Instruction Manual

Model 1586-06
RF Attenuator

May 2009   Rev A

```
  1      2      3      MODEL 1586
                       RF ATTENUATOR
 12.5   53.5   16.3                   CROSS TECHNOLOGIES INC.
 14.5   17.5   11.1
  4      5      6     EXECUTE              PS1   PS2
```
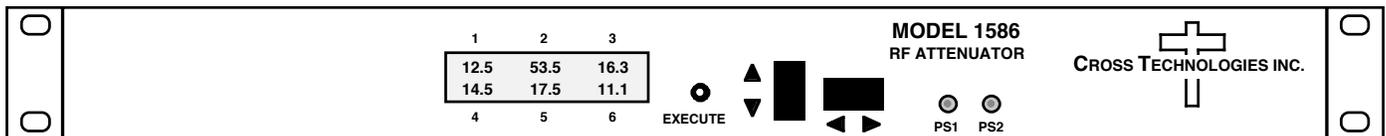
Data, drawings, and other material contained herein are proprietary to Cross Technologies, Inc.,
but may be reproduced or duplicated without the prior permission of Cross Technologies, Inc.
for purposes of operating the equipment.

When ordering parts from Cross Technologies, Inc., be sure to include the equipment
model number, equipment serial number, and a description of the part.

CROSS TECHNOLOGIES, INC.

6170 Shiloh Road
Alpharetta, Georgia 30005

(770) 886-8005
FAX (770) 886-7964
Toll Free 888-900-5588

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com

INSTRUCTION MANUAL

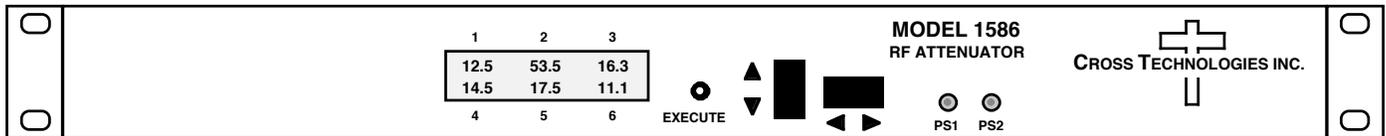## MODEL 1586-06 RF Attenuator

CROSS TECHNOLOGIES, INC.

6170 Shiloh Road
Alpharetta, Georgia 30005

(770) 886-8005
FAX (770) 886-7964
Toll Free 888-900-5588

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com

MODEL 1586-06 RF Attenuator

1.0 General

1.1 Equipment Description - The 1586-06 RF contains six General Microwave Model 3496H-64-4 11 Bit Digital PIN Attenuators and Local/Remote control circuitry to independently adjust each attenuator. Multi-function push button switches select the attenuation locally. Local operation starts when the Execute button is pushed. The upper left first digit of the first attenuator value is underlined and the Left/Right pushbutton switch is used to select the digit to be adjusted by using the Up/Down pushbutton switch. On completion of the attenuator value adjustments, the Execute button is pushed again to restore the operating mode to Remote (please note that all attenuator values are stored in real time as they are changed). When in Local control a time-out returns the mode to Remote if no activity is noted on any of the switches for 20 seconds. The attenuator values are stored in nonvolatile memory so these values remain when power is cycled off and on. Front panel LEDs provide indication of DC power (red/green). Each General Microwave Attenuator provides an attenuation range of 64 dB from 4 to 68 dB. Remote operation also controls each attenuator and allows status monitoring of attenuator settings and power supply alarms. Attenuator settings appear on the LCD display. Connectors are SMA, female for inputs and outputs and DB9 female for the RS422 remote control. The unit is powered by redundant 100-240 ±10% VAC power supplies, and mounted in a 1 3/4" X 19" X 19" rack mount chassis.

FRONT PANEL
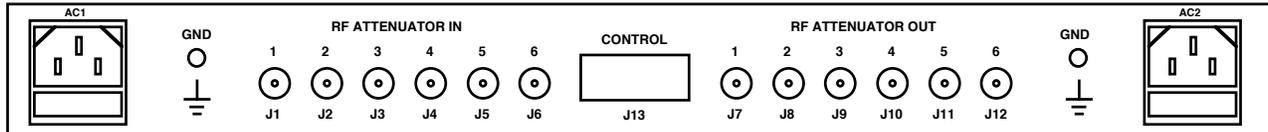
REAR PANEL

FIGURE 1.1 Model 1586-06 Front and Rear Panels

1.2 Technical Characteristics

TABLE 1.0 1586-06 RF Attenuator Specifications*

Input/Output Characteristics

Impedance/Return Loss	50 Ω /10 dB
Frequency	6 to 12 GHz
Level, maximum	+20 dBm
1dB compression	+10 dBm

