Service Manual

Tektronix

RFA300
Measurement Set 8VSB

071-0199-01

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

www.tektronix.com

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

WARRANTY

Tektronix warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If a product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

THIS WARRANTY IS GIVEN BY TEKTRONIX IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX' RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Service Assurance

If you have not already purchased Service Assurance for this product, you may do so at any time during the product's warranty period. Service Assurance provides Repair Protection and Calibration Services to meet your needs.

Repair Protection extends priority repair services beyond the product's warranty period; you may purchase up to three years of Repair Protection.

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; you may purchase up to five years of Calibration Services.

Service Assurance Advantages

- Priced well below the cost of a single repair or calibration
- Avoid delays for service by eliminating the need for separate purchase authorizations from your company
- Eliminates unexpected service expenses

For Information and Ordering

For more information or to order Service Assurance, contact your Tektronix representative and provide the information below. Service Assurance may not be available in locations outside the United States of America.

Name	VISA or Master Card number and expiration
Company	date or purchase order number
Address	Repair Protection (1,2, or 3 years)
City, State, Postal code	Calibration Services (1,2,3,4, or 5 years)
Country	Instrument model and serial number
Phone	Instrument purchase date

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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.

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:

CAUTION
Refer to Manual

WARNING
High Voltage

Protective Ground
(Earth) Terminal

Service Safety Summary

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

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

Disconnect Power. To avoid electric shock, switch off the instrument power, and then disconnect the power cord from the mains power.

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

To avoid electric shock, do not touch exposed connections.

Preface

This manual contains the servicing information for the RFA300 Measurement Set 8VSB. This instrument is composed of the RFA300 measurement set hardware and application software installed in a mainframe platform.

The information included in this manual explains how to verify, service, troubleshoot, and repair the system to the module level:

- *Specifications* describes functional characteristics and performance requirements for the RFA300 Measurement Set 8VSB
- *Operating Information* tells you how to install and operate the instrument.
- *Theory of Operation* provides descriptions of the RFA300 measurement set modules.
- *Performance Verification* describes how to verify the functional performance of the RFA300 measurement set.
- *Adjustment Procedures* gives the field adjustment procedures.
- *Maintenance* contains the following information:
  - How to safely handle static sensitive modules and components
  - How to remove and replace modules
  - Diagnostic and troubleshooting information and procedures
- *Options* provides a brief description of the available options for the RFA300 measurement set.
- *Replaceable Parts List* gives all module and mechanical parts that comprise the RFA300 measurement set. Parts are identified on an indexed illustration to make them easier to identify.

Related Manuals

TheRFA300 Measurement Set 8VSB user documentation consists of the following:

- The *RFA300 Measurement Set 8VSB User Manual* details how to operate this RF measurement system.

Manual Conventions

The following terms and conventions are used throughout this manual:

- The term measurement set is used interchangeably with the more formal term RFA300 Measurement Set 8VSB
- The term platform refers to the mainframe platform that hosts the RFA300 Measurement Set 8VSB modules.

Introduction

This manual contains maintenance information for the RFA300 Measurement Set 8VSB. Take a few minutes to read this short introduction before doing any repair or service work on the instrument.

Before You Begin

This manual is for servicing the RFA300 Measurement Set 8VSB. To prevent injury to yourself or damage to the measurement set, fulfill the following requirements before you attempt service:

- Be sure you are a qualified service person.
- Read the Safety Summary found at the beginning of this manual.
- Read this sections *Service Strategy.*

When using this manual to service your RFA300 measurement set system, be sure to heed all warning, cautions, and notes.

Service Strategy

This manual contains the following maintenance and repair procedures:

- Periodic maintenance
- Performance verification
- Field adjustments
- Module removal and replacement
- Module-level fault diagnosis

Once you isolate a problem with a module, use the *Replaceable Parts List* in this manual to determine the correct module part number to order from Tektronix.

Tektronix Service Offerings

Tektronix provides service to cover repair under warranty. Other services are available that may provide a cost-effective answer to your service needs.

Whether providing warranty repair service or any of the other services listed below, Tektronix service technicians, trained on Tektronix products, are best equipped to service your RFA300 measurement set system. Tektronix technicians are appraised of the latest information on improvements to the product as well as the latest product options.

Warranty Repair Service

Tektronix warrants this product for one year from the date of purchase. (The warranty appears after the title page and copyright page in this manual.) Tektronix technicians provide warranty service at most Tektronix service locations worldwide. Your Tektronix product catalog lists all service locations worldwide.

Repair Service

Tektronix offers single per-incident and annual maintenance agreements that provide Depot Service repair of this product.

Of these services, the annual maintenance agreement offers a particularly cost-effective approach to service for many owners of the RFA300 Measurement Set 8VSB. Such agreements can be purchased to span several years.

Self Service

Tektronix supports repair to the module level by offering a *Module Exchange* program.

Module Exchange. This service reduces down time for repair by allowing you to exchange most modules for remanufactured ones. Tektronix ships you an updated and tested exchange module from the Beaverton, Oregon, service center. Each module comes with a 90-day service warranty.

For More Information. Contact your local Tektronix service center or sales engineer for more information on any of the repair or adjustment services previously described.

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.

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 given in this 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 RFA300 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 1–1: 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 1–1. 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

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

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 1–1: IF filter characteristics

Measurement Specifications

Table 1–2: 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 1–2: 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 1–2: 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 RFA300 measurement set.
Pilot Amplitude Deviation	± (0.1 dB + 0.2 × deviation reading) dB When S/N ≥ 25 dB with high smoothing

Table 1–2: 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 FCC Regulation 47 CFR 73.622 (h). 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. Measurements are made in a 30 kHz bandwidth and are corrected to the 500 kHz reference bandwidth specified by the FCC. This process is specifically allowed by the FCC. The 8VSB Transmitter Emissions Mask for the measurements is shown in Figure 1–2 . No measurements need to be made any closer to the band edge than one half of the resolution bandwidth of the measuring instrument. The default mask has been adjusted to this requirement. In the event interference is caused to any service, greater attenuation may be required.
✓Measurement Limit	≥ –70 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 1–2: 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 mlliradians RMS, integrated over the range from 2 kHz to 300 kHz.
Peak to Average Ratio	
Marker Accuracy	± 1 dB

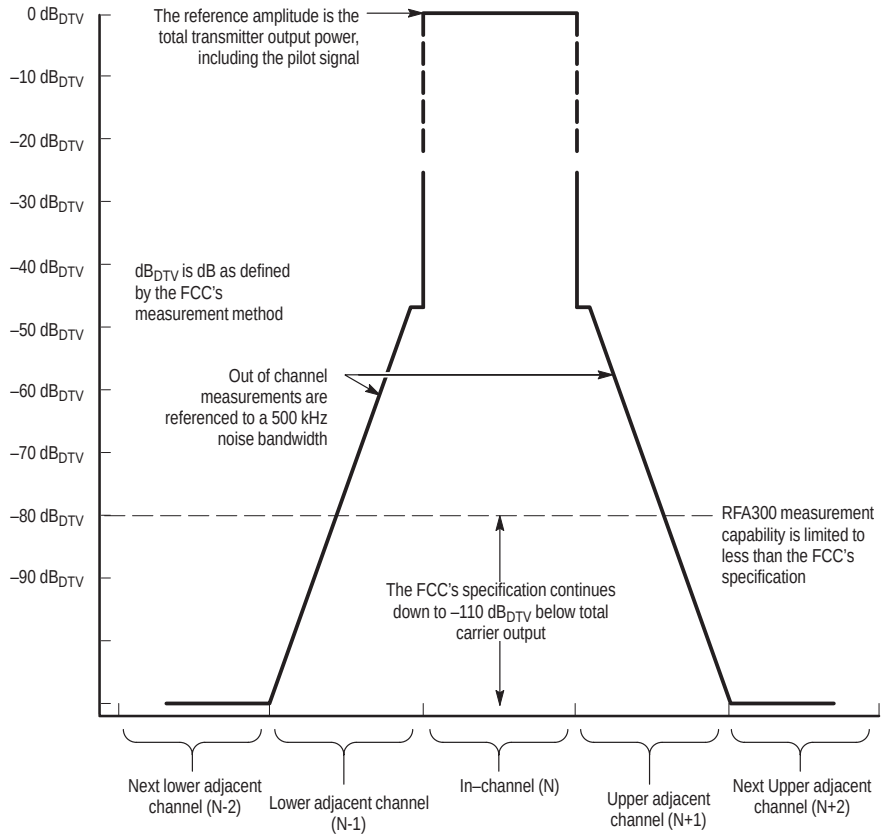


Figure 1–2: 8VSB transmitter emissions mask

Platform Characteristics

Table 1–3: 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 chipset.
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 chipset.
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	2.1 GByte (replaced by 3.2 GByte drive)
Interface	ATA/Enhanced IDE (EIDE)

Table 1–3: 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 1–4: 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 1–4: 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 1–5: 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 1–6: 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 1–6: 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 1–7: AC power source characteristics

Characteristic	Description
Source Voltage	Range for the line voltage needed to power the RFA300 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 1–8: 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 1,524 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 1–8: 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 1–9: Dynamics

Characteristic	Description
Random Vibration:	
Operating	0.27 g_{RMS} total from 5 Hz to 500 Hz, 10 minutes each axis, 3-axes, 30 minutes total.
Non-Operating	2.28 g_{RMS} total from 5 Hz 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 1–10: Transportation

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

Electromagnetic Compatibility

Table 1–11: 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 1–11: 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° C 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 1–12: 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).**

Standard Accessories

The following accessories are provided as standard components to the RFA300 Measurement Set 8VSB.

- *RFA300 Measurement Set 8VSB User Manual* 071-0198-XX
- RFA300 Measurement Set 8VSB Application Software on CDROM 063-3053-XX
- Windows 95 Software and manual on CD-ROM 063-2505-00
- Windows 95 start-up disk 063-3185-00
- QA Plus software on floppy disks 063-2506-00
- WIN95 Keyboard 119-5662-00
- Tektronix three button mouse 119-4330-02
- Standard IEC power cord 161-0230-01
- 10 dB Attenuator, connectors N to N (for those instruments that have a 10 dB internal attenuator rather than a 20 dB internal attenuator) 119-6328-00

- Front protective cover 200-4408-00

Optional Accessories

The following items are optional accessories. An optional power cord is provided in lieu of the Standard power cord when the product is ordered with a power cord option.

- Accessory Pouch 161-0230-01
- Standard power cord options
  - Opt. A1 – Universal Euro 220 V, 50 Hz 161-0104-06
  - Opt. A4 – North America 240 V, 60 Hz 161-0104-08
- Rackmount kit with instructions 016-2691-01
- *RFA300 Measurement Set 8VSB Service Manual* 071-0199-XX

Getting Started

The *Getting Started* section of this chapter provides basic information about using and installing the RFA300 Measurement Set 8VSB. There is information about the physical instrument and introductory information about how to operate it. The *Operating Basics* section that follows provides a conceptual overview of how the RFA300 measurement set works.

Installation

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

Hardware Installation

The instrument is designed to operate on a bench, on a cart, or in a rackmount cradle 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 the* Optional Accessories *list in* Specification*. 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 2–2 and connect the power cord to the instrument. Refer to Table 2–1 for the supply voltage rating and connect the other end of the power cord to the proper source. Do not connect to any power source other than one for which the instrument is rated.

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

The RFA300 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*.

Operating Requirements

Table 2–1 lists the operating requirements for the RFA300 measurement set. Refer to *Specifications* for a complete specification list.

Table 2–1: Operating requirements

Requirement	Specification
Source voltage	90 VAC to 250 VAC RMS, 47 Hz to 63 Hz.
Steady State input current	6.5 Amperes RMS
Maximum power consumption	540 Watts
Temperature	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 1,524 m altitude).
Humidity	20% to 80% relative humidity, non-condensing. Max wet bulb temperature: +31° C (derates relative humidity to ~50% @ 50° C or 122° F).
Altitude	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).

RF Connections

The quality of the input signal path is critical in obtaining the full-specified performance of the RFA300 measurement set. Therefore, you must connect the RFA300 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 0.02 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 feet 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 2–1 and 2–2 to connect the RFA300 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 RFA300 measurement set to your transmitter in a manner that ensures the instrument will receive only one channel. Power to the RFA300 measurement set must be greater 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.

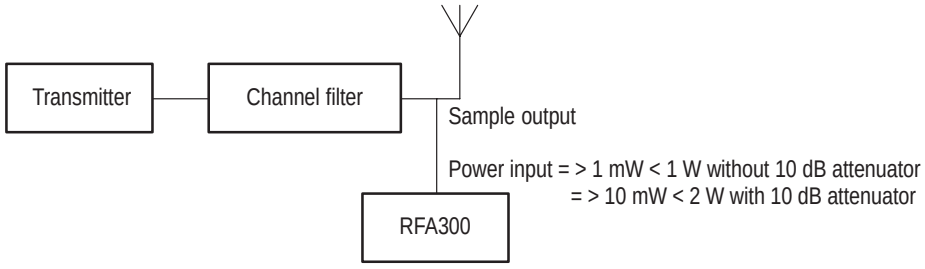


Figure 2–1: Transmitter connection

***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.*

Interface Connectors

The interface connectors on the rear and side of the measurement set, shown in Figure 2–2 and Figure 2–3, provide interconnection ports for peripheral devices and networking. Table 1–5 and Table 1–6 in *Specifications* list the pin assignments for the rear panel and side panel connectors.

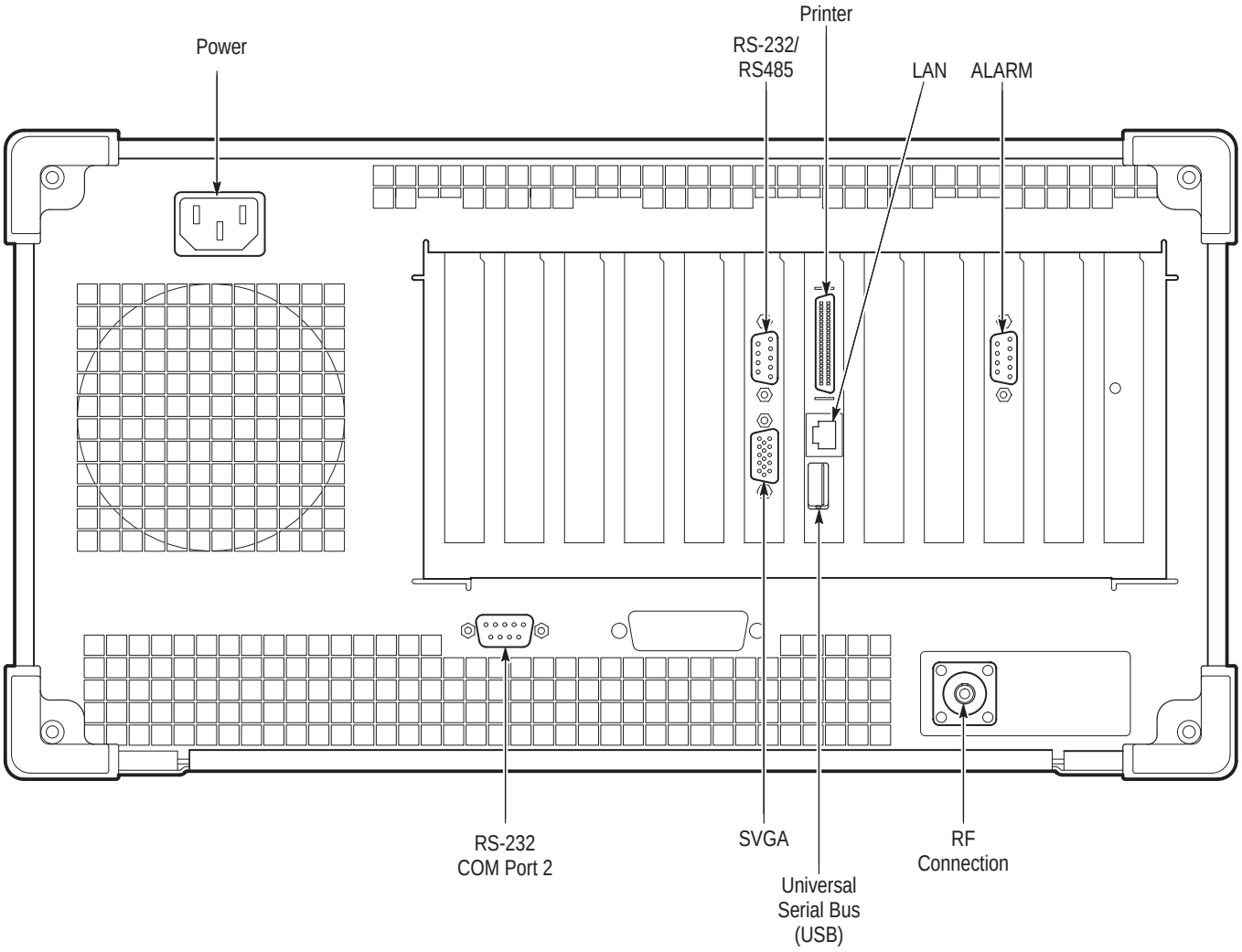


Figure 2–2: RFA300 measurement set rear view

Keyboard and Monitor Connections

Connect the keyboard and monitor to the left-hand side of the instrument as shown in Figure 2–3.

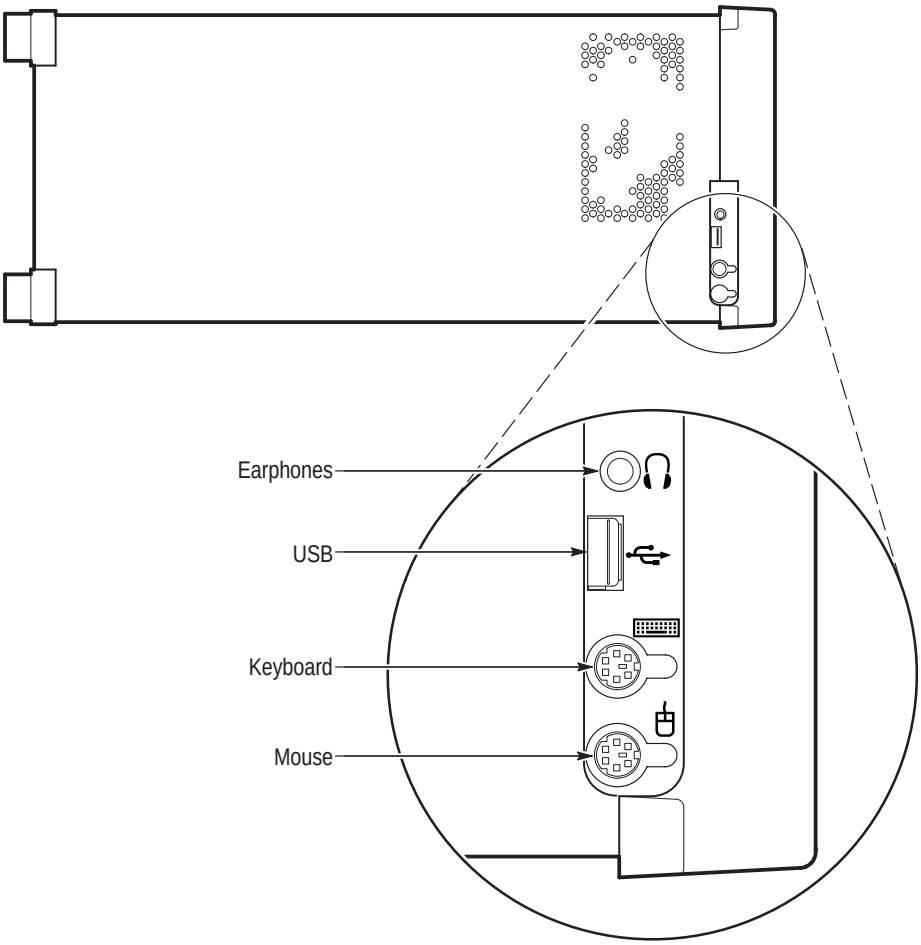


Figure 2–3: Keyboard and monitor connections

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 2–7.

First Time Power On

Power on the RFA300 measurement set as follows:

1. Press the On/Standby switch to power on the instrument (see Figure 2–4 for the switch location).

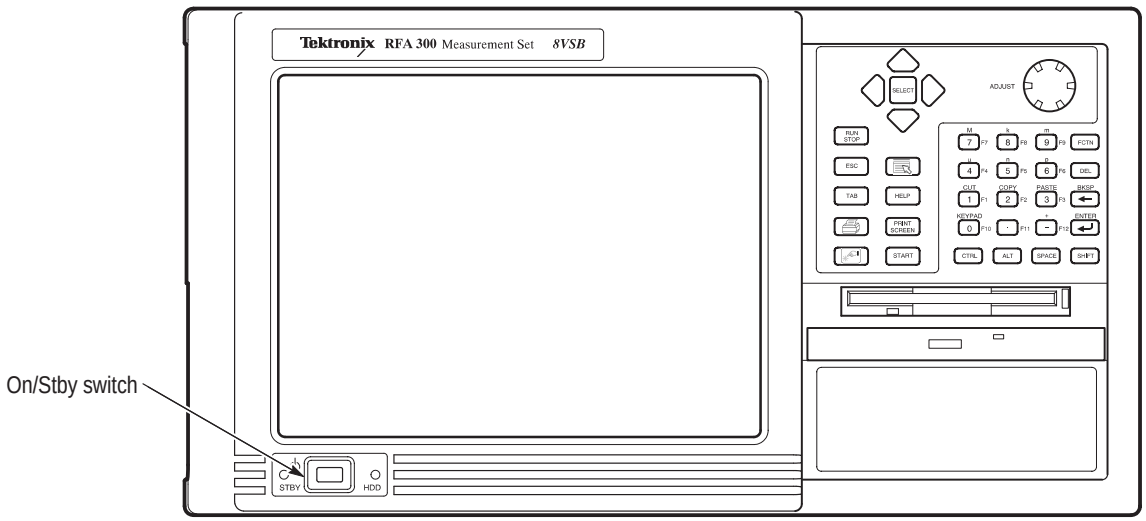


Figure 2–4: On/Stby switch

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, each time you power on the RFA300 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 RFA300 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**. At least 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.*

Operating Basics

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

The RFA300 measurement set is built into a mainframe (called the platform) that uses Microsoft® Windows 95 as its operating system. The RFA300 Measurement Set 8VSB makes measurements that are used to determine the quality of a transmitted 8VSB digital television broadcast signal.

The system consists of the following components:

- The key system components, installed in the mainframe, are modules that down convert the broadcast TV channel frequency, lock on to the carrier pilot, and digitize the incoming analog data.
- RFA300 Measurement Set 8VSB application software consists of the user interface, signal demodulation, signal measurement, and results presentation.

Front Panel

The front panel controls can be used to operate the RFA300 measurement set without the mouse or keyboard. Figure 2–5 shows the front panel.

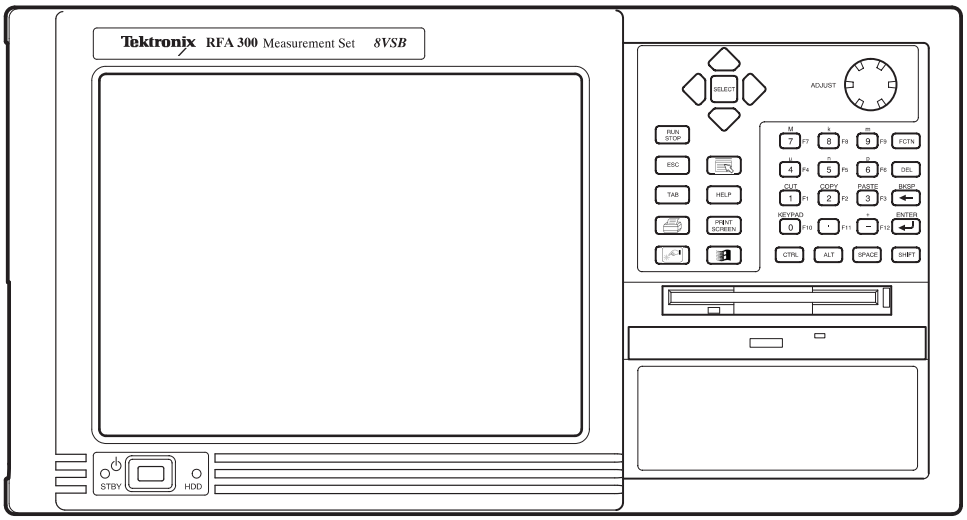


Figure 2–5: RFA300 Measurement Set 8VSB front panel

Keys

You can use the front panel keys as an alternative to a keyboard. All the keys and key combinations are available from the front panel.

For key combinations, it is not necessary to hold down more than one key at a time. For example, you can press SHIFT in the hex keypad, and then press a QWERTY key to accomplish a Shift+key combination. The same is true for other key combinations, such as CTRL and ALT keys.

Table 2–2 list front panel key controls and describes their use.

Table 2–2: Front panel key controls

Control name	Mechanism	Description
Up Arrow	Button	Navigate and change focus from one window function to another
Left Arrow	Button	
Right Arrow	Button	
Down Arrow	Button	
Select	Button	Same as mouse button one
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, pause 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 - 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 (sticky key feature)
Del	Button	Deletes selected text or object
←	Button	Backspace key

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

Control name	Mechanism	Description
↵	Button	Enter key
Ctrl	Button with LED	Control key (LED indicates when keypad is in control mode) Refer to Table 2–3 for a list of control functions (sticky key feature)
Alt	Button with LED	Alternate key (LED indicates when keypad is in alternate mode) (sticky key feature)
Space	Button	Space bar or use as mouse button 1
Shift	Button with LED	Shift key (LED indicates when keypad is in shift mode) (sticky key feature)

Table 2–3: Control key combination functions

Control key	Function
Ctrl+A	Invokes the AutoScale function
Ctrl+B	Opens the previous window
Ctrl+C	COPY
Ctrl+F	Opens the following window
Ctrl+H	Opens the Home Window
Ctrl+K	Opens the Keypad dialog box when the Keypad is displayed in a 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	Activates the Touchscreen
Ctrl+V	PASTE
Ctrl+X	CUT
Ctrl+Y	REPEAT
Ctrl+Z	UNDO

Touch Screen

The touch screen allows you to use your finger to point to and activate controls as a substitute for the mouse cursor and buttons. Move your finger around the screen to simulate mouse movement. Tap the screen, using your finger to select an object. Double tap on a screen object to activate its associated function.

Home Window

The Home Window is the point-of-entry into the RFA300 measurement set. From the Home Window, you can access all measurements by clicking on the appropriate icon. A measurement begins to run immediately as soon as the window opens. Figure 2–6 shows the Home Window. Refer to the *Reference* chapter in the *RFA300 Measurement Set 8VSB User Manual* for an overview of each measurement window.

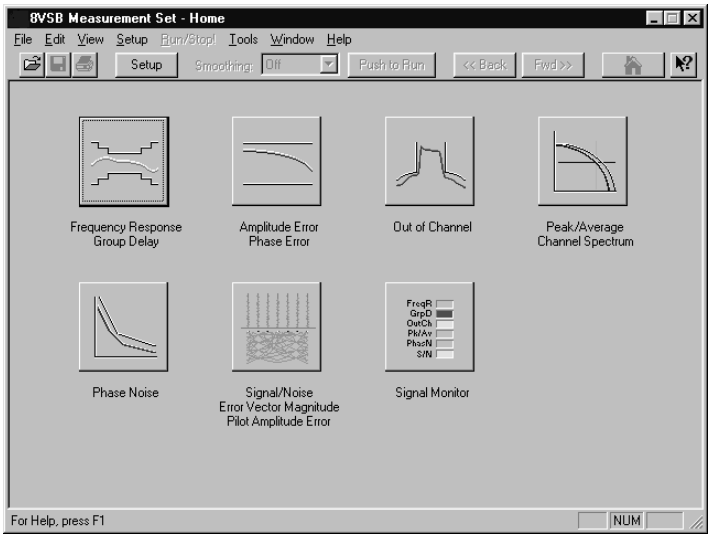


Figure 2–6: Home Window

Menus

Menu selections are available from any measurement window and the Signal Monitor window. Refer to the RFA300 measurement set 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 2–7 shows the toolbar followed by a list of the functions.

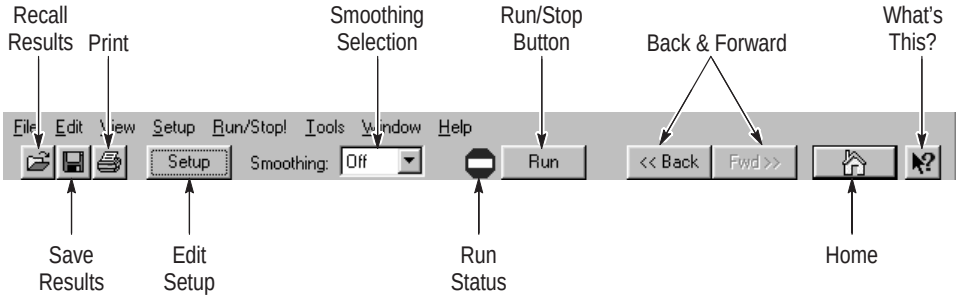


Figure 2–7: Toolbar

Table 2–4: Toolbar functions

Toolbar selection	Function
Recall Results	Recalls a previously saved measurement
Save Results	Saves 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.
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 of the RFA300 measurement set. An explanation of how help works is on page 2–17.

Selecting Channel Frequency

Before running measurements you must select your channel frequency and determine that the input signal has sufficient power to the RFA300 measurement set. Without sufficient power at the test signal input, the instrument cannot

perform accurate measurements. To select frequency perform the following procedure:

1. Connect the instrument to your transmitter using the *RF Connection* information on page 2–2.
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 to enter is the pilot frequency, not the channel center frequency. Refer to* Selecting channel frequency *in the online help.*

---

6. Click on Apply then click on the Verify 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 accordingly.
8. Close the Input Signal Power dialog box and click OK to close the Instrument Setup dialog box.

Limits

After selecting your channel frequency and checking input signal power, you can edit caution and alarm limits. Limits are a set of caution and alarm parameters. The instrument compares each new result against the edited limits as soon as you enter the measurement window. To edit limits do the following steps:

1. Click the Setup button located in the toolbar.
2. Click the Limits tab.
3. Select the results that 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 counterproductive. 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 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 steps:

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 easily save your results to a database using the following steps:

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

You can print results or export them 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 steps:

1. Open the Signal Monitor window.

2. Click Setup in the Toolbar.
3. Select the measurements you want to monitor.
4. Select either how often you want your results to be automatically saved or Off to disable the auto save 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. In the Setup window, click the 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 RFA300 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 2–8.

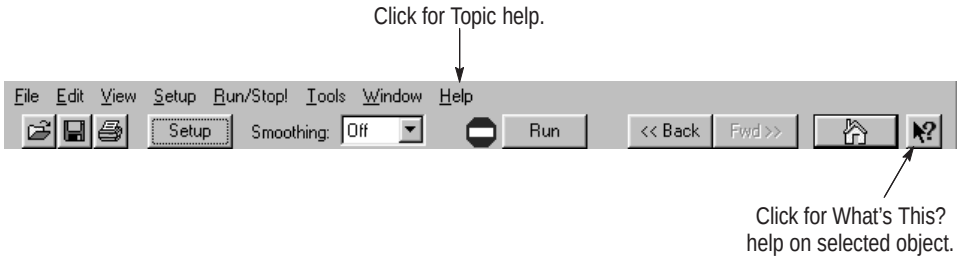


Figure 2–8: Help menu

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 can be more helpful to use than the Contents tab. As you enter a word into the text field, Help searches for and highlights the topic, if one can be found. If you do not find the topic you want in the index, try the Find tab. Enter a word or phase and help displays all topics in the online help that contain the entered 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 2–8, 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 Measurement Set 8VSB 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 the files and folders that 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.

Theory of Operation

The RFA300 Measurement Set 8VSB is a digital television 8VSB signal quality measurement instrument. The measurement set system consists of four modules that are installed in a standard mainframe platform. The mainframe processor has the capability to make the calculations and data transfers required to do the signal measurements. The mainframe circuitry also provides the power and user interface connections to the installed modules. The measurement set modules accept the radio frequency input on a selected TV channel from 7 to 69, down converts it, and digitizes the signal for demodulation and analysis.

Mainframe Operation

The functional operation is divided between the mainframe and the measurement set modules. The functional description starts with the mainframe and its capabilities. A simplified block diagram of the mainframe is shown in Figure 3–1.

The System Bus is contained in a backplane circuit board, The bus directly connects to all applications modules shown in the block diagram. Full system bus connections to the application modules are provided. Power and control signal connections are provided for all the plug in modules and other modules installed in the mainframe lower compartment.

System Busses

The System Bus contains three sub-busses plus other signal wires:

- Power Sub-Bus

  This sub-bus carries power and ground to the applications modules.

- Control Sub-Bus

  The control bus is a PCI bus.

- Communications Sub-Bus

  The communications sub-bus provides the intermodule connections.

- Audio Bus

  This bus provides a way to route an audio signal generated on any Application Module to the Internal Speaker and the Headphone Jack.

- Other Signals. Other signals include such things as trigger signals, supplies for local regulation by application modules, and a serial bus for a simple processor interface.

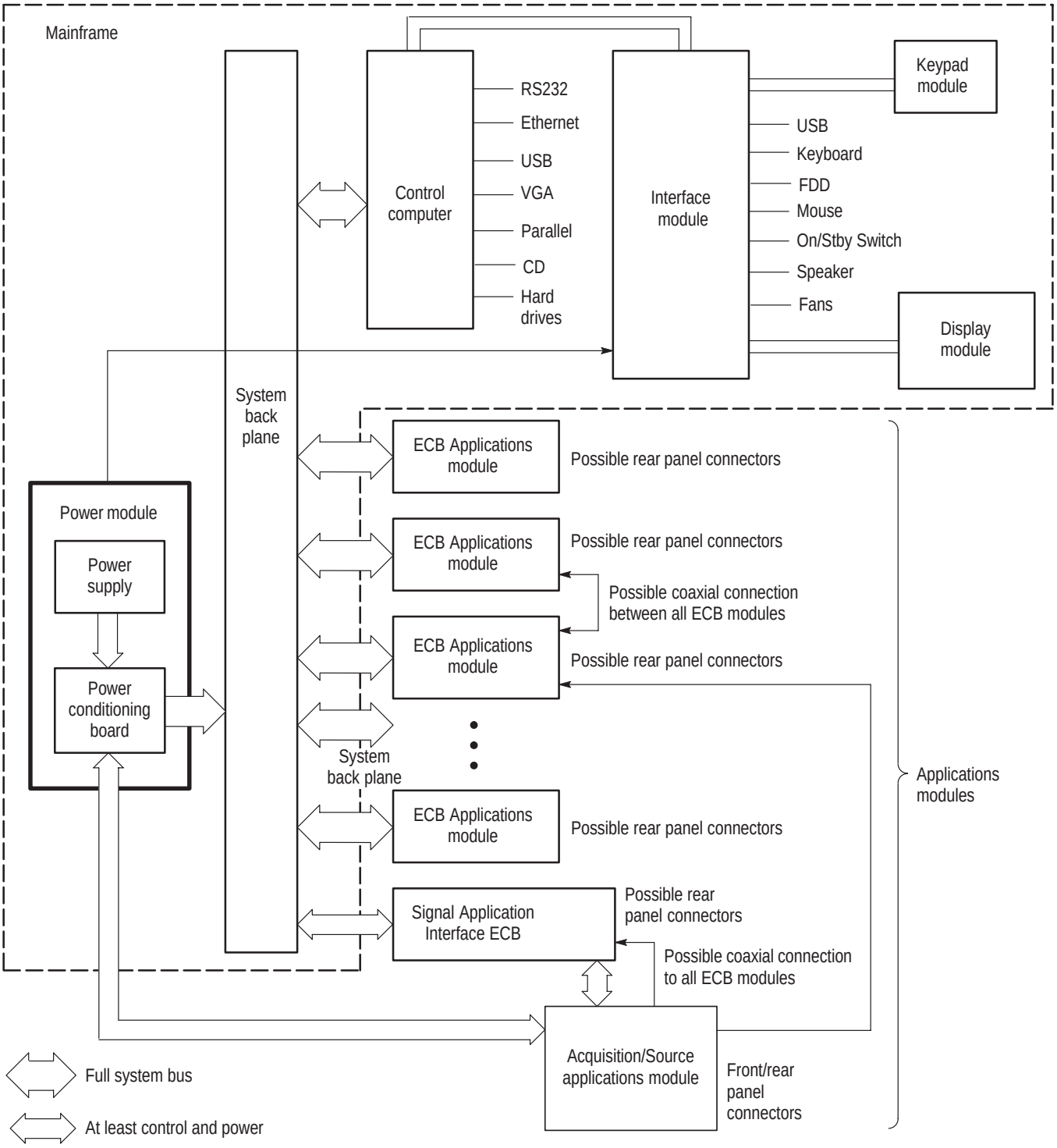


Figure 3–1: Platform block diagram

Power Supply

The Power Module consists of the Power Conditioning Board, a purchased power supply, the ac supply connector with line filter, and the power supply cooling fan. The Power Module supplies the PCI bus voltages through the backplane connectors that engage when the module is bolted in place. Other voltages are provided to the mainframe modules through connectors and ribbon cables.

The power conditioning board distributes power from the main power supply to the backplane, to the front panel, and to the SCSI drive connector. The +5 V and +12 V from the main supply are distributed through current limit circuitry. Additional filter circuitry supplies clean voltages to the acquisition circuitry. Dc-to-dc converters on the power conditioning circuit board generate six of the supplied voltages. These voltages are the +7.5 V, –7.5 V, +3.3 V, +15 V, –15 V, and +33 V supplies. The power conditioning board also does the power on/off switching, generates the line trigger, provides the fan drive voltage, and drives the power supply status indication circuitry.

