CSAT

Comtech EF Data Family of C-Band Satellite Transceivers:

- CSAT-5060 +10dBm, 5W, 10W, 20W, 25W, 50W, 100W, and 125W Transceivers
- CSAT-6070 5W, 10W, 20W, 25W, 50W, and 100W Transceivers

Installation and Operation Manual

For Firmware Ver. 1.2.1 or Higher

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PREFACE

About this Manual

This manual is the replacement document for the following previously released manuals:

- CSAT-5060 C-Band Satellite Transceiver Installation and Operation Manual (CEFD P/N MN/CSAT5060.IOM)
- CSAT-6070 5 to 25 Watt C-Band Satellite Transceiver Installation and Operation Manual (CEFD P/N MN/CSAT607025.IOM)
- CSAT-6070 50 Watt C-Band Satellite Transceiver Installation and Operation Manual (CEFD P/N MN/CSAT607050.IOM)

The document provides installation and operation information for the Comtech EF Data CSAT Family of Satellite Transceivers. It is intended for the persons responsible for the operation and maintenance of the CSAT-5060 or CSAT-6070 outdoor products. If you have any questions regarding the operation of this equipment, please contact Comtech EF Data Product Support.

Related Documents

- Comtech EF Data RF Control – CRFC Transceiver/Amplifier M&C Utility User Guide (CEFD P/N MN-CRFC)
- Comtech EF Data CiLink – CSAT/XSAT Transceiver iPaq Link M&C Utility Installation and Operaton Manual (CEFD P/N MN/CiLink.IOM)
- Comtech EF Data CPLINK – CSAT/XSAT Transceiver Palm Link 2 M&C Utility Installation and Operaton Manual (CEFD P/N MN/CPLINK.IOM)

Disclaimer

Comtech EF Data has reviewed this manual thoroughly in order to provide an easy-to-use guide to this equipment. All statements, technical information, and recommendations in this manual and in any guides or related documents are believed reliable, but the accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the products described. Further, Comtech EF Data reserves the right to make changes in the specifications of the products described in this manual at any time without notice and without obligation to notify any person of such changes.

If there are any questions regarding this equipment or the information in this manual, please contact Comtech EF Data Product Support.

Conventions and References

Patents and Trademarks

See all of Comtech EF Data's Patents and Patents Pending at http://patents.comtechefdata.com.

Comtech EF Data acknowledges that all trademarks are the property of the trademark owners.

Warnings, Cautions, Notes, and References

A **WARNING** indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

A **CAUTION** indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. **CAUTION** may also be used to indicate other unsafe practices or risks of property damage.

A **NOTE:** gives you important information about a task or the equipment.

A **REFERENCE** directs you to important operational information or details furnished elsewhere, either in the manual or in adjunct Comtech EF Data publications.

Examples of Multi-Hazard Notices
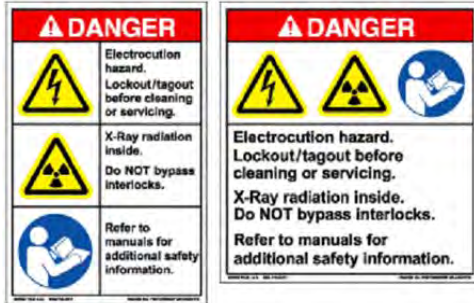
Recommended Standard Designations

Electronic Industries Association (EIA) designations supersede Recommended Standard (RS) designations. Reference to the old RS designations may appear where it might concern actual text (e.g., RS-232) displayed on the product panels and on screens or pages in the Serial Remote or HTTP (Web Server) Interfaces. All other references in the manual refer to EIA designations.

CAUTION
It is important that you review and understand the Safety and Compliance information that follows.

Safety and Compliance

Electrical Safety and Compliance

CAUTION
NEUTRAL FUSING – DOUBLE POLE/NEUTRAL FUSING IS USED ON THE PRIME POWER SUPPLY INPUT.

This equipment has been designed to minimize exposure of personnel to hazards. For further information, contact Comtech EF Data Product Support. The operators and technicians must:

- Know how to work around, with, and on high voltage equipment.
- Exercise every precaution to ensure personnel safety.
- Exercise extreme care when working near high voltages.
- Be familiar with the warnings presented in this manual.

Installation Guidelines Regarding Power Line Quality

Comtech EF Data has become familiar with the varying quality of the AC power grid around the world. Observing the following installation guidelines should help ensure a reliable installation.

- **Surge suppression** – High voltage surges can cause failure of the power supply. These surges are typically caused by circuit switching on the main AC power grid, erratic generator operation, and also by lightning strikes. While the LPOD does have built in surge suppression, if the unit is to be installed in a location with questionable power grid quality, Comtech EF Data recommends installation of additional power conditioning/surge suppression at the power junction box.
- **Grounding** – The LPOD provides a grounding terminal. This is provided to allow you to ground the LPOD to the antenna's grounding network. All components installed at the antenna should be grounded to a common grounding point at the antenna.
- **Electrical welding** – If welding needs to take place at the antenna, disconnect all cables from the LPOD except for the ground wire. Cap all RF connections with terminations. This will prevent damage to the input/output circuitry of the LPOD.
- **Lightning** – Lightning strikes on or around the antenna will generate extremely high voltages on all cables connected to the LPOD. Depending on the severity of the strike, the LPOD's internal surge protection combined with the recommended external suppression may protect the LPOD's power supply. However, if the installation will be in an area with a high probability of lightning strikes, Comtech EF Data recommends the installation of surge suppression on the RF and IF cables. One source of these suppressors is PolyPhaser (www.polyphaser.com).

Product Support

For all product support, please call:

+1.240.243.1880

+1.866.472.3963 (toll free USA)

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+1.480.333.2200

Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a specific period from the date of shipment, and this period varies by product. In most cases, the warranty period is two years. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective. Repairs are warranted for the remainder of the original warranty or a 90 day extended warranty, whichever is longer. Contact Comtech EF Data for the warranty period specific to the product purchased.

For equipment under warranty, the owner is responsible for freight to Comtech EF Data and all related customs, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges only for return of the equipment from the factory to the owner. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

All equipment returned for warranty repair must have a valid RMA number issued prior to return and be marked clearly on the return packaging. Comtech EF Data strongly recommends all equipment be returned in its original packaging.

Comtech EF Data Corporation's obligations under this warranty are limited to repair or replacement of failed parts, and the return shipment to the buyer of the repaired or replaced parts.

Limitations of Warranty

The warranty does not apply to any part of a product that has been installed, altered, repaired, or misused in any way that, in the opinion of Comtech EF Data Corporation, would affect the reliability or detracts from the performance of any part of the product, or is damaged as the result of use in a way or with equipment that had not been previously approved by Comtech EF Data Corporation.

The warranty does not apply to any product or parts thereof where the serial number or the serial number of any of its parts has been altered, defaced, or removed.

The warranty does not cover damage or loss incurred in transportation of the product. The warranty does not cover replacement or repair necessitated by loss or damage from any cause beyond the control of Comtech EF Data Corporation, such as lightning or other natural and weather related events or wartime environments.

The warranty does not cover any labor involved in the removal and or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for repair or replacement.

The warranty excludes any responsibility by Comtech EF Data Corporation for incidental or consequential damages arising from the use of the equipment or products, or for any inability to use them either separate from or in combination with any other equipment or products.

A fixed charge established for each product will be imposed for all equipment returned for warranty repair where Comtech EF Data Corporation cannot identify the cause of the reported failure.

Exclusive Remedies

Comtech EF Data Corporation's warranty, as stated is in lieu of all other warranties, expressed, implied, or statutory, including those of merchantability and fitness for a particular purpose. The buyer shall pass on to any purchaser, lessee, or other user of Comtech EF Data Corporation's products, the aforementioned warranty, and shall indemnify and hold harmless Comtech EF Data Corporation from any claims or liability of such purchaser, lessee, or user based upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Notes:

Notes:

Chapter 1. INTRODUCTION

1.1 Overview

CSAT-5060 +10 dBM Unit

CSAT-5060/6070
5W to 25W P_{1dB} Unit (6W to 32W P_{sat})

CSAT-5060/6070
50W P_{1dB} Unit (63W P_{sat})

CSAT-5060 100W/125W,
CSAT-6070 100W P_{1dB} (125W and 150W P_{sat}) Units
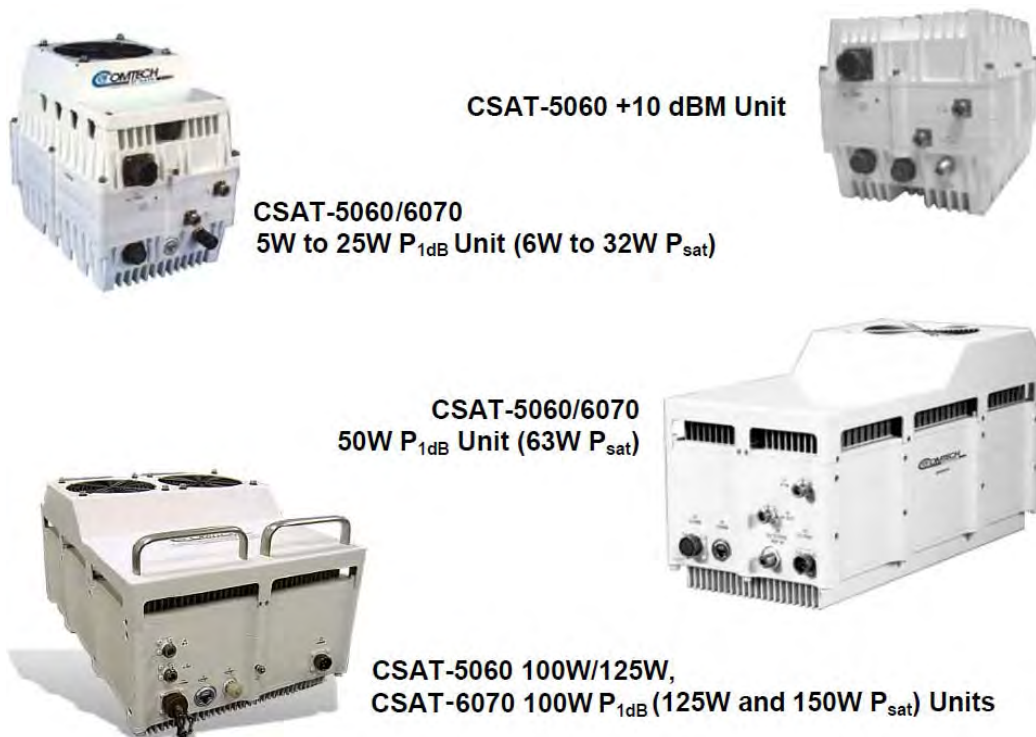
Figure 1-1. Comtech EF Data CSAT Family of Transceivers

Comtech EF Data's CSAT-5060 and CSAT-6070 families of Outdoor Satellite Transceivers (**Figure 1-1**) – referred to collectively throughout this manual as the **CSAT** – deliver full rated power as measured at the 1 dB compression point and at the output flange. The dual synthesizers in the unit deliver phase noise performance exceeding the Intelsat specification. The design of the unit provides

a high Third Order Intercept (TOI) that allows multi-carrier applications without the concerns associated with lower power environments.

The CSAT is environmentally sealed and is designed to be hard mounted on or near the antenna structure. The covered cooling fan(s) housed at the outside of the unit maintains reduced operating temperature for enhanced reliability.

The **CSAT-5060 5W through 125W** and **CSAT-6070 5W through 100W** units are designed for use in communication or satellite uplink data systems for the reception of Single or Multiple Channel(s) Per Carrier (SCPC/MCPC), Demand Assignment Multiple Access (DAMA), and Time Division Multiple Access (TDMA) communication signals. The CSAT also can be used in communications system applications with full transponder HDTV and analog TV.

> The CSAT-5060 (standard C-Band) Transceivers differ from the CSAT-6070 (INSAT band) Transceivers only in Tx and Rx frequency. See **Chapter 2. SPECIFICATIONS** for specification information on all CSAT products.

The **CSAT-5060 +10dBm** unit is designed to mate with an external Solid State Power Amplifier (SSPA) (e.g., Comtech EF Data's HPOD SSPA) or a Traveling Wave Tube Amplifier (TWTA) to provide even higher output power.

1.2 Functional Description

> Typical for all models, the Down Converter and Up Converter local oscillators are independently synthesized to allow simplex or duplex operation. To simplify operation, they share: a common power supply; an internal high stability 10 MHz reference oscillator; and the Monitor and Control (M&C) unit.

The phase noise performance of both the Up Converter and Down Converter sections exceeds the Intelsat phase noise mask for IBS and IDR services by 6 dB. This allows phase dependent demodulators to provide the best possible performance. The close-in phase noise is also very low making the converter ideal for low data rate applications such as DAMA hub earth stations.

Comtech EF Data transceivers are designed to operate continuously at an ambient temperature as low as -40°C, with the unit temperature at approximately -25°C. For temperatures below -30°C, after power-up it may take

up to 45 minutes for the unit temperature to stabilize. During this time, the transceiver may log various alarms/events. This is normal and is to be expected.

1.2.1 CSAT-5060 +10dBm Transceiver Operation

The CSAT-5060 +10dBmTransceiver is designed for use in communication systems, or in satellite uplink data systems, for the reception of SCPC, DAMA, and TDMA communication signals. It also can be used in communications system applications with full transponder HDTV and analog TV.

This transceiver provides an upconverted output, via the 'J8 | EXT AMP' connector, that is used to drive an external SSPA or TWTA. The down conversion side of the transceiver operates the same as the higher power versions of the same CSAT. The converter is environmentally sealed and is designed to be hard mounted on or near the antenna structure.

CAUTION – The downconverter RF input connector is wired to supply DC voltage to an LNA. This voltage is capable of damaging any test equipment connected to the connector. Do not connect test equipment to the connector without a coaxial DC block between the connector and the test equipment.

The dimensional envelope of the CSAT-5060 +10dBm Transceiver is identical to that of the CSAT-5060/6070 5W to 25W units, with the exception that the **'J8 EXT AMP'** connector is present instead of the **'J8 | ETHERNET'** connector.

- **Chapter 2. SPECIFICATIONS**
- **Chapter 4. SYSTEM CONNECTORS**

1.2.2 RF Signal Conversion

1.2.2.1 Down Converter

> ⚠️ **WARNING!**
> **The Down Converter RF input connector is wired to supply DC voltage to an LNA. This voltage is capable of damaging any test equipment connected to this connector. To prevent such damage, you must make sure to connect a coaxial DC block between your test equipment and the Down Converter RF input connector.**
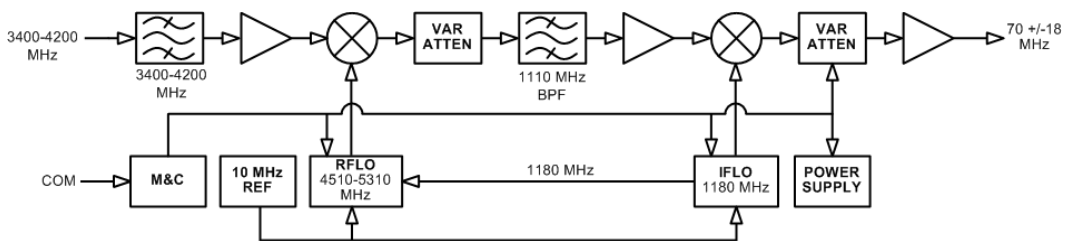
Figure 1-2. CSAT Down Converter Section – Functional Block Diagram

The Down Converter section operates over the 3400 to 4200 MHz frequency range, with a temperature compensated gain of -45 dBm. This high level of gain provides an IF output signal level of +13 dBm at 1 dB of gain compression. This provides the capability to handle longer modem cable runs, or fan out for splitting networks without requiring additional line amplifiers.

The input signal is mixed down to the 1110 MHz IF in the first conversion mixer. The Down Converter RFLO synthesizer in the 4510 to 5310 MHz frequency range provides the High side LO injection in 1.000 or 2.500 MHz steps for this mixing process. Both step sizes are automatically selectable.

IF filtering is provided by the 1110 MHz BPF. It is just wide enough to pass the 36 MHz bandwidth of the desired signal while maintaining more than adequate amplitude and group delay flatness. At the same time, it is narrow enough to provide the necessary rejection to the image, the RFLO, and other spurious signals. The second mixer operates at a fixed input frequency of 1110 MHz. It operates with high side LO injection at 1180 MHz provided by the Down Converter IFLO and converts the IF signal down to the 70 $\pm$18 MHz output frequency.

1.2.2.2 Up Converter
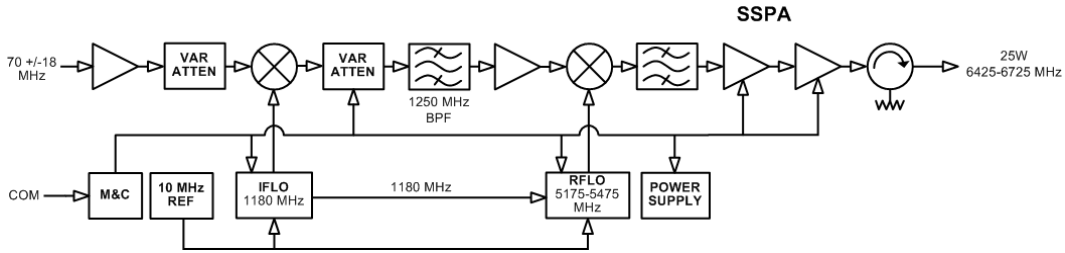
Figure 1-3. CSAT Up Converter Section – Functional Block Diagram

The Up Converter section operates over the 5845 to 6425 MHz frequency range, with a temperature compensated gain. The RF output level is specified as minimum at 1 dB gain compression over the operating temperature range.

The RF input to the Upconverter is at 70 ±18 MHz at a typical level of -35 dBm, which provides an output power backoff of 8 dB. In operation, the input signal is mixed up to the 1250 MHz IF in the first conversion mixer operating at a fixed frequency Low side LO injection at 1180 MHz is provided by the Up Converter IFLO.

IF filtering is provided by the 1250 MHz BPF. It is just wide enough to pass the 36 MHz bandwidth of the desired signal while maintaining more than adequate amplitude and group delay flatness. At the same time, it is narrow enough to provide the necessary rejection to any unwanted mixer products, the IFLO, and other spurious signals.

The second mixer up converts the 1250 MHz IF signal to the desired output frequency. It uses low side LO injection in the 4595 to 5175 MHz frequency range provided by the Upconverter RFLO in 1.000 or 2.500 MHz steps. Both step sizes are automatically selectable. The upconverter signal is then filtered to reject the RFLO leakage, and any other unwanted mixer spurs at the mixer output. The output signal is then amplified by a series of internally matched power FET's to raise the power level of the output signal to the specified level. An isolator is provided at the output of the high power output stage to protect it from mismatches at the output connection to the antenna feed.

1.2.3 Monitor and Control (M&C)

(LEFT: CRFC SW Utility / MIDDLE: CPLINK Handheld Unit / RIGHT: CiLink Handheld Unit)

Figure 1-4. Available Comtech EF Data CSAT M&C Utilities

The Monitor & Control Assembly is designed to monitor the functions of the transceiver, and provide the control for remote command and query inputs to the Up and Down Converter sections. It controls the attenuator and frequency settings, and it monitors the alarm system and logs any alarms or faults that might occur.

All configuration control, status retrieval and adjustments are available with connections as follows:

- Serial remote M&C of the CSAT is available through its 'J5 | COMM' port. ASCII commands and queries are issued through the serial remote interface. Serial remote control inputs are provided through the EIA-232 or EIA-485 pinouts in this 19-pin circular connector. Connect a serial adapter cable from the 'J5 | COMM' port on the CSAT to a User PC equipped with a terminal emulator utility or Comtech EF Data's CRFC software utility, or a utility such as Comtech EF Data's available CPLINK or CiLink handheld M&C devices (**Figure 1-4**).
- Ethernet remote M&C of the CSAT is available through its RJ-45 'J8 | ETHERNET' port. Connect a CAT5 Ethernet cable from the User PC Ethernet port to the 'J8 | Ethernet' port on the CSAT for SNMP, Telnet, or HTTP Interface operation.

1.2.4 Operational References

For:	See:
• **System Connections**	**Chapter 4. SYSTEM CONNECTORS**
• **Standalone Operation Setup Instructions**	**Chapter 5. STANDALONE (SINGLE THREAD) INSTALLATION**
• **Firmware Updating Instructions**	**Chapter 6. FIRMWARE UPDATE**
• **Basic Operating Instructions and Procedures**	**Chapter 7. SYSTEM OPERATION**
• **Ethernet Interface Operations**	**Chapter 8. ETHERNET INTERFACE OPERATION**
• **Serial Interface Operations**	**Chapter 9. SERIAL INTERFACE OPERATION**
• **Resolving Problems**	**Appendix A. MAINTENANCE and TROUBLESHOOTING**
• **1:1 Redundancy Installation**	**Appendix B. OPTIONAL 1:1 REDUNDANT SYSTEM INSTALLATION**
• **1:1 Redundancy Operation**	**Appendix C. OPTIONAL 1:1 REDUNDANT SYSTEM OPERATION**

Notes:

Chapter 2. SPECIFICATIONS

⊙ **These specifications are typical for all CSAT products unless noted.**

2.1 Environmental and Physical Specifications

2.1.1 Regulatory Compliance

- "CE" as follows:
    - EN 50082-1 (EMC/Generic Immunity)
    - EN 55022 Class B (Emissions)
    - EN 55024 (Immunity)
    - EN 60950 (Safety)
- FCC Part 15 Subpart B
- RoHS-Compliant

2.1.2 Environmental Specifications

2.1.2.1 Temperature Range

- **Operating:**   -40° to 131° F (-40° to 55° C)
- **Storage:**   -58° to 167 F° (-50° to 75° C)

2.1.2.2 Altitude

15,000 ft Mean Sea Level (MSL)

2.1.2.3   Humidity (Non-condensing)

0 to 100% Relative

2.1.2.4   Ingress Protection Rating

Designed for Ingress Protection Rating IP66 (1st 6="Dust tight" solid particle protection; 2nd 6="Powerful water jets" liquid ingress protection)

2.1.3   Physical Specifications

2.1.3.1   Dimensions

- **+10dBm Unit:**
  8" H x 8" W x 11" D (203.2mm H x 203.2mm W x 279.4mm D)
- **5W to 25W Units:**
  10.75" H x 8" W x 11" D (273.05mm H x 203.2mm H x 279.4mm D)
- **50W Units:**
  9.75" H x 10" W x 23" D (247.65mm H x 254mm W x 584.2mm D)
- **100W/125W Units:**
  10" H x 12.5" W x 26" D (254mm H x 317.5mm H x 660.4mm D)

2.1.3.2   Weight

- **+10dBm, 5W to 25W Units:**   36 lbs (16 kg)
- **50W Units:**   65 lbs (29 kg)
- **100W/125W Units:**   80 lbs (40 kg)

2.1.3.3   Power and Grounding

2.1.3.3.1   Prime Power

- **STANDARD AC:**   90-260VAC, 47-63 Hz frequency
- **OPTIONAL DC:**   -48VDC

2.1.3.4   RF Power

2.1.3.4.1   CSAT-5060

10dBm; 5W; 10W; 210W; 25W; 50W; 100W; 125W

2.1.3.4.2   CSAT-6070

5W; 10W; 210W; 25W; 50W; 100W

2.1.3.5   AC Power

Steady-State True AC Power Requirement (110V AC)

2.1.3.5.1   CSAT-5060

120W; 150W; 200W; 220W; 250W; 410W; 759W; 850W

2.1.3.5.2   CSAT-6070

150W; 200W; 250W; 410W; 759W

2.1.3.6   Grounding

An M4 stud provides a common ground connection among equipment

2.1.3.7   External Connectors

2.1.3.7.1   RF Connectors

2.1.3.7.1.1   RF Input

- (1X) J2 | RF IN (+10dBm Unit, 5W to 25W Units): 50 Ω Type 'N' Female
- (1X) J7 | RF IN (50W, 100W/125W Units): 50 Ω Type 'N' Female

2.1.3.7.1.2   RF Output

- (1X) J2 | RF OUT (50W, 100W/125W Units): CPR137G Waveguide Flange
- (1X) J7 | RF OUT (+10dBM, 5W to 25W Units): 50Ω Type 'N' Female

2.1.3.7.2   IF Connectors

2.1.3.7.2.1   IF Input

(1X) J1 | IF IN: 50Ω Type 'N' Female

2.1.3.7.2.2   IF Output

(1X) J6 | IF OUT: 50Ω Type 'N' Female

2.1.3.7.3   External Reference Connector

(1X) J4 | EXTERNAL REF IN: 50Ω Type 'N' Female

2.1.3.7.4   Ethernet Comms Connector

(1X) J8 | ETHERNET: Weatherproof RF-45 Port for operation of the Ethernet M&C Interface (SNMP, Telnet, HTTP)

The Ethernet Interface is not available on the CSAT-5060 +10dBm unit.

2.1.3.7.5   Serial Comms Connector

(1X) J5 | COMM: 19-pin Circular Connector for operation of the EIA-232/ EIA-485 Serial M&C Interface

2.1.3.7.6   External Amplifier Connector (+10dBM Unit ONLY)

(1X) J8 | EXT AMP: 8-pin Circular Connector providing converted output for driving an external SSPA or TWTA

2.2   Operational Specifications

2.2.1   COMMON

2.2.1.1   Conversion

Dual, no spectral inversion

2.2.1.2   Frequency Step Size

1.0 MHz and 2.0 MHz, automatic

2.2.1.3   Frequency Stability Over Time

- $\pm 1 \times 10^{-9}$/day
- $\pm 1 \times 10^{-7}$/year

2.2.1.4   Frequency Stability Over Temperature

$\pm 1 \times 10^{-8}$ /-40° to 55°C (-40° to 131°F)

2.2.1.5   Phase Noise

Parameter	Limit (dBc/Hz)
100 Hz	-66
1 KHz	-76
10 KHz	-86
100 KHz	-96

2.2.1.6   Group Delay

2.2.1.6.1   Linear

0.1ns/MHz

2.2.1.6.2   Parabolic

$0.02ns/MHz^3$

2.2.1.6.3   Ripple

1ns Peak-to-Peak

2.2.1.7   Voltage Standing Wave Ratio (VSWR)

1.25:1 Typical for RF Input VSWR or IF Output VSWR

2.2.2   TRANSMIT

2.2.2.1   Frequency RF

2.2.2.1.1   CSAT-5060

- **STANDARD:** 5845 to 6425 MHz
- **OPTIONAL EXTENDED:** 6425 to 6725 MHz
- **OPTIONAL WIDE:** 5850 to 6650 MHz
- **OPTIONAL SUPERWIDE:** 5845 to 6725 MHz

2.2.2.1.2   CSAT-6070

- 6725 to 7025 MHz

2.2.2.2   Frequency IF

- **STANDARD:**   70 MHz $\pm$18 MHz
- **OPTIONAL:**   140 MHz $\pm$36 MHz

2.2.2.3   LNA (Low Noise Amplifier)

Customer-defined

2.2.2.4   Output Power

2.2.2.4.1   CSAT-5060

Unit	P_{1db}	P_{sat}
+10dBm	10dBm	
5W	5W (37dBm)	38dBm (6W)
10W	10W (40dBm)	41dBm (12W)
20W	20W (43dBm)	43.8dBm (24W)
25W	25W (44dBm)	45dBm (32W)
50W	50W (47dBm)	48dBm (63W)
100W	100W (50dBm)	51dBm (125W)
125W	125W (51dBm)	51.8dBm (150W)

2.2.2.4.2   CSAT-6070

Unit	P_{1db}	P_{sat}
5W	5W (37dBm)	38dBm (6W)
10W	10W (40dBm)	41dBm (12W)
20W	20W (43dBm)	43.8dBm (24W)
25W	25W (44dBm)	45dBm (32W)
50W	50W (47dBm)	48dBm (63W)
100W	100W (50dBm)	51dBm (125W)

2.2.2.5   Gain

Unit	Value
+10dBm	25dB
5W	65dB
10W	68dB
20W	71dB
25W	71dB
50W	74dB
100W/125W	77dB

2.2.2.6   Gain Flatness

- ±0.75 dB Full RF Band
- ±0.75 dB per 36 MHz

2.2.2.7   Gain Stability

- ±0.25 dB at constant temperature
- ±1.00 dB from -40°C to +55°C (-40°F to +131°F)

2.2.2.8   Attenuator Range/Steps

0 to 25 dB in 0.25 dB steps

2.2.2.9   Carrier Mute

-70 dBc

2.2.2.10 Intermodulation

-28 dBc typical for two carriers each @ 6 dB Output Power Backoff (OPBO) from rated power (3 dB total OPBO)

2.2.2.11 Second Harmonic

-55 dBc

2.2.2.12 Spurious

2.2.2.12.1 AC Line Harmonics

-45 dBc

2.2.2.12.2 Carrier-related, <500 kHz

-60 dBc

2.2.2.12.3 All Other Inband

-65 dBc

2.2.2.13 AM to PM Conversion

3.0° @ 6 dB OPBO from rated power

2.2.3   RECEIVE

2.2.3.1   Frequency RF

2.2.3.1.1   CSAT-5060

2.2.3.1.1.1   Converter

3400 to 4200 MHz

2.2.3.1.1.2   LNA (Low Noise Amplifier)

STANDARD: 3400 to 4200 MHz
OPTIONAL: 3625 to 4200 MHz

2.2.3.1.2   CSAT-6070

4500 to 4800 MHz

2.2.3.2   Frequency IF

- **STANDARD:**   70 MHz ±18 MHz
- **OPTIONAL:**   140 MHz ±36 MHz

2.2.3.3   Output Power, P1dB

+13 dBm

2.2.3.4   Gain (w/o LNA)

45 dB

2.2.3.5   Gain Flatness (w/o LNA)

- ±0.75 dB Full RF Band
- ±0.75 dB per 36 MHz

2.2.3.6   Gain Stability (w/o LNA)

- ±0.25 dB at constant temperature
- ±1.00 dB from -40°C to +55°C (-40°F to +131°F)

2.2.3.7   Two-Tone Intermodulation

-50 dBc for two tones @ 0 dBm each, 1 MHz apart

2.2.3.8   Image Rejection

-60 dBc

2.3   Dimensional Envelope Drawings

(!) **Dimensions are provided for reference only and are subject to change without notice. Typical for all figures, all dimensions are in inches. Bracketed dimensions are in metric units [mm].**
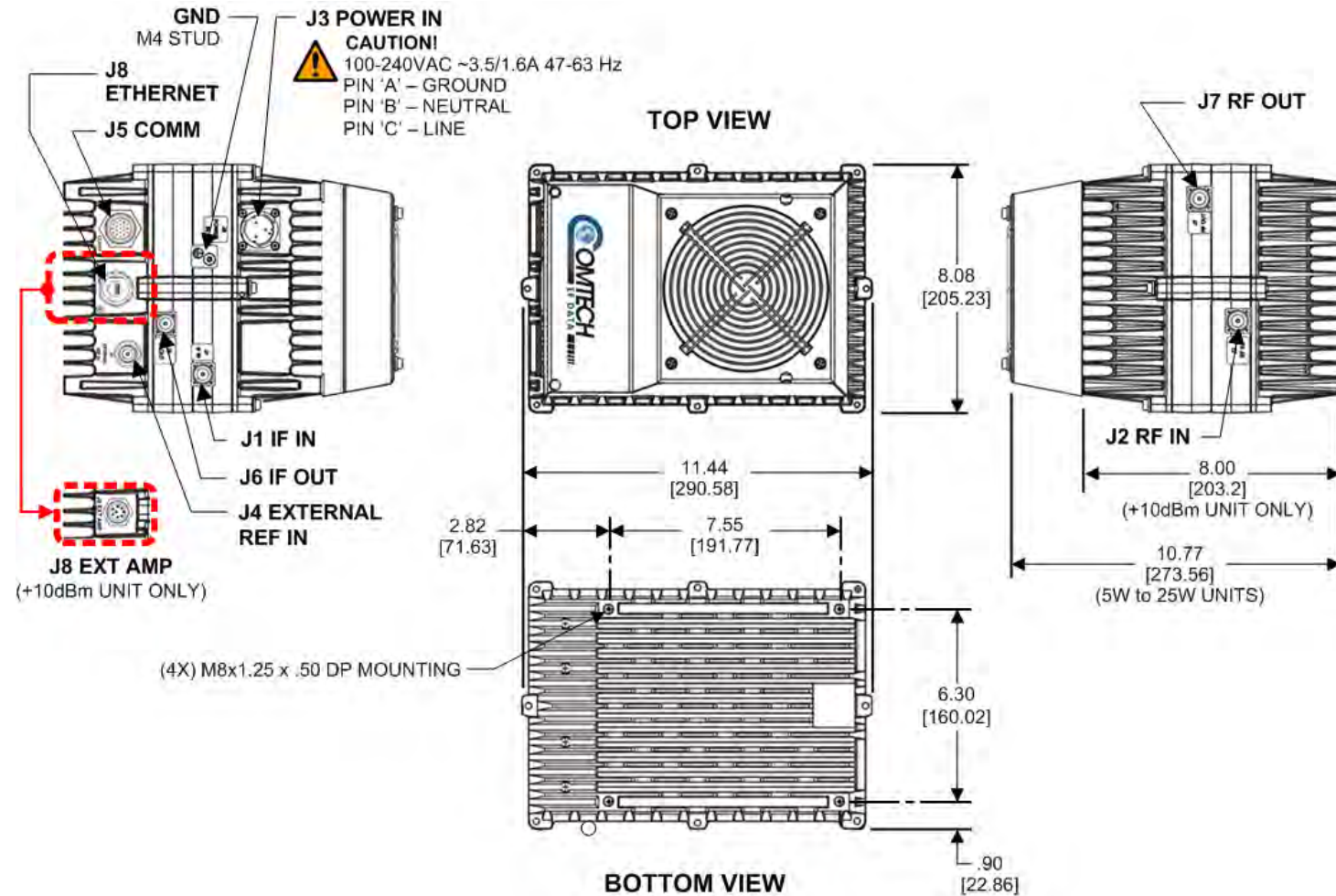
Figure 2-1. CSAT-5060 +10 dBm and CSAT-5060/6070 5W to 25W Units Dimensional Envelope
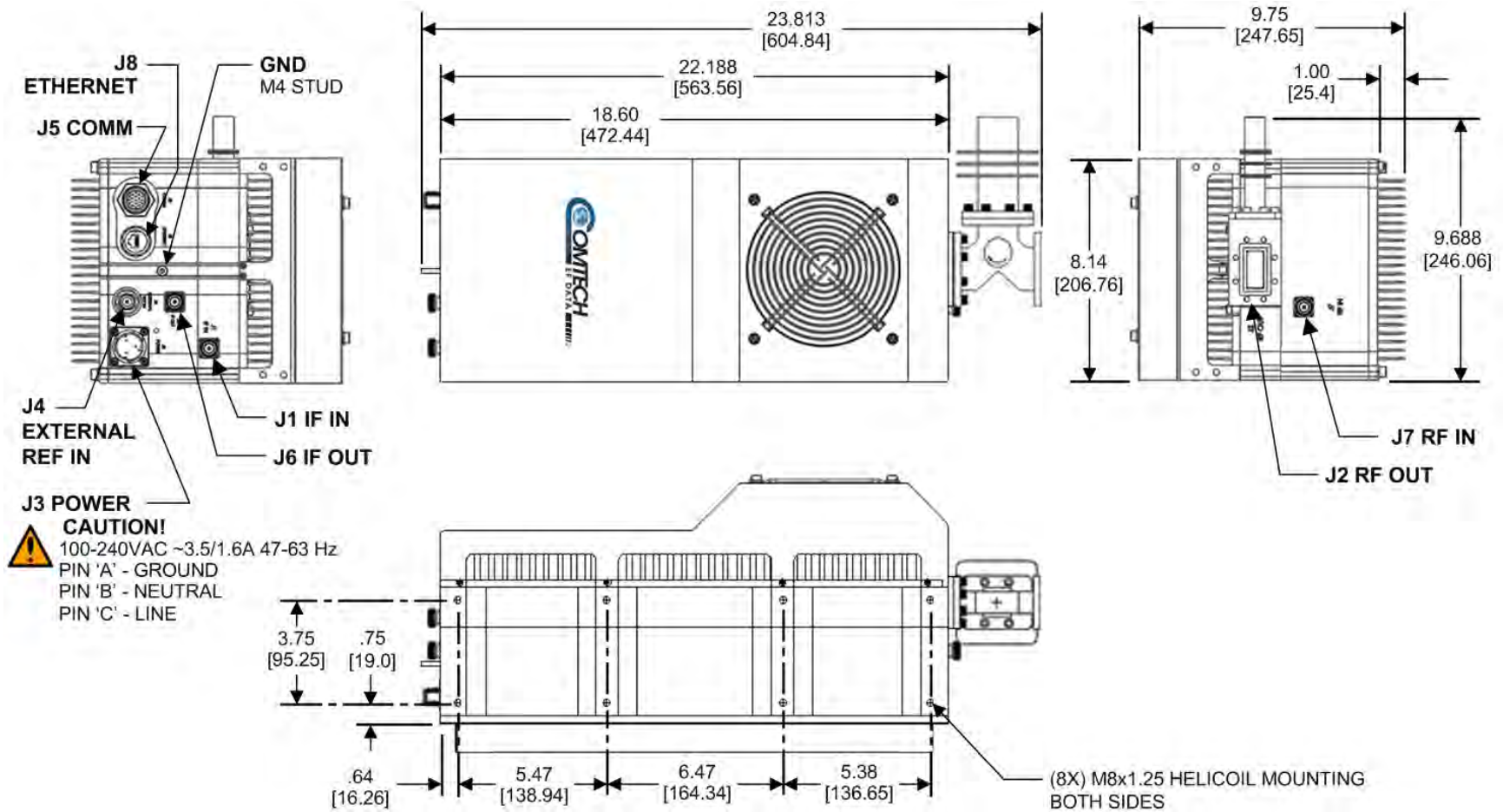
Figure 2-2. CSAT-5060/6070 50W Units Dimensional Envelope
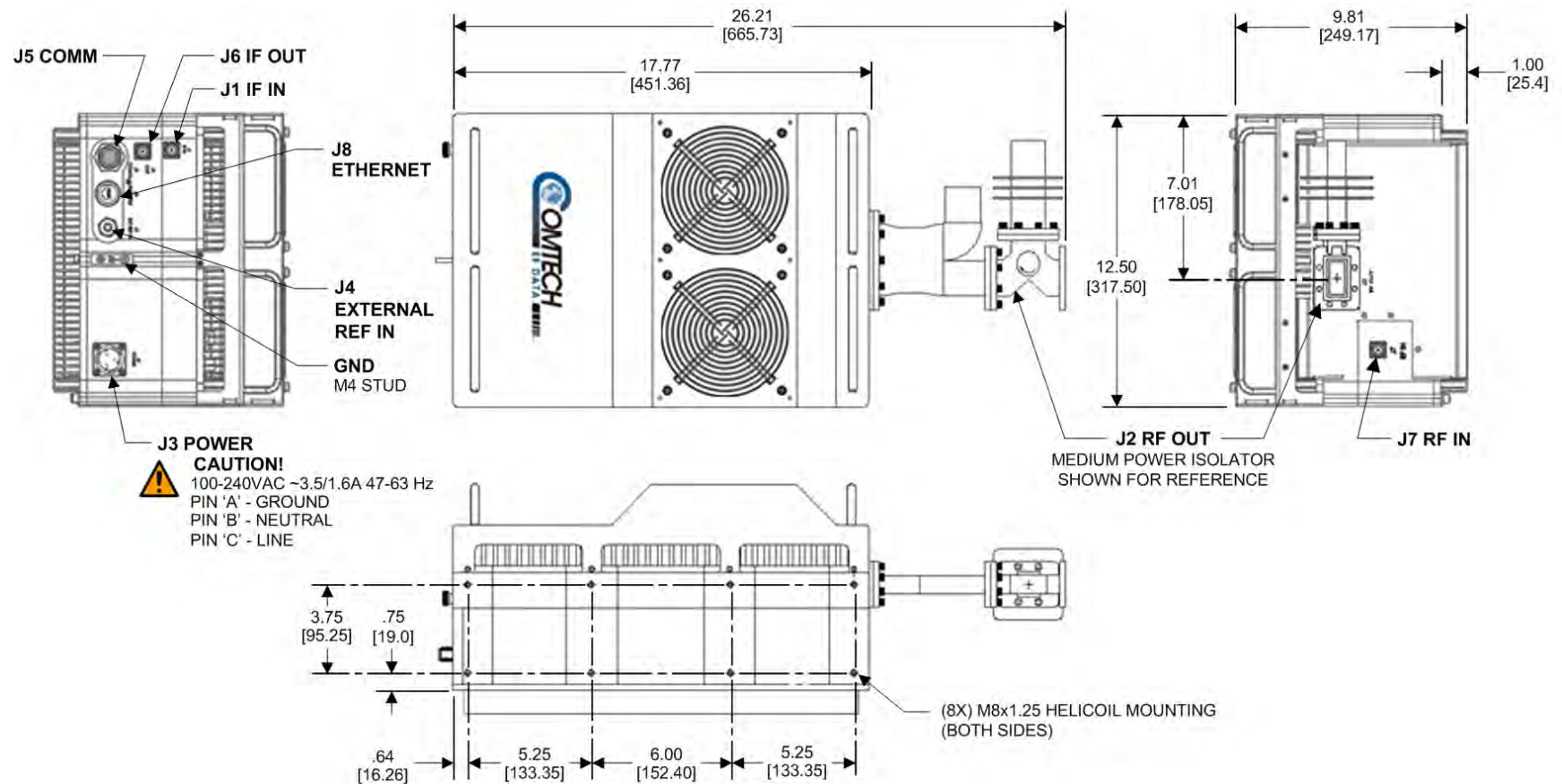
Figure 2-3. CSAT-5060/6070 100W Units and CSAT-5060 125W Unit Dimensional Envelope
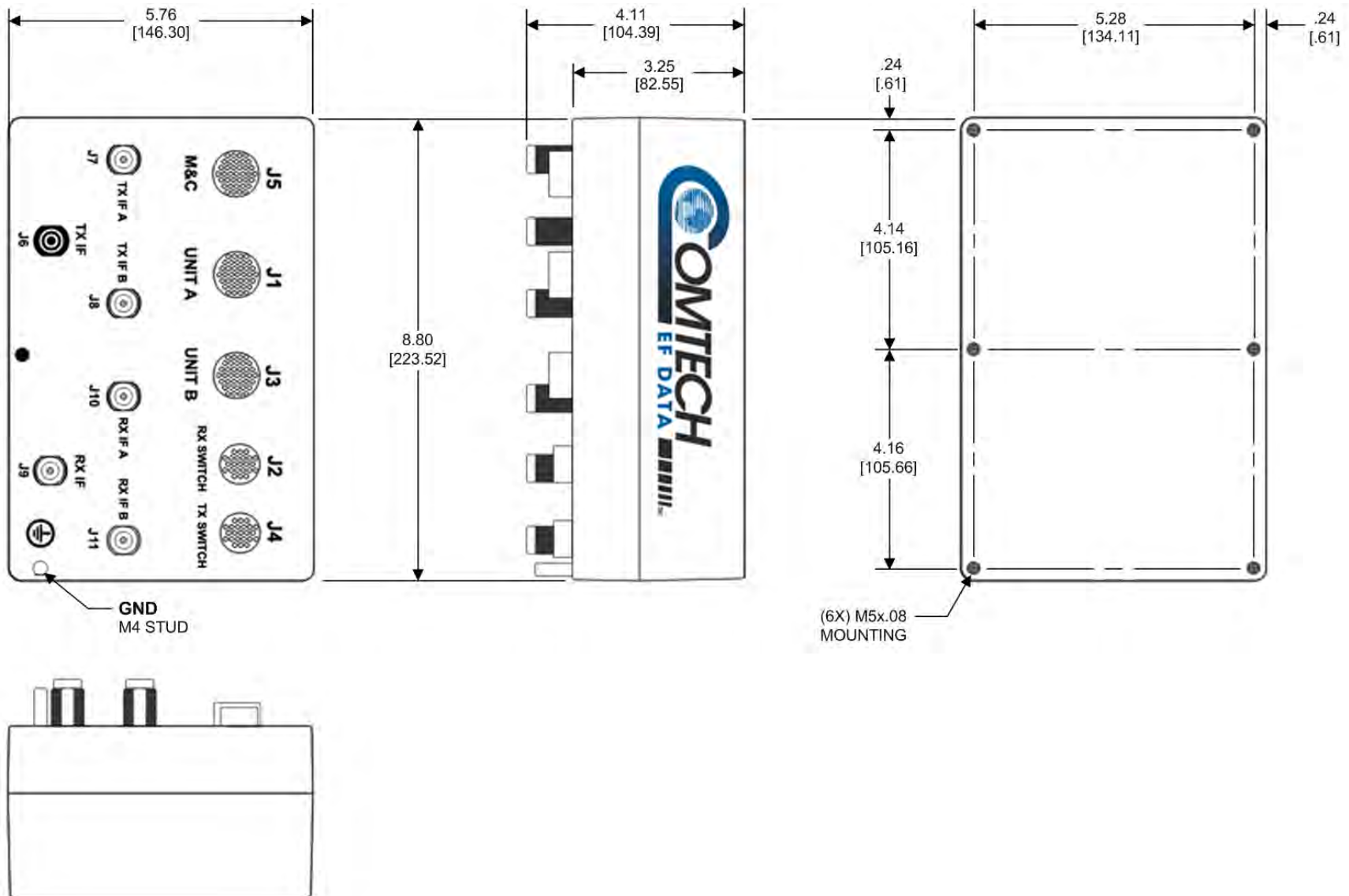
Figure 2-4. AS/0490 RSU-5060 Redundant Switch Unit (RSU) Dimensional Envelope

Chapter 3. UNPACKING AND INSPECTION

Typical for all product shipments (e.g., CSAT-5060/6070 unit(s), LNA(s), Single-thread or redundant installation kits, etc), your Comtech EF Data products were shipped in reusable cardboard carton(s) containing protective foam spacing.

CAUTION – THIS EQUIPMENT CONTAINS PARTS AND ASSEMBLIES SENSITIVE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD). USE ESD PRECAUTIONARY PROCEDURES WHEN HANDLING THE EQUIPMENT.

Once opened, inspect the shipment. Do these steps:
1. **Keep all shipping materials.**
2. **Check the packing list to make sure the shipment is complete.**
3. **Inspect the equipment for damage. If damage exists, immediately contact the carrier and Comtech EF Data to submit a damage report.**
4. **Read your manual(s).**

Notes:

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Chapter 4. SYSTEM CONNECTORS

4.1 Overview

- See **Chapter 8. ETHERNET INTERFACE OPERATION** for information about using the Ethernet Interface M&C functionality.
- See **Chapter 9. SERIAL INTERFACE OPERATION** for information about using the Serial Interface remote commands and queries.
- See **Appendix B. OPTIONAL 1:1 REDUNDANT SYSTEM INSTALLATION** and **APPENDIX C. OPTIONAL 1:1 REDUNDANT SYSTEM OPERATION** for detailed information for installing and using the CSATs in a 1:1 redundancy configuration via the AS/0490 RSU-5060 Redundancy Switch Unit (RSU) Interface.
- See **Appendix D. CABLE DRAWINGS** for figures showing the cables available for use in standalone and 1:1 redundant CSAT systems.

This chapter provides user reference to the CSAT connectors provided for signal input, signal output; monitor and control (M&C) of the unit; and grounding of the unit to the antenna's grounding network.

4.2 Water Tight Sealing

⚠️ **CAUTION**
All external cable assemblies for the outdoor equipment MUST be properly sealed to prevent water intrusion. Failure to achieve water tight sealing will result in possible performance degradation and even product failure.

IMPORTANT: To maintain your product warranty, you must follow these guidelines and recommendations during equipment installation:

- Ensure all external connections to the equipment are hand-tightened and wrapped with a self-amalgamating tape such as **3M Type 23 Scotch Self-Amalgamating Tape** (or equivalent). The sealing must cover the external connector housing and extend beyond the end of the heatshrink that covers the connector termination of the cable assembly.
- Squeeze the self-amalgamating tape tightly and make sure both ends of the tape have formed around the connector and cable to create a water tight seal.
- ALL unused external connectors MUST be covered with caps and sealed. Make sure to inspect the connector cap rubber seal for cracks before using.

4.2.1 Customer Cable Assemblies

⚠️ **CAUTION**
Should you receive an accessory kit that contains only the mating cable connectors, or if you (the end-user) choose to supply your own cables and connectors, Comtech EF Data strongly recommends that you use an adhesive lined heatshrink such as **TE Connectivity #ATUM-24/6-0** (or equivalent) to cover the connector strain-relief area. Your sealed, water tight cable ends should appear as per this example:

4.3   CSAT Interface Connectors

The CSAT external connectors (**Figure 4-1**) provide all necessary connections between the CSAT-5060 or CSAT-6070 units and other equipment.

The **CSAT-5060 5W through 125W** C-Band Transceivers and the **CSAT-6070 5W through 100W** INSAT Transceivers each provide: two IF signal connectors (**J1** and **J6**); two RF signal connectors (**J2** and **J7**); one power connector (**J3**) plus a ground stud; two electrical control interface connectors (**J4** and **J5**); and an Ethernet interface connector (**J8***).

> * The **CSAT-5060 +10dBm** unit provides a connector (**J8**) that is used to provide an upconverted output that drives an external SSPA or TWTA. Ethernet operation is not available on this product.
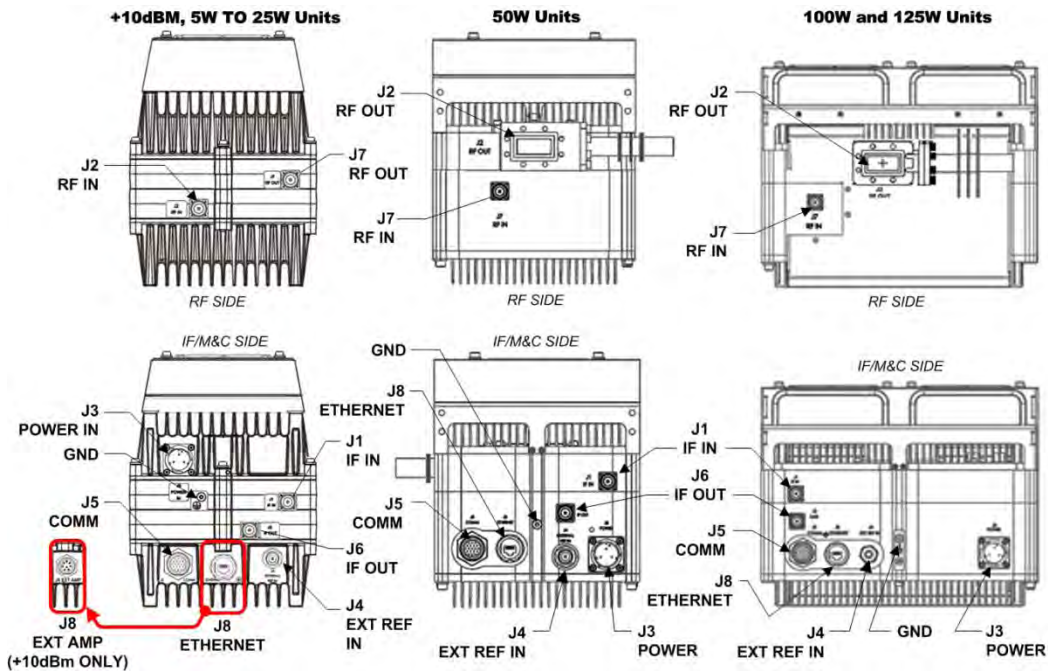
Figure 4-1. CSAT External Connectors

4.3.1   IF Signal Interface Connectors

4.3.1.1   IF Signal Input / Output Ports ('J1 | IF IN' / 'J6 | IF OUT')

The '**J1 | IF IN**' and '**J6 | IF OUT**' connectors are 50Ω Type 'N' female connectors.

4.3.2   RF Signal Interface Connectors

4.3.2.1   RF Signal Input Port ('J2 | RF IN' / 'J7 | RF IN')

The RF Input connector is a 50Ω Type 'N' female connector, labeled **'J2 | RF IN'** on the **CSAT-5060 +10dBm** and **CSAT-5060/6070 5W to 25W** units, and **'J7 | RF IN'** on the **CSAT-5060 50W**, **100W** and **125W** units and the **CSAT-6070 50W** and **100W** units. To prevent damage to the CSAT, RF input levels should not exceed +13 dBm.

4.3.2.2   RF Signal Output Interface ('J2 | RF OUT' / 'J7 | RF OUT')

WARNING!
FOR SAFETY REASONS, NEVER LOOK DIRECTLY INTO THE WAVEGUIDE OUTPUT.

The RF Output interface may be a waveguide or coaxial interface – this depends on the CSAT model and/or frequency range of the unit. See **Figure 4-1** and **Table 4-1**.

Table 4-1. CSAT "RF OUT" Connections

Units	Ref Des	Interface (Output) type
• CSAT-5060 +10dBm units • CSAT-5060/6070 5W to 25W units	J7	Type 'N' Coax Output
• CSAT-5060 50W and 100W/125W units • CSAT-6070 50W and 100W units	J2	CPR137G Waveguide Flange

4.3.3   Power and Ground Interfaces

4.3.3.1   Standard 90 to 260VAC Power Main ('J3 | POWER')

> ⚠️ **WARNING!**
> **Product damage or personal injury may result if you do not properly review the information in this section.**
> 1) **Make sure to note the pinout specification for the 'J3 | POWER' connection.**
> 2) **For the 50W and 100W/125W units, never turn the unit ON without proper waveguide termination on the 'J2 | RF OUT' port. You can be exposed to dangerously high electromagnetic levels.**

 The CSAT does not contain a 'Power On/Off' switch. The CSAT is powered ON by connecting the appropriate power cable (e.g., CEFD P/N CA/WR0081) from the prime power source to the '**J3 | POWER'** connector (this connector may also be labeled **'J3 | POWER IN'**).

Per **Section 2.1 Environmental and Physical Specifications** in this manual, the standard prime power source is 90-260VAC, 47-63 Hz.

Mating Connector:
CEFD P/N CN/CA3106E18-22SB (ITT/Cannon FCA3106E18-22SB).

Table 4-2. 'J3 | POWER' AC Power Pinout

Pin	Assignment
A	GND
B	NEUTRAL (L2)
C	LINE (L1)

4.3.3.2 Optional DC Power Main ('J3 | POWER')
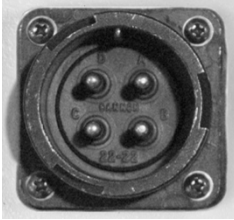
See (**Table 4-3**) for the Pinout specification unique to the CSAT's optional DC power interface.

Mating Connector:
CEFD P/N CN/MS-PLST4F01 (ITT Cannon CA06COM-E18-10SB).

Table 4-3. 'J3 | POWER' DC Power Pinout

Pin	Assignment
A	V+
B	N/C
C	N/C
D	V-

4.3.3.3 Optional -48VDC Input ('J3 | POWER')

Unit Connector Type:
CEFD P/N CN-0000288 (ITT/Cannon CA3102E20-15SB-F80A232)

Supplied Mating Connector:
CEFD P/N CN-0000289 (ITT/Cannon CA3106E20-15SB-F80A232)

Table 4-4. 'J3 | POWER' -48VDC Power Pinout

Pin	Assignment
A	V+
B	V+
C	NO CONNECT
D	NO CONNECT
E	V-
F	V-
G	GROUND (Note 2)

Notes:

1) Use 12 AWG wire to each of the appropriate pins, according to the individual pinout specification.
2) As an alternative, the ground connection can be made to the unit's external ground stud.

4.3.3.4   Ground Connector

Use this M4 stud, available where shown in Figure 4-2, to connect a common chassis ground among equipment.
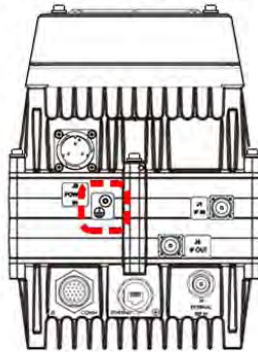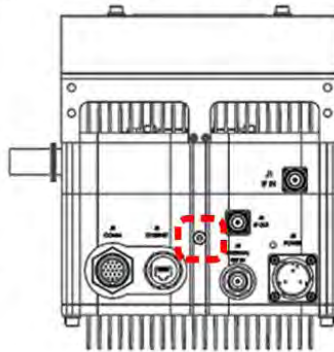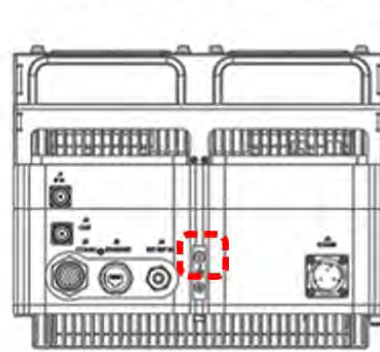
Figure 4-2. CSAT Ground Connector Locations

4.3.4   Electrical Control Interface Connections

4.3.4.1   'J4 | EXTERNAL REF IN' Connector

The '**J4 | EXTERNAL REF IN** connector is a 50Ω Type 'N' female connector that provides a 5 MHz or 10 MHz external reference port in addition to internal frequency reference.

4.3.4.2   'J5 | COMM' Remote Communications Connector

See CHAPTER 9. SERIAL INTERFACE OPERATION for information about using the serial-based remote commands and queries.

The **'J5 | COMM'** port is a 19-pin circular connector.

Unit Connector Type:
CEFD P/N CN/MS3112-E14-19S (Glenair IPT02E-14-129S-F7).

Mating connector:
CEFD P/N MS3116J14-19P (Amphenol ENPT06J-14-19P(027)).

Table 4-5. 'J5 | COMM' Pinout

Pin	Name	Description	Direction / Type
A	RS485 RX+	EIA-485 Rx+, from User M&C or RSU-5060 J5 M&C	Pass-thru
B	RS485 RX-	EIA-485 Rx-, from User M&C or RSU-5060 J5 M&C	Pass-thru
C	RS485 TX+	EIA-485 Tx+, to User M&C or RSU-5060 J5 M&C	Pass-thru
D	RS485 TX-	EIA-485 Tx-, to User M&C or RSU-5060 J5 M&C	Pass-thru
E	B ONLINE CLOSED	Shorted to Pin K = CSAT B Online	Output
F	N/C		
G	N/C		
H	N/C		
J	N/C		
K	IND/FLT COMMON		Input
L	A FAULT OPEN	Shorted to Pin K = CSAT A Faulted	Output
M	B FAULT OPEN	Shorted to Pin K = CSAT B Faulted	Output
N	N/C		
P	RED AUTO/MAN	Ground = Manual, Open = Auto	Input
R	N/C		
S	A ONLINE CLOSED	Shorted to Pin K = CSAT A Online	Output
T	GROUND		Passive
U	GROUND		Passive
V	SWITCH CMD	Momentary short to GND, otherwise OPEN	Input

4.3.4.3   'J8 | EXT AMP' Connector (CSAT-5060 +10dBm UNIT ONLY)
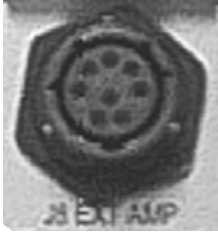
The **J8 EXT AMP** connector is an 8-pin circular connector. It is available only on the **CSAT-5060 +10dBm** unit. It provides a converted output used to drive an external SSPA or TWTA.

Unit Connector Type:
CEFD P/N CN/MS3116J12-8P (ITT Cannon P/N MS3116J112-8P)

Table 4-6. 'J8 EXT AMP' Pinout

Pin	Signal Description
A	RX+ (Direct connection to corresponding RS 485pin on J5)
B	RX- (Direct connection to corresponding RS 485pin on J5)
C	TX+ (Direct connection to corresponding RS 485pin on J5)
D	TX- (Direct connection to corresponding RS 485pin on J5)
E	No Connect
F	Fault (Normally Open), Connection to Pin G will be interpreted as a fault of the external amplifier
G	Fault Common
H	Ground

4.3.4.4   About Circular Connectors

Circular connector pairs (**Figure 4-3**) feature a sleeve lock configuration, with an array of pins (male side, left) coupled to mating sockets (female side, right).

