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Standards: FCC Part 90/IC RSS-119
Report #: 2012275

Appendix N: Manual

Please refer to the following pages.

momentum[™]

HDT300 DMR Tier III Trunked Repeater Site



TABLE OF CONTENTS

Page

1	SAFETY AND REGULATORY INFORMATION	5
1.1	SAFETY SYMBOL CONVENTIONS	5
1.2	IMPORTANT SAFETY INFORMATION.....	5
1.3	MAXIMUM PERMISSIBLE EXPOSURE LIMITS	6
1.4	DETERMINING MPE RADIUS	6
1.5	SAFETY TRAINING INFORMATION.....	7
1.6	ELECTROMAGNETIC INTERFERENCE	7
1.7	REGULATORY APPROVALS	8
1.7.1	Federal Communications Commission.....	8
1.7.2	Industry Canada.....	9
2	SPECIFICATIONS.....	10
3	OVERVIEW	12
3.1	HDT300 STATION COMPONENTS.....	13
3.1.1	Transceiver Shelf.....	13
3.1.2	Fan Shelf.....	14
3.1.3	Channel Unit (CHU).....	16
3.1.4	Base Station Controller Unit (BSCU).....	17
3.1.5	Power Supply Unit (PSU).....	18
3.1.6	Extended Interface Board	19
4	INSTALLATION	20
4.1	TOOLS	20
4.2	UNPACKING AND INSPECTION	20
4.3	GROUNDING THE EQUIPMENT	20
4.3.1	Surge Protection Devices (SPDs)	21
4.4	INSTALLING THE EQUIPMENT	21
4.4.1	Installing the Fan Shelf.....	21
4.4.2	Installing the Transceiver Shelf	22
4.4.3	Installing the Extended Interface Board	24
4.5	CABLE CONNECTIONS	24
4.5.1	Initial Backplane Cable Connections.....	24
4.5.2	Multi-Shelf Multi-Cabinet Cable Connections.....	26
4.6	INSTALLING MODULES.....	27
4.7	FRONT PANEL CONNECTIONS.....	29
4.7.1	RF Antenna Connections.....	29
4.7.2	GPS Receiver Antenna Connections	29
4.7.3	Additional front panel connections.....	29
5	POST-INSTALLATION INSPECTION.....	30
6	POWER-UP	31
7	CUSTOMER RESOURCES	32
7.1	REPLACEMENT PARTS	32
7.2	TECHNICAL ASSISTANCE.....	32
7.3	TECH-LINK	32

TABLE OF CONTENTS

Page

FIGURES

Figure 3-1: Transceiver Shelf and Fan Assembly (Configured with 4-RF Channels) 12

Figure 3-2: Transceiver Shelf 13

Figure 3-3: Connections on ICB (Rear View) 14

Figure 3-4: Fan Unit (Front Panel) 14

Figure 3-5: CHU Front Panel 16

Figure 3-6: BSCU Front Panel 17

Figure 3-7: PSU Front Panel..... 18

Figure 3-8: Extended Interface Board (External Connections View) 19

Figure 3-9: Extended Interface Board (Internal Connections View) 19

Figure 4-1: HDT300 Backplane Wiring Diagram 25

Figure 4-2: HDT300 Multi-Shelf – Multi Cabinet Configuration 26

Figure 4-3: Loosening the Ejector 27

Figure 4-4: Installing the BSCU 28

Figure 4-5: Module Placement and Front Panel Cable Connections 28

TABLES

Table 3-1: Transceiver Shelf Rear Panel Connections 14

Table 3-2: Fan LED Indicators 15

Table 3-4: Descriptions on CHU Front Panel 16

Table 3-5: CHU LED Indicators..... 16

Table 3-6: BSCU Front Panel Description 17

Table 3-7: BSCU LED Indicators..... 17

Table 3-8: PSU Front Panel Features 18

Table 3-9: LED Indicators on PSU Front Panel 18

Table 4-1: Tools and Meter 20

Table 4-2: Fan DIP Switch Settings 22

Table 4-3: Interconnection Board DIP Switch Configuration 23

Table 6-1: Power and Alarm Indicator Checklist 31

1 SAFETY AND REGULATORY INFORMATION

1.1 SAFETY SYMBOL CONVENTIONS

The following conventions are used in this manual to alert the user to general safety precautions that must be observed during all phases of operation, installation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere violates safety standards of design, manufacture, and intended use of the product. Harris assumes no liability for the customer's failure to comply with these standards.



The **WARNING** symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** symbol until the conditions identified are fully understood or met.



The electrical hazard symbol indicates there is an electrical shock hazard present!



The **CAUTION** symbol calls attention to an operating procedure, practice, or the like, which, if not performed correctly or adhered to, could result in damage to the equipment or severely degrade equipment performance.



The **NOTE** symbol calls attention to supplemental information, which may improve system performance or clarify a process or procedure.



The **ESD** symbol calls attention to procedures, practices, or the like, which could expose equipment to the effects of Electro-Static Discharge. Proper precautions must be taken to prevent ESD when handling circuit boards or modules.

1.2 IMPORTANT SAFETY INFORMATION

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Harris assumes no liability for the customer's failure to comply with these standards.

SAVE THIS MANUAL — It contains important safety, installation, and operating instructions.

- **BEFORE USING THIS EQUIPMENT**, please follow and adhere to all warnings, safety and operating instructions located on the product and in this manual.
- **GROUNDING AND POWER CONNECTION** — To reduce risk of electrical shock and to minimize exposure to radio frequency (RF) energy, connect the equipment to a properly grounded power source and site ground point as described in this manual.
- **MAXIMUM PERMISSIBLE RF EXPOSURE LIMITS** —This equipment generates and uses RF energy. Any changes or modifications to this equipment not expressly approved by Harris may cause harmful interference and could void the user's authority to operate the equipment.

- **ELECTROSTATIC DISCHARGE SENSITIVE COMPONENTS** — This equipment contains electronic components that may be damaged by electrostatic discharge. Proper precaution must be taken when handling circuit modules. As a minimum, grounded wrist straps should be used at all times when handling circuit modules.
- Care should be taken so objects do not fall onto or liquids do not spill into the interior of the equipment.
- **DO NOT** connect auxiliary equipment not recommended or sold by Harris. To do so may result in the risk of fire, electric shock or injury to persons.
- **DO NOT** attempt to operate this product in an explosive atmosphere unless it has been specifically certified for such operation.
- To reduce risk of electric shock, isolate the unit and disconnect electrical power before attempting any maintenance or interior cleaning.
- Use only fuses of the correct type, voltage rating and current rating as specified in the parts list. Failure to do so can result in fire hazard.
- Never wear conductive objects such as watches, bracelets, rings, etc., while installing or servicing the equipment.

1.3 MAXIMUM PERMISSIBLE EXPOSURE LIMITS

DO NOT TRANSMIT with this base station and its antenna when persons are within the MAXIMUM PERMISSIBLE EXPOSURE (MPE) radius of the radio frequency (RF) antenna. The MPE radius is the minimum distance from the antenna axis that ALL persons should maintain in order to avoid RF exposure higher than the allowable MPE level set by the FCC.



FAILURE TO OBSERVE THESE LIMITS MAY ALLOW ALL PERSONS WITHIN THE MPE RADIUS TO EXPERIENCE RF RADIATION ABSORPTION, WHICH EXCEEDS THE FCC MAXIMUM PERMISSIBLE EXPOSURE (MPE) LIMIT. IT IS THE RESPONSIBILITY OF THE BASE STATION OPERATOR TO ENSURE THAT THE MAXIMUM PERMISSIBLE EXPOSURE LIMITS ARE OBSERVED AT ALL TIMES DURING BASE STATION TRANSMISSION. THE BASE STATION OPERATOR MUST ENSURE NO BYSTANDERS ARE WITHIN THE MPE RADIUS LIMITS WHEN THE STATION IS TRANSMITTING.

