



Microwave Digital Radios

TRuepoint® 5000,

6 to 38 GHz

The RFU Installation

P/N IMN-903001-E05



TRUEPOINT® 5000 SERIES

**THE RFU INSTALLATION
PART No. IMN-903001-E05
OCTOBER 2006**



Revision history

Issue date	Status	Description of change / revision
March 22, 2004	DRN C9650	• First release
September 21, 2004	ECO 22745	• General update
March 23, 2005	ECO 24037	• Added TRuepoint® 5100 RFU and frequency options, • General update, including TRuepoint® 5200 pictorials
April 2006	PCO 25548	Product Release 6: • Added Air link capacities for 38 GHz • Added expanded Regulatory Information for all frequency plans, and new section on Applying the ACU Losses • General and editorial update
October 2006	PCO 26986	• General update, added ROHS Compliance declaration, including a new set of applicable P/Ns (Table 7-2) • Added information on the Forces Acting on a Pole-mounted TR5200 Radio • Added Chapter 6 , on TRuepoint® 5200 N+N Configurations and parts ordering

Part N° IMN-903001-E05

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WARNING

Making adjustments and/or modifications to this equipment that are not in accordance with the provisions of this instruction manual or other supplementary documentation may result in personal injury or damage to the equipment, and may void the equipment warranty.

AVERTISSEMENT

Tout réglage ou modification faits à cet équipement hors du cadre édicté par ce guide d'utilisation ou par toute autre documentation supplémentaire pourraient causer des blessures ou endommager l'équipement et peut entraîner l'annulation de sa garantie.

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Die an diesen Geräten gemachte Einstellungen und/oder Änderungen, welche nicht gemäß dieser Bedienungsanleitung, oder gemäß anderen zusätzlichen Anleitungen, ausgeführt werden, können Verletzungen oder Materialschäden zur Folge haben und eventuell die Garantie ungültig machen.

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Llevar a cabo ajustamientos y/o modificaciones a este equipo, sin seguir las instrucciones provistas por este manual u otro documento adicional, podría resultar en lesiones a su persona o daños al equipo, y anular la garantía de este último.

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不按该说明书有关条例或其它补充文件对该设备所做的调整和 / 或 改型可能会引起人身伤害或损坏设备，并且设备保修也将失效。

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PREFACE

ROHS Compliance

Harris Corporation – Microwave Communications Division
Compliance with Restriction of the Use of Certain Hazardous Substances
(RoHS) European Directive
TRuepoint® 4000 and TRuepoint® 5000

Harris MCD holds strong commitments to comply with the requirements of applicable environmental laws and regulations, including those of the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Harris MCD anticipates RoHS-compliant module releases of the TRuepoint® product family by no later than July 1, 2006, and has determined that non-RoHS compliant equipment cannot be shipped after the implementation date into countries which have adopted the directive.

In order to achieve this objective, Harris MCD has been working with its supply chain partners to eliminate the identified hazardous substances from its products and to secure vendor statements of compliance. Additionally, Harris MCD has assigned new part numbers in order to distinguish field replaceable units (FRUs) as RoHS-compliant.

Exemptions:

Harris MCD acknowledges that the “Directive does not apply to spare parts for the repair, or to the reuse, of electrical and electronic equipment put on the market before July 1, 2006”, and may continue to support these existing products with non-RoHS-compliant product after the implementation date.

Harris MCD further recognizes that certain exemption criteria apply as defined in the Annex of Directive 2002/95/EC, according to Article 4.2, such as applications 5, 6, 7 and 8 (use of lead in glass, use of lead as an alloying element, lead used in high-melting temperature solders, and cadmium plating, respectively) or any other relevant Commission Decisions, amending for the purposes of adapting to technical progress, the Annex to Directive 2002/95/EC.

ISO 9001 Certification

The Harris Microwave Communications Division is committed to total customer satisfaction and is I.S. EN ISO 9001: 2000 registered for the design, manufacture, installation and service of microwave radio products and systems.

Technical Assistance Center

Our Technical Assistance Center (TAC) is staffed with factory trained and highly qualified Product Support staff whose task is to provide telephone support to resolve complex customer equipment problems quickly and accurately in a timely manner. Customers who completed product training given by Harris Microwave Communications Division and are equipped with proper test equipment and spare parts will experience quick resolution of their equipment problems.

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All other countries: +1-514-421-8333

You can also contact us through e-mail at:
crcusa@harris.com

Registered customers can obtain key product information on our
Premier Web Site at: <https://premier.harris/microwave>



Service Registration Form

Dear Customer,
To facilitate warranty support and to receive product update information, please register on the Harris MCD Premier Customer website:

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

If you are unable to register online, please complete the form at the bottom of this page and return this page to our customer service department.

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By email: crcmtl@harris.com

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Requestor's Name: _____

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ZIP/Postal Code: _____ Country: _____

Telephone Number: _____ Fax Number: _____

Email: _____

Original Sales Order/PO Number: _____

Sales order numbers are found in your documentation and are stencilled on the equipment rack base plate, for example, A44044A1.

SCOPE OF THIS MANUAL

Foreword

This document provides instructions for installing the TRuepoint® 5100 and 5200 RFUs, according to planned or acquired options. It also provides information on

- Cable connections to the SPU;
- Grounding guidelines; and
- Basic troubleshooting.



This release covers frequency options in the 6-to-38 GHz range, for the TRuepoint® 5100 and 5200 RFUs.

Using this Manual

This manual has been optimized for fast Web viewing, and text shown in [this format](#) identifies navigation links leading to locations that are internal or external to the manual.



For installing a TRuepoint® 5100 or 5200 terminal, you should **start** with this manual. This manual provides information specific to the [RFU](#), although some reference is made to particular sections of the other system-[Related Manuals](#), as appropriate.

Structure of this Manual

Besides this introductory Chapter, this Manual contains the following:

Chapter 2, General Description

A closer look at the RFU and options. General Specifications and System Compliance to known Standards are also covered.

Chapter 3, Installing the 5100 RFU

One of the manual's core chapters: provides steps for installing the 5100 RFU, (13-38 GHz), and the required cable connections for general Setup.

Chapter 4, Installing the 5200 RFU

Provides steps for installing the 5200 RFU, (6-11 GHz), and the required cable connections for general Setup.

Chapter 5, Maintenance

Steps for replacing 5200 RFU modules and the 5100 RFU.

Chapter 6, TRuepoint® 5200 N+N Configurations

Special applications in three multiple TR5200 RFU configurations. Includes a Table for ordering required parts.

Chapter 7, Options and Ordering

Ordering field replaceable units and Customer Service information.

Chapter 8, Glossary

Compilation of acronyms and special terms — and their definitions, where appropriate — used throughout the TRuepoint® user documentation.

Key Features of the TRuepoint® 5000 RFUs

- RFU is capacity independent
- RFU 5100 is optimized for 1+0 unprotected configuration
- RFU 5200 is optimized for 1+1 MHSB protected configuration
- Errorless receiver switching
- [ATPC](#) and [DTPC](#) operation
- Transmitter Reverse Channel Switching (RCS)
- Revertive Transmitter Switching
- Bandwidth selection by software.

Related Manuals

Manual P/N	Title	Comments
Top Level		
IMN-903000-Exx	System Description	Top level document providing a broad overview of the TRuepoint® 5000 platform. Includes Theory of Operation, General Specifications, and Performance Tables.
User Manuals (recommended order of use)		
IMN-903001-Exx	RFU Installation	This document
IMN-903002-Exx	SPU Installation	Provides instructions for installing the SPU and its components (modules). It also provides general setup and basic troubleshooting information.
IMN-903003-Exx	Operator's Interface	Provides advanced system configuration, monitoring, control and troubleshooting information.
Quick Reference		
QRC-903000-Exx	Quick Reference Card	Provides a graphical representation of the TRuepoint® software menus

GENERAL DESCRIPTION

The TRuepoint® 5100 RFU

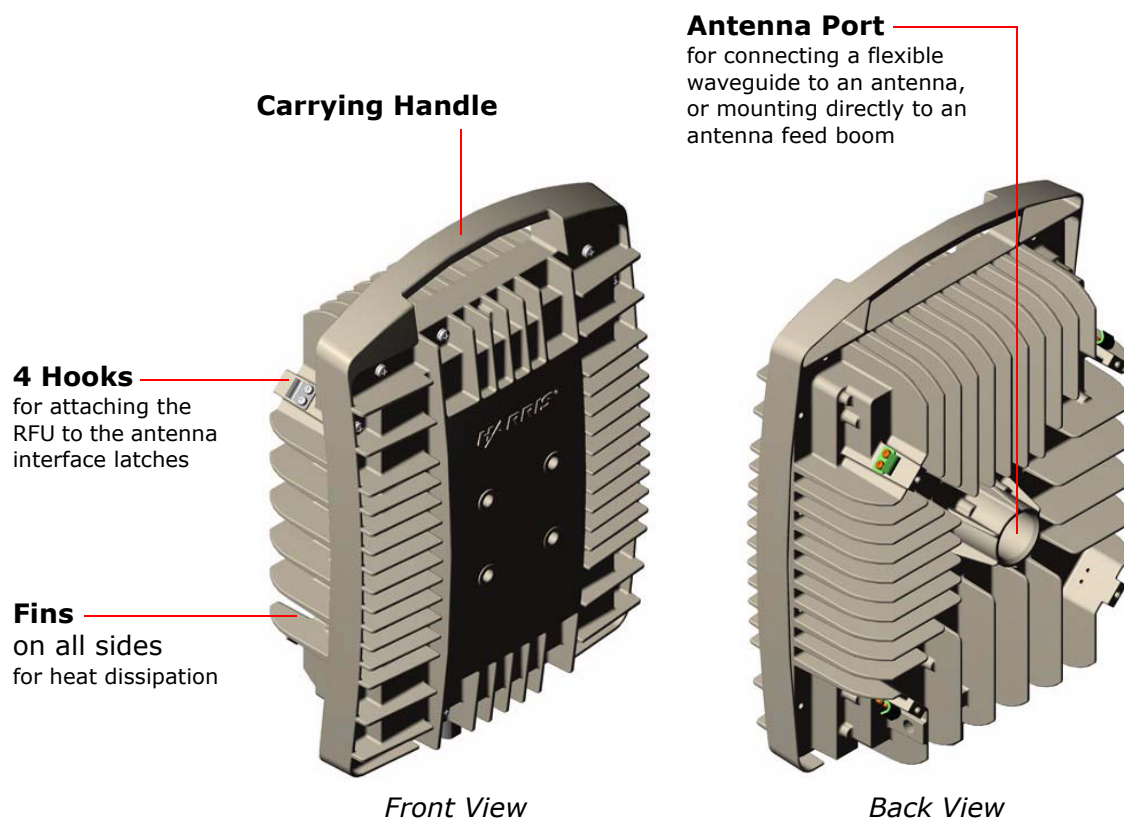


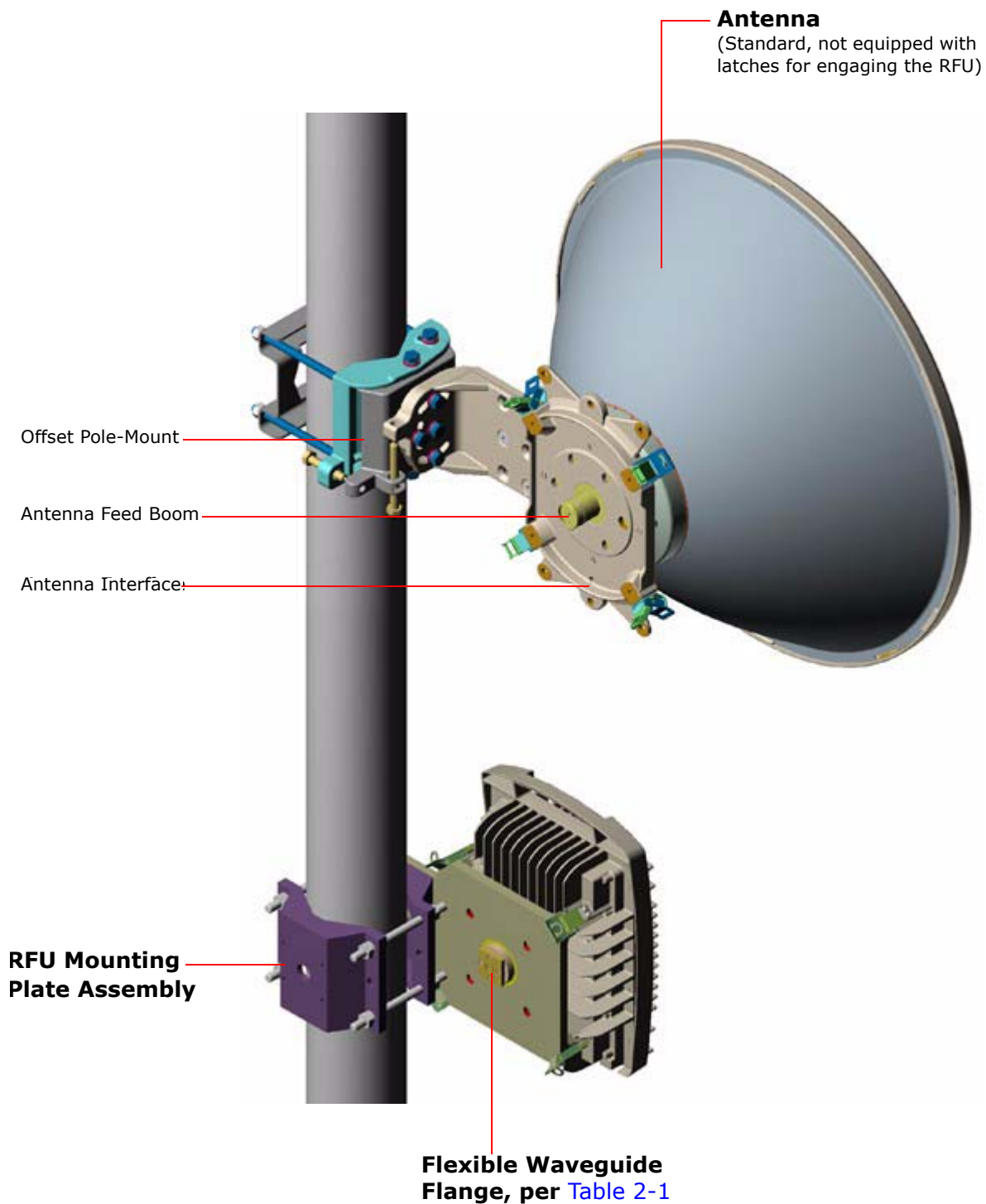
Figure 2-1: RFU in the Separate Mount Configuration

Figure 2-2: RFU in the Detachable Mount Configuration

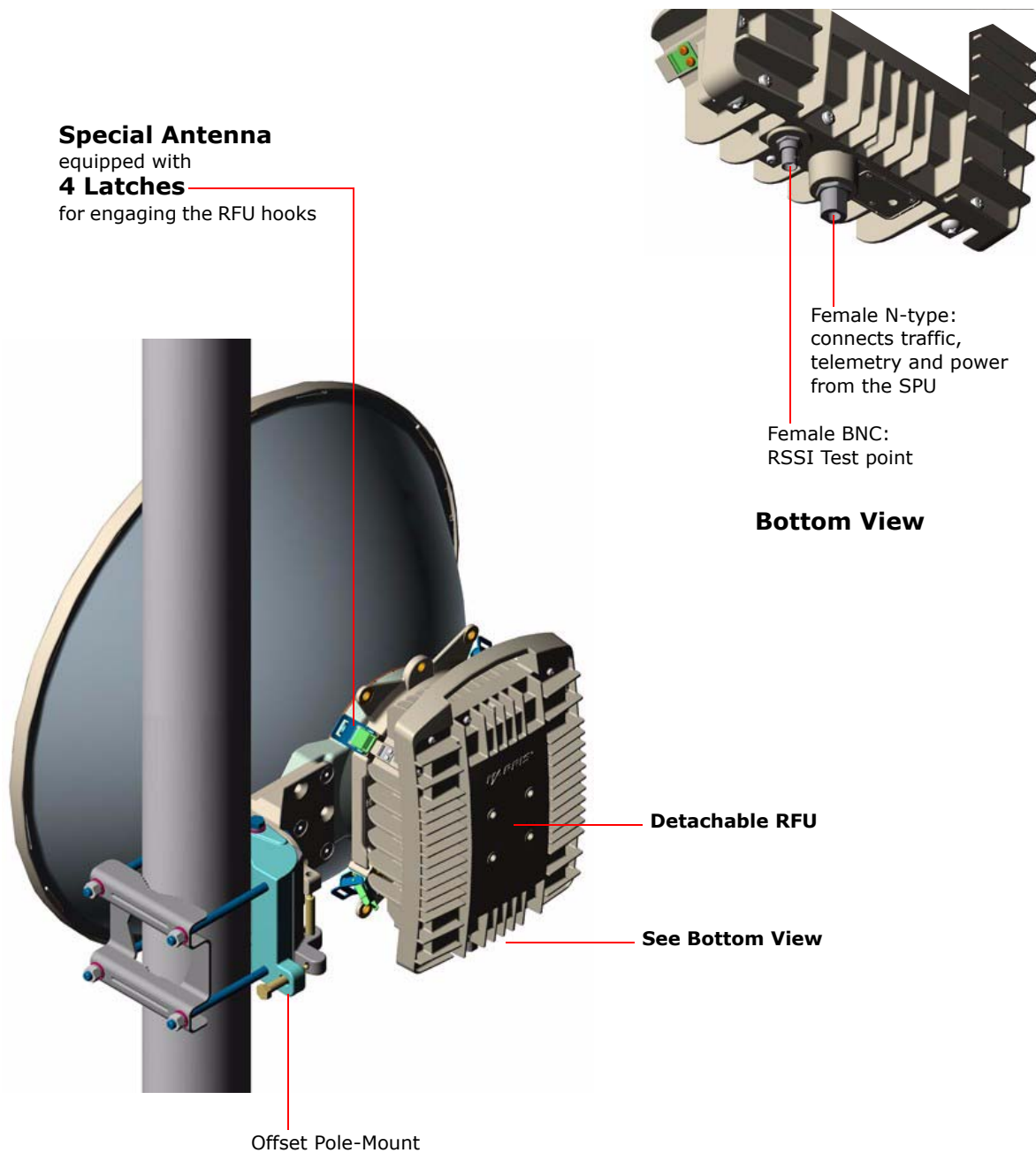
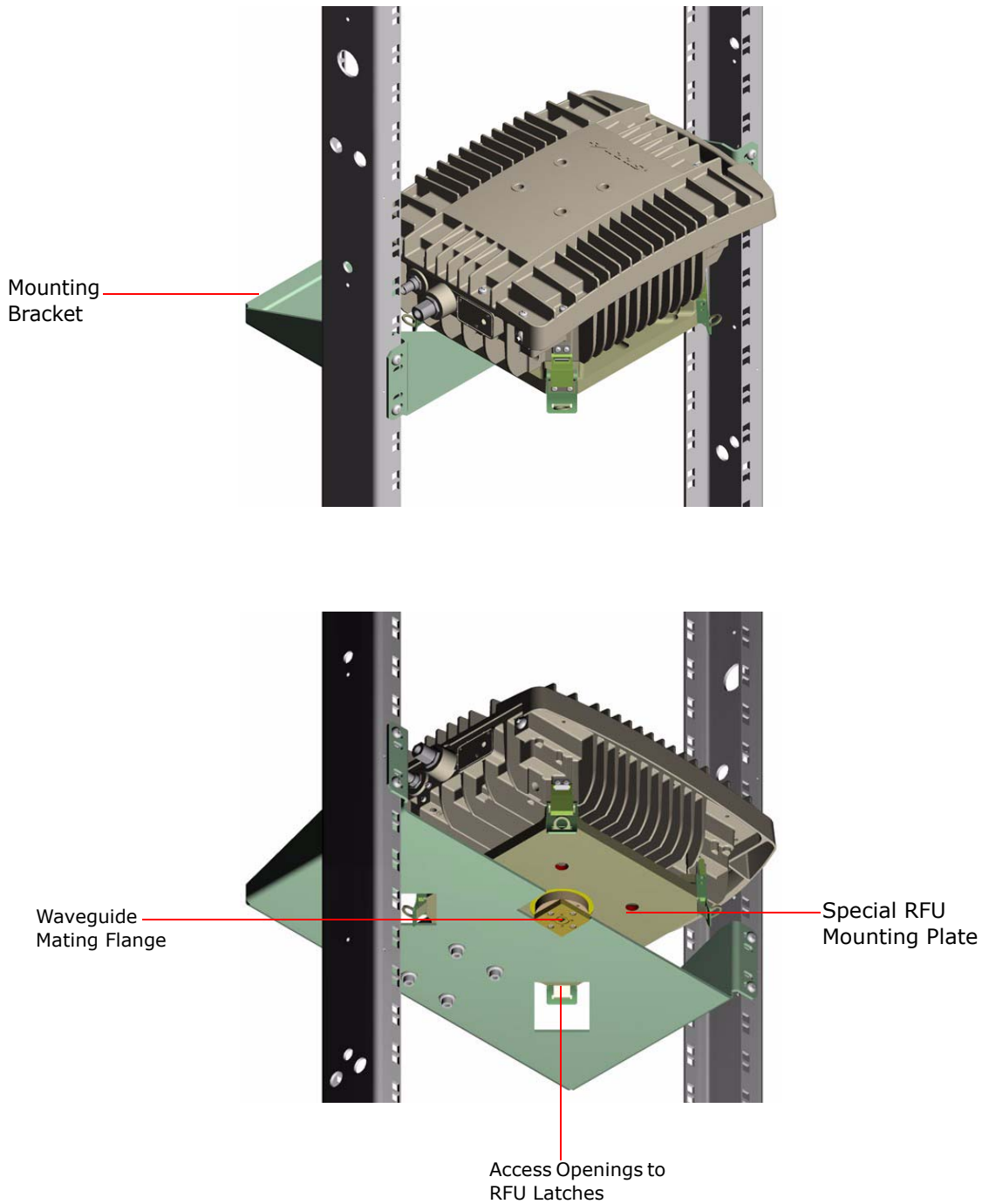


Figure 2-3: The Indoor Rack-Mount Option

The TRuepoint® 5200 RFU

This RFU configuration (1 or 2 E-bends) is suitable **only** for indoor **rack-mounting** and outdoor **pole-mounting** (separate)

Antenna Port

for connecting a flexible waveguide to an antenna

4 mounting screws,

for securing the RFU to the indoor-mounting bracket
(**Option:** kit to be ordered separately)

Side-fins

for heat dissipation

4 Hooks

for attaching the RFU to the antenna interface latches

Carrying Handle

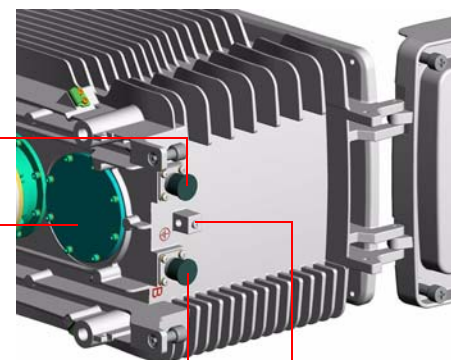
Door latch

Lockable door,

secured shut through 4 screws
(to prevent water and dust infiltration)

Female N-Type Connector, Radio A

Diplexer Port, Radio B



Female N-Type Connector, Radio B

Grounding Point

Bottom View

Figure 2-4: An Unprotected RFU
(2-ft antenna shown in the Separate Mount)

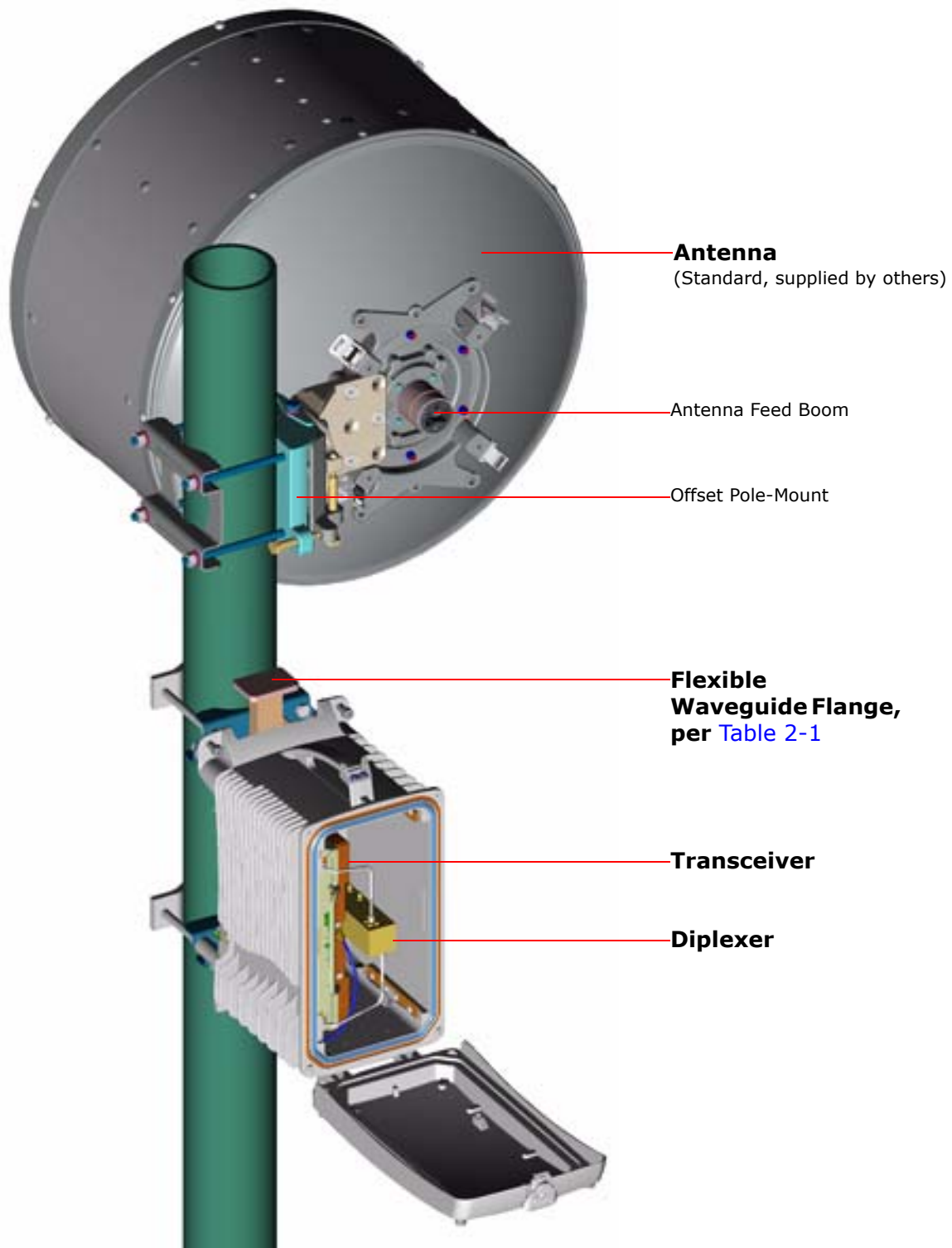


Figure 2-5: An Unprotected RFU
(2-ft antenna shown in the Detachable Mount)

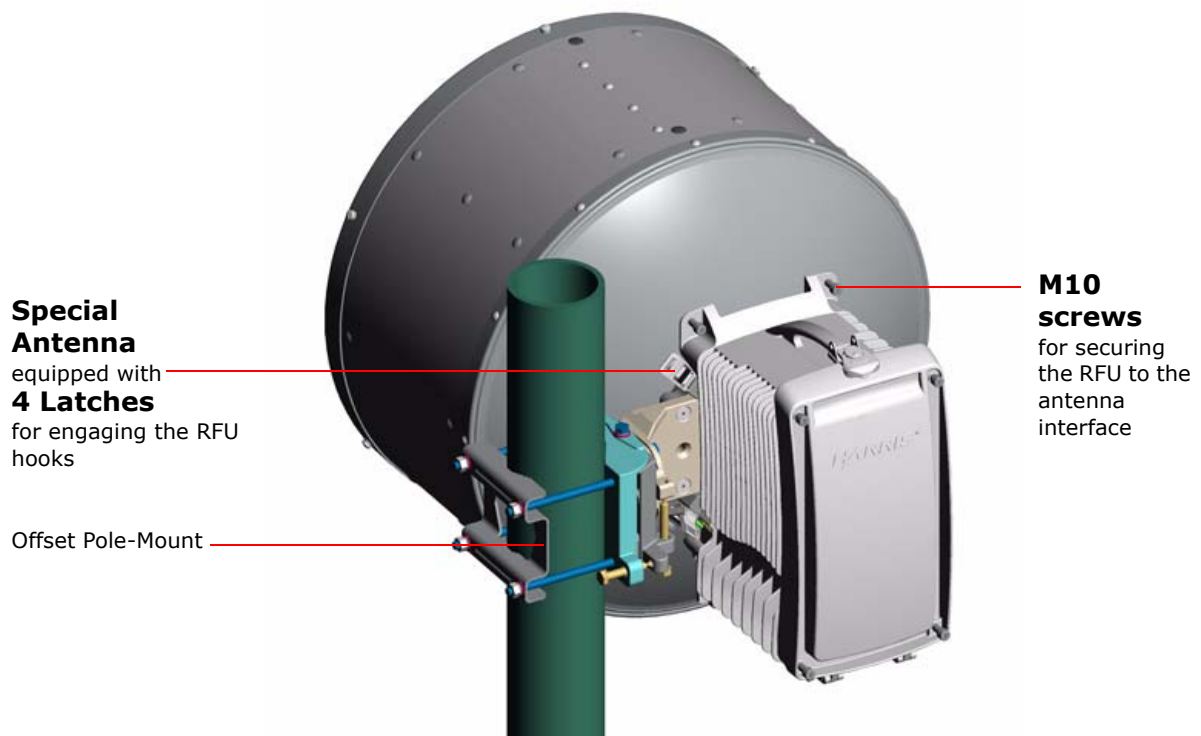


Figure 2-6: A Protected RFU — MHSB Configuration

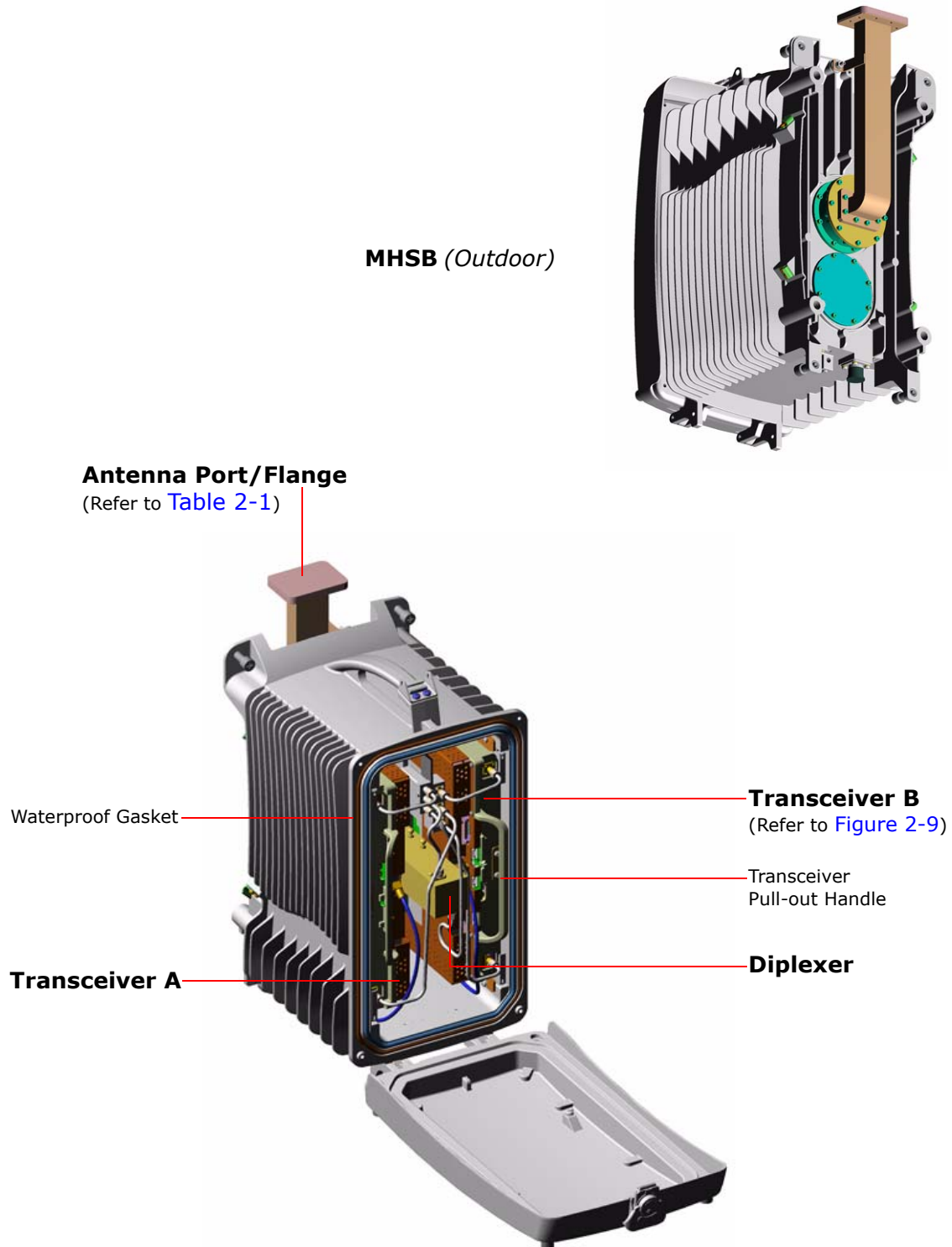


Figure 2-7: A Protected RFU, Frequency Diversity



Frequency Diversity (*Outdoor*)

Frequency Diversity (*Indoor*)

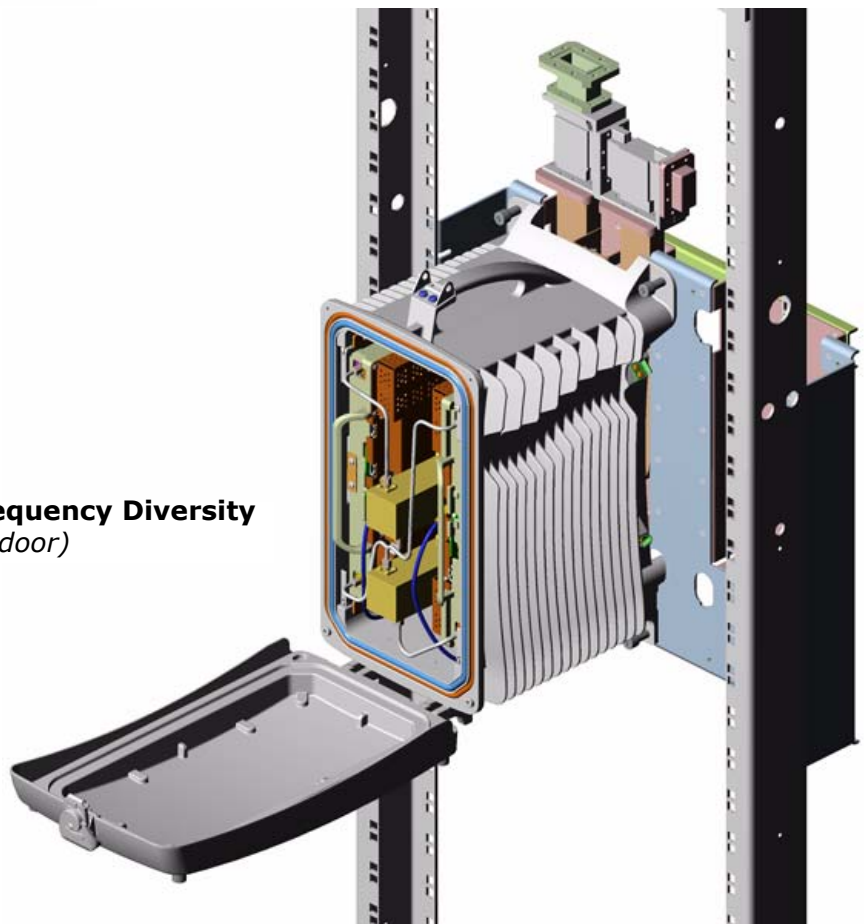


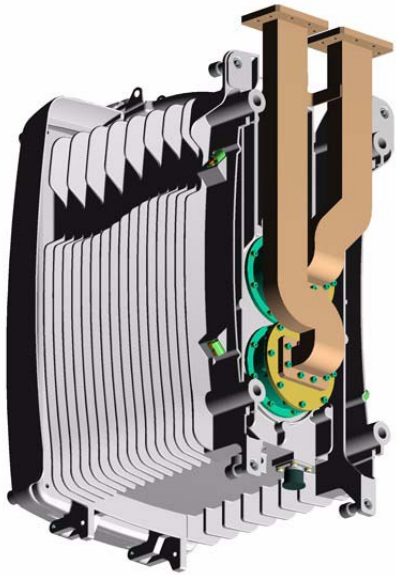
Figure 2-8: Protected RFU, Space Diversity**Space Diversity**
*(Outdoor)***Space Diversity**
(Indoor)

Figure 2-9: The 6-23 GHz Transceiver
Transceiver B shown

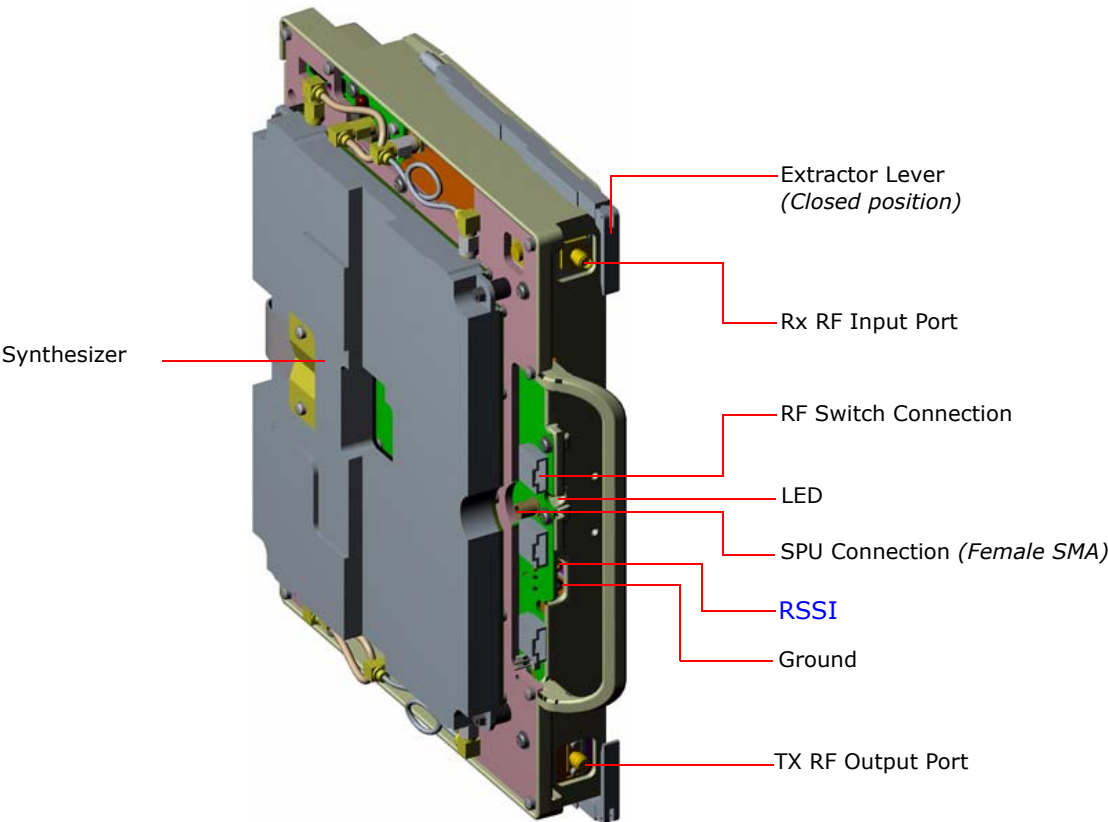


Table 2-1: Waveguide and Flange Type

Freq, GHz	Flange Type		Holes for Fasteners	Waveguide Type
	IEC	EIA/US Mil		
6	PDR 70	CPR 137	All open for #8-32 screws (0.170 in/4.3mm dia.)	WR 137
7	PDR 84	CPR 112		WR 112
13	PDR 120	UG-419U		WR 62 / R140
15	PDR 140	UG-419U	Tapped holes for M3 or #6-32 screws	WR 62 / R140
18	PDR 220	UG-595U		WR 42 / R220
23	PDR 220	UG-595A/U		WR 42 / R220
26	PBR 220	UG 596A/U		WR 42 / R220
38	PBR 320	UG 600A/U		WR 28 / R320

General Specifications



Always consult your Harris representative for available frequency plans and options.

