Tektronix

# AD951A & AD953A
# MPEG Test System
# Getting Started Manual

## 071-1422-00

www.tektronix.com

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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. To avoid potential hazards, use this product only as specified.

*Only qualified personnel should perform service procedures.*

While using this product, you may need to access other parts of the system. Read the General Safety Summary in other system manuals for warnings and cautions related to operating the system.

### To Avoid Fire or Personal Injury

**Use Proper Power Cord.** Use only the power cord specified for this product and certified for the country of use.

**Connect and Disconnect Properly**. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

**Ground the Product.** This product is grounded through the grounding conductor of the mainframe 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.

**Observe All Terminal Ratings.** To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal

**Powering Off.** The power cord provides Mains disconnect.

**Replace Batteries Properly.** Replace batteries with the same type and rating.

**Do Not Operate Without Covers.** Do not operate this product with covers or panels removed.

**Use Proper Fuse.** Use only the fuse type and rating specified for this product.

**Avoid Exposed Circuitry.** Do not touch exposed connections and components when power is present.

**Wear Eye Protection.** Wear eye protection if exposure to high-intensity rays or laser radiation exists.

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

**Do Not Operate in Wet/Damp Conditions.**

**Do Not Operate in an Explosive Atmosphere.**

**Keep Product Surfaces Clean and Dry.**

**Provide Proper Ventilation.** Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

**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:

# 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, switch off the instrument power, then disconnect the power cord from the mains power.

**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.

Use only Tektronix approved components when servicing the unit.

# Preface

This manual describes the functions and use of the Tektronix AD951A & AD953A MPEG Test System. The manual is organized into the following sections:

- ***Getting Started***
  This chapter includes a description and overview of the AD951A & AD953A MPEG Test Systems. This chapter explains how to install the MPEG Test Systems, powering them on and off, how to set up the GPSI interfaces, and how to configure the interface settings for the Player and Monitor/Recorder programs.

- ***Operating Basics***
  This chapter provides a brief introduction to the software applications installed in the AD951A & AD953A MPEG Test Systems. For detailed operating information about the applications, refer to the *AD951A & AD953A MPEG Test System User Manual.*

- ***Appendices***
  This section contains the following appendices:

  - Appendix A: Cleaning and Maintenance. This appendix describes how to clean and maintain the AD951A & AD953A. This appendix includes basic information on troubleshooting the AD951A & AD953A. Information on repackaging the instrument for shipment also appears in this appendix.

  - Appendix B: GPSI Settings. This appendix provides important user information about configuring the General Purpose Serial Interface II+ card.

  - Appendix C: System Recovery. This appendix explains how to reinstall the operating system and application software if you should encounter problems with the software.

  - Appendix D: Network Troubleshooting. This appendix provides a high-level overview of diagnosing and troubleshooting network connection problems.

- ***Glossary***

- ***Index***

For detailed information on using the AD951A & AD953A MPEG Test System, please refer to the *AD951A & AD953A MPEG Test System User Manual*.

# Related Material

Additional documentation, such as Read Me files, may be included on the installation disks.

The following table lists the other manuals available for the AD951A & AD953A MPEG Test System.

**Table i-1: Related Documentation**

| Title | Part Number | Description |
|---|---|---|
| AD951A & AD953A MPEG Test System User Manual | 071-1423-00 | Provides in-depth operating information for the software applications included in the AD951A & AD953A |
| AD951A & AD953A MPEG Test System Technical Reference | 071-1425-00 | Provides the AD951A & AD953A specifications and a performance verification procedure. Available only as a PDF file on the *AD951A & AD953A MPEG Test System Recovery* CD-ROM. |

The following URLs access the Web sites for the standards organizations listed (the URLs listed were valid at the time or writing):

- MPEG-2 standards (International Organization for Standards)

  http://www.iso.ch/

- DVB standards (European Technical Standards Institute)

  http://www.etsi.org/

- ATSC standards (Advanced Television Systems Committee)

  http://www.atsc.org/

# Manual Conventions

Naming conventions for the interface elements are based on standard Windows naming conventions. Naming conventions for MPEG-2, ATSC, and DVB structures follow the conventions derived from the standards documents listed above. In addition, the following formatting conventions apply to this manual:

- **Bold** text refers to specific interface elements that you are instructed to select, click, or clear.
  Example: Select **Settings** from the Configuration menu.

- Mono-spaced text can indicate the following:
  - Text you enter from a keyboard
    Example: Enter the network identity (`http://TSMonitor01`)
  - Characters you press on your keyboard
    Example: Press `CTRL+C` to copy the selected text.
  - Paths to components on your hard drive
    Example: The program files are installed at the following location:
    `C:\Program Files\Tektronix\`

## Contacting Tektronix


**Phone** 1-800-833-9200*

**Address** Tektronix, Inc.
Department or name (if known)
14200 SW Karl Braun Drive
P.O. Box 500
Beaverton, OR 97077
USA

**Web site** www.tektronix.com


### Support - North & South America

**Sales support** 1-800-833-9200, select option 1*

**Service support** 1-800-833-9200, select option 2*

**Technical support** Email: techsupport@tektronix.com

1-800-833-9200, select option 3*

* - toll free in North America.

6:00 a.m. -- 5:00 p.m. Pacific time
After office hours, please leave a voice mail message.

### Support - Europe & the Rest of the World

**Sales Support** +44 (0)1344 392000

**Service & Technical Support**

Telephone +44 (0)1223 200700

Fax +44 (0)1223 200701

# Getting Started

# Product Description

The AD951A & AD953A are rack-mountable MPEG Test Systems that play, record and multiplex MPEG-2 transport streams. The AD953A also includes a protocol analyzer capable of analyzing transport streams in MPEG-2, DVB, ATSC and ISDB environments.

Figure 1-1 shows the front panel of the AD951A & AD953A unit.

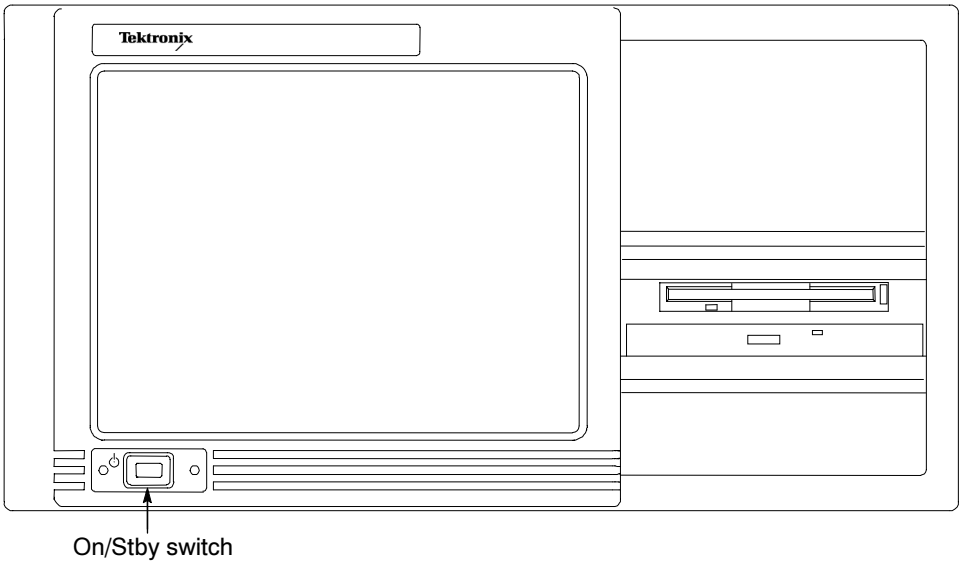



**Figure 1-1: AD951A & AD953A front panel**

## Features & Benefits

The AD951A & AD953A offer the following features (depending on model and installed options):

- MPEG, DVB, ATSC, and ISDB compliance testing
- In-depth off-line analysis capability to solve problems and isolate faults quickly
- Real-time monitoring to TR101 290 with powerful trigger mode to track down operational faults quickly

- Real time and deferred time Transport Stream timing measurements including PCR Arrival Interval, PCR accuracy (PCR_AC), PCR overall jitter (PCR_OJ), PCR Arrival Time (network jitter), PCR frequency offset (PCR_FO), and deferred time drift rate (PCR_DR) measurement and graphing
- Stream playout and recording provides repeatable test source and capture capability for the development environment
- Easy-to-interpret detailed graphical display of real-time and off-line analysis tools
- Wide range of industry standard interfaces for plug and play connectivity
- Modular design allows you to purchase only the performance you require today
- Easy to upgrade for changing needs

## MPEG Test System Overview

The MPEG Test System provides facilities to (depending on model and installed options):

- Record and Playout MPEG-2 transport streams
- Monitor an input stream to detect user defined events and conformance violations. The monitor can trigger recording and raise alarms in response to detection of events.
- View the data in Transport and Packetized Elementary Streams. Analyze the data and check the streams for conformance violations to the relevant MPEG-2, DVB and ATSC standards.
- Analyze the behavior of streams in the MPEG-2 T-STD Buffer model.
- Edit and modify the data in streams that have been recorded or otherwise synthesized.

The MPEG Test System is designed for set-top box manufacturers, multiplexer designers, systems integrators, and service providers. The MPEG Test System is easy to use, with an intuitive Windows™ based user interface.

**Development and System Integration** In the development environment, the MPEG Test System is a convenient signal source and powerful debug tool. Its ability to playout the same video test stream repeatedly, at data rates of up to 90 Mbps provides the stimulus source for integrated receiver decoder (IRD) and modulator developers.

The ability of the MPEG Test System to capture and analyze long video streams allows engineers to rapidly search and identify video packets causing malfunctions in the equipment under test. Stream capture can be triggered either by events in the monitored video stream or by external sources.

The MPEG Test System can derive its playout clock from an external clock source, or synthesize the correct clock setting for each file internally.

**Production Test** In the production environment, the MPEG Test System provides a source of repeatable test patterns for the test and alignment of IRDs and modulators. The reliability, embedded diagnostics, and modularity of the system provide for the minimum down time during the working life of the unit.

**Transmission Monitoring** For program and service providers, the real time MPEG-2 monitoring facility of the MPEG Test System provides confidence that the program material meets the MPEG-2 requirements. Non-conformance to the MPEG-2 rules is displayed on a graphical user interface, along with a statistical analysis of the program multiplex.

All of the MPEG Test System facilities described above are available.

## Standard and Optional Accessories

A range of options is available for the AD951A & AD953A units.

Table 1-2 shows the options available for the AD953A unit.

**Table 1-2: AD953A Options**

| Item | Option | Description |
|---|---|---|
| AD953A | | Mainframe including one MPEG Interface Card (MIC) with Record and Play software, Multiplexer, Make Seamless Wizard, TS Cutter, TS Maker, TS Editor, TS Analyzer, PES and Buffer Analyzer, and Monitor Plus |
| | DU | Adds second MIC card and HDD |
| | ASPT | ASI Interface card with time stamping |
| | GPPC | GPSI Interface card |
| | DB | Carousel Analyzer |
| | CG | Carousel Generator |
| | DBCG | Bundle software including Carousel Analyzer and Carousel Generator |
| | ES | Elementary Stream Analyzer |
| | IX | Satellite Mux – Japan |
| | BC | Cable Mux – Japan |
| | RM | Rack Mount Tray |
| | R3 | Three-year repair service |
| | A0 | North American power |
| | A1 | Universal Euro power |
| | A2 | United Kingdom power |
| | A3 | Australia power |
| | A4 | 240V North American power |
| | A5 | Switzerland power |
| | A6 | Japan power |
| | A10 | China power |
| | A99 | No power cord or AC adapter |

Table 1-3 shows the options available for the AD951A unit.

**Table 1-3: AD951A Options**

| Item | Option | Description |
|---|---|---|
| AD951A | | Mainframe including one MPEG Interface Card (MIC) with Record and Play software, MUX Software Make Seamless Wizard, TS Cutter, TS Maker, TS Editor |
| | DU | Adds second MIC card and HDD |
| | ASPT | ASI Interface card with time stamping |
| | GPPC | GPSI Interface card |
| | TSAL | Transport Stream Analyzer with limited file size |
| | TSA | Transport Stream Analyzer |
| | TSAP | Transport Stream Analyzer plus PES and Buffer Analyzer |
| | PB | PES and Buffer Analyzer |
| | MPLUS | Monitor Plus |
| | DB | Carousel Analyzer |
| | CG | Carousel Generator |
| | DBCG | Bundle software including Carousel Analyzer and Carousel Generator |
| | ES | Elementary Stream Analyzer |
| | IX | Satellite Mux – Japan |
| | BC | Cable Mux – Japan |
| | RM | Rack Mount Tray |
| | R3 | Three-year repair service |
| | A0 | North American power |
| | A1 | Universal Euro power |
| | A2 | United Kingdom power |
| | A3 | Australia power |
| | A4 | 240V North American power |
| | A5 | Switzerland power |
| | A6 | Japan power |
| | A10 | China power |
| | A99 | No power cord or AC adapter |

Table 1-4 shows the upgrade kits that are currently available.

**Table 1-4: AD951A & AD953A Field Upgrade Options**

| Item | Option | Description |
|---|---|---|
| ADSAUP | TSAL | Transport Stream Analyzer with limited file size |
| | TSA | Transport Stream Analyzer |
| | TSAP | Transport Stream Analyzer plus PES and Buffer Analyzer |
| | MPLUS | Monitor Plus |
| | DB | Carousel Analyzer |
| | CG | Carousel Generator |
| | DBCG | Carousel Analyzer and Carousel Generator |
| | ES | ES Analyzer |
| | IX | Satellite Mux – Japan |
| | BC | Cable Mux – Japan |
| | PB | PES Analyzer and Buffer Analyzer |
| | XS | XSI Analyzer. SKY or NDS approved customers only. |
| | VI | VIACCESS Analyzer. VIACCESS approved customers only. |
| | OP | OPEN TV Analyzer. OPEN TV approved customers only. |

## Software Protection

The MPEG Test System software applications require that a dongle be fitted so that they can be accessed. A dongle is a small hardware device that is connected directly to the parallel port. Any printer compatible with the installed operating system can be connected to the unit through the dongle.

Each dongle is individually programmed for a user and enables the purchased set of options. The dongle is installed at the factory.

# MPEG Test System Installation

This section describes how to install the AD951A & AD953A unit. The analysis functions can be used with no installation other than providing power and making a transport stream available on the hard disk of the unit. The monitoring and real-time analysis functions similarly require power but also require connection to a Transport Stream.

