5-40 Watt, C-Band LP BUC Transmitter Module

Operation and Maintenance Manual

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mitec

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Mitec Telecom Inc.

Designers and manufacturers of telecom and wireless products

9000 Trans Canada,
Pointe-Claire, Quebec, Canada
H9R 5Z8

OPERATION AND MAINTENANCE MANUAL	Preliminary ☐	Released ☒

REVISION RECORD

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0		Engineering Release.	27 Mar 07	
1		Revised to include Serial Protocol Documentation Appendix	07 May 07	
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3		Convert it to generic to apply to 5 watt to 40 watt	14 Nov 07	
4		Updated drawings and included fan replacement procedure	06 Dec 07	
5		Updated specs and drawings	11 Jun 08	GC
6		Updated for F-type connector option	06 Nov 08	GC
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CM Approval

TITLE:

5 to 40 Watt C Band Low Power Transmitter Module

Designer: Gary Cyr Date: 27 Mar 07		**REV 7**
Technical Writer: C. Strunga Date: 27 Mar 07	**DOCUMENT NO. 213440-001MA**	**PAGE 1 OF 38**

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Preface

Scope

This document covers the installation, operation, and maintenance of the 5 to 40 Watt C Band Low Power Transmitter Modules for the models shown in the table below. It contains information intended for engineers, technicians and operators working with the transmitter module.

Model	Power Level
MTX-596437-60-ES-20	5 Watts
MTX-596440-60-ES-20	10 Watts
MTX-596443-60-ES-20	20 Watts
MTX-596446-60-ES-20	40 Watts
MTX-596737-60-ES-20	5 Watts
MTX-596740-60-ES-20	10 Watts
MTX-596743-60-ES-20	20 Watts
MTX-596746-60-ES-20	40 Watts

To make inquiries, or to report errors of fact or omission in this document, please contact the technical writing department at **Mitec Telecom Inc**. at (514) 694-9000.

IMPORTANT

Important information concerning the operation and care of this product, as well as the safety of authorized operators is highlighted throughout this document by one of the following labels:

NOTE

Indicates a reminder, special consideration, or additional information that is important to know.

CAUTION!

Identifies situations that have the potential to cause equipment damage.

WARNING!!

Identifies hazardous situations that have the potential to cause equipment damage, as well as serious personal injury.

1 Introduction

The Low Power Transmitter module is a highly reliable, high quality, cost efficient Low Power Transmitter systems designed for use in VSAT applications. This line of superior products, engineered using state of the art technology, is characterized by unparalleled durability and dependability. The system also has high linearity and system gain stability over the full operating temperature range. The standard output operating frequency range is 5.850 GHz to 6.425 GHz. Super Extended Option is also available at the frequency range 5.850 GHz to 6.725 GHz.

1.1 Receiving and Inspection

The transmitter module is designed to function outdoors and will arrive in standard shipping containers. Immediately upon receipt of the transmitter module, check the Bill of Lading against the actual equipment you have received. Inspect the shipping containers exteriors for visible damage incurred during shipping.

CAUTION!

Handle the transmitter module with extreme care. Excessive shock may damage transmitter module's delicate internal components.

NOTE

Before unpacking the shipping containers, move them near to the site where the system will be mounted. Ensure that the containers are oriented correctly in accordance with the "This Side UP "labels. Carefully remove the transmitter module and packing material from the shipping containers.

Using the supplied packing list, verify that all items have been received and undamaged during shipment. Verify that all items are complete. If there are any omissions or evidence of improper packaging, please notify **Mitec Telecom Inc.** immediately.

1.1.1 Equipment Damage or Loss

Mitec Telecom Inc. is not responsible for damage or loss of equipment during transit. For further information, contact the responsible transport carrier.

When declaring equipment as damaged during transit, preserve the original shipping cartons to facilitate inspection reporting.

1.1.2 Return of Equipment

When returning equipment to **Mitec** for repair or replacement:

1. Identify, in writing, the condition of the equipment.
2. Refer to the sales order, Purchase Order and the date the equipment was received.

Notify **Mitec** Sales Administration Department of the equipment condition and obtain a Return Material Authorization (RMA) number and shipping instructions. Mitec will pay for the cost of shipping the product to the customer after the repairs are completed.

NOTE

Do not return any equipment without an RMA number*. This is important for prompt, efficient handling of the returned equipment and of the associated complaint.*

1.2 Preparing for Installation

Before attempting to install or use the transmitter module, we recommend that you first familiarize yourself with the product by reading through this manual. Understanding the operation of the system will reduce the possibility of incorrect installation, which can cause damage or injury to yourself or others.

*The transmitter module **must** be installed in accordance with the conditions and recommendations contained in the following sections.*

When you are ready to begin your installation, use the information in Section 2 (Installation & Overview) as a guide for making all the required electrical connections.

1.2.1 Safety Precautions

Carelessness or mishandling of the transmitter module may damage the unit, causing serious injury to yourself or others. Please adhere to the following:

WARNING!!

To avoid personal injury, always ensure that the waveguide port is properly connected before applying RF power to the system.

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2 Installation & Overview

2.1 General Description

This section describes the installation and theory of operation of the transmitter module.

The module is a stand-alone Transmitter System powered from DC source. It will amplify an input signal from an L-Band RF source up to a power level of 5, 10, 20 or 40 Watts CW in C-Band.

The BUC consists of a Power Supply and RF Amplifier. The power supply provides the DC voltages to the RF amplifier. The RF amplifier is capable of providing an output level of 5 to 40W, and contains over temperature shut down and protection circuits. The 5W to 10W systems are within a housing that is designed so that no additional cooling fan is required to prevent the internal electrical components of the SSPA from over-heating, the 20W and 40W systems have a cooling fan installed in for the purpose. The BUC is for outdoor use and is secured onto a mounting frame by the CPRG137 waveguide attached to the RF output and by up to four #10-32 threaded mounting holes opposite the RF output. Two additional mounting holes are available one on each side of the unit.

2.2 Specifications

Table 1 summarizes the specifications of the 5 to 40 Watt C Band Low Power Transmitter Module. For mechanical specifications, refer to the outline drawing in Appendix A. Table 1 below lists the specifications.

Table 1 – Specifications

RF Performance	
Output Frequency Range MTX-5964xx-60-ES-20 MTX-5967xx-60-ES-20	 Standard: 5.85 to 6.425 GHz Super Extended: 5.85 to 6.725 GHz
IF Frequency Range MTX-5964xx-60-ES-20 MTX-5967xx-60-ES-20	 Standard: 950 to 1525 MHz Super Extended: 950 to 1825 MHz
Conversion Type	Single, fixed L.O, non-inverting
L.O Frequency MTX-5964xx-60-ES-20 MTX-5967xx-60-ES-20	 4.90 GHz

RF Performance	
Frequency Sense	Positive
Output Power @ 1 dB G.C.P. MTX-596x37-60-ES-20 MTX-596x40-60-ES-20 MTX-596x43-60-ES-20 MTX-596x46-60-ES-20	 +37 dBm min, at room temperature +40 dBm typ, at room temperature +43 dBm min, at room temperature +46 dBm min, at room temperature
Linear Gain at room temperature MTX-596x37/40-60-ES-20 MTX-596x43/46-60-ES-20	 64 dB nominal, 60dB min. 68 dB nominal, 65dB min.
Maximum Level Input, No damage	-5 dBm max
Gain Stability (over temperature @ fixed frequency)	1.5 dB p-p nominal; 2 dB p-p max.
Gain Variation (over frequency @ fixed temperature)	1.5 dB p-p nominal; 2 dB p-p max. over 575 MHz 1.0 dB p-p max. over 36 MHz
IM3 (total power = P1db – 3 dB)	-26 dBc max. at room temperature
Requirement for External Reference Frequency Power Phase Noise	 10 MHz (sine-wave) -5 to +5 dBm @ input port without any phase noise degradation; -10 to +10 dBm operational -135 dBc/Hz max. @ 100 Hz -140 dBc/Hz max. @ 1 kHz -143 dBc/Hz max. @ 10 kHz -143 dBc/Hz max. @ 100 kHz
L.O Phase Noise	-60 dBc/Hz, max. @ 100 Hz -70 dBc/Hz, max. @ 1 kHz -80 dBc/Hz, max. @ 10 kHz -90 dBc/Hz, max. @ 100 kHz
Spurious In-band Out of Band Receive Band	 -50 dBc, max @ 5.850 to 6.425 GHz -50 dBc, max -70 dBm max. @ 3.625 to 4.200 GHz
Receive Band Noise Power	-87 dBm/4kHz max. @ 3.625 to 4.200 GHz
Input Impedance	50 ohms nominal
Input V.S.W.R.	2:1 max.
Output V.S.W.R.	2:1 max.
Output Load V.S.W.R. for Non Damage	Infinite:1
DC Voltage Requirement MTX-596x37/40-60-ES-20 MTX-596x43/46-60-ES-20	 18 V to 50 VDC 32 V to 50 VDC
Absolute Maximum Power MTX-596x37-60-ES-20 MTX-596x40-60-ES-20 MTX-596x43-60-ES-20 MTX-596x46-60-ES-20	 60W 75W 180W 280W

RF Performance	
Absolute Maximum Current	
MTX-596x37-60-ES-20	3.3 AMPS @ 18V
MTX-596x40-60-ES-20	4.2 AMPS @ 18V
MTX-596x43-60-ES-20	5.6 AMPS @ 32V
MTX-596x46-60-ES-20	8.7 AMPS @ 32V
Mute internally built	Shuts off the BUC when L.O. unlocked
Status LED	Bicolor ; RED = Alarm , GREEN = Operational
M&C	
Interface Type	FSK
Mute control	Via FSK or disconnecting 10MHz ext.
Temperature Monitor	Via FSK
Out Of Lock Alarm Status	Via FSK
Summary Alarm Status	Via FSK
Output Power Detection	Via FSK, with 15 dB dynamic range
FSK interface (multiplexed on IF)	
Transmitter	
Frequency	650 kHz ±5%
Deviation	±60 kHz
Output level	-5 to -15dBm (50 Ohm)
Receiver	
Frequency	650 kHz
Locking range	±32 kHz
Input sensitivity	-15 dBm
Mechanical Specifications	
Input Interface	[IF/10MHz/DC Power/FSK optional] N-type, female (F-type optional)
Output Interface	Waveguide, CPR137G (Grooved) with Flange
Package	Outdoor, weather resistant
Size (overall dimensions	See Appendix A for outline drawings
Weight	
MTX-596x37/40-60-ES-20	8.8 lbs (4.0 kg)
MTX-596x43/46-60-ES-20	10.0 lbs (4.5 kg)

Environmental	**Operational**	**Storage**
Temperature Range	-40° to +55°C	-40°C to +75°C
Humidity	0 to 100%	
Altitude	15,000 ft AMSL	

2.2.1 Controls and status

The controls and indicators pertaining to this specific model are described in Appendix B.

2.2.2 General Considerations

The module shall meet all specifications over full bandwidth and under all environmental conditions when terminated with a load of VSWR at 1.5:1 unless otherwise specified. All RF specifications shall be met within five minutes after applying DC power, except gain stability and gain flatness, which shall be met after a warm-up period of twenty minutes. During the warm-up period, the module **MUST NOT** exhibit any alarm or require an RF mute input signal to reset any alarm/fault latches.

2.3 Basic Mechanical Characteristics

2.3.1 External View of the Transmitter Module

The physical external dimensions of the transmitter module are shown in the outline drawing in Appendix A and Table 1. All inputs and outputs are also shown in the outline drawing

2.3.2 Connections and Mounting Hardware

The connections require a coaxial cable with an N-type (F-type optional for up to 10Watt unit) male connector for the IF Input and waveguide CPR137F (flat) for RF output. The BUC is mounted using up to four #10-32 threaded holes opposite the CPR137G RF output.

2.4 Assembly and Installation

Use the information in this section as a guide to assemble and install the transmitter module.

CAUTION!

Only authorized technical personnel should perform the installation and proper electrical hookups of the transmitter module.

2.4.1 Lifting the Transmitter Module into Position and Temporary Attachment

The transmitter module weighs approximately 10 lbs (4.5 kg), which may be handled by a single person. Remove all plastic caps from the connectors. Lift the transmitter module. The transmitter module is now ready for permanent attachment.