Feature	Description
1	Primary Alignment features
2	Secondary Alignment features
3	Sleeve Lock features
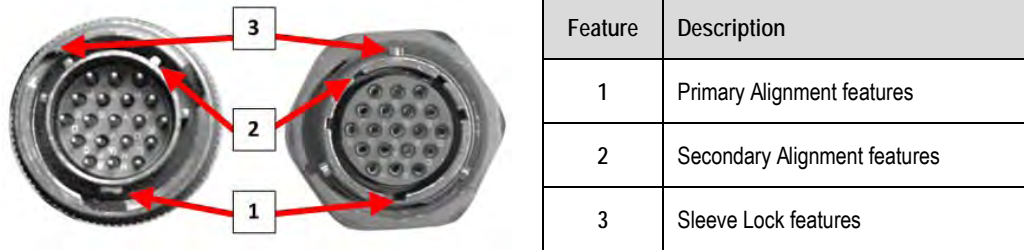
Figure 4-3. Circular Connector Example

Connection Instructions – Engage all of the alignment and lock features between the male connector (on the interconnection cable) and the female socket.

Do these steps to secure the connection:
1. Engage the primary and secondary alignment tabs on the male connector with the mating cutouts on the female socket.
2. Push the male connector into the female socket.
3. Turn the male connector sleeve clockwise until the sleeve lock cutouts engage fully with the female socket tabs and you hear a "click" sound.

4.3.4.5   'J8 | ETHERNET' Communications Port

This interface operates at 10/100/1000 Mbps, auto-negotiating, half and full duplex. The maximum Ethernet packet size is 1522 bytes (including Ethernet headers and CRC).

See Chapter 9. ETHERNET INTERFACE OPERATION for information about using the CSAT's remote Ethernet M&C functionality.

This connector is not available on the CSAT-5060 +10dBm units.

CAUTION
For permanent Ethernet connections, you MUST use the appropriate mating connector on your supplied Ethernet cable to ensure a weatherproof installation. See **Section 4.3.4.5.1** and **Figure 4-4**.

Connector Type	Ref Des | Name	Direction
Weatherproof RJ-45 female modular jack	J8 | ETHERNET	In/Out

Unit Connector Type:
Amphenol LTW Technology Co. Ltd. P/N RJS-5EPFFJ-SC7009

4.3.4.5.1   Fabricate a Weatherproof Ethernet Cable

See **Figure 4-4**. To fabricate a field-installable Ethernet cable for use with the Ethernet-ready CSAT, use the CN-0020514 and CN/HED87522-8002 connectors provided in CEFD Kit KT-0020567.

Do these steps:

1. Peel off the backing from the connector gasket (Item 2.5) and affix the gasket to the front face of the connector body (Item 2.4). Be sure to align the gasket cutout to the opening on the connector body.
2. Thread the RJ-45 cable (Item 1, provided by user) through the Item 2 components as shown. Be sure to note the order and orientation of all components prior to final assembly of the RJ-45 cordset.
3. Install the RJ-45 plug (Item 3) onto the user cable. Be sure to use the proper tooling when assembling the cordset.
4. Assemble all components:
    *   At the front, depress the RJ-45 plug tab and seat the connector into its mating socket in the connector body.
    *   At the back, slip the compression bushing (Item 2.2) into the connector body.
    *   Screw the end cap (Item 2.1) onto the connector body. DO NOT OVERTIGHTEN.
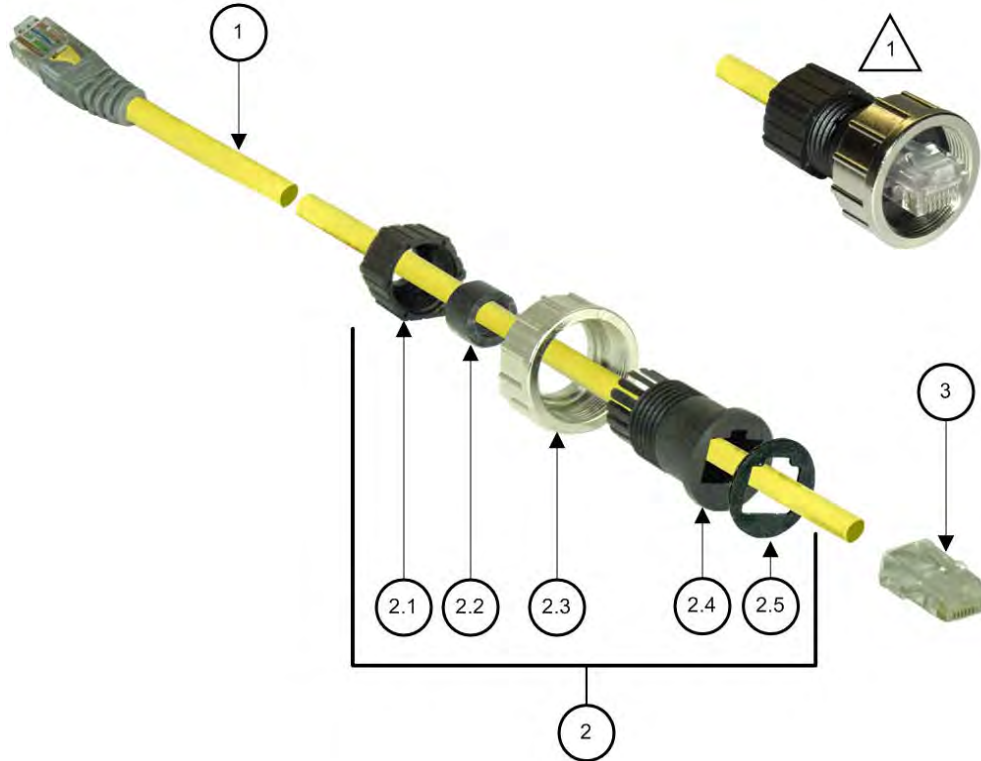
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	N/A	RJ-45 8-PIN CABLE, LENGTH A/R, PROVIDED BY USER
2	1	CN-0020514	Amphenol LTW Technology Co., LTD. Weatherproof Threaded Coupling Style RJ-45 Connector. P/N LTWRJ-00BMMA-SL7006 consisting of Items 2.1 through 2.5
2.1	1	N/A	END CAP
2.2	1	N/A	COMPRESSION BUSHING
2.3	1	N/A	CONNECTOR NUT
2.4	1	N/A	CONNECTOR BODY
2.5	1	N/A	GASKET
3	1	CN/HED87522-8002	RJ-45 8-PIN CONNECTOR (PLUG)

Figure 4-4. Ethernet Cable Fabrication Kit KT-0020567

Figure 4-4 Notes:

1) Detail shows cable end as assembled.

Notes:

Chapter 5. STANDALONE (SINGLE-THREAD) INSTALLATION

5.1 Overview

The terms and "standalone" and "single-thread" refer to applications that use a single (1) CSAT unit. Several kits are available from Comtech EF Data to mount and install standalone CSATs, depending on the CSAT unit ordered.

> For any standalone installation, you should perform tasks in the following sequence:
>
> 1. Unpack and inspect all materials as instructed in **Chapter 3. UNPACKING AND INSPECTION**.
> 2. Prepare for installation as instructed in this section.
> 3. See **Section 5.2** for pole-mounted configuration instructions.
> 4. See **Section 5.3** for spar-mounted configuration instructions.
> 5. All CSAT standalone and 1:1 redundant application configurations require installation of a C-Band LNA (Low Noise Amplifier), purchased separately. See **Section 5.4** for standalone C-Band LNA Installation.
> 6. **Section 5.5** outlines the common RF cabling connections required of all CSAT systems. For purpose of brevity, all mention of this cabling requirement for standalone applications refers you to this chapter section.
> - See **Section 4.2 Water Tight Sealing** in **Chapter 4. SYSTEM CONNECTORS** for important outdoor installation considerations.
> - See **Appendix C. CABLE DRAWINGS** for information about the cables that are available for use with the CSAT.

5.1.1   Installation Manpower Recommendation

Comtech EF Data recommends that, at a minimum, you employ two technicians to install any CSAT Standalone System.

5.1.2   Typical Required Installation Tools

Comtech EF Data recommends that, at a minimum, you use these tools to install any CSAT Standalone System:

- Adjustable wrench;
- English *and* Metric unit box or socket wrenches (hex nuts and hex head bolts are used);
- Medium Phillips™ screwdriver (Phillips head screws are used);
- Tin snips.
- Marker or pen (to note strap trim or bracket positioning locations).

5.2   Pole Mount Installations

Unit-specific assembly and installation: Detailed assembly and installation instructions are provided on a per-unit basis as follows:

- **Section 5.2.1** outlines the typical assembly and installation instructions for each AS/0414 Universal Pole Mounting Kit required for standalone and redundant CSAT installations. All further installation instructions will refer back to this section.
- **Section 5.2.2** outlines standalone assembly and installation for the CSAT-5060 +10dBM and CSAT-5060/6070 5W to 25W units.
- **Section 5.2.3** outlines standalone assembly and installation for the CSAT-5060 50W and 100W/125W units, and the CSAT-6070 50W and 100W units.

5.2.1   AS/0414 Universal Pole Mounting Kit

1) This kit accommodates a pole diameter of up to 13.00" (330.2 mm) OD maximum.
2) Your installation may require the use of two kits.
3) All further mention of use of this kit in this chapter refers you back to this section.
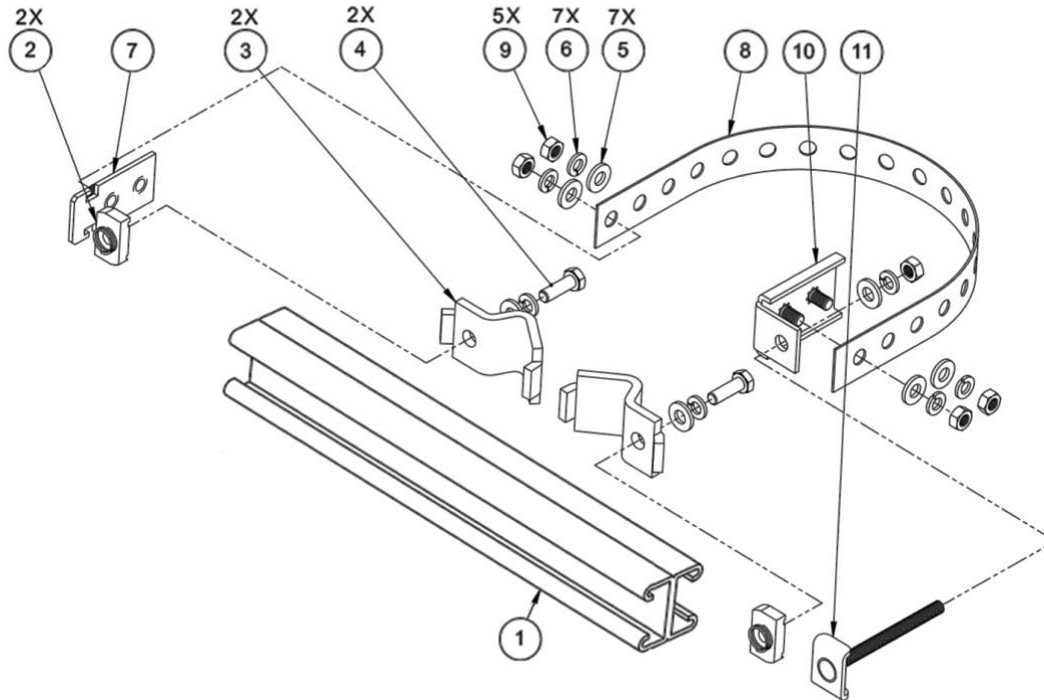
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	FP/BR0078	DUAL CHANNEL UNISTRUT
2	2	HW/M8SPRING NUT	SPRING NUT, M8
3	2	HW/BLK-PIPE2-8	PIPE BLOCK
4	2	HW/M8X1.25X25HEXSS	SS HEX HEAD BOLT, M8, 25MM LG
5	7	HW/M8FLATSS	SS FLAT WASHER, M8
6	7	HW/M8LOCKSS	SS LOCKWASHER, M8
7	1	FP/BR0069	FLOATING STRAP BRACKET
8	1	FP/BR0071	PIPE STRAP (TRIM TO REQUIRED LENGTH)
9	5	HW/M8X1.25MMHEXNUTSS	SS HEX NUT, M8
10	1	FP/BR0070	FIXED STRAP BRACKET
11	1	FP/BR0072	STRAP TENSIONER BOLT

Figure 5-1. AS/0414 Universal Pole Mounting Kit

Use this kit in combination with a product-specific CSAT mounting kit to secure the CSAT standalone configuration to a standard satellite dish support pole. The number of kits used depends on the weight of the unit.

Do these steps to install each kit:
1. Place the Unistrut (Item 1) on a flat surface.

2. Slide both spring nuts (Item 2) into the Unistrut channel. Make sure to seat the springs against the interior wall of the channel.
3. Loosely fasten the Pipe Blocks (Item 3) to the spring nuts using (2X each) M8 hex bolts (Item 4), flat washers (Item 5), and lockwashers (Item 6).
4. Position the semi-assembled Unistrut and Pipe Blocks against the mounting pole, then slide the Pipe Blocks until they contact either side of the mounting pole. Make sure that the Pipe Blocks are centered within the Unistrut. Tighten the mounting hardware.
5. Slide the Floating Strap Bracket (Item 7) into the Unistrut channel. Make sure that the bracket studs face outward.
6. Loosely assemble the Floating Strap Bracket to the Pipe Strap (Item 8) with (2X each) M8 flat washers (Item 5), lockwashers (Item 6), and hex nuts (Item 9).
7. Do the following:
   a. Holding the kit subassembly in place against the mounting pole, slide the Fixed Strap Bracket (Item 10) into the Unistrut channel until it abuts the adjacent Pipe Block.
   b. Wrap the Pipe Strap around the pole, fitting the strap onto the Fixed Strap Bracket studs as snugly as possible. Score or otherwise mark a trim line on the Pipe Strap then, using the tin snips, trim the Pipe Strap to suit as shown in the side view provided in **Figure 5-2**.
8. Do the following:
   a. Remove the Fixed Strap Bracket (Item 10) from the Unistrut channel, and assemble the Strap Tensioner Bolt (Item 11) to the Fixed Strap Bracket (the bolt head will abut the interior wall of the channel).
   b. Slide this subassembly back into the Unistrut channel until it abuts the adjacent Pipe Block.
9. Secure the Pipe Strap (Item 8) using the Fixed Strap Bracket (Item 10), with (2X each) M8 hex nuts (Item 9), flat washers (Item 5), and lockwashers (Item 6).
10. As shown in **Figure 5-2**, secure the Fixed Strap Bracket (Item 10) in place using the Strap Tensioner Bolt (Item 11) with (1X each) M8 flat washer (Item5), lockwasher (Item 6), and hex nut (Item 9); tighten as needed.
11. Disassemble as needed, and then use the tins snips to trim the Pipe Strap length to suit (**Figure 5-2**, side view). Reassemble as needed.
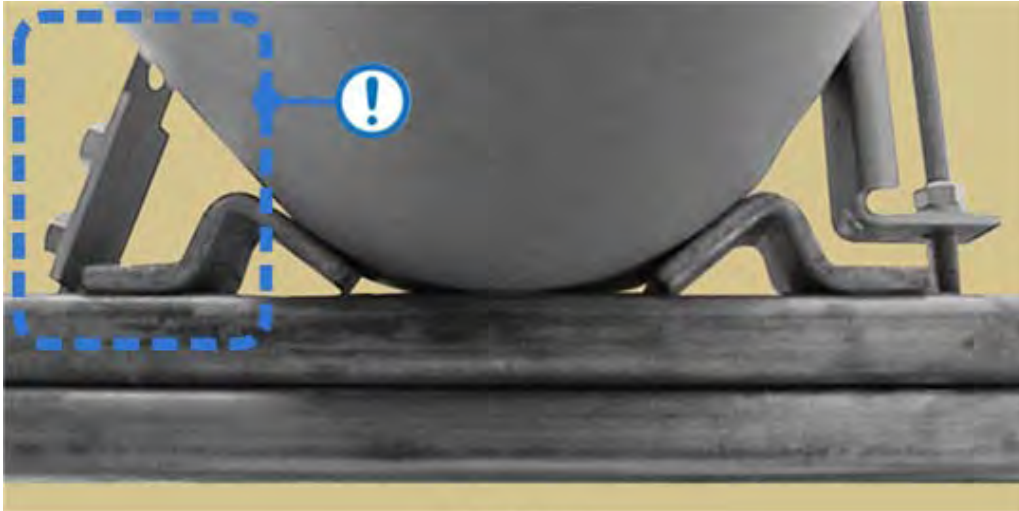
Top View
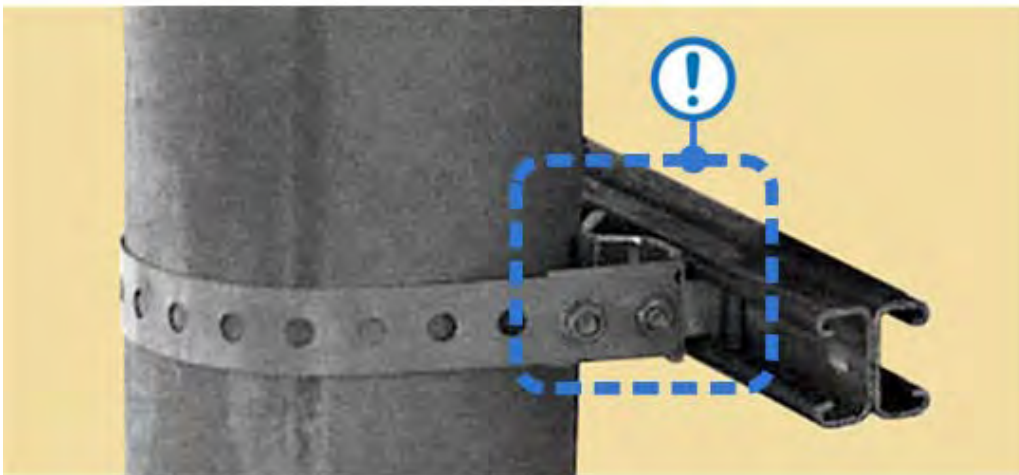
Side View

(!) Use tin snips to trim back the Pipe Strap (Item 8) length.

Figure 5-2. AS/0414 Universal Pole Mounting Kit – Final Assembly

The assembled kit appears as shown in the top and side view example shown in **Figure 5-2**. Depending on the application, you may proceed to the next phase of installation.

5.2.2 CSAT-5060 +10dBm, CSAT-5060/6070 5W to 25W Unit Standalone Pole Mount Installations (CEFD Kit P/N AS/0599)
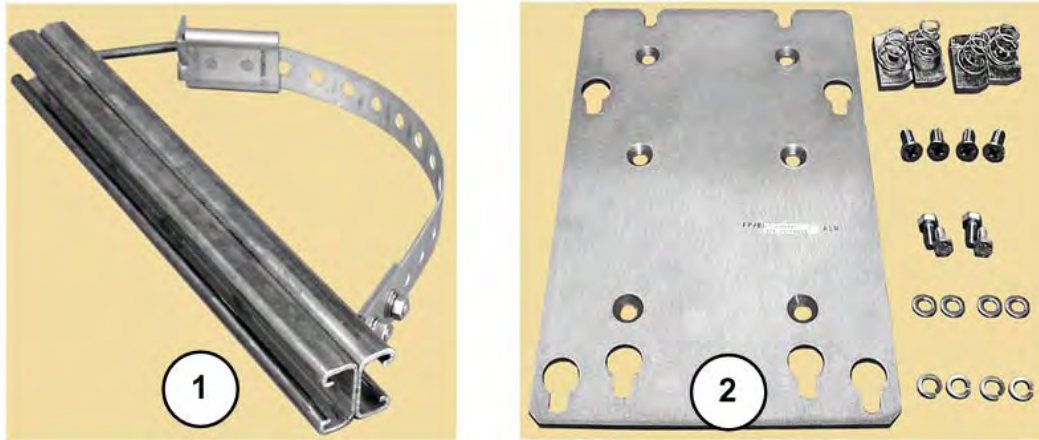
ITEM	QTY	CEFD PART NO.	DESCRIPTION	FIGURE
1	1	AS/0414	UNIVERSAL POLE MOUNTING KIT	5-1
2	1	AS/0608	STANDALONE MOUNTING KIT (CSAT-5060 +10dBm units, CSAT-5060/6070 5W to 25W units)	5-4

Figure 5-3. AS/0599 Standalone Installation Kit

Depending on the type of installation required (i.e., pole-mounted versus spar-mounted), not all of the hardware provided in these kits may be used/necessary.

Figure 5-3 illustrates the components of the AS/0599 Standalone Assembly Kit, used to install standalone CSAT-5060 +10dBm unit and CSAT-5060/6070 5W to 25W unit configurations.

For detailed information on the individual items provided in this kit, see the figure specified in the table and/or the installation procedures provided in this section.
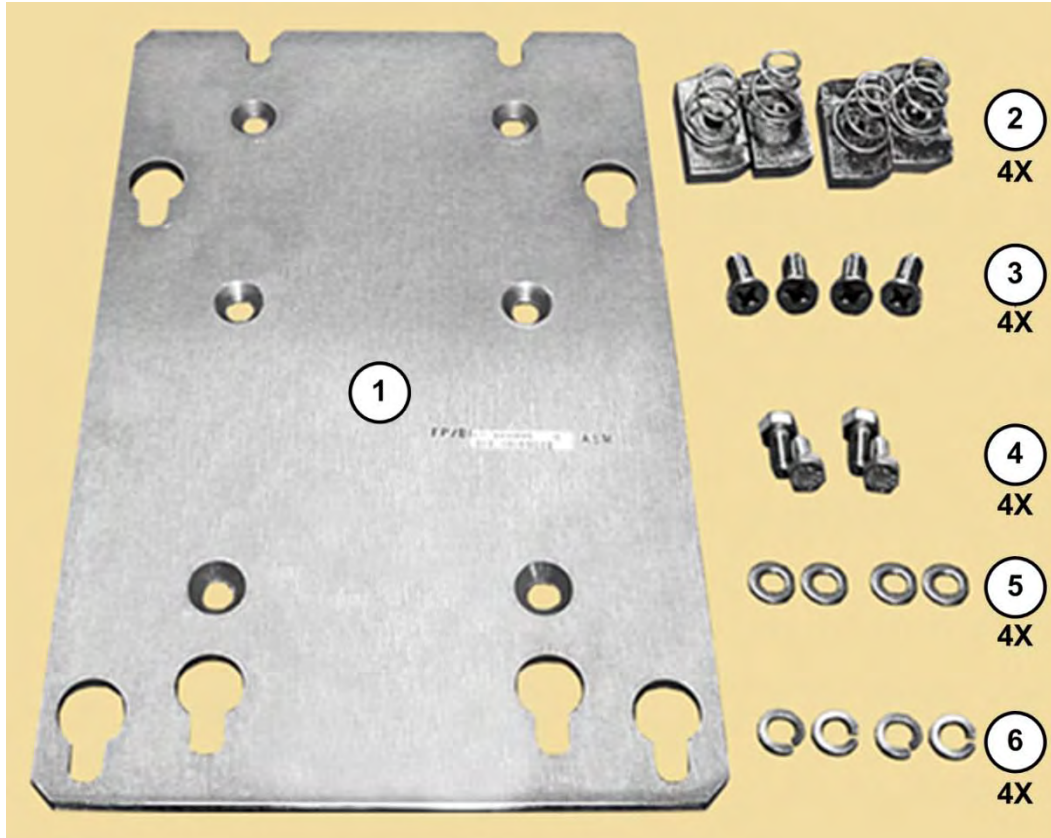
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	FP/BR0095	STANDALONE MOUNTING PLATE
2	4	HW/M8SPRING NUT	SPRING NUT, M8
3	4	HW/M8X1.25X20MMFHSS	FLAT HEAD SCREW, M8 X 20MM LG
4	4	HW/M8X1.25MMHEX	HEX HEAD BOLT, M8 X 16MM LG
5	4	HW/M8FLATSS	FLAT WASHER, M8
6	4	HW/M8LOCKSS	LOCKWASHER, M8

Figure 5-4. AS/0608 Standalone Mounting Kit

Do these steps to install each kit:

FOR STEPS 1 THROUGH 11, see Section 5.2.1. Perform the tasks required to install the Universal Pole Mounting Kit AS/0414 (Kit Item 1) onto the satellite dish support pole.

CONTINUING WITH STEP 12, assemble Kit Item 2, the AS/0608 Standalone Mounting Kit, to the assembled Kit Item 1, the AS/0414 Universal Pole Mounting

Kit (see **Figure 5-4** to identify all Kit Item 2 subassembly items). Proceed with these steps:

12. Slide two spring nuts (subassembly Item 2) into installation position (3.75" [95.3 mm] apart, centered to the support pole) in the Unistrut channel. Make sure to seat the springs against the interior wall of the channel.

13. Loosely assemble the Standalone Mounting Plate (subassembly Item 1) into position against the Unistrut and the installed spring nuts using (2X each) M8 flat screws (subassembly Item 3). Re-center the assembled plate to the pole if necessary, and tighten the flat head screws to complete assembly.

> **(!)** **Make sure to install the Standalone Mounting Plate with the slots positioned downward (Figure 5-5).**
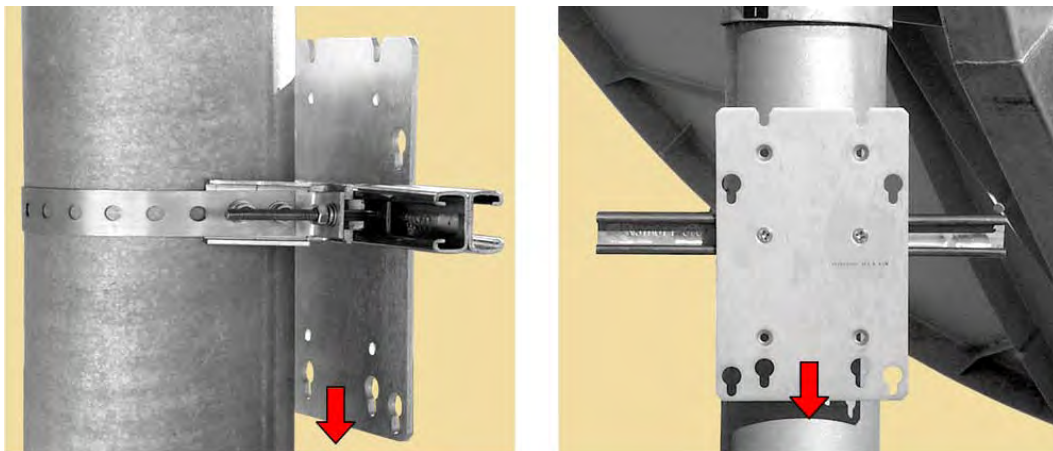
Figure 5-5. AS/0608 Standalone Mounting Kit – Plate Assembly Orientation

As shown in **Figure 5-6**, mount the CSAT to the installed Mounting Plate. Continue with these steps:

14. Loosely install (4X each) of the M8 hex bolts (subassembly Item 4), flat washers (subassembly Item 5), and lockwashers (subassembly Item 6) into the threaded inserts provided in the bottom of the CSAT unit.

15. Position the CSAT to the surface of the Mounting Plate, hooking the pre-assembled mounting hardware through the plate's key slots. Make sure that no washers are caught between the CSAT and plate, and then carefully drop the CSAT into position.

16. Secure the CSAT installation by firmly bolting the CSAT mounting hardware to the Mounting Plate.
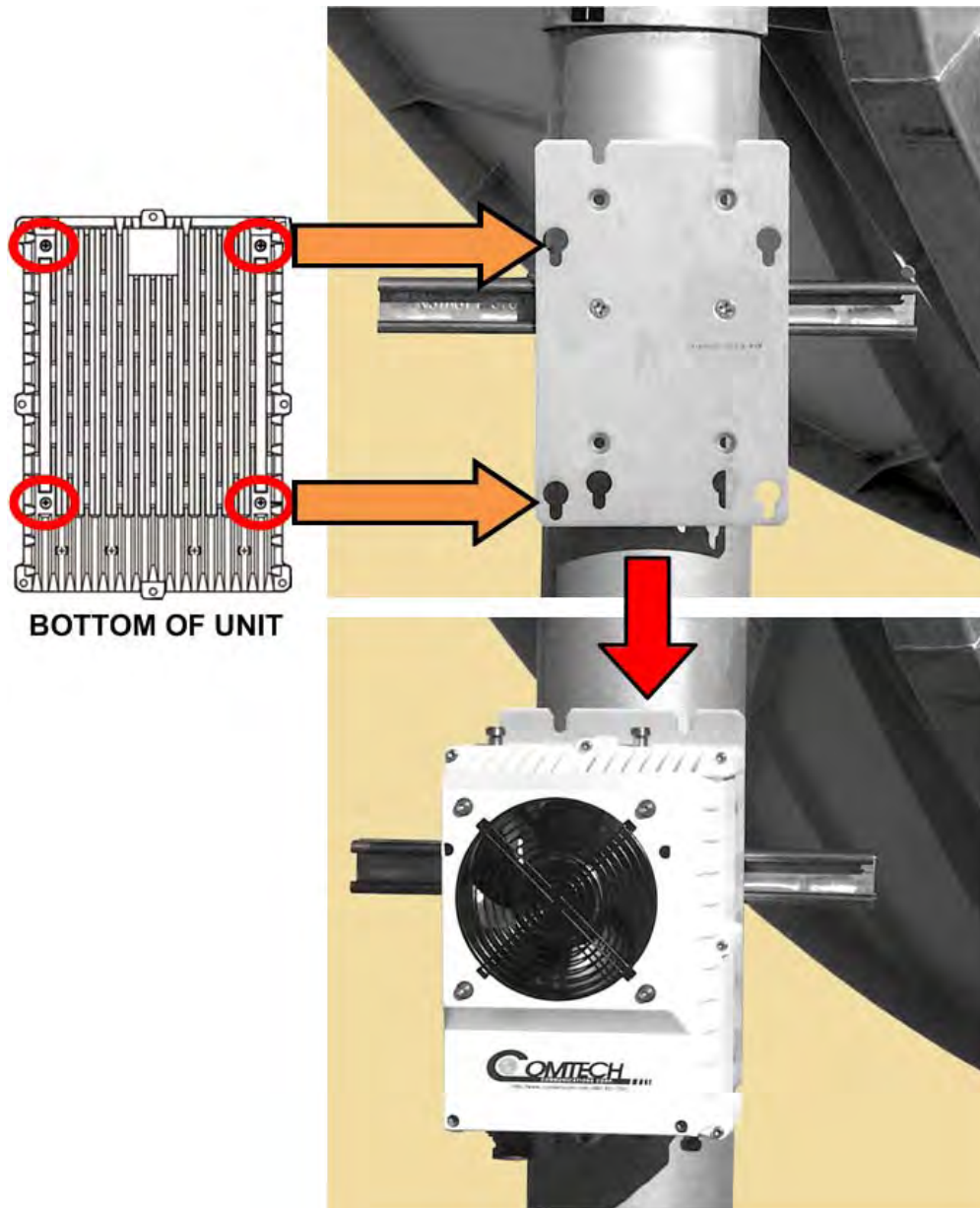
Figure 5-6. Assemble CSAT to Mounting Plate

The assembled kit appears as shown in the bottom example shown in **Figure 5-6**. Depending on the application, you may proceed to the next phase of installation – i.e., installing the C-Band LNA and/or RF cable connections.

5.2.3   CSAT-5060 50W through 125W Units / CSAT-6070 50W and 100W Units Standalone Pole Mount Installations (CEFD Kit P/N AS/0600)

Figure 5-3 illustrates the components of the AS/0600 Standalone Installation Kit, used to install CSAT-5060 50W through 125W and CSAT-6070 50W and 100W unit configurations.

For detailed information on the individual items provided in this kit, see the figure specified in the table and/or the installation procedures provided in this section.
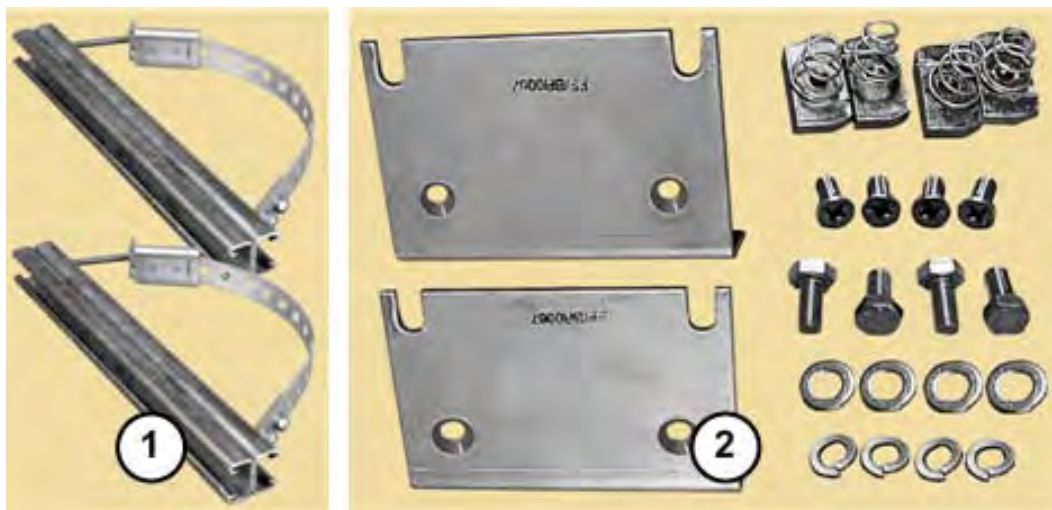
ITEM	QTY	CEFD PART NO.	DESCRIPTION	FIGURE
1	2	AS/0414	UNIVERSAL POLE MOUNTING KIT	5-1
2	1	AS/0415	STANDALONE MOUNTING KIT (CSAT-5060 50W, 100W/125W units, CSAT-6070 50W and 100W units)	5-7

Figure 5-7. AS/0600 CSAT Standalone Installation Kit

Do these steps to install each kit:
FOR STEPS 1 THROUGH 11, see **Section 5.2.1** and perform the tasks as needed to install each AS/0414 Universal Pole Mounting Kit (Kit Item 1) onto the satellite dish support pole.

Kit Item 2 subassembly note: This kit is used for both 50W and 100W/125W unit installations.

ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	2	FP/BR0067	STANDALONE MOUNTING BRACKET
2	4	HW/M8SPRING NUT	SPRING NUT, M8
3	4	HW/M8X1.25X20MMFHSS	FLAT HEAD SCREW, M8 X 20MM LG
4	4	HW/M8X1.25MMHEX	HEX HEAD BOLT, M8 X 16MM LG
5	4	HW/M8FLATSS	WASHER, FLAT M8
6	4	HW/M8LOCKSS	LOCKWASHER, M8

Figure 5-8. AS/0415 Standalone Mounting Bracket Kit

Beginning with Step 12, assemble Kit Item 2, the AS/0415 Standalone Mounting Kit (see Figure 5-8 to identify all Kit Item 2 subassembly items). Typical on each assembled AS/0414 (Kit Item 1), continue with these steps:

12. Slide 2X spring nuts (subassembly Item 2) into installation position (3.75" [95.3 mm] apart, centered to the support pole) in the Unistrut channel. Make sure to seat the springs against the interior wall of the channel.

13. For each Mounting Bracket (subassembly Item 1): Loosely assemble the Bracket into position against the Unistrut and the installed spring nuts using 2X each of the M8 flat screws (subassembly Item 3). Re-center the assembled plate to the pole if necessary, and tighten the flat head screws to complete assembly.
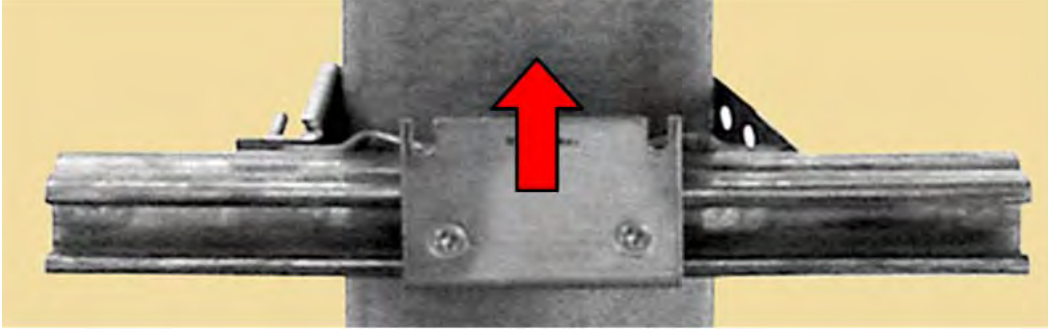
Figure 5-9. AS/0415 Standalone Mounting Kit – Slot Orientation

1) The CSAT features threaded inserts on both sides of the unit. This allows for flexible left-hand (LH) or right-hand (RH) mounting arrangements. See the 50W or 100W/125W Dimensional Envelope figures provided in **Chapter 2. SPECIFICATIONS**. These figures provide guidance in determining your installation preference (e.g., LH versus RH positioning, and the spacing of the pole-mounted Unistruts).

2) Make sure to install each Standalone Mounting Bracket with its slots positioned upward (**Figure 5-9** and **Figure 5-10**).

As shown in **Figure 5-10**, mount the CSAT to the installed Mounting Bracket. Continue with these steps:

14. Loosely install 4X each of the M8 hex bolts (subassembly Item 4), flat washers (subassembly Item 5), and lockwashers (subassembly Item 6) into the proper threaded inserts provided in the sides of the CSAT unit.

15. Position the CSAT to the surface of the Mounting Brackets. Make sure that no washers are caught between the CSAT and brackets, and then carefully drop the CSAT into position in the bracket slots.

16. Secure the CSAT installation by firmly bolting the CSAT mounting hardware to the Mounting Brackets.

Do not impede air flow. You must install the unit with the exhaust fan(s) facing outward (e.g., opposite the back of the satellite dish). You must also make sure that the air intake vents are free of obstructions.

Figure 5-11 shows final installation of a CSAT-5060 100W or 125W unit, or a CSAT-6070 100W unit.
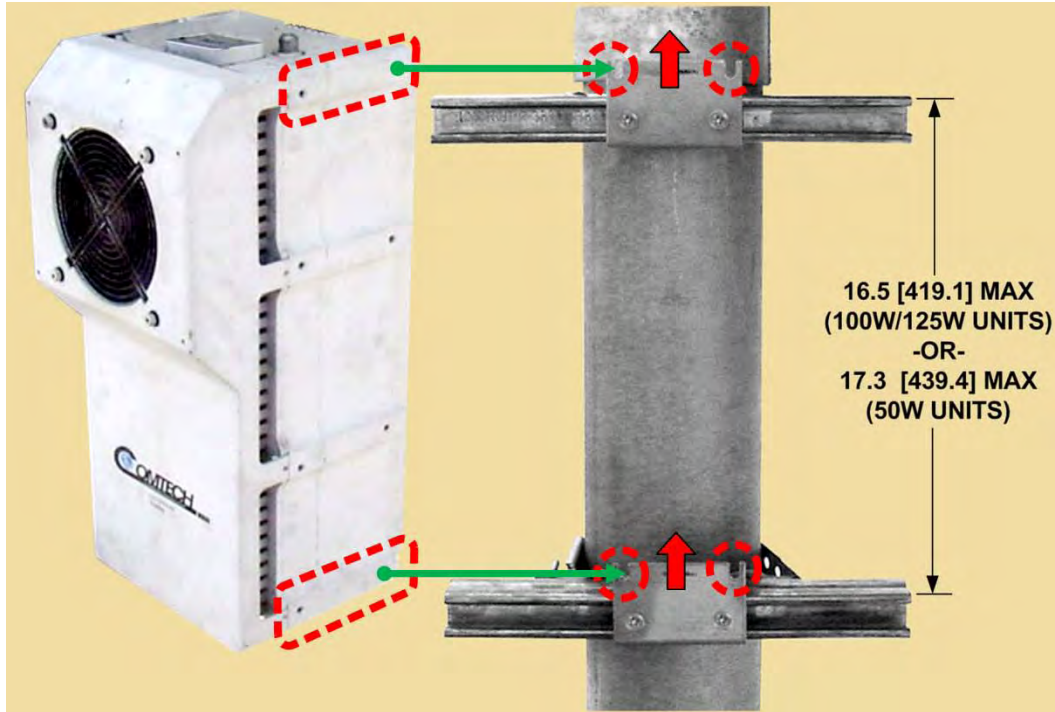
Figure 5-10. Assembly Example – CSAT Unit to Mounting Brackets (50W Unit shown)

Figure 5-11. Installed CSAT (100W/125W Unit Shown, Side view)

Depending on the application, you may proceed to the next phase of installation – i.e., installing the C-Band LNA and/or RF cable connections.

5.3   Spar Mount Installation
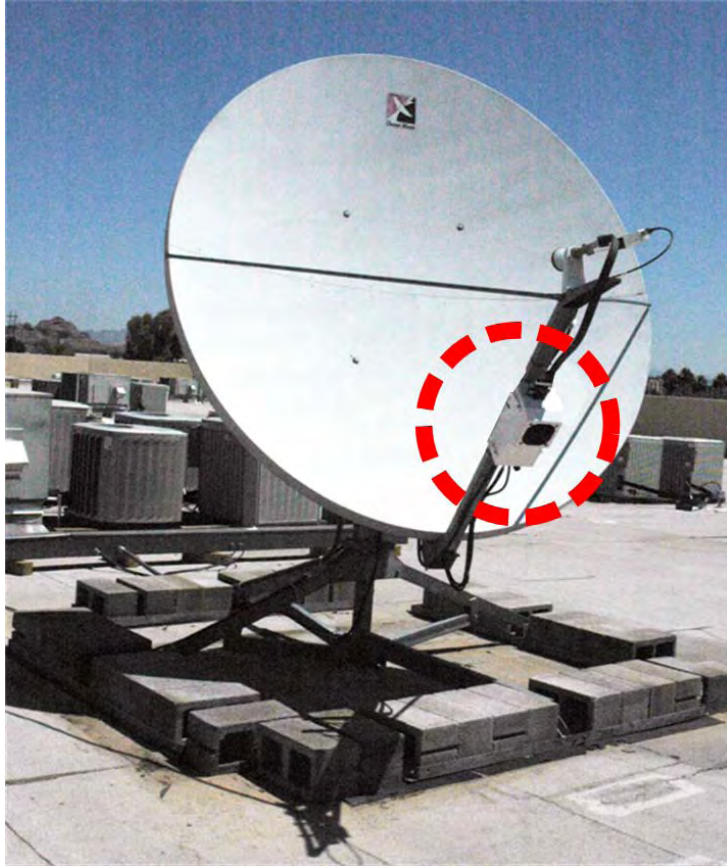
Figure 5-12. Spar Mount Installation Example

You may install your CSAT-5060 +10dBm, or CSAT-5060/6070 5W to 50W standalone configuration on the antenna spar instead of on the satellite dish support pole. **Figure 5-12** shows a typical Comtech EF Data spar mount SSPA installation.

⚠️ **CAUTION!**
Due to weight considerations, you may not mount a 100W or 125W unit to an antenna spar. You may only mount your unit onto a standard satellite dish support pole.

See **Table 5-1** for the list of available Comtech EF Data installation kits. Your antenna's manufacturer and the spar type used determine which kit you will need.

Table 5-1. Comtech EF Data Spar Mount Installation Kits

FOR CSAT UNIT	CEFD KIT NO.	DESCRIPTION	USE WITH ANTENNA
+10dBM, 5W to 25W	KT/9676	1.75" X 4" [44.5 x 101.6 mm] SPAR MOUNT INSTALLATION KIT	COMTECH ANTENNA SYSTEMS, INC.
	KT/9676-1	1" X 2" [25.4 x 50.8 mm] SPAR MOUNT INSTALLATION KIT	GENERAL DYNAMICS SATCOM TECHNOLOGIES: VERTEX AND PRODELIN SERIES
	KT/9676-2	2.5" X 2.5" [63.5 x 63.5 mm] SPAR MOUNT INSTALLATION KIT	CHANNEL MASTER
50W	KT/9675	1.75" X 4" [44.5 x 101.6 mm] SPAR MOUNT INSTALLATION KIT	COMTECH ANTENNA SYSTEMS, INC.
	KT/9675-1	1" X 2" [25.4 x 50.8 mm] SPAR MOUNT INSTALLATION KIT	GENERAL DYNAMICS SATCOM TECHNOLOGIES: VERTEX AND PRODELIN SERIES
	KT/9675-2	2.5" X 2.5" [63.5 x 63.5 mm] SPAR MOUNT INSTALLATION KIT	CHANNEL MASTER

Unit-specific assembly and installation: Detailed assembly and installation instructions are provided on a per-unit basis as follows:

- **Section 5.3.1** outlines standalone assembly and installation for the CSAT-5060 +10dBM and CSAT-5060/6070 5W to 25W units.
- **Section 5.3.2** outlines standalone assembly and installation for the CSAT-5060/6070 50W units.

5.3.1 CSAT-5060 +10dBm, CSAT-5060/6070 5W to 25W Unit Standalone Spar Mount Installations (CEFD Kit P/N KT/9676x)

Use the KT/9676x Spar Mount Installation Kit (Figure 5-13) that is appropriate for your installation.

Figure 5-13 Notes:
1) The antenna spar cross-section determines the bracket profile.
2) The Item 1A Adapter Brackets are provided in Kit KT/9675 only.
3) The hardware items and quantities used may vary.
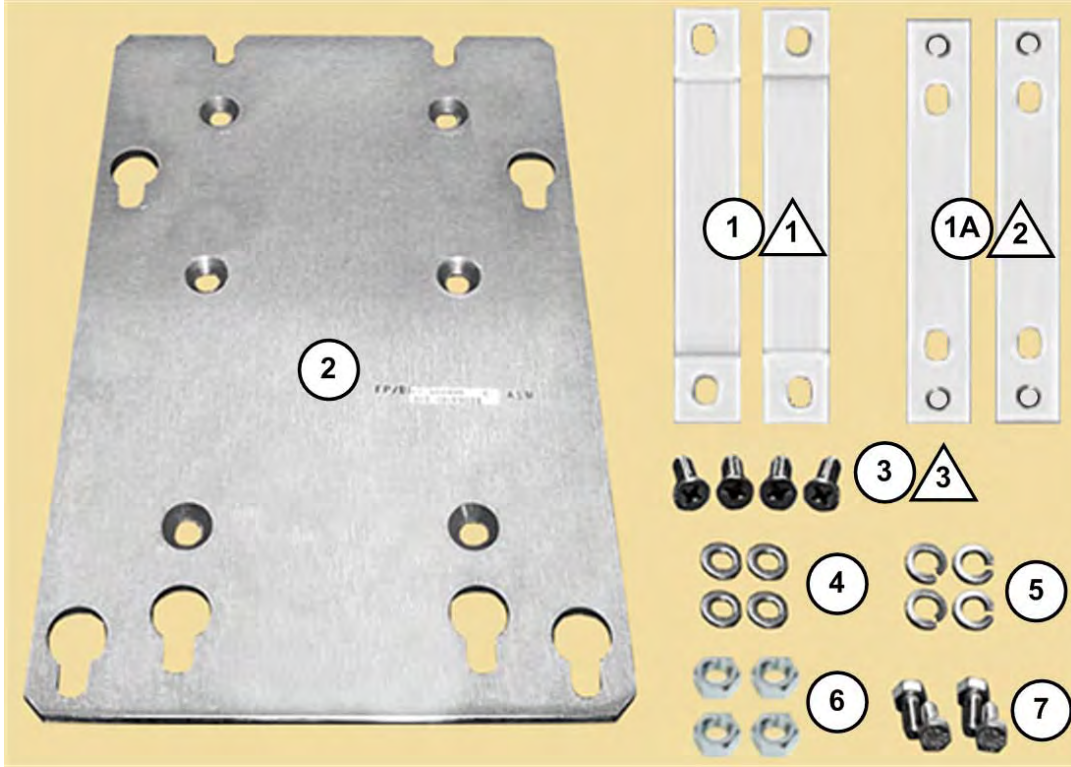
| ITEM | CEFD KIT / QTY REQ'D | | | CEFD PART NO. | DESCRIPTION |
	KT/9676	KT/9676 -1	KT/9676 -2		
1	2	–	–	FP/BR0084	MOUNTING BRACKET 1.75" X 4" [44.5 x 101.6 mm] SPAR
	–	2	–	FP/BR0073	MOUNTING BRACKET 1" x 2" 1" X 2" [25.4 x 50.8 mm] SPAR
	–	–	2	FP/BR9776-1	MOUNTING BRACKET 2.5" X 2.5" [63.5 x 63.5 mm] SPAR
1A	2	–	–	FP/BR0083	ADAPTER BRACKET 1.75" X 4" [44.5 x 101.6 mm] SPAR
2	1	1	1	FP/BR0095	PLATE, STANDALONE MOUNTING
3	4	–	–	HW/M8X1.25X16MMFH	FLAT HEAD SCREW, M8 X 16MM LG
4	12	8	8	HW/M8FLATSS	FLAT WASHER, M8
5	12	8	8	HW/M8LOCKSS	LOCKWASHER, M8
6	12	8	8	HW/M8X1.25HEXNUTSS	HEX NUT, M8
7	4	4	4	HW/M8X1.25MMHEX	HEX HEAD BOLT, M8 X 16MM LG

Figure 5-13. Spar Mount Installation Kit (CEFD P/N KT/9676x)

5.3.1.1   Comtech Antenna Systems, Inc. Antennas (Kit KT/9676)

Do these steps to install each kit:

1. **Assemble the Adapter Brackets (Item 1A) onto the Single-Thread Mounting Plate (Item 2). See Figure 5-14.** Use 2X each per bracket: M8 flat head screws (Item 3), flat washers (Item 4), lockwashers (Item 5), and hex nuts (Item 6).

2. **Install the plate subassembly onto the antenna spar. See Figure 5-15.** Use the Spar Mounting Brackets (Item 1) and 2X each per bracket: M8 flat washers (Item 4), lockwashers (Item 5), and hex nuts (Item 6).

> ⓘ Be sure to note the orientation of the Mounting Plate's key slots (used for mounting the CSAT unit) as shown by the red arrow in the assembly figures that follow.
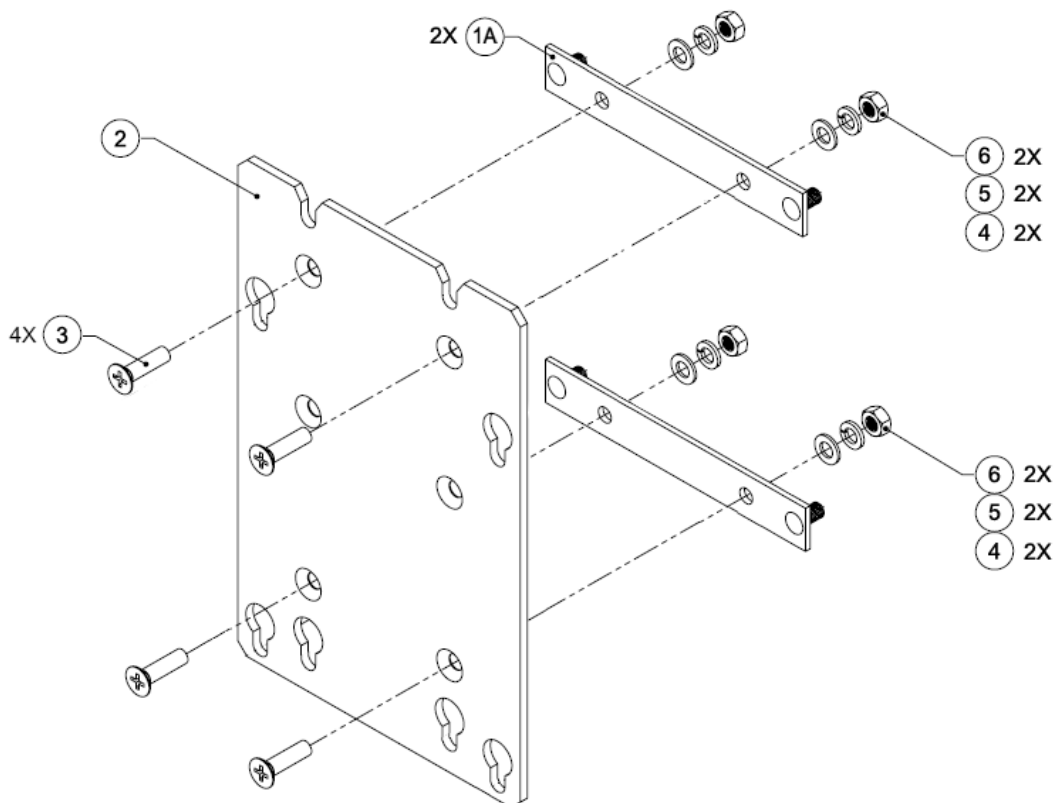
Figure 5-14. KT/9676 Assembly – Adapter Plate (1A) to Mounting Plate (2)
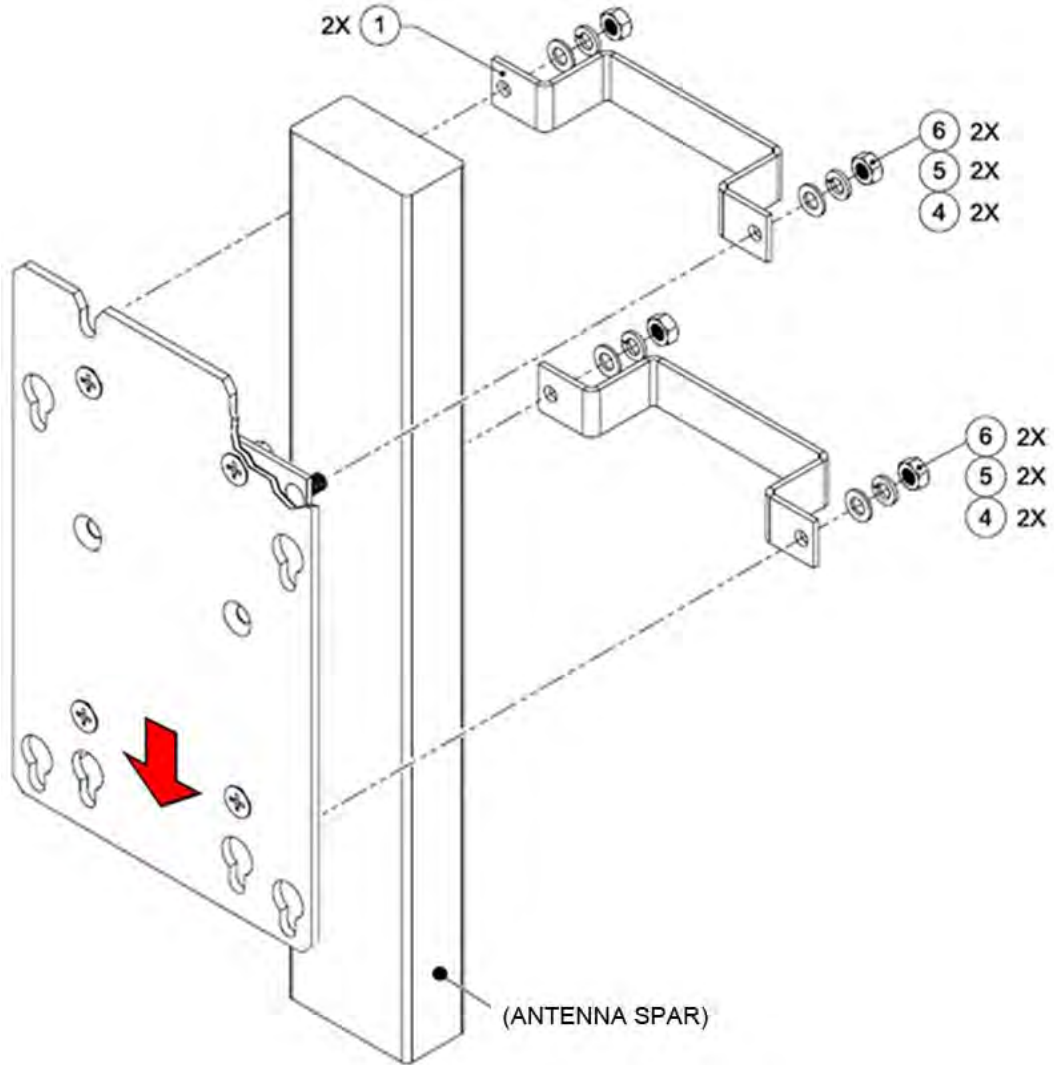
Figure 5-15. KT/9676 Assembly – Mounting Plate Subassembly to Spar

5.3.1.2   Vertex or Prodelin Antennas (Kit KT/9676-1) or Channel Master Antennas (Kit KT/9676-2)

Do these steps to install each kit:

1. **See Figure 5-16.** Install the Single-Thread Mounting Plate (Item 2) onto the antenna spar using the Spar Mounting Brackets (Item 1) with (2X each per bracket) M8 flat head screws (Item 3), flat washers (Item 4), lockwashers (Item 5), and hex nuts (Item 6).
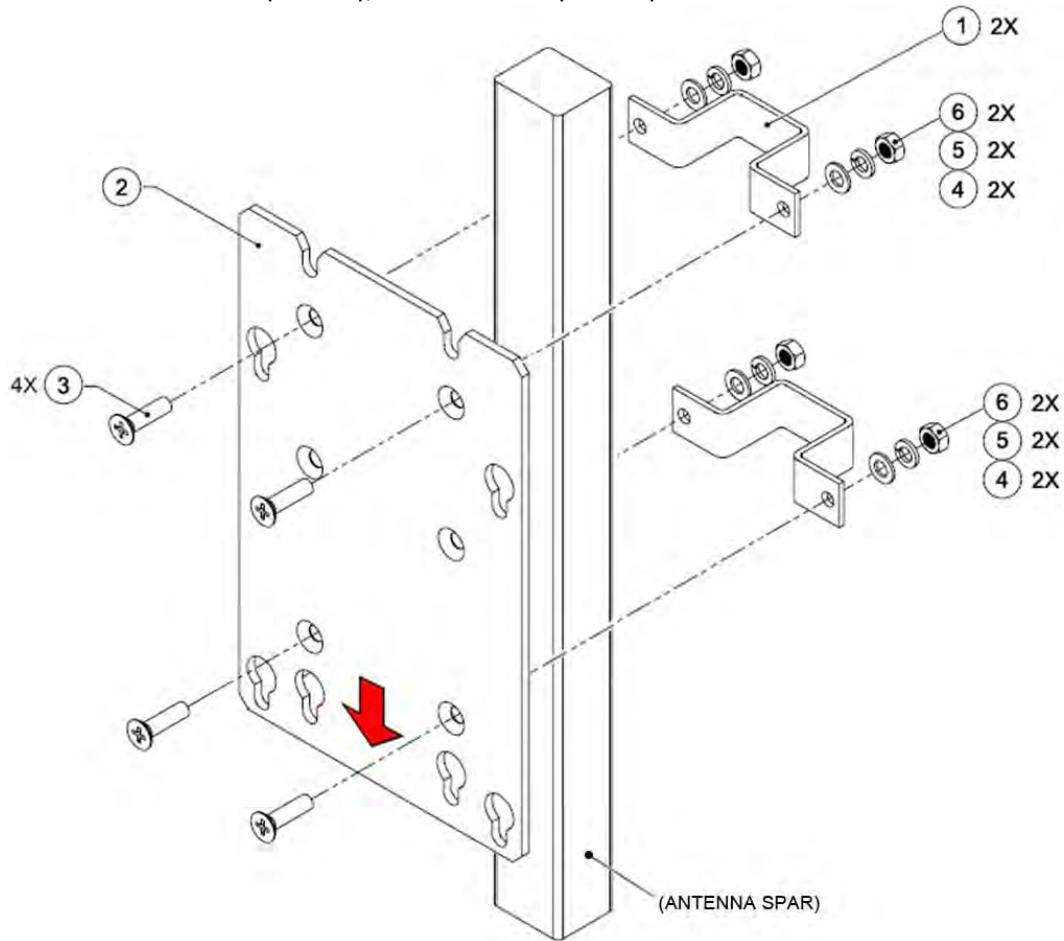
Figure 5-16. KT/9676-X Assembly – Mounting Plate to Spar Assembly

5.3.1.3   Typical Unit to Spar Assembly

To complete installation, you must install the CSAT unit onto the antenna spar. Typical for all kits, continue with these steps:

1. **Pre-assemble the mounting hardware to the CSAT unit. See Figure 5-17.** Loosely install (4X each) of the M8 hex bolts (Item 7); flat washers (Item 4); and lockwashers (Item 5) into the threaded inserts provided at the rear of the CSAT unit.