Regulatory Information

Table 2-2: ANSI Plans, 6-11 GHz

ANSI Frequency Planning — TRuepoint® 5200				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
L6	5.915-6.425	SRSP 305.9	29.65	252.04
L6	5.925-6.425	FCC part 101	2.5	251.875/ 252.04
L6	5.925-6.425	FCC part 101	3.75, 5, 10, 30	252.04
U6	6.425-6.930	SRSP 306.4 Issue 4	10, 20, 30	90, 100, 340
U6	6.425-6.930	SRSP 306.4 Issue 5	2.5, 5, 10, 20, 30	90, 100, 250, 340
U6	6.425-6.525	FCC part 74.602	20 (25 allocated)	N/A
U6	6.425-7.125	China	30	345
U6	6.430-7.110	Malaysia MCMC SRSP-513	20, 40	340
U6	6.430-7.125	Brazil Norma 028/94, Pakistan	20, 30	340
U6	6.525-6.875	FCC part 101	2.5	345
U6	6.525-6.875	FCC part 101	3.75, 5, 10	160 (170/180)
U6	6.590-6.770	SRSP 306.5	20	N/A
U6	6.875-7.125	FCC part 74.602	20 (25 alloc)	N/A
7	7.11-7.425	Malaysia MCMC SRSP-514	28	168
7	7.125-7.725	SRSP 307.1 Issue 4	2.5, 5, 10, 20, 30	175 sub-plan 1 150 sub-plan 2
7	7.435-7.750	ITU-R Rec. F.385-8 annex 2	5, 10, 20	160

Table 2-2: ANSI Plans, 6-11 GHz (continued)

ANSI Frequency Planning — TRuepoint® 5200				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
7	7.450-7.895	NTIA	3.75, 5, 10, 30	180, 270
8	7.725-8.275	SRSP 307.7 Issue 4	10, 20, 30	300
8	8.030-8.500	NTIA	3.75, 5, 10, 30	180
8	8.275-8.500	SRSP 308.2	18.75	
10.5/ 11	10.55-10.68	FCC part 101.147	2.5, 3.75, 5	65
10.5/ 11	10.55-10.68	ITU-R Rec. F.747 annex 2	2.5	65
10.5/ 11	10.55-10.68	SRSP 310.5 Issue 1	2.5, 5	65
10.5/ 11	10.696-11.71	FCC part 101 (2000 version)	2.5, 3.75, 5, 10, 30, 40	500/490
10.5/ 11	10.696-11.71	China	20, 40	530
10.5/ 11	10.696-11.71	SRSP 310.7 (Issue 1)	2.5, 3.75, 5, 10, 20, 40	490

Table 2-3: ANSI Plans, 13-38 GHz

ANSI Frequency Planning — TRuepoint® 5100 and 5200				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
13	12.70-13.25	FCC CFR47 part 74.602	10, 20 (25 allocated)	N/A
14	14.200-14.500	FCC 14.2-14.4		
15	14.5-15.35	ITU-R Rec. F.636-3 annex 2	2.5	640
15	14.5-15.35	SRSP 314.5 issue 2	5, 10, 20, 40	475
15	14.5-15.35	NTIA	2.5, 3.75, 5, 10, 30	
18	17.700-19.700	FCC part 101	5, 10, 20, 40	340 1560 (340) 1560
18	17.700-19.700	Proposed FCC (FWCC)	2.5, 5, 30	1560
18	17.7-19.7	ITU-R Rec. F.595-8 annex 2 (North America)	5, 10, 20, 40	1560/340
18	17.7-19.7	Malaysia MCMC SRSP-527	40	1000

Table 2-3: ANSI Plans, 13-38 GHz (continued)

ANSI Frequency Planning — TRuepoint® 5100 and 5200				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
18	17.7-19.7	ITU Rec. F 595-8 annex 4 Co-channel and interleaved	2.5, 5, 27.5 (interleave)	1010
18	17.7-19.7	Argentina	20	120
18	17.70-18.14, 19.26-19.70	SRSP 317.7 (issue 1)	10, 20, 40	1560
18	18.58-18.82, 18.92 -19.16	SRSP 318.5 (issue 2)	5, 10, 20	340
18	18.58-19.160	Brazil Norma 004/91	5, 10	340
23	21.2-23.6	FCC part 101		1200
23	21.2-23.6	ITU-R Rec. F637-3 annex 4 (North America)	50	1200
23	21.8-22.4, 23.0-23.6	SRSP 321.8 (Issue 1) Replace SRSP 321.2	2.5, 5, 10, 15, 20, 40, 50	1200
38	38.6-40.0	FCC part 101 SRSP 338.6 Issue 1	2.5, 5, 10, 15, 20, 30, 50 (50)	700

Table 2-4: CEPT Plans, 6-23 GHz

CEPT Frequency Planning — TRuepoint® 5200				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
L6	5.925-6.425	ITU-R Rec. F.383-7 CEPT Rec. 14-01 China Brazil Res.105 France	29.65	252.04
L6	5.915-6.425	Malaysia MCMC SRSP-512	29.65	252.04
L6	5.925-6.425	Nicaragua	3.5, 7, 14, 28	
L6	5.925-6.425	Bosnia	28, 40	252.04
L6	5.925-6.425	ITU-R Rec. F.383-7 annex 1	40	240
U6	6.425-7.125	China	40	340
U6	6.425-7.125	France (CEPT14-02 ITU-R 384)	40	340
U6	6.425-7.125	CEPT 14-02	20, 40	340
U6	6.425-7.125	Nicaragua	3.5, 7, 14, 28	
U6	6.430-7.125	ITU-R Rec. F.384-7	20, 40	340

Table 2-4: CEPT Plans, 6-23 GHz (continued)

CEPT Frequency Planning — TRuepoint® 5200				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
7	7.110-7.750	ITU-R Rec. F.385-8 annex 3	28	168, 196
7	7.125-7.725	DRAFT ECC/REC/(02)06	3.5, 7, 14,28	154
7	7.125-7.425	China	28	154
7	7.250-7.550	ITU-R Rec. F.385-8 annex 5	3.5	161
7	7.250-7.550	Russia (ITU)	3.5, 7	161
7	7.350-7.842	Dominican Republic Dom56	27	276
7	7.375-7.750	France (ITU-R F.385-8)		
7	7.425-7.725	ITU-R Rec. F.385-8 (f0=7575)	7	161
7	7.425-7.725	Malaysia MCMC SRSP-515	7	161
7	7.425-7.725	Malaysia MCMC SRSP-515	28	154
7	7.425-7.725	ITU-R Rec. F.385-8 (f0=7575)	For f0=7.275, 7.400, or 7.700; Used by agreement with the administration concerned	
7	7.425-7.725	ITU-R Rec. F.385-8 annex 1 China	28	154
7	7.425-7.725	ITU -R Rec. F.385-8 annex 1	28	182
7	7.425-7.725	Argentina	7	161
7	7.425-7.725	Argentina	28	154
7	7.425-7.725	Brazil Norma 001/95	3.5, 7, 14, 28	154
7	7.425-7.900	ITU-R Rec. F.385-8 annex 4	7, 14, 28	245
7		Switzerland	3.5, 7, 14, 28	151.614
8	7.725-8.275	China	14.825, 29.65	311.32
8	7.725-8.275	ITU-R Rec. F.386-6 annex 1 Brazil Reg. 005/96 Malaysia MCMC SRSP-516	29.65	311.32
8	7.900-8.400	ITU-R Rec. F.386-6 annex 4 Russia	7,14,28	266
8	7.900-8.500	DRAFT ECC/REC/(02)06	3.5, 7, 14, 28	310
8	8.025-8.500	France (Decision 97-390)	3.5	213.5
8	8.025-8.500	France (Decision 99-37)	7, 14, 28	208
8	8.200-8.500	Argentina	14	119
8	8.200-8.500	Argentina	7	126

Table 2-4: CEPT Plans, 6-23 GHz (continued)

CEPT Frequency Planning — TRuepoint® 5200				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
8	8.275-8.500	China & Dom57 (Dominican Republic) Brazil Res. 106 ITU-R Rec. F.386-6 annex 3 Malaysia MCMC SRSP-517	14	119
8	8.275-8.500	China & Dom57 (Dominican Republic) Brazil Res. 106 ITU-R Rec. F.386-6 annex 3 Malaysia MCMC SRSP-517	7	126
8	8.275-8.500	ITU-R Rec. F.386-6	11.662	151.614
10	10.0-10.68	Italy	28	350
10	10.15-10.68	CEPT Rec. 12-05	3.5, 7, 14, 28	350
10	10.15-10.65	Brazil Res. 191, Argentina secc27	5 blocks- 28/30	350
10.5/ 11	10.5-10.68	ITU-R Rec. F.747 annex 1	7	91
10.5/ 11	10.5-10.68	France (ITU 747)	7	
10.5/ 11	10.5-10.68	Argentina	7	91
10.5/ 11	10.55-10.68	France	14, 28	84
10.5/ 11	10.696-11.71	France (12*40 CEPT)	40	490
10.5/ 11	10.696-11.71	ITU-R Rec. F.387-9 ITU-R Rec. F.387-9 Annex 1 Argentina, Russia Brazil Norma 016/94 Dom59 (Dominican republic) Malaysia MCMC SRSP-518	40	530
10.5/ 11	10.696-11.71	CEPT Rec. 12-06	40	530/490
10.5/ 11	10.696-11.71	ITU-R Rec. F.387-9 Annex 2	40	490
13	12.70-13.25	Argentina	7, 28	266
13	12.70-13.25	ITU-R Rec. F.497-6	3.5, 7, 14, 28	266
13	12.70-13.25	France	3.5, 7	266

Table 2-4: CEPT Plans, 6-23 GHz (continued)

CEPT Frequency Planning — TRuepoint® 5200				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
13	12.70-13.25	Russia (ITU)	3.5, 7, 28	266
13	12.70-13.25	Malaysia MCMC SRSP-525	3.5, 7, 28	266
13	12.70-13.25	CEPT Rec. 12-02 China	3.5, 7, 14, 28	266
14	14.200-14.500	China 14.2-14.5	3.5, 7, 14, 28,	140
14	14.200-14.500	ITU-R F.746 annex 5	3.5, 7, 14, 28,	140
14	14.250-14.500	France	14	
15	14.4-15.35	ITU-R Rec. F.636-3 Malaysia MCMC SRSP-526	3.5, 7, 14, 28	490
15	14.4-15.35	Russia (ITU)	14, 28	490
15	14.4-15.35	ITU-R Rec. F.636-3	3.5, 7, 14, 28	420
15	14.4-15.35	Russia (ITU)	14, 28	420
15	14.5-15.35	Australia (FX3, App.1)	7, 14, 28	644
15	14.5-15.35	Argentina	7, 14	728
15	14.5-15.35	Argentina	28	322
15	14.5-15.35	CEPT Rec. 12-07	3.5, 7, 14, 28, 56	728
15	14.5-15.35	Brazil Res. 129	3.5, 7, 14	420
15	14.5-15.35	China	3.5, 7, 14, 28	420
15	14.5-15.35	Dominican Republic Dom60	27	840
15	14.501-15.341	BAPT 211 ZV 038/15 GHz	3.5, 7, 14	728
15	15.25-15.35	France	10	
15		Mexico	3.5, 7, 14, 28	315
18	17.700-19.700	ITU-R Rec. F.595-8 Malaysia MCMC SRSP-527	27.5, 55	1010
18	17.7-19.7	Mexico	27.5	1615
18	17.7-19.7	Russia (ITU)	27.5, 55	1010
18	17.7-19.7	CEPT Rec.12-03 France	13.75, 27.5, 55	1010
18	17.7-19.7	China	55	1120
18	17.7-19.7	China	27.5	1092.5
18	17.7-19.7	ITU Rec. F 595-8 annex 3 (UK)	3.5	1008

Table 2-4: CEPT Plans, 6-23 GHz (continued)

CEPT Frequency Planning — TRuepoint® 5200				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
18	17.7-19.7	Malaysia MCMC SRSP-527	7	1006
18	17.7-19.7	ITU Rec. F 595-8 annex 5	3.5, 7	1010
18	17.7-19.7	Brazil (Norma 15/96)	27.5, 55	1560
18	17.7-19.7	Argentina	27.5	1010
23	21.2-23.6	Malaysia MCMC SRSP-528	3.5, 5, 14, 28, 56	1232
23	21.2-23.6	ITU-R Rec. F 637-3 annex 1 (UK)	3.5, 7, 14, 28	1232
23	21.2-23.6	ITU-R Rec. F637-3 annex 3	3.5, 7, 14, 28, 56	1008
23	21.2-23.6	ITU-R Rec. F637-3 annex 5 (Germany)	3.5, 7, 14, 28, 56	1008
23	21.2-23.6	Russia	3.5, 7, 14, 28, 56	1232
23	21.2-23.6	Argentina China	3.5, 7, 14, 28	1232
23	21.2-23.6	France (22-22.6 & 23-23.6) (CEPT)	3.5, 7, 14, 28	1008
23	21.2-23.6	France (22.6-23)	3.5, 7, 14, 28	252
23	21.8-23.6	Brazil	3.5, 5, 14, 28, 56	1232
23	22.0-23.6	CEPT T/R 13-02 Annex A	3.5, 7, 14, 28, 56	1008

Table 2-5: CEPT Plans, 13-38 GHz

CEPT Frequency Planning — TRuepoint® 5100				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
13	12.70-13.25	Argentina	7, 28	266
13	12.70-13.25	ITU-R Rec. F.497-6	3.5, 7, 14, 28	266
13	12.70-13.25	France	3.5, 7	266
13	12.70-13.25	Russia (ITU)	3.5, 7, 28	266
13	12.70-13.25	Malaysia MCMC SRSP-525	3.5, 7, 28	266
13	12.70-13.25	CEPT Rec. 12-02 China	3.5, 7, 14, 28	266
14	14.200-14.500	China 14.2-14.5	3.5, 7, 14, 28,	140
14	14.200-14.500	ITU-R F.746 annex 5	3.5, 7, 14, 28,	140
14	14.250-14.500	France	14	
15	14.4-15.35	ITU-R Rec. F.636-3 Malaysia MCMC SRSP-526	3.5, 7, 14, 28	490
15	14.4-15.35	Russia (ITU)	14, 28	490
15	14.4-15.35	ITU-R Rec. F.636-3	3.5, 7, 14, 28	420
15	14.4-15.35	Russia (ITU)	14, 28	420
15	14.5-15.35	Australia (FX3, App.1)	7, 14, 28	644
15	14.5-15.35	Argentina	7, 14	728
15	14.5-15.35	Argentina	28	322
15	14.5-15.35	CEPT Rec. 12-07	3.5, 7, 14, 28, 56	728
15	14.5-15.35	Brazil Res. 129	3.5, 7, 14	420
15	14.5-15.35	China	3.5, 7, 14, 28	420
15	14.5-15.35	Dominican Republic Dom60	27	840
15	14.501-15.341	BAPT 211 ZV 038/15 GHz	3.5, 7, 14	728
15	15.25-15.35	France	10	
15		Mexico	3.5, 7, 14, 28	315
18	17.700-19.700	ITU-R Rec. F.595-8 Malaysia MCMC SRSP-527	27.5, 55	1010
18	17.7-19.7	Mexico	27.5	1615
18	17.7-19.7	Russia (ITU)	27.5, 55	1010
18	17.7-19.7	CEPT Rec.12-03 France	13.75, 27.5, 55	1010
18	17.7-19.7	China	55	1120

Table 2-5: CEPT Plans, 13-38 GHz (continued)

CEPT Frequency Planning — TRuepoint® 5100				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
18	17.7-19.7	China	27.5	1092.5
18	17.7-19.7	ITU Rec. F 595-8 annex 3 (UK)	3.5	1008
18	17.7-19.7	Malaysia MCMC SRSP-527	7	1006
18	17.7-19.7	ITU Rec. F 595-8 annex 5	3.5, 7	1010
18	17.7-19.7	Brazil (Norma 15/96)	27.5, 55	1560
18	17.7-19.7	Argentina	27.5	1010
23	21.2-23.6	Malaysia MCMC SRSP-528	3.5, 5, 14, 28, 56	1232
23	21.2-23.6	ITU-R Rec. F 637-3 annex 1 (UK)	3.5, 7, 14, 28	1232
23	21.2-23.6	ITU-R Rec. F637-3 annex 3	3.5, 7, 14, 28, 56	1008
23	21.2-23.6	ITU-R Rec. F637-3 annex 5 (Germany)	3.5, 7, 14, 28, 56	1008
23	21.2-23.6	Russia	3.5, 7, 14, 28, 56	1232
23	21.2-23.6	Argentina China	3.5, 7, 14, 28	1232
23	21.2-23.6	France (22-22.6 & 23-23.6) (CEPT)	3.5, 7, 14, 28	1008
23	21.2-23.6	France (22.6-23)	3.5, 7, 14, 28	252
23	21.8-23.6	Brazil	3.5, 5, 14, 28, 56	1232
23	22.0 -23.6	CEPT T/R 13-02 Annex A	3.5, 7, 14, 28, 56	1008
26	24.5-26.5	France (ART 99-831)	14, 28, 56	1008
26	24.5-26.5	Malaysia MCMC SRSP-509	28	1008
26	24.5-26.5	CEPT T/R 13-02 Annex B ITU-R Rec. F 748-4 Annex 1 China (ITU)	3.5, 7, 14, 28, 56	1008

Table 2-5: CEPT Plans, 13-38 GHz (continued)

CEPT Frequency Planning — TRuepoint® 5100				
Band	Frequency Range, GHz	Regulatory Information	Channel Spacing, MHz	T/R Spacing, MHz
38	36.0-37.0	ITU-R F.749-2 Annex 2	3.5, 7, 14, 28, 56	462
38	37.0-40.0	E-rate in Argentina (secc27, 37.14-40.0), Peru (37.0-40.0)	3.5, 7, 14, 28	700
38	37.0-39.5	CEPT T/R 12-01 annex A ITU-R F.749-2 Annex 1 Russia (ITU) Brazil Reg. 002/96 China (ITU)	3.5, 7, 14, 28, 56	1260
38	37.000-39.500	France	3.5, 7, 14	1260

Transmitter Characteristics

Output Attenuation Range (dB), in 0.5 dB steps,
programmable through telemetry commands from SPU's controller

TRuepoint® 13 to 38 GHz (usable for ATPC operation)	• 40 (QPSK), 35 (16QAM), 30 (32QAM and higher)
TRuepoint® 6 to 11 GHz (usable for ATPC operation)	• 30 (All)

Local Oscillator Frequency

Source	RF frequency synthesizer	
Step size	• ≥ 10 GHz	125 kHz maximum
	• ≤ 8 GHz	5 kHz maximum (1 kHz resolution at configuration point, through software)
PA Low Output Alarm	• 32QAM	3 dB drop with 1 dB hysteresis
	• All others	4 dB drop with 2 dB hysteresis

Receiver Characteristics

IF frequency	70 MHz
Image rejection	-65 dBc minimum (wideband filtering, > 80MHz) -85 dBc minimum (narrowband filtering, ≤ 80MHz)
Maximum input level for a given maximum BER	Per "Maximum RSL" entry below
Maximum RSL at specified RBER	• QPSK: -17 dBm • 16 QAM and higher: -24 dBm
Receive overload level without damage	0 dBm
Receiver oscillator frequency stability (including 5 years ageing)	± 5 ppm
RSL display accuracy over temperature	±3 dB for RSL from -25 to -90 dBm or RSL _{low} , (highest of the two levels)
RSL _{low}	RSL equal or lower than the RSL at 10 ⁻⁶ BER level, +6 dB

Mechanical Characteristics

Connections RFU to SPU, coaxial cable with N-Type connectors

Physical Description

RFU	Height, mm	Width, mm	Depth, mm	Weight, kg
5200, 6 GHz	442	216	300	19.65, max.
5200, 7-23 GHz	442	216	300	18.0
5100, 13-38 GHz	358	254	122	6.0

Coaxial Cable Length



Values in [Table 2-6](#) assume the presence of an adequate and sound grounding method, executed according to the tower manufacturer's recommendations, that connects to a [Common Grounding Point](#), per [Figure 4-16](#).

Table 2-6: Maximum Allowable SPU-RFU Coaxial Cable Length, With Adequate Grounding^a

SPU Input, 21.6 V _{DC}	Low loss RG8U				Low loss foam heliax	
	Belden 9913 or Eq.		C2FP or Eq.		LDF2-50 or Eq.	
RFU Band, GHz	ft.	m.	ft.	m.	ft.	m.
6-11	821	250	599	183	878	268
13	833	254	735	224	1000	305
14; 15; 18	833	254	735	224	1000	305
23; 26; 28	833	254	735	224	1000	305
38	833	254	735	224	1000	305

a. Per Figure 4-15

Environmental	
Subject	Compliance
Lightning Protection	Figure 3-13 and Figure 4-16 recommend a protection scheme that uses grounding kits. Harris Corporation recommends that such lightning protection or other alternatives thereto be provided in compliance to Local and/or National Electrical Codes
Temperature range	• Full specification: -33° C to + 55° C (meets ETSI EN 300 019-1-3, class 3.1E) • Operational: -40° C to + 55° C (modules cold starting, traffic passing without synch losses and BER better than 1.0×10^{-6} after 15 min warm-up) • Storage: -55° C to + 70° C
Humidity	• 5 – 100% condensing
Altitude	• 0 to 5000 m AMSL
Vibration	• ETSI EN 300 019-2-4 V2.1.2 (1999-09) class 4.1 - 5 sweep cycles per axis (Stationary, sinusoidal, in-use position)
Transit Vibration	• ETSI EN 300 019-2-2 V2.1.2 (1999-09) class 2.3 (random vibration, shocks and drop)
EMI / EMC and Safety Compliance	
Subject	Compliance to Standards
Safety	• IEC 60950-1 • EN 60950-1 • CSA C22.2 No. 60950-1 • UL 60950-1 • EN 60215
EMC	• FCC Part 15, Subpart B, Class B • Canada ICES-003, Class B • ETSI EN 301 489-01 V1.4.1 (08-2002) (Part 1: Common technical requirements = common part for all radio equipment) • ETSI EN 301 489-4 (08-2002) (Part 4: Specific conditions for fixed radio links and ancillary equipment and services)

INSTALLING THE 5100 RFU

General

Scope

This chapter describes the installation procedures applicable to the TRuepoint® RFU, in the 13-38 GHz frequencies.

Site Requirements

Before starting the following installation procedures, a pipe must be installed on a rooftop or a tower. The pipe diameter must be 115 mm (4.5 in.). A waterproof entry to the SPU shelter and a good grounding point must also be available.

Qualifications of Installation Personnel



The installation, maintenance, or removal of antenna systems requires qualified, experienced personnel. Harris installation instructions have been written for such personnel. Antenna systems should be inspected once a year by qualified personnel to verify proper installation, maintenance, and condition of the equipment.

Installation of the microwave radio and associated equipment is to be performed by a skilled person. Power connections to the radio must be made in compliance of the local electrical code by a [Skilled Person](#).

Harris Corporation disclaims any liability or responsibility for the results of improper or unsafe installation practices.

Installation Types of the RFU

This chapter describes the following installation procedures:

[Installing the RFU Outdoors — the Detachable Mount..... 3-3](#)

- RFU directly **attached** to a pole-mounted antenna.

[Installing the RFU Outdoors — the Separate Mount..... 3-17](#)

- RFU mounted on a pole and **separated** from a pole-mounted antenna

[Installing the RFU Indoors — the Rack Mount..... 3-28](#)

- RFU mounted **indoors** on a special bracket attached to a 19-inch rack.

Installing the RFU Outdoors — the Detachable Mount

Before starting, check that you have the parts and tools required. The parts are shown in [Figure 3-2](#). The tools are listed in [Table 3-1](#).

Table 3-1: List of Tools Required for the Installation of the RFU

Tool	Required Equipment Specifications	Where Used
Miscellaneous tools for installing connectors on the SPU to RFU coaxial cable.	See the manufacturer documentation provided with the connector.	• Where applicable, install the optional sunshield, on Page 3-11
Adjustable wrench	11/16" (18 mm) jaws	• Throughout
Rope and hook with safety latch	Common	• To bring equipment up the pipe.



Follow the instructions of the antenna manufacturer that are enclosed with the antenna for the exact details of how to assemble, install, and align the antenna. Drawings shown here of the antenna assembly are for reference only and are intended to simply show the order in which the antenna and the RFU are assembled.

Space Requirements



[Figure 3-1](#) provides overall dimensions for installing this type of radio configuration, **excluding** the antenna information, since this varies according to the type of antenna that is provided by others.

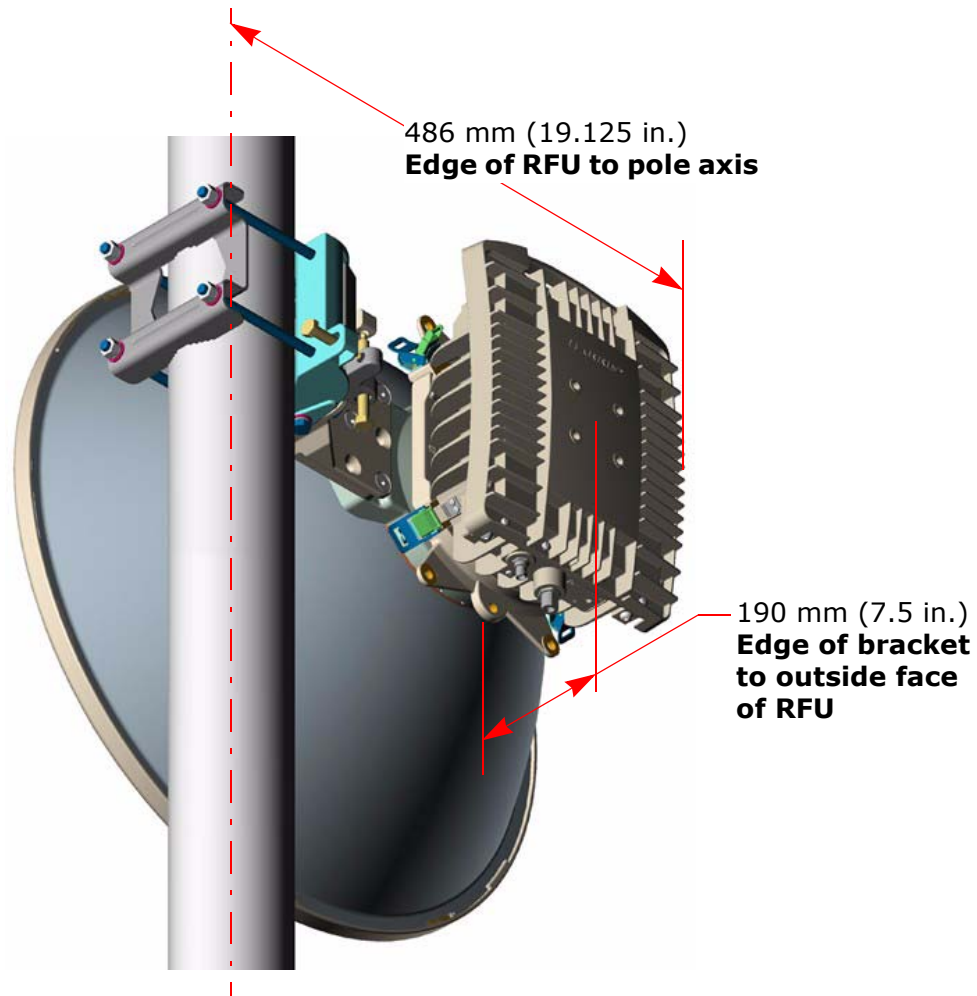
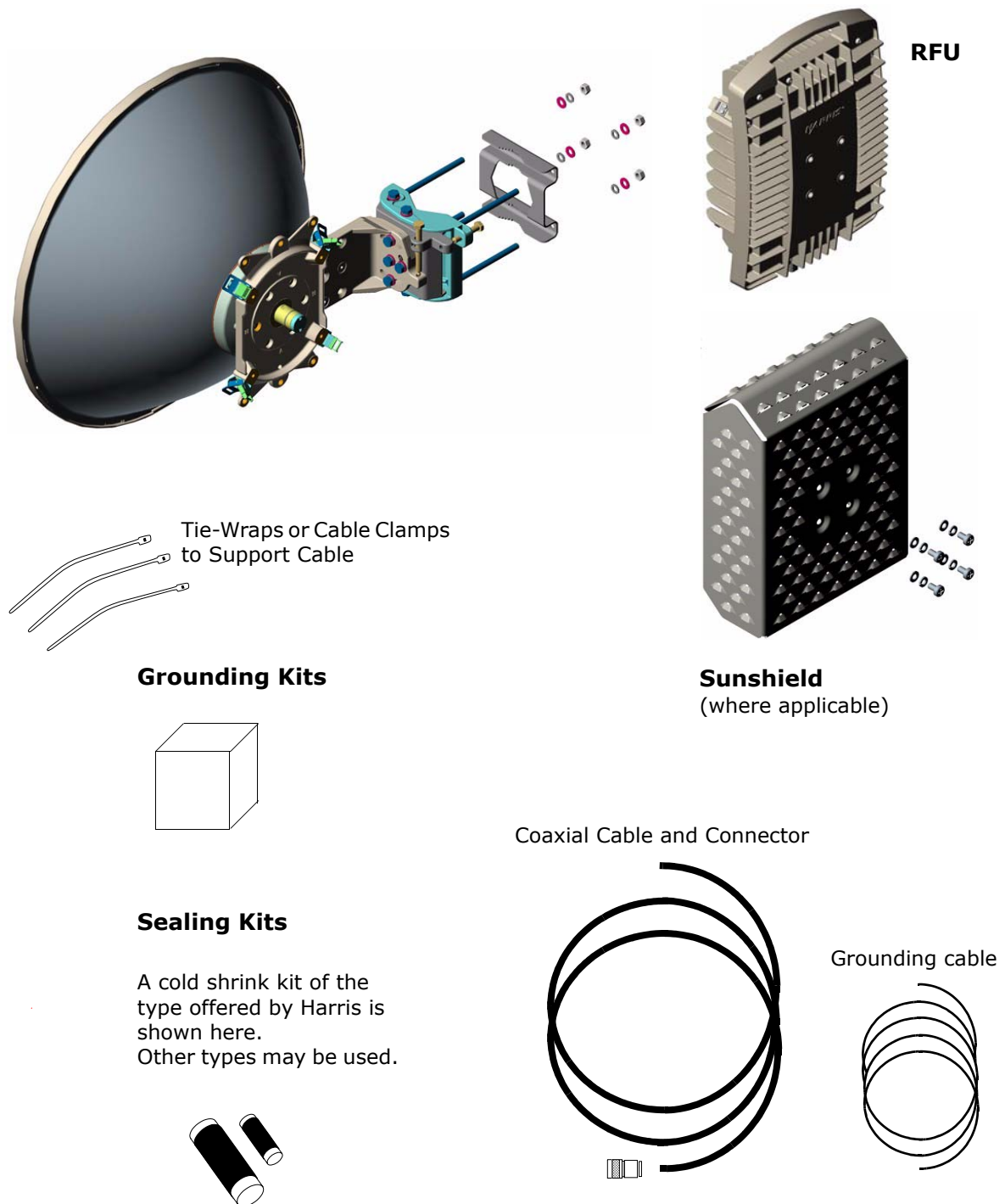
Figure 3-1: Overall Space Requirements

Figure 3-2: Parts required for the Detachable Mount Installation: (See Chapter 6 for part numbers)

Antenna, equipped for the RFU direct mounting



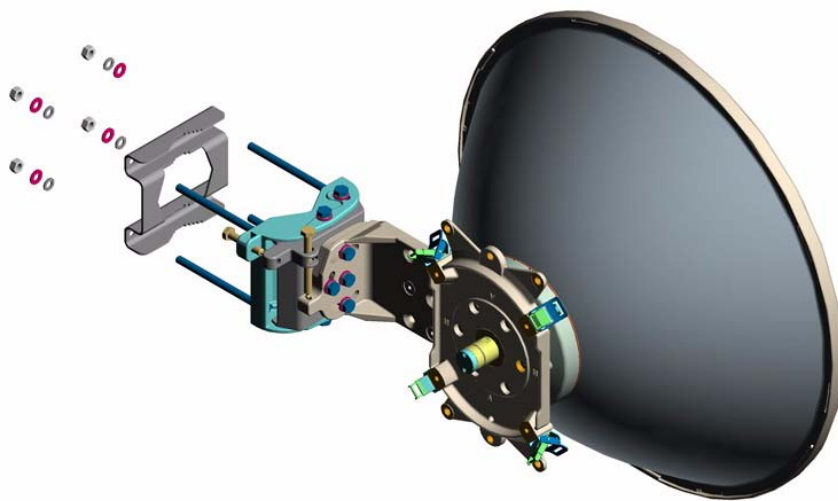
1 Assemble the antenna

Tools and material required

- Common tools

Following the instructions packed with it, assemble the antenna. Please note that assembly is different depending on whether the antenna is to be to the left or the right of the pipe.

Figure 3-3: The Parabolic Antenna



2 Set the antenna polarization

Tools and material required

- Allen keys, 5 mm and 2 mm (part of the antenna manufacturer's mounting kit)

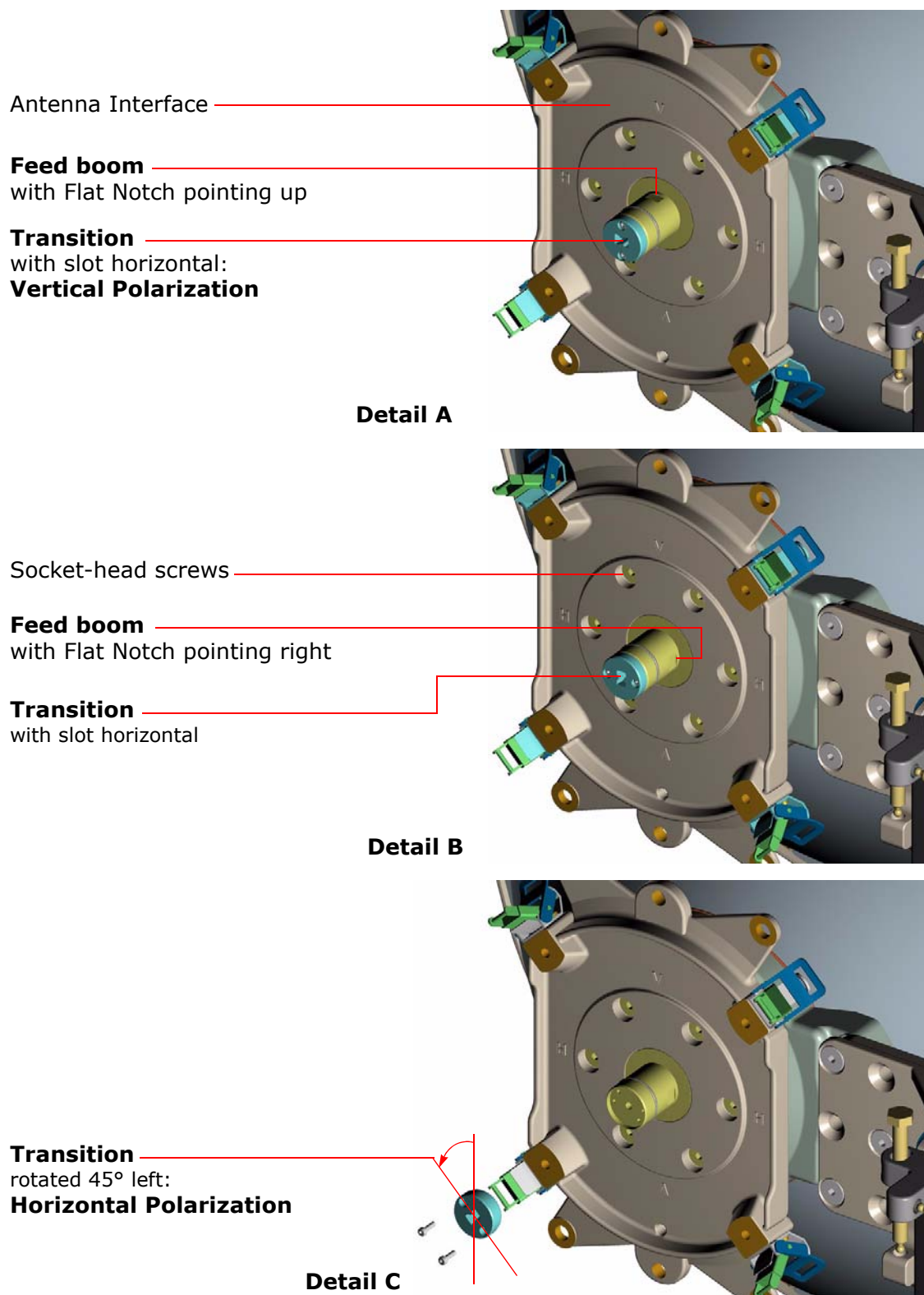
The polarization of the antenna is controlled by combining the position of the antenna feed boom and a [Transition](#) placed on the feed boom.

Use the following table to determine the action necessary for obtaining the required polarization.

Polarization	Rotate		Relative Position		Refer to
	Feed boom	Transition	Flat Notch	Slot (Transition)	
Vertical	No action required		Vertical	Horizontal	Detail A
Horizontal	Right or left	—	Horizontal	Vertical	Detail B
	—	Right or left, 45 degrees	Horizontal	Tilted right or left, 45 degrees	Detail C

For setting the [Horizontal Polarization](#), proceed as follows, referring to the Table above, for the relative positions of the [Feed boom](#) and [Transition](#):

1. Using the Allen key provided in the kit, loosen the 6 [Socket-head screws](#) enough to allow the feed boom to rotate freely.
2. Rotate the feed boom 90 degrees to the **right**, or **left** until it bottoms. (flat notch pointing right or left, aligned with the letter H embossed on the [Antenna Interface](#). Tighten the 6 socket-head screws.
3. Using an Allen key, remove the 2 small socket-head screws on the [Transition](#).
4. Rotate the [Transition](#) 45 degrees to the left or right, aligning its screw holes over those of the boom's face, then replace and tighten the 2 small socket-head screws. Tighten the small socket-head screws.

Figure 3-4: Setting the Antenna Polarization

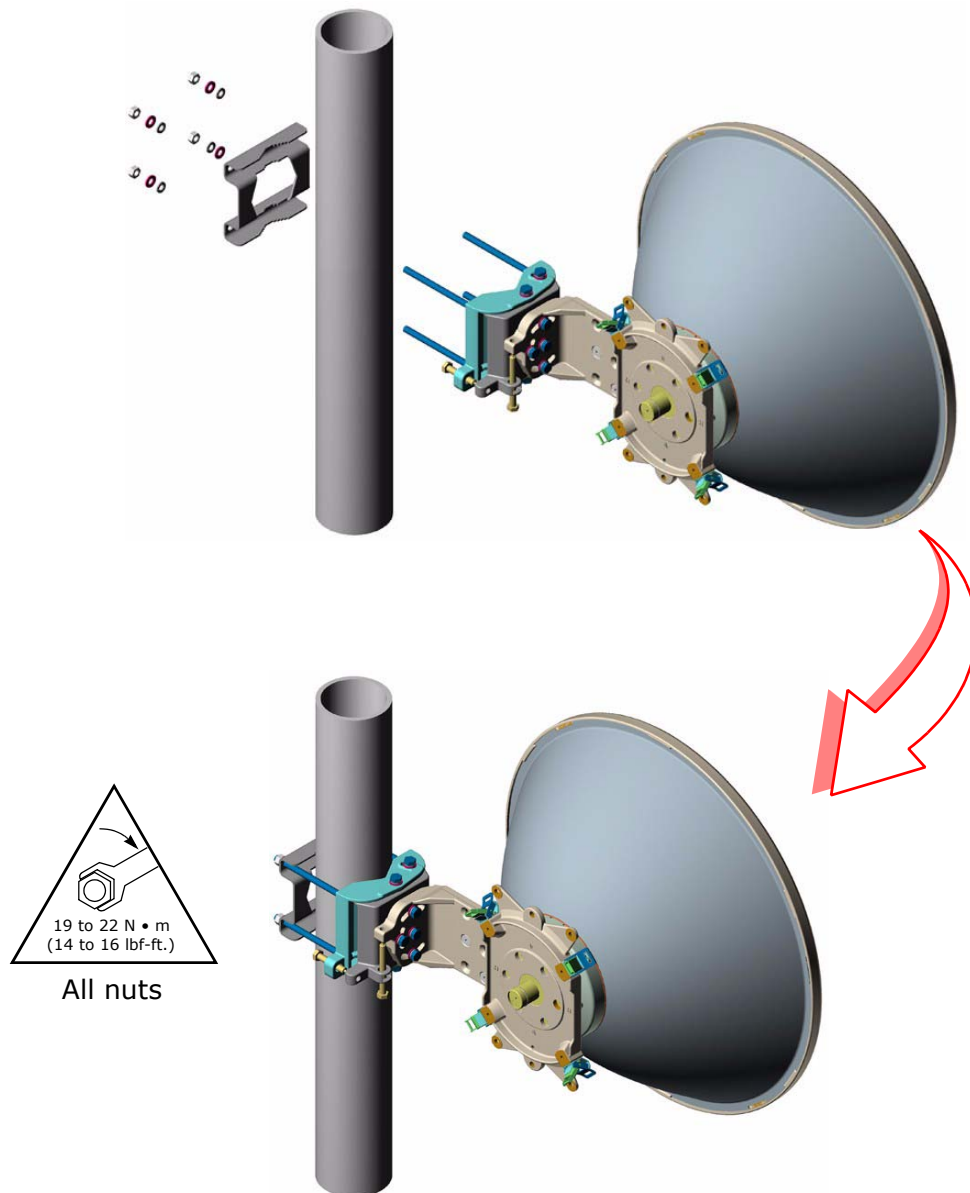
3 Mount the antenna to the mast

Tools and material required

- Adjustable wrenches

Referring to [Figure 3-5](#), and the instructions packed with the antenna, mount the antenna onto the antenna mast. Tighten the bolts finger-tight.

Figure 3-5: Mounting the Antenna to the mast



4 Latch the RFU to the antenna

Tools and material required

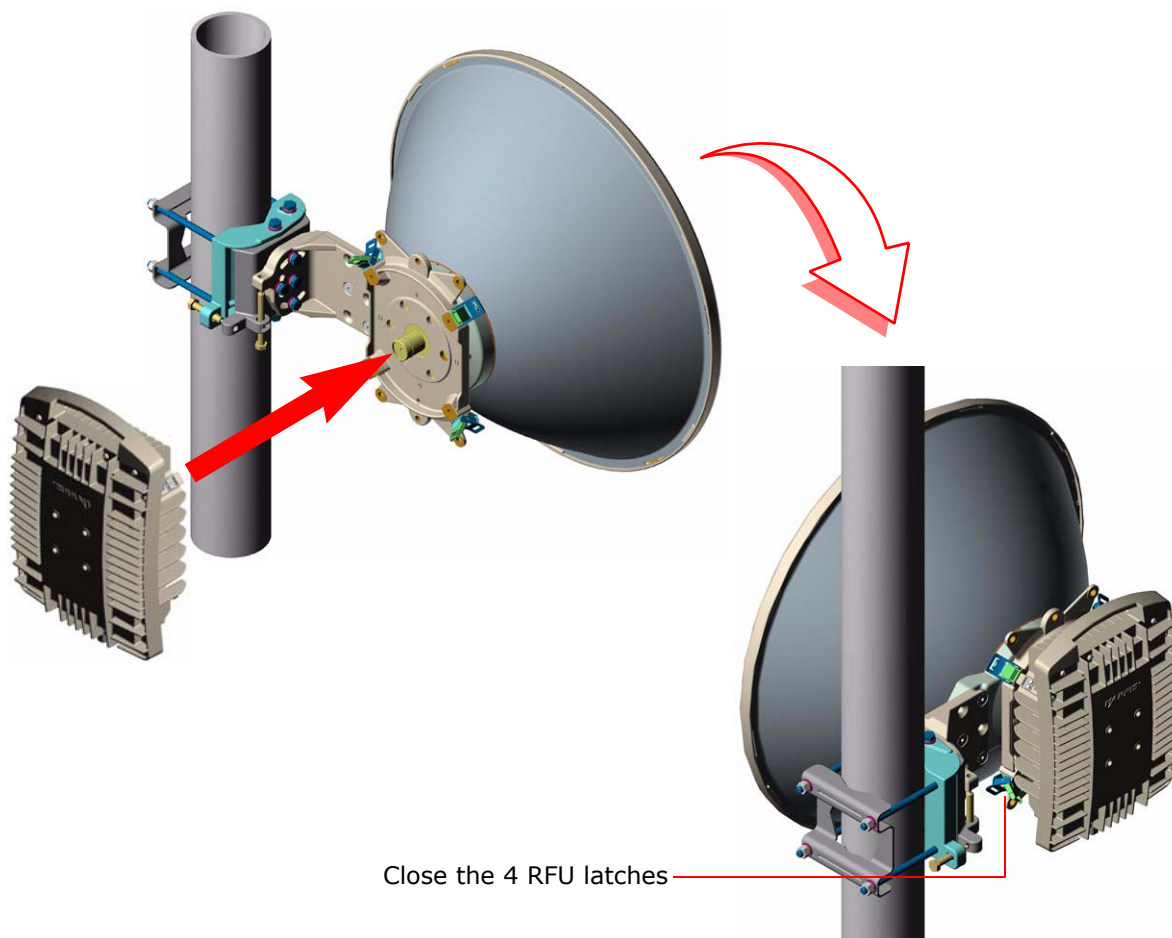
- Adjustable wrench
- Antenna alignment kit (optional)



Remove information tag and cap, then apply moderately silicone grease to the whole feed boom area, but not to its face. Failure to do so, will cause the RFU to jam.