A shorted or overcurrent condition on any of the outputs of the main supply causes a shutdown and cycling of the main power supply. The dc-to-dc converters foldback for an overcurrent condition and also shutdown the main supply for a shorted output.

PCI Backplane

The PCI backplane supports up to 10 standard PCI modules, and accepts custom application modules. The backplane interconnects the power supply output voltages to the remainder of the system, including the fans, and distributes the system clock. All communication to, from, and between the system modules is supported.

Mainframe Controller

The controller module mounts vertically in the center of the card cage. It connects into the PCI backplane through a standard 32 pin PCI connector. An additional 64 bit PCI connector provides for I/O communication to the backplane, and through the backplane, provides I/O to the rear panel and interconnections to the front panel assembly.

Front Panel Interface

The front panel interface assembly interconnects the system controller with the LCD flat panel display, the floppy disk drive, the CD drive, front panel keypads, the touch panel, and the mouse and keyboard ports. The PC speaker audio is also routed from the controller to the speaker through the front panel interface.

LCD Flat Panel Display

A backlighted 10.4-inch diagonal Active Matrix Thin Film Transistor (TFT) LCD panel provides the internal color display. To extend the life of the backlight and prevent burning of the TFT LCD screen, the cold-cathode fluorescent backlight can be dimmed to 60% of its maximum brightness with a custom screen-saver or mainframe utilities applet. A DC switching regulator board, included as part of the display assembly, provides the backlight high voltage

supply. The LCD display connects to the front panel interface board through a display adapter board in the display assembly.

Touch Panel

The touch panel is a standard 10.4 inch panel mounted over the surface of the flat panel display. The touch panel is active at the same time as the mouse. A second front panel processor combines the mouse and touch screen signals to generate and receive standard mouse scan-codes from the system controller.

Hard Disk Drive

The hard disk drive is a standard 2.5-inch IDE drive that interfaces directly to the system controller through an EIDE (Enhanced Integrated Device Electronics) extension of the PCI bus.

Floppy Disk Drive

The floppy disk drive is a standard one-half inch drive that supports 3.5-inch, 1.44 Mbyte high-density, double-sided floppy disks.

CD Drive

The CD drive is a half-height drive similar to standard lap top computers. A CD caddy is not needed. Open and close the CD drive drawer manually to insert and or remove a CD from the drive.

Mouse and Keyboard Ports

Plug in a PS2 compliant mouse and keyboard to the ports at the lower left side (as you face it) of the bezel. These port are interfaced through the front panel processors to the mainframe controller.

RFA300 Measurement Set Functional Description

The RFA300 measurement set application consists of three plug in modules and one bolted in module in a mainframe platform. A simplified block diagram of the modules and the signal interconnection is shown in Figure 3–2.

Simplified Block Description

The down converter module is a shielded RF assembly in the mainframe lower compartment. The down converter attenuates and down converts the input signal from the TV transmitter to a 10 MHz to 16 MHz IF (intermediate frequency). There are two paths through the down converter. A wide-band channel is used for all modes that demodulate the 8VSB signal. A narrow-band channel is used when measuring spectrum content over a band of ± 2 channels on either side of the input TV channel. The narrow-band channel provides greater dynamic range than the acquisition module A/D converter. Software control during the sweep makes up for this dynamic range difference and gives full hardware dynamic range to the spectral measurement.

The 8VSB transmissions from the TV transmitter include a low amplitude sample of the real-axis carrier signal. This sample, called the pilot, is used to

acquire the carrier. Certain signal processing simplifications are possible if the 8VSB signal is down converted to place the pilot frequency at the symbol frequency, 10.762 ... MHz. Also, the 8VSB signal must be sampled at a multiple of the pilot IF. In the RFA300 measurement set, a multiple of four is used. Therefore, the acquisition A/D converter is clocked at 43.048... MHz.

A pilot-lock system tunes the pilot of the IF signal to 10.76 MHz. The frequency The pilot signal is tuned by varying the frequency of the local oscillator (LO) signal used in the frequency conversion. The synthesizer module provides the local oscillator signal to the down converter module and also routes the power and control signals to the down converter module.

The acquisition module digitizes the IF signal applied from the down converter at four times the pilot IF (the symbol frequency rate). Local memory in acquisition module holds the digitized signal until it is accessed by the main-frame CPU. The system CPU, under control of the RFA300 measurement set application software programming, demodulates the digitized 8VSB signal and measures the signal's characteristics.

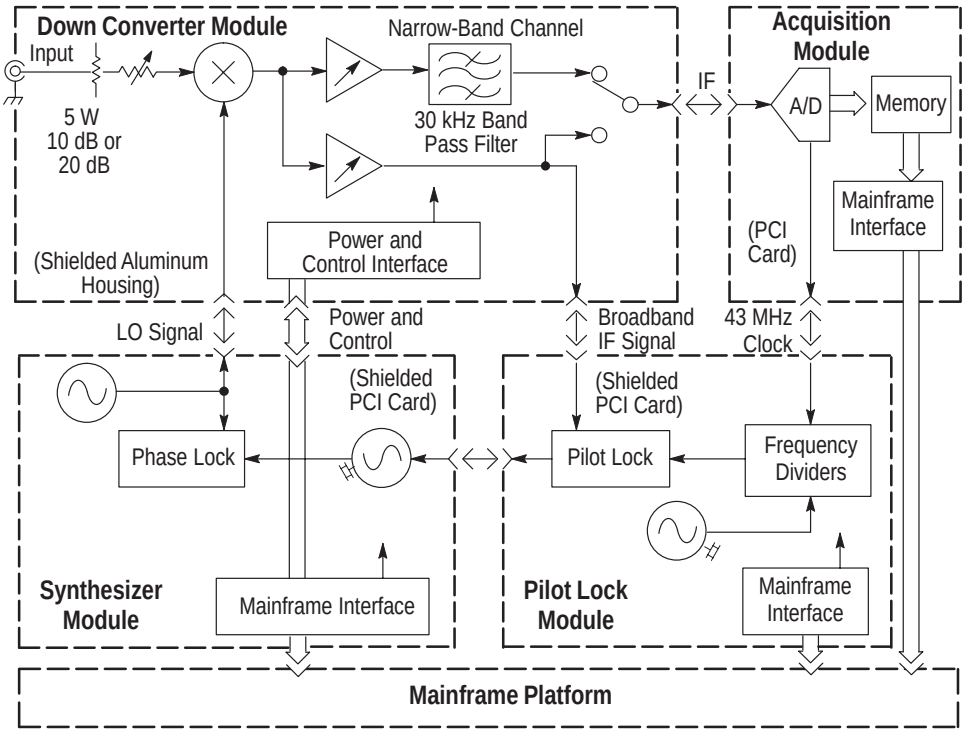


Figure 3–2: Simplified block diagram of the RFA300

Software Demodulation

A diagram of the software demodulation process is shown in Figure 3–3. The first step of the process converts the digitized IF signal to a lower frequency so that the pilot frequency is at zero Hertz. The signal is then passed through an

idealized 8VSB receiver bandpass filter in the complex frequency domain taking into account any small errors caused by the RFA300 hardware. The symbol timing is determined and the signal is resampled to create samples that represent the signal amplitude at the instant of each symbol. The pilot is subtracted, leaving raw data at the correct constellation values.

A self-adjusting equalizer is used to estimate the linear distortion characteristics of the input signal. Unflatness and envelope delay distortions within the signal are estimated by using feedback to make the equalizer filter adjustments needed to minimize intersymbol errors. Part of this process generates an idealized signal that is used in the desired-to-undesired power ratio (S/N) calculations. The various outputs of the software demodulation process are passed to the measurement algorithms.

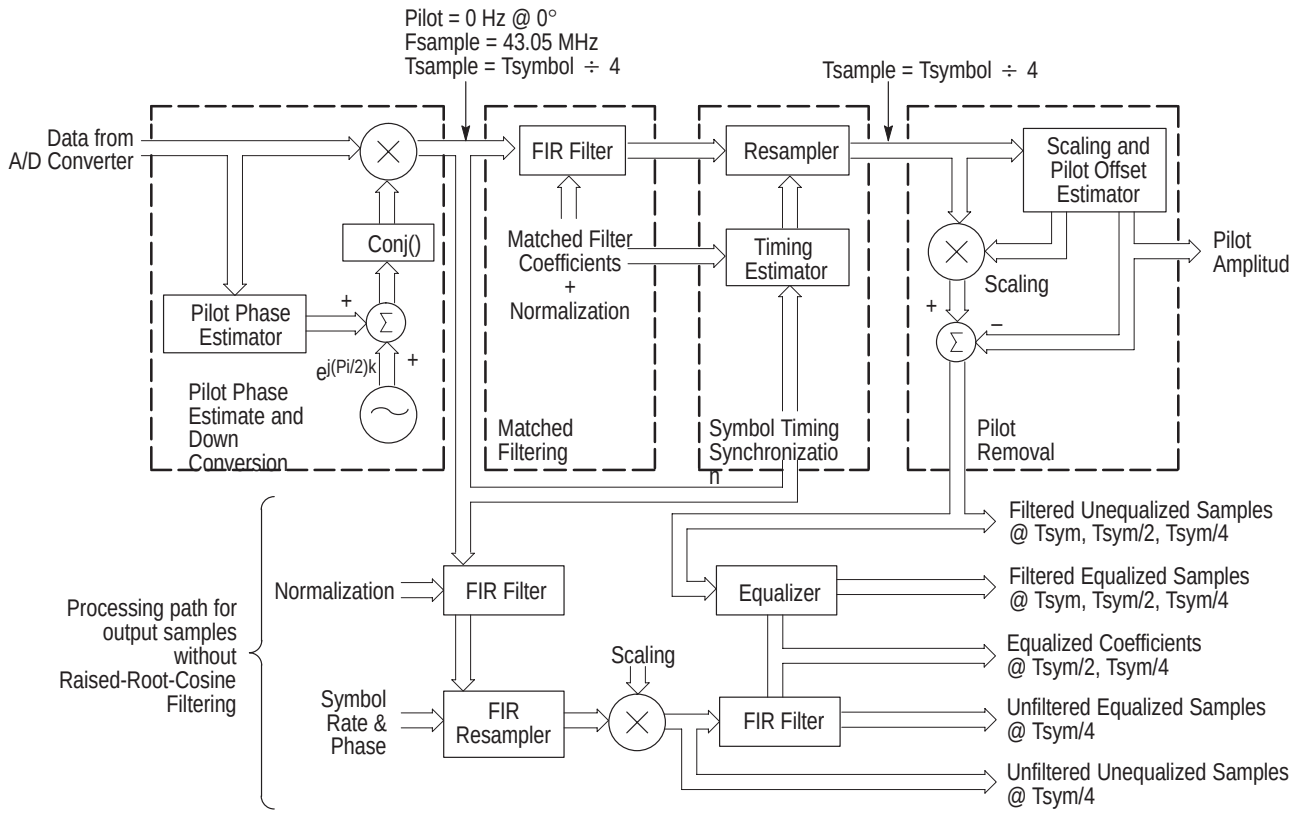


Figure 3–3: Software demodulation process

Down Converter

The RFA300 measurement set is designed to provide highly accurate measurement of the 8VSB signal directly from the transmitter. The down converter module processes the applied 8VSB signal and passes it on to the acquisition module and the pilot lock module. A block diagram of the down converter module is shown in Figure 3–4.

Input Attenuation. The input attenuator reduces the input signal amplitude to the appropriate level for the input mixer of the down converter. Two stages of signal attenuation are used. A fixed 5 watt, 10 dB or 20 dB attenuator at the input terminal attenuates the normally high amplitude signal obtained from the transmitter sample output that can be in the range of 1 watt or more.

***NOTE**. A modification to the RFA300 changed the 20 dB input attenuator to a 10 dB attenuator to permit measurements on lower amplitude signals. Modified products are supplied with an external 10 dB attenuator to permit the full specified input amplitude to be applied.*

After the input attenuator, a selector switch selects between the external input or the internal input. The unused input is terminated. The second attenuator stage is a variable attenuator that adjusts the amplitude of the selected signal to the appropriate level for direct application to the input mixer stage.

Input Mixer. The input mixer combines the input TV signal and the local oscillator (LO) signal to produce the intermediate frequency (IF) of 10 MHz to 16 MHz. There is only one stage of conversion and no preselection circuitry. A single, direct-conversion mixer stage introduces less linear distortion than a multiple conversion receiver.

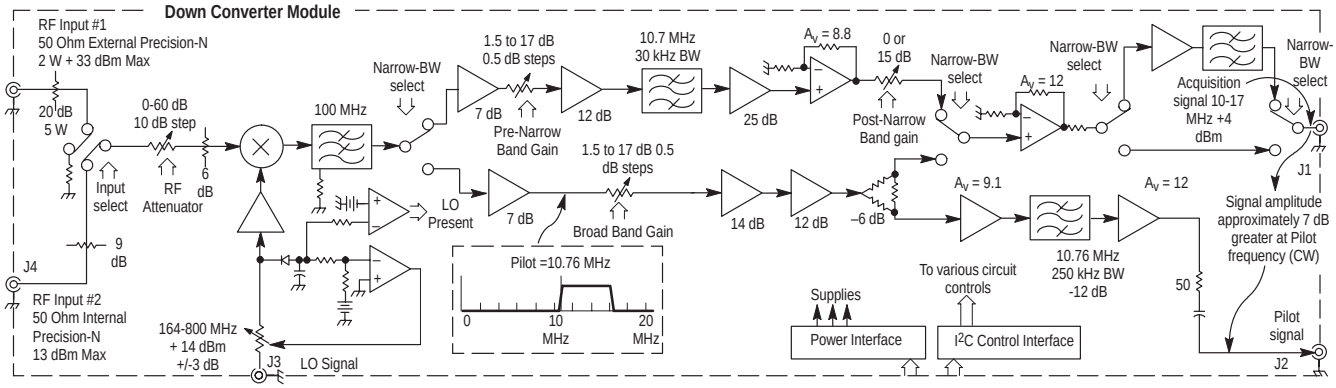


Figure 3–4: Down converter module block diagram

Duplexing Filter. The filter following the mixer eliminates the LO signal feedthrough and terminates the mixer sum products (Fsb + LO) while passing the IF frequency (Fsb – LO). The filter passband is set as high as possible to limit the effects of the filter on the 8VSB IF signal. Following the filter, the signal takes one of two paths depending on the measurement being made.

Signal Demodulation Path. Amplifiers in the signal demodulation path amplify and adjust the signal to the correct level for application to the acquisition module. A filter circuit eliminates the spectral content of a signal sample well removed from the pilot signal for application to the pilot lock module.

Narrow Band Filter Path. Circuitry in the narrow band filter path amplifies and filters the signal to a 30 kHz bandwidth. When making out-of-channel emission measurements, the 15 dB gain-step attenuator makes it possible to do the wide-dynamic-range, narrow-band measurements within the limited dynamic range of the A/D converter. Attenuators adjust the path gain both before and after the filter to optimize the signal amplitude for the A/D converter in the acquisition module.

Acquisition

The acquisition module contains the A/D converter and local acquisition RAM. The illustration in Figure 3–5 is a simplified block diagram of the acquisition module. The input to the module presents a nominal 50 Ω input to the IF signal from the down converter. A capacitor couples the 1 V_{P-P} full scale IF signal to the input of the A/D converter. A 1 V_{P-P} acquisition clock at 43.05 MHz, obtained from the pilot lock module, clocks the A/D converter.

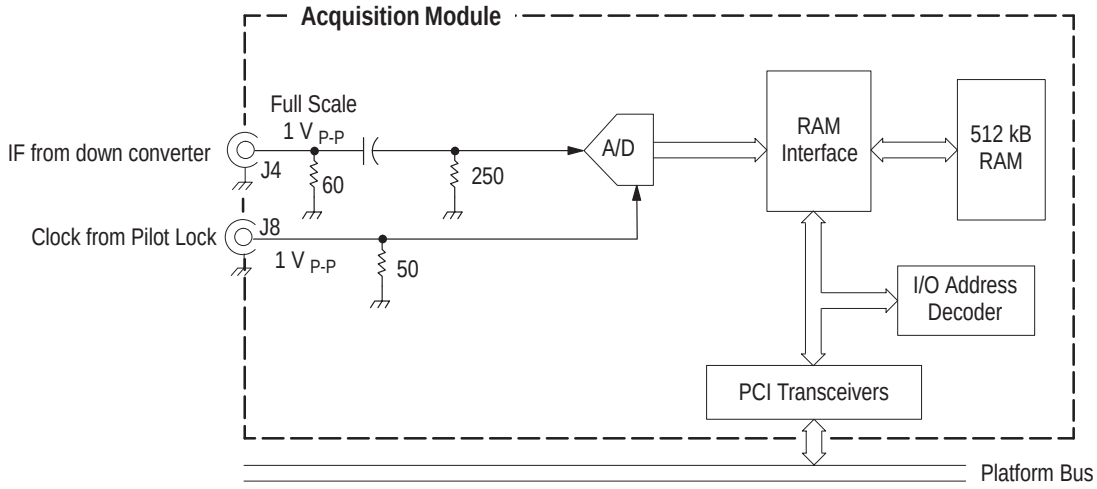


Figure 3–5: Acquisition module block diagram

The 512 kB RAM stores the digitized signal until it is accessed by the system controller for processing. Communication of the data and addressing of the RAM is handled through the PCI interface.

Synthesizer

The synthesizer module provides the Local Oscillator (LO) frequency to the down converter. A block diagram of the synthesizer module is shown in Figure 3–6.

Local Oscillators. The synthesizer module has two high frequency local oscillators that are combined to provide LO signals that tune over an octave range from 400 MHz to 829 MHz. The LO signal is used either directly or counted down by factors of 2^n to derive the correct LO frequency from 164 MHz to 829 MHz for the TV channel (from Ch 7 to Ch 69) to be down converted. Two phase-lock-loop circuits control the frequency of the local oscillators.

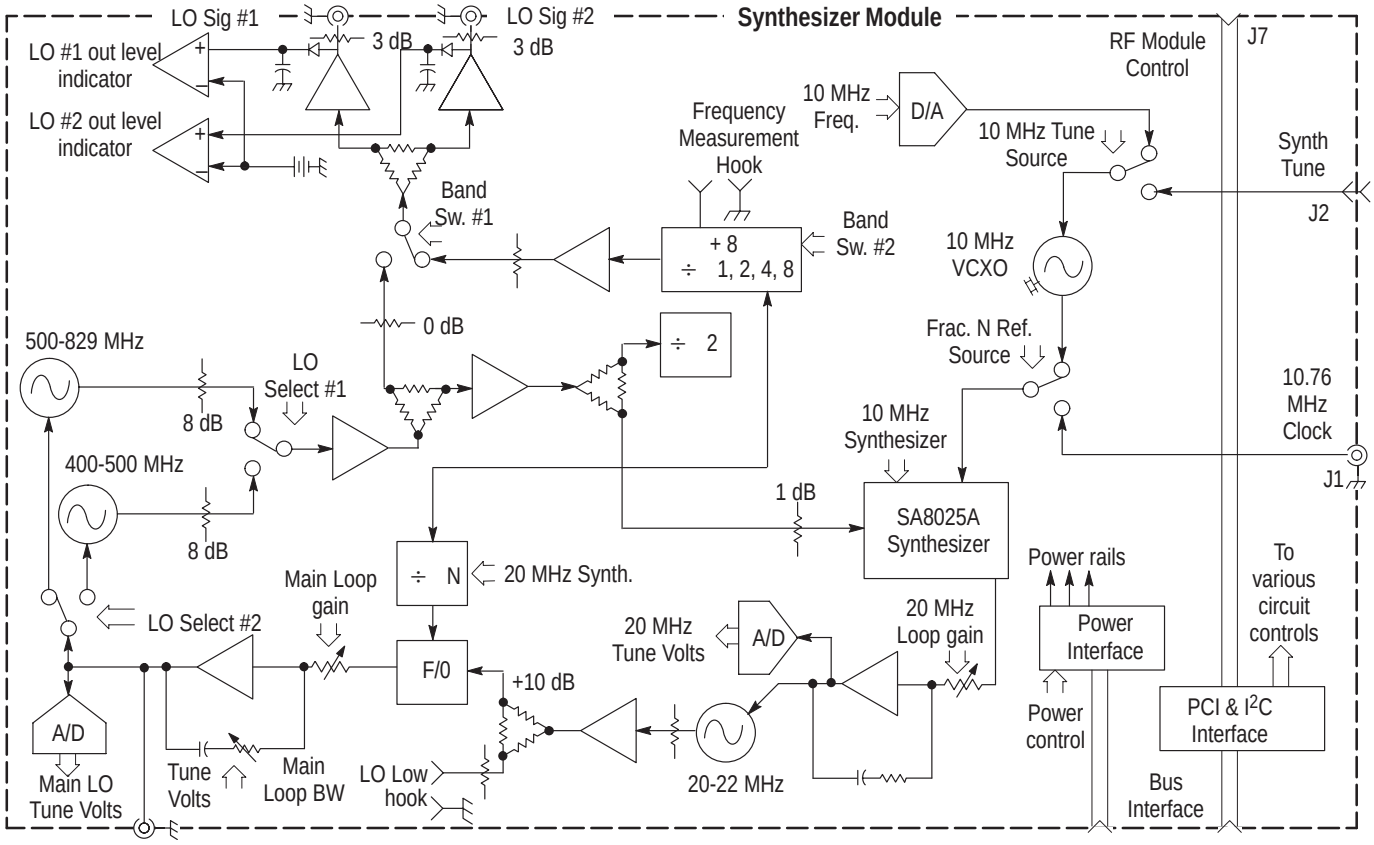


Figure 3–6: Synthesizer block diagram

Phase-Lock-Loop Circuits. The main loop circuit feedback path is the divide-by-N counter followed by a phase/frequency detector. A 20 MHz to 22 MHz VCO (voltage-controlled oscillator) provides the reference to the phase/frequency detector. The main loop is fairly wideband and provides the necessary control to minimize the phase noise generated by the high frequency local oscillators.

The 20 MHz phase-lock-loop circuit uses a fractional-N synthesizer and a 10 MHz VCXO (voltage-controlled crystal oscillator) to control the frequency of the 20 MHz oscillator. This loop circuit also provides the frequency accuracy of the synthesizer. Two sources can provide a control voltage to the 10 MHz VCXO. One source is derived from the pilot lock module when the measurement set is operating in the demodulation mode. For out-of-channel emissions measurements, the 10 MHz VCXO control voltage is derived from a D/A converter.

Pilot Lock

A block diagram of the pilot lock module is shown in Figure 3–7. The 8VSB signals are transmitted as 8-level, suppressed carrier digital signals. A small amount of the carrier frequency, a pilot signal, is transmitted in an 8VSB broadcast to enable a receiver to lock to the carrier signal. The pilot lock module provides the pilot lock function and produces specialized clock frequencies required to tune the measurement set and demodulate the 8VSB signal.

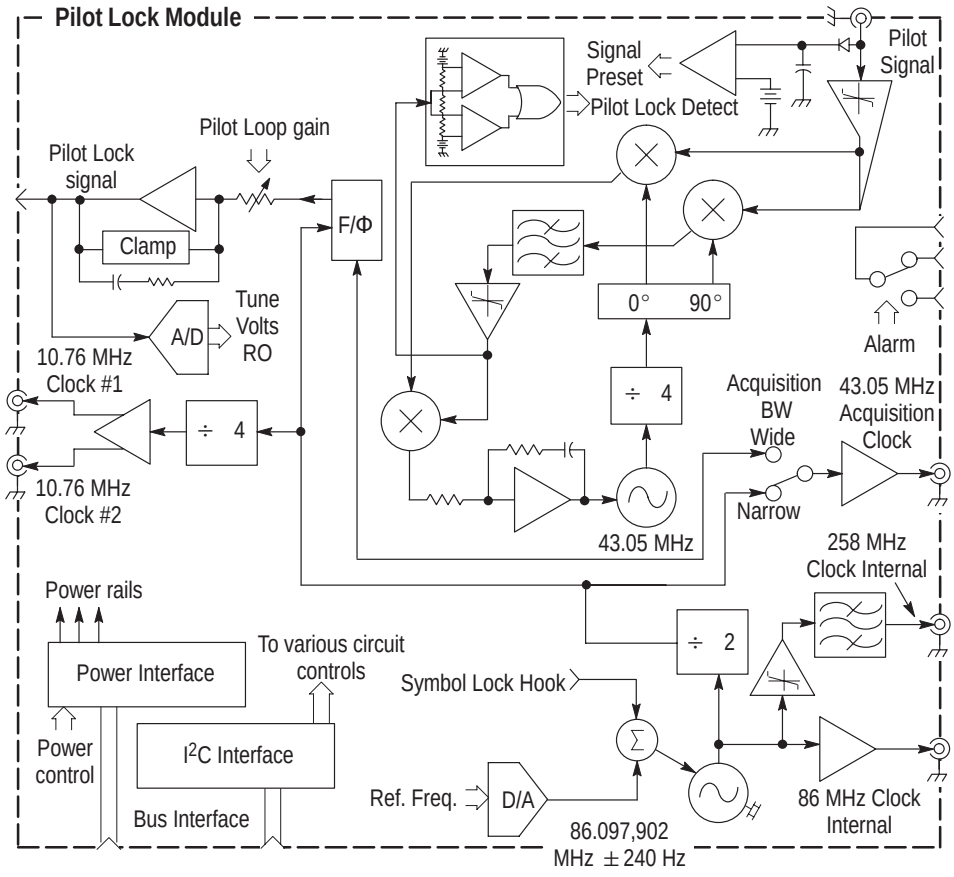


Figure 3–7: Pilot lock block diagram

Pilot Lock Input. The pilot signal output from the down converter module is a spectrum limited 8VSB signal. The signal is limited to a frequency range near the pilot signal at 10.76 MHz (the pilot signal frequency in the down converted IF signal). The amplitude is limited to set it to a fixed amplitude, and then used as the reference signal in a phase-lock-loop circuit. This loop operates with a bandwidth of about 2 kHz and phase locks the 43.05 MHz VCO (voltage-controlled oscillator) to the fourth harmonic (43.05 MHz) of the IF pilot signal frequency.

Second Phase Lock Loop. The second loop of the pilot lock module compares the frequency of the 43.05 MHz VCO to a signal derived from the 86.1 MHz reference oscillator in a frequency/phase detection circuit. The error signal from this comparison tunes the 10 MHz VCXO in the synthesizer module in a loop bandwidth of about 75 Hz. The tuning synchronizes the long term frequency of the 43.05 MHz pilot lock signal (and thereby the pilot IF frequency) with the 86.1 MHz reference oscillator.

86.1 MHz Reference. The 86.1 MHz reference is buffered to provide an internal source. A chain of dividers with buffered outputs provides various sub multiples of the 86.1 MHz clock. In addition, the 238.3 MHz output is derived from the 86.1 MHz reference. Th 238.3 MHz output, connected to the RF in #2 connector, supplies the internal down-converter input used for calibration.

Performance Verification

This section contains procedures for verifying that the instrument performs according to the characteristics stated in the *Specifications* section.

If the instrument is not able to pass these tests, refer to the *Maintenance* section for troubleshooting procedures.

***NOTE**. To complete the procedures in this section you need a basic understanding of the Windows 95 operating system, and the RFA300 Measurement Set 8VSB application. For detailed operating instructions, refer to the Windows 95 manuals and the* RFA300 Measurement Set 8VSB User Manual.

Test Software

Testing software containing some special testing applications is used for the Performance Verification procedure and the Adjustment procedure. The software saves the user setup files and user data files for restoration after the testing is done. As a final step, the software removes the testing software from the RFA300 measurement set to prevent its inadvertent use in normal operation of the product. The software is provided on a floppy disk as an accessory to this service manual.

Test Interval

Perform the procedure once every 12 months of operation to ensure that the performance is within tolerance.

Prerequisites

The RFA300 measurement set is limited to situations where a single, high-amplitude, 8VSB-RF signal is available for direct input to the measurement set.

The tests in this section require that the following performance conditions be met:

- 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 instrument must be in an environment with temperature, altitude, humidity, and vibration within the operating limits described in the *Specifications* section.
- The instrument must be powered from a source maintaining voltage and frequency within the limits described in the *Specifications* section.
- Any conditions that are unique to a particular characteristic are expressly stated as part of the characteristic.

Equipment Required

Table 4–1 lists the test equipment needed to complete the Performance Verification procedure. The table identifies examples and minimum tolerances, where applicable. If you substitute other equipment for the examples listed in Table 4–1, the equipment must meet or exceed the tolerances.

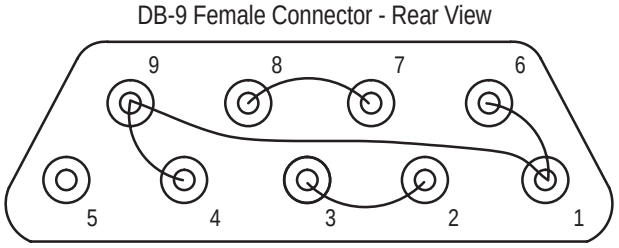
Table 4–1: Required equipment list

Test equipment	Minimum requirement	Example
8VSB Signal Source	10 mW to 2 W (+10 dBm to +33 dBm)	
Signal Generator	Frequency range 174 MHz to 806 MHz, FM modulation 100 KHz, frequency deviation 80 kHz, output amplitude +10 dBm to +30 dBm	Rohde & Schwarz SMT03 Signal Generator
Signal Generator	Frequency range 174 MHz to 818 MHz, modulation CW, output amplitude 0 dBM to –80 dBm	Marconi 2024 Signal Generator
Spectrum Analyzer	0 to 1 GHz, with tracking generator; frequency accuracy better than 10 Hz at 400 MHz	Rohde & Schwarz FSEB20/30 Spectrum Analyzer
SWR Bridge	50 Ω impedance, N-type connectors	Wiltron 60NF50
N-type barrel connector	Connectors, N-type, male-to-male barrel adapter. SWR 1.06 or better	MMC 8803B
50 Ω coaxial cable	Connectors N-type male, length 72 inches	Tektronix part number 012-0114-00
Precision 50 Ω coaxial cable (2 ea.)	Connectors BNC male, length 36 inches	Tektronix part number 012-0482-00
3-way power combiner/divider	Connectors, SMA female	Tektronix part number 015-0565-00
Adapters[1] (3 ea.)	Connectors, SMA male to BNC female	Tektronix part number 015-0554-00
Adapters[1] (2 ea.)	Connectors, BNC female to N-type male	Tektronix part number 103-0045-00

Table 4–1: Required equipment list (cont.)

Test equipment	Minimum requirement	Example
RS232 loop-back connector	Connector, DB 9, purchased or user fabricated loop-back connector	See Figure 4–1 for the wiring diagram
Performance verification software	RFA300 Performance Verification and Field Adjustment Software disk	Tektronix part number 063-3247-00

1 **Adapter types depend on the coaxial cables used to make the signal interconnections. The example adapters assumes a coaxial cable with BNC connectors. If you use interconnection cables with SMA connectors and N-type connectors where needed to make the connections, additional adapters are not required.**



Pin	Signal Name	Abbreviation
Pin 1	Carrier Detect	(CD)
Pin 2	Receive Data	(RD)
Pin 3	Transmit Data	(TD)
Pin 4	Data Terminal Ready	(DTR)
Pin 5	Signal Ground	(SG)
Pin 6	Data Set Ready	(DSR)
Pin 7	Request to Send	(RTS)
Pin 8	Clear to Send	(CTS)
Pin 9	Ring Indicator	(RI)

Figure 4–1: RS-232 loop-back connector wiring diagram

RFA300 Test Record

Photocopy this page and use it to record the performance test results for your RFA300 Measurement Set 8VSB.

RFA300 Test Record

Instrument Serial Number: _____ Certificate Number: _____

Temperature: _____ RH %: _____

Date of Calibration: _____ Technician: _____

Channel Frequency: _____

RFA300 performance test	Measured value		Test limit
Residual S/N			≧ 40 dB
Residual EVM			≦ 1%
Residual MER			≧ 40 dB
Residual Flatness Error			≦ 0.25 dB peak-to-peak
Residual Group Delay Error			≦ 8 ns peak-to-peak
Residual Phase Noise			< –105 dBc/Hz at 20 kHz offset
Return Loss			≧ 30 dB
Out of Channel Measurement Limit			≧ 80 dB
Out of Channel Accuracy	**Measured value**	**Calculated step size**	**Step size test limits**
–7 dBm		-	-
–17 dBm			10 dB ± 2 dB
–27 dBm			10 dB ± 2 dB
–37 dBm			10 dB ± 2 dB
–47 dBm			10 dB ± 2 dB
–57 dBm			10 dB ± 2 dB

Measurement Set Power-On

1. Connect the keyboard to the keyboard port (located on the lower left side panel at the front of the measurement set).
2. Connect the mouse to the mouse port (located on the lower left side panel at the front of the measurement set).
3. Connect power cord to the mainframe power supply connector (located on the rear of the measurement set).

***NOTE**. The RFA300 measurement set may begin to power up upon connecting the power cord.*

4. Push the measurement set front panel On/Stby button (see Figure 4–2 for the location).

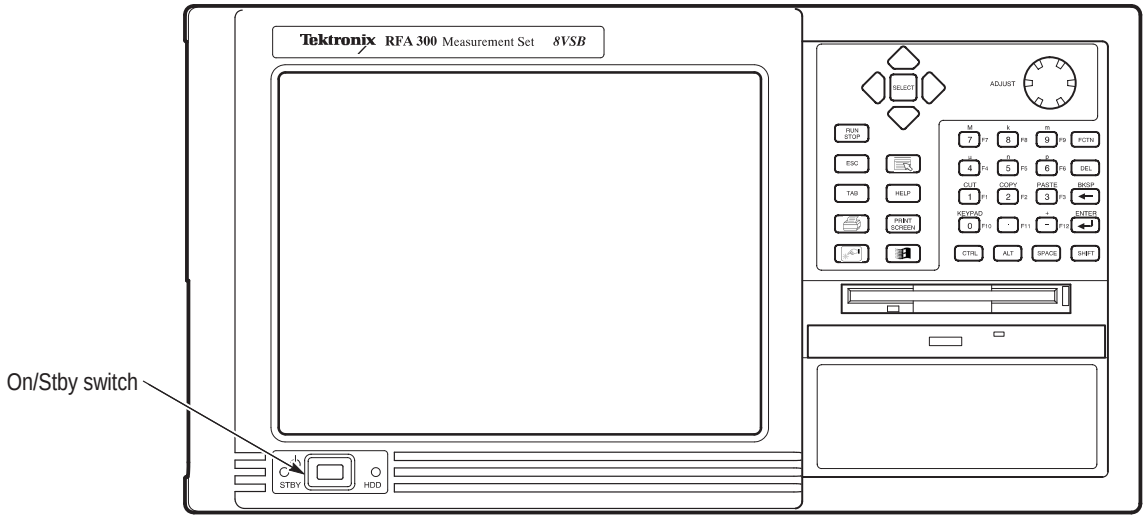


Figure 4–2: On/Stby switch

5. Before the measurement set starts loading Windows 95, perform the following check:

   Check that the keypad buttons highlighted in Figure 4–3 light up during boot up.

   If there is doubt about whether or not any of the buttons lighting up during boot up, then push the On/Stby button as many times as required to check the lights.

***NOTE**. The On/Stby button has to be pressed before Windows 95 begins to load. Possible error messages may appear if the measurement set is turned off during loading of Windows 95 program.*

6. While the measurement set is loading Windows 95, check that the two green colored LED - STBY and HDD (located at the lower left corner of the front panel) are operating.

7. Wait about 30 seconds for the Enter Network Password window to appear on the LCD display. Note that the RFA300 measurement set can be configured to bypass the network password window and the start up continues as in step 9.

8. With the mouse, point to and select Cancel.

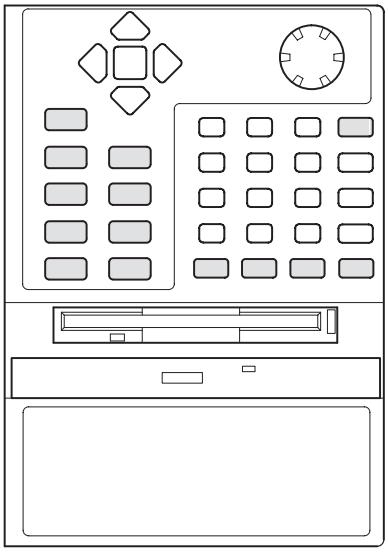


Figure 4–3: Front panel keypad showing highlighted buttons (in gray)

9. Listen for a short tune (Sounds) played by the measurement set speaker.

10. Wait for the instrument to complete the power-on self-tests and start Windows.

Functional Verification Procedure

NOTE. *The RFA300 measurement set can be configured to start up the RFA300 application at power on. In that case, you will not have to start the application.*

The functional verification consists of confirming the basic operation of the RFA300 measurement set. The power-on diagnostic tests are done during the power-on process. These tests check the basic functionality of the measurement set. If a failure is detected, the Power-on diagnostics dialog box opens with the failed test indicated.

1. Start the RFA300 measurement set application if it does not start automatically. The Calibration window is displayed, and a progress indicator shows the calibration and diagnostic progress.
2. If the power-on diagnostics fail or the RFA300 measurement set fails to boot up correctly, refer the problem to a qualified service person.

Extended Diagnostics

Run the extended diagnostics to test functionality in more detail. Use the following steps to run the extended diagnostics.