2. **Install the CSAT unit onto the antenna spar. See Figure 5-17.** Position the CSAT to the surface of the Mounting Plate, and then hook the pre-assembled mounting hardware through the plate's key slots. Make sure that no washers are caught between the CSAT and plate, and then carefully slide the CSAT into position.

3. **Bolt down the CSAT unit to the Mounting Plate. See Figure 5-18** or **Figure 5-19** for examples of a finished spar-mount CSAT installation.
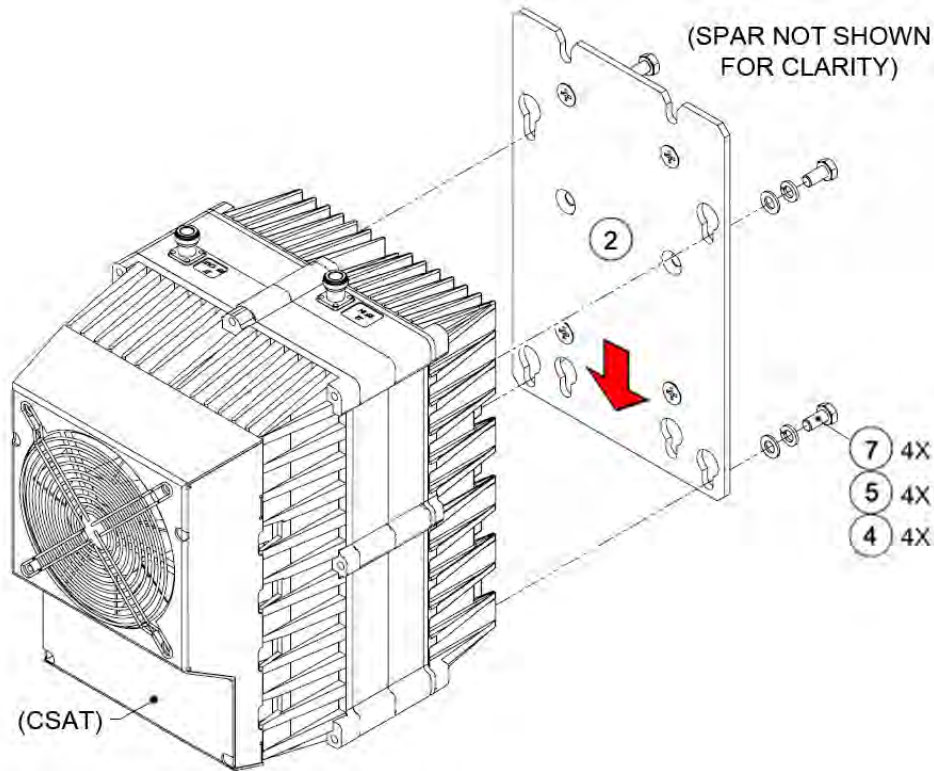
Figure 5-17. CSAT to Mounting Plate – Hardware Pre-Assembly
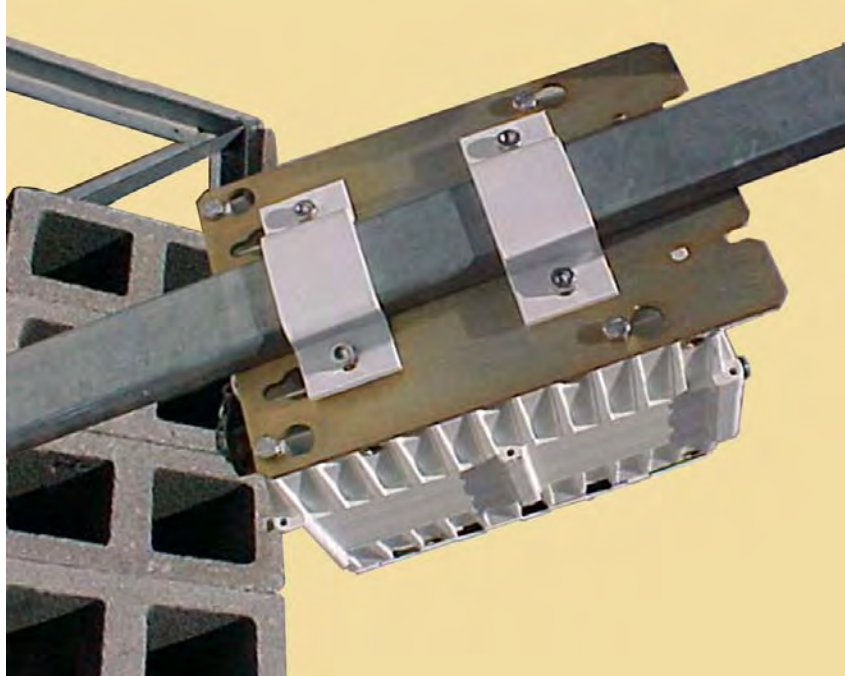
Figure 5-18. CSAT to Spar – Final Assembly
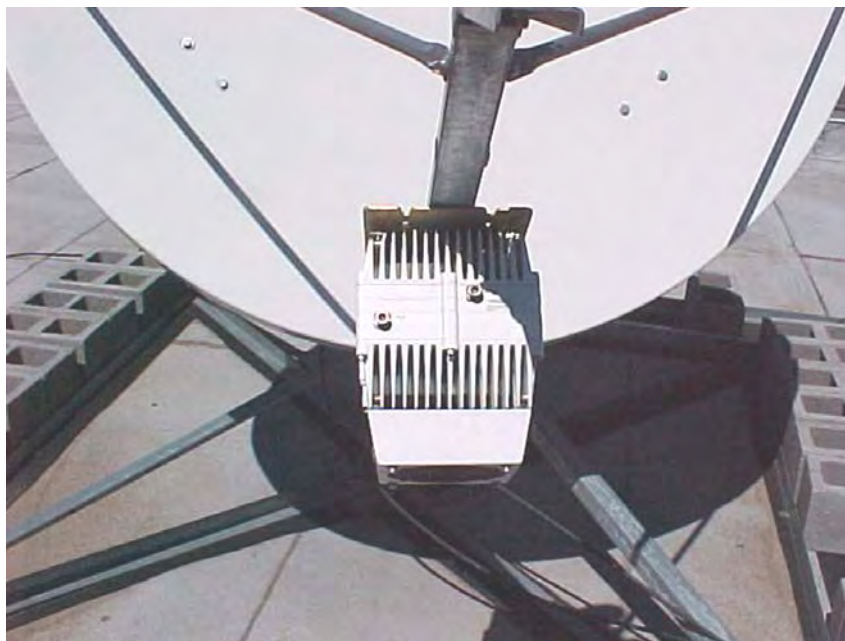
Figure 5-19. Example – Spar Mount Installation Complete

Depending on the application, you may proceed to the next phase of installation – i.e., installing the C-Band LNA and/or RF cable connections.

5.3.2   CSAT-5060/6070 50W Units Standalone Spar Mount Installations (CEFD Kit P/N KT/9675x)

You may install your CSAT-5060/6070 50W standalone configurations on the antenna spar instead of the satellite dish support pole. Use the Spar Mount Installation Kit (**Figure 5-20**) that is appropriate for your installation.
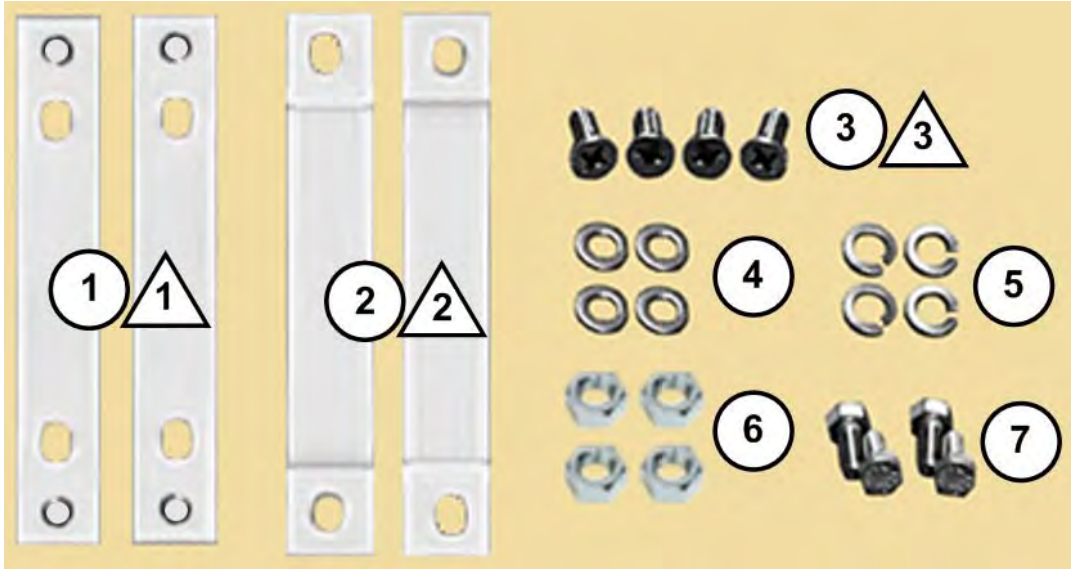
ITEM	CEFD KIT / QTY REQ'D			CEFD PART NO.	DESCRIPTION
	KT/9675	KT/9675 -1	KT/9675 -2		
1	2	–	–	FP/BR0083	ADAPTER BRACKET 1.75" X 4" [44.5 x 101.6 mm] SPAR
2	2	–	–	FP/BR0084	MOUNTING BRACKET 1.75" X 4" [44.5 x 101.6 mm] SPAR
	–	2	–	FP/BR0073	MOUNTING BRACKET 1" x 2" 1" X 2" [25.4 x 50.8 mm] SPAR
	–	–	2	FP/BR9776-1	MOUNTING BRACKET 2.5" X 2.5" [63.5 x 63.5 mm] SPAR
3	4	–	–	HW/M8X1.25X16MMFH	FLAT HEAD SCREW, M8 X 16MM LG
4	4	4	4	HW/M8FLATSS	FLAT WASHER, M8
5	4	4	4	HW/M8LOCKSS	LOCKWASHER, M8
6	4	–	–	HW/M8X1.25HEXNUTSS	HEX NUT, M8
7	–	4	4	HW/M8X1.25MMHEX	HEX HEAD BOLT, M8 X 16MM LG

Figure 5-20. KT/9675 Spar Mount Installation Kit – 50W Units

Figure 5-20 Notes:
1) The Item 1 Adapter Brackets are provided in Kit KT/9675 only.
2) The Item 2 Bracket profile varies based on the spar cross-section.
3) The hardware items and quantities used may vary.

⚠️ **CAUTION!** 100/125W units may **not** be spar-mounted due to weight considerations.

5.3.2.1   Comtech Antenna Systems, Inc. Antennas (Kit KT/9675)

Do these steps to install each kit:
1. **See Figure 5-21.** Assemble the Adapter Brackets (Item 1) onto the CSAT unit. Use 2X M8 flat head screws (Item 3) per bracket.
2. **See Figure 5-22.** Install the CSAT unit subassembly onto the antenna spar using the Spar Mounting Brackets (Item 2) and (2X each per bracket) M8 flat washers (Item 4), lockwashers (Item 5), and hex nuts (Item 6).
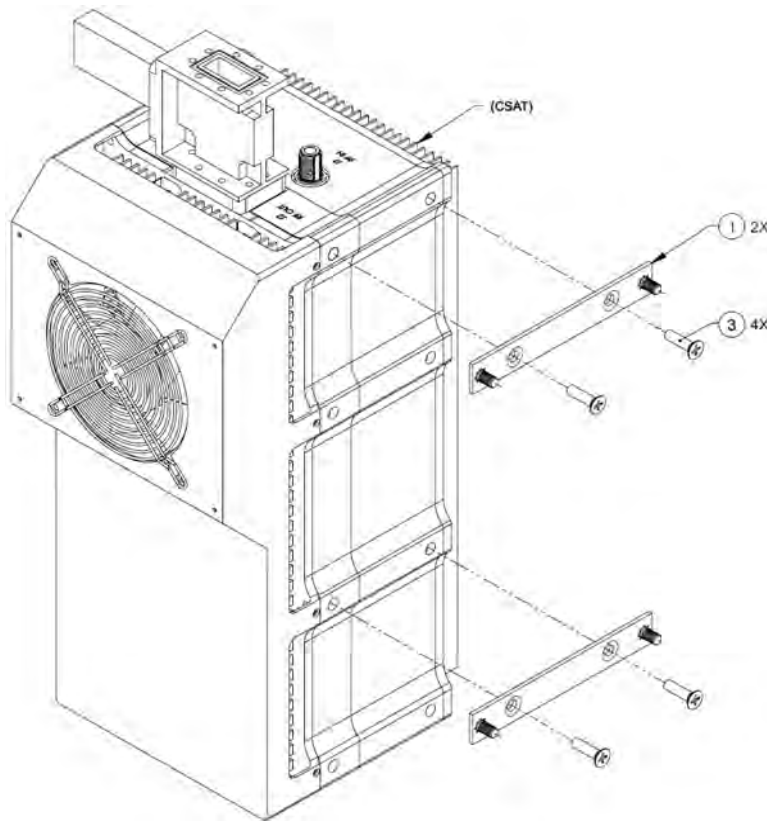
Figure 5-21. KT/9675 Assembly – Assemble Adapter Plates to Unit
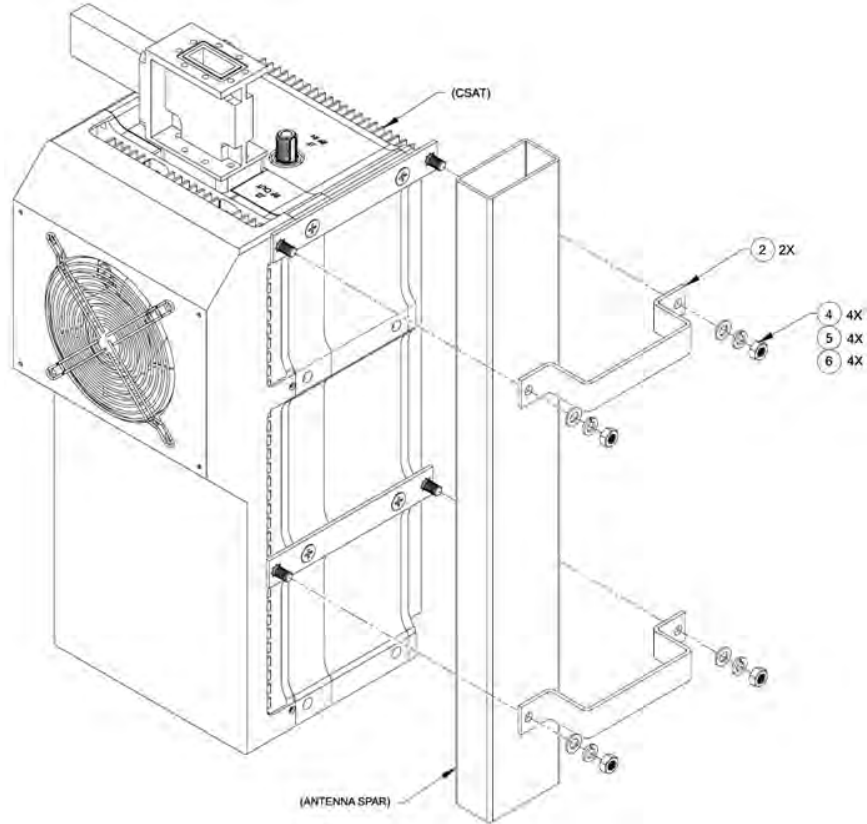
Figure 5-22. KT/9675 Assembly – Install Unit Onto Antenna Spar

5.3.2.2 Vertex or Prodelin Antennas (Kit KT/9675-1) or Channel Master Antennas (Kit KT/9675-2)

To install either kit, do these steps:

1. **See Figure 5-23.** Install the CSAT unit onto the antenna spar. Use the Spar Mounting Brackets (Item 2) with 2X each per bracket: M8 hex bolts (Item 7), flat washers (Item 5), and lockwashers (Item 6).
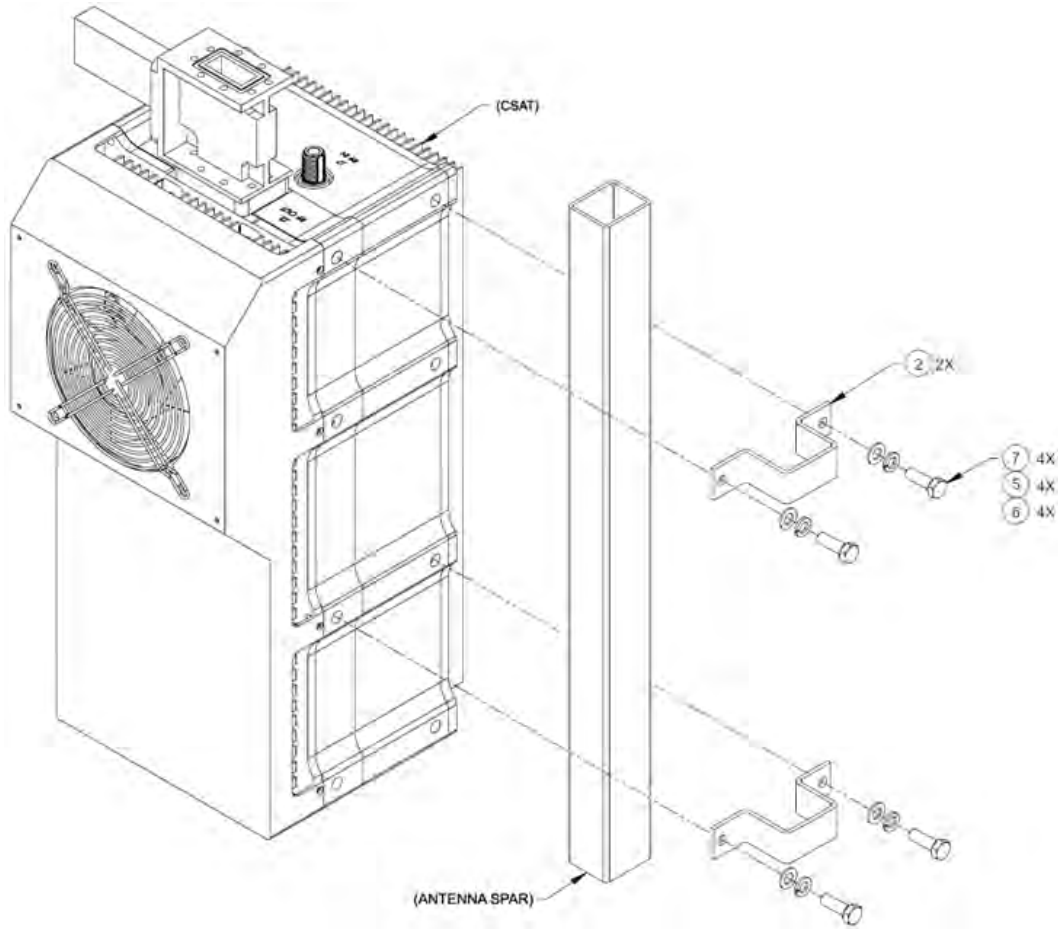
Figure 5-23. KT/9676-X Assembly – Unit to Spar Assembly

Depending on the application, you may proceed to the next phase of installation – i.e., installing the C-Band LNA and/or RF cable connections.

5.4   CSAT Low Noise Amplifier (LNA)

The Standalone Low Noise Amplifier (LNA) mounts to the antenna's Orthomode Transducer (OMT) using the items shown in **Figure 5-24**.
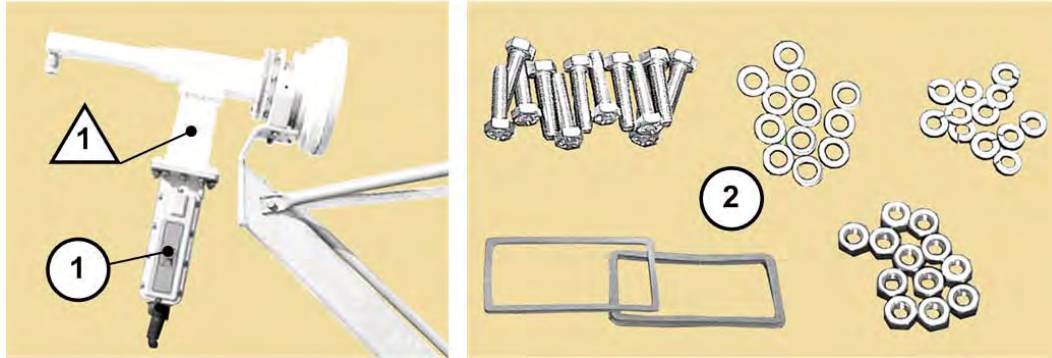
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	Varies by operational requirements – contact Comtech EF Data Product Support	C-Band LNA (Low Noise Amplifier)
2	1	AS/0461	KIT, WAVEGUIDE INSTALLATION, CPR229

Figure 5-24. Required Standalone LNA Items

1) The Orthomode Transducer (OMT) is provided by the user.
2) Installation of a C-Band LNA is required regardless of unit type or configuration (i.e., one LNA is required for a Standalone configuration, or two LNAs for 1:1 Redundancy).
3) For detailed information about the C-Band LNA used in CSAT applications, refer to its Installation and Operation Manual (CEFD P/N MN/LNAS.IOM).
4) For any standalone installation, you should perform tasks in the following sequence:
   1. Unpack and inspect all materials as instructed in **Chapter 3. UNPACKING AND INSPECTION**.
   2. Prepare for installation as instructed in **Section 5.1**.
   3. Carefully follow the installation procedures outlined in this section.
   4. All CSAT configurations require cabling connections using Cabling Kit AS/0440. See **Section 5.5**.

5.4.1 CSAT Standalone Low Noise Amplifier (LNA) Assembly and Installation Using Kit AS/0461
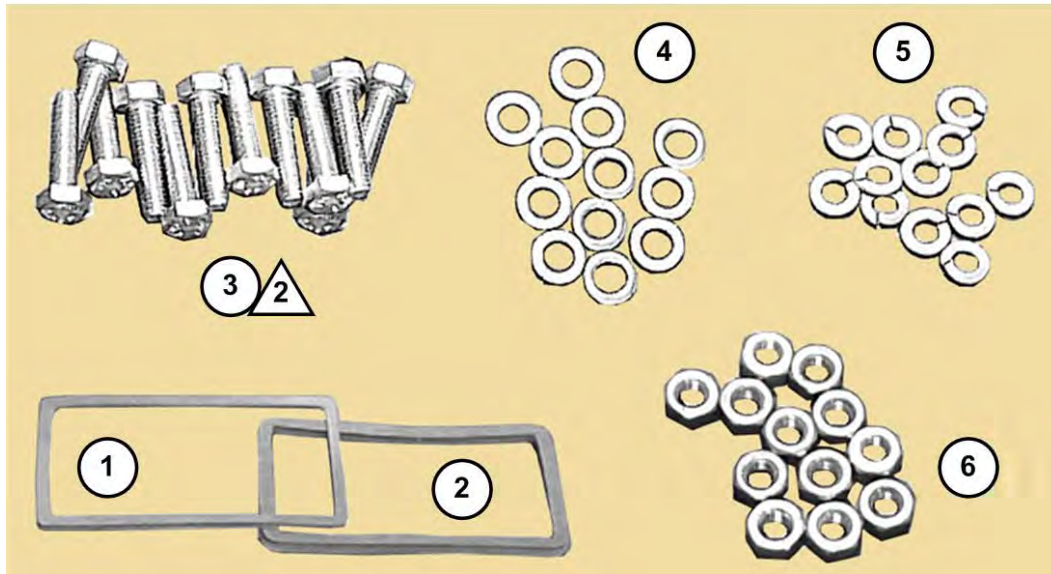
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	GA/GSKTCPR229HALF	CPR229 GASKET, HALF THICKNESS
2	1	GA/GSKTCPR229FULL	CPR229 GASKET, FULL THICKNESS
3	12	HW/M6X1X30MMHEX	HEX HEAD BOLT, M6 X 30MM
4	24	HW/M6FLAT	FLAT WASHER, M6
5	12	HW/M6LOCK	LOCKWASHER, M6
6	12	HW/M6X1HEXNUT	HEX NUT, M6

Figure 5-25. CPR229 Waveguide Installation Kit AS/0461

Figure 5-25 Notes:
1) This kit is used with all CSAT installations, for both Standalone and 1:1 Redundancy applications.
2) The required quantities of mounting hardware may vary by application.

See Figure 5-26. Do these steps to install the LNA onto the OMT:
1. Remove the protective covers from the user-supplied antenna OMT flange and the LNA flange. MAKE SURE TO KEEP ALL SURFACES CLEAN AT ALL TIMES!
2. Install the appropriate gasket in the LNA flange (antenna end):
   a. If only one of the flange surfaces has a gasket groove, use the Half Thickness Gasket (Item 1).

    b. If both flange surfaces have gasket grooves, use the Full Thickness Gasket (Item 2) instead.

3. Mate the OMT and LNA flanges. Make sure to keep the gasket firmly seated during assembly. Use the mounting hardware in as-required quantities:

    a. From the OMT flange outer face – use the M6 hex bolt and flat washer (Items 3 and 4);

    b. From the LNA flange outer face – use the M6 flat washer, lockwasher, and hex nut (Items 4, 5, and 6).
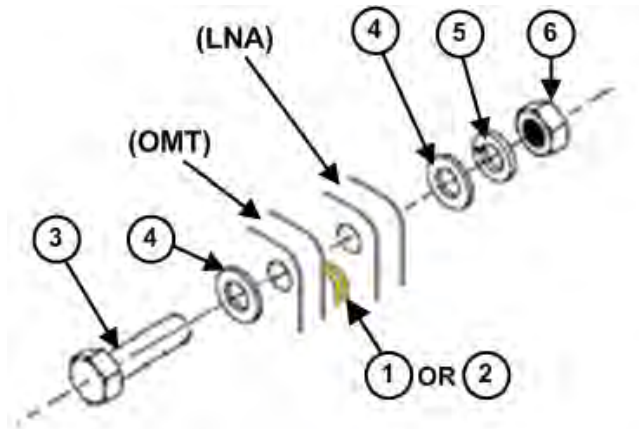
Figure 5-26. OMT to LNA Flange-to-Flange Assembly

The unit is now ready for installation of the RF cable connections.

5.5   CSAT RF Cabling

⚠️ **WARNING!**
The Downconverter RF input connector is wired to supply DC voltage to a Low Noise Amplifier (LNA). This voltage is capable of damaging any test equipment connected to the connector. Do not connect test equipment to this connector without a coaxial DC block between the connector and the test equipment.

🔍 See **Chapter 4. SYSTEM CONNECTORS** for detailed information about the available cabling interfaces. See **Section 4.2 Water Tight Sealing** for important cabling guidelines and recommendations.

QTY	CEFD PART NO.	CABLE DESCRIPTION
2	**CA/RF0097**	RF COAX CABLE, TYPE 'N' CONNECTORS, 3' LG (+10DBM – 25W SIMPLEX/DUPLEX OR 50W-125W DUPLEX)
2	**CA/RF0112**	RF COAX CABLE, TYPE 'N' CONNECTORS, 9' LG (+10DBM – 25W SIMPLEX/DUPLEX OR 50W-125W DUPLEX)
2	**CA/RF0140**	RF COAX CABLE, TYPE 'N' CONNECTORS, 17' LG (+10DBM – 25W SIMPLEX/DUPLEX OR 50W-125W DUPLEX)
2	**CA/6357-25**	RF COAX CABLE, TYPE 'N' CONNECTORS, 25' LG (+10DBM – 25W SIMPLEX/DUPLEX OR 50W-125W DUPLEX)

Figure 5-27. CEFD Cables for CSAT RF Connections

One pair of RF cables (**Figure 5-27**) is required for Standalone installation at the RF side of the unit (**Figure 5-28**). On the IF / M&C side of the unit, all cable connections are user-supplied.

Care must be exercised in cable installation. Install the cables using the most direct route, avoiding all sharp bends. Secure the routed cables with clamps and ties.

Signal attenuation and possible loss of signal can occur in the presence of moisture. Therefore, cable connectors used in outdoor applications must be sealed to avoid leakage – this applies particularly for Type 'N' connectors, where moisture can seep into both the junctions at the plug end of the connector (between the fixed and movable parts), and where the cable connects to the connector.

All cable junctions, including military style (MS) connectors, must be sealed with a self-amalgamating tape, such as 3M Type 23 Scotch Self-Amalgamating Tape or its equivalent.
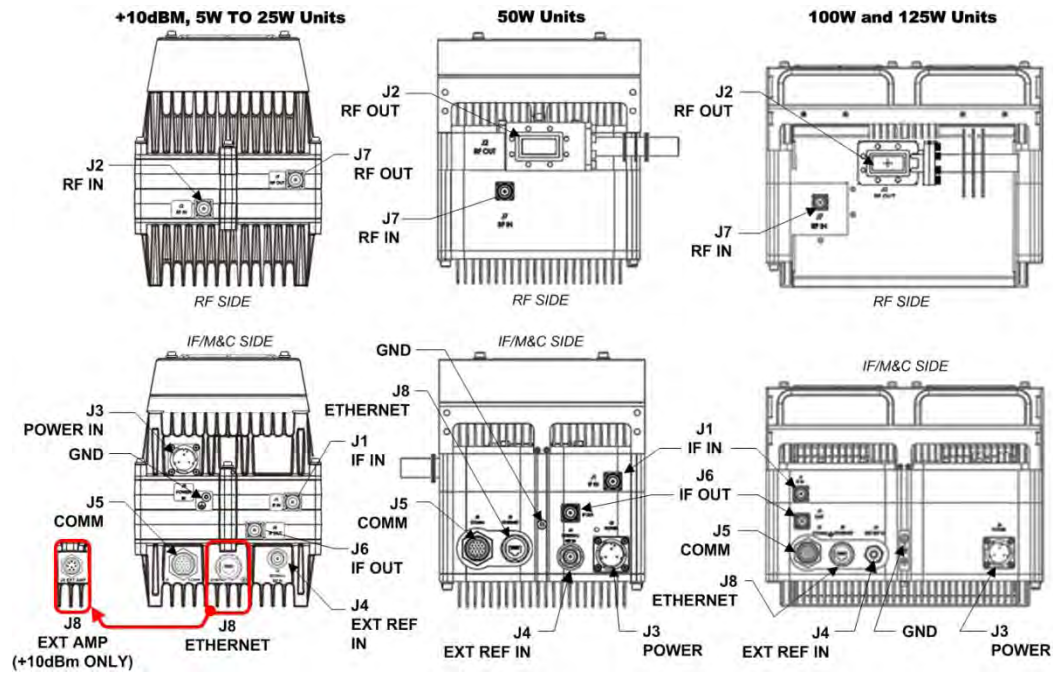
Figure 5-28. CSAT Cabling Connections (By Unit)

Chapter 6. FIRMWARE UPDATE

6.1 Firmware Update Overview

Make sure to operate the CSAT with its latest available firmware.

See Appendix E. FIRMWARE UPDATE IN NON-ETHERNET UNITS for instructions on updating the firmware for CSAT-5060 +10dBm units, or any CSAT unit that does not feature the 'J8 | Ethernet' port.

Comtech EF Data's CSAT family of Outdoor Satellite Transceivers are factory-shipped with the latest version of operating firmware. If you need to update the firmware, you can apply the update to the CSAT without having to remove it from operation. You may directly acquire the download from Comtech EF Data's web site (www.comtechefdata.com), or receive the archive file by e-mail from Comtech EF Data Product Support.

6.1.1 CSAT Firmware Update Procedure Summary

1. Download the firmware update archive file to a user-supplied PC. The user PC must be Microsoft Windows® compatible.
2. Ethernet remote M&C of the CSAT is available by connecting a weatherproof CAT5 Ethernet cable from the CSAT RJ-45 'J8 | Ethernet' port (for SNMP, Telnet, or HTTP Interface operation) to the User PC Ethernet port.
3. Serial remote M&C of the CSAT is available by connecting a serial adapter cable from the CSAT 'J5 | COMM' port to a User PC equipped with a terminal emulator utility or Comtech EF Data's CRFC software utility, or a

utility such as Comtech EF Data's available CPLINK or CiLink handheld M&C devices.

4. Extract the firmware update files from the archive download file. Then, use the CSAT Management IP Address to connect the FTP (File Transfer Protocol) client to an FTP server, and FTP transfer the files from the User PC to the CSAT. You may also use Comtech EF Data's "FLSHCSAT" or "CReflash"utility applications.

6.1.2   About Firmware Numbers, File Versions, and Formats

The Comtech EF Data Web site catalogues its firmware update archive files by product type (e.g., router, modem, etc.), the specific model, and optional hardware configurations. The CSAT firmware update archive files are provided under "Home | Support | Software Downloads | Flash & Software Update Files |Transceiver Software Downloads | CSAT-5060, CSAT-6070 & XSAT-7080 Software Downloads":

- The CSAT firmware download hyperlink for ETHERNET-BASED products appears as F0020597X_V###
- The CSAT firmware download hyperlink for Serial-only (non-Ethernet) products appears as F1516X_V###.

Typical for both, 'X' is the revision letter, and '###' represents the firmware version number – e.g., V121 = Version 1.2.1. Comtech EF Data provides its archive download files in two compressed formats – *.exe (self-extracting) and *.zip (compressed):

- The self-extracting *.exe file does not require use of a third-party utility program.
- Some firewalls do not allow the download of self-extracting *.exe files. You must instead download the *.zip file, and extract the firmware files from the download with a user-supplied third-party file archiver and compression utility program such as PKZIP for Windows, WinZip, ZipCentral, etc. (PKZIP for DOS is not supported due to file naming conventions). Comtech EF Data does not provide this utility program.

For detailed information on handling archived files, read your archive utility program's Help documentation.

6.2   Prepare for the Firmware Download

6.2.1   Required User-supplied Items

You will need a Microsoft Windows-based PC equipped with available serial and Ethernet ports, a compatible Web browser (e.g., Internet Explorer), and a terminal emulator program (e.g., Tera Term or HyperTerminal).

6.2.1.1   CSAT to PC Connections

The ETHERNET connection requires a weatherproof CAT5e Ethernet cable to connect the CSAT **'J8 | Ethernet'** port to the User PC Ethernet port.

For the SERIAL firmware update process, the CEFD CA/WR12243-1 System Programming Cable (**Figure 6-2**) is available from Comtech EF Data to connect the CSAT **'J5 | COMM'** port to the User PC serial port.
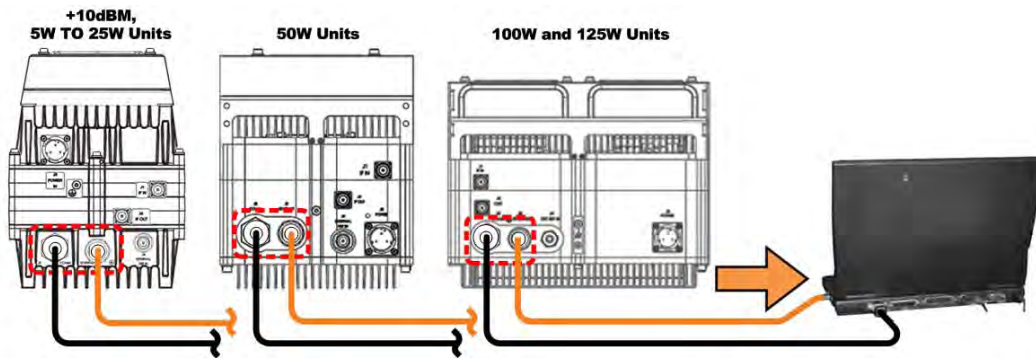
Figure 6-1. CSAT Ethernet and Serial Connections

Figure 6-2. CEFD CA/WR12243-1 System Programming Cable

6.2.2   Configure the Terminal Emulator Program

On the User PC – Open the terminal emulator program, and then configure the program's serial port communication and terminal display operation:

- Baud Rate = 38400 bps
- Data Bits = 8
- Stop bits = 1
- Parity = NO
- Local Echo = ON
- Port Flow Control = NONE
- Display New Line Rx/Tx = CR

Read your terminal emulator program user guide or HELP feature for operating and configuration instructions.

6.2.3   Get the CSAT Management IP Address and Firmware Information

Do these steps:

1. On the CSAT – Apply power to the unit. Your power connection varies depending on your ordered unit.

   See **Section 4.3.3 Power and Ground Interfaces** in this manual to identify your specific power connector.

2. Identify your default Management IP Address. You will not be able to access the CSAT HTTP (Web Server) Interface without this information.
3. Get the firmware information using either of these methods:
   - To use the HTTP Interface, see Section 6.2.3.1.
   - To use the Serial Remote Interface, see Section 6.2.3.2.

6.2.3.1   Use the HTTP Interface to Find the Firmware Information

Chapter 8. ETHERNET INTERFACE OPERATION

Do these steps:

1. Go to one of these pages to review the firmware information:

- The 'SC/13320 Board Firmware Version' section of the 'Config | Utility' page provides the firmware details as Boot, Bulk1, and Bulk2, as shown in this example:

SC/13320 Board Firmware Version
    Boot: FW-0000082,1.1.1 ,11/20/08
    Bulk 1: FW-0020597B,1.2.1 ,02/20/13
    Bulk 2: FW-0020597B,1.2.1 ,02/20/13

- The 'Status | Monitor' page provides the firmware number, as shown in this example:

    Equipment Type: CSAT-5060/000 2.35
    Serial Number: C000000000
    Firmware Number: FW1516
    Online Status: Offline
    Summary Fault: OK

2. Write down your firmware information for further reference or to provide to Comtech EF Data Product Support.

6.2.3.2   Use the Serial Interface to Find the Firmware Information

Chapter 9. SERIAL INTERFACE OPERATION

Use your terminal emulator program or CPLINK or CiLink handheld M&C device to execute remote queries with the CSAT. Use either of these remote queries to find the firmware information:

- Condensed : **<0/SWR?{CR}**
  (returns the firmware version numbers running under Boot, Bulk1, and Bulk2, in the form B.B.BB)
- Detailed : **<0/FRW?{CR}**
  (returns the complete information of the firmwares running under Boot, Bulk1, and Bulk2 in the form FW-AAAAAAA B.B.BB DD/MM/YY, where:
    o FW-AAAAAAA = the firmware part number
    o B.B.BB = the firmware version number
    o DD/MM/YY = the firmware release date (Day/Month/Year)

6.2.4 Make a Temporary Folder (Subdirectory) on the User PC

The temporary folder is where you store the firmware archive download. There are several ways you can make a temporary folder on a Windows PC:

- To use the Windows Desktop, see Section 6.2.4.1.
- To use Windows Explorer, see Section 6.2.4.2.
- To use the Run and Browse windows, see Section 6.2.4.3.
- To use Windows Command-line or the Command Prompt, see Section 6.2.4.4.

1) These examples specify drive letter "**c:**". You can use any valid, writable drive letter.
2) Typical for many of the tasks that follow, type the command as instructed and then press **Enter**.

After you make the temporary folder, proceed to Section 6.3 to download and extract the firmware files.

6.2.4.1 Use Windows Desktop to Make a Folder
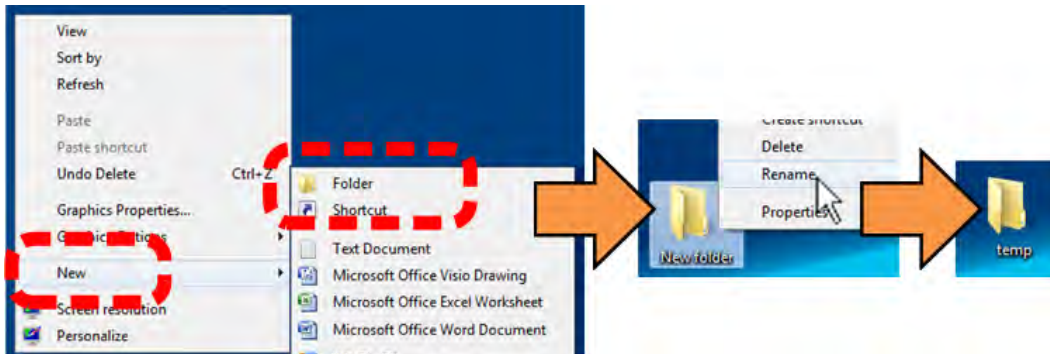
Do these steps:

1. Right-click anywhere on the desktop to open the popup submenu.
2. Select **New > Folder** to make the new, temporary folder on the desktop.
3. Right-click on the new folder and then select **Rename** from the popup submenu. Rename this folder to "temp" or some other convenient, unused name.

6.2.4.2 Use Windows Explorer to Make a Folder
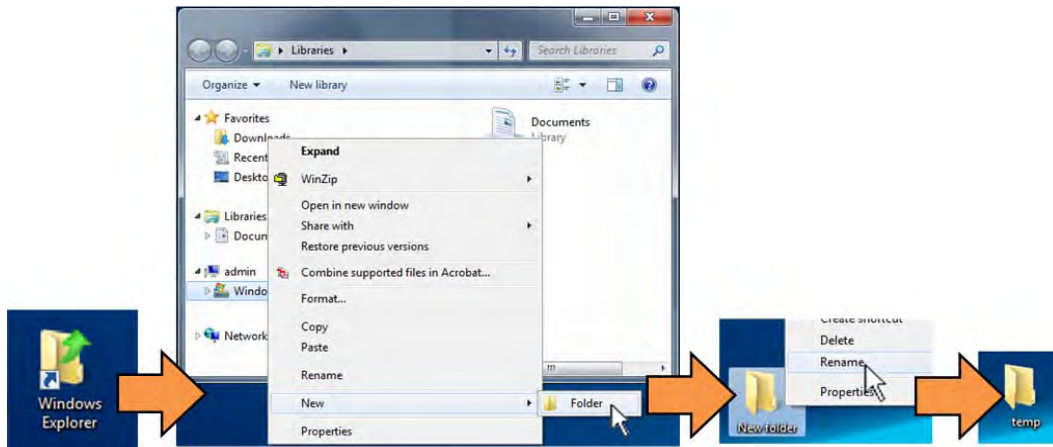
Do these steps:
1. Left-double-click the Windows Explorer icon on the Windows Desktop.
2. Depending in your Windows OS version: select **File > New > Folder**, or click your Folder Destination (e.g., **Windows (C:)** and then **New Folder** to make the new, temporary folder in the active location.
3. Right-click the **New Folder** folder name, and then **Rename** this folder to "temp" or some other convenient, unused name.

6.2.4.3 Use the Run and Browse Windows to Make a Folder
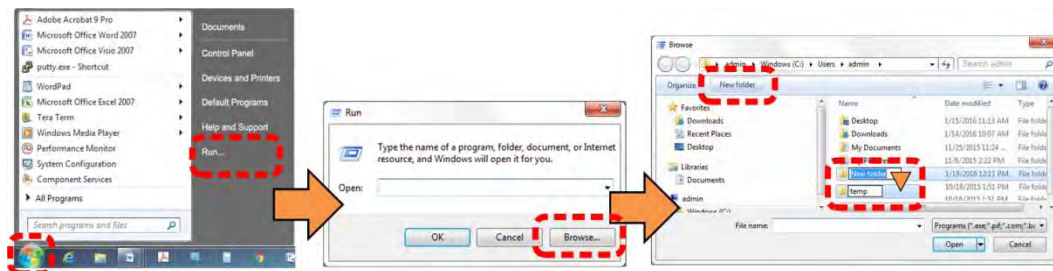
Select **Start** on the Windows taskbar and then do these steps:
1. Click **Run…** to open the **Run** window.
2. Click **Browse…** to open the **Browse** window.
3. Click **New Folder**. This can be an icon or a text label, depending on the Windows OS version.
4. Right-click the **New Folder** folder name, and then **Rename** this folder to "temp" or some other convenient, unused name.

6.2.4.4   Use Windows Command-line or Command Prompt to Make a Folder
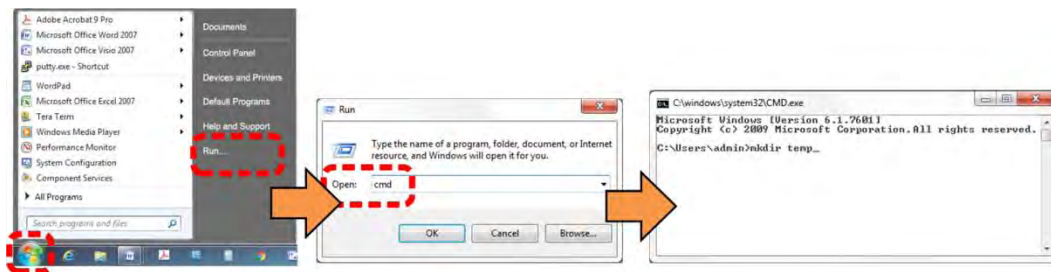
Select **Start** on the Windows taskbar and then do these steps:

1. Click **Run…** to open the **Run** window (or, depending on Windows OS version prior to Windows 95, click the **MS-DOS Prompt** icon from the Main Menu).

2. Open a Command-line window:
   - For Windows 95 or Windows 98 – type "command".
   - For any Windows OS versions later than Windows 98 – type "cmd" or "command".
   - Alternately, from **Start**, select the **All Programs > Accessories** popup submenu, and then select **Command Prompt**:
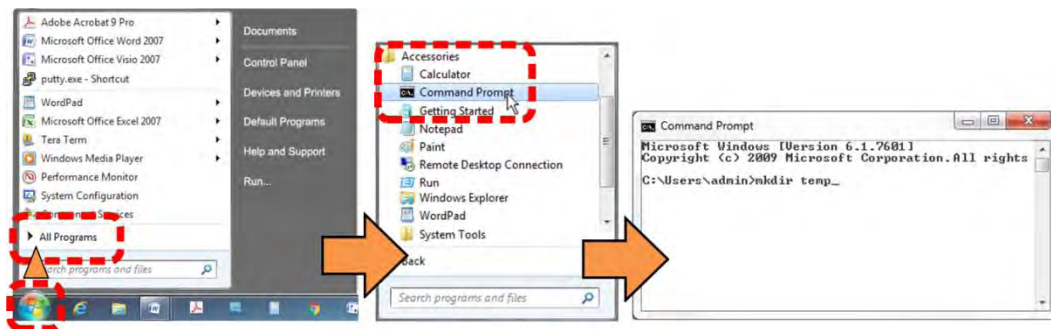
3. From the c:\> prompt, type either "mkdir temp" or "md temp" (both "mkdir" and "md" mean "make directory"), and then press **Enter**.

There will now be a "temp" folder created and available for placement of the firmware file download.

6.3 Download and Extract the Firmware Update Files

Do these steps:

1. Go online to www.comtechefdata.com.
2. On the Main page – Under **Support Information** or the **Support** tab, select the **Software Downloads** hyperlink.
3. On the **Software Downloads** page – Click **Download Flash and Software Update Files**.
4. On the **Flash Updates Index** page – Select the (**Select a Product Line**) **Transceivers** hyperlink.
5. On the **Transceivers** product page – Select the **CSAT** product hyperlink;
6. Select the appropriate firmware archive EXE or ZIP file download hyperlink.
7. Once you select the EXE or ZIP hyperlink, the **File Download** dialogue opens on your browser and prompts an action. You may otherwise click **[Cancel]** to quit the file download process. Note the following:
   - For EXE files:
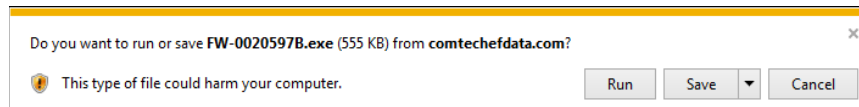
   - o Click **[Run]** to open the self-extractor dialogue window. Use **[…]** (Browse) to select your destination folder. Click **[Extract]** to extract the files. Your results display as per this example – click**[OK]** to close. Your files are now available for transfer to the CSAT.

   - o Click **[Save]** to download the EXE file to your Downloads folder. Once the download is complete the dialogue prompts you to either **[Run]** the self-extracting file, or to open or view the Windows Downloads folder for further action.
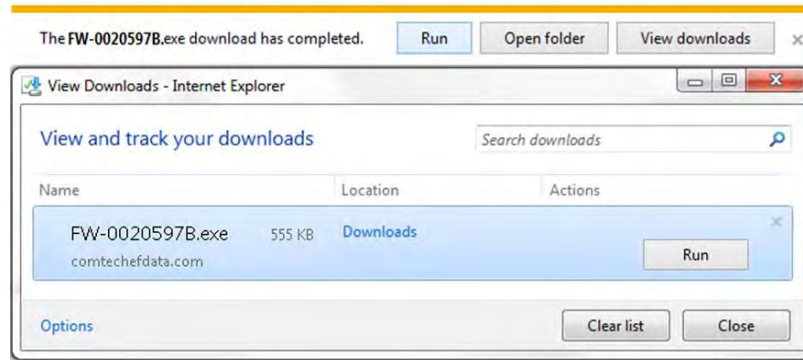
- For ZIP files:

- Click **[Open]** to open the archive file. Use the WinZip features to select the files for extraction to your destination folder.
- Click **[Save]** to download the ZIP file to your Windows Downloads folder. Once the download is complete the dialogue prompts you to either **[Open]** the archive file, or to open or view the Windows Downloads folder for further action.

8. If not already done with **File Download > Open**, you must extract, at a minimum, these files (filenames are subject to change):
    - For ETHERNET-BASED UNITS (FW-0020597):
        - FW-0000597X_CSAT_Ethernet_#_#_#.bin (the Firmware Bulk Image file)
        - CSAT_Ethernet-ReleaseNotes_v#_#_#.pdf (the Firmware Release Notes PDF file)
    - FOR SERIAL-BASED UNITS (F1516):
        - F1516-1V_CSAT_X_XX.CCC (the Firmware Bulk Image file)
        - FLSHCSAT.EXE (the Firmware Update utility app)
        - CCCflash.hlp (the Firmware Update help files)
        - ReleaseNotes_CSAT_X_XX.pdf (the Firmware Release Notes PDF file)

    WHERE: 'X' is the firmware revision letter, and '#_#_#' is the firmware version (e.g., FW Ver. 1.2.1 = "1_2_1")

9. Confirm availability of the firmware files in the temporary folder. There are several ways you can view the contents of the temporary folder on a Windows-based PC:

- To use the Windows Desktop, see Section 6.3.1.1.
- To use Windows Command-line or Command Prompt, see Section 6.3.1.2.

After you confirm the firmware files are in the folder, proceed to Section 6.4 to upload the firmware update to the CSAT.

6.3.1.1   Use Windows Desktop to View Folder Contents

From the Windows Desktop:
1. Double-left-click the Windows Explorer icon, and then double-left-click as needed to locate, and then open, the "temp" folder (directory) created earlier on the Windows Desktop.
2. Use the **Browse** window (**Start > ...Run > Browse**) to locate, and then double-click to open, the "temp" folder.

6.3.1.2   Use Windows Command-line to View Folder Contents

Using Command-line or Command Prompt:
1. Type "**cd c:\temp**" at the Windows Command-line prompt to change to the temporary folder (directory) created earlier using Command-line.
2. Type "**dir**" to list the files extracted to the temporary folder from the downloaded archive file.

6.4   Upload the Firmware Files and Update the CSAT Unit

6.4.1   Important Considerations

Before you proceed with the firmware update, make sure that:
- You connect the CSAT **'J8 | ETHERNET'** port and the CSAT **'J5 | COMM'** receptacle to the user PC using one of the methods described in Section 6.2.1.1.
- Your PC is running a terminal emulation program for operation of the CSAT Serial or Ethernet Telnet interfaces.
- FOR ETHERNET-BASED UNITS – you have noted your CSAT Management IP Address.

- Your PC is running a compatible Web browser for operation of the CSAT HTTP Interface.
- You download or otherwise have Comtech's latest firmware files available on the User PC in an accessible temporary folder.
- FOR SERIAL-ONLY UNITS – You download or otherwise have Comtech's "FLSHCSAT.EXE" or "CREFLASH.EXE" utility available on the User PC in an accessible temporary folder. **See Appendix E. FIRMWARE UPDATE IN NON-ETHERNET UNITS**.

6.4.2 Steps to FTP Upload the Firmware Files (Ethernet-based Firmware Update Procedure)

1) Typical for all steps: "xxx.xxx.xxx.xxx" represents the assigned unit Management IP Address.
2) Type all commands without quotes, and press Enter to execute.

1. To proceed, you should already have noted the Management IP Address for the CSAT as instructed in Section 6.2.3.
2. Use Windows Command-line to send a ping command. To ping the unit, type "ping xxx.xxx.xxx.xxx" at the Windows Command-line prompt. The response should confirm whether the unit is connected and communicating correctly with the User PC.
3. Use Windows Command-line to transfer the files from the User PC to the CSAT unit via FTP:
   a. Type "ftp xxx.xxx.xxx.xxx" to open the FTP session.
   b. Type "bin" to set the binary transfer mode.
   c. Type "prompt".
   d. Type "hash".
   e. To begin the file transfer, type "put FW-0000597X_CSAT_Ethernet_#_#_#.bin bulk:"

   The destination "bulk:" must be all lower-case.

   The process sequences through several blocks – this may take several minutes for the transfer to occur. Wait for the file transfer to end.

   In the event you receive the "Connection closed by remote host." message, wait another minute before continuing. The firmware update sometimes takes longer than the FTP client allows.

   f. Type "bye" to close the FTP session.

   g. Close the Command-line window.

4. Repeat Step 3 to FTP the F1516 firmware, except for 3e: Type "put F1516-1x.ccc csatbulk:"

  🛈 The destination "csatbulk:" must be all lower-case.

5. To verify that the PC-to-unit FTP file transfer was successful, find the current firmware information via the HTTP or Serial/Telnet interface (see Sections 6.3.1.1 or 6.3.1.2).

The Firmware Update process is now complete.

Notes:

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Chapter 7. STANDALONE (SINGLE-THREAD) OPERATION

7.1 Overview

This chapter provides an overview for configuration and operation of the CSAT products in standalone (single-thread) configurations. The information provided herein defines the meaning and use of all of the controllable parameters of the CSAT.

1) See Appendix C. OPTIONAL 1:1 REDUNDANT SYSTEM OPERATION for information about using the CSAT in 1:1 redundant configurations.
2) See the following chapters in this manual for further information on the subject matter addressed in this chapter:
   - **Chapter 3. SYSTEM CONNECTORS**
   - **Chapter 4. STANDALONE (SINGLE-THREAD) INSTALLATION**
   - **Chapter 8. ETHERNET INTERFACE OPERATION**
   - **Chapter 9. SERIAL INTERFACE OPERATION**
   - **Appendix A: MAINTENANCE AND TROUBLESHOOTING**

7.2 System Power

The CSAT does not contain a 'Power On/Off' switch. The CSAT is powered ON by connecting the 'J3 | POWER IN' connector to the appropriate prime power source. See **Sect. 2.1 Environmental and Physical Specifications** and **Sect. 4.3.3 Power**

and Ground Interfaces in this manual for the CSAT's available power source specifications.

> ⚠️ **WARNING!**
> **Never turn the unit ON without proper waveguide termination on the 50W and 100W/125W units' 'J7 RF OUT' port. Individuals can be exposed to dangerously high electromagnetic levels.**
>
> **Further, when directly connecting the CSAT to laboratory test equipment, a DC block should be used between the 'J2' or 'J7 | RF IN' port and RF test source. The reason for this is that the CSAT can be configured to supply an 11VDC, 400 mA LNA Current Source output on this port. The DC block will protect any test equipment connected directly to the 'J2/J7 RF IN' connector.**

7.3   Common CSAT Configuration and Operation Parameters

The CSAT provides an RF Downconverter Terminal, RF Upconverter Terminal, and RF High Power Amplifier (HPA) in a single weather-safe package. The information presented in this section is typical of all controllable parameters for the CSAT in standalone configurations. You may use the HTTP Ethernet (Web Server) Interface or Serial Remote Interface to execute operational changes.

7.3.1   Frequency

Both the TX and RX frequencies are user-configurable:
- The TX frequency can be selected to any frequency divisible by either 1.0 MHz or 2.5 MHz in the valid TX frequency range.
- The RX frequency can be selected to any frequency divisible by either 1.0 MHz or 2.5 MHz in the valid RX frequency range.

Ethernet HTTP Interface Pages: 'Config | TX' and 'Config | RX'

Serial Remote Command Examples: <0001/UFQ=6137.0{CR} (TX)
                                    <0001/DFQ=3720.0{CR} (RX)

7.3.2   Attenuation

Both the TX and RX attenuations are user-configurable:
- The RX attenuation can be selected between 00.00 dB and 25.00 dB in 0.25 dB increments.
- The TX attenuation can be selected between 00.00 dB and 25.00 dB in 0.25 dB increments.

Ethernet HTTP Interface Pages: 'Config | TX' and 'Config | RX'

Serial Remote Command Examples: <0001/UAT=11.50{CR} (TX)
                                    <0001/DAT=04.25{CR} (RX)

7.3.3   Mute Mode

The CSAT offers two operating modes with regards to frequency changes and unit muting:
1. **Muted after frequency change** – If the Mute Mode is set to '1' (MUT=1), the firmware will leave the IF or RF muted following a change to either the Downconverter Frequency or Upconverter Frequency respectively. The operator can then 'unmute' the unit using the commands in the next section.
2. **Unmuted after frequency change** – If the Mute Mode is set to '0' (MUT=0), the firmware will automatically 'unmute' the IF or RF following a change to the Downconverter Frequency or Upconverter Frequency respectively. This assumes that the unit was 'unmuted' prior to the frequency change and that there are no faults following the change.

Ethernet HTTP Interface Pages: 'Config | Unit'

Serial Remote Command Example: <0001/MUT=0{CR}
                                    The default setting for this mode is '1'.

7.3.4   Mute

The state of both the Transmitter (output) and the Receiver (input) are user controllable.

The transmitter output state (the **'J2'** or **'J7 | RF OUT'** port) will be ON *only* if these three requirements are met:
1. The transmitter hardware shall be fault free (i.e., no Synthesizer or IFLO faults);
2. The transmitter must be unmuted (i.e., UMU=0);
3. The transmitter Amplifier shall be ON (i.e., AMP=1).

The receiver input state (the **'J1 | IF IN'** port) will be ON *only* if these two requirements are met:
1. The receiver hardware must be fault free (i.e., no Synthesizer or IFLO faults);
2. The receiver shall be unmuted (i.e., DMU=0).

Ethernet HTTP Interface Pages: 'Config | TX' and 'Config | RX'

Serial Remote Command Examples: <0001/UMU=0{CR} (TX)
                                                     <0001/DMU=0{CR} (RX)

7.3.5   Tx Amplifier

The TX amplifier ON/OFF state is user controllable. Turning the TX amplifier OFF removes the 10VDC supply to the RF Power FETs. The TX Amplifier must be ON in order for the CSAT to transmit an RF signal.

Ethernet HTTP Interface Pages: 'Config | TX'

Serial Remote Command Example: <0001/AMP=1{CR}

7.3.6   Channel Slope Adjust Mode

Comtech EF Data's CSAT transceivers provide two operating modes for the Transmitter RF output and Receiver IF input channel slopes:
1. **Calibrated** – In Calibrated mode, the CSAT firmware uses a calibration 'lookup' table based on the selected frequency to determine the optimum channel slope setting.
2. **Manual** – In Manual mode, the customer adjusts the channel slope using the DSA and USA commands defined in the next section.

