User Manual

Tektronix

2792
Spectrum Analyzer

070-8631-02

Please check for change information at the rear of this manual.

First Printing: January 1994

Instrument Serial Numbers

Each instrument manufactured by Tektronix has a serial number on a panel insert or tag, or stamped on the chassis. The first letter in the serial number designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

B010000	Tektronix, Inc., Beaverton, Oregon, USA
E200000	Tektronix United Kingdom, Ltd., London
J300000	Sony/Tektronix, Japan
H700000	Tektronix Holland, NV, Heerenveen, The Netherlands

Instruments manufactured for Tektronix by external vendors outside the United States are assigned a two digit alpha code to identify the country of manufacture (e.g., JP for Japan, HK for Hong Kong, IL for Israel, etc.).

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

Printed in U.S.A.

WARRANTY

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such 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; or c) 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 WITH RESPECT TO THIS PRODUCT IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED 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.

Preface

This manual provides you with the information necessary to operate the Tektronix 2792 Portable Spectrum Analyzer.

This manual is divided into sections and appendixes.

- *Section 1, Getting Started*, includes a general product description.
- *Section 2, Operating Basics*, includes information on instrument unpacking, storage, descriptions to familiarize you with the front and rear panels, and a general operational check. Also included in Section 2 are the menu operation, the dedicated function keys, data entry, marker control and operation, and a description of all front-panel keys and menus.
- *Section 3, Reference*, includes general operating information and examples.
- The Appendixes include the instrument options and accessories, an alphabetical listing of all instrument menus, and the electrical specifications.

The following manuals are also available for the 2792 Spectrum Analyzer.

- 2790 Series Programmer Manual includes all GPIB commands, queries, and responses for the instrument family. Applicable syntax diagrams and a functional command listing are also included.
- 2792 Service Volume 1 includes the performance check procedure, adjustment procedure, maintenance information, theory of operation, the replaceable electrical and mechanical parts lists, and the exploded views.
- 2792 Service Volume 2 includes the schematic diagrams, circuit board illustrations, and component lookup tables.

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General Safety Summary

This general safety information is for operating and servicing personnel. Specific warnings and cautions may also be found throughout this manual where they apply.

Symbols and Terms

These two terms appear in manuals:

- CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.
- WARNING statements identify conditions or practices that could result in personal injury or loss of life.

These two terms appear on equipment:

- *CAUTION* indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.
- *DANGER* indicates a personal injury hazard immediately accessible as one reads the marking.

These symbols appear in manuals:

This symbol indicates where applicable cautionary or other information is to be found.

Static-Sensitive Devices

These symbols appear on equipment:

DANGER
High Voltage

Protective ground (earth) terminal

ATTENTION
Refer to manual

Refer to manual

Specific Precautions

Observe all of these precautions to ensure your personal safety and to prevent damage to either the spectrum analyzer or equipment connected to it.

Grounding the Spectrum Analyzer

This product is intended to operate from a power source that does not apply more than 250 V_{RMS} between the supply conductors or between either supply conductor and ground.

WARNING: This product is grounded through the grounding conductor of the power cord. To avoid electric shock, plug the power cord into a properly wired receptacle. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation. (IEC Safety Class I).

Power Disconnect

The main power disconnect is by means of the power cord, or, if provided, an AC power switch.

Use the Proper Power Cord

Use only the power cord and connector specified for your product. Use only a power cord that is in good condition. CSA Certification includes the equipment and power cords appropriate for use in the North America power network. All other power cords supplied are approved for the country of use.

Use the Proper Fuse

To avoid fire hazard, use only a fuse of correct type, voltage rating, and current rating.

Use the Proper Voltage Setting

Make sure the line selector is in the proper position for the power source being used.

Remove Loose Objects

During disassembly or installation procedures, screws or other small objects may fall to the bottom of the mainframe. To avoid shorting out the power supply, do not power-up the instrument until such objects have been removed.

Provide Proper Ventilation

Always allow at least 5.08 cm (2 in.) clearance adjacent to the ventilation holes at the sides, bottom, and back of the 2792.

Prevent Damage During Setup

The 2792 can be damaged by incorrect AC supply voltages, RF inputs that exceed the maximum ratings, operation in very high temperatures or without adequate ventilation, immersion in liquids, and physical abuse.

Do Not Operate Without Covers

To avoid personal injury or damage to the product, do not operate this product with covers or panels removed. To avoid the possibility of overheating, do not operate the 2792 in a carrying case.

Remove From Operation

If you have reason to believe that the instrument has suffered a component failure, do not operate the instrument until the cause of the failure has been determined and corrected.

Do Not Operate in Wet/Damp Conditions

Using the 2792 in wet/damp conditions or inclement weather may result in electric shock or damage to the instrument.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

German Postal Information

Certificate of the Manufacturer/Importer

We hereby certify that the 2792 and all factory-installed options complies with the RF Interference Suppression requirements of Postal Regulation Vfg. 243/1991, Amended per Vfg. 46/1992

The German Postal Service was notified that the equipment is being marketed.

The German Postal Service has the right to re-test the series and to verify that it complies.

TEKTRONIX

Bescheinigung des Herstellers/Importeurs

Hiermit wird bescheinigt, daß der/die/das 2792 und alle fabrikinstallierten Optionen in Übereinstimmung mit den Bestimmungen der Amtsblatt-Verfügung Vfg. 243/1991 und Zusatzverfügung 46/1992 funkentstört sind.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhalten der Bestimmungen eingeräumt.

TEKTRONIX

NOTICE to the user/operator:

The German Postal Service requires that Systems assembled by the operator/user of this instrument must also comply with Postal Regulation, Vfg. 243/1991, Par. 2, Sect. 1.

HINWEIS für den Benutzer/Betreiber:

Die vom Betreiber zusammengestellte Anlage, innerhalb derer dieses Gerät eingesetzt wird, muß ebenfalls den Voraussetzungen nach Par. 2, Ziff. 1 der Vfg. 243/1991, genügen.

NOTICE to the user/operator:

The German Postal Service requires that this equipment, when used in a test setup, may only be operated if the requirements of Postal Regulation, Vfg. 243/1991, Par. 2, Sect. 1.8.1 are complied with.

HINWEIS für den Benutzer/Betreiber:

Dieses Gerät darf in Meßaufbauten nur betrieben werden, wenn die Voraussetzungen des Par. 2, Ziff. 1. 8.1 der Vfg. 243/1991 eingehalten werden.

General Information

Product Description

The Tektronix 2792 Spectrum Analyzer is a high-performance instrument with an internal coaxial frequency range of 10 kHz to 21 GHz, and up to 27 GHz with Tektronix external waveguide mixers when Option 04 is installed. The minimum resolution bandwidth is 1 kHz, and provides measurement resolution proportional to the frequency accuracy or span. The minimum span is 2 kHz. In addition to conventional digital storage features, non-volatile memory (NVRAM) stores up to 9 separate waveforms with their readouts and markers. You can recall these waveforms later for additional analysis and comparison. Also, you can store up to 10 different front-panel control setups for future recall. The 2792 can selectively count one particular signal out of several that may be present at its input.

The single and delta markers provide direct readout of frequency and amplitude information of any point along any displayed trace. Or, you can get the relative (delta) frequency and amplitude information between any two points along any displayed trace or between traces. The additional major performance features of your instrument include:

- synthesizer frequency accuracy
- remote operation over GPIB
- precision signal counting
- single and delta marker modes
- precise amplitude measurement
- digital storage and real time display
- 1 kHz to 3 MHz resolution bandwidth
- user-defined macros
- multiband sweep
- front-panel keypad for data entry
- strong front end
- full screen plot
- menu-driven user interface
- instrument settings and waveforms stored in non-volatile memory (NVRAM)
- dedicated function keys for commonly performed tasks

Accessories

The following lists include all the standard accessories currently shipped with each spectrum analyzer and all available optional accessories.

Standard Accessories (contact your Tektronix sales representative for Tektronix Part Numbers and ordering information)

Cable; 50 Ω, BNC to BNC, 45.72 cm (18 inches)
Cable; 50 Ω, N to N, 182.88 cm (6 feet)
Cable; 75 Ω, BNC to BNC, 106.68 cm (42 inches) (part of Option 07 only)
Cable; SMA to SMA (part of Option 04 only)
Adapter; N Male to BNC Female
Adapter Connector; BNC Male to F Female (part of Option 07 only)
Fuse; 4A fast-blow[a], 2 each
Power cord[a]
Clamp; Power Cord
Shield; Rear Connector
Diplexer Assembly (part of Option 04 only)
    Adapter; TNC to SMA
    Cable; Semi-rigid
Waveguide Mixer; WM4780K (part of Option 04 only)
User Manual
Programmer Manual

a For Options A1, A2, A3, A4, and A5 the power cord is replaced with an appropriate power cord, and the fuses are replaced with 2A slow blow.

Optional Accessories (contact your Tektronix sales representative for Tektronix Part Numbers and ordering information)

Service Kit
    includes
        1 Extender; Front Panel
        1 Extender; Power Module
        1 Extender; Accessories Interface
        1 Cable; Ribbon
        3 Cables; Coaxial, SMB Male to SMB Female
        1 Handle; VR Module
        1 Kit; Circuit Board Extender
            includes
                1 Extender Board; Left
                2 Extender Boards; Right
                1 Extender Board; Right GPIB
                1 Frame (extrusion for circuit board extender)
                6 Screws; Pan-head (with flat and lock washers)
Diplexer Assembly; (standard with Option 04 only)
    includes
        1 Adapter; TNC to SMA
        1 Cable; Semi-rigid
CRT Visor
DC Blocking Capacitor; Type N Connector
Power Splitter (for Option 07)

GPIB Cable
Transit Case; Hard
Transit Case; Soft
Service Manual; Volume 1
Service Manual; Volume 2

Although not required for spectrum analyzer operation, Tektronix offers additional accessory products for use with spectrum analyzers, such as tracking generators. Tektronix also prepares software packages that add to the instrument use. The packages contain many applications and utility routines covering swept-frequency measurements, waveform storage and recall, signal analysis, and remote site monitoring. The routines can be performed by non-technical operators as well as technical and experienced spectrum analyzer users. For additional information and ordering, contact your local Tektronix sales office or representative.

Options

The following list includes all options currently available for the spectrum analyzer. *Appendix A, Options* of this Manual contains additional information on all of the options.

Options A1, A2, A3, A4, and A5—Power Cord Options
Option B1—Service Manual
Option B2—Two Complete Manual Sets
Options M7 and M9—Extended Service and Warranty Options
Option 03 — EXT REF Input
Option 04 — External Mixer Coverage to 325 GHz (not available with Option 07)
Option 07 — 75 Ω Input
Option 30—Cradlemount for 19-inch Rackmounting
Option 39—Silver Battery
Option 41—Digital Microwave Radio
Option 42—110 MHz IF Output

Installation

Incoming Inspection

The 2792 was inspected both mechanically and electrically before shipment. It should be free of mechanical damage and meet or exceed all electrical specifications. *Appendix C, Specification*, lists the 2792 performance requirements. A detailed electrical performance verification procedure in the ***2792 Service Manual, Volume 1*** provides a check of all these specified performance requirements. If the 2792 does not meet operational check requirements, contact your local Tektronix Field Office or representative.

A *Functional Check* procedure located later in this section tests the basic performance of this 2792. When completing this procedure, you will become more familiar with the instrument controls and features.

Storage and Repackaging

Long-term and Short-term Storage

Short Term (less than 90 days)—For short-term storage, store the instrument in an environment that meets the non-operating Environmental Specifications in *Appendix C, Specification* of this Manual.

Long Term—For instrument storage of more than 90 days, use the original shipping container to repackage the instrument. Package the instrument in a vapor bag with a drying material and store in a location that meets the non-operating Environmental Specifications in *Appendix C, Specification* of this manual. If you have any questions about storing procedures, contact the Tektronix Factory Service Center in Beaverton, Oregon. (Your local Tektronix Service Center or representative can help you with this contact.)