1. Go to the Tools menu and select Diagnostics.
2. Click the Extended Diagnostics tab.
3. Use the mouse to select All Modules and Test.
4. Select One Time and click Run. Check that all the tests pass.
5. Click on Close to exit the Diagnostics dialog box.

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

NOTE. *The tests in this procedure can be performed on any television channel in the range of 174 MHz to 806 MHz (channel 7 to channel 69). If you have no preferred channel, the Normalization and testing should be done on channel 50 (pilot frequency is 686.31 MHz) to assure the best operation of the range of channels.*

Verify Input Signal Power

The input signal test selects the channel frequency and verifies that the input signal has sufficient power. Without sufficient power the instrument cannot perform accurate measurements. Use the following steps to check the input signal functionality:

1. Connect the RF input connector of the RFA300 measurement set to the 8VSB transmitter RF sample output connector using a 50 Ω coaxial cable with N-type connectors on both ends. Use the appropriate connector adapter as necessary to connect to the transmitter. The signal power applied to the RFA300 measurement set must be more than 1 milliwatt and less than 1 watt for the internal 10 dB attenuator (0 dBm to +30 dBm). 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 (+10 dBm to +33 dBm).

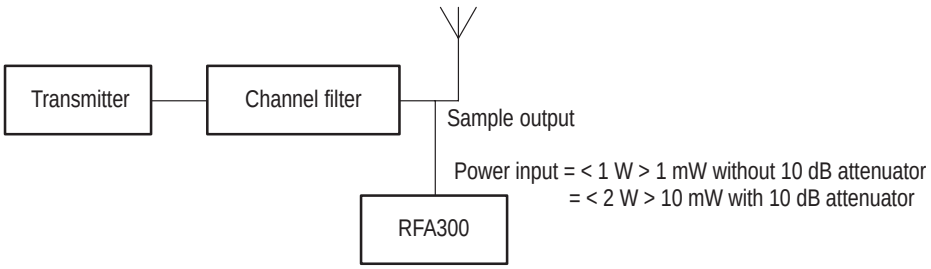


Figure 4–4: Transmitter connection

2. Click the Setup button on the toolbar. Select the System Tab in the Setup dialog box.
3. Enter the channel frequency (the pilot frequency) of the transmitter.
4. Click the Verify Input Signal Power button.
5. Verify that the input signal level is in the OK range (in the green). If it is below the green level, the signal power to the measurement set must be increased. You can add the 10 dB external attenuator provided with the 10 dB input attenuator instruments, if necessary to reduce the signal power.

NOTE. *With the 10-dB internal signal attenuator modification, 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.*

---

6. Close the dialog box and click OK to close the Instrument Setup dialog box.

Measurement Functionality

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

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 measurements graphic within a few seconds.
3. Verify that the readout area for both measurements is updating.
4. Do the same procedure for each measurement. Note that you must select some of the measurement graphs using the selection tabs.

NOTE. *Several of the measurements take some time to complete.*

- Amplitude Error and Phase Error
- Out-of-Channel Emissions
- Peak-to-Average Ratio and Channel Spectrum (select tab)
- Phase Noise
- Error Vector Magnitude and Pilot Amplitude Error and Signal to Noise Ratio (tab between Constellation and Eye Diagram)

5. Click on the × in the upper right corner of the application window to shut down the RFA300 application

Touch Screen Test

NOTE. *Pointing to (touching) the measurement set LCD display with your finger causes the cursor to move to that location.*

1. Verify that the touch screen is operating.
   a. Point to and touch various locations on the measurement set display as shown in Figure 4–5.
   b. Verify that the arrow cursor moves to each location touched in approximately one second.
   c. Move the mouse down to the bottom of the screen to get the Start icon or use the Start button in the keypad. Select the Windows 95 menu by clicking the Start icon.

d. Deselect the Windows 95 menu by touching the top right corner of the display.

2. Verify touch screen uniformity. The cursor arrow should smoothly follow within 1/8 inch of the touch position.

a. Drag your finger tip diagonally across the touch screen from top right corner of display to bottom left corner.

b. Drag your finger tip vertically across the touch screen from top to bottom.

c. Drag your finger tip horizontally across the touch screen from right to left.

If this test fails, do the *Calibrate the Touch Screen* procedure starting on page 5–11 in the *Adjustment Procedure* section.

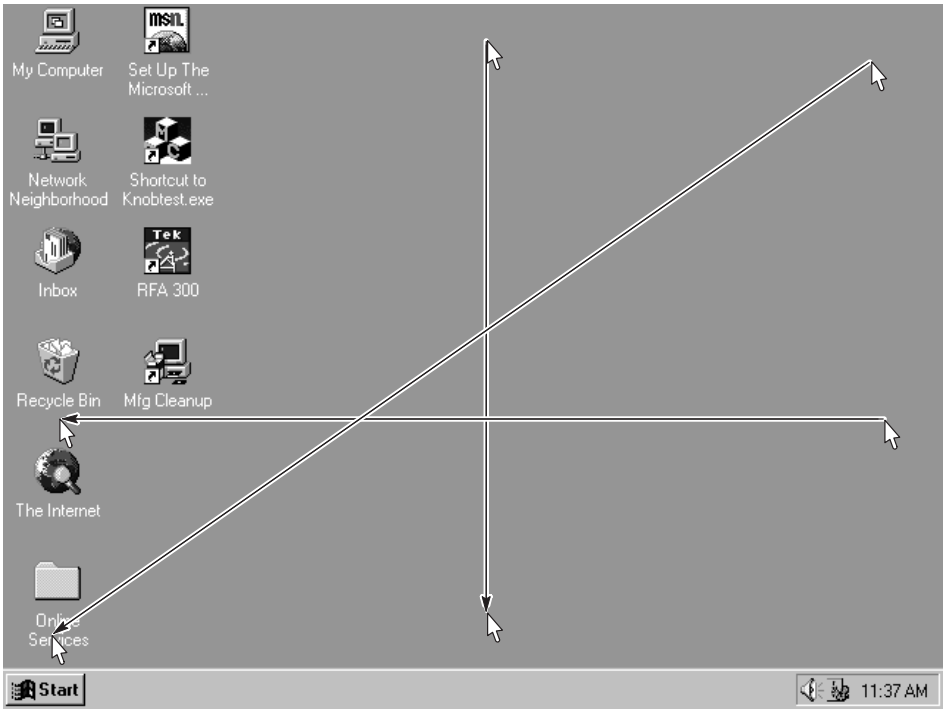


Figure 4–5: Windows95 main screen with cursors at various locations

CD ROM and Stereo Port Tests

1. If the Start task bar is not present on the bottom of the screen, press the Start button to display it.
2. Push the release button in the center of the CD drive drawer to release the drawer.
3. Pull the CD drive drawer open and insert a music CD disc on the center spindle. Press down on the disc to snap it onto the spindle.
4. Close the CD drive drawer.
5. Wait (approximately 15 seconds) for tune (Sounds) to be played by the measurement set speaker.

***NOTE**. If no music is heard, check the speaker volume control setting. Single click on the speaker on the speaker icon to display the speaker volume control. Increase the volume control setting toward maximum (up) until you hear music from the measurement set speaker.*

---

6. With the mouse, point to and double click on the speaker icon located at lower right hand corner of the screen.
7. In the Volume Control window, set the CD Audio volume to minimum level using the mouse as follows:
   a. Click on CD Player; then click on volume control.
   b. Position the cursor on the CD Audio volume control lever.
   c. Click and hold down the mouse select button while dragging the cursor to the lowest volume level setting.
   d. Release the select button.
8. Plug a stereo headset into the measurement set headphone jack, located on the left side panel above the keyboard jack.
9. Use the mouse cursor to increase the volume level while listening for tunes from both headphones.
10. Check the stereo balance control using the following procedure:
    a. Click on CD Player, and then click on Volume Control.
    b. Shift the volume control balance lever to full right and verify that only the right headphone has sound.

c. Shift the volume control balance lever to full left and verify that only the left headphone has sound.

11. Shift the volume control balance lever back to the center position.

12. Point to and select the × box to close the Volume Control window.

13. In the taskbar, click on the CD Player task label.

14. In the CD Player window, click on Disc and select Exit.

15. Select Exit to close the CD Player window.

16. Remove the CD disc from the CD drive.

17. Close the CD drive drawer.

18. Disconnect the headphones from the headphone jack.

Selection/Booting of QAPlus_WIN-WIN Program

1. Select the Windows95 menu by touching the Start icon.

2. With the touch screen, follow the path shown in Figure 4–6.

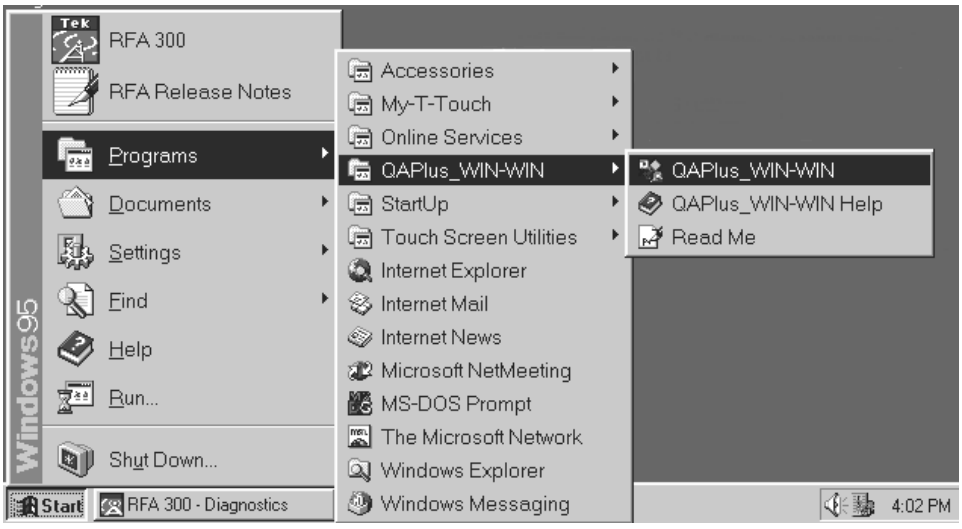
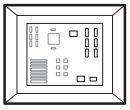


Figure 4–6: QAPlus_WIN-WIN Path

3. Wait for the DIAGSOFT window to appear.

4. With touch screen or mouse, point to and select OK.

System Board Tests

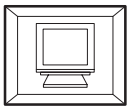
1. With touch screen, point to and select System Board. 
2. In the Test Selection box, select the following tests:

   IC Data Paths Test

   Calendar/Clock Tests

   NPU Test
3. Deselect all other tests.
4. With touch screen, point to and select Run Tests.
5. When prompted, answer the “Is the date correct?” and “Is the clock operating?” questions.
6. Wait for the Test Results window to appear.
   a. If the Pass completed successfully message appears, then point to and select OK.
   b. If a failure message appears, refer the problem to a qualified service person.
7. Upon passing the tests, point to and select Cancel box.

LCD Display Polarizer and Dust/Contamination Checks

1. With touch screen, point to and select Video. 
2. In the Test Selection box, deselect the Linearity Test.
3. With touch screen, point to and select Run Tests.
4. Verify that the Black Color Test appears on the measurement set display (see Figure 4–7).

Polarizer check screen

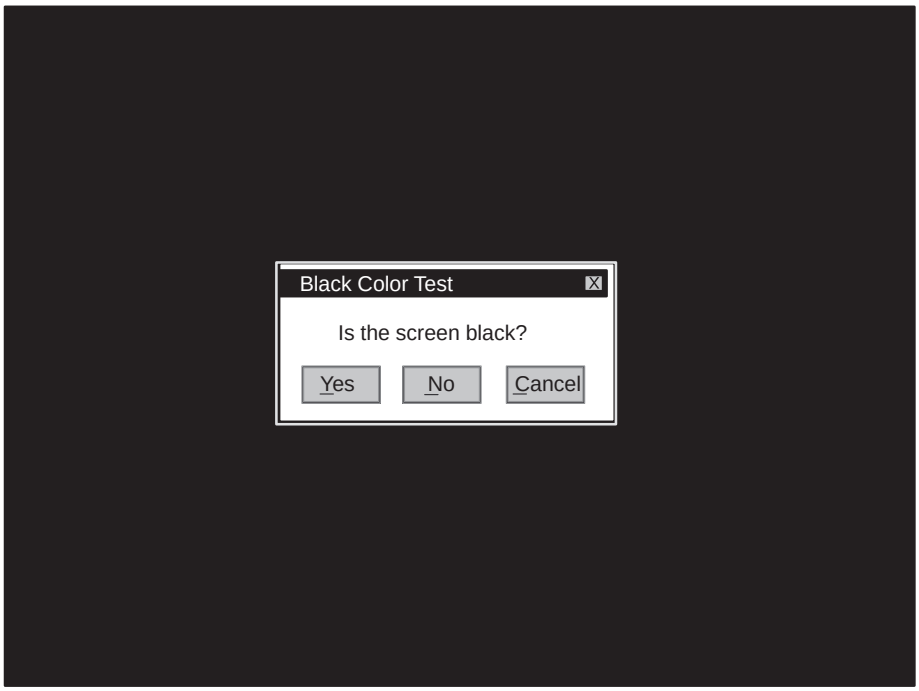


Figure 4–7: Black color test screen

5. Check that the display screen has none of the defects listed below:
   - **a.** Scratches.
   - **b.** Bubbles, wrinkles or dents.
   - **c.** Objects or dust trapped in display screen.
   - **d.** If defects are found, refer them to a qualified service person.
6. Upon passing checks, point to and select Yes.
7. Verify that the White Color Test screen appears on the measurement set display (see Figure 4–8).

Dust/Contamination check screen

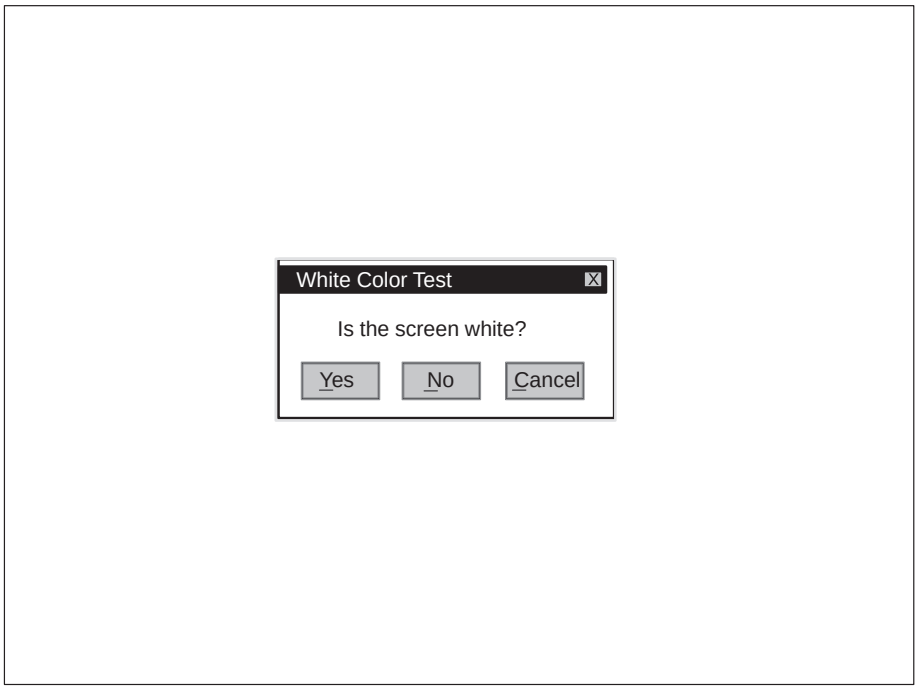


Figure 4–8: White color test screen

8. Check that the display screen has none of the defects listed below:
   a. Dust or contamination.
   b. Finger prints.
9. If defects are found, refer the problem to a qualified service technician.
10. Upon passing checks, point to and select Yes.

LCD Display Red/Green/Blue Pixel Checks

1. Verify that the Red Color Test appears on the measurement set display (see Figure 4–9).
2. Position your eyes approximately 18 inches from the display screen.
3. While viewing the screen from left to right side, perform the following checks:
   a. Check that there are no dark spots, bright spots or any other defects that effect the red color of the screen.
   b. Check that the screen intensity appears even with no locations where the red color is missing. Refer to Figure 4–9 for possible defects.

c. If defects are found, refer the problem to a qualified service technician.

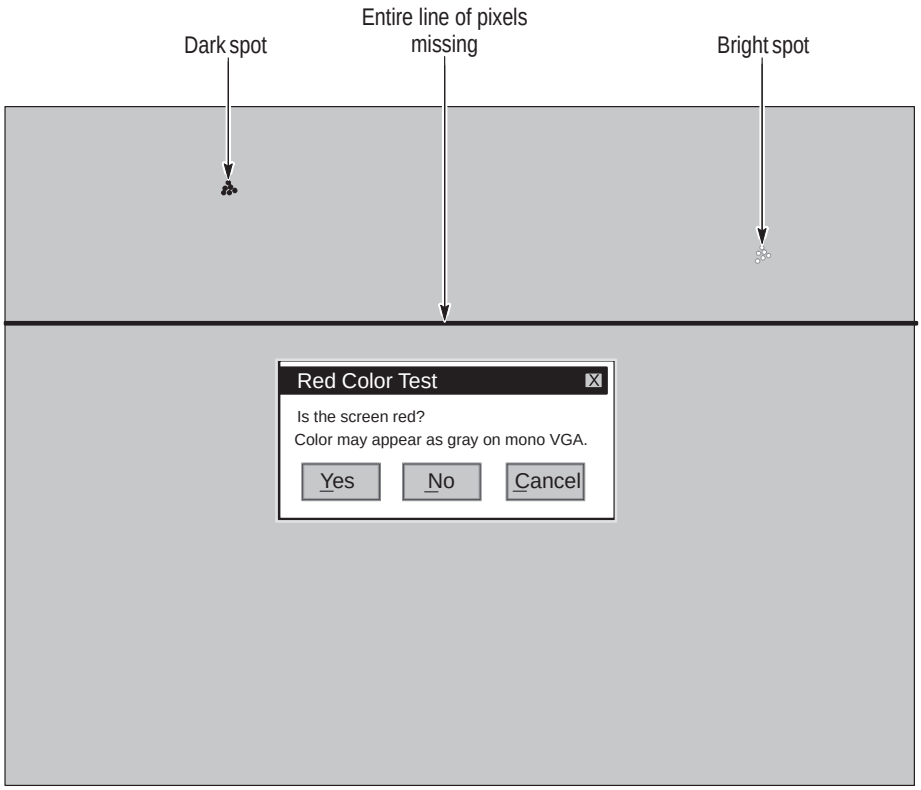


Figure 4–9: LCD Display with Defects

4. Move the color test window to the top right hand corner of screen:

a. Move the cursor to the blue colored title bar with the mouse.

b. Press and hold the mouse select button.

c. Move the window to the top right hand corner of screen by moving the mouse.

d. Release the mouse select button.

5. Repeat the checks made in step 3 for the blue screen.

6. Upon passing checks, point to and select the Yes box.

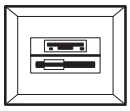
7. Repeat step 2 through step 5 for the green pixels in the Green Color Test.

8. Upon passing checks, point to and select the Yes box.

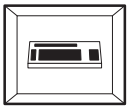
9. Repeat step 2 through step 5 for the blue pixels in the Blue Color Test.

10. Upon passing the checks, point to and select the Yes box.
11. In the Test Results window, point to and select OK.
12. Point to and select Cancel.

Floppy Drive Tests

1. With touch screen, point to and select Floppy Drives box. 
2. In the Test Selection box, select the Butterfly Access Test for the first test.
3. Deselect all other tests.
4. Using the touch screen, point to and select Run Tests.
5. When instructed, insert a virus free diskette into drive A; then point to and select OK.
6. Wait for the Test Results window to appear.
   a. If the Pass completed successfully message appears, then point to and select OK.
   b. If a failure message appears, refer the problem to a qualified service person.
7. Upon passing tests, point to and select Cancel.
8. Eject the diskette.

Keyboard Tests

1. With the touch screen, point to and select Keyboard. 
2. With touch screen, point to and select Run Tests.
3. In the Keyboard Test window, point to and select OK.
4. On the keyboard, press each of the top row keys.
5. Check that all the top row keys have been muted (changed to gray) on the LCD display.
6. With touch screen or mouse, point to and select Stop.
7. In the Keyboard Test window, look at the test results.
   a. If the “Pass completed successfully” message appears, point to and select OK.
   b. If a failure occurred during the keyboard test, refer the problem to a qualified service person.
8. Upon passing tests, point to and select Cancel.

Keypad Tests

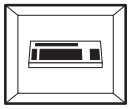
1. With touch screen, point to and select Keyboard. 
2. Using the touch screen, point to and select Run Tests.
3. In the Keyboard Test window, point to and select OK.
4. On the front panel keypad, press each keypad button.
5. Check that the corresponding keyboard keys have been muted (changed to gray) on the LCD display (see Table 4–2).
   a. If a keyboard key has already been muted (changed to gray) by a previous keypad button, the keypad button being tested can still be detected by a slight glitch in the display key when the button is pressed. This indicates that the keypad button is working. Repeated pressing of a button will help detect the glitches.

Table 4–2: Keypad test

Keypad button	Keyboard equivalent	Keypad button	Keyboard equivalent
Up Arrow	Up Arrow	Fctn (Lighted) F1-F12	Fctn Key illuminates F1-F12
Down Arrow	Down Arrow	Del	Del
Right Arrow	Right Arrow	← Backspace	Bksp
Left Arrow	Left Arrow	↵ Enter	Enter
Select	Space Bar	Shift (Lighted)	Shift
Run/Stop	Ctrl R	–	–
ESC	Esc	.	.
TAB	TAB	0	0
Print	Ctrl P	1	1
Touch Screen	Ctrl Alt T (key light toggles)	2	2
Insert	INS	3	3
Help	F1	4	4
Print Screen	PrSn	5	5
Windows Icon	Start Menu (Esc to clear)	6	6
Ctrl	Ctrl (Lighted)	7	7
Alt	Alt (Lighted)	8	8
Space	Space Bar	9	9

6. With touch screen or mouse, point to and select Stop.

7. In the Keyboard Test window, select Yes.

   a. If the “Pass Completed Successfully” message appears, point to and select OK.

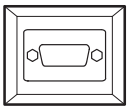
   b. If a failure occurred during the keyboard test, refer the problem to a qualified service person.

8. Upon passing tests, point to and select Cancel.

RS232 Tests

Running this test disables the touch screen. All menu selections must be done with the mouse. Check the RS232 operation using the following steps:

1. Connect an external loop-back connector to the RS232 communications port (COM2) located on the mainframe chassis. (See Figure 4–1 on page 4–3 for the wiring diagram of the loop-back connector.)

2. Use the mouse, to point to and select COM. 

3. With mouse, select:

COM 1:	Internal Data Path Test
	Internal Loopback Test
COM 2:	Internal Data Path Test
	Internal Loopback Test
	RTS/CTS (Ext Loopback)

   Deselect all other boxes.

4. With mouse, point to and select Run Tests

5. Wait for the Test Results window to appear.

   a. If the Pass complete message appears, point to and select OK.

   b. If a failure message appears, refer the problem to a qualified service person.

6. Upon passing tests, point to and select Cancel box.

7. Exit QA Plus. Select × in the upper right corner, and then select Exit at the prompt.

8. Remove the loop-back connector from the RS232 communication port.

Knob Test

Check the front panel control knob using the following steps:

1. Use the mouse or the touch screen, to point to and click on the Start icon.
2. With the mouse or touch screen, point to and click on Run as indicated in Figure 4–10.
3. Type the following command:

   `knobtest.exe`

4. Press the keyboard Enter key
5. Turn the keypad knob in both directions and observe the results.

Figure 4–10: Run selection in the Start menu

6. Check that the size of the window changes when the knob is turned.

   If the size of the window does not change, refer the problem to a qualified service person.

7. Upon passing the knob test, select OK.

RFA300 Operational Checks

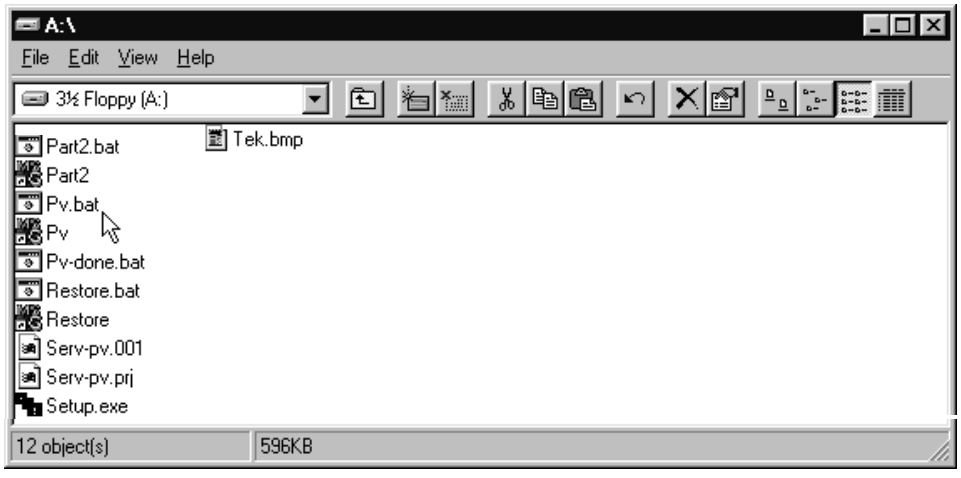
The following operational checks for the RFA300 Measurement Set 8VSB test that the measurement capability of the measurement set meets the stated specification accuracy. While performing these tests, ignore any masks or test limits that are enabled or set; ignore any pass/fail indications displayed; do not change any mask or test limit settings.

NOTE. *The tests in this procedure can be performed on any television channel in the range of 174 MHz to 806 MHz (channel 7 to channel 69). If you have no preferred channel, the Normalization and testing should be done on channel 50 (pilot frequency is 686.31 MHz) to assure the best operation of the range of channels.*

Load the Performance Verification Software

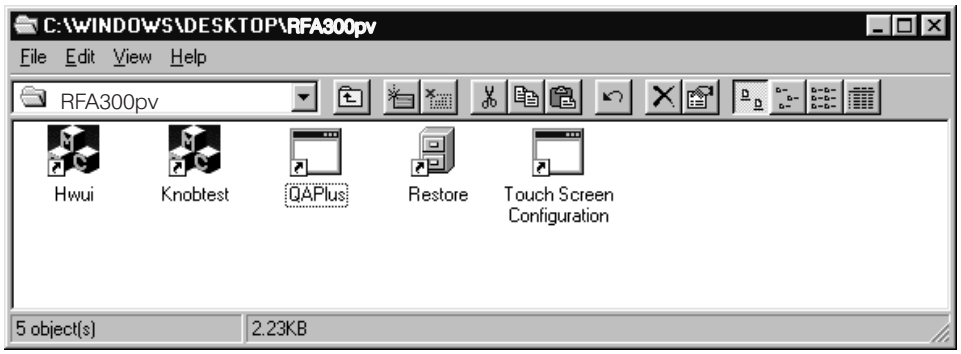
The performance verification software contains programs used for the performance verification and adjustment procedures. Load the software using the following steps:

1. If the RFA300 application is running, exit the application (File / Exit).
2. Insert the RFA300 Performance Verification and Field Adjustment Software diskette into the floppy disk drive.
3. Click on Start in the task bar. In the Start menu, select Run.
4. Type a:\pv in the Open text box and press the OK button.



5. When the TekOnly menu appears, check Enable the Tek Only menu, and then press the OK button.

6. Open the RFA300 PV folder on the desktop. Shortcut icons to the test programs are assembled in the folder for ease of accessing the test routines.



Preparation for Testing

1. Connect the RF input connector of the RFA300 measurement set to the 8VSB reference quality signal using a 50 Ω coaxial cable with N-type connectors or the appropriate adapters on both ends. The signal power applied to the RFA300 measurement set must be in the range of 10 mW to 2 W (+10 dBm to +33 dBm) for correct operation.
2. Start the RFA300 application and wait for the application to finish initializing.
3. From the Home window click the Setup button on the toolbar.
4. Select the System tab.

NOTE. *Refer to* Selecting channel frequency *in the RFA300 online help for the channel pilot frequencies.*

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5. Enter the channel pilot frequency of the reference 8VSB signal connected to the RF input connector of the measurement set.
6. Click on the Verify Input Signal Power button.
7. Verify that the input signal level is in the OK range (in the green).
8. Close the dialog box and click OK to close the Instrument Setup dialog box.

NOTE. *Make a copy of the RFA300 Test Record form on page 4–4 and use it to record the test results for the performance verification procedure.*

Test Procedure

1. From the Home window, click on the Signal/Noise - Error Vector Magnitude - Pilot Amplitude Error icon.
2. In the toolbar, set Smoothing to High.
3. Check Signal/Noise is greater than 40 dB.
4. Check EVM is less than 1%.
5. Check Complex MER is greater than 40 dB.
6. From the Home window, click on the Frequency Response - Group Delay icon.
7. In the toolbar, note the current Smoothing selection; then set Smoothing to High.
8. Check Freq Resp peak-to-peak is less than 0.25 dB.
9. Check Group Delay peak-to-peak is less than 8 ns.
10. In the toolbar, restore Smoothing to the previous setting, and then click on Home.
11. From the Home window, click on the Phase Noise icon.
12. In the toolbar set Smoothing to High.
13. Wait two minutes for smoothing to be fully effective, and then use a cursor to check that the phase noise curve is less than –105 dB at 20 kHz.

If there are any failures in the preceding RFA300 operational checks, do the *Normalize the RFA300* procedure starting on page 5–2 in the *Adjustment Procedure* section.

LO LOW Resonator Check

The purpose of the LO LOW resonator check is to verify that the resonator is properly set to provide the correct oscillator tune range and low phase noise.

LO LOW Resonator Check Procedure

1. Exit the RFA300 measurement application (if running).
2. In the RFA300 PV folder, double click on the Hwui icon to run the `hwui.exe` program. This program displays a control screen (the Hardware User Interface - HwUi) used in making the various checks and adjustments in the RFA300.
3. Select Synthesizer (see Figure 4–11).
4. Select LOLow Filter = 1.
5. Set LO Freq (MHz) = 200.000.
6. Set Tune Src = Internal.
7. Set Coarse Tune = 50.
8. Press the Update button in the FracN Board box.

NOTE. *THE ABOVE STEPS ARE VERY IMPORTANT! If any of the steps above are not correct, ALL THE STEPS BELOW WILL DE-TUNE LO LOW!*

9. Press the Update button in the Lock Indicators box.
   a. Verify that LO Latch Lock and LO RT Lock are checked.
   b. Note the state of FracN Latch Lock and FracN RT Lock.
10. If either FracN Latch Lock or FracN RT Lock is not checked, the resonator needs adjustment (refer the *Adjustment Procedure* section).
11. If all the Lock Indicators are checked, press the FracN ADC button and note the value (see the Note below).

NOTE. *The value for FracN ADC will not be correct until the* FracN ADC *button is pushed.*

12. If the FracN ADC volts is between –0.80 V and +0.80 V, the resonator does not need adjustment.

If the voltage is outside the limits given above, do the *LOLow Resonator Adjustment* and the *LOLow Calibration* procedures starting on page 5–5 in the *Adjustment Procedure* section.

13. Exit the `hwui.exe` program.

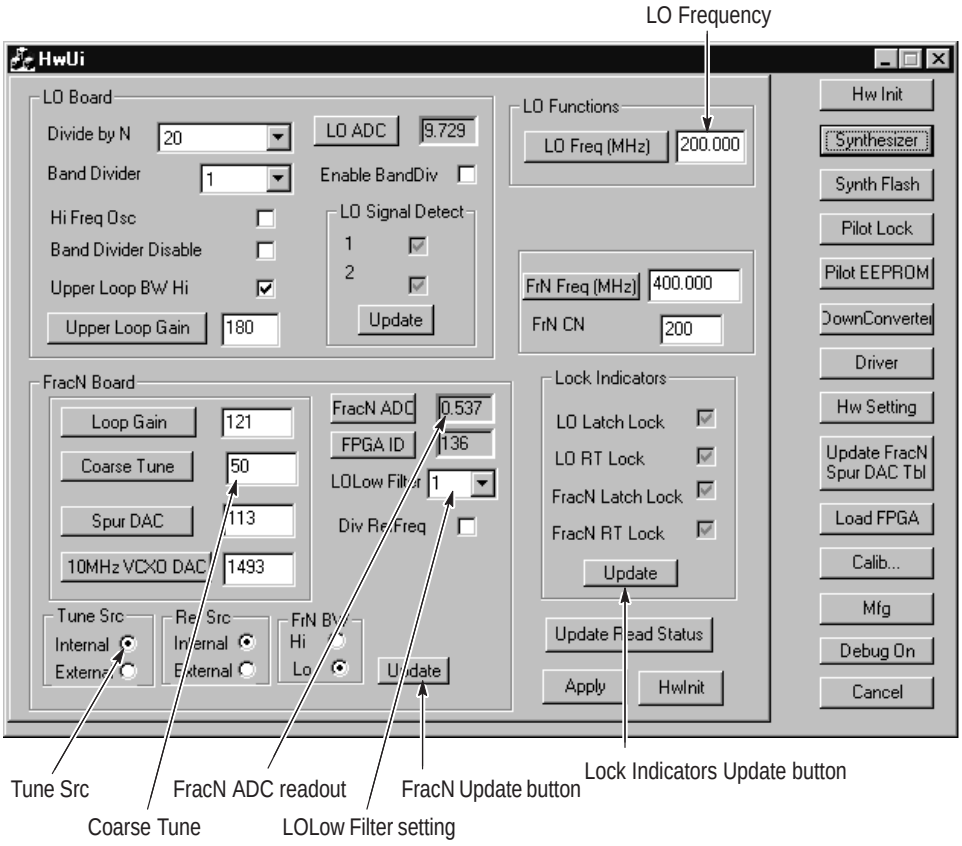


Figure 4–11: Hwui screen with Synthsizer selected

Fractional-N Synthesizer Check

For the Fractional-N synthesizer, the 10 MHz VCXO frequency and the 86.1 MHz VCXO are checked to determine if they need adjustment.

Preparation for Testing

Prepare to make the oscillator checks using the following procedure:

1. Connect the RF input connector of the RFA300 measurement set to the spectrum analyzer.

2. Setup the spectrum analyzer as follows:

a. Center frequency to 400 MHz.

b. Span to 50 kHz.

c. Resolution BW to 500 Hz.

d. Reference level to –30 dBm.

e. Video BW to 500 Hz.

f. Turn on the frequency counter.

3. Exit the RFA300 measurement application if it is running.
4. Run the program `hwui.exe`.
5. In the Hwui window, click the Down Converter soft key.
6. In the Down Converter window, set the Input Atten to 0 dB.

10 MHz VCXO Frequency Check

1. Select the Synthesizer menu (shown previously in Figure 4–11 on page 4–25).
2. Set LO Frequency (MHz) to 400.000.
3. Press the LO Freq (MHz) button.
4. Push Tune Src for Internal.
5. Verify that Ref Src is Internal.
6. Press Update in the FracN board box and Lock Indicators box.
7. Verify that all four lock indicators are checked.
8. Measure the 400.000 MHz signal using the spectrum analyzer. Note: The signal amplitude is low, usually about –50 dBm.
9. Check the counter measurement for the following condition:

   Frequency is greater than 399,997,500 Hz and less than 400,002,500 Hz.

If the counter measurement is not within the frequency limits given above, do the *10 MHz VCXO Frequency Adjustment* procedure starting on page 5–9 in the *Adjustment Procedure* section.

86.1 MHz VCXO Frequency Check

1. Set the center frequency of the spectrum analyzer to 430,489,510 Hz.
2. Select Hw Setting in the HWUI window.
3. Scroll down the list of LO LOW band data to find the LO LOW band number and the DAC value associated with 21.52 MHz. Use 21.53 MHz if the frequency steps are odd.

   Example: LO LOW band is typically 5; the DAC value may be around 100.
4. Push Cancel.
5. Select Synthesizer in the HWUI window.
6. Set LOLow Filter to the band associated with 21.52 MHz.

   Example: LOLow Filter = 5.
7. Set Coarse Tune to the value associated with 21.52 MHz.

   Example: Coarse Tune = 100.
8. Press Coarse Tune button in the FracN Board box.
9. Push Ref Src to External.
10. Push Update in the Lock Indicators box. All four lock indicators should be check marked. If the FracN lock indicators are not check marked, the LOLow Filter or Coarse Tune (or both) may be wrong.
11. Measure the signal frequency with the spectrum analyzer counter. Note: The signal amplitude is low, usually about –50 dBm.
12. Check the counter measurement for the following condition:

    Frequency is greater than 430,487,000 Hz and less than 430,492,000 Hz.
13. Close the `hwui` application.

If the counter measurement is not within the frequency limits given above, do the *86.1 MHz VCXO Frequency Adjustment* procedure starting on page 5–10 in the *Adjustment Procedure* section.