Channel Characteristics

Attenuator range	4 to 68 dB
Frequency Response	
4 to 24 dB atten	±1.5 dB
25 to 44 dB atten	±2.0 dB
45 to 68 dB atten	±2.0 dB
Attenuator Accuracy	
4 to 24 dB atten	±0.5 dB
25 to 44 dB atten	±1.0 dB
45 to 68 dB atten	±1.5 dB
Temp Coefficient	±0.025 dB/°C

Controls, Indicators

Attenuator Selection	direct readout LCD; pushbutton switches or remote selection
Power Indicators	Red/Green LED (Alarm/Normal)
Remote	RS422, 9600 baud, no parity, 8 data bits, 1 start and stop bit

Other

RF Connectors	SMA (female)
Remote Connector	DB9 (female)
Size	19 inch, 1RU standard chassis 1.75" high X 19.0" deep
Power, Redundant	100-240 ±10% VAC, 47-63 Hz, 45 watts max

---

*-20°C to +55°C; 0% to 100% humidity (all based on Model 3496H-64 specifications); Specifications subject to change without notice

1.3 Monitor and Control Interface

A) Remote serial interface

Protocol - RS422, Asynchronous, 9600 baud rate, no parity, 8 data bits, 1 start bit, and 1 stop bit.

Connector - Rear panel, DB9 female

Pinouts (**RS422)**

Pin #	Function
1	TX Data +
2	Rx Data +
3	No Connection
4	No Connection
5	GND
6	TX Data -
7	Rx Data -
8	PS1 Alarm Relay: Closure to GND when Power Supply 1 Alarm
9	PS2 Alarm Relay: Closure to GND when Power Supply 2 Alarm

B) Commands - Table 1.1 lists the commands to Set Attenuation and Request Status for the 1586 and briefly describes them.

General Command Format - The general command format is {aCD...}#, where:
{ = start byte
a = address, one byte within the range 0X40 - 0X5F
C = 1 character, either C (command) or S (status)
D = 1 character or more of data (depends on command)
} = stop byte
= Check Sum (CheckSum = Mod[(char value - 32), 95] +32)

Table 1.1 1586 Commands/Status Request		
Command	Syntax	Description
Set Attenuation	{aCyxxx}#	where:
		• y = attenuator number, 1-6
		• xxx = 3 characters
		• Range: 040 to 680 (4.0 to 68.0 dB, 0.1 dB steps)
Command Status	{aS}#	Returns {aSbbbcccdddeeefffgggHJ} where:
		• bbb...ggg = Attenuator 1-6 setting (123=12.3dB)
		• HJ = Power Supply1, Power Supply2 Alarm bits (0=normal, 1=alarm)

C) Acknowledgement

After a command is sent the 1586 sends a return {aCy}# indicating the command has been received and executed and which attenuator was adjusted. If an invalid command is sent or an incorrect checksum is detected, no response is given.