Ethernet HTTP Interface Pages: 'Config | TX' and 'Config | RX'

Serial Remote Command Examples: <0001/USM=1{CR} (TX)
                                    <0001/DSM=1{CR} (RX)

7.3.7   Channel Slope Adjust

Both the Tx RF output and the RX IF input channel slopes are user controllable:

- The transmit channel slope can be varied for approximately 2dB of positive slope. The parameter for controlling this is the 'Up Slope Adjust', which can be set from 0.0 to 1.0 in 0.1 steps.
- The receiver channel slope can be varied for approximately 2dB of positive slope. The parameter for controlling this is the 'Down Slope Adjust', which can be set from 0.0 to 1.0 in 0.1 steps.
- Typical for TX and RX, the default setting is 0.0 and is the value used when the channel flatness is tuned and tested in the factory. 1.0 corresponds to approximately 2dB of positive slope.

Ethernet HTTP Interface Pages: 'Config | TX' and 'Config | RX'

Serial Remote Command Examples: <0001/USA=0.8{CR} (TX)
                                    <0001/DSA=0.0{CR} (RX)

7.3.8   Reference Frequency Adjust

A manual, fine adjustment of the internal 10MHz reference frequency is provided as a user controllable parameter. This parameter can be set from 000 to 255, resulting in a change of approximately 6.5 kHz and 4.0 kHz at the Tx RF output and RX IF input ports, respectively.

Ethernet HTTP Interface Page: 'Config | Unit'

Serial Remote Command Example: <0001/REF=087{CR}
                                   The default setting is '087'.

7.3.9   External Reference Fault Logic

The CSAT allows you to select whether or not the summary fault relay is activated if the internal 10MHz reference loses lock with the external reference attached to the **'J4 | EXTERNAL REF IN'** port.

Ethernet HTTP Interface Page: 'Config | Unit'

Serial Remote Command Example: <0001/XRF=0{CR}
                                                              The default setting is '0'.

7.3.10   Cold Start Function

The CSAT provides an optional 'Cold Start' feature that will ensure that the internal 10MHz reference signal is at a stable temperature prior to allowing the RF and IF outputs to be turned ON. A fixed cold start interval of 15 minutes is used.
- If 'Cold Start' is ON when the CSAT is powered ON, the IF and RF outputs will remain muted for 15 minutes even if all the conditions defined in Sect. 7.3.3 are satisfied. At the end of the 15-minute interval, the RF and IF output will automatically be turned ON if the conditions of Sect. 7.3.3 are met.
- If a CSAT was powered ON with 'Cold Start ON', the operator can override this function by setting 'Cold Start OFF'.

Ethernet HTTP Interface Page: 'Config | Unit'

Serial Remote Command Example: <0001/CLD=1{CR}

7.3.11   Auto Fault Recovery

This parameter defines how the CSAT responds to momentary fault conditions.
- If 'Auto Fault Recovery' is OFF and a fault condition occurs, that causes either the RF or IF output to be muted, then that fault condition clears, the CSAT will remain muted. In this mode, operator intervention is necessary to return the CSAT to normal operating mode.
- If 'Auto Fault Recovery' is ON and the same situation occurs, the CSAT will automatically be unmuted and return to normal operating mode. To

protect against repetitive, momentary faults, if the CSAT experiences five occurrences of the same fault, the 'Auto Fault Recovery' parameter will automatically be set to OFF.

Example: If the Upconverter IFLO synthesizer goes unlocked and starts sweeping while Auto Fault Recovery is *ON*, the CSAT would see an unlocked / locked condition at the sweep rate of the IFLO synthesizer. After the 5th occurrence, the firmware will set Auto Fault Recovery to *OFF* and keep the CSAT RF output muted.

Ethernet HTTP Interface Page: 'Config | Unit'

Serial Remote Command Example: <0001/AFR=1{CR}

7.3.12   LNA Current Source

WARNING!
Never turn the unit ON without proper waveguide termination on the 50W and 100W/125W units' 'J7 RF OUT' port. Individuals can be exposed to dangerously high electromagnetic levels.

Further, when directly connecting the CSAT to laboratory test equipment, a DC block should be used between the 'J2' or 'J7 | RF IN' port and RF test source. The reason for this is that the CSAT can be configured to supply an 11VDC, 400 mA LNA Current Source output on this port. The DC block will protect any test equipment connected directly to the 'J2/J7 RF IN' connector.

The CSAT-5060 has the circuitry necessary to source current, at 11 VDC up to 400 mA, up the 'J2' or 'J7 | RF IN' port in order to power a Low Noise Amplifier (LNA). You may turn this current source ON or OFF.

Ethernet HTTP Interface Page: 'Config | LNA'

Serial Remote Command Example: <0001/LCS=1{CR}

When LCS=2, the summary fault relay will be deactivated (LFL=0).

7.3.13   LNA Current Calibration and Current Window

The CSAT-5060 provides the capability to monitor the LNA current when configured to supply current to a C-Band LNA. Additionally, an adjustable window detect for the LNA current is provided.

After installing the LNA (see Sect. 5.4 in this manual) and turning on the current source, you can 'Calibrate' the current and set a window from ±20% to ±50% to trigger an alarm. You can disable the 'window detect' feature by setting the window value to ±99%. The default setting is '99'.

Ethernet HTTP Interface Page: 'Config | LNA'

Serial Remote Command Examples: <0001/CAL={CR}
                                                          (This command takes no arguments.)
                                                          <0001/LCW=40{CR}

7.3.14   Set Physical Address

This is the Physical (Remote) Address to which the CSAT responds. This address can be set to any value between 0001 and 9999. The default setting is '0001'.

Ethernet HTTP Interface Page: 'Config | Unit'

Serial Remote Command Example: <0001/SPA=0001{CR}

7.3.15   Set Baud Rate

The Baud Rate of the 'J5 | COMM' communications port can be set to any of the following values: 1200, 2400, 4800, 9600, 19200, or 38400. The default setting is '9600'.

Ethernet HTTP Interface Page: 'Config | Unit'

Serial Remote Command Example: <0001/SBR=9600{CR}

7.3.16   Set Date / Time

The CSAT contains a battery-powered Real Time Clock (RTC) used to provide date and time stamping of events, alarms and faults. You may set both the date and time.

Ethernet HTTP Interface Page: 'Config | Utility'

To set the date:
Serial Remote Command Example: <0001/DAY=042916{CR}
                                     (Sets date to April 29, 2016)

To set the time:
Serial Remote Command Example: <0001/TIM=231259{CR}
                                     (Sets time to = 21:12:59, or 9:12:59 PM)

Notes:

Chapter 8. ETHERNET INTERFACE OPERATION

8.1 Overview

Operation of the CSAT Ethernet Interface is available when you connect a user-supplied, Windows-based PC to the RJ-45 '**J8 | ETHERNET**' communications port on the CSAT using the appropriate adapter cable.

Three protocols are available to use for Ethernet remote M&C. Operate these protocols separately.

- Simple Network Management Protocol (SNMP). This requires a user-supplied Network Monitoring System (NMS) and a user-supplied Management Information Base (MIB) File Browser.

> **CAUTION**
> Comtech EF Data recommends use of the Ethernet-based SNMP interface for advanced users only. All other users are strongly encouraged to use the CSAT HTTP Interface for remote Monitor and Control (M&C) of the CSAT.

- Telnet Interface. You may use the serial remote control protocol via this interface. This requires use of Windows Command-line, or a user-supplied terminal emulation program such as HyperTerminal.
- HTTP (Web Server) Interface. This requires a compatible user-supplied web browser such as Internet Explorer.

8.1.1 Prerequisites

Before you proceed with Ethernet remote product management, make sure the following is true:

- The CSAT is operating with the latest version firmware files.

- The User PC is running a terminal emulation program for operation of the CSAT Telnet Interface.
- The User PC is running a compatible web browser for operation of the CSAT HTTP Interface.
- The User PC is connected to the CSAT RJ-45 '**J8 | ETHERNET'** port. You may connect the User PC Ethernet port to the CSAT with the available CA-0000352 Ethernet Interface Cable (part of CEFD Kit KT-0000203).
- You have recorded the CSAT's Management IP Address.

8.2   SNMP Interface

SNMP is an Internet-standard protocol for managing devices over IP networks. An SNMP-managed network has three key components:
- The managed device. This includes the CSAT.
- The SNMP Agent. This software runs on the CSAT. The CSAT SNMP Agent supports both SNMPv1 and SNMPv2c.
- The user-supplied Network Management System (NMS). This software runs on the User PC.

8.2.1 Management Information Base (MIB) Files

An MIB file is used for SNMP remote management of a unique device, and consist of a tree of nodes called Object Identifiers (OIDs). Each OID provides remote management of a particular function. These MIB files should be compiled in a user-supplied MIB Browser or SNMP Network Monitoring System server.

In these CSAT MIB file names, the letter x represents the revision of the file.

8.2.1.1   ComtechEFData Root MIB file

- FW-0020546x.mib
- ComtechEFData MIB file gives the root tree for all Comtech EF Data CSAT products and consists of only the following OID:
    - Name: comtechEFData
    - Type: MODULE-IDENTITY
    - OID: 1.3.6.1.4.1.6247
    - Full path: iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).comtechEFData(6247) Module: ComtechEFData

8.2.1.2   CSAT MIB file

- FW-0020599x.mib
- MIB file consists of all of the OID's for management of the CSAT functions

8.2.1.3   CSAT Traps MIB file

- FW-0020600x.mib
- Trap MIB file provides SNMPv1 traps common for the CSAT.

8.2.2 SNMP Community Strings

CAUTION
In SNMP v1/v2c, the SNMP Community String is sent unencrypted in the SNMP packets. Caution must be taken by the network administrator to ensure that SNMP packets travel only over a secure and private network if security is a concern.

The CSAT uses Community Strings as a password scheme that provides authentication before gaining access to the router agent's MIBs. They are used to authenticate users and determine access privileges to the SNMP agent. The CSAT defines three Community Strings for SNMP access:

- Read Community   default = public
- Write Community   default = private
- Trap Community   default = comtech

Type the SNMP Community String into the user-supplied MIB Browser or Network Node Management software.

For correct SNMP operation, the CSAT MIB files must be used with the associated version of the CSAT M&C. See the CSAT FW Release Notes for information on the required FW/SW compatibility.

8.2.3 SNMP Traps

The CSAT SNMP agent supports both SNMPv1 and v2c. The CSAT Traps file needs to be compiled only if SNMPv1 traps are to be used.

The CSAT has the ability to send out SNMP traps both when a fault occurs and when a fault clears in the unit. You may configure which style of traps the CSAT sends by using the CSATSNMPTrapVersion OID.

The CSAT supports the following MIB2 SNMPv1 traps and v2 notifications:

MIB2 SNMPv1 trap: Authentication Failure	5
MIB2 SNMPv2 notifications: Authentication Failure	1.3.6.1.6.3.1.1.5.5

The CSAT supports the following Faults SNMPv1 traps and v2 notifications:

Faults SNMPv1 traps:	
csatEthernet24VPowerSupplyEventV1	62477401
csatEthernet20VPowerSupplyEventV1	62477402
csatEthernet12VPowerSupplyEventV1	62477403
csatEthernet10VPowerSupplyEventV1	62477404
csatEthernet5VPowerSupplyEventV1	62477405
csatEthernetN5VPowerSupplyEventV1	62477406
csatEthernetTxSynthesizerEventV1	62477407
csatEthernetTxIFLOEventV1	62477408
csatEthernetRxSynthesizerEventV1	62477409
csatEthernetRxIFLOEventV1	62477410
csatEthernetReferenceEventV1	62477411
csatEthernetLNACurrentEventV1	62477412
csatEthernetFanCurrentEventV1	62477413
csatEthernetTemperatureEventV1	62477414
csatEthernetShutdownEventV1	62477415
csatEthernetIICEventV1	62477416
csatEthernetEEPROMChecksumEventV1	62477417
csatEthernetLowBatteryEventV1	62477418
csatEthernetRedundantSwitchEventV1	62477419
csatEthernetSummaryFaultV1	62477420
Faults SNMPv2 notifications:	
csatEthernet24VPowerSupplyEvent	1.3.6.1.4.1.6247.74.2.1.1
csatEthernet20VPowerSupplyEvent	1.3.6.1.4.1.6247.74.2.1.2
csatEthernet12VPowerSupplyEvent	1.3.6.1.4.1.6247.74.2.1.3
csatEthernet10VPowerSupplyEvent	1.3.6.1.4.1.6247.74.2.1.4
csatEthernet5VPowerSupplyEvent	1.3.6.1.4.1.6247.74.2.1.5
csatEthernetN5VPowerSupplyEvent	1.3.6.1.4.1.6247.74.2.1.6
csatEthernetTxSynthesizerEvent	1.3.6.1.4.1.6247.74.2.1.7

csatEthernetTxIFLOEvent	1.3.6.1.4.1.6247.74.2.1.8
csatEthernetRxSynthesizerEvent	1.3.6.1.4.1.6247.74.2.1.9
csatEthernetRxIFLOEvent	1.3.6.1.4.1.6247.74.2.1.10
csatEthernetReferenceEvent	1.3.6.1.4.1.6247.74.2.1.11
csatEthernetLNACurrentEvent	1.3.6.1.4.1.6247.74.2.1.12
csatEthernetFanCurrentEvent	1.3.6.1.4.1.6247.74.2.1.13
csatEthernetTemperatureEvent	1.3.6.1.4.1.6247.74.2.1.14
csatEthernetShutdownEvent	1.3.6.1.4.1.6247.74.2.1.15
csatEthernetIICEvent	1.3.6.1.4.1.6247.74.2.1.16
csatEthernetEEPROMEvent	1.3.6.1.4.1.6247.74.2.1.17
csatEthernetLowBatteryEvent	1.3.6.1.4.1.6247.74.2.1.18
csatEthernetRedundantSwitchEvent	1.3.6.1.4.1.6247.74.2.1.19
csatEthernetSummaryFaultEvent	1.3.6.1.4.1.6247.74.2.1.20

8.3   Telnet Interface

Chapter 9. SERIAL INTERFACE OPERATION
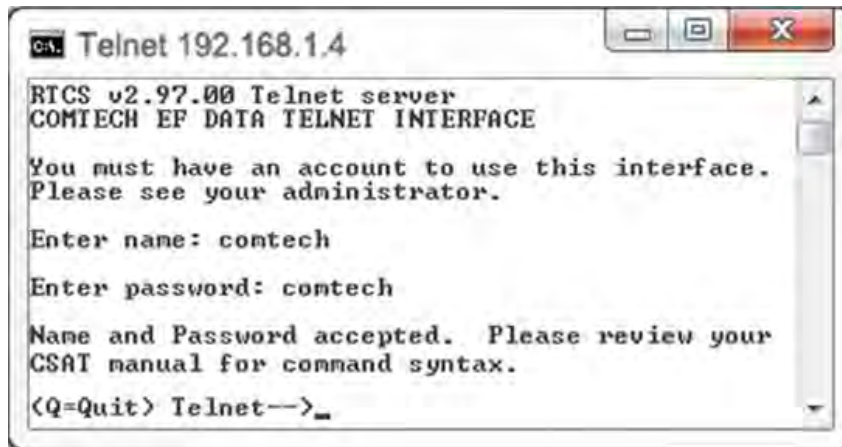
Figure 8-1. Telnet Interface Example – Windows Command-line

Telnet is implemented in the Ethernet M&C in a "Telnet wrapper." When the user 'Telnets' to the CSAT, it emulates a local EIA-232 or EIA-485 serial connection. You can then type the same command or query syntax that you would use from a serial remote terminal and the Ethernet M&C "unwraps" the

Telnet packet and sends it on to the CSAT system, which responds to it as if it was a serial remote command.

The Telnet interface requires user login at the **Administrator** level and **Read/Write** level. Once logged into the Telnet interface as the Administrator, you have access to the Serial Interface Remote Control operations. An example of the login process is shown in **Figure 8-1**.

8.3.1 Using HyperTerminal for Telnet Remote Control Operation
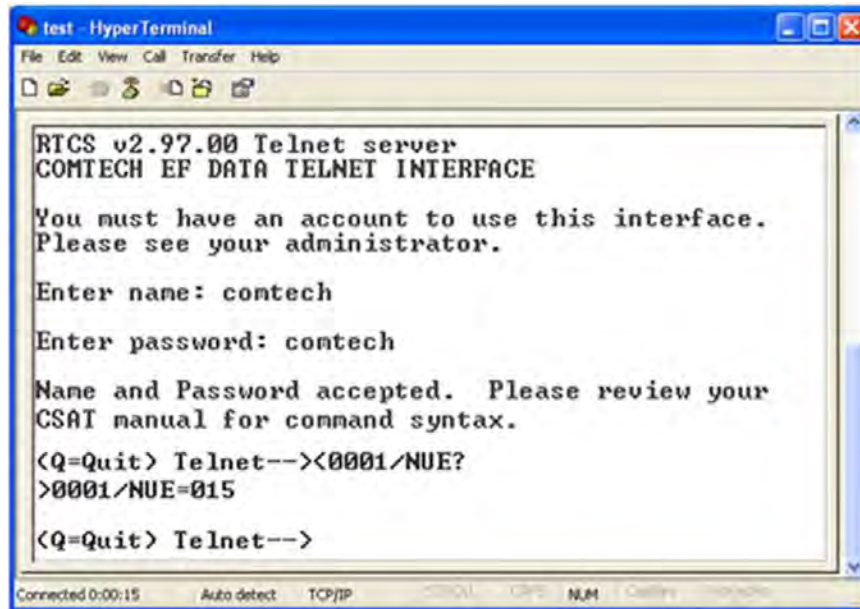
Figure 8-2. Telnet Interface Example – HyperTerminal

There is a disadvantage when using Windows Command line as a Telnet client with the Remote Control protocol. For the messages coming from the Telnet Server, Command line cannot translate a carriage return command (\r) to a carriage return + line feed command (\r\n). Therefore, any multi-line Target-to-Controller response (e.g., the response to the FRW? query) shows as one line, with the latter lines overwriting the previous lines.

To see the full response messages, you can use the HyperTerminal terminal emulation program configured as a Telnet client. An example of the login process and remote control operation, when using HyperTerminal as the interface, is shown in **Figure 8-2**.

8.3.1.1   Configure HyperTerminal for Telnet Remote Control Operation
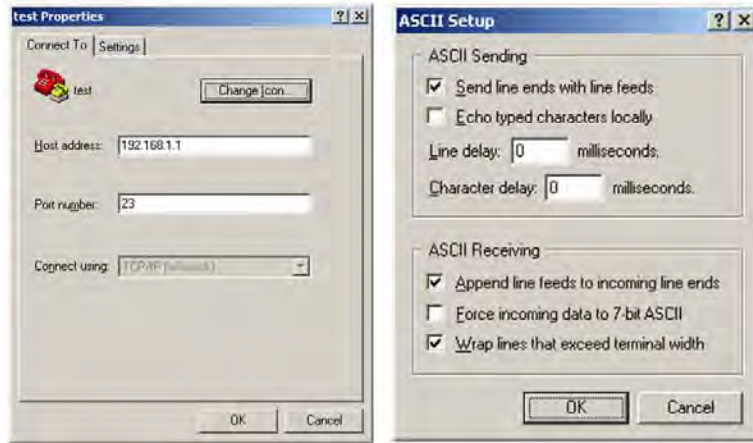
Figure 8-3. Configure HyperTerminal

See **Figure 8-3**. Do these steps:

1. Make sure to define the Connect To Telnet connection properties correctly (File → Properties) (**Figure 8-3**, left):
    a. Enter the CSAT's Traffic/Management IP Address as the "Host address" (e.g., 192.168.1.1).
    b. Enter TCP Port 23 as the "Port number".
    c. Set "Connect using" to TCP/IP (Winsock) instead of COM1 or COM2.
    d. Click [OK] to save your settings.
2. For ASCII Setup (File → Properties → Settings → ASCII Setup) (**Figure 8-3**, right):
    a. Check the "Send line ends with line feeds" option in the 'ASCII Sending' section.
    b. Check the "Append line feeds to incoming line ends" option in the 'ASCII Receiving' section.
    c. Click [OK] to save your settings.

8.4   HTTP (Web Server) Interface

A user-supplied web browser allows the full M&C of the CSAT through its HTTP Interface. This embedded web application is designed for use with Microsoft's Internet Explorer Version 5.5 or higher. It is a non-secure web application.

8.4.1 Enable the HTTP Interface
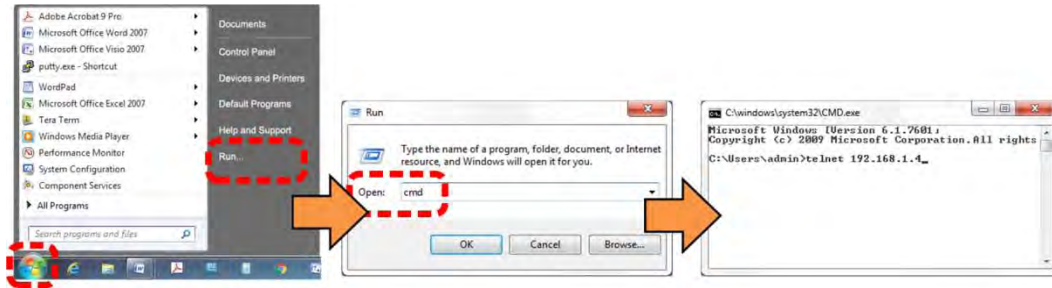
Figure 8-4. Open Windows Command-line

Follow these steps to enable the HTTP Interface in the CSAT using only a 10/100BaseTx remote interface (this assumes that you are running a Microsoft Windows OS):

See **Figure 8-4** and do these steps:
1. Select **Start**, then **Run**, then type "**cmd**" to open the Windows Command-line window.
2. Type "**Telnet 192.68.1.4**" to start a Telnet session with the unit using the default Management IP address.

See **Figure 8-5** and do these steps:
3. Enter the Telnet username and password (the default for both parameters is **comtech**):
4. The LRS remote command sets or returns Local or Remote state in the form x, where x=0, 1, 2, or 3:
    - LRS=0 (Local)
    - LRS=1 (Serial)
    - LRS=2 (Ethernet)
    - LRS=3 (Serial+Ethernet) (default value)

    Use the **LRS=2** remote command to set the remote access parameter for Ethernet remote control.

Figure 8-5. Telnet Login and Remote Command Execution

You must assign a unique IP Address for each unit on the network before connecting to an existing network. As the IP address may need to be changed to something other than the factory default setting, use the remote command **IPA=xxx.xxx.xxx.xxx.yy**, where: **xxx.xxx.xxx.xxx** is a valid IP address on the network where the unit is to be installed, and **yy** is the range (typically, **yy** = 24).

Changing the **IPA** value requires that you cycle power on the unit, and then start a new Telnet session using the new IP address.

See Chapter 9. SERIAL INTERFACE OPERATION for more information about the **LRS** and **IPA** commands.

8.4.2 HTTP Interface User Login

Do these steps:

1. From the PC, enter the default Management IP Address for the CSAT (i.e., **http://192.168.1.4**) into the **Address** area of the browser.

2. In the Login window, type the **User name** and **Password**, and then click **OK**. The default User Name and Password are both **comtech**.

Once the valid User Name and Password is accepted, the CSAT HTTP Interface splash page shows (Figure 8-6). The unit and firmware version in this example will differ from your setup.
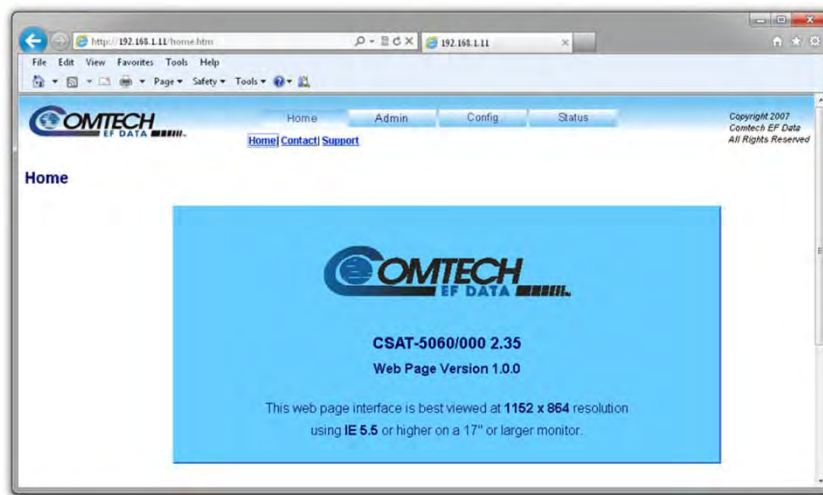
Figure 8-6. CSAT HTTP Interface "Splash" Page Example

8.4.3 HTTP Interface Features

8.4.3.1   Menu Tree

Home	Admin	Config	Status
Home	Access	Unit	Monitor
Contact	SNMP	Tx	Alarms
Support		Rx	Switch
		Utility	
		Redundancy	
		LNA	

Figure 8-7. CSAT HTTP Interface Menu Tree

Figure 8-7 shows the menus and pages in the CSAT HTTP Interface. This interface has four top level navigation tabs, shown in blue. Each top level tab has page hyperlinks (grey). These hyperlinks open individual nested Web pages.

8.4.3.2   Page Navigation

The HTTP Interface has four navigation tabs at the top of each page. Click a navigation tab to see its page hyperlinks. Click a page hyperlink to open a page.

This manual uses a convention for all web pages to show you how to navigate to the featured page: Navigation Tab | Page Hyperlink. For example, "Home | Home" instructs you to click the 'Home' navigation tab, and then click the 'Home' page hyperlink.

8.4.3.3   Page Sections

This manual explains the purpose and operation for each Web page and its sections.

Each page has one or more sections. The title at the upper-left corner of each page or section describes its operational features. Each section can have editable

fields, action buttons and read-only displays for a specific function.

8.4.3.4   Action Buttons

Action buttons are important in the CSAT HTTP Interface. Click an action button to do one of these tasks:

- Click **[Refresh]** to see the latest page data.
- Reset changed parameters to remove **unsaved** changes.
- **Submit** (save) changes.

> If you change any parameters, make sure to click the related action button before you leave the page. If you go to another page without first clicking the action button, your changes are not saved.

8.4.3.5   Drop-down Lists

A drop-down list lets you choose from a list of selections. Left-click the drop-down button to open the list. Then, left-click on an item to select that choice.
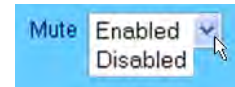
8.4.3.6   Text or Data Entry

Text boxes let you type data into a field. An action button can be associated with a single text box, or a group of text boxes. For any text box, left-click anywhere inside the box and type the desired data into that field. Make sure to press **ENTER** when done typing.
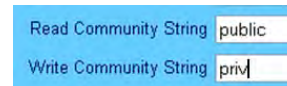
Click the related action button to save the data.

8.5 HTTP Interface Page Examples and Descriptions

See Chapter 9. SERIAL INTERFACE OPERATION for detailed operating information for the configuration and monitoring features available throughout this interface.

The page figures provided in this section are intended for reference only. Your setup will differ.

8.5.1 Home Pages

Click the **Home** tab, and then select the **Home**, **Contact**, or **Support** hyperlink to continue.

8.5.1.1 Home | Home

Use this page to identify the product. Click the **Home** navigation tab or the page hyperlink to return to this page from anywhere in the HTTP Interface.
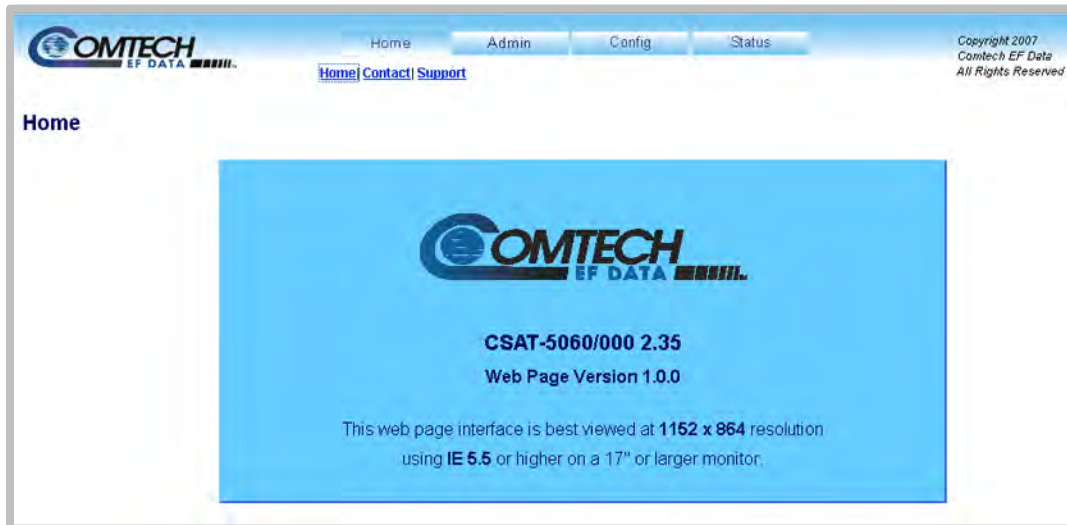
Figure 8-8. CSAT 'Home | Home' Page (PS .5 Unit Example Shown)

8.5.1.2   Home | Contact

For all product support, please call:

+1.240.243.1880

+1.866.472.3963 (toll free USA)

Figure 8-9. 'Home | Contact' Page

8.5.1.3   Home | Support

For this page to operate correctly, the CSAT administrator must identify the SMTP server, domain name, and destination on the 'Admin | SNMP' page (Sect. 8.5.2.2).

Figure 8-10. 'Home | Support' Page

Use this page to compose an e-mail message for questions or problems with the CSAT.

The **Problem Report** area of the display allows up to 256 characters maximum.

The 'Home | Support' page uses Simple Mail Transport Protocol (SMTP) to send E-mail to Comtech EF Data Product Support: cdmipsupport@comtechefdata.com

Once you enter the **Contact Information** and compose a message in the **Problem Report** text window, click [**Submit E-mail**] to send the message.

8.5.2 Admin (Administration) Pages

These pages are available only to users who have logged in using the Administrator Name and Password.

Use these administrator pages to set up user access. Click the **Admin** tab, and then select the **Access** or **SNMP** hyperlink to continue.

8.5.2.1   Admin | Access

Click **[Refresh]** to see the latest page data.

Figure 8-11. 'Admin | Access' Page

Network Maintenance

- **IP Gateway**, **IP Address/Range** – Enter the desired IP Gateway Address and IP Address/Range in these text boxes.
- **MAC Address** (read-only) – The MAC is set at the factory to a guaranteed unique address that you cannot modify.

Click **[Reset]** to restore the previously saved settings.

Click **[Change IP Address]** to save any changes.

System Account Access Information

Name fields can be any alphanumeric combination with a maximum length of 10 characters.

Password fields can be any alphanumeric combination with a maximum length of 10 characters.

- **Admin**, **Read/Write**, **and Read Only Names and Passwords** – The factory defaults for these names/passwords are:
  - **Admin**   comtech/comtech
  - **Read/Write**   opcenter/1234
  - **Read Only**   monitor/1234
- **SMTP Server:** Enter the mail server IP address from where you want to send the e-mail.
- **SMTP Domain Name / Destination:** The Administrator can assign the SMTP Domain Name and Destination. This is required if you wish to use the e-mail feature of the 'Home | Support' Page (Sect. 8.5.1.3).
  - For **SMTP Domain Name**, enter the domain of the e-mail server (usually found to the right of the @ symbol in an e-mail address).
  - For **SMTP Domain Destination**, enter the e-mail recipient name (usually found to the left of the @ symbol in an e-mail address).

Click **[Reset]** to restore the previously saved settings.

Click **[Submit Access]** to save any changes.

Webpage Timeout

The Webpage Timeout sets the time period that can pass before the HTTP Interface pages time out.
- Use the drop-down list to select **5 minutes** (default) or **8 hours**.
- Click **Submit**.

The **Status | Status** page automatically refreshes once every ten seconds, and resets the timeout counter.

8.5.2.2   Admin | SNMP

Figure 8-12. 'Admin | SNMP' Page

At any time, click **[Refresh]** to update this page and see the most recent data.

SNMP

- **Simple Network Management** – Use the drop-down list to select Enabled or Disabled.
- The **Read Community String** and **Write Community String** fields can be any combination of characters and a length of 0 to 20 characters.
    o **Read Community String** factory default is "public".
    o **Write Community String** factory default is "private".
- **SNMP Contact** – Enter the contact data.
- **SNMP Name** – Enter the name.
- **SNMP Location** – Enter the location.
- **Enable Authentication Trap** – Use the drop-down list to select **Enabled** or **Disabled**.
- The Administrator can assign up to two **SNMP Trap IP Addresses**.
- **Trap Version** – Use the drop-down list to select the version.
- The **Trap Community String** field can be any combination of characters and a length of 0 to 20 characters. The factory default for the SNMP Trap Community String is "comtech".

Click **[Reset]** to restore the previously saved settings.

Click **[Submit SNMP]** to save any changes.

SNTP

- **SNTP** – Use the drop-down list to set the Simple Network Time Protocol as **Enabled** or **Disabled**.
- **Server Address** – The Administrator assigns the SNTP server address in the form **000.000.000.000**.

Click **[Submit]** to save these SNTP settings.

8.5.3 Config (Configuration) Pages

Use the **Config** pages to configure all operating parameters for the CSAT. Click
the **Config** tab, and then select the **Unit**, **Tx**, **Rx**, **Utility**, **Redundancy**, or **LNA**
hyperlink to continue.

8.5.3.1   Config | Unit

Figure 8-13. 'Config | Unit' Page

At any time, click **[Refresh]** to update this page and see the most recent data.

Mute Mode

Use the drop-down list to choose **Unmuted after Frequency Change** or **Muted
after Frequency Change**.

Click **[Change]** to save the setting.

Cold Start

Use the drop-down list to choose **Disabled** or **Enabled**.

Click **[Change]** to save the setting.

Fault Recovery

Use the drop-down list to choose **Automatic** or **Manual.**

Click **[Change]** to save the setting.

External Reference Fault Logic

Use the drop-down list to choose **Not Monitored** or **Monitored** for software monitoring of the external reference source. If **Monitored** is selected and there is no source, a fault is reported.

Click **[Change]** to save the setting.

Reference Adjust

Enter a numeric value from **0** to **255** to set the reference oscillator tuning voltage. The default voltage value is 87.

Click **[Change]** to save the setting.

Serial

Remote Address – Enter a physical remote address from **0001** to **9999**.

Baud Rate – Use the drop-down list to set the operating baud rate as 1200, 2400, 4800, 9600 , 19200, or 38400 bps.

Click **[Change Serial Configuration]** to save these settings.

8.5.3.2   Config | Tx

Use this page to configure the Transmit (Tx) operational settings for the unit.

Figure 8-14. 'Config | Tx' Page

At any time, click **[Refresh]** to update this page and see the most recent data.

Tx Attenuation

Enter a numeric value from 00.00 to 25.00 to set the transmit attenuation in dB.
The default value is 10.00.

Click **[Change]** to save the setting.

Mute

Use the drop-down list to select Disabled or Enabled for the transmitter mute.

Click **[Change]** to save the setting.

Slope Mode

Use the drop-down list to select Manual or Calibrated.

Click **[Change]** to save the setting.

Slope Adjust

Enter a numeric value from 0.0 to 1.0 to set the slope adjust.

Click **[Change]** to save the setting.

Frequency (MHz)

Enter a numeric value from 5845.0 to 6425.0 for a standard unit to set the transmit frequency in MHz. The default value is 5845.0 MHz.

Click **[Change]** to save the setting.

Amplifier

Use the drop-down list to select Off or On for the transmit amplifier.

Click **[Change]** to save the setting.

8.5.3.3   Config | Rx

Use this page to configure the Receive (Rx) operational settings for the unit.
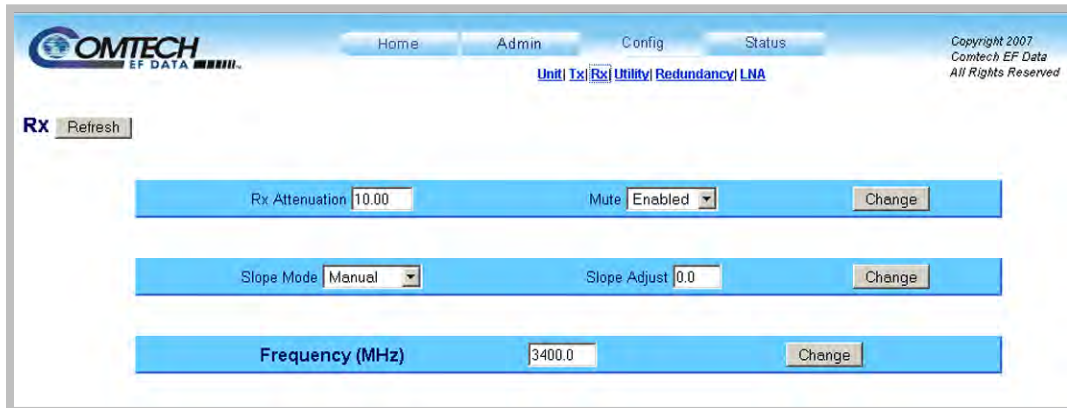
Figure 8-15. 'Config | Rx' Page

At any time, click **[Refresh]** to update this page and see the most recent data.

Rx Attenuation

Enter a numeric value from **00.00 to 20.00** to set the receive attenuation in dB. The default value is 10.00.

Click **[Change]** to save the setting.

Mute

Use the drop-down list to select **Disabled** or **Enabled** for the receiver mute.

Click **[Change]** to save the setting.

Slope Mode

Use the drop-down list to select **Manual** or **Calibrated.**

Click **[Change]** to save the setting.

Slope Adjust

Enter a numeric value from **0.0 to 1.0** to set the slope adjust.

Click **[Change]** to save the setting.

Frequency (MHz)

Enter a numeric value from **3625.0 to 4200.0 for a standard unit** to set the receive frequency in MHz. The default value is 3400.0 MHz. Click **[Change]** to save the setting.

8.5.3.4   Config | Utility

Use this page to configure Utility operating parameters for the unit.

Figure 8-16. 'Config | Utility' Page

At any time, click **[Refresh]** to update this page and see the most recent data.

Date and Time

Enter the **Date** and/or the **Time**:

Field	Format	Minimum Value	Maximum Value
Date (MM/DD/YY)	Month	01	12
	Day	01	31
	Year	00	99
Time (HH:MM:SS)	Hours	00	23
	Minutes	00	59
	Seconds	00	59

Click **[Change Date/Time]** to save the settings.

Circuit ID

Enter a Circuit ID (unit label) of up to 24 characters.

Click **[Change CID]** to save the string.

Current SC/13320 Active Firmware Image # *(read-only)*

This example identifies **Image 2** as the Current Active Firmware Image.

Next Reboot Image – Use the drop-down list to select the Next Reboot Image as **1** or **2.**

Click **[Submit]** to save the setting.

SC/13320 Board Firmware Version *(read-only)*

This *read-only* section identifies the current Boot, Bulk1, and Bulk2 firmware loads.

Part Number

This section displays the unit part number assigned at the factory.

8.5.3.5   Config | Redundancy Page

Use this page to configure the unit for redundant operations.

Figure 8-17. 'Config | Redundancy' Page

At any time, click **[Refresh]** to update this page and see the most recent data.

Redundancy Mode (Online Unit Only)

Use the drop-down list to select **Manual** or **Auto**.

Click **[Change]** to save the setting.

Tx Gain Offset

Enter a numeric value from -**0.00** to **-4.00** to set the transmit gain offset in dB. Changes are permitted in 0.25 dB increments.

Click **[Change]** to save the setting.

Rx Gain Offset

Enter a numeric value from -**0.00** to **-4.00** to set the receive gain offset in dB. Changes are permitted in 0.25 dB increments.

Click **[Change]** to save the setting.

Force Redundancy Switch

Click **[Send the Command]** on the Online unit to change its status from Online to Offline.

8.5.3.6   Config | LNA Page

Use this page to configure the Low Noise Amplifier (LNA) current alarm settings.

Figure 8-18. 'Config | LNA' Page

At any time, click **[Refresh]** to update this page and see the most recent data.

LNA Current Source

Use the drop-down list to select the LNA Current Source as **Enabled**, **Disabled,** or **Offline LNA Disabled**.

Click **[Change]** to save the setting.

Current Window

Enter a percentage value from **20** to **50** in increments of 1 percent. If the monitored LNA Current exceeds this value, an alarm occurs. If you set the value to 99, the LNA Current alarm monitoring is *disabled*.

Click **[Change]** to save the setting.

LNA Fault Logic

Use the drop-down list to select **No Summary Fault** or **Summary Fault**.

Click **[Change]** to save the setting.

Calibrate

Click **Send the Command** to set the calibration point for the LNA Current alarm.

8.5.4 Status Pages

Use the **Status** pages for updates on the operational status, logged alarms and redundancy switch status for the unit.

Click the **Status** tab, and then select the **Monitor**, **Alarms, or Switch** hyperlink to continue.

8.5.4.1   Status | Monitor

Use this page to monitor the operating status of the unit.

Figure 8-19. 'Status | Monitor' Page

At any time, click **[Refresh]** to update this page and see the most recent data.

8.5.4.2 Status | Alarms

Use this page to view and manage logged alarms.
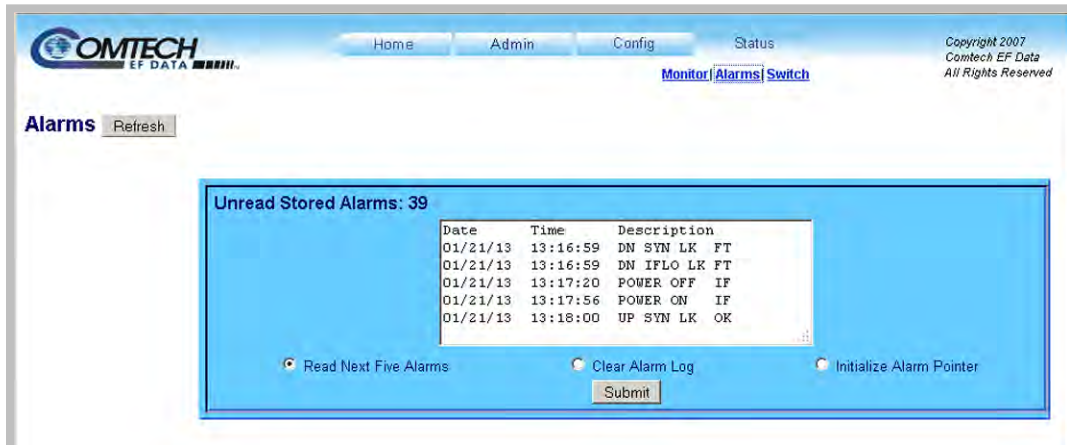
Figure 8-20. 'Status | Alarms' Page

At any time, click **[Refresh]** to update this page and see the most recent data.

Unread Stored Alarms:

This *read-only s*crollable display lists unread stored alarms in sequential, date-stamped format.

The unit returns and displays the five oldest stored alarms in the log. All alarms that are read from the log are also automatically removed from the log. The running tally of unread stored alarms (##) decrements accordingly to 00 once the log is cleared.

To manage the Unread Stored Alarms:
- Click the **Read Next Five Alarms** radio button, and then click **[Submit]** to display the next five unread alarms in the log.
- Click the **Clear Alarms Log** radio button, and then click **[Submit]** to clear all of the alarms stored in the log.
- Click the **Initialize Alarms Pointer** radio button, and then click **[Submit]** to reset the internal pointer to the beginning of the log.

8.5.4.3   Status | Switch

Use this *read-only* page to see the operating status of any Redundancy Switches used with the unit.
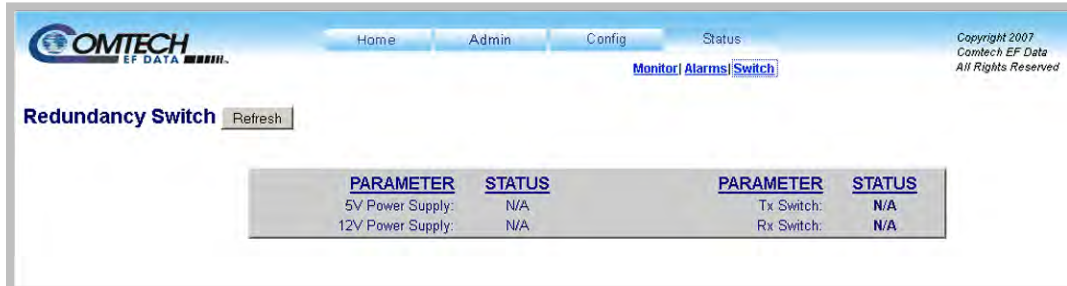
Figure 8-21. 'Status | Switch' Page

At any time, click **[Refresh]** to update this page and see the most recent data.

Chapter 9. SERIAL INTERFACE OPERATION

Make sure to operate the CSAT with its latest available firmware.

9.1 Overview

Serial-based remote management of Comtech EF Data's CSAT family of Outdoor Satellite Transceivers is available using the 19-pin **'J5 | COMM'** port. This chapter summarizes key parameters and procedures and their associated remote commands and queries, and provides detailed instructions for use of the serial remote interface.

9.2 Remote Control Protocol and Structure

The electrical interface is either an EIA-232 connection (for the control of a single device) or an EIA-485 multi-drop bus (for the control of many devices). Data is transmitted in asynchronous serial form using ASCII characters. Control and status information is transmitted in packets of variable length in accordance with the structure and protocol defined in this chapter.

9.2.1 EIA-232

This is a simple configuration in which the Controller device is connected directly to the Target via a two-wire-plus-ground connection. Controller-to-Target data is carried, via EIA-232 electrical levels, on one conductor, and Target-to-Controller data is carried in the other direction on the other conductor.

See Table 9-1. The CSAT EIA-232 interface provides five signals but only requires two wires (TD, RD) plus ground; the other two signals are provided for terminal equipment that requires RTS/CTS handshaking. The CSAT simply ties these two signals together.

Table 9-1. EIA-232 Interface

Pin	Signal Name	I/O	Description
E	EIA-232 RD	Input	CSAT RX Line
G	EIA-232 TD	Output	CSAT TX Line
T	Ground	Passive	Ground

9.2.2 EIA-485

For applications where multiple devices are to be monitored and controlled, full-duplex (or 4-wire) EIA-485 is preferred. Half-duplex (2-wire) EIA-485 is possible, but is not preferred.

See Table 9-2. The EIA-485 interface is a 4-wire interface plus ground. Because a half-duplex communication protocol is used, the (+)TX and (+)RX as well as the (−)TX and (−)RX signals can be tied together at the user end to support a 2-wire interface. The EIA-485 driver is only active during transmission and is Tri-Stated when not in use.

Table 9-2. EIA-485 Interface

Pin	Signal Name	I/O	Description
A	EIA-485 (+)RX	Input	CSAT RX Line
B	EIA-485 (-)RX	Input	CSAT RX Line Complement
C	EIA-485 (+)TX	Output	CSAT TX Line
D	EIA-485 (-)TX	Output	CSAT TX Line Complement
T	Ground	Passive	Ground

In full-duplex EIA-485 communication, there are two separate, isolated, independent, differential-mode twisted pairs, each handling serial data in different directions. It is assumed that there is a 'Controller' device (a PC or dumb terminal), which transmits data, in a broadcast mode, via one of the pairs. Many 'Target' devices are connected to this pair, which all simultaneously receive data from the Controller. The Controller is the only device with a line-driver connected to this pair – the Target devices only have line-receivers connected. In the other direction, on the other pair, each Target has a Tri-Stateable line driver connected, and the Controller has a

line-receiver connected. All the line drivers are held in high-impedance mode until one (and only one) Target transmits back to the Controller.

Each Target has a unique address, and each time the Controller transmits, in a framed 'packet' of data, the address of the intended recipient Target is included. All of the Targets receive the packet, but only one (the intended) will reply. The Target enables its output line driver, and transmits its return data packet back to the Controller, in the other direction, on the physically separate pair.

EIA-485 (Full Duplex) operation is summarized by its two differential pairs – one pair for Controller-to-Target, one pair for Target-to-Controller:
- Controller-to-Target pair – Pair has one line driver (Controller), and all Targets have line-receivers.
- Target-to-Controller pair – Pair has one line receiver (Controller), and all Targets have Tri-State drivers.

9.2.3   Basic Serial Protocol

Serial data can be transmitted and received by a Universal Asynchronous Receiver/Transmitter (UART).

Serial data is transmitted as asynchronous serial characters:
- Asynchronous character format is 8-N-1 (8 data bits, no parity, 1 stop bit)
- Baud rate can vary from 1200 through 38,400 baud.

Serial data is transmitted in framed packets. All bytes within a packet are printable ASCII characters less than ASCII code 127 (DELETE). The Carriage Return and Line Feed characters are considered printable.

The Controller device manages the monitor and control processes. It is the only device that can start data transmission at will. Messages sent from the Controller to the Target require responses, except in these cases:
- Acknowledging receipt of a "command" – an instruction message issued by the Controller – to change the configuration of the Target.
- Returning data that was requested by the Controller – response to a "query" message – that requests information from the Target.

Target devices can transmit data only when the Controller tells them to.

9.2.4 Packet Structure

Table 9-3. Controller-to-Target

	Start of Packet	Device Address	Address Delimiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
Character	<		/		= or ?		Carriage Return {CR}
ASCII Code	60		47		61 or 63		13
# Characters	1	4	1	3	1	n	1

Controller-to-Target Examples: (COMMAND) <0135/UAT=12.25{CR}
(QUERY) <0135/UAT?{CR}

Table 9-4. Target-to-Controller

	Start of Packet	Device Address	Address Delimiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
Character	>		/		=, ?, !, or *		Carriage Return {CR}, Line Feed {LF}
ASCII Code	62		47		61, 63, 33 or 42		13, 10
# Characters	1	4	1	3	1	From 0 to n	2

Target-to-Controller Example: (QUERY RESPONSE) >0135/UAT=07.75{CR}{LF}

9.2.4.1 Start of Packet

These characters are used to provide a reliable indication of the start of packet. They must not appear anywhere else in the body of the message:

- **Controller-to-Target:** This is the "<" character (ASCII code 60). It is also known as the "less than" character.
- **Target-to-Controller:** This is the ">" character (ASCII code 62). It is also known as the "greater than" character.

9.2.4.2 Device (Target Unit) Base Address

Up to 9,999 devices can be uniquely addressed. In both EIA-232 and EIA-485 applications, the permissible range of values is 0001 to 9999. Program the address into a Target using the **Set Physical Address (SPA=)** serial remote command.

The Controller Unit sends a packet with the address of a Target – the destination of the packet. When the Target responds, the address used is the same address, to indicate to the Controller the source of the packet. The Controller does not have its own address.

9.2.4.3   Address Delimiter

This is the forward slash character: **/** (ASCII code 47)

9.2.4.4   Instruction Code

This three-character alphabetic sequence is intended to be a mnemonic of its operational function. This aids in the readability of the message, should you display it in its raw ASCII form. For example, "UAT" means "Upconverter Attenuation; "IPA" means "IP Address", etc. Only upper case alphabetic characters may be used (A-Z, ASCII codes 65-90).

9.2.4.5   Instruction Code Qualifier

This single character further qualifies the preceding instruction code. Instruction Code Qualifiers obey specific rules.

9.2.4.5.1   Controller-to-Target Rules

From Controller-to-Target, the permitted qualifiers are "=" or "?" (ASCII codes 61 or 63):

= (ASCII code 61)

This qualifier is the Assignment Operator (AO). It means that the parameter defined by the preceding byte should be set to the value of the argument(s) that follow it. For example: UAT=12.50 means "set the transmit attenuation to 12.50 dB."

? (ASCII code 63)

This qualifier is the Query Operator (QO). It means that the Target should return the value of the parameter(s) defined by the preceding byte. For example: UAT? means "return the current value of the transmit attenuation".

9.2.4.5.2   Target-to-Controller Rules

From Target-to-Controller, the Target transmits the symbol =, ?, !, *, or # (ASCII codes 61, 63, 33, 42, or 35) to the Controller:

= (ASCII code 61)

"=" displays in two ways:
1. If the Controller sends a command to set a parameter's value, and the parameter value is valid, the Target accepts the command by replying with no message arguments. For example: >0001/UAT={CR}{LF}
2. If the Controller sends a query to a Target, the Target responds with the configured setting. For example, the query UAT? means "return the current value of the transmit attenuation" – the Target responds with >0001/UAT=xx.xx{CR}{LF} (where 'xx.xx' represents the configured value in dB).

? (ASCII code 63)

"?" is used as follows:
1) If the Controller sends a command to set a parameter to a particular value, and that value is not valid, the Target rejects the command by echoing the instruction code, with no message arguments, followed by this character. For example: >0001/UAT?{CR}{LF}.
2) This indicates that there was an error in the instruction code sent by the Controller.

! (ASCII code 33)

"!" displays when the Controller sends a command that the Target does not recognize. The Target rejects the command by echoing the invalid instruction code, followed by this character. For example: >0001/XYZ!{CR}{LF}

* (ASCII code 42)

"*" is used if the master sends a command to set a parameter to a particular valid value, but the CSAT will not permit that parameter to be changed at that time. The slave will reject the instruction by responding with this character, with no message arguments. For example: >0001/UAT*{CR}{LF}.

(ASCII code 35)

"#" is used as follows:
1) If the Controller sends a command that the slave cannot currently execute because of hardware resource issues, the slave will acknowledge the message by echoing the invalid instruction, followed by the # character.

2) This response can only occur if the operator sends two or more hardware configuration type of commands without allowing adequate time between commands for the hardware to be configured. For example: If you attempt to change both the Up and Down Converter frequencies with less than 100 milliseconds occurring between commands.

3) If the "#"response is returned, the command has not been accepted and you must resend the command.

9.2.4.6   Optional Message Arguments

Arguments are not required for all messages. Arguments include these ASCII codes:
- Characters "0" through "9" (ASCII codes 48 through 57)
- Period "." (ASCII code 46)
- Comma "," (ASCII code 44)

9.2.4.7   End of Packet

- Controller-to-Target: This is the Carriage Return character {CR} (ASCII code 13).
- Target-to-Controller: This is the two-character sequence of Carriage Return and Line Feed {CR}{LF} (ASCII codes 13 and 10). This pairing shows the valid end of a packet.

9.3   Remote Commands and Queries

9.3.1   Index

9.3.2   Commands and Queries – Serial-based AND Ethernet-based Systems

(!) See Sect. 9.2.4.5 for the use of Instruction Code Qualifiers in Controller-to-Target ("Command" or "Query") and Target-to-Controller ("Response to Command") communications.