1. Turn the RFU for the required polarization observing the Caution given in Figures 3-2 and 3-3.
2. Latch the RFU to the antenna per Figure 3-6.

Figure 3-6: Attaching the RFU to the Antenna



5 Where applicable, install the optional sunshield



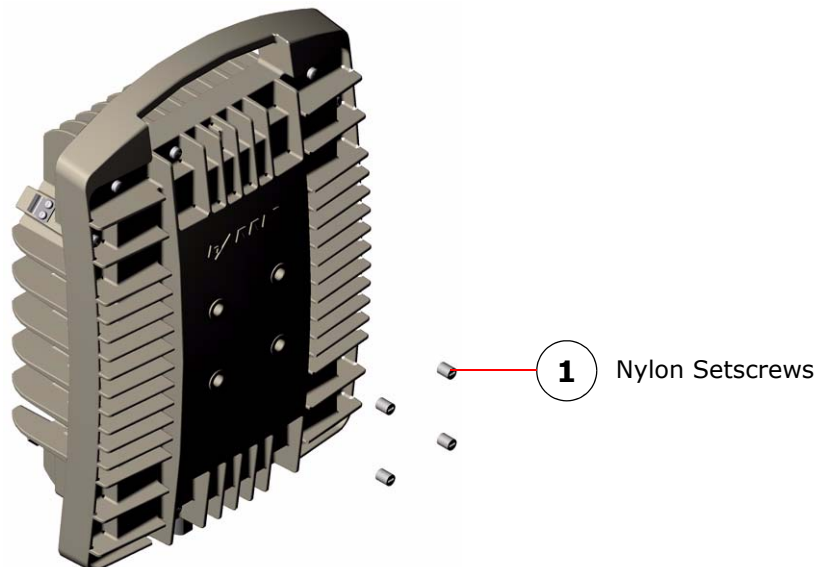
The specified TRuepoint® 5100 RFU operating temperature is guaranteed up to +55°C (131°F). Temperature rise associated with heat gain from direct sun rays can reach +15°C. In extremely hot regions where ambient temperatures of 40°C are common, the equivalent ambient operating temperature reported by the RFU under direct sun light may exceed the +55°C maximum rating. Where required, install the optional sunshield as shown in [Figure 3-7](#).

Tools and material required

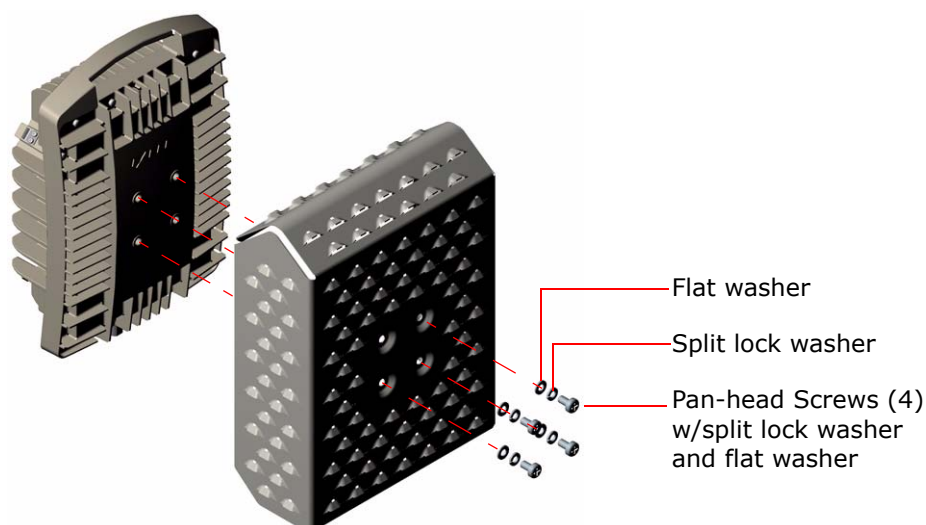
- Phillips-tip screwdriver
- Flat-tip screwdriver

1. Using the flat-tip screwdriver, unfasten the 4 [Nylon Setscrews](#), thus uncovering the screw holes on the RFU enclosure.

Figure 3-7: Installing the Optional Sunshield on the RFU



2. Place the sunshield over the RFU by aligning the 4 screw holes on the RFU with those of the sunshield.

Figure 3-8: Aligning the Sunshield on the RFU

3. Thread the [Pan-head Screws \(4\)](#) with their washers through the sunshield's through-holes and into the respective screw holes on the RFU.
4. Using the Phillips-tip screwdriver, fasten all 4 Pan-head screws, until they bottom, without overtightening.

Figure 3-9: Sunshield in Final Position

6 Install the coaxial cable from the RFU to the SPU

Tools and material required

- Adjustable wrench
 - Coaxial cable with connector
 - Tie-wraps or other means of supporting coaxial cable along run
 - Sealing kit (supplied with radio)
1. Following the instructions that come with the connector, install a connector on one end of the coaxial cable that is to go from the RFU to the SPU.
 2. Connect the connectorized end of the coaxial cable to the RFU, as shown is [Figure 3-10](#).

Figure 3-10: Connecting The Coaxial Cable to the RFU

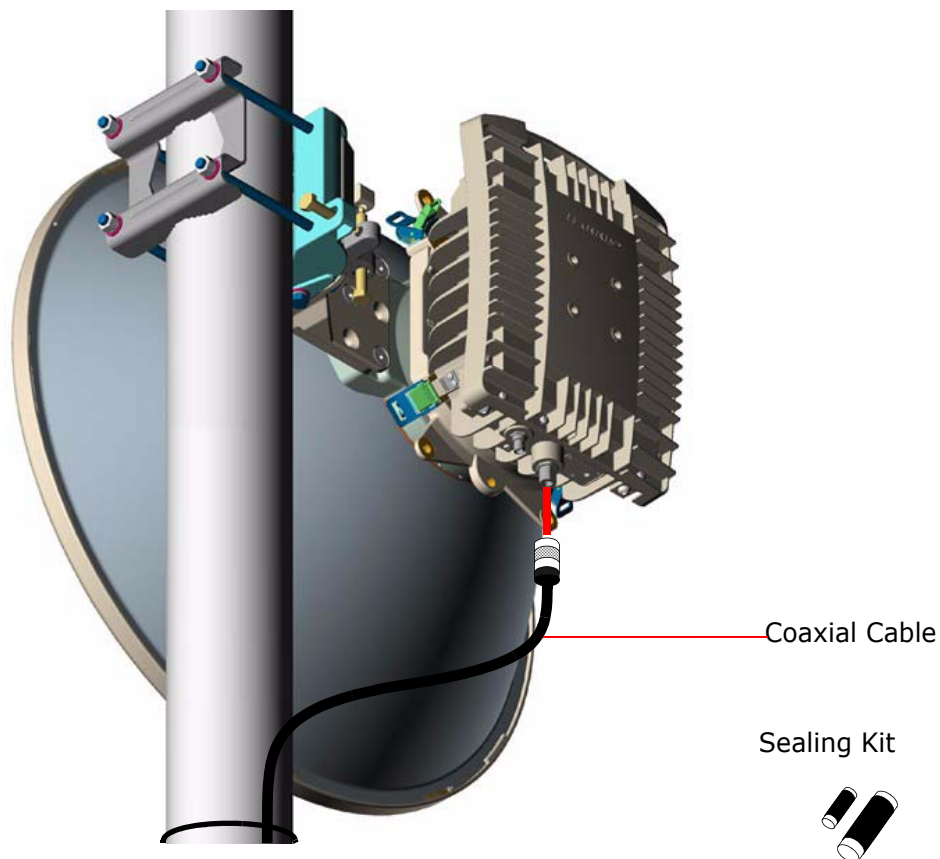
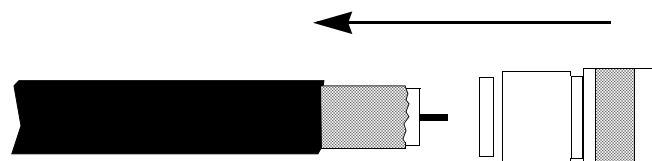
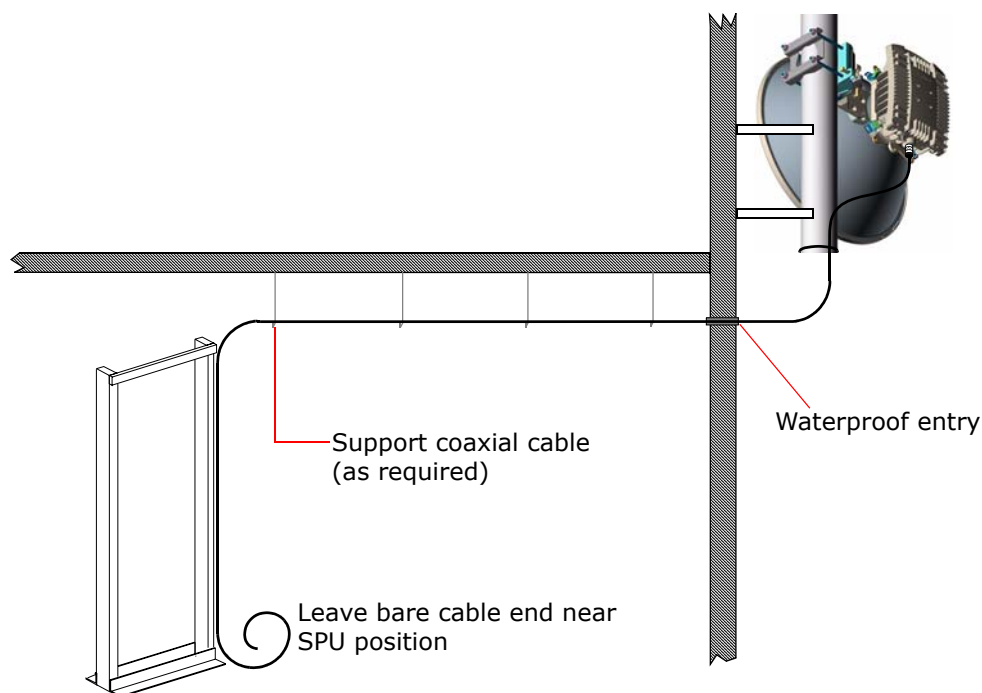


Figure 3-11: Installing the Connector on the Cable

Follow Manufacturer's Instructions

3. Following the instructions in the [Sealing Kit](#), waterproof the connection to the RFU.
4. Run the [Coaxial Cable](#) from the RFU to the SPU or the place where the SPU will be. Attach the coaxial cable to supports as required and bring it indoors through a waterproof entry.

Figure 3-12: Typical Cable Run

5. IF the SPU has already been installed, cut the cable to the correct length, install a connector and connect the coaxial cable to the SPU. Otherwise leave the bare end of the coaxial cable near the place where the SPU is to be installed.

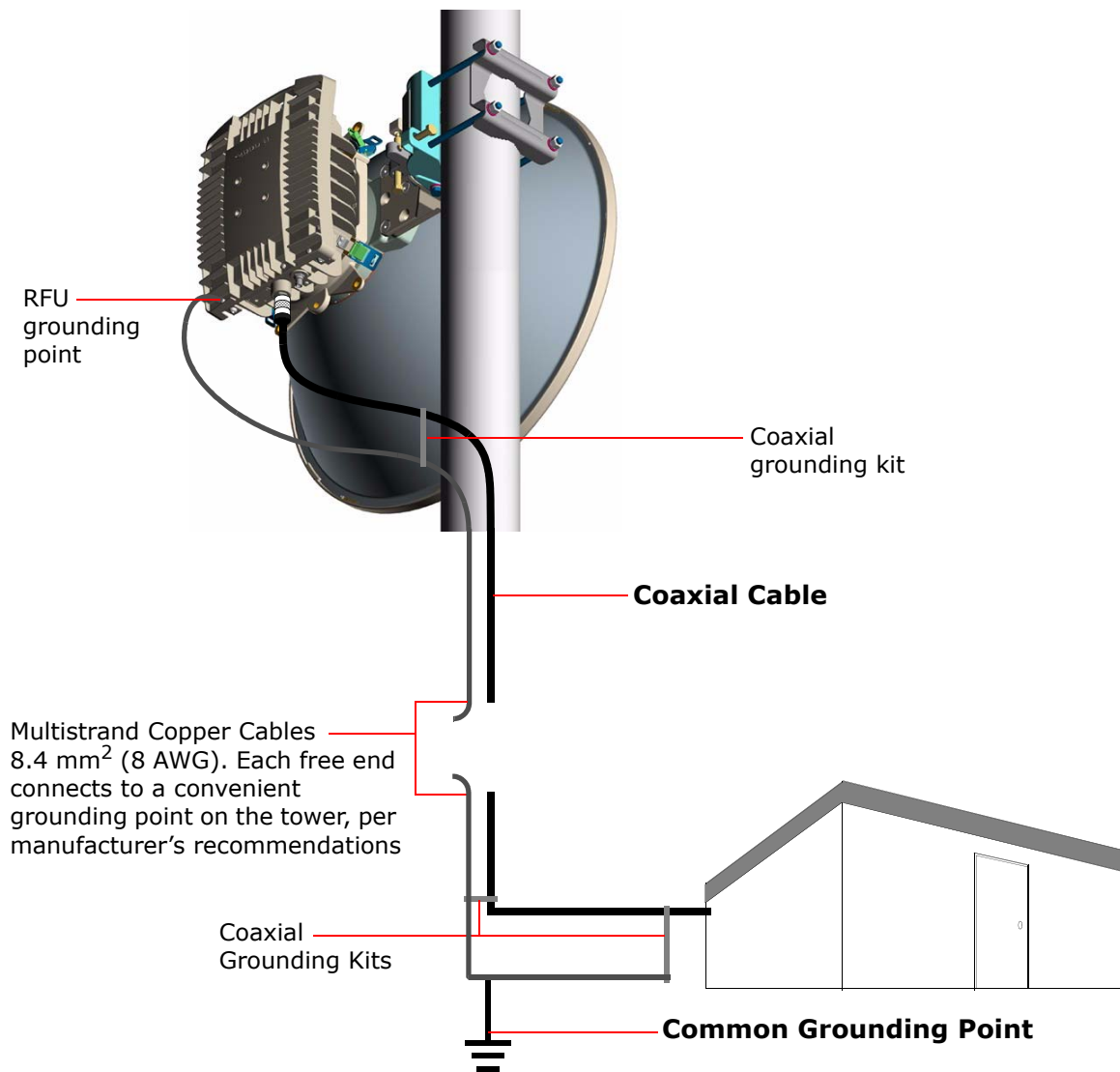
7 Ground the RFU and the Coaxial Cable

Tools and material required

- Common tools
- Three or more grounding kits (part # 099-099500-002)

1. Ground the RFU.
2. Following the instructions in the grounding kits, ground the coaxial cable at the RFU, the SPU and on the antenna side of any right angle turns.

Figure 3-13: Grounding the RFU and Coaxial Cable



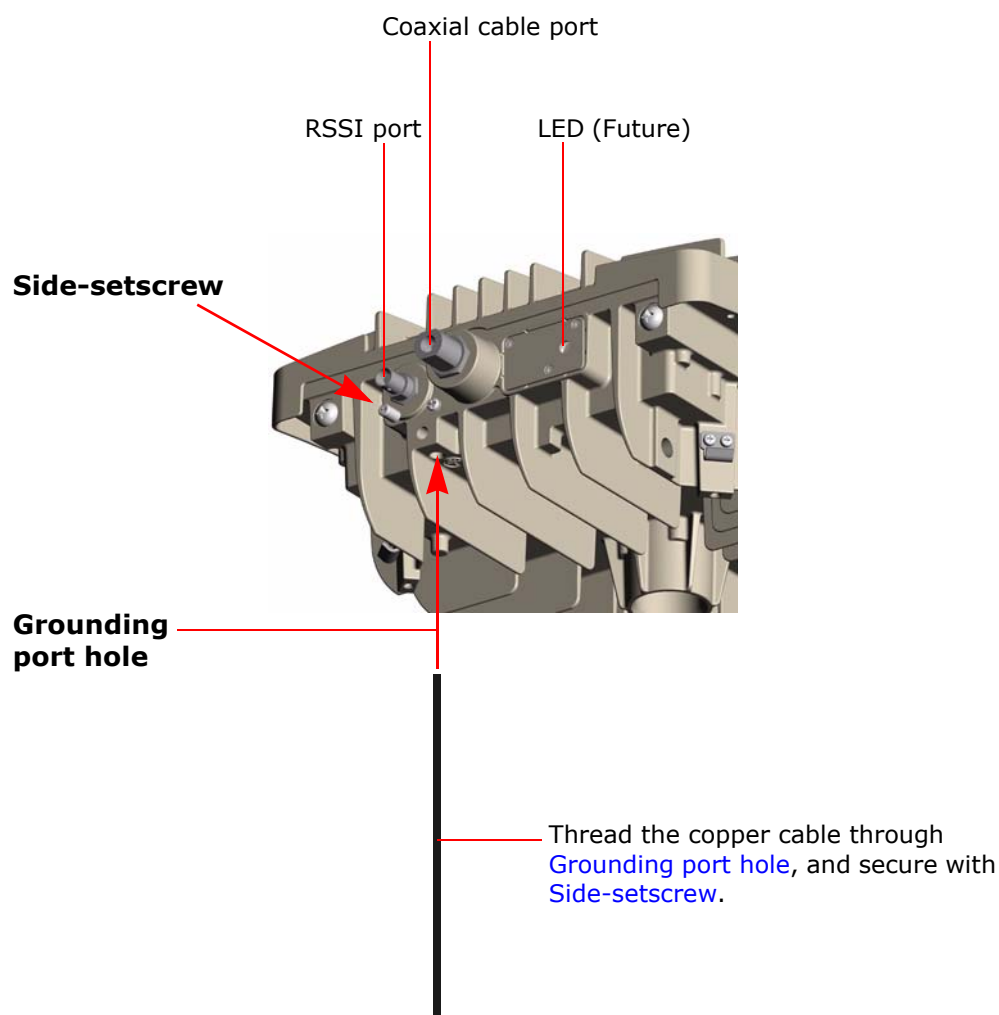
**Grounding Requirements:**

For a roof-top installation, connect to the building ground, or the water supply pipe where it enters the building.

For a tower installation connect to a good ring ground system made from buried copper cables and rods.

Do NOT connect to the electrical utility ground.

Figure 3-14: RFU Grounding Detail



Installing the RFU Outdoors — the Separate Mount

Tools and Parts required

- Refer to [Table 3-2](#), for the tools required for this installation
- Refer to [Figure 3-15](#), for the required Parts

Table 3-2: List of Tools Required for the Installation of the RFU

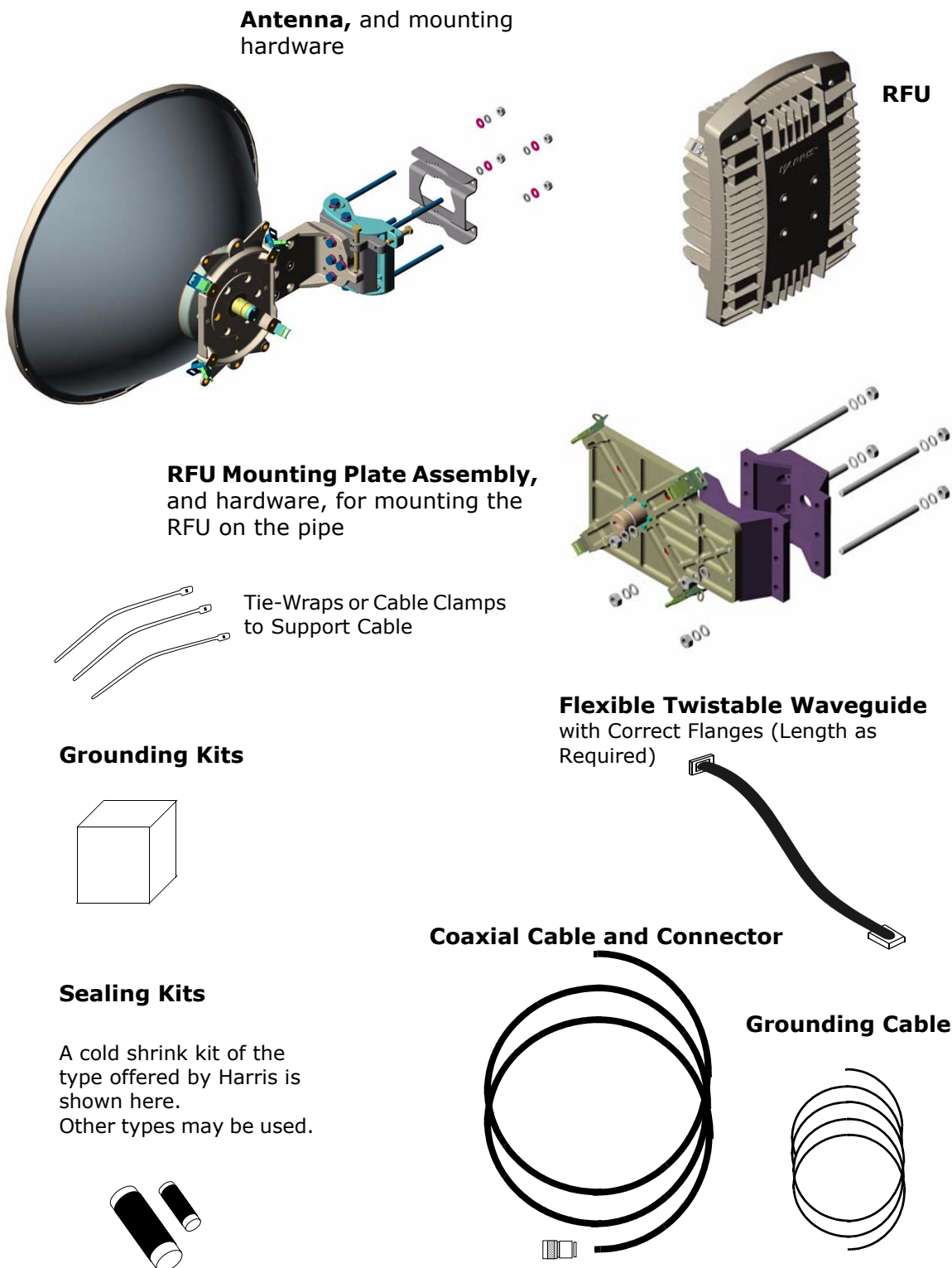
Tool	Required Equipment Specifications	Where Used
Miscellaneous tools for installing connectors on the SPU to RFU coaxial cable.	See the manufacturer documentation provided with the connector.	• Attach the mounting hardware to a pipe , on Page 3-19
Adjustable wrench	11/16" (18 mm) jaws	• Throughout
Ratchet with socket	11/16" (18 mm) socket	
Multimeter	Common	

Prerequisite installation steps:

- [Assemble the antenna](#), on [page 3-6](#)
- [Set the antenna polarization](#), (if applicable), on [page 3-7](#)
- [Mount the antenna to the mast](#), on [page 3-9](#)

Proceed with Procedure Step 4, for this RFU configuration

Figure 3-15: Parts required for the Separate Mount Installation, (See Chapter 6 for part numbers)



4 Attach the mounting hardware to a pipe

Tools and material required

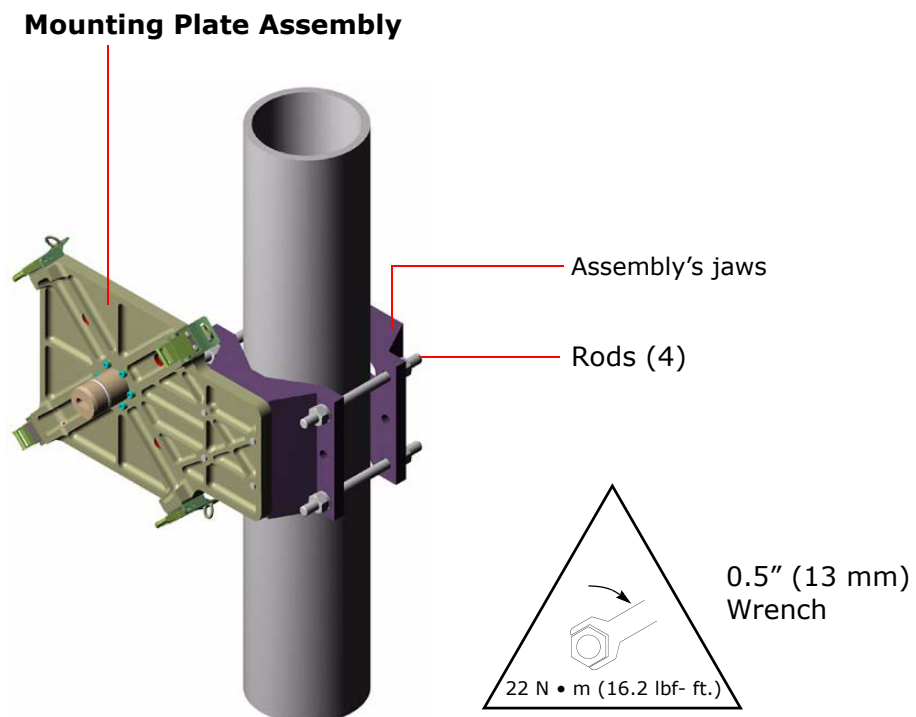
- An open-end 0.5" (13 mm) wrench



When selecting the position for the mounting hardware, remember that it must be connected to the antenna by the available waveguide.

1. Loosen the nuts on the rods to widen the opening between the 2 halves ([Assembly's jaws](#)) of the mounting plate assembly, and slide the assembly over the top of a pipe, if possible.
2. If you do not have access to the pipe's top, unscrew and remove the nuts and washers from the rods on **one half** of the assembly, separate the [Assembly's jaws](#), then mount the jaws on the pipe while aligning the rods through the corresponding holes on the other half of the assembly.
3. Ensure that the assembly is level, then secure the assembly to the pipe by tightening the nuts and washers on the rods, as shown in [Figure 3-16](#).

Figure 3-16: Installing the RFU-Mounting Plate Assembly



5 Mount the RFU on the mounting hardware

Tools and material required

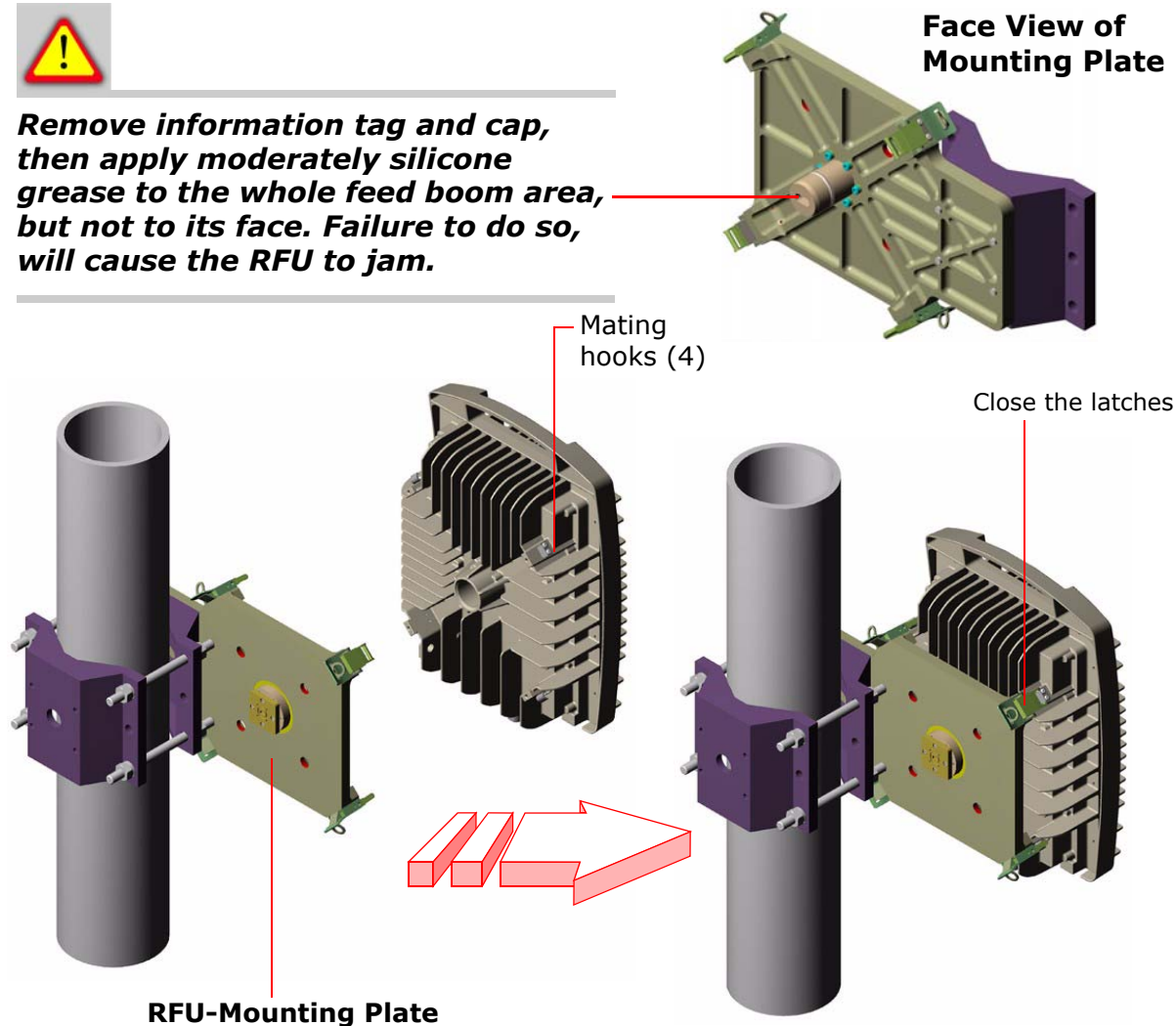
- Adjustable wrench

1. Making sure to leave the O-ring in place, remove the protective tape from the waveguide ports on the RFU and the [RFU-Mounting Plate](#).
2. Apply silicone grease, observing the Caution given in [Figure 3-17](#).
3. Place the RFU against the RFU-mounting plate so that the cylindrical feed fits into a corresponding cavity on the RFU.
4. Place the locking latches over the corresponding mating hooks, then [Close the latches](#) so that the RFU is locked to the [RFU-Mounting Plate](#).

Figure 3-17: Attaching the RFU to the Mounting Plate



Remove information tag and cap, then apply moderately silicone grease to the whole feed boom area, but not to its face. Failure to do so, will cause the RFU to jam.



6 Where applicable, install the optional sunshield

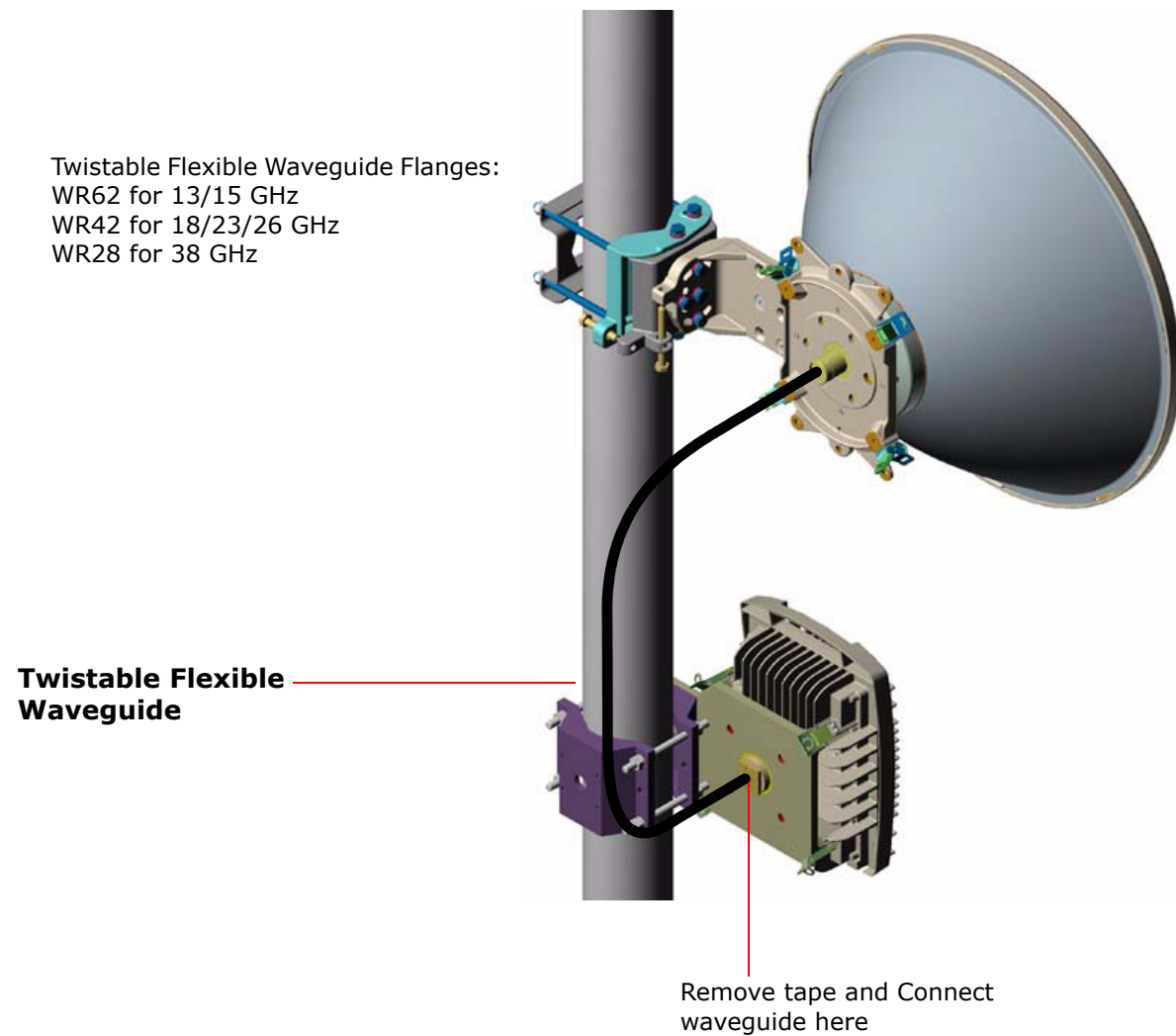


Refer to Step 5 on [page 3-11](#).

7 Connect the waveguide between the RFU and the antenna

Tools and material required

- Common tools
 - Tools listed in the manufacturer's instructions
1. Connect the flexible waveguide between the RFU-mounting assembly and the antenna.
 2. Be careful not to kink or dent the waveguide, and if you must support it, be sure that the material used does not compress it. The waveguide must be installed in such a way that it does not rub against hard objects in the wind.

Figure 3-18: Installing the Flexible Waveguide

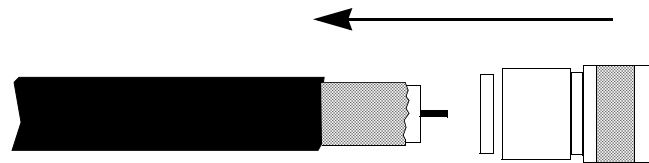
8 Install an “N” type connector on one end of the coaxial cable

Tools and material required

- Common tools
- Tools listed in the manufacturer’s instructions

Install a male “N” type connector on one end of the coaxial cable that is to connect the RFU to the SPU. Leave the other end bare at this time.

Figure 3-19: Installing the Connector on the Cable



FOLLOW MANUFACTURER'S INSTRUCTIONS

9 Install the coaxial cable

Tools and material required

- Adjustable wrench
- Coaxial cable with connector on one end (see [Figure 3-21](#) for cable types and lengths).
- Tie-wraps or other means of supporting coaxial cable along run
- Sealing kit

1. Connect the connectorized end of the coaxial cable to the RFU.
2. Following the instructions in the sealing kit, waterproof the connection to the RFU.
3. Run the coaxial cable from the RFU to the SPU or the place where the SPU will be. Attach the coaxial cable to supports as required and bring it indoors through a waterproof entry.

Figure 3-20: Typical Cable Run

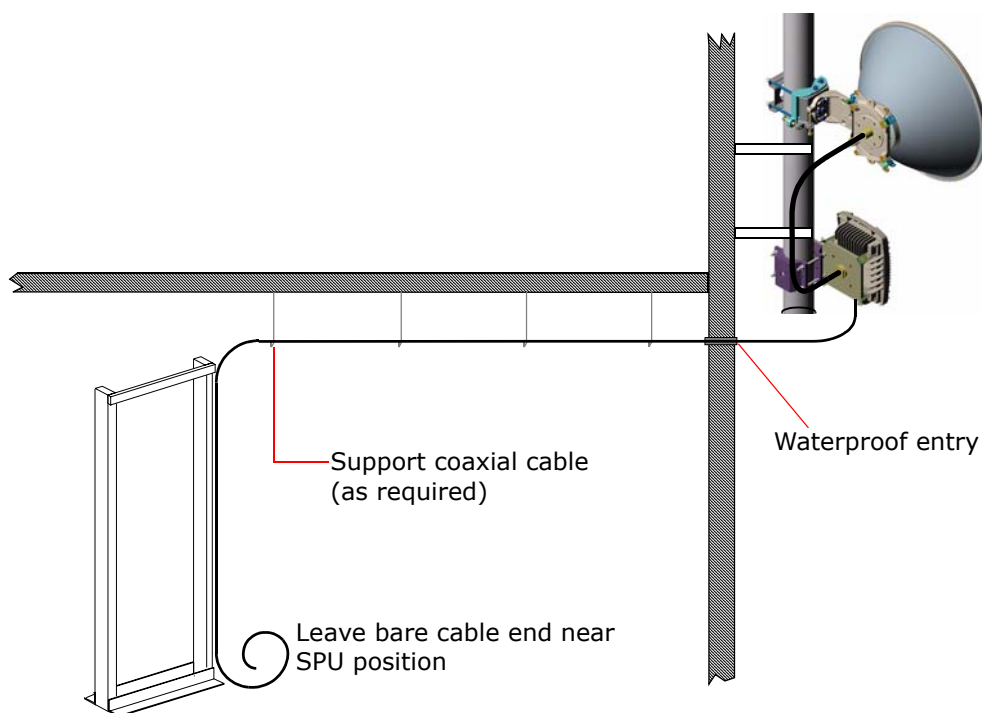
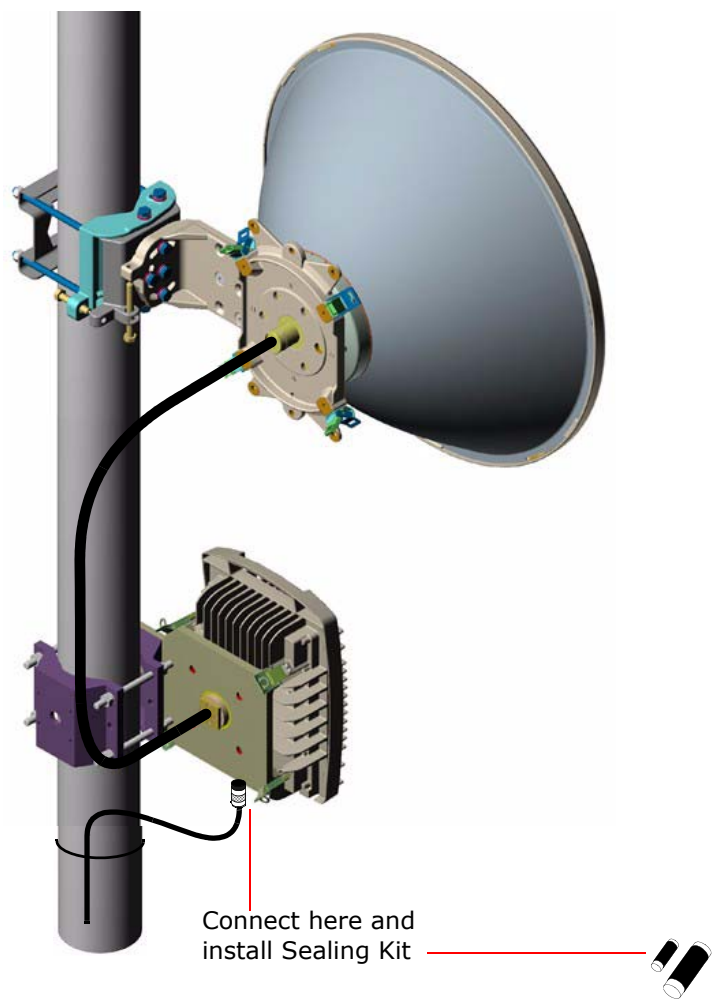


Figure 3-21: Connecting The Coaxial Cable to the RFU



INSTALLING THE
5100 RFU

Coaxial Cable Type

Part Number	Description	Comments
087-099499-XX0	Foam core 50 Ω heliax shielded cable (Andrews LDF2-50)	Cable only, XX0 = 210 m to 300 m in 10 m increments
099-901208-001	45 m	Kit contains low loss RG 8/U cable, sealing kit, 2 N-type connectors, and 3 grounding kits.
099-901208-002	Low loss 50 Ω 90 m	
099-901208-003	RG 8/U kit 150 m	
099-901208-004	210 m	

10 Ground the RFU and the coaxial cable

Tools and material required

- Common tools
- Three or more grounding kits

1. Ground the RFU.
2. Following the instructions in the grounding kits, ground the coaxial cable at the RFU, the SPU and on the antenna side of any right angle turns.

