# S7720AD-A4-LTC
# Serial Digital Audio De-embedder
# And VITC to LTC Translator
# Instruction Manual



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# INFORMATION TO USERS IN EUROPE

## NOTE

### CISPR 22 CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the European Union EMC directive. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

# INFORMATION TO USERS IN THE U.S.A.

## NOTE

### FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## WARNING

Changes or Modifications not expressly approved by Evertz Microsystems Ltd. could void the user's authority to operate the equipment.

Use of unshielded plugs or cables may cause radiation interference. Properly shielded interface cables with the shield connected to the chassis ground of the device must be used.

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# REVISION HISTORY

| REVISION | DESCRIPTION | DATE |
|---|---|---|
| 1.0 | First Release | Mar 03 |

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# 1. OVERVIEW

The S7720AD-A4-LTC Audio De-embedders extract embedded audio as specified by SMPTE 272M from a 270 Mb/s serial digital video signal. In addition the S7720AD-A4-LTC has the ability to read vertical interval time code (D-VITC) from the SDI video and convert it to linear time code (LTC).

SMPTE 272M allows for up to four groups (4 channels/group) to be embedded within a serial digital signal. The S7720AD-A4-LTC can de-embed one audio group onto two balanced AES outputs and 4 balanced analog audio outputs.

**Features:**

- Front panel LEDs indicating module status, video presence, selected audio group data is present
- LED indication for the presence of each of the 4 audio groups within the input video
- Audio group selection via card edge DIP switches
- 4 balanced audio channel outputs or 3 balanced audio an one balanced LTC (DIP Switch selectable)
- DIP switch selection of VITC reader line

