User Manual

Tektronix

RFA300
Measurement Set 8VSB

071-0198-03

www.tektronix.com

Tektronix, Inc., P.O. Box 500 Beaverton, OR 97077

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Calibration Services provide annual calibration of your product, standards compliance and required audit documentation, recall assurance, and reminder notification of scheduled calibration. Coverage begins upon registration.

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- Eliminates unexpected service expenses

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Name	VISA or Master Card number and expiration
Company	date or purchase order number
Address	Repair Protection (3 years)
City, State, Postal code	Instrument model and serial number
Country	Instrument purchase date
Phone	

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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.

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.

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.

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

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.

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:

Preface

This manual contains operating information for the RFA300 Measurement Set 8VSB. The manual consists of the following sections:

- *Chapter 1: Getting Started.* Provides a product description, installation procedures, connection information, and information on getting the instrument ready for use.
- *Chapter 2: Operating Basics.* Provides basic information about using the instrument.
- *Chapter 3: Reference.* Contains an overview of each measurement window and of the 8VSB standard.
- *Appendix A: Specifications.* Lists the environmental, physical, and electrical properties of the instrument.
- *Appendix B: User Service.* Provides user service information including general care, preventive maintenance, and troubleshooting.
- *Appendix C: Software Installation.* Describes how to format a hard drive and reinstall the operating system software and associated hardware drivers.
- *Appendix D: Mask File Formatting.* Describes how to format a mask file using a text editor.

Related Documentation

In addition to this user manual, the following documentation is available for your measurement set.

- The online help provides information about using the measurement set. To view online help, select Help Topics from the Help menu.
- The optional *RFA300 Measurement Set 8VSB Service Manual* provides board-level service information.

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
Sales support	1-800-833-9200, select option 1*****
Service support	1-800-833-9200, select option 2*****
Technical support	Email: support@tektronix.com 1-800-833-9200, select option 3***** 1-503-627-2400 6:00 a.m. – 5:00 p.m. Pacific time

*** This phone number is toll free in North America. After office hours, please leave a voice mail message.**
Outside North America, contact a Tektronix sales office or distributor; see the Tektronix web site for a list of offices.

Getting Started

This chapter provides basic information about using and installing the RFA300 Measurement Set 8VSB. There is information about the physical instrument and introductory material on how to operate it. Once you have a basic understanding, proceed to the next chapter, *Operating Basics*, to form a conceptual model of how the measurement set works.

Product Description

The measurement set provides information on 8VSB digital television signals in conformance with the ATSC Digital Television Standard. Signals are acquired at the transmitter and the measurements consist of the following:

- Complex Modulation Error Ratio
- Signal to Noise Ratio
- Error Vector Magnitude
- Pilot Amplitude Error
- Out-of-Channel Emissions
- Frequency Response Error
- Group Delay
- Amplitude Error
- Phase Error
- Phase Noise Error
- Peak to Average Ratio
- Channel Spectrum (display of the selected channel, not a measurement)

The instrument's measurements can run continuously, thereby monitoring transmitter performance on a constant basis. Operation of the instrument is controlled from the front panel keypad and the touch screen or from an attached keyboard and mouse. Figure 1–1 shows the front panel of the measurement set.

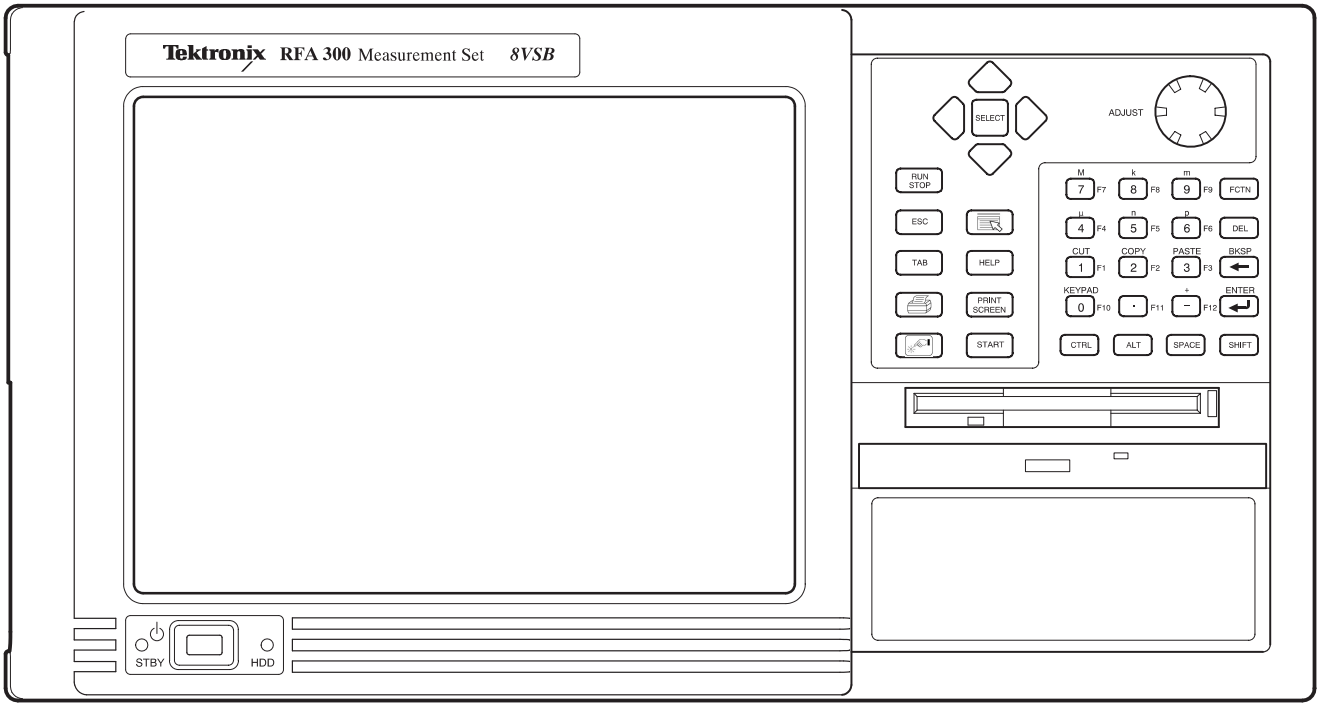


Figure 1–1: RFA300 8VSB Measurement Set front panel

The measurement set uses Microsoft's Windows 95 operating system. The Home window is the point-of-entry into the program. Access each measurement from the Home window by clicking on the appropriate icon as shown in Figure 1–2.

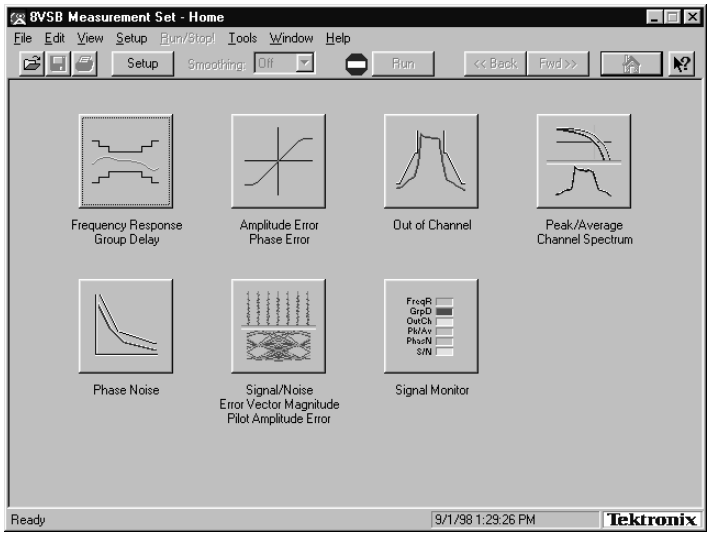


Figure 1–2: Home window

Refer to the next chapters *Operating Basics* and *Reference* for an overview on operating the measurement set. For detail information, refer to the online help.

Accessories

Tables 1–1 and 1–2 lists the standard and optional accessories.

Table 1–1: Standard accessories

Description	Quantity	Part number
RFA300 Measurement Set 8VSB User Manual	1 ea	071-0198-XX
RFA300 Measurement Set 8VSB Application Software on CD-ROM	1 ea	063-3053-XX
Windows 95 Software and manual on CD-ROM	1 ea	063-2776-XX
Windows 95 start up disk	1 ea	063-3185-XX
QA Plus software on floppy disks	1 ea	063-2506-XX
WIN95 keyboard (US)	1 ea	119-5662-XX
Tektronix three-button mouse	1 ea	119-4330-XX
Standard IEC power cord	1 ea	161-0230-XX
10 dB Attenuator, connectors N to N (for instruments with the 10 dB internal attenuator)	1 ea	119-6328-00
Front protective cover	1 ea	200-4408-XX

Table 1–2: Optional accessories

Description	Quantity	Part number
Accessory pouch	1 ea	016-1441-XX
Power cord options		
Opt. A1 Universal Euro 220 V, 50 Hz	1 ea	161-0104-06
Opt. A4 North America 240 V, 60 Hz	1 ea	161-0104-08
Rackmount kit w/ instructions	1 ea	016-1691-XX
RFA300 Measurement Set 8VSB Service Manual	1 ea	071-0199-XX

Installation

Read this section before attempting any installation procedures. This section describes site considerations, power requirements, and ground connections for your instrument.

Check the Shipping List

Verify that you have received all of the parts of your measurement set. Use the shipping lists that came with your instrument to compare against the actual contents of your order. You should also do the following:

- Verify that you have the correct power cord for your geographical area.
- Verify that you have the CD that contains a backup copy of the installed software. Store the CD in a safe location where you can easily retrieve the software for maintenance purposes.
- Verify that you have a boot disk in case you reformat the hard drive or damage operating system files or drivers.

***NOTE**. Keep the software packaging available. You will need it to enter the Windows 95 software registration number when you first power on the analyzer. (See Step 3 under* Powering On and Off *on page 1–10.)*

- Verify that you have all the other standard and optional accessories that you ordered.

Hardware Installation

This section deals with hardware installation. To reinstall software refer to *Appendix C: Software Installation* in this manual.

The instrument is designed to operate on a bench, cart, or in a rack in the normal position (on the bottom feet). For proper cooling, at least two inches (5.1 cm) of clearance is recommended on the rear and sides of the mainframe.

***CAUTION.** For rack mounting, the product must be installed in its specified rack cradle as listed in Table 1–2. For proper cooling, the air temperature at all air intake vents (inside of the rack) must not exceed 50° C.*

You can also operate the instrument while it rests on the rear feet. If you operate the instrument in that position, make sure that you properly route any cables coming out of the rear of the instrument to avoid damaging them.

Before you can operate the product, you must connect the provided power cord. Refer to Figure 1–4 and connect the power cord to the instrument. Refer to Table 1–3 for the supply voltage rating and connect the other end of the power cord to the proper source. Do not connect to any power sources other than those for which the instrument is rated.

CAUTION. *Keep the bottom of the instrument clear of obstructions to ensure proper cooling.*

The measurement set is limited to situations where a single, high-amplitude, 8VSB RF signal is available for direct input to the measurement set. Refer to *RF Connections* on page 1–7.

Operating Requirements

Table 1–3 lists the operating requirements. Refer to *Appendix A: Specifications* for a complete specification list.

Table 1–3: Operating requirements

Requirement	Specification
Source voltage	90–250 VAC_{RMS}, 47–63 Hz
Steady State input current	6 A_{RMS} maximum, 1.9 A typical
Maximum power consumption	540W
Temperature	0°C to +45°C (32°F to 113°F), 30°C/hr max gradient, non-condensing (derated 1°C per 1,000 ft. above 5,000 ft. altitude)
Humidity	20% to 80% relative humidity, non-condensing. Max wet bulb temperature: +31°C (derates relative humidity to ~50% @ 50°C).
Altitude	To 10,000 ft. (3,040m), (derated 1°C per 1,000 ft. above 5,000 ft. altitude).

Creating a Startup Disk

A disk titled RFA300 Windows 95 Start Up Disk is shipped with the instrument. Use this disk to restart your measurement set in case of a major hardware or software failure. This section creates an extra startup disk in case the original becomes corrupted.

All software is installed at the factory. If you ever need to reinstall, refer to *Appendix C: Software Installation.*

***NOTE**. You cannot reinstall software without a startup disk.*

To create a startup disk, do the following:

1. Open **My Computer/Control Panel**, and double–click on **Add/Remove Programs**.
2. Select the **Startup Disk** tab.
3. Click the **Create Disk** button and follow instructions.
4. Copy the following files to the startup disk:
   - C:REALMODE\MSCDEX.EXE
   - C:REALMODE\TEAC_CDI.SYS
   - C:WINDOWS\COMMAND\XCOPY.EXE
   - C:WINDOWS\COMMAND\XCOPY32.EXE
5. Create a file named AUTOEXEC.BAT in the startup disk. Add the line `MSCDEX.EXE /D:TEAC-CDI/L:D` to the file.
6. Open the **CONFIG.SYS** file in the startup disk and add `DEVICE=TEAC_CDLSYS /D:TEAC-CDI` to the end file.

RF Connections

The quality of the input signal path is critical in obtaining the full-specified performance of the measurement set. Therefore, you must connect the measurement set to your transmitter using high quality cable and connectors. The following list provides the requirements needed for the RF connection:

- Hold the nonflatness of the input signal to approximately 0.05 dB P-P or less over the width of the channel.
- Keep the station's radiated signal to at least 63 dB down from the sampled signal in the line by using appropriate shielding.
- The cable with connectors must have a return loss of at least 26 dB (VSWR $\leq$ 1.10) over the channel width and a loss tilt of less than .02 dB over the channel width. This assumes that the tap used to obtain the signal has a return loss of $\geq$ 30 dB (VSWR $\leq$ 1.065).

High quality cable and connectors are required to meet the listed requirements. The connectors should be precision grade at both ends of the cable. The best cable type is dependent on the run length and operating frequency. The return loss requirement is hardest to meet at high frequencies, while the loss tilt is hardest to meet at low frequencies. In either case, minimize the difficulties by using only a few feet for cable length. Longer lengths (50 ft. or more) place extreme requirements on cable quality specifications.

The RF connection to your transmitter is located on the rear of the instrument. Refer to Figures 1–3 and 1–4 to connect the measurement set to your transmitter and for other connections. The standard instruments prior to serial number B010194 have an internal 20 dB input attenuator. Modified instruments and those after B010194 have an internal 10 dB input attenuator and are provided with an external 10 dB attenuator that can be connected in series at the RF input connector.

Connect the measurement set to your transmitter in a manner that ensures the instrument will receive only one channel. Power to the measurement set must be more than 1 milliwatt and less than 1 watt for the internal 10 dB attenuator. If you either have an internal 20 dB attenuator or connect the external 10 dB attenuator to the internal 10 dB input attenuator, the input power range is greater than 10 milliwatts to less than 2 watts.

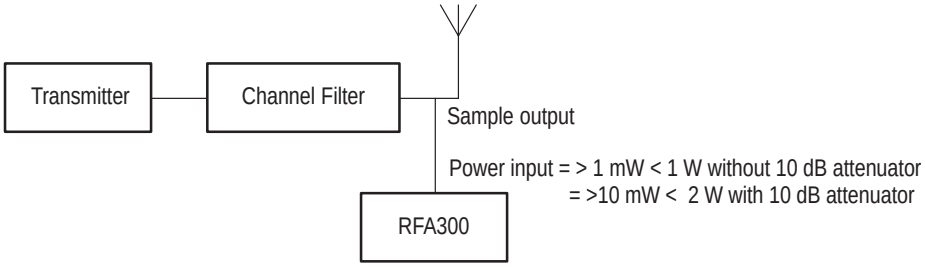


Figure 1–3: Transmitter connection

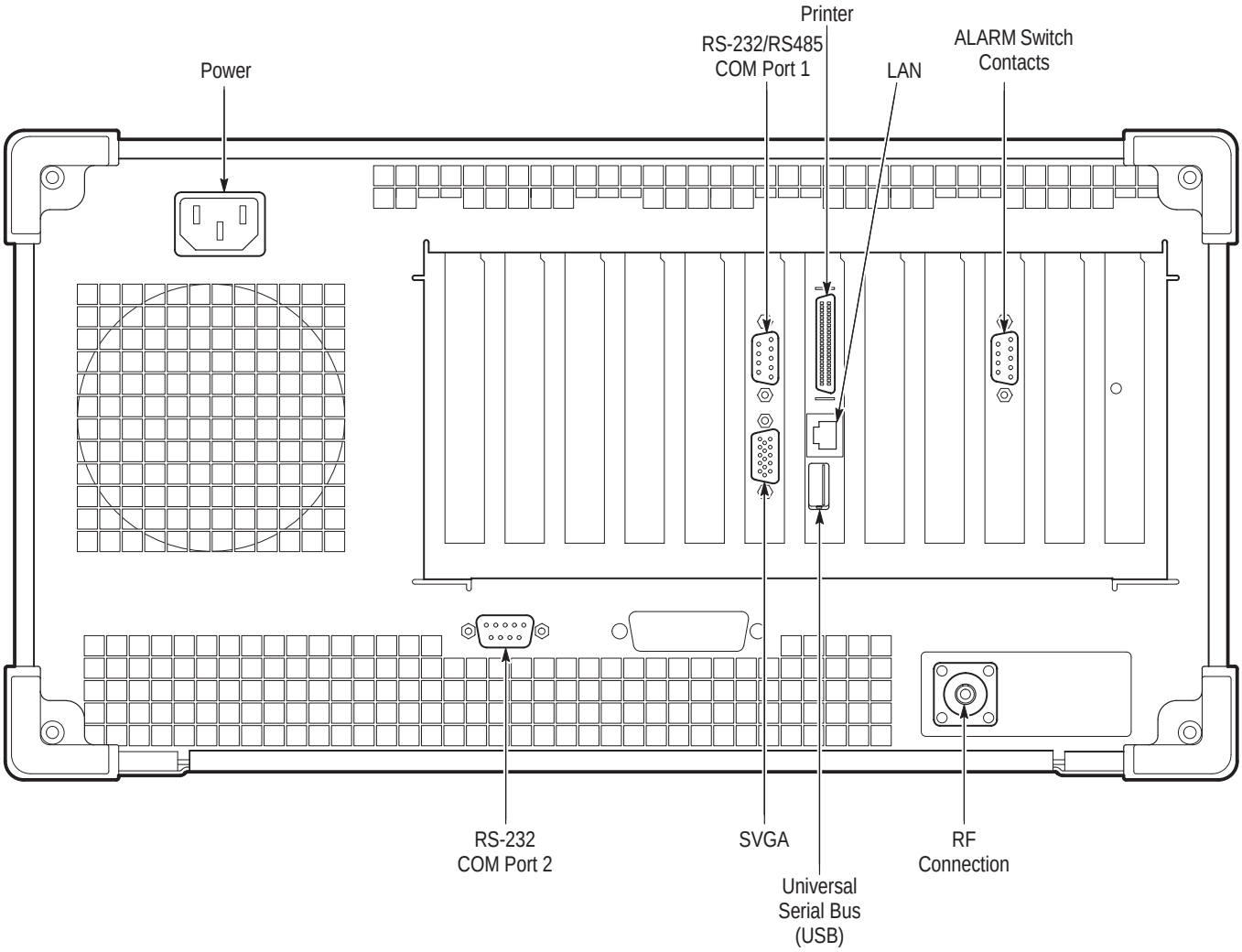


Figure 1–4: Rear view

Interface Connections

The interface connectors on the rear and side of the RF measurement set, shown in Figure 1–4 and Figure 1–5, provide the interconnection ports for peripheral devices and networking. Pin assignments for the rear panel and side panel connectors are listed in Table A–5 and Table A–6 in *Appendix A:Specifications*.