AD951A & AD953A units are configured with the software and hardware options purchased. Options can be added using Upgrade Kits available from Tektronix.

## Unpacking the AD951A & AD953A

The following table lists the standard accessories that are shipped with the AD951A & AD953A.

**Table 1-5: Standard Accessories for the AD951A & AD953A**

| Quantity | Description | Part number |
|---|---|---|
| 1 ea | Certificate of Authenticity, Windows NT 4.0 | NA |
| 1 ea | AD951A & AD953A MPEG Test System Recovery CD-ROM | 063-3744-00 |
| 1 ea | AD951A & AD953A MPEG Test System Getting Started Manual | 071-1422-00 |
| 1 ea | AD951A & AD953A MPEG Test System User Manual | 071-1423-00 |
| 1 ea | AD951A & AD953A MPEG Test System Technical Reference | 071-1425-00 |
| 1 ea | 105-key Keyboard with Integrated Tracking Device | 119-6989-00 |
| 1 ea | Protective front panel cover | 200-4408-01 |

## Placing the Instrument

The AD951A & AD953A units can be operated from a bench or installed in a rack using the Rack Tray (Option RM) that can also be purchased as an accessory. The Rack Tray is supplied with installation instructions. Maintain rack air temperature at all of the product's air intake vents within specifications (see the *AD951A & AD953A MPEG Test System Technical Reference Manual*, 071-1425-XX).

***CAUTION**. Do not operate the AD951A & AD953A in the vertical position. Using it in the vertical position does not allow sufficient clearance for cables at the rear of the unit.*

### Test System Interconnections

Use the following procedure to make electrical, signal and network connections:

***CAUTION**. Do not supply power to the instrument until after all other connections have been made.*

1. After the unit has been installed in a rack or mounted on a bench, make the transport stream, network and peripheral device connections necessary for the working environment. See the following figure for the locations of these connectors. Note that this is only one possible configuration; the configuration on your instrument will depend on the installed options.

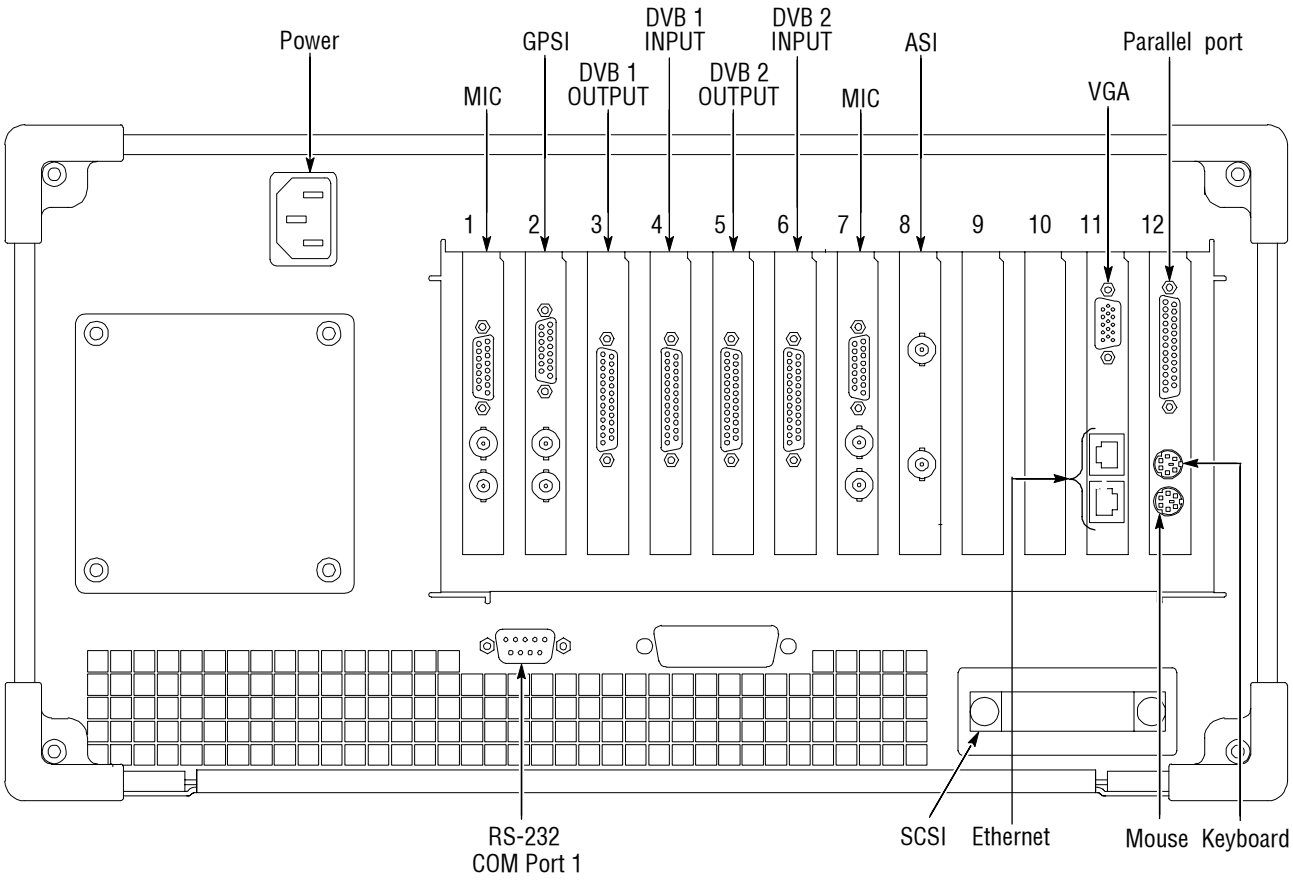



**Figure 1-2: AD951A & AD953A rear-panel connectors**

***CAUTION***. *To prevent instrument damage from overheating, maintain at least two inches (5.1 cm) of clearance at the rear and sides of the instrument cabinet when locating the instrument on a bench.*

The following table describes the transport stream, network and peripheral device connectors. See the *AD951A & AD953A MPEG Test System Technical Reference* for more detailed information about each connector and signal input and output formats.

**Table 1-6: Rear-panel Connectors**

| Position | Board | Connector function | Description |
|---|---|---|---|
| 1 and/or 7 | MIC | Input/Output | 15-pin, D-type connector providing clock and trigger input and outputs. |
| | | Precision Clock | 75 ohm BNC connector for clock input. |
| | | Precision Clock | 75 ohm BNC connector for clock output. |
| 2 and/or 8 | Interface (GPSI) | RS422/RS485 /ECL/DHEI | 26-pin, D-type for high-speed serial interface variants. |
| | | SMPTE/SSI | 75 ohm BNC connector for SMPTE/SSI input. |
| | | SMPTE/SSI | 75 ohm BNC connector for SMPTE/SSI output. |
| 3 & 5 | DVB | DVB output | 25-way, D-type parallel interface for DVB output |
| 4 & 6 | DVB | DVB input | 25-way, D-type parallel interface for DVB input |
| 2 and/or 8 | Interface (ASI+ TS) | ASI | 75 ohm BNC connector for ASI input. |
| | | ASI | 75 ohm BNC connector for ASI output. |
| 11 | I/O | Monitor | 15-pin, D-type for SVGA monitor. |
| | | Ethernet | 10 Base-T/100 Base-T, RJ45 connector for Ethernet communications. |
| | | Ethernet | Gigabit connector for Ethernet communications. |
| 12 | SBC | Parallel | 44-pin, D-type for parallel communication. The security device (dongle) is located here. |
| | | Keyboard | Six pin mini-DIN connectors for PS2 compatible keyboard (duplicated on side panel). |

**Table 1-6: Rear-panel Connectors**

| | | | |
|---|---|---|---|
| | | Mouse | Six pin mini-DIN connectors for PS2 compatible keyboard (duplicated on side panel). |
| Rear panel | | RS232 | 9-pin connector for COM (serial) connections. |
| | | SCSI Terminator | Terminates the SCSI bus. |
| | | Power | Connect AC Mains power here. |
| Side Panel | | Keyboard | Six pin mini-DIN connectors for PS2 compatible keyboard (duplicated on rear panel). |
| | | Mouse | Six pin mini-DIN connectors for PS2 compatible keyboard (duplicated on rear panel). |
| | | USB | USB is not supported on the AD951A or AD953A. |
| | | Headphones | Connector for attach headphones bypassing the internal speaker. |

**2.** Plug in the keyboard to the proper rear panel connectors. Note that the keyboard has two connectors at the end of the cable, one connector for the keyboard and one connector for the track pad. Refer to Figure 1-2. Alternative connectors for mouse and keyboard are provided on the side panel of the unit. See Figure 1-3.

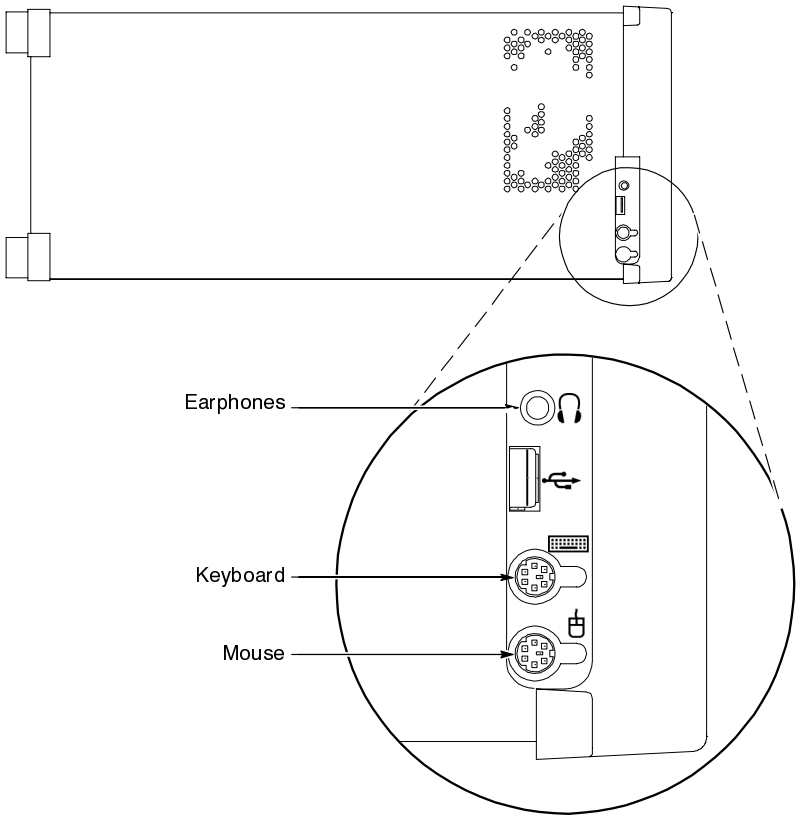



**Figure 1-3: Side-panel connectors**

3. Verify that the dongle is installed on the rear panel Parallel port and that the securing screws are tightened to 4 inch-pounds of torque (45 Newton centimeters).

***CAUTION****. To prevent instrument damage from electrostatic discharge, ensure that the dongle securing screws are properly tightened before operating the instrument.*

The AD951A & AD953A MPEG Test System applications will not run without the dongle installed. Do not remove the dongle.

To use the Parallel port with the dongle installed, attach any parallel port cables (such as a printer) directly to the dongle. The dongle does not interfere with parallel communications.

***Note:*** *If you return the test system to a Tektronix Service Center for upgrade or repair, do not remove the dongle.*

### Supplying Power

The MPEG Test System is designed to operate from a single-phase power source having one of its current carrying conductors at or near earth ground (the neutral conductor). Power sources that have both current carrying conductors live with respect to ground, such as phase-to-phase or multiphase systems, are not recommended. A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

The electrical operating requirements for the AD951A & AD953A unit are shown in Table 1-7. See the *AD951A & AD953A MPEG Test System Technical Reference* for more detailed electrical characteristics.

**Table 1-7: Electrical Operating Requirements**

| Requirement | Specification |
|---|---|
| Source Voltage | 100 to 240 VAC ± 10 % (90 to 264 VAC RMS) |
| Frequency | 50/60 Hz |
| Maximum Power Consumption | 4 Amps maximum;<br>105 watts typical<br>120 watts typical with Option DU installed |
| Inrush Surge Current | 13 A at 240 VAC, 50 Hz |

After you have installed the AD951A & AD953A and completed making the signal and peripheral connections, plug the power cord into the mains. See Figure 1-2 for the location of the power connector on the rear panel.

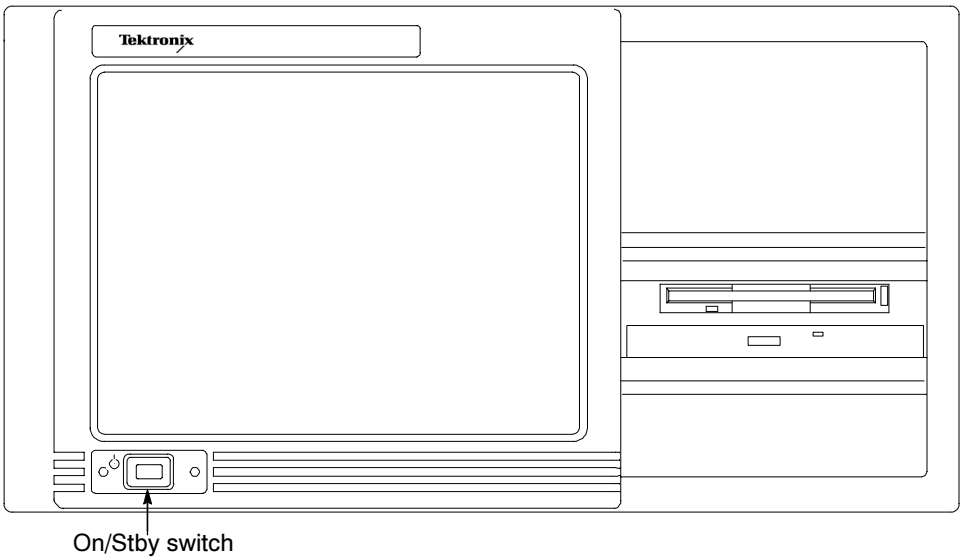
## Powering On and Off

This section contains the procedure for powering on the instrument for the first time. To power off the instrument, see *Powering Off*.