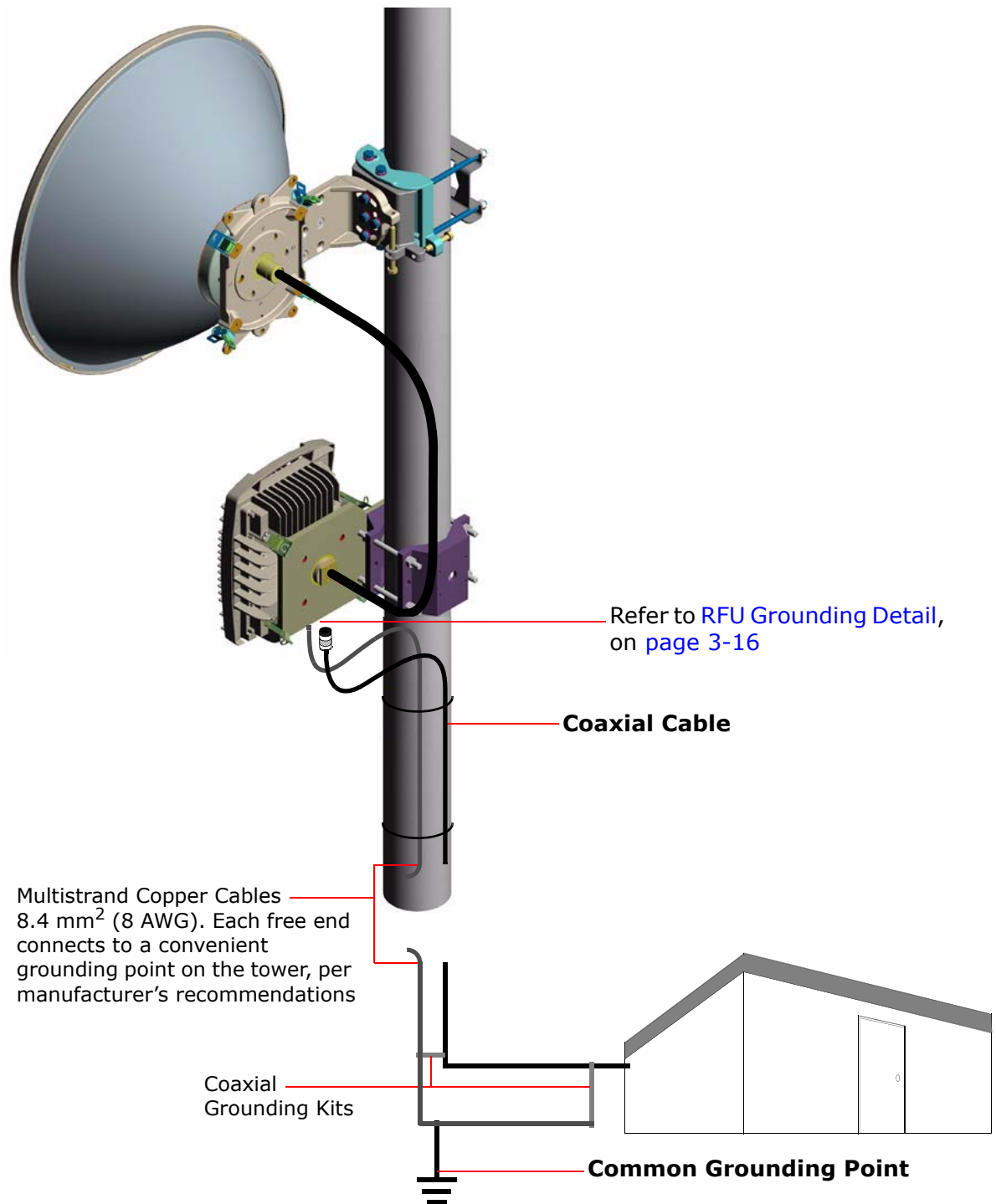


Grounding Requirements:

For a roof-top installation, connect to the building ground, or the water supply pipe where it enters the building.

For a tower installation connect to a good ring ground system made from buried copper cables and rods.

Do NOT connect to the electrical utility ground.

Figure 3-22: Grounding the RFU and Coaxial Cable

Installing the RFU Indoors — the Rack Mount

Before starting, check that you have the material and tools required. The parts are shown in [Figure 3-23](#). The tools are listed in [Table 3-3](#).

Material required

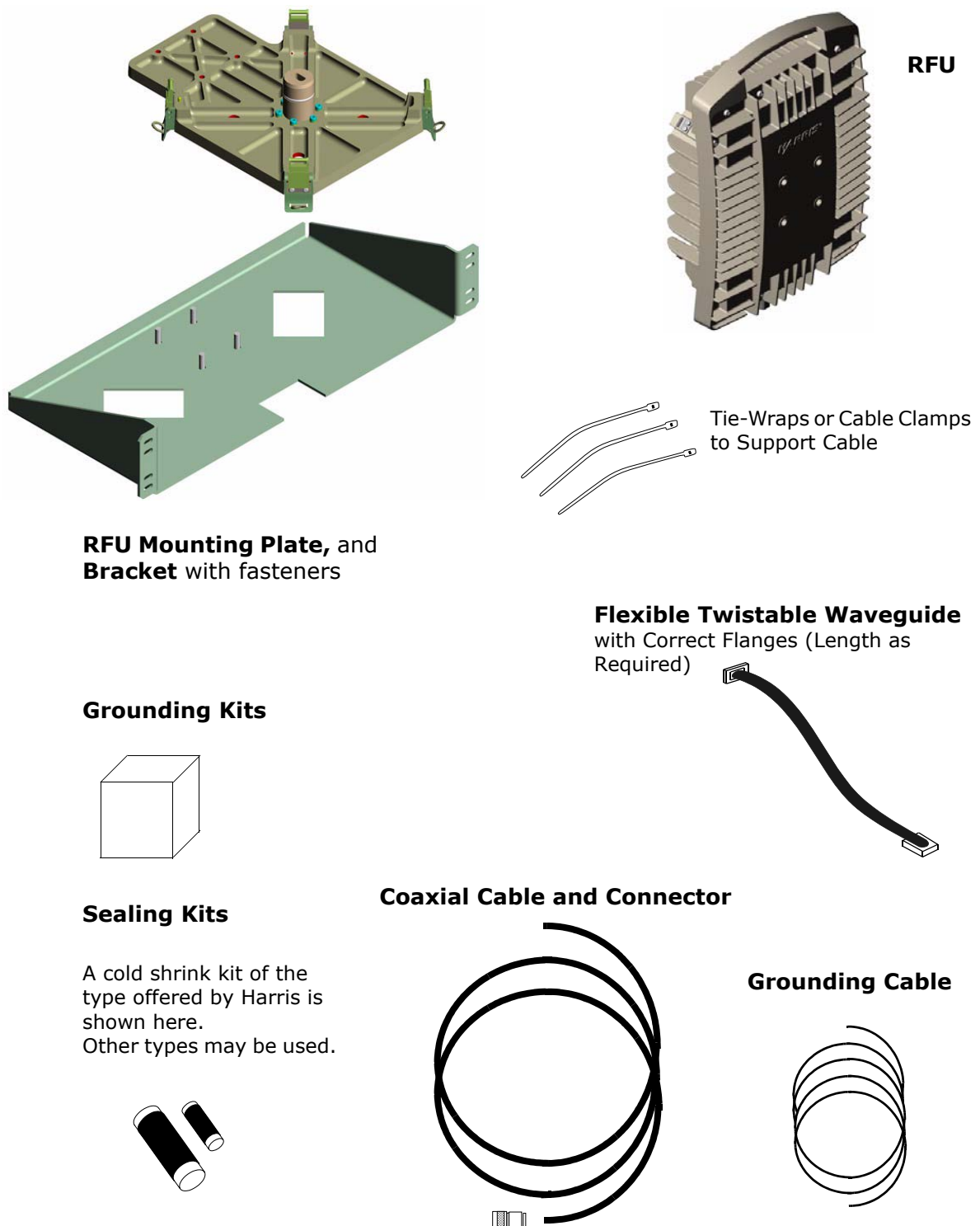
- RFU indoor mounting bracket kit for TRuepoint® 13 to 38 GHz, in a 19 inch rack

Refer to Chapter 6 for Part Numbers.

Table 3-3: Tools Required for Installing the RFU

Tool	Where Used
Phillips-head screwdriver	• Install the RFU Rack-mounting Bracket , on Page 3-30
Allen key for M6 socket-head screws	• Install the Mounting Plate , on Page 3-31

Figure 3-23: Parts for the Detachable RFU Indoor Installation
(on a 19-inch rack)



1 Install the RFU Rack-mounting Bracket

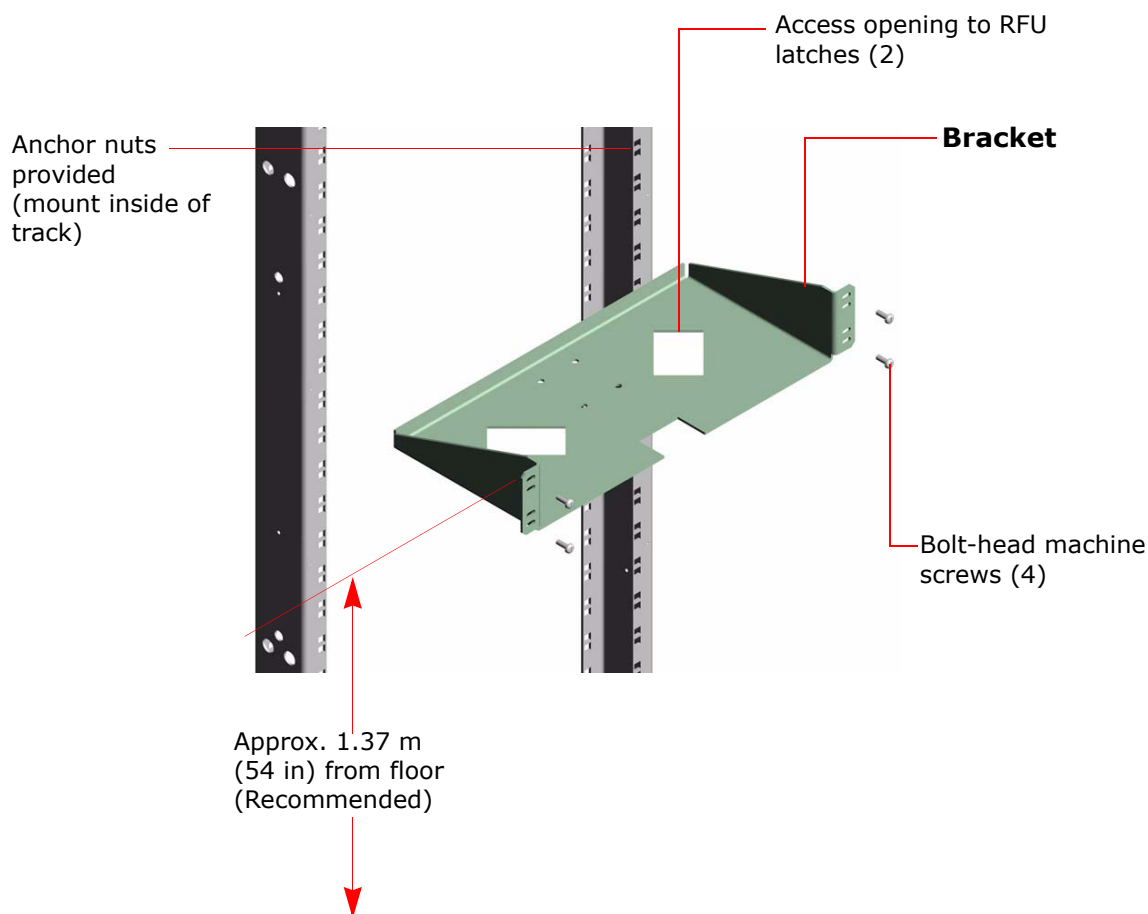
1. Determine the desired mounting height of the RFU bracket, 1.37 m (54 in) from floor recommended per [Figure 3-24](#).



If you are installing the RFU under other equipment, be sure to leave enough space above so that the RFU can be installed and removed.

2. Place the provided anchor nuts (to receive the bolt-head machine screws) behind the bracket mounting holes in the rack.
3. Using the provided bolt-head machine screws, attach the RFU rack-mounting bracket to the rack.

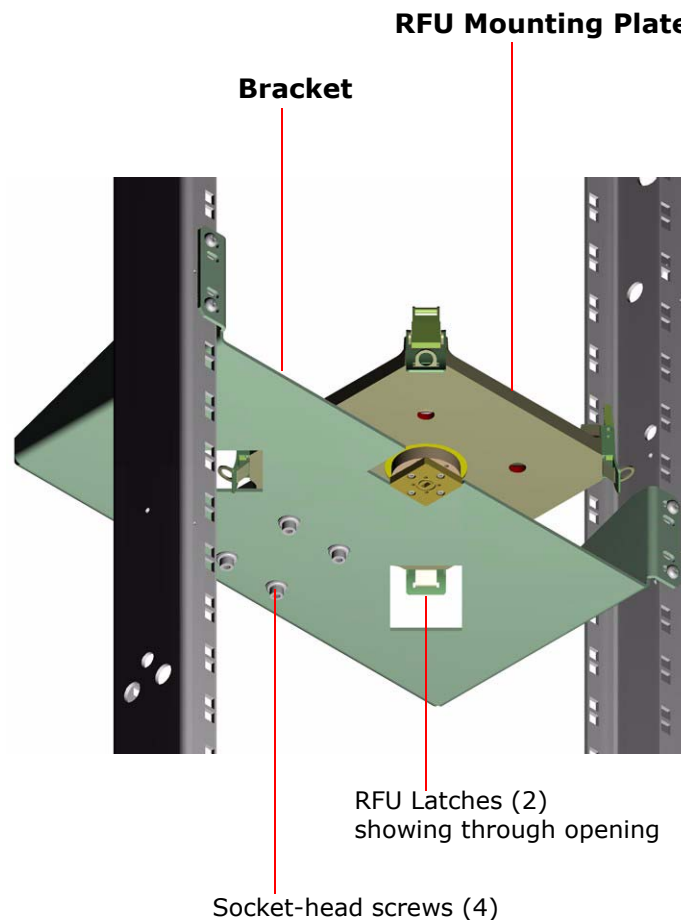
Figure 3-24: Mounting the RFU Bracket



2 Install the Mounting Plate

1. Align the screw holes of the mounting plate over those of the rack-mounting bracket. (See [Figure 3-25](#)).
2. Secure the mounting plate to the bracket by fastening the four socket-head screws provided into the threaded holes of the plate (from underneath the bracket).
3. Ensure that you can freely grasp the 2 RFU latches through the corresponding access openings in the bracket.

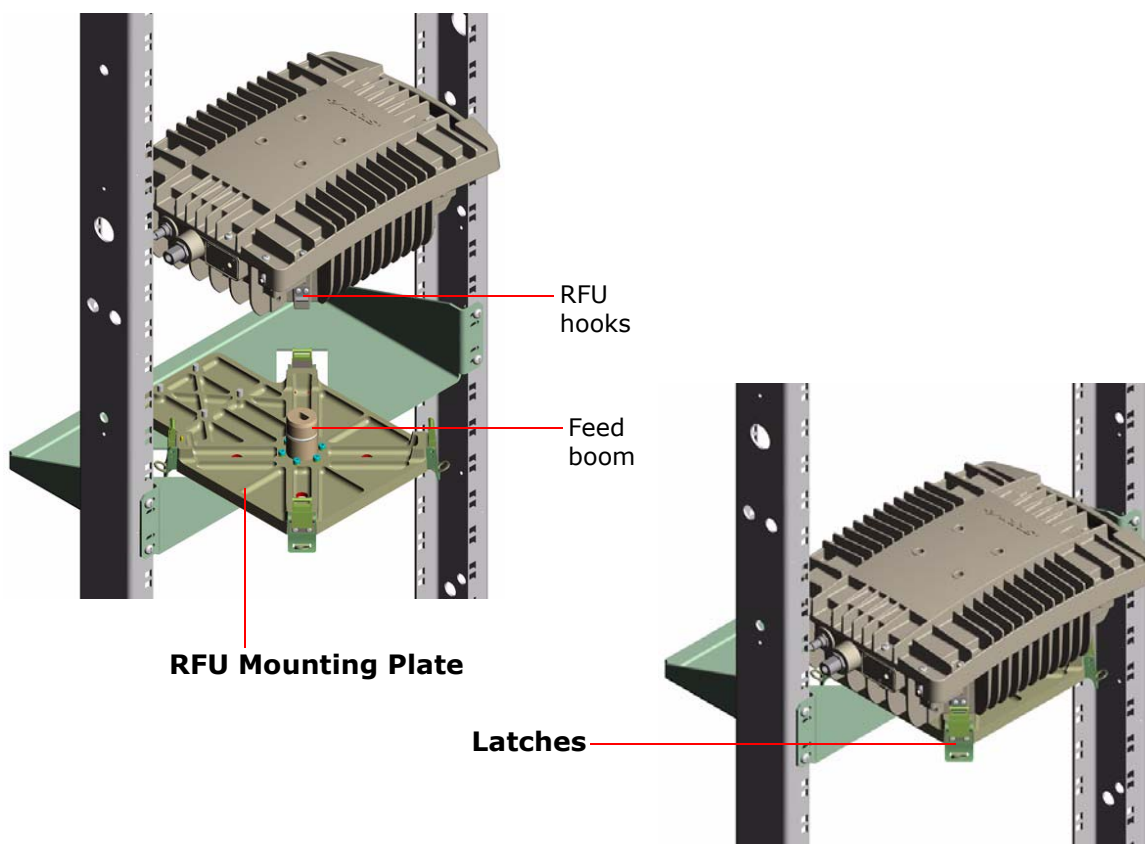
Figure 3-25: Attaching Mounting Plate to Bracket



3 Attach the RFU to the Mounting Plate

1. Apply the silicone grease to the **Feed boom**, observing the caution given below.
2. Place the RFU over the feed boom in such a way that the feed is well seated in the RFU's antenna cavity and that the 4 **RFU hooks** are opposite the 4 latches. (Refer to **Figure 3-26**).
3. Latch the RFU to the **RFU Mounting Plate**, (4 latches).

Figure 3-26: Attaching the RFU to the Mounting Plate



Remove information tag and cap, then apply moderately silicone grease to the whole feed boom area, but not to its face, as shown in the red information tag's Figure. Failure to do so, will cause the RFU to jam.

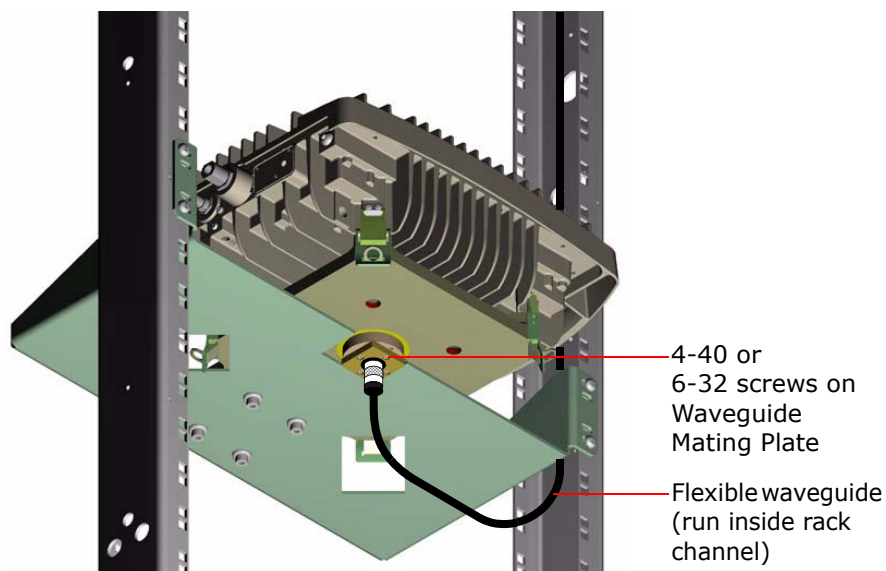
4 Connect the flexible waveguide to the RFU

Tools and material required

- Common Tools
- Enough rigid or helical waveguide to go from the rack to the antenna
- A piece of flexible twistable waveguide
- A pressure unit or pressure inlet
- Other waveguide accessories (supports, waterproof entry, etc.) as required

1. Connect the end of a length of flexible waveguide to its mating plate using 4 screws, as shown in [Figure 3-27](#).
2. Run the flexible waveguide along the inside of the rack channel.

Figure 3-27: Connecting the Flexible Waveguide to the RFU



Waveguide Data

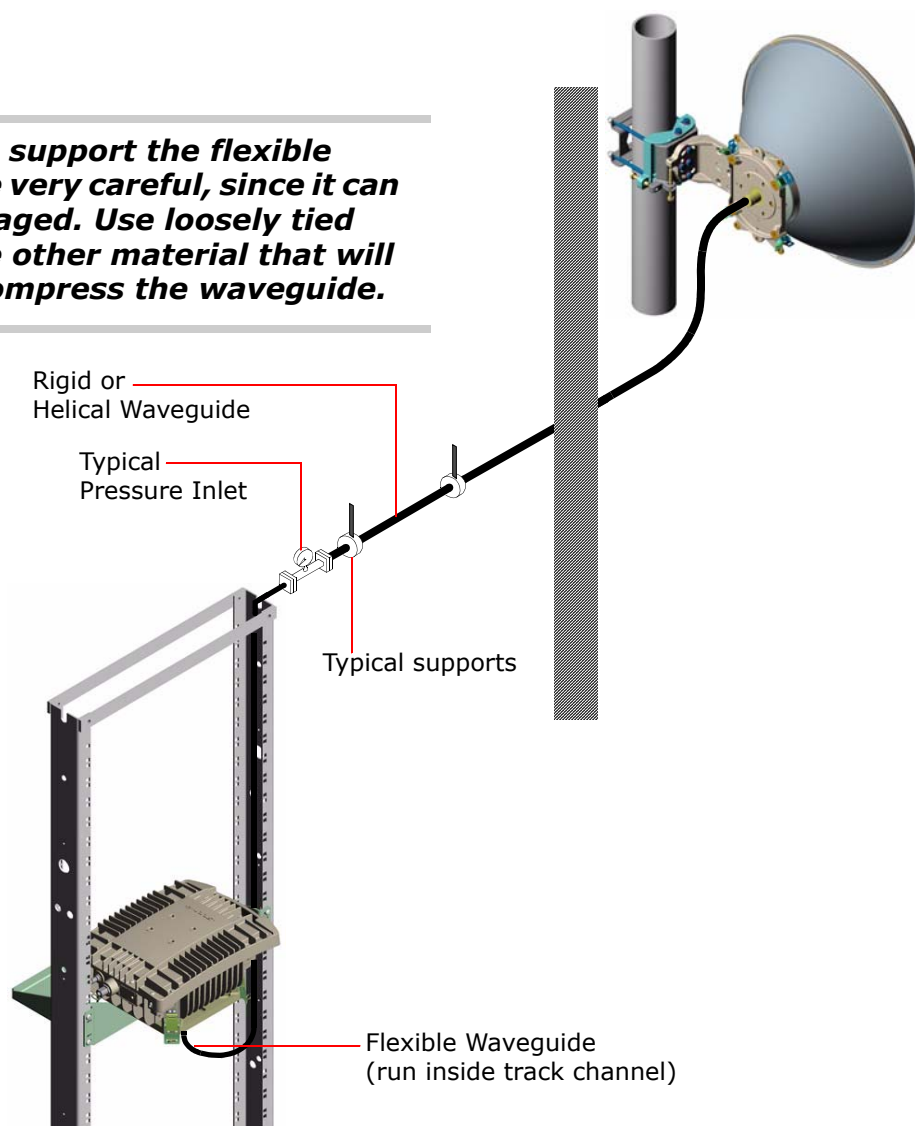
Band, GHz	Waveguide	Tapped for
13 and 15	WR62 / UG-419U	6-32 screws
18 and 23	WR42 / UG-595U	
38	WR28 / WR22 / UG-599U	4-40 screws

3. Run rigid or helical waveguide from the antenna to a point above the rack. Support and ground the waveguide as required. We recommend that you pressurize the waveguide with dry air as well. (See [Figure 3-28](#)).
4. Connect the waveguide port to the rigid wave guide with a length of flexible twistable waveguide. If possible, do **NOT** support the flexible twistable waveguide, otherwise, observe the caution given below.

Figure 3-28: Waveguide Installation



If you need to support the flexible waveguide, be very careful, since it can be easily damaged. Use loosely tied twine or some other material that will not bend or compress the waveguide.



5. If the SPU has already been installed connect the RFU to the SPU with a short length of coaxial cable. (Refer to [Figure 3-10](#) for details).
6. Ground the RFU by running a separate grounding wire from the RFU to the site's main ground point. Do not use the same grounding wire as the SPU's. (Refer to [Figure 3-14](#) for details).

INSTALLING THE 5200 RFU

General

Site Requirements

Before starting this procedure, a pipe must be installed on a rooftop or a tower. The pipe diameter must be 115 mm (4.5 in.). A waterproof entry to the SPU shelter and a good grounding point must also be available.

The TRuepoint® RFU 5200 installs in one of three mounting configurations as follows.

Installation Types

This chapter describes the following installation procedures:

- Installing the RFU Outdoors — the Separate Mount..... 4-2
 - RFU mounted on a pole and **separated** from a pole-mounted antenna¹
- Installing the RFU Outdoors — the Detachable Mount..... 4-11
 - RFU directly **attached** to a pole-mounted antenna.
- Installing the RFU Indoors 4-21
 - RFU mounted **indoors** on a special bracket attached to a 19-inch rack.

1. Antenna sizes can be 1, 2, 2.5 and 4 ft. diameter, according to frequency requirements.

Installing the RFU Outdoors — the Separate Mount



Pole-mounted antennas for this **RFU Separate Mount** are typical and supplied **by others**. If you are installing a TRuepoint™ system with space diversity protection, you need to install two RFUs for each SPU, as shown in [Figure 4-2](#). To do so, repeat the steps given here for each RFU.

Before starting, check that you have the parts and tools required. the parts are shown in [Figure 4-1](#). The tools are listed in [Table 4-1](#).

Table 4-1: Tools and Equipment required for the Installation

Tool	Required Equipment Specifications	Where Used
Miscellaneous tools for installing connectors on the SPU to RFU coaxial cable.	See the manufacturer documentation provided with the connector.	• Install the RFU-to-SPU coaxial cable, page 4-15
Adjustable wrench	11/16" (18 mm) jaws	Throughout
Ratchet with socket	11/16" (18 mm) socket	
Rope and hook with safety latch	Common	Figure 4-5
Multimeter	Common	• Install the RFU-to-SPU coaxial cable, page 4-15



Although this step does not require opening the RFU enclosure, should you ever need to do so, ensure wearing an ESD wrist strap that is attached to a convenient grounding point on the RFU enclosure, before touching any internal component.

Figure 4-1: Parts for a Pole-mounted RFU Installation:
Refer to [Chapter 7](#) for part numbers.

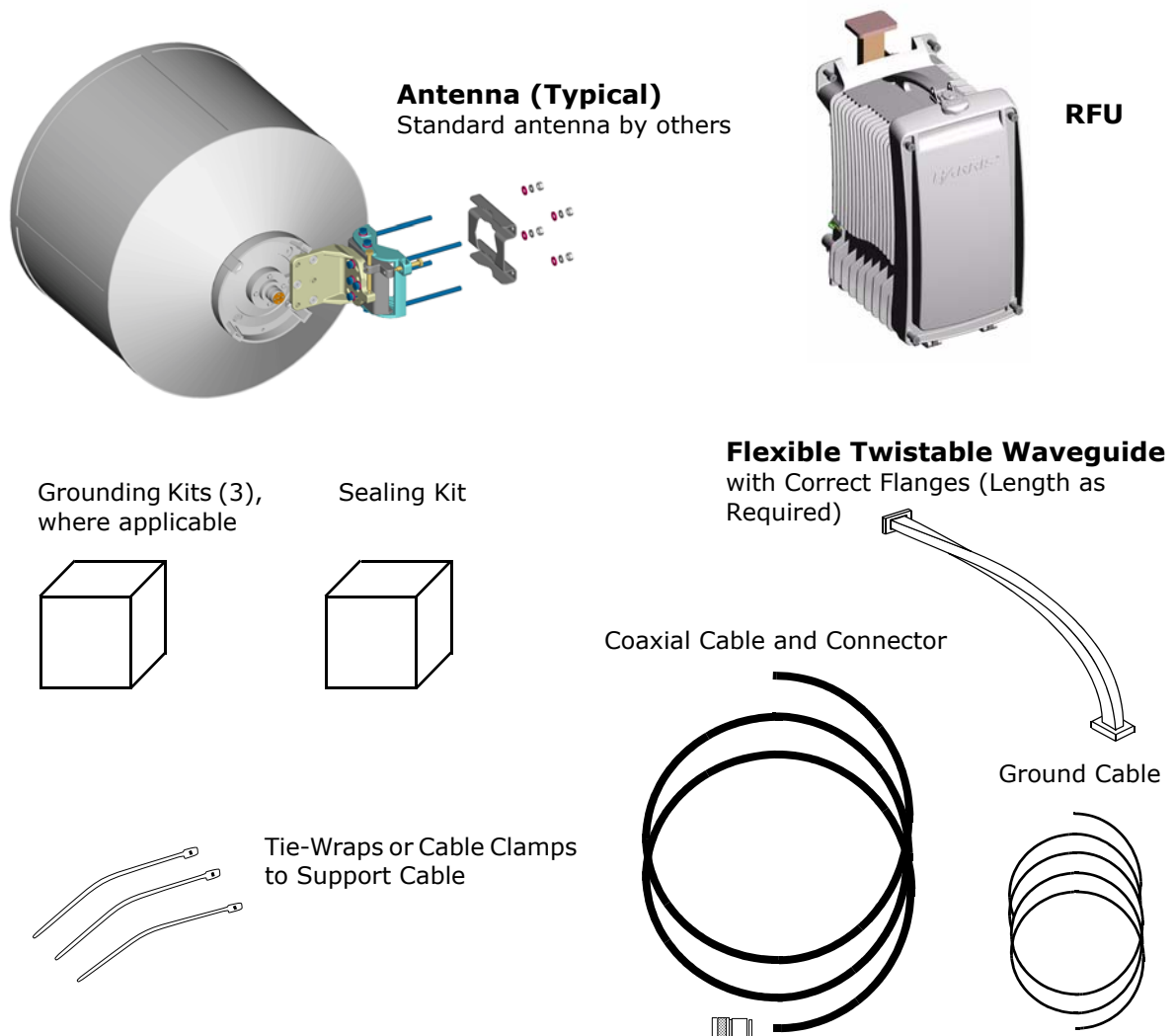
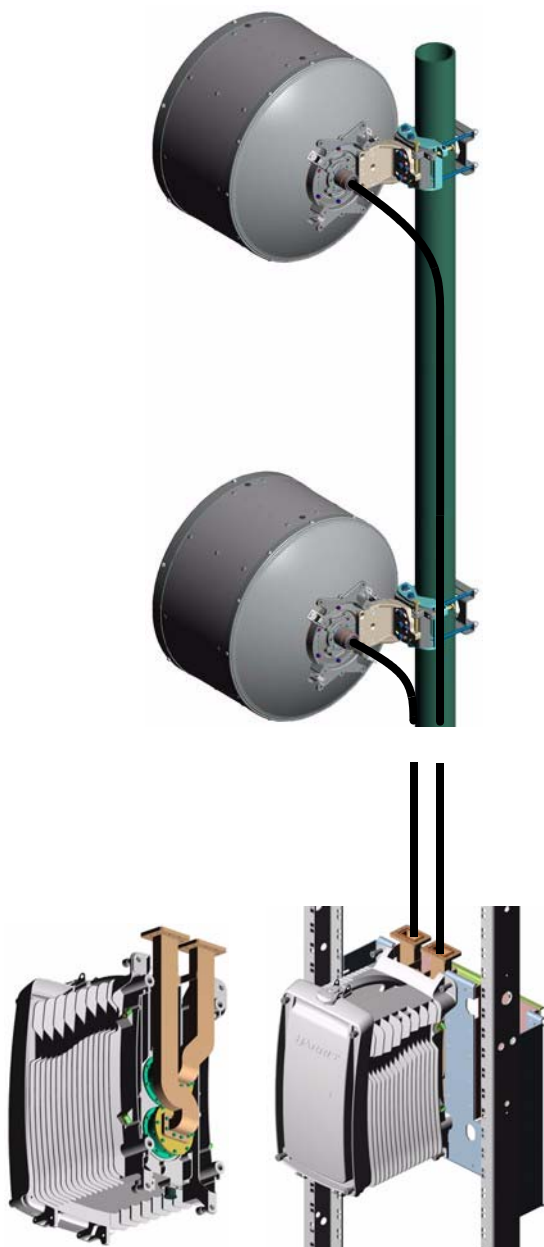


Figure 4-2: Space Diversity Configurations. *A space diversity terminal requires two antennas. It also requires two RFUs if the RFUs are mounted near or on the antennas. If the RFU is mounted in a rack or a cabinet, the installer must connect pressurized waveguide from two transceivers in a single RFU to the two antennas.*

RFU Mounted in Rack/Cabinet



RFUs Mounted on Pole



All pole-mounted antennas shown are typical and supplied by others. Antenna illustrations may differ from actual equipment.

1 Install the antenna

Tools and material required

- Refer to the antenna manufacturer's installation instructions



Follow the instructions of the antenna manufacturer that are enclosed with the antenna for the exact details of how to assemble, install, and align the antenna. Illustrations shown here of the antenna assembly are for reference only and are intended to simply show the order in which the antenna and the RFU are assembled.

1. When mounting the antenna, point it as closely as possible at the coordinating site.
If you cannot see the coordinating site, use a compass and map to roughly align the antenna. A more precise alignment will be done later under heading ***Fine align the antenna***, in the **SPU Installation** manual, IMN-903002-Exx.
2. While the antenna is on the ground, set the antenna for horizontal or vertical polarization according to the transmission engineering requirements of the hop. Follow the antenna manufacturer's instructions.

2 Install the optional sunshield



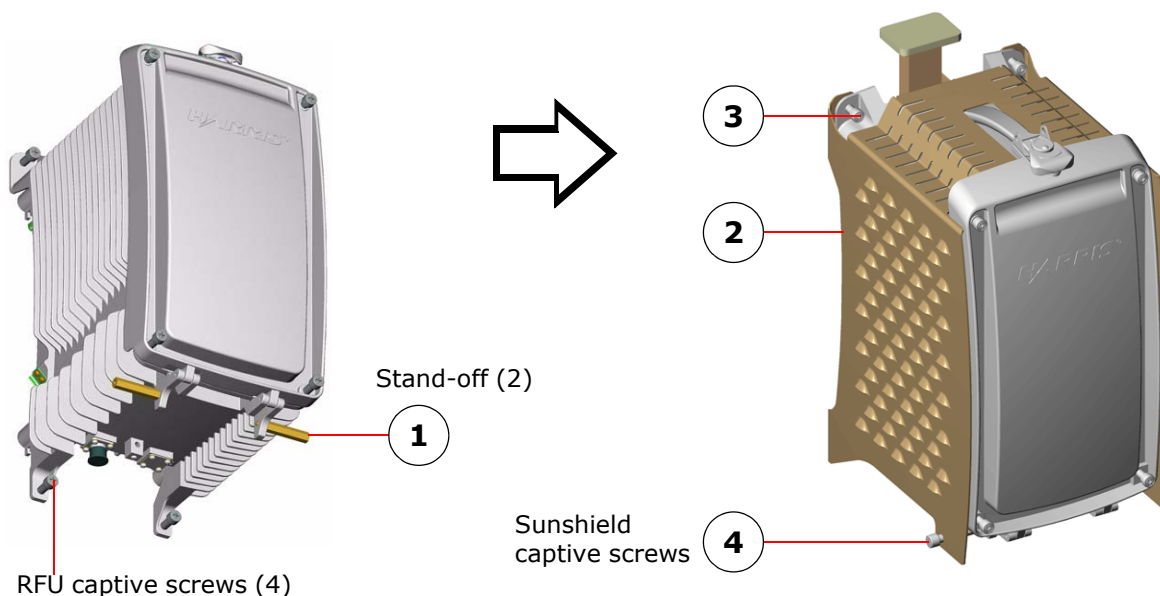
The specified TRuepoint® 5200 RFU operating temperature is guaranteed up to +55°C (131°F). Temperature rise associated with heat gain from direct sun rays can reach +15°C. In extremely hot regions where ambient temperatures of 40°C are common, the equivalent ambient operating temperature reported by the RFU under direct sun light may exceed the +55°C maximum rating. Where required, install the optional sunshield as shown in [Figure 4-3](#).

Tools and material required

- screwdriver

1. Tighten the two stand-offs (from kit P/N: 098-902581-001) into the tabs located at the bottom of the RFU.
2. Wrap the sunshield around the RFU, as shown in the [Figure 4-3](#).
3. Attach the RFU to the sunshield with the captive screws located at the top and bottom backside of the RFU.
4. Tighten the captive screws located at the bottom of the sunshield to the stand-offs installed in Step 1 above.

Figure 4-3: Installing the Optional Sunshield on the RFU



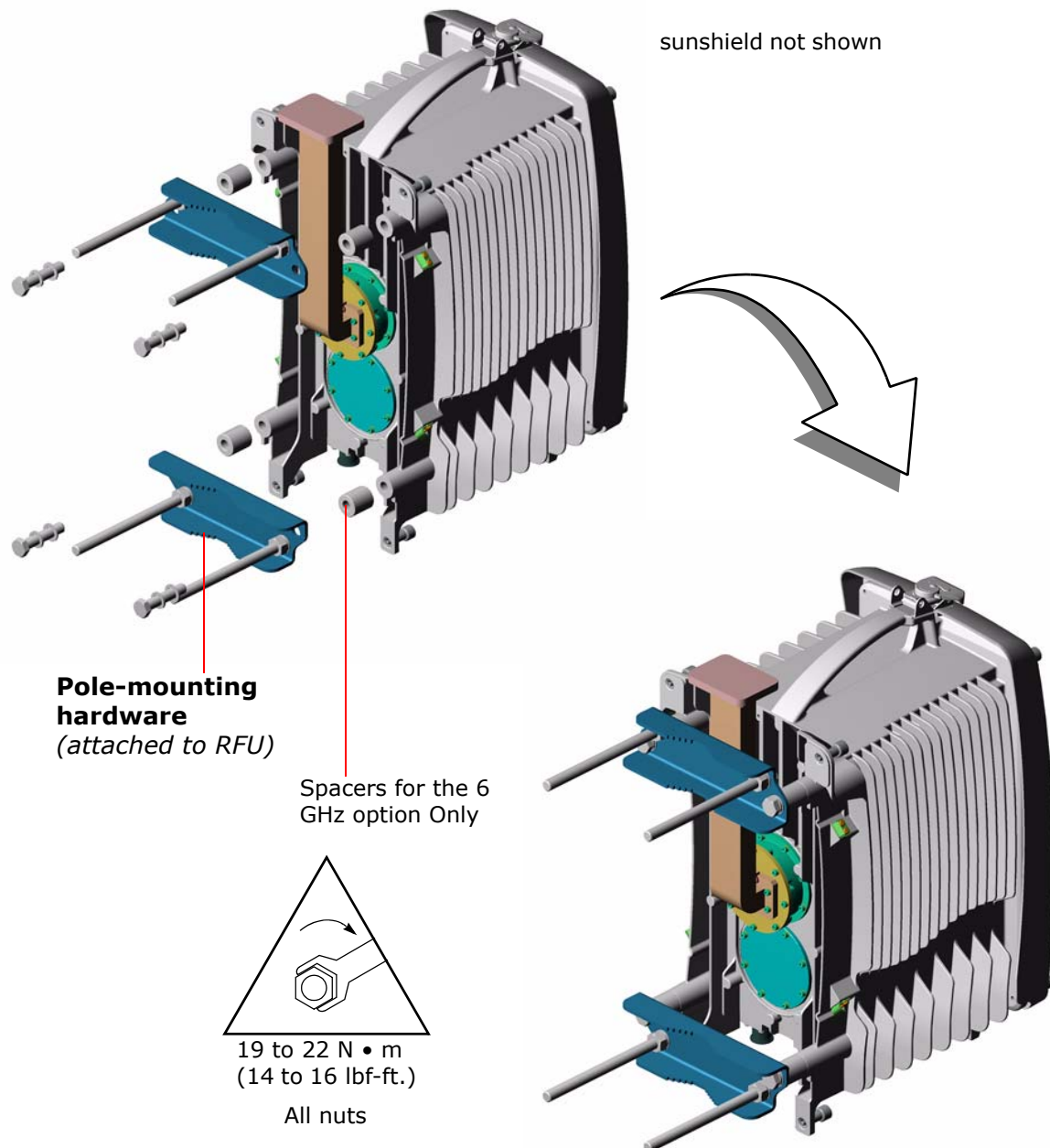
3 Install the RFU mounting hardware

Tools and material required

- Adjustable wrench
- Pole-mounting kit P/N 098-903035-001, for 6 GHz only; or
- Pole-mounting kit P/N 098-903035-002, for 7 to 23 GHz

Install the mounting hardware on the RFU as shown in [Figure 4-4](#).

Figure 4-4: Installing the RFU Mounting Hardware



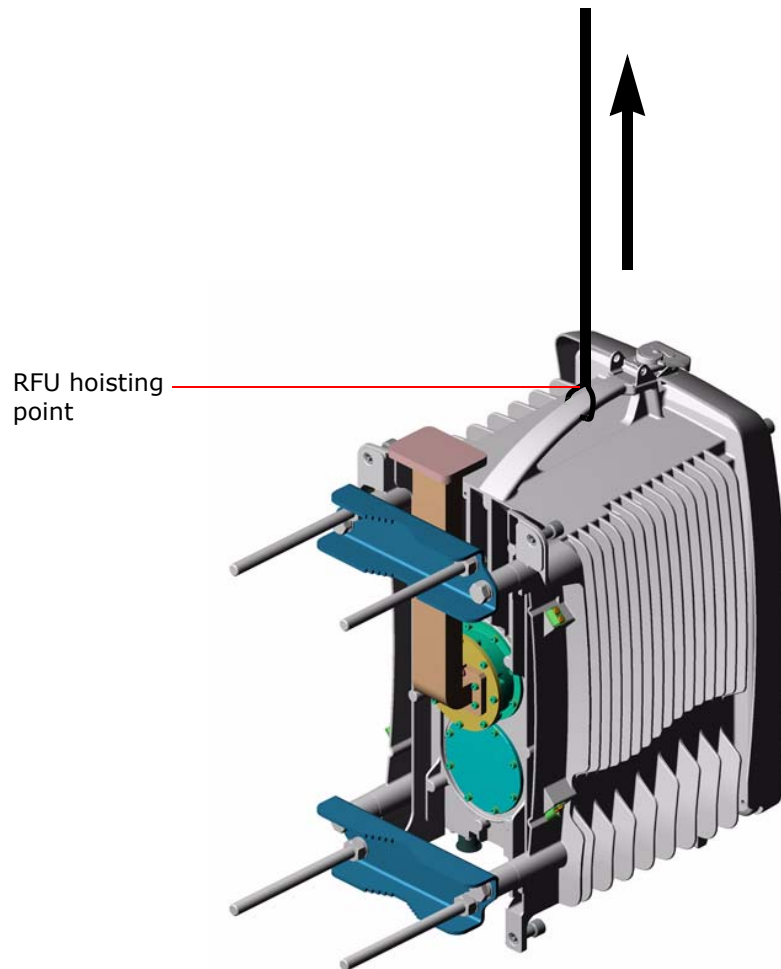
4 Hoist the RFU to the antenna

Tools and material required

- Rope with safety hook

Attach a strong rope to the hoist point shown in [Figure 4-5](#), and hoist the RFU up the mast.