Keyboard and Mouse Connections

Connect the keyboard and mouse to the left-hand side of the instrument as shown in Figure 1–5.

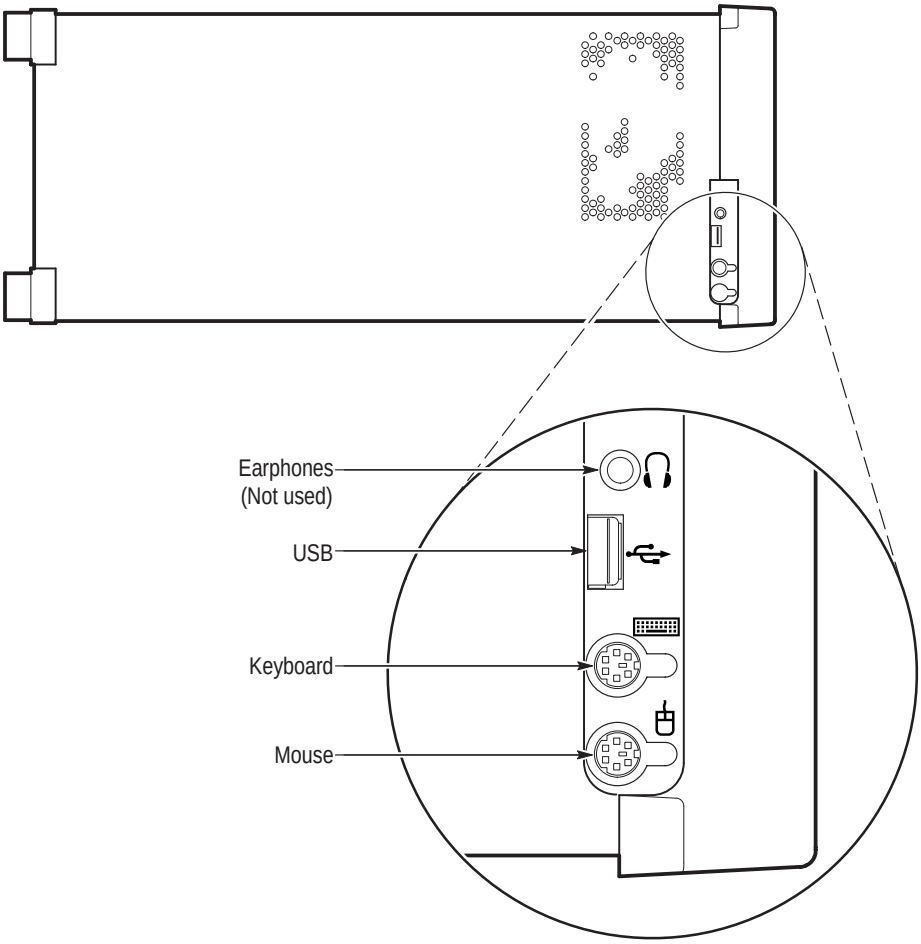


Figure 1–5: Keyboard and mouse connections

Powering On and Off

This section contains the procedure for powering on the instrument for the first time. To power off the instrument, refer to *Powering off* on page 1–11.

First Time Power On

Power on the measurement set as follows:

1. Press the On/Standby switch to power on the instrument (see Figure 1–6 for the switch location).

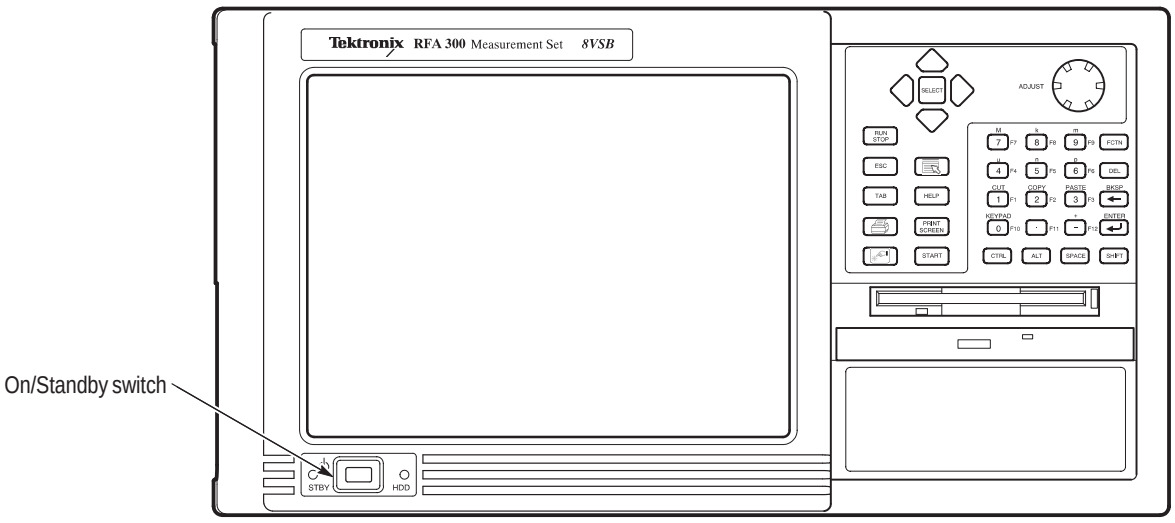


Figure 1–6: On/Standby switch

2. Wait for the instrument to complete 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, do the following steps:

   a. Enter a user name (for example, RFA300) 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.

   d. Proceed with step 3.

3. Follow the instructions on the screen and enter the Windows 95 Product Identification number (located above the bar code) on the Windows 95

software package that came with your instrument. Enter other information as required.

The internal setup software automatically configures your instrument and installs all required devices. After the setup software completes configuration, the measurement set application will start.

The next time you power on, the application starts automatically. You do not need to perform step 3.

Powering off Always power off the instrument using the Windows 95 shutdown process and then press the On/Standby switch.

NOTE*. Once a month, power down and restart the instrument. The measurement set performs an internal calibration as part of the power on procedure. This ensures the optimum measurement accuracy of the instrument.*

Selecting Channel Frequency

Select the channel frequency and verify that the RF input signal has sufficient power. Without sufficient power at the test signal input, the instrument cannot perform accurate measurements. To select frequency perform the following procedure:

1. Connect your transmitter to the instrument's RF connector shown on page 1–8.
2. Power on the instrument.
3. Click the Setup button on the toolbar.
4. Click on the System tab if the System page is not showing.
5. Enter the desired frequency.

NOTE*. The frequency is the pilot frequency, not channel center. Refer to* Selecting channel frequency *in the online help.*

6. Click on Apply then click on the Input Signal Power button.
7. Verify that the RF input signal level is in the OK range. If the level is not OK, adjust the output of your transmitter or add or remove the external 10 dB attenuator as necessary.
8. Close the Input Signal Power dialog box and click OK to close the System dialog box.

Incoming Inspection

Incoming inspection consists of verifying basic operation of the measurement set. The Power-on diagnostics check basic functionality. These diagnostics run every time you power on the instrument. If a failure is detected, the Power-on diagnostics dialog box opens with the failed test indicated.

Extended Diagnostics

Run the extended diagnostics to test functionality in more detail. To run extended diagnostics, do the following procedure:

1. Go to the Tools menu and select Diagnostics.
2. Click the Extended Diagnostics tab.
3. Select All Modules and Tests and then select One Time.
4. Click Run and observe that a failure does not occur.

If a failure does occur, contact Tektronix using the information provided in the *Preface* of this manual or click on Support located under the Help menu.

Signal Power

Select the channel frequency (refer to *Selecting Channel Frequency* on page 1–11) and verify that the RF input signal has sufficient power. Without sufficient power at the test signal input, the instrument cannot perform accurate measurements.

NOTE*. Without the external 10 dB attenuator (for those instruments that have the internal 10 dB attenuator rather than the 20 dB internal attenuator), the input power indicator indicates over amplitude power input beginning at 0.2 W (+23 dBm). The variable attenuator of the input circuitry has enough range to handle up to 1 W at the input connector.*

Measurement Functionality

Open each measurement window and verify that activity is occurring. For example, to check Frequency Response and Group Delay do the following procedure:

1. From the Home window, click on the Frequency Response and Group Delay icon to open the measurement window.
2. Verify that a signal is visible in each waveform graphic within a few seconds.
3. Verify that the readout for both measurements is updating.

Perform the same procedure for each measurement.

Operating Basics

This chapter describes the basic operation of the RFA300 Measurement Set 8VSB. For operating details, refer to the online help.

Front Panel

The front panel controls are used to operate the measurement set without the mouse or keyboard. Figure 2–1 shows the front panel.

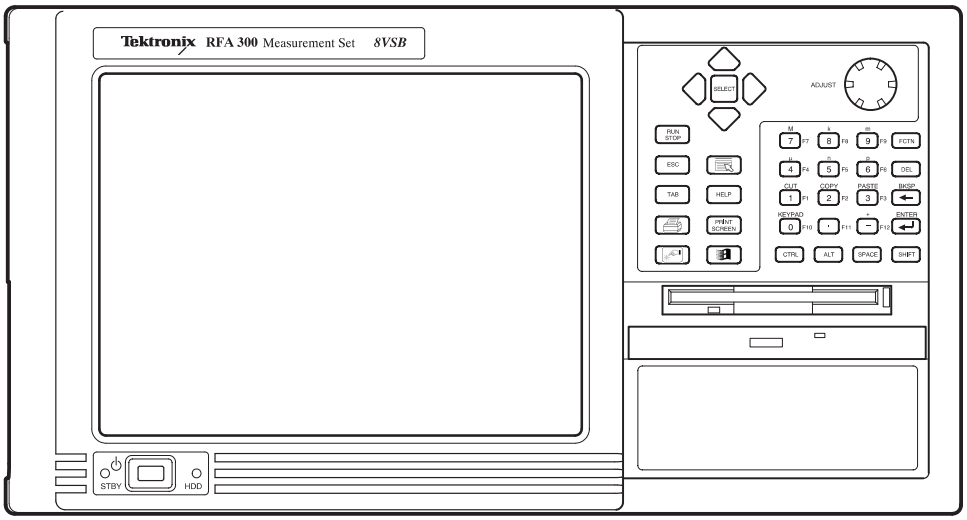


Figure 2–1: Front panel

Keys

You can use the front panel keys as an alternative to a keyboard. All keys and key combinations critical to operating the instrument or for basic Window's tasks are available via the front panel. To enter letters of the alphabet or special characters, use the soft keyboard feature. Refer to *Entering text from the screen* in the online help.

For key combinations, it is unnecessary to hold down more than one key at a time. For example, you can press SHIFT in the hex keypad, and then press another key to accomplish a Shift+key combination. The same is true for other key combinations, such as CTRL and ALT keys. This feature is often referred to as a locked mode.

Table 2–1 lists front panel-key controls and describes their use.

Table 2–1: Front panel-key controls

Control name	Mechanism	Description
Up Arrow	Button	Use to navigate and change focus from one window function to another.
Left Arrow	Button	
Right Arrow	Button	
Down Arrow	Button	
Select	Button	Same as the space key.
Adjust Knob	Rotary encoder	Multi-function control, increment/decrement field values or screen element size or position.
Run/Stop	Button with 3-color LED	Starts or stops a measurement. LED indicates whether product is in Run or stop state.
Esc	Button	Standard Escape key.
Tab	Button	Standard Tab key.
Print	Button	Prints the current measurement using the same print settings as for the previous print.
Touch	Button	Toggles Touch Screen state on and off. LEDs indicate Touch Screen On/Off state.
Menu (Application key)	Button	Same as mouse button two.
Help	Button	Opens the Help contents. Standard F1 key
Print Screen	Button	Copies the screen to the clipboard. Alt plus Print Screen copies the active window.
START Key	Button	Opens the Windows Start menu.
Numbers 0 to 9, . (period), and – (minus	Buttons	Standard number keys, most have second (Shift) and third (Function) functions.
Fctn	Button with LED	Modifier for numeral keys to create keys F1 through F12. Locked mode key feature. LED indicates when on.
Del	Button	Deletes selected text or object.
←	Button	Backspace key.
↵	Button	Enter key.
Ctrl	Button with LED	Control key. LED indicates when keypad is in control mode. Refer to Table 2–2 for a list of control functions. Locked mode key feature.
Alt	Button with LED	Alternate key. LED indicates when keypad is in alternate mode. Locked mode key feature.

Table 2–1: Front panel-key controls (Cont.)

Control name	Mechanism	Description
Space	Button	Space bar or use as mouse button 1
Shift	Button with LED	Shift key. LED indicates when keypad is in shift mode. Locked mode key feature.

Table 2–2: Control key combination functions

Control key	Function
Ctrl+A	Invokes the AutoScale function
Ctrl+B	Opens the previous window (same as the toolbar<<Back)
Ctrl+C	COPY
Ctrl+F	Opens the following window (same as the toolbar Fwd >>)
Ctrl+H	Opens the Home window
Ctrl+K	Opens the Keypad dialog box
Ctrl+O	Opens the Recall Results dialog box
Ctrl+P	Prints the measurement
Ctrl+S	Saves the results of the current measurement
Ctrl+T	Toggles the Touchscreen on or off
Ctrl+V	PASTE
Ctrl+X	CUT
Ctrl+Y	REPEAT
Ctrl+Z	UNDO

Touch Screen

The touch screen allows you to use your finger instead of a mouse. Move your finger around the screen to move the cursor. Tap to select an object and select ENTER to activate the object.

Home Window

The Home Window is the point-of-entry into the measurement set. From the home window, you access all measurements by clicking on the appropriate icon. A measurement begins to run immediately when the window opens. Figure 2–2 shows the Home window. Refer to the *Reference* chapter for an overview of each measurement window.

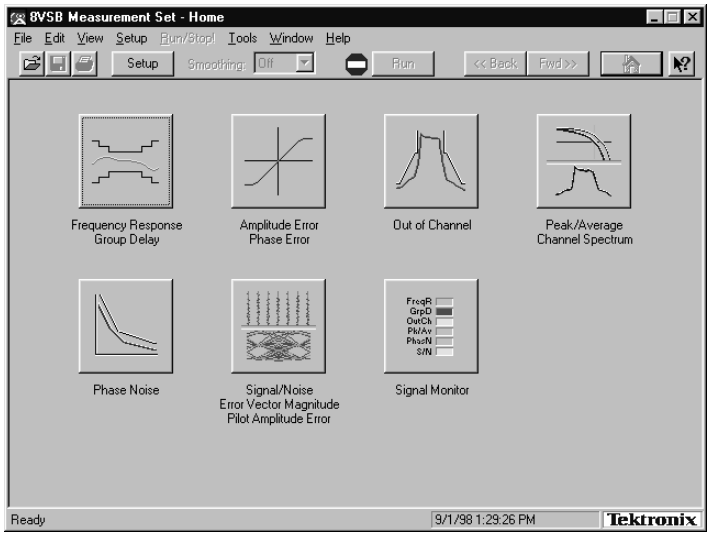


Figure 2–2: Home window

Menus

Menu selections are available from any measurement window and the Signal Monitor window. Refer to the online help for a description of each menu selection.

Toolbar

All toolbar selections are available from any measurement window and the Signal Monitor window. The toolbar provides an easy method for accessing frequently-used functions. Figure 2–3 shows the toolbar followed by a list of the functions.

