GE MDS
Intrepid-HC HP

Wireless Broadband Transceiver

Version 1.x

GE MDS
industrial wireless networks

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Safety Precautions & Declared Material

Fiber Optic Line Precautions

⚠ Before turning on the equipment, make sure that the fiber optic cable is intact and is connected to the transmitter.

⚠ **Do not attempt to adjust the laser drive current.**

⚠ **Do not use broken or non-terminated fiber optic cables/connectors or look straight at the laser beam.**

ATTENTION: The laser beam is invisible!

⚠ **The use of optical devices with the equipment will increase eye hazard.**

⚠ **CLASS 1 LASER PRODUCT**

Complies with IEC 60 825-1:1993 + A1:1997 + A2:2001, and EN 60825-1:1994 + A1:1996 + A2:2001

General Equipment Precautions

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

⚠ **When working with an IDU, note the following risk of electric shock and energy hazard: Disconnecting one power supply disconnects only one power supply module. To isolate the unit completely, disconnect all power supplies.**

⚠ **Machine noise information order - 3. GPSGV, the highest sound pressure level amounts to 70 dB (A) or less, in accordance with ISO EN 7779.**

Safety Precautions & Declared Material *(continued)*

Static electricity may cause bodily harm, as well as harm to electronic components inside the device.

Anyone responsible for the installation or maintenance of the IDU must use an ESD Wrist Strap.

ESD protection measures must be observed when touching the IDU.

To prevent damage, before touching components inside the device, all electrostatic **must be discharged** from both personnel and tools.

RoHS Compliance Declaration

⊠子信息⊠品有毒有害物⊠申明

Electronic Information Products Declaration of Hazardous/Toxic Substances

成分名称 Component	危害物质 Hazardous Substance					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr VI)	多溴联苯 Polybrominated Biphenyls (PBB)	多溴二苯醚 Polybrominated Diphenyl Ethers (PBDE)
单板 / 电路模块 PCB/Circuit Modules	Comply	Comply	Comply	Comply	Comply	Comply
结构件 Mechanical Parts	Comply	Comply	Comply	Comply	Comply	Comply
电缆 Cables	Comply	Comply	Comply	Comply	Comply	Comply

GE MDS

Chapter 1: Installation

General

This guide provides installation procedures for the following GE MDS Intrepid-HC HP systems:

- GE MDS Intrepid-HC HP 1+0/1+1 configuration

- GE MDS Intrepid-HC HP 2+2 XPIC configuration

- GE MDS Intrepid-HC HP N+1 configuration

About GE MDS Intrepid-HC HP

The GE MDS Intrepid-HC HP supports multiple capacities, frequencies, modulation schemes, and configurations for various network requirements. Its RF transceiver units operate in the frequency range of 6-11 GHz.

GE MDS Intrepid-HC HP capacities can be upgraded from 45 Mbps up to N x 155 Mbps.

For long distance links and backbone requirements, GE MDS Intrepid-HC HP offers Space Diversity functionality. Each transceiver can contains two receivers and one transmitter, which enable built-in diversity capability.

Built in Diversity in each transceiver increases the reliability of the link. In a 1+1/2+2 Hot Standby or N+1 configuration with Space Diversity, if a hardware failure occurs, the Diversity will not be affected.

GE MDS Intrepid-HC HP is installed in a Split-Mount configuration, as shown in the following example illustration.

2+0 Configuration

The GE MDS Intrepid-HC HP RFU works together with Intrepid-HC, Intrepid-HC HP/T, and Intrepid-HC 64P, which are modular network connectivity IDUs designed to meet growing market demands for increased spectral-efficient systems.

GE MDS Intrepid-HC is designed to deliver double the capacity using a single 28 MHz wide channel. The system is easy to install, offers a variety of interface possibilities, and represents a cost-effective alternative to fiber.

GE MDS Intrepid-HC HP/T (all indoor, trunked unit) is a high capacity N+1 trunk radio system that was designed to support multiple capacities, frequencies, modulation schemes, and configurations for various network requirements.

GE MDS Intrepid-HC 64P is a high capacity PDH radio designed for seamless upgrade from medium to high capacity, with a built-in Fast Ethernet port and switch.

GE MDS Intrepid-HC HP RFUs together with the different GE MDS IDUs provide a powerful, reliable, and comprehensive solution for a variety of wireless network scenarios and requirements.
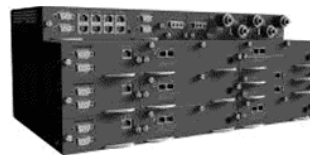
GE MDS Intrepid-HC HP RFU

GE MDS Intrepid-HC IDU

GE MDS Intrepid-HC 64P IDU

GE MDS Intrepid-HC HP/T IDU

About the GE MDS Intrepid-HC HP OCBs

GE MDS Intrepid-HC HP RFUs and OCBs (Outdoor Circulator Blocks) can be chained in different ways for different configurations.

Two types of OCBs can be used:

- Type1 OCB

- Type2 OCB

The main difference between the two types are the circulator directions. Depending on the configuration, OCB Type 1 or Type 2 are used together with waveguide shorts, waveguide loads, U Bends, C Bends, or couplers.

Each OCB has four waveguide access points: two in the front, and two at the rear. The diversity access point is optional.

If the system is not configured for diversity, all the relevant access points on the OCB must be terminated using waveguide shorts.
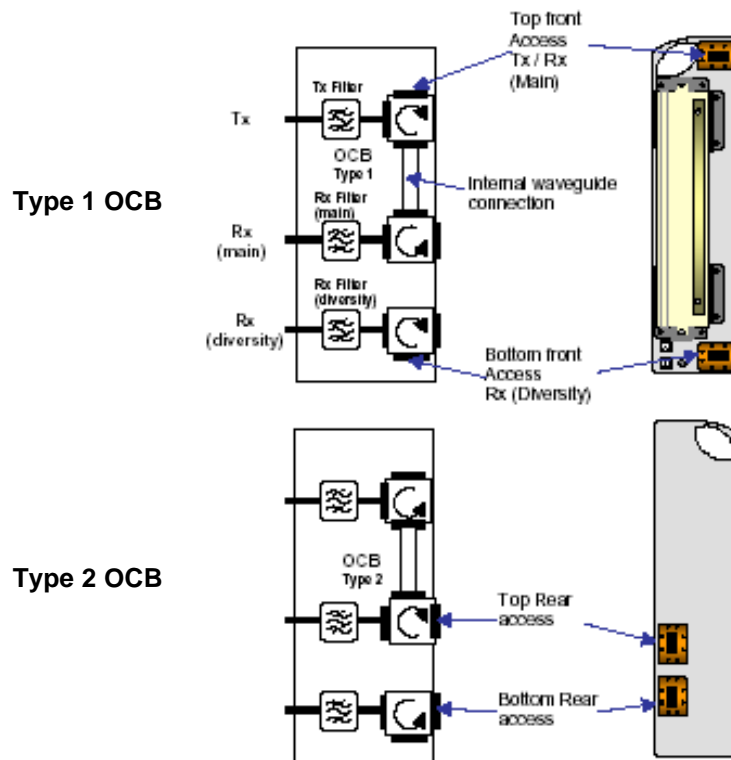
1+0/1+1 Installation

This section describes the installation procedure for GE MDS Intrepid-HC HP in a 1+0 or 1+1 configuration.

The components involved in this procedure include the following:

- RFU
- OCB
- Hanger Kit
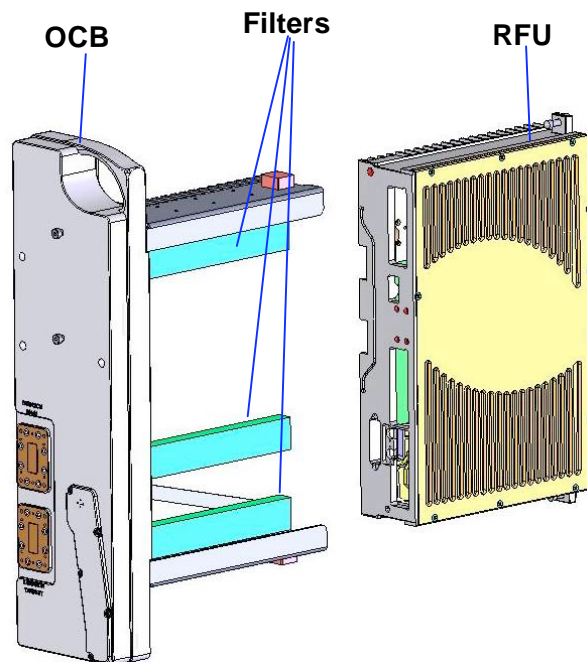- Pole Mount Kit

Assembling the RFU and OCB

The RFU is generally assembled in the factory with the OCB, and delivered as a single unit.

If the RFU is delivered separately with the OCB, do the following:

Important: *The instructions in this guide should be performed indoors.*

1. Remove the RFU and the OCB from the box.

2. Make sure that the OCB sealing gasket is in place.

OCB Sealing Gasket
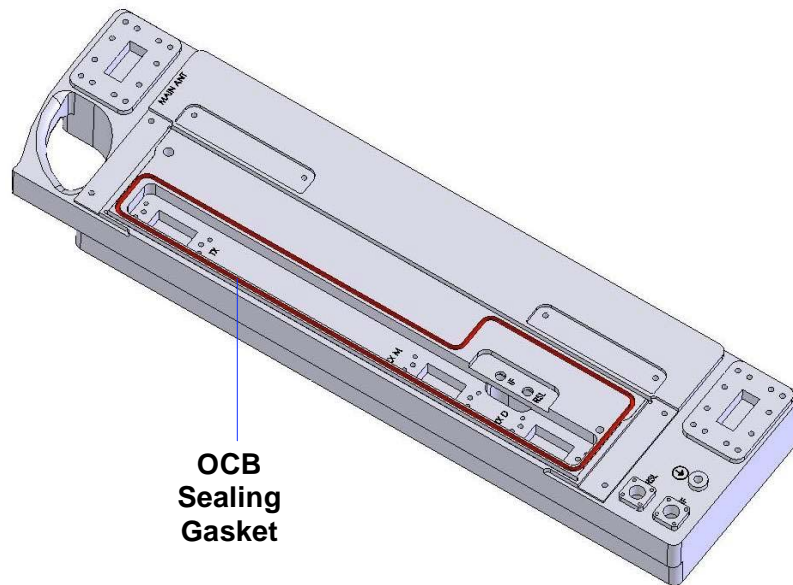
3. Gently slide the RFU in the OCB, making sure that the two empty spaces in the RFU correspond to the filter positions on the OCB.
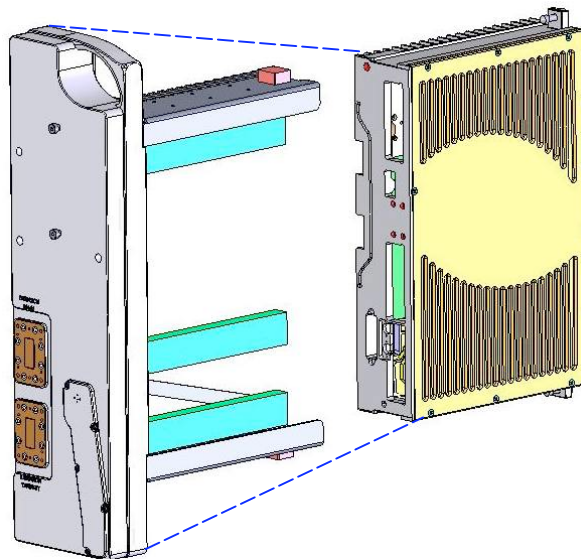
4. Tighten the Allen Head screws to the OCB using an Allen wrench.

Allen Head Screws
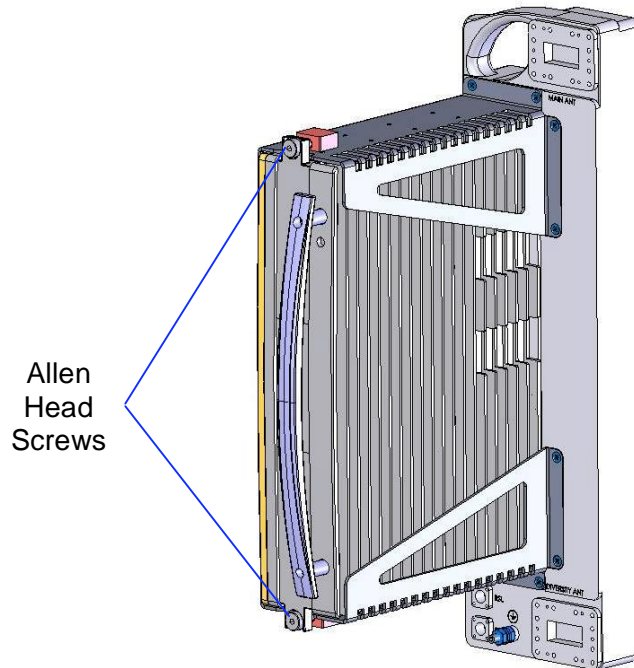
Assembling the Hanger Kit

The Hanger Kit is used to connect two RFUs and OCBs to the Pole Mount Kit. It consists of a single metal plate.

To assemble the Hanger Kit together with the RFU and OCB:

1. Place the RFU on the floor and hold it upright, as shown in the photo below.

2. Place the Hanger Kit in line with the OCB, as shown in the illustration below, and fasten the Kit to the OCB using 3 large (M-10 type) screws.

Three Screws Fastening the Hanger Kit to the OCB

Hanger Bend (to place on the Pole Kit)

Main Extension

Diversity Extension
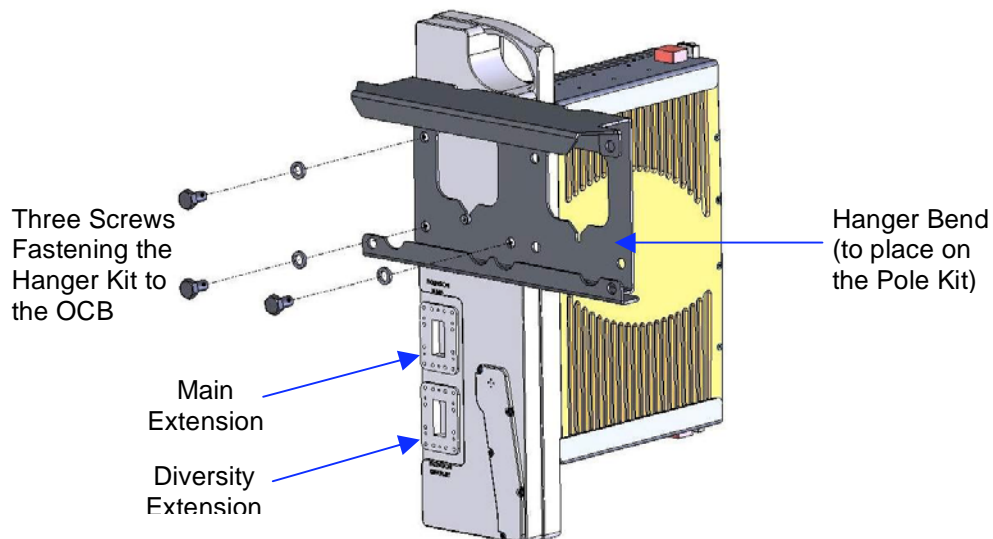
Assembling the Pole Mount Kit

The Pole Mount Kit is used to connect the Hanger Kit (together with the RFU and OCB) to the pole.

The kit consists of a single metal plate with a clamp assembly.

Important: The diameter of the pole upon which the kit is mounted must be between 50 mm (2") and 125 mm (5").

To assemble the Pole Mount Kit on the pole:

1. Open the Pole Mount Kit clamp, and assemble the kit on the pole, as shown in the following illustration.

Four Screws Fastening the Pole Mount Kit to the Pole
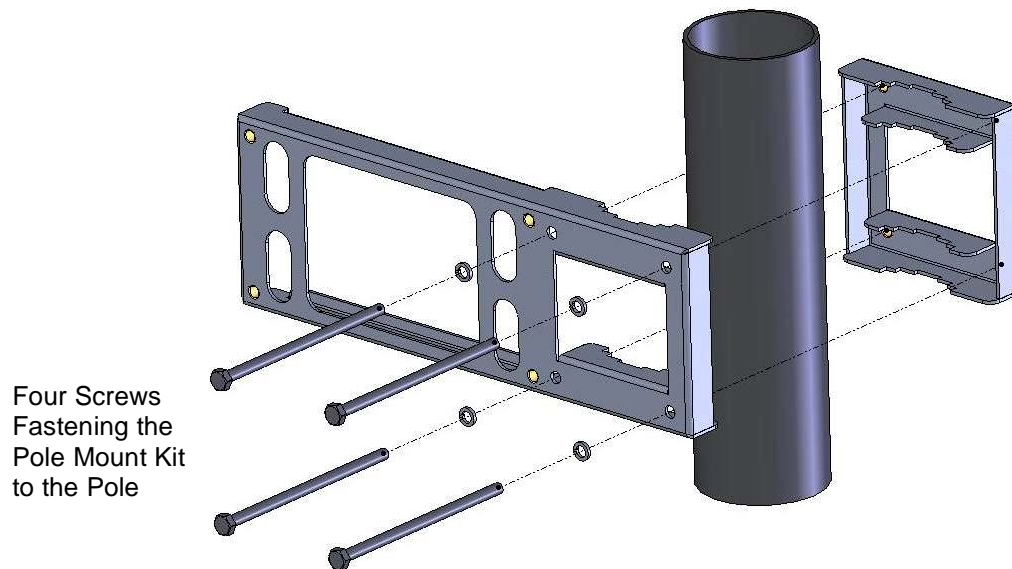
2. Fasten the kit to the pole using the 4 screws, as shown in the photo above.

Assembling the Hanger Kit (with RFU and OCB) and Pole Mount Kit

To assemble the Hanger Kit and the Pole Mount Kit:

1. Lift the Hanger Kit with the fastened RFU and OCB, and hang it, using the Hanger Bend, on the Pole Mount Kit, as shown in the following illustrations.
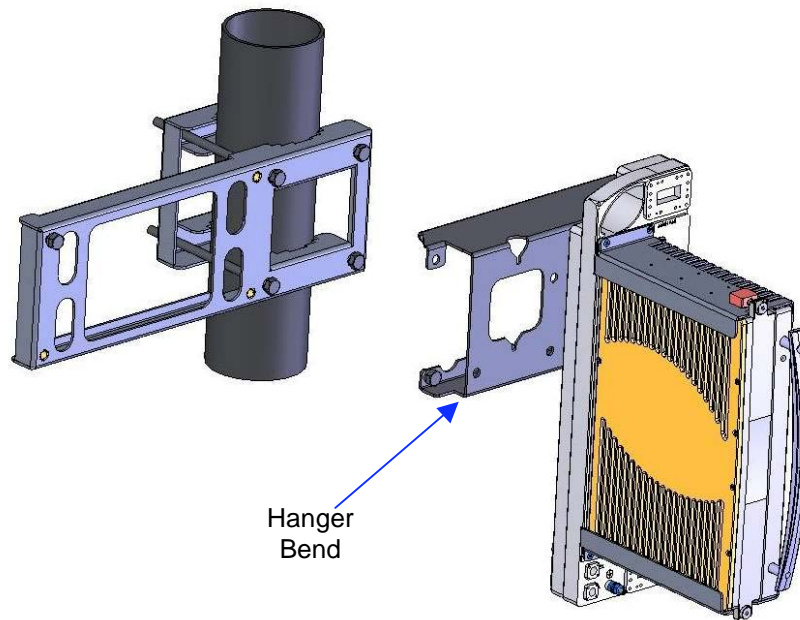
Hanger
Bend

Side view
showing how
the Hanger
Kit is hung on
the Pole
Mount Kit.
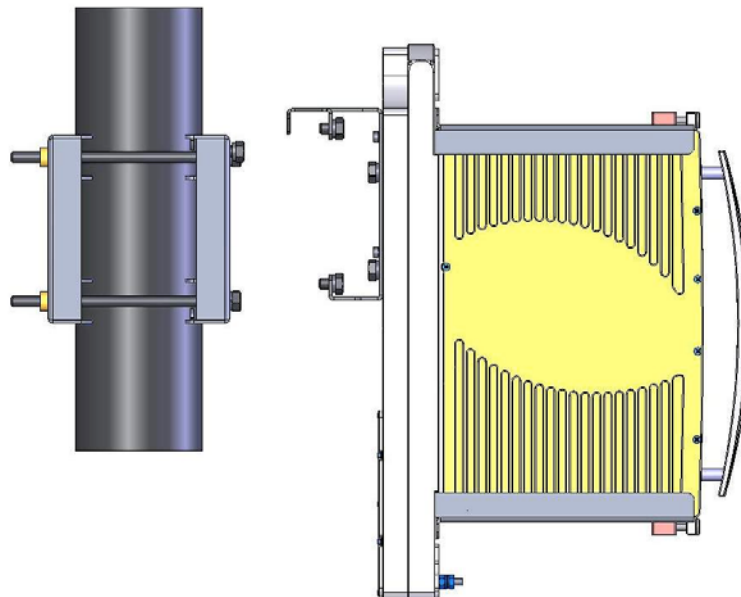
Side view of
the Hanger
Kit assembled
on the Pole
Mount Kit.
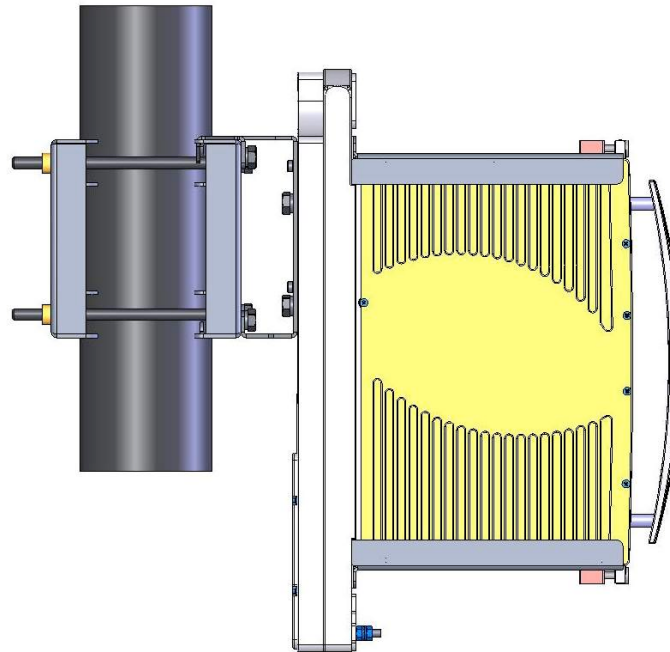
2. Fasten the Hanger Kit to the Pole Mount Kit using 4 large (M-10 type) screws, as shown in the following illustration.

Screws
fastening
the Hanger
Kit to the
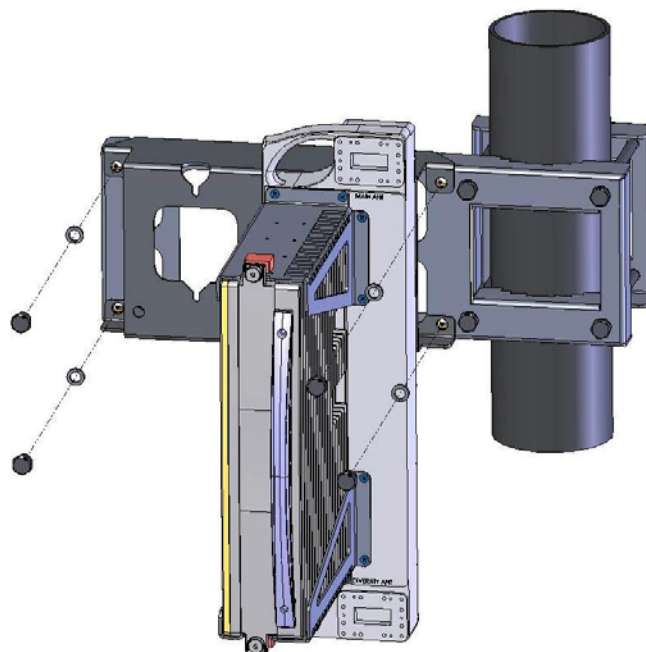
Each Pole Mount Kit can accommodate two RFUs and OCB units, as shown in the following illustration.