2.4.2 Securing the Transmitter Module

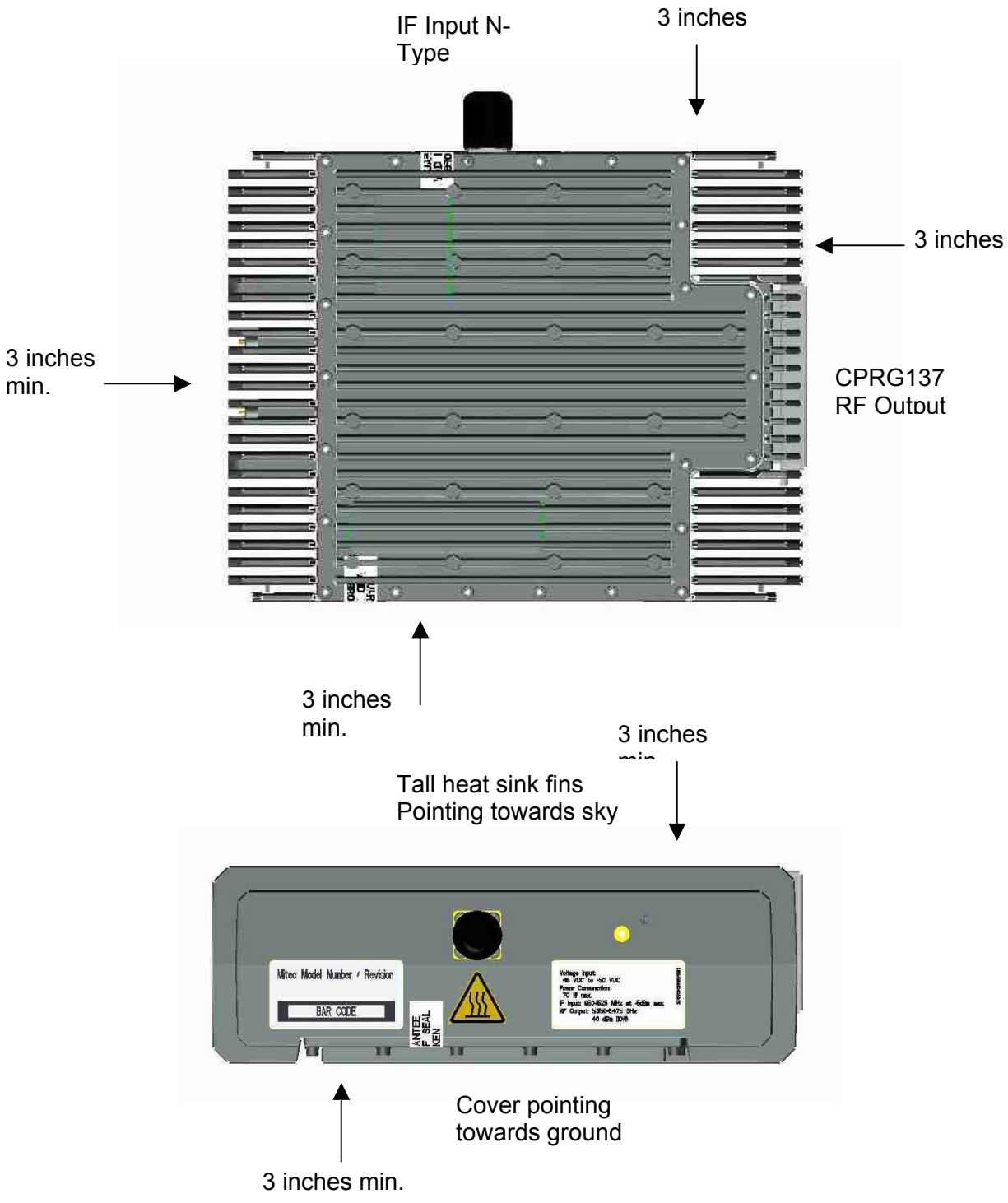
Secure the transmitter module to the mounting frame using the hardware described in Section 2.3.2. Attach the proper cable or waveguide for IF input and RF output to the corresponding connector of the transmitter module. Refer to the outline drawing in Appendix A.

NOTE

The connectors are labeled clearly and have different pin layout. Refer to the outline drawing in Appendix A. It is impossible to incorrectly install the mating connectors.

The BUC requires a steady flow of air. To provide a sufficient airflow, the BUC shall be properly oriented, with the deepest heat sink fins facing up, and mounted with a minimum clearance of 3.0 inches on all sides of the BUC (see Figure 1). Adequate cooling for the BUC will provide years of robust performance.

Top View



Side View

Figure 1 – Recommended Distance for Mounting on the Hub

2.5 Functional Overview

2.5.1 General

This section describes the transmitter module functions in detail. The functional overview explains the RF amplification, protection circuit and power distribution. The block diagram in Figure 3 illustrates the transmitter module.

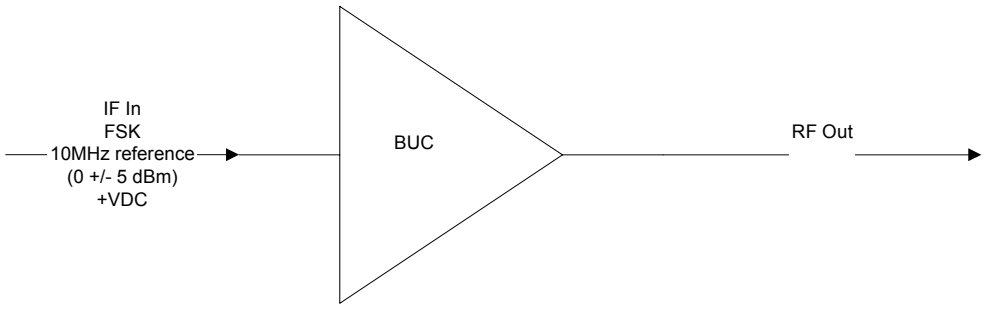


Figure 2 – System Block Diagram

2.5.2 IF/RF Conversion and Amplification

The IF Input signal with a 10MHz reference, 0 ± 5dBm and +Vdc, enters the BUC by a coaxial cable, is converted to C-Band by the BUC and goes through an isolator, which provides a good VSWR at the input.

To achieve the rated output power, GaAs transistors, as well as other microwave components within the RF Amplifier, provide the necessary gain and low insertion loss. The amplified signal is transmitted through waveguide to a satellite up-link system.

2.5.3 Protection and Control

The transmitter has an optional FSK serial interface. All control and monitor signals are translated within the micro-controller and then passed through the FSK serial interface.

The control system can provide the following M&C functions:

- System Alarm: when an amplifier is not functioning properly.
- Mute Control (via FSK) or disconnecting the 10MHZ input
- Output power monitoring
- Temperature Monitoring

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3 Operation

This Section describes the verification of the operation and control of the transmitter module. It shall be performed by authorized personnel prior to maintenance and/or repair.

3.1 Procedure

Verify that the installation procedure described in Section 2 was completed. A complete physical check of the customer's system is suggested.

WARNING!

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*The output power available at the output waveguide flange is extremely hazardous. Under **no circumstances** should the transmitter be operated without the waveguide feed or a Low Power load attached. Do not operate this equipment in the presence of flammable gases or fumes. Failure to observe this precaution will result in personal injury. Safe and careful installation of this transmitter will eliminate the possibility of accidents and provide years of robust performance.*

Turn ON the power and allow a warm up period of twenty minutes before operating the transmitter module. This will assure stable gain and power. The transmitter module can function with a coupler when a direct measurement of the output power is made.

NOTE

The transmitter module can withstand any source or load VSWR. However, the transmitter module will meet all specification requirements only if the source/load VSWR is sufficient (see Section 2.2).

NOTE

Normal operation is not possible if the antenna feeder VSWR is greater than 1.5:1.

CAUTION!

It is strongly recommended not to exceed -5 dBm maximum IF Input level. The transmitter module will be in deep saturation if overdriven. RF performance will degrade significantly, and proper operation will not be possible. This operational condition is the survival mode for the transmitter module. Never exceed the maximum safe IF Input level or permanent damage to the transmitter module may result.

4 Maintenance

This Section contains information on how to maintain and troubleshoot the transmitter module. The transmitter module is extremely reliable, requiring very little preventive maintenance or repair. Should there be a malfunction, this Section also contains technical information to help diagnose basic failures.

4.1 Preventive Maintenance

4.1.1 Procedure

WARNING!

Shut down the transmitter module before disassembly and remove all cables and connections. Failure to observe this precaution may result in personal injury or death. This includes the removal of any RF power originating from other system components.

4.1.2 Transmitter Module System Preventive Maintenance

Preventive maintenance is limited to checking the performance of the transmitter module. No electrical or mechanical adjustments are required for normal operation. Periodic cleaning of the heat sink fins will ensure adequate ambient cooling.

4.1.3 Performance Check

Verify that the system is properly set up as per Section 2 and 3. The power output at 1dB compression shall be measured for evaluating the performance of the transmitter module.

It is recommended to measure the following parameters for ensuring that the transmitter module is in good working condition:

- Gain and Gain flatness
- RF load VSWR and RF source VSWR
- Two-Tone Intermodulation Distortion
- Return Loss at the RF input and RF output of the TRANSMITTER MODULE

Using a Source and an IF input signal level within the small signal region of the transmitter module, measure the power level at the RF input and RF output. Refer to the outline drawing in Appendix A. Plot the swept response on a test data sheet. From the plot, determine gain and gain flatness.

With an IF Input signal level within the small signal region of the transmitter module, measure the VSWR (Return Loss) at the RF input and RF output. Refer to the outline drawing in Appendix A. Plot the swept return loss for both the IF Input and RF Output signals on a test data sheet. From the plot determine the return loss.

From the output power measurements determine $P1_{dB}$. Record value on a test data sheet.

Measure the Two-tone Intermodulation Suppression using two equal signals separated by 5 MHz. Record value on test data sheet.

4.1.4 Transmitter Module Cooling System Preventive Maintenance

Preventive maintenance is limited to checking the performance of the 5W and 10W transmitter module. No electrical or mechanical adjustments are required for normal operation. Periodic cleaning of the heat sink fins will ensure adequate ambient cooling.

Preventive maintenance is limited to checking the performance of the 20W and 40W transmitter module cooling system. No electrical or mechanical adjustments are required for normal operation.

The cooling system fan is the least reliable component in the 20W and 40W transmitter module. Wearing of the fan bearings will cause the RPM to drop and will create a higher than average heat-sink temperature. It is recommended to replace the fan after 2 years of operation. Cleaning of the heat sink fins during a fan replacement will ensure adequate fan cooling.

The cooling system in the 20W and 40W transmitter module was designed so that the fan can be replaced easily in the field. The replacement fan will be terminated with a mating connector matching the fan being replaced. Refer to Figure 3 on the following page for the exploded assembly view of the 20W and 40W transmitter module.

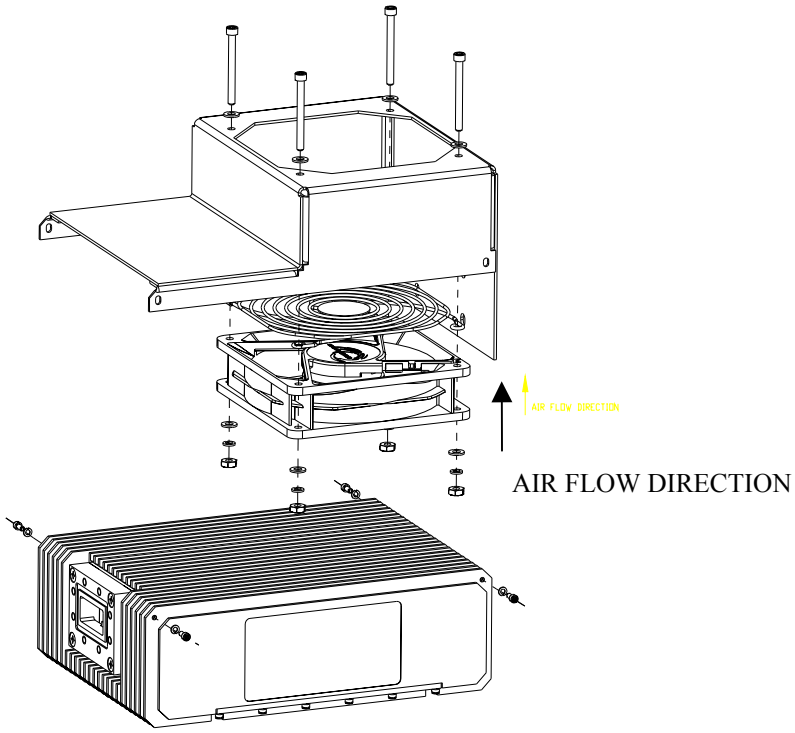

Figure 3 - Cooling Fan Replacement

To replace the fan in the 20W and 40W transmitter module, perform the following:

1. Remove the four screws, lock washers and flat washers from the shroud on both sides of the transmitter module. Keep all fasteners for installation later.
2. Gently angle off the shroud off the rear of the transmitter module (opposite the CPR137G RF Output).
3. Locate the fan power connector within the pocket of the transmitter module heat sink fins.
4. Carefully disconnect the fan power connector from the cable assembly attached to the transmitter module.
5. Fully remove the shroud from the transmitter module. Clean any debris away from within the transmitter module heat sink fins.
6. Remove the four nuts, screws, lock washers and flat washer securing the fan and finger grill to the inside of the shroud. Keep all fasteners for installation later.

7. Reinstall the replacement fan with finger guard onto the inside of the shroud using the fasteners previously removed.

   Note: The direction of the fan airflow by identifying the arrows on the fan casing. Ensure the finger guard is oriented to fit flush into the shroud fan opening.

8. Reconnect the fan power connector to the cable assembly attached to the transmitter module.

Angle the shroud onto the rear of the transmitter module and store any excess fan cable length within the pocket of the transmitter module heat sink fins. The fan power cable will exit up out of the heat sink fins.

Place the shroud flat into place onto the transmitter module. Align and reinstall the shroud using the fasteners previously removed.

The 20W or 40W transmitter module is now ready for operation and no other periodic maintenance is required.

4.1.5 Troubleshooting

WARNING!!

Cable connection and disconnection shall be done carefully to avoid physical damage to the cables and connectors, which may cause intermittent problems in the future.

Use Table 2 to quickly isolate a fault within the transmitter module. If the transmitter module is defective, notify **mitec** and follow the process detailed in section 1.1.2.

Symptom	**Action**
Fails performance test	*For 5W and 10W transmitter modules*: Check power source, RF source, cabling and connectors. Clean thoroughly. If correct, transmitter module is defective. Return transmitter module to Mitec. *For 20W and 40W transmitter modules*: Check power source, RF source, cabling and connectors. Check for clogged fan and debris in heat-sink fins. Clean thoroughly. If fan is worn, replace fan. If correct, transmitter module is defective. Return transmitter module to Mitec.

Table 2 - Recommended Corrective Actions

4.1.6 Out-of Warranty Repair

A non-warranty and out-of-warranty repair service is available from **mitec** for a nominal charge. The customer is responsible for paying the cost of shipping the BUC both to and from **mitec** for these repairs.