Figure 4-5: Hoisting the RFU up to the Antenna



5 Attach the RFU to the antenna mast

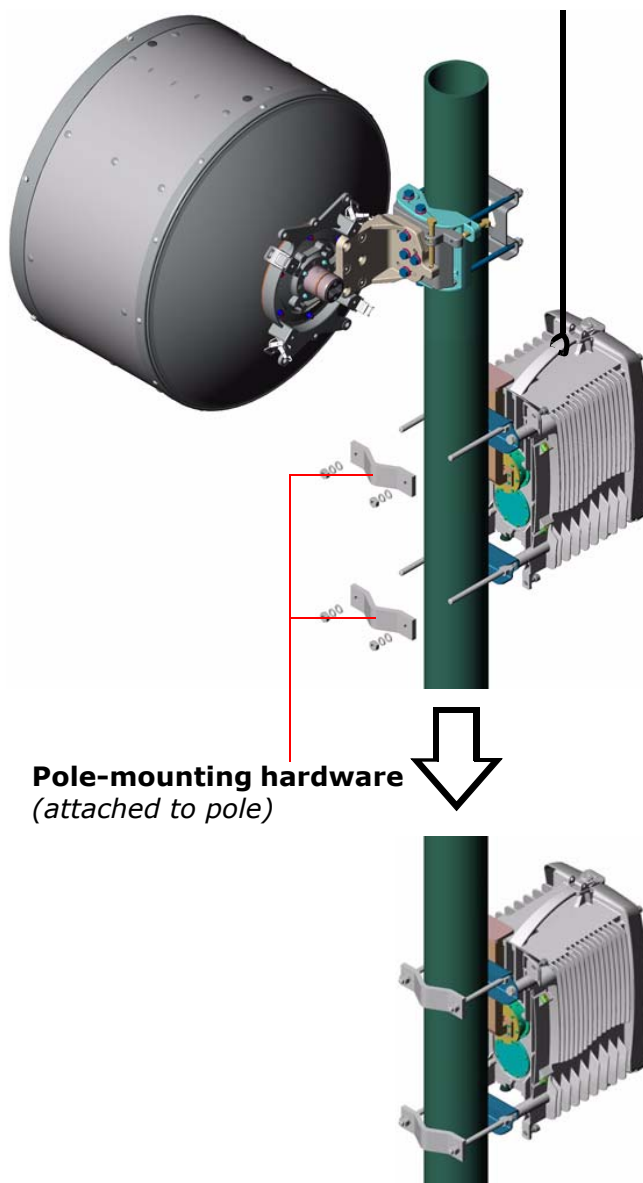


This step applies **only** to the **RFU Separate Mount**, (RFU separated from the antenna).

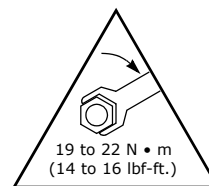
Tools and material required

- 2 adjustable wrenches

Figure 4-6: Attaching the RFU to the Mast



Remove the rope **Only** after securing the RFU to the pole.



All nuts

6 Connect the flexible waveguide, RFU to antenna

Tools and material required

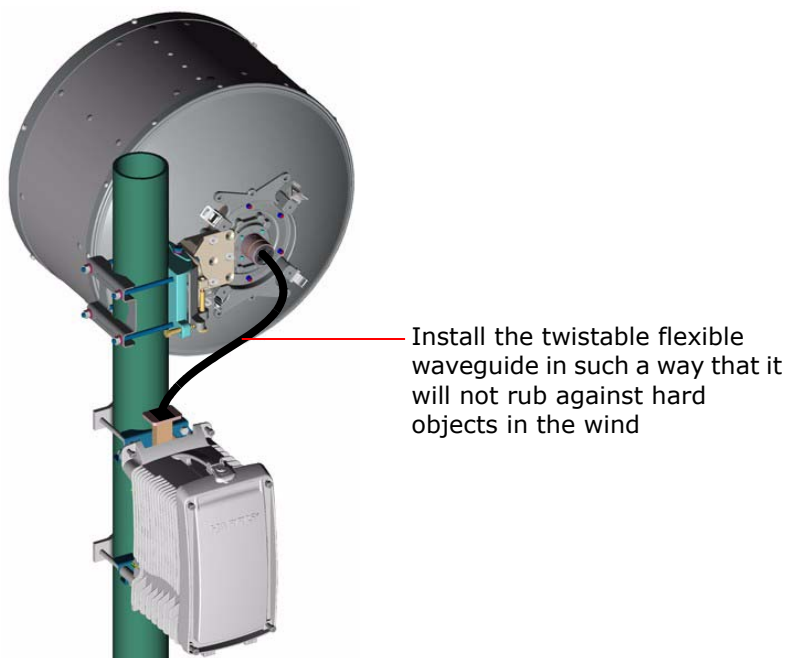
- 2 adjustable wrenches

Use a length of twistable-flexible waveguide to connect the RFU to the antenna. Be sure to use the right type of waveguide and flanges for the frequency options of the RFU. Refer to [Table 4-2](#).

Table 4-2: Waveguide Flange Type

Freq, GHz	Flange Type	Holes	Waveguide
6	• CPR 137 Grooved	• All open for # 8-32 screws	• WR 137
7	• CPR 112 Grooved		• WR 112
8	• CPR 112 Grooved	• All open for M4 screws	• WR 112
11	• CPR 90 Grooved		• WR 90
13	• UG Choke		• WR 75
15	• UG 541A/U	• Tapped holes for M3 or # 6-32 screws	• WR 62
18	• UG 596A/U		• WR 42
23	• UG 596A/U		• WR 42

Figure 4-7: Connecting the Waveguide



Installing the RFU Outdoors — the Detachable Mount



This Configuration uses an antenna fitted with a special [Hub Interface](#) for attaching the RFU **directly** to the antenna.

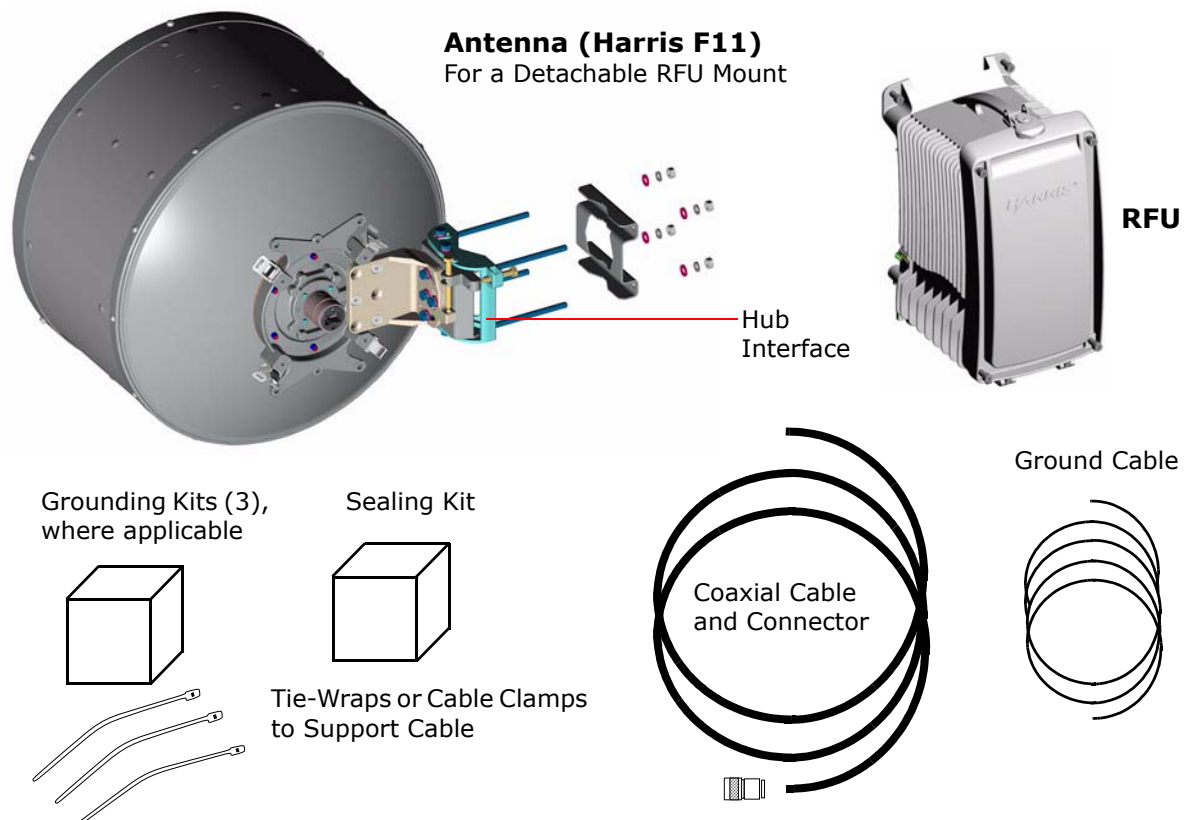
Tools and equipment required

- Refer to [Table 4-1](#).

Prerequisite installation steps:

- [Install the antenna](#), on [page 4-5](#)
- [Install the optional sunshield](#), (if applicable), on [page 4-6](#)
- [Hoist the RFU to the antenna](#), on [page 4-8](#)

Figure 4-8: Parts for a Pole-mounted RFU Installation:
Refer to [Chapter 7](#) for part numbers.



1 Attach the RFU to the antenna hub

Tools and material required

- Harris F11-type Antenna (2-ft for 7/8 GHz, and 4-ft for 6 GHz)
- 2 adjustable wrenches

1. Follow the antenna manufacturer's instructions to set the rotator in the required polarization, (default is vertical polarization). Align the antenna feed boom with the RFU's receptacle; referring to heading [Hoist the RFU to the antenna](#), on [page 4-8](#).



Remove information tag and cap, then apply moderately silicone grease to the whole feeder boom area, but not to its face, as shown in the red information tag's Figure. Failure to do so, will cause the RFU to jam.

2. Engage the 4 latches located on the [Antenna hub](#) over the RFU's 4 hooks.
3. Secure the RFU to the antenna hub by screwing the 4 hex-head bolts provided into the RFU's [Threaded bosses](#).

Figure 4-9: Attaching an RFU Directly to the Antenna

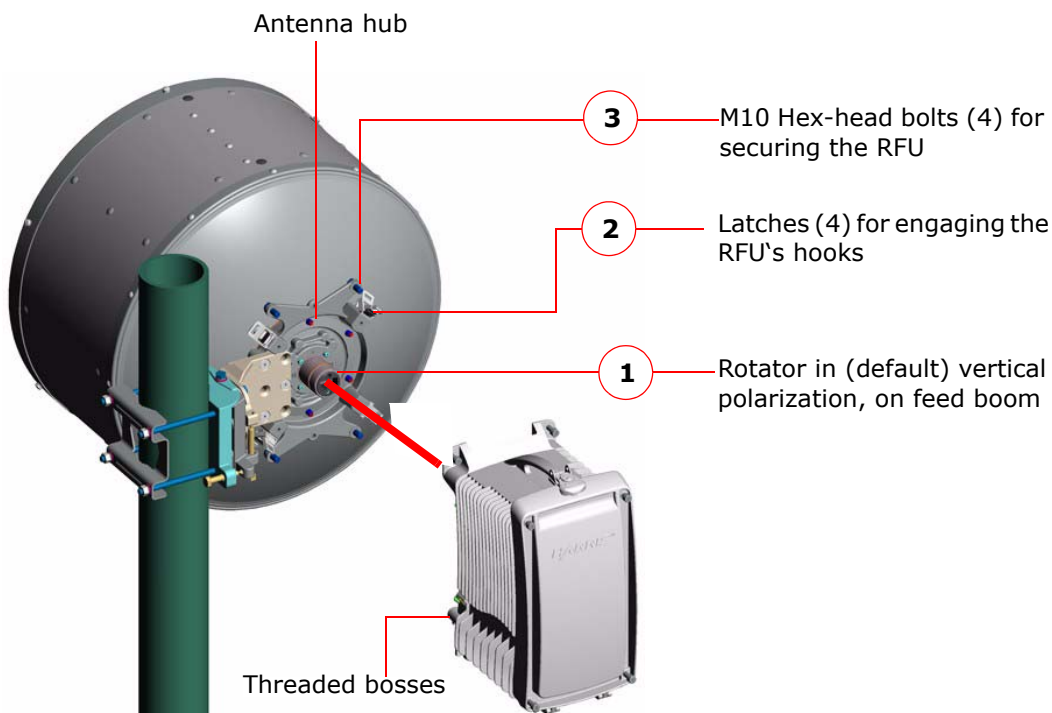


Figure 4-10: Installation Dimensions for an RFU Mounted Directly to a 2-Ft Antenna

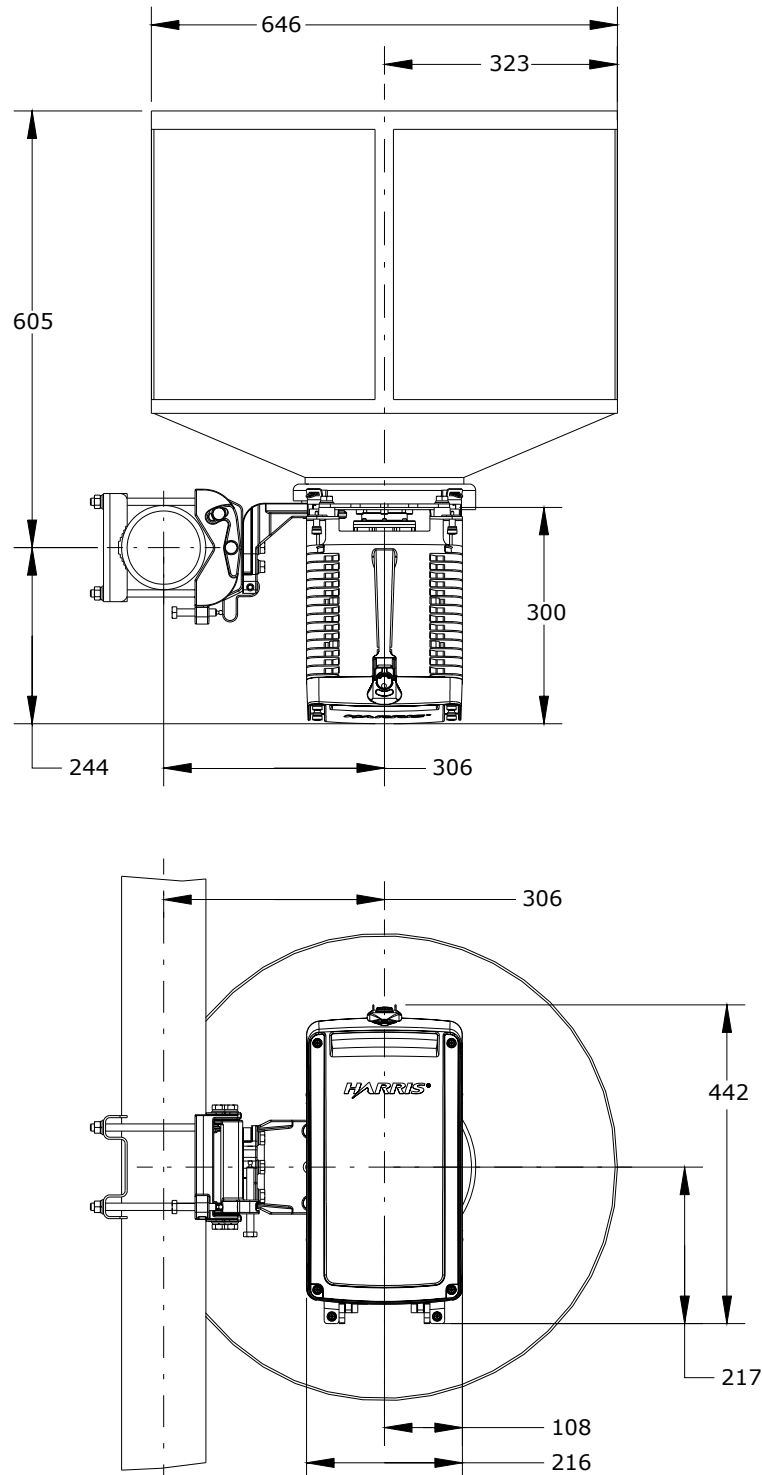
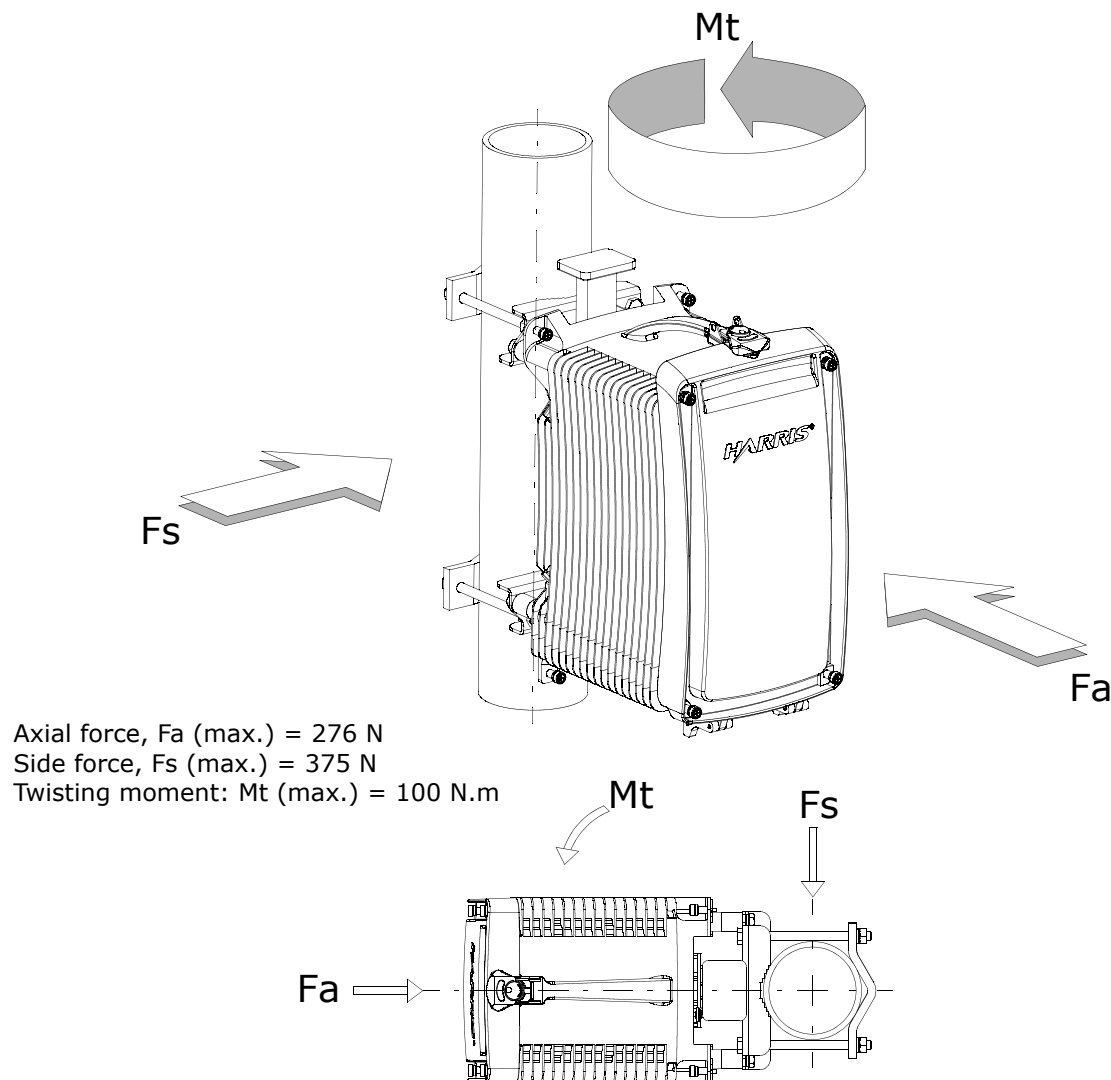


Figure 4-11: Forces Acting on a Pole-mounted TR5200 Radio
(excluding antenna forces)



These values are the maximum estimated for each parameter (at a wind speed = 180 km/hr (75 mph)) and do not occur simultaneously. Values shown account for a maximum ice build-up of 2 inches on the radio's top surface.

2 Install the RFU-to-SPU coaxial cable



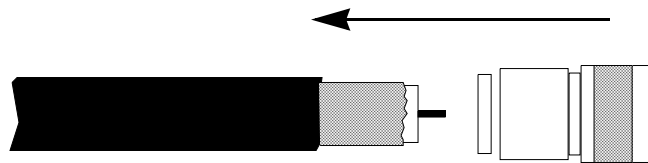
Steps 8 and 9 apply to ALL three [Installation Types](#).

Tools and material required

- Adjustable wrench
- Multimeter
- Coaxial cable with N-Type connector, cable lengths per [Table 2-6](#) on page [2-23](#).
- Tie-wraps or other means of supporting the coaxial cable along the run
- Sealing kit

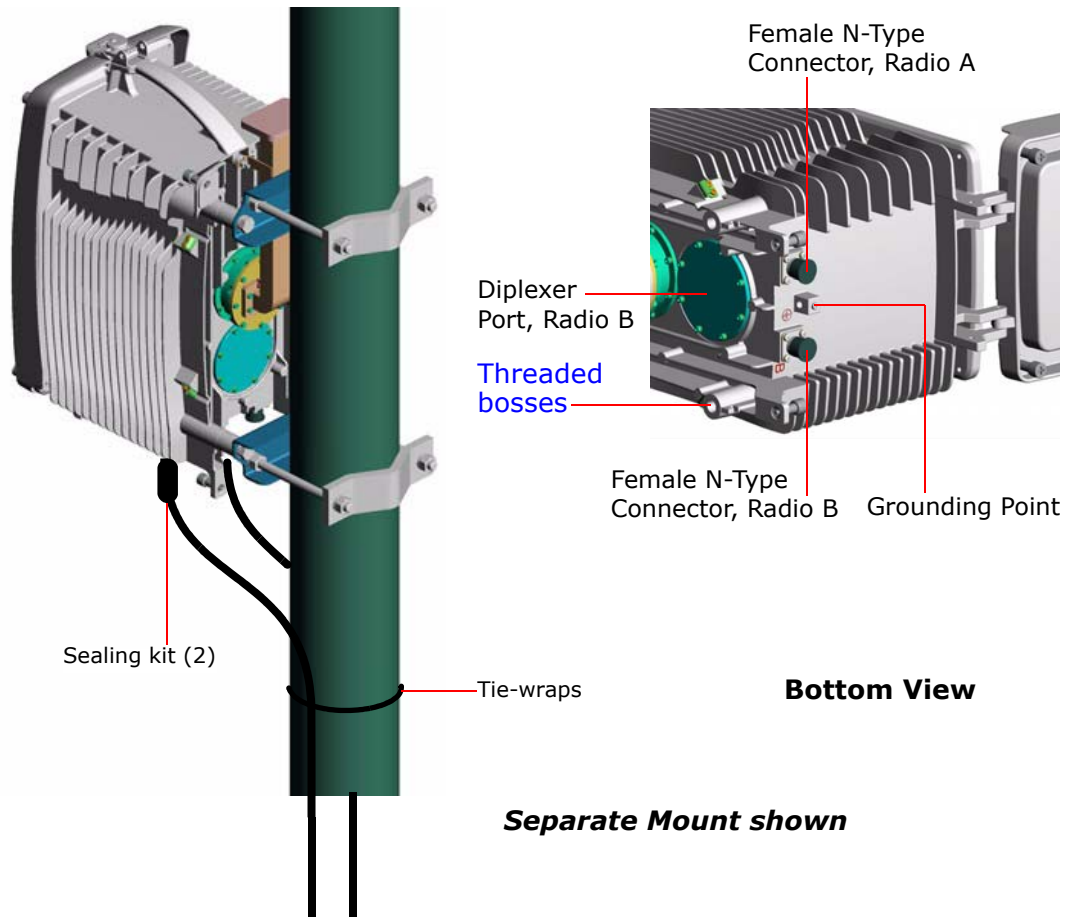
1. Following the instructions accompanying the connector, install a connector on one end of the coaxial cable that is to go from the RFU to the SPU.

Figure 4-12: Installing the Connector on the Cable



Follow manufacturer's instructions

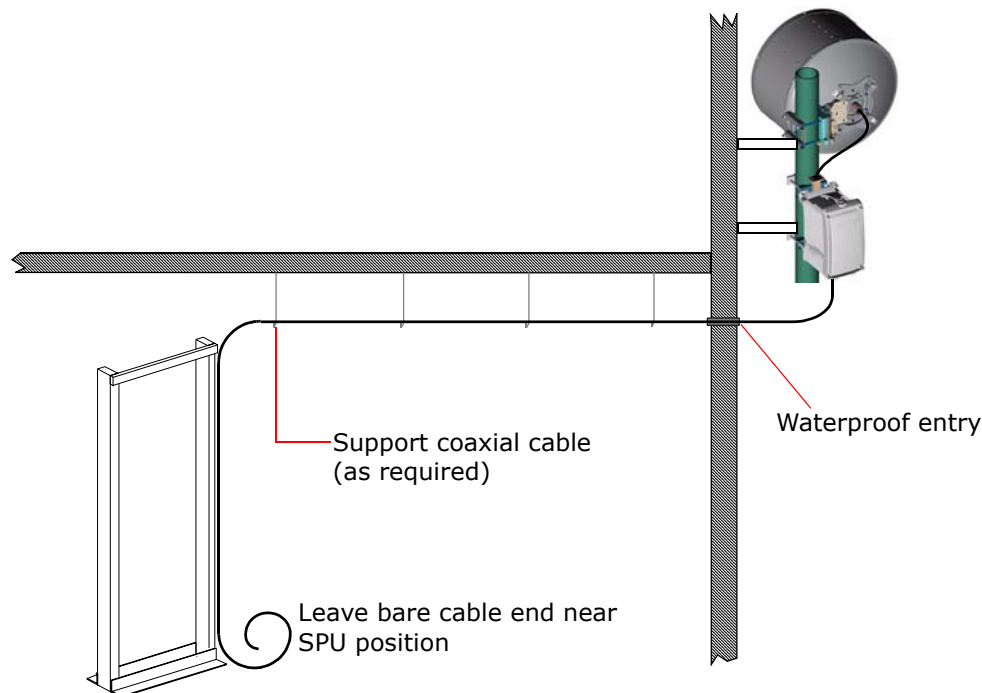
2. Verify that the resistance between the coaxial cable's center connector and the shield is more than 100 Ω .
3. Verify that the SPU's power switch is off.
4. Connect the connectorized end of the coaxial cable to the RFU.

Figure 4-13: Connecting the Coaxial Cable to the RFU

Part Number	Description	Comments
087-099499-XX0	Foam core 50 Ω heliax shielded cable (Andrews LDF2-50)	Cable only, XX0 = 210 m to 300 m in 10 m increments
099-901208-001		45 m
099-901208-002	Low loss 50 Ω RG 8/U kit	90 m
099-901208-003		150 m
099-901208-004		210 m

5. Following the instructions in the sealing kit, waterproof the connection to the RFU.
6. Run the coaxial cable from the RFU to the SPU or the place where the SPU will be. Attach the coaxial cable to supports as required and bring it indoors through a waterproof entry.

Figure 4-14: Typical Cable Run



7. If the SPU has already been installed
 - cut the cable to the correct length;
 - install a connector;
 - check for shorts (see caution below); and
 - connect the coaxial cable to the SPU.

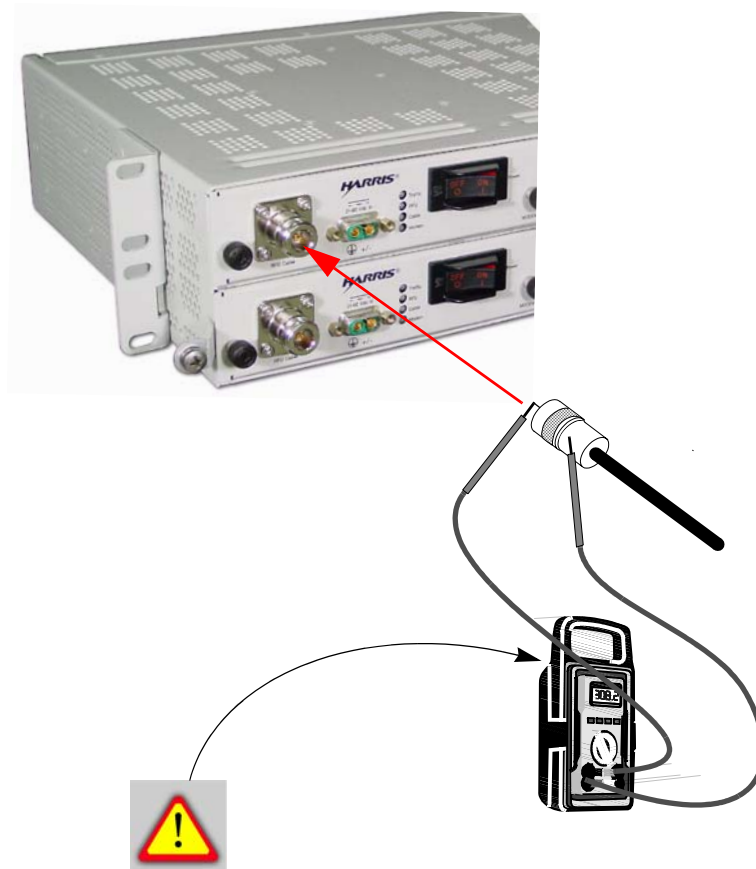
On a protected system, ensure connecting Channel-A to the top Modem (A) and Channel B to the bottom Modem (B). If the SPU has not been installed yet, leave the bare end of the coaxial cable near the place where the SPU is to be installed.

8. Using the multimeter, check that the resistance between the coaxial cable's center connector and the shield is **more** than 100 Ω , with the far end connected to the RFU.



A lower resistance value indicates that there is a short in the coaxial cable or in the RFU that may damage the SPU's breaker when it is switched ON. If this is the case, replace the faulty element (cable or RFU).

Figure 4-15: Connecting the Coaxial Cable to the SPU, (if present).



Resistance between the coaxial cable's center connector and the shield must be more than 100 Ω

3 Ground the RFU and the Coaxial Cable

Tools and material required

- Common tools
- Three or more grounding kits



SAFETY REQUIREMENT:
Connect the RFU ground lug to the earth ground.
Do not connect it to the electrical utility ground.



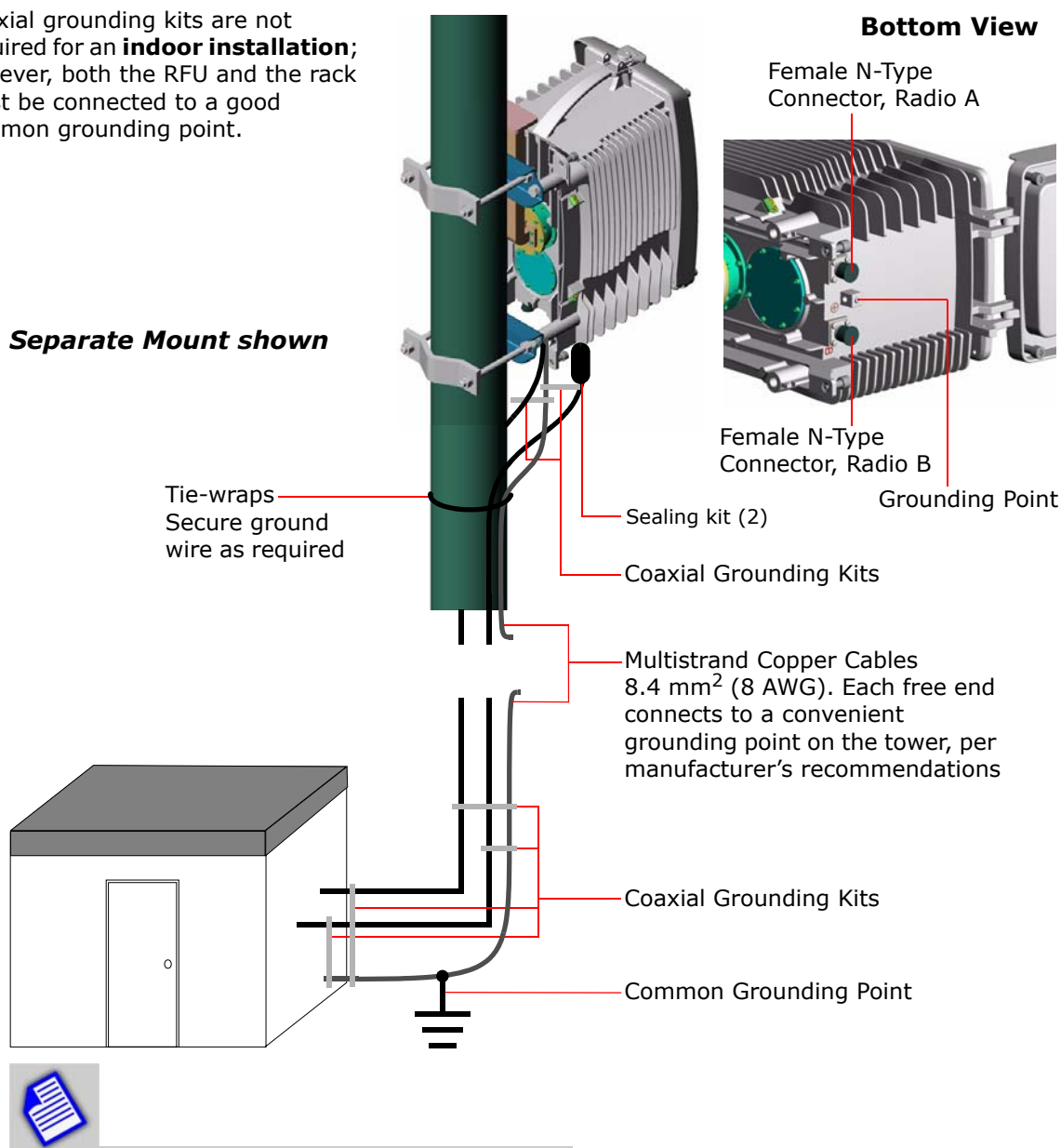
For a protected radio, ground both coaxial cables.

1. Ground the RFU as shown in [Figure 4-16](#).
2. Use the grounding kits to ground the coaxial cable at the RFU, the SPU and on the antenna side of any right angle turns.

Figure 4-16: Grounding the RFU and the Coaxial Cable.

Install coaxial grounding kits at the RFU, on the antenna side of every right angle turn, and at the entry to the shelter.

Coaxial grounding kits are not required for an **indoor installation**; however, both the RFU and the rack must be connected to a good common grounding point.



For a roof-top installation, connect to the building ground, or the water supply pipe just before it enters the building. For a tower installation, connect to a good ring ground system made from buried copper cables and rods.

Installing the RFU Indoors

Tools and material required

- Common tools
- Waveguide pressurizing equipment
- One of the following screw kits (ordered separately)
 - 098-903040-001 for one RFU, 6 GHz
 - 098-903040-002 for one RFU, 7-23 GHz
 - 098-903040-003 for two RFUs, 6 GHz
 - 098-903040-004 for two RFUs, 7-23 GHz

4 Where required, install the RFU indoors

1. Using the screws and clips provided, attach the rack-mounting bracket to the rack. We recommend putting it in rack-mounting spaces 23 through 32. Remember that, because of the waveguide, nothing should go in the rack above the radio. (Refer to [Figure 4-17](#)).
2. Align and insert the RFU's [Threaded bosses](#) (back of the RFU) into the slots provided for them on the bracket. (Refer to [Figure 4-17](#)).
3. Secure the RFU to the bracket by screwing the four [Captive screws](#) on the RFU into the threaded holes provide on the bracket.
4. Run rigid or helical waveguide from the antenna to a point above the rack. Support and ground the waveguide as required. We recommend that you pressurize the waveguide with dry air as well. (Refer to [Figure 4-18](#)).
5. Connect the RFU's [Antenna Port](#) to the rigid wave guide with a short length of flexible twistable waveguide. If possible, **DO NOT** support the flexible twistable waveguide.



If you must support the flexible twistable waveguide, refer to the cautionary note in [Figure 4-18](#).

6. Ground the RFU by running a separate grounding wire from the RFU to the site's main ground point. **DO NOT** use the same grounding wire as the SPU.
7. If the SPU has already been installed, connect the RFU to the SPU with one or two short lengths of coaxial cable.

Figure 4-17: Mount the rack-mounting bracket to the rack or cabinet

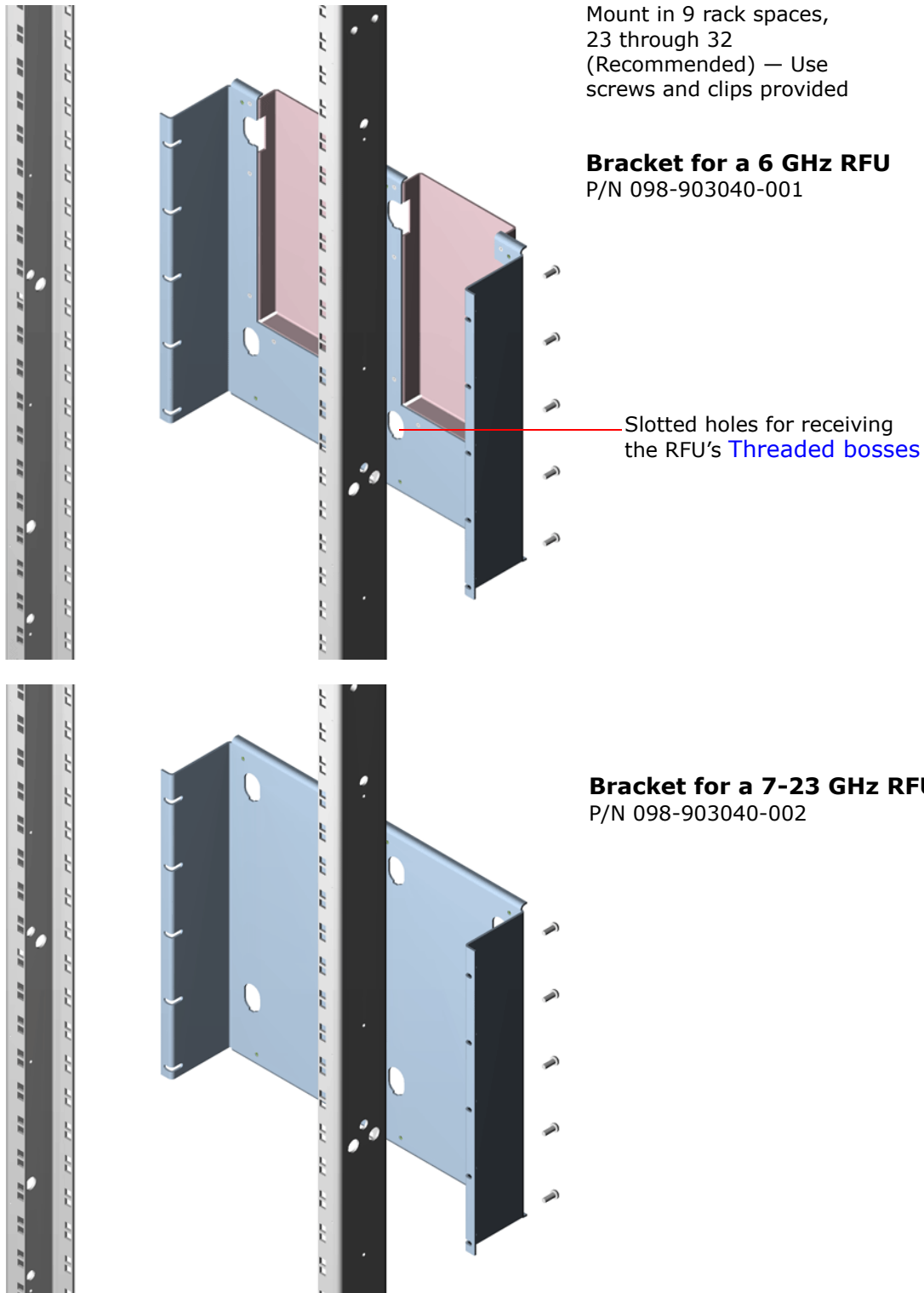
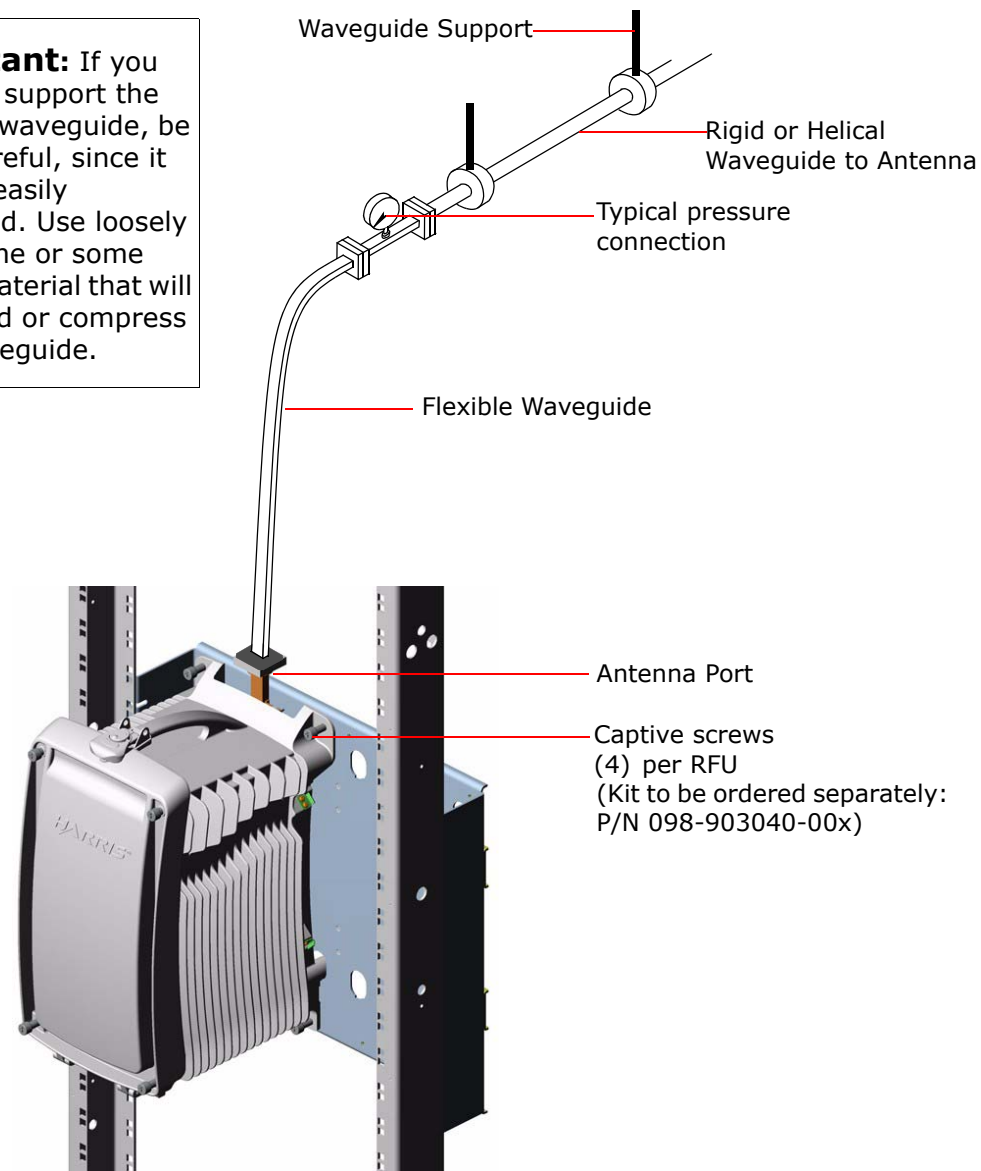


Figure 4-18: Mount the RFU and install waveguide

Important: If you need to support the flexible waveguide, be very careful, since it can be easily damaged. Use loosely tied twine or some other material that will not bend or compress the waveguide.