2.0 Installation

2.1 Mechanical - The 1586-06 consists of one Controller PCB and six General Microwave Model 3496H-64-4 11 Bit Digital PIN Attenuators housed in a 1 RU (1 3/4 inch high by 19 inch deep) chassis. Two switching, ±15, +5 VDC power supplies provide redundant power for the assemblies. The 1586-06 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 1586-06 is assembled.
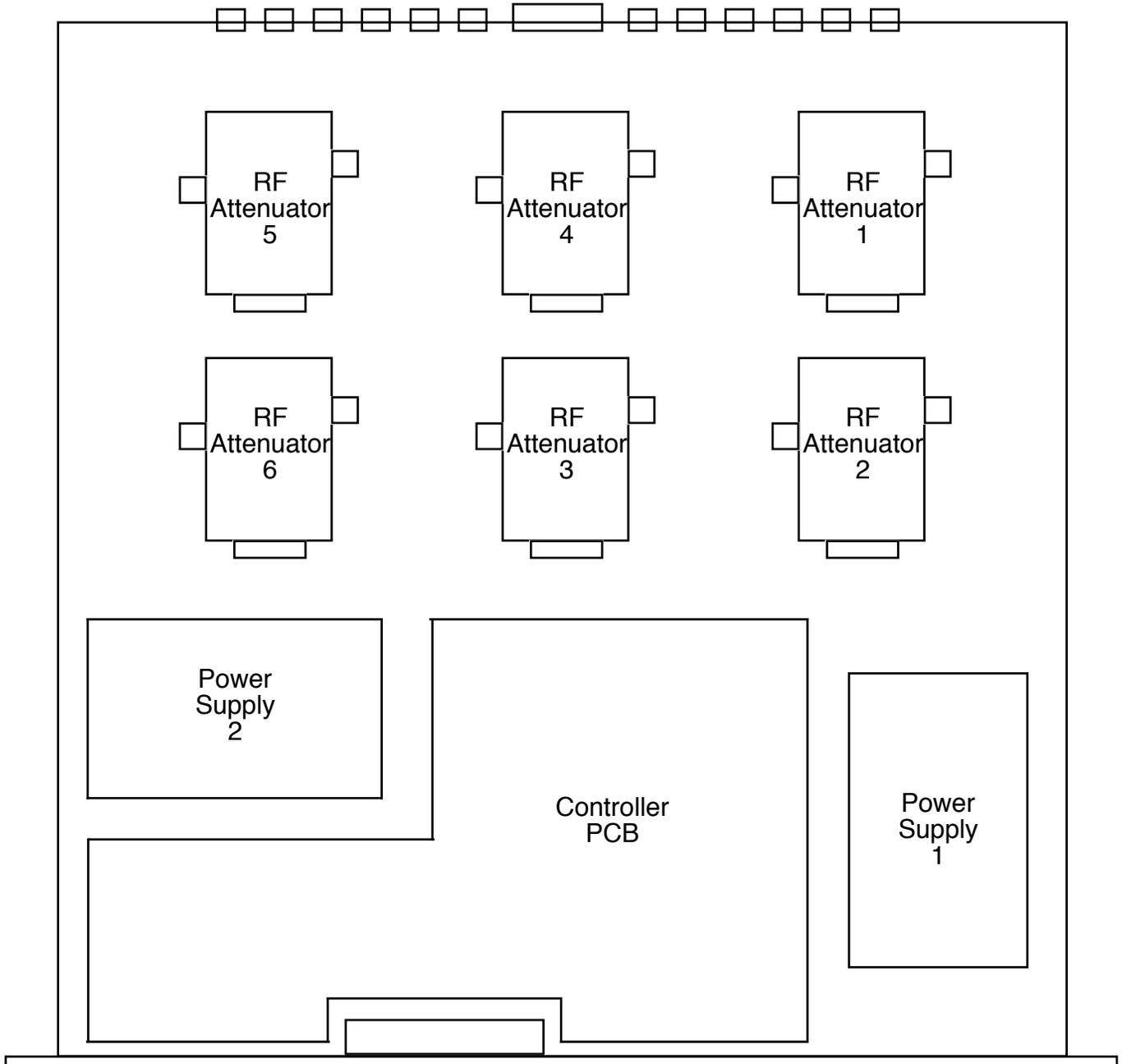
FIGURE 2.0 1586-06 Mechanical Assembly

2.2 Rear Panel Input/Output Signals - Figure 2.1 shows the input and output connectors on the rear panel.

AC1 - POWER IN
AC input for switching power supply. 100-240 ±10% VAC, 47-60 Hz.

J1, J2, J3, J4, J5, J6 - RF ATTENUATOR IN
6 - 12 GHz RF input, +20 dBm max, 50 ohms, SMA female connector.

AC2 - POWER IN
AC input for switching power supply. 100-240 ±10% VAC, 47-60 Hz.

J13 - CONTROL
DB9 female connector for remote control. see Table 2.1.

J7, J8, J9, J10, J11, J12 - RF ATTENUATOR OUT
6 - 12 GHz RF Output, +20 dBm max, 50 ohms, SMA female connector.

