

**INSTRUCTION MANUAL**  
**MODEL 2089-17 AGILE 1.7-1.95 GHZ**  
**DOWNCONVERTER**

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# INSTRUCTION MANUAL MODEL 2089-17 AGILE 1.7-1.95 GHZ DOWNCONVERTER

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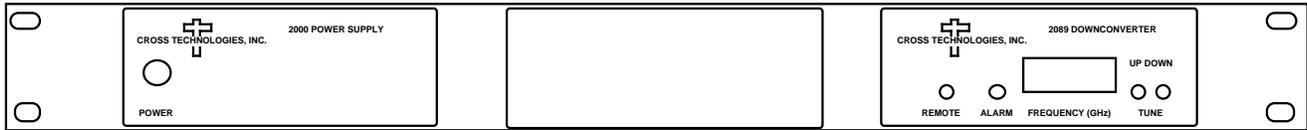
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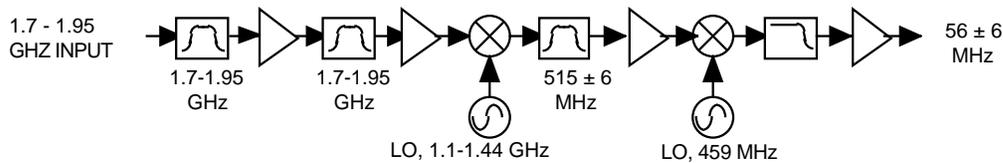
# MODEL 2089-17 AGILE 1.7 - 1.95 GHZ DOWNCONVERTER

## SECTION 1 GENERAL

**1.1 Equipment Description** - The 2089-17 Agile Downconverter converts a 1700 to 1950 MHz signal to 515 MHz in 1.0 MHz steps with a low side 1185 to 1435 MHz first LO and then to  $56 \pm 6$  MHz with low side 459 MHz LO. Up and down tune push buttons control the output frequency displayed on the LED indicators. Frequency selection can be remotely selected via an RS232C data input. A red LED PLL alarm lights if the phase locked loop (PLL) of the first LO is unlocked and this alarm also goes to an open drain FET output. A Yellow LED indicates remote operation. A switching power supply provides power and the chassis is a 1 3/4", rack mount.