### First Time Power On

Power on the test system as follows:

1. Press the front-panel On/Standby switch to power on the unit.




2. Wait for the instrument to complete its power-on self-tests.

   The screen displays an Enter Windows Password dialog box prompting you for a logon name and password. However, if a password is entered, then each time you power on the measurement set you will be prompted for logon information. To avoid this, perform the following steps:

   a. Enter a user name (for example, AD953A) in the Enter Windows Password dialog box.

   b. Click OK, but do not enter a password.

   c. Click OK in the Set Windows Password dialog box, but do not enter a password.

### Powering Off

Always power off the instrument using the Windows NT shutdown process (select **START > Shut down…**).

## Network Installation

The AD951A & AD953A MPEG Test System can be attached to a computer network. Refer to your Network Administrator for details of the correct network configuration. For installation and operating instructions, refer to the documentation that is supplied with the network hardware and software.

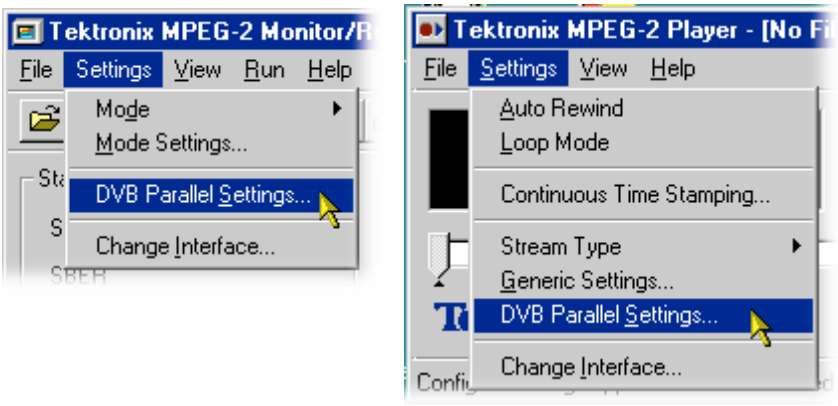
# Interface Setup

Interface settings need be specified for real-time applications; that is Player, Monitor/Recorder, Stream Monitor Plus and Carousel Generator. Note that Carousel Generator can also be used off-line.

## MPEG Interface Card Setup

The MPEG Interface Card (MIC) settings can be configured from both the Player and Monitor/Recorder programs.

Select the **DVB Parallel Settings...** option from the **Settings** menu of either Monitor/Recorder (below left) or Player (below right) to open the Parallel Settings control.




***NOTE**: If the **DVB Parallel Settings...** option is missing from the **Settings** menu, another interface is currently selected. In this case, click on the **Change Interface...** option to select the MPEG Interface Card. Refer to the Interface Selection sub-section under Player in the User Manual for more details.*

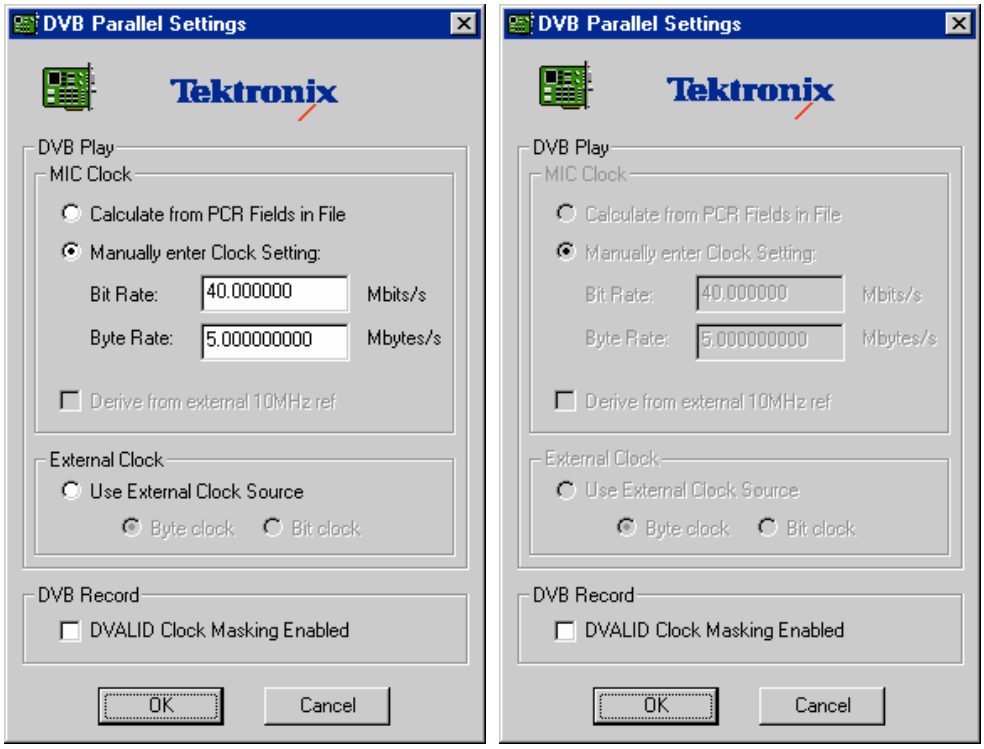
***NOTE**: For Playout, the DVB Parallel Settings dialog displayed will be dependent upon the **Stream Type** setting; **Transport**, signifying a standard DVB stream or **BS Digital**, signifying an ISDB-S stream. The dialogs are described separately in the following paragraphs.*

## DVB Parallel Settings (Transport)

The DVB Parallel Settings dialog shown below is displayed when the **Transport** Stream Type has been previously selected from the Settings menu.

The dialog provides options to configure the playout clock settings and to mask the DVALID signal when recording.

If the control is opened from Player the **DVB Play** options are enabled (below left), but disabled when opened from Monitor/Recorder (below right).




## DVB Play

**MIC Clock.** These options are only available when the control is opened from Player. They are disabled (grayed out) when opened from Monitor/Recorder.

| | |
|---|---|
| **Calculate from PCR fields in File** | Calculates the clock rate from the PCR Fields in the file to be played out. |
| **Manually enter Clock Setting** | Allows the clock rate to be typed in as either the **Bit Rate** or **Byte Clock** frequency to an accuracy of one bit per second.<br><br>Typing a value in either field causes the other to be recalculated and updated automatically. |
| **Derive from External 10 MHz Source** | Allows an external 10 MHz reference clock to be used to generate the required data rate instead of the internal clock. This would be used where greater accuracy than that available from the internal clock is required. |

### External Clock

Selecting the **Use External Clock Source** option makes the card take the clock signal from the external input instead of the internal clock.

Either **Byte clock** or **Bit clock** can be enabled in order to deliver the correct clock rate. Note that the byte rate is equivalent to the bit rate divided by eight.

### DVB Record

| | | |
|---|---|---|
| ☐ | **DVALID Clock Masking Enabled** | This function only applies to the DVB parallel input port. |

Enabling this option allows the system to cope with packet sizes that are not standard 188 or 204 byte. It does this by stopping the internal clock when the DVALID signal is low.

In a 204 byte stream with dummy RS data, the DVALID signal will usually go low on byte 189 and return to high on byte 1 of the next packet. In a 204-byte stream with valid RS, the DVALID signal is always high and the clock masking function will have no effect. Similarly, in a 188-byte stream the DVALID signal is always high.

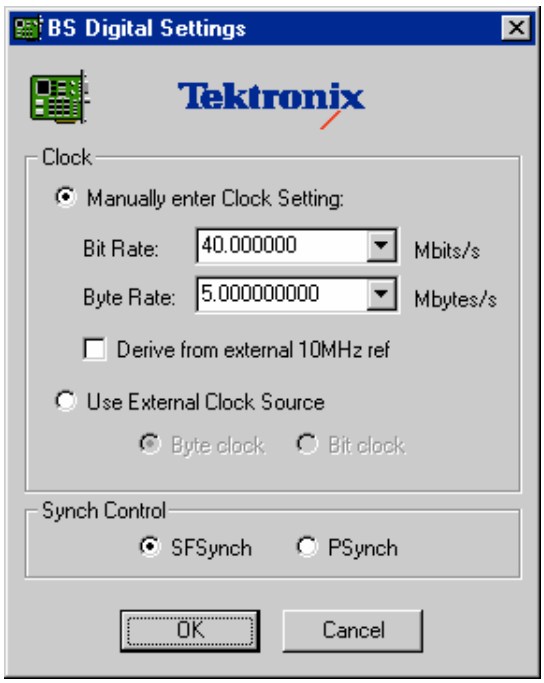
This function affects how the machine acquires sync and how it records. Before a recording can start, five consecutive sync bytes have to be identified. Without the DVALID function enabled, a check is made for the presence of a sync byte at the 188 and 204 packet boundaries and the state of the DVALID line is ignored. With the DVALID function enabled, a check is still made for five consecutive sync bytes every 188 or 204 bytes and the state of the DVALID line is checked, so that counting only occurs in the periods when the DVALID signal is high since the clock is masked when the signal is low.

Hence, in a stream where the DVALID is permanently high, acquisition will depend on the packet sizes being correct. In a stream where the DVALID is low between the end of a 188-byte packet and the next sync byte, any bytes in excess of 188 will usually be ignored so that synchronization can be achieved with packets of any size.

The DVALID Clock Masking Enabled tick box is only available when a file selected for recording is a 188-byte file. When the DVALID function is enabled, the generic record settings are for the packet type at the DVB interface and can by default only be set to 188.

### DVB Parallel Settings (BS Digital)

The BS Digital Settings dialog shown below is displayed when the **BS Digital** Stream Type has been previously selected from the Settings menu.




The DVB Parallel Settings control provides options to configure the playout clock settings.

**Clock.** Allows either the on-board clock source or an external clock source to be selected.

**Manually enter Clock Settings** — The default (and recommended) **Bit Rate** to be used for BS Digital streams is 56.610000 Mbit/s. Other values can be entered.

The **Byte Rate** is 'Bit Rate / 8' MBps (Mbytes/s) (i.e. Default is 7.076250000 MBps).

If a value is entered in one field, the corresponding value will be automatically calculated and entered in the other field.

**Use External Clock Source** — Selecting this option makes the card take the clock signal from the external input instead of the internal clock.

Either **Byte clock** or **Bit clock** can be enabled in order

to deliver the correct clock rate. Note that the byte rate is equivalent to the bit rate divided by eight.

**Synch Control** Packet synchronization can be controlled using either the Superframe synch pulse (**SFSynch**) at the start of each superframe or the packet synch pulse (**Psynch**) at the start of each packet.

## Asynchronous Serial Interface Setup

The Asynchronous Serial Interface (ASI+ TS) adapter allows connection to equipment with an interface compliant with the DVB Asynchronous Serial Interface as defined in DVB document A010 (Interfaces for CATV/SMATV Headends and Similar professional equipment). The card also allows for connection to equipment with the Divicom M2S interface and provides burst mode packet transmission. The time-stamping function time stamps the incoming ASI data and allows arrival time dependent PCR measurements to be made.

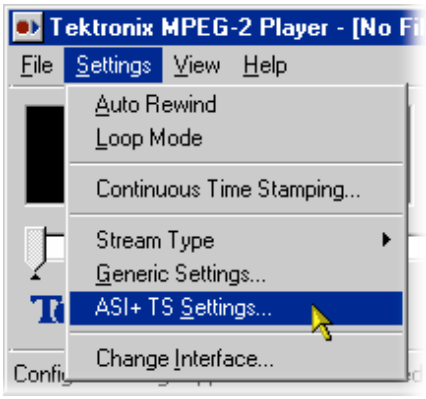
ASI uses a fixed-rate data stream operating at 270 Mbps. The ASI adapter allows either playout, monitoring or recording of transport streams. Simultaneous playout and recording are not possible. When recording or monitoring, the incoming data is looped through to the ASI output.

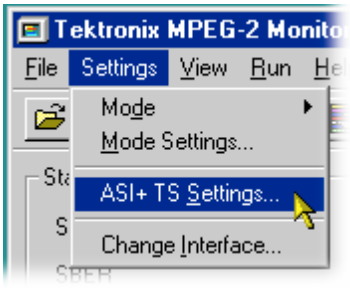
***NOTE**. Loop-through from ASI to DVB parallel will not work since the ASI internal clock runs at a different rate to the transport stream clock. For additional support, contact your local dealer.*

## Operation

Once the ASI adapter is fitted, the MPEG Test System will automatically detect the card on power-on. The Asynchronous Serial Interface settings can then be configured from both the Player and Monitor/Recorder programs.

Select the **ASI Settings...** option from the **Settings** menu of either Player (right) or Monitor/Recorder (below) to open the Parallel Settings control.

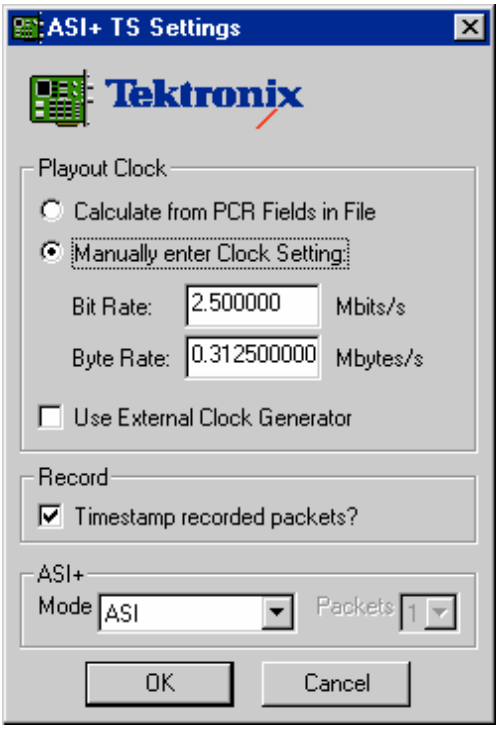



***NOTE**. If the **ASI Settings...** option is missing from the **Settings** menu, either another interface is currently selected or the ASI adaptor has not been detected.*

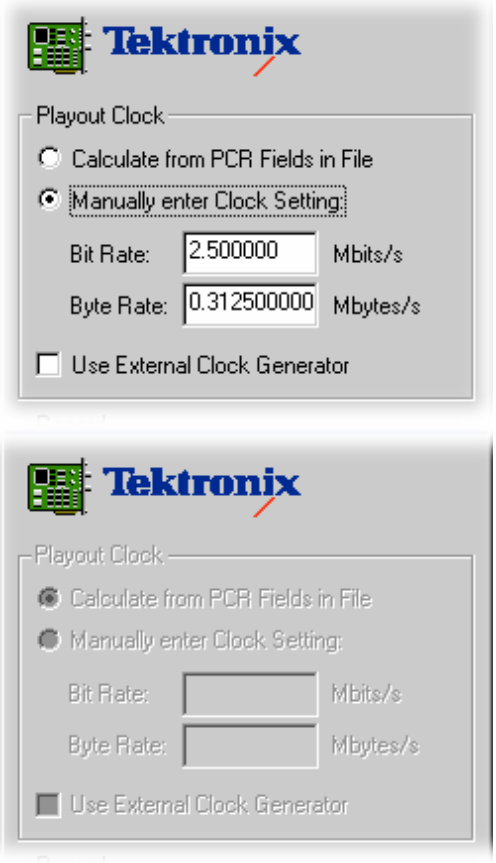
*If another interface is currently selected, click on the **Change Interface...** option to switch to the ASI+ TS. Refer to the Interface Selection sub-section under Player for more details.*

The **ASI+ TS Settings** dialog is displayed:



The **ASI+ TS Settings** controls provide options to configure the clock settings and Divicom M2S compatible and Burst modes. An additional option for enabling time-stamping of recorded packets is also available.

