MTX 5–40 Watt, C-Band Block Up Converter

Operation & Maintenance Manual

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OPERATION AND MAINTENANCE MANUAL	Preliminary ☐	Released ☐

REVISION RECORD

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MTX 5-40 Watt C-Band Block Up Converter

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Preface

Scope

This document covers the installation, operation, and maintenance of the MTX 5-40 Watt C-Band Block Up Converter. It contains information intended for engineers, technicians and operators working with the BUC module.

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

IMPORTANT

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

NOTE

Indicates a reminder, a 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 Block Upconverter (BUC) is a highly reliable, high quality, cost efficient unit designed for use in VSAT applications. This line of products, using state of the art technology, is characterized by unparalleled durability and dependability. The BUC also has high linearity and gain stability over the full operating temperature range. The standard output operating frequency range is 5.850 GHz to 6.425 GHz. Other frequency options are also available ranging from 5.725GHz to 7.025GHz.

Refer to Table 2 - Specifications.

Figure 1 - 5-10W C-Band BUC

Figure 2 - 20-40W C-Band BUC

1.1 Receiving and Inspection

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

CAUTION!

Handle the BUC module with extreme care. Excessive shock may damage BUC 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 BUC 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 **MitecVsat.** immediately.

1.1.1 Equipment Damage or Loss

MitecVsat. 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 **MitecVsat** 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 **MitecVsat** Sales Administration Department of the equipment condition and obtain a Return Material Authorization (RMA) number and shipping instructions. MitecVsat 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 BUC 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, thereby causing damage or injury to yourself or others.

*The BUC 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 Chapter 2 (Installation) as a guide for making all the required electrical connections.

1.2.1 Safety Precautions

Carelessness or mishandling of the BUC 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.

2. Installation & Overview

2.1 General Description

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

The stand-alone 5/10W BUC is powered from a +18 to +55 VDC power source and the 20/40W BUC from +32 to +55VDC power source. The BUC amplifies an input signal from an L-Band RF source up to a power level of 40W Watts in C-Band.

The BUC is capable of providing an output level of 5W, 10W, 20W or 40W, and is equipped with over temperature shut down and protection circuits. The 5W and 10W BUCs are incorporated in housing designed for convection cooling so that no additional cooling fan is required to prevent the internal electrical components of the unit from over-heating. The 20W and 40W BUCs have a fan to prevent from over heating. The BUC is for outdoor use and is secured onto a mounting frame by the WR137G (Grooved) waveguide attached to the RF output and by up to four #10-32 threaded mounting holes opposite to the RF output. Two additional mounting holes are available one on each side of the unit.

The Low Power C-Band BUC product line comes with different optional interfaces.

They are mainly 3 interface categories:

1. BUCs equipped with FSK M&C only and powered through the coaxial IF connector have part number suffixes: -20, -25, -27.
2. BUCs equipped with RS232/RS485/Ethernet and powered through the coaxial IF connector have part number suffixes: -41, -48.
3. BUCs which are Redundancy Ready, equipped with RS232/RS485/Ethernet and powered through an MS connector have part number suffixes: -40, -47.

Table 1 – List of Low Power C-Band BUC Models offered

Configuration	5/10W	20/40W
External Ref. FSK	MTX-F1F237/40-60-ES-20	MTX-F1F243/46-60-ES-20
External Ref. FSK, DC Connector		MTX-F1F243/46-60-ES-25
Internal Ref. FSK	MTX-F1F237/40-60-ES-27	MTX-F1F243/46-60-ES-27
External Ref., M&C, Redundancy Ready	MTX-F1F237/40-60-ES-40	MTX- F1F243/46-60-ES-40
Internal Ref., M&C, Redundancy Ready	MTX-F1F237/40-60-ES-47	MTX- F1F243/46-60-ES-47
External Ref., M&C	MTX-F1F237/40-60-ES-41	MTX- F1F243/46-60-ES-41
Internal Ref., M&C	MTX-F1F237/40-60-ES-48	MTX- F1F243/46-60-ES-48

Note: - F1F2 stands for the low end, high end of the frequency for the BUC as follows:

5964: Standard C-Band (5.850-6.425 GHz); 5967: Super Extended C-Band (5.850-6725 GHz)

6467: Palapa C-Band (6.425-6.725 GHz); 6770: Insat C-Band (6.725-7.025 GHz)

5764: Low Extended C-Band (5.725-6.425 GHz); 6064: Custom C-Band (6.070-6.425 GHz)

The models equipped with built-in switching logic can be used in Redundant Systems. A 1:1 redundant configuration can be created by simply adding BUCs and interconnecting them without the use of an external controller. Refer to Section 3 for additional information.

The models equipped with RS232/RS485/Ethernet interfaces, the user can monitor and control the operating parameters of the system by using either the M&C serial port or the Ethernet interface ports.

The BUC is equipped with a waveguide flange for the RF Output, an N-type connector for the RF Input and Mil connectors for the discrete, redundancy, serial and Ethernet interface ports. The BUC interfaces are all active and no configuration is required.

2.2 Features

- Compact design.
- 1:1 redundant-ready with no need for external redundancy controller.
- FSK or (RS-232/485/Ethernet) user interface.
- WEB page hosting for comprehensive operation.

2.3 Options

- Mounting bracket.
- AC or DC power supply.
- Redundancy Kit.
- Mounting frame for redundancy kit.

2.4 Specifications

Table 3 summarizes the specifications of the MTX 5-40 Watt C-Band Block Up Converter. For mechanical specifications, refer to the outline drawing in Appendix A.

Table 2 - Specifications

Parameters	Specifications
Output Frequency Range	
Band 1: Standard C-Band	5850-6425 GHz
Band 2: Super Extended C-Band	5.85 to 6.725 GHz
Band 3: Low Extended C-Band	5.725 to 6.425 GHz
Band 4: PALAPA C-Band	6.425 to 6.725 GHz
Band 5: INSAT C-Band	6.725 to 7.025 GHz
Band 6: Custom C-band	6.070 to 6.425 GHz
IF Frequency Range	
Band 1: Standard C-Band	950 to 1450 MHz
Band 2: Super Extended C-Band	950 to 1825 MHz
Band 3: Low Extended C-Band	975 to 1675 MHz
Band 4: PALAPA C-Band	975 to 1275 MHz
Band 5: INSAT C-Band	1275 to 1575 MHz
Band 6: Custom C-band	950 to 1305 MHz
Conversion Type	Single, fixed L.O, non-inverting
L.O Frequency	
Band 1: Standard C-Band	4.90 GHz
Band 2: Super Extended C-Band	4.90 GHz
Band 3: Low Extended C-Band	4.75 GHz
Band 4: PALAPA C-Band	5.45 GHz
Band 5: INSAT C-Band	5.45 GHz
Band 6: Custom C-band	5.12 GHz
Output Power @ 1 dB G.C.P	
5W	+37 dBm
10W	+40 dBm nom. (39.5 dBm min.)
20W	+43 dBm
40W	+46 dBm nom.
Linear Gain at room temperature	
5W	60 min.
10W	63 min.
20W	66 min.
40W	68 min.
Gain Stability (over temperature @ fixed frequency)	±1.5 dB nominal, ±2.0 dB max.
Gain Variation (over frequency @ fixed temperature)	±0.5 dB over 36 MHz for all bands ±2.0 dB over full band for Bands 1,4,5,6 ±2.5 dB over full band for Band 2 ±2.25 dB over full band for Band 3
IM3 (total power = P1db – 3 dB)	-25 dBc max.
Requirement for External Reference	
Frequency	10 MHz (sine-wave)
Power	±5 dBm @ input port without any phase noise degradation; ±10 dBm operational
Phase Noise	-135 dBc/Hz max. @ 100 Hz -140 dBc/Hz max. @ 1 kHz -143 dBc/Hz max. @ 10 kHz

Parameters	Specifications
	-143 dBc/Hz max. @ 100 kHz
Internal Reference Option	(Requires warm up period of up to 15 minutes at cold).
L.O Phase Noise	-65 dBc/Hz, max. @ 100 Hz -75 dBc/Hz, max. @ 1 kHz -85 dBc/Hz, max. @ 10 kHz -95 dBc/Hz, max. @ 100 kHz
Spurious	-55 dBc max for Bands 1,3,4,5,6 -45 dBc for Band 2
Receive Band Noise Power	-150 dBm/Hz max.
Input Impedance	50 ohms (75 Ohms Optional for 5W and 10W only)
Input V.S.W.R.	1:50:1
Output V.S.W.R.	1.20:1
Output Load V.S.W.R. for Non Damage	Infinite:1
DC Power Requirement 5W 10W 20W 40W	 +18 VDC to +55 VDC, 45W typ +18 VDC to +55 VDC, 70W typ. +32 VDC to +55 VDC, 140W typ. +32 VDC to +55 VDC, 250W typ.
Mute internally built	Shuts off the BUC when L.O. is unlocked
Status LED	Bicolour; RED =Alarm, GREEN = Operational
M&C	
M&C Interface Type: MTX-F1F2PP-60-ES-20//25/27 MTX-F1F2PP-60-ES-40/41/47/48	 FSK RS232/RS485/Ethernet
Mute control	Via M&C Interface or disconnecting 10MHz ext.
Temperature Monitor	Via M&C Interface
Out Of Lock Alarm Status, Out Of Lock Alarm Status, Sum Alarm Status	Via M&C Interface
Output Power Detection	Via M&C Interface, 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	N-type, female (50 Ohms), Optional F-type female (75 Ohms)
Output Interface	Waveguide Flange, WR137G (Grooved)
Package	Outdoor, weather resistant
Size (overall dimensions) 5W/10W 20W/40W	 9.00" x 7.04" x 3.00" (228mm x 179mm x 76mm) 9.00" x 7.04" x 5.28" (228mm x 179mm x 134mm)
Weight 5W/10W 20W/40W	 9.10 lbs (4.10 kg) 10.25 lbs (4.65 kg)

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

NOTE

[1] *Performance may varies on extended frequency model.*

NOTE

Technical specifications are subject to change without notice.

2.4.1 Controls and Indicators

The controls and indicators are:

- Via FSK signal through the IF Input connector for all models which have the following suffixes in their part number: -20, -25, -27.
- ia RS232/RS485/Ethernet interfaces for all models which have the suffixes in their part number: -40, -47, -41 & -48.

2.4.2 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.

2.5 Interfaces

The following tables detail the interfaces for the BUC system. Refer to assembly drawing in Appendix A for locations on the front and rear panels.

