InterReach Spectrum™
Main and Secondary Remote Access Unit
Installation Guide
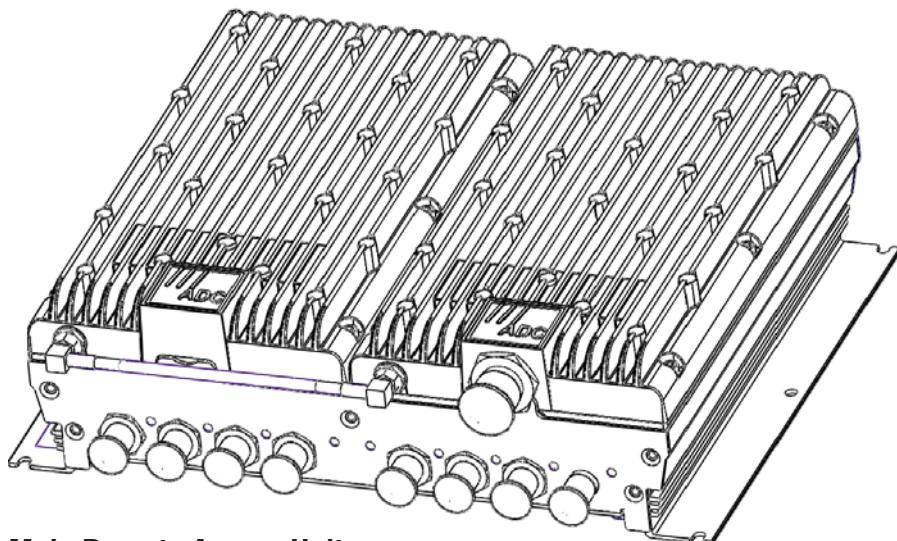
Main Remote Access Unit

Secondary Remote Access Unit

TABLE OF CONTENTS

PREFACE

This manual provides installation instructions for ADC® InterReach Spectrum™ Remote Access Units.

InterReach Spectrum User Documentation

The InterReach Spectrum user documentation is intended for system administrators, engineers and installers responsible for planning, administering, configuring, and maintaining ADC InterReach Spectrum systems. Table 1 lists the manuals that correspond to this InterReach Spectrum release.

Table 1. *InterReach Spectrum User Documentation*

Title	ADCP Number
InterReach Spectrum Quick Start Guide	ADCP-77-165
InterReach Spectrum Host Unit Installation Guide	ADCP-77-166
InterReach Spectrum Expansion Module Group Installation Guide	ADCP-77-167
InterReach Spectrum Remote Access Unit Installation Guide	ADCP-77-168
InterReach Spectrum™ Element Management System 7.0 User Manual	ADCP-77-163
FlexWave Prism OADM Splice Box Installation Guide	ADCP-77-151

Document Cautions and Notes

Two types of messages, identified below, appear in the text:

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.**

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 equipment uses a Class 1 Laser according to FDA/CDRH rules. Laser radiation can seriously damage the retina of the eye. Do not look into the ends of any optical fiber. Do not look directly into the optical transceiver of any digital unit or exposure to laser radiation may result. Use an optical power meter to verify active fibers. Immediately place a protective cap or hood over any radiating transceiver or optical fiber connector to avoid the potential of dangerous amounts of radiation exposure. This practice also prevents dirt particles from entering the adapter or connector.**

CAUTION!   **This system is a RF Transmitter and continuously emits RF energy. Maintain a minimum clearance of three feet (91.4 cm) from the antenna while the system is operating. Wherever possible, shut down the RAN before servicing the antenna.**

