

Service Manual



764 Digital Audio Monitor

070-8810-02

This document supports software version 1.1 and above.

Warning

The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.



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EC Declaration of Conformity

We

Tektronix Holland N.V.
Marktweg 73A
8444 AB Heerenveen
The Netherlands

declare under sole responsibility that the

764 Digital Audio Monitor

meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility and Low Voltage Directive 73/23/ECC for Product Safety. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EMC Directive 89/336/EEC:

EN 50081-1 Emissions:

EN 55022 Class B Radiated and Conducted Emissions

EN 50082-1 Immunity:

IEC 801-2 Electrostatic Discharge Immunity

IEC 801-3 RF Electromagnetic Field Immunity

IEC 801-4 Electrical Fast Transient/Burst Immunity

Low Voltage Directive 73/23/EEC:

EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use

High-quality shielded cables must be used to ensure compliance to the above listed standards.

This product complies when installed into any of the following Tektronix instrument enclosures:

1700F00, Standard Cabinet bearing part number 437-0100-04

1700F02, Portable Cabinet bearing part number 390-0018-07

1700F05, Rack Adapter bearing part number 437-0095-04

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

Only qualified personnel should perform service procedures.

Injury Precautions

Use Proper Power Cord. To avoid fire hazard, use only the power cord specified for this product.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Use Proper Fuse. To avoid fire hazard, use only the fuse type and rating specified for this product.

Do Not Operate Without Covers. To avoid electric shock or fire hazard, operate this product only within an enclosure that prevents contact with interior electrical components.

Do Not Operate in Wet/Damp Conditions. To avoid electric shock, do not operate this product in wet or damp conditions.

Do Not Operate in an Explosive Atmosphere. To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Product Damage Precautions

Use Proper Power Source. Do not operate this product from a power source that applies more than the voltage specified.

Provide Proper Ventilation. To prevent product overheating, provide proper ventilation.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:



WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*



CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbols may appear on the product:



DANGER
High Voltage



Protective Ground
(Earth) Terminal



ATTENTION
Refer to Manual



Double
Insulated

Certifications and Compliances

Refer to the specifications section for a listing of certifications and compliances that apply to this product.

Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, disconnect the main power by means of the power cord or, if provided, the power switch.

Use Caution When Servicing the CRT. To avoid electric shock or injury, use extreme caution when handling the CRT. Only qualified personnel familiar with CRT servicing procedures and precautions should remove or install the CRT.

CRTs retain hazardous voltages for long periods of time after power is turned off. Before attempting any servicing, discharge the CRT by shorting the anode to chassis ground. When discharging the CRT, connect the discharge path to ground and then the anode. Rough handling may cause the CRT to implode. Do not nick or scratch the glass or subject it to undue pressure when removing or installing it. When handling the CRT, wear safety goggles and heavy gloves for protection.

Use Care When Servicing With Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

X-Radiation. To avoid x-radiation exposure, do not modify or otherwise alter the high-voltage circuitry or the CRT enclosure. X-ray emissions generated within this product have been sufficiently shielded.

Preface

Operating information in this manual applies to instruments with Software Version 1.1 and later. Follow these steps to check the version of the software in your 764 Digital Audio Monitor:

1. During normal operation, press the **MENU** button to reveal the on-screen menus.
2. Turn the multifunction knob to highlight the “Service” menu item; then press a soft button — to the right of the display — to select the Service submenu.
3. Turn the multifunction knob to highlight the “Information:” submenu item, then press the “SOFTWARE VERSION” soft button. Version information will appear on the instrument display.

Upgrades from Software Version 1.0 are available free of charge; please contact your Tektronix representative or the nearest Tektronix field office for ordering information.



Specifications

Specifications

Introduction

The material in this section is organized into two main groupings: the specification tables and the supporting figures. The specification tables include:

- Input Specifications
- Interface Parameters
- Output Specifications
- Physical and environmental specifications

The supporting figures follow the specification tables.

Safety Standard Compliance

The following safety standards apply to the 764 Digital Audio Monitor:

- ANSI/ISA S82 — Safety Standard for Electrical and Electronic Test, Measuring, Controlling, and Related Equipment.
- CAN/CSA C22.2 No. 1010.1 — Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.
- IEC1010-1 — Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use (1990).
- UL3111-1 — Standard for Electrical Measuring and Test Equipment.

EMI Compliance

NOTE. *The Tektronix 764 meets the following standards when shielded interconnect cables are used and when installed in one of the following Tektronix enclosures:*

1700F00, bearing part number 437-0100-04
1700F02, bearing part number 390-0018-07
1700F05, bearing part number 437-0095-04

- 47 CFR, Chapter 1 (FCC Rules), Part 15, Class A.
- EN 50 081-1 Generic Emission Standard. Part 1: Residential, commercial and light industry.

- EN 50 082-1 Generic Immunity Standard. Part 1: Residential, commercial and light industry.
- EN 60555-2 Disturbances in Supply Systems Caused by Household Appliances and Similar Electrical Equipment, Part 2: Harmonics.

Specification Tables

Table 1–1: Digital Audio Inputs

| Characteristic | Performance Requirements | Supplemental Information |
|---|-------------------------------|--|
| Impedance | | |
| Balanced inputs (XLR) | | |
| Term switched in | 110 $\Omega \pm 5\%$ | 0.1 MHz to 6 MHz |
| Term switched out | Return loss >30 dB | 0.1 MHz to 6 MHz. Relative to 110 Ω load at loop-through connector. |
| Unbalanced inputs | Return loss > 30 dB | Relative to 75 Ω load at loop-through connector. |
| Input level | | |
| Balanced inputs | 0.2 to 10 V_{p-p} | |
| Unbalanced inputs | 50 m V_{p-p} to 2 V_{p-p} | |
| Reference input | | |
| Balanced input | | |
| Connector type | | XLR, terminated, no loop-through |
| Input impedance | 110 $\Omega \pm 5\%$ | 0.1 to 6 MHz |
| Input level | 0.6 to 10 V_{p-p} | |
| Unbalanced input | | |
| Connector type | | BNC, terminated, no loop-through |
| Input impedance | 75 $\Omega \pm 10\%$ | 0.1 to 6 MHz |
| Input level | 0.2 V_{p-p} to 2 V_{p-p} | |
| Sample rate locking range, all audio inputs | 27 kHz to 52 kHz | If locking is verified at 30 kHz, 27 kHz is guaranteed by design. |

Table 1–2: Level Meters and Phase Display

| Characteristic | Performance Requirements | Supplemental Information |
|-----------------------------------|--------------------------|--|
| Attack and Decay Characteristics: | | Ballistics are guaranteed by design. |
| True Peak | | PPM decay characteristics; no attack delay. |
| PPM | | per IEC 268-10A and IEEE std. 152-1991 |
| VU | | per IEEE std. 152-1991 |
| Level Meter accuracy | ± 0.05 dB | Steady 1 kHz tone, 0 to -20 dBFS, no de-emphasis |
| De-emphasis accuracy | ± 0.25 dB | 50/15 μ s and CCITT J.17 |
| AGC Control Range | 0 dBFS to -40 dBFS | |

Table 1–3: SMPTE Time Code Inputs

| Characteristic | Information |
|------------------------------------|---|
| VITC (Vertical Interval Time Code) | Reads NTSC and PAL VITC conforming to IEC publication 461; indicates time as Hours:Minutes:Seconds. |
| Input connector | BNC, 75 Ω termination, no loop-through |
| Input signal | Video with VITC, 1 volt nominal |
| LTC (Longitudinal Time Code) | LTC conforming to IEC publication 461; indicates time as Hours:Minutes:Seconds. |
| Input connector | XLR balanced, unterminated, no loop-through |
| Input signal | Range: 250 mV _{p-p} to 10 V _{p-p} . |

Table 1–4: Interface Parameter Measurements

| Characteristic | Performance Requirements | Supplemental Information |
|-----------------|----------------------------------|---------------------------------|
| Sample rate | | |
| Range | 27 kHz to 52 kHz | |
| Resolution | 0.01 kHz | |
| Accuracy | Within .01 kHz | |
| Synchronization | | |
| Range | $\pm 40\%$ of dig. audio frame | |
| Accuracy | $\pm 2\%$ of digital audio frame | |
| Indication | | "Frame Sync Err" (session view) |

Table 1-5: Headphone Output

| Characteristic | Performance Requirements | Supplemental Information |
|--------------------|--------------------------|-------------------------------|
| Output voltage | > 10 V _{p-p} | into 150 Ω load, 0 dBFS input |
| Frequency response | 20 Hz to 20 kHz ±2 dB | |
| Balance | ±0.5 dB | |
| Distortion | THD+N < 0.05% | 20 kHz measurement bandwidth |

Table 1-6: VGA Output

| Characteristic | Information |
|----------------------|-----------------|
| Resolution | 640 X 480 VGA |
| Signal Level Voltage | |
| White | 0.7 V |
| Black | 0 V |
| Blanking | 0 V |
| Horizontal Sync | TTL, low true |
| Vertical Sync | TTL, low true |
| Load Impedance | |
| Red | 75 ohms |
| Green | 75 ohms |
| Blue | 75 ohms |
| Horizontal Sync | TTL compatible |
| Vertical Sync | TTL compatible |
| Timing/Frequency | |
| Pixel Clock | 25.175 MHz |
| Horizontal Rate | 31.469 kHz |
| Vertical Rate | 59.940 Hz |
| Pin Assignments | |
| pin: 1 | Red |
| 2 | Green |
| 3 | Blue |
| 4 | NC |
| 5 | Ground |
| 6 | Red Ground |
| 7 | Green Ground |
| 8 | Blue Ground |
| 9 | NC |
| 10 | Ground |
| 11 | NC |
| 12 | NC |
| 13 | Horizontal Sync |
| 14 | Vertical Sync |
| 15 | NC |

Table 1-7: Power Requirements

| Characteristic | Information |
|-------------------|------------------|
| Input voltage | 90–250 VAC |
| Input frequency | 50 or 60 Hz |
| Power consumption | 56 Watts typical |

Table 1-8: Physical Characteristics

| Characteristic | Information |
|---------------------------|--|
| Height | 5 ¹ / ₄ inches (13.3 cm) |
| Width | 8 ¹ / ₂ inches (21.6 cm) |
| Depth | 17 inches (43.2 cm) |
| Weight Net Shipping | 10 lbs (4.54 kg) 17 lbs 5 oz (7.85 kg) |

Table 1-9: Environmental Characteristics

| Characteristic | Information |
|-------------------------------------|--|
| Temperature Operating Storage | NOTE: Safety certification compliance to +40° C 0° C to +50° C (32 to 122° F) –55° C to +75° C (–67 to +167° F) |
| Humidity | Will operate at 93% relative humidity for up to five days Meets requirements of the five-day humidity cycling test described in Tektronix standard 062-2847-00 |
| Altitude Operating Storage | NOTE: Safety certification compliance to 2000 m to 15,000 feet (4572 m) to 50,000 feet (15420 m) |
| Vibration (Operating) | 15 minutes each axis at 0.013 inch, frequency varied from 7–55–7 Hz in five-minute cycles with the instrument attached to a vibration platform Dwell for 10 minutes each axis at any resonant frequency, or 33 Hz if no resonant frequency is found (Tektronix std. 062–2858–00). |
| Shock (non-operating) | 30 Gs, 1/2 sine, 11 ms duration; 3 shocks per surface |
| Transportation | Meets the requirements of NTSB Test Procedure 1A, category II (24 inch drop) |
| Equipment Type | Measurement |
| Equipment Class | Class I (grounded product) (As defined in IEC 1010-1, Annex H.) |

Table 1-9: Environmental Characteristics (Cont.)

| Characteristic | Information |
|-----------------------|---|
| Installation Category | Installation Category II (as defined in IEC 1010-1, Annex J) |
| Pollution Degree | Pollution Degree 2 (as defined in IEC 1010-1; indoor use only) |



Operating Information

Operating Information

This section contains information on installing, setting up, and operating your 764 Digital Audio Monitor. The operating information is excerpted from the User manual for your convenience.

Installation and Setup

This subsection contains information you'll need to put your 764 Digital Audio Monitor Digital Audio Monitor into service. For a detailed description of instrument capabilities, and instructions for its use, see *Operating Basics*, beginning on page 2–10.

Unpacking

Please save the packaging material in case you must later ship the instrument for calibration or service.

The following accessory items are included with the 764 Digital Audio Monitor:

- The User Manual, part number 070–8811–XX
- A Power Cord

Any cabinet ordered with the instrument will be shipped in a separate carton.

This Service manual is an optional accessory, also shipped separately.

Mechanical Installation

To accommodate the installation needs of users worldwide, Tektronix provides the 764 Digital Audio Monitor without an enclosure. To ensure proper cooling, electromagnetic shielding, and protection against accidental electrical shock, install the instrument in the Tektronix enclosure that best suits your application.

NOTE. *The Tektronix 764 meets EMI/EMC standards when shielded interconnect cables are used, and when installed in one of the following Tektronix enclosures:*

1700F00, bearing part number 437–0100–04
1700F02, bearing part number 390–0018–07
1700F05, bearing part number 437–0095–04

The plain enclosure is shown in Figure 2–1. A portable case and a rackmount are also available. All of these cabinets may be ordered through your nearest Tektronix field office or representative.

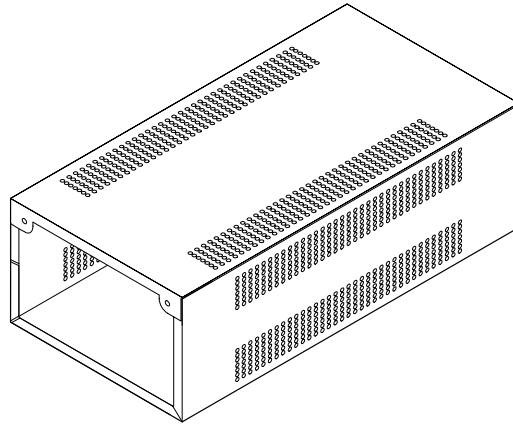


Figure 2-1: The 437-0100-04 plain enclosure (rear view)



WARNING. Do not transport an instrument in one of the optional enclosures without first installing the cabinet mounting screws, as shown in Figure 2-2. Without the mounting screws, an instrument can slip out of its cabinet if tipped forward. Property damage or injury may result.

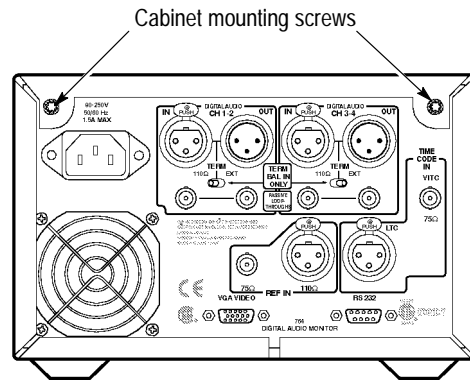


Figure 2-2: Rear view of the 764 Digital Audio Monitor in a Tektronix enclosure

Connecting the 764

Except for the headphone jack, all connectors are on the rear panel of the 764, shown in Figure 2–3. The connections you make depend on your particular installation and operating environment. See the following paragraphs for explanations of the connectors and their functions.

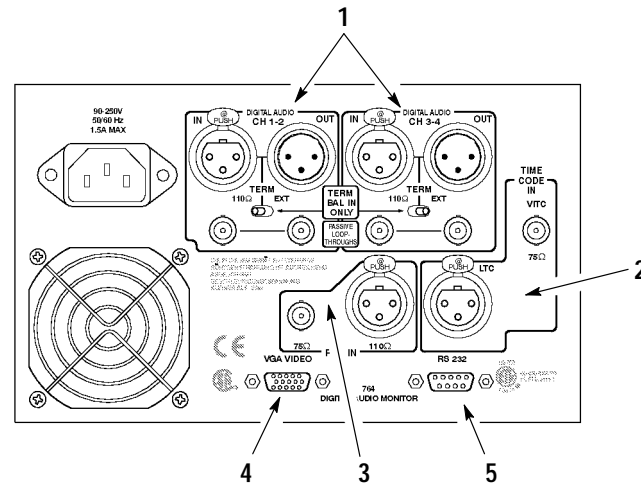


Figure 2–3: The 764 Digital Audio Monitor rear panel and connectors

(1) Digital Audio Inputs and Loop-throughs

The 764 has two two-channel digital audio inputs, one labeled CH 1–2, and the other labeled CH 3–4. Each input has two passive loop-throughs, which allow you to switch the instrument off with no effect on the through signal. The loop-throughs are:

- Balanced XLR connectors for signals conforming to the AES/EBU (AES3–1992) standard. Set the TERM switches immediately below these connectors to EXT when the 764 is installed in-line; select 110 Ω (internal termination) when the instrument is at the end of the signal path.
- 75 Ω BNC connectors that accept unbalanced, digital audio signals in both professional (AES/EBU) and consumer (IEC958) formats. These inputs have no provision for internal termination; if the 764 is placed at the end of a signal path, install a 75 Ω end-line termination (Tektronix part number 011–0102–00) on the unused loop-through connector.

Because RCA phono plugs are commonly used in consumer digital audio, a phono plug-to-BNC male cable or adapter¹ may be required to input consumer digital audio to the 764 Digital Audio Monitor.

¹ Available in North America through Markertek™ Video Supply, phone (800) 522-2025

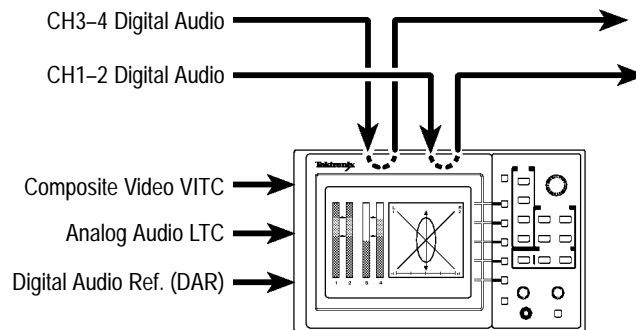


Figure 2-4: Connecting the 764 to your system

NOTE. The balanced (XLR) loop-throughs are the default 764 input connectors. To use either of the unbalanced (BNC) loop-throughs, you must first reconfigure the instrument through the on-screen menus. See General Menu Techniques/Setting the Input Type, on page 2-8, for instructions.

(2) Time Code Inputs

VITC. Reads vertical interval time code from NTSC or PAL analog video per IEC publication 461 specifications. The time code can be shown on the SESSION display, and stamped on each error on a printed Session Report. The format of the Session View time display is Hours:Minutes:Seconds.

LTC. Reads linear time code that also conforms to IEC specifications. The time code can be shown on the Session display, and stamped on each error on a printed Session Report. The format of the time display is Hours:Minutes:Seconds.

(3) Reference Inputs

Connect your house digital audio reference (DAR) signal to one of the REF IN connectors. These connectors (one BNC, one XLR) accept the same formats as the Digital Audio Inputs. They are internally terminated. As with the audio inputs, the default connector is XLR; use the on-screen menus to select the BNC connector. The 764 can use any AES signal as a DAR; it will use the reference input to detect and measure frame synchronization of AES signals.

(4) VGA Video Output

To see a larger, color image of the 764 display (as illustrated in Figure 2–5), connect a VGA-compatible monitor to this standard 15-pin output. Table 1–6 on page 1–4 lists the characteristics of the Video Output signal.

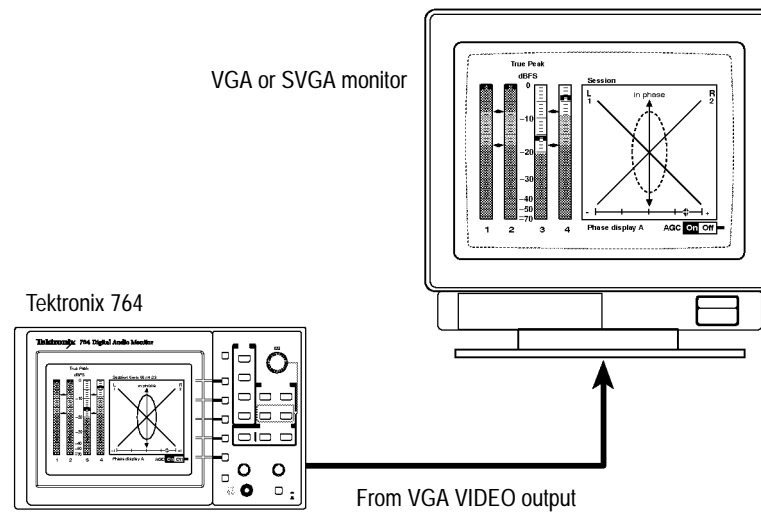


Figure 2–5: Using an external color monitor

(5) RS-232 Communications Port

Through the RS-232 port, you can:

- Output a record of the input signal and program, either to an ASCII printer or a personal computer running a communications application, such as PRO-COMM® or the Terminal accessory of Microsoft® Windows™. See *Session Reports*, beginning on page 2–27, for more information.

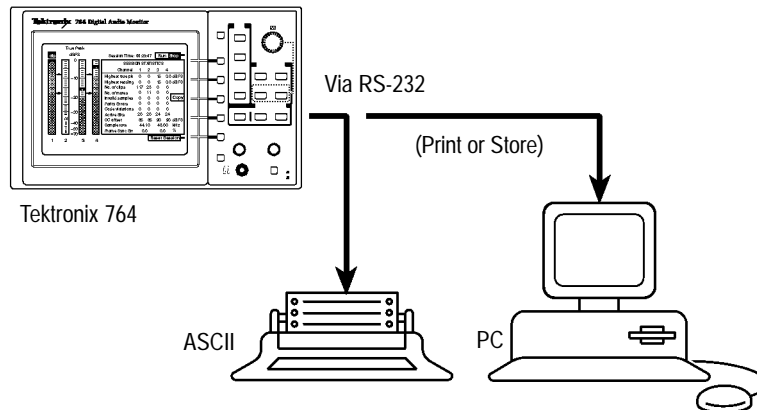


Figure 2-6: Outputting a session report

- Download future 764 software upgrades through a personal computer. Please contact your Tektronix representative or the nearest Tektronix office for information about software upgrades. Installation instructions are provided with each upgrade kit.

Headphones

The front-panel headphone output lets you listen to the audio programs contained in the digital input signals. The connector accepts a standard .25 inch (6.35 mm) stereo plug; it is wired as shown in Figure 2-7. Adjust the output level with the VOLUME knob.

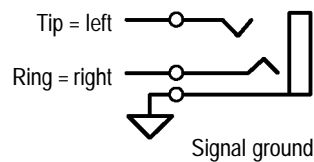


Figure 2-7: The headphone output (schematic)

By factory default, the headphone output automatically follows the phase display; that is, it contains the audio programs decoded from the two channels that you are monitoring with the Lissajous pattern and correlation meter. You may also choose to listen to any two of the input channels, independent of the phase display choices; for instructions, see *Selecting Headphone Channels*, in the Reference section of the User manual.

Supplying Power

You can operate the 764 Digital Audio Monitor on any AC power supply that provides 90 to 250 V at 50 to 60 Hz. If the power cord supplied with your instrument is incorrect for your local AC supply, please contact your nearest Tektronix representative or field office.



WARNING. When power is supplied, line voltage will be present in the instrument, even if the POWER switch is set to STANDBY. Contact with line voltage can cause serious injury or death. Do Not touch exposed connections or components when the instrument is connected to the local AC supply and the cover is removed.

Initial Power Up and Configuration

Once you have connected a signal source to at least one of the 764 Digital Audio Monitor DIGITAL AUDIO inputs, switch the instrument On. When the start-up diagnostics are completed, the instrument will begin operation in the Audio View/Session display.

If a signal source is connected through one of the XLR inputs, the corresponding level meters will show the signal levels. If the input is through a BNC connector, you must reconfigure the input with the following procedure before you can monitor the signal. In either case, please take this opportunity to familiarize yourself with the 764 menu structure and techniques.

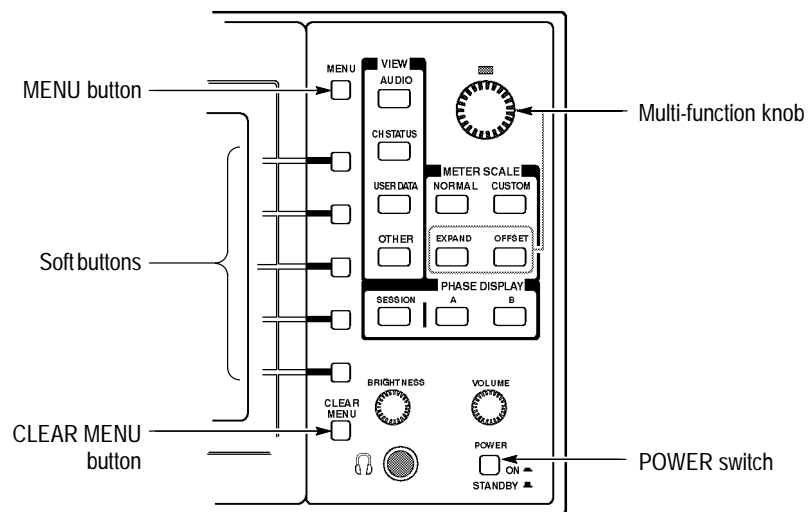


Figure 2-8: Controls for initial power up and configuration

General Menu Techniques/Setting the Input Type

1. Press the **MENU** button to enter the TOP MENU.
2. When the 764 is in menu mode, the **MENU** button provides access to context-sensitive **HELP** messages. Press **MENU** now to see the TOP MENU help message; the display will resemble Figure 2-9. Press the button again to clear the message.

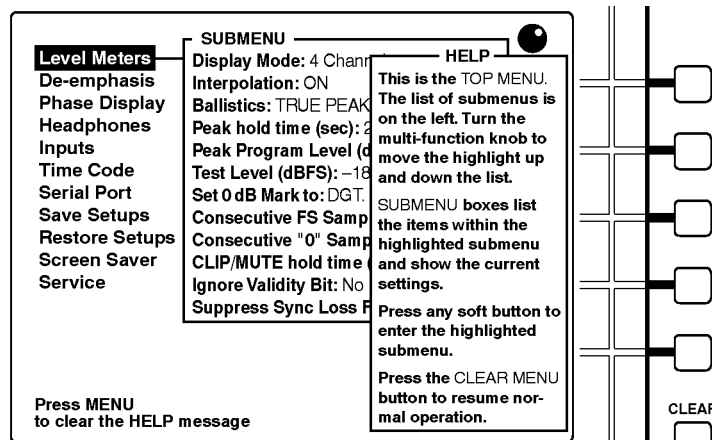


Figure 2-9: The top menu HELP message

3. The **knob icon** appears in the upper-right corner of the display when the multi-function knob is active. Here, you may turn the knob to scroll among the TOP MENU choices. Turn the knob now to scroll the menu highlight to the **Inputs** entry, as shown in Figure 2-10.

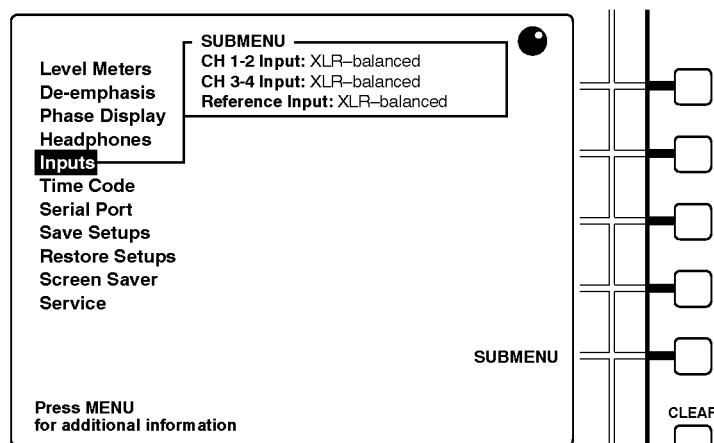


Figure 2-10: Selecting from the top menu

- The five buttons immediately to the right of the display are called soft buttons. The printed/molded lines to the left of these buttons serve to associate the buttons with on-screen menu choices or functions. In Figure 2–10, the bottom soft button is associated with the SUBMENU function, but you can press *any* soft button to enter the Inputs submenu. After you do, the display will resemble the one illustrated in Figure 2–11.

NOTE. *There are no other soft button assignments in the top menu level. For operator convenience, then, the 764 Digital Audio Monitor is configured so that pressing any one of the five soft buttons selects the highlighted submenu.*

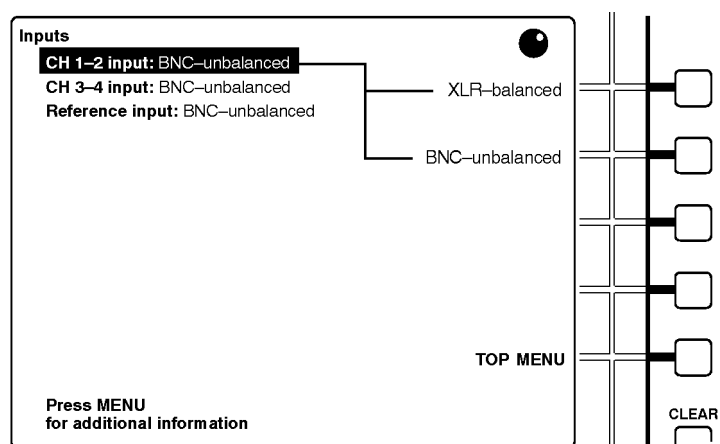


Figure 2–11: The inputs submenu

- To change the channel 1–2 input to the BNC connector, press the soft button to the right of the BNC-unbalanced choice. The change will be in effect when you exit the menu and return to normal operation.
- Turn the multi-function knob to move the menu highlight to the CH 3–4 input: (second) line.
- If desired, change the channel 3–4 input to the BNC connector by pressing the associated soft button.
- You may also use the same technique to specify the type of input that will receive the house digital audio reference (DAR) signal, if any.
- Press the **CLEAR MENU** button to exit the menus and resume normal operation. If you have selected the appropriate input type, the corresponding level meters should now respond to the input audio program.

Operating Basics

This subsection contains the basic information needed to use your 764 Digital Audio Monitor. The subsections are: Overview, Front Panel Controls, The Level Meters, The Phase Display, The Session Display, Session Reports, The Channel Status View, The User Data View, and Other Features.

Overview

The 764 Digital Audio Monitor permits in-line monitoring of the audio program contained in a digital audio signal without first converting it to analog form. In addition, it can report and interpret the ancillary data that is transmitted through the Channel Status and User Data bits of the digital data stream.

The 764 Digital Audio Monitor uses three display “views” to perform those functions — the Audio view, the Channel Status view, and the User Data view — as described in the following paragraphs. (To locate buttons mentioned in the text, see *Front Panel Controls*, beginning on page 2–12.)

Monitoring an Audio Program with the Audio View

The Audio view (with the Session Statistics displayed, as shown in Figure 2–12) is the power-up default configuration of the 764. Otherwise, the Audio View is never more than two button presses away:

1. Press the CLEAR MENU button to exit any on-screen menu.
2. Press the VIEW:AUDIO button.

The left portion of the Audio view display always contains four bar graph level meters. The right portion contains either a numerical display of session statistics (see Figure 2–12) or the Phase display (shown in Figure 2–13). Configure the right side of the Audio view display with the three PHASE DISPLAY buttons: A, B, and SESSION.

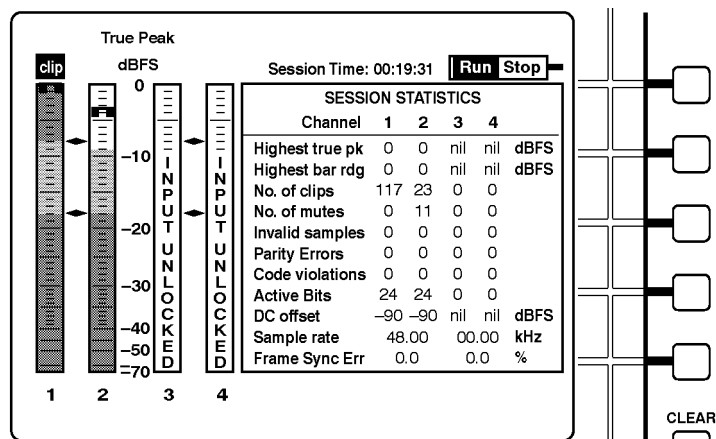


Figure 2-12: The 764 Digital Audio Monitor AUDIO/SESSION view

The 764 Digital Audio Monitor has many options that affect the appearance and behavior of the Audio view features. For more information, see *The Level Meters*, beginning on page 2-15, *Sum and Difference Bars*, on page 2-20, *The Phase Display*, on page 2-21, and *The Session Display*, on page 2-24.

Session Reports

The 764 can also output Session Reports, which are permanent records of session activity, through the rear-panel RS-232 port. The reports can either be sent directly to a printer or captured on a PC and saved to disk.

This feature adds important utility to the 764 because it permits unattended screening of digital audio programs for errors and peak levels. When the audio monitor encounters errors and peaks, they are time-stamped with the active session time code, which makes it easy to return to the part of the program that contains the event of interest. See page 2-27 for more information.

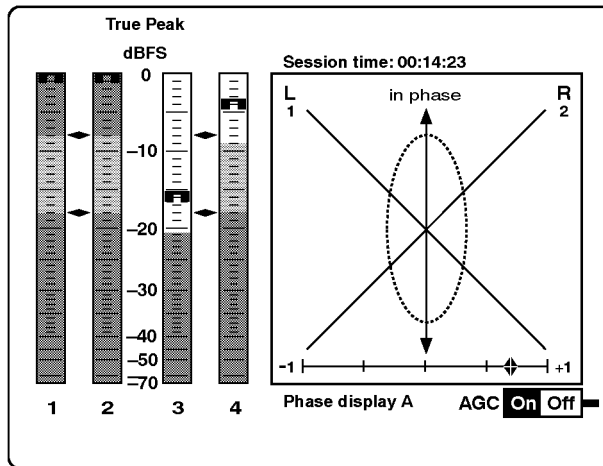


Figure 2–13: The 764 Digital Audio Monitor AUDIO/PHASE view

Monitoring the Ancillary Data

The Channel Status view reports the information embedded in the channel status bytes of the incoming serial digital signal. Select the Channel Status view by pressing CLEAR MENU (if necessary, to exit the on-screen menus) and then the VIEW:CH. STATUS button. You may select a number of Channel Status view options with the Soft buttons to the right of the display. See *The Channel Status View*, beginning on page 2–29, for more information.

The User Data view reports the information embedded in the User bytes of the incoming signal. Select the User data view by pressing CLEAR MENU (if necessary, to exit the on-screen menus) and then the VIEW:USER DATA button. You may select a number of User Data view options with the Soft buttons. See *The User Data View*, beginning on page 2–30, for more information.

Other Features

With the 764 Digital Audio Monitor, you can also save up to three instrument configurations (setups) for later recall; see page 2–31.

Front-panel Controls

Figure 2–14 shows the following 764 Digital Audio Monitor front panel controls.

- 1 **Soft buttons.** Use the five Soft buttons to select choices or toggle settings that are indicated on the CRT display. In Figure 2–12, for example, the top Soft button is used to toggle the Session between Run and Stop.
- 2 **MENU button.** Press the MENU button to invoke the display menu and call up context-sensitive help text when a menu is on screen.