Couplers
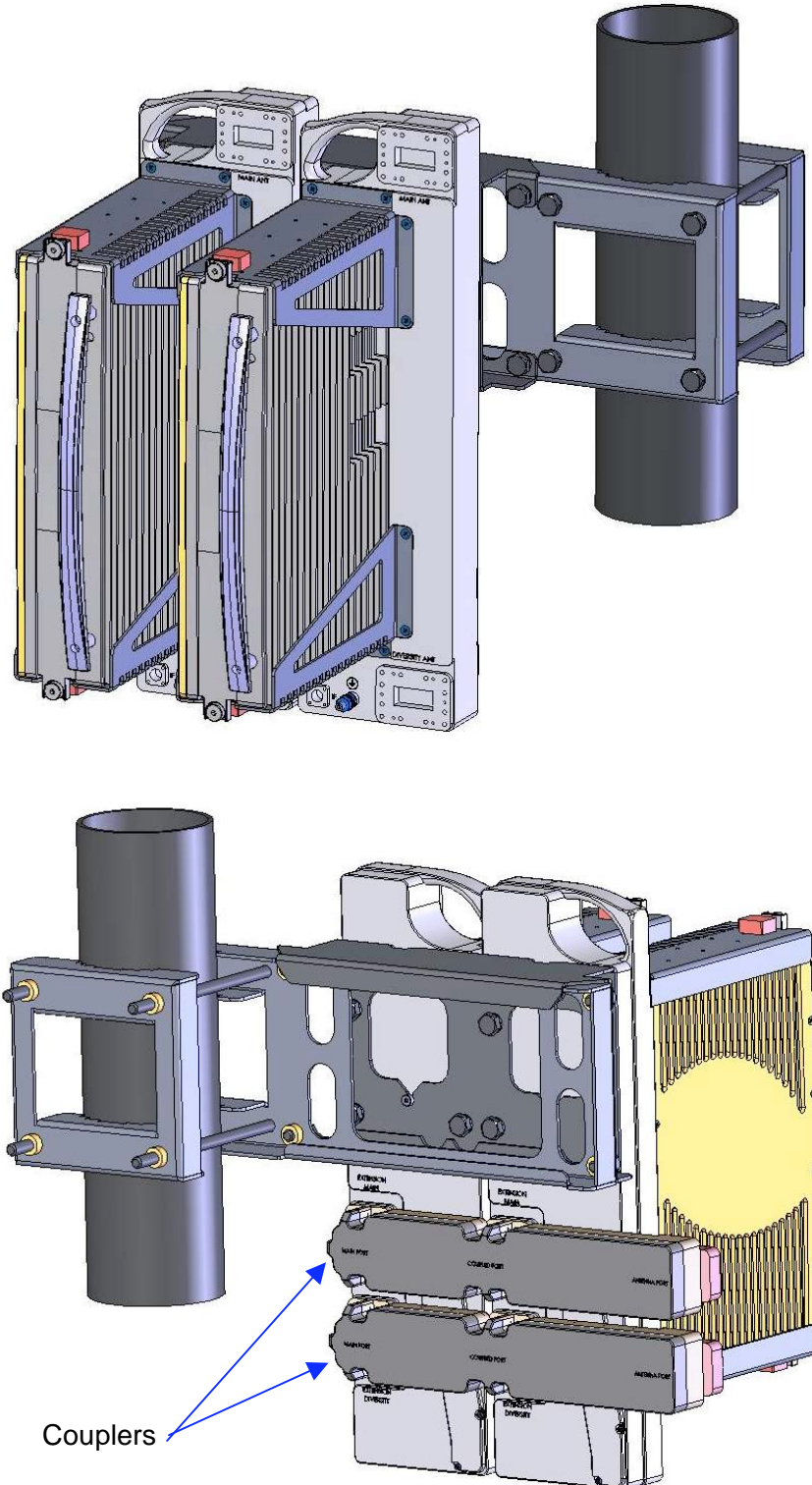
RFU Cable Connections

The RFU cable connectors are located on the bottom of the RFU, as shown in the following photo:
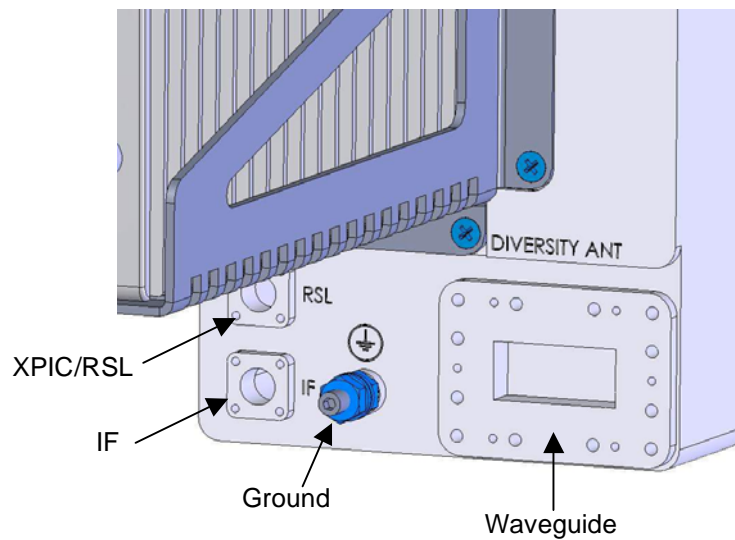
The connections include the following:

XPIC/RSL   For XPIC functionality and radio signal monitoring.

IF   Connects the RFU to the IDU.

Ground   Used for electrical ground.

Flexible Waveguide   Connects the RFU to the antenna.

2+2 XPIC Installation

This section describes the installation procedure for GE MDS Intrepid-HC HP in a 2+2 XPIC configuration.

Flexible Waveguide Connection to Main Horizontal and Vertical Antenna Ports

Elliptical Waveguide / Waveguide-to-Coax Connection to Diversity Horizontal and Vertical Antenna Ports
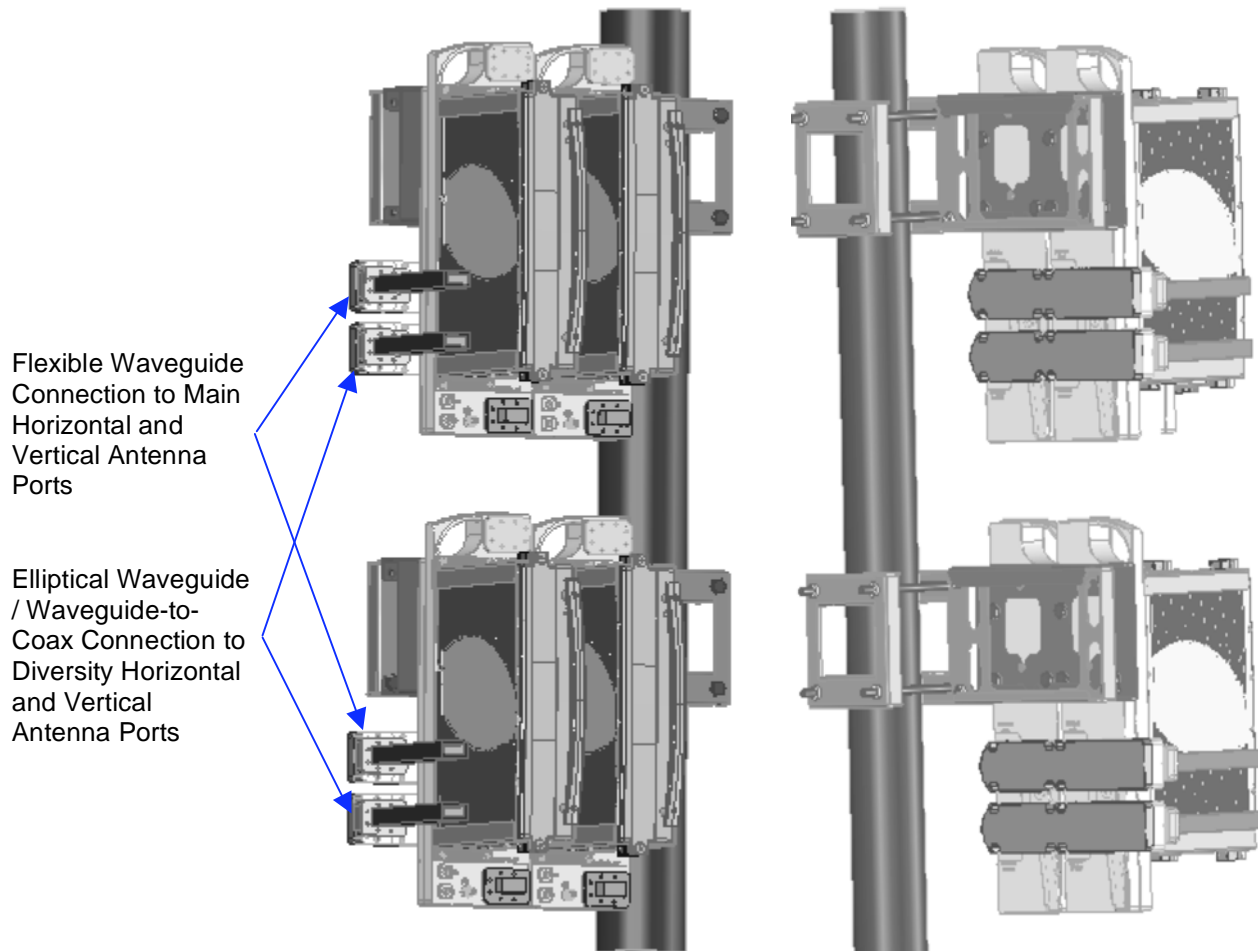
Installation Components

M10 Screws Fastening the OCB to the Hanging Bracket

Hanging Bracket

Lifting Handle

Pole Mount Kit with Clamp Bracket

Diversity Coupler

Main Coupler
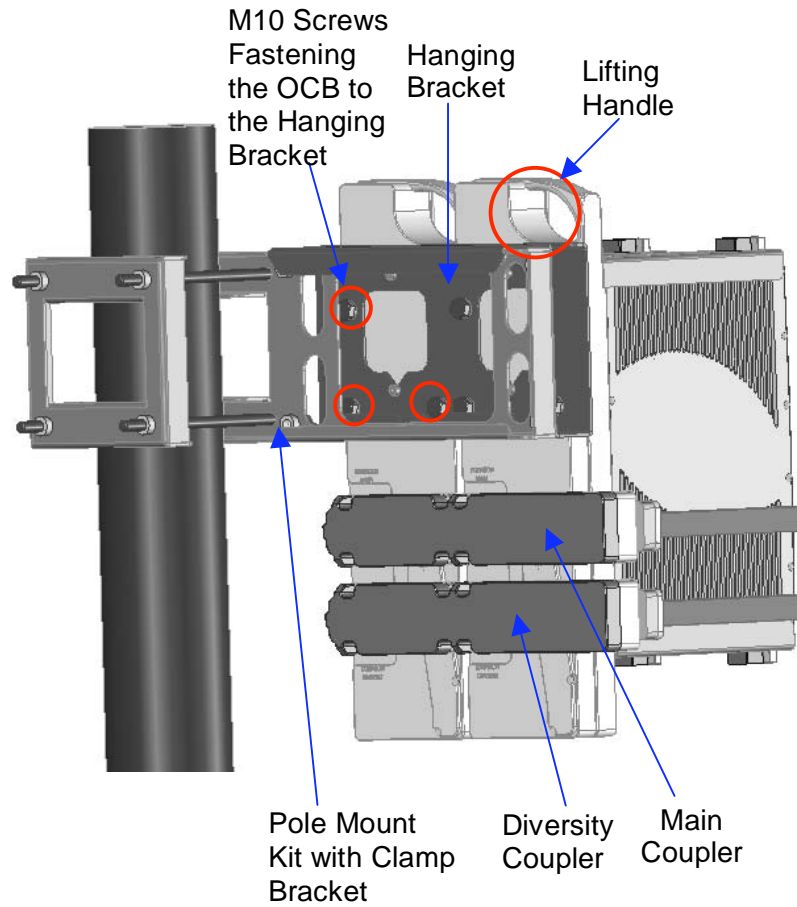
Installation Procedure

1. Connect both pole mount kits to the pole.

   If the RFUs are to be assembled one above the other, there should be a minimum distance of 40 cm between the two pole mount kits, as shown in the following illustration.
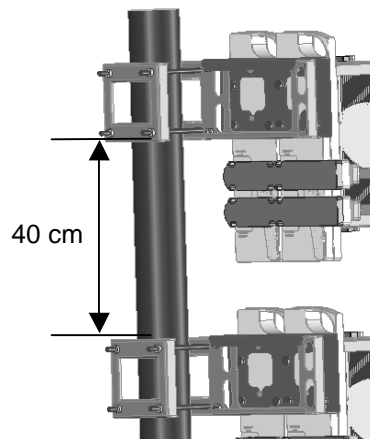
40 cm

![GE MDS logo]

Important: The diameter of the pole upon which the kit is mounted must be between 50 mm (2") and 125 mm (5").

2. Connect shorts and 50 ohm terminations on all OCBs (shorts on main antenna ports, 50 ohm terminations on diversity antenna ports).

3. Assemble both couplers on the OCBs.

4. Attach the hanging bracket to the OCBs and tighten the screws that fasten the OCB to the hanging-bracket.

5. Gently lift the assembled unit to the pole using the lifting handle.

6. Place the assembled units on the pole mount clamp bracket and fasten the M10 screws, as shown in the following illustration.

M10 Screws used to Fasten the Units to the Pole Mount Clamp
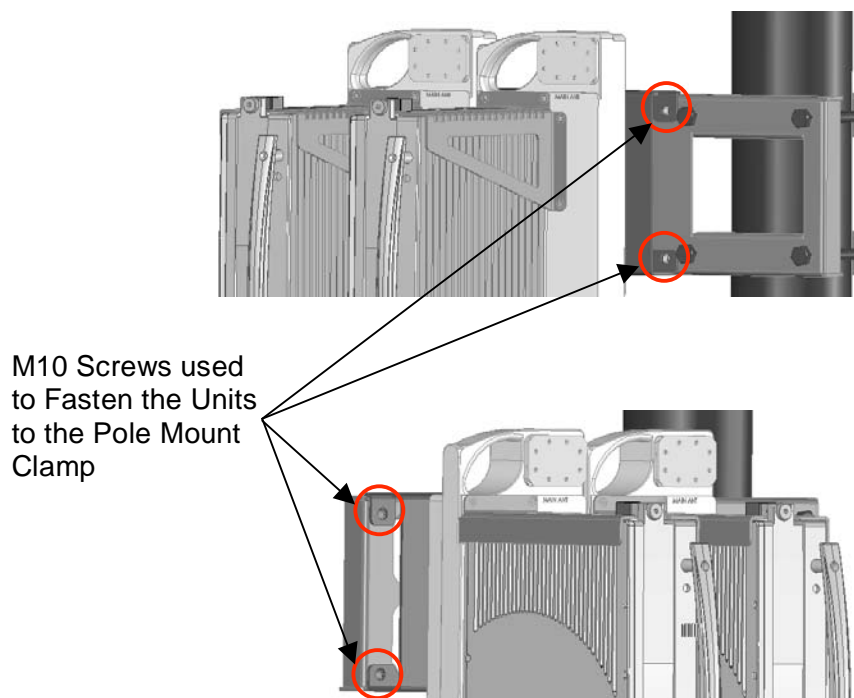
7. Connect the XPIC cables between the units, as shown in the following illustration.

Main Antenna H Pole Port

Diversity Antenna H Pole Port

XPIC Cables

Main Antenna V Pole Port

Diversity Antenna V Pole Port
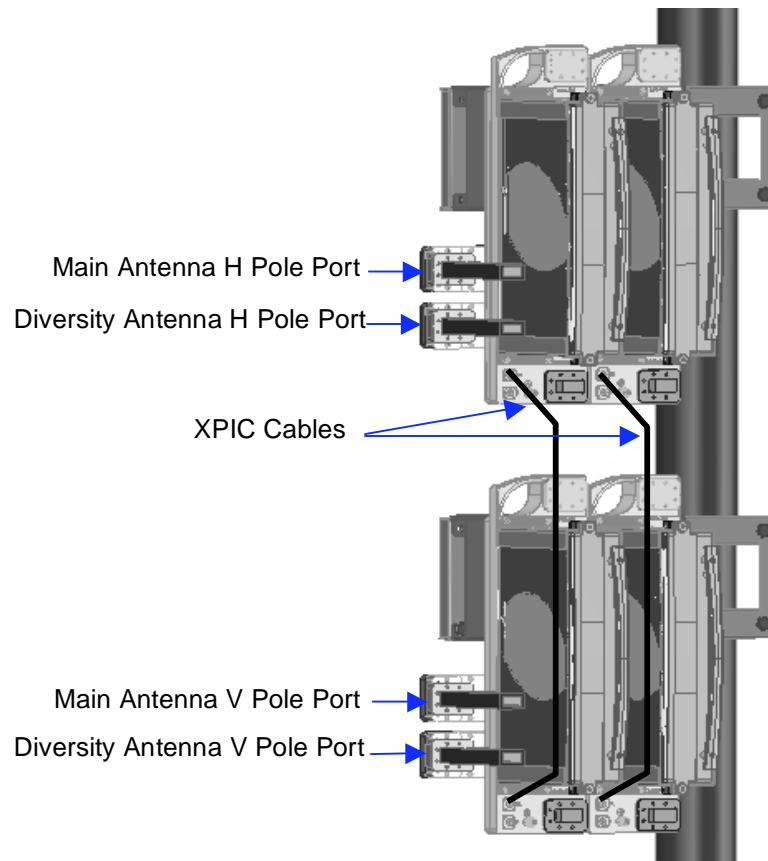
8. Connect the flexible waveguides to the antennas, as shown in the illustration above (V and H poles are selected as required - in the illustration above they are selected arbitrarily).

N+1 Split Mount Installation

This section describes the installation procedure for GE MDS Intrepid-HC HP in an N+1 split mount configuration, where N is less than or equal to 5.

A split mount N+1 configuration is achieved using Type-1 and Type-2 OCBs alternatively.

Two Type 1 and Type 2 OCBs are interconnected via U bends at the rear extension ports. The third OCB is chained to the second OCB through the main and diversity ports, using a flexible waveguide.

Each OCB is connected to the relevant IF cable from the Intrepid-HC HP/T Baseband Indoor.

The following example shows a 4+1 space diversity dual pole configuration.

4+1 SD Dual Pole
Split Mount
(OCB Front View)

4+1 SD Dual Pole
Split Mount
(OCB Rear View)
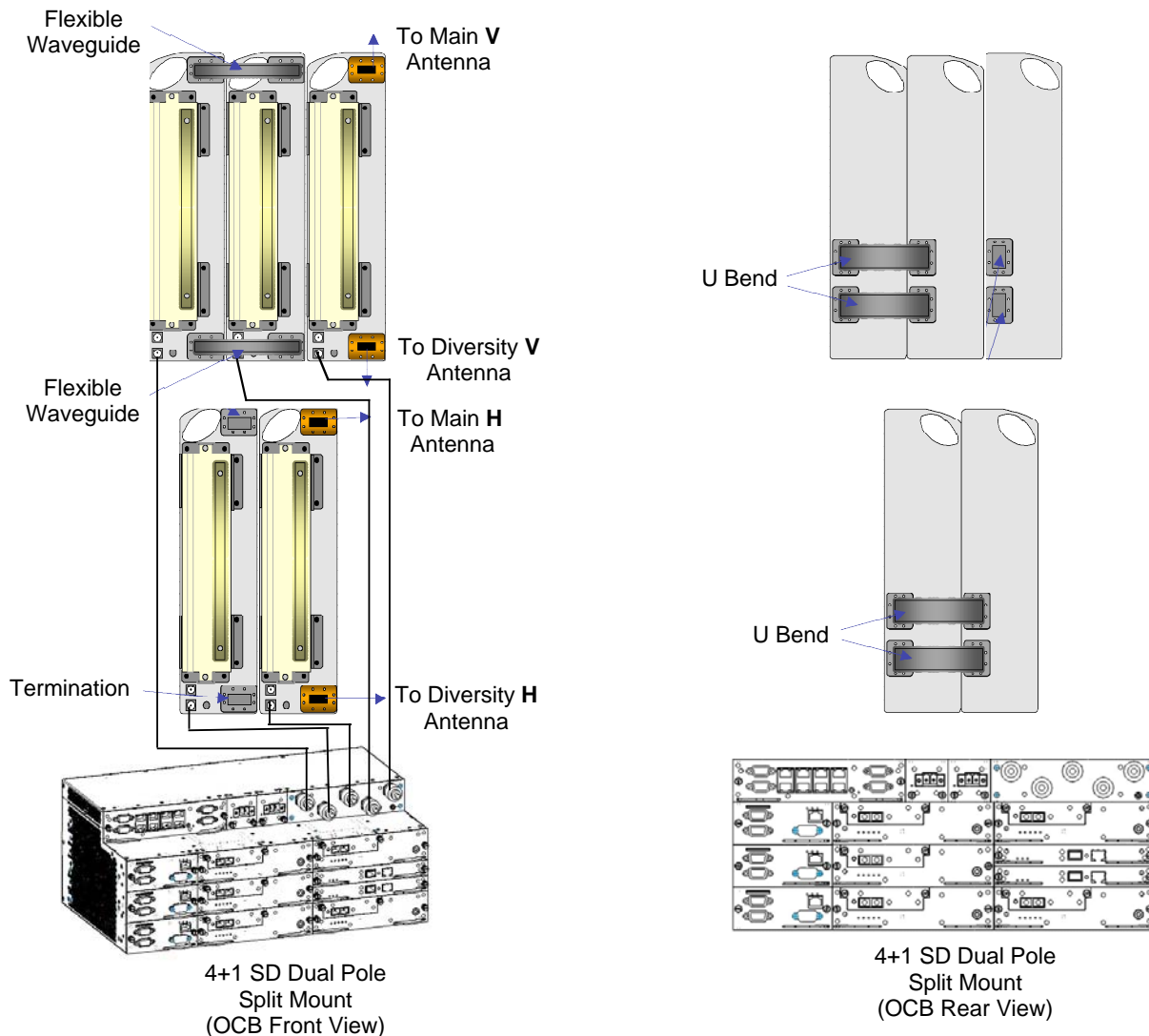
Note: When installing an N+1 configuration, assemble the OCBs in an inverted order, to maintain the same branching loss between the carriers, as shown in the following illustration.

Site A

Site B

C1   C2   C3

C3   C2   C1
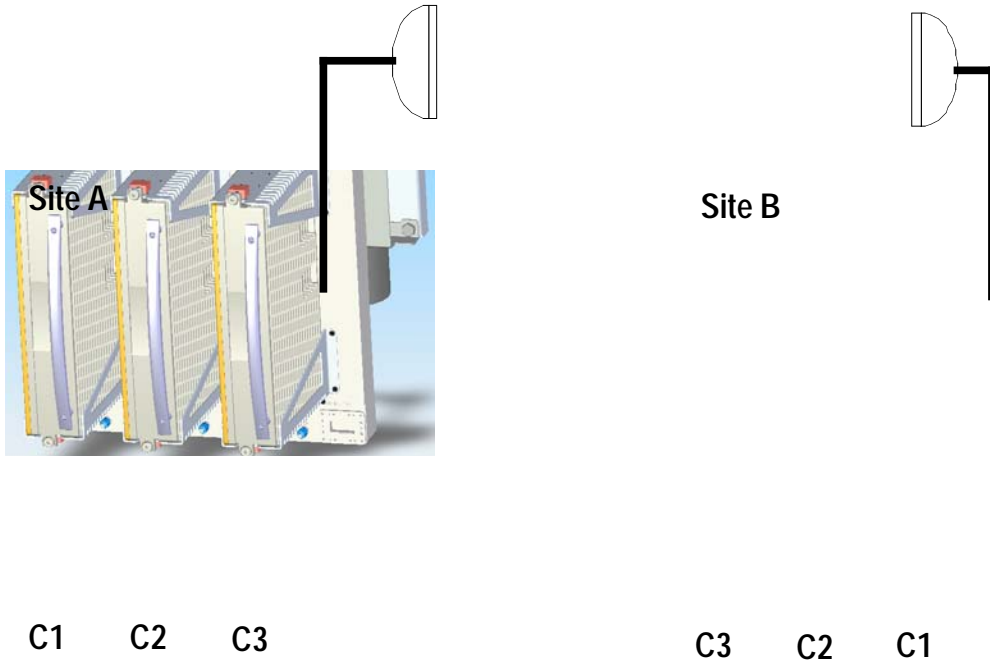
Installation Configuration Illustrations

This section provides illustrations of different GE MDS Intrepid-HC HP installation configurations.