Table 3 – Connector Interface

Name	Description	Used on BUC with Suffix No.
RF input (J1)	N-type connector (female)	-20, -25, -27, -40, -41, -47, -48
RF output (J2)	CPRG 137 wave guide	-20, -25, -27, -40, -41, -47, -48
User RS-485/232/Ethernet/ User Discrete Interface (J4)	Circular MS3112F14-19P	-40, -41, -47, -48
Redundancy interface (J6)	Circular MS3112F14-15P Redundancy function comprising: • Switch monitoring and control • BUC summary alarm monitoring • BUC redundancy position.	-40, -47,
DC (Line power) (J3)	Circular MS3102R16-11P	-25, -40, -47

Table 4 - DC Input Connector

DC input – J3		
PIN	Name	Description
A	+Vdc	See table 2
B	GND	

Table 5 - RS485 M&C Connector Pin-outs

User RS-485/232/Ethernet/User Discrete interface – J4			
Pin	Name	Interface Type	Interface Description
A	Tx+	RS-485	RS-485 Interface Half Duplex
B	Tx-		
C	Rx+		
D	Rx-		
E	Tx	RS-232	RS-232
F	Rx		
G	GND		
H	ETx+	ETHERNET	ETHERNET
J	ETx-		
K	ERx+		
L	ERx-		
M	E_GND		
N	ALARM NO	Sum Alarm NO	Pin N Opens From Pin P on Alarm
P	ALARM COM	Sum Alarm COM	
R	ALARM NC	Sum Alarm NC	Pin R Closes From Pin P on Alarm
S	Mute IN	Mute CMD	To Mute short Pin S to Pin T
T	MUTE RTN		

Table 6 - Redundant Interface Connector (Redundancy Option)

Redundant Interface – P6	
Pin	**Name**
A	CAN_H
B	CAN_L
C	ADD-0
D	GND
E	ADD-1
F	GND
G	ADD-2
H	GND
J	SUM_ALARM_OUT
K	GND
L	SUM_ALARM_A_IN
M	GND
N	SUM_ALARM_C_IN
P	+12V_OUT
R	GND

2.6 Basic Mechanical Characteristics

2.6.1 External View of the BUC Module

The physical external dimensions of the BUC module are shown in the outline drawing in Appendix A and Table 2 - Specifications. All inputs and outputs are shown in the outline drawing

2.6.2 Connections and Mounting Hardware

The connections and mounting hardware are as follows:

- All models which have the following suffixes in their part number: -20, -27 require:
  - A coaxial cable with an N-type male connector for the IF/DC Input
  - A waveguide CPRG 137 (Grooved) for RF output.
  - The BUC is mounted using the up to four #10-32 threaded holes opposite the W/G RF output.
- All models which have the following suffixes in their part number: -41 & -48 require:
  - A coaxial cable with an N-type male connector for the IF/DC Input
  - A waveguide CPRG 137 (Grooved) for RF output
  - An MS Connector for the RS232/RS485/Ethernet Interfaces

  - The BUC is mounted using the up to four #10-32 threaded holes opposite the W/G RF output.

- All models which have the following suffixes in their part number: -40 & -47 require:
  - A coaxial cable with an N-type male connector for the IF Input
  - A waveguide CPRG 137 (Grooved) for RF output
  - An MS Connector for the RS232/RS485/Ethernet Interfaces
  - An MS Connector for the DC Power.
  - An MS Connector for the Redundancy Connection of 1+1 system
  - The BUC is mounted using the up to four #10-32 threaded holes opposite the W/G RF output.

2.7 Assembly and Installation

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

CAUTION!

Only authorized technical personnel should perform the Installation and proper electrical hookups of the BUC module.

2.7.1 Lifting the BUC Module into Position and Temporary Attachment

The BUC module weighs approximately 9.00/10.25 lbs (4.10/4.65 kg), which may be handled by a single person. Remove all plastic caps from the connectors. Lift the BUC module. The BUC module is now ready for permanent attachment.

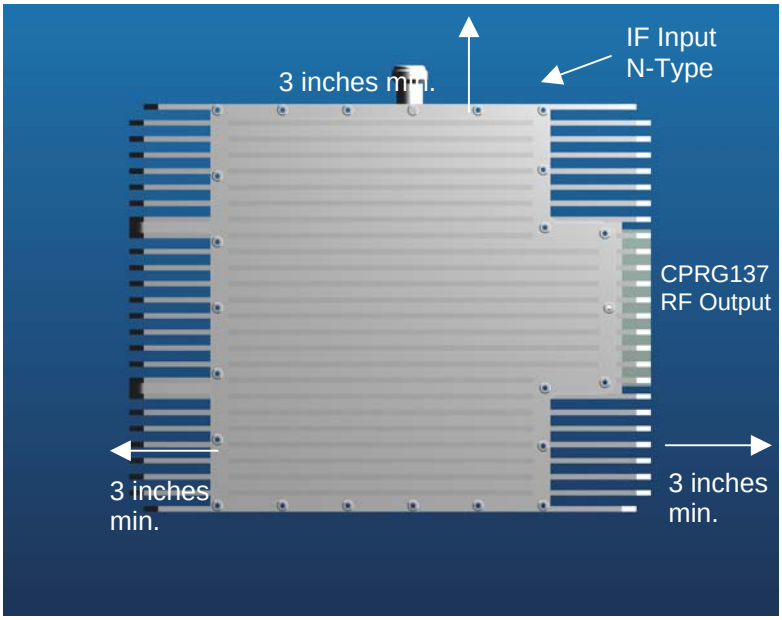
2.7.2 Securing the BUC Module

Secure the BUC module on to the mounting frame using the hardware described in section 2.6.2. Attach the proper cable or waveguide for IF input and RF output to the corresponding connector of the BUC module. Refer to the outline drawing in Appendix A.

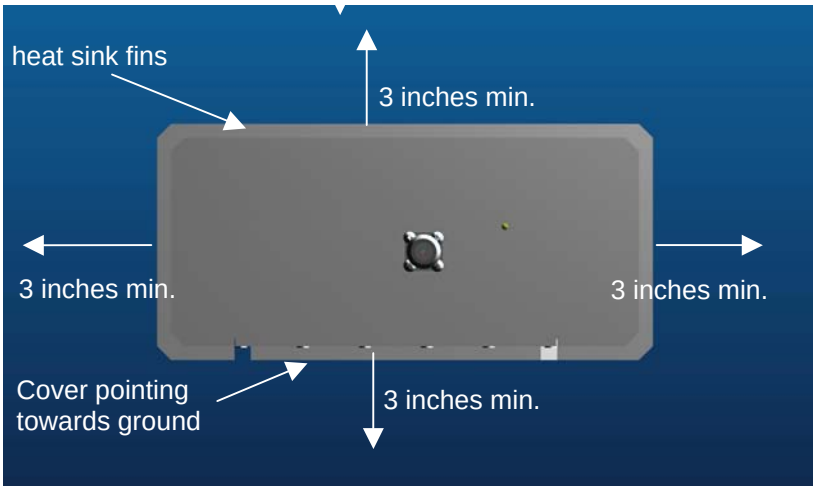
NOTE

The connectors are labeled clearly and has 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 3– Recommended Distance for Mounting on the Hub). Adequate cooling for the BUC will provide years of top performance.



Top View



Side View

Figure 3– Recommended Distance for Mounting on the Hub

2.8 Functional Overview

This section provides a functional description of the BUC explaining the RF amplification, protection circuit and power distribution. The main elements of the BUC are illustrated in the high-level block diagram of Figure 2.

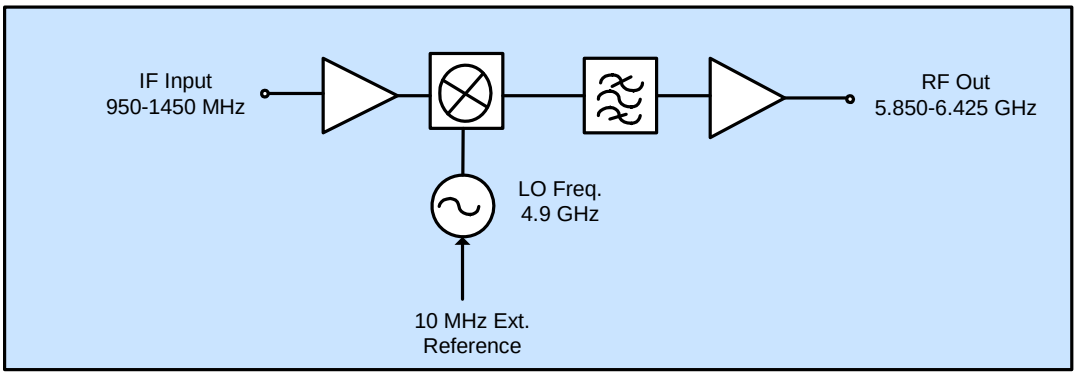


Figure 4 – High Level Block Diagram of the BUC

2.8.1 IF/RF Conversion and Amplification

The BUC translates the L-band signal in the 950-1450 MHz range to the C-band in the 5.850-6.425 GHz range. With a gain between 60 dB to 70 dB the BUC amplifies the signal to produce 5W, 10W, 20W or 40W (P1 dB) output power. It maintains high quality signal integrity due to the low noise characteristics of its local oscillator and the linearity of the components used in the conversion, filtering and amplification processes. The units are powered from a DC source of +18 to +55 VDC for the +5W and 10W units and from +32 to +55 VDC for the 20 W and 40W units.

The L-Band Input signal, 10 MHz reference and +VDC power, are fed to the BUC via the coaxial connector.

GaAs transistors, as well as other microwave components within the RF Amplifier, are used to provide the necessary gain, low insertion loss and required rated power . The RF output signal is transmitted through the WR137 waveguide to the VSAT antenna feed.

2.8.2 Protection and Control

Depending on the M&C Interface option all control and monitor signals are translated within the micro-controller and then passed through:

- The FSK serial interface for all models which have the following suffixes in their part number: -20, -25, -27.
- The RS232/RS485/Ethernet for all models which have the following suffixes in their part number: -40, -47, -41 & -48.

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

- System Alarm: when an amplifier is not functioning properly.
- Mute Control (via M&C) or disconnecting the 10MHz input

- Output power monitoring
- Temperature Monitoring

2.8.3 Communication Protocols

All control and monitor signals are translated within the micro-controller and are then passed through the FSK Serial Interface multiplexed with IF or through the RS232/RS485/Ethernet depending on the interface option used.

FSK and Serial Protocols are described in Appendix B.

WEB pages are described in detail in Appendix C.

SNMP is described in appendix D.

3. BUC Operation

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

3.1 Procedure

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

WARNING!

*The output power available at the output waveguide flange is extremely hazardous. Under **no circumstances** should be BUC be operated without the waveguide feed or a high 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 BUC will eliminate the possibility of accidents and provide years of top performance.*

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

NOTE

The BUC module can withstand any source or load VSWR. However, the BUC 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 -20 dBm maximum IF Input level. The BUC module will be in deep saturation if overdriven. RF performance will degrade significantly and proper operation is not possible. This operational condition is the survival mode for the BUC module. Never exceed the maximum safe IF Input level of -20dBm (0.01W) or permanent damage to the BUC module may result.

3.2 Connector Interface

The connector interface is described in M&C specifications in table in section 2.5.

4. Redundancy Operation

4.1 General Description

All BUC models which have the following suffixes in their part number: -40, -47 are "redundant ready" and with the addition of the redundant kit components, can be used in the 1:1 Redundant System, MitecVsat model MRK-596443-ES-11. All monitoring and control of the redundancy switch is contained within the BUC.

For complete description of the redundant system refer to the User Manual **219915-001MA.**

NOTE

Redundancy Kits are sold separately.

4.1.1 1:1 Redundant System MRK-596443-ES-11

The 1:1 Redundant System is designed to provide redundancy backup for one on-line main path unit. It consists of 2 BUCs, one on-line, one on hot standby, 1 waveguide switch with all the necessary W/G, a coax cable termination and a control cable.

It performs manual or automatic "switch-to-backup" of the system's on-line path BUC.

Figure 6 shows the block diagram of the 1:1 system.

