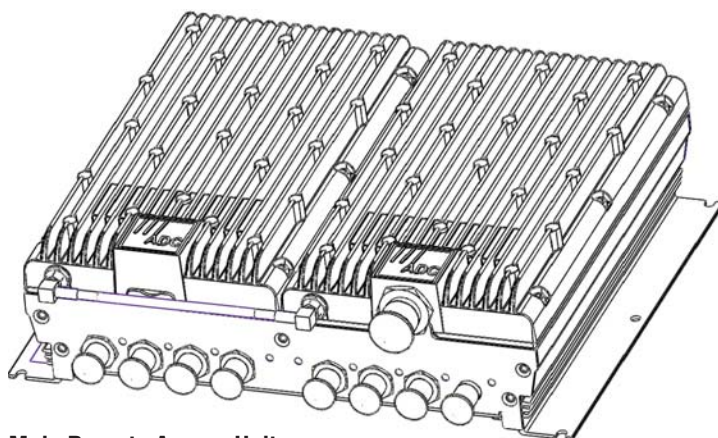


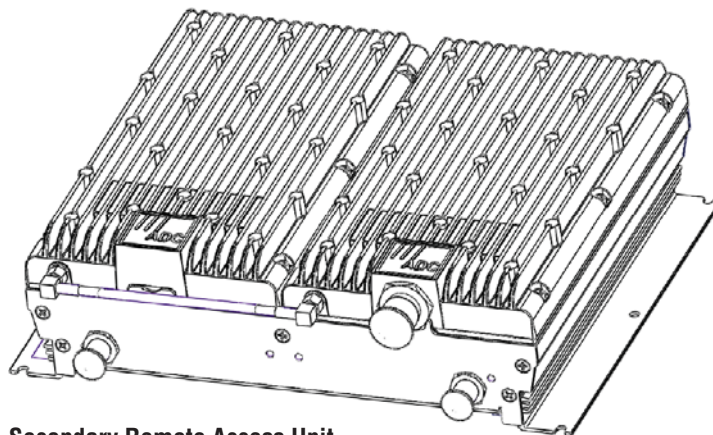
# InterReach Spectrum™ Remote Access Unit

Installation Guide - Preliminary Update - Issue 3

ADCP-77-168 • Issue 3 • July 2012



Main Remote Access Unit



Secondary Remote Access Unit

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## **Screenshots in User Documentation**

Due to concurrent development of this documentation, artwork, and the InterReach Spectrum Element Management System (EMS), there may be some minor discrepancies between screenshots contained in this documentation and those actually displayed in the InterReach Spectrum EMS. These discrepancies will generally be few and minor and should not affect your understanding of InterReach Spectrum EMS.

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## PREFACE

This manual provides installation instructions for InterReach Spectrum® Remote Access Units (RAUs). [Table 1](#) lists the RAUs that are supported in this document.

**Table 1.** *Supported Spectrum Remote Access Units*

Catalog Number	Description
SPT-M1-8519-1	SPECTRUM, 850-1900 MAIN RAU
SPT-M1-AWS19-11	SPECTRUM, 2100AWS Path 1-1900 Path 1 MAIN RAU
SPT-S1-2121-1-MIMO	SPECTRUM, 2100AWS MIMO SECONDARY RAU
SPT-S1-7070-1-MIMO	SPECTRUM, 700 MIMO SECONDARY RAU, UpperC-LowerABC
SPT-S1-8019-22	SPECTRUM, 800 Path 2-1900 Path 2 SECONDARY RAU
SPT-S1-8090-1	SPECTRUM, 800-900 SMR SECONDARY RAU
SPT-S1-80AWS-1	SPECTRUM, 800-2100AWS Path 1 SECONDARY RAU
SPT-S1-8519-22	SPECTRUM, 850 Path 2-1900 Path 2 SECONDARY RAU
SPT-S1-AWS19-12	SPECTRUM, 2100AWS Path 1-1900 Path 2 SECONDARY RAU
SPT-S2-70AWS-1-SISO	SPECTRUM, 700 SISO-2100AWS Path 1 SEC RAU, UpperC-LowerABC
SPT-S2-70AWS-22-SISO	SPECTRUM, 700 Path 2 SISO-2100AWS Path 2 SEC RAU, UpperC-LowerABC

## Revision History

Issue	Document Date	Technical Updates
1	September 2010	Original
2	December 2011	Added “Supported Spectrum Remote Access Units” on page 2, “RAU N Connectors” on page 10, and “Nominal Passband Gains” on page 17. Updated “Appendix D: Contacting TE Connectivity” on page 25.
3	June 2012	Updated IC standards in “Standards Certification” on page 4; updated “Composite Power Out of RAU” on page 18.

## InterReach Spectrum User Documentation

The InterReach Spectrum user documentation is intended for system administrators, engineers and installers responsible for planning, administering, configuring, and maintaining TE Connectivity InterReach Spectrum systems. [Table 2](#) lists the manuals that correspond to this InterReach Spectrum release.

**Table 2.** *InterReach Spectrum User Documentation*

<b>Title</b>	<b>ADCP Number</b>
<i>InterReach Spectrum Quick Start Guide</i>	ADCP-77-165
<i>InterReach Spectrum Host Unit Installation Guide</i>	ADCP-77-166
<i>InterReach Spectrum Expansion Module Group Installation Guide</i>	ADCP-77-167
<i>InterReach Spectrum Remote Access Unit Installation Guide</i>	ADCP-77-168
<i>InterReach Spectrum Element Management System 7.2 User Manual</i>	ADCP-77-189
<i>FlexWave Prism OADM Splice Box Installation Guide</i>	ADCP-77-151

Two types of messages, identified below, appear in the InterReach Spectrum user documentation:

**CAUTION!** Caution text indicates operations or steps that could cause personal injury, induce a safety problem in a managed device, destroy or corrupt information, or interrupt or stop services.

**NOTE:** Note text contains information about special circumstances.

## Standards Certification

**FCC:** This equipment complies with the applicable sections of Title 47 CFR, Part 22 (800 MHz Cellular), Part 24 (1900 MHz - PCS), Part 90 (800/900 - SMR), and Part 27 (700 MHz, 2100 MHz - AWS).

**IC:** This equipment complies with the applicable sections of RSS-131 (800/900 – SMR), RSS-132 (800 - Cellular), and RSS-133 (1900 – PCS). The term “IC:” before the radio certification number only signifies that Industry Canada Technical Specifications were met.

The Manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.

**NOTE:** The U.S. Federal Communications Commission (FCC) has developed guidelines for evaluation of human exposure to RF emissions. The guidelines incorporate limits for Maximum Permissible Exposure (MPE) for power density of transmitter operating at frequencies between 300 kHz and 100 GHz. Limits have been set for portable, mobile, and fixed equipment. TE Connectivity products fall in the category of fixed equipment; products intended to be permanently secured and exposures are evaluated for distances greater than 40cm (15.75”). Portable devices fall into exposures of less than 20cm, where SAR evaluations are used.