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Appendix A

Drawings & Schematic Diagrams

5 to 40 Watt C Band Low Power Transmitter Module - Outline Drawings

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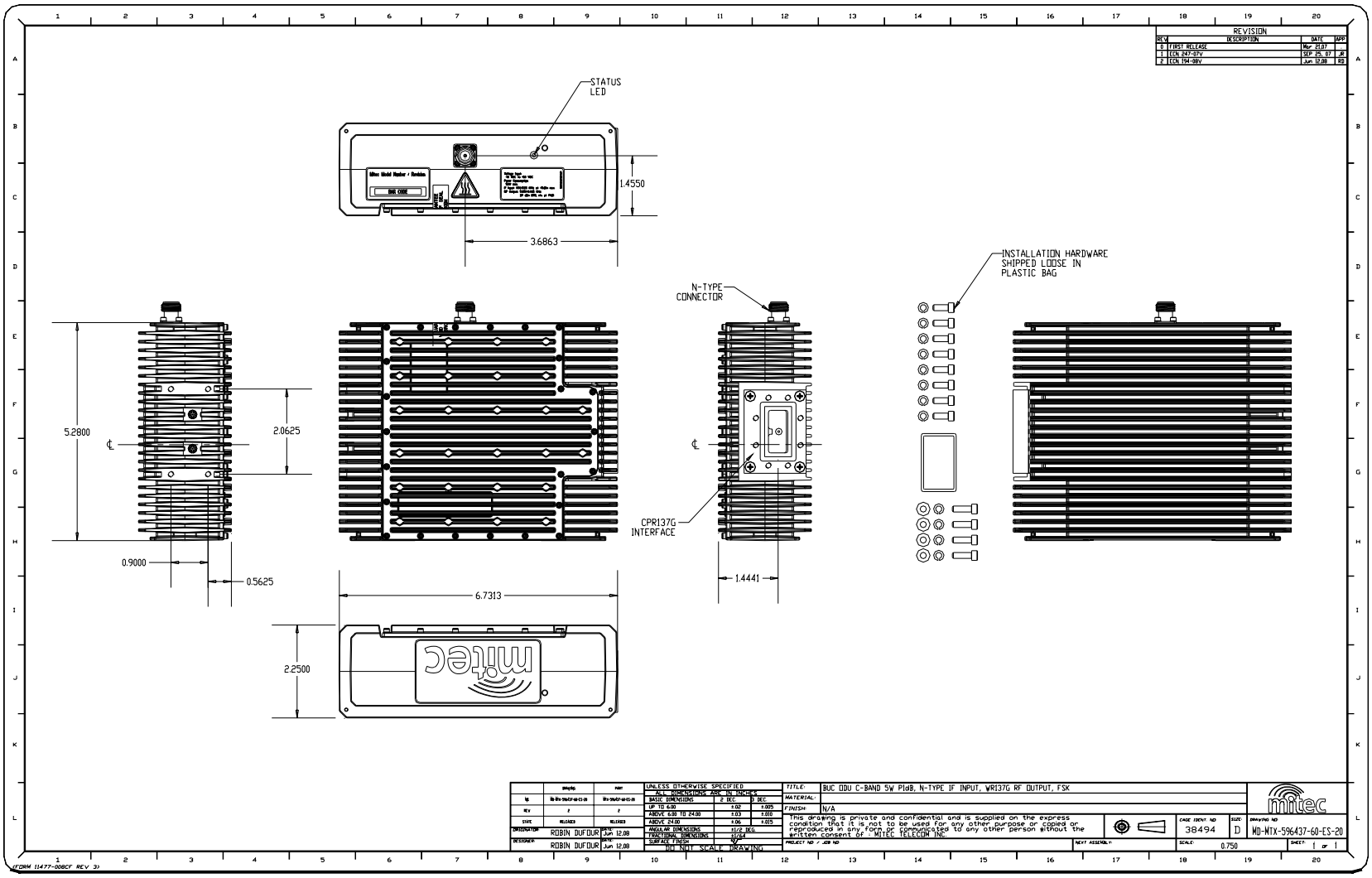

Figure 4 - MTX-596x37-60-ES-20 - Outline drawing

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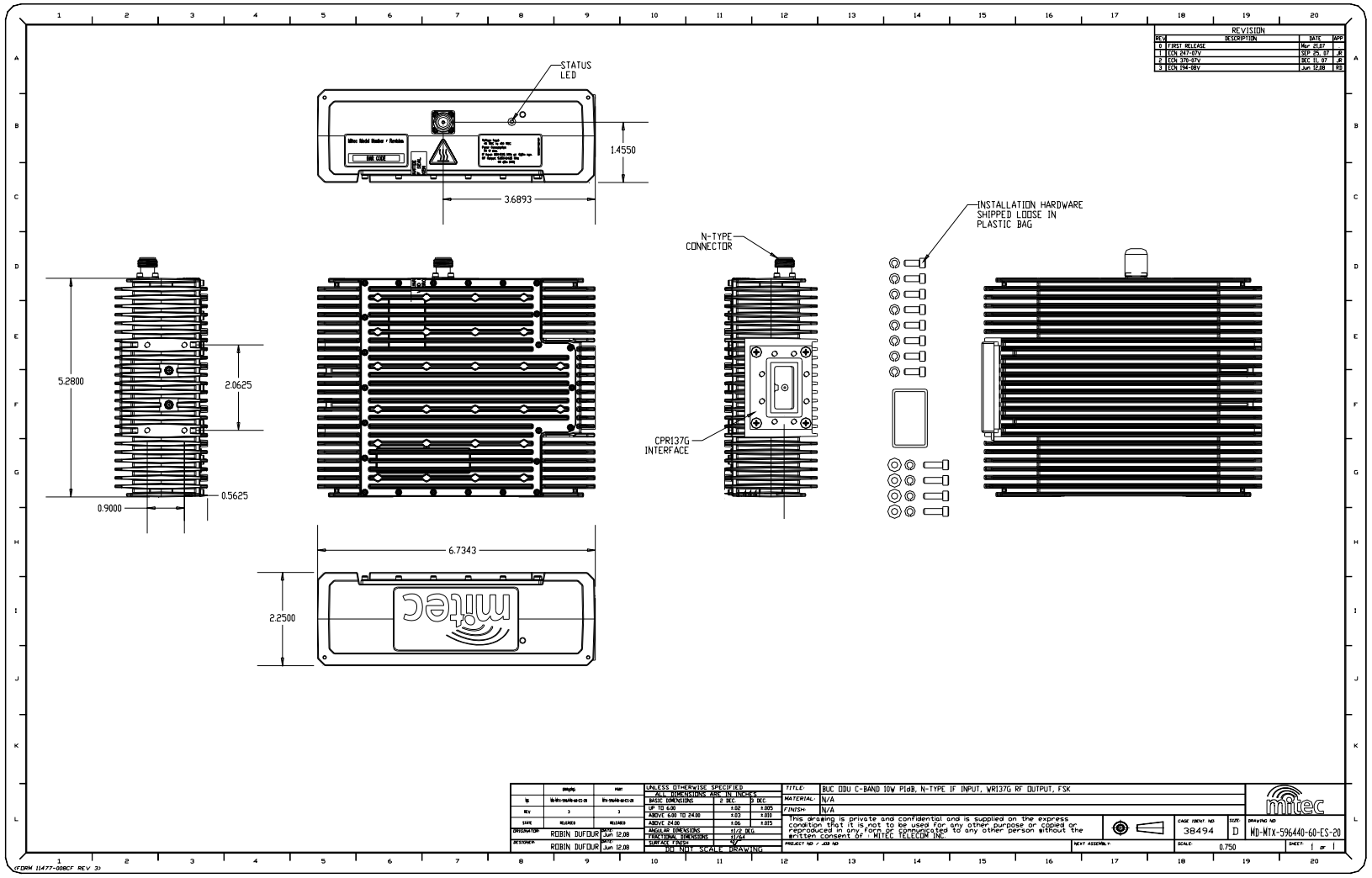

Figure 5 - MTX-596x40-60-ES-20 - Outline drawing

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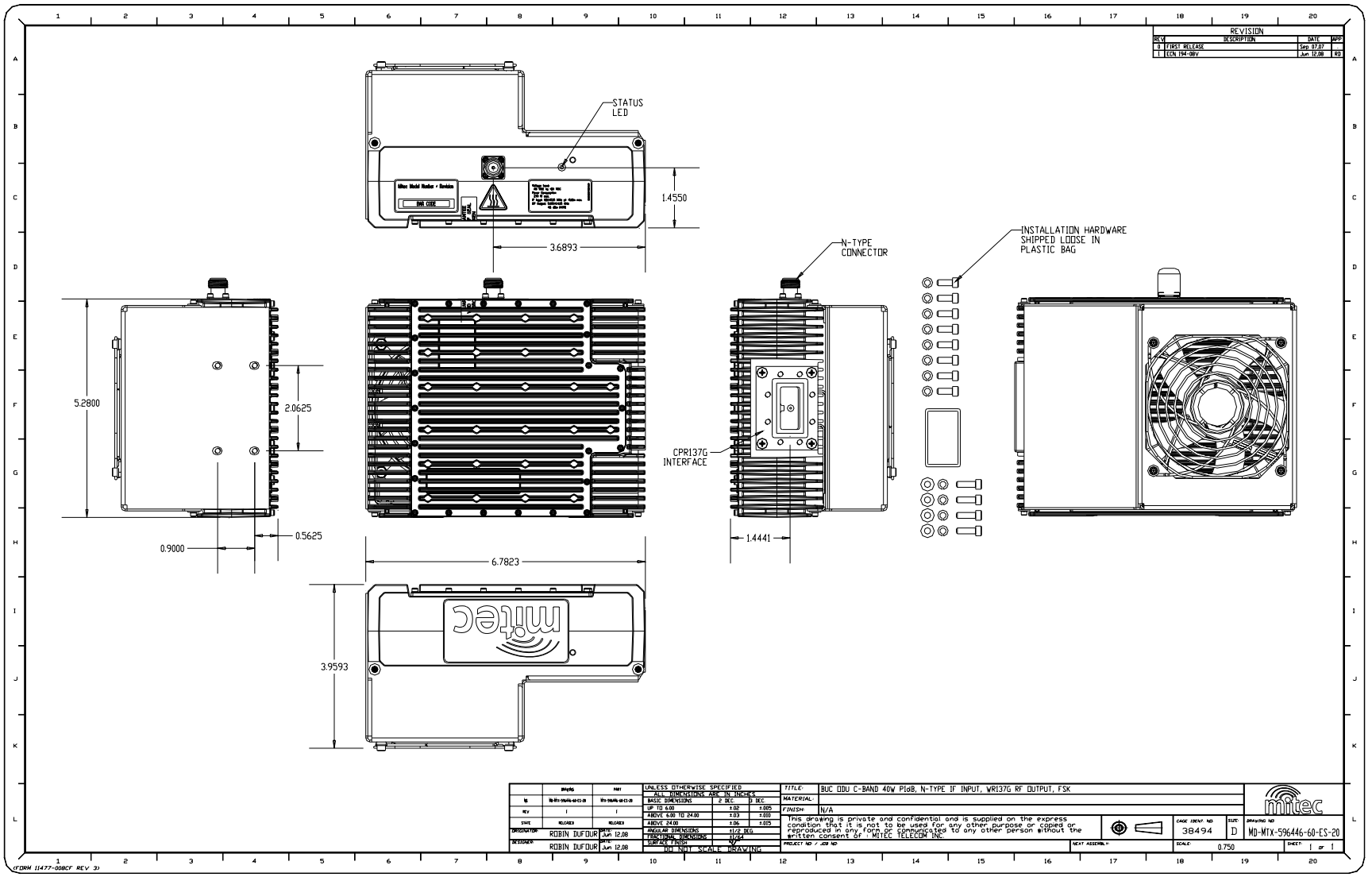

Figure 6 - MTX-596x43/46-60-ES-20 – Outline drawing

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Appendix B

Serial Protocol Documentation

Appendix B contains the serial protocol documentation relevant to this product.

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Document Name:	Technical Specification	**Revision:**	1
File Name:	CBand_BUC_FSK_Protocol V1	**Page:**	Page 1 of 6
Model Number:	N/A	**Originator:**	Qingjun Zhang

Revision	Date	Change Summary	Approval
1	27-Mar-2007	Document creation	C. Villeneuve

C Band BUC FSK Protocols

TABLE OF CONTENT

1 Introduction

This document describes the implementation of the SkyWan Monitor and Control Protocol Version 1 (SMCP-V1). It also follows the protocol defined in the reference document [3]'s chapter 16 for the BUC FSK communications. **RFT** (**R**adio **F**requency **T**ransmitter) is used here to designate the whole system RFT + MCU excluding the IDU.

1.1 Reference Documents

[1]. SkyWan Monitor and Control Protocol Version 1 (SMCP-V1), ND SatCom
[2]. SMCP-V1.doc Rev2, mitec telecom
[3]. CDM-570/570L Installation and Operation Manual, Chapter 16.

1.2 USART Settings

As per the IDU SMCP "Physical Layer" specifications, the RFT has below settings:

- Data rate: 9600 bit/s
- Data per character 8
- Parity none
- Stop bit 1
- Min RFT response time 10mS
- Max RFT response time 20mS

2 Packets Analysis

2.1 RX Packets

The packets received by the RFT is 7 bytes long and have the following generic format:

ADDR	CMD	DATA0	DATA1	DATA2	DATA3	FCS

Where:

	Byte	Definition	Value
0	**ADDR**	Address of the RFT	0x01 to 0x0F
1	**CMD**	Command type	0x01 to 0x04
2	**DATA0**	Data byte0	0x00 to 0xFF
3	**DATA1**	Data byte1	0x00 to 0xFF
4	**DATA2**	Data byte2	0xAA
5	**DATA3**	Data byte3	0xAA
6	**FCS**	Frame Check Sequence	0x00 to 0xFF

As per the specifications, there are only four commands from the IDU: ***Status Request***, ***Set/Reset Transmitter***, ***Set New Address*** and ***Set New Frequency***.

The byte ADDR is the current RFT address.
The byte FCS could be any value (0x00 to 0xFF) and represents the algebraic sum of ADDR + CMD + DATA0 + DATA1 + DATA2 + DATA3.

2.1.1 Status Request

ADDR	0x01	0xAA	0xAA	0xAA	0xAA	FCS

2.1.2 Set Transmission (Enable/Disable)

ADDR	0x02	TXB	0xAA	0xAA	0xAA	FCS

TXB: The transmitter enable byte. TXB = 0x00 ⇒ Disable the Transmitter
TXB = 0x01 ⇒ Enable the Transmitter

2.1.3 Set RFT Address

ADDR	0x03	NADDR	0xAA	0xAA	0xAA	FCS

NADDR: New RFT Address byte. Should be between 0x01 and 0x0F.

2.1.4 Set RFT Frequency

ADDR	0x04	FRQ0	FRQ1	0xAA	0xAA	FCS

FREQ0: Input Frequency divided by 256 (in MHz.)

FREQ1: Input Frequency modulo 256 (in MHz.)