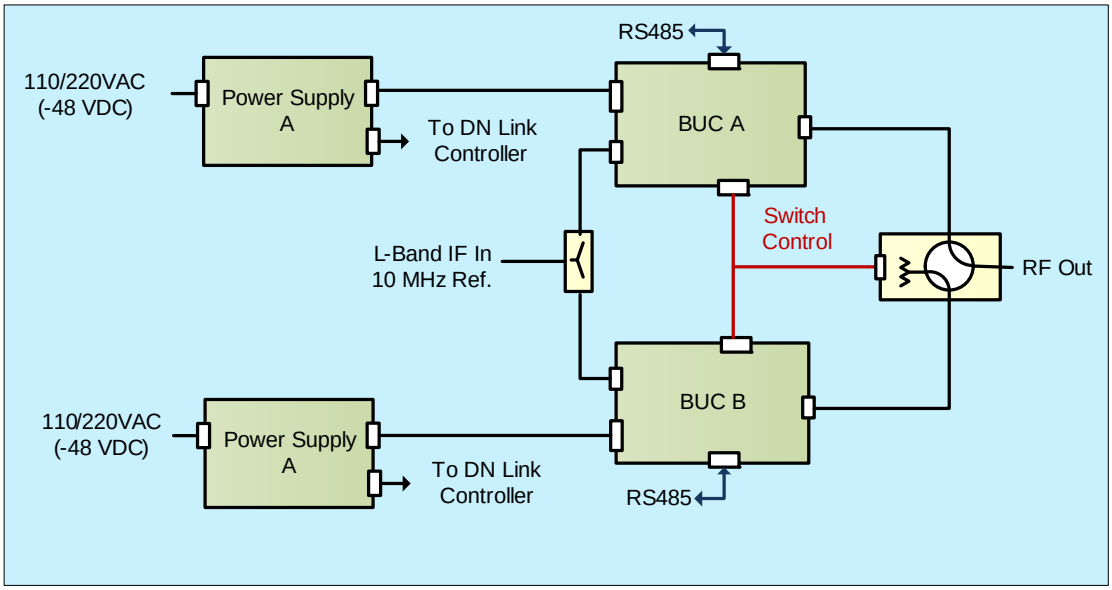


Figure 5 - 1:1 System Block Diagram

4.1.2 Redundant Mode Control Mechanism and Criteria

There is no hierarchy in the 1:1 system, any of the BUCs, A or B can be on-line indistinctively, if there is no alarm issued.

The following events will automatically switch the traffic of the "on-line" BUC to the Standby BUC:

- BUC Summary Alarm.
- Lost connection on the redundancy interface
- Total power failure (the BUC is off)

After the automatic switch over, the system remains in Auto mode. There will be no switch over when the faulty BUC returns to normal operation.

4.2 Operating Modes

In a redundant configuration, switching operation can be MANUAL or AUTO (automatic). These modes are defined as:

MANUAL - switching occurs in response to operator actions.

AUTO - switching occurs in response to internal control program logic

NOTE

The system default power-up mode is AUTO.

Auto Mode

In Auto mode, the system controls the redundant switching feature in response to detected alarms.

Manual Mode

Manual mode can be entered via the user serial or Ethernet M&C interface of any of the system BUCs. It can be used for the purpose of Maintenance/Test or in the case of Auto Control mechanism failure.

NOTE

Manual mode inhibits the automatic switching in case of an alarm.

4.3 Serial Interface Controls and Indicators

The following sections summarize the control and indicators that are available on the M&C interface. For additional details, refer to the serial protocol documentation in Appendix B or WEB page hosting Appendix C.

Controls via M&C Interface

- Mute Control

The following controls are available only in redundancy configuration.

- Switch Toggle Control
- Auto/Manual Control

Indicators via Serial Interface

- BUC Summary Alarm
- Mute Status
- BUC Temperature
- BUC output Power
- BUC Gain reporting
- DC Input Voltage

The following indicators are available only in redundancy configurations

- Redundant system configuration (1:1)
- Auto/Manual
- BUC Redundancy Status (active/stand by; stand alone);
- BUC Position in the System (A/B/C)
- Switch position status
- Switch Alarm status

4.4 Redundancy System Assembly

For the Redundancy System assembly diagrams, parts lists and connections refer to the User Manual **219015-001MA.**

5. Maintenance

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

5.1 Preventive Maintenance

5.1.1 Procedure

WARNING!

Shut down the BUC 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.

5.1.2 BUC Module System Preventive Maintenance

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

5.1.3 BUC Module Cooling System Preventive Maintenance

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

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 BUC module was designed so that the fan can be replaced easily in the field. The replacement fan issued will be terminated with a mating connector matching the fan being replaced. Refer to Figure 7 below showing the exploded assembly view of the 20W/40W BUC module.

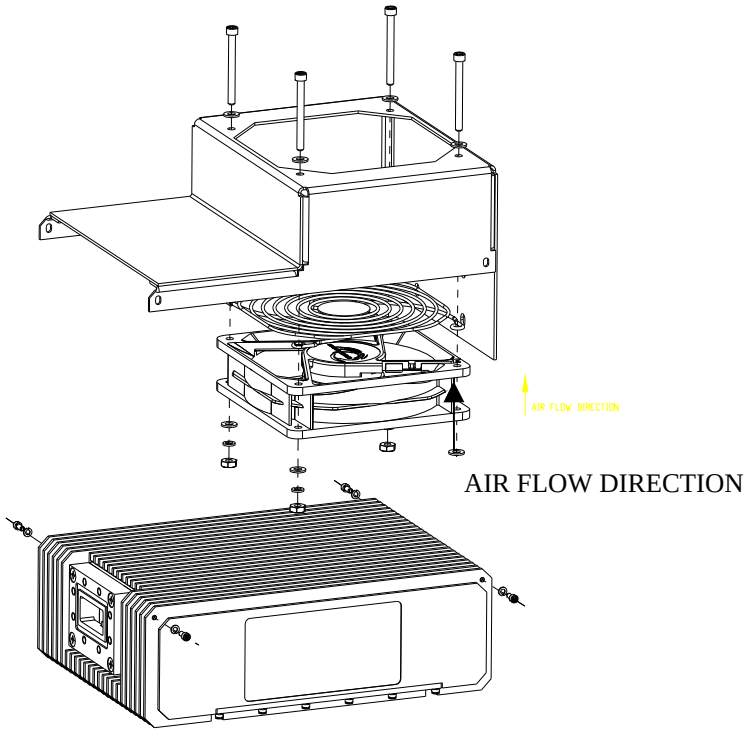


Figure 6 - Cooling Fan Replacement

To replace the fan in the 20/40W BUC module, perform the following:

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

9. Angle the shroud onto the rear of the BUC module and store any excess fan cable length within the pocket of the BUC module heat sink fins. The fan power cable will exit up out of the heat sink fins.
10. Place the shroud flat into place onto the BUC module. Align and reinstall the shroud using the fasteners previously removed.
11. The 16W or 20W BUC module is now ready for operation and no other periodic maintenance is required.

5.1.4 Performance Check

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

It is recommended to measure the following parameters for ensuring that the BUC 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 BUC Module.

Using a Source and an IF input signal level within the small signal region of the BUC 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 BUC 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 P1dB. 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.

5.1.5 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 7 provides some help to quickly isolate a fault within the BUC module. If the BUC module is defective, notify **MitecVsat** and follow the process detailed in section 1.1.2.

Table 7 - Recommended Corrective Actions

Symptom	Action
Fails performance test	For 5/10W Check power source, RF source, 10 MHz source, cabling and connectors. Clean thoroughly. If BUC module is defective, return to **MitecVsat**. For 20W/40W Check power source, RF source, 10 MHz source, cabling and connectors. Check for clogged fan and debris in heat sink fins. Clean thoroughly. If fan is warm, replace fan. If BUC module is defective, return to MitecVsat.

5.1.6 Out-of Warranty Repair

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

5.1.7 Preventive maintenance

The MTX BUC is an extremely reliable device requiring very little maintenance, or repair. However it is recommended to periodically clean the cooling fins and fan from dust and debris.

Appendix A

Drawings and Diagrams

Appendix A contains the drawings and diagrams relevant to the MTX 5-40 Watt C-Band Block Up Converter

5W, 10W, 20W, 40W BUC

Part Number	Description
MD-MTX-596440-60-ES-20	L to C-Band 5W/10W MTX BUC- Outline drawing
MD-MTX-596440-60-ES-40	L to C-Band 5W/10W MTX BUC (with Integrated Controller) - Outline drawing
MD-MTX-596446-60-ES-20	L to C-Band 20W/40W MTX BUC- Outline drawing
MD-MTX-596446-60-ES-40	L to C-Band 20W/40W MTX BUC (with Integrated Controller)- Outline drawing

For the Power Supply Option refer to corresponding User Manual as indicated below:

Indoor Rack Mount 150W Power Supply

Part Number	Description	User Manual
217537-002MD	1U Rack Mount Indoor Power Supply, 110/220 VAC, 150W for standalone operation	217537-002MA
218907-002MD	2U Rack Mount Indoor Power Supply -48 VDC, 150W for standalone operation	218907-002MA
217537-001MD	1U Rack Mount Indoor Power Supply 110/220 VAC, 150W, equipped with Bias-tee, for standalone operation	217537-001MA
218907-001MD	2U Rack Mount Indoor Power Supply -48 VDC, 150W, equipped with Bias-Tee, for standalone operation	218907-001MA

Indoor Rack Mount 480W Power Supply

Part Number	Description	User Manual
215559-002MD	1U Rack Mount Indoor Power Supply, 110/220 VAC, 480W for standalone operation	215559-002MA
218908-002MD	2U Rack Mount Indoor Power Supply -48 VDC, 480W for standalone operation	218908-002MA
215559-001MD	1U Rack Mount Indoor Power Supply 110/220 VAC, 480W, equipped with Bias-Tee, for standalone operation	215559-001MA
218908-001MD	2U Rack Mount Indoor Power Supply -48 VDC, 480W, equipped with Bias-Tee, for standalone operation	218908-001MA

Outdoor 480W Power Supply

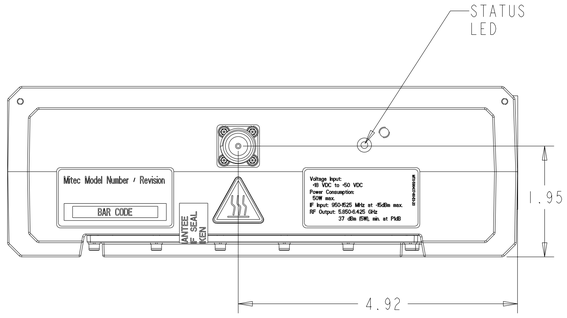
Part Number	Description	User Manual
215560-003MD	Outdoor Power Supply 110/220 VAC, for standalone operation	215560-003MA
215560-001MD	Outdoor Power Supply 110/220 VAC, equipped with Bias-Tee, for standalone operation	215560-001MA
215560-002MD	Outdoor Power Supply 110/220 VAC, for redundant operation	215560-002MA
215988-003MD	Outdoor Power Supply -48V DC, for standalone operation	215988-003MA
215988-001MD	Outdoor Power Supply -48 VDC, equipped with Bias-Tee, for standalone operation	215988-001MA
215988-002MD	Outdoor Power Supply -48 VDC, for redundant operation	215998-002MA

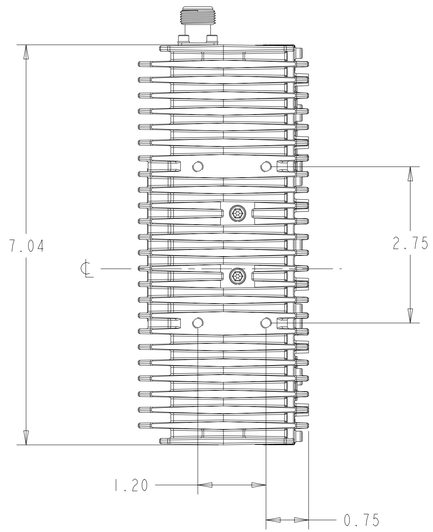
For the redundant configuration refer to the User Manual as indicated below:

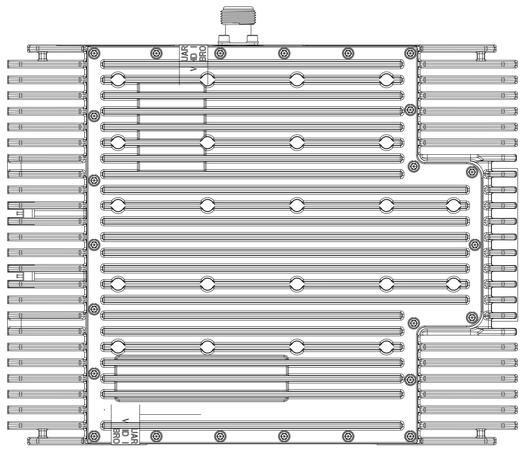
1+1 Redundancy Kit for 5W, 10W, 20W, 40W BUC Systems

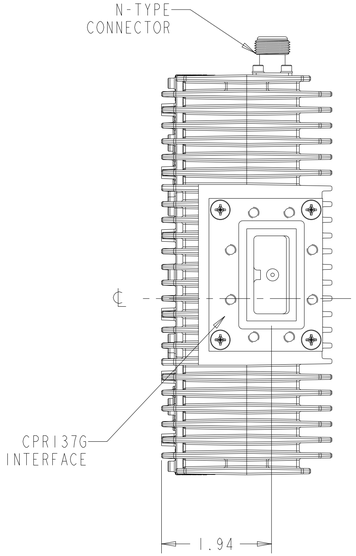
Part Number	Description	User Manual
MRK-596446-ES-11	1+1 Redundancy Kit for MTX C-Band 5/10/20/40W BUC.	219015-001MA

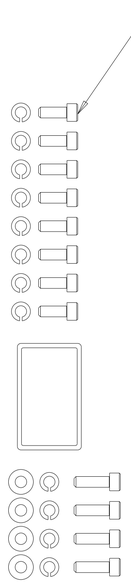
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	Mar 21,07	
1	ECN 247-07V	SEP 25, 07	JR
2	ECN 223-08V	Jul 02,08	RD

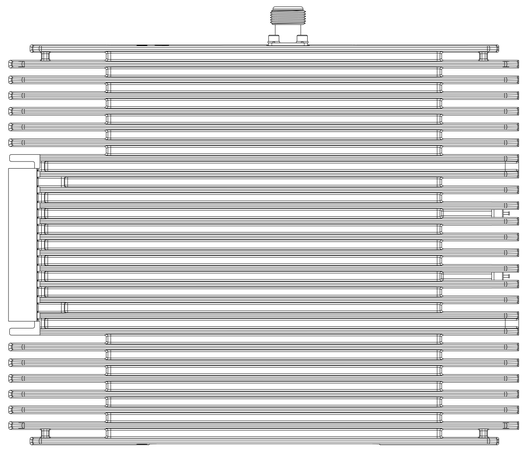


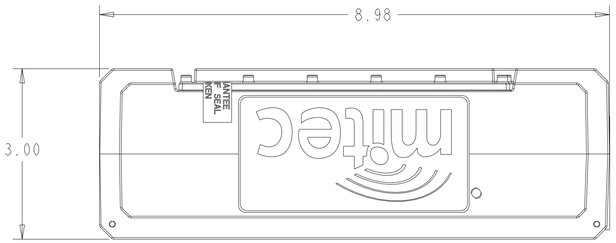












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REV	2	2
STATE	RELEASED	RELEASED
ORIGINATOR:	ROBIN DUFOUR	DATE: Jul 02,08
DESIGNER:	ROBIN DUFOUR	DATE: Jul 02,08

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	

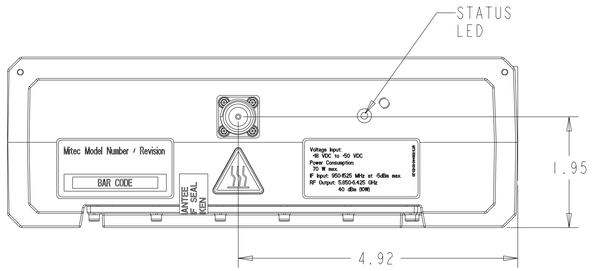
DO NOT SCALE DRAWING

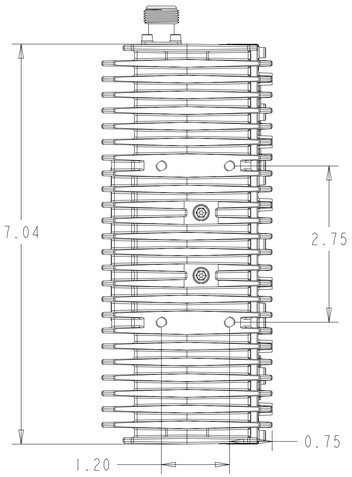
TITLE: BUC ODU C-BAND 5W P1dB, N-TYPE IF INPUT, WR137G RF OUTPUT, FSK
MATERIAL:
FINISH: N/A

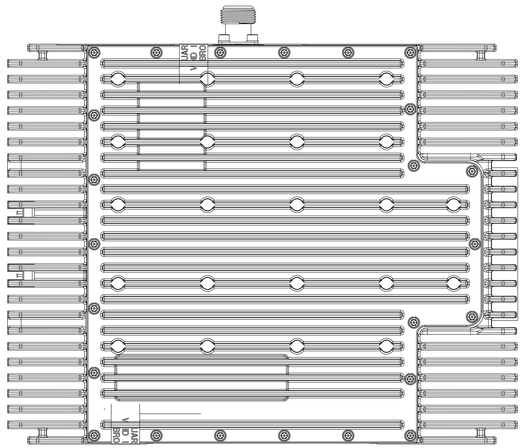
PROJECT NO: / JOB NO:
NEXT ASSEMBLY:
CAGE IDENT. NO: 38494
SIZE: D
DRAWING NO: MD-MTX-596437-60-ES-20
SCALE: 0.750
SHEET: 1 OF 1

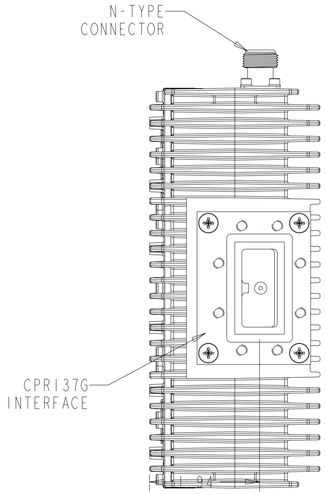
(FORM 11477-008CF REV 3)

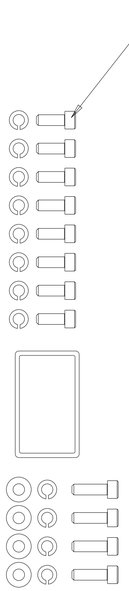
REVISION			
REV	DESCRIPTION	DATE	APP
0	FIRST RELEASE	Mar 21,07	
1	ECN 247-07V	SEP 25, 07	JR
2	ECN 370-07V	DEC 11, 07	JR
3	ECN 194-08V	Jul 02,08	RD

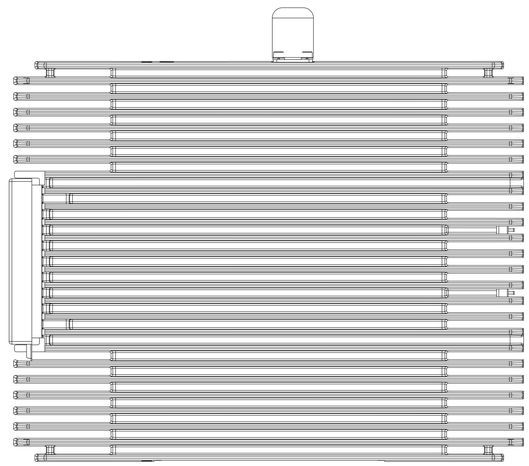


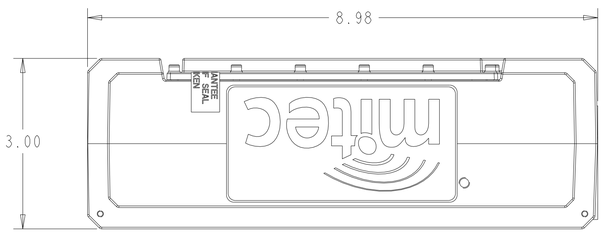












	DRAWING	PART
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REV	3	3
STATE	RELEASED	RELEASED
ORIGINATOR:	ROBIN DUFOUR	DATE: Jul 02,08
DESIGNER:	ROBIN DUFOUR	DATE: Jul 02,08

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: BUC ODU C-BAND 10W P1dB, N-TYPE IF INPUT, WR137G RF OUTPUT, FSK

MATERIAL: N/A

FINISH: N/A

PROJECT NO: / JOB NO:

NEXT ASSEMBLY:

CAGE IDENT. NO: 38494

SIZE: D

DRAWING NO: MD-MTX-596440-60-ES-20

SCALE: 0.750

SHEET: 1 of 1

(FORM 11477-008CF REV 3)

Appendix B

Appendix B contains the Serial Protocol and the FSK Protocol Documentation.

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.

Revision	Date	Change Summary
00	08-Apr-2011	Protocol specification for Low Power Block Up Converters and redundant systems.

Serial Communication Protocol Specification for MTX Low Power Block Up Converters and MRK Up-Link 1:1 Redundancy Systems

(5-40W C-Band and 8-20W Ku-Band)

Table of Contents

1 Project Overview

This document describes the communications protocol used to communicate with Mitec 5-40W C-Band and 8-20W Ku-Band MTX Block Up Converters and MRK up-link redundant systems.

2 Definitions and Acronyms

The following terms appear throughout this document:

CM:	Control Module.
Controller:	The microprocessor-based card and associated embedded software which handles all communications between the customer interface and the amplifier.
CRC:	Cyclic Redundancy Check
Customer Interface Port:	The interface port through which the device used by the customer will interact with the Control Module.
Customer Interface Device:	The interface device used by the customer to interact with the Control Module (i.e. typically a modem or PC).
PC:	Personal Computer.
RF:	Radio Frequency.
SCI:	Serial Communications Interface.
SSPA:	Solid State Power Amplifier.
BUC:	Block Up Converter.

3 Scope

This document covers all aspects of the communication protocol which are required for the customer to develop a controlling device (typically a PC application program or modem) to interface with the Mitec product.

4 Serial Communications Link Interface

4.1 Customer Interface Port Configuration

The customer interface port of the controller is configured as follows:

Baud Rate:	19200bps
Data bits:	8
Stop bits:	1
Parity:	None
HW Control	None

4.2 Customer Interface Transport Medium

The customer interface transport medium for this product may be configured for RS485 half duplex (2-wire) or RS232.