Antenna gain is restricted to 1.5 W ERP (2.49 W EIRP) in order to satisfy RF exposure compliance requirements. If higher than 1.5 W ERP, routine MPE evaluation is needed. The antennas should be installed to provide at least 40cm from all persons to satisfy MPE requirements of FCC Part 2, 2.1091.

**UL/CUL:** This will be installed in a restricted access location. This equipment complies, per UL and CUL 50, Standard for Enclosures for Electrical Equipment.

**UL/CUL:** This equipment complies with UL and CUL 60950-1 Standard for Safety for Information Technology Equipment, including Electrical Business Equipment.

**UL/CUL:** All InterReach Spectrum RAUs are Plenum rated and suitable for use in environmental air space in accordance with Section 300-22(C) of the National Electrical Code, and Sections 2-128, 12-010(3) and 12-100 of the Canadian Electrical Code, Part 1, CSA C22.1.

**UL:** This equipment is UL Plenum rated under UL 2043.

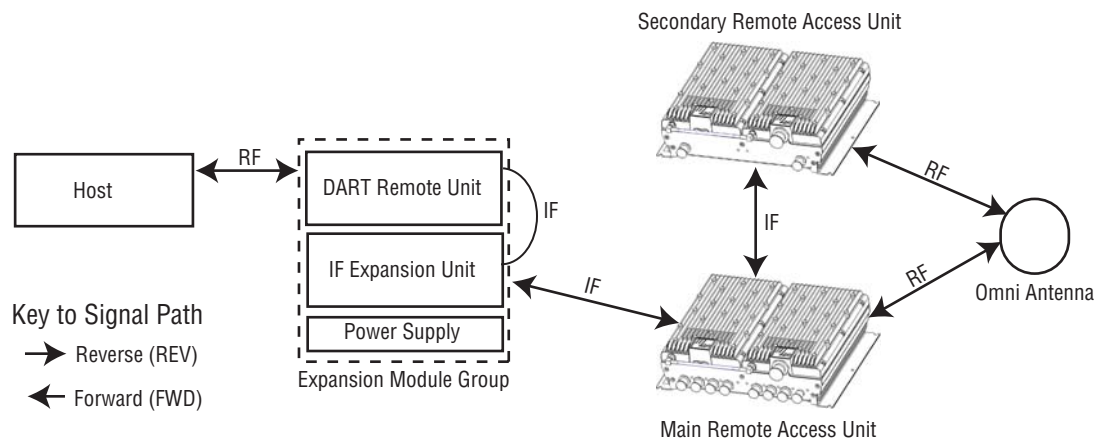
**CAUTION!** Modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## PRODUCT OVERVIEW

InterReach Spectrum supports up to eight frequency bands in a single system. Each antenna location supports those bands in modular, group pairings. Each location includes a Main Remote Access Unit (MRAU), which can power up to three additional Secondary Remote Access Units (SRAUs). An MRAU supports two frequency bands, and each SRAU can support up to two frequency bands, for a total of up to eight frequency bands. MRAUs and SRAUs are grouped logically, based on common service provider groupings and include, as an example:

- 850/1900
- 700/700 MIMO
- 800/900 SMR
- 1900/AWS.

To add more frequency bands, you connect an SRAU to the existing MRAU. [Figure 1](#) illustrates how RF and IF signals are sent between Spectrum units and modules.



**Figure 1.** REV and FWD Signals for the RAU

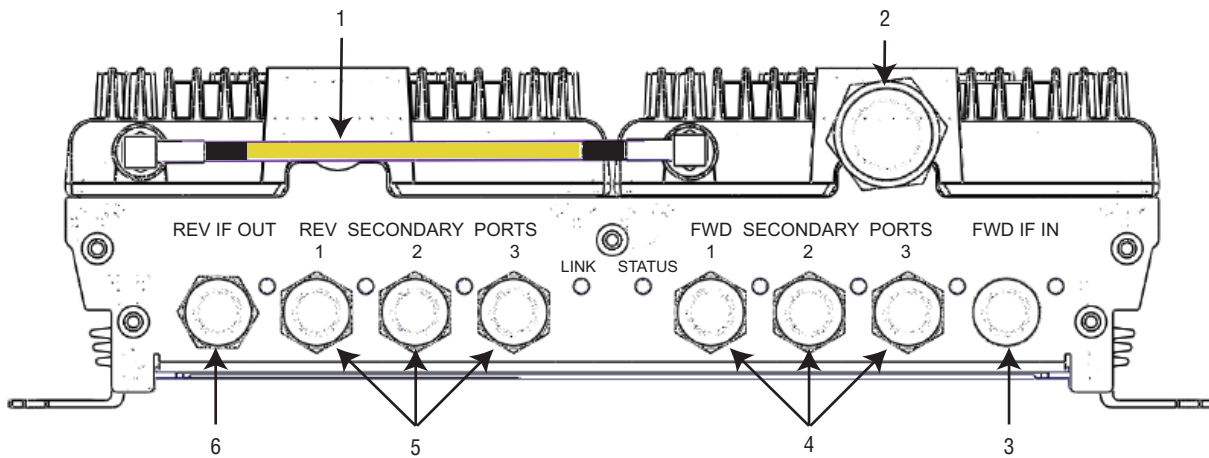
**NOTE:** This book refers to the **Omni Antenna (4214-M727)**, which is the antenna that TE Connectivity recommends. Other antennas may be used. For further information on the Omni Antenna, see [“Appendix C: Omni Antenna”](#) on page 24.

## Main Remote Access Units

The Main Remote Access Unit (MRAU) receives FWD IF signals from an IF Expansion Unit (IFEU), which is part of the Spectrum Expansion Module Group, using 75Ω CATV cable. The MRAU converts the IF signals to RF and sends them to a passive RF antenna using 50Ω coaxial cable. The MRAU also receives configuration information and power from and sends its status information to the IFEU.

The MRAU receives REV RF signals from a passive RF antenna using 50Ω coaxial cable. It converts the signals to IF and sends them to the IFEU using 75Ω CATV cable.