**Figure 1.1 2089-17 Agile 1.7 - 1.95 GHz Downconverter**



**Figure 1.2 2089-17 Block Diagram**

## 1.2 Technical Characteristics

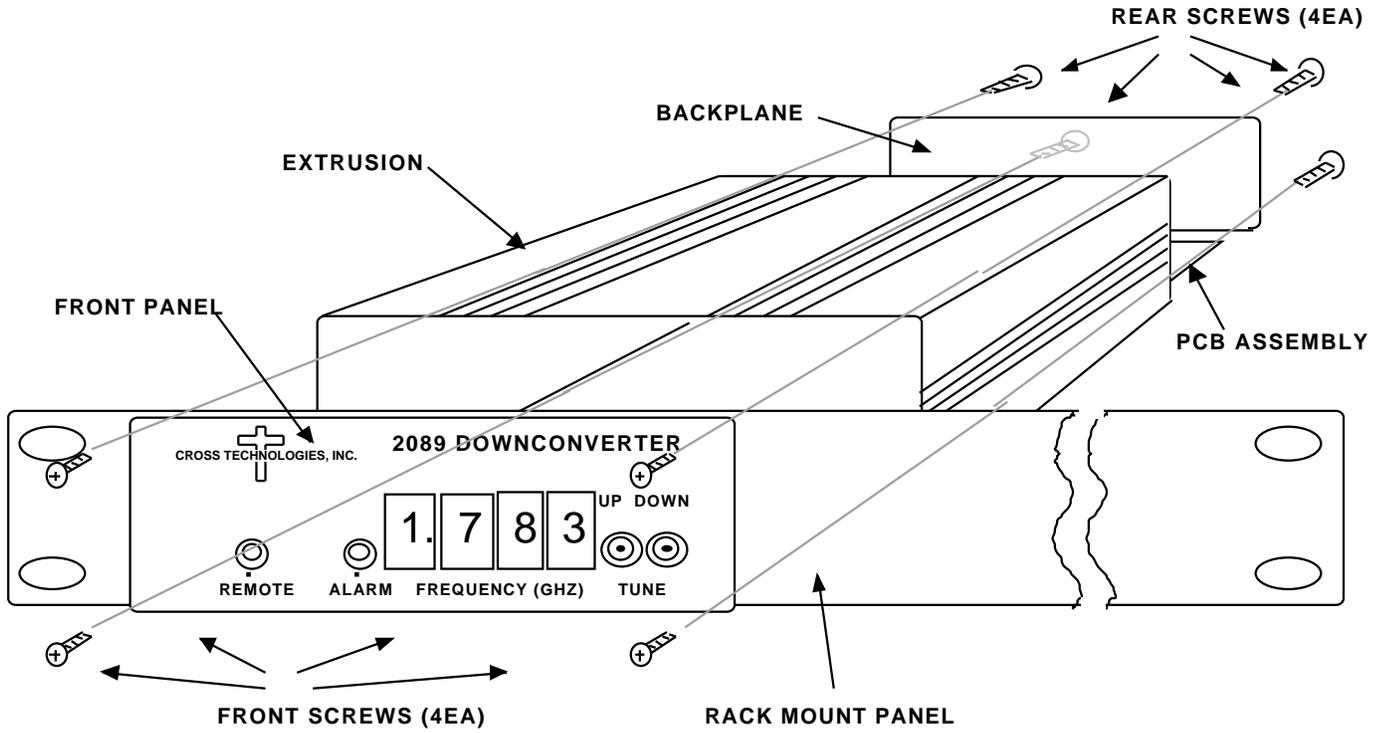
**TABLE 1.0 2089-17 DOWNCONVERTER SPECIFICATIONS**

<u>Characteristics</u>	<u>Specifications*</u>
<b>Input Characteristics</b>	
Input Impedance/RL	75 /10db
Frequency	1700 - 1950 MHz
Noise Figure	15 dB Max, (12 dB Max design goal)
Input Level, range	-30 to -70 dBm
Input 1dB/3RD ORDER	-25 / -15 dBm
<b>Output Characteristics</b>	
Impedance/RL	75 /15db
Frequency ,IF out	$56 \pm 6$ MHz ( $56 \pm 8$ MHz design goal)
Output Spurious	<-40 dBC in band, <-25 dBC < -60 dBm in
Level with -30dBm in	-5 dBm, $\pm 2$ dB
Output 1dB/3RD ORDER	+0 / +10 dBm
<b>Channel Characteristics</b>	
Gain	+25 dB $\pm 2$ dB
Frequency Response	$\pm 0.5$ dB, 6 MHz band .
<b>Synthesizer Characteristics</b>	
Frequency Accuracy	$\pm 10$ kHz max
Phase Noise, Suitable for;	64 kB/s QPSK, 1/2 FEC
Frequency Selection	1 MHz min steps
Reference Frequency	25 MHz; 10 MHz external reference for future versions
<b>Indicators</b>	
DC Power	Green LED
PLL Alarm	Red LED
Frequency	four, 7 segment LED displays
<b>Other</b>	
RF in, IF out Connectors	F, female, F, female
Size	19" wide X 1.75" high X 13.0" deep
Power	90 to 260 VAC, 50 to 60 Hz, 30 watts

