Microwave Digital Radios

TRuepoint™ 5000,
6 to 38 GHz

RFU Installation
P/N IMN-903001-E02
TRuepoint™ 5000 Series

THE RFU INSTALLATION
PART NO. IMN-903001-E02
SEPTEMBER 2004
## Revision history

<table>
<thead>
<tr>
<th>Issue date</th>
<th>Status</th>
<th>Description of change / revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 22, 2004</td>
<td>DRN C9650</td>
<td>• First release</td>
</tr>
</tbody>
</table>
| September 21, 2004 | ECO 22745| • General update,  
• Modified procedure Replacing a Transceiver, page 4-2  
• Updated General Specifications section, page 2-6 |
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.

WARNUNG
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.

ATENCIÓN
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.

警告
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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CHAPTER 6, GLOSSARY

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ISO 9001 Certification

The Harris Microwave Communications Division is committed to total customer satisfaction and is I.S. EN ISO 9001: 1994 registered for the design, manufacture, installation and service of microwave radio systems.

ISO 14001 Certification

Harris Microwave Communication Division believes that corporations have a responsibility towards the environment and must operate their business in a manner that integrates environmental preoccupation.

Harris Microwave Communications Montreal operations is I.S. EN ISO 14001:1996 registered for the design, manufacture, installation and service of microwave radio 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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Fax: +60-3-7722-2826
Email: LeeEH@trisilco.com.my or rahaidah@trisilco.com.my

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http://www.microwave.harris.com/cservice
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 and return the form at the bottom of the page to our customer service department.

By Fax: 514-421-3555
By email: crcmtl@harris.com
By mail: Harris Corporation
Microwave Communications Division
3 Hotel de Ville
Dollard-des-Ormeaux, Quebec
CANADA H9B3G4

PLEASE PRINT:

Company Name: ____________________________
Requestor's Name: __________________________
Title: __________________ Dept: ____________
Address: ________________________________
City: __________________ State/Province: ___
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.*
Foreword

This document provides instructions for installing the TRuepoint™ 5200 RFU, according to planned or acquired options. It also provides information on
- Cable connections to the SPU;
- Grounding guidelines; and
- Basic troubleshooting.

This document is subject to change without notice.

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™ 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 5200 RFU**
The Manual’s core Chapter: provides steps for installing the RFU, and the required cable connections for general Setup.

**Chapter 4, Maintenance**
Steps for replacing RFU modules.

**Chapter 5, Options and Ordering**
Ordering field replaceable units and Customer Service information.

**Chapter 6, Glossary**
Compilation of acronyms and special terms — and their definitions, where appropriate — used throughout the TRuepoint™ user documentation.
Key Features of the TRuepoint™ 5000 RFU

- RFU is capacity independent
- Fully programmable modem, from 4 QAM to 256 QAM and Reed Solomon, or Reed Solomon concatenated with 2 or 4D TCM, depending on system gain and bandwidth requirements
- In-service performance monitoring with parameters compliant to ITU-T G.826/828 recommendations
- Self-diagnostics to differentiate the path alarms from the equipment alarms
- Errorless receiver switching
- Programmable relay contacts for alarm indication or site control
- Site alarms monitoring
- Tributary (local and remote), IF and RF loopback. (RF loopback available through leakage, by receiver adjustment to the transmit frequency with some frequency band exception)
- ATPC and DTPC operation
- Bandwidth selection by software.

Related Manuals

<table>
<thead>
<tr>
<th>Manual P/N</th>
<th>Title</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMN-903000-Exx</td>
<td>System Description</td>
<td>Top level document providing a broad overview of the TRuepoint™ 5000 platform. Includes Theory of Operation, General Specifications, and Performance Tables.</td>
</tr>
<tr>
<td>User Manuals</td>
<td>(recommended order of use)</td>
<td></td>
</tr>
<tr>
<td>IMN-903001-Exx</td>
<td>RFU Installation</td>
<td>Provides instructions for installing the SPU and its components (modules). It also provides general setup and basic troubleshooting information.</td>
</tr>
<tr>
<td>IMN-903002-Exx</td>
<td>SPU Installation</td>
<td></td>
</tr>
<tr>
<td>IMN-903003-Exx</td>
<td>Operator’s Interface</td>
<td>Provides advanced system configuration, monitoring, control and troubleshooting information.</td>
</tr>
<tr>
<td>Quick Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QRC-903000-Exx</td>
<td>Quick Reference Card</td>
<td>Provides a graphical representation of the TRuepoint™ software menus.</td>
</tr>
</tbody>
</table>
Chapter 2

General Description

The TRuepoint™ 5200 RFU — A Closer Look

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
- **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)
Figure 2-1: An Unprotected RFU
(2-ft antenna shown in the Separate Mount)

Antenna
(Standard, not equipped with latches for engaging the RFU)

Antenna Feed Boom

Offset Pole-Mount

Flexible Waveguide Flange, per Table 2-1

Transceiver

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

- **Special Antenna** equipped with **4 Latches** for engaging the RFU hooks
- **Offset Pole-Mount**
- **M10 screws** for securing the RFU to the antenna interface
Figure 2-3: A Protected RFU — MHSB Configuration

Antenna Port/Flange
(Refer to Table 2-1)

Waterproof Gasket

Transceiver B
(Refer to Figure 2-4)
- Transceiver Pull-out Handle

Transceiver A

Diplexer

Female N-Type Connector, Radio A

Diplexer Port, Radio B

Female N-Type Connector, Radio B

Grounding Point

Bottom View
Figure 2-4: The 6 GHz Transceiver

Transceiver B Shown

Table 2-1: Waveguide Flange Type

<table>
<thead>
<tr>
<th>Freq, GHz</th>
<th>Flange Type</th>
<th>Waveguide Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>• CPR 137 Grooved flange, all open for 8/32 screws (0.170 in/4.3mm dia.)</td>
<td>• WR 137</td>
</tr>
<tr>
<td>7</td>
<td>• CPR 112 Grooved flange, all open for 8/32 screws (0.170 in/4.3mm dia.)</td>
<td>• WR 112</td>
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</table>
## General Specifications

