TECHNICAL MANUAL

UP CONVERTER
C BAND

UCS/B SERIES

Vertex RSI™
A TriPoint Global Company

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Website: www.tripointglobal.com

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Part Number: TM-UCSC

Revision B

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WARRANTY

VertexRSI warrants its products for a period of two (2) years from the date of shipment to be free from defects caused by faulty materials or poor workmanship.

The terms and conditions of this warranty are as follows

- The purchaser must notify VertexRSI promptly upon discovery of such defect.
- The purchaser must return the defective product, postpaid, to:

  VertexRSI
  101 Round Hill Drive
  Rockaway, NJ 07866

- Evaluation of the defective product at Vertex RSI shall disclose that such defects exist and have not been caused by misuse, neglect, improper handling, alteration or accident.

VertexRSI reserves the right to make product improvements and/or design changes in any of its products without incurring any obligation or liability to make the same changes in units previously shipped.

Rev. B

Table of Contents

Section 3 (continued)

Section 4 (continued)

Appendices

List of Illustrations

List of Tables

Section 1 General Information

1.0 HOW TO USE THIS MANUAL

This manual contains installation, operation, maintenance, and parts information for the C-Band UCS or UCB single band SATELLITE UP CONVERTER, manufactured by VertexRSI, Rockaway, New Jersey. The UCSU and USBU Ultra-low Phase Noise models are also included. Information is organized according to section. Within each section the pages, figure and tables are numbered by section and by order of appearance within the section. Unless otherwise noted, any information about the UCS model applies to the UCB and Ultra-low Phase Noise models.

1.1 SAFETY INFORMATION

This equipment has been designed to minimize exposure of personnel to hazards.

WARNING

A continuous safety earth ground must be provided from the main power source through the main power cord. This is provided in the power cable shipped with the unit. If this power cord is damaged, it should be replaced with cord of equal or better specifications. This cord can be obtained from VertexRSI.

Servicing instructions are for use by trained personnel only. To avoid dangerous electric shock, do not perform any servicing unless qualified to do so. Do not replace components with the power cord connected to the equipment.

WARNING

Some of the adjustments described in this manual are performed with power applied while protective covers are removed. Always be careful not to come on contact with dangerous voltages while performing these procedures, and never work alone.

With power applied to the unit and the cover removed, be aware that a rotating fan is operating.

Do not operate the equipment in the presence of flammable gasses or fumes. Operation of any electrical equipment in such an environment is dangerous. And can cause explosions and/or fires.

1.2 GENERAL INTRODUCTION

This manual provides operation and service instructions for the VertexRSI C-Band up converter. The UCS up converter consists of a power supply, forced-air cooling system, microprocessor-based monitor and control circuitry and the modules required for up conversion. It incorporates extensive monitor and control functions that are accessible from the front panel as well as through a remote RS-422 bus. A general description of the front and rear panels is given in 1.5 and 1.6 respectively

The UCS up converter is housed in an enclosure destined for mounting in a standard EIA 19-inch rack, requiring a 1.75-inch high vertical space.

1.3 PURPOSE OF EQUIPMENT

The UCS up converter is a fully synthesized up converter having an input IF frequency of 70 (140) MHz and covering the C-Band transmitting RF frequencies in 1 or 125 kHz steps. It incorporates extensive monitor and control functions that are accessible from the front panel as well as through a remote RS-422 bus.

1.4 SPECIFICATIONS

The RF, power, physical and environmental specifications for the UCS up converter are listed in Table 1-1.

1.5 FRONT PANEL

All the operating controls and indicators for the UCS up converter are located on the front panel. The front panel is depicted in Figure 1-1 and incorporates a two-line alphanumeric back-lit LCD display, a red LED summary alarm indicator, a tactile-feedback keypad, an IF monitor jack (BNC), and an RF monitor jack (SMA). When the unit is powered on, the LCD display indicates the power on condition by displaying the major operating parameters. Using the two MENU keys on the keypad accesses the various monitor and control functions. The left/right arrow keys and the Enter key are used to change the operating parameters of the equipment. For detailed operating instructions, refer to Section 3.2.

1.6 REAR PANEL

The rear panel is depicted in Figure 1-2. It incorporates a power switch (J1), the forced air outlet, remote monitor and control connectors (J4, J5 and J6), chassis ground, the RF output connector (J3), the IF input connector (J2) and an optional external Reference Input connector (J7). See Section 2 for interconnecting requirements and pinouts.

1.7 COOLING

Cooling of the equipment is achieved by circulating cool air, through the inlet grille near the converter module, and moving it across the heat producing components with an internal fan. The heated air exits the equipment through the exhaust grille near the power connector.

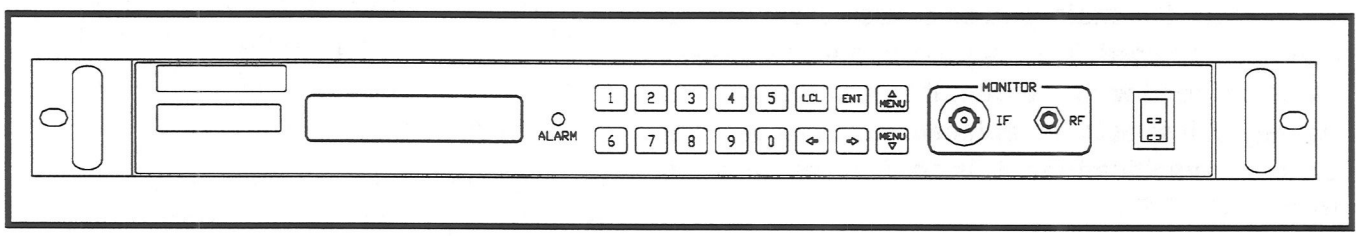


FIGURE 1-1. Front Panel

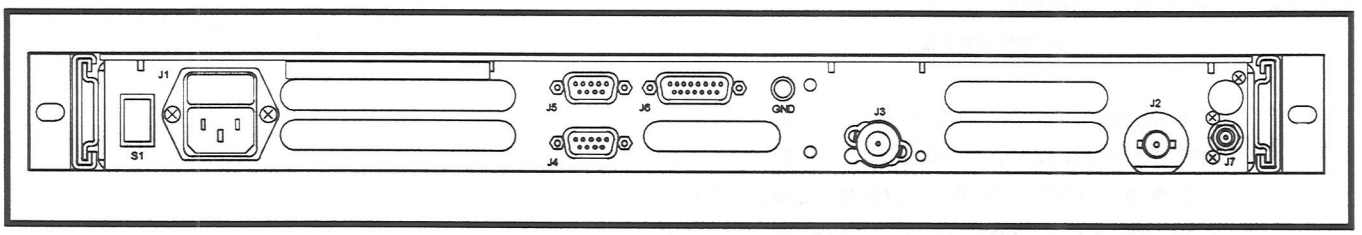


FIGURE 1-2. Rear Panel

Table 1-1 C-Band Up Converter Specifications

RF OUTPUT CHARACTERISTICS

Frequency range - C Band *	any band in 5.845-6.250 or 6.425-7.025 GHz ranges
Step size *	100 Hz, 1kHz, 125 kHz
Impedance	50 ohms, Type "N"-F connector
Return loss	21 dB Min.
RF Monitor	-20 dBc Nom., 50-ohms, SMA-F connector
Frequency Stability	+/-1x10^{-9}/day
	+/-2x10^{-8} 0° C to +50° C

IF INPUT CHARACTERISTICS

Frequency range *	70 +/-20 MHz (140 +/-40 MHz)
Input Power Range (nominal)	-70 to -15 dBm
Impedance	75 ohms, BNC-F connector, (50 ohms optional)
Return loss	26 dB Min.

IF/RF PERFORMANCE

Frequency sense		Positive (no spectral inversion)	
Gain at Max. setting		29 - 34 dB	
IF Attenuator		0 to 25 dB Min. in 0.1 dB steps, (Local/Remote)	
L-band Attenuator		0 to 25 dB Min. in 0.1 dB steps, (Local/Remote)	
Output 1 dB compression		+9 dBm Min., +10 dBm Typ.	
Gain variation	IF band	0.5 dB Max.	
	RF band	1.5 dB Max.	
Gain slope		0.05 dB/MHz p-p Max.	
Gain stability		+/-0.25 dB/day Max. over any 10°C temp. change	
Group delay		+/- 20 MHz	+/- 40 MHz
	linear	0.012 ns/MHz Max.	0.006 ns/MHz Max.
	parabolic	0.004 ns/MHz^2 Max.	0.001 ns/MHz^2 Max.
	ripple	0.9 ns p-p Max.	0.9 ns p-p Max.
AM/PM conversion		0.1°/dB Max. to 0 dBm output	
Noise figure		18 dB Max., 16 dB Typ.	
Intermodulation distortion		40 dBc Min. with 2 carriers @ 0 dBm output	
Spurious	carrier related	-60 dBc Max. @ 0 dBm output	
	non-car. related	-80 dBm Max. (L Band attenuation >= 5 dB)	
AC line spurs	fundamental	-40 dBc Max.	
	sum of all harm.	-43 dBc Max.	
Phase Noise	Standard Model	Ultra Low Noise Model	
	-50 dBc/Hz Typ.	-60 dBc/Hz Typ.	@ 10 Hz
	-70	-75	100 Hz
	-80	-91	1 kHz
	-86	-106	10 kHz
	-105	-112	100 kHz
	-115	-125	1 MHz

Note: Product specifications subject to change without notice, contact factory for latest information.

Table 1-1 C-Band Up Converter Specifications (continued)

GENERAL

Temperature	operating	-20 to +50° C
	storage	-50 to +70° C
Humidity		5 to 95% RH, non-condensing
Altitude	operating	10,000 ft.
	non-operating	40,000 ft.
Shock/Vibration		as encountered in mobile trailer and commercial shipping environments
Summary alarm		Form C contact closure
Weight	UCS Model	19 pounds Typ.
	UCB Model	11 pounds Typ. (w/12 VDC system)
Size	UCS Model	19" W x 1.75" H x 22" D
	UCB Model	19" W x 1.75" H x 18" D
Operating power		85 - 265 VAC +/-10%, 47-63 Hz
	UCS Model	90 VA Typ., 100 VA Max.
	UCB Model	50 VA Typ., 80 VA Max. (w/12 VDC system)

* see model number list in Appendix B

Section 2 Installation

2.0 INTRODUCTION

This section defines the installation requirements by which the C-Band UCS Singleband SATELLITE UP CONVERTER, will meet the published specifications.

2.1 UNPACKING AND INSPECTION

Remove the unit from its shipping container and inspect for any damage sustained during shipment. Save the packing material for reshipment back to the factory or to another site. Report any damage to the shipping forwarder in accordance with required procedures.

2.2 INSTALLATION REQUIREMENTS

The UCS up converter is designed for mounting in a standard EIA 19-inch rack. The unit must be supported on the sides and space must be allowed at the rear of the unit to permit the flow of cooling air. The unit should be installed in an environment that is within the environmental envelope described in Table 1-1. Primary power must be made available that is within the specified limits.

2.3 MECHANICAL INSTALLATION

The mechanical configuration of the unit is shown in Figure 2-1. It is equipped with threaded inserts on either side for the installation of slides. Slides are not provided with the unit; however, it has been designed to be compatible with Model C-300-S-422-RC-3S, manufactured by General Devices of Indianapolis, Indiana, and they may be ordered as an option. The front panel is equipped with slots to accommodate user-supplied retaining screws.

CAUTION

MOUNTING THE UNIT BY ONLY THE FRONT PANEL WILL CAUSE EXTENSIVE DAMAGE.

2.4 ELECTRICAL CONNECTIONS

All electrical connections are made to the rear panel of the unit. The BNC and SMA connector on the front panel are for periodic monitoring and is normally left open. Below is a description of each of the rear panel connectors and its interface requirements. The chassis ground is threaded for a #10-32 screw.

2.4.1 Power Input (J1)

This connector is an IEC 320-C14 male and will accept any compatible mating connector. The power cord supplied as standard with the unit is equipped with a NEMA 5-15P male plug at the opposite end and is compatible with most 115 VAC supplies.

The units are manufactured with a Universal Input Power supply that will accept voltages in the range of 85V to 265V AC.

CAUTION

DAMAGE MAY RESULT IF THE INCORRECT VOLTAGE IS APPLIED TO THE UNIT.

2.4.2 IF Input (J2)

This connector is a BNC female. The BNC male mate (not supplied) should be compatible with the 75-ohm coax used to connect to the system.

