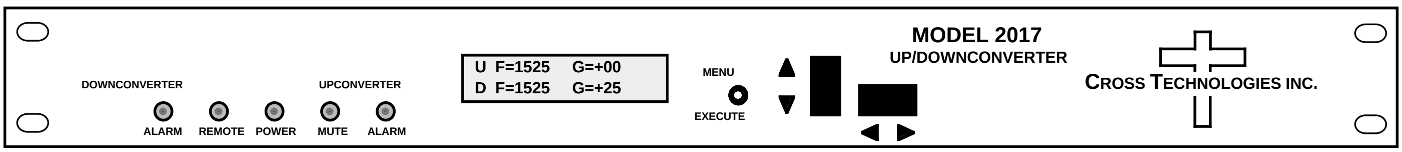
Instruction Manual

Model 2017-03A
Up/Downconverter

August 2019, Rev. J



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INSTRUCTION MANUAL

MODEL 2017-03A Up/Downconverter

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MODEL 2017-03A Up/Downconverter

1.0 General

1.1 Equipment Description

The 2017-03A L-band Up/Downconverter converts 70 MHz to 950-1525 MHz (Up) and 950-1525 MHz to 70 MHz (Down) in 1 MHz steps with low group delay and flat frequency response. The 2017-03A has lower RF level out of the upconverter and higher RF level into the downconverter than the 2017-03 and is typically used to interface an L-band modem to a 70 MHz IF upconverter and downconverter. Multi-function push button switches select the RF frequency, gain, and other parameters. Front panel LEDs provide indication of DC power (green), PLL alarm for up and downconverters (red), remote operation (yellow), and Upconverter mute (yellow). Gain can be manually adjusted over a -25 to +15 dB range for the upconverter and over a 0 to +50 dB range for the downconverter by the front panel multi-function push-button switches. Remote operation allows selection of frequency and gain. Parameter selection and frequency and gain settings appear on the LCD display. Connectors are BNC female for IF and the optional external reference input and output, and Type F female for RF. A high stability (±0.01ppm) option is also available. It is powered by a 100-240 ± 10% VAC power supply and housed in a 1.75” X 19” X 16” 1RU chassis.

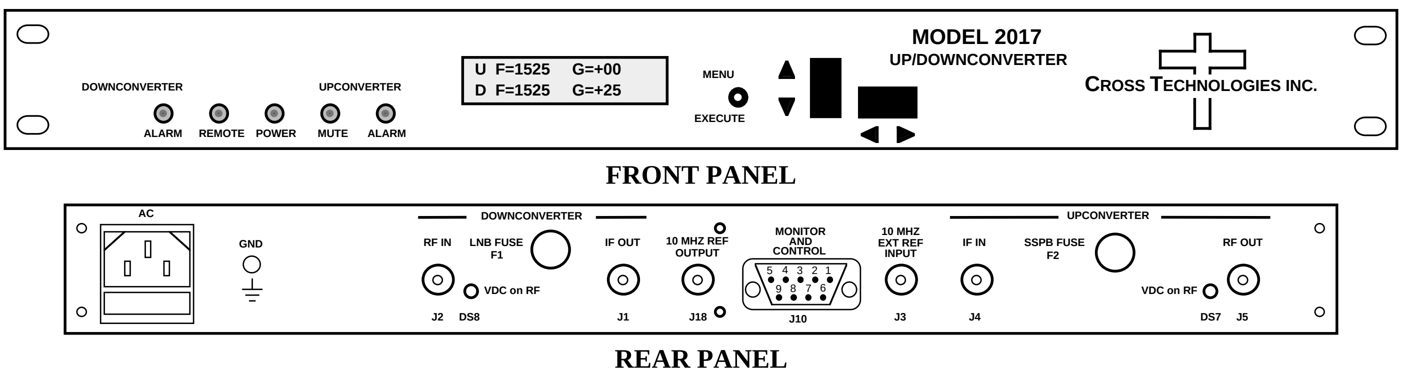


Figure 1.1 Model 2017-03A Front and Rear Panels

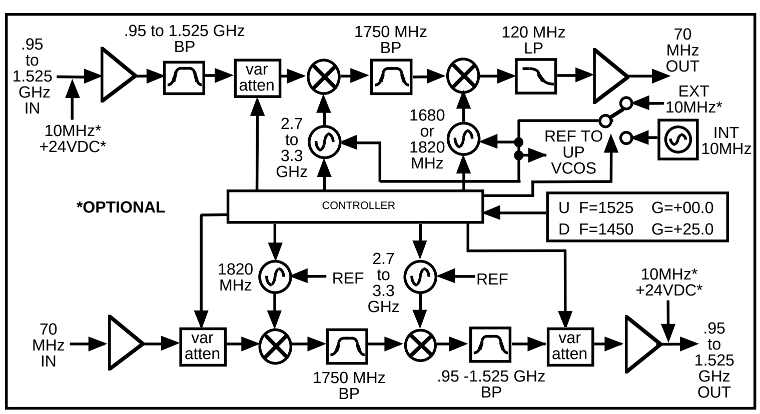


Figure 1.2 Model 2017-03A Up/Downconverter Block Diagram

1.2 Technical Characteristics

TABLE 1.0 2017-03A Up/Downconverter Specifications*

---UPCONVERTER---

Input Characteristics (IF)

