


OPERATION & MAINTENANCE MANUAL
UP/DN CONVERTER
L-BAND
LT-3600 SERIES



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SECTION 1**General Information****1.0 INTRODUCTION**

This manual contains installation, operation, and maintenance information for the Integrated L-Band Up/Dn Converter manufactured by VertexRSI, Longview, Tx. Information is organized according to section. Within each section the pages, figures and tables are numbered by section and by order of appearance within the section. Unless otherwise noted, any information about the unit applies to the LT-3600, Base Part Number 201667.

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 in 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.

1.2 GENERAL INTRODUCTION

This manual provides operation and service instructions for the Integrated L-Band Up/Dn Converter. The unit consists of a power supply, forced-air cooling system, microprocessor-based CCA (circuit card assembly) and control circuitry and the modules required for up and down conversion. It incorporates extensive monitor and control functions that are accessible from the front panel as well as through a remote serial bus. A general description of the front and rear panels is given in Sections 1.5 and 1.6. A description of the Keypad and Display can be found in Section 3.

The Integrated L-Band Up/Dn 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 Integrated L-Band Up/Dn Converter is a fully synthesized up and down converter covering 575 or 1000 MHz bandwidth receiving RF frequencies in up to 125 kHz steps. The unit incorporates extensive monitor and control functions that are accessible from the front panel as well as through a remote RS-232/422/485 bus.

The LT-3600 can be configured to accommodate various requirements involving an IF of 70 or 140 MHz, non-inverted or inverted spectrum, with standard or high-stability 10 MHz reference oscillator or any combination the user desires. Combined with jumper selectable and user programmable options, the LT-3600 is flexible to user requirements.

1.4 SPECIFICATIONS

The specifications for the Integrated L-Band Up/Dn Converter are listed in Table 1-1, along with the mechanical dimensions.

1.5 FRONT PANEL

All the operating controls and indicators for the Integrated L-Band Up/Dn Converter are located on the front panel. The front panel is depicted in Figure 1-1. Alarm and level monitoring of the L-Band Up/Dn Converter CCA, an external LNB, and SSPB modules is accomplished through the front panel display and keyboard interface.

1.6 REAR PANEL

The rear panel is depicted in Figure 1-2. It incorporates, from left to right, Grounding Lug (GND), Power Connector, Optional 10MHz high stability reference output (J1), 10 MHz reference input (J2), IF Out (J3), L-Band In (J4), On/Off Switch for Dc output on J4 (SW2), Cooling Fans, Down Converter StarSwitch Interface (Opt.) (J5), SSPB monitor and control (J6), Remote Serial Interface (J7), Up Converter StarSwitch Interface (Opt.) (J8), IF In (J9), On/Off Switch for Dc output on J10 (SW3), L-Band Out (J10).

(J4), On/Off Switch for Dc output on J4 (SW2), Cooling Fans, Down Converter StarSwitch Interface (Opt.) (J5), SSPB monitor and control (J6), Remote Serial Interface (J7), Up Converter StarSwitch Interface (Opt.) (J8), IF In (J9), On/Off Switch for Dc output on J10 (SW3), L-Band Out (J10).

In the lower right hand side of the rear panel is a label that refers to the operation and maintenance manual and revision level that applies to this converter.

1.7 COOLING

Cooling of the equipment is achieved by pulling in cool air through the two side inlet grills. The heated air exits the equipment through the two rear panel mounted exhaust fans.

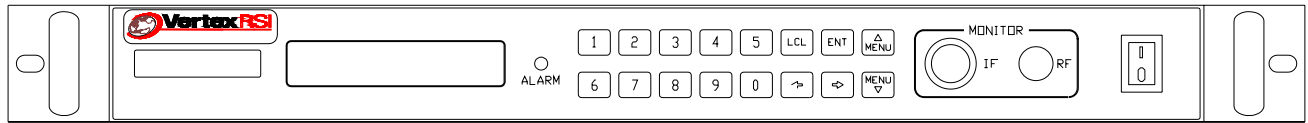


Figure 1-1 Front Panel w/Keypad and LCD Display

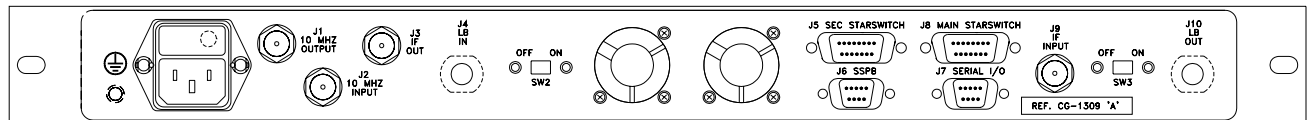


Figure 1-2 Rear Panel

1.8 Part Number Configuration

The Part Number Selection Chart shows configuration options that are set at the factory prior to shipment. The voltage output to J4 and J10 may be changed as required by the customer, however this requires removal of the cover and resetting internal jumper connections. This should be performed by qualified personnel.

| Base Number | | 1 st Digit | | 2 nd Digit | | 3 rd Digit | | 4 th Digit | |
|-------------|---|-----------------------|---------|-----------------------|--------|-----------------------|------------------------|-----------------------|-----------------------|
| | | IF Operation | | L-Band | | Bias Voltage | | Ref. Oscillator | |
| 201667 | - | 1 | 70 MHz | 1 | Std. | 0 | None | 0 | Std 10Mhz |
| | | 2 | 140 MHz | 2 | Extend | 1 | D/C-22VDC U/C-22VDC | 1 | Hi Accuracy 10 MHz |
| | | | | | | 2 | D/C-22VDC U/C-15VDC | | |

| 5 th Digit | | 6 th Digit | | 7 th Digit | |
|-----------------------|---------------|-----------------------|-----------|-----------------------|-----|
| L-Band Ports | | 10 MHz Ref. Out | | StarSwitch Ready | |
| 0 | SMA Female | 0 | No Output | 0 | No |
| 1 | N-Type Female | 1 | U/C & D/C | 1 | Yes |
| | | 2 | U/C Only | | |
| | | 3 | D/C Only | | |

Note: If connected to a StarSwitch, No Bias Voltage Output is allowed.