1.4 DETERMINING MPE RADIUS

THE MAXIMUM PERMISSIBLE EXPOSURE RADIUS is unique for each site and is determined during site licensing time based on the complete installation environment (i.e. co-location, antenna type, transmit power level, etc.). Determination of the MPE radius is the responsibility of the installation licensee. Calculation of the MPE radius is required as part of the site licensing procedure with the FCC.

1.5 SAFETY TRAINING INFORMATION



THIS BASE STATION GENERATES RADIO FREQUENCY (RF) ELECTROMAGNETIC ENERGY WHEN IT IS TRANSMITTING. THIS BASE STATION IS DESIGNED FOR AND CLASSIFIED AS “OCCUPATIONAL USE ONLY,” MEANING IT MUST BE USED ONLY IN THE COURSE OF EMPLOYMENT BY INDIVIDUALS AWARE OF THE HAZARDS AND THE WAYS TO MINIMIZE SUCH HAZARDS. THIS BASE STATION IS NOT INTENDED FOR USE BY THE “GENERAL POPULATION” IN AN UNCONTROLLED ENVIRONMENT. IT IS THE RESPONSIBILITY OF THE BASE STATION OPERATOR TO ENSURE THE MAXIMUM PERMISSIBLE EXPOSURE LIMITS ARE OBSERVED AT ALL TIMES DURING STATION TRANSMISSIONS. THE BASE STATION OPERATOR IS TO ENSURE THAT NO BYSTANDERS COME WITHIN THE RADIUS OF THE MAXIMUM PERMISSIBLE EXPOSURE LIMITS.

When licensed by the FCC, this base station complies with the FCC RF exposure limits when persons are beyond the MPE radius of the antenna. In addition, the Harris base station’s installation complies with the following Standards and Guidelines with regard to RF energy and electromagnetic energy levels and evaluation of such levels for exposure to humans:

- FCC OET Bulletin 65 Edition 97-01 Supplement C, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
- American National Standards Institute (C95.1 – 1992), IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
- American National Standards Institute (C95.3 – 1992), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.



To ensure human exposure to RF electromagnetic energy is within the FCC allowable limits for occupational use, do not operate the base station in a manner that would create an MPE radius in excess of that allowed by the FCC.



Changes or modifications not expressly approved by Harris could void the user’s authority to operate the equipment.

1.6 ELECTROMAGNETIC INTERFERENCE

During transmissions, this radio generates RF energy that can possibly cause interference with other devices or systems. To avoid such interference, turn off the radio in areas where signs are posted to do so. **DO NOT** operate the transmitter in areas that are sensitive to electromagnetic radiation such as hospitals, aircraft, and blasting sites.

1.7 REGULATORY APPROVALS

1.7.1 Federal Communications Commission

The transmitting device described within this manual has been tested and found to meet the following regulatory requirements:

FCC FILING DATA FOR MASTR V BASE STATION			
FREQUENCY BAND (MHz)	POWER OUTPUT (ADJUSTABLE) (Watts)	FCC TYPE ACCEPTANCE NUMBER	APPLICABLE FCC RULES
136 – 174	1-50	OWDTR-0103E	Part 90
400 – 470	1-50	OWDTR-0102-E	Part 90
450 – 520	1-50	OWDTR-0104-E	Part 90
851 – 870	1-35	OWDTR-0108-E	Part 90
935 – 941	1-30		

This receiver associated with this transmitting device has been tested and declared to meet the regulatory requirements defined in the following sub-sections. Associated FCC labeling may be found on page 2.

1.7.1.1 FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and,
2. This device must accept any interference received, including interference that may cause undesired operation.

1.7.1.2 Information to the User

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an AC outlet on a circuit different from that which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

1.7.2 Industry Canada

INDUSTRY CANADA FILING DATA FOR MASTR V BASE STATION		
FREQUENCY BAND (MHZ)	INDUSTRY CANADA CERTIFICATION NUMBER	APPLICABLE INDUSTRY CANADA RULES
136 – 174	3636B-0103	RSS-119
400 – 470	3636B-0102	RSS-119
450 – 520	3636B-0104	RSS-119
851 – 870 935 – 941	3636B-0108	RSS-119

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

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.



The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb.

L'installateur de cet équipement radio doit garantir que l'antenne est trouvée ou montrée tel qu'il n'émet pas de champ de RF plus de la Santé les limites du Canada pour la population générale; consultez le Code 6 de Sécurité, disponible de la Lande le site Internet du Canada www.hc-sc.gc.ca/rpb.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

2 SPECIFICATIONS

General

Models:	HD-XCV1 (VHF) HD-XCU1 (UHF-L) HD-XCU2 (UHF-H) HD-XC89 (800/900 MHz)
Modulation Type:	4-Level FSK (index: 0.27), TDMA
Transmission Rate:	9.6 kbps
AC Power Input:	100V to 240V (50~60Hz)
Full Load Power Consumption:	Per 4-carrier shelf: ≤1200W
Operating Temperature:	-30°C to +60°C
Storage Temperature:	-40°C to +85°C

Receiver

Frequency Ranges:	136 to 174 MHz (model HD-XCV1) 400 to 470 MHz (model HD-XCU1) 450 to 512 MHz (model HD-XCU2) 806 to 825 MHz and 896 to 902 MHz (model HD-XC89)
Antenna Ports:	SMA Female (3 ports/ch., main and 2 diversity)
Static Sensitivity:	≤ -119 dBm at 5% BER (no diversity) ≤ -122 dBm at 5% BER (triple diversity) ≤ -116 dBm at 1% BER
Dynamic Sensitivity:	≤ 112 dBm at 5% BER (no diversity, attenuated by 8km/hr and 100km/hr): ≤ -109 dBm at 5 % BER (triple diversity)
Dynamic Range:	≥ 115 dB
Adjacent Channel Selectivity:	≥ 60 dB
Intermodulation Rejection:	≥ 70 dB
Spurious Emissions:	≤ -57 dBm (9 KHz~1 GHz) ≤ -47 dBm (1 GHz to 12.75 GHz)

Transmitter

Frequency Ranges:	136 to 174 MHz (model HD-XCV1) 400 to 470 MHz (model HD-XCU1) 450 to 512 MHz (model HD-XCU2) 851 to 870 MHz and 935 to 941 MHz (model HD-XC89)
Antenna Port:	Type-N Female, 50 Ohm
TX Power Output:	1 to 50 Watts per RF Channel (VHF/UHF), ±1.5 dB 1 to 35 Watts per RF Channel (800 MHz), ±1.5 dB 1 to 30 Watts per RF Channel (900 MHz), ±1.5 dB
Modulation Accuracy:	≤ 5.0%
Frequency Offset:	± 1.50 kHz
Intermodulation Attenuation:	≥ 60 dB
Adjacent Channel Power Rejection (ACPR):	≥ 60 dB
Transient Switch ACPR:	≥ 50dB
Spurious Emission:	≤ -36dBm (9 KHz to 1 GHz) ≤ -30dBm (1 GHz to 12.75 GHz)

I/O Ports

GPS Antenna:	SMA Female
Port to MSO:	E1: BNC-Female/DB9-Female Ethernet: RJ-45
Local Maintenance Port:	RS232/Ethernet

Weights and Dimensions

	DEPTH in (cm)	WIDTH in (cm)	HEIGHT in (cm) or RU
Transceiver Shelf (less modules)		19 (48.3)	7RU
Fan Shelf (includes fan drawers)		19 (48.3)	1RU
Extended Interface Board	2.5 (6.5)	11.8 (30)	4.3 (11)
CHU module	16.1 (41)	1.2 (3.0)	10.2 (26)
BSCU module	16.1 (41)	1.9 (4.8)	10.2 (26)
PSU module	16.1 (41)	1.9 (4.8)	10.2 (26)

Notes: For 19” rack mountable equipment, heights may be defined in Rack Units (RU). One (1) RU is equal to 1.75 in. (4.45 cm). For example: 2-RU equals 3.5 in. (8.9 cm), 3-RU equals 5.25 in. (13.3 cm), etc.