### MRAU Ports, Cable, and Connectors

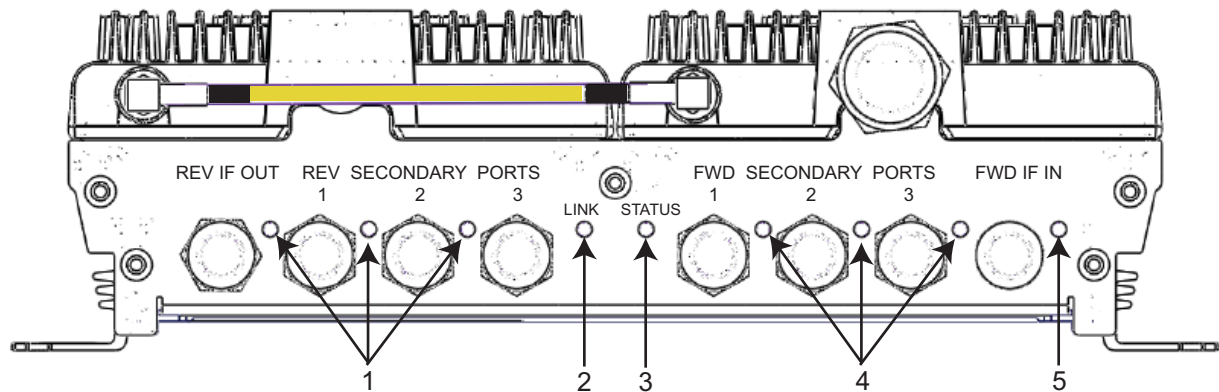


Ref #	Component	Device	Function
1	RF SubMiniature version A (SMA) cable <sup>(1)</sup>	50Ω RF SMA-to-SMA cable	Connects two RF bands together when there is only one N-type connector on the RAU. For cases when there is an N-type connector for each RF band (700MIMO or PCS/AWS), there will not be an SMA cable.
2	Antenna port(s)	50Ω N-type connector	Connects to an antenna. See <a href="#">Table 3 on page 10</a> .
3	FWD IF IN connector	F connector port	Connects to the IFEU FWD Module IF OUT connector via CATV cable.
4	FWD SECONDARY PORTS (1 - 3)	F connector ports	Connect to a SRAU SECONDARY FWD connector via CATV cable.
5	REV SECONDARY PORTS (1 - 3)	F connector ports	Connect to a SRAU SECONDARY REV connector via CATV cable.
8	REV IF OUT connector	F connector port	Connects to the IFEU REV Module IF IN connector via CATV cable.

(1) The AWS/PCS MRAUs does NOT have an RF SMA cable, and has two Antenna ports.



## MRAU LEDs



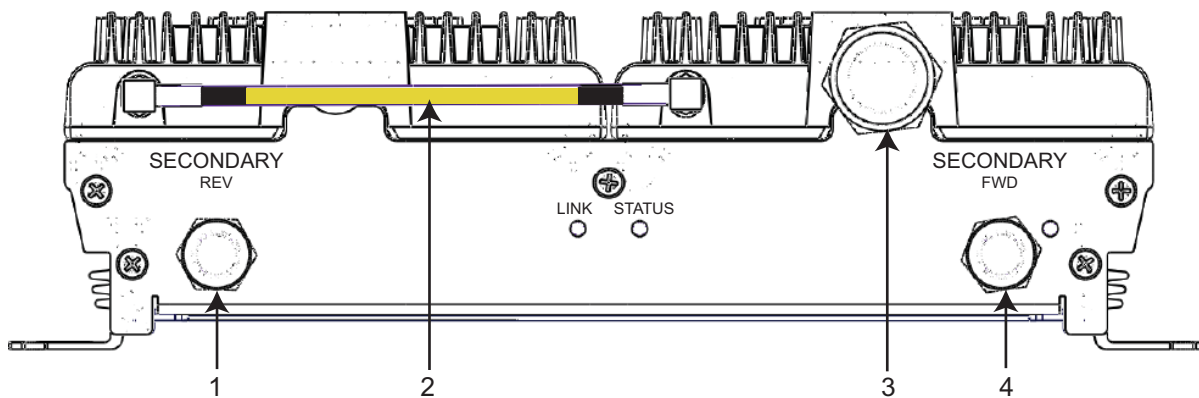
Ref #	LED	LED Color	Description
1	FWD SECONDARY PORT (1 - 3)	<ul style="list-style-type: none"> <li>• Green</li> <li>• Blinking Green</li> <li>• Yellow</li> <li>• Blinking Yellow</li> <li>• Red</li> <li>• Off</li> </ul>	<ul style="list-style-type: none"> <li>• Downstream unit correctly connected; unit has no alarms or a Minor alarm is active.</li> <li>• SRAU or band is set out-of-service.</li> <li>• FWD cable connected to SRAU, no REV cable connected.</li> <li>• FWD and REV cables are not connected to the same port number (incorrectly paired).</li> <li>• Major alarm in downstream unit, fault lockout, or SRAU disconnected.</li> <li>• No SRAU previously connected.</li> </ul>
2	LINK	<ul style="list-style-type: none"> <li>• Green</li> <li>• Red</li> <li>• Off</li> </ul>	<ul style="list-style-type: none"> <li>• MRAU receiving communications from the IFEU.</li> <li>• MRAU has not received communications from the IFEU for more than 90 seconds.</li> <li>• During initial power up, MRAU is powering up and waiting for IFEU communications.</li> </ul>
3	STATUS	<ul style="list-style-type: none"> <li>• Green</li> <li>• Blinking Green</li> <li>• Red</li> </ul>	<ul style="list-style-type: none"> <li>• Unit has no alarms or a Minor alarm is active.</li> <li>• Unit or band is set out-of-service.</li> <li>• Major alarm detected.</li> </ul>
4	REV SECONDARY PORT (1 - 3)	<ul style="list-style-type: none"> <li>• Green</li> <li>• Blinking Green</li> <li>• Blinking Yellow</li> <li>• Red</li> <li>• Off</li> </ul>	<ul style="list-style-type: none"> <li>• Downstream unit correctly connected, unit has no alarms or minor alarm</li> <li>• SRAU or band is set out-of-service.</li> <li>• FWD and REV cables are not connected to the same port number (incorrectly paired).</li> <li>• Major alarm in downstream unit, fault lockout, or SRAU disconnected.</li> <li>• No SRAU previously connected.</li> </ul>
5	FWD IF IN	<ul style="list-style-type: none"> <li>• Green</li> <li>• Yellow or Blinking Yellow</li> <li>• Off</li> </ul>	<ul style="list-style-type: none"> <li>• MRAU is powered on correctly.</li> <li>• There is an IFEU FWD connection, but there is no IFEU REV connection or the IFEU REV connection is paired incorrectly.</li> <li>• Cable is not connected to the IFEU FWD port.</li> </ul>

## Secondary Remote Access Units

A Secondary Remote Access Unit (SRAU) receives FWD IF signals from the MRAU, using 75Ω CATV cable. The SRAU converts the IF signals to RF and sends them to a passive RF antenna using 50Ω coaxial cable. The SRAU, through the MRAU, also receives configuration information and power from and sends its status information to the IFEU.

The SRAU receives REV RF signals from a passive RF antenna using 50Ω coaxial cable. It converts the signals to IF and sends them to the MRAU using 75Ω CATV cable.

