TransCell 1900CB System

Installation Manual for Use with Fiber and Coaxial Cable Networks

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TransCell 1900CB System

Installation Manual for Use with Fiber and Coaxial Cable Networks

REVIEW AND CONCURRENCE

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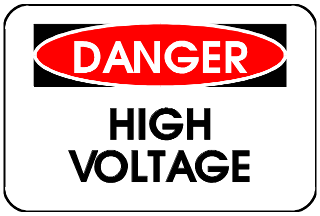


- High leakage current: The Hub rack, internal or external (environmental) enclosure must be connected to Protective Earth ground before any connection is made to +24 VDC prime power.
- High Voltages (110/220 VAC and 24 VDC) are present within the Hub rack or environmental enclosure. Use extreme caution when working inside the rack/enclosure.
- High voltages may exist close to the CMI location; use standard electrical industry safety practices when working on an installed CMI.
- High voltages (110/220 VAC RMS) exist on the AC power input to the CMI. Use extreme caution when removing the AC power cable to avoid coming in contact with the center conductor.
- Laboratory tests conducted in accordance with ANSI/IEEE C95.1-1992 show that a transmitting CMI poses no radiation hazard to persons in close proximity to the transmitting antenna. However, for added safety when working near a CMI, maintain a minimum distance of 12 inches from the transmitting antenna.

ESD CAUTION

The CMI contains circuit card assemblies that are sensitive to Electrostatic Discharge (ESD) damage. Whenever handling the CMI, use ESD precautionary procedures to minimize the risk of permanent ESD damage to circuit card components. Low relative humidity level increases the potential for damage to ESD-sensitive devices.

FCC License Data

The CMI is licensed by the Federal Communications Commission for operation in the frequency band as noted on the product label affixed to the CMI Chassis.

National Recognized Test Laboratories (NRTL) Data

Cable Microcell Integrator (CMI), Models 1000000G1-33, 1000501G1-6, 1000601G1-33, and 1000701G1-6: Listed as **Communications Service Equipment NRTL 1950**

Hub Equipment Racks (Models 1000023P1 and 1000025P1) with the Hub Interface Converters (Models 1000604G1-3 and 8334760G1-3) and Hub Control Unit Model (1000015P1): Basic Listing as **Information Technology Equipment**, Complementary Listing as **Professional Video Equipment**

SECTION 1
INTRODUCTION

1.1 SCOPE

This manual contains installation and checkout instructions for the components of the TransCell 1900CB system. The TransCell 1900CB system provides the means to distribute wireless Personal Communications Services (PCS) telephony signals encoded with the Code Division Multiple Access (CDMA) protocol over fiber or coaxial cable infrastructures. This manual addresses the TransCell 1900CB installation for both fiber and coaxial networks, and for both indoor and outdoor Hub equipment, distinguishing the unique requirements for each case as needed. The manual is organized as follows:

- *Section 1, Introduction* - terminology definitions, brief descriptions of the TransCell 1900CB system and its major components
- *Section 2, Hub Indoor/ Outdoor Rack Installation* - installation and checkout of the Hub Equipment (HE) rack configurations; installation of the Hub Control Unit (HCU), and the Hub Interface Converter (HIC)
- *Section 3, CMI Installation* - Cable Microcell Integrator (CMI) installation and checkout of the outside cable network at selected remote locations in the service area
- *Section 4, BTS Interface and Network Optimization* - measurement and adjustment procedures for optimal integration of the TransCell 1900CB system with the Base Transceiver Stations (BTS), with variations according to BTS manufacturer
- *Appendix A, Radio Frequency Interface Unit (RFIA) Installation* - installation of the RFIA, to provide a cable transition at the HIC, provide a stable 10 or 15 MHz reference signal for the HICs in the primary or expansion racks and the duplexing of signals between the HICs and the BTS
- *Appendix B, PCS channel-number-to-frequency cross-reference table*
- *Appendix C, HIC Channel Number-to-frequency cross-reference table*

1.2 TERMINOLOGY, ACRONYMS, AND ABBREVIATIONS

1.2.1 TransCell 1900CB Terminology

The following words and phrases are used throughout this manual when referring to signal flow over the fiber/cable network, between the subscriber's PCS handset and the wireless telephony network's BTS:

- Forward Link – direction of the fiber/cable network from the HIC to the CMI, supporting communications from the BTS to subscriber units.
- Forward Path - the physical/electrical path for forward link signals
- Reverse Link – direction of the fiber/cable network from the CMI to the HIC, supporting communications from subscriber units to the BTS.
- Reverse Path - the physical/electrical path for reverse link signals

1.2.2 Acronyms and Abbreviations

AWG	American Wire Gage
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
CMI	Cable Microcell Integrator
CRT	Cathode Ray Tube
Ctl	Control
EIA	Electronic Industries Association
ESD	Electrostatic Discharge
FCC	Federal Communications Commission
FWD	Forward (BTS to Subscriber)
HCU	Hub Control Unit
HE	Hub Equipment
HFC	Hybrid Fiber Coax Infrastructure
HIC	Hub Interface Converter
IF	Intermediate Frequency
kbps	Kilobits Per Second
LED	Light Emitting Diode
MHz	Megahertz
NOCC	Network Operation Control Center
NRTL	National Recognized Test Lab
OA&M	Operation, Administration, and Maintenance
PCS	Personal Communications Services
PEGND	Protective Earth Ground
PN	Pseudo Noise
POTS	Plain Old Telephone Service
RBW	Resolution Bandwidth
RCV	Receive
Ref	Reference
REV	Reverse (Subscriber to BTS)
RFIA	Radio Frequency Interface Assembly
RTN	Return
Rx	Receive
SMIU	Sector Management Interface Unit
Tx	Transmit
UL	Underwriters Laboratories
XMIT	Transmit

1.2.3 Notation Conventions in this Manual

This manual assumes that the user has a basic knowledge of the Windows NT®operating system. Several typographic conventions and standard Windows NT® terms are used in this manual when discussing the TransCell Network Manager software. They are as follows:

Mouse Commands - The TransCell Network Manager software uses only the left mouse button:

- "click" - press and release the left mouse button
- "double-click" - press and release left mouse button twice in quick succession

Menu Commands - Menu commands are bolded with each command level separated from the previous one by a slash (/) mark, e.g., "Select **Privileges/Modify Privileges**."

Button Names – Command button names in dialogs are underlined, e.g., "To confirm selection, click OK."

Key Names - Key names are spelled out and appear in small, bold capital letters, e.g. **ENTER, ESCAPE, AND CONTROL.**

Dialogs and Messages - Dialog and message titles appear in all upper case (capital) letters, and generally the name is referenced exactly as shown on the title bar, e.g., the PCS FREQUENCY dialog. However, in cases where the dialog title varies according to privilege level, enclosure, or sector, the title is shortened to exclude this variable information unless the variable is important. If a dialog title is referenced that includes a specific HIC or CMI number, the number is represented by the bracketed letter **n**: e.g., CMI CONTROL PANEL: ALPHA SECTOR, CMI [n].

Dialog Options - Dialog options (text boxes and radio buttons) are shown in italics, e.g., "Type in the desired *PCS Frequency*." All instructions to "select" or "choose" an option imply clicking on that option, although options can be selected via the keyboard as well.

Keyboard Input - Instructions for keyboard entries start with "Type in...", and anything that should be typed in verbatim is shown in a contrasting font. For example, "Type in `config01.dtb` in the *File Name* box."

Displayed Text - Text displayed in a dialog box is shown in another contrasting font, e.g., "The CONFIGURATION OPTIONS dialog displays the query "`Do you Want To Restore a Pre-existing Configuration?`".

1.3 REFERENCE DOCUMENTATION

- Hub Control Unit (HCU)-associated vendor hardware/software documentation (Computer, Monitor, Watchdog Timer, etc.) Transcept Document No. 1000015P1
- TransCell 1900CB System Acceptance Test Procedure Requirements, Transcept Document No. 1000095
- Mobile Station-Base Station Compatibility Std for Wideband Spread Spectrum Cellular Systems, TIA/EIA-95-B

1.4 SYSTEM OVERVIEW

The TransCell 1900CB system permits the transport of CDMA PCS signals between a Base Transceiver Station (BTS) and mobile users over fiber/coaxial cable infrastructures. The cable network (fiber, coax, or hybrid) is used to distribute the PCS signals between the cable Hub or hub facility and attached remote locations throughout the service area.

The TransCell 1900CB system has four primary components: Cable Microcell Integrator (CMI), Hub Interface Converter (HIC), RF Interface Assembly (RFIA), and Hub Control Unit (HCU) and two fiber optic peripherals: Hub Fiber Interface (HFI) and Remote Fiber Interface (RFI). The HICs and CMIs provide the carrier frequency translation and signal conditioning needed for the CDMA signal (single carrier or three-carrier) interfaces between mobile user, BTS, and fiber/coaxial network. The HCU provides the operation, administration, and maintenance (OA&M) functions for the system. The RFI and HFI provide the conversion between light and RF energy.

As shown in Figure 1-1, in the reverse path a CMI at a remote location receives a CDMA signal from a mobile PCS unit via the receive antennas, converts its PCS carrier frequency to an IF frequency and sends the signal to the associated HIC at the Hub. The HIC converts the signal carrier back to the PCS frequency and routes the signal to the BTS. The BTS then switches the signal into the telephone network.

In the forward path, the process is inverted. The HIC receives the CDMA signal from the BTS, translates the carrier frequency to an IF frequency and sends the signal to the CMI. The CMI translates the signal carrier back to the PCS frequency, amplifies the signal, and radiates it via the transmit antenna for capture by the mobile PCS unit. One HIC provides the BTS interface for up to three CDMA sectors and may control as many as 30 CMIs.

The HICs and CMIs normally handle the transport of PCS traffic over the fiber/coaxial network without assistance from the HCU. The HCU is used to set up frequency, attenuation, and fault reporting parameters and to change those parameters as needed. In normal operation, the HCU allows operators to monitor system operational status and alarms.

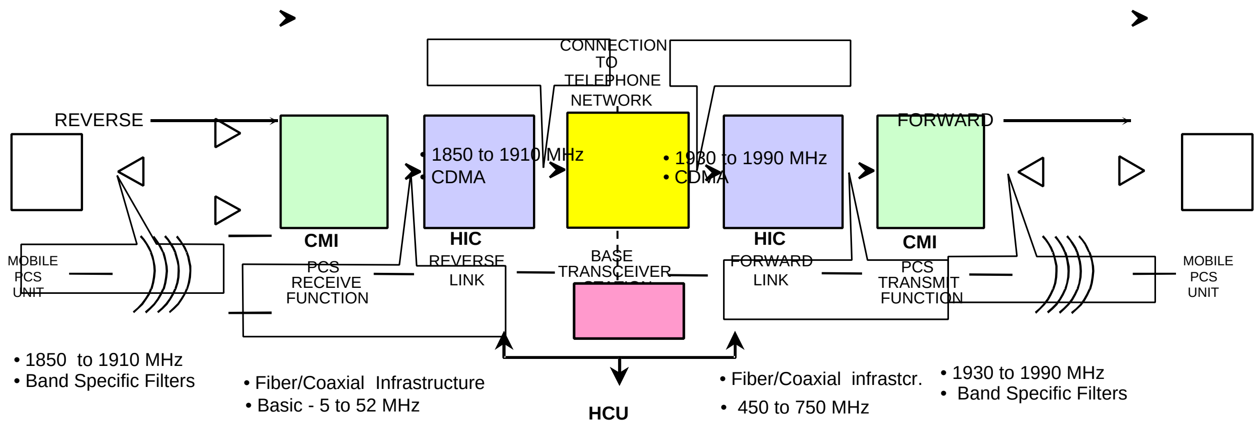


Figure 1-1. TransCell 1900CB System Functional Block Diagram

For installations with existing environmentally controlled indoor Hub or hub facilities, the typical TransCell 1900CB configuration consists of up to three Hub Equipment (HE) enclosures stacked, containing a HCU, three Hub Fiber Interface Units (HFIs), three RF Interface Assemblies (RFIAs), and three HICs. Additional enclosures may be purchased when more than three HICs are required at a given site. Each HIC is connected to several CMIs which are installed on the outside fiber/coaxial network.

For ruggedized outdoor installations, the HCU and HICs are housed in an outdoor environmental controlled enclosure.

Either the indoor or outdoor system installation may also include a network interface unit to remote the HCU for centralized monitoring and control of PCS network operation.

1.4.1 Hub Equipment (HE) Enclosure Configurations

The HE enclosure contains these major components:

- ♦ Hub Control Unit (HCU)
- ♦ RF Interface Assembly (RFIA)
- ♦ Hub Interface Converters (HICs)
- ♦ Hub Fiber Interface Unit (HFI) (Optional)
- ♦ +24 VDC Power Supply (Optional)

There are three stackable enclosure configurations available. One enclosure houses the HCU (PC, Monitor, and Keyboard). The second enclosure houses an RFIA, HIC, HFI (optional), Power Supply (Optional), and a network interface box (remote configuration only). The third enclosure houses two RFIAs, two HICs, and two HFIs (Optional). Section 2 of this manual contains a detailed assembly list for each enclosure configuration. The following paragraphs describe the major assemblies that are normally installed in the configurations along with some optional assemblies.

1.4.1.1 Hub Control Unit (HCU)

The HCU is installed in one Hub equipment enclosure. A single HCU supports up to 26 HICs. The HCU may also be installed in a central location (NOCC) and remoted to an outside enclosure. This configuration is used for those installations in uncontrolled environments. The major HCU hardware components are:

- ♦ Computer chassis
- ♦ Color CRT Monitor
- ♦ Keyboard/Touchpad/Mouse

The HCU is the monitoring and control device for the attached HIC units and their assigned CMIs. It monitors various system parameters to verify that these units are operational and that signal power is being maintained at the proper levels. The HCU communicates with the HICs over an RS-485 interface via a LonWorks® card located in the computer, and through the HICs it communicates with the CMIs. The HCU interprets all faults reported by the HICs and CMIs into alarms, which are logged and displayed. The computer also contains one or more modems for remote monitoring and control of the HCU located at a central control point.

The major HCU software components are:

- Microsoft® Windows NT®
- pcANYWHERE Version 8.0 or later (optional)
- TransCell Network Manager software
- Software drivers for custom HCU functions

1.4.1.2 RF Interface Assembly (RFIA)

The RFIA provides a transition from the larger and more rigid cables from the BTS and cable plant to smaller and more flexible cables for connecting the HICs. It also provides a stable 10 or 15-MHz reference signal for the HICs.

Depending on the site requirements these RFIA configurations provide duplexing of the RF signals between the HIC and the BTS and the cabling between the HIC and HFI or Fiber/Coaxial Network. One RFIA is required for each HIC installed in the enclosure(s). Each RFIA requires +24 VDC for operation. For more detailed description and installation instructions, see Appendix A.

1.4.1.3 Hub Interface Converter (HIC)

The HIC is the direct interface between the RFIA and Fiber/Coaxial network. It processes up to three forward link sector of CDMA PCS signals (single carrier or three carriers) and up to three pairs of diversity reverse link CDMA PCS signals (single carrier or three carriers). The HIC converts the PCS frequencies from the BTS to an intermediate frequency (IF) suitable for transmission over fiber/coaxial cable to its associated CMIs, and it converts the IF signals from the CMIs to PCS frequencies for the BTS. The HIC uses rear panel connectors to interface with the RFIA and HFI or coaxial cable network. Each HIC supports up to 10 CMIs on each of three CDMA sectors (up to 30 CMIs total per HIC). The HIC assigns each CMI its frequency and gain levels.

Each HIC consists of two-circuit card assemblies that contains the components for the three sector interfaces and the digital circuitry. A DC-operated fan cools the HIC by pulling air into the front and exhausting the air via the rear side panels.

1.4.1.4 Hub Fiber Interface (HFI)

The HFI is an interface unit that converts IF CDMA signals to/from light and interfaces the HIC with the fiber network. The HFI contains three independent fiber optic transceivers that may be configured to support multiple fiber optic networks. Typical configurations are one HFI per HIC since one sector is typically designated to a geographical area and each HIC supports three sectors. The HFI power source requirements is +24VDC. Each fiber optic transceiver unit contains a separate laser on/off lockable switch located on the front panel of the unit.

1.4.1.5 Cable Assemblies

Cable assemblies provided with each enclosure interconnect the installed assemblies within the enclosure. Cable assemblies are not provided for external interconnection between the enclosure and BTS or fiber/cable network. Refer to Section 2 for a list of cable assemblies provided with each enclosure configuration.

1.4.1.6 Equipment enclosure

The indoor and outdoor equipment enclosure is a standard EIA design that holds and secures standard 19-inch-wide enclosure-mounted assemblies. The equipment enclosure dimensions are:

	Indoor Enclosure	Outdoor Enclosure
♦ Height	24 inches	39 inches (minus lift brackets)
♦ Depth	25 inches	26 inches
♦ Width	20 inches	24 inches

1.4.1.7 +24 VDC Power Supply Assembly (Optional)

For installation sites where an external +24 VDC prime power source is unavailable, an optional +24 VDC Power Supply is available for enclosure installation. The +24 VDC Power Supply operates on either 110 or 220 VAC. The +24 VDC Power Supply will be used to power all three of the HICs installed in an enclosure.

1.4.2 Remote Fiber Interface (RFI)

The RFI is a fiber node. The unit contains a fiber optic transceiver and an AC (110/220VAC) to DC power supply. The RFI resides at the demarcation point, between the Hub HFI and a network of Coaxial CMIs, where the fiber no longer is available and coaxial cable must be extended to the CMIs.

1.4.3 Cable Microcell Integrator (CMI)

The CMI is the communications link between the PCS handset and the fiber/cable network. It processes a single forward link and single pair of diversity reverse link CDMA PCS carriers (single carriers or three-carriers). Each CMI is controlled by its assigned HIC. The CMI is comprised of the following major hardware assemblies:

- ♦ Power Extractor - routes the tapped coaxial IF CDMA signals to/from the RF Transceiver in a coaxial CMI.
- ♦ Internal Fiber Interface – converts light to/from the IF frequencies to/from the RF transceiver in a fiber CMI.
- ♦ Transceiver - responds to control messages from the assigned HIC and converts the CDMA signals to the appropriate transmission frequencies.
- ♦ Power Amplifier - enabled/disabled by the assigned HIC; boosts the CDMA signal sent to the PCS handset via an antenna.
- ♦ Power Supply - converts the 110/220VAC power to the DC voltages required by the Transceiver, Internal Fiber Interface, and Power Amplifier.
- ♦ CMI Housing Assembly - environmentally sealed fireproof enclosure for all of the four CMI assemblies.
- ♦ Antennas – one transmit and two receive, typically omnidirectional. Antennas are optionally available from Transcept, depending on customer preference.

1.4.3.1 Power Extractor

The CMI Power Extractor is available in two configurations:

- Single (or *Combined*) Mode, Sub-Split: Basic frequency range - 5 to 42 MHz
- Single (or *Combined*) Mode, Mid-Split: Extended frequency range - 5 to 52 MHz

The Power Extractor routes the following signals:

- Reverse link signals from the Transceiver module, 5 to 42 MHz (basic) or 5 to 52 MHz (extended)
- Forward link signals to the Transceiver module, 450 to 750 MHz

> **NOTE**
>
> References to reverse link frequency range in this manual imply a range of 5 to 52 MHz. However, if a single mode sub-split (basic) Power Extractor module is installed in a CMI, the range for that CMI will be 5 to 42 MHz.

The relationship between the Power Extractor configuration and the way in which the CMI is electrically connected to the coaxial cable is as follows:

- The *Single Mode* is configured to operate with both the forward and reverse link signals on a single interface port (FWD/REV). The CMI is configured in this mode by installing the Single Mode, Sub-Split (basic frequency range) or the Single Mode, Mid-Split (extended frequency range) Power Extractor module.

The Power Extractor accommodates field-replaceable, plug-in attenuator pads for both the forward and reverse paths, and a field-replaceable, plug-in equalizer (should be zero for typical installations) in the forward path. These component locations are accessible when the CMI housing cover is open, without the need to remove the Power Extractor. The CMI is shipped with no pads or equalizer installed. It will accept Scientific Atlanta model numbers PP-0 to PP-10 attenuator pads, or equivalent, and Scientific Atlanta model number EQ750 equalizers, or equivalent.

1.4.3.2 Internal Fiber Transceiver

The Internal Fiber Transceiver converts 1310nm-laser light to IF energy that feeds the RF Transceiver in the forward direction. In the reverse direction, the unit converts IF energy from the RF Transceiver to 1550nm light (2mW max). The power interface to the Internal Fiber Interface is DC power coming from the power supply. The fiber optic cable is connected to the fiber network via a coupler and passes through a housing interface and connected directly to the Internal Fiber Transceiver.

1.4.3.3 Transceiver

The Transceiver contains a dual receiver and a transmitter, and incorporates both analog and digital signal processing and control. Reverse link RF signals, originating in the PCS wireless domain, are received by both the primary and diversity receivers, processed and sent, via the coaxial/fiber network, to a Hub location. Forward link signals, originating at the Hub, travel via the coaxial/fiber network to the CMI where they are processed by the transmitter and sent to the Power Amplifier.

The Transceiver has four LED indicators on its outer surface, clearly visible when the CMI cover is open. One LED is normally lit to indicate presence of +5 VDC power, while the other three are normally unlit. These three LEDs light only to indicate particular Transceiver fault conditions. The Transceiver is available in three different PCS frequency band sets (A/D, B/E, C/F) (see Table 3-2); the desired band set is selected at the time of order.

1.4.3.4 Power Supply

The Power Supply requires a 110/220VAC, 50/60-Hz voltage input. It produces four DC voltages, +25V, +15V, +5V, and -15V, for use by the Transceiver and Power Amplifier. For overcurrent protection, the Power Supply AC input is fused. The fuse is accessible with the power supply cover removed.

1.4.3.5 Power Amplifier

The Power Amplifier operates in one of three 20-MHz pass bands corresponding to the selected Transceiver frequency band for a single carrier CMI. For a multi-carrier (three) unit, the power amplifier covers the entire 60MHz pass band. Power Amplifier parameters include:

- Gain Approximately 60 dB
- Power Output +35.0 dBm/+39.0dBm max
- Power Output Dynamic Range 15 dB minimum

1.4.4 CMI Antennas

The CMI requires three antennas for operation: two receive and one transmit. For typical aerial operation, 6-dBi gain antennas, approximately 8 inches in length, are used. The receive antennas are installed on brackets and extend below a messenger strand. The transmit antenna is installed on a bracket and extends above a messenger strand. A separation of six feet between the diversity receive antennas is recommended to achieve reasonable spatial diversity. The use of the 6-dBi gain antennas with a minimum transmit-to-receive antenna distance of 36 inches will achieve the required transmit-to-receive antenna isolation in excess of 40 dB. See the paragraph 3.3.5.2 for installation procedures.

1.4.5 Outdoor Enclosure Unit)

The outdoor enclosure configuration is a ruggedized equivalent of an indoor enclosure without the HCU, used for installation in uncontrolled environments. The enclosure accommodates a network interface unit, HIC, an RFIA (timing reference source), a +24VDC power supply (optional), and a heating/cooling unit. All modules in the enclosure are either rack mountable or mounted on 19-inch trays. The maximum footprint of the pedestal is 24 x 26 inches. The maximum height of the cabinet is 45 inches (including lift brackets). The enclosure conforms to NEMA 3R requirements.

SECTION 2
HUB ENCLOSURE INSTALLATION

This section describes the installation of the Hub equipment and their constituent components. Most of the component installation procedures are identical between the indoor and outdoor configurations; differences are stated in the installation procedures.

2.1 INSTALLATION TASKS

Installing the Hub equipment involves the following major tasks:

- Preparing space for the individual enclosure
- Installing equipment in the enclosure
- Installing interconnecting cables in the rack
- Installing interconnecting cables between equipment and fiber/coaxial network
- Installing interconnecting cables between equipment and BTS
- Installing interconnecting cables between HIC and HFI
- Installation checkout

2.2 TOOLS, TEST EQUIPMENT, AND SUPPLIES

Table 2-1 lists the tools and test equipment needed (but not supplied) to support the enclosure installation.

Table 2-1. Enclosure Installation Tools and Test Equipment

Hand Tools	Test Equipment
• Philips Screwdriver # 2 head • Flat Blade Screwdriver # 2 head • Wrench, 5/16 inch • Wrench, 7/16 inch • Wrench, 3/8 inch • Nut Driver ¼ inch • Tape Measure • Torque Wrenches • Cable Tie Installation Tool, Panduit GS2B, or equivalent	• Hand-held Digital Multimeter with test probes • Spectrum Analyzer, HP 8593 or equivalent

2.3 INSTALLATION PARTS LIST

Table 2-2 lists the typical parts shipped for each Hub installation. Before proceeding with the installation, inventory the kit contents to ensure all parts are present for the applicable installation.

Table 2-2. Hub Equipment Enclosure Assembly Installation Kit

Assembly Item	Part No.	Indoor Enclosure 1000023P1	Outdoor Enclosure 8339254G1
Equipment enclosure			
Indoor Hub Enclosure	1000023P1	Up to 3	
Outdoor Hub Enclosure	1000025P1		1
Hub Enclosure Stacking Kit	1000059G1	Up to 2	
Hub Enclosure Cable Kit	1000064G1	Up to 3	1
Hub Power Supply Assembly (Optional)	1000056G1	1 (Optional)	1 (Optional)
Communications Harness	1000063G1	1	1
Cable ties, 12 inches long	PLT3S-C	12	12
Cable ties, 5.25 x 3.32 inches	SST1.5I-C	10	2
Cable Tie Mount, Self Adhesive	ABMM-AT-C	2	2
Cable Clamp, 3/8”, Nylon	NAS1397P6N	5	2
Busbar Assembly	P/O Enclosure	Up to 3	1
Equipment			
Hub Control Unit (HCU) Assembly Computer, Pentium Monitor, 14-inch color PS/2 Keyboard with Touchpad, Computer Power Cord Monitor Power Cord Rack Mounting Brackets Windows NT®, Version 4.0 PcANYWHERE, Version 8.0 (Optional)	1000022G1	1	N/A
Hub Interface Converter (HIC)	1000604G1,G2, or G3 OR 8334760G1,G2, or G3	Up to 3 OR Up to 3	1
Hub Fiber Interface (HFI) (Optional)	1000014P2	Up to 3 (Optional)	1 (Optional)
Hub Power Supply Assembly (Optional)	1000056G1	1 (Optional)	1 (Optional)
RF Interface Assembly (RFIA)	1000035G1,G2, G3	Up to 3	1

2.4 POWER REQUIREMENTS

Both the indoor and outdoor enclosures require external 110/220 VAC, single phase, 50/60 Hz with use of power supply and HCU, or +24 VDC for prime power.

2.4.1 Typical Prime Power Requirements

When both 110/220 VAC, single phase, 50/60 Hz and +24 VDC are available at the installation site, an enclosure with 3 HICs/HFIs installed requires approximately 8 amperes of +24 VDC power. The HCU requires approximately 2.0 amperes of 110 VAC, 50/60 Hz (or approximately 1.0 ampere of 220 VAC, 50/60 Hz), single phase power.

2.4.2 Protective Earth Grounding

The Hub Equipment Enclosures must be properly grounded to protect installers and operators from electrical shock. For this purpose there are two-1/4 in. x 20 ground studs located on the left and right rear of the enclosure floor panel. These studs are used to ground the internal components to the enclosure and to connect the enclosure to the site ground. The site grounding cable should consist of UL-approved wire of no less than 14 gauge. The wire should attach to one of the ground stud by means of a properly sized ring terminal. The enclosure is supplied with a split washer and a 1/4-in. x 20 nut to secure the grounding cable ring terminal to the stud.

2.5 HUB EQUIPMENT CONFIGURATION AND SPACE REQUIREMENTS

2.5.1 Suggested Floor Space Requirements

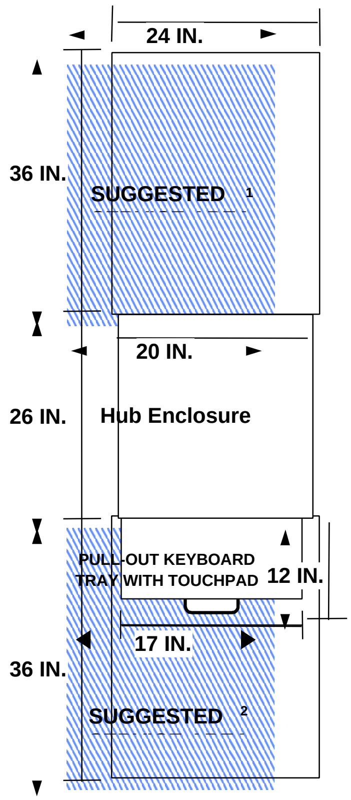
Figure 2-1 shows the suggested floor space to support the Indoor Hub Equipment enclosure installation, operator workspace, and service area.