3 OVERVIEW

The Harris HDT300 is a Tier III-compliant Digital Mobile Radio (DMR) trunked repeater system based on the European Telecommunications Standards Institute (ETSI) open digital radio Standard TS 102 361 parts 1-4. Sites are currently available in the Land Mobile Radio bands 136 to 174 MHz, 400 to 470 MHz, 450 to 520 MHz, and 800/900 MHz.

A fully configured HDT300 trunked site includes 16-RF channels housed in four (4) transceiver shelves. Each transceiver shelf (refer to Figure 3-1) can support up to 4-RF channels. Each channel is capable of 1 to 50 Watts RF output power in the VHF and UHF bands, 1 to 35 Watts in the 800 MHz band, and 1 to 30 Watts RF output power in the 900 MHz band. An RF channel operates within a 12.5 kHz channel spacing using Time Division Multiple Access (TDMA), a 2-timeslot (4-level FSK) constant envelope modulation scheme.

Four (4) RF shelves may be interfaced together to support up to sixteen RF channels per site. A fully configured site supports up to 32 timeslots; one timeslot operating as a Control Channel, another providing dedicated GPS data, and the remaining installed timeslots for voice or data communications.



Figure 3-1: Transceiver Shelf and Fan Assembly (Configured with 4-RF Channels)

3.1 HDT300 STATION COMPONENTS

The main hardware components that make up the HDT300 base station include the following:

- Transceiver Shelf
- Fan Shelf
- Channel Unit
- Base Station Controller Unit
- Power Supply Unit
- Extended Interface Board

The transceiver shelf, part number HD-TM1E, houses the station modules, provides interconnection points to additional transceiver shelves, and to the Extended Interface Board.

The CHannel Unit (CHU) provides a 12.5 kHz RF channel with a 2-timeslot TDMA call capability. Each transceiver shelf may be populated with up to four (4) CHUs.

The Base Station Controller Unit (BSCU) provides site call and management. Up to two (2) BSCUs may be installed and setup in a Main BSCU - Backup BSCU configuration.

The Power Supply Unit (PSU) provides conversion from 110/240 VAC to the DC voltages required to power the station equipment. Each PSU provides DC power to both BSCU modules while PSU1 powers CHU1 and CHU2 and PSU2 powers only CHU3 and CHU4.

3.1.1 Transceiver Shelf

The transceiver shelf shown in Figure 3-2 is a 19-inch rack mountable, 7-RU assembly. Each transceiver shelf can accommodate up to four (4) CHannel Units (CHU), two (2) Base Station Controller Units (BSCU), and two (2) Power Supply Units (PSU).

The transceiver shelf's Interconnection Backboard (backplane) provides DC power distribution, signal distribution among the modules, and signal distribution to another next transceiver shelf.

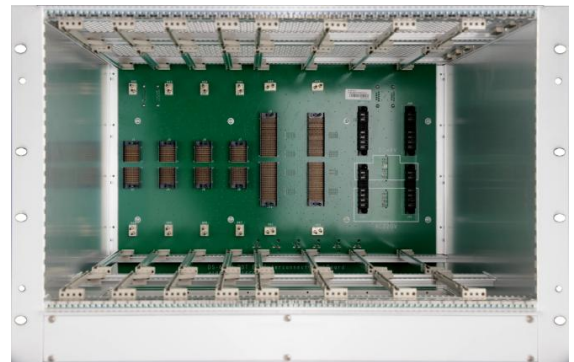
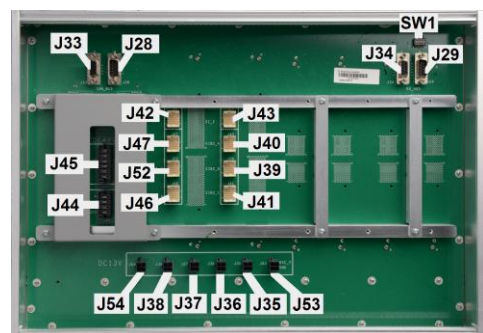


Figure 3-2: Transceiver Shelf

3.1.1.1 InterConnect Backboard (ICB)

The ICB (refer to Figure 3-3) is mounted to the rear of the transceiver shelf and provides power interconnection, synchronization clock interconnection, signaling, voice and data interconnection, monitor interconnection, I/O interconnection to a second transceiver shelf and the Extended Interface Board (refer to Section 3.1.6).

All connection points located on the front of the ICB are for module connectivity. Connection points located on the rear of the ICB (refer to Figure 3-3)



provide connectivity to other transceiver shelves, programming and test, and the Fan Unit. **Figure 3-3: Connections on ICB (Rear View)**

Table 3-1: Transceiver Shelf Rear Panel Connections

CONNECTION	FUNCTION
J44	110/220 VAC Input
J35, J36, J37, J38, J53, J54	13.2 VDC Outputs
J45	-48 VDC Input (Not Supported at this time)
SW1	DIP Switch
J42, J43	Extended Chassis (EC) Interface
J28, J33	CAN-BUS Monitor Interface
J29, J34	RS485 Monitor Interface
J39, J40, J41, J46, J47, J52	EIB Interface

3.1.2 Fan Shelf












The fan shelf, part number HD-BS1C, is a 19” rack mountable 1-RU assembly comprised of a custom subrack housing six (6) fans, a fan monitor board, backplane board, front panel status LEDs, and built-in temperature sensors.

The fan monitor board is mounted in the center assembly. DC power, control, and monitor connections are made at the rear panel. DIP Switch S3 is used to associate the fan shelf to the corresponding transceiver shelf. The DIP switch settings are described in Section 4.4.1. Section S3-3 is the Least Significant Bit (LSB) and S3-4 is the Most Significant Bit (MSB). Fan shelves 1 through 4 are assigned Logic 0 through 3, respectively.



Figure 3-4: Fan Unit (Front Panel)

Table 3-2: Fan LED Indicators

LABEL	COLOR	DESCRIPTION
POWER	RED 	Fan Power On
	OFF 	Fan Power Failure
1	GREEN 	Fan 1 OK
	OFF 	Fan off or not installed
	FLASHING GREEN 	Fan 1 Fault
2	GREEN 	Fan 2 OK
	OFF 	Fan off or not installed
	FLASHING GREEN 	Fan 2 Fault
3	GREEN 	Fan 3 OK
	OFF 	Fan off or not installed
	FLASHING GREEN 	Fan 3 Fault

CONNECTION	FUNCTION
RS485_M, RS485_F	RS485 Monitor Interface
CAN_M, CAN_F	CAN-BUS Monitor Interface
J21, J22	Power Input
S3	DIP Switch

3.1.3 Channel Unit (CHU)

The CHU shown in Figure 3-5 is a microprocessor controller transceiver module with circuits for power amplification, TX excitation unit, baseband signal processing, and up to three (3) diversity receiver inputs. The CHU front panel and LED indicators are described in Table 3-3 and Table 3-4. The CHU is available in the 136-174 MHz band, 400-470 MHz band, 450-520 MHz, and 800/900 MHz band.