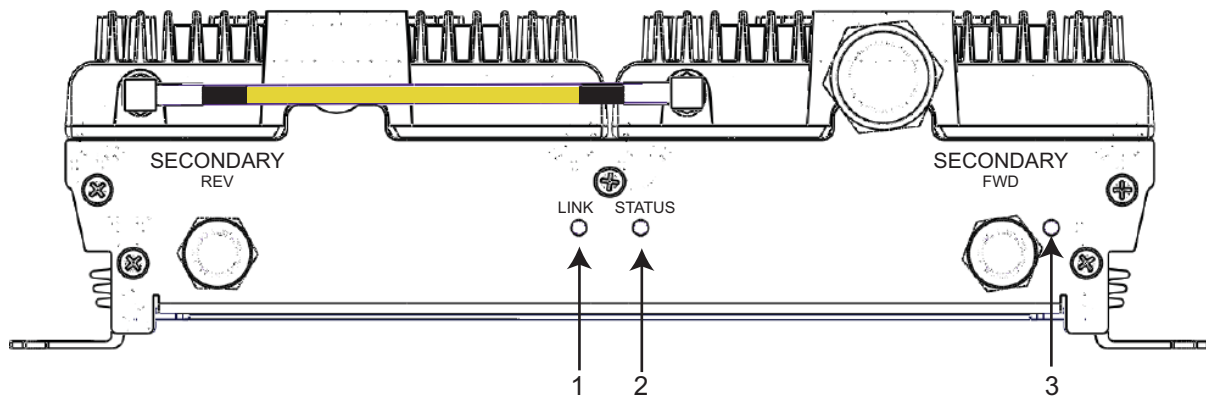
### SRAU Ports, Cable, and Connectors



Ref #	Component	Device	Function
1	SECONDARY REV connector	F connector port	Connects to one of the MRAU REV SECONDARY ports (1 - 3) via CATV cable.
2	RF SMA cable <sup>(1)</sup>	50Ω RF SMA-to-SMA cable	Connects two RF bands together when there is only one N-type connector on the RAU. For cases when there is an N-type connector for each RF band (700MIMO or PCS/AWS), there will not be an SMA cable.
3	Antenna port(s)	50Ω N-type connector	Connects to an antenna. See <a href="#">Table 3 on page 10</a> .
4	SECONDARY FWD connector	F connector port	Connects to one of the MRAU FWD SECONDARY ports (1 - 3) via CATV cable.

(1) The 700 MIMO SRAUs does NOT have an RF SMA cable, and has two Antenna ports.

## SRAU LEDs



Ref #	LED	LED Color	Description
1	LINK	<ul style="list-style-type: none"> <li>Green</li> <li>Red</li> <li>Off</li> </ul>	<ul style="list-style-type: none"> <li>SRAU receiving communications from the IFEU.</li> <li>SRAU has not received communications from the IFEU for more than 90 seconds.</li> <li>During initial power up, SRAU is powering up and waiting for IFEU communications.</li> </ul>
2	STATUS	<ul style="list-style-type: none"> <li>Green</li> <li>Blinking Green</li> <li>Red</li> </ul>	<ul style="list-style-type: none"> <li>Unit has no alarms or a Minor alarm is active.</li> <li>Unit or band is set out-of-service.</li> <li>Major alarm detected.</li> </ul>
3	SECONDARY FWD	<ul style="list-style-type: none"> <li>Green</li> <li>Yellow or Blinking Yellow</li> <li>Off</li> </ul>	<ul style="list-style-type: none"> <li>SRAU is powered on correctly.</li> <li>There is an MRAU FWD connection, but there is no MRAU REV connection or the MRAU REV connection is paired incorrectly.</li> <li>Cable is not connected to the MRAU FWD port.</li> </ul>

## RAU N Connectors

Each RAU also has one or two 50- $\Omega$  N-type connectors that connect to a passive antenna. Table 3 lists the number of N-type connectors available on each RAU model.

**Table 3.** Number of N Connectors on RAUs

Catalog Number	Description	Number of RF N Connectors*
SPT-M1-8519-1	SPECTRUM, 850-1900 MAIN RAU	1
SPT-M1-AWS19-11	SPECTRUM, 2100AWS Path 1-1900 Path 1 MAIN RAU	2
SPT-S1-2121-1-MIMO	SPECTRUM, 2100AWS MIMO SECONDARY RAU	2
SPT-S1-7070-1-MIMO	SPECTRUM, 700 MIMO SECONDARY RAU, UpperC-LowerABC	2
SPT-S1-8019-22	SPECTRUM, 800 Path 2-1900 Path 2 SECONDARY RAU	1
SPT-S1-8090-1	SPECTRUM, 800-900 SMR SECONDARY RAU	1
SPT-S1-80AWS-1	SPECTRUM, 800-2100AWS Path 1 SECONDARY RAU	1
SPT-S1-8519-22	SPECTRUM, 850 Path 2-1900 Path 2 SECONDARY RAU	1
SPT-S1-AWS19-12	SPECTRUM, 2100AWS Path 1-1900 Path 2 SECONDARY RAU	2
SPT-S2-70AWS-1-SISO	SPECTRUM, 700 SISO-2100AWS Path 1 SEC RAU, UpperC-LowerABC	1
SPT-S2-70AWS-22-SISO	SPECTRUM, 700 Path 2 SISO-2100AWS Path 2 SEC RAU, UpperC-LowerABC	1
* There are two bands per RAU, which results in two N connectors. When there is one N connector, the two bands are combined internally and both bands use the single N connector.		

## INSTALL THE RAUs AND ANTENNAS

Follow the steps in the order provided to install the RAUs and antennas.

### Mount the RAUs and Antennas

#### General Safety Precautions

**CAUTION!** Wet conditions increase the potential for receiving an electrical shock when installing or using electrically powered equipment. To prevent electrical shock, never install or use electrical equipment in a wet location or during a lightning storm.

**CAUTION!** This system is a RF Transmitter and continuously emits RF energy. Maintain a minimum 8-inch (20 cm) clearance from the antenna while the system is operating. Whenever possible, shut down the RAN before servicing the antenna.

**NOTE:** RAUs are suitable for use in environmental air space in accordance with Section 300-22(c) of the National Electrical Code, and Sections 2-128, 12-010(3) and 12-100 of the Canadian Electrical Code, Part 1, CSA C22.1.

**CAUTION!** Install RAUs in indoor locations only. Do not connect an antenna installed in an outdoor location to a RAU, unless it is in an approved AOC weatherproof NEMA4 housing.

**CAUTION!** Attach all RAUs securely to a stationary object (that is, a wall, pole, or ceiling brackets). To mount a RAU securely to a wall, ceiling bracket, or pole, use #6 diameter fasteners in the four slotted mounting holes.

**CAUTION!** Do the following to maintain proper ventilation:

- Keep at least 76 mm (3-inch) clearance around the RAU.
- Do not stack RAUs on top of each other.
- Always mount the RAU with the solid face (containing the mounting holes) against the mounting surface.

**NOTE:** You can place the RAU, without its fastening hardware, on a flat surface, such as a shelf, desk, cabinet, or any other horizontal surface that allows stable placement, with the mounting base facing down to the mounting surface.