Impedance/Return Loss	75 Ω /18 dB
Frequency	70 ± 18 MHZ
Input Level	-40 to -10 dBm

Output Characteristics (RF)

Impedance/Return Loss	75 Ω/12 dB
Frequency	950 to 1525 MHz
Output level	-35 to -15 dBm
Output 1 dB compression	-10 dBm

Channel Characteristics

Gain range (adjustable)	-25 to +15 dBm, 1 dB steps
Frequency Sense	Non-inverting

---DOWNCONVERTER---

Input Characteristics (RF)

Impedance/Return Loss	75Ω/12 dB
Frequency	950 to 1525 MHz
Noise Figure, Max.	15 dB @ max. gain
Input Level range	-60 to -10 dBm
Input 1 dB compression	-5 dBm @ 0 dB gain

Output Characteristics (IF)

Impedance/Return Loss	75 Ω /18 dB
Frequency	70 ± 18 MHZ
Output Level	-10 to 0 dBm
Output 1 dB compression	+5 dBm

Channel Characteristics

Gain range (adjustable)	0 to +50 dB
Image Rejection	> 50 dB, min.
Frequency Sense	Inverting Non-inverting

---UP & DOWNCONVERTER---

Channel Characteristics

Frequency Response	± 1.5 dB, entire band; ± 0.5 dB, 36 MHz BW
Spurious Response	<-50 dBC
Group Delay, max.	0.01 ns/MHz^2 parabolic; 0.03 ns/MHz linear; 1 ns ripple

Synthesizer Characteristics

Frequency Accuracy	±1.0 ppm internal reference (±0.01 ppm **option H**) internal reference
Frequency Step	1 MHz (125 kHz, **option X**)

Phase Noise @ F (Hz)>	100 Hz	1KHz	10KHz	100kHz	1MHz
dBC/Hz	-75	-75	-85	-100	-120

10MHz Level (In/Out)	3 dBm ± 3 dB, 75 ohms (**option -E**)

Controls, Indicators

Frequency Selection	Direct readout LCD; pushbutton switches or remote selection
Gain Selection	Direct readout LCD; pushbutton switches or remote selection
Power; Alarm; Rem; Mute	Green LED; Red LED; Yellow LED; Red LED
Remote	RS232C, 9600 baud (RS485, **option Q**)

Other

RF Connectors	Type F (female) (see Table 2.2 for connector options)
IF Connectors	BNC (female) (see Table 2.2 for connector options)
10MHz Connectors	BNC (female), 50/75 Ω (**option E**)
Alarm/Remote Connector	DB9, male - NO or NC contact closure on alarm
Size	19 inch standard chassis 1.75” high X 16.0” deep
Power	100 - 240 (±10% VAC), 47 - 63 Hz, 25 watts max.

Options

E -	External 10 MHz ref
H -	High Stability (±0.01ppm) internal ref
Q -	RS485 Remote Interface
L-	LNB Voltage, +24VDC, 0.5 amps
T -	Temperature Sensor
V -	SSPB Voltage, +24 VDC, 2.5 Amps
X -	125 kHz frequency steps
X1 or X1-	125 or 100 kHz Frequency Steps

Connectors/Impedance

B - 75Ω BNC (RF), 75Ω BNC (IF)
C - 50Ω BNC (RF), 75Ω BNC (IF)
D - 50Ω BNC (RF), 50Ω BNC (IF)
J - 75Ω F-type (RF), 50Ω BNC (IF)
N - 50Ω N-type (RF), 75Ω BNC (IF)
M - 50Ω N-type (RF), 50Ω BNC (IF)

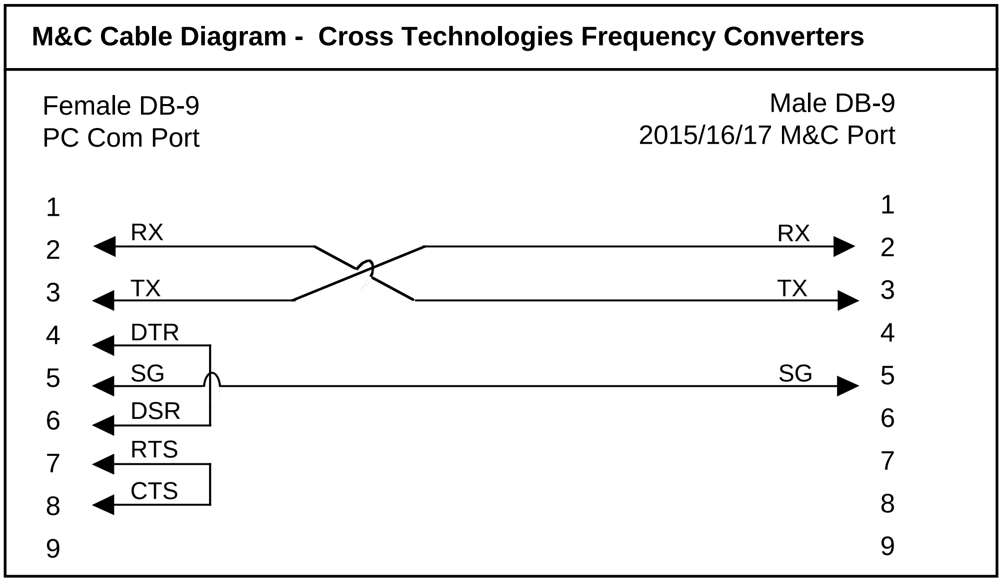
Connector Options: See Table 2.2

*+10˚C to +40˚C; Specifications subject to change without notice

1.3 Monitor and Control Interface

A) Remote Serial Interface

Protocol: RS-232C, 9600 baud rate, no parity, 8 data bits, 1 start bit, and 1 stop bit.
(RS-232C, RS-422, or RS-485 - **option Q**)



Connector: Rear panel, DB-9 male

J10 Pinouts (RS-232C/422/485)	
Pin	**Function**
1	Rx-
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Tx-
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

B) Status Requests

Table 1.1 lists the status requests for the 2017-03A and briefly describes them.