Table 3-3: Descriptions on CHU Front Panel

NO.	NAME	DESCRIPTION
1	RXA	Diversity RX Antenna Port
2	RXB	RX Antenna Port
3	RXC	Diversity RX Antenna Port
4	LED Panel	LED Indicators
5	RS232	Test and Configuration
6	TX	TX Antenna Port

Table 3-4: CHU LED Indicators

LABEL	COLOR	DESCRIPTION
PWR	GREEN	PSU Active, No Faults
	OFF	No Power
RUN	GREEN	BSCU Communications Normal
	FLASHING GREEN	CHU is Starting
	OFF	CHU is Repeating
TX	GREEN	CHU is Allocating Channel
	OFF	TX Channel is Free
RX	GREEN	Carrier Signal Present
	OFF	RX Channel is Free
ALM	RED	CHU Fault
	OFF	No CHU Fault
PLL	RED	PLL Unlocked
	OFF	PLL Active, No Faults

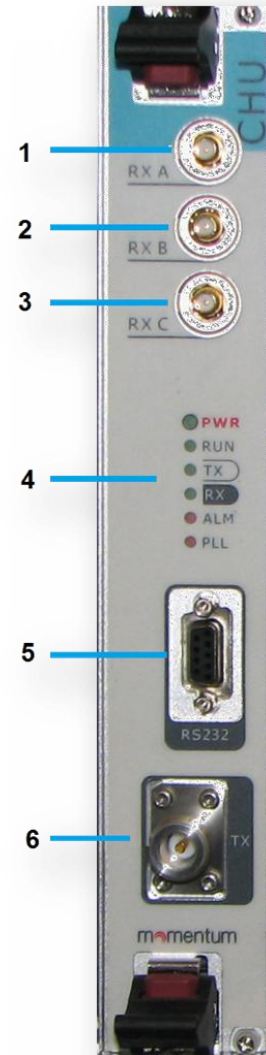


Figure 3-5: CHU Front Panel

3.1.4 Base Station Controller Unit (BSCU)

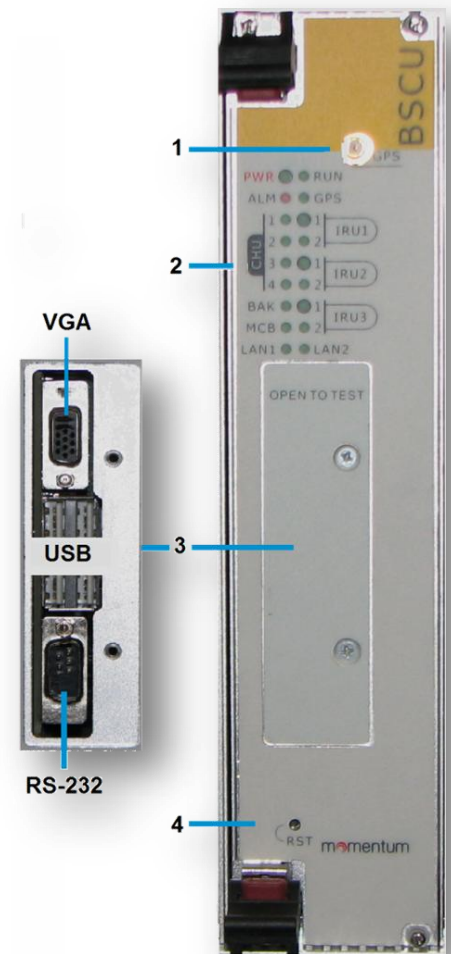
The BSCU, part number HD-BS1A, manages the overall operation of the site; assigning channels, timeslots, and interfacing with the LAN, Ethernet, and other devices. Each transceiver shelf may be equipped with a redundant MSCU. The front panel features are illustrated in Figure 3-6 and the LED indicators are described in Table 3-6.

Table 3-5: BSCU Front Panel Description

NO.	NAME	DESCRIPTION
1	GPS	GPS Antenna Port
2	LED Panel	LED Indicators
3	OPEN TO TEST	VGA, USB, and RS232
4	RST	BSCU Reset

Table 3-6: BSCU LED Indicators

LABEL	COLOR	DESCRIPTION
PWR	GREEN	Power On
	OFF	Power Failure
RUN	FAST FLASH GREEN	BSCU Main Mode
	SLOW FLASH GREEN	BSCU Backup Mode
	GREEN	BSCU Starting
	OFF	BSCU not working
ALM	RED	BSCU Fault
	OFF	No BSCU faults
GPS	FLASHING GREEN	Disabled via Local Command
	GREEN	Disabled via GPS Rcvr
	OFF	Enabled, Active
CHU1 -4	GREEN	BSCU-CHU Link Active
	FLASHING GREEN	BSCU-CHU Data Transfer
	OFF	BSCU-CHU No Comms
IRU1 3	GREEN	BSCU-IRU Link Active
	FLASHING GREEN	BSCU-IRU Data Transfer
	OFF	BSCU-IRU No Comms
BAK	GREEN	BSCU Main-BSCU Backup Link Active
	FLASHING GREEN	BSCU-BSCU Data Transfer
	OFF	BSCU-BSCU No Comms
MCB	GREEN	BSCU-MCB Link Active
	FLASHING GREEN	BSCU-MCB Data Transfer
	OFF	BSCU-MCB No Comms
LAN1 LAN2	GREEN	BSCU-LAN Link Active
	FLASHING GREEN	BSCU-LAN Data Transfer
	OFF	BSCU-LAN No Comms



**Figure 3-6:
BSCU Front Panel**

3.1.5 Power Supply Unit (PSU)

The PSU, part number HD-BS1B, consists of power monitoring board, power module, and LED panel. The front panel of the PSU is illustrated in Figure 3-7. The PSU indicators are described in Table 3-8.

Table 3-7: PSU Front Panel Features

NO.	NAME	DESCRIPTION
1	LED Panel	LED Indicators
2	ON/OFF	Power Switch

Table 3-8: LED Indicators on PSU Front Panel













LABEL	COLOR	DESCRIPTION
ALM	RED 	Major Alarm
	FLASHING RED 	Minor Alarm
	OFF 	No Faults
PWR 1	GREEN 	Path 1 Outputs Active
	FLASHING GREEN 	Path 1 Outputs HVCC or LVCC Alarm
	OFF 	Path 1, No Output Voltage
PWR 2	GREEN 	Path 2 Outputs Active
	FLASHING GREEN 	Path 2 Outputs HVCC or LVCC Alarm
	OFF 	Path 2, No Output Voltage
BSC	GREEN 	BSC Output Voltage Normal
	FLASHING GREEN 	BSC Over/Under Voltage Alarm
	OFF 	BSC Failure



Figure 3-7: PSU Front Panel



The power module has two-path outputs including HVCC and LVCC.

3.1.6 Extended Interface Board

The Extended Interface Board (EIB), part number HD-TM1F, shown in Figure 3-8 and Figure 3-9 provides E1, Ethernet, Monitor, and Auxiliary Interface connections. The EIB is required to provide connectivity to an IP network or transceiver shelf 3 and 4. Figure 3-8 shows the side of the assembly where external connections are made to the station. Figure 3-9 shows the

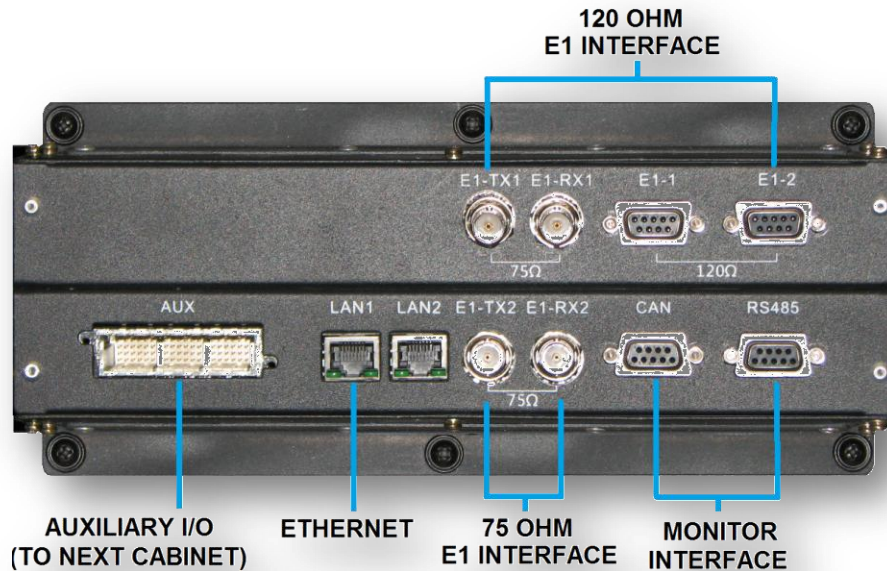


Figure 3-8: Extended Interface Board (External Connections View)



Figure 3-9: Extended Interface Board (Internal Connections View)

4 INSTALLATION

4.1 TOOLS

The following tools are required for installation:

Table 4-1: Tools and Meter

General Tools	Claw hammer, slot type screwdriver, large Phillips screwdriver, wrench, paper knife, connector board and A type ladder.
Special Tools	ESD-preventive wrist strap, cable peeler and crimping pliers.
Meter	Multimeter

4.2 UNPACKING AND INSPECTION



After removal from the shipping container, examine the components and installation items for broken, damaged, loose, or missing parts. If any are noted, contact Harris representative immediately to discuss and arrange for the return of the equipment for replacement. Any unauthorized attempts to repair or modify this equipment will void the warranty and could create a safety hazard.