**CAUTION!** If installing the RAU on a flat surface, the surface must be able to hold a minimum 7-pound load securely.

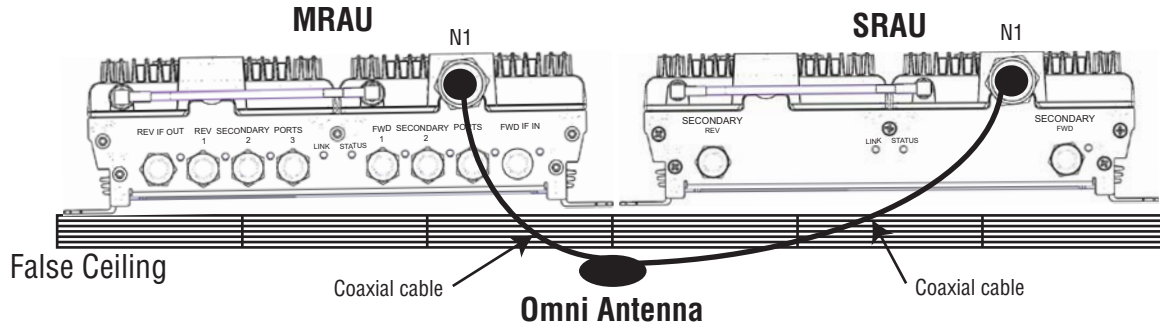
Do the following, in the order presented, to mount the RAUs and antennas:

- 1 Mount all MRAU and SRAUs in the locations marked on the floor plans.
- 2 Install the passive antennas according to the manufacturer's installation instructions.

**NOTE:** It is common practice to install passive antennas below the ceiling. If you install a passive antenna above the ceiling, when estimating the antenna coverage area, account for additional loss due to the ceiling material.

- 3 Connect a passive multi-band antenna to the N connector on each RAU using coaxial cable with the least amount of loss possible. (See “Appendix C: Omni Antenna” on page 24 for information on the Omni Antenna ports.)

**CAUTION!** Firmly hand-tighten the N connector. DO NOT over-tighten the connector.



## Connect the IFEU to the MRAU

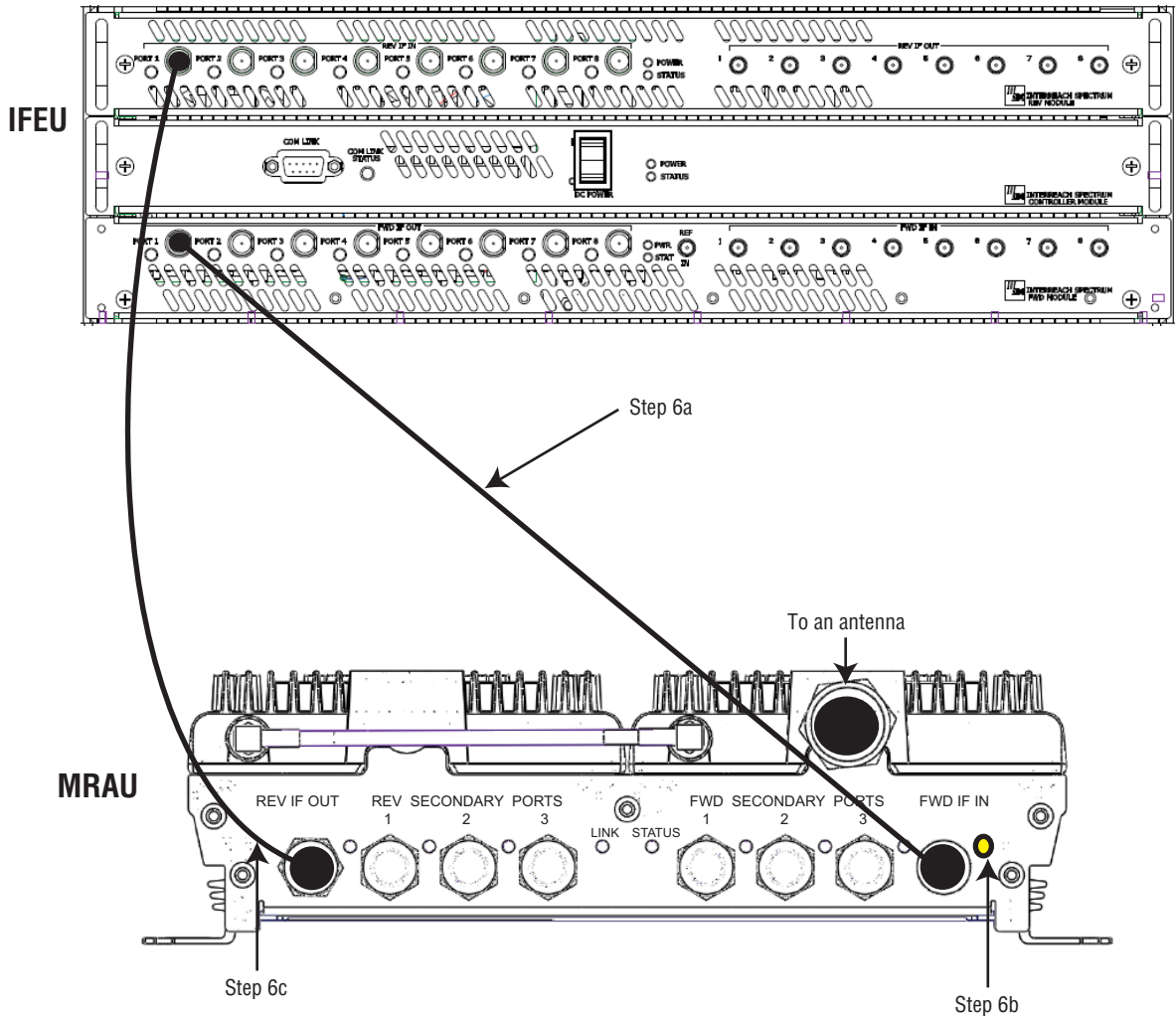
**NOTE:** The IFEU should be powered up before starting this procedure; see the *InterReach Spectrum Expansion Module Group Installation Guide (ADCP-77-167)*.

- 4 Follow these rules for the CATV cables when connecting the IFEU to the MRAU:
  - The FWD and REV cables should be close to the same length.
  - The FWD and REV cables should be the same cable type (both RG6 or both RG11).
  - A pair of CATV cables connects each MRAU to the IFEU. The IFEU REV Module IF IN port and the IFEU FWD Module IF OUT port must match. For example, if IFEU REV Module IF IN Port 3 is used, use IFEU FWD Module IF OUT Port 3.
  - Refer to “Appendix B: 75-Ohm CATV Cable” on page 19 for information on maximum RG-6 or RG-11 CATV cable lengths.
- 5 Test the cable termination for each CATV cable before installing it.
- 6 Connect F connector CATV cables on the IFEU and MRAU, in the order given below.