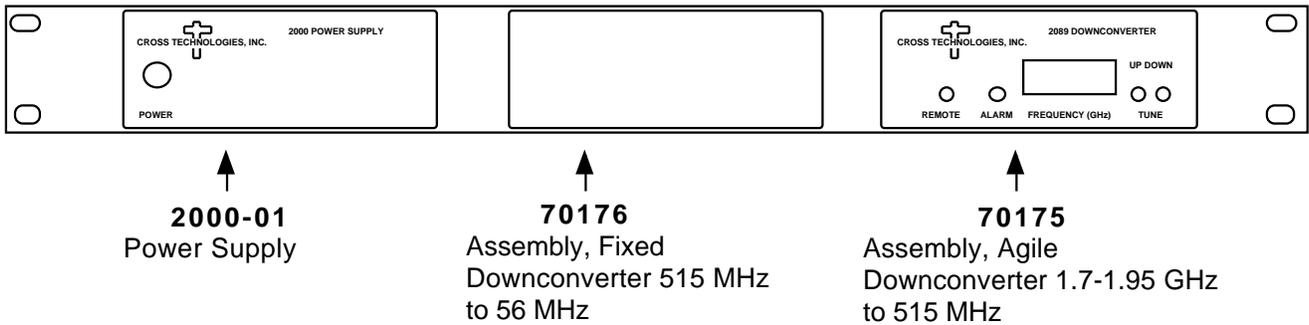
\*+10 to +40 degrees C; 2000 meters max elevation; 80% max humidity; Pollution Degree 2; Specifications subject to change without notice

**2.0 Installation**

**2.1 Mechanical** - The 2089-17 consists of three assemblies (See Figure 2.2) mounted on a 1 3/4" X 19" panel that can be mounted to a rack using the 4 holes at the ends. Both converter assemblies derive ± 15V from the Cross Technologies, Inc. model 2000-01. To access the PCB of each assembly, see Figure 2.1.



**FIGURE 2.1 SERIES 2000 ASSEMBLY DRAWING**



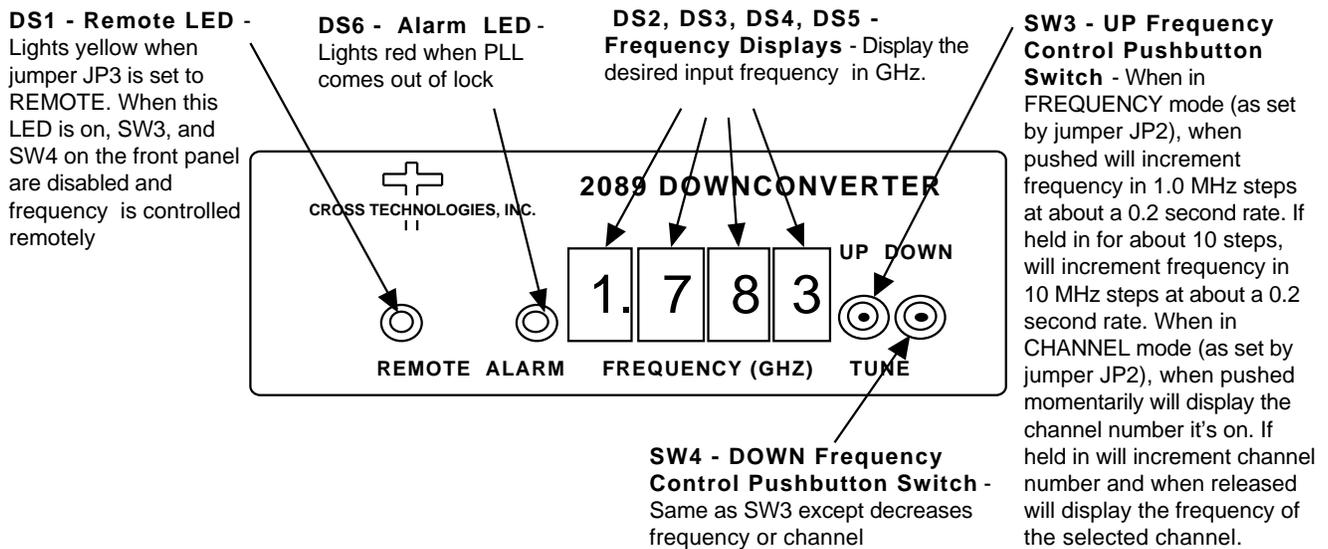
**Figure 2.2 - 2089-17 Downconverter Assemblies**