For Waveguide Flange specifications, refer to [Table 4-2](#).

Maintenance

There is no routine maintenance required on the TRuepoint® radio. If a radio does fail, it is repaired by replacing faulty module(s) in the RFU. There are no field adjustments to be made within the RFU.

Basic Troubleshooting

Table 5-1 identifies probable causes of typical problems through the Modem’s LEDs. For more advanced troubleshooting, refer to the *Operator’s Interface* manual, IMN-903003-Exx.

Table 5-1: Indicator Light Display Description

Module	Label	Color	Meaning
	RFU	Green	The RFU is operating properly
		Red	The RFU has failed
	CABLE	Green	The cable connecting the SPU to the RFU is working properly
		Red	The cable connecting the SPU to the RFU has failed.

Replacing Units

Replacing a 5100 RFU

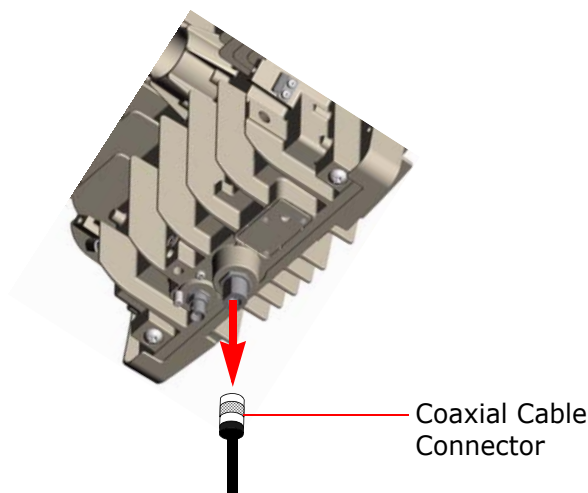


In a non-protected system this procedure will affect traffic. In a protected system, ensure locking traffic on the available channel during maintenance.

Procedure

1. If the system is protected, force traffic to the available channel.
2. Switch OFF power at the SPU.
3. Disconnect the coaxial cable at the RFU.

Figure 5-1: Disconnecting the Coaxial Cable at the RFU



Remove the RFU

- For the detachable RFU with antenna assembly, undo the four latches and pull the RFU away from the antenna, ([Figure 5-2](#)).
- For the Separate Mount assembly, open the four latches to disengage the RFU's mating hooks, and pull the RFU away from the [RFU-Mounting Plate Assembly](#).

Figure 5-2: Removing the Detachable RFU from the Assembly

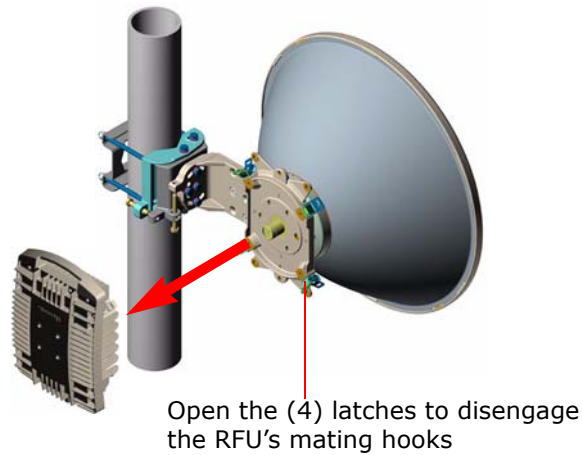
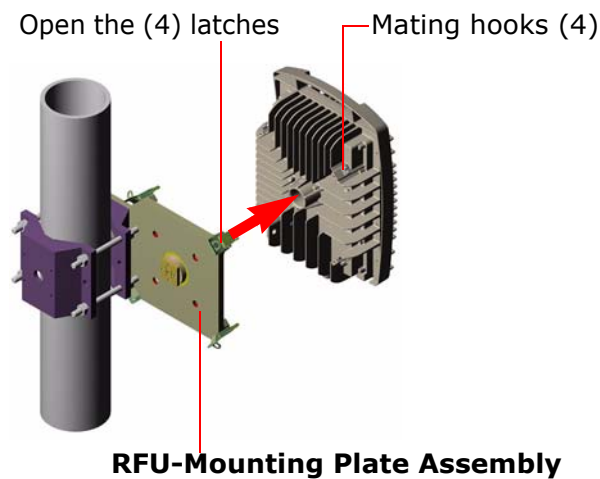


Figure 5-3: Removing the Detachable RFU from the Mounting Plate Assembly



Install a new RFU

1. Apply silicone grease to the antenna cylinder, referring to the [Caution](#), on page [3-10](#).
2. Install the new RFU with the same part number by reversing the appropriate procedure referenced by Figures [3-6](#) and [3-17](#).
3. Reconnect the coaxial cable.
4. If outdoors, install a new sealing kit on the coaxial cable connector.
5. Reconfigure the system through the [HHT](#), and referring to section [Configure the radio](#), in the SPU Installation manual IMN-90300-exx.

Replacing a 5200 Transceiver



Before working on the inside of the 5200 RFU, ensure wearing an ESD wrist strap that is attached to a convenient grounding point on the RFU enclosure. In a non-protected system this procedure will affect traffic. In a protected system, ensure locking traffic on the available channel during maintenance.

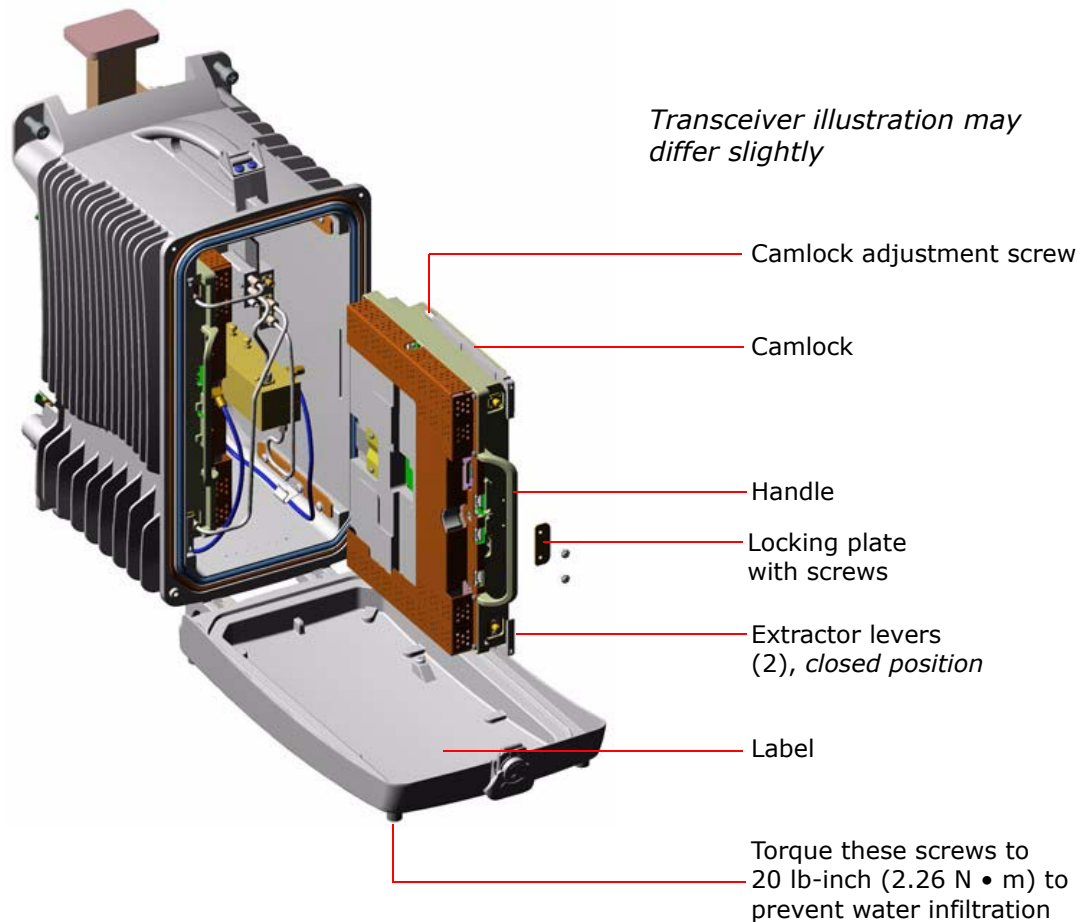
If an alarm indicates that the transceiver is malfunctioning, replace the defective unit as follows:

1. Set the circuit breaker on the SPU (Modem) to the O (off) position.
2. Open the door of the RFU.



Tag (label) wires and cables before disconnecting them.

3. Disconnect the cables going to and from the transceiver that you intend to remove.
4. Unfasten the screws and [Locking plate](#) that hold the transceiver in place.
5. Put the [Extractor levers](#) of the transceiver in horizontal position.
6. Grasp the transceiver's [Handle](#), and pull out the transceiver from the RFU enclosure.
7. Insert the new transceiver (bearing the **same** Part Number), and latch the [Extractor levers](#) by putting them in closed position (vertical).
8. If necessary, tighten or loosen the [Camlock adjustment screw](#) so as to provide a tight fit for the transceiver once it is in latched position: there should be no side movement.
9. Refasten the screws and [Locking plate](#) that hold the transceiver in place.
10. Using the optional 5/16 inch torque wrench (P/N 029-900160-001), set to 0.1 kg · m (9.0 lb-inch), reconnect the cables going to and from the transceiver, referring to the [Wiring Labels](#), in Figures 5-7 through 5-11.

Figure 5-4: Removing a Transceiver

- 11.** Close the RFU door, and torque its 4 thumb screws to 20 lb-inch, (2.26 N • m) to prevent water infiltration.
- 12.** Set the circuit breaker on the SPU (Modem) to the I (ON) position.
- 13.** Verify that there are no alarms on the system.
- 14.** If you do receive an alarm, such as ALARM / SYSTEM / RFU NOT UPGRADED, this would indicate that the new transceiver's software version is not compatible with the system. In this case, continue with the next step.
- 15.** Upgrade the RFU software through CONTROL / RFU DOWNLOAD / UPGRADE RFU.
- 16.** Finally, verify that the frequency and power output level comply with the specifications, using the HHT in the path STATUS / RADIO / TX A (B), STATUS / RADIO / RX A (B), STATUS / RADIO / PA TX A (B) PWR.

Replacing a Diplexer — for a Separate Mount

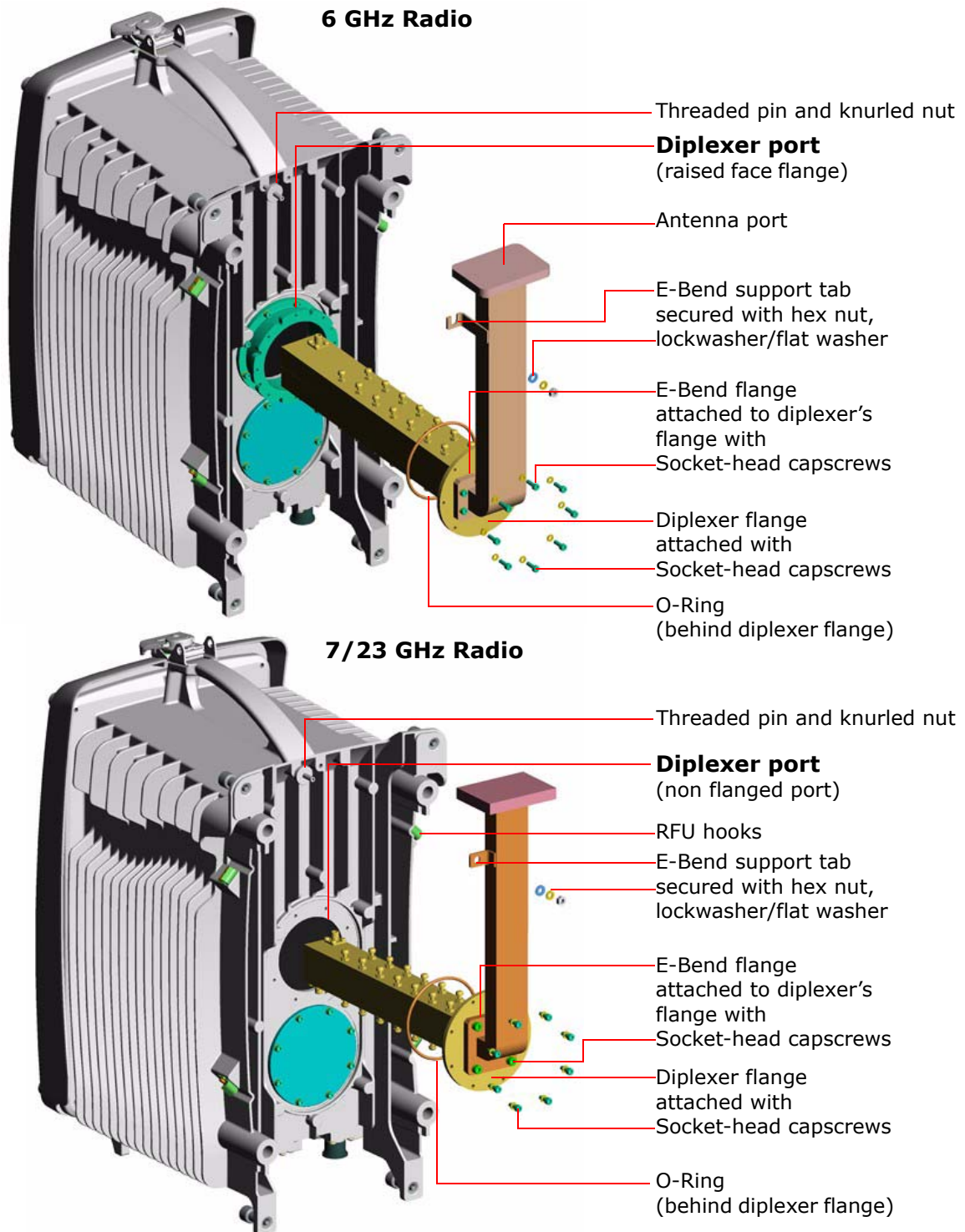


This procedure requires dismounting the RFU from the pole, and traffic interruption. You need to move traffic to an alternate equipment (or channel) before starting.

1. Remove traffic from the affected channel and switch off the radio.
2. Reverse installation Steps 2 to 6, starting on [page 4-6](#), to disconnect the waveguide from the [Antenna port](#), and detach the RFU from its pole-mount.
3. Using the optional 5/16 in torque wrench (P/N 029-900160-001), disconnect all semi-rigid cables from the ACU. If the radio is protected ([MHSB](#)), detach the RF switch from the diplexer.
4. Use a 5.5 mm open-end key as a hex driver, for Steps 5 through 10.
5. Remove the hex nut/lockwasher/flat washer to detach the [E-Bend support tab](#) from the [Threaded pin and knurled nut](#) on the enclosure.
6. Separate the [E-Bend flange](#) from the [Diplexer flange](#) by removing the [Socket-head capscrews](#) (6, for 6 GHz or 4, for 7/8 GHz). Keep the E-bend at hand for re-assembly.
7. Remove the eight screws (see [Figure 5-5](#)) that attach the [Diplexer flange](#) to the radio, and carefully pull the diplexer out of the RFU enclosure. Ensure removing the [O-Ring](#) from its groove in the [Diplexer flange](#) for re-assembly.
8. Re-place the [O-Ring](#) in the groove of the new [Diplexer flange](#) before carefully inserting the diplexer through the [Diplexer port](#).
9. Attach the [Diplexer flange](#) to the enclosure with the eight screws removed in Step 7, above.
10. Align the [E-Bend support tab](#) on the captive [Threaded pin and knurled nut](#). Adjust the position of the E-Bend to be plumb and true by turning the knurled nut, as required, then re-attach the [E-Bend flange](#) to the [Diplexer flange](#) using the fasteners removed in Step 6, above.
11. Use the fasteners removed in Step 5 to secure the [E-Bend support tab](#) onto the [Threaded pin and knurled nut](#). Tighten all fasteners as necessary.
12. Using the 5/16 inch torque wrench, set to 0.1 kg · m (9.0 lb-inch), re-attach the semi-rigid cables removed in Step 3, above.
13. If the radio is protected ([MHSB](#)), re-attach the RF switch to the diplexer.

14. Re-install the RFU on the pole, referring to Installation Procedures 2 to 6, starting on [page 4-6](#), and connect the waveguide to the [Antenna port](#).

Figure 5-5: Removing the Diplexer — Separate Mount



Replacing a Diplexer — for a Detachable Mount

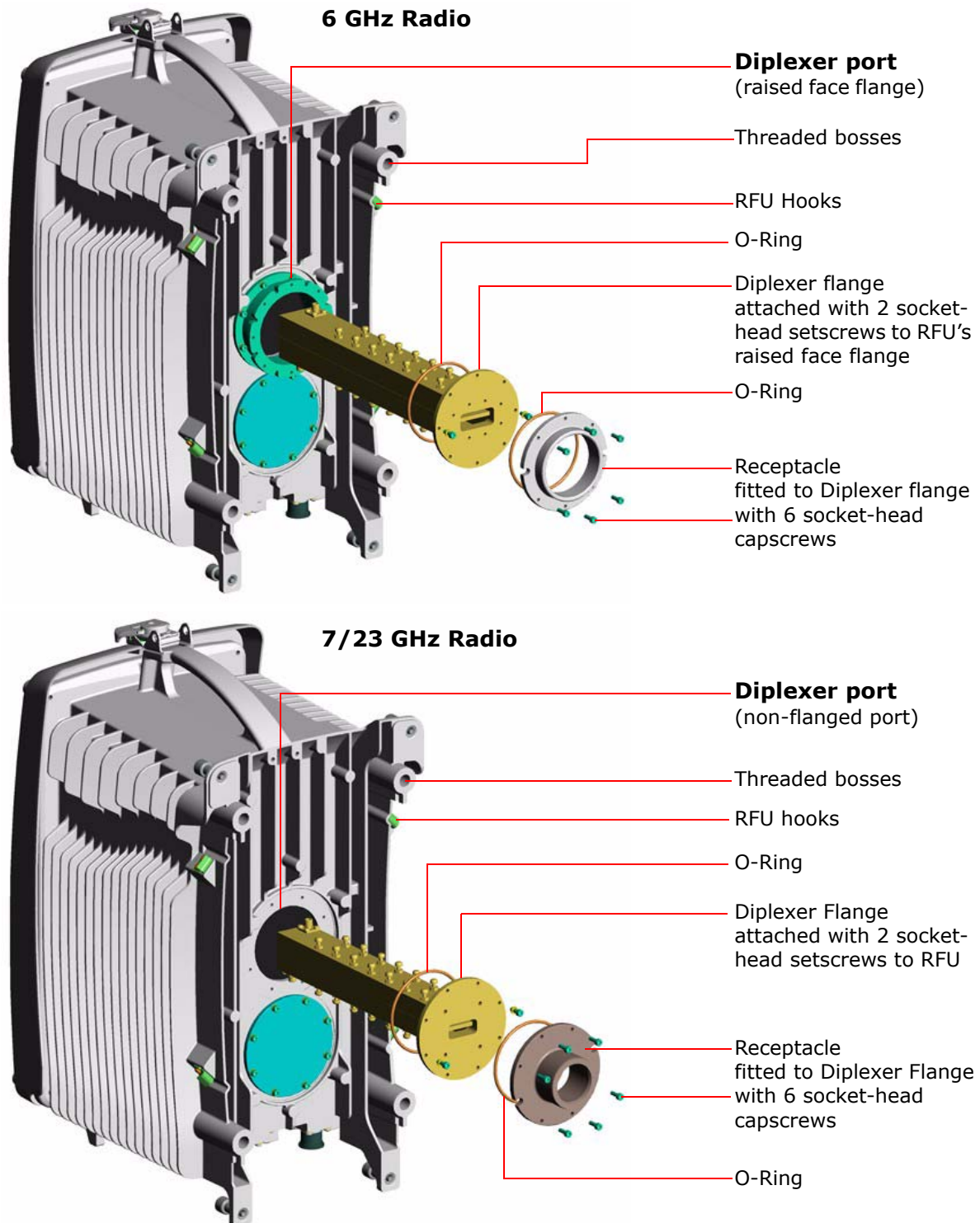


This procedure requires dismounting the RFU from the pole, and traffic interruption. You need to move traffic to an alternate equipment (or channel) before starting.

1. Remove traffic from the affected channel and switch off the radio.
2. Reverse Installation Procedures 2 to 1, as applicable, starting on [page 4-12](#), to detach the RFU from the antenna.
3. Using an adjustable wrench, unscrew the 4 hex-head bolts (back of the [Antenna hub](#)) from the RFU's [Threaded bosses](#).
4. Disengage the 4 latches (located on the [Antenna hub](#)) from the [RFU hooks](#), and detach the RFU from the antenna hub.
5. Using the 5/16 in torque wrench (P/N 029-900160-001), disconnect all semi-rigid cables from the ACU. If the radio is protected ([MHSB](#)), detach the RF switch from the diplexer.
6. Use a 5.5 mm open-end key as a hex driver, for Steps 7 through 12.
7. Remove the 6 screws (see [Figure 5-6](#)) that hold the [Receptacle](#) to the [Diplexer flange](#), remove the [O-Ring](#) from its groove in the [Receptacle](#), and keep it at hand for re-assembly.
8. Remove the 2 screws ([Figure 5-6](#)) that attach the [Diplexer flange](#) to the radio, and carefully pull the diplexer out of the RFU enclosure. Ensure removing the [O-Ring](#) from its groove in the [Diplexer flange](#) and keep it for re-assembly.
9. Re-place the [O-Ring](#) in the groove of the new [Diplexer flange](#) before carefully inserting the diplexer through the [Diplexer port](#).
10. Attach the [Diplexer flange](#) to the enclosure with the 2 screws removed in Step 8, above.
11. Replace the [O-Ring](#) in its groove on the mating face of the [Receptacle](#), ensuring that it does not dislodge during mounting.
12. Position the 2 [Receptacle](#)'s side notches over the 2 [Diplexer flange](#) setscrews, then re-attach the [Receptacle](#) to the [Diplexer flange](#) using the 6 screws removed in Step 7, above.
13. Using the 5/6 in torque wrench, set to 0.1 kg · m (9.0 pound-inches), re-attach the semi-rigid cables removed in step 5, above.
14. If the radio is protected ([MHSB](#)), re-attach the RF switch to the diplexer.

- 15.** Re-install the RFU on the antenna, referring to Installation Procedures 2 to 1, as applicable, starting on [page 4-6](#).

Figure 5-6: Removing the Diplexer — For the Detachable Mount



Wiring Labels



The following figures are shown for reference ONLY and cable routing may differ slightly from actual routing. Always refer to the wiring [Label](#) affixed on the inside of the RFU door. Part numbers shown in these figures refer to semi-flex cables with SMA-to-SMA connectors. These cable part numbers are required when ordering spares.

Figure 5-7: Wiring for an Unprotected RFU, 6/7 GHz

Option 023-902608-001

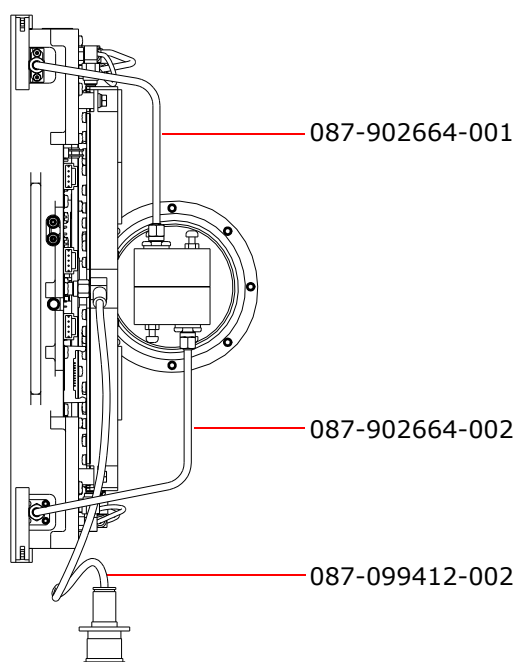


Figure 5-8: Wiring for a Protected RFU, 6/7 GHz with MHSB Equal/Unequal Split

Option 023-902608-002

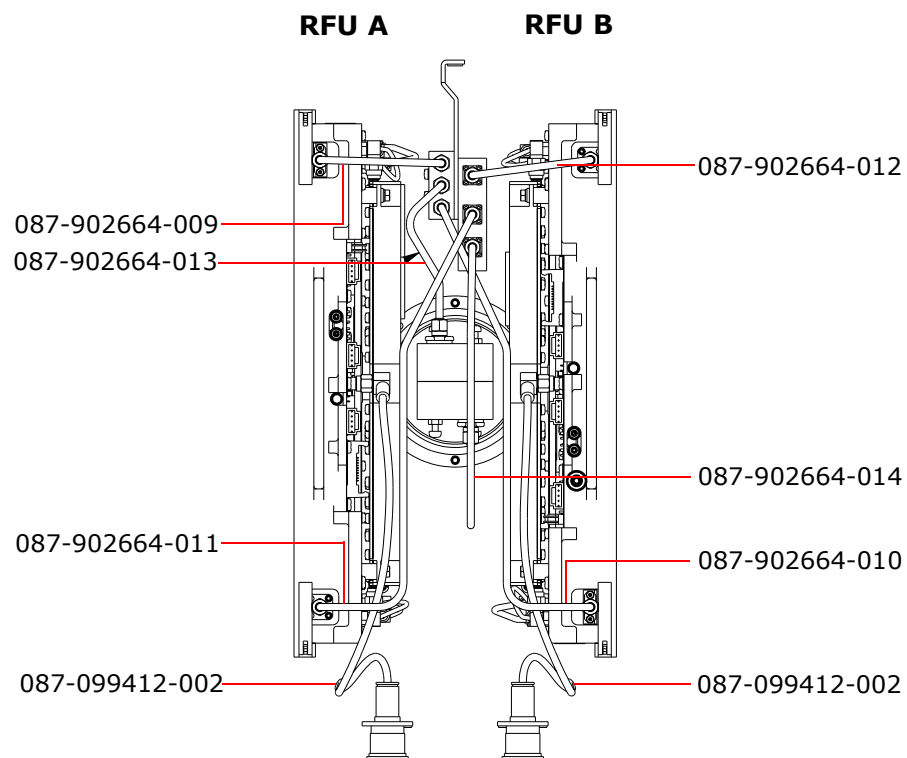
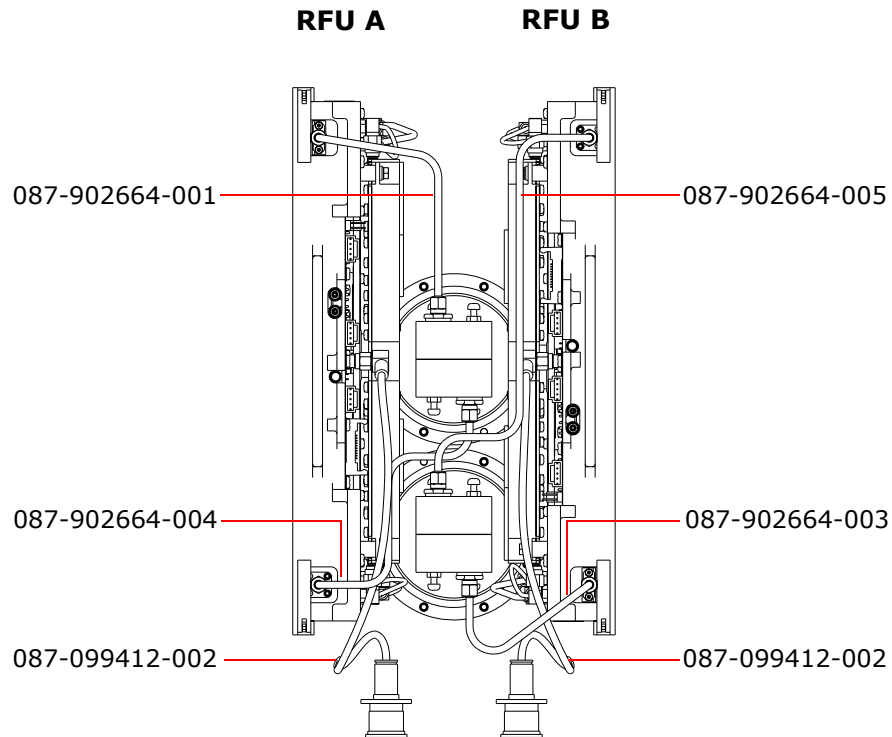


Figure 5-9: Wiring for a Protected RFU, 6-11 GHz with SD, and FD/SD Indoor

Option 023-902608-003



**Figure 5-10: Wiring for a Protected RFU, 6-11 GHz with SD,
and FD/SD Outdoor**

Option 023-902608-004

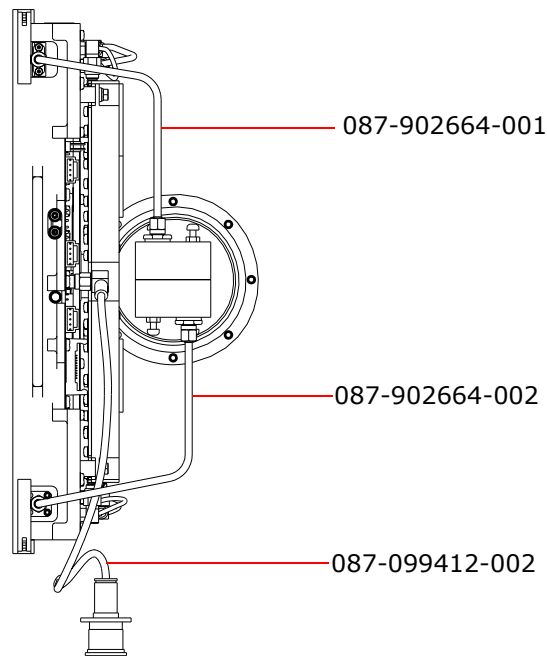


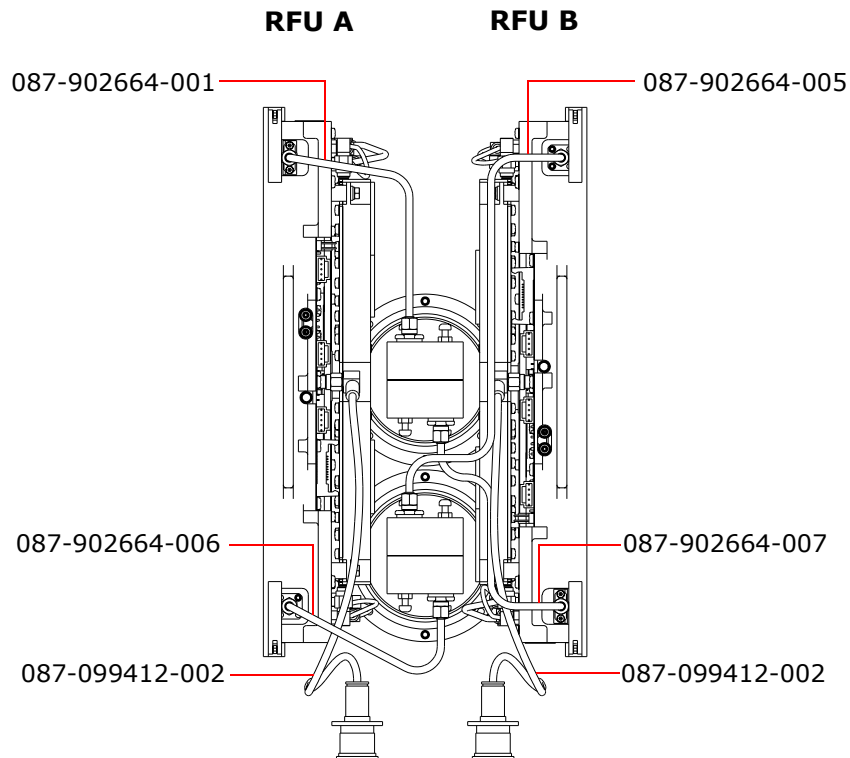
Figure 5-11: Wiring for a Protected RFU, 6-11 GHz with FD**Option 023-902608-005**

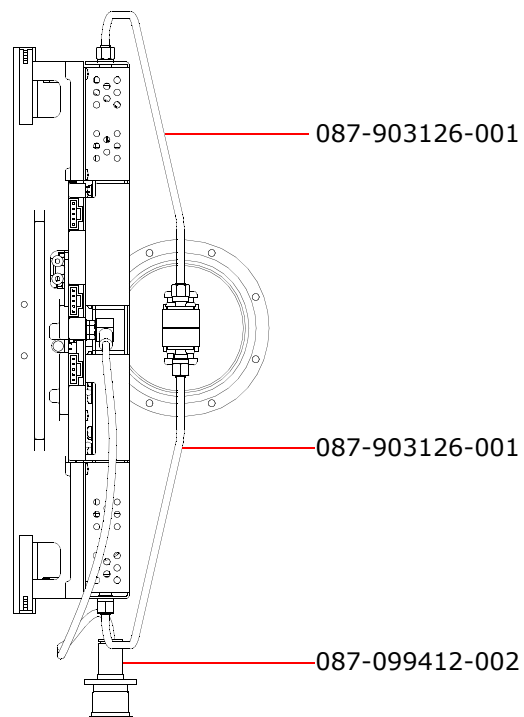
Figure 5-12: Wiring for an Unprotected RFU, 13-23 GHz**Option 023-903313-001**

Figure 5-13: Wiring for a Protected RFU, 13-23 GHz with MHSB Equal/Unequal Split

Option 023-903313-002

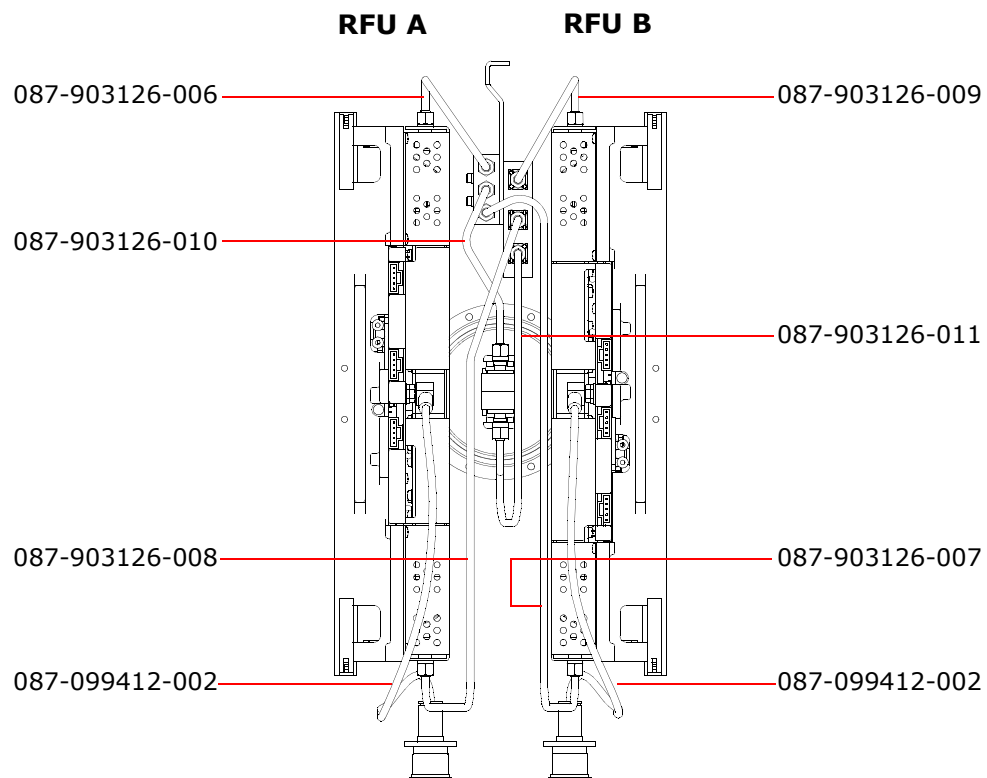


Figure 5-14: Wiring for a Protected RFU, 13-23 with SD and FD/SD Indoor

Option 023-903313-003

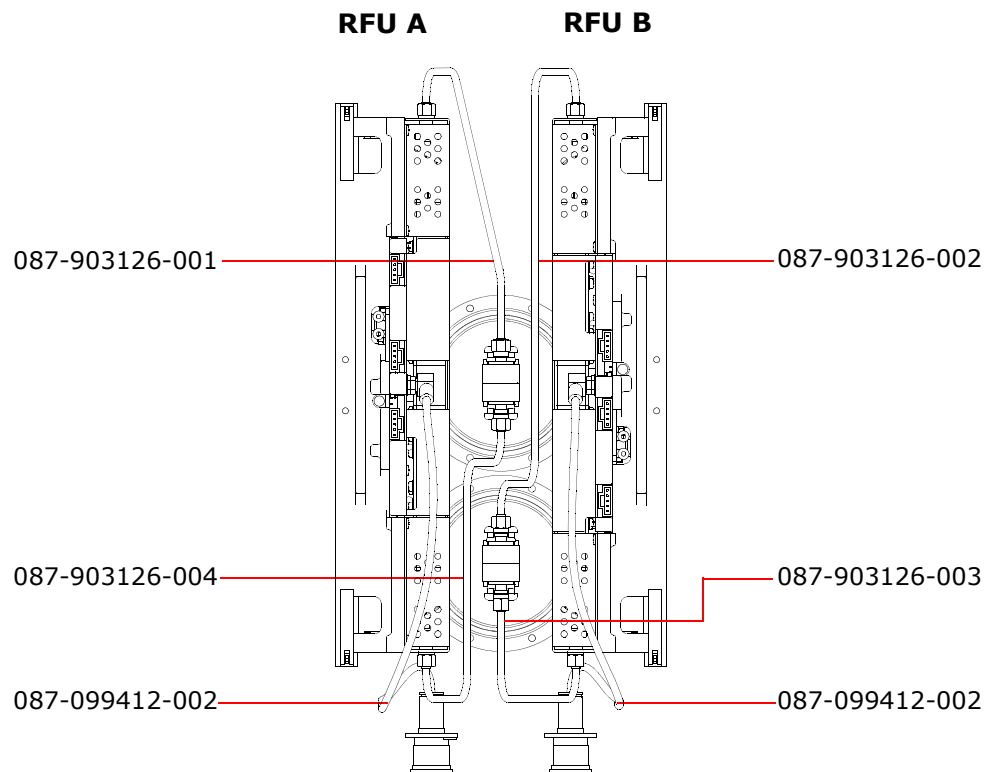
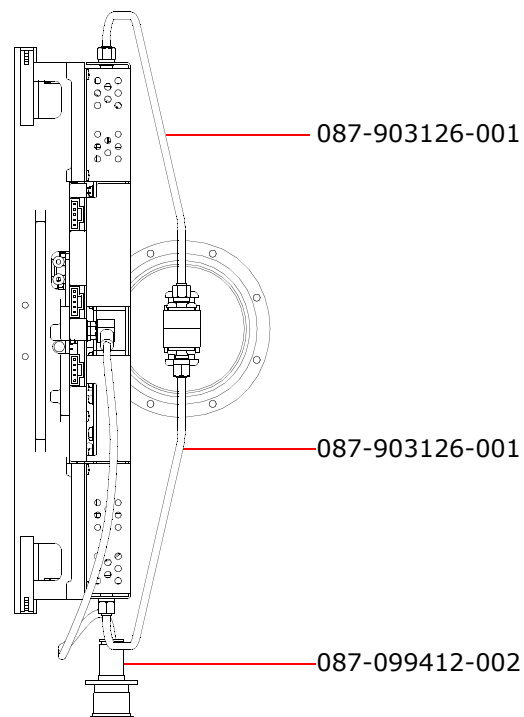


Figure 5-15: Wiring for a Protected RFU, 13-23 GHz with SD and SD/FD Outdoor

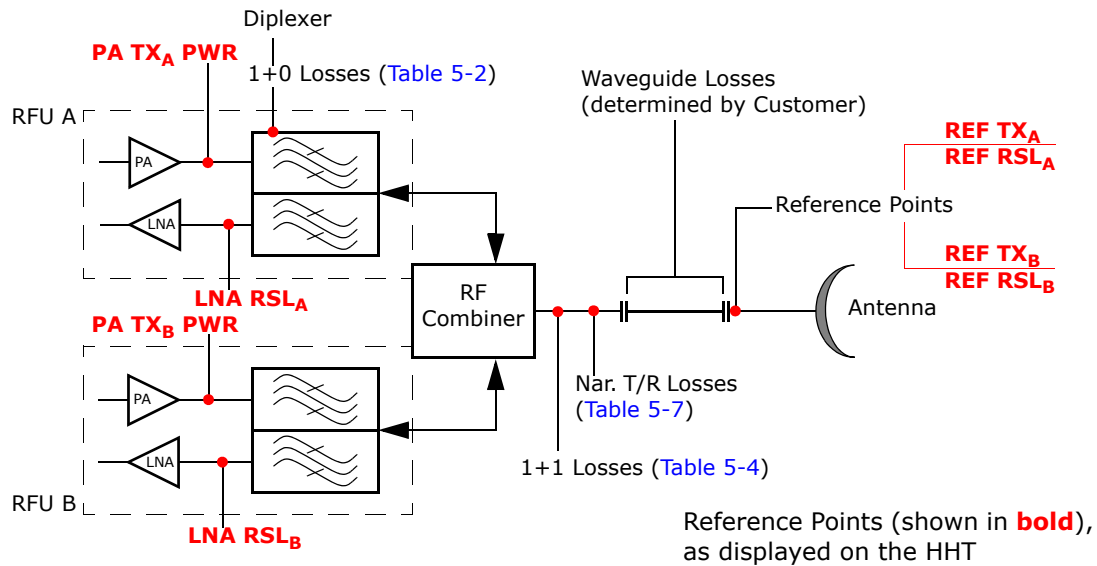
Option 023-903313-004



Applying the ACU Losses



Total Losses can be entered through a user interface (*Web-CIT* or *HHT*) in the following fields:
TX A (B) ACU LOSS, to determine Tx Output, and
RX A (B) ACU LOSS, to determine the RSL, both at the [Reference Points](#).