If the LEDs do not perform as described in this procedure, refer to “MRAU LEDs” on page 7.

- a Connect a CATV cable from one of the IFEU FWD Module IF OUT connectors (1 - 8) to the MRAU FWD IF IN connector.
- b Confirm that the MRAU FWD IF IN LED is yellow, which indicates a correct physical connection.
- c Connect a CATV cable from the IFEU REV Module IF IN connector (1 - 8) to the MRAU REV IF OUT connector, making sure that you pair the port used to the same port number selected in Step 6a.

If the connection is correct, the MRAU powers up and the MRAU FWD IF IN LED turns green.



## Connect the MRAU to SRAUs

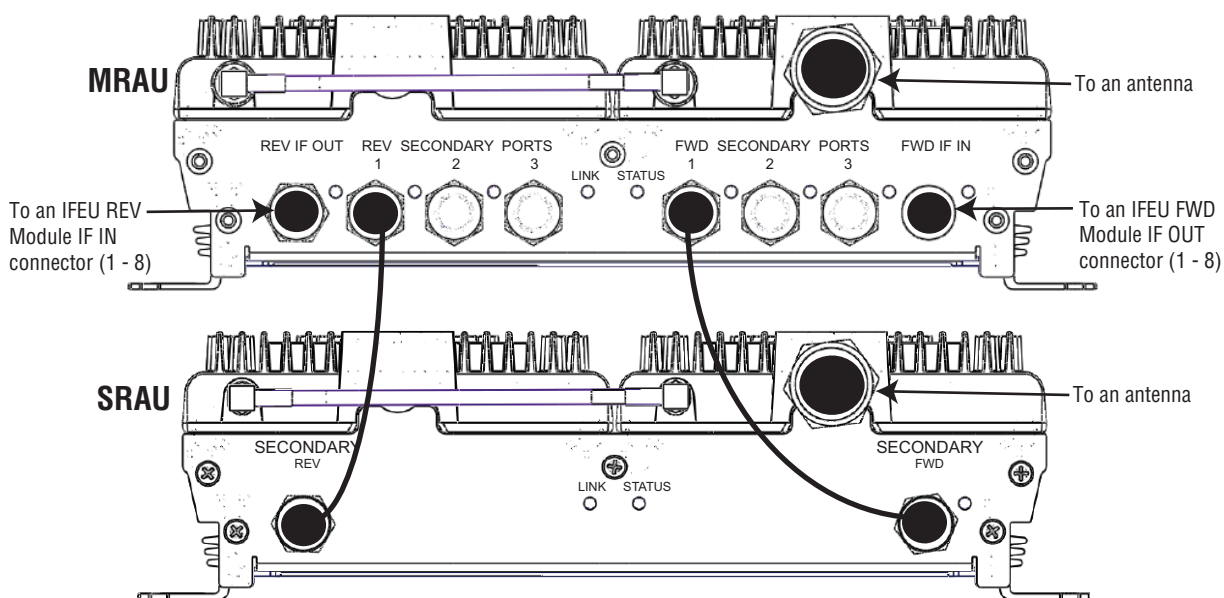
**CAUTION!** To prevent interference, do not install an 850/1900 MRAU antenna near an 800/900 SRAU. The 850 MHz band must be 20 feet away from the 800/1900 SRAU's passive antenna.

- 7 Use one of the following 6' and 20' CATV RG6 jumpers, available for purchase from TE Connectivity, to connect an MRAU to SRAUs.

TE Connectivity Part Number	Description	Note
300469-0	6' RG-6 Cable; F Male to F Male	CATV cable that connects the MRAU to SRAUs. Two cables required per SRAU.
300469-1	20' RG-6 Cable; F Male to F Male	CATV cable that connects the MRAU to SRAUs. Two cables required per SRAU.

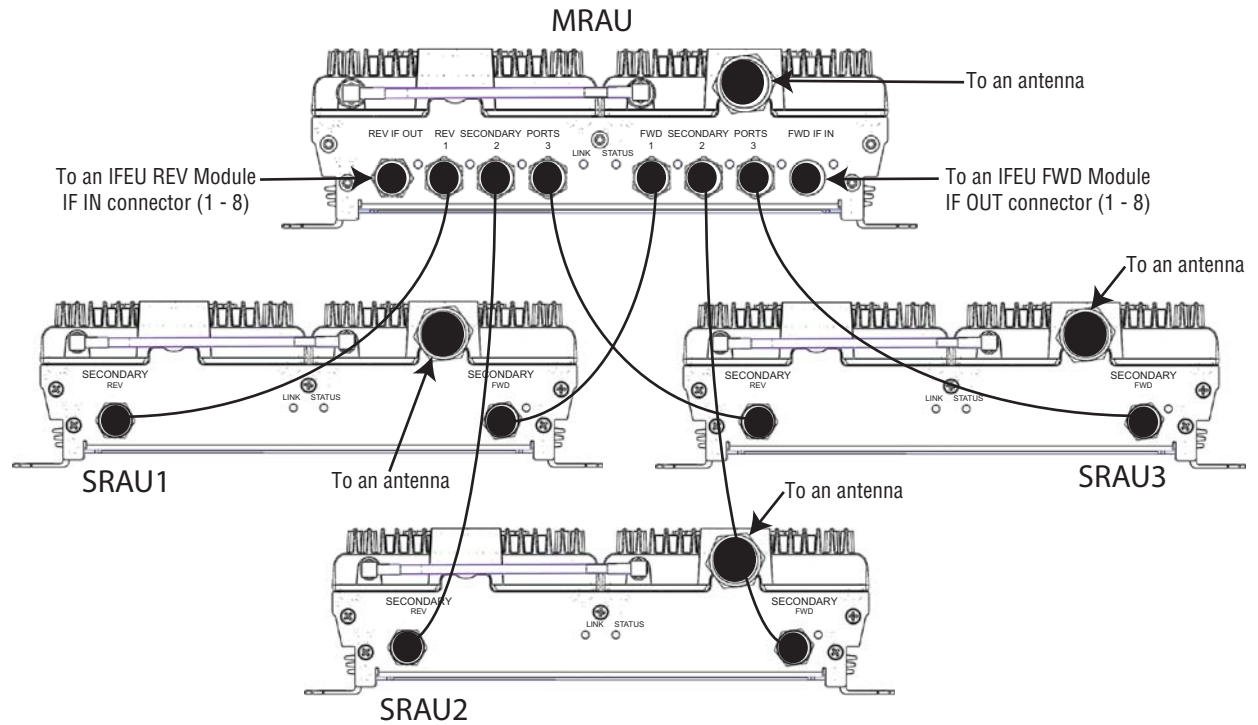
- 8 Test the cable termination for each CATV cable before installing it.
- 9 Connect F connector CATV cables from the MRAU to an SRAU, in the order given below. If the LEDs do not perform as described in this procedure, refer to [“SRAU LEDs” on page 9](#).
  - a Connect a CATV cable from an MRAU FWD SECONDARY PORT (1, 2, or 3) F connector to the SRAU SECONDARY FWD F connector.
  - b Confirm that the SRAU SECONDARY FWD LED is yellow, which indicates a correct physical connection.
  - c Connect a CATV cable from an MRAU REV SECONDARY PORT (1, 2, or 3) F connector to the SRAU SECONDARY REV F connector, matching the same port number selected in Step 9a. That is, if in Step 9a you connected an F connector to the MRAU FWD SECONDARY PORT 1, the paired CATV cable must connect to the MRAU REV SECONDARY PORT 1.