*** PLEASE NOTE: The two character {aa}(00-31) prefix, in the table below, should be used ONLY when RS-485, (OPTION-Q), is selected.**

Table 1.1 2017-03A Status Requests		
Command	**Syntax***	**Description**
Command Status	{aaS1}	Returns {aaS1bbbbccccdddeeffLMNOP} where:
		• bbbb = Tx frequency
		4 characters - standard (7 characters - Option-X)
		• cccc = Rx frequency
		4 characters - standard (7 characters - Option-X)
		• ddd = Tx gain (-10 to 30)
		• ee = Rx gain (00 to 50)
		• ff = Tx input level (10 to 40 => -10 to -40 dBm)
		• L = 0 - non-inverted Receiver; L = 1 - inverted
		• M = 0 - Receiver synth alarm
		• N = 0 - Transmitter synth alarm
		• O = 0 - Summary alarm
		• P = 0 - Transmit signal disabled (muted)
External 10MHz (option E)	{aaS2}	Returns {aaS2bcd} where:
		• b = 1 - External 10MHz selected
		• c = 1 - 10MHz inserted on upconverter RF (J5)
		• d = 1 - 10MHz inserted on downconverter RF (J2)
LNB Current (option L)	{aaS3}	Returns {aaS3bb} where:
		• bb = LNB current, range 00 to 50 (0 to 500 ma)
SSPB Current (option V)	{aaS4}	Returns {aaS4bbb} where:
		• bbb = SSPB current, range 000 to 250 (0 to 2500 ma)

C) Commands

Table 1.2 lists the commands for the 2017-03A and briefly describes them. After a command is sent the 2017-03A sends a return “>” indicating the command has been received and executed.

General Command Format - The general command format is {aaCND...}, where:

{ = start byte
aa = address (RS-485 only **option Q**)
C = 1 character, either C (command) or S (status)
N = 1 character command or status request
D = 1 character or more of data (depends on command)
} = stop byte

*** PLEASE NOTE: The two character {aa}(00-31) prefix, in the table below, should be used ONLY when RS-485, (OPTION-Q), is selected.**

Table 1.2 2017-03A Commands

Command	Syntax*	Description
Set Transmitter Frequency	{aaC1xxxx}	where:
		• xxxx = 4 characters standard (7 characters -Option-X)
		• Range: 0950 to 1525 MHz
Set Transmitter Input Level	{aaClxx}	where:
		• xx = 2 characters
		• Range: 10 to 40 (-10 to -40 dBm)
Set Receiver Frequency	{aaC2xxxx}	where:
		• xxxx = 4 characters standard (7 characters -Option-X)
		• Range: 0950 to 1525 MHz
Set Transmit Gain	{aaC3xxxx}	where:
		• xxxx = 2 or 3 characters
		• Range: -25 to +15 (-25 to +15 dB, in 1 dB steps)
Set Receiver Gain	{aaC4xxx}	where:
		• xx = 2 characters
		• Range: 00 to 50 (00 dB to 50 dB, in 1 dB steps)
Enable Tx	{aaCAx}	where x =:
		• 0 to disable Tx signal
		• 1 to enable Tx signal
External 10MHz (option E)	{aaCEx}	where x =:
		• 0 to disable External 10MHz ref signal
		• 1 to enable External 10MHz ref signal
Insert 10MHz on UP RF (option E)	{aaC5x}	where x =:
		• 0 to disable 10MHz upconverter insertion on RF (J5)
		• 1 to enable 10MHz upconverter insertion on RF (J5)
Insert 10MHz on DOWN RF (option E)	{aaC6x}	where x =:
		• 0 to disable 10MHz downconverter insertion on RF (J2)
		• 1 to enable 10MHz downconverter insertion on RF (J2)
Downconverter Spectrum	{aaC7x}	where x =:
		• 0 for non-inverted
		• 1 for inverted
Enable Remote	#	Just # sign
Disable Remote	{aaCR0}*	{CR and zero}

1.4 Environmental Use Information

A. **Elevated operating ambient temperature** - if installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack may be greater than room ambient temperature. Therefore, consideration should be given to Tmra.

B. Reduced air flow - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. Additional space between unit may be required.

C. Mechanical loading - Mounting of equipment in a rack should be such that a hazardous condition does not exist due to uneven weight distribution.

D. Circuit Overloading - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits could have on over current protection and supply wiring. Appropriate consideration of equipment name plate rating should be used, when addressing this concern.

E. Reliable Earthing - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connection to the Branch (use of power strips).