When the control is opened from Player the **Playout Clock** options are enabled (below top), but disabled when opened from Monitor/Recorder (below bottom).




### Playout Clock

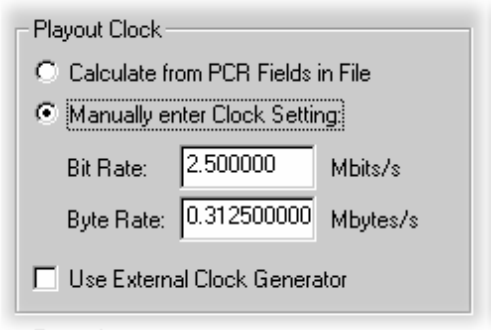
When enabled, the options for setting the Playout Clock are:

**Calculate from PCR fields in File**

Calculates the playout clock rate from the PCR Fields in the file to be played out.

**Manually enter Clock Setting**

Allows the clock rate to be typed in as either the Bit Rate or Byte Rate frequency:



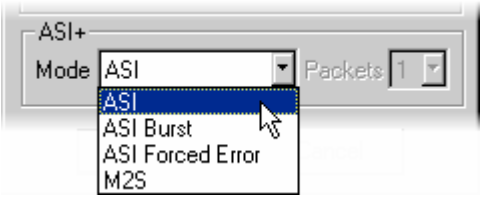

Typing a value in either field causes the other to be recalculated and updated automatically.

**Use External Clock Generator**

Selecting this option makes the card take the playout clock signal from the external input instead of the internal clock.

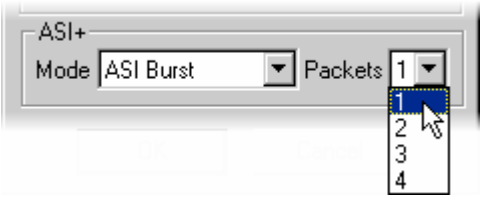
### Mode Settings

Four Mode setting options are available:




**ASI —**The operating mode of the standard ASI.

**ASI Burst –** Data is transmitted in bursts of 1, 2 3 or 4 transport stream packets. The number of packets in each burst is specified in the **Packets** field:




**ASI Forced Error –** Causes an error byte to be transmitted in position 15 of each packet.

**M2S –** Selects Divicom M2S compatible mode.

Allowable mode settings are as follows:

| Playout | Monitor/Record |
|---|---|
| ASI | ASI or M2S |
| ASI Burst | ASI or M2S |
| ASI Forced Error | ASI or M2S |
| M2S | M2S |

## Time-Stamping

With the **Timestamp recorded packets** function enabled, the ASI+ TS adapter time stamps the incoming ASI data, which allows arrival time dependent PCR measurements to be made.

The timestamp comprises five bytes of data added at the end of each 204-byte packet in a transport stream. Incoming 188-byte packets are increased to 204 bytes to accommodate the time stamp data. For 204-byte packets of incoming data, the last five bytes are overwritten with the time stamp data.

## GPSI Setup

The General Purpose Serial Interface II+ (GPSI II+) is supplied as a ‘daughter board’ option to the MPEG Interface Card (MIC), as fitted to the MPEG Test System. This interface adapter card allows connection to a broad range of ATSC and DVB equipment where a high-speed serial interface is used. The range offered includes: RS422/485, ECL (AC), ECL (DC), SMPTE 310M, DHEI and DVB SSI.

| | GPSI II+ | |
|---|---|---|
| | Tx | Rx |
| RS422 | ✓ | ✓ |
| SSI | ✓ | ✓ |
| SMPTE310 | ✓ | ✓ |
| ECL(AC) | ✓ | ✓ |
| ECL(DC) | ✓ | ✓ |
| DHEI | ✓ | ✓ |

This ‘one card does all’ GPSI interface is able to internally recover or generate the clock signal on bi-phase interfaces with on-board PLL and LSI logic. The GPSI adapter has on-board high precision clock references that support ATSC 8-VSB and 16-VSB bit rates. It also provides ECL support for the Harris CD-1, General Instruments DHEI and negative ECL, and compatible equipment on the 26-pin D-type connector.

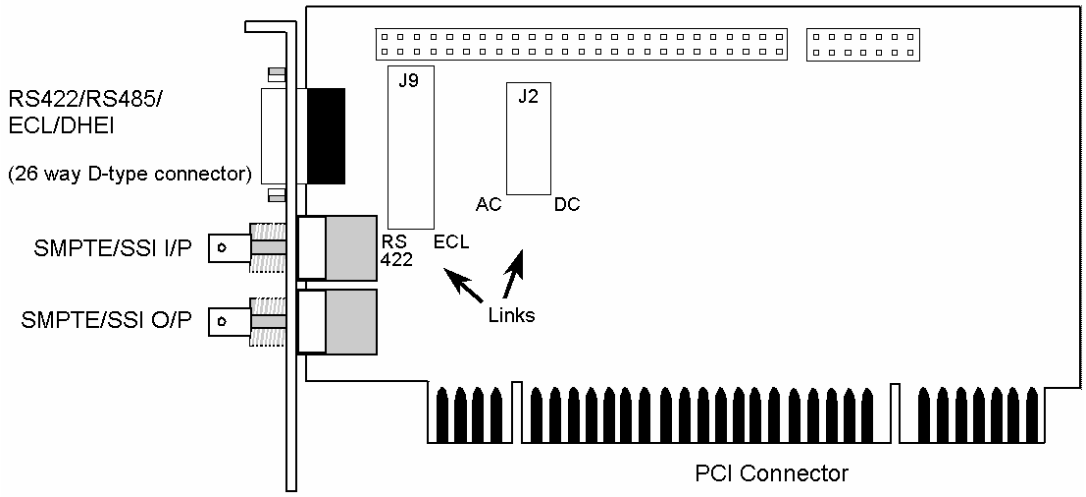
The GPSI supports 188, 204 and 208-byte data packets.

The system provides software programmable input and output selection. The same flexibility is extended to clock source selection for receive and transmit. The SSI and SMPTE 310M can recover clock and data in the range 1 MHz to 44 MHz.

Internally the GPSI adapter connects directly to the MIC card.

### GPSI Layout

A simplified plan view of the GPSI II+ adapter card is shown below.



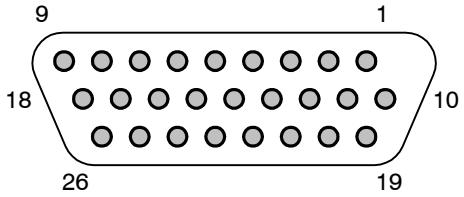

The data IN and OUT connectors are described with respect to the GPSI adapter, that is, SMPTE/SSI O/P acts as a signal source from the adapter.

The 26-pin D-type connector is shared between Harris’ ECL AC coupled interface, GI’s DHEI DC coupled interface and the RS422 interface. The interface type is selected using on-board links (J2 and J9); the procedure for changing these links is described in Appendix B. They are summarized in the following table.

| Interface Type | J2 | J9 |
|---|---|---|
| RS422 | DC | RS422 |
| ECL AC | AC | ECL |
| ECL DC | DC | ECL |
| DHEI | DC | ECL |

### RS422/RS485/LVDS/ECL/DHEI Connector

The pin numbering for the 26-pin RS422/RS485/LVDS/ECL/DHEI Connector is:




The pin allocation is shown in the following table.

**Table 1-8: RS422/RS485LVDS/ECL/DHEI Connector**

| Pin Number | Function |
|---|---|
| 1 | Chassis GND |
| 2 | Enable Sense A out return |
| 3 | Packet Sync A out -ve |
| 4 | Packet Data A out -ve |
| 5 | Packet Clock A out +ve |
| 6 | Packet Clock A out -ve |
| 7 | Reference Clock A out +ve |
| 8 | Reference Clock A out -ve |
| 9 | GND |
| 10 | |
| 11 | Enable Sense A loop out |
| 12 | Packet Sync A out +ve |

**Table 1-8: RS422/RS485LVDS/ECL/DHEI Connector**

| | |
|---|---|
| 13 | Packet Data A out +ve |
| 14 | |
| 15 | Packet Data B in -ve |
| 16 | Packet Sync B in -ve |
| 17 | Enable Sense B in return |
| 18 | |
| 19 | Reference Clock B in +ve |
| 20 | Reference Clock B in -ve |
| 21 | Packet Clock B in +ve |
| 22 | Packet Clock B in -ve |
| 23 | Packet Data B in +ve |
| 24 | Packet Sync B in +ve |
| 25 | Enable Sense B loop in |
| 26 | |

The following tables show which pins are used by each interface type and give an interface specific function description.

**Table 1-9: RS422/RS485 Connector**

| Pin Number | Function |
|---|---|
| 1 | Chassis GND |
| 3 | Packet Sync A out -ve |
| 4 | RS422 Data out -ve |
| 5 | RS422 Clock out +ve |
| 6 | RS422 Clock out -ve |
| 7 | Reference Clock A out +ve |
| 8 | Reference Clock A out -ve |
| 9 | GND |
| 12 | Packet Sync A out +ve |
| 13 | RS422 Data out +ve |

**Table 1-9: RS422/RS485 Connector**

| | |
|---|---|
| 15 | RS422 Data in -ve |
| 21 | RS422 Clock in +ve |
| 22 | RS422 Clock in -ve |
| 23 | RS422 Data in +ve |

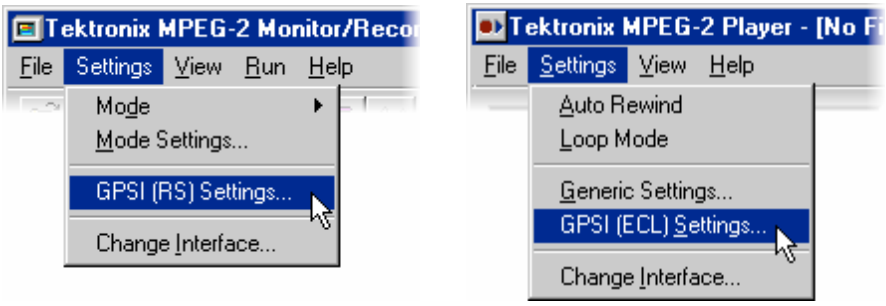
**Table 1-10: ECL Connector (AC and DC)**

| Pin Number | Function |
|---|---|
| 1 | Chassis GND |
| 3 | Packet Sync A out -ve |
| 4 | ECL Data out -ve |
| 5 | ECL Clock out +ve |
| 6 | ECL Clock out -ve |
| 7 | Reference Clock A out +ve |
| 8 | Reference Clock A out -ve |
| 9 | GND |
| 12 | Packet Sync A out +ve |
| 13 | ECL Data out +ve |
| 15 | ECL Data in -ve |
| 21 | ECL Clock in +ve |
| 22 | ECL Clock in -ve |
| 23 | ECL Data in +ve |

## Operation

Once the GPSI Interface is installed, the MPEG Test System automatically detects the card on power-on. The interface settings can then be configured from both the Player and Monitor/Recorder programs.

Select the **GPSI (*nnn*) Settings...** option (where *nnn* is **ECL**, **RS** or **SSI**) from the **Settings** menu of either Monitor/Recorder (below left) or Player (below right) to open the GPSI Card Settings control.



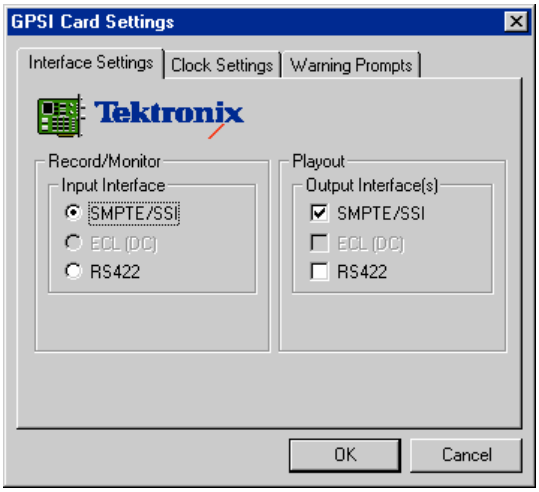

***NOTE.*** *The setting dialog displayed will depend on the on-board link settings.*

*If the* ***GPSI ( ) Settings...*** *option is missing from the* ***Settings*** *menu either another interface is currently selected or the GPSI adapter has not been detected. If another interface is selected, click on the* ***Change Interface...*** *option to switch to the GPSI Interface. Refer to the Interface Selection sub-section under Player for more details.*

The GPSI Card Settings control has three tabs: **Interface Settings**, **Clock Settings** and **Warning Prompts**.

### Interface Settings

The Interface Settings tab provides options for selecting an input interface and one or more output interfaces.


**Record/Monitor**

**SMPTE/SSI**

Selects input from the Bi-Phase/SSI interface, via BNC connector

**ECL**

Selects the ECL interface as the input source

**RS422**

Selects the RS422/RS458 interface as the input source

Select the ECL interface if the DHEI format is required. DHEI is automatically detected by this interface.