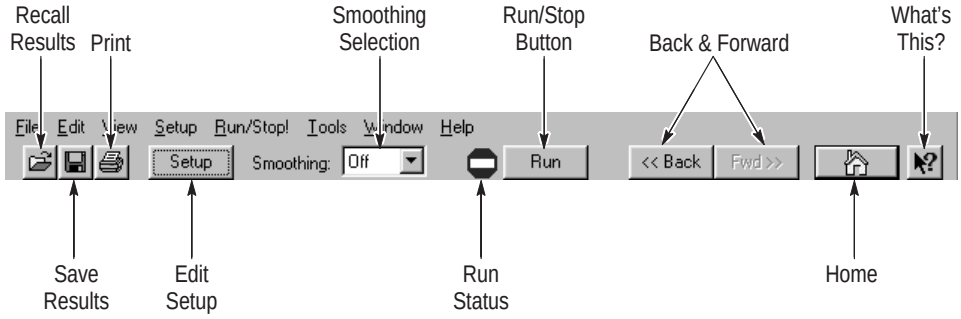


Figure 2–3: Toolbar

Table 2–3: Toolbar functions

Toolbar selection	Function
Recall Results	Recalls a previously saved measurement.
Save Results	Save the results of the current measurement.
Print	Prints one copy of the current measurement.
Edit Setup	Provides setup controls for the instrument and measurements.
Smoothing Selection	Selects the degree for reducing the variations of the waveform and results. Smoothing is accomplished differently for each type of measurement. Refer to the online help for each measurement window to determine how smoothing is accomplished. **Note:** Beginning with software version 1.4.0.0, the High Smoothing selection in the Out-of-Channel Emissions measurement is changed to reduce the amount of signal variation and make the Mask measurements more precise.
Run Status	Shows when the measurement is running or stopped. Red is stopped and green is running.
Run/Stop Button	Begins or stops performing measurements.
Back and Forward	Back opens the previously opened window. Forward opens the following window.
Home	Returns to the Home window.
What's This?	Provides a brief description of the selected control or object.

Making a Measurement

The following provides a basic overview of how to make and save a measurement. Refer to the online help for details on other operating features. An explanation of how help works is on page 2–9.

Selecting Frequency

Before running measurements you must select your channel frequency and determine that the input signal has power within the correct range. Refer to *Selecting Channel Frequency* on page 1–11 for the procedures on selecting channel frequency and checking input signal power.

Limits Versus Masks

Before proceeding, you should understand the differences between limits and masks. Limits are a set of parameters against which numeric measurement results can be compared automatically. You can choose the color to highlight results that violate parameters.

The mask-testing feature allows you to set visual parameters within the graphic portion of the measurement window. The masks are lines against which you can compare waveforms.

Limits

After selecting your channel frequency and checking input signal power, you can edit caution and alarm limits. The instrument compares each new result against the current limits as soon as you enter the measurement window. To edit limits, do the following:

1. Click the Setup button located in the toolbar.
2. Click the Limits tab.
3. Select which results are to be compared against the limits when the measurement is running.
4. Enter the low value for Alarm. The value must be less than the low Caution value.
5. Enter the low value for Caution. The value must be less than High Caution and greater than Low Alarm.
6. Enter the high value for Caution. The value must be less than High Alarm and greater than Low Caution.
7. Enter the high value for Alarm. The value must be greater than High Caution.

For some measurements, you cannot enter values for all limits as it would be counter productive. For example, there is no reason to set a high caution or alarm value for signal-to-noise when you want the signal-to-noise ratio to be as high as possible.

Masks

The mask-testing feature is not on when you receive your instrument. To turn masks on and off and to select different masks, do the following:

1. Open a measurement window. For example, open the Amplitude and Phase Error window.
2. Click the Setup button located in the toolbar.
3. Select the appropriate box to enable a mask test. The mask is enabled when checked.
4. Select the mask you want to use.
5. Click OK to accept your changes and return to your measurement window.

Not all of the measurements need and do not include a mask test. Those that do not are the Signal/Noise, Error Vector Magnitude, and Pilot Amplitude Error window and Peak/Average and Channel Spectrum window.

You can create a mask for those measurements that include mask testing. Refer to *Mask file formatting* in the online help.

Viewing Results

Once you open a measurement window, notice that the measurement runs and provides results soon after the window opens. To stop the measurement, press the Stop button located in the toolbar. To restart, press the Run button.

Saving Results

After making a measurement, you can save your results to a database by doing the following:

1. Go to the File menu and select Save Results As.
2. Enter name, destination, and any notes you want saved with the results.

Results can be printed or exported to other applications using the Report dialog box selected in the File menu. You can also recall results for further study at any time.

Signal Monitor

The Signal Monitor allows you to continuously monitor one or more of the other measurement's numeric results in one window. To select the measurements to monitor, do the following:

1. Open the Signal Monitor window.
2. Click Setup in the Toolbar.
3. Select the measurements you want to monitor.
4. Select how often you want your results to be automatically saved, or select Off to disable the function.

5. If you selected At Intervals in step 4, enter the amount of hours to save between AutoSave actions.

NOTE. *An indication of how long the instrument can run before running out of space is provided. Click the File Size button to limit the size of your result database files. Refer to* Limiting the size of a results database file *in the online help.*

6. Select when to be notified (under Notification Criteria) if a caution, alarm, or error occurs. You can also select not to be notified.

7. If you selected to be notified in step 6, select the notification action.

NOTE. *Before you can set up Email notification, you must install a Messaging Application Program Interface (MAPI) compliant Email application.*

8. Click on the Email Settings button to change Email parameters.

NOTE. *Selecting Send Email opens the Email dialog box if the destination is not yet specified. You can enter the address, include a message, and send the current results or only results that have violated limits.*

9. Click Suspend Actions and select how often you want to be notified. Click OK to close.

10. Click the Setup's OK button to apply your selections and to return to the Signal Monitor window.

Online Help

The online help gives detailed information about the operation of the measurement set. Look in the online help for details about user selections and controls that are not described in this manual.

To access online help, go to the Help menu as shown in Figure 2–4.

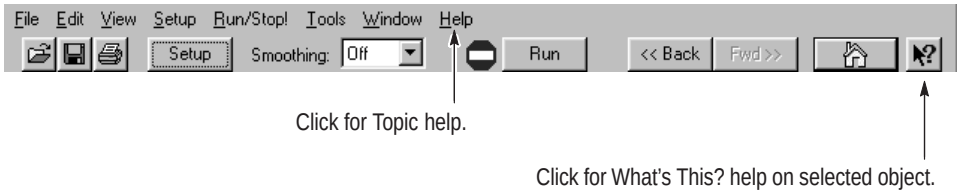


Figure 2–4: Help menu

Help Topics

Help topics tell you how to perform tasks and describe software features and selections shown on the screen. There are two types of help topics, reference topics and task topics.

Reference topics describe application features, such as the measurement windows. Reference topics may also describe concepts. Reference topics are available through the Help menu and through Help buttons in dialog boxes. From the Help menu, click Help Topics, and locate the topic using the Contents or Index tab. The Index tab is easier to use. As you enter a word into the text field, Help searches for and highlights the topic if one can be found. If not, try the Find tab. Enter a word or phase and help will display all topics that contain the word or phrase. The Help on Window selection in the Help menu provides reference help for the current window.

Task topics provide procedure information on how to perform specific tasks. Task topics are available through the Help menu. From the Help menu, click Help Topics, and locate the topic using the Contents or Index tab.

What's This? Help

What's This? help provides a short description of the control or screen feature selected. First, click the What's This? button on the toolbar as shown in Figure 2–4, and then click the item of interest.

Windows 95 Online Help

Information about Windows features is available through the Windows help system. Access Windows help as you would with any Windows application:

1. Go to the Windows taskbar and click Start.
2. Select Help from the popup menu.

NOTE. *To access Windows 95 help using the Touchscreen, press the START key on the font panel.*

Release Notes

The online Release Notes contain information about this release of the RFA300 application. Check the Release Notes for information such as software compatibility and software version differences from last release.

To access the Release Notes, go to the Windows 95 taskbar and click Start, or press the front panel START key. The Release Notes are at the top of the Start menu.

Backing Up Files

You should back up your files on a regular basis. Use the Windows Back Up tool to back up files stored on the hard disk. The Back Up tool is located in the following path: Programs\Accessories\System Tools\Back. Start the tool and determine which files and folders you want to back up. Use the Windows online help for information on using the Back Up tool.

In particular, you should back up your user-generated masks, setup files, and the results database files.

Reference

This section gives an overview of each measurement within the measurement set and the 8VSB transmitter.

Out of Channel Emissions

This section provides an overview of the Out of Channel Emissions measurement window. For more in-depth information, refer to the online help.

Out of Channel Emissions is a vital measurement that is specified by the FCC. To prevent interference outside of the allotted spectrum, the RF signal must comply with the specified mask for the transmitter under test.

NOTE. *The measurement set is limited to measurements between 0 and -80 dB on the FCC's scale.*

The measurement set performs the measurement by calculating the power of the signal that passed through an ≈ 30 kHz filter before being digitized. The measured values are adjusted to an equivalent 500 kHz noise bandwidth and divided by the total transmitter output power. This is the FCC measurement method.

The Out of Channel Emissions measurement window is shown in Figure 3–1. The measurement window contains the following areas:

- A listing of measurement results.
- A mask test pass or fail indicator.
- Controls for selecting the number of channels to display.
- Controls for resolution.
- Cursor direction controls.
- A listing of each cursor's position and the difference between the two.
- Graphic showing the spectral waveform with the selected mask overlaid on the spectrum display, if enabled from the setup (refer to *Out of Channel Emissions Setup* next).

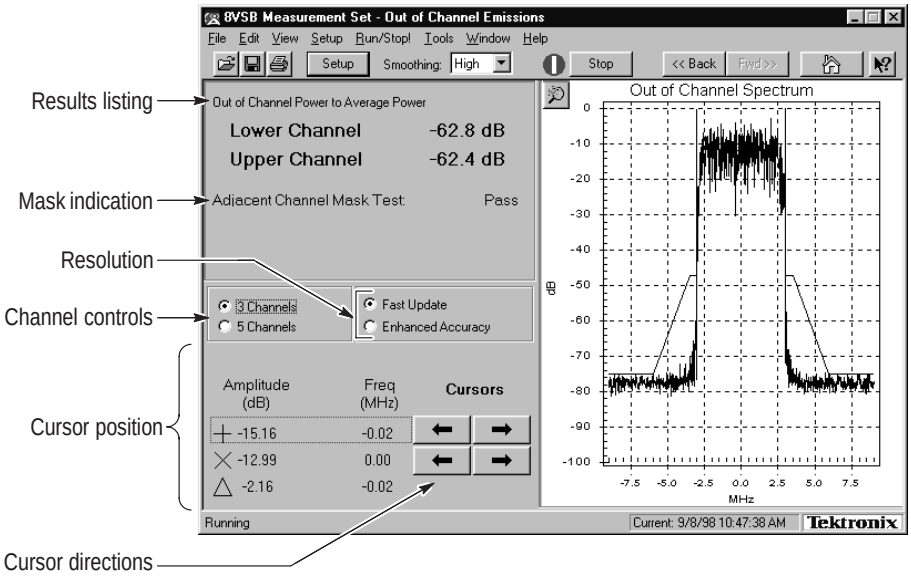


Figure 3–1: Out of Channel Emissions measurement window

Out of Channel Emissions Setup

Click the Setup button in the toolbar to enable mask testing and select a mask for the measurement window. The setup dialog box contains the control for turning masks on and off, plus a list of available masks. You can create your own mask and place it into the measurement set for use. Refer to *Appendix D: Mask File Formatting* in this manual for detailed instructions. Figure 3–2 shows the Out of Channel Emissions setup.

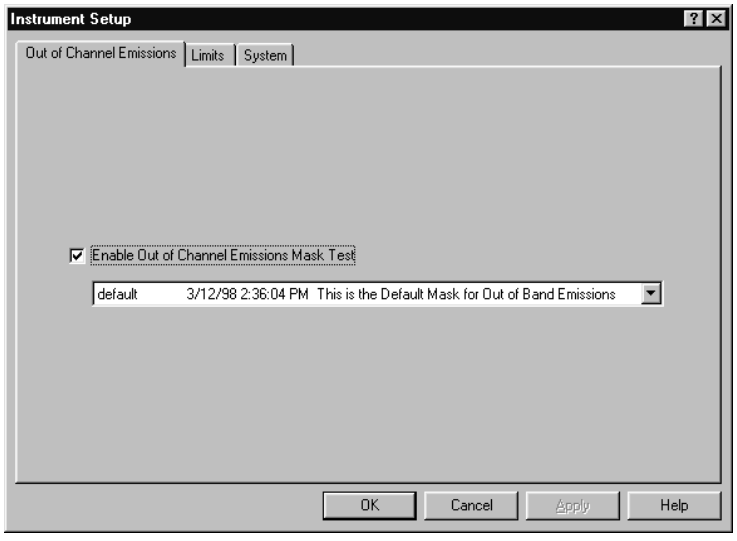


Figure 3–2: Out of Channel Emissions setup

S/N, EVM, and Pilot Amplitude Error

This section provides a brief overview of the Signal-to-Noise, Error Vector Measurement, and Pilot Amplitude Measurement window. For more in-depth information, refer to the online help.

The S/N, EVM, and Pilot Amplitude Error measurement window provides an overview of the transmitter's 8VSB signal quality. Signal-to-Noise (S/N), Error Vector Magnitude (EVM), and Complex Modulation Error Ratio (MER) are similar measurements. The calculations for each are slight deviations from each other. Refer to S/N, EVM, and Complex MER calculations in the online help.

Figure 3–3 shows the measurement window with the constellation display. The window contains the following areas:

- A listing of measurement results.
- Two display graphics: constellation and eye diagram.
- A control for turning equalization on and off. Equalization removes linear distortions from the measurements. This allows you to distinguish among causes of poor signal quality.
- A control for subtracting the pilot amplitude from the horizontal axis.

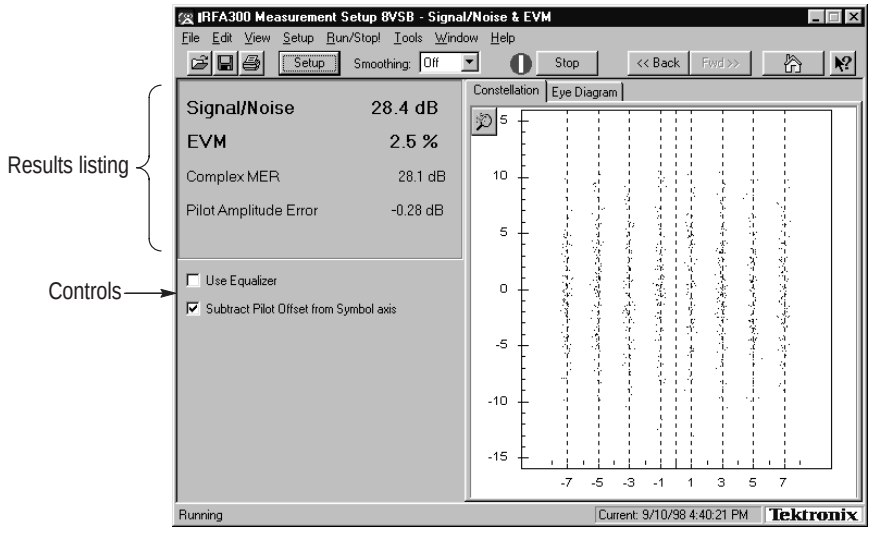


Figure 3–3: S/N, EVM, and Pilot Amplitude measurement window

S/N The S/N measurement provides a broad measure of impairments in the transmitted signal. S/N is the power ratio between the ideal received signal and the difference between the ideal and actual received signal as measured along the real axis during symbol times only. A comparison is made between the deviation

of the actual digitally modulated television signal and an ideal signal of the same data. This measurement is the major all-in-one indicator of the transmitter's signal quality. The test is an early indication of system problems before they become bit errors and is more sensitive to modulation errors than Bit Error Ratio (BER) tests.

EVM The EVM (Error Vector Magnitude) measurement also provides a broad analysis of the transmitted signal. EVM analysis can reveal incorrect filter shaping (see VSB Modulation on page 3–18) and other modulation quality problems.

Complex MER Complex MER is a complex form of S/N. The measurement is made by including Q (quadrature) channel information into the calculation. Refer to Complex MER calculation in the online help.

Pilot Amplitude Error This measurement shows any error of the pilot signal amplitude.

Phase Noise

This section provides a brief overview of the Phase Noise measurement window. For more in-depth information, refer to the online help.

This measurement window measures the random low frequency phase deviations of the entire 8VSB signal. Phase noise is typically added by the transmitter's frequency synthesizer system. Phase noise can reduce the S/N ratio.

The measurement set performs this measurement by calculating the residual phase jitter. This jitter is what is left after removing the effects of other transmission errors.

The Phase Noise measurement window is shown in Figure 3–4. The measurement window contains the following areas:

- Listing of measurement results
- A mask test pass or fail indicator
- Cursor direction controls
- Listing of each cursor's position and the difference between the two
- Graphic showing the pilot's phase noise spectral density measured in dBc/Hz versus frequency. The selected mask is overlaid on the display, if you enabled any in the setup (see *Phase Noise Setup* next).

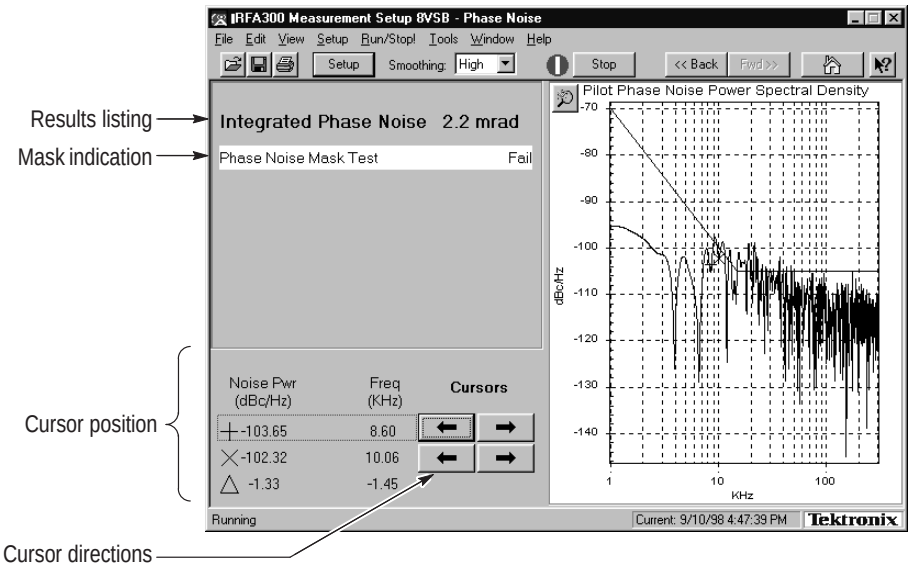


Figure 3–4: Phase Noise Measurement window

Phase Noise Setup

Click the Setup button in the toolbar to enable and select a mask for the measurement window. The setup dialog box contains the control for turning masks on and off, plus a list of available masks. You can create your own mask and place it into the measurement set for use. Refer to *Appendix D: Mask File Formatting* in this manual for detailed instructions. Figure 3–5 shows the Phase Noise setup.