2.4.3 RF Output (J3)

This connector is a type "N" female (SMA or TNC optional). The male mate (not supplied) should be compatible with the 50-ohm coax used to connect to the system.

2.4.4 Summary Alarm (J4)

This connector is a 9-pin male miniature type "D" connector (M24308/3-1) with standard #4-40 female screw-lock hardware mounting. The mating shell, pins, and strain relief are not supplied. The pin function and pin-out is as follows:

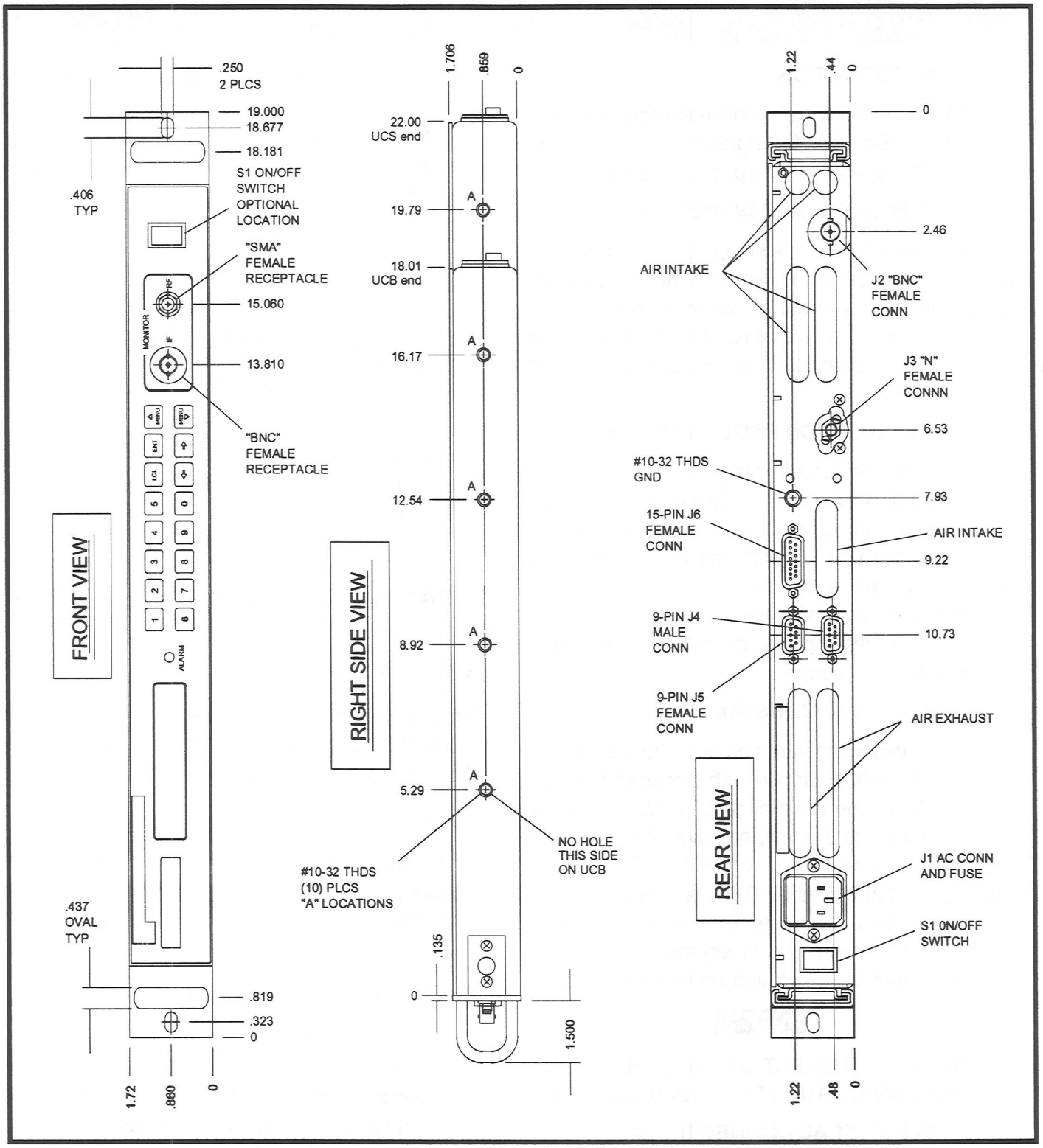


FIGURE 2-1. Singleband Outline Drawing

Pin 1 Relay NC (closed for alarm condition)
Pin 2 Relay Common
Pin 3 Relay NO (closed for normal operation)
Pin 4 Switch Control, MS
Pin 5 Switch Control, MV
Pin 8 Switch Control, M0
Pin 9 Switch Control, M1

2.4.5 Serial Interface (J5)

This connector is a 9-pin female miniature type "D" connector (M24308/1-1) with standard #4-40 female screw-lock hardware mounting. The mating shell, pins, and strain relief are not supplied. The electrical interface to this connector is for a standard RS-422 bus. For bus protocol requirements, refer to Section 3-3. The convention used for the signals is a logic Hi for Mark (Rest) and a logic Lo for Space. The pin-out, on the converter side, is as follows:

Pin 3	RXD +	Pin 4	TXD +
Pin 5	Ground	Pin 6	TXD -
Pin 7	Alarm summary (open collector)		
Pin 9	RXD -		

2.4.6 Options Connector (J6)

This connector is a 15-pin female miniature type "D" connector (M24308/1-2) with standard #4-40 female screw-lock hardware mounting. It is used for both an External Power Detector and for use with a STARswitch™ model Redundancy Switch. Each use is described in more detail below.

2.4.6.1 XMT Power Detector

This use of the connector is to support an external power detector located on the coupled port of a power coupler at the output of the system power amplifier.

The connector, detector and associated components are not supplied. The type of detector used is not limited; however, the unit was specifically designed to interface directly with Models N425A, N426A, and N427A manufactured by General Microwave Corporation of Amityville, New York. If any of these detectors is used, the up converter will display power directly in dBm. Following is a pin-out of J6 as it relates to the recommended connections to the General Microwave detectors.

J6	Function	Detector
Pin 1	+15 VDC @ 20 mA max.	Pin A
Pin 3	-15 VDC @ 20 mA max.	Pin B
Pin 5	Feedback	Pin C
Pin 6	0 to -10 V full scale	Pin D
Pin 7	Ground	Pin L
Pin 8	Zero (arm of pot)	Pin F

Regardless of which detector is used, it should be set to output 1 milliwatt full scale. Provision for zeroing the detector is inside the up converter via VR3, located on the **A5** assembly (see Figure 6-1).

If a detector other than one of those specified is used, it should present a voltage output to pin 6 of **J6** in the range of 0 to -10 volts, where the voltage is proportional to RF power and the full scale output of -10 volts corresponds to 1 milliwatt. The voltages available on pins 1 and 3 may be used providing the current ratings are not exceeded.

2.4.6.2 STARswitch™ Control

The STARswitch™ Redundancy Switch is intended as a lower cost, higher performance alternative to the existing designs of redundancy switches provided by VertexRSI. This switch is designed for use with VertexRSI Up or Down Converters with a software revision that includes an "S" prefix. This can be confirmed via the Switch Request Menu on the Converter display.

The switch is controlled by the alarms of the converters, and status of the switches is also reported via the converters. There are no operator controls on the STARswitch™. A new menu has been pro-

vided on converters with a software revision beginning with an "S" that allows additional control of the STARswitch™. More detailed information is available in the STARswitch™ Redundancy Switch's manual. The pin outs for use with it are given below.

J6	Function
Pin 1	+15 VDC
Pin 2	Ground
Pin 7	Ground
Pin 9	MS
Pin 10	M0
Pin 11	M1
Pin 12	M2
Pin 13	Status
Pin 14	MV
Pin 15	Switch Alarm

2.4.7 External Reference Input (IN)

This connector, if requested, is a type SMA female (BNC optional). The male mate (not supplied) should be compatible with the 50-ohm coax used to connect to the system.

2.5 OPERATIONAL CHECK

To verify that the basic functions of the unit are operational, it is recommended that the following checkout procedure be followed prior to final system integration. If there are any questions regarding performing the indicated operations, refer to Section 3.2.

2.5.1. Setup

Connect the unit to a primary power source, turn on the power switch (connect the external reference (IN) signal to the unit if used). Verify that the LCD displays two lines of information. If the display contrast is not acceptable, adjust using procedure shown in **Section 5.2.2.** Using the keypad on the front panel of the converter, perform the following procedure.

1. Press LCL to enter **(DEFAULT STATE)** menu.
2. MENU to **SET FREQUENCY** menu. Using the numeric keys 0-9, set to the desired frequency and press the ENT button.
3. MENU to **SET L BAND ATTEN** menu. Set to **00.0** dB. Press ENT.
4. MENU to **SET IF ATTEN** menu. Set to **00.0** dB. Press ENT.
5. MENU to **MUTE CONTROL** menu. Select "**ON**".
6. MENU to **SET ALARM MASK** menu. Set to **11111111**. Press ENT
7. MENU to **SET OUT THRS** menu. Set to **-40** dBm. Press ENT.
8. MENU to **CLEAR ALARM HIS** menu. Press the ENT button.
9. Press LCL.

2.5.2 Level Monitor

1. Press LCL to enter **(DEFAULT STATE)** menu.
2. Connect a power meter to **J3** and an input signal to **J2** at a suitable frequency to obtain an on-channel output of +5.0 dBm.
3. MENU to display output level. Verify that displayed level is within 1 dB of +5.0 dBm.
4. Reduce input **IF** power to obtain an output of 0 dBm. Press ENT . Verify that displayed level is within 1 dB of 0 dBm.

2.5.3 Attenuator Control

1. Press LCL to enter **(DEFAULT STATE)** menu.
2. Connect a power meter to **J3** and an input signal to **J2** at a suitable frequency to obtain an on-channel output of 0.0 dBm.

3. MENU to **SET L BAND ATTEN** menu.
4. Set attenuator to 5.0 dB. Verify that the output drops to -5.0 dBm ± 1.0 dB.
5. Set attenuator to 10.0 dB. Verify that the output drops to -10.0 dBm ± 1.0 dB.
6. Set attenuator to 15.0 dB. Verify that the output drops to -15.0 dBm ± 1.0 dB.
7. Set attenuator to 20.0 dB. Verify that the output drops to -20.0 dBm ± 1.0 dB.
8. Set attenuator to 25.0 dB. Verify that the output drops to -25.0 dBm ± 1.0 dB.
9. Return attenuator to 00.0 dB.
10. MENU to **SET IF ATTEN** menu and repeat steps 4 through 8.

2.5.4 Mute Control

1. Press LCL to enter **(DEFAULT STATE)** menu.
2. Connect a power meter to **J3** and an input signal to **J2** at a suitable frequency to obtain an on-channel output of +5 dBm.
3. MENU to **SET MUTE CONTROL** menu. Select **OFF** and then ENT. Verify that there is the output drops to the mute level.
4. Select **ON** and press ENT. Verify that the output level returns to +5.0 dBm.
5. MENU to **SET OUT THRS** menu. Set to **00.0** dBm.
6. MENU to **SET MUTE CONTROL** menu. Select **AUTO**, press ENT and then LCL. Decrease the input signal level by 15 dB. Verify that the output level of the unit drops to mute level, that the alarm LED is lit and that the unit is **"OFF."**
7. MENU to **SET MUTE CONTROL** menu. Select **"ON"** and press ENT. Reset the input level to the original setting, verify that the output level returns to the normal operating state and the LED is off.
8. MENU to **SET OUT THRS** menu. Set to -40 dBm. Press LCL.

2.5.5 Alarms

1. Press LCL to enter **(DEFAULT STATE)** menu.
2. Connect a power meter to **J3** and an input signal to **J2** at a suitable frequency to obtain an on-channel output of +5 dBm. Verify that the operate display shows "ATTEN 00.0 DB".
3. MENU to the **FAULT CODE** menu. Verify that the **00000000** is displayed. Verify that the alarm led is not lit.
4. Using an ohmmeter, verify that there is a low impedance between pins 2 and 3 and a high impedance between pins 1 and 2 on the 9-pin, male connector which is located on the rear panel (J4).
5. MENU to **SET OUT THRS** menu. Set to **00.0** dBm. Press LCL.
6. Reduce the signal level to obtain an output of -10 dBm. Verify that the display shows **LOCAL ALARM** and that the alarm LED is lit.
7. MENU to the **FAULT CODE** menu. Verify that the **00000011** is displayed.
8. Using an ohmmeter, verify that here is a low impedance between pins 1 and 2 and a high impedance between pins 2 and 3 on the 9-pin, male connector which is located on the rear panel (J4).
9. MENU to the **SET ALARM MASK** menu. Set the alarm mask to **11111101**.
10. MENU to the **FAULT CODE** menu. Verify that the **00000010** is displayed and the alarm LED is off.