2.2 TX Packets (Response Packets)

To the received packet of figure-a the Packet Handler will generate a packet that looks like figure-b:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ADDR	0x01	0xAA	0xAA	0xAA	0xAA	FCS

Figure-a

	bit7	bit6	bit5	bit4	Bit3	bit2	bit1	bit0
Byte 0	ADDR				0	0	0	0
Byte 1	⌊CurrentCwPower/2.56dBm⌋							
Byte 2	(CurrentCwPower/0.01dBm) modulo 256							
Byte 3	Housing Temperature *(signed byte)*							
Byte 4	PWR-ID				TX	C	PLL	T
Byte 5	SW-VER				RESERVED			
Byte 6	FCS							

Figure-b

ADDR: the unit ID address
T: A flag that indicates whether the housing temperature is within range or not.
PLL: A flag that indicates whether the phase lock loop is locked or not.
C: A flag that indicates whether the last received packet was consistent or not.
TX: A flag that indicates whether the unit transmitter is enabled or not.
PWR-ID: A nibble that contains the power class id number.
SW-VER: A nibble that contains the current running firmware version.
FCS: A byte that represents the frame check sequence.

2.2.1 ADDR Field - BYTE0

Address echo (addressX16); permissible value: 0x10 .. 0xF0.

2.2.2 Power (Integer Part) - BYTE1

This is the current power divided by 2.56dBm and rounded down (*(CurrentCwPower * 100) / 256).*

2.2.3 Power (Decimal Part) - BYTE2

This is the current power divided by 0.01dBm and modulo 256 (*(CurrentCwPower * 100) modulo 256*).

2.2.4 Housing Temperature - BYTE3

This is the current housing temperature in DegC. It is 8 bit signed char.

2.2.5 Power Class ID (PWR-ID) – BYTE4 (High Nibble)

This is the power class identification nibble. For detail code definition, refer to the ND SatCom specs.

ID	1	2	3	4	5	6	7	8	9	10	11	12
Power	2W	4W	5W	8W	10W	16W	20W	25W	40W	60W	30W	125W

2.2.6 Transmit Enable/Disable (TX) – BYTE4 (Bit3)

This is the flag that tells about the unit mute status.
TX=0: transmission disabled (the unit is muted).
TX=1: transmission enabled (the unit is unmuted).

2.2.7 Consistency (C) – BYTE4 (Bit2)

This flag tells whether the last packet received by the unit had consistent parameters or not.
0: last request packet was consistent.
1: inconsistency in last request packet detected.

2.2.8 Phase-Locked Loop (PLL) – BYTE4 (Bit1)

This flag is not implemented yet in the BUC (no hardware).
0: PLL currently locked
1: PLL currently out of lock.

2.2.9 Temperature Within Tolerable Range (T) – BYTE4 (Bit0)

This flag indicates whether the unit housing temperature is within tolerable temperature or not.
0: housing temperature currently within range
1: housing temperature currently out of range.

2.2.10 Reserved Nibble – BYTE5 (Low Nibble)

This nibble is reserved as its name says it.

2.2.11 Software Version (SW-VER) - BYTE5 (High Nibble)

1.. 15: version of software (firmware) running on RFT controller.

2.2.12 Frame Check Sequence (FCS) – BYTE6

This is an error detection byte that is calculated over the whole frame (6 bytes). It is the algebraic sum of the packet from byte0 to byte5.

Appendix C

Accessories:

Power supply:

- 057-0024: 1U rack mount Indoor Power Supply, 110/220Vac, for 5/10/20/40W C-Band MTX BUCs.
- 215559-001MD: 1U rack mount Indoor Power Supply, 110/220Vac, + Bias-Tee, for 5/10/20/40W C-Band MTX BUCs, used for standalone option.
- 215560-001MD: Outdoor Power Supply 110/220Vac, + Bias Tee, for 5/10/20/40W C-Band MTX BUCs, used for standalone option.
- 215560-002MD: Outdoor Power Supply 110/220Vac, for 5/10/20/40W C-Band MTX BUCs for redundancy system.
- 215560-003MD: Outdoor Power Supply -48Vdc, for 8/16 Ku Band and 10/20/40 C Band MTX's BUC.
- 215988-001MD: Outdoor Power Supply -48Vdc, + Bias Tee, for 5/10/20/40W C-Band MTX BUCs, used for standalone option.
- 215988-002MD: Outdoor Power Supply -48Vdc, for 5/10/20/40W C-Band MTX BUCs for redundancy system.
- 215988-003MD: Outdoor Power Supply 90-264Vac, for 8/16 Ku Band and 10/20/40 C Band MTX's BUC.
- 215564-001MD: BIAS T 50VDC 10 AMP.

Mounting kit:

215035-001MD : Boom Mounting Kit, MTX Low Power C-Band BUC.

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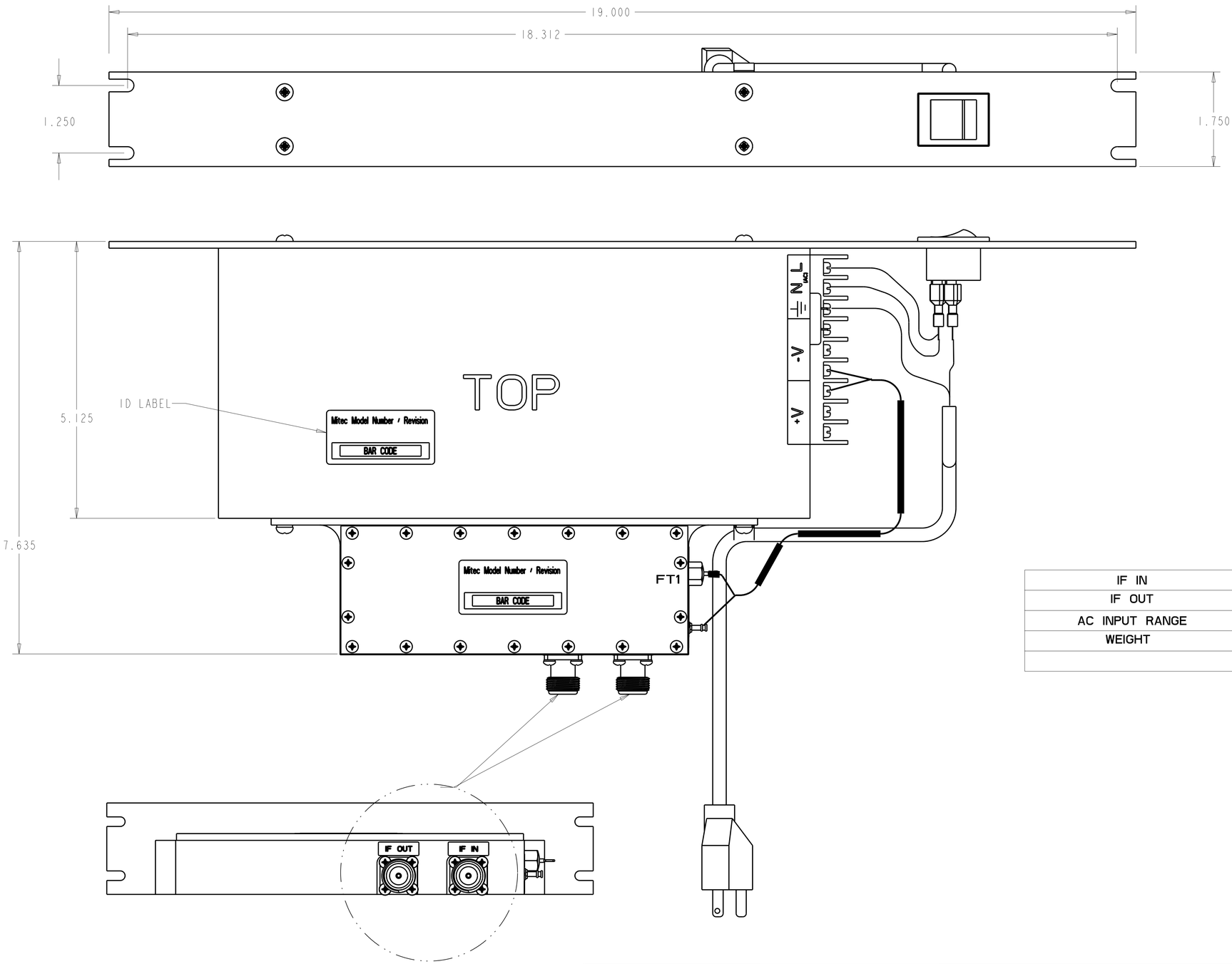
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	OCT 21/08	



IF IN	FSK AND L BAND
IF OUT	FSK, L-BAND AND DC 48 VDC 480 W MAX.
AC INPUT RANGE	90-260 VAC - 50-60 Hz
WEIGHT	3 Kg

	DRAWING	PART
NO.	215559-001MD	215559-001
REV	0	0
STATE	RELEASED	RELEASED
ORIGINATOR: DARCY CRAWLEY	DATE: OCT 21/08	
DESIGNER: DARCY CRAWLEY	DATE: OCT 21/08	

UNLESS OTHERWISE SPECIFIED		
ALL DIMENSIONS ARE IN INCHES		
BASIC DIMENSIONS	2 DEC.	3 DEC.
UP TO 6.00	±.02	±.005
ABOVE 6.00 TO 24.00	±.03	±.010
ABOVE 24.00	±.06	±.015
ANGULAR DIMENSIONS	±1/2 DEG.	
FRACTIONAL DIMENSIONS	±1/64	
SURFACE FINISH	√	
DO NOT SCALE DRAWING		

TITLE: 480W IDU AC TO 48VDC P/S WITH BIAS TEE

MATERIAL:

FINISH:

PROJECT NO: / JOB NO:

NEXT ASSEMBLY:

CAGE IDENT. NO: 38494

SIZE: D

DRAWING NO: 215559-001MD

SCALE: 1.000

SHEET: 1 OF 1

(FORM 11477-008CF REV 3)

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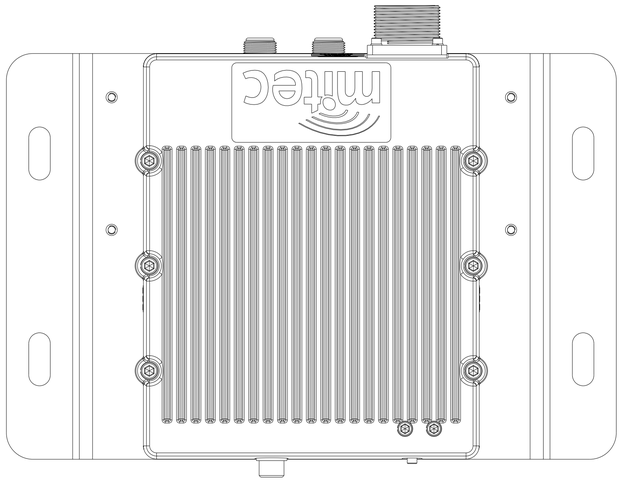
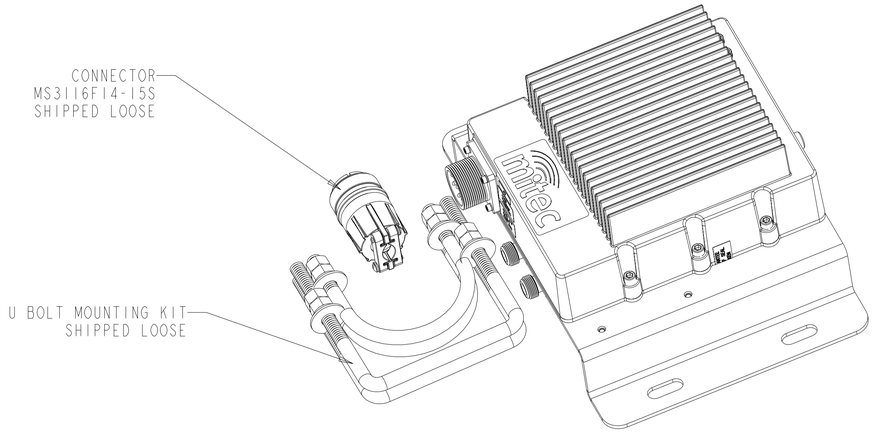
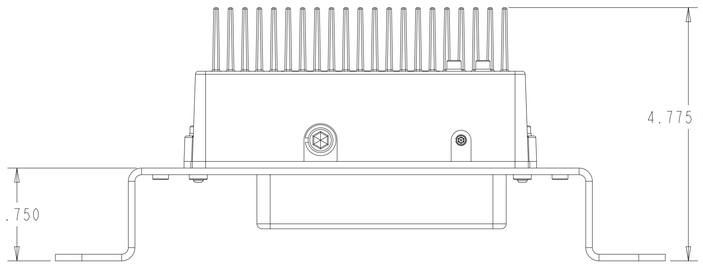
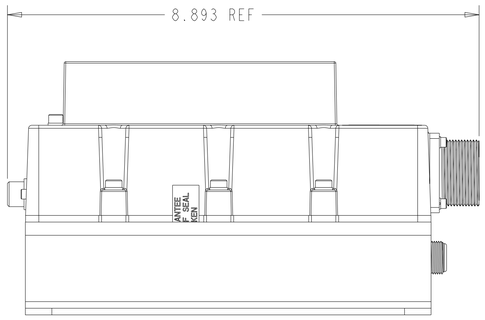
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	Sep 24,08	RD

