Instruction Manual

Model 3115-33-95

3 Channel Block Upconverter

October 2020, Rev. 0

CH 1 —— CH 2 ——
G1 = +11.5   G2 = +10.5
G3 = +14.5

1   2   3   4   A
                   B

ALARMS —— REMOTE POWER
CH 3 —— CH 4

MENU

EXECUTE

MODEL 3115
UPCONVERTER

CROSS TECHNOLOGIES INC.
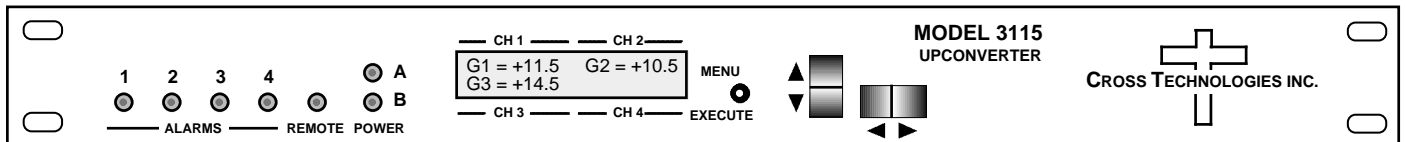
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INSTRUCTION MANUAL

Model 3115-33-95 Block Upconverter, 3 Channel

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Model 3115-33-95
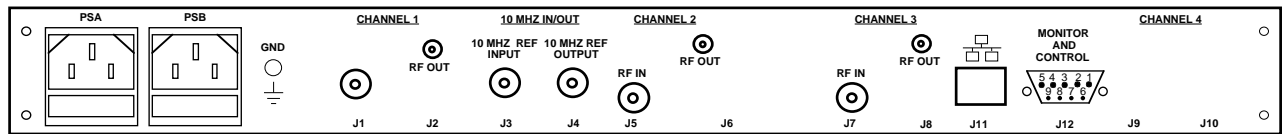## Block Upconverter 3 Channel

1.0 General

1.1 Equipment Description

The 3115-33-95 Block Upconverter, 3 Channel converts 0.95 - 1.95 GHz, maximum range, to three different RF bands (See Channel Chart) with **high side LOs (inverted spectrums)**. The L-band to RF gain is +15 dB, maximum. Connectors are SMA female for the RF OUT and BNC female for the L-band input for all three channels and external reference input and selected reference output. Front panel LEDs indicate Remote Operation, DC Power, and PLL Alarm. Gain and internal/external/Auto reference selection are controlled by front panel switches or remote M&C (via the RS-232C/485 connector or optional Ethernet) and shown on the LCD Display. In AUTO, the 10 MHz reference stays in external if the external level is in the +3 ±3 dBm range. It is powered by a 100-240 ± 10% VAC power supply, and in a 1RU rack mount chassis, 1.75" H X 19.0" W X 16.0" deep.
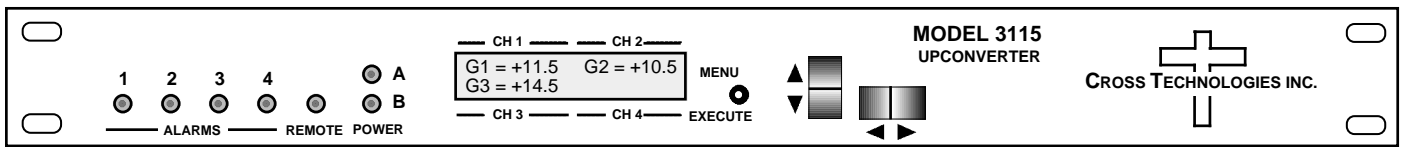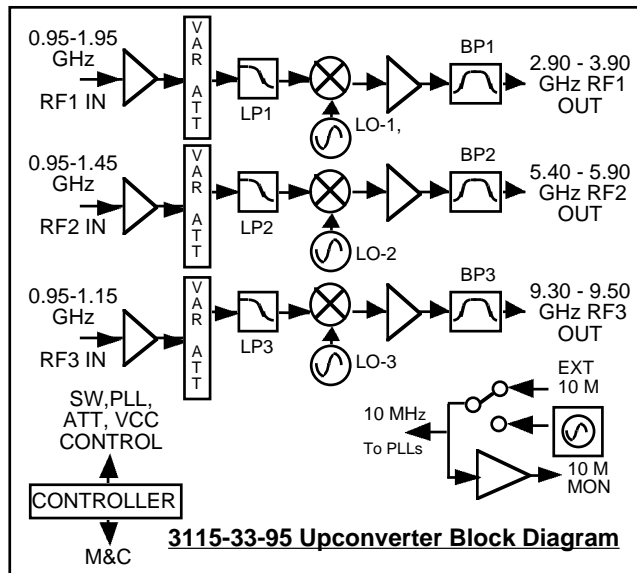

FRONT PANEL (3115-33-95 Block Upconverter)

Rear Channel 3115-33-95 - Three Channel shown with optional Ethernet and redundant power supply)