Input Return Loss Check

This test checks that the input impedance of the RFA300 measurement set meets the specification for a return loss of greater than 25 dB over the designed frequency range. Make the test using the following procedure:

1. Set up the test equipment as shown in Figure 4–12. Do not connect the SWR bridge to the RF input of the RFA300.

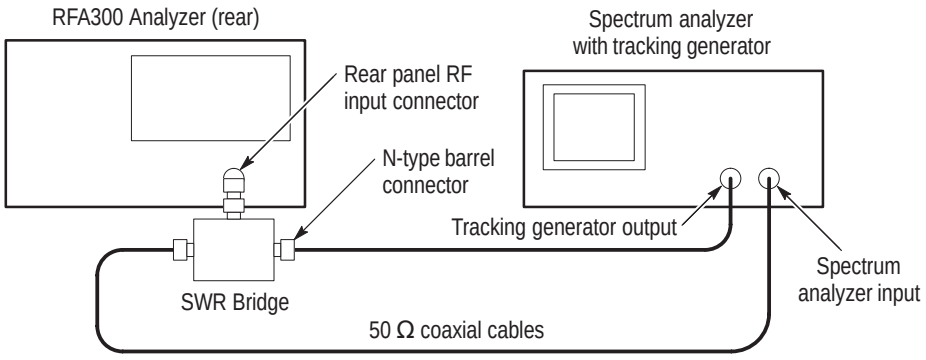


Figure 4–12: Return loss test setup

2. Set the spectrum analyzer as follows:

- Center frequency 500 MHz
- Span 800 MHz (80 MHz per div)
- Resolution Bandwidth 20 kHz
- Video Bandwidth 1 kHz
- Ref Level 0.0 dBm

3. Set the tracking generator as follows:

- Output 0 dBm
- Frequency offset None
- Modulation None
- Tracking generator On

4. Single sweep the tracking generator. The trace indicates the open circuit reflected power. Note its lowest point in dBm.

5. Connect the SWR bridge to the RF input of the RFA300 measurement set using a precision N-type barrel connector for the shortest possible connection from the SWR bridge to the RF input connector.

6. Single sweep the tracking generator again. This time the trace indicates the reflected power from the input circuit of the RFA300 riding on the noise floor as shown in Figure 4–13.

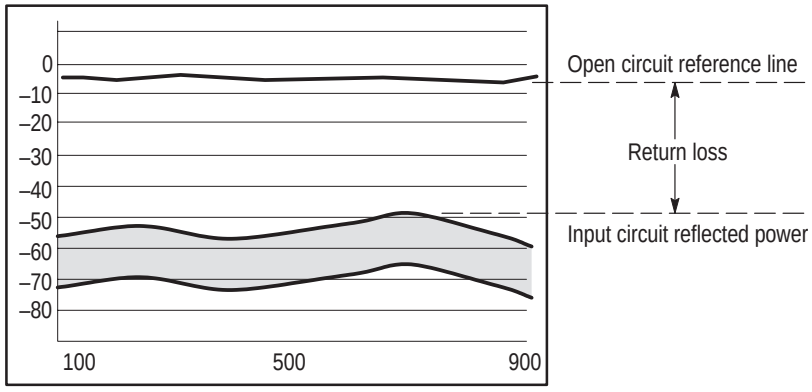


Figure 4–13: Return loss calculation

7. Check that the return loss is greater than 25 dB for all frequencies between 174 MHz and 806 MHz. The return loss is the difference between the Open Circuit and Input Circuit reflected traces (see Figure 4–13).

8. Disconnect the test equipment.

Out-of-Channel Measurement Limits

This check measures the difference between the peak RF signal power and the noise floor to determine if the measurement limit meets the specification of 80 dB or more. Make the check using the following procedure:

1. Start the RFA300 application if it is not running.
2. If not on the Home window, click on the Home icon. In the Home window, click on the Out of Channel icon.
3. In the Out-of-Channel measurement window, select 5 Channels mode and Enhanced Accuracy; in the toolbar, select High Smoothing.
4. Set the RFA300 measurement set to any frequency within the measurement range of the set. For example, use 686 MHz.
5. Set the RF signal generator carrier frequency to 2.67 MHz above the RFA300 measurement set frequency. To set it for the example given in step 4, set the generator for 688.67 MHz.
6. Set the signal generator for frequency modulation of the carrier at 100 kHz with a deviation of 80 kHz (sine-wave modulation).
7. Set the signal generator for an RF output power of +10 dBm.
8. Connect the signal generator output to the RF input connector of the RFA300 measurement set.
9. Use the RFA300 measurement set delta markers to compare the peak signal power to the noise floor as shown in Figure 4–14.
   a. Set the + cursor at the peak of the RF signal. Use the zoom[1] feature to expand the waveform to better position the cursor on the peak.
   b. Set the ※ cursor on the center the noise floor at –12 MHz from the carrier.
   c. Check that the difference reading is equal to or greater than 80 dB.

1 **The zoom feature automatically rescales the display area bounded by a box defined with the mouse. Position the mouse cursor where you want to start the box. Hold down the left mouse button and draw a box that defines the area you want to zoom.**

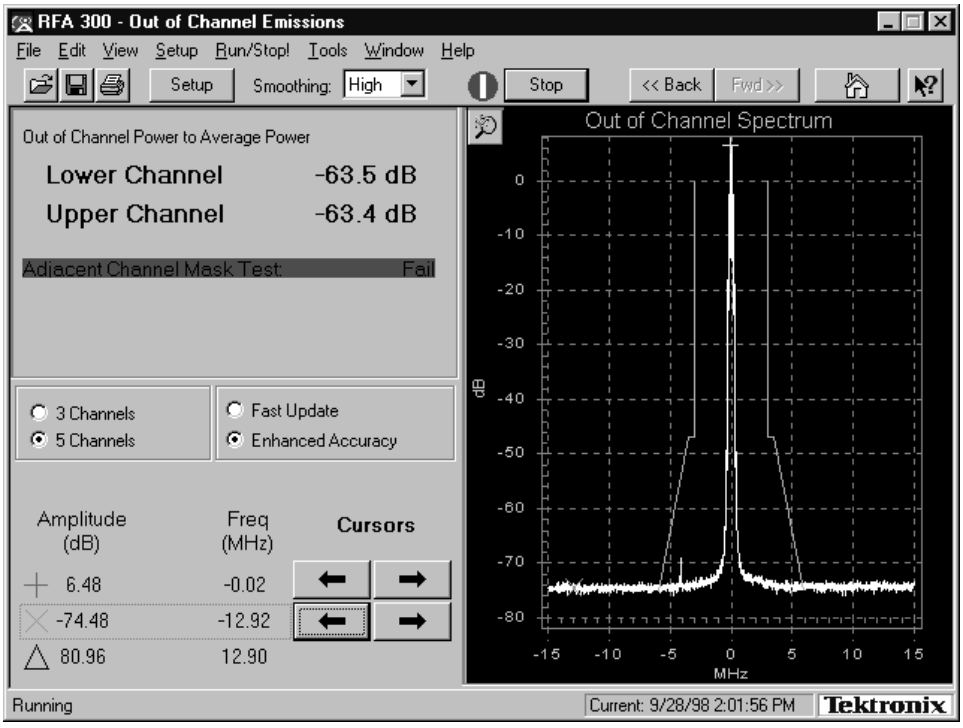


Figure 4–14: Out of Channel Measurement limits test

Out-of-Channel Accuracy

This test checks the accuracy of the out-of-channel signal amplitude measurement using a second signal of known accuracy. Make the check using the following procedure:

1. If not on the Home window, click on the Home icon. In the Home window, click on Out of Channel icon.
2. In the Out-of-Channel measurement window, select 5 Channels mode and Enhanced Accuracy; and in the toolbar, select High Smoothing.
3. Set the RFA300 measurement set to any frequency within the measurement range of the set. For example, use 686 MHz.
4. Set the RF signal generator carrier frequency to 2.67 MHz above the RFA300 measurement set frequency. To set it for the example given in step 4, set the generator for 688.67 MHz.
5. Set the signal generator for frequency modulation of the carrier at 100 kHz with a deviation of 80 kHz (sine-wave modulation)
6. Set the signal generator for an RF output power of +13 dBm.

7. Set up the second signal generator for a CW output at 12 MHz below the first signal generator. For the example frequency in step 4, set the second frequency generator to 676.67 MHz.

8. Set the output power of the CW signal generator at –7 dBm.

9. Use a 6 dB resistive splitter/combiner and the necessary 50 Ω coaxial cables and connector adapters to combine the two frequency generator signals.

10. Connect the signal generators, combiner, and RFA300 measurement set as shown in Figure 4–15.

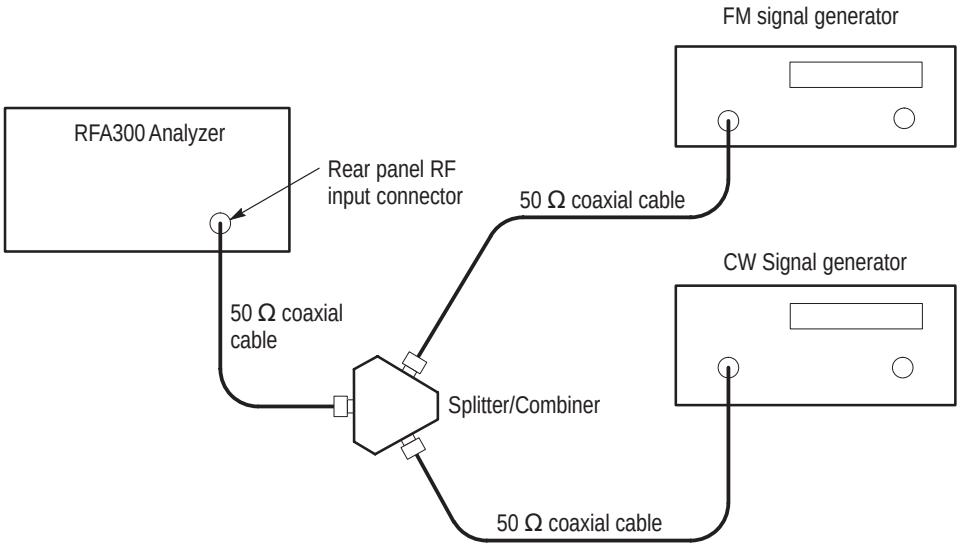


Figure 4–15: Out-of-channel accuracy test setup

11. Start the Out of Channel measurement.

12. Place a cursor on the peak of the second RF signal (see Figure 4–16). Use the zoom feature[1] to better position the cursor at the peak. Record the reading (see the RFA300 test record form on page 4–4).

1 **The zoom feature automatically rescales the display area bounded by a box defined with the mouse. Position the mouse cursor where you want to start the box. Hold down the left mouse button and draw a box that defines the area you want to zoom.**

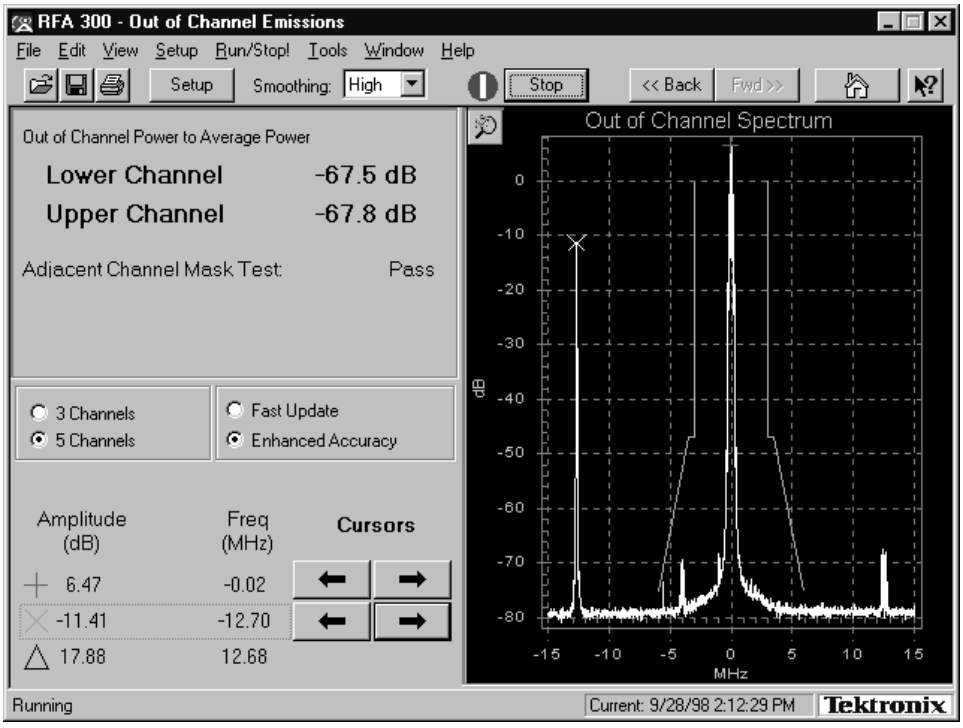


Figure 4–16: Out-of-Channel measurement accuracy test showing initial second tone amplitude

13. Decrease the amplitude of the CW signal in 10 dB steps and check that the amplitude measurement tracks the generator output amplitude for each step as shown in Figure 4–17 (see NOTE below). Record the cursor readings at each step and calculate the difference for each step.

NOTE. *For each step change, stop and then start the measurement using the Stop/Run button in the toolbar to get a new measured amplitude.*

14. Repeat step 13 until the second generator amplitude is down in the noise floor.

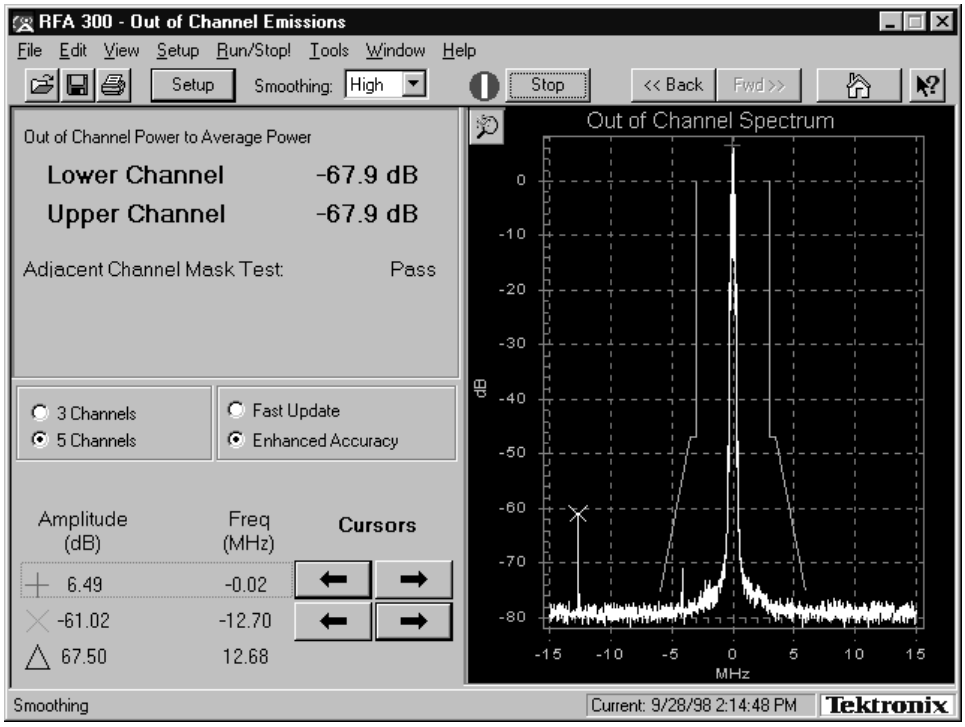


Figure 4–17: Out-of-Channel measurement accuracy showing reduced second tone amplitude

Restore Data Files

After the testing and adjustments are finished, restore the user setup and the user data files using the following steps:

1. Exit the RFA300 application if it is running.
2. Insert the *RFA300 Performance Verification and Field Adjust Software* disk into the floppy disk drive.
3. In the RFA300 PV folder, double click on the Restore icon.
4. In the RFA300 Mfg Config Setup window:

   Are you sure you want to configure/cleanup the instrument for shipment?

   Click Yes.
5. Important: In the Mfg Configuration Complete window, select No, I will restart my computer later, and then click FINISH.
6. When the Mfg Configuration Complete dialog box disappears from the display window, press any key to continue. The user files (setups, masks,

colors, etc.) that were saved at the beginning of this procedure are now all restored.

7. Verify that the RFA300 PV folder is removed from the desktop.
8. Remove the *RFA300 Performance Verification and Field Adjust Software* disk from the floppy disk drive.
9. In the Shut Down Window, select Restart the Computer, and then click Yes.
10. Start the RFA300 application (if it does not start automatically).
11. Verify that RFA300 application starts as it should, and that the Tek Only menu item is removed from the RFA300 menu bar.
12. Exit the RFA300 application, and shut down the computer as described in the following *Measurement Set Shut Down* procedure.

Measurement Set Shut Down

1. Move the cursor to the box titled Start.
2. With cursor pointing to the Start box, click the mouse select button.
3. Move the cursor to the box titled Shut Down (see Figure 4–18).

Figure 4–18: Window95 Start window

4. With cursor pointing to Shut Down, click the mouse select button.
5. In the Shut Down Windows window that appears, move the cursor to the Yes box and click the mouse select button.
6. Wait for the following screen to appear.

7. Set the measurement set On/Stby switch to Stby.

Adjustment Procedure

This section provides the recommended field adjustments for the RFA300 Measurement Set 8VSB. Testing software containing some special testing applications is used for the Performance Verification steps before any adjustments are made. The software saves the user setup files and user data files for restoration after the testing is done. As a final step, the software removes the testing software from the RFA300 measurement set to prevent its inadvertent use in normal operation of the product. The software is provided on a floppy disk as an accessory to this service manual.

Equipment Required

Table 5–1 lists the test equipment needed to perform the adjustment procedure. The table identifies examples and provides the minimum tolerances, where applicable. If other test equipment is substituted, it must meet or exceed the tolerances listed.

Table 5–1: Required equipment list

Test equipment	Characteristic	Example
Spectrum analyzer	Frequency accuracy better than 10 Hz at 400 MHz.	Rohde & Schwarz FSEB20/30 Spectrum Analyzer
50 Ω coaxial cable	Connectors N-type male, length 72 inches	Tektronix part number 012-0114-00
Adjustment tool	Plastic handle, small metallic bit. Less than three inches overall.	Tektronix part number 003-1433-01
8VSB Reference Signal Source	Frequency in the range of 174 MHz to 806 MHz (channel 7 to channel 69); output power in the range of 10 mW to 2 W (+10 dBm to +33 dBm)	Customer provided 8VSB digital TV test signal source.
Performance verification and adjustment software	RFA300 Performance Verification and Field Adjustment Software diskette	Tektronix part number 063-3247-00

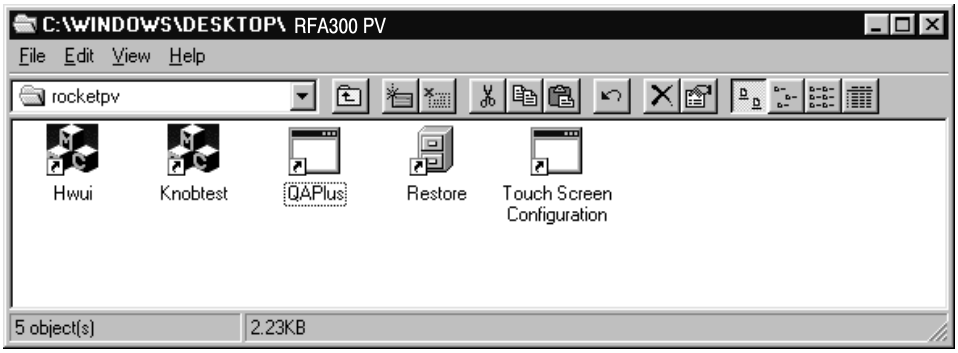
Normalize the RFA300

The normalization procedure is required if any of the *RFA300 Operational Checks*, starting on 4–21, failed. Normalization is a software routine that performs internal measurements and adjustments of the hardware to optimize the operation of the RFA300 measurement set

***NOTE**. Normalization can be performed on any television channel in the range of 174 MHz to 806 MHz (channel 7 to channel 69). If you have no preferred channel, normalization should be done on channel 50 (pilot frequency is 686.31 MHz) to assure the best operation of the range of channels.*

1. Connect the RF input connector of the RFA300 measurement set to the 8VSB reference quality signal using a 50 Ω coaxial cable with N-type connectors or the appropriate adapters on both ends. With 20 dB of input attenuation, the signal power applied to the RFA300 measurement set must be in the range of 10 mW to 2 W (+10 dBm to +33 dBm) for correct operation. For modified instruments with a 10 dB input attenuator, the signal power can be in the range of 1 mW to 1 W (0 dBm to +30 dBm).
2. Connect a mouse and a keyboard to the appropriate connector on the left-hand side of the measurement set.
3. Turn on the measurement set.
4. If you have the performance verification software loaded, skip to step 5. If you do not have the performance verification software loaded, load it now as follows:
   - **a.** If the RFA300 application is running, exit the application (File / Exit).
   - **b.** Insert the PVFA diskette into the floppy disk drive.
   - **c.** Open My Computer; then open $3^1/_2$ Floppy (A:).
   - **d.** Double click on the PV icon. The RFA300 PV Installation screen is displayed.
   - **e.** In the RFA300 PV/Adjust Installation window, click GO to load the performance verification software.
   - **f.** When the RFA300 PV Installation screen goes away, press any key to continue.
   - **g.** In Tek Only dialog box, verify that Enable the Tek Only menu is checked and Enable Use File Mode is not checked. Click OK.
   - **h.** Close the $3^1/_2$ Floppy (A:) and My Computer windows.
   - **i.** Remove the diskette from the floppy disk drive.

5. Open the RFA300 PV folder on the desktop. Shortcut icons to the test programs are assembled in the folder for ease of accessing the test routines.



6. Start the RFA300 measurement set application.

***NOTE**. The toolbar Setup button is not the same as the Setup menu item.*

7. Adjust the 8VSB reference signal frequency to 686.31 MHz (the channel 50 pilot frequency).

***NOTE**. If you are using a frequency other than channel 50, refer to* Selecting channel frequency *in the online help for other channel pilot frequencies.*

8. Press the Setup button on the toolbar and select the System tab.
9. In the Instrument Tuning box, set the frequency to 686.31 MHz (or other channel frequency). Click the Apply button.
10. Click on the Verify Signal Input Power button.
11. Check that the Input Signal Power thermometer display is green with the level in the OK range.
12. Click the Close button. Click OK to close the Instrument Setup menu.
13. Go to the Tek Only selection in the toolbar. Click on Normalization/Calibration.
14. Press the Run button, if necessary, to start the Normalization

A line appears in each of the graph displays a few seconds later. The shape of the line changes as normalization takes place. When the Stop button changes back to Run, normalization is finished.

15. Check that the Calibration Status is PASS.
16. Disconnect the 8VSB reference signal from the measurement set.

LO Low Resonator Check and Adjustment

The purpose of the LO Low resonator adjustment is to center the resonator in order to produce the correct oscillator tune range and keep the phase noise low.

The resonator must be manually adjusted before the LO LOW automatic calibration of the V/F curves for every band is performed. A LO LOW calibration must always be done immediately after the resonator is adjusted or the stored calibration values will be wrong. The measurement set application software initiates automatic recalibration in every band when the resonator frequency drifts due to time and temperature.

LO Low Resonator Check Procedure

1. Exit the RFA300 application, if running.
2. In the RFA300 PV folder double click on the Hwui icon.
3. In the Hwui window, select Synthesizer (see Figure 5–1).
4. In the Synthesizer window, make the following selections:
   a. Select LOLow Filter = 1.
   b. Set LO Freq (MHz) = 200.000.
   c. Set Tune Src = Internal.
   d. Set Coarse Tune = 50.
5. Press the Update button in the FracN Board box.

***NOTE**. The above steps are very important! if any of the steps above are not done correctly, all the steps below will de-tune the LO low.*

6. Press the Update button in the Lock Indicators box.
7. Check the Lock Indicators.
   a. Select UPDATE and note whether the boxes are checked.
   b. Verify that LO Latch Lock and LO RT Lock are checked.
   c. Note the state of FracN Latch Lock and FracN RT Lock.
8. If either FracN Latch Lock or FracN RT Lock is not checked, C688 needs to be adjusted.

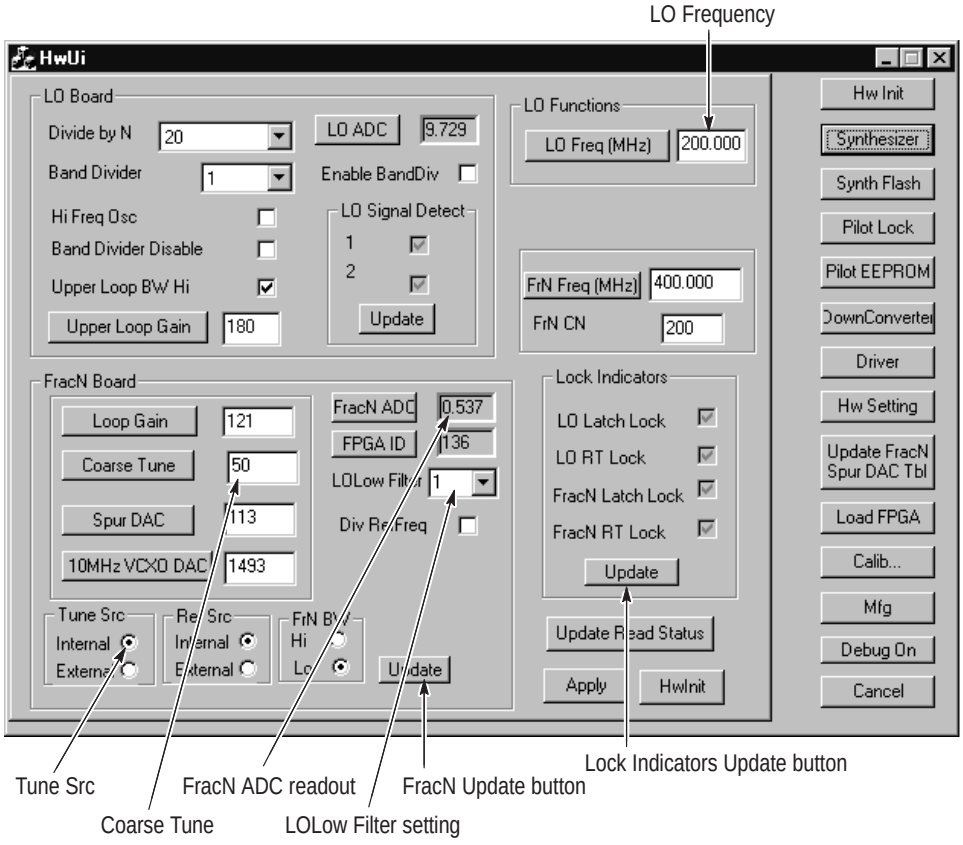


Figure 5–1: Hwui window with Synthesizer selected

9. If all the Lock Indicators are checked, press the FracN ADC button and note the value.

NOTE*. The value for FracN ADC will not be correct until the* FracN ADC *button is pushed.*

10. If the FracN ADC voltage reading is between –0.80 V and +0.80 V, then C688 does not need to be adjusted. If the voltage is outside the given range, do the LOLow Resonator Adjust and the LOLow Calibration procedures.

LO Low Resonator Adjustment

The LO Low Resonator adjustment, C688, is adjusted by inserting a screwdriver through the hole in the shield on the rear panel.

1. If either FracN Latch Lock or FracN RT Lock is not checked, adjust C688 while repeatedly pressing the Lock Indicator Update until both of these lock indicators are checked.

2. When all lock indicators are checked, observe FracN ADC (update it by pushing the FracN ADC button).
3. Adjust C688 so that the FracN ADC voltage is between –0.30 V and +0.30 V. FracN ADC must be continuously pushed in order to display new values.

LO Low Calibration

Calibrate the LO Low bands using the following procedure:

1. In HWUI, Select Calib and push the LO Low Calib button (see Figure 5–2). This step may take a few minutes if LO LOW is being calibrated for the first time.
2. After the calibration is finished, a dialog box that says, Calibration Success appears. Select OK.

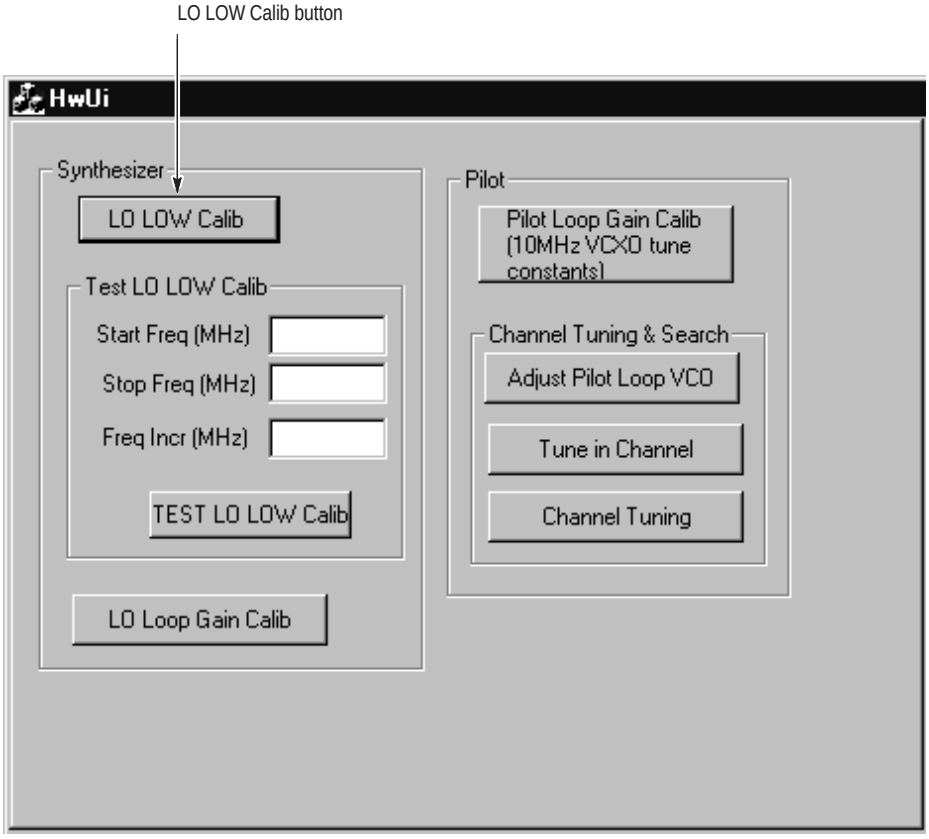


Figure 5–2: Partial Hwui window with Calib selected

3. Press the Hw Setting button.

4. Scroll through the hardware settings until LO-LOW Band data appears (see Figure 5–3).

5. LO-LOW Band 0 should have no calibration data. It is unused (until the instrument senses the need for more range).

6. LO-LOW Band 1 should start at “20.000 MHz 50.” If this is not true, C688 is not properly adjusted.

7. Check the amount of overlap at each band transition. Overlap is the difference between the highest frequency in one band and the lowest frequency in the next band.

   There should be greater than 40 kHz of overlap between each band. Typical overlap is in the range of 150 to 250 kHz. For example, if the highest frequency in band 1 is 20.400 MHz, the lowest frequency in band 2 must be less than 20.360 MHz. The maximum frequency in one band must be a little higher than the minimum frequency of the next highest band.

8. Select Cancel to close the Hardware Settings window, and then exit the Hwui window.

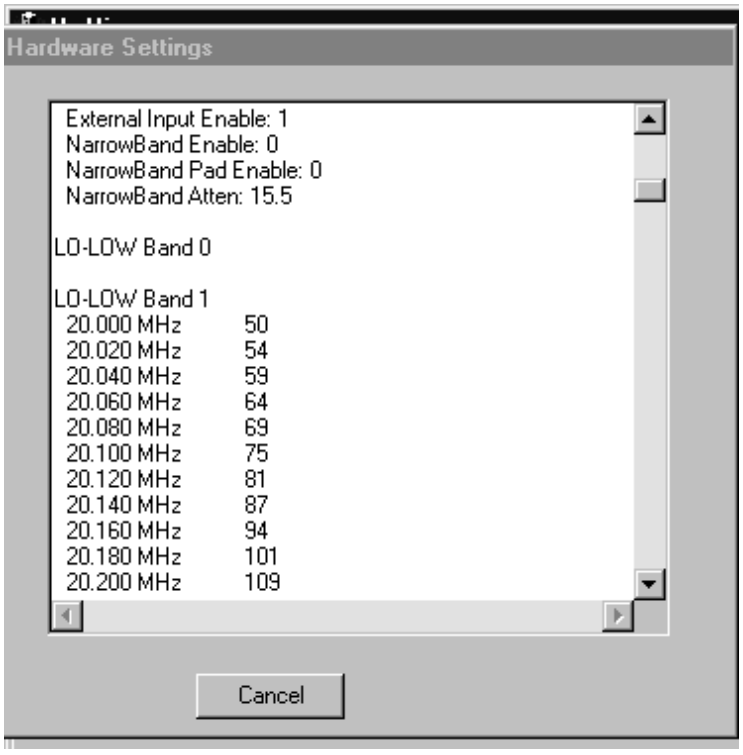


Figure 5–3: Hardware Settings window in Hwui screen

Fractional-N Synthesizer Adjustment

First, check the Fractional-N synthesizer, the 10 MHz VCXO frequency and the 86.1 MHz VCXO. Make adjustments if needed. Do the LO Low resonator adjustment first to center the LO Low resonator before doing the oscillator adjustments.

Preparation for Adjustments

Prepare to make the oscillator checks and adjustments using the following procedure:

1. Connect the RF input connector of the RFA300 measurement set to the spectrum analyzer.
2. Setup the spectrum analyzer as follows:
   - **a.** Center frequency to 400 MHz.
   - **b.** Span to 50 kHz.
   - **c.** Resolution BW to 500 Hz.
   - **d.** Reference level to –30 dBm.
   - **e.** Video BW to 500 Hz.
   - **f.** Turn on the frequency counter.
3. Exit the RFA300 measurement application if it is running.
4. In the RFA300 PV folder, double click the Hwui icon to run the `hwui.exe` program.
5. Select the Down Converter menu.
6. Set the Input Atten to 0 dB.

10 MHz VCXO Frequency Check

The frequency accuracy of the 10 MHz VCXO determines the frequency accuracy of the synthesizer for those measurements that are not pilot-locked. Check the 10 MHz VCXO frequency as follows:

1. Select the Synthesizer menu.
2. Set LO Frequency (MHz) to 400.000.
3. Push Tune Src for Internal.
4. Verify that Ref Src is Internal.
5. Verify that all four lock indicators are checked.

6. Measure the 400.000 MHz signal using the spectrum analyzer. Note: The signal amplitude is low, usually about –50 dBm.

7. Check the counter measurement for the following conditions:

   a. If the counter measurement is greater than 399,997,500 Hz and less than 400,002,500 Hz., the 10 MHz VCXO does not need to be adjusted.

   b. If the counter measurement is not within the frequency range limits given, continue with the 10 MHz VCXO adjustment procedure.

10 MHz VCXO Frequency Adjustment

If the 10 MHz VCXO Frequency is not within the limits given above, use the following procedure to adjust the frequency:

1. In the Hwui window, select MFG (see Figure 5–4).

2. Use the mouse cursor to select Synthesizer 10 MHz VCXO Calibration.

3. Push Start. The 10 MHz VCXO Calibration menu will appear.

4. Use the arrow keys to move the frequency to the value closest to 400.000 MHz. (The minimum error will be less than 100 Hz.)

5. Push NvSave to save the new DAC value.

6. Push Cancel. This does not cancel the value saved in step 5.

7. When the Done dialog box appears, select OK.

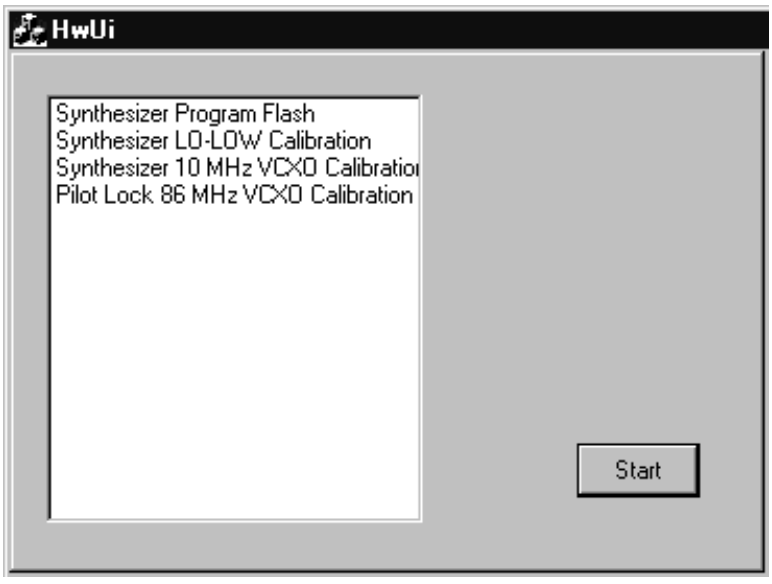


Figure 5–4: Partial Hwui screen with MFG selected

86.1 MHz VCXO Frequency Check

1. Set the center frequency of the spectrum analyzer to 430,489,510 Hz.
2. In the Hwui window, select the Hw Setting menu.
3. Scroll down the list of LO LOW band data to find the LO LOW band number and the DAC value associated with 21.52 MHz. Use 21.53 MHz if the frequency steps are odd.

   Example: LO LOW band is typically 5; the DAC value may be around 100.
4. Push Cancel.
5. In the Hwui window, select Synthesizer.
6. Set LOLow Filter to the band associated with 21.52 MHz.

   Example: LOLow Filter = 5.
7. Set Coarse Tune to the value associated with 21.52 MHz.

   Example: Coarse Tune = 100.