Option Descriptions:

- 1st Digit – IF Frequency, Options 3 and 4 are set for inverted spectrum.
- 2nd Digit – Standard – 950 to 1525 MHz, Extended – 950 to 1950 MHz
- 3rd Digit – Bias voltage outputs are switchable in rear panel, if selected.
- 4th Digit – A reference oscillator is built in to the main board. The high accuracy unit is optional.
- 5th Digit – D/C Input and U/C Output Port Type (J4 & J10)
- 6th Digit – The output from the 10 MHz reference oscillator may be connected to either or both.
- 7th Digit – StarSwitch Ready includes output connections to J5 and J8 for control between the Starswitch and the LT3600.

Table 1-1 Integrated L-Band Specifications

| | |
|--|---|
| UPCONVERTER | |
| Input Frequency Range | 50 to 90 MHz |
| Input Impedance | 50 Ohms |
| Input Level Range | -20 to -40 dBm |
| Output Frequency Range | 950 to 1525 MHz 950 to 1950 MHz (Optional) |
| Output Impedance | 50 Ohms |
| Output Return Loss | 18dB |
| Conversion Gain | 10 to 30 dB (0.5 dB steps) |
| Gain Linearity (over 10 dB) | ± 0.5 dB |
| Gain Linearity (over 20 dB) | ± 1.0 dB |
| Gain Stability (0 to +50 °C) | ± 0.75 dB |
| Amplitude Response (over any 36 MHz) | ± 0.75 dB |
| Amplitude Response (over 875 MHz) | ± 1.0 dB |
| Output Power (1 dB GCP) | +10 dBm (minimum) |
| 3 rd Order Intermodulation (for 2 car. each at 0 dBm o/p) | -40 dBc |
| Spurious (at 0 dBm output) | -55 dBc |
| Non-Carrier | -60 dBm |
| Transmit Spectrum Sense | Non-Inverting or Inverting |
| Noise Power Density | -125 dBm/Hz |
| DOWNCONVERTER | |
| Input Frequency Range | 950 to 1950 MHz |
| Input Impedance | 50 Ohms |
| Input Level Range | -75 to -35 dBm |
| Output Frequency Range | 50 to 90 MHz |
| Output Impedance | 50 Ohms |
| Input Return Loss | 18dB |
| Conversion Gain | 25 to 45 dB (0.5dB steps) |
| Gain Linearity (over 10 dB) | ± 0.5 dB |
| Gain Linearity (over 20 dB) | ± 1 dB |
| Gain Stability (0 to +50 °C) | ± 1 dB |
| Frequency Response (over 36 MHz) | ± 0.75 dB |
| Frequency Response (over 575 MHz) | ± 1 dB |
| Output Power (1 dB GCP) | ± 10 dBm |
| Non-Carrier | -55 dBm |
| Spurious Over 52 to 88 MHz (at 0 dBm output) | -50 dBc |
| Receive Spectrum Sense | Inverting or Non-Inverting |
| Noise Figure | 15 dB max |

Table 1-1 Integrated L-Band Specifications

| OPTIONAL INTERNAL REFERENCE | |
|------------------------------------|------------------------|
| Reference Frequency | 10.000 MHz |
| Stability (0 to +50 °C) | $\pm 2 \times 10^{-8}$ |
| Aging per Day | $\pm 1 \times 10^{-9}$ |
| Output Level (rear panel) | + 12 dBm ± 2 dB |
| Phase Noise @ 10 Hz | -115 dBc/Hz |
| 100 Hz | -135 dBc/Hz |
| 1 kHz | -145 dBc/Hz |
| 10 kHz | < -150 dBc/Hz |

| UPCONVERTER and DOWNCONVERTER | |
|---|---|
| Synthesizer Configuration | Dual U/C and D/C with Independent Programmability |
| Tx Synthesizer and Rx Synthesizer Step Size | 125 kHz |
| Parameter Memory Storage | Non-Volatile EEPROM |
| L-Band Output Phase Noise: | |
| at 100 Hz Offset | -66 dBc/Hz |
| at 1 kHz Offset | -76 dBc/Hz |
| at 10 kHz Offset | -86 dBc/Hz |
| at 100 kHz Offset | -96 dBc/Hz |
| at 1 MHz Offset | -106 dBc/Hz |

| INTERNAL REFERENCE | |
|--|-------------------|
| Reference Frequency | 10.000 MHz |
| Stability (0 to +50 °C) | ± 1 PPM |
| Reference Output Calibration | ± 10 Hz |
| Reference Programmable Control | ± 20 Hz |
| Output Level (10 MHz on LB IN J4 coax) | -2 dBm ± 2 dB |
| Output Level (10 MHz on LB OUT J10 coax) | -2 dBm ± 2 dB |
| Output 2 nd Harmonic | -40 dBc |

| EXTERNAL REFERENCE INPUT | |
|---------------------------------|--------------|
| Input Frequency | 10.000 MHz |
| Input Level | 0 to +13 dBm |
| Frequency Stability | As Required |

| CHASSIS PHYSICAL SIZE | |
|------------------------------|--------------|
| Height | 1.75 inches |
| Depth | 18 inches |
| Width | 19 inches |
| Weight | 12 lbs. max. |

Table 1-1 Integrated L-Band Specifications

| INTERFACE AND CONNECTORS | |
|--|------------------------------|
| Voltage (auto-ranging) | 115/230 VAC \pm 15% |
| Internal Electronics (Power) | 25 watts |
| StarSwitch Interface Connectors (Options) | DB-15 (Female) |
| Remote Serial Interface: Standard: RS-422/RS-485 (J7) | DB-9 (Male) |
| External SSPB Monitor and Control (J6) | DB-9 (Female) |
| DC Output to LNB on J4 (coaxial) (Options) | 22 VDC @ 0.5 amps (max) |
| DC Output to SSPB on J10 (coaxial) (Options) | 22 or 15VDC @ 2.0 amps (max) |
| Operational Temperature Range | 0 to 50 °C |

SECTION 2**Installation****2.0 INTRODUCTION**

This section defines the installation requirements by which the Integrated L-Band Up/Dn 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 LT-3600 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 side 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 chassis is equipped with threaded inserts on either side for the installation of slides. Slides are not provided with the unit. 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 following describes the rear panel connectors and its interface requirements. The chassis ground is a #10-32 lug on the back panel.