**2.2 Controls and Indicators** - Figure 2.3 shows front panel controls and indicators.

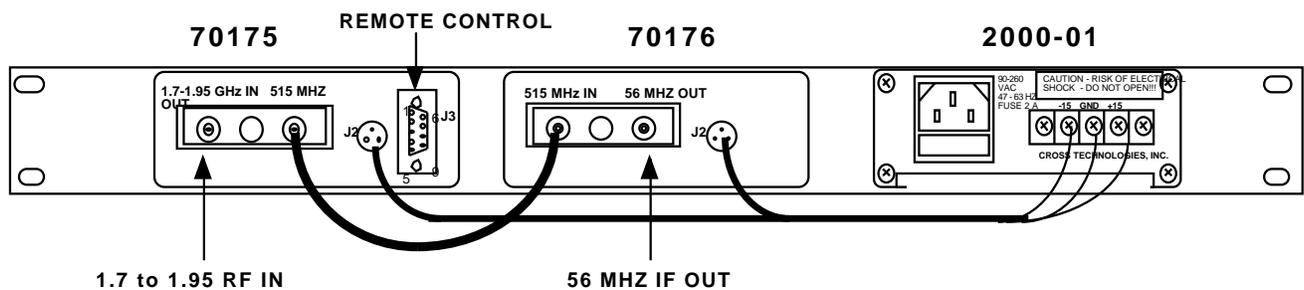
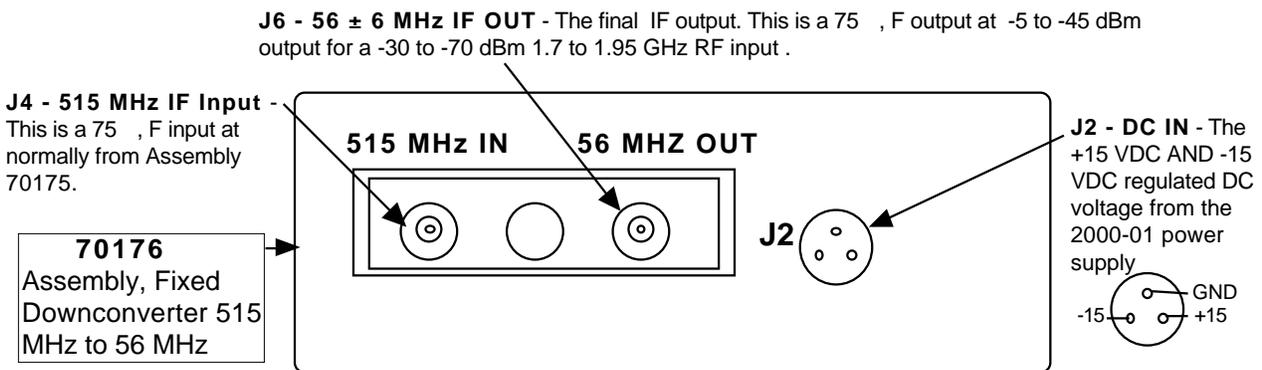
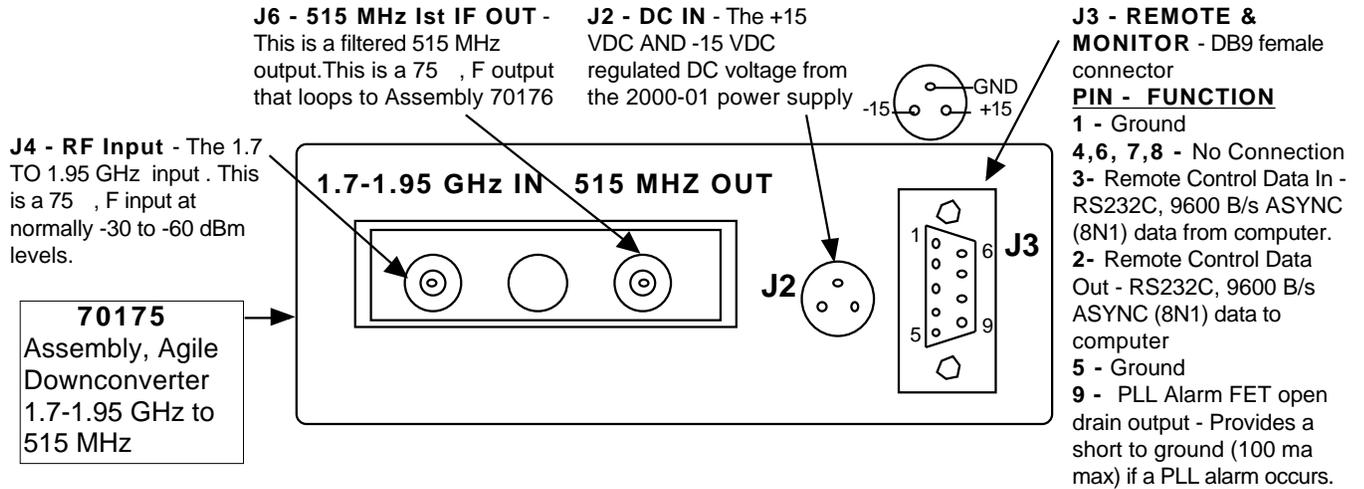
**2.3 Input / Output Signals** - Figure 2.4 shows the input and output signals to the 2089.