2.5.2 Floor Loading Requirements

In order to safely support the weight of a fully loaded enclosure unit, the floor of the installation site must be rated for a load of 150 pounds per square foot or more .

2.5.3 Typical Enclosure Configuration

Figure 2-2 shows a typical enclosure configuration as it appears before installation of the rack-mounted assemblies. The indoor enclosure configurations use the same enclosures and are stackable up to three high. Each individual enclosure is 24 inches high, 25 inches deep, and 20 inches wide (outside dimensions). A minimum of 36 inches of clear space behind the enclosure is recommended for servicing and proper ventilation. The HCU contains an extendable keyboard tray, which adds another 36 inches of clearance requirement in front of the enclosure for operator workspace. The enclosures are bolted together via the “Hub Enclosure Stacking Kit; PN 1000059G1” and it is recommended that the enclosure be bolted to the floor.



NOTES

1. **Suggested work area for installation and maintenance**
2. **Suggested work area to support installation and operation**

Figure 2-1. Recommended Hub Equipment Floor Space

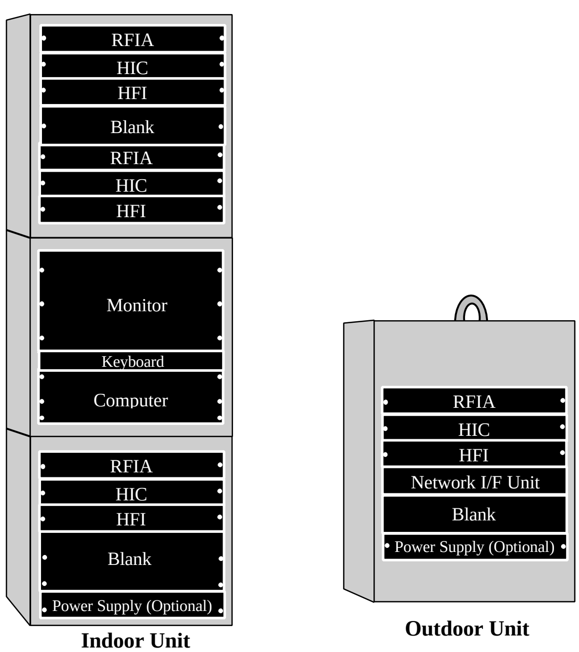


Figure 2-2. Typical Enclosure Configuration

2.6 INSTALLATION OF ASSEMBLIES IN EQUIPMENT ENCLOSURE

Paragraph 2.6.1, Indoor and outdoor enclosure installation, provides step-by-step instructions for installing hardware assemblies, cables, wiring, etc.

2.6.1 Hub Enclosure Installation

For installation sites that do not provide an external +24 VDC power source, an optional internal +24 VDC Power Supply, part number 1000056G1, must be installed in the enclosure. If an external +24 VDC power source is available, skip to paragraph 2.6.1.2.

2.6.1.1 Hub +24 VDC Power Supply Installation

If the +24 VDC Power Supply has been procured as an option, install as follows:

a. Connect Power Supply Input Cable (supplied with unit) to an AC outlet/source as follows:

   Black wire to Line AC (L1) terminal

   White wire to Neutral AC (L2) terminal

   Green wire to ground terminal

b. Verify polarity of wires, then connect ring terminal ends of Power Supply Output Cable P/N 1000056G1 to V1 (+) and (–) terminals.

> **NOTE**
>
> See 2.6.1.3 for connecting the output of the +24 VDC Power Supply to the Prime Power Panel.

c. Connect ring terminal of PEGND cable P/N 1000060G1 to ¼-inch ground stud on back of the +24 VDC Power Supply.

d. Install +24 VDC Power Supply into rack in the bottom of the lower enclosure unit.

e. Secure +24 VDC Power Supply to rack with two 10-32 in. x 0.50 screws and washers.

f. Connect FASTON® connector of PEGND cable to PEGND leg of busbar at a position adjacent to +24 VDC Power Supply.

g. … wer

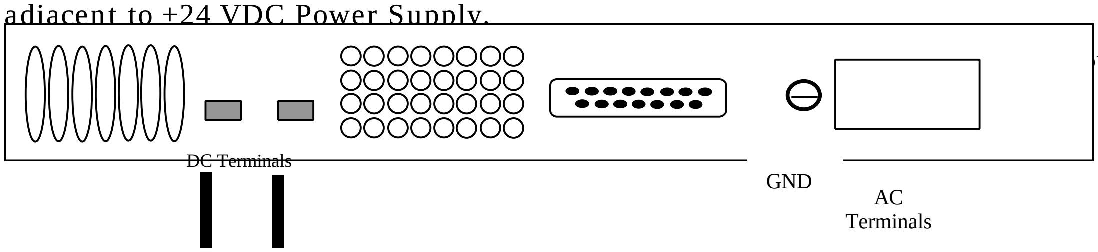


Figure 2-3. +24 VDC Power Supply Rear Panel

2.6.1.2 Hub Control Unit (HCU) Installation

The HCU, Keyboard, and Computer will take up one entire enclosure. For the outside enclosure, these items are replaced with a network interface unit (PN 1000057G1) and the HCU is remote from the outside enclosure. The following procedure is for the indoor enclosure configuration.

> **NOTE**
>
> Both fixed and sliding sections of the keyboard slides are installed in the rack at the factory. As part of the HCU installation, the sliding (keyboard tray) section of each slide is removed from the rack and installed on the keyboard tray.

a. Using a short cable tie, secure both touchpad cable and keyboard cable to cable tie mount at rear of left slide.

b. Using six short cable ties, secure both touchpad cord and keyboard cable along length of cable retractor. Do not over-stretch keyboard cable coils.

c. Locate two HCU rack-mounting brackets packed with HCU software media.

d. Remove hardware from bracket mounting holes on left and right sides toward front of computer.

e. Using hardware removed, attach two brackets to chassis and tighten.

f. Insert computer into enclosure at location shown in Figure 2-4.

g. Slide computer onto angle rails and secure to rack using four 10-32 in. x .50 mounting screws and washers.

h. Connect keyboard cable to KEYBOARD connector at rear of HCU computer chassis (Figure 2-5).

i. Connect touchpad cable to MOUSE connector at rear of HCU computer chassis (Figure 2-5).

j. While supporting front and back of HCU monitor, carefully insert monitor into front of rack at location shown in Figure 2-4.

k. Secure HCU monitor to rack using eight mounting screws and washers supplied with monitor.

l. Connect HCU monitor video cable to video connector at rear of HCU computer chassis (Figure 2-5).

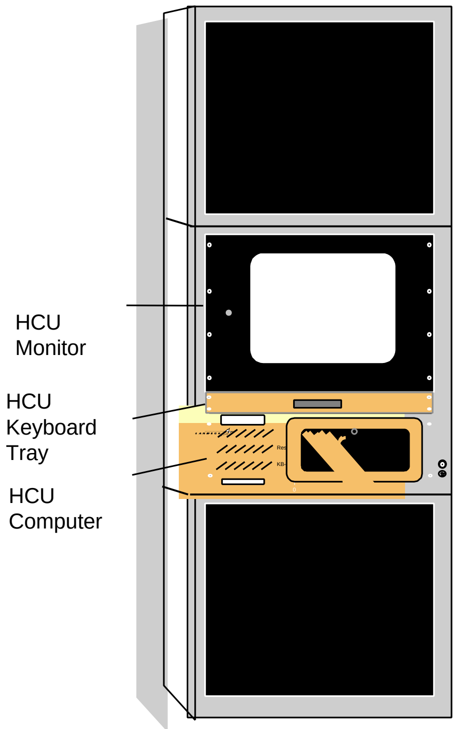


Figure 2-4. Typical Indoor Enclosure Configuration

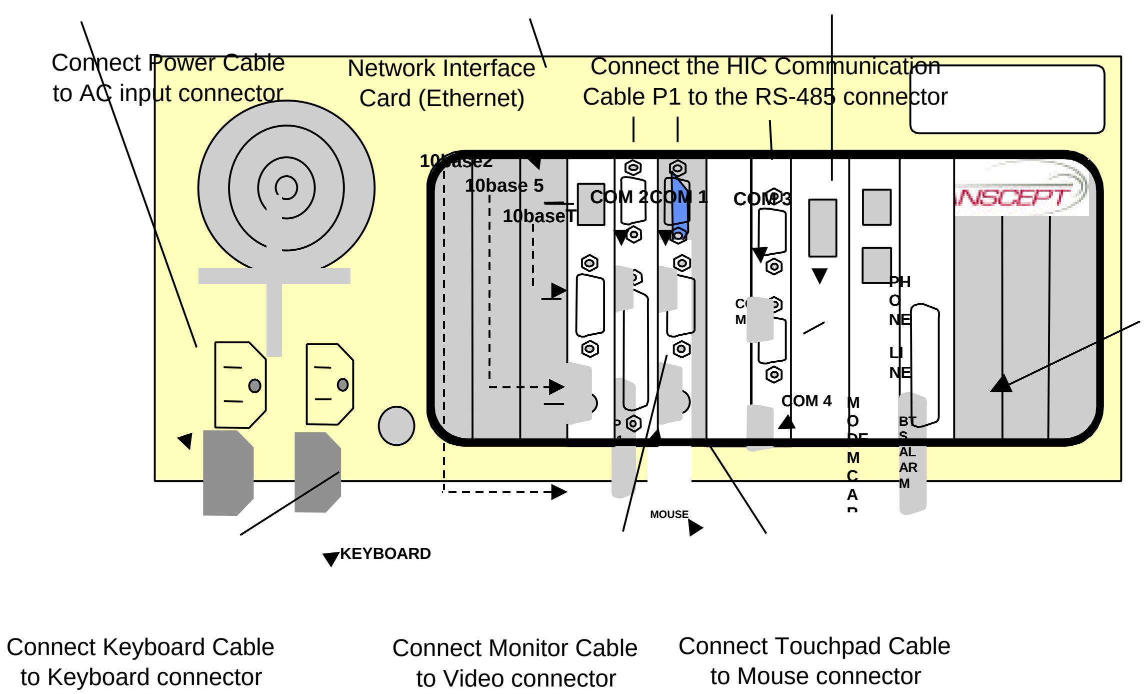


Figure 2-5. HCU Computer Rear View

2.6.1.3 +24 VDC Prime Power Installation

The +24 VDC interface for the Indoor Enclosures are terminal blocks located on the inside of each enclosure on the upper rear panels. The terminal block accepts two wires (+24VDC and RTN) and distributes the power through busbars. Wire sizes accepted by the terminal block range from AWG #14 to AWG # 4.

a. Before connecting power to enclosure, ensure that internal or external +24 VDC power is OFF.

b. Secure +24 VDC input wires from the Power Supply or external power source to Input Terminal Block with compression screws. Using a flat blade screwdriver, back off the two screws on input section of Input Terminal Block.

NOTE
For enclosures using the optional +24 VDC Power Supply, use power supply output cable P/N 1000056G1 in place of the on-site external +24 VDC power cabling.

2.6.1.4 Initial Prime Power Test

This test requires a multimeter capable of measuring +24 VDC, and associated test probes. The external or internal +24 VDC supply should be energized at this time. Perform the following procedure to verify the voltage:

Using a multimeter, measure and record busbar voltage. (The Enclosure/HIC data sheet at the end of this manual may be reproduced and used for recording.) Verify that voltage is between +20 and +28 VDC and that polarity matches labels on busbar mounting brackets.

2.6.1.5 Initial HCU Test

a. At the HCU front panel, set monitor power switch to ON and observe that power indicator lights. (The monitor power may be from the computer.)

b. Set computer power switch to ON and observe that power indicator lights. If monitor is powered from computer, monitor power indicator will also light.

c. Observe that computer boots up within 45 seconds and monitor displays Windows NT® desktop screen.

d. Pull out keyboard tray and operate touchpad to verify cursor control.

e. Place cursor on **Start** button on Windows NT desktop and click left mouse button. A pop up menu appears.

f. Place cursor on **Shut Down ...** selection and click left mouse button. A SHUTDOWN WINDOW dialog appears.

g. Click on *Shut down the computer?* Then click on <u>Yes</u> button. The computer begins an orderly shutdown process. Wait until a screen message appears indicating that it is safe to remove power from computer.

2.6.1.6 RF Interface Assembly (RFIA) Installation

NOTE

It is highly recommended that the RFIAs be installed in the enclosure in the following order so that the enclosure does not become top-heavy and unstable if the enclosure is not bolted to the floor:

- The first RFIA should be installed in the top slot of the lower enclosure below the keyboard.
- RFIAs 2 and 3 should be installed starting in the slot just above the bottom slot of the top enclosure followed by one in the top slot of the top enclosure.

a. Install RFIAs in enclosure by sliding them onto angle brackets and securing them with screws and washers.

b. Repeat step *a* for remaining RFIAs.

c. Locate +24VDC Power Wiring Harness P/N 1000062G1 (Figure 2-7) for each RFIA.

d. At a location parallel to RFIA PWR connector, connect +24VDC connector of wiring harness to +24VDC busbar and +24VRTN connector to +24VRTN busbar.

e. Plug mating connector of power cable into RFIA PWR connector and tighten connector retaining screws.

f. Repeat steps d and e for remaining RFIAs.

2.6.1.7 Hub Fiber Interface (HFI) (Option)

a. Install HFIs in enclosure by sliding them onto angle brackets and securing them with screws and washers.

b. Repeat step *a* for remaining HFIs.

c. Locate +24VDC Power Wiring Harness P/N 1000074G1 for each HFI.

d. At a location parallel to HFI PWR connector, connect +24VDC connector of wiring harness to +24VDC busbar and +24VRTN connector to +24VRTN busbar.

e. Plug mating connector of power cable into HFI PWR connector and tighten connector retaining screws.

f. Repeat steps d and e for remaining HFIs.

2.6.1.8 Hub Interface Converter (HIC) Installation

> **NOTE**
>
> It is highly recommended that the HICs be installed in the enclosure in the following order so that the enclosure does not become top-heavy and unstable if the enclosure is not bolted to the floor:
>
> - The first HIC should be installed in the slot below the RFIA of the lower enclosure below the keyboard.
> - HICs 2 and 3 should be installed starting in the lower slot of the top enclosure followed by one in the upper part of the top enclosure below the RFIA.

a. Install HICs in enclosure by sliding them onto angle brackets and securing them with screws and washers.

b. Connect one end of GND Cable Assembly P/N 1000060G1 to ground studs on the enclosures located on the bottom panel of the enclosure and the other end on to the wing nut screw on the back of the HIC.

c. Repeat steps *a* and b for remaining HICs.

d. Locate +24VDC Power Wiring Harness P/N 1000062G1 (Figure 2-7) for each HIC.

e. At a location parallel to HIC PWR connector, connect +24VDC connector of wiring harness to +24VDC busbar and +24VRTN connector to +24VRTN busbar.

f. Plug mating connector of power cable into HIC PWR connector and tighten connector retaining screws.

g. Repeat steps d and f for remaining HICs.

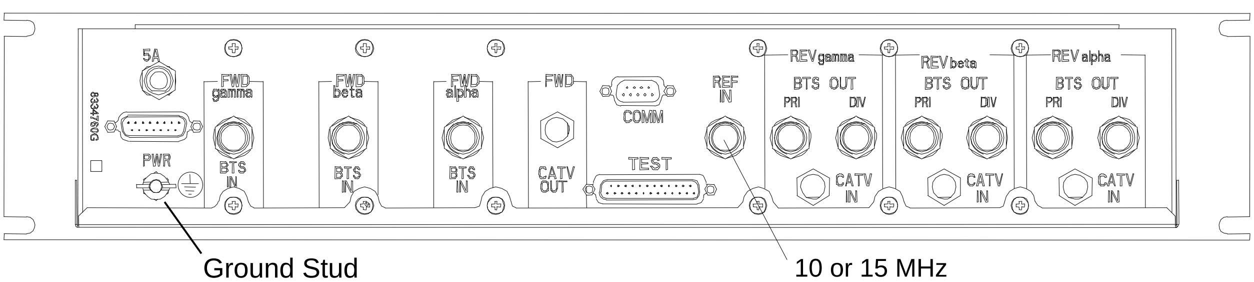


Figure 2-6. HIC Rear Panel

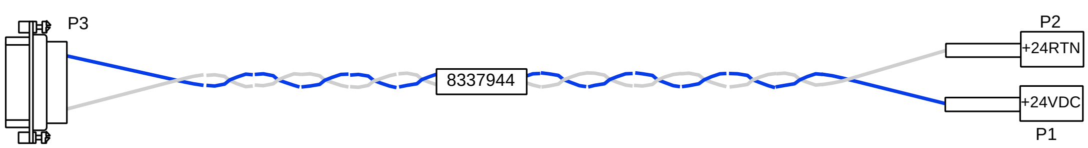


Figure 2-7. HIC Power Wiring Harness 1000062G1

2.6.1.9 Digital Communications Wiring Installation

The HIC communicates with the computer via an RS-485 interface using a LonWorks® protocol. The RS-485 interface uses twisted 3-wire 22-gauge wire, beginning at the computer and connecting to the upper and lower HIC modules a RS-485 cable assembly PN 1000063G1. Figure 2-8.

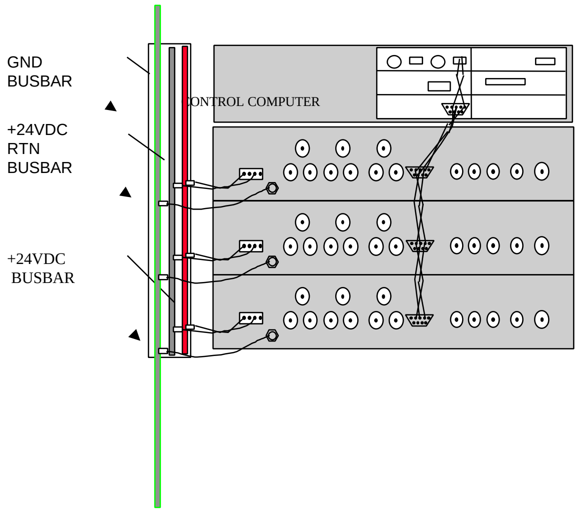


Figure 2-8. Three HIC Control Interconnect Diagram (not to scale)

a. Mate connector P1 of HIC Communication Wiring Harness P/N 1000063G1 (Figure 2-9) to RS-485 port on computer rear panel (Figure 2-5).

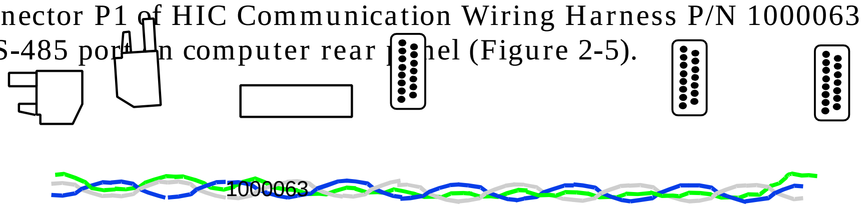


Figure 2-9. HIC Communication Wiring Harness P/N 8339969G1

b. Connect the other connector to the additional HICs.

2.7 HUB EQUIPMENT CABLE INSTALLATION

With the exception of the indoor and outdoor interface cables between the RFIA and HIC and between the HIC and HFI, external RFIA interface cables are not provided with the enclosures or HICs. The cables are provided locally by the user at the installation site. For the Hub Equipment enclosures, the user must provide up to 14 cables for each RFIA/HIC installed:

One cable to interface the 15 MHz Reference to the HIC (if using external reference), four cables interface the HIC with the coaxial network (if applicable), three fiber cables interface the HFI with the fiber network (if applicable), and nine cables interface the RFIA with the BTS. Figure 2-10 shows the RF cable interconnections between a single installed HIC, an RFIA, coaxial network, and BTS. If the HFI is required, configure the cables between the HIC and HFI to meet the fiber network architecture.

2.7.1 10/15 MHz Reference cable Installation between RFIA and HIC

a. Connect a RF cable (PN 1000066G1) to 15-MHz output of RFIA and route cable to vicinity of HIC. Do not connect cable at this time.

b. Measure power level at output of cable. Verify that 15 MHz output level from RFIA is between 0 and -16 dBm.

c. Record measured power level (the Enclosure/HIC data sheet at the end of this manual may be reproduced and used for recording).

d. Connect cable to Ref In port on HIC after level has been verified and recorded.

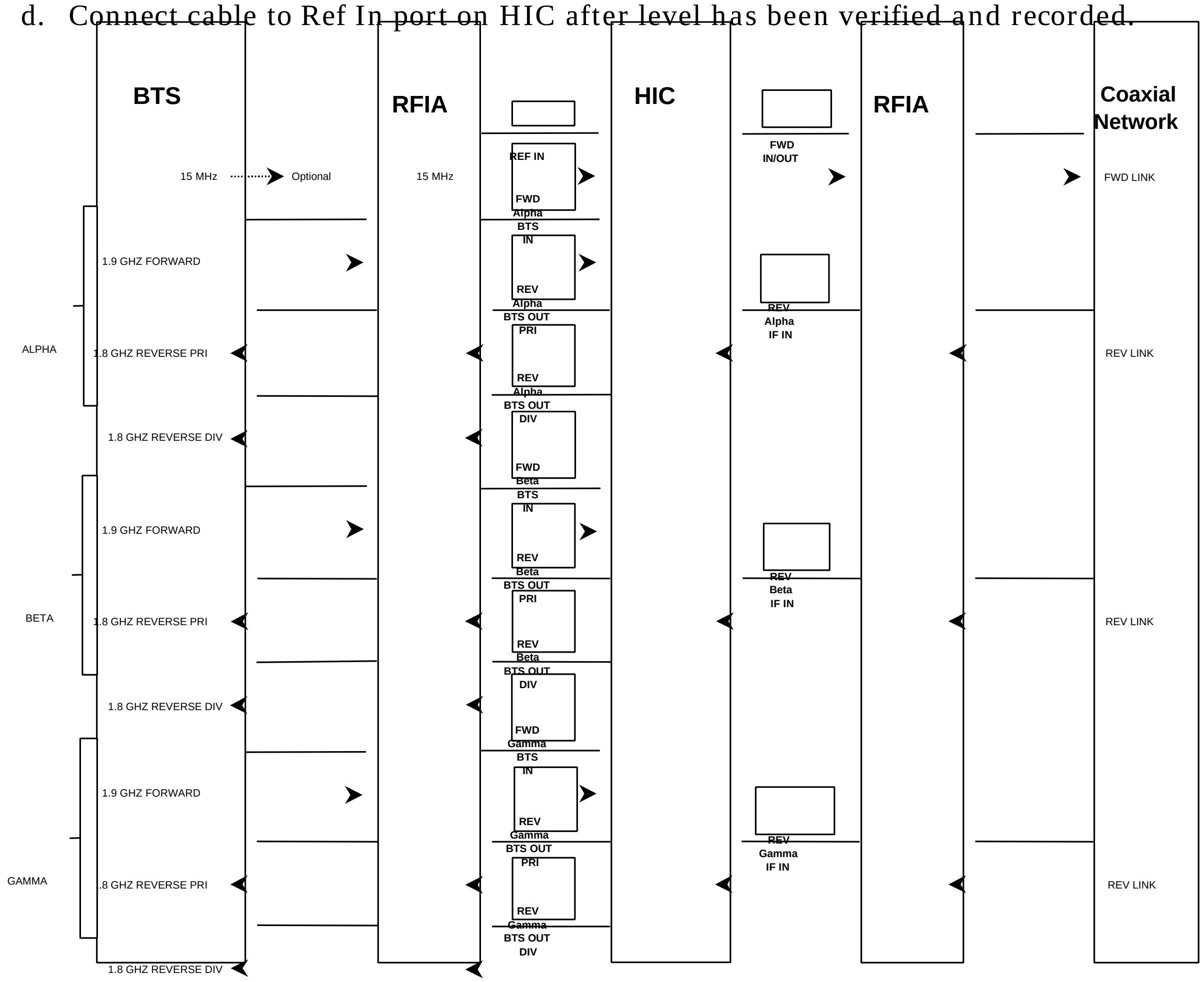


Figure 2-10. BTS/HIC/Coaxial Network RF Cabling Diagram (15MHz from RFIA shown)

2.7.2 Remote User Interface

The HCU computer provides four general purpose RS-232 serial ports to be used to facilitate remote access and control of the HCU graphical user interface. These interfaces may be used to connect to a NOCC. The ports are located on the HCU computer rear panel (Figure 2-5):

- Com1: RS-232
  - Supports a data rate of up to 9600 bps
  - Read Only Port (ROP)
  - All messages are in ASCII text message format
  - Used to transmit alarms to the NOCC on an unsolicited basis
- Com2: RS-232
  - Supports a data rate of up to 9600 bps
  - Read/Write Port (RWP)
  - All messages are in ASCII text message format
  - Handles the remote operator interaction
  - Receives remote operator queries and control messages
  - Transmits status and statistics back to remote operator
- Com3: RS-232
  - Supports a data rate of up to 9600 bps
  - General purpose port for remote graphical user interface
- Com4: Growth
  - Supports a data rate of up to 9600 bps
  - General purpose port for remote graphical user interface

2.7.3 HCU Modem

The HCU computer is provided with an internal modem, which supports a data transmission rate of up to 56 kbps. This interface may be used to connect to a NOCC through a phone line. The modem connectors (Phone, Line) are located on the rear panel of the HCU computer (Figure 2-5).

2.8 INSTALLATION CHECKOUT - INITIAL TURN-ON

These installation checkout procedures provide a confidence check of the TransCell 1900CB Hub equipment before interfacing it with the BTS. These procedures should be performed prior to installing any CMIs. BTS interfacing and network optimization is covered in Section 4 of this manual.

2.8.1 Reverse Link Input from Network Infrastructure

This procedure checks the power level of the reverse link input signal from the fiber/coaxial plant to each HIC sector.

a. Connect a reverse link RF cable from an appropriate alpha sector reverse link device in Hub enclosure and route cable to selected HIC.

b. Connect cable to REV alpha CATV IN port on rear panel of selected HIC.

c. Repeat steps *a* through *d* for reverse link beta and gamma sectors.

> **NOTE**
>
> To minimize disturbance of HIC cables that have already been routed and tied at the rear of the rack, it is recommended that each HIC be electrically checked after it is installed, before proceeding to the next HIC installation.

d. Continue to paragraph 2.8.2 to verify HIC operation before proceeding with cabling for next HIC installation.

2.8.2 HIC Initial Turn-on and Communication Test

a. Verify that power switches on all HICs, computer, and monitor are OFF.

b. Verify that +24 VDC BUSBAR PWR.

c. If installed, set the +24 VDC Power Supply power switch to ON and observe that the power supply indicates +24 VDC on meter.

> **NOTE**
>
> The HIC data sheet at the end of this manual may be reproduced and used for recording the measured levels specified in the following procedures.

d. Set computer and monitor power switches to ON position.

e. Extend keyboard tray.

f. Set front panel PWR switch, of first HIC to **1** (ON) and verify that green front panel PWR indicator lights.

g. Observe that HIC front panel LEDs blink and remain off. Normal indications for these LEDs are as follows:

ID	Lights to identify activated HIC (acquired by HCU software)
FAULT	Lights to indicate a operational fault in HIC
COMM	Flashes to indicate communications between HIC and CMI; if indicator is continuously lit, probable fault in HIC

h. Repeat step f. and g. for remaining installed HICs.

i. Set HIC front panel PWR switch to **0** (OFF) on all HICs.

j. Set both computer and the monitor power switches to OFF.

2.8.3 HCU Setup for HIC Checkout

a. Using touchpad, select HCU Control Panel icon in Program Group.

b. Observe that CONFIGURATION OPTIONS dialog (Figure 2-11) appears on monitor.

c. Click No to accept default system configuration and display HUB CONTROL PANEL dialog.

d. Observe that HUB CONTROL PANEL: USER dialog (Figure 2-12) appears on monitor.

e. At HUB CONTROL PANEL: USER dialog, select **Privileges/Increase Privileges** from menu bar. HCU SYSTEM ACCESS dialog appears.

f. Enter Super-User password and click OK to return to HUB CONTROL PANEL dialog. Verify that dialog title bar now reads HUB CONTROL PANEL: SUPER-USER.