11. MENU to the **SET ALARM MASK** menu. Set the alarm mask to **11111111**.

12. MENU to **SET OUT THRS** menu back to -40 dBm or to the required operating level. Verify that alarm led is not lit.

13. MENU to **CLEAR ALARM HISTORY** menu.

    Press ENT. Press LCL to return to the default menu.

2.6 SYSTEM INTEGRATION

To ensure that the up converter is giving peak performance, it is necessary to set its gain structure to best match the system environment in which it is placed. The L band attenuator can be set at system level either by the front panel keypad or by the RS-422 bus. The IF attenuator, however, is a manual adjustment and must be set at the time of installation. To perform this adjustment, refer to Section 5.2. This adjustment should be performed any time there is a system change that might change the level of the IF signal.

If the optional XMT detector is used (see Section 2.4), it must be calibrated to the characteristics of the system into which it is installed. Refer to Section 5.6 for the complete calibration procedure.

Section 3 Operation

3.0 INTRODUCTION

The UCS up converter can be controlled from the front panel or remotely via an RS-422 serial bus located on the rear panel of the converter. The front panel controls and indicators are detailed below in Figure 3-1. Various menus are available for **CONTROL** and **MONITOR** purposes.

See Figure 3-2 for a listing of the menus and Section 3.4 for detailed descriptions of each menu. Tables 3-1 through 3-7 give a complete description of the bus commands and conventions for operating the converter remotely.

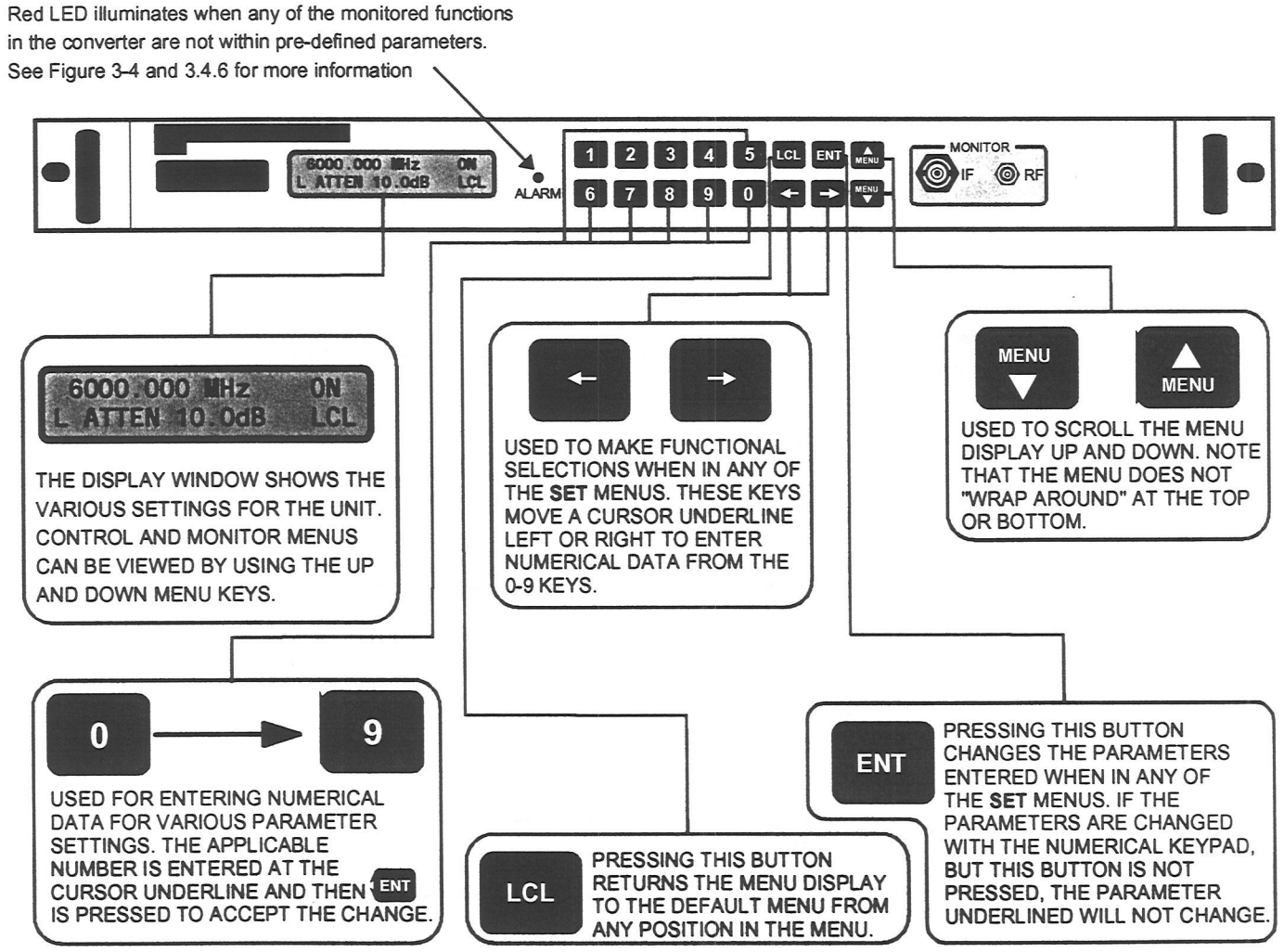
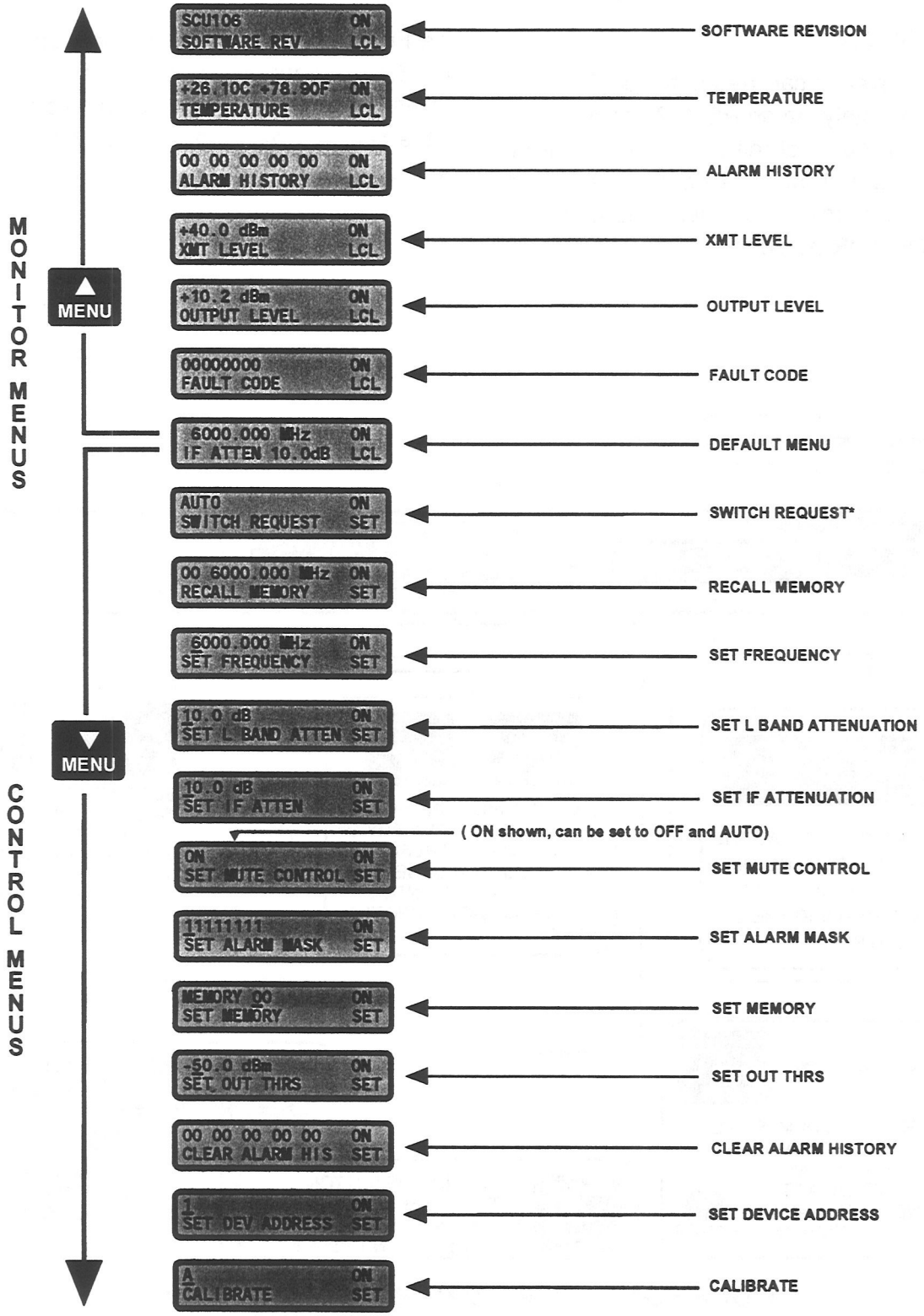


FIGURE 3-1. Front Panel Controls and Indicators

FIGURE 3-2. Menu Listing



3.1 OPERATING MODES

The up converter can be operated from the front panel keypad or through the RS-422 serial bus, which can be accessed from the M&C connector on the rear of the unit. To eliminate the problems associated with two sources of control, four different operating modes have been established. The three-letter display of the modes, **LoCaL**, **ReMoTe**, **SET**, and **CAL**ibrate are viewed from the **MODE WINDOW** of the front panel display.

3.1.1 Local (LCL) Mode

The unit always powers up in the **LCL** mode. From this mode either the keypad or the bus can use any of the monitor functions available and either can assume control.

3.1.2 Set Mode

If the keypad assumes control, the unit enters the **SET** mode. In the **SET** mode, the bus still has monitor functions available, but the control commands are disabled. The keypad relinquishes control in one of two ways: It is returned to a monitor function (**LCL** mode) or, if no key is pressed for 30 seconds, it defaults to **LCL** mode.

3.1.3 Remote (RMT) Mode

The bus assumes control by issuing a control command, upon which the unit enters the **RMT** mode. This can only occur if the unit is in the **LCL** mode. The keypad can return to the **LCL** or **SET** modes at any time after the bus command is processed by making the appropriate entry.

3.1.4 Calibrate (CAL) Mode

The **CAL** mode can only be entered through the keypad and is used for bench checks.

3.2 KEYPAD CONTROL

The front panel keypad, in conjunction with the LCD display, can be used to control all the functions in the converter. The unit enters the default state (see 3.4.7) upon power application or if unattended for more than 30 seconds. See Figure 3-1 for a description of the controls and indicators.

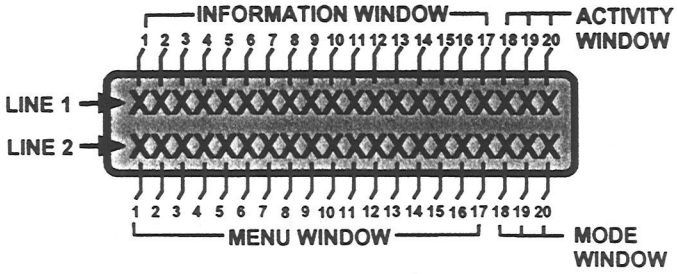


Figure 3-3. Display

3.3 LCD DISPLAY

The front panel back lit display consists of 2 lines of 20 characters each. These two lines are divided into four separate display areas or windows. The first 17 characters of the first line are defined as the **Information Window**. The last 3 characters of the first line are defined as the **Activity Window**. The first 17 characters of the second line are defined as the **Menu Window**. The last 3 characters of the second line are defined as the **Mode Window**. The 17th character of each line is always blank and is used as a separator.

3.3.1 Information Window

This part of line 1 displays data. In the **LCL** mode it displays the current operating conditions of the unit. In the **SET** or **CAL** modes, it displays the data entered from the keypad.

3.3.2 Activity Window

Displays the current mute status of the unit. If the unit is muted, **OFF** is displayed. If the unit is not muted **ON** is displayed.