Note that in this section, the following abbreviations are used:

HSB - Hot Standby

FD - Frequency Diversity

SD - Space Diversity

DP - Dual Pole

MP - Main Path

SP - Secondary Path

MA - Main Antenna

DA - Diversity Antenna

N/A - Not Applicable

WG - Waveguide

X/Y dB: X refers to 6-8 GHz, Y refers to 11 GHz

1+0 & 1+0 Space Diversity

1+0 Configuration

SP Antenna	1
IDC + Chassis	1
IDM-155	1

1+0		B.L	W.G
M.P	M.A	0dB	0.5dB
	D.A	N/A	N/A
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

FlexibleWG

TX — TX f1 — TX Filter

RFU

RX M — RX f1 — RX Filter — 50 ohm

OCB type 1

RX D — RX f1 — RX Filter
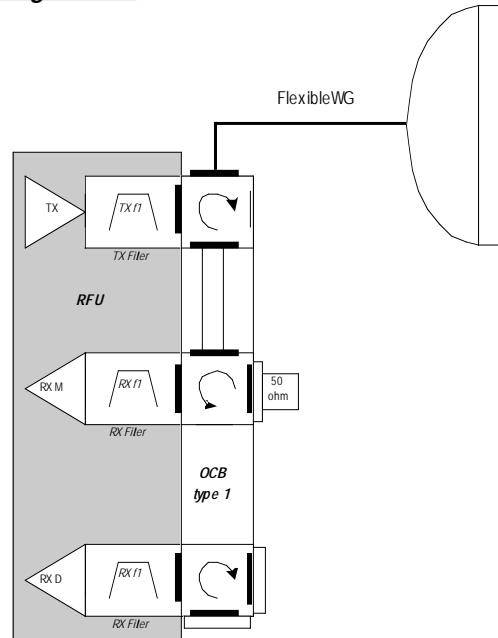
1+0 SD Configuration

1+0SD		B.L	W.G
M.P	M.A	0dB	0.5dB
	D.A	0dB	1.5/2.5dB*
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

*CoaxCable3.5/5dB

FlexibleWG

TX — TX f1 — TX Filter

RFU

RX M — RX f1 — RX Filter — 50 ohm

OCB type 1

RX D — RX f1 — RX Filter — 50 ohm

Eliptical WG
orCoaxCable
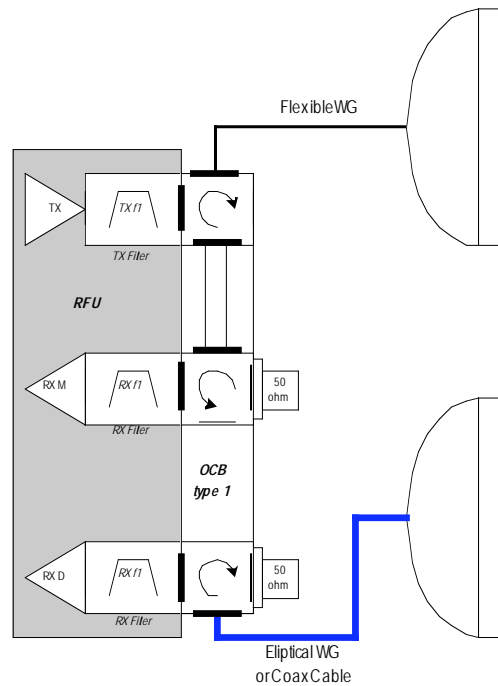
1+1 Hot Standby & 1+1 Hot Standby Space Diversity

1+1 HSB Configuration

50ohm Termination	2
Short	4
Coupler Type 1	1
Flex WG 1.2m	1
SP Antenna	1
IDC + Chassis	1
IDM-155	2
Protection Kit	1

1+1 HSB		B.L	W.G
M.P	M.A	1.6/1.8dB	0.5dB
	D.A	N/A	N/A
S.P	M.A	7/7.4dB	0.5dB
	D.A	N/A	N/A
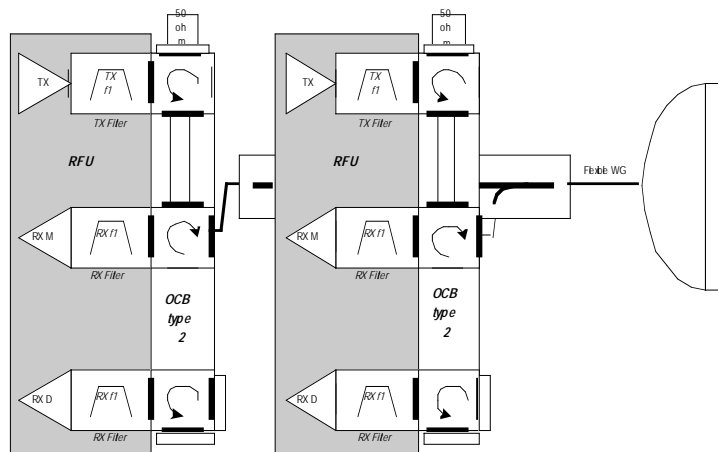
1+1 SD Configuration

1+1 SD		B.L	W.G
M.P	M.A	1.6/1.8dB	0.5dB
	D.A	1.6/1.8dB	1.5/2.5dB*
S.P	M.A	7/7.4dB	0.5dB
	D.A	1.6/1.8dB	1.5/2.5dB*

*Coax Cable 3.5/5dB
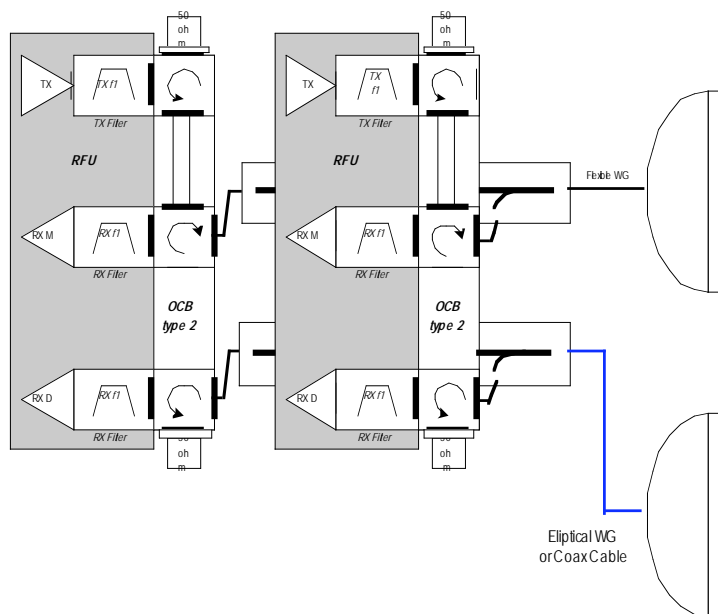
1+1 Frequency Diversity & 1+1 Frequency Diversity + Space Diversity

1+1 FD Configuration

50ohm Termination	1
Short	4
U Bend WG Type 1	1
Flex WG 1.2m	1
SP Antenna	1
IDC + Chassis	1
IDM-155	2
Protection Kit	1

1+0FD		B.L	W.G
M.P	M.A	0.25dB	0.5dB
	D.A	N/A	N/A
S.P	M.A	N/A	N/A
	D.A	N/A	N/A
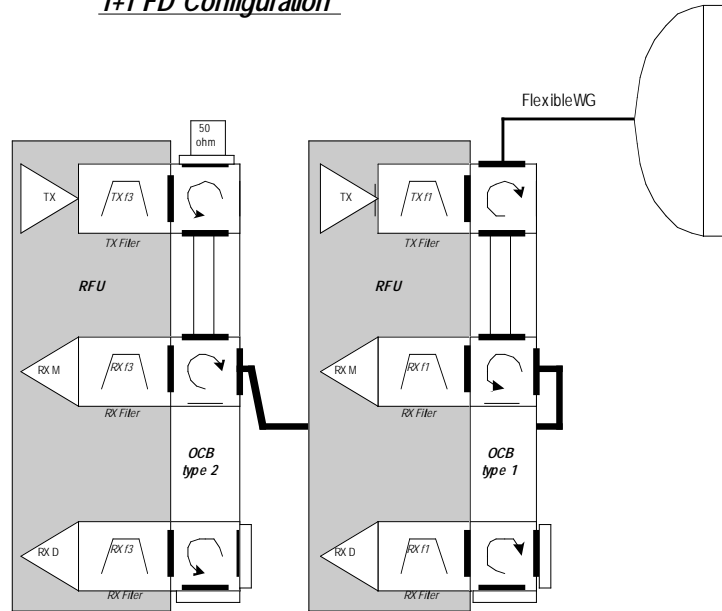
1+1 FD/SD Configuration

1+0SD		B.L	W.G
M.P	M.A	0.25dB	0.5dB
	D.A	0.25dB	1.5/2.5dB*
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

*Coax Cable 3.5/5dB
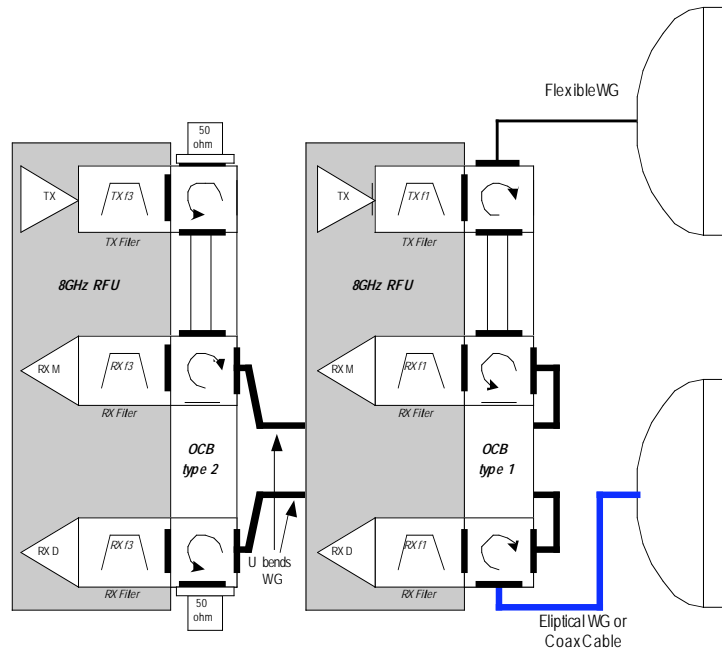
1+1 Space Diversity BBS

1+1 SD BBS Configuration

FlexibleWG

TX
TX f1
TX Filter

RFU

RX M
RX f1
RX Filter

50 ohm

OCB type 1

RX D
RX f1
RX Filter

Main antenna

FlexibleWG

TX
TX f1
TX Filter

RFU

RX M
RX f1
RX Filter

50 ohm

OCB type 1

RX D
RX f1
RX Filter
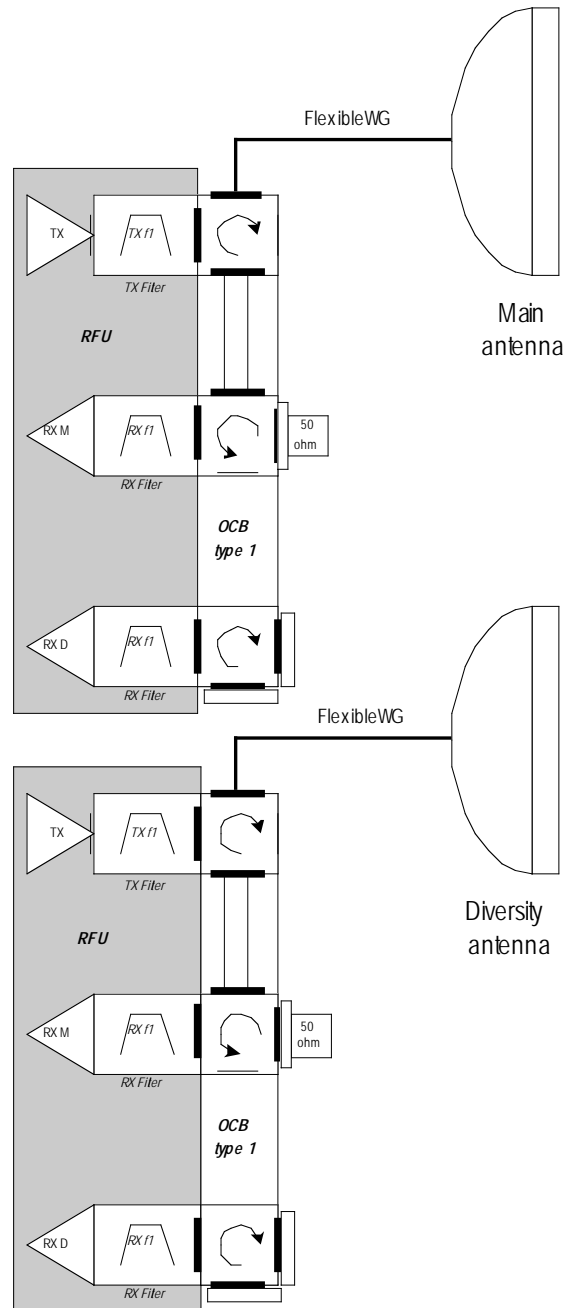
Diversity antenna

1+0 SD BBS		B.L	W.G
M.P	M.A	0dB	0.5dB
	D.A	0dB	0.5dB
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

2+0 Dual Pole & 2+0 Space Diversity Dual Pole

2+0 DP Configuration

Flex WG 1.2m	2
DP Antenna	1
XPIC cable 3m long	1
IDC + Chassis	1
IDM-155	2

2+0 DPA		B.L	W.G
M.P	M.A	0dB	0.5dB
	D.A	N/A	N/A
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

Flexible WG

TX TX f1 TX Filter RFU RX M RX f1 RX Filter 50 ohm OCB type 1 RX D RX f1 RX Filter

TX TX f1 TX Filter RFU RX M RX f1 RX Filter 50 ohm OCB type 1 RX D RX f1 RX Filter
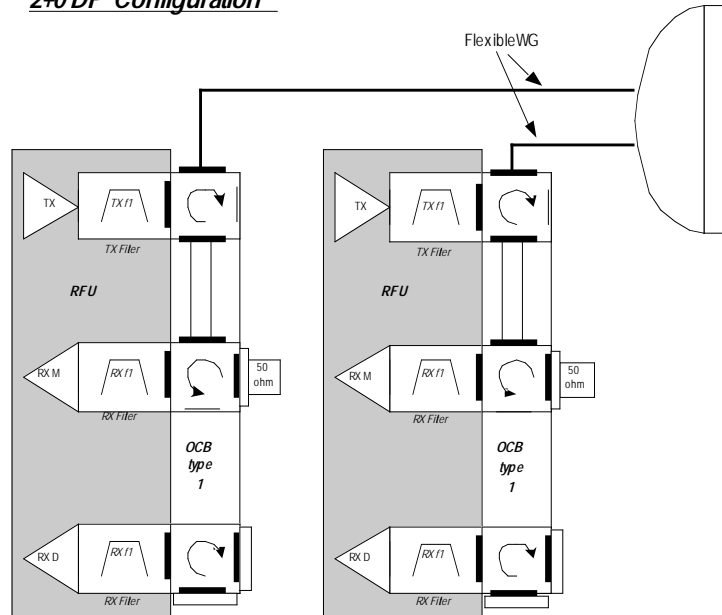
2+0 SD DP Configuration

2+0 SDDPA		B.L	W.G
M.P	M.A	0B	0.5dB
	D.A	0dB	1.5/2.5dB*
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

*Coax Cable 3.5/5dB

Flexible WG

TX TX f1 TX Filter RFU RX M RX f1 RX Filter 50 ohm OCB type 1 RX D RX f1 RX Filter 50 ohm

TX TX f1 TX Filter RFU RX M RX f1 RX Filter 50 ohm OCB type 1 RX D RX f1 RX Filter 50 ohm

Eliptical WG or Coax Cable
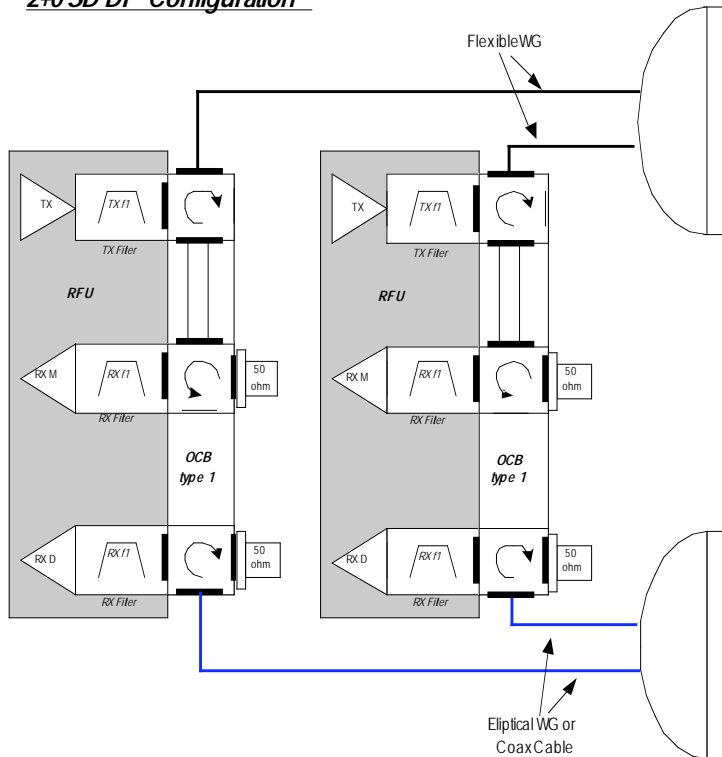
2+0 Single Pole & 2+0 Space Diversity Single Pole

2+0 SP Configuration

Pole Mount	1
50ohm Termination	1
Short	4
U Bend W G Type 1	1
Flex W G 1.2m	1
SP Antenna	1
IDC + Chassis	1
IDM-155	2

2+0 SPA		B.L	W.G
M.P	M.A	0.25dB	0.5dB
	D.A	N/A	N/A
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

FlexibleWG

50 ohm

TX | TX f2 | TX Filter
RFU
RX M | RX f2 | RX Filter
OCB type 2
RX D | RX f2 | RX Filter

TX | TX f1 | TX Filter
RFU
RX M | RX f1 | RX Filter
OCB type 1
RX D | RX f1 | RX Filter
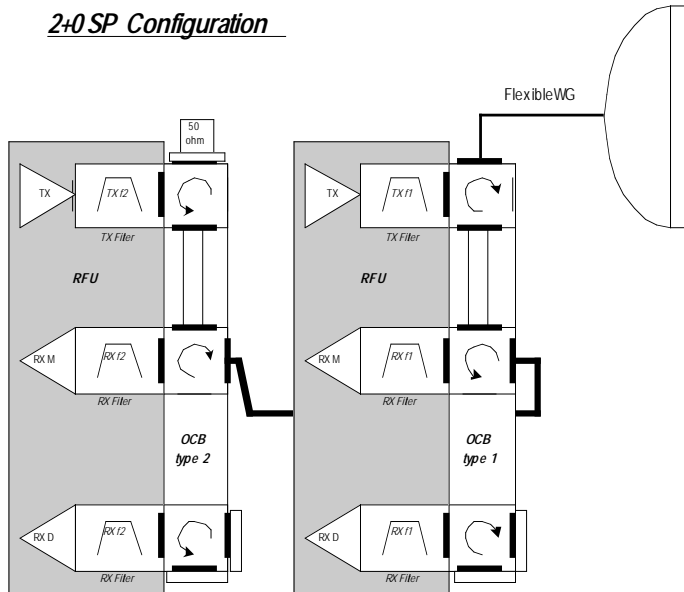
2+0 SD SP Configuration

2+0 SD SPA		B.L	W.G
M.P	M.A	0.25dB	0.5dB
	D.A	0.25dB	1.5/2.5dB*
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

*CoaxCable3.5/5dB

FlexibleWG

50 ohm

TX | TX f1' | TX Filter
8GHz RFU
RX M | RX f1 | RX Filter
OCB type 2
RX D | RX f1 | RX Filter
50 ohm

TX | TX f0' | TX Filter
8GHz RFU
RX M | RX f0 | RX Filter
OCB type 1
RX D | RX f0 | RX Filter

U bends WG

Eliptical WG or CoaxCable
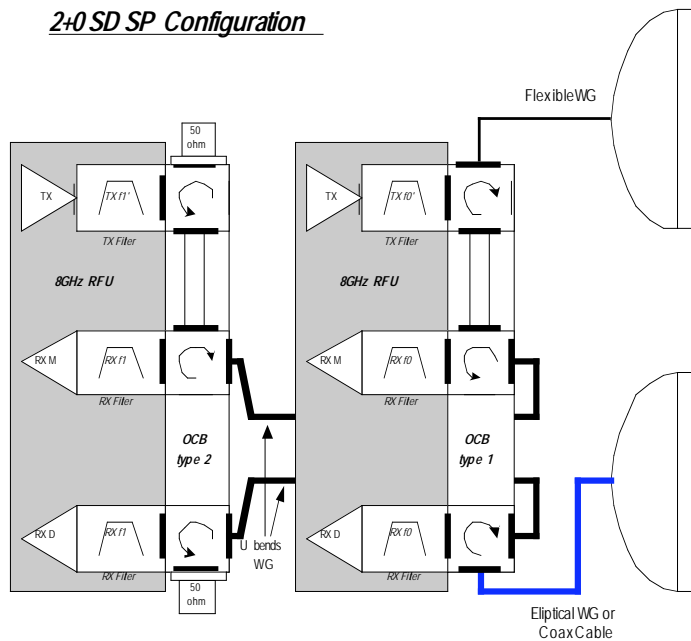
2+2 Hot Standby Dual Pole

2+2 HSB DP Configuration

2+2 HSB DPA		B.L	W.G
M.P	M.A	1.6/1.8dB	0.5dB
	D.A	N/A	N/A
S.P	M.A	7/7.4dB	0.5dB
	D.A	N/A	N/A

GE MDS Intrepid-HC HP Installation Guide

1-25
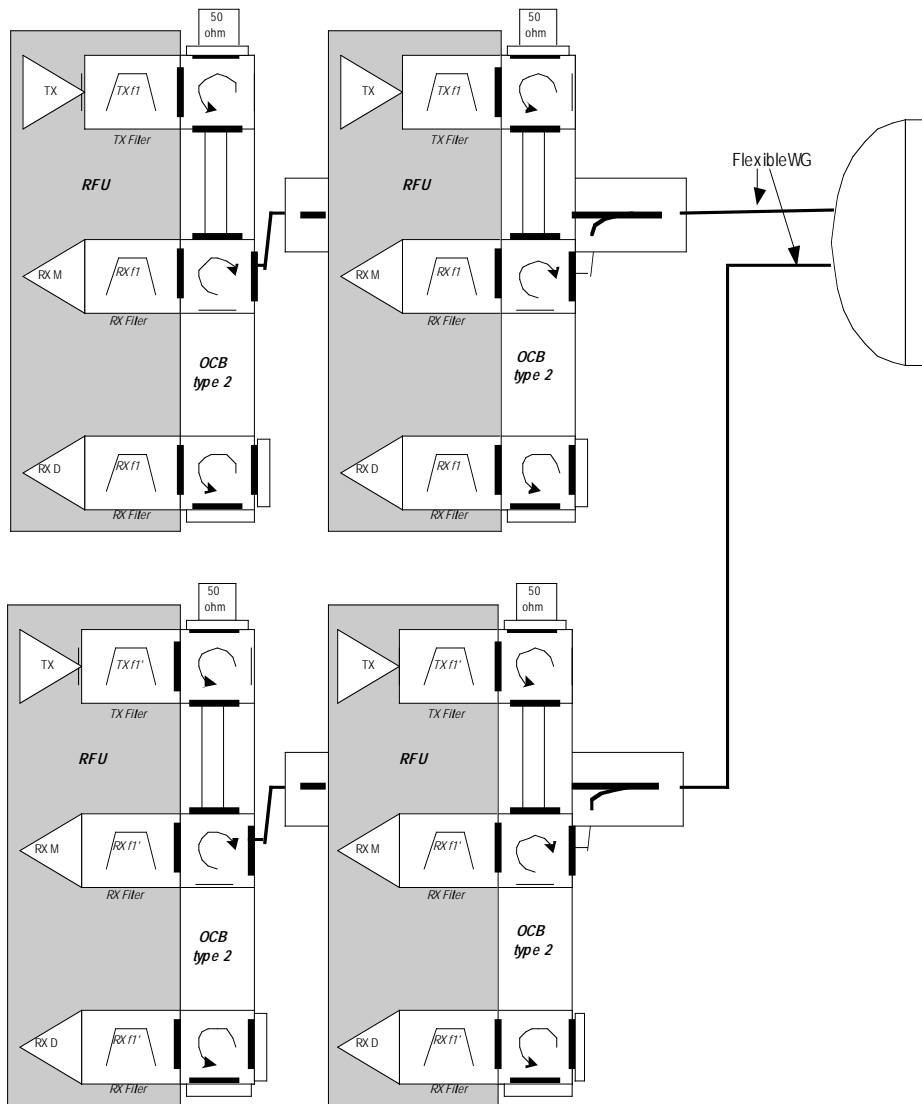
2+2 Hot Standby Single Pole

2+2 HSB SP Configuration

Coupler Type 2	1
Flex W G 1.2m	2
SP Antenna	1
IDC + Chassis	2
IDM-155	4
Protection Kit	2

2+2 HSB SP A		B.L	W.G
M.P	M.A	1.9/2.1dB	0.5dB
	D.A	N/A	N/A
S.P	M.A	7.3/7.7dB	1dB
	D.A	N/A	N/A
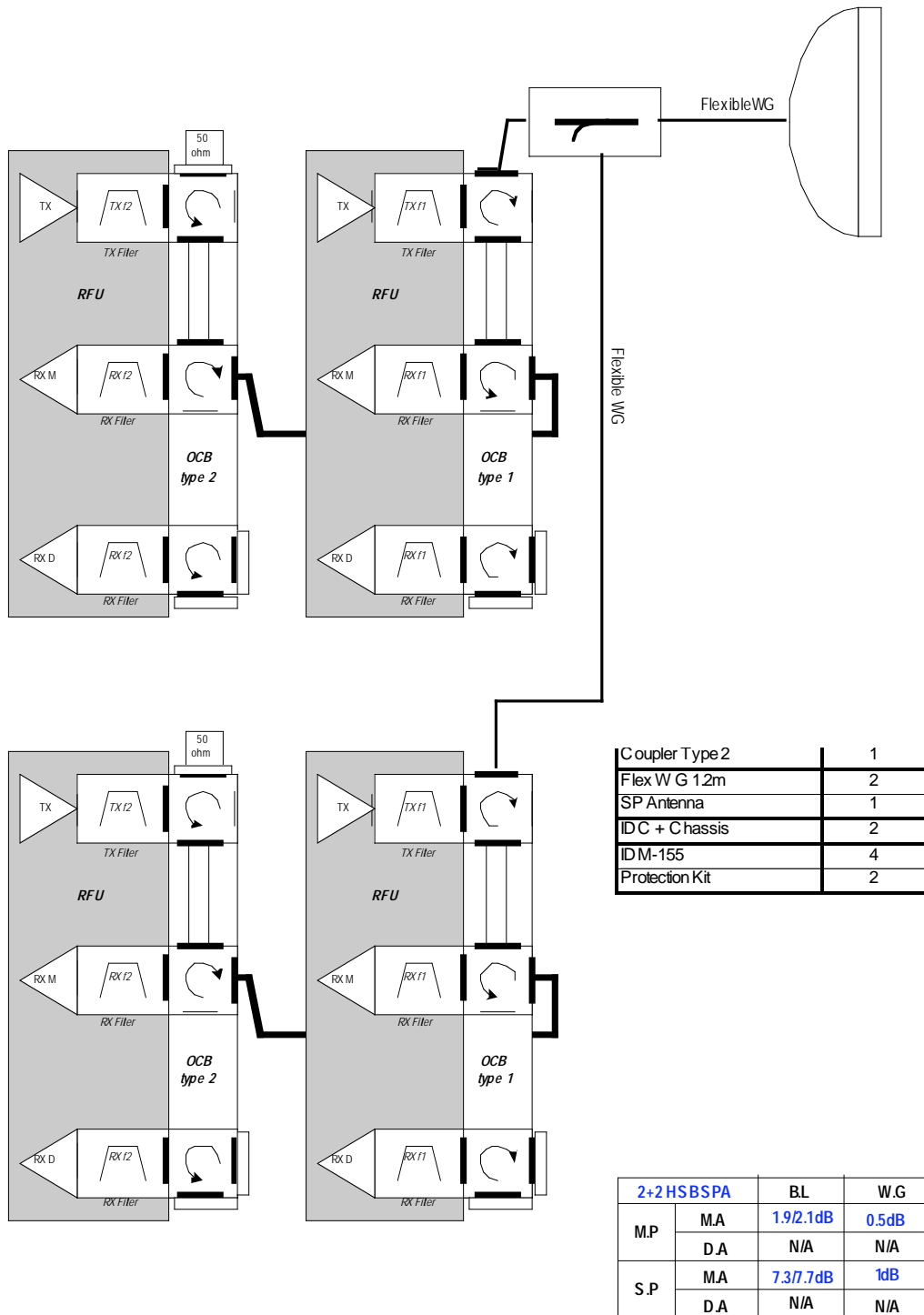
2+2 Space Diversity Dual Pole