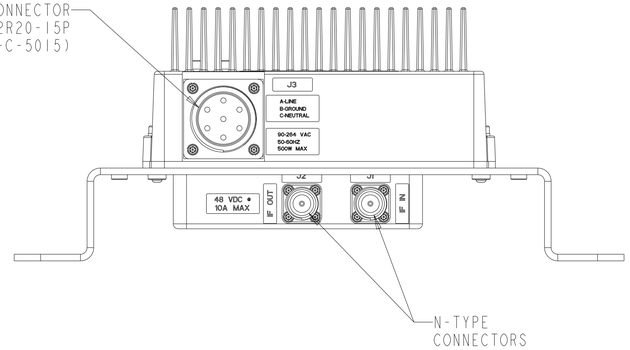


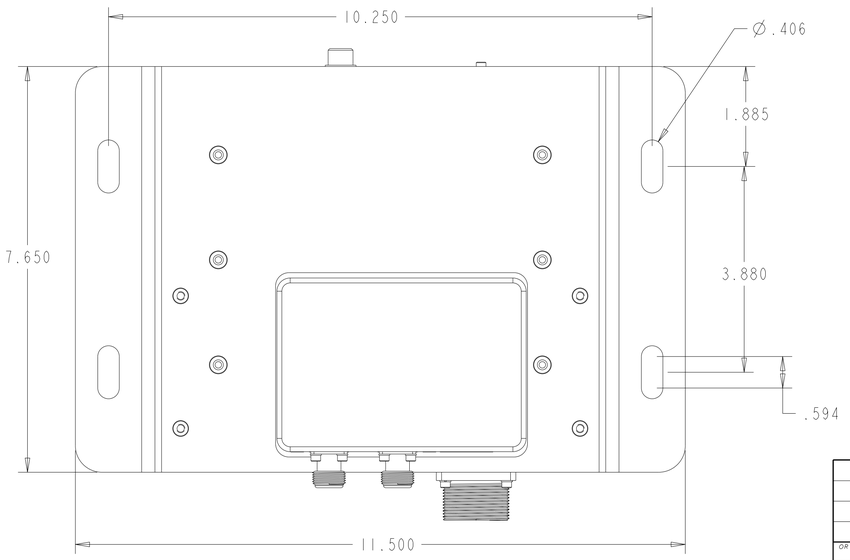


SCALE 0.500









	DRAWING	PART
NO.	215560-001MD	SEE PART LIST
REV	0	
STATE	RELEASED	RELEASED
ORIGINATOR:	ROBIN DUFOUR	DATE: Sep 24,08
DESIGNER:	ROBIN DUFOUR	DATE: Sep 24,08

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES		
BASIC DIMENSIONS	2 DEC.	3 DEC.
UP TO 6.00	±.02	±.005
ABOVE 6.00 TO 24.00	±.03	±.010
ABOVE 24.00	±.06	±.015
ANGULAR DIMENSIONS	±1/2 DEG.	
FRACTIONAL DIMENSIONS	±1/64	
SURFACE FINISH	63	

DO NOT SCALE DRAWING

TITLE: PS ODU, 90-264VAC + BIAS TEE, FOR 8/16W KU-BAND & 10/20/40W C-BAND MTX BUCs

MATERIAL: SEE PART LIST

FINISH: SEE NOTES

CAGE IDENT. NO: 38494 | SIZE: D | DRAWING NO: 215560-001MD

PROJECT NO: / JOB NO: | NEXT ASSEMBLY: | SCALE: 0.700 | SHEET: 1 OF 1

(FORM 11477-008CF REV 3)

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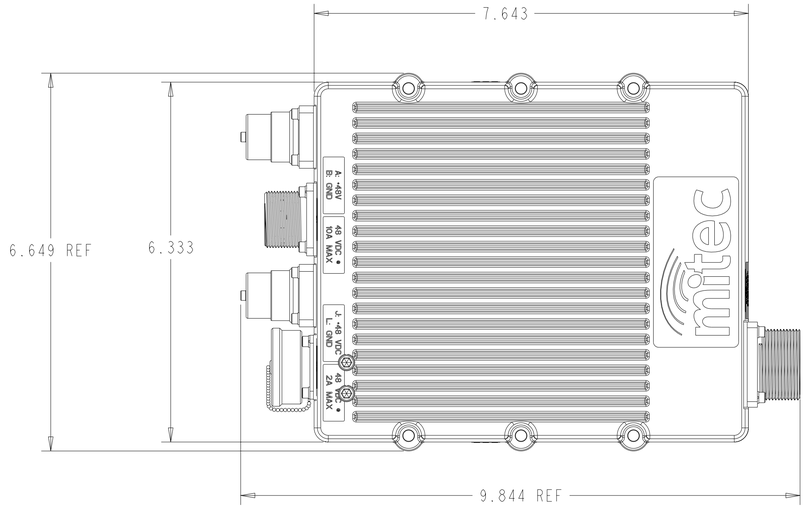
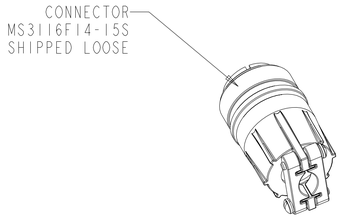
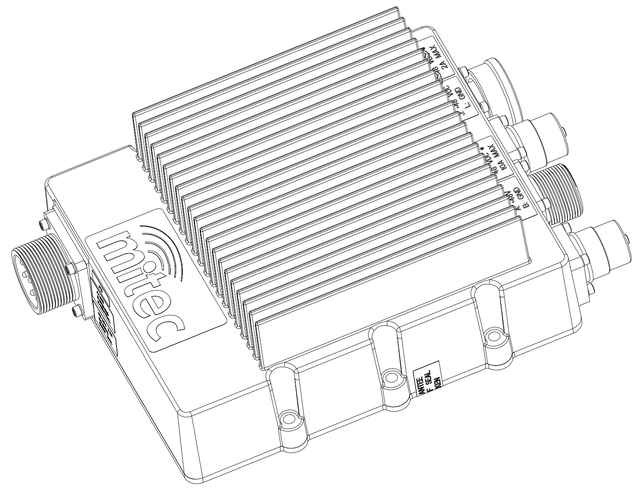
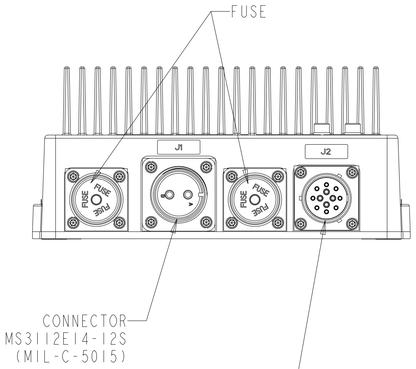
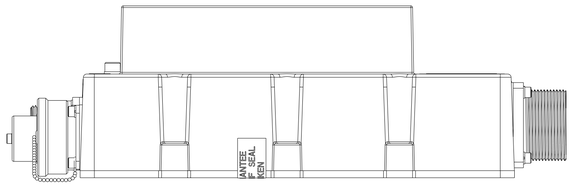
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	Sep 24,08	RD

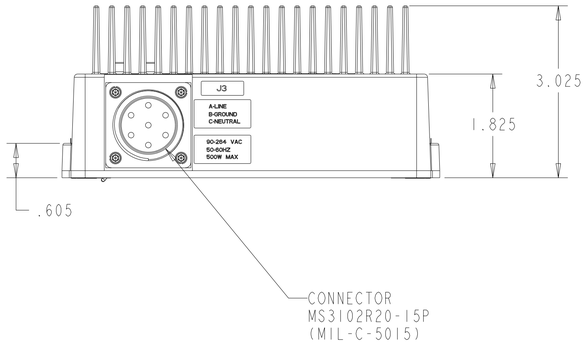


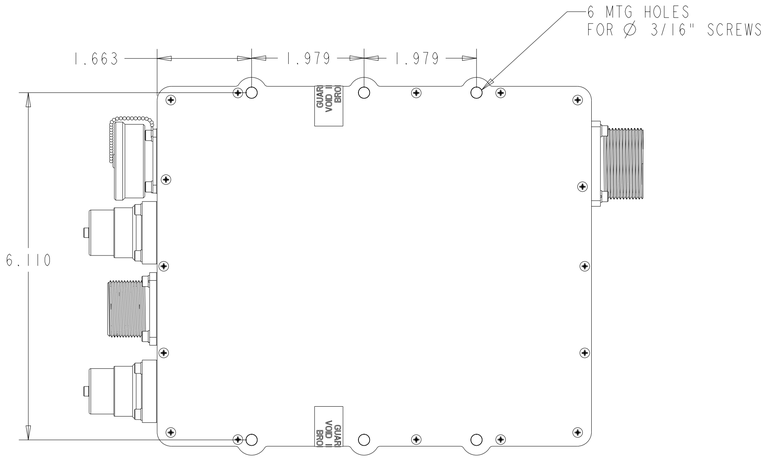












	DRAWING	PART
NO.	215560-002MD	SEE PART LIST
REV	0	
STATE	RELEASED	RELEASED
ORIGINATOR:	ROBIN DUFOUR	DATE: Sep 24,08
DESIGNER:	ROBIN DUFOUR	DATE: Sep 24,08

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES

BASIC DIMENSIONS	2 DEC.	3 DEC.
UP TO 6.00	±.02	±.005
ABOVE 6.00 TO 24.00	±.03	±.010
ABOVE 24.00	±.06	±.015
ANGULAR DIMENSIONS	±1/2 DEG.	
FRACTIONAL DIMENSIONS	±1/64	
SURFACE FINISH	63	

DO NOT SCALE DRAWING

TITLE: PS ODU, 90-264VAC FOR 8/16W KU-BAND & 10/20/40W C-BAND MTX BUCs
MATERIAL: SEE PART LIST
FINISH: SEE NOTES

PROJECT NO: / JOB NO:
NEXT ASSEMBLY:
CAGE IDENT. NO: 38494
SIZE: D
DRAWING NO: 215560-002MD
SCALE: 0.750
SHEET: 1 OF 1

(FORM 11477-008CF REV 3)

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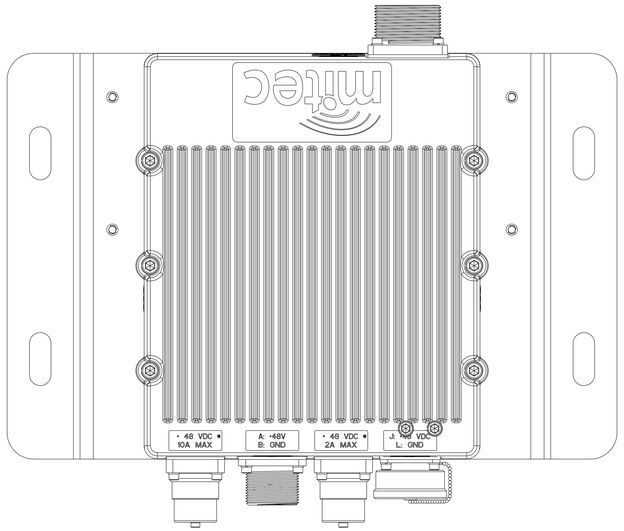
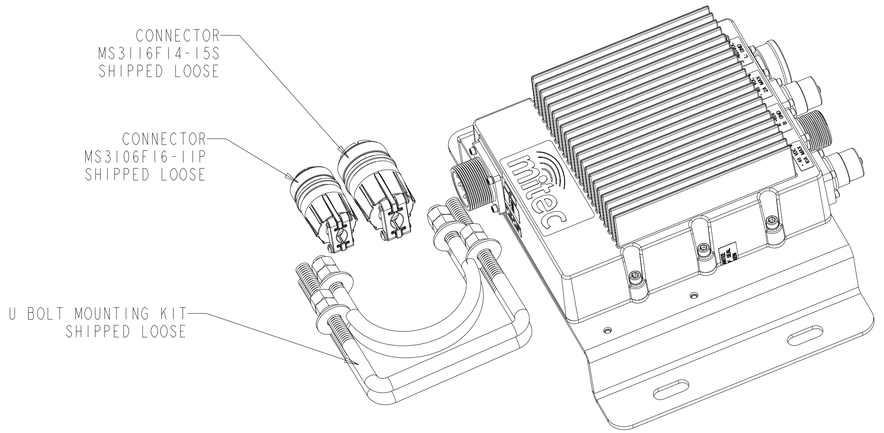
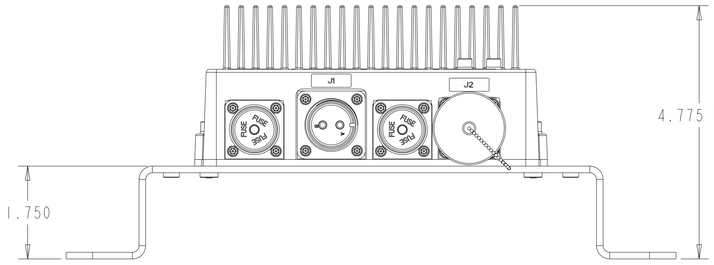
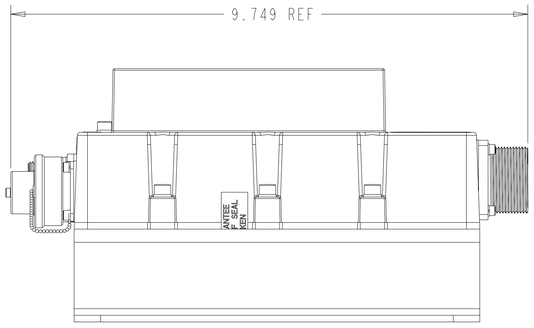
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	Dec 09,08	RD

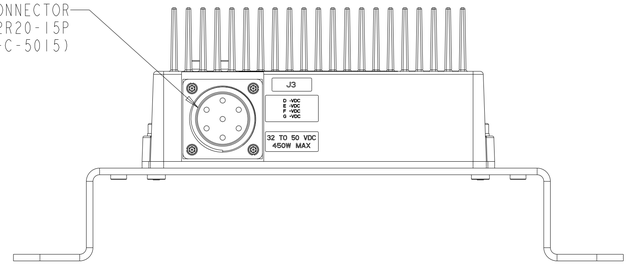


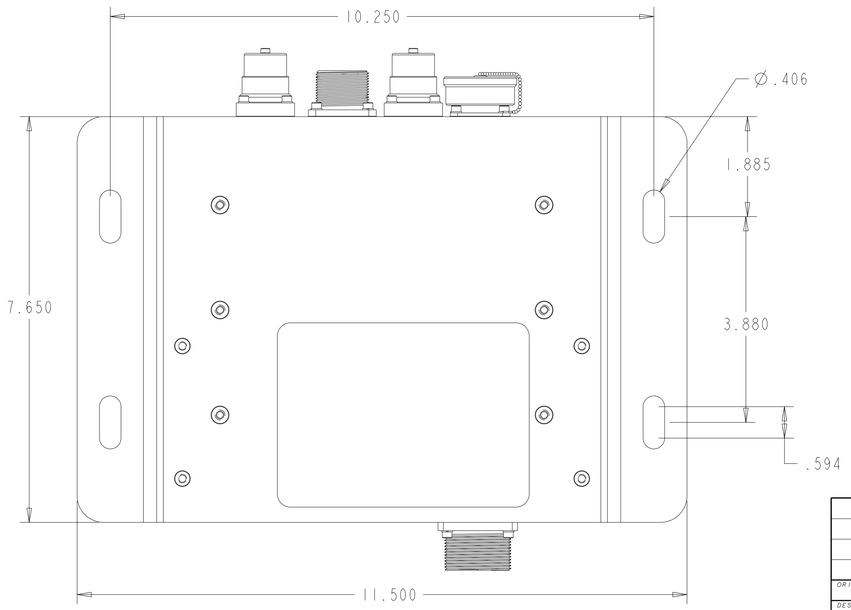


SCALE 0.500









	DRAWING	PART
NO.	215560-003MD	SEE PART LIST
REV	0	
STATE	RELEASED	RELEASED
ORIGINATOR:	ROBIN DUFOUR	DATE: Dec 09,08
DESIGNER:	ROBIN DUFOUR	DATE: Dec 09,08