FIGURE 1.1   Model 3115-33-95 Front and Rear Panels

3115-33-95 Upconverter Block Diagram

1.2 Technical Specifications

TABLE 1.0	3115-33-95 Block Upconverter Technical Specifications**				
Input Characteristics					
Impedance/Return Loss	50Ω/14 dB (See Table 2.2 for connector options)				
Frequency	0.95 to 1.95 GHz				
Noise Figure, Max.	20 dB at maximum gain				
Input Level Range	-30 to -10 dBm				
Non-damage input	+10 dBm at max. gain				
Output Characteristics					
Impedance/Return Loss	50Ω / 14 dB				
Frequency	See Channel Chart				
Output Level Range	-15 to 0 dBm				
Output 1 dB compression	+10 dBm,min.at max. gain				
Channel Characteristics					
Gain at Fc	+15 ±3 dB max., (+15 to 0 dB variable in 0.5±0.5 dB steps)				
Spurious inband	> 50 dBc sig dep. or sig indep.. (G_{max})				
Spurious, Out of band	<-50 dBm, signal independent; fc ± 2 GHz				
Intermod 2 Tone	> 50 dBc two carriers ea at -5 dBm out, G_{max}				
Frequency Response	±1.5 dB, over RF band; ± 0.5 dB, 40 MHz BW				
Frequency Sense	Inverted Spectrum				
Lo Characteristics					
Lo Frequency	Channel Specific, See Channel Chart				
Frequency Accuracy	± 0.01 ppm max over temp internal reference; ext. reference input				
Phase Noise @ Freq F (Hz)	100	1k	10k	100k	1M
Specification dBc/Hz	-70	-70	-80	-100	-110
10 MHz Level (In or Out)	3 dBm, ± 3 dB, 50 ohms; works with 75 ohms				
Controls, Indicators					
Gain, 10M Frequency	LCD; PB switches or via M&C, (Ethernet optional)				
Remote Power, Mute	Yellow LED: Green LED: Yellow LED				
PLL Alarm	Red LED, External contact closure				
Other					
RF In, RF Out, Conn.	BNC 50Ω, SMA (female)				
10 MHz Connectors	BNC (female), 50 ohms: Works with 75 ohms				
Monitor/ Control Conn.	RS232C/485, DB9, Female; Ethernet (Optional), RJ45				
Size	1RU rack mount chassis, 1.75" high x 16.0" deep				
Power	100-240 ±10% VAC, 47- 63 Hz, 25 watts maximum				

Channel Chart - Frequencies, LOs

CHANNEL NO.	IN RANGE (GHz)	OUT RANGE (GHz)	LO* (GHz)
1	0.95-1.95	2.90-3.90	**4.85**
2	0.95-1.45	5.40-5.90	**6.85**
3	0.95-1.15	9.30-9.50	**10.45**
		* BOLD = INVERTED	

Available Options

```
 ┌─────────────────────────────────────────┐
 │              Options                     │
 │ R -  Redundant Power Supply              │
 │     Remote M&C Ethernet Options          │
 │ W8 - Ethernet w/web browser Interface    │
 │ W18 - Ethernet w/SNMP (and MIB) Interface│
 │ W28 - Ethernet w/direct TCP/IP Interface │
 │ W828 - W8 + W18 + W128                   │
 │                                          │
 │     Connector Options                    │
 │ S7 - 50Ω SMA (RF), 75Ω BNC (L-BAND)      │
 │ SS - 50Ω SMA (RF), 50Ω SMA (L-BAND)      │
 │  Contact Cross for other options         │
 └─────────────────────────────────────────┘
```
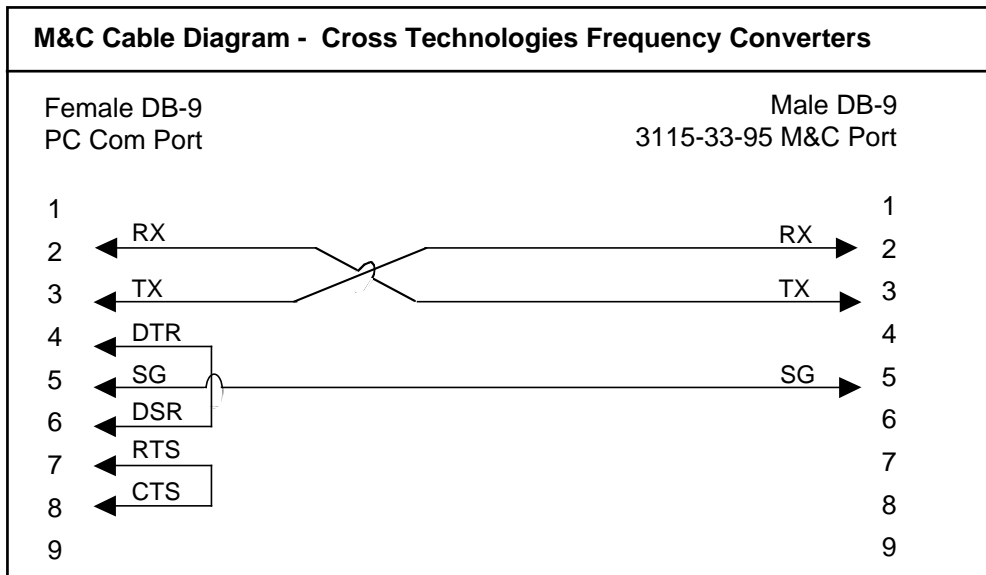
1.3 Monitor and Control Interface

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)

M&C Cable Diagram - Cross Technologies Frequency Converters

Female DB-9		Male DB-9
PC Com Port		3115-33-95 M&C Port

```
1                                              1
      RX                            RX
2   ◄─────────────╲    ╱─────────────►   2
      TX            ╲  ╱           TX
3   ◄────────────────╳────────────────►   3
      DTR           ╱  ╲                  4
4   ◄──┐
      SG                            SG
5   ◄──┤       ┌───────────────────────►   5
      DSR      │
6   ◄──┘       │                          6
      RTS      │
7   ◄──┐       │                          7
      CTS      │
8   ◄──┘                                  8

9                                              9
```

Connector: Rear panel, DB-9 female

J12 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 3115-33-95 and briefly describes them.

* **PLEASE NOTE:** Status requests of values specific to a channel
must be preceded by a *i where *i is the channel number.