### Playout

**SMPTE/SSI**

Selects playout using the Bi-Phase/SSI interface, via BNC connector

**ECL**

Selects the ECL interface for playout

**RS422**

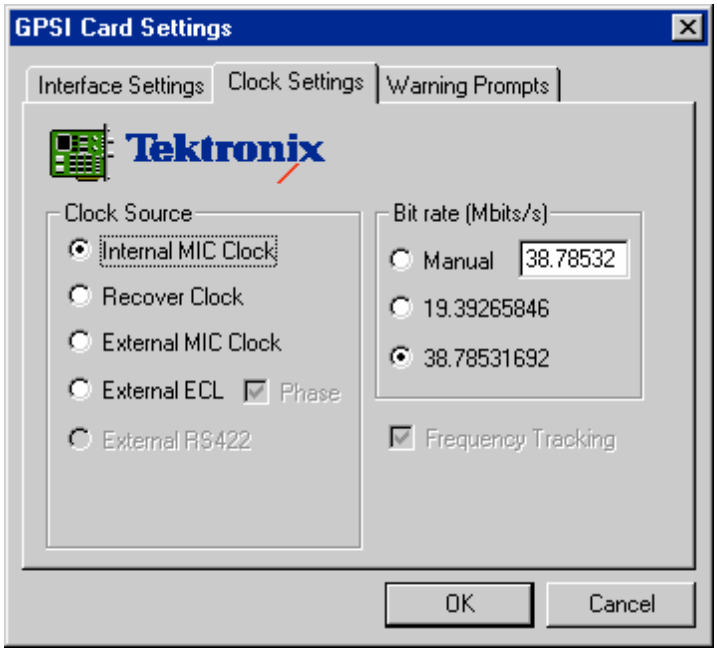
Selects the RS422/RS485 interface for playout

**DHEI**

Selects the ECL (DC) interface with DHEI format for playout

### Clock Settings

The Clock Settings tab provides options for selecting the clock source and data rates.



### Clock Source

**Internal MIC Clock**

Take the clock signal from the parent MPEG Interface Card.

The Bit rate options are available when this option is selected.

**Recover Clock**

Acquires clock signal from the Bi-phase data.

The Bit rate options are available when this option is selected unless **Frequency Tracking** is selected.

This option is only available when the **SMPTE/SSI** is selected as the input interface on the **Interface Settings** tab. It is grayed out when any other input interface is selected.

**External MIC Clock**

Select the external clock as the clock source for RS422, DHEI or ECL interface clock source.

**External ECL**

Select the external ECL interface as the clock source.

**Phase**

Select this option to correct the phase if the external Bi-phase clock is inverted.

**External RS422**

Select the external RS422/485 interface as the clock source.

This option is only available when the **RS422** is selected as the input interface on the **Interface Settings** tab. It is grayed out when any other input interface is selected.

### Bit Rate

These options are only available when the Internal **MIC Clock** or **Recover Clock** option is selected in the **Clock Source** panel.

**Manual**

When **Manual** is selected, the bit rate is specified as Mbit/s in the associated field.

**19.39265846**

Select a bit rate of 19.39265846 Mbit/s

**38.78531692**

Select a bit rate of 38.78531692 Mbit/s.

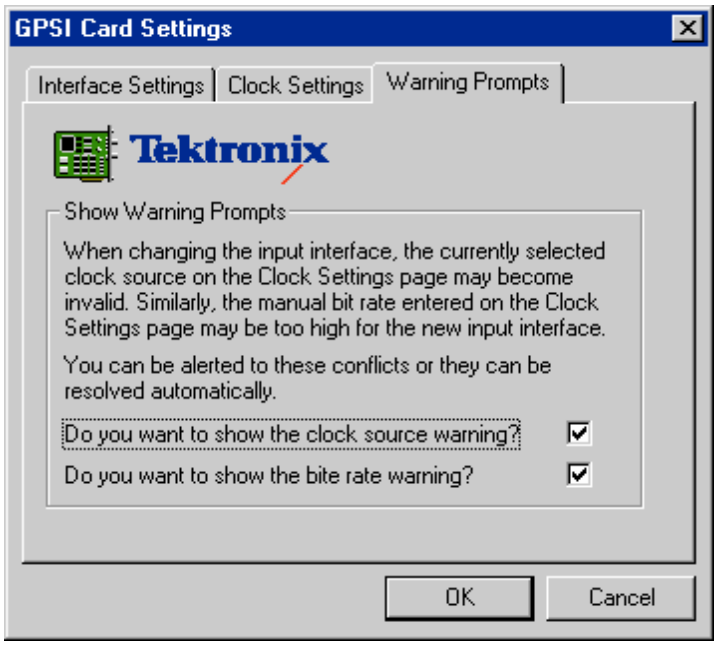
### Frequency Tracking

**Frequency Tracking**

This option only applies to the SMPTE/SSI interface receiver. When selected, the user can input data at any rate between 38.5 Mbit/s and 44 Mbit/s; the receiver will automatically track to the rate and recover the data and clock.

## Warning Prompts

The Warning Prompts tab allows clock source and bit-rate warning messages to be disabled, as described in the **Show Warning Prompts** panel below.



☑ **Do you want to show the clock source warning?**

Displays a warning dialog when selecting a new **Input Interface** from the **Interface Settings** tab if the **Clock Source** on the **Clock Settings** tab is not valid for that interface.

☑ **Do you want to show the bit rate warning?**

Displays a warning dialog when selecting a new **Input Interface** from the **Interface Settings** tab if a manual **Bit rate** is specified on the **Clock Settings** tab which is too fast for the new interface.

# Operating Basics

# Operating Basics

## Software Applications

This section provides a brief overview of the software applications that comprise the MPEG Test System. Note that not all options may be enabled. Detailed descriptions of all applications can be found in the *AD951A & AD953A MPEG Test System User Manual* (071-1423-xx).

**Table 2-1 Installed Applications**

| Application \ Product | 951A | 953A | Stand alone |
|---|---|---|---|
| Transport Stream (TS) Analyzer<br>Transport stream analysis with user-selectable MPEG-2, DVB and ATSC conformance tests. Shows transport structure, header contents, hexadecimal packet contents, PCR timing /transport rate graphs and an error message log. | (Option) | | (Option) |
| TS Analyzer Lite<br>As for the TS Analyzer except that the file size of transport streams to be analyzed is limited to 192 MB. | (Option) | - | - |
| Packetized Elementary Stream (PES) Analyzer<br>PES analysis with selectable test options. Shows PES program structure, header contents, packet contents, PTS/DTS timing graphs and analysis reports. | (Option) | | (Option) |
| Transport Stream – System Target Decoder (T-STD) Buffer Analyzer<br>Analyzes program streams modeling their behavior in, and their conformance to, the MPEG-2 T-STD Buffer Model. | (Option) | | (Option) |
| Tracer<br>Views the message log produced by T-STD Buffer Analyzer. | (Option) | | (Option) |
| Player<br>Records and Plays out MPEG-2 streams. | | | - |
| TS Monitor/Recorder<br>Monitors and/or Records MPEG-2 transport streams – gives viewing of the transport stream multiplex, triggered and filtered recordings, logging of events, generation of an external alarm signal linked to transport stream events. | | | - |
| TS Editor<br>Viewing and Editing of transport stream packets, via a hexadecimal view of the packet contents and semantic interpretation of the header. Provides facilities to: remap PIDs, recalculate PCR values and introduce PCR inaccuracies. | | | - |

**Table 2-1 Installed Applications**

| Application \ Product | 951A | 953A | Stand alone |
|---|---|---|---|
| Multiplexer<br>Multiplexes table information and packetized elementary streams together to synthesize new transport streams. A fine level of control is provided to allow non-conformances and test cases to be specified for new transport streams. |  |  | - |
| Make Seamless Wizard<br>Guides the user through the process of creating an MPEG-2 file for use by Stream Player in continuously looped operation. |  |  | |
| Stream Monitor Plus<br>Monitors one or more transport streams. Updates graphs, status displays and event logs in real time.<br>Can make sequences of recordings, unattended, whenever user specified events occur. |  <br>(Option) |  | - |
| Elementary Stream Analyzer<br>Elementary Stream analysis at video picture and audio level. This includes vector graphs and macroblock picture quality. |  <br>(Option) |  <br>(Option) |  <br>(Option) |
| Broadcast Satellite Digital Multiplexer<br>The BSDM allows multiple transport streams, together with TMCC information, to be multiplexed into a BS Digital stream. A single transport stream may also be exported from an existing BS Digital stream. |  <br>(Option) |  <br>(Option) |  <br>(Option) |
| Broadcast Cable Digital Multiplexer<br>The BCDM allows multiple transport streams, together with TSMF information, to be multiplexed to produce ISDB-C streams (TSMF streams). It can also demultiplex existing TSMF streams and allow the TSMF to be edited. |  <br>(Option) |  <br>(Option) |  <br>(Option) |
| Carousel Analyzer<br>Data analysis showing structure, bitrate, repetition rate, syntax and semantics of data items. |  <br>(Option) |  <br>(Option) |  <br>(Option) |
| Carousel Generator<br>Provides in-depth off-line generation of MPEG-2, DVB transport streams containing a range of data broadcast protocols. |  <br>(Option) |  <br>(Option) |  <br>(Option) |
| TS Maker<br>Creates and initializes files for recording. |  |  | - |
| TS Cutter<br>Extracts sections of MPEG-2 files to new files. |  |  | - |
| Script Pad<br>Enables users to create and modify System Information (SI) scripts. |  |  | - |
| Custom SI Scripting<br>A background document which describes the scripting arrangements of the AD951A & AD953A. |  |  | - |
| Proprietary Analysis Software<br>Analysis of proprietary DTV standards is carried out in the MPEG Test System by the addition of plug-in modules. |  <br>(Option) |  <br>(Option) | - |
| | Supplied as required on separate disks | | |

# Appendices

# Appendix A: Cleaning and Maintenance

This appendix describes general care and service procedures for the MPEG Test System.

- *Preventive Maintenance* provides cleaning instructions.
- *In Case There is a Problem* provides some hints for troubleshooting startup errors.
- *Repackaging for Shipment* gives instructions for packing and shipping the instrument.

## General Care

Protect the instrument from adverse weather conditions. The instrument is not waterproof.

***CAUTION****. To avoid damage to the instrument, do not expose it to sprays, liquids, or solvents.*

*Do not use chemical cleaning agents; they may damage the instrument. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.*

## Preventive Maintenance

Check the electrical performance and that the instrument accuracy is certified (calibrated) once a year.

Preventive maintenance mainly consists of periodic cleaning. Periodic cleaning reduces instrument breakdown and increases reliability. You should clean the instrument as needed, based on the operating environment. Dirty conditions may require more frequent cleaning than computer room conditions.

### Cleaning the Exterior

Clean the exterior surfaces of the instrument with a dry, lint-free cloth or a soft-bristle brush. If dirt remains, use a cloth or swab dampened with a 75% isopropyl alcohol solution. A swab is useful for cleaning in narrow spaces around the

controls and connectors. Do not use abrasive compounds on any part of the instrument.

***CAUTION**. Avoid getting moisture inside the instrument during external cleaning and use only enough solution to dampen the cloth or swab. Use a 75% isopropyl alcohol solution as a cleanser and rinse with deionized water.*

*Do not wash the front-panel On/Standby switch. Cover the switch while cleaning the instrument.*

### Cleaning the Compact Disc Drive

The compact disc drive requires routine maintenance to operate at maximum efficiency. The compact discs can be damaged if dirt and dust accumulate on the surface of the discs. Store any discs in their protective containers to keep them from being exposed to dust or dirt.

***CAUTION**. Electrostatic discharge (ESD) can damage components in the CD-ROM drive. Do not touch lens or exposed metallic parts on the platter, with the exception of the center hub.*

Clean the face of the CD-ROM drive monthly with a cloth dampened with deionized water.

***CAUTION**. Do not allow moisture to enter the disc drive. When power is applied, the internal components might be damaged.*

### Cleaning the Keyboard

Clean the exterior surfaces of the keyboard and integrated tracking device with a dry, lint-free cloth or a soft-bristle brush. A swab is useful for cleaning in narrow spaces around the controls and connectors. Do not use abrasive compounds on any part of the instrument.

***CAUTION**. Avoid getting moisture inside the keyboard and integrated tracking device during external cleaning and use only enough solution to dampen the cloth or swab. Use a 75% isopropyl alcohol solution as a cleanser and rinse with deionized water.*

# In Case of Problems

This section addresses problems that you may encounter while using the test system. This section does not identify specific problems related to performance verification or adjustments. The diagnostic procedures for the AD951A & AD953A provided in this section can help you isolate problems. For a performance verification procedure, refer to the *AD951A & AD953A MPEG Test System Technical Reference*, supplied as a PDF file on the *AD951A & AD953A MPEG Test System Recovery* CD-ROM.

Power-on diagnostics run when you first power on the instrument to start the test system application. These diagnostics check the operating system and hardware for correct operation. If error messages occur during the power-on diagnostics, there may be a system error that prevents the AD951A & AD953A software from starting.

Table A-1 lists some of the symptoms of hardware problems (related to the operating system and peripheral devices) and possible solutions.

**Table A-1: Troubleshooting power-on failures**

| Symptom | Possible causes and recommended actions |
|---|---|
| Instrument does not power on | Verify that the power cord is connected to the instrument and to the power source.<br><br>Check that the instrument receives power when you press the On/Standby switch; check that fans start.<br><br>Check that power is available at the power source.<br><br>Contact your local Tektronix service center. |
| Instrument powers on but does not complete the power-on sequence | Check for and remove any disk in the floppy disk drive; make sure instrument boots from the hard disk drive. |
| Power-on diagnostics fail | Contact your local Tektronix service center. |
| Instrument does not recognize accessories such as monitor, printer, or keyboard | Check that accessories are properly connected or installed.<br><br>Contact your local Tektronix service center. |
| Instrument will not power off with On/Standby switch | Try powering off the instrument using the Windows NT shutdown procedure. If the instrument still does not power off, use the task manager to close down tasks. Finally, try the hard shutdown procedure; push and hold the On/Standby switch for five seconds to power off the instrument. |

### Software Problems

Your MPEG Test System comes with software already installed. For any suspected software problems, try to isolate the problem to the test system application software or to other installed software.

Many software problems are due to corrupted or missing software files. In most cases, the easiest way to solve software problems is to reinstall the software. See the *Software Repair and Recovery* appendix.

If you suspect networking problems, see *Appendix D: Network Troubleshooting*.

### Test System Hardware Diagnostics

Hardware problems can have several causes. Review the installation instructions in this manual to verify that you have properly installed the instrument. If you are certain that you have installed the instrument correctly, run the Hardware Diagnostics application to identify problems with the test system components. There are no user serviceable parts in the AD951A & AD953A, so you should contact your local Tektronix Service representative if you have a hardware problem.