- 3 VIEW Selection buttons.** Use the VIEW selection buttons to select the AUDIO, CH STATUS, or USER DATA views. These buttons are inactive when a menu is present on the 764 Digital Audio Monitor display. The OTHER button is not used in this version of the instrument.

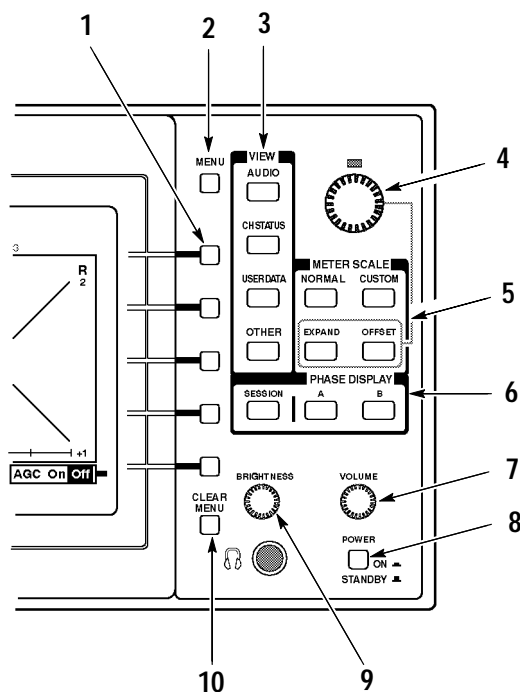


Figure 2-14: The 764 Digital Audio Monitor front-panel controls

- 4 Multi-function knob.** Turn the multi-function knob to expand and offset the meter scale and to scroll the various on-screen menus. The LED immediately above the knob will light, and a knob icon will appear in the upper-right of the display to indicate that the knob is active.
- 5 METER SCALE buttons.** Use the METER SCALE buttons to control the scale of the Audio view level meters. The default scale, selected with NORMAL, is illustrated in Figure 2-12. Use EXPAND and OFFSET — with the Multi-function knob — to configure the range and offset of the Custom scale. See *The Level Meters*, beginning on page 2-15, for more information.
- 6 PHASE DISPLAY and SESSION buttons.** Use the PHASE DISPLAY and SESSION buttons to configure the right portion of the Audio view.

The A and B PHASE DISPLAY buttons select a Lissajous Phase display with correlation meter, as illustrated in Figure 2–13. The A and B phase pairings are, by default:

- Pair A, left = input channel 1; Pair A, right = input channel 2.
- Pair B, left = input channel 3; Pair B, right = input channel 4.

You can change the orientation of the Lissajous display (from soundstage to X–Y) and the phase channel pairings through on-screen menus. See *The Phase Display*, beginning on page 2–21, for more information.

The SESSION button selects a Session Statistics panel, illustrated in Figure 2–12. See *The Session Display*, beginning on page 2–24, for more information.

- 7 **Headphone VOLUME control.** The VOLUME knob affects only the analog headphone output.
- 8 **POWER switch.** The POWER switch positions are ON and STANDBY. A portion of the instrument power supply remains active when the switch is in the Standby position. Unplug the 764 Digital Audio Monitor to isolate it completely from the main power supply; instrument settings will be preserved with internal battery back up.
- 9 **Display BRIGHTNESS control.** Turn the BRIGHTNESS knob to adjust the brightness of the 764 Digital Audio Monitor display. This control does not affect the output of the rear-panel VGA VIDEO connector.
- 10 **CLEAR MENU button.** Press the CLEAR MENU button to exit the on-screen menu and return to the most recent view (Audio, Channel Status, or User Data).

The Level Meters

The 764 Digital Audio Monitor level meters are vertical bar graphs in which the height of each bar indicates the amplitude of the audio program contained on the corresponding input channel. The levels of all four input channels are shown in the default meter configuration, illustrated in Figure 2–15. You can also select — through on-screen menus — two channel plus sum and difference mode, shown in Figure 2–16.

It is important to realize that almost every feature of the 764 level meters may be customized to suit your particular needs. The features and your options are explained briefly in the following numbered paragraphs. Choose the options that are appropriate to your particular application through the on-screen menus; see *Configuring the Level Meters*, beginning on page 2–17.

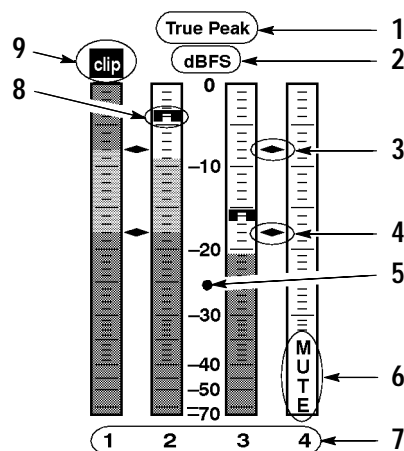


Figure 2–15: The 764 Digital Audio Monitor level meters

- 1 **Meter Ballistics.** The term “Meter Ballistics” refers to the dynamic response or attack/decay characteristics of the meters. The meters can emulate three common types of analog audio level meter. Choices are VU with the scale extended to permit display of true peaks on the same bar; PPM, a quasi-peak meter with 10 ms integration time and slow decay; and True Peak, with instantaneous response and slow decay.
- 2 **Scale Units (dBFS or dBr).** By default, the zero dB mark is at digital full scale, and units are in dB relative to full scale (dBFS). You may also set the 0 dB mark to either the Peak Program level or the Test level — see (3) and (4) below. In either case, the scale units will become dB relative to the chosen zero point (dBr).
- 3 **Peak Program level.** Peak Program level is usually the maximum permissible level for audio program material. The default Peak Program level is –8 dBFS; you may set it to the integer value between 0 (FS) and –30 dBFS that is appropriate to your particular needs. The diamond-shaped Peak Pro-

gram level scale markers will be red on an (optional) external color display; if the audio program exceeds this level, the portion of the meter bar above the level will also be red.

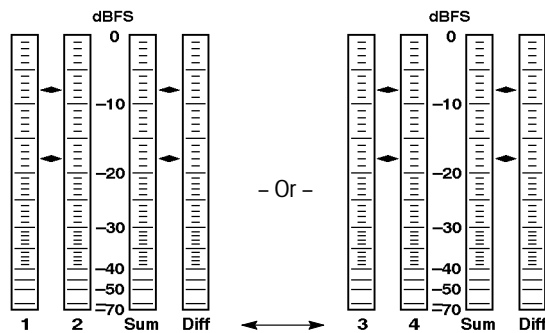


Figure 2-16: The sum and difference display modes

- 4 **Test Level.** Test level is also known as Reference level or Line-up level. The diamond-shaped Test level marker will be yellow on an external color display, and the part of the meter bar between this level and Peak Program level will also be yellow. The default test level is -18 dBFS; it may be set to any integer between 0 and -30 dBFS.
- 5 **Variable scale.** The meter scale range and offset may be adjusted through the `METER SCALE:EXPAND` and `:OFFSET` buttons. This feature lets you more closely monitor program levels in a selected portion of the meter, such as immediately above and below the Test level. To adjust either the range or offset, press the appropriate button; then turn the multi-function knob. Press `METER SCALE:NORMAL` to restore the default meter scale.
 - The normal range is 70 dB (0 dBFS to -70 dBFS); custom range may be as little as 10 dB or as great as 90 dB.
 - Shape: The upper 20 dB of the scale is linear in dB; the scale is progressively compressed below -20 dBFS.
 - The upper limit of the meter scale is the anchor for expansion and compression; that is, the top scale number remains the same when you expand or compress the scale.
 - The lower limit (bottom) of the scale cannot be adjusted below -90 dBFS; the upper limit (top) cannot be higher than 0 dBFS, or lower than -20 dBFS.
- 6 **Mute indicator (and other messages).** The MUTE indicator is one of seven messages that can appear in the lower half of each meter bar. The remaining messages are intended to alert you to possible errors in the input signal; they are explained in *In-Bar Warning Messages*, in the Reference section of the User manual.

You can specify the number of consecutive all-zero samples required for a MUTE indication. The default is ten samples; the range is 0 to 100. The Mute indicator always reacts to unprocessed input data, regardless of Interpolation or de-emphasis settings (see *Interpolation*, or *De-emphasis*, in the Reference section of the User Manual for more information).

You may also specify the persistence (hold time) for the in-bar indicators between 1 and 30 seconds; the default is 2 seconds.


- 7 **Meter bar labels.** The meter bar labels depend on the display mode. The channel numbers (1, 2, 3, and 4) correspond to the rear-panel input labels; Sum indicates $(L+R)/2$, and Diff indicates $(L-R)/2$.
- 8 **True peak indicators.** The true peak indicators always show true peak values, regardless of the selected meter ballistics. These indicators are particularly useful when you have selected PPM or VU ballistics, which have rise times that may prevent you from seeing peaks in program material containing steep transients. By default, the peak indicators persist at the most recent program peak for 2 seconds; you can set the peak hold time (through the level meters submenu) between 0 and 10 seconds in one second increments.

Please be aware that although the peak indicators may reveal higher peaks than VU or PPM ballistics, the indicators *do* act on the same, processed data as the meters. If interpolation is ON, the peak indicators show peaks in the oversampled data, and these peaks may be higher than those in the raw input data (see *Interpolation*, in the Reference section of the User manual). If de-emphasis (AUTO, CCITT J.17, or 50/15) is selected, the peaks — particularly at higher frequencies — may be lower than in the raw data (see *De-emphasis*, also in the User manual).

- 9 **Clipping flag.** The user can specify the number of consecutive full scale samples that constitute clipping. The range is from 1 to 100 samples. The flag will appear when the 764 detects clipping (that is, the specified number of consecutive full scale samples) and will persist for the same hold time chosen for the Mute indicator. Like the Mute indicator, the clipping flag always reacts to unprocessed input data, regardless of Interpolation or de-emphasis settings.

Configuring the Level Meters

To adjust either the range or offset of the level meters, press **METER SCALE:EXPAND** or **METER SCALE:OFFSET**; then turn the multi-function knob. For best results (and least confusion), expand the scale to the desired range first; then adjust the offset to view the meter region of interest. For example, to change normal scale to a custom scale showing only the -10 to -30 dBFS range (see Figure 2–17), perform the following steps:

1. Press **METER SCALE:EXPAND**; then turn the multi-function knob clockwise [] to expand the scale range to 20 dB, top to bottom.

2. Press **METER SCALE:OFFSET**, and turn the multi-function knob counterclockwise [↺] to shift the scale upwards by 10 dB.

Press **METER SCALE:NORMAL** to restore the default meter scale; to later restore the custom scale and offset, press **METER SCALE:CUSTOM**.

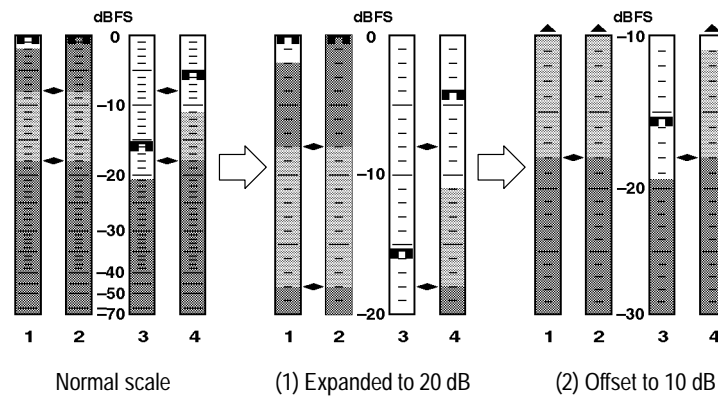


Figure 2-17: Creating a custom meter scale

Level Meter submenu selections

Follow the steps below to make all remaining level meter configuration selections through the Level Meters submenu. As with meter scale, all selections apply to all four input channels, and all four meter bars.

1. If necessary, press **CLEAR MENU** to exit any menu and resume normal operation.
2. Press **MENU** to enter the root menu (**TOP MENU**).
3. Turn the multi-function knob to scroll the menu highlight to the Level meters entry.
4. Press any soft button to enter the level meters submenu. The display resembles Figure 2-18.

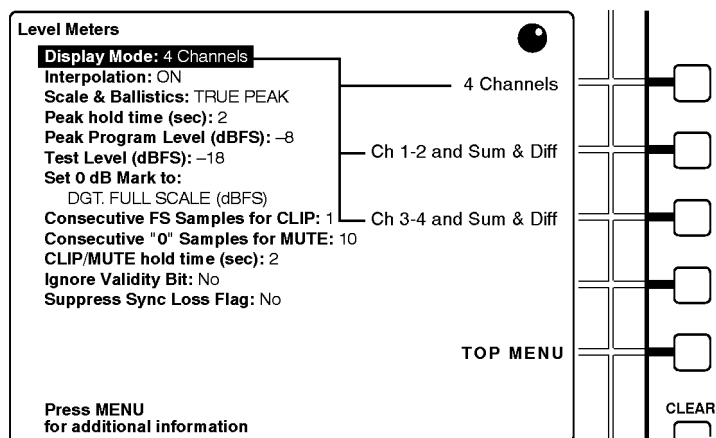


Figure 2-18: The level meters submenu

- Again, use the multi-function knob to scroll the menu highlight to the parameter you wish to configure. The soft button assignments will change to reflect your choice of settings. For menu items that have numeric settings, the top two soft buttons become increment/decrement controls designated with up and down arrow icons, as represented in Figure 2-19.

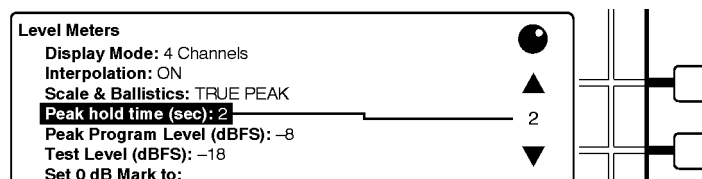


Figure 2-19: Soft buttons and numeric settings

- Press the soft button that corresponds to the desired setting or that increments or decrements the numeric value. (A numeric value will continue to increase or decrease as long as you hold the button down or until you reach an adjustment limit.) The text after the parameter name in the submenu column (on the left side of the display) changes to confirm new parameter settings.
- Repeat steps (5) and (6) until you have configured the meters to suit your needs.
- Press the TOP MENU soft button to return to the top menu, or press CLEAR MENU to exit the menus and resume normal operation.

Sum and Difference Bars

When you choose to display Sum and Difference bars, the two left-hand bars show the levels of one input channel pair (A or B), and the right-hand bars emulate the sum and difference bars of an analog audio monitor, such as the Tektronix 760. Note that the sum is actually *half* of the sum of the left- and right-channel data, while the difference is *half* of the difference between the channels. That is:

$$Sum = \frac{L + R}{2}$$

$$Diff = \frac{L - R}{2}$$

The Sum and Difference bars use the same scale and ballistics and all other settings as the channel level meters. Session statistics — other than sum and difference peaks — are *not* accumulated for the Sum and Difference bars, because they would be either meaningless or redundant. See Figure 2–20 and see *The Session Display*, beginning on page 2–24, for more information.

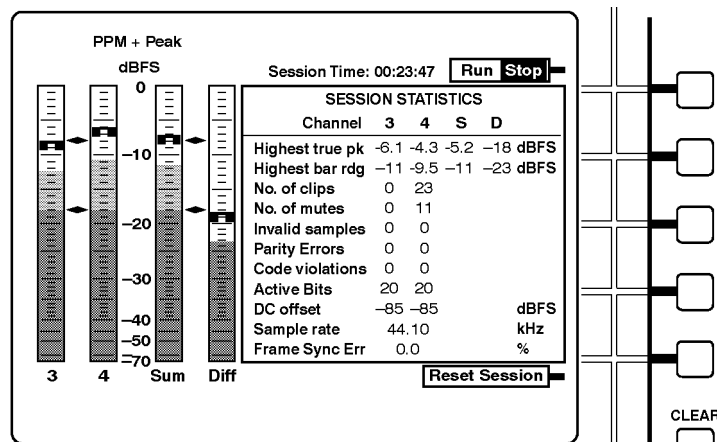


Figure 2–20: Sum and difference bars and the session display

The Phase Display

The 764 764 Digital Audio Monitor Phase display is a Lissajous pattern display augmented with a (phase) Correlation meter. It is designed for convenient, qualitative monitoring of the phase relationship between any two input channels. The Phase display always uses interpolated (4X oversampled) data, even if interpolation is turned off in the level meters submenu. You can set the instrument for either Soundstage or X–Y orientation of the Lissajous pattern, as illustrated in Figure 2–21.

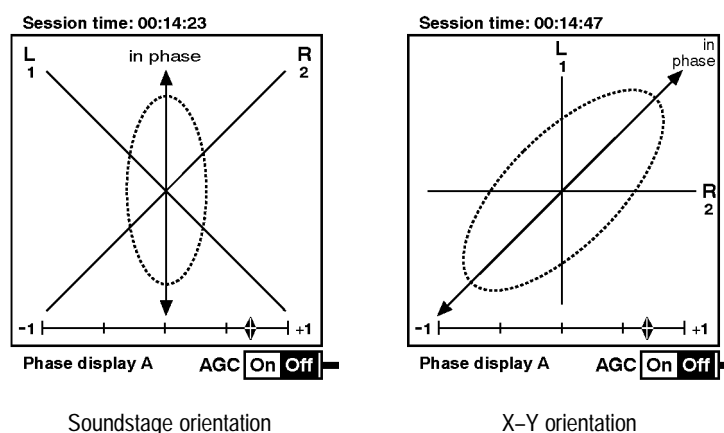


Figure 2–21: The 764 Digital Audio Monitor phase display

The Lissajous Pattern

The Lissajous portion of the phase display is a plot of one channel against another on an orthogonal pair of axes. The X–Y orientation — shown on the right in Figure 2–21 — plots left channel data along the vertical axis and right channel data on the horizontal axis, emulating the conventional X–Y oscilloscope display. The default Soundstage orientation, which is shown on the left in the Figure, rotates the X–Y pattern 45 degrees counterclockwise so that the channel data are plotted along diagonal axes, and mono (or in-phase) audio appears along the vertical (“straight ahead”) axis.

If you are unfamiliar with Lissajous phase patterns and their interpretation, see Tektronix application note, *Stereo Audio Measurements Using the 760A Audio Monitor*. The concepts discussed apply to the Lissajous display of the 764 Digital Audio Monitor as well.

Phase Channel Pairings

By default, the phase display pairings are input channels 1 and 2 in pair A and channels 3 and 4 in pair B. You may configure either pair to display the phase relationship of any two of the input channels. For example, if you wish to monitor the relationship of channels 1 and 4 while retaining the ability to monitor the

default pair A (channels 1 and 2), you could configure channels 1 and 4 as pair B with the following procedure:

1. During normal operation, press the **MENU** button to invoke the on-screen menu.
2. Turn the multifunction knob to highlight the Phase Display menu item and press any soft button to enter the Phase Display submenu.
3. Turn the multifunction knob to highlight the Pair B: Left Channel Assignment item.
4. Press the soft button to the right of the number 1 on the instrument display. This sets input channel 1 as the left channel of phase pair B.
5. If necessary, turn the multifunction knob to highlight the Pair B: Right Channel Assignment item.
6. Press the soft button to the right of the number 4 on the instrument display. This sets input channel 4 as the right channel of phase pair B.
7. Press the **CLEAR MENU** button to exit the on-screen menus. Select **VIEW:AUDIO** and **PHASE DISPLAY:B** and confirm that the labels on the ends of the left and right axes of the Lissajous graticule read L1 and R4 respectively, as shown in Figure 2–22.

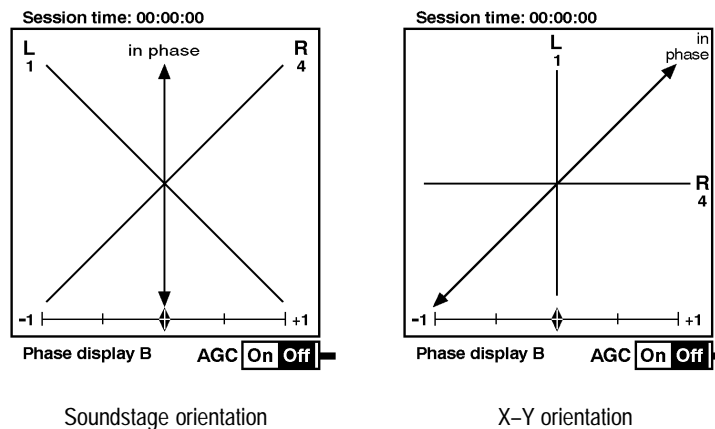


Figure 2–22: Phase display B with channels 1 and 4 paired

AGC

AGC (automatic gain control) keeps the Lissajous pattern visible and within the bounds of the phase display for signal levels between 0 dBFS and approximately –40 dBFS. When the AGC is Off, full scale is equivalent to the Peak Program level (see page 2–15). AGC does not affect the correlation meter. Press the bot-

tom soft button (immediately above CLEAR MENU) to toggle AGC On/Off. The status of the AGC is indicated at the bottom right of the phase display.

NOTE. *The illustrations in this manual are reverse, or negative, representations of instrument displays; on the actual display, AGC status is indicated by black lettering within a white highlight.*

The Correlation Meter

The Correlation meter, illustrated in Figure 2–23, displays a true mathematical phase correlation (mono compatibility) between the two channels of the phase pair, independent of signal amplitude. You may find it easier to interpret the correlation meter than the Lissajous pattern. The position of the diamond-shaped pointer indicates the correlation between the two selected channels. The meter will read +1 when the channels contain identical signals (frequency and phase); it will measure –1 when the signals have the same frequency (or frequencies), but are 180 degrees out of phase. A center-scale (0) reading indicates uncorrelated — or random — signals.

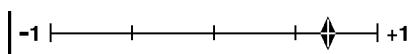


Figure 2–23: The phase correlation meter

When you use the 764 Digital Audio Monitor to monitor audio programs (as opposed to simple test tones), the pointer typically reads between +0.5 and +1 and will move as the correlation between the two channels changes. Choose the time constant of the meter — and thus the speed of meter response — through the Phase Display submenu. Please see the Reference section of the *764 Digital Audio Monitor User Manual* for more information.

The Session Display

The Session display is a dynamic readout of session history; it is illustrated in Figure 2–24. When the 764 is in Audio view, press the PHASE DISPLAY:SESSION button to toggle between the Phase display and the Session display.

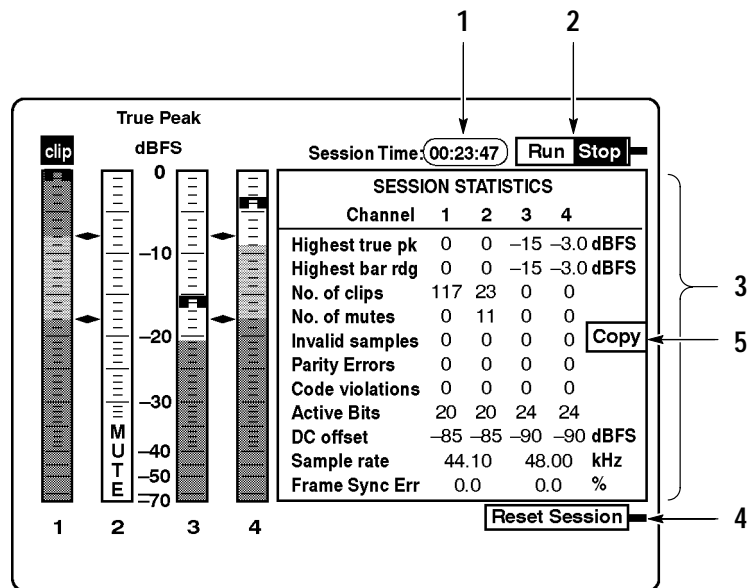


Figure 2–24: The 764 Digital Audio Monitor AUDIO/SESSION view

Features of the Session Display

The following numbered paragraphs correspond to the numbered features visible in Figure 2–24.

- 1 **Time readout.** By default, this is Session time. Session time is the time elapsed since the session was started, or since the most recent session reset. You can set the 764 — through the Time Code submenu — to display VITC (Vertical Interval Time Code) or LTC (Linear Time Code) in place of Session time. The instrument uses the chosen time code to time-stamp any errors encountered during the Session. The time information is saved in NVRAM for use when you output a Session report (see page 2–27).
- 2 **Run(ning)/Stop(ped) indicator and soft button assignment.** This indicator is associated with the top soft button, immediately below the MENU button. The current state is highlighted. Run means that the Session is running and statistics are accumulating. Stop means that the Session is suspended (stopped). Press the soft button to toggle the Session between Run(ning) and Stop(ped).
- 3 **Session Statistics.** The Session Statistics are explained immediately after this list of features.

- 4 **ResetSession.** The Reset Session indicator and soft button assignment is visible only when the Session is stopped. Press the associated soft button (immediately above CLEAR MENU) to reset all Session statistics to 0 or blank (unknown). Note that a Session reset erases all Session statistics from memory; if you plan to output a Session report, do so *before* you reset the Session.
- 5 **Copy soft button.** The Copy soft button is present when you select SHORT REPORT or LONG REPORT through the Serial Port submenu and the session has been stopped but not reset. Press the soft button to output a session report to an attached printer or personal computer. Please see *Session Reports*, beginning on page 2–27, for more information.

Session Statistics

The session display reports these values for the four input channels:

- Highest true peak in the session. It is equal to the highest peak indicator reading on the corresponding level meter, and does not depend on the meter Scale & Ballistics selected through the Level Meters submenu.
- Highest meter bar reading (bar rdg) of the session. This corresponds to the highest reading of the meter bar, which — for a given audio program — may depend on the meter Scale & Ballistics selected through the Level Meters submenu.
- Number of CLIPs detected during the session. This is directly affected by the Consecutive FS Samples for CLIP setting in the Level Meters submenu.
- Number of MUTEs detected during the session. Affected by the Consecutive '0' Samples for Mute setting in the Level Meters submenu.
- Number of invalid samples encountered during the session. The 764 counts a sample as invalid when its validity bit is set high. All these fields will read off when the Ignore Validity Bit item in the Level Meters submenu is set to YES.
- Number of parity errors detected during the session. This will increment if the 764 detects incorrect parity in a received digital audio word. Parity errors suggest problems with the digital signal source or signal path.
- Code Violations, or the number of raw serial data subframes containing bi-phase coding errors encountered during the session. Code Violations indicate an incorrect or unreliable serial digital signal or transmission path.
- The digital audio word length, detected by monitoring bit activity in the part of the digital signal reserved for audio sample data. Although it is not likely, this number *can* differ from the sample length information indicated in the Channel Status bits of the digital input signal.
- DC Offset, reported in dBFS (dB relative the the full scale amplitude of the input signal). Note that an offset of –60 dBFS is only 0.001 of the full scale

amplitude, while an offset of -90 dBFS is approximately 3.16×10^{-5} of full scale.

- The measured sample rate. This number is independent of the sample rate indicated in the Channel Status bits of the digital input data, but should be the same.
- Frame Synchronization Error — for each input with respect to the Digital Audio Reference (DAR), when one is present at the REFERENCE input. Otherwise — when both inputs are active but no DAR is present — the error of input 3–4 relative to input 1–2, as depicted in Figure 2–25. Errors are expressed as the percentage of a complete digital audio frame.

Notice the “No Reference Signal” message in Figure 2–25. It will appear whenever a DAR is absent from the REFERENCE input.

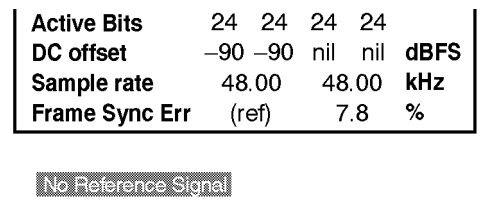


Figure 2–25: Sync Error reporting in the absence of a DAR

The AES11 standard specifies that synchronization errors should be no greater than 25% of the audio sample frame. When the synchronization error exceeds this limit, a SYNC ERR flag is displayed under the meter bars of the unsynchronized input. Figure 2–26 illustrates the flags as they would appear if each input signal preceded or followed the DAR signal by more than 25% of a frame.

Both the No Reference Signal message and the SYNC ERR flags may be suppressed through the Level Meters submenu (see the User manual for details).

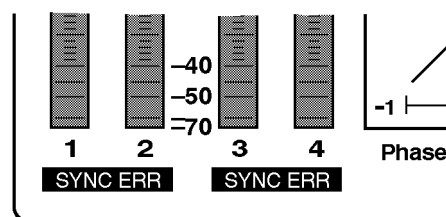


Figure 2–26: The SYNC ERR flags

Session Reports

The 764 can output the data collected during a session — in the form of ASCII text Session Reports — through the rear-panel RS-232 connector. You can print reports on a serial printer, or save them to files on an IBM®-compatible Personal Computer (PC). The 764 can generate two types of session report, short and long.

```

Tektronix 764 Session Screen Report                               (short report)
-----
Title                               Date
Time Code used: Session HH:MM:SS
Starting time 00:00:00
Ending time 00:00:41
Elapsed time 00:00:41
-----
Settings:
Display Mode:                               4 Channels
Interpolation:                              ON
Ballistics:                                TRUE PEAK
Peak Program Level (dBFS):                  -8
Test Level (dBFS):                          -18
Consecutive full-scale samples for clip:    1
Consecutive zero samples for mute:         10
De-emphasis used on channel 1:              NONE
De-emphasis used on channel 2:              NONE
De-emphasis used on channel 3:              NONE
De-emphasis used on channel 4:              NONE
-----

```

| | Channel 1 | Channel 2 | Channel 3 | Channel 4 | |
|---------------------------|-----------|-----------|-----------|-----------|------|
| Highest True Peak Reading | -0.7 | 0 | 0 | 0 | dBFS |
| Highest Bar Reading | -0.7 | 0 | 0 | 0 | dBFS |
| Clips Found | 0 | 0 | 234 | 234 | |
| Mutes Found | 15 | 17 | 0 | 0 | |
| Invalid Samples Found | 0 | 0 | 0 | 0 | |
| Parity Errors Found | 0 | 0 | 0 | 0 | |
| Code Violations Found | 11 | 12 | 27 | 33 | |
| Number of Active Bits | 24 | 24 | 24 | 24 | |
| DC Offset | -58.9 | -70.3 | -52.2 | -62.0 | dBFS |
| Starting Sample Rate | 44.10 | | 48.00 | | kHZ |
| Ending Sample Rate | 48.00 | | 48.00 | | kHZ |
| Number of changes | 3 | | 3 | | |
| Frame Sync Error | 3 | | 0 | | % |

Figure 2–27: A short session report

The short report, shown in Figure 2–27, is a record of what happened during the session. It contains a print-out of the statistics tabulated on the 764 Session display, and lists several instrument settings that can affect meter behavior.

In addition to all the information in the short report, the long report contains time-stamped peak and error data and gives more detail about active bits, DC offset, and sample rates. Figure 2–28 is an example of the additional information contained in a long report.

```

-----
Time Stamped Information Follows:
-----
Highest True Peak Reading - within each 20 second interval
Channel 1          Channel 2          Channel 3          Channel 4
Session  dBFS    Session  dBFS    Session  dBFS    Session  dBFS
00:00:09 -10.8   00:00:09 -8.1    00:00:11 -8.1    00:00:12 -8.1
00:00:31 -4.9   00:00:31  0    00:00:31  0    00:00:31  0
-----
Highest Bar Reading - within each 20 second interval
Channel 1          Channel 2          Channel 3          Channel 4
Session  dBFS    Session  dBFS    Session  dBFS    Session  dBFS
00:00:10 -13.6   00:00:10 -12.1  00:00:12 -12.1  00:00:12 -12.1
00:00:31 -4.9   00:00:31  0    00:00:30  0    00:00:30  0
-----
Clips Found - NONE
-----
Mutes Found
Channel 1          Channel 2          Channel 3          Channel 4
Session           Session           Session           Session
00:00:37          00:00:37          00:00:32          00:00:32
-----
Invalid Samples Found - NONE
-----
Parity Errors Found - NONE
-----
Code Violations Found
Channel 1          Channel 2          Channel 3          Channel 4
Session           Session           Session           Session
00:00:17          00:00:17          00:00:36          00:00:36
-----
Number of Active Bits
Channel 1          Channel 2          Channel 3          Channel 4
Minimum  Bits     Minimum  Bits     Minimum  Bits     Minimum  Bits
00:00:13  0       00:00:13  0       00:00:13  0       00:00:13  0
Maximum  Bits     Maximum  Bits     Maximum  Bits     Maximum  Bits
00:00:00  24      00:00:00  24      00:00:00  24      00:00:00  24
-----
DC Offset
Channel 1          Channel 2          Channel 3          Channel 4
Minimum  dBFS     Minimum  dBFS     Minimum  dBFS     Minimum  dBFS
00:00:00  nil     00:00:00  nil     00:00:00  nil     00:00:00  nil
Maximum  dBFS     Maximum  dBFS     Maximum  dBFS     Maximum  dBFS
00:00:00  nil     00:00:00  nil     00:00:00  nil     00:00:00  nil
Average  dBFS     Average  dBFS     Average  dBFS     Average  dBFS
00:00:00  nil     00:00:00  nil     00:00:00  nil     00:00:00  nil
-----
Sample Rate
Channels 1-2          Channels 3-4
Session  kHz          Session  kHz
00:00:26  00.00          00:00:12  48.00
-----

```

Figure 2-28: Additional data on the long report

There are two types of time-stamped information, peak readings and error events. Peak readings are the highest true peak and the highest meter reading encountered during each consecutive peak reading interval in the session. An error event is a clip, mute, invalid sample, parity error, or code violation episode, consisting of at least one such error.

The time stamp is the hour:minute:second when the peak or error occurred, in the time format — Session, VITC, or LTC — selected through the Time Code submenu.

To output a session report:

1. Connect the 764 to the printer or PC. Cable requirements are explained in the Reference section of the User manual.
2. Select the appropriate communications and report options (flow control, baud rate, type of report, and time-stamp period) through the Serial Port submenu; see *Serial Port Submenu*, in the Reference section of the User manual.
3. Run a session.

4. Stop the session, but *do not* reset it. Press the Copy soft button (feature 5 in Figure 2–24). The 764 will send the report to the printer or PC, indicating the remaining number of lines on the bottom of the display. Press the soft button a second time to cancel the report.

The Channel Status View

The 764 Channel Status view displays the channel status information that is embedded in AES3–1992 (professional) or IEC–958 (consumer) digital audio signals. Press **CLEAR MENU** (if necessary to exit a menu), then press the **VIEW:CH. STATUS** button to select the Channel Status view.

You can choose to display the Channel Status in one of four formats: fully decoded text (the default, illustrated in Figure 2–29), binary (Figure 2–30), transmission-order binary, or hexadecimal. To change display formats, press the soft button assigned to the desired format, as listed on the right side of the Channel Status View.