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. ADC products fall in the category of fixed equipment; products intended to be permanently secured and exposures are evaluated for distances greater than 20cm (7-7/8"). 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 20cm 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: 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.
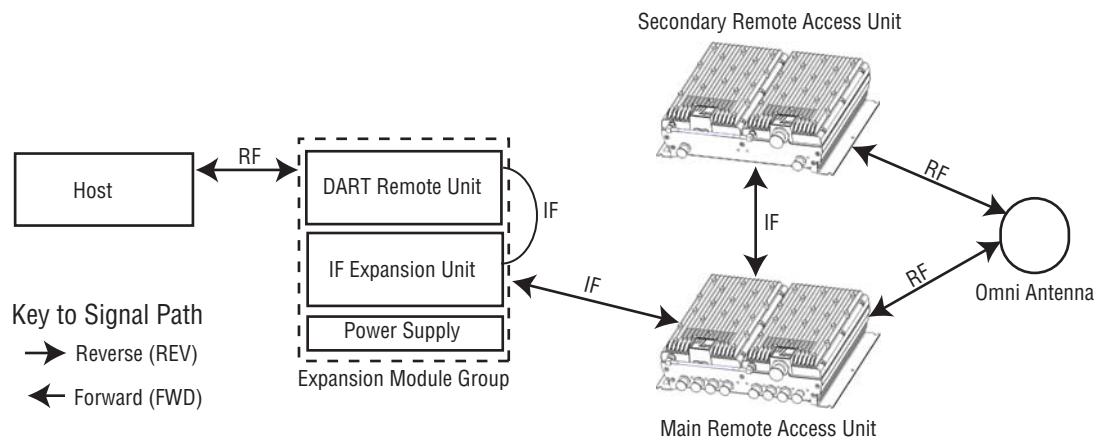
Figure 1. REV and FWD Signals for the RAU

NOTE: **This book refers to the Omni Antenna (4214-M727), which is the antenna that ADC recommends. Other antennas may be used. For further information on the Omni Antenna, see** "Appendix C: Omni Antenna" on page 21**.**

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
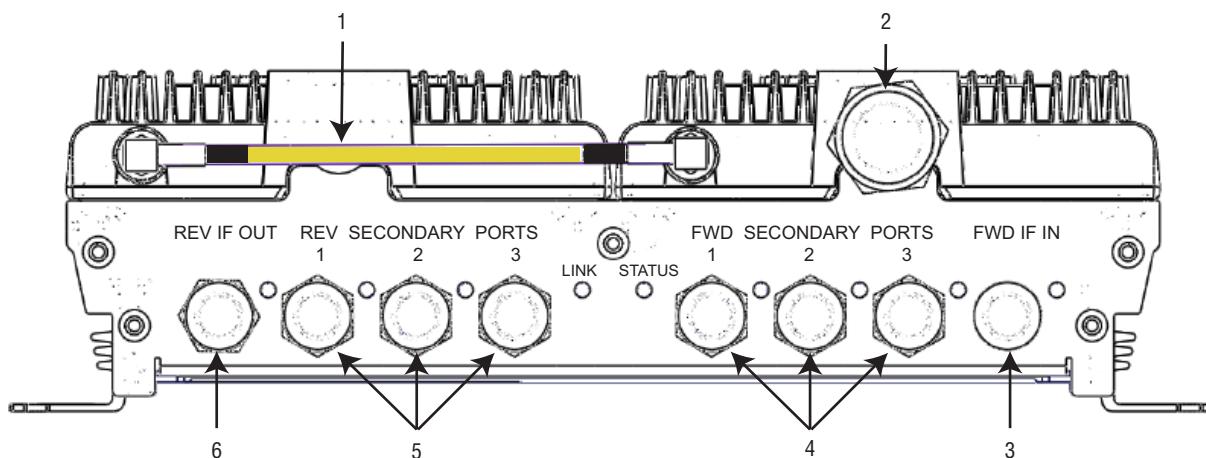
Ref #	Component	Device	Function
1	RF SubMiniature version A (SMA) cable [1]	50Ω RF SMA-to-SMA cable	Connects two RF bands together when there is only one N-type connector on the RAU.
			For cases when there is an N-type connector for each RF band (700MIMO or PCS/AWS), there will not be an SMA cable.
2	Antenna port	50Ω N-type connector	Connects to an antenna.
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)	• Green • Blinking Green • Yellow • Blinking Yellow • Red • Off	• Downstream unit correctly connected; unit has no alarms or a Minor alarm is active. • SRAU or band is set out-of-service. • FWD cable connected to SRAU, no REV cable connected. • FWD and REV cables are not connected to the same port number (incorrectly paired). • Major alarm in downstream unit, fault lockout, or SRAU disconnected. • No SRAU previously connected.
2	LINK	• Green • Red • Off	• MRAU receiving communications from the IFEU. • MRAU has not received communications from the IFEU for more than 90 seconds. • During initial power up, MRAU is powering up and waiting for IFEU communications.
3	STATUS	• Green • Blinking Green • Red	• Unit has no alarms or a Minor alarm is active. • Unit or band is set out-of-service. • Major alarm detected.
4	REV SECONDARY PORT (1 - 3)	• Green • Blinking Green • Blinking Yellow • Red • Off	• Downstream unit correctly connected, unit has no alarms or minor alarm • SRAU or band is set out-of-service. • FWD and REV cables are not connected to the same port number (incorrectly paired). • Major alarm in downstream unit, fault lockout, or SRAU disconnected. • No SRAU previously connected.
5	FWD IF IN	• Green • Yellow or Blinking Yellow • Off	• MRAU is powered on correctly. • There is an IFEU FWD connection, but there is no IFEU REV connection or the IFEU REV connection is paired incorrectly. • Cable is not connected to the IFEU FWD port.