2.4.1 Power Input

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 unit is manufactured with a Universal Input Power supply that will accept voltages in the range of 115 or 230 +/-15% VAC.

CAUTION

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

2.4.2 L-Band Output (J10)

This connector is selectable as an SMA or N-Type female. The mate (not supplied) should be compatible with the 50-ohm coax used to connect to the system.

CAUTION

DC OUTPUT CURRENT MAY BE PRESENT ON J4 AND J10 DEPENDING ON POWER OPTIONS SUPPLIED FOR THE SSPB AND LNB.

2.4.3 IF Input (J9)

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

2.4.4 IF Output (J3)

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

2.4.5 L-Band Input (J4)

This connector is selectable as an SMA or N-Type female. The male mate (not supplied) should be compatible with the 50-ohm coax used to connect to the system.

2.4.6 External 10 MHz Input (J2)

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

2.4.7 SSPB Interface (J6)

This connector is a 9-pin female miniature type “D” connector with standard #4-40 female screw-lock hardware mounting. The mating shell, pins, and strain relief are not supplied. Outputs are open collector and inputs have internal 1K full PS to +5V. The pin-out is as follows:

| | |
|-------|---|
| Pin 1 | SSPB Band Control Output - (Low = Lo Band) |
| Pin 2 | Amplifier Fault - Open (Hi) = ALM |
| Pin 3 | Thermal Alarm Input – Open (Hi) = ALM |
| Pin 4 | Lock Alarm Input - Open (Hi) = ALM |
| Pin 5 | Up/Dn Converter Ground |
| Pin 6 | SSPB Attenuator/Enable Control – (Lo = Enable) |
| Pin 7 | Not Used |
| Pin 8 | SSPB Detector Input + Analog 0-5V |
| Pin 9 | SSPB Detector Input – Analog 0-5V |

2.4.8 Remote Serial I/O Interface (J7)

This connector is a 9-pin male miniature type “D” connector 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-422/485 bus. This port may be reconfigured for RS-232 as shown below. 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 is as follows for RS-422/485:

| | |
|-------|------------------------------|
| Pin 1 | Rx - |
| Pin 2 | Rx + |
| Pin 3 | Tx + |
| Pin 4 | Tx - |
| Pin 5 | Ground |
| Pin 6 | Alarm Relay: Common |
| Pin 7 | Alarm Relay: Normally Closed |
| Pin 8 | Not Used |
| Pin 9 | Alarm Relay: Normally Open |

Port J7 may be reconfigured for RS-232 interface by changing the following jumpers locations on the main board inside the converter:

| Serial Port | RS-422/485 | RS-232 |
|-------------------------|---------------------|------------|
| JP3 | Jumpers On | Jumpers On |
| TXD SER 0 | 1-2 5-6 7-8 | 13-14 |
| RXD SER 1 (Standard) | 9-10 11-12 17-18 | 15-16 |
| JP3 | 3-4 5-6 7-8 | 13-15 |
| TXD SER 1 | 9-10 11-12 | 14-16 |
| RXD SER 0 | 19-20 | |
| JP2 | Remove | Install |

The pinout for RS-232 is as follows:

| | |
|-------|------------------------------|
| Pin 1 | Not Used |
| Pin 2 | Rx + |
| Pin 3 | Tx + |
| Pin 4 | Not Used |
| Pin 5 | Ground |
| Pin 6 | Alarm Relay: Common |
| Pin 7 | Alarm Relay: Normally Closed |
| Pin 8 | Not Used |
| Pin 9 | Alarm Relay: Normally Open |

2.4.9 High Stability 10 MHz Reference Output (J1) (Optional Connector)

This connector is a BNC female. BNC jumper cable is supplied with this option for connection to J2.

2.5 OPERATIONAL CHECK

To verify that the basic functions of the unit are operational, it is recommended that the following check-out procedure be followed prior to final system integration. If there are any questions regarding performing the indicated operations, refer to Section 3-3.

2.5.1 Setup

Connect the unit to a primary power source and turn on the power switch at the front of the unit. Verify that the power led is illuminated. If the power led is not illuminated, check the power cord and fuse. A spare 3.15 A fuse is provided inside the power connector.

Switch the primary power off and connect the IF out, LB in, IF in and the LB out at the rear of the chassis to J3, J4, J9 and J10 respectively. Re-establish the primary source of power. The Front display will light and status will be displayed.

SECTION 3

Operation

3.0 INTRODUCTION

The Up/Down Converter can be controlled from the front panel or remotely via a serial bus located on the rear panel of the converter. Various menus are available for **EDIT** and **DISPLAY** purposes.

See Figure 3-2 for a listing of the menus. Section 4 gives a complete description of the bus commands and conventions for operating the converter remotely.

Red LED illuminates when any of the monitor functions in the converter are not within pre-defined parameters.