- In Text mode, the Channel Status data is spelled out in “plain English,” as shown in Figure 2–29. The 764 Digital Audio Monitor will decode embedded channel status data per AES3–1992 or IEC–958 depending on the state of the first-transmitted channel status bit (bit 0 of byte 0). Press the top (**CHAN**) soft button to toggle between the two input channel pairs (1&2 and 3&4).

| CHANNEL STATUS | Channel 1 | Channel 2 | |
|-------------------|--------------------|--------------------|-----------------|
| Channel use | professional audio | professional audio | CHAN 1 2 3 4 |
| Data use | audio | audio | FORMAT Text |
| Emphasis | no emphasis | no emphasis | Binary |
| Locking of source | locked | locked | Xmsn Order |
| Sample frequency | 48 kHz | 48 kHz | Binary |
| Channel mode | 2-channel | 2-channel | Hex |
| User bits mode | not indicated | not indicated | |
| AUX bits use | main audio | main audio | |
| Audio word length | not indicated | not indicated | |
| Reference signal | not a ref. | not a ref. | |
| Origin | AM70 | AM70 | |
| Destination | ABCD | EFGH | |
| Sample number | 0 | 0 | |
| Time of day | 00:00:00 | 00:00:00 | |
| Block CRC | is valid | is valid | CLEAR |

Figure 2–29: The channel status view, text mode

- In binary display mode (illustrated in Figure 2–30), you may turn the multi-function knob to highlight various bits or blocks of bits for same-screen plain English decoding. For example, bits 3 through 5 of byte 0 indicate the (pre)emphasis, if any, that has been applied to the audio program; when you move the screen highlight to those bits, the type of emphasis will be displayed in decoded text near the bottom of the screen. Only one channel at a

time is shown in binary mode; the selected channel is indicated on the top line of the display. Press the CHAN soft button repeatedly to cycle among the four input channels.

- The Xmsn Order Binary display reverses the bit order to correspond to transmission order (LSB first) of the Channel Status bits. Use the knob as in the binary display to highlight bits or bit-blocks for decoding. Press the CHAN soft button repeatedly to cycle among the four input channels.
- Hex format is included for compatibility with other instrumentation. All four input channels are shown on one display.

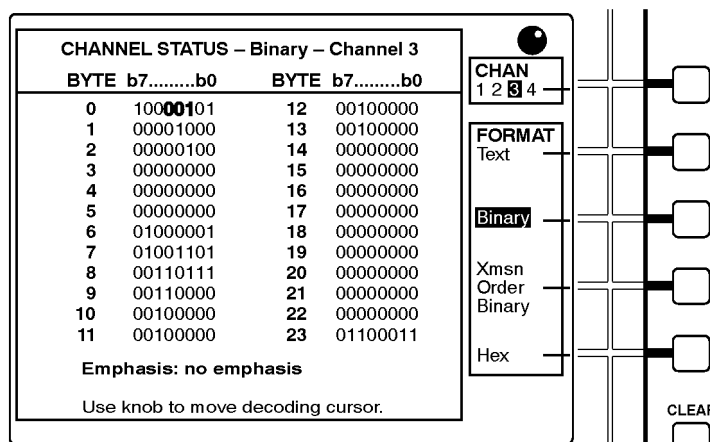


Figure 2-30: The channel status view, binary mode

The User Data View

The 764 User Data view is intended to display optional User information that may be embedded in the user bits of digital audio signals. As this is written, the 764 can only interpret and display data that is block-aligned with the Channel status data; the 764 Digital Audio Monitor cannot interpret IEC-908 (Compact Disk) user data. Press CLEAR MENU (if necessary to exit a menu), then press the VIEW:USER DATA button to select the User Data view.

User data may be displayed either in Hexidecimal form or as the equivalent ASCII text. The Text mode is shown in Figure 2-31. Select the desired format by pressing the appropriate soft key. The Hexidecimal display format has room for data from all four input channels; the Text display shows two channels at a time. In the Text display, press the top (CHAN) soft button to toggle between the two input channel pairs (1&2 and 3&4).

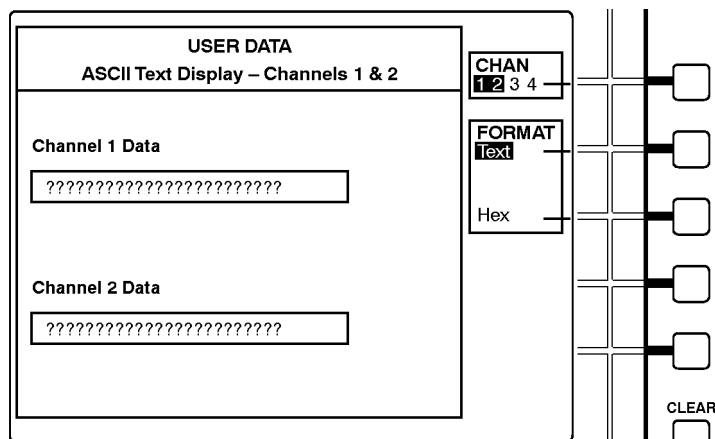


Figure 2–31: The user data view, text mode

Other Features Saving and Restoring Setups

The 764 Digital Audio Monitor automatically stores current front panel and menu settings in non-volatile RAM. The instrument restarts every time in the Audio View/Session Display, with the session stopped and session time (if it is the current Time Code selection) reset to zero. All other settings will be as when the 764 Digital Audio Monitor was switched off.

For added flexibility, you can also save up to three instrument configurations, recall them later, or restore the factory default settings with the techniques described next.

Saving a Setup. You can save up to three additional instrument configurations in NVRAM for convenient later recall through the Save Setups submenu. To do so:

1. Configure the instrument as desired with the front-panel controls and through the various submenus.
2. Enter the top menu. (Press **CLEAR MENU** and then **MENU** to enter the top menu anytime the 764 Digital Audio Monitor is operating.)
3. Use the multi-function knob to scroll the menu highlight to Save Setups. Press any soft button to enter the submenu.
4. Press one of the three available soft buttons to save the instrument settings. A highlighted message — **SETUP #N** has been saved — will appear on screen when the operation is complete.
5. Press **CLEAR MENU** to resume normal instrument operation.

Restoring a Setup. To recall a setup or restore factory default settings:

1. Enter the top menu.
2. Use the multi-function knob to scroll the menu highlight to Restore Setups. Press any soft button to enter the submenu. It will resemble the display illustrated in Figure 2–32.
3. Press one of the four soft buttons to recall/restore the associated instrument settings. A highlighted message — SETUP #*N* has been restored — will appear on screen to signal that the operation is complete.
4. Press CLEAR MENU to resume normal instrument operation with the newly-recalled settings.

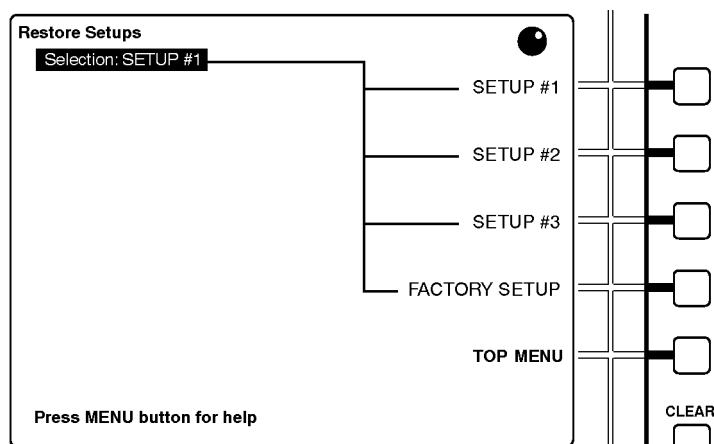


Figure 2–32: The restore setups submenu

Editing a Setup. To edit an existing, saved setup:

1. Recall the Setup through the Recall Setups submenu.
2. Change the instrument settings as desired.
3. Save the Setup as the same setup number through the Save Setups submenu.



Performance Verification

Performance Verification

This section contains detailed procedures for verifying the performance of the Tektronix 764 Digital Audio Monitor Digital Audio Monitor.

A performance verification checklist appears on page 3–3.

Step-by-step verification procedures begin on page 3–4.

Adjustment procedures, which are required only after repair or replacement of the instrument display, display board, or power supply, are described in Section 5 of this manual.

Required Equipment

Table 3–1 contains a list of the equipment required for the 764 Digital Audio Monitor performance verification procedures. Other equipment may be substituted; however, care must be used to ensure that the accuracy of the substituted equipment meets or exceeds the listed requirements. Use of inadequate equipment may result in faulty measurements.

NOTE. Use of the listed test equipment ensures an accuracy ratio of 4:1 or better for warranted performance requirements, with the following exceptions:

| <i>Characteristic</i> | <i>Requirement</i> | <i>Ratio Achieved</i> |
|----------------------------------|-------------------------------|-----------------------|
| <i>Frame Sync Error Accuracy</i> | <i>2% of dig. audio frame</i> | <i>3.03</i> |
| <i>Headphone Output Balance</i> | <i>0.05 dB</i> | <i>3.33</i> |

Table 3–1: Required test equipment

| Item | Qty | Information/Min. Requirements | Example |
|---|-------------|--|--|
| Audio Generator/Analyzer | 1 | | Tektronix AM700 |
| Cable: Digital Audio, XLR ends | 3 | Male-to-Female | Markertek SC6XXJ |
| Cable: XLR-to-Stereo Phone plug <i>Or</i> "Y" cable: stereo phone plug to (2) mono phone jacks and Cable: Mono phone plug to XLR | 1 1 2 | Male stereo-to-(2) female mono Male-to-Male | Custom, see Figure 3–2 <i>Or</i> Markertek YPP-117 and Markertek SC6XS |
| Cable: 75 Ω coaxial, BNC | 2 | Male-to-Male | Tektronix part number 012–0074–00 |
| Termination: 75 Ω BNC | 2 | 0.025% precision | Tektronix part number 011–0102–01 |

Table 3-1: Required test equipment (Cont.)

| Item | Qty | Information/Min. Requirements | Example |
|--|-----|---|--|
| Spectrum Analyzer with internal tracking generator | 1 | Freq. Range: 325 MHz Sensitivity: up to 50 dB | Tektronix 2712 Option 04 |
| N-to-BNC adapter | 2 | Male N to female BNC | Standard Tektronix 2712 accessory; part number 103-0045-00 |
| High Frequency RF Bridge | 1 | ≥46 dB return loss sensitivity, 50 kHz to 325 MHz | Wideband Engineering part number A57TGACR |
| Termination: 75 Ω BNC | 2 | Precision, 0-500 MHz | Wideband Engineering part number A56T75B |
| 75 Ω BNC adapter | 1 | Male-to-male | Hewlett-Packard part number 1250-1288 |
| Precision 50 Ω BNC cable | 2 | Male-to-male, 1% precision | Tektronix part number 012-0482-00 |
| Digital Audio Balun | 1 | Male-to-male | ETS, Inc.* part number PA 810 |
| Termination: 110 Ω, female XLR | 1 | ≥1% precision | Custom, see page 3-24 |

* 1394 Willow Rd, Menlo Park, CA 94025, USA

Verification Checklist

Table 3–2 lists the procedures that are described in this section. Once you are familiar with these procedures, you may use the table as a checklist for 764 Digital Audio Monitor performance verification.

There are two categories of 764 Digital Audio Monitor verification procedures: those that require an audio generator/analyzer, such as the Tektronix AM700; and those that require a spectrum analyzer with a built-in tracking generator, such as the Tektronix 2712, option 04. The two setup categories are separated by a double line in Table 3–2.

Table 3–2: The 764 Digital Audio Monitor performance verification procedures

| ✓ | Characteristic/Procedure | Requirement(s) | Page |
|---|---|---|------|
| | Input level, balanced inputs | 0.2 V _{p-p} to 10.0 V _{p-p} | 3–6 |
| | Input level, unbalanced inputs | 50 mV _{p-p} to 2 V _{p-p} | 3–7 |
| | Frequency lock range | 27 kHz to 52 kHz | 3–7 |
| | Sample rate measurements | Resolution: 0.01 kHz Accuracy: ± 0.01 kHz | 3–9 |
| | “Frame Sync Err” measurements | Range: ± 40% of dig. audio frame Accuracy: ± 2% of dig. audio frame | 3–9 |
| | Meter accuracy (True Peak) | ± .05 dB (1.0 kHz tone, 0 to –20 dBFS, no de-emphasis) | 3–11 |
| | Meter accuracy (VU) | ± .05 dB (1.0 kHz tone, 0 to –20 dBFS, no de-emphasis) | 3–11 |
| | Meter accuracy (PPM) | ± .05 dB (1.0 kHz tone, 0 to –20 dBFS, no de-emphasis) | 3–12 |
| | De-emphasis (50/15 μs and CCITT J.17) | ± .25 dB | 3–12 |
| | Phase display AGC range | 0 dBFS to –40 dBFS | 3–13 |
| | Headphones output | Output Voltage: > 10 V _{p-p} into a 150 Ω load, 0 dBFS input signal Frequency response: ± 2 dB from 20 Hz to 20 kHz Balance: ± 0.5 dB Distortion: THD+N ≤ 0.05% | 3–14 |
| | Return loss, unbalanced digital audio loop-throughs | > 30 dB | 3–19 |
| | Impedance, unbalanced REF input | 75 Ω ± 10%, 0.1 to 6.0 MHz | 3–20 |
| | Impedance, balanced REF Input | 110 Ω ± 5%, 0.1 to 6.0 MHz | 3–21 |
| | Impedance, balanced digital audio inputs (terminated) | 110 Ω ± 5%, 0.1 to 6.0 MHz | 3–23 |
| | Return loss, balanced digital audio inputs (unterminated) | > 30 dB, 0.1 to 6.0 MHz | 3–23 |

Typographic Conventions

All procedures in this section use the following typographic conventions:

- Physical features of the 764 and the test equipment used in these procedures are indicated with bold, sans serif type. These features include connectors, control knobs, and buttons. Feature names are capitalized in this text as they are printed on the instrument. Examples: **MENU** and **Enter**. Grouped controls are designated by the group name and the control name, separated only by a colon. Examples: **APPLICATIONS:Digital** and **VIEW:AUDIO**.
- Selections that appear on instrument display screens — such as 764 soft button assignments and AM700 touch screen choices — are enclosed in angle brackets. Again, words are capitalized (and italicized) in this text as they appear on the instrument displays. Examples: <Waveform Control>, <FACTORY SETUP>, and <Follow A>.

Audio Generator/Analyzer Procedures

The following procedures — through *Headphone Outputs*, beginning on page 3–14 — require an audio generator/analyzer, such as the Tektronix AM700.

NOTE. *To avoid repeating lengthy setup instructions, each of the Audio Generator/Analyzer procedures assumes that you are continuing with the instrument configurations from the end of the preceding procedure. Unless you are very familiar with AM700 and 764 Digital Audio Monitor operation, please perform all procedures in the order they are described.*

- Setup**
1. Connect the AM700 digital generator output (**Digital-Out** on the front panel) to the 764 CH 1–2 XLR Digital Audio input with an XLR cable.
 2. At the 764:
 - a. Connect an XLR cable from the CH 1–2 XLR output to the CH 3–4 XLR input.
 - b. Set the termination switch for CH 1–2 to its unterminated (**EXT**) position.
 - c. Set the termination switch for CH 3–4 to its terminated (**110 Ω**) position.
 3. Connect the AM700 unbalanced digital audio output (on the rear panel) to one of the 764 CH 1–2 Digital Audio BNCs with a 75 Ω cable.
 4. At the 764, connect a 75 Ω coaxial cable from the second CH1–2 Digital Audio BNC to the one of the CH 3–4 BNCs. Terminate the CH3–4 loop-through with a 75 Ω terminator.

5. Connect an XLR cable between the AM700 balanced output (**AES REF OUT** on the rear panel) and the 764 **REF IN (110 Ω)** connector.
6. Switch the AM700 On, if necessary, and reset the instrument to Factory Default settings with these steps:
 - a. Press **UTILITIES:Configure**; then select <State Saving> from the touch screen.
 - b. Select <Factory Default>; then confirm the choice by selecting the second, smaller <Factory Defaults> from the touch screen.
7. If the 764 Digital Audio Monitor is operating, press the front-panel **POWER** switch to change it to the Standby (off) position.
8. Press and hold the **VIEW:OTHER** button and switch the instrument On. Continue pressing the **VIEW:OTHER** button. After a few seconds, the display will flash twice and then the message

Start mode "RUN POWERUP DIAGNOSTICS" recognized

will appear.
9. Release the **VIEW:OTHER** button. The instrument will conduct a sequence of self-diagnostic tests, which should last no more than three minutes (if all tests pass). Normal operation will begin when the test sequence is done. See Appendix A for more information about the internal diagnostic utilities.
10. When normal operation begins, enter the 764 Restore Setups submenu with the following steps:
 - a. Press the **MENU** button to enter the top menu.
 - b. Turn the multifunction knob to move the menu highlight to the <Restore Setups> item.
 - c. Press a soft button to select the submenu.
11. Press the <**FACTORY SETUP**> soft button to restore all factory settings.
12. Press the **CLEAR MENU** button to exit the Restore Setups submenu.
13. Press the **VIEW:AUDIO** and **PHASE DISPLAY:A** buttons (if necessary) to configure the instrument display as shown in Figure 3–1.

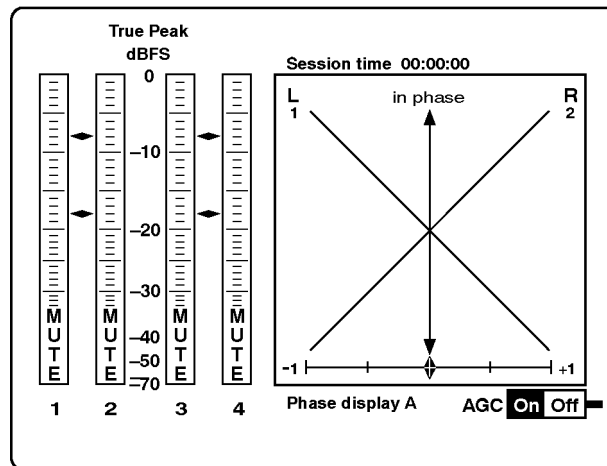


Figure 3-1: The 764 Digital Audio Monitor audio level and phase display

14. Let the 764 Digital Audio Monitor and AM700 warm up for approximately 20 minutes to ensure proper operation and measurements.

Input Level, Balanced Inputs

Requirement: $0.2 V_{p-p}$ to $10.0 V_{p-p}$

1. On the AM700:
 - a. Press the GENERATOR:Control button.
 - b. Select <Waveform Control> on the touch screen. Touch <Digital SF 1> (to select the first digital subframe) and confirm that the output is <Sine>, and the <Frequency> is 1000.0 Hz (or 1.000 kHz).
 - c. Select <Amplitude> on AM700 touch screen; then hold down the Units button (below the control knob) until the units popup menu appears.
 - d. Set the amplitude units to dBFS.
(Turn the large control knob to highlight <dBFS> on the popup; then press Enter.)
 - e. Set the amplitude to -10 dBFS.
(Press <Amplitude> again; then press +/-, 1, 0, and Enter.)
 - f. Select <Digital SF 2> (the second digital subframe) and confirm that it is set to <Follow A>.
 - g. Select <Advanced Digital Interface>; then set the XLR Output to $0.2 V_{p-p}$.
(Select <XLR Output>, input 0.2 with the keypad, then press Enter.)
 - h. Press the front-panel GENERATOR:On button to illuminate the word “On.”

2. Verify that 764 level meters are stable and read -10 dBFS on all four channels.
3. At the AM700, change the XLR Output to $10.000 V_{p-p}$.
(Select <XLR Output>, input 10 through the keypad, and then press Enter.)
4. Verify that 764 level meters continue to be stable and read -10 dBFS on all four channels.

Input Level, Unbalanced Inputs

Requirement: $50 mV_{p-p}$ to $2 V_{p-p}$

1. Press the 764 MENU button; then enter the Input submenu.
(Turn the multifunction knob to highlight <Input>; then press a soft button to enter the submenu).
2. Press the soft button next to <BNC-unbalanced> to change the CH 1–2 input to the 75Ω connector.
3. Turn the multifunction knob counterclockwise to highlight <CH 3–4 Input:>, and set that input to the 75Ω connector by pressing the <BNC-unbalanced> soft button.
4. Press the 764 CLEAR MENU button.
5. Verify that 764 level meters are stable and read -10 dBFS on all four channels.
6. Set the AM700 BNC Output amplitude to $0.05 V_{p-p}$.
(Select <Advanced Digital Interface> on the touch screen and then <BNC Output>; input 0.05 with the keypad and then press Enter.)
7. Verify that 764 level meters continue to be stable and read -10 dBFS on all four channels.
8. Set the AM700 BNC Output amplitude to $2.0 V_{p-p}$.
(Select <BNC Output>, enter 2, and then press Enter.)
9. Verify that 764 level meters remain stable and continue to register -10 dBFS on all four channels.

Frequency Lock Range

Requirement: 27 kHz to 52 kHz

1. Continue with the instrument settings from the previous procedure.
2. Through the Inputs submenu, set the 764 inputs back to XLR-balanced. Be sure to press CLEAR MENU when you are done to exit the on-screen menus.

3. On the AM700:
 - a. Set the XLR Output Amplitude to 5.0 V_{p-p}.
(Select <XLR Output>, input 5 through the keypad, and then press Enter.)
 - b. Set the frequency mode to <Variable>.
(Select <Frequency Mode> on the touch screen, turn the large knob to highlight <Variable>, and then press Enter.)
 - c. Set the sample frequency to 52.0 kHz.
(Select <Variable Freq> on the touch screen and then press 5, 2, and mV/kHz, in that order.)
 - d. Select <Waveform Control> and then <Digital SF 2> on the touch screen. Change the second subframe waveform function from <Follows A> to <Sine> using the touch screen and the large control knob. Press the Enter button near the keypad to confirm the choice. The resulting sine-wave encoded in subframe 2 will have the same frequency and amplitude as the signal on subframe 1, but will not have the same phase.
4. Press the PHASE DISPLAY:A button on the 764.
5. Verify that the Phase Display A contains a constant-phase ellipse.
6. Press the 764 PHASE DISPLAY:B button.
7. Verify that the Phase Display B contains a constant-phase ellipse.
8. Press the 764 PHASE DISPLAY:SESSION button.
9. Verify that the Sample Rate (displayed near the bottom of the SESSION STATISTICS display) is 52.00 kHz for both inputs (CH 1–2 and CH 3–4).
10. Change the AM700 sample frequency to 30 kHz:
 - a. Select <Advanced Digital Interface> on the touch screen
 - b. Select <Variable Freq> and then press 3, 0, and mV/kHz, in that order.
11. Verify that the SESSION STATISTICS Sample Rate for both inputs (CH 1–2 and CH 3–4) is 30.00 kHz. Note that this is the lowest sample rate that the AM700 can generate. However, if the 764 can lock to a 30 kHz sample rate signal, its ability to lock to a 27 kHz signal is guaranteed by design.
12. Press the 764 PHASE DISPLAY:A button.
13. Verify that the 764 Phase Display A contains a constant-phase ellipse.

**Sample Rate
Measurements**

Requirements:

| | |
|------------|----------------|
| Resolution | 0.01 kHz |
| Accuracy | ± 0.01 kHz |

1. Continue with the setup from the previous procedure. Press the 764 **PHASE DISPLAY:SESSION** button to restore the **SESSION STATISTICS** display.
2. In the Advanced Digital Interface display of the AM700, set the <Frequency Mode> back to <Audio Sample Rate>.
3. Select <Advanced Digital Audio> on AM 700 touch screen, and set the <Digital Audio:Sample Rate> to 32 kHz. (Touch <Sample Rate> to reveal the popup menu; turn the large control knob clockwise to highlight <32 kHz>; then press Enter.)
4. Verify that the 764 **SESSION STATISTICS** Sample Rate for both CH 1–2 and CH 3–4 is 32.00 kHz ± 0.01 kHz.
5. Press the 764 **VIEW:CH. STATUS** button. Select the text readout of CH1–2 status, if necessary, with the <FORMAT:Text> and <CHAN> soft buttons.
6. Verify that the sample frequency indicated in the channel status bytes is 32 kHz. Press the 764 <CHAN> soft button once and confirm that the CH 3–4 sample frequency status is also 32 kHz.
7. Set the AM700 Sample Rate to 44.1 kHz.
8. Verify that the sample frequency indicated on the 764 **CHANNEL STATUS** display is 44.1 kHz
9. Press the 764 **VIEW:AUDIO** button and verify that the **SESSION STATISTICS** Sample Rate for both CH 1–2 and CH 3–4 is 44.10 kHz ± 0.01 kHz.
10. Set the AM700 Sample Rate to 48 kHz.
11. Verify that the 764 **SESSION STATISTICS** Sample Rate for both CH 1–2 and CH 3–4 is 48.00 kHz ± 0.01 kHz.
12. Press the 764 **VIEW:CH. STATUS** button and verify that the sample frequency indicated in the channel status bytes is 48 kHz

**“Frame Sync Err”
Measurement**

Requirements:

| | |
|----------|-----------------------------------|
| Range | $\pm 40\%$ of digital audio frame |
| Accuracy | $\pm 2\%$ of digital audio frame |

1. Continuing from the Sample Rate verification procedure, press the 764 **VIEW:AUDIO** button to return to the Level Meters and Session display

2. At the AM700:
 - a. Through <Waveform Control>, set the AM700 digital subframe 1 amplitude to 0 dBFS.
 - b. Select <Advanced Digital Interface> and then select <Phase Offset>. Press **Units** once or twice to set the offset units to percent (%); then change the phase offset to 25%.
3. Wait approximately 10 seconds and then verify that the Frame Sync Err readout on the 764 SESSION STATISTICS display is between 23% and 27% ($25\% \pm 2\%$) for both CH 1–2 and CH 3–4.
4. If the Frame Sync Err readout is 25% or greater, verify that the SYNC ERR flag has appeared below the CH 1–2 and CH3–4 level meters. If the reported error is less than 25%:
 - a. Verify that the SYNC ERR flag is *not* visible.
 - b. Increase the AM700 <Phase Offset> enough to give a 764 Digital Audio Monitor Sync Err readout of 25%.
 - c. When the Frame Sync Err readout is 25%, verify that the SYNC ERR flag has appeared below the CH 1–2 and CH3–4 level meters.
5. At the AM700, set the <Phase Offset> to 40%.
6. Wait approximately 10 seconds and then verify that the Frame Sync Err readout on the 764 SESSION STATISTICS display is between 38% and 42% ($40\% \pm 2\%$) for both CH 1–2 and CH 3–4.
7. Verify that the SYNC ERR flag remains visible below the CH 1–2 and CH3–4 level meters.
8. At the AM700, set the <Phase Offset> to –25%.
9. Wait approximately 10 seconds and then verify that the Frame Sync Err readout on the 764 SESSION STATISTICS display is between –23% and –27% ($-25\% \pm 2\%$) for both CH 1–2 and CH 3–4.
10. At the AM700, set the <Phase Offset> to –40%.
11. Wait approximately 10 seconds and then verify that the Frame Sync Err readout on the 764 SESSION STATISTICS display is between –38% and –42% ($40\% \pm 2\%$) for both CH 1–2 and CH 3–4.
12. At the AM700, set the <Phase Offset> to –22%.
13. Wait approximately 10 seconds and then verify that the Frame Sync Err readout on the 764 SESSION STATISTICS display is between –20% and –24% ($-22\% \pm 2\%$) for both CH 1–2 and CH 3–4.

14. Verify on the 764 that the SYNC ERR warning flags are OFF.

15. Return the AM700 <Phase Offset> setting to 0%.

Meter Accuracy (True Peak)

Requirement: ± 0.05 dB (steady 1.000 kHz tone, 0 to -20 dBFS, no de-emphasis)

1. Continue with the setup from the Synchronization procedure and enter the 764 Service submenu. (Press **MENU**, turn the multifunction knob to highlight the <Service> menu item, and then press a soft button.)
2. Turn the 764 numeric level readout ON. (Highlight <Numeric Level Readout>; then press the <ON> soft button.)
3. Press **CLEAR MENU** on the 764. Note the numeric program level readout that now obscures the top portion of the SESSION display.
4. Confirm (or make) these AM700 <Waveform Control> settings:
 - <Digital SF 2> = <Follow A>
 - <Digital SF 1><Frequency> = 1000 Hz
 - <Digital SF 1><Amplitude> = -10 dBFS
5. Verify that the 764 numeric level readout indicates between -9.95 and -10.05 (-10 ± 0.05 dB) for all four Bars (Channels).
6. At the AM700, set the <Digital SF 1> amplitude to -20 dBFS.
7. Verify that the 764 numeric level readout is between -19.95 and -20.05 (-20 ± 0.05 dB) for all four channels.

Meter Accuracy (VU)

Requirement: ± 0.05 dB (steady 1.000 kHz tone, 0 to -20 dBFS, no de-emphasis)

1. Continue from the previous procedure, and change the 764 meter ballistics to Extended VU through the Level Meters submenu.
 - a. Press **MENU**, turn the multifunction knob to highlight the <Level Meters> menu item, and then press a soft button.
 - b. Turn the multifunction knob counterclockwise to highlight the <Ballistics> submenu item.
 - c. Press the <EXTENDED VU> soft button and then press **CLEAR MENU**.
2. At the AM700, set the <Digital SF 1> amplitude to -20 dBFS.
3. Verify that the 764 numeric level readout is between -19.95 and -20.05 (-20 ± 0.05 dB) for all four channels.

4. At the AM700, set the <Digital SF 1> amplitude to -10 dBFS.
5. Verify that the 764 numeric level readout indicates between -9.95 and -10.05 (-10 ± 0.05 dB) for all four channels.

Meter Accuracy (PPM)

Requirement: ± 0.05 dB (steady 1.000 kHz tone, 0 to -20 dBFS, no de-emphasis).

1. Continue with the instrument settings from the previous procedure and change the 764 meter ballistics to PPM through the Level Meters submenu.
 - a. Press **MENU**. The <Level Meters> menu item should be highlighted; press a soft button to enter the submenu.
 - b. Turn the multifunction knob counterclockwise to highlight the <Ballistics> submenu item.
 - c. Press the <PPM> soft button; then press **CLEAR MENU**.
2. Verify that the 764 numeric level readout indicates between -9.95 and -10.05 (-10 ± 0.05 dB) for all four channels.
3. At the AM700, set the <Digital SF 1> amplitude to -20 dBFS.
4. Verify that the 764 numeric level readout is between -19.95 and -20.05 (-20 ± 0.05 dB) for all four channels.

De-emphasis (50/15 μ s and CCITT J.17)

Requirement: ± 0.25 dB.

1. Continue with the instrument settings from the previous procedure. Select 50/15 μ s de-emphasis for all four 764 meters through the De-emphasis submenu.
 - a. Press **MENU**. Turn the multifunction knob to highlight the De-emphasis item and press any soft button to enter the De-emphasis submenu.
 - b. Select 50/15 de-emphasis for all four channels.
 - c. Press **CLEAR MENU**. Confirm that <De-emp> appears above both 764 meter pairs.
2. At the AM700, set the <Digital SF 1> amplitude to 0 dBFS.
3. Verify that the 764 numeric level readout indicates between -0.12 and -0.62 dB (-0.37 ± 0.25 dB) for all four channels.
4. At the AM700, set the <Digital SF 1> Frequency to 4000 Hz.
5. Verify that the 764 numeric level readout indicates between -3.29 and -3.79 dB (-3.54 ± 0.25 dB) for all four channels.

6. At the AM700, set the <Digital SF 1> Frequency to 10000 Hz.
7. Verify that the 764 numeric level readout indicates between -7.36 and -7.86 dB (-7.61 ± 0.25 dB) for all four channels.
8. At the 764, change the de-emphasis to CCITT J.17 for all four channels.
9. At the AM700, set the <Digital SF 1> Frequency to 400 Hz.
10. Verify that the 764 numeric level readout indicates between -2.02 and -2.52 dB (-2.27 ± 0.25 dB) for all four channels.
11. At the AM700, set the <Digital SF 1> Frequency to 2000 Hz.
12. Verify that the 764 numeric level readout indicates between -11.52 and -12.02 dB (-11.77 ± 0.25 dB) for all four channels.
13. At the AM700, set the <Digital SF 1> Frequency to 6400 Hz.
14. Verify that the 764 numeric level readout indicates between -17.01 and -17.51 dB (-17.26 ± 0.25 dB) for all four channels.
15. Change the de-emphasis settings of all four 764 input channels back to <NONE>.

Phase Display AGC Range

Requirement: 0 dBFS to -40 dBFS

1. Press the 764 PHASE DISPLAY:A button to replace the SESSION display with the Channel 1–2 Lissajous-Soundstage phase display. Confirm that AGC is On; if it is not, press the <AGC> soft button to toggle it <On>.
2. At the AM700:
 - a. Set the <Digital SF 1> function to <Sine>, the sine <Frequency> to 1000 Hz, and its <Amplitude> to 0.0 dBFS.
 - b. Change the <Digital SF 2> function from <Follow A> to <Sine>; then set the subframe 2 <Frequency> to 100 Hz.

- c. Select <Sweep Control>; then press <Digital SF 1> and make or confirm these settings:

Sweep Direction *Start->Stop*
 Spacing *Logarithmic*
 Points per Sweep 10
 Sweep Count 1
 Automatic Timing . . . (checked)
 Voltage Mode *Sweep*
 Voltage Start 0.000000 dBFS
 Voltage Stop -40.000000 dBFS
 Freq Mode *CW*

- d. Select <Digital SF 2> and make or confirm the same settings.

3. Press the AM700 **Sweep/Run** button to initiate an amplitude sweep. You may:
 - Watch the <Amplitude> field of the AM700 <Waveform Control> display to monitor the progress of the sweep.
 - Stop the amplitude sweep at any time by pressing the **Sweep/Run** button a second time.
 - Press the **Sweep/Run** button again — when the sweep is complete (or stopped) — to begin a new sweep at the 0 dBFS start level.
4. Verify that the diamond-shaped lissajous pattern on the 764 phase display returns to the same approximate size after each step of the sweep, from 0 dBFS to -40 dBFS. The amplitude sweep will take approximately 15 seconds.

Headphones Output

Requirements:

Output Voltage >10 V_{p-p} into a 150 Ω load, 0 dBFS input signal
 Frequency response ±2 dB from 20 Hz to 20 kHz
 Balance ±0.5 dB
 Distortion THD+N ≤0.05%

1. Connect the 764 Digital Audio Monitor headphone output to the AM700 **Analog In:A** and **Analog In:B** connectors with a stereo phone plug (1/4 inch)-to-XLR adapter as illustrated in Figure 3-2.