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
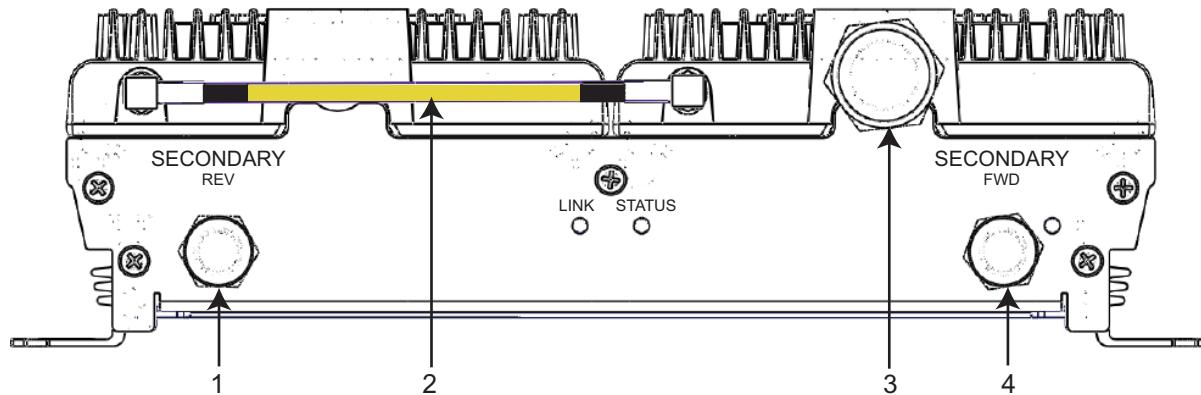
Ref #	Component	Device	Function
1	SECONDARY REV connector	F connector port	Connects to one of the MRAU REV SECONDARY ports (1 - 3) via CATV cable.
2	RF SMA cable [1]	50Ω RF SMA-to-SMA cable	Connects two RF bands together when there is only one N-type connector on the RAU. For cases when there is an N-type connector for each RF band (700MIMO or PCS/AWS), there will not be an SMA cable.
3	Antenna port	50Ω N-type connector	Connects to an antenna.
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	• Green • Red • Off	• SRAU receiving communications from the IFEU. • SRAU has not received communications from the IFEU for more than 90 seconds. • During initial power up, SRAU is powering up and waiting for IFEU communications.
2	STATUS	• Green • Blinking Green • Red	• Unit has no alarms or a Minor alarm is active. • Unit or band is set out-of-service. • Major alarm detected.
3	SECONDARY FWD	• Green • Yellow or Blinking Yellow • Off	• MRAU is powered on correctly. • There is an MRAU FWD connection, but there is no MRAU REV connection or the MRAU REV connection is paired incorrectly. • Cable is not connected to the MRAU FWD port.