## Repackaging for Shipment

Your instrument was originally shipped by Tektronix in a carton with packaging components designed to protect the instrument from damage during shipment. If you need to ship the instrument to another location, it is strongly recommended that you use the original shipping carton and packaging components to provide adequate protection during shipment.

***CAUTION**. To prevent the loss of your instrument's warranties, Tektronix strongly recommends that you use your original shipping carton (one that is in good condition) when you ship the instrument to another location or when you return the instrument to a Tektronix service center for repair.*

*Tektronix cannot honor the instrument's warranties if the instrument arrives at the service center damaged and it was not shipped in its original carton or in a replacement carton (and its supporting packaging material) purchased from Tektronix. If you lose your original packaging material, contact your Tektronix representative to obtain replacement packaging.*

### Packaging Inspection

When preparing to ship your instrument to another location, it is important to inspect your existing packaging materials for condition and missing components.

If the condition of your existing packaging materials is poor, or if you are missing some of the components, it is strongly recommended that you order a new packaging kit.

### Replacement Packaging Materials

New packaging materials are available from Tektronix. To obtain these items, contact your Tektronix representative.

The replacement packaging kit, Tektronix part number 065-0714-XX, includes all the packaging material required to properly package the instrument for shipment.

### Repackaging Procedure

When the instrument is shipped, it is important to package it well to protect the instrument. It is not necessary to return the accessories received with the instrument when returning the instrument for repair.

1. If the instrument is to be shipped to a Tektronix field office for repair, attach a tag to the instrument showing the following:
   - Owner's name and address
   - Instrument serial number
   - Description of the problem(s) encountered and/or service required.
2. Place the protective front cover on the front of the instrument.
3. Place the instrument in the protective bag. The bag prevents dust, moisture, and other debris from entering the cabinet.
4. Fold the top of the bag neatly over the top of the instrument to make it as flat as possible and seal with packing tape.
5. Place the front cushion over the front of the instrument.
6. Place the rear cushion over the rear of the instrument.
7. Carefully lift the instrument with front and rear cushions attached and lower it into the shipping box.
8. Position the cardboard tray into the top of the box, pressing the tray down until it rests on the tops of the front and rear cushions.

***Note:*** *To ensure packaging integrity and product safety, the tray must be installed regardless if any accessories are being included in the package.*

9. If you are shipping the accessories, arrange the accessories in the tray.
10. Close and tape the shipping box.
11. Attach the appropriate shipping documents needed to ship the instrument to its destination.

# Appendix B: GPSI Settings

The General Purpose Serial Interface II+ (GPSI II+) is a ‘daughter board’ supplied as an option to the MPEG Interface Card (MIC). This interface adapter card allows connection to a broad range of ATSC and DVB equipment where a high-speed serial interface is used. The range offered includes: RS422/485, ECL (AC), ECL (DC), SMPTE 310M, DHEI and DVB SSI.

This ‘one card does all’ GPSI interface is able to internally recover or generate the clock signal on bi-phase interfaces with on-board PLL and LSI logic. The GPSI adapter has on-board high precision clock references that support ATSC 8-VSB and 16-VSB bit rates. It also provides ECL support for the Harris CD-1, General Instruments DHEI and negative ECL, and compatible equipment on the 26-way D-type connector.

The GPSI supports 188, 204 and 208-byte data packets.

The system provides software programmable input and output selection. The same flexibility is extended to clock source selection for receive and transmit. The SSI and SMPTE 310M can recover clock and data in the range 1 MHz to 44 MHz.

Internally the GPSI adapter connects directly to the MIC card.

## Layout

A simplified plan view of the GPSI II+ card is shown in Figure Figure B-1.

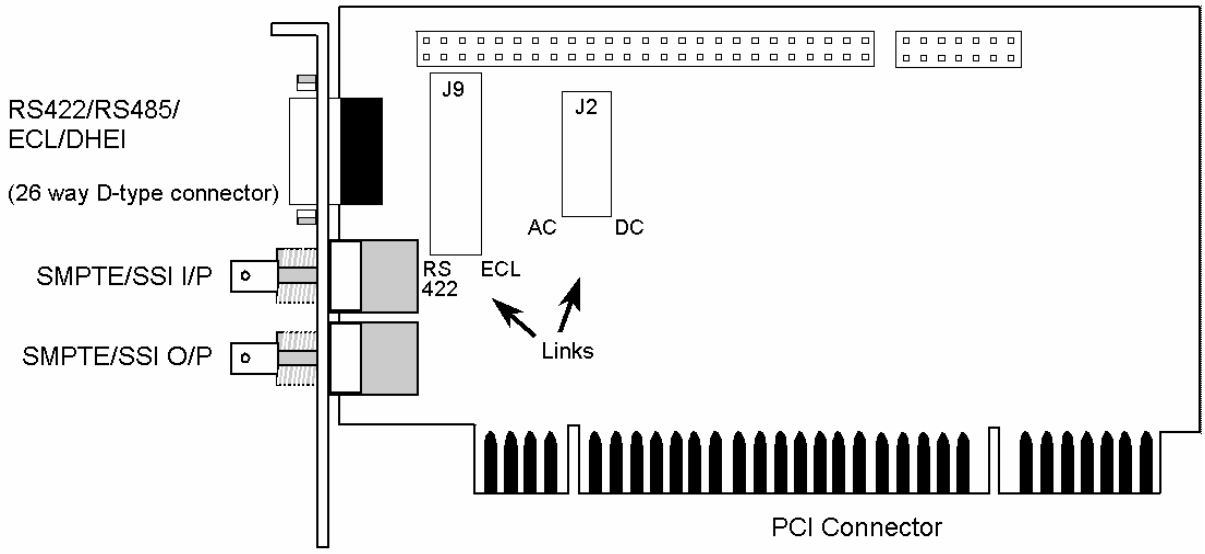



**Figure B-1: GPSI board link locations**

***NOTE**. The data IN and OUT connectors are described with respect to the GPSI adapter; that is, the SMPTE/SSI O/P acts as a signal source from the adapter.*

The 26-way D-type connector is shared between Harris' ECL AC coupled interface, GI's DHEI DC coupled interface and the RS422 interface. The interface type is selected using on-board links (J2 and J9). They are summarized in the following table:

**Table B-1 GPSI Board Link Settings**

| Interface Type | J9 | J2 |
|---|---|---|
| RS422 | RS422 | DC |
| ECL AC | ECL | AC |
| ECL DC | ECL | DC |
| DHEI | ECL | DC |

For example, Figure B-2 Shows the settings required for RS422.

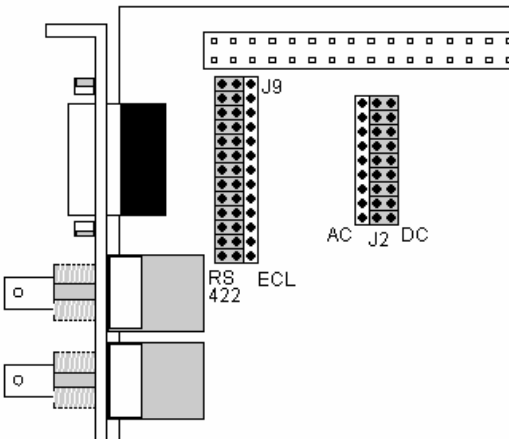
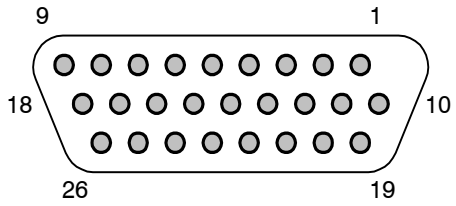



**Figure B-2: GPSI board RS422 link settings**

***NOTE**. All links in a bank must be in the same position.*

## RS422/RS485/LVDS/ECL/DHEI Connector

The pin numbering for the 26-pin RS422/RS485/LVDS/ECL/DHEI Connector is:




The pin allocation, detailed by pin number, is:

**Table B-2: RS422/RS485/LVDS/ECL/DHEI Connector Pin Allocation**

| Pin Number | Function |
|---|---|
| 1 | Chassis GND |
| 2 | Enable Sense A out return |
| 3 | Packet Sync A out -ve |
| 4 | Packet Data A out -ve |
| 5 | Packet Clock A out +ve |
| 6 | Packet Clock A out -ve |
| 7 | Reference Clock A out +ve |
| 8 | Reference Clock A out -ve |
| 9 | GND |

**Table B-2: RS422/RS485/LVDS/ECL/DHEI Connector Pin Allocation**

| | |
|---|---|
| 10 | - |
| 11 | Enable Sense A loop out |
| 12 | Packet Sync A out +ve |
| 13 | Packet Data A out +ve |
| 14 | - |
| 15 | Packet Data B in -ve |
| 16 | Packet Sync B in -ve |
| 17 | Enable Sense B in return |
| 18 | - |
| 19 | Reference Clock B in +ve |
| 20 | Reference Clock B in -ve |
| 21 | Packet Clock B in +ve |
| 22 | Packet Clock B in -ve |
| 23 | Packet Data B in +ve |
| 24 | Packet Sync B in +ve |
| 25 | Enable Sense B loop in |
| 26 | - |

The Tables B-3 and B-4 show which pins are used by each interface type and give an interface specific function description.

**Table B-3: RS422/RS485 Connector Pin Allocation**

| Pin Number | Function |
|---|---|
| 1 | Chassis GND |
| 3 | Packet Sync A out -ve |
| 4 | RS422 Data out -ve |
| 5 | RS422 Clock out +ve |
| 6 | RS422 Clock out -ve |
| 7 | Reference Clock A out +ve |
| 8 | Reference Clock A out -ve |
| 9 | GND |
| 12 | Packet Sync A out +ve |
| 13 | RS422 Data out +ve |
| 15 | RS422 Data in -ve |
| 21 | RS422 Clock in +ve |
| 22 | RS422 Clock in -ve |
| 23 | RS422 Data in +ve |

**Table B-4: ECL Connector (AC and DC) Connector Pin Allocation**

| Pin Number | Function |
|---|---|
| 1 | Chassis GND |
| 3 | Packet Sync A out -ve |
| 4 | ECL Data out -ve |
| 5 | ECL Clock out +ve |
| 6 | ECL Clock out -ve |
| 7 | Reference Clock A out +ve |
| 8 | Reference Clock A out -ve |
| 9 | GND |
| 12 | Packet Sync A out +ve |
| 13 | ECL Data out +ve |
| 15 | ECL Data in -ve |
| 21 | ECL Clock in +ve |
| 22 | ECL Clock in -ve |
| 23 | ECL Data in +ve |

## Changing Link Settings

The following procedures tell you how to remove a GPSI card from the mainframe in order to change the link settings. The GPSI card is located in the card bay of the mainframe.

***WARNING.*** *To avoid personal injury or damage to the unit, do not operate without covers. Disconnect power to the unit before removing the covers or panels. Do not operate this product with covers or panels removed.*

***CAUTION.*** *Only qualified personnel should perform this procedure. Read the* Service Safety Summary *and the* General Safety Summary *before performing this procedure.*

### Recommended Tools

- An antistatic wrist strap for safe handling of assemblies containing static sensitive devices
- A screwdriver with a T15 Torx tip to remove the cabinet cover and the module mounting screws.
- A 1/4-inch or larger flat-blade screwdriver.
- An 8-inch adjustable wrench or appropriate size open-end wrench (for cabinet removal).
- A 9/16-inch open-end wrench to remove the nuts from the BNC connectors.

### Removing the cabinet

Before you can remove the GPSI card, you must remove the cabinet. Use the following procedure to remove the cabinet:

1. Put on a static grounding wrist strap.
2. Power down the system and unplug the power cord.
3. Disconnect any cables connected to the rear panel and note their locations for reinstallation.
4. Put the protective front cover on the instrument and set the cabinet upright on the working surface with the rear panel facing up.
5. Remove the handle (see Figure B-3).

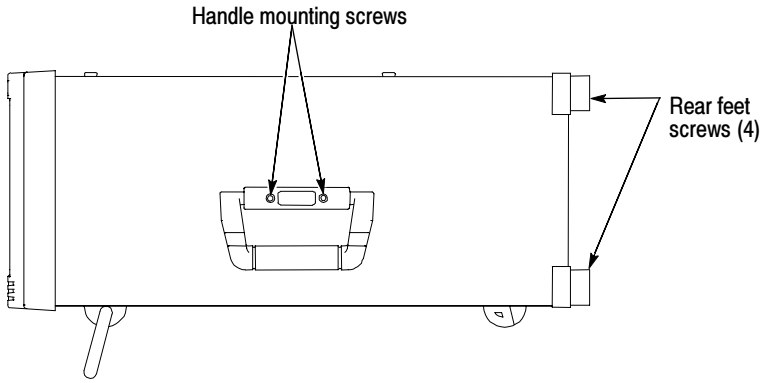



**Figure B-3: Removing the handle**

6. Remove the four feet from the rear of the instrument (see Figure B-3).

7. Use either an adjustable wrench or appropriate size open–end wrench as a lever to pry the cabinet loose from the chassis. Loosen each side alternately until the cabinet is released from the EMI gasket.

8. Slide the cabinet up and off the chassis.

---

***CAUTION***. *Use care when touching the EMI shielding strips around the front of the chassis. The fingers of the strip are easily bent and any protruding sharp edges become a potential cutting hazard when you handle the chassis.*

---

### Removing the GPSI Card

Refer to Figure B-4 when performing this procedure.