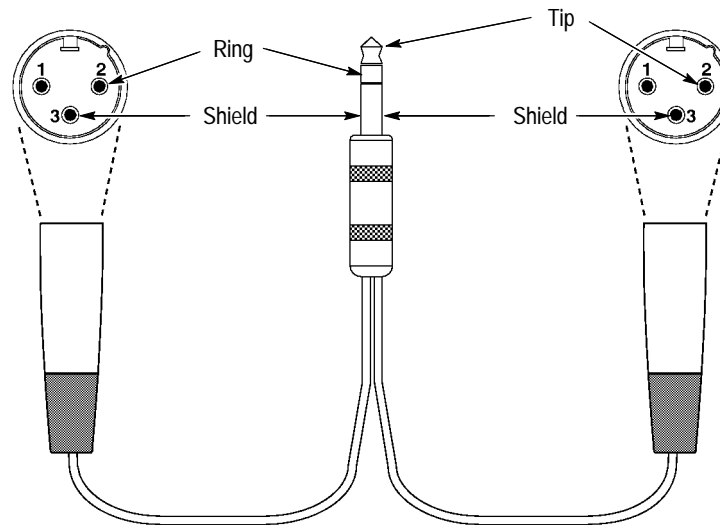


Figure 3-2: Cable connections for headphone output verification

2. Confirm that the AM700 <Digital SF 1> <Frequency> is 1000 Hz, and change the subframe <Amplitude> to 0.0 dBFS.
3. Set the <Digital SF 2> function to <Follow A>.
4. Configure the AM700 generator sweep control settings with the following steps:
 - a. Select <Sweep Control> on the AM700 touch screen.
 - b. Select <Digital SF 1> ; then confirm or make these settings:

| | | |
|------------------|-------|-----------------------|
| Sweep Direction | | <i>Start->Stop</i> |
| Spacing | | <i>Logarithmic</i> |
| Points per Sweep | | 10 |
| Sweep Count | | 1 |
| Automatic Timing | ... | (checked) |
| Voltage Mode | | <i>Fixed</i> |
| Freq Mode | | <i>Sweep</i> |
| Freq Start | | 20 kHz (20000 Hz) |
| Freq Stop | | 20 Hz |
 - c. Select <Digital SF 2> and confirm or make the same settings listed above.
5. Configure the AM700 inputs and adjust the 764 headphone output level with the following steps:
 - a. Select **APPLICATIONS:Analyzer** on the AM700. After several seconds, the Meas 1 waveform display will appear on the instrument screen.

- b. Press **UTILITIES:Configure** on the AM700 and then choose <Input Selection> from the touch screen.
- c. Confirm or make these AM700 Input Configuration settings:
 - FP A Impedance *150 ohms*
 - FP B Impedance *150 ohms*
 - FP A Range Auto (checked)
 - FP B Range Auto (checked)
 - Channel 1 *High Res A*
 - Channel 2 *High Res B*
- d. At the AM700:
 - Press the **SYSTEM CONTROLS:Clear Menu** button.
 - Select <RT>, on the upper left of the Audio Analyzer display to reveal the Real Time readout window.
 - Select the <Ch1> <Level> from the Real Time display (it may help to use the eraser-end of a pencil); then change the units to V (rms volts).
- e. Adjust the 764 **VOLUME** control until <Ch1> <Level> readout in the real time window is between 3.54 V (10.0 V_{p-p}) and 4.00 V (11.3 V_{p-p}). This will Verify the 764 output voltage performance requirement of >10.0 V_{p-p}.

6. Configure the AM700 Analyzer Application with the following steps:

- a. Press the **SYSTEM CONTROLS:Menu** button. <Enables> (at the bottom of the display) will be highlighted; <Channel 1> and <Channel 2> (on the right side of the display) will be checked.
- b. Select <Stereo> and <THD> from the right edge of the touch screen as well.
- c. Press **SYSTEM CONTROLS:Clear Menu**.
- d. Press the **UTILITIES:Configure** button; then select <Measurement Setup>. The <General> category will be active.
- e. Select <Meas 1> and confirm or make the following settings, as necessary:

| | |
|--------------|------------------|
| Quantity | Source |
| <i>Level</i> | <i>Channel 1</i> |

VS

| | |
|------------------|------------------|
| Quantity | Source |
| <i>Frequency</i> | <i>Channel 1</i> |

- f. Select <Meas 2> and confirm or make the following settings, as necessary:

| | |
|--------------|------------------|
| Quantity | Source |
| <i>Level</i> | <i>Channel 2</i> |

vs

| | |
|------------------|------------------|
| Quantity | Source |
| <i>Frequency</i> | <i>Channel 2</i> |

- g. Select <Meas 3> and confirm or make the following settings, as necessary:

| | |
|--------------|------------------|
| Quantity | Source |
| <i>THD+N</i> | <i>Channel 1</i> |

vs

| | |
|------------------|------------------|
| Quantity | Source |
| <i>Frequency</i> | <i>Channel 1</i> |

- h. Select <Meas 4> and confirm or make the following settings, as necessary:

| | |
|--------------|------------------|
| Quantity | Source |
| <i>THD+N</i> | <i>Channel 2</i> |

vs

| | |
|------------------|------------------|
| Quantity | Source |
| <i>Frequency</i> | <i>Channel 2</i> |

- i. Select <Sweep (Global)>.
- j. Set <Sweep Source> to <External>.
- k. Select <Settled (Global)>.
- l. Set <Samples> to <5>.
- m. Press <Accept Changes>. The Audio Analyzer display will return to the AM700 screen.
- n. Touch <RT>, on the upper left of the Audio Analyzer display, to dismiss the real time readout window.
- o. Touch the second, third, and fourth Graph Icons near the top of the AM700 screen to activate the Meas 2, 3, and 4 view windows.

- p. Change the Meas 1 vertical scale units to dBr with the following procedure:
 - Touch the view window to select it.
 - Press and hold the **Units** button to reveal the popup units menu.
 - Turn the large control knob clockwise to highlight <dBr>.
 - Press **Enter** to confirm the choice.
 - Press **Set Ref.**
 - q. Use the same procedure to change the Meas 2 vertical scale units to dBr.
 - r. Press the **UTILITIES:Configure** button; then select <Measurement Setup>. The <General> category will be active.
 - s. Select <Sweep (Global)>.
 - t. Set <Sweep Source> back to <Generator>.
 - u. Press <Accept Changes>.
7. Trigger a sweep and review the results.
- a. Press the **Sweep/Run** button on the AM700; the orange LED next to that button will light to indicate that the frequency sweep is in progress. The sweep will take approximately 55 seconds.
 - b. When the sweep is complete (the **Sweep/Run** LED will turn off), press and hold **SYSTEM CONTROLS:Rescale** to rescale all four Meas view windows.
 - c. Verify that the frequency response curves in the Meas 1 and Meas 2 windows are flat within ± 2 dBr from 20 Hz to 20 kHz.
 - d. Verify that the Channel 1 (Meas 1) and Channel 2 (Meas 2) frequency response is equal within ± 0.5 dBr.
 - e. Verify that the THD+N shown in Meas 3 and Meas 4 is less than 0.05% from 20 Hz to 20 kHz.

Spectrum Analyzer Procedures

Perform the remaining procedures with a spectrum analyzer that has a built-in tracking generator; for example, a Tektronix 2712, option 04. You may disconnect the audio generator/analyzer used in all earlier procedures.

**Return Loss,
Unbalanced (75 Ω BNC)
Digital Audio
Loop-throughs**

Requirement: >30 dB

1. Connect a precision 50 Ω cable from the spectrum analyzer RF INPUT to the RF Output on the high-frequency RF Bridge.
2. Connect a precision 50 Ω cable from the spectrum analyzer TG OUTPUT to the RF Input on the RF Bridge.
3. Connect a 75 Ω male-to-male BNC adapter to the RF bridge device under test connector. The equipment setup should now resemble the arrangement illustrated in Figure 3–3.
4. Press **MENUS:DEMOD/TG** on the spectrum analyzer. Turn the Tracking Generator On and set the Tracking Generator Fixed Level to 0.00 dBm. Exit the **DEMOD/TG** menu.
5. Configure the spectrum analyzer as follows:
 - Span/div 1 MHz;
 - Vertical scale 10 dB/div
 - Frequency range 6 MHz
 - Resolution bandwidth . 300 kHz
6. Turn the spectrum analyzer marker (MRK) ON and set it to 6 MHz.
7. Through the spectrum analyzer Input Menu, set the **EXTERNAL ATTEN/AMPL** to 0 dB.

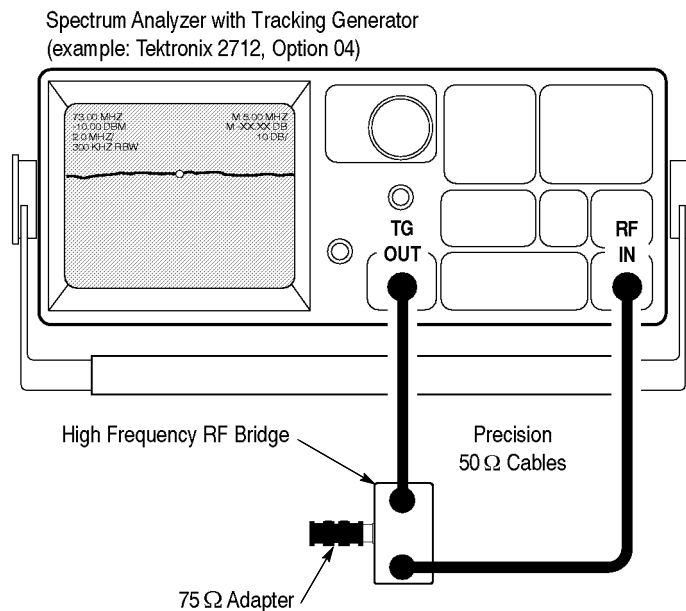


Figure 3–3: Initial return loss setup

8. Set the spectrum analyzer Reference Level to the first major division down from the top on the analyzer display.
9. Note the reference level readout. This number will depend on the characteristics of the RF Bridge and connecting cables.
10. Enter the Input Menu again, and adjust the External Attenuation Amplitude by the amount noted in the previous step. (For example, if the Reference Level reading was -24.5 dBm, enter 24.5, and then press the **-dBx** key.)
11. Confirm that the reference level readout is now -0.00 dB.
12. Attach the $75\ \Omega$ male-to-male BNC connector on the RF bridge to one of the 764 Digital Audio Monitor **DIGITAL AUDIO CH 1-2** input BNCs.
13. Terminate the CH 1-2 loop-through with a precision $75\ \Omega$ terminator.
14. Verify that the Reference Level readout on the spectrum analyzer is ≥ 30 dB.
15. Move the RF Bridge and the loop-through terminator to the 764 Digital Audio Monitor **DIGITAL AUDIO CH 3-4** input BNCs.
16. Verify that the Reference Level readout on the spectrum analyzer is ≥ 30 dB.

Impedance, Unbalanced ($75\ \Omega$ BNC) REF Input

Requirement: $75\ \Omega \pm 10\%$, 0.1 to 6.0 MHz

A convenient method of checking impedance over the specified frequency range is to measure the return loss. Return loss may be related to impedance with the following formula:

$$\text{Return Loss (dB)} = 20 \log \left| \frac{R_1 + R_0}{R_1 - R_0} \right|$$

Where R_0 is the nominal impedance and R_1 is the actual impedance.

For convenience, Table 3-3 lists equivalent return loss values for $R_0 = 75\ \Omega, \pm 10\%$. As you can see, the 764 Digital Audio Monitor balanced inputs will meet the impedance requirement if the measured return loss is 26.45 dB or greater.

1. Continue with the setup from the previous procedure (unbalanced input return loss).
2. Move the RF bridge to the 764 Digital Audio Monitor **REF IN:75 Ω** (BNC) connector.
3. Verify that the spectrum analyzer Reference Level is ≥ 26.45 dB from 0.1 to 6.0 MHz.
4. Switch the 764 Digital Audio Monitor power to **STANDBY** (off).

5. Verify that the spectrum analyzer Reference Level is still ≥ 26.45 dB from 0.1 to 6.0 MHz.
6. Switch the 764 Digital Audio Monitor power back on.

Table 3-3: Impedance vs. Return Loss, $R_0 = 75 \Omega$

| Return Loss | Impedance (ohms) | % of Nominal |
|---------------------|------------------|----------------|
| 25.575 | 67.5 | 90% |
| 26.205 | 68 | |
| 27.604 | 69 | |
| 29.248 | 70 | |
| 31.246 | 71 | |
| 31.821 | 71.25 | 95% |
| 33.804 | 72 | |
| 37.385 | 73 | |
| 43.464 | 74 | |
| ∞ (Infinity) | 75 | 100% (Nominal) |
| 43.580 | 76 | |
| 37.616 | 77 | |
| 34.151 | 78 | |
| 32.256 | 78.75 | 105% |
| 31.709 | 79 | |
| 29.827 | 80 | |
| 28.299 | 81 | |
| 27.016 | 82 | |
| 26.444 | 82.5 | 110% |

Impedance, Balanced (XLR) REF Input

Requirement: $110 \Omega \pm 5\%$, 0.1 to 6.0 MHz

This and the next procedure also check return loss to verify impedance of the balanced inputs over the required frequency range.

Table 3-4 lists equivalent return loss values for $R_0 = 110 \Omega, \pm 10\%$. The 764 Digital Audio Monitor balanced inputs will meet the impedance requirement ($\pm 5\%$) if the measured return loss is 32.26 dB or greater.

1. Continue with the setup from the previous procedure (unbalanced input impedance).

2. Replace the 75 Ω male-to-male BNC adapter on the RF bridge device under test connector with a digital audio balun.
3. Through the spectrum analyzer Input Menu, set the EXTERNAL ATTEN/AMPL to 0 dB.
4. Set the spectrum analyzer reference level to the first major division down from the top of the display.

Table 3-4: Impedance vs. Return Loss, $R_0 = 110 \Omega$

| Return Loss, dB | Impedance (ohms) | % of Nominal |
|---------------------|------------------|----------------|
| 25.575 | 99 | 90% |
| 26.444 | 100 | |
| 27.401 | 101 | |
| 28.465 | 102 | |
| 29.666 | 103 | |
| 31.045 | 104 | |
| 31.821 | 104.5 | 95% |
| 32.669 | 105 | |
| 34.648 | 106 | |
| 37.187 | 107 | |
| 40.749 | 108 | |
| 46.809 | 109 | |
| ∞ (Infinity) | 110 | 100% (Nominal) |
| 46.888 | 111 | |
| 40.906 | 112 | |
| 37.424 | 113 | |
| 34.964 | 114 | |
| 33.064 | 115 | |
| 32.256 | 115.5 | 105% |
| 31.519 | 116 | |
| 30.219 | 117 | |
| 29.097 | 118 | |
| 28.112 | 119 | |
| 27.235 | 120 | |
| 26.444 | 121 | 110% |

5. Note the reference level readout. This number will depend on the characteristics of the RF Bridge, cables, and balun.
6. Enter the Input Menu again and set the EXTERNAL ATTEN/AMPL Amplitude to offset the reference level noted in the previous step (For example if the reference level reading was -24.5 dBm, enter 24.5, and then press the **-dBx** key.)
7. Confirm that the reference level is now -0.00 dB.
8. Connect the RF bridge/balun to the 764 Digital Audio Monitor REF IN:110 Ω (XLR) connector.
9. Verify that the spectrum analyzer Reference Level is 32.26 dB or greater from 0.1 to 6.0 MHz.
10. Switch the 764 Digital Audio Monitor power to **STANDBY** (off).
11. Verify that the spectrum analyzer Reference Level is still 32.26 dB or greater from 0.1 to 6.0 MHz.
12. Switch the 764 Digital Audio Monitor power back on.

**Impedance, Balanced
(XLR) Digital Audio Inputs
(terminated)**

Requirement: $110 \Omega \pm 5\%$, 0.1 to 6.0 MHz

1. Continue with the setup from the previous procedure.
2. Move the RF bridge/balun from the REF IN connector to the CH 1–2 DIGITAL AUDIO:IN (XLR) connector.
3. Set the CH 1–2 TERM switch to the 110 Ω position, if necessary.
4. Verify that the spectrum analyzer Reference Level is ≥ 32.26 dB from 0.1 to 6.0 MHz.
5. Move the RF bridge/balun from the CH 1–2 DIGITAL AUDIO:IN connector to the CH 3–4 DIGITAL AUDIO:IN connector.
6. Set the CH 3–4 TERM switch to the 110 Ω position, if necessary.
7. Verify that the spectrum analyzer Reference Level is 32.26 dB or greater from 0.1 to 6.0 MHz.

**Return Loss,
Balanced (XLR)
Digital Audio Inputs
(unterminated)**

Requirement: >30 dB, 0.1 to 6.0 MHz

1. Remove the RF bridge/balun from the CH 3–4 DIGITAL AUDIO:IN connector.
2. Connect a $110 \Omega \pm 1\%$ termination to the RF bridge/balun.

NOTE. Construct a 110 Ω termination from the insert (“core”) of a female XLR connector, such as a Switchcraft® QG3F or QG3FD shown in Figure 3–4. Solder a 110 $\Omega \pm 1\%$ metal film resistor across solder lugs 2 and 3. For best results, trim the resistor leads as short as possible.

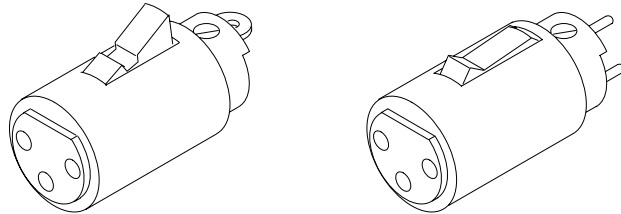


Figure 3–4: XLR connector inserts

3. Verify that the spectrum analyzer Reference Level is 35 dB or greater from 0.1 to 6.0 MHz. This step checks the termination; if the return loss of the termination alone is not ≥ 35 dB, acquire or construct a more accurate termination and repeat this check.
4. Remove the termination from the RF bridge/balun and attach it to the CH 1–2 DIGITAL AUDIO:OUT (XLR) connector.
5. Connect the RF bridge/balun to the CH 1–2 DIGITAL AUDIO:IN (XLR) connector.
6. Set the CH 1–2 and CH 3–4 TERM switches to the EXT position.
7. Verify that the spectrum analyzer Reference Level is 30 dB or greater from 0.1 to 6.0 MHz.
8. Move the RF bridge/balun and the termination from the CH 1–2 DIGITAL AUDIO (XLR) connectors to the CH 3–4 DIGITAL AUDIO connectors.
9. Verify that the spectrum analyzer Reference Level is 30 dB or greater from 0.1 to 6.0 MHz.

Restore the 764 Factory Defaults

Enter the 764 Restore Setups submenu with the following steps:

1. Press the MENU button to enter the top menu.
 - a. Turn the multifunction knob to move the menu highlight to the <Restore Setups> item.
 - b. Press a soft button to select the submenu.
2. Press the <FACTORY SETUP> soft button to restore all factory settings.

3. Press the <TOP MENU> soft button to exit the Restore Setups submenu.
4. Switch the instrument off and disconnect all cables, as necessary.



Adjustment Procedures

Adjustment Procedures

Adjustments in the 764 Digital Audio Monitor are limited to power supply voltage and the visual characteristics (linearity, size, focus, contrast and brightness) of the video display. The adjustments *do not* affect the accuracy of the instrument, and periodic adjustment is not required. Perform these adjustments only after servicing either the Power Supply or Display circuit board assemblies.

Required Equipment

Table 4–1 contains a list of the equipment recommended for use in the 764 Digital Audio Monitor Adjustment Procedures. Other equipment may be substituted; however, care must be used to ensure that the accuracy of the substituted equipment meets or exceeds the listed requirements. Use of inadequate equipment may result in faulty measurements and adjustments.

Table 4–1: Required test equipment

| Item | Qty | Minimum Requirements | Example |
|---|-----|---|-----------------------------------|
| DMM | 1 | 0.1% DC Volts Accuracy | Tektronix DMM252 |
| Oscilloscope with Counter/Timer/Trigger (CTT) | 1 | 100 MHz Bandwidth, timebase with 0.001% accuracy. | Tektronix 2465B with Option 06 |
| Passive 10X Oscilloscope probe | 2 | | Tektronix P6137 (std. with 2465B) |
| Photometer | 1 | | Tektronix J17 TekLumaColor™ |
| 8° luminance head for photometer | 1 | | Tektronix J1803 luminance head |

Typographic Conventions

- Physical features of the 764 and the test equipment used in these procedures are indicated with bold, sans serif type. These features include connectors, control knobs, and buttons. Feature names are capitalized in this text as they are printed on the instrument. Examples: **MENU** and **Enter**. Grouped controls are designated by the group name and the control name, separated by a colon. Examples: **APPLICATIONS:Digital** and **VIEW:AUDIO**.
- Selections that appear on instrument display screens — such as 764 Digital Audio Monitor menu selections and soft button assignments — are enclosed in “angle brackets.” Again, words are capitalized in this text as they appear on the instrument displays. Examples: <Waveform Control>, <FACTORY SETUP>, and <Follow A>.

Preparation

1. Set the 764 Digital Audio Monitor **POWER** switch to **STANDBY** (off) and disconnect the main AC power supply.
2. Remove the cabinet mounting screws from the rear of the instrument and slide the 764 Digital Audio Monitor from its enclosure.
3. Reconnect the 764 Digital Audio Monitor to the main AC supply and switch it On. Let the instrument warm up for approximately 20 minutes before proceeding.



WARNING. To avoid serious injury, Do Not touch exposed connections or components when operating the instrument with the protective enclosure removed. Dangerous potentials exist at several points within the 764 Digital Audio Monitor.

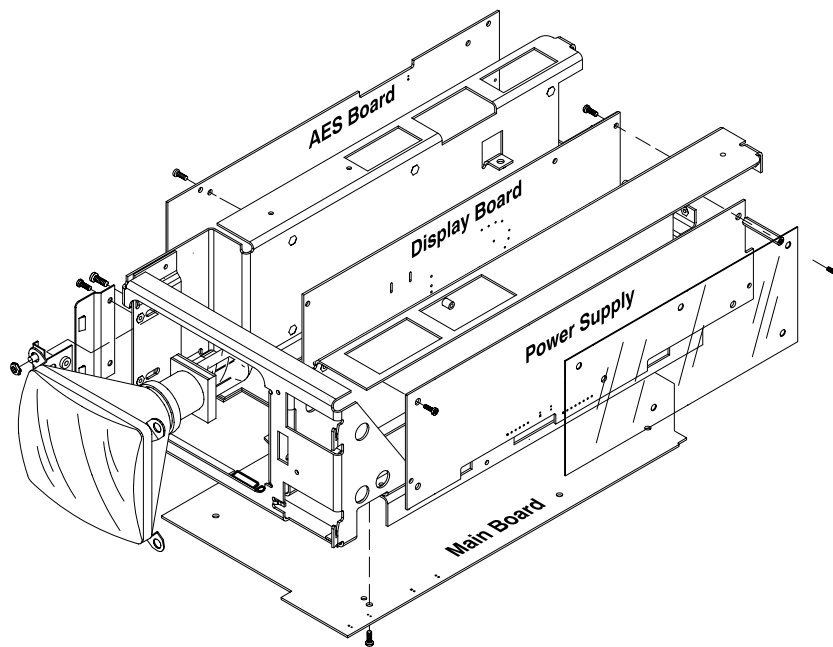


Figure 4-1: The 764 Digital Audio Monitor circuit board assemblies

Procedures

Power Supply

1. Set the 764 Digital Audio Monitor on its left side, with the Power Supply circuit board assembly facing up.
2. Connect the common (or ground, or low) DMM lead to pin 1 of J903 on the 764 Digital Audio Monitor Main board. Pin 1 is identified by the stripe on the cable leading from the power supply to the Main board; it is the pin closest to the front of the instrument.
3. Connect the V/ Ω (red) DMM lead to pin 2 of the same connector (J903 on the Main circuit board).
4. If necessary, remove the clear plastic power supply shield and adjust R5 on the Power Supply board for $+5 \pm .02$ V.



WARNING. *Dangerous potentials exist at several points within the 764 Digital Audio Monitor power supply. To avoid electrical shock, use extreme caution when the protective shield has been removed. Do Not touch exposed connections or components.*

5. Switch the 764 Digital Audio Monitor to STANDBY.
6. Disconnect the DMM and replace the power supply shield.

Display Board

The remaining adjustment procedures apply to the 764 Digital Audio Monitor video display circuit board assembly. Unless otherwise noted, all adjustments (Rxx, Lx), connectors (Jxxx), and test points (TPx) are on the Display board.

Preparation. To perform the display adjustments, you must first remove the tinted CRT filter from the front of the instrument. The filter is retained by the CRT bezel; the bezel is held by four locking tabs, two on each side. The tabs are approximately $\frac{3}{4}$ inch (2 cm) from the top and bottom of the bezel. To release each of the four locking tabs:

1. Insert a thin screwdriver blade next to the tab in the space between the main front panel and the bezel.
2. Gently pry outward; that is, move the screwdriver handle away from the center of the CRT. See Figure 4–2.

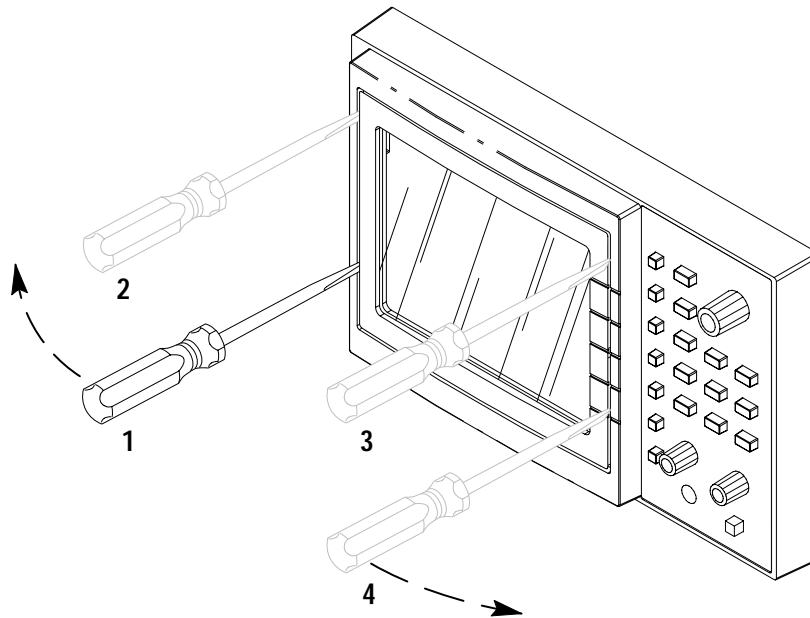


Figure 4-2: Releasing the bezel locking tabs

3. Pull the corner of the bezel forward slightly, away from the front of the instrument. Use care not to put excessive force on the tabs that remain engaged in the front panel.

When all four tabs have been released, you may remove the bezel and the filter from the instrument.

Adjust the Free Running Display

1. Remove the video data cable from J104 on the 764 Digital Audio Monitor Main board, then switch the instrument power on.
2. Attach 10X probes to both CH 1 and CH 2 of the oscilloscope.
3. Connect the CH 1 probe to TP1.
4. Use the automatic setup function of the oscilloscope (on the 2465B, press **SETUP:AUTO**) — or make the following adjustments:
 - VERTICAL MODE = CH 1
 - CH 1 Coupling = 1 M Ω , DC
 - CH 1 vertical scale = 50 V/div
 - Horizontal scale = 10 μ s/div
 - TRIGGER MODE = A, AUTO LVL

- TRIGGER SOURCE = CH 1
 - TRIGGER COUPLING = DC
5. Once you have acquired the signal, press **SETUP:MEASURE** on the 2465B, then select **<FREQ>** (**VERTICAL:MODE:CH 1**) to automatically measure the frequency.
 6. The optimal frequency is 31.47 kHz (period = 31.78 μ s). If the measured frequency is not between 31.00 and 32.00 kHz, adjust R20 (H. HOLD; counterclockwise to decrease the frequency, clockwise to increase it) and select **SETUP:MEASURE**, **<FREQ>** again.
 7. Adjust and check the frequency repeatedly until it is as close to 31.47 kHz as possible.
 8. Move the oscilloscope probe to TP2.
 9. Reset the oscilloscope scales:
 - CH1 vertical = 10 V/div
 - Horizontal = 5 ms/div
 10. Once you have acquired the signal, press **SETUP:MEASURE** on the oscilloscope, then select **<FREQ>** to automatically measure the frequency.
 11. The optimal frequency is 55 Hz (period = 18.2 ms). If the measured frequency is not between 54 and 56 Hz, adjust R45 (V. HOLD; counterclockwise to decrease the frequency, clockwise to increase it) and select **SETUP:MEASURE**, **<FREQ>** again.
 12. Adjust and check the frequency repeatedly until it is as close to 55 Hz as possible.
 13. Switch 764 Digital Audio Monitor power to **STANDBY**.
 14. Reconnect the video data cable to J104 on the main board.

Yoke Alignment

1. Switch the 764 Digital Audio Monitor back On.
2. Follow these steps to display the Crosshatch test pattern:
 - a. Press **MENU**.
 - b. Turn the Multifunction knob to highlight the **<Service>** menu choice, then press a soft button to enter the Service submenu.
 - c. The **<Adjustment:TEST PATTERNS>** menu item will be highlighted. Press the **<TEST PATTERNS>** soft button. The Crosshatch pattern (a 6-row \times 8-column grid with a lowercase “e” in the center of each cell) will appear on the display.

3. If necessary, adjust the size of the crosshatch pattern — with L4 (width) and R43 (V. SIZE) — to fill the CRT faceplate.
4. Adjust the CRT deflection yoke only if needed to make the crosshatch pattern square with the front casing. Be sure to tighten the yoke retaining screw when you are done.
5. Adjust the CRT centering rings only if necessary to center the display on the screen.

NOTE. *The centering rings may cause some distortion to the display. Adjust the centering rings for the least amount of distortion and the best centering.*

Focus

1. At the test oscilloscope, set the
 - CH1 vertical scale to 50V/div;
 - CH2 vertical scale to 50V/div;
 - Horizontal scale to 10 μ s/div; and the
 - Trigger to CH2.
2. Connect the CH1 oscilloscope probe to TP4. Connect the CH2 probe to TP1. Observe the relative phase of two signals. The phase of CH1 and CH2 should remain relatively close throughout this procedure.
3. Adjust L5 (close to TP1) for best overall focus of the display, paying close attention to the display edges.
4. Adjust R36 (FOCUS) for the most uniform focus across the entire display.

NOTE. *Pay particular attention to focus of the lowercase “e” in the upper left corner of the display.*

5. Press the top 764 Digital Audio Monitor soft button (now assigned to <Stairstep>) twice to select the Black Screen test pattern.
6. Adjust R64 (BLACK) fully counterclockwise, then back clockwise to the point where the raster becomes indistinguishable from the outer regions on the CRT display.

Adjust Size And Linearity

1. Continue with the setup from the previous procedure.
2. Press the top 764 Digital Audio Monitor soft button (now assigned to <White Screen>) twice to restore the Crosshatch test pattern.

3. Adjust R15 (H. PHASE) and R57 (V. CEN.) to center the pattern on the CRT.
4. Adjust both L4 (width) and R43 (V. SIZE) together to make the corners of the crosshatch pattern reach to the corners of the CRT. Note that it may be necessary to make a minor adjustment to centering rings (see *Yoke Alignment*, on page 4–5) for precise horizontal adjustment.
5. Adjust R48 (V. LIN) so all squares in the crosshatch pattern are the same height.
6. Repeat steps 3 through 5 as necessary to center the test pattern on the CRT faceplate.

Adjust Black And White Levels

1. Turn the 764 Digital Audio Monitor **BRIGHTNESS** control to maximum (fully clockwise).
2. Attach the photometer head to the center of the 764 Digital Audio Monitor CRT.
3. Select the 764 Digital Audio Monitor Black Screen test pattern with the top soft button.
4. Adjust R64 (BLACK) for a photometer reading of 0.65 ± 0.05 fl (footlam-berts).
5. Press the <White Screen> soft button on the 764 Digital Audio Monitor to select the White test pattern.
6. Adjust R4 (WHITE) for a photometer reading of 200 ± 2 fl.

***NOTE.** Black and White level adjustments interact, so it may be necessary to repeat steps 3 through 6 to attain proper intensity levels.*

7. Remove the photometer head from the 764 Digital Audio Monitor CRT.
8. Reinstall the CRT filter and bezel. The bezel is a snap fit in the main front panel, and no tools are required.
9. Adjust The 764 Digital Audio Monitor **BRIGHTNESS** knob for the desired display intensity.
10. Switch the 764 Digital Audio Monitor to **STANDBY**.
11. Slide the 764 Digital Audio Monitor back into its enclosure and secure the instrument with the two cabinet mounting screws.



Maintenance

Maintenance

This section contains information pertaining to the maintenance and repair of the 764 Digital Audio Monitor Digital Audio Monitor. Before proceeding, please read the Safety Summaries at the beginning of this manual and note the following General information.

General

Do not attempt to repair the instrument during its warranty period. The warranty is printed at the front of this manual. If the instrument fails to perform as expected during the warranty period, please contact your nearest Tektronix representative or field office.



WARNING. To avoid electrical shock, disconnect the instrument from the AC power supply before removing the cabinet or replacing any components.



CAUTION. Static discharge can damage any semiconductor component in this instrument.

Static-Sensitive Components

The 764 Digital Audio Monitor contains electrical components that are susceptible to damage from static discharge. Static voltages of 1 kV to 30 kV are common in unprotected environments. Observe the following precautions to avoid static damage:

- Minimize handling of static-sensitive components.
- Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
- Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should only be performed at a static-free workstation by qualified personnel.
- Nothing capable of generating or holding a static charge should be allowed on the workstation surface.
- Keep the component leads shorted together whenever possible.
- Pick components up by the body, never by the leads.

- Do not slide the components over any surface.
- Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.
- Use a soldering iron that is connected to earth ground.
- Use only special antistatic, suction-type or wick-type desoldering tools.

Troubleshooting

The troubleshooting information in this section is intended to help qualified service personnel identify the circuit board assembly (the module) that is responsible for instrument malfunction. Replacement modules are available from Tektronix, Inc. You may find it most convenient, however, to return a malfunctioning 764 Digital Audio Monitor to the nearest Tektronix service center for diagnosis and repair because it will not always be possible to determine which of two modules is faulty without actually replacing one of them and because, in rare instances, instrument failures can be caused by faults in interconnecting cables or cable connectors.

Diagnostic Utilities

The 764 Digital Audio Monitor has a number of built-in diagnostic utilities that you can run through the front panel or through the RS-232 port. The diagnostics can be helpful in identifying faulty circuit board assemblies; see *Using the Built-in Diagnostics*, on page 5–2. Appendix A contains a complete discussion of the diagnostics and their use.

Using the Built-in Diagnostics

In the event of an instrument malfunction, always attempt to run the internal diagnostics first. See Appendix A for complete instructions. If you are unable to run the diagnostics through the front panel, try to run them in terminal mode through the RS-232 port, as explained in the Appendix.

- If the problem is persistent, run all the diagnostics once. An easy way to do this through the front panel is to press and hold the **VIEW:OTHER** button while switching the 764 Digital Audio Monitor from Standby to On. Continue pressing the **VIEW:OTHER** button until the diagnostics mode is acknowledged on the instrument display. When the display reports a test failure, note the name of the diagnostic (visible at the top of the results table) and press the **VIEW:USER DATA** button to continue the sequence. The instrument will begin normal operation, if possible, once the sequence is complete.
- If the problem is intermittent, loop all the diagnostics until the instrument fails a test. An easy way to do this through the front panel is to press and hold the **PHASE DISPLAY:A** and **PHASE DISPLAY:B** buttons while switching the 764 Digital Audio Monitor from Standby to On. Keep pressing the **PHASE DISPLAY** buttons until the diagnostics mode is acknowledged on the instrument display. Let the loop continue until a test fails or until, on a periodic check of

the display, you see a reverse video (black on white) –FAIL– flag in the upper left corner. Then stop the loop and view the diagnostic error log to learn which test or tests have failed.