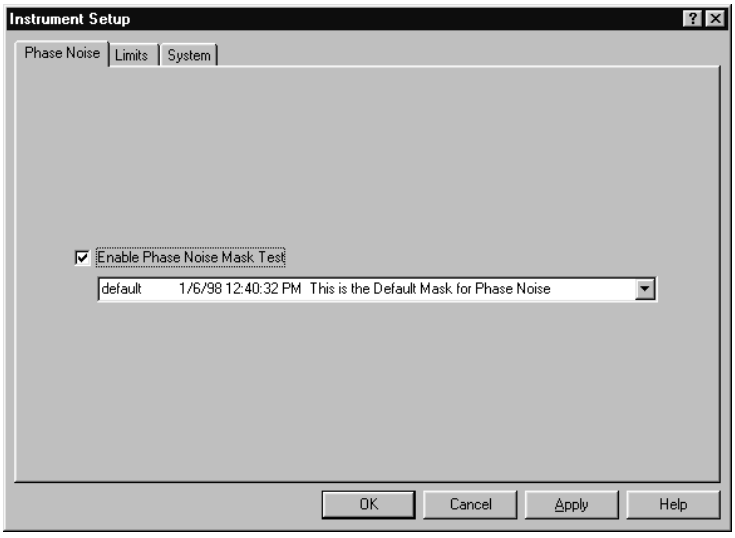


Figure 3–5: Phase Noise setup

Frequency Response and Group Delay

This section provides a brief overview of the Frequency Response and Group Delay measurement window. For more in-depth information, refer to the online help.

This measurement measures frequency response and group delay errors. These errors are the result of linear distortion caused by transmitter imperfections or possibly small impedance mismatches or both.

The frequency response errors are listed in dB. The frequency at which the minimum and maximum errors were found is also shown. Group delay errors are in nanoseconds.

The measurement set calculates these measurements by deriving the amplitude and time delay response of the channel from the equalizer tap coefficients. Frequency response and group delay are calculated relative to the pilot frequency or the center of the channel as selected in the setup.

The Frequency Response and Group Delay measurement window is shown in Figure 3–6. The measurement window contains the following areas:

- A listing of measurement results.
- Cursor direction controls.
- A mask pass or fail indicator for each measurement.
- A listing of each cursor's position and the difference between the two.
- Graphics showing frequency response measured in dB versus frequency and group delay measured in time (nanoseconds) versus frequency. Selected masks are overlaid on the display, if you enabled any in the setup (refer to *Frequency Response and Group Delay Setup* next).

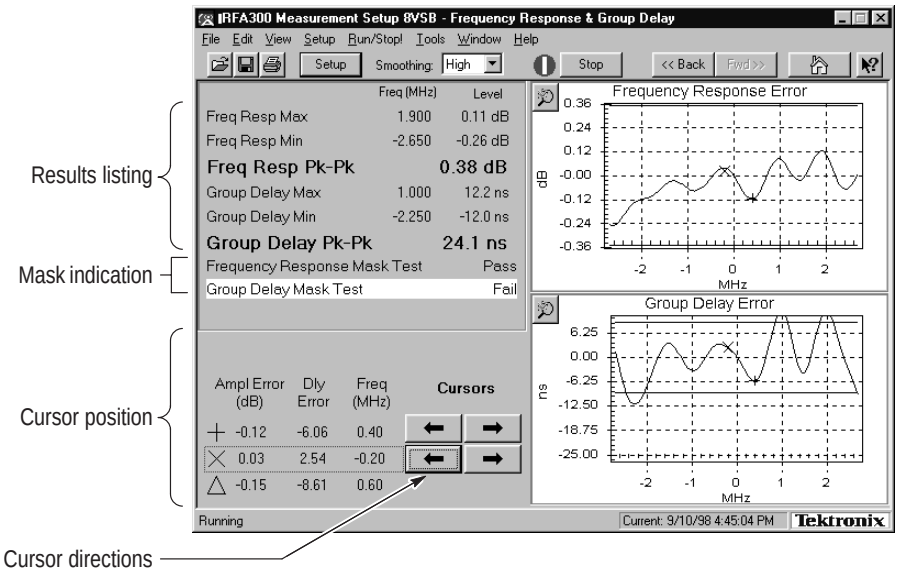


Figure 3–6: Frequency Response and Group Delay measurement window

Frequency Response and Group Delay Setup

Click the Setup button in the toolbar to enable and select a mask for each measurement in the measurement window. In addition, the setup has a reference point selection for the measurements: either channel center or the pilot. The setup contains the control for turning masks on and off, plus a list of available masks. You can create your own mask and place it into the measurement set for use. Refer to *Appendix D: Mask File Formatting* in this manual for detailed instructions. Figure 3–7 shows the Frequency Response and Group Delay setup.

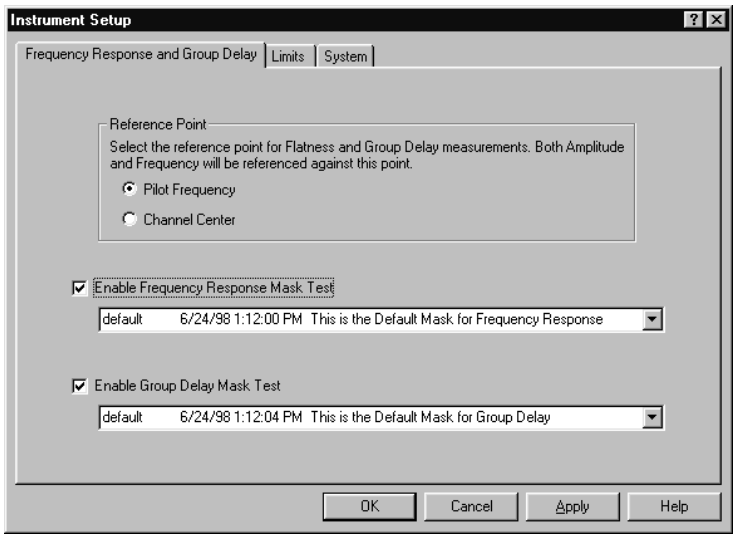


Figure 3–7: Frequency Response and Group Delay setup

Amplitude and Phase Errors

This section provides a brief overview of the Amplitude and Phase Errors measurement window. For more in-depth information, refer to the online help.

This measurement measures amplitude and phase errors, which are nonlinear distortions. A signal's phase can shift with amplitude. Transmitters, particularly high power ones, can exhibit amplitude errors in the form of clipping or compression when close to full power. These errors decrease a transmitter's Signal-to-Noise ratio, thereby reducing the coverage area.

The measurement set performs the measurement by calculating ideal signal magnitude and phase from the received I/Q signal and comparing it with the actual signal.

The Amplitude and Phase Errors measurement window is shown in Figure 3–8. The measurement window contains the following areas:

- A listing of measurement results.
- A mask test pass or fail indicator for each measurement.
- Cursor direction controls.
- A listing of each cursor's position and the difference between the two.

- Graphics showing signal amplitude error versus ideal signal amplitude measured in dB versus constellation units (refer to the *Glossary*) and signal phase errors versus ideal signal amplitude measured in degrees versus constellation units. The selected masks are overlaid on the graphics, if enabled from the setup (refer to *Amplitude and Phase Errors Setup* next).

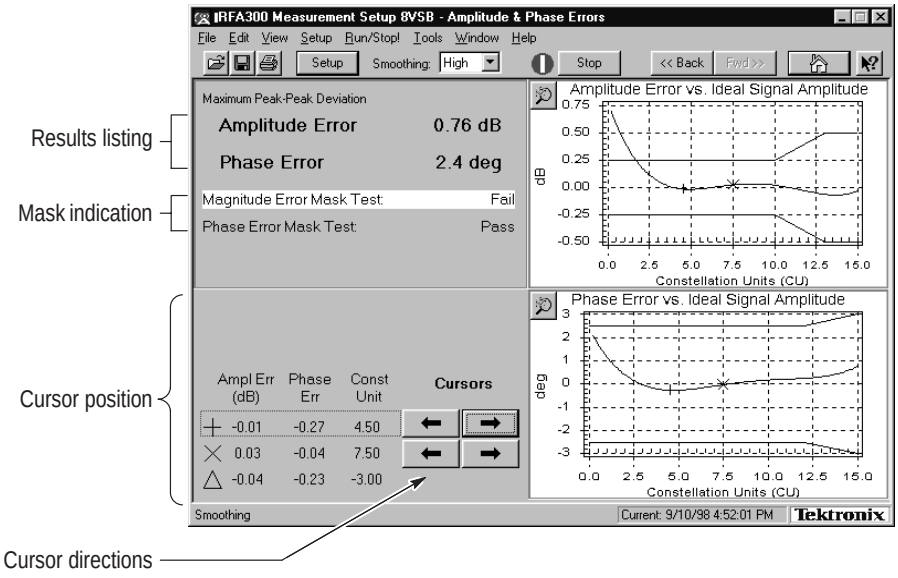


Figure 3–8: Amplitude and Phase Errors measurement window

Amplitude and Phase Errors Setup

Click the Setup button in the toolbar to enable and select masks for the measurement window. The Setup dialog box contains controls for turning masks on and off and selections for using different masks. You can create your own mask and place it into the measurement set for use. Refer to *Appendix D: Mask File Formatting* in this manual for detailed instructions. Figure 3–9 shows the Amplitude and Phase Errors setup.

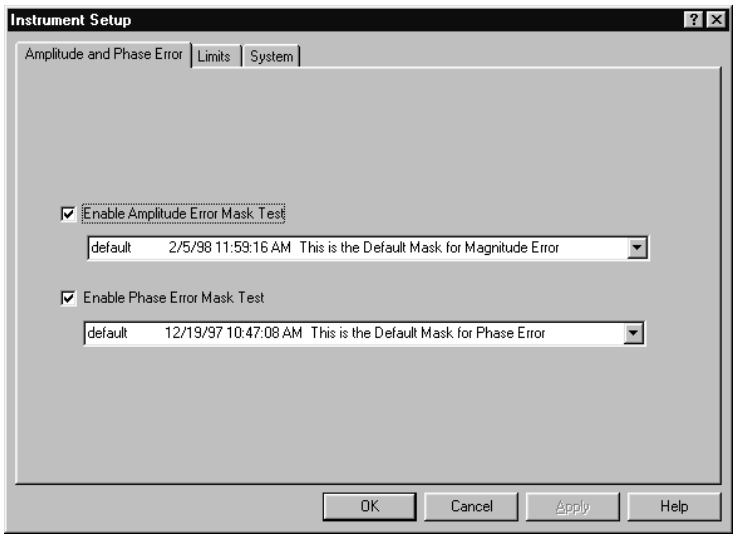


Figure 3–9: Amplitude Error and Phase Error setup

Peak-to-Average and Channel Spectrum

This section provides a brief overview of the Peak-to-Average and Channel Spectrum measurement window. For more in-depth information, refer to the online help.

This window measures the cumulative distribution of peak power over time. Peak power is the maximum value of envelope power that is randomly reached by the digitally modulated signal. Power amplifiers driven beyond their capability cause compression of peaks. This distorts the signal causing out of channel emissions and lower signal-to-noise ratio.

The measurement is calculated by taking the percentage of time that the signal is greater than the average amplitude. This measurement and the ideal are both plotted on the Peak-to-Average graph.

The Peak-to-Average and Channel Spectrum measurement window is shown in Figure 3–10. The measurement window contains the following areas:

- Listing of measurement results.
- A selection control for setting the target operating point in the peak-to-average graphic. Select the target operating point method in the setup (refer to *Peak-to-Average Setup* next).
- Graphics showing the measured and ideal peak-to-average power curves and the channel spectrum. The channel spectrum is another tool to assess a transmitter's amplitude linearity. To view this graph, click on the Channel Spectrum's tab (see Figure 3–10).

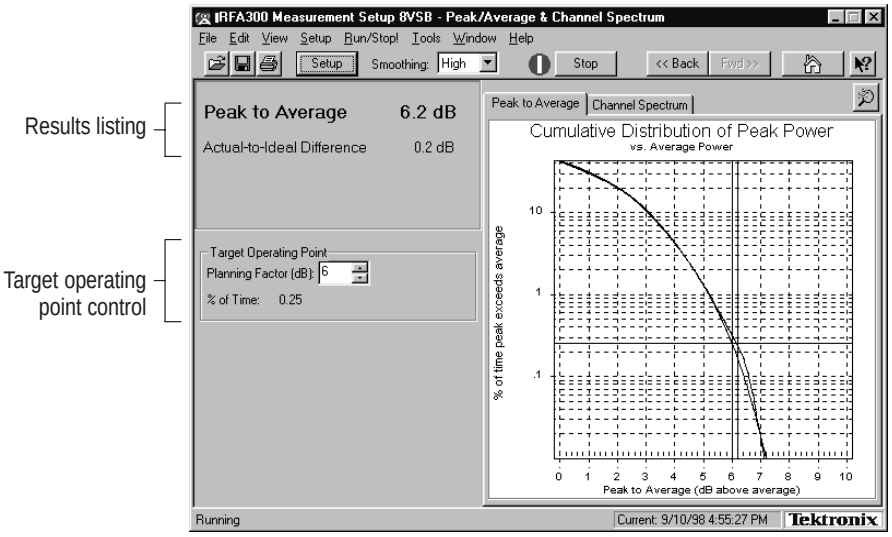


Figure 3–10: Peak-to-Average and Channel Spectrum measurement window

Peak-to-Average Setup

Click the Setup button in the toolbar to select the target operating point method for the measurement window. You can select in dB or percentage of time. Figure 3–11 shows the Peak-to-Average Setup.

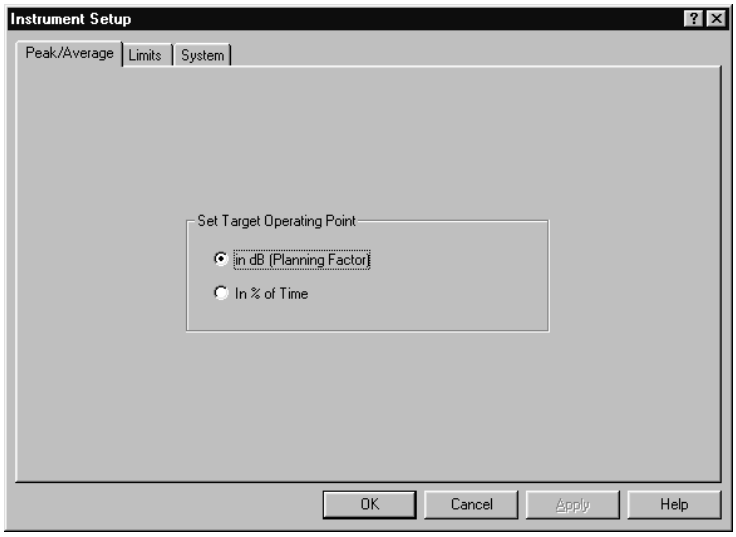


Figure 3–11: Peak-to-Average Setup

Signal Monitor

This section provides a brief overview of the Signal Monitor measurement window. For more in-depth information, refer to the online help.

The Signal Monitor allows you to continuously monitor one or more of the other measurements in one window while the instrument is unattended. You can enter the setup for each measurement in each measurement's Setup dialog box. Set all cautions and alarms in the Limits dialog box (refer to *Limits* on page 2–6). The selection of which measurements to monitor is made in the Signal Monitor Setup. Figure 3–12 shows the Signal Monitor measurement window.

Figure 3–12: Signal Monitor measurement window

Signal Monitor Setup

In addition to selecting measurements to monitor, you can also select the following in the Signal Monitor Setup:

- How often to save your results automatically, if at all.
- Size limit for the results database file.
- When and how to be notified of caution, alarm, and error conditions. Choices of how to be notified include sound, saving results, email, and by activation of an external device (see Figure 1–4 on page 1–8 for the alarm connection location).
- How often or when to be notified.

Figure 3–13 shows the Signal Monitor Setup.