5 Communication Protocol Framing

5.1 SCI Packet Frame Format

The packets exchanged with the master controller will have the following format (regardless of direction):

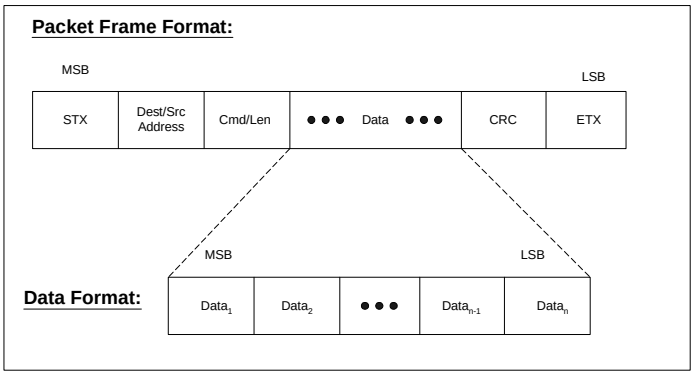


Figure 1) SCI Packet Frame Format

5.2 SCI Packet Byte Description

- **STX** is the start transmission byte (defined as 0x7E). This byte is used to determine the start of a packet.

- **Dest/Src Address** contains the destination address in the high nibble and the source address in the low nibble. The destination address is the address of the device which is to process the packet. The source address is the address of the device which sent the packet. Note that the device address of the customer interface device is always = 0x0F.

- **CMD/Len** contains the packet command in the high nibble and the number of bytes in the data portion of the packet in the lower nibble.

  The following commands may be sent by the customer interface device:

GET (command high nibble = 0x0)	Request the current value of a database element.
SET (command high nibble = 0x1)	Set the database element to the specified value.

  The following commands may be returned to the customer interface device:

UPD (command high nibble = 0x8)	Return the current value of a database element.
ACK (command high nibble = 0xE)	Acknowledge a received packet.
NACK (command high nibble = 0xF)	Reject a received packet (Not ACKnowledge).

- **$Data_1$ - $Data_n$** contains the packet payload. The value of the data bytes is specific to the command and will be covered in following sections.

- **CRC** is the cyclic redundancy check and is calculated by performing a byte-wise exclusive OR of the Dest/Src address byte, Cmd/Len byte and all data bytes. A bit-wise inversion is then applied to the CRC before being inserted into the packet. Refer to 5.4 CRC Calculation Example.

- **ETX** is the end transmission byte (defined as 0x7F). This byte is used to determine the end of a packet.

5.3 Default Address Values

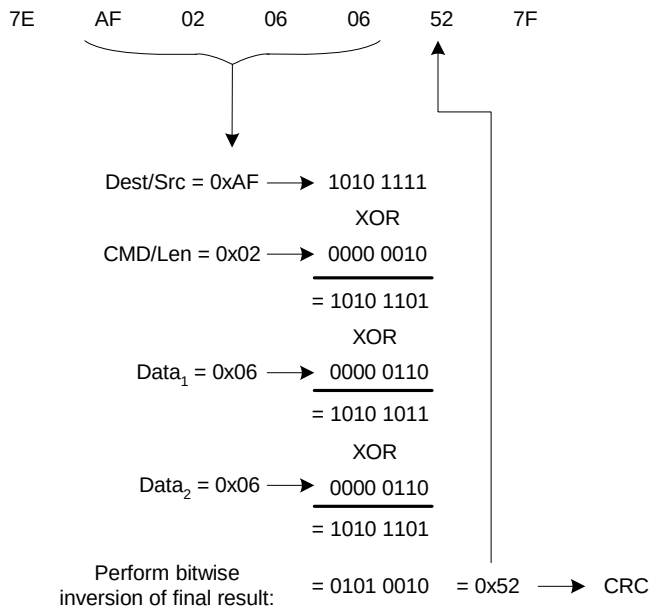
The customer interface device (e.g. a PC) must always be assigned address 0xF.

Standalone BUC: a standalone BUC defaults to address 0xA. The main controller will always respond to address 0xF. So communication with a standalone BUC can be established using address 0xA or address 0xF.

Redundant system: in a redundant system, upon connecting the redundancy cable, the address of the unit is automatically set to 0xA for unit A and 0xB for unit B. Communication has to be established using addresses 0xA and 0xB, respectively.

5.4 CRC Calculation Example

To send a command to read the temperature (database element = 0x0606) from unit A (device address 0x0A), the command is:



5.5 Command / Reply Packet Sequencing

Under normal operating conditions, the main control module will only send a packet to the customer interface device in response to a packet received from the customer.

6 Default Reply Packet Format

This section identifies the packet format of the ACK (Acknowledge) and NACK (Not acknowledge) replies which may be sent to the customer interface device in response to a received command.

NOTE: The packets shown in the list below are based on the assumption that the master controller device address is set to 0xA for unit A and 0xB for unit B. Any standalone unit will reply to address 0xF. To modify the commands for different addresses, the Dest/Src byte and the CRC byte will have to change in all packets. In the following: ***X = main controller serial address and ZZ = CRC.***

Reply	Packet Format	Explanation	Interpretation	Examples
ACK (Acknowledge)	7E FX E0 ZZ 7F	Acknowledge that the received packet was properly processed.	X = Device address of the packet source device.	1) reply: 7E FF E0 E0 7F ACK reply sent from the main control module (address 0xF) 2) reply: 7E FA E0 E5 7F ACK reply sent from unit A
NACK (Not Acknowledge)	7E FX F1 YY ZZ 7F	Indicate that a problem was encountered with the received packet.	X = Device address of the packet source device. YY = Error code: 02 = Incorrect no of bytes for the command. 03 = Incorrect CRC. 18 = Unrecognized command. 30 = Set command attempted on a protected element.	1) reply: 7E FF F1 03 F2 7F NACK reply sent from the main control module (address 0xF) for an invalid CRC 2) reply: 7E FA F1 18 EC 7F NACK reply sent from unit A for an unrecognized command

7 BUC Command List

7.1 BUC Monitor Commands

This section identifies the list of commands available to monitor the status of the BUC.

NOTES:

1. The packets shown in the list below are based on the assumption that the master controller device address is set to 0xA for unit A and 0xB for unit B. Any standalone unit will reply to address 0xF. To modify the commands for different addresses, the Dest/Src byte and the CRC byte will have to change in all packets. In the following: ***X = main controller serial address and ZZ = CRC***.
2. In case of error, a NACK reply will be received. Refer to section 6 for possible error codes.

Command	Possible Replies	Interpretation	Examples
Get Global Status 7E XF 02 FF 09 ZZ 7F Query for global status parameters (mute status, alarms, temperature, output power)	**Update Global Status** 7E FX 8B FF 09 MM WW YY TT TT GG GG PP PP ZZ 7F	Updates global status of the BUC, where: MM = mute status; 0x00 if unmuted, 0x01 if muted. WW YY = alarm status, see below* for bit definitions. TT TT = signed number representing 10 * temperature in deg C. GG GG = Not used. PP PP = 10 * Output power in dBm. ***Alarm bit definitions**: WW bitmap is defined as: **Bit 0-6:** Not used **Bit 7:** Summary alarm status (0 = no critical alarm; 1 = critical alarm) YY bitmap is defined as: **Bit 0:** PLL out of lock alarm status **Bit 1:** BUC DC power supply fail alarm status **Bit 2:** Over temperature alarm status **Bit 3:** FSK internal communication alarm status **Bits 4-6:** Not used **Bit 7:** Low input voltage alarm status	1) cmd: 7E AF 02 FF 09 A4 7F reply: 7E FA 8B FF 09 01 80 04 03 66 00 00 00 C8 50 7F Unit A: Mute status = 01; muted Alarm bits = 0x8004; Over temperature alarm Temp = 0x0366 = 0d870; 870/10 = 87 °C Output power = 0x00C8 = 0d200; 200/10 = 20.0 dBm
Get Input Voltage 7E XF 02 19 FF ZZ 7F Query for input voltage value	**Update Input Voltage** 7E FX 84 19 FF VV VV ZZ 7F	VV VV = 10 * Input voltage in Volts.	1) cmd: 7E AF 02 19 FF B4 7F reply: 7E FA 84 19 FF 02 00 65 7F Unit A input voltage = 0x0200 = 0d512, 512/10 = 51.2 V
Get Software Version 7E XF 02 FF 00 ZZ 7F Query Main Control Module for SW version	**Update Software Version** 7E FX 8A FF 00 YY YY YY YY GG GG RR RR ZZ 7F	Global software version. YY YY YY YY = SW version base number. GG GG = SW version configuration. RR RR = SW version revision (in ASCII).	1) cmd: 7E AF 02 FF 00 AD 7F reply: 7E FA 8A FF 00 00 21 88 56 00 01 30 30 8E 7F The resulting software version is: 218856-01-R00

7.2 BUC Control Commands

This section identifies the list of commands available to control the BUC.

NOTES:

1. The packets shown in the list below are based on the assumption that the master controller device address is set to 0xA for unit A and 0xB for unit B. Any standalone unit will reply to address 0xF. To modify the commands for different addresses, the Dest/Src byte and the CRC byte will have to change in all packets. In the following: ***X = main controller serial address and ZZ = CRC***.
2. In case of error, a NACK reply will be received. Refer to section 6 for possible error codes.

Command	Possible Replies	Interpretation	Examples
Mute / Unmute 7E XF 14 13 01 00 MM ZZ 7F Enable / disable RF output	**ACK** Refer to 6	MM = 0x00 to unmute; 0x01 to mute.	1) cmd: 7E AF 14 13 01 00 00 56 7F reply: 7E FA E0 E5 7F ACK received from unit A. Unmute unit A.
Reset Alarms 7E XF 14 06 0B YY YY ZZ 7F Reset all latched alarms	**ACK** Refer to 6	YY YY = any value will reset the alarms, for example 00 00.	1) cmd: 7E AF 14 06 0B 00 00 49 7F reply: 7E FA E0 E5 7F ACK received from unit A. Alarms reset on unit A.
Clear Alarm Log 7E XF 14 06 20 YY YY ZZ 7F Clear all alarm log history	**ACK** Refer to 6	YY YY = any value will reset the alarm log, for example 00 00. This command will clear all alarm history from the controller memory. Note that in redundant configuration, alarm history will be cleared in all units.	1) cmd: 7E AF 14 06 20 00 00 62 7F reply: 7E FA E0 E5 7F ACK received from unit A. Alarm log history reset.

8 Network Access Command List

8.1 GET Network Configuration

This section identifies the list of commands available to query the network configuration.

NOTES:

1. The packets shown in the list below are based on the assumption that the master controller device address is set to 0xA for unit A and 0xB for unit B. Any standalone unit will reply to address 0xF. To modify the commands for different addresses, the Dest/Src byte and the CRC byte will have to change in all packets. In the following: ***X = main controller serial address and ZZ = CRC***.
2. In case of error, a NACK reply will be received. Refer to section 6 for possible error codes.