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
TX Frequency	UFQ=	UFQ?	6 bytes	Command or Query. Sets or returns TX Frequency in valid range. Frequencies divisible by 1MHz and 2.5 MHz are allowed. **COMMAND EXAMPLE:** <0001/UFQ=5901.0{CR}	UFQ? UFQ=	UFQ=xxxx.x
RX Frequency	DFQ=	DFQ?	6 bytes	Command or Query. Sets or returns RX Frequency in valid range. Frequencies divisible by 1MHz and 2.5 MHz are allowed. **COMMAND EXAMPLE:** <0001/DFQ=3652.5{CR}	DFQ? DFQ=	DFQ=xxxx.x
TX Attenuation	UAT=	UAT?	5 bytes	Command or Query Sets or returns TX Attenuation, in dB, from 00.00 to 25.00 in 00.25 dB steps. **COMMAND EXAMPLE:** <0001/UAT=12.75{CR}	UAT? UAT=	UAT=xx.xx
RX Attenuation	DAT=	DAT?	5 bytes	Command or Query Sets or returns RX Attenuation, in dB, from 00.00 to 20.00 in 00.25 dB steps. **COMMAND EXAMPLE:** <0001/DAT=12.75{CR}	DAT? DAT=	DAT=xx.xx
TX Gain Offset	UGO=	UGO?	5 bytes	Command or Query. Sets or returns TX Gain Offset for 1:1 redundancy configurations, in dB, from -0.00 to -4.00 in 00.25 dB steps **COMMAND EXAMPLE:** <0001/UGO=-1.25{CR}	UGO?	UGO=xx.xx
RX Gain Offset	DGO=	DGO?	5 bytes	Command or Query. Sets or returns RX Gain Offset for 1:1 redundancy configurations, in dB, from -0.00 to -4.00 in 00.25 dB steps **COMMAND EXAMPLE:** <0001/DGO=-1.25{CR}	DGO?	DGO=xx.xx
TX Amplifier	AMP=	AMP?	1 byte	Command or Query. Turn TX Amplifier OFF or ON, where: 0=Amplifier OFF 1=Amplifier ON	AMP= AMP?	AMP=x
Mute Mode	MUT=	MUT?	1 byte	Command or Query. Sets or returns Mute Mode, where: 0=Unmuted after Frequency change 1=Muted after Frequency change	MUT= MUT?	MUT=x

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
TX Mute	UMU=	UMU?	1 byte	Command or Query. Sets or returns TX Mute, where: 0=Transmitter Unmuted 1=Transmitter Muted	UMU= UMU?	UMU=x
RX Mute	DMU=	DMU?	1 byte	Command or Query. Sets or returns RX Mute, where: 0=Receiver Unmuted 1=Receiver Muted	DMU= DMU?	DMU=x
TX Slope Mode	USM=	USM?	1 byte	Command or Query. Sets or returns TX Slope Mode, where: 0 =Manual Mode 1=Calibrated Mode	USM= USM?	USM=x
TX Slope Adjust	USA=	USA?	3 bytes	Command or Query. Sets or returns TX Slope Adjustment, from 0.0 to 1.0, in 0.1 steps **COMMAND EXAMPLE:** <0001/USA=0.3{CR}	USA= USA?	USA=x.x
RX Slope Mode	DSM=	DSM?	1 byte	Command or Query. Sets or returns RX Slope Mode, where: 0 =Manual Mode 1=Calibrated Mode	DSM= DSM?	DSM=x
RX Slope Adjust	RSA=	USA?	3 bytes	Command or Query. Sets or returns RX Slope Adjustment, from 0.0 to 1.0, in 0.1 steps **COMMAND EXAMPLE:** <0001/DSA=0.3{CR}	DSA= DSA?	USA=x.x
Reference Oscillator Adjust	REF=	REF?	3 bytes	Command or Query. Sets or returns Reference Oscillator Adjustment, from 000 to 255, in 001 steps **COMMAND EXAMPLE:** <0001/REF=087{CR} **NOTE:** REF cannot be adjusted when the CSAT is locked to an external reference source.	REF= REF?	REF=xxx
Cold Start	CLD=	CLD?	1 byte	Command or Query. Sets or returns Cold Start, where: 0=Disabled 1=Enabled	CLD= CLD?	CLD=x
Auto Fault Recovery	AFR=	AFR?	1 byte	Command or Query. Sets or returns Auto Fault Recovery, where: 0=Disabled 1=Enabled	AFR= AFR?	AFR=x

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Online Status	N/A	ONL?	1 byte	Query Only. Return Online status, where: 0=OFFLINE 1=ONLINE **Query Example:** <0001/ONL?{CR} >0001/ONL=1{CR}{LF}	ONL= ONL?	ONL=x
LNA Current Source	LCS=	LCS?	1 byte	Command or Query. Sets or returns LNA Current Source, where: 0=Disabled 1=Enabled 2=Enabled only if Tx is ONLINE **NOTE:** When you select LCS=2, this disables LNA Fault Logic (LFL=0).	LCS= LCS?	LCS=x
LNA Fault Logic	LFL=	LFL?	1 byte	Command or Query. Sets or returns whether or not the LNA Current window monitor affects the Summary Fault Relay (SFR), where: 0=LNA Current fault does not affect the SFR 1=LNA Current fault will affect the SFR **NOTE:** LFL is automatically disabled (LFL=0) when you select LCS=2.	LFL= LFL?	LFL=x
LNA Current Calibrate	CAL=	N/A	N/A	Command only. Set the calibration point for the LNA Current Alarm feature. **COMMAND EXAMPLE:** <0001/CAL={CR} (THIS COMMAND TAKES NO ARGUMENTS)	CAL=	N/A
LNA Current Window	LCW=	LCW?	2 bytes	Command or Query. Sets or returns the LNA Current Monitor Window, in ± % of the calibrated LNA Current, from 20 to 50, in 1% steps. **NOTE:** Setting the value to 99 disables the alarm function. **COMMAND EXAMPLE:** <0001/LCW=30{CR} (Sets the alarm window at ± 30%)	LCW= LCW?	LCW=xx
External Reference Fault Logic	XRF=	XRF?	1 byte	Command or Query. Sets or returns monitoring of the external reference source, where: 0=Ext Reference not monitored 1=Ext Reference is monitored and the lock state reported. **NOTE:** If enabled and no source is present a fault will be reported.	XRF= XRF?	XRF=x
Redundancy Controller Box Operating Mode	RAM=	RAM?	1 byte	Command or Query. Sets or returns control of the Redundancy Controller, where: 0=Manual Mode 1=Auto Mode **NOTE:** This command is accessible only via the Online unit	RAM= RAM?	RAM=x

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Redundancy Controller Box Toggle Operation	RTG=	N/A	N/A	Command only. When sent to the online CSAT, toggles the Redundancy Controller Box TX and RX switches. COMMAND EXAMPLE: <0001/RTG={CR} (THIS COMMAND TAKES NO ARGUMENTS)	RTG= RTG?	N/A
Remote (Physical) Address	SPA=	SPA?	4 bytes	Command or Query. Sets or returns the Remote (Physical) Address, from 0001 to 9999, in steps of 0001. COMMAND EXAMPLE: <0001/SPA=0890{CR}	SPA= SPA?	SPA=xxxx
Remote Baud Rate	SBR=	SBR?	4 bytes	Command or Query. Sets or returns the serial interface Baud Rate, where: 1200=1200 baud 2400=2400 baud 4800=4800 baud 9600=9600 baud 19K2=19200 baud 38K4=38400 baud NOTE: Unit responds on the existing baud rate and then changes to the new baud rate.	SBR= SBR?	SBR=xxxx
RTC Date	DAY=	DAY?	6 bytes	Command or Query. Sets or returns the Real Time Clock calendar date, where: dd=day of the month, from 01 to 31 mm=month of the year, from 01 to 12 yy=year, from 97 to 96 (1997 to 2000, then 2000 to 2096) COMMAND EXAMPLE: <0001/DAY=042457{CR} (Sets date to April 24, 2057)	DAY= DAY? DAY*	DAY=ddmmyy
RTC Time	TIM=	TIM?	6 bytes	Command or Query. Sets or returns the Real Time Clock time, where: hh=hours, in military format, from 00 to 23 mm=minutes, from 00 to 59 ss=seconds, from 00 to 59 COMMAND EXAMPLE: <0001/TIM=231259{CR} (Sets time to 23 hrs, 12 mins, 59 secs from midnight – i.e. 11:12:59 PM)	DAY= DAY? DAY*	DAY=ddmmyy

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)

Global Configuration	CGC=	CGC?	60 bytes	Command or Query.
				Sets or returns global configuration of unit, in the form:
				FFFF.FAA.AAMSB.BGG.GGZffff.faa.aamsb.bgg.ggNRCXOOOLWWDeeeeeee, where:
				  F=TX Frequency – same as UFQ= (6 bytes)
				  A=TX Attenuation – same as UAT= (5 bytes)
				  M=TX Mute – same ad UMU= (1byte)
				  S=TX Slope Mode – same as USM= (1 byte)
				  B=TX Slope Value – same as USA= (3 bytes)
				  G=TX Gain Offset – same as UGO= (5 bytes)
				  Z=TX Amplifier State – same as AMP= (1 byte)
				  f=RX Frequency – same as UFQ= (6 bytes)
				  a=RX Attenuation – same as UAT= (5 bytes)
				  m=RX Mute – same ad UMU= (1byte)
				  s=RX Slope Mode – same as USM= (1 byte)
				  b=RX Slope Value – same as USA= (3 bytes)
				  g=RX Gain Offset – same as UGO= (5 bytes)
				  N=Mute Mode – same as MUT= (1 byte)
				  R=Auto Fault Recovery – same as AFR= (1 byte)
				  C=Cold Start Mode – same as CLD= (1 byte)
				  X=Ext Ref Fault Logic – same as XRF= (1 byte)
				  O=Ref Oscillator Adjust – same as REF= (3 bytes)
				  L=LNA Current Source – same as LCS= (1 byte)
				  W=LNA Current Window – same as LCW= (3 bytes)
				  D=LNA Fault Logic – same as LFL= (1 byte)
				  e=expansion (7 bytes), set to '0'
				Query Example: <0001/CGC?{CR}
				                >0001/CGC=5901.012.75000.3-0.0013652.512.75000.3-0.00110108719900000000{CR}{LF}
					CGC=
					CGC?
						CGC=FFFF.FAA.AAMSB.BGG.GGZffff.faa.aamsb.bgg.ggNRCXOOOLWWDeeeeeee

Clear All Stored Alarms	CAA=	N/A	N/A	Command only. Clears the Target unit's buffer of all stored events **COMMAND EXAMPLE:** <0001/CAA={CR} (THIS COMMAND TAKES NO ARGUMENTS)	CAA=	N/A
Re-initialize Retrieved Alarms Point	IAP=	N/A	N/A	Command only. Instructs the unit to "zero out" the retrieved alarms pointer to allow user to retrieve the complete stored events log. **COMMAND EXAMPLE:** <0001/IAP={CR} (THIS COMMAND TAKES NO ARGUMENTS)	IAP=	N/A

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)

List New Alarms (Retrieve Next 5 Unread Stored Alarms)	N/A	LNA?	145 bytes	Query only
				Returns the oldest 5 Stored Events that have not yet been read over the serial interface. Reply format: Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where:
				  Sub-body=YYYYYYYYYY ZZ hhmmss,mmddyy
				  YYYYYYYYYY=fault description.
				  ZZ=alarm type (FT=Fault, OK=Clear, IF=Information)
				NOTES:
				1) If there are no new events, the CSAT responds with >0001/LNA*{CR}{LF}
				2) The CSAT incorporates a circular buffer capable of holding 100 events/alarms.
					N/A	LNA=YY...ss

Total New Alarms (Retrieve Number of Unread Stored Alarms)	N/A	TNA?	2 bytes	Query only. Returns the number of Stored Events that remain unread over the serial interface. **QUERY RESPONSE EXAMPLE:** >0001/TNA=18{CR}{LF}	N/A	TNA=xx
Circuit Identification	CID=	CID?	24 bytes	Command or Query. Sets or returns the user-defined Circuit ID string (label), which is a fixed length of 24 characters. Valid characters include: Space ( ) * + _ , . / 0-9 A-Z	CID= CID?	CID=x...x
Retrieve Firmware Number	N/A	FRW?	6 bytes	Query only. Returns the M&C Board's Firmware Number. **QUERY RESPONSE EXAMPLE:** >0001/FRW=F1519{CR}{LF}	N/A	FRW?x...x

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Concise Alarm Status	N/A	CAS?	19 bytes	Query only. Returns the alarm status of the CSAT in condensed form abcdefghijklmnopqrs where: Typical a through s=0 (OK) or 1 (FT): a=24V Power Supply Alarm b=20V Power Supply Alarm c=12V Power Supply Alarm d=10V Power Supply Alarm e=+5V Power Supply Alarm f=-5V Power Supply Alarm g=TX Synthesizer Lock Detect Alarm h=TX IFLO Lock Detect Alarm I=RX Synthesizer Lock Detect Alarm j=RX IFLO Lock Detect Alarm k=Reference Lock Detect Alarm l=LNA Current Alarm m=Fan Current Alarm n=Temperature Alarm o=HPA Thermal Shutdown Alarm p=Internal IIC-bus Alarm q=EEPROM checksum Alarm r=NVRAM/RTC Low Battery Alarm s=Redundancy switch alarm	N/A	CAS=a...s
Concise Configuration Status	N/A	CCS?	31 bytes	Query only. Returns the configuration status of the CSAT in condensed form uuuu.udddd.daa.aabb.bbotamrncfx where: uuuu.u=TX frequency dddd.d=RX frequency aa.aa=TX attenuation bb.bb=RX attenuation o=Online status where 0=OFFLINE, 1=ONLINE t=Transmitter status where 0=OFF, 1=ON a=Amplifier status where 0=OFF, 1=ON m=TX Mute status where 0=Unmuted, 1=Muted r=Receiver status where 0=OFF, 1=ON n=RX Mute status where 0=Unmuted, 1=Muted c=Cold Start where 0=Disabled, 1=Enabled f=Auto Fault Recover where 0=Disabled, 1=Enabled x=External Reference present where 0=NO, 1=YES	N/A	CCS=x...x

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)

Concise LNA Status	N/A	CLS?	4 bytes	Query only.
				Returns the LNA status of the CSAT in condensed form abbc where:
				  a=LNA Current where 0=OFF, 1=ON
				  bb=Current Windows, in %
				  c=LNA Fault Logic, where 0=OFF, 1=ON
					N/A	CLS=abbc

Concise Maintenance Status	N/A	CMS?	80 bytes	Query only.
				Returns the maintenance status of the CSAT in condensed form aaa.abbb.bccc.cddd.deee.e fff.fggg.ghhh.hiii.ijjj.jkkk.klll.lmmm.mnnn.nooo.oppp.p where:
				  aaa.a=24V Power Supply
				  bbb.b=20V Power Supply
				  ccc.c=12V Power Supply
				  ddd.d=10V Power Supply
				  eee.e=+5V Power Supply
				  fff.f=-5V Power Supply
				  ggg.g=TX Synthesizer Tuning Voltage
				  hhh.h=TX IFLO Tuning Voltage
				  iii.i=RX Synthesizer Tuning Voltage
				  jjj.j=RX IFLO Tuning Voltage
				  kkk.k=Reference Tuning Voltage
				  lll.l=LNA Current in milliamps
				  mmm.m=Fan Current in milliamps
				  nnn.n=Up Conv Heat Sink Temperature
				  ooo.o=RF Output Power in dB
				  ppp.p=Down Converter Temperature
				NOTE: Unit returns "xxx.x" when value is not available.
					N/A	CMS=x...x

Concise Utility Status	N/A	CUS?	10 bytes	Query only.
				Returns the utility status of the CSAT in condensed form brrru.ud.d where:
				  b=Baud Rate where 1=1200, 2=2400, 3=4800, 4=9600, 5=19200, and 6=38400
				  rrr=Reference Adjust
				  u.u=Up Converter Slope Adjust
					N/A	CUS= brrru.ud.d

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Retrieve Alarm Status	N/A	RAS?	171 bytes	Query only. Returns the alarm status of the CSAT. **QUERY RESPONSE EXAMPLE:** >0001/RAS={CR} 24VLT=OK{CR} 20VLT=OK{CR} 12VLT=OK{CR} 10VLT=OK{CR} P5VLT=OK{CR} N5VLT=OK{CR} USYNH=OK{CR} UIFLO=OK{CR} DSYNH=OK{CR} DIFLO=OK{CR} REFLD=OK{CR} LNACR=OK{CR} FANMN=OK{CR} HSTMP=OK{CR} SHTDN=OK{CR} IICFT=OK{CR} CHKSM=OK{CR} BATLW=OK{CR} REDSW=OK{CR}{LF}	N/A	RAS=x...x

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Retrieve Configuration Status	N/A	RCS?	113 bytes	Query only. Returns the configuration status of the CSAT. **QUERY RESPONSE EXAMPLE:** >0001/RCS={CR} UFQ=5845.0{CR} DFQ=3625.0{CR} UAT=12.50{CR} DAT=01.50{CR} ONL=YES{CR} XMT=ON{CR} AMP=ON{CR} UMU=OFF{CR} RCV=ON{CR} DMU=OFF{CR} CLD=OFF{CR} AFR=ON{CR} EXT=NO{CR}{LF}	N/A	RCS=x...x
Retrieve Equipment Type	N/A	RET?	20 bytes	Query only. Returns the unit Model Number and the firmware version number. **QUERY RESPONSE EXAMPLE:** >0001/RET=CSAT-5060/050 V1.02{CR}{LF}	N/A	RET=x...x
Retrieve LNA Status	N/A	RLS?	23 bytes	Query only. Returns the LNA status of the CSAT. **QUERY RESPONSE EXAMPLE:** >0001/RLS={CR} LCS=ON{CR} LCW=40{CR} LFL=1{CR}{LF}	N/A	RLS=x...x

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Retrieve Maintenance Status	N/A	RMS?	175 bytes	Query only. Returns the maintenance status of the CSAT. **QUERY RESPONSE EXAMPLE:** >0001/RMS={CR} 24VT=023.9{CR} 20VT=020.3{CR} 12VT=012.0{CR} 10VT=010.2{CR} P5VT=005.0{CR} N5VT=-05.0{CR} USYN=008.2{CR} UIFL=003.9{CR} DSYN=006.3{CR} DIFL=003.8{CR} REFV=002.9{CR} LNAC=081.9{CR} FANC=541.0{CR} UTMP= 37.0{CR} POWR=25.0-{CR} DTMP= 34.0{CR}{LF}	N/.A	RMS=x...x
Retrieve Redundancy Status	N/A	RRS?	37 bytes	Query only. Returns the redundancy status of the CSAT. **NOTE:** Query is accessible via the Online unit. **QUERY RESPONSE EXAMPLE:** >0001/RRS={CR} R 5V=5.0{CR} R 12V=11.8{CR} TX SW=OK{CR} RX SW=OK{CR}{LF}	N/A	RRS=x...x
Retrieve Serial Number	N/A	RSN?	10 bytes	Query only. Returns the 9-digit unit serial number **QUERY RESPONSE EXAMPLE:** >0001/C0001234567{CR}{LF}		RSN=Cxxxxxxx xx

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Retrieve Utility Status	N/A	RUS?	32 bytes	Query only. Returns the utility status of the CSAT. **QUERY RESPONSE EXAMPLE:** >0001/RUS={CR} BDR=9600{CR} REF=087{CR} USA=0.3{CR} DSA=0.4{CR}{LF}	N/A	RUS=x...x

Summary Fault Status	N/A	SFS?	1 byte	Query only.
				Returns the status of the CSAT Summary Fault Relay where:
				   0=OK
				   1=FT
				QUERY RESPONSE EXAMPLE: >0001/SFS=0{CR}{LF}
					N/A	SFS=x

9.3.3 Remote Commands and Queries – Ethernet-based Systems ONLY

(!) See Sect. 9.2.4.5 for the use of Instruction Code Qualifiers in Controller-to-Target ("Command" or "Query") and Target-to-Controller ("Response to Command") communications.

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Firmware Image	IMG=	IMG?	1 byte	Command or Query. Sets or returns the active firmware image, where: 1=Bulk Image #1 is currently active 2=Bulk Image #2 ids currently active. COMMAND EXAMPLE: <0001/IMG=2{CR} (Selects Image #1 as active)	IMG= IMG? IMG* IMG#	IMG=x
Management IP Address	IPA=	IPA?	18 bytes	Command or Query. Sets or returns the Management IP Address and network prefix for the 10/100 BaseT Ethernet port in the form xxx.xxx.xxx.xxx.xxx.yy where: xxx.xxx.xxx.xxx=Management IP Address yy=Network Prefix (from 8 to 30) COMMAND EXAMPLE: <0001/IPA=192.168.001.004.24{CR} (sets to Default IP Address)	IPA= IPA? IPA* IPA#	IPA=xxx.xxx.xxx.xxx.yy
Gateway IP Address	IPG=	IPG?	15 bytes	Command or Query. Sets or returns the Gateway IP Address for the 10/100 BaseT Ethernet port in the form xxx.xxx.xxx.xxx.xxx where: xxx.xxx.xxx.xxx=Gateway IP Address COMMAND EXAMPLE: <0001/IPA=192.168.001.005{CR} (sets to Default IP Address)	IPG= IPG? IPG*	IPG=xxx.xxx.xxx.xxx
Unit MAC Address	N/A	MAC?	17 bytes	Query only. Returns the MAC address for the unit, in hexadecimal format. QUERY RESPONSE EXAMPLE: >0001/MAC=00-06-B0-00-D2-A7{CR}{LF}	N/A	MAC=xx-xx-xx-xx-xx-xx
Time Enable Protocol	TPE=	TPE?	1 byte	Command or Query. Sets or returns the Ttime Protocol, where: 0=Time Protocol disabled 1=Time Protocol enabled	TPE= TPE?	TPE=x
Time Protocol Server	TPS=	TPS?	15 bytes	Command or Query. Sets or returns the Time Server IP Address for the Unit TX Ethernet management port, where: xxx.xxx.xxx.xxx=Time Server IP Address COMMAND EXAMPLE: <0001/TPS=192.168.001.005{CR}	TPS= TPS?	TPS=xxx.xxx.xxx.xxx

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)

Local/Remote Status	LRS=	LRS?	1 byte	Sets or returns the user local/remote status where:
				  1=Serial Remote (EIA-232/EIA-485)
				  2=Ethernet
				  3=Ethernet+Serial
				  4=FSK
				NOTE: Selecting FSK mode (LRS=4) may cause some serial remote commands to respond with # code (hardware resource issues).
				COMMAND EXAMPLE: <0001/LRS=1 (Serial Remote selected)
					LRS=
					LRS?
						LRS=x

Retrieve Part Number	N/A	PNM?	Byte length varies 1-95 bytes	Query only. Returns the Comtech EF Data part number for the unit. **NOTE:** This part number is the unit's DOTCODE at the time of manufacture. It may be up to 95 printable ASCII characters in length. **QUERY RESPONSE EXAMPLE:** >0001/PNM=CSAT5060-005{CR}{LF}	N/A	PNM=[1-95]
Retrieve Firmware Number (Ethernet Board)	N/A	FRM?	Byte length varies	Query only. Returns the boot, Bulk1 and Bulk2 firmware loaded into the unit. **QUERY RESPONSE EXAMPLE:** >0001/FRM={CR} Boot:{CR} FW-0000082;0.0.1a;04/09/08{CR} Bulk1:{CR} FW-0020597-;1.1.1 ;05/02/12{CR} Bulk2:{CR} FW-0020597-;1.1.1 ;05/02/12{CR}{LF}	N/A	FRM=x...x
Firmware Revision	N/A	SWR?	6 bytes	Query only. Returns the revision number of the firmware installed in the unit for the Ethernet board, in the form x.x.x. **QUERY RESPONSE EXAMPLE:** >0001/SWR=2.0.2{CR}{LF}	SWR= SWR?	SWR=x.x.x
Admin Name	ADN=	ADN?	10 bytes	Command or Query. Sets or returns the Admin name for the Telnet Interface. **COMMAND EXAMPLE:** <0001/ADN=Comtech{CR}	ADN= ADN?	ADN=x...x
Admin Password	ADP=	ADP?	10 bytes	Command or Query. Sets or returns the Admin password for the Telnet Interface. **COMMAND EXAMPLE:** <0001/ADP=Comtech{CR}	ADP= ADP?	ADN=x...x

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
SNMP Enable	SNM=	SNM?	1 byte	Command or Query. Sets or Returns SNMP operation, where: 0=Disabled 1=Enabled	SNM= SNM?	SNM=x
SNMP System Contact	SSC=	SSC?	20 bytes	Command or Query. Sets or returns SNMP System Contact label. **COMMAND EXAMPLE:** <0001/SSC=Joe NetAdmin{CR} **NOTE:** If not configured, the unit returns an empty string >0001/SSC={CR}{LF}	SSC= SSC?	SSC=[1-20]
SNMP System Location	SSL=	SSL?	20 bytes	Command or Query. Sets or returns SNMP System location label. **COMMAND EXAMPLE:** <0001/SSL=Upper level north{CR} **NOTE:** If not configured, the unit returns an empty string >0001/SSL={CR}{LF}	SSL= SSL?	SNM=[1-20]
SNMP Unit Name	SSN=	SSN?	20 bytes	Command or Query. Sets or returns SNMP System unit label. **COMMAND EXAMPLE:** <0001/SSN=Remote1{CR} **NOTE:** If not configured, the unit returns an empty string >0001/SSN={CR}{LF}	SSN= SSN?	SSN=[1-20]
SNMP Read Community	SRC=	SRC?	20 bytes	Command or Query, Sets or returns the SNMP Read Community String. **COMMAND EXAMPLE:** <0001/SRC=public{CR} **NOTE:** An empty string is not allowed.	SRC= SRC?	SRC=[1-20]
SNMP Write Community	SWC=	SWC?	20 bytes	Command or Query, Sets or returns the SNMP Write Community String. **COMMAND EXAMPLE:** <0001/SWC=private{CR} **NOTE:** An empty string is not allowed.	SWC= SWC?	SWC=[1-20]
SNMP Trap Version	STV	STV?	1 byte	Command or Query. Sets or returns the SNMP Trap Version to be used to send traps, where: 1=SNMP Trap Version 1 2=SNMP Trap Version 2		
SNMP Authentication Trap Enable	SNA=	SNA?	1 byte	Sets or returns SNMP Authentication Trap, where: 0=Disabled 1=Enabled		
SNMP Trap Destination IP Address 1	STA=	STA?	15 bytes	Command or Query. Used to set the first SNMP Trap destination IP Address, where traps will be sent, where: xxx.xxx.xxx.xxx=IP Address 1 **COMMAND EXAMPLE:** <0001/STA=010.006.030.001{CR} **NOTE:** When not configured, query response= >0001/STA=0.0.0.0{CR}{LF}	STA= STA?	STA=xxx.xxx.xxx.xxx

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
SNMP Trap Destination IP Address 2	STB=	STB?	15 bytes	Command or Query. Used to set the second SNMP Trap destination IP Address, where traps will be sent, where: xxx.xxx.xxx.xxx=IP Address 2 **COMMAND EXAMPLE:** <0001/STB=010.006.030.002{CR} **NOTE:** When not configured, query response= >0001/STB=0.0.0.0{CR}{LF}	STB= STB?	STA=xxx.xxx.xxx.xxx

Appendix A. MAINTENANCE AND TROUBLESHOOTING

A.1 Overview

This appendix provides procedures to assist you in the checkout, maintenance and troubleshooting of the CSAT. Comtech EF Data recommends that you use a spare CSAT to replace any CSAT removed from the system for maintenance.

Figure A-1 shows a block diagram for a typical CSAT unit: its input and output signals, cable connection interfaces, and standard modules.
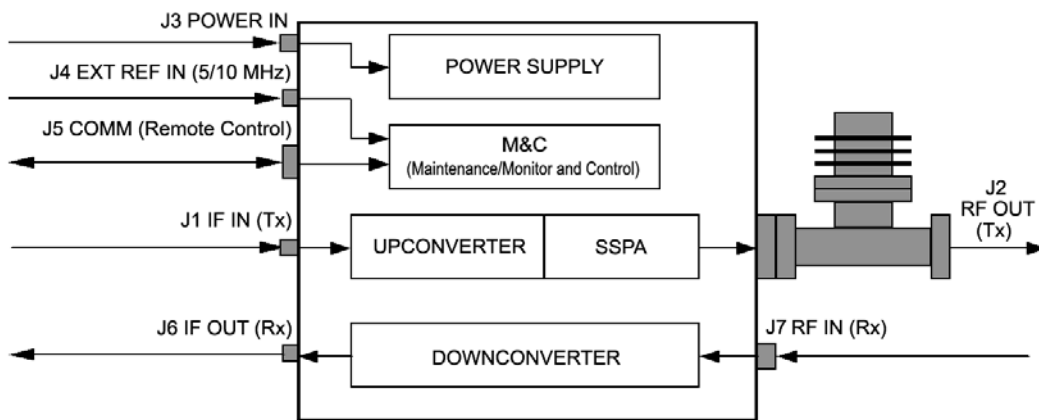
Figure A-1. CSAT Feature Block Diagram (50W Unit Example)

A.2   Water Tight Sealing

CAUTION

Before you engage operation of your equipment, you MUST make sure that all external cable assemblies for the outdoor equipment are properly sealed to prevent water intrusion. Failure to achieve water tight sealing will result in possible performance degradation and even product failure.

To maintain your product warranty, you must follow the guidelines and recommendations provided in Section 4.2 Water Tight Sealing (Chapter 4. SYSTEM CONNECTORS).

A.3   Maintenance Testing

Make sure to properly install your CSAT system, and observe the proper operating procedures.

For:	See:
• System Connections	**Chapter 4. SYSTEM CONNECTORS**
• Standalone Operation Setup Instructions	**Chapter 5. STANDALONE (SINGLE THREAD) INSTALLATION**
• Basic Operating Instructions and Procedures	**Chapter 7. SYSTEM OPERATION**
• Ethernet Interface Operations	**Chapter 8. ETHERNET INTERFACE OPERATION**
• Serial Interface Operations	**Chapter 9. SERIAL INTERFACE OPERATION**
• 1:1 Redundancy Installation	**Appendix B. OPTIONAL 1:1 REDUNDANT SYSTEM INSTALLATION**
• 1:1 Redundancy Operations	**Appendix C. OPTIONAL 1:1 REDUNDANT SYSTEM OPERATION**

Note that:
- The CSAT contains an Upconverter, a Solid-State Power Amplifier (SSPA) and a Downconverter.
- The Upconverter translates the IF input frequency of 52 to 88 MHz to an RF frequency of 5845 to 6425 MHz depending on the setting for the output frequency.
- The IF input level is -20 to -30 dBm (typical). The signal is then amplified by the SSPA to the desired output level.
  - **For 100W/125W units only:** $\geq$ +50 dBm (+51dBm) at 1 dB compression.
- The Downconverter translates the RF input signal down to the IF output frequency of 52 to 88 MHz.
- The RF input level is -45 dBm (typical) and the IF output level is +20 dBm at 1 dB compression.

A.4 Troubleshooting

A.4.1 System Faults

CSAT operating problems can first be identified using status indicators acquired through serial remote control queries (via the '**J5 | COMM**' port connection). Check the Alarm Status for possible faults, or an indication of a marginal performance tolerance condition.

When a fault condition is indicated, using the Retrieve Alarm Status query (**RAS?**) can identify the specific fault(s). This query returns the status (OK/FT) of all CSAT functions, as described in **Chapter 9. SERIAL INTERFACE OPERATION**.

A.4.1.1 DC Power Supply Voltages

- 24 VDC
- 20 VDC
- 12 VDC
- 10 VDC
- P5 VDC (+5 VDC)
- N5 VDC (-5 VDC)

A fault ("FT") indicates a voltage level exceeding ±10% of the power supply voltage. If the voltage exceeds ± 10%, contact Comtech EF Data Product Support.

A.4.1.2   Fan Fault

Contact Comtech EF Data Product Support for troubleshooting help.

A.4.1.3   Temperature Fault

CSAT Over Temperature Fault: A fault ("FT") indicates that the converter is over temperature. Turn the prime power switch off and return the CSAT to Comtech EF Data for repair.

A.4.1.4   RF Converter Module

Synthesizer and IFLO Lock Detect Fault: During normal operation, neither the Upconverter nor the Downconverter synthesizer or IFLO should experience a Lock Detect fault.

Note the following:
- If one or more of these functions is faulted, the CSAT will not function properly.
- If a fault condition exists and an EXT REF is being used, check the connection to the CSAT and make sure it is secure.
- It may be necessary to remove the EXT REF if it is faulty.
- If the fault still exists, contact Comtech EF Data Product Support.

A.4.1.5   Reference Oscillator Module

Reference Lock Detect: A fault ("FT") indicates that the reference oscillator is not locked. Check all connections to the converter module to make sure they are secure. If the fault still exists, contact Comtech EF Data Product Support.

A.4.1.6   LNA Current Fault

This can indicate either a problem in the CSAT LNA current source circuitry or a problem with the LNA.
Note the following:
- First, ensure that the LNA is connected and that no shorts exist. Use the serial remote query RMS? to obtain the measured LNA current.

- If the LNA and cable are OK, proceed to disconnect the LNA and measure from the center conductor of the cable to the shield of the cable using a DVM. A voltage of 12 VDC shall be measured if the LNA Current Source is Enabled (i.e., LCS=1).
- Contact Comtech EF Data Product Support for further troubleshooting.

Notes:

Appendix B. OPTIONAL 1:1 REDUNDANT SYSTEM INSTALLATION

B.1   Overview

The term "1:1 Redundant System" refers to an optional application that uses two CSAT units operating in redundancy. Several kits are available from Comtech EF Data to mount and install CSATs in 1:1 redundancy, depending on the CSAT units ordered.

For any 1:1 installation, you should perform tasks in the following sequence:
1. Unpack and inspect all materials as instructed in **Chapter 3. UNPACKING AND INSPECTION**.
2. Prepare for installation as instructed in this appendix.
3. See **Section 4.2 Water Tight Sealing** in **Chapter 4. SYSTEM CONNECTORS** for important outdoor installation considerations.

B.1.1.1   Installation Manpower Recommendation

Comtech EF Data recommends that, at a minimum, you employ two technicians to install any CSAT 1:1 Redundancy System.

B.1.1.2   Typical Required Installation Tools

Comtech EF Data recommends that, at a minimum, you use these tools to install any CSAT 1:1 Redundancy System:

- Adjustable wrench;
- English *and* Metric unit box or socket wrenches (hex nuts and hex head bolts are used);
- Medium Phillips™ screwdriver (Phillips head screws are used);
- Tin snips.
- Marker or pen (to note strap trim or bracket positioning locations).

B.1.1.3   Sequence of Installation for 1:1 Redundancy Systems

Due to weight considerations, you may not mount any 1:1 Redundancy System to an antenna spar. You may only mount your system onto a standard satellite dish support pole.

Instructions to assemble and install a CSAT 1:1 Redundant System are presented throughout the remainder of this appendix in the following order:

- **Section B.2.1 Universal Pole Mount Kit:** Assembly of all CSAT 1:1 Redundant Systems installations requires two AS/0414 Universal Pole Mount Kits. For purpose of brevity, all subsequent mention in this appendix of this kit use refers you back to this section.
- **CSAT Unit-specific assembly and installation for 1:1 applications:**
    - **Section B.2.2** outlines use of CSAT-5060 +10dBM units in a 1:1 redundancy application.
    - **Section B.2.3** outlines assembly and installation for CSAT-5060/6070 5W to 25W units.
    - **Section B.2.4** outlines assembly and installation for CSAT-5060/6070 50W units.
    - **Section B.2.5** outlines assembly and installation for CSAT-5060 100W and 125W units, and for CSAT-6070 100W units.
- **Section B.3 LNA Installation:** Assembly of the C-Band LNAs (purchased separately) uses the AS/0438 LNA Switch Kit, AS/0502 TRF Support Bracket Kit, and the AS/0461 CPR229 Waveguide Kit for all 1:1 redundant applications. For purpose of brevity, all subsequent mention in this appendix of this kit use refers you to this section.
- **Section B.4 Cable Connections and Installation:** Cable connections required for all CSAT systems include the AS/0440 1:1 C-Band RSU Cabling Kit. For purpose of brevity, all subsequent mention in this appendix of this kit's use refers you to this section.

B.2   Installation of CSAT 1:1 Redundancy Systems

B.2.1   AS/0414 Universal Pole Mounting Kit

Figure B-1 identifies the AS/0414 kit items. All redundant configurations require the use of two kits, spaced accordingly. Use this kit in combination with a product-specific CSAT mounting kit to secure the CSAT 1:1 Redundancy configuration to a standard satellite dish support pole.
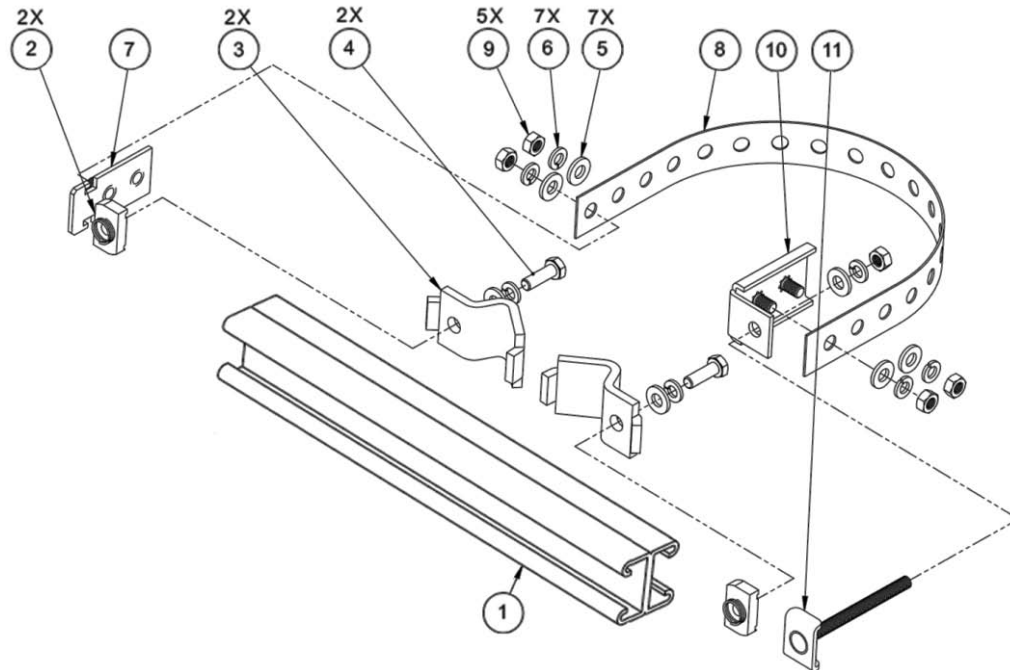
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	FP/BR0078	DUAL CHANNEL UNISTRUT
2	2	HW/M8SPRING NUT	SPRING NUT, M8
3	2	HW/BLK-PIPE2-8	PIPE BLOCK
4	2	HW/M8X1.25X25HEXSS	BOLT, HEX HEAD, M8, 25MM LG, SS
5	7	HW/M8FLATSS	FLAT WASHER, M8, SS
6	7	HW/M8LOCKSS	LOCKWASHER, M8, SS
7	1	FP/BR0069	FLOATING STRAP BRACKET
8	1	FP/BR0071	PIPE STRAP (TRIM TO REQUIRED LENGTH)
9	5	HW/M8X1.25MMHEXNUTSS	HEX NUT, M8, SS
10	1	FP/BR0070	FIXED STRAP BRACKET
11	1	FP/BR0072	STRAP TENSIONER BOLT

Figure B-1. AS/0414 Universal Pole Mounting Kit (2 Req'd)

Figure B-1 Notes:

1) This kit accommodates a pole diameter of up to 13.00" (330.2 mm) OD maximum.
2) All further mention in this appendix of this kit's use refers you back to this section.

Do these steps to install each kit:

1. Place the Unistrut (Item 1) on a flat surface.
2. Slide both M8 spring nuts (Item 2) into the Unistrut channel. Make sure to seat the springs against the interior wall of the channel.
3. Loosely fasten the Pipe Blocks (Item 3) to the M8 spring nuts using (2X each) M8 hex bolts, flat washers, and lockwashers (Items 4, 5 and 6).
4. Position the semi-assembled Unistrut and Pipe Blocks against the mounting pole, then slide the Pipe Blocks until they contact either side of the mounting pole. Make sure that the Pipe Blocks are centered within the Unistrut. Tighten the mounting hardware.
5. Slide the Floating Strap Bracket (Item 7) into the Unistrut channel. Make sure that the bracket studs face outward.
6. Loosely assemble the Floating Strap Bracket to the Pipe Strap (Item 8) with (2X each) M8 flat washers, lockwashers, and hex nuts (Items 5, 6 and 9).
7. Do the following:
   a. Holding the kit subassembly in place against the mounting pole, slide the Fixed Strap Bracket (Item 10) into the Unistrut channel until it abuts the adjacent Pipe Block.
   b. Wrap the Pipe Strap around the pole, fitting the strap onto the Fixed Strap Bracket studs as snugly as possible. Score or otherwise mark a trim line on the Pipe Strap then, using the tin snips, trim the Pipe Strap to suit as shown in the side view in **Figure B-2**.
8. Do the following:
   a. Remove the Fixed Strap Bracket (Item 10) from the Unistrut channel, and assemble the Strap Tensioner Bolt (Item 11) to the Fixed Strap Bracket (the bolt head will abut the interior wall of the channel).
   b. Slide this subassembly back into the Unistrut channel until it abuts the adjacent Pipe Block.
9. Secure the Pipe Strap (Item 8) using the Fixed Strap Bracket (Item 10), with (2X each) M8 flat washers, lockwashers, and hex nuts (Items 5, 6, and 9).

10. As shown in the top view in **Figure B-2**, secure the Fixed Strap Bracket (Item 10) in place using the Strap Tensioner Bolt (Item 11) with (1X each) M8 flat washer, lockwasher, and hex nut (Items 5, 6 and 9); tighten to suit.

11. As shown in the side view in **Figure B-2**, disassemble as needed, and then use the tins snips to trim the Pipe Strap length to suit. Reassemble the kit to the pole to suit.
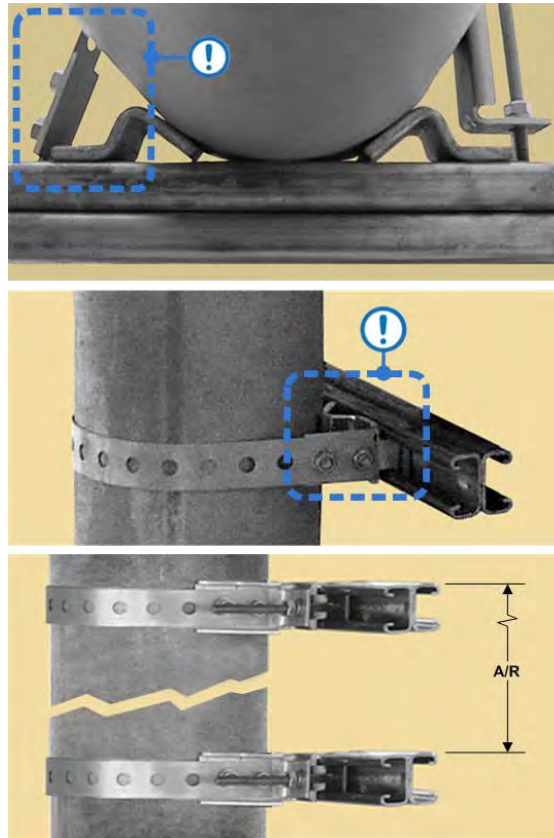
Figure B-2. AS/0414 Universal Pole Mounting Kit – Final Adjustments

Figure B-2 Notes:
1) Use tin snips to trim back the Pipe Strap (Item 8) length to suit.
2) Spacing of the installed AS/0414 pair depends on your specific CSAT 1:1 redundancy application.

To proceed with assembly, see your product-specific section in this appendix.

B.2.2   CSAT-5060 +10dBm 1:1 Redundant System Installation

The CSAT-5060 +10dBmTransceiver is designed for the reception of SCPC, DAMA, and TDMA communication signals, as well as communications system applications with full transponder HDTV and analog TV. This transceiver provides an upconverted output, via the 'J8 | EXT AMP' connector, that is used to drive an external SSPA or TWTA.

Figure B-3 shows two example installations of CSAT-5060 +10dBm units used in a Comtech EF Data HPOD 1:1 Redundancy configuration. These configurations, as shown, use the AS/0608 CSAT Mounting Kits (see **Section B.2.3.1.3**) for mounting the +10dBm units to the parent 1:1 redundant product system.

Because installations are tailored to the equipment supported by the redundant +10dBm pair, this manual does not provide specific instructions for installation. Refer to your support product user manual, or contact Comtech EF Data Product Support for assistance.
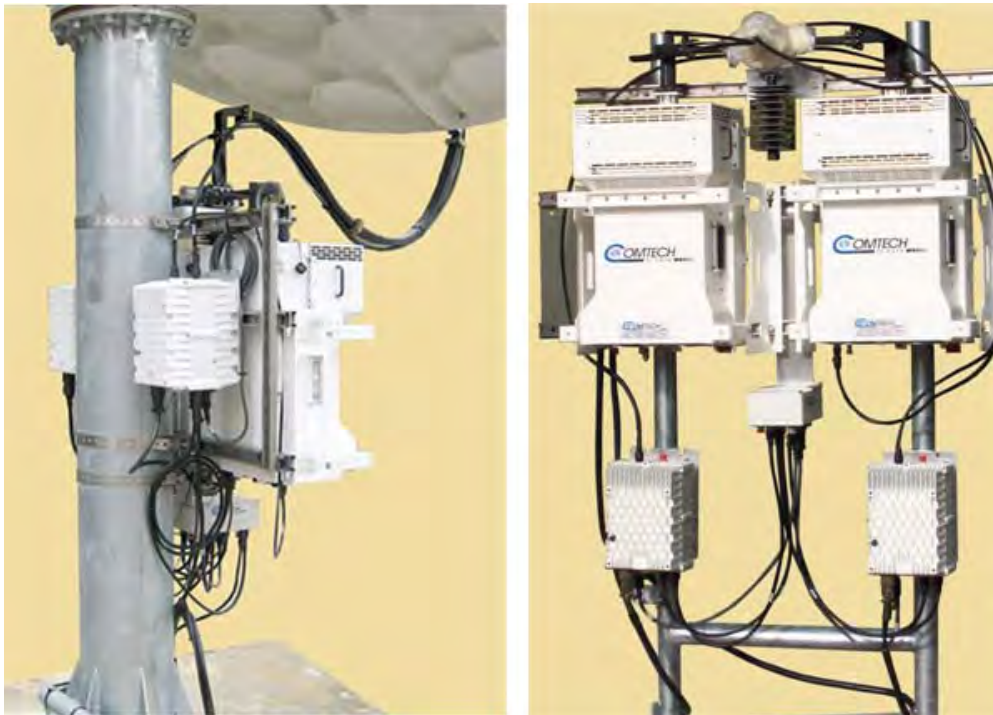
Figure B-3. HPOD/CSAT-5060 +10dBm 1:1 Redundant System Examples

B.2.3   CSAT 5W to 25W Unit 1:1 Redundant System Installation

For detailed information on the individual items provided in this kit, refer to the following sections for installation procedures:

- See **Section B.2.3.1** to install the AS/0596 CSAT 5W to 25W Unit 1:1 Mounting Kit items.
- See **Section B.2.3.2** to install the CSAT 5W to 25W 1:1 redundant pair.
- See **Section B.2.3.3** to install the AS/0510 CSAT 5W to 25W Unit 1:1 RF Switching Components Kit items.

B.2.3.1   Install the AS/0596 5W to 25W Unit 1:1 Mounting Kit

Figure B-4 identifies the AS/0596 kit items. Use this kit to install two CSAT 5W to 25W units in a 1:1 redundancy configuration. For detailed information on the individual items provided in this kit, refer to the section specified in the table and/or the installation procedures provided in this section.

ITEM	QTY	CEFD PART NO.	DESCRIPTION	SECTION
1	2	AS/0414	KIT, UNIVERSAL POLE MOUNTING	B.2.3.1.1
2	1	AS/0489	KIT, 1:1 RSU/TX SWITCH MOUNTING	B.2.3.1.2
3	2	AS/0608	KIT, CSAT MOUNTING	B.2.3.1.3

Figure B-4. AS/0596 CSAT 5W to 25W Unit 1:1 Mounting Kit

B.2.3.1.1   AS/0596 Item 1: Install the AS/0414 Universal Pole Kits

Do these steps to install each kit:
FOR STEPS 1 THROUGH 11, install the two AS/0414 Universal Pole Mounting Kits (AS/0596 Item 1) onto the satellite dish support pole. See **Section B.2.1** for these installation tasks.

> **See Figure B-5.** Using the FP/BR0080 RSU/TX Switch Mounting Bracket (part of AS/0596 Item 2) as the guide: the vertical spacing between the two assembled Unistruts kits should measure **7.25" [183 mm]** apart (top edge to top edge). See Section B.2.1 if you need to adjust this spacing.
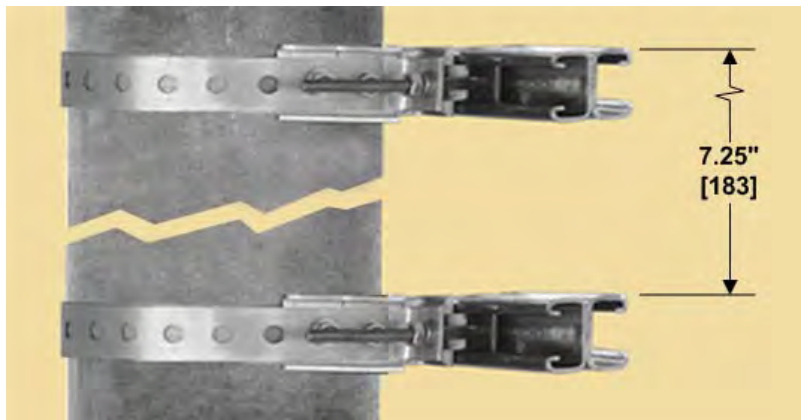
Figure B-5. AS/0414 Kit Spacing for CSAT 5W to 25W Units

PROCEED TO STEP 12 in the next section to assemble the AS/0489 1:1 RSU/TX Switch Mounting Kit (AS/0596 Item 2) to the installed AS/0414 Unistruts.

B.2.3.1.2 AS/0596 Item 2: Install the AS/0489 RSU/TX Switch Mounting Kit
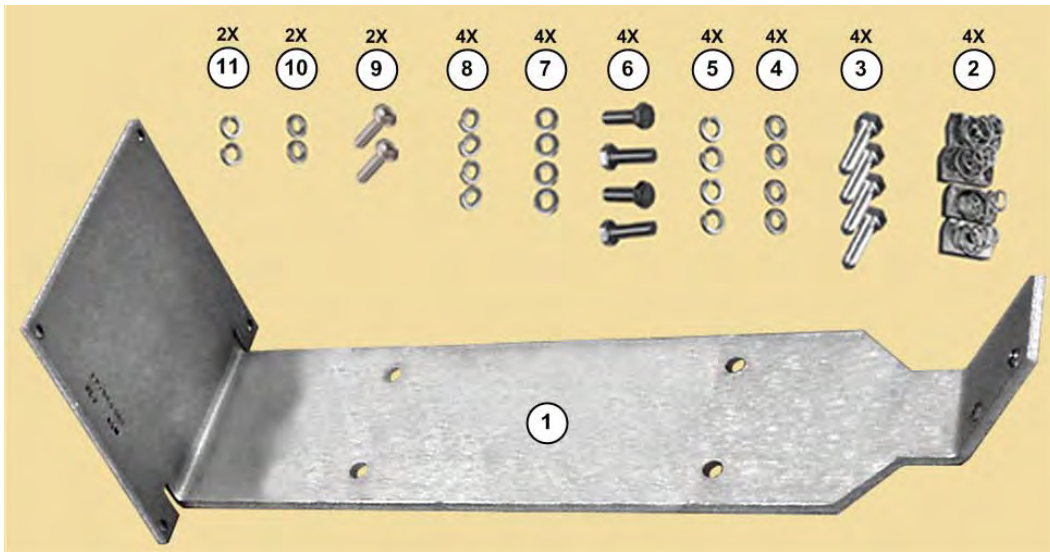
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	FP/BR0080	BRACKET, RSU/TX SWITCH MOUNTING
2	4	HW/M8SPRINGNUT	SPRINGNUT, M8
3	4	HW/M8X1.25X25HEXSS	BOLT, HEX HEAD, M8 X 25MM LG
4	4	HW/M8FLATSS	FLAT WASHER, M8
5	4	HW/M8LOCKSS	LOCKWASHER, M8
6	4	HW/M5X.08X15MMHEX	BOLT, HEX HEAD, M5 X 15MM LG
7	4	HW/M5FLAT	FLAT WASHER, M5
8	4	HW/M5LOCK	LOCKWASHER, M5
9	2	HW/M4X10PHP	SCREW, PAN HEAD PHILLIPS, M4 X10 MM LG
10	2	HW/M4FLAT	FLAT WASHER, M4
11	2	HW/M4LOCK	LOCKWASHER, M4

Figure B-6. AS/0489 1:1 RSU/TX Switch Mounting Kit (AS/0596 Item 2)

Figure B-6 Note:
Set aside AS/0489 Items 6 through 11 for installation of the AS/0490 RSU-5060 Redundant Switch Unit (RSU) (AS/0510 Item 1 – see **Section B.2.3.3.1**) and the AS/0503 TX Switch Assembly (AS/0510 Item 2 – see **Section B.2.3.3.2**).

Continue with installation from **Section B.2.3.1.1**:

12. Slide two M8 spring nuts (AS/0489 Item 2) into installation position (**2.4"
    [61 mm]** apart, centered to the support pole) into each Unistrut channel.
    Make sure to seat the springs against the interior wall of the channel.

13. Loosely assemble the FP/BR0080 RSU/TX Switch Mounting Bracket
    (AS/0489 Item 1) into position against the Unistruts and the installed M8
    spring nuts using (2X per Unistrut) M8 hex bolts, flat washers, and
    lockwashers (AS/0489 Items 3, 4, and 5). Re-center the assembled bracket
    to the pole if necessary, and tighten all hardware to complete assembly.

> See **Figure B-7**. Make note of the correct orientation of the
> FP/BR0080 bracket. The RSU mounting flange (Feature 'A') is
> positioned at the bottom; by default, this positions the TX
> Switch mounting flange (Feature 'B') at the top.
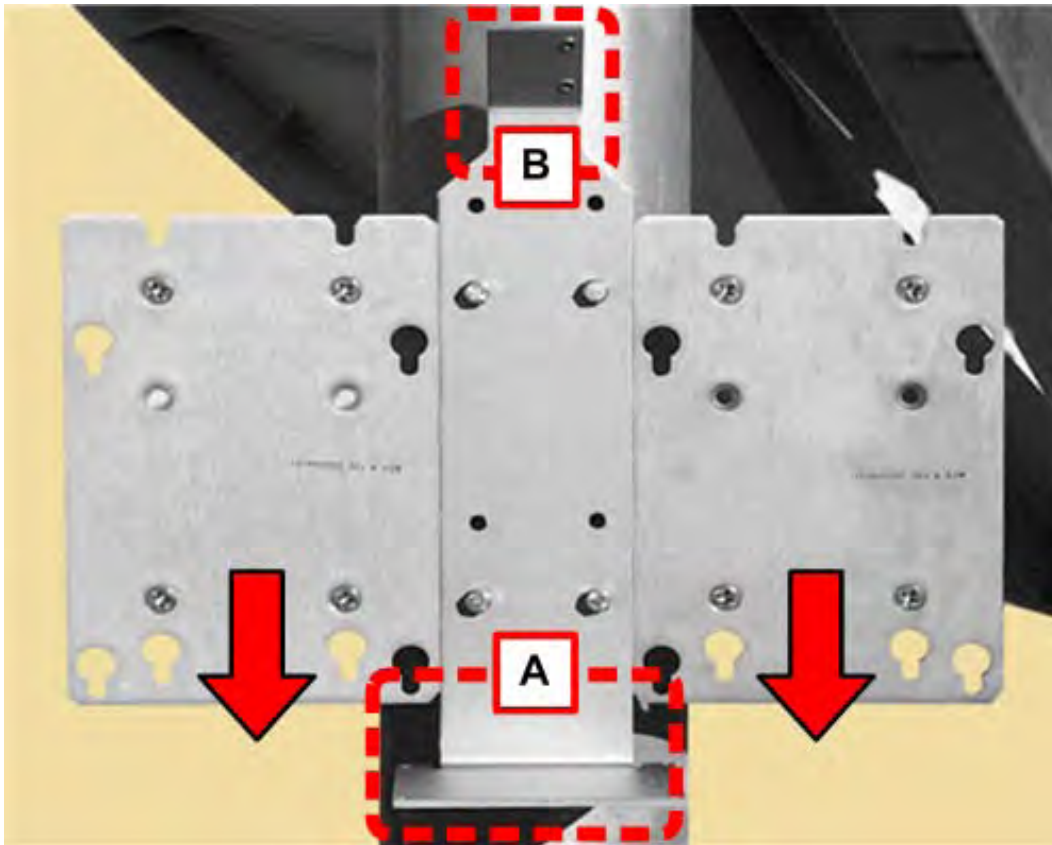
Figure B-7. Assembled AS/0596 Kit Items – Slot and Flange Orientation

PROCEED TO STEP 14 in the next section to assemble the AS/0608 Mounting Kits
(AS/0596 Item 3) to the installed AS/0414 Unistruts.

B.2.3.1.3 AS/0596 Item 3: Install the AS/0608 Mounting Kits
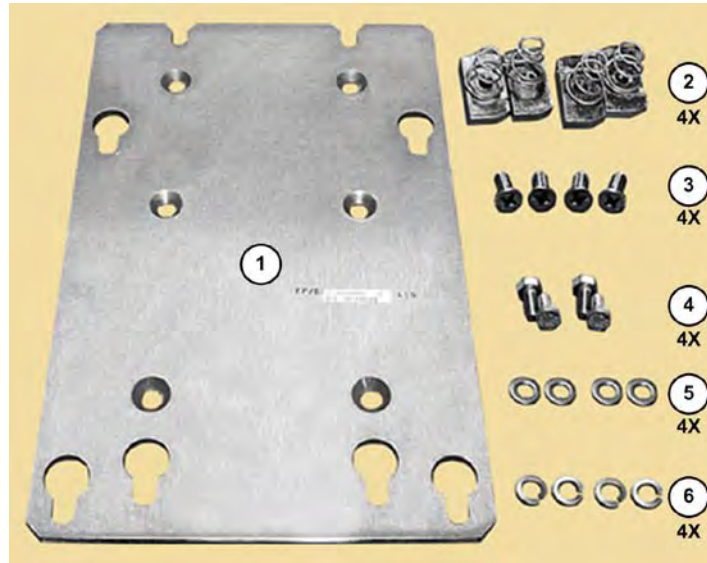
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	FP/BR0095	CSAT MOUNTING PLATE
2	4	HW/M8SPRING NUT	SPRING NUT, M8
3	4	HW/M8X1.25X20MMFHSS	FLAT HEAD SCREW, M8 X 20MM LG
4	4	HW/M8X1.25MMHEX	HEX HEAD BOLT, M8 X 16MM LG
5	4	HW/M8FLATSS	FLAT WASHER, M80
6	4	HW/M8LOCKSS	LOCKWASHER, M8

Figure B-8. AS/0608 Mounting Kit (AS/0596 Item 3 – 2 Req'd)

Continue with installation from **Section B.2.3.1.2**. Do these steps:

14. Slide M8 spring nuts (AS/0608 Item 2) into installation position (3.75" [95 mm] apart, two per side per Unistrut) in the Unistrut channels. Make sure to seat the springs against the interior wall of the channel.

15. Loosely assemble the FP/BR0095 Mounting Plates (AS/0608 Item 1) into position against the Unistruts and the installed M8 spring nuts. Use (4X per plate) the M8 flat head screws (AS/0608 Item 3). Slide the assembled plates flush to the sides of the FP/BR0080 RSU/TX Switch Mounting Bracket, and then tighten the flat head screws to complete assembly.

🛈 See **Figure B-7**. Make note of the correct orientation of the plates' key slots, to ensure proper installation of the CSAT units.

PROCEED TO STEP 16 in the next section to assemble the CSAT 5W to 25W units to the installed FP/BR0095 Mounting Plates.

B.2.3.2   Install the CSAT 5W to 25W 1:1 Units

Continue with installation from **Section B.2.3.1.3**. Do these steps:

16. **TYPICAL FOR EACH CSAT UNIT**, loosely install (4X each) of the M8 hex bolts, flat washers, and lockwashers (AS/0608 Items 4, 5 and 6) into the M8 threaded inserts installed in the CSAT housing.

> (!) For ease of assembly, you might choose to install the RSU (AS/0510 Item 1) onto its mounting flange on the FP/BR0080 RSU/TX Switch Mounting Bracket before you install the CSAT units into operating position. See **Section B.2.3.3.1**.

17. Position each CSAT to the surface of its FP/BR0095 Mounting Plate by hooking the pre-assembled mounting hardware through the plate's key slots. Make sure that no washers are caught between the CSAT and plate, and then carefully drop the CSAT into position.

18. Secure each unit by firmly tightening the CSAT mounting hardware.

> (!) For all installations, make sure to position the unit with the exhaust fan(s) facing outward (e.g., opposite the back of the satellite dish). Keep the unit air intake vents free of any obstructions that might otherwise impede air flow.

BOTTOM OF UNIT 'A'   BOTTOM OF UNIT 'B'

Figure B-9. Assemble CSATs to Mounting Plates

Once the CSAT units are in installed position, you are ready to install the AS/0510 5W to 25W Unit 1:1 RF Switching Components.

B.2.3.3 Install the Kit AS/0510 5W to 25W Unit 1:1 RF Switching Components

Figure B-10 shows the AS/0510 kit items. For detailed information on the individual items provided in this kit, refer to the section specified in the table and/or the installation procedures provided in this section.

ITEM	QTY	CEFD PART NO.	DESCRIPTION	SECTION
1	1	AS/0490	ASSY, RSU-5060 REDUNDANT SWITCH UNIT (RSU)	0
2	1	AS/0503	ASSY, TX SWITCH	B.2.3.3.2
3	1	AS/0438	KIT, LNA SWITCH	B.3.1
4	1	AS/0461	KIT, CPR229 WAVEGUIDE INSTALLATION	B.3.3
5	1	AS/0440	KIT, C-BAND RSU CABLING	B.4

Figure B-10. AS/0510 5W to 25W Unit 1:1 RF Switching Components Kit

See Figure B-11. For ease of assembly, installation of the AS/0510 kit items is suggested in the following sequence:

- **Feature 'A'** – See **Section B.2.3.3.1** to install the AS/0490 RSU-5060 Redundant Switch Unit (RSU) (AS/0510 Item 1) onto the FP/BR0080 RSU/TX Switch Mounting Bracket (AS/0596 Item 1).
- **Feature 'B'** – See Steps 16 through 18 in **Section B.2.3.2** to install the 5W to 25W CSAT Redundant pair onto the FP/BR0095 Mounting Plates (AS/0608 Item 1).

> ⓘ For all installations, make sure to position the unit with the exhaust fan(s) facing outward (e.g., opposite the back of the satellite dish). Keep the unit air intake vents free of any obstructions that might otherwise impede air flow.

- **Feature 'C'** – See **Section B.2.3.3.2** to assemble and install the AS/0503 TX Switch (AS/0510 Item 2) onto the FP/BR0080 RSU/TX Switch Mounting Bracket (AS/0596 Item 1).