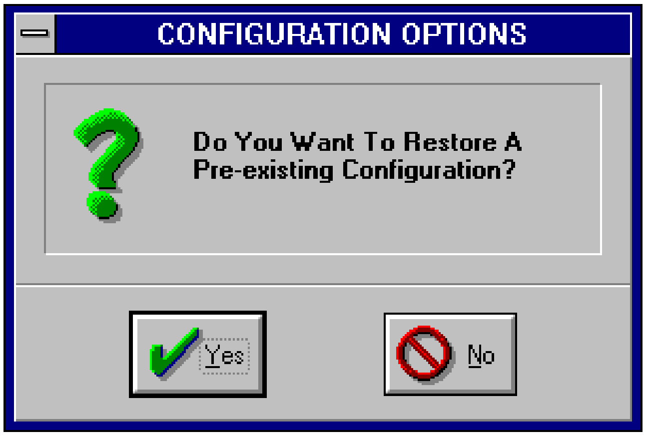


Figure 2-11. CONFIGURATION OPTIONS Dialog

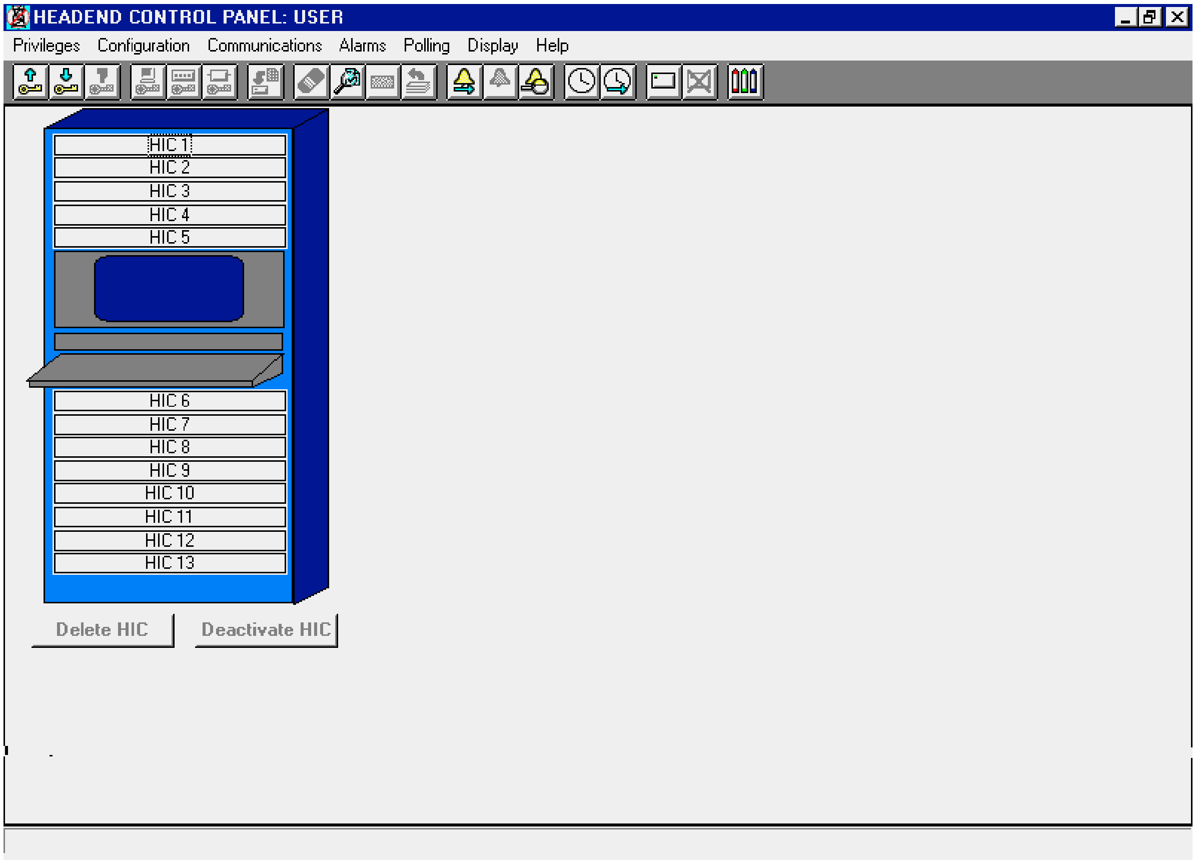


Figure 2-12. HUB CONTROL PANEL: USER Dialog

2.8.4 HIC Activation

This procedure, also referred to as HIC acquisition, adds the selected HIC to the database for monitoring and control by the HCU. The procedure also shows that the HIC and HCU are communicating and that all cable interconnections are satisfactory.

a. On selected HIC, set front panel power switch to **1** (ON).

b. Observe that PWR indicator is lit and ID, FAULT, and COMM indicators are not lit.

c. At HUB CONTROL PANEL: SUPER-USER dialog (Figure 3-5 of O&M manual), double-click on numbered panel (HIC 1–HIC 13) representing HIC to be activated.

d. Observe that ADD HIC dialog (Figure 2-13) appears.

e. Type data in following boxes (do not press enter):

Enter *Neuron ID* using 12 Hexadecimal characters (required)

Enter *Cell ID* (Optional reference data)

Enter *Serial Number* of HIC (Optional reference data)

f. Type in *Reverse Frequency* values for *Alpha/Beta/Gamma* sectors. Minimum spacing between *Primary* and *Diversity* values is 2 MHz, maximum is 4.75 MHz for a single carrier system and 5.5MHz for a three carrier system. Overall range is 5 to 52 MHz or 5 to 42 MHz, depending on Power Extractor configuration in the CMIs. This range can be set in 0.25-MHz increments.

g. Type in *Forward Channel* number: Range 62–94, 100–116.

h. Type in desired *PCS Frequency*: Range 1930–1990 MHz in 0.05 MHz steps.

i. Set following options to indicated position:

Power Output (Enable/Disable)

Reference Tone (Enable/Disable)

Control Tone (Enable/Disable)

Reset (Defaults/Last Values)

j. Click OK to add new HIC.

k. Verify that HUB CONTROL PANEL dialog appears and that numbered panel icon representing added HIC appears in green.

> **NOTE**
>
> A non-green, flashing HIC icon indicates an alarm. Alarm information may be viewed by selecting **Alarms/Show Unacknowledged Alarms** from the HUB CONTROL PANEL menu bar. Table 4-2 in this manual provides a complete list of alarms.

l. Observe that ID indicator blinks on front panel of selected HIC.

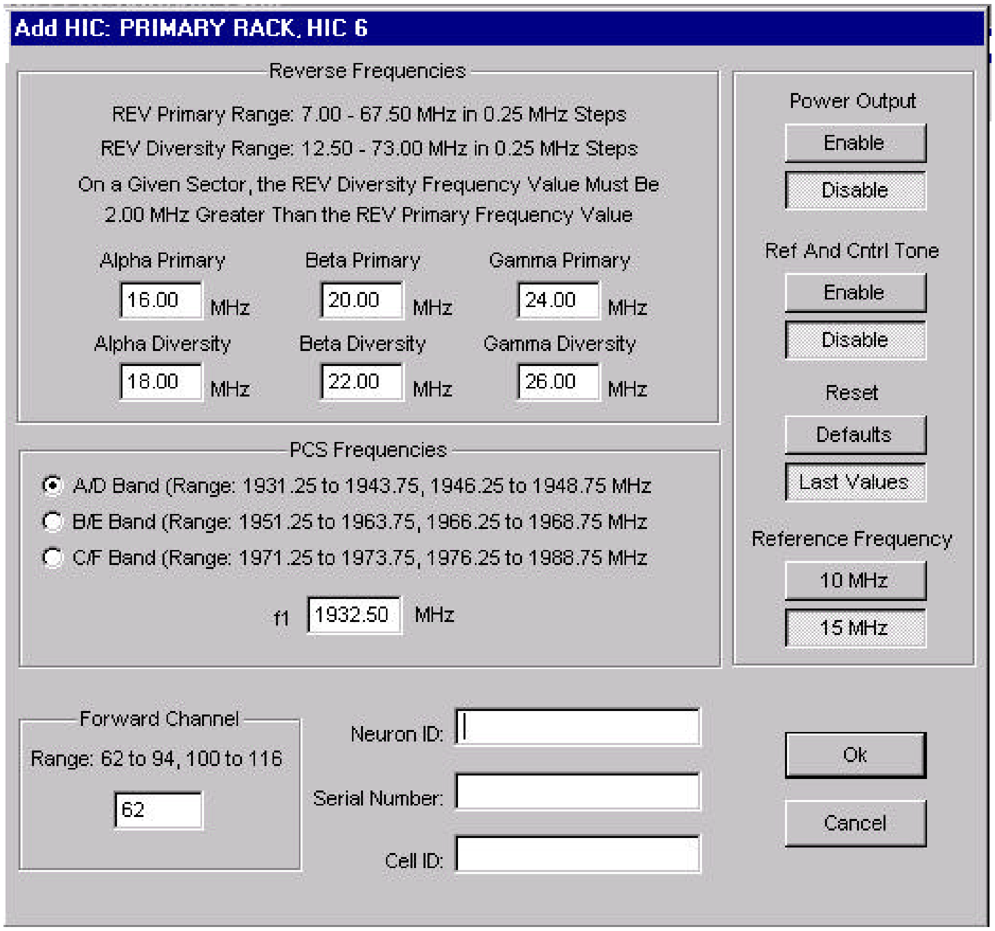


Figure 2-13. Typical ADD HIC Dialog

2.8.5 HIC Reference and Control Tone Output

This procedure measures and sets the Reference and Control Tone levels at the HIC FORWARD TEST POINT (10 dB down). At the REFERENCE AND CONTROL TONE dialog (Figure 2-14), set the *Attenuator Setting* such that the power level is initially -14 dBm at the test point (-4 dBm at the HIC FWD CATV OUT port).

a. Connect a Spectrum Analyzer to the FORWARD TEST POINT (75-Ohm).

b. Set Spectrum Analyzer as follows:

Center Frequency: Ch.62 = 453 MHz; typical

Scale: 10 dB/div

Span: 8 MHz

Peak Search or Set Marker to:

Single Carrier System:

? HIC Reference signal at lower end of signal spectrum (Ch.62 = 450.85 MHz) and adjust HIC Reference attenuator in step *c*.

? HIC Control signal at upper end of signal spectrum (Ch.62 = 455.05 MHz) and adjust HIC Control attenuator in step *c*.

Multiple Carrier System:

? HIC Reference signal at lower end of signal spectrum (Ch.62 = 450.05 MHz) and adjust HIC Reference attenuator in step *c*.

? HIC Control signal at upper end of signal spectrum (Ch.62 = 455.85 MHz) and adjust HIC Control attenuator in step *c*.

c. Determine HIC Reference and Control Tone Output Level and set to -14 dBm at FORWARD TEST POINT:

Maximum Output Level = -9 dBm

Minimum Output Level = -19 dBm

d. Record and save the attenuator settings.

e. Final power level adjustment for integration with the forward link should be completed using external 75Ω attenuator pads on the power extractor or adjustable trim pot on internal fiber unit within the CMI.

f. Connect HIC FWD CATV output to the coaxial network forward link when the proper levels are set.

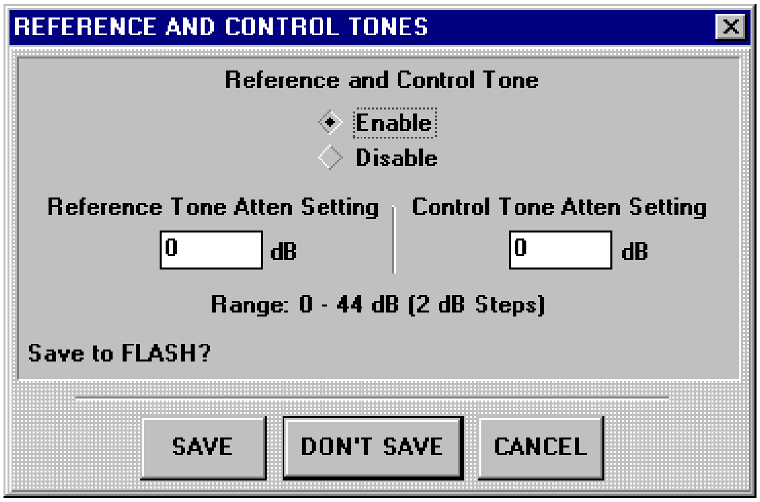


Figure 2-14. REFERENCE AND CONTROL TONES Dialog

SECTION 3.
CMI INSTALLATION

3.1 CMI INSTALLATION REQUIREMENTS

Installing the Cable Microcell Integrator (CMI) involves these major tasks:

- Determining the physical site location for the CMI
- Selecting the CMI configuration required
- Installing the CMI with attaching antennas fiber, and cables
- Performing CMI electrical checks
- Activating CMI

NOTE

The CMI FWD channel needs to be set to the desired HIC IF operating channel prior to activation of the CMI. This can be completed prior to installation using the appropriate power (110/220 VAC) and the CMI Initialization Tool, or by using the CMI Initialization Tool after power has been connected during installation. For initial deployment this may be completed at the HIC and GUI.

Prior to starting the installation procedure, locate and remove the 4-inch by 4-inch removable bar-code label from the CMI carton, and attach it to the Installation Work Order or other appropriate documentation. This label includes critical identification data, which will be required to activate the CMI after installation.

3.1.1 Tools, Test Equipment and Supplies

Table 3-1 lists the tools and test equipment needed to support the CMI installation.

Table 3-1. CMI Installation Support Needs

Hand Tools
Wrench, 1/2 inch hex socket for CMI Cover bolts
Wrench, torque (145 in-lb), 1/2-inch for CMI Hinged Cover
Wrench, open-end 1/2-inch, for Seizure Screw Access Port
Wrench, torque (30 in-lb), 3/4-inch
Screwdriver, flat blade, medium, for Power Extractor mounting screw and 75-Ohms port seizure screws (Coaxial Installation)
Nut Driver ¼ inch for 75-Ohms port seizure screws (Coaxial Installation)
Long Reach Test Point Adapter, Antec No. SCI 039719 or equivalent (Coaxial Installation)
Gilbert Fiber Interface Adapter (Gilbert No. NS7270-n;1,5,9,or 11) (Fiber Installation)
Test Equipment
Hand-held Digital Multimeter with test probes
Stealth meter, or equivalent

3.1.2 CMI Configurations

The TransCell 1900CB CMI is available in 12 major different configurations, based on the combination of the Power Extractor, Fiber Optic Module, and PCS frequency band selections. The CMI configurations are listed in Table 3-2.

Table 3-2. CMI Configurations

Part Number	Configuration Description
1000000G1-G11	CMI Assembly A/D Band, Single FA, Fiber Unit
1000000G12-G22	CMI Assembly B/E Band, Single FA, Fiber Unit
1000000G23-G33	CMI Assembly C/D Band, Single FA, Fiber Unit
1000501G1-G2	CMI Assembly A/D Band, Single FA, Coaxial Unit
1000501G3-G4	CMI Assembly B/E Band, Single FA, Coaxial Unit
1000501G5-G6	CMI Assembly C/D Band, Single FA, Coaxial Unit
1000601G1-G11	CMI Assembly A/D Band, Three FA, Fiber Unit
1000601G12-G22	CMI Assembly B/E Band, Three FA, Fiber Unit
1000601G23-G33	CMI Assembly C/D Band, Three FA, Fiber Unit
1000701G1-G2	CMI Assembly A/D Band, Three FA, Coaxial Unit
1000701G3-G4	CMI Assembly B/E Band, Three FA, Coaxial Unit
1000701G5-G6	CMI Assembly C/D Band, Three FA, Coaxial Unit

3.1.3 Transcept-Furnished Items for CMI Installation

Each CMI is shipped with two Hanger Bracket Assemblies 1000503G1 for cable strand installation. Any additional required mounting hardware is provided by the customer. The items listed in Table 3-3 are optionally available from Transcept.

Table 3-3. Optional Transcept-Furnished Items for CMI Installation

Configuration Description	Qty
Antenna Assembly, Receive (2), Transmit (1), 6 dBi	3
Cable Assembly, Receive, 50 ohms, Type N (male) connector 3m length	2
Cable Assembly, Transmit, 50 ohms, Type N (male) connector 2m length	1

3.1.4 Customer-Furnished Items for CMI Installation

Table 3-4 lists the customer-furnished equipment required to complete the CMI installation. Before proceeding with the CMI installation, inventory the items listed in Table 3-3 (if not furnished by Transcept) and Table 3-4 to ensure all necessary parts are available for installation.

Table 3-4. Customer-Furnished Items for CMI Installation

Nomenclature	Qty
RF Cable from coaxial network (Coaxial Installation)	1*
Fiber Cable from fiber network (Fiber Installation)	1
75 Ohms Directional Coupler or tap (coaxial installation)	1
Optical Splitter (fiber installation)	
Prime Power Cable (fiber installation)	

* One or both cables, depending on installation requirements, 75 ohm, 5/8-inch 24-thread male connector

3.1.5 CMI External Connector Identification

Figure 3-1 and Figure 3-2 show the locations of the CMI external connectors. Table 3-5 briefly describes the purpose of each external connection point.

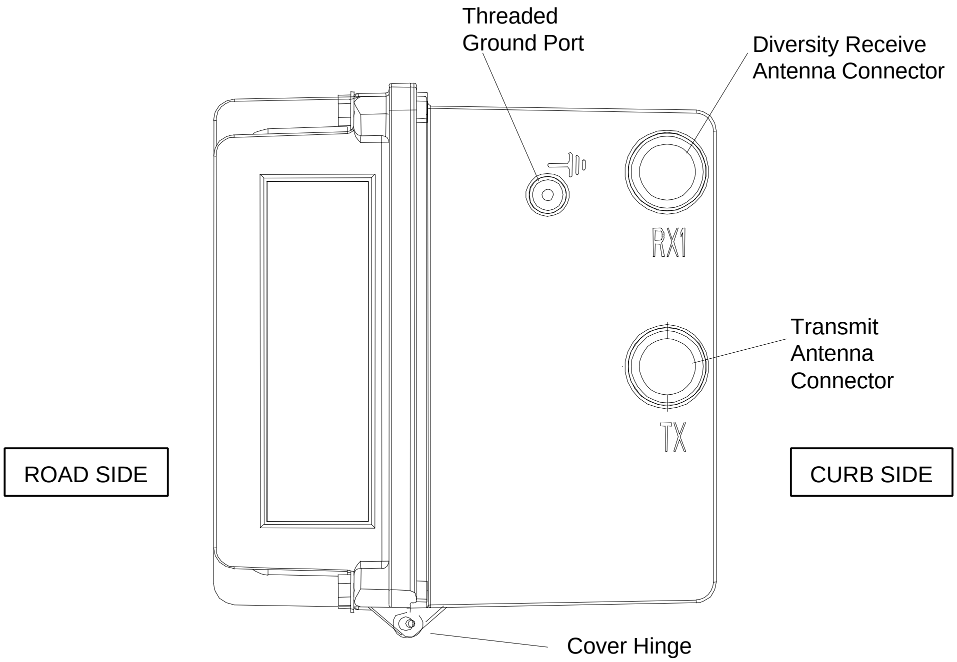


Figure 3-1. CMI Chassis Right End View

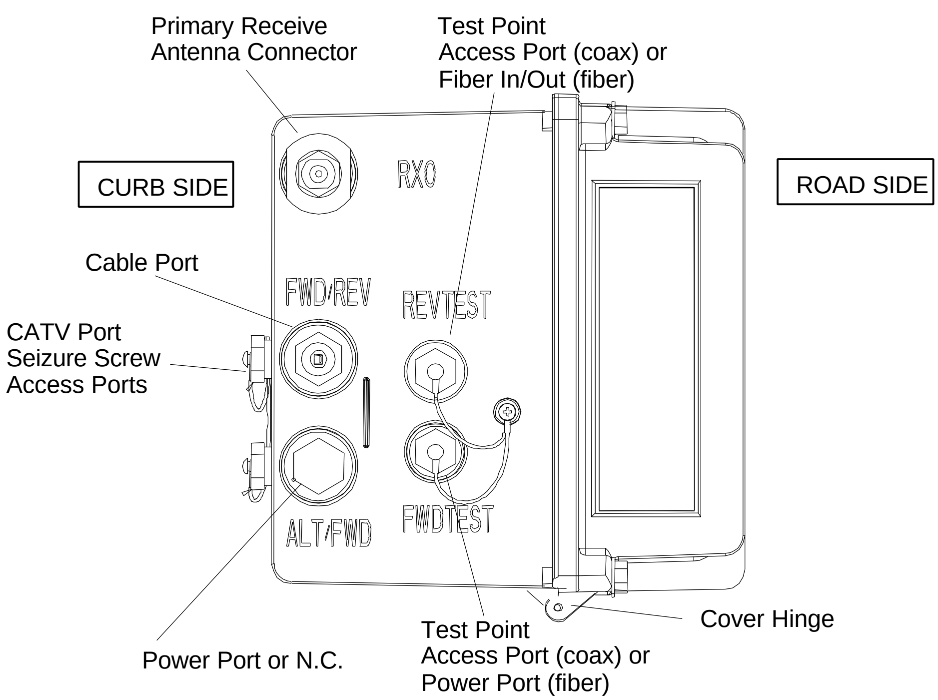


Figure 3-2. CMI Chassis Left End View

Table 3-5. CMI External Connections

Connection Point	Description
Threaded Grounding Point	10-32 in. x 1/2-inch hole tapped into a boss, to secure a ground wire to Protective Earth grounding point. (Protective Earth is a UL/NRTL term.) See paragraph 3.3.5.4.
RX0 Primary Receive Antenna Connector	Primary receive antenna connection; Type N (male), 50 ohm connector
TX Antenna Connector	Transmit antenna connection; Type N (male), 50 ohm connector
RX1 Diversity Receive Antenna Connector	Diversity receive antenna connection; Type N (male), 50 ohm connector
REVTEST, FWDTEST Test Point Access Ports	Provides probe access for measuring reverse link and forward link signal levels for coaxial CMIs. Weather-protected by 15/16-inch hex cover caps. Provide power inputs and fiber inputs for fiber CMIs. See paragraph 3.4.
CATV Port Seizure Screw Access Ports	Access for tightening seizure screws on 75-Ohms Connector center conductors. See paragraph 3.3.2.1.
CATV Cable Ports	Tapped holes provided for customer-supplied KS type adapters; see paragraph 3.3.2.1. The other port is used for power input for a coaxial installation.

3.2 SITE PREPARATION

The following paragraphs are provided for information and guidance for the CMI Assembly installation. At the site, the installer must:

- Determine the CMI location on the messenger strand.
- Determine the CMI power configuration required for the CMI installation site.
- For installing the customer furnished-equipment, the installer should reference the internal procedures for general, overhead, and underground installation of the telecommunications components.

3.3 CMI HARDWARE INSTALLATION GUIDE

WARNING
Potentially dangerous High Voltage exists on the AC power cable to the CMI Assembly that could cause bodily injury or even death. During a line surge or fault condition, High Voltage also could be present on the antenna connectors. Use extreme care and required safety precautions while working on the CMI installation and handling the AC power cable. To avoid any chance of overexposure to RF emissions when working near a CMI, maintain a minimum distance of **12 in.** from the transmitting antenna.

3.3.1 CMI Access

3.3.1.1 Opening the Assembly

WARNING
The CMI hinged cover (roadside) contains the Power Supply and therefore is heavy. If a CMI must be opened in the installed position, always support the cover with one hand when releasing the last captive screw to avoid equipment damage and/or personal injury.

The hinged CMI Assembly housing is secured with eight captive bolts. Place the CMI on any firm surface and release the bolts, using a 1/2-inch socket wrench. Open the cover carefully, keeping in mind that the cover (roadside) portion contains the Power Supply and therefore is heavy.

3.3.1.2 Closing the Assembly

CAUTION
When closing the CMI Assembly, ensure that all internal wiring is clear of the housing seal before securing captive screws to avoid possible equipment damage. **NOTE** To restore the watertight seal on a CMI Assembly, the captive bolts must be torqued to 140–145 in-lb, in the proper sequence.

Place the CMI Assembly on any firm surface. Carefully close the cover, ensuring that all internal wiring is clear of the housing seal. Torque the eight captive bolts to 140–145 in-lb in the sequence shown in Figure 3-3.

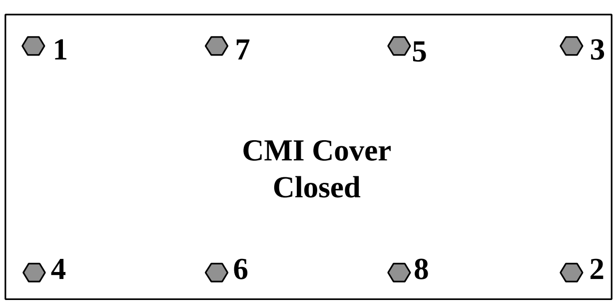


Figure 3-3. CMI Bolt Tightening Sequence

3.3.2 CMI Port and Power Extractor Configuration Options

> **NOTE**
>
> If the installation site requires an alternate CMI configuration, it is strongly recommended that the changes be made on the ground prior to installing the CMI on the cable strand.

3.3.2.1 CMI Coxial Configurations

There is Coaxial CMI configurations uses either a *housing-to-F* adapter or a *housing-to-hardline* connector (shown in Figure 3-4). One or both ports are used, based on installation requirements. The housing-to-F adapter or the housing-to-hardline connector is threaded into the CMI housing, with its center conductor secured and connected to the internal CMI circuits by a seizure screw. The procedure for cutting the center conductor to proper length is shown in Figure 3-5. The seizure screw is accessed by removing a threaded plug located at the rear of the CMI chassis (curbside). The seizure screw is tightened using a medium flat-blade screwdriver or a ¼-inch nut driver.

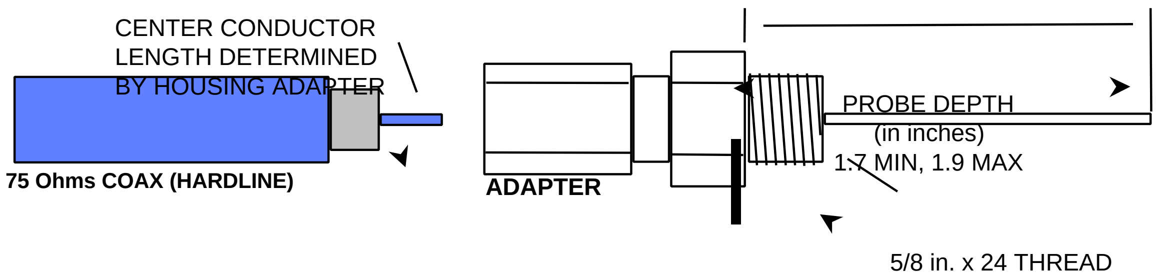


Figure 3-4. Typical Housing-to-Hardline Connector Interface

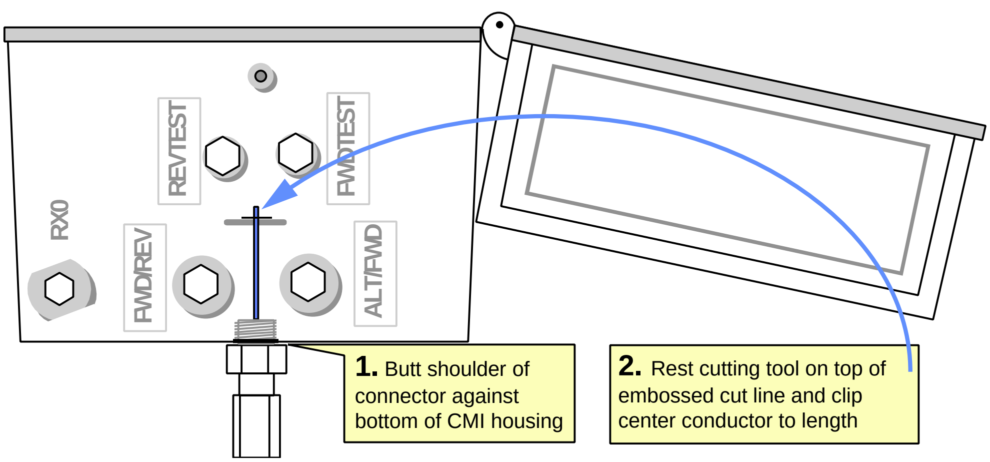


Figure 3-5. Procedure for Cutting Coaxial Center Conductor to Length

The coaxial CMI configuration uses the FWD/REV port for the RF signal interface. The other ALT/FWD port is used to supply source power to the unit (110/220VAC).