Repackaging for Shipment

If the 2792 is to be shipped to a Tektronix Service Center for service or repair, attach a tag to the instrument that shows the following information:

- the owner and address
- the name of the individual at your location who can be contacted
- the instrument serial number (located on the instrument rear panel)
- a description of the service required

If the original shipping container is unfit for use or not available, use the following repackaging procedure and the example of Figure 1-1, or contact your local Tektronix Service Center or representative for assistance.

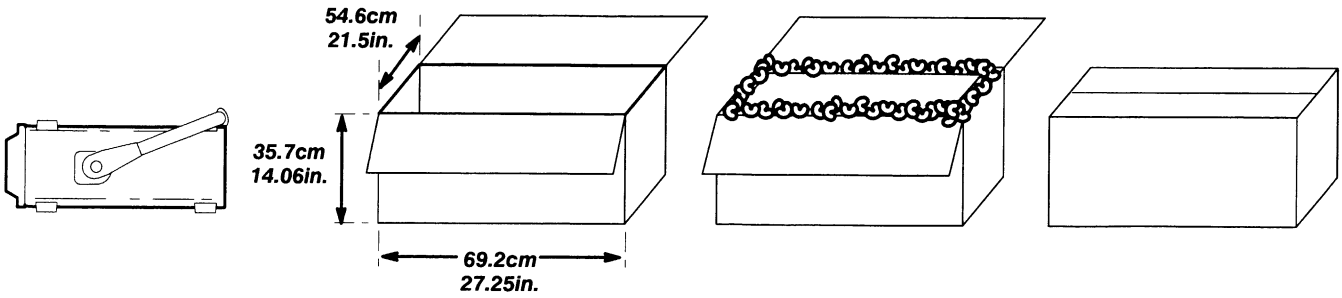


Figure 1-1: Repackaging the Spectrum Analyzer

1. Use a container of corrugated cardboard with a test strength of 375 pounds (170 kilograms) and inside dimensions that are at least six inches (15 centimeters) more than the equipment dimensions (listed in Physical Characteristics in *Appendix C, Specification*), to allow for cushioning.
2. Install the instrument front and rear cover, and surround the instrument with plastic sheeting to protect the finish.
3. Cushion the instrument on all sides with packing material or plastic foam.
4. Seal the container with shipping tape or an industrial, heavy-duty stapler.

Transit Case

We recommend using a high-impact, ruggedized transit case if your 2792 is to be frequently shipped between sites. A hard transit case that meets these requirements and has space to hold most of the standard accessories is available as an optional accessory from Tektronix. Contact your local Tektronix Field Office or representative for ordering information.

Instrument Installation

Air Flow Requirement

A minimum clearance of 7.6 cm (3 inches) at the rear of the 2792 is needed for proper ventilation.

The 2792 may be operated in any position that allows air flow in the bottom and out the rear of the instrument. Feet on the four corners allow enough clearance even if the 2792 is stacked with other instruments. The air is drawn in by a fan through the bottom and is released out the back. Avoid locating the instrument where paper, plastic, or any other material might block the air flow. Three inches (7.62 centimeters) of clearance is required at the rear of the instrument.

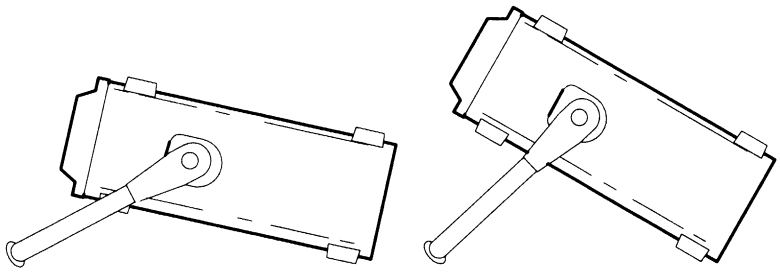
CAUTION

Special air-flow considerations are required if the 2792 Spectrum Analyzer *is part of a rackmount configuration. Do not allow the temperature at the air intake on the bottom of the 2792 to exceed the maximum instrument operating temperature of 55°C. Overheating can cause long-term reliability and safety problems. Excessive overheating will result in the thermal fuse opening. If the thermal fuse opens, the 2792 will cease to operate, and the instrument will require servicing. Refer any heating or cooling questions to qualified service personnel.*

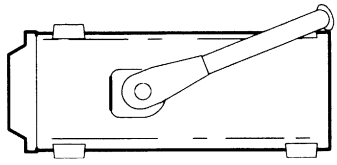
Handle

You can position the 2792 handle at several angles to serve as a tilt stand (see Figure 1-2A). To stack instruments, position the handle at the top rear of the instrument; refer to Figure 1-2B.

To change the handle position, press in at both pivot points and rotate the handle to the desired position.



A



B

Figure 1-2: Handle Positions

Cabinet

WARNING

It can be hazardous to remove or replace the cabinet on the 2792. Serious electrical shock can result from improper handling. Only qualified service personnel should attempt to remove or replace the 2792 cabinet.

Front Cover and Accessories Pouch

The front cover provides a dust-tight and water-tight seal, and a convenient place to store accessories and external waveguide mixers. Use the cover to protect the 2792 front panel during storage or transportation. To remove the cover, stand the 2792 on the two back feet so the name on the handle is facing up and towards you, and pull slightly out and up on the sides of the cover. The accessories pouch is attached to the inside of the cover. To open the accessories pouch, pull up evenly on the flap.

Rack Installation

A field-installation kit is available to permit the 2792 to be rack mounted in a standard 48.3 cm (19 inches) wide rack on a non-tilting slide-out track. We recommend fan-forced ventilation of the rack enclosure. If the rack adapter assembly is installed in an enclosed rack, a minimum depth of 63.5 cm (25 inches) behind the front panel is recommended for proper air circulation.

The rack adapter kit contains the slide-out tracks and all necessary mounting hardware. Contact your Tektronix Field Office or representative for additional information and ordering instructions.

Connecting Power

Power Source and Requirements

WARNING

Changing the input power requirements can be hazardous. To avoid serious injury from electrical shock, be sure to remove the power cord from the power source before removing the fuse.

Follow the safety requirements below whenever working with instrument power.

- Work safely.
- Know the intended power source.
- Set the instrument for the power source.
- Check the fuse for proper ratings.
- Use the power cord and plug intended for the power source.

Operate the 2792 from either 115 VAC or 230 VAC nominal line voltage with a range of 90 to 132 or 180 to 250 VAC, at 47 to 63 Hz. Power and voltage requirements are printed on a rear-panel plate mounted below the power input jack.

Changing Input Power Requirements

The ***2792 Service Manual, Volume 1***, contains a procedure for changing the input power requirements.

WARNING

To avoid electrical shock, only qualified service personnel should attempt to change the input power requirements.

International power cord and plug configurations are shown in *Appendix A, Options* in this manual.

Changing the Fuse

The 2792 uses a 4 A fast-blow fuse for 115 VAC operation, and a 2 A slow-blow fuse for 230 VAC operation.

WARNING

To avoid electrical shock, remove the power cord from the power receptacle before removing the fuse.

1. Disconnect the power cord from the rear receptacle on the 2792.
2. Insert a flat blade screw driver into the slot on the fuse holder (see Figure 1-3), push in, and twist.
3. Remove the fuse holder and replace the line fuse with the appropriate fuse for the voltage range selected.

4. Install the fuse and fuse holder as follows:

- Insert the fuse and fuse holder into the rear panel mount.
- Insert a flat blade screw driver into the slot on the fuse holder, push in, and twist.

You are now ready to operate the 2792.

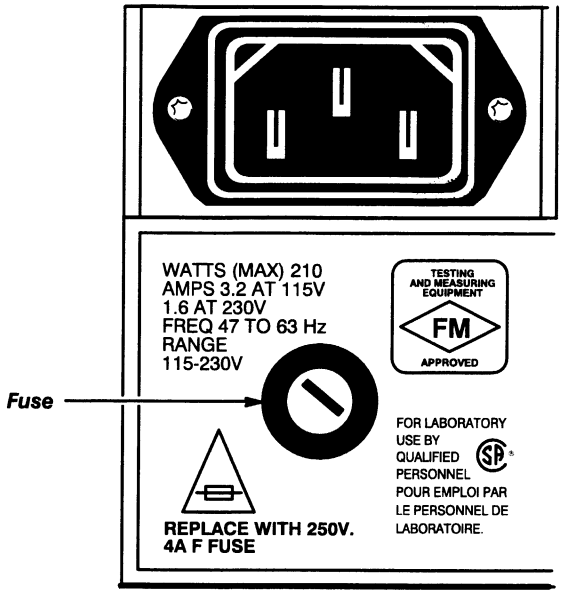


Figure 1-3: Location of Fuse

Quick Check Out

This section contains overviews of the 2792 front and rear panels, an initial turn on procedure, and a brief functional checkout procedure.

Front-panel Overview

Screen

The 2792 Spectrum Analyzer screen displays the main instrument operating parameters, up to three waveforms, the current menu (if selected), and the status of the **USER DEFINABLE** knob and **KEYPAD** (see Figure 1-4). Also displayed are the active function parameter readouts.

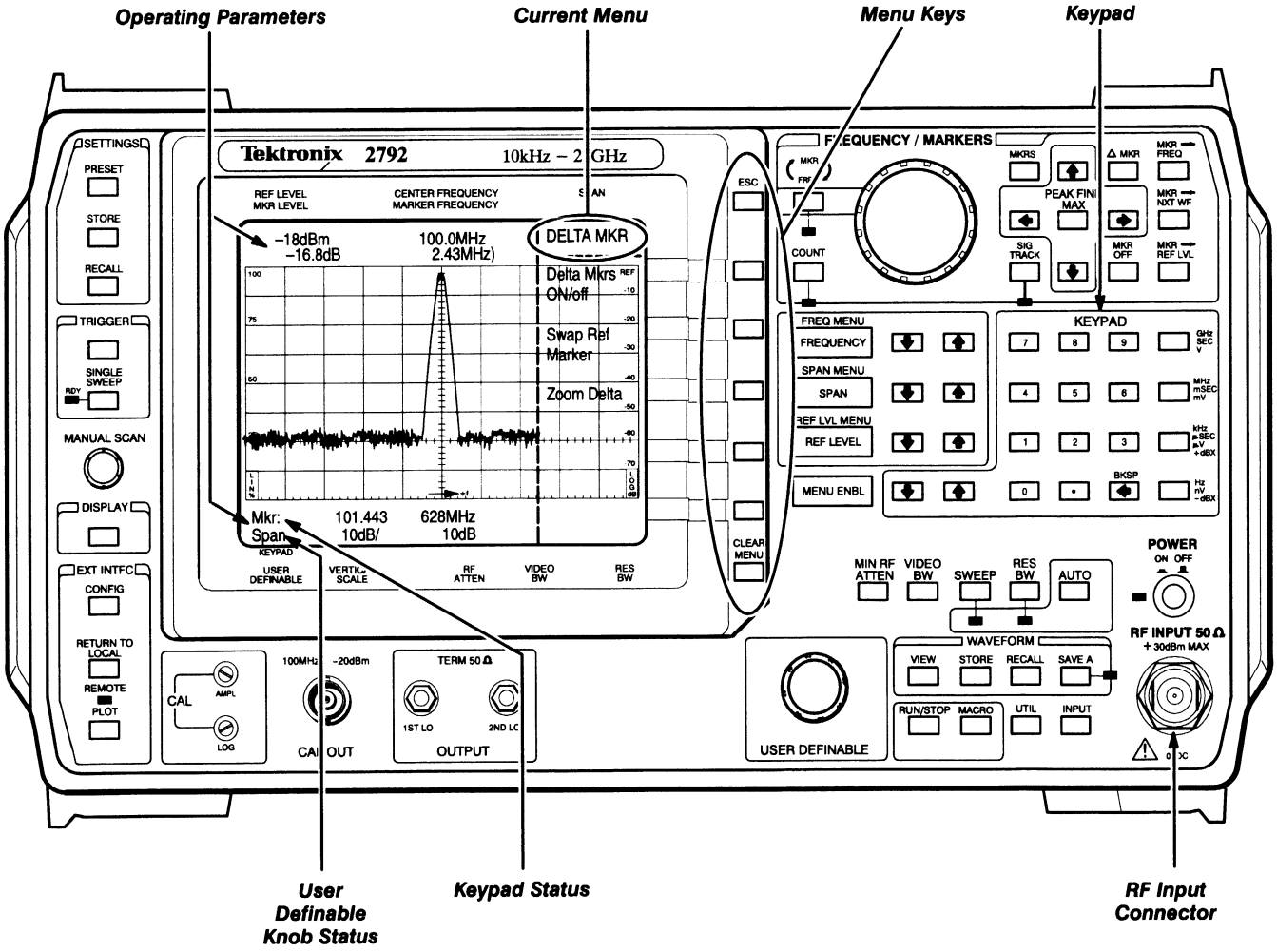


Figure 1-4: Spectrum Analyzer Screen Parameters

Keys

The 2792 front panel has the following keys:

- 27 dedicated function keys (light gray on instrument)
- 26 menu keys (dark gray on instrument)
- 18 **KEYPAD** keys

The light gray function keys execute functions each time they are pressed. These keys are dedicated to specific functions, regardless of the menu state. For example, the **SPAN** ↑ and ↓ keys control span steps even if the **RES BW** menu is displayed.