Carefully unpack the equipment and examine each item. If there is any damage to the equipment, contact the carrier immediately and have their representative verify the damage. If you fail to report the shipping damage immediately, you may forfeit any claim against the carrier.

When unpacking the equipment, check the contents against the packing list. Contact your Harris representative and the carrier if any discrepancies are noted. Carefully open each rack and inspect the contents to ensure the enclosed equipment has not been damaged during delivery. If damage has occurred, note details of the damage and, if necessary, contact the carrier immediately and have their representative verify the damage. Contact your Harris representative if the damage is such that installation cannot proceed.

4.3 GROUNDING THE EQUIPMENT

Ensure all equipment and facilities meet the requirements for grounding and lightning protection. Site Grounding and Lightning Protection Guidelines manual AE/LZT 123 4618/1 provides proper grounding procedures. These guidelines must be observed in order to protect the equipment and service personnel from lightning and other sources of electrical surges.

Each 19” rack mounted assembly typically has a grounding point identified on the assembly. Use this location to ground each sub-assembly to the cabinet or rack ground bus bar. Properly ground the bus bar to the building or room’s ground system.

Transmission lines, telephone equipment, HVAC equipment, door frames, and any other metallic objects located in and around the facility must be properly grounded per the site grounding manual.

4.3.1 Surge Protection Devices (SPDs)

All RF transmission lines and surge protection devices (SPDs) should be grounded in accordance with procedures presented in Site Grounding and Lightning Protection Guidelines manual AE/LZT 123 4618/1. PolyPhaser® or similar SPD devices are required for all RF, phone, or on-site control lines entering the building from external sources. For GPS antenna installation, Harris recommend using a GPS surge arrestor, part number HD-TM1M-02, inline with each GPS antenna.

4.4 INSTALLING THE EQUIPMENT

The HDT300 is designed to be installed in a 19-inch rack or cabinet. A ground bus bar should be utilized to minimize ground loops and the potential for electrical surges, such as lightning, from traveling through the equipment while dissipating to the grounding system.

Carefully pre-plan the rackup, locating the fan shelf directly under each transceiver shelf, and ensuring adequate air flow above and below the rackup. It is also recommended to install the modules after the shelf is fully installed, the grounding bus bar system is fully installed and the bus bar is properly grounded to the site grounding system.

Additionally, it may be beneficial to begin installing equipment from the bottom of the rack or cabinet and building up the rail. It is recommended to follow the steps shown in the following sub-sections when installing equipment.

The first transceiver and fan shelf installation supports the first four (4) RF channels. For sites with five (5) or more RF channels, multiple transceiver and fan shelf installations are preformed. Typically, two (2) individual rackups consisting of a transceiver shelf, fan shelf, and EIB may be installed per the average tall rack or cabinet (supporting RF channels 1 through 8). For RF channels 9 through 16, a second cabinet or rack is typically required.

4.4.1 Installing the Fan Shelf

1. Determine the installation location along the rails and if required, install screw clips in the two (2) screw locations.
2. Install screws in the two (2) mounting locations.
3. Install a ground wire from the fan shelf rear panel to the ground bus bar.

For best performance, equipment ground wires should be constructed using UL-listed compression-type connectors and 14-gauge or larger stranded ground wire. Always use gradual bends in the wire (no sharp angles).

4. Set DIP Switch S3 for the proper shelf identity per the following instructions:

DIP Switch S3 is used to associate the fan shelf to the corresponding transceiver shelf. The DIP switch settings are described in Table 4-2. Section S3-3 is the Least Significant Bit (LSB) and S3-4 is the Most Significant Bit (MSB). Fan shelves 1 through 4 are assigned Logic 0 through 3, respectively.

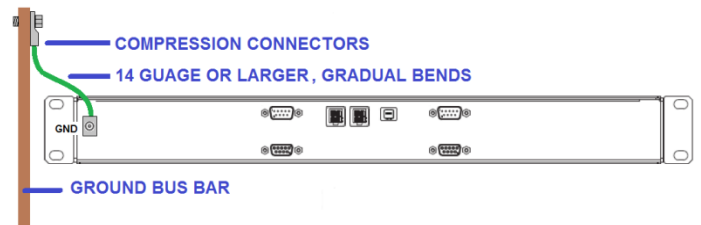


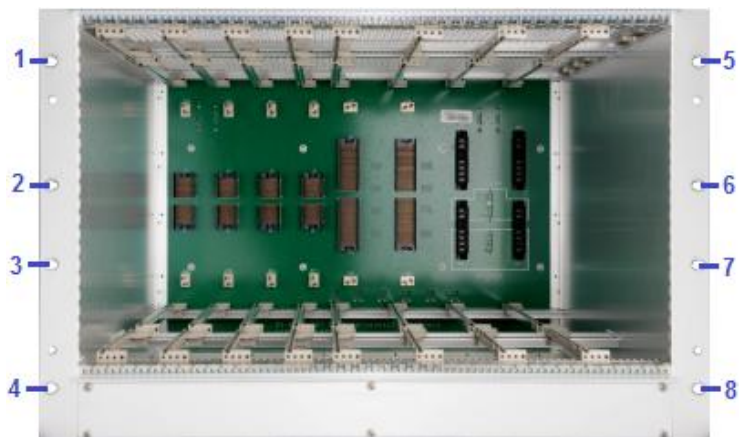
Table 4-2: Fan DIP Switch Settings

FAN SHELF #	Shown set for Shelf 1				DIP SWITCH S3 CONFIGURATION
	SW1-1	SW1-2	SW1-3 (LSB)	SW1-4 (MSB)	
Fan Shelf 1 (RF Channels 1 through 4)	NA	NA	ON	ON	
Fan Shelf 2 (RF Channels 5 through 8)	NA	NA	OFF	ON	
Fan Shelf 3 (RF Channels 9 through 12)	NA	NA	ON	OFF	
Fan Shelf 4 (RF Channels 13 through 16)	NA	NA	OFF	OFF	

* N/A = Not applicable (not used).

4.4.2 Installing the Transceiver Shelf

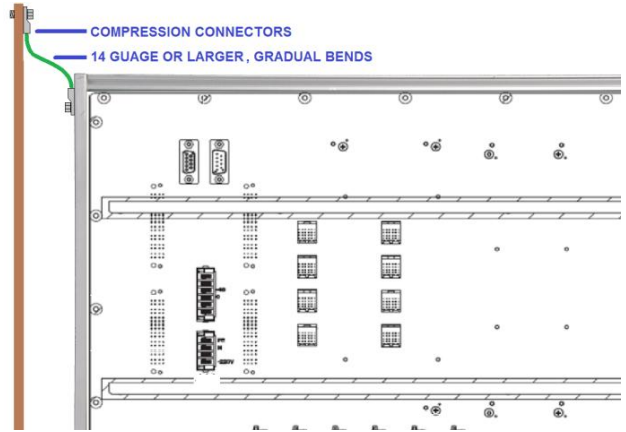
1. Install the transceiver shelf just above the associated fan shelf. If required, install screw clips in the eight (8) corresponding screw locations along the rails.
2. Install screws in all eight (8) mounting locations.



3. Install a ground wire from the transceiver shelf to the ground bus bar.

For best performance, equipment ground wires should be constructed using UL-listed compression-type connectors and 14-gauge or larger stranded ground wire. Always use gradual bends in the wire (no sharp angles).