Figure 5-16: Identifying Losses Reference Points

Example calculation for **REF TX_A** of a **Combiner-Protected**

MHSB, Uneq split Configuration consisting of:

- 2 x TR 5100 RFU, 38 GHz
- T/R 700 MHz
- Outdoor mounted, with 1.2 ft length of flexible waveguide

Computing Total Losses: Tx A ACU Loss

Tx A ACU Loss =	U Losses	+	P Losses	+	N Losses	+	W Losses
	1+0		1+1		Narrow T/R		Waveguide
	(Table 5-2)		(Table 5-4)		(Table 5-7)		(by Customer)
5.0 dB =	1.8		1.2		0.8		1.2

Example calculation for **REF RSL_B** of a **Protected** MHSB,

Uneq split Configuration consisting of:

- 2 x TR 5200 RFU, 10.3 GHz
- T/R 150 MHz
- Indoor mounted, with a 100 m (328.1 ft) length of flexible waveguide

Computing Total Losses: Rx B ACU Loss

Rx B ACU Loss =	U Losses	+	P Losses	+	N Losses	+	W Losses
	1+0		1+1		Narrow T/R		Waveguide
	(Table 5-3)		(Table 5-5)		(Table 5-8)		(by Customer)
22.7 dB =	1.5		10.1		0.5		10.6

Table 5-2: ACU Losses, (dB) — 5100 RFU, Unprotected (U)

Freq. Band, GHz	Unprotected, (1+0)	
	Tx	Rx
13	1.0	1.0
15	1.0	1.0
18	1.0	1.0
23	1.0	1.0
26	1.3	1.3
38	1.8	1.8

Table 5-3: ACU Losses, (dB) — 5200 RFU, Unprotected (U)

Freq. Band, GHz	Unprotected, (1+0)	
	Tx	Rx
6	1.0	1.0
7	1.0	1.0
8	1.5	1.5
10	1.5	1.5
11	1.5	1.5
13	1.5	1.5
15	1.5	1.5
18	1.5	1.5
23	1.5	1.5

Table 5-4: Combiner Losses, (dB) — 5100 RFU, 1+1 Configurations (P)

Freq. Band, GHz	MHSB Eq. Split		MHSB, Unequal Split		
	Tx	Rx	Tx A (only)	Rx B	Rx A
13	3.2	3.2	1.0	10.0	1.0
15	3.2	3.2	1.0	10.0	1.0
18	3.5	3.5	1.0	10.0	1.0
23	3.5	3.5	1.0	10.0	1.0
26	3.5	3.5	1.0	10.0	1.0
38	3.5	3.5	1.2	10.5	1.2

Table 5-5: Additional Losses, (dB) — 5200 RFU, 1+1 Configurations (P)

Freq. Band, GHz	MHSB, Eq. Split		MHSB, Uneq. Split			Space Div., 1 Encl.	
	Tx	Rx	Tx	Rx B	Rx A	Tx	Rx
6	0.4	3.4	0.4	10.1	1.1	0.4	0.0
7	0.4	3.4	0.4	10.1	1.1	0.4	0.0
8	0.4	3.4	0.4	10.1	1.1	0.4	0.0
10	0.4	3.4	0.4	10.1	1.1	0.4	0.0
11	0.4	3.4	0.4	10.1	1.1	0.4	0.0
13	0.7	3.5	0.7	10.2	1.2	0.7	0.0
15	0.7	3.5	0.7	10.2	1.2	0.7	0.0
18	0.9	3.6	0.9	10.3	1.3	0.9	0.0
23	0.9	3.8	0.9	10.8	1.7	0.9	0.0

Freq. Band, GHz	Space Div., 2 Encl.		SD, 1 Enc, Split Tx/Rx		FD/SD, 2 Encl.		Freq. Div., 1 Encl.	
	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx
6	0.4	0.0	0.0	0.0	0.0	0.0	1.0	0.9
7	0.4	0.0	0.0	0.0	0.0	0.0	1.0	0.9
8	0.4	0.0	0.0	0.0	0.0	0.0	0.5	0.4
10	0.4	0.0	0.0	0.0	0.0	0.0	0.6	0.5
11	0.4	0.0	0.0	0.0	0.0	0.0	0.6	0.5
13	0.7	0.0	0.0	0.0	0.0	0.0	0.4	0.6
15	0.7	0.0	0.0	0.0	0.0	0.0	0.4	0.6
18	0.9	0.0	0.0	0.0	0.0	0.0	0.6	0.9
23	0.9	0.0	0.0	0.0	0.0	0.0	0.6	0.9

Description of Abbreviations showing in Table 5-5

MHSB, Eq. Split Monitored Hot Standby, Equal Split

MHSB, Uneq. Split Monitored Hot Standby, Unequal Split

Space Div., 1 Encl Space Diversity, with 1 Enclosure

Space Div., 2 Encl Space Diversity, with 2 Enclosures

SD, 1 Enc, Split Tx/Rx Space Diversity, with 1 Enclosure, Split Transmit/Receive

FD/SD, 2 Encl. Frequency/Space Diversity, with 2 Enclosures

Freq. Div., 1 Encl. Frequency Diversity, with 1 Enclosure

Table 5-6: Additional Losses, (dB) — 5200 RFU, N+N Configurations

Freq. Band, GHz	MHSB, Eq. and Uneq. Split		Other Configurations	
	Tx	Rx A/B	Tx	Rx A/B
6	0.6	0.6	0.3	0.3
7 to 11	0.7	0.7	0.4	0.4

Table 5-7: Narrow T/R Losses, (dB) — 5100 RFU (N)

Freq. Band, GHz	T/R Spacings, MHz			
	120	315, 322	340	700
15	—	0.3	—	—
18	2.1	—	0.6	—
38	—	—	—	0.8

Table 5-8: Narrow T/R Losses, (dB) — 5200 RFU (N)

Freq. Band, GHz	T/R Spacings, MHz					
	65, 84, 91	98 to 150	120	150 to 300	315, 322	340
10	—	0.5	—	0.2	—	—
11	1.2	—	—	—	—	—
15	—	—	—	—	0.3	—
18	—	—	2.2	—	—	0.4

TRUEPOINT® 5200 N+N CONFIGURATIONS



This Chapter provides typical block diagrams illustrating applications that combine different RFU options offered in 3 main configurations. You can build variants to these configurations by combining multiple configurations, such as a [Fully expanded 4+0 Configuration](#), on page [6-3](#) and a 2+0 configuration, for example. For component installation instructions of such configurations, refer to [Chapter 4](#) of this manual.

Special Considerations

- In N+N systems, (1+1 optimized, in 6-11 GHz), the antenna return loss must be a **minimum of 24 dB**.
- For N+N systems, we strongly recommend keeping to a **minimum** the length of the flexible waveguide mounted on the antenna port. Such a waveguide will generate an Inter-modulation Distortion (IMD) that could fall in the receiver band, depending on the frequency pairs selection.

Figure 6-1: MHSB, 2+2, 2 Frequencies, in 2 Outdoor Enclosures with One Antenna, Single Port Expansion

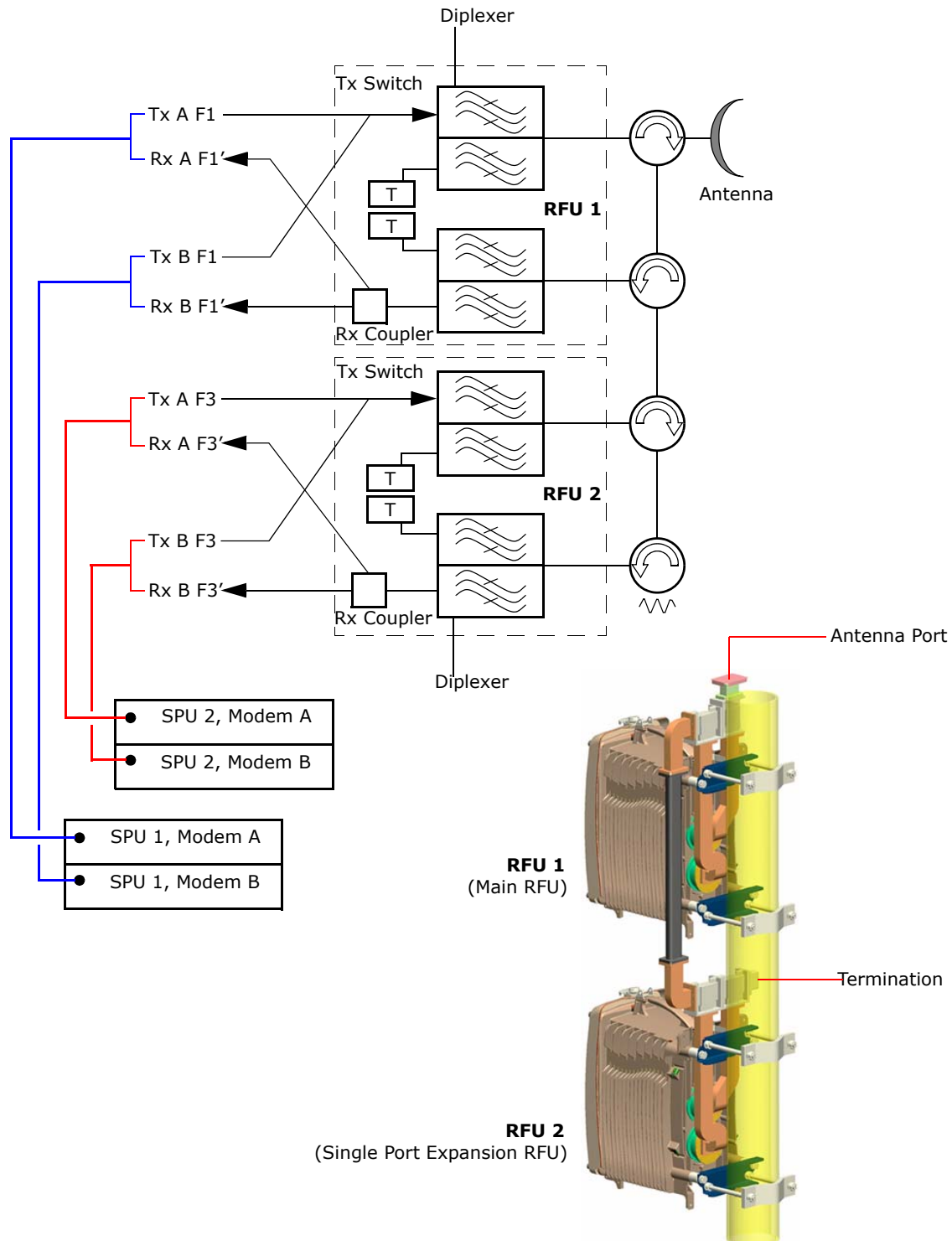
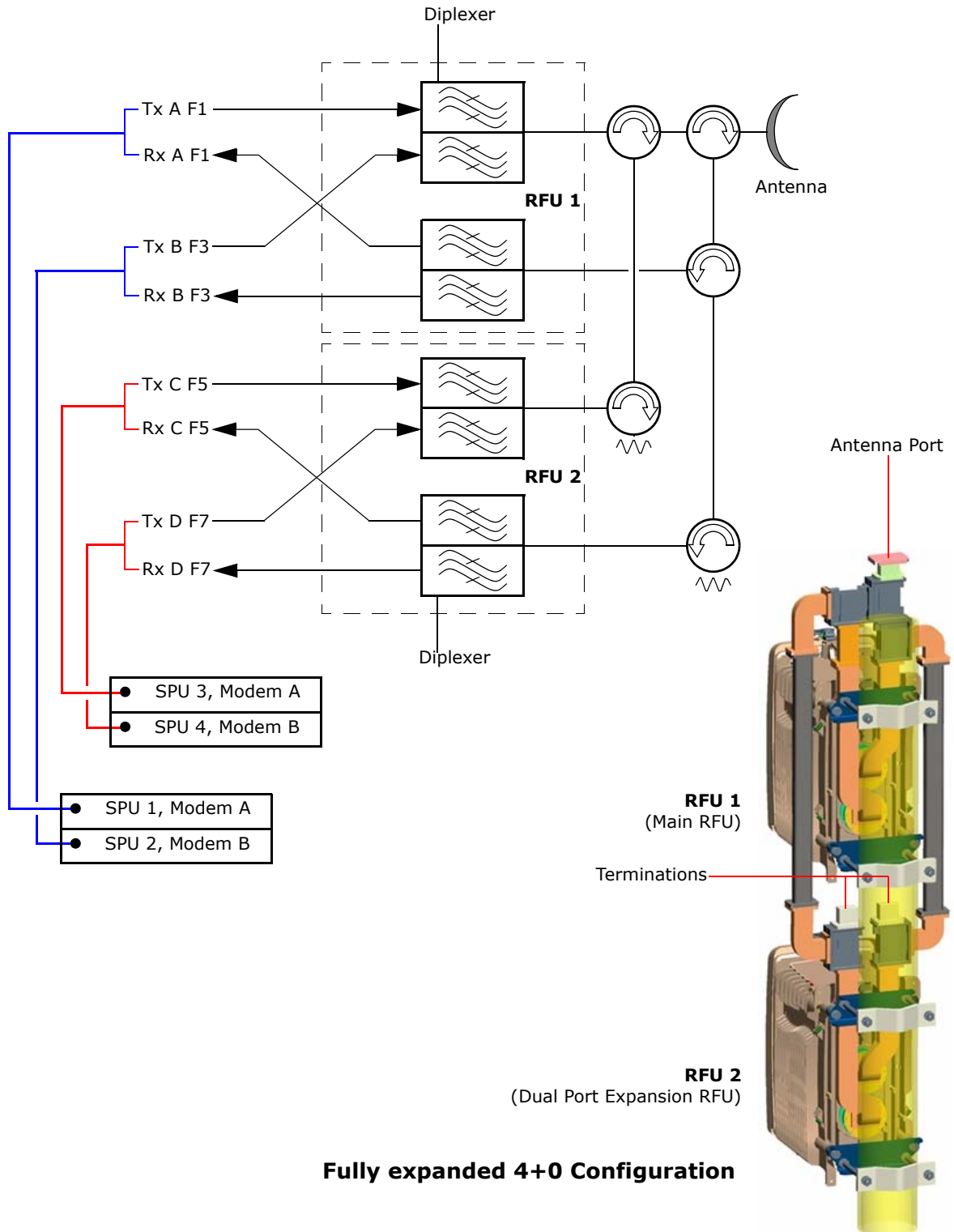


Figure 6-2: FD, 4+0, 4 Frequencies, in 2 Outdoor Enclosures with One Antenna, Dual Port Expansion



TRUEPOINT® 5200
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CONFIGURATIONS

Figure 6-3: FD, 2+2, 4 Frequencies, in 2 Indoor Enclosures with One Antenna, Single Port Expansion

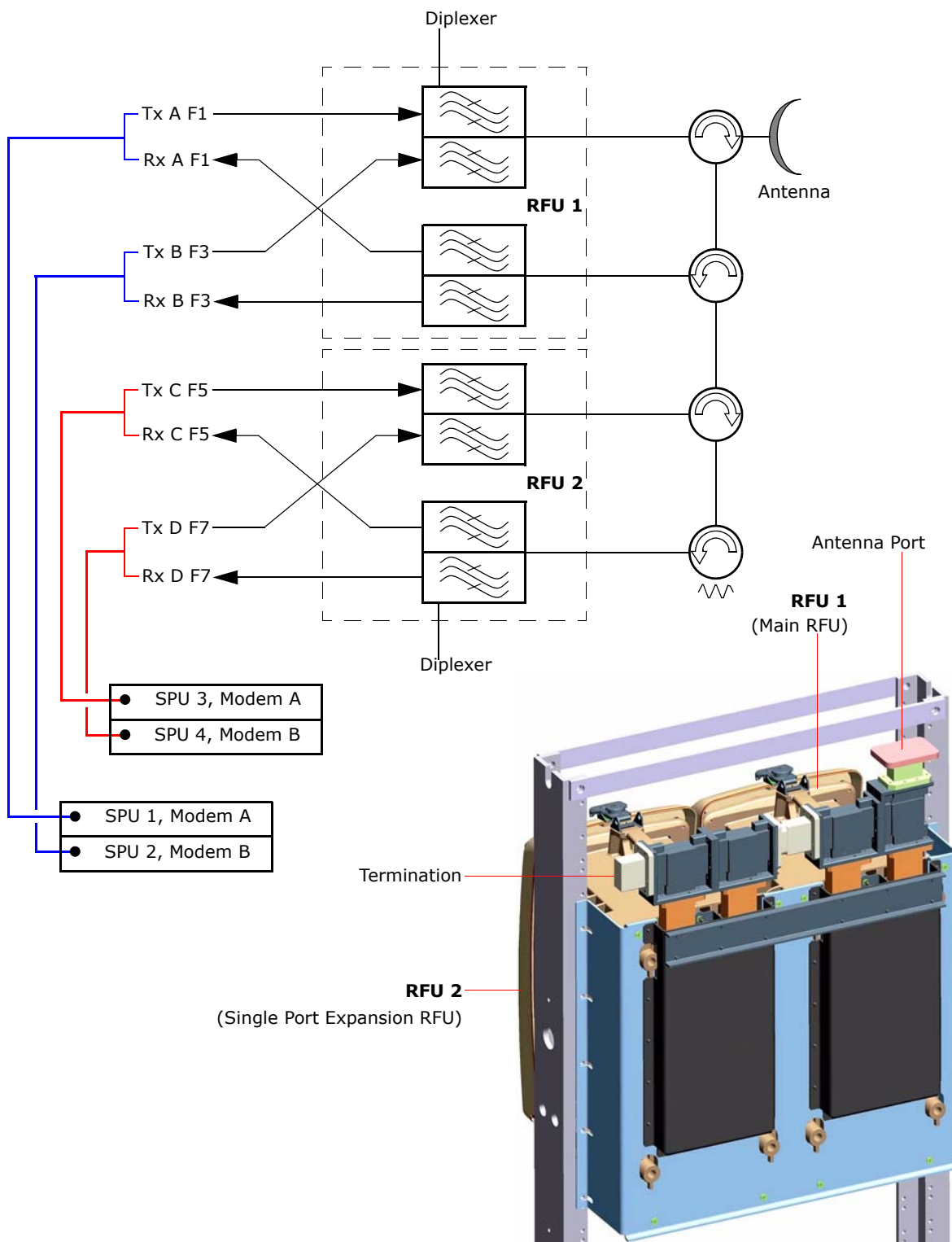


Table 6-1: N+N Component and Accessories Ordering

Configuration			Expansion Kit	
Expandable from	To	Protection/Installation Types	Qty	Description
1+0	2+0	- Unprot-to-Unprotected, Outdoor - Dual port expansion, Figure 6-2	1	• 098-903483-001
			1	• Applicable Transceiver
1+0	3+0	- Unprot-to-Unprotected, Outdoor - Dual port expansion, Figure 6-2	2	• Applicable Transceiver
			1	• 098-903472-0xx
			1	• 098-903481-002
			1	• 201-903472-1xx
			2	• Required Diplexer
1+0	4+0	- Unprot-to-Unprotected, Outdoor - Dual port expansion, Figure 6-2	3	• Applicable Transceiver
			1	• 098-903472-0xx
			1	• 098-903481-002
			1	• 098-903483-001
			2	• 201-903472-1xx
1+0	1+1	- Unprot-to-MHSB, Indoor/Outdoor - Single port expansion, Figure 6-1 and Figure 6-3	1	• 098-903482-001
			1	• Applicable Transceiver
1+0	1+1	- Unprot-to-FD, Outdoor - Dual port expansion, Figure 6-2	1	• 098-903483-001
			1	• Applicable Transceiver
2+0	3+0	- Unprot-to-Unprotected, Outdoor - Dual port expansion, Figure 6-2	1	• 201-903472-1xx
			2	• Required Diplexer
			1	• 098-903472-0xx
			1	• 098-903481-001
			1	• Applicable Transceiver
2+0	4+0	- Unprot-to-Unprotected, Outdoor - Dual port expansion, Figure 6-2	1	• 201-903472-1xx
			2	• Required Diplexer
			1	• 098-903472-0xx
			1	• 098-903481-002
			2	• Applicable Transceiver
1+1	2+2	- Unprot-to-MHSB, Indoor - Single port expansion, Figure 6-3	2	• 201-903470-1xx
			2	• Required Diplexer
			1	• 098-903470-0xx
			1	• 098-903480-002
			2	• Applicable Transceiver

Table 6-1: N+N Component and Accessories Ordering (continued)

Configuration		Protection/Installation Types	Expansion Kit	
Expandable from	To		Qty	Description
1+1	2+2	• Unprot-to-MHSB, Outdoor • Single port expansion, Figure 6-1	1	• 201-903471-1xx
			2	• Required Diplexer
			1	• 098-903471-0xx
			1	• 098-903480-002
			2	• Applicable Transceiver
1+1	2+2	• Unprot-to-MHSB, Outdoor • Dual port expansion, Figure 6-2	1	• 201-903472-1xx
			2	• Required Diplexer
			1	• 098-903472-0xx
			1	• 098-903480-002
			2	• Applicable Transceiver
1+1	2+2	• Unprot-to-FD, Outdoor • Dual port expansion, Figure 6-2	1	• 201-903472-1xx
			2	• Required Diplexer
			1	• 098-903472-0xx
			1	• 098-903481-002
			2	• Applicable Transceiver
3+0	4+0	• Unprot-to-Unprotected, Outdoor • Dual port expansion, Figure 6-2	1	• 098-903483-001
			1	• Applicable Transceiver

Table 6-2: TRuepoint® 5200 RFU, 6 GHz N+N Configurations

Part Number	Description	Comments
201-903470-001	RFU, N+N Indoor Single Port, Standard, 6 GHz	Includes waveguide and circulator assembly.
201-903470-101	RFU, N+N Indoor Single Port, Expandable, 6 GHz	
201-903471-001	RFU, N+N Outdoor Single Port, Standard, 6 GHz	
191-903110-001	Transceiver, 5.915-6.425 GHZ	
191-903120-001	Transceiver, 6.425-7.125 GHZ	
101-902825-101	Diplexer, 5670-6170 MHz, T/R=266 MHz	- TR/TR Diplexers - One port connected to transmitter, and the other to receiver
101-902825-201	Diplexer, 5915-6425 MHz, T/R=240-260 MHz	
101-902825-301	Diplexer, 6540-6875 MHz, T/R=160-180 MHz	
101-902825-401	Diplexer, 6425-7125 MHz, T/R=340-345 MHz	
101-902825-501	Diplexer, 6580-6780 MHz, T/R=90-100 MHz	
101-902825-601	Diplexer, 6780-7125 MHz, T/R=80-140 MHz	- TT/RR Diplexers; - Both ports connected to transmitters, or both ports connected to receivers
101-903495-101	Diplexer, 5670-6170 MHz, TBDTT TBD MHz	
101-903495-201	Diplexer, 5915-6425 MHz, T/R=59.3 MHz, T/T=73 MHz	
101-903495-301	Diplexer, 5915-6425 MHz, T/R=80 MHz, T/T=80 MHz	
101-903495-401	Diplexer, 6425-7125 MHz, T/R= 60 MHz, T/T=70 MHz	
101-903495-501	Diplexer, 6425-7125 MHz, T/R=80 MHz, T/T=100 MHz	

Table 6-3: TRuepoint® 5200 RFU, 7/8 GHz N+N Configurations

Part Number	Description	Comments
201-903470-011	RFU, N+N Indoor Standard Single Port, 7/8 GHz	
201-903470-111	RFU, N+N Indoor Single Port Expandable, 7/8 GHz	
201-903471-011	RFU, N+N Outdoor Single Port, Standard, 7/8 GHz	• Includes waveguide and circulator assembly
201-903471-111	RFU, N+N Outdoor Single Port, Expandable, 7/8 GHz	
201-903472-011	RFU, N+N Outdoor Dual Port, Standard, 7/8 GHz	
201-903472-111	RFU, N+N Outdoor Dual Port, Expandable, 7/8 GHz	
191-903150-001	Transceiver, 7 GHZ	
191-903160-001	Transceiver, 8 GHZ	
101-902695-101	Diplexer, 7100-7750 MHz, T/R=150-200 MHz	• TR/TR Diplexers. One port connects to transmitter, the other to receiver.
101-902695-301	Diplexer, 7725-8275 MHz, T/R=300-312 MHz	
101-902695-401	Diplexer, 7900-8500 MHz, T/R=180-310 MHz	
101-903496-101	Diplexer, 7100-7750 MHz, T/T=56 MHz, T/R=63 MHz	• TT/RR Diplexers. Both ports connected to transmitters....or both ports connected to receivers
101-903496-201	Diplexer, 7400-7900 MHz, T/T=56 MHz, T/R=63 MHz	
101-903496-301	Diplexer, 7725-8275 MHz, T/T=56 MHz, T/R=63 MHz	
101-903496-401	Diplexer, 7900-8500 MHz, T/T=56 MHz, T/R=63 MHz	
101-903496-501	Diplexer, 8200-8500 MHz TBDTT TBD MHz	
098-903470-011	Expansion Kit, N+N Indoor Single Port, 7/8 GHz	• Includes flexible waveguide
098-903471-011	Expansion Kit, N+N Outdoor Single Port, 7/8 GHz	
098-903472-011	Expansion Kit, N+N Outdoor Dual Port, 7/8 GHz	
101-902676-001	Rx Splitter, 3 dB, 5.6-8.8 GHz	• To be ordered with diplexer
101-902677-001	Rx Coupler, 10 dB, 5.6-8.8 GHz	

OPTIONS AND ORDERING

To maintain your microwave radio with a minimum of down time, your organization will have to maintain a stock of spare units (or modules). To do so, you may wish to order additional spares from time to time, to assure that you have enough spares to properly maintain the system. In addition, after you replace a faulty unit with a spare, you will want to return the faulty unit to Harris for repair. This Chapter explains how to accomplish these tasks.

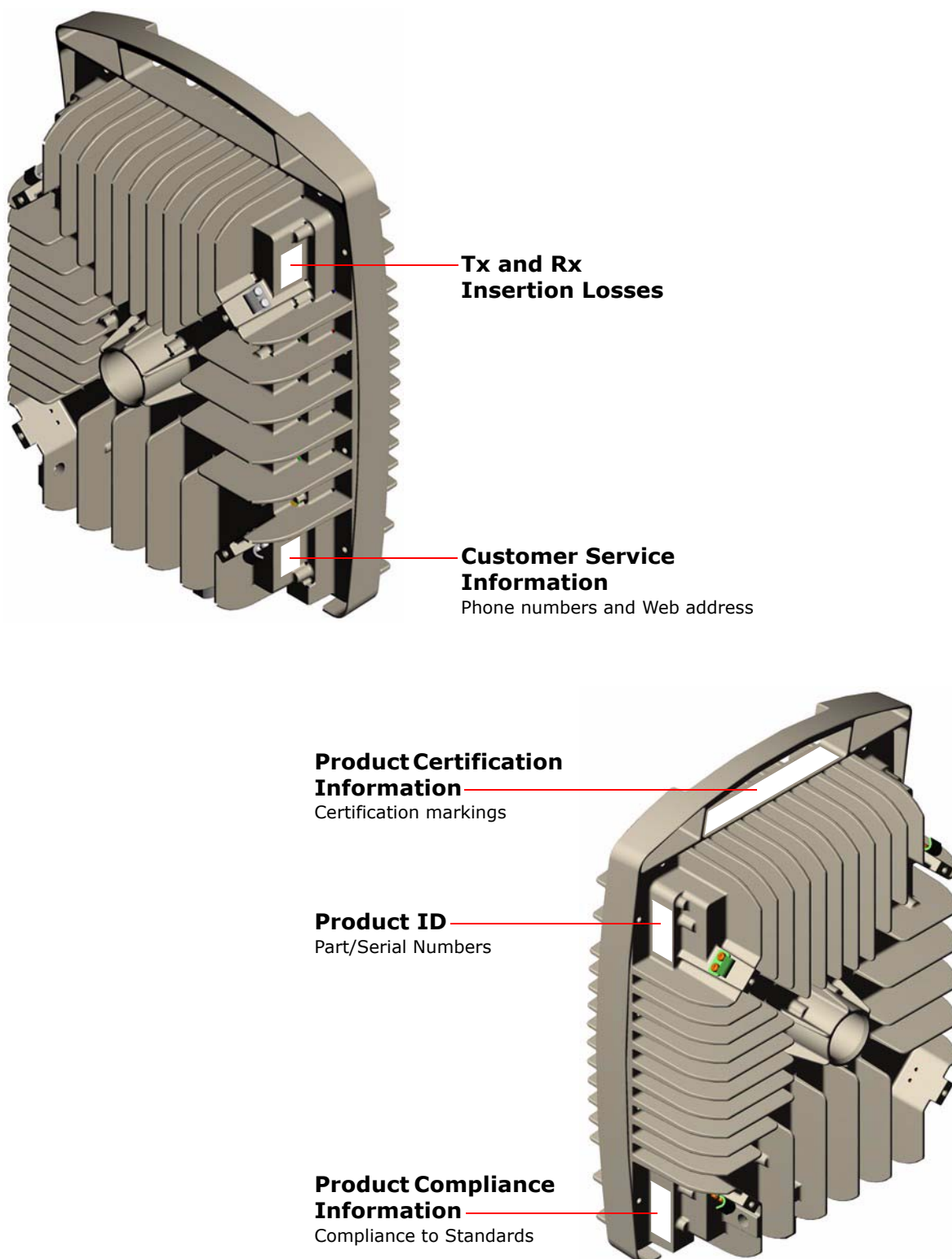
Ordering

Part Numbers Versus Product Codes

The best way to identify an item that you wish to order is to give us a part number. A part number identifies a specific part and is found on a label affixed to the part, as shown in [Figure 7-1](#). On that label, there may also be a product code, which is a more general number that identifies the most up to-date part that serves a specific function. If possible, please provide the **Part Number**.

Spare Unit Ordering Information

When you order spare parts for your existing system, refer to the parts list in [Table 7-1](#) and provide the **Part Number**.

Figure 7-1: Important Label Locations, 5100 RFU

Placing the order

Address all orders for spare units to:

In Canada

Spare Parts Service Centre

Harris Corporation - Microwave Communications Division

3, rue de l'Hôtel de Ville

Dollard-des-Ormeaux, Québec,

Canada H9B 3G4

Phone: 1-800-227-8332

1-514-421-8333

Fax: 1-514-421-3555

Table 7-1: Common Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
TRuepoint® 5100 RFU, 13 GHz		
201-903200-001	RFU, 12751-12865 MHz, T/R 266 MHz	• With spacer for outdoor applications, when flex/twist is shorter than 2 meters
201-903200-002	RFU, 13017-13131 MHz, T/R 266 MHz	
201-903200-003	RFU, 12863-12977 MHz, T/R 266 MHz	
201-903200-004	RFU, 13129-13243 MHz, T/R 266 MHz	
201-903200-601	RFU, 12751-12865 MHz, T/R 266 MHz	• With isolator, for indoor applications, or outdoor applications when flex/twist is longer than 2 meters
201-903200-602	RFU, 13017-13131 MHz, T/R 266 MHz	
201-903200-603	RFU, 12863-12977 MHz, T/R 266 MHz	
201-903200-604	RFU, 13129-13243 MHz, T/R 266 MHz	
TRuepoint® 5100 RFU, 15 GHz		
201-903210-001	RFU, 14501-14732 MHz, T/R 420 MHz	• With spacer for outdoor applications, when flex/twist is shorter than 2 meters
201-903210-002	RFU, 14921-15152 MHz, T/R 420 MHz	
201-903210-003	RFU, 14697-14928 MHz, T/R 420 MHz	
201-903210-004	RFU, 15117-15348 MHz, T/R 420 MHz	
201-903210-005	RFU, 14500-14732 MHz, T/R 644/728 MHz	
201-903210-006	RFU, 15117-15350 MHz, T/R 644; 728 MHz	
201-903210-007	RFU, 14620-14767 MHz, T/R 315; 322 MHz	
201-903210-008	RFU, 14935-15089 MHz, T/R 315; 322 MHz	
201-903210-009	RFU, 14760-14907 MHz, T/R 315; 322 MHz	
201-903210-010	RFU, 15075-15229 MHz, T/R 315; 322 MHz	
201-903210-011	RFU, 14403-14634 MHz, T/R 490 MHz	
201-903210-012	RFU, 14893-15124 MHz, T/R 490 MHz	
201-903210-013	RFU, 14627-14858 MHz, T/R 490 MHz	
201-903210-014	RFU, 15117-15348 MHz, T/R 490 MHz	
201-903210-015	RFU, 14500-14715 MHz, T/R 475 MHz	
201-903210-016	RFU, 14975-15190 MHz, T/R 475 MHz	
201-903210-017	RFU, 14660-14875 MHz, T/R 475 MHz	
201-903210-018	RFU, 15135-15350 MHz, T/R 475 MHz	

Table 7-1: Common Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
TRuepoint® 5100 RFU, 15 GHz		
201-903210-601	RFU, 14501-14732 MHz, T/R 420 MHz	• With isolator, for indoor applications, or outdoor applications when flex/twist is longer than 2 meters
201-903210-602	RFU, 14921-15152 MHz, T/R 420 MHz	
201-903210-603	RFU, 14697-14928 MHz, T/R 420 MHz	
201-903210-604	RFU, 15117-15348 MHz, T/R 420 MHz	
201-903210-605	RFU, 14500-14732 MHz, T/R 644; 728 MHz	
201-903210-606	RFU, 15117-15350 MHz, T/R 644; 728 MHz	
201-903210-607	RFU, 14620-14767 MHz, T/R 315; 322 MHz	
201-903210-608	RFU, 14935-15089 MHz, T/R 315; 322 MHz	
201-903210-609	RFU, 14760-14907 MHz, T/R 315; 322 MHz	
201-903210-610	RFU, 15075-15229 MHz, T/R 315; 322 MHz	
201-903210-611	RFU, 14403-14634 MHz, T/R 490 MHz	
201-903210-612	RFU, 14893-15124 MHz, T/R 490 MHz	
201-903210-613	RFU, 14627-14858 MHz, T/R 490 MHz	
201-903210-614	RFU, 15117-15348 MHz, T/R 490 MHz	
201-903210-615	RFU, 14500-14715 MHz, T/R 475 MHz	
201-903210-616	RFU, 14975-15190 MHz, T/R 475 MHz	
201-903210-617	RFU, 14660-14875 MHz, T/R 475 MHz	
201-903210-618	RFU, 15135-15350 MHz, T/R 475 MHz	

Table 7-1: Common Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
TRuepoint® 5100 RFU, 18 GHz		
201-903220-601	RFU, 17700-18220 MHz, T/R 1008; 1010 MHz	
201-903220-602	RFU, 18700-19220 MHz, T/R 1008; 1010 MHz	
201-903220-603	RFU, 18175-18700 MHz, T/R 1008; 1010 MHz	
201-903220-604	RFU, 19185-19705 MHz, T/R 1008; 1010 MHz	
201-903220-605	RFU, 17700-18210 MHz, T/R 1560; 1615 MHz	
201-903220-606	RFU, 19185-19705 MHz, T/R 1560; 1615 MHz	
201-903220-607	RFU, 18580-18703 MHz, T/R 340 MHz	
201-903220-608	RFU, 18920-19043 MHz, T/R 340 MHz	
201-903220-609	RFU, 18700-18823 MHz, T/R 340 MHz	
201-903220-610	RFU, 19040-19163 MHz, T/R 340 MHz	• With isolator, for Indoor/Outdoor Applications
201-903220-611	RFU, 18580-18620 MHz, T/R 120 MHz	
201-903220-612	RFU, 18700-18740 MHz, T/R 120 MHz	
201-903220-613	RFU, 18620-18660 MHz, T/R 120 MHz	
201-903220-614	RFU, 18740-18780 MHz, T/R 120 MHz	
201-903220-615	RFU, 18660-18700 MHz, T/R 120 MHz	
201-903220-616	RFU, 18780-18820 MHz, T/R 120 MHz	
201-903220-617	RFU, 17700-18210 MHz, T/R 1092.5 MHz	
201-903220-618	RFU, 18795-19305 MHz, T/R 1092.5 MHz	
201-903220-619	RFU, 18090-18610 MHz, T/R 1092.5 MHz	
201-903220-620	RFU, 19185-19705 MHz, T/R 1092.5 MHz	
TRuepoint® 5100 RFU, 23 GHz		
201-903230-601	RFU, 21200-21800 MHz, T/R 1200; 1232 MHz	
201-903230-602	RFU, 22400-23000 MHz, T/R 1200; 1232 MHz	
201-903230-603	RFU, 21800-22400 MHz, T/R 1200; 1232 MHz	• With isolator, for Indoor/Outdoor Applications
201-903230-604	RFU, 23000-23600 MHz, T/R 1200; 1232 MHz	
201-903230-605	RFU, 22000-22600 MHz, T/R 1008; 1010 MHz	
201-903230-606	RFU, 23000-23600 MHz, T/R 1008; 1010 MHz	

Table 7-1: Common Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
TRuepoint® 5100 RFU, 38 GHz		
201-903250-601	RFU, CF 38775 MHz, B/W 350 MHz, T/R 700 MHz	• CF= center frequency • With isolator, for Indoor Applications, or Outdoor applications when Flex/Twist is longer than 2 meters.
201-903250-602	RFU, CF 39475 MHz, B/W 350 MHz, T/R 700 MHz	
201-903250-603	RFU, CF 39125 MHz, B/W 350 MHz, T/R 700 MHz	
201-903250-604	RFU, CF 39825 MHz, B/W 350 MHz, T/R 700 MHz	
201-903250-605	RFU, CF 37310 MHz, B/W 620 MHz, T/R 1260 MHz	
201-903250-606	RFU, CF 38570 MHz, B/W 620 MHz, T/R 1260 MHz	
201-903250-607	RFU, CF 37928 MHz, B/W 620 MHz, T/R 1260 MHz	
201-903250-608	RFU, CF 39188 MHz, B/W 620 MHz, T/R 1260 MHz	
TRuepoint® 5200 RFU, 6-11 GHz		
201-903440-001	RFU, Unprotected 6-11 GHz	• Assembly includes all items that are NOT optional or frequency dependent.
201-903442-001	RFU, MHSB and Equal/Unequal 6-11 GHz	
201-903444-001	RFU, SD and SD/FD IN 6-11 GHz	
201-903446-001	RFU, SD and SD/FD OUT 6-11 GHz	
201-903448-001	RFU, Frequency Diversity 6-11 GHz	
201-903449-001	RFU, Unprotected, Wired for protection 6-11 GHz	
201-903450-001	RFU, MHSB/SD 6-11 GHz	
ACU, Transceiver and Ancillaries, 6 GHz		
191-902666-201	ACU, FD 5915-6425 MHz, 29.65 MHz B/W	• Includes 2 diplexers and a circulator • For Separate configuration only
191-902666-301	ACU, FD 5915-6425 MHz, 40 MHz B/W	
191-902666-401	ACU, FD 6425-7125 MHz, 30 MHz B/W	
191-902666-501	ACU, FD 6425-7125 MHz, 40 MHz B/W	• Includes 2 diplexers • Requires 2 E-bends for Indoor Separate configuration
191-902667-201	ACU, FD/SD 5915-6425 MHz, 29.65 MHz B/W	
191-902667-301	ACU, FD/SD 5915-6425 MHz, 40 MHz B/W	
191-902667-401	ACU, FD/SD 6425-7125 MHz, 30 MHz B/W	
191-902667-501	ACU, FD/SD 6425-7125 MHz, 40 MHz B/W	
191-903110-001	Transceiver, 5.915-6.425 GHz	• For 6 GHz
191-903120-001	Transceiver, 6.425-7.125 GHz	
101-902676-001	Splitter Rx 3 dB 5.6-8.8 GHz	• Order with Diplexer
101-902677-001	Coupler Rx 10 dB 5.6-8.8 GHz	

Table 7-1: Common Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
101-902825-201	Diplexer, 5915-6425 MHz, T/R 240-260 MHz	• Includes 1 Diplexer, only
101-902825-401	Diplexer, 6425-7125 MHz, T/R 340-345 MHz	
101-902825-301	Diplexer, 6540-6875 MHz, T/R 160-180 MHz	
101-902825-501	Diplexer, 6580-6780 MHz, T/R 90-100 MHz	
ACU, Transceiver and Ancillaries, 7/8 GHz		
191-902748-101	ACU, FD 7100-7750 MHz	• Includes 2 diplexers and a circulator • For Separate configuration only
191-902748-201	ACU, FD 7400-7900 MHz	
191-902748-301	ACU, FD 7725-8275 MHz	
191-902748-401	ACU, FD 7900-8500 MHz	
191-902749-101	ACU, FD/SD 7100-7750 MHz	• Includes 2 diplexers • Requires 2 E-bends for Indoor Separate configuration
191-902749-201	ACU, FD/SD 7400-7900 MHz	
191-902749-301	ACU, FD/SD 7725-8275 MHz	
191-902749-401	ACU, FD/SD 7900-8500 MHz	
191-903150-001	Transceiver, 7 GHz	• For 7/8 GHz
191-903160-001	Transceiver, 8 GHz	
101-902676-001	Splitter, Rx 3 dB 5.6-8.8 GHz	• Order with Diplexer
101-902677-001	Coupler, Rx 10 dB 5.6-8.8 GHz	
101-902695-101	Diplexer, 7100-7750 MHz, T/R 150-200 MHz	• Includes 1 Diplexer, only
101-902695-201	Diplexer, 7400-7900 MHz, T/R 245 MHz	
101-902695-301	Diplexer, 7725-8275 MHz, T/R 300-312 MHz	
101-902695-401	Diplexer, 7900-8500 MHz, T/R 180-310 MHz	
101-902695-501	Diplexer, 8200-8500 MHz, T/R 115-130 MHz	
ACU, Transceiver and Ancillaries, 10.5 / 11.7 GHz		
102-902686-101	Diplexer, 10500-10680 MHz T/R 65 MHz	• Includes 1 diplexer only
102-902686-201	Diplexer, 10500-10680 MHz T/R 84 and 91 MHz	
102-902686-301	Diplexer, 10695-11710 MHz T/R 490-530 MHz	
TRuepoint® 5200 RFU, 13-23 GHz		
201-903441-001	RFU, Unprotected, 13-23 GHz	• Assembly includes all items that are NOT optional or frequency dependent.
201-903443-001	RFU, MHSB Eq/Uneq, 13-23 GHz	
201-903445-001	RFU, SD, and SD/FD Indoor, 13-23 GHz	
201-903447-001	RFU, SD, and SD/FD Outdoor, 13-23 GHz	
201-903451-001	RFU, Unprot., Wired MHSB Eq/Uneq, 13-23 GHz	