3.3.3 Menu Window

Displays the name of the menu selected by the keypad. For the default state, it displays **LOCAL ALARM** if there is an alarm condition in the unit or **IF ATTEN**

XX.XdB if there is none, where **XX.X** represents the current attenuation value.

3.3.4 Mode Window

Displays the current mode status, which can be **LCL**, **SET, RMT**, or **CAL**.

3.4 MONITOR AND CONTROL MENUS

There are a number of menus that are displayed for various purposes. The menus above the default menu are MONITOR menus and all others are CONTROL menus. Figure 3-2 gives a listing of the menus for this unit. Detailed descriptions of each menu, and its function for this model of converter, are below.

3.4.1 SOFTWARE REV

The **INFORMATION WINDOW** displays the Software Revision Level.

3.4.2 TEMPERATURE

The **INFORMATION WINDOW** displays the ambient internal temperature of the unit in °C and °F. If the temperature rises up to +75°C (+167°F) the converter will go into the mute mode, lock the key pad and display "UNIT TOO HOT". Turning the unit OFF and ON again will unlock the keypad.

3.4.3 ALARM HISTORY

The **INFORMATION WINDOW** displays the last 5 alarms. The alarm on the right is the most recent one. The format is in Hex and the two digits represent the Alarm 1 and Alarm 2 from left to right. See Section 3.4.6 Fault Code for details.

3.4.4 XMT LEVEL

The INFORMATION WINDOW displays the power level of the system transmitter in dBm. In order for this function to work properly, the optional external detector (see Section 2.4) must be installed and the coupling value for the detector must be entered into the unit using the CAL mode (see section 2.6 and 5.6).

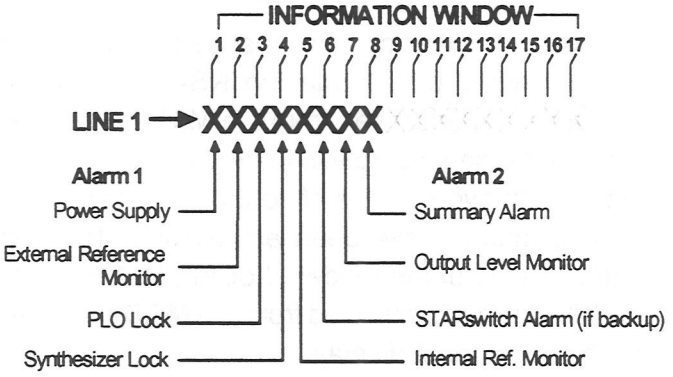


Figure 3-4 Alarms

3.4.5 OUTPUT LEVEL

The INFORMATION WINDOW displays the power level of the RF output of the converter in dBm. This reading is only useful for the upper 15 dB of the converter's dynamic range.

3.4.6 FAULT CODE

The **INFORMATION WINDOW** displays an 8-bit binary word, representing the status of each of the up to 7 internal alarms. A "0" indicates the alarm senses a normal operational status and a "1" indicates an alarm condition. See Figure 3-4 for descriptions.

3.4.7 (Default State)

The **INFORMATION WINDOW** displays the center RF output frequency of the unit in 1 kHz resolution and the **MENU WINDOW** displays the current IF attenuation value or an alarm warning, which is displayed as **LOCAL ALARM**. This menu position can be reached from any other menu position by pressing the **LCL** button.

3.4.8 SWITCH REQUEST

This menu is only available on STARswitch™ compatible versions and is used to control the STARswitch™ Redundancy Switch(es) via **J6** on the rear panel. This menu has three functions that can

be controlled from the front panel or the M&C remote interface.

3.4.9 RECALL MEMORY

The converter incorporates a memory capable of storing up to 100 different frequencies and attenuation values.

The INFORMATION WINDOW displays a two digit number corresponding to a memory location and only its current frequency value. Use the left/right arrow button to scroll through the memories, or the numeric keys to enter a specific memory location. Pressing the "ENT" button will recall the memory and set the converter accordingly.

3.4.10 SET FREQUENCY

The INFORMATION WINDOW displays the current operating frequency with a cursor on the first digit. A new frequency can be selected using the left/right arrows and the numbered buttons. If a frequency outside the permitted frequency band is entered, the original frequency will be maintained.

3.4.11 SET L BAND ATTEN

The INFORMATION WINDOW displays the current attenuation value of the converter's L-Band attenuator with a cursor on the first digit. A new attenuation value can be selected using the left/right arrows and the numbered buttons. If a value greater than 29.9 dB is entered, the original value will be maintained.

3.4.12 SET IF ATTEN

The INFORMATION WINDOW displays the current attenuation value of the converter's IF attenuator with a cursor on the first digit. A new attenuation value can be selected using the left/right arrows and the numbered buttons. If a value greater than 29.9 dB is entered, the original value will be maintained.

3.4.13 SET MUTE CONTROL

The INFORMATION WINDOW displays the current status of the mute function. The status can be changed by using the left/right arrows. The three choices are:

ON	The converter is not muted.
OFF	The converter is muted.
AUTO	The converter mute is controlled by the summary alarm.

3.4.14 SET ALARM MASK.

The INFORMATION WINDOW displays the current status of the alarm mask, which is an 8-bit binary word. The mask can be changed bit-by-bit using the left/right arrows and the numbered buttons. A "1" in a given bit allows that alarm to affect the summary alarm, whereas a "0" inhibits it. The order of the individual alarms is the same as that for the alarm status (see above). The summary alarm cannot be masked.

NOTE: In this menu an alarm condition can be simulated. Change the summary alarm bit to "0", press the ENT button. The Alarm LED will light (or go off, if there is an alarm). Pressing the MENU or LCL will clear the test.

3.4.15 SET MEMORY

The converter incorporates a memory capable of storing up to 100 different frequencies. The **INFORMATION WINDOW** prompts the user for a numerical entry, 00-99, corresponding to the memory to be set. Upon the entry of a memory number, the window displays the current value for that memory with the cursor on the first frequency digit. A new frequency can be selected using the left/right arrows and the numbered buttons. If a frequency outside the permitted frequency band is entered, the original frequency will be maintained in that memory location. The current L-Band and IF attenuator values will also

be stored automatically.

The current L-Band and IF attenuator values will also be stored automatically.

NOTE: When used as a back-up converter with a redundancy switch (Model RS-XXX), memories 01 through 04 (01 through 08 for *STAR*switch™ Models) are reserved to duplicate the values in the primary converter.

3.4.16 SET OUT THRS

The INFORMATION WINDOW displays the low-level threshold for the output level alarm. The value can be set or changed by using the numbered buttons.

3.4.17 CLEAR ALARM HIS

The INFORMATION WINDOW display "00 00 00 00 00". Pressing the "ENT" button will erase the last 5 alarms and set the alarm history menu back to "00".

3.4.18 SET DEV ADDRESS

The INFORMATION WINDOW displays the ASCII character representing the current device address for BUS CONTROL applications (see Section 3.5). The unit is shipped with the ASCII character "1" as the device address. It can be changed by using the left/right arrows.

3.4.19 CALIBRATE

See Section 5.6 for the use of the CALIBRATE function.

3.5 BUS CONTROL

The UCS up converter can be monitored and controlled from an appropriate remote device through an RS-422 interface. The interface protocol chosen incorporates a specific device address for each converter, thereby permitting up to 63 converters or similar slave devices to be parallel-connected on a single four-wire bus.

3.5.1 Data Format

The **DATA FORMAT** supports a standard asynchronous ASCII format with one start bit, eight data bits (LSB first), one stop bit, and no parity. Baud rate is fixed at 9600 baud.

3.5.2 Command Format

The **COMMAND FORMAT** for the remote monitoring and controlling device is as follows:

STX | ADDRESS | COMMAND | (DATA) | ETX | CHECKSUM

3.5.2.1 STX

This is the ASCII start-of-text character, 02(hex).

3.5.2.2 ADDRESS

This is the device address, selectable from the front panel of the converter, and is a single ASCII character in the range of **31**(hex) through **6F**(hex).

The converter ignores any command that contains an address other than its own.

3.5.2.3 COMMAND

This is a single ASCII character in the range of **30**(hex) through **3A**(hex). The function of each command character is described in Table 3-1.

3.5.2.4 DATA

This is a string of ASCII characters that form a part of certain control functions. The length of the data string may be up to 9 characters, depending upon the requirements of the specific control command. The data requirements for each of the command functions are described below.

3.5.2.5 ETX

This is the ASCII end-of-text character, 03(hex).

3.5.2.6 CHECKSUM

This is the bit-by-bit exclusive OR of all characters in

the data stream, from the STX to the ETX characters, inclusive.

3.5.3 Response Format

The **RESPONSE FORMAT** for the converter is as follows:

ACK/NAK | ADDRESS | COMMAND | (DATA) | ETX | CHECKSUM

3.5.3.1 ACK/NAK

If the command received by the converter is in the correct format, then the first character returned is the ASCII character ACK 06(hex). If the command character or the data stream is not valid, then the first character returned is NAK 15(hex).

3.5.3.2 ADDRESS

This is the device address, as described above.

3.5.3.3 COMMAND

This is a repeat of the function command requested by the controlling device.

3.5.3.4 DATA

This is a string of ASCII characters that form a part of certain responses. The length of the data string may be up to 32 characters. If the first character returned is NAK, no DATA string is returned. The data format for each of the command responses is described below.

3.5.3.5 ETX

This is the ASCII end-of-text character, 03(hex).

3.5.3.6 CHECKSUM

CHECKSUM is the bit-by-bit exclusive OR of all characters in the data stream, from the ACK/NAK to the ETX characters, inclusive.

TABLE 3-1. Bus Command List

HEX Command	Function	Command Data/Format	Response Data/Format
30	Device Number	None	See Table 3-2
31	Status Poll	None	See Table 3-3
32	Set Frequency	**XXXX.XXX** Frequency in MHz	See Table 3-4
33	Set L-Band Attenuator	**XX.X** dB of Attenuation	See Table 3-4
34	Step Attenuator (L-Band Atten.)	+ to increment/0.1 dB steps - to increment/0.1 dB steps	See Table 3-4
35	Set Alarm Mask	See Table 3.5	See Table 3-4
36	Mute Control	**30H** Mutes Converter **31H** Unmutes Converter **32H** Mutes Converter on Summary Alarm	See Table 3-4
37	Set IF Attenuator	**XX.X** dB of Attenuation	See Table 3-4
38*	Switch Request	**30H** SBY **31H** ONLINE **32H** AUTO	See Table 3-4
39*	Recall Memory	**XX** 00-99	See Table 3-4
3A*	Set Memory	**XX** 00-99	See Table 3-4
3B*	View Memory Location	**XX** 00-99	See Table 3-6
3C*	Program Memory Location	See Table 3-7	See Table 3-4

* Notes:

Command 3A copies the current frequency and Attenuator Values to Memory Location XX, whereas Command 3C is used to write new values to Memory Location XX.

Command 38-3A are for all STARswitch compatible converters, any Firmware that starts with an "S".
Command 3B-3C are for STARswitch compatible converters, with Firmware Revision "SCU106" and above.