### ANSI Frequency Planning

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency Range, GHz</th>
<th>Regulatory Information</th>
<th>Channel Spacing, MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL6</td>
<td>5.670 - 6.170</td>
<td>GL34 (Canada)</td>
<td>3.5, 5.25, 10, 20</td>
</tr>
<tr>
<td>L6</td>
<td>5.915 - 6.425</td>
<td>FCC Part 101, SRSP 305.9</td>
<td>2.5, 3.75, 5, 10, 29.65, 30</td>
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<tr>
<td>U6</td>
<td>6.425 - 7.125</td>
<td>FCC Part 101, Part 74, SRSP 306.4 Iss. 4 and SRSP 306.5 Iss. 2</td>
<td>2.5, 3.75, 5, 10, 20, 25, 30</td>
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<tr>
<td>7</td>
<td>7.100 - 7.900</td>
<td>NTIA, SRSP 307.1, Iss. 4, ITU-R F-385-7 An.2</td>
<td>2.5, 3.75, 5, 7.5, 10, 20, 30</td>
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<tr>
<td>8</td>
<td>7.725 - 8.500</td>
<td>NTIA, SRSP 307.7, Iss. 4, SRSP 308.2, Iss. 3</td>
<td>3.75, 5, 10, 18.75, 20, 30</td>
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<tr>
<td>10.5-10.68</td>
<td>10.500 - 10.680</td>
<td>FCC Part 101, SRSP 310.5 Iss. 1</td>
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<td>11</td>
<td>10.700 - 11.700</td>
<td>FCC Part 101, SRSP 310.7 Iss. 1</td>
<td>2.5, 3.75, 5, 10, 20, 30, 40</td>
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<tr>
<td>15</td>
<td>14.400 - 15.350</td>
<td>SRSP 314.5 Iss. 2, NTIA</td>
<td>2.5, 3.75, 5, 10, 20, 30, 40</td>
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<tr>
<td>18</td>
<td>17.700 - 19.700</td>
<td>FCC Part 101, Part 74, SRSP (317.7, 318.5)</td>
<td>5, 10, 20, 40</td>
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<tr>
<td>23</td>
<td>21.200 - 23.600</td>
<td>FCC Part 101 (including STL), SRSP 321.8 Iss. 1</td>
<td>2.5, 5, 7.5, 10, 15, 20, 25, 40, 50</td>
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<td>28</td>
<td>27.350 - 29.500</td>
<td>FCC Part 101</td>
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<td>31</td>
<td>31.000 - 31.300</td>
<td>FCC Part 101, ITU-R F.746.5 An. 7</td>
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<td>38</td>
<td>37.000 - 40.000</td>
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### CEPT Frequency Planning

<table>
<thead>
<tr>
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<th>T/R Spacing, MHz</th>
<th>Channel Spacing, MHz</th>
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<tr>
<td>LL6</td>
<td>5.670 - 6.170</td>
<td>266 (Russia)</td>
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<td>L6</td>
<td>5.925 - 6.425</td>
<td>240, 252.04</td>
<td>28 (Bosnia), 29.65, 40</td>
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<td>6.425 - 7.125</td>
<td>340, 345 (China)</td>
<td>20, 30 (China), 40</td>
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<td>10</td>
<td>10.500 - 10.680</td>
<td>65, 84 (France), 91 (Argentina)</td>
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<td>26</td>
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<td>1008</td>
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<td>27.350 - 29.500</td>
<td>1008</td>
<td>3, 5, 7, 14, 28, 56</td>
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<tr>
<td>31</td>
<td>31.000 - 31.300</td>
<td>140</td>
<td>3.5, 7, 14, 28</td>
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<td>32</td>
<td>31.800 - 33.400</td>
<td>812</td>
<td>3.5, 7, 14, 28, 56</td>
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<td>38</td>
<td>37.000 - 40.000</td>
<td>700 (Argentina), 1260</td>
<td>3.5, 7, 14, 28, 56</td>
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</tbody>
</table>

### Transmitter Characteristics

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

- **Truepoint™ 13 to 38 GHz**
  - 40 (QPSK), 35 (16QAM), 30 (32QAM and higher)
- **Truepoint™ 6 to 11 GHz**
  - 30 (All)

**Local Oscillator Frequency**

<table>
<thead>
<tr>
<th>Source</th>
<th>RF frequency synthesizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step size</td>
<td>(\geq 10) GHz 250 kHz maximum</td>
</tr>
<tr>
<td></td>
<td>(\leq 8) GHz 5 kHz maximum (1 kHz resolution at configuration point, through software)</td>
</tr>
</tbody>
</table>

**PA Low Output Alarm**

- **32QAM** 3 dB drop with 1 dB hysteresis
- **All others** 4 dB drop with 2 dB hysteresis

---

Harris Corporation

Truepoint™ 5000 RFU
2-8 General Description

System Characteristics

Modulation
4, 16, 32, 64, 128 and 256 QAM

FEC: Low Capacity
Reed-Solomon

Medium/High Capacity
Reed-Solomon concatenated with 2D or 4D TCM, depending on bandwidth and system gain requirement

Operating Temperature Range

<table>
<thead>
<tr>
<th></th>
<th>Indoor, °C</th>
<th>Outdoor, °C</th>
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</thead>
<tbody>
<tr>
<td>Guaranteed Performance</td>
<td>-5 to +50</td>
<td>-33 to +55</td>
</tr>
<tr>
<td>Operational</td>
<td>-10 to +55</td>
<td>-40 to +55</td>
</tr>
<tr>
<td>Humidity</td>
<td>95% max</td>
<td></td>
</tr>
</tbody>
</table>

Power Consumption, Watts

<table>
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<tr>
<th>Unit</th>
<th>Unprotected</th>
<th>Protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFU and cable</td>
<td>80.5</td>
<td>161</td>
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</table>

Mechanical Characteristics

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

Power Consumption
Refer to Table 2-4, for detailed information

Physical Description

<table>
<thead>
<tr>
<th>Radio</th>
<th>Height, mm</th>
<th>Width, mm</th>
<th>Depth, mm</th>
<th>Weight, kg</th>
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<tbody>
<tr>
<td>RFU, 6 GHz</td>
<td>442</td>
<td>216</td>
<td>300</td>
<td>19.65</td>
</tr>
<tr>
<td>RFU, 7 GHz</td>
<td>442</td>
<td>216</td>
<td>300</td>
<td>19.01</td>
</tr>
</tbody>
</table>

Environmental

Subject
Compliance

Lightning Protection
Figure 3-15 recommends 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 (Operational means that the modules will start at cold and traffic will pass without synchronization losses and BER will be better than 1.0x10-6 after 15 minutes warm-up)
• Storage: -55° C to + 70° C

Humidity
• 5 – 95% non 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)
• ETSI EN 300 019-2-2 V2.1.2 (1999-09) class 2.3 (random vibration, shocks and drop)
EMI / EMC and Safety Compliance

<table>
<thead>
<tr>
<th>Subject</th>
<th>Compliance to Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>• IEC 60950-1&lt;br&gt;• EN 60950-1&lt;br&gt;• CSA C22.2 No. 60950-1&lt;br&gt;• UL 60950-1&lt;br&gt;• EN 60215</td>
</tr>
<tr>
<td>EMC</td>
<td>• FCC Part 15, Subpart B, Class B&lt;br&gt;• Canada ICES-003, Class B&lt;br&gt;• ETSI EN 301 489-1 V1.4.1 (08-2002) (Part 1: Common technical requirements = common part for all radio equipment)&lt;br&gt;• ETSI EN 301 489-4 (08-2002) (Part 4: Specific conditions for fixed radio links and ancillary equipment and services)</td>
</tr>
</tbody>
</table>

Equipment ITU Emissions Designators

Table 2-2: Bandwidth Allocation (MHz), and [Designator]