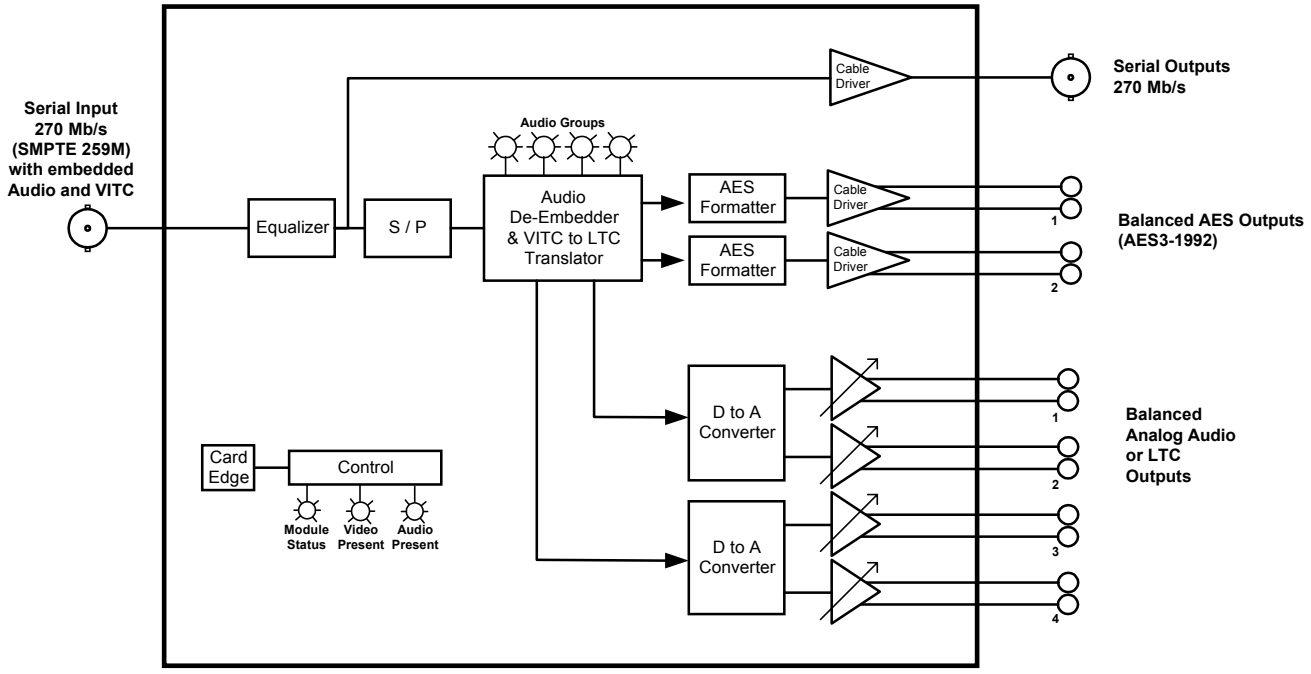


**Figure 1: 7720AD-A4-LTC Block Diagram**

# 2. INSTALLATION

The S7720AD-A4-LTC module comes in the 7700 series standalone enclosure. The S7720AD-A4-LTC module comes with an external 12 VDC power adapter that plugs into your local power mains. The rear plate of the enclosure has 2 BNC connectors, a 6 pin terminal strip and a 12 pin terminal strip. The rear plate also has a DC power jack and a 9 pin female D connector that is used for upgrading the module firmware.

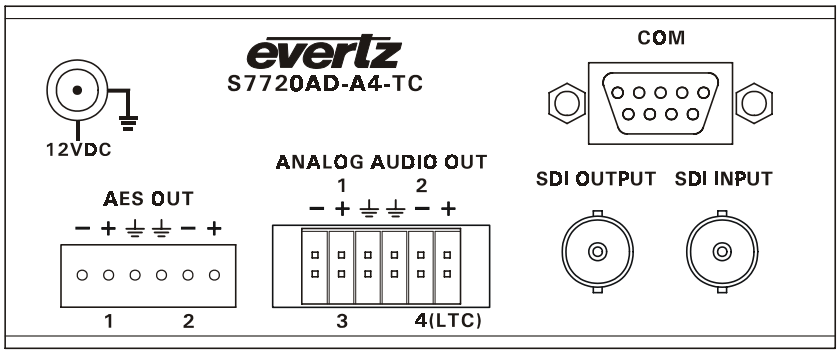


**Figure 2: S7720AD-A4-LTC Rear Panel**

## 2.1. SDI VIDEO CONNECTIONS

**SDI INPUT** This BNC connector is for 10-bit serial digital video signals with embedded audio compatible with the SMPTE 259M standard.

**SDI OUTPUT** This BNC connector is a serial component video output that contains an equalized copy of the input video.

## 2.2. AES AUDIO CONNECTIONS

This 6 pin terminal block contains balanced AES that has been de-embedded from the SDI video. The output audio cables can be secured into the removable portion of the terminal strips using a small screwdriver. The removable part of the terminal strip is then inserted into the rear panel.

**AES OUTPUT 1** AES audio output from channels 1 and 2 of the audio group selected by DIP switches 1 and 2 for de-embedding.

**AES OUTPUT 2** AES audio output from channels 3 and 4 of the audio group selected by DIP switches 1 and 2 for de-embedding.

## 2.3. ANALOG AUDIO AND LTC CONNECTIONS

This 12 pin terminal block contains balanced analog audio that has been de-embedded from the SDI video. The output audio cables can be secured into the removable portion of the terminal strips using a small screwdriver. The removable part of the terminal strip is then inserted into the rear panel.

**ANALOG OUTPUT 1 to 4** Analog audio output from channels 1 to 4 of the audio group selected by DIP switches 1 and 2 for de-embedding.

Analog output 4 can also be selected as a LTC output from the D-VITC being read from the SDI video. (See section 5.2)

### 2.4. POWER

The S7720AD-A4-LTC comes with an auto-ranging DC voltage adapter that automatically senses the input voltage. Power should be applied by connecting a 3-wire grounding type power supply cord to the power entry module on the DC voltage adapter. The power cord should be minimum 18 AWG wire size; type SST marked VW-1, maximum 2.5 m in length. The DC cable of the voltage adapter should be connected to the DC power jack on the S7720AD-A4-LTC module rear panel.


The S7720AD-A4-LTC is fitted with an internal auto-resetting fuse. To reset the fuse, disconnect the DC power source for 30 seconds and then reconnect it to reapply power to the unit.