- If the diagnostics will not run through the front panel *or* the RS-232 port, and the power supply is providing power to the fan and front panel LEDs, the fault is almost certainly in the Main (A1) circuit board assembly.
- If the diagnostics will run and one or more tests fail, consult the following table to identify the module or modules that could be at fault.

| A failed test in this diagnostic | Suggests that this module is faulty |
|----------------------------------|---|
| CPU | Main (A1) |
| DSP | Main <i>or</i> AES (A2) <i>or</i> the interconnection ¹ |
| Display | Main ² |
| Front Panel | Front Panel (A3) <i>or</i> Main <i>or</i> the interconnection |
| AES | AES <i>or</i> Main <i>or</i> XLR (A6) <i>or</i> an interconnection ³ |

¹ Failed DSP diagnostic tests usually indicate a faulty Main module. Replace that module, then retest. Suspect the AES module or the connecting cable only if the test fails after Main module replacement.

² If the 764 Digital Audio Monitor CRT displays no picture, yet the instrument *passes* the display diagnostic (run through the RS-232 port), suspect the Display (A5) module or the connection between it and the Main module.

³ Do not suspect the Main module if the instrument passes all CPU and DSP diagnostics.

- Module replacement instructions begin on page 5–20.
- Be sure to run the diagnostics at least once after you replace a module to confirm that the repair is effective. For maximum confidence, loop the diagnostics for a minimum of one-half hour to ensure that the instrument will pass all tests after reaching normal operating temperature.

The Signal Path Diagnostics

Two of the DSP diagnostic tests and all *but* two of the AES diagnostic tests exercise various parts of the 764 Digital Audio Monitor signal path, a major portion of the instrument that occupies circuits on the AES, Main, and XLR modules. Understanding the signal path diagnostics may help you determine which of the involved modules is at fault.

In the signal path diagnostics, the three instrument DSPs (digital signal processors, on the Main module) act as AES signal generators and signal receivers; the signal path diagnostics use them in several combinations to generate and receive specific test vectors that are routed through different portions of the signal path circuitry. When the test vectors are received by one (or more) of the DSPs, they are compared against stored reference vectors for accuracy. The diagnostic interface reports a PASS result if the instrument software detects no difference be-

tween stored and received data. Passing results for all of these tests indicate that the instrument signal path is functioning correctly.

The diagram in Figure 5-1 shows how multiple circuit board assemblies fit into the 764 Digital Audio Monitor signal path architecture. The diagrams in Figures 5-2 through 5-9 illustrate the flow of data in the DSP and AES diagnostic tests that involve the 764 Digital Audio Monitor signal path. A short explanation of the diagnostic test accompanies each diagram. The signal path diagnostics include the following tests:

In the DSP diagnostic:

- Transfer Register tests, DSP1→3 Xfer and DSP2→3 Xfer, Figure 5-2.
- DMA test, DSP3 DMA (map RAM), Figure 5-3.

In the AES diagnostic:

- Receiver tests, DSP1 Rx Loop and DSP2 Rx Loop, Figure 5-4.
- Oversampler tests, DSP1 Oversampler and DSP2 Oversampler, Figure 5-5.
- User data tests, DSP1 User Data and DSP2 User Data, Figure 5-6.
- Channel status tests, DSP1 Chnl Status and DSP2 Chnl Status, Figure 5-7.
- Errors tests, DSP1 Rx Err Detect and DSP2 Rx Err Detect, Figure 5-8.
- Cross channel tests: DSP1 Cross Channel and DSP2 Cross Channel, Figure 5-9.

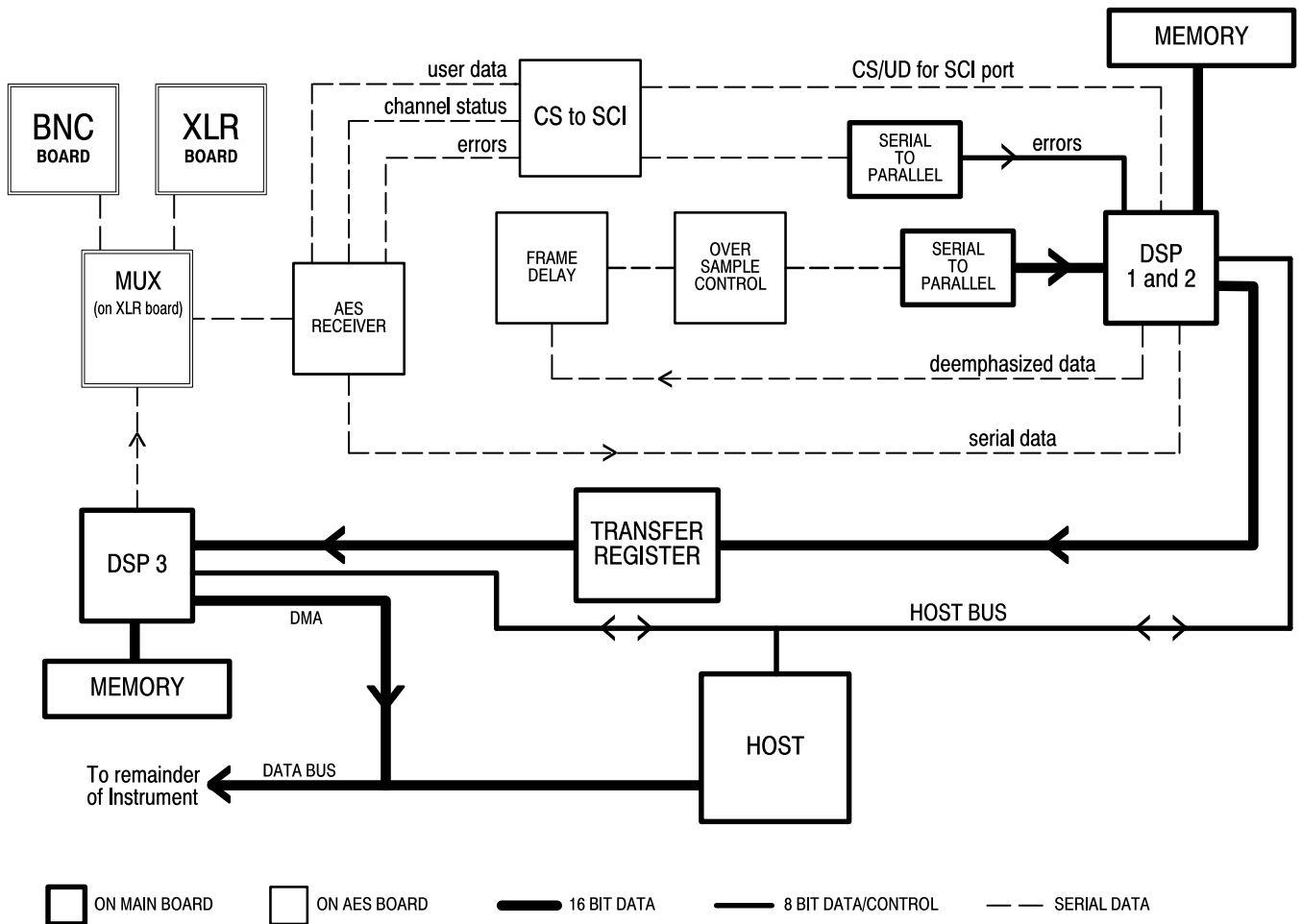


Figure 5-1: The 764 Digital Audio Monitor signal processing block diagram

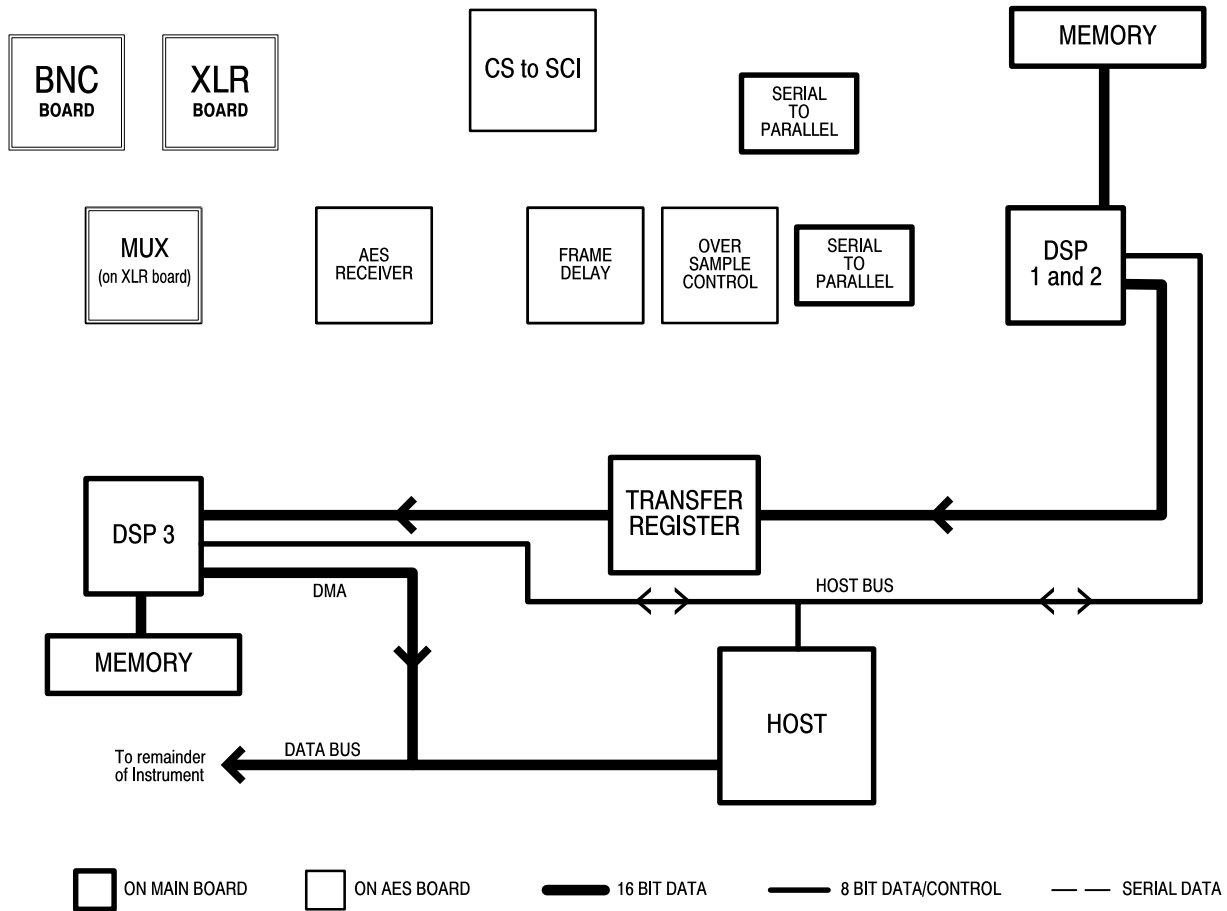


Figure 5-2: The transfer register test

In the transfer register test, DSP 1 and DSP 2 transmit data to DSP 3 through the respective transfer registers and DSP 3 compares the test vectors with a local copy. This test applies only to circuits on the Main board.

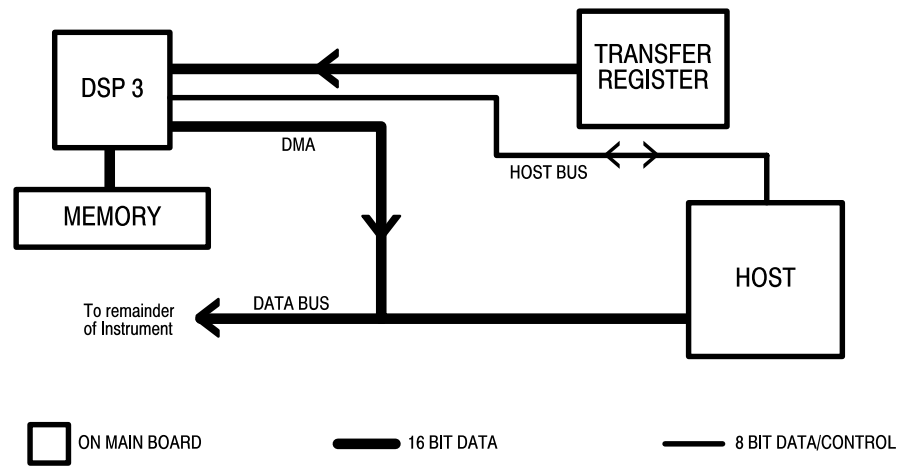


Figure 5-3: The DMA (direct memory access) test

In the DMA test, a test vector block is sent from DSP 3 into the 68330 main memory. The destination address of the transfer is a test buffer that is compared to the original vector. The comparison is done on the host level. Errors are reported if the received block is incorrect. This test applies only to circuits on the main board.

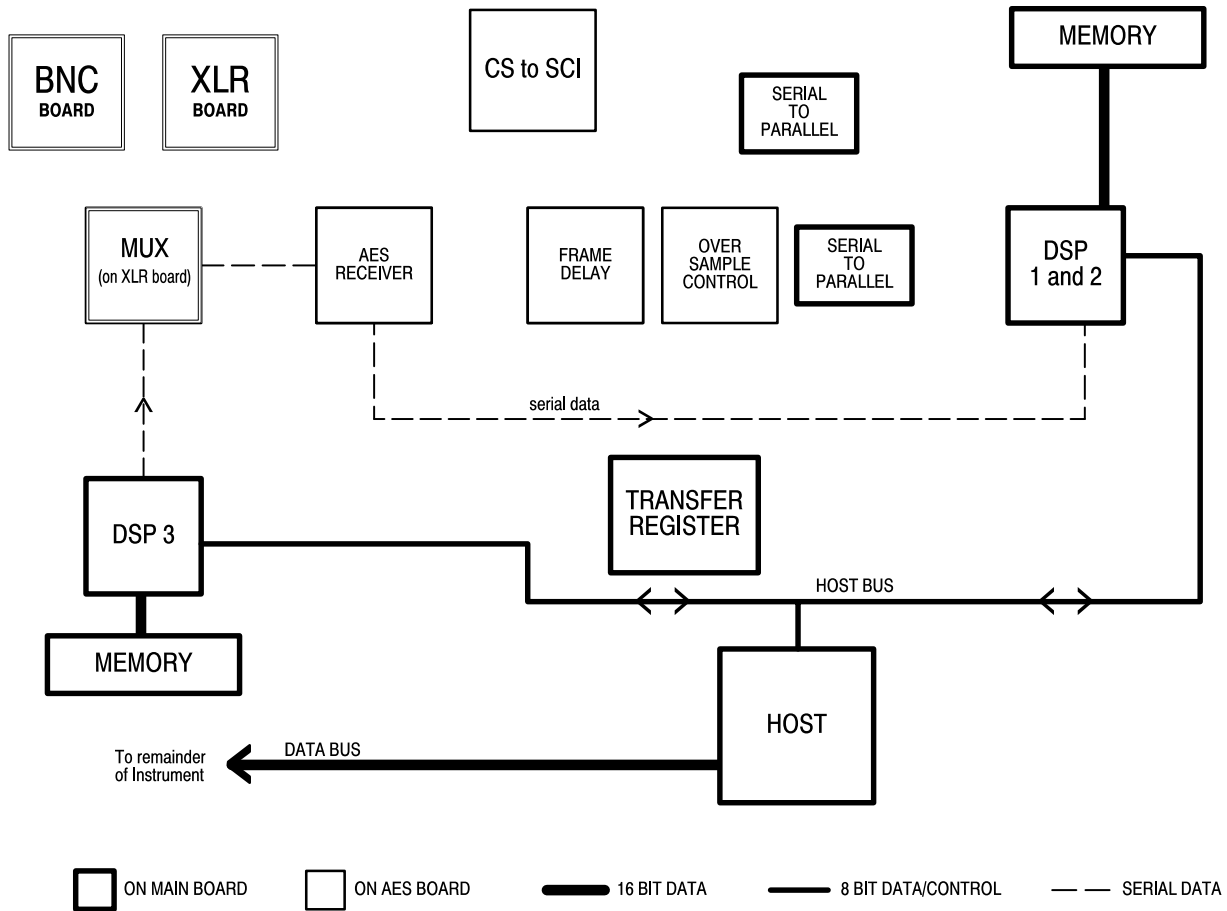


Figure 5-4: The receiver loop-through test

In the receiver test, DSP 3 generates an AES bit stream that is routed through the MUX on the XLR board. AES receivers 1 and 2 on AES board pass the data back to DSP 3 on the Main board for comparison to a local reference. Boards used: Main, AES, and XLR.

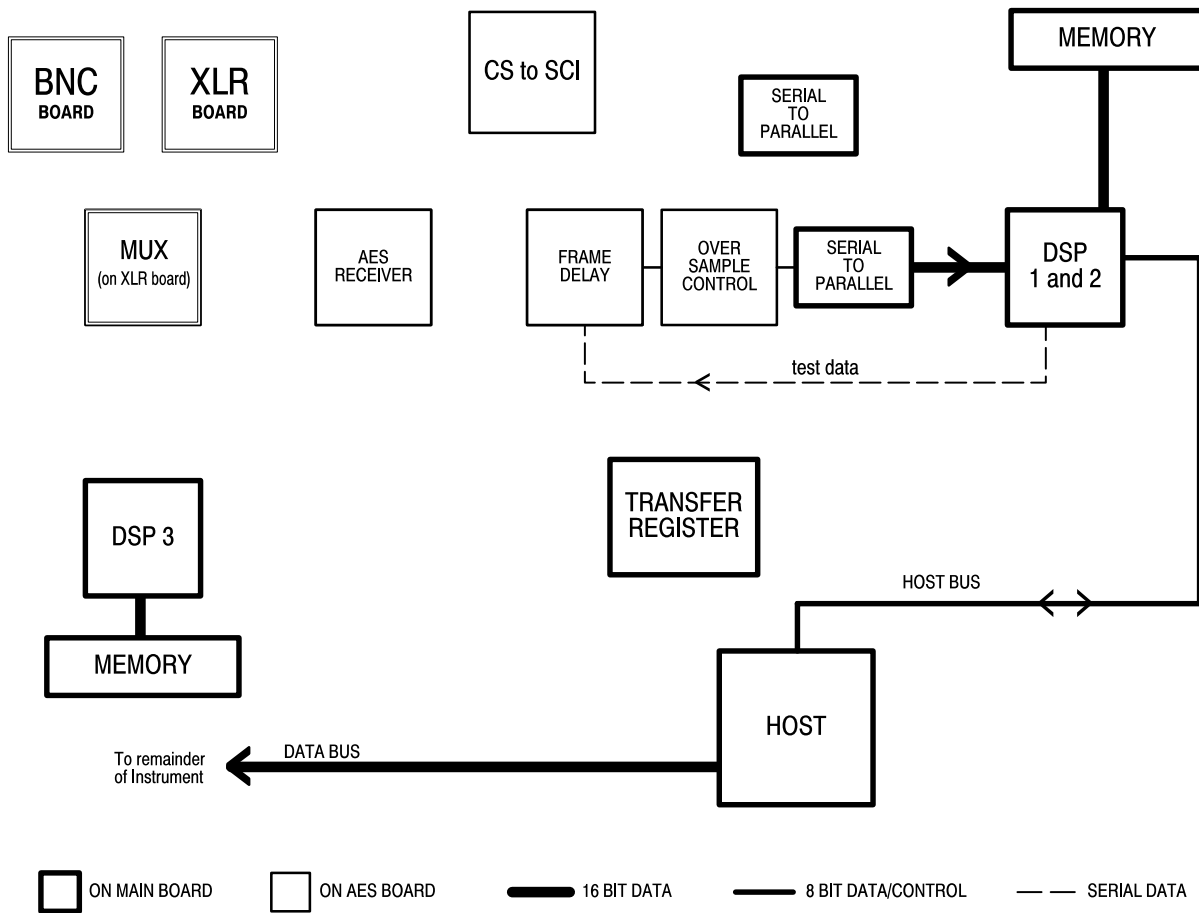


Figure 5-5: The oversampler test

In the oversampler test, data is generated by DSP 1 and 2 and routed via the SSI port through the respective AES board oversampler and then back to the respective DSP where it is compared to stored reference data. Boards used: Main and AES.

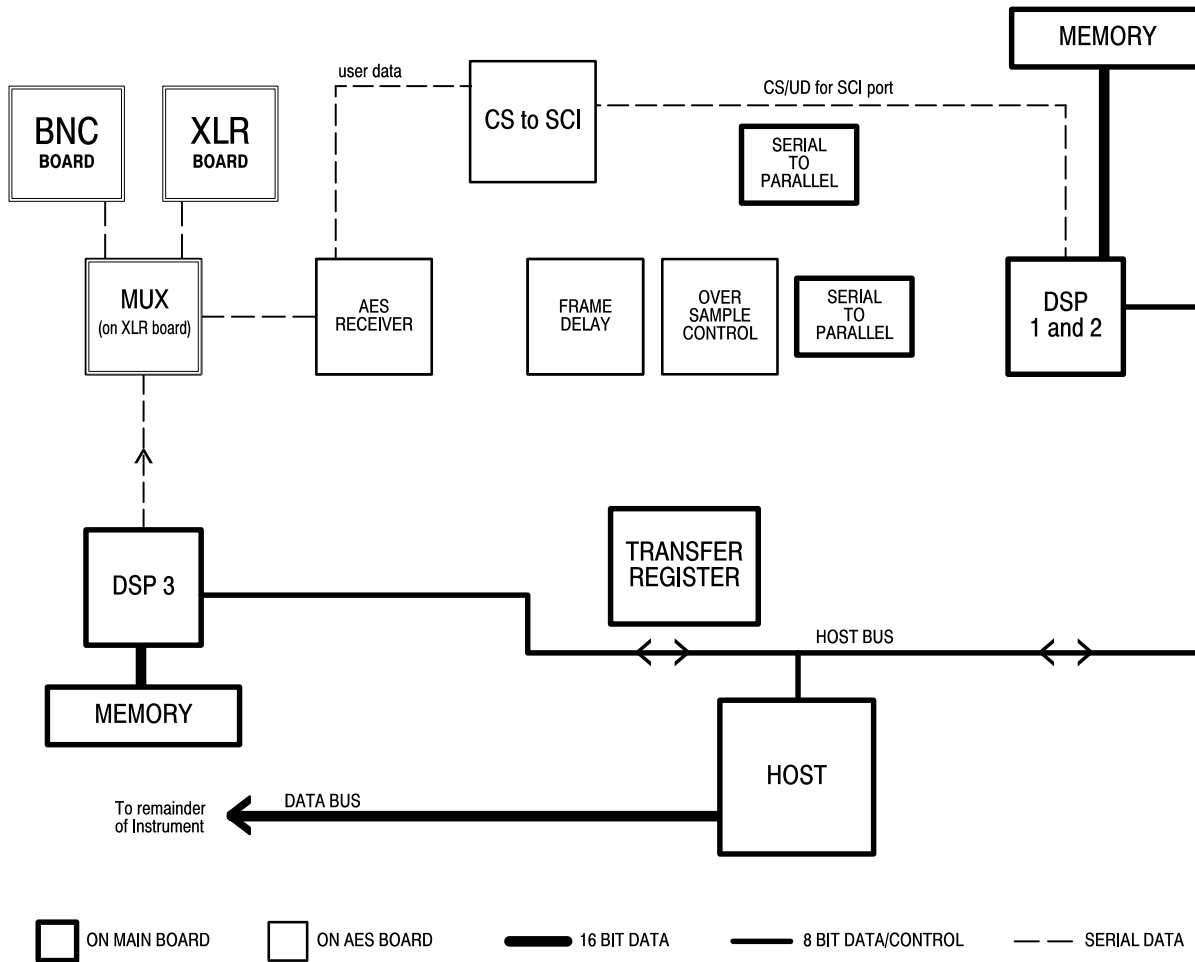


Figure 5-6: The user data tests

In the user data tests, DSP 3 generates an AES bit stream with user data encoded. The bit stream is routed through test input 1 or 2 on the XLR board. The AES receivers on the AES board detect the user data bits and route them back to the respective DSP on the main board for comparison with reference data. Boards used: Main, AES, and XLR.

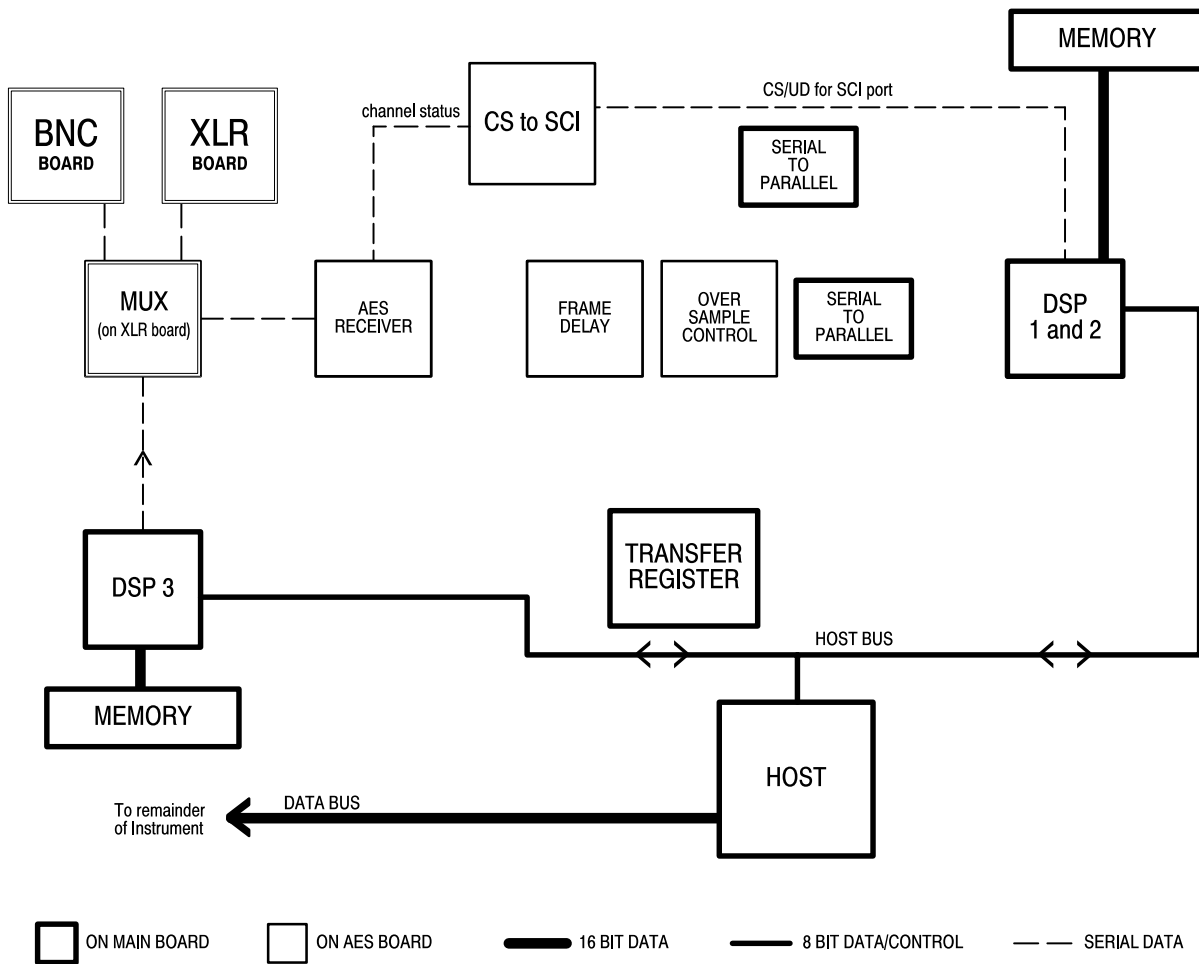


Figure 5-7: The channel status tests

In the channel status tests, DSP 3 generates an AES bit stream with channel status data encoded. The bit stream is routed through test input 1 or 2 on the XLR board. The AES receivers on the AES board detect the channel status bits and route them back to the respective DSP on the main board for comparison with reference data. Boards used: Main, AES, and XLR.

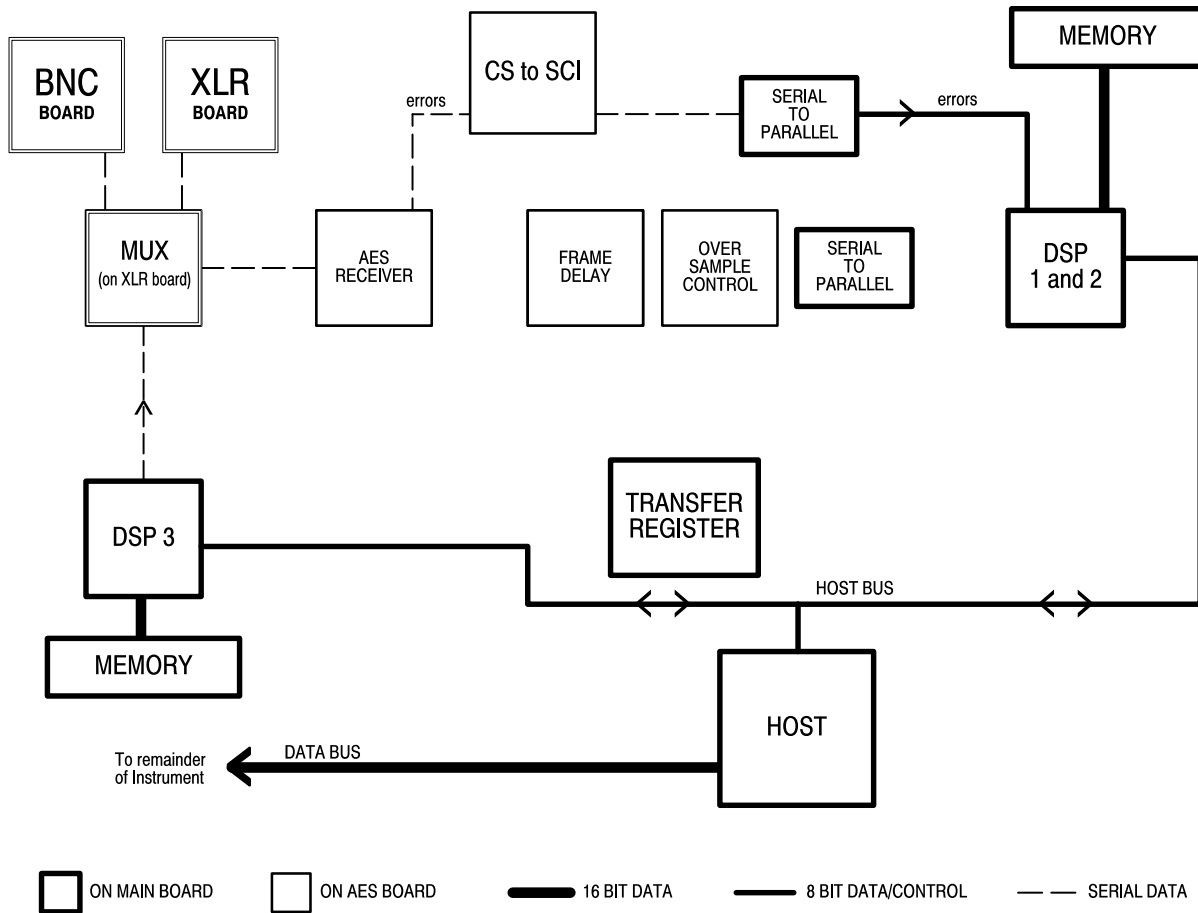


Figure 5-8: The receiver error tests

In the receiver error tests, DSP 3 generates a series of invalid AES signals with errors in coding, validity, parity, and CRCs. The signals are routed through test inputs 1 and 2 on the XLR board and detected by AES receivers 1 and 2 on the AES board. The detected error bits are then routed back to the respective DSP on the main board, where the errors are tallied and compared to the expected number of errors. This test checks the hardware associated with error packing. Boards used: Main, AES, and XLR.

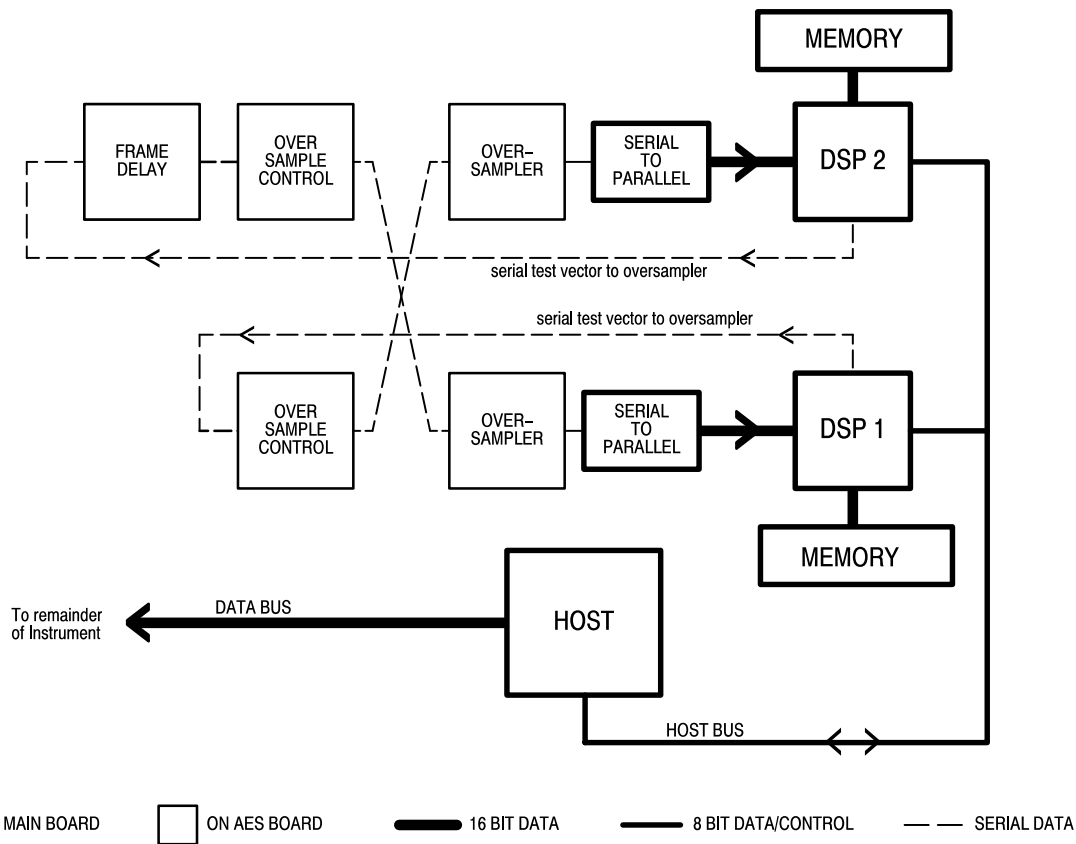


Figure 5-9: The cross channel mode tests

There are two parts to each cross channel test. Each half checks one DSP cross channel path. In the DSP 1 test, for example, DSP 2 is set to generate an AES test vector out of its serial port to the serial-to-parallel converter. Meanwhile, DSP 1 generates a different AES test vector out of its serial port that is routed to its oversampler. The cross channel mode is selected and both signals are captured by the serial-to-parallel converter. DSP 1 should have one channel from DSP 2 and one channel from its own test vector. The test for DSP 2 is the mirror of the DSP 1 test. Boards used: Main and AES.