<table>
<thead>
<tr>
<th>Capacity</th>
<th>CEPT, Lower 6 (5.915-6.425 GHz)</th>
<th>ANSI, Lower 6 (5.915-6.425 GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>QPSK</td>
<td>16QAM</td>
</tr>
<tr>
<td></td>
<td>QPSK</td>
<td>16QAM</td>
</tr>
<tr>
<td>2 E1</td>
<td>29.65</td>
<td>[29M7D7W]</td>
</tr>
<tr>
<td>4 E1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 E1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 E1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 E3+1 E1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 E1</td>
<td>29.65</td>
<td>[29M7D7W]</td>
</tr>
<tr>
<td>STM1+</td>
<td>1 E1</td>
<td>28</td>
</tr>
<tr>
<td>STM1+</td>
<td>1 E1</td>
<td>29.65</td>
</tr>
<tr>
<td>4 DS1</td>
<td>2.5</td>
<td>[2M50D7W]</td>
</tr>
<tr>
<td>8 DS1</td>
<td>3.75</td>
<td>[3M75D7W]</td>
</tr>
<tr>
<td>12 DS1</td>
<td>5</td>
<td>[5M00D7W]</td>
</tr>
<tr>
<td>16 DS1</td>
<td>5</td>
<td>[5M00D7W]</td>
</tr>
</tbody>
</table>
### General Description

#### Capacity

<table>
<thead>
<tr>
<th>Capacity</th>
<th>ANSI, Lower 6 (5.915-6.425 GHz), Continued</th>
</tr>
</thead>
<tbody>
<tr>
<td>QPSK</td>
<td>16QAM</td>
</tr>
<tr>
<td>1 DS3+</td>
<td></td>
</tr>
<tr>
<td>1 DS1</td>
<td>10</td>
</tr>
<tr>
<td>28 DS1</td>
<td>10</td>
</tr>
<tr>
<td>3 DS3</td>
<td></td>
</tr>
<tr>
<td>3 DS3+</td>
<td></td>
</tr>
<tr>
<td>3 DS1</td>
<td></td>
</tr>
<tr>
<td>OC3</td>
<td></td>
</tr>
<tr>
<td>4 DS3</td>
<td></td>
</tr>
</tbody>
</table>

#### Capacity

<table>
<thead>
<tr>
<th>Capacity</th>
<th>CEPT, Upper 6 (6.425-7.125 GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QPSK</td>
<td>16QAM</td>
</tr>
<tr>
<td>2 E1</td>
<td></td>
</tr>
<tr>
<td>4 E1</td>
<td></td>
</tr>
<tr>
<td>8 E1</td>
<td></td>
</tr>
<tr>
<td>16 E1</td>
<td></td>
</tr>
<tr>
<td>1 E3+1 E1</td>
<td></td>
</tr>
<tr>
<td>21 E1</td>
<td>20</td>
</tr>
<tr>
<td>STM1+</td>
<td></td>
</tr>
<tr>
<td>1 E1</td>
<td></td>
</tr>
</tbody>
</table>

#### Capacity

<table>
<thead>
<tr>
<th>Capacity</th>
<th>ANSI, Upper 6 (6.425-7.125 GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QPSK</td>
<td>16QAM</td>
</tr>
<tr>
<td>4 DS1</td>
<td>2.5</td>
</tr>
<tr>
<td>8 DS1</td>
<td>3.75</td>
</tr>
<tr>
<td>12 DS1</td>
<td>5</td>
</tr>
<tr>
<td>16 DS1</td>
<td>5</td>
</tr>
</tbody>
</table>
### Table 2-2: Bandwidth Allocation (MHz), and [Designator] (continued)

<table>
<thead>
<tr>
<th>Capacity</th>
<th>ANSI, Upper 6 (6.425-7.125 GHz), Continued</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>QPSK</td>
</tr>
<tr>
<td>1 DS3+</td>
<td>10</td>
</tr>
<tr>
<td>1 DS1</td>
<td>10</td>
</tr>
<tr>
<td>28 DS1</td>
<td>30</td>
</tr>
<tr>
<td>3 DS3</td>
<td>30</td>
</tr>
<tr>
<td>3 DS3+</td>
<td>30</td>
</tr>
<tr>
<td>3 DS1</td>
<td>30</td>
</tr>
<tr>
<td>OC3</td>
<td>30</td>
</tr>
<tr>
<td>4DS3</td>
<td>30</td>
</tr>
</tbody>
</table>

### Table 2-3: Maximum Allowable SPU-RFU Coaxial Cable Length

<table>
<thead>
<tr>
<th>SPU Input Voltage, 21 V_DC</th>
<th>Low loss RG8U</th>
<th>RG8U</th>
<th>Low loss foam heliax</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Belden 9913 or Eq.</td>
<td>C2FP or equivalent with lightning protection</td>
<td>C2FP or equivalent without lightning protection</td>
</tr>
<tr>
<td>RFU Freq.</td>
<td>ft.</td>
<td>m.</td>
<td>ft.</td>
</tr>
<tr>
<td>23 to 38 GHz</td>
<td>198</td>
<td>60</td>
<td>289</td>
</tr>
<tr>
<td>13 to 18 GHz</td>
<td>121</td>
<td>37</td>
<td>177</td>
</tr>
<tr>
<td>6 to 11 GHz</td>
<td>34</td>
<td>10</td>
<td>49</td>
</tr>
</tbody>
</table>
### Table 2-4: Power Consumption, (Watts)

<table>
<thead>
<tr>
<th>RFU — (Freq, GHz)</th>
<th>Maximum(^a)</th>
<th>Typical(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>70.5</td>
<td>63</td>
</tr>
<tr>
<td>7</td>
<td>70.5</td>
<td>63</td>
</tr>
<tr>
<td>8</td>
<td>70.5</td>
<td>63</td>
</tr>
<tr>
<td>HPA 6 GHz, additional</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>HPA 7 GHz, additional</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>HPA 8 GHz, additional</td>
<td>43</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Maximum: With the HPA exception, as measured at 21V\(_{DC}\) with a long SPU to RFU cable

\(^b\) Typical: At 48V\(_{DC}\) using a short SPU to RFU cable (≤100 ft).
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.................... 3-2
  • RFU mounted on a pole and separated from a pole-mounted antenna\(^1\)

Installing the RFU Outdoors — the Detachable Mount............... 3-11
  • RFU directly attached to a pole-mounted antenna.

Installing the RFU Indoors.................................................... 3-20
  • 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.
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.

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 3-2. 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 3-1. The tools are listed in Table 3-1.
Table 3-1: Tools and Equipment required for the Installation

<table>
<thead>
<tr>
<th>Tool</th>
<th>Required Equipment Specifications</th>
<th>Where Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miscellaneous tools for installing connectors on the SPU to RFU coaxial cable.</td>
<td>See the manufacturer documentation provided with the connector.</td>
<td>• Install the RFU-to-SPU coaxial cable, on page 3-14</td>
</tr>
<tr>
<td>Adjustable wrench</td>
<td>11/16&quot; (18 mm) jaws</td>
<td>Throughout</td>
</tr>
<tr>
<td>Ratchet with socket</td>
<td>11/16&quot; (18 mm) socket</td>
<td></td>
</tr>
<tr>
<td>Rope and hook with safety latch</td>
<td>Common</td>
<td>Figure 3-5</td>
</tr>
<tr>
<td>Multimeter</td>
<td>Common</td>
<td>• Install the RFU-to-SPU coaxial cable, on page 3-14</td>
</tr>
</tbody>
</table>

Figure 3-1: Parts for a Pole-mounted RFU Installation:
Refer to Chapter 5 for part numbers.