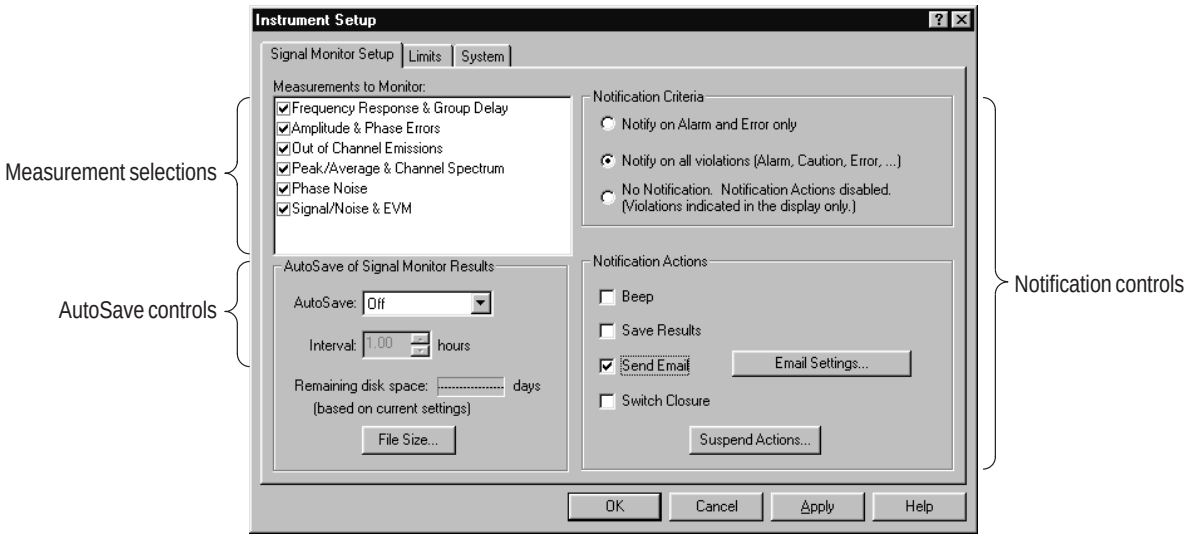


Figure 3–13: Signal Monitor Setup

8VSB Overview

This section provides an overview of the 8VSB transmitter. For a complete understanding of the transmitter, refer to Advanced Televisions Systems Committee (ATSC) Digital Television Standard document A/53. This document is available from the World Wide Web at ftp://atsc.org/pub/Standards.

The 8VSB standard is a RF modulation format used to broadcast Digital Television (DTV) to the home. This format was proposed by the ATSC and adopted by the FCC. The 8VSB transmitter generates the 8VSB signal as shown in Figure 3–14. The transmitter must take the bit-stream output from a MPEG II encoder and transmit it on a 6 MHz RF channel.

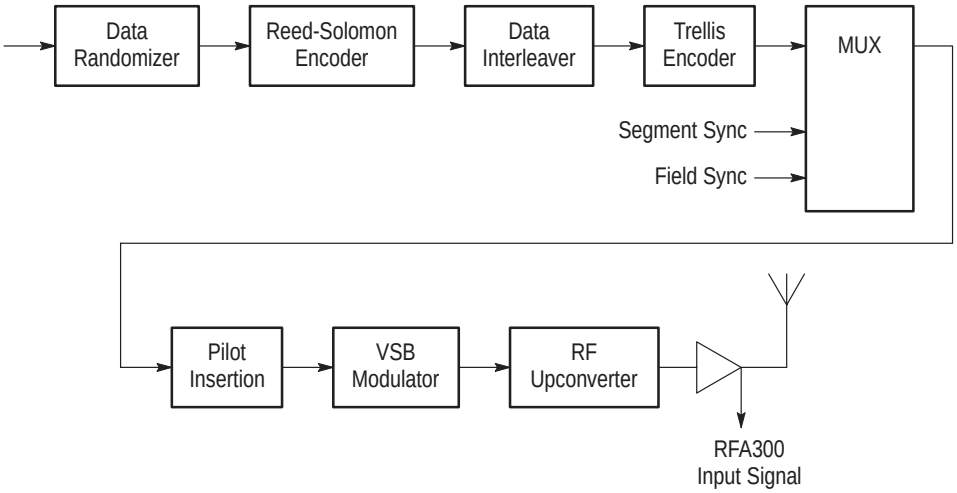


Figure 3–14: 8VSB exciter block diagram

Data Randomizer

In order to use the 6 MHz channel space with maximum efficiency, the 8VSB bit stream must be randomized with a pseudo-random bitstream. This ensures a flat noise-like spectrum and reduces interference to NTSC channels. A recurring rhythmic pattern causes the RF energy content to cluster at certain areas in the frequency spectrum. Therefore, without additional processing, certain parts of the 6 MHz channel could be overused, while other areas are underused. The Data Randomizer changes each byte value to a known pseudo-random binary sequence (PRBS). The PRBS process is reversed in the television receiver to recover the correct data value.

Reed-Solomon Encoder

The Reed-Solomon (RS) encoder uses Forward Error Correction (FEC) to correct received bit errors that can occur during transmission. The RS encoder takes the 187-byte data block and adds 20 parity bytes. The receiver compares the 187-byte block to the 20 parity bytes to determine if the data is valid. RS encoding can correct up to 10 byte errors per one 187-byte data block (packet).

Data Interleaver

Some noise burst durations are longer than the RS encoder can manage. For further protection, a time diversity scheme called data interleaving is used. Refer to Figure 3–15.

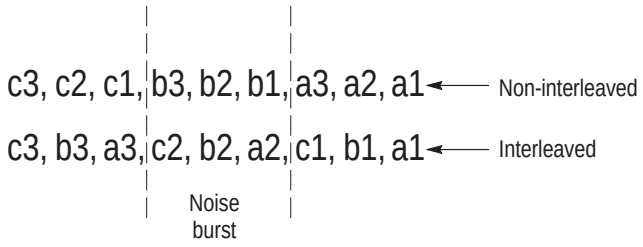


Figure 3–15: Data interleaving

A noise burst could delete all the b bytes of a non-interleaved signal resulting in a loss that the RS decoder in a receiver cannot recover. However, if the data is interleaved, only one byte is lost in each of the a, b and c byte segments of the interleaved signal. This leaves enough data for the decoder to determine the correct value. In reality, 8VSB data is interleaved to a depth of 52. This allows the decoder to determine the correct value of data that has been damaged by a 193 μs noise burst.

Trellis Encoder

A Trellis Encoder is another Forward Error Correction method. However, where as the RS encoder dealt with the entire data packet as a block, the Trellis encoder affects the stream of bits as they develop through time. Trellis encoding is accomplished by Trellis-Coded Modulation (TCM). TCM is a combination of coding and modulation that does not require additional bandwidth expansion although there are extra bits for FEC.

The Trellis encoder takes an eight-bit byte and splits it into four two-bit words. Every two-bit word is compared with previous words. A three-bit code is assigned to each two-bit word that describes the transition from the previous word to the current one. Therefore, for every two bits in, the encoder produces three bits out. The Trellis decoder (Viterbi) in a receiver uses the three bits to reconstruct the evolution of the data stream from one two-bit word to the next. The Trellis and Viterbi coding scheme is very effective in managing white noise.

Multiplexer

Supplementary sync signals are added to a multiplexer to form the 8VSB baseband signal. Each of the eight levels represents a symbol value. After every 828 symbols, a Segment sync is sent. The Segment sync is two-level binary data that is 10 constellation units peak-to-peak in amplitude and four symbols long. This makes each 8VSB data segment 832 symbols long as shown in Figure 3–16. The Segment sync has two roles: it replaces the sync byte that was removed before the RS encoding, and it increases the signal robustness. It is easily located by the receiver's decoder in the presence of noise.

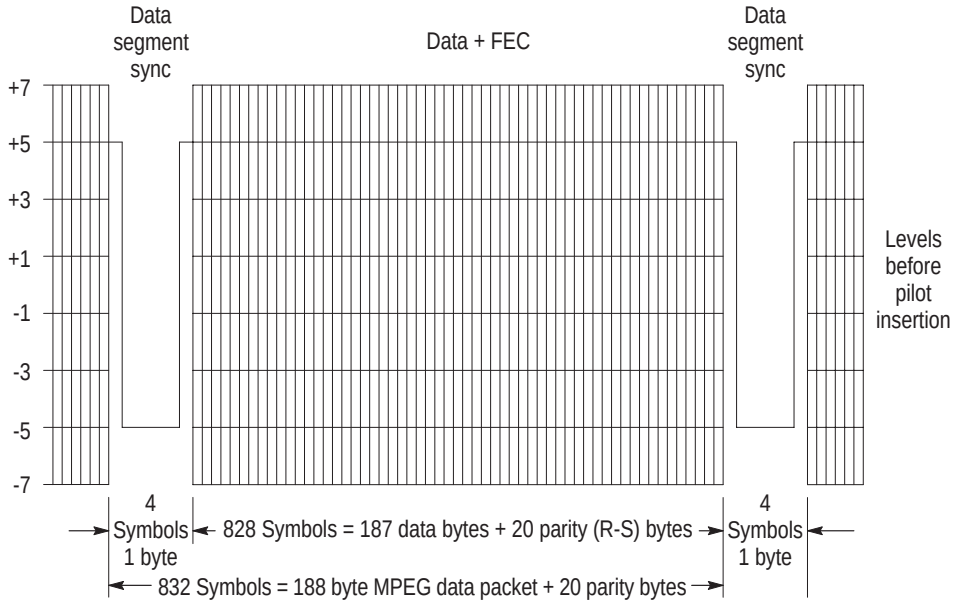


Figure 3–16: Data segment sync

The other sync signal added to the multiplexer is the Frame synchronizing segment. As shown in Figure 3–17, a transmission data frame is 616 segments (48.4 ms) long. A Frame sync segment is sent every 313 segments (24.2 ms). The Frame sync segment carries the training reference signals for the receiver equalizer. It consists of the following:

- Four byte segment sync.
- Five hundred and eleven reference symbols that the receiver uses for adjusting long equalizer taps.
- Three sets of 63 reference symbols for short equalization.
- Twenty-four symbols for VSB level ID.
- Ninety-two reserved symbols.
- Twelve symbols repeated from the previous segment.

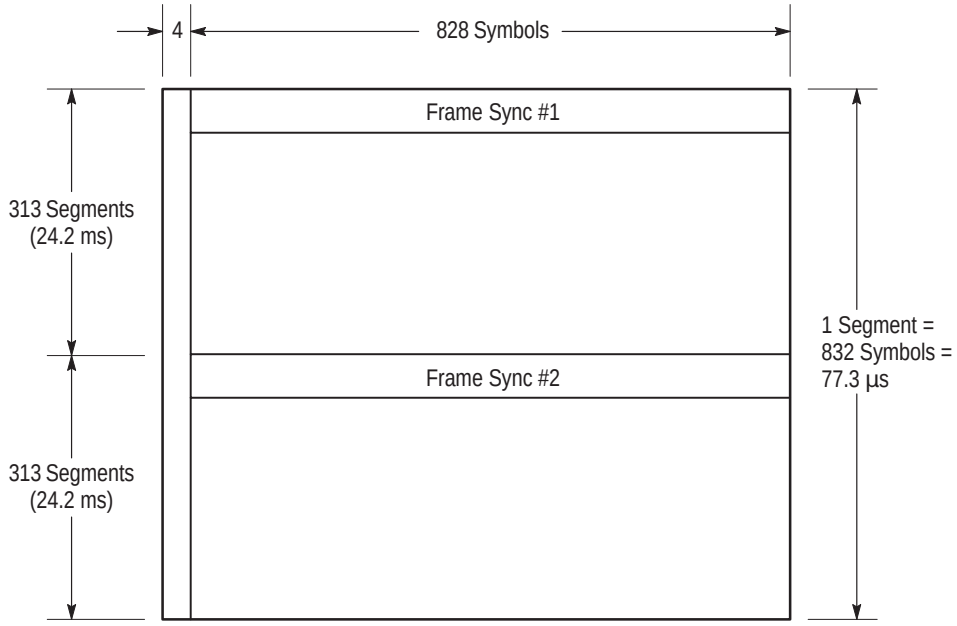


Figure 3–17: Frame synchronizing segment

Pilot Insertion

A small DC offset is added to the baseband signal to produce a pilot at the carrier frequency of the resulting modulated spectrum. The pilot is 0.3 dB of average signal power and is used by the receiver for carrier acquisition. The receiver then uses the Segment sync to lock on the symbol timing.

VSB Modulation

The 8VSB signal is transmitted as a single sideband suppressed carrier signal. The baseband signal is typically mixed with a 44 MHz signal and passed through a root-raised cosine filter. The output is a 44 MHz IF signal, upper sideband only, with root-raised cosine response.

Correction Processor

A correction processor is either a closed-loop correction system or an open-loop correction system, depending on how advanced the transmitter is. The correction processor is used to shape the exciter signal to precorrect for frequency response and envelope delay errors in the transmitter power amplifier. Precorrection can also reduce non-linear errors.

A closed-loop system samples the outgoing RF to determine what type and how much correction is needed and adjusts the precorrection accordingly. A less advanced transmitter can have an open-loop precorrection system that requires manual adjustments to the controls in a shaping network to produce the corrected output.

Appendix A: Specifications

This section lists the electrical, physical, and environmental characteristics of the RFA300 Measurement Set 8VSB. The specifications given for return loss and input signal amplitude are for the measurement sets with the 10 dB internal attenuator modification. If you have an unmodified RFA300 measurement set, with an internal 20 dB input attenuator, the input signal amplitude specification given for use with the external 10 dB attenuator connected applies.

Specification Tables

The tables list the specifications for the RFA300 Measurement Set 8VSB. All specifications are guaranteed unless labeled typical. Typical specifications are provided for your convenience but are not guaranteed. Specifications marked with the ✓ symbol are checked in the Performance Verification Procedures (refer to the *RFA300 Measurement Set 8VSB Service Manual*).

Performance Conditions

The Performance requirements are valid within the environmental limits if the instrument was adjusted at 25°C ± 5°C and you allowed a minimum warm-up time of 20 minutes.

The measurement set is limited to situations where a single, high-amplitude, 8VSB RF signal is available for direct input to the measurement set.

RFA300 Measurement Set Specifications

Table A–1: Input specifications

Characteristic	Description
RF Input	
Input Frequency Range	
Demodulation Modes	Channel 7 through Channel 69 (174 MHz to 806 MHz)
Out-of-channel Emission Modes	162 MHz to 818 MHz
Input impedance	50 Ω
✓Return Loss	Greater than 25 dB, 174 MHz to 806 MHz (typically greater than 30 dB).
Signal Amplitude	
Without external 10 dB attenuator	1 mW to 1 W (0 dBm to +30 dBm) **Note:** The input power indicator indicates over amplitude power input beginning at 0.2 W (+23 dBm). The variable attenuator of the input circuitry has enough range to handle up to 1 W at the input connector.
With external 10 dB attenuator or with internal 20 dB attenuator	10 mW to 2 W (+10 dBm to +33 dBm)
IF Filter	For all measurements requiring demodulation, the 8VSB signal is passed through a DSB-based vestigial sideband IF filter with the characteristics given in the formula shown in Figure A–1. The formula also defines the idealized frequency response curve of the transmitter.
Adjacent Channels	≤ 50 dB, Analog ≤ 50 dB, Digital This specification is the allowable signal amplitude of TV signals other than the one the RFA300 is to measure. It is defined as the ratio of the desired signal's average power divided by the sync tip power of analog TV or average power of DTV signals.
Other Spurious Signals	≤ 50 dB

$$H(F) = \begin{cases} 0 & -\infty < F \le \left(F_{Pilot} - \dfrac{F_{Symbol}\alpha}{4}\right) \\ \sqrt{\dfrac{1}{2}\left[1 + \sin\left(2\pi \dfrac{(F - F_{pilot})}{F_{Symbol}\alpha}\right)\right]} & \left(F_{Pilot} - \dfrac{F_{Symbol}\alpha}{4}\right) < F \le \left(F_{Pilot} + \dfrac{F_{Symbol}\alpha}{4}\right) \\ 1 & \left(F_{Pilot} - \dfrac{F_{Symbol}\alpha}{4}\right) < F \le \left(F_{Pilot} + \dfrac{F_{Symbol}}{2}\left(1 - \dfrac{\alpha}{2}\right)\right) \\ \sqrt{\dfrac{1}{2}\left[1 - \sin\left[2\pi \dfrac{\left(F - F_{Pilot} - \dfrac{F_{Symbol}}{2}\right)}{F_{Symbol}\alpha}\right]\right]} & \left(F_{Pilot} + \dfrac{F_{Symbol}}{2}\left(1 - \dfrac{\alpha}{2}\right)\right) < F \le \left(F_{Pilot} + \dfrac{F_{Symbol}}{2}\left(1 + \dfrac{\alpha}{2}\right)\right) \\ 0 & \left(F_{Pilot} + \dfrac{F_{Symbol}}{2}\left(1 + \dfrac{\alpha}{2}\right)\right) < F < \infty \end{cases}$$

Where:

$$F_{Symbol} = \left(\frac{1539}{715}\right) 5 \times 10^6 = 10,762,238 \ MHz$$

Tol: ± 30 *Hz*
Perform all calculations using the nominal value

$$\alpha = \frac{2(6 \ MHz)}{F_{Symbol}} - 1 = 0.1150097$$

Figure A–1: IF filter characteristics

Measurement Specifications

Table A–2: Measurement specifications

Characteristic	Description
S/N (Signal to noise ratio)	S/N is the ratio of ideal signal power to all other signal contributions (noise, distortion products, etc.). Data is taken only from the I channel (that is the real axis; in phase with the pilot) at each symbol time. $S/N = 20\ log \left[\frac{\sqrt{\sum_{j=1}^{N} \left(I_j^{\,2} \right)}}{\sqrt{\sum_{j=1}^{N} \left(\delta I_j^{\,2} \right)}} \right]$ Where: S/N = Signal to Noise Power Ratio in dB. I_j = Ideal received I-channel signal δI_j = Error in the actual received I-channel signal.
S/N Accuracy	Reading is within ± 1 dB of the correct value. When S/N ≥ 25 dB with high smoothing
✓Residual S/N	≥ 40 dB The amount of S/N that is created within the instrument.

Table A–2: Measurement specifications (Cont.)