Signal Path Troubleshooting Waveforms

This section describes several waveforms that you can use to help troubleshoot the 764 Digital Audio Monitor signal path circuitry. The waveforms may be particularly helpful to the technician in determining whether the cause of a malfunction is on the AES circuit board assembly, on the Main circuit board assembly, or in the interconnecting cables.

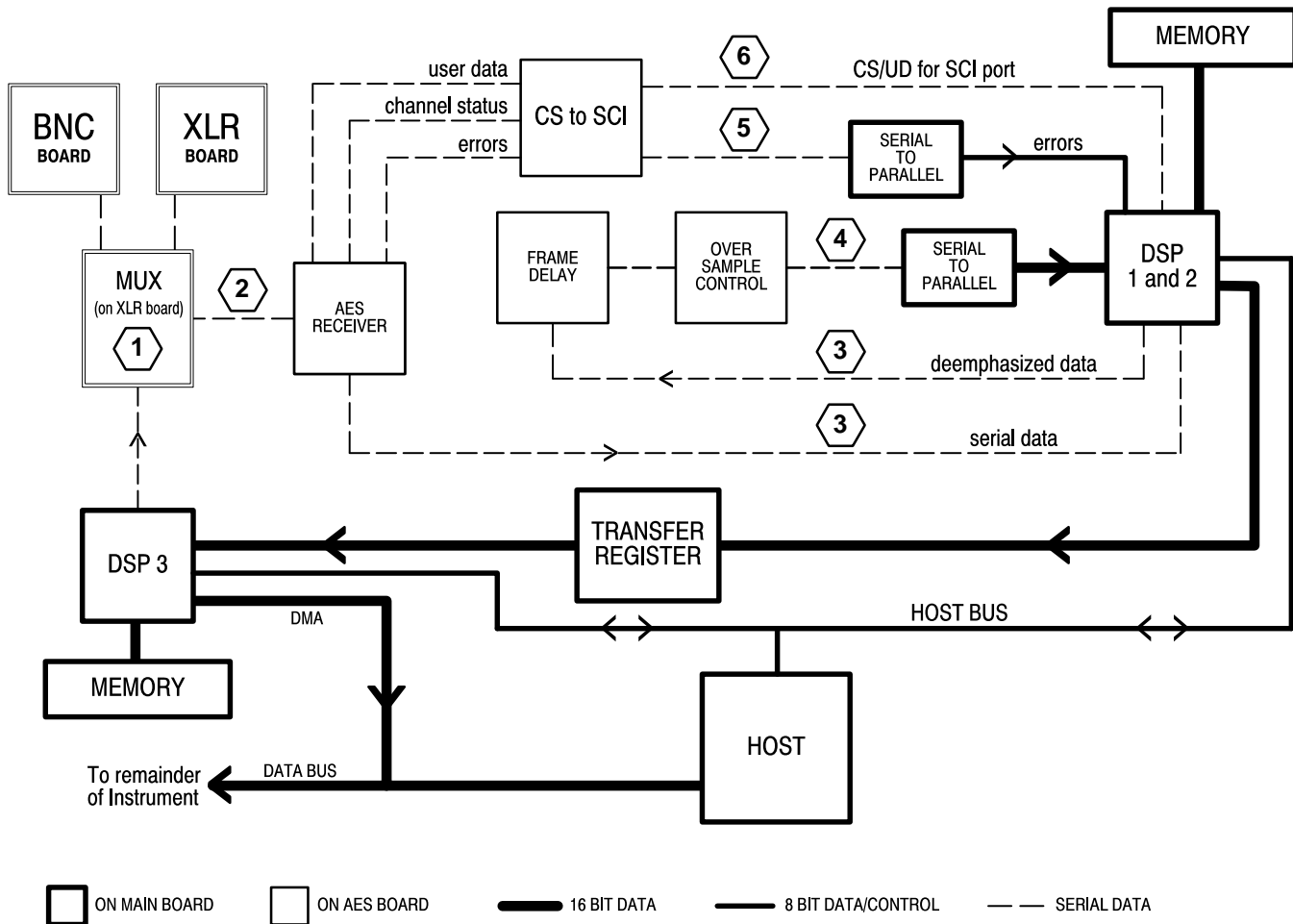


Figure 5-10: Troubleshooting waveform locations

Locations

The following descriptions identify the troubleshooting waveforms with their locations in the signal processing block diagram. The locations are indicated by the numbers in Figure 5-10.

The primary test points and circuits specified in the following descriptions are for input channels 1 and 2; test points and circuits enclosed in brackets [such as these] are for input channels 3 and 4.

Test Conditions

The described waveforms should be present during normal operating mode when the following conditions are met:

- A user supplied, known-good signal is present at the input(s)
- The correct input (BNC or XLR) is set through the Inputs submenu
- The SESSION display is selected, ensuring that cross-channel mode is off

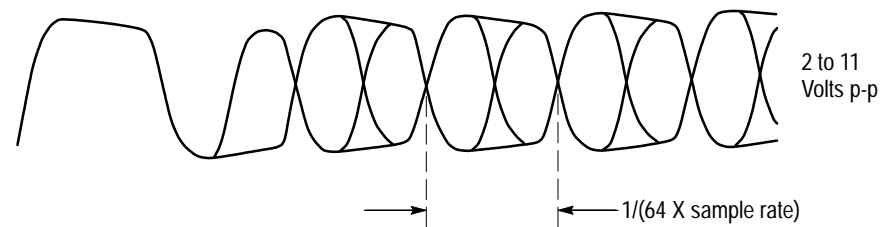


Figure 5-11: Troubleshooting waveform, location 1

Location 1: XLR Board, TP11 [TP12]

The waveform at location 1, shown in Figure 5-11, is an amplified version of the input signal, diode limited to ± 5.7 volts. It should be between $2 V_{p-p}$ and $11 V_{p-p}$ for normal input levels.

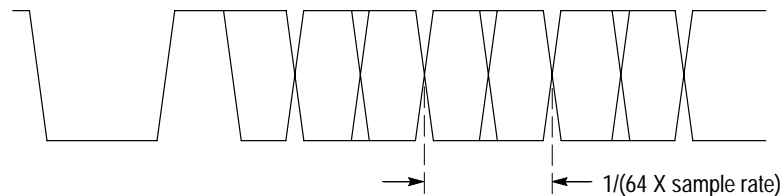


Figure 5-12: Troubleshooting waveform, location 2

Location 2: AES Board, pin 9 of U401 [U501]

The waveform at location 2, diagrammed in Figure 5-12, is the input signal after passing through a comparator on the XLR Board and through passive signal conditioning on the AES Board.

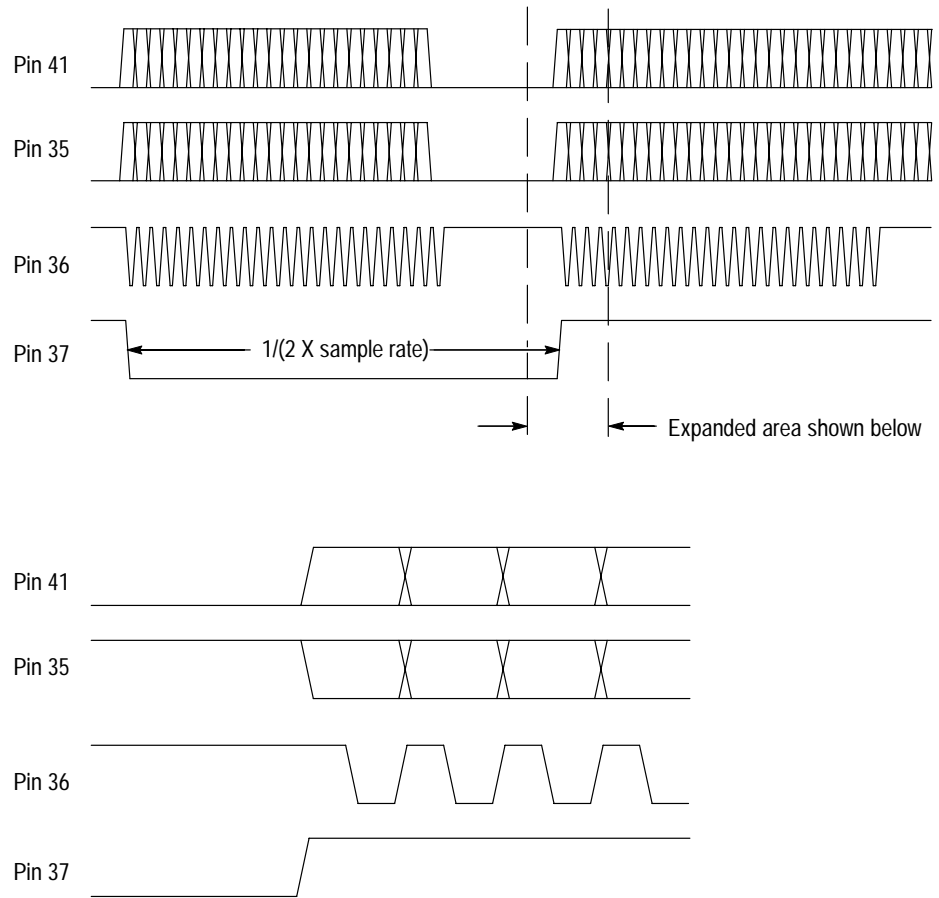


Figure 5-13: Troubleshooting waveforms, location 3

Location 3: AES Board, U405 [U505]

The signals at location 3, diagrammed in Figure 5-13, communicate audio data to and from DSP1 [DSP2]. Pins 35, 36, and 37 are decoded audio data, clock, and frame sync sent to the DSP; pin 41 is processed (de-emphasized) audio data from the DSP.

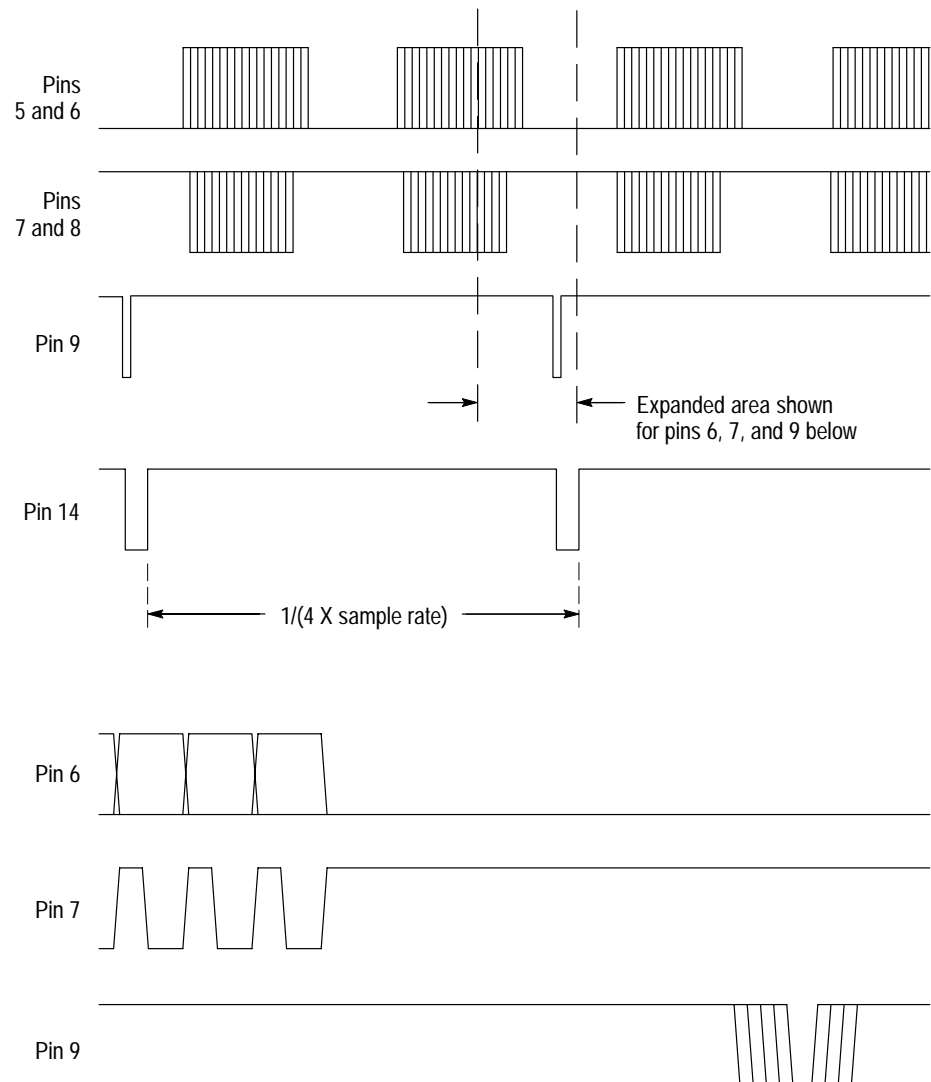


Figure 5–14: Troubleshooting waveforms, location 4

Location 4: AES Board, U404 [U504]

The signals at location 4, diagrammed in Figure 5–14, send oversampled audio data serially from the AES Board to serial-to-parallel registers on the Main Board. Pins 5 and 6 are serial data, pins 7 and 8 are bit clocks, and pin 9 is the register clock that occurs after all 16 data bits have been clocked out. Pin 14 is an interrupt that tells the DSP that a new parallel word is ready for processing.

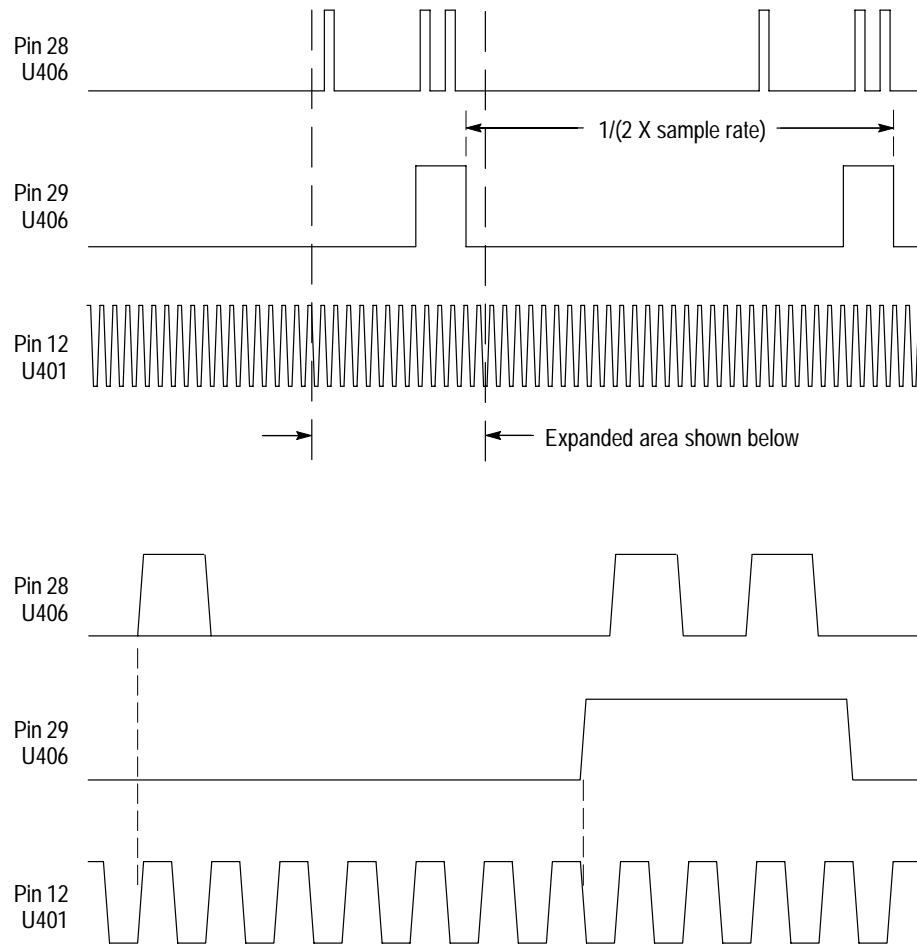


Figure 5–15: Troubleshooting waveforms, location 5

Location 5: AES Board, U406 [U508] and U401 [U506]

The signals at location 5, diagrammed in Figure 5–15, send error flags serially from the AES Board receiver IC to serial-to-parallel registers on the Main Board. These flags consist of 8 bits that encode the validity bit, confidence flag, CRC error, parity error, coding error, and loss of clock. Pin 28 is the data, pin 29 is the register clock, and U401 pin 12 [U506 pin 7] is the bit clock.

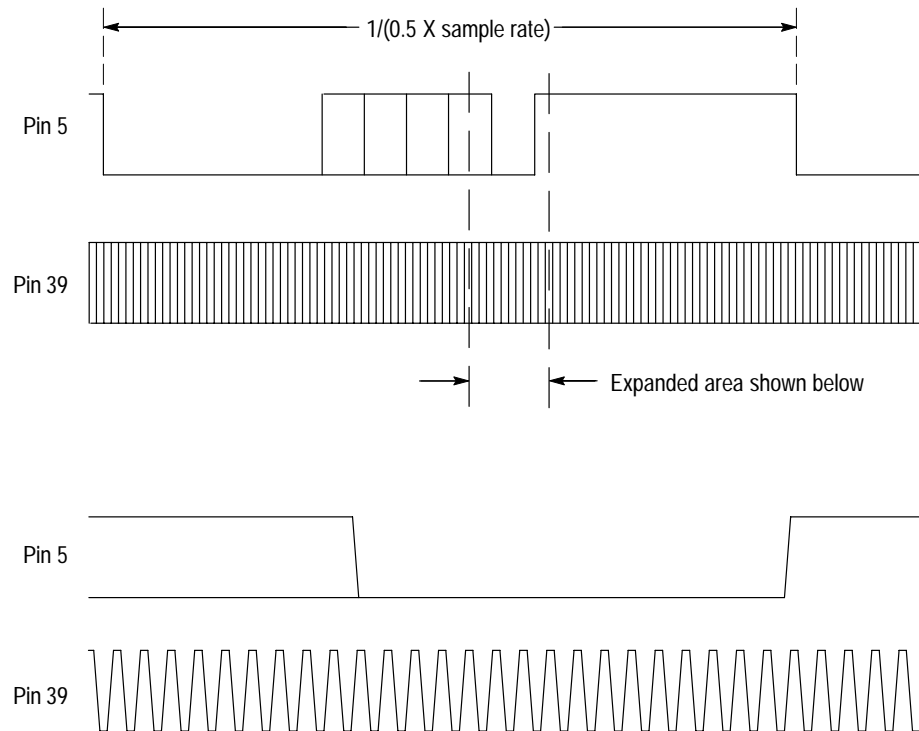


Figure 5-16: Troubleshooting waveforms, location 6

Location 6: AES Board, U406 [U508]

The signals at location 6, diagrammed in Figure 5-16, send Channel Status bits, User bits, and the block start flag serially from the AES Board to the SCI port of DSP1 [DSP2] on the Main Board. Pin 5 is the data and pin 39 is the clock that runs at 16 times the data bit rate. The data is formatted as a start bit (low), four User bits, four Channel Status bits, the block flag bit, and a stop bit (high).

Module Removal and Replacement



WARNING. To avoid electrical shock, disconnect the instrument from the AC power supply before removing the cabinet or replacing any components.



CAUTION. To avoid damage to the chassis, do not over-tighten the threaded fasteners in the 764 Digital Audio Monitor when reassembling the instrument. Please note the following recommended maximum torques.

Torque Specifications

#4 fasteners (for example, the stud/spacers that fasten the D-connector board to the rear panel): 3 to 5 Inch-pounds (0.34–0.56 N·m).

#6 fasteners (for example, the Torx-head screws used to fasten the rear panel to the remainder of the chassis): 7 to 9 Inch-pounds (0.79–1.02 N·m).

Removing the Enclosure (Cabinet)

Disconnect all cables from the 764 Digital Audio Monitor and remove the two cabinet mounting screws shown in Figure 5–17. Slide the instrument forward out of the enclosure.

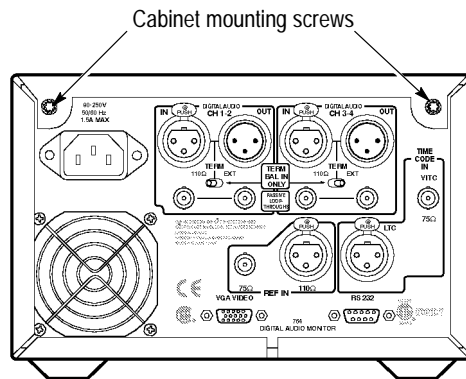


Figure 5–17: Rear view of the 764 Digital Audio Monitor in a Tektronix enclosure

Front Panel Assembly

Removal

1. Lay the 764 on its top (the Main board will be facing up) and carefully remove the headphone cable from J701 of the AES board. Note the cable routing, then pull it through the hole between the bottom and side of the chassis.

2. Turn the instrument onto its side so the power supply faces up. Carefully remove the power switch cable from J4 of the power supply and the front panel control cable from J103 of the Main circuit board (10 conductors).
3. Turn the instrument right-side up on the work surface, taking care not to pinch the headphone cable under the chassis. Note that the front panel assembly is attached with two screws on the left side (see Figure 5–18) and hinged to the main chassis on the right side. Figure 5–19, taken from the exploded diagram in *Replaceable Parts* section of this manual, shows more detail; the front panel bracket is part of the front panel assembly.

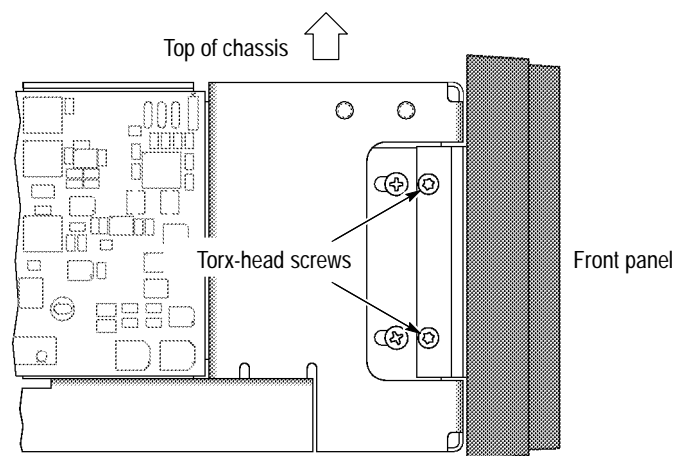


Figure 5–18: The front panel retaining screws

4. Remove the two front panel retaining screws, then pull the left side of the assembly away from the front of the chassis. You may have to pull the front panel bracket slightly to the left to clear the CRT mounting bracket.

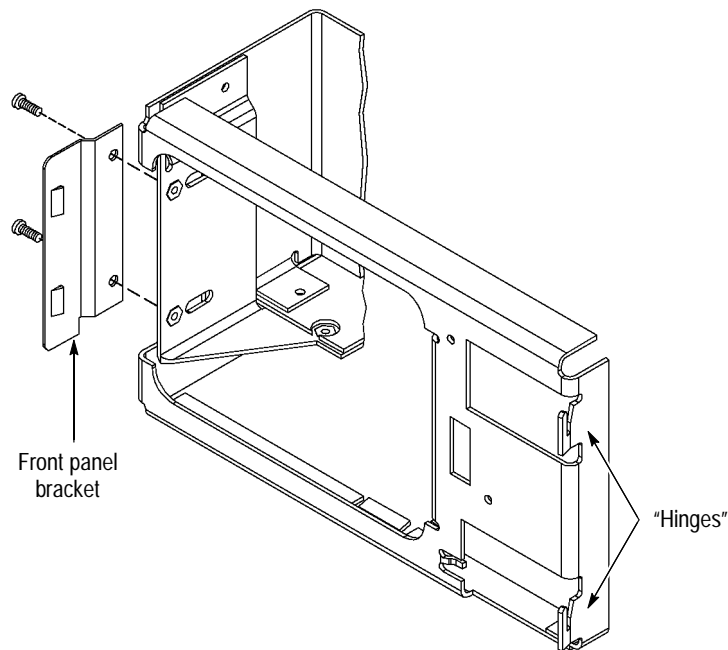


Figure 5-19: The front of the 764 chassis

5. Angle the front panel assembly approximately 20 degrees to the plane of the chassis front, and carefully lift it off of the chassis hinges. Pass the three cables through the openings in the chassis as you remove the assembly from the instrument.



CAUTION. The cables that lead to the power switch and headphones connector contain light-gage, multi-strand wires. Use care when manipulating these cables to avoid breaking the soldered ends of the wires.

6. To remove the front panel circuit board (A3) and other components of the front panel assembly:
 - a. Remove the power switch assembly (A10) by carefully separating the plastic hook clips and pulling the switch and small circuit board from the back of the front panel frame.
 - b. Remove the Multifunction, **BRIGHTNESS**, and **VOLUME** knobs. The **BRIGHTNESS** and **VOLUME** knobs are secured with one set-screw each; the Multifunction knob is held by two set-screws. Loosen the set-screws with a 1/16 inch hex (allen) wrench.
 - c. Remove the two front panel retaining nuts (tightened against the circuit board) with a 1/4 inch socket or nut driver, then remove the outer nomenclature panel from the front of the plastic frame.

- d. Carefully remove the circuit board from the back of the frame; *do not use force*.
- e. Disengage the vinyl button pad from the pins that locate it to the plastic frame and remove it, if necessary.
- f. Unscrew the locknut to remove the headphone connector, if necessary.

Replacement

- Reverse the removal procedure.

CRT

NOTE. *To avoid electric shock or injury, use extreme caution when handling the CRT. Only qualified personnel familiar with CRT servicing procedures and precautions should remove or install the CRT.*

CRTs retain hazardous voltages for long periods of time after power is turned off. Before attempting any servicing, discharge the CRT by shorting the anode to chassis ground. When discharging the CRT, connect the discharge path to ground and then the anode. Rough handling may cause the CRT to implode. Do not nick or scratch the glass or subject it to undue pressure when removing or installing it. When handling the CRT, wear safety goggles and heavy gloves for protection.

Removal

1. Follow steps 1 through 5, above, to remove the front panel assembly.
2. Remove the seven-conductor socket from the base of the CRT, and remove the deflection yoke cable from J4 on the Display board.
3. Remove the four retaining nuts with an 11/32 inch (or 9 mm) nut driver or socket wrench.
4. Pull the CRT far enough out of the chassis to peel back the suction cup that surrounds the end of the high voltage cable. Use needle-nosed pliers to disengage the two-pronged spring clip from the side of the CRT.

Replacement

- Reverse the removal procedure.

Display Board (A5)

If you can successfully remove and replace the high voltage cable from the side of the CRT with the CRT remaining in place (see step 4 above), there is no need to remove the CRT for this procedure.

Removal

1. Peel back the suction cup on the CRT that surrounds the end of the high voltage cable and use needle-nosed pliers to disengage the two-pronged spring clip from the side of the CRT.
2. Remove the seven-conductor socket from the base of the CRT, and remove the deflection yoke cable from J4 on the Display board.
3. Disconnect the +12.5 V cable from J6 on the power supply, and the video data cable from J104 on the Main circuit board.
4. Remove the four Torx-head screws that hold the Display board to the chassis, then pull the circuit board toward the top of the chassis to disengage the three tabs from the corresponding chassis slots. Guide the video data cable through the chassis opening with one hand while removing the board with the other.

Replacement

- Reverse the removal procedure. Be sure the clear plastic shield is in place between the circuit board and the chassis, and guide the cables through the chassis opening before inserting the circuit board tabs into the chassis slots. Confirm that both prongs of the high voltage cable end are engaged in the side of the CRT.

AES Board (A2)

Removal

1. Carefully remove the cables from J912 (headphones), J902 (power supply), and J701 (input). Push the connector-end of the input cable through the cut-out on the top of the chassis.
2. Disconnect the cables from J801 and J901 of the Main circuit board assembly; straighten each cable as necessary and push its connector end through the chassis cut-out.
3. Remove the retaining nut from the rear-panel VITC connector.
4. With a #15 Torx driver, remove the six (6) screws that attach the circuit board assembly to the chassis.
5. Grasp the power supply cable in one hand and pull it gently away from the AES circuit board assembly. Then grasp the front end of the assembly and lift it enough to clear the chassis. Finally, pull the board toward the front of the instrument until the VITC BNC is clear of the rear panel, and lift the

board away from the chassis. If you are returning the assembly to Tektronix, be sure to put it in an anti-static bag.

Replacement

1. Confirm that there is one locknut on the VITC connector (J911), and that it is within 1/16 inch (1.5 mm) of bottoming on the connector body.
2. Hold the connector end of the power supply cable away from the chassis with one hand and move the AES circuit board assembly into place — VITC-connector end first — with the other hand.
3. Adjust the BNC locknut so that the holes in the circuit board align with the threaded chassis stand-offs when the locknut is flush with the rear panel.
4. Thread the six mounting screws through circuit board and into the chassis stand-offs. Do not fully tighten the screws.
5. Install and tighten the outer VITC connector retaining nut.
6. Tighten the assembly mounting screws; be careful not to over-tighten.
7. Push the cables that lead from J801 and J901 through the chassis and attach them to the Main circuit board assembly.
8. Carefully remove the cables from J912 (headphones), J902 (power supply), and J701 (input). Push the connector-end of the input cable through the cut-out on the top of the chassis.

Main Board (A1)

Removal

1. Carefully remove the cables from J103, J104, J903, J105, J801, and J901.
2. Remove the eleven (11) Torx-head screws that attach the circuit board assembly to the chassis.
3. Lift the assembly away from the chassis. If you are returning the assembly to Tektronix, be sure to put it in an anti-static bag.

Replacement

- Reverse the removal procedure; be careful not to over-tighten the mounting screws.

Power Supply (A4)

To avoid electrical shock, wait approximately two minutes after unplugging the AC power cord from the main power supply before beginning this procedure.

Removal

1. Remove the five Torx-head screws that retain the clear plastic power supply shield.
2. Desolder the two wires from J2; note the relative positions of the gray/brown (hot) and gray/blue (neutral) wires for correct reassembly.
3. Carefully disconnect the cables from Power Supply assembly connectors J4 (power switch), J6 (display board), J7 (AES board), J8 (Main board), and J9 (cooling fan).
4. Remove the five spacer posts and two Torx-head screws that fasten the Power Supply to the chassis.
5. Lift the assembly away from the chassis.

Replacement

- Reverse the removal procedure. Be sure to solder the gray/brown (hot) wire to the circuit board run that leads from J2 to the fuse (F1). Be careful not to over-tighten the mounting screws. Be sure to replace the plastic shield; *do not* operate the instrument when the shield is not in place.

Rear Panel Assembly

The rear panel assembly includes the following circuit board assemblies: XLR (A6), BNC (A8), Reference (A7), and D-Connector (A9). The D-Connector board may be removed without further disassembly; removal of any of the other boards requires the removal of the D-Connector board and the input/reference subassembly.

Remove D-Connector board and input/reference subassembly

1. Set the instrument upside-down on a flat surface and disconnect the 26-conductor D-Connector cable from J105 on the main circuit board.
2. With a 3/16 inch socket or nut driver, remove the threaded stud/spacers from either side of the RS-232 and VGA D-connectors (see Figure 5–20), and remove the **D-Connector Board** from the rear panel.

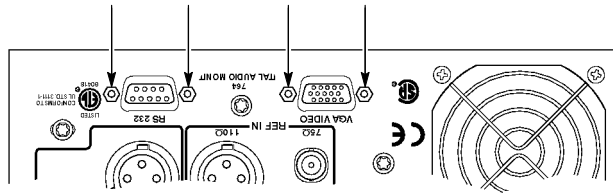


Figure 5–20: The stud/spacers that retain the d-connector assembly

3. Turn the instrument right-side up, and disconnect the input data bus cable from J912 of the AES board.
4. Remove the lock nut from the rear-panel VITC connector (BNC), and the five (5) Torx-head screws — shown in Figure 5–21 — that hold the rear panel to the remainder of the chassis and the input/reference subassembly.

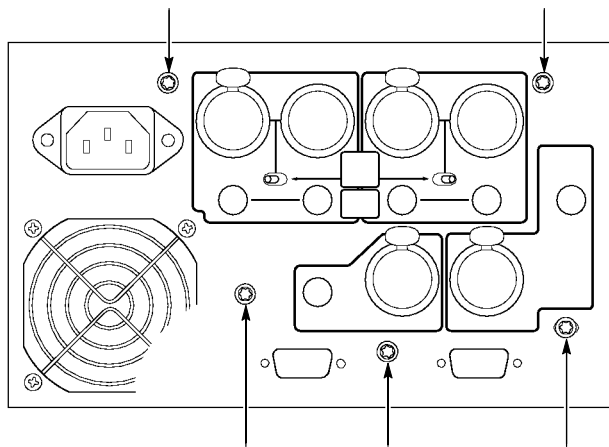


Figure 5–21: The rear-panel retaining screws

5. Gently pull the rear panel away from the XLR and BNC connectors on the input/reference subassembly. Note that the panel will remain connected to the power supply board by the fan and AC supply wires.
6. Remove the two Torx-head screws that hold the XLR board — and thus the rest of the input/reference subassembly — to the 764 Digital Audio Monitor chassis. Carefully lift the subassembly away from the rest of the instrument.

NOTE. Once the audio/reference input assembly has been removed from the rear panel, the three circuit board assemblies — XLR, BNC, and Reference — may be removed separately, in any order you like.

Remove XLR Board

1. Disconnect the input data bus cable from J5 on the XLR board.
2. Release the four DIGITAL AUDIO XLR connectors from their housings to separate the XLR circuit board assembly from the remainder of the audio/reference subassembly.

To release the XLR connectors from their housings, insert a small flat-blade screwdriver¹ into the slot that is accessible through the hole near the center of each XLR connector (see Figure 5–22). Turn the screwdriver counter-clockwise — less than 1/4 turn is required — to release the latch.

3. Pull the XLR board gently away from the subpanel to extract the connectors from their housings.

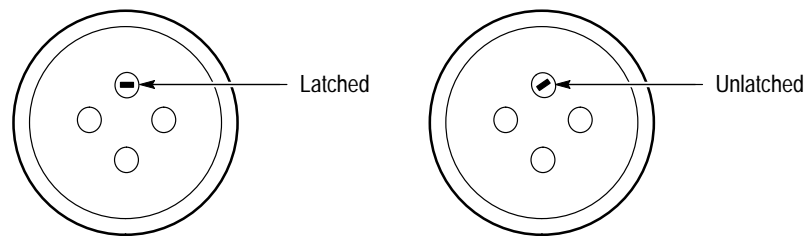


Figure 5–22: XLR connector

Remove BNC Board

1. Disconnect the 34-conductor data bus cable from the XLR and Reference circuit board assemblies. For convenience, you may leave the cable connected to the BNC board.
2. Remove the locknuts from the four Digital Audio loopthrough BNCs to free the BNC board from the subpanel.