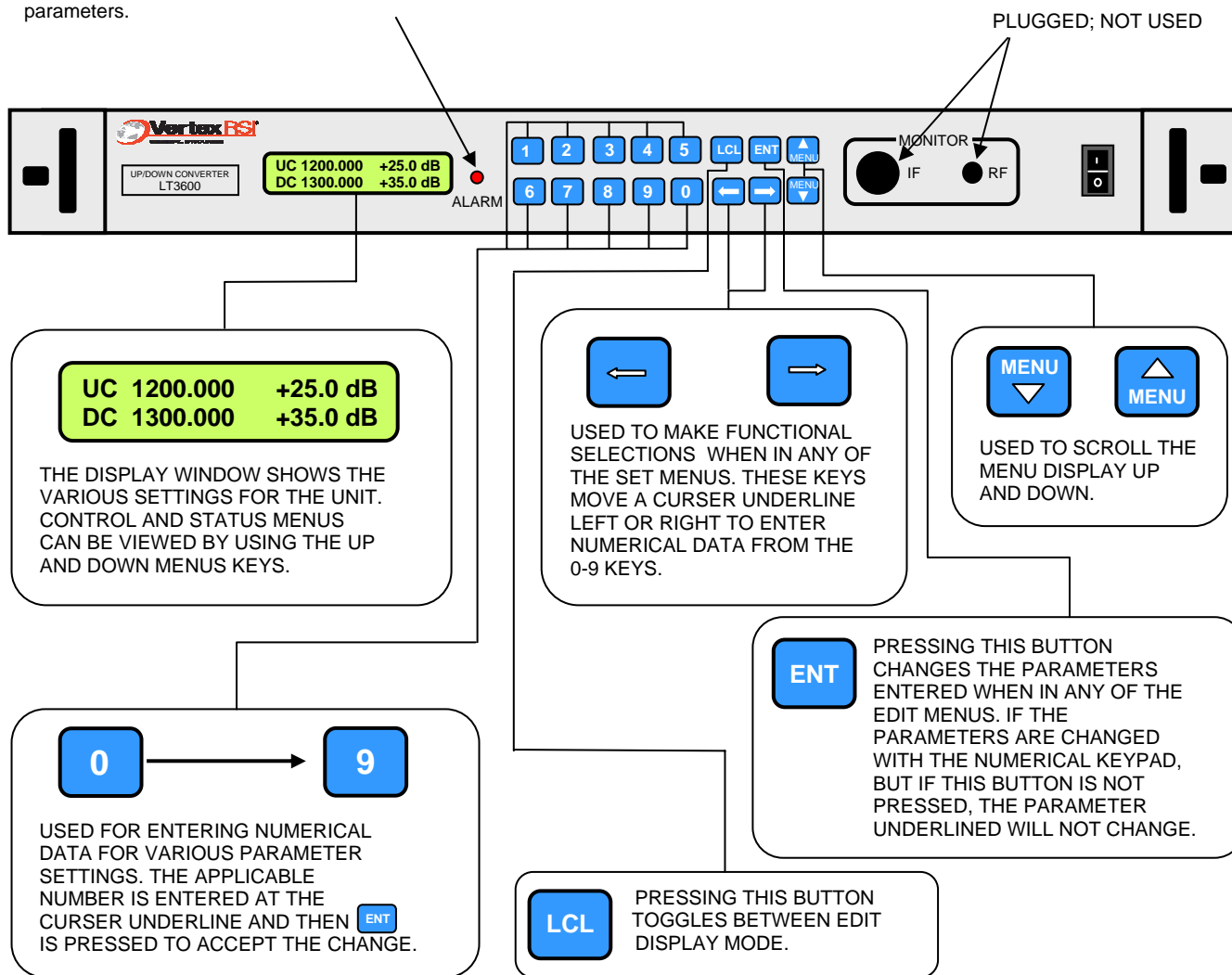


Figure 3-1 Front Panel Controls and Indicators

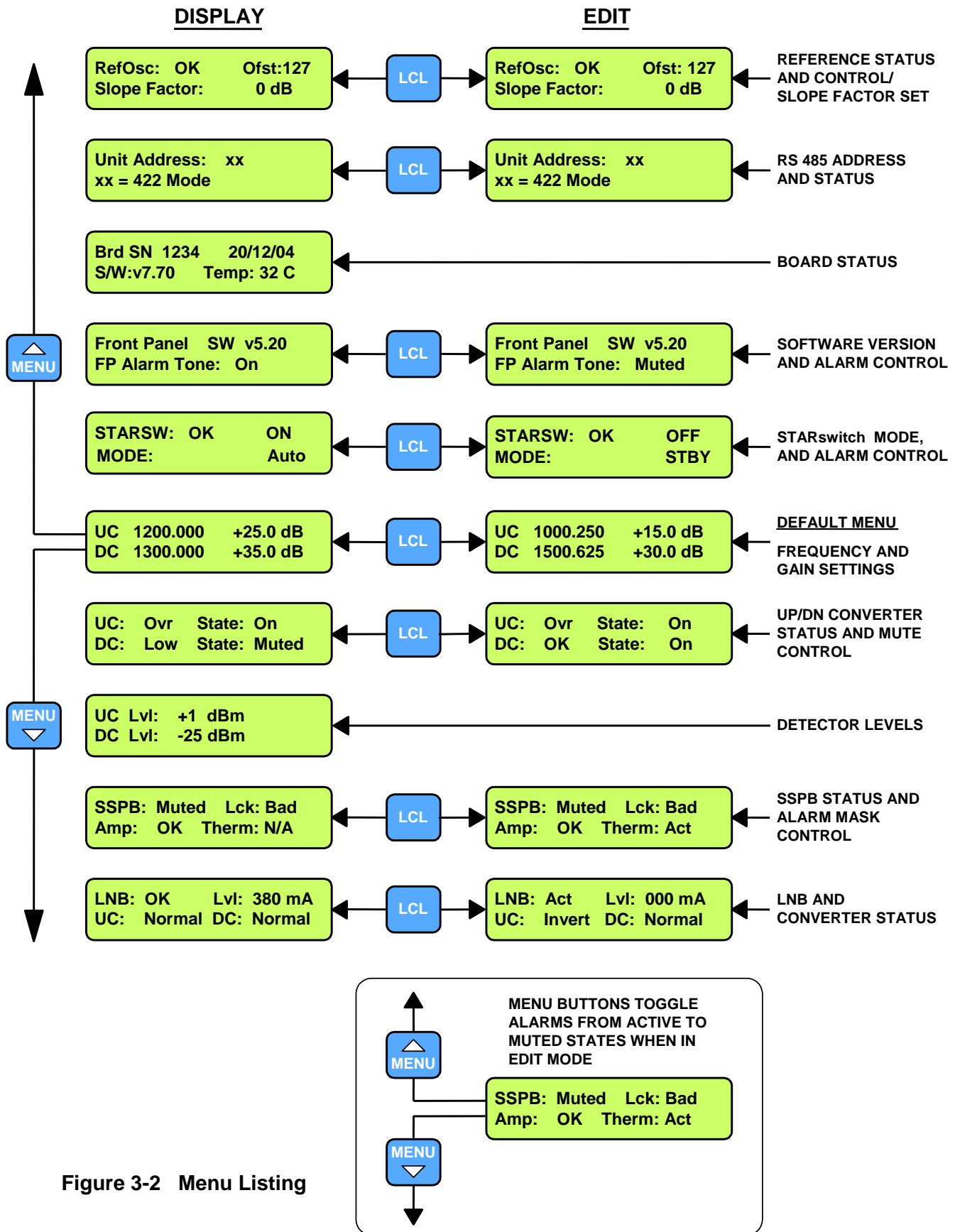


Figure 3-2 Menu Listing

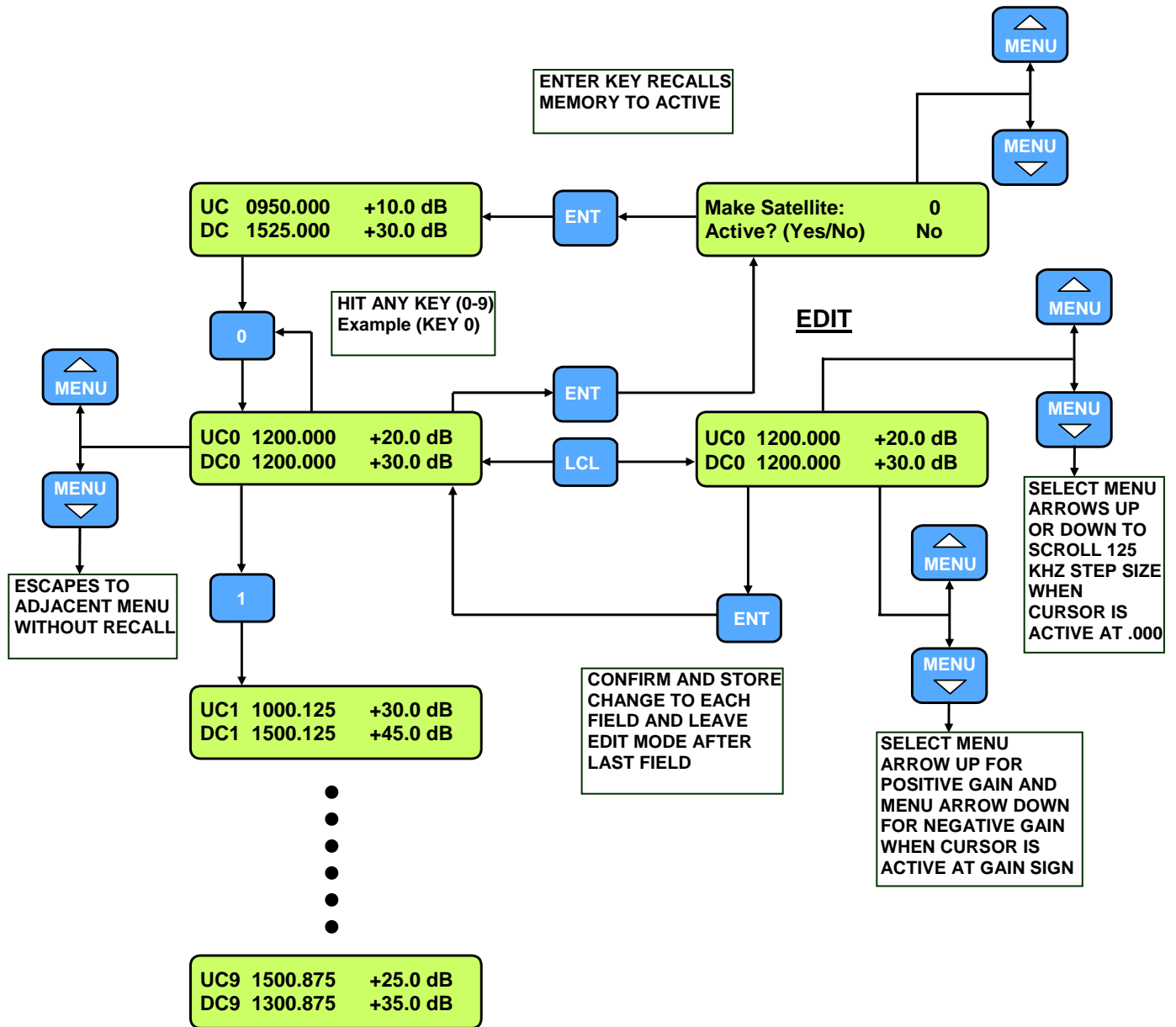


Figure 3-3 Satellite Memory

3.1 StarSwitch Operation

The LT3600 UP/DOWN Converter may be used in conjunction with the StarSwitch to provide redundancy switch over operations if configured as StarSwitch Ready. The following modes of operation may be selected.

3.1.1 Auto Mode

Upon reaching the StarSwitch Menu the information shown in Figure 3-4 will be displayed. The Information Window can have three selections, AUTO, STBY, or ON. The converter's default is AUTO. Any of the three selections stated previously can be made, and will be activated when the ENTER key is pressed.

If a particular converter is in the AUTO mode, and an alarm is activated, it will be backed up by the backup converter if there are no other alarms in the system. **REMEMBER: ONE AND ONLY ONE ALARM IN THE SYSTEM CAUSES A SWITCHOVER.**



A rectangular display box with a light green background and a black border. It contains two lines of text: "STARSW: OK" followed by "ON" on the first line, and "MODE:" followed by "AUTO" on the second line.