Antenna (Typical)
Standard antenna by others

Flexible Twistable Waveguide
with Correct Flanges (Length as Required)

Grounding Kits (3), where applicable
Sealing Kit
Tie-Wraps or Cable Clamps to Support Cable

Coaxial Cable and Connector
Ground Cable

Harris Corporation TRuepoint™ 5000 RFU
Figure 3-2: **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.
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. 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.

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

Tools and material required

- Screwdriver

A sunshield is required if the RFU is to operate in direct sunlight and the ambient temperatures exceed 35-38 °C. Where required, install the optional sunshield as shown in Figure 3-3.

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 3-3.

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 3-3: 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 3-4.

Figure 3-4: Installing the RFU Mounting Hardware

Pole-mounting hardware (attached to RFU)

Spacers for the 6 GHz option Only

19 to 22 N·m (14 to 16 lbf-ft.)
All nuts
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 3-5, and hoist the RFU up the mast.

Figure 3-5: 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 3-6: Attaching the RFU to the Mast**

Pole-mounting hardware *(attached to pole)*

Remove the rope *Only* after securing the RFU to the pole.
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 3-2.

Table 3-2: Waveguide Flange Type

<table>
<thead>
<tr>
<th>Freq, GHz</th>
<th>Flange Type</th>
<th>Waveguide Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>• CPR 137 Grooved flange, all open for 8/32 screws (0.170 in/4.3mm dia.)</td>
<td>• WR 137</td>
</tr>
<tr>
<td>7</td>
<td>• CPR 112 Grooved flange, all open for 8/32 screws (0.170 in/4.3mm dia.)</td>
<td>• WR 112</td>
</tr>
</tbody>
</table>

Figure 3-7: Connecting the Waveguide

Install the twistable flexible waveguide in such a way that it will not rub against hard objects in the wind.
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 3-1.

Prerequisite installation steps:
- Install the antenna, on page 3-5
- Install the optional sunshield, (if applicable), on page 3-6
- Hoist the RFU to the antenna, on page 3-8

Figure 3-8: Parts for a Pole-mounted RFU Installation:
Refer to Chapter 5 for part numbers.
7 Attach the RFU to the antenna hub

Tools and material required

- Harris HR1-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 3-8.

![Warning]

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 3-9: Attaching an RFU Directly to the Antenna
Figure 3-10: Installation Dimensions for an RFU Mounted Directly to a 2-Ft Antenna
8 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 2-3 on page 2-11.
- 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 3-11: 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 3-12: Connecting the Coaxial Cable to the RFU

![Figure 3-12: Connecting the Coaxial Cable to the RFU](image)

<table>
<thead>
<tr>
<th>Description</th>
<th>Comments</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foam core 50 Ω heliax shielded cable (Andrews LDF2-50)</td>
<td>Cable only, XX0 = 210 m to 300 m in 10 m increments</td>
<td>087-099499-XX0</td>
</tr>
<tr>
<td>Low loss 50 Ω RG 8/U kit</td>
<td>45 m</td>
<td>099-901208-001</td>
</tr>
<tr>
<td></td>
<td>90 m</td>
<td>099-901208-002</td>
</tr>
<tr>
<td></td>
<td>150 m</td>
<td>099-901208-003</td>
</tr>
<tr>
<td></td>
<td>210 m</td>
<td>099-901208-004</td>
</tr>
</tbody>
</table>
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 3-13: 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 3-14: 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.
9  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 3-15.

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.
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.

Figure 3-15: 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.
Installing the RFU Indoors

Tools and material required
- Common tools
- Waveguide pressurizing equipment

10 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 3-16).

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 3-17).

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 3-17).

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 3-17.

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 3-16: Mount the rack-mounting bracket to the rack or cabinet

Mount in 9 rack spaces, 23 through 32 (Recommended) — Use screws and clips provided

Bracket for a 6 GHz RFU
P/N 098-903040-001

Bracket for a 7-23 GHz RFU
P/N 098-903040-002

Slotted holes for receiving the RFU’s Threaded bosses
Figure 3-17: 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.

<table>
<thead>
<tr>
<th>Freq, GHz</th>
<th>Flange Type</th>
<th>Waveguide Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>• CPR 137 Grooved flange, all open for 8/32 screws (0.170 in/4.3mm dia.)</td>
<td>• WR 137</td>
</tr>
<tr>
<td>7</td>
<td>• CPR 112 Grooved flange, all open for 8/32 screws (0.170 in/4.3mm dia.)</td>
<td>• WR 112</td>
</tr>
</tbody>
</table>
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 4-1 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 4-1: Indicator Light Display Description

<table>
<thead>
<tr>
<th>Module</th>
<th>Label</th>
<th>Color</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFU</td>
<td>Green</td>
<td>The RFU is operating properly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>The RFU has failed</td>
<td></td>
</tr>
<tr>
<td>CABLE</td>
<td>Green</td>
<td>The cable connecting the SPU to the RFU is working properly</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>The cable connecting the SPU to the RFU has failed</td>
<td></td>
</tr>
</tbody>
</table>
Replacing Units

Replacing a Transceiver

Traffic is interrupted during this procedure. You may want to move traffic to alternate equipment (or channel) before starting.

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.

3. Disconnect the cables going to and from the transceiver that you intend to remove.
4. Unfasten the screw securing the Bracket stopper (if present), discard the stopper, and re-place the Holdding screw and washer in their initial location.
5. Put the Extractor levers (2), vertical = closed position horizontal = open position 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 (2), vertical = closed position horizontal = open position 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. Reconnect the cables going to and from the transceiver, referring to the Wiring Labels, in Figures 4-4 through 4-8.

**Figure 4-1: Removing a Transceiver**

Before removing the transceiver, remove the screw and washer holding the bracket stopper.

10. Close the door of the RFU.

11. Set the circuit breaker on the SPU (Modem) to the I (ON) position.

12. Verify that there are no alarms on the system.

13. 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.

14. Upgrade the RFU software through CONTROL / RFU DOWNLOAD / UPGRADE RFU.

15. Finally, verify that the power output level complies with the specifications, using the HHT in the path 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 3-10, to disconnect the waveguide from the Antenna port, and detach the RFU from its pole-mount.

3. Using a 5/16 in torque wrench, 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 4-2) 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 pound-inches), 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 3-6, and connect the waveguide to the Antenna port.

**Figure 4-2: Removing the Diplexer — Separate Mount**

### 6 GHz Radio

- Threaded pin and knurled nut
- **Diplexer port** (raised face flange)
- Antenna port
- E-Bend support tab secured with hex nut, lockwasher/flat washer
- E-Bend flange attached to diplexer’s flange with Socket-head capscrews
- Diplexer flange attached with Socket-head capscrews
- O-Ring (behind diplexer flange)

### 7/8 GHz Radio

- Threaded pin and knurled nut
- **Diplexer port** (non flanged port)
- RFU hooks
- E-Bend support tab secured with hex nut, lockwasher/flat washer
- E-Bend flange attached to diplexer’s flange with Socket-head capscrews
- Diplexer flange attached with Socket-head capscrews
- O-Ring (behind diplexer flange)
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 7, as applicable, starting on page 3-12, 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 a 5/16 in torque wrench, 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 4-3) 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 4-3) 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 coaxial cables removed in step 3, 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 7, as applicable, starting on page 3-6.

