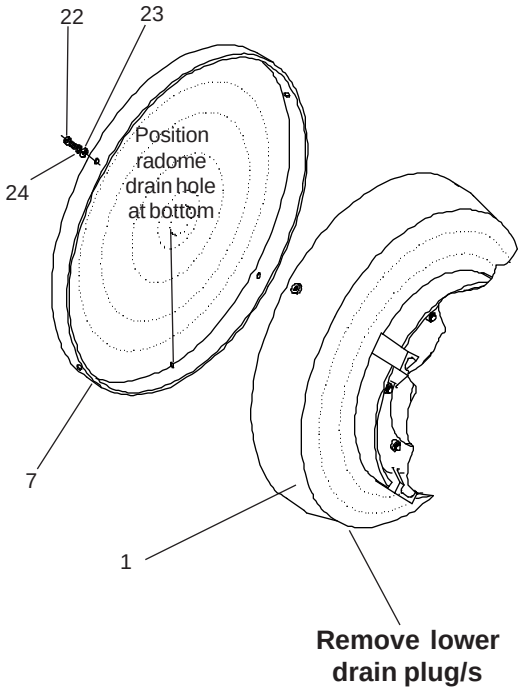


4



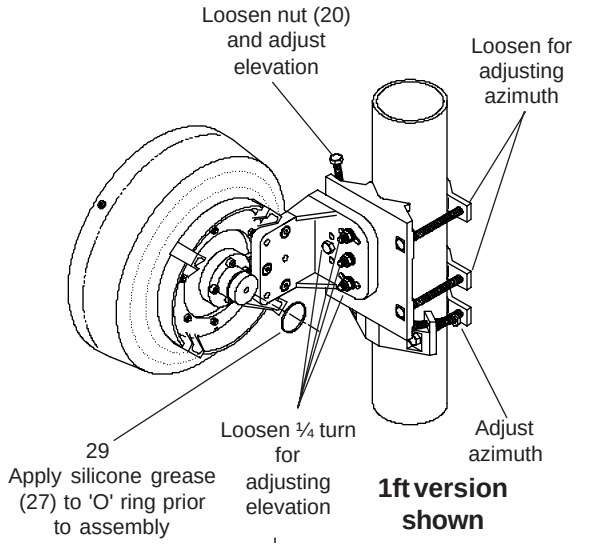
1ft low profile version shown

6



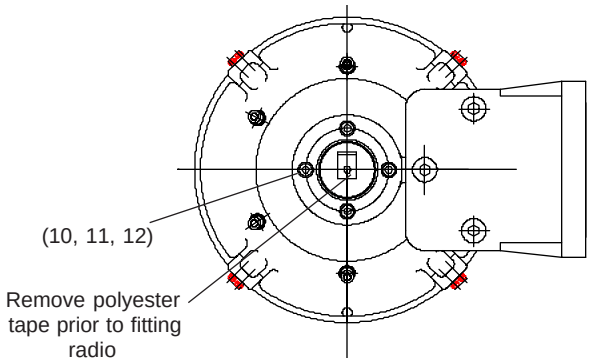
1ft low profile version shown

7



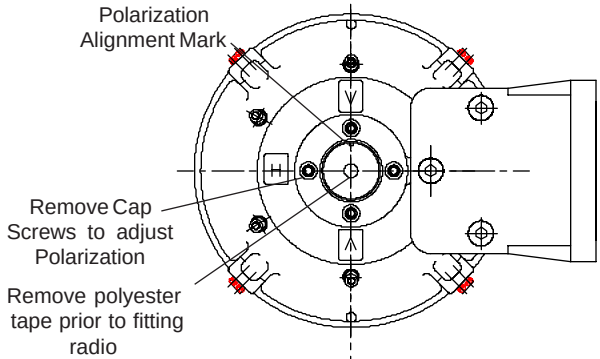
1ft version shown

8

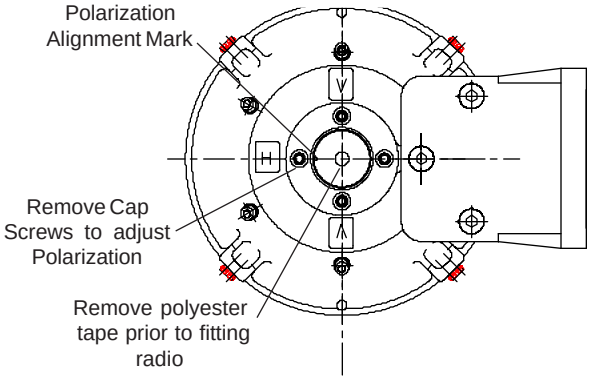


Single Polarized Application

(polarization (H or V set by the integrated radio)



Vertically Polarized Application



Horizontally Polarized Application

Table 1. Antenna Parts List

Item	Description	Part no.	Qty
1	Reflector assy (1ft)	#	1
	Reflector assy (2ft)	113503	1
2	Mounting bracket	109457	1
3	Mount pivot plate	109087	1
4	V-clamp	109088	3*
5	Elevation adjustment bolt	109092	1*
6	Elevation pivot boss	109273	1*
7	Radome (1ft)	107924-DET§	1
	Radome (2ft)	108991-DET§	1
8	Azimuth adjustment clamp	109093	1
9	Feed assembly (2ft)	#	1
	Feed assembly (2ft)	#	1
10	M6 x 16 soc head screw, ss	100622-9	4
11	M6 lockwasher, ss	100522-29	4
12	M6 flatwasher, ss	100521-30	4
13	M10x 70 hex hd scr, ss	100534-100	2*
14	M10 spring washer, ss	100522-37	4*
15	Flat washer, ss	100521-37	4*
16	M10 x 45 hex head screw, ss	100534-55	3*
17	M10 spring washer, gs	100522-39	6*
18	M10 hex nut, gs	100526-39	6*
19	M10 x 150 hex head screw, gs	100534-160	6*
20	M10 hex nut, ss	100526-37	7*
21	M10 x 75 hex hd screw, ss	100534-109	1*
22	M5 x 16 pan hd screw, ss (1ft)	100510-45	4
	M6 x 20 pan hd screw, ss (2ft)	100511-34	6
23	M6 flatwasher, ss (1ft)	100521-19	4
	M6 flatwasher, ss (2ft)	100521-25	6
24	M6 lockwasher ss (1ft)	100522-21	4
	M6 lockwasher ss (2ft)	100522-25	6
25	Allen Key	100668-6	1
26	Vinyl Glove	207402	2
27	Silicone grease (tube)	12225	1
28	M10 x 40 c'sk skt hd scr, ss	204035-26	3*
29	'O'-ring	106837-3	1*
30	Loctite (sachet)	108171	1*
31	Conductive Grease	203233-2	1

ss/gs stainless steel/galvanized steel
Frequency Dependant
§ DET is a variable part number depending on, where applicable, frequency, colour & logo requirement

* Mount Kit 109913-4

Table 2. Fastener Torque Specifications

Fastener	Torque value in N·m (lb·ft) for each fastener size					
Size	M5	M6	M8	M10	M12	M16
Stainless steel	4.5 (3.3)	7.7 (5.7)	18.7 (13.8)	39.2 (28.9)	65.1 (48)	161 (118.7)
Galvanized steel	2.7 (2)	4.5 (3.3)	11.1 (8.1)	22 (16.2)	38 (28)	95 (70.1)