F. Top Cover - There are no serviceable parts inside the product so, the Top Cover should not be removed. If the Top Cover is removed the ground strap and associated screw MUST BE REINSTALLED prior to Top Cover screw replacement. FAILURE TO DO this may cause INGRESS and/or EGRESS emission problems.

2.0 Installation

2.1 Mechanical - The 2017-03A consists of one RF/Controller PCB housed in a 1 RU (1 3/4 inch high) by 16 inch deep chassis. A switching, ± 12, +5, +24 VDC power supply provides power for the assemblies. The 2017-03A can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 2017-03A is assembled.

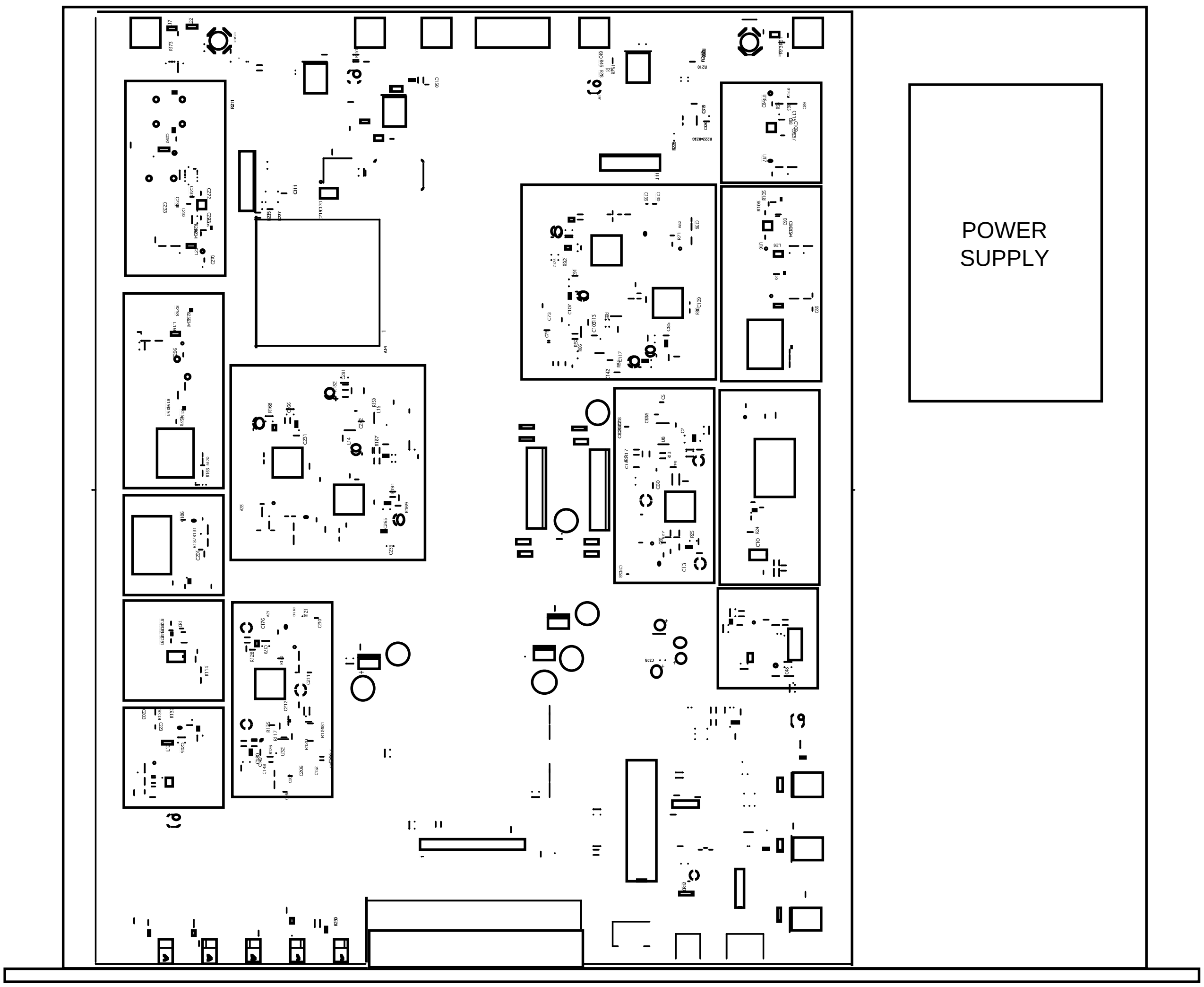


Figure 2.0 Model 2017-03A Mechanical Assembly

2.2 Rear Panel Input/Output Signals and Control -

Figure 2.2 shows the input and output connectors on the rear panel.