INSTALL THE RAUS AND ANTENNAS

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

Mount the RAUs and Antennas

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: 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.

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.

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 21 for information on the Omni Antenna ports.)

CAUTION!   Firmly hand-tighten the N connector. DO NOT over-tighten the connector.
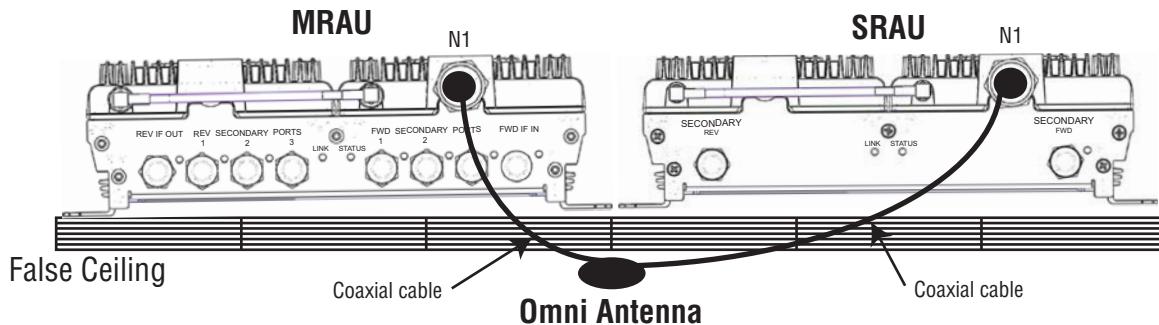
Connect the IFEU to the MRAU

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 16 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 6.

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.