If the connection is correct, the SRAU powers up and the SRAU SECONDARY FWD LED turns green.





- 10 Repeat [Step 9](#) to install up to two more SRAUs, as per system design.



## Configure the MRAUs and SRAUs

Refer to the *InterReach Spectrum™ Element Management System 7.0 User Manual (ADCP-77-163)* for information on how to configure the MRAUs and SRAUs.

## APPENDIX A: SPECIFICATIONS

### Remote Access Unit Specifications

Operating Temp	-25°C to +50°C
Storage Temperature	-40°C to +70°C
Humidity	10% to 90% non-condensing
Dimensions	11.50" x 9.00" x 3.50"
Weight	7.49 Pounds
Power Source	+54Vdc (from IFEU)

### Spectrum System Specifications

#### RF Specification

Supported Frequency Blocks	2 per Remote Antenna Unit; 1-8 per Host Unit
Bandwidth	1.5 to 75 MHz non-contiguous
Frequency Band Supported	850 Cellular; 800 iDEN; 900 iDEN; 1900 PCS; 2100 AWS; 700 Upper C Lower ABC

#### Propagation Delay

System Delay	<12 microseconds
Delay Management Digital	(Manual or Automatic)

#### Noise Figure

Noise Figure	For 1 Host, 1 DRU, 8 RAUs: < 17 dB For 1 Host, 4 DRUs, 32 RAUs: < 23 dB
Input IP3	>-10 dBm

#### Optical Specifications

Optical Budget	10 dB (Standard); 26 dB (Optional)
Digital Transport Rate	3.072 Gbps

## Nominal Passband Gains

	RF Frequency	
	TX	RX
850 Cell		
Bandwidth	869-894	824-849
Gain (dB)	40	30
800 SMR		
Bandwidth	851-869	806-824
Gain (dB)	40	30
900 SMR		
Bandwidth	935-940	896-901
Gain (dB)	40	30
1900 PCS		
Bandwidth	1930-1995	1850-1915
Gain (dB)	40	30
2100 AWS		
Bandwidth	2110-2155	1710-1755
Gain (dB)	40	30
700 Upper C		
Bandwidth	746-756	776-786
Gain (dB)	40	30
700 Lower ABC		
Bandwidth	728-746	698-716
Gain (dB)	40	30

## Output Power

Output P1dB Power per Band

26 dBm 850MHz Cell  
 26 dBm 1900MHz PCS  
 26 dBm 700MHz Upper C Lower ABC  
 26 dBm 2100MHz AWS  
 26 dBm 800 iDEN  
 26 dBm 900 iDEN

## Composite Power Out of RAU

	RF Frequency		Number of RF Carriers					
	TX	RX	1	2	4	8	16	
850 Cell	869-894	824-849	26.0	20.0	14.0	9.0	5.5	GSM
			23.0	17.5	12.0	8.0	5.0	EDGE
			18.0	15.0	12.0	9.0	6.0	CDMA
			18.0	15.0	12.0	9.0		WCDMA
			18.0	15.0	12.0	9.0		LTE
800 SMR	851-869	806-824	17.5	14.0	10.0	6.5		iDEN
			26.0	19.5	13.5	8.5		APCO 25 C4FM
			18.0	15.0	12.0	9.0	6.0	CDMA
			18.0	15.0	12.0	9.0		LTE
900 SMR	935-940	896-901	17.5	14.0	10.0	6.5		iDEN
			26.0	19.5	13.5	8.5		APCO 25 C4FM
			18.0	15.0	12.0	9.0	6.0	CDMA
			18.0	15.0	12.0	9.0		LTE
1900 PCS	1930-1995	1850-1915	26.0	20.0	14.0	9.0	5.5	GSM
			23.0	17.5	12.0	8.0	5.0	EDGE
			18.0	15.0	12.0	9.0	6.0	CDMA
			18.0	15.0	12.0	9.0		WCDMA
			18.0	15.0	12.0	9.0		LTE
2100 AWS	2110-2155	1710-1755	18.0	15.0	12.0	9.0		WCDMA
			18.0	15.0	12.0	9.0		LTE
700 Upper C	746-756	776-786	18.0	15.0	12.0	9.0		LTE
700 Lower ABC	728-746	698-716	18.0	15.0	12.0	9.0		LTE

**NOTE:** Industry Canada - 24.83 dBm rated output power for 2100MHz AWS

**NOTE:** Industry Canada - 46.8MHz Declared Bandwidth Gain for 2100MHz AWS

## APPENDIX B: 75-OHM CATV CABLE

The 75-Ohm CATV Cable:

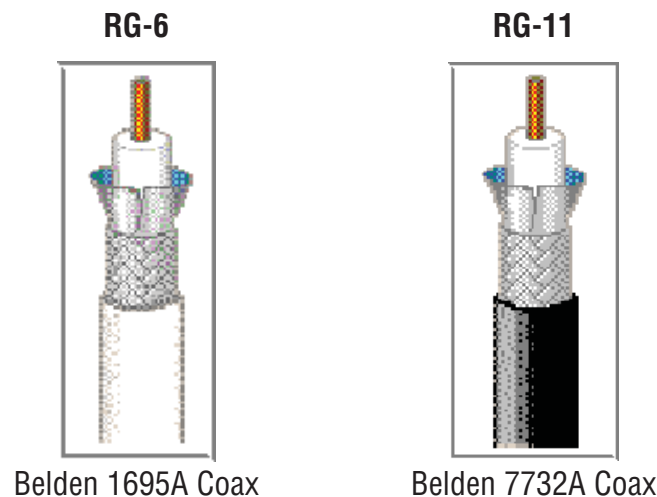
- connects the IFEU to MRAU(s) and the MRAU(s) to the SRAU(s)
- transmits (FWD) multiband and receives (REV) IF signals
- delivers DC electrical power to the RAUs. The Spectrum IFEU DC voltage output is +54Vdc nominal. If the IFEU reaches its current limit, a current-limiting circuit protects it.
- carries configuration and status information
- uses 75 $\Omega$  type-F connectors with captive center pins.