The dark gray menu keys select top level menus that list function choices and lower-level menus related to the key function. The keys to the right of the screen area on the CRT bezel choose a function or display additional lower-level menus. Pressing another menu key displays its function menu, replacing any other menu; however, when a lower-level menu is selected, the title from the top-level menu is kept so that the return path is still present. You press the **ESC** key to move up to the next higher menu level. You press the **CLEAR MENU** key to remove any menu from the screen.

You use the **KEYPAD** to enter and change instrument parameters when a menu key is pressed. The active **KEYPAD** parameter is displayed in the first line of readout below the graticule (see Figure 1-4).

The functions of the 2792 Spectrum Analyzer keys are discussed in detail in *Section 2, Operating Basics*.

Knobs

The 2792 Spectrum Analyzer has three front-panel knobs:

- The **FREQUENCY/MARKERS** knob is dedicated to frequency and marker control.
- The **USER DEFINABLE** knob is assignable to various instrument functions (such as sweep or minimum attenuation). The current knob assignment is shown in the second line of readout below the graticule area (see Figure 1-4).

CAUTION

Do not allow a high-intensity dot to remain stationary on the CRT. The CRT phosphor could be permanently damaged.

- The **MANUAL SCAN** knob allows you to manually sweep the CRT trace across the screen when its function is selected.

The functions of the 2792 Spectrum Analyzer knobs are discussed in more detail in *Section 2, Operating Basics*.

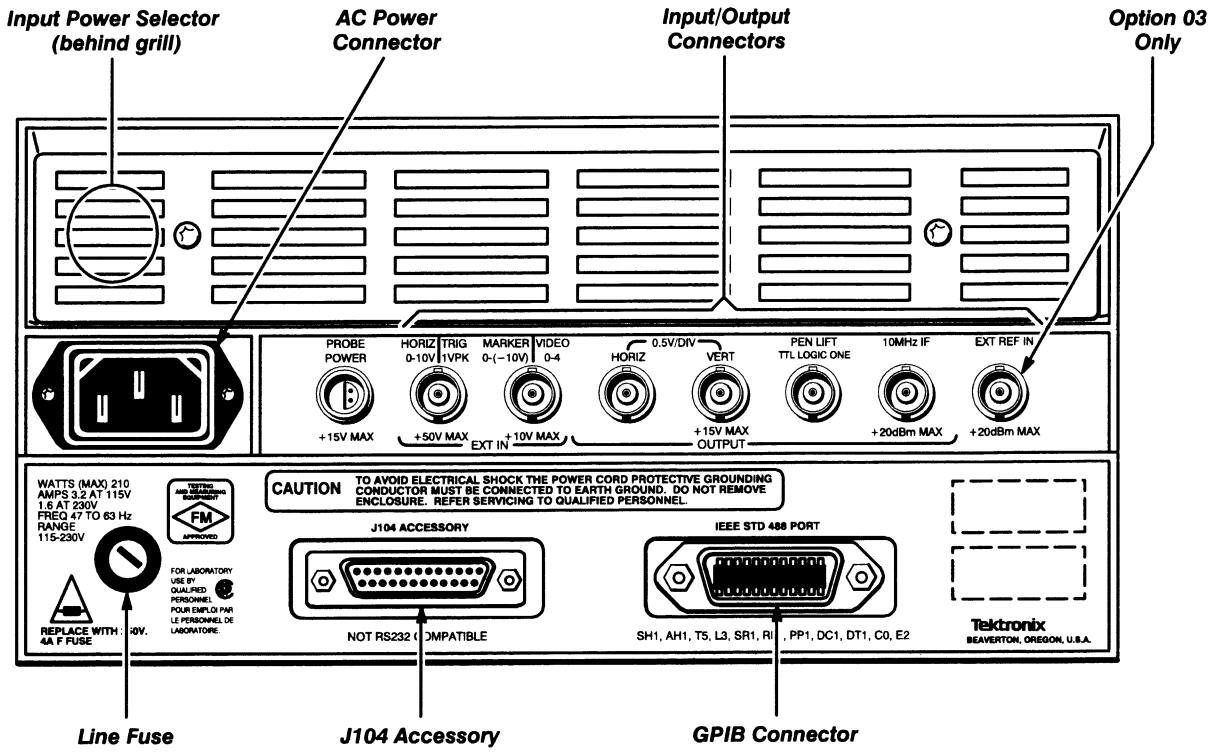


Figure 1-5: Spectrum Analyzer Rear Panel

Rear-panel Overview

The rear panel of the 2792 provides external access to some of the input and output signals of the instrument (see Figure 1-5). Input power, fuse, and grounding information is printed on the rear panel.

Input Power Selector—Input power requirements are changed with the Input Power Selector switch. Be sure the switch is set for the appropriate voltage range (either 115 V or 230 V). The appropriate line fuse must be installed for the input power range selected. Refer to *Line Fuse* later in this section.

NOTE

The Input Power Selector switch is located beneath the plastic grill on the rear panel.

PROBE POWER—This connector provides power for active probe systems.

Input/Output Connectors—The BNC connectors provide access to some of the instrument input and output signals. These connectors are described in *Section 2, Operating Basics.*

IEEE STD 488 PORT—This connector interfaces the 2792 to the GPIB bus.

J104 ACCESSORY—This 25-pin connector provides bi-directional access to the instrument bus. This connector is described in *Section 2, Operating Basics*.

Line Fuse—The line fuse can be accessed from the rear panel if replacement becomes necessary. Replace the line fuse with the appropriate fuse for the voltage range selected. Two fuse types (described below) may be installed, depending upon the Input Power Selector switch setting. See fuse information in the *Safety Summary* earlier in this manual before changing the fuse.

115 V Operation . . . . . 4 A, 250 V, fast-blow fuse
230 V Operation . . . . . 2 A, 250 V, slow-blow fuse

AC Power Source — Use only the power cord and connector recommended for your instrument to connect to the input power source. See Power Source in *Section 2, Operating Basics* and the Power information in the *Safety Summary* earlier in this manual for more information.

Initial Turn On

1. Connect the 2792 power cord to an appropriate power source.
2. Press the **POWER** button.

   The main control processor within the instrument performs a power-up routine. As part of this routine, the processor firmware version displays briefly, and the processor runs a memory and I/O test. When the power-up routine is finished, the instrument is ready to operate. Any power-up diagnostic failures display on the screen.
3. The 2792 is now ready to operate.

   Refer to *User Adjustments* in *Section 3, Reference*, for detailed information on setting screen parameters (such as viewing intensity) and performing the Vertical Cal routine.

NOTE

A 30-minute warm-up time is required to ensure that the instrument meets most specifications. If the instrument has been off for extended time periods, we recommend a 24-hour warm-up to allow the internal time base to stabilize.

After storage at temperatures below −15°C, the instrument may not reset when power is first turned on. If this happens, allow the instrument to warm up for at least 15 minutes, then turn the power off for 5 seconds and back on.

The 2792 operating functions and modes are initialized to the following factory (default) power-up states.

REF LEVEL	0dBm
CENTER FREQUENCY	0.90GHz
MARKER FREQUENCY	0.00GHZ
SPAN	MAX
USER DEFINABLE knob	SPAN
KEYPAD	CENTER FREQUENCY
VERTICAL SCALE	10dB/
RF ATTEN	20dB
VIDEO BW	Full (No readout)
RES BW	3MHz

The power-up state is shown in Figure 1-6.

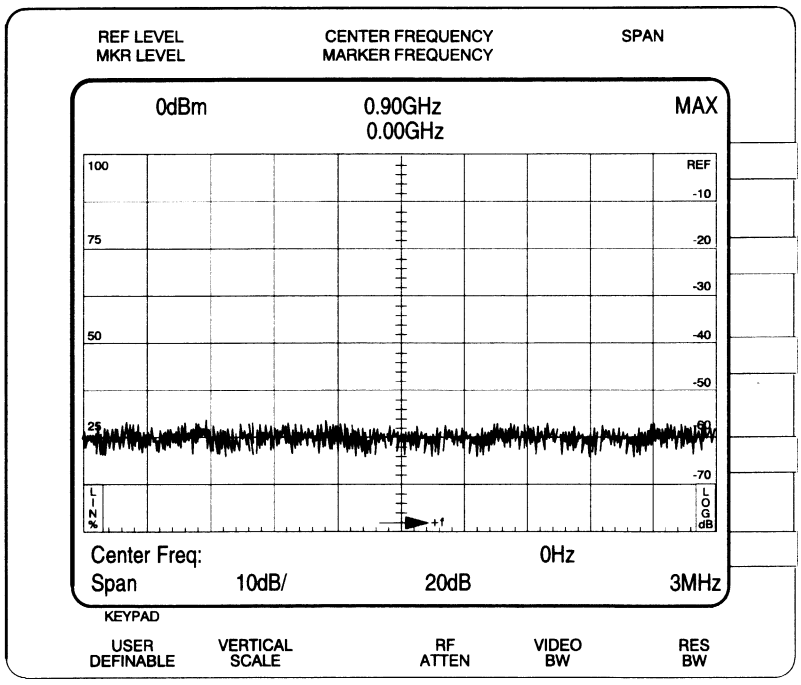


Figure 1-6: Typical Power Up Display

Functional Check

The 2792 Spectrum Analyzer is adjusted and tested thoroughly at the factory for optimum performance. This procedure checks that the instrument operates properly. The **100 MHz CAL OUT** signal is used as the source to check most of the operational characteristics. Since this internal signal is very accurate, this check procedure should satisfy most incoming inspection requirements. This check will also familiarize you with instrument operation. A detailed Performance Check that verifies all performance requirements is described in the ***2792 Service Manual, Volume 1*** (contact your local Tektronix Field Office or representative for ordering information).

This procedure checks the operation of front-panel keys and controls and ensures that the LEDs light when the appropriate function is active. Temporary **KEYPAD** assignments, assigning functions to the **USER DEFINABLE** knob, and use of the **ESC** (escape) key are described in this procedure. The procedure gives an overview of most instrument keys, controls, and menus; however, it does not discuss all of the menu selections. For descriptions of all menu selections, refer to *Section 2, Operating Basics* and *Appendix B, Menu Selectable Functions*.

Preliminary Preparation

Perform the *Initial Turn On* procedure described earlier in this section, and allow the instrument to warm up for at least 30 minutes. Perform the following functional checks in the order given.