If the installation requirements dictate the use of housing-to F-adapter(s), it is strongly recommended that the adapter installation be performed on the ground prior to installing the CMI on the cable strand.

The assembly sequence of 75-ohms coax and housing-to-hard-line adapter to CMI is determined by mechanical constraints. Figure 3-6 shows an exploded view of these items. The housing-to-hard-line adapter must be threaded into the CMI housing; therefore, it must be separate from the 75-ohms coax during installation or removal. The seizure screw is tightened against the housing-to-hard-line adapter center conductor after the adapter is installed. The 75-ohms coax is joined to the housing-to-hard-line adapter after the adapter is secured to the CMI. The adapter must be torqued to 30 in-lb.

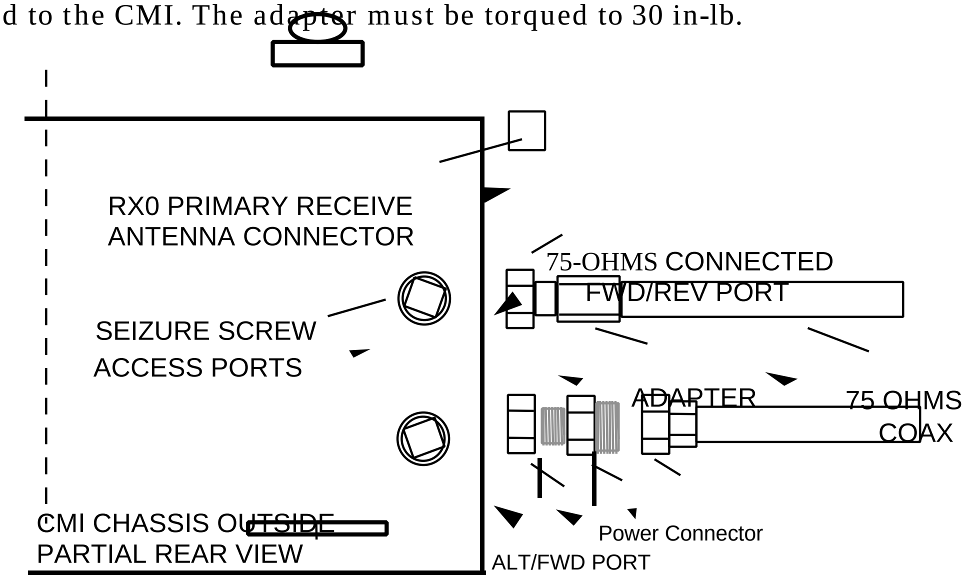


Figure 3-6. Assembly of Typical Housing to Hard-line/Power Connectors

3.3.2.2 Power Extractor Options

This document uses the terms *single* interface mode (also referred to as the combined interface mode) in describing how the CMI is interfaced to the 75 Ohms coaxial network. These terms are further defined as follows:

The CMI Power Extractor module is available in the configuration, as defined below:

- Single Interface Mode with frequency ranges as follows:
  - Basic Frequency Range or Sub-Split - 5 to 42 MHz
  - Extended Frequency Range or Mid-Split - 5 to 52 MHz[1]

The Power Extractor module is shown in Figure 3-7. The outward appearance of the two configurations are identical except for the serial number. The eighth digit from the left of the serial number is always **1** for the single interface mode (basic frequency range) configuration; always **2** for the single interface mode (extended frequency range) configuration. (The seventh digit from the left of the Power Extractor serial number is always 2). For example, serial number 989T002**1**0000 indicates a single (combined) interface mode (basic frequency range) configuration.

The Power Extractor accommodates field-replaceable, plug-in attenuator pads for both the forward and reverse coaxial paths, and a field-replaceable, plug-in equalizer in the forward coaxial path (typically, the equalizer is set to 0dB). These component locations are accessible when the CMI housing cover is open without the need to remove the Power Extractor. The CMI is shipped with no pads or equalizer installed. It will accept Scientific Atlanta model number PP-0 to PP-10 attenuator pads or equivalents and Scientific Atlanta model number EQ750 equalizers or equivalents. For typical installations, either configuration of the Power Extractor will meet the requirements.

[1] With this Power Extractor configuration, no other forward link services are allowed below 150 MHz.

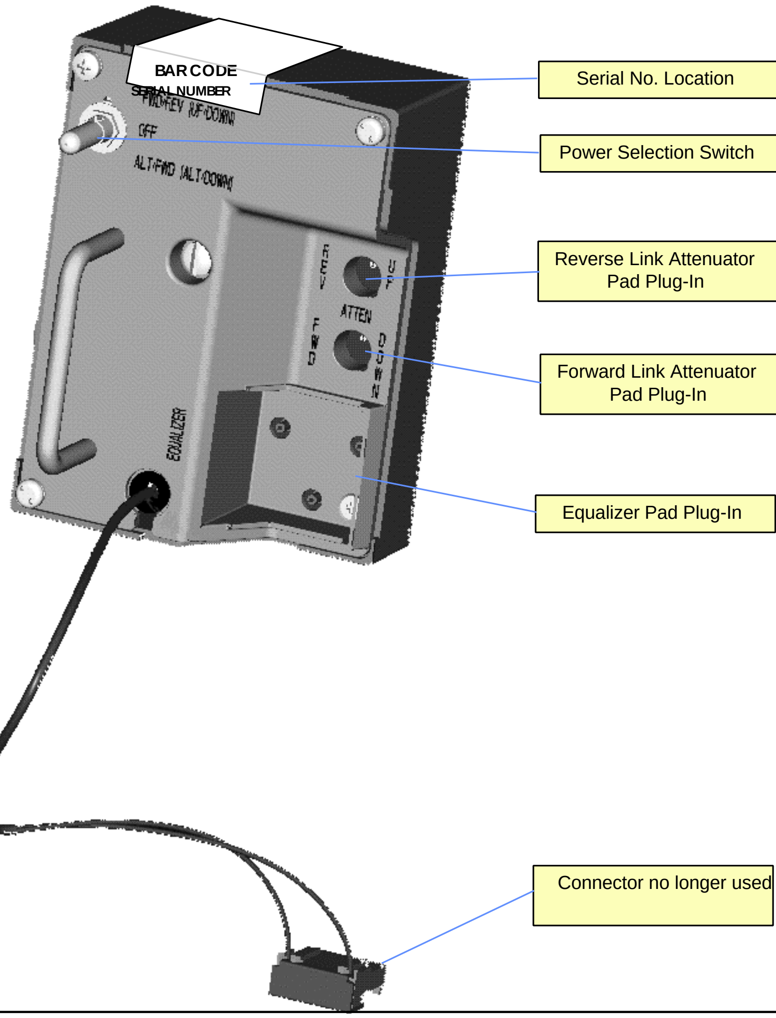


Figure 3-7. Power Extractor

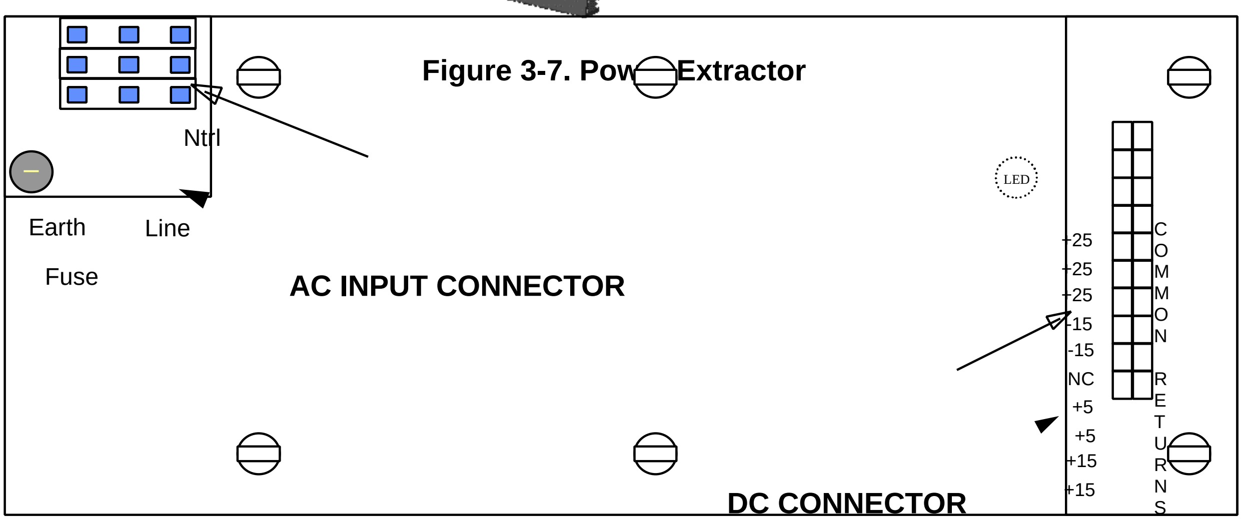


Figure 3-8. Power Supply Input Connector

3.3.3 Coaxial or Fiber Network Interface to the CMI

A coaxial network typically connects to the CMI through a 75 Ohms tap or coupler. The tap or coupler is selected by the required loss between the Hub and the CMI at that location.

A fiber network typically connects to the CMI in a similar manner as a coaxial network. The fiber drop is coupled in to the network via a fiber splice. The operational range of the fiber CMI (10 to 20 dBo; Hub to/from CMI) determines the coupled value required. The fiber passes through the CMI housing via a Gilbert connector (PN NS7270-n; 1,5,9,or 11) or equivalent.

3.3.4 Power Extractor Reverse Link/Forward Link RF Attenuation (Coaxial Installation)

The Power Extractor plugs into the CMI chassis and Connector Plate. It is secured by one captive screw. As shown in Figure 3-7, the Power Extractor contains two plug-in attenuator pad receptacles, one for adding reverse link attenuation and one for adding forward link attenuation. It also includes a plug-in equalizer receptacle for forward path equalization.

The Power Extractor is shipped with no pads or equalizer installed. It is recommended that both attenuation and equalization values be initially set to 0 dB. The pad receptacles will accept Scientific Atlanta model numbers PP-0 to PP-10 attenuator pads or equivalent. The changing of pad values is discussed as part of the installation adjustments in paragraphs 3.5. The equalizer receptacle will accept Scientific Atlanta model number EQ750 equalizers or equivalent. (Pads and equalizers may be provided by Transcept at the initial installation, at customer request.)

3.3.5 Installing the CMI

3.3.5.1 Attaching CMI to Messenger Strand

CMI Bracket Assembly 1000503G1 is provided with the CMI. These brackets secure the CMI Assembly approximately three inches below the messenger strand. It is recommended that the brackets be secured to the CMI before ascending to the cable strand. The washer, lock washer and bolt supplied with the bracket are assembled in the order shown in Figure 3-9. Recommended torque range is 75 to 90 in-lb.

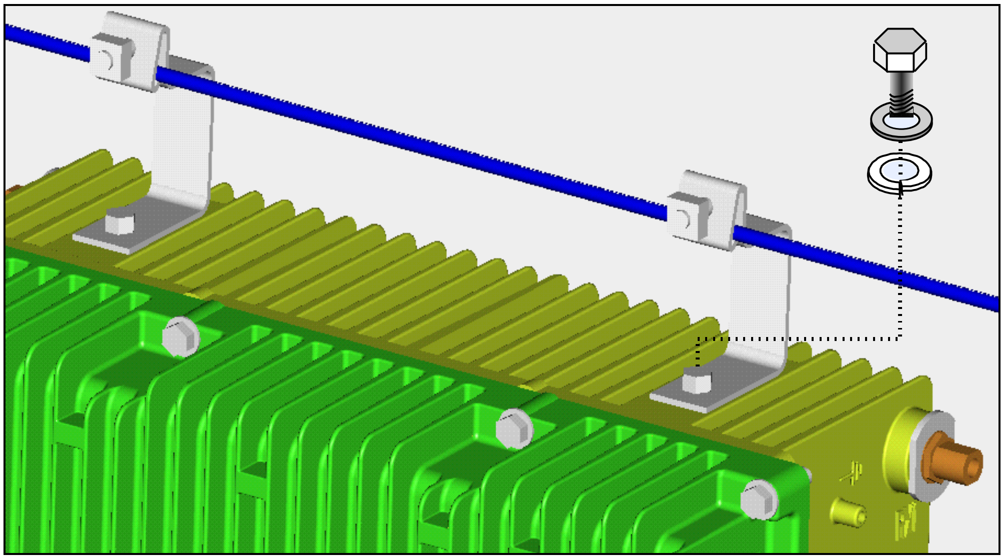


Figure 3-9. CMI Bracket Installation

3.3.5.2 Attaching Antennas to Messenger Strand

This procedure is provided for general guidance when installing the transmit and receive antennas for the CMI Assembly. The installer should follow the specific installation procedure provided by the antenna vendor with the antenna equipment.

a. Prior to installing, assemble antenna-mounting bracket provided with antenna.

WARNING

Potentially dangerous High Voltage exists on the AC power cable to the CMI Assembly that could cause bodily injury or even death. During a line surge or fault condition, High Voltage also could be present on the antenna connectors. Use extreme care and required safety precautions while working on the CMI installation and handling the AC power cable.

To avoid any possibility of overexposure to RF emissions when working near a CMI, maintain a minimum distance of eight inches from the transmitting antenna.

NOTE

Ensure that Transmit Antenna element is installed pointing upward and extending above the messenger strand; ensure that the receive antennas are pointing downward.

b. Locate and position transmit antenna so that element points *upward*. Typical setups are shown in Figure 3-10 for guidance. Attach antenna mounting bracket to messenger strand.

c. Locate and position two receive antennas so that elements point *downward* (Figure 3-10).

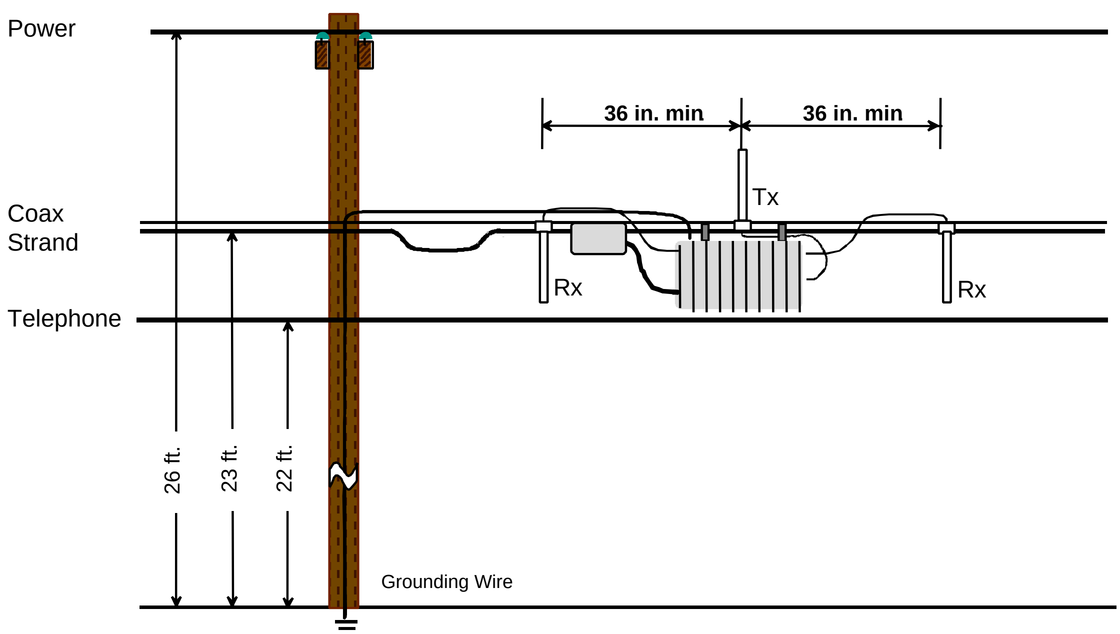


Figure 3-10. Antenna Installation (Option 1)

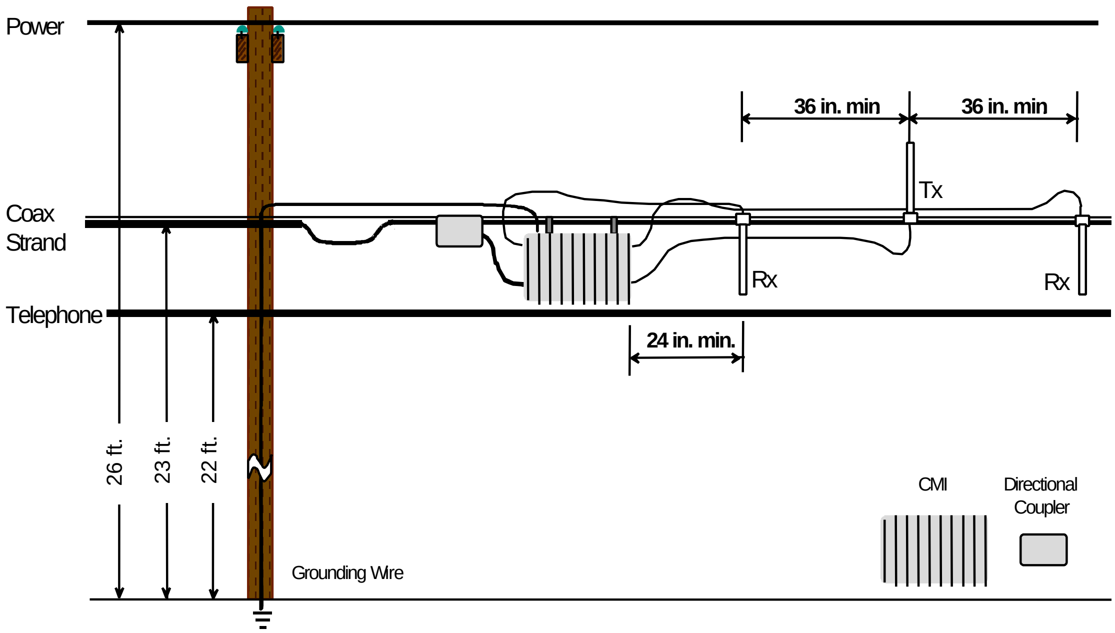


Figure 3-11. Antenna Installation (Option 2)

3.3.5.3 Installing and Routing Cables

Cable installation and routing includes securing cables to the messenger strand and interconnecting the various hardware assemblies using (reference 3.3.6).

3.3.5.4 Protective Earth Grounding

The following guidance is provided for the Protective Earth Grounding wire/cable. (Refer to Figure 3-1 for CMI threaded grounding connection point.) The recommended grounding hardware is a No. 6 stranded ground wire attached to a No. 6 crimped ground lug with a No. 10 screw.

3.3.5.5 Antenna Cables

This procedure is provided for guidance for routing the antenna cables. This installation procedure routes the signal cables between the CMI and the three antenna elements. Refer to Figure 3-12 for CMI connector location.

> **NOTE**
>
> This procedure is intended only as a general guide. The instructions provided with the Antenna Mounting Kits take precedence over this guide.

a. Temporarily secure each cable with approximately an eight-inch service/drop loop to messenger strand cable using a tie wrap.

b. Route and connect cables to CMI as follows:

Transmit Antenna element connector to CMI TX antenna connector.

Receive (Primary) Antenna element connector to RX0 connector.

Receive (Diversity) Antenna element connector to RX1 connector.

c. Coil cables to remove excess slack.

d. Secure cables, maintaining an eight-inch service/drop loop to messenger strand using a tie wrap.

e. Apply waterproofing tape to all connections on CMI Assembly.

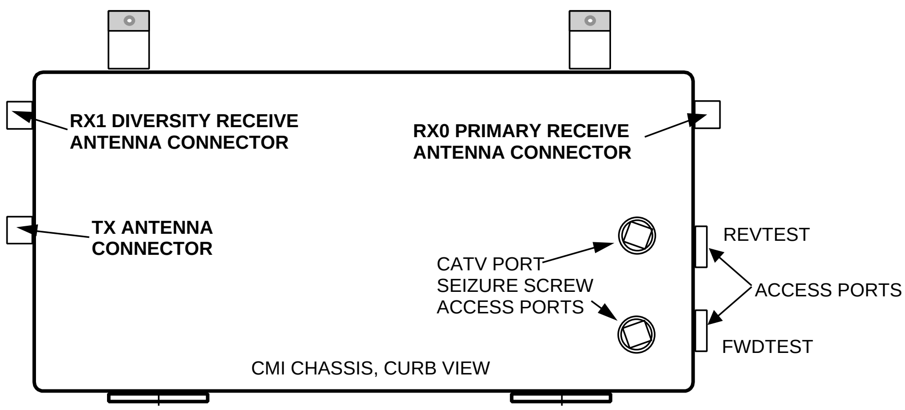


Figure 3-12. CMI Assembly Rear View

3.3.6 Power and CDMA SIGNAL Cables

This procedure is provided for guidance for routing the Power and CDMA signal cables.

a. Ensure that CMI is mechanically configured to accept cables as applicable per paragraph 3.3.1.

b. Before connecting AC power cable to CMI, verify that source is 110/220VAC, 50/60Hz.

c. Temporarily secure each cable with approximately an eight-inch service/drop loop to messenger strand using a tie wrap.

d. Route and connect cables to CMI.

e. Coil cables to remove excess slack.

f. Secure cables, maintaining an eight-inch service/drop loop to messenger strand using a tie wrap.

g. Apply waterproofing seal (customer furnished) to all connections on CMI Assembly.

3.3.7 CMI Power Check

After the CMI is mounted on the cable strand and all cables are installed, do the following:

a. Open CMI per paragraph 3.3.1.

b. *For a coaxial installation:* if not already done, install the FWD ATTEN pad, REV ATTEN pad and EQUALIZER pad in power extractor module. Use 0 dB or other appropriate estimated value (refer to paragraph 3.3.4).

c. Turn on the power supply.

d. Observe that green LED power indicator on Transceiver is illuminated.

e. Close CMI per paragraph 3.3.1.

3.4 MEASUREMENT TEST POINTS

The CMI contains two test ports, one for reverse link and one for the forward link RF measurements. For the coaxial CMIs, the test point access ports are on the left side of the CMI when viewed from road. The access ports connect internally to the power extractor, as shown in Figure 3-13. For the fiber CMIs, the test ports are located on the fiber optic modules inside the CMI.

NOTE

The FWDTEST and REVTEST measurements can be performed using a Wavetech Stealth meter or similar device for single tone measurements only. The Stealth meter is not recommended for measuring wideband signals such as CDMA.

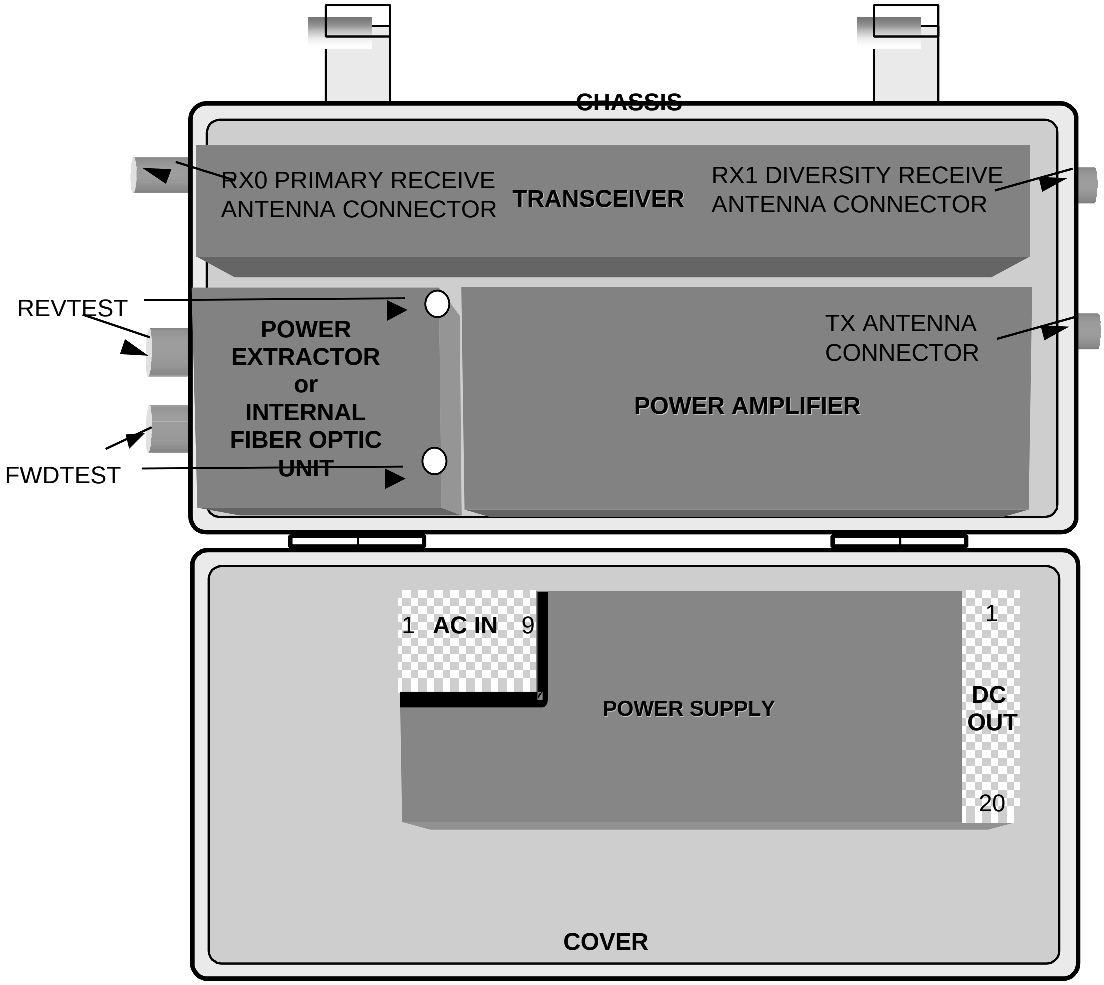


Figure 3-13. CMI Test Point Access and Subassembly Layout

3.5 FORWARD LINK CMI INSTALLATION MEASUREMENTS AND ADJUSTMENTS

WARNING

Potentially dangerous High Voltage exists on the AC power cable to the CMI Assembly that could cause bodily injury or even death. Use extreme care and required safety precautions while working on the CMI installation and handling the AC power cable.

NOTE

The CMI data sheet at the end of this manual may be reproduced and used for recording the measured levels specified in the following procedures.

3.5.1 CMI Forward Link Reference and Control Tone Input Level Check

> **NOTE**
>
> The network and assigned HIC at the Hub must be active for the following level checks. PCS Hub and network technician on-site support is required to complete the CMI integration procedure.

This procedure checks the forward link reference and control tone signal levels at the CMI to ensure the levels are within specification.

a. Open CMI per paragraph 3.3.1. Verify that both attenuator pads and equalizer pad, 0 dB or other calculated values, are installed in Power Extractor (Coaxial installations only).

b. At CMI, access the forward test ports as shown in Figure 3.17.

c. Insert a Long Reach Test Point Adapter through access hole to mate with Power Extractor test point (-20 dB) for a coaxial CMI or connect to the SMA connectors on the top of the fiber optic units (-10 dB) for a fiber CMI.

d. At the forward test point, measure the level of HIC forward link Reference Tone at lower edge of appropriate HIC channel (appropriate forward link channel is user selectable from HCU). Replace FWD ATTEN pad with a different value as needed or adjust the trim pots on the fiber optic unit (refer to paragraph 3.3.4) to obtain -75 dBm ± 5 dB for the coaxial CMI and –65 dBm ± 5 dB for the fiber CMI. Record measured level and pad value.

e. At the forward test point, verify that level of HIC forward link Control Tone. The appropriate forward link channel is user selectable from HCU and is -75 dBm ± 5 dB for the coaxial CMI and –65 dBm ± 5 dB for the fiber CMI. Record measured level and pad value.

f. Replace FWDTEST test port plug (coaxial CMI), and close CMI per paragraph 3.3.1.

3.6 REVERSE LINK CMI INSTALLATION MEASUREMENTS AND ADJUSTMENTS

Most reverse link CMI measurements and adjustments are made from the TransCell 1900CB Hub equipment. The only reverse link adjustment made at the CMI is changing the value of the REV attenuator pad or adjusting the trim pots on the fiber unit.

3.6.1 Activate CMI

> **NOTE**
>
> Although it is not required, it is recommended to have a technician at the field location of the CMI being activated to complete the integration process.