## 3. SPECIFICATIONS

### 3.1. SERIAL VIDEO INPUT

**Standard:** SMPTE 259M C – 525 and 625 component.
**Connector:** 1 BNC per IEC 169-8
**Equalization:** Automatic 300m @ 270 Mb/s with Belden 8281 or equivalent cable
**Return Loss:** > 15 dB up to 540 Mb/s

### 3.2. SERIAL VIDEO OUTPUTS

**Standard:** same as input - equalized
**Connectors:** 1 BNC per IEC 169-8
**Signal Level:** 800mV nominal
**DC Offset:** 0V ±0.5V
**Rise and Fall Time:** 740ps nominal
**Overshoot:** <10% of amplitude
**Return Loss:** > 15 dB up to 270 Mb/s

### 3.3. BALANCED AES AUDIO OUTPUTS

**Number of Outputs:** 2
**Standard:** AES3-1992 balanced AES
**Connectors:** 6 pin removable terminal strip
**Sampling Rate**: 48 kHz
**Signal Level:** 5V p-p
**Impedance:** 110 Ohms

### 3.4. ANALOG AUDIO OUTPUT

**Number of Outputs:** 4
Output 4 is used for LTC when VITC reader is enabled
**Type:** Balanced analog audio
**Connector:** 12 pin removable terminal strip
**Output Impedance:** 66Ω
**Signal Level:** 0dB FS =>8 to 24dBu into 10 kΩ loads (user settable)
0dB FS =>8 to 22dBu into 600 Ω loads (user settable)
**Frequency Response:** < ± 0.1dB (20Hz to 20kHz)
**THD+N:** > 90dB RMS @ 1kHz, with 24dBu output
> 100dB RMS @ 20Hz to 20kHz, with 24dBu output
**Crosstalk isolation:** > 100dB RMS (20Hz to 20kHz)

### 3.5. VITC READER

**Standard:** SMPTE 12M, SMPTE 266M
**Reader Line Range:**
**525 line video:** 10 to 31
**625 line video:** 6 to 31

### 3.6. LINEAR TIME CODE OUTPUT

**Standard:** SMPTE 12M
**Rate:**
**525 line video:** 29.97 Frames per second
**625 line video:** 25 Frames per second
**Number of Outputs:** 1 (when VITC reader is enabled)
**Type:** Balanced
**Connector:** 4 pins on 12 pin removable terminal strips
**Output Impedance:** 66Ω balanced
**Signal Level:** 1.6 volts p-p nominal

### 3.7. SYSTEM PERFORMANCE

**Deembedding Latency:**
**SDI to AES:** 1.35 msec (7720AD-A4)
**SDI to Analog:** 2.25 msec

### 3.8. ELECTRICAL

**Voltage:** + 12VDC (auto ranging 100-240 VAC to 12 VDC power adapter provided)
**Power:** 12 watts
**EMI/RFI:** Complies with FCC Part 15, class A and EU EMC directive.

### 3.9. PHYSICAL

**Dimensions:** 14 " L x 4.5 " W x 1.9 " H
(355 mm L x 114 mm W x 48 mm H)
**Weight:** approx. 1.5 lbs. (0.7 Kg)

# 4. STATUS INDICATORS

The location of the status LEDs is shown in Figure 3.

## 4.1. MODULE STATUS LEDS

**MODULE OK** This Green LED will be On when the module is operating properly

**LOCAL FAULT** This Red LED makes it easy to identify one module in a frame that is missing an essential input or has another fault.

The LED will blink on and off if the microprocessor is not running.

The LED will be on solid when input video is lost, the selected audio group is missing or has DBN errors, or there is a fault in the module power supply.

**VIDEO PRESENT:** This Green LED will be On when there is a valid video signal present at the module input.

**AUDIO PRESENT:** This Green LED will be On if the audio group(s) selected is present and free from DBN errors.

## 4.2. AUDIO GROUP STATUS LEDS

Four LEDs located on the lower half (opposite the DIP switch) indicates the presence of the four audio groups as shown below. Audio Group LED 1 is located near the center of the printed circuit board.

| Audio Group LED | Color | Audio Group Status |
|---|---|---|
| 1 | Off | Group 1 embedded audio is not present on the video input. |
| | Green | Group 1 embedded audio is present on the video input. |
| 2 | Off | Group 2 embedded audio is not present on the video input. |
| | Green | Group 2 embedded audio is present on the video input. |
| 3 | Off | Group 3 embedded audio is not present on the video input. |
| | Green | Group 3 embedded audio is present on the video input. |
| 4 | Off | Group 4 embedded audio is not present on the video input. |
| | Green | Group 4 embedded audio is present on the video input. |

**Table 1: Audio Group Status LEDs**

The audio group LEDs are also used in conjunction with the pushbutton and toggle switch to allow the user to adjust the volume level of each of the 4 analog outputs. See section 0 for information on adjusting the analog volume levels.