Characteristic	Description
EVM (Error vector magnitude)	EVM is the square root of the mean of the squares (RMS) of the magnitudes of the real axis symbol error vectors, divided by the magnitude of the real (in-phase) part of the outermost ideal constellation state. The symbol error is the difference between the received real axis symbol and ideal its ideal value. EVM is often expressed as a percent. Error Vector Magnitude (EVM) is defined by the following formula: $EVM_{RMS} = \sqrt{\frac{\frac{1}{N}\sum_{j=1}^{N} \delta I_j^{\,2}}{S_{max}^{\,2}}} \; x \; 100\%$ Where: EVM_{RMS} = Error Vector Magnitude (%) δI_j = The error in the real axis received signal value. S_{max} = Magnitude of the real (in-phase) part of the vector to the outermost state of the constellation. EVM can also be expressed in terms of dB, where EVMdB = 20*log(100/EVM%) Note that the ratio in intentionally inverted to make the value in dB positive.
EVM Accuracy	± 12% of the correct reading. When S/N ≥ 25 dB with high smoothing
✓Residual EVM	≤ 1% Residual EVM is created within the RFA300 measurement set.

Table A–2: Measurement specifications (Cont.)

Characteristic	Description
Complex MER (Modulation Error Ratio)	Complex Modulation Error Ratio (Complex MER) is a complex form of the S/N measurement that is made by including Q (quadrature) channel information in the ideal and error signal power computations, similar to EVM. MER is defined by the following formula: $MER = 20 log \left[\frac{\sqrt{\sum_{j=1}^{N} \left(I_j^2 + Q_j^2 \right)}}{\sqrt{\sum_{j=1}^{N} \left(\delta I_j^2 + \delta Q_j^2 \right)}} \right]$ Where: MER = Modulation error ratio I_j and Qj = Ideal I-channel and Q-channel symbols δI_j and δQj= Errors between received and ideal I-channel and Q-channel symbols.
MER Accuracy	± 1 dB of the correct reading. When S/N ≥ 25 dB with high smoothing
✓Residual MER	≥ 40 dB Residual MER is created within the RFA300 measurement set.
Pilot Amplitude Deviation	± (0.1 dB + 0.2 × deviation reading) dB When S/N ≥ 25 dB with high smoothing

Table A–2: Measurement specifications (Cont.)

Characteristic	Description
Out-of-Channel Emissions	Out of channel emissions are spectral power versus frequency measurements similar to those made by a spectrum analyzer. FCC Out of Channel Emissions Standard as referenced to MM Docket No. 87-268. In the first 500 kHz from the authorized channel edge, transmitter emissions must be attenuated no less that 47 dB below the average transmitted power. More than 6 MHz from the channel edge, emissions must be attenuated no less than 110 dB below the average transmitted power. At any frequency between 0.5 MHz and 6 MHz from the channel edge, emissions must be attenuated no less than the value determined by the following formula: Attenuation in dB = –11.5(△f + 3.6) where △f = frequency difference in MHz from the edge of the channel. All attenuation limits are based on a measurement bandwidth of 500 kHz. The 8 VSB Transmitter Emissions Mask for the measurements is shown in Figure A–2. This mask lowers the power radiated in the adjacent channel to a level of –44 dB below the average power transmitted. Other measurement bandwidths may be used as long as the appropriate correction factors are applied. In the event interference is caused to any service, greater attenuation may be required.
✓Measurement Limit	≥ –80 dB_{DTV} dB_{DTV} is dB as defined by the FCC's measurement method.
✓Out-of-Channel Accuracy	± 2 dB over a range of ± 12 MHz with respect to the edges of the channel in use
Upper/Lower Channel Power Accuracy	± 3 dB Shows the integrated power present in the upper and lower adjacent channels.
Transmitter Frequency Response Error	Plots the deviation of the transmitter's spectral amplitude as a function of frequency with respect to the ideal 8VSB root-cosine transmitter curve.
Frequency range	Measurements are made from 0 to +5.68 MHz with respect to the pilot frequency of the signal under test.
Display accuracy	± (0.25 + 0.05 × p-p measured amplitude deviation) dB
✓Residual Flatness Error	0.25 dB peak-to-peak error over the frequency range
Transmitter Group Delay	Plots deviation of the transmitter's spectral group delay response from the ideal. The ideal group delay response is zero variation over the channel bandwidth.
Frequency Range	From 0 kHz to +5.68 MHz with respect to the pilot frequency of the signal under test.
Display Accuracy	± (4 + 0.2 × p-p measured group delay deviation) ns
✓Residual Group Delay Error	8 ns peak-to-peak over the frequency range
Amplitude Error	Plots the transmitter's instantaneous amplitude error as a function of amplitude. This error is typically caused by an amplifier's gain changing because of signal amplitude.
Accuracy	± (0.1 + 0.2 × p-p dB p-p measured amplitude error) dB
Phase Error	Plots the signal's instantaneous phase error as a function of amplitude. This error is typically caused by variation of an amplifier's phase because of signal amplitude.
Residual Phase Accuracy	± (5 + 0.2 × p-p degrees measured error) degree

Table A–2: Measurement specifications (Cont.)

Characteristic	Description
Phase Noise	
Phase Noise Marker Accuracy	± 5 dB
✓Residual Phase Noise	≤ –105 dBc/Hz at 20 kHz carrier offset This is the single sideband noise exhibited by the RFA300 local oscillator.
Residual Phase Jitter	≤ 5 milliradians RMS, integrated over the range from 2 kHz to 300 kHz.
Peak-to-Average Ratio	
Marker Accuracy	± 1 dB

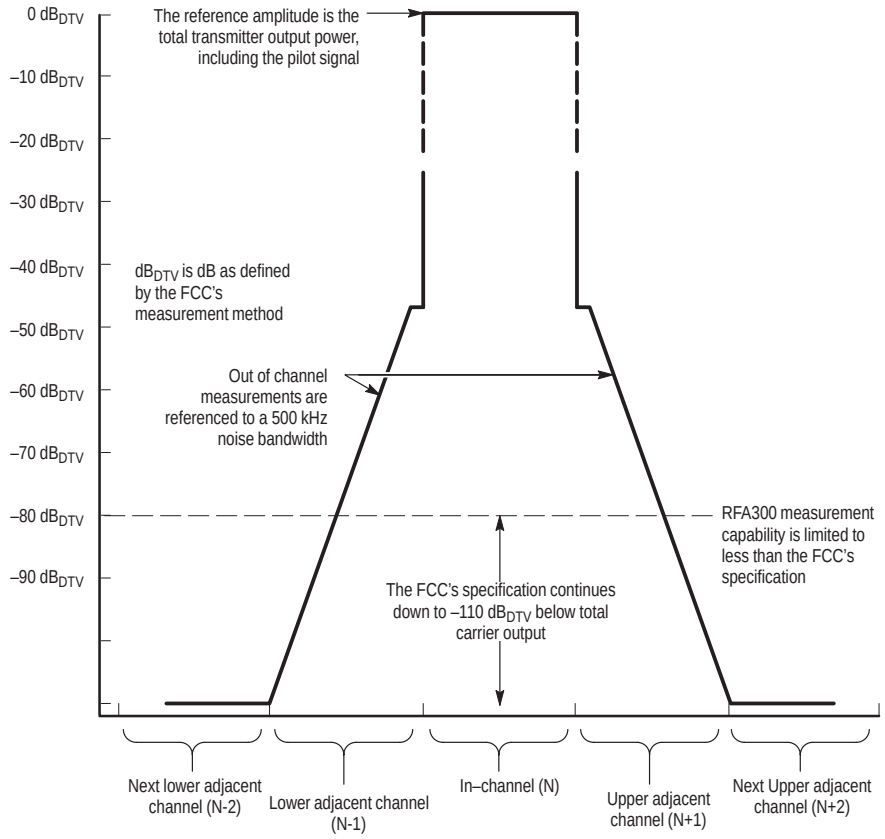


Figure A–2: 8VSB transmitter emissions mask

Platform Characteristics

Table A–3: Processor system characteristics

Characteristic	Description
CPU Processor Type	Intel P5 – 200 MMX processor with an Intel 82430HX (Triton II) PCI chip set.
Main Memory	EDO DRAM resides on the host processor bus via the 82430HX chip set.
Available Configurations	Standard: 32 MByte Enhanced: 128 MByte
Style	16M & 64M SODIMM
Speed	60ns
Burst Read page hit/miss	4-2-2-2/10-2-2-2
Installed Configuration	32 MByte; must be installed in 16 MByte pairs
Cache Memory	Level 2 (L2) Write-back cache resides on the host processor bus via the 82430HX chip set.
Capacity	256 KByte
Style	Fixed SMT, not socketed
Speed (data/tag)	8.5/10ns
Burst Read Cycle	3-1-1-1
Burst Writes Cycle	3-1-1-1
Flash BIOS	Provides PC Plug-and-Play services with and without Windows 95/NT PnP OS. Flash based BIOS, field upgradable via a floppy disk. Forced recovery capable via floppy.
Capacity	1 MByte
Style	Fixed SMT, not socketed
Real-Time Clock and CMOS Setups NVRAM	Real-time clock/calendar with a resolution of 1 second or less. Standard and advanced PC CMOS setups, see BIOS specifications.
Retention Time: RTC, CMOS Setup, & PnP NVRAM	Battery life is typically > 7 years
Floppy Disk Drive	Standard 3.5" PC compatible High-Density Floppy Disk Drive (FDD) connecting to the ISA bus via a Super I/O controller.
Size	1.44 MByte
Technology	High-density double-sided (2HD)
EIDE Hard Disk Drive	Standard PC compatible Enhanced Integrated Device Electronics (EIDE) HDD connecting to the Front Panel Interface Board.
Formatted Capacity	1.4 / 2.1 GByte replaced by 3.2 GByte drive (119-6232–60)
Interface	ATA/Enhanced IDE (EIDE)

Table A–3: Processor system characteristics (Cont.)

Characteristic	Description
CD-ROM	PC compatible half height IDE CD-ROM drive connecting to the Front Panel Interface Board.
Interface	IDE (ATAPI)
Speed	>8X

Table A–4: Display system characteristics

Characteristic	Description
System Classification	Standard PC graphics accelerator technology (bitBLT based) residing on the Peripheral Component Interconnect (PCI) bus capable of supporting both an internal color LCD display and an external color SVGA/XGA monitor, as well as support multimedia graphics, MPEG-1 compression and YCrCb Video. Cirrus Logic CL-GD7555 GUI-Accelerated XGA/SVGA controller chip utilized.
Display Memory	DRAM based frame-buffer memory.
Installed	2 MByte
Width	32-bit
Style	Fixed SMT, not socketed
Speed	70 ns dual-CAS DRAM
Display Selection	Hardware sense of external SVGA monitor during BIOS boot sequence defaults to the internal color LCD display, or, if attached, to an external SVGA monitor. Dual display (Simulscan) of the external SVGA monitor with the internal color LCD is possible as long as internal and external displays operate at the same resolution (limited to 640x480 on current TFT LCD) and display rates.
External Display Drive	1-SVGA/XGA compatible analog output port. Display Size: user selected via Win95/NT display applet. Resolution (Pixels) / Colors / DDC1 640x480: / 256 / yes 640x480: / 64K / yes 640x480: / 16.8M (infinite colors) / no 800x600: / 256 colors / yes 800x600: / 64K colors / yes 1024X768: / 256 colors / yes 1280X1024: / 256 colors / yes
Internal Display Classification	Color LCD (NEC TFT NL6448AC33-24) Thin Film Transistor (TFT) 10.4” active-matrix color LCD display whose intensity is controllable via software.

Table A–4: Display system characteristics (Cont.)

Characteristic	Description
Internal Display Resolution and Area	Color LCD (NEC TFT NL6448AC33-24): 640 pixels horizontal by 480 pixels vertical (640X480) with 211.2 mm (8.3″) by 158.4mm (6.2”) of viewing area (10.4” diagonal).
Internal Display Color Scale	Color LCD (NEC TFT NL6448AC33-24)
Internal Display Viewing Angle	Color LCD (NEC TFT NL6448AC33-24): Contrast ratio of no more than 10:1: Horizontal (θ_x): 80 degrees typical left/right. Vertical (θ_y) : 80 degrees typical upside/downside.
Internal Display White Luminance (brightness) and Uniformity	Color LCD (NEC TFT NL6448AC33-24): L max: 180 cd/m^2 typical
Internal Display Contrast Ratio	Color LCD (NEC TFT NL6448AC33-24): Typical: 150:1
Internal Display Refresh Rates	Color (NEC TFT NL6448AC33-24): 59.94 frames/sec max, non-interlaced.

Table A–5: Front panel interface characteristics

Characteristic	Description
Mouse Port	PS2 compatible mouse port utilizing a mini-DIN connector. Pin assignments: 1. data — 4. +5V. 2. NC — 5. clock 3. ground — 6. NC
Keyboard Port	PS2 compatible keyboard port utilizing a mini-DIN connector. Pin assignments: 1. data — 4. +5V. 2. NC — 5. clock 3. ground — 6. NC
USB Port	Series A USB receptacle Pin assignments: 1. Vbus — 3. +Data 3. +data — 4. GND
Touch Panel	Standard 10.4 in. touch panel pointing device mounted on the surface of the TFT display, connecting to the Front Panel Interface Board.

Table A–6: Rear panel interface characteristics

Characteristic	Description
Parallel Interface Port	Port supports standard Centronics mode, Enhanced Parallel Port (EPP), or Microsoft high-speed mode (ECP) and utilizes a 36-pin high-density mini-D connector. Compliant with IEEE P1284-C/D2 for bi-directional Parallel Peripheral Interface for Personal Computers (draft) style 1284-C. Pin assignments for compatible mode: 1. BUSY — 19. GND 2. SLCT — 20. GND 3. ACK* — 21. GND 4. ERR* — 22. GND 5. PE — 23. GND 6. DO — 24. GND 7. D1 — 25. GND 8. D2 — 26. GND 9. D3 — 27. GND 10. D4 — 28. GND 11. D5 — 29. GND 12. D6 — 30. GND 13. D7 — 31. GND 14. INIT* — 32. GND 15. STB* — 33. GND 16. SLIN* — 34. GND 17. AFD* — 35. GND 18. HLH — 36. PLH See IEEE P1284-C for pin connection definitions for other modes
Serial Interface Port (On circuit card mounting bracket)	9-pin male D-sub connector to support RS232/485 serial port. Compliant to EIA/TIA 574 Pin Assignments (RS232): 1. DCD — 6. DSR 2. RXD — 7. RTS 3. TXD — 8. CTS 4. DTR — 9. RI 5. GND Pin Assignments (RS485): 1. RXD– — 6. CTS– 2. RXD+ — 7. RTS+ 3. TXD+ — 8. CTS+ 4. TXD– — 9. RTS– 5. GND

Table A–6: Rear panel interface characteristics (Cont.)

Characteristic	Description
Serial Interface Port (on back panel)	9-pin male D-sub connector RS232 Pin Assignments (RS484): 1. RXD– 6. CTS– 2. RXD+ 7. RTS+ 3. TXD+ 8. CTS+ 4. TXD– 9. RTS– 5. GND
SVGA Output Port	15-pin female high density-D-sub SVGA connector. Compliant with EIA RS 343A. Selectable 640 X 480 (VGA), 800 X 600, and 1024 X 768 (SVGA). When internal display is active, VGA mode must be selected for this SVGA output port. Pin assignments: 1. Red 9. (key) 2. Green 10. GND 3. Blue 11. NC 4. NC 12. NC 5. GND 13. HSYNC 6. AGND 14. VSYNC 7. AGND 15. NC 8. AGND
USB Port	Series A USB receptacle Pin assignments: 1. Vbus 3. +Data 2. –Data 4. GND
Ethernet Port	10 Base-T/100 Base-T on PCI bus, RJ45 Connector, Plug & Plan compatible, Bus master mode. RJ45 Pin assignments: 1. TX+ 5. NC 2. TX– 6. RX– 3. RX+ 7. NC 4. NC 8. NC
Alarm Contacts	DB-9 female connector. C-form relay contacts change state upon an alarm condition Contact Ratings 28 V, 2A maximum. Pin assignments: 1. Normally open 3. Common 5. Normally open

Power Characteristics

Table A–7: AC power source characteristics

Characteristic	Description
Source Voltage	Range for the line voltage needed to power the measurement set to meet performance requirements. 90 VAC to 250 VAC RMS, 47 Hz to 63 Hz, continuous range CAT II
Fuse Rating	8 A Fast / 250 V
Maximum Power Consumption	540 Watts max, 170 Watts typical
Steady State Input Current	6 Amps max, 1.9 Amps RMS typical
Inrush Surge Current	65 Amps maximum
Power Factor Correction	Yes

Environmental Characteristics

Table A–8: Environmental characteristics

Characteristic	Description
Cooling airflow	Intake is from the front and sides of the instrument. Exhaust is to the bottom and rear of the instrument.
Required Clearance	2 in. (50 mm) air space adjacent to the bottom of the instrument is required.
Use Rating	Rated for indoor use only.
Atmospherics	
Temperature:	
Operating (meeting accuracy specifications)	0°C to 45°C (32°F to 113°F), 30°C/hr max gradient, non-condensing (derated 1°C or 1.8 °F per 1,000 ft. or 305 m above 5,000 ft. or 1524 m altitude)
Operating (without damage)	0°C to 50°C (32°F to 122°F), 30°C (54°F)/hr max gradient, non-condensing (derated 1°C per 1,000 ft. or 305 m above 5,000 ft or 1524 m altitude) With a floppy diskette media in the floppy drive the operating specification lower limit is 10°C (50°F).
Non-operating	–20°C to 60°C (–4°F to 140°F), 30°C (54°F)/hr max gradient, non-condensing.
Humidity	
Operating	20% to 80% relative humidity, non-condensing. Max wet bulb temperature: 31°C or 87.8°F (derates relative humidity to ~50% at 50°C or 122°F).
Non-operating	8% to 80% relative humidity, non-condensing. Max wet bulb temperature: 40°C or 104°F (derates relative humidity to ~55% at 50°C or 122°F).

Table A–8: Environmental characteristics (Cont.)