This procedure, also referred to as CMI acquisition, adds the selected CMI to the database for monitoring and control by the HCU via the assigned HIC. The procedure also shows that the HIC and CMI are communicating and that all cable interconnections appear to be satisfactory.

a. Ensure that Hub enclosure, is turned ON and appropriate HIC is active.

b. At menu bar of HUB CONTROL PANEL dialog (Figure 3-14), select **Alarms**, then **CMI Manual Override Control**.

c. At MANUAL OVERRIDE dialog , click Manual Override Indicator OFF to disable all Manual Override alarms, then click OK.

d. At HCU CONTROL PANEL dialog, double-click on appropriate HIC icon.

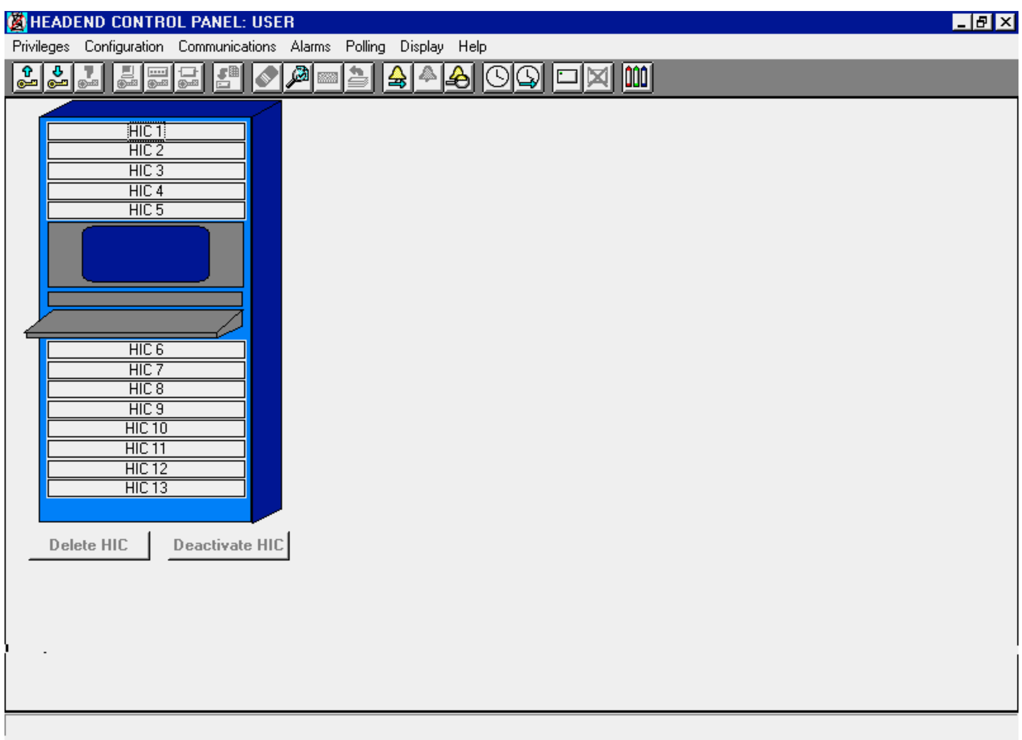


Figure 3-14. Typical HUB CONTROL PANEL Dialog

e. Ensure CMI and HIC are both assigned to the same Forward HIC channel selected for operation. (Refer to CMI install/initialization paragraphs 3.1 and 3.3.5).

f. Set HIC CONTROL PANEL dialog (Figure 3-15) controls as follows:

- Click *Current Sector* (Alpha, Beta, Gamma)
- Ensure that *Reverse Frequencies* are properly set; click Control button to adjust if needed.
- Ensure that *PCS Frequency* is properly set; click Control button to adjust if needed.

g. At HIC CONTROL PANEL dialog (Figure 3-15), double-click on appropriate CMI icon (CMI 1 through CMI 100) for sector which selected CMI is to be assigned.

h. Observe that ADD CMI dialog (Figure 3-16) appears.

i. Type data in the following boxes (do not press enter):

- *Enter Neuron ID* using 12 hexadecimal numbers (required)
- *Enter Serial Number* (optional reference data)
- *Enter Location* (optional reference data)

j. Click OK to add new CMI to selected HIC/sector (Alpha/Beta/Gamma).

k. At HIC CONTROL PANEL dialog, confirm that icon of added CMI is green. If alarms occur and the network/BTS signals are connected and correct, the added CMI is the suspected failure. Refer to Table 4-2 to confirm probable source of failure.

NOTE

Table 4-2 lists the alarms recognized by the HCU software and the probable equipment failure for each alarm. At HUB CONTROL PANEL dialog, Click **Alarms**, then **Manual Override Control**.

l. At CMI MANUAL OVERRIDE dialog, click Manual Override Indicator ON and select all desired alarms, then click OK.

m. Activate remaining CMIs assigned to selected HIC that are installed in network, beginning with step *g* above.

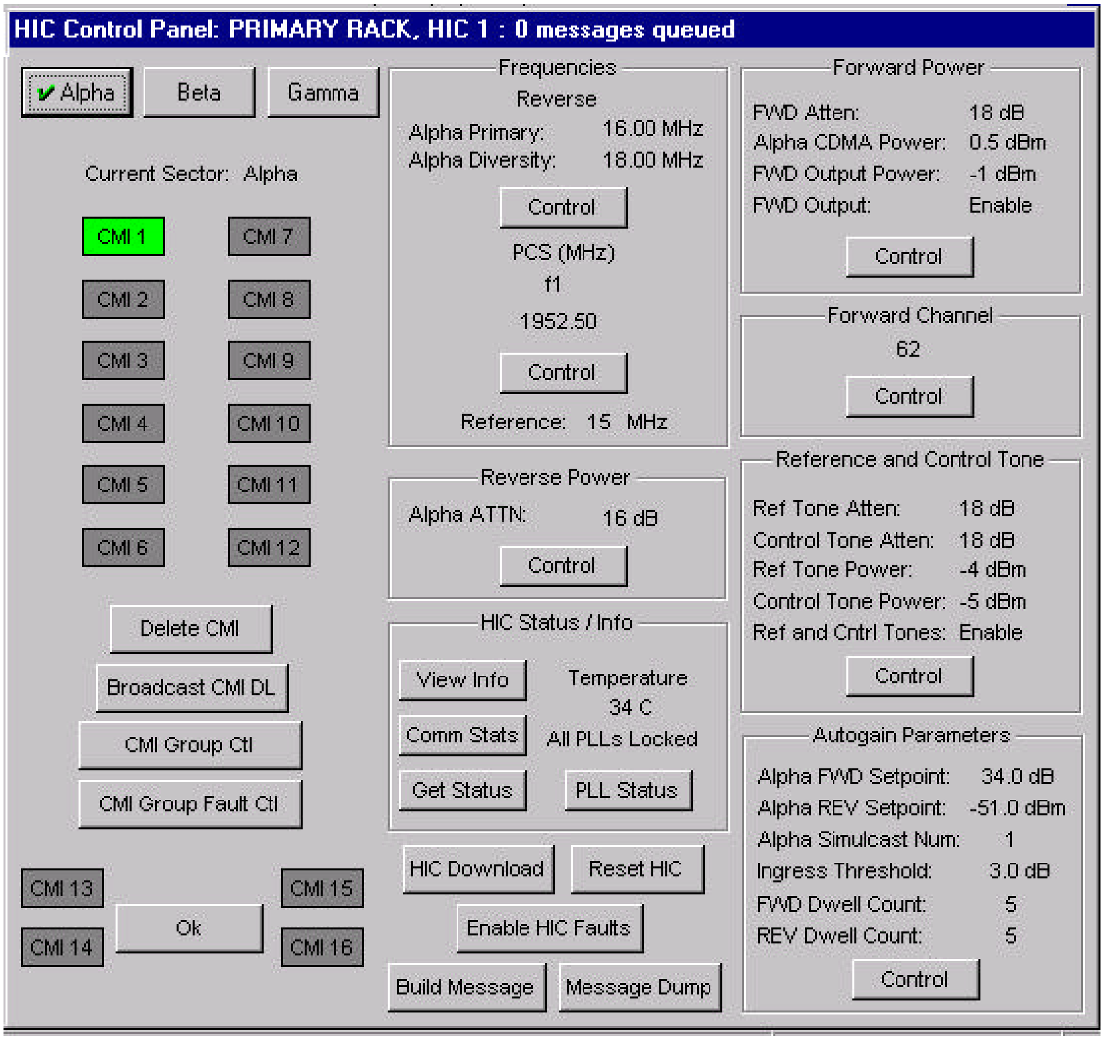


Figure 3-15. Typical HIC CONTROL PANEL Dialog

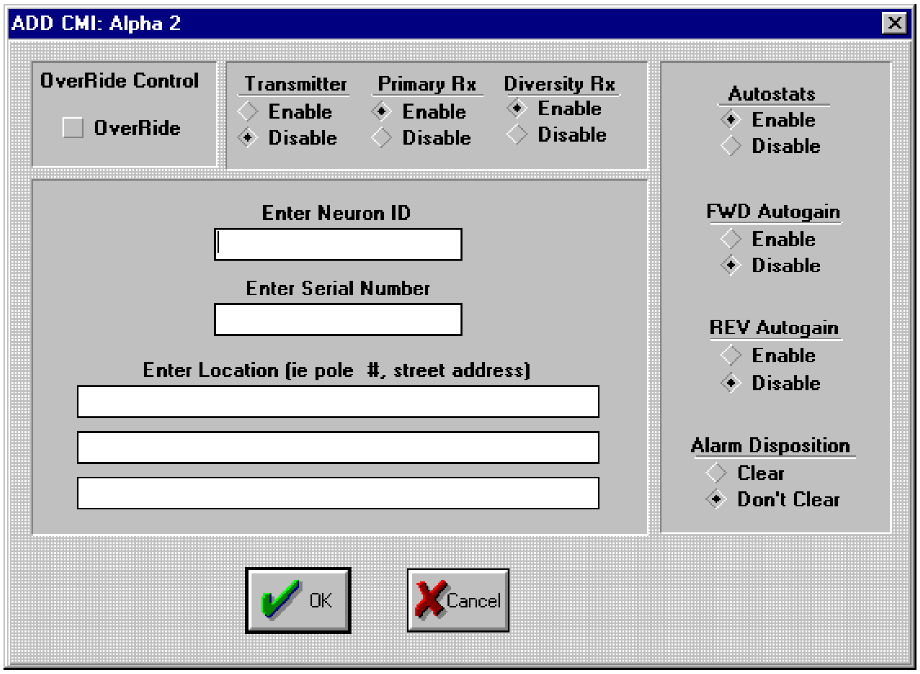


Figure 3-16. Typical ADD CMI Dialog

3.6.2 Reverse Link Gain Adjustment

This procedure determines the reverse path pad value in the CMI power extractor module or the amount of adjustment that the trim pot needs to be changed to on the fiber unit, in order to set up a consistent reverse link gain between the CMI, network loss, and HIC. Therefore, when all CMIs are set to the operating reverse link setpoint level, they will operate at roughly the same reverse link output power level.

> **NOTE**
>
> The Reverse Link Gain Adjustment procedure assumes that all fiber nodes; RFIs (if applicable) on the reverse link of the cable plant have been adjusted for a consistent gain between fiber node and HIC, in preparation for CMI deployment.

3.6.2.1 Setting CMI Reverse Link Signal Level Setpoint at HIC

This procedure is used to determine the target reverse link HIC input level from all the CMIs assigned to a given HIC in a given sector. Subsequently, the reverse AGC setpoint for each HIC sector will be determined and stored for proper function of reverse autogain.

a. Verify that measured control tone power from each CMI at HIC input is in range of -54 dBm to -48 dBm, and record value. This level is the reverse autogain setpoint.

b. At HIC CONTROL PANEL dialog, click on Control button to display AUTOGAIN SETPOINTS dialog. Enter value determined from previous step in REV Setpoint box for a given sector.

c. Enter number of CMIs that will be operating on the associated sector. The HCU will automatically determine the Reverse Autogain Setpoint necessary for the reverse autogain operation.

3.6.2.2 Measure CMI Reverse Link Control Tone at HIC

a. At HIC CONTROL PANEL dialog, click CMI Group Ctl to display CMI GROUP CONTROL dialog. At CMI GROUP CONTROL dialog, disable all faults, autostats, and autogain (FWD and REV) for every CMI attached to HIC.

b. Connect a 50-ohm Type F test connector and cable to a spectrum analyzer (75 Ω input).

c. Connect a Type F test cable to appropriate sector of HIC REVERSE TEST POINTS for CMI being measured.

d. Set up spectrum analyzer to reverse link frequency for CMI being adjusted.

e. At HIC CONTROL PANEL dialog, open CMI CONTROL PANEL for CMI being measured. Set REV Control Tone Attn to 10 dB.

f. Set spectrum analyzer for a ‘Max hold’ measurement.

g. At CMI CONTROL PANEL dialog, click Get Status.

h. Measure and record level of reverse link control tone at HIC REVERSE TEST POINTS port. This level should be approximately -60 dBm.

i. At CMI CONTROL PANEL dialog, click Reverse Power Control button to display CMI REVERSE POWER dialog. At CMI REVERSE POWER dialog, adjust *Control Tone ATTN* until reverse control tone is within 2 dB of -60 dBm. Adjust reverse attenuation as necessary.

j. If *Control Tone ATTN* setting required is outside the range of 6 to 14 dB, add attenuation in CMI power extractor by installing a larger value attenuator pad (see paragraph 3.3.4). After new pad is installed, repeat the steps in paragraph 3.6.2.1 to verify HIC input power level. Record new pad value.

> **NOTE**
>
> By setting the reverse attenuation of the Power Extractor based on the Reverse Control ATTN the Reverse Primary ATTN, Reverse Diversity ATTN and the Reverse Combined ATTN will fall into place.

k. Save this value by clicking Save To EEPROM.

3.6.3 Adjusting Reverse Gain at the HIC

a. Connect a 50-ohm Type F test connector and cable to a spectrum analyzer (75 Ω input).

b. Connect a Type F test cable to appropriate sector of HIC REVERSE TEST POINTS for CMI being measured.

c. Set up spectrum analyzer to reverse link frequency for CMI being adjusted.

d. At CMI CONTROL PANEL dialog, click Ping to display the PING CMI dialog.

> **NOTE**
>
> The PING CMI dialog is used to test the reverse continuity for the CMI and to set the reverse attenuation if necessary.

e. At PING CMI dialog:

 1) Select:

  ? Both Primary and Diversity Pedestal

  ? In Band

  ? Test Signal ON

 2) Click Send

f. Measure test signal using a peak search and video averaging on spectrum analyzer, or set marker to CW signal to be measured. Record power level (in dBm).

g. At CMI REVERSE POWER dialog, adjust CMI reverse attenuators to get Ping Tones at Ping Tone Setpoint window on PING CMI dialog. Note that HIC test point is 10 dBc below HIC input. Therefore, measured value at HIC test point should be 10 dB below Ping Tone Setpoint.

> **NOTE**
>
> HIC test ports are -10 dBc with respect to the HIC CATV IN ports.

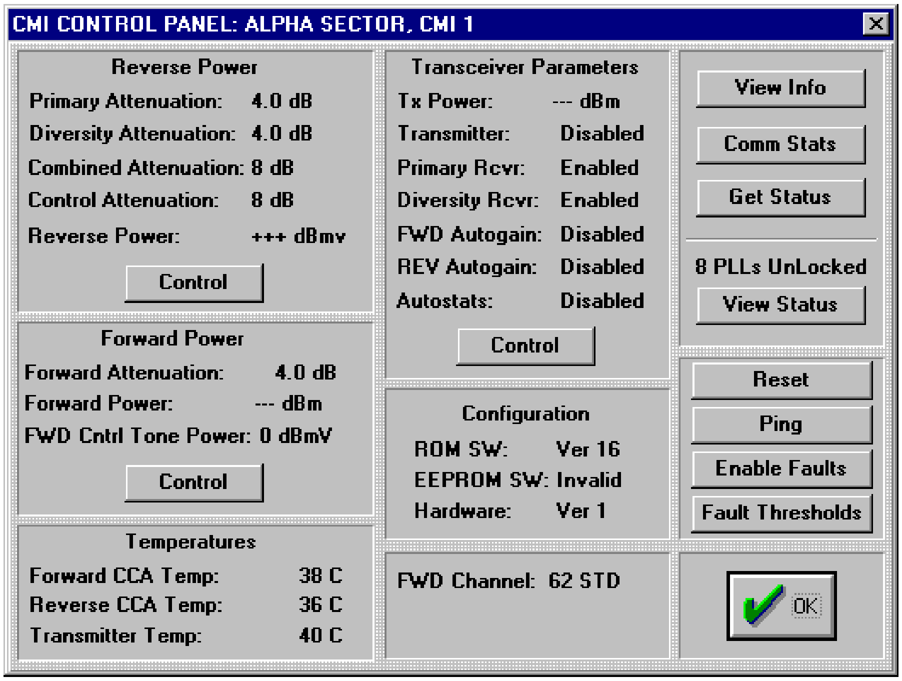


Figure 3-17. Typical CMI CONTROL PANEL Dialog

SECTION 4.
BTS INTERFACE AND NETWORK OPTIMIZATION

4.1 INTRODUCTION

The purpose of this section is to configure a CDMA PCS Base Transceiver Station (BTS) to operate a group of Cable Microcell Integrators (CMIs) in simulcast. The BTS may or may not operate a conventional tower configuration in simulcast with the CMI simulcast sector.

The CMI distributed antenna system allows a PCS provider to connect multiple transceivers to a single sector of a BTS. To allow this, the BTS must be configured to compensate for the additional delay induced by the transport medium between transmitters. The BTS has several tools in place to accomplish this, and when configured properly, the distributed antenna system will be transparent to the network in terms of timing delay.

If the BTS is to simulcast a conventional tower antenna (macrocell) with a number of CMIs, the impact to the link budgets of both macrocell and CMIs must be assessed.

4.2 MEASUREMENT/CALCULATION OF CMI DELAYS

Base stations that process PCS calls through TransCell 1900CB equipment require nonstandard settings due to additional delay in the forward and reverse links. More specifically, the delay results from the addition of a CMI, a Hub Interface Converter (HIC) and a coaxial, fiber, or HFC network in the RF path.

For the following four applications, the time delay (that is, coaxial/fiber lengths) between the forward and reverse links must be determined. The induced delay is either equal or unequal depending on the coaxial/fiber distances in the forward and reverse paths. The CMIs involved can be on multiple fiber nodes and/or coax with passive splitters/combiners. The applicable BTS settings are on a sector basis for each case:

a. Sector dedicated to TransCell 1900CB - Timing equal

b. Sector dedication to TransCell 1900CB - Timing unequal

c. Sector for TransCell 1900CB simulcasting with tower - TransCell 1900CB timing equal

d. Sector for TransCell 1900CB simulcasting with tower - TransCell 1900CB timing unequal

4.2.1 Sector Dedicated to TransCell 1900CB - Timing Equal

4.2.1.1 Description

The architecture in Figure 4-1 shows three sectors of a BTS dedicated to TransCell 1900CB. The HFC physical layer for the forward and reverse links is either shared or parallel and has the same delay times from the BTS to the CMI antenna.

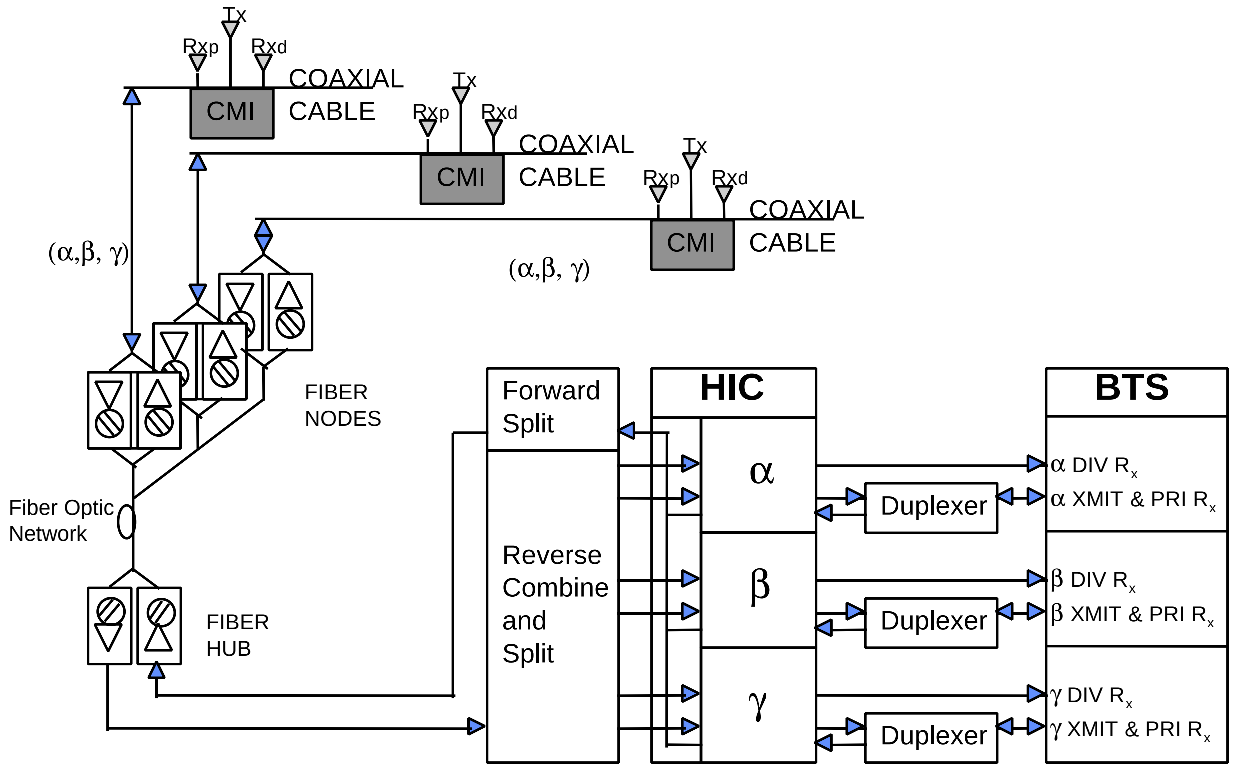


Figure 4-1. Sector Dedicated to TransCell 1900CB with Equal Timing Links

The delay added by the CMI and the HIC is the same for the forward link as it is for the reverse link. Since timing is equalized on the network and TransCell 1900CB equipment, and all PCS communications to the wireless handset are conducted through the CMIs, the BTS does not have to account for any differential timing on the forward and reverse links other than that internal to itself.

4.2.1.2 Basic BTS Settings for Dedicated Sector with Equal Timing

For the dedicated sector with equal timing, two TIA/EIA-95-B settings must be taken into account, time reference and search window size. The BTS sets the search window in which the mobile unit searches for usable multipath components of the set of appropriate pilot signals. The following procedures are recommended for determining the setting of these two parameters.

Regarding the time reference, section 6.1.5.1 of TIA/EIA-95-B states that the personal station time reference "…shall be within ± 1 µs of the time of occurrence of the earliest multipath component being used…" This establishes a common reference for system time when searching for multiple BTS pilot signals.

For a dedicated sector implementation of TransCell 1900CB, the earliest multipath component in the reverse link would typically appear at the antenna of the CMI that has the least amount of delay to the base station. To determine which CMI this is, the delay between each CMI antenna and the BTS input must be determined, either by measuring or calculating the delay to each CMI antenna. The delay calculation or measurement is made in a single direction if the timing in the dedicated sector implementation is equal in either direction. To calculate the delay to a CMI antenna, the following formula is employed:

$$D_{TOTAL} = D_{CMI/HIC} + D_{FIBER} + D_{COAX} + D_{LINE\ AMP} \quad \textbf{[1]}$$

where: $D_{CMI/HIC}$ is the group delay in one direction of the CMI and the HIC = 12 µs

D_{FIBER} is the fiber delay at 5 µs/km of fiber (2.04 x 10^8 m/s). Actual value can be obtained from fiber/cable specification sheets. It will be slightly different for the different types of fiber or coaxial cable.

D_{COAX} is the coaxial delay at 3.8 µs/km (2.74 x 10^8 m/s). Actual value can be obtained from fiber/cable specification sheets. It will be slightly different for the different types of fiber or coaxial cable.

$D_{LINE\ AMP}$ is the delay added by all the line amps = 10 ns x no. of line amps (actual value can be obtained from amplifier manufacturer or specification sheets)

Once all the calculations have been made, the lowest delay value is then used for the time reference setting on the BTS. This will move 0-system time out to the CMI antenna that is nearest timewise. The calculated or measured value should be added to the default value for both “Tx_offset” and Rx_offset”.

NOTE

For the time reference calculation, D_{AIR} is 0 for a handset within 25 feet of the nearest (timewise) CMI antenna.

The second setting that must be adjusted for TransCell 1900CB is the search window size. This again is caused by the delay inherent with TransCell 1900CB. The settings affect the *active* search window, the *neighbor* search window, and the *remainder* search window, if active. Section 6.6.6.2.1 of TIA/EIA-95-B defines the establishment of search windows and details the available base station settings and the resultant window sizes. TIA/EIA-95-B states that: “The search window size for each pilot in the Active Set and the Candidate Set shall be the number of PN chips specified in Table 6.6.6.2.1-1 with the window centered around the earliest arriving multipath component of the pilot.”

The window size determines the number of chips off of center that the handset searches when looking for PN offsets (set of pilot signals). This should be sized according to the expected delay. The same holds true for the neighbor list and the remainder list. Table 4-1 lists the window size settings in Table 6.6.6.2.1-1 of TIA/EIA-95-B along with the equivalent delay length.

For the dedicated sector with equal timing, the search window setting is selected from Table 4-1 after calculating, with Equation [1] above, the delay for both the most delayed CMI and the least delayed CMI in the sector and calculating the differential. This then is the range through which the search window must repeatedly pass to pick up all CMIs in the sector. Equation [2] determines the search window size. The search window is centered on the CMI antenna that is nearest timewise. This calculation is made with a maximum over-air propagation delay of 5.1 µs (1.5 km) to the most delayed CMI and a minimum over-air delay of 0 µs to the least delayed CMI (the CMI whose nearest antenna is 0 system time set point). Hence the search window size is calculated as shown in Equation [2] in terms of µs and Table 4-1 determines the setting.

$$SRCH\_WIN\_A = (D_{TOTAL,\ MAX}\ [D_{AIR}\ @1.5\ km] - D_{TOTAL,\ MIN}\ [D_{AIR}\ @0\ km])/2 \qquad \textbf{[2]}$$

Note: D_{AIR} is always zero.

Table 4-1. Search Window Sizes

Srch_win_Active/Candidate Srch_win_Neighbor Srch_win_Remainder	Window Size (PN chips)	Window Delay Length (ms)
00	4	3.25
01	6	4.88
02	8	6.50
03	10	8.14
04	14	11.34
05	20	16.28
06	28	22.90
07	40	32.56
08	60	48.84
09	80	65.12
10	100	81.40
11	130	105.82
12	160	130.24
13	226	183.96
14	320	260.48
15	452	367.93

4.2.2 Sector Dedicated to TransCell 1900CB - Timing Unequal

4.2.2.1 Description

This architecture, shown in Figure 4-2, is similar to that shown in Figure 4-1 except that the forward and reverse paths have different timing. As with section 4.2.1, the BTS sectors are dedicated to CMIs. Although three sectors are shown, one or two sectors can be dedicated to TransCell 1900CB with the remainder dedicated to towers. The CMIs can be on multiple fiber nodes. The HFC physical layer for forward and reverse links is neither shared nor parallel and has different delay times from BTS to CMI antenna. Since timing is not equal on the HFC network and all PCS communications to the wireless handset are conducted through the CMIs, the BTS has to account for the differential timing between the forward and reverse links on the TransCell 1900CB physical layer. This can be accomplished through either search windows or differential timing settings. Both are discussed in the following paragraphs.