**2.4 Accessing and Changing On-Card Jumpers and Controls** - Figure 2.5 shows jumpers (with factory settings) and other on-card controls. To remove the printed circuit board (PCB) from the extrusion for access to the jumpers and controls:

- 1.) Remove four (4) **rear panel screws** (see Figure 2.1).
- 2.) **Gently** pull the backplane and PCB assembly completely out of the extrusion.
- 3.) Be sure the **power supply is disconnected**, move jumpers to the desired positions (Figure 2.5).
- 4.) **To set Channel frequencies** apply power via power supply and program frequencies (see Section 2.5.3).
- 5.) **Always remove power** when installing the PCB in to the extrusion. Make sure the shield goes in the lower channel and the PCB in the next channel above that in the extrusion.
- 6.) **Gently** push the backplane and PCB assembly completely in to the extrusion so the front panel controls go through the front panel.
- 7.) Install four (4) **rear panel screws**.



**FIGURE 2.3 2089 Front Panel Controls and Indicators**



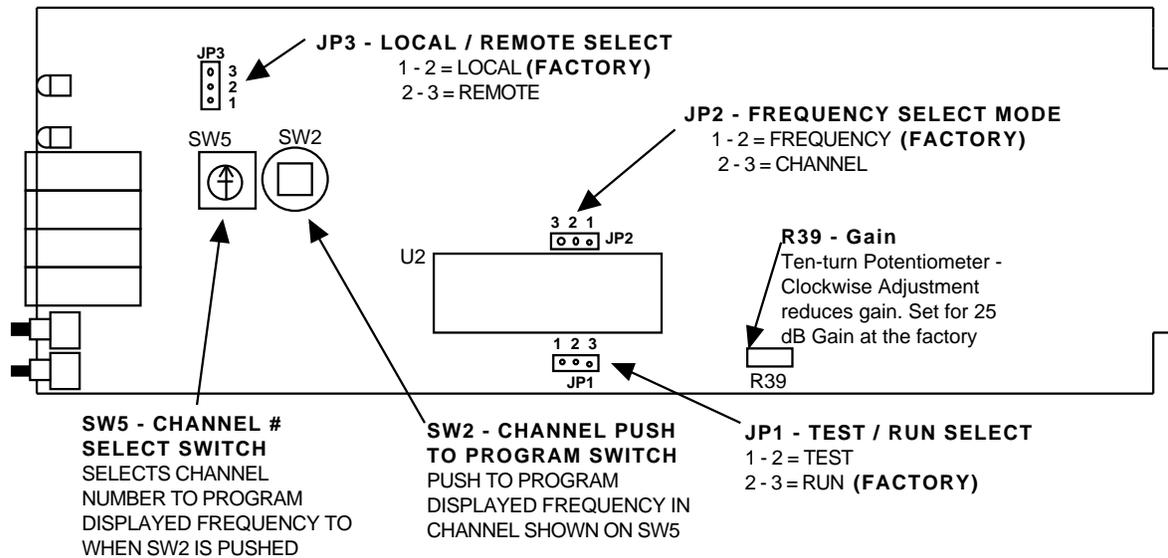
## 2089 INPUTS OUTPUTS AND INTERCONNECTIONS

**FIGURE 2.4 2089, 70175 AND 70176 Inputs and Outputs**

## 2.5 Installation / Operation -

### 2.5.1 Local Operation -

- 1.) If required, check that on-card jumpers are set to the desired positions (Figure 2.5)
- 2.) Make sure the 2000-01 power supply to the 2089-17 assemblies and the 2000-01 to 90-260 VAC, 50-60 Hz.
- 3.) Make sure the units are interconnected as shown at the bottom Figure 2.4.
- 4.) Connect a -30 to -60 dBm signal to RF In of 70175 (Figure 2.4)
- 5.) Set the desired frequency by pushing SW3 or SW4. If numbers 0 to 9 appear when pushing SW3 or SW4, the 2089-17 is set for the channel mode (with on-card jumper JP4, Figure 2.5). See section 2.5.2 for frequency setting information.
- 6.) Be sure DS1 and DS6 are off (Figure 2.3).
- 7.) Note the 56 MHz signal out of the 56 MHz output (J6) on Assembly 70176 (Figure 2.4).