   Push the Coarse Tune button.
8. Set Ref Src to External.
9. Push Update in the Lock Indicators box. All four lock indicators should be check marked. If the FracN lock indicators are not check marked, the LOLow Filter or Coarse Tune (or both) may be wrong.
10. Measure the signal frequency with the spectrum analyzer counter. The signal amplitude is usually about –50 dBm.
11. Check the counter measurement for the following conditions:

    a. If the counter measurement is greater than 430,487,000 Hz and less than 430,492,000 Hz., the 86.1 MHz VCXO does not need to be adjusted.

    b. If the counter measurement is not within the frequency range limits given, continue with the 86.1 MHz VCXO adjustment procedure.

86.1 MHz VCXO Frequency Adjustment

If the 86.1 MHz VCXO Frequency is not within the limits given above, use the following procedure to adjust the frequency:

1. In the Hwui window, select MFG.
2. Deselect Synthesizer 10 MHz VCXO Calibration, if it is highlighted.
3. Select Pilot Lock 86 MHz VCXO Calibration.
4. Push Start.

5. Use the arrow keys to adjust the Coarse DAC and the Fine DAC to set the frequency to the value closest to 430,489,510 Hz. Note: After setting the two DAC voltages to adjust the frequency, the oscillators may have up to ±200 Hz of drift within a few minutes. You do not have to check this drift.
6. Push NvSave to save the new DAC values.
7. Push Cancel (this does not cancel the saved DAC values).
8. When the Done dialog box appears, push OK.

This completes the adjustment procedure for the oscillators. Disconnect the test equipment.

Calibrate the Touch Screen

Do the touch screen calibration if the touch screen fails the in the performance verification procedure. Refer to *Touch Screen Test* on page 4–9.

1. With the mouse, point to and click on the Start icon. The Start icon is located in the bottom left corner of the display.
2. With the mouse, point to and select Programs.
3. Select TOUCH SCREEN UTILITIES.
4. Select CONFIGURATION.
5. Select INTERFACE.
6. Select RESET. Follow reset instructions.
7. Use the mouse cursor to point to OK and and select it with a click of the mouse button.
8. Select CALIBRATION.
9. Select CALIBRATE. Follow calibration instructions using fine tipped object that has a soft (non-scratching) point.
10. Click on the OK box using the mouse.
11. Select EXIT.

Restore Data Files

After the testing and adjustments are finished, restore the user setup and the user data files using the following steps:

1. Exit the RFA300 application if it is running.

2. Insert the *RFA300 Performance Verification and Field Adjust Software* disk into the floppy disk drive.
3. In the RFA300 PV folder, double click on the Restore icon.
4. In the RFA300 Mfg Config Setup window:

   Are you sure you want to configure/cleanup the instrument for shipment?

   Click Yes.
5. Important: In the Mfg Configuration Complete window, select No, I will restart my computer later, and then click FINISH.
6. When the Mfg Configuration Complete dialog box disappears from the display window, press any key to continue. The user files (setups, masks, colors, etc.) that were saved at the beginning of this procedure are now all restored.
7. Verify that the RFA300 PV folder is removed from the desktop.
8. Remove the *RFA300 Performance Verification and Field Adjust Software* disk from the floppy disk drive.
9. In the Shut Down Window, select Restart the Computer, and then click Yes.
10. Start the RFA300 application (if it does not start automatically).
11. Verify that RFA300 application starts as it should, and that the Tek Only menu item is removed from the RFA300 menu bar.
12. Exit the RFA300 application, and shut down the computer using the Shut down the computer? selection in the Start menu.
13. Turn off the power switch.

This is the end of the adjustment procedure.

Maintenance

This section provides the service information for the RFA300 Measurement Set 8VSB. Information about the following topics is provided: Handling Static-Sensitive Components, Cleaning and Inspection, Removal and Replacement Instructions, Diagnostic tests, and Troubleshooting.

Preparation

These maintenance instructions are for qualified technicians. Be sure to read the Safety Summaries at the front of the manual before beginning service.

Prior to removing the cabinet from the product, read *Handling Static-Sensitive Components*.

CAUTION. *To prevent static discharge damage, service the product only in a static-free environment. Observe standard handling precautions for static-sensitive devices while maintaining this product. Always wear a grounded wrist strap, grounded foot strap, and static resistant apparel.*

Handling Static-Sensitive Components

This instrument contains electrical components that are susceptible to damage from static discharge. Static voltages from 1 kV to 30 kV are common in unprotected environments. Table 6–1 shows the relative static discharge susceptibility of various semiconductor classes.

Table 6–1: Static susceptibility

Semiconductor class	Voltage
ECL	200 V - 500 V
Shottky Signal Diodes	250 V
Shottky TTL	500 V
HF Bipolar Transistors	400 V - 600 V
JFETs	600 V - 800 V
Linear Microcircuits	400 V - 1000 V
Low Power Schottky TTL	900 V
TTL	1200 V

Observe the following precautions to avoid damaging static-sensitive devices:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive components or assemblies.
3. Discharge the static voltage from your body by wearing a wrist grounding strap when handling static-sensitive components. Service assemblies containing static-sensitive components at static-free work stations.
4. Remove any device capable of generating or holding a static charge from the work station surface.
5. Whenever possible keep the component leads shorted together.
6. Pick up components by the body, never by the leads.
7. Do not slide components over any surface.
8. Avoid handling components in areas where the floor or work surface covering is capable of generating a static charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only special antistatic suction or wick-type desoldering tools.

Preventive Maintenance

Once a year the electrical performance should be checked and the instrument accuracy certified (calibrated).

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.

Clean the entire RFA300 measurement set often enough to prevent dust and dirt from accumulating. Dirt can act as a thermal insulating blanket that prevents effective heat dissipation. In addition, dust buildup can provide high-resistance electrical leakage paths between conductors or components in a humid environment.

Exterior of Instrument

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 washing the instrument.

Use only deionized water when cleaning. 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.

Display

Clean the face of the display screen using a soft, lint-free dampened cloth.

Compact Disc Drive

The compact disc (CD) drive requires routine maintenance to operate at maximum efficiency. Compact discs can be damaged if dirt and dust accumulate on the surface. To prevent damage, a CD should be properly stored in its protective container when not in use.

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 dampened cloth.

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

Keyboard

The keyboard may require occasional cleaning to remove lint or oil buildup. Use the following procedure to clean the keyboard.

1. If the product is operating, stop any running applications and shut down the operating system.
2. Turn off the power to the mainframe.
3. Unplug the keyboard from the mainframe.
4. Clean all lint and loose debris from the keyboard with either clean, dry, low velocity air or with a clean, soft brush.
5. Clean the external surfaces with a soft cloth dampened with a solution of mild detergent and water. Do not allow solution to run into the keyboard.

CAUTION. *If liquids such as coffee or soft drinks have gotten into the keyboard, intermittent operation can occur. If this has happened, consider replacing the keyboard.*

6. Reconnect the keyboard to the keyboard connector on the left side of the mainframe.

Mouse

Occasional cleaning is necessary to remove accumulated lint, which hampers smooth ball movement. Use the following procedure to clean the inside of the ball cavity. If the mouse is damaged, replace it.

1. Turn off the main power switch.
2. Unplug the mouse from the mainframe.
3. Turn over the mouse and loosen the ball retaining ring by inserting your fingers into the slots and turn in the direction indicated by the arrows (counterclockwise) approximately 45 degrees.
4. Turn the mouse right side up, cupping the bottom of the mouse in your hand, and gently tap until the retaining ring and ball drop into your hand.
5. Clean all lint and loose debris from the ball cavity with either clean, dry, low velocity air or with a clean, soft brush. Next, clean any remaining foreign material from the ball cavity with a soft, clean cloth. Do not use hydrocarbon or chemical-based cleaning solutions inside the ball cavity.
6. Replace the mouse ball and retaining ring. Rotate the retaining ring clockwise (opposite direction to the arrows) until the ring locks into place.
7. Reconnect the mouse to the mouse connector on the left side of the mainframe.

WARNING. *To avoid any potential of electrical shock, disconnect power before removing the cabinet.*

Interior

Examine the interior of the mainframe for dust build up. If the interior needs cleaning, use low-velocity, dry air to blow away dust or lint. If air alone does not remove all of the dust and lint, use a soft brush to complete the task. Exercise extreme care not to disturb components on the plug-in circuit boards during cleaning.

CAUTION. *This instrument contains static sensitive devices that can be damaged by static discharge. Wear a wrist grounding strap when working on or with modules inside the mainframe cabinet.*

In Case of Problems

This section addresses problems that you may encounter while using the RFA300 measurement set. This section does not identify specific problems relating to performance verification or adjustments. For information on performance verification procedures or adjustment procedures, refer to those sections of this manual.

Diagnostics

The following diagnostic tools are available with your RFA300 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 occur 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.

Before running any of the diagnostics, you should check the online release notes to verify the instrument software matches the module firmware.

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 *Software Installation* on page 6–40 for instructions on reinstalling software.

Refer to Table 6–2 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 xvii.

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.

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 6–2 lists some of the symptoms of hardware problems and possible solutions.

Table 6–2: Troubleshooting

Symptom	Possible causes and recommended action
Instrument does not power on	Verify that all power cords are 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.
Display is blank	Controls turned down; adjust controls for brightness and contrast. Faulty flat panel display module; contact your local Tektronix service center.
Instrument powers on but does not complete the power-on sequence	Check for CD in CD-ROM drive; make sure instrument boots from the hard disk drive. Possible software failure or corrupted hard disk; refer to *Software Problems* on page 6–5.
Power-on diagnostics fail	Isolate problem to faulty platform or to faulty module. Contact your local Tektronix service center.

Table 6–2: Troubleshooting (Cont.)

Symptom	Possible causes and recommended action
Instrument does not recognize accessories such as mouse or keyboard	Check that accessories are properly connected or installed. Try connecting other standard PC accessories or contact your local Tektronix service center.
Windows 95 comes up but the RFA300 measurement set application does not	Instrument not set up to start RFA300 measurement set application at power on. Start application from the desktop, by double clicking on the RFA300 icon. Faulty or corrupt software; reinstall the RFA300 measurement set application software.
Windows 95 comes up in Safe mode	Exit the Safe mode and restart the instrument.
Instrument will not power off with On/Standby switch	The instrument Utilities may be set up to disable hard power off. Check the setting of the instrument Utilities (the instrument Utilities are located in the Windows 95 Control Panel). The Windows 95 operating system may have a problem. Try powering off the instrument using the Windows 95 shutdown procedure. If the instrument still does not power off, disconnect power cord and reconnect after 10 seconds to reboot the instrument.

Checking the Power Supply Module

The field service check of the power supply consist of checking the LED indicators in the power supply.

1. Position the measurement set so that you can see into the chassis holes located on the right side of the cabinet.
2. Connect the power cord to the measurement set and press the On/Stdy button to turn on the measurement set.
3. Check that the measurement set power ups and starts normal operation.
4. Look through the holes in the cabinet on the right side of the measurement set. There is a slot in the front of the power supply module to view the LED power supply indicators. The green LED should be lit. If the red LED is lit at least one supply is out of tolerance or the “Power good” circuits are defective.
5. Remove the power supply module (refer to *Power Supply Removal and Replacement* on page 6–29) and exchange it with a known good power supply.

Removal and Replacement Instructions

The following procedures tell you how to remove and replace the RFA300 Measurement Set 8VSB modules and mainframe components. Part numbers for the modules are in the *Replaceable Parts List*.

Replaceable RFA300 Modules

The standard RFA300 Measurement Set 8VSB consists of the following replaceable components:

- Down converter module
- Synthesizer module
- Pilot Lock module
- Acquisition A/D module

The mainframe unit consist of the following replaceable components:

- Processor module (controller board)
- Front panel Interface module
- Disk drive
- Power supply module
- Front panel keypad module

- Flat panel display
- Floppy disk drive/CDROM drive assembly
- CDROM drive
- Cooling fans

Recommended Tools

The following tools are recommended for RFA300 Measurement Set 8VSB assembly removal and replacement:

- An anti-static wrist strap for safe handling of assemblies containing static sensitive devices
- A screwdriver with T10, T15, and T20 Torx tips to remove the module mounting screws
- A 1/4 inch or larger flat tip screwdriver to remove server side panel screws
- An 8 inch adjustable wrench or appropriate size open end wrench

Removing the Front Panel Bezel

Remove the front bezel to permit removal of the flat panel display, the key pad assembly, the interface circuit board, and the CD/floppy disk drive assembly. The front bezel snaps onto the chassis. There are three snaps across the top and three across the bottom. Remove the front panel bezel as follows:

1. Use pliers to grasp the On/Stby key and pull straight out on the key to disconnect the key cap from the switch.
2. Use your fingers to lift up on the back edge at the top of the bezel to release the bezel from the snaps. If you use a tool for leverage be careful not to bend the fingers of the EMI shielding strips.
3. After you have released the snaps across the top, pull the top of the bezel toward you slightly to clear the chassis. This should release the bottom of the bezel from the chassis.
4. Lift the bezel off the front of the chassis.

Removing the RFA300 Cabinet

The cabinet must be removed to access any of the RFA300 application modules and to access the mainframe modules and cable connectors to the controller board. Use the following procedure to remove the cabinet:

1. Be sure that you are wearing a static grounding wrist strap.
2. Before removing the cabinet, shut down the RFA300 measurement set and unplug the power cord.
3. Disconnect any cables connected to the rear panel connectors of the measurement set. Note their locations for reinstallation.

4. Put the protective front cover on the measurement set and sit the cabinet upright on the working surface with the rear panel up.

5. Remove the two screws from the handle on the left side of the cabinet (see Figure 6–1). These screws attach to post mounted on the power supply module.

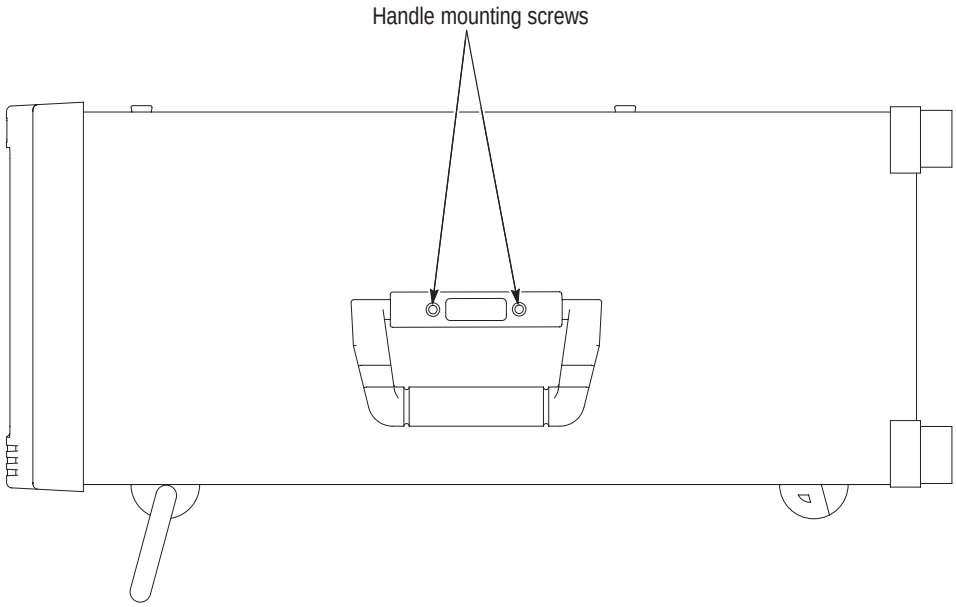


Figure 6–1: Right side handle screws

6. Remove the screws from the four feet on the rear of the mainframe chassis.

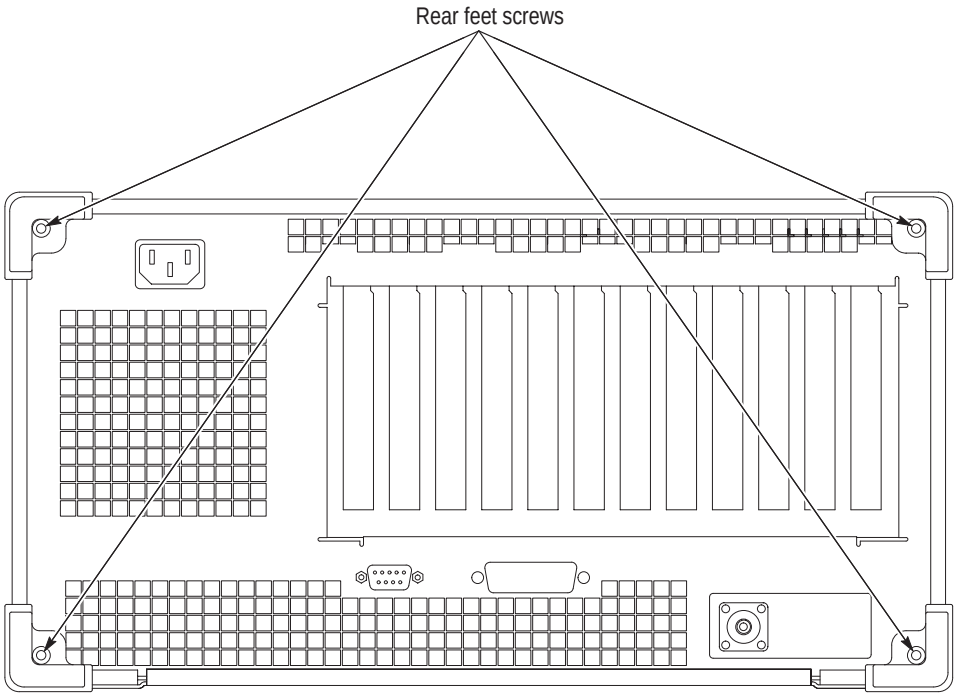


Figure 6–2: Rear panel feet removal

7. Use either an adjustable wrench or appropriate size open end wrench as a lever to pry the cabinet loose from the chassis. Loosen each side alternately until the cabinet is released from the EMI gasketing.
8. Slide the cabinet up and off the chassis.

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

Replacing the RFA300 Cabinet

1. Place the protective front cover on the face of the measurement set.
2. Position the measurement set face down on a stable working surface with enough head room to install the cabinet.
3. Position the cabinet correctly to install it, and slide the cabinet over the end of the mainframe chassis.
4. Slide the cabinet evenly down on the chassis making sure all the internal cables are clear and do not catch.

5. When the front of the cabinet comes in contact with the cabinet retaining tabs around the front of the chassis, make sure the edges of the cabinet go under the tabs. You may have to push on the sides of the cabinet to get all the edges under the tabs and over the EMI strips around the front of the chassis.
6. At the rear of the chassis, you may have to push on the sides of the cabinet to get the rear of the cabinet to fit over the edges of the chassis and EMI gasketing.
7. When the cabinet is completely in place on the chassis, install the four rear feet.
8. Position the handle on the left side of the chassis and replace the two screws that attach the handle to the chassis (see Figure 6–1).

RFA300 Application Modules

The RFA300 measurement set plug in modules are located in the mainframe card cage. The down converter module is located in the mainframe bottom compartment in a separate, and shielded, chassis subassembly. The following procedures start after removal of the cabinet from the mainframe.

NOTE. *There are many cables and connectors to disconnect and reconnect to remove and replace RFA300 modules. Make note of the cables you disconnect and the routing of the cables as you remove a module to assist you in making the correct connections when you reinstall the replacement module.*

Removing the Acquisition Module

1. Remove the holding screws from the top and bottom of the acquisition module.
2. Carefully pull up on the module to loosen it from the back plane module connectors. You may have to alternate lifting on the front and the rear of the module to work it loose from the from the connectors and the card cage.
3. When the module is loose from the connector, lift the module up to gain access to the interconnections cables.

CAUTION. *Use care when disconnecting the RF interconnection cables from the circuit board connectors. Do not force the connector from side to side; the board connector may break.*

4. Disconnect the interconnection cables from the acquisition module (see Figure 6–3 for connector locations.

   a. J4 to J1 of the down converter module.

   b. Cable coupling connector between J8 of the acquisition module and J0340 of the pilot lock module (cable label 0).

5. Place the removed module on a static free work surface or in a static protection bag.

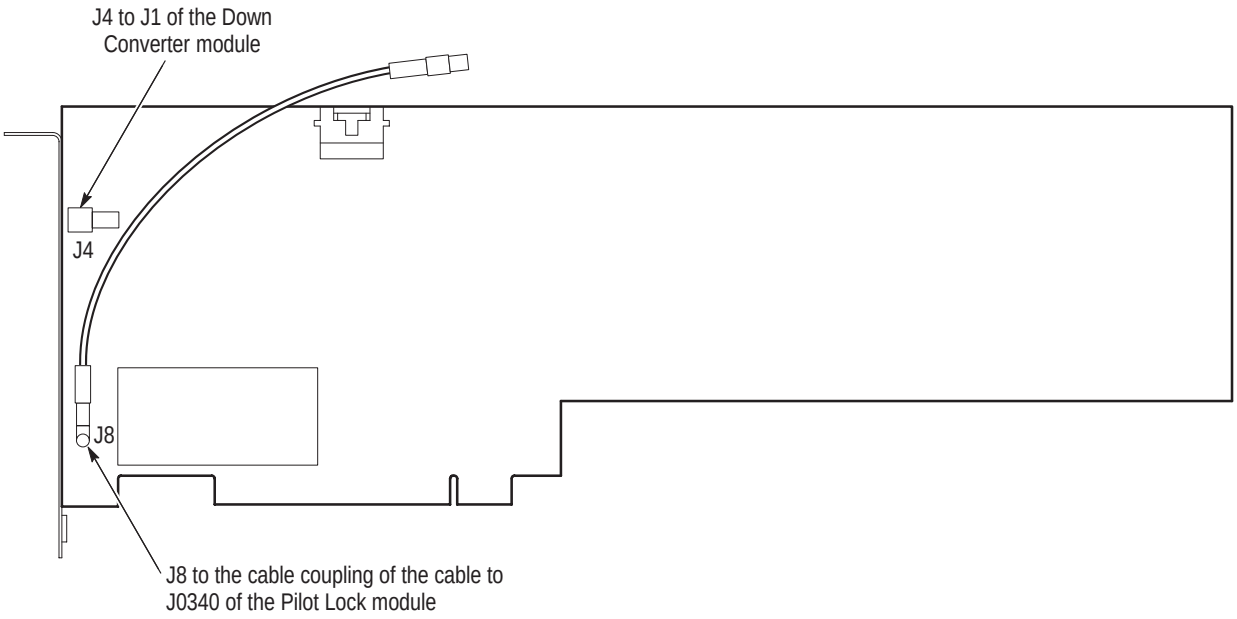


Figure 6–3: Acquisition module connector locations

Removing the Pilot Lock Module

1. Remove the acquisition module (refer to *Removing the Acquisition Module* on page 6–12 for the removal instructions) to gain access to the pilot lock module connectors.

2. Remove the holding screws from top and bottom of the pilot lock module rear panel.

3. Carefully pull up on the module to loosen it from the backplane connectors.

4. When the module is loose from the connectors, lift the module up to gain access to the interconnection cables.

5. Disconnect the interconnection cables from the Pilot Lock module (see Figure 6–4 for connector locations.

a. Cable coupling connector between J0270 Clock (cable label 7) and J1 of the synthesizer module.

b. J0340 43.05 MHz Acquisition clock (cable label 0) to the acquisition module J8 (already disconnected at the cable coupling connector if the acquisition module is removed).

c. J0440 Pilot Signal (cable label 2) to J2 of the down converter module.

d. Cable coupling connector between J0460 Tune voltage (cable label 6) and J2 of the synthesizer module.

e. J0480 86 MHz Clock to J4 Internal input of the down convertor module (not connected).

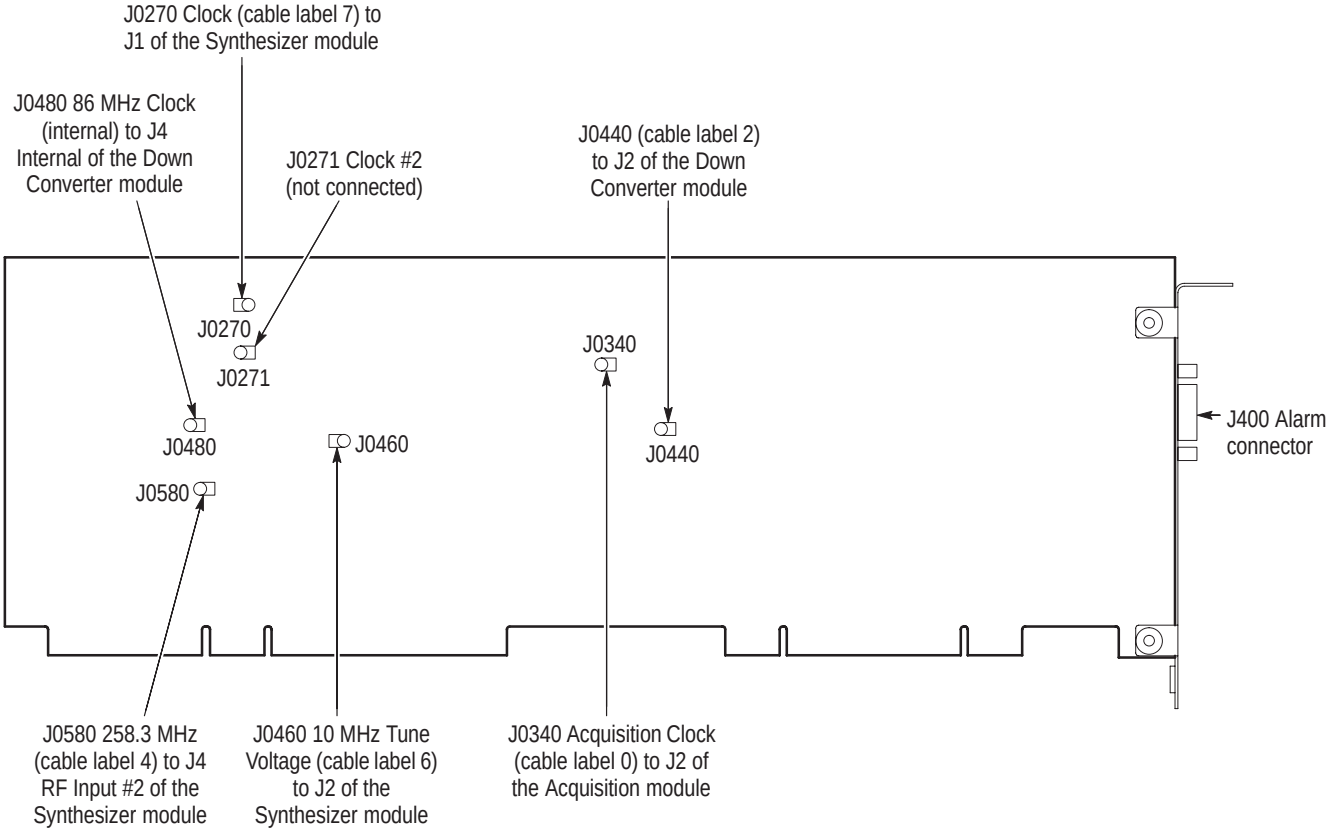


Figure 6–4: Pilot lock module connector locations

f. J0580 258.3 MHz (cable label 4) to the down converter module RF Input #2 Internal, J4.

6. Place the removed module on a static free work surface or in a static protection bag.

Removing the Synthesizer Module

1. Remove the holding screws from the top and bottom of the synthesizer module rear panel. The synthesizer module is a two circuit board assembly; do not attempt to dismantle the assembly.
2. Disconnect the following cable connectors between pilot lock module and the synthesizer module (see Figure 6–5 for the cables to disconnect).
   a. Cable connector coupling between J2 of the synthesizer module and J0460 of the pilot lock module (cable label 6).
   b. Cable connector coupling between J1 of the synthesizer module and J0270 of the pilot lock module (cable label 7).
3. Press the release on the front side of the four conductor data connector (at the top of the board near the rear) and disconnect it from J7.
4. Carefully pull up on the module to loosen it from the backplane connectors.
5. When the module is loose from the backplane connectors, lift the module up to gain access to the remaining interconnection cable.

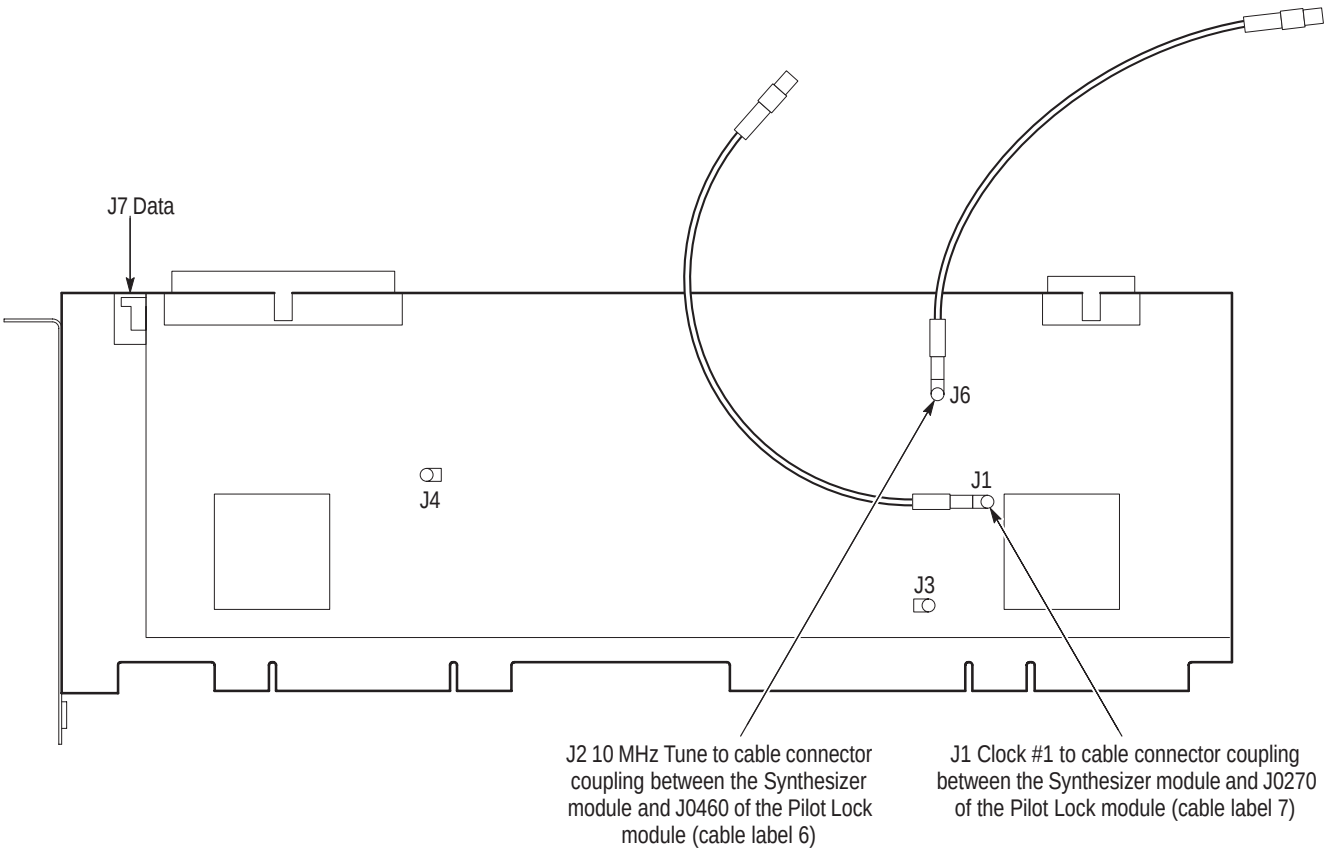


Figure 6–5: Synthesizer module Frac-N board cable connections

6. Disconnect J3 (cable label 3), the LO signal #1 output to J3 of the down converter module LO input, from the synthesizer module.

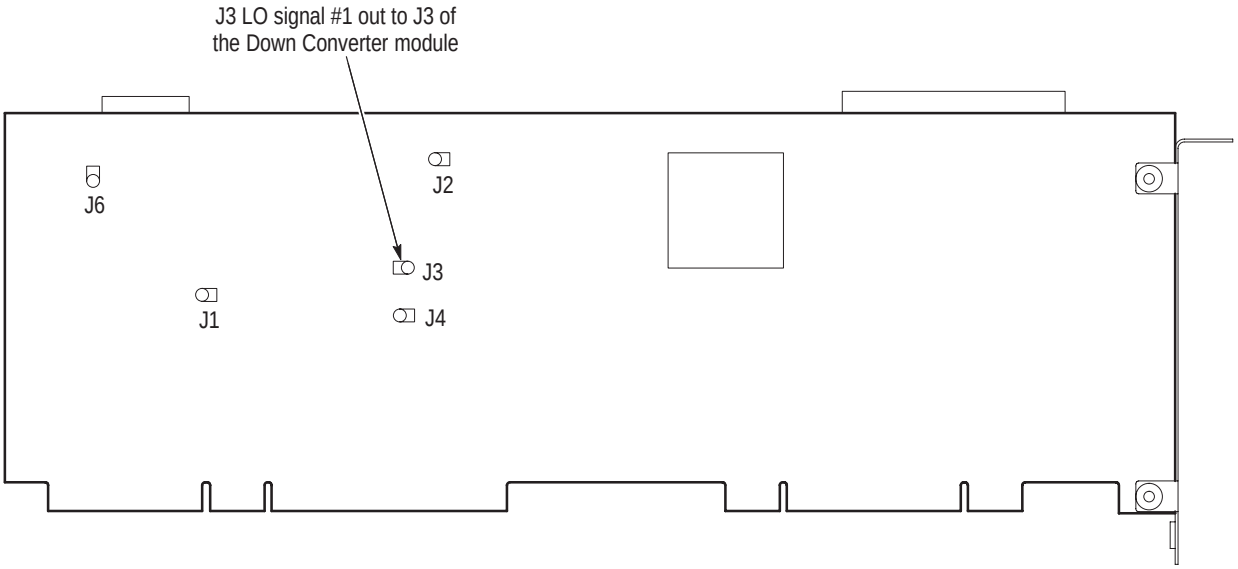


Figure 6–6: Synthesizer module connector locations

7. Place the removed module on a static free work surface.

Removing the Down Converter Module

1. Disconnect the external signal cable from the Down Converter assembly.
2. Remove the mainframe cabinet (see *Removing the RFA300 Cabinet* on page 6–9 for the removal procedure). The down converter module is located in the bottom compartment of the RFA300 mainframe chassis.

WARNING. *Do not pull on or twist the heat sinks located near the center of the down converter circuit board. You can break the component leads to the circuit board.*

3. Disconnect the interconnection coaxial cables from the down converter module (see Figure 6–7 for the connector locations).
   - **a.** J1 IF signal (cable label 1) to the acquisition module J4.
   - **b.** J2 Pilot signal (cable label 2) to J0440 of the pilot lock module.
   - **c.** J3 LO input (cable label 3) to J3 of the synthesizer module.
   - **d.** J4 internal input (cable label 4) to J0580 of the pilot lock module.

e. J24 data to the synthesizer module J7.

f. J5 power connector.

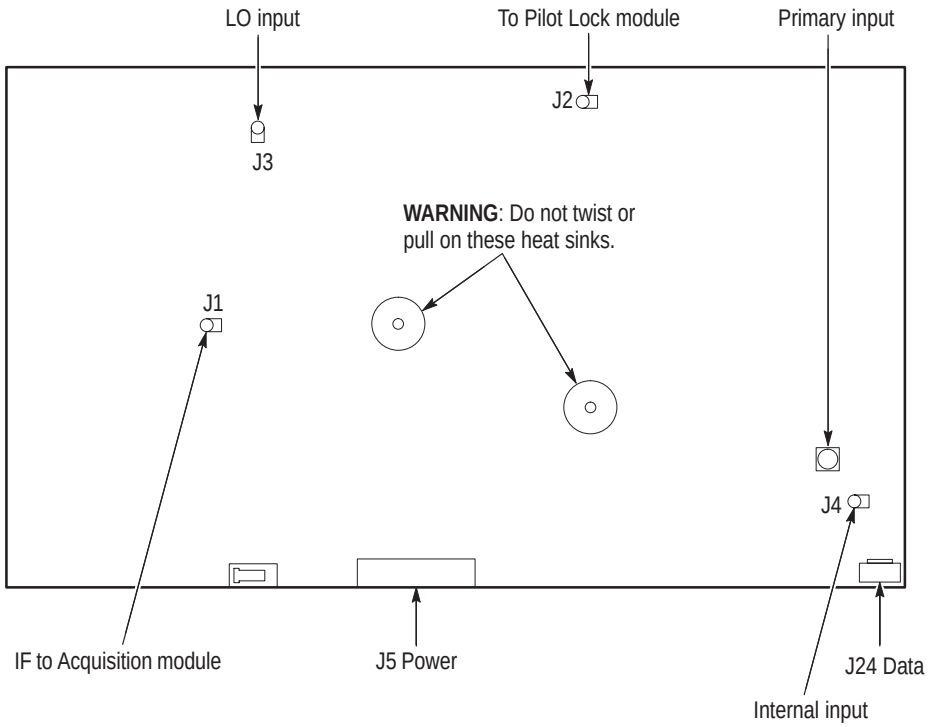


Figure 6–7: Connector locations on the down converter module

4. Remove the eight screws holding the down converter assembly to the mainframe chassis.

Reinstalling the Down Converter Assembly

1. Position the mainframe with the left side down and the bottom of the chassis facing you.

2. Insert the three screws that attach the down converter assembly to the side of the chassis before you lift the down converter into position to install it.

3. Lift the down converter into position to line up the three screw holes in the down converter with the screws in the chassis and start the screws. Do not tighten yet.