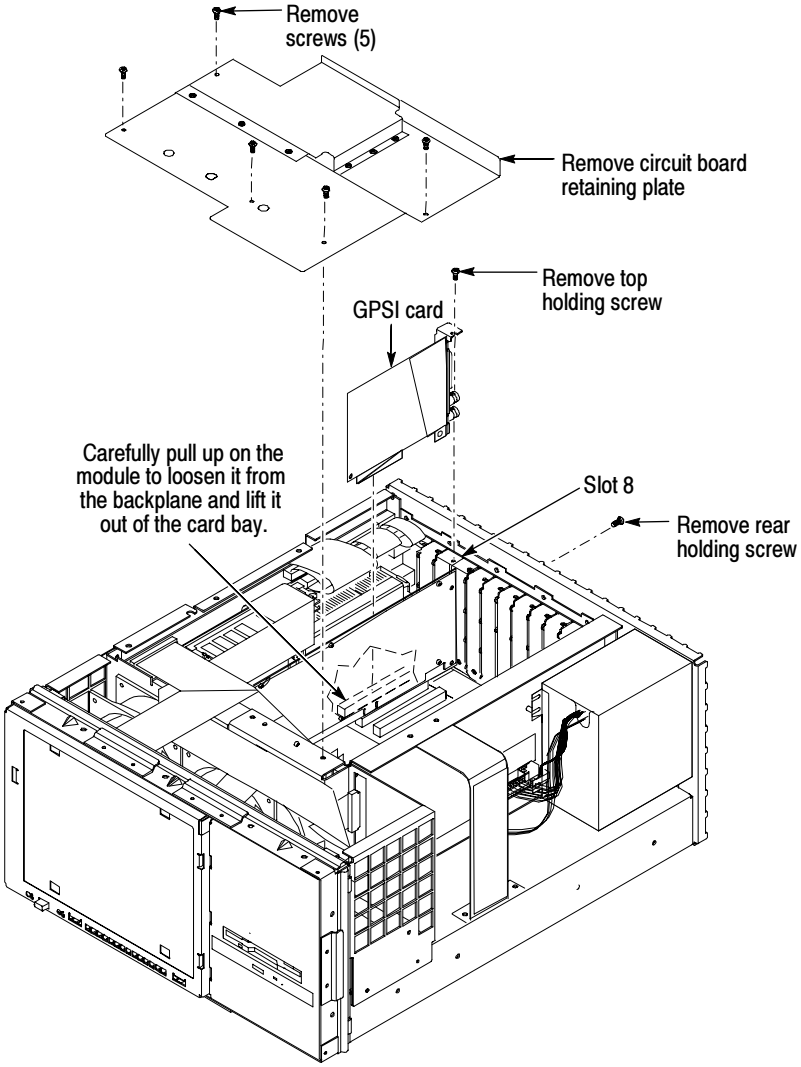



**Figure B-4: Removing the GPSI card**

1. Remove the retaining plate from the mainframe.
2. Remove the top holding screws from the GPSI card and the bracket immediately to its right.
3. Remove the rear holding screw from the GPSI card.
4. Remove the nuts from the two BNC connnectors on the GPSI rear bracket.

5. Disconnect the 50-pin and 14-pin connectors from the GPSI card. See Figure B-5.

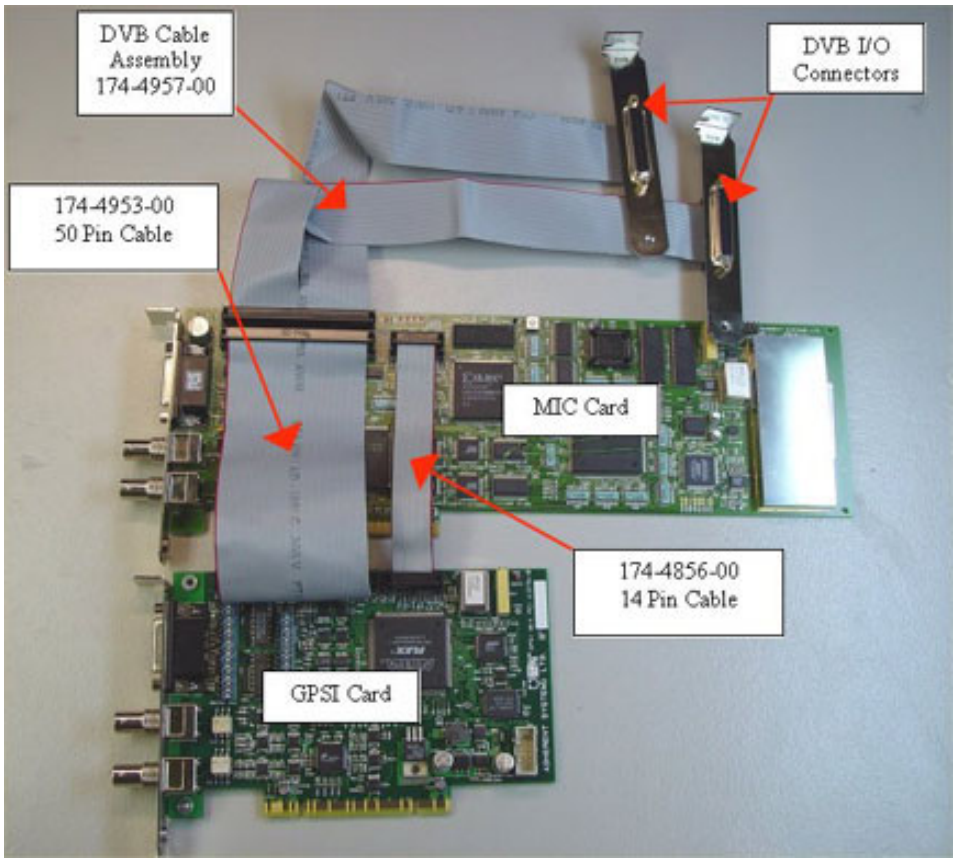



**Figure B-5: Disconnecting the cables from the GPSI card**

6. Position the split DVB cables so they are out of the way of the GPSI board.
7. Carefully pull the GPSI card up and towards the front of the instrument so that the BNC connectors clear the rear panel.
8. Set the links as required according to Table B-1.

After you have set the links as needed, reinstall the GPSI card.

### Reinstalling the GPSI Card

Reinstall the GPSI card by performing the previous steps in reverse order and keeping the following items in mind:

- When replacing the GPSI card, ensure that it is fully seated into the backplane board.

- Check that the securing screws are reinstalled.
- Replace the 50-pin and 14-pin cables that connect to the MIC card.

### Replacing the Cabinet

1. When replacing the cabinet, slide it back down over the instrument carefully, ensuring that all internal cables are clear and do not catch.
2. When the front of the cabinet comes in contact with the cabinet retaining tabs around the front of the chassis, make sure the edges of the cabinet go under the tabs. You may have to push on the sides of the cabinet to get all the edges under the tabs and over the EMI strips around the front of the chassis.
3. At the rear of the chassis, you may have to push on the sides of the cabinet to get the rear of the cabinet to fit over the edges of the chassis and EMI gasketing.
4. Reinstall the handle and the four rear feet.

# Appendix C: System Recovery

If you have problems with either BIOS configuration or system/application software, use the procedures in this section to restore the system to factory default installation and configuration.

***NOTE**. If you are restoring software after replacing the hard disk drive with one you ordered as a replacement from Tektronix, follow the instructions provided with the hard disk drive replacement kit.*

*If you are restoring software after reformatting the hard drive, perform all of the procedures in this section in sequence.*

## Overview

These procedures require the *AD951A & AD953A MPEG Test System Recovery* CD-ROM, which was shipped with the MPEG Test System.

Only a qualified technician that is familiar with installing drivers and configuring systems for networking should perform this installation.

These tips apply to the procedures in this section:

- Use default settings unless otherwise indicated in the following procedures.
- These procedures use drive “D:” as the CD drive.
- At the end of some steps, you are instructed to restart the system. To do this, if you are prompted to restart, select **Yes.** If not prompted, select **Shutdown** from the Start menu and then select **Restart the computer.**

You can use the procedures in this section to do any of the following:

- Restore the system BIOS settings to factory defaults.
- Restore the complete system, including installation and configuration, to factory defaults.

The complete system includes:

- Microsoft Windows NT 4.0
- Windows NT Service Pack 6A

- Internet Explorer 6.0
- Network Netbeui protocol and Network TCP/IP printing service
- Sigmatel Sound Driver
- Mobility Radeon 7500 Display Driver (ATI)
- Tektronix Jamaica Soft Power Down Driver & Shutdown Service
- Intel EtherExpress PRO/100B and PRO/1000 PCI Adapter Driver
- Symbios SCSI Driver
- Veritas Stomp RecordNow MAX software
- Tektronix AD951A & AD953A MPEG Test Systems application software

## Restore the BIOS Settings

***CAUTION**. The* AD951A & AD953A MPEG Test System *is programmed with custom BIOS settings; choosing any other settings will cause instrument malfunction. Do not use the setup defaults of the BIOS manufacturer.*

When the AD951A & AD953A MPEG Test System is booted from the CD–ROM, the readme.txt file will display instructions.

### Boot Options

The system is set at the factory to boot from a floppy, CD-ROM, and then the hard disk drive. If this setting has been changed, you must reset the boot options before you can restore the BIOS settings from the CD-ROM.

To reset the boot options, perform the following procedure:

1. Reboot the Test System.
2. Press **DEL** to enter BIOS setup when prompted on system startup.
3. Go to the Advanced BIOS Features setup menu.
4. Change the First, Second, and Third Boot Device to:
   Floppy, CDROM, and then HDD-0.

5. Exit with **Save Settings**.

### Restore BIOS settings from the CD-ROM

To reprogram the CMOS NVRAM to the custom factory settings for the BIOS, perform the following steps:

1. Power up the MPEG Test System.
2. Press **DEL** to enter BIOS setup when prompted on system startup.
3. Select **Load Optimized Defaults** and **Y** to confirm selection.
4. In the Advance BIOS Features menu, change the **First, Second, and Third Boot Device** to **Floppy, CDROM, and HDD-0**.
5. In the Integrated Peripherals menu, change the **Init Display First** to **Onboard/AGP**, change the **Parallel Port Mode** to **ECP+EPP**, and change the **EPP Mode Select** to **EPP 1.9**.
6. In the Power Management menu, change the **ACPI Function** to **Disabled** and the **Power Management** function to **Min Saving**.
7. In the PnP/PCI Configurations menu, change the **PNP OS Installed** to **Yes**, change the **Resources Controlled By** to **Manual**. Now in the IRQ Resources menu, change the **IRQ-11 assigned to** to **Legacy ISA**.
8. In the PC Health Status menu, change the **CPU Warning Temperature** to **70 °C/158 °F**, change the **Shutdown Temperature** to **80 °C/185 °F**, change the **Warning Beep** to **Enabled**, and change the **CPU Fan Failure Warning** to **Enabled**.
9. Save the changes and exit.

## Restore the Contents of the Hard Disk

In some situations, such as when the power has been interrupted or files were mistakenly deleted, the system may fail to boot from the hard drive. If this happens, use the *AD951A & AD953A MPEG Test System Recovery* CD-ROM to restore the hard drive to factory default installation status.

The AD951A & AD953A MPEG Test System contains one IDE hard disk drive with one partition. The partition is approximately 4096 MB and is formatted with the NTFS format.

### Easy Restore

To restore the contents of this partition (NT system and application software), use the following steps. This restore process is effective only if the hard disk drive is still good. (The process should take less than 15 minutes.)

1. Power up the MPEG Test System with the *AD951A & AD953A MPEG Test System Recovery* CD-ROM in the CD-ROM drive.
2. Enter `restdisk.bat` at the DOS prompt.
3. Click **Continue** when prompted.
4. In the warning dialog box, confirm with **Yes**. A window will show the progress of the restore function.
5. Remove the CD-ROM from the drive and restart the system when prompted. in the following step.

This completes the *Software Installation Procedure*.

# Appendix D: Network Troubleshooting

Networks are based on standards; however, there are many unique characteristics of each network (LAN or WAN) that make it difficult to troubleshoot without a thorough knowledge of the specific network. Consequently, an expert who knows your network characteristics should perform in-depth network troubleshooting.

This appendix provides some basic procedures that can eliminate some of the more common sources of network errors. If you cannot resolve problems using these procedures, contact your network administrator.

## Basic Requirements

Fulfill the following requirements before troubleshooting your host machines:

- Configure your system for use on the network as described in the documentation that is supplied with the Network Adapter card. Contact your network administrator for details.
- Ensure that any applications that you may have loaded on your test system since receiving it are not using the ports assigned to the test system components.

## IP Parameters

The illustrations in this section depict how each IP parameter (IP address, subnet mask, and default gateway) can negatively affect network connectivity.

### Incorrect IP Address

If the IP address for your test system is incorrect (not unique), then you may or may not be able to communicate over the network. In Figure D-1, TVTest_1 uses the same IP address as Rennes. If Rennes is started first, TVTest_1 will recognize the IP address conflict and will not load TCP/IP; consequently, the system will not be reachable over the network.

If your IP address is incorrect, and the IP address does not exist on your subnet, you may be able to communicate from the device (system or monitoring station), but you may not be able to communicate with the device.

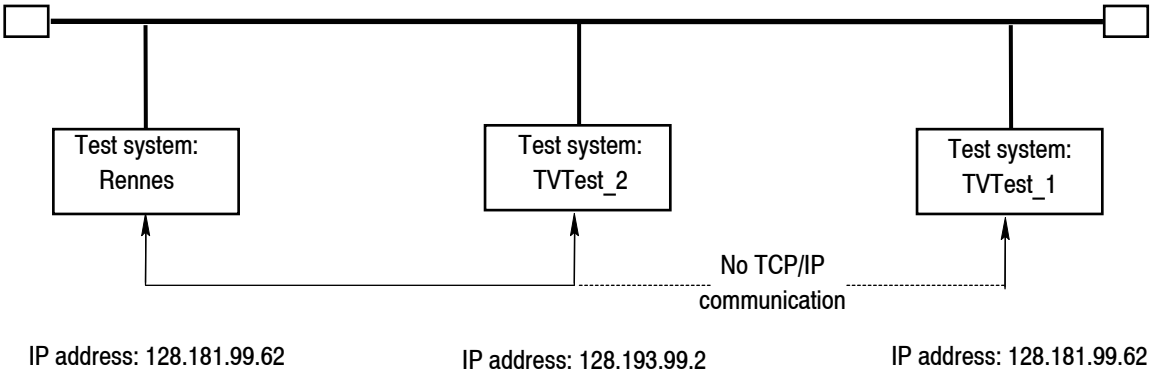



**Figure D-1: Incorrect IP address**

### Incorrect Subnet Mask

Subnets and subnetting networks is complex and requires a thorough understanding of IP addressing. Call your network administrator if you think your networking problem involves subnets. Figure 4-8 shows a simple (and fairly common) subnet mask problem.

In Figure D-2, the subnet mask for TVTest_1 indicates that the network address is contained in the first two bytes of the IP address. In dotted decimal notation, the network address is 128.181. This information allows the device to communicate with any other device with the same network address without being routed through a default gateway.