**FIGURE 2.5 2089 On-Card Jumpers and Controls** (See Section 2.4 for instructions on removing the PCB from the extrusion)

**2.5.2 Frequency Setting, Frequency Mode** - In this mode, the frequency is selected by pushing the up and down switches (SW3, SW4) on the front panel until the desired frequency is indicated on the front on the display. The frequency displayed is the desired input frequency. EEROM U3 stores the last frequency set so in the event of power failure the downconverter will go to the frequency it was set to prior to the power outage. The front panel frequency setting switches increment or decrement the frequency in 1.0 MHz steps at approximately a 5 step per second rate. If the switch remains depressed for approximately ten steps, the rate increases by a factor of ten.

**2.5.3 Frequency Setting, Channel Mode** - A second tuning mechanism is channel selection. This is accomplished when the on board three-pin jumper (JP2) (Figure 2.5) is set to the “channel” position. Ten preset channels (0-9) can be selected as follows:

1. The 2089-17 PCB is removed from the extrusion (see section 2.4 for instructions) to access the channel selecting decimal switch (SW5) and the push to program switch (SW2) (Figure 2.5). With the display mode jumper (JP2) set in the frequency mode, the frequency set switches (SW3,SW4) are pushed to the frequency desired (Figure 2.2).
2. The decimal switch (SW5) is set to the channel number desired to be programmed (Figure 2.5).
3. Push programming button (SW2) to program the displayed frequency into that channel number (Figure 2.5).
4. The above steps are repeated for any additional channels that are desired to be programmed.
5. When finished, set JP2 (Figure 2.5) in the “Channel” position if this tuning mechanism is desired.

At the factory, channels zero through nine are programmed from 1700 to 1950 MHz in 25 MHz steps. When in the remote mode, either frequencies or channel numbers can be provided, but programming of the channels can only be done locally. The frequency display (DS2, DS3, DS4, DS5) in the channel mode displays the current channel number selected when SW3 or SW4 is pushed, and, if the switch is held for more than 2 seconds, the channel numbers are incremented or decremented depending on which button is pushed. The display indicates zero through nine for channel number, and, when the desired channel is selected and the button is released for one to two seconds, the frequency of that channel is shown on the frequency display and this frequency display remains until switch SW3 or SW4 is pushed again.