1. **Initial Set Up**

   a. Connect the **100 MHz CAL OUT** signal to the **RF INPUT** connector, using a 50 Ω coaxial cable and Type N-to-BNC adapter.

   b. Press **PRESET** to set the instrument to the factory-default conditions.

   c. Press the **DISPLAY** key to show the **DISPLAY** menu.

   d. Select the **CRT Adjust Menu** from the **DISPLAY** menu.

   e. Select **Intensity Adjust** and perform the displayed instructions:

   - Set display brightness as desired using the **USER DEFINABLE** knob
   - Press **−dBX**

   f. Enter a frequency of 900 MHz, using the **KEYPAD** as follows:

   - Press **9**
   - Press **0**
   - Press **0**
   - Press **MHz**

As you enter the value, it displays on the screen in the first readout line below the graticule area. When you press **MHz** (the terminator key), a **MARKER FREQUENCY** of 0.90 GHz displays in the second readout line. The new frequency setting also displays in the **KEYPAD** buffer readout line.

g. Press the **SPAN** key, and enter a span of 500 MHz, using the **KEYPAD** as follows:

- Press **5**
- Press **0**
- Press **0**
- Press **MHz**

As you press the keys, the data displays on the screen in the **KEYPAD** readout line. When you press the **MHz** key, the value normally displays in the first readout line above the graticule area under **SPAN**; however, the **SPAN** menu overwrites this area until the menu is exited.

h. Press the **REF LEVEL** key, and enter −20 dBm using the **KEYPAD** as follows:

- Press **2**
- Press **0**
- Press **−dBX**

i. Press the **CLEAR MENU** key. The display should be similar to that shown in Figure 1-7.

2. **Front-panel Calibration**

a. Press the **UTIL** key to display the **UTIL** menu.

b. Select **Vertical Cal** to display the **VERTICAL CAL** menu.

c. Select **Continue** (the **100 MHz CAL OUT** was connected to the **RF INPUT** in step 1).

d. Follow the on-screen directions to calibrate the display.

e. Press **ESC** to return to the full display.

3. **Check Marker Activities**

a. Press the **MKRS** key (gray key to the right of the **FREQUENCY/MARKERS** knob) to display the **MARKERS** menu.

The single (frequency) marker automatically turns on at center screen. The **MKR** indicator below the **MKR↔FREQ** key lights.

b. Press **ESC** to clear the menu.

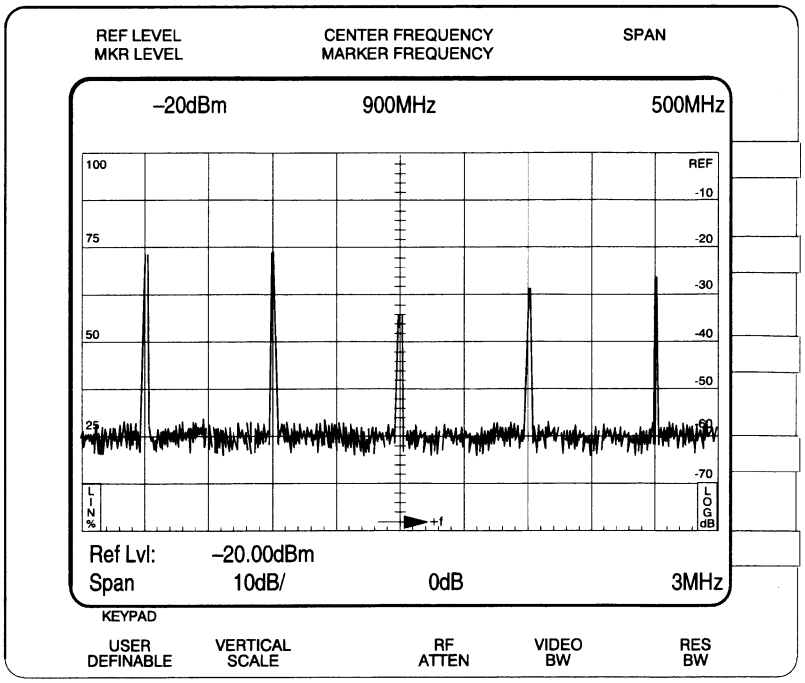


Figure 1-7: Display of Initial Set Up Parameters

c. Rotate the **FREQUENCY/MARKERS** knob to move the marker across the waveform. Slowly rotate the knob to position the marker at the peak of the signal nearest center screen. The **MARKER FREQUENCY** readout at the top of the screen should be approximately 900 MHz and the **MARKER LEVEL** should be approximately −40 dBm.

NOTE

*When you use the **PEAK FIND** arrow key functions described below, a message displays if the function cannot be executed. For example, if you press the ← key and there is no signal peak to the left, the message* `No CW to the left above the threshold` *displays.*

d. Press the **PEAK FIND MAX** key. The marker moves to the maximum signal peak on the screen.

e. Press the **PEAK FIND** ← key. The marker moves to the next on-screen signal peak to the left.

f. Press the **PEAK FIND** → key. The marker moves to the next on-screen signal peak to the right.

g. Press the **PEAK FIND** ↓ key. The marker moves to the next on-screen signal peak lower in amplitude.

h. Press the **PEAK FIND** ↑ key. The marker moves to the next on-screen signal peak higher in amplitude.

i. Press the **MKR** → **FREQ** key. The signal at the marker moves to center frequency, and the marker follows.

j. Press **PRESET**.

k. Enter a center frequency of 100 MHz using the **KEYPAD**.

l. Press **SPAN.**

m. Enter 50 MHz using the **KEYPAD**.

n. Press the **PEAK FIND MAX** key to turn on the marker and automatically position it to the highest on-screen signal peak.

o. Press the **MKR** → **REF LVL** key; the signal at the marker moves to the top of the screen (reference level), and the marker follows.

p. Press the **MKRS** key.

q. Select **BW Mkr Menu**.

r. Select **Set BW Level** from the **BW MARKER** menu.

s. Using the **KEYPAD**, enter 20 dB. Note the action of the two dots and the **MKR LEVEL** readout.

   The dots indicate the amplitude level below the signal peak where bandwidth is measured. The measurements displayed in the marker readout line are the bandwidth level and the frequency difference between the two dots (see Figure 1-8).

t. Select **BW Marker OFF** in the **BW MARKER** menu.

u. Press the Δ **MKR** key to bring up the **DELTA MKR** menu.

v. Rotate the **FREQUENCY/MARKERS** knob to move the reference (tunable) marker.

   Note that the Δ **Mkr** readout displays the frequency and amplitude difference between the two markers (see Figure 1-9).

w. Select **Swap Ref Marker** from the **DELTA MKR** menu.

x. Rotate the **FREQUENCY/MARKERS** knob to move the reference marker again.

   Note that the secondary (delta) and reference (tunable) markers are exchanged. Since only the reference marker is movable, this allows you to now move what was previously the delta (fixed) marker.

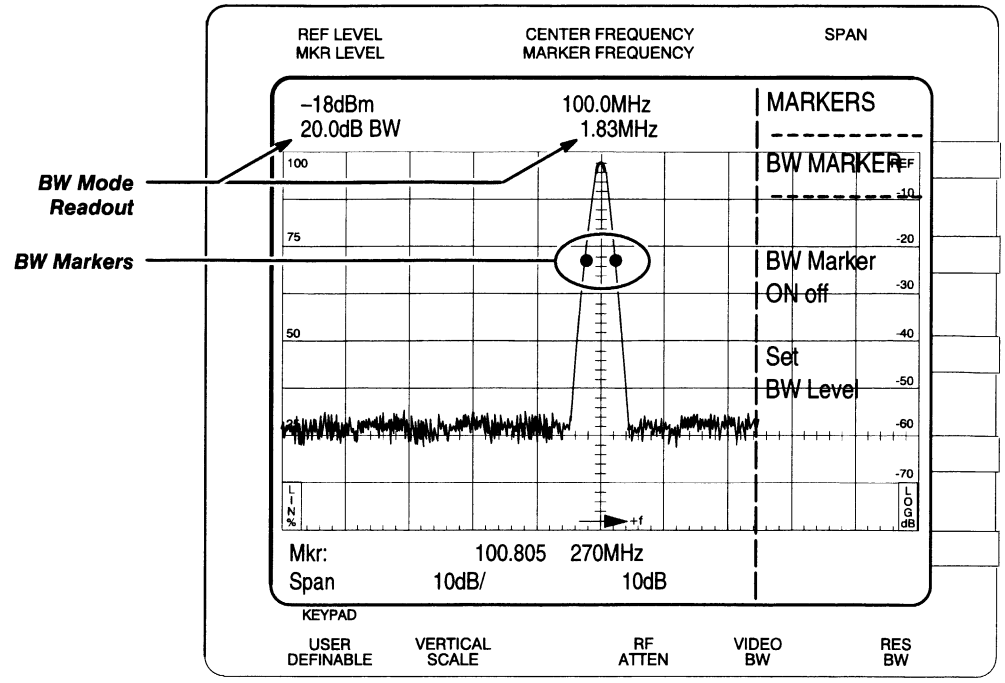


Figure 1-8: Bandwidth Mode Display

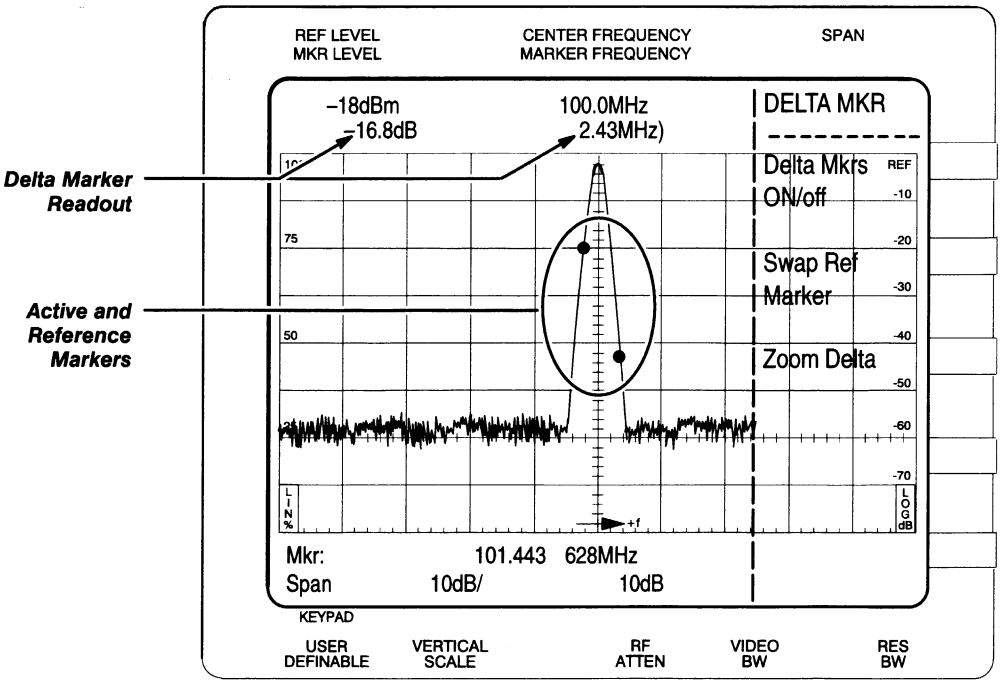


Figure 1-9: Delta (Δ) Marker Mode Display

4. **Frequency Counter**

   a. Press the **PRESET** key.

   b. Use the function keys and **KEYPAD** to set the following parameters to the values indicated:

      FREQUENCY 100MHz
      SPAN 50MHz
      REF LEVEL ..... −20dBm

   c. Press **COUNT** to display the **COUNTER** menu. A count of the signal at center screen is displayed (approximately 100 MHz), preceded by the letter C for count.

   d. Rotate the **FREQUENCY/MARKERS** knob clockwise so the signal peak is not at center-screen.

   e. Press the **PEAK FIND MAX** key.

      Note that the counted frequency is different than the center frequency. When a marker is active, frequency is counted at the marker location.