Command	Possible Replies	Interpretation	Examples
Get MAC Address 7E XF 02 FF 20 ZZ 7F Query MAC Address	**Update MAC Address** 7E FX 88 FF 20 Y1 Y2 Y3 Y4 Y5 Y6 ZZ 7F	Y1 Y2 Y3 Y4 Y5 Y6 = 6 bytes representing the MAC address.	1) cmd: 7E AF 02 FF 20 8D 7F reply: 7E FA 88 FF 20 **00 04 A3 00 00 00** F5 7F The MAC address is **00:04:A3:00:00:00**
Get Host Name **(Net Bios Name)** 7E XF 02 FF 21 ZZ 7F Query Host Name	**Update Host Name** 7E FX 8D FF 21 Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8 Y9 Y10 Y11 ZZ 7F	Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8 Y9 Y10 Y11 = 11 bytes representing the Host Name (in ASCII).	1) cmd: 7E AF 02 FF 21 8C 7F reply: 7E FA 8D FF 21 **4D 54 43 30 39 31 33 31 30 30 31** 07 7F The Host Name is **4D 54 43 30 39 31 33 31 30 30 31** in ASCII = MTC09131001
Get DHCP Configuration 7E XF 02 06 31 ZZ 7F Query Dynamic Host Configuration Protocol Setting	**Update DHCP Configuration** 7E FX 84 06 31 00 YY ZZ 7F	Update Dynamic Host Configuration Protocol Setting YY = 00 DHCP disabled YY = 01 DHCP enabled	1) cmd: 7E AF 02 06 31 65 7F reply: 7E FA 84 06 31 00 01 B7 7F DHCP is enabled. 2) cmd: 7E AF 02 06 31 65 7F reply: 7E FA 84 06 31 00 00 B6 7F DHCP is disabled.

8.2 SET Network Configuration

This section identifies the list of commands available to change the network configuration.

NOTES:

1. The packets shown in the list below are based on the assumption that the master controller device address is set to 0xA for unit A and 0xB for unit B. Any standalone unit will reply to address 0xF. To modify the commands for different addresses, the Dest/Src byte and the CRC byte will have to change in all packets. In the following: ***X = main controller serial address and ZZ = CRC***.
2. In case of error, a NACK reply will be received. Refer to section 6 for possible error codes.

Command	Possible Replies	Interpretation	Examples
Set Host Name (NetBios Name) 7E XF 1D FF 21 Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8 Y9 Y10 Y11 ZZ 7F Set Host Name	**ACK** Refer to 6	Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8 Y9 Y10 Y11 = 11 bytes for Host Name (in ASCII). Note that this command will cause a reset of the controller in order to restart with the new host name.	1) cmd: 7E AF 1D FF 21 **4D 54 43 31 32 33 34 35 36 37 38** C1 7F reply: 7E FA E0 E5 7F (Ack) The Host Name is set to **4D 54 43 31 32 33 34 35 36 37 38** (in ASCII) = MTC12345678 Controller will be reset in order to restart with the new host name.
Set DHCP Configuration 7E XF 14 06 31 00 YY ZZ 7F Set Dynamic Host Configuration Protocol Setting	**ACK** Refer to 6	Set Dynamic Host Configuration Protocol Configuration YY = 00 disable DHCP YY = 01 enable DHCP	1) cmd: 7E AF 14 06 31 00 01 72 7F reply: 7E FA E0 E5 7F (Ack) DHCP is enabled. 2) cmd: 7E AF 14 06 31 00 00 73 7F reply: 7E FA E0 E5 7F (Ack) DHCP is disabled.
Restore Default Values 7E XF 14 06 30 00 00 ZZ 7F Restore Network Configuration Default Values	**ACK** Refer to 6	This command enables DHCP and restores the following parameters to their factory default values: • Host Name • IP Address • Gateway • Subnet Mask • Primary DNS • Secondary DNS Note that this command will cause a reset of the controller in order to restart with the new configuration.	1) cmd: 7E AF 14 06 30 00 00 72 7F reply: 7E FA E0 E5 7F (Ack) Controller will be reset in order to restart with the new configuration.

9 Redundant System Command List

9.1 Redundant System Monitor Commands

This section identifies the list of commands available **ONLY IN CASE OF A REDUNDANT SYSTEM** to monitor the redundant system and switches status.

NOTES:

1. The packets shown in the list below can be sent to address 0xA for unit A or 0xB for unit B. The same status will be received from both units. To modify the commands for different addresses, the Dest/Src byte and the CRC byte will have to change in all packets.
2. In the following: ***X = main controller serial address and ZZ = CRC***.
3. In case of error, a NACK reply will be received. Refer to section 6 for possible error codes.

Command	Packet Format	Interpretation	Examples
Get Redundant System Status 7E XF 02 FF 08 ZZ 7F Query controller for system mode & configuration and switch position	**Update Redundant System Status:** 7E FX 86 FF 08 00 WW 00 YY ZZ 7F	WW = System status, bitmap defined as follows: **Bit 0:** System configuration: 0 = 1:1 config; 1 = 1:2 config. **Bit 1:** Operation mode: 0 = auto; 1 = manual. **Bits 2-6:** Not used. **Bit 7:** Stand-alone bit: 0 = redundant config; 1 = stand-alone. YY = Switch position, bitmap defined as follows: **Bits 1,0:** RF switch 1 position. **Bits 2-7:** Not used. Where: 00: switch is stuck between 2 positions or disconnected. 11: undetermined position. 01: switch in position A. 10: switch in position B.	1) cmd: 7E AF 02 FF 08 A5 7F reply: 7E FA 86 FF 08 00 02 00 01 77 7F System in 1:1 redundant configuration, manual mode RF switch 1 in position A
Get System and Switches Alarm Status 7E XF 02 FF 0C ZZ 7F Query controller for current system and switches alarms	**Update System and Switches Alarm Status:** 7E FX 86 FF 0C VV WW 00 YY ZZ 7F	VV WW = System alarm status: VV = Bitmap as follows: **Bit 0:** Switch 1 CAN bus communication alarm **Bit 1:** Not used **Bit 2:** Unit B CAN bus communication alarm **Bit 3:** Unit A CAN bus communication alarm **Bit 4:** Manual mode warning **Bits 5-6:** Not used **Bit 7:** System summary alarm WW = Bitmap as follows: **Bit 0:** Unit A summary alarm **Bit 1:** Unit B summary alarm **Bits 2-7:** Not used YY = Switches alarm status, bitmap defined as follows: **Bit 0:** RF switch 1 out of position **Bit 1:** Not used **Bit 2:** RF switch 1 unable to move **Bits 3-7:** Not used **All alarm and warning bits**: 0 = no alarm or warning; 1 = alarm or warning.	1) cmd: 7E AF 02 FF 0C A1 7F reply: 7E FA 86 FF 0C 10 00 00 00 60 7F Manual mode warning No switch alarms

9.2 Redundant System Control Commands

This section identifies the list of commands available **ONLY IN CASE OF A REDUNDANT SYSTEM** to control the switch and the redundancy mode.

NOTES:

1. Note that the switch control commands are sent to unit B (address 0xB) by default. In a 1:1 configuration, these packets can be sent to unit A or unit B.
2. In the following: ***X = main controller serial address and ZZ = CRC***.
3. In case of error, a NACK reply will be received. Refer to section 6 for possible error codes.

Command	Possible Replies	Interpretation	Examples
Set Auto/Manual operation mode 7E XF 14 06 03 00 YY ZZ 7F	**ACK** Refer to 6	Select system operation mode (automatic or manual): YY: 00 = auto mode (default); 01 = manual mode	1) cmd: 7E BF 14 06 03 00 01 50 7F Set system in manual mode 2) cmd: 7E BF 14 06 03 00 00 51 7F Set system in auto mode
Drive switches 7E XF 14 06 09 WW YY ZZ 7F	**ACK** Refer to 6	Drive a switch to the required position. WW = switch to drive: 00: RF switch 1. YY = switch new position: 01: drive to side A. 02: drive to side B.	1) cmd: 7E BF 14 06 09 00 01 5A 7F Drive RF switch 1 to side A. 2) cmd: 7E BF 14 06 09 00 02 59 7F Drive RF switch 1 to side B.
Toggle switches 7E XF 14 06 0A 00 YY ZZ 7F	**ACK** Refer to 6	Alternate the position of a switch. YY = switch to toggle: 00: RF switch 1.	1) cmd: 7E BF 14 06 0A 00 00 58 7F Toggle RF switch 1.

10 Appendix I: Troubleshooting Guide

Problem	Possible Remedies
No response at all from the control module serial interface.	1) Ensure the cable assembly is wired properly (refer to pin definitions table in the user manual) and that it is properly connected between the control module customer interface port and the customer device. 2) Verify that the com port parameters are as specified in 4.1 Customer Interface Port Configuration. 3) Ensure the user has administration privileges on the PC to change the com port settings. If not, make sure the com port baud rate is set at the correct value. 4) Confirm that the customer interface cable is connected to the correct PC com port. 5) Ensure that there are no other applications executing on the same com port. 6) Ensure the com port No. is not exceeding 9. In case of communication failure, try to change it to a lower number. 7) If using RS485, ensure port (or converter) is set to half duplex (2-wire configuration), and that echo is turned off. 8) Ensure that external RS485 converter has its own power supply. 9) Disable “Fast flush” property on the RS485 converter, if available (Moxa converter Uport). 10) If using a control module address other than 0xF, then try sending a command to address 0xF. Note that the control module will respond to all commands received with destination address 0xF. 11) If the transport medium is RS485 half duplex, note that some PC cards require software control of the RS485 transmit and receive buffer enable lines. The software in the customer device may need to coordinate the enabling /disabling of these buffers. It is also possible that the timing between the transition needs to be adjusted. 12) Ensure the control module is powered on.
Packet response is not as expected.	1) Confirm that the Destination / Source address byte is not inverted (i.e. Destination address is in the upper nibble, source address is in the lower nibble).
Reply packet is incomplete.	1) If software control of the transmit and receive buffer enable lines is required (RS485 half duplex), then it is possible that the timing between the transition needs to be adjusted.
Ethernet communication cannot be established.	1) Try using default IP address 169.254.1.1. 2) Using the serial interface, check the network configuration parameters (host name and DHCP configuration).

Appendix C

1. Access via Ethernet Interface.

Note: Each unit is shipped with a unique host name and the DHCP function enabled.

2. Required pre-setting on the PC.

You must configure an Ethernet interface on your computer before you can access the BUC via Ethernet.

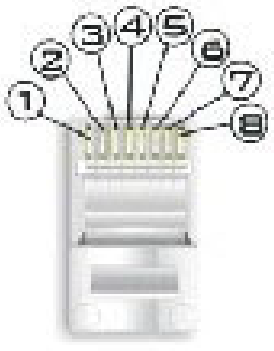
Following cable configurations are possible:

3. BUC connected to a PC / Laptop.

From BUC J4 Pin	To RG45 Pin	Name	Description	EIA/TIA 568A cable colors	EIA/TIA 568B or AT&T 258A cable colors
K	1	TX+	Transmit Data+	White with green strip 	White with orange stripe 
L	2	TX-	Transmit Data-	Green with white stripe or solid green 	Orange with white stripe or solid orange 
H	3	RX+	Receive Data+	White with orange stripe 	White with green stripe 
	4	n/c	Not connected	Blue with white stripe or solid blue 	Blue with white stripe or solid blue 
	5	n/c	Not connected	White with blue stripe 	White with blue stripe 
J	6	RX-	Receive Data-	Orange with white stripe or solid orange 	Green with white stripe or solid 
	7	n/c	Not connected	White with brown strip 	White with brown strip 
	8	n/c	Not connected	Brown with white stripe or solid brown 	Brown with white stripe or solid brown 