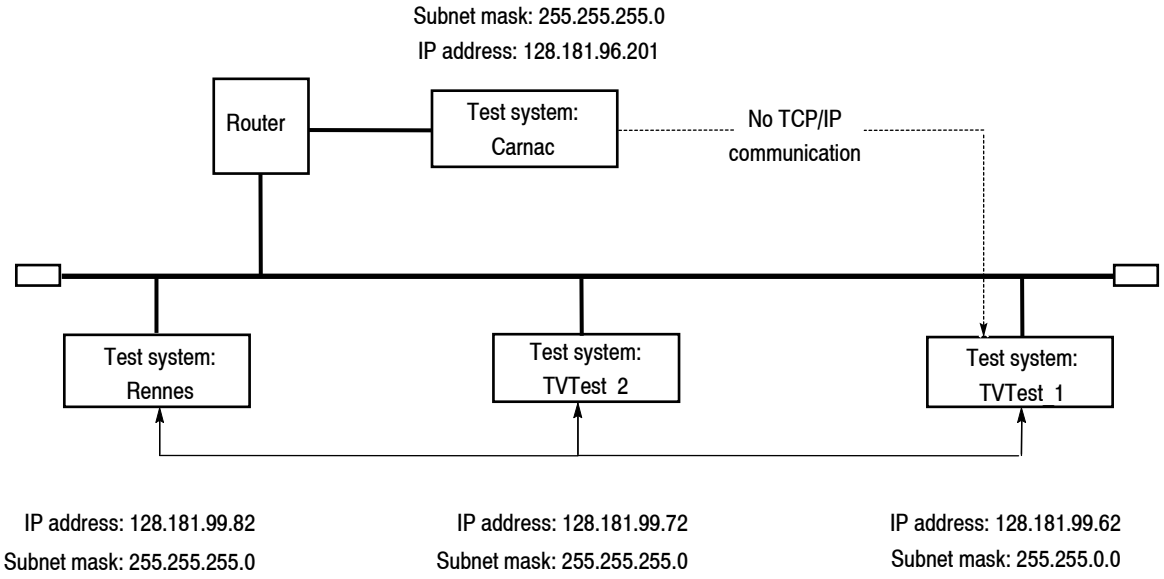



**Figure D-2: Incorrect subnet mask**

TVTest_1 cannot communicate with Carnac, because, according to the subnet mask on TVTest_1, Carnac and TVTest_1 are logically on the same network. Consequently, messages sent from TVTest_1 to Carnac are never routed. Because these two devices do not share a medium, TVTest_1 will never find the correct address for the network card on Carnac and will not be able to reach Carnac.

TVTest_1 can communicate with TVTest_2 and Rennes because these three devices share a medium, so messages from TVTest_1 do not need to be routed. TVTest_1 is therefore able to find the correct addresses for TVTest_2 and Rennes in spite of having an incorrect subnet mask.

### Incorrect Default Gateway IP Address

The default gateway you have specified in the TCP/IP Properties dialog box is the device that "knows about" your subnetwork and others on your network. When you send messages (for instance traps from your system to a device on another subnet), the default gateway is able to route the message to the appropriate subnet. If the IP address specified in the TCP/IP Properties dialog box is incorrect, messages to devices on other subnets will not reach their destination (because they never made it to the default gateway). See Figure D-3.

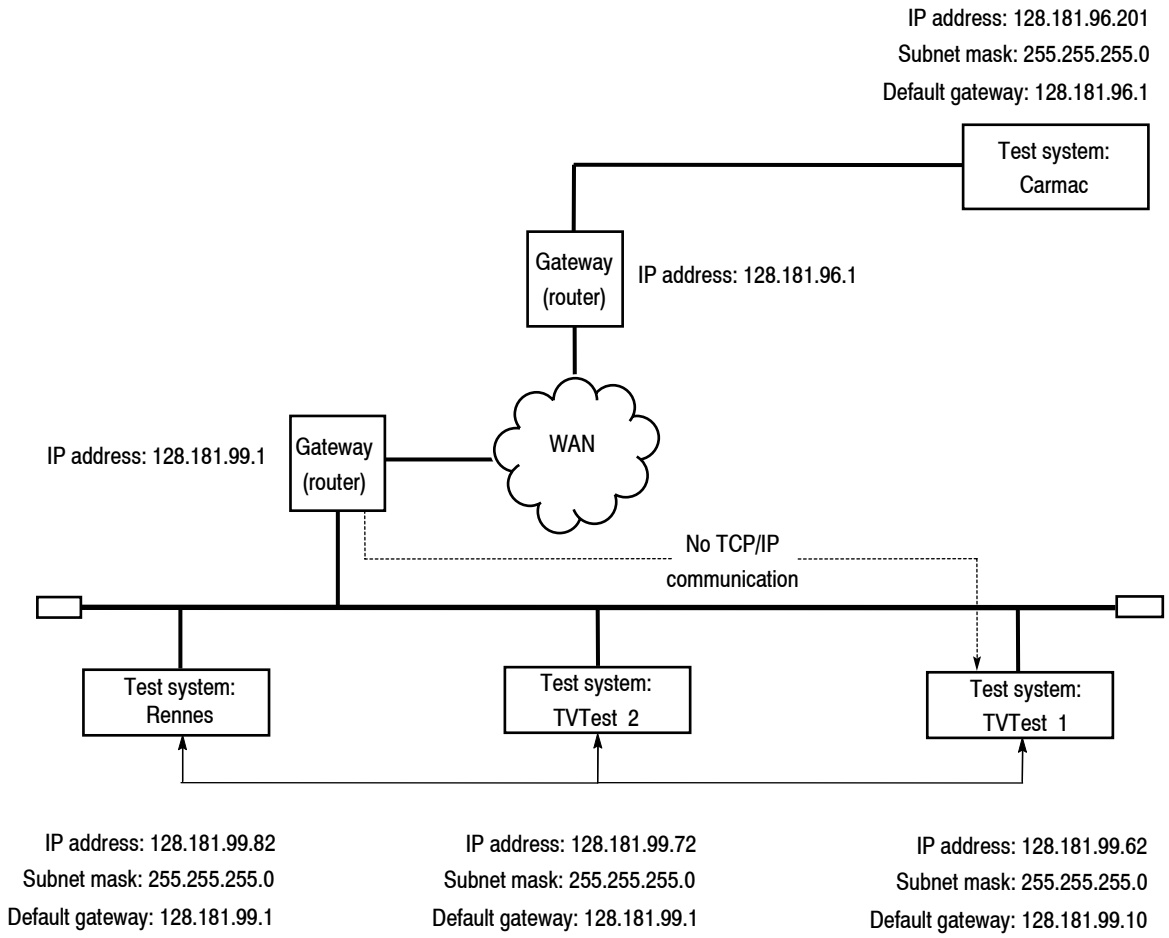



**Figure D-3: Incorrect default gateway IP address**

# Common Troubleshooting Procedures

Many of the procedures performed in the following sections are common tasks. Use these procedures when called for in the following sections.

### Pinging a Host Machine

One of the utilities provided with all TCP/IP installations is Ping.exe. (Look in the `C:\winnt\system32\` directory.) This utility allows you to send communication packets to and record the response from an indicated host machine. This, in essence, determines whether your packets arrived at the destination. To run ping, use the following procedure:

1. Select **Run** from the Start menu. The Run dialog box appears.
2. Type one of the following into the Run text box:

   ```
   ping machineName
   ```

   ```
   ping IPaddress
   ```

   In the examples, `machineName` and `IPaddress` represent the host machine name and IP address, respectively, of the networked device you are trying to ping.
3. Click **OK**.

   A DOS window appears indicating whether or not the destination is responding to the ping. In Figure D-4, the destination machine (Oxford4) is not responding.

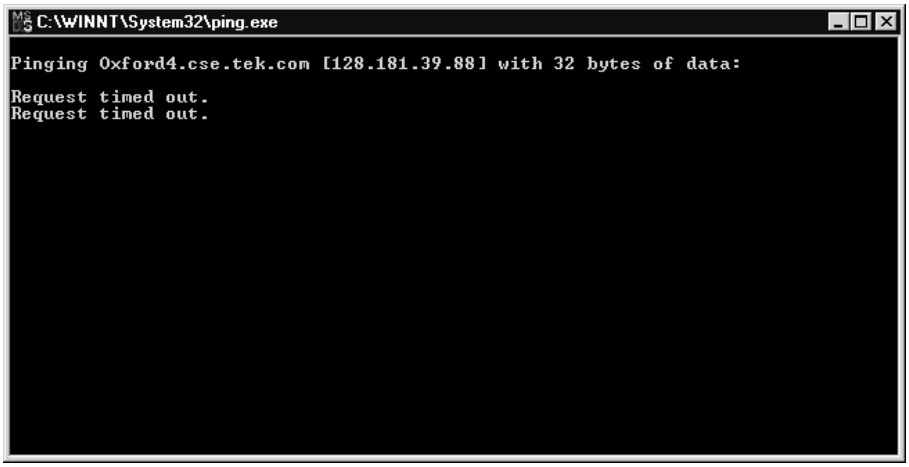



**Figure D-4: Ping.exe command window**

Ping only runs briefly, and the DOS window closes when the process is complete.

### Tracing the Route of TCP/IP Packets.

Sometimes it is helpful to know how far your packets made it on the way to a destination machine and which devices the packets pass through on the way. The utility that provides this functionality is `tracert.exe`. Tracert can also indicate a congested point in the network. To run tracert, use the following procedure:

1. Select **Run** from the Start menu. The Run dialog box appears.
2. Type one of the following into the Run text box:

   ```
   tracert machineName
   ```

   ```
   tracert IPaddress
   ```

   In the examples, `machineName` and `IPaddress` represent the host machine name and IP address, respectively, of the networked device you are trying to reach.
3. Click **OK**.

   A DOS window appears (see Figure D-5) indicating the progress of your packets. The far right column indicates the IP address of the nodes on the network that successfully pass your tracert packets. This information indicates the last good node on the path to the destination device.

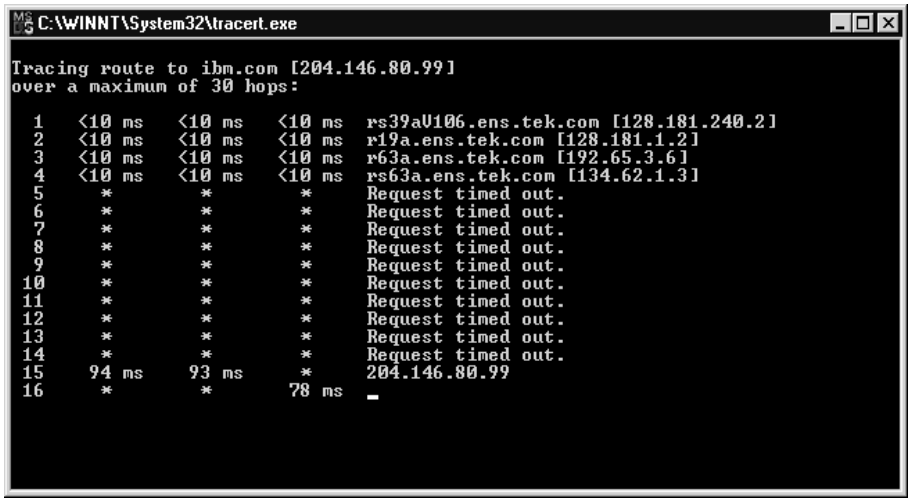



**Figure D-5: Tracert.exe command window**

### Finding IP Addresses for Devices on Your Network

At times, you may need to find or confirm the IP address of a computer on your network (or, conversely, the network name if all you have is an IP address). You may want to find this information to ensure that IP addresses and network names you use in the Hosts file are correct. The utility that will display this information is `nslookup.exe`. Use nslookup as described below:

1. Point to the Start button and then select **MSDOS**. The command line interface appears.

2. Enter one of the following and press **Enter**, where `machineName` or `IP address` is the network name or IP address, respectively, of the device you are trying to lookup.

   ```
   nslookup machineName
   ```

   ```
   nslookup IP address
   ```

   The network name and IP address of the device you are trying to lookup is displayed. If your network uses DNS, the IP address and network name of the DNS server is also displayed. See Figure D-6.

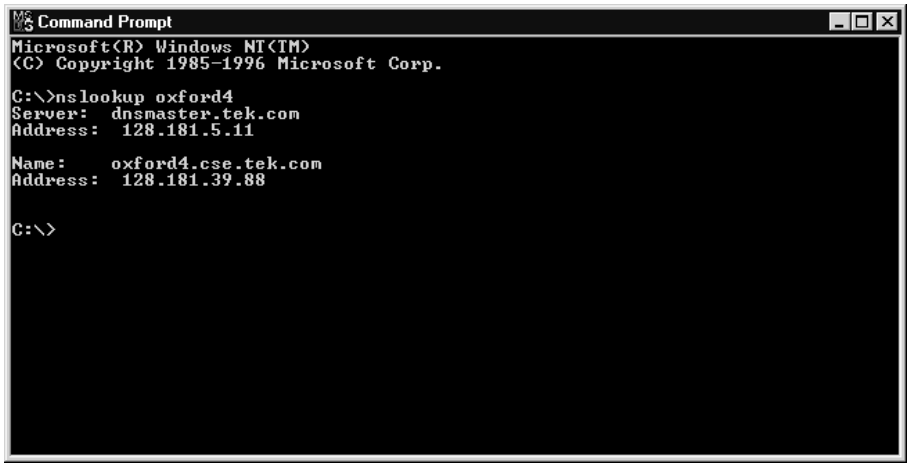



**Figure D-6: Command prompt with nslookup results**

## Sources of Network Information

If you need more information about network troubleshooting, some potential resources are listed below.

***NOTE.*** *These resources may provide you with more information. Most of this information is supplied as is, with no warranty as to its fitness, written or implied. The best source of network troubleshooting help is your network administrator.*

- Cisco Systems, Inc. http://www.cisco.com/

  This site is particularly useful for networks that use Cisco devices. (This URL was valid as of January 2004.)

- Dulaney, E; Lawrence, S; Scrimger, R; Tilke, A; White, J; Williams, R; Wolford, K. *MCSE Training Guide: TCP/IP*. Indianapolis, IN. New Riders, 1998

  This is a training guide for Microsoft Certified Systems Engineer certification, and covers TCP/IP and network troubleshooting.

- Taylor, E. *Network Troubleshooting Handbook*. New York, NY. McGraw–Hill, 1999

# Glossary

# Glossary

ASI – Asynchronous Serial Interface

ATSC – Advanced Television Systems Committee

DVB – Digital Video Broadcasting

GPSI – General Purpose Serial Interface

MIC – MPEG Interface Card

SMPTE – Society of Motion Picture and Television Engineers

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