4. Set DIP Switch SW1 for the proper shelf identity per the following instructions:



DIP Switch SW1 is used to identify the transceiver shelf to the BSCU. The DIP switch settings are described in Table 4-3. Transceiver Shelves 1 through 4 are assigned Logic 0 through 3, respectively, using SW1-1 and SW1-3. Section SW1-1 is the Least Significant Bit (LSB) and SW1-3 the Most Significant Bit (MSB). Sections SW1-2 and SW1-4 are not used.



The DIP switch is mounted in an inverted position. SW1-1 is actually the right-most position as viewed while facing the rear panel.

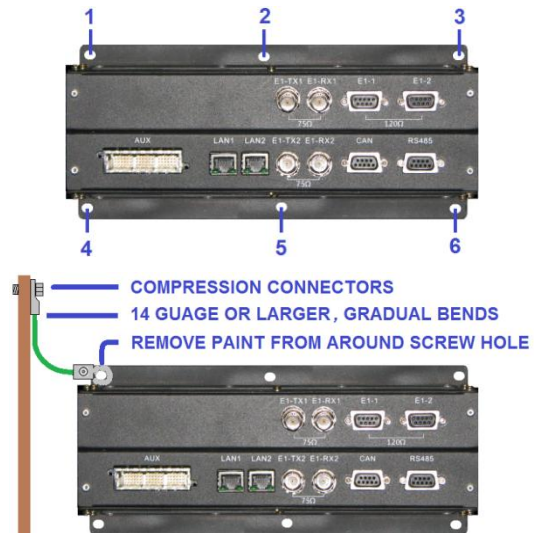
Table 4-3: Interconnection Board DIP Switch Configuration

TRANSCEIVER SHELF #	Shown set for Shelf 1				DIP SWITCH SW1 CONFIGURATION
	SW1-4 (Not Used)	SW1-3 (MSB)	SW1-2 (Not Used)	SW1-1 (LSB)	
Transceiver Shelf 1 (RF Channels 1 through 4)	NA	ON	NA	ON	← OFF (1) ← ON (0)
Transceiver Shelf 2 (RF Channels 5 through 8)	NA	ON	NA	OFF	← OFF (1) ← ON (0)
Transceiver Shelf 3 (RF Channels 9 through 12)	NA	OFF	NA	ON	← OFF (1) ← ON (0)
Transceiver Shelf 4 (RF Channels 13 through 16)	NA	OFF	NA	OFF	← OFF (1) ← ON (0)

* N/A = Not applicable (not used).

4.4.3 Installing the Extended Interface Board

1. Determine the installation location and install using the six (6) screw locations.



2. Install a ground wire from the EIB panel to the ground bus bar.

If possible, install the ground lug to the rear of the EIB panel where the surface is not painted. Alternately, remove paint from around one hole on the front of the panel's mounting flange.

For best performance, equipment ground wires should be constructed using UL-listed compression-type connectors and 14-gauge or larger stranded ground wire. Always use gradual bends in the wire (no sharp angles).

4.5 CABLE CONNECTIONS

Figure 4-1 represents a 4-channel rackup. Up to four (4) rackups similar to that shown in Figure 4-1 may be connected for a maximum of 16 RF channels at one site. Backplane connections at each of the four rackups are similar with only cable additions for interconnecting the multiple rackups.

4.5.1 Initial Backplane Cable Connections

Before installing cables, the equipment shelves and grounding system should be installed as per the previous sub-sections.



Make sure all AC and DC power input is Off or disabled before making connections to the equipment.

1. Make the following backplane cable connections as shown on Figure 4-1.
 - a. Cable from EIB LAN&E1 connection to the transceiver shelf J46, J47, and J52 connections.
 - b. Cable from EIB's CAN connection to the transceiver shelf J28.
 - c. Cable from EIB's RS485 connection to the fan shelf J29.
 - d. Cable from transceiver shelf J34 to the fan shelf RS485_M.
 - e. Cable from transceiver shelf J35 to the fan shelf DC input.
 - f. Cable from transceiver shelf J36 to the fan shelf DC input.
 - g. Cable from transceiver shelf J33 to the fan shelf CAN_M.
 - h. Customer supplied AC power cable Chassis GND wire to transceiver shelf J44-PE.
 - i. Customer supplied AC power cable Neutral wire to transceiver shelf J44-N.
 - j. Customer supplied AC power cable Leg 1 (L1) wire to transceiver shelf J44-220V.

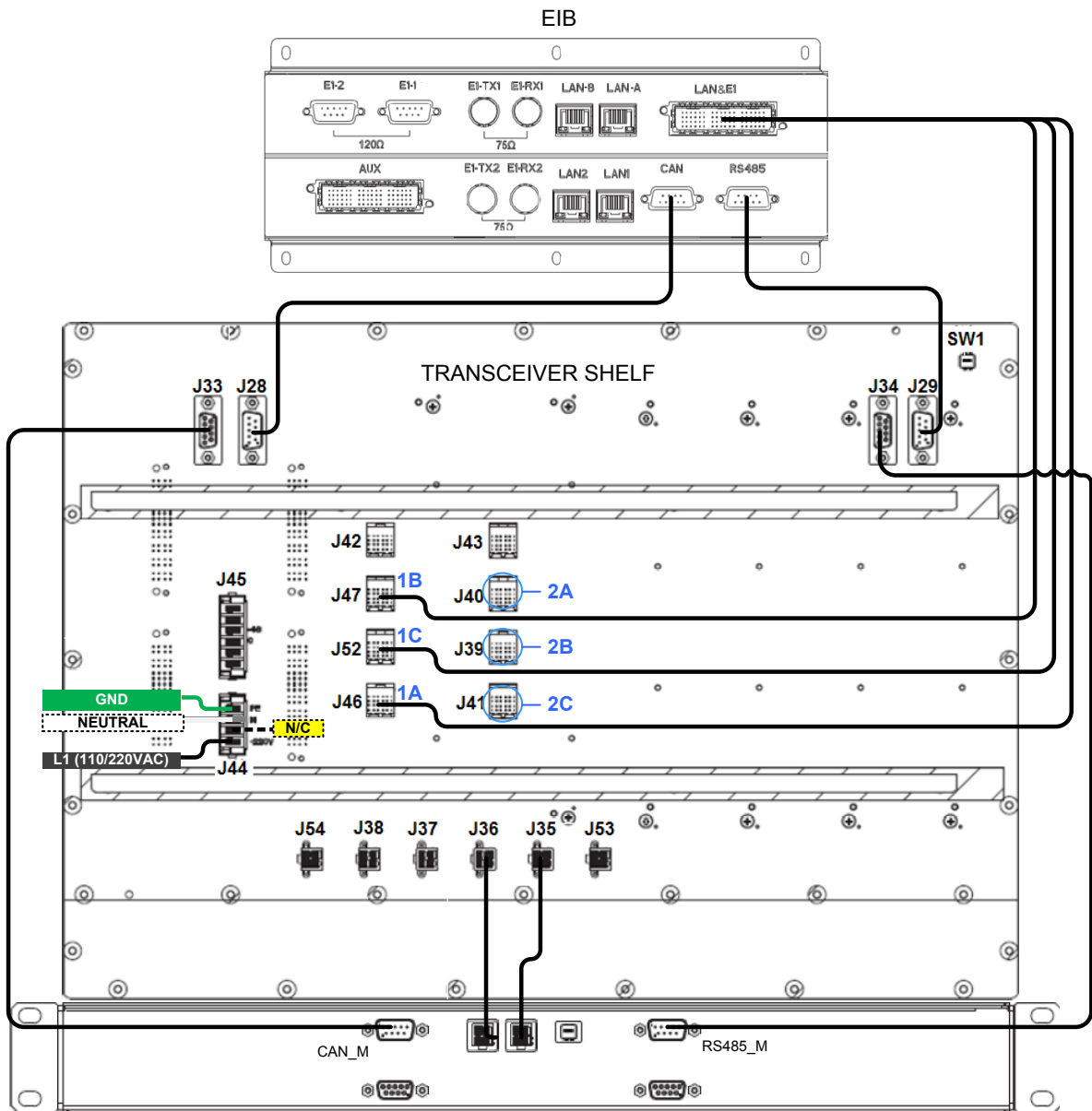


Figure 4-1: HDT300 Backplane Wiring Diagram

4.5.2 Multi-Shelf Multi-Cabinet Cable Connections

Figure 4-1 represents a 4-channel rackup. Up to four (4) rackups similar to that shown in Figure 4-1 may be connected for a maximum of 16 RF channels at one site. Backplane connections at each of the four rackups are similar with only cable additions for interconnecting the multiple rackups.