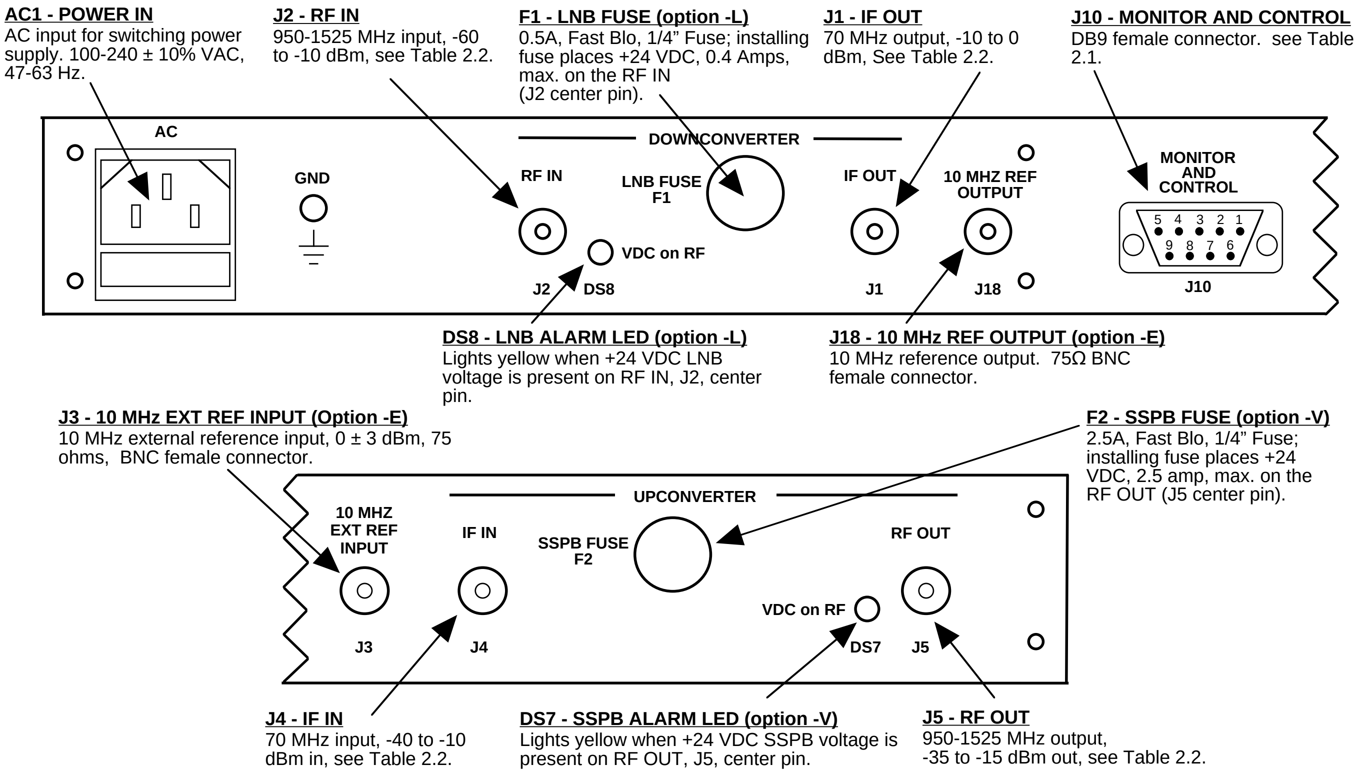
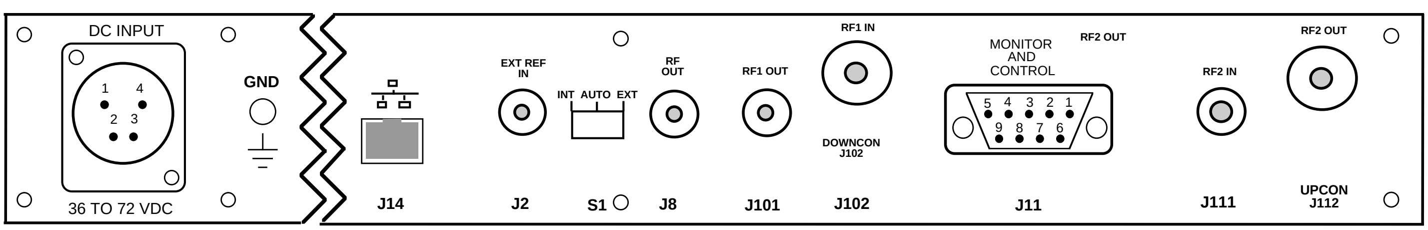


Figure 2.1 Model 2017-03A Rear Panel I/O’s

Shown below (Option P48) - Rear Panel Input/Output Signals with Option P48, 48 VDC nominal 36 TO 72 VDC, 4A maximum.



Tables 2.1, 2.2 & 2.3 show the input and output connectors on the rear panel.

TABLE 2.1 J10 Pinouts (RS-232C/422/485*)	
Pin	**Function**
1	Rx-
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Tx-
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

TABLE 2.3 DC1 Pinouts	
Pin#	**Function**
1	Minus DC input
2	NC
3	Plus DC input
4	NC
Shell	Ground

***Remote Serial Interface**
Interface: DB-9 Male
Protocol: RS-232C (RS-485, **option Q**),
9600 baud, no parity, 8 data bits, 1 start bit, 1 stop bit.

TABLE 2.2 IF/RF Connector Options		
Option	**IF**	**RF**
STD	BNC, 75Ω	Type F, 75Ω
B	BNC, 75Ω	BNC, 75Ω
C	BNC, 75Ω	BNC, 50Ω
D	BNC, 50Ω	BNC, 50Ω
F	Type F, 75Ω	Type F, 75Ω
J	BNC, 50Ω	Type F, 75Ω
K	BNC, 50Ω	BNC, 50Ω
M	BNC, 50Ω	Type N, 50Ω
N	BNC, 75Ω	Type N, 50Ω

2.3 Front Panel Controls and Indicators -

The following are the front panel controls and indicators.