4. BUC connected to LAN.

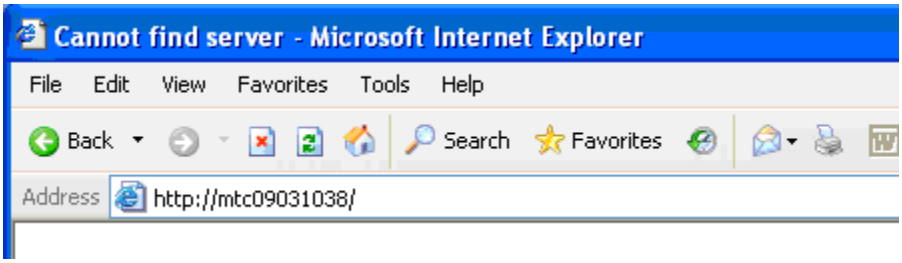
From BUC J4 Pin	To RG45 Pin	Name	Description	EIA/TIA 568A cable colors	EIA/TIA 568B or AT&T 258A cable colors
H	1	TX+	Transmit Data+	White with green strip	White with orange stripe
J	2	TX-	Transmit Data-	Green with white stripe or solid green	Orange with white stripe or solid orange
K	3	RX+	Receive Data+	White with orange stripe	White with green stripe
	4	n/c	Not connected	Blue with white stripe or solid blue	Blue with white stripe or solid blue
	5	n/c	Not connected	White with blue stripe	White with blue stripe
L	6	RX-	Receive Data-	Orange with white stripe or solid orange	Green with white stripe or solid
	7	n/c	Not connected	White with brown strip	White with brown strip
	8	n/c	Not connected	Brown with white stripe or solid brown	Brown with white stripe or solid brown



RJ45 pin configuration

5. Web Access

From your web browser address bar type in the last 8 digit of the serial number preceded with "http//mtc"



1. Home page
2. Seven different pages can be selected from the HOME page:
3. System type. Standalone or redundant.
4. Configuration of the Ethernet parameters.
5. BUC A or standalone telemetry.
6. BUC B telemetry.
7. Redundancy system telemetry
8. Alarm Log events.
9. Help page

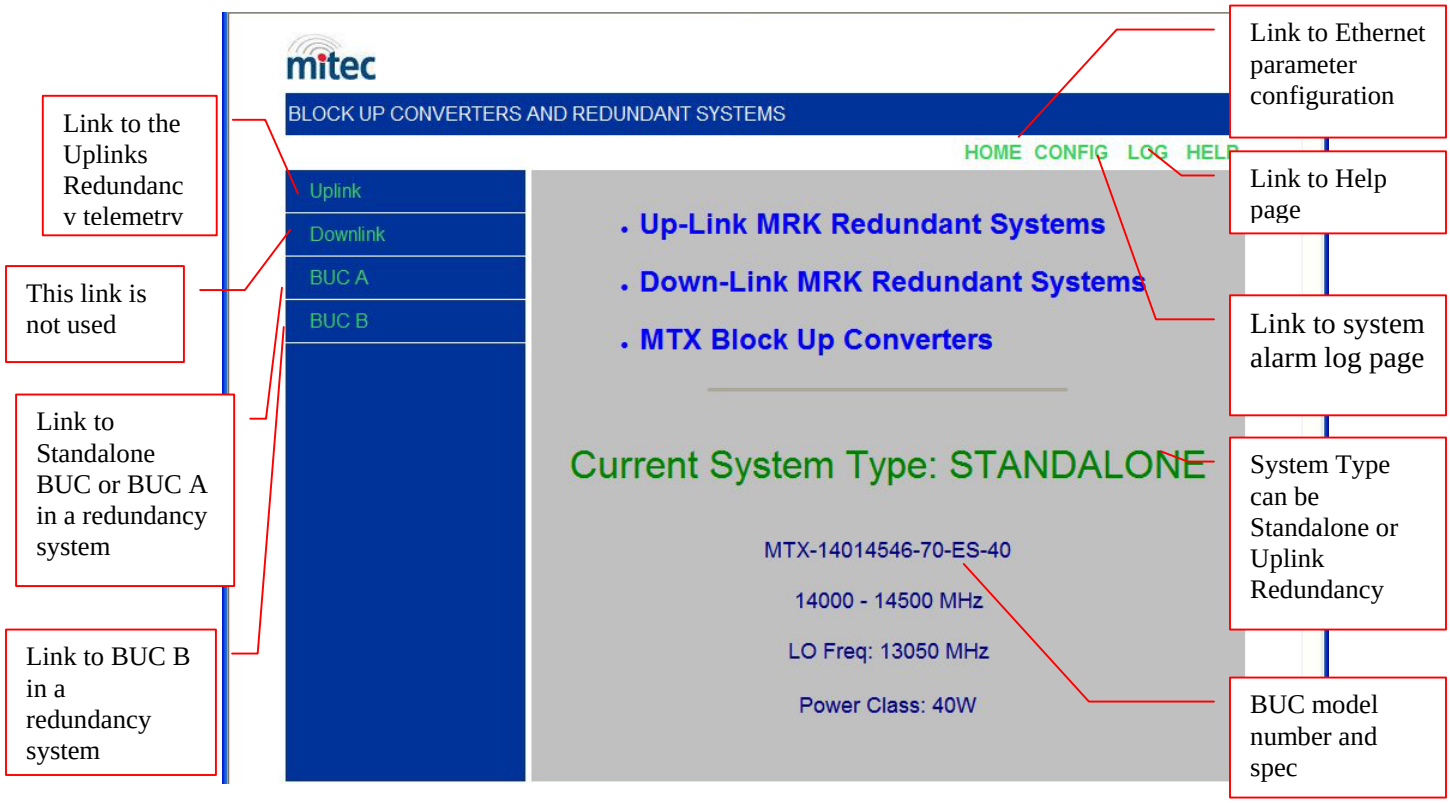


Figure C1 - Home page

NOTE

Changes to network configuration of this devise must be done by authorized personnel. Mis-configuration of this product could cause a Network failure.

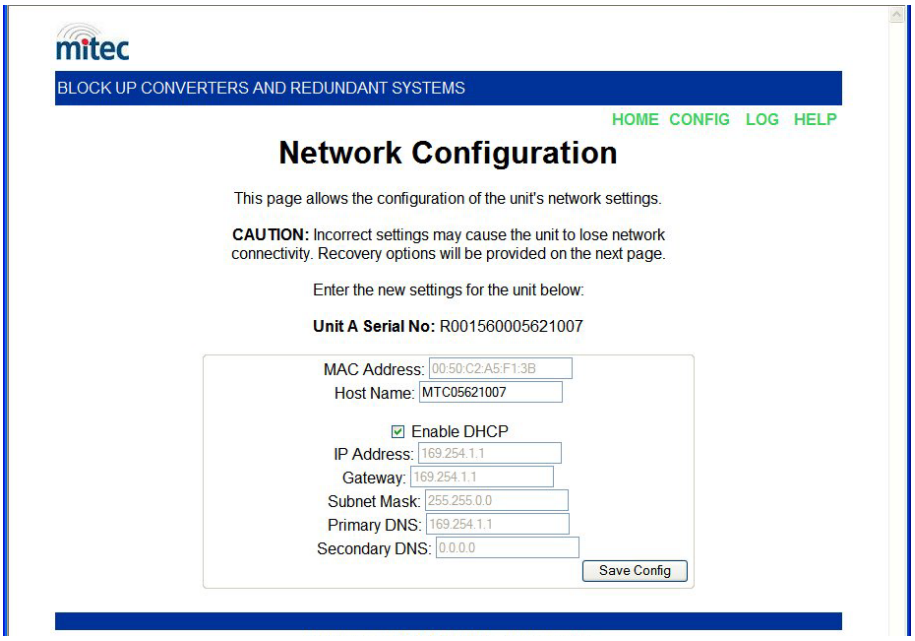


Figure C2 - Configuration of the Ethernet parameters

- Unit serial number: Read only. Factory set. Each unit have a unique number
- MAC Address: Read only. Factory set. Each unit has a unique address.
- Host Name: Configurable. Factory default, the Unit serial number.
- Enable DHCP: Configurable. Factory default, Enable.
- IP Address: Configurable. Factory default, 169.254.1.1
- Gateway: Configurable. Factory default, 169.254.1.1
- Subnet Mask: Configurable. Factory default, 255.255.0.0
- Primary DNS: Configurable. Factory default, 169.254.1.1
- Secondary DNS: Configurable. Factory default, 0.0.0.0

NOTE

In standalone configuration BUC A link is used.

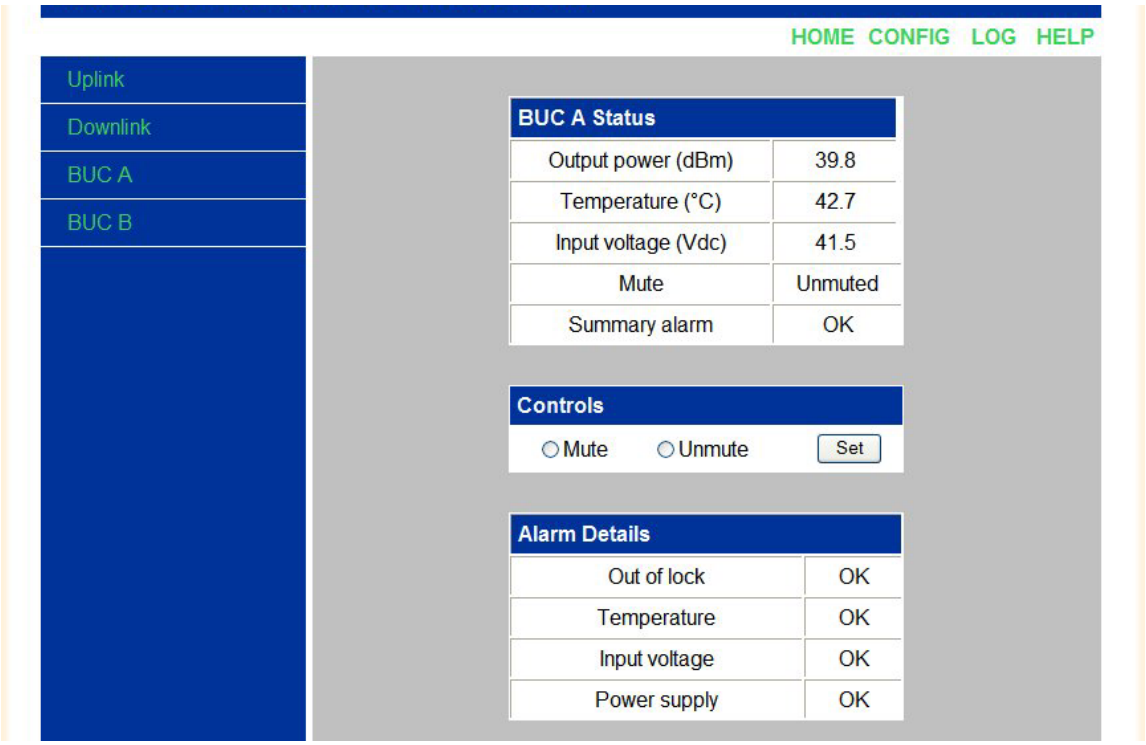


Figure C3 - BUC telemetry

- Output Power: Display the output detector value in dBm.
- Temperature: Display the BUC Hot spot temperature in degree Celsius.
- Input Voltage: display the BUC input voltage value in volts.
- Input frequency: Not measured. Memory value.
- Mute: Display the BUC Mute status. (Mute or Unmute)
- Summary alarm: Display BUC internal system failure. (OK or FAULT)
- Mute control: Let you set between MUTE and UNMUTE the output power.
- Out of lock alarm: 10MHz reference is missing.
- Temperature alarm: The BUC hot spot as exceeded 87 degree Celsius.
- Input voltage alarm: The input voltage is below 40Vdc.
- Power supply alarm: failure of the power supply card.