4. Install the two attaching screws at the rear of the chassis and the three screws at the front of the down converter module. Tighten all the screws.

5. Route and reconnect the interconnection coaxial cables to the down converter module (see Figure 6–7 for the connector locations).

a. J1 IF signal (cable label 1) from J4 of the acquisition module.

b. J2 Pilot signal (cable label 2) from J0440 of the pilot lock module.

c. J3 LO input (cable label 3) from J3 of the synthesizer module.

d. J4 internal input (cable label 4) from J0580 of the pilot lock module.

e. J24 data from the synthesizer module J7.

f. J5 power connector.

Reinstalling an RFA300 PCI Module

1. Insert the module into the card cage at the correct slot position.
2. Route and reconnect the module interconnection cables (refer to the module removal instructions for a list of the connections to reconnect).
3. Carefully align the module edge connector with the backplane connectors.
4. Apply firm pressure to completely seat the module in the connectors.
5. Replace the module holding screws to hold the module in the card cage.

Mainframe Platform Modules

The front panel modules do not require the cabinet to be removed to remove and replace them. Removing the snap on bezel exposes the attaching screws for the flat panel display and the key pad assembly. Removing the flat panel display also permits access to the front panel interface circuit board.

Removing the Flat Panel Display

The flat panel display assembly comes as an assembled and tested unit. Remove the Flat Panel Display assembly as follows:

1. Remove the front panel bezel (see *Removing the Front Panel Bezel* on page 6–9 for the removal procedure).
2. Remove the six screws attaching the display assembly to the chassis. There are two screws at the top, two at the bottom, and two at the left side of the assembly (see Figure 6–8).
3. Pull the display assembly away from the chassis to expose the connector to the front panel interface circuit board.

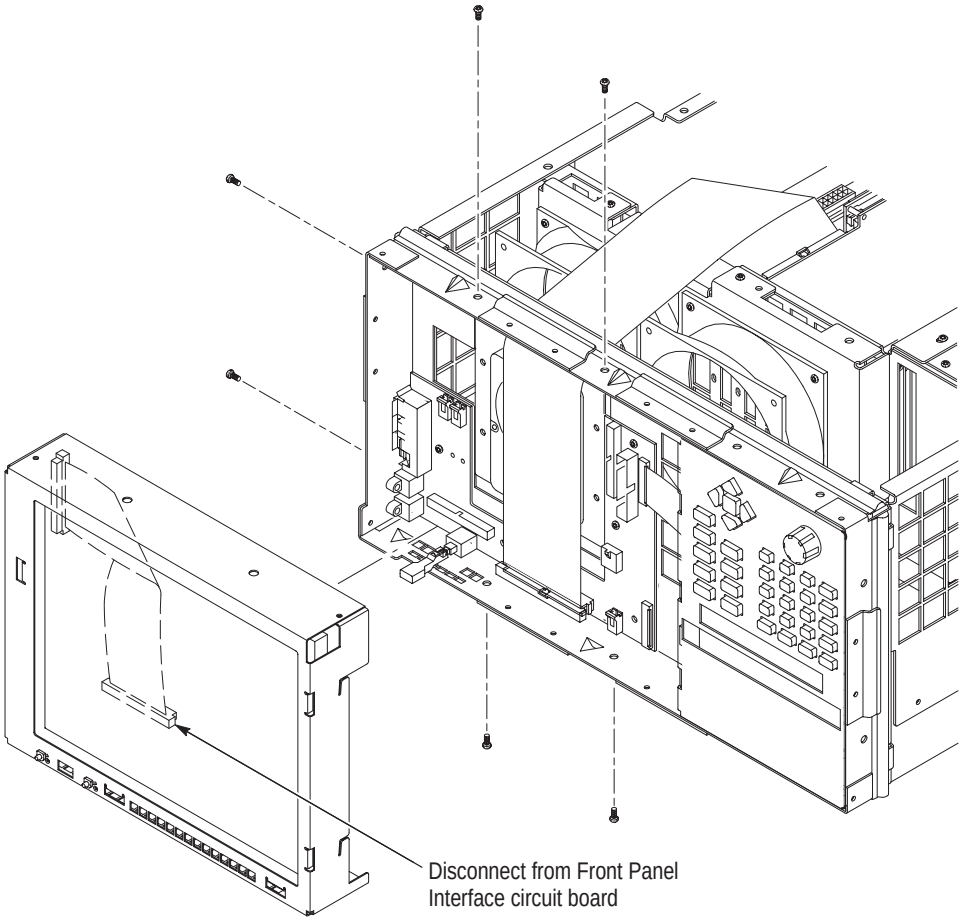


Figure 6–8: Flat panel display removal

4. Disconnect the ribbon cable connector from the front panel interface circuit board.

Reinstalling the Flat Panel Display

Make sure all of the cables to the interface assembly are properly connected before replacing the flat panel display assembly. After that, use the following procedure to replace the display assembly:

1. Position the flat panel display to permit the display assembly interconnection cable to be reconnected and connect it to the display connector on the front panel interface circuit board.
2. Carefully slide the display assembly into the chassis to align it with the mounting screw holes.
3. Install the six attaching screws; two on the top, two on the side, and two on the bottom of the chassis.

Removing the Key Pad Assembly

After removing the front panel bezel and flat panel display assembly, remove the front panel key pad assembly as follows:

1. Remove the six screws holding the keypad assembly to the mainframe chassis. There are two across the top, two across the bottom, and two on the right side of the assembly (see Figure 6–9).

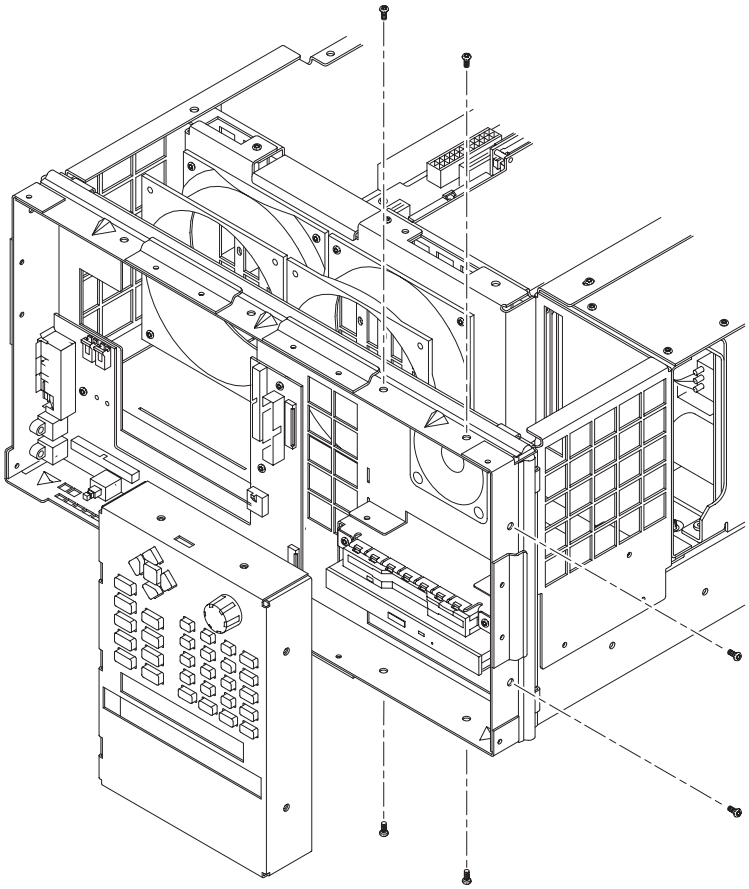


Figure 6–9: Key pad assembly removal

2. Disconnect the key pad interconnection cable from the front panel interface circuit board.
3. Slide the key pad assembly out of the chassis.

Replacing the Key Pad Assembly

1. Position the key pad assembly to slide it into the chassis.
2. Carefully slide the key pad assembly into place and align the mounting screws holes.

3. Connect the key pad assembly interconnection ribbon cable to the key pad connector on the front panel interface circuit board (see Figure 6–10).

4. Install the six attaching screws.

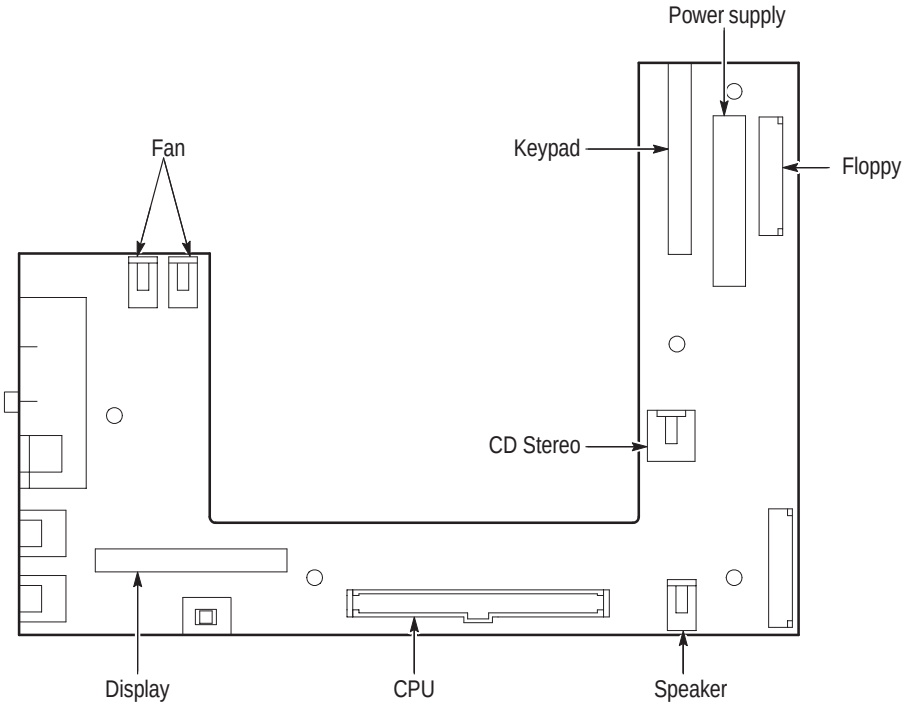


Figure 6–10: Front panel interface circuit board connectors

Removing the CD and Floppy Disk Drive Assembly

The cabinet, front bezel, display assembly, and keypad assembly must be uninstalled to remove the CD and disk drive assembly for service. Remove the CD and Floppy Disk drive assembly as follows:

1. Remove the mainframe cabinet (see *Removing the RFA300 Cabinet* on page 6–9 for the removal procedure).

2. Remove the front panel bezel (refer to *Removing the Front Panel Bezel* on page 6–9 for the removal procedure).

3. Remove the display assembly (refer to *Removing the Flat Panel Display* on page 6–18 for the removal procedure).

4. Remove the key pad assembly (refer to *Removing the Key Pad Assembly* on page 6–20 for the removal procedure).

5. Remove the three screws attaching the CD and Floppy Disk Drive assembly to the chassis. There are two screws on the front of the assembly and one on the rear inside the front panel compartment of the chassis.

6. Disconnect the floppy drive cable from the floppy drive connector. Lift up the locking latch on the floppy drive connector to release the interconnection cable and pull up on the cable to separate it from the connector.
7. Disconnect the audio cable from the CD drive four pin connector (see Figure 6–13).
8. Disconnect the CD drive cable from the Controller board.
9. Slide the CD and Floppy Disk Drive assembly out through the front of the chassis. You may have to lift the front of the assembly slightly to clear the EMI shielding fingers.
10. When the CD drive cable connector is clear of the front of the chassis, carefully disconnect it from the CD drive connector adapter board.

Removing and Replacing the CDROM Drive

The floppy disk drive and the CD drive are assembled in the same unit, but can be separately replaced.

1. Remove the four crosstip screws that hold the CD drive to the chassis.
2. Slide the CD drive out of the lower bay of CD and floppy drive chassis.

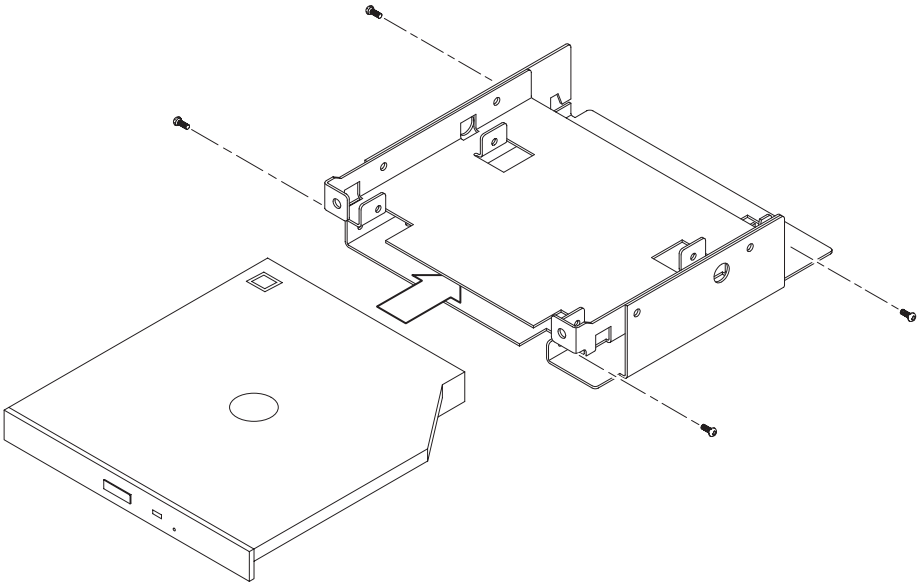


Figure 6–11: Chassis screw locations for CD drive

Reinstall the CD Drive.

1. Insert CD drive into lower bay of CD and floppy drive chassis.

2. Align CD drive mounting holes with chassis holes.

3. Attach CD drive to chassis with four crosstip screws. Torque the screws to 2 in-lbs.

Removing and Replacing the Floppy Disk Drive

The floppy disk drive and the CD drive are assembled in the same unit, but can be separately replaced.

1. Remove the four cross tip screw holding the floppy disk drive to the assembly.

2. Lift the floppy disk drive up off the chassis as shown in Figure 6–12.

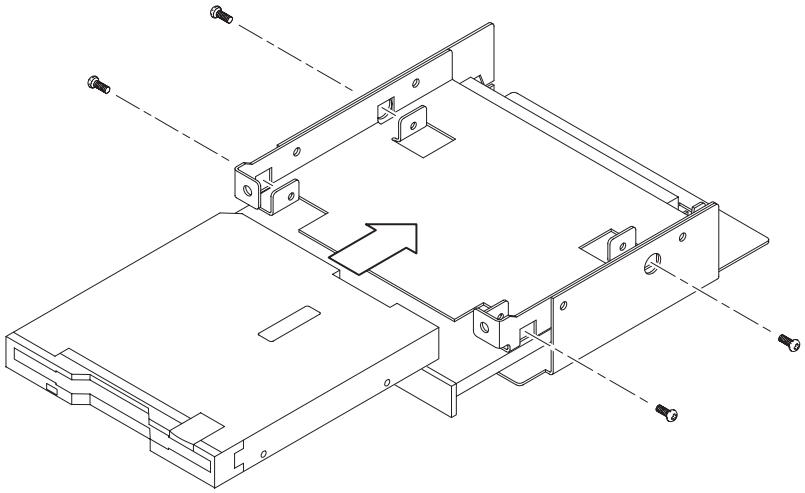


Figure 6–12: Chassis screw locations for the floppy disk drive

Replace the Floppy Disk Drive.

1. Place the replacement floppy drive onto the chassis / CD drive as shown in Figure 6–12.

2. Attach the floppy drive to chassis with four crosstip screws. Torque each screw to 2 in-lbs.

Reinstalling the CD and Floppy Disk Drive Assembly

When the CD and Floppy drive assembly is assembled it can be reinstalled into the chassis.

1. Align the assembly with the slot in the chassis.

2. Connect the CD drive cable to the CD drive connector adapter board.

3. Slide the assembly into the compartment and line up the attaching screw holes.
4. Install the three attaching screws, two in the front and one in the rear of the assembly.
5. Attach the audio cable to CD drive four pin connector.
   a. Align the audio cable white colored dot with pin 1 of CD drive four pin connector.
   b. Plug the audio cable onto the CD drive connector (see Figure 6–13)
6. Attach the floppy drive cable to the floppy drive connector.
   a. Lift up floppy drive locking latch.
   b. With the contacts of the short end of floppy drive cable facing towards the floppy drive, insert cable into floppy drive connector as shown in Figure 6–13.
   c. While supporting the circuit board, push the locking latch closed.

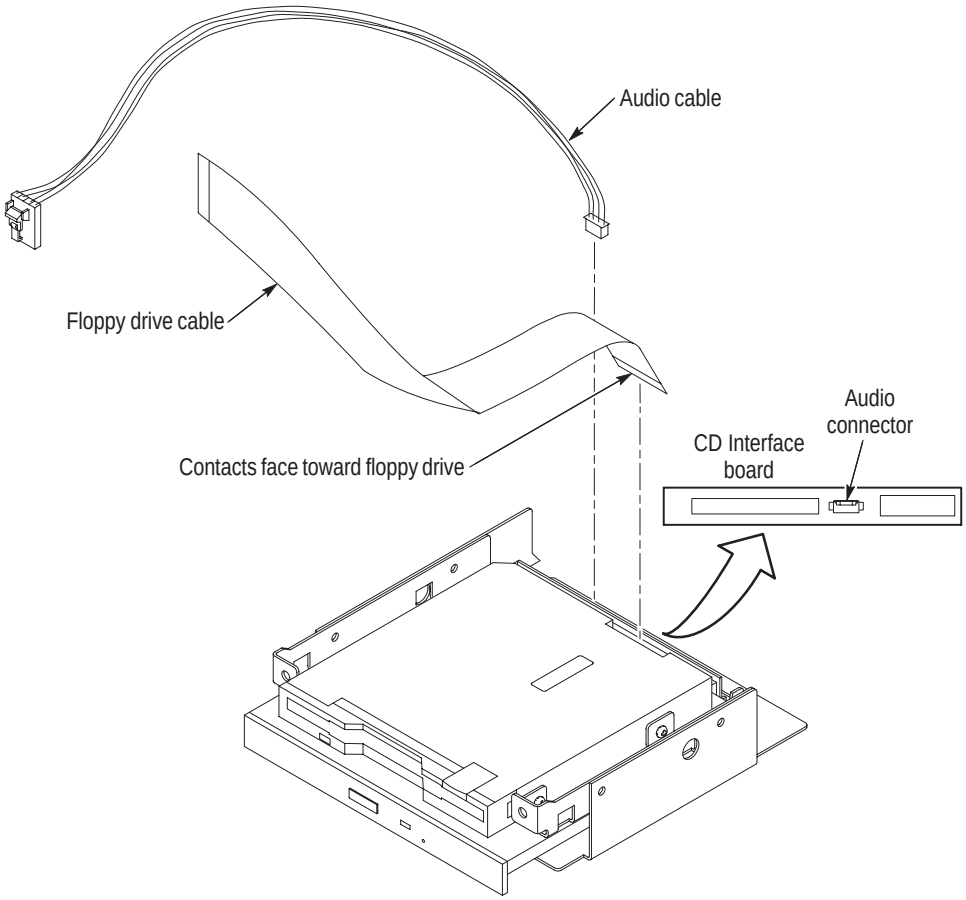


Figure 6–13: Floppy disk drive and CD audio connector installation

Removing the Hard Disk Drive

The disk drive is installed in the mainframe immediately behind the flat panel display on the left side of the mainframe. The mainframe cabinet must be removed to access the disk drive assembly

1. Be sure that you are wearing a static grounding wrist strap.
2. Shut down the mainframe and unplug the power cord.
3. Remove the mainframe cabinet (see *Removing the RFA300 Cabinet* on page 6–9 for the removal procedure).
4. Disconnect the top of the cable clamp holding the ribbon cables to the top of the hard disk drive mounting bracket.
5. Remove two attaching screws from the hard drive mounting assembly.
6. Disconnect ribbon cables as needed to free the hard drive assembly from the mainframe.

7. Lift disk drive assembly straight up out of the mainframe.
8. Disconnect power cable and the hard drive interconnection cable.
9. Place the drive on a static free work area.

Install the Hard Drive to the Bracket Assembly

1. Wear a static grounding wrist strap when handling a disk drive.

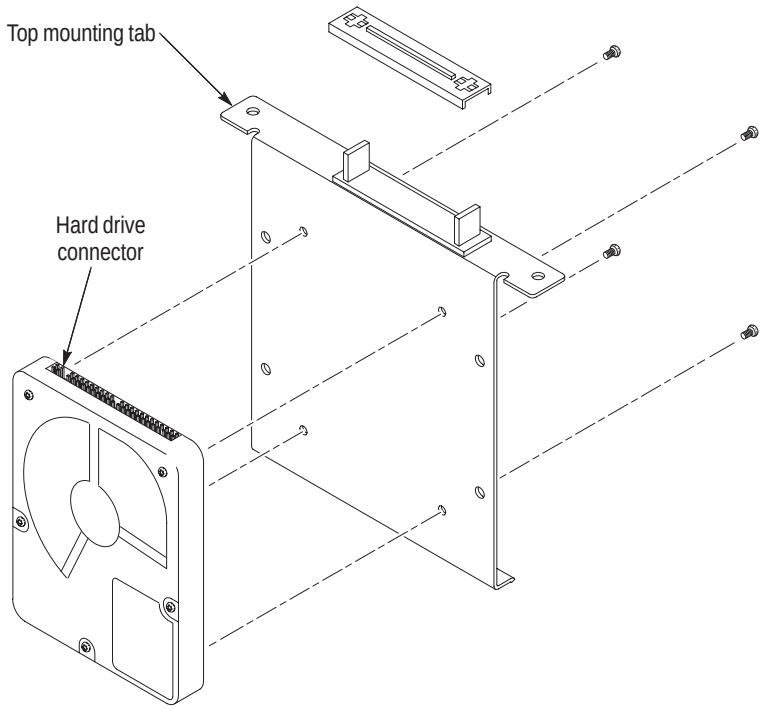


Figure 6–14: Bracket screw locations for hard disk drive

2. With bracket top mounting tab facing away from hard drive, as shown in Figure 6–14, place hard drive against bracket.
3. Align hard drive mounting holes with bracket holes.
4. Attach hard drive to bracket with four crosstip screws. Torque each screw to 2 in-lbs.
5. Plug the ribbon cable (long end) onto the hard drive connector as shown in Figure 6–15.

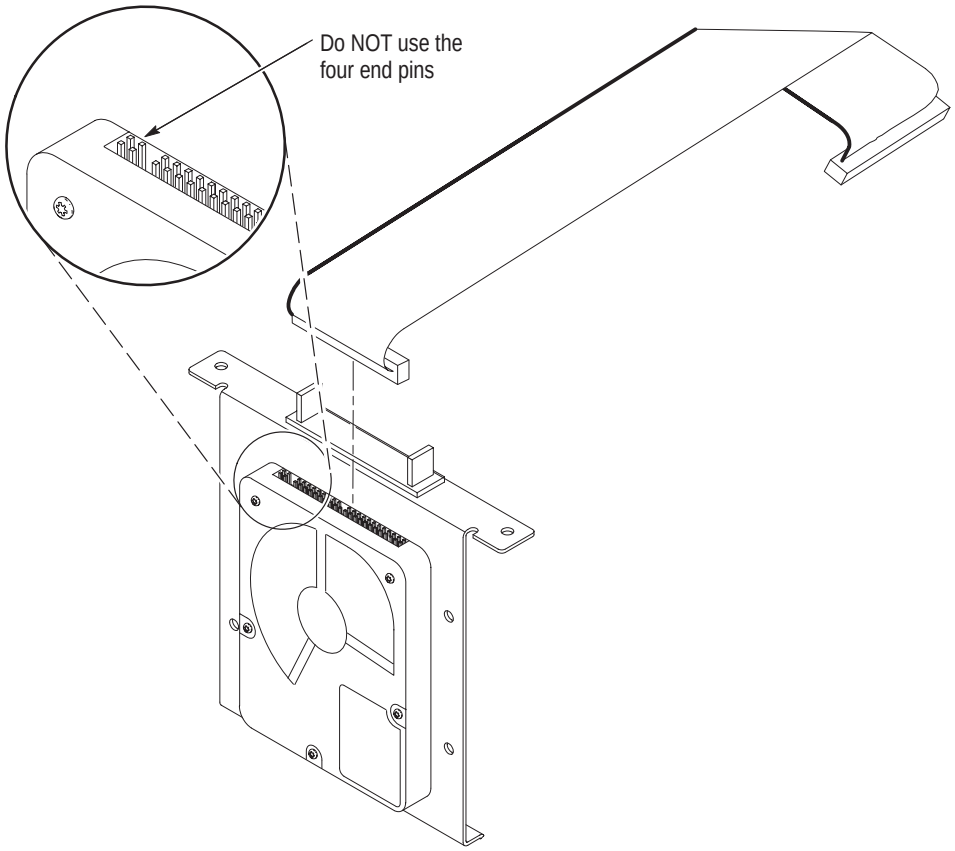


Figure 6–15: Hard drive ribbon cable orientation

NOTE. *The orientation of the ribbon cable red colored band is shown in Figure 6–15.*

Hard Drive Assembly Replacement

Use the following steps to reinstall the hard drive assembly.

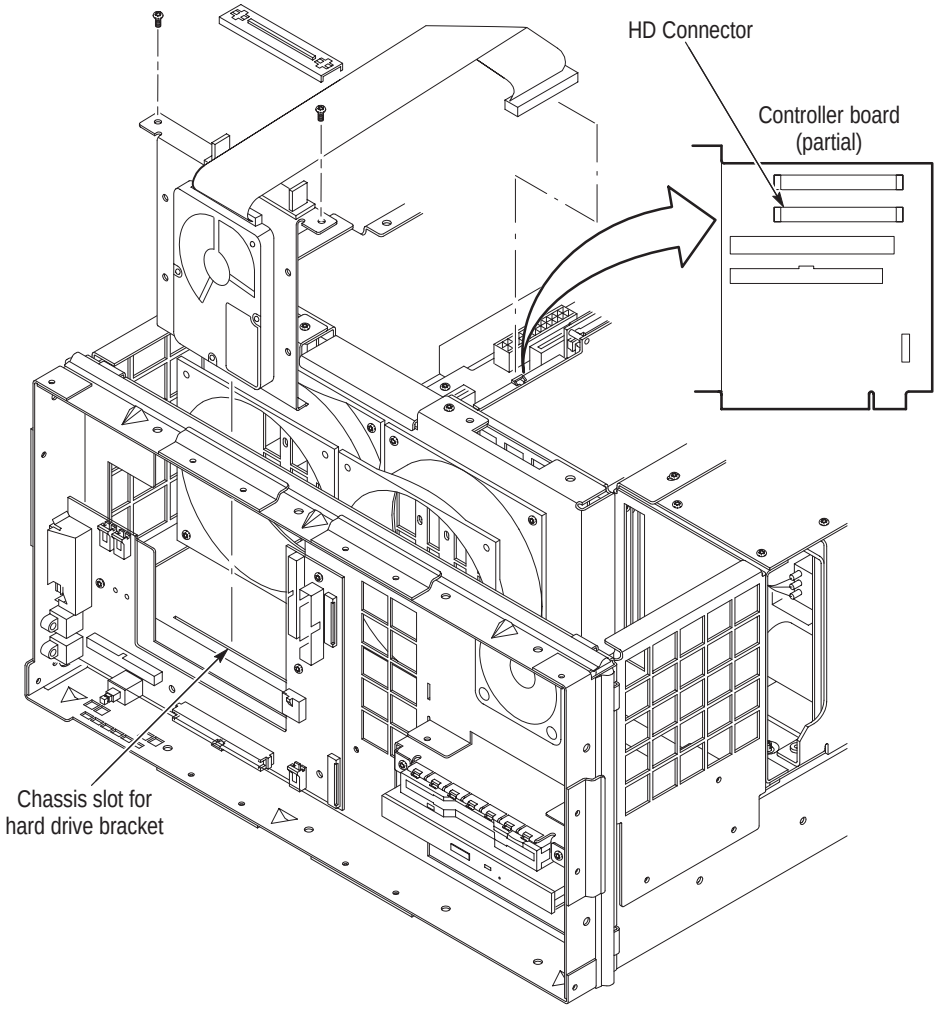


Figure 6–16: HD installation with controller cable connectors

1. Install the hard drive assembly onto the mainframe chassis as shown in Figure 6–16.

***NOTE**. Hard drive bracket inserts into chassis slot, as identified in 6–16. Note the orientation of the pin 1 indicator on the ribbon cable.*

2. Attach the hard drive assembly to the chassis with two T15 screws. Torque the screws to 8 in-lbs.
3. Plug the hard drive ribbon cable onto controller board “HD” connector.

4. Reroute and reconnect any other ribbon cables that were disconnected to remove the hard drive assembly.

5. Attach the top of the cable clamp on the hard drive mounting bracket.

Speaker Replacement

1. Route the speaker wire harness through mainframe chassis hole as shown in Figure 6–17.

2. Attach speaker to chassis with four T15 screws. Torque the screws to 8 in-lbs.

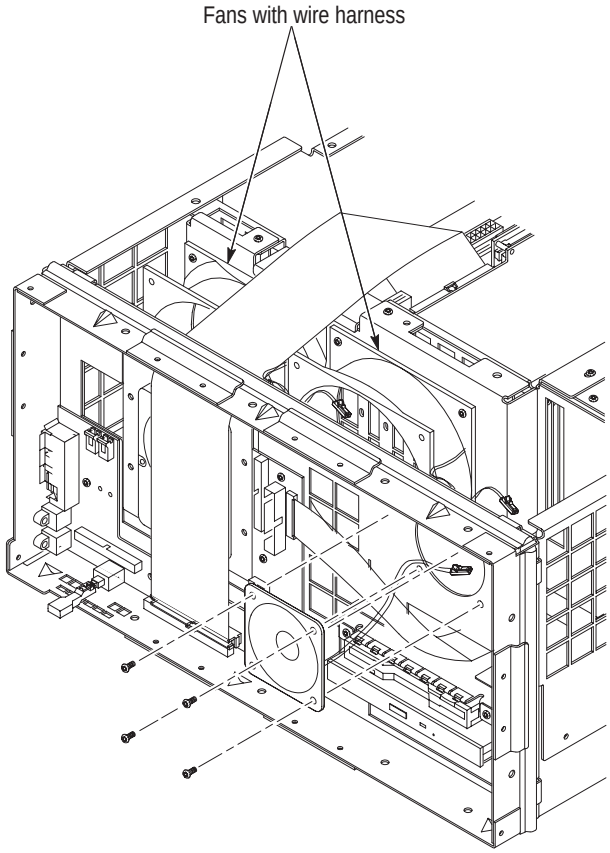


Figure 6–17: Speaker installation and fan locations

Power Supply Removal and Replacement

Use the following steps to remove the power supply module:

1. Turn off and disconnect the main power from the RFA300 measurement set.

2. Remove the measurement set cabinet (refer to *Removing the Cabinet* on page 6–9 for the removal instructions).

3. Remove the five short and two long T15 screws that attach the power supply module to the chassis (see Figure 6–18 for the screw locations).

   a. At the front of the power supply module, remove one short T15 screw. Use a long shafted screwdriver to access the front screw through the hole in the chassis.

   b. At the top of the power supply, remove two short T15 screws.

   c. At the rear of the power supply, remove two short screws and two long T15 screws.

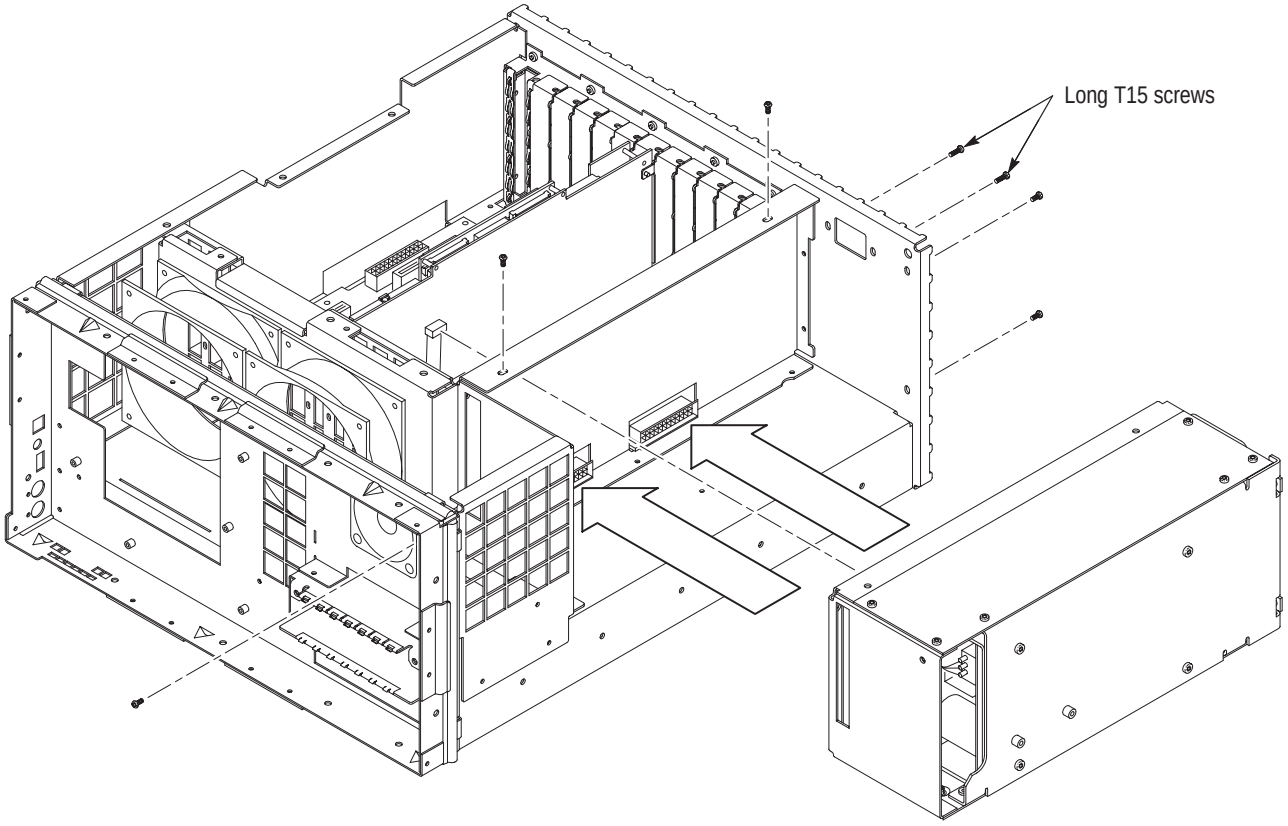


Figure 6–18: Power supply long and short screw locations

4. Disconnect the backplane ribbon cable from the power supply module connector.

5. Disconnect the front panel ribbon cable from the front of the power supply module.

6. Slide the power supply module out of the chassis. Use a flat blade screwdriver as necessary to disconnect the power supply connectors from the backplane connectors.

Reinstall the Power Supply. Use the following steps to reinstall the power supply module:

1. Align the power supply connectors with backplane connectors as shown in Figure 6–18.
2. Press power supply module onto backplane connectors/main chassis.
3. Attach the power supply module to the chassis with five short and two long T15 screws. Torque the screws to 8 in-lbs.
   a. At the front of the power supply module, attach the power supply to the chassis with one short T15 screw.
   b. Attach the top of the power supply to the chassis with two short T15 screws.

***NOTE**. The long T15 screws are used for attaching the power supply to the chassis at either side of the line filter opening.*

   c. At the rear of the power supply, attach the power supply to the chassis with two short screws and two long T15 screws.
4. Plug the backplane ribbon cable onto the power supply module connector.

Removal and Installation of Memory onto the Controller Board

The controller board replacement module is provided with the memory boards installed. Routine servicing of the controller board does not require removal and replacement of the memory boards on the controller. Use the following procedure to remove the memory boards.

Memory Board Removal.

1. Remove the controller board from the mainframe to gain access to the memory board retaining clips. Refer to *Controller Board Removal and Replacement* on page 6–33 for removal instructions.
2. Starting with the controller board upper location the controller board, remove the memory boards as follows:
   a. Use your finger tips to release both of the memory board retaining clips. While holding the clips open, move the top edge of the memory board out of the clips.

b. With the top edge of the memory board out of the retaining clips, carefully pull the memory board out of the connector on the controller board.

c. Place the removed memory board in an antistatic container.

d. Repeat a, b, c to remove the inside memory board.

Memory Board Installation.

1. Starting with the memory board nearest to the controller board, install the memory boards onto the controller board as shown in Figure 6–19.

a. Align memory board with controller board so that notch in memory board faces towards controller board fan.

b. Align the memory board contacts with the memory connector and press the memory board into the connector contacts.

c. With fingers located near both top edges of the memory board, push memory board toward the controller board until the memory board snaps into the retaining clips.