IFEU

MRAU

Step 6a

To an antenna

REV IF OUT   REV SECONDARY PORTS   FWD SECONDARY PORTS   FWD IF IN

1   2   3   LINK   STATUS   1   2   3

Step 6c

Step 6b
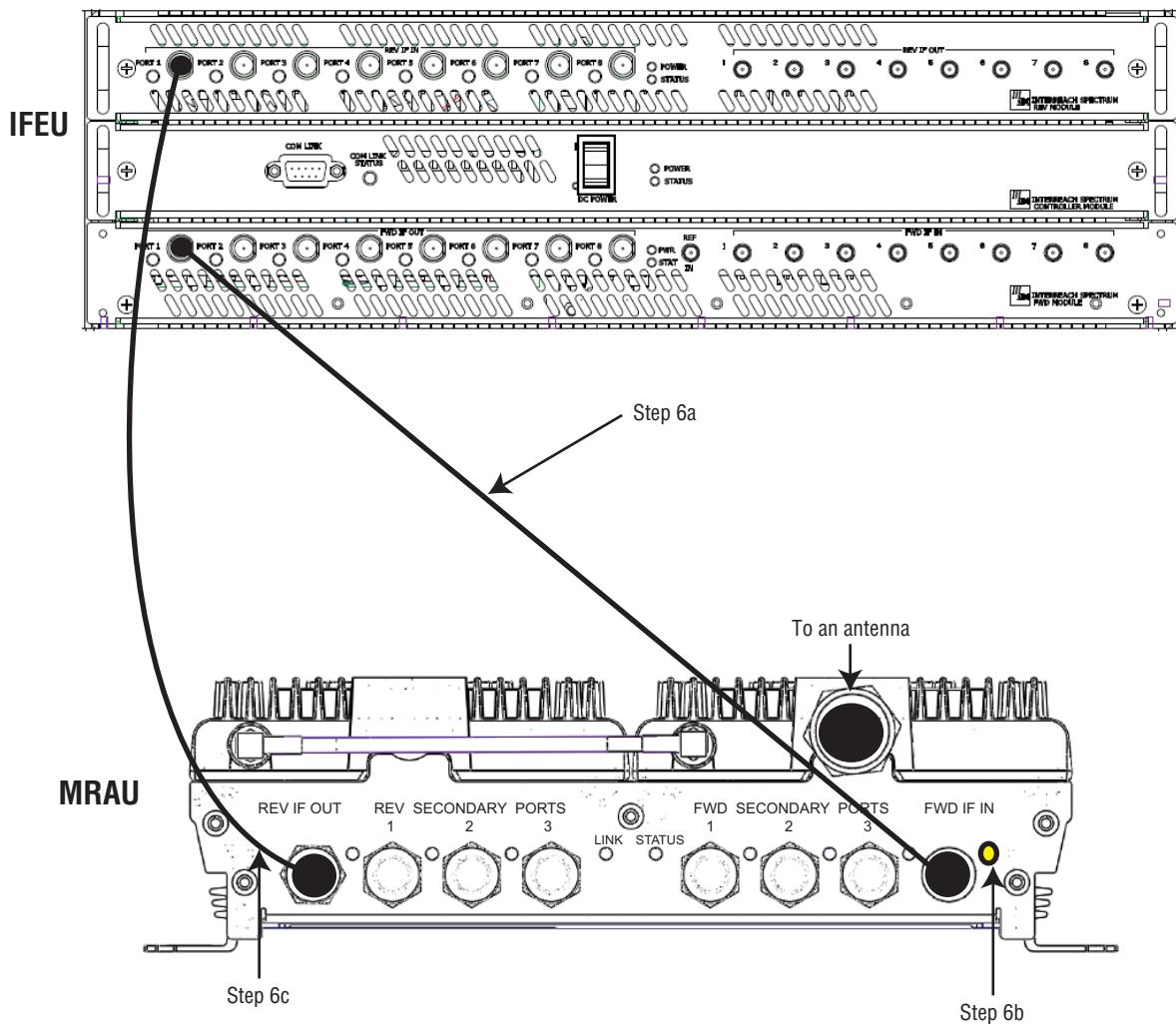
Connect the MRAU to SRAUs

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 ADC, to connect an MRAU to SRAUs.

ADC 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 8.

   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.
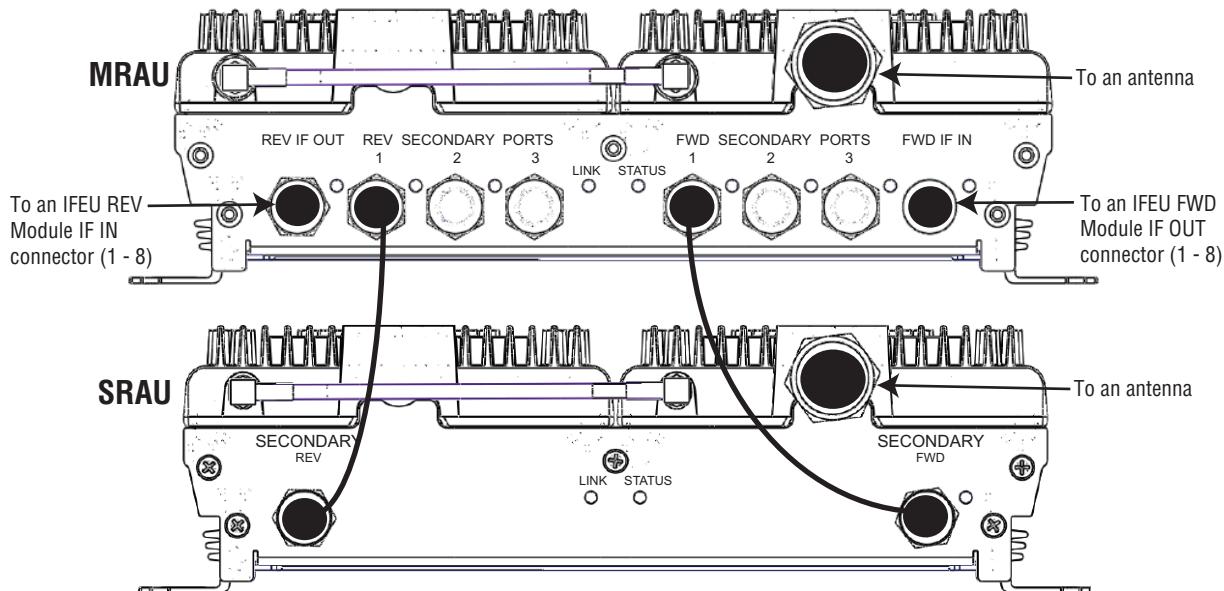
10 Repeat Step 9 to install up to two more SRAUs, as per system design.