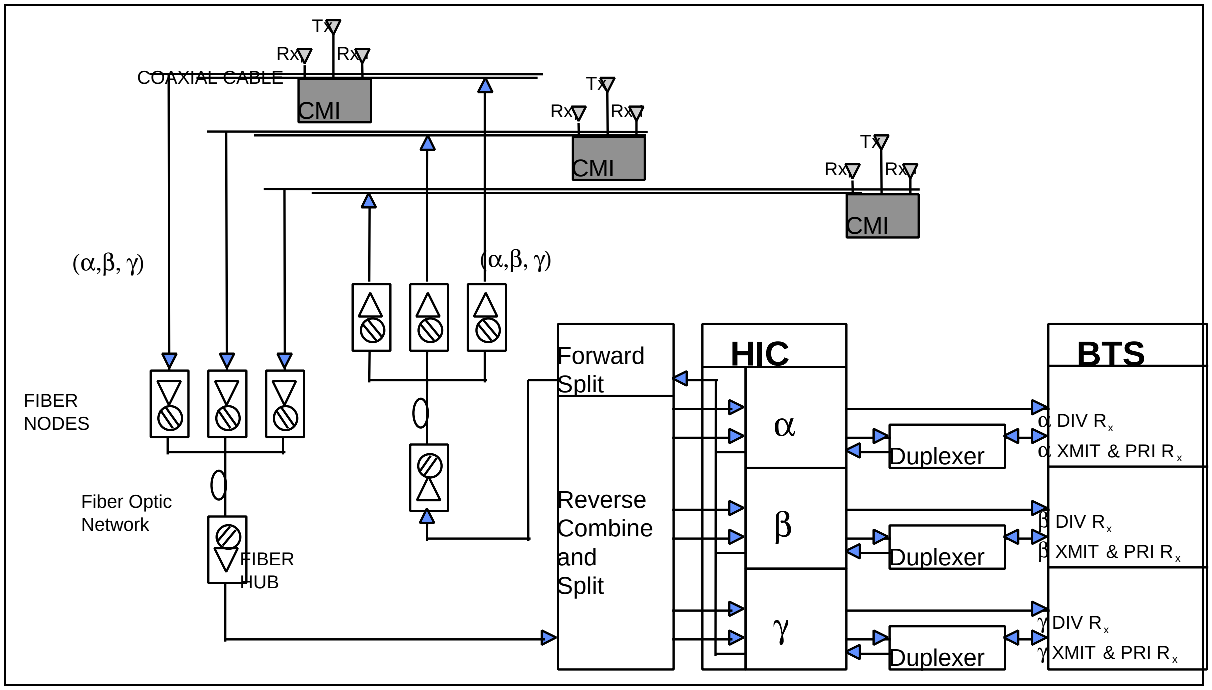


Figure 4-2. Sector Dedicated to TransCell 1900CB with Unequal Timing Links

4.2.2.2 Basic BTS Settings for Dedicated Sector with Unequal Timing

For the dedicated sector with unequal timing, the two basic TIA/EIA-95-B settings already discussed—time reference and search window size—must be taken into account, and possibly differential timing as well. The following procedures are recommended for determining the setting of the two basic parameters.

Time reference is calculated in the same manner as it was in section 4.2.1.2, except that it is established by determining the delay along both links to each CMI and comparing them. The delay calculations are made in each direction utilizing Equation [1]. The time reference is determined by taking the delay that is the smallest and represents the nearest CMI timewise. The forward path timing delay (Equation [1]) should be added to the default setting for “Tx_offset”. The reverse path time reference should be added to the default setting for “Rx_offset”.

The search window size is set in the same manner as it was in section 4.2.1.2. Equation [2] is used to determine the search window size in µs based on the longest delay path and the shortest delay path regardless of which link they are on. The shortest delay path is also at the CMI whose nearest antenna is 0 system time set point. These two values are calculated with Equation [1]. Table 4-1 is then referred to for the setting once the window size is determined.

4.2.3 Simulcasting with a Tower - Timing Equal Within TransCell 1900CB

4.2.3.1 Description

This architecture, shown in Figure 4-3, is similar to that shown in Figure 4-1 except that the BTS interface is through a coupled port. The RF for the alpha sector is split between TransCell 1900CB and the tower antenna. This is a tower-CMI simulcast and can be done on all three sectors, although Figure 4-3 shows it only for the alpha sector. The HFC physical layer for forward and reverse links is either shared or parallel and has the same delay times from BTS to CMI antenna.

Timing between links is equalized on the HFC network and TransCell 1900CB equipment but not with the tower antenna. There will be a significant delay to the CMI because of the HFC network and TransCell 1900CB group delay. PCS communications to the wireless handset on the alpha sector can be through either the CMIs or the tower, and they can hand off to each other. In handing off from the tower to the CMI, the BTS would regard the CMI signal as a delayed multipath. To discriminate signals from the CMI to the tower, the BTS would regard the tower signal as an advanced multipath.

4.2.3.2 Basic BTS Settings for Shared Sector with Equal Timing

For the shared sector, two basic TIA/EIA-95-B settings must be taken into account as in the previous cases, time reference and search window size. The following procedures are recommended for determining the setting of the two basic parameters.

Time reference is determined at the tower antenna, not the CMI, and assumes that tower antenna distance from the BTS is less than the distance to the first CMI. This avoids negative time and meets the TIA/EIA-95-B standard definitions for absolute time. The delay is calculated from Equation [1] using only the D_{COAX} term, which defines the delay over the heliax that runs from the BTS to the tower antenna.

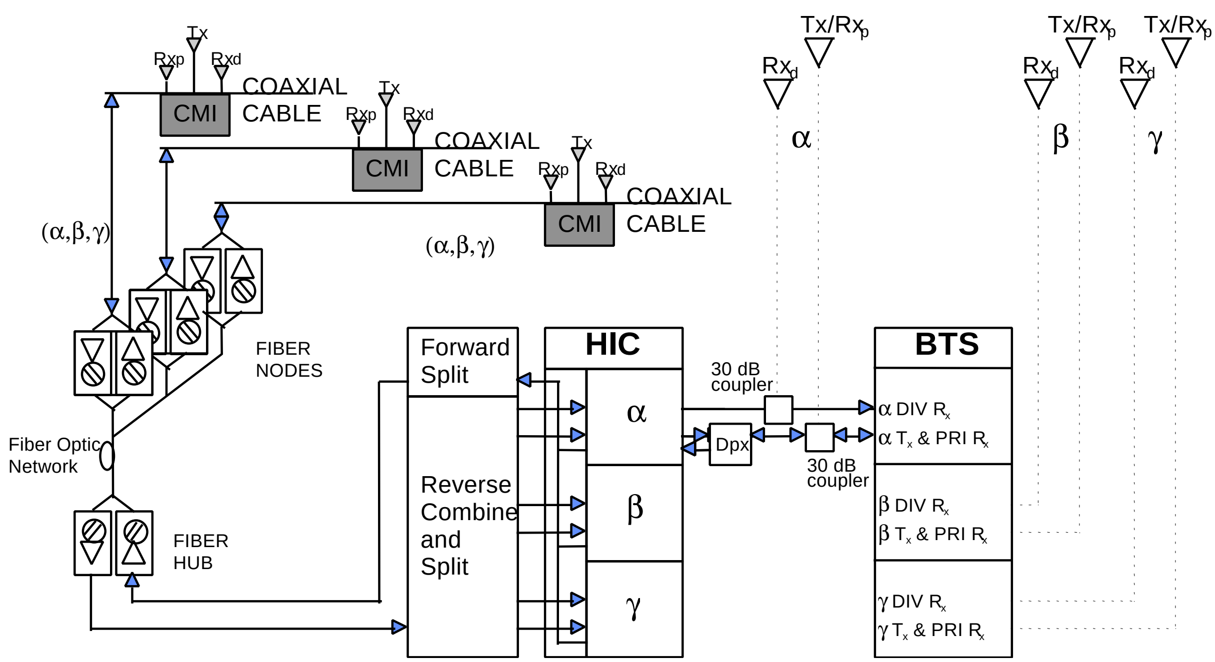


Figure 4-3. Tower Sector Split with TransCell 1900CB - Timing Equal

The search window size is set in the manner similar to that in paragraph 4.2.1.2 except that the window is centered around the absolute time at the tower antenna where the time reference is set. Equation [2] is used to determine the search window size in µs based on the longest delay path out to the furthest CMI (calculated with Equation [1]) and the shortest delay path at the time reference antenna (0 second delay). Table 4-1 is then referred to for the setting once the window size is determined.

It should be noted in this situation that the search window will be opened up more than it would be for the tower alone. Thus in an established network, where the search windows have been set prior to the addition of TransCell 1900CB, the search window sizing of adjacent sectors that can hand off to the CMIs must be reset. The neighbor search windows for these sectors must be set at the same value as the active search window for the sector that contains the CMIs since the same delay rationale applies whether it is a handoff across sectors or within a sector.

4.2.4 Split Sector - Timing Unequal Within TransCell 1900CB

4.2.4.1 Description

This architecture, shown in Figure 4-4, is similar to that shown in Figure 4-2 except that the BTS interface is through a coupled port. The RF for the sector is split between TransCell 1900CB and the tower antenna. This is a tower-CMI simulcast and can be done on all three sectors, although Figure 4-3 shows it only for the alpha sector. The HFC physical layer for forward and reverse links is neither shared nor parallel and has different delay times from BTS to different CMI antenna. This is not the case with the tower, which will have identical timing on the forward and reverse links. Also, as in section 4.2.3, there will be a significant delay to the CMI as compared to the tower because of the HFC network and TransCell 1900CB group delay. PCS communications to the wireless handset on the alpha sector can be through either the CMIs or the tower and they can handoff to each other. As in section 4.2.3, handing off in either direction is not a problem with the proper time reference and window settings.

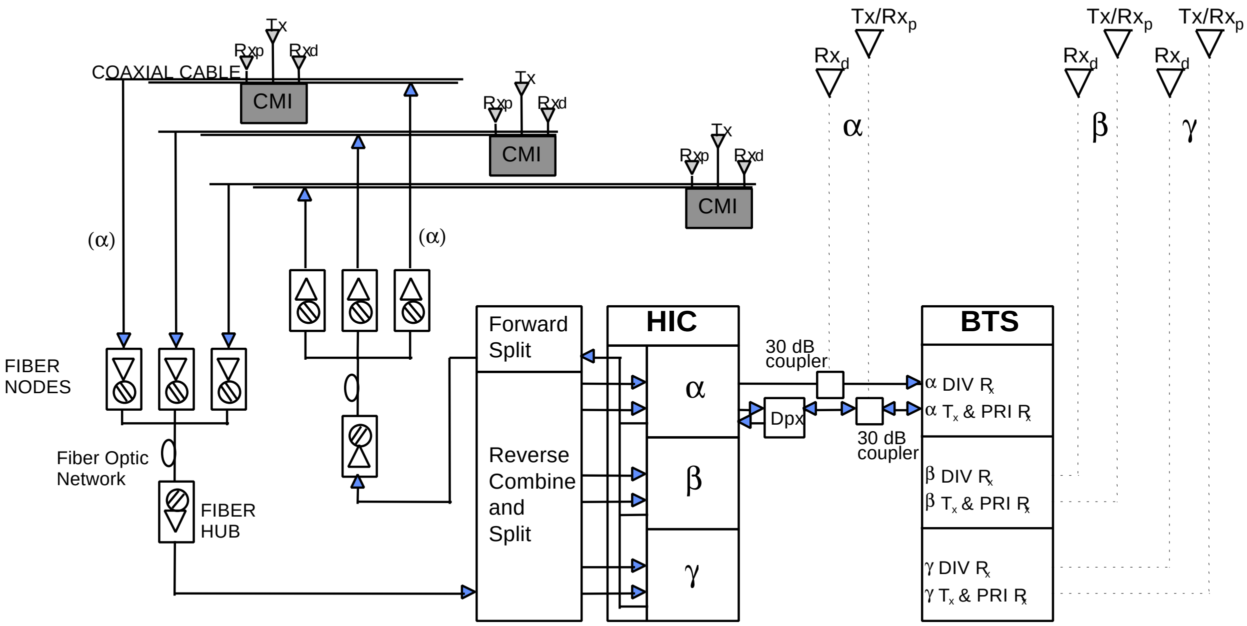


Figure 4-4. Tower Sector Split With TransCell 1900CB - Timing Unequal

4.2.4.2 Basic BTS Settings for Shared Sector with Unequal Timing

For the shared sector, two basic TIA/EIA-95-B settings must be taken into account as in the previous cases, time reference and search window size. The following procedures are recommended for determining the setting of the two basic parameters.

As in section 4.2.3, time reference is determined at the tower antenna, not the CMI. The delay is calculated from Equation [1] using only the D_{COAX} term, which defines the delay over the heliax which runs from the base station to the tower antenna.

The search window size is set in the manner similar to that in section 4.2.1.2 except that the window is centered around the absolute time at the tower antenna where the time reference is set, and calculations must be made for both the forward and reverse link of all CMIs. Equation [2] is used to determine the search window size in µs based on the longest delay path out to the furthest CMI (calculated with Equation [1]) and the shortest delay path at the time reference antenna (0 second delay). Table 4-1 is then referred to for the setting once the window size is determined.

As was noted in section 4.2.3.2, the search window will be opened up more than it would be for the tower alone. In an established network, the search window sizing of adjacent sectors that can hand off to the CMIs must be reset. The neighbor search windows for these sectors must be set at the same value as the active search window for the sector that contains the CMIs since the same delay rationale applies whether it is a handoff across sectors or within a sector.

4.3 ASSESSMENT OF BTS SECTORS

Prior to connecting any TransCell 1900CB equipment to the BTS, verify that the applicable BTS sector has been acceptance tested to the customer's satisfaction. Also, if the CMIs are to be simulcast with a macrocell tower antenna, the link budgets of the CMIs and the macrocell must account for additional degradation in sensitivity and the resulting impact to the RF footprints of both the tower and the attached CMIs. The BTS coverage tests should be constructed to adequately address this issue.

All of the RF signal parameters are with respect to a single carrier. If total power is measured (ie., via a power meter), the user is required to correlate the measurements to a single carrier (ie., a single carrier is 4.75dB less than a three carrier signal).

4.4 PHYSICAL INTERFACES WITH BTS

The following are recommended procedures for interconnecting the HICs with the BTS and the Hub.

> **NOTE**
>
> The cables needed for a full enclosure occupy much space and can interfere with normal equipment servicing by obscuring view and blocking access. As each HIC is installed, special care should be taken to bundle and route the cables in a manner that minimizes space use.
>
> In order to complete the following HIC integration procedure, network technician on-site support is required.

The procedures that follow provide the initial checks and adjustments needed to integrate an installed (acquired) HIC with the BTS in both Forward and Reverse directions.

is provided for reference for the Forward link level check, and Figure 4-7 for the Reverse link level check.

Cross-reference tables for PCS channel number-to-frequency and HIC channel number-to-frequency are provided in Appendix B and Appendix C, respectively.

a. At HUB CONTROL PANEL: SUPER-USER dialog, double-click on desired installed HIC (green icon).

b. Observe that HIC CONTROL PANEL dialog appears (Figure 4-9).

c. Verify HIC CONTROL PANEL dialog displays the following desired settings. Click on associated <u>Control</u> button to change setting, if needed.

- FWD Channel is set as needed by user (channel values)
- Both Reference Tone and Control Tone enabled

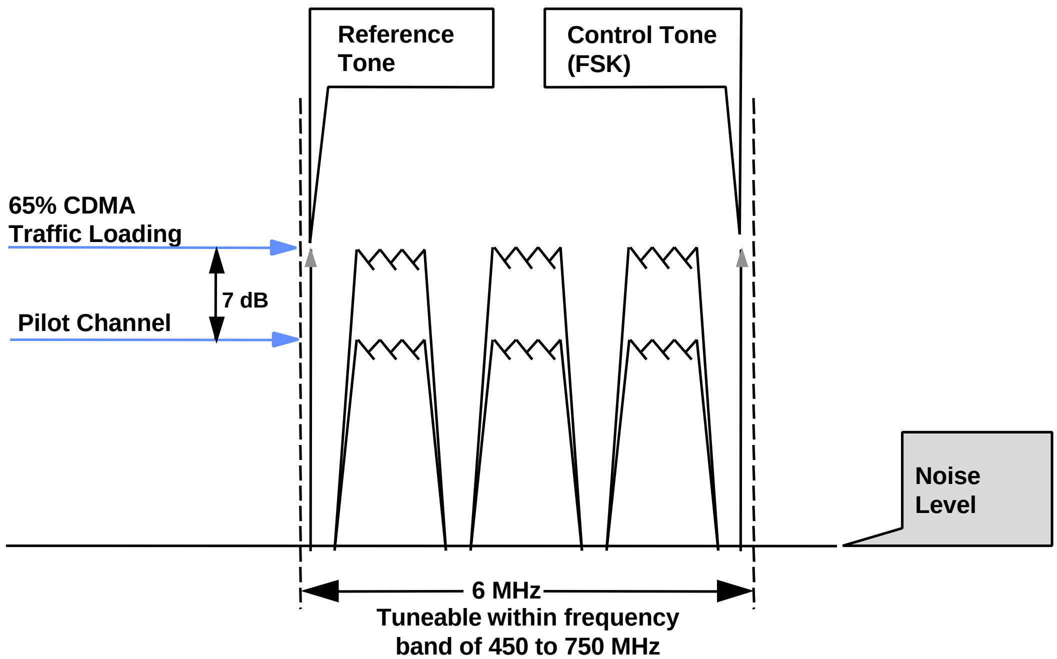
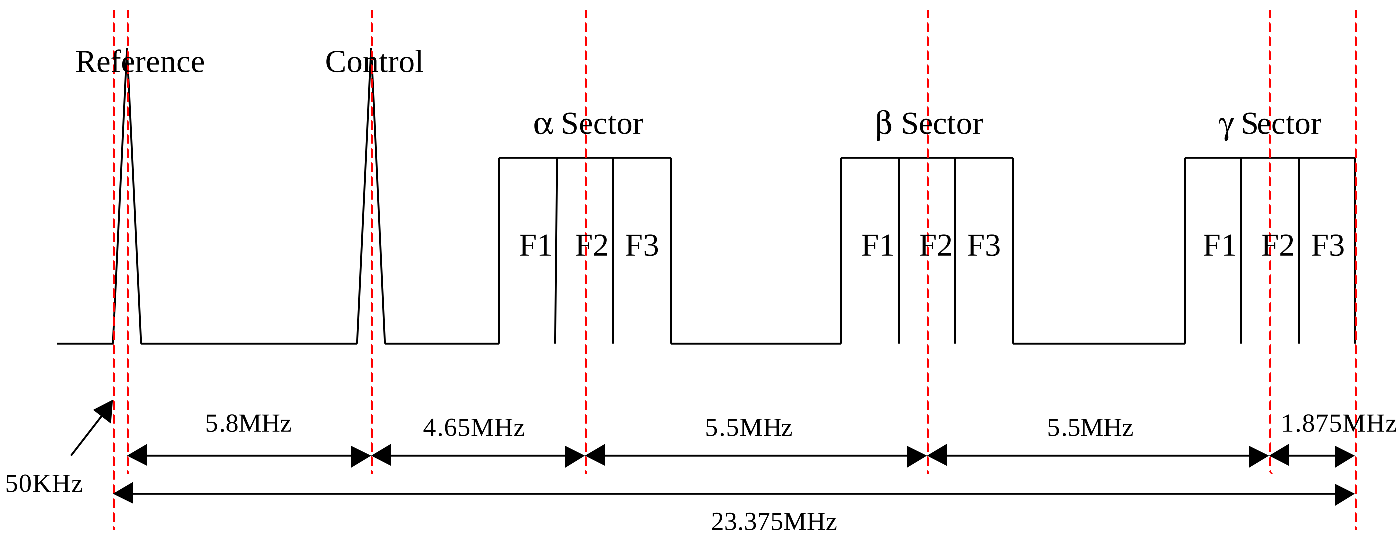


Figure 4-5. Typical Forward Link Levels; Single Carrier

Figure 4-6. Typical Forward Link Levels; Three Carrier



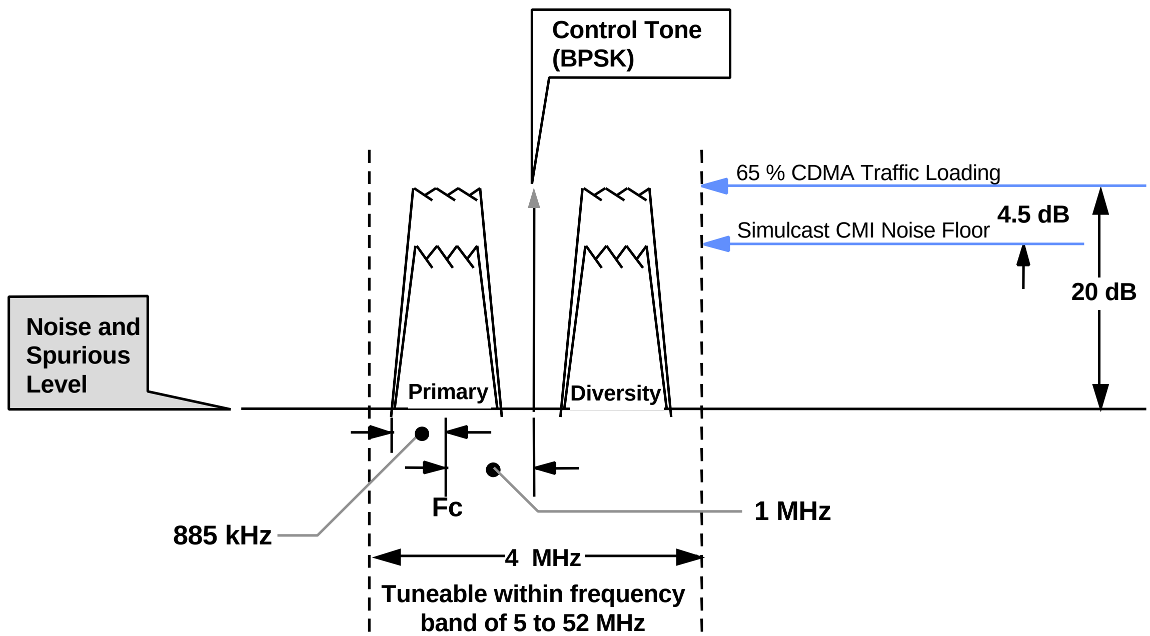


Figure 4-7. Typical Reverse Link Levels; Single Carrier

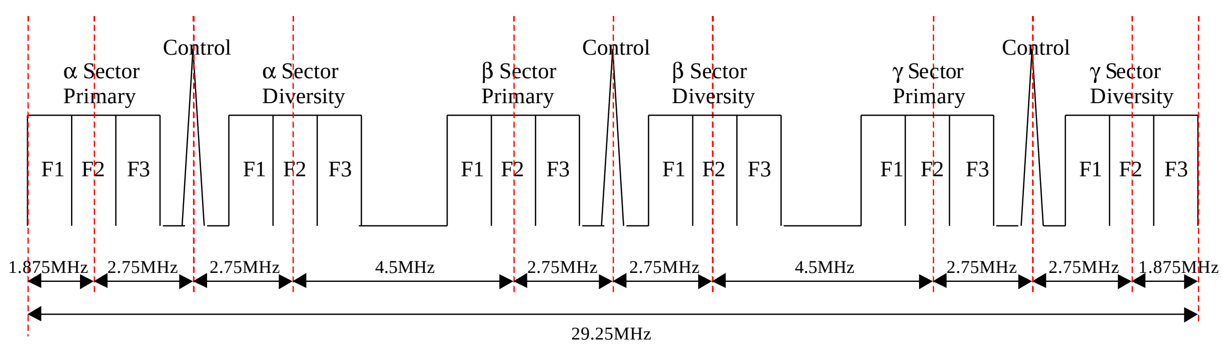


Figure 4-8. Typical Reverse Link Levels; Three Carrier

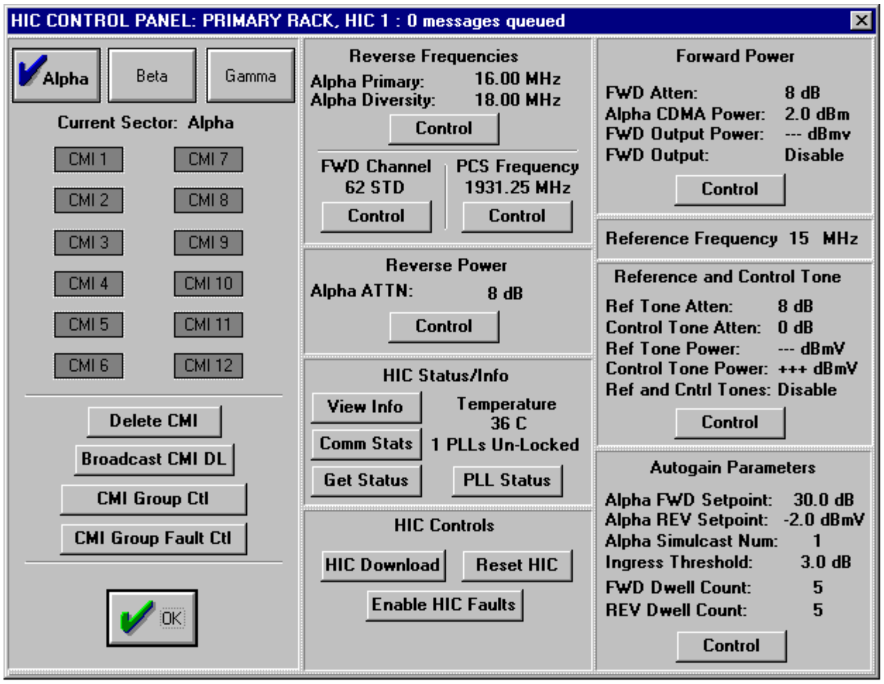


Figure 4-9. HIC CONTROL PANEL: Dialog

> **NOTE**
>
> The CMI data sheet at the end of this manual may be reproduced and used for recording the measured levels specified in the following procedures.

4.4.1 Measurement of HIC Reverse Link Output

This procedure assumes that the reverse link from the network has been tested with active CMIs per paragraphs 2.8.1.

a. For sector to be measured, disconnect RFIA BTS OUT PRI/DIV output cables from RFIA (if applicable).

b. Disconnect HIC Input cable for sector to be measured (if applicable).

c. Using a 75Ω cable, connect a signal generator to HIC input port of sector to be measured. Set signal generator as follows with RF output DISABLED:

- *Frequency:* CMI reverse link Primary (or Diversity) pedestal center frequency for the sector being measured.
- If measuring RFIA/HIC REV Primary BTS output, set the signal generator to CMI REV Primary pedestal center frequency; if measuring RFIA/HIC REV Diversity BTS output, set to the CMI REV Diversity pedestal center frequency.
- *RF Output Power Level:* -39 dBm Connect spectrum analyzer to HIC BTS OUT PRI/DIV output terminals using 50 Ω connectors, and set spectrum analyzer as follows:
- Center Frequency: REV PCS CDMA Channel (Chan. 150 = 1857.5 MHz)
- Scale: 2 dB/div
- Span: 6 MHz
- RBW: 1.25 MHz (or 30 kHz)

d. Enable RF output of signal generator to inject CW signal into HIC CATV IN port.

e. Determine if reverse link output level of CW signal is between -50 and -60 dBm. Adjust reverse link attenuator of HIC until the CW signal is -55 dBm ± 1 dB.

4.4.1.1 HIC CDMA Reverse Link Output to BTS

> **NOTE**
>
> This procedure assumes all connections between the HIC and the network have been made and the external equipment, RF signals, and communications are functioning properly.
>
> The Reverse output power of the HIC is -50 to -60 dBm (nominal of -55 dBm) with –93 dBm injected at CMI receive ports. Depending on cable length and Reverse BTS input power level specification, external attenuator pads may be necessary for optimal performance.

The RFIA/HIC provides the CDMA Reverse link input signals to the BTS. Each HIC provides a pair of reverse link signals for each sector, designated PRI (Primary) and DIV (Diversity).

a. Connect an RF cable to alpha sector reverse link Primary (Rx - S1D0) input port of BTS, and route cable to selected RFIA/HIC in the Hub enclosure.

b. Secure cable to appropriate cable troughs to eliminate any strain on cable connectors.

c. Verify that both reverse RFIA/HIC output levels (primary and diversity) are within specification in accordance with paragraph 4.4.1.

d. Connect cable to REV alpha BTS OUT PRI port on rear panel of selected RFIA. (Figure 4-10).

e. Connect an RF cable to alpha sector reverse link Diversity (Rx - S1D1) input port of BTS, and route cable to selected RFIA/HIC.

f. Connect cable to REV alpha BTS OUT DIV port on rear panel of selected RFIA.

g. Repeat steps *a* through f for beta sector of RFIA/HIC and BTS, connecting to S2D0 and S2D1 ports on BTS.

h. Repeat steps *a* through f for gamma sector of RFIA/HIC and BTS, connecting to S3D0 and S3D1 ports on BTS.