5. **External Interface Configuration**

   a. Press the **CONFIG** key to display the **CONFIG** menu.

   b. Select **GPIB Menu** from the **CONFIG** menu.

   c. Select **Set GPIB Address** from the **GPIB** menu.

   d. Using the **KEYPAD**, set the GPIB address to any selection from 0 to 30, and press **+dBX**.

   e. To verify the GPIB address entry, select **Set GPIB Address** and check that the address value in the first line of readout below the graticule area is the one entered in the previous step.

   f. Select **Operation Mode Menu**, and then select **Talk Only ON**.

   g. Press **ESC** twice to return to the **CONFIG** menu.

   h. Select **Plotter Menu 1** or **Plotter Menu 2** and the plotter type that you are using.

6. **Plot**

   a. Connect your GPIB plotter to the **IEEE STD 488 PORT** on the rear panel according to the directions supplied with the plotter.

   b. Press the **PLOT** key to send the screen information to the plotter over the GPIB. The screen data is stored into a plotter buffer so that the instrument can be used while the plotter is working.

      Turn on the graticule illumination (press **DISPLAY** and select **Grat Illum ON**) to plot the CRT graticule. Menu selections will not appear on the plot.

7. **Store and Recall Settings**

   a. Press the **PRESET** key to set the instrument to the factory default settings. Note the SPAN value (MAX).

   b. Press the **SETTINGS STORE** key to display the **SET STORE** menu and the settings registers (see Figure 1-10).

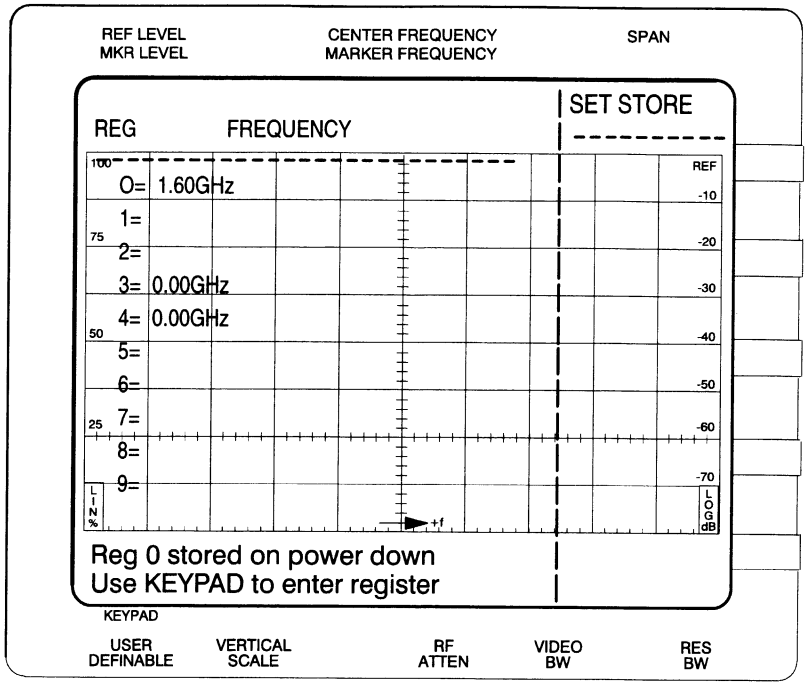


Figure 1-10: Listing of Registers in the SET STORE Menu

   c. Use the **KEYPAD** to enter **2**. The 2792 stores the front-panel settings in register 2 and returns to the display.

   d. Press the **SPAN** key.

   e. Use the **KEYPAD** to set the span to 50 MHz. Note that the SPAN value in the first line of readout above the graticule area is 50 MHz.

   f. To recall stored front-panel settings:

   - Press **SETTINGS RECALL** to display the **SET RECALL** menu and the settings register.
   - Use the **KEYPAD** to enter **2**. The 2792 recalls the front–panel settings stored in register 2 (refer to step c) and returns to the display. Note that the SPAN value is **MAX** (the stored setting).

8. **Check RF Attenuation and IF Gain**

   a. Press the **PRESET** key.

b. Use the function keys and **KEYPAD** to set the following parameters to the values indicated:

FREQUENCY 100MHz
SPAN 50MHz
REF LEVEL ..... −20dBm

c. Press **MIN RF ATTEN** to display the **MIN ATTEN** menu.

d. Select **Assign to User Def** from the **MIN ATTEN** menu to assign the **USER DEFINABLE** knob.

e. Rotate the **USER DEFINABLE** knob clockwise, and check that the signal peak is constant for each attenuator step. Note that the noise moves up as the attenuation approaches 60 dB (see Figure 1-11).

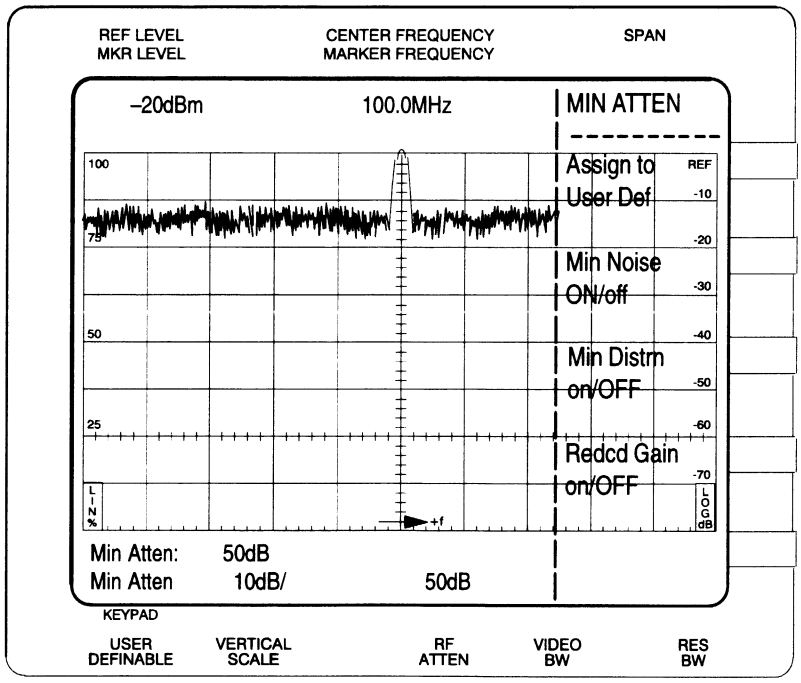


Figure 1-11: Typical Display of RF Attenuation and IF Gain Check when RF Attenuation Setting is 50 dB

9. **Sweep**

a. Press **PRESET**.

b. Press **VIEW** to display the **WF VIEW** menu.

c. Select **View A OFF** and **View B OFF**.

d. Press the **SWEEP** key to display the **SWEEP** menu.

The sweep operates in Auto mode (**SWEEP** indicator on). Note the auto sweep operation.

CAUTION

Do not allow a high-intensity dot to remain stationary on the CRT. The CRT phosphor could be permanently damaged.

e. Select **Man Sweep ON**. The sweep parameter reading changes to **MAN**.

f. Rotate the **MANUAL SCAN** knob and note its effect.

g. Select **Man Sweep OFF**. The sweep returns to the Auto mode.

10. **Video Bandwidth**

a. Press the **PRESET** key.

b. Press the **VIDEO BW** key to display the **VIDEO BW** menu.

c. The default video bandwidth filter is **FULL**. Note the noise level of the signal with **FULL** selected.

d. Select **WIDE** and note the noise level.

e. Select **NARROW** and note the noise level.

11. **Waveform View, Store, Recall, and Control**

a. Press the **PRESET** key.

b. Press the **VIEW** key to display the **WF VIEW** menu.

The **View A** and **View B** waveforms are **ON**; the **Max Hold** and **B–Save A** waveforms are **OFF**.

c. Note the displayed waveform.

d. Press the **WAVEFORM STORE** key to display the **WF STORE** menu and the waveform register list.

e. Use the **KEYPAD** to enter **1**. The 2792 stores the waveform in register 1 and returns to the display.

f. Press **SPAN**.

g. Use the **KEYPAD** to set the span to 50 MHz. Note the display.

h. Press the **WAVEFORM RECALL** key to display the **WF RECALL** menu and the waveform register list.

i. Use the **KEYPAD** to enter **1**.

The 2792 recalls the waveform stored in the register 1 and displays both the stored waveform and the active waveform (see Figure 1-12). In this example the stored waveform is the A trace (**SAVE A** LED is lighted), and the active waveform is the B trace.

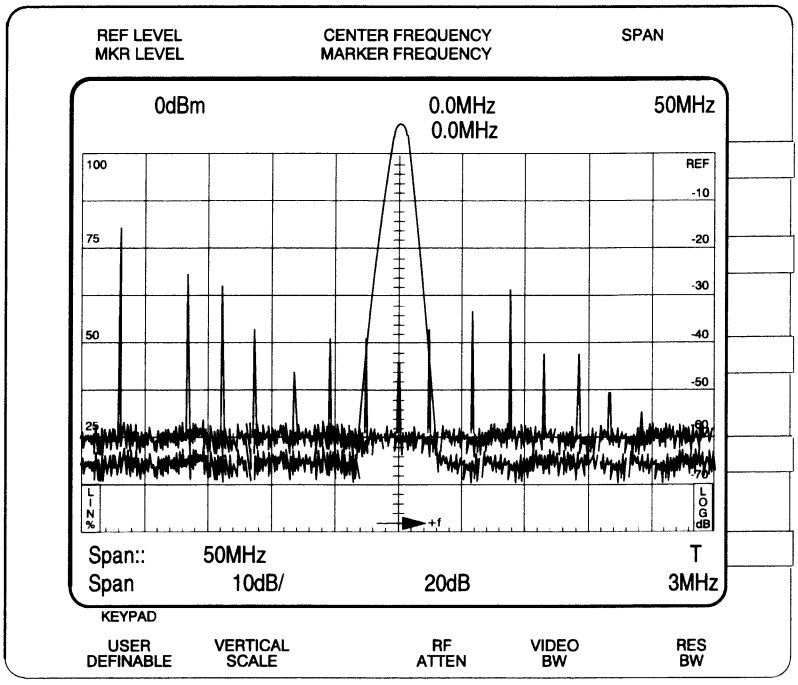


Figure 1-12: Display of Stored and Active Waveforms

12. **Identify Mode**

    a. Press the **PRESET** key.

    b. Press the **SPAN** key.

    c. Use the **KEYPAD** to set the span to 50 kHz.

    d. Press **INPUT** to display the **INPUT** menu.

    e. Select **Identify ON**. Note that alternate sweeps change amplitude by one graticule division.

13. **Macros**

You can prepare customized programs or macros, prepared with the use of a controller and down-loaded over the GPIB, and assign the programs to a storage register location for future operation. Tektronix stores four useful macros into the **MACRO** menu at the factory.

To run an existing macro, press **MACRO** and select the desired register number from the **KEYPAD**. The program runs automatically.

a. Press the **PRESET** key.

b. Press the **MACRO** key to display the **MACRO** menu and its macro registers list (0 to 7).

c. Use the **KEYPAD** to select Register 2. This runs a macro entitled FIND AND ZOOM MAX SIGNAL. The largest signal is located by a marker and centered on the screen.

Operating Control and Features

The 2792 is controlled by menus, dedicated operation keys, controls, and connectors. This section contains detailed operating information of all of the front-panel key and menu selection choices available for the 2792. While these choices will become obvious with instrument familiarity, we introduce them in a slightly different manner than they will be observed on the screen. Following the menu information are the front- and rear-panel controls and connectors. The main 2792 operating features are covered in this section with illustrations to show you exactly what to expect to see on the screen during many operations.

Display Modes

The 2792 uses two main display modes; normal waveform and register list.

Menus, prompts, and status message information are text variables that may occur in a waveform display.

The readouts and waveforms will not be displayed while a register list is displayed. When a register list is removed, the 2792 will always return to its previous display state.