Typically, two (2) individual rackups of a transceiver shelf, fan shelf, and EIB may be installed per the average tall rack or cabinet (supporting RF channels 1 through 8). For RF channels 9 through 16, a second cabinet or rack is typically required.

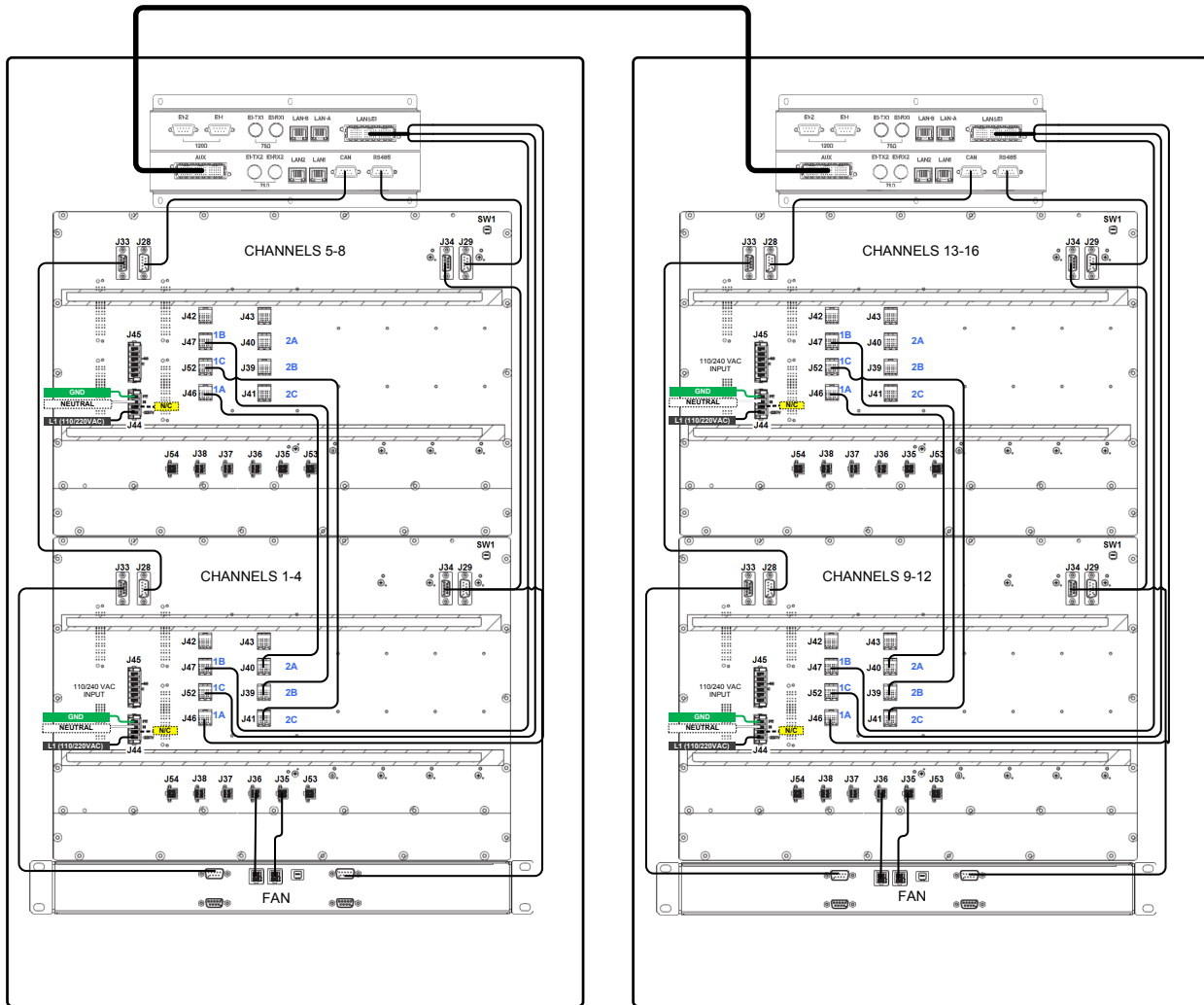


Figure 4-2: HDT300 Multi-Shelf – Multi Cabinet Configuration

4.6 INSTALLING MODULES



Some components of the power system carry hazardous voltage in operation. Direct or indirect contact through moist objects with these components will result in fatal injury.



Make sure all AC input power is turned off to the equipment and the power switch on each PSU is set to the Off position before installing the PSU modules.



The ESD symbol calls attention to procedures, practices, or the like, which could expose equipment to the effects of Electro-Static Discharge. Proper precautions must be taken to prevent ESD when handling circuit boards or modules.

Cabinets and racks may be pre-racked and tested in a shop or staging environment; however, the Momentum modules and fan drawers must be removed from the shelves before transporting the rackup. This will prevent damage to the shelf units and modules.



DO NOT transport a pre-assembled rackup without first removing the modules and fans from the shelf assemblies. The weight of the installed modules and fan drawers can potentially damage the shelf assemblies during transport.

1. Install the modules into the shelf slots as shown in Figure 4-5 per the following instructions:
 - a. Loosen the two ejectors by pressing the red locking mechanism to release the ejectors (refer to Figure 4-3).

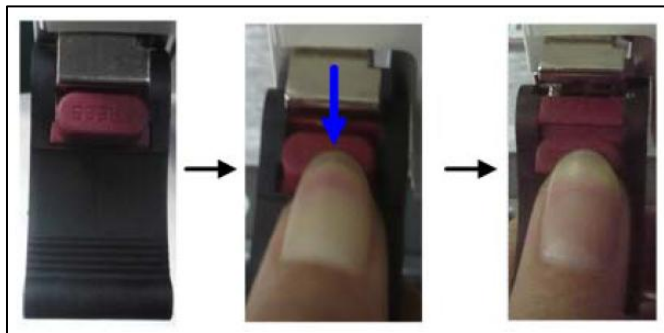


Figure 4-3: Loosening the Ejector

- b. Slide the BSCU along the guide rails smoothly as shown in Figure 4-4.
 - c. Re-latch the ejectors after the module is fully inserted into the card cage.
 - d. Tighten the screw located within each ejector.
 - e. Tighten the screw on the top and bottom-right corners of each module as shown in Figure 4-4.