**2.5.4 Remote Operation** - Frequency control can be remotely commanded from an external (not supplied) PC using a simple DOS program. To place the 2089-17 in the Remote mode, place on-card jumper JP3 in the REMOTE (pins 2-3) position (Figure 2.5) and observe yellow LED DS1 (Figure 2.3) is on. Serial ASYNC (8N1) data is received via RS232C receiver U4 and sent via RS232C transmitter U13 at a 9.6kB/s data rate. When in the remote mode, either frequencies or channel numbers can be provided, but programming the frequencies of the channels can only be done locally.

**2.5.5 Remote Control DOS Program** - The 2089-17 remote control program (REMOTE.EXE, diskette supplied with the 2089-17) runs on an IBM compatible computer under DOS. The user is prompted to select one of three possible functions, which are:

1. Set Frequency
2. Set Channel
3. Set Gain (Not provided for the 2089-17)

When Set Frequency is selected, the up arrow and down arrow keys are used to increase or decrease the 2089's input frequency in 1.0 MHz increments.

When Set Channel is selected, the up arrow and down arrow keys are used to select one of ten possible channels. The frequency of each channel must be programmed locally, as described in section 2.5.3.

When Set Gain is selected, the up arrow and down arrow keys are used to select one of three possible gains.

The remote control program sends commands to the 2089-17 through pin 3 of the DB9 connector, J3 (Figure 2.3). Pin 3 is an RS-232 serial port set to accept 8N1 formatted data. Each command sent to the 2089-17 consists of an instruction byte followed by one or two bytes of data. The 2089-17 acknowledges receiving and successfully executing each remote control command by sending an **acknowledge byte** (9600 baud, 8N1 format) through pin 2 of the DB9 connector, J3.

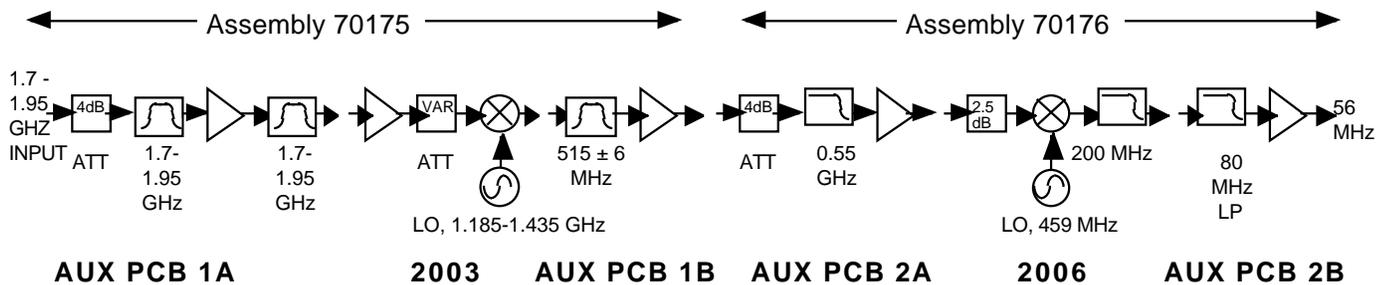
**The instruction byte to set input frequency** is 0A (hex). This byte must be followed by two data bytes of the desired input frequency in BCD format. The following list shows examples of this.

<u>input Frequency</u>	<u>Control Bytes (Acknowledge byte = 06 (hex))</u>
1700 MHz	0A (hex), 17 (hex), 00 (hex)
1867 MHz	0A (hex), 18 (hex), 67 (hex)
.	.
.	.
1950 MHz	0A (hex), 19 (hex), 50 (hex)

**The instruction byte to set channel** is 0B (hex). This byte must be followed by a data byte that selects one of 10 possible channels. The following list shows examples of this.

<u>Channel</u>	<u>Control Bytes (Acknowledge byte = 07 (hex))</u>
0	0B (hex), 00 (hex)
1	0B (hex), 01 (hex)
.	.
.	.
9	0B(hex), 09 (hex)

**3.0 Detailed Diagram, 2089-17 - See Figure 3.0**



**Figure 3.0 2089-17 Down Converter Detailed Block Diagram**