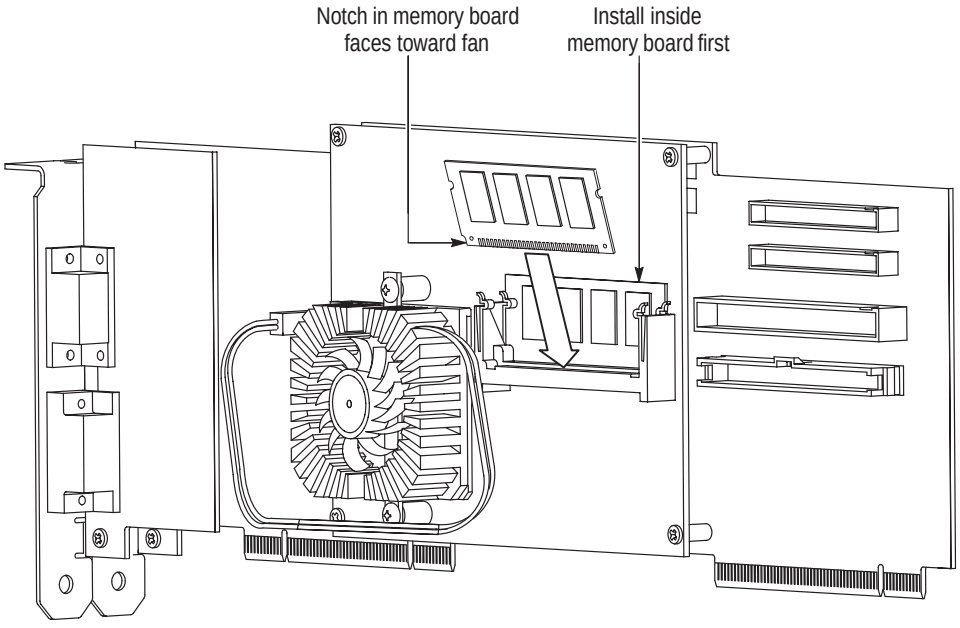


Figure 6–19: Memory board installation

Controller Board Removal and Replacement

Use the following procedure to remove the controller board.

1. Remove the four T15 screws that hold the controller board to mainframe chassis (see Figure 6–20 for the screw locations).

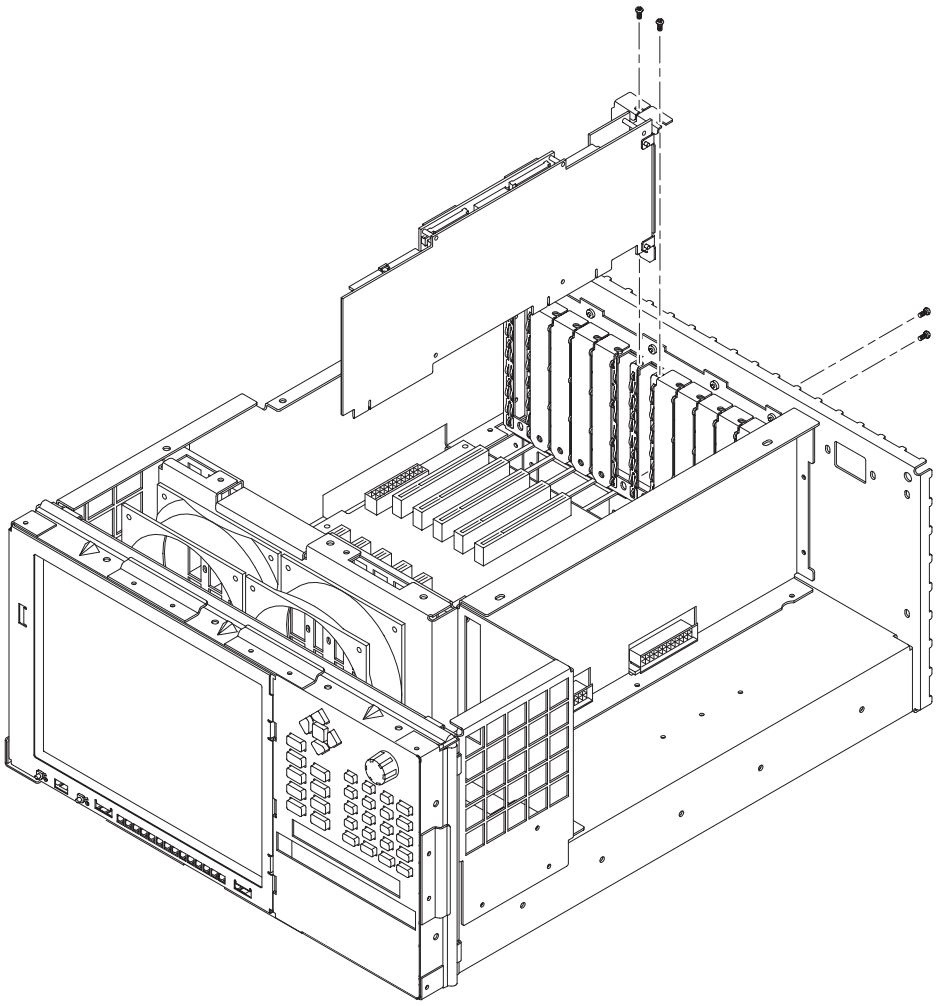


Figure 6–20: Controller board orientation and screw locations

2. Carefully pull up on the controller board to loosen it from the backplane connectors.
3. When the board is loose from the backplane connectors, lift the assembly up to gain access to the interconnection cable release catches.
4. Disconnect the interconnection cables from the controller board by releasing the catches or both ends of the connector.

a. CD drive

b. Interface board

c. Hard disk drive

Reinstall the Controller Board. Use the following procedure to reinstall the controller circuit board.

1. Position the controller board in the card cage. Refer to Figure 6–20 for orientation of controller board to back plane assembly.
2. Reconnect the cable connectors to the Front Panel interface board, the CD ROM drive, and the hard disk drive (see Figure 6–21 for connector locations).
   a. Align the connector pin carefully, and then press down firmly to seat the connector.
   b. Ensure that the connector catches on both ends of the connector are fully closed.

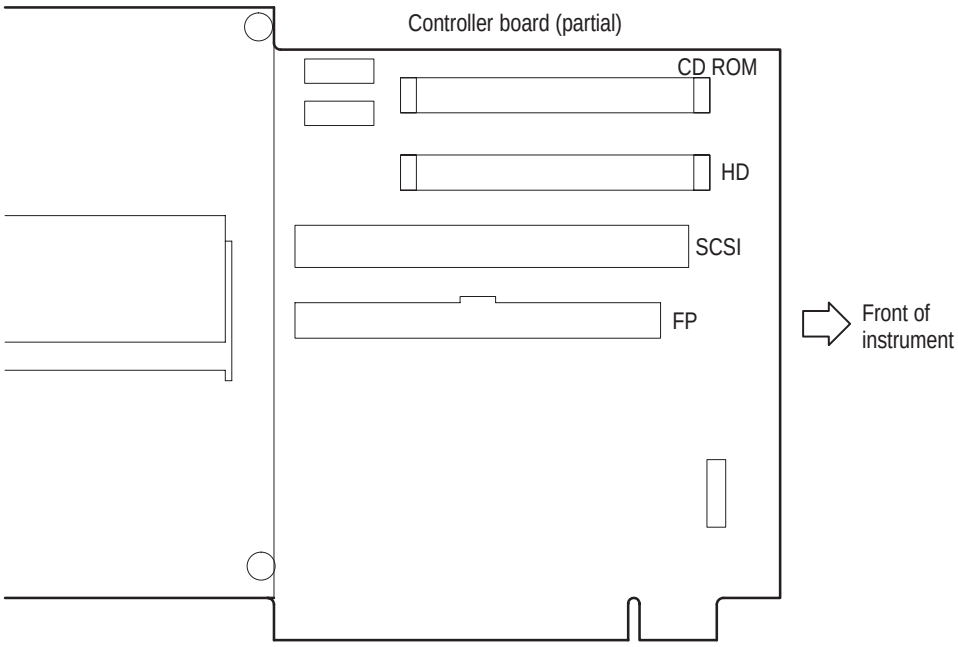


Figure 6–21: Controller board connectors

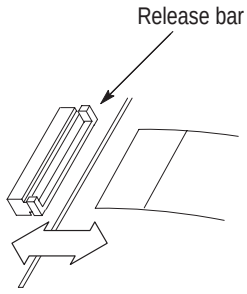
3. Align the controller board edge connectors with the PCI slot connectors and press down firmly to seat the controller board in the connectors.

4. Attach the controller board and the attached I/O board brackets to the mainframe chassis with four T15 screws. Torque the screws to 8 in-lbs.

Interface Board Removal and Replacement

Use the following procedure to remove the interface board:

1. Remove the flat panel display (see *Removing the Flat Panel Display* on page 6–18 for the procedure).
2. Disconnect the speaker wire from the interface board J980 connector (see Figure 6–23).
3. Disconnect the right side fan wire from the interface board J420 (right FAN) connector.
4. Disconnect the left side fan wire from the interface board J410 (left FAN) connector.
5. Disconnect the disk drive flexible circuit board from the interface board disk drive connector.
   a. Release the locking latch on the flexible circuit board connector.
   b. Pull the flexible circuit board straight out of the connector.



6. Disconnect the controller ribbon cable from the interface board.
7. Disconnect the key pad assembly ribbon cable from the interface board.
8. Remove the five T15 screws from the front of the board and the two metric screws on the left side that attach the interface board to the chassis (see Figure 6–22 for the screw locations).

Reinstall the Interface Board. Install the interface board onto the mainframe chassis as shown in Figure 6–22.

1. Orient interface board so that the board components are facing up and the mouse/keyboard connectors are to the left.

2. Align the interface board mounting holes with the chassis studs and place the board onto chassis.

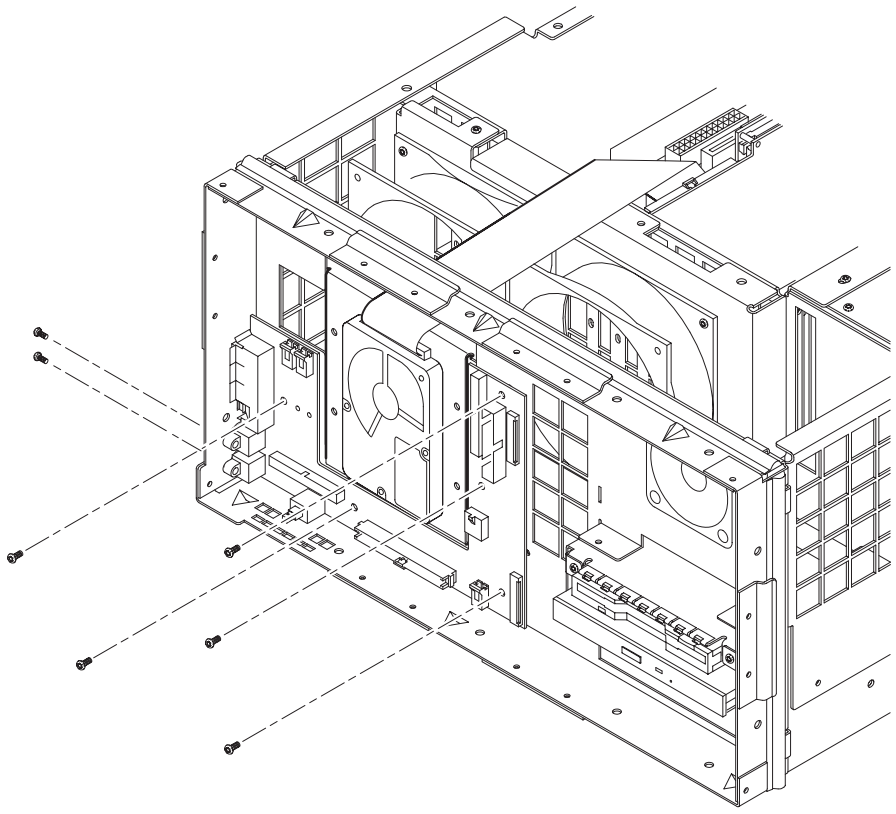


Figure 6–22: Screw locations for the interface circuit board

3. Attach the interface board to chassis with five T15 screws through the front of the board and two metric screws at the side connectors. Torque the T15 screws to 8 in-lbs. Torque the metric screws to 2 in-lbs.
4. Route both fan wire harnesses through slot in chassis as shown in Figure 6–23.
5. Plug the left side fan wire harness into the interface board J410 (left FAN) connector as shown in Figure 6–23.
6. Plug the right side fan wire harness into the interface board J420 (right FAN) connector as shown in Figure 6–23.
7. Route the speaker wire harness through the top/right chassis ventilation hole as shown in Figure 6–23.

8. Plug speaker wire harness into interface board J980 connector as shown in Figure 6–23.

9. Connect the disk drive flexible circuit board to the interface board disk drive connector.

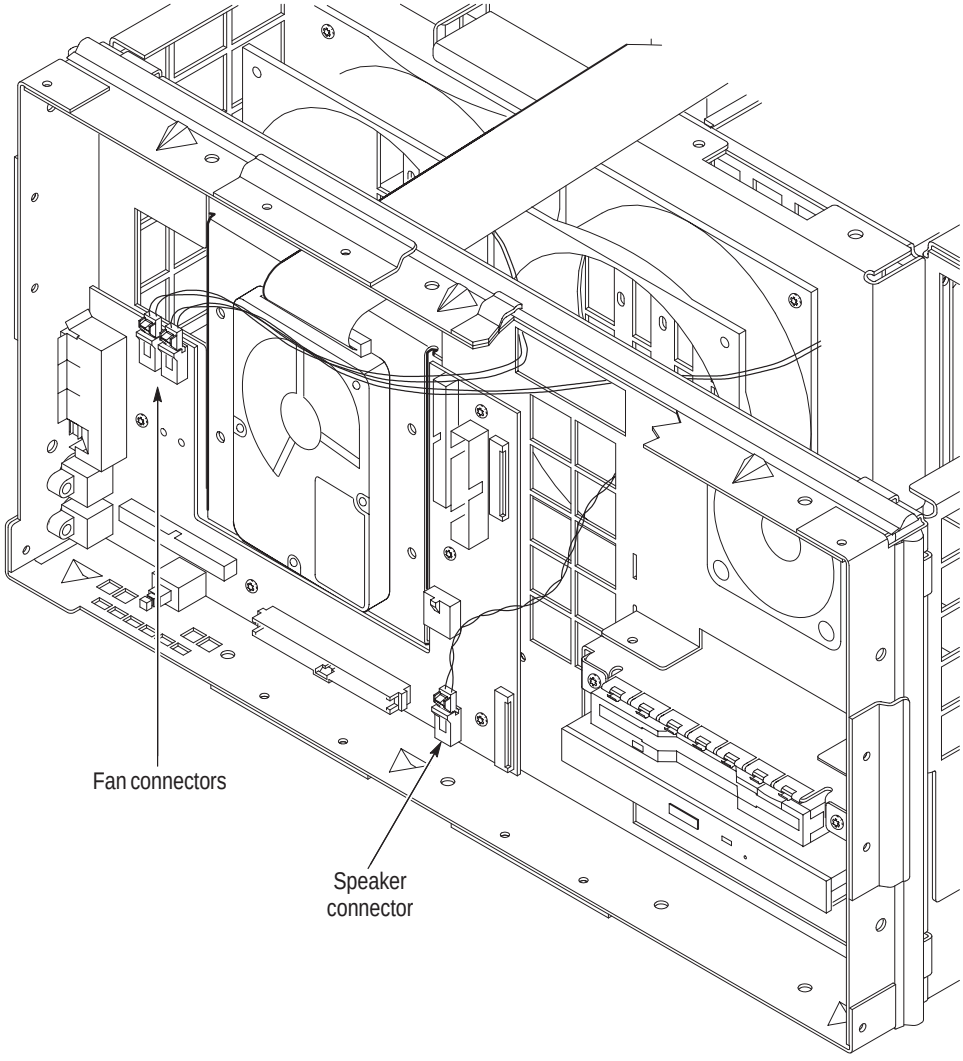


Figure 6–23: Cut-away view showing wire routing of fan and speaker wires

10. Connect the ribbon cable connector from the controller to the interface board controller connector.

11. Connect the ribbon cable connector from the key pad assembly to the interface board.

12. Reinstall the flat panel display module.

Backplane Circuit Board Removal and Replacement

To remove the backplane, the power supply and all of the plug in circuit boards must first be removed.

Remove the Backplane. With the cabinet off the chassis, use the following procedure to remove the backplane:

1. Remove the power supply module (see *Power Supply Removal and Replacement* on page 6–29).
2. Remove all the plug in modules from the card cage (see the RFA300 module removal instructions starting with *Removing the Acquisition Module* on page 6–12).
3. Remove the 15 screws holding the backplane board assembly to the chassis with a T15 screw tip screwdriver (see Figure 6–24 for the screw locations).
4. Lift the back plane board assembly out of the chassis.

Reinstall the Backplane. Use the following procedure to reinstall the backplane circuit board into the platform card cage.

1. Place the backplane board assembly into the mainframe chassis. See Figure 6–24 for orientation of back plane to chassis.
2. Attach backplane board assembly to the chassis with fifteen T15 screws. Torque the screws to 8 in-lbs.
3. Reinstall the PCI plug in modules using their reinstallation instructions (refer to *Reinstalling an RFA300 PCI Module* on page 6–18 and *Reinstall the Controller Board* on page 6–34).
4. Reinstall the power supply assembly using its reinstallation instructions (refer to *Power Supply Removal and Replacement* on page 6–29).
5. Reinstall the cover and bezel to complete the assembly (refer to *Removing the Front Panel Bezel* and *Removing the RFA300 Cabinet* on page 6–9).

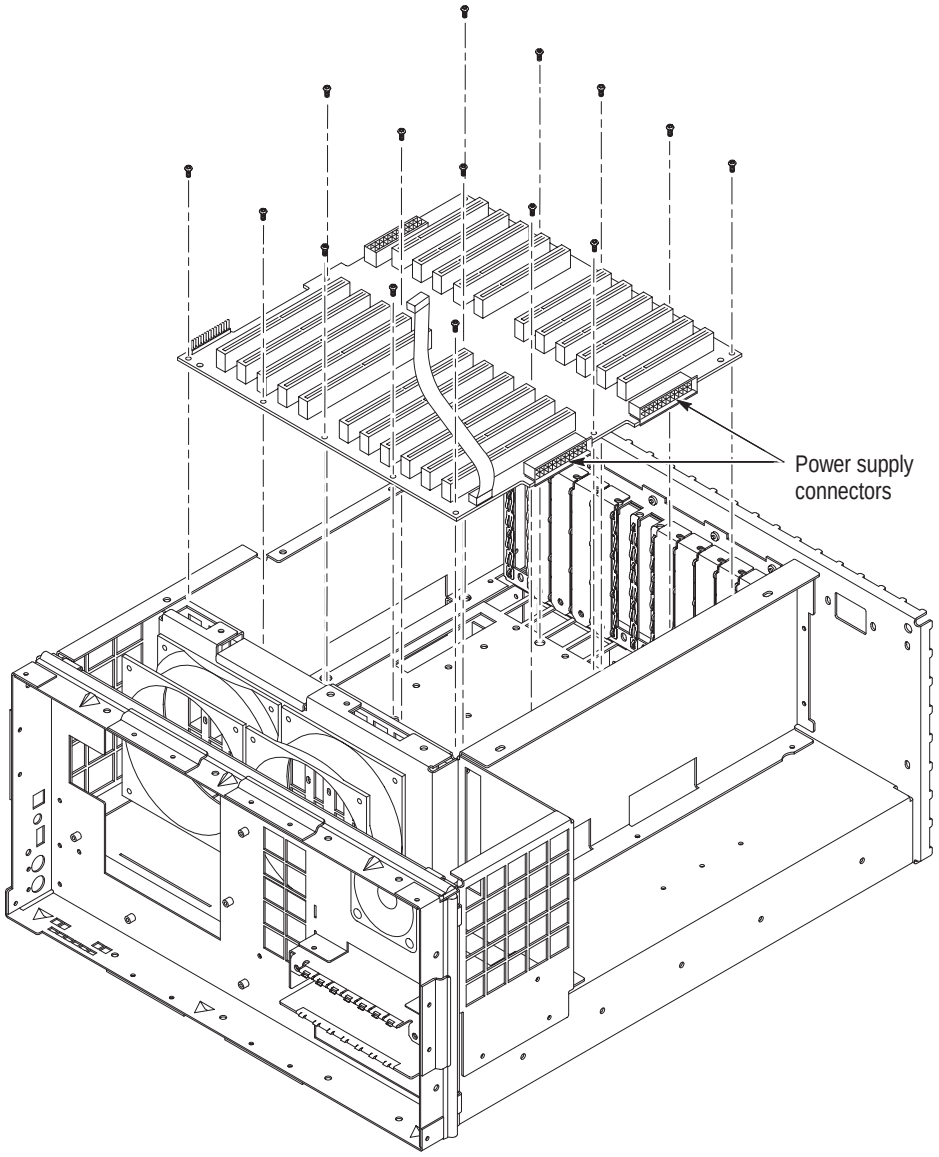


Figure 6–24: Backplane orientation and screw locations

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 RFA300 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 RFA300 measurement set.
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 RFA300 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 the 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 RFA300 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:\DRIV-ER\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 RFA300 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 RFA300 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.

RFA 300 Appearance

The following procedures set up the default screen appearance for the RFA300 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 removing the Knobtest icon 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 and store it with the other backup software for the instrument.

This concludes the software installation for the RFA300 measurement set.

Repacking for Shipment

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

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

The RFA300 Measurement Set 8VSB is shipped in cartons designed to provide it with the maximum protection. If you ship the instrument subsequently, you will need to use these cartons, the spacer pads, the protective bag, and the instrument support inserts to provide adequate protection.

***NOTE**. The RFA300 Measurement Set 8VSB shipping carton in good condition must be used to return the instrument to Tektronix service centers. We cannot honor the warranties if the* measurement set *is not shipped in its original carton or in a replacement carton and its supporting packaging material purchased from Tektronix. Contact your Tektronix representative to obtain new packaging.*

Obtaining Replacement Packaging

New packaging material is available from Tektronix. The part numbers are in Table 6–3 and in the *Replaceable Mechanical Parts List* in the service manual. Packaging components are shown in Figure 6–26. Each component has an index number, which also appears in Table 6–3. To obtain these items contact your nearest Tektronix office or representative.

Table 6–3: Packaging material

Item	Tektronix part number	Index number
Accessory tray	004-4851-00	
Accessory tray	004-4852-00	
Spacer pad (makes two pads for inner shipping box)	004-4925-00	
Protective bag	006-8164-00	
Top tray (cardboard insert)	004-4912-00	1
Instrument support inserts; top and bottom	004-4913-00	2
Inner shipping box	004-4926-00	3
Shipping box	004-4914-00	4

Repackaging Instructions

When the RFA300 is shipped, it is important to provide it with the maximum protection. Figure 6–26 shows how to repackage the measurement set for shipment. As the figure shows, it is not necessary to have the accessories received with the RFA300 in the package for reshipment to repair. If you are shipping to another site for reinstallation, the accessories are packed last in accessory trays at the top of the box.

The inner shipping box, pads, and protective bag provide the necessary protection to allow the shipping materials of the outer shipping box to correctly support the product for shipment. Pack the inner shipping box as follows:

1. If you have the original packaging material, start by placing one of the spacer pads in the bottom of the inner box. Position the side of the pad with the smaller, square holes against the side of the box as shown in Figure 6–25.

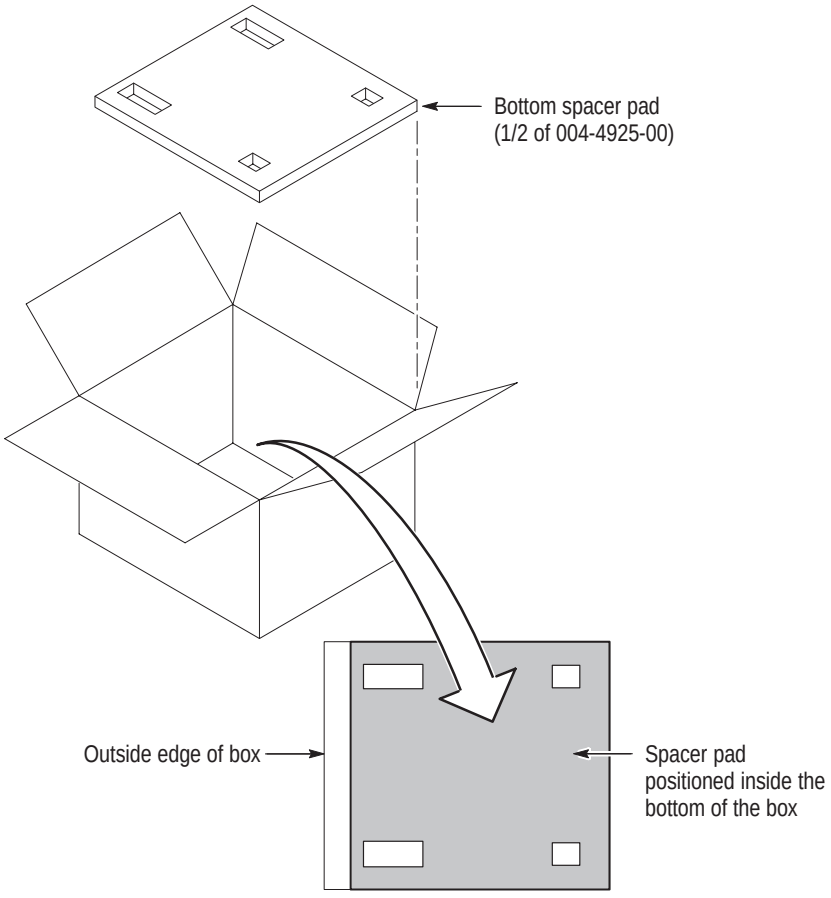


Figure 6–25: Placement of bottom spacer pad in inner shipping box

2. Remove the optional accessory pouch, if installed, and place the protective front cover on the front of the measurement set.
3. Place the RFA300 in the protective bag. The bag prevents dust, moisture, or other small packaging debris from entering the cabinet.
4. Fold the top of the bag neatly over the top of the RFA300 to make it as flat as possible and seal with packing tape.
5. Place the bagged RFA300 in the inner shipping box. The small feet on the bottom of the cabinet go in the square holes in the spacing pad and the larger feet near the front of the RFA300 go in the larger rectangular holes. The bezel end of the cabinet fits over the edge of the spacer pad.
6. Place the other spacer pad on top of the RFA300. Again, place the side with the small square holes against the side of the box. The protective front cover on the bezel of the RFA300 is not covered by the top spacer pad.
7. Close and tape the inner shipping box.
8. Place one of the support inserts in the bottom of the outer shipping box, film side up as shown in Figure 6–26.
9. Place the sealed inner shipping box in the center of the bottom support insert in the outer shipping box.

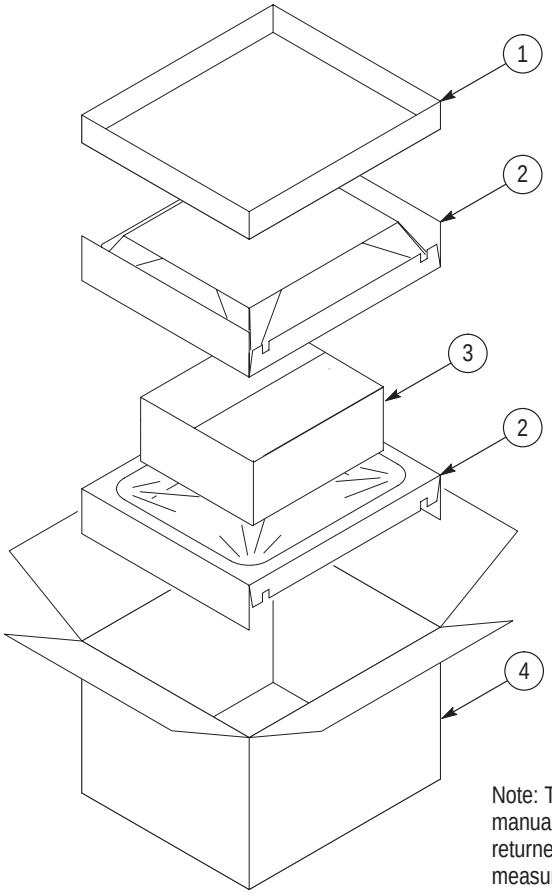


Figure 6–26: Repackaging the RFA300 measurement set

10. Put the second support insert over the inner shipping box, film side down.

NOTE. *If you are using new packing material purchased from Tektronix, pre-stretch the film in the support inserts by pushing down firmly several times on the top support insert.*

11. Place the top tray in the box. If you are not shipping accessories with the measurement set, close and tape the outer shipping box.

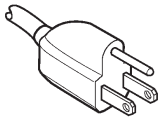
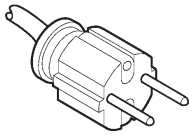
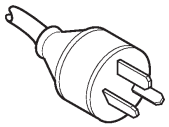
12. When shipping the accessories, place the two accessory trays in the top tray, arrange the accessories in the trays, and then close and tape the outer shipping box.

13. Attach the appropriate shipping documents needed to ship the measurement set to its destination (either to Tektronix for repair or to another location).

Options

The power cord options shown in Table 7–1 are available for the RFA300 Measurement Set 8VSB.

Table 7–1: Power cord options

Plug configuration	Normal usage	Option number
	North America 125 V/15A Plug NEMA 5-15P	Standard
	Europe 230 V	A1
	Australia 230 V	A3

Replaceable Electrical Parts

The replaceable electrical parts are the replaceable plugin modules and the circuit board assemblies. Those parts, along with the interconnection cables, replaceable hardware, and the accessories, are indexed in the mechanical parts exploded view illustrations. The part numbers are listed in the Replaceable Parts list in Section 10 of this manual.

Diagrams

This section provides two block diagrams of the RFA300 Measurement Set 8VSB circuit boards. Use the RFA300 module block diagram to aid in identifying the interaction between modules when troubleshooting. Use the exploded view diagrams in the *Replaceable Parts List* of Section 10 to locate the modules installed in the RFA300 Measurement Set 8VSB. Use the interconnection block diagram to determine cable connections when removing or replacing modules.

***NOTE**. If you remove a module, made a note of the cable routing within the measurement set to aid in reinstalling the module and any interconnection cables that you remove.*

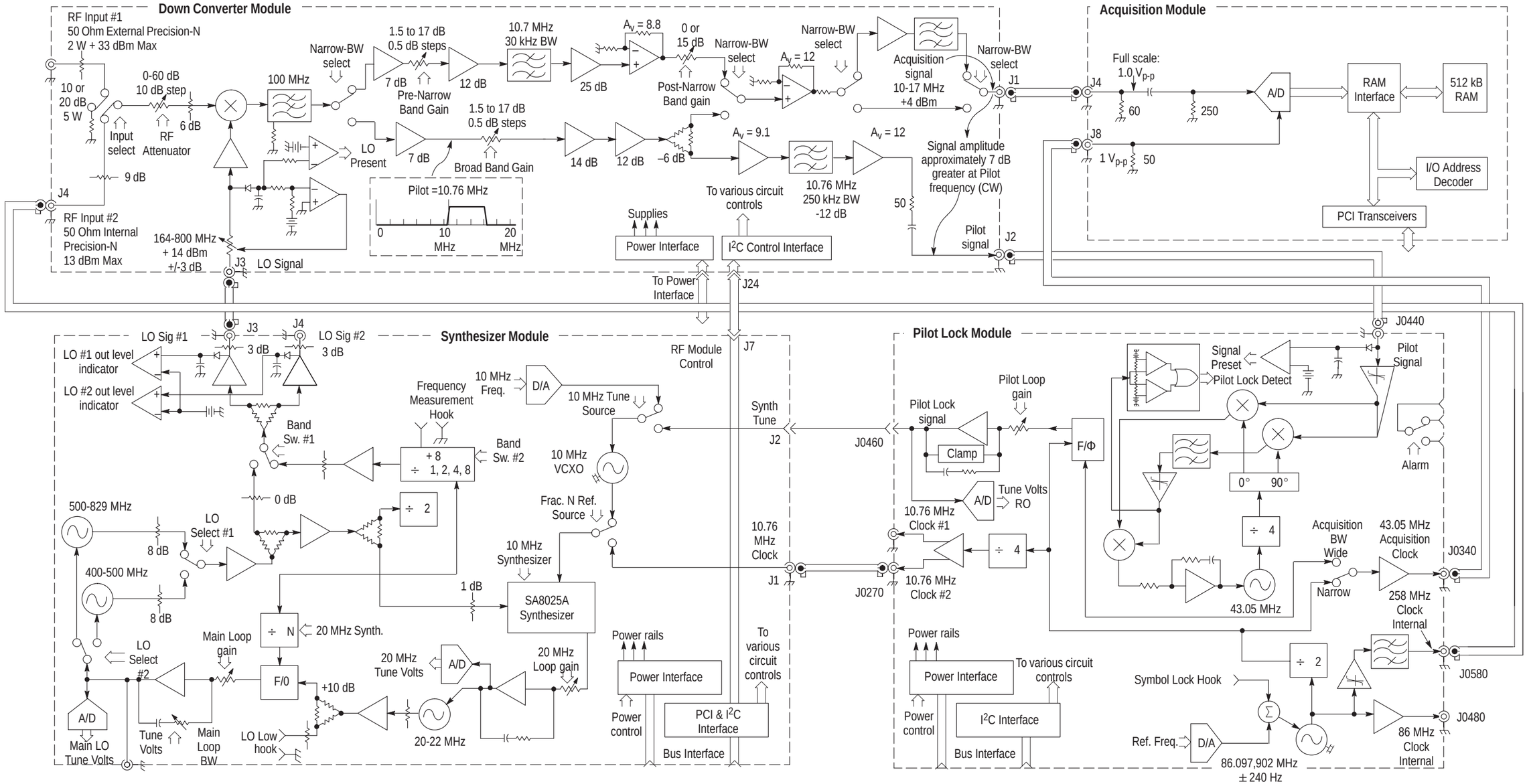


Figure 9–1: RFA300 Measurement Set 8VSB block diagram

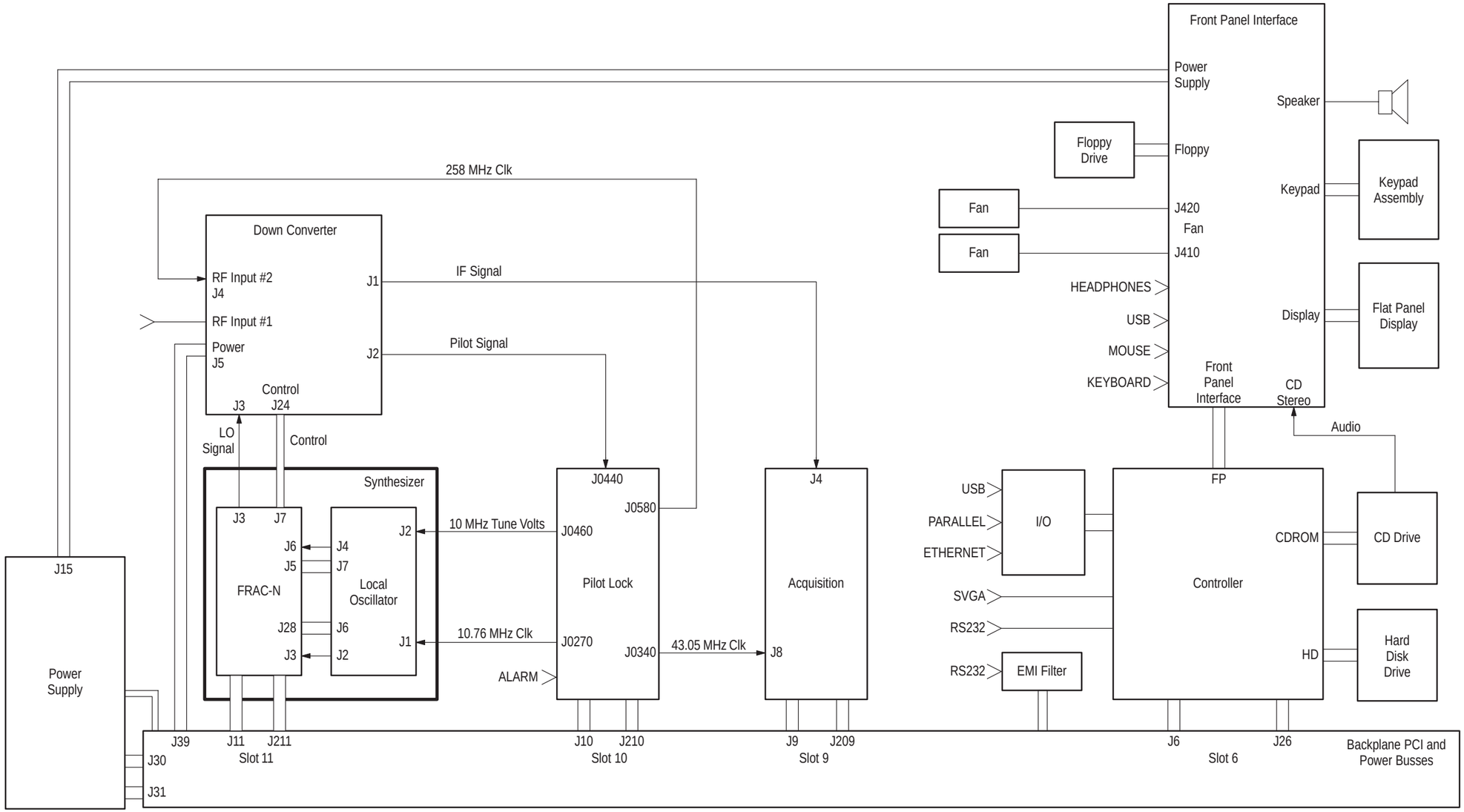


Figure 9–2: Interconnection block diagram

Replaceable Parts

This section contains a list of the replaceable modules for the RFA300 Measurement Set 8VSB. Use this list to identify and order replacement parts.