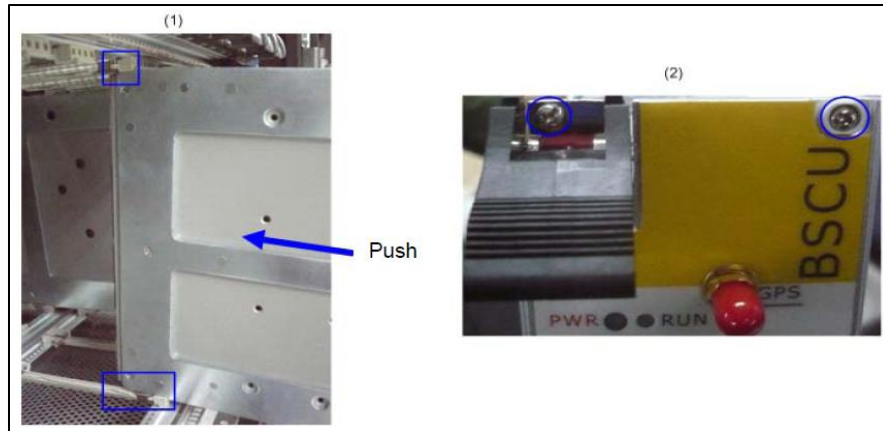


Figure 4-4: Installing the BSCU

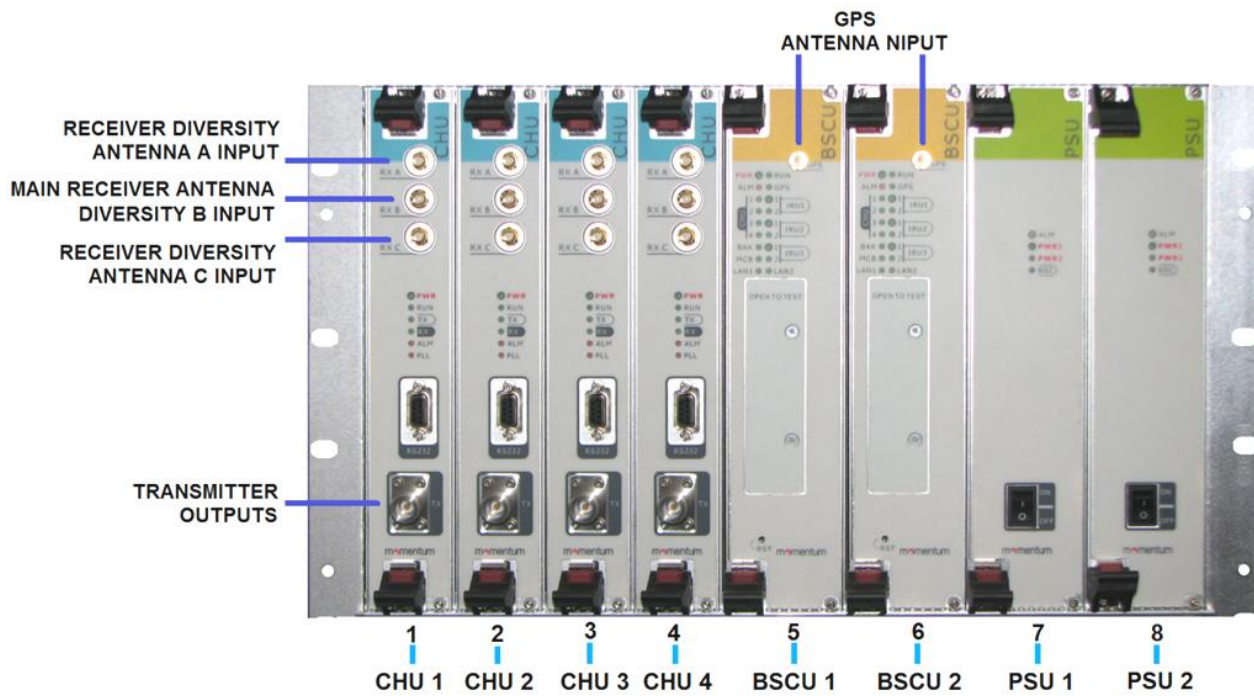


Figure 4-5: Module Placement and Front Panel Cable Connections

4.7 FRONT PANEL CONNECTIONS

4.7.1 RF Antenna Connections

The CHU modules include RF connections for the RX and TX antennas. Cables for each connection are customer supplied and must be high grade, low loss cables. Cable lengths should be kept as short as possible to minimize cable loss; however, it may be desirable to use the same type cable for each similar connection and similar lengths to minimize imbalances between channels during operation.

4.7.2 GPS Receiver Antenna Connections

The GPS receiver input on each BSCU module is a non-powered antenna connection. A GPS antenna, part number HD-TM1M-01, is available and may be ordered through the Harris representative for the HDT300 system. A GPS antenna surge arrestor, part number HD-TM1M-02, should be installed along with each GPS antenna. If both BSCU modules are installed, the GPS antenna inputs may be connected to separate GPS antennas (desired method, antennas not supplied) or connected to a common GPS antenna using a customer supplied power splitter/multicoupler.

Follow all manufacturers' instructions for installing and connecting the GPS antenna to the BSCU. Cable lengths should be kept as short as possible to minimize cable loss. Any recommended maximum antenna cable lengths should be observed. For installations requiring longer than recommended cable lengths, an amplified antenna system is recommended or use an inline RF antenna amplifier designed specifically for GPS antenna systems.

4.7.3 Additional front panel connections

Additional front panel connections for RS232 and other ports are used during setup and configuration and out of the scope of this manual.

5 POST-INSTALLATION INSPECTION

Verify the following before proceeding with power-up of the system:

- a. The cabinet or rack has been installed and grounded per the Site Grounding and Lightning Protection Guidelines Manual, AE/LZT 123 4618/1.
- b. All safety ground connections are:
 - i. Properly crimped.
 - ii. Connected to the proper connection points on the equipment.
 - iii. Connected to the ground bus bar using gradual bends in an upward fashion.
 - iv. Nut and/or bolts securing the ground lugs are sufficiently tightened.
- c. All AC power cables have been labeled and installed per Section 4.5.
- d. All rear panel control cable connections have been labeled and installed per Section 4.5
- e. All modules have been installed per Section 4.6.
- f. All front panel power switches on the PSU units have been set to the Off position.
- g. All front panel RF antenna connections are labeled and installed per Section 4.7.
- h. Verify all receive and transmit antenna ports are connected to 50 ohm load resistors of sufficient power rating.



To prevent unintentional or malicious interference to other radio systems, the receive and transmit antenna ports of all new installations should first be connected to 50 ohm load resistors of sufficient power rating until the system is programmed to the proper operating frequencies and ready to be deployed.

6 POWER-UP

1. Transmitter and receiver antenna ports should be connected to 50 ohm load resistors of sufficient power rating until the system is programmed to the proper operating frequencies and ready to be deployed.
2. Verify the post installation inspection in Section 5 is complete.
3. Apply power to the equipment from the AC mains breaker or switch.
4. Set all power switches on the PSU modules to the On position.
5. Verify all modules power up properly with no alarms (refer to Table 6-1).

Table 6-1: Power and Alarm Indicator Checklist

Name	Normal Power Indication
CHU	The PWR indicator on the front panel glows and the ALM indicator goes out.
BSCU	The PWR indicator on the front panel glows and the ALM indicator goes out.
PSU	The PWR indicator on the front panel glows and the ALM indicator goes out.
FAN	The PWR indicator on the front panel glows.



NOTE

If any LED indicators indicate a failure, power down the cabinet, reseal the modules, and re-power the cabinet. If the issue persists, contact your dealer.

7 CUSTOMER RESOURCES

7.1 REPLACEMENT PARTS

To order replacement parts, contact the Customer Care center at:

<http://www.pspc.harris.com/CustomerService>

Or use one of the following phone numbers, fax numbers, or email addresses:

United States:

- Phone Number: 1-800-368-3277
- Fax Number: 1-321-409-4393 (U.S. Only)
- E-mail: PSPC_CustomerFocus@harris.com

International:

- Phone Number: 434-455-6403
- Fax Number: 321-409-4394
- E-mail: PSPC_InternationalCustomerFocus@harris.com

7.2 TECHNICAL ASSISTANCE

If any of the radio equipment requires repair, or if there are questions or concerns about the installation of this equipment, contact the Harris Technical Assistance Center (TAC) using the following telephone numbers or e-mail address:

- United States and Canada: 1-800-528-7711 (toll free)
- International: 1-434-385-2400
- Fax: 1-434-455-6712
- E-mail: PSPC_tac@harris.com

7.3 TECH-LINK

For more information about this and other Harris PSPC products, check out our Tech-Link service at:

<https://premier.pspc.harris.com/>

Tech-Link is a one stop link to Technical Documentation (downloadable PDFs) - Software Revisions - Feature Encryption - pictorials of parts and accessories - and other information pertaining to our products. Information that will enhance your service efforts -- 24 hours a day, 7 days a week.

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