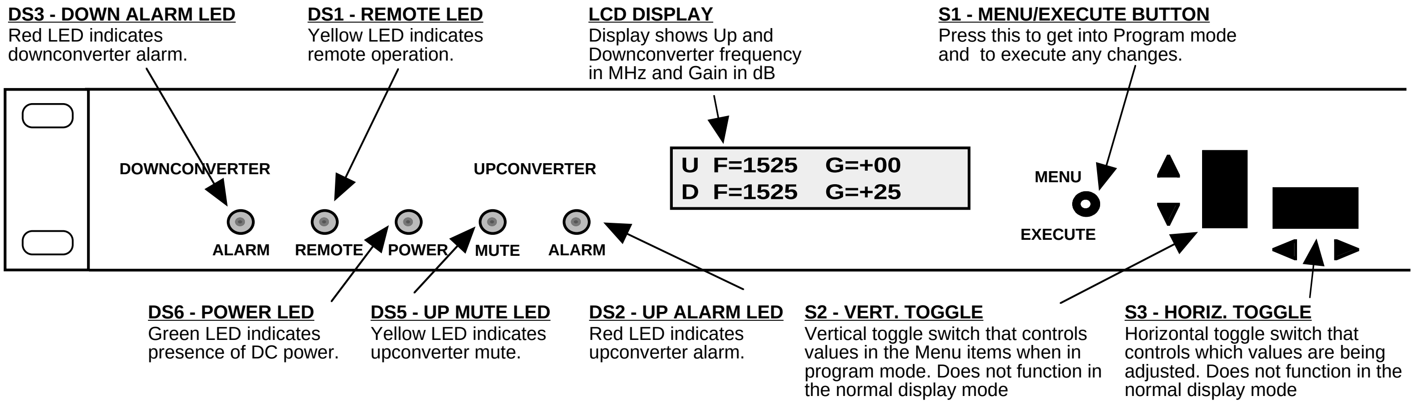


Figure 2.2 Model 2017-03A Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 2017-03A, Upconverter Section

1.) Connect a -40 dBm to -10 dBm signal to IF In, J4 (Figure 2.1).
2.) Connect the RF OUT, J5, to the external equipment.
3.) Connect 100 - 240 (±10% VAC), 47 - 63 Hz to AC on the back panel.
4.) Set the desired output frequency (See Section 2.5 Menu Settings).
5.) Set the input level (See Section 2.5 Menu Settings).
6.) (option V) To power the SSPB (+24 VDC, 2.5 amps max.) from the 2017-03A install a 2.5 amp 1/4” fuse in F2.
7.) Be sure DS6 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.2)

CAUTION!!! INSTALLING A FUSE IN F2 PUTS +24 VDC, 2.5 AMP POWER ON THE CENTER PIN AND MAY DAMAGE EQUIPMENT IF IMPROPERLY CONNECTED TO EQUIPMENT THAT CANNOT HANDLE THIS VOLTAGE OR HAS A DC PATH TO GROUND.

2.4.2 Installing and Operating the 2017-03, Downconverter Section

1.) Connect a -60 dBm to -10 dBm signal to RF In, J2 (Figure 2.1).
2.) Connect the IF OUT, J1, to the external equipment.
3.) Connect 100-240 ±10% VAC, 47 - 63 Hz to AC on the back panel.
4.) Set the desired input frequency (See Section 2.5 Menu Settings).
5.) Set the gain to get an output level in the 0 to -20 dBm range (See Section 2.5 Menu Settings).
6.) (option -L) To power the LNB (+24 VDC, 0.5 amps, max.) from the 2017-03A install a 1 amp 1/4” fuse in F1.

CAUTION!!! INSTALLING A FUSE IN F1 PUTS +24 VDC, 0.5 AMP POWER ON THE CENTER PIN AND MAY DAMAGE EQUIPMENT IF IMPROPERLY CONNECTED TO EQUIPMENT THAT CANNOT HANDLE THIS VOLTAGE OR HAS A DC PATH TO GROUND.

7.) Be sure DS6 (green, DC Power) is on and DS2 (red, Alarm) is off (Figure 2.2).
8.) **AC Fuse -** The fuse is a 5 mm X 20 mm, 2 amp slow blow (Type T) and is inserted in the far slot in the drawer below the AC input as shown in Figure 2.3. There is a spare fuse in the near slot. If a fuse continues to open, the power supply is most likely defective.