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES		
BASIC DIMENSIONS	2 DEC.	3 DEC.
UP TO 6.00	±.02	±.005
ABOVE 6.00 TO 24.00	±.03	±.010
ABOVE 24.00	±.06	±.015
ANGULAR DIMENSIONS	±1/2 DEG.	
FRACTIONAL DIMENSIONS	±1/64	
SURFACE FINISH	63	
DO NOT SCALE DRAWING		

TITLE: -48VDC PS ODU, FOR 8/16W KU-BAND & 10/20/40W C-BAND MTX BU W Bracket

MATERIAL: SEE PART LIST

FINISH: SEE NOTES

PROJECT NO: / JOB NO:

NEXT ASSEMBLY:

CAGE IDENT. NO: 38494

SIZE: D

DRAWING NO: 215560-003MD

SCALE: 0.700

SHEET: 1 OF 1

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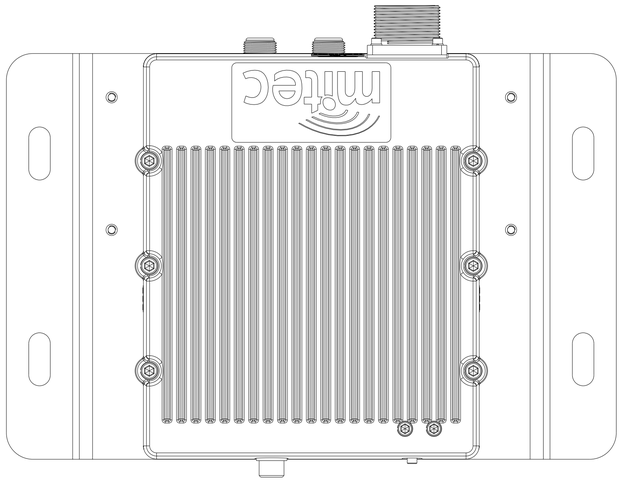
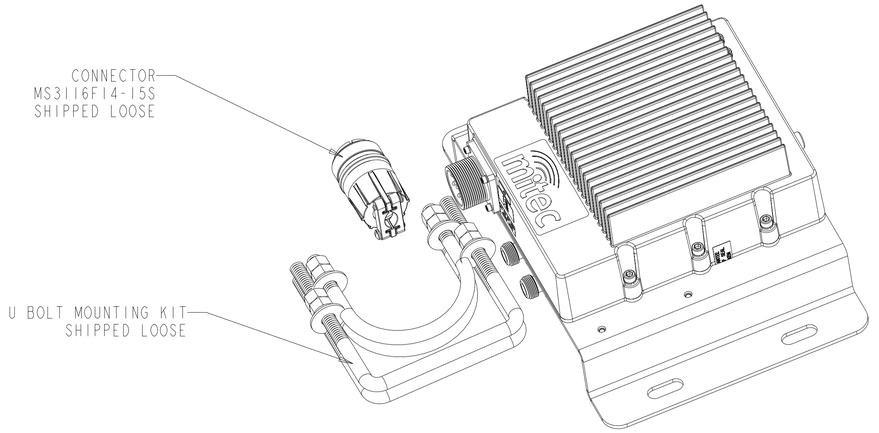
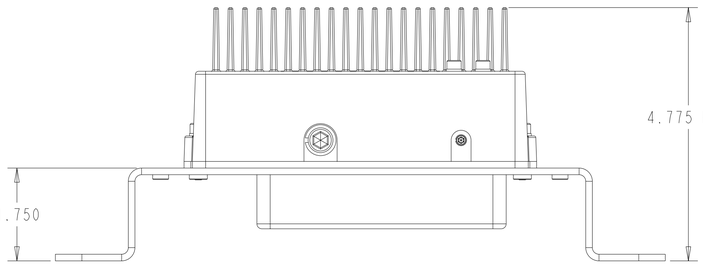
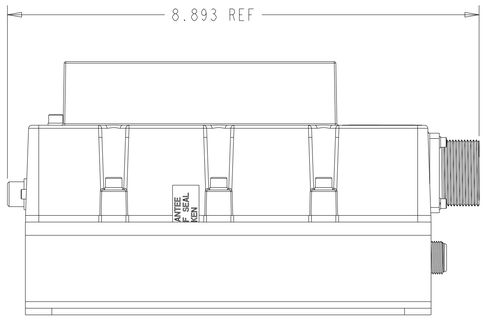
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	Sep 24,08	RD

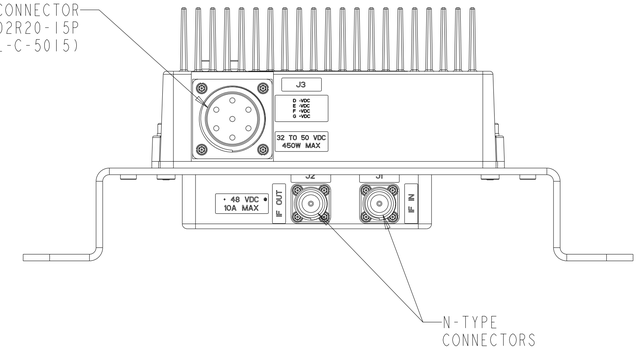


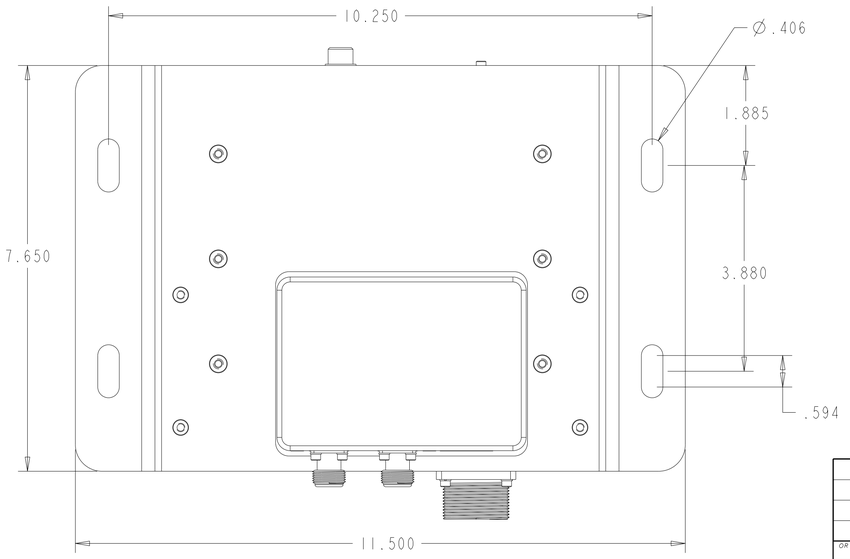


SCALE 0.500









	DRAWING	PART
NO.	215988-001MD	SEE PART LIST
REV	0	
STATE	RELEASED	RELEASED
ORIGINATOR:	ROBIN DUFOUR	DATE: Sep 24,08
DESIGNER:	ROBIN DUFOUR	DATE: Sep 24,08

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES		
BASIC DIMENSIONS	2 DEC.	3 DEC.
UP TO 6.00	±.02	±.005
ABOVE 6.00 TO 24.00	±.03	±.010
ABOVE 24.00	±.06	±.015
ANGULAR DIMENSIONS	±1/2 DEG.	
FRACTIONAL DIMENSIONS	±1/64	
SURFACE FINISH	63	

DO NOT SCALE DRAWING

TITLE: -48VDC PS ODU + BIAS TEE, FOR 8/16W KU-BAND & 10/20/40W C-BAND MTX BU

MATERIAL: SEE PART LIST

FINISH: SEE NOTES

CAGE IDENT. NO: 38494 | SIZE: D | DRAWING NO: 215988-001MD

PROJECT NO: / JOB NO: | NEXT ASSEMBLY: | SCALE: 0.700 | SHEET: 1 OF 1

(FORM 11477-008CF REV 3)

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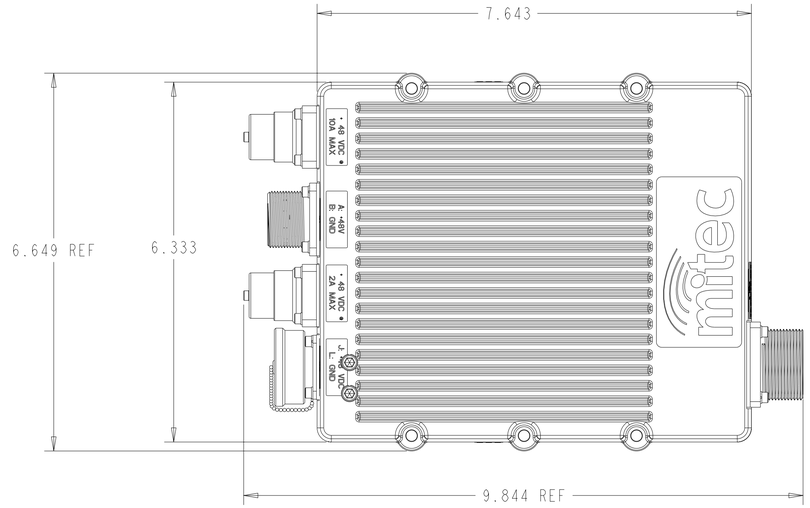
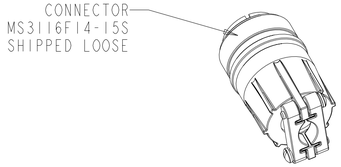
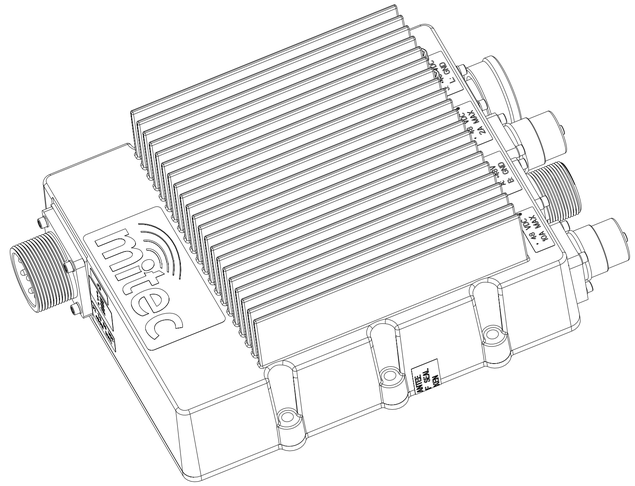
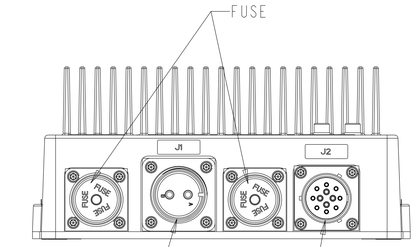
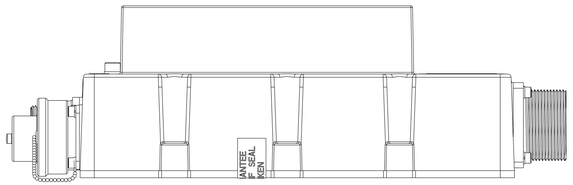
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	Dec 09,08	RD

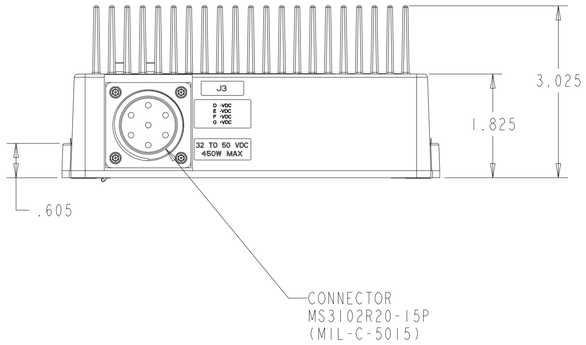


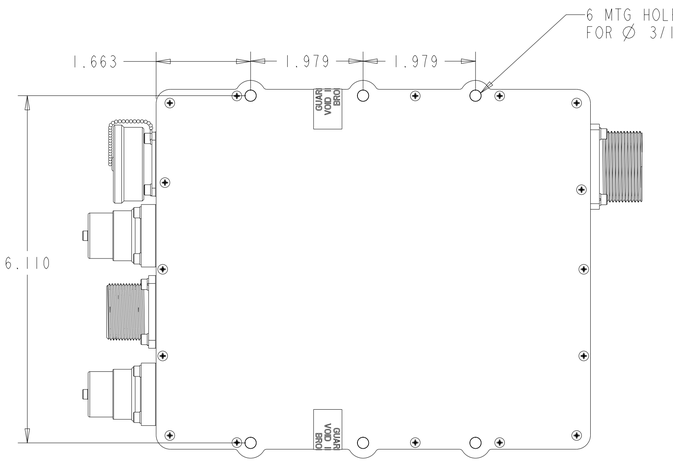












	DRAWING	PART
NO.	215988-002MD	SEE PART LIST
REV	0	
STATE	RELEASED	RELEASED
ORIGINATOR:	ROBIN DUFOUR	DATE: Dec 09,08
DESIGNER:	ROBIN DUFOUR	DATE: Dec 09,08

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES

BASIC DIMENSIONS	2 DEC.	3 DEC.
UP TO 6.00	±.02	±.005
ABOVE 6.00 TO 24.00	±.03	±.010
ABOVE 24.00	±.06	±.015
ANGULAR DIMENSIONS	±1/2 DEG.	
FRACTIONAL DIMENSIONS	±1/64	
SURFACE FINISH	63	