Figure 3-4 StarSwitch Display – Auto Selection

3.1.2 StandBy Mode

When STBY has been selected, the display will change to the display shown in Figure 3-5a. In this mode the converter with this selection will be backed up if there are no other alarms in the system. Upon switchover to the backup converter, the display will change to Figure 3-5b indicating STBY in the Activity Window. Under normal operation the Summary Alarm would only be ON if there were another alarm activated on the converter, however in this case, the Summary Alarm is forced to be ON regardless of the state of the other alarms. The operator can still view the state of alarms via the other menus, i.e. if an alarm has been activated it will be displayed, however the Summary Alarm will always be ON.



Two rectangular display boxes with a light green background and a black border. The left box contains "STARSW: OK" followed by "ON" on the first line, and "MODE:" followed by "STBY" on the second line. The right box contains "STARSW: OK" followed by "STBY" on the first line, and "MODE:" followed by "STBY" on the second line.

Figure 3-5 StarSwitch Display – STBY Selection

3.1.3 ON Mode

When ON Mode has been selected, the display will change to the display shown in Figure 3-6. This mode is the opposite to the STBY mode, in that the Summary Alarm is turned OFF, so even if there was a valid alarm, the converter would not show a Summary Alarm. As in the STBY mode the operator can still view the state of the alarms via the other menus, i.e. if an alarm has been activated it will be displayed, however the Summary Alarm will be OFF.

NOTE: If the converter is already in STBY mode, a change to the ON mode will not occur, unless there is no alarm in the system.



A rectangular display box with a light green background and a black border. It contains two lines of text: "STARSW: OK" followed by "ON" on the first line, and "MODE:" followed by "ON" on the second line.

Figure 3-6 StarSwitch Display – ON Selection

3.1.4 Backup Converter Operation

The Backup Converter must be programmed to store all of the Converter Frequencies and Gains in the system, in its Satellite Memory Locations, corresponding to the Converter Number (1 to 8) labeled on the StarSwitch Interface cables. Figure 3-7 shows the Backup Converter in Auto Mode ready to Backup any converter in the system and after backing up Converter 2.

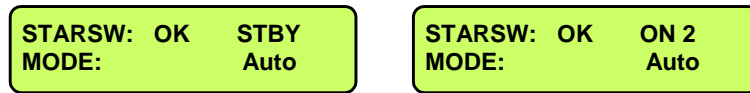


Figure 3-7 StarSwitch Display – Backup Converter

3.1.5 StarSwitch Alarm

The StarSwitch Alarm is displayed as “Fault” in the StarSwitch Menu Window on the Backup Converter only. A fault indicates either an internal StarSwitch Unit failure or a Power Off condition detected on any one of the Converters in the system. The StarSwitch Alarm however, does not activate the Summary Alarms, and the Backup Converter will still backup an Online Converter when it is powered down. Figure 3-8 shows the Backup Converter display after Converter 1 has been powered off and the Backup has taken over.

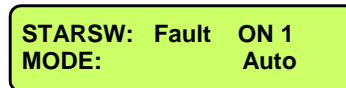


Figure 3-8 StarSwitch Display – Fault Indication

3.1.6 Dual StarSwitch Operation

Each LT3600 Converter has two StarSwitch Interface connectors (J8, Main and J5, Secondary) to control two StarSwitch Units, for systems where switching for both Up and Down Converter sections is required. The two interfaces are not independent as an alarm in either Up or Down Converter system will cause both to switch to the backup converter. This is necessary since a failed unit, including both Up and Down Converter sections, will need to be removed for service. Ensure that J8, Main Interface, is used if only one StarSwitch Unit is configured in the system.

3.2 Front Panel Alarm Settings

| | <u>Menu Page</u> | <u>Active Modes</u> | <u>Mask (Default)</u> | <u>Comment</u> | |
|----|------------------------|-------------------------|-------------------------|---|--|
| 1) | Starswitch | Auto ON STBY | Auto | Must select "Auto" Mode when Starswitch is not present. Forces summary alarm to OFF (see Starswitch operation). Forces summary alarm to ON (see Starswitch operation). | |
| 2) | Front Panel Alarm Tone | Muted On | Muted | Mutes audio tone when in alarm. (has no effect on Summary Alarm condition). Audio Tone will indicate an Alarm. | |
| 3) | Reference Oscillator | N/A Act OK Bad | N/A | Disable Alarm if External Reference Oscillator is not present. Activate for External Reference Alarm (select in Edit Mode). External Reference is detected (Active Mode) External Reference is not detected (Active Mode). | |
| 4) | LNB | N/A Act OK Bad | N/A | Disable Alarm if LNB (or BDC) is not present. Activate for LNB supply current Alarm (select in Edit Mode). LNB supply current is within acceptable range (Active Mode) LNB supply current is not within acceptable range (Active Mode) | |
| 5) | SSPB | Lck | N/A Act OK Bad | N/A | Disable Alarm if SSPB (or BUC) is not present. Activate for SSPB, PLL Alarm (select in Edit Mode). SSPB, PLL is Locked (Active Mode) SSPB, PLL is not Locked (Active Mode) |
| | | Amp | N/A Act OK Bad | N/A | Disable Alarm if SSPB (or BUC) is not present. Activate for SSPB, Amplifier Summary Alarm (select in Edit Mode). SSPB, Amplifier Summary Alarm is OFF (Active Mode) SSPB, Amplifier Summary Alarm is ON (Active Mode) |
| | | Therm | N/A Act OK Bad | N/A | Disable Alarm if SSPB (or BUC) is not present. Activate for SSPB, Thermal Alarm (select in Edit Mode). SSPB, Thermal Alarm is OFF (Active Mode) SSPB, Thermal Alarm is ON (Active Mode) |

SECTION 4**Serial Command Set****4.0 GENERAL**

The standard Up/Dn Converter is controlled via a rear panel serial link (RS-422/485)(Reconfigurable to RS-232). With the front panel control, a user can operate the L-Band Up/Dn Converter from its front panel as well as from the serial link. This section describes the format for the ASCII serial control as well as front panel operation.