<u>*2+2 SD DP Configuration*</u>
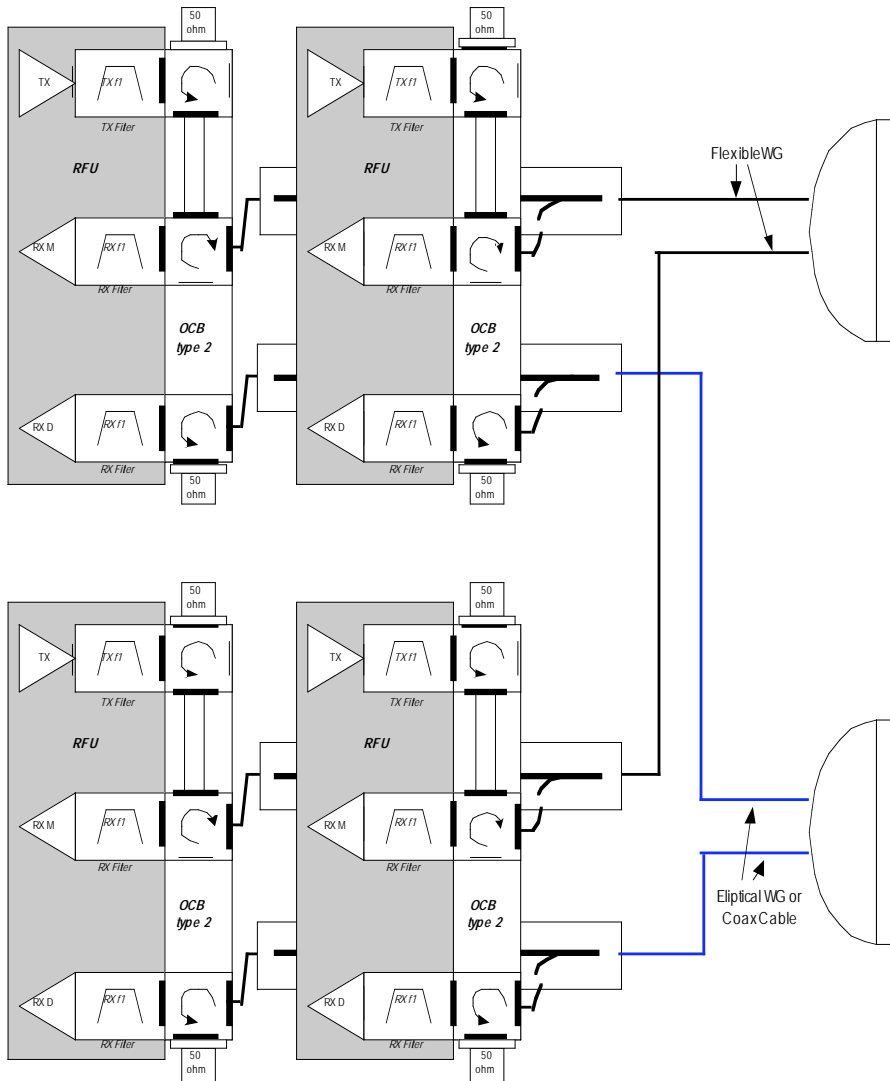
2+2 SD DPA		B.L	W.G
M.P	M.A	1.6/1.8dB	0.5dB
	D.A	1.6/1.8dB	1.5/2.5dB*
S.P	M.A	7/7.4dB	0.5dB
	D.A	7/7.4dB	1.5/2.5dB*

*Coax Cable 3.5/5dB

2+2 Space Diversity Single Pole

2+2 SD SP Configuration
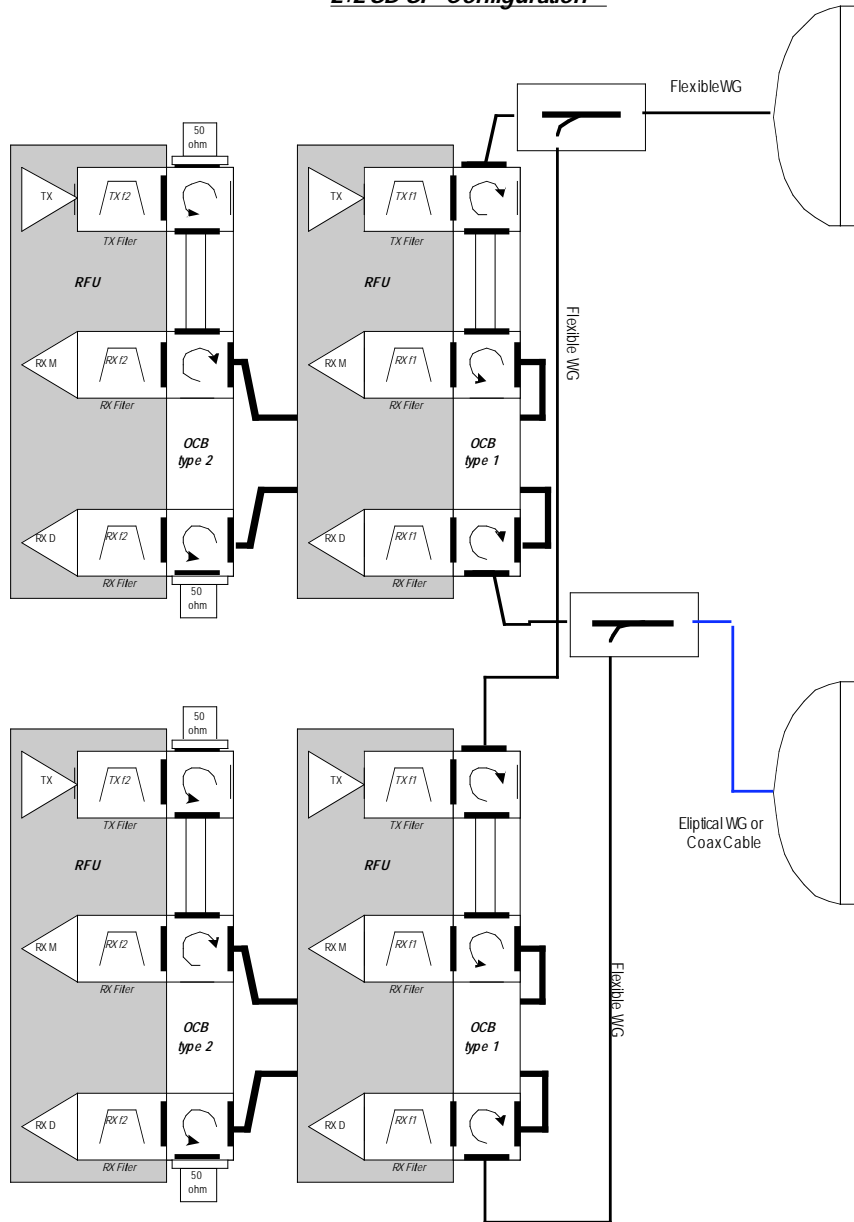
2+2 SDSPA		B.L	W.G
M.P	M.A	1.9/2.1dB	0.5dB
	D.A	1.9/2.1dB	1.5/2.5dB*
S.P	M.A	7.3/7.7dB	1dB
	D.A	7.3/7.7dB	2/3dB**

*CoaxCable3.5/5dB
**CoaxCable4/5.5dB

2+2 Frequency Diversity Single Pole

2+2 FD SP Configuration
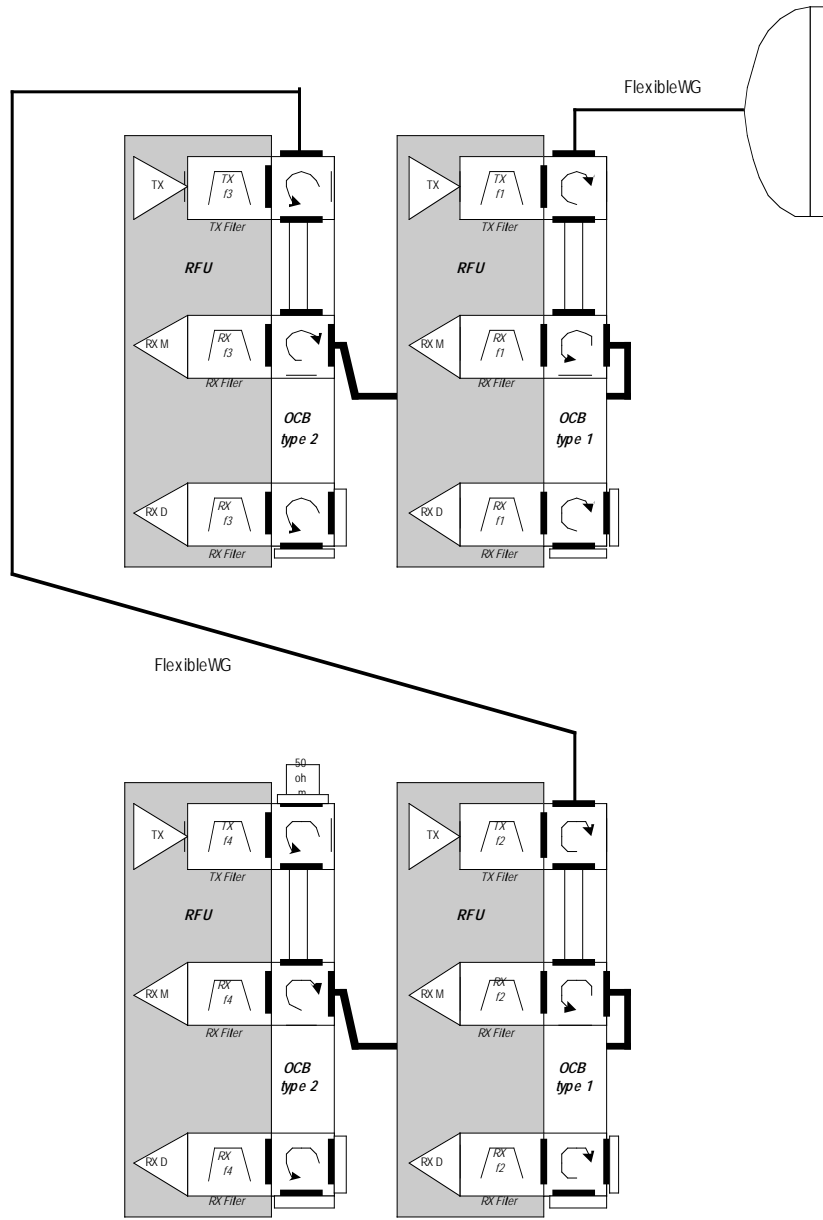
2+2 FDSPA		B.L	W.G
M.P	M.A	0.75dB	1dB
	D.A	N/A	N/A
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

2+2 Hot Standby Frequency Diversity Dual Pole

2+2 HSB FD DP Configuration
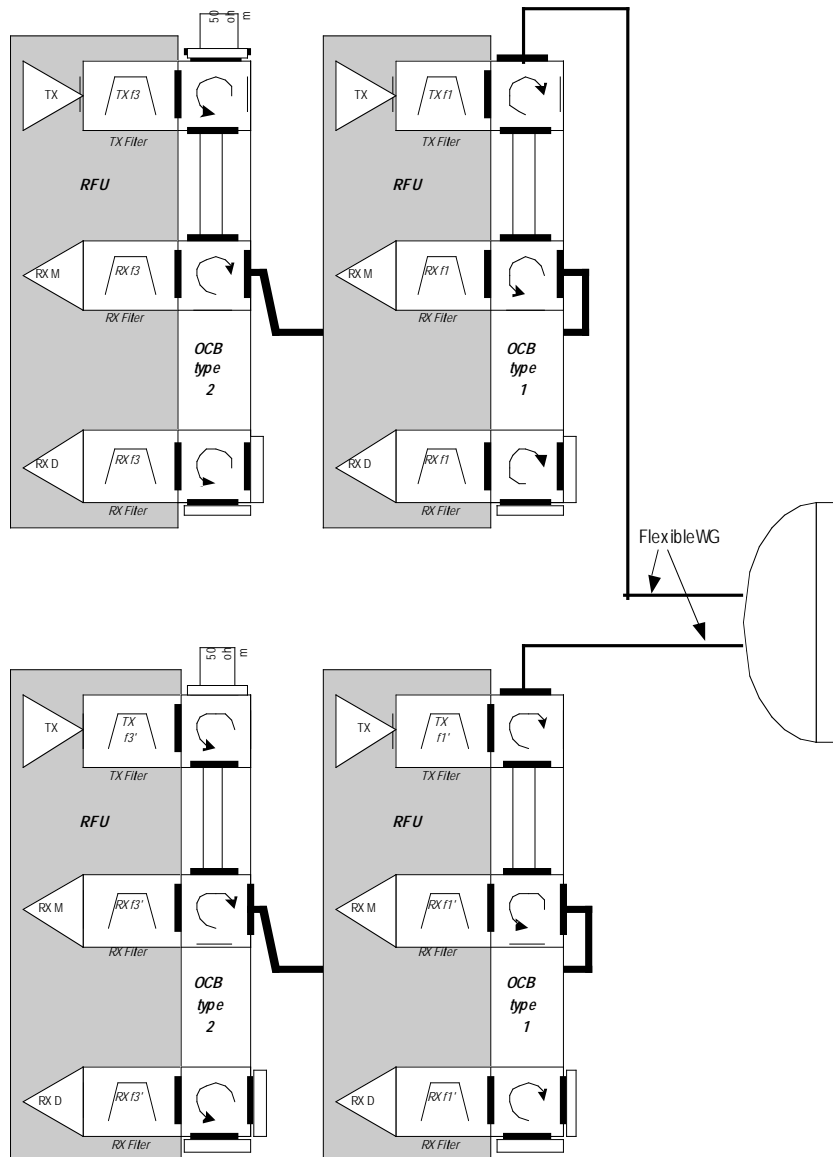
2+2 FDDPA		B.L	W.G
M.P	M.A	0.25dB	0.5dB
	D.A	N/A	N/A
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

2+2 Frequency Diversity / Space Diversity Dual Pole

2+2 SD/FD DP Configuration
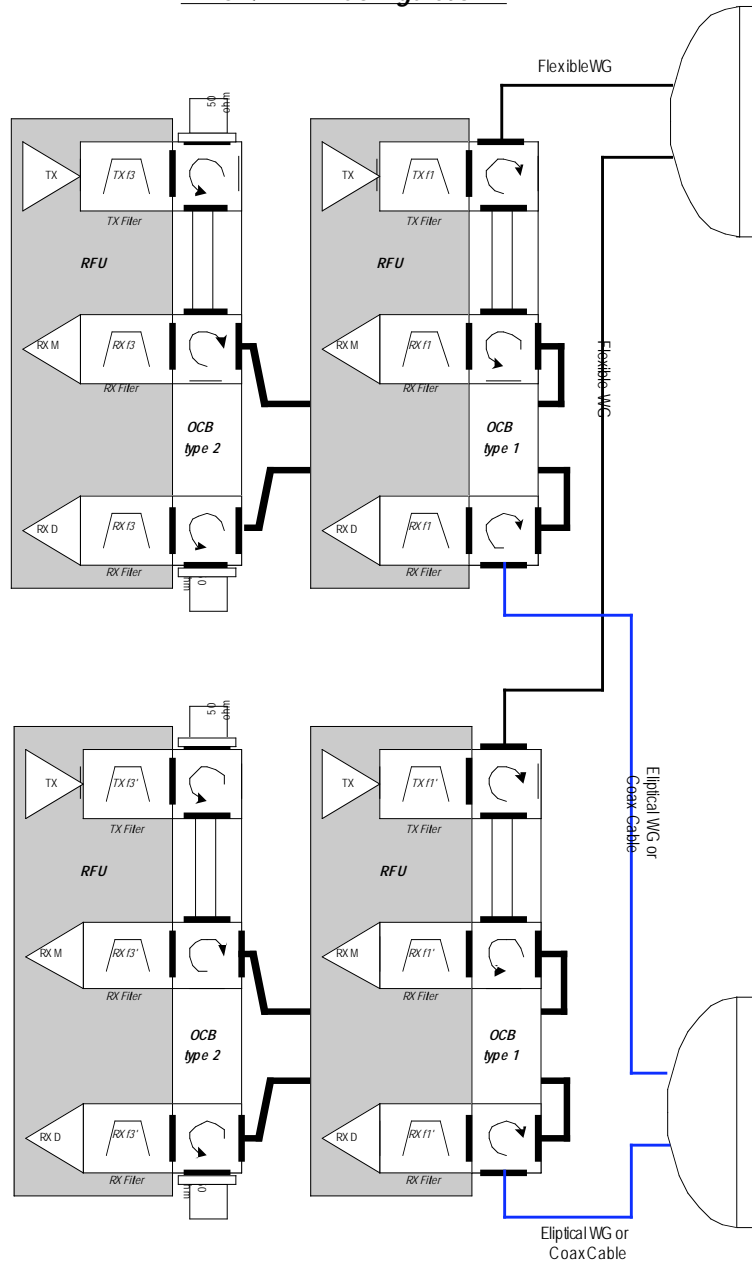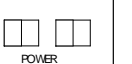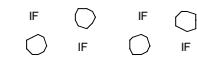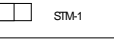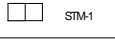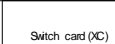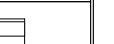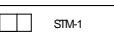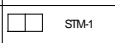
3+3 SD DPA		B.L	W.G
M.P	M.A	0.25dB	0.5dB
	D.A	0.25dB	1.5/2.5dB*
S.P	M.A	N/A	N/A
	D.A	N/A	N/A

*CoaxCable3.5/5dB

N+1 Systems

4+1 FD DP Configuration
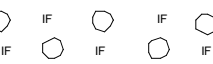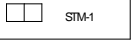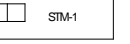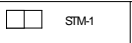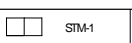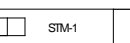
5+1 FD DP Configuration

4+1 FD SD DP Configuration

5+1 FD SD DP Configuration

GE MDS

Chapter 2: Initial System Setup

General

After the system is installed and tested, and antenna alignment is performed, the next step is initial IDU setup and configuration.

Initial setup procedures are performed on a craft terminal via a serial port connection.

Note:

Configuration procedures are generally performed using the NMS software supplied with MDS Intrepid-HC HP.

A description of the NMS and how to use it is provided in the *NMS User Guide*.

The craft terminal should be used only to perform the initial setup procedures described in this chapter. Once the system is up and running, use NMS to maintain and operate the system on a regular basis.

Initial Setup Steps

The initial MDS Intrepid-HC HP setup procedure includes the following steps:

Procedures Performed using a Craft Terminal:

- Connecting to the IDU via the terminal port

- Defining IP addresses

- Setup Options

Procedures Performed using the NMS:

- Connecting to the Ethernet port

- Installing the software

- Setting the local TX frequency channel

- Specifying system information

- Configuring the local/remote transport

- Configuring trap forwarding

- Setting up external alarms

Connecting the Line Interfaces

Initial Setup using the Craft Terminal

The following procedures are performed after the RFU and antenna are installed.

Connecting to the IDU via Serial Port

Turn the IDU power switch ON.

On the front panel of the IDU, the DRWR LED should be lit green.

To set up the HyperTerminal connection:

1. Connect the RS-232 port of your computer to the RS-232 (9-pin) port on the IDU front panel. This port is labeled "Terminal".

2. Select **Start, Programs, Accessories, Communication, HyperTerminal**.

3. Double-click the **HyperTerminal** application icon.

4. For **Connection Description**, type **Terminal**, and click **OK**.

5. In the **Connect Using** field (Phone Number), select **Direct to Com 1**, and click **OK**.

6. In the **Port Settings** tab (Com 1 Properties), specify the following settings:

   Bits per second - 19,200

   Data bits - 8

   Parity - None

   Stop bits - 1

   Flow control - Hardware

7. Click **OK**.

8. After you connect to the terminal, to enter the terminal setup program, press **Enter**.

9. For password, use **admin**.

Defining IP Addresses

Before you can configure the MDS Intrepid-HC HP system, you need to define IP addresses using the craft terminal.

The MDS Intrepid-HC HP includes two IP interfaces: an Ethernet interface, and a serial interface. Each interface has its own IP address and IP mask.

The IP address is a four digit number separated by decimal points. Each IP address is a pair netid,hostid, where *netid* identifies a network, and *hostid* identifies a host on the network. The IP mask separates between the netid and hostid.

For example, if the IP address is 192.114.35.12 (11000000 01110010 00100011 00001100), and the IP mask is 255.255.255.0 (11111111 11111111 11111111 00000000), the netid is 192.114.35, and the hostid is 12.

An IP interface can only communicate with hosts that are on the same net (have the same netid). In the example above, the interface can communicate only with hosts that have netid 192.114.35 (for 1 to 255).

If The transceiver has a frame to send to a host that is not on the Ethernet IP netid or the serial IP netid, the frame should be sent to an intelligent device (usually a gateway) on the network. Such a device, known as a "default router", will know how to send the frame over the internet. The default gateway should be a host on one of the Transceiver interface *netid*s.

The following figure shows how the transceiver is integrated in the local network.

GE MDS Intrepid-HC HP Installation Guide   2-3
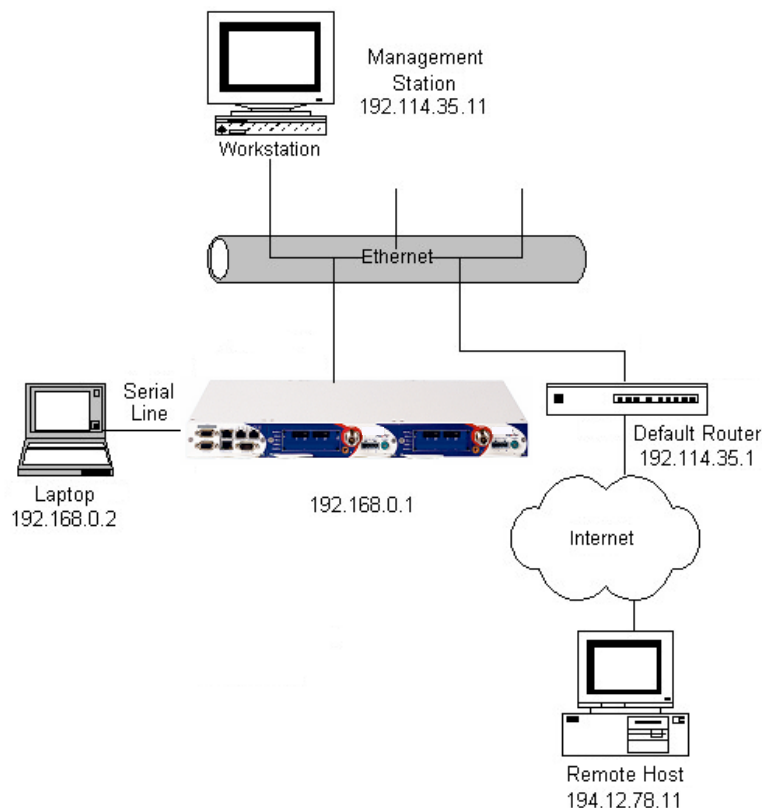
To define IP Addresses:

1. In the main terminal program menu, select **Configuration**.

2. Select **IDC**.

3. Select **Basic**.
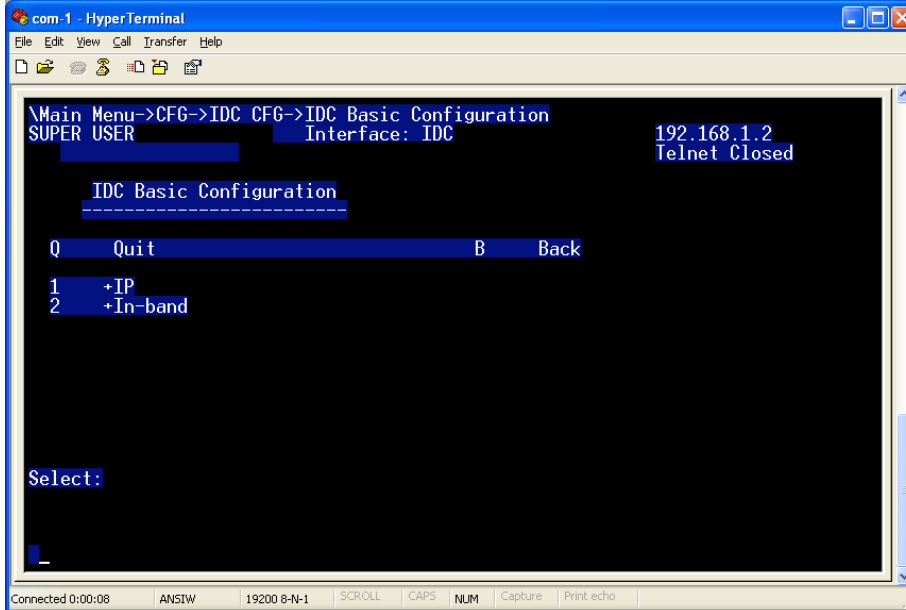
4. Select **IP** and define the addresses as described above.

Important   After you set up IP addresses, restart the IDU to activate them.

Setup Options in the Terminal Program

The main menu in the terminal setup program includes the following options:

Configuration (1) - the main setup section in which you can configure the IDC, the right and left drawers, protection, SNMP management, in-band routing, and other such parameters.

System Status (2) - used to obtain information about the different software versions currently used in the system.

Maintenance (3) - used to perform software upload, download, and reset.

Diagnostics (4) - used to perform loopbacks and obtain system information.

Logs (5) - used to view alarm and configuration log reports.

Additional Setup Using the NMS

Some of the initial setup procedures require the use of The NMS.

Once initial setup is complete, use The NMS to run the system on a daily basis.

Connecting to the Ethernet Port

1. Connect a **crossed** Ethernet cable from your PC to the Ethernet Port. If the connection is to a LAN (wall connection) use the standard Ethernet cable.

2. Make sure the IP address on your PC is on the same sub-net as you defined in the MDS Intrepid-HC HP indoor unit (in most cases, the first three numbers of the IP address must be identical, depending on the sub-net mask).