FIGURE 2.1 1586-06 Rear Panel I/O's

TABLE 2.1 J13 Pinouts (RS-422*)	
Pin	Function
1	TX Data +
2	RX Data +
3	No Connection
4	No Connection
5	GND
6	TX Data -
7	RX Data -
8	PS1 Alarm: closure to GND on Alarm
9	PS2 Alarm: closure to GND on Alarm

*Remote Serial Interface
Interface: DB-9 Male
Protocol: RS-422, Asynchronous, 9600 baud rate, no parity, 8 data bits, 1 start bit, 1 stop bit

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

LCD DISPLAY
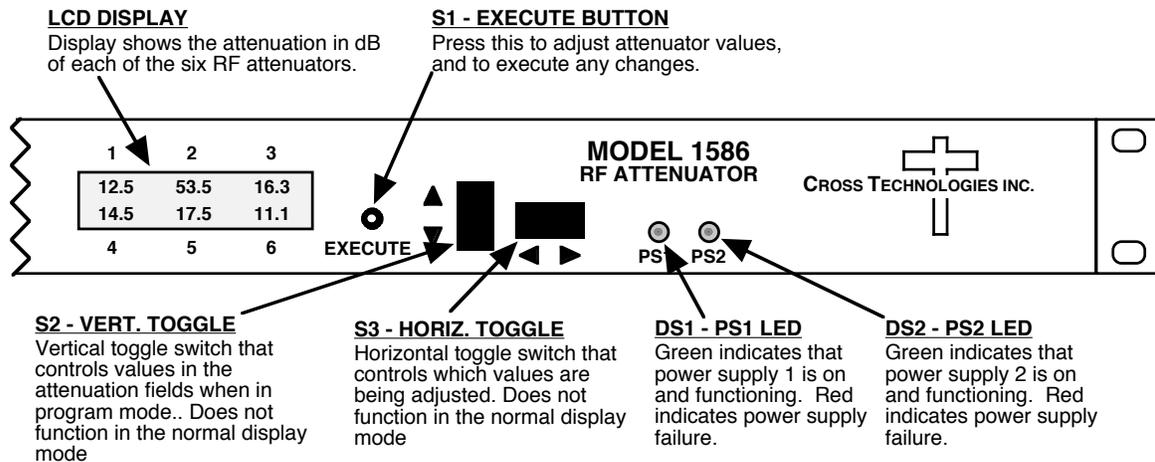Display shows the attenuation in dB of each of the six RF attenuators.

S1 - EXECUTE BUTTON
Press this to adjust attenuator values, and to execute any changes.

	1	2	3
	12.5	53.5	16.3
	14.5	17.5	11.1
	4	5	6

MODEL 1586
RF ATTENUATOR

CROSS TECHNOLOGIES INC.

S2 - VERT. TOGGLE
Vertical toggle switch that controls values in the attenuation fields when in program mode.. Does not function in the normal display mode

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

DS1 - PS1 LED
Green indicates that power supply 1 is on and functioning. Red indicates power supply failure.

DS2 - PS2 LED
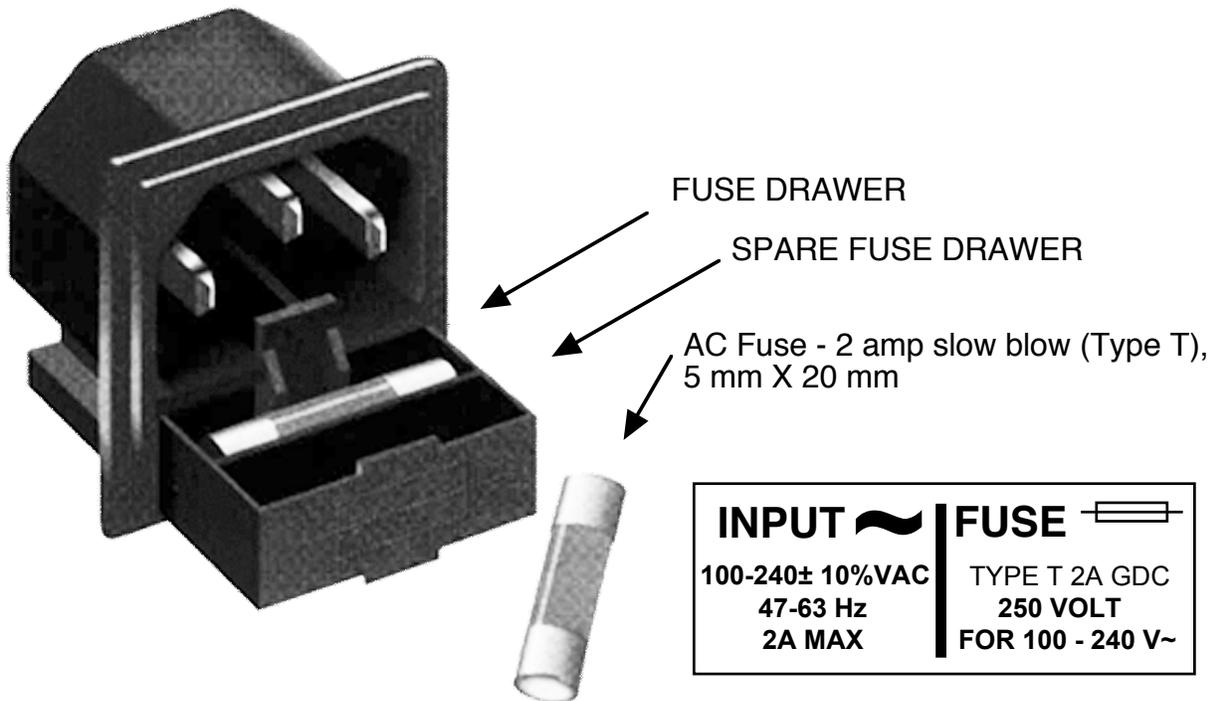Green indicates that power supply 2 is on and functioning. Red indicates power supply failure.