Parts Ordering Information

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

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

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

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

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

Module Servicing

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

Module Exchange

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

Module Repair and Return

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

New Modules

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

Using the Replaceable Parts List

This section contains a list of the mechanical and/or electrical components that are replaceable for theRFA300 Measurement Set 8VSB. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

Parts List Column Descriptions

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

Abbreviations

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

Mfr. Code to Manufacturer Cross Index

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

Manufacturers cross index

Mfr. code	Manufacturer	Address	City, state, zip code
00779	AMP INC.	CUSTOMER SERVICE DEPT PO BOX 3608	HARRISBURG, PA 17105-3608
049S6	FUJITSU COMPUTER PRODUCTS OF AMERICA INC	2904 ORCHARD PARKWAY	SAN JOSE, CA 95134-2009
05791	LYN-TRON INC	SOUTH 6001 THOMAS MALLEN RD	SPOKANE, WA 99204
060D9	UNITREK CORPORATION	3000 COLUMBIA HOUSE BLVD, SUITE 120	VANCOUVER, WA 98661
06915	RICHCO	5825 N TRIPP AVE P.O. BOX 804238	CHICAGO, IL 60646
0ADN8	DELTA PRODUCTS CORP-DPZ	4405 CUSHING PARKWAY	FREMONT, CA 94538
0D1M6	NMB TECHNOLOGIES INC	9730 INDEPENDENCE AVE	CHATSWORTH, CA 91311
0JR05	TRIQUEST PRECISION PLASTICS	3000 COLUMBIA HOUSE BLVD PO BOX 66008	VANCOUVER, WA 98666-6008

Manufacturers cross index (cont.)

Mfr. code	Manufacturer	Address	City, state, zip code
0KAW4	SEAGATE PERIPHERALS INC.	3081 ZANKER ROAD	SAN JOSE, CA 95134-2128
0KB01	STAUFFER SUPPLY CO	810 SE SHERMAN	PORTLAND, OR 97214-4657
0KB05	NORTH STAR NAMEPLATE INC	5750 NE MOORE COURT	HILLSBORO, OR 97124-6474
0L0L7	RADISYS CORPORATION	5445 NE DAWSON CREEK DRIVE	HILLSBORO, OR 97124
0LUA3	PHILIPS COMPONENTS	100 PROVIDENCE PIKE	SLATERSVILLE, RI 02876
0ZZ84	INSIGHT ELECTRONICS	12002 115TH AVE NE	KIRKLAND, WA 98034
12136	PHC INDUSTRIES INC	1643 HADDON AVE PO BOX 1448	CAMDEN, NJ 08103
2W733	BELDEN WIRE & CABLE COMPANY	2200 US HWY 27 SOUTH PO BOX 1980	RICHMOND, IN 47374
3M099	PORTLAND SCREW COMPANY	6520 N BASIN AVE	PORTLAND, OR 97217
46628	LOGITECH INC	6505 KAISER DR	FREMONT, CA 94555
50356	TEAC AMERICA INC	7733 TELEGRAPH RD PO BOX 750	MONTEBELLO, CA 90640-6537
52152	3M COMPANY	INDUSTRIAL TAPE DIVISION 3M CENTER	ST PAUL, MN 55144-1000
61058	MATSUSHITA ELECTRIC CORP OF AMERICA	PANASONIC INDUSTRIAL CO DIV TWO PANASONIC WAY	SECAUCUS, NJ 07094
61162	JFW INDUSTRIES INC	5134 COMMERCE SQUARE DRIVE	INDIANAPOLIS, IN 46237–9738
6Y440	MICRON SEMICONDUCTOR PRODUCTS INC	8000 S FEDERAL WAY PO BOX 6	BOISE, ID 83707-0006
74594	COMPONENT RESOURCES INC	BUSSMAN PARTS C/O CASEY LAKEY 14525 SW WALKER ROAD	BEAVERTON, OR 97006
7X318	KASO PLASTICS INC	5720-C NE 121ST AVE, STE 110	VANCOUVER, WA 98682
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077-0001
93907	CAMCAR DIV OF TEXTRON INC	ATTN: ALICIA SANFORD 516 18TH AVE	ROCKFORD, IL 611045181
TK1869	ALPS	100 N CNTRE AVE	ROCKVILLE CENTRE, NY 11570
TK1935	ACCRA-FAB INC	11007 NE 37TH CIRCLE	VANCOUVER, WA 98682
TK1943	NEILSEN MANUFACTURING INC	3501 PORTLAND RD NE	SALEM, OR 97303
TK2250	ARROW ELECTRONICS INC.	9500 SW NIMBUS AVE, BLDG E	BEAVERTON, OR 97008–7163
TK2376	CONDUCTIVE RUBBER TECH	22125 17TH AVE SE, SUITE 117	BOTHELL, WA 98021
TK2411	TEKTRONIX HONG KONG	8/F MAPPIN HOUSE 98 TEXACO RD	TSUEN WAN, N. T., HONG KONG CN
TK2383	PANASONIC INDUSTRIAL CO	1600 MCCANDLESS DR	MILPITAS, CA 95035
TK2480	WILLAMETTE PLASTIC	1111 NW 5TH PLACE	CANBY, OR 97013

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–1							
1	343–1604–00			1	RETAINER: CIRCUIT BOARD, 0.050 AL.	TK1943	343–1604–00
2	211–0408–00			8	SCR, ASSEM WSHR: 4–40 X 0.250, PNH, STL, ZINC, T–10 TORX DR, SEMS	0KB01	211–0408–00
3	156–7816–00			2	IC, MEMORY:CMOS, DRAM, 4M X 32 DRAM, 16MEG DRAM, MT8LDT432HG–6X, DIMM 72 (PART ON CONTROLLER CIRCUIT BD)	6Y440	MT8LDT432HG–6X
4	407–4652–00			1	BRACKET:ANGLE, LEFT, SST, 3066	TK0191	407–4652–00
5	407–4571–00			1	BRACKET: 0.044 THK, PCI BOARD(PILOT LOCK), C1010/1020 CRS, ZI PLT	TK1943	407–4571–00
6	407–4526–00			2	BRACKET: 0.044 CRS, ZINC PLATE, 3.760 X 0.850	TK1943	407–4526–00
7	211–0722–00			80	SCREW, MACHINE: 6–32 X 0.250, PNH, STL, CDPL, T–15 TORX DRIVE	0KB01	ORDER BY DESCRIPTION
8	119–5832–00			1	LINE FILTER: GEN PURPOSE, 6A, 50/60 HZ, 115/260 VAC, IEC CONNECTOR, 06GENG3E, SNAP IN,	0ADN8	06GENG3E
9	650–3760–00			1	PWR SUPPLY ASSY	80009	650–3760–00
10	039–0041–00		B010171	1	CONTROLLER: PICMG PCI SINGLE BOARD COMPUTER WITH PENTIUM PROCESSOR, PFS–070	0L0L7	PFS–070
	039–0041–01	B010172		1	CONTROLLER: PICMG PCI SINGLE BOARD COMPUTER WITH PENTIUM PROCESSOR, PFS–070	0L0L7	PFS–070
11	672–1505–00			1	CIRCUIT BD ASSY: DIGITIZER, 039–0000–00	80009	672–1505–00
12	672–1507–00			1	CIRCUIT BD ASSY: MODULE, PILOT	80009	672–1507–00
13	672–0397–50			1	CIRCUIT BD ASSY: SYNTHESIZER MODULE, 672–0397–00 TESTED	80009	672–0397–50

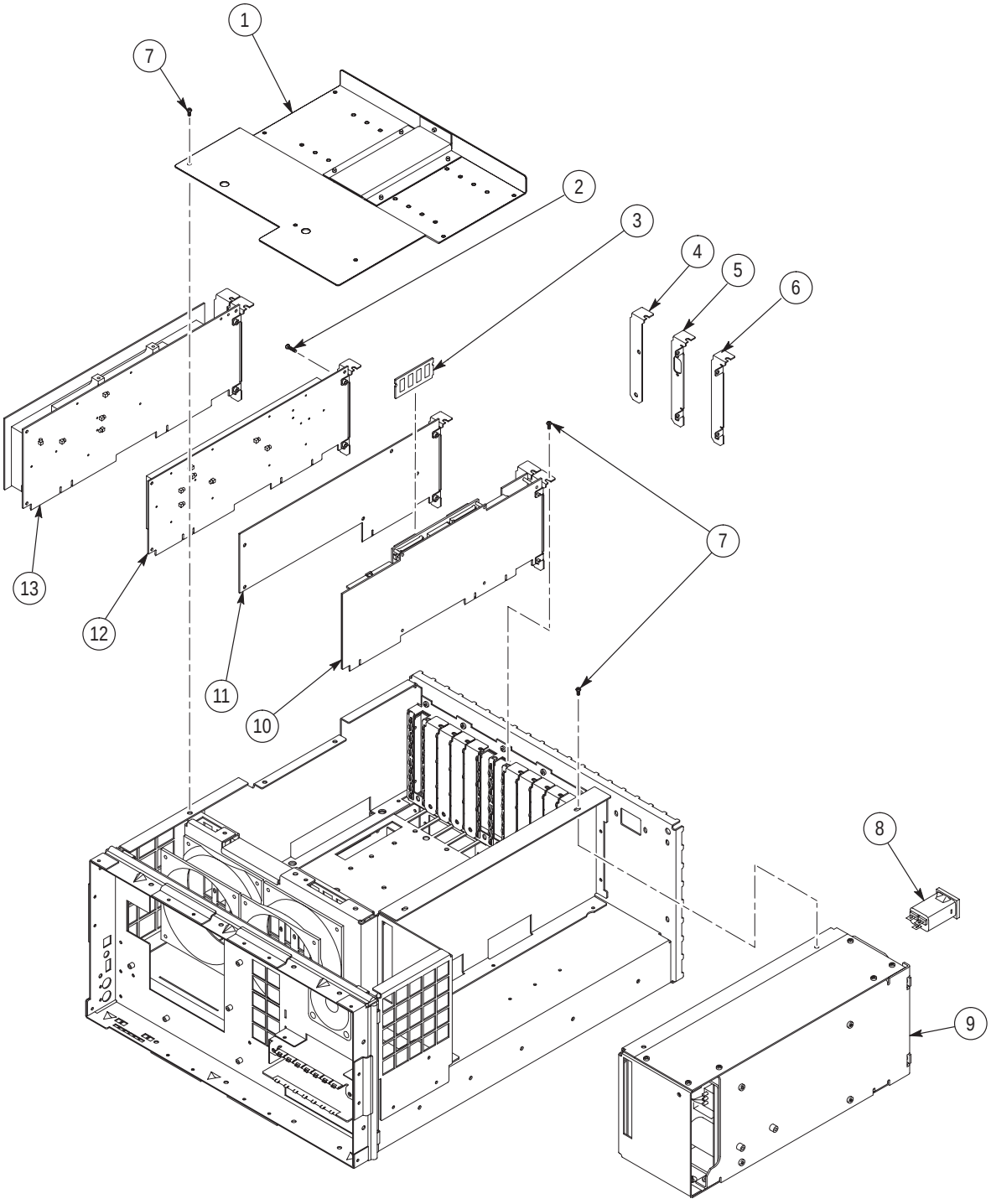


Figure 10–1: Replaceable PCI modules

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–2							
1	211–0722–00			80	SCREW, MACHINE: 6–32 X 0.250, PNH, STL, CDPL, T–15 TORX DR	0KB01	ORDER BY DESCRIPTION
2	671–4123–00			1	CIRCUIT BD ASSY: BACKPLANE BD, 679–4123–00 TESTED, 389–2405–00 WIRED	80009	671–4123–00
3	131–0890–01			2	CONN, HARDWARE:DSUB, JACK SCREW, 4–40 X 0.312 L HEX HD, STL CD PL, W/2 FLAT WASHERS, 1 LOCK WASHERS	0KB01	131–0890–00
4	211–0721–00			2	SCREW, MACHINE:6–32 X 0.375, PNH, STL, CDPL, T–15 TORX DR	0KB01	ORDER BY DESCRIPTION
5	343–0775–00			1	CABLE, CLAMP:RIBBON, 1.0 X 1.0, GRAY, POLYVINYL, W/URETHANE FOAM TAPE BACKING, RETAINS 6 RIBBON C	52152	80610029243/3484–1000
6	671–4544–00			1	CIRCUIT BD ASSY: RS32 EMI FILTER, 679–4544–00 TESTED, 389–2684–00 WIRED	80009	671–4544–00
7	650–3829–00			1	DRIVE, SUBASSY: DISK, FLOPPY/CD	80009	650–3829–00
	650–4061–00			1	DRIVE, SUBASSY: DISK, FLOPPY/CD	80009	650–4061–00
8	211–0840–00			4	SCREW, MACHINE: M2.6 X 0.45MM PITCH X 4.0MM L, PHILIPS, PNH (FOR FLOPPY DISK DRIVE)	0KB01	.26C4MXPHY
9	672–1506–00		B0101094	1	CIRCUIT BD ASSY: MODULE, DOWN CONVERTER, 671–4234–00	80009	672–1506–00
	672–1506–01	B0101094		1	CIRCUIT BD ASSY: MODULE, DOWN CONVERTER, 671–4234–01	80009	672–1506–01
10	211–0950–00			4	SCREW, MACHINE: M2X3MM, PHL, PNH, STL NI PL (FOR CD OPTICAL DRIVE)	0KB01	0310248–0
11	407–4512–00			1	BRACKET ASSY: DRIVES MOUNTING, 0.040 ALUMINUM, ALLOY 5052 H34, SPOTWELDED ASSY, SAFETY CON	TK1943	407–4512–00
	407–4721–01			1	BRACKET ASSY: DRIVES MOUNTING, 0.040 ALUMINUM, ALLOY 5052 H34, SPOTWELDED ASSY, SAFETY CON	TK1943	407–4721–01
12	671–4377–00			1	CIRCUIT BD ASSY:CD ROM INTERFACE, 679–4377–00 TESTED, 389–2561–00 WIRED, STAGECOACH	80009	671–4377–00
13	348–1432–00			1	FOOT, RUBBER:6.5MM W X 43.50MM L, 2MM THK, RUBBER, BLACK, INSTRUMENT SUPPORT APPARATUS, P5200	TK2411	348–1432–00
14	119–5728–00			1	DISK DRIVE: OPTICAL, 644MB, CD–ROM, 16.7 MB/SEC, IDE/ATAPI, CD–224E–903	50356	CD–224E–903
15	119–5677–00			1	DISK DRIVE: FLOPPY, 3.5 INCH, 1.44MB, BLACK, 0.5 INCH HIGH, DSDD, FD–04HF–2300	50356	FD–04HF–2300
	119–5677–01			1	DISK DRIVE: FLOPPY, 3.5 INCH; 1.44MB, GRAY , 0.5 INCH HIGH, DSDD, 101.6 X 110 X 12.7MM; FD–04HF–2300 DISK	50356	FD–04HF–2300
	119–6106–00			1	DISK DRIVE: FLOPPY, 3.5INCH, 1.44 MB, 0.5 IN HIGH, BLACK BEZEL, DDDS, 96 X 126 X 12.7MM, FD–05HF563	TK2250	FD–05HF5630
16	614–0943–00		B010167	1	KEYPAD ASSY	80009	614–0943–00
	614–0943–01	B010168		1	KEYPAD ASSY	80009	614–0943–01
	614–0943–02			1	KEYPAD ASSY	80009	614–0943–02
	334–9592–01			1	MARKER, IDENT, OVERLAY		

Replaceable parts list (cont.)

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
17	344–0790–00			1	KNOB		
18	200–4384–01			1	BEZEL: PC ABS, 9 X 17 X 1.50	TK1935	200–4384–01
19	334–9582–00			1	MARKER, IDENT: LABEL, POWER BUTTON, 2.000 X 0.735	0KB05	334–9582–00
20	352–1068–00			2	LENS, LIGHT: CLEAR, ACRYLIC, LIGHT PIPE, 1.729 X 0.140	7X318	352–1068–00
21	366–0791–00			1	KEYCAP: POWER, 0.2X0.4X1.326, POLYCARBONATE	7X318	366–0791–00
22	650–3761–00			1	DISPLAY ASSY	80009	650–3761–00
23	119–5683–00	B010100	B010149	1	DISK DRIVE: WINCHESTER, 2.5 IN, 1.4GB 0.5 INCH, 12MS, IDE, ST91420AG	0KAW4	ST–91420AG
	119–6061–00	B010150	B010199	1	DISK DRIVE: WINCHESTER, 2.5 IN, 2.1GB, 9.5 MM, IDE, MHF2021AT	049S6	MHF2021AT
	119–6232–00			1	DISK DRIVE: WINCHESTER, 2.5 IN, 3.2GB, 9.5 MM, 13MS SEEK TIME IDE, 4200 RPM, MOBILE, MHF2032AT	049S6	MHF2032AT
	119–6232–60				DISK DRIVE PROGRAMMED RFA300: WINCHESTER, 2.5 IN; 3.2GB, 12.5 MM HIGH, IDE; MHD2032AT	80009	119–6232–60
24	407–4515–01				BRACKET:HARD DRIVE MTG,0.050THK,AL,ALLOY 5052 H32	TK1943	407–4515–01
25	211–0910–00			4	SCREW, MACHINE:M3 X 0.5 X 4MM, PNH, STL ZI PLT, PHL	74594	210–0910–00
26	343–1636–00			1	CLAMP, COVER:FLT CABLE ROUTING CLAMP, 343–1627–00 BASE	06915	FCRC–21C
27	343–1627–00			1	CABLE, CLAMP: 0.5H X 2.98L, 0.625 W, NYLON 6–6, ADHESIVE, COVER 343–1636–00	06915	FCRCS–21B–4
28	211–0895–00			2	SCREW, MACH:M2.6 X 0.45 X 8MM, PHILLIPS, PNH, ZINC YELLOW	0KB01	211–0895–00
29	671–4126–01			1	CIRCUIT BD ASSY: INTERFACE PCB, 679–4126–01 TESTED, 389–2408–00 WIRED	80009	671–4126–01
30	119–5695–00			2	FAN, DC: TUBEAXIAL, 12 V, 3.24W, 2300 RPM, 83 CFM, 119MM X 38MM, 35 DBA, W/2 PIN CONNECTOR,	TK1943	NMB 4715KL–04W–B10–P00

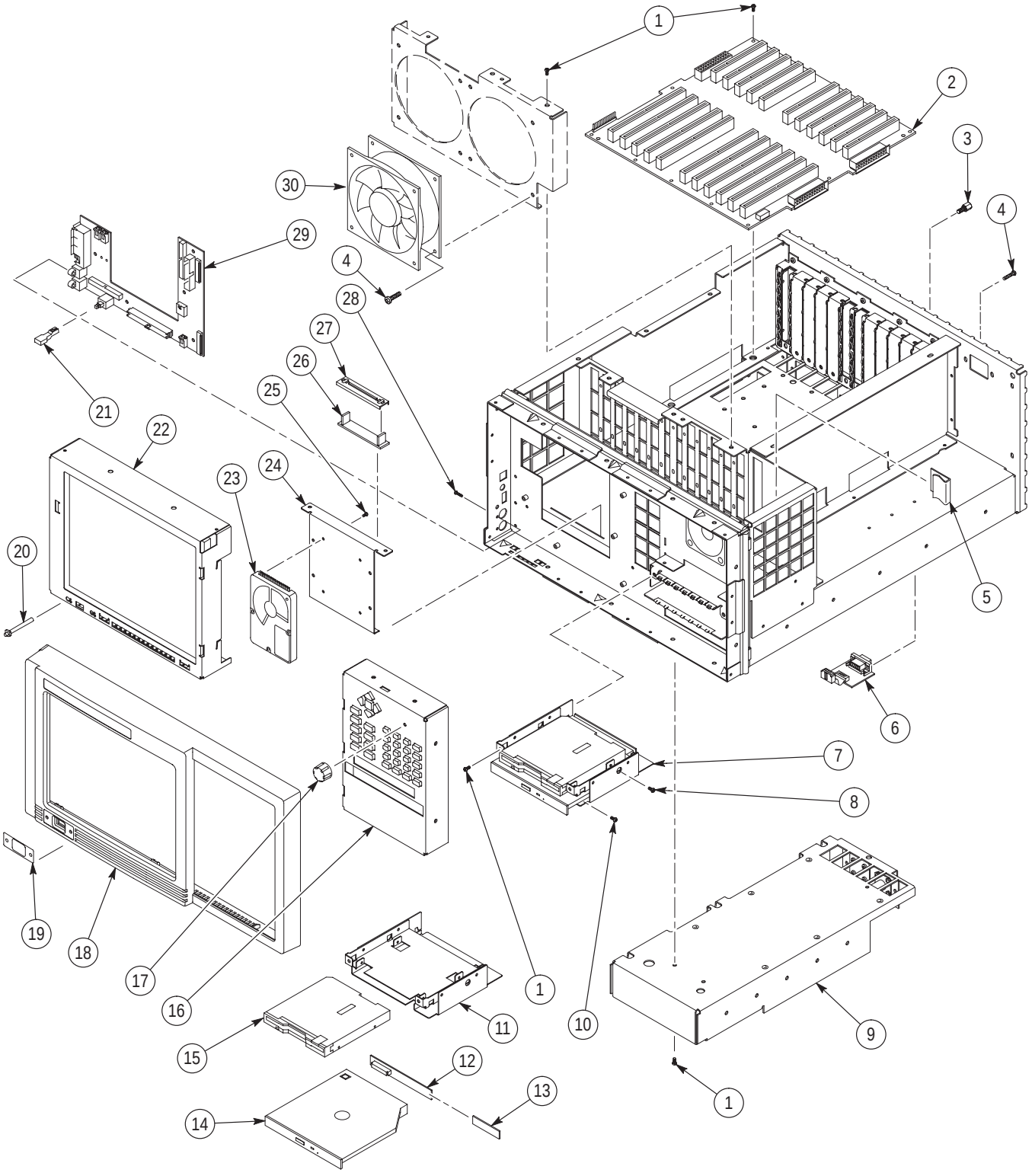


Figure 10–2: Mainframe parts

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–3							
1	174–3785–00			1	CA ASSY, SP, ELEC: RIBBON, CD DRIVE, IDC, 44, 12.0 L, (RCPT, FEMALE, STR, 2 X 22, 0.079 CTR (2MM), 30 GOLD)	060D9	174–3785–00
2	174–3886–00			1	CA ASSY: SP, RIBBON, IDC, 34, 28 AWG, 1.125 L, 3M 33665/34 CABLE, (2 X 17, FEMALE, RTANG, 0.100 CT	060D9	174–3886–00
3	174–3899–00			2	CA, ASSY, SP: ELECTRIC, CPD, 4, 26 AWG, 14.0 L, (BOX, FEMALE, 1 X 4, STR, LATCHING, AMP 103958–3) BOTH ENDS	060D9	174–3899–00
4	174–3873–00			1	CA ASSY: RF, COAXIAL, RFD, 1, 50 OHM, RG316, 10.0 L, (SMA PLUG, RTANG) X (MMCX, PLUG, STR)	060D9	174–3873–00
5	174–3872–00			1	CA, ASSY: RF, COAXIAL, RFD, 50OHM, RG316, 20.0 L, (MMCX PLUG, STR) X (SMA PLUG, RTANG)	060D9	174–3872–00
6	174–3865–00			3	CA ASSY: RF, RFD, 1, RG174, 50 OHMS, 14.0 L, MMCX STR TO MMCX STR	060D9	174–3865–00
7	174–3864–00			1	CA ASSY: RF, RFD, 1, RG174, 50 OHM, 10.0 L, MMCX STR TO MMCX STR	060D9	174–3864–00
8	174–3795–00			1	CABLE ASSY, SP: SPEAKER, CPD, 30–26AWG, 10.0 L, 1X2, 0.1 CTR, RCPT, FEMALE, LATCHING, PLZ, MTE, AMP 103961	060D9	174–3795–00
9	174–3786–00			1	CA ASSY, SP, ELEC: HIGH DENSITY, FLOPPY DRIVE, ZIF, 26, 0.039 CTR, TIN PLATED END FOR ZIF–LINE CONNECTOR	060D9	174–3786–00
	174–3786–01			1	CA ASSY, SP, ELEC: HIGH DENSITY, FLOPPY DRIVE, ZIF, 26, 0.039 CTR, TIN PLATED END FOR ZIF–LINE CONNECTOR	060D9	174–3786–01
10	174–3875–00			1	CA ASSY: SP, DISCRETE, CPD, 8, 11.0 L, (2 X X12, FEMALE, 0.165CTR, STR, MINI–FIT JR) X (1 X 8, FEM	060D9	174–3875–00
11	174–3784–00			1	CA ASSY, SP, ELEC: HIGH DENSITY, PROCESSOR, HDI, 100, 18.0 L, CONN, RCPT BOTH ENDS, FEMALE, STR, 1 X 100, 0.	060D9	174–3784–00
12	174–3814–00			1	CA ASSY, SP, ELEC: RIBBON, IDC, 4, 26–30 AWG, 15.0 L, (FEMALE, STR, 2 X 2, 0.079 CTR (2MM), BERG 69307–004)	060D9	174–3814–00
13	174–3789–00			1	CA ASSY, SP, ELEC: RIBBON, FRT PNL POWER, IDC, 30, 28AWG, PVC, 3 FOLDS (2.25 L, 8.5 L, 5.5L, 2.5L), (RCPT, F	060D9	174–3789–00
14	174–3787–00			2	CA ASSY, SP, ELEC: RIBBON, DISPLAY ADAPTOR BOARD, FLX, 50, 28AWG, 6.5 L, (RCPT, 2 X 50, FEMALE, STR, 0.079 C	060D9	174–3787–00
15	174–3887–00			1	CABLE ASSY: SP, RIBBON, IDC, 14, 28 AWG, 1.125 L, 3M 33665/14 CABLE, (2 X 14, FEMALE, RTANG, 0.100 CT	060D9	174–3887–00
16	174–3967–00			3	CA ASSY: RF, COAX, RFD, 1, 50 OHM, RD 316, 7.4 L, (MMCX, PLUG, STR) X (MMCX, JACK, STR),	060D9	174–3967–00
17	174–3863–00			2	CA ASSY: RF, RFD, 1, RG174, 50 OHM, 6.00 L, MMCX STR TO MMCX STR	060D9	174–3863–00
18	174–3788–00			1	CA ASSY, SP, ELEC: RIBBON, EIDE DRIVE, FLX, 44, (RCPT, FEMALE, RTANG, 2 X 22, 0.079 CTR (2MM), 30 GOLD) BO	060D9	174–3788–00
	174–4228–01				CA ASSY:IDE TO HARDDRIVE FROM PIO,2MM,2 X 22,2.0 INCHES	060D9	174–4228–01

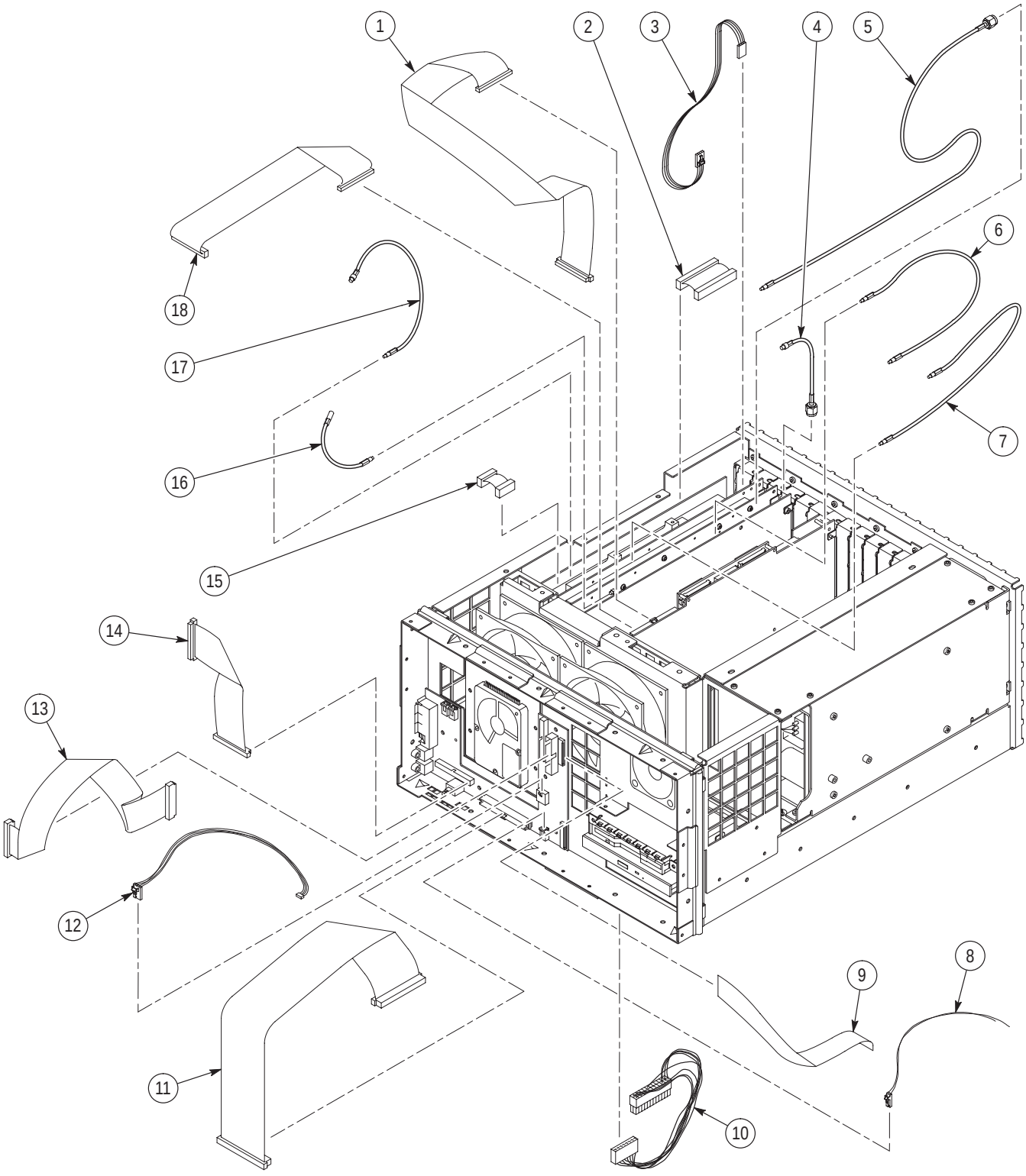


Figure 10–3: Cables

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10–4							
1	200–4408–00			1	COVER: PROTECTIVE, 0.125 ABS, BLACK, HAIRCELL TEXTURED GSE, W/ADHESIVE FOAM	TK2480	200–4408–00
2	348–1154–01			4	FOOT, CABINET:POLYCARBONATE, LEXAN940, EARTH BROWN	80009	348–1154–01
3	211–0738–00			4	SCREW, MACHINE:6–32 X 0.625, PNH, STL BLK ZI, TORX	93907	ORDER BY DESCRIPTION
4	367–0477–00			1	HANDLE, CARRYING: DUAL DUROMETER MOLDED HANDLE, POLYPROPYLENE HANDLE VINYL GRIP SECTION,	12136	PT 3170
5	212–0213–00			2	SCREW, MACHINE: 8–32 X 0.75 L, PNH, STL, BLACK OXIDE PL, TORX	0KB01	212–0213–00
6	161–0230–01			1	CABLE, POWER, STANDARD IEC		
7	390–1176–00			1	CABINET, WRAPARO: WITH HANDLE AND MTG FEET, 0.050 ALUMINUM, SAFETY CONTROLLED	TK1943	390–1176–00
					STANDARD ACCESSORIES		
	119–4330–02			1	POINTER ASSY: MOUSE, 400 DPI MOUSE, LOGITECH, SAD35–6MD,	46628	SAD35–6MD
	119–5662–00			1	KEYBOARD:104 WINDOWS, RT5156TW	0D1M6	122761–001
	119–6328–00	B0101094		1	ATTENUATOR,FXD:10DB,N FEMALE TO N MALE (PROVIDED WITH INSTRUMENTS WITH THE 10 DB INTERNAL ATTENUATOR)	61162	50–FP–010–H6N
	063–3053–01			1	SOFTWARE PKG:CD ROM, RFA300 APPLICATION	TK2548	063–3053–01
	063–2506–00			1	SOFTWARE PKG:QUALITY ASSURANCE ADVANCED DIAGNOSTICS, QA PLUS, VER 7.01, WHEN INSTALLED VER 7.1	60128	QA PLUS.WIN OEM VER 7.01
	063–2776–00			1	SOFTWARE PKG:MICROSOFT WINDOWS 95, OEM, VER 4.00.950B.ORSII, 2 CD ROM, MANUAL & 3.5 INCH DISK	60128	000–39801
	063–3185–00			1	SOFTWARE PKG:WIN95 STARTUP BOOT DISK,RFA SERIES	80009	063–3185–00
	071–0198–03	B0101094		1	MANUAL, TECH:USER, W/CD ROM, 063–3053–00, RFA300 MEASUREMENT SET 8VSB	TK2548	071–0198–03
					OPTIONAL ACCESSORIES		
	016–1441–00				POUCH, PLASTIC:PLASTIC POUCH, TLA704	TK2582	TK1441 BLACK CORDURA
	161–0104–00				CA ASSY, PWR:3, 18 AWG, 98 L, 250V/10AMP, 98 INCH, RTANG, IEC320, RCPT X STR, NEMA 15–5P, W/CORD GRIP	S3109	ORDER BY DESCRIPTION
	161–0104–06				CA ASSY,PWR:3,1.0MM SQ,250V/10A,2.5 METER,RTANG,IEC320,RCPT,EUROPEAN,	TK1373	ORDER BY DESCRIPTION
	016–1691–01				RACKMOUNT KIT: W/075–0372–00 INSTRUCTION SHEET, COMMON PLATFORM	80009	016–1691–01
	071–0199–01	B0101094			MANUAL, TECH: SERVICE, RFA300 MEASUREMENT SET 8VSB	TK2548	071–0199–01

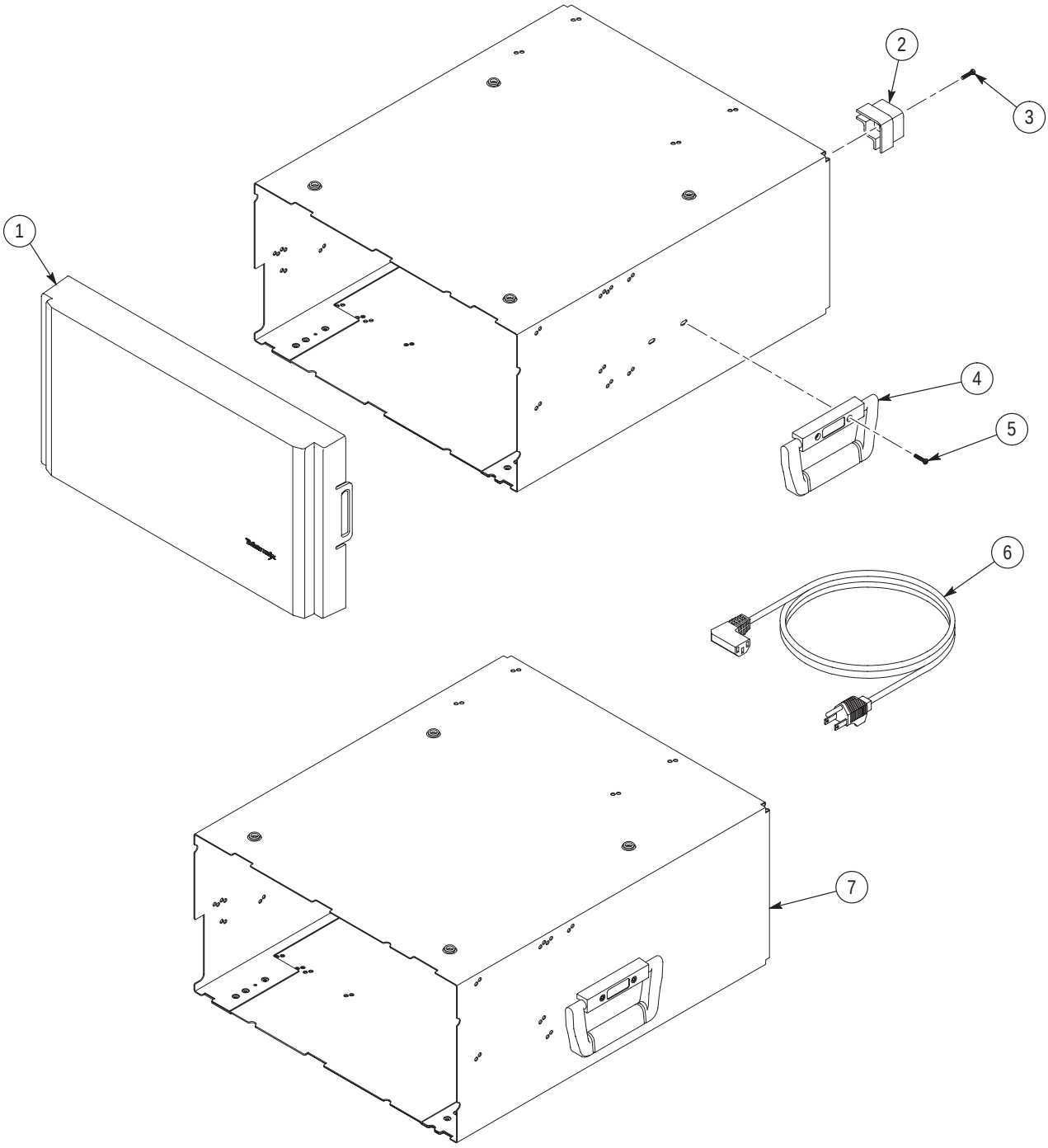


Figure 10–4: Cabinet parts and accessories