Readout Modes

The 2792 uses three possible readout modes for the display; normal readout, menu readout, and message readout.

Normal Readout Mode—The line at the top of the CRT contains the reference level, frequency, and span readouts. If the markers are active (primary or delta), the second line from the top of the screen contains the marker level and marker frequency readouts. The second line from the bottom of the CRT contains the keypad assignment and keypad entered data. The line at the bottom of the CRT contains the user definable knob assignment, vertical scale, RF attenuation, video filter, and resolution bandwidth readouts. All keypad-entered data will be highlighted.

Menu Readout Mode—All readouts appear as described above, except the right eleven characters of each line will be overwritten by the menu text. This effectively removes the span and resolution bandwidth readout from view. When menus are removed, the display returns to the Normal Readout mode.

Message Readout Mode—Two message types can be displayed during instrument operation; warning and status. Each type is displayed at a specific screen location. See *Appendix B, Menu Selectable Functions* for additional information on messages, including all menu text.

Dedicated Function Keys and Knob

There are 28 white, dedicated function keys on the 2792 front panel. These white keys initiate frequently performed actions, as shown below, without calling up a menu.

- Operating increment and decrement step functions of frequency, span, and reference level
- Most common marker functions
- Single sweep
- Return from GPIB to local operation
- Program sequence run/stop
- Escape from current menu level
- Clear all menus
- Enable main operating menus
- Plotter activity
- Power up
- Instrument preset
- Save and turn on the A waveform
- Enable the **FREQUENCY/MARKER** knob selection

The 2792 dedicated function keys are for the most commonly performed, general, spectrum analyzer operations. Any of the dedicated activities are available while menus are displayed (except during the Store and Recall operations for settings and waveforms). However, if any register list is displayed (for example Store Register), the dedicated function keys are ignored; except, **POWER** is still operable. Only the **KEYPAD** and menu selection keys are active. In addition, the **FREQUENCY/MARKERS** knob is dedicated to control of the frequency and marker tuning and the **MANUAL SCAN** knob controls manual scanning. Described here are the **POWER**, **ESC**, and step keys. The other dedicated function keys and the knob are described with their related function later in this section.

POWER Key

Press this key to turn the main power supply on and off. When power is turned off with the front-panel **POWER** key, the present instrument front-panel setup is stored in register 0 (see Store and Recall Settings later in this section) so this setup can be easily recalled. Full RF attenuation is switched in when power is switched off to protect the 1st mixer from overload and damage.

ESC Key

Press this key to remove the current menu, abort a **KEYPAD** entry, or remove the store or recall register displays. Removal will be according to hierarchical standing from the lowest to the highest; that is, data entry will be removed first, then screen prompts, then a register list or menu. See Menu Operation and Data Entry in this section for more information.

Step Keys

Press one of these six keys to increment or decrement frequency, span, or reference level in prescribed amounts. The frequency and reference level increment and decrement step amounts can be changed with the **STEP SIZE** menu.

KEYPAD Data Entry

The data entry **KEYPAD** is enabled for a particular parameter when that parameter's key is pressed, when a menu is called up, or when a prompt requires **KEYPAD** entry. Screen readouts will display both the parameter and its **KEYPAD**-entered value on the readout line directly below the graticule. The increment and decrement keys will step the selected parameter in predefined (default) steps.

The **KEYPAD** has ten keys for numbers 0 through 9, four keys for the 13 units terminators, a decimal point key, a backspace (**BKSP**) key, and increase and decrease step keys; see Figure 2-1. These keys enter and change the values of the instrument settings.

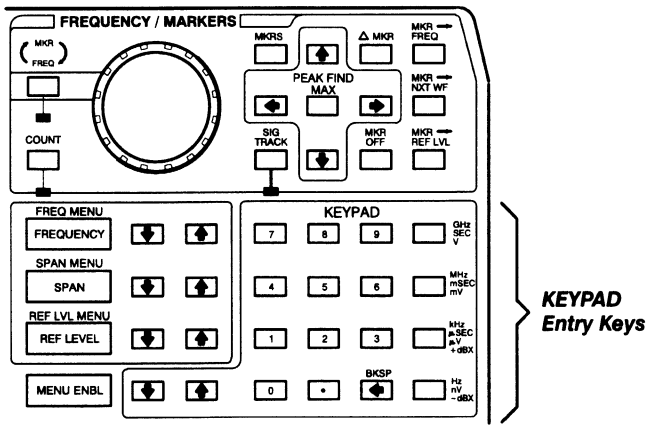


Figure 2-1: KEYPAD Entry Keys

Permanent KEYPAD Assignment—The **KEYPAD** is assigned to a parameter that allows data entry when a gray menu key is pressed. This assignment is automatic for the following activities and remains assigned (even if the menu is removed from the screen) until another menu in this list is selected.

- Center Frequency
- Marker Frequency (primary and delta)
- Minimum RF Attenuation
- Reference Level
- Resolution Bandwidth
- Span
- Sweep
- Vertical Scale
- Peaking

Dedicated step keys will provide USER DEFINABLE steps for center frequency, span, and reference level.

Use the **KEYPAD** to enter the value for an instrument setting. The setting being acted on and its current value are displayed on the screen directly to the right of the **KEYPAD** label. Data entered from the **KEYPAD** is displayed in a highlighted mode. When a data value has been sent to the instrument, it is displayed in the **KEYPAD** buffer area. The entry is then terminated with a units key or **ESC** to conclude the activity (**CLEAR MENU** will not terminate data entry on a permanent **KEYPAD** assignment).

NOTE

*Any permanent keypad entry activity that has not been terminated with a units terminator key or **ESC** will be aborted when any front-panel menu key is pressed.*

The step keys will step the current setting (as displayed in the **KEYPAD** status area) up or down by the factory-default selection.

Temporary KEYPAD Assignment—Temporary **KEYPAD** assignments originate from a menu or are assigned by the instrument (for example, a register list entry), or when an activity requires data entry not directly related to the current **KEYPAD** assignment (for example Min Atten). The **KEYPAD** is assigned to the temporary activity and reverts back to its previous assignment as soon as the entry is completed. This temporary assignment is indicated in the highlight mode at the **KEYPAD** buffer area. For value entries where no unit is required, any of the terminator keys may be used. The following activities cause the **KEYPAD** to be temporarily assigned.

- Start and Stop Frequency
- Frequency Step Size and Frequency Band
- Reference Level Offset and Step Size
- Counter Resolution

- Bandwidth Marker and Marker XdB Levels
- Marker Threshold
- GPIB Address
- B – Save A Offset
- Mixer Loss

Example

1. Press **MKRS** to select the **MARKERS** menu, then select **Peak Find Menu**. Note that the marker frequency is assigned to the **KEYPAD**.
2. Select **Threshold Menu**.
3. Select **Set Threshold**, and the **KEYPAD** is temporarily assigned to the marker threshold. The current marker threshold is highlighted in the **KEYPAD** buffer area (first readout line below the graticule area).
4. Select the marker threshold value you want, using the **KEYPAD**. Be sure to press the appropriate terminator key; either **+dBX** or **−dBX**. Note that the **KEYPAD** assignment returns to marker frequency when you press the terminator key.
5. Select **Set Threshold** to verify the marker threshold value changed to the new value you just selected.
6. Press **ESC** three times to return to the **MARKERS** menu, or press **CLEAR MENU** to return to the full display.

Register entries contain only one digit and are, therefore, automatically terminated by the instrument. After data is entered in response to a prompt, the **KEYPAD** area will revert to its previous parameter entry.

If **ESC** or **CLEAR MENU** is pressed before data entry is completed, data entry will be aborted and no action will be taken. If **ESC** is used, the temporary **KEYPAD** assignment is cleared, and the **KEYPAD** assignment reverts to its previous (permanent) assignment. If **CLEAR MENU** is used, all menus are removed, and the **KEYPAD** is reassigned to the previous permanent assignment.

A temporary **KEYPAD** assignment can also be aborted by pressing any gray menu key. This will result in the **KEYPAD** being assigned to the new selected **KEYPAD** assignment. If the menu key does not have a default assignment, then the **KEYPAD** will revert to the previous permanent **KEYPAD** assignment.

If an out-of-range value is entered on a temporary **KEYPAD** assignment, a warning message will be displayed, and the temporary **KEYPAD** assignment remains to allow another selection.

FREQUENCY/ MARKERS Knob

The **FREQUENCY/MARKERS** knob is a high-resolution, non-detented knob dedicated to tuning the center frequency or the marker. Center frequency tuning is done in 0.1 division increments, regardless of the selected span. In the Max Span mode, the center frequency is fixed, and only the marker or frequency dot is tuned. The knob is shifted between frequency and marker tuning with the **MKR↔FREQ** key.

USER DEFINABLE Knob

The **USER DEFINABLE** knob can be assigned to various functions, which allows you to customize the instrument; see Figure 2-2. The knob will move in steps, selected with menu choices in some cases.

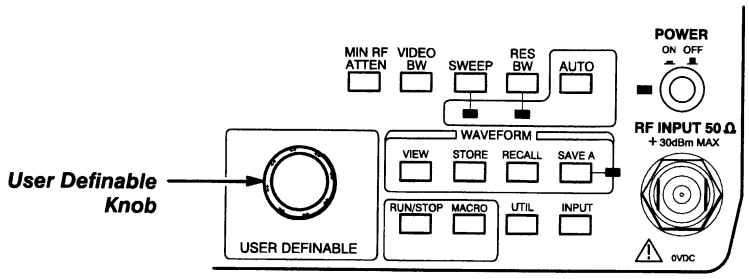


Figure 2-2: USER DEFINABLE Knob

The current assignment of the knob is displayed on the bottom of the screen directly above the USER DEFINABLE label. If the knob has not had its assignment changed, it will be at the factory-set assignment of SPAN.

These parameters have menu selections available for knob assignment.

- Peaking
- Minimum RF Attenuation
- Reference Level
- Vertical Scale
- Resolution Bandwidth
- Span
- Sweep
- Peak/Average

MANUAL SCAN Knob

CAUTION

Do not allow a high-intensity dot to remain stationary on the CRT. The CRT phosphor could be permanently damaged.

With **Man. Sweep ON** (in the **SWEEP** Menu), rotate this knob to manually scan the spectrum.

Marker Control and Operation

The 2792 marker control uses a combination of dedicated-operation keys and menu operation for easy access to the most commonly performed marker tasks, such as finding signal peaks and signal tracking. A single marker is turned on as soon as the **MKRS** key is pressed and the **FREQUENCY/MARKER** knob is switched to Mkr. This primary marker mode provides direct readout of frequency and amplitude information at any point along any displayed waveform. The Delta (Δ) Marker mode provides relative (delta) frequency and amplitude information between any two points along any displayed waveform or between waveforms. It is possible to measure the average noise power in a 1 Hz bandwidth of the current marker position with dBX (1Hz). There can be no markers on a real-time (analog) waveform. Related marker information is located in *Section 3, Reference* under Defining Peak Find Characteristics For Markers.

Marker Terms

The following definitions of marker terms are used throughout this discussion.

- **Active waveform**—Any normal, max hold, or real-time waveform.
- **Inactive waveform**—Any waveform saved in a register and recalled for viewing (for example, Save A).
- **Primary marker**—The marker that changes frequency or position when tuning with the **FREQUENCY/MARKERS** knob (**MKR** light is lit), or with **MKR → CF**, or **MKR → REF LVL**. This marker stays at its specific screen location when center frequency is changed. If the markers are off, the primary marker is automatically turned on at center screen if one of the following marker dedicated-function keys is pressed.

  MKR ↔ FREQ
  MKR → FREQ
  MKR → NXT WF
  MKR → REF LVL
  PEAK FIND arrow keys or **MAX**

  Turn off the primary marker with the **MKR OFF** key, by selecting **Marker OFF** from the **MARKERS** menu, or by pressing the **PRESET** key to go back to the factory default conditions.
- Δ **Delta marker**—The second marker is displayed. The delta marker stays at its specific frequency, which can be off screen, and is not directly moveable with marker movement controls. The primary and delta markers can be interchanged with the **Swap Primary Marker** function in the **DELTA MKR** menu.