Further:

- **Feature 'D'** – See **Section B.3.1** to assemble the AS/0438 LNA Switch Kit (AS/0510 Item 3); see **Section B.3.2** to assemble the AS/0502 TRF Support Bracket Kit; see **Section B.3.3** to install the assembled LNA Switch and TRF w/Support Bracket to the antenna OMT using the AS/0461 CPR229 Waveguide Installation Kit (AS/0510 Item 4).
- **Feature 'E'** – See **Section B.4** to install the AS/0440 1:1 C-Band RSU Cabling Kit (AS/0510 Item 5).
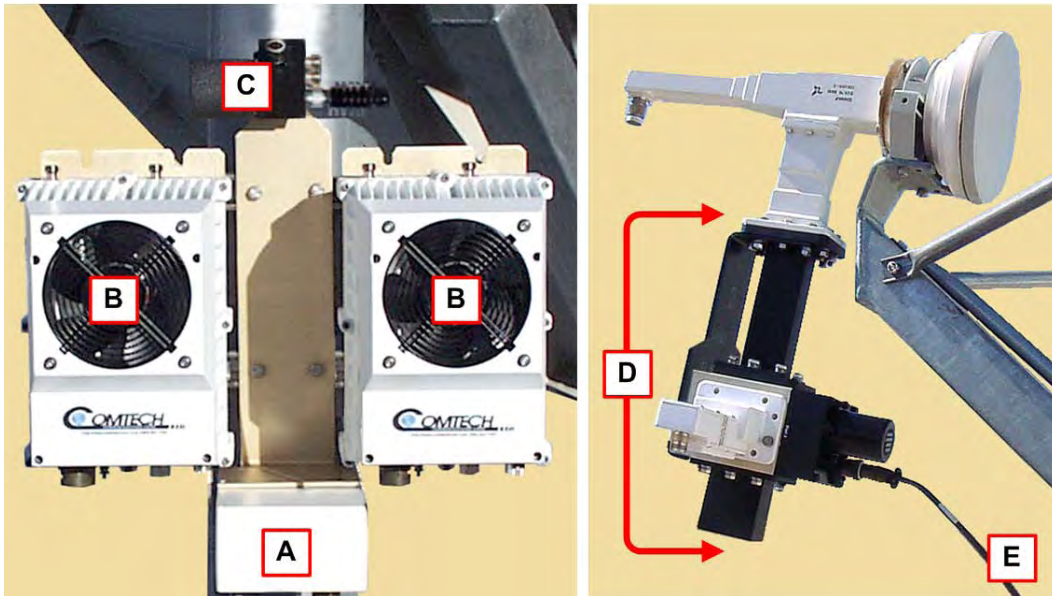
Figure B-11. CSAT 5W to 25W Unit 1:1 RF Components – As Installed

B.2.3.3.1   AS/0510 Item 1: Install the AS/0490 RSU-5060 Redundant Switch Unit (RSU)
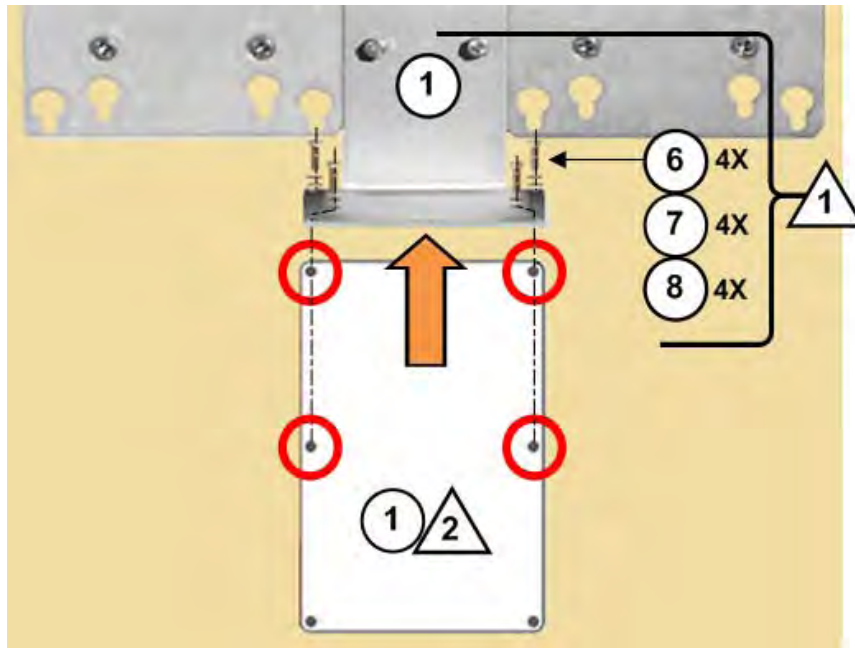
Figure B-12. Install the RSU

Figure B-12 Notes:
1) Item 1 and Items 6 through 8 as noted here are part of the AS/0489 1:1 Switch Mounting Kit (AS/0596 Item 2 – see **Figure B-6**).
2) Item 1 as noted here is the AS/0490 RSU-5060 Redundant Switch Unit (RSU) (AS/0510 Item 1 – see **Figure B-10**).
3) The CSAT units are not shown for clarity.

See **Figure B-11** and **Figure B-12**. Do these steps:
1. Place the RSU (AS/0510 Item 1) against the bottom face of the FP/BR0080's RSU mounting flange.

    > The hole pattern for the RSU's M5 threaded inserts is offset to force the correct orientation of the RSU to the RSU/TX Switch Mounting Bracket.

2. Use the (4X each) M5 hex bolts, flat washers, and lockwashers (AS/0489 Items 6, 7, and 8) to secure the RSU in place.

B.2.3.3.2   AS/0510 Item 2: Assemble and Install the AS/0503 TX Switch Kit
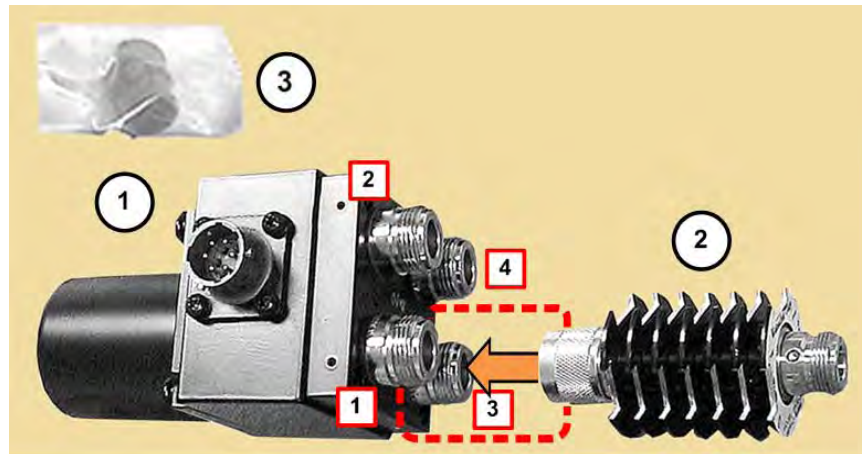
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	SW/COAX-N-F-SEALED	SWITCH, COAX, TYPE 'N' FEMALE, 25VDC 5.9-6.5 SEALED
2	1	FP/WG9605-1	ATTENUATOR, WAVEGUIDE MOD w/TERMINATION
3	1	CN/MDC-NTYPE	CAP, DUST, CONNECTOR (SEE NOTE 2)

Figure B-13. AS/0503 TX Switch Kit (AS/0510 Item 2)

Figure B-13 Notes:

1) These items, while included in this kit as ordered from Comtech EF Data, are spare items and are not used for this application. They are not shown in this manual or otherwise specified for use:

QTY	CEFD PART NO.	DESCRIPTION
2	CA/RF0097	CABLE, RF
4	HW/M4FLAT	FLAT WASHER, M4
4	HW/M4LOCK	LOCKWASHER, M4
4	HW/M4X.07X8MMPHMS	SCREW, PAN HEAD, M4 X 8MM LG

2) Keep the RSU connector capped until the redundancy system is cabled for operation. See Section B.4.

You must pre-assemble the TX Switch components before you can install the switch in its operating position. Do these steps:

1. See **Figure B-13**. Assemble the Attenuator w/50Ω termination (Item 2) to Port [3] on the TX Switch (Item 1). **Figure B-14** shows the correct

orientation of the Attenuator ID Plate relative to the switch ports (labeled as [1] through [4]).

2. See **Figure B-15**. Use the (2X each) M4 pan head screws, flat washers, and lockwashers (AS/0489 Items 6, 7, and 8) to secure the TX Switch Assembly in place against front face of the FP/BR0080 RSU/TX Switch Mounting Bracket (AS/0489 Item 1) TX Switch mounting flange.
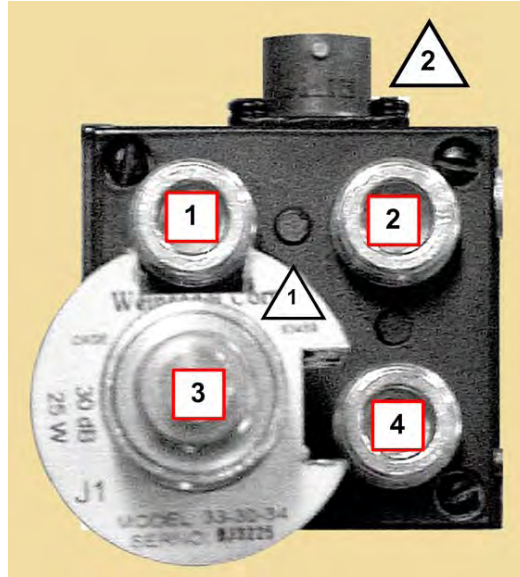
Figure B-14. AS/0503 TX Switch Assembly – Attenuator ID Plate and Port Orientation

Figure B-14 Notes:

1) The Attenuator ID Plate is notched to "key" its installation relative to Switch Ports [1] and [4]. This provides a visual "assurance" of the attenuator's proper connection to Port [3].

2) The circular connector receptacle accommodates the switching control cable that connects the redundant system to the RSU-5060 'J4 | TX SWITCH' connector. Protect this interface until the redundant system is ready for cabling.

3) Make sure to install the switch components to the correct ports:
   - Port [1] – TX from the CSAT Unit 'A' 'J7 | RF OUT' connector
   - Port [2] – User RF output (to Antenna)
   - Port [3] – Load (Attenuator w/50Ω termination)
   - Port [4] – TX from the CSAT Unit 'B' 'J7 | RF OUT' connector
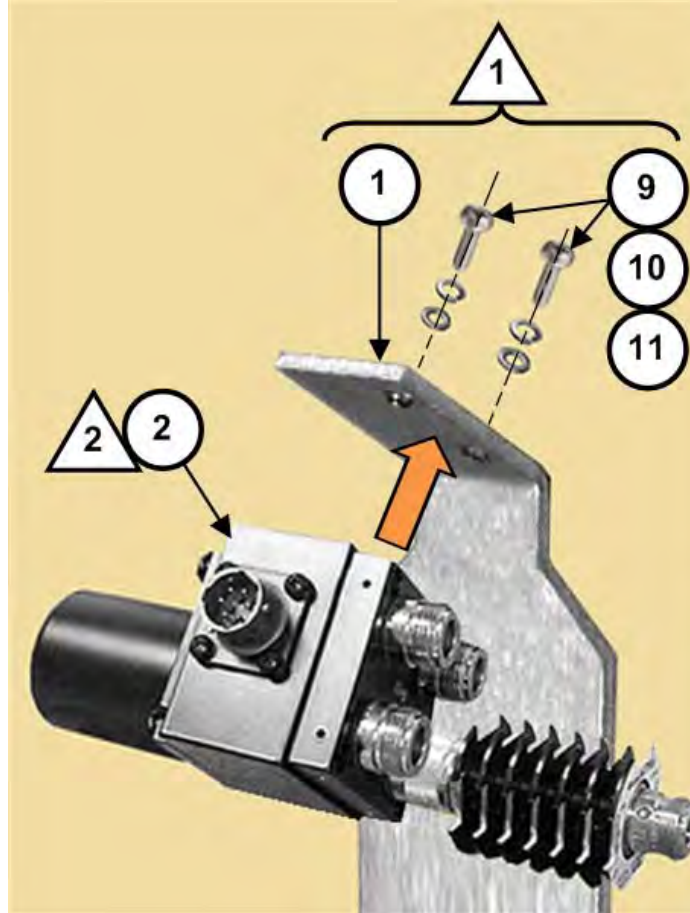
Figure B-15. AS/0503 TX Switch Installation

Figure B-15 Notes:
1) Item 1 and Items 9 through 11 as shown here are part of the AS/0489 1:1 Switch Mounting Kit (AS/0596 Item 2 – see **Figure B-6**).
2) Item 2 as shown here is the AS/0503 TX Switch Assembly (AS/0510 Item 2 – see **Figure B-13**). (The connector dust caps are not shown.)

With the TX Switch installed, you are ready to assemble and install the CSAT 1:1 Redundancy Low Noise Amplifiers (LNAs):
- See **Section B.3.1** to assemble the AS/0438 LNA Switch Kit (AS/0510 Item 3);
- See **Section B.3.2** to assemble the AS/0502 TRF Support Bracket Kit;
- See **Section B.3.3** to install the assembled LNA Switch Kit and TRF w/Support Bracket to the antenna OMT using the AS/0461 CPR229 Waveguide Installation Kit (AS/0510 Item 4).

B.2.4   CSAT 50W Unit 1:1 Redundant System Installation

For detailed installation information, refer to the following sections:

- See **Section B.2.4.1** to install the AS/0597 CSAT 50W Unit 1:1 Mounting Kit.
- See **Section B.2.4.2** to install the CSAT 50W 1:1 redundant pair.
- See **Section B.2.4.3** to install the AS/0458 CSAT 50W Unit 1:1 RF Switching Components Kit.

B.2.4.1   Install the AS/0597 1:1 Mounting Kit

Figure B-16 identifies the AS/0597 kit items. Use this kit to install two CSAT 50W units in a 1:1 redundancy configuration. For detailed information on the individual items provided in this kit, refer to the section specified in the table and/or the installation procedures provided in this section.
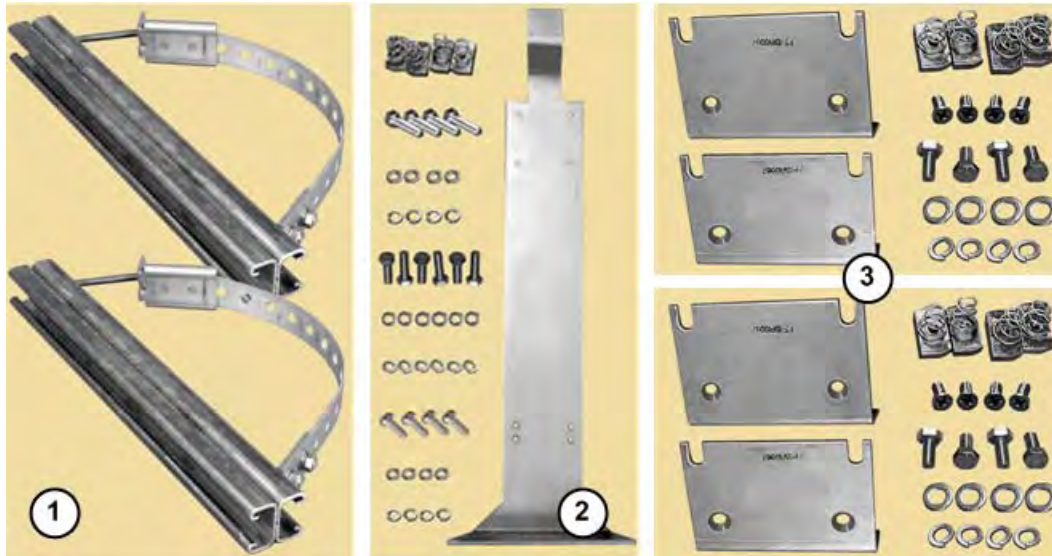
ITEM	QTY	CEFD PART NO.	DESCRIPTION	SECTION
1	2	AS/0414	UNIVERSAL POLE MOUNTING KIT	B.2.4.1.1
2	1	AS/0437	1:1 RSU/TX SWITCH MOUNTING KIT	B.2.4.1.2
3	2	AS/0415	CSAT MOUNTING KIT	B.2.4.1.3

Figure B-16. AS/0597 CSAT 50W Unit 1:1 Mounting Kit

B.2.4.1.1 AS/0597 Item 1: Install the AS/0414 Universal Pole Kits

Do these steps to install each kit:

FOR STEPS 1 THROUGH 11: Assemble the two AS/0414 Universal Pole Mounting Kits (AS/0597 Item 1) onto the satellite dish support pole. See **Section B.2.1** for these installation tasks.

> See **Figure B-17**. Use the FP/BR0066 RSU/TX Switch Mounting Bracket (part of AS/0597 Item 2) as the guide: the vertical spacing between the two assembled Unistruts kits should measure **17.32" [440 mm]** apart (top edge to top edge). See **Section B.2.1** if you need to adjust this spacing.
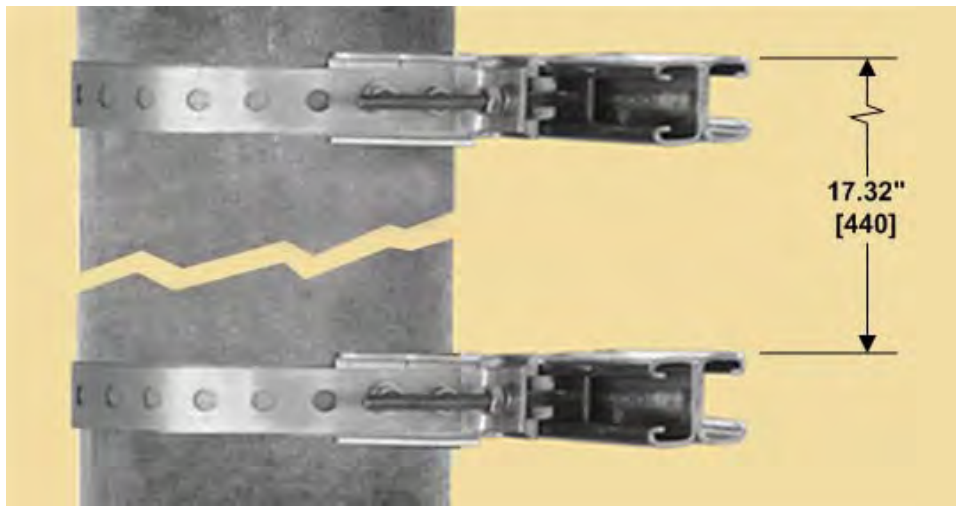
Figure B-17. AS/0414 Kit Spacing for CSAT 50W Units (AS/0597 Item 1)

PROCEED TO STEP 12 in the next section to assemble the AS/0437 1:1 RSU/TX Switch Mounting Kit (AS/0597 Item 2) to the installed AS/0414 Unistruts.

B.2.4.1.2   AS/0597 Item 2: Install the AS/0437 RSU/TX Switch Mounting Kit

Figure B-18 identifies the AS/0597 kit items. **Figure B-19** shows the kits as assembled.
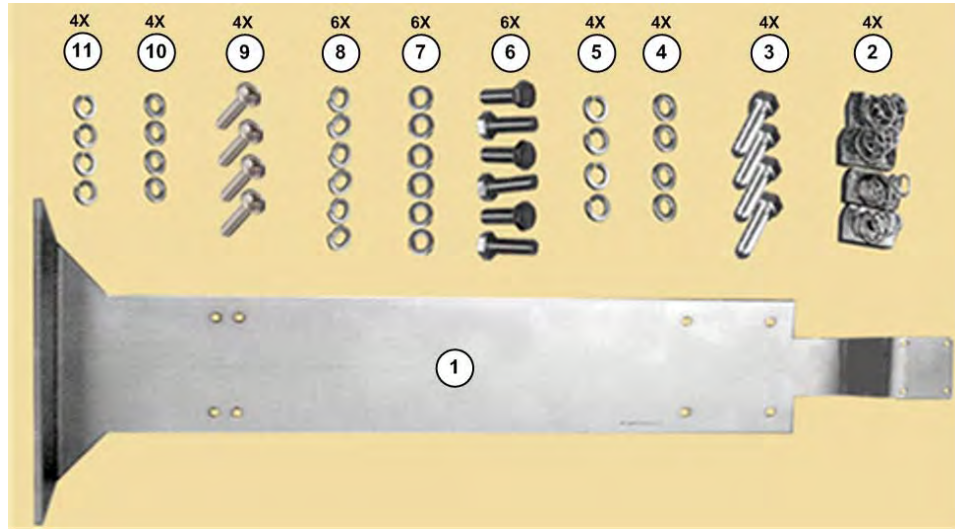
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	FP/BR0066	BRACKET, RSU/TX SWITCH MOUNTING
2	4	HW/M8SPRINGNUT	SPRINGNUT, M8
3	4	HW/M8X1.25X25HEXSS	BOLT, HEX HEAD, M8 X 25MM LG
4	4	HW/M8FLATSS	FLAT WASHER, M8
5	4	HW/M8LOCKSS	LOCKWASHER, M8
6	6	HW/M5X.08X15MMHEX	BOLT, HEX HEAD, M5 X 15MM LG
7	6	HW/M5FLAT	FLAT WASHER, M5
8	6	HW/M5LOCK	LOCKWASHER, M5
9	4	HW/M4X10PHP	SCREW, PAN HEAD PHILLIPS, M4 X10 MM LG
10	4	HW/M4FLAT	FLAT WASHER, M4
11	4	HW/M4LOCK	LOCKWASHER, M4

Figure B-18. AS/0437 RSU/TX Switch Mounting Kit (AS/0597 Item 2)

Figure B-18 Note:
Set aside AS/0437 Items 6, 7, and 8 for installation of the AS/0490 RSU-5060 Redundant Switch Unit (RSU) (see **Section B.2.4.3.1**). Set aside Items 9 through 11 for installation of the AS/0462 TX Switch and Waveguide Installation Kit (see **Section B.2.4.3.2**).

Continue with installation from **Section B.2.4.1.1**:

12. Slide two M8 spring nuts (AS/0437 Item 2) into installation position (3.50" [89 mm] apart, centered to the support pole) into each Unistrut channel. Make sure to seat the springs against the interior wall of the channel.

13. Loosely assemble the FP/BR0066 RSU/TX Switch Mounting Bracket (AS/0437 Item 1) into position against the Unistruts and the installed M8 spring nuts using (2X per Unistrut) M8 hex bolts, flat washers, and lockwashers (AS/0597 Items 3, 4, and 5). Re-center the assembled bracket to the pole if necessary, and tighten all hardware to complete assembly.

See Figure B-19:

1) Make note of the correct use of the FP/BR0066 bracket mounting holes (Feature 'A'). Installation of the 50W units is "keyed" to use the <u>lower</u> set of holes.

2) Make note of the correct orientation of the assembled FP/BR0066 bracket. The RSU mounting flange (Feature 'B') is positioned at the <u>bottom</u>; by default, this positions the TX Switch mounting flange (Feature 'C') at the <u>top</u>.
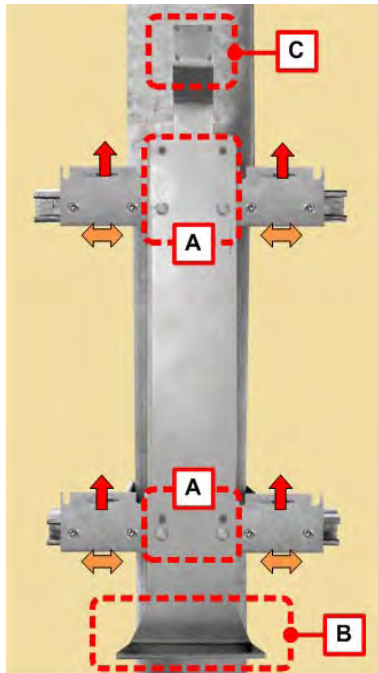
Figure B-19. AS/0597 Mounting Kit – FP/BR0066 and FP/BR0067 Brackets Slot and Flange Orientation for 50W Units

PROCEED TO STEP 14 in the next section to assemble the AS/0415 Mounting Kits (AS/0597 Item 3) to the installed AS/0414 Unistruts.

B.2.4.1.3   AS/0597 Item 3: Install the AS/0415 Mounting Kits

Figure B-20 identifies the AS/0415 kit items. **Figure B-19** shows the kits as assembled. Make sure to install the brackets with the slots properly positioned.

ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	2	FP/BR0067	CSAT MOUNTING BRACKET
2	4	HW/M8SPRING NUT	SPRING NUT, M8
3	4	HW/M8X1.25X20MMFHSS	FLAT HEAD SCREW, M8 X 20MM LG
4	4	HW/M8X1.25MMHEX	HEX HEAD BOLT, M8 X 16MM LG
5	4	HW/M8FLATSS	FLAT WASHER, M8
6	4	HW/M8LOCKSS	LOCKWASHER, M8

Figure B-20. AS/0415 Mounting Kit (AS/0596 Item 3 – 2 Req'd)

Continue installation from **Section B.2.4.1.2**. On either side of the assembled FP/BR0066 bracket, do these steps:

14. Slide 2X spring nuts (AS/0415 Item 2) into installation position (spaced 3.00" [72 mm] apart) in the Unistrut channel. Make sure to seat the springs against the interior wall of the channel.
15. For each FP/BR0067 Mounting Bracket (AS/0415 Item 1): Loosely assemble each bracket against the Unistrut and its installed spring nuts using 2X each of the M8 flat head screws (AS/0415 Item 3).
16. **See Figure B-19 and Figure B-28.** Slide each assembled FP/BR0067 bracket against the FP/BR0066 bracket. DO NOT FULLY TIGHTEN THE FLAT HEAD SCREWS AT THIS TIME. THESE BRACKETS MAY NEED TO BE REPOSITIONED TO ACCOMMODATE INSTALLATION OF THE AS/0462 TX SWITCH AND WAVEGUIDE ASSEMBLY TO THE CSAT UNITS. SEE **SECTION B.2.4.3.2**.

B.2.4.2 Install the CSAT 50W Units

Comtech EF Data hardware kit AS/0402-2 is available for assembling CSAT 50W units in 1:1 redundant applications. Contact Comtech EF Data Product Support for more information.

Continue installation from **Section B.2.4.1.3.** Mount the CSATs to the loosely assembled FP/BR0067 Mounting Brackets. **See Figure B-21.** Do these steps:

17. Loosely install 4X each of the M8 hex bolts, flat washers, and lockwashers (AS/0415 Items 4, 5, and 6) into the proper threaded inserts provided in the CSAT housings.
18. Position each CSAT to the surface of the FP/BR0067 Brackets. Make sure that no washers are caught between the CSAT and brackets, and then carefully drop the CSAT into position in the bracket slots.
19. TEMPORARILY secure each CSAT unit by <u>loosely</u> bolting the CSAT mounting hardware at the back of the FP/BR0067 Brackets.
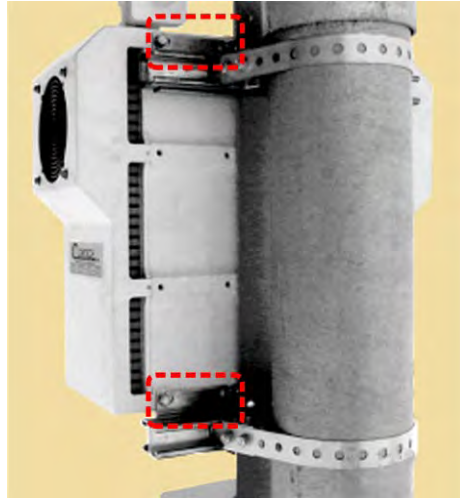
Figure B-21. Assembly Example – 50W Units to FP/BR0067 Brackets

Figure B-21 Notes:
1) The CSAT threaded inserts allow for flexible left-hand (LH) or right-hand (RH) mounting arrangements. See the 50W Dimensional Envelope provided in **Chapter 2. SPECIFICATIONS**.
2) Do not impede air flow. You must install the unit with the exhaust fan(s) facing outward (e.g., opposite the back of the satellite dish). You must also make sure that the air intake vents are free of obstructions.

Once the CSAT units are in initially installed position, you are ready to install the 50W Unit 1:1 RF Switching Components.

B.2.4.3 Install the AS/0458 50W Unit 1:1 RF Switching Components

Figure B-22 shows the AS/0458 kit items. For detailed information on the individual items provided in this kit, refer to the section specified in the table and/or the installation procedures provided in this section.
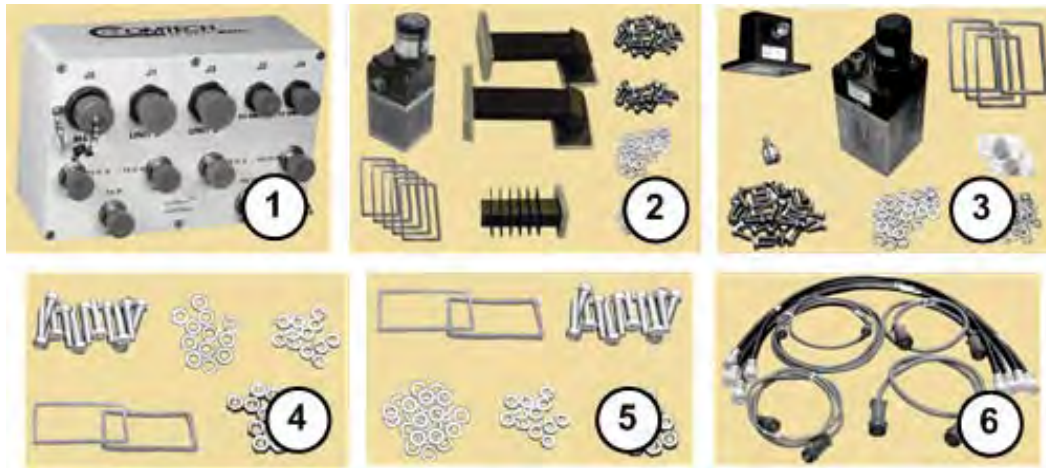
ITEM	QTY	CEFD PART NO.	DESCRIPTION	SECTION
1	1	AS/0490	ASSY, RSU-5060 REDUNDANT SWITCH UNIT (RSU)	B.2.3.3.1
2	1	AS/0462	KIT, TX SWITCH AND WAVEGUIDES	B.2.3.3.2
3	1	AS/0438	KIT, LNA SWITCH AND WAVEGUIDES	B.3.1
4	1	AS/0460	KIT, CPR137 WAVEGUIDE INSTALLATION	SEE NOTE
5	1	AS/0461	KIT, CPR229 WAVEGUIDE INSTALLATION	B.3.3
6	1	AS/0440	KIT, C-BAND RSU CABLING	B.4

Figure B-22. AS/0458 CSAT 50W Unit 1:1 RF Switching Components Kit

The Item 4 AS/0460 CPR137 Waveguide Installation Kit, while included in this kit as ordered from Comtech EF Data, are spare items intended for installation of the Item 2 AS/0462 Tx Switch and Waveguide Kit. They are not otherwise specified for use in this manual.

See Figure B-23. For ease of assembly, installation of the 1:1 RF Switching components is suggested in the following sequence:

- **Feature 'A'** – See Steps 17 through 19 in **Section B.2.4.2** to install the CSAT 50W 1:1 redundant pair onto the FP/BR0067 Mounting Brackets (AS/0415 Item 1).

  > ⓘ For all installations, make sure to position the unit with the exhaust fan(s) facing outward (e.g., opposite the back of the satellite dish). Keep the unit air intake vents free of any obstructions that might otherwise impede air flow.

- **Feature 'B'** – See **Section B.2.4.3.1** to install the AS/0490 RSU-5060 Redundant Switch Unit (RSU) (AS/0458 Item 1) onto the FP/BR0066 RSU/TX Switch Mounting Bracket (AS/0597 Item 1).

- **Feature 'C'** – See **Section B.2.4.3.2** to assemble and install the AS/0462 TX Switch Kit (AS/0458 Item 2) onto the FP/BR0066 RSU/TX Switch Mounting Bracket (AS/0437 Item 1).

- **Feature 'D'** – See **Section B.3.1** to assemble the AS/0438 LNA Switch Kit (AS/0458 Item 3); **Section B.3.2** to assemble the AS/0502 TRF Support Bracket Kit; and **Section B.3.3** to install the assembled LNA Switch and TRF w/Support Bracket to the antenna OMT using the AS/0461 CPR229 Waveguide Installation Kit (AS/0458 Item 5).

- **Feature 'E'** – See **Section B.4** to install the AS/0440 1:1 C-Band RSU Cabling Kit (AS/0458 Item 6).
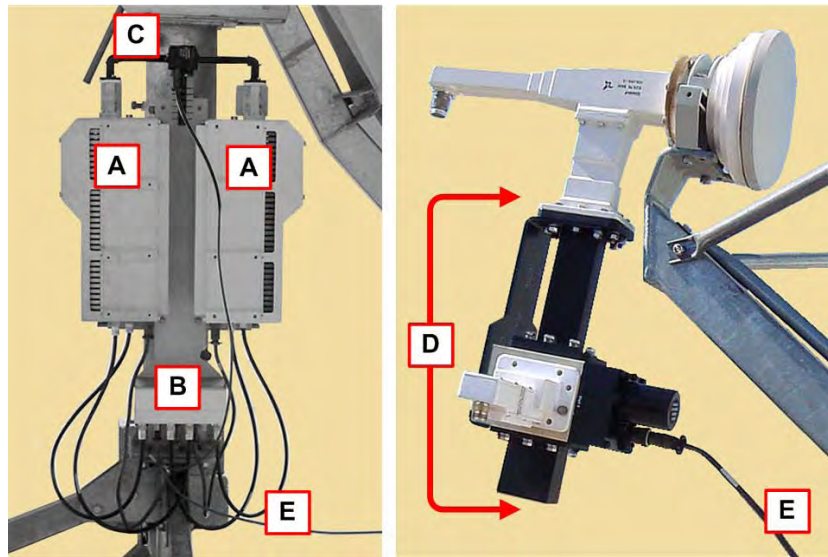
Figure B-23. CSAT 50W 1:1 RF Switching Components

B.2.4.3.1 AS/0458 Item 1: Install the AS/0490 RSU-5060 Redundant Switch Unit (RSU)
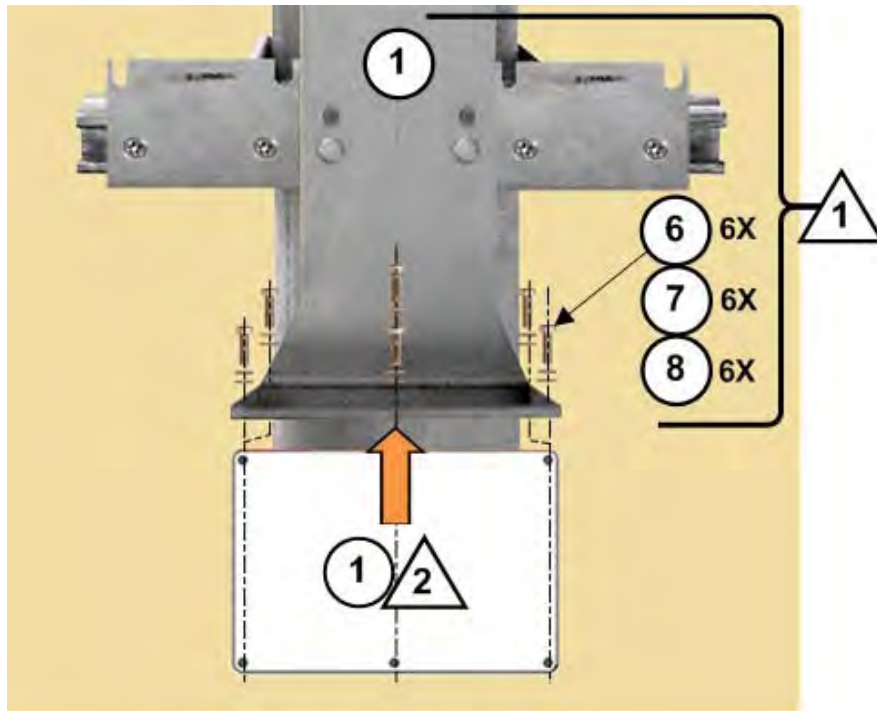
Figure B-24. Install the RSU

Figure B-24 Notes:
1) Item 1 and Items 6, 7, and 8 as noted here are part of AS/0597 Item 2 (AS/0437 1:1 RSU/TX Switch Mounting Kit – **Figure B-18**).
2) Item 1 as noted here is AS/0458 Item 1 (**Figure B-22**) – the AS/0490 RSU-5060 Redundant Switch Unit (RSU).
3) The CSAT units are not shown for clarity.

See **Figure B-23** and **Figure B-24**. Do these steps:
1. Place the RSU box assembly (AS/0458 Item 1) against the bottom face of the FP/BR0066 RSU/TX Switch Mounting Bracket's RSU mounting flange.

    ⓘ The hole pattern for the RSU's M5 threaded inserts is offset to force the correct orientation of the RSU to the RSU/TX Switch Mounting Bracket.

2. Use the (6X each) M5 hex bolts, flat washers, and lockwashers (AS/0437 Items 6, 7, and 8) to secure the RSU in place.

B.2.4.3.2   AS/0458 Item 2: Assemble and Install the AS/0462 1:1 TX Switch and Waveguide Kit
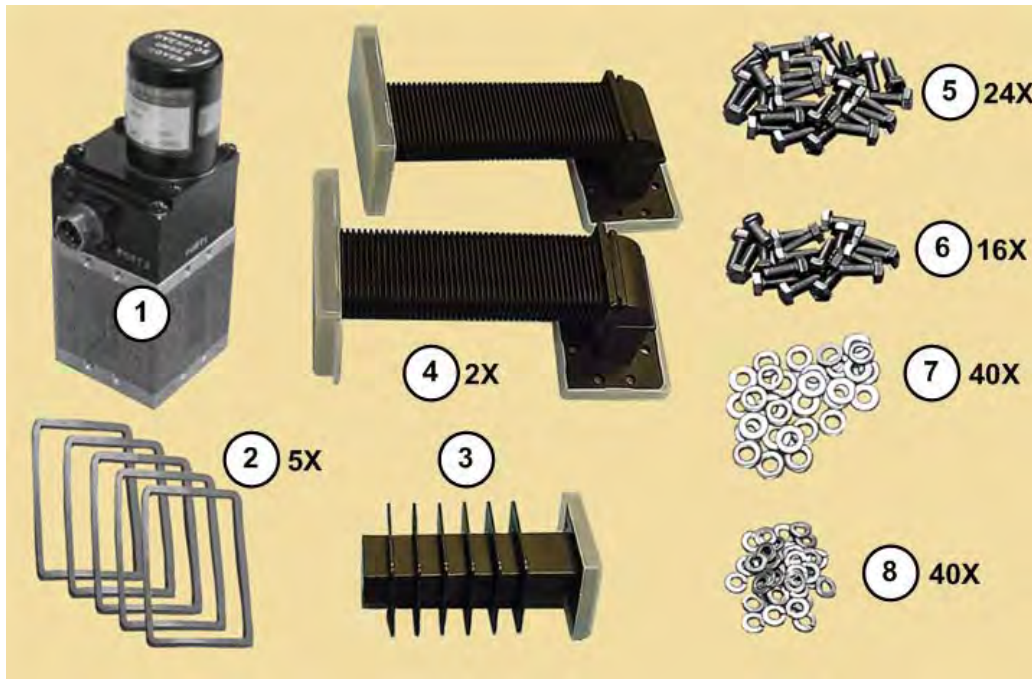
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	SW/WG3AGSM	SWITCH, CPR137G, +24V, SEALED, METRIC
2	5	GA/GSKTCP137FUL	GASKET, CPR137, FULL THICKNESS
3	1	FP/WG0034	WAVEGUIDE TERMINATION, SMALL FINS
4	2	FP/WG0043	WAVEGUIDE, CPR137, 90° "E" 5.50 FLEX X 2.00
5	24	HW/M5X.08X12MMHEX	BOLT, HEX HEAD, M5 X 12MM LG
6	16	HW/M5X.08X15MMHEX	BOLT, HEX HEAD, M5 X 15MM LG
7	40	HW/M5FLAT	WASHER, FLAT, M5
8	40	HW/M5LOCK	LOCKWASHER, M5

Figure B-25. AS/0462 TX Switch and Waveguide Installation Kit (AS/0458 Item 2)

You must pre-assemble the TX Switch components before you can install the switch in its operating position. Unless noted, all items specified here are components of AS/0458 Kit Item 2 (AS/0462 TX Switch and Waveguide Installation Kit).

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Do these steps:
1. Remove the protective coverings from the TX Switch (Item 1) Ports [1] through [3]. Remove the dust caps from the Item 3 and 4 Switch-side waveguide flanges. (Leave the CSAT-side flanges capped.) MAKE SURE TO KEEP ALL SURFACES CLEAN AT ALL TIMES!
2. Install the gaskets (Item 2) into the three flange grooves.
3. Use 8X each of the M5 12mm long hex bolts, flat washers, and lockwashers (Items 5, 7, and 8) to assemble the Termination (Item 3) to Switch Port [2].
4. Typical for both Waveguides (Item 3): Use 8X each of the M5 12mm long hex bolts, flat washers, and lockwashers (Items 5, 7, and 8) to assemble the Waveguides to Switch Ports [1] and [3].

> **See Figure B-26.** Make sure to install the switch components to the correct ports:
> - Port [1] – TX from the CSAT Unit 'A' 'J2 | RF OUT' waveguide flange.
> - Port [2] – Termination.
> - Port [3] – TX the CSAT Unit 'B' 'J2 | RF OUT' waveguide flange.
> - Port [4] – User RF output (to Antenna).
> - The circular connector receptacle adjacent to Port [2] accommodates the switching control cable that connects the redundant system to the RSU-5060 'J4 | TX SWITCH' connector. Protect this interface until the redundant system is ready for cabling.

5. **See Figure B-27.** Item 1 and Items 9, 10, and 11 in this figure are part of AS/0597 Item 2 – the AS/0437 RSU/TX Switch Mounting Kit (**Figure B-18**). Secure the TX Switch Assembly to the FP/BR0066 RSU/TX Switch Mounting Bracket (Item 1):
   a. Place the TX Switch assembly against the <u>front</u> face of the TX Switch flange (on the FP/BR0066 bracket).
   b. From the <u>back</u> face of the FP/BR0066 bracket TX Switch flange: Use the M4 pan head screws, flat washers, and lockwashers (Items 9, 10, and 11) to secure the TX Switch in operating position.
6. Install the two remaining gaskets (AS/0462 Item 2) into the flange grooves (waveguide CSAT-side flanges).
7. Mate the TX Switch and Waveguide assembly to the CSAT units. Make sure to keep the gaskets firmly seated while assembling the flanges. Flex

the TX Switch waveguide ducts (AS/0462 Item 4) as needed to align the flanges to the CSAT 'J2 | RF OUT' waveguide flanges. **Figure B-27** shows a properly aligned configuration that is ready for boltdown to the CSAT unit 'J2 | RF OUT' waveguide flanges.

8. IF THE FLANGES ALIGN CORRECTLY, THE SYSTEM IS READY TO BE SECURED:
   a. Mark the Unistruts at the edges of each of the FP/BR0067 brackets to note their existing locations.
   b. Carefully remove the CSAT units from their assembled positions.
   c. Make sure the FP/BR0067 brackets are in their as-installed locations. Securely tighten the flat head screws.
   d. Re-install the CSAT units onto the FP/BR0067 brackets. (Take care not to damage TX Switch if left in its assembled position.) Securely tighten the mounting hardware.

9. IF YOU ARE UNABLE TO PROPERLY ALIGN THE FLEXIBLE WAVEGUIDE DUCT FLANGES AT MINIMUM SPACING (I.E., FULLY COMPACTED), REPOSITION THE FP/BR0067 BRACKET SETS TO ACCOMMODATE FINAL ASSEMBLY. **See Figure B-28:**
   a. Slide the CSAT units as needed along the Unistruts until the CSAT flanges line up with the TX Switch flanges.
   b. Mark the Unistruts at the edges of each of the repositioned FP/BR0067 brackets to note their new locations.
   c. Remove the CSAT units from their assembled positions.
   d. Make sure the FP/BR0067 brackets are in their marked locations. Securely tighten the flat head screws.
   e. Re-install the CSAT units onto the FP/BR0067 brackets. (Take care not to damage the TX Switch if left in its assembled position.) Securely tighten the mounting hardware.

10. **See Figure B-29**. Use 8X each of the M5 15mm long hex bolts, flat washers, and lockwashers (AS/0462 kit Items 6, 7 and 8) to secure each TX Switch flange to its CSAT waveguide flange.

With the TX Switch installed, you are ready to assemble and install the CSAT 1:1 Redundancy Low Noise Amplifiers (LNAs):

- See **Section B.3.1** to assemble the AS/0438 LNA Switch Kit (AS/0458 Item 3);
- See **Section B.3.2** to assemble the AS/0502 TRF Support Bracket Kit;

- See **Section B.3.3** to install the assembled LNA Switch and TRF w/Support Bracket to the antenna OMT using the AS/0461 CPR229 Waveguide Installation Kit (AS/0458 Item 5).
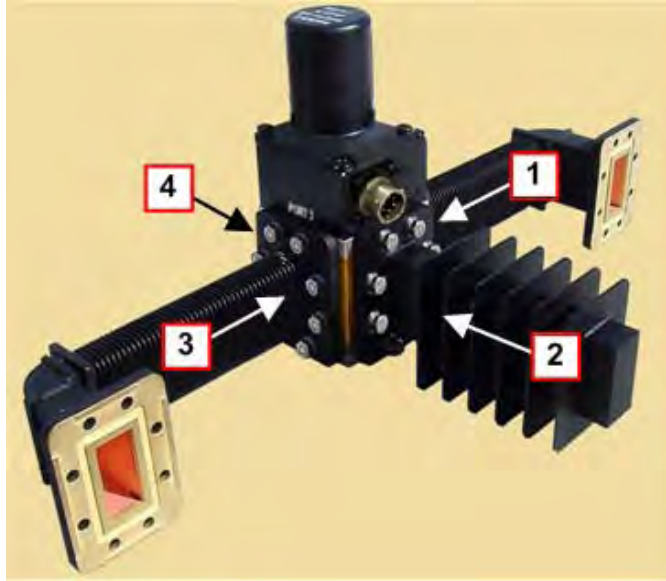
Figure B-26. AS/0462 Kit Assembly – Switch Port Assignments
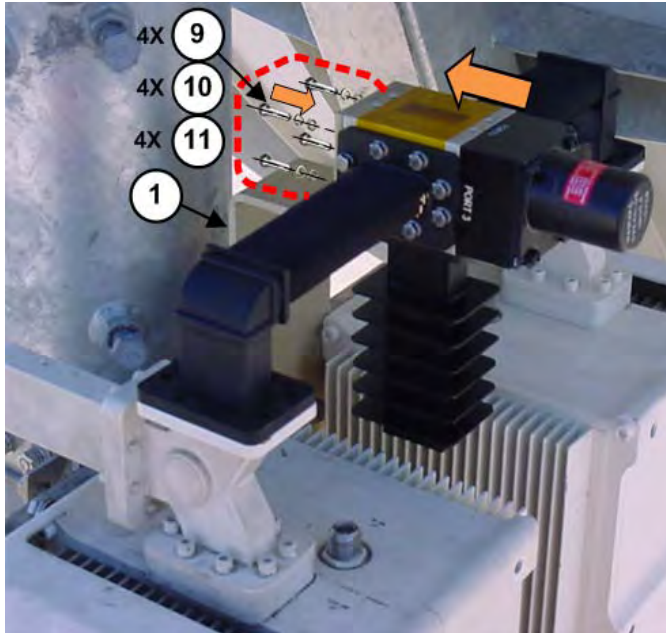
Figure B-27. AS/0462 TX Switch Installation Onto the FP/BR0066 RSU/TX Switch Mounting Bracket
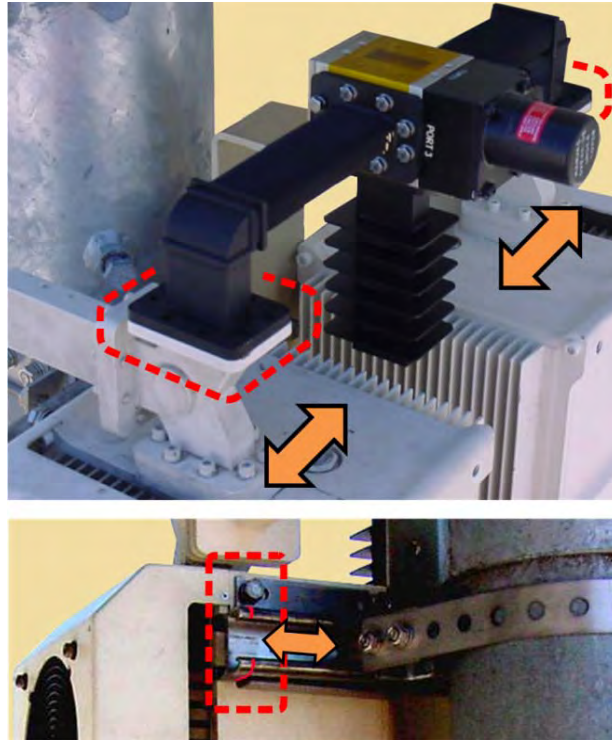
Figure B-28. AS/0462 TX Switch Installation – Reposition CSAT Units to Accommodate Waveguide Flange Assembly
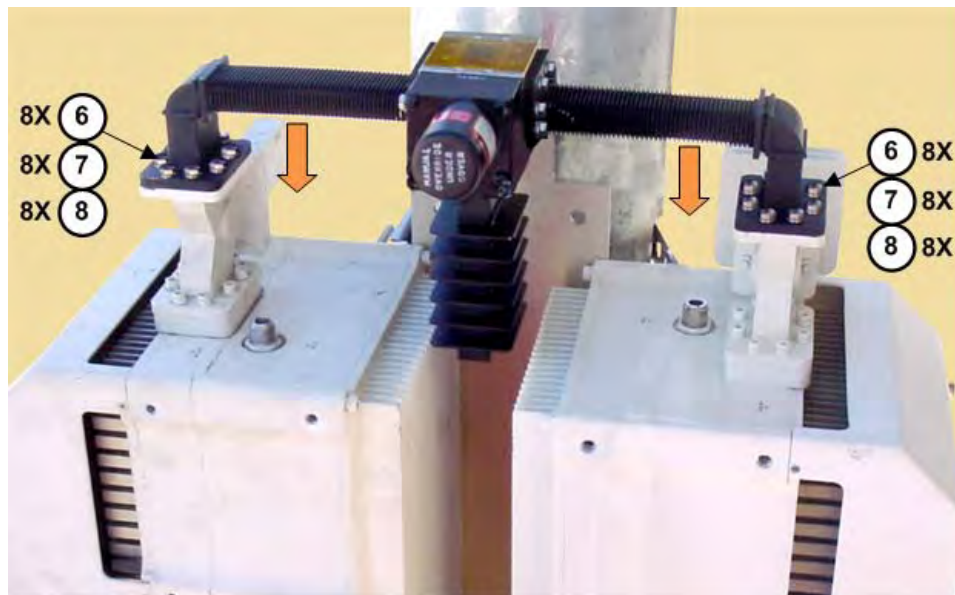
Figure B-29. AS/0462 TX Switch Installation – Final Boltdown to CSAT Unit Waveguides

B.2.5   CSAT-5060 100W or 125W, CSAT-6070 100W Unit 1:1 Redundant System Installation

For detailed installation information, refer to the following sections:

- See **Section B.2.5.1** to install the AS/0598 CSAT 100W/125W Unit 1:1 Mounting Kit.
- See **Section B.2.5.2** to install the CSAT 100W/125W 1:1 redundant pair.
- See **Section B.2.5.3** to install the AS/0511 CSAT 100W/125W Unit 1:1 RF Switching Components.

B.2.5.1   Install the AS/0598 1:1 Mounting Kit

Figure B-30 identifies the AS/0598 kit items. Use this kit to install two CSAT-5060 100W/125W or CSAT-6070 100W units in a 1:1 redundancy configuration. For detailed information on the individual items provided in this kit, refer to the section specified in the table and/or the installation procedures provided in this section.
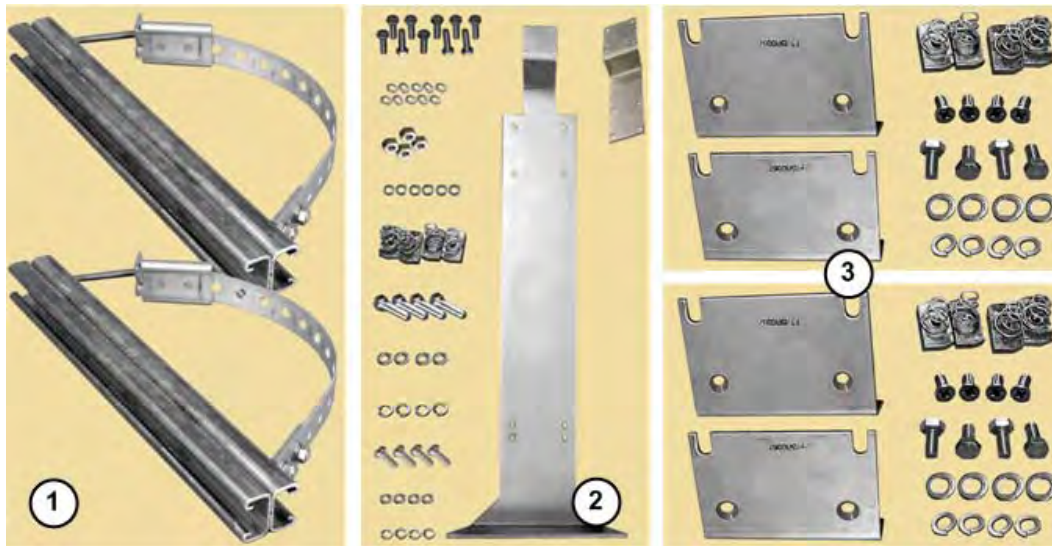
ITEM	QTY	CEFD PART NO.	DESCRIPTION	SECTION
1	2	AS/0414	UNIVERSAL POLE MOUNTING KIT	B.2.5.1.1
2	1	AS/0479	1:1 RSU/TX SWITCH MOUNTING KIT	B.2.5.1.2
3	2	AS/0415	CSAT MOUNTING KIT	B.2.5.1.3

Figure B-30. AS/0598 CSAT 100W/125W Unit 1:1 Mounting Kit

B.2.5.1.1 AS/0598 Item 1: Install the AS/0414 Universal Pole Kits

Do these steps to install each kit:

FOR STEPS 1 THROUGH 11: Assemble the two AS/0414 Universal Pole Mounting Kits (AS/0598 Item 1) onto the satellite dish support pole. See **Section B.2.1** for these installation tasks.

> ⓘ **See Figure B-31.** Use the FP/BR0066 RSU/TX Switch Mounting Bracket (part of AS/0598 Item 2) as the guide: the vertical spacing between the two assembled Unistruts kits should measure **19.82" [503 mm]** apart (top edge to top edge). See **Section B.2.1** if you need to adjust this spacing.

Figure B-31. AS/0414 Kit Spacing for CSAT 100W/125W Units

PROCEED TO STEP 12 in the next section to assemble the AS/0479 1:1 RSU/TX Switch Mounting Kit (AS/0598 Item 2) to the installed AS/0414 Unistruts.

B.2.5.1.2   AS/0598 Item 2: Install the AS/0479 RSU/TX Switch Mounting Kit

Figure B-32 identifies the AS/0479 kit items. **Figure B-34** shows the kits as assembled.
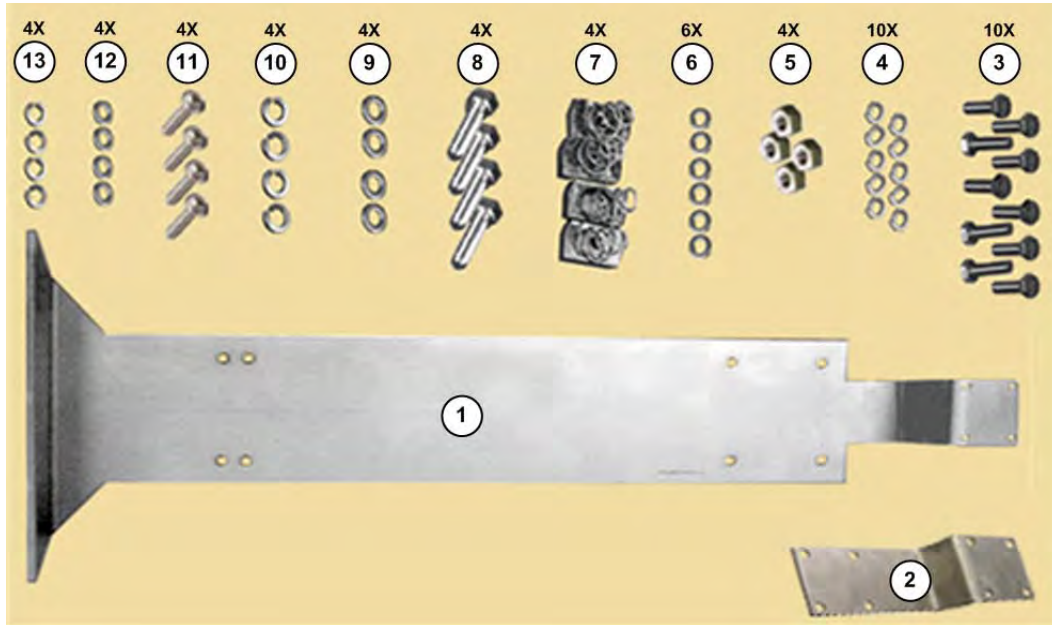
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	FP/BR0066	BRACKET, RSU/TX SWITCH MOUNTING
2	1	FP/BR0082	BRACKET, EXTENSION
3	10	HW/M5X.08X15MMHEX	BOLT, HEX HEAD, M5 X 15MM LG
4	10	HW/M5LOCK	LOCKWASHER, M5
5	4	HW/M5X.08HEXNUT	NUT, HEX, M5
6	6	HW/M5FLAT	FLAT WASHER, M5
7	4	HW/M8SPRINGNUT	SPRINGNUT, M8
8	4	HW/M8X1.25X25HEXSS	BOLT, HEX HEAD, M8 X 25MM LG
9	4	HW/M8FLATSS	FLAT WASHER, M8
10	4	HW/M8LOCKSS	LOCKWASHER, M8
11	4	HW/M4X10PHP	SCREW, PAN HEAD PHILLIPS, M4 X10 MM LG
12	4	HW/M4FLAT	FLAT WASHER, M4
13	4	HW/M4LOCK	LOCKWASHER, M4

Figure B-32. AS/0479 RSU/TX Switch Mounting Kit (AS/0598 Item 2)

Figure B-32 Note:
Set aside AS/0479 6X each of Items 3, 4, and 6 for installation of the AS/0490 RSU-5060 Redundant Switch Unit (RSU) (see **Section B.2.5.3.1**). Set aside Items 11 through 13 for installation of the AS/0478 TX Switch and Waveguide Installation Kit (see **Section B.2.5.3.2**).

Continue with installation from **Section B.2.5.1.1**. Do these steps:

12. See **Figure B-33**. Assemble the FP/BR0082 Extension Bracket (Item 2) onto the FP/BR0066 RSU/TX Switch Mounting Bracket (Item 1). Use 4X each of the M5 hex bolts, lock washers, and hex nuts (Items 3, 4 and 5) to assemble the brackets as shown.
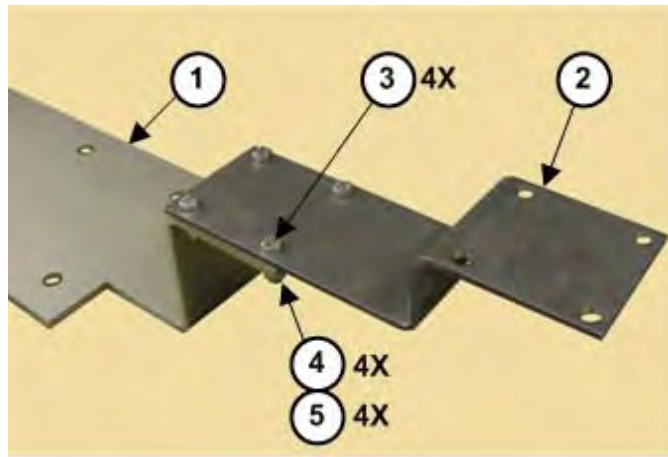
Figure B-33. AS/0479 RSU/TX Switch Mounting Kit – Extension Bracket Assembly

13. Slide two M8 spring nuts (AS/0479 Item 7) into installation position (3.50" [89 mm] apart, centered to the support pole) into each Unistrut channel. Make sure to seat the springs against the interior wall of the channel.

14. Loosely assemble the assembled brackets (AS/0479 Items 1 and 2) into position against the Unistruts and the installed M8 spring nuts using (2X per Unistrut) M8 hex bolts, flat washers, and lockwashers (AS/0479 Items 8, 9 and 10). Re-center the assembled bracket to the pole if necessary, and tighten all hardware to complete assembly.