Remove Reference Board

1. Disconnect the input data bus cable from J12 on the Reference board.
2. Remove the locknut from the REFERENCE BNC and release the REFERENCE and LTC XLR connectors from their housings (see *Remove XLR Board*, above).
3. Carefully pull the Reference board away from the subpanel to extract the XLR connectors from their housings and to free the circuit board assembly from the subpanel.

¹ Technicians at Tektronix use 3/32 inch screwdrivers that have been filed narrower to fit the slot and blunted for strength.

Replacement

Reverse the removal procedures:

1. Reassemble the input/reference subassembly as necessary.
2. Attach the subassembly to the 764 Digital Audio Monitor chassis with the two screws through the XLR circuit board. Do not fully tighten the screws.
3. Carefully slide the rear panel over the subassembly connectors, then replace the five rear-panel screws shown in Figure 5–21. Tighten these screws only after all five have been started.
4. Tighten the two screws that secure the XLR board to the instrument chassis.
5. Replace the nut on the VITC connector.
6. Replace the D-Connector board.



Options

Options

There are several enclosure (cabinet) and power cord options available for the 764 Digital Audio Monitor. These options are discussed in the following paragraphs.

Enclosures

To accommodate the installation needs of users worldwide, Tektronix provides the 764 without an enclosure. To ensure proper cooling, electromagnetic shielding, and protection against accidental electrical shock, install the instrument in the Tektronix enclosure that best suits your application.

NOTE. *The Tektronix 764 meets EMI/EMC standards when installed in one of the listed Tektronix enclosures, and when shielded interconnect cables are used.*

- Plain Cabinet (1700F00), part number 437–0100–04
- Portable Cabinet (1700F02), part number 390–0018–07
- Side-by-side Rack Adapter (1700F05), part number 437–0095–04

The following accessories can be used when only one instrument is installed in the 1700F05 Rack Adapter:

Filler Panel, 1700F06

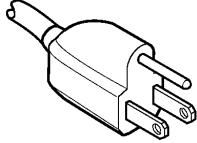
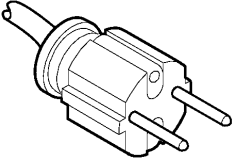
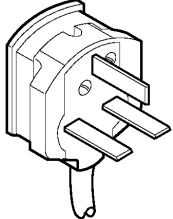
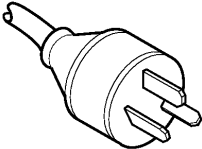
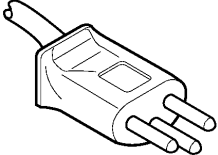
Utility Drawer, 1700F07

- Snap on front cover (included with the 1700F02), part number 200–2897–01

Power Cords

The power cord options are described in Table 6–1. Please contact the nearest Tektronix field office or representative if you received the incorrect power cord with your instrument.

Table 6-1: Power Cord Identification

| Plug Configuration | Normal Usage | Option Number |
|---|-------------------------|---------------|
|  | North America 115 V | Standard |
|  | Europe 230 V | A1 |
|  | United Kingdom 230 V | A2 |
|  | Australia 240 V | A3 |
|  | Switzerland 230 V | A5 |



Replaceable Parts

Replaceable Parts

This section contains a list of the replaceable components for the 764. Use this list to identify and order replacement parts.

Parts Ordering Information

Replacement parts are available through your local Tektronix field office or representative.

Changes to Tektronix products are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest improvements. Therefore, when ordering parts, it is important to include the following information in your order.

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

Module Servicing

Modules can be serviced by selecting one of the following three options. Contact your local Tektronix service center or representative for repair assistance.

Module Exchange. In some cases you may exchange your module for a remanufactured module. These modules cost significantly less than new modules and meet the same factory specifications. For more information about the module exchange program, call 1-800-TEK-WIDE, extension 6630.

Module Repair and Return. You may ship your module to us for repair, after which we will return it to you.

New Modules. You may purchase replacement modules in the same way as other replacement parts.

Using the Replaceable Parts List

This section contains a list of the mechanical and/or electrical components that are replaceable for the 764. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

Parts List Column Descriptions

| Column | Column Name | Description |
|---------|-----------------------|--|
| 1 | Figure & Index Number | Items in this section are referenced by figure and index numbers to the exploded view illustrations that follow. |
| 2 | Tektronix Part Number | Use this part number when ordering replacement parts from Tektronix. |
| 3 and 4 | Serial Number | Column three indicates the serial number at which the part was first effective. Column four indicates the serial number at which the part was discontinued. No entries indicates the part is good for all serial numbers. |
| 5 | Qty | This indicates the quantity of parts used. |
| 6 | Name & Description | An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification. |
| 7 | Mfr. Code | This indicates the code of the actual manufacturer of the part. |
| 8 | Mfr. Part Number | This indicates the actual manufacturer's or vendor's part number. |

Abbreviations Abbreviations conform to American National Standard ANSI Y1.1–1972.

Mfr. Code to Manufacturer Cross Index The table titled Manufacturers Cross Index shows codes, names, and addresses of manufacturers or vendors of components listed in the parts list.

Manufacturers Cross Index

| Mfr. Code | Manufacturer | Address | City, State, Zip Code |
|------------------|---|--|------------------------------|
| 0D1M6 | NMB TECHNOLOGIES INC | 9730 INDEPENDENCE AVE | CHATSWORTH, CA 91311 |
| 0GV52 | SCHAFFNER EMC INC | 9-B FADEM ROAD | SPRINGFIELD, NJ 07081 |
| 0JR05 | TRIQUEST PRECISION PLASTICS | 3000 LEWIS & CLARK HWY PO BOX 66008 | VANCOUVER, WA 98666-6008 |
| 0KB01 | STAUFFER SUPPLY | 810 SE SHERMAN | PORTLAND OR 97214 |
| 0KB05 | NORTH STAR NAMEPLATE | 5750 NE MOORE COURT | HILLSBORO OR 97124-6474 |
| 05791 | LYN-TRON INC | 3150 DAMON WAY | BURBANK CA 91505-1015 |
| 50783 | WINTRON INC (FORMERLY: PENN-TRAN CORP) | 250 RUNVILLE ROAD | BELLEFONTE, PA 16823 |
| 32997 | BOURNS INC | TRIMPOT DIVISION 1200 COLUMBIA AVE | RIVERSIDE, CA 92507-2114 |
| 54186 | MICRO POWER SYSTEMS INC | 3151 JAY ST | SANTA CLARA CA 95054 |
| 54972 | CLINTON ELECTRONICS CORP | 6701 CLINTON RD | ROCKFORD IL 61111-3863 |
| 73743 | FISCHER SPECIAL MFG CO | 111 INDUSTRIAL RD | COLD SPRING KY 41076-9749 |
| 7X318 | KASO PLASTICS INC | 11013 A NE 39TH | VANCOUVER, WA 98662 |
| 80009 | TEKTRONIX INC | 14150 SW KARL BRAUN DR PO BOX 500 | BEAVERTON OR 97077-0001 |
| 80126 | PACIFIC ELECTRICORD CO | 747 W REDONDO BEACH PO BOX 10 | GARDENA CA 90247-4203 |
| 86928 | SEASTROM MFG CO INC | 456 SEASTROM STREET | TWIN FALLS, ID 83301 |
| S3109 | FELLER U.S. CORPORATION | 72 VERONICA AVE UNIT 4 | SUMMERSET NJ 08873 |
| TK0435 | LEWIS SCREW CO | 4300 S RACINE AVE | CHICAGO IL 60609-3320 |
| TK2469 | UNITREK CORPORATION | 3000 LEWIS & CLARK HWY SUITE 2 | VANCOUVER, WA 98661 |
| TK2541 | AMERICOR ELECTRONICS LTD | 2682 W COYLE AVENUE | ELK GROVE VILLAGE IL 60007 |
| TK2548 | XEROX BUSINESS SERVICES DIV OF XEROX CORPORATION | 14181 SW MILLIKAN WAY | BEAVERTON OR 97077 |
| TK2640 | STERLING ELECTRONICS | 6160 SW ARTIC DRIVE | BEAVERTON, OR 97005 |

Replaceable Parts

Replaceable Parts List

| Fig. & Index Number | Tektronix Part Number | Serial No. Effective | Serial No. Discont'd | Qty | Name & Description | Mfr. Code | Mfr. Part Number |
|---------------------|-----------------------|----------------------|----------------------|-----|--|-----------|------------------|
| 1-1 | 426-2513-00 | | | 1 | FRAME,FRONT:FRONT FRAME SECTION,764 | 80009 | 426251300 |
| -2 | 426-2517-00 | | | 1 | BEZEL,FRONT:FRONT FRAME SECTION BEZEL,764 | 80009 | 426251700 |
| -3 | 378-0258-00 | | | 1 | FLTR,CONTRASTIN:GRAY,POLYCARBONATE | 80009 | 378025800 |
| -4 | 366-1701-01 | | | 2 | KNOB:GY,0.127 ID X 0.392 OD X 0.4 H | 80009 | 366-1701-01 |
| -5 | 366-0665-00 | | | 1 | KNOB:GRAY,0.41 ID X 0.546 OD X 0.67 H | 7X318 | ORDER BY DESC |
| -6 | 333-4154-00 | | | 1 | PANEL,FRONT:4.46 X 2.55,POLY 0.010,ALUM,764 *MOUNTING PARTS* | 80009 | 333415400 |
| -7 | 210-0407-00 | | | 2 | NUT,PLAIN,HEX:6-32 X 0.25,BRS CD PL *END MOUNTING PARTS* | 73743 | 3038-402 |
| -8 | 671-3220-00 | | | 1 | CIRCUIT BD ASSY:764 FP (A3 ONLY) | 80009 | 671-3220-00 |
| -9 | 119-4952-00 | | | 1 | KEYPAD ASSY:KEYPAD ASSY,MATTE,SILICONE RBR,764 | 80009 | 119495200 |
| -10 | 174-3469-00 | | | 1 | CA,ASSY,SP:SHLD CMPST,SDI,4,26 AWG16.0 L,1X4,0.1 CTR,RCPT X PHONO JACK,STEREO,0.250,XLR FR (CONNECTED AT A2J701) | 80009 | 174-3469-00 |
| -11 | 671-3472-00 | | | 1 | CIRCUIT BD ASSY:ON/OFF BD (A10 ONLY) *ATTACHED PARTS* | 80009 | 671-3472-00 |
| -12 | 366-1559-01 | | | 1 | PUSH BUTTON:GRAY,0.18 SQ X 0.43 *END ATTACHED PARTS* | 0JR05 | ORDER BY DESC |
| -13 | 671-3171-01 | | | 1 | CKT BD ASSY:MAIN (A1 ONLY) *MOUNTING PARTS* | 80009 | 671-3171-01 |
| -14 | 211-0722-00 | | | 11 | SCREW,MACH:6-32 X 0.250,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS* | 0KB01 | ORDER BY DESC |
| -15 | 337-4020-00 | | | 1 | SHIELD,ELECT:MAIN BOTTOM,LEXAN,764 | 80009 | 337402000 |
| -16 | 337-4018-00 | | | 1 | SHIELD,ELECT:POWER SUPPLY TOP,LEXAN,764 | 80009 | 337-4018-00 |
| -17 | 211-0722-00 | | | 5 | SCREW,MACH:6-32 X 0.250,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS* | 0KB01 | ORDER BY DESC |
| -18 | 334-8767-00 | | | 1 | LABEL:WARNING,YELLOW,PAPER,4.250X 2.250 INCH | TK2548 | 334-8767-00 |
| -19 | 174-3382-00 | | | 1 | CA ASSY,PWR:RIBBON,CPM,6,18 AWG,2.25 L,1X6,0.156 CTR,W/ FRICTION LOCK X PCB,0.156 CTR,POWER (CONNECTED AT A1J903 AND A4J8) | 80009 | 174-3382-00 |
| -20 | 174-3385-00 | | | 1 | CA ASSY,SP:RIBBON,FOLDED,IDC,10,28 AWG,300V,2X5,0.1 CTR,RCPT X 3.5 L TO FOLD,4.3 L TO 2X5,R (CONNECTED AT A2J902 AND A4J7) | 80009 | 174-3385-00 |
| -21 | 671-3162-00 | B010100 | B010130 | 1 | CKT BD ASSY:POWER SUPPLY,764 | 80009 | 671-3162-00 |
| | 671-3162-01 | B010131 | | 1 | CKT BD ASSY:POWER SUPPLY,764 (A4 ONLY) *MOUNTING PARTS* | 80009 | 671-3162-01 |
| -22 | 211-0722-00 | | | 2 | SCREW,MACH:6-32 X 0.250,PNH,STL,CDPL,T-15 TORX DR | 0KB01 | ORDER BY DESC |
| -23 | 129-1410-00 | | | 5 | SPACER,POST:1.312 SPACING,6-32 INT & EXT,0.250 HEX, STL,CAD PLATING CHROMATE CONVERSION COAT(YEL) *END MOUNTING PARTS* | 05791 | ST6981-1.312-32 |
| -24 | 337-4019-00 | | | 1 | SHIELD,ELEC:POWER SUPPLY BOTTOM,764,LEXAN | 80009 | 337401900 |

Replaceable Parts List (Cont.)

| Fig. & Index Number | Tektronix Part Number | Serial No. Effective | Serial No. Discont'd | Qty | Name & Description | Mfr. Code | Mfr. Part Number |
|---------------------|-----------------------|----------------------|----------------------|-----|--|-----------|------------------|
| -25 | 657-0103-02 | | | 1 | MONITOR ASSEMBY,764 (Includes -25 CIRCUIT BD ASSY, -36 CRT, and -38 DEFLECTION YOKE) *CIRCUIT BD MOUNTING PARTS* | 80009 | 657-0103-02 |
| -26 | 211-0722-00 | | | 3 | SCREW,MACH:6-32 X 0.250,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS* | 0KB01 | ORDER BY DESC |
| -27 | 337-4022-00 | | | 1 | SHIELD,ELECT:DISPLAY BOTTOM,LEXAN,764 | 80009 | 337402200 |
| -28 | 174-3378-00 | | | 1 | CA ASSY,SP:RIBBON,IDC,34,28 AWG,2X17,0.1 CTR,RCPT X 2X17,RCPT,3.1 L X 2X17,RCPT,4.35 L X 7 (CONNECTED AT A2J912,A6J5,A8J9 AND A7J12) | 80009 | 174-3378-00 |
| -29 | 671-3221-00 | B010100 | B010222 | 1 | CIRCUIT BD ASSY:764 AES | 80009 | 671-3221-00 |
| | 671-3221-01 | B010223 | B010334 | 1 | CIRCUIT BD ASSY:764 AES | 80009 | 671-3221-01 |
| | 671-3221-02 | B010335 | | 1 | CIRCUIT BD ASSY:764 AES (A2 ONLY) *MOUNTING PARTS* | 80009 | 671-3221-02 |
| -30 | 211-0722-00 | | | 6 | SCREW,MACH:6-32 X 0.250,PNH,STL,CDPL,T-15 TORX DR | 0KB01 | ORDER BY DESC |
| -31 | 220-0497-00 | | | 2 | NUT,PLAIN,HEX:0.5-28 X 0.562 HEX,BRS CD PL | 0KB01 | 220-0497-00 |
| -32 | 210-1039-00 | | | 1 | WASHER,LOCK:0.521 ID,INT,0.025 THK,SST *END MOUNTING PARTS* | 0KB01 | 1224-02-00-0541 |
| -33 | 337-4021-00 | | | 1 | SHIELD,ELECT:AES BOTTOM,764 | 80009 | 337402100 |
| -34 | 407-4351-00 | | | 2 | BTACKET,CRT:CLINTON,764 *MOUNTING PARTS* | 80009 | 407435100 |
| -35 | 212-0004-00 | | | 4 | SCREW,MACHINE:8-32 X 0.312,PNH,STL *END MOUNTING PARTS* | TK0435 | ORDER BY DESC |
| -36 | 657-0103-02 | | | 1 | MONITOR ASSEMBY,764 (Includes -25 CIRCUIT BD ASSY, -36 CRT, and -38 DEFLECTION YOKE) *CRT MOUNTING PARTS* | 80009 | 657-0103-02 |
| -37 | 210-0458-00 | | | 4 | NUT,PL,ASSEM WA:8-32 X 0.344,STL CD PL *END MOUNTING PARTS* | 0KB01 | 210-0458-00 |
| -38 | 657-0103-02 | | | 1 | MONITOR ASSEMBY,764 (Includes -25 CIRCUIT BD ASSY, -36 CRT, and -38 DEFLECTION YOKE) | 80009 | 657-0103-02 |
| -39 | 333-4155-00 | | | 1 | PANEL,REAR:764 *MOUNTING PARTS* | 80009 | 333415500 |
| -40 | 211-0720-00 | | | 2 | SCR,ASSEM WSHR:6-32 X 0.500,PNH,STL,CDPL,T-15 TORX | 0KB01 | ORDER BY DESC |
| -41 | 211-0722-00 | | | 4 | SCREW,MACH:6-32 X 0.250,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS* | 0KB01 | ORDER BY DESC |
| -42 | 407-4346-00 | | | 1 | BRACKET,INPUT:INPUT BRACKET,764 *MOUNTING PARTS* | 80009 | 407434600 |
| -43 | 211-0722-00 | | | 3 | SCREW,MACH:6-32 X 0.250,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS* | 0KB01 | ORDER BY DESC |
| -44 | 671-3245-00 | B010100 | B010136 | 1 | CIRCUIT BD ASSY:XLR | 80009 | 671-3245-00 |
| | 671-3245-01 | B010137 | | 1 | CIRCUIT BD ASSY:XLR (A6 ONLY) *MOUNTING PARTS* | 80009 | 671-3245-01 |
| -45 | 211-0101-00 | | | 8 | SCREW,MACHINE:4-40 X 0.25,FLH,100 DEG,STL *END MOUNTING PARTS* | TK0435 | ORDER BY DESC |

Replaceable Parts

Replaceable Parts List (Cont.)

| Fig. & Index Number | Tektronix Part Number | Serial No. Effective | Serial No. Discont'd | Qty | Name & Description | Mfr. Code | Mfr. Part Number |
|---------------------|----------------------------|----------------------|----------------------|--------|---|----------------|------------------------------|
| -46 | 671-3247-00 | | | 1 | CKT BD ASSY:BNC,764 (A8 ONLY) *MOUNTING PARTS* | 80009 | 671-3247-00 |
| -47 | 220-0497-00 | | | 4 | NUT,PLAIN,HEX:0.5-28 X 0.562 HEX,BRS CD PL | 0KB01 | 220-0497-00 |
| -48 | 210-1039-00 210-1522-00 | B010100 B010279 | B010278 | 4 4 | WASHER,LOCK:0.521 ID,INT,0.025 THK,SST WASHER:0.700 OD X 0.480 ID, 0.045THK, ELECTRO-CON *END MOUNTING PARTS* | 0KB01 80009 | 1224-02-00-0541 210152200 |
| -49 | 671-3246-00 | | | 1 | CIRCUIT BD ASSY:764 REFERENCE (A7 ONLY) *MOUNTING PARTS* | 80009 | 671-3246-00 |
| -50 | 211-0101-00 | | | 4 | SCREW,MACHINE:4-40 X 0.25,FLH,100 DEG,STL | TK0435 | ORDER BY DESC |
| -51 | 220-0497-00 | | | 1 | NUT,PLAIN,HEX:0.5-28 X 0.562 HEX,BRS CD PL | 0KB01 | 220-0497-00 |
| -52 | 210-1039-00 210-1522-00 | B010100 B010279 | B010278 | 1 1 | WASHER,LOCK:0.521 ID,INT,0.025 THK,SST WASHER:0.700 OD X 0.480 ID, 0.045THK, ELECTRO-CON *END MOUNTING PARTS* | 0KB01 80009 | 1224-02-00-0541 210152200 |
| -53 | 671-3248-00 | | | 1 | CIRCUIT BD ASSY:D-CONNECTOR,764 (A9 ONLY) *MOUNTING PARTS* | 80009 | 671-3248-00 |
| -54 | 214-3903-01 | | | 4 | SCREW,JACK:4-40 X 0.312 EXT THD,4-40 INT THD,0.188 HEX,STEEL,CADPLATE *END MOUNTING PARTS* | 0KB01 | 214-3903-01 |
| -55 | 407-4347-00 | | | 2 | BRACKET,FAN:FAN BRACKET,764 *MOUNTING PARTS* | 80009 | 407434700 |
| -56 | 211-0014-00 | | | 4 | SCREW,MACHINE:4-40 X 0.5,PNH,STL *END MOUNTING PARTS* | TK0435 | ORDER BY DESC |
| -57 | 200-4151-00 | | | 1 | GUARD,FAN:2.75 INCHS,WIRE FORM,NICKEL CHROME PLATED,FG238 | 54186 | FG238 |
| -58 | 119-5069-00 | | | 1 | FAN,DC:TBAX;12V,0.84W,70MA,3,000 RPM,22DBA,11 CFM | 0D1M6 | 2408NL-04W-B20 |
| -59 | 348-1471-00 | | | 4 | MOUNT,RESILIENT:FAN CUSH,.760 X .774,SILICONE RBR | 80009 | 348147100 |
| -60 | 210-0407-00 | | | 1 | NUT,PLAIN,HEX:6-32 X 0.25,BRS CD PL | 73743 | 3038-402 |
| -61 | 210-0202-00 | | | 1 | TERMINAL,LUG:0.146 ID,LOCKING,BRZ TIN PL | 86928 | A-373-158-2 |
| -62 | 198-5808-00 | | | 1 | WIRE SET,ELEC:DISCRETE,CUT/KIT,3,18 AWG,4.0 L,2,0.375 X 0.25 CUT,1,0.375 X 0.375 CUT,5-6,9-2 | TK2469 | 198-5808-00 |
| -63 | 119-0420-00 | | | 1 | FILTER,RFI:6A,250VAC,400HZ *MOUNTING PARTS* | 0GV52 | FN323B-6/01 |
| -64 | 211-0101-00 | | | 2 | SCREW,MACHINE:4-40 X 0.25,FLH,100 DEG,STL *END MOUNTING PARTS* | TK0435 | ORDER BY DESC |
| -65 | 131-4131-00 | | | 1 | CONN,PLUG,ELEC:MALE W/LOCKING ADPTR,EXTMTG | 80126 | B-0778 |
| -66 | 407-4349-00 | | | 1 | BRACKET,FNT:FRONT BRACKET,ALUM,764 *MOUNTING PARTS* | 80009 | 407434900 |
| -67 | 211-0722-00 | | | 2 | SCREW,MACH:6-32 X 0.250,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS* | 0KB01 | ORDER BY DESC |
| -68 | 348-1467-00 | | | 1 | SHIELD,GKT,ELEC:CLIP-ON,3.00 X .544 X 0250 | 80009 | 348146700 |
| -69 | 426-2518-00 | | | 1 | CHASSIS:FRAME SECTION,764 | 80009 | 426251800 |

Replaceable Parts List (Cont.)

| Fig. & Index Number | Tektronix Part Number | Serial No. Effective | Serial No. Discont'd | Qty | Name & Description | Mfr. Code | Mfr. Part Number |
|---------------------|-----------------------|----------------------|----------------------|-----|--|-----------|------------------|
| -70 | 311-2542-00 | | | 1 | RES, VAR:PNL, CERMET, 10K OHMS, 20%, .25W, CONT ROTATION, 9MM SQUARE, 0.125 SHAFT SLOTTED, 0.750 | 32997 | 3310H-PC1-103 |
| -71 | 311-2532-00 | | | 2 | RES, VAR:5K OHM, 20%, 0.25W, LINEAR, 9MM SQ, 0.125 SHAFT, SLOTTED, 0.500 L FMS, PC TERM, 3310Y | 32997 | 3310Y-011-502 |
| | 070-8811-03 | | | 1 | MANUAL, TECH:USERS, 764, DP | TK2548 | 070881103 |
| -72 | 161-0216-00 | | | 1 | CABLE ASSY, PWR, :3, 18 AWG, 2.5M L, BLACK (STANDARD ONLY) | 80126 | C7120-25M-BL |
| | | | | | OPTIONAL ACCESSORIES | | |
| -73 | 161-0215-00 | | | 1 | CABLE ASSY, PWR, :3, 0.75MU, 2.5MM L, GREY (EUROPEAN OPTION A1 ONLY) | 80126 | 0-5335-008-GY |
| -74 | 161-0066-10 | | | 1 | CA ASSY, PWR:3, 0.1MM SQ, 250V/10A, 2.5 METER, STR, IEC320, RCPT X 13A, FUSED UK PLUG(13A FUSE), UNITED KINGDOM, SAFTEY CONTROLLED (UNITED KINGDOM OPTION A2 ONLY) | S3109 | BS/13-H05VVF3G0 |
| -75 | 161-0066-11 | | | 1 | CA ASSY, PWR:3, 1.0MM SQ, 250V/10A, 2.5 METER, STR, IEC320, RCPT, AUSTRALIA, SAFTEY CONTROLLED (AUSTRALIAN OPTION A3 ONLY) | S3109 | 198-000 |
| -76 | 161-0154-00 | | | 1 | CA ASSY, PWR:3, 1.0MM SQ, 250V/10A, 2.5 METER, STR, IEC320, RCPT, SWISS, SAFTEY CONTROLLED (SWISS OPTION A5 ONLY) | S3109 | 12-H05VVF3G 00- |
| | 070-8810-02 | | | 1 | MANUAL, TECH:SERVICE, 764, DP | 80009 | 070881002 |
| | 016-0475-00 | | | 1 | VIEWING HOOD:1740 | 80009 | 016047500 |
| | 200-3897-01 | | | 1 | COVER, FRONT:1700F02, HOT STAMPED (OPTION 20 ONLY) | 80009 | 200389701 |
| | ----- | | | 1 | CAMERA, SCOPE:C9 | | |
| | ----- | | | 1 | PLAIN, CASE:1700F00 | | |
| | ----- | | | 1 | PTD CASE ASSY:1700F02 | | |
| | ----- | | | 1 | RACK ADAPTER, SIDE-BY-SIDE:1700F05 | | |
| | ----- | | | 1 | FILLER PANEL:1700F06 | | |
| | ----- | | | 1 | DRAWER, UTILITY:1700F07 | | |



Appendix

Appendix A: The Diagnostic Interface

The diagnostic interface in the 764 is a development of diagnostic utilities used in other Tektronix instruments. The interface is rather complex, but can be very helpful in troubleshooting the 764. This Appendix discusses the diagnostic interface and tests in detail. For a better understanding of the diagnostics and their use, please begin with the Overview.

Overview

The 764 Digital Audio Monitor diagnostic interface provides access to five “diagnostics” that exercise different sections of instrument hardware and software. These are: the **CPU** and **DSP** diagnostics, which check different portions of the Main circuit board assembly; and the **Display**, **Front Panel**, and **AES** diagnostics, which apply to the display, front panel, and AES circuit boards. Within each diagnostic are one or more tests. Each test has an associated main pass/fail result and, where applicable, one or more sub-tests. A list of the tests that make up the five diagnostics begins on page A-21.

You may run all five diagnostics once or initiate diagnostic looping — in which the sequence of all tests repeats indefinitely — directly from the 764 Digital Audio Monitor front panel. Either operation is quite easy and does not require learning the diagnostic interface. See *Running All Diagnostics Once or Looping All Diagnostics Indefinitely* under *Front Panel Operation* (page A-3).

Other operations require that you use the diagnostic interface. You may run the interface either from the 764 Digital Audio Monitor front panel, or through RS-232 remote control. The operations available only through the diagnostic interface include:

- Running or looping one of the five diagnostics
- Running tests that require user interaction
- Creating custom diagnostic sequences
- Changing how the results are displayed
- Viewing the error log or selecting error logging options
- Clearing NVRAM and resetting the instrument to factory defaults
- Reading the firmware date codes
- Changing the 764 Digital Audio Monitor Powerup mode
- Adjusting the diagnostics display brightness

If you wish to perform any of these tasks, finish reading this overview and then continue with *Interface Basics*, which begins on page A-3.

Terms Used in This Appendix

The meanings of some terms used in the 764 Digital Audio Monitor diagnostic interface may not be obvious. Most terms are explained when they are first used. The following terms are used throughout this appendix; please familiarize yourself with them before proceeding.

Powerup mode

The mode of operation that the instrument enters when it is switched On. The diagnostics are bypassed in the default Quick Start powerup mode.

Startup menu

The home, top, or root menu for the diagnostic interface. You can configure the 764 Digital Audio Monitor to display this menu every time the instrument is switched On.

Powerup diagnostics

The go/no-go diagnostic tests that do not require user interaction. All but two of the diagnostic tests in the current version of software are “powerup” diagnostics. You can configure the 764 Digital Audio Monitor to run all powerup diagnostics every time the instrument is switched On. Running only the powerup tests in one of the five diagnostics requires using the diagnostic interface.

Loop

Repeat a sequence of diagnostic tests indefinitely. The sequence can include all tests in all five diagnostics, or any combination of the tests in one of the diagnostics. You can configure the 764 Digital Audio Monitor to begin looping all of the diagnostics every time the instrument is switched On.

Log

Collect test results in an region of 764 Digital Audio Monitor NVRAM that has been reserved for that information. In most diagnostic modes, failing results are logged by default.

Front-panel mode

The diagnostic interface is controlled through the 764 Digital Audio Monitor front panel. This mode is convenient for testing an instrument “as installed,” as it requires no additional equipment or setup.

Remote mode

The diagnostic interface is controlled via RS-232 remote control from a dumb terminal or a personal computer. Remote mode is most useful in a service environment when repeated, customized testing is required. Once initial setup is done, selection of diagnostic options is much faster in remote mode. It may also be necessary to use remote mode to diagnose problems that affect the front panel or display.

Abort

End the current process or go back to the previous menu.

Typographic Conventions

All instructions and explanations in this appendix follow these typographic conventions:

- Physical features (control knobs, buttons, and keys) of the 764 and the optional terminal or PC keyboard are indicated with bold, sans serif type. Feature names are capitalized in this text as they are printed on the equipment. Examples: **MENU** and **Enter**. Grouped controls are designated by the group name and the control name, separated by a colon. Example: **VIEW:AUDIO**.
- Text that appears on the instrument display or a terminal screen — such as error messages and menus — are indicated with a monospaced typeface. Again, words are capitalized exactly as they are on the instrument display. For example:

Start mode "LOOP ON DIAGNOSTICS" recognized

When the display text is integrated into the text of this appendix, it is enclosed in angle brackets for clarity. Examples: <R ... -RUN- loop> and <(DISABLED) >.

Interface Basics

The diagnostic interface was originally designed for remote operation from a dumb terminal or PC. It has been adapted for operation through the 764 Digital Audio Monitor front panel, but the adaptation bears little resemblance to the normal user interface of the instrument.

The basic Front Panel mode techniques used to invoke and run the diagnostics and diagnostic interface are explained next; explanation of Remote mode diagnostic basics begins on page A-6.

Front Panel Operation

As mentioned in the *Overview* section, you may run all five diagnostics once or initiate diagnostic looping directly from the 764 Digital Audio Monitor front panel. Please see the next two topics, *Running All Diagnostics Once* and *Looping All Diagnostics Indefinitely*, for instructions.

If you wish to perform any of the other operations that require using the diagnostic interface, first read *Starting the Diagnostic Interface* (page A-4) and *Conventions and Techniques* (page A-5). Then skip to *Running the Diagnostics*, on page A-9.

Running All Diagnostics Once

1. If the 764 Digital Audio Monitor is operating, press the front-panel **POWER** switch to change it to the Standby (Off) position.

2. Press and hold the **VIEW:OTHER** button and switch the instrument On. Continue pressing the **VIEW:OTHER** button. After a few seconds the display will flash twice; then the message

Start mode "RUN POWERUP DIAGNOSTICS" recognized

will appear.

3. Release the **VIEW:OTHER** button. All the diagnostic tests will run once, and normal operation will begin when the test sequence is completed. For more information, see *The Powerup Diagnostics*, on page A-10.

Looping All Diagnostics Indefinitely

1. If the 764 Digital Audio Monitor is operating, press the front-panel **POWER** switch to change it to the Standby (Off) position.
2. Press and hold the **PHASE DISPLAY:A** and **PHASE DISPLAY:B** buttons and switch the instrument On. Continue pressing both phase display buttons. After a few seconds, the display will flash twice; then the message

Start mode "LOOP ON DIAGNOSTICS" recognized

will appear.

3. Release the **PHASE DISPLAY:A** and **PHASE DISPLAY:B** buttons. The entire diagnostic test sequence will run repeatedly until you interrupt the process. If the instrument fails a test, the failure will be reported and logged as the sequence and loop continue.
4. To end diagnostics looping, first press the 764 Digital Audio Monitor **MENU** button to interrupt the current test and then press **CLEAR MENU** to abort the loop.

The diagnostic interface will present you with the Configure Diags Loop Mode menu; see page A-12. If you wish to review the results log, press the **CLEAR MENU** button a second time to reach the Startup menu shown in Figure A-1. See *Viewing the Results Log*, on page A-18, for more information.

Starting the Diagnostic Interface

For all other diagnostic operations, start the diagnostic interface with the following procedure.

1. If the 764 Digital Audio Monitor is operating, press the front-panel **POWER** switch to change it to the Standby (Off) position.

2. Press and hold the 764 Digital Audio Monitor MENU button and switch the instrument On. Continue to hold the MENU button down. After a few seconds, the display will flash twice; then the message

Start mode "RUN STARTUP MENU" recognized

will appear.

3. Release the MENU button and the Startup menu will appear, as shown in Figure A-1. This is the home menu of the 764 Digital Audio Monitor diagnostic utilities.

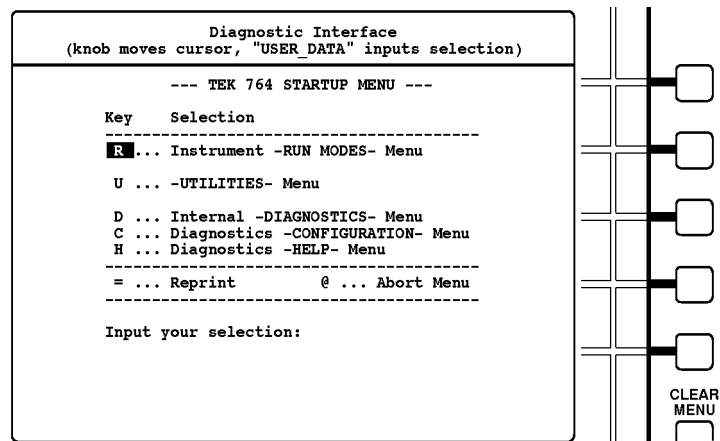


Figure A-1: The startup menu display

Conventions and Techniques

When operating the diagnostic interface through the 764 Digital Audio Monitor front panel:

- Move the cursor/highlight by turning the 764 Digital Audio Monitor multi-function knob. (In Figure A-1, the cursor is on the letter R that precedes the < Instrument -RUN MODES- Menu > selection.)
- To select an option, highlight the letter or symbol that precedes that option and then press the VIEW:USER DATA button.