Figure 4-3: Removing the Diplexer — For the Detachable Mount

6 GHz Radio

Diplexer port
(raised face flange)

Threaded bosses

RFU Hooks

O-Ring

Diplexer flange
attached with 2 socket-head setscrews to RFU

O-Ring

Receptacle
fitted to Diplexer flange
with 6 socket-head capscrews

7/8 GHz Radio

Diplexer port
(non-flanged port)

Threaded bosses

RFU Hooks

O-Ring

Diplexer Flange
attached with 2 socket-head setscrews to RFU

O-Ring

Receptacle
fitted to Diplexer Flange
with 6 socket-head capscrews
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 4-4: Wiring for an Unprotected RFU, 6/7 GHz

Option 023-902608-001
Figure 4-5: Wiring for a Protected RFU, 6/7 GHz with MHSB Equal/Unequal Split

Option 023-902608-002
Figure 4-6: Wiring for a Protected RFU, 6/7 GHz for SD, and FD/SD Indoor

Option 023-902608-003
Figure 4-7: Wiring for a Protected RFU, 6/7 GHz for SD, and FD/SD Outdoor

Option 023-902608-004
Figure 4-8: Wiring for a Protected RFU, 6/7 GHz for FD

Option 023-902608-005
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 5-1. 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 5-1 and provide the Part Number.
Figure 5-1: Sample Part Label, RFU

Product Name: TRG200 RFU MHSE EQUINEQ
Product: RF207E163024A0U23
PN: 201-903301-001
Issue: 06
ATTENTION: RFU Connects to TR5000 SPU

SN: M1115385

Figure 5-2: Sample Part Label, Transceiver

Product Name: XCVR 5.915-6.425 GHZ LOWER BAND
Product: N/A
PN: 191-903110-001
Issue: 03

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 5-1: Common Parts for TRuepoint™ 6-11 GHz RFU

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>191-903110-001</td>
<td>Transceiver 5.915-6.425 GHz</td>
<td>• Select one item. Specify frequency.</td>
</tr>
<tr>
<td>191-903120-001</td>
<td>Transceiver 6.425-7.125 GHz</td>
<td></td>
</tr>
<tr>
<td>191-903150-001</td>
<td>Transceiver 7.100-7.900 GHz</td>
<td></td>
</tr>
<tr>
<td>191-903160-001</td>
<td>Transceiver 7.725-8.500 GHz</td>
<td></td>
</tr>
<tr>
<td>098-903035-001</td>
<td>Pole-Mounting Kit, 6 GHz</td>
<td>• Pole-Mount option</td>
</tr>
<tr>
<td>098-903035-002</td>
<td>Pole-Mounting Kit, 7-23 GHz</td>
<td></td>
</tr>
<tr>
<td>098-903040-001</td>
<td>Rack-Mounting Kit, 6 GHz</td>
<td>• Rack-Mount option</td>
</tr>
<tr>
<td>098-903040-002</td>
<td>Rack-Mounting Kit, 7-23 GHz</td>
<td></td>
</tr>
<tr>
<td>098-902581-001</td>
<td>Sunshield Kit</td>
<td>• Optional. Select as required.</td>
</tr>
<tr>
<td>098-902775-001</td>
<td>Dust Seal Kit</td>
<td></td>
</tr>
</tbody>
</table>

### Diplexer Specifications, for reference only, not for ordering

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>For 6 GHz RFU Config.</th>
</tr>
</thead>
<tbody>
<tr>
<td>101-902680-201</td>
<td>Diplexer, 5915-6305 MHz, 240-260 T/R spacing</td>
<td>• Unprotected</td>
</tr>
<tr>
<td>101-902680-202</td>
<td>Diplexer, 6035-6425 MHz, 240-260 T/R spacing</td>
<td>• Unp wired for MHSB eq. or uneq. split</td>
</tr>
<tr>
<td>101-902680-301</td>
<td>Diplexer, 6540-6795 MHz, 160-180 T/R spacing</td>
<td>• MHSB eq. or uneq. split</td>
</tr>
<tr>
<td>101-902680-302</td>
<td>Diplexer, 6625-6875 MHz, 160-180 T/R spacing</td>
<td>• Space diversity, indoors</td>
</tr>
<tr>
<td>101-902680-401</td>
<td>Diplexer, 6430-6940 MHz, 340/345 T/R spacing</td>
<td>• Space diversity, outdoors</td>
</tr>
<tr>
<td>101-902680-402</td>
<td>Diplexer, 6590-7100 MHz, 340/345 T/R spacing</td>
<td></td>
</tr>
<tr>
<td>101-902680-501</td>
<td>Diplexer, 6580-6720 MHz, 90/100 T/R spacing</td>
<td></td>
</tr>
<tr>
<td>101-902680-502</td>
<td>Diplexer, 6610-6750 MHz, 90/100 T/R spacing</td>
<td></td>
</tr>
<tr>
<td>101-902680-503</td>
<td>Diplexer, 6640-6780 MHz, 90/100 T/R spacing</td>
<td></td>
</tr>
<tr>
<td>101-902695-101</td>
<td>Diplexer, 7100-7900 MHz, 150-245 T/R spacing</td>
<td>For 7 and 8 GHz.</td>
</tr>
<tr>
<td>101-902695-201</td>
<td>Diplexer, 7725-8500 MHz, 208-312 T/R spacing</td>
<td>• FD Indoor/Outdoor</td>
</tr>
<tr>
<td>101-902695-301</td>
<td>Diplexer, 8200-8500 MHz, 115-130 T/R spacing</td>
<td>• FD/SD Indoor</td>
</tr>
<tr>
<td>101-902695-501</td>
<td>Diplexer, 7100-7900 MHz, 150-245 T/R spacing</td>
<td>• FD/SD Outdoor</td>
</tr>
</tbody>
</table>

### ACU Specifications, for reference only, not for ordering

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>For 6 GHz RFU</th>
</tr>
</thead>
<tbody>
<tr>
<td>191-902666-201</td>
<td>ACU FD 5915-6425 MHz, 29.65 MHz Ch. Spacing</td>
<td>• Separate configuration only.</td>
</tr>
<tr>
<td>191-902666-301</td>
<td>ACU FD 5915-6425 MHz, 40 MHz Ch. Spacing</td>
<td></td>
</tr>
<tr>
<td>191-902666-401</td>
<td>ACU FD 6425-7125 MHz, 30 MHz Ch. Spacing</td>
<td></td>
</tr>
<tr>
<td>191-902666-501</td>
<td>ACU FD 6425-7125 MHz, 40 MHz Ch. Spacing</td>
<td></td>
</tr>
<tr>
<td>191-902667-201</td>
<td>ACU FD/SD 5915-6425 MHz, 29.65 MHz Ch. Spacing</td>
<td>For 6 GHz RFU, with 2 receptacles, detachable or separate configurations.</td>
</tr>
<tr>
<td>191-902667-301</td>
<td>ACU FD/SD 5915-6425 MHz, 40 MHz Ch. Spacing</td>
<td></td>
</tr>
<tr>
<td>191-902667-401</td>
<td>ACU FD/SD 6425-7125 MHz, 30 MHz Ch. Spacing</td>
<td></td>
</tr>
<tr>
<td>191-902667-501</td>
<td>ACU FD/SD 6425-7125 MHz, 40 MHz Ch. Spacing</td>
<td></td>
</tr>
</tbody>
</table>
### Table 5-1: Common Parts for TRuepoint™ 6-11 GHz RFU