Characteristic	Description
Altitude	
Operating	Up to 10,000 ft. (3,040m), (derated 1°C or 1.8°F per 1,000 ft. [305 m] above 5,000 ft. [1524 m] altitude)
Non-Operating	40,000 ft (12,190 m)

Table A–9: Dynamics

Characteristic	Description
Random Vibration:	
Operating	0.27 g RMS otal from 5 to 500 Hz, 10 minutes each axis, 3-axes, 30 minutes total.
Non-Operating	2.28 g's RMS total from 5 to 500 Hz, 10 minutes each axis, 3-axes, 30 minutes total.
Functional Shock: Operating	Half-sine, 30 g's, 11ms duration. 3 drops each side, 18 shocks total (no media in floppy disk drive).

Table A–10: Transportation

Characteristic	Description
Transportation Package Material	Transportation Package material meets recycling criteria as described in Environmental Guidelines for Package Design (Tektronix part number 063-1290-00) and Environmentally Responsible Packaging Handbook (Tektronix part number 063-1302-00).

Electromagnetic Compatibility

Table A–11: Certifications and compliances

Category	Standards or description
EC Declaration of Conformity – EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Union: EN 55011 Class A Radiated and Conducted Emissions EN 55011 Class B Conducted Emissions EN 61000-3-2 AC Power Line Harmonic Emissions EN 50082-1 Immunity: EN 61000-4-2 Electrostatic Discharge Immunity EN 61000-4-3 RF Electromagnetic Field Immunity (10 V/M) EN 61000-4-4 Electrical Fast Transient/Burst Immunity EN 61000-4-5 Power Line Surge Immunity EN 61000-4-6 RF Conducted Immunity (10 V) EN 61000-4-8 Magnetic Field Immunity EN 61000-4-11 Powerline Interruptions AS/NZS 2064.1/2 Industrial, Scientific, and Medical Equipment: 1992
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits.
EC Declaration of Conformity – Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union: Low Voltage Directive 73/23/EEC, amended by 93/69/EEC EN 61010-1:1993 Safety requirements for electrical equipment for measurement control and laboratory use.
U.S. Nationally Recognized Testing Laboratory Listing	ANSI/ISA S82.01:1994 Safety standard for electrical and electronic test, measuring, controlling, and related equipment.
Canadian Certification	CAN/CSA C22.2 No. 1010.1 Safety requirements for electrical equipment for measurement, control, and laboratory use.
Additional Compliance	UL3111-1 Standard for electrical measuring and test equipment. IEC61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.
Installation (Overvoltage) Category	Terminals on this product may have different installation (overvoltage) category designations. The installation categories are: CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location. CAT II Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected. CAT I Secondary (signal level) or battery operated circuits of electronic equipment.

Table A–11: Certifications and compliances (Cont.)

Category	Standards or description	
Pollution Degree	A measure of the contaminates that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.	
	Pollution Degree 1	No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.
	Pollution Degree 2	Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
	Pollution Degree 3	Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
Laser Classification	This product contains a CD ROM drive which utilizes a Class 1 laser and complies with EN60825–1:94, as well as with the U.S. FDA regulations. The drive is marked with the laser's classification and the date of manufacture, as well as the following information: Complies with the DHHS rules 21 CFR Chapter 1, Subchapter J applicable at the date of manufacture.	
Safety Standards		
Safety Certification Compliance		
Temperature, operating	+5 to +50° C	
Altitude (maximum operating)	2000 meters	
Equipment Type	Test and measuring	
Savety Class	Class 1 (as defined in IEC 1010-1, Annex H) – grounded product	
Installation (Overvoltage) Category	Overvoltage Category II (as defined in IEC 1010-1, Annex J)	
Pollution Degree	Pollution Degree 2 (as defined in IEC 1010-1). Note: Rated for indoor use only.	
Supply Voltage Range	100 – 240 VAC 50/60 Hz, single phase	
Current Rating	6.0 Amps max	
Fuse Rating	Mains fuse is 8A, 250V, Fast; Not operator replaceable. Refer servicing to qualified service personnel.	
Relative Humidity (maximum operating)	80 % for temperatures up to 31° C, decreasing linearly to 50 % at 40° C	

Mechanical (Physical) Characteristics

Table A–12: Mechanical characteristics

Characteristic	Description
Classification	Transportable platform intended for design and development bench/lab based applications.
Overall Dimensions	
Height	8.5 inches (w/o feet) (21.6 cm)
Width	17 inches (43.2 cm)
Depth	22 inches (55.9 cm)
Weight	
RFA300	38 lb (17.2 kg)
Maximum loaded pouch[1]	10 lb (4.5 kg)
Shipping Weight	74 lb (33 kg)
Construction Materials	Chassis parts are constructed of aluminum alloy and aluminized steel; front panel and trim pieces are constructed of plastic; circuit boards are constructed of glass and/or ceramic-glass laminate.

1 **Pouch weight must be added to each configuration weight for total system weight; for example maximum overall system weight is 48 lbs (21.8 kg).**

Appendix B: User Service

This appendix describes general care and service procedures for the RFA300 Measurement Set 8VSB.

Instrument and module service troubleshooting procedures are located in the service manual (refer the *Preface* for a list of manuals).

General Care

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

Do not store or leave the instrument where the LCD display will be exposed to direct sunlight for long periods.

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

Preventive Maintenance

Check the electrical performance and the instrument accuracy 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.*

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

Use a 75% isopropyl alcohol solution as a cleanser and rinse with deionized water.

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

Cleaning the Display

Clean the face of the display using a soft cloth dampened with deionized water.

Cleaning the Compact Disc Drive

The compact disc (CD) drive requires routine maintenance to operate at maximum efficiency. The CDs can be damaged if dirt and dust accumulate on the surface. Store the CDs in their protective containers where they will not be 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.*

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

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

Cleaning the Keyboard and Mouse

Clean the exterior surfaces of the keyboard and mouse 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 mouse 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 use chemical cleaning agents; they may damage the instrument. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

In Case of Problems

This section addresses problems that you may encounter while using the measurement set. This section does not identify specific problems relating to performance verification or adjustments. For information on running performance verification procedures or adjustment procedures, refer to the *RFA300 Measurement Set 8VSB Service Manual*, available as an optional accessory.

Diagnostics

The following diagnostic tools are available with your measurement set:

- Power-on diagnostics. These diagnostics run when you first power on the instrument or when you first start the measurement set application. If any diagnostic failures are detected during power on, the Power-On Diagnostics dialog box appears.
- Extended diagnostics. These diagnostics test the instrument more thoroughly than the power-on diagnostics. You can use the extended diagnostics to isolate problems down to an individual module. The extended diagnostics are part of the measurement set application. To run extended diagnostics, go to the Tools menu, select Diagnostics, and click on the Extended Diagnostics tab.
- QAPlus diagnostics. The QAPlus diagnostics are a separate Windows 95 application located in the Windows 95 Start Programs menu. The diagnostics check the basic operation of the controller including the following items: system board, video, hard disk, memory, communications port, printer port, mouse, and keyboard.

Use the diagnostics to isolate problems to software or hardware within the instrument. For additional help on the diagnostics, contact your local Tektronix representative.

Software Problems

Your RFA300 Measurement Set 8VSB comes with software already installed. For any suspected software problems, try to isolate the problem to the measurement set application software or to other installed software.

Run the QAPlus diagnostics software to identify hardware or software problems. Follow the QAPlus online help instructions for running the diagnostics software. The diagnostics are located in the Start menu under Programs/ QAPlus_Win-Win.

Many software problems can be due to corrupted or missing software files. In most cases the easiest way to solve software problems is to reinstall the software and follow the on-screen instructions. Refer to *Appendix C: Software Installation* for instructions on reinstalling software.

Refer to Table B–1 for a list of software and hardware troubleshooting information and recommended action.

If you suspect problems with the software, contact your local Tektronix representative or refer to *Contacting Tektronix* on page viii.

Hardware Problems

Hardware problems can have several causes. The first step to identifying a problem is to review the installation instructions in this manual to verify that you have properly installed the instrument. The second step is to determine if the problem is in the mainframe or the measurement set's modules.

If you are certain that you have installed the instrument correctly, run the extended diagnostics (located under the tools menu) to identify any problems with the individual modules.

If your instrument powers up so that you have access to the desktop, run the QAPlus diagnostics software to identify possible controller hardware problems. Follow the QAPlus online help instructions for running the diagnostics software. The diagnostics are located in the Windows 95 Start menu under Programs/ QAPlus_Win-Win.

Table B–1 lists some of the symptoms of hardware problems and possible solutions.

Table B–1: Troubleshooting

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. Check that the instrument receives power when you press the On/Standby switch; check that fans start and that front-panel indicators light. Check that power is available at the power source. Instrument failure; 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. Possible software failure or corrupted hard disk. Refer to *Software Problems* at the beginning of this chapter.
Power-on diagnostics fail	Isolate problem to faulty platform or to faulty module. 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. Contact your local Tektronix service center.
Windows 95 comes up but the measurement set application does not	Instrument not set up to start measurement set application at power on; start application from the desktop by double clicking on the RFA300 icon. Make sure the Start/Programs/Startup folder contains a shortcut to the measurement set application. Faulty or corrupt software, refer to *Software Problems* at the beginning of this chapter.
Windows 95 comes up in Safe mode	Exit the Safe mode and restart the instrument.
Instrument will not power off with On/Standby switch	Windows 95 operating system problem. Try powering off the instrument using the Windows 95 shutdown procedure. If the instrument still does not power off, push and hold the On/Standby switch for five seconds to power off the instrument.

Repacking for Shipment

If an instrument is to be shipped to a Tektronix field office or to Tektronix Customer Service for repair, attach a tag to the instrument showing the following:

- Owner's name and address
- Serial number
- Description of the problem(s) encountered and/or service required

When packing an instrument for shipment, use the original packaging. If it is unavailable or not fit for use, contact your Tektronix representative to obtain new packaging.

Appendix C: Software Installation

There may be occasions when you have to reinstall software after replacing the hard disk, or restore software that has been deleted or corrupted. The procedures in this section explain how to reinstall all software onto the hard disk.

***NOTE**. If you are reinstalling after replacing the hard disk, you should perform all of the procedures in this section in sequence.*

The process of installing software on an RFA300 hard disk consists of the following major steps:

- Preparing the hard disk
- Installing Windows 95 on the hard disk
- Installing other applications on the hard disk
- Installing the RFA300 application and drivers

The following lists the software components that you installed:

- Microsoft Windows 95 OSR2
- Cirrus Logic GDS7555 Driver
- Dynapro SC3 Touch Screen Driver
- Symbios 53C860 SCSI Driver
- DEC DC21X4 NDIS 4.0 Driver
- DiagSoft QAPlus/WIN-WIN version
- Tektronix JPS software
- Tektronix RFA300 application software and drivers

This procedure assumes that you have the following:

- An RFA300 Series, Windows 95 Startup Disk
- An RFA300 CD-ROM titled RFA300 Measurement Set 8VSB Application Software
- A non-partitioned, low-level formatted hard disk installed in the measurement set
- A Windows 95, OSR2 CD-ROM

Preparing the Hard Disk

If you are installing software on a new hard disk, you must partition and format the hard disk. If you are reinstalling software, it is not necessary to partition unless the partition has been damaged; however, you must reformat.

Partitioning the Hard Disk

To partition your hard disk, complete the following steps:

1. Power off the measurement set. Refer to the powering off procedures on page 1–11.
2. Insert the **RFA Series Windows 95 Start Up Disk** in the floppy drive, and then turn on the power.
3. From the command prompt, type: `A:\FDISK`
4. Select **N**, when asked Do you wish to enable large disk support?.
5. Select option **4** to view partitions on the fixed disk. If there are any, use option **3** to remove them.
6. From the FDISK Options page, select option **1** to go to the Create DOS Partition or Logical DOS Device page, and then select option **1** to Create Primary DOS Partition.
7. Select **Y,** when asked Do you wish to use the maximum available size for a Primary DOS Partition and make the partition active?.
8. Press **ESC** to exit FDISK.
9. Restart the measurement set.

Formatting the Hard Disk

You must perform the format after you replace the hard disk, or when the partitioning or the format of the hard disk has been damaged. If you find that you need to format the hard disk, make sure that you have backup copies of your user files (if possible) so that you can reinstall them later.

To format the hard disk, type: `A:\FORMAT C:` from the command prompt.

Installing Software

The following procedures assume that the hard disk is properly formatted and partitioned.

Windows 95 OSR2 Installation Procedure

To install Windows 95 software, complete the following steps:

1. Power on the measurement set if it is not already on.
2. Type: `mkdir C:\WIN95` from the command prompt, to create a directory for Windows 95 files.
3. Insert the Windows 95, OSR2 CD-ROM.
4. From the command prompt, type `XCOPY D:\WIN95 C:\WIN95 /s /v` to copy all the files to hard disk.
5. From the command prompt, type: `C:\WIN95\SETUP` to setup Windows 95.
6. Press **ENTER** to continue.
7. Click **Continue** from the Windows 95 Setup dialog box.
8. Click **Yes** in the Software License Agreement dialog box.
9. Click **Next** in the Window 95 Setup Wizard dialog box.
10. Choose **C:\WINDOWS** for the Windows 95 directory.
11. Click **Next** to continue.
12. Select **Typical** in Setup Options and click **Next** to continue.
13. Enter the Certificate of Authenticity number from the Windows 95 user manual and click **Next** to continue.
14. Enter **User Information** and click **Next** to continue.
15. Select **Network Adapter** and **Sound, MIDI, or Video Capture Card** in the Analyzing Your Computer dialog box and click **Next** to continue.
16. Select **Install the most common components (recommended)** in the Windows Components dialog box and click **Next** to continue.
17. Select **Yes, I want a startup disk (recommended)** in the Startup Disk dialog box and click **Next** to continue.
18. Click **Next** in the Start Copying Files dialog box.
19. Insert a blank disk in the floppy drive to create a Windows Startup Disk when asked.

20. Click **Finish** in the Finishing Setup dialog box.

21. You might receive an error message that states:

    ```
    An internal stack overflow has caused this session to be
    halted. Change the STACKS setting in your CONFIG.SYS file,
    and then try again.
    ```

    To comply, turn the power off and back on again. When Windows 95 starts up, it will go through and setup a list of Windows components. You can now continue the installation.

22. Set the Date and Time properties as appropriate.

23. Click **Cancel** in the Add Printer Wizard dialog box if a printer is not connected; otherwise click **Next** to install the printer driver.

24. Click the **OK** button when Windows 95 asks to restart the computer.

Configuring Power Management

To configure the power management of the instrument, do the following steps:

1. Open My Computer/Control Panel and double-click **Power**.

2. Clear the check box to Allow Windows to manage power use.

3. Click **OK** to close the Power Properties dialog box and restart the computer.

Cirrus Logic Display Driver

This procedure adds the driver for the display. To add the driver, do the following steps:

1. Insert the CD-ROM labeled RFA300 Measurement Set 8VSB Application Software into the CD-ROM drive.

2. Open My Computer/Control Panel and double-click **Display**.

3. Select the **Settings** tab.

4. Click the button labeled **Advanced Properties**.

5. Select the **Adapter** tab, then click the **Change** button.

6. Click the **Have Disk** button.

7. Type the path to the files as **D:\DRIVER\Cirrus\Disk1**, in the Install From Disk dialog box.

8. Click the **OK** button. After the disk is scanned, you will see a display of the available devices.

9. Select the device named **Cirrus Logic 755X PCI 1.30**.

10. Click **OK** to begin loading the driver.
11. Click **OK** to close the Insert Disk dialog box.
12. When asked for the driver in disk 2, type the path to the files as `D:\DRIVER\Cirrus\Disk2` and click the **OK** button.
13. After the driver is loaded, click the **Close** button to close the Advanced Display Properties dialog box.
14. Click the **Close** button to close the Display Properties dialog box. It will prompt you to restart the instrument; click the **Yes** button to restart.
15. When the instrument is restarted, close the Color Correction dialog box.

DynaPro SC3 Touch Screen Driver

This procedure adds the driver for the Touch Screen feature. To add the driver, do the following steps:

1. Insert the CD-ROM labeled RFA300 Measurement Set 8VSB Application Software into the CD-ROM drive.
2. Press the **START** front panel key and enter the Run menu.
3. Type `D:\DRIVER\Dynapro \install.exe`.
4. Click **Next** to continue.
5. Select the following communication port settings:
   - Port: COM3
   - Interrupt IRQ4
   - I/O Address 3E8
6. Click **Next** to continue.
7. Click **Install** to continue.
8. Click **OK** to continue.
9. When asked for the directory for default.ini, do not use the Browser. Type in `D:\DRIVER\Dynapro\`.

   A dialog box may appear stating that the COM port is being used by another device. Select **Yes** to assign the COM port to touch screen.
10. After the driver is installed, click **Yes** to restart the instrument.
11. Open the Control Panel and select the **System** icon.
12. Select the **Device Manager** tab.

13. Open **Communications Port (COM3)** listed under the **Ports (COM & LPT)** entry.
14. In the **Port Setting** tab, change the settings to the following:
    - Bits per second 2400
    - Data bits 8
    - Parity None
    - Stop bits 1
    - Flow control None
15. Click **OK** to close the Port Setting dialog box.
16. Click **OK** to close the System Properties dialog box.
17. Press the **START** front panel key.
18. From the Start menu, select **Programs/Touch Screen Utilities/Configuration**.
19. Click the **Interface** button.
20. Select the following settings:
    - COM Port COM3
    - Interrupt IRQ4
    - Address 3E8
    - Connection UART
    - Cal. Data Host
21. Click **OK** to save the settings.
22. Click **Exit** to end the Configuration Utilities.
23. Restart the instrument.
24. Press the **START** front panel key.
25. From the Start menu, select **Programs/Touch Screen Utilities/Configuration**.
26. Click the **Interface** button.
27. Click the **Reset** button to reset the touch screen.
28. Click **Start** in the Reset Touch Controller dialog box.