DO NOT SCALE DRAWING

TITLE: -48VDC PS ODU, FOR 8/16W KU-BAND & 10/20/40W C-BAND MTX BU
MATERIAL: SEE PART LIST
FINISH: SEE NOTES

PROJECT NO: / JOB NO:
NEXT ASSEMBLY:
CAGE IDENT. NO: 38494
SIZE: D
DRAWING NO: 215988-002MD
SCALE: 0.750
SHEET: 1 OF 1

(FORM 11477-008CF REV 3)

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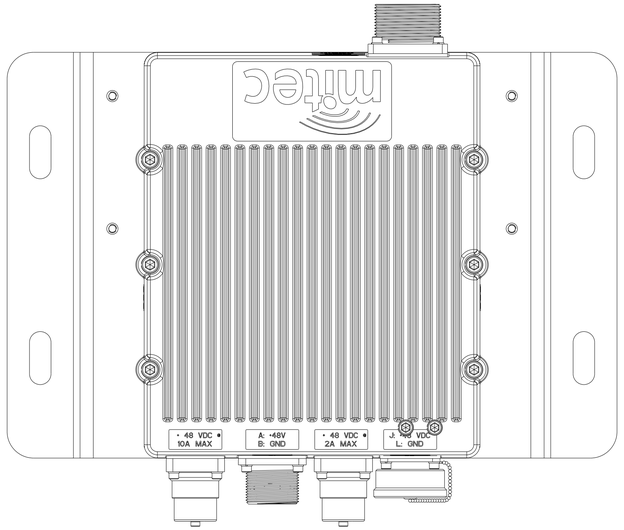
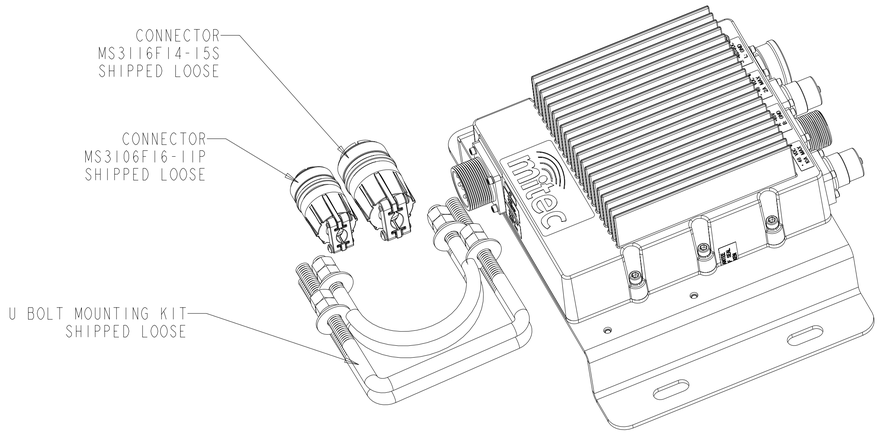
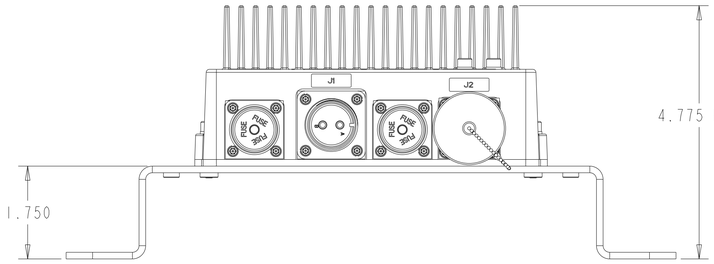
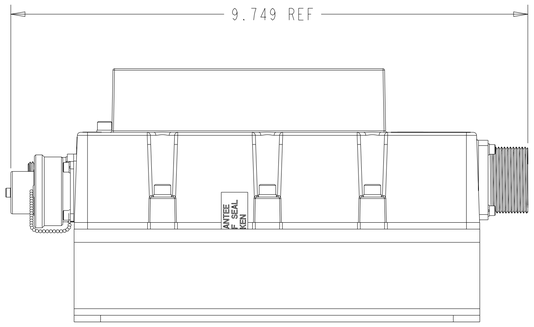
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	Dec 09,08	RD

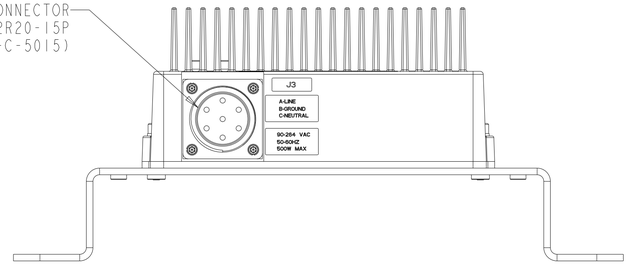


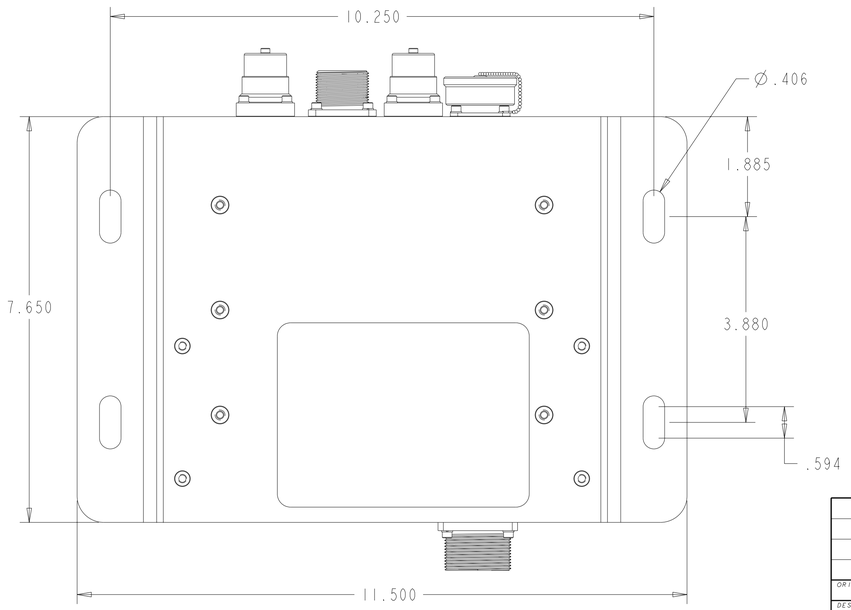


SCALE 0.500









	DRAWING	PART
NO.	215988-003MD	SEE PART LIST
REV	0	
STATE	RELEASED	RELEASED
ORIGINATOR:	ROBIN DUFOUR	DATE: Dec 09,08
DESIGNER:	ROBIN DUFOUR	DATE: Dec 09,08

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES		
BASIC DIMENSIONS	2 DEC.	3 DEC.
UP TO 6.00	±.02	±.005
ABOVE 6.00 TO 24.00	±.03	±.010
ABOVE 24.00	±.06	±.015
ANGULAR DIMENSIONS	±1/2 DEG.	
FRACTIONAL DIMENSIONS	±1/64	
SURFACE FINISH	√	

DO NOT SCALE DRAWING

TITLE: PS ODU, 90-264VAC FOR 8/16W KU-BAND & 10/20/40W C-BAND MTX BUCs W Bracket

MATERIAL: SEE PART LIST

FINISH: SEE NOTES

CAGE IDENT. NO: 38494

SIZE: D

DRAWING NO: 215988-003MD

PROJECT NO: / JOB NO:

NEXT ASSEMBLY:

SCALE: 0.700

SHEET: 1 OF 1

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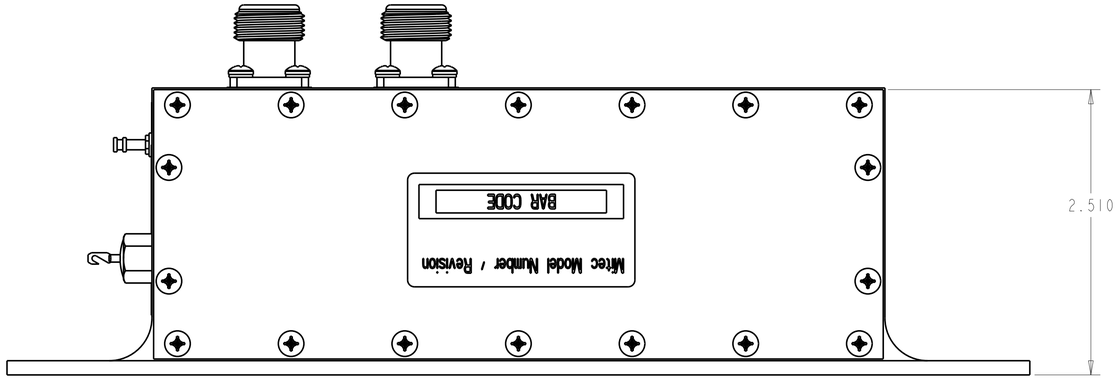
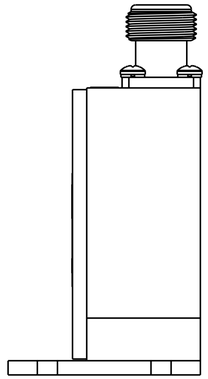
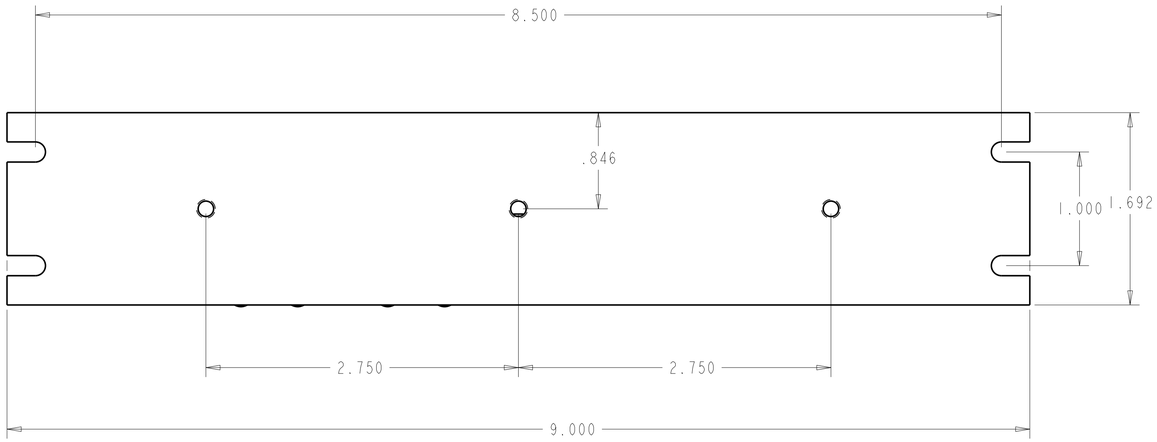
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	Jun 27,08	

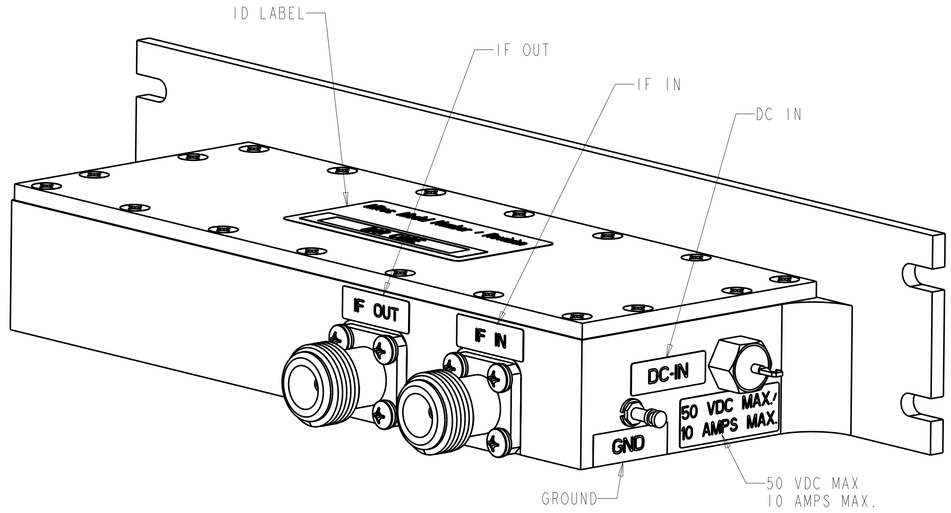




OPTION TABLE

DASHES	FINISH	REVISION
215564-001MD	TRIVALENT CHROMATE	0
215564-002MD	TRIVALENT CHROMATE & PAINT WHITE	0





IF IN	FSK AND L BAND
IF OUT	FSK, L-BAND AND DC
DC IN	50 VDC MAX. AT 10 AMP MAX.