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

TABLE 1.1 3115-33-95 Status Requests		
Command	**Syntax***	**Description**
Get channel gain	{aa*iSG}	Returns {*iSGxxx} where:
		• i = 1, 2, 3 or 4 designating the channel number
		• xxx = gain to nearest 1.0 dB (e.g., +14 = 14 dB)
Get reference status	{aaSE}	Returns {SExy} where :
		• x = setting: 0 for internal 10 MHz;
		1 for external 10 MHz; 2 for auto detect
		• y = currently selected in hardware :
		0 for internal 10 MHz; 1 for external 10 MHz
Get reference offset (Option O)	{aaSO}	Returns {SOxxxxx} where :
		• xxxxx = an offset amount between -2000 & +2000

TABLE 1.1 3115-33-95 Status Requests Continued		
Command	**Syntax***	**Description**
Get IP address	{aaSi}	Returns {Sixxx.xxx.xxx.xxx} where :
(If Ethernet Option, W8, W18, or W28, enabled)		• xxx.xxx.xxx.xxx = IP address
Get subnet mask	{aaSs}	Returns {Ssxxx.xxx.xxx.xxx} where :
(If Ethernet Option, W8, W18, or W28, enabled)		• xxx.xxx.xxx.xxx = subnet mask
Get alarm status	{aaSA}	Returns {SAabcd} where:
		• a=channel 1 alarm state (0 for alarm off; 1 for alarm on)
		• b=channel 2 alarm state (0 for alarm off; 1 for alarm on)
		• c=channel 3 alarm state (0 for alarm off; 1 for alarm on)
		• d=channel 4 alarm state (0 for alarm off; 1 for alarm on)
Get product/model info	{aaSV}	Returns {SV3115-33-95xxxver5.00} where:
		• 3115-33-95 = product model
		• xxx = list of options, if any
		•"ver"=separates model & options from firmware version
		• 5.00 = firmware version

(C) Commands

Table 1.2 lists the commands for the 3115-33-95 and briefly describes them. After a command is sent the 3115-33-95 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**)
> 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: Commands specific to a channel must be preceded
>   by *i where i is the channel number.

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

Table 1.2 3115-33-95 Commands		
Command	**Syntax***	**Description**
Set Channel Gain	{aa*iCGxx}	where i = :
		• 1, 2, 3 or 4 designating the channel number
		• xx = gain to nearest 1.0 dB (e.g., {1CG15} sets channel 1 gain to 15 dB.)
Spectrum invert on output	{aa*iCXx}	where i = :
		• 1, 2, 3 or 4 designating the channel number
		• x = 0 for non-invert; 1 for invert
10 MHz reference mode	{aaCEx}	where x = :
		• 0 for internal 10 MHz; 1 for external 10 MHz; 2 for auto detect
Reference offset/adjust	{aaCOxxxxx}	where x = :
(Option O)		• xxxxx = an offset amount between -2000 & +2000

1.4 Environmental Use Information

A. **Rack-Mounting** - To mount this equipment in a rack, please refer to the installation instructions located in the user manual furnished by the manufacturer of your equipment rack.

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

C. **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. (Maximum Recommended Ambient Temperature)

D. **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 units may be required.
   NOTE: Additional space between units is **recommended** if multiple Quad-channel units are to be stacked in the same rack.

E. **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.

F. **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).

G. **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 3115-33-95 consists of one RF/Controller PCB housed in a 1 RU (1 3/4 inch high) by 16 inch deep chassis. A switching, ±12, +24, +5 VDC power supply provides power for the assemblies. The 3115-33-95 can be secured to a rack using the 4 holes on the front panel. Figure 2.1 shows how the 3115-33-95 is assembled.
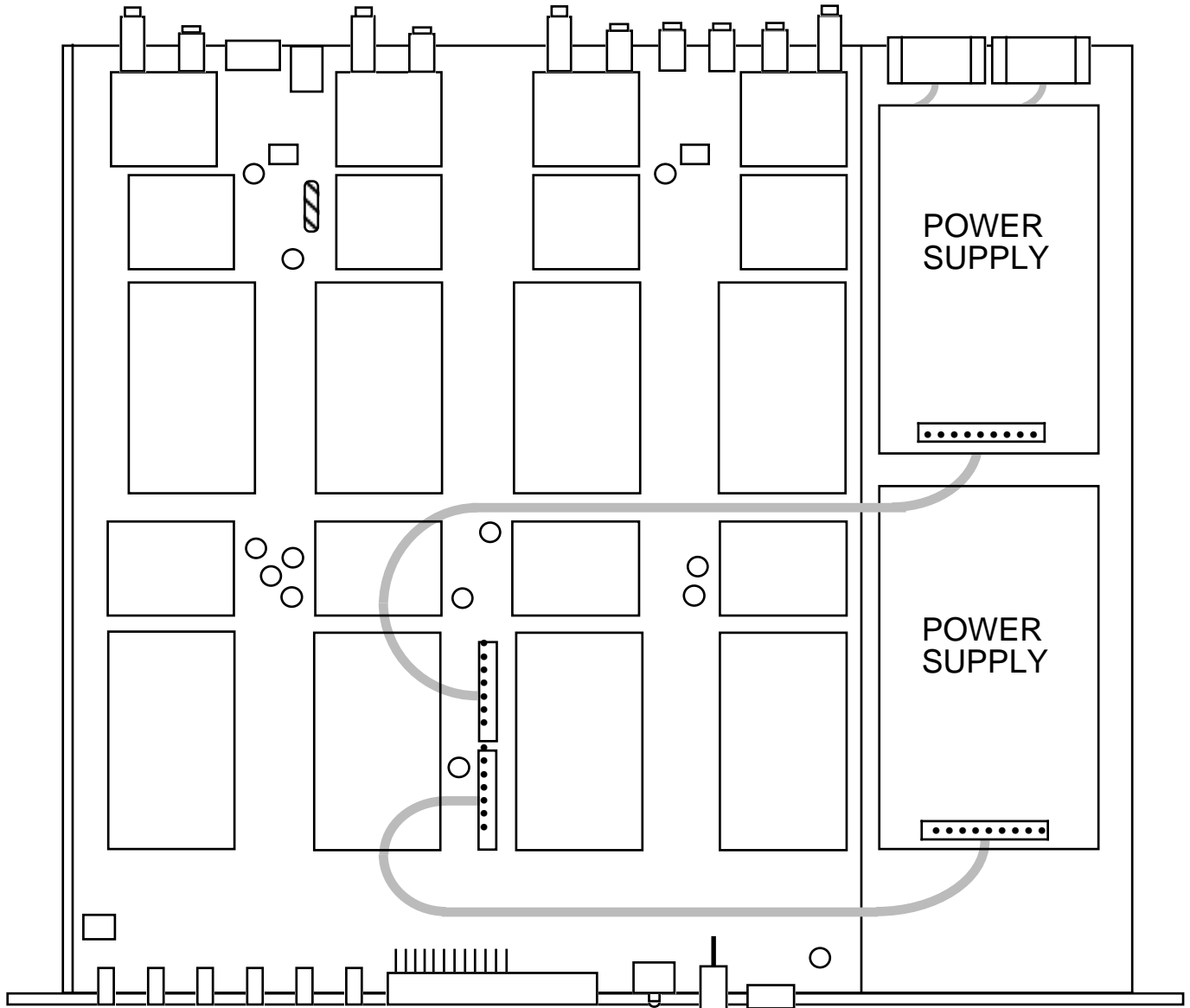