MRAU

To an antenna

To an IFEU REV Module
IF IN connector (1 - 8)

To an IFEU FWD Module
IF OUT connector (1 - 8)

To an antenna

SRAU1

To an antenna

SRAU3

To an antenna

SRAU2
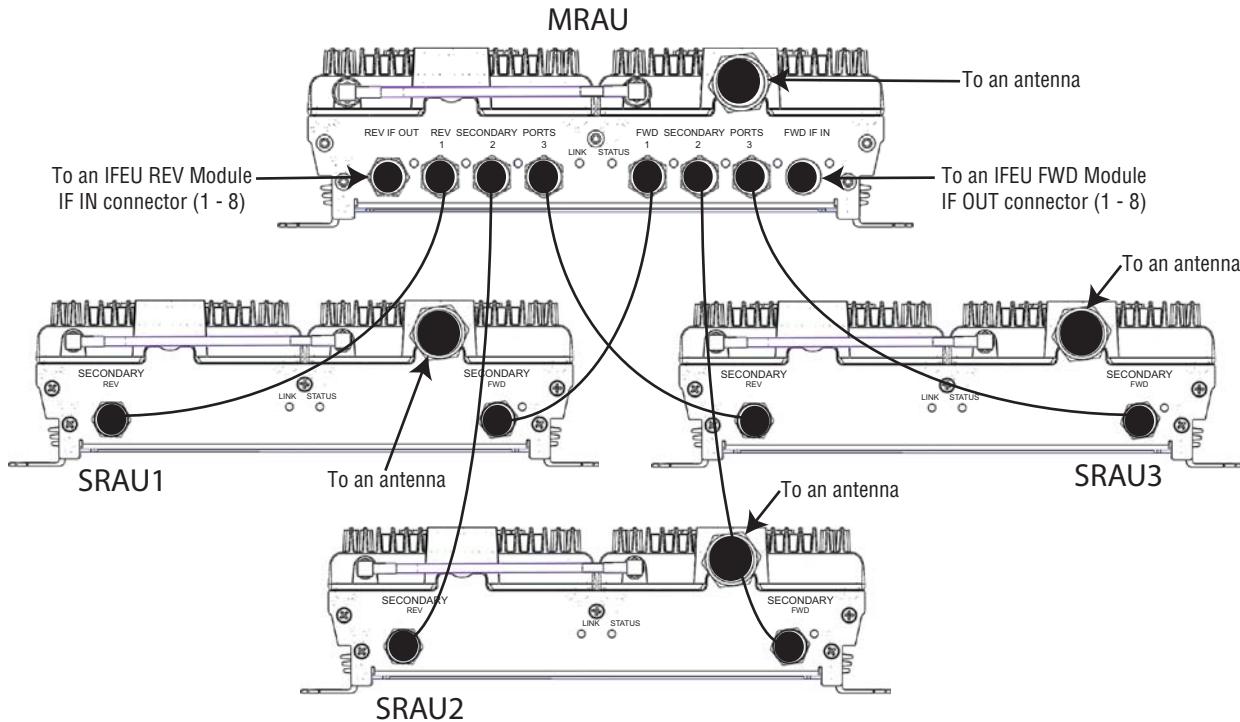
Configure the MRAUs and SRAUs

Refer to the *ADC 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

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

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

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)