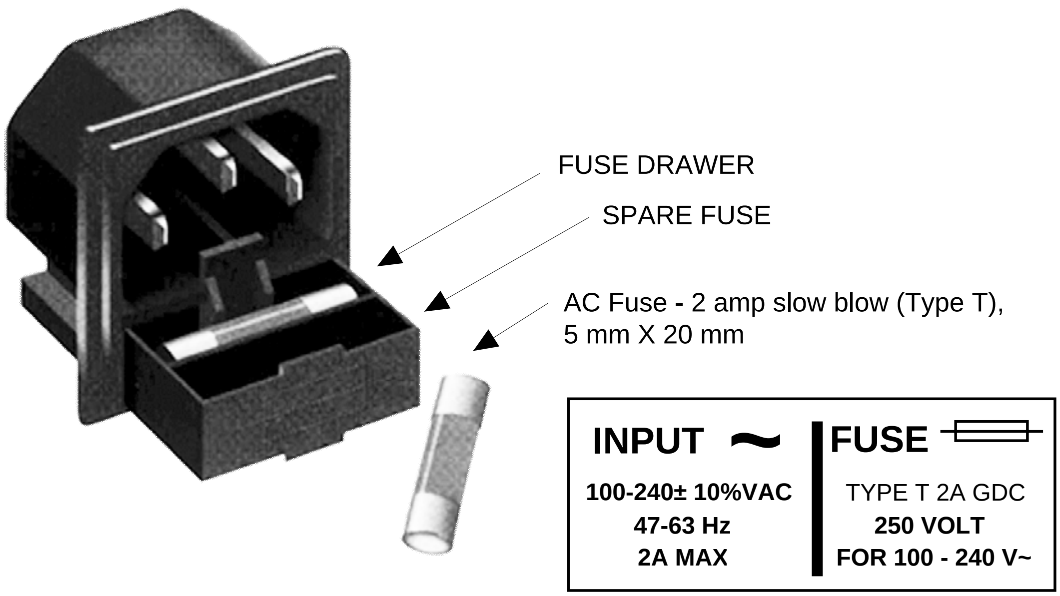


Figure 2.3 Fuse Location and Spare Fuse

2.5 Menu Settings

2.5.1 Functions - This section describes operation of the front panel controls. There are three operator switches, the LCD display and alarm indicator LEDs. All functions for the equipment are controlled by these components. The functions are (see Figure 2.2):

Power Up
Normal Display

Menu 1	Up Frequency in MHz
Menu 2	Up Input Lvl (Set from -45 to -15)
Menu 3	Down Frequency in MHz
Menu 4	Down Gain (set 0 to +50 for -10 to 0 dBm out range)
Menu 5	Up Mute
Menu 6	Set Unit to Remote Operation
Menu 7	Set Downconverter Spectrum Sense
Menu 8	Select External 10 MHz Ref (option E)
Menu 9	Upconverter Reference Out (option E)
Menu 10	Downconverter Reference Out (option E)
Menu 11	Set RS-485 mode (option Q)
Menu 12	Set RS-485 address (option Q)
Menu 13	View PCB Temperature (option T)
Menu 14	View LNB and/or SSPB Current (options L and/or V)
Save Menu	When go to end

Alarm indications appear on the LEDs (see figure 2.2).

All program changes must start with the operation of the Menu/Execute switch and must also end with the operation of the Menu/Execute switch verified by the “Save Settings?” Menu. If this sequence is not followed, none of the changes will take effect. If programming is initiated and no operator action takes place for approximately 12 seconds (before the final press of the Menu/Execute switch) the display will revert to its previous status and you will need to start over.

2.5.2 Power-On Settings

<u>NOTE</u>: THE LAST STATUS OF A UNIT IS RETAINED EVEN WHEN POWER IS REMOVED. WHEN POWER IS RESTORED, THE UNIT WILL RETURN TO IT'S PREVIOUS SETTINGS.

When power is first applied, the LCD display goes through three steps.

1. The LCD goes black to show all segments are functioning.
2. The software version will be displayed.

```
REV1.00
```

3. The present frequency and gain of the up and downconverter is shown.

```
U F=1350   G=+00.0
D F=1250   G=+20.0
```

The unit is now operational and ready for any changes the operator may desire.

2.5.3 Control Switches

1. <u>Menu/Execute</u> - Any change to the programming of the unit must be initiated by pressing the Menu/Execute switch and completed by pressing the Menu/Execute switch.
2. <u>Horizontal Switch</u> - This switch is mounted so its movement is horizontal and moves the cursor left or right.
3. <u>Vertical Switch</u> - This switch is mounted so its movement is vertical and has two functions:
   a. During frequency , gain, input level changes, the vertical movement will raise or lower the number in the direction of the arrows.
   b. For other functions such Mute on/off, the vertical switch will alternately turn the function on or off regardless of the direction operated.

2.5.4 Frequency Changes

At any time during the modification process, if you have made a mistake and do not wish to save the changes you have made, **do not press the Menu/Execute switch**; simply do nothing for approximately 12 seconds, and the system will return to the normal operating mode or scroll to **"R"** and push the menu/Execute switch and select **"NO"** in the **"SAVE SETTINGS?"** window.

To change the FREQUENCY:

Operate the Menu/Execute switch until you get to the menu item you want to change (see Figure 2.4 for the sequence of menu options). The following display is for changing the upconverter frequency:

```
UP  F = 1350                R
```

Pressing the Up/Down switch down will toggle the display to:

```
UP  F = 1450                R
```

By using the horizontal rocker switch the cursor can be moved left or right.

```
UP  F = 1450                R
```

<u>NOTE</u>: CHANGES DO NOT TAKE PLACE ON FREQUENCY UNTIL YOU GO TO THE SAVE MENU AND INDICATE YOU WANT TO SAVE THE CHANGES.

When the display indicates the value desired you can push the Menu/Execute switch to the next item:

```
UP INLVL = -2 0             R
```

NOTE: CHANGES TAKE PLACE ON LEVEL AND GAIN IMMEDIATELY BUT DO NOT GET SAVED UNTIL YOU GO TO THE SAVE MENU AND INDICATE YOU WANT TO SAVE THE CHANGES.