NMS PC Requirements

Before you install the NMS software, verify that your PC has the following minimum requirements:

For Windows

Processor: Pentium 4, 2.8 GHz (minimum)

Memory (RAM):   256 MB minimum

Operating System: Windows 2000 or above

Serial Port: RS-232 (Hyper-Terminal)

For UNIX

Processor: Blade 100 Ultra 5 (minimum)

Memory (RAM):   256 MB minimum

Operating System: Solaris 8 or 10

Installing the Network Management Software (NMS)

Note: More detailed information about the NMS installation is provided in *Chapter 5 - Operation*.

1. Insert the NMS CD in the CD drive.

2. In Windows Explorer, double-click the setup.exe file.

    The installation program begins.

3. Follow the instructions displayed.

Starting the NMS

1. Select **Start, Programs, NMS**, **NMS Element Manager**.

    The NMS Login window appears.
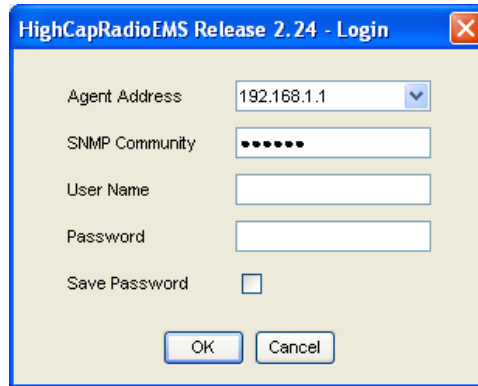
NMS Login Window

2. Enter the IP address of the IDU, and the SNMP community (for SNMP protocol access).

3. For User Name use **admin** and for Password use **admin** (default settings).

4. Select **Save Password** if you want the NMS to remember the password you entered.

    Note that there are two types of passwords, each with a different security level for authorized activities:*Read Only* - user is permitted to perform monitoring activities only. *Read/Write* - user is permitted to change system configuration and system administrator parameters, and perform monitoring activities.

After you log in, the Main NMS window appears.
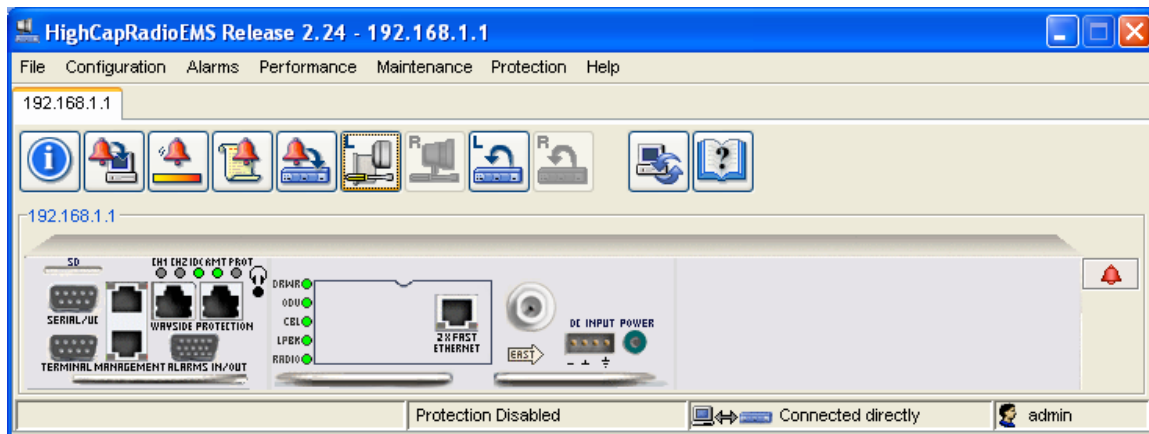
Main NMS Window

Setting the Local TX Frequency Channel

If the TX frequency was previously defined using the HyperTerminal, use this screen only to verify that the correct frequency was set.

1. Select **Configuration, RFU Left/Right, RFU Configuration**, or click the RFU icon in the tool bar.

At the top of the window, the system displays TX/Rx ranges, the gap between them, and the channel bandwidth.
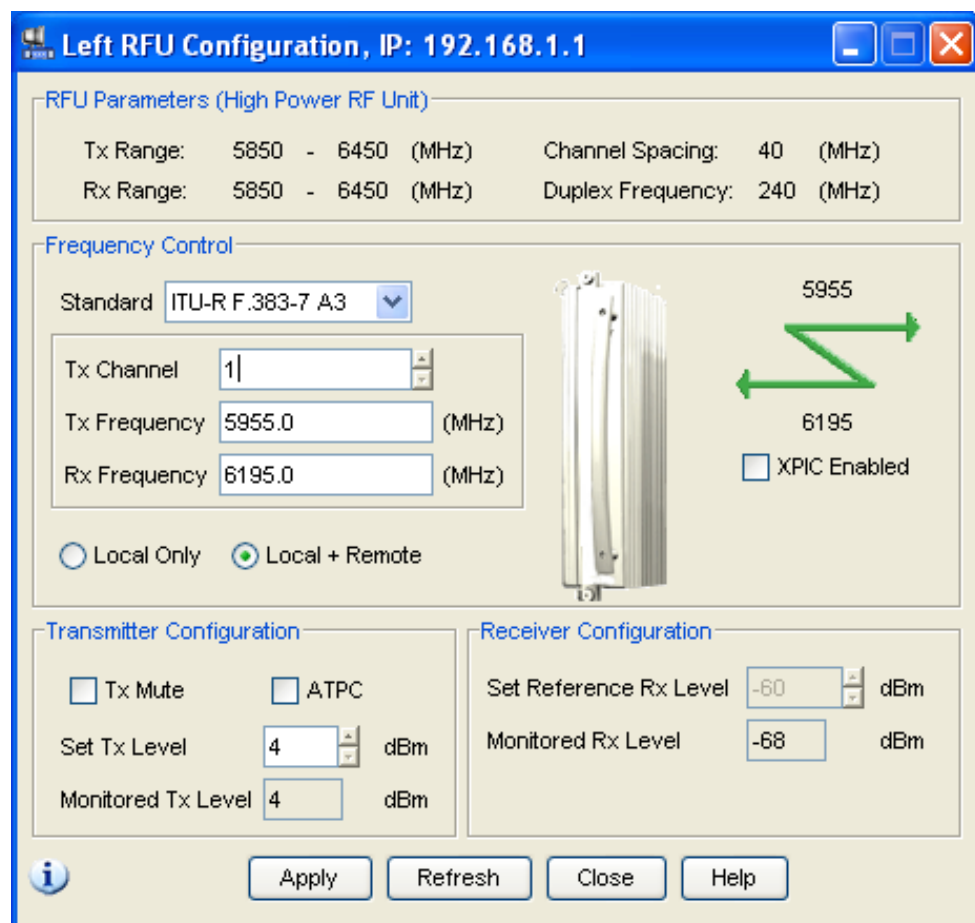
RFU Configuration Window

> **Note:** In the window shown above, the RFU illustration shows two antennas. Only one antenna appears in the illustration if the IFC (IF Combiner) is not supported.

2. The **RFU Parameters** area is read-only. The Duplex Frequency value changes in accordance with the TX/RX frequency values.

3. You can change the TX and RX frequencies of the ODU in one of the following ways:

   Manually enter the TX frequency and/or RX frequency (6, 7, 8, 10, 11 GHz only) in the respective fields.

Or click the up/down arrows in the TX Channel field to select the channel (the frequency will be updated accordingly).

For the **Frequency Control** area, note the following:

Only one standard is generally shown, predetermined by the ODU parameters. When the standard is unknown, the **TX Channel** field will be disabled.

TX Channel selection is possible only when a predefined standard file was installed. In some cases, you may be able to select more than one standard.

The **Rx Frequency** field is read-only for systems other than 6, 7, 8, 10, and 11 GHz.

The arrow on the right side in the Frequency Control area is green when communication exists between the local and remote units. If there is no communication between the units, the arrow is red.

4. Select the **XPIC Enabled** option if you want to activate the XPIC mechanism.

   With The transceiver operating in co-channel dual polarization (CCDP) mode, using the cross polarization interference canceller (XPIC) algorithm, two STM-1 signals can be transmitted over a single 28 MHz channel, using vertical and horizontal polarization. This enables double capacity in the same spectrum bandwidth.

   Note: Setting XPIC for the right drawer will effect the left drawer as well, and vice versa.

5. Select **Local Only** if you want to frequency changes to affect only the local unit. Select **Local + Remote** if you want frequency changes to affect the remote unit as well.

   Note: If there is a communication failure between the local and remote units, the Local + Remote option will be disabled.

6. In the **Transmitter Configuration** area, select **TX Mute** to block transmission to the remote unit. By default, this option is not selected.

   Select **ATPC** to activate the Automatic Transmit Power Control feature.

   For **Set TX Level**, enter or select the designated signal level. Possible range is -10 to max power level. By default, the transmit signal level is set to the maximum power level.

   The **Monitored TX Level** field (read-only) displays the system's transmitted power level.

7. In the **Receiver Configuration** area, the **Set Reference Rx Level** field should be set to the Rx level to which the actual level will be compared. This field is active only if ATPC is enabled.

   Receiver Mode is the Rx path, which can be set to Main, Diversity, or Combined. This field appears only if IFC (IF Combiner) is supported.

   RSL Connector Source can be Diversity or Main. This field appears only if XPIC is not supported and IFC is supported.

   The **Monitored Rx Level (Main)** field is read-only and displays the received power level.

   Monitored Rx Level (Diversity) is a read-only field that displays the received power level of the Diversity channel.

8. Click **Apply** to save the settings.

9. Click **Close**.

![GE MDS logo]

Specifying System Information

To specify system information:

1. Select **File**, **Local/Remote**, **System Information**., or click the System Information icon ![icon].
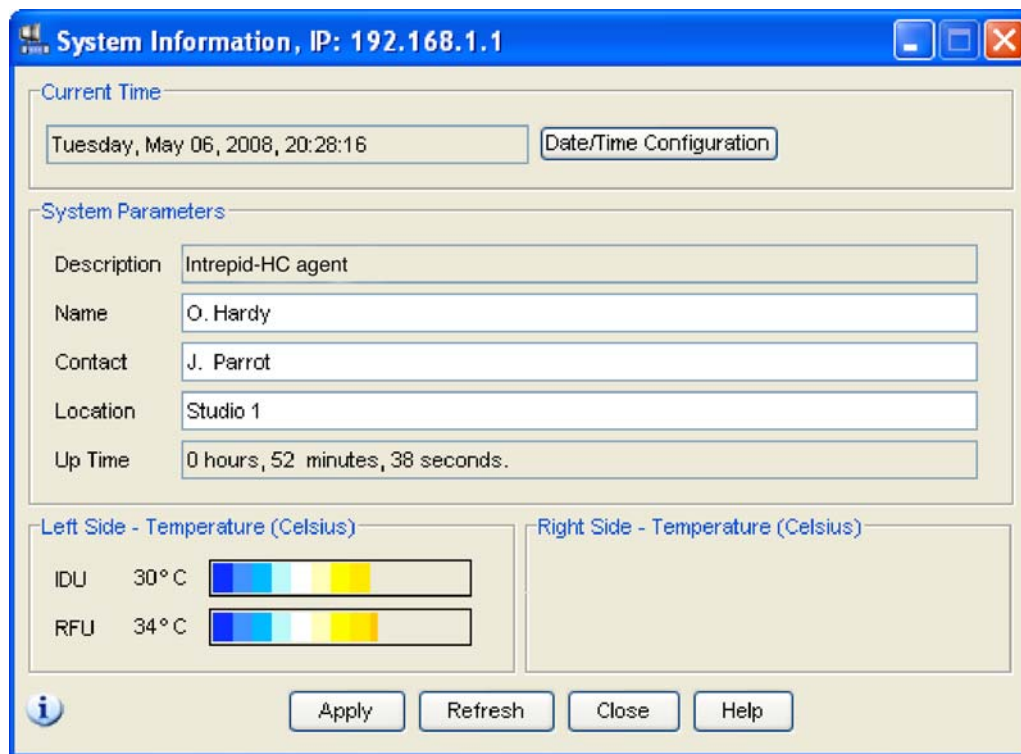
System Information Window

2. In the **Current Time** area, click **Date/Time Configuration** and set the date and time (in the format HH:MM:SS).

3. The read-only **Description** field provides information about the Transceiver system.

4. (Optional) In the **Name** field, enter a name for this link. By convention, this is the node's fully-qualified domain name.

5. (Optional) In the **Contact** field, enter the name of the person to be contacted when a problem with the system occurs. Include information on how to contact the designated person.

6. (Optional) In the **Location** field, enter the actual physical location of the node or agent.

7. The **Up Time** field, **Software Versions** area, and **Serial Numbers** area are read-only.

8. Click **Apply**. The settings are saved.

9. Click **Close**.

Local/Remote Transport Configuration

The Local/Remote Transport Configuration window allows you to change threshold levels for the radio and alarms, and to configure special transmission parameters. This is recommended for advanced users only.

Note: You will need to restart the NMS if you change the transport protocol.

1. Select **Configuration, Local/Remote, IDU, Transport**.

    The Transport Configuration window appears.
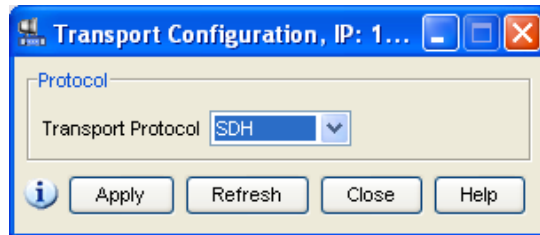
Transport Configuration Window

2. The **Protocol** field displays the current data transfer protocol. To change the protocol, click the drop down list and select SDH, SONET, or SONET-C.

3. Click **Apply** to save the settings.

4. Click **Close**.

Trap Forwarding Configuration

This section explains how to set up a trap forwarding plan. If your application does not require trap forwarding, you can skip the following procedure.

1. Select **Configuration**, **Local/Remote**, **Management System**, **Traps Configuration**, or click the Traps Configuration icon.

The Trap Forwarding Configuration window appears.

Trap Forwarding Configuration Window

2. In the **Managers IP Address** area, specify the IP addresses of the managers to which you want traps to be sent. For each manager IP you specify, specify the **Trap Port**, and for **Send Trap for Alarms with Severity**, select the severity filter to determine which types of alarms will be forwarded.

3. In the **Send Trap for Alarms of Group** section, you determine which alarms will be sent as SNMP traps to each manager. In each manager column, select the alarm types you want to include for that manager.

4. In the **Trap Options** area, select **Standard traps include serial number** if you want trap messages to include the IDU serial number.

   Select **Report local traps of far end IDU** if you want remote IDU trap messages to be reported locally.

   Select **Use different ID for each alarm type** if you want each type of alarm to receive a unique ID.

   Select **Send "clear" traps with zero severity** if you want a trap with a "clear" severity (instead of the alarm's original severity) to be sent to the IP addresses you specified.

5. For **CLLI** (Common Language Location Identifier), enter up to 18 characters that will represent your system ID when traps are sent.

6. For **Heartbeat Period**, a heartbeat signal will be generated every x minutes (the number you enter) to tell your system that the trap mechanism is working.

7. Click **Apply** to save the settings.

External Alarms Setup

The procedure detailed in this section is required only if alarms generated by external equipment are connected to the IDU, or if the IDU alarm outputs are connected to other equipment (using the alarms I/O connector).

1. Select **Configuration**, **Local/Remote**, **IDU**, **External Alarms**, or click the **Local/Remote External Alarms** icon.

The Input/Output External Alarms window appears.

Input/Output External Alarms Window

Follow the steps below for both the Local and Remote sides.

The microcontroller in the IDU reads alarm inputs (dry contact) and transmits them to the management system. This allows The transceiver to report external alarms that are not related to its own system.

For each alarm on the left side of the window, do the following:

2. Click on the box next to the alarm number to enable/disable the alarm.

3. If you enable an alarm, enter a description of the alarm in the text field.

4. Select the alarm's severity level from the drop-down list (Major, Minor, Warning, or Event).

5. The transceiver provides three alarm outputs that can be used by other systems to sense alarms. The outputs are configured on the right side of the window.

The alarm outputs are Form C Relays. Each output relay provides three pins, as follows:

Normally Open (NO)

Normally Closed (NC)

Common (C)

Output alarms can be defined as any of the following:

Major

Minor

Warning

External

Power

BER

Line

Loopback

LOF

IDU

ODU

Cable

Remote

The default alarm output setting for each relay is "Power".

The relays may be connected to customer-specific applications. Refer to Appendix B for details concerning the alarm connector pin assignments.

6. After you complete the configuration, click **Apply** to save the settings.

7. Click **Close**.

Exiting the NMS

To exit the NMS, select **File**, **Exit** in the main window.

Initial Setup for Intrepid-HC HP/T IDU

Initial Setup Steps for up to 9+1 Configuration

Cascading two Intrepid-HC HP/T IDUs at each site enables a configuration of up to 9+1 (10 carriers), or XPIC 7+1 with two additional carriers.

The setup steps for a configuration of up to 9+1, are identical to those of the configuration of up to 4+1 (see above) except for the following differences:

- You must configure all six IDCs using the HyperTerminal.

- You must specify if you are using cascading mode, using the HyperTerminal

- You must specify in which IDU the protected link will be defined.

To set the cascading mode:

1. In the main terminal program menu, select **Configuration**.

2. Select **System configuration**.

3. Select **Cluster configuration**.

   Specify the number of sub-racks in the system. 1 for stand alone, or 2 for cascading mode.

   Specify either 1 or 2 for the sub-rack number. The protected carrier will be in sub-rack 1.
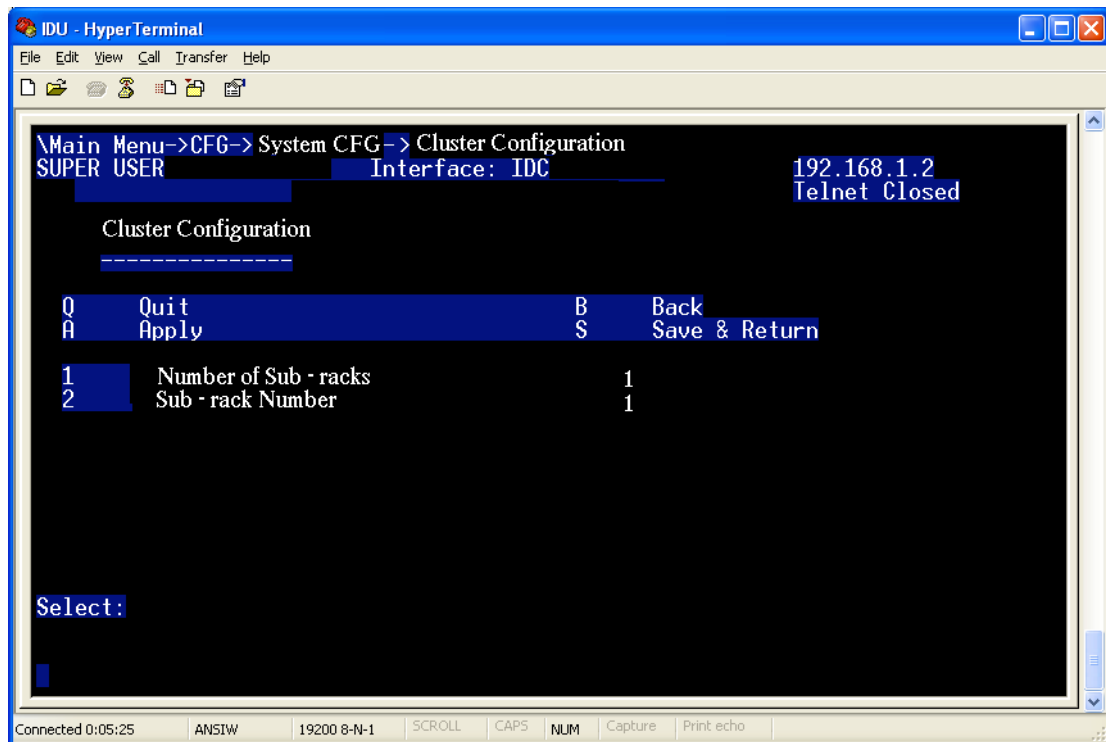
Defining IP Addresses

Before you can configure the Intrepid-HC HP/T system, you need to define four IP addresses using the craft terminal.

The Intrepid-HC HP/T includes three levels of two IP interfaces: an Ethernet interface, and a serial interface. Each interface has its own IP address and IP mask.

You must configure an IP address for each of the three IDCs - a unique shelf number for each shelf in the cluster.

In addition, you must define same *base IP address* for every Intrepid-HC HP/T IDC. The address is a four digit number separated by decimal points. Each IP address is a pair netid-hostid, where *netid* identifies a network, and *hostid* identifies a host on the network. The IP mask separates between the netid and hostid.

For example, if the IP address is 192.114.35.12 (11000000 01110010 00100011 00001100), and the IP mask is 255.255.255.0 (11111111 11111111 11111111 00000000), the netid is 192.114.35, and the hostid is 12.

An IP interface can only communicate with hosts that are on the same net (have the same netid). In the example above, the interface can communicate only with hosts that have netid 192.114.35 (for 1 to 255).

If Intrepid-HC HP/T has a frame to send to a host that is not on the Ethernet IP netid or the serial IP netid, the frame should be sent to an intelligent device (usually a gateway) on the network. Such a device, known as a "default router", will know how to send the frame over the internet. The default gateway should be a host on one of the Intrepid-HC HP/T interface *netid*s.

The Intrepid-HC HP/T cluster is managed as a single Network Element (NE) by the EMS.

The following figure illustrates an Intrepid-HC HP/T management model from an EMS/NMS point of view.
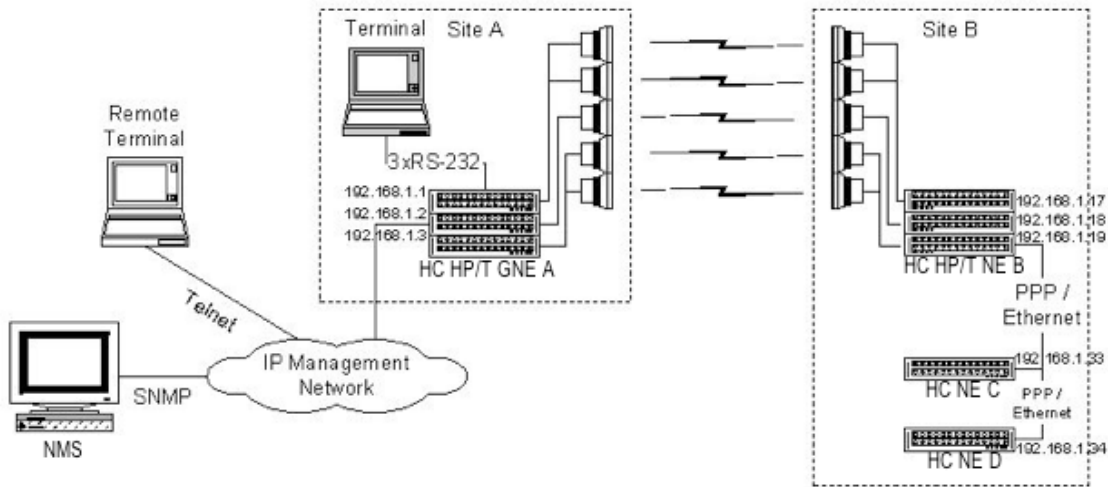
Each IDC calculates its own IP address, considering cascade shelf# and floor#: $IP = IPbase + 3*shelf\# + floor\#$

where:

IPbase is dividable by 8 (i.e. = IPbase & 0xfffffff8),

shelf# = 0, which is the cascade master (the one with the protected carrier), or 1 for cascade slave,

floor# = 1, 2, or 3 (the number of the floor within the Intrepid-HC HP/T shelf).

In-band Management

In-band management of the Intrepid-HC HP/T link chain must be configured carefully due to a large number of public IP address allocations. In addition, it should be noted that in-band management becomes a limiting factor for chain length when only the Class C DCN is used.

The figure below illustrates the largest Class C in-band subnet (with CIDR = 26 bits, i.e. subnet mask 255.255.255.192).

The DCN shown in the figure makes use of the 192.168.1.64 in-band subnet. This subnet allows 62 nodes 192.168.1.65 - 192.168.1.126, and has a broadcast address of 192.168.1.127.

It is assumed that the Intrepid-HC HP/T at site A has a single GNE 1 assigned to one of the IDCs.

All three IDCs at site A have direct out-of-band IP connectivity with remote management applications (NMS, SNMP Agent, Telnet). The remaining Intrepid-HC HP/T chain IP addresses are accessed via the GNE IDC.

MDS Intrepid-HC HP Installation and Operation
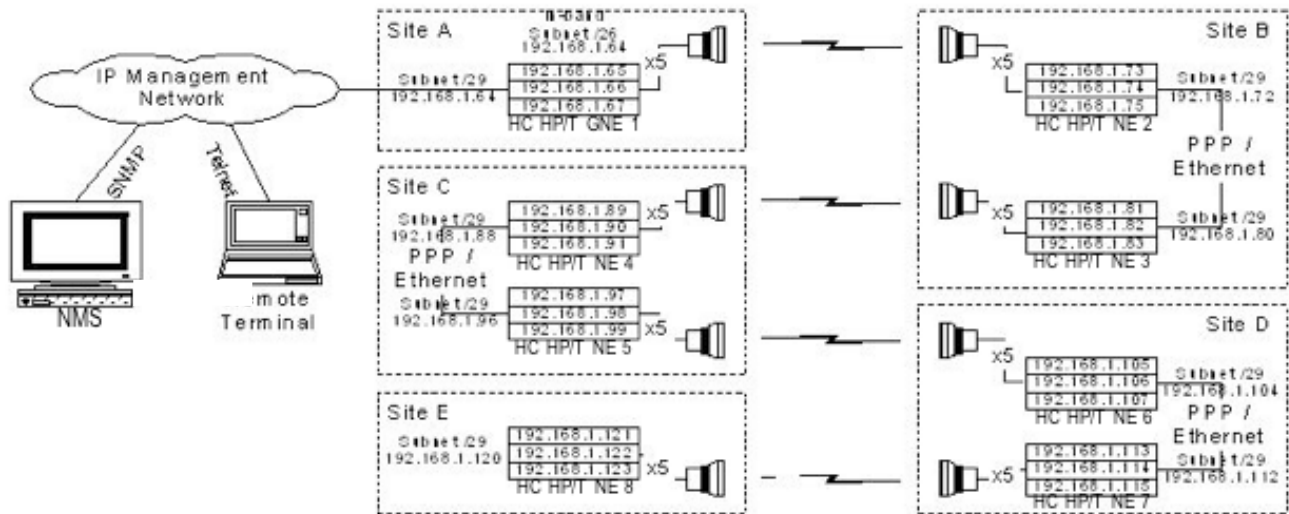
Note that the Inband bytes run through the upper level of the cluster.