FIGURE 2.2 1586-06 Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 1586-06 RF Attenuator

1.) Connect +20 dBm max signal(s) to any or all of the six RF Attenuator Inputs, J1 - J6 (Figure 2.1).

2.) Connect the desired RF Attenuator Outputs, J7 - J12, to the external equipment (Figure 2.1).

3.) Connect 100-240 ±10% VAC, 47 - 63 Hz to AC1 and/or AC2 on the back panel.

4.) Set the desired attenuation for each attenuator (See Section 2.5 Menu Settings).

5.) Be sure DS1 and/or DS2 (DC Power) is green (Figure 2.2).

6.) **AC Fuses -** The fuses are 5 mm X 20 mm, 2 amp slow blow (Type T) and are inserted in the far slot in the drawer below the AC inputs 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.

FUSE DRAWER

SPARE FUSE DRAWER

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~

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 and the LCD display. All adjustments for the equipment are controlled by these components. Alarm indications appear on the LEDs (see figure 2.2).

All program changes must start with the operation of the Execute switch and will end either with the operation of the Execute switch or when the unit times out after approximately 20 seconds. Either way, all changes made to the RF attenuator values occur in real time and are stored immediately.

2.5.2. Power On Settings

NOTE: 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.

1	2	3
REV 1.00		
4	5	6

3.The present attenuation of each RF attenuator is shown.

1	2	3
12.5	53.5	16.3
14.5	17.5	11.1
4	5	6

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

2.5.3 Control Switches

1.Execute. Any change to the programming of the unit must be initiated by pressing the Execute switch. All changes made while in this mode occur in real time.

2.Cursor Movement - Horizontal Switch. This switch is mounted so its movement is horizontal and moves the cursor left or right.

3.Adjustment - Vertical Switch. This switch is mounted so its movement is vertical and will raise or lower the selected digit in the direction of the arrows.

2.5.4 Attenuation Changes

All changes made to the attenuations of the six RF attenuators occur in real time. If you change an attenuator's value, it changes immediately and is saved at the same time.

To change the attenuation:

1.Press the Execute switch to edit the RF attenator values. The cursor will be placed at the first digit of the first attenuator as shown:

```
    1           2           3
 ┌──────────────────────────────┐
 │  12.5       53.5       16.3   │
 │  14.5       17.5       11.1   │
 └──────────────────────────────┘
    4           5           6
```

Pressing the Up/Down switch up will change the selected attenuator digit and toggle the display to:

```
    1           2           3
 ┌──────────────────────────────┐
 │  22.5       53.5       16.3   │
 │  14.5       17.5       11.1   │
 └──────────────────────────────┘
    4           5           6
```

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

```
    1           2           3
 ┌──────────────────────────────┐
 │  22.5       53.5       16.3   │
 │  14.5       17.5       11.1   │
 └──────────────────────────────┘
    4           5           6
```

NOTE: ANY ATTENUATION CHANGES THAT ARE MADE TAKE EFFECT IMMEDIATELY.
When the display indicates the value desired either push the Execute switch or simply wait for the unit to time out to exit Execute mode.

2.5.5 Alarm Indications

An alarm condition will occur if either power supply fails to supply DC voltage to the controller circuit board. The corresponding power supply LED will turn red on alarm.

2.6 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.

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 unit may be required.

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.

CROSS TECHNOLOGIES, INC.

6170 Shiloh Road
Alpharetta, Georgia 30005

(770) 886-8005
FAX (770) 886-7964
Toll Free 888-900-5588

WEB www.crosstechnologies.com
E-MAIL info@crosstechnologies.com