See Figure B-34:
1) Make note of the correct use of the bracket mounting holes (Feature 'A'). Installation of the 100W or 125W units is "keyed" to use the upper set of holes.
2) Make note of the correct orientation of the assembled switch

brackets. The RSU mounting flange (Feature 'B') is positioned at the
<u>bottom</u>; by default, this positions the TX Switch "extended"
mounting flange (Feature 'C') at the <u>top</u>.
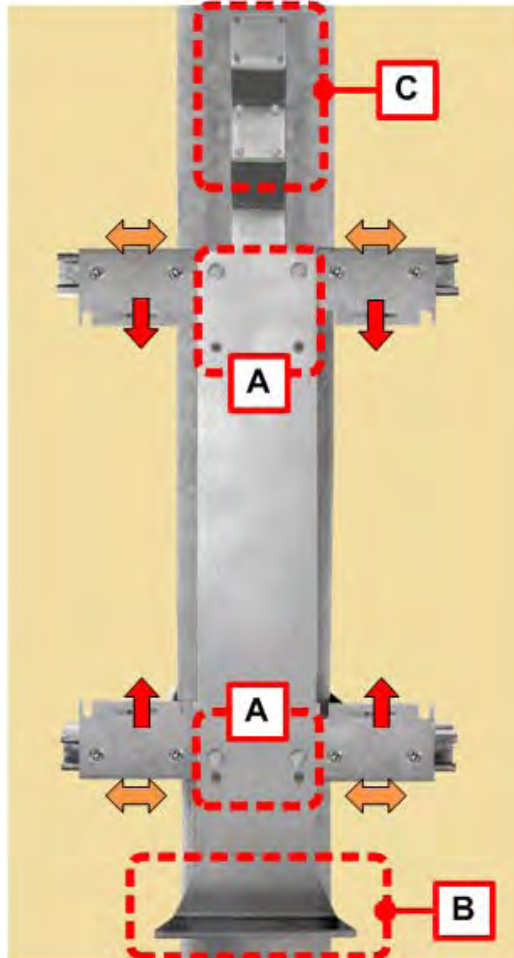
**Figure B-34. AS/0598 Mounting Kit – FP/BR0066 and FP/BR0082,
FR/BR0067 Brackets Slot and Flange Orientation for 100W/125W Units**

PROCEED TO STEP 15 in the next section to assemble the AS/0415 Mounting Kits
(AS/0598 Item 3) to the installed AS/0414 Unistruts.

B.2.5.1.3   AS/0598 Item 3: Install the AS/0415 Mounting Kits

Figure B-35 identifies the AS/0415 kit items. **Figure B-34** shows the kits as assembled. Make sure to install the brackets with the slots properly positioned.

ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	2	FP/BR0067	MOUNTING BRACKET
2	4	HW/M8SPRING NUT	SPRING NUT, M8
3	4	HW/M8X1.25X20MMFHSS	FLAT HEAD SCREW, M8 X 20MM LG
4	4	HW/M8X1.25MMHEX	HEX HEAD BOLT, M8 X 16MM LG
5	4	HW/M8FLATSS	FLAT WASHER, M8
6	4	HW/M8LOCKSS	LOCKWASHER, M8

Figure B-35. AS/0415 Mounting Kit (AS/0598 Item 3 – 2 Req'd)

Continue with installation from **Section B.2.5.1.2**. On either side of the assembled FP/BR0066 bracket, do these steps:

15. Slide 2X spring nuts (AS/0415 Item 2) into installation position (3.00" [72 mm] apart) in the Unistrut channel. Make sure to seat the springs against the interior wall of the channel.
16. For each FP/BR0067 Mounting Bracket (AS/0415 Item 1): Loosely assemble each bracket against the Unistrut and its installed spring nuts using 2X each of the M8 flat head screws (AS/0415 Item 3).
17. See **Figure B-34** and **Figure B-36**. Make note of the correct slot orientation of the FP/BR0067 brackets. DO NOT FULLY TIGHTEN THE FLAT HEAD SCREWS AT THIS TIME. THESE BRACKETS MAY NEED TO BE REPOSITIONED TO ACCOMMODATE INSTALLATION OF THE AS/0478 TX SWITCH AND WAVEGUIDE ASSEMBLY TO THE CSAT UNITS. SEE **SECTION B.2.5.3.2**.

B.2.5.2 Install the CSAT 100W or 125W Units

(!) Comtech EF Data hardware kit AS/0402-2 is available for assembling CSAT 100W or 125W units in 1:1 redundant applications. Contact Comtech EF Data Product Support for more information.

Continue installation from **Section B.2.5.1.2**. Mount the CSATs to the loosely assembled FP/BR0067 Mounting Brackets. **See Figure B-36.** Do these steps:

18. Loosely install 4X each of the M8 hex bolts, flat washers, and lockwashers (AS/0415 Items 4, 5, and 6) into the proper threaded inserts provided in the CSAT housings.
19. Position each CSAT to the surface of the FP/BR0067 Brackets. Engage the upper hex bolts within the upper bracket's slots. Make sure that no washers are caught between the CSAT and brackets. Carefully drop the CSAT into position in the bottom bracket's slots.
20. TEMPORARILY secure each CSAT unit by <u>loosely</u> bolting the CSAT mounting hardware at the back of the FP/BR0067 Brackets.
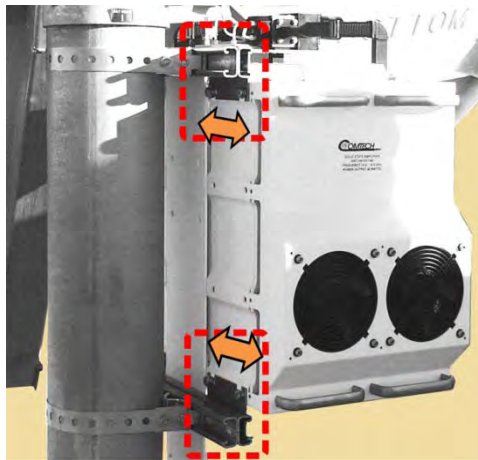
Figure B-36. Assembly Example – 100W/125W Units to FP/BR0067 Brackets

(!) **Figure B-36 Notes:**
1) The CSAT threaded inserts allow for flexible left-hand (LH) or right-hand (RH) mounting arrangements. See the 100W/125W Dimensional Envelope provided in **Chapter2. SPECIFICATIONS**.
2) Do not impede air flow. You must install the unit with the exhaust fan(s) facing outward (e.g., opposite the back of the satellite dish). You must also make sure that the air intake vents are free of obstructions.

Once the CSAT units are in initially installed position, you are ready to install the Kit AS/0511 100W or 125W Unit 1:1 RF Switching Components.

B.2.5.3   Install the AS/0511 100W or 125W Unit 1:1 RF Switching Components

Figure B-37 shows the AS/0511 kit items. For detailed information on the individual items provided in this kit, refer to the section specified in the table and/or the installation procedures provided in this section.

ITEM	QTY	CEFD PART NO.	DESCRIPTION	SECTION
1	1	AS/0490	ASSY, RSU-5060 REDUNDANT SWITCH UNIT (RSU)	B.2.5.3.1
2	1	AS/0478	KIT, TX SWITCH AND WAVEGUIDES	B.2.5.3.2
3	1	AS/0438	KIT, LNA SWITCH	B.3.1
4	1	AS/0460	KIT, CPR137 WAVEGUIDE INSTALLATION	SEE NOTE
5	1	AS/0461	KIT, CPR229 WAVEGUIDE INSTALLATION	B.3.3
6	1	AS/0440	KIT, C-BAND RSU CABLING	B.4

Figure B-37. AS/0511 CSAT 100W/125W Unit 1:1 RF Switching Components Kit

The Item 4 AS/0460 CPR137 Waveguide Installation Kit, while included in this kit as ordered from Comtech EF Data, are spare items intended for installation of the Item 2 AS/0478 Tx Switch and Waveguide Kit. They are not otherwise specified for use in this manual.

See Figure B-38. For ease of assembly, installation of the 1:1 RF Switching components is suggested in the following sequence:

- **Feature 'A'** – See Steps 18 through 20 in **Section B.2.5.2** to install the CSAT 100W or 125W 1:1 redundant pair onto the FP/BR0067 Mounting Brackets (AS/0415 Item 1).

  > For all installations, make sure to position the unit with the exhaust fan(s) facing outward (e.g., opposite the back of the satellite dish). Keep the unit air intake vents free of any obstructions that might otherwise impede air flow.

- **Feature 'B'** – See **Section B.2.5.3.1** to install the AS/0490 RSU-5060 Redundant Switch Unit (RSU) (AS/0511 Item 1) onto the FP/BR0066 RSU/TX Switch Mounting Bracket (AS/0479 Item 1).

- **Feature 'C'** – See **Section B.2.5.3.2** to assemble and install the AS/0478 TX Switch and Waveguide Kit (AS/0511 Item 2) onto the FP/BR0082 RSU/TX Switch Mounting Bracket Extension (AS/0479 Item 2).

Further:

- **Feature 'D'** – See **Section B.3.1** to assemble the AS/0438 LNA Switch Kit (AS/0511 Item 3); Section **B.3.2** to assemble the AS/0502 TRF Support Bracket Kit; and Section **B.3.3** to install the assembled LNA Switch and TRF w/Support Bracket to the antenna OMT using the AS/0461 CPR229 Waveguide Installation Kit (AS/0511 Item 5).

- **Feature 'E'** – See **Section B.4** to install the AS/0440 1:1 C-Band RSU Cabling Kit (AS/0511 Item 6).
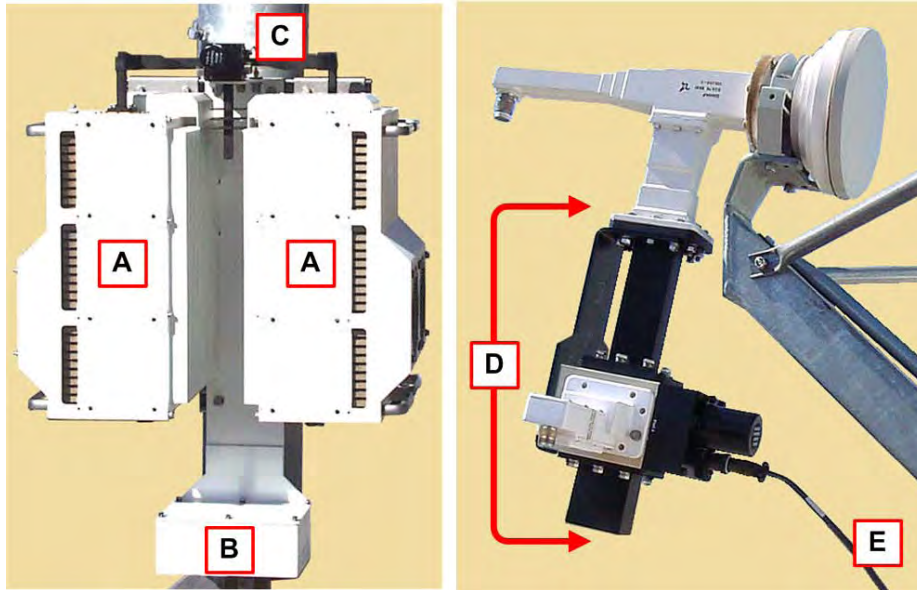
Figure B-38. CSAT 100W or 125W 1:1 RF Switching Components

B.2.5.3.1 Install the AS/0490 RSU-5060 Redundant Switch Unit (RSU)
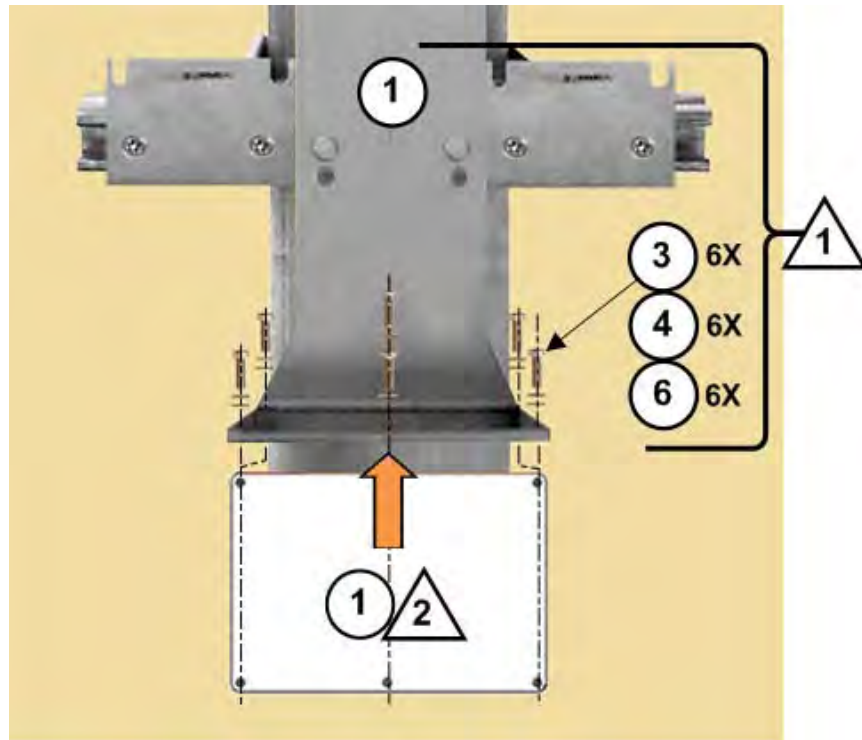
Figure B-39. Install the RSU

Figure B-39 Notes:
1) Items 1 and Items 3, 4, and 6 as noted here are part of AS/0598 Item 2 (AS/0479 1:1 RSU/TX Switch Mounting Kit – see **Figure B-32**).
2) Item 1 as noted here is AS/0511 Item 1 (**Figure B-37**) – the AS/0490 RSU-5060 Redundant Switch Unit (RSU).
3) The CSAT 100W or 125W units are not shown for clarity.

See **Figure B-38** and **Figure B-39**. Do these steps:
1. Place the RSU box against the bottom face of the FP/BR0066 RSU/TX Switch Mounting Bracket's RSU mounting flange.

   > The hole pattern for the RSU's M5 threaded inserts is offset to force the correct orientation of the RSU to the RSU/TX Switch Mounting Bracket.

2. Use the (6X each) M5 hex bolts, flat washers, and lockwashers (AS/0479 Items 3, 4, and 6 – see **Figure B-39**) to secure the RSU in place.

B.2.5.3.2 AS/0511 Item 2: Assemble and Install the AS/0478 1:1 TX Switch and Waveguide Kit
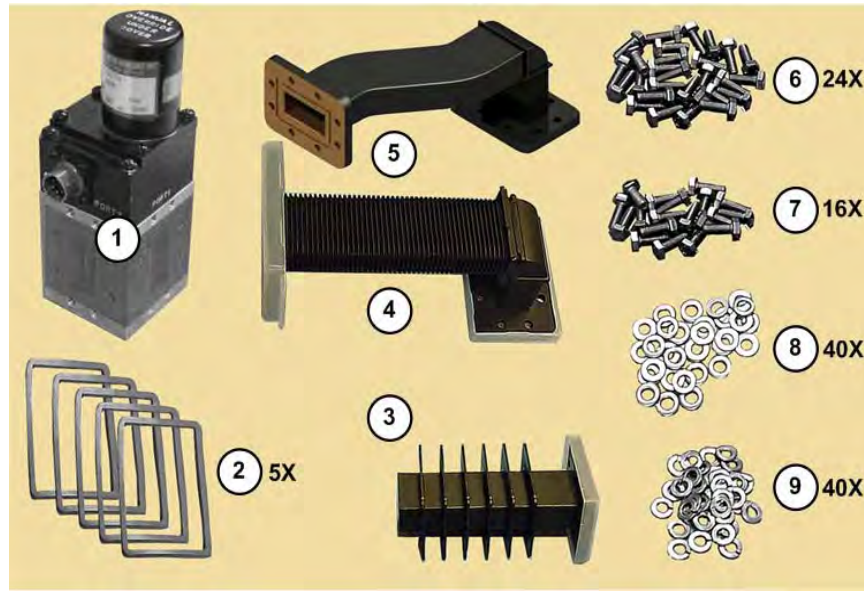
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	SW/WG3AGSM	SWITCH, CPR137G, +24V, SEALED, METRIC
2	5	GA/GSKTCP137FUL	GASKET, CPR137, FULL THICKNESS
3	1	FP/WG0034	WAVEGUIDE TERMINATION, SMALL FINS
4	1	FP/WG0043	WAVEGUIDE, CPR137, 90° "E" 5.50 FLEX X 2.00
5	1	FP/WG0051	WAVEGUIDE, CPR137, JOGGED
6	24	HW/M5X.08X12MMHEX	BOLT, HEX HEAD, M5 X 12MM LG
7	16	HW/M5X.08X15MMHEX	BOLT, HEX HEAD, M5 X 15MM LG
8	40	HW/M5FLAT	WASHER, FLAT, M5
9	40	HW/M5LOCK	LOCKWASHER, M5

Figure B-40. AS/0478 TX Switch and Waveguide Installation Kit

You must pre-assemble the TX Switch components before you can install the switch in its operating position. Unless noted, all items specified here are components of AS/0511 Kit Item 2 (AS/0478 TX Switch and Waveguide Installation Kit).

Do these steps:
1. Remove the protective coverings from the TX Switch (Item 1) Ports [1] through [3]. Remove the dust caps from the Item 3, 4, and 5 Switch-side

waveguide flanges. (Leave the CSAT-side flanges capped.) MAKE SURE TO KEEP ALL SURFACES CLEAN AT ALL TIMES!

2. Install the gaskets (Item 2) into the three flange grooves.

3. Use 8X each of the M5 12mm long hex bolts, flat washers, and lockwashers (Items 6, 8, and 9) to secure the Termination (Item 3) to Switch Port [2].

4. Use 8X each of the M5 12mm long hex bolts, flat washers, and lockwashers (Items 6, 8, and 9) to assemble each Waveguide to the Switch: Item 4 to Port [1], and Item 5 to Port [3].

> **See Figure B-41.** Make sure to install the switch components to the correct ports:
> * Port [1] – TX from the Item 5 "JOGGED" waveguide flange to the CSAT Unit 'A' 'J2 | RF OUT' waveguide flange.
> * Port [2] – Termination.
> * Port [3] – TX from the Item 4 "FLEX" waveguide flange to the CSAT Unit 'B' 'J2 | RF OUT' waveguide flange.
> * Port [4] – User RF output (to Antenna).
> * The circular connector receptacle adjacent to Port [2] accommodates the switching control cable that connects the redundant system to the RSU-5060 'J4 | TX SWITCH' connector. Protect this interface until the redundant system is ready for cabling.

5. **See Figure B-42.** Secure the AS/0478 TX Switch and Waveguide Assembly (Feature 'D') to the FP/BR0082 Bracket Extension (part of Feature 'B'):

    a. Place the TX Switch assembly against the front face of the switch mounting flange.

    b. From the back face of the flange: Use the 4X M4 pan head screws, flat washers, and lockwashers (AS/0598 Items 11, 12, and 13) to secure the TX Switch in operating position.

6. Install the two remaining gaskets (AS/0478 Item 2) into the flange grooves (waveguide CSAT-side flanges).

7. Mate the TX Switch and Waveguide assembly to the CSAT units. Make sure to keep the gaskets firmly seated while assembling the flanges. Flex the TX Switch waveguide ducts (AS/0478 Items 4 and 5) as needed to align the flanges to the CSAT 'J2 | RF OUT' waveguide flanges.

> **CAUTION** – DO NOT remove the factory-installed waveguide combiner from the CSAT 'J2 | RF OUT' interface. Improper installation will damage the unit and void your warranty.

8. IF THE FLANGES ALIGN CORRECTLY, THE SYSTEM IS READY TO BE SECURED:
   a. Mark the Unistruts at the edges of each of the FP/BR0067 brackets to note their existing locations.
   b. Carefully remove the CSAT units from their assembled positions.
   c. Make sure the FP/BR0067 brackets are in their as-installed locations. Securely tighten the flat head screws.
   d. Re-install the CSAT units onto the FP/BR0067 brackets. (Take care not to damage TX Switch if left in its assembled position.) Securely tighten the mounting hardware.

9. IF YOU ARE UNABLE TO PROPERLY ALIGN THE FLEXIBLE WAVEGUIDE DUCT FLANGES AT MINIMUM SPACING (I.E., FULLY COMPACTED), REPOSITION THE FP/BR0067 BRACKET SETS TO ACCOMMODATE FINAL ASSEMBLY. **See Figure B-43:**
   a. Slide the CSAT units as needed along the Unistruts until the CSAT flanges line up with the TX Switch flanges.
   b. Mark the Unistruts at the edges of each of the repositioned FP/BR0067 brackets to note their new locations.
   c. Remove the CSAT units from their assembled positions.
   d. Make sure the FP/BR0067 brackets are in their marked locations. Securely tighten the flat head screws.
   e. Re-install the CSAT units onto the FP/BR0067 brackets. (Take care not to damage the TX Switch and Waveguide Assembly if left in its assembled position.) Securely tighten the mounting hardware.

10. **See Figure B-42**. Use 8X each of the M5 15mm long hex bolts, flat washers, and lockwashers (AS/0478 kit Items 7, 8, and 9) to secure each TX Switch flange to its CSAT waveguide flange.

With the TX Switch installed, you are ready to assemble and install the CSAT 1:1 Redundancy Low Noise Amplifiers (LNAs):

- See **Section B.3.1** to assemble the AS/0438 LNA Switch Kit (AS/0511 Item 3);
- See **Section B.3.2** to assemble the AS/0502 TRF Support Bracket Kit;
- See **Section B.3.3** to install the assembled LNA Switch and TRF w/Support Bracket to the antenna OMT using the AS/0461 CPR229 Waveguide Installation Kit (AS/0511 Item 5).
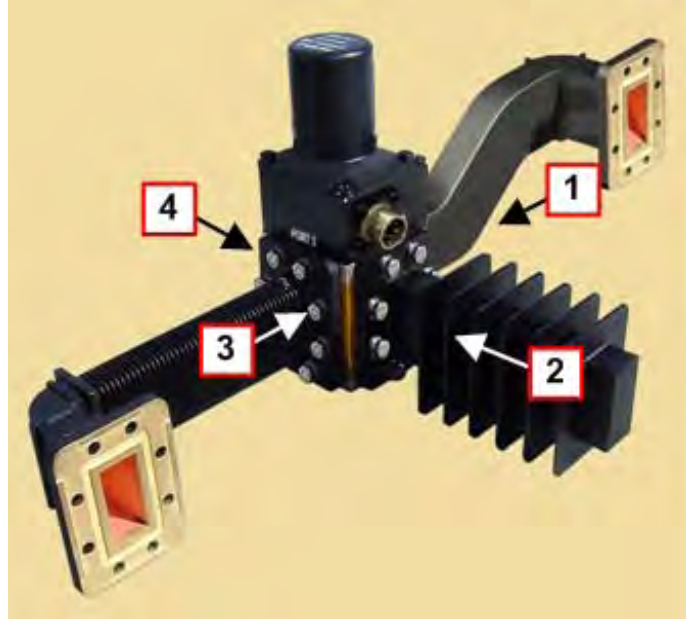
Figure B-41. AS/0478 Kit Assembly – Switch Port Assignments
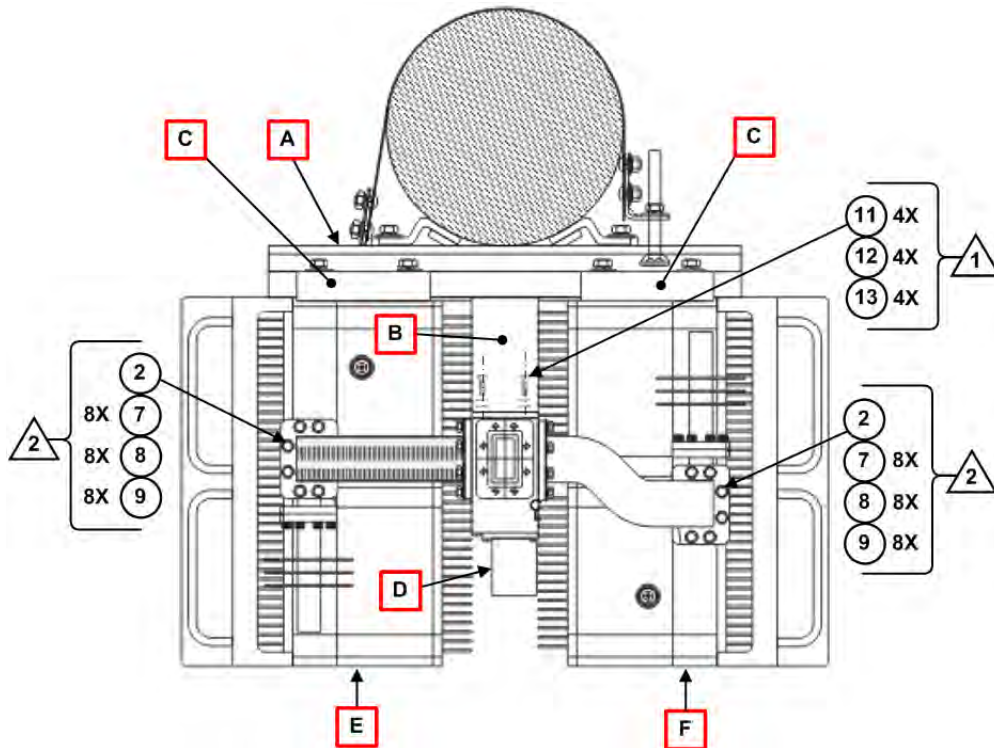
Figure B-42. CSAT 100/125W 1:1 Redundancy System Components Assembly

Figure B-42 Notes:

1) Items 11, 12, and 13 are part of the AS/0598 RSU/TX Switch Mounting Kit.
2) Items 2, 7, 8, and 9 are part of the AS/0478 TX Switch and Waveguide Kit.
3) Assembled 1:1 Redundancy System components are as shown:
   - **Feature 'A'** – AS/0414 Universal Pole Kit
   - **Feature 'B'** – AS/0598 RSU/TX Switch Mounting Kit Brackets
   - **Feature 'C'** – AS/0415 CSAT Mounting Kit FP/BR0067 Brackets
   - **Feature 'D'** – AS/0478 TX Switch and Waveguide Kit (Assembled)
   - **Feature 'E'** – CSAT Unit 'A'
   - **Feature 'F'** – CSAT Unit 'B'
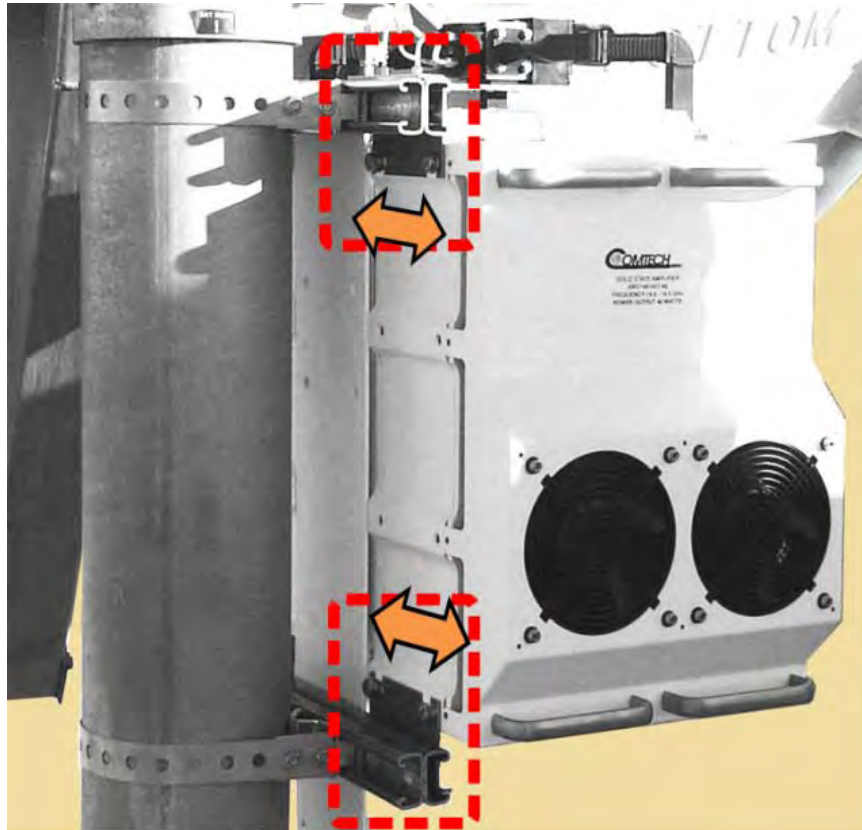
Figure B-43. AS/0462 TX Switch Installation – Reposition CSAT Units to Accommodate Waveguide Flange Assembly

B.3 CSAT 1:1 Redundancy Low Noise Amplifier (LNA) Assembly and Installation

1) Installation of a C-Band LNA is required regardless of unit type or configuration (i.e., one LNA is required for a Standalone configuration, or two LNAs for a 1:1 Redundancy system).
2) The Orthomode Transducer (OMT), Low Noise Amplifiers (LNAs) and Transmit Reject Filter (TRF) are supplied by the user.
3) For detailed information about the C-Band LNA used in CSAT applications, refer to its Installation and Operation Manual (CEFD P/N MN/LNAS.IOM).
4) For any installation, you should perform tasks in the following sequence:
    1. Unpack and inspect all materials as instructed in **Chapter 3. UNPACKING AND INSPECTION**.
    2. Prepare for installation as instructed in **Section B.1.**
    3. Carefully follow the installation procedures outlined in this section.
    4. All CSAT configurations require cable connections, including the AS/0440 1:1 C-Band RSU Cabling Kit:
        - Item 5 in the AS/0510 CSAT 5W to 25W Unit 1:1 RF Switching Components Kit (**Figure B-10**)
        - Item 6 in the AS/0458 CSAT 50W Unit 1:1 RF Switching Components Kit (**Figure B-22**).
        - Item 6 in the AS/0511 CSAT 100W/125W Unit 1:1 RF Switching Components Kit (**Figure B-37**).

See **Figure B-44**. The Redundant Low Noise Amplifier (LNA) Assembly requires two user-supplied LNAs and a user-supplied Transmit Reject Filter (TRF). The LNA Switch and TRF Assemblies install onto the antenna's Orthomode Transducer (OMT) using the AS/0461 CPR229 Waveguide Installation Kit:
- Item 4 in the AS/0510 CSAT 5W to 25W Unit 1:1 RF Switching Components Kit (**Figure B-10**);
- Item 5 in the AS/0458 CSAT 50W Unit 1:1 RF Switching Components Kit (**Figure B-22**).

- Item 5 in the AS/0511 CSAT 100W/125W Unit 1:1 RF Switching Components Kit (**Figure B-37**).
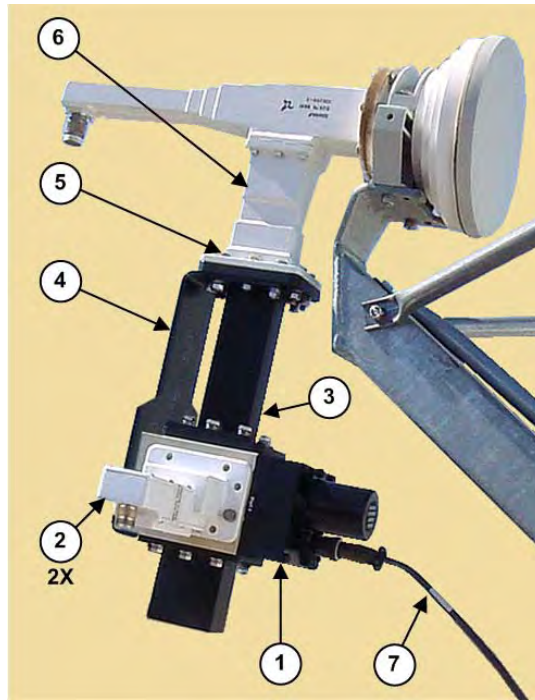
ITEM	QTY	CEFD PART NO.	DESCRIPTION	KIT FIGURE(S)
1	1	AS/0438	KIT, LNA SWITCH	Figure B-45
2	2	USER-SUPPLIED, VARIES BY OPERATIONAL REQUIREMENTS	LOW NOISE AMPLIFIER (LNA)	N/A
3	1	USER-SUPPLIED, VARIES BY OPERATIONAL REQUIREMENTS	TRANSMIT REJECT FILTER (TRF)	N/A
4	1	AS/0502	KIT, TRF SUPPORT BRACKET	Figure B-48
5	1	AS/0461	KIT, CPR229 WAVEGUIDE INSTALLATION	Figure B-50
6	1	USER-SUPPLIED, VARIES BY OPERATIONAL REQUIREMENTS	ORTHOMODE TRANSDUCER (OMT)	N/A
7	1	AS/0440	KIT, C-BAND RSU CABLING	Figure B-53

Figure B-44. Redundant LNA Switch Assembly Items

B.3.1 Kit AS/0438: Assemble the LNA Switch

ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	28P1084	ADAPTER, CPR229 TO TYPE 'N'
2	1	CN/CX50NMALE	CONNECTOR, TYPE 'N' 50Ω TERMINATION
3	1	SW/WG2AGSM	SWITCH, LNA, SEALED, CPR229 +24V
4	4	GA/GSKTCPR229FULL	GASKET, CPR229, FULL THICKNESS
5	36	HW/M6X1X15MMHEX	HEX HEAD BOLT, M6 X 15MM LG
6	36	HW/M6FLAT	FLAT WASHER, M6
7	36	HW/M6LOCK	LOCKWASHER, M6
8	2	15D1002	COVER, DUST, CONNECTOR

Figure B-45. AS/0438 LNA Switch Kit

Do these steps:

1. See **Figure B-46**. Assemble the Termination Connector (Item 2) to the CPR229-to-Type 'N' Adapter (Item 1).

2. Assemble the flanged kit items (i.e., the CPR229-to-Type 'N' Adapter w/Termination Connector) and the user-supplied flanged components (i.e., LNA-A, LNA-B, and the TRF) to the LNA Switch (Item 1). Typical for each component flange:

   a. Remove the protective covers from the component flange and its assigned switch port. MAKE SURE TO KEEP ALL SURFACES CLEAN AT ALL TIMES!

   b. Install a gasket (Item 4) into each component's flange groove.

c. Secure each component to the switch with the required quantity of M6 hex bolts, flat washers, and lockwashers (Items 5, 6, and 7).

Figure B-46. Assemble the Adapter and Termination

Figure B-47. LNA Switch – Port Assignments

See Figure B-47. The component port assignments and mounting hardware set (Items 5, 6, and 7) quantities are as follows:

- Port [1] – LNA-B (USER-SUPPLIED): Use 8 sets.
- Port [2] – CPR229-to-Type 'N' Adapter w/Termination (Items 3 and 4): Use 10 sets.

- Port [3] – LNA-A (USER-SUPPLIED): Use 8 sets.
- Port [4] – TRANSMIT REJECT FILTER (TRF) (USER-SUPPLIED): Use 10 sets.
- The circular connector receptacle provided on this switch accommodates the switching control cable that connects the LNA Switch to the RSU-5060 'J2 | RX SWITCH' connector. Protect this interface until the redundant system is ready for cabling.

B.3.2   Kit AS/0502: Assemble the TRF Support Bracket to the LNA Switch
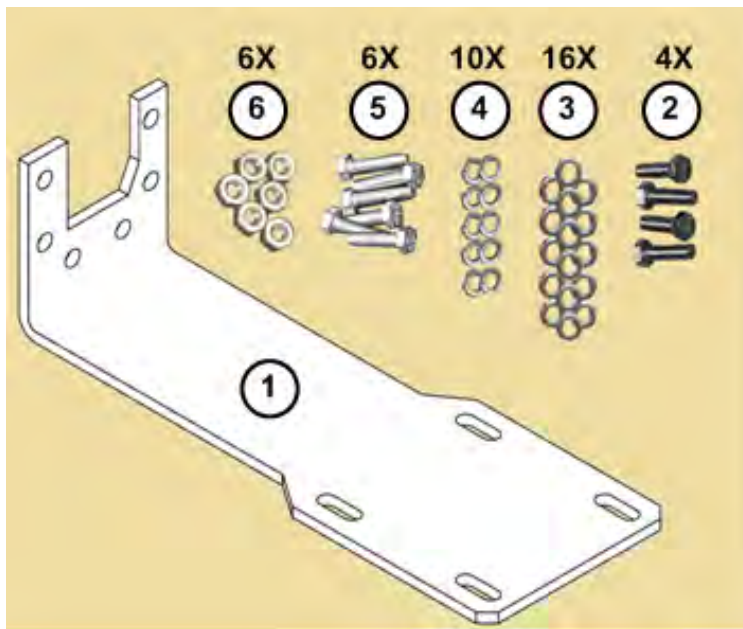
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	FP-0000536	BRACKET, TRF SUPPORT
2	4	HW/M6X1X20MMHEX	BOLT, HEX HEAD, M6 X 20MM, SS
3	16	HW/M6FLAT	FLAT WASHER, M6 (SEE NOTE)
4	10	HW/M6LOCK	LOCKWASHER, M6 (SEE NOTE)
5	6	HW/M6X1X30MMHEX	BOLT, HEX HEAD, M6 X 30MM, SS (SEE NOTE)
6	6	HW/M6X1HEXNUT	NUT, HEX, M6 (SEE NOTE)

Figure B-48. AS/0502 TRF Support Bracket Kit

(!) **Figure B-48 Note:**
Items 5, 6, and quantities of Items 3 and 4 as provided in this kit may be regarded as spare mounting hardware used to install the assembled LNA Switch/TRF w/Support Bracket to the antenna OMT. These same parts are otherwise provided for this use in the AS/0461 CPR229 Waveguide Installation Kit.

Do these steps:

1. Slide the FP-0000536 TRF Support Bracket (AS/0502 Item 1) into place (i.e., against the bottom surface of the LNA Switch (AS/0438 Item 3), and on the inside face of the TRF's antenna-end flange).

2. See **Figure B-49**. Loosely secure the TRF Support Bracket to the bottom of LNA Switch. Use the (4X each) M6 20mm long hex bolts, flat washers, and lockwashers (AS/0502 Items 2, 3 and 4).

   (!) Final boltdown of the TRF Support Bracket to the LNA Switch and the TRF is not required until you install the assembled LNA Switch/TRF w/Support Bracket onto the OMT (see **Section B.3.3**).
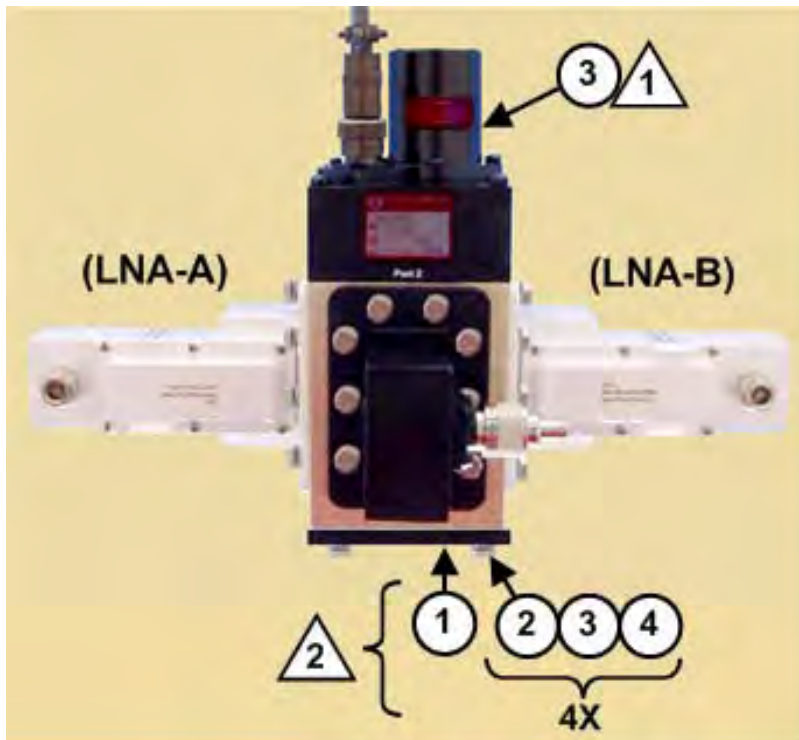
Figure B-49. TRF Support Bracket to LNA Switch Assembly

Figure B-49 Notes:

1) The LNA Switch (Item 3) is provided in the AS/0438 LNA Switch Kit – see **Figure B-45**.
2) The TRF Support Bracket (Item 1) and M6 mounting hardware (Items 2, 3 and 4) are provided in the AS/0502 TRF Support Bracket Kit – see **Figure B-51**.
3) LNA-A, LNA-B, and the TRF (not visible) are user-supplied.

B.3.3   Kits AS/0461 and AS/0502: TRF-to-OMT Installation
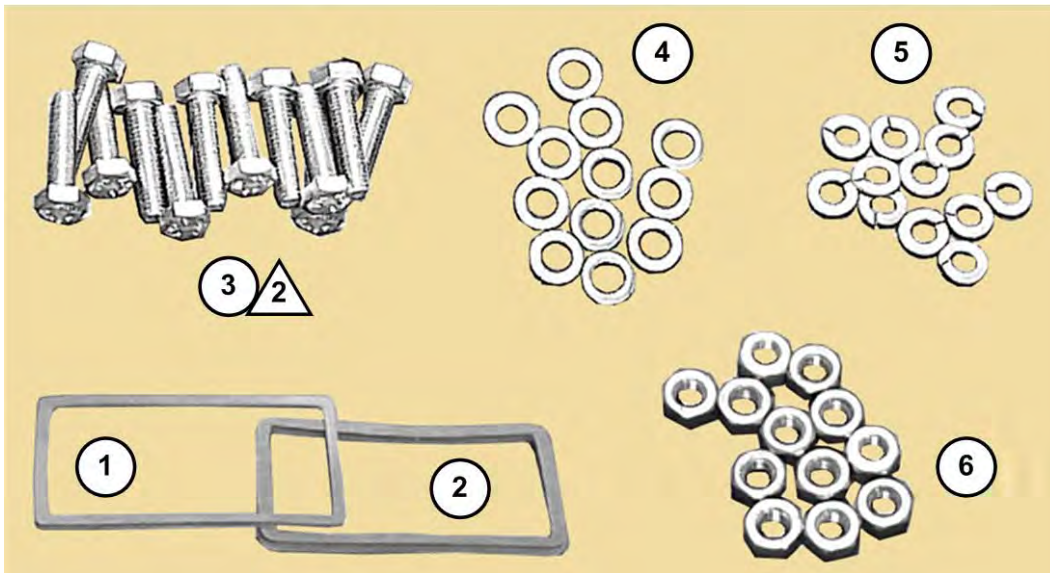
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	1	GA/GSKTCPR229HALF	CPR229 GASKET, HALF-THICKNESS
2	1	GA/GSKTCPR229FULL	CPR229 GASKET, FULL THICKNESS
3	12	HW/M6X1X30MMHEX	HEX HEAD BOLT, M6 X 30MM
4	24	HW/M6FLAT	FLAT WASHER, M6
5	12	HW/M6LOCK	LOCKWASHER, M6
6	12	HW/M6X1HEXNUT	HEX NUT, M6

Figure B-50. AS/0461 CPR229 Waveguide Installation Kit

Figure B-50 Notes:

1) This kit is used with all CSAT installations, for both Standalone and 1:1 Redundancy applications. For each redundant application, it is provided as:

- Item 4 in the AS/0510 CSAT 5W to 25W Unit 1:1 RF Switching Components Kit (**Figure B-10**).
- Item 5 in the AS/0458 CSAT 50W Unit 1:1 RF Switching Components Kit (**Figure B-22**).
- Item 5 in the AS/0511 CSAT 100W/125W Unit 1:1 RF Switching Components Kit (**Figure B-37**).

2) The required quantities of mounting hardware may vary by application.
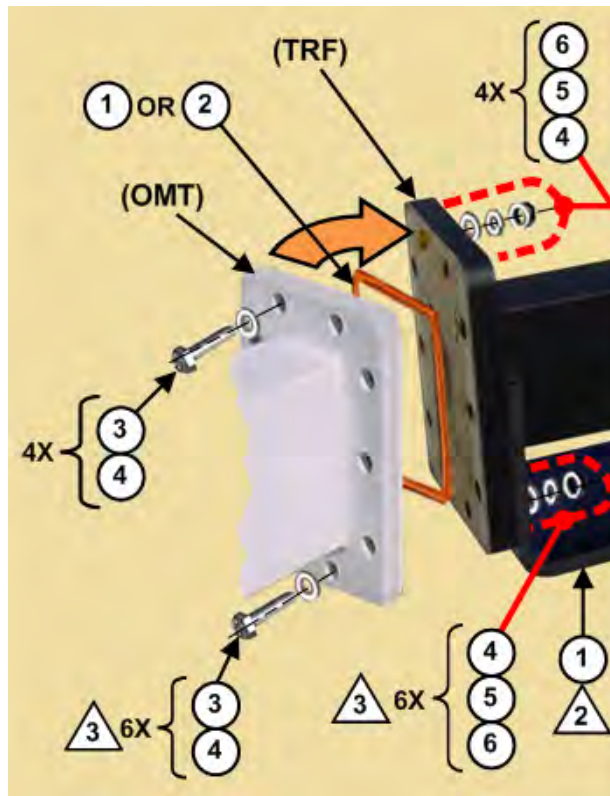
Figure B-51. OMT-to-TRF Flange-to-Flange Assembly

Figure B-51 Notes:

1) Unless noted, all mounting hardware shown here is provided in the AS/0461 CPR229 Waveguide Installation Kit.
2) The FP-0000536 TRF Support Bracket is provided as Item 1 in the AS/0502 TRF Support Bracket Kit – see **Figure B-48**. The TRF should already be securely installed on the LNA switch; the TRF Support Bracket should be loosely assembled onto the LNA Switch – see **Figure B-49**.

3) Items 3 through 6 in the AS/0461 CPR229 Waveguide Installation Kit (see **Figure B-10**) are also available in the AS/0502 TRF Support Bracket Kit – see **Figure B-48**. In that kit, Items 5, 6, and quantities of Items 3 and 4 may be regarded as spare mounting hardware used to install the assembled LNA Switch/TRF w/Support Bracket to the antenna OMT.

See Figure B-51. Do these steps to install the assembled LNA Switch/TRF w/Support Bracket onto the OMT:

1. Remove the protective covers from the user-supplied antenna OMT flange and the antenna-end TRF flange. MAKE SURE TO KEEP ALL SURFACES CLEAN AT ALL TIMES!

2. Install the appropriate flange gasket:
   a. If only one of the flange surfaces has a gasket groove, use the Half Thickness Gasket (AS/0461 Item 1).
   b. If both flange surfaces have gasket grooves, use the Full Thickness Gasket (AS/0461 Item 2) instead.

3. Mate the OMT to the TRF as shown. Make sure to keep the gasket firmly seated while assembling the flanges. Use the AS/0461 mounting hardware in as-required quantities:
   a. At the OMT flange outer face – use the M6 30mm long hex bolts and flat washers (AS/0461 Items 3 and 4). See **Figure B-51** Note 3.
   b. At the TRF flange or TRF Support Bracket outer face – use the M6 flat washers, lockwashers, and hex nuts (AS/0416 Items 4, 5, and 6). See **Figure B-51** Note 3.

4. After you secure the TRF to the antenna OMT, tighten the mounting hardware securing the TRF Support Bracket to the LNA Switch – see **Figure B-49**.

The unit is now ready for the RF cable connections.

B.4 CSAT 1:1 Redundancy System Cable Connections

> ⚠️ **WARNING!**
> The Downconverter RF input connector is wired to supply DC voltage to a Low Noise Amplifier (LNA). This voltage is capable of damaging any test equipment connected to the connector. Do not connect test equipment to this connector without a coaxial DC block between the connector and the test equipment.

> 🔍 See **Chapter 4. SYSTEM CONNECTORS** for detailed information about the available cabling interfaces. See **Section 4.2 Water Tight Sealing** for important cabling guidelines and recommendations.

Figure B-52 shows the cabling connections for all CSAT units. Care must be exercised in cable installation. Install the cables using the most direct route, avoiding all sharp bends. Secure the routed cables with clamps and ties.
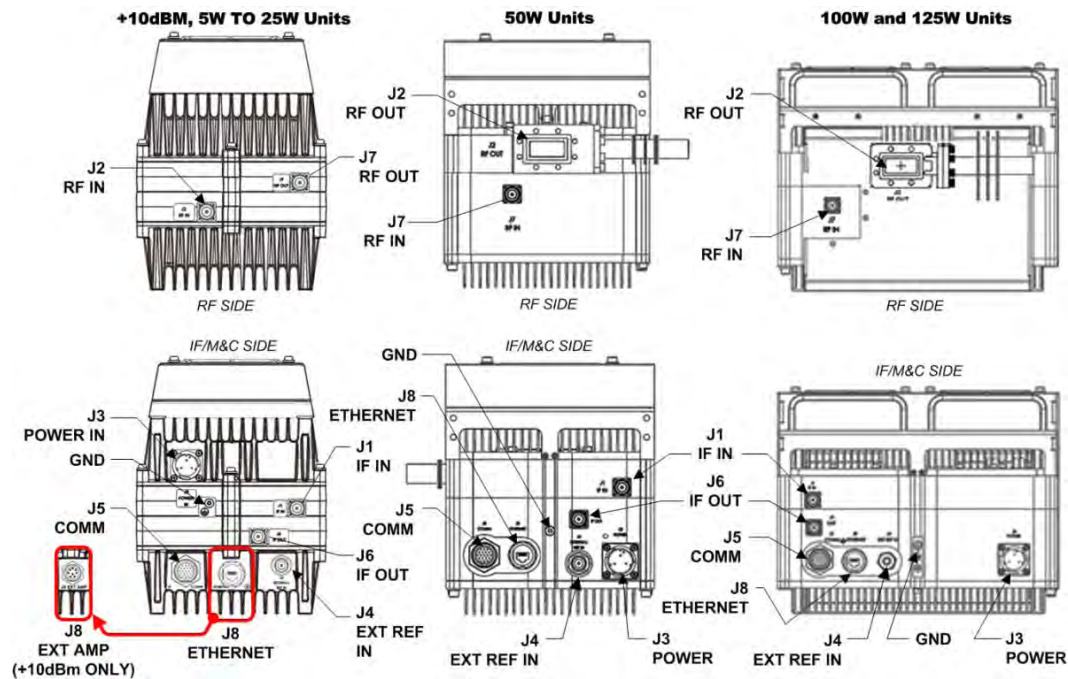
Figure B-52. CSAT-5060/6070 Cabling Connections (By Unit)

Signal attenuation and possible loss of signal can occur in the presence of moisture. Therefore, cable connectors used in outdoor applications must be sealed to avoid leakage – this applies particularly for Type 'N' connectors, where

moisture can seep into both the junctions at the plug end of the connector (between the fixed and movable parts), and where the cable connects to the connector.

All cable junctions, including military style (MS) connectors, must be sealed with a self-amalgamating tape, such as 3M Type 23 Scotch Self-Amalgamating Tape or its equivalent.
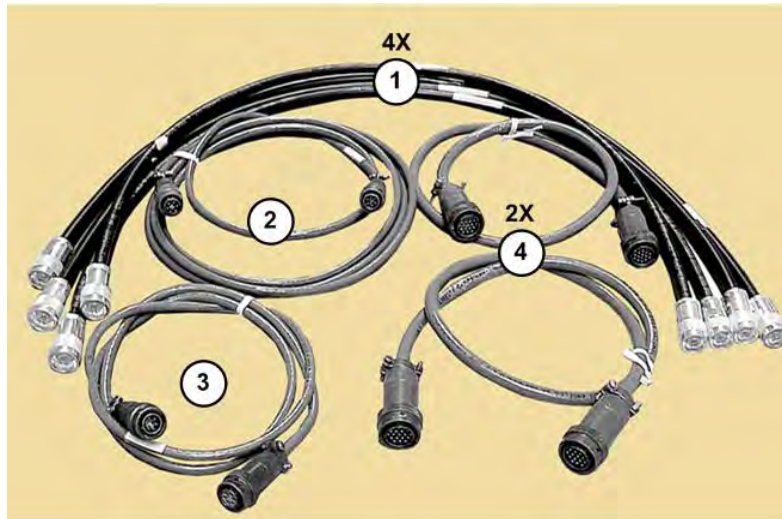
ITEM	QTY	CEFD PART NO.	CABLE DESCRIPTION/ROUTING
1	4	CA/RF0097	RF COAX CABLE, TYPE 'N' CONNECTORS, 3' LG: • CSAT 'J6 | IF OUT' TO RSU 'J10 | RX IF A' / 'J11 | RX IF B' • CSAT 'J1 | IF IN' TO RSU 'J7 | TX IF A' / 'J8 | TX IF B'
2	1	CA/WR0051	CABLE, CONTROL: RSU 'J2 | RX SWITCH' TO LNA SWTCH, LENGTH A/R
3	1	CA/WR0052	CABLE, CONTROL: RSU 'J4 | TX SWITCH' TO TX SWITCH, LENGTH A/R
4	2	CA/WR0053	CABLE, COMMUNICATIONS, 3' LG: • CSAT 'J5 | COMM' TO RSU 'J1 | UNIT A' / 'J3 | UNIT B'

Figure B-53. AS/0440 1:1 C-Band RSU Cabling Kit

Follow the cabling diagrams provided by **Figure B-54**, **Figure B-55**, and **Figure B-56**:

- On the IF/M&C side of the units:
  - Use the AS/0440 1:1 C-Band RSU Cabling Kit (**Figure B-53**) to connect the AS/0490 RSU-5060 to the CSAT IF IN/OUT ports; the

CSAT 'J5 | COMMS' M&C ports; the TX Switch; and the LNA
Switch. The User M&C and IF cables are not provided.