SCALE 1.750

	DRAWING	PART
NO.	215564-000MD	215564-000
REV	0	SEE OPTION TABLE
STATE	RELEASED	RELEASED
ORIGINATOR: DARCY CRAWLEY		DATE: Jun 27,08
DESIGNER: DARCY CRAWLEY		DATE: Jun 27,08

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES

BASIC DIMENSIONS	2 DEC.	3 DEC.
UP TO 6.00	±.02	±.005
ABOVE 6.00 TO 24.00	±.03	±.010
ABOVE 24.00	±.06	±.015
ANGULAR DIMENSIONS	±1/2 DEG.	
FRACTIONAL DIMENSIONS	±1/64	
SURFACE FINISH	32	

DO NOT SCALE DRAWING

TITLE: BIAS T 50 VDC 10 AMP.
MATERIAL:
FINISH: SEE OPTION TABLE

PROJECT NO: / JOB NO:
NEXT ASSEMBLY:

mitec

CAGE IDENT. NO: 38494
SIZE: D
DRAWING NO: 215564-000MD
SCALE: 1.500
SHEET: 1 OF 1

(FORM 11477-008CF REV 3)

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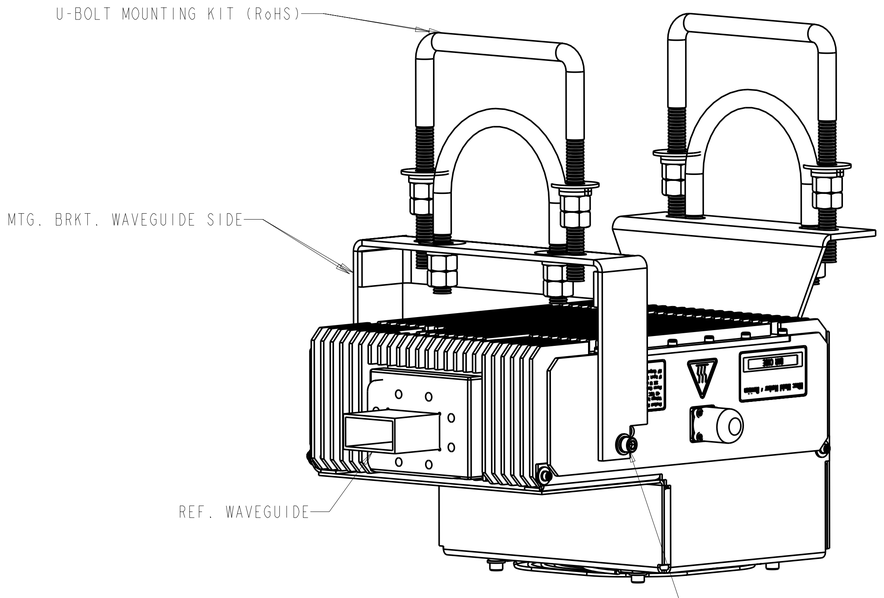
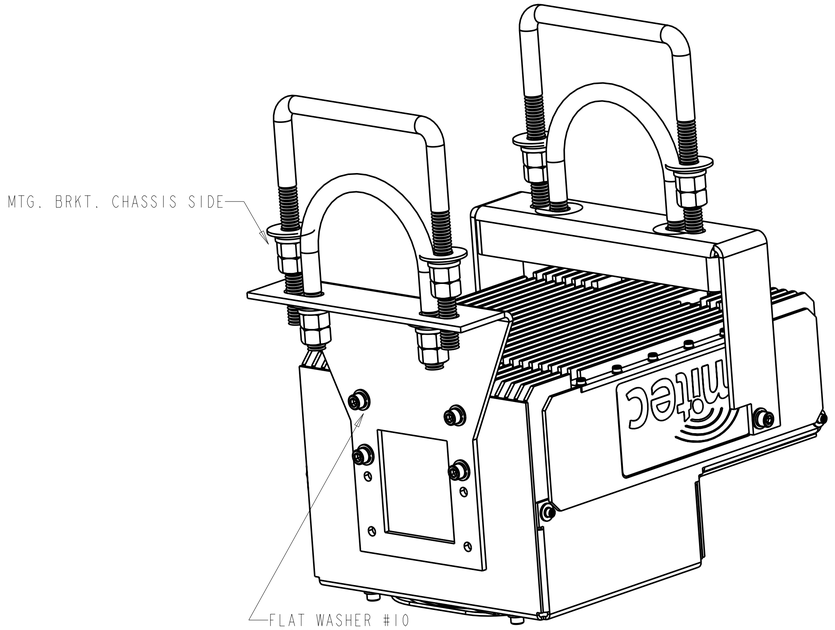
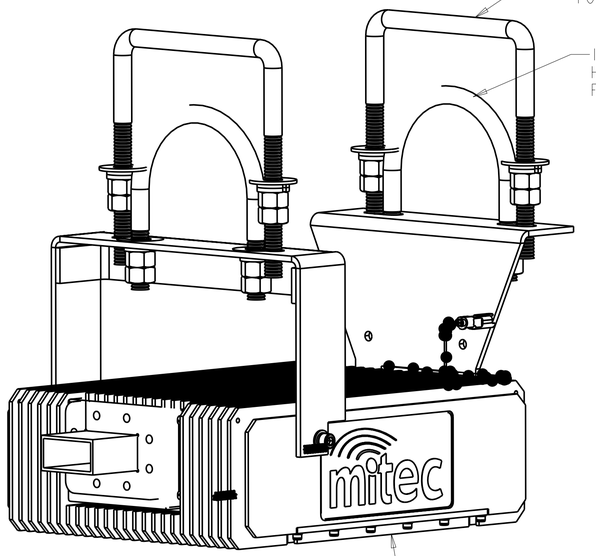
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	Mar 05,08	
1	ECN-215-08V	JUNE 28/08	DC

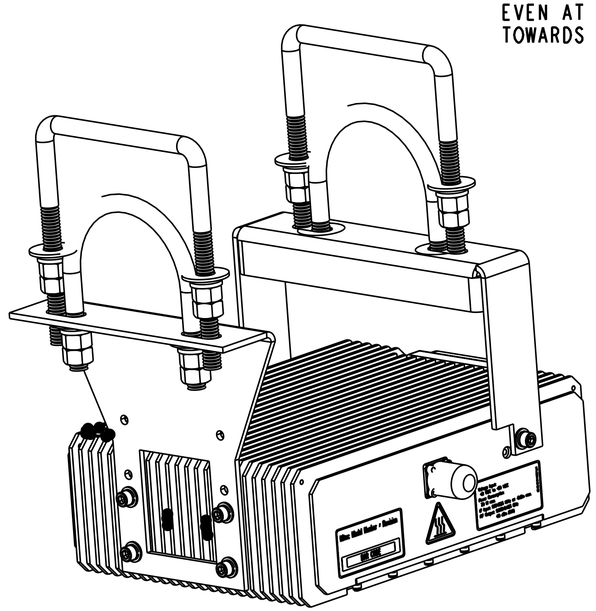
UNIT EQUIP WITH FAN





UNITS WITHOUT FAN





	DRAWING	PART
NO.	215035-00IMD	215035-001
REV	1	0
STATE	RELEASED	RELEASED
ORIGINATOR:	DARCY CRAWLEY	DATE: Mar 05,08
DESIGNER:	DARCY CRAWLEY	DATE: Mar 05,08

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES

	2 DEC.	3 DEC.
BASIC DIMENSIONS		
UP TO 6.00	±.02	±.005
ABOVE 6.00 TO 24.00	±.03	±.010
ABOVE 24.00	±.06	±.015
ANGULAR DIMENSIONS	±1/2 DEG.	
FRACTIONAL DIMENSIONS	±1/64	
SURFACE FINISH	125	

DO NOT SCALE DRAWING

TITLE: LP BUC BOOM MTG. KIT

MATERIAL:

FINISH:

PROJECT NO: / JOB NO:

NEXT ASSEMBLY:

CAGE IDENT. NO: 38494

SIZE: D

DRAWING NO: 215035-001IMD

SCALE: 1.000

SHEET: 1 OF 2

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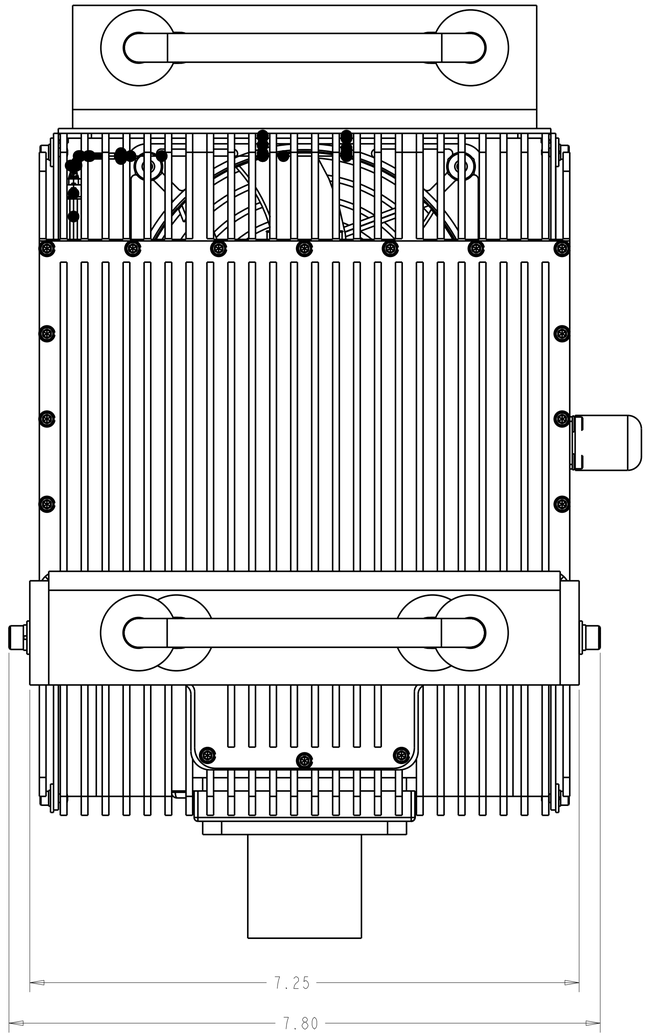
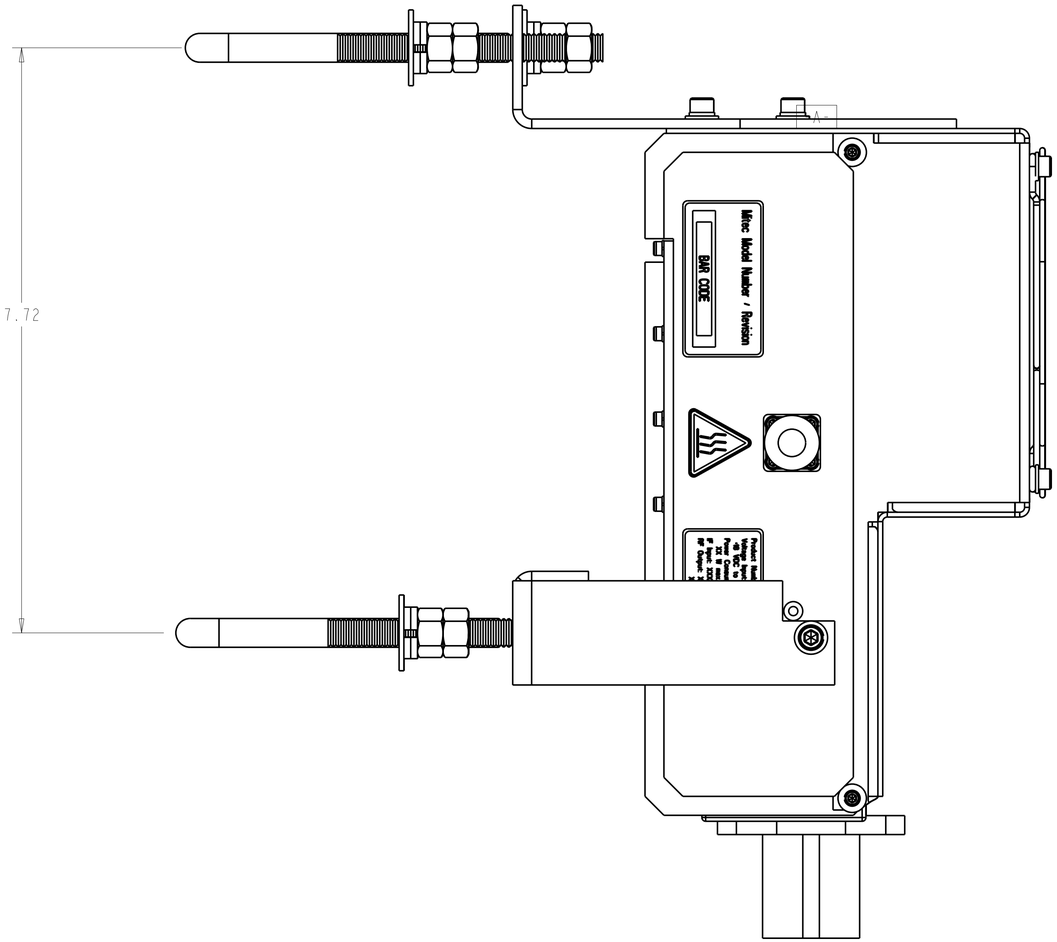
REVISION			
REV	DESCRIPTION	DATE	APP
0	SEE SHEET 1	Jun 26,08	





	DRAWING	PART
NO.	215035-001MD	20WATT-40WATT
REV	1	0
STATE	PTC WM LIFECYCLE STATE	PTC WM LIFECYCLE STATE
ORIGINATOR: DARCY CRAWLEY	DATE: Jun 26,08	
DESIGNER: DARCY CRAWLEY	DATE: Jun 26,08	

UNLESS OTHERWISE SPECIFIED		
ALL DIMENSIONS ARE IN INCHES		
BASIC DIMENSIONS	2 DEC.	3 DEC.
UP TO 6.00	±.02	±.005
ABOVE 6.00 TO 24.00	±.03	±.010
ABOVE 24.00	±.06	±.015
ANGULAR DIMENSIONS	±1/2 DEG.	
FRACTIONAL DIMENSIONS	±1/64	
SURFACE FINISH	63	
DO NOT SCALE DRAWING		

TITLE: LP BUC BOOM MTG. KIT
MATERIAL:
FINISH:

PROJECT NO: / JOB NO:
NEXT ASSEMBLY:
CAGE IDENT. NO: 38494
SIZE: D
DRAWING NO: 215035-001MD
SCALE: 1.000
SHEET: 2 of 2

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Appendix D

Spare Parts

Appendix C contains a table of recommended spare parts for on-hand replacement. The following sheet can be copied and used as a fax form to order the required spare parts. Please make sure to include all identifying information to facilitate the processing of your order. The order may also be sent via email or regular mail delivery, at the following address.

Mitec Telecom inc.
9000 Trans Canada Blvd.
Pointe Claire, Québec, Canada
H9R 5Z8

Fax: (514) 694-3814
Email: sales@mitectelecom.com

For additional information, please contact our customer service department at:
(514) 694-9000 or 1-800-724-3911

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Mitec Telecom Inc. *Designers and manufacturers of telecom & wireless products* *ISO 9001 Certified*	
Spare Parts Order Form	**5 to 40 Watt C Band Low Power Transmitter Module**

From:			
Place By:		**Signature:**	
Telephone:			
Fax		**Email:**	

Part Description	Part Number	Quantity	Unit Price*	Line Total*

* To be completed by **Mitec** Sales Department

Fax to: Customer Service (514) 694-3814