FIGURE 2.1   3115-33-95 Mechanical Assembly
(Shown with with redundant power supply

2.2 Rear Panel Input/Output Signals

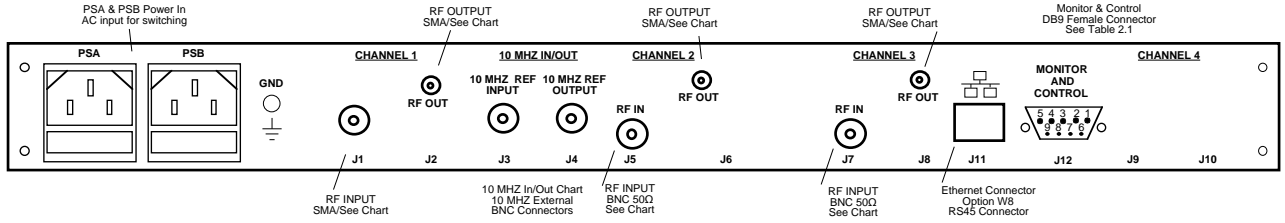Figure 2.2 shows the input and output connectors on the rear panel.

FIGURE 2.2   3115-33-95 Rear Panel I/Os
REAR PANEL (3115-33-95 Three Channel show above)

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

*Remote Serial Interface
        Interface: DB-9 female
        Protocol: RS-232C, 9600 baud rate, no parity, 8 data bits, 1 start bit, 1 stop bit.

TABLE 2.2 IF/RF Connector Options		
Option	RF IN	RF OUT
STD	BNC, 50Ω	Type SMA
S7	BNC, 75Ω	BNC, 75Ω
SS	SMA	SMA

x = # of Channels
Contact Cross Technologies for other options

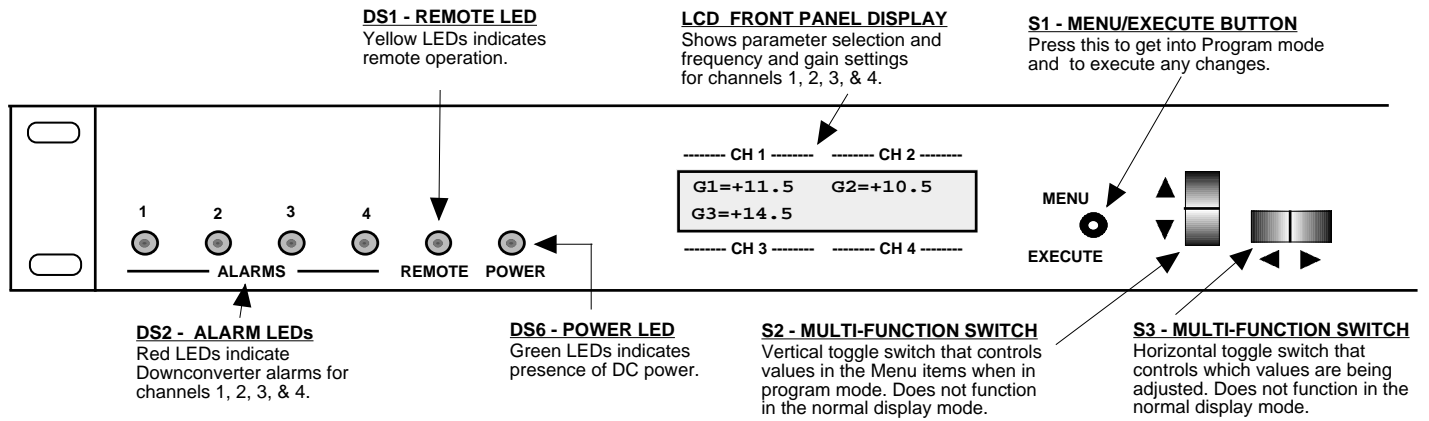**2.3 Front Panel Controls and Indicators -** The following are the front panel controls and indicators.

DS1 - REMOTE LED
Yellow LEDs indicates
remote operation.

LCD FRONT PANEL DISPLAY
Shows parameter selection and
frequency and gain settings
for channels 1, 2, 3, & 4.