Note: Some commands and status strings have been changed as of Software Release v7.70 (main board) and v5.20 (front panel). Units marked with “Rev A” on the rear panel support the new protocol.

4.1 LT-3600 SERIAL INTERFACE

The serial interface format to the Up/Dn Converter for RS-422 is identical to the RS-485 format except that under RS-485, the format includes an address field (aa in the format below).

4.2 COMMUNICATION PROTOCOL

Baud Rate: 9600
 Parity: None
 Data Bits: Eight
 Start Bits: One
 Stop Bits: One

4.2.1 General Data Format

{aaCND...}

Where:

{ = Start byte
 aa = 2 character address (00 to 50, remote interface only)
 C = 1 character, either C (Command) or S (Status)
 N = 1 number 0 to 9, A,B,C Command or Status Number
 D = 1 or more Data characters (depending on command)
 } = Stop byte

Note: The address is only used in the RS-485 mode when having several addressable units communicating with one station.

4.3 COMMANDS

4.3.1 Set UP/Converter Frequency

{aaC1xxxx} Where xxxx(x) = First 4 numeric data characters
 Range: 0950 to 1525 (MHz) for Std. Band units
 Range: 0950 to 1950 (MHz) for Extended Band units
 Where (xxxx)x = Fifth character is fractional MHz as follows
 0 = 0.0 MHz
 1 = +0.125 MHz
 2 = +0.250 MHz
 3 = +0.375 MHz
 4 = +0.500 MHz
 5 = +0.625 MHz
 6 = +0.750 MHz
 7 = +0.875 MHz

Note: If only four characters entered, 0 is assumed as fifth digit.

4.3.2 Set DOWN/Converter Frequency

{aaC2xxxx} Where xxxx(x) = First 4 numeric data characters
 Range: 0950 to 1950 (MHz) for Std and Extended Band units
 Where (xxxx)x = Fifth character is fractional MHz as follows
 0 = 0.0 MHz
 1 = +0.125 MHz
 2 = +0.250 MHz
 3 = +0.375 MHz
 4 = +0.500 MHz
 5 = +0.625 MHz
 6 = +0.750 MHz
 7 = +0.875 MHz

Note: If only four characters entered, 0 is assumed as fifth digit.

4.3.3 Set UP/Converter Gain

{aaC3xxxx} Where xxxx = 4 numeric data characters
 Range: +100 to +300 (+10.0 dB to +30.0 dB)
 in 0.5 dB steps

4.3.4 Set DOWN/Converter Gain

{aaC4xxxx} Where xxxx = 4 numeric data characters
 Range: +250 to +450 (+25.0 dB to +45.0 dB)
 in 0.5 dB steps

4.3.5 Set Internal 10 MHz Ref Oscillator Offset

{aaC5xxx} Where xxx = 3 numeric data characters
 Range: 000 to 255 (0 through 10 volts)

4.3.6 Enable SSPB

{aaC6x} Where x = 0 to disable SSPB control
 and x = 1 to enable SSPB control

4.3.7 DOWN/Converter (LNB) Spectrum Control

{aaC7x} Where x = 0 for Non-Inverting spectrum
and x = 1 for Inverting spectrum

4.3.8 UP/Converter Spectrum Control

{aaC7TXz} Where z = 0 for Non-Inverting spectrum
and z = 1 for Inverting spectrum

4.3.9 SSPB Band Control

{aaC8x} Where x = 0 for SSPB Std.Band control
and x = 1 for SSPB Extended Band control

4.3.10 Set SSPB Gain (Attenuation)

{aaC9xx} Where xx = 2 data characters (sign and number)
Range: -8 to -0 (-8 to 0 dB) or ++ for full on.

4.3.11 Enable UP/Converter

{aaCAx} Where x = 0 to disable or mute the transmitter
and x = 1 to enable or un-mute the transmitter

4.3.12 Enable DOWN Converter

{aaCBx} Where x = 0 to disable or mute the DOWN/Converter
and x = 1 to enable or un-mute the DOWN/Converter

4.3.13 Satellite Memory Store

{aaCSSxyyyyyyyyy} Where x = Number from 0 to 9 (memory position)
y = ASCII character making up to a 10 character name for the satellite

Stores current UP and DOWN Converter Frequencies and Gains to storage position specified along with a Text name for that satellite is so desired.

4.3.14 Satellite Memory Recall

{aaCSRx} Where x = Number from 0 to 9 (memory position)
Recalls saved satellite settings of Frequencies and Gains to the current set-up.

4.3.15 StarSwitch Mode Select

{aaCWx} Where x = A – Auto Mode
x = S – Standby Mode
x = O – ON Mode

4.4 STATUS REQUESTS

4.4.1 Command Status

{aaS1}

Returns: {aaS1bbbbccccdddeeeeffUL}

Where
 bbbb = Up/Converter Frequency (as above)
 cccc = Down/Converter Frequency (as above)
 dddd = Up/Converter Gain
 eeee = Down/Converter Gain
 fff = Ref. Osc. Offset
 U = 0 for Non-Inverting Up/Converter, 1 for Inverting
 L = 0 for Non-Inverting LNB, 1 for inverting

4.4.2 Fractional Frequency Status

{aaSF}

Returns: {aaSFxy}

Where: x = U/C Fractional Frequency (0 to 7, in 125 kHz increments)
 Where: y = D/C Fractional Frequency (0 to 7, in 125 kHz increments)