# 5. CARD EDGE CONTROLS

An 8 position DIP switch gives the user control over the de-embedder. The ON position is closest to the PCB. Table 2 gives an overview of the DIP switch functions. Sections 5.1 to 5.3 show the assigned DIP switch functions. There is also a toggle switch and pushbutton that are used to set the volume level for the analog outputs.

In order to gain access to these controls you will need to remove the front cover. Turn the two captive screws located on the front panel counter clockwise several turns until they release completely from the top cover. Carefully remove the front cover. To replace the front cover, align the two captive screws with the threaded inserts of the top cover. Make sure that the everlz is at the top. Turn the two captive screws clockwise several turns until they are finger tight.

| DIP Switch | Function |
|---|---|
| 1 | AES 1 and AES 2 Group Selection |
| 2 | |
| 3 | VITC Reader Line Select |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | Analog Audio Volume Adjust Enable |

**Table 2: DIP Switch Functions**

## 5.1. SELECTING THE AUDIO GROUP THAT WILL BE DE-EMBEDDED

The SMPTE 272M standard permits up to 4 groups of 4 audio channels to be embedded into the 270 Mb/s video bitstream.

The S7720AD-A4-LTC de-embeds one group of audio (selected by switches 1 and 2) onto the AES and analog outputs.

| DIP Switch | | Audio Group Output on AES and Analog Outputs |
|---|---|---|
| 1 | 2 | |
| Off | Off | 1 |
| Off | On | 2 |
| On | Off | 3 |
| On | On | 4 |

**Table 3: Audio Group Switch Settings**

## 5.2. CONTROLLING THE VITC READER AND LTC TRANSLATOR (SETTING THE VITC READER LINE NUMBER)

Switches 3 to 7 are used to select the line that the VITC reader will recover vertical interval time code from. When switches 3 to 7 are set to a valid line as shown in Table 4 the VITC reader will be enabled for reading on the selected line and analog audio output 4 will be used to output LTC that is slaved to the decoded VITC. When switches 3 to 7 are all Off the VITC reader will be disabled and analog audio output 4 will be used to outputting the audio from channel 4.

| Dip Switch | Line Selected |
|---|---|

| 3 | 4 | 5 | 6 | 7 | 525 Video | 625 Video |
|---|---|---|---|---|---|---|
| Off | Off | Off | Off | Off | Disabled | Disabled |
| Off | On | On | Off | Off | Disabled | 6 |
| On | On | On | Off | Off | Disabled | 7 |
| Off | Off | Off | On | Off | Disabled | 8 |
| On | Off | Off | On | Off | Disabled | 9 |
| Off | On | Off | On | Off | 10 | 10 |
| On | On | Off | On | Off | 11 | 11 |
| Off | Off | On | On | Off | 12 | 12 |
| On | Off | On | On | Off | 13 | 13 |
| Off | On | On | On | Off | 14 | 14 |
| On | On | On | On | Off | 15 | 15 |
| Off | Off | Off | Off | On | 16 | 16 |
| On | Off | Off | Off | On | 17 | 17 |
| Off | On | Off | Off | On | 18 | 18 |
| On | On | Off | Off | On | 19 | 19 |
| Off | Off | On | Off | On | 20 | 20 |
| On | Off | On | Off | On | 21 | 21 |
| Off | On | On | Off | On | 22 | 22 |
| On | On | On | Off | On | 23 | 23 |
| Off | Off | Off | On | On | 24 | 24 |
| On | Off | Off | On | On | 25 | 25 |
| Off | On | Off | On | On | 26 | 26 |
| On | On | Off | On | On | 27 | 27 |
| Off | Off | On | On | On | 28 | 28 |
| On | Off | On | On | On | 29 | 29 |
| Off | On | On | On | On | 30 | 30 |
| On | On | On | On | On | 31 | 31 |

**Table 4: VITC Reader Line Select Switch Settings**

## 5.3. ADJUSTING THE VOLUME LEVEL ON THE ANALOG OUTPUTS

The toggle switch and pushbutton on the card edge are used to adjust the volume control of the analog outputs individually.