OR you can scroll to "R", push the Menu/Execute switch to get to:

```
SAVE SETTINGS?           YN
```

Selecting **Y** will save the new settings. Selecting **N** will revert to the previous settings.
Pushing the Menu/Execute switch then takes you to the :

```
U  F=1450    G=+00.0
D  F=1250    G=+20.0
```

Figure 2.4 shows all the menu items and how to make changes.

2.5.5 Gain/Level Changes

When you get to this menu note that the gain changes will be made as you make them but if you do not wish to save the changes you have made, scroll to **“R”** and push the menu/Execute switch and select **“NO”** in the **“SAVE SETTINGS?”** window or **do not press the Menu/Execute switch**; simply do nothing for approximately 12 seconds, and the system will return to the normal operating mode.

2.5.5.1 Upconverter Input Level

To set the upconverter input level, first push the Menu/Execute switch until you get to the upconverter input level setting:

Operate the Menu/Execute switch until you get to the menu item you want to change see Figure 2.4 for the sequence of menu options.

The following display is for changing the upconverter input level. This is an important setting to optimize spurious and should be made as accurately as possible:

```
UP INLVL = -20                R

```

Pressing the Up/Down switch down will toggle the display digit selected until you have the desired level. NOTE: **THE VALUE WILL NOT BE STORED UNTIL YOU INDICATE YES IN THE SAVE SETTINGS WINDOW.**

```
UP INLVL = -10                R

```

By using the horizontal rocker switch the cursor can be moved left or right .

```
UP INLVL = -1 0               R

```

When the display indicates the value desired you can push the Menu/Execute switch to the next item OR you can scroll to “R”, push the Menu/Execute switch to get to:

```
SAVE SETTINGS?           Y N

```

Selecting **Y** will save the new settings. Selecting **N** will revert to the previous settings.
Pushing the Menu/Execute switch then takes you to the :

```
U  F=1450    G=+00.0
D  F=1350    G=+20.0
```

Figure 2.4 shows all the menu items and how to make changes.

2.5.5.2 Downconverter Gain

To set the downconverter gain, first push the Menu/Execute switch to get to the gain setting:

Operate the Menu/Execute switch until you get to the menu item you want to change see Figure 2.4 for the sequence of menu options.

The following display is for changing the downconverter gain. This is an important setting to optimize spurious and should be made as accurately as possible to provide an output in the -10 to 0 dBm level range:

```
DN G = +30.0                R
```

Pressing the Up/Down switch to change the level in 1 or 10 dB steps. By using the horizontal rocker switch the cursor can be moved left or right. Pressing the Up/Down switch down will toggle the display digit selected until you have the desired gain.

<u>NOTE</u>: THE GAIN WILL BE CHANGED AS YOU ADJUST THE NUMBERS. HOWEVER, THE VALUE WILL NOT BE STORED UNTIL YOU INDICATE YES IN THE SAVE SETTINGS WINDOW.

When the display indicates the value desired you can push the Menu/Execute switch to the next item OR you can scroll to “R”, push the Menu/Execute switch to get to:

```
SAVE SETTINGS?          YN
```

Selecting **Y** will save the new settings. Selecting **N** will revert to the previous settings.
Pushing the Menu/Execute switch then takes you to the :

```
U F=1450   G=+00.0
D F=1350   G=+30.0
```

Figure 2.4 shows all the menu items and how to make changes.

2.5.5 Alarm Indications

An alarm condition for will occur if any local oscillator phase lock loop (PLL) comes out of lock.

	Display		
	ON POWER UP		
Power Up	REV 1.00		
	NORMAL DISPLAY		
Normal Display	U F = 1450 G = +00.0 D F = 1350 G = +25.0		PUSH BUTTON
	PUSHING MENU/EXECUTE SEQUENCE		
Menu 1 Up Frequency	UP F = 1450 R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 2 Up Input Level (Set from -40 to -10)	UP INLVL = -20 R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 3 Down Frequency	DN F = 1350 R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 4 Down Gain (set 0 to +50 for -20 to 0 dBm out level)	DN G = +25.0 R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 5 Up Mute	UP MUTE OFF R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 6 For Other Settings (below)	OTHER? Y N	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 7 Set Unit to Remote Operation	REMOTE OFF R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 7 Set Downconverter Spectrum Sense	DN SPECTRUM NON R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 8 Select 10 MHz Reference INT, EXT, or AUTO (option -E)	INT REF _ R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 9 Select Upconverter Reference Out (option -E)	UP REF OUT OFF R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 10 Select Downconverter Reference Out (option -E)	DN REF OUT OFF R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 11 Reference Offset (option -E)	FREQ ADJUST R Offset = +000	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 12 Set Remote Mode (option -Q)	RS 485 OFF R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 13 Set RS-485 Address (option -Q)	ADDRESS = 00 R	SCROLL <> SCROLL ⌃⌄	PUSH BUTTON
Menu 14 View LNB current and SSPB current (options -L and -V)	LNB DC = 0.32 A R SSB DC = 1.86 A		PUSH BUTTON
Save? When go to end	SAVE SETTINGS? Y N	SCROLL <>	PUSH BUTTON

Figure 2.4 Menu Display and Sequence

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