- Some diagnostic menu selections have front-panel button equivalents. The full list — available through the <H ... Diagnostic -HELP- Menu> selection — is:

| KEY (SELECTION) | FR-PNL BUTTON |
|---------------------------|----------------------|
| SPC (Pause) | OFFSET (METER SCALE) |
| RET (Continue) | EXPAND (METER SCALE) |
| '@' (Abort) | CLEAR MENU |
| '=' (Reprint) | MENU |
| '+' (Select All) | AUDIO (VIEW) |
| '-' (Un-SEL All) | NORMAL (METER SCALE) |
| '!' (Done Selecting) | EXPAND (METER SCALE) |
| '>' (Next Menu Page) | PHASE DISPLAY-A |
| '<' (Prev Menu Page) | PHASE DISPLAY-B |

The most useful of these equivalents is **CLEAR MENU** for <@ ... Abort Menu>. The next paragraph explains.

- Select <@ ... Abort Menu> (highlight <@> and press **VIEW:USER DATA**, or simply press **CLEAR MENU**) to move back to the previous screen. For example, when in the Run Modes menu, aborting the menu will return the interface to the Startup menu shown in Figure A-1.
- The “Key” column heading, the unique letter or symbol that precedes each option, and the <Input your selection:> line are carried over from the original remote mode design of the diagnostic interface. They have no significance in the front panel operating mode.
- The <Reprint> option simply redraws the screen. It is of little use in the front panel operating mode.

Remote Operation

If you are running the diagnostics through RS-232 remote control, please read *Starting the Diagnostics* and *Conventions and Techniques*, below. Then proceed to *Running the Diagnostics*, on page A-9, for further information.

Starting the Diagnostic Interface

1. Set the 764 Digital Audio Monitor **POWER** switch to Standby (Off) and disconnect the instrument from the main AC power supply.
2. Remove the cabinet mounting screws from the rear of the instrument and slide the 764 Digital Audio Monitor from its enclosure.



WARNING. *Dangerous potentials exist at several points within the 764 Digital Audio Monitor. To avoid electrical shock, Do Not touch exposed connections or components when operating the instrument with the protective enclosure removed.*

3. Reconnect the 764 to the main AC supply; then connect the instrument — through the RS-232 port — to a PC or terminal. Cable requirements are explained in the Reference section of the User manual.
4. If possible, make the following settings in the PC or terminal communications application:

```
Data Bits . . . . . 8
Stop Bits . . . . . 1
Parity . . . . . none
Flow Control . . . . . none or Xon/Xoff
Baud Rate . . . . . 38400
```

If your hardware/software does not support a 38400 Baud data rate, select the next highest rate available. Then follow these steps to reset the 764 Digital Audio Monitor baud rate to match:

- a. Switch the 764 Digital Audio Monitor On while holding the **MENU** button down. After a few seconds, the display will flash twice; then the message


```
Start mode "RUN STARTUP MENU" recognized
```

 will appear.
 - b. Release the **MENU** button, and the Startup menu, illustrated in Figure A-1, will appear. Note that the selection cursor (highlight) is on the letter R that precedes the <Instrument -RUN MODES- Menu > selection.
 - c. Turn the multifunction knob to highlight the letter C that precedes the <Diagnostics -CONFIGURATION- Menu > selection.
 - d. Press the **VIEW:USER DATA** button on the 764 Digital Audio Monitor front panel to enter the Diagnostics Configuration submenu.
 - e. Turn the multifunction knob to highlight the letter B that precedes the <Set Diagnostics -BAUD RATE-> selection. Press the **VIEW:USER DATA** button to enter that submenu
 - f. Turn the multifunction knob to highlight the letter that precedes the baud rate that matches the communications application setting. Press **VIEW:USER DATA** button to select that baud rate for the 764 Digital Audio Monitor.
 - g. Switch the 764 Digital Audio Monitor to Standby (Off).
5. Set the 764 Digital Audio Monitor bottom-side up and locate DIP Switch S101 on the Main circuit board. Set Switches 1 and 8 to the ON position (see Figure A-2).

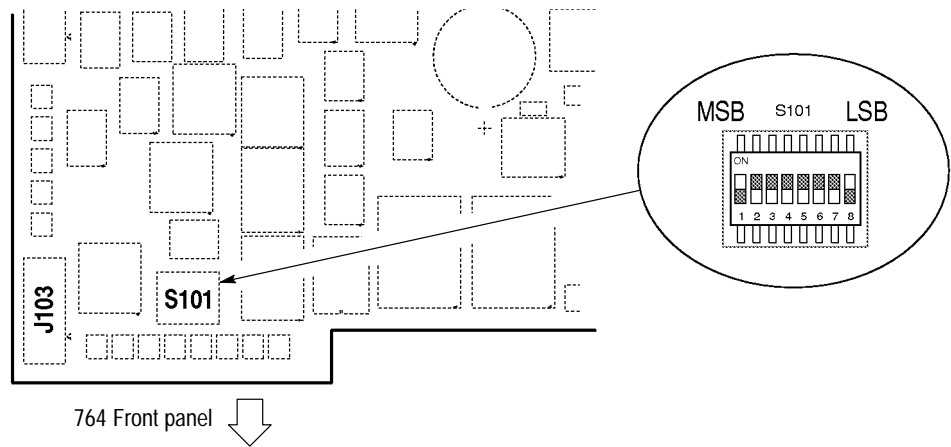


Figure A-2: S101 location and settings for remote diagnostics mode

- Switch the instrument On. After approximately 10 seconds, the following message will appear on the terminal screen:

```
--*-*- WELCOME TO THE TEK 764 DEBUGGER -*-*-
```

```
Type 'h' or '?' for help
```

```
A:00000000 D:0081fffc R/W-->
```

The debugger is not part of the diagnostic utilities; please proceed directly to the next step.

- Type Q on the terminal keyboard to invoke the Startup menu shown below. This is the home menu for all 764 Digital Audio Monitor diagnostic utilities.

```
--- TEK 764 STARTUP MENU ---
```

```
Key      Selection
-----
R ... Instrument -RUN MODES- Menu
U ... -UTILITIES- Menu
D ... Internal -DIAGNOSTICS- Menu
C ... Diagnostics -CONFIGURATION- Menu
H ... Diagnostics -HELP- Menu
-----
= ... Reprint      @ ... Abort Menu
-----
```

```
Input your selection:
```

Conventions and Techniques

When operating the diagnostic interface via RS-232 remote control:

- Select an option by typing the unique letter or symbol that precedes the menu entry. Do not press the Enter (Return) key. Type R, for example, to access the Run Modes menu from the Startup menu shown above.
- You may type lowercase letters to select options that are designated with a letter of the alphabet. However, you must use the Shift key to type symbols (such as !, @, and +) if they are shifted characters on your keyboard.
- Select <@ ... Abort Menu> (type @) to move back to the previous menu. For example, if you were in the Run Modes menu, typing @ would return you to the Startup menu.
- You may also press the Esc key to select <@ ... Abort Menu>.
- Select <Reprint > (by typing =) to rewrite the current menu on the terminal screen.
- In some circumstances, the interface will display a message similar to the following:

```

=====
                        --- R E M I N D E R ---
=====
RET:Continue           "R":Rerun           ESC:Abort

```

On these occasions, type Enter (labeled Return on many keyboards) to continue (resume) the process; type R to restart/rerun the process; or press the Esc key (rather than typing @) to stop the process and return to the previous menu.

Running the Diagnostics

The remainder of this section contains explanations and step-by-step procedures for using the 764 Digital Audio Monitor diagnostic interface. The explanations and procedures assume that you are familiar with the conventions and techniques for your chosen mode (front panel or remote) of diagnostic operation. If you are not, please consult the *Interface Basics* section (page A-3) before proceeding.

Through the 764 Digital Audio Monitor diagnostic interface, you can:

- Run all tests of all five diagnostics once (see page A-10).
- Run all five diagnostics in a continuous loop (see page A-11).
- Choose looping options (see page A-12)
- Run or loop all the tests in an individual diagnostic (see page A-14).
- Construct and run (or loop) a custom sequence of tests that are in one of the diagnostics (see page A-17).

- Choose options for error reporting and logging (see page A-13).
- View the error log (see page A-18).
- Perform other tasks:
 - Clear NVRAM and reset the instrument to factory defaults (see page A-19)
 - Read the firmware date codes (see page A-19)
 - Change the 764 Digital Audio Monitor Powerup mode (see page A-20)
 - Adjust the diagnostics display brightness (see page A-21)

Running All Diagnostics Once

Follow these steps to perform all Diagnostic tests once:

1. Start the diagnostic interface as described in the *Interface Basics* section of this appendix.
2. From the Startup menu, select `<R ... Instrument -RUN MODES- Menu >`.
3. From the Run Modes menu, select `<P ... POWERUP DIAGS run powerup diagnostics >`. The diagnostic interface will begin running the 764 Digital Audio Monitor diagnostic tests.

The Powerup Diagnostics

After you start the Powerup Diagnostics, all diagnostics will run once, and normal operation will begin after the test sequence is completed. If the instrument fails a test, the failure will be reported and logged, and the sequence will pause for 60 seconds. During that time a message similar to the reminder below will appear on the instrument display or the terminal screen.

```

=====
                --- R E M I N D E R ---
=====
RET:Continue      "R":Rerun      SPC:Pause      ESC:Abort
-< Will automatically Continue in nn counts >-
    
```

If you do nothing, the sequence will resume after 60 seconds. Before then, you may: choose `<RET:Continue >` to continue the sequence; choose `<"R":Rerun >` to restart/rerun the failed test; choose `<SPC:Pause >` to cancel the “continue in *nn*” countdown and pause indefinitely; or choose `<ESC:Abort >` to cancel the sequence and return to the Run Modes menu.

Note that although Powerup Diagnostics may seem to be an inappropriate name for this mode, you can configure the 764 Digital Audio Monitor to perform the sequence every time you switch it On; see page A-20.

Looping the Diagnostic Tests

Diagnostic looping is the continual repetition of a diagnostic test sequence. At the top level of the interface, looping repeats all tests in all five diagnostics. Each sequence repetition is assigned a loop number, and logged failures are identified with the number of the loop in which they occurred. You may wish to use looping to detect an intermittent error. Looping is also the only way to run *all* of the tests with an alarm/pause on error mode in effect.

1. Start the diagnostic interface as described in the *Interface Basics* section of this appendix.

2. From the Startup menu, select

R ... Instrument -RUN MODES- Menu

3. From the Run Modes menu, select

L ... DIAGS LOOP loop all diagnostics

The entire diagnostic test sequence will repeat until you interrupt the process. If the instrument fails a test, the failure will be reported and logged while the sequence and loop continue.

4. **To end the diagnostics loop**, follow the directions on the instrument display or terminal screen: in front panel mode, press **MENU** and then **CLEAR MENU**; in remote mode, press the space bar and then **Esc**. The diagnostic interface will present you with the Configure Diags Loop Mode menu; see the next topic for information about these options. If you wish to review the results log, select **<@ ... Abort Menu>** to return to the Startup menu. See *Results Log Utilities*, on page A-18, for additional information.

Choosing Loop Options

To customize the diagnostics looping mode:

1. Follow the previous procedure to begin a diagnostic loop.
2. Follow the instructions on the instrument display or terminal screen to interrupt; then abort the loop. The diagnostic interface will present you with this main Loop Configuration menu:

```

          --- CONFIGURE DIAGS LOOP MODE ---
Current DIAGS LOOP session aborted during loop X. Reconfigure as desired
and select "-RUN-" to start a new session, or select "Abort Menu" to
exit DIAGSLOOP mode.
    
```

| Key | Selection |
|-------|-----------------------------------|
| A ... | Toggle -ALARM- Mode (DISABLED) |
| D ... | Result -DISPLAY- Mode (MIN REQ'D) |
| L ... | Result -LOGGING- Mode (MIN REQ'D) |
| R ... | -RUN- loop |
| = ... | Reprint |
| @ ... | Abort Menu |

Input your selection:

Note that < (DISABLED) > alarm and < (MIN REQ'D) > results display and logging are the default settings.

3. Select the desired alarm, display, and logging options with the techniques explained below; the diagnostic interface will return to the above menu after each selection.
4. Select < R ... -RUN- loop > to restart the diagnostic loop with the newly selected options in effect.
5. When you again interrupt and abort the loop, the diagnostic interface will return to the main loop configuration menu. Select < Abort Menu > a second time to exit looping mode and return to the Startup menu; note that when you do, all looping options will revert to their default settings.

Configuring the Alarm Mode

- Select < A ... Toggle -ALARM- Mode > to toggle the alarm between enabled and disabled.

If the instrument fails a test when the alarm is enabled, the diagnostic interface will issue a visible or audible alarm and interrupt the sequence/loop. You will have the option of continuing the loop, aborting the loop, or rerunning the failed test.

Note that the alarm mode will default to < DISABLED > once you return to the Startup menu (by selecting < @ ... Abort Menu > from the Loop Configuration menu).

Configuring the Result Display Mode

1. Select <D ... Result -DISPLAY- Mode > to access this submenu:

```

--- CONFIGURE DIAGS LOOP MODE ---
Select a RESULT DISPLAY MODE from the list below:
Key   Selection
-----
0 ... Show Main results -ONLY-
A ... Show -ALL- results
M ... Show -MINIMUM- required results
-----
= ... Reprint           @ ... Abort Menu
-----
Input your selection:

```

2. Select the desired results display mode. The display will return to the Loop Configuration menu.

This choice determines the detail with which test results are reported on the instrument display or terminal screen. There is no discernable difference between the MINIMUM and Main options. Therefore, select <Show -ALL- results > if you want to display results in more detail.

Note that the result display mode will default to <MIN REQ'D > once you return to the Startup menu (by selecting <Abort Menu > from the main Configure Diags Loop menu).

Configuring the Result Logging Mode

1. Select <L ... Result -LOGGING- Mode > to access this submenu:

```

--- CONFIGURE DIAGS LOOP MODE ---
Select a RESULT LOGGING MODE from the list below:
Key   Selection
-----
0 ... Log Main results -ONLY-
A ... Log -ALL- results
M ... Log -MINIMUM- required results
D ... -DISABLE- Results Logging
-----
= ... Reprint           @ ... Abort Menu
-----
Input your selection:

```

2. Select the appropriate results logging mode. The display will return to the Loop Configuration menu.

This choice determines the number and detail of results that are saved in the NVRAM error log. Keep the default (<-MINIMUM- required >) selection to log only the tests that fail; select <0 ... Log Main results -ONLY-> to log all pass-

ing and failing main test results; and select <A ... Log -ALL- results> to save detailed results of all sub-tests as well.

Note that all failing results — including the sub-results that caused the failure — are logged under the <-MINIMUM- required> option. Therefore, most users will prefer to keep the default setting because the other options add only *passing* results to the log. The NVRAM reserved for the error log will fill completely (and overflow) in one loop when <Log -ALL- results> is selected.

Note that the results logging mode will default to <MIN REQ'D> once you return to the Startup menu (by selecting <@ ... Abort Menu> from the main loop configuration menu).

Running an Individual Diagnostic

To run only one of the diagnostics (CPU, DSP, Display, Front Panel, or AES):

1. Start the diagnostic interface as described in the *Interface Basics* section of this appendix.
2. From the Startup menu, select

D ... Internal -DIAGNOSTICS- Menu

After a few seconds, this menu will appear on the instrument display or terminal screen:

```

          --- INTERNAL DIAGNOSTICS ---
Select a diagnostic to execute from the list below
Key   Selection
-----
A ... CPU Diagnostic
B ... DSP Diagnostic
C ... Display Diagnostic
D ... Front Panel Diagnostic
E ... AES Diagnostic
-----
= ... Reprint      @ ... Abort Menu
-----

```

Input your selection:

3. Select one of the five diagnostics. The following Run Mode menu will appear.

```

          --- XXX Diagnostic ---
Select an OVERALL RUN MODE from the list below:
Key      Selection
-----
P ... -POWERUP- Mode
A ... -AUTORESET- Mode
C ... -CUSTOM- Mode
-----
= ... Reprint      @ ... Abort Menu
-----
Input your selection:

```

4. Select Powerup mode to run all powerup tests in the selected diagnostic once. The tests will progress as described under *The Powerup Diagnostics*, on page A-10, and the interface will return to the Run Mode menu after the last test in the sequence has run. Select the Custom run mode to run or loop one, several, or all of the tests in the selected diagnostic. Custom mode offers a number of options; see the next topic for more information. Autoreset mode is identical to Powerup mode in the current version of 764 Digital Audio Monitor software.

The Custom Diagnostic Run Mode

In the Custom diagnostic run mode, you can:

- Run or loop all of the tests of the chosen diagnostic
- Run or loop only selected tests of the chosen diagnostic
- Select display, logging, looping, and alarm options for the tests

To enter the Custom diagnostic run mode:

1. Perform the first three steps of the previous procedure:
 - a. Start the diagnostic interface.
 - b. From the Startup menu, select <D ... Internal -DIAGNOSTICS- Menu >.
 - c. Select the desired diagnostic from the internal diagnostics menu.

2. Select <C ... -CUSTOM- Mode>. The default Custom Run Mode menu will appear on the display or terminal screen:

```

          --- XXX Diagnostic ---
Configure CUSTOM RUN MODE parameters and the test sequence as desired.
Key      Selection
-----
S ... -SEQUENCE- Type          (CUSTOM)
1 ... Advance Mode             (MANUAL)
2 ... Result Display Mode      (SHOW ALL)
3 ... Result Logging Mode      (DISABLED)
B ... -BUILD- New Test Sequence
-----
= ... Reprint                  @ ... Abort Menu
-----

Input your selection:

```

Note that this menu will change in response to some selections to include or hide options that are not available or compatible with all other selections. For example, if you start with the above menu and select another advance mode — such as Automatic or On Pass — the menu will reappear with looping and alarm mode selections added. Similarly, if you started from the above menu and changed the sequence type (to Powerup or Autoreset), the default advance mode will become <ON PASS>, and the interface will therefore *also* add looping and alarm mode selections. In practice, this means that selecting <S ... -SEQUENCE- Type> from the above menu and selecting <POWERUP> will transform the Custom Run Mode menu into the following:

```

          --- XXX Diagnostic ---
Configure CUSTOM RUN MODE parameters and the test sequence as desired.
Select "RUN" to begin execution.
Key      Selection
-----
S ... -SEQUENCE- Type          (POWERUP)
1 ... Advance Mode             (ON PASS)
2 ... Result Display Mode      (MIN REQ'D)
3 ... Result Logging Mode      (MIN REQ'D)
4 ... Toggle Looping Mode      (DISABLED)
5 ... Toggle Alarm Mode        (DISABLED)
R ... -RUN- Test Sequence
-----
= ... Reprint                  @ ... Abort Menu
-----

Input your selection:

```

(Note that the last item in the menu also changes — from <B ... -BUILD- New Test Sequence> to <R ... -RUN- Test Sequence>.)

Because of this feature, always select Custom Mode menu settings in this order: 1) sequence type; 2) advance mode; and 3) display, logging, looping, and alarm modes, if available.

Display, logging, and alarm options are explained under *Choosing Loop Options*, on page A–12. Looping mode is discussed under *Looping the Diagnostic Tests*, on page A–11. Sequence type and Advance mode are explained in the next few paragraphs.

Sequence Type

Available Sequence types have the same names as the Overall Run Modes: Powerup, Autoreset, and Custom. Selecting the Powerup *sequence* in the Custom *run mode* lets you run all of the “powerup” tests in a given diagnostic with custom advance, display, logging, looping, and alarm settings; selecting the Autoreset sequence permits similarly customized running of all the autoreset tests (which, in this version of 764 Digital Audio Monitor software, are identical to the power-up tests). Selecting the Custom *sequence* in the Custom *run mode* gives you the choice of which tests in the diagnostic to run in addition to control over how they will run.

A list of the tests that make up each of the five diagnostics begins on page A–21. All tests, except those marked “UI:” (for User Interaction) are powerup tests. You may run user interaction tests only in a Custom sequence.

Advance Mode

The Advance mode selection determines how the diagnostic interface progresses through a sequence of tests. The selections are:

```
A ... -AUTOMATICALLY- advance to next test
P ... Advance on -PASS- (waits on non-Pass)
F ... Advance on -FAIL- (waits on non-Fail)
M ... -MANUAL- (waits for user input)
```

Choose <-AUTOMATICALLY- advance to next test> when you intend to watch the progress of the entire sequence, or when you plan to later check the results log for failed tests. Select <Advance on -PASS-> when you wish to stop the sequence or loop when the interface encounters the first test failure. Select <Advance on -FAIL-> in the unlikely event that you expect failure and wish to stop the sequence or loop on the first passing test. Select <-MANUAL-> to step through a sequence test-by-test.

Creating and Running a Custom Test Sequence

1. From the Startup menu, select <D ... Internal -DIAGNOSTICS- Menu >.
2. Select the desired diagnostic from the internal diagnostics menu.
3. Select <C ... -CUSTOM- Mode >. The default Custom Run Mode menu will appear on the display or terminal screen.

4. Select <B ... -BUILD- New Test Sequence >. A list of the available tests will appear on the display or terminal screen. (The available tests are also listed in this appendix under *Custom Sequence Choices*, on page A-21.)
5. Choose the appropriate tests from the list and then select <! ... Done Selecting > to return to the Custom Run Mode menu.
6. Configure the remaining custom run modes — advance, display, logging, looping, and alarm — as desired. Looping and alarm options will be available when the advance mode is *not* <MANUAL >.
7. Select <R ... -RUN- Test Sequence > to begin execution.

Results Log Utilities

By default, the 764 Digital Audio Monitor diagnostic interface keeps a log of all failing diagnostic results — including the sub-results that caused the failure — to NVRAM. You can also configure the interface to log passed tests to two different levels of detail. See *Configuring the Result Logging Mode*, on page A-13, for more information.

The results log will list the earliest results first, and the most recent results last. When the NVRAM reserved for the error log fills completely, the oldest results are removed from the top of the list at the same time that a new result is added to the bottom.

Reviewing and Clearing the Error Log

1. From the Startup menu, select <U ... -UTILITIES- Menu >.
2. From the Utilities menu, select <E ... -ERROR LOG- utilities >. The following menu will appear.

```

          --- ERROR LOG UTILITIES ---
Key      Selection
-----
V ... -VIEW- Error Log
C ... -CLEAR- Error Log
O ... Toggle -OVERFLOW- mode
-----
= ... Reprint      @ ... Abort Menu
-----
    
```

3. Select <V ... -VIEW- Error Log > to review logged errors. Follow the directions on the instrument display or terminal screen to scroll through the error list. The interface will return to the above menu when it reaches the bottom of the list.
4. It is good practice to clear the error log before running any diagnostics; doing so will prevent uncertainty as to when an error occurred. To clear the error log, select <C ... -CLEAR- Error Log > from the above menu.

Other Tasks The tasks explained in this section are: clearing/resetting NVRAM, reading the firmware date codes, reading the 764 Digital Audio Monitor Instrument ID number, changing the 764 Digital Audio Monitor powerup mode, and adjusting the brightness of the diagnostic display.

Clearing/Resetting NVRAM

NOTE. *Resetting NVRAM will destroy all user-saved instrument setups, the diagnostic error log, and all diagnostic configuration settings. All settings will revert to default; it will not be possible to recover lost information. If you are running the diagnostic interface in remote mode at other than 38,400 baud, communications with the instrument will be interrupted.*

1. Start the diagnostic interface as described in the *Interface Basics* section of this appendix.
2. From the Startup menu, select <U ... -UTILITIES- Menu>.
3. From the Utilities menu, select <N ... NVRAM utilities>.
4. From the NVRAM utilities menu, select <C ... CLEAR System NVRAM> (neither the <BACKUP> nor the <RESTORE> options are implemented in existing 764 Digital Audio Monitor software versions). The following message will appear on the instrument display; a similar message would appear on a terminal screen.

```

CLEAR SYSTEM NVRAM UTILITY
=====
### WARNING -- Clearing system NVRAM will destroy: ###
-- All user files: setups, data, etc
-- Diagnostics Error log
-- All Diagnostic configuration info
[ Instrument will revert to its Factory Default settings; ]
[ Diagnostics NVRAM (& error log) will be re-initialized. ]

### Press -MENU BUTTON- to clear NVRAM, any other to abort ###

```

5. Follow the instructions to clear NVRAM or abort the operation.

Reading the Firmware Date Codes

1. From the Startup menu, select <U ... -UTILITIES- Menu>.
2. From the Utilities menu, select <F ... FIRMWARE Date Codes>.

Reading the 764 Digital Audio Monitor Instrument ID Number

1. From the Startup menu, select <U ... -UTILITIES- Menu>.
2. From the Utilities menu, select <I ... Show INSTRUMENT ID number>.

Changing the 764 Digital Audio Monitor Powerup Mode

This setting determines what happens when you switch the 764 Digital Audio Monitor On with the front-panel **POWER** switch. Quick Start, in which all diagnostics are bypassed, is the default powerup mode.

1. Start the diagnostic interface as described in the *Interface Basics* section of this appendix.
2. From the Startup menu, select `<C ... Diagnostics -CONFIGURATION- Menu>`.
3. From the Configuration menu, select `<P ... Set Diagnostics POWERUP Mode>`. The Powerup Mode menu will name the current setting and offer these four options:

```

Q ... QUICK START ..... Skip Diagnostics, start Instrument
M ... STARTUP MENU ..... Access Diagnostics and Utilities
P ... POWERUP DIAGS ..... Do Diagnostics, start Instrument
L ... DIAGS LOOP ..... Loop on Diagnostics
    
```

4. Select the desired mode. The diagnostic interface will return to the Configuration menu. The 764 Digital Audio Monitor will start up in the selected mode the next time you switch the power On; the setting will remain in effect until you change it again or until you clear NVRAM (at which time the setting will return to the Quick Start default; see page A-19).

You can override the current powerup mode by pressing the appropriate front-panel button (or buttons) while switching the instrument on. The following message will appear on the display if you select `<H ... Diagnostics -HELP- Menu>` from the Startup menu and then select `<P ... List special instrument -POWERUP- modes >`.

```

                SPECIAL INSTRUMENT POWER-UP MODES
                =====
These modes are accessed by powering up the instrument with
the indicated button(s) held in. The instrument will flash
twice and recognize the mode about 5 seconds after power-up,
after which the buttons must be released.
NOTE: The Boot Switches -MUST- be in their Factory Default
position to access these modes (see Service Manual).
POWER-UP MODES          BUTTON(S) TO HOLD IN
-----
QUICK START INSTRUMENT ... NORMAL (METER SCALE)
RUN STARTUP MENU ..... MENU
RUN POWERUP DIAGNOSTICS .. OTHER (VIEW)
LOOP ON DIAGNOSTICS ..... PHASE_A & PHASE_B
REPROGRAM INSTRUMENT .... MENU & CLEAR_MENU
    
```

The Boot Switches are switches 1 and 8 in DIP Switch S101 on the Main 764 Digital Audio Monitor circuit board (see Figure A-2, on page A-8). The factory default position for these switches is OFF.

Adjusting the Diagnostics Display Brightness

The 764 Digital Audio Monitor front-panel **BRIGHTNESS** control is disabled when the diagnostic interface is running. To adjust display brightness when diagnostics are running in the front panel mode:

1. From the Startup menu, select <C ... Diagnostics CONFIGURATION Menu>.
2. From the Configuration menu, select <I ... Set Diagnostics INTENSITY>.
3. Turn the 764 Digital Audio Monitor multifunction knob to adjust display brightness; then press any front-panel button to return to the Configuration menu. Any setting between 20% and 80% will be saved in NVRAM for use during later diagnostic sessions. The setting will also affect display brightness during instrument initialization in a Quick Start (see the previous topic), but is overridden by the **BRIGHTNESS** knob during normal operation.

The Diagnostic Tests

This section lists the tests in the five 764 Digital Audio Monitor diagnostics. Tests marked “UI” require user interaction and may be selected only when building a custom sequence in Custom Diagnostics run mode (see page A-17). All other tests are considered Powerup tests.

CPU Diagnostic

- Boot ROM
- Spurious Interrupt
- Serial Ports
- Inst ID H/W
- Option H/W Reg
- System RAM
- Mapping RAM
- UI:NVRAM

DSP Diagnostic

- DSP1 Host Inf
- DSP2 Host Inf
- DSP3 Host Inf
- DSP1 Interrupt
- DSP2 Interrupt
- DSP3 Interrupt

- DSP1 X Int'l RAM
- DSP1 X Ext'l RAM
- DSP1 Y Int'l RAM
- DSP1 Y Ext'l RAM
- DSP1 P Int'l RAM
- DSP1 P Ext'l RAM
- DSP2 X Int'l RAM
- DSP2 X Ext'l RAM
- DSP2 Y Int'l RAM
- DSP2 Y Ext'l RAM
- DSP2 P Int'l RAM
- DSP2 P Ext'l RAM
- DSP3 X Int'l RAM
- DSP3 Y Int'l RAM
- DSP3 P Int'l RAM
- DSP3 External RAM
- DSP1 Boot
- DSP2 Boot
- DSP3 Boot
- DSP1→3 Xfer
- DSP2→3 Xfer
- DSP3 DMA (map RAM)

Display Diagnostic

- Video ASIC
- Video RAM
- Video Interrupt
- Int'l RAM DAC
- Ext'l RAM DAC
- Int'l Bright DAC
- Ext'l Bright DAC

Front Panel Diagnostic

- LED Sequence
- Buttons
- UI:LED Test/TS

AES Diagnostic

- AES Board Version
- Time Code Circuit
- DSP1 Rx Loop
- DSP2 Rx Loop
- DSP1 Oversampler
- DSP2 Oversampler
- DSP1 User Data
- DSP2 User Data
- DSP1 Chnl Status
- DSP2 Chnl Status
- DSP1 Rx Err Detect
- DSP2 Rx Err Detect
- DSP1 Cross Channel
- DSP2 Cross Channel



Glossary

Glossary

CLIP

One or more consecutive positive or negative full scale samples. The actual number of consecutive samples that constitute a CLIP may be adjusted through the Level Meters submenu; the factory setting is one (1).

Copy

Output a session report via the rear-panel RS-232 port.

Frame Sync Err

Frame synchronization error between the input pair and the reference, as a percentage of the digital audio frame.

MUTE

One or more consecutive zero samples. The actual number of consecutive samples that constitute a MUTE may be adjusted through the Level Meters submenu; the factory setting is ten (10).

Module

A circuit board assembly. The 764 Digital Audio Monitor contains the following modules:

| | | | |
|----|--------------|-----|-------------|
| A1 | Main | A6 | XLR |
| A2 | AES | A7 | Reference |
| A3 | Front panel | A8 | BNC |
| A4 | Power supply | A9 | D-connector |
| A5 | Display | A10 | On/Off |

nil

The measured signal level is lower than -90 dBFS

Session

A mode of instrument operation during which the digital audio input signals are monitored, and signal data are collected.

Session Time

The time elapsed since the beginning of the current Session.

True Peak

The actual highest positive or negative audio sample value. True Peaks will often be greater than the highest meter reading when Extended VU or PPM ballistics are used.

Test Level

Also called alignment level or reference level. Usually the signal level used for system alignment. In the 764, this setting determines the placement of level meter markers and a meter bar intensity/color threshold.



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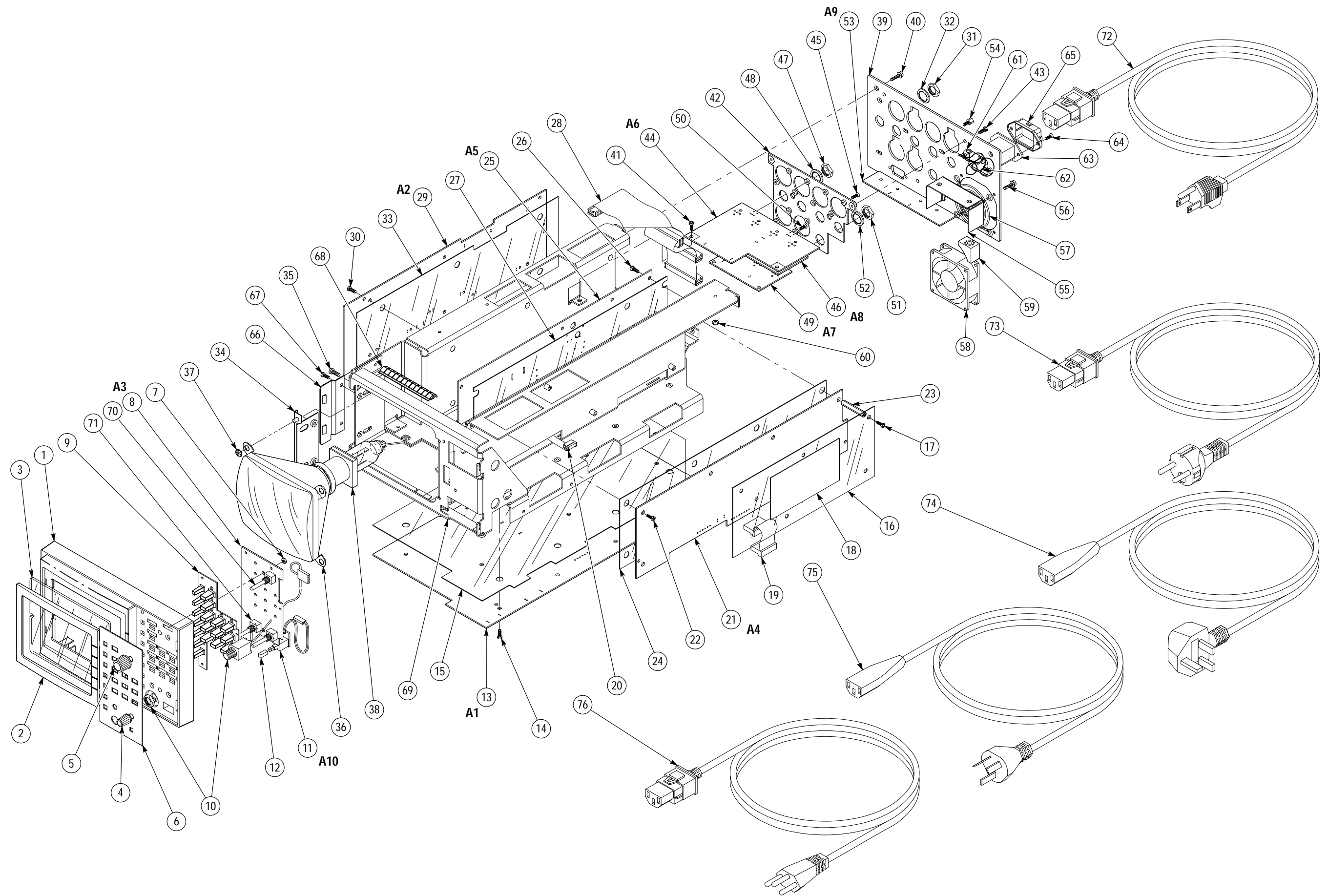


FIG. 1 EXPLODED VIEW