**The level of analog output 4 does not affect the LTC level when the VITC reader is enabled.**

When DIP switch 8 is Off, volume level adjustments are disabled to prevent accidental changes. When DIP switch 8 is On the user can adjust the volume of each of the analog audio outputs.

The three position, return to center toggle switch is used in conjunction with a momentary pushbutton to adjust the level of the outputs. The Audio Group LEDs, located on the lower end of the module (opposite the DIP switch) are used to indicate when the module is in volume level adjust mode and which output is being adjusted. When one of the LED's is flashing this indicates that you are adjusting the level of the respective channel as shown in Table 5.

| Audio Group LED | Color | Audio Group Status |
|---|---|---|
| **1** | Flashing | Analog Output 1 level can be adjusted with toggle switch. |
| **2** | Flashing | Analog Output 2 level can be adjusted with toggle switch. |
| **3** | Flashing | Analog Output 3 level can be adjusted with toggle switch. |
| **4** | Flashing | Analog Output 4 level can be adjusted with toggle switch. |

**Table 5: Analog Audio Level Adjustment LEDs**

To enter the volume control mode, press the pushbutton. The Output 1 Volume level adjust LED will start flashing, indicating that the toggle switch can be used to adjust the volume level of analog output 1. Pressing the toggle switch up will increase the volume level and pressing the toggle switch down will decrease the volume level.

Continue adjusting the volume level of the other outputs by pressing the pushbutton to select the desired output and then using the toggle switch to adjust the level. Press the pushbutton the fourth time will exit volume adjust mode. None of the LEDs will be flashing. You can lock the volume levels by turning off DIP switch 8. If you stop pressing either the pushbutton or toggle switch for more than 30 seconds, the module will exit the volume adjust mode.

# 6. JUMPERS

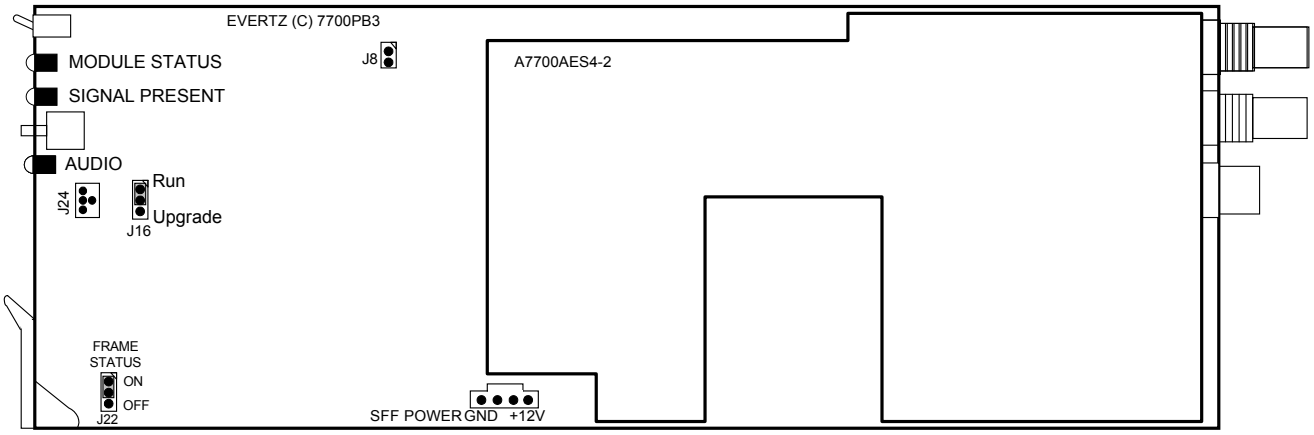


**Figure 3: Location of Jumpers and Status LEDS**

## 6.1. FRAME STATUS JUMPER

**FRAME STATUS** The FRAME STATUS jumper J22 located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus. As this module is mounted in the 7700 standalone enclosure this jumper has no effect in either position.