The Ethernet interface of every Network Element (NE) is assigned the CIDR=/29 subnet, i.e. subnet mask 255.255.255.248. This allows 6 elements to be communicated over the interface. These addresses can be fully utilized when two Intrepid-HC HP/T shelves are cascaded for 7+1 group protection.

The figure above shows "back-to-back" connected Intrepid-HC HP/T shelves at the same sites: B, C, and D, for East/West chaining. Two NE IDCs (NE 2 and NE 3), at the same site, are connected over a PPPoE link.

This scheme allows four links of up to 7+1 (eight Intrepid-HC HP/T shelves, as shown, or sixteen shelves cascaded in pairs) chained through the same NMS/SNMP Agent management, when IP addresses are allocated as described above.

Notes:

1. The CIDR=/29 subnet allows external element communication (such as a laptop connected to the site B LAN) only if there are less than six IDCs operating on two cascaded Intrepid-HC HP/T shelves. The subnet is not sufficient for three Intrepid-HC HP/T cascading shelves. Three cascaded shelves require CIDR=/28 nodes (subnet mask 255.255.255.240). This reduces the available number of chained links to 50%.

---

2. High protocol timing constraints (SNMP/TFTP) are expected in Intrepid-HC HP/T link chains due to the large number of hops (each East/West site adds two in-band routing hops), and a large number of managed IDC nodes.

The following slight optimization may be useful for a chain topology (but not for a ring):

One of the in-band NE management channels is configured as a Default GNE Direction, assuming the channel leads to the nearest GNE under normal conditions. Then, in-band routing chooses this channel as a first priority for every "in-band packet" generated internally, or received from the Ethernet interface.

To define IP Addresses:

1. In the main terminal program menu, select **Configuration**.

2. Select **System configuration**.

3. Select **IDC configuration**.

4. Select **IDC Basic configuration**.

5. Select **IP**.
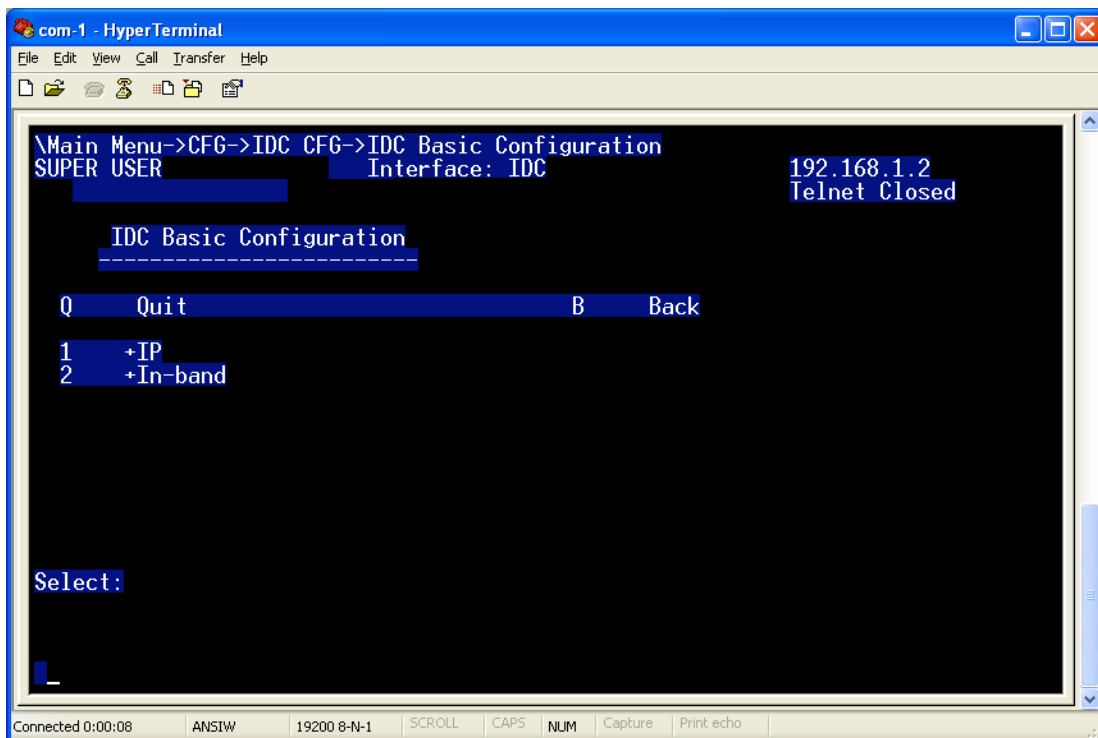
6. Define the addresses as described above: element IP and basic IP of the units.
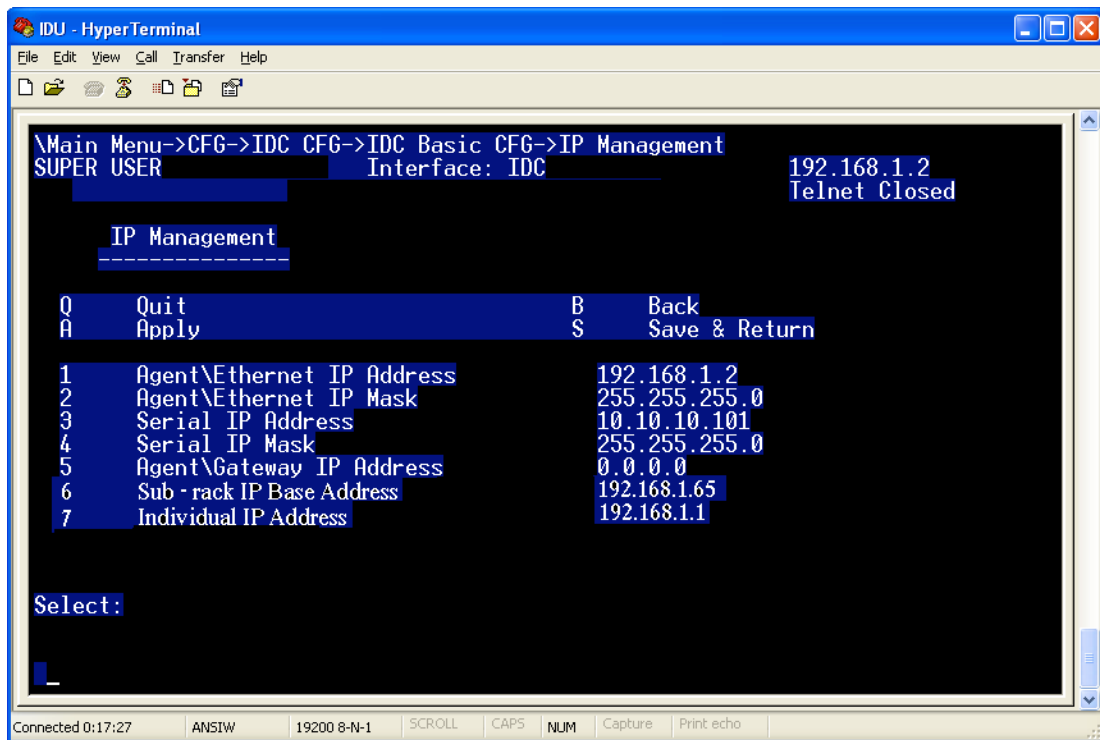
Important: After you set up IP addresses, restart the IDUs to activate them.

7. Repeat the steps above for the remaining IDCs in the Intrepid-HC HP/T IDU.

Setup Options in the Terminal Program

The main menu in the terminal setup program includes the following options:

Configuration (1) - the main setup section in which you can configure the IDC, the right and left drawers, protection, SNMP management, in-band routing, and other such parameters.

System Status (2) - used to obtain information about the different software versions currently used in the system.

Maintenance (3) - used to perform software upload, download, and reset.

Diagnostics (4) - used to perform loopbacks and obtain system information.

Logs (5) - used to view alarm and configuration log reports.

Additional Setup Using the NMS

After you perform initial setup via the terminal, some additional procedures should be performed via the NMS software.

Note: The information in this section is provided only for basic initial setup. More detailed information about the NMS is provided in the *NMS User Guide*.

Connecting to the Ethernet Port

1. Connect a **crossed** Ethernet cable from your PC to the Ethernet Port. If the connection is to a LAN (wall connection), use the standard Ethernet cable.

2. Make sure the IP address on your PC is on the same sub-net as the one you defined for the IDU (in most cases, the first three numbers of the IP address must be identical, depending on the sub-net mask).

NMS PC Requirements

Before you install the NMS software, verify that your PC has the following minimum requirements:

For Windows

Processor:	Pentium 4, 2.8 GHz (minimum)
Memory (RAM):	256 MB minimum
Operating System:	Windows 2000 or above
Serial Port:	RS-232 (Hyper-Terminal)

For UNIX

Processor:	Blade 100 Ultra 5 (minimum)
Memory (RAM):	256 MB minimum
Operating System:	Solaris 8 or 10

Installing the Network Management Software (NMS)

Note: More detailed information about NMS installation is provided in the *NMS User Guide*.

1. Insert the NMS CD in the CD drive.
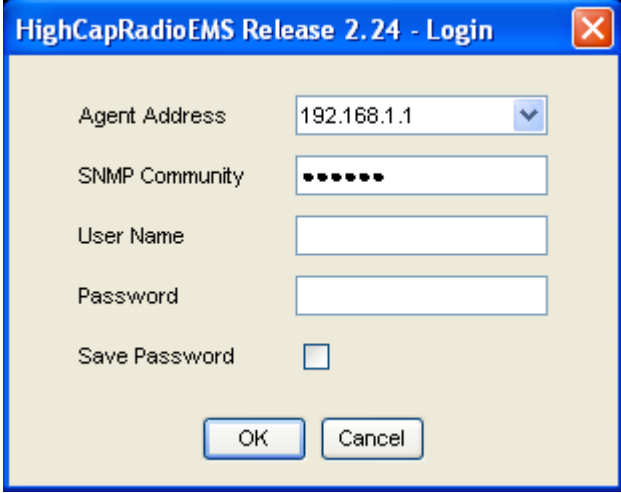
2. In Windows Explorer, double-click the setup.exe file.

    The installation program begins.

3. Follow the instructions displayed.

Starting the NMS

1. Select **Start, Programs, NMS**, **NMS Element Manager**.

    The NMS Login window appears.

NMS Login Window

2. Enter the IP address of the second IDC, and the SNMP community (for SNMP protocol access). If you are working in cascading mode, select the IP address of the second IDC in the master unit.

3. For User Name use **admin** and for Password use **admin** (default settings)

4. Select **Save Password** if you want NMS to remember the password you entered.

    Note that there are two types of passwords, each with a different security level for authorized activities: *Read Only* - user can perform monitoring activities only.
    Read/Write - user can change system configuration and system administrator parameters, and perform monitoring activities.

After you log in, the Main NMS window appears.

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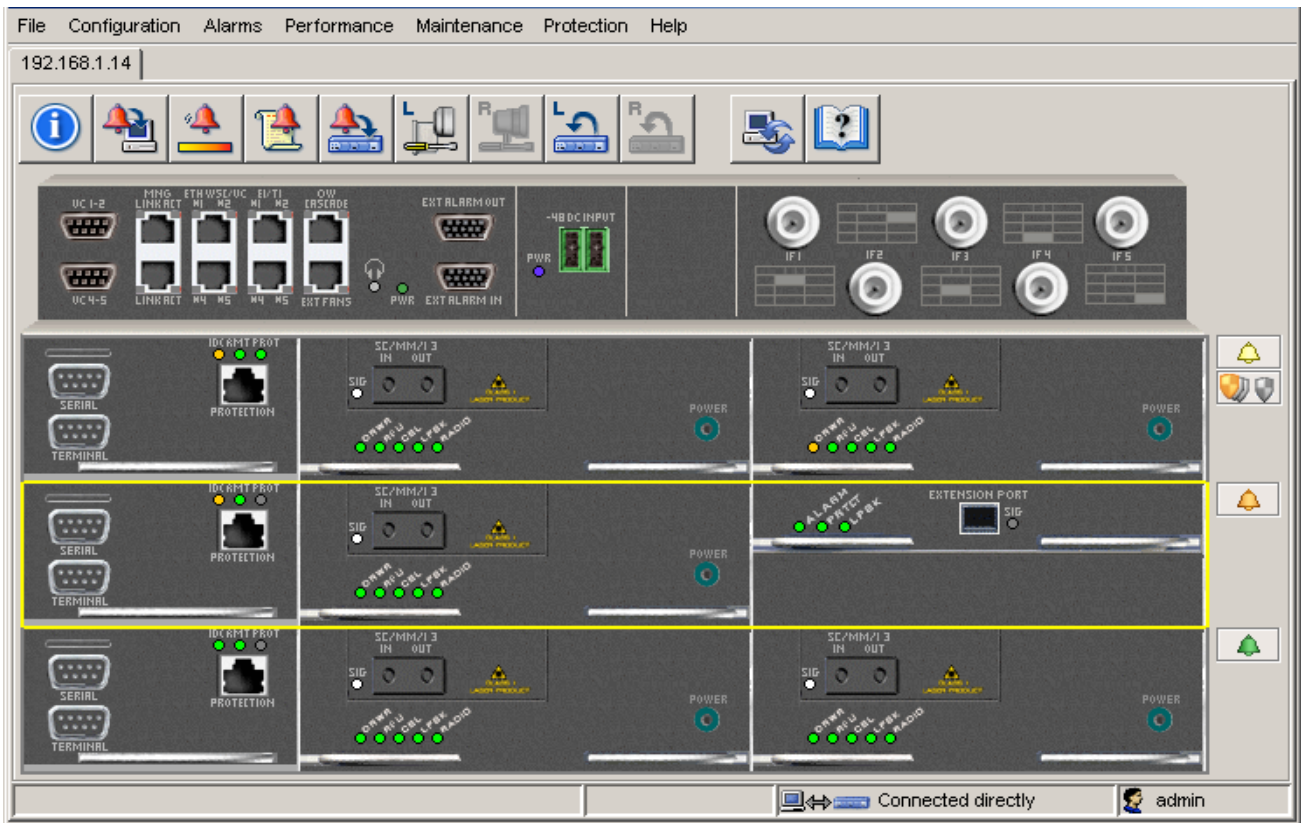
Main NMS Window for Intrepid-HC HP/T

Setting the Local TX Frequency Channel

If the TX frequency was previously defined using the HyperTerminal, use the frequency window in the NMS only to verify that the correct frequency was set.

Note that the concept of N+1 system configuration is to first configure all the carriers separately to work as a stand alone system. After all the carriers are set up as an N+0 configuration, including the XPIC links, then the protection type is configured.

1. Select **Configuration, RFU, RFU Configuration**, or click the RFU icon in the tool bar.

At the top of the window, the system displays TX/Rx ranges, the gap between them, and the channel bandwidth.
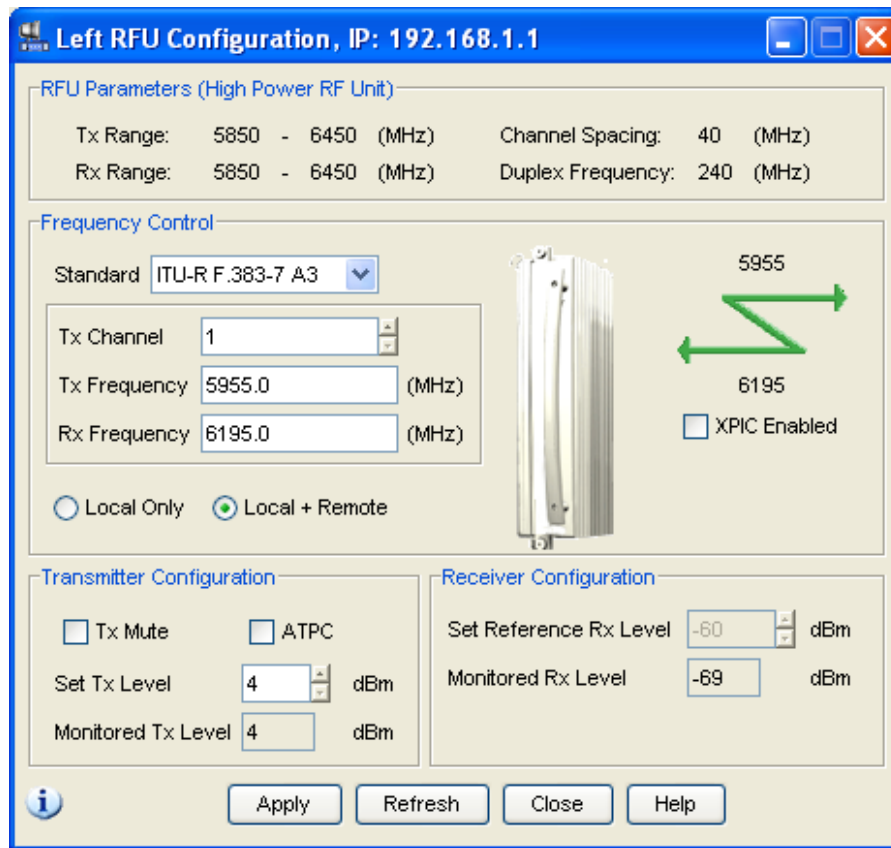
RFU Configuration Window

2. In the Frequency Control section, set the TX Channel to the required channel. By default, it is set to the first channel. If you are unsure of the required channel, refer to the *System Descriptions* guide for channel allocations.

 The frequency of the selected TX channel appears in the TX Frequency field.

3. If you prefer, you can set the TX frequency by entering a frequency, in MHz, in the TX Frequency section. If the frequency is not available, a warning message will appear to enable the entered frequency, or to change it to the nearest available channel.

4. Select the XPIC option (which appears under the RFU illustration) to activate the XPIC mechanism. The mechanism is used to cancel cross polar interference in a dual polarization system.

5. Select the Local Only option. By default, the Local + Remote option is selected. However, since there is no connection to the remote unit at this time, the Local + Remote option is not available.

6. Click **Apply** to save the settings.

7. Click **Close**.

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Setting up the N+1 Configuration

1. Select **Protection, H/W protection, H/W protection type**.
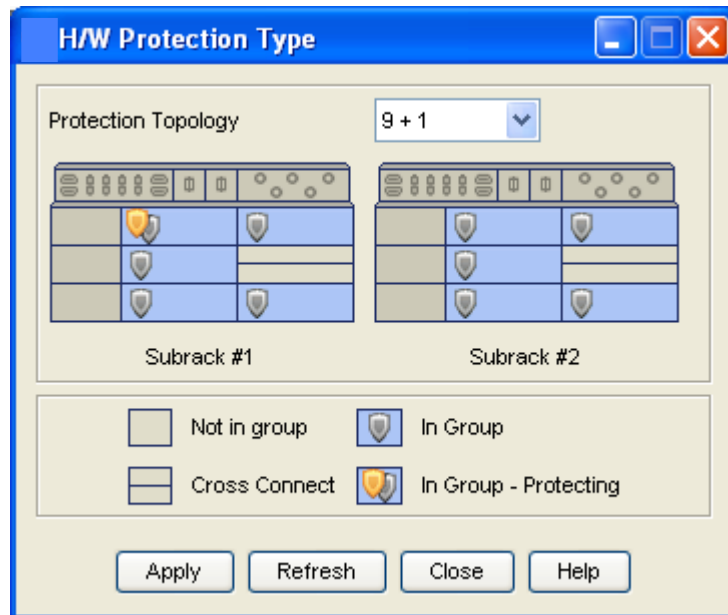
H/W Protection Type Window

2. Click the Protection Topology drop-down list and select the required configuration, as follows:

   HSB 1+1 - the upper level is activated with two drawers that protect each other, while the standby drawer is muted.

   HSB 2+2 - levels one and three of the IDU are activated. Each level protects the other when the standby IDU is muted. Each level operates in XPIC mode. External protection cables need to be connected between levels one and three.

   1+1 - the +1 algorithm is activated. The upper level includes two carriers, whereby the left one is protected.

   2+1 - three separate carriers with one protected.

   3+1 - four separate carriers with one protected.

   4+1 - five separate carriers with one protected.

   5+1 - cascade mode, six separate carriers with one protected.

   6+1 - cascade mode, seven separate carriers with one protected.
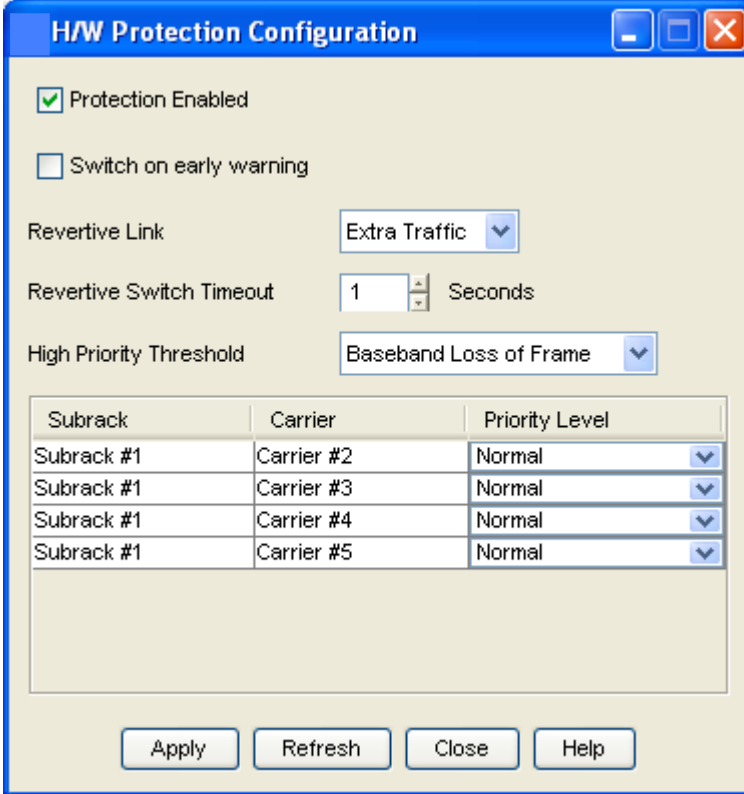
   7+1 - cascade mode, eight separate carriers with one protected.

   8+1 - cascade mode, nine separate carriers with one protected.

9+1 - cascade mode, ten separate carriers with one protected.

3. Select **Protection, H/W protection, H/W protection configuration**.

    The following window will appear if the protection type you selected was between 1+1 and 9+1.

H/W Protection Configuration Window

4. Select **Protection Enabled**.

5. Select **Switch On Early Warning** if you want the switch to occur when the system reaches an MSE of -28.

6. For **Revertive Link**, select the carrier that will be connected to the +1 modem. Your selection will be used in cases where a switch occurs and then the system returns to normal operation.

    Examples

    Revertive = Extra Traffic
    If a major alarm occurs at site A, a request is sent to site B to transmit through the Extra Traffic channel. The switch that is performed is Hitless (up to 10 ms), and the Extra Traffic channel will no longer exist on both sides by definition (generally, the system can protect up to two faults at different sides). The moment the alarm is cleared, the +1 (Extra Traffic) modem will refer to the input from the +1 MUX.

    Revertive = None
    Each carrier MUX will receive two inputs: its own modem, and the +1 modem. The Extra Traffic channel will not exist. Data to the MUX (for each of the defined carriers) will be received from its own modem until the

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first hitless fault. When the fault is cleared, the MUX will receive data from two sources: the +1 modem, and its own modem, meaning the next fault in this channel will be errorless (if other carriers will fail, the data will be hitless).

Revertive = Carrier#X

MUX number X will always receive two sources: the +1, and its own, unless there is a fault in another carrier. If MUX number X receives two sources, and a fault occurs, the switch is errorless. In all the other cases, the switch is hitless.

7. For **Revertive Switch Timeout**, specify the period (in seconds) after which the revertive mode will be activated.

8. For **High Priority Threshold**, click the drop-down list and select the criteria upon which the system will perform a switch to the channel you chose as high priority.

    The options include: Baseband Loss of Frame, Baseband Excessive BER, Baseband Signal Degrade, and Early Warning

9. In the priority table, designate the high priority channel(s). A high priority channel will be switched first when the criteria chosen for the threshold is met, even if a major fault occurs in a different channel.