Menu Operation

Many 2792 functions are controlled through menus. There are 22 front-panel keys that call up menus for selection of multiple tasks. Most of the gray menu keys bring up the first-level menus or perform some function immedi-

ately (for example, a primary marker is turned on when **MKRS** is pressed) or enable the **KEYPAD** (for example, when **SWEEP** is pressed). See **MENU ENBL** Key later in this section for alternate menu selection.

Menu Selection

There are five keys to the right of the displayed menu, which are used to access additional, second-level and third-level menus that activate less frequently needed activities.

The menu choices appear in a boxed, vertical column on the right-hand side of the screen. Figure 2-3 shows the first level of the **MARKERS** menu.

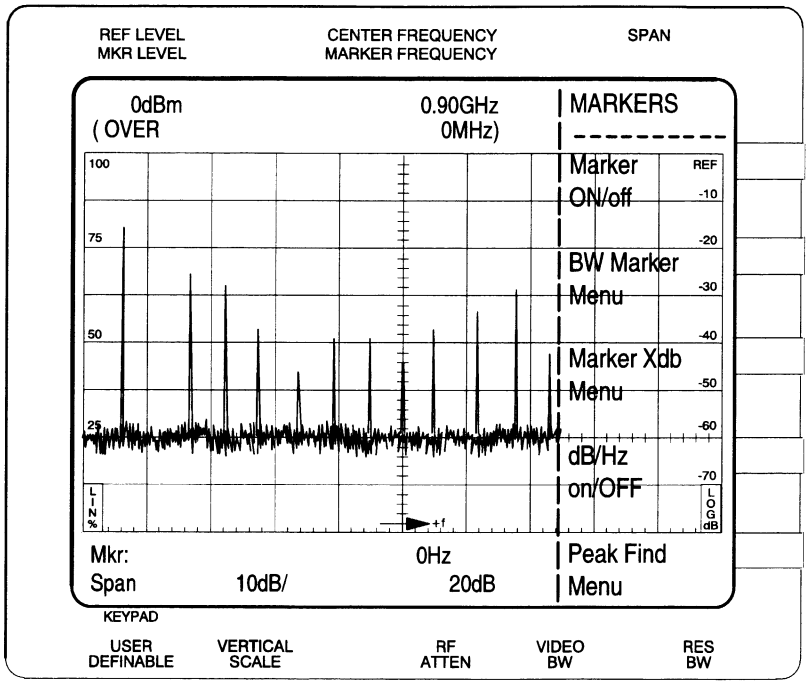


Figure 2-3: Display of First Level of the MARKERS Menu

NOTE

The current waveform(s) and screen readout will be covered by the displayed menu.

Press any menu key and select a function from the first-level menu that is displayed, or select a second-level menu by pressing the key on the bezel to the right of your selection. A selected function will be active immediately or a screen prompt will alert you to additional action required on your part. From a second-level menu, you can select a function or, in some cases, select a third-level menu. Press **ESC** to step back one level of a menu.

The **KEYPAD** is automatically assigned by menu selections when any of the menu functions allow data entry. The **KEYPAD** will also be temporarily assigned during some other menu operations. See KEYPAD Data Entry earlier in this section for specific information.

While most instrument functions can be controlled through the menus, some front-panel keys are set aside for commonly performed tasks. These are discussed under Dedicated Function Keys and Knob earlier in this section.

NOTE

All non-menu (white) front-panel keys, ***FREQUENCY/ MARKERS*** *knob, the* ***USER DEFINABLE*** *knob and* ***MANUAL SCAN*** *knob continue to function as expected while any menu is displayed.*

CAUTION

Any permanent keypad entry that has not been completed with a units terminator key or ***ESC*** *will be aborted when any menu key is pressed (see the Data Entry description in this section).*

MENU ENBL Key

There is an exception with the gray frequency, span, and reference level keys. The **MENU ENBL** key must be pressed before these keys in order for the menu to be called up when the 2792 screen is in the Normal Readout mode. This procedure is used because these three functions are accessed frequently for front-panel use without the necessity of using the respective menus. (It is not necessary to use **MENU ENBL** to call up any other menus.) When the 2792 is already in the Menu Readout mode, the frequency, span and reference level first-level menus can be called up by simply pressing the gray key itself.

Menu Selection Keys

Use these five keys to select actions and operations from the instrument menus; see Figure 2-4. Press the key beside the lower-level menu or function to select it. The **ESC** key is discussed separately under Dedicated Function Keys and Knob earlier in this section.

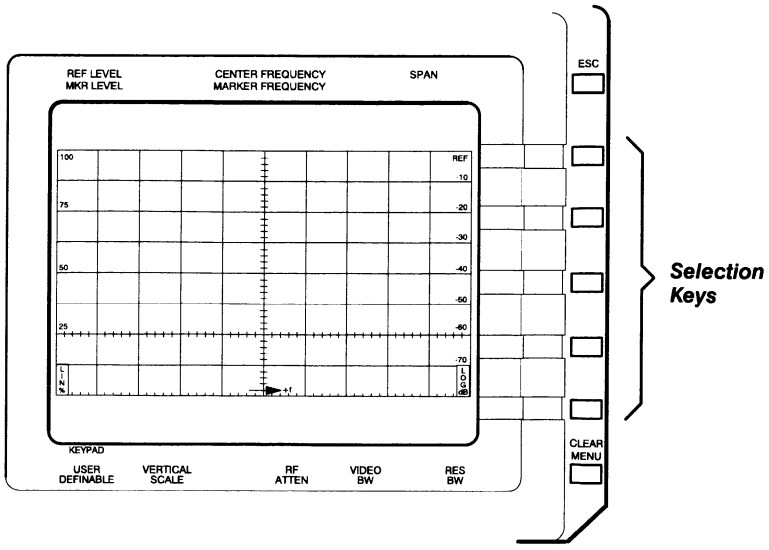


Figure 2-4: Menu Keys to Select a Lower-level Menu or Function

Menu Actions

There are up to five selections (plus **ESC**ape) from a first-level menu. When a lower-level menu is selected, it will be displayed in front of the upper-level menu; see Figure 2-5. The name of the upper-level menu will stay on the screen with the lower-level menu covering and overlapping the selections. There are up to four possible selections (plus **ESC**) from a second-level menu and up to three possible selections (plus **ESC**) from a third-level menu.

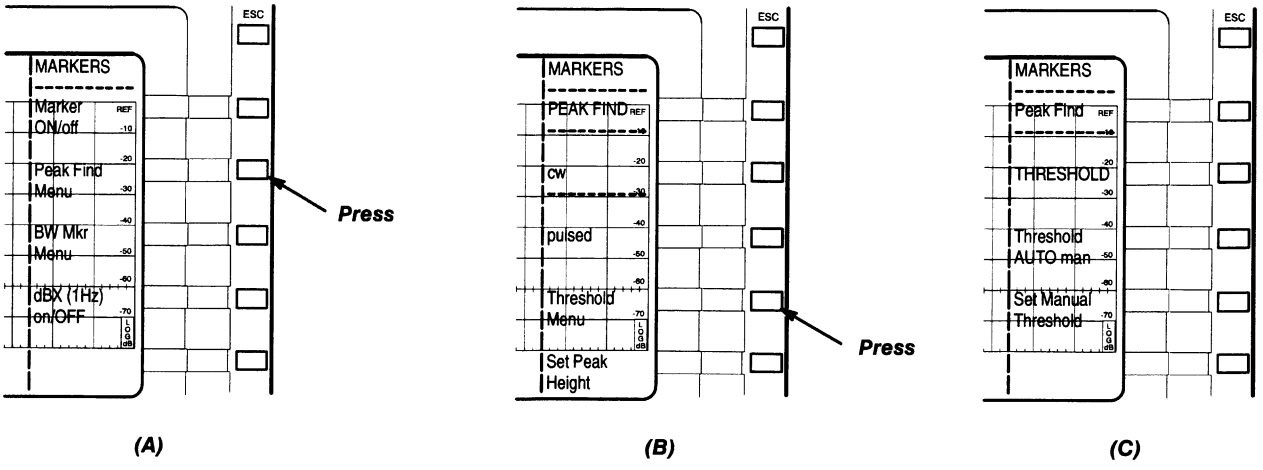


Figure 2-5: MARKERS Menu Depicting Lower-level Menu Overlap

With a first-level menu (for example, **MARKERS**) on the screen, choose any one of the following actions.

- Select a function (**Marker OFF**)

  Select the key to the immediate right of a desired function to enable that function. When the function is complete, select another function or one of the following actions.

- Select a lower-level menu **(Peak Find Menu**)

  With a first-level or second-level menu on the screen, select the key to the immediate right of a desired lower-level menu to bring that menu to the screen (the word Menu will alert you that additional, related selections are available).

- Remove the menu

  Removing one menu level at a time.

  Select **ESC** while at the first-level menu to remove the menu from the screen. Continuing our example, select **ESC** once to remove **PEAK FIND** menu information and a second time to remove **MARKER** menu information.

  Removing all menu levels at once.

  Press **CLEAR MENU** and the complete spectrum will be displayed.

When a front-panel menu selection key is pressed, any menu currently on the screen is replaced by the new menu selection.

Appendix B, Menu Selectable Functions lists all instrument functions alphabetically and shows in which menu these functions occur.

A brief description of each available menu choice is given in this section when the key operations are presented.

Menu Representation Syntax

We have used different graphic methods to indicate the following menu conditions.

- factory-default, power-up
- toggle situations
- mutually-exclusive selections
- lower-level menus

Factory-default Power-up Conditions

The 2792 is shipped from the factory fully functional and set to conditions that provide a good starting position for instrument operation. These are the factory-default, power-up conditions. These conditions come up when the instrument is first powered up. For purposes of illustration, we show factory-default conditions in this section fully capitalized as they will appear on the screen.

For example, the **VIDEO BW** menu is illustrated as

FULL	all upper case, bold face
wide	all lower case, regular face
narrow	all lower case, regular face

where the instrument is factory-set to the FULL condition (all three conditions are equally user-selectable).

Toggle Situations

Another situation also involves the **VIDEO BW** menu. The three conditions are each enclosed in double brackets (≪ ≫) in this manual. This indicates a toggle situation where only one of the conditions at a time is available in instrument operation, and one of the selections always must be in effect. For example, this is how the **VIDEO BW** menu is shown here

≪FULL≫
≪wide≫
≪narrow≫

Another example of a toggle situation is from the **COUNTER** menu.

Count
≪on OFF≫

where the **Count** function must be either **ON** or **OFF**.

Menu Descriptions

This information describes all available instrument menu selections and functions.

Frequency (see Figure 2-6)

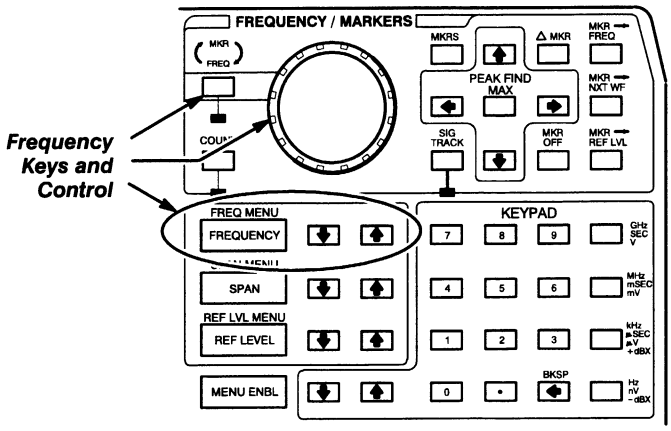


Figure 2-6: Frequency Keys and Control

The **KEYPAD** is enabled (permanently) for center frequency entry when either **FREQUENCY** is pressed or **MENU ENBL** and **FREQUENCY** are pressed to call up the **FREQUENCY** menu. If the center frequency entered

is not in the current frequency range, the nearest frequency range that contains the frequency will be automatically selected. The center frequency range that can be selected is 0 Hz to 21 GHz (0 kHz to 325 GHz with Option 04 installed). Values that are entered outside this range will be ignored. Frequency digits that are entered from the **KEYPAD** are terminated with one of the four terminator keys.