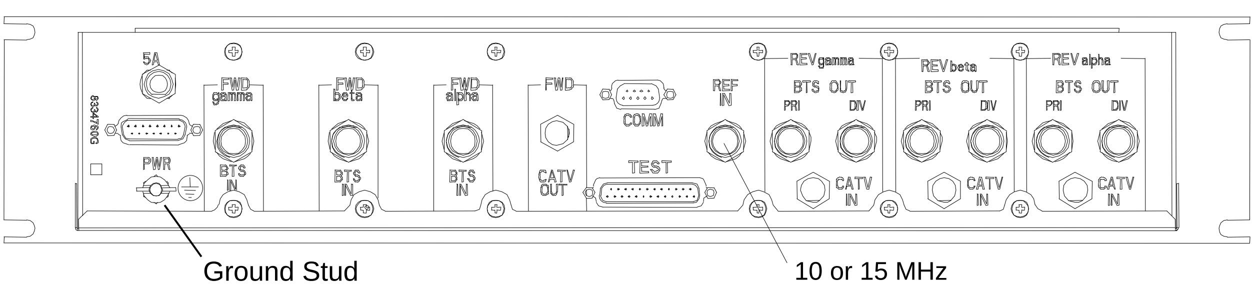


Figure 4-10. HIC Rear Panel

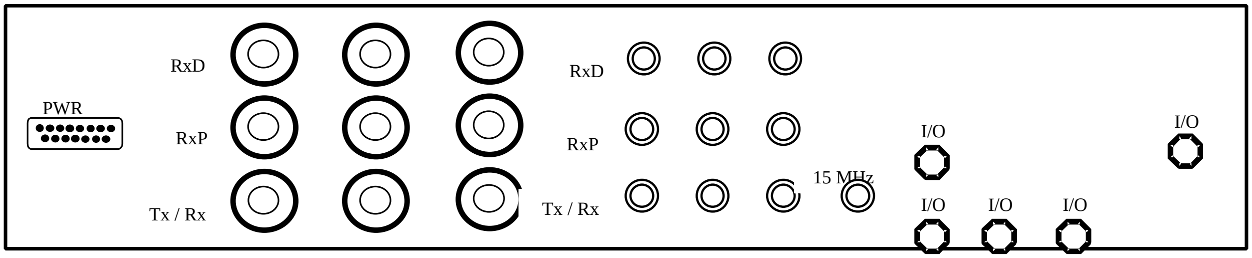


Figure 4-11. RFIA Rear Panel

4.4.2 CDMA Forward Link Input from BTS

The BTS provides the CDMA forward link input signal to the installed RFIA/HICs. Each installed RFIA/HIC is divided into three sectors, designated alpha, beta, and gamma. The sectors operate independent of each other, communicating over separate cables with three BTS sectors, also designated alpha, beta, and gamma. The following procedure is used to measure the HIC forward link CDMA Input Power level after interfacing with the BTS.

CAUTION
Because some BTS units are capable of generating an extremely high forward link power level, it is important to measure the forward link output of the BTS prior to connecting it to the HIC input.

a. Connect a Forward link RF cable to alpha sector (S1) forward link CDMA output port of BTS, and route cable over to vicinity of selected RFIA/HIC in the Hub enclosure. Do not connect cable at this time.

b. Secure cable to appropriate cable troughs to eliminate any strain on cable connectors.

c. For sector to be measured, connect HIC forward link CDMA input cable (after RFIA) from BTS to spectrum analyzer input (50 Ω).

d. Set spectrum analyzer as follows:

- Center Frequency: FWD PCS Channel Frequency (PCS Ch. 25 = 1931.25 MHz)
- Span: 6 MHz; 1.25 MHz (or 30 kHz RBW)
- Scale: 2 dB/div
- Input Impedance: 50 Ω
- Units: dBm
- Video Averaging: 100 Averages

e. Measure HIC CDMA input levels from BTS using display line after 100 averages. Ensure that input levels are within specification:

Single CDMA Carrier, 1.25 MHz RBW		
	65% Pole	*Pilot Only*
Maximum	+5.0 dBm	-2.0 dBm
Minimum	-2.0 dBm	-9.0 dBm
Single CDMA Carrier, 30 kHz RBW		
	65% Pole	*Pilot Only*
Maximum	-12.7 dBm	-19.7 dBm
Minimum	-19.7 dBm	-26.7 dBm

f. Record measured level.

g. After level has been verified, connect Forward link cable between RFIA alpha sector and FWD alpha BTS IN port on rear panel of selected HIC (Figure 4-10).

h. Repeat steps *a* through *g* for beta and gamma sectors to complete one RFIA/HIC/BTS connection. (The BTS beta sector is S2 and the gamma sector is S3.)

4.4.3 CDMA Forward Link Output to Coaxial Network

The HIC provides the CDMA Forward link signal to the coaxial network or fiber network through the HFI. Each HIC provides a single forward link signal (one or three carriers), the combined output of all three sectors.

a. Connect a forward link RF or Fiber cable from appropriate forward link device in Hub; route cable to selected HIC or HFI in Hub enclosure.

b. Secure cable to appropriate cable troughs to eliminate any strain on cable connectors.

c. Connect coaxial cable to FWD CATV OUT port on rear panel of selected HIC for a coaxial installation (Figure 4-10) or connect the fiber cable to the appropriate HFI transceiver port.

4.4.3.1 HIC Forward Link CDMA Pilot Level

This procedure verifies that the CDMA Pilot Level at the HIC FWD CATV OUT port is between -26 and -36 dBm.

> **NOTE**
> CDMA levels should be measured in a 1.23-MHz resolution bandwidth. However, a 30-kHz RBW can be used by adding a 16.1-dB correction factor to the measured level in order to obtain the actual level. (16:1 = 10_{LOG} 1.23 MHz/30 kHz)

a. Connect a spectrum analyzer to HIC FORWARD TEST POINT (75 Ω).

b. Set spectrum analyzer as follows:

- Center Frequency: FWD HIC Channel
- Scale: 2 dB/div
- Span: 6 MHz
- RBW: 1.25 MHz (or 30 kHz)

c. Adjust span and/or center frequency so that forward CDMA pedestals for all sectors can be seen.

d. Measure HIC forward CDMA output at HIC FORWARD TEST POINT with spectrum analyzer, using display line and 100 averages. Determine if forward link CDMA power levels are within range:

Single CDMA Carrier, 1.25 MHz RBW		
	65% Pole	*Pilot Only*
Maximum	-19 dBm	-26 dBm
Minimum	-29 dBm	-36 dBm
Single CDMA Carrier, 30 kHz RBW		
	65% Pole	*Pilot Only*
Maximum	-35 dBm	-42 dBm
Minimum	-45 dBm	-52 dBm

e. Adjust attenuation as needed in HIC FORWARD POWER dialog (Figure 4-12) to attain required power level specification. Record amplitude and attenuator setting.

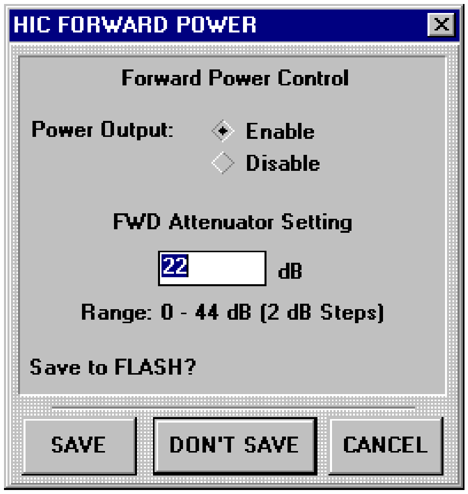


Figure 4-12. HIC FORWARD POWER Dialog

Table 4-2. Recognized Alarm List

Name	Alarm ID	Action Indicator	Criticality	Alarm Source	Probable Equip
BTS Alpha Forward Output Alarm	5	Manual	Critical	HIC	BTS
BTS Beta Forward Output Alarm	6	Manual	Critical	HIC	BTS
BTS Gamma Forward Output Alarm	7	Manual	Critical	HIC	BTS
BTS Alpha Forward Output Warning	8	Manual	Minor	HIC	BTS
BTS Beta Forward Output Warning	9	Manual	Minor	HIC	BTS
BTS Gamma FWD Output Warning	10	Manual	Minor	HIC	BTS
External Reference Output Alarm	11	Manual	Critical	HIC	Ref Source
HIC Forward Output Alarm	1	Manual	Critical	HIC	HIC
HIC Forward Output Warning	2	Manual	Minor	HIC	HIC
HIC Forward Communications Alarm	3	Manual	Minor	HIC	HIC
HIC Forward Reference Alarm	4	Manual	Critical	HIC	HIC
HIC Reverse Output Alarm	12	Manual	Critical	HIC	HIC
HIC Reverse Communications Alarm	13	Manual	Minor	HIC	HIC
HIC Temperature Alarm	14	Manual	Minor	HIC	HIC
HIC Processor Alarm	15	Manual	Minor	HIC	HIC
HIC Not Responding Alarm	16	Manual	Critical	HCU	HCU
HIC Manual Override Alarm *	61	Manual	Critical	HCU	None
CMI Forward Output Alarm	21	Manual	Major	CMI	CMI
CMI Forward Comms Alarm	23	Manual	Minor	CMI	CMI
CMI Forward Reference Alarm	24	Manual	Major	CMI	Network
CMI Reverse Output Alarm	25	Manual	Major	CMI	CMI
CMI Reverse Communications Alarm	26	Manual	Minor	CMI	CMI
CMI Temperature Alarm	27	Manual	Minor	CMI	CMI
CMI Processor Alarm	28	Manual	Major	CMI	CMI
CMI Forward Output Warning	22	Manual	Info	CMI	CMI/ Network
CMI Manual Override Alarm *	62	Manual	Major	HCU	None
CMI Manual Override Warning *	63	Manual	Minor	HCU	None
Network Continuity Warning	42	Manual	Minor	CMI	Network
Network Reverse Continuity Recovered	45	Manual	Info	CMI	Network
Network Forward Continuity Recovered	46	Manual	Info	CMI	Network
Network Continuity Alarm	41	Manual	Major	HIC	Network
Network Forward Continuity Warning	43	Manual	Minor	HIC	Network
Network Reverse Continuity Alarm	44	Manual	Major	HIC	Network
Network Prime Power Alarm	47	Manual	Info	CMI	Network

* The device attribute causing the alarm must be re-enabled before the alarm can be closed.

4.5 INITIAL SETTING OF BTS PARAMETERS

4.5.1 Initial Conditions

a. The BTS should be installed and connected to the RFIA/ HIC.

b. The CDMA power levels should be set in both directions throughout the TransCell 1900CB system to meet nominal operating conditions.

c. The link budgets associated with the RF footprint of each CMI and macro sector (if simulcasting with CMIs) should have been evaluated prior to CW testing. The bases for the link budgets will be verified with the fine-tuning of the BTS parameters (paragraph 4.6).

4.5.2 Guidelines for Initial Setting of Parameters

The delay to each CMI should be measured/calculated as described in paragraph 4.2. This measurement/calculation will be used only as a means of establishing an initial phone call over the TransCell 1900CB system; the actual delay will be measured later.

The forward delay value should be added to the manufacturer's default forward delay (BTS hardware delay) in the *Tx_offset_fine* parameter. The reverse path delay estimate will be incorporated into the *Rx_offset_fine* parameter by adding the estimate to the manufacturer's default value. Note that these values may be in either decimal or hexadecimal depending on the BTS manufacturer. Typically, the values will be entered in units of 1/8 PN chip (approximately 101.75 ns).

The BTS uses a parameter called the *access time-out* to determine how long to wait for a given phone to respond to a paging message when originating calls. This parameter may need to be increased for use with a TransCell 1900CB sector. The parameter to be changed is called *ACC_TMO* and defines the access time-out by the equation:

$$T_A = (2 + ACC\_TMO) * 80 \text{ ms}$$

Typically, an increase of 2 or 3 units will be sufficient. A larger increase can be used initially, then stepped down later during system optimization.

At this point it should be possible to place a call at the nearest CMI location using the CMI transport system in both directions. A mobile diagnostic monitor can be used to verify that the forward link signal is using the CMI path, rather than an "over-air" path from a distant tower. In the reverse direction, the CMI receivers can be disabled to verify which CMI path is being utilized.

Once it is confirmed that the call is using the CMI transport path in both directions, a call trace should be initiated on the given test phone and used to monitor a phone call for several seconds. The switch log of the call trace will record round trip delay from the channel cards in the BTS through the mobile unit. This value will be used to refine the earlier delay estimates.

The round-trip delay divided by 2 will yield a preliminary one-way delay. (Note: It is very important that the physical transport path be identical in both directions. If this is not the case, then a BTS correction factor is needed to compensate for BTS propagation delay differences in the two directions. (i.e., Tx_Delay offset, Rx_Delay offset).

4.6 OPTIMIZING BTS PARAMETER SETTINGS

a. Activate all CMIs and towers to be used in the network.

b. Conduct extensive drive test to verify call origination and handoff performance.

c. Adjust timing parameters as necessary to improve call-processing performance.

Appendix A

Radio Frequency Interface Assembly (RFIA) Configuration Procedure

Radio Frequency Interface Assembly (RFIA) Configuration Procedure

A-1 TOOLS REQUIRED

- DVM
- Common hand tools

A-2 SUPPLIES REQUIRED

- Cable ties (furnished)
- Miscellaneous internal interconnect cables (furnished)
- Cabling for external connections to BTS and cable plant (supplied by customer)

A-3 EQUIPMENT DESCRIPTION

The RF Interface Assembly (RFIA) provides an interface between the HIC, BTS, HFI, and Coaxial Network. It also generates a stable 15-MHz reference signal to the HICs installed in the indoor enclosure and the outdoor enclosure.

The RF Interface Plate Assembly (see Figure C-1) serves as a transition point within the Hub equipment enclosure to convert the larger and more rigid cabling from the BTS and coaxial network to smaller and more flexible cabling to the HIC. One RFIA is required for each HIC installed. This configuration is mounted in the rear of the enclosure directly above the associated HIC and occupies space the size of one HIC.

This panel provides the interface between the HIC ("TNC" connectors), the BTS ("N" connectors) and the coaxial network or the HFI ("F" connectors). There are nine type N connectors that interface the signals for the three sectors from the BTS to the HIC and four type F connectors that interface the reverse IF signals and the forward IF signal for all three sectors to the HIC. A 15 MHz oscillator on the assembly provides a reference frequency for the HIC.

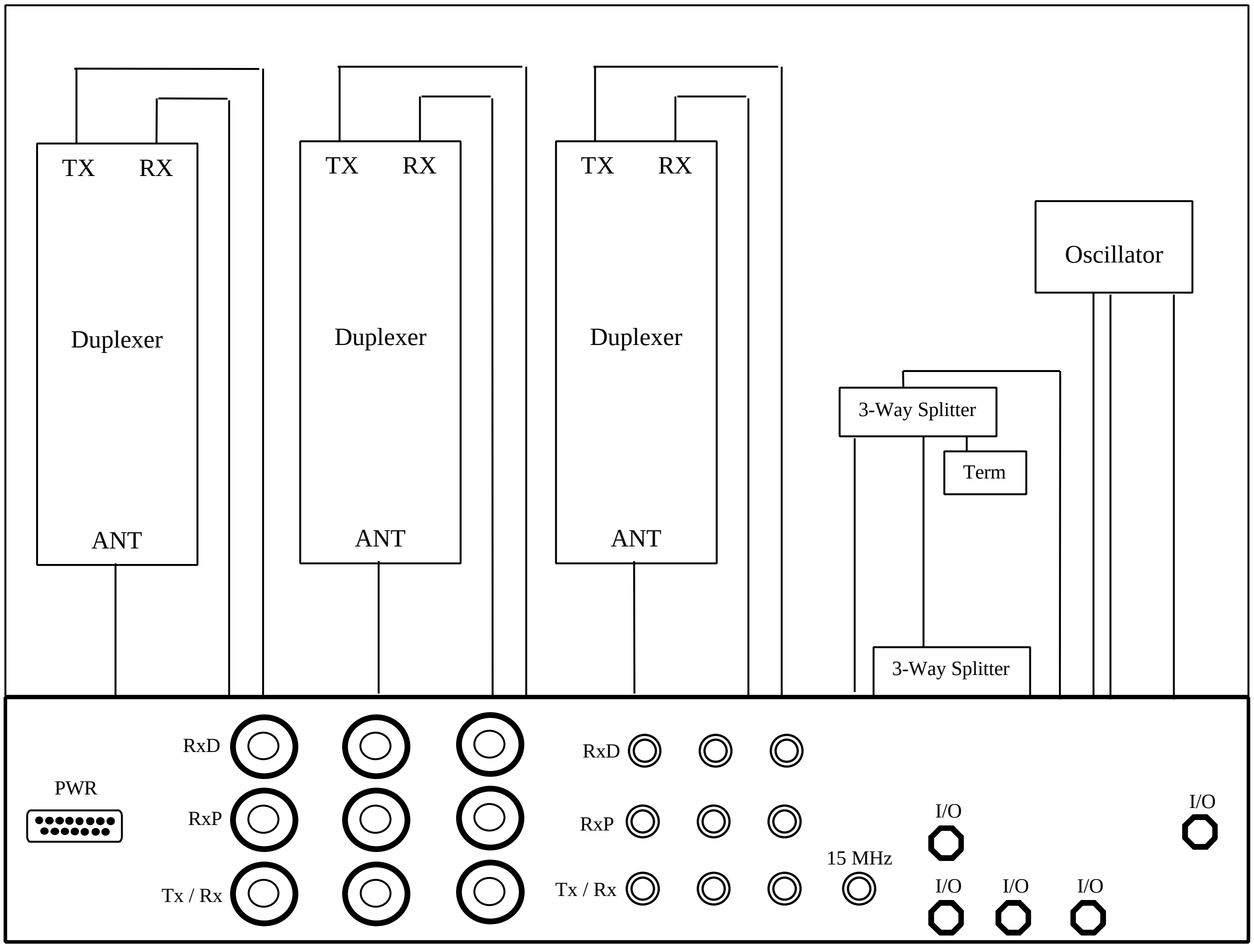


Figure C-1. RF Interface Plate Assembly

The RFIA configurations provide duplexing of the RF signals between the HIC, the BTS and the coaxial network or HFI. When necessary, amplifiers may be inserted to increase the power levels of the signals between the HIC and BTS.

A duplexer is used to permit coupling of transmit and receive signals through a single port. This device is used primarily for those installations that require the interfacing a single BTS sector to a single HIC, or two or three sectors of a BTS to a single HIC.

One RFIA is required for each HIC installed. Each RFIA requires +24 VDC for operation.

Appendix B

PCS Channel Number-To-Frequency Cross-reference

PCS Channel Number-to-Frequency Cross Reference

PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)
A Band: 0 - 299 *			50	1932.50	1852.50	101	1935.05	1855.05
0	1930.00	1850.00	51	1932.55	1852.55	102	1935.10	1855.10
1	1930.05	1850.05	52	1932.60	1852.60	103	1935.15	1855.15
2	1930.10	1850.10	53	1932.65	1852.65	104	1935.20	1855.20
3	1930.15	1850.15	54	1932.70	1852.70	105	1935.25	1855.25
4	1930.20	1850.20	55	1932.75	1852.75	106	1935.30	1855.30
5	1930.25	1850.25	56	1932.80	1852.80	107	1935.35	1855.35
6	1930.30	1850.30	57	1932.85	1852.85	108	1935.40	1855.40
7	1930.35	1850.35	58	1932.90	1852.90	109	1935.45	1855.45
8	1930.40	1850.40	59	1932.95	1852.95	110	1935.50	1855.50
9	1930.45	1850.45	60	1933.00	1853.00	111	1935.55	1855.55
10	1930.50	1850.50	61	1933.05	1853.05	112	1935.60	1855.60
11	1930.55	1850.55	62	1933.10	1853.10	113	1935.65	1855.65
12	1930.60	1850.60	63	1933.15	1853.15	114	1935.70	1855.70
13	1930.65	1850.65	64	1933.20	1853.20	115	1935.75	1855.75
14	1930.70	1850.70	65	1933.25	1853.25	116	1935.80	1855.80
15	1930.75	1850.75	66	1933.30	1853.30	117	1935.85	1855.85
16	1930.80	1850.80	67	1933.35	1853.35	118	1935.90	1855.90
17	1930.85	1850.85	68	1933.40	1853.40	119	1935.95	1855.95
18	1930.90	1850.90	69	1933.45	1853.45	120	1936.00	1856.00
19	1930.95	1850.95	70	1933.50	1853.50	121	1936.05	1856.05
20	1931.00	1851.00	71	1933.55	1853.55	122	1936.10	1856.10
21	1931.05	1851.05	72	1933.60	1853.60	123	1936.15	1856.15
22	1931.10	1851.10	73	1933.65	1853.65	124	1936.20	1856.20
23	1931.15	1851.15	74	1933.70	1853.70	125	1936.25	1856.25
24	1931.20	1851.20	75	1933.75	1853.75	126	1936.30	1856.30
25	1931.25	1851.25	76	1933.80	1853.80	127	1936.35	1856.35
26	1931.30	1851.30	77	1933.85	1853.85	128	1936.40	1856.40
27	1931.35	1851.35	78	1933.90	1853.90	129	1936.45	1856.45
28	1931.40	1851.40	79	1933.95	1853.95	130	1936.50	1856.50
29	1931.45	1851.45	80	1934.00	1854.00	131	1936.55	1856.55
30	1931.50	1851.50	81	1934.05	1854.05	132	1936.60	1856.60
31	1931.55	1851.55	82	1934.10	1854.10	133	1936.65	1856.65
32	1931.60	1851.60	83	1934.15	1854.15	134	1936.70	1856.70
33	1931.65	1851.65	84	1934.20	1854.20	135	1936.75	1856.75
34	1931.70	1851.70	85	1934.25	1854.25	136	1936.80	1856.80
35	1931.75	1851.75	86	1934.30	1854.30	137	1936.85	1856.85
36	1931.80	1851.80	87	1934.35	1854.35	138	1936.90	1856.90
37	1931.85	1851.85	88	1934.40	1854.40	139	1936.95	1856.95
38	1931.90	1851.90	89	1934.45	1854.45	140	1937.00	1857.00
39	1931.95	1851.95	90	1934.50	1854.50	141	1937.05	1857.05
40	1932.00	1852.00	91	1934.55	1854.55	142	1937.10	1857.10
41	1932.05	1852.05	92	1934.60	1854.60	143	1937.15	1857.15
42	1932.10	1852.10	93	1934.65	1854.65	144	1937.20	1857.20
43	1932.15	1852.15	94	1934.70	1854.70	145	1937.25	1857.25
44	1932.20	1852.20	95	1934.75	1854.75	146	1937.30	1857.30
45	1932.25	1852.25	96	1934.80	1854.80	147	1937.35	1857.35
46	1932.30	1852.30	97	1934.85	1854.85	148	1937.40	1857.40
47	1932.35	1852.35	98	1934.90	1854.90	149	1937.45	1857.45
48	1932.40	1852.40	99	1934.95	1854.95	150	1937.50	1857.50
49	1932.45	1852.45	100	1935.00	1855.00	*** Ch. 0 to 24 Not Valid**		

PCS Channel Number-to-Frequency Cross Reference (continued)

PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)
151	1937.55	1857.55	201	1940.05	1860.05	251	1942.55	1862.55
152	1937.60	1857.60	202	1940.10	1860.10	252	1942.60	1862.60
153	1937.65	1857.65	203	1940.15	1860.15	253	1942.65	1862.65
154	1937.70	1857.70	204	1940.20	1860.20	254	1942.70	1862.70
155	1937.75	1857.75	205	1940.25	1860.25	255	1942.75	1862.75
156	1937.80	1857.80	206	1940.30	1860.30	256	1942.80	1862.80
157	1937.85	1857.85	207	1940.35	1860.35	257	1942.85	1862.85
158	1937.90	1857.90	208	1940.40	1860.40	258	1942.90	1862.90
159	1937.95	1857.95	209	1940.45	1860.45	259	1942.95	1862.95
160	1938.00	1858.00	210	1940.50	1860.50	260	1943.00	1863.00
161	1938.05	1858.05	211	1940.55	1860.55	261	1943.05	1863.05
162	1938.10	1858.10	212	1940.60	1860.60	262	1943.10	1863.10
163	1938.15	1858.15	213	1940.65	1860.65	263	1943.15	1863.15
164	1938.20	1858.20	214	1940.70	1860.70	264	1943.20	1863.20
165	1938.25	1858.25	215	1940.75	1860.75	265	1943.25	1863.25
166	1938.30	1858.30	216	1940.80	1860.80	266	1943.30	1863.30
167	1938.35	1858.35	217	1940.85	1860.85	267	1943.35	1863.35
168	1938.40	1858.40	218	1940.90	1860.90	268	1943.40	1863.40
169	1938.45	1858.45	219	1940.95	1860.95	269	1943.45	1863.45
170	1938.50	1858.50	220	1941.00	1861.00	270	1943.50	1863.50
171	1938.55	1858.55	221	1941.05	1861.05	271	1943.55	1863.55
172	1938.60	1858.60	222	1941.10	1861.10	272	1943.60	1863.60
173	1938.65	1858.65	223	1941.15	1861.15	273	1943.65	1863.65
174	1938.70	1858.70	224	1941.20	1861.20	274	1943.70	1863.70
175	1938.75	1858.75	225	1941.25	1861.25	275	1943.75	1863.75
176	1938.80	1858.80	226	1941.30	1861.30	276	1943.80	1863.80
177	1938.85	1858.85	227	1941.35	1861.35	277	1943.85	1863.85
178	1938.90	1858.90	228	1941.40	1861.40	278	1943.90	1863.90
179	1938.95	1858.95	229	1941.45	1861.45	279	1943.95	1863.95
180	1939.00	1859.00	230	1941.50	1861.50	280	1944.00	1864.00
181	1939.05	1859.05	231	1941.55	1861.55	281	1944.05	1864.05
182	1939.10	1859.10	232	1941.60	1861.60	282	1944.10	1864.10
183	1939.15	1859.15	233	1941.65	1861.65	283	1944.15	1864.15
184	1939.20	1859.20	234	1941.70	1861.70	284	1944.20	1864.20
185	1939.25	1859.25	235	1941.75	1861.75	285	1944.25	1864.25
186	1939.30	1859.30	236	1941.80	1861.80	286	1944.30	1864.30
187	1939.35	1859.35	237	1941.85	1861.85	287	1944.35	1864.35
188	1939.40	1859.40	238	1941.90	1861.90	288	1944.40	1864.40
189	1939.45	1859.45	239	1941.95	1861.95	289	1944.45	1864.45
190	1939.50	1859.50	240	1942.00	1862.00	290	1944.50	1864.50
191	1939.55	1859.55	241	1942.05	1862.05	291	1944.55	1864.55
192	1939.60	1859.60	242	1942.10	1862.10	292	1944.60	1864.60
193	1939.65	1859.65	243	1942.15	1862.15	293	1944.65	1864.65
194	1939.70	1859.70	244	1942.20	1862.20	294	1944.70	1864.70
195	1939.75	1859.75	245	1942.25	1862.25	295	1944.75	1864.75
196	1939.80	1859.80	246	1942.30	1862.30	296	1944.80	1864.80
197	1939.85	1859.85	247	1942.35	1862.35	297	1944.85	1864.85
198	1939.90	1859.90	248	1942.40	1862.40	298	1944.90	1864.90
199	1939.95	1859.95	249	1942.45	1862.45	299	1944.95	1864.95
200	1940.00	1860.00	250	1942.50	1862.50			

PCS Channel Number-to-Frequency Cross Reference (continued)

PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)
D Band: 300 - 399			351	1947.55	1867.55			
300	1945.00	1865.00	352	1947.60	1867.60			
301	1945.05	1865.05	353	1947.65	1867.65	401	1950.05	1870.05
302	1945.10	1865.10	354	1947.70	1867.70	402	1950.10	1870.10
303	1945.15	1865.15	355	1947.75	1867.75	403	1950.15	1870.15
304	1945.20	1865.20	356	1947.80	1867.80	404	1950.20	1870.20
305	1945.25	1865.25	357	1947.85	1867.85	405	1950.25	1870.25
306	1945.30	1865.30	358	1947.90	1867.90	406	1950.30	1870.30
307	1945.35	1865.35	359	1947.95	1867.95	407	1950.35	1870.35
308	1945.40	1865.40	360	1948.00	1868.00	408	1950.40	1870.40
309	1945.45	1865.45	361	1948.05	1868.05	409	1950.45	1870.45
310	1945.50	1865.50	362	1948.10	1868.10	410	1950.50	1870.50
311	1945.55	1865.55	363	1948.15	1868.15	411	1950.55	1870.55
312	1945.60	1865.60	364	1948.20	1868.20	412	1950.60	1870.60
313	1945.65	1865.65	365	1948.25	1868.25	413	1950.65	1870.65
314	1945.70	1865.70	366	1948.30	1868.30	414	1950.70	1870.70
315	1945.75	1865.75	367	1948.35	1868.35	415	1950.75	1870.75
316	1945.80	1865.80	368	1948.40	1868.40	416	1950.80	1870.80
317	1945.85	1865.85	369	1948.45	1868.45	417	1950.85	1870.85
318	1945.90	1865.90	370	1948.50	1868.50	418	1950.90	1870.90
319	1945.95	1865.95	371	1948.55	1868.55	419	1950.95	1870.95
320	1946.00	1866.00	372	1948.60	1868.60	420	1951.00	1871.00
321	1946.05	1866.05	373	1948.65	1868.65	421	1951.05	1871.05
322	1946.10	1866.10	374	1948.70	1868.70	422	1951.10	1871.10
323	1946.15	1866.15	375	1948.75	1868.75	423	1951.15	1871.15
324	1946.20	1866.20	376	1948.80	1868.80	424	1951.20	1871.20
325	1946.25	1866.25	377	1948.85	1868.85	425	1951.25	1871.25
326	1946.30	1866.30	378	1948.90	1868.90	426	1951.30	1871.30
327	1946.35	1866.35	379	1948.95	1868.95	427	1951.35	1871.35
328	1946.40	1866.40	380	1949.00	1869.00	428	1951.40	1871.40
329	1946.45	1866.45	381	1949.05	1869.05	429	1951.45	1871.45
330	1946.50	1866.50	382	1949.10	1869.10	430	1951.50	1871.50
331	1946.55	1866.55	383	1949.15	1869.15	431	1951.55	1871.55
332	1946.60	1866.60	384	1949.20	1869.20	432	1951.60	1871.60
333	1946.65	1866.65	385	1949.25	1869.25	433	1951.65	1871.65
334	1946.70	1866.70	386	1949.30	1869.30	434	1951.70	1871.70
335	1946.75	1866.75	387	1949.35	1869.35	435	1951.75	1871.75
336	1946.80	1866.80	388	1949.40	1869.40	436	1951.80	1871.80
337	1946.85	1866.85	389	1949.45	1869.45	437	1951.85	1871.85
338	1946.90	1866.90	390	1949.50	1869.50	438	1951.90	1871.90
339	1946.95	1866.95	391	1949.55	1869.55	439	1951.95	1871.95
340	1947.00	1867.00	392	1949.60	1869.60	440	1952.00	1872.00
341	1947.05	1867.05	393	1949.65	1869.65	441	1952.05	1872.05
342	1947.10	1867.10	394	1949.70	1869.70	442	1952.10	1872.10
343	1947.15	1867.15	395	1949.75	1869.75	443	1952.15	1872.15
344	1947.20	1867.20	396	1949.80	1869.80	444	1952.20	1872.20
345	1947.25	1867.25	397	1949.85	1869.85	445	1952.25	1872.25
346	1947.30	1867.30	398	1949.90	1869.90	446	1952.30	1872.30
347	1947.35	1867.35	399	1949.95	1869.95	447	1952.35	1872.35
348	1947.40	1867.40				448	1952.40	1872.40
349	1947.45	1867.45	**B Band: 400 - 699**			449	1952.45	1872.45
350	1947.50	1867.50	400	1950.00	1870.00	450	1952.50	1872.50

PCS Channel Number-to-Frequency Cross Reference (continued)

PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)
451	1952.55	1872.55	501	1955.05	1875.05	551	1957.55	1877.55
452	1952.60	1872.60	502	1955.10	1875.10	552	1957.60	1877.60
453	1952.65	1872.65	503	1955.15	1875.15	553	1957.65	1877.65
454	1952.70	1872.70	504	1955.20	1875.20	554	1957.70	1877.70
455	1952.75	1872.75	505	1955.25	1875.25	555	1957.75	1877.75
456	1952.80	1872.80	506	1955.30	1875.30	556	1957.80	1877.80
457	1952.85	1872.85	507	1955.35	1875.35	557	1957.85	1877.85
458	1952.90	1872.90	508	1955.40	1875.40	558	1957.90	1877.90
459	1952.95	1872.95	509	1955.45	1875.45	559	1957.95	1877.95
460	1953.00	1873.00	510	1955.50	1875.50	560	1958.00	1878.00
461	1953.05	1873.05	511	1955.55	1875.55	561	1958.05	1878.05
462	1953.10	1873.10	512	1955.60	1875.60	562	1958.10	1878.10
463	1953.15	1873.15	513	1955.65	1875.65	563	1958.15	1878.15
464	1953.20	1873.20	514	1955.70	1875.70	564	1958.20	1878.20
465	1953.25	1873.25	515	1955.75	1875.75	565	1958.25	1878.25
466	1953.30	1873.30	516	1955.80	1875.80	566	1958.30	1878.30
467	1953.35	1873.35	517	1955.85	1875.85	567	1958.35	1878.35
468	1953.40	1873.40	518	1955.90	1875.90	568	1958.40	1878.40
469	1953.45	1873.45	519	1955.95	1875.95	569	1958.45	1878.45
470	1953.50	1873.50	520	1956.00	1876.00	570	1958.50	1878.50
471	1953.55	1873.55	521	1956.05	1876.05	571	1958.55	1878.55
472	1953.60	1873.60	522	1956.10	1876.10	572	1958.60	1878.60
473	1953.65	1873.65	523	1956.15	1876.15	573	1958.65	1878.65
474	1953.70	1873.70	524	1956.20	1876.20	574	1958.70	1878.70
475	1953.75	1873.75	525	1956.25	1876.25	575	1958.75	1878.75
476	1953.80	1873.80	526	1956.30	1876.30	576	1958.80	1878.80
477	1953.85	1873.85	527	1956.35	1876.35	577	1958.85	1878.85
478	1953.90	1873.90	528	1956.40	1876.40	578	1958.90	1878.90
479	1953.95	1873.95	529	1956.45	1876.45	579	1958.95	1878.95
480	1954.00	1874.00	530	1956.50	1876.50	580	1959.00	1879.00
481	1954.05	1874.05	531	1956.55	1876.55	581	1959.05	1879.05
482	1954.10	1874.10	532	1956.60	1876.60	582	1959.10	1879.10
483	1954.15	1874.15	533	1956.65	1876.65	583	1959.15	1879.15
484	1954.20	1874.20	534	1956.70	1876.70	584	1959.20	1879.20
485	1954.25	1874.25	535	1956.75	1876.75	585	1959.25	1879.25
486	1954.30	1874.30	536	1956.80	1876.80	586	1959.30	1879.30
487	1954.35	1874.35	537	1956.85	1876.85	587	1959.35	1879.35
488	1954.40	1874.40	538	1956.90	1876.90	588	1959.40	1879.40
489	1954.45	1874.45	539	1956.95	1876.95	589	1959.45	1879.45
490	1954.50	1874.50	540	1957.00	1877.00	590	1959.50	1879.50
491	1954.55	1874.55	541	1957.05	1877.05	591	1959.55	1879.55
492	1954.60	1874.60	542	1957.10	1877.10	592	1959.60	1879.60
493	1954.65	1874.65	543	1957.15	1877.15	593	1959.65	1879.65
494	1954.70	1874.70	544	1957.20	1877.20	594	1959.70	1879.70
495	1954.75	1874.75	545	1957.25	1877.25	595	1959.75	1879.75
496	1954.80	1874.80	546	1957.30	1877.30	596	1959.80	1879.80
497	1954.85	1874.85	547	1957.35	1877.35	597	1959.85	1879.85
498	1954.90	1874.90	548	1957.40	1877.40	598	1959.90	1879.90
499	1954.95	1874.95	549	1957.45	1877.45	599	1959.95	1879.95
500	1955.00	1875.00	550	1957.50	1877.50	600	1960.00	1880.00

PCS Channel Number-to-Frequency Cross Reference (continued)

PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)
601	1960.05	1880.05	651	1962.55	1882.55	700	1965.00	1885.00
602	1960.10	1880.10	652	1962.60	1882.60	701	1965.05	1885.05
603	1960.15	1880.15	653	1962.65	1882.65	702	1965.10	1885.10
604	1960.20	1880.20	654	1962.70	1882.70	703	1965.15	1885.15
605	1960.25	1880.25	655	1962.75	1882.75	704	1965.20	1885.20
606	1960.30	1880.30	656	1962.80	1882.80	705	1965.25	1885.25
607	1960.35	1880.35	657	1962.85	1882.85	706	1965.30	1885.30
608	1960.40	1880.40	658	1962.90	1882.90	707	1965.35	1885.35
609	1960.45	1880.45	659	1962.95	1882.95	708	1965.40	1885.40
610	1960.50	1880.50	660	1963.00	1883.00	709	1965.45	1885.45
611	1960.55	1880.55	661	1963.05	1883.05	710	1965.50	1885.50
612	1960.60	1880.60	662	1963.10	1883.10	711	1965.55	1885.55
613	1960.65	1880.65	663	1963.15	1883.15	712	1965.60	1885.60
614	1960.70	1880.70	664	1963.20	1883.20	713	1965.65	1885.65
615	1960.75	1880.75	665	1963.25	1883.25	714	1965.70	1885.70
616	1960.80	1880.80	666	1963.30	1883.30	715	1965.75	1885.75
617	1960.85	1880.85	667	1963.35	1883.35	716	1965.80	1885.80
618	1960.90	1880.90	668	1963.40	1883.40	717	1965.85	1885.85
619	1960.95	1880.95	669	1963.45	1883.45	718	1965.90	1885.90
620	1961.00	1881.00	670	1963.50	1883.50	719	1965.95	1885.95
621	1961.05	1881.05	671	1963.55	1883.55	720	1966.00	1886.00
622	1961.10	1881.10	672	1963.60	1883.60	721	1966.05	1886.05
623	1961.15	1881.15	673	1963.65	1883.65	722	1966.10	1886.10
624	1961.20	1881.20	674	1963.70	1883.70	723	1966.15	1886.15
625	1961.25	1881.25	675	1963.75	1883.75	724	1966.20	1886.20
626	1961.30	1881.30	676	1963.80	1883.80	725	1966.25	1886.25
627	1961.35	1881.35	677	1963.85	1883.85	726	1966.30	1886.30
628	1961.40	1881.40	678	1963.90	1883.90	727	1966.35	1886.35
629	1961.45	1881.45	679	1963.95	1883.95	728	1966.40	1886.40
630	1961.50	1881.50	680	1964.00	1884.00	729	1966.45	1886.45
631	1961.55	1881.55	681	1964.05	1884.05	730	1966.50	1886.50
632	1961.60	1881.60	682	1964.10	1884.10	731	1966.55	1886.55
633	1961.65	1881.65	683	1964.15	1884.15	732	1966.60	1886.60
634	1961.70	1881.70	684	1964.20	1884.20	733	1966.65	1886.65
635	1961.75	1881.75	685	1964.25	1884.25	734	1966.70	1886.70
636	1961.80	1881.80	686	1964.30	1884.30	735	1966.75	1886.75
637	1961.85	1881.85	687	1964.35	1884.35	736	1966.80	1886.80
638	1961.90	1881.90	688	1964.40	1884.40	737	1966.85	1886.85
639	1961.95	1881.95	689	1964.45	1884.45	738	1966.90	1886.90
640	1962.00	1882.00	690	1964.50	1884.50	739	1966.95	1886.95
641	1962.05	1882.05	691	1964.55	1884.55	740	1967.00	1887.00
642	1962.10	1882.10	692	1964.60	1884.60	741	1967.05	1887.05
643	1962.15	1882.15	693	1964.65	1884.65	742	1967.10	1887.10
644	1962.20	1882.20	694	1964.70	1884.70	743	1967.15	1887.15
645	1962.25	1882.25	695	1964.75	1884.75	744	1967.20	1887.20
646	1962.30	1882.30	696	1964.80	1884.80	745	1967.25	1887.25
647	1962.35	1882.35	697	1964.85	1884.85	746	1967.30	1887.30
648	1962.40	1882.40	698	1964.90	1884.90	747	1967.35	1887.35
649	1962.45	1882.45	699	1964.95	1884.95	748	1967.40	1887.40
650	1962.50	1882.50				749	1967.45	1887.45
			E Band: 700 - 799			750	1967.50	1887.50

PCS Channel Number-to-Frequency Cross Reference (continued)

PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)
751	1967.55	1887.55	**F Band: 800 - 899**					
752	1967.60	1887.60	800	1970.00	1890.00	850	1972.50	1892.50
753	1967.65	1887.65	801	1970.05	1890.05	851	1972.55	1892.55
754	1967.70	1887.70	802	1970.10	1890.10	852	1972.60	1892.60
755	1967.75	1887.75	803	1970.15	1890.15	853	1972.65	1892.65
756	1967.80	1887.80	804	1970.20	1890.20	854	1972.70	1892.70
757	1967.85	1887.85	805	1970.25	1890.25	855	1972.75	1892.75
758	1967.90	1887.90	806	1970.30	1890.30	856	1972.80	1892.80
759	1967.95	1887.95	807	1970.35	1890.35	857	1972.85	1892.85
760	1968.00	1888.00	808	1970.40	1890.40	858	1972.90	1892.90
761	1968.05	1888.05	809	1970.45	1890.45	859	1972.95	1892.95
762	1968.10	1888.10	810	1970.50	1890.50	860	1973.00	1893.00
763	1968.15	1888.15	811	1970.55	1890.55	861	1973.05	1893.05
764	1968.20	1888.20	812	1970.60	1890.60	862	1973.10	1893.10
765	1968.25	1888.25	813	1970.65	1890.65	863	1973.15	1893.15
766	1968.30	1888.30	814	1970.70	1890.70	864	1973.20	1893.20
767	1968.35	1888.35	815	1970.75	1890.75	865	1973.25	1893.25
768	1968.40	1888.40	816	1970.80	1890.80	866	1973.30	1893.30
769	1968.45	1888.45	817	1970.85	1890.85	867	1973.35	1893.35
770	1968.50	1888.50	818	1970.90	1890.90	868	1973.40	1893.40
771	1968.55	1888.55	819	1970.95	1890.95	869	1973.45	1893.45
772	1968.60	1888.60	820	1971.00	1891.00	870	1973.50	1893.50
773	1968.65	1888.65	821	1971.05	1891.05	871	1973.55	1893.55
774	1968.70	1888.70	822	1971.10	1891.10	872	1973.60	1893.60
775	1968.75	1888.75	823	1971.15	1891.15	873	1973.65	1893.65
776	1968.80	1888.80	824	1971.20	1891.20	874	1973.70	1893.70
777	1968.85	1888.85	825	1971.25	1891.25	875	1973.75	1893.75
778	1968.90	1888.90	826	1971.30	1891.30	876	1973.80	1893.80
779	1968.95	1888.95	827	1971.35	1891.35	877	1973.85	1893.85
780	1969.00	1889.00	828	1971.40	1891.40	878	1973.90	1893.90
781	1969.05	1889.05	829	1971.45	1891.45	879	1973.95	1893.95
782	1969.10	1889.10	830	1971.50	1891.50	880	1974.00	1894.00
783	1969.15	1889.15	831	1971.55	1891.55	881	1974.05	1894.05
784	1969.20	1889.20	832	1971.60	1891.60	882	1974.10	1894.10
785	1969.25	1889.25	833	1971.65	1891.65	883	1974.15	1894.15
786	1969.30	1889.30	834	1971.70	1891.70	884	1974.20	1894.20
787	1969.35	1889.35	835	1971.75	1891.75	885	1974.25	1894.25
788	1969.40	1889.40	836	1971.80	1891.80	886	1974.30	1894.30
789	1969.45	1889.45	837	1971.85	1891.85	887	1974.35	1894.35
790	1969.50	1889.50	838	1971.90	1891.90	888	1974.40	1894.40
791	1969.55	1889.55	839	1971.95	1891.95	889	1974.45	1894.45
792	1969.60	1889.60	840	1972.00	1892.00	890	1974.50	1894.50
793	1969.65	1889.65	841	1972.05	1892.05	891	1974.55	1894.55
794	1969.70	1889.70	842	1972.10	1892.10	892	1974.60	1894.60
795	1969.75	1889.75	843	1972.15	1892.15	893	1974.65	1894.65
796	1969.80	1889.80	844	1972.20	1892.20	894	1974.70	1894.70
797	1969.85	1889.85	845	1972.25	1892.25	895	1974.75	1894.75
798	1969.90	1889.90	846	1972.30	1892.30	896	1974.80	1894.80
799	1969.95	1889.95	847	1972.35	1892.35	897	1974.85	1894.85
			848	1972.40	1892.40	898	1974.90	1894.90
			849	1972.45	1892.45	899	1974.95	1894.95

PCS Channel Number-to-Frequency Cross Reference (continued)

PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)
C Band: 900 - 1199 *			950	1977.50	1897.50	1001	1980.05	1900.05
900	1975.00	1895.00	951	1977.55	1897.55	1002	1980.10	1900.10
901	1975.05	1895.05	952	1977.60	1897.60	1003	1980.15	1900.15
902	1975.10	1895.10	953	1977.65	1897.65	1004	1980.20	1900.20
903	1975.15	1895.15	954	1977.70	1897.70	1005	1980.25	1900.25
904	1975.20	1895.20	955	1977.75	1897.75	1006	1980.30	1900.30
905	1975.25	1895.25	956	1977.80	1897.80	1007	1980.35	1900.35
906	1975.30	1895.30	957	1977.85	1897.85	1008	1980.40	1900.40
907	1975.35	1895.35	958	1977.90	1897.90	1009	1980.45	1900.45
908	1975.40	1895.40	959	1977.95	1897.95	1010	1980.50	1900.50
909	1975.45	1895.45	960	1978.00	1898.00	1011	1980.55	1900.55
910	1975.50	1895.50	961	1978.05	1898.05	1012	1980.60	1900.60
911	1975.55	1895.55	962	1978.10	1898.10	1013	1980.65	1900.65
912	1975.60	1895.60	963	1978.15	1898.15	1014	1980.70	1900.70
913	1975.65	1895.65	964	1978.20	1898.20	1015	1980.75	1900.75
914	1975.70	1895.70	965	1978.25	1898.25	1016	1980.80	1900.80
915	1975.75	1895.75	966	1978.30	1898.30	1017	1980.85	1900.85
916	1975.80	1895.80	967	1978.35	1898.35	1018	1980.90	1900.90
917	1975.85	1895.85	968	1978.40	1898.40	1019	1980.95	1900.95
918	1975.90	1895.90	969	1978.45	1898.45	1020	1981.00	1901.00
919	1975.95	1895.95	970	1978.50	1898.50	1021	1981.05	1901.05
920	1976.00	1896.00	971	1978.55	1898.55	1022	1981.10	1901.10
921	1976.05	1896.05	972	1978.60	1898.60	1023	1981.15	1901.15
922	1976.10	1896.10	973	1978.65	1898.65	1024	1981.20	1901.20
923	1976.15	1896.15	974	1978.70	1898.70	1025	1981.25	1901.25
924	1976.20	1896.20	975	1978.75	1898.75	1026	1981.30	1901.30
925	1976.25	1896.25	976	1978.80	1898.80	1027	1981.35	1901.35
926	1976.30	1896.30	977	1978.85	1898.85	1028	1981.40	1901.40
927	1976.35	1896.35	978	1978.90	1898.90	1029	1981.45	1901.45
928	1976.40	1896.40	979	1978.95	1898.95	1030	1981.50	1901.50
929	1976.45	1896.45	980	1979.00	1899.00	1031	1981.55	1901.55
930	1976.50	1896.50	981	1979.05	1899.05	1032	1981.60	1901.60
931	1976.55	1896.55	982	1979.10	1899.10	1033	1981.65	1901.65
932	1976.60	1896.60	983	1979.15	1899.15	1034	1981.70	1901.70
933	1976.65	1896.65	984	1979.20	1899.20	1035	1981.75	1901.75
934	1976.70	1896.70	985	1979.25	1899.25	1036	1981.80	1901.80
935	1976.75	1896.75	986	1979.30	1899.30	1037	1981.85	1901.85
936	1976.80	1896.80	987	1979.35	1899.35	1038	1981.90	1901.90
937	1976.85	1896.85	988	1979.40	1899.40	1039	1981.95	1901.95
938	1976.90	1896.90	989	1979.45	1899.45	1040	1982.00	1902.00
939	1976.95	1896.95	990	1979.50	1899.50	1041	1982.05	1902.05
940	1977.00	1897.00	991	1979.55	1899.55	1042	1982.10	1902.10
941	1977.05	1897.05	992	1979.60	1899.60	1043	1982.15	1902.15
942	1977.10	1897.10	993	1979.65	1899.65	1044	1982.20	1902.20
943	1977.15	1897.15	994	1979.70	1899.70	1045	1982.25	1902.25
944	1977.20	1897.20	995	1979.75	1899.75	1046	1982.30	1902.30
945	1977.25	1897.25	996	1979.80	1899.80	1047	1982.35	1902.35
946	1977.30	1897.30	997	1979.85	1899.85	1048	1982.40	1902.40
947	1977.35	1897.35	998	1979.90	1899.90	1049	1982.45	1902.45
948	1977.40	1897.40	999	1979.95	1899.95	1050	1982.50	1902.50
949	1977.45	1897.45	1000	1980.00	1900.00	*** Ch. 1176 to 1199 Not Valid**		

PCS Channel Number-to-Frequency Cross Reference (continued)

PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)	PCS Ch. No.	PCS Tx Freq. (MHz)	PCS Rx Freq. (MHz)
1051	1982.55	1902.55	1101	1985.05	1905.05	1151	1987.55	1907.55
1052	1982.60	1902.60	1102	1985.10	1905.10	1152	1987.60	1907.60
1053	1982.65	1902.65	1103	1985.15	1905.15	1153	1987.65	1907.65
1054	1982.70	1902.70	1104	1985.20	1905.20	1154	1987.70	1907.70
1055	1982.75	1902.75	1105	1985.25	1905.25	1155	1987.75	1907.75
1056	1982.80	1902.80	1106	1985.30	1905.30	1156	1987.80	1907.80
1057	1982.85	1902.85	1107	1985.35	1905.35	1157	1987.85	1907.85
1058	1982.90	1902.90	1108	1985.40	1905.40	1158	1987.90	1907.90
1059	1982.95	1902.95	1109	1985.45	1905.45	1159	1987.95	1907.95
1060	1983.00	1903.00	1110	1985.50	1905.50	1160	1988.00	1908.00
1061	1983.05	1903.05	1111	1985.55	1905.55	1161	1988.05	1908.05
1062	1983.10	1903.10	1112	1985.60	1905.60	1162	1988.10	1908.10
1063	1983.15	1903.15	1113	1985.65	1905.65	1163	1988.15	1908.15
1064	1983.20	1903.20	1114	1985.70	1905.70	1164	1988.20	1908.20
1065	1983.25	1903.25	1115	1985.75	1905.75	1165	1988.25	1908.25
1066	1983.30	1903.30	1116	1985.80	1905.80	1166	1988.30	1908.30
1067	1983.35	1903.35	1117	1985.85	1905.85	1167	1988.35	1908.35
1068	1983.40	1903.40	1118	1985.90	1905.90	1168	1988.40	1908.40
1069	1983.45	1903.45	1119	1985.95	1905.95	1169	1988.45	1908.45
1070	1983.50	1903.50	1120	1986.00	1906.00	1170	1988.50	1908.50
1071	1983.55	1903.55	1121	1986.05	1906.05	1171	1988.55	1908.55
1072	1983.60	1903.60	1122	1986.10	1906.10	1172	1988.60	1908.60
1073	1983.65	1903.65	1123	1986.15	1906.15	1173	1988.65	1908.65
1074	1983.70	1903.70	1124	1986.20	1906.20	1174	1988.70	1908.70
1075	1983.75	1903.75	1125	1986.25	1906.25	1175	1988.75	1908.75
1076	1983.80	1903.80	1126	1986.30	1906.30	1176	1988.80	1908.80
1077	1983.85	1903.85	1127	1986.35	1906.35	1177	1988.85	1908.85
1078	1983.90	1903.90	1128	1986.40	1906.40	1178	1988.90	1908.90
1079	1983.95	1903.95	1129	1986.45	1906.45	1179	1988.95	1908.95
1080	1984.00	1904.00	1130	1986.50	1906.50	1180	1989.00	1909.00
1081	1984.05	1904.05	1131	1986.55	1906.55	1181	1989.05	1909.05
1082	1984.10	1904.10	1132	1986.60	1906.60	1182	1989.10	1909.10
1083	1984.15	1904.15	1133	1986.65	1906.65	1183	1989.15	1909.15
1084	1984.20	1904.20	1134	1986.70	1906.70	1184	1989.20	1909.20
1085	1984.25	1904.25	1135	1986.75	1906.75	1185	1989.25	1909.25
1086	1984.30	1904.30	1136	1986.80	1906.80	1186	1989.30	1909.30
1087	1984.35	1904.35	1137	1986.85	1906.85	1187	1989.35	1909.35
1088	1984.40	1904.40	1138	1986.90	1906.90	1188	1989.40	1909.40
1089	1984.45	1904.45	1139	1986.95	1906.95	1189	1989.45	1909.45
1090	1984.50	1904.50	1140	1987.00	1907.00	1190	1989.50	1909.50
1091	1984.55	1904.55	1141	1987.05	1907.05	1191	1989.55	1909.55
1092	1984.60	1904.60	1142	1987.10	1907.10	1192	1989.60	1909.60
1093	1984.65	1904.65	1143	1987.15	1907.15	1193	1989.65	1909.65
1094	1984.70	1904.70	1144	1987.20	1907.20	1194	1989.70	1909.70
1095	1984.75	1904.75	1145	1987.25	1907.25	1195	1989.75	1909.75
1096	1984.80	1904.80	1146	1987.30	1907.30	1196	1989.80	1909.80
1097	1984.85	1904.85	1147	1987.35	1907.35	1197	1989.85	1909.85
1098	1984.90	1904.90	1148	1987.40	1907.40	1198	1989.90	1909.90
1099	1984.95	1904.95	1149	1987.45	1907.45	1199	1989.95	1909.95
1100	1985.00	1905.00	1150	1987.50	1907.50			

Appendix C

HIC Channel Number-To-Frequency Cross-reference

HIC Channel Number-To-Frequency Cross-Reference

HIC No.	Start Freq. (MHz)
62	450
63	456
64	462
65	468
66	474
67	480
68	486
69	492
70	498
71	504
72	510
73	516
74	522
75	528
76	534
77	540
78	546
79	552
80	558
81	564
82	570
83	576
84	582
85	588
86	594
87	600
88	606
89	612
90	618
91	624
92	630
93	636
94	642
100	648
101	654
102	660
103	666
104	672
105	678
106	684
107	690
108	696
109	702
110	708
111	714
112	720
113	726
114	732
115	738
116	744

ENCLOSURE/HIC DATA SHEET

HIC Serial Number ______________________________

Neuron® Chip Number ______________________________

Location/Cell ID ______________________________

Name	Value
Busbar voltage	____________ VDC
10/15 MHz Reference	____________ dBm
HIC Reference Tone attenuator	____________ dB
HIC Control Tone attenuator	____________ dB
Reverse Link Video Reference	____________ dBm
Reverse Link Autogain Setpoint	____________ dBm
Reverse Link Control Tone Attenuation	____________ dB
Reverse Gain Adjustment, Ping Test Tone	____________ dBm
CDMA Forward Link input power	____________ dBm
Forward Link Pilot Level at FWD Test Point	____________ dBm
FWD Attenuator Setting	____________ dB
Reference Tone Amplitude at Hub	____________ dBm
Reference and Control Tone Attenuator setting	____________ dB
Video Reference Level at Hub	____________ dBm
Forward Link CDMA Pilot Level at Hub	____________ dBm
Final FWD Attenuator setting	____________ dB

CMI DATA SHEET

CMI Serial Number ______________________________

Neuron® Chip Number ______________________________

Location ______________________________

Name	Value
HIC Forward Link Reference Tone level (at CMI)	____________ dBm
HIC Forward Link Control Tone level (at CMI)	____________ dB
FWD ATTEN pad value	____________ dB
REV ATTEN pad value (Reverse Gain at CMI)	____________ dB