Table 3-2. Device Number Response

A typical response to Device Number (30H) would be as follows:

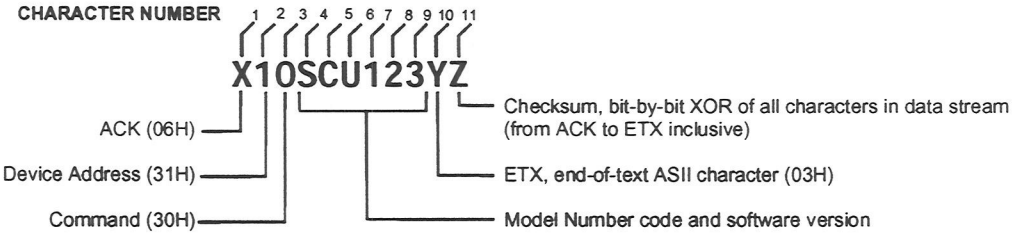


Table 3-3. Status Poll Response

A typical response to Status Poll (31H) would be as follows:

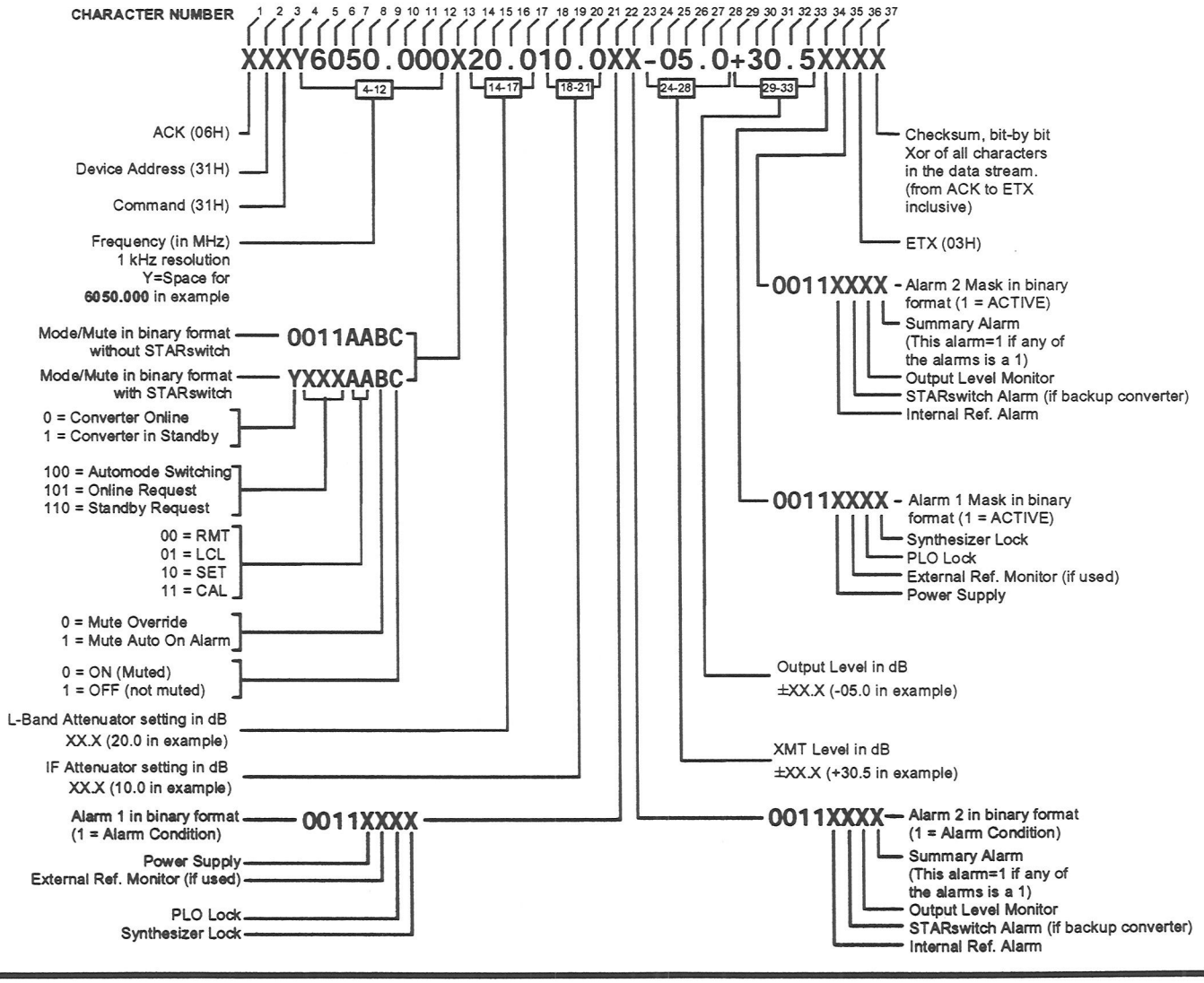
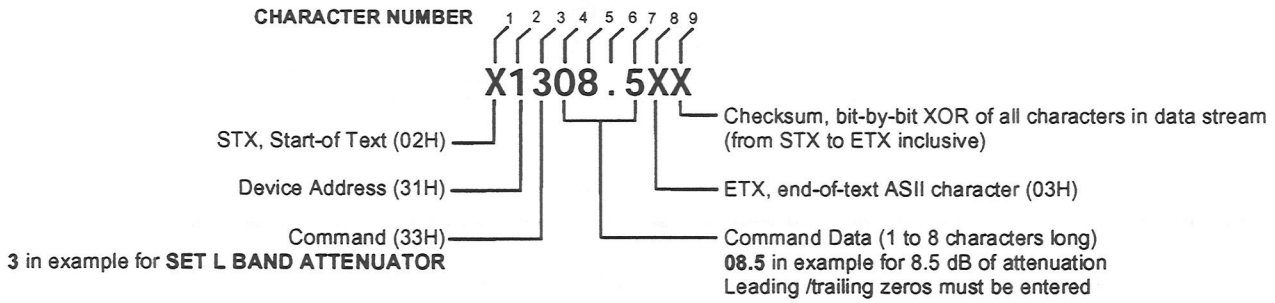


Table 3-4. Set Data Command and Response

A typical command (32H-3BH) would be as follows:



A typical response to a command (32H-3AH) would be as follows:

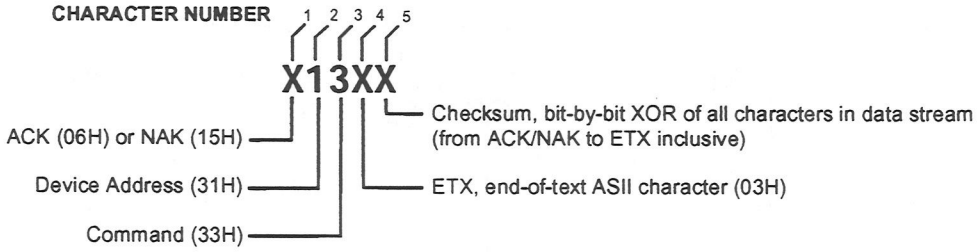


Table 3-5. Set Alarm Mask Command

The alarm data mask is two characters long:

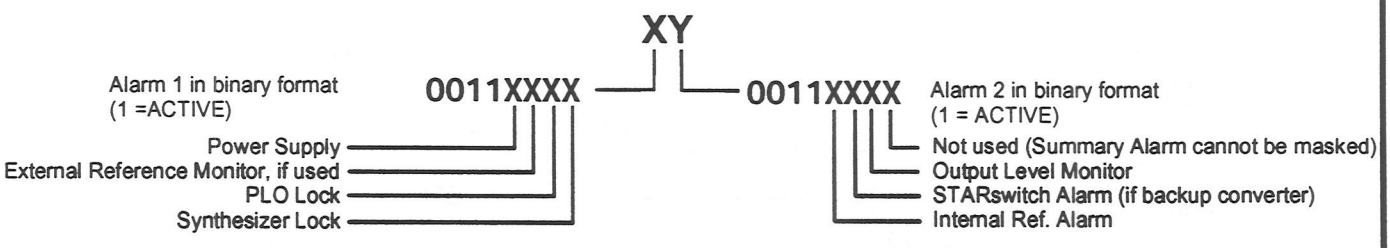


Table 3-6. View Memory Location

A typical response to View Memory Location (3BH) would be as follows:

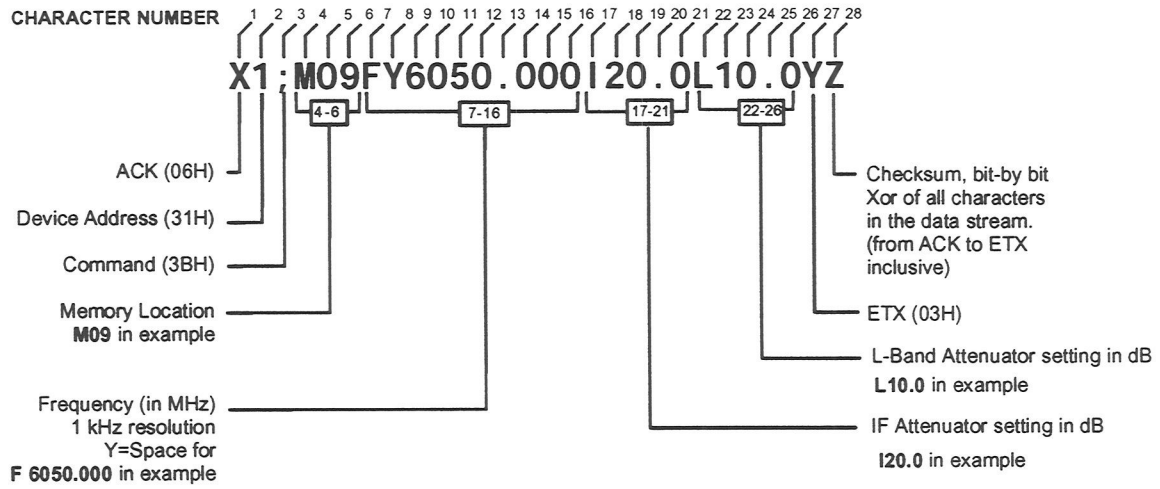
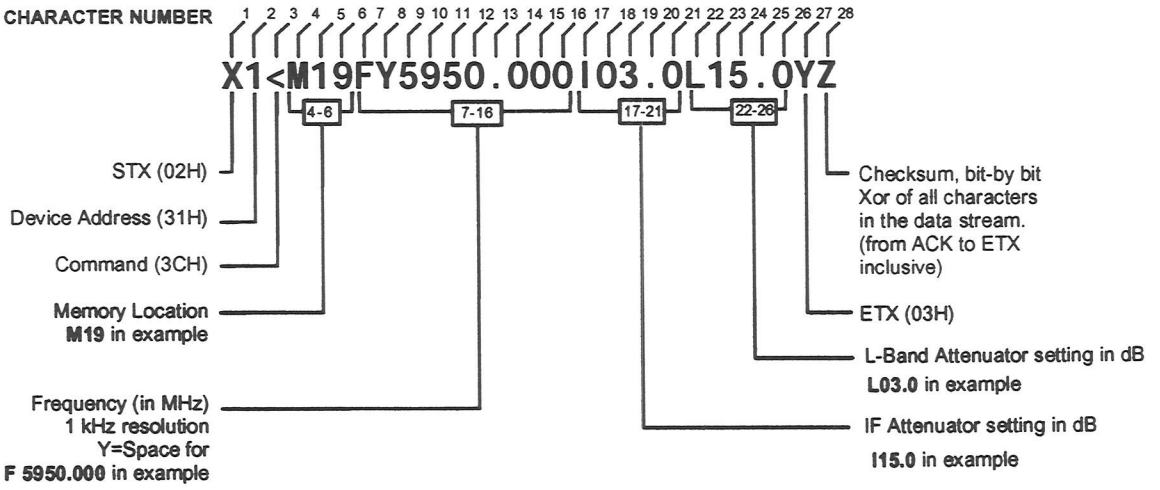


Table 3-7 Program Memory Location

A typical command, Program Memory Location, (3CH) would be as follows:



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Section 4 Theory of Operation

4.0 INTRODUCTION

This section gives a general description of the operation of the UCS up converter unit. Each one of the sub-assemblies in the unit is assigned a sequential **"A"** designator. These sub-assemblies are shown in Figure 4-1 with their designators, descriptive titles, RF interconnections and gross DC Wiring connections. Figure 4-2 shows the discrete DC Wiring details.

4.1 MODULE DESCRIPTIONS

A description of each major module is given in this chapter including the way in which the various sub-assemblies work together to achieve the desired operational parameters.

4.1.1 Power Supply

The primary power input supplied to the fused connector **J1** is routed to the power switch **S1** and subsequently delivered tot he universal switching power supply, **A2**, which accepts voltages within the range of 85-265 VAC. There are two major versions of the switching power supply, the one operates a 15 VDC system, the other operates a 12 VDC system. Module variations for the different systems are noted in Table 6-1, Replaceable Modules.

The 15 VDC system supply generates 4 regulated voltages, +24 V, +18 V, +5 V, and -15 V. The voltages are routed to the filter board **A3**. The filter board filters the voltages, generates +14 V for the cooling blower, **A4** and derives +15 V from the +18 V. The 4 regulated voltages are routed to the microprocessor board, **A5**, where they are distributed to the other assemblies as required to power the remainder of the converter. These voltages are as follows (+24 V is not used):

+18 V +15 V +5 V -15 V

The 12 VDC system supply generates 3 regulated voltages, +12 V, +5 V, and -12 V. The supply generates 12 V for the cooling blower, **A4**. The voltages are routed to the microprocessor board, **A5**, where they are distributed to the other assemblies as required to power the remainder of the converter. The difference in the wiring from the 15 VDC system is detailed in Figure 4-3.

For both system types, adjustment for the +5 volt supply is available via a potentiometer located on the power supply. See Figure 6-1 for location and Section 5 for the adjustment procedure.

NOTE: Adjusting the +5 V will affect the +18 V and -15 V (or +12 V and -12 V) voltages proportionately.