S1 - MENU/EXECUTE BUTTON
Press this to get into Program mode
and to execute any changes.

```
-------- CH 1 --------   -------- CH 2 --------

G1=+11.5     G2=+10.5
G3=+14.5

-------- CH 3 --------   -------- CH 4 --------
```

MENU

EXECUTE

1   2   3   4

ALARMS   REMOTE   POWER

DS2 - ALARM LEDs
Red LEDs indicate
Downconverter alarms for
channels 1, 2, 3, & 4.

DS6 - POWER LED
Green LEDs indicates
presence of DC power.

S2 - MULTI-FUNCTION SWITCH
Vertical toggle switch that controls
values in the Menu items when in
program mode. Does not function
in the normal display mode.

S3 - MULTI-FUNCTION SWITCH
Horizontal toggle switch that
controls which values are being
adjusted. Does not function in the
normal display mode.

FIGURE 2.3   3115-33-95 Front Panel Controls and Indicators

2.4 Operation

2.4.1 Installing and Operating the 3115-33-95 Downconverter
1. Connect a -30 dBm to 10 dBm signal to RF IN, J1 (Figure 2.2).
2. Connect the RF OUT, J2, to the external equipment.
3. Connect 100-240 ±10% VAC, 47 - 63 Hz to AC on the back panel.
4. Set the input frequency (See Section 2.6 Menu Settings).
5. Set the gain for 0.0 to +30.0 dB (See Section 2.6 Menu Settings).
6. Be sure DS6 (green, DC Power, PSA, PSB) is on and DS2 (red, Alarm) is off (Figure 2.3).
7. <u>AC Fuse</u> **-** 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 2.4. There is a spare fuse in the near slot. If a fuse continues to open, the power supply is most likely defective.

FUSE DRAWER

SPARE FUSE

AC Fuse - 2 amp slow blow (Type T),
5 mm X 20 mm

INPUT ~	FUSE ▭
100-240± 10%VAC	TYPE T 2A GDC
47-63 Hz	**250 VOLT**
2A MAX	**FOR 100 - 240 V~**
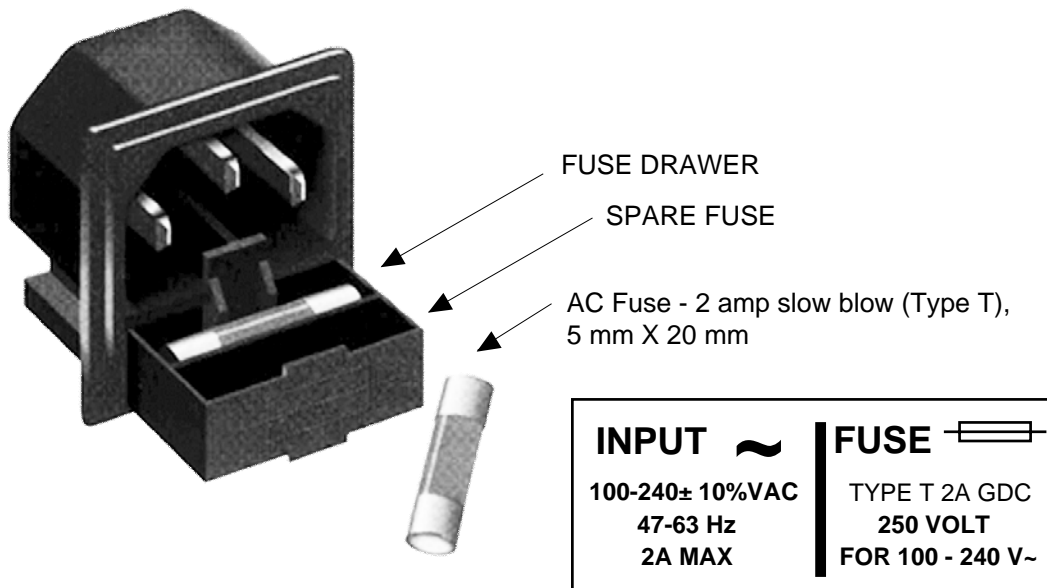
<u>FIGURE 2.4   Fuse Location and Spare Fuse</u>

2.5 Power On Settings

Figure 2.5 shows the various Front Panel LCD Displays that you will see during the Power Up sequence and the Settings modes. The first two displays (Power Up, displaying Model Number, Rev. Level and IP Address are only displayed briefly during the Power On sequence.

The Normal Display is what you will see while the unit is in normal operating mode.
When power is first applied, the LCD display goes through three steps.
      1. The model number and options will be displayed.
      2. The unit reads the IP address (if Ethernet option installed) and displays IP Address.
      3. The current frequency setting of each channel downconverter is displayed.

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

The Menu Displays are those displays you will see when making any Setting changes.

NOTE: Mode Settings and Values will be changed as you select them, but they will NOT BE SAVED if you do not select Save and YES. If you do not wish to save any settings you can either select Save and NO or you can NOT press the Menu/Execute switch and simply do nothing for approximately 30 seconds and the unit will return to the previously saved Mode and Value Settings.

The "**R**" shown on the menu is a Return setting that allows you to Stop and Save wherever you are in the Settings mode, without going through all the Menu screens.

2.5.1 Control Switches

      1. Menu/Execute - 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 (Figure 2.3).
      2. Horizontal Switch - This switch is mounted so its movement is horizontal and moves the cursor left or right (Figure 2.3).
      3. Vertical Switch - This switch is mounted so its movement is vertical and has two functions:
          a. During frequency, gain changes, the vertical movement will raise or lower the number in the direction of the arrows (Figure 2.3).
          b. For other functions such Mute on/off, the vertical switch will alternately turn the function on or off regardless of the direction operated.