4.4.3 Level Status

{aaS2}

Returns: {S2MLffppeett}

Where: M = ASCII-hex Char. MSN of bitmapped status
 F indicates no alarm in group
 D7 – Low = SSPB Lock Alarm
 D6 – Low = SSPB Thermal Alarm
 D5 – Low = SSPB Amp Alarm
 D4 – Low = LNB Alarm
 Where: L = ASCII-hex Char. LSN of bitmapped status
 F indicates no alarm in group
 D3 – Low = Ext. 10 MHz Ref. Osc. Alarm
 D2 – Low = Down/Converter Synthesizer Alarm
 D1 – Low = Up/Converter Synthesizer Alarm
 D0 – Low = Summary Alarm
 Where: ff = 2 Chars., Forward SSPB Power Detection
 Range: 00 or 16 to 40 (dBm) (00 = No SSPB)
 Where: pp = 2 Chars., L-Band Output Level Detection
 Range: 25 to +5 (-25 to +5 dBm)
 Where: rr = 2 Chars., IF Output Level Detection
 Range: 25 to +5 (-25 to +5 dBm)
 Where: tt = 2 Chars., on board Temperature Monitor
 Range: 00 to 70 (0 to 70°C)

4.4.4 L-Band Status

{aaS3}

Returns: {S3bbCddTReeN}

Where:

- bb = 2 Chars., LNB current Detection
Range: 00 to 99 (0 - 990 mA)
- C = 1 Character, SSPB Band Control
Range: 0 = low band, 1 = high band
- dd = 2 Characters, SSPB Gain
Range: -8 to -0 or ++ (dB) ++ = Full On
- T = 1 Character, Up/Converter enable
Range: 0 = disable, 1 = enable
- R = 1 Character, Down/Converter enable
Range: 0 = disable, 1 = enable
- ee = 2 Character, SSPB current detection
Range: 00 to 30 (0 – 3.0 A)
- N = 0 for SSPB Disable, 1 SSPB Enable

4.4.5 Set Cable Slope Factor

{aaFx}

Where: x = numeric character
Range: 0 to 5 (dB/500 MHz)

4.4.6 Query Cable Slope Factor

{aaF}

Returns: {F = x}

Where: x = numeric character
Range: 0 to 5 (dB/500 MHz)

4.4.7 Serial Number Read

{aaID}

Returns: {aaIDyymmddxxxx}

Where :

- yy = last 2 digits of year
- mm = month
- dd = day
- xxxx = 4 digit sequence number

4.4.8 Query Software Version

{aaV}

Returns: {aaVr.ii}

Where:

- r = Software Release number (1 – 9)
- ii = Software Issue number (00 – 99)

4.4.9 Query Card Type

{aaZ}

Returns: {aaZxx}

Where:

- xx = L-Band Card Type (1 – 8)
- 10 = 70 MHz IF, Std. Band Unit (SBU)
- 20 = 140 MHz IF, SBU
- 11 = 70 MHz IF, Ext Band Unit (EBU)
- 21 = 140 MHz IF, EBU
- 50 = 70 MHz IF, SBU with Inv. Up/Converter Spectrum
- 60 = 140 MHz IF, SBU with Inv. Up/Converter Spectrum
- 51 = 70 MHz IF, EBU with Inv. Up/Converter Spectrum
- 61 = 140 MHz IF, EBU with Inv. Up/Converter Spectrum

4.4.10 Satellite Memory Status Query

{aaSSx}

Returns: {aaSSxbbbbccccdddeeee}{aayyyyyyyyyy}

Where x = Number from 0 to 9 (memory position)

Where:

- x = The number of the Satellite Memory location
- bbbb = Frequency for the Up/Converter
- cccc = Frequency for the Down/Converter
- dddd = Gain for the Up/Converter
- eeee = Gain for the Down/Converter
- y = ASCII character making up to a 10 character name for the satellite

4.4.11 Satellite Fractional Frequency Status

{aaSGn}

Returns: {aaSGnxy}

Where: n = Number from 0 to 9 (memory position)

Where:

- n = The number of the Satellite Memory position.
- x = U/C Fractional Frequency (0 to 7, in 125 kHz increments)
- y = D/C Fractional Frequency (0 to 7, in 125 kHz increments)

4.4.12 StarSwitch Status

{aaSW}

Returns: {aaSWxnyz}

Where:

- x = O – ON (Current Status)
- X = S – STBY (Current Status)
- n = – No Converter Backed Up, (Space)
- n = 1 – Converter 1 Backed Up, (1 to 8)
- y = A – Auto Mode
- y = S – STBY Mode
- y = O – ON Mode
- z = G – SW ALM Green (Normal)
- z = R – SW ALM Red (Fault)

| | |
|-------------------|--------------------------------|
| Appendix A | Manual Revision History |
|-------------------|--------------------------------|

| | | | | | |
|-----------------------------|------------|----------|-------------|---------|------|
| C – Add Starsw menu | M. Neely | 2-03-05 | D. Snyder | 2-03-05 | 6323 |
| B – Add Satellite Menu Info | M. Neely | 10-14-05 | D. Snyder | 10-5-05 | 6129 |
| A – Gain signs | M. Neely | 8-15-05 | D. Snyder | 8-15-05 | 6020 |
| - Original Release | M. Neely | 11-5-04 | D. Snyder | 11-5-04 | 5442 |
| Rev. No/change | Revised By | Date | Approved By | Date | ECO# |

| | |
|-------------------|--------------------------------------|
| Appendix B | CCA Software Revision History |
|-------------------|--------------------------------------|

| | |
|------|---|
| 7.72 | StarSwitch Menu and Status Update |
| 7.71 | Added RS-485 address to Fractional Frequency Status |
| 7.70 | High/Low gains with signs, M&C changes (July 05) |
| 7.56 | 1950 MHz limit, invert ref. osc. alarm (May 05) |
| 7.55 | Freq. and gain limits, fixed starswitch 485 address (Feb. 05) |
| 7.54 | Original (Jan. 05) |

| | |
|-------------------|--|
| Appendix C | Display Panel Software Revision History |
|-------------------|--|

| | |
|------|---|
| 5.22 | StarSwitch Alarm display message is now "Fault" was "Bad". |
| 5.21 | Reversed Relay Alarm - now energized in no alarm condition. |
| 5.20 | Gain signs added, U/C Spectrum invert (July 05) |
| 5.03 | Fix Display errors (Jan. 05) |
| 5.01 | Original (Dec. 04) |

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