    The Priority Level options include:

    - Normal - regular operation according to the N+1 mechanism
    - High Priority
    - Not Protected – stand-alone channel without protection

Specifying System Information

Note: To specify system information, you must perform the following steps in all three IDCs in the Intrepid-HC HP/T IDU:

1. Select **File**, **System, Information**., or click the System Information icon .
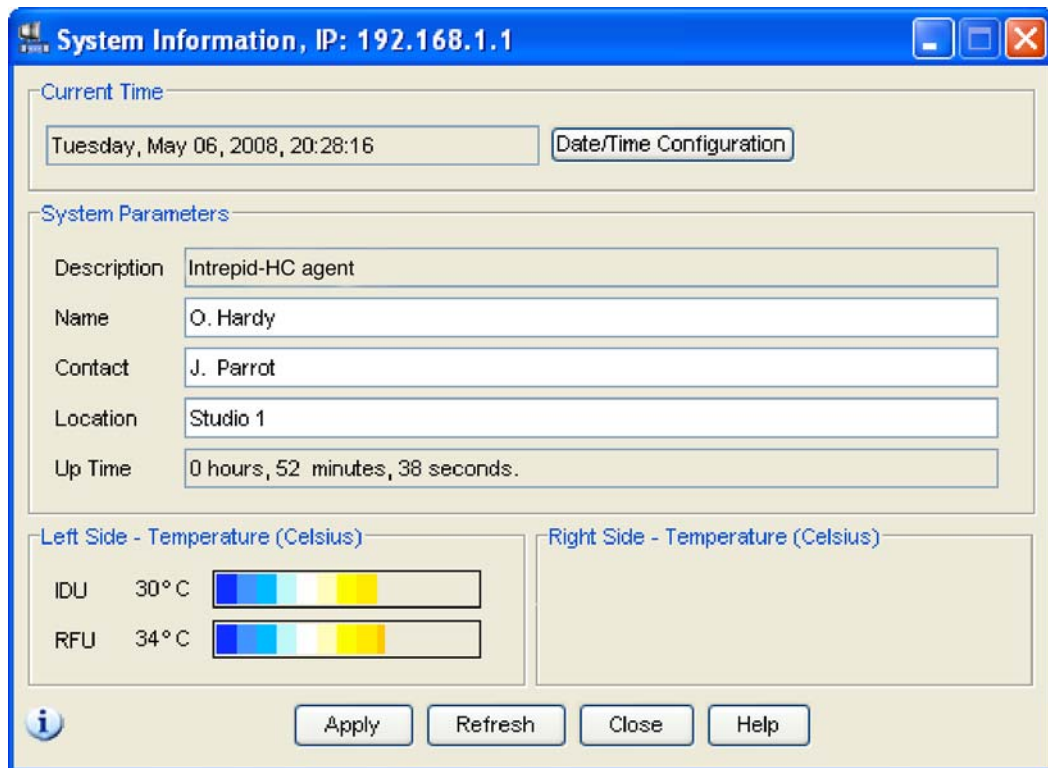
System Information Window

2. In the **Current Time** area, click **Date/Time Configuration** and set the date and time (in the format HH:MM:SS).

3. The read-only **Description** field provides information about the GE MDS Intrepid-HC HP system.

4. (Optional) In the **Name** field, enter a name for this link. By convention, this is the node's fully-qualified domain name.

5. (Optional) In the **Contact** field, enter the name of the person to be contacted when a problem with the system occurs. Include information on how to contact the designated person.

6. (Optional) In the **Location** field, enter the actual physical location of the node or agent.

7. The **Up Time** field is read-only and shows how long the system has been operating continuously.

8. For **Left/Right Carrier Name**, specify the name you want to give the carrier for identification purposes.

9. Click **Apply**. The settings are saved.

10. Click **Close**.

Local/Remote Transport Configuration

The Local/Remote Transport Configuration window allows you to change threshold levels for the radio and alarms, and to configure special transmission parameters. This is recommended for advanced users only and should be done in all of the three IDCs in the Intrepid-HC HP/T IDU.

Note: You will need to restart the NMS if you change the transport protocol.

1. Select **Configuration, IDU, Transport**.

    The Transport Configuration window appears.
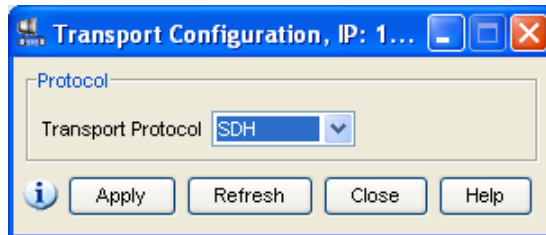
Transport Configuration Window

2. The **Protocol** field displays the current data transfer protocol. To change the protocol, click the drop down list and select SDH, SONET, or SONET-C.

3. Click **Apply** to save the settings.

4. Click **Close**.
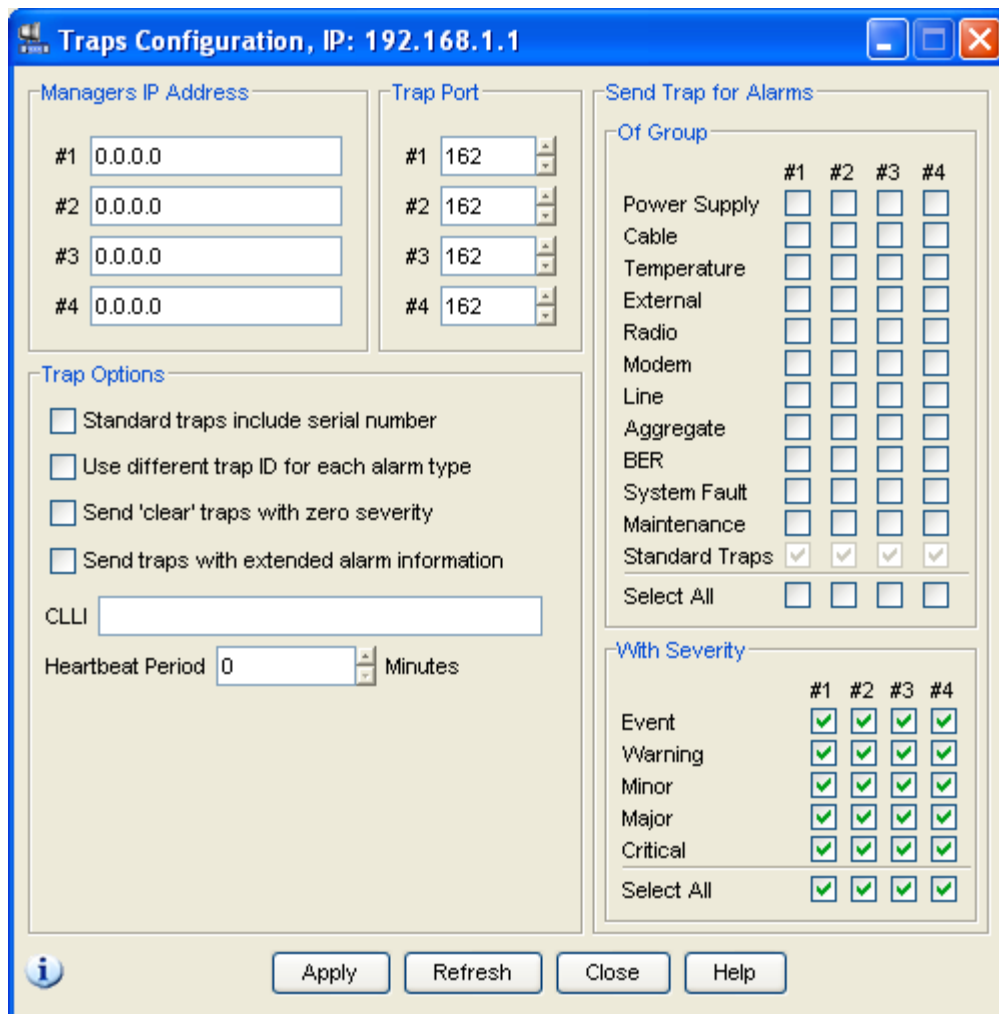
Trap Forwarding Configuration

This section explains how to set up a trap forwarding plan. If your application does not require trap forwarding, you can skip the following procedure.

1.   Select **Configuration**, **Management System**, **Traps Configuration**, or click the Traps Configuration icon.

The Trap Forwarding Configuration window appears.

Trap Forwarding Configuration Window

2.   In the **Managers IP Address** area, specify the IP addresses of the managers to which you want traps to be sent. For each manager IP you specify, specify the **Trap Port**, and for **Send Trap for Alarms with Severity**, select the severity filter to determine which types of alarms will be forwarded.

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3. In the **Send Trap for Alarms of Group** section, you determine which alarms will be sent as SNMP traps to each manager. In each manager column, select the alarm types you want to include for that manager.

4. In the **Trap Options** area, select **Standard traps include serial number** if you want trap messages to include the IDU serial number.

    Select **Report local traps of far end IDU** if you want remote IDU trap messages to be reported locally.

    Select **Use different ID for each alarm type** if you want each type of alarm to receive a unique ID.

    Select **Send "clear" traps with zero severity** if you want a trap with a "clear" severity (instead of the alarm's original severity) to be sent to the IP addresses you specified.

5. For **CLLI** (Common Language Location Identifier), enter up to 18 characters that will represent your system ID when traps are sent.

6. For **Heartbeat Period**, a heartbeat signal will be generated every x minutes (the number you enter) to tell your system that the trap mechanism is working.

7. Click **Apply** to save the settings.

External Alarms Setup

The procedure detailed in this section is required only if alarms generated by external equipment are connected to the IDU, or if the IDU alarm outputs are connected to other equipment (using the alarms I/O connector).

The IDU has eight external alarm inputs and five external alarm outputs. Since each of the three levels support five outputs, the system uses the OR function between the outputs of each floor, and accordingly generates the alarm.

1. Select the middle floor of the IDU, and select **Configuration**, **IDU**, **External Alarms**.

    Or, click the **External Alarms** icon .

    Or, click the **EXT ALARM IN** icon on the IDU front panel .

    The Input/Output External Alarms window appears.
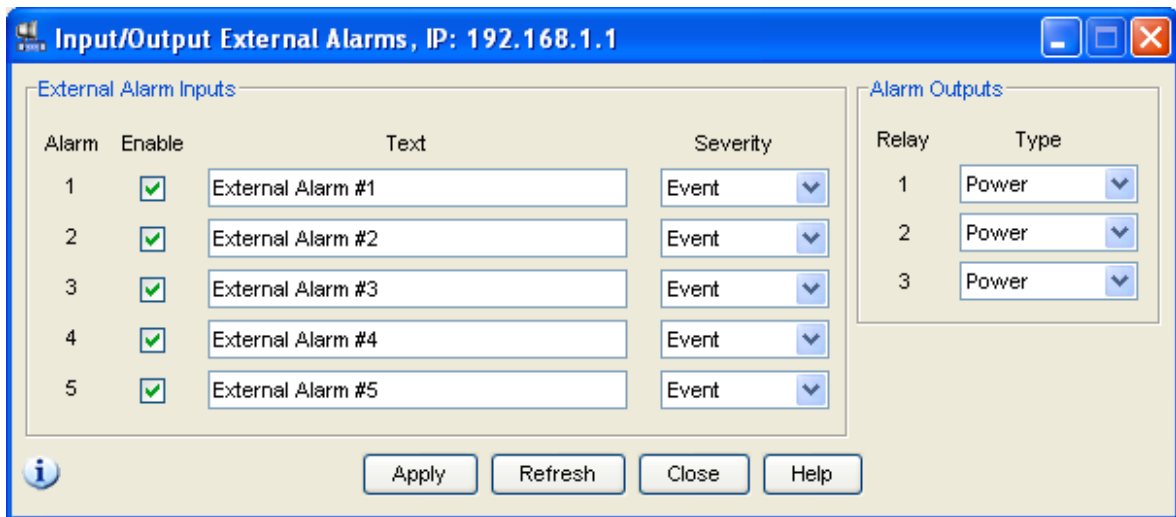
Input/Output External Alarms Window

Follow the steps below for both the Local and Remote sides.

The microcontroller in the IDU reads alarm inputs (dry contact) and transmits them to the network management system. This allows Intrepid-HC HP/T to report external alarms that are not related to its own system.

For each alarm on the left side of the window, do the following:

2. Click the box next to the alarm number to enable/disable the alarm.

3. If you enable an alarm, enter a description of the alarm in the text field.

4. Select the alarm's severity level from the drop-down list (Major, Minor, Warning, or Event).

5. Intrepid-HC HP/T provides five alarm outputs that can be used by other systems to sense Intrepid-HC HP/T alarms. The outputs are configured on the right side of the window.

   The alarm outputs are Form C Relays. Each output relay provides three pins, as follows:

   Normally Open (NO)
   Normally Closed (NC)
   Common (C)

Output alarms can be defined as any of the following:

   Major
   Minor
   Warning
   External
   Power
   BER
   Line
   Loopback

LOF

IDU

ODU

Cable

Remote

The default alarm output setting for each relay is "Power".

The relays may be connected to customer-specific applications. Refer to Appendix B for details concerning the alarm connector pin assignments.

6. After you complete the configuration, click **Apply** to save the settings.

7. Click **Close**.

Exiting the NMS

To exit the NMS, select **File**, **Exit** in the main window.

Connecting Line Interfaces

After configuring the system in accordance with the previous sections, the line interfaces can be connected to the IDU.

For a description of the line interfaces, see the *System Descriptions* guide.

Note the following interface terminology:

• For connectors or signals labeled TX, the signals are sent from the transceiver.

• For connectors or signals labeled RX, the signals are sent to the transceiver.

Chapter 3: Acceptance & Commissioning Procedures

General

This chapter provides the factory's recommended Acceptance and Commissioning Procedure for the GE MDS Intrepid-HC HP. Acceptance and commissioning should be performed after initial setup is complete.

The purpose of this procedure is to verify correct installation and operation of the installed link and the interoperability with customer end equipment.

Acceptance and Commissioning procedures include the following stages:

- Site Acceptance Procedure

- Commissioning of radio link in a 1+0 configuration

- Commissioning of radio link in a 1+1 configuration

- Commissioning of radio link in a 2+0 XPIC configuration

The Site Acceptance Procedure is a checklist that summarizes the installation requirements of the site at which the products were installed.

The commissioning tests cover the required configuration information that should be recorded, and the tests that should be performed on the radio link in 1+0, 1+1 and 2+0 configurations.

Site Acceptance Procedure

The purpose of the following procedures is to verify that all installation requirements were noted and checked. Following this procedure will ensure proper, long-lasting, and safe operation of the product.

The checklist below summarizes the installation requirements of the site.

SITE ACCEPTANCE CHECKLIST	
1. SITE INFORMATION	
Customer:	
Radio model:	
Site name:	
Site code:	
Radio link code:	
Site address:	
2. ANTENNA MOUNTING	
Antenna mount type:	
Mount is of sufficient height to clear local obstructions	OK
Mount is safely positioned to not cause a safety hazard	OK
Mount is secure and perpendicular	OK
Mount is grounded as per site specifications	OK
All steelwork is Galvanized or Stainless Steel as appropriate	OK
3. ANTENNA	
Antenna type (model and size):	
Antenna is securely fixed to mount	OK
Antenna is grounded as per site specifications	OK
Antenna sway braces are installed correctly (where applicable)	OK
Antenna Radome is securely fitted (where applicable)	OK
Water drain plugs are fitted and removed, as appropriate	OK
Antenna sealing O-Ring is properly fitted and not damaged	OK
Antenna/Launch unit polarization is as per link requirements	OK

GE MDS

SITE ACCEPTANCE CHECKLIST (continued)	
4. OUT-DOOR UNIT	
Type of RFU mount:	(Direct or Remote mount)
RFU is securely mounted to the antenna or pole	OK
RFU is grounded as per installation instructions	OK
RFU's polarization is as per link requirements	OK
RFU is installed properly and has no physical damage	OK
For Remote-Mount Only:	
Remote mount kit is securely mounted to the pole	OK
Flexible waveguide has no physical damage and connectors are sealed	OK
All flexible waveguide bolts are secured using washers and lock-washers, as appropriate	OK
Flexible waveguide is secured to the pole	OK
6. COAX CABLE	
Overall cable length:	
Cable type:	
N-Type connectors assembled properly on the cable	OK
Cable connected securely to RFU and IDU	OK
Cable connector is weather-proofed (sealed) at the RFU	OK
At the RFU, cable has a service/drip loop to prevent moisture from entering the connector	OK
Cable is secured using suitable restraints to fixed points at regular intervals (0.5 m recommended)	OK
Cable has no sharp bends, kinks, or crushed areas. All bends are per manufacturer specifications	OK
Grounding/lightning protection is as per site specifications	OK
Lightning protection type and model:	
Cable point-of-entry to building/shelter is weather-proof	OK
Cable ends are properly labeled	OK

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SITE ACCEPTANCE CHECKLIST (continued)	
7. FLEXIBLE WAVEGUIDE	
Flexible WG type:	
Flexible WG is connected securely to RFU and Antenna	OK
Flexible WG connector is weather-proofed (sealed) at the RFU	OK
At the RFU, the flexible WG has a service/drip loop to prevent moisture from entering the connector	OK
Flexible WG is secured using suitable restraints to fixed points at regular intervals (0.5 m recommended)	OK
Flexible WG has no sharp bends, kinks, or crushed areas. All bends are per manufacturer specifications	OK
Flexible WG ends are properly labeled	OK
8. IN-DOOR UNIT	
IDU is securely mounted to the rack	OK
IDU is located in a properly ventilated environment	OK
IDU fans are functional and air flow to the fans is not disrupted	OK
IDU and rack are grounded as per site specifications	OK
Traffic cables and connections are properly terminated as per manufacturer/cable instructions	OK
All cabling is secured, tidy, and visibly labeled	OK
9. DC POWER SUPPLY - Two Inputs	
Measured DC voltage input to the IDU:	(-40.5 to -72 VDC)
Power-Supply maximum current:	(at least 3 Amperes)
Power-Supply is properly grounded	OK
DC power backup type:	
IDU DC connector is secure and the DC input leads are correctly terminated (no bare wires are visible)	OK
IDU DC connector (+) and (GND) leads are shorted and GND is grounded	OK
10. RACK INSTALLATION	
Rack is mounted to the shelter floor with four screws	OK
Rack is mounted to the shelter wall with two screws	OK

SITE ACCEPTANCE CHECKLIST (continued)	
11. REMARKS/NOTES	
12. GENERAL INFORMATION	
Site accepted by:	Name:
	Title:
	Company:
	Signature:
	Date:
Site approved by:	Name:
	Title:
	Company:
	Signature:
	Date:

Site Acceptance Checklist Notes

The following notes provide important additional information about the Site Acceptance Checklist.

1.   Antenna Mounting

● Mounting pole is of sufficient height to clear local obstructions, such as parapets, window cleaning gantries, and lift housings.

● Mounting Pole is of sufficient height, and is safely positioned, so as not to cause a safety hazard. No person should be able to walk in front of, or look directly into the path of the microwave radio beam. Where possible, the pole should be away from the edge of the building.

● Mounting pole is secure and perpendicular. A pole that is not perpendicular may cause problems during antenna alignment.

● Mounting pole is grounded as per site specifications. All operators and site owners have specific requirements regarding the grounding of installations. As a minimum, typical requirements are such that any metal structure must be connected to the existing lightning protection ground of the building. Where it extends beyond the 45-degree cone of protection of existing lightning conductors, additional lightning protectors should be installed.

● All steelwork is Galvanized or Stainless Steel, as appropriate to prevent corrosion.

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2. Antenna

● Antenna is grounded as per site specifications. See the third point in the Antenna Mounting section above.

● Antenna sway braces are fitted and installed correctly, where applicable. Typically, for an antenna of 1.2 m or larger, an extra sway brace is fitted to the mounting frame of the antenna. This sway brace should not be mounted to the same pole as the antenna, but should be installed directly back to the tower or an alternative point.

● Antenna Water Drain Plugs are fitted and removed, where appropriate. Some antennas have moisture drain plugs installed at various points around the antenna. The purpose of these plugs is to allow any moisture that forms on the inside of the antenna or radome to drip out and prevent a pool within the antenna. Only the plugs at the bottom of the antenna, after installation, should be removed. All other plugs should be left in position.

3. RFU (RF Unit)

● The RFU is grounded as per installation instructions. See the third point in the Antenna Mounting section above.

● The RFU Polarization is as per link requirements and matches the polarization of the antenna.

4. Indoor Unit

● The main traffic connections are correctly terminated and crimped as per cable and connector manufacturer instructions. All fiber optic patch leads should be routed carefully and efficiently, using conduits to prevent damage to the cables.

  All other user terminations are secure and correctly terminated.

● All labeling is complete as per site requirements. Labeling is specific to each customer. At a site with only one installation, labeling may be unnecessary. However, at sites with multiple installations, correct and adequate labeling is essential for future maintenance operations.

  Typical labeling requirements include:

  Antenna labels - for link identity and bearing
  RFU labels - for link identity, frequency, and polarization
  Coax cable labels - for link identity, close to the RFU, IDU, and either end of any joint
  IDU labels - for link identity

1+0 Commissioning Procedure

Scope

This section describes the recommended commissioning tests for a GE MDS Intrepid-HC HP radio link in a 1+0 configuration.

The purpose of the commissioning tests is to verify correct and proper operation of the product.

Commissioning Test

The following tests should be performed on each installed link.

Link Verification

- "Radio" LED on the IDM front panel is green, indicating the radio link is up.
- Received Signal Level (RSL) is up to +/- 4 dB from the expected (calculated) level at both ends of the link.
- Radio Bit Error Rate (BER) is $10E^{-11}$ or higher.
- If working with ATPC, ATPC is operating as expected (RSL = reference level).
- After connecting test equipment or end equipment to the line interfaces, all LEDs on the front panel of the IDM are green.

Line Interfaces Test

- 155 Mbps Interface - connect SDH/SONET/ATM test equipment to the 155 Mbps interface and verify error-free operation for at least 1 hour. Use a physical or software loop at the far end.
- 50/100/200 Mbps, GbE Interface - connect a Packet Analyzer to the Fast Ethernet interface and verify error-free operation (no packet loss) for at least 1 hour. Use a physical loop at the far end.
- 45 Mbps Interface - connect PDH test equipment to the DS3 interface and verify error-free operation for at least 1 hour. Use a physical or software loop at the far end.
- 2 Mbps/1.5 Mbps - connect PDH test equipment to the E1/T1 interface and verify error-free operation for at least 1 hour. Use a physical or software loop at the far end.

Interoperability Verification

- Connect customer end equipment to the line interfaces, and verify correct operation.
- Further interoperability tests should be performed in accordance with the specific requirements of the connected end equipment.

Management Verification

- Install network management software on the PC, and launch the program.

- Verify that you can manage the link and that you are able to perform changes to the link configuration (frequency channel, TX power, system name, time & date, etc.) via NMS.

- Verify that the NMS reports the correct parameters when performing the above.

- Verify that there are no active alarms on the link.

- If the management station is located at a remote site (Network Operation Center), verify that the management station can manage the link and receive traps.

Loopback Operation

- Perform line loopback, IDU loopback, RFU loopback, and Remote loopback, and verify that the system operates accordingly.

![GE MDS logo]

1+1 Commissioning Procedure

Scope

This section describes the recommended commissioning tests for a GE MDS Intrepid-HC HP radio link in 1+1 HSB (Hot Standby) and SD (Space Diversity) or FD (Frequency Diversity) configurations (internal protection).

The purpose of the commissioning tests is to verify correct and proper operation of the product.

Note that in this section:

Primary refers to the RFUs connected to the main path of the directional coupler in a 1+1 HSB configuration.

Secondary refers to the RFUs connected to the secondary path of the directional coupler in a 1+1 HSB configuration.

Commissioning Tests

The following tests should be performed on each installed link.

Link Verification

The following steps should be repeated for each of the four RFU combinations (Primary-Primary, Primary-Secondary, Secondary-Primary, Secondary-Secondary).

- "Radio" LED on the IDM front panel is green, indicating the radio link is up.

- Received Signal Level (RSL) is up to +/- 4 dB from the expected (calculated) level at both ends of the link.

- Radio Bit Error Rate (BER) is $10E^{-11}$ or higher.

- If working with ATPC, ATPC is operating as expected (RSL = reference level).

- After connecting test equipment or end equipment to the line interfaces, all LEDs on the front panel of the IDM are green.

Line Interfaces Test

- 155 Mbps interface - connect SDH/SONET/ATM test equipment to the 155 Mbps interfaces using splitters, and verify error-free operation for at least 1 hour. Use physical loop between the splitters at the far end.

- 50/100/200 Mbps, GbE interface - connect a Packet Analyzer to the Fast Ethernet interfaces using an FE splitter, and verify error-free operation (no packet loss) for at least 1 hour. Use a physical loop at the far end.

- 45 Mbps interface - connect PDH test equipment to the DS3 interfaces using splitters, and verify error-free operation for at least 1 hour. Use a physical loop between the splitters at the far end.

- 2 Mbps/1.5 Mbps - connect PDH test equipment to the E1/T1 interfaces using splitters, and verify

error-free operation for at least 1 hour. Use a physical loop between the splitters at the far end.

Switching Tests

Define each of the N channels as preferred (one at a time) for errorless switching to the +1 channel. The regular channel supports hitless switching to the +1 channel.

155 Mbps Interface

● Connect SDH/SONET/ATM test equipment to the 155 Mbps interfaces using splitters. Use physical loop between the splitters at the far end. Verify that there are no alarms.

● Perform the following switching tests from one IDM to the other, and verify the system switches automatically.

  - Power: power off the active IDM

  - Radio: disconnect the coax cable of the active IDM

  - Line: disconnect the 155 Mbps line input of the active IDM

  - Management: force a switch using the NMS

● For diversity configurations, verify that each receiver is receiving its own signal, and then mute the active RFU. Verify that the receiver at the far end still receives from the diversity path. Verify that there are no errors in the test equipment.

50/100/200 Mbps, GbE Interface

● Connect a Packet Analyzer to the Fast Ethernet interfaces using splitters. Use a physical loop between the splitters at the far end. Verify no alarms exist.

● Perform the following switching tests from one IDM to the other, and verify the system switches automatically.

  - Power: power off the active IDM

  - Radio: disconnect the coax cable of the active IDM

  - Management: force a switch using the NMS

45/2/1.5 Mbps Interface

● Connect PDH test equipment to the interfaces using splitters. Use a physical loop between the splitters at the far end. Verify no alarms exist.

● Perform the following switching tests from one IDM to the other, and verify the system switches automatically.

  - Power: power off the active IDM

  - Radio: disconnect the coax cable of the active IDM

  - Management: force a switch using the NMS

Interoperability Verification

- Connect the customer end equipment to the line interfaces and verify correct operation.

- Further interoperability tests should be performed in accordance with the specific requirements of the connected end equipment.

Management Verification

- Install network management software on the PC and launch the program.

- Verify that you can manage the link and that you are able to perform changes to the link configuration (frequency channel, TX power, system name, time & date, etc.) via the NMS.

- Verify that the NMS reports the correct parameters when performing the above.

- Verify that there are no active alarms on the link.

- If the management station is located a t a remote site (Network Operation Center), verify that the management station can manage the link and receive traps.

2+0 XPIC Commissioning Procedure

Scope

This section describes the recommended commissioning tests for a GE MDS Intrepid-HC HP radio link in a 2+0 XPIC Co-Channel-Dual-Polarization configuration.