4.1.2 Frequency Reference

The frequency reference for the UCS up converter is derived entirely from the reference oscillator, **A9**. This ovenized crystal oscillator determines the frequency stability and the close-to-carrier phase noise characteristics of the unit. It is equipped with a screwdriver tuning adjustment to compensate for long-term aging drift. See Section 5-2 for frequency adjustment.

The output of the reference oscillator is fed into the PLO, **A11** or directly into the Synthesizer/PLO (**A8**). The PLO includes a two-way power divider and routes the reference signal to the synthesizer.

Refer to Appendix D for information on External References.

4.1.3 Synthesizer/PLO

UCS up converters are equipped with a Synthesizer/PLO module, **A8.**

This module provides two output signals:

-the agile local oscillator, LO2, for the second conversion in the up converter chain. The output frequency corresponds to a serial BCD input word, the step size and frequency band is model number dependent.

- the fixed frequency local oscillator, LO1, for the first conversion in the up converter chain. The output frequency is 1,112.5 MHz.

Both output frequencies are phase-locked to a reference signal. In addition to the LO1 and LO2 outputs, the Synthesizer/PLO module provides an alarm signal which provides an indication if any of the internal loops is out of lock.

4.1.4 Converter

The heart of the singleband converter is the up converter module, **A12**. The signal path involves two conversions, with an L-Band section at 1,182.5 MHz (1,290 MHz for 140 MHz IF). Both conversions are non-inverting, resulting in no net spectral inversion.

The 70 (140) MHz IF comprises both fixed gain and variable attenuator elements. The combination permits setting the level to the first mixer at the optimum point for best signal-to-noise performance without suffering from intermodulation products. The coupled IF monitor point before the first mixer is 20 dB lower than the level presented to the mixer; thus, to present a -10 dBm level to the mixer, the IF attenuator is set to obtain a -30 dBm level at the coupled port on the front panel.

The amplifier stages in the 70 (140) MHz IF chain can be shut off to mute the converter. The mute control input mutes the converter if the input is grounded.

Both the first and second mixers require +10 +/-3 dBm LO drive levels.

The up converter is equipped with analog, electronically-variable L-Band and IF attenuators. These are intended primarily to permit the user to control transmit power within the system.

The RF output path has a coupler/detector operating in a voltage-linear mode. Because of physical constraints in the unit, the detector is only useful over a 10-15 dB range. Its accuracy is not dependable below -5 dBm.

4.1.5 Microprocessor

The microprocessor board, **A5**, performs multiple functions. As mentioned above, it serves as power distribution for the entire unit. In addition it does the following functions:

- Routes digital frequency selection information from the I/O board to the synthesizer.

- Routes digital alarm information from the PLO and the synthesizer to the I/O ports.

- Routes the analog level monitor signal from the converter module to the I/O ports.

- Monitors the supply voltages and sends alarm signals to the I/O ports if any is out of tolerance.

- Performs analog scaling functions on the L-Band and IF attenuator control so that the analog signal from the I/O port is compatible with the attenuator circuit in the up converter module.

- Performs analog scaling functions on the external transmitter detector signal so that it will be compatible with the input on the I/O port.

- Performs the digital level translation necessary for the signal from the I/O port to drive the converter mute function.

- Performs the RS-232 to RS-422 translation for the remote control bus.

- Contains the form "C" relay and necessary driver for the I/O port to provide a summary alarm relay output. Also contains the driver for the summary alarm LED on the front panel.

4.2 MONITOR AND CONTROL

The monitor and control functions of the UCS up converter are contained and controlled by the microprocessor and software on the **A5** processor board. The processor board interfaces to the remote RS-422 bus through an RS-232 to RS-422 translator. It interfaces to the rest of the converter and front panel through I/O ports.

The software is stored in ROM while the current operating and monitoring settings and memories are stored in NVRAM (min. 10 years lifetime). Upon start-up the software scans the NVRAM. If no error is detected, the last settings before shut down, will be restored or else the "ALARM" LED will be lit, and the user will be prompted to "hit any key" to restore the default settings and start the initialization process.

The detailed interrelation between the hardware and software required to make the UCS up converter perform as described in Section 3 is beyond the scope of this publication. It is the intention that the foregoing description be sufficiently detailed to enable a knowledgeable user to make optimum use of the many powerful features embodied in the unit, and, should a problem occur, enable a knowledgeable technician to trace the problem to its source.

4.3 REDUNDANCY SWITCH USE

The details for the use of the UCS up converter with the RS Series of Redundancy Switches and the STARswitch™ are outlined in Appendix E respectively. Refer to the applicable switch manual for detailed information.

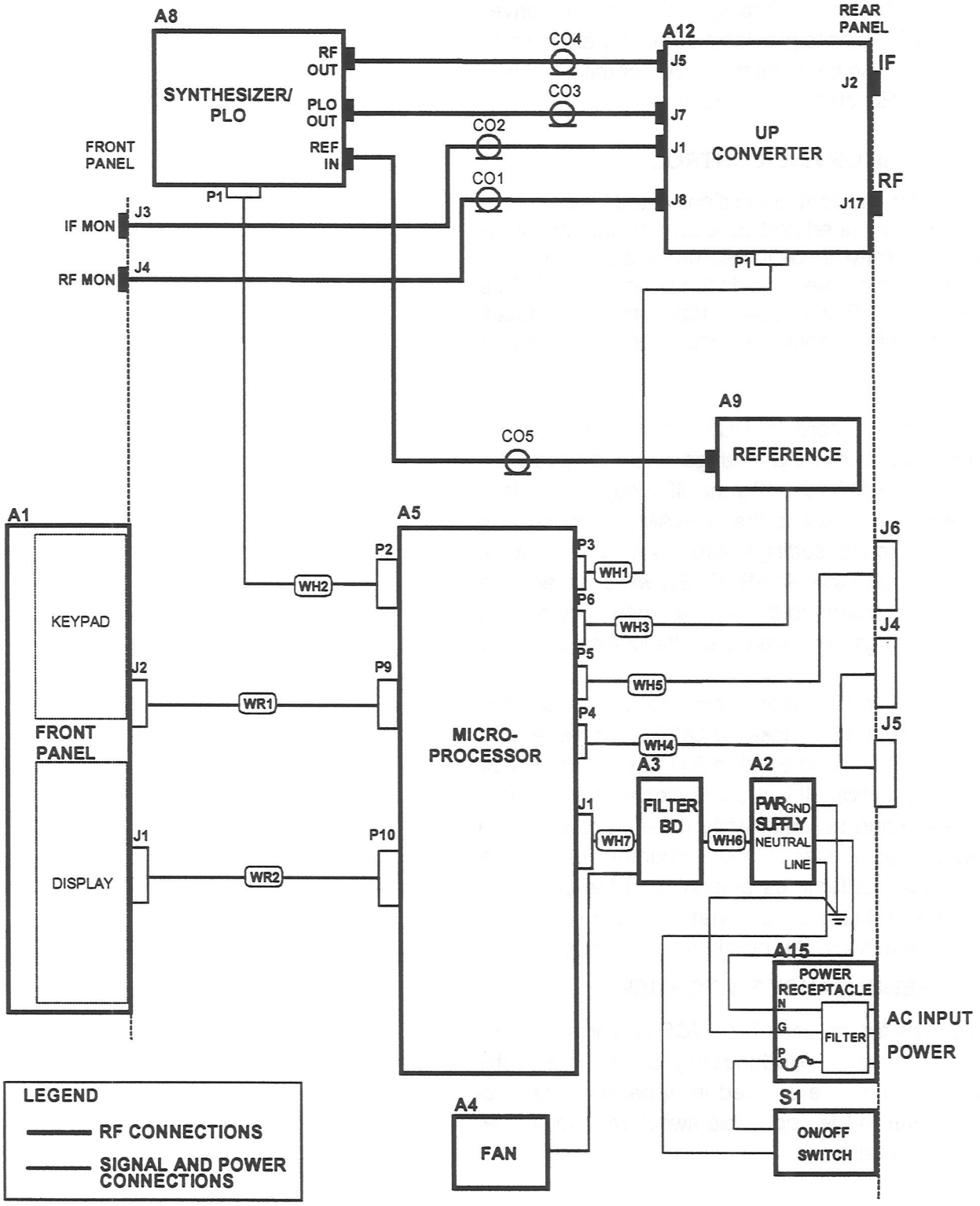

Figure 4-1 Up Converter Block Diagram

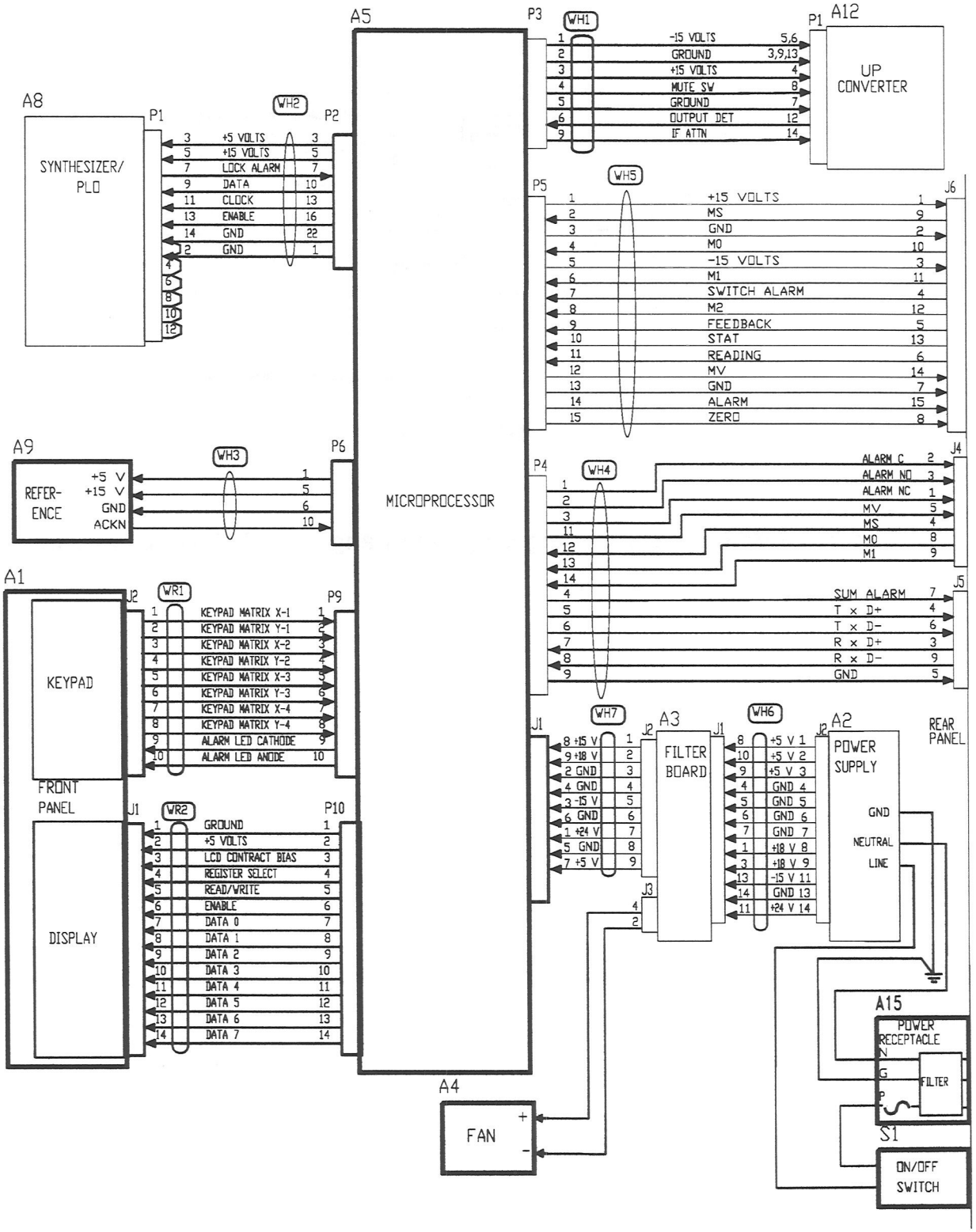

Figure 4-2 Up Converter Wiring Diagram

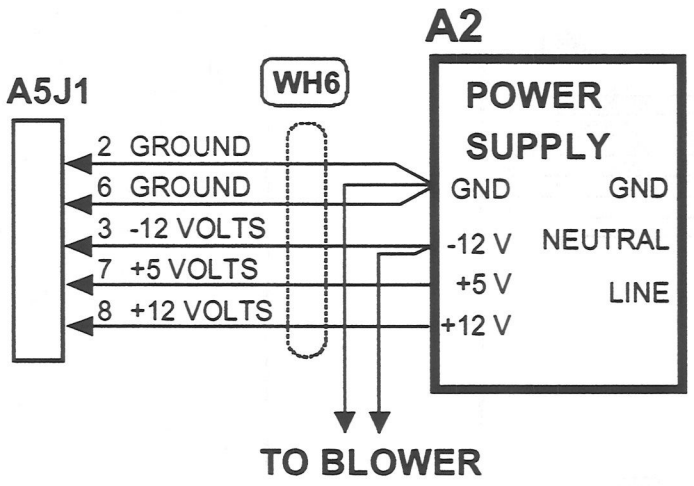

Figure 4-3 Up Converter Wiring Diagram Change for 12 VDC Power Supply

Section 5 Maintenance

5.0 INTRODUCTION

The UCS up converter is constructed with four basic integrated modules. The purpose of this section is to provide the necessary information for regular maintenance on the unit and, in case of difficulty, for locating the fault. Section 6 provides the parts information and component location diagram (Figure 6-1) necessary to obtain replacement modules. It is not within the scope of this publication to provide service information on the modules themselves. Any attempt to service the individual modules will void any warranty or exchange policies that may be in effect.