### CATV Cable Requirements

**Belden CATV cable or equivalent is required (see Figure 2).**

- For the RG-6 cable, use a Belden 1695A Coax.
- For the RG-11 cable, use a Belden 7732A Coax.

**NOTE:** TE Connectivity requires solid copper center conductor CATV cable for proper DC voltage to the RAU and maximum distances.



**Figure 2.** Belden 1695A and 7732A Coax Cables

- Use RG-6 or RG-11 CATV cable between the IFEU and MRAU, the typical lengths of which are listed below.

Cable Type	Minimum Length		Maximum Length	
	Meters	Feet	Meters	Feet
RG-6	0	0	140	459
RG-11	0	0	200	656

- Use only RG-6 CATV cable between the MRAU and SRAU, the lengths of which are listed below.

RG-6 Cable	Meters	Feet
Typical	2	6.56
800/900 iDEN to 850 CELL	6	19.68
800 AWS to 850 CELL	6	19.68

## Belden 1695A Coax Specifications

### Description

RG-6/U type, 18 AWG solid 0.040-inch bare copper conductor, plenum, foam FEP insulation, Duofoil® + tinned copper braid shield (95% coverage), Flamarrest® jacket.

### Overall Physical Characteristics

Conductor	One Coax 18 AWG Solid stranding Bare Copper (BC) conductor material 0.040-inch diameter
Insulation	Teflon® Foam Fluorinated Ethylene Propylene (FFEP) 0.170-inch diameter
Outer Shield Layer 1	Duofoil® Tape Aluminum Foil-Polyester Tape-Aluminum Foil 100% coverage
Outer Shield Layer 2	Braid Tinned Copper (TC) 95% coverage
Outer Jacket	Flamarrest® Low Smoke Polyvinyl Chloride (LS PVC)
Overall Cabling	0.234-inch overall nominal diameter

## Overall Nominal Electrical Characteristics

Characteristic Impedance	75.000 $\Omega$
Inductance	0.103 $\mu$ H/ft.
Capacitance Conductor to Shield	16.100 (pF/ft.)
Velocity of Propagation	82 (%)
Delay	1.240 (ns/ft.)
Conductor DC Resistance	6.400 @ 20°C ( $\Omega$ /1000 ft.)
Outer Shield DC Resistance	2.800 @ 20°C ( $\Omega$ /1000 ft.)
Attenuation	

Freq. (MHz)	Attenuation (dB/100 ft.)
1.000	0.240
3.580	0.450
5.000	0.550
7.000	0.650
10.000	0.750
67.500	1.740
71.500	1.780
88.500	1.940
100.000	2.100
135.000	2.400
143.000	2.500
180.000	2.800
270.000	3.400
360.000	4.000
540.000	5.200
720.000	6.100
750.000	6.200
1000.000	7.300
1500.000	9.200
2000.000	10.900
2250.000	11.600
3000.000	13.700

## Belden 7732A Coax Specifications

### Description

RG-11/U type, 14 AWG solid 0.064-inch bare copper conductor, plenum, foam FEP insulation, Duofoil® + tinned copper braid shield (95% coverage), fluorocopolymer jacket.

### Overall Physical Characteristics

Conductor	One Coax 18 AWG Solid stranding Bare Copper (BC) conductor material 0.064-inch diameter
Insulation	Teflon® Foam Fluorinated Ethylene Propylene (FFEP) 0.274-inch diameter
Outer Shield Layer 1	Duofoil® Tape Aluminum Foil-Polyester Tape-Aluminum Foil 100% coverage
Outer Shield Layer 2	Braid Tinned Copper (TC) 95% coverage
Outer Jacket	Fluorocopolymer (PVDF)
Overall Cabling	0.348-inch overall nominal diameter



## Overall Nominal Electrical Characteristics

Characteristic Impedance	75.000 $\Omega$
Inductance	0.091 $\mu$ H/ft.
Capacitance Conductor to Shield	16.300 (pF/ft.)
Velocity of Propagation	83 (%)
Delay	1.220 (ns/ft.)
Conductor DC Resistance	2.500 @ 20°C ( $\Omega$ /1000 ft.)
Outer Shield DC Resistance	1.600 @ 20°C ( $\Omega$ /1000 ft.)
Attenuation	

Freq. (MHz)	Attenuation (dB/100 ft.)
1.000	0.150
3.580	0.260
5.000	0.300
7.000	0.340
10.000	0.400
67.500	1.200
71.500	1.240
88.500	1.400
100.000	1.500
135.000	1.780
143.000	1.840
180.000	2.090
270.000	2.600
360.000	3.100
540.000	3.890
720.000	4.570
750.000	4.680
1000.000	5.500
1500.000	6.910
2000.000	8.130
2250.000	9.200
3000.000	10.200

## APPENDIX C: OMNI ANTENNA

The Omni Antenna (4214-M727), shown in [Figure 3](#), is a round radome with the following specifications:

- 8.5-inch diameter
- 1.65-inch height
- 72-inch pigtailed cables that are plenum-rated cables with N (male) connectors



**Figure 3.** Omni Antenna

**NOTE:** Two antennas per RAU is required for MIMO performance.

The Omni Antenna supports the following:

- Port 1
  - 698-806 MHz (700 Upper C Lower ABC)
  - 1710-2170 MHz (AWS)
- Port 2
  - 806-941 MHz (Cellular/SMR)
  - 1850-1990 MHz (PCS)
- Port 3
  - 2500-2700 MHz (WiMAX)

## APPENDIX D: CONTACTING TE CONNECTIVITY



### PHONE

#### U.S.A. or CANADA

Sales: ..... 1-800-366-3891  
 Extension ..... 73000  
 Technical Assistance: ..... 1-800-530-9960  
 Connectivity Extension: ..... 73475  
 Wireless Extension: ..... 73476

#### EUROPE

Sales Administration: +32-2-712-65 00  
 Technical Assistance: +32-2-712-65 42

#### EUROPEAN TOLL FREE NUMBERS

Germany: ..... 0180 2232923  
 UK: ..... 0800 960236  
 Spain: ..... 900 983291  
 France: ..... 0800 914032  
 Italy: ..... 0800 782374

#### ASIA/PACIFIC

Sales Administration: +65-6294-9948  
 Technical Assistance: +65-6393-0739

#### ELSEWHERE

Sales Administration: +1-952-917-3000  
 Technical Assistance: +1-952-917-3475



### EMAIL

#### Connectivity Products

United States: Connectivity.Tac@te.com  
 Europe: Euro.Tac@te.com  
 Asia/Pacific: AsiaPacific.Tac@te.com

#### All Wireless Products

WirelessSupport@te.com



### ONLINE ACCESS

#### Customer Portal

[http://www.adc.com/Americas/en\\_US/1268116693520](http://www.adc.com/Americas/en_US/1268116693520)

#### Online Customer Support Request

<https://nssales.adc.com/ftr/ftrhome1.asp>







[www.te.com/adc](http://www.te.com/adc)