The purpose of the commissioning tests is to verify correct and proper operation of the product.

Important! Since operation of the XPIC system depends on correct installation, make sure the guidelines for XPIC system installation provided below are followed correctly.

XPIC Installation Guidelines

Antenna and RFU Installation

1. Install the dual polarization antenna and point it in the direction of the other site.

2. Install the two RFUs on a dual polarization antenna using the appropriate mounting kit, and mark the RFUs with V and H respectively.

IDU-RFU Cable Installation

1. Install two cables between the RFUs and the drawers (IDMs). Note that cable length difference should not exceed 10 meters.

2. Mark the cables with V and H respectively, and make sure V is connected to the right drawer and H is connected to the left drawer.

3. Mark the drawers respectively.

Antenna Alignment

1. Power up drawer V on both ends of the link and configure it to the desired frequency channel and maximum power.

2. Align the antennas, one at a time, until expected RSL is achieved. Make sure the achieved RSL is no more than +/-4 dB from the expected level.

Polarization Alignment

Polarization alignment is required to verify that the antenna feeds are adjusted, to ensure that the antenna XPD (Cross Polarization Discrimination) is achieved.

Polarization adjustment should be done on one antenna only.

1. Power up drawer V on both ends of the link and record the RSL reading on one end.

2. Power off drawer V on that end and power on drawer H.

3. Check the RSL obtained on this RFU on H pol, and compare it to the RSL obtained by the RFU installed on the V pol.

4. Verify that XPI (Cross Polarization Interference) is at least 25 dB

    where:

    $XPI = RSL_{POL} - RSL_{XPOL}$

    $RSL_{POL} \rightarrow$ Link RSL with the same polarization used at both sites.

    $RSL_{XPOL} \rightarrow$ Link RSL with orthogonal polarizations used at both sites.

5. If XPI is less than 25 dB, adjust the feed polarization by opening the polarization screw and gently rotating the feed to minimize the RSL_{XPOL}.

    Note that polarization alignment is not always possible since the RSL_{XPOL} may fall below the sensitivity threshold of the RFU.

    It is also recommended to try to maximize the XPI as much as possible, by aligning the polarization.

XPIC Commissioning Tests

Individual Link Verification

Before operating in XPIC configuration, each of the links (V and H) should be commissioned individually in order to verify its proper operation.

1   Power up only drawer V at both ends and verify its frequency channel and TX power configuration.

2   Verify that the RSL is no more than +/-4 dB from the expected level.

3   Run BER stability test on the link for at least 15 minutes to ensure error-free operation.

4   Power up only drawer H at both ends and verify its frequency channel and TX power configuration.

5   Verify that the RSL is no more than +/-4 dB from the expected level.

6   Run BER stability test on the link for at least 15 minutes to ensure error-free operation.

XPIC Configuration Verification

1   Using the XPIC cable, connect the two RFUs at each end to the TNC connectors. Make sure the cable is no longer than 3 meters.

2   Configure the drawers to work in XPIC mode.

3   Verify that the RSL at all four RFUs is no more than +/-4 dB from the expected level.

4   Verify that no alarms exist (if a 155 Mbps line is connected).

5   Run BER stability test on each of the 155 Mbps links for at least 1 hour to ensure error-free operation.

Note: In a 2+2 configuration, repeat each step above for each of the four coupled RFU combinations.

XPIC Recovery Verification

In order to verify XPIC operation, simulate the faults described below.

1   Disconnect the IDU-RFU cable for each of the drawers (one at a time), and verify that the other link is operating.

2   Disconnect the XPIC cable and check that the relevant alarms are generated.

3   Power down each of the drawers and verify that the other link is operating.

4   Swap the V and H cables and check that the relevant alarm is generated.

5   Mute and then un-mute one RFU at a time and verify that the other link is operating.

Note: In a 2+2 configuration, repeat each step above for each of the four coupled RFUs connected to the two standby IDUs.

2+2 Verification

Perform the tests specified in *Switching Tests* in the *1+1 Commissioning Procedure* section earlier in this guide.

In this case, the switch will be from a main IDU connected to the main V and main H RFUs, to the secondary IDU connected to the coupled V and coupled H RFUs.

GE MDS Intrepid-HC HP Commissioning Log

The Commissioning Log is an integral part of the commissioning procedure and should be filled in for each installed link.

The Commissioning Log gathers all relevant information regarding the installed link and contains a checklist of all recommended commissioning tests.

Maintaining the Commissioning Log is important for tracking your installations, and to provide essential data for your Networks.

Upon completing the Commissioning Log, store it in a safe place where it can be accessed for possible troubleshooting needs.

GE MDS Intrepid-HC HP LINK COMMISSIONING LOG				
1. GENERAL INFORMATION				
Customer:				
Radio model:				
Configuration:				
Radio link code:				
Site 1 name & add:				
Site 2 name & add:				
2. IN-DOOR UNIT	**Site 1 Drawers Right / Left**		**Site 2 Drawers Right / Left**	
IDC model:				
Wayside channel:				
IDC p/n:				
IDC s/n:				
SW IDC:				
Drawer model				
Main channel				
Drawer p/n				
Drawer s/n				
FW Mux:				
FW Modem:				
Cfg Modem:				

GE MDS Intrepid-HC HP LINK COMMISSIONING LOG (continued)				
3. RFU	**Site 1 Drawers Right / Left**		**Site 2 Drawers Right / Left**	
RFU model:				
RFU p/n:				
RFU Main s/n:				
SW RFU:				
TX frequency (MHz):				
Rx frequency (MHz):				
Link ID:				
TX power (dBm):				
ATPC on/off:				
ATPC ref level:				
RFU Polarization:				
4. ANTENNA	**Site 1 Drawers Right / Left**		**Site 2 Drawers Right / Left**	
Antenna model:				
Antenna size:				
Manufacturer:				
Mounting type:				
Mounting losses:				
5. LINK PARAMETERS	**Site 1 Drawers Right / Left**		**Site 2 Drawers Right / Left**	
Link distance:				
Rain zone:				
Expected RSL (dBm):				
Expected Diversity RSL (dBm):				
RSL Main (dBm):				
RSL Diversity (dBm):				
Deviation from exp?				
RSL ≤4 dB?				

GE MDS Intrepid-HC HP LINK COMMISSIONING LOG (continued)				
6. COMMISSIONING TESTS	**Site 1 Drawers Right / Left**		**Site 2 Drawers Right / Left**	
Front panel LEDs:	All green	All green	All green	All green
Line loopback:	Pass	Pass	Pass	Pass
IDU loopback:	Pass	Pass	Pass	Pass
RFU loopback:	Pass	Pass	Pass	Pass
Radio BER:	Pass	Pass	Pass	Pass
STM-1 test:	Pass	Pass	Pass	Pass
Fast Ethernet test:	Pass	Pass	Pass	Pass
8 x E1/T1 test:	Pass	Pass	Pass	Pass
E3/DS3 test:	Pass	Pass	Pass	Pass
Wayside E1 test:	Pass	Pass	Pass	Pass
Wayside Eth test:	Pass	Pass	Pass	Pass
XPIC test:	Pass	Pass	Pass	Pass
Switching test:	Pass	Pass	Pass	Pass
7. MANAGEMENT CONFIGURATION	**Site 1**		**Site 2**	
Eth Main IP address:				
Eth Coupled IP address:				
Eth IP mask:				
Serial IP address:				
Serial IP mask:				
Default router:				
In-band enabled?				
Gateway/NE:				
In-band channel 1:				
In-band channel 2:				
Ring IP address:				
Ring IP mask:				
Network ID:				
8. REMARKS/NOTES				

| GE MDS Intrepid-HC HP LINK COMMISSIONING LOG |
(continued)

9. INSTALLATION INFORMATION		
Installed by:	Name:	
	Company:	
	Date:	
	Signature:	
Commissioned by:	Name:	
	Company:	
	Date:	
	Signature:	

Appendix A: Connector Pin-Outs

General

This appendix provides pin-outs for IDU connectors, including the following:

- External Alarms Connector

- Protection Connector

- 8 x E1/T1 Connector

- Modem-PPP Cross Cable

- Wayside Channel Connectors

External Alarms Connector Pin-Out

The External Alarms connector is a D-type 15 pin connector.

Pin	Signal	I/O	Description
1	EXT_IN_1	Input	External input alarm #1
2	EXT_IN_2	Input	External input alarm # 2
3	EXT_IN_3	Input	External input alarm #3
4	EXT_IN_4	Input	External input alarm #4
5	EXT_IN_5	Input	External input alarm #5
6	Relay 3 C	Output	Relay #3 common pin
7	Relay 3 NO	Output	Relay #3 normally open pin
8	Relay 2 NO	Output	Relay #2 normally open pin
9	GND	GND	GND
10	Relay 1 NC	Output	Relay #1 normally closed pin
11	Relay 3 NC	Output	Relay #3 normally closed pin
12	Relay 2 C	Output	Relay #2 common pin
13	Relay 2 NC	Output	Relay #2 normally closed pin
14	Relay 1 C	Output	Relay #1 common pin
15	Relay 1 NO	Output	Relay #1 normally open pin
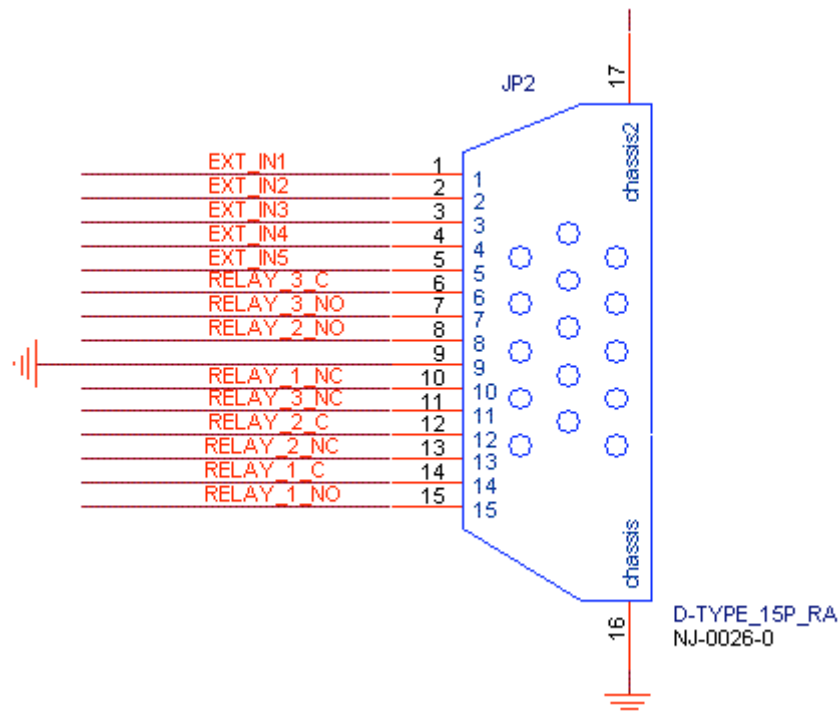
Protection Connector Pin-Out

The Protection connector for is an Rj-45, 8-pin, male type connector.

Pin		Function
Left	Right	
1	1	GND
2	5	E_SLF_OUT
3	6	IDC TXD
4	7	Cable Echo
5	2	E_MT_IN
6	3	IDC RXD
7	4	NA
8	8	GND

8 x E1/T1 Connector Pin-Out

The 8 x E1/T1 connector is a 36-pin connector.

Connector Pin #	Signals	Color		Connector Pin #	Signals	Color	
11	OUT - TIP 1	Brown/Red	TWISTED PAIR	1	IN - TIP 1	Blue/White	TWISTED PAIR
29	OUT - RING 1	Red/Brown		19	IN - RING 1	White/Blue	
12	OUT - TIP 2	DarkBlue/Red	TWISTED PAIR	2	IN - TIP 2	Orange/White	TWISTED PAIR
30	OUT - RING 2	Red/DarkBlue		20	IN - RING 2	White/Orange	
13	OUT - TIP 3	Blue/Black	TWISTED PAIR	3	IN - TIP 3	Green/White	TWISTED PAIR
31	OUT - RING 3	Black/Blue		21	IN - RING 3	White/Green	
14	OUT - TIP 4	Orange/Black	TWISTED PAIR	4	IN - TIP 4	Brown/White	TWISTED PAIR
32	OUT - RING 4	Black/Orange		22	IN - RING 4	White/Brown	
15	OUT - TIP 5	Green/Black	TWISTED PAIR	5	IN - TIP 5	DarkBlue/White	TWISTED PAIR
33	OUT - RING 5	Black/Green		23	IN - RING 5	White/DarkBlue	
16	OUT - TIP 6	Brown/Black	TWISTED PAIR	6	IN - TIP 6	Blue/Red	TWISTED PAIR
34	OUT - RING 6	Black/Brown		24	IN - RING 6	Red/Blue	
17	OUT - TIP 7	DarkBlue/Black	TWISTED PAIR	7	IN - TIP 7	Orange/Red	TWISTED PAIR
35	OUT - RING 7	Black/DarkBlue		25	IN - RING 7	Red/Orange	
18	OUT - TIP 8	Blue/Yellow	TWISTED PAIR	8	IN - TIP 8	Green/Red	TWISTED PAIR
36	OUT - RING 8	Yellow/Blue		26	IN - RING 8	Red/Green	
9,10	Shell (1)	-	SHIELD				

Notes:

- Shell is connected to IDU chassis GND.
- The following pins are **not** connected: 27,28.

Modem-PPP Cross Cable Pin-Outs

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

DB9 to DB9 Cross Cable

DB9 Male		Connection	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

Notes:

1. Shell is connected to IDU chassis GND.
2. The following pins are **not** connected: 6, 7, 8, 9, 15, 23, 36, 37, 38, 39.

Wayside Channel Connector Pin-Outs

The following are pin-outs for Wayside channel interfaces.

E1/T1 Connector Pin-Out

RJ-45 Male Connector Pin	Signal
1	Ch1_Rx+, Receive Positive - Primary
2	Ch1_Rx-, Receive Negative - Primary
3	Ch2_Rx+, Receive Positive - Secondary
4	Ch1_Tx+, Transmit Positive- Primary
5	Ch1_Tx-, Transmit Negative - Primary
6	Ch2_Rx-, Receive Negative - Secondary
7	Ch2_Tx+, Transmit Positive - Secondary
8	Ch2_Tx-, Transmit Negative - Secondary

10BaseT Connector Pin-Out

RJ-45 Male Connector Pin	Signal
1 2	Twisted Pair, Out - Tx Ch2 (Right)
3 6	Twisted Pair, In - Rx Ch2 (Right)
4 5	Twisted Pair, Out - Ch1 Tx (Left)
7 8	Twisted Pair, In - Ch1 Rx (Left)

GE MDS Intrepid-HC HP Installation and Operation

GE MDS

Appendix B: PPP/SLIP Driver Installation

Installation for Windows 2000/2003/XP

1. Click **Start**, **Settings**, **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 users**.
10. Click **Next**.
11. Type **The connection Name**.
12. Click **Finish**.

Configuring PPP

1. Click **Start**, **Settings**, **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 Unit).
12. Click **OK**.
13. Click **OK**.

GE MDS

Appendix C: Frequency Information

General

This appendix provides frequency information for the GE MDS Intrepid-HC HP.

Note: For other frequency channels not listed in this appendix, please contact your factory representative.

Frequency Channels

6L GHz (5.85-6.45 GHz)

ITU-R F.383-7 [1-3]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
240	1	5955.00	1	6195.00
	2	5995.00	2	6235.00
	3	6035.00	3	6275.00
	4	6075.00	4	6315.00
	5	6115.00	5	6355.00
	6	6155.00	6	6395.00

ITU-R F.383-7 [0] / FCC 101.147(i8)				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
252.04	1	5945.20	1	6197.24
	2	5974.85	2	6226.89
	3	6004.50	3	6256.54
	4	6034.15	4	6286.19
	5	6063.80	5	6315.84
	6	6093.45	6	6345.49
	7	6123.10	7	6375.14
	8	6152.75	8	6404.79

FCC 101.147(i7)				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
	1	5935.32	1	6187.36
	2	5945.2	2	6197.24
	3	5955.08	3	6207.12
	4	5964.97	4	6217.01
	5	5974.85	5	6226.89
	6	5984.73	6	6236.77
	7	5994.62	7	6246.66
	8	6004.5	8	6256.54
	9	6014.38	9	6266.42
	10	6024.27	10	6276.31
	11	6034.15	11	6286.19
	12	6044.03	12	6296.07
252.04	13	6053.92	13	6305.96
	14	6063.8	14	6315.84
	15	6073.68	15	6325.72
	16	6083.57	16	6335.61
	17	6093.45	17	6345.49
	18	6103.33	18	6355.37
	19	6113.22	19	6365.26
	20	6123.1	20	6375.14
	21	6132.98	21	6385.02
	22	6142.87	22	6394.91
	23	6152.75	23	6404.79
	24	6162.63	24	6414.67

ITU-R F.384-7				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
260	1	5955.00	1	6215.00
	2	6015.00	2	6275.00
	3	6075.00	3	6335.00
	4	6135.00	4	6395.00

ITU-R F.497-6 [0]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
266	1	5941.00	1	6207.00
	2	5969.00	2	6235.00
	3	5997.00	3	6263.00
	4	6025.00	4	6291.00
	5	6053.00	5	6319.00
	6	6081.00	6	6347.00
	7	6109.00	7	6375.00
	8	6137.00	8	6403.00

6H GHz (6.45-7.1 GHz)

ITU-R F.384-7				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
340	1	6460.00	1	6800.00
	2	6500.00	2	6840.00
	3	6540.00	3	6880.00
	4	6580.00	4	6920.00
	5	6620.00	5	6960.00
	6	6660.00	6	7000.00
	7	6700.00	7	7040.00
	8	6740.00	8	7080.00

FCC 101.147(k7)				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
170	1	6545	1	6715
	2	6555	2	6725
	3	6565	3	6735
	4	6585	4	6745
160	1	6595	1	6755
	2	6605	2	6765
	3	6615	3	6775
	4	6625	4	6785
	5	6635	5	6795
	6	6645	6	6805
	7	6655	7	6815
	8	6665	8	6825
	9	6675	9	6835
	10	6685	10	6845
	11	6695	11	6855

	12	6705	12	6865
40	1	6535	1	6575

7 GHz (7.1-7.9 GHz)

ITU-R 385-7 [1]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
154A	1	7442	1	7596
	2	7470	2	7624
	3	7498	3	7652
	4	7526	4	7680
	5	7554	5	7708

ITU-R 385-7 [1]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
154B	1	7456	1	7610
	2	7484	2	7638
	3	7512	3	7666
	4	7540	4	7694
	5	7568	5	7722

ITU-R 385-7 [0]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
161	1	7138.5	1	7299.5
	2	7226	2	7387
	3	7428	3	7589
	4	7526	4	7687

ITU-R 385-7 [1]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
245	1	7442	1	7687
	2	7470	2	7715
	3	7498	3	7743
	4	7526	4	7771
	5	7554	5	7799
	6	7582	6	7827
	7	7610	7	7855
	8	7638	8	7883

ITU-R 385-7 [0]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
161A	1	7138.5	1	7299.5
	2	7166.5	2	7327.5
	3	7194.5	3	7355.5
	4	7222.5	4	7383.5
	5	7250.5	5	7411.5
	11	7145.5	11	7306.5
	12	7173.5	12	7334.5
	13	7201.5	13	7362.5
	14	7229.5	14	7390.5
	21	7152.5	21	7313.5
	22	7180.5	22	7341.5
	23	7208.5	23	7369.5
	24	7236.5	24	7397.5
	31	7159.5	31	7320.5
	32	7187.5	32	7348.5
	33	7215.5	33	7376.5
	34	7243.5	34	7404.5

ITU-R 385-7 [0]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
161B	1	7263.5	1	7424.5
	2	7291.5	2	7452.5
	3	7319.5	3	7480.5
	4	7347.5	4	7508.5
	5	7375.5	5	7536.5
	11	7270.5	11	7431.5
	12	7298.5	12	7459.5
	13	7326.5	13	7487.5
	14	7354.5	14	7515.5
	21	7277.5	21	7438.5
	22	7305.5	22	7466.5
	23	7333.5	23	7494.5
	24	7361.5	24	7522.5
	31	7284.5	31	7445.5
	32	7312.5	32	7473.5
	33	7340.5	33	7501.5
	34	7368.5	34	7529.5

ITU-R 385-7 [0]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
161C	1	7438.5	1	7599.5
	2	7466.5	2	7627.5
	3	7494.5	3	7655.5
	4	7522.5	4	7683.5
	5	7550.5	5	7711.5
	11	7445.5	11	7606.5
	12	7473.5	12	7634.5
	13	7501.5	13	7662.5
	14	7529.5	14	7690.5
	21	7452.5	21	7613.5
	22	7480.5	22	7641.5
	23	7508.5	23	7669.5
	24	7536.5	24	7697.5
	31	7459.5	31	7620.5
	32	7487.5	32	7648.5
	33	7515.5	33	7676.5
	34	7543.5	34	7704.5

ITU-R 385-7 [0]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
161D	1	7563.5	1	7724.5
	2	7591.5	2	7752.5
	3	7619.5	3	7780.5
	4	7647.5	4	7808.5
	5	7675.5	5	7836.5
	11	7570.5	11	7731.5
	12	7598.5	12	7759.5
	13	7626.5	13	7787.5
	14	7654.5	14	7815.5
	21	7577.5	21	7738.5
	22	7605.5	22	7766.5
	23	7633.5	23	7794.5
	24	7661.5	24	7822.5
	31	7584.5	31	7745.5
	32	7612.5	32	7773.5
	33	7640.5	33	7801.5
	34	7668.5	34	7829.5

ITU-R 385-7 [3]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
168B	1	7457	1	7625
	2	7485	2	7653
	3	7513	3	7681
	4	7541	4	7709
	5	7569	5	7737

ITU-R 385-7 [1]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
182	1	7428	1	7610
	2	7456	2	7638
	3	7484	3	7666
	4	7512	4	7694
	5	7540	5	7722

ITU-R 385-7 [3]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
196	1	7121	1	7317
	2	7149	2	7345
	3	7177	3	7373
	4	7205	4	7401
	5	7233	5	7429

ITU-R 385-7 [4]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
245	1	7442	1	7687
	2	7470	2	7715
	3	7498	3	7743
	4	7526	4	7771
	5	7554	5	7799
	6	7582	6	7827
	7	7610	7	7855
	8	7638	8	7883

8 GHz (7.8-8.5 GHz)

ITU-R 386-6 [4]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
266	1	7926	1	8192
	2	7954	2	8220
	3	7982	3	8248
	4	8010	4	8276
	5	8038	5	8304
	6	8066	6	8332
	7	8094	7	8360
	8	8122	8	8388

GE MDS Intrepid-HC HP Installation and Operation

ITU-R 386-6 [1]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
311.32A	1	7747.70	1	8059.02
	2	7777.35	2	8088.67
	3	7807.00	3	8118.32
	4	7836.65	4	8147.97
	5	7866.30	5	8177.62
	6	7895.95	6	8207.27
	7	7925.60	7	8236.92
	8	7955.25	8	8266.57

ITU-R 386-6 [1]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
311.32B	1	7732.875	1	8044.195
	2	7762.525	2	8073.845
	3	7792.175	3	8103.495
	4	7821.825	4	8133.145
	5	7851.475	5	8162.795
	6	7881.125	6	8192.445
	7	7910.775	7	8222.095
	8	7940.425	8	8251.745

ITU-R 386-6 [3]				
T/R Separation	n (L)	Center Frequency MHz	n (H)	Center Frequency MHz
119	1	8293	1	8412
	2	8307	2	8426
	3	8321	3	8440
	4	8335	4	8454
	5	8349	5	8468
	6	8363	6	8482

IN CASE OF DIFFICULTY...

GE MDS products are designed for long life and trouble-free operation. However, this equipment, as with all electronic equipment, may have an occasional component failure. The following information will assist you in the event that servicing becomes necessary.

TECHNICAL ASSISTANCE

Technical assistance for GE MDS products is available from our Technical Support Department during business hours (8:00 A.M.—5:30 P.M. Eastern Time). When calling, please give the complete model number of the radio, along with a description of the trouble/symptom(s) that you are experiencing. In many cases, problems can be resolved over the telephone, without the need for returning the unit to the factory. Please use one of the following means for product assistance:

        Phone: 585 241-5510   E-Mail: TechSupport@GEmds.com

        FAX: 585 242-8369   Web: www.GEmds.com

FACTORY SERVICE

Component level repair of this equipment is not recommended in the field. Many components are installed using surface mount technology, which requires specialized training and equipment for proper servicing. For this reason, the equipment should be returned to the factory for any PC board repairs. The factory is best equipped to diagnose, repair and align your radio to its proper operating specifications.

If return of the equipment is necessary, you must obtain a Service Request Order (SRO) number. This number helps expedite the repair so that the equipment can be repaired and returned to you as quickly as possible. Please be sure to include the SRO number on the outside of the shipping box, and on any correspondence relating to the repair. No equipment will be accepted for repair without an SRO number.

SRO numbers are issued online at **www.GEmds.com/support/product/sro/**. Your number will be issued immediately after the required information is entered. Please be sure to have the model number(s), serial number(s), detailed reason for return, "ship to" address, "bill to" address, and contact name, phone number, and fax number available when requesting an SRO number. A purchase order number or pre-payment will be required for any units that are out of warranty, or for product conversion.

If you prefer, you may contact our Product Services department to obtain an SRO number:

Phone Number: 585-241-5540
Fax Number: 585-242-8400
E-mail Address: productservices@GEmds.com

The radio must be properly packed for return to the factory. The original shipping container and packaging materials should be used whenever possible. All factory returns should be addressed to:

        GE MDS, LLC
        Product Services Department
        (SRO No. XXXX)
        175 Science Parkway
        Rochester, NY 14620 USA

When repairs have been completed, the equipment will be returned to you by the same shipping method used to send it to the factory. Please specify if you wish to make different shipping arrangements. To inquire about an in-process repair, you may contact our Product Services Group using the telephone, Fax, or E-mail information given above.

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