5.1 REGULAR MAINTENANCE

The UCS up converter is practically maintenance-free. Regular maintenance items include routine cleaning and periodic adjustment of the internal Reference Oscillator. The time interval for each of these must be determined at the system level as each is dependent upon service conditions and system requirements.

Cooling for the unit is done by drawing ambient air in through various openings in the rear and forcing it out through an opening in the rear next to the power switch. Any particulate matter suspended in the air can thus be deposited inside the unit. A buildup of matter may eventually restrict air flow and lead to overheating in the unit. The air holes and the interior of the unit should be cleaned at periodic intervals to insure cool and reliable operation. Remove the cover and use a soft brush or vacuum, paying special attention to the impeller of the blower. **Solvents or aqueous solutions of any kind should never be used inside the unit.** After cleaning, inspect the unit to insure that the cabling and connectors are intact before replacing the cover.

The front panel surface should be cleaned as required to remove hand oils, dust and dirt. Use a soft cloth dampened with a mild detergent and water. **Strictly avoid the use of harsh chemicals or strong solvents** that might damage the panel and render the unit inoperative.

5.2 ADJUSTMENTS

This chapter describes the various adjustments required, either periodically or with the replacement of a module, for optimum performance of the up converter.

WARNING

WHEN OPERATING THE UNIT WITH THE COVER OFF, KEEP CLEAR OF THE POWER SUPPLY, FILTER BOARD AND BLOWER ASSEMBLIES (A2, A3 AND A4). FAILURE TO DO SO COULD RESULT IN SERIOUS PERSONAL INJURY!

5.2.1 Frequency Adjustment

The accuracy of the frequency conversion of the up converter is entirely dependent upon the 10 MHz reference oscillator. Because of aging drift in this oscillator, it may be necessary to adjust it periodically. To do this, refer to Figure 6-1 and locate the access screw on the left side of the unit just behind the front panel. Remove the access screw and set the frequency using a **small flat, insulating screwdriver.** When making this adjustment, the frequency can be monitored in one of two ways: Inject a 70 (140) MHz signal into the input of the unit and monitor the frequency of the output, comparing it to a known on-channel frequency; or, remove the cover of the unit and measure the frequency of the PLO at connector A8IFLO. This should be exactly 1,112.500 MHz if the reference oscillator is correctly set. After setting the oscillator frequency, replace the access screw in the reference oscillator before returning the unit into service.

In addition to the periodic maintenance requirements, there is one other customer adjustment which can

be made on the up converter. This is not normally required for regular maintenance, but should be checked during initial system installation and may be included as part of a regular system calibration procedure.

5.2.2 LCD Contrast Adjustment

The contrast of the LCD display is dependent upon the electrical bias applied to it from the **A5** assembly. To change the bias, refer to Figure 6-1 and locate potentiometer VR1. Make adjustment using a **small flat, insulating screwdriver**.

5.2.3 +5 Volt Adjustment

If the replacement of the Power Supply module **A2** is required, the +5 volt output can be adjusted by locating the adjustment screw (R16) on the module (see Figure 6-1), and, monitoring the +5 volt output with a voltmeter, setting the potentiometer for +5 volts ±5%. Adjusting this voltage also affects the +18 and -15 VDC voltages.

5.2.4 RS-232 Setting

To change the port setting from the default RS-422 setting to RS-232, locate the microprocessor board **A5** and add a jumper over the two pins labeled **W2**. See Figure 6-1 for the location. In this configuration on connector **J5**, pins 6 and 9 are not used, pin 4 is Tx D and pin 3 is Rx D.

5.2.5 XMT Det. Zero Adjustment

When using an external power detector (see section 2-4), it may be necessary to make an adjustment for zero power. Referring to Figure 6-1, locate the VR3 on the **A2** assembly. With the external detector terminated into a passive load, set this screwdriver adjustment to obtain a voltage null between pins 6 and 7 of **J6** on the rear panel.

5.2.6 IF Attenuator Adjustment

The up converter is equipped with a variable attenuator in the 70(140) MHz IF chain. This attenuator can be controlled through the front panel or the remote and must be set at the time of installation. To set this attenuator to its optimum point, connect the system's IF output signal to J2 of the unit and a power meter to the IF monitor port on the front panel. With the system operating at its normal level, set the attenuator for a power reading of -30 dBm. This adjustment should be performed any time there is a system change that might affect the level of the IF signal.

5.3 PERFORMANCE CHECKS

Basic performance checks for the UCS up converter are given in Section 2-5.

5.4 REMOVAL AND REPLACEMENT

To effect removal and replacement of the UCS up converter in the system, refer to the applicable system manual. To remove and replace a module in the unit, refer to Figure 6-1 for locations. All hardware mounting is done with standard #2-56, #4-40, and #6-32 hardware. Exact location of screws, nuts, washers, and spacers should be noted when a module is removed so that the replacement module can be assembled in a like manner. Likewise, if any of the cabling is repaired or disturbed, the affected cables should be dressed and anchored as before. Tighten all hardware and ensure that the unit is free of loose parts before replacing cover and returning to service. To effect the removal of a particular module:

1. Disconnect unit from AC power before servicing.
2. Remove any RF cabling.
3. Remove any DC connectors or solder connections.
4. Remove mounting hardware and retain.
5. Remove module.

6. To install new module, reverse steps 4 through 1.

5.5 TROUBLESHOOTING

Should a difficulty arise in the operation of the UCS up converter, a repair should only be attempted by a qualified technician.

The operational instructions are given in Section 3 and the Theory of Operation is presented in Section 4 of this publication. You should be thoroughly familiar with the contents of both sections before attempting a repair. In addition to these two sections, Figure 6-1 shows the location of all of the cables and wires which interconnect the various modules.

Figures 4-1, 4-2, and 4-3 provide RF and DC wiring diagrams for fault finding.

The signal flow for each signal is denoted by an arrow and the function of each interconnecting wire is given. Levels are given where applicable, and all logic lines are TTL/CMOS compatible. A detailed description of the microprocessor board is beyond the scope of this publication and unless you are particularly knowledgeable in the area, detailed troubleshooting of the **A5** assembly should not be attempted.

5.6 CALIBRATION

The CALIBRATE function is accessible from the front panel of the unit (see Section 3-4.) To enter CAL mode from the CALIBRATE menu item, use the left/right arrows to select the letter "W" in the information window, then depress "ENT". The "MENU" buttons can then be used to scroll through the 3 different calibration constants (IF Attenuation Curve, IF Attenuation Gain, Output Detector and XMT Detector) which can be changed in the CAL mode. To change a given constant, use the left/right arrows and the number keys. Use the "ENT" button to validate any changes and the "LCL" button to exit CAL mode. Below is a listing of the calibration constants and a description of each. Before any changes are made, the current calibration constants should be recorded for later resetting, if needed.

5.6.1 L Attenuation Curve

This constant is normally 0.550 and determines the shape factor of the L band attenuator. If the ATTEN GAIN constant is set for correct full scale operation and the low-to-mid ranges exhibit excessive error, then the ATTEN CURVE constant should be altered by a small percentage. After changing the ATTEN. CURVE constant, the ATTEN. GAIN constant must be corrected before evaluating the results. This constant comes calibrated from the factory; however, it may need alterations if the **A12** module is replaced.

5.6.2 L Attenuation Gain

This constant is normally about 1.000 and determines the full scale accuracy of the L band attenuator. It comes calibrated from the factory; however, it may need alteration if the **A12** module is replaced.

5.6.3 IF Attenuation Curve

This constant determines the shape factor of the IF attenuator. If the ATTEN GAIN constant is set for correct full scale operation and the low-to-mid ranges exhibit excessive error, then the ATTEN CURVE constant should be altered by a small percentage. This percentage, and the direction of change, are determined by trial and error adjustments. After changing the ATTEN CURVE constant, the ATTEN GAIN constant must be corrected before evaluating the results. This constant comes calibrated from the factory; however, it may need alteration if the **A12** module is replaced.

5.6.4 IF Attenuation Gain

This constant determines the full scale accuracy of the IF attenuator. If the full scale gain exhibits excessive error, then the ATTEN GAIN constant should be altered by a small percentage. This percentage,

and the direction of change, are determined by trial and error adjustments. After changing the ATTEN GAIN constant, the ATTEN CURVE constant must be corrected before evaluating the results. It comes calibrated from the factory; however, it may need alteration if the **A12** module is replaced.

5.6.5 Output Detector

This constant is nominally about 03.800 and determines the power conversion factor for the display of the RF output power level. It comes calibrated from the factory; however, it may need alteration if the **A12** module is replaced.

5.6.6 XMT Offset

This constant is set at the time of installation of the unit into the system (see Section 2.6). The XMT OFFSET is expressed in dB and represents the RF coupling value between the transmitted power and the power delivered to the XMT detector head.

For example, if the power level reaching the antenna is 50 KW (+77 dBm) and the detector is registering 0.5 milliwatt (-3 dBm), then the net coupling value is (+77 - (-3)) = 80 dB. In this case, the XMT OFFSET should be set to 80.000. Once this constant is set, it will remain intact unless the converter is changed or the antenna feed configuration is changed.

5.6.7 General

All of the calibration constants are stored in the EPROM and the NVRAM installed on the **A5** board. If changes need to be made only the NVRAM (U6) will be updated.

NOTE: If an initialization process is initiated during start-up, the NVRAM (U6) will be reprogrammed with the original values and any of the changes will need to be entered again.

Section 6 Illustrated Parts List

6.0 INTRODUCTION

This section consists of a parts list and a location diagram of all major components, RF and wiring interconnections the UCS up converter. Table 6-1 contains all of the major repairable and replaceable modules and sub-assemblies as depicted in Figures 6-1 and 6-2. Either refer to Table 6-1 for the part number or find the component in the figure and use the Ref. Des. to cross reference to the part number.

6.1 UNLISTED ITEMS

The parts list of this section do not include such standard items as might be procured locally. These items include standard #2-56, #4-40, and #6-32 hardware, ribbon cables, ribbon connectors, coaxial cables, and coaxial connectors. Each of these items is available from a variety of sources and each serves only the most basic function in the unit.