2.5.2 Gain 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 30 seconds, and the system will return to the normal operating mode.
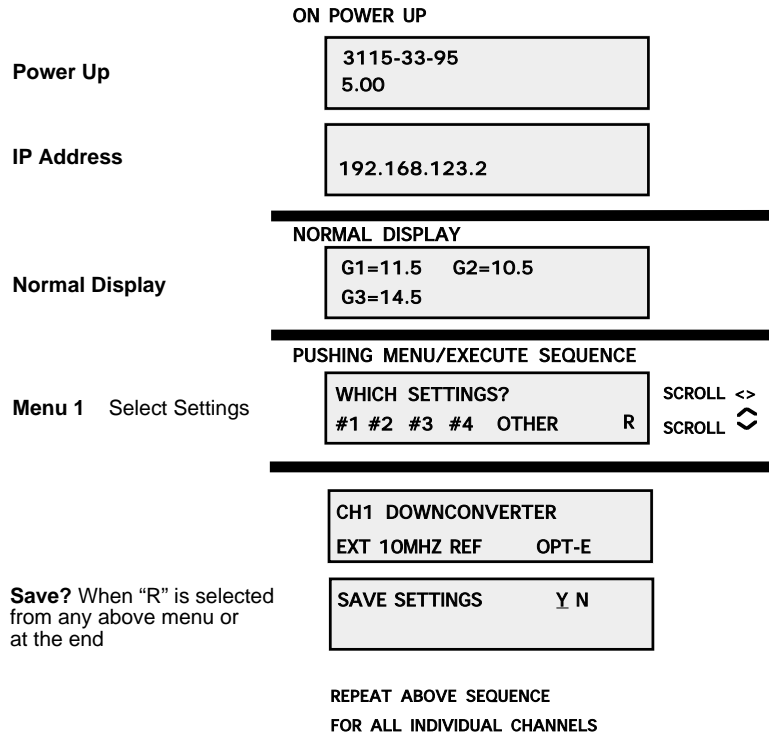
To change the DOWNCONVERTER GAIN:

>   Push the Menu/Execute switch to get to the gain setting.
>   See Figure 2.5 for the sequence of menu options.

>   **NOTE: 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.**

2.6 Menu Settings

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 30 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.

Alarm indications appear on the LEDs (See figure 2.3). An alarm condition will occur if any local oscillator phase lock loop (PLL) comes out of lock. The Remote LED will light when you select the Remote mode.

ON POWER UP

Power Up

```
3115-33-95
5.OO
```

IP Address

```
192.168.123.2
```

NORMAL DISPLAY

Normal Display

```
G1=11.5     G2=10.5
G3=14.5
```

PUSHING MENU/EXECUTE SEQUENCE

Menu 1 Select Settings

```
WHICH  SETTINGS?
#1 #2  #3  #4   OTHER      R
```
SCROLL <>
SCROLL ⌄⌃

```
CH1  DOWNCONVERTER
EXT 1OMHZ REF        OPT-E
```

Save? When "R" is selected from any above menu or at the end

```
SAVE SETTINGS          Y N
```

REPEAT ABOVE SEQUENCE
FOR ALL INDIVIDUAL CHANNELS

3.0 Ethernet Interface Installation and Operation (Option W8, W18 or W28)

This manual applies to Cross Technologies products equipped with a 10/100 Base-T compatible Ethernet interface for control and monitoring of its operating parameters. The following sections describe the operation and setup of those interfaces.   An HTML script interface allows the user to monitor and control the converter using a standard web browser. SNMP (Simple Network Management Protocol) is also supported. Contact *Cross Technologies* for the SNMP MIB file.

3.1 Connection
3.1.1 Direct Connection to a PC

For control from a local PC, attach the 3115-33-95 Ethernet port to the Ethernet network connector on the PC using a crossover RJ-45 cable.

3.1.2 LAN Connection
For LAN connections, attach the 3115-33-95 Ethernet port to the LAN using a normal RJ-45 cable. Use any PC on the LAN to connect to the 3115-33-95.