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	23	20	18	17.5	GSM
			23	20.5	18	17	17	EDGE
			16	16	16	16		CDMA
			15	14	12.5			WCDMA
800 SMR	851-869	806-824	17.5	17	16	15.5		iDEN
			26	22.5	19.5	17.5		APCO 25 C4FM
900 SMR	935-940	896-901	17.5	17	16	15.5		iDEN
			26	22.5	19.5	17.5		APCO 25 C4FM
1900 PCS	1930-1995	1850-1915	26	23	20	18	17.5	GSM
			23	20.5	18	17	17	EDGE
			16	16	16	16		CDMA
			15	14	12.5			WCDMA
2100 AWS	2110-2155	1710-1755	15	14	12.5			WCDMA
700 Upper C	746-756	776-786	15	14	12.5			LTE
700 Lower ABC	728-746	698-716	15	14	12.5			LTE

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 75Ω type-F connectors with captive centerpins.

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: ADC requires solid copper center conductor CATV cable for proper DC voltage to the RAU and maximum distances.

RG-6   **RG-11**

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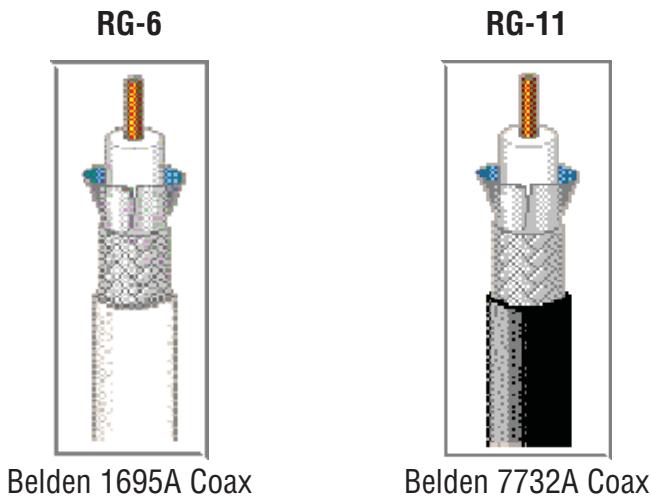
Figure 2. Belden 1695A and 7732A Coax Cables

*   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	75.000Ω
Inductance	0.103 μH/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 (Ω/1000 ft.)
Outer Shield DC Resistance	2.800 @ 20°C (Ω/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	75.000Ω
Inductance	0.091 μH/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 (Ω/1000 ft.)
Outer Shield DC Resistance	1.600 @ 20°C (Ω/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 pigtails 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 ADC

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

13944-Q

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Singapore 189702.

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Minneapolis, MN 55440-1101, USA

ADC European Customer Service, INC
**Belgicastraat 2,**
1930 Zaventem, Belgium

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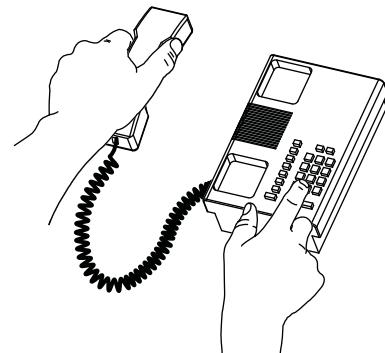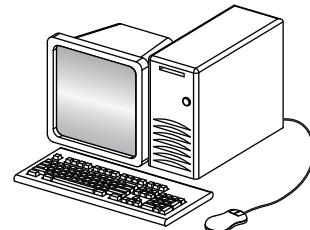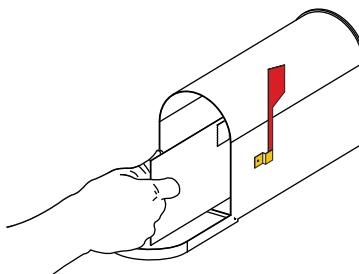
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