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACU Specifications, for reference only, not for ordering (Continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>191-902748-101</td>
<td>ACU FD 7100-7750 MHz</td>
<td>For 7/8 GHz RFU, separate configuration only.</td>
</tr>
<tr>
<td>191-902748-201</td>
<td>ACU FD 7400-7900 MHz</td>
<td></td>
</tr>
<tr>
<td>191-902749-101</td>
<td>ACU FD SD 7100-7750 MHz</td>
<td>For 7/8 GHz RFU, 2 receptacles, detachable or separate configurations</td>
</tr>
<tr>
<td>191-902749-201</td>
<td>ACU FD SD 7400-7900 MHz</td>
<td></td>
</tr>
<tr>
<td>101-902676-001</td>
<td>Splitter, Rx 3 dB, 5.6-8.8 GHz</td>
<td>Specify frequency, for MHSB equal or unequal split</td>
</tr>
<tr>
<td>101-902677-001</td>
<td>Coupler, Rx 10 dB, 5.6-8.8 GHz</td>
<td></td>
</tr>
<tr>
<td>099-902709-001</td>
<td>Spacer Kit, for ACU</td>
<td>For 6 GHz RFU Only, One per diplexer.</td>
</tr>
<tr>
<td><strong>Antenna Specifications, ordering per customer’s choice</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>101-903005-207</td>
<td>Antenna, 2 ft 7/8 GHZ VHP2-71W-HR1</td>
<td></td>
</tr>
<tr>
<td>101-903005-406</td>
<td>Antenna, 4 ft 6 Ghz VHP4-59W-HR1</td>
<td></td>
</tr>
<tr>
<td>099-903005-001</td>
<td>Receptacle, Vertical Polarization 6 GHz-HR1, Andrew P/N 117 712</td>
<td></td>
</tr>
<tr>
<td>099-903005-002</td>
<td>Receptacle, Vertical Polarization 7/11 GHz-HR1, Andrew P/N 117 711</td>
<td></td>
</tr>
<tr>
<td>IMN-903001-Exx</td>
<td>Extra Instruction Manual (English)</td>
<td></td>
</tr>
<tr>
<td>CDR-903000-Exx</td>
<td>CD ROM containing manuals</td>
<td></td>
</tr>
</tbody>
</table>
Customer Service Information

Quality Policy

Harris Microwave Communications Division's value system focuses on customer satisfaction, continuous process improvement, and growth through new products.

Standard Product Warranty

Harris Microwave Communications Division, (hereafter Harris MCD), warrants that each product of its own manufacture shall, at the time of delivery and for a period of twenty-four (24) months thereafter, be free from defects in materials and workmanship. For such products that are installed by Harris MCD, this warranty shall extend for eighteen (18) months from date of installation, provided that the time from the date of delivery to the date of installation does not exceed six months. Such warranty shall not include any consumable components to which a specific manufacturer's guarantee applies. If any Harris MCD product shall prove to be defective in materials or workmanship under normal intended usage, operation and maintenance during the applicable warranty period as determined by Harris MCD after examination of the product claimed to be defective, then Harris MCD shall repair or replace, at Harris MCD's sole option, such defective product, in accordance with procedures specified below, at its own expense, exclusive, however, of the cost of labor by the customer's own employees, agents or contractors in identifying, removing or replacing the defective part(s) of the product.

In composite equipment assemblies and systems, which include equipment of such other than Harris MCD manufacture, Harris MCD's responsibility under this warranty provision for the non Harris MCD manufactured portion of the equipment shall be limited to the other equipment manufacturer's standard warranty. Provided, however, that if the other manufacturer's standard warranty period is of a shorter duration than the warranty period applicable to Harris MCD's manufactured equipment, then Harris MCD shall extend additional coverage to such other equipment manufacturer's warranty equal to the differential in time between the expiration of the other manufacturer's warranty and the duration of Harris MCD's manufactured equipment warranty applicable to such order.
Harris MCD shall repair or replace, at Harris MCD's sole option, such other manufacturer's defective part(s) within sixty (60) days after receipt of such parts by Harris MCD in accordance with the below specified procedures, at Harris MCD's own expense, exclusive, however, of cost of labor by the customer's own employees, agents or contractors in identifying, removing or replacing the defective part(s) of the product.

An authorization to return products to Harris MCD under this warranty must be obtained from a Harris MCD representative prior to making shipment to Harris MCD's plant, and all returns shall be shipped freight prepaid. Collect shipments will not be accepted, but Harris MCD will prepay return freight charges on repaired and replaced products found to be actually defective.

Liability of Harris MCD for breach of any and all warranties hereunder is expressly limited to the repair or replacement of defective products as set forth in this Chapter, and in no event shall Harris MCD be liable for special, incidental or consequential damages by reason of any breach of warranty or defect in materials or workmanship. Harris MCD shall not be responsible for repair or replacement of products which have been subjected to neglect, accident or improper use, or which have been altered by other than authorized Harris MCD personnel.

The foregoing warranties are in lieu of all other warranties whether oral, written, expressed, implied, or statutory. In particular, the implied warranties of fitness for particular purpose and merchantability are hereby disclaimed and shall not be applicable either from Harris MCD or any other equipment manufacturer. Harris MCD's warranty obligations and buyer's remedies thereunder are solely and exclusively as stated herein. In no case shall Harris MCD be liable for indirect kinds of damages, including but not limited to special, incidental, and consequential damages, or loss of capital, revenue, or profits. In no event shall Harris MCD's liability to buyer, or any party claiming through buyer, be in excess of the actual sales price paid by buyer for any items supplied hereunder.
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.

Technical Assistance Center

For all information related to the Technical Assistance Center nearest you, refer to the Preface of this Manual.

24-Hour Technical Assistance

Technical support is available 24 hours per day, seven days a week. Product Support Engineers are available in the USA from 6:30am to 5pm PST, Monday through Friday, and 7:30am to 5:00pm EST in Canada. At all other times, our Product Support Engineers will return your call within 30 minutes whenever you have traffic affecting or traffic threatening situations. For the USA, call us at 1-800-227-8332. For International, call us at 1-514-421-8333 or fax to 1-514-421-3555. 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 Return

Harris MCD repairs all its manufactured products as well as coordinates repairs on vendor items which are part of its systems. The standard repair turn around time for current production models is 5 working days upon receipt of the defective parts. The part number listing following this section shows which items are current production models by the designator “RBP” or “SOB.” Standard repair turn around time for other products is 15 working days. Manufacturing Discontinued items repair turnaround is subject to the availability of parts.

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.

Call 1-800-227-8332 or 1-514-421-8333 (Canada), or fax your request to 1-514-421-3555.

Repair and Exchange Warranty

Harris MCD’s warranty policy is as follows:

- Repair Warranty: 90 days
- Exchange Warranty: 90 days

and/or the remainder of the original product warranty period, whichever is greater.