- On the RF side of the units:
  - o All units require two CA/RF0112 Coaxial Cables, length ordered as
    required for your installation, to connect the CSAT 'J2 | RF IN' (5W
    to 25W units) or 'J7 | RF IN' (50W to 125W units) Type 'N'
    connectors to the AS/0438 LNA Switch LNA-A and LNA-B Type 'N'
    connectors.
  - o The 5W to 25W units require two CA/RF0097 3' Coaxial Cables, to
    connect the CSAT 'J7 | RF OUT' Type 'N' connectors to the
    AS/0503 TX Switch (Unit A to Port 1, Unit B to Port 3).
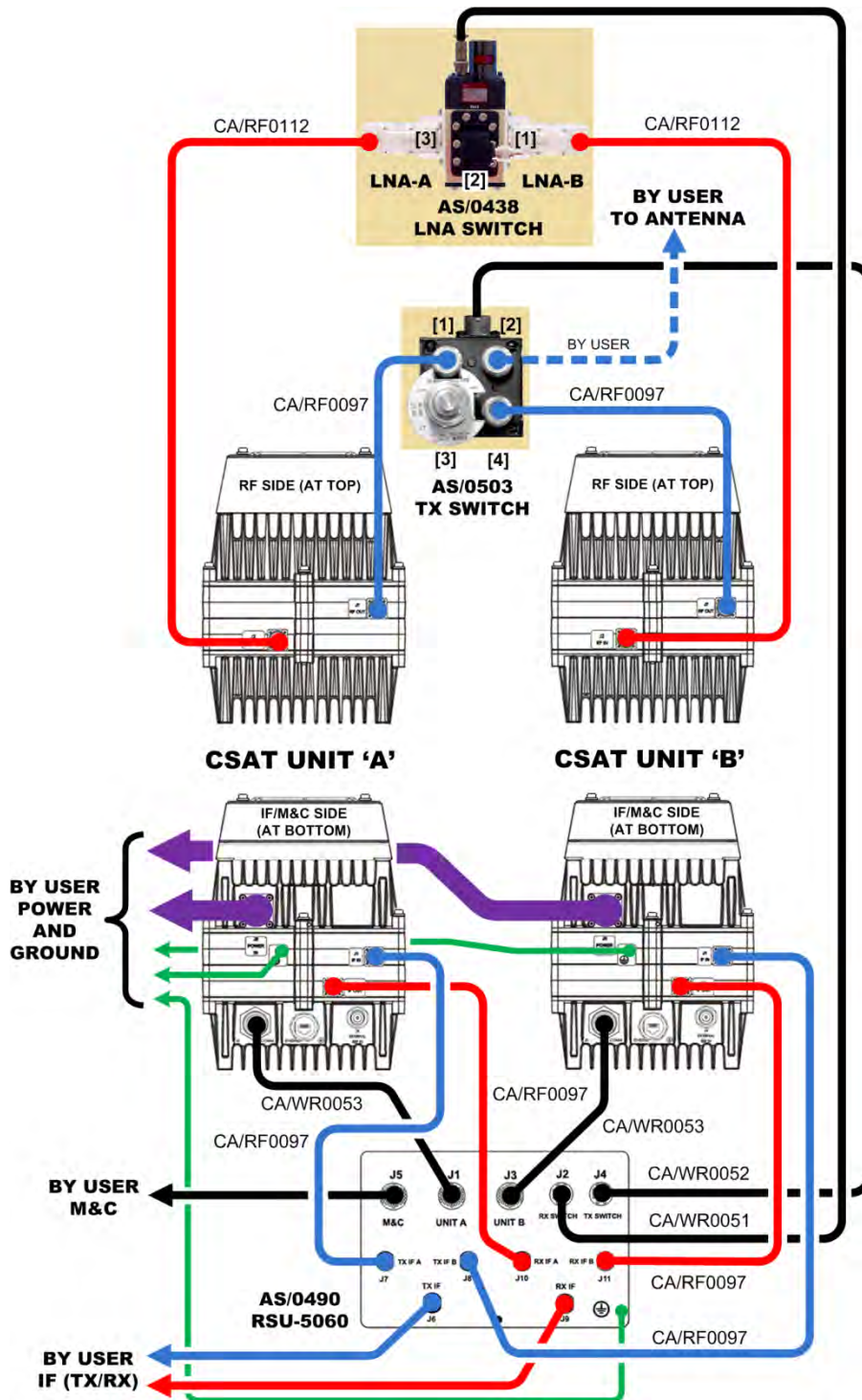
Figure B-54. CSAT 5W-25W Unit Cabling Diagram
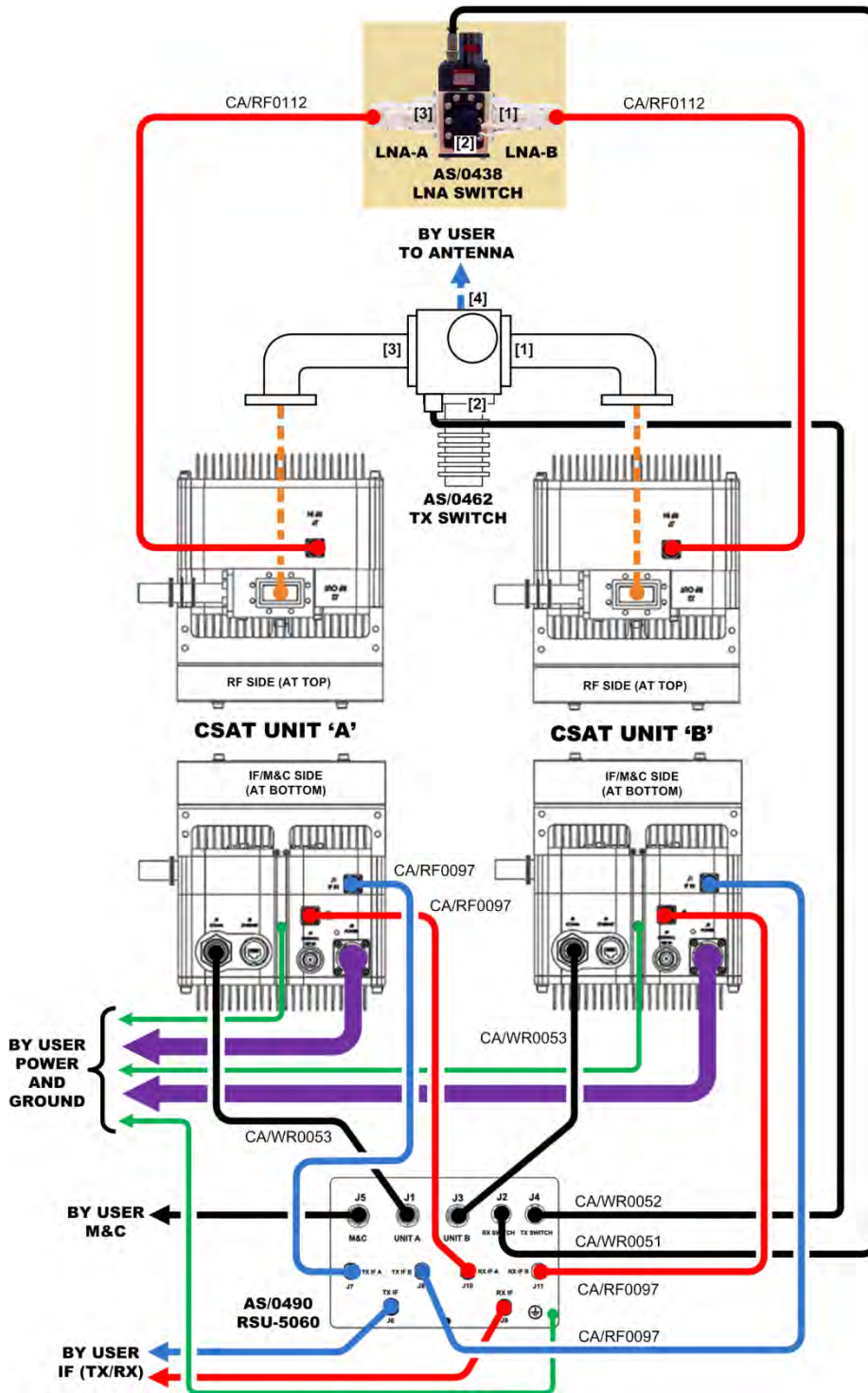
Figure B-55. CSAT 50W Unit Cabling Diagram
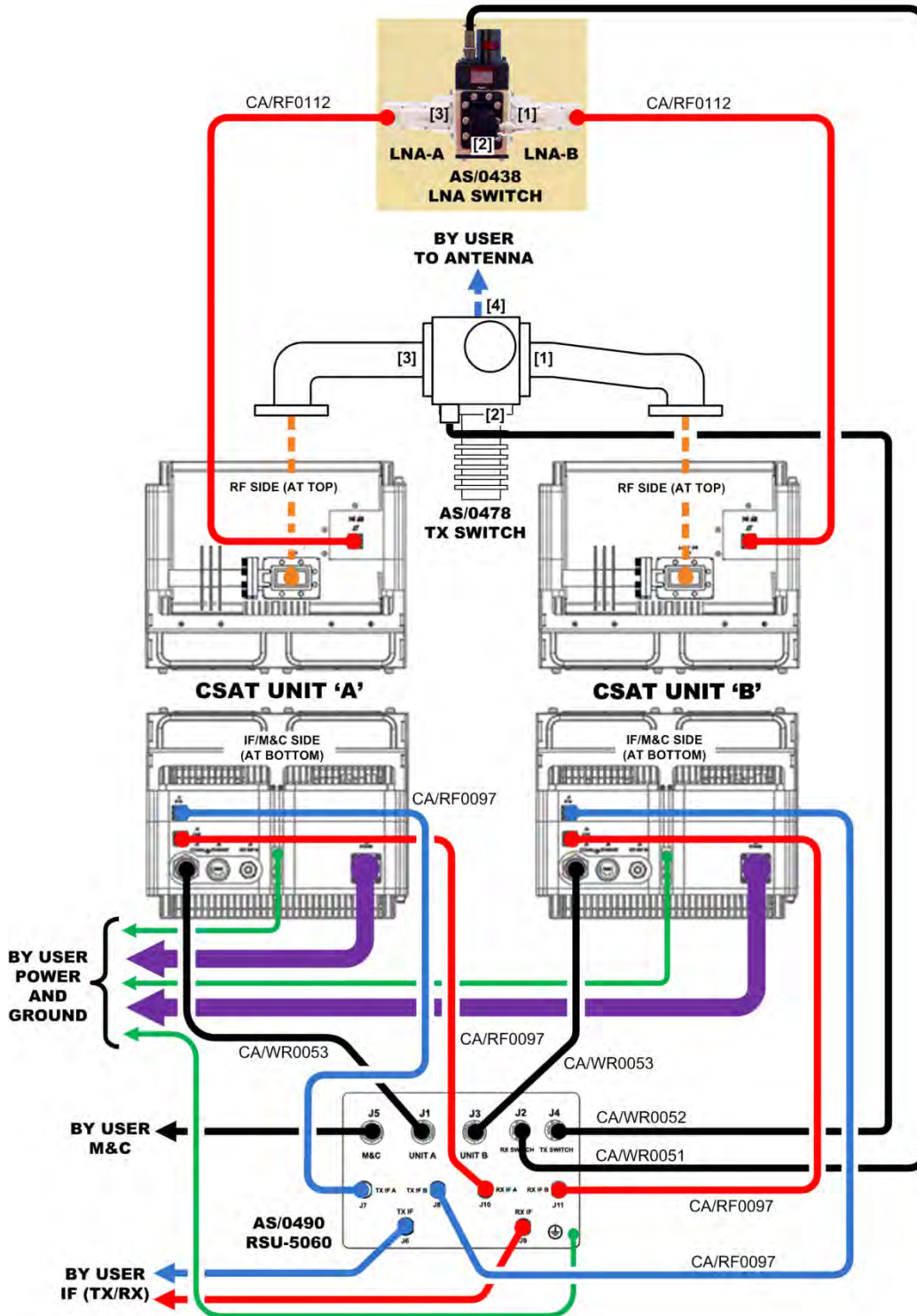
Figure B-56. CSAT 100W/125W Unit Cabling Diagram

Appendix C. OPTIONAL 1:1 REDUNDANT SYSTEM OPERATION

C.1   Redundant Operation Overview

The CSAT 1:1 Redundant System provides fully-automatic detection, switching, and status for both its configuration and operational health. The system is designed such that standalone operation is a functional subset of the fully redundant CSAT system. This provides you with transparent functionality regardless of the mode or the complexity of the system's operational setup. **Figure C-1** provides the block diagram for a typical CSAT 1:1 Redundant System.
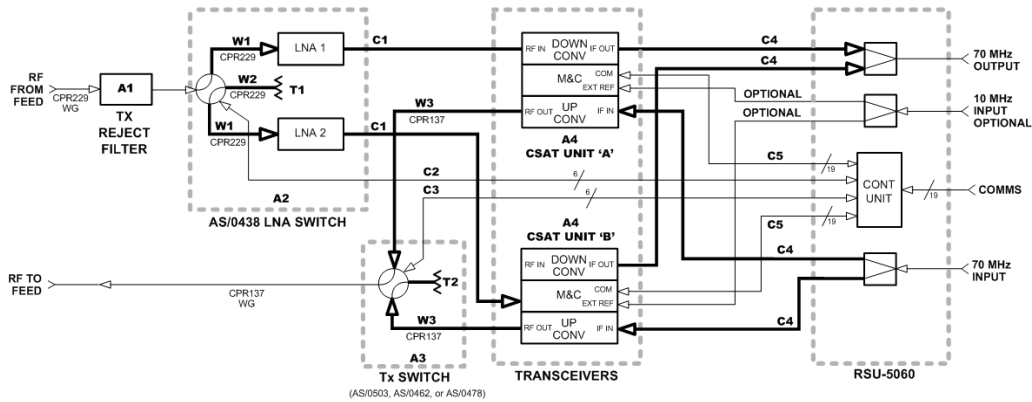
Figure C-1. Typical CSAT 1:1 Redundant System Diagram

Comtech EF Data's CSAT 1:1 Redundant System is designed to reduce the workload of a Customer M&C system in two manners:

- First, Comtech EF Data's **AS/0490 RSU-5060 Redundant Switch Unit** (shown in **Figure C-2**, referred to hereafter as the **RSU**) can be configured

to automatically monitor the status of the two CSATs and always keep the unfaulted CSAT ONLINE.

- Second, configuration commands sent to the ONLINE CSAT via the EIA-485 interface are automatically passed along to the OFFLINE CSAT using the **AUXCOM** interface. Therefore, if you want to change a configuration parameter such as Tx Frequency for the system, you simply send the command to the currently ONLINE CSAT and the OFFLINE CSAT will automatically receive the same command. This automatic update feature applies to the following configuration parameters:
  - o Transmit Frequency;
  - o Receive Frequency;
  - o Transmit Attenuation
  - o Receive Attenuation;
  - o Auto Fault Recovery;
  - o Cold Start.

In addition to this automatic update feature, the CSAT is designed to sense whether it has gone from being the OFFLINE unit to the ONLINE unit and automatically performs the following functions if necessary:
  - o Turns ON the Transmit Amplifier;
  - o Turns OFF the Transmit Mute;
  - o Turns OFF the Receive Mute.

This function allows you to run the OFFLINE unit with the Power Transistors turned OFF to reduce power consumption as desired. However, it is important to note that change in unit temperature of approximately 10° to 20°C (50° to 68°F) can occur after turning the Tx Amplifier ON, and that this affects gain stability during this warm up period.

C.2 AS/0490 RSU-5060 Redundant Switch Unit (RSU)

Figure C-2. AS/0490 RSU-5060 Redundant Switch Unit (RSU)

The AS/0490 RSU-5060 Redundant Switch Unit (RSU) (**Figure C-2**) enables the CSAT C-Band Satellite Transceiver to operate in 1:1 redundant configurations. A CSAT fully redundant system provides automatic detection, switching, and status for both its configuration and health. The system is designed such that stand-alone operation is a functional sub-set of the fully redundant CSAT system. This provides you with transparent functionality regardless of the mode or complexity in which the system has been setup to operate.

The RSU is designed to provide single-point control for both the TX and the LNA (RX) transfer (waveguide) switches. In addition, the RSU provides you with a single interface connection to the M&C system. Through this interface, you can access and control all configuration, monitor, and faults status parameters of both CSATs. The RSU is a 'smart box'; the unit contains a microcontroller running algorithms to process status and command information from the two CSATs and control the TX and LNA switches accordingly.

C.2.1   RSU Features

C.2.1.1   Mechanical Interface

The RSU is housed in a weather-resistant, sealed aluminum housing with five external circular connectors ('J1' through 'J5') and six Type 'N' female connectors ('J6' through 'J11'). Detailed connector information, including pinout tables, is provided later in this appendix. See **Figure 2-4** in **Chapter 2. SPECIFICATIONS** for the RSU's dimensional envelope.

The RSU is mounted on site to the Comtech EF Data FP/BR0080 or FP/BR0066 RSU/TX Switch Mounting Bracket. See your pertinent CSAT unit section in **Appendix B. OPTIONAL 1:1 REDUNDANT SYSTEM INSTALLATION** for these available mounting configurations. Kits available from Comtech EF Data provide these brackets and the mounting hardware needed for installation.

C.2.1.2   Electrical Interfaces

Due to the parallel nature of the M&C interface, only EIA-485 and EIA-422 communications are supported by this configuration.
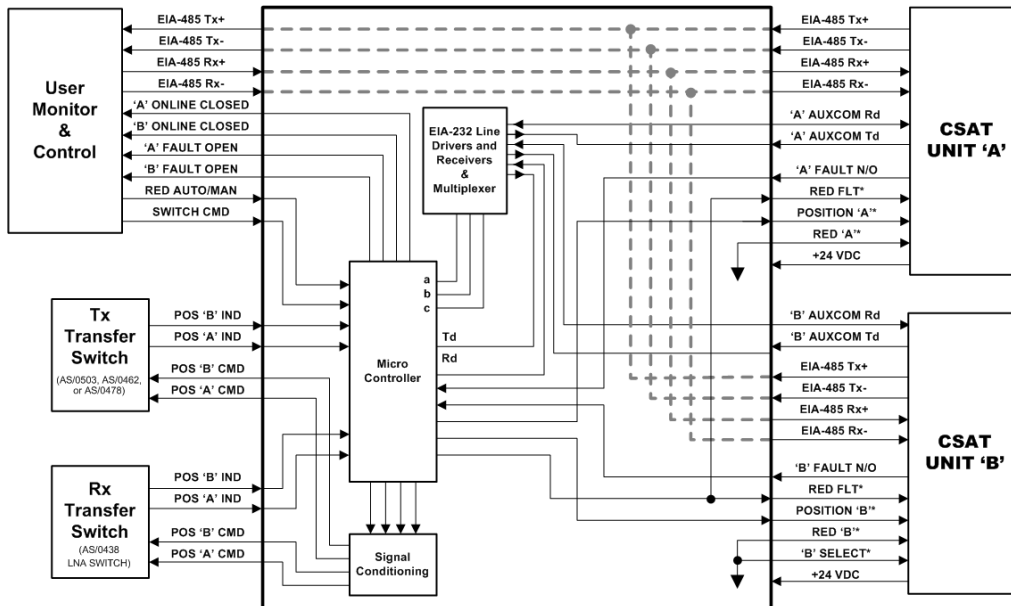
Figure C-3. RSU-5060 Operational Schematic

C.2.1.2.1   EIA-485 Interfaces

Figure C-3 provides an operational schematic for the RSU. The RSU provides a single point interface for the customer's M&C system by pigtailing the 4-wire EIA-485 input to the RSU's '**J5 | M&C'** port and passing it out on the RSU's '**J1 | UNIT A'** and '**J3 | UNIT B'** interface connectors.

When using the EIA-485 4-wire interface to communicate with the individual CSATs, subsequent addresses are employed through use of the '**B SELECT***' signal going to CSAT Unit 'B' on the '**J3 | UNIT B'** interface connector. You must set or change the address of both units using the Set Remote Physical Address command (SPA=XXXX), defined later in this appendix, in conjunction with the global address "0000".

C.2.1.3   Cabling Connections
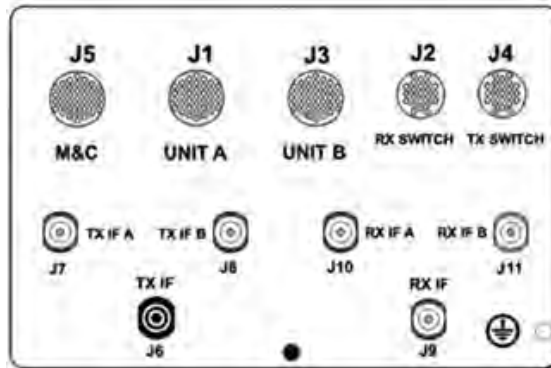
RSU Connector	Function	Connects to…
J1	UNIT A	CSAT Unit 'A' Comms Interface	J5	COMMS on CSAT Unit 'A'
J2	RX SWITCH	RX LNA Switch Interface	CEFD P/N AS/0438
J3	UNIT B	CSAT Unit 'B' Comms Interface	J5	COMMS on CSAT Unit 'B'
J4	TX SWITCH	Tx Switch Interface	CEFD P/N AS/0503, AS/0462, or AS/0478
J5	M&C	Monitor & Control Interface	User M&C
J6	TX IF	Tx IF Input	User Tx IF Equipment
J7	TX IF A	CSAT Unit 'A' Tx IF Output	J1	IF IN on CSAT Unit 'A'
J8	TX IF B	CSAT Unit 'B' Tx IF Output	J1	IF IN on CSAT Unit 'B'
J9	RX IF	RX IF Output	User RX IF Equipment
J10	RX IF A	CSAT Unit 'A' RX IF Input	J6	IF OUT on CSAT Unit 'A'
J11	RX IF B	CSAT Unit 'B' RX IF Input	J6	IF OUT on CSAT Unit 'B'

Figure C-4. RSU Cabling Connections

Figure C-4 provides a quick reference for the connections required between the RSU and other components of a typical CSAT 1:1 Redundant System. For complete redundancy system cabling diagrams, see **Section B.4 CSAT 1:1 Redundant System Cabling** in **Appendix B. OPTIONAL 1:1 REDUNDANT SYSTEM INSTALLATION**.

C.2.1.3.1   'J1 | UNIT A' Connector

This 19-pin circular connector provides the communications and control signals as well as the +24 VDC power signal necessary between CSAT Unit 'A' and the RSU.

Table C-1. 'J1 | UNIT A' Connector Pinout

Pin	Signal Name	Type	Description
A	EIA-485 RX+	Pass-thru	EIA-485 RX+, from M&C to CSAT Unit A
B	EIA-485 RX-	Pass-thru	EIA-485 RX-, from M&C to CSAT Unit A
C	EIA-485 TX+	Pass-thru	EIA-485 Tx+, to M&C from CSAT Unit A
D	EIA-485 TX-	Pass-thru	EIA-485 Tx-, to M&C from CSAT Unit A
E	n.c.		
F	REDUND_FLT*	Output	Fault Signal to CSAT Unit A from RSU
G	n.c.		
H	AUXCOM_RD	Output	EIA-232 from RSU to CSAT Unit A
J	AUXCOM_TD	Input	EIA-232 from CSAT Unit A to RSU
K	FAULT COMMON	Output	
L	CSAT A FLT – NO	Input	Shorted to Pin K = O.K., open = Faulted
M	n.c.		
N	n.c.		
P	POSITION A*	Output	Ground = Unit A Online, Open = Unit A Offline
R	A +24V	Input	+24VDC input power
S	REDUNDANCY A*	Output	Ground signal to CSAT Unit A
T	GROUND	Passive	
U	GROUND	Passive	
V	n.c.		

'J1' Functional Notes:
1) **REDUNDANCY A/B SIGNALS:** Pin 'S' on the 'J1' connector is used to tell the CSAT Unit 'A' that it is in a redundant configuration.
2) **REDUND_FLT SIGNAL:** Pin 'F' on the 'J1' connector is an output signal from the RSU to the CSAT to provide status indication to the CSATs regarding the operating condition of the RSU and the Tx and the LNA (RX) transfer switches. This signal is normally a one-half hertz square wave. If this signal goes away, the ONLINE CSAT uses the AUXCOM (EIA-232) interface to the RSU to get more information regarding the problem at

hand. This information is available to you via the "RRS?" query described later in this appendix.

3) **AUXCOM SIGNALS:** Pins 'H' and 'J' on the 'J1' connector are the EIA-232 RD and EIA-232 TD signals, respectively. The AUXCOM interface is used solely in conjunction with the RSU and should not be confused with the 'Customer EIA-232' interface available on the CSAT 'J5 | COMM' connector (pins 'E' and 'F'). The AUXCOM interface is used by the ONLINE CSAT to ascertain information from the OFFLINE CSAT as well as the RSU.

C.2.1.3.2   'J2 | RX SWITCH' Connector

This 6-pin circular connector provides the control and indicator signals between the AS/0438 LNA Switch (RX Transfer Switch) and the RSU.

Table C-2. 'J2 | RX SWITCH' Connector Pinout

Pin	Signal Name	Type	Description
A	POS A CMD	Output	24 VDC, 350 millisecond, Command Pulse
B	CMD RETURN	Passive	Grounded internal to RSU
C	POS B CMD	Output	24 VDC, 350 millisecond, Command Pulse
D	POS A INDICATOR	Input	Shorted to Pin E = POSITION A
E	IND COMMON	Passive	Grounded internal to RSU
F	POS B INDICATOR	Input	Shorted to Pin E = POSITION B

C.2.1.3.3   'J3 | UNIT B' Connector

This 19-pin circular connector provides the communications and control signals as well as the +24 VDC power signal necessary between CSAT Unit 'B' and the RSU.

Table C-3. 'J3 | UNIT B' Connector Pinout

Pin	Signal Name	Type	Description
A	EIA-485 RX+	Pass-thru	EIA-485 RX+, From M&C to CSAT Unit B
B	EIA-485 RX-	Pass-thru	EIA-485 RX-, From M&C to CSAT Unit B
C	EIA-485 TX+	Pass-thru	EIA-485 Tx+, To M&C from CSAT Unit B
D	EIA-485 TX-	Pass-thru	EIA-485 Tx-, To M&C from CSAT Unit B
E	n.c.		
F	REDUND_FLT*	Output	Fault Signal to CSAT Unit B from RSU
G	n.c.		
H	AUXCOM_RD	Output	EIA-232 from RSU to CSAT Unit B
J	AUXCOM_TD	Input	EIA-232 from CSAT Unit B to RSU
K	FAULT COMMON	Output	
L	CSAT A FLT – NO	Input	Shorted to Pin K = O.K., open = Faulted
M	n.c.		
N	n.c.		

Pin	Signal Name	Type	Description
P	POSITION A*	Output	Ground = Unit B Online, Open = Unit B Offline
R	A +24V	Input	+24VDC input power
S	REDUNDANCY A*	Output	Ground signal to CSAT Unit B
T	GROUND	Passive	
U	GROUND	Passive	
V	n.c.		

'J3' Functional Notes:

1) **REDUNDANCY A/B SIGNALS:** Pin 'S' on the 'J3' connector is used to tell the CSAT Unit 'B' that it is in a redundant configuration.

2) **REDUND_FLT SIGNAL:** Pin 'F' on the 'J3' connector is an output signal from the RSU to the CSAT to provide status indication to the CSATs regarding the operating condition of the RSU and the Tx and the LNA (RX) transfer switches. This signal is normally a one-half hertz square wave. If this signal goes away, the ONLINE CSAT will use the AUXCOM (EIA-232) interface to the RSU to get more information regarding the problem at hand. This information is available to you via the "RRS?" query described later in this appendix.

3) **AUXCOM SIGNALS:** Pins 'H' and 'J' on the 'J3' connector are the EIA-232 RD and EIA-232 TD signals, respectively. The AUXCOM interface is used solely in conjunction with the RSU and should not be confused with the 'Customer EIA-232' interface available on the CSAT 'J5 | COMM' connector (pins 'E' and 'F'). The AUXCOM interface is used by the ONLINE CSAT to ascertain information from the OFFLINE CSAT as well as the RSU.

C.2.1.3.4 'J4 | TX SWITCH' Connector

This 6-pin circular connector provides the control and indicator signals between the AS/0503, AS/0462, or AS/0478 TX Transfer Switch (Tx Waveguide Switch) and the RSU.

Table C-4. 'J4 | TX SWITCH' Connector Pinout

Pin	Signal Name	Type	Description
A	POS A CMD	Output	24 VDC, 350 millisecond, Command Pulse
B	CMD RETURN	Passive	Grounded internal to RSU
C	POS B CMD	Output	24 VDC, 350 millisecond, Command Pulse
D	POS A INDICATOR	Input	Shorted to Pin E = POSITION A
E	IND COMMON	Passive	Grounded internal to RSU
F	POS B INDICATOR	Input	Shorted to Pin E = POSITION B

C.2.1.3.5   'J5 | M&C' Connector

This 19-pin circular connector provides the communications and control signals between the RSU and the user M&C system.

Table C-5. 'J5 | M&C' Connector Pinout

Pin	Signal Name	Type	Description
A	RS485 RX+	Pass-thru	RS-485 RX+, from M&C to CSAT Units A & B
B	RS485 RX-	Pass-thru	RS-485 RX-, from M&C to CSAT Units A & B
C	RS485 TX+	Pass-thru	RS-485 Tx+, to M&C from CSAT Units A & B
D	RS485 TX-	Pass-thru	RS-485 Tx-, to M&C from CSAT Units A & B
E	B ONLINE CLOSED	Output	Shorted to Pin K = CSAT Unit B Online
F	n.c.		
G	n.c.		
H	n.c.		
J	n.c.		
K	IND/FLT COMMON	Input	
L	A FAULT OPEN	Output	Shorted to Pin K = CSAT Unit A Faulted
M	B FAULT OPEN	Output	Shorted to Pin K = CSAT Unit B Faulted
N	n.c.		
P	RED AUTO/MAN	Input	Ground = Manual, Open = Auto
R	n.c.		
S	A ONLINE CLOSED	Output	Shorted to Pin K = CSAT Unit A Online
T	GROUND	Passive	
U	GROUND	Passive	
V	SWITCH CMD	Input	Momentary short to GND, otherwise OPEN

'J5' Functional Notes:

1) **REDUNDANCY AUTO/MANUAL SIGNAL:** Pin 'P' on the 'J5' connector is the 'RED AUTO/MANUAL' input pin. You can use this signal to control the operating mode of the RSU. If this pin is left open, the RSU operates in the AUTO mode. In AUTO mode, the RSU monitors the state of CSAT Units 'A' and 'B' via the 'A/B FAULT N.O.' signals on the 'J1 | UNIT A' / 'J3 UNIT B' connectors. If the ONLINE unit fails, the RSU automatically commands both the TX and the LNA (RX) transfer switches to change position.

    ⊙   If the OFFLINE unit also is FAULTED, no switchover will occur.

    The 'RED AUTO/MANUAL' signal has a corresponding REMOTE COMMAND, "RAM=X". You may use this command, defined later in this appendix, to control the operating mode of the RSU assuming that Pin 'P' is left open. (Note: Grounding Pin 'P' forces the RSU into MANUAL mode independent of the "RAM=X" remote command.)

2) **SWITCH COMMAND SIGNAL:** Pin 'V' on the 'J5' connector is the 'SWITCH CMD' input pin. You can use this signal to command the RSU to change the position of both the TX and the LNA (RX) transfer switches. This pin

should normally be left OPEN and momentarily shorted to ground to force a switchover (minimum pulse width for this signal is 100mS). The RSU operating mode does affect how it responds to the 'SWITCH CMD' command:

- If the operating mode is AUTO, a momentary short to ground on Pin V will cause the RSU-5060 to change the position of the Tx and RX transfer switches **only if** the currently OFFLINE unit is not faulted.
- If the operating mode is MANUAL, a momentary short to ground on Pin V will **always** cause the RSU-5060 to change the position of the TX and RX transfer switches. Like the 'RED AUTO/MANUAL' signal above, the 'SWITCH CMD' also has a corresponding REMOTE COMMAND, "RTG=". This command, defined in Appendix A, has the same effect as a momentary short to ground on Pin V.

C.2.1.3.6   'J6 | TX IF' / 'J7 | TX IF A' / 'J8 | TX IF B' Type 'N' Connectors

The Tx IF input signal is drawn from the user equipment to the RSU at the 'J6 | TX IF' connector. The RSU contains a power splitter that feeds the IF input signal to both CSAT Unit 'A' and CSAT Unit 'B' via the 'J7 | TX IF A' and 'J8 | TX IF B' connectors. The IF power at either 'J7' and 'J8' will nominally be 3dBm less than the IF input power at 'J6'.

C.2.1.3.7   'J9 | RX IF' / 'J10 | RX IF A' / 'J11 | RX IF B' Type 'N' Connectors

The RX IF output signal is fed to the user equipment from the RSU at the 'J9 | RX IF' connector. The RSU contains a power combiner that draws the IF output signals from both CSAT Unit 'A' and CSAT Unit 'B' via the 'J10 | RX IF A' and 'J11 | RX IF B' connectors and provides a single output at 'J9'. The IF output power at 'J9' will nominally be 3dBm less than the IF output power at either 'J10' or 'J11'.

C.3   CSAT Operational Settings for 1:1 Redundancy

See **Chapter 9. SERIAL INTERFACE OPERATION** for detailed information about using Serial Remote Command and Queries.

C.3.1   Set the Remote (Physical) Addresses (SPA)

The Remote (Physical) address to which the CSAT responds can be set to any value between 0001 and 9999. You can set or change the address of both units via the SPA command in conjunction with the global address 0000.

Associated Remote Command Example:
To set the CSAT Unit 'A' and Unit 'B' addresses to 0064 and 0065, respectively, send the following remote serial SPA command: <0000/SPA=0064{CR}.

Note the factory default physical remote address is 0001.

C.3.2   Set the RSU Operating Mode (Auto/Manual) (RAM)

The RSU initializes to the AUTO mode when power is first applied. You can otherwise set, via the RAM command to the ONLINE CSAT, the RSU's Operating Mode:

- RAM=0 – In MANUAL mode, the RSU will only switch the position of the Tx and RX transfer switches when commanded to do so via either the RTG= command, or via Pin 'V' on the RSU's 'J5 | M&C' interface.
- RAM=1 – In AUTO mode the RSU monitors the state of the two CSATs and will automatically switch the OFFLINE unit online if the ONLINE unit faults.

Associated Remote Command Examples:
RSU OPERATING MODE COMMANDS: <0135/RAM=0{CR} (MANUAL MODE)
                                    <0135/RAM=1{CR} (AUTO MODE)

C.3.3   Toggle the RSU Operating Mode (RTG)

You can cause the RSU to switch the position of both the TX and LNA (RX) transfer switches using this command:

- If the RSU is in AUTO mode, the command will only cause a switchover if the OFFLINE unit is currently UNFAULTED.
- If the RSU is in MANUAL mode, the command will cause a switchover independent of the state of the OFFLINE unit.

Associated Remote Command Example:
RSU MODE TOGGLE COMMAND: <0135/RTG={CR} (TOGGLES MODES)

C.3.4   Retrieve (Query) Redundancy Status (RRS)

You can obtain the redundancy status of the CSAT by issuing this query to the ONLINE CSAT.

Associated Remote Query Example:
REDUNDANCY STATUS QUERY: <0001/RRS?{CR}
                             >0001/RRS={CR}
                             R 5V=5.0{CR}
                             R 12V=11.8{CR}
                             TX SW=OK{CR}
                             RX SW=OK{CR}{LF}

C.3.5   Set the Gain Offset (DGO/UGO)

Both the RX and Tx Gain Offsets are user configurable. You may set these parameters to adjust for gain difference between the two CSATs in the redundancy. Select an offset between 0.00 dB and –4.00 dB in 0.25 dB increments.

Associated Remote Command/Query Examples:
RX GAIN OFFSET COMMAND: <0135/DGO=-1.75{CR}
RX GAIN OFFSET SETTING QUERY: <0135/DGO?{CR}
                              >0135/DGO=-1.75{CR}{LF}

TX GAIN OFFSET COMMAND: <0135/UGO=-1.00{CR}
TX GAIN OFFSET SETTING QUERY: <0135/UGO?{CR}
                              >0135/UGO=-1.00{CR}{LF}

C.3.6   Set the LNA Fault Logic (LFL)

The CSAT allows you to select whether or not the summary fault relay is activated when the LNA current moves beyond the prescribed window. This allows you to control whether or not the RSU will switch on an LNA current alarm in the redundant configuration.

Associated Remote Command/Query Examples:
LFL DISABLE COMMAND: <0135/LFL=0{CR}
LFL ENABLE COMMAND: <0135/LFL=1{CR}
LFL STATUS QUERY: <0135/LFL?{CR}
                                  >0135/LFL=1{CR}{LF} (LFL is ENABLED)

By default, the setting is 0. An LNA current fault does not affect the summary fault relay.

Notes:

Appendix D. CABLE DRAWINGS

D.1   Overview

This appendix provides line details for the cables available for use with the CSAT in Standalone or 1:1 Redundancy applications. Each figure references the cable's technical specifications – e.g., connector types used, wiring lists, etc.

The European EMC Directive (EN55022, EN50082-1) requires that you use properly shielded cables for DATA I/O. These cables must be double-shielded from end-to-end, ensuring a continuous ground shield.

1) See **Sect. 4.2 Water Tight Sealing** for important cabling guidelines and recommendations.
2) The tables in this appendix cross-reference cable use in CSAT Standalone applications detailed in **Chapter 5. STANDALONE (SINGLE-THREAD) INSTALLATION** as well as the various 1:1 Redundancy application examples provided in **Appendix B. OPTIONAL 1:1 REDUNDANT SYSTEM INSTALLATION**.

D.2   Utility/Control Cables

App D FIG	CEFD CABLE P/N	DESCRIPTION	USED FOR:	SEE FIGURE
D-1	CA/WR12243-1	UTILITY CABLE, SYSTEM PROGRAMMING (FIRMWARE UPDATE), 19-PIN CIRCULAR CONN TO 9-PIN SERIAL CONN, 6'	CSAT 'J5 | COMM'►USER PC 9-PIN SERIAL CONNECTION	6-2
D-2	CA/WR0051	CONTROL CABLE, 6-PIN CIRCULAR CONNS	RSU 'J2 | RX SWITCH' ►LNA (RX TRANSFER) SWITCH CONTROL CONNECTION	B-51 THRU B-54
D-3	CA/WR0052	CONTROL CABLE, 6-PIN CIRCULAR CONNS	RSU 'J4 | TX SWITCH' ►TX TRANSFER SWITCH CONTROL CONNECTION	B-51 THRU B-54
D-4	CA/WR0053	CONTROL CABLE, 19-PIN CIRCULAR CONNS	RSU 'J1 | UNIT A' AND 'J3 | UNIT B' ►CSAT 'J5 |COMM' CONNECTIONS	B-51 THRU B-54

D.2.1 CA/WR12243-1 User Utility Cable, 19-Pin to 9-Pin

Use this EIA-232 cable for serial-based firmware update of the CSAT. Connect this cable from the 19-pin CSAT 'J5 | COMM' circular connector to a 9-pin User PC serial port.
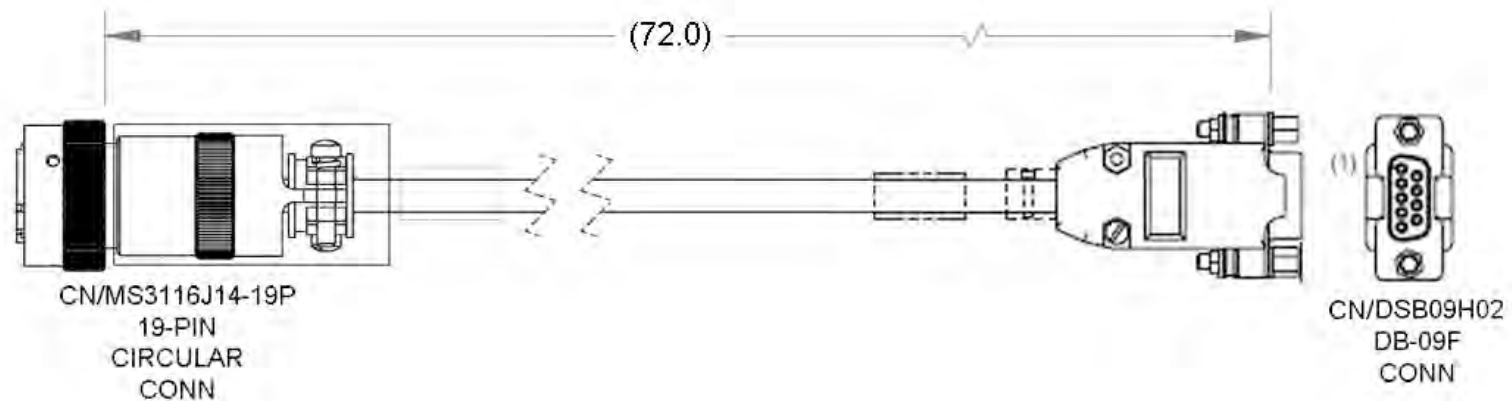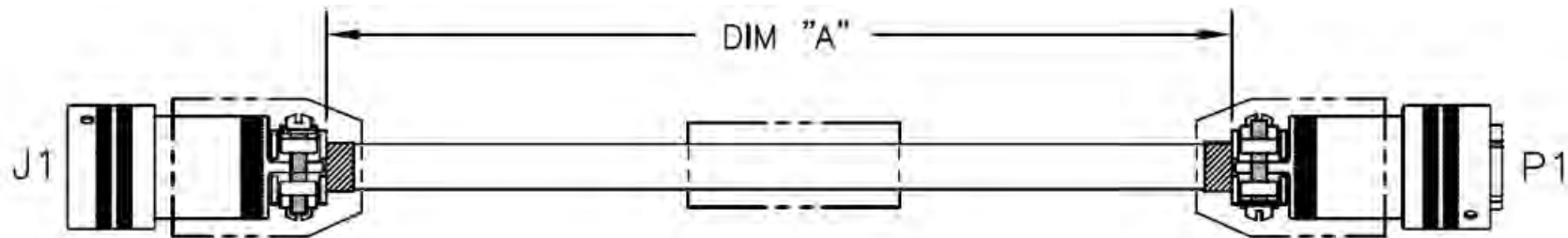

Figure D-1. Programming (Firmware Update) Cable (CEFD P/N CA/WR12243-1)

D.2.2   CA/WR0051 LNA Switch Control Cable, 6-Pin to 6-Pin

This 6-pin to 6-pin circular connector cable connects the RSU '**J2 RX SWITCH**' connector to the AS/0438 LNA Switch in 1:1 Redundant applications.
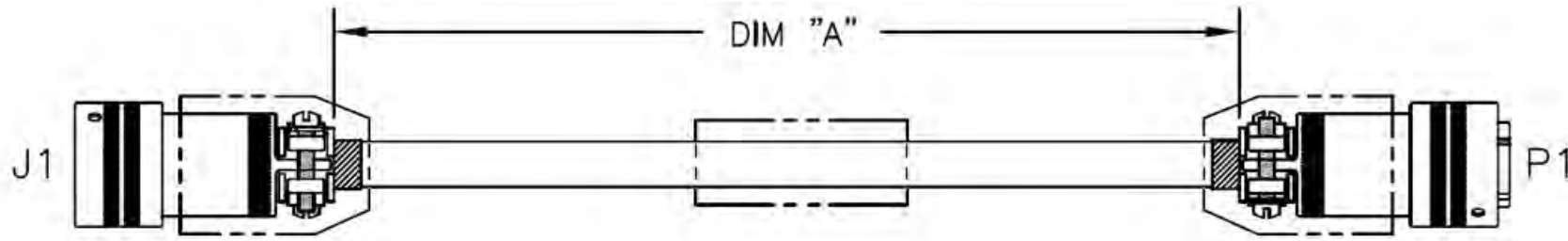

CEFD P/N	DIM "A"
CA/WR0051	108.00±4.00
CA/WR0051-1	180.00±4.00
CA/WR0051-12	144.00±4.00
CA/WR0051-2	420.00±4.00
CA/WR0051-30	30' ±4.00
CA/WR0051-50	50' ±4.00
CA/WR0051-100	100' ±4.00
CA/WR0051-150	150' ±6.00
CA/WR0051-175	175' ±6.00
CA/WR0051-200	200' ±6.00

WIRE TERMINATION LIST		
FROM J1	DESCRIPTION	TO P1
A	Pos A (Cmd)	A
B	Com (Cmd)	B
C	Pos B (Cmd)	C
D	Pos A (Ind.)	D
E	Com (Ind.)	E
F	Pos B (Ind.)	F

Figure D-2. LNA Switch Control Cable (CEFD P/N CA/WR0051)

D.2.3   CA/WR0052 TX Switch Control Cable, 6-Pin to 6-Pin

This 6-pin to 6-pin circular connector cable connects the RSU '**J4 TX SWITCH**' connector to the AS/0503, AS/0462, or AS/0478 TX Transfer Switch in 1:1 Redundant applications.

CEFD P/N	DIM "A" (IN)
CA/WR0052	48.00 +/- 2.00
CA/WR0052-1	36.00 +/- 1.50

WIRE TERMINATION LIST		
FROM J1	DESCRIPTION	TO P1
A	Pos A (Cmd)	A
B	Com (Cmd)	B
C	Pos B (Cmd)	C
D	Pos A (Cmd)	D
E	Com (Cmd)	E
F	Pos B (Cmd)	F

Figure D-3. TX Switch Control Cable (CEFD P/N CA/WR0052)

D.2.4   CA/WR0053 COMMS Cable, 19-Pin to 19-Pin

This 19-pin to 19-Pin circular connector cable connects the RSU **'J1 | UNIT A'** or **'J3 | UNIT 'B'** connector to the CSAT Unit 'A' or Unit 'B' **'J5 | COMM'** port in 1:1 Redundant applications.
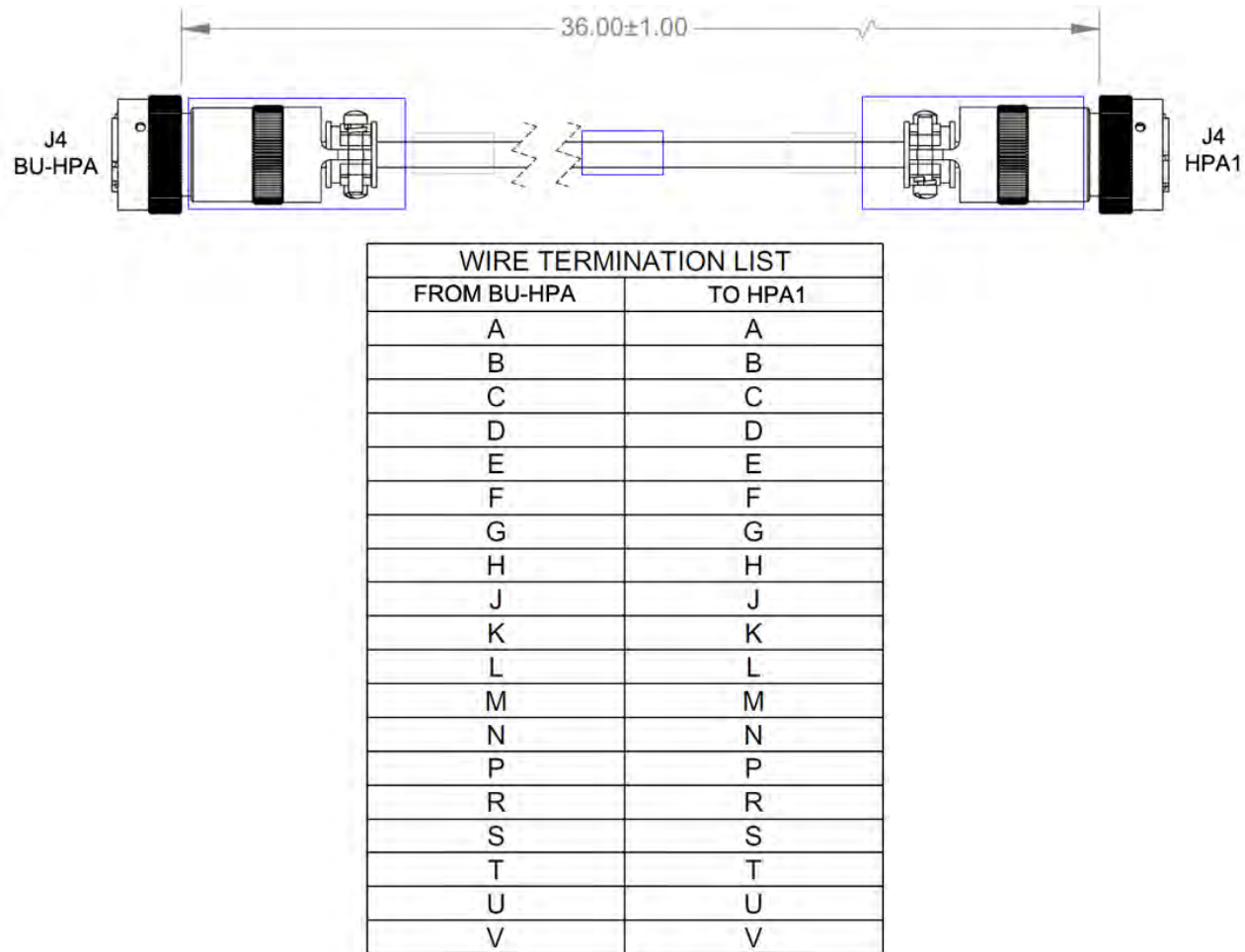

WIRE TERMINATION LIST	
FROM BU-HPA	TO HPA1
A	A
B	B
C	C
D	D
E	E
F	F
G	G
H	H
J	J
K	K
L	L
M	M
N	N
P	P
R	R
S	S
T	T
U	U
V	V

Figure D-4. COMMS Cable (CEFD P/N CA/WR0053)

D.3   Data/IF/RF Cables

App D FIG	CEFD CABLE P/N	DESCRIPTION	USED FOR:	SEE FIGURE
D-5	KT-0020567	Ethernet Cable Fabrication Kit (RJ-45 to RJ-45)	CSAT 'J8 | ETHERNET' port▶User PC Ethernet Port	4-4
D-6	CA/6357-X	Type 'N' to Type 'N' 1/4" Coaxial Cable (lengths vary)	CSAT Rx or Tx connections: See cabling information in **Chapter 5. STANDALONE (SINGLE THREAD) INSTALLATION** or **APPENDIX B. OPTIONAL 1:1 REDUNDANT SYSTEM INSTALLATION**	5-27
D-7	CA/RF0097	Type 'N' to Type 'N' 1/4" Coaxial Cable – 3'		5-27, B-51 THROUGH B-54
	CA/RF0112	Type 'N' to Type 'N' 1/4" Coaxial Cable – 9'		
	CA/RF0140	Type 'N' to Type 'N' 1/4" Coaxial Cable – 17'		

D.3.1   Ethernet Cable Fabrication Kit KT-0020567

See **Sect. 4.3.4.5.1** in **Chapter 4. SYSTEM CONNECTORS** to fabricate the weatherproof CAT5 Ethernet cable that connects the CSAT 'J8 | ETHERNET' port to the User PC M&C Ethernet port in Standalone or 1:1 Redundant applications.
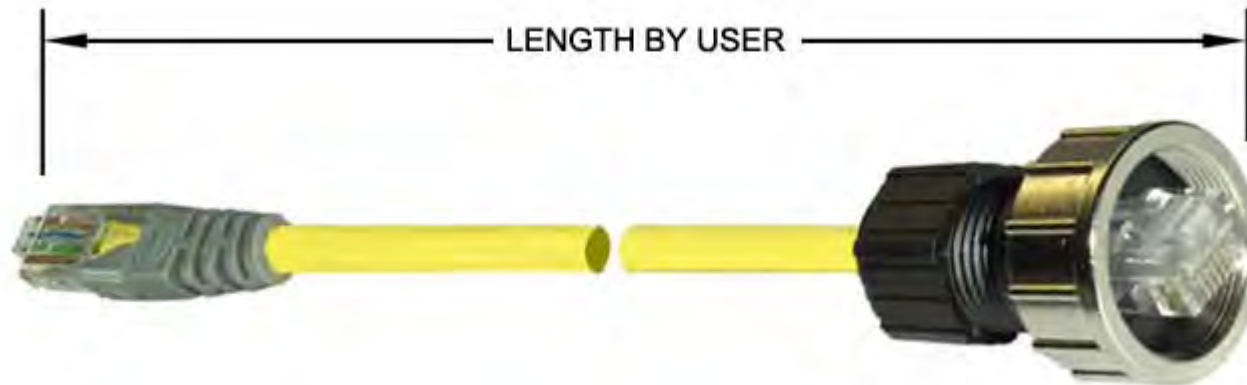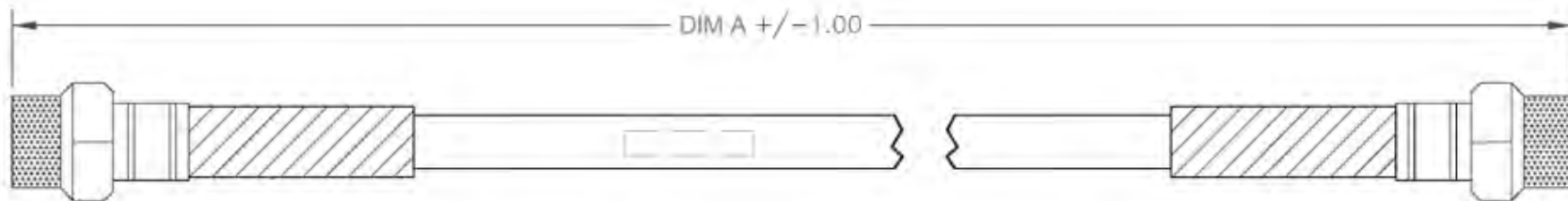

Figure D-5. Weatherproof Ethernet Cable (Use CEFD P/N KT-0020567)

D.3.2   IF/RF Cable (Type 'N')

Use these Type 'N' cables for the Rx or Tx connections in CSAT Standalone or 1:1 Redundancy applications.

CEFD PART NO.	DIM 'A' ±1.00"	VSWR	INSERTION LOSS
CA/RF0097	36.00" (3')	1.25:1 MAX @ 5.5-8.5 GHz	0.5dB MAX 5.5-8.5 GHz
CA/RF0112	108.00" (9')	1.25:1 MAX @ 3.2-5.0 GHz	1.5dB MAX 3.2-5.0 GHz
CA/RF0140	204.00" (17')	1.25:1 MAX @ 3.2-5.0 GHz	2.5dB MAX 3.2-5.0 GHz

Figure D-6. 1/4" Coaxial Cable (See Table for CEFD P/N)

D.3.3   CA/6357-XX IF/RF Cable (Type 'N')

Use these Type 'N' cables for the Rx or Tx connections in CSAT Standalone applications.
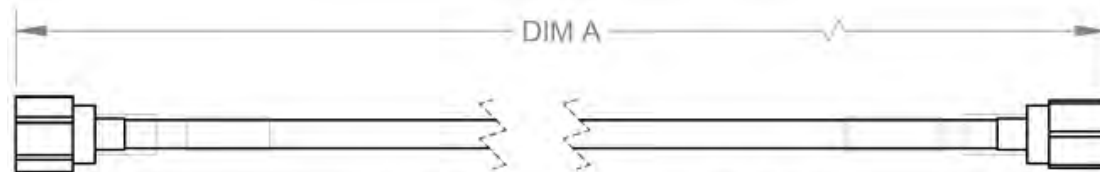
CABLE ASSEMBLY SPECIFICATION				
PART NUMBER	DIM A (ft)	FREQ	VSWR	INSERTION LOSS
CA/6357-10	10.0±.5			
CA/6357-15	15.0±1.0			
CA/6357-20	20.0±1.0			
CA/6357-25	25.0±1.0			
CA/6357-30	30.0±1.0			
CA/6357-40	40.0±1.5			
CA/6357-50	50.0±2.0			
CA/6357-75	75.0±3.0			
CA/6357-100	100.0±3.0			
CA/6357-125	125.0±3.0	2 Ghz	1.25:1	1.0 dB/ 10 ft MAX
CA/6357-150	150.0±3.0			
CA/6357-175	175.0±3.0			
CA/6357-200	200.0±3.0			
CA/6357-225	225.0±3.0			
CA/6357-250	250.0±3.0			
CA/6357-275	275.0±3.0			
CA/6357-300	300.0±3.0			
CA/6357-2	2.0±.3			
CA/6357-4	4.0±.3			
CA/6357-5	5.0±.3			

Figure D-7. 1/4" Coaxial Cable (See Table for CEFD P/N)

Appendix E. FIRMWARE UPDATE IN NON-ETHERNET UNITS

E.1 Overview

This appendix provides the procedure to update the firmware for the CSAT-5060 +10dBm unit, as well as any older CSAT unit that does not have the 'J8 | ETHERNET' port.

E.1.1 Important Considerations

Read Chapter 6. FIRMWARE UPDATE Sections 6.1 through 6.3 before proceeding.

Before proceeding, you should have:
1. Downloaded the firmware update archive file to a user-supplied PC. The User PC must be Microsoft Windows® compatible.
2. Connected your CSAT unit to the User PC. See **Figure E-1**. Serial remote M&C of the CSAT is available by connecting a serial adapter cable such as the optional Comtech EF Data System Programming Cable (CEFD P/N CA/WR12243-1) from the CSAT '**J5 | COMM**' port to a User PC.
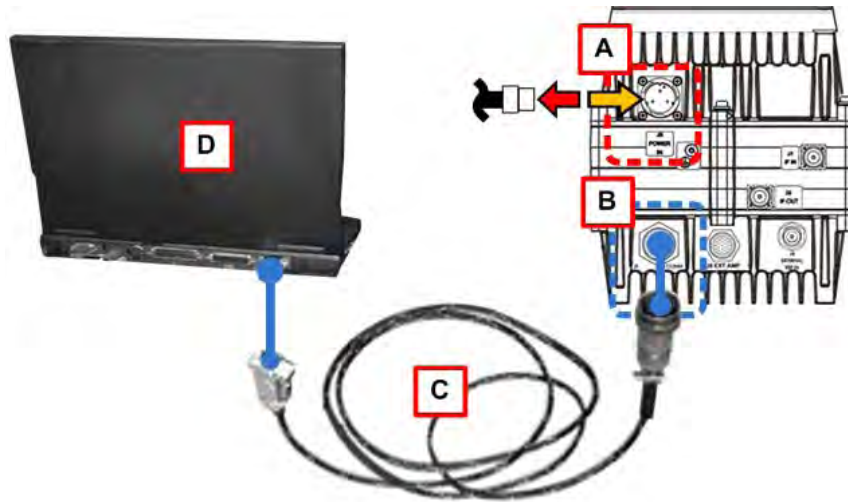
| Feature	Description
A	CSAT **'J3 | POWER IN'** Connection
B	CSAT **'J5 | COMM'** Connection
C	Optional Comtech EF Data System Programming Cable (CEFD P/N CA/WR12243-1)
D	User PC with available serial port

Figure E-1. CSAT Firmware Update Setup – Non-Ethernet Units (+10dBm Unit Shown)

# E.2 Steps to Upload the Firmware Files Using FLSHCSAT.EXE or CReflash.EXE

1) Use of these applications is subject to compatibility with your Windows OS. Contact Comtech EF Data Product Support for assistance.
2) In the examples that follow, this appendix uses "FLSHCSAT.exe" as the firmware upload application.

Do these steps:

1. From the temporary folder – Locate, and then double-click, the "FLSHCSAT.exe" or "CReflash.exe" filename or icon. The application opens:
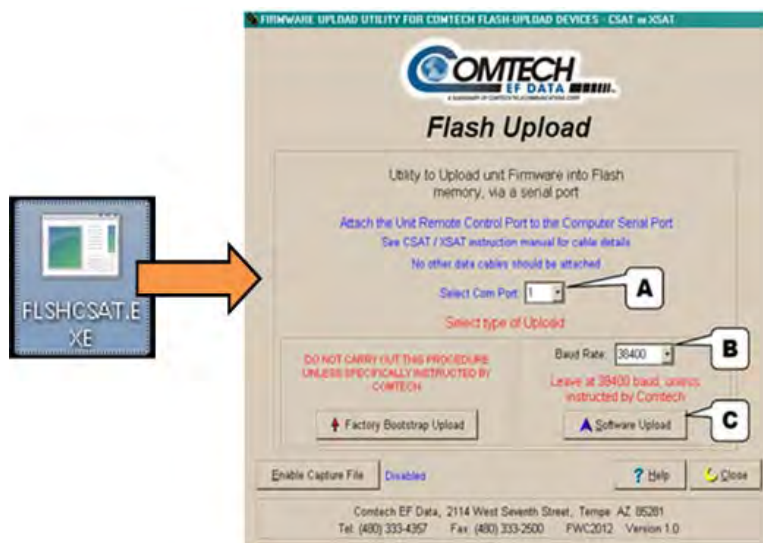

2. From the application, use the "**Serial Com Port**" dropdown list to select the pertinent serial port used for communication between the PC and the CSAT. **COM1** is chosen in this example (noted at **'A'**).
3. Do **not** select a "**Baud Rate**" (noted at **'B'**) unless otherwise instructed by Comtech EF Data Product Support. **You must use the default selection of 38400 bps.**
4. Click **[Software Upload]** (noted at **'C'**).
5. Click **[Choose File]** from the "**Main Software Upload**" dialogue box.
6. From the "**Select a File Name**" dialogue box, use the window on the right to navigate to the desired folder. Then, double-click on the firmware file from the window on the left.
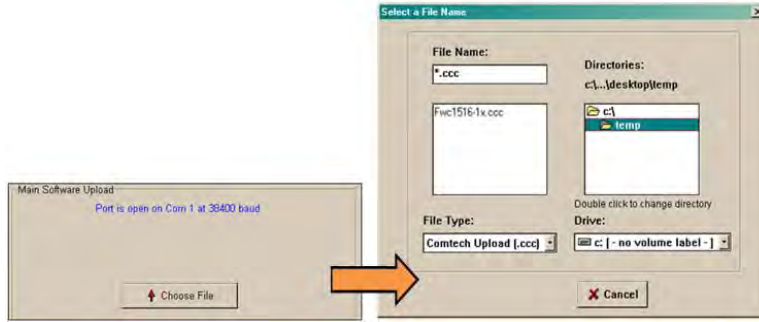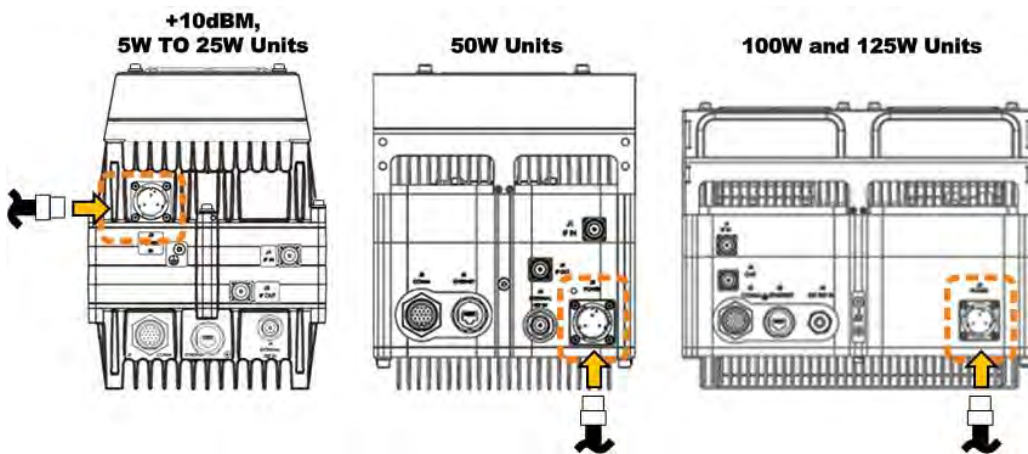
7. Power OFF the CSAT unit by disconnecting the **'J3 | POWER IN'** cable:
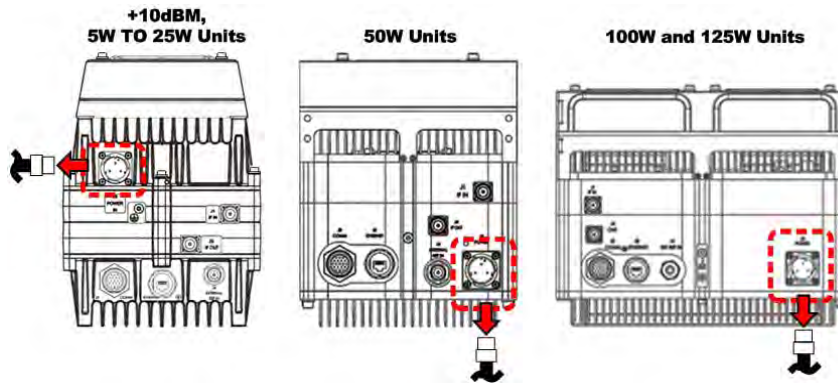
8. With the CSAT power disconnected, click **[Start Upload]**.
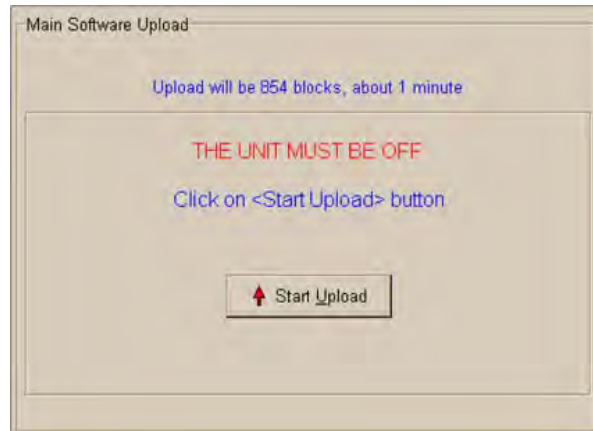
9. When prompted, reconnect the **'J3 | POWER IN'** connector cable.

10. Once you re-establish communications between the PC and CSAT, the upload takes place. **Do not interrupt this upload process**.

> ⓘ If the upload is not successful for any reason – e.g., the communications cable is not physically connected, the wrong COM port is specified, you have inadvertently interrupted the upload, etc. – you may troubleshoot the setup as needed, then click **[Repeat Upload]** or **[Go Back to Start]** to resume or retry the upload process.

11. Upon successful completion of the upload, you may click on **[Go Back to Start]** (if, for example, more than one CSAT unit requires update) or **[Close]** (to exit the application).

12. Disconnect the CEFD CA/WR12243-1 System Programming Cable and reconnect the original System Comms connection cable.

The Firmware Update process is now complete.