3.2 Ethernet Configuration
Each product must be configured with an appropriate IP address, Netmask, and Gateway assigned by your network manager. The 3115-33-95 is preset at the factory with a static address that is briefly displayed on the LCD Display during Power On Sequence (192.168.123.2 is the default). The device server in the 3115-33-95 has a built in HTTP based configuration manager that is used to configure network settings. To access the configuration manager open a web browser and enter the IP address of the product in the browser's address field.   The window shown in Figure 3.0 will appear. As delivered, there is no password set. Choose your user name and password here or leave those fields blank and click OK to proceed to the Configuration Manager web page screen, Figure 3.1.
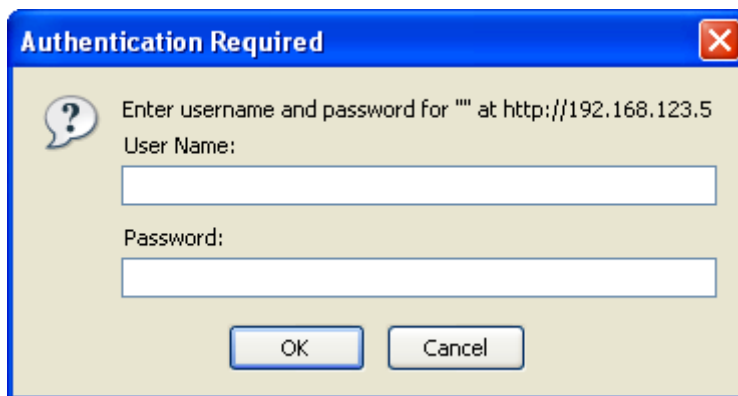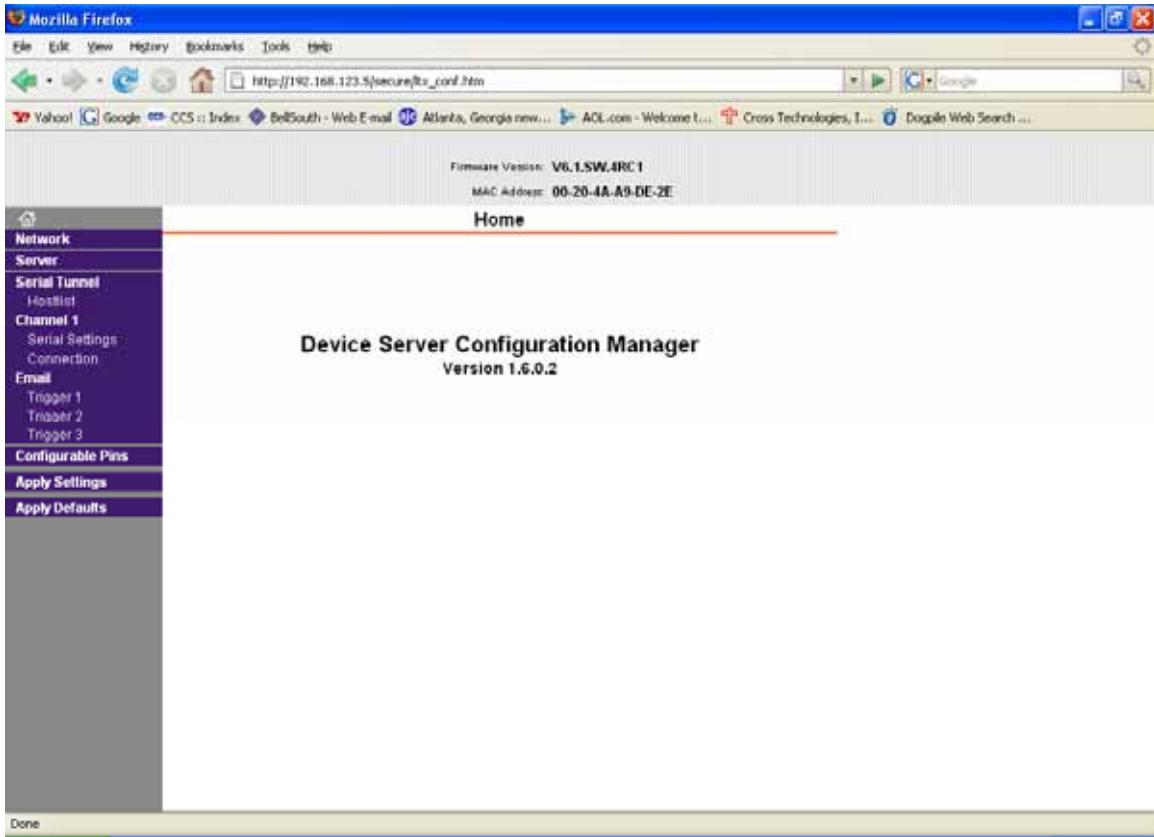

Figure 3.0:   Password Screen

Figure 3.1:   Configuration Manager Screen
(Example above shows Configuration Manger Screen for Model 3115-33-95)

Once logged in, you will be presented with the Configuration Manager web page. In the left frame of the configuration manager click on Network to display the Network Settings screen.   Enter the IP address, Subnet mask, and Gateway address with delimiter dots (example: 192.168.123.2 (Default)). Click "Apply Settings" in the left frame to apply the new settings in the network device.
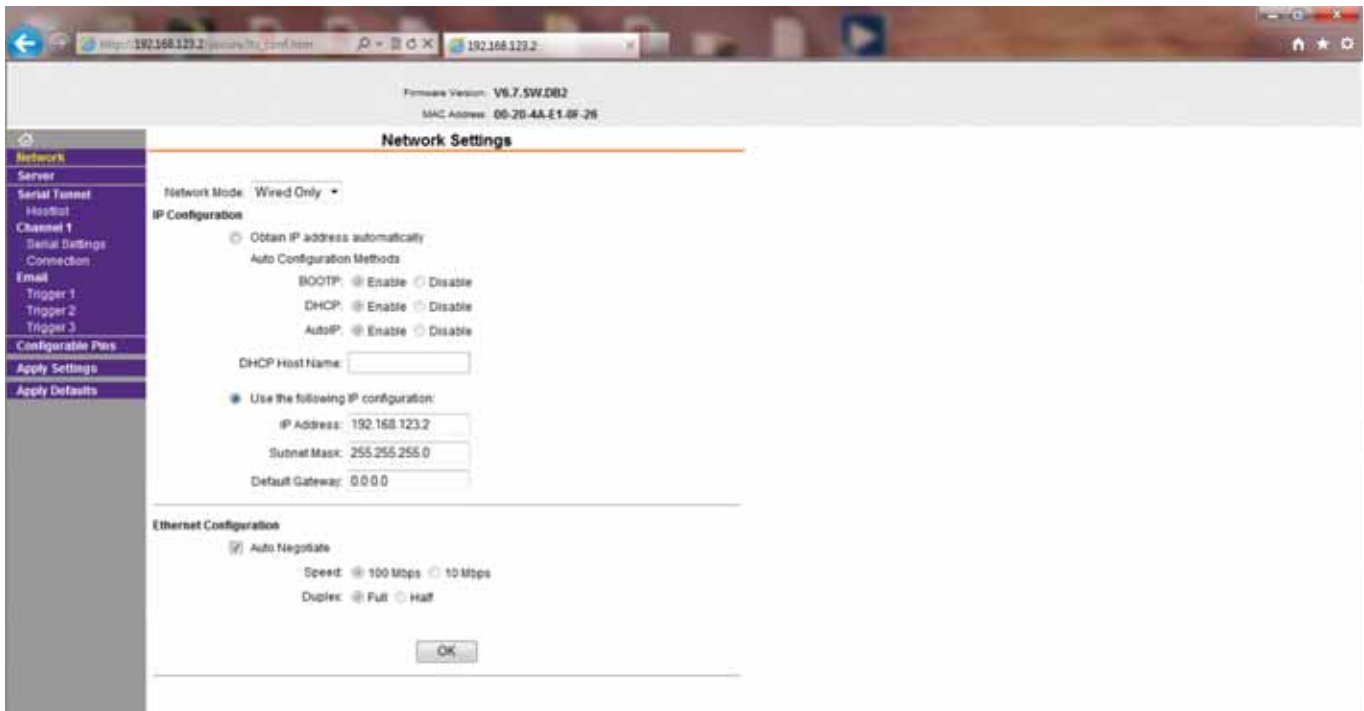
Figure 3.2: Network Settings Web Page Screen
(Example above shows Network Settings Screen for Model 3115-33-95)