Table 7-1: Common Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
Transceiver and Ancillaries, 13 GHz		
191-903610-001	Transceiver, 13 GHz	
101-902676-003	Splitter, Rx 3 dB 12.7-15.4 GHz	• Order with Diplexer
101-902677-003	Coupler, Rx 10 dB 12.7-15.4 GHz	
101-902679-101	Diplexer, 12751-13131 MHz, T/R 266 MHz	
101-902679-102	Diplexer, 12863-13243 MHz, T/R 266 MHz	• Includes 1 Diplexer, only
101-902679-103	Diplexer, 12700-12814 MHz, T/R 266 MHz	
Transceiver and Ancillaries, 15 GHz		
191-903620-001	Transceiver, 15 GHz	
101-902676-003	Splitter, Rx 3 dB 12.7-15.4 GHz	• Order with Diplexer
101-902677-003	Coupler, Rx 10 dB 12.7-15.4 GHz	
101-902745-401	Diplexer, 14403-14634 MHz, T/R 490 MHz	
101-902745-501	Diplexer, 14500-14715 MHz, T/R 475 MHz	
101-902745-201	Diplexer, 14500-14732 MHz, T/R 640-728 MHz	
101-902745-101	Diplexer, 14501-14732 MHz, T/R 420 MHz	• Includes 1 Diplexer, only
101-902745-301	Diplexer, 14620-14767 MHz, T/R 315, 322 MHz	
101-902745-402	Diplexer, 14627-14858 MHz, T/R 490 MHz	
101-902745-502	Diplexer, 14660-14875 MHz, T/R 475 MHz	
101-902745-102	Diplexer, 14697-14928 MHz, T/R 420 MHz	
101-902745-302	Diplexer, 14760-14907 MHz, T/R 315, 322 MHz	
Transceiver and Ancillaries, 18 GHz		
191-903630-601	Transceiver, 18 GHz LO, with isolator	• For Outdoor/Indoor applications when Flex/Twist is greater than 2 m.
191-903630-602	Transceiver, 18 GHz HI, with isolator	
101-902676-004	Splitter, Rx 3 dB 17.7-19.7GHz	• Order with diplexer
101-902677-004	Coupler, Rx 10DB 17.7-19.7GHz	

Table 7-1: Common Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
101-902688-101	Diplexer, 17700-18220 MHz, T/R 1008, 1010 MHz	• P/N includes 1 diplexer only.
101-902688-102	Diplexer, 18175-18700 MHz, T/R 1008, 1010 MHz	
101-902688-201	Diplexer, 17700-18210 MHz, T/R 1560, 1615 MHz	
101-902688-301	Diplexer, 18580-18703 MHz, T/R 340 MHz	
101-902688-302	Diplexer, 18700-18823 MHz, T/R 340 MHz	
101-902688-401	Diplexer, 18580-18620 MHz, T/R 120 MHz	
101-902688-402	Diplexer, 18620-18660 MHz, T/R 120 MHz	
101-902688-403	Diplexer, 18660-18700 MHz, T/R 120 MHz	
101-902688-501	Diplexer, 17700-18210 MHz, T/R 1092.5 MHz	
101-902688-502	Diplexer, 18090-18610 MHz, T/R 1092.5 MHz	
098-903104-001	E-bend kit, 18/23 GHz, Single	• One e-bend per port on the RFU 5200.
098-903104-002	E-bend kit, 18/23 GHz, Dual	
Transceiver and Ancillaries, 23 GHz		
191-903640-601	Transceiver, 23 GHz, LO, with isolator	• For Outdoor/Indoor applications when Flex/Twist is greater than 2 m.
191-903640-602	Transceiver, 23 GHz, HI, with isolator	
101-902676-005	Splitter, Rx 3 dB 21.2-23.6 GHz	• Select one. • To be ordered with diplexer as specified.
101-902677-005	Coupler, Rx 10DB 21.2-23.6 GHz	
101-902692-101	Diplexer, 21200-21816 MHz, T/R 1200, 1232	• PN includes 1 diplexer only.
101-902692-102	Diplexer, 21800-22400 MHz, T/R 1200, 1232	
101-902692-201	Diplexer, 22000-22600 MHz, T/R 1008, 1010	
098-903104-001	E-bend kit, 18/23 GHz, Single	• One e-bend per port on the RFU 5200.
098-903104-002	E-bend kit, 18/23 GHz, Dual	
Antennas and Miscellaneous Accessories		
029-900160-001	Torque Wrench, 5/16 in., 9 lbs-in. (for TR5200 RFUs only)	• Optional, for SMA cable connectors
098-902581-001	Sunshield	• Optional, for TRuepoint® 5200
098-903211-001	Sunshield	• Optional, for TRuepoint® 5100
099-902319-001	Split Mount Assembly Kit, 38 GHz	• Optional. Pole-mount kit for outdoor applications.
099-902319-002	Separate Mounting Plate Assy Kit, 23/26 GHz	
099-902319-003	Split Mount Assembly Kit, 18 GHz	
099-902319-004	Split Mount Assembly Kit, 13/15 GHz	

Table 7-1: Common Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
099-902500-001	RFU Indoor Mounting Bracket Kit, 13/15 GHz	• Optional. Rack Mounting Bracket Kit for mounting RFU 5100 indoor in a 19" rack. Includes RFU rack mounting bracket and plate.
099-902500-002	RFU Indoor Mounting Bracket Kit, 18 GHz	
099-902500-003	RFU Indoor Mounting Bracket Kit, 23 GHz	
098-903035-002	Pole-mount Kit, 7-23 GHz	• For TRuepoint® 5200
098-903040-001	Rack-mount Kit, 4 SHCS for one 6 GHz RFU	• Optional for TRuepoint® 5200
098-903040-002	Rack-mount Kit, 4 SHCS for one 7-23 GHz RFU	
098-903040-003	Rack-mount Kit, 8 SHCS for two 6 GHz RFUs	
098-903040-004	Rack-mount Kit, 8 SHCS for two 7-23 GHz RFUs	• For TRuepoint® 5200
098-903041-001	E-bend Kit, 6 GHz Single	
098-903041-002	E-bend Kit, 6 GHz Dual	
098-903042-001	E-bend Kit, 7/8 GHz, Single	• For TRuepoint® 5200
098-903042-002	E-bend Kit, 7/8 GHz, Dual	
099-903005-001	Receptacle, Vertical Polarization 6 GHz-F11	
099-903005-002	Receptacle, Vertical Polarization 7/11 GHz-F11	
099-902709-001	Spacer Kit, for Diplexer	
099-902319-004	Separate Mount Assembly Kit	• Pole-mount kit
099-902775-001	Dust Seal Kit, for RFU	• Optional, cable installation kit. To be used with 901208, 920248, 901206 RG-8 cable kits listed above
099-901206-001	Kit, Cable Installation Tools, C2FP RG-8/U	
029-020070-092	Torque Wrench, 5/16"	
087-903346-002	Cable, ground, 198 mm	• Optional, for TR5200 RFU door
101-903005-207	Antenna, 2 ft 7/8 GHz VHP2-71W-F11	
101-903005-406	Antenna, 4 ft 6 GHz VHP-59W-F11	
101-903005-407	Antenna, 4 ft 7/8 GHz VHP	
IMN-903001-Exx	Extra Instruction Manual (English)	• Optional
CDR-903000-Exx	CD ROM containing manuals	

Table 7-2: Common RoHS Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
TRuepoint® 5100 RFU, 13 GHz		
202-903200-001	RFU, 12751-12865 MHz, T/R 266 MHz	• With spacer for outdoor applications, when flex/twist is shorter than 2 meters
202-903200-002	RFU, 13017-13131 MHz, T/R 266 MHz	
202-903200-003	RFU, 12863-12977 MHz, T/R 266 MHz	
202-903200-004	RFU, 13129-13243 MHz, T/R 266 MHz	
202-903200-601	RFU, 12751-12865 MHz, T/R 266 MHz	• With isolator, for indoor applications, or outdoor applications when flex/twist is longer than 2 meters
202-903200-602	RFU, 13017-13131 MHz, T/R 266 MHz	
202-903200-603	RFU, 12863-12977 MHz, T/R 266 MHz	
202-903200-604	RFU, 13129-13243 MHz, T/R 266 MHz	
TRuepoint® 5100 RFU, 15 GHz		
202-903210-001	RFU, 14501-14732 MHz, T/R 420 MHz	• With spacer for outdoor applications, when flex/twist is shorter than 2 meters
202-903210-002	RFU, 14921-15152 MHz, T/R 420 MHz	
202-903210-003	RFU, 14697-14928 MHz, T/R 420 MHz	
202-903210-004	RFU, 15117-15348 MHz, T/R 420 MHz	
202-903210-005	RFU, 14500-14732 MHz, T/R 644/728 MHz	
202-903210-006	RFU, 15117-15350 MHz, T/R 644; 728 MHz	
202-903210-007	RFU, 14620-14767 MHz, T/R 315; 322 MHz	
202-903210-008	RFU, 14935-15089 MHz, T/R 315; 322 MHz	
202-903210-009	RFU, 14760-14907 MHz, T/R 315; 322 MHz	
202-903210-010	RFU, 15075-15229 MHz, T/R 315; 322 MHz	
202-903210-011	RFU, 14403-14634 MHz, T/R 490 MHz	
202-903210-012	RFU, 14893-15124 MHz, T/R 490 MHz	
202-903210-013	RFU, 14627-14858 MHz, T/R 490 MHz	
202-903210-014	RFU, 15117-15348 MHz, T/R 490 MHz	
202-903210-015	RFU, 14500-14715 MHz, T/R 475 MHz	
202-903210-016	RFU, 14975-15190 MHz, T/R 475 MHz	
202-903210-017	RFU, 14660-14875 MHz, T/R 475 MHz	
202-903210-018	RFU, 15135-15350 MHz, T/R 475 MHz	

Table 7-2: Common RoHS Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
TRuepoint® 5100 RFU, 15 GHz		
202-903210-601	RFU, 14501-14732 MHz, T/R 420 MHz	• With isolator, for indoor applications, or outdoor applications when flex/twist is longer than 2 meters
202-903210-602	RFU, 14921-15152 MHz, T/R 420 MHz	
202-903210-603	RFU, 14697-14928 MHz, T/R 420 MHz	
202-903210-604	RFU, 15117-15348 MHz, T/R 420 MHz	
202-903210-605	RFU, 14500-14732 MHz, T/R 644; 728 MHz	
202-903210-606	RFU, 15117-15350 MHz, T/R 644; 728 MHz	
202-903210-607	RFU, 14620-14767 MHz, T/R 315; 322 MHz	
202-903210-608	RFU, 14935-15089 MHz, T/R 315; 322 MHz	
202-903210-609	RFU, 14760-14907 MHz, T/R 315; 322 MHz	
202-903210-610	RFU, 15075-15229 MHz, T/R 315; 322 MHz	
202-903210-611	RFU, 14403-14634 MHz, T/R 490 MHz	
202-903210-612	RFU, 14893-15124 MHz, T/R 490 MHz	
202-903210-613	RFU, 14627-14858 MHz, T/R 490 MHz	
202-903210-614	RFU, 15117-15348 MHz, T/R 490 MHz	
202-903210-615	RFU, 14500-14715 MHz, T/R 475 MHz	
202-903210-616	RFU, 14975-15190 MHz, T/R 475 MHz	
202-903210-617	RFU, 14660-14875 MHz, T/R 475 MHz	
202-903210-618	RFU, 15135-15350 MHz, T/R 475 MHz	

Table 7-2: Common RoHS Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
TRuepoint® 5100 RFU, 18 GHz		
202-903220-601	RFU, 17700-18220 MHz, T/R 1008; 1010 MHz	
202-903220-602	RFU, 18700-19220 MHz, T/R 1008; 1010 MHz	
202-903220-603	RFU, 18175-18700 MHz, T/R 1008; 1010 MHz	
202-903220-604	RFU, 19185-19705 MHz, T/R 1008; 1010 MHz	
202-903220-605	RFU, 17700-18210 MHz, T/R 1560; 1615 MHz	
202-903220-606	RFU, 19185-19705 MHz, T/R 1560; 1615 MHz	
202-903220-607	RFU, 18580-18703 MHz, T/R 340 MHz	
202-903220-608	RFU, 18920-19043 MHz, T/R 340 MHz	
202-903220-609	RFU, 18700-18823 MHz, T/R 340 MHz	
202-903220-610	RFU, 19040-19163 MHz, T/R 340 MHz	• With isolator, for Indoor/Outdoor Applications
202-903220-611	RFU, 18580-18620 MHz, T/R 120 MHz	
202-903220-612	RFU, 18700-18740 MHz, T/R 120 MHz	
202-903220-613	RFU, 18620-18660 MHz, T/R 120 MHz	
202-903220-614	RFU, 18740-18780 MHz, T/R 120 MHz	
202-903220-615	RFU, 18660-18700 MHz, T/R 120 MHz	
202-903220-616	RFU, 18780-18820 MHz, T/R 120 MHz	
202-903220-617	RFU, 17700-18210 MHz, T/R 1092.5 MHz	
202-903220-618	RFU, 18795-19305 MHz, T/R 1092.5 MHz	
202-903220-619	RFU, 18090-18610 MHz, T/R 1092.5 MHz	
202-903220-620	RFU, 19185-19705 MHz, T/R 1092.5 MHz	
TRuepoint® 5100 RFU, 23 GHz		
202-903230-601	RFU, 21200-21800 MHz, T/R 1200; 1232 MHz	
202-903230-602	RFU, 22400-23000 MHz, T/R 1200; 1232 MHz	
202-903230-603	RFU, 21800-22400 MHz, T/R 1200; 1232 MHz	• With isolator, for Indoor/Outdoor Applications
202-903230-604	RFU, 23000-23600 MHz, T/R 1200; 1232 MHz	
202-903230-605	RFU, 22000-22600 MHz, T/R 1008; 1010 MHz	
202-903230-606	RFU, 23000-23600 MHz, T/R 1008; 1010 MHz	

Table 7-2: Common RoHS Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
TRuepoint® 5100 RFU, 38 GHz		
202-903250-601	RFU, CF 38775 MHz, B/W 350 MHz, T/R 700 MHz	• CF= center frequency • With isolator, for Indoor Applications, or Outdoor applications when Flex/Twist is longer than 2 meters.
202-903250-602	RFU, CF 39475 MHz, B/W 350 MHz, T/R 700 MHz	
202-903250-603	RFU, CF 39125 MHz, B/W 350 MHz, T/R 700 MHz	
202-903250-604	RFU, CF 39825 MHz, B/W 350 MHz, T/R 700 MHz	
202-903250-605	RFU, CF 37310 MHz, B/W 620 MHz, T/R 1260 MHz	
202-903250-606	RFU, CF 38570 MHz, B/W 620 MHz, T/R 1260 MHz	
202-903250-607	RFU, CF 37928 MHz, B/W 620 MHz, T/R 1260 MHz	
202-903250-608	RFU, CF 39188 MHz, B/W 620 MHz, T/R 1260 MHz	
TRuepoint® 5200 RFU, 6-11 GHz		
202-903440-001	RFU, Unprotected 6-11 GHz	• Assembly includes all items that are NOT optional or frequency dependent.
202-903442-001	RFU, MHSB and Equal/Unequal 6-11 GHz	
202-903444-001	RFU, SD and SD/FD IN 6-11 GHz	
202-903446-001	RFU, SD and SD/FD OUT 6-11 GHz	
202-903448-001	RFU, Frequency Diversity 6-11 GHz	
202-903449-001	RFU, Unprotected, Wired for protection 6-11 GHz	
202-903450-001	RFU, MHSB/SD 6-11 GHz	
202-903490-001	RFU, 1+1 SD/FD OUT 2+2 ready	
ACU, Transceiver and Ancillaries, 6 GHz		
192-902666-201	ACU, FD 5915-6425 MHz, 29.65 MHz B/W	• Includes 2 diplexers and a circulator • For Separate configuration only
192-902666-301	ACU, FD 5915-6425 MHz, 40 MHz B/W	
192-902666-401	ACU, FD 6425-7125 MHz, 30 MHz B/W	
192-902666-501	ACU, FD 6425-7125 MHz, 40 MHz B/W	
192-902667-201	ACU, FD/SD 5915-6425 MHz, 29.65 MHz B/W	• Includes 2 diplexers • Requires 2 E-bends for Indoor Separate configuration
192-902667-301	ACU, FD/SD 5915-6425 MHz, 40 MHz B/W	
192-902667-401	ACU, FD/SD 6425-7125 MHz, 30 MHz B/W	
192-902667-501	ACU, FD/SD 6425-7125 MHz, 40 MHz B/W	
192-903110-001	Transceiver, 5.915-6.425 GHz	• For 6 GHz
192-903120-001	Transceiver, 6.425-7.125 GHz	
102-902676-001	Splitter Rx 3 dB 5.6-8.8 GHz	• Order with Diplexer
102-902677-001	Coupler Rx 10 dB 5.6-8.8 GHz	

Table 7-2: Common RoHS Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
102-902825-201	Diplexer, 5915-6425 MHz, T/R 240-260 MHz	• Includes 1 Diplexer, only
102-902825-401	Diplexer, 6425-7125 MHz, T/R 340-345 MHz	
102-902825-301	Diplexer, 6540-6875 MHz, T/R 160-180 MHz	
102-902825-501	Diplexer, 6580-6780 MHz, T/R 90-100 MHz	
ACU, Transceiver and Ancillaries, 7/8 GHz		
192-902748-101	ACU, FD 7100-7750 MHz	• Includes 2 diplexers and a circulator • For Separate configuration only
192-902748-201	ACU, FD 7400-7900 MHz	
192-902748-301	ACU, FD 7725-8275 MHz	
192-902748-401	ACU, FD 7900-8500 MHz	
192-902749-101	ACU, FD/SD 7100-7750 MHz	• Includes 2 diplexers • Requires 2 E-bends for Indoor Separate configuration
192-902749-201	ACU, FD/SD 7400-7900 MHz	
192-902749-301	ACU, FD/SD 7725-8275 MHz	
192-902749-401	ACU, FD/SD 7900-8500 MHz	
192-903150-001	Transceiver, 7 GHz	• For 7/8 GHz
192-903160-001	Transceiver, 8 GHz	
102-902676-001	Splitter, Rx 3 dB 5.6-8.8 GHz	• Order with Diplexer
102-902677-001	Coupler, Rx 10 dB 5.6-8.8 GHz	
102-902695-101	Diplexer, 7100-7750 MHz, T/R 150-200 MHz	• Includes 1 Diplexer, only
102-902695-201	Diplexer, 7400-7900 MHz, T/R 245 MHz	
102-902695-301	Diplexer, 7725-8275 MHz, T/R 300-312 MHz	
102-902695-401	Diplexer, 7900-8500 MHz, T/R 180-310 MHz	
102-902695-501	Diplexer, 8200-8500 MHz, T/R 115-130 MHz	
ACU, Transceiver and Ancillaries, 10.5 / 11.7 GHz		
102-902686-101	Diplexer, 10500-10680 MHz T/R 65 MHz	• Includes 1 diplexer only
102-902686-201	Diplexer, 10500-10680 MHz T/R 84 and 91 MHz	
102-902686-301	Diplexer, 10695-11710 MHz T/R 490-530 MHz	
TRuepoint® 5200 RFU, 13-23 GHz		
202-903441-001	RFU, Unprotected, 13-23 GHz	• Assembly includes all items that are NOT optional or frequency dependent.
202-903443-001	RFU, MHSB Eq/Uneq, 13-23 GHz	
202-903445-001	RFU, SD, and SD/FD Indoor, 13-23 GHz	
202-903447-001	RFU, SD, and SD/FD Outdoor, 13-23 GHz	
202-903451-001	RFU, Unprot., Wired MHSB Eq/Uneq, 13-23 GHz	

Table 7-2: Common RoHS Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
Transceiver and Ancillaries, 13 GHz		
192-903610-001	Transceiver, 13 GHz	
102-902676-003	Splitter, Rx 3 dB 12.7-15.4 GHz	• Order with Diplexer
102-902677-003	Coupler, Rx 10 dB 12.7-15.4 GHz	
102-902679-101	Diplexer, 12751-13131 MHz, T/R 266 MHz	• Includes 1 Diplexer, only
102-902679-102	Diplexer, 12863-13243 MHz, T/R 266 MHz	
102-902679-103	Diplexer, 12700-12814 MHz, T/R 266 MHz	
Transceiver and Ancillaries, 15 GHz		
192-903620-001	Transceiver, 15 GHz	
102-902676-003	Splitter, Rx 3 dB 12.7-15.4 GHz	• Order with Diplexer
102-902677-003	Coupler, Rx 10 dB 12.7-15.4 GHz	
102-902745-401	Diplexer, 14403-14634 MHz, T/R 490 MHz	• Includes 1 Diplexer, only
102-902745-501	Diplexer, 14500-14715 MHz, T/R 475 MHz	
102-902745-201	Diplexer, 14500-14732 MHz, T/R 640-728 MHz	
102-902745-101	Diplexer, 14501-14732 MHz, T/R 420 MHz	
102-902745-301	Diplexer, 14620-14767 MHz, T/R 315, 322 MHz	
102-902745-402	Diplexer, 14627-14858 MHz, T/R 490 MHz	
102-902745-502	Diplexer, 14660-14875 MHz, T/R 475 MHz	
102-902745-102	Diplexer, 14697-14928 MHz, T/R 420 MHz	
102-902745-302	Diplexer, 14760-14907 MHz, T/R 315, 322 MHz	
Transceiver and Ancillaries, 18 GHz		
192-903630-601	Transceiver, 18 GHz LO, with isolator	• For Outdoor/Indoor applications when Flex/Twist is greater than 2 m.
192-903630-602	Transceiver, 18 GHz HI, with isolator	
102-902676-004	Splitter, Rx 3 dB 17.7-19.7GHz	• Order with diplexer
102-902677-004	Coupler, Rx 10DB 17.7-19.7GHz	

Table 7-2: Common RoHS Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
102-902688-101	Diplexer, 17700-18220 MHz, T/R 1008, 1010 MHz	• P/N includes 1 diplexer only.
102-902688-102	Diplexer, 18175-18700 MHz, T/R 1008, 1010 MHz	
102-902688-201	Diplexer, 17700-18210 MHz, T/R 1560, 1615 MHz	
102-902688-301	Diplexer, 18580-18703 MHz, T/R 340 MHz	
102-902688-302	Diplexer, 18700-18823 MHz, T/R 340 MHz	
102-902688-401	Diplexer, 18580-18620 MHz, T/R 120 MHz	
102-902688-402	Diplexer, 18620-18660 MHz, T/R 120 MHz	
102-902688-403	Diplexer, 18660-18700 MHz, T/R 120 MHz	
102-902688-501	Diplexer, 17700-18210 MHz, T/R 1092.5 MHz	
102-902688-502	Diplexer, 18090-18610 MHz, T/R 1092.5 MHz	
098-903796-001	E-bend kit, 18/23 GHz, Single	• One e-bend per port on the RFU 5200.
098-903796-002	E-bend kit, 18/23 GHz, Dual	
Transceiver and Ancillaries, 23 GHz		
192-903640-601	Transceiver, 23 GHz, LO, with isolator	• For Outdoor/Indoor applications when Flex/Twist is greater than 2 m.
192-903640-602	Transceiver, 23 GHz, HI, with isolator	
102-902676-005	Splitter, Rx 3 dB 21.2-23.6 GHz	• Select one. • To be ordered with diplexer as specified.
102-902677-005	Coupler, Rx 10DB 21.2-23.6 GHz	
102-902692-101	Diplexer, 21200-21816 MHz, T/R 1200, 1232	• PN includes 1 diplexer only.
102-902692-102	Diplexer, 21800-22400 MHz, T/R 1200, 1232	
102-902692-201	Diplexer, 22000-22600 MHz, T/R 1008, 1010	
098-903796-001	E-bend kit, 18/23 GHz, Single	• One e-bend per port on the RFU 5200.
098-903796-002	E-bend kit, 18/23 GHz, Dual	
Antennas and Miscellaneous Accessories		
098-903786-001	Sunshield	• Optional, for TRuepoint® 5200
098-903915-001	Sunshield	• Optional, for TRuepoint® 5100
099-903850-001	Split Mount Assembly Kit, 38 GHz	• Optional. Pole-mount kit for outdoor applications.
099-903850-002	Separate Mounting Plate Assy Kit, 23/26 GHz	
099-903850-003	Split Mount Assembly Kit, 18 GHz	
099-903850-004	Split Mount Assembly Kit, 13/15 GHz	

Table 7-2: Common RoHS Parts for TRuepoint® 5100 and 5200 RFUs

Part Number	Description	Comments
099-903930-001	RFU Indoor Mounting Bracket Kit, 13/15 GHz	• Optional. Rack Mounting Bracket Kit for mounting RFU 5100 indoor in a 19" rack. Includes RFU rack mounting bracket and plate.
099-903930-002	RFU Indoor Mounting Bracket Kit, 18 GHz	
099-903930-003	RFU Indoor Mounting Bracket Kit, 23 GHz	
098-903890-002	Pole-mount Kit, 7-23 GHz	• For TRuepoint® 5200
098-903905-001	Rack-mount Kit, 4 SHCS for one 6 GHz RFU	• Optional for TRuepoint® 5200
098-903905-002	Rack-mount Kit, 4 SHCS for one 7-23 GHz RFU	
098-903905-003	Rack-mount Kit, 8 SHCS for two 6 GHz RFUs	
098-903905-004	Rack-mount Kit, 8 SHCS for two 7-23 GHz RFUs	
098-903791-001	E-bend Kit, 6 GHz Single	• For TRuepoint® 5200
098-903791-002	E-bend Kit, 6 GHz Dual	
098-903792-001	E-bend Kit, 7/8 GHz, Single	
098-903792-002	E-bend Kit, 7/8 GHz, Dual	
099-903005-001	Receptacle, Vertical Polarization 6 GHz-F11	
099-903005-002	Receptacle, Vertical Polarization 7/11 GHz-F11	
099-903784-001	Spacer Kit, for Diplexer	
099-903850-004	Separate Mount Assembly Kit	• Pole-mount kit
099-903685-001	Dust Seal Kit, for RFU	
087-903346-002	Cable, ground, 198 mm	• Optional, for TR5200 RFU door
101-903005-207	Antenna, 2 ft 7/8 GHz VHP2-71W-F11	
101-903005-406	Antenna, 4 ft 6 GHz VHP-59W-F11	
101-903005-407	Antenna, 4 ft 7/8 GHz VHP	
IMN-903001-Exx	Extra Instruction Manual (English)	• Optional
CDR-903000-Exx	CD ROM containing manuals	

Customer Service Information

Standard Customer Service Support Guidelines

Harris MCD offers many after-sales services such as Technical Assistance, Repair and Advance Replacements. For details on our services, policies, procedures and how to reach us, please visit our web site at <https://premier.harris.com/microwave/> and access the *Worldwide Customer Service – Support Guidelines Document*. If you cannot access our web site, please call us at **1-800-227-8332 (514-421-8333)** or email us at cs-order@harris.com to get a copy.

Services Offered

- Technical assistance from highly qualified Product Support engineers to resolve technical questions / problems on the phone.
- Field Service support to resolve equipment problems on site by highly professional Field Service engineers.
- Repair of equipment at our Repair, Return facilities in a timely and cost-effective manner.
- Customers may benefit from the Harris MCD Refurbish and Retune Program to ensure that their systems will continue to operate at optimal performance as well as benefit from the latest engineering improvements which we continue to implement into Harris MCD products.
- 24-hour emergency telephone support by highly qualified Product Support engineers for traffic affecting or traffic threatening problems.
- 24-hour emergency shipment of replacement parts on selected items to minimize downtime.
- Product training by highly qualified instructors that maximizes product performance and minimizes maintenance costs.



Harris Microwave Customer Support

Harris provides world-class service for all our valued customers including 24/7 technical support. Your priority calls are handled through our Technical assistance Center (TAC):

USA, Canada, Caribbean: +1-800-227-8332

All other countries: +1-514-421-8333

You can also contact us through e-mail at:
crcusa@harris.com

Registered customers can obtain key product information on our
Premier Web Site at: <https://premier.harris.com/microwave>

Technical Assistance Centre

Technical support is available 24 hours per day, seven days a week, 365 days per year. Product Support Engineers are available worldwide to help you with your technical questions or problems. For the USA/Canada, call us at **1-800-227-8332**. For International, call the Technical Assistance Centre near you or contact us at **1-514-421-8333**, fax to **1-514-421-3555** or email us at crcusa@harris.com.

Please provide us with the following information when you call:

1. Your name, company and telephone number.
2. Equipment type and Sales Order number or FWL number found at the bottom of the rack.
3. Detailed description of the problem.

Repair and Returns Services

Harris MCD repairs all its manufactured products as well as coordinates repairs on vendor items which are part of its systems. The typical repair turn around time for current production models is 5 working days upon receipt of the defective parts and 15 working days for Manufacture Discontinued items, subject to the availability of parts (some restrictions apply).

Repair charges and turn around time for OEM (vendor) items are set by Harris MCD suppliers. Our close working relationships with our suppliers assure us of the best repair prices and turn around time.

For more details, contact us in the USA/Canada at **1-800-227-8332**, for other regions, contact the Harris Repair and Return centre nearest you, or call us at **1-514-421-8333**, fax your request to **1-514-421-3555** or email us at cs-order@harris.com.

On-Site Field Service Support

Harris MCD factory trained Field Service engineers are available to perform on-site technical assistance on an as needed basis when telephone assistance can not be effectively rendered. All request for on-site assistance should be made to the Technical Assistance Center. Call the Technical Assistance Center nearest you or directly call our U.S.A. TAC office at **1-800-227-8332 (1-650-594-3800)** or email us at crcusa@harris.com.

Annual Repair Service Program (ARSP)

Our ARSP service will assure you that all your repairs will be covered for a minimal fee paid up front. Repairs will be processed immediately and unexpected large repair expenses will be avoided. Only Harris MCD manufactured units are covered by the Annual Repair Service Program. The antenna system as well as OEM equipment like the channel banks are excluded. ***This warranty extension excludes any units deemed “irreparable” due to misuse or abuse of the units and replacement of parts subject to normal wear and tear.*** Equipment must be in good operating condition prior to purchasing a warranty extension service. For a more complete warranty coverage (including OEM equipment), please refer to our section titled Maintenance Level Agreements (MLA).

For more details please visit our web site at <https://premier.harris.com/microwave/> and access the Datasheet “Annual Repair Service Program”. For pricing information you can contact us at **1-800-227-8332 (514-421-8333)** or email us at cs-order@harris.com.

Maintenance Level Agreements (MLA)

Harris MCD’s Maintenance Level Agreements (MLA) provide ongoing support for Harris hardware, software and OEM products beyond the expiration of standard warranties. This comprehensive network maintenance program ensures that Harris-supplied networks will continue to perform critical functions, providing the peace of mind our customers expect.

For more details please visit our web site at <https://premier.harris.com/microwave/> and access the *Datasheet “Maintenance Level Agreements (MLA)”*. For pricing information you can contact us at **1-800-227-8332 (514-421-8333)** or email us at cs-order@harris.com.

Customer Training

Harris MCD offers operation and maintenance courses for microwave, lightwave, multiplex and network operation and management systems. The courses are designed to maximize product performance and minimize maintenance costs. Regular classes are held in some of our North-American and International facilities. For information on currently available courses, pricing and training locations, please visit our WEB site at <http://www.microwave.harris.com/support/training/> or e-mail us at mcdtrain@harris.com.

CHAPTER

8

GLOSSARY



This chapter provides an expanded description (as appropriate) of most of the acronyms used in this manual.

ACU	Antenna Coupling Unit
ADM	<i>Add/Drop Multiplexer</i> — A Digital multiplexing equipment that adds/removes individual signals to/from a collection of multiplexed signals in a network.
AGC	Automatic Gain Control
AIS	Alarm Indication Signal
AIS-L	Line Alarm Indication Signal
AMI	Alternate Mark Inversion
ATM	<i>Asynchronous Transfer Mode</i> — A dedicated connection switching technology that organizes digital data into 53-byte cell units and transmits them over a physical medium using digital signal technology. Relative to other related cells, each cell is processed asynchronously and queued before being multiplexed over the transmission path.
ATPC	<i>Automatic Transmit Power Control</i> — A feature of digital microwave radio equipment that adjusts the transmitter output power based on path fading detected at the receiver.
B1	<i>Bit Interleaved Parity-8 (BIP-8)</i> — An RSOH byte for error checking the complete STM-1 signal at the end of a regenerator section.
B2	<i>Bit Interleaved Parity-24 (BIP-24)</i> — MSOH bytes for error checking an STM-1 signal (minus the RSOH) at the end of the multiplexer section.
B8ZS	Bipolar 8 Zero Substitution

CLEC	<i>Competitive Local Exchange Carrier</i> — A service provider that builds and operates communication networks in metropolitan areas, thus providing customers with an alternative to local telephone companies.
DADE	<i>Differential Absolute Delay Equalization</i> — An adjustment to render a protected system hitless.
DHCP	Dynamic Host Configuration Protocol
DTPC	<i>Dynamic Transmit Power Control</i> — A feature enabling the regulation of a target receive signal level by remotely and proportionally controlling the corresponding transmitter output power level.
ESCAN	<i>Extended SCAN Protocol</i> — A Harris proprietary protocol that is more efficient and allows for faster communications than the SCAN protocol, also from Harris.
FD	Frequency Diversity
FEC	<i>Forward Error Correction</i> — A communication technique that compensates for a noisy transmission channel by sending, along with the primary data payload, additional information to correct for errors that occur in transmission.
FIR	<i>Finite Impulse Response filter</i> — Designates one of two primary types of digital filters used in Digital Signal Processing applications.
FTP	<i>File Transfer Protocol</i>
HDB3	High Density Bipolar order 3
HDLC	<i>High-level Data Link Control</i> — A bit-oriented synchronous data link layer protocol developed by ISO. HDLC specifies a data encapsulation method on synchronous serial links using frame characters and checksums.
HHT	<i>Handheld terminal</i> — A Harris' user interface device (also known as a display keypad). It allows the user to configure and monitor the radio when not using CIT or Web-CIT .
IF	Intermediate Frequency
IP	<i>Internet Protocol</i> — A method or protocol by which data is sent from one computer to another on the Internet.
K1 and K2	In an SDH system, K1 and K2 are MSOH bytes used for controlling the multiplexer section protection switching, signalling Alarm Indication Signal (AIS), Far End Remote Failure (FERF), and signalling Automatic Protection Switching (APS) alarms, when implemented.
LAN	<i>Local-area Network</i> — A data network located on a user's premises within a limited geographical area. Widely used technology standards in LANs are Ethernet, FDDI, and Token Ring.
LOH	<i>Line Overhead</i> — Contains the media's framing, routing protocol, and network-layer protocol overhead.
MHSB	Monitored Hot Standby
MMC	<i>MultiMediaCard</i> — A compact, removable standard for storing and retrieving digital information in small, low-power devices. MultiMediaCards use flash technology for reusable recording, and ROM technology for read-only applications.

MSOH	<i>Multiplexer Section Overhead</i> — As part of an SDH frame (multiplexer), refers to the processing time required by codes for error checking and control of transmissions.
MSUU	<i>Microwave Software Upgrade Utility</i> — A Harris' proprietary software utility for upgrading the software and firmware of the TRuepoint® radios. Uses Microsoft Windows 2000® Service Pack 4 or later.
MTBF	<i>Mean Time Between Failures</i> — The average time (usually expressed in hours) in which a component operates without failure. It is calculated by dividing the total number of failures into the total number of operating hours observed.
MTBO	<i>Mean Time Between Outages</i> — A function of MTBF , MTTR and the probability that the monitoring circuits detect a failure. The only circuits considered in the MTBO calculations are the ones that impact traffic.
MTR	Mean Time To Restore
MTTR	<i>Mean Time To Recovery</i> — The average time (usually expressed in minutes) that a device will take to recover from a non-terminal failure.
MUX	<i>Multiplexer</i> — A circuitry that combines two or more information-carrying channels for transmission over one channel, by using frequency division or time division techniques
NMS	<i>Network Management System</i> — such as Harris' FarScan™.
OC-<i>n</i>	<i>Optical Carrier Level <i>n</i></i> — The optical signal that results from an optical conversion of a synchronous transport signal <i>n</i> (STS-<i>n</i>). This is the signal that will form the basis of the interface.
ODU	<i>Outdoor Unit</i> — Refer to RFU , described below.
OMM	Optical Multimode
OSM	Optical Single Mode
PDH	<i>Plesiosynchronous Digital Hierarchy</i> — A complex multiplexing scheme of bit stuffing and byte interleaving. It multiplexes the lower level 64 kbit/s circuits into a successively higher order 2 Mbit/s, 34 Mbit/s, 140 Mbit/s and 565 Mbit/s aggregate rates.
PPP	<i>Point-to-Point Protocol</i> — A TCP/IP routing protocol that allows communications over serial communications lines without the use of other adapters, such as modems.
QAM	<i>Quadrature Amplitude Modulation</i> — A method of combining two amplitude-modulated signals into a single channel, thereby doubling the effective bandwidth.
QPSK	<i>Quadrature Phase Shift Keying</i> — A digital frequency modulation technique used for sending data over coaxial cable networks.
RDI-L	Remote Defect Indication - Line
RCS	<i>Reverse Channel Switching</i> — A rich feature set that provides protection against potential far-end transmitter silent failure.

Restricted Area	A location qualified in accordance with IEC Standard 60950-1 as providing an access that can only be gained by Skilled Persons or users who have been instructed about the reasons for the restriction applied to the location and about any precautions to be taken; and access achieved through the use of a Tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.
RFCOH	<i>Radio Frame Complementary Overhead</i> — Refers to data that is added to a data transmission unit, (such as Netcom data packets).
RFU	<i>Radio Frequency Unit</i> — The radio unit that is installed mainly outdoors.
RIP	Routing Information Protocol
RMS	Rack Mounting Space
RPC	Radio Processing Card
RS	<i>Revertive Switching</i> — A process that sends traffic back to the original working card after the card returns online.
RSL	Received Signal Level
RSOH	<i>Regenerator Section Overhead</i> — As part of an SDH frame (regenerator), refers to the processing time required by codes for error checking and control of transmissions.
RSSI	<i>Received Signal Strength Indicator</i> - A parameter returned from a transceiver that gives a measure of the RF signal strength, either uplink or downlink.
SD	Space Diversity
SDH	<i>Synchronous Digital Hierarchy</i> — An international standard for synchronous data transmission on optical media. SDH uses a multiplexing structure that enables direct access to individual 2 Mbit/s data streams from within the higher order aggregate line signals, which lays the foundation for benefits of distributed traffic switching and protection.
SDLC	<i>Synchronous Data Link Control</i> — A bit-oriented, full-duplex serial protocol that has spawned numerous similar protocols, including HDLC and LAPB.
SDM	<i>Signal Distribution Module</i> — An optional module used in conjunction with a redundant multiplexer, as part of the protection unit that is integrated with the SPU .
Skilled Person	A skilled person is considered to have the necessary knowledge and practical experience of electrical and radio engineering to appreciate the various hazards that can arise from working on radio transceivers, and takes appropriate precautions to ensure the safety of personnel. This individual is considered to be a skilled person only if he/she is competent to take responsibility for both his/her safety and for that of unskilled personnel under his/her immediate supervision, when working on the transceiver. Training requirements for a skilled person should not only be confined to technical matters and, preferably, should include first-aid treatment, especially methods of artificial resuscitation: respiration and cardiac compression (heart massage).
SNCP	<i>Subnetwork Connection Protection</i> — Designates path-switched SDH rings that employ redundant, fiber-optic transmission facilities. Organized in pairs, one fiber transmits in one direction while the backup fiber transmits in the other. If the primary ring fails, the backup takes over.

SNMP	<i>Simple Network Management Protocol</i> — Protocol used to facilitate network management by exchanging information between equipment on a network.
SONET	<i>Synchronous Optical Network</i> — An ANSI standard for synchronous data transmission on optical media that is the equivalent of SDH , described above.
SPU	<i>Signal Processing Unit</i> (Also referred to as IDU) — The indoor rack-mounted unit that contains plug-in modules for handling and processing the signal received from the RFU .
STM-<i>n</i>	<i>Synchronous Transport Module</i> — A data unit transmitted within a fixed time slot of 125 μ s, also known as frame. SDH transport defines a range of frames, STM-1...STM-64, each corresponding to a particular transmission rate, such as STM-1 (155 Mbit/s), STM-4 (622 Mbit/s), STM-16 (2.5 Gbit/s), and STM-64 (10 Gbit/s).
STS-<i>n</i>	<i>Synchronous Transport Signal, Level <i>n</i></i> — The basic logical building block signal of a SONET . The STS-1 (level 1) signal has a rate of 51.840 Mbit/s. The international equivalent of this rate is the STM.
TCM	<i>Trellis-Coded Modulation</i> — A bandwidth-efficient scheme that combines error-correction coding with modulation. The redundancy thus introduced by the coding does not expand the bandwidth, since the parity bits are absorbed by the extended signal constellation. Two-dimensional (2D) TCM uses dependency between in-phase and quadrature symbols, while four-dimensional (4D) TCM introduces dependency between symbols of two successive intervals.
TCP/IP	<i>Transmission Control Protocol/Internet Protocol</i> — A standard that provides connectivity across computer platforms ranging from mainframes to Macintoshes. These computers can exchange data when connected over a compatible network scheme, such as Ethernet or X.25. Originally developed by the Department of Defense in the 70's, these protocols are now a de facto industry standard.
UDP	<i>User Datagram Protocol</i> — A TCP/IP protocol that describes how messages reach application programs within a destination computer.
WAN	<i>Wide-area Network</i> — A network that provides telecommunication services to a geographic area larger than that served by a local area network or a metropolitan area network.
Web-CIT	<i>Web-Craft Interface Tool</i> — A Harris' proprietary software utility for monitoring and controlling the operation and configuration of the TRuepoint [®] radios. Located on the TRuepoint [®] Controller, any of the two NTWRK/LAN ports allows for connecting a PC running the <i>Web-CIT</i> server that is embedded in the radio. This web server stores HTML pages and applets that provide a user interface for monitoring and controlling any TRuepoint [®] Network Element, using the Microsoft [®] Internet Explorer, version 5.5 and later.

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