Module Exchange

You may prefer to receive a replacement unit before you send your defective unit to us. Harris MCD maintains an inventory of many different modules that can be shipped to you within 24 hours. Parts requiring retune can be shipped within 48 hours.

Emergency exchange is available with a 24 hour turnaround for current production models of some products and 48 hours for other products. Emergency exchanges are billed at actual exchange prices (zero for warranty units) plus 200.00 USD per unit regardless of warranty status.

All exchanged units must be returned to us within 20 calendar days (domestic) / 45 calendar days (international) from date of shipment to avoid getting invoiced for the difference between the exchange price and the list price.
The returned unit must match the product specification of the advance exchange unit like for like. If the returned unit is non-repairable you will be invoiced for the difference between the exchange price and the list price. The unit will be discarded unless advised otherwise.

Return Material Authorization

Before sending in your equipment for repair, please call us at **1-800-227-8332**, or **1-514-421-8333**. (Repair and Return) or fax your request to **1-514-421-3555**. See the last page in this Chapter for the rapid request RMA form. This will ensure that the repairs will be done in a timely manner and eliminate any delays due to incomplete information. Please provide us with the following information when you call us.

1. Your name, company and telephone number.
2. Equipment type, part number, serial number and FWL number found at the bottom of the rack.
3. Detailed description of the problem.
4. Purchase order number.
5. Billing and shipping addresses.
6. Any special return packing or shipping instructions.
7. Customs clearance information if from overseas.

Please return the part with a ‘Trouble Reporting Tag’ attached to it to the address provided by the return coordinators.

Tags illustrated in Figure 5-3 are supplied with the equipment when shipped from Harris.
Restocking Charge

An incremental charge, calculated as a percentage of the current list price, is invoiced as per the following table for exchanged units returned later than the 20 calendar days (domestic) / 45 calendar days (international) from date of shipment:

1- 45 days overdue   15% charge
46-120 days overdue  45% charge
> 120 days overdue   no returns accepted.

You will be invoiced for the difference between the exchange price and the list price.
Emergency Repair

Emergency repair is available with a 24 hour turn around time for products that are of current production and 48 hours for other products. Turnaround time for Manufacturing Discontinued items is subject to the nature of the problems. Emergency repairs are billed at actual repair price (zero for warranty units) plus 200.00 USD per unit regardless of warranty status. Our normal shipping time is 4:00 PM unless special shipping instructions are requested.

Equipment Damaged During Shipment

Please check for shipping damage when your equipment is received.

Inspect all cartons at the time of delivery. Visible damage should be brought to the attention of the carrier at once. In the event of concealed damage, keep the shipping container, packing material and equipment intact. It is your responsibility to file any claims for damage or loss with the carrier.

After the carrier has inspected the damaged material, contact Harris' Repair Administration Department to obtain a return authorization, then return the damaged equipment to Harris. Once repair costs including any and all associated freight costs have been established, you will be advised and these charges may be included in your claim. Harris will make every effort to expedite replacement of damaged goods that are the result of shipping damage.

Evaluation Fee

There is a 195.00 USD evaluation charge per unit if no problem is found and no repair is required.
Irreparable Units

Equipment which has been damaged due to customer negligence or which has parts removed will be repaired at prevailing flat repair fee or on a time and material basis whichever is higher regardless of the warranty status. Any equipment that we have determined to be irreparable, will be returned to the customer. A 195.00 USD evaluation fee will be assessed. This fee will be credited if the customer purchases a replacement unit within 30 days.

Return Freight

Harris MCD prepays standard return freight back to our customers. Return freight back to customers on billable repairs is invoiced to the customers. A 200.00 USD handling charge is added in excess of freight charges for international shipments.

Incoming shipments should be sent DDU (delivered duty unpaid). Outgoing shipments will be sent EXW (EX Works), Service Center locations.

Customers are responsible for clearance and insurance of goods (except for USA / Canada custom clearance).

The customer pays for shipping units to Harris MCD for both warranty and out-of-warranty repairs. Harris does not accept inbound shipments that are C.O.D. Special shipping requests may be subject to additional charge.

Please make sure to pack the unit in such a way as to prevent electrostatic discharge and physical damage in transit.

On-Site Field Service Repair

Harris MCD factory trained Field Service engineers are available to perform on-site repairs on an as needed basis when telephone assistance can not be effectively rendered. All request for on-site assistance should be made to Technical Assistance Center. Call the Technical Assistance Center nearest you.
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.

Customer Training

Harris MCD offers courses in microwave, lightwave and multiplex system operation 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 and training locations, please visit our WEB site at http://www.microwave.harris.com/cservice/ctmain.htm

Special classes can be held at customer sites. Training is available for standard products. All other training requirements must be quoted by the Customer Training Department.
General Training Policy

- Quoted prices are in USD unless noted otherwise.
- Class size is limited to 12 students maximum, except for FarScan™ courses which are limited to 6, unless specified otherwise.
- Training manuals are provided by Harris.
- Courses are in English unless specified otherwise.
- A Purchase Order is required to confirm registration.
- A cancellation fee of 50% will be applied if a customer cancels a scheduled class or reservation in a pre-scheduled class within three weeks of the scheduled date.
- A cancellation fee of 100% will be applied if a customer cancels a scheduled class or reservation in a pre-scheduled class within one week of the scheduled date.
- The Customer shall provide traffic-free radio equipment, computer(s), (if required), and test equipment when training is held at locations other than at a Harris Training and Education Center.
- All pre-scheduled courses can be cancelled or postponed at the discretion of Harris three weeks prior to the scheduled date if the minimum attendance is not met.
- All Quoted prices are valid for a period of ninety (90) days.
- Courses cannot be filmed, videotaped or recorded.
- Students attending courses are responsible for arranging for their meals, accommodations and transportation.
- An attendance of 100% is required of each student to complete the course and to be awarded a certificate of completion.
### Glossary