29. Click the **Advanced** button.
30. Select the following settings:
    - Averaging (samples) 32
    - Rejection Level 40
    - Settling Time (µsec) 100
    - Screen Wires 8
    - Auto-Averaging Check
    - Low-Power Mode Uncheck
31. Click **OK** to exit the Advanced Controller Options dialog box.
32. Click **Reset** button in Interface Configuration Options dialog box.
33. Click **OK** to exit the Interface Configuration Options dialog box.
34. Click the **Calibration** button.
35. Click the **Calibrate** button to calibrate the touch screen and follow instructions.
36. Click **OK** to end the calibration.
37. Click **Exit** to end the configuration utilities.

Symbios 53C860 SCSI Driver

This procedure adds the driver for the PCI SCSI Bus Controller. To add the driver, do the following steps:

1. Insert the CD-ROM labeled RFA300 Measurement Set 8VSB Application Software into the CD-ROM drive.
2. Open **My Computer/Control Panel** and double-click on the **System** icon.
3. Select the **Device Manager** tab and remove **PCI SCSI Bus Controller** listed under Other devices.
4. Restart the instrument. When Windows starts up, it will find the new device and ask to install the driver for the PCI SCSI Bus Controller.
5. Click the **Next** button to continue.
6. Windows will not be able to find the driver. Click the **Other Locations** button and enter the path as `D:\DRIVER\Symbios`.
7. Click **OK** to continue. Windows will find the driver for the device Symbios Logic 8600SP PCI SCSI Adapter.

8. Click **Finish** to continue.
9. Select **D:\DRIVER\Symbios**, when asked for the Symbios Logic 8XX Install Disk directory.
10. After the driver is installed, restart the instrument.

DEC DC21X4 NDIS 4.0 Ethernet Driver

To add the driver for the PCI Ethernet Controller, do the following steps:

1. Insert the CD-ROM labeled RFA300 Measurement Set 8VSB Application Software into the CD-ROM drive.
2. Open **My Computer/Control Panel** and double-click **System**.
3. Select **Device Manager** tab, and remove **PCI Ethernet Controllers** listed under Other Devices.
4. Restart the instrument. When Windows starts up, it will find the new device and ask to install the driver for PCI Ethernet Controller.
5. Click the **Next** button to continue.
6. Windows will not be able to find the driver. Click the **Other Locations** button and enter the path as `D:\DRIVER\Dec\ INF`.
7. Click **OK** to continue. Windows will find the driver for the device Digital Semiconductor 21143/2 based 10/100 mbps Ethernet Controller.
8. Click **Finish** to continue.
9. Click **OK** at the prompt for computer and workgroup name.
10. Enter a computer and workgroup name as appropriate.
11. When ask for PCI Netcard Drivers Directory, set location to **D:\DRIVER\Dec**.
12. Click **OK** to continue.
13. When ask for the Windows 95 CD-ROM directory, set the location to **C:\WIN95**.
14. After the driver is installed, restart the instrument.
15. During the startup routine and when asked, enter a user name and password for Microsoft networking if appropriate, or cancel.

QA Plus Diagnostics

To install the QAPlus diagnostic software, complete the following steps:

1. Insert the QA Plus disk labeled **QAplus/Win-Win Version 7.01** into drive A. Be sure that the QAplus disk is not write protected.
2. Open **My Computer/Control Panel** and double-click **Add/Remove Programs**.
3. Select **Install** and follow the directions.
4. The Install program will inform you that it intends to create the directory C:\win-win on your hard disk, and it will ask you to approve or enter an alternative location. Click **Continue** to approve this directory name.
5. Enter user information when prompted.

NOTE. *If you are using a set of QA Plus disks that have been previously installed, you will not be able to enter the name. You will be warned that these disks have been installed previously, and you must acknowledge that fact before proceeding.*

6. A dialog box will appear, asking if it is OK to create a set of Icons for the Program Manager for QAPlus diagnostics. Click **Create** to approve this.
7. When the installation is complete, the release notes are displayed. Read the notes and exit.
8. Press the **Ctrl-Alt-Del** keys to display a list of current tasks.
9. Select the **QAPlus Installation** task and click the **End Task** button. After several seconds, another dialog box will appear advising you that the application is not responding. Click **End Task** again to end the QA Plus installation.
10. Close the **Program Manager** folder icon located at the bottom of the screen when the desktop reappears.
11. Insert into drive A the QA Plus disk labeled **QAplus/Win-Win OEM Manual**.
12. Copy the file **Qawwusro.exe** from drive A to the C:\Win-win directory.
13. Remove the **QAplus** disk from drive A.

Installing Tektronix JPS Software

To install software for the RFA300 platform, complete the following steps:

1. Insert into the CD-ROM drive the CD-ROM labeled **RFA300 Measurement Set 8VSB Application Software**.
2. Open **My Computer/Control Panel** and double-click **System**.
3. Select the **Device Manager** tab and double-click the **Computer** icon.
4. Select the **Reserve Resources** tab and select the **Interrupt request (IRQ)** button.
5. Click the **Add** button, and type 11 for the IRQ line. It may say the resource you are trying to reserve is currently in use by another device in the system. Click **OK** to continue.
6. Click **OK** to close the Computer Properties dialog box.
7. Click **OK** to close the System Properties dialog box.
8. Press the **START** front panel key and open the Run menu.
9. Type `D:\DRIVER\Jps\Disk1\SETUP.EXE` and click **OK**.
10. Click **Next** from the Choose Destination Location dialog box.
11. Click **Next** from Start Copying Files dialog box.
12. If asked for the next disk, enter the path as `D:\DRIVER\Jps\Disk2`.
13. When the driver is installed, select the **Yes, I want to restart my computer now** button and click **Finish** to restart the instrument.

RFA300 Base Application Software Installation

The RFA300 application software CD you received has two application software upgrades (PR1 and PR2) with the base application software for use in case the RFA300 application must be completely reinstalled. The upgrade changes are not included as part of the base application installation. The base application must be installed first, and then the added releases are installed. To install the RFA300 application software, complete the following steps:

1. Insert the CD-ROM labeled **RFA300 Measurement Set Application Software** into the CD-ROM drive.
2. Press the **START** front panel key and open the Run menu.
3. Type `D:\dao30\setup.exe` and click **OK**.
4. Click **Next** to continue the DAO setup.
5. Click **OK** to complete the DAO setup.
6. Press the **START** front panel key again and reenter the Run menu.

7. Type `D:\odbc30\setup.exe` and click **OK**.
8. Click **Next** to continue the ODBC setup.
9. Click **Finish** to complete the ODBC setup.
10. Press the **START** front panel key and open the Run menu.
11. Type `D:\rfa300\setup.exe` and click **OK**.
12. Click **Next** to continue the RFA300 setup.
13. Select the typical setup and click **Next** to continue.
14. Click **Next** to begin copying files.
15. Click **OK** on the My-T-Touch license agreement.
16. Click **OK** on the default path for My-T-Touch.
17. Click **OK** to complete the My-T-Touch installation.
18. Click **Finish** at the completion of pass 1.
19. The instrument will restart and continue the installation.
20. Click **OK** on the JamCursorControl.ocx registration.
21. Click on the **RFA300** icon on the task bar to bring the finish dialog box to the front.
22. Click **Finish** to complete the RFA 300 application installation. The instrument will restart.

Upgrade PR1. Use the following instructions to perform the PR1 upgrade installations of the RFA300 application software after you have installed the base application software.

1. Turn on the measurement set if not already in operation and wait for the power-on procedure to finish. The RFA300 application will start if the start up menu has not been changed from the factory setting.
2. Exit the RFA300 application (**File / Exit**) if the application is running.
3. Open the CD drive, place the RFA300 Measurement Set 8VSB Application Software disc in the CD drive on the disk spindle, and close the drive door.
4. Select **Run** from the taskbar **Start** menu.
5. Type `d:\pr1\setup` and press **Enter** (the return key on a keyboard). The upgrade welcome screen will appear.
6. Press **Next** on the upgrade welcome screen to continue the RFA300 setup.

7. Click **Next** again to begin copying files.
8. Click **Finish** to complete pass 1 of the setup.
9. Click **Finish** to complete pass 2 of the RFA300 application installation. The measurement set will restart.
10. Continue with the following installation procedure for PR2.

Upgrade PR2. Use the following instructions to install the PR2 upgrade of the RFA300 application software after you have installed the base application software and the PR1 upgrade.

1. Exit the RFA300 application (**File / Exit**), if the application is running.
2. Select **Run** from the taskbar **Start** menu.
3. Type d:\pr2\setup and press **Enter** (the return key on a keyboard). The upgrade initialization screen will appear.
4. Click **Finish** to complete the setup.
5. Remove the RFA300 Application Software disc from the CD drive.
6. Store the CD with the other backup software you received with your measurement set for use in case the application must be completely reinstalled.

Upgrade PR2 Default Limits. The PR2 upgrade installs a new default limits set (specifically the defaults limits for the EVM measurement are changed). If you want to use these new default limits for all measurements, do the following procedure to restore the new default limits set.

1. Start up the RFA300 application.
2. Select **Setup**, then **Edit Setup**, and select the **Limits** tab.
3. Press the button labeled **Restore Limits**.
4. Select the **Default Limits**.
5. Press the button labeled **Restore**, and then press **OK**.

Installing RFA300 Hardware Drivers

To install the RFA300 hardware drivers, complete the following steps:

1. Open **My Computer/Control Panel** and double-click **System**.
2. Select the **Device Manager** tab, and remove both **PCI Card** devices listed under **Other Devices**.

3. Restart the instrument. When Windows starts up, it will find the new device and ask to install the driver for PCI Card. This is the RFA300 acquisition card.
4. Click the **Next** button to continue.
5. Windows will not be able to find the driver. Click the **Other Locations** button and browse to **C:\jsrc\bin\acqbrd**. Click **OK**.
6. Click **OK** to continue. Windows will find the driver for device Signatec PnP Device.
7. Click **Finish** to continue.
8. Click **OK** to close the Insert Disk dialog box.
9. When asked for the Signatec Driver Disk, browse to **C:\jsrc\bin\acqbrd** and select **sigdrv.vxd**.
10. Press **OK** to accept the file.
11. Press **OK** to end the dialog box. Windows will find another new device and ask to install the driver for PCI Card. This is the RFA300 synthesizer card.
12. Click the **Next** button to continue.
13. Windows will not be able to find the driver. Click the **Other Locations** button and browse to **C:\jsrc\bin\synthbrd**. Click **OK** to end the browse.
14. Click **OK** to continue. Windows will find the driver for the device Tektronix Synthesizer.
15. Click **Finish** to continue.
16. Click **OK** to close the Insert Disk dialog box.
17. When asked for the Tektronix Driver Disk, browse to **C:\windows\system\vmm32** and select **windrvr.vxd**.
18. Press **OK** to accept the file.
19. Press **OK** to end the dialog box.
20. Select **Yes** at the prompt to restart the instrument.

RFA300 Appearance

The following procedures set up the default screen appearance for the measurement set. It is recommended that you enter the defaults as listed. This ensures the optimal screen visibility and usability for the touch screen feature.

Menu Text. To enter the default font size, complete the following steps:

1. Right click on background.
2. Select **Properties**.
3. Click on the **Appearance** tab.
4. Click on the word **normal** for menu display.
5. Change **Font Size** to 10.
6. Click **OK**.

Color. To set the color palette, complete the following steps:

1. Right click on the background.
2. Select **Properties**.
3. Click on the **Settings** tab.
4. Change **Color Palette** to **High Color (16-bit)**.
5. Click **OK**.
6. Select **Apply settings without restarting** and click **OK** at the Compatibility Warning dialog box.
7. Click **OK** on the Display Properties dialog box.
8. Click **Yes** to accept the settings.

Task Bar. To set the properties for the task bar, complete the following steps:

1. Right click on the **Taskbar**.
2. Select **Properties**.
3. Select **Auto Hide** and **Always On Top**. Leave **Show Clock** selected.
4. Click **OK**.

Startup Folder. To set the properties for the Startup Folder, complete the following steps:

1. Right click on the task bar.
2. Select **Properties**.
3. Select the **Start Menu Programs** tab.
4. Click the **Add** button.
5. Browse to **C:\jsrc\bin\rfa.exe**.

6. Click **Open**.
7. Click **Next**.
8. Select the **Startup** folder.
9. Click **Next**.
10. Enter **RFA300** for the shortcut name.
11. Click **Finish**.
12. Click **OK** to exit the Properties dialog box.

Completing the Installation

To complete the software installation procedure, perform the following steps:

1. Double-click the **Mfg Cleanup** icon on the desktop.
2. Click **Yes** to confirm the operation.
3. Click **OK** to accept if a warning about Jamaica Knobtest icon removal is displayed.
4. Select **Yes, I want to restart my computer now**.
5. The instrument will restart and the software will initialize at startup.
6. Click **OK** on all RFA300 warnings about default setups, limits, and results databases.
7. Remove the CD-ROM labeled RFA300 Measurement Set 8VSB Application Software from the CD-ROM drive.

This concludes the software installation for the measurement set.

Appendix D: Mask File Formatting

The mask-testing feature allows you to set visual parameters within the graphic portion of the measurement window. The masks are lines against which you can compare waveforms.

To create your own mask files you must understand how they are formatted. This section provides that information. For information on creating a specific mask, refer to the online help: for example, *Creating Out of Channels Emission mask*s.

Mask files have the following generic format:

- Mask files are stored as text files. You can create them using a text editor.
- The extension on a mask file must be of the form ".mskxx" where xx is an integer representing the ResultID value for the mask test result for this file (see Line 1 below).
- Mask files must be placed in C:\RFA300\Masks to be recognized.

The format of mask files is as follows:

- Lines are delimited with the newline character.
- Numbers on a line are comma delimited (the newline character is typically generated with a carriage return in most text editors).
- Line lengths are limited to 200 characters maximum.
- Line 1 contains the ResultID value for the mask test result for this file. Refer to Table D–1.
- Line 2 contains a note associated with the file.
- Line 3 contains a number that represents the number of points in the mask.
- Lines 4 through x each contain one point in the mask. The format of this line is (x, y1, y2), or (y, x1, x2). Normally masks are of the first form. If the mask has a single value per x location, it will be (x, y1), otherwise if it has two values per x location (for example, a min and a max), it will be of the form (x, y1, y2).
- A mask of the form (y, x1, x2) is one which does not necessarily have a value for all x locations. x and y numbers are in integer or scientific format.

Table D–1 list the ResultID for each type of mask.

Table D–1: ResultID Values for Mask Tests

Mask test	ResultID
Frequency Response	69
Group Delay	70
Phase Error	81
Phase Noise	77
Amplitude Error	80
Out of Channel Emissions	62

Glossary

Alarm Limit
A parameter set in the Limits dialog box. When a measurement exceeds the parameter, you are notified in the measurement or Signal Monitor window.

Amplitude Error
An error that is typically caused by an amplifier's gain changing because of signal amplitude. The measurement set plots the signals instantaneous amplitude error as a function of amplitude.

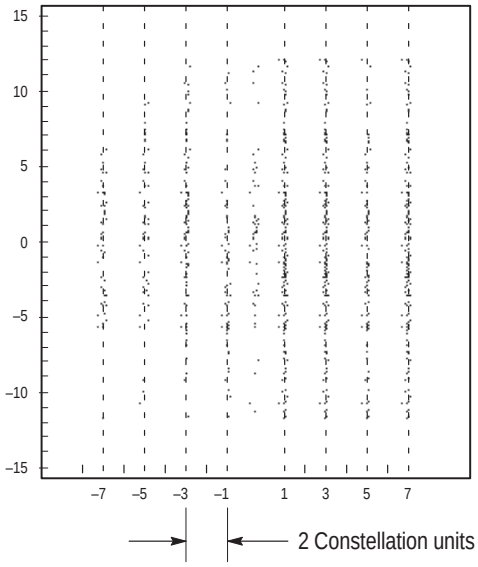
AutoScale
Sets the scale factor for both axes to default values.

Bit Error Ratio (BER)
The ratio of bits correctly received to bits received in error.

Caution Limit
A parameter set in the Limits dialog. When a measurement exceeds the parameter, you are notified in the measurement or Signal Monitor window. Caution limits are typically set to warn you when the measurement is close to exceeding the Alarm limit.

Constellation Unit

A unit half of the minimum distance between two digital (8VSB) symbols. This is illustrated next using the constellation graph of the EVM window. Note that a constellation unit is half of the minimum distance between two I-channel constellation levels.



Many measurements are made in constellation units. Unit size remains constant while the Digital Television signal varies in amplitude.

Frequency Response

The variation of signal amplitude over a channel's frequency range.

Group Delay

The relative time of propagation of packets of information at frequencies in the spectrum of a waveform.

Limits Set

A set of caution and alarm parameters against which numeric measurement results are compared.

Masks

A visual parameter within the graphic portion of the measurement window against which acquired waveforms are compared.

Peak Transient Power

The maximum value of envelope power occasionally reached by a digitally modulated signal.

Phase Error

An error typically caused by variation of an amplifier's phase changing because of signal amplitude. The measurement set plots the signals instantaneous phase error as a function of amplitude.

Phase Noise

A noise typically added to the digital modulation by the transmitter's frequency synthesizer system. The measurement set measures the pilot's phase noise.

Result

The outcome of a measurement in numeric, pass/fail, and graphic forms.

Results Database

A file where results from a measurement are held for later recall, exporting, or reporting. Data in these files can also be used for further study or analysis by external applications. The files are in Microsoft Access format.

Signal to Noise

The power ratio between the ideal received signal and the difference between the ideal and actual received signal along the real axis.

Session

A collection of any results saved by the Signal Monitor during the time between the Run and Stop events. A session can include a few results or the results from many iterations through a set of measurements.

Setup

A collection of instrument control settings that includes measurement, monitoring, and viewing parameters. Setups do not include any option settings or system frequency selection.

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