### 6.2. UPGRADE JUMPER

**UPGRADE** The UPGRADE jumper J16 located at the front of the module is used when firmware upgrades are being done to the module if it is mounted in the 7700FR frame. As this module is mounted in the 7700 standalone enclosure this jumper has no effect in either position. See section 7 of this manual for information on how to upgrade modules that are in the stand alone enclosure.

## 7. UPGRADING FIRMWARE

The S7720AD-A4-LTC is fitted with a COM port connector that can be connected to a PC with a straight through cable. You will need the following equipment in order to update the 7700PB Firmware

- PC with available communications port. The communication speed is 57600 baud, therefore a 486 PC or better with a 16550 UART based communications port is recommended.
- "Straight-thru" serial extension cable (DB9 female to DB9 male) or (DB25 female to DB9 male)
- Terminal program that is capable of Xmodem file transfer protocol. (such as HyperTerminal)
- New firmware supplied by Evertz.

### 7.1. PART 1: CONFIGURING THE UNIT FOR FIRMWARE UPGRADES

1. Connect the 9 pin male connector on the straight through serial extension cable to the COM port on the rear of the unit. Connect the 9 pin female connector to the PCs' RS-232 communications port

### 7.2. PART 2: TERMINAL PROGRAM SETUP

2. Start the terminal program.

3. Configure the port settings of the terminal program as follows:

| | |
|---|---|
| Baud | **57600** |
| Parity | **no** |
| Data bits | **8** |
| Stop bits | **2** |
| Flow Control | **None** |

4. Apply power to the S7720AD-A4-LTC unit. After the unit powers up, a banner with the boot code version information should appear in the terminal window. The cursor to the right of the word "BOOT>" should be spinning for about 5 seconds then the unit will continue to boot.

For example:

```
EVERTZ MFC5407 MONITOR 2.1.3
COPYRIGHT 1997, 1998, 1999, 2000, 2001 EVERTZ MICROSYSTEMS LTD.
COLD BOOT |
```

5. The following is a list of possible reasons for failed communications:

   - Defective 7700PB Serial Upgrade cable.
   - Wrong communications port selected in the terminal program.
   - Improper port settings in the terminal program. (Refer to step 7 for settings).

1. While the cursor is spinning press the <CTRL> and <X> keys on your computer keyboard at the same time, this should stop the cursor from spinning. The spinning prompt will only remain for about 5 seconds. You must press <CTRL-X> during this 5 second delay. If the unit continues to boot-up, simply cycle the power and repeat this step.

2. Hit the <ENTER> key on your computer once.

3. Type the word “upgrade”, without quotes, and hit the <ENTER> key once.

4. The boot code will ask for confirmation. Type "y", without quotes.

5. You should now see a prompt asking you to upload the file.

### 7.3. PART 3: UPLOADING THE NEW FIRMWARE

11. Upload the “*.bin” file supplied using the X-Modem transfer protocol of your terminal program. If you do not start the upload within 10 minutes the 7700PB Boot code will time out. You can restart the upgrade process by removing and reinstalling the module.

12. The boot code will indicate whether the operation was successful upon completion of the upload.

    For Example:

```
UPLOAD OKAY
MFC5407 WARM BOOT > |
```

13. The following is a list of possible reasons for a failed upload:

- If you get the message "transfer cancelled by remote" you must restart the terminal program and load the bin file, then remove and install the module again.
- The supplied “*.bin” file is corrupt.
- Wrong file specified to be uploaded.
- The PCs’ RS-232 communications port can’t handle a port speed of 57600.
- Noise induced into the 7700PB Serial Upgrade cable.

### 7.4. PART 4: COMPLETING THE UPGRADE

14. Type the word “boot”, without quotes, and hit the <ENTER> key once or power cycle the unit. The unit should now reboot.

15. You can now close the terminal program and disconnect the RS-232 serial cable from the PC.

The update procedure is now completed.