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

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACU</td>
<td>Antenna Coupling Unit</td>
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<tr>
<td>ADM</td>
<td>Add/Drop Multiplexer — A Digital multiplexing equipment that adds/removes individual signals to/from a collection of multiplexed signals in a network.</td>
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<tr>
<td>AGC</td>
<td>Automatic Gain Control</td>
</tr>
<tr>
<td>AIS</td>
<td>Alarm Indication Signal — In a DS1 system, a transmitted all-ones signal replacing the normal signal to maintain transmission continuity indicating to the receive terminal that there is a transmission fault located either at, or upstream from, the transmitting terminal.</td>
</tr>
<tr>
<td>AMI</td>
<td>Alternate Mark Inversion</td>
</tr>
<tr>
<td>APS</td>
<td>Automatic Protection Switching — A feature that allows a radio to recover automatically from failures.</td>
</tr>
<tr>
<td>ATM</td>
<td>Asynchronous Transfer Mode — 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.</td>
</tr>
<tr>
<td>ATPC</td>
<td>Automatic Transmit Power Control — A feature of digital microwave radio equipment that adjusts the transmitter output power based on path fading detected at the receiver.</td>
</tr>
<tr>
<td>B1</td>
<td>Bit Interleaved Parity-8 (BIP-8) — An RSOH byte for error checking the complete STM-1 signal at the end of a regenerator section.</td>
</tr>
<tr>
<td><strong>B2</strong></td>
<td>Bit Interleaved Parity-24 (BIP-24) — MSOH bytes for error checking an STM-1 signal (minus the RSOH) at the end of the multiplexer section.</td>
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<tr>
<td><strong>B8ZS</strong></td>
<td>Bipolar 8 Zero Substitution</td>
</tr>
<tr>
<td><strong>CLEC</strong></td>
<td>Competitive Local Exchange Carrier — A service provider that builds and operates communication networks in metropolitan areas, thus providing customers with an alternative to local telephone companies.</td>
</tr>
<tr>
<td><strong>DADE</strong></td>
<td>Differential Absolute Delay Equalization — An adjustment to render a protected system hitless.</td>
</tr>
<tr>
<td><strong>DHCP</strong></td>
<td>Dynamic Host Configuration Protocol</td>
</tr>
<tr>
<td><strong>DTPC</strong></td>
<td>Dynamic Transmit Power Control — A feature enabling the regulation of a target receive signal level by remotely and proportionally controlling the corresponding transmitter output power level.</td>
</tr>
<tr>
<td><strong>FD</strong></td>
<td>Frequency Diversity</td>
</tr>
<tr>
<td><strong>FEC</strong></td>
<td>Forward Error Correction — 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.</td>
</tr>
<tr>
<td><strong>FIR</strong></td>
<td>Finite Impulse Response filter — Designates one of two primary types of digital filters used in Digital Signal Processing applications.</td>
</tr>
<tr>
<td><strong>FTP</strong></td>
<td>File Transfer Protocol</td>
</tr>
<tr>
<td><strong>HDB3</strong></td>
<td>High Density Bipolar order 3</td>
</tr>
<tr>
<td><strong>HDLC</strong></td>
<td>High-level Data Link Control — 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.</td>
</tr>
<tr>
<td><strong>HHT</strong></td>
<td>Handheld terminal — 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.</td>
</tr>
<tr>
<td><strong>IF</strong></td>
<td>Intermediate Frequency</td>
</tr>
<tr>
<td><strong>IP</strong></td>
<td>Internet Protocol — A method or protocol by which data is sent from one computer to another on the Internet.</td>
</tr>
<tr>
<td><strong>K1 and K2</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>LAN</strong></td>
<td>Local-area Network — 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.</td>
</tr>
<tr>
<td><strong>LOH</strong></td>
<td>Line Overhead — Contains the media's framing, routing protocol, and network-layer protocol overhead.</td>
</tr>
<tr>
<td><strong>MHSB</strong></td>
<td>Monitored Hot Standby</td>
</tr>
<tr>
<td><strong>MMC</strong></td>
<td>MultiMediaCard — 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.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
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<tr>
<td>MSOH</td>
<td><em>Multiplexer Section Overhead</em> — As part of an SDH frame (multiplexer), refers to the processing time required by codes for error checking and control of transmissions.</td>
</tr>
<tr>
<td>MSUU</td>
<td><em>Microwave Software Upgrade Utility</em> — A Harris’ proprietary software utility for upgrading the software and firmware of the TRuepoint™ radios. Uses Microsoft Windows 2000® Service Pack 4 or later.</td>
</tr>
<tr>
<td>MUX</td>
<td><em>Multiplexer</em> — A circuitry that combines two or more information-carrying channels for transmission over one channel, by using frequency division or time division techniques</td>
</tr>
<tr>
<td>NMS</td>
<td><em>Network Management System</em> — such as Harris’ FarScan™.</td>
</tr>
<tr>
<td>OC-n</td>
<td><em>Optical Carrier Level n</em> — The optical signal that results from an optical conversion of a synchronous transport signal n (STS-n). This is the signal that will form the basis of the interface.</td>
</tr>
<tr>
<td>OMM</td>
<td>Optical Multimode</td>
</tr>
<tr>
<td>OSM</td>
<td>Optical Single Mode</td>
</tr>
<tr>
<td>PDH</td>
<td><em>Plesiosynchronous Digital Hierarchy</em> — 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.</td>
</tr>
<tr>
<td>PPP</td>
<td><em>Point-to-Point Protocol</em> — A TCP/IP routing protocol that allows communications over serial communications lines without the use of other adapters, such as modems.</td>
</tr>
<tr>
<td>QAM</td>
<td><em>Quadrature Amplitude Modulation</em> — A method of combining two amplitude-modulated signals into a single channel, thereby doubling the effective bandwidth.</td>
</tr>
<tr>
<td>QPSK</td>
<td><em>Quadrature Phase Shift Keying</em> — A digital frequency modulation technique used for sending data over coaxial cable networks.</td>
</tr>
<tr>
<td>RDI-L</td>
<td>Remote Defect Indication - Line</td>
</tr>
<tr>
<td>RCS</td>
<td><em>Reverse Channel Switching</em> — A rich feature set that provides protection against potential far-end transmitter silent failure.</td>
</tr>
<tr>
<td>Restricted Area</td>
<td>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.</td>
</tr>
<tr>
<td>RFCOH</td>
<td><em>Radio Frame Complementary Overhead</em> — Refers to data that is added to a data transmission unit, (such as Netcom data packets).</td>
</tr>
<tr>
<td>RFU</td>
<td><em>Radio Frequency Unit</em> — The radio unit that is installed mainly outdoors.</td>
</tr>
<tr>
<td>RIP</td>
<td>Routing Information Protocol</td>
</tr>
<tr>
<td>RMS</td>
<td>Rack Mounting Space</td>
</tr>
<tr>
<td>RPC</td>
<td>Radio Processing Card</td>
</tr>
<tr>
<td>RS</td>
<td><em>Revertive Switching</em> — A process that sends traffic back to the original working card after the card returns online.</td>
</tr>
</tbody>
</table>
**RSL**  Received Signal Level

**RSOH**  *Regenerator Section Overhead* — As part of an SDH frame (regenerator), refers to the processing time required by codes for error checking and control of transmissions.

**RSSI**  *Received Signal Strength Indicator* - A parameter returned from a transceiver that gives a measure of the RF signal strength, either uplink or downlink.

**SD**  Space Diversity

**SDH**  *Synchronous Digital Hierarchy* — 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**  *Synchronous Data Link Control* — A bit-oriented, full-duplex serial protocol that has spawned numerous similar protocols, including HDLC and LAPB.

**SDM**  *Signal Distribution Module* — 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**  *Subnetwork Connection Protection* — 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**  *Simple Network Management Protocol* — A protocol used to facilitate network management by exchanging information between equipment on a network.

**SONET**  *Synchronous Optical Network* — An ANSI standard for synchronous data transmission on optical media that is the equivalent of SDH, described above.

**SPU**  *Signal Processing Unit* (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-n**  *Synchronous Transport Module* — A data unit transmitted within a fixed time slot of 125 µs, 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-n**  *Synchronous Transport Signal, Level n*— 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  
*Trellis-Coded Modulation* — 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  
*Transmission Control Protocol/Internet Protocol* — 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  
*User Datagram Protocol* — A TCP/IP protocol that describes how messages reach application programs within a destination computer.

WAN  
*Wide-area Network* — 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  
*Web-Craft Interface Tool* — 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 Web-CIT 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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