3.3 Web Page M & C

Enter the following address in a web browser to access the M&C web page:

http://<ip address>/serial/0/setup.htm where <ip address>   is the IP address
of the 3115-33-95.

Figure 3.3 Model 3115-33-95 Web Page

3.4 SNMP Configuration

Setting of SNMP parameters such as Community Write and Community Read strings requires a Telnet®
connection to port 9999. The following instructions explain how to establish such a Telnet connection using
Windows XP's utility Hyper Terminal.

Start the Hyper Terminal application and select "New Connection" from the "File" drop down menu.
The next screen is a "Connect To" dialog box.

1. Enter the IP address of the 3115-33-95 in the "Host address:" field.

2. Enter 9999 in the "Port Number:" field.

3. Select TCP/IP (Winsock) from the "Connect using:" drop down menu.

Figure 3.4 shows an example of the Hyper Terminal settings required to access the SNMP configuration menu.
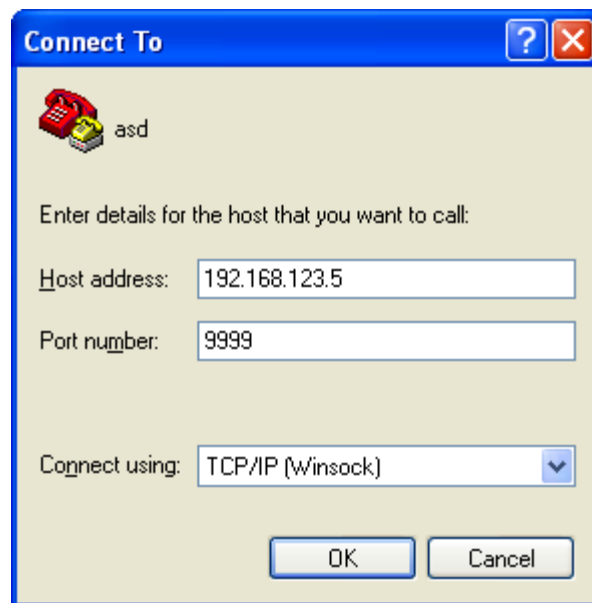

Figure 3.4:   Telnet® Settings in Hyper Terminal

Once the *Telnet* ® connection is established you will be prompted to "Press Enter for Setup Mode".
Press enter and a menu of device server configuration options will appear. Select menu item 3, "SNMP
configuration". You will be presented with a screen like shown in Figure 3.5. You will be prompted to
enter SNMP community read and write strings.

You may select either **Public** or **Private** SNMP community read and write strings.

If you select **Private** you must enter at least one (1) and up to three (3) IP addresses of SNMP managers that will access the unit.   This is required even though SNMP traps are not implemented. The unit will NOT process SNMP Set & Get commands if you do not enter least one (1) IP addresses of an SNMP manager.
If you select **Public**, access is allowed for any number of authorized IP addresses of SNMP Managers. It is not required to enter IP Addresses of SNMP Managers.
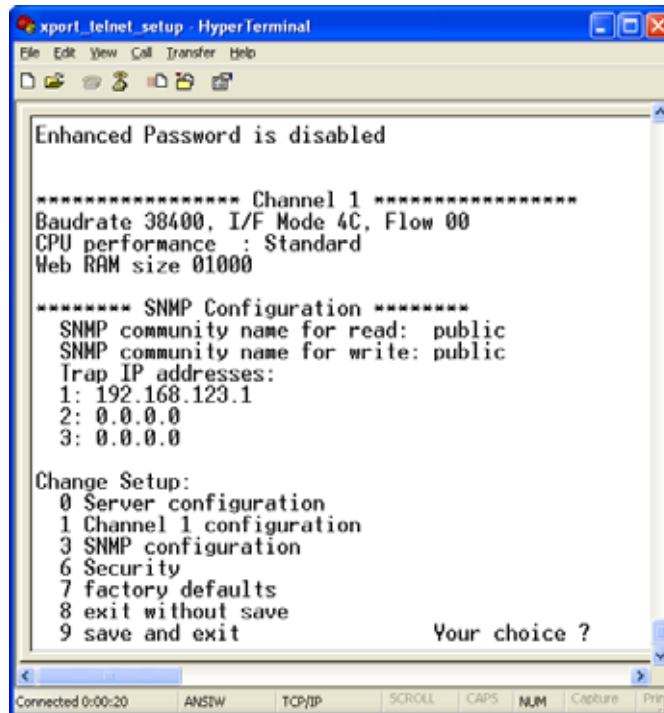

Figure 3.5:   Device Server Configuration Menu

Once you have completed you SNMP set up, select item #9, "SAVE AND EXIT"

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