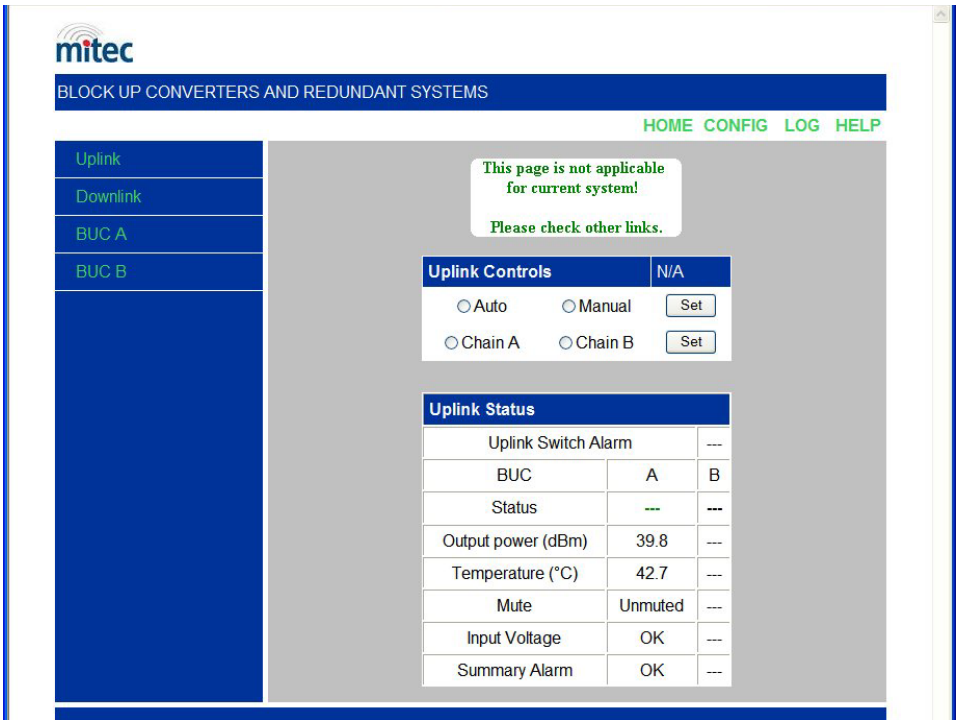


Figure C4 - Up link Redundancy system telemetry

- Auto / manual control: let you set between automatic switching of the failed online BUC to the backup or manual switching between the two BUC.
- Chain A / Chain B control: Let you, in manual mode, switch BUC A or BUC B to the output.
- Uplink switch alarm: Switch stock in between position, Switch as not turn on command or it as stop communicating with the system.
- BUC A / B status: “Active” when its output is routed to the antenna. “Standby” when its output is routed to the load.

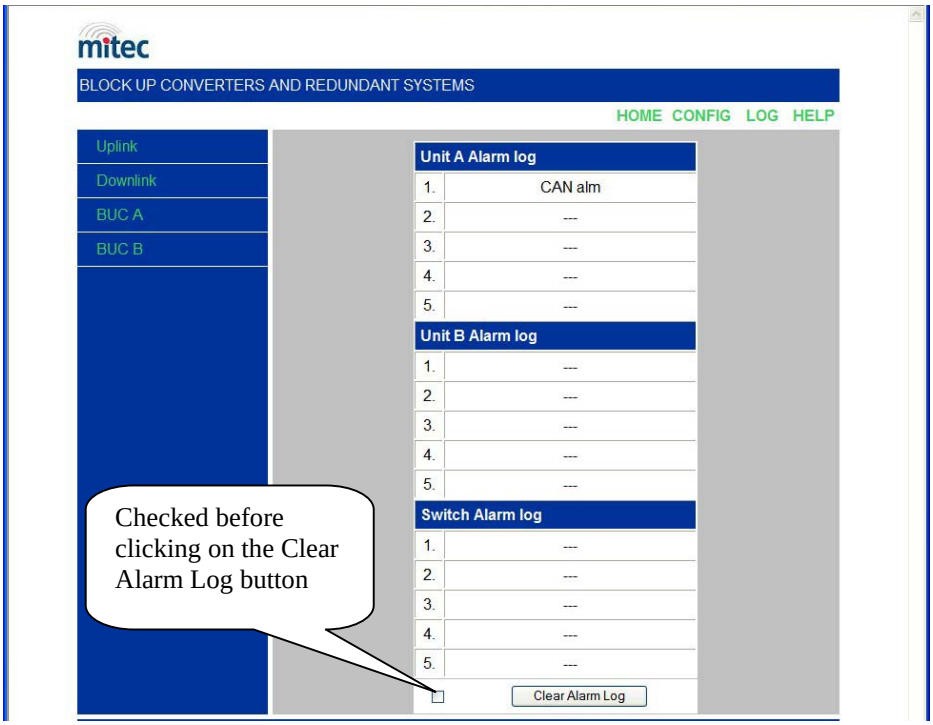


Figure C5 - Alarm Log events: (Non chronological events)

- Unit A alarm Log: Last 5 alarm on Standalone BUC or BUC A in the redundancy system.
- Unit B alarm log: Last 5 alarm on BUC B in the redundancy system.
- Switch alarm log: Last 5 alarm on the SWITCH in the redundancy system.
- Clear alarm log button: Will clear the alarm log. (It is recommended to clear the alarm log after installation.)

NOTE

In order to clean the alarm log the small box beside the : clear alarm log" button must be checked before clicking on the button.

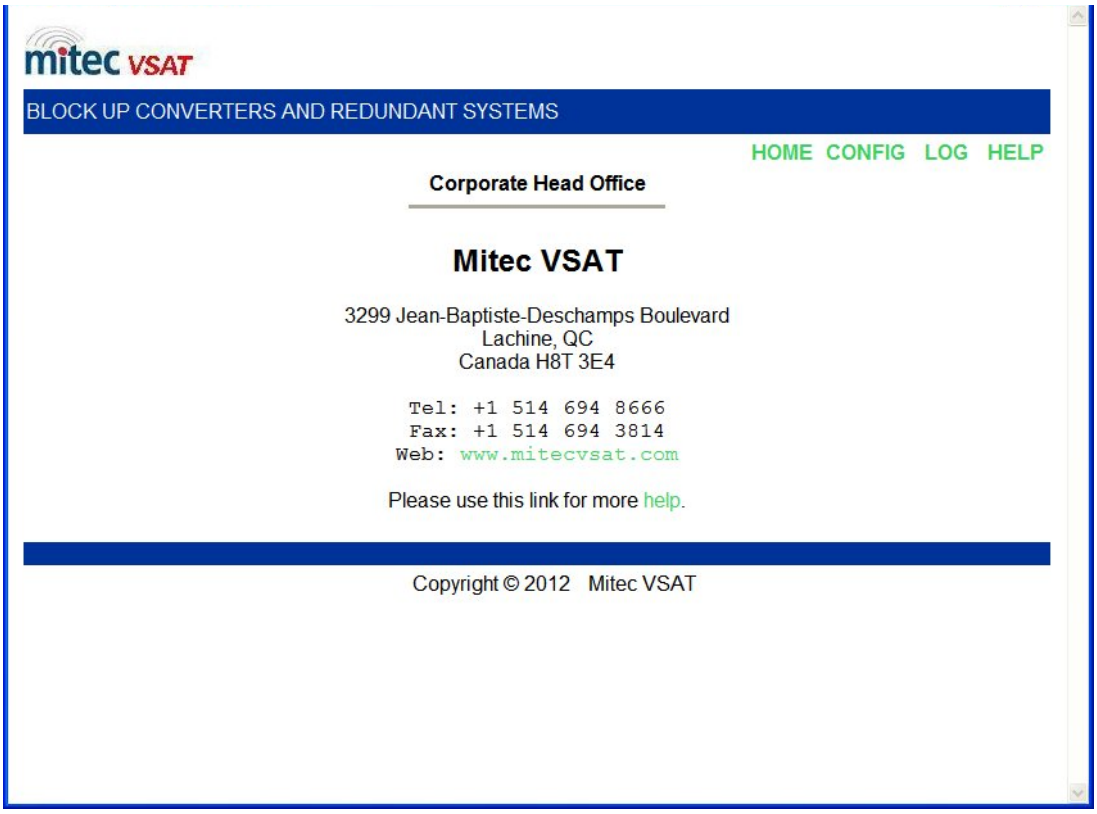


Figure C6 – Help page. Under development.

Appendix D

SNMP

The BUC supports SNMP Version 1 protocol and can be accessed using a Network Management System (NMS) software. The MIB file “Mitec-BUC-MIB” is provided to be loaded to the SNMP manager MIB directory. For the MIB file please consult mitecVsat.

The following configuration is used for the BUC:

- default IP address: 169.254.1.1
- host name: MTC followed by last 8 digits of the unit’s serial number
- port 161
- traps disabled
- MIB file Mitec-BUC-MIB.mib

Through SNMP, the BUC parameters can be monitored and controlled both in standalone and in 1:1 redundant configuration.

Note that SNMP traps are disabled. Moreover, gain control is not applicable for low power BUCs.

Appendix E

1. Accessories:

Indoor Rack Mount 150W Power Supplies

Part Number	Description
217537-002MD	1U Rack Mount Indoor Power Supply, 110/220 VAC, 150W for standalone operation
218907-002MD	2U Rack Mount Indoor Power Supply -48 VDC, 150W for standalone operation
217537-001MD	1U Rack Mount Indoor Power Supply 110/220 VAC, 150W, equipped with Bias-tee, for standalone operation
218907-001MD	2U Rack Mount Indoor Power Supply -48 VDC, 150W, equipped with Bias-Tee, for standalone operation

Indoor Rack Mount 480W Power Supplies

Part Number	Description
215559-002MD	1U Rack Mount Indoor Power Supply, 110/220 VAC, 480W for standalone operation
218908-002MD	2U Rack Mount Indoor Power Supply -48 VDC, 480W for standalone operation
215559-001MD	1U Rack Mount Indoor Power Supply 110/220 VAC, 480W equipped with Bias-tee, for standalone operation
218908-001MD	2U Rack Mount Indoor Power Supply -48 VDC, 480W equipped with Bias-Tee, for standalone operation

Outdoor 480W Power Supplies

Part Number	Description
215560-003MD	Outdoor Power Supply 110/220 VAC, for standalone operation
215560-001MD	Outdoor Power Supply 110/220 VAC, equipped with Bias-Tee, for standalone operation
215560-002MD	Outdoor Power Supply 110/220 VAC, for redundant operation
215988-003MD	Outdoor Power Supply -48V DC, for standalone operation
215988-001MD	Outdoor Power Supply -48 VDC, equipped with Bias-Tee, for standalone operation
215988-002MD	Outdoor Power Supply -48 VDC, for redundant operation

Mounting Kit

Part Number	Description
215035-002MD	Boom Mounting Kit, MTX Low Power Ku-Band BUC

Appendix F

1. Spare Parts

Appendix D 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.

MitecVsat.

3299 Jean-Baptiste-Deschamps

Lachine, QC, H8T 3E4

Canada

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

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

MitecVsat

Designers and manufacturers of telecom & wireless products
ISO 9001 Certified

Spare Parts Order Form

MTX 5-40 Watt C-Band Block Up Converter

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

Part Description	Part Number	Quantity	Unit Price*	Line Total*

* To be completed by **MitecVsat** Sales Department

Fax to: Customer Service (514) 694-3814