TABLE 6-1. Replaceable Modules

Ref. Des.	Description	Part Number	Qty. 15 VDC	Qty. 12 VDC
A1	Front Panel, keypad and labels	C11369-1 (Rr Pwr Sw) C11376-1 (Frt Pwr Sw)	1	1
A2*	Power Supply	A13459	1	---
A2*	Power Supply	A14231	---	1
A3	Filter Board	C11640	1	---
A4*	Blower Assembly	A12574-1	1	---
A4*	Blower Assembly	A14239	---	1
A5	Microprocessor	A13765	1	1
A8*	Synthesizer Module	A13727-08/17/25/26/28	1	1
A9	Reference Oscillator	C11215	1	1
A12*	Up Converter Module	UC5/6-[r][t]-[y][z]	1	---
A12*	Up Converter Module	UC5/6-[r][t]-[y][z]2	---	1
A15	AC Connector	A12545	1	1
F1	Fuse, 2A	A12187-2	1	1
U5	EPROM	A12873-[x]	1	1
U6	NVRAM	A12209	1	1
S1	Switch, power	A13892	1	1

[x] = specify UCS up converter model number
[r] = a letter
[t] =5 for 50 Ohms, =7 for 75 Ohms
[y] =1 for 140 MHz IF, =2 for 70 MHz IF
[z] =N for type N, =S for SMA, =T for TNC connector
* module configurations change according to step size and frequency range, and Part Lists may be changed without notice, refer to the actual module for the correct part number

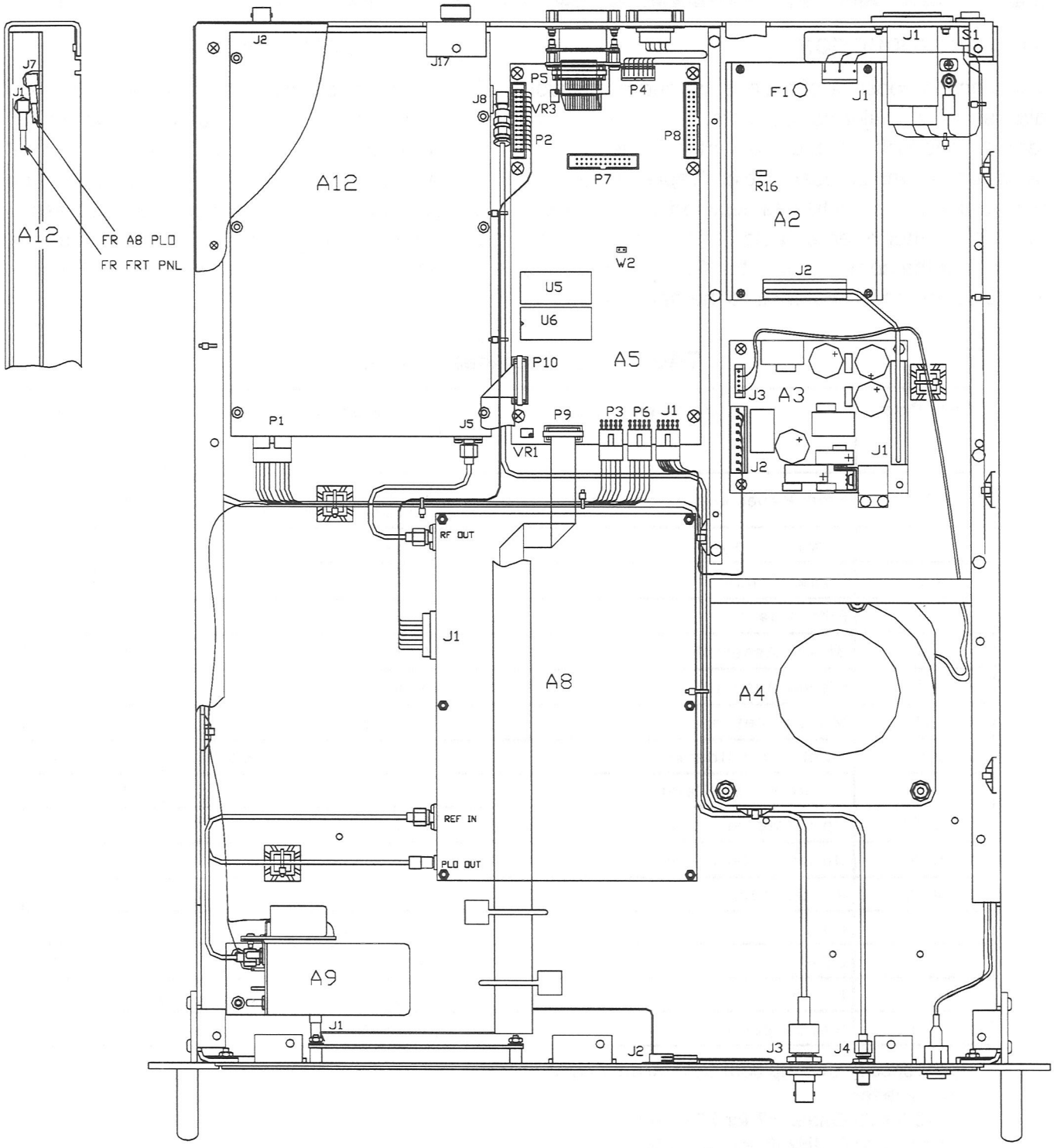

Figure 6-1. Down Converter Component Location Diagram

Appendix A Revision History

The following revision history applies.

Release Date	ECO	Rev Lvl
May 12, 1994	-------	PREL
May 19, 1994	-------	01
October 18, 1994	-------	02
December 15, 1994	-------	03
May 15, 1995	-------	04
November 25, 1996	-------	05
March 6, 1997	-------	06
July 6, 1997	-------	07
September 29, 1998	-------	08
August 11, 1998	-------	09
August 1, 2000	00-13684	A
September 3, 2002	02-14847	B

The following revision levels apply.

Page	Rev.
1	B
2	B
3	A
4	A
5	A
6	A
7	A
8	A
9	B
10	B
11	A
12	A
13	A
14	A
15	A
16	A
17	A
18	A
19	A
20	A
21	A
22	A
23	A
24	A
25	A
26	A
27	A
28	A
29	A
30	A
31	A
32	A
33	A
34	A
35	A
36	A
37	A
38	A
39	A
40	A
41	B
42	A
43	A
44	A
45	A
46	A
47	A
48	A
49	A
50	A

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Appendix B — Model Number List

The following is a partial listing of the Singleband up converters to which this manual applies:

MODEL # *	FREQUENCY	STEP
UCS5-002-1/2	5.845 - 6.425 GHz	125 kHz
UCS5-101-1/2	5.845 - 6.425 GHz	1 kHz
UCS5-004-1/2	5.850 - 6.425 GHz	125 kHz
UCS5-103-1/2	5.850 - 6.425 GHz	1 kHz
UCS5-006-1/2	5.925 - 6.425 GHz	125 kHz
UCS5-105-1/2	5.925 - 6.425 GHz	1 kHz
UCS5-008-1/2	5.850 - 6.441 GHz	125 kHz
UCS5-107-1/2	5.850 - 6.441 GHz	1 kHz
UCS5-010-1/2	5.850 - 6.485 GHz	125 kHz
UCS5-109-1/2	5.850 - 6.485 GHz	1 kHz
UCS5-012-1/2	5.850 - 6.725 GHz	125 kHz
UCS5-111-1/2	5.850 - 6.725 GHz	1 kHz
UCS5-014-1/2	5.850 - 6.460 GHz	125 kHz
UCS5-113-1/2	5.850 - 6.460 GHz	1 kHz
UCS5-016-1/2	5.800 - 6.500 GHz	125 kHz
UCS5-115-1/2	5.800 - 6.500 GHz	1 kHz
UCSU6-100-1/2	6.425 - 6.725 GHz	100 Hz
UCSU6-002-1/2	6.725 - 7.025 GHz	125 kHz
UCSU6-101-1/2	6.725 - 7.025 GHz	1 kHz
UCSU6-004-1/2	6.425 - 6.725 GHz	125 kHz
UCSU6-103-1/2	6.425 - 6.725 GHz	1 kHz
UCS6-008-1/2	6.700 - 7.000 GHz	125 kHz
UCS6-107-1/2	6.700 - 7.000 GHz	1 kHz

* -1 models are 140 MHz IF
-2 models are 70 MHz IF

This manual may become applicable to other models as they become available.

The following options are available:

50 ohms IF impedance
"SMA" or "TNC" RF connectors
Rack mount slides
Front panel ON/OFF switch
RS-232 interface/RS-485
External reference input

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Appendix C *Serial Interfaces*

RS-232 INTERFACE

The UCS up converter can be equipped with a optional RS-232 serial interface instead of the standard RS-422 serial interface.

The serial connector **J5,** located on the rear panel, is a 9-pin female miniature type "D" connector (M24308/1-1) with standard #4-40 female screw-lock hardware mounting. The mating shell, pins, and strain relief are not supplied. The electrical interface to this connector is for a standard RS-232 bus. No handshaking is needed. For bus protocol requirements, refer to Section 3-3.

The pin-out is as follows:

Pin #	Signal
1	Not Used
2	Not Used
3	RXD
4	TXD
5	Ground
6	Not Used
7	Summary alarm (open collector)
8	Not Used
9	Not Used

RS-485 INTERFACE

The UCS up converter can be equipped with an optional RS-485 serial interface instead of the standard RS-422 serial interface.

The serial connector **J5,** located on the rear panel, is a 9-pin female miniature type "D" connector (M24308/1-1) with standard #4-40 female screw-lock hardware mounting. The mating shell, pins, and strain relief are not supplied. The electrical interface to this connector is for a standard RS-485 bus. No handshaking is needed. For bus protocol requirements, refer to Section 3-3.

The pin-out is as follows:

Pin #		Signal
1		Not Used
2		Not Used
3	*	RXD+, TXD+
4		Connect to Pin 3 *
5		Not Used
6	*	RXD-, TXD-
7		Summary alarm (open collector)
8		Not Used
9		Connect to Pin 6 *

* Jumpers to be in mating connector

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Appendix D External Reference

The UCS up converter can be equipped for an external 5 or 10 MHz reference frequency input and operated in three different modes based upon options chosen at time of ordering:

a. External Reference Only

When the external reference is not connected to the converter, the converter is in a state of alarm.

b. Auto-detect External Reference

The converter can also be equipped for use with both its internal or an external, 5 or 10 MHz reference frequency input (frequency set at factory). When the external reference is connected, it is in use. When not connected or not powered, the internal reference is used and an alarm is reported.

c. Manual Switching between Internal and External

A cable loop (see Figure D-1 below) connects the external reference input connector **IN**, to an SMA connector **OUT** beside it, which is fed from an internal 10 MHz reference source. Disconnecting the cable loop from **IN** allows connection of the external reference source.

The external reference input connector **IN,** located on the rear panel, is a female SMA (BNC and TNC optional). The male mate (not supplied) should be compatible with the 50-ohm coax used to connect to the system.

To assure compatibility with IESS 308/308 the following minimum specifications for the external reference are recommended:

Frequency:	5 or 10 MHz
Level:	+13 +/-2 dBm
Impedance:	50 ohms
Stability:	Aging +/-1 x 10^{-9}/day
Phase Noise:	
-110 dBc	@ 10 Hz offset
-140 dBc	@ 100 Hz offset
-160 dBc	@ 1 kHz offset

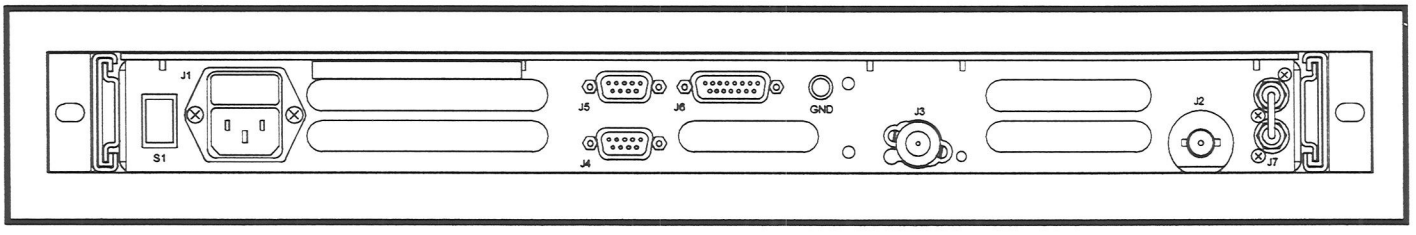

FIGURE D-1. Back Panel with External Reference Loop

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Appendix E RS Series Redundancy Switch Use

If the Converter is used in a Redundancy System with an RS-002 (1:2) or RS-002/004 (1:2, 1:3, 1:4) Switch, and is setup as the system back-up converter, the following restriction applies:

> Memory locations 1, 2, 3, and 4 are reserved, they are to be programmed with the operating parameters of the on-line converters 1 through 4, respectively. (e.g. Memory location 1 on the back-up converter should be set to the same frequency and L-Band attenuation as the on-line converter 1, etc.)

NOTE: IF Attenuation is set at the "System Level" (see Para. 3.3 for this procedure).

The back-up converter will automatically be set to the memory location of the designated priority on-line converter. Refer to the RS-002/004 Manual for the proper operation of the switch.

NOTE: Whenever the operating parameters of an on-line converter are changed, the corresponding memory location in the back-up converter must be updated, via front panel or remote.

The converters are connected to the switch via the Rear J4 connector. See Para. 2.4 for the Pin-out of the converter and refer to the RS-002/004 Manual for the Switch Pin-out.

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