The **FREQUENCY** increment and decrement keys step in span divided by ten (or one division) steps.

Table 2-1: FREQUENCY Menu

Menu/Selection Choice	Description
Set Start/Stop	Select the start frequency and stop frequency settings. The **KEYPAD** is assigned (temporarily) to frequency start/stop. The `Start Freq:` prompt will appear on the **KEYPAD** assignment readout line. Enter the start frequency, press any terminator key, and the `Stop Freq:` prompt will appear. After the stop frequency has been entered, the **KEYPAD** assignment will return to center frequency entry. If **Set Start/Stop** is pressed during the entry of center frequency, the current entry is aborted, and the **KEYPAD** is initialized for start frequency entry.
Step Size Menu	Set the **FREQUENCY** increment and decrement keys to different values.
Auto ≪ON off≫	Automatically sets the frequency step size to the current span divided by ten (one horizontal division). In this mode, the frequency step size will track the span (that is, as the span changes, so does the frequency step size).
Set Step in Hz	The **KEYPAD** is assigned (temporarily) to set the frequency step size. A screen prompt will display the current frequency step size. A warning message will be displayed if an out of range value is entered.
Set to CF	Set the frequency step size to the current center frequency value. (See the following Set to Marker description.)
Set to Marker	Set the frequency step size to the current value of the marker. If the primary marker is not on, it will be turned on and set at the current center frequency. (The Set to Marker selection has the same effect as Set to CF.) If delta markers are on, the steps size is set to the frequency difference between the markers.
Freq Corr ≪ON off≫	Instrument frequency corrections are toggled on and off. This reduces the amount of hold off time between sweeps. The error message `FREQ CORRECTIONS DISABLED` is displayed on the screen followed by the warning `Frequency Corrections Off` when the frequency corrections are turned off. (This error message will also be displayed in the Current Status list described under the **UTIL** menu.)

Table 2-1: FREQUENCY Menu (Cont.)

Menu/Selection Choice	Description
Set Freq Band	Enable the **KEYPAD** increment and decrement keys to increase or decrease the frequency band. The **KEYPAD** is enabled for direct band number entry (**KEYPAD** entry of 3 corresponds to Band 3 or 3 GHz to 7.1 GHz). Terminate **KEYPAD** entry with any of the terminator keys. The current band number will be displayed on the **KEYPAD** assignment readout line along with the frequency span covered by that band. When the frequency band is changed, an attempt is made to preserve the 1st and 2nd LO frequencies. If this is not possible, the nearest center frequency within the new band is selected. When returning to a previous band, without changing center frequency, the original LO frequencies are always used, so the center frequency is preserved. External mixers are automatically selected in frequency ranges above 21 GHz.

FREQUENCY/MARKERS Knob—The dedicated function **FREQUENCY/MARKERS** knob is a high-resolution (50 positions per revolution), free turning control for frequency and marker tuning. Shift between frequency and marker control with the **MKR** ↔ **FREQ** key. When the MKR indicator is lit, the **FREQUENCY/MARKER**S knob is tuning markers.

When the indicator is not lit, the knob is tuning frequency. Since you can be making fine adjustments or tuning over a very wide range, the results of tuning this control are determined by the tuning speed. That is, if the knob is turned slowly, it moves the frequency or marker in small increments, while rapid turning moves the frequency or marker in larger increments; although, always in a percent of span.

FREQUENCY ↑ and FREQUENCY ↓ Keys—The **FREQUENCY** increment and decrement keys change the frequency by the amount set in the **Frequency Step Size** menu. The power up (default) value is the span divided by ten (**Frequency Step Size Auto ON**).

Span (see Figure 2-7)

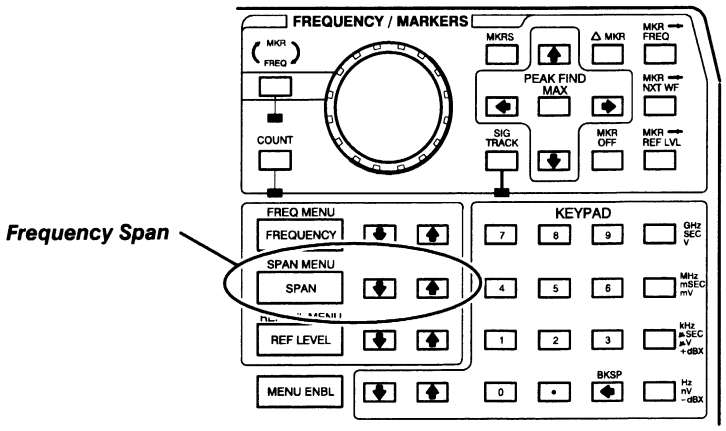


Figure 2-7: Span Keys

The **KEYPAD** is enabled for span entry when either **SPAN** is pressed or **MENU ENBL** and **SPAN** are pressed to call up the **SPAN** menu.

NOTE

The span parameters addressed in the following table are for the entire graticule (that is, 1 MHz span corresponds to 100 kHz/div).

Table 2-2: SPAN Menu

Menu/Selection Choice	Description
Assign to User Def	Enable the **USER DEFINABLE** knob to increment and decrement the span in a 1-2-5 sequence. Rotate the knob clockwise to increase the span or rotate the knob counterclockwise to decrease the span. The 2792 will maintain, if possible, a calibrated display if **Auto ON** is selected (from the **SWEEP** menu). The **KEYPAD** increment and decrement keys step in a 1-2-5 sequence. All span entries from the **KEYPAD** will be rounded to two significant digits (for example, 50.5 MHz becomes 51 MHz; 114 MHz becomes 110 MHz).
Zero Span ≪on OFF≫	Set the instrument to the Zero Span mode (Time Domain mode). When **Zero Span** is **ON**, **Max Span** must be **OFF**, and vice versa. The 2792 operates like a tunable receiver. The 2792 displays signals within the resolution bandwidth in the time domain, with the horizontal axis representing time instead of frequency. When the Zero Span mode is exited, the instrument reverts back to the span setting in effect when the Zero Span mode was invoked.

Table 2-2: SPAN Menu (Cont.)

Menu/Selection Choice	Description
Max Span ≪on OFF≫	Set the instrument to the Max Span mode, and the full band is displayed. When **Max Span** is **ON**, **Zero Span** must be **OFF**, and vice versa. A dot near the top of the screen indicates the center frequency readout position on the span. This dot and the center frequency position will be center screen when the span is reduced from the maximum position. When the markers are on, they show the frequency position, and the dot goes to center. When the Max Span mode is exited, the instrument reverts back to the span setting in effect when the Max Span mode was invoked.

SPAN ↑ and SPAN ↓ Keys — The **SPAN** increment and decrement keys change the span in a 1-2-5 sequence.

Reference Level (see Figure 2-8)

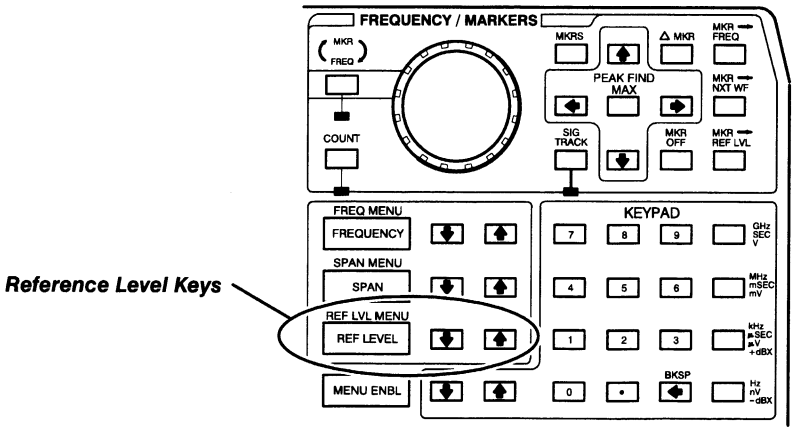


Figure 2-8: Reference Level Keys

The **KEYPAD** is enabled for reference level entry when either **REF LEVEL** is pressed or **MENU ENBL** and **REF LEVEL** are pressed to call up the **REF LEVEL** menu.

All **KEYPAD** entries will be rounded to the nearest quarter dB (that is, −20.3 dBm becomes −20.25 dBm) and will be displayed on the **KEYPAD** assignment line. The **REF LEVEL** readout (upper left corner of the CRT) will be rounded to the nearest dB. The **KEYPAD** increment and decrement keys will step in 1 division steps when in the log mode and in a 1-2-5 sequence when in the linear mode.

Table 2-3: REF LEVEL Menu

Menu/Selection Choice	Description
Assign to User Def	Enable the **USER DEFINABLE** knob to increment and decrement the reference level.
Vert Scale Menu	The **KEYPAD** is assigned to set the vertical scale.
Assign to User Def	Enable the **USER DEFINABLE** knob to increment and decrement the vertical scale by 1 dB per step.
≪LOG (DB)≫	Use the **KEYPAD** to enter the vertical scale in dB. No decimal values are allowed. The current vertical scale will be displayed on the **KEYPAD** assignment line.
≪linear≫	Use the **KEYPAD** to enter the vertical scale in volts. The current vertical scale will be displayed on the **KEYPAD** assignment line. The vertical scale entered is rounded so that the reference level falls on an even 0.25 dB boundary.
Units Menu	Select the reference level units.
DBM	Set the reference level units to dBm (dB referenced to 1 mW; 0 dBm = 1 mW).
dBV	Set the reference level units to dBV (dB referenced to 1 V).
dBmV	Set the reference level units to dBmV (dB referenced to 1 mV).
dBμV	Set the reference level units to dBμV (dB referenced to 1 μV).
Set Ref Offset	The **KEYPAD** is enabled for reference level offset entry. The **KEYPAD** increment and decrement keys will step the reference level offset in 1 dB steps in either the log or linear modes.
Step Size Menu	Set the reference level step size for the reference level increment and decrement keys.
Auto ≪ON off≫	Set the reference level step size to one vertical division in the log mode and a 1-2-5 vertical scale sequence in linear.
Set Step Size	The **KEYPAD** is assigned (temporarily) to set the reference level step size. The current **KEYPAD** assignment is `Ref Lvl Step:` followed by the current step size value.

REF LEVEL ↑ and REF LEVEL ↓ Keys — The **REF LEVEL** increment and decrement keys change the reference level in the amount set in the **Step Size** menu. The power up (default) value will be one vertical division (**Auto ON**).

Count (see Figure 2-9)

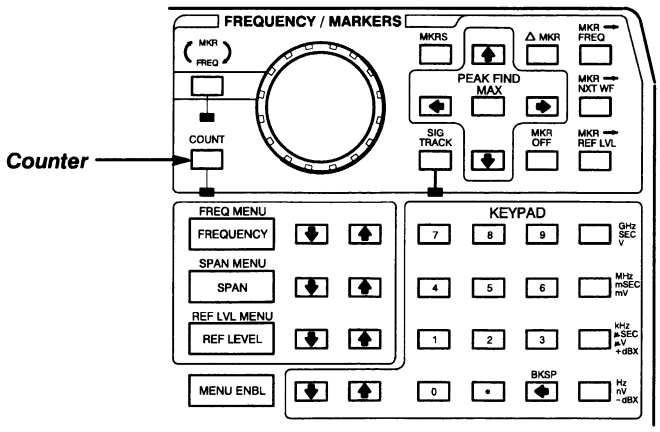


Figure 2-9: Count Key

Press **COUNT** to turn the counter function on and call up the **COUNTER** menu. The front-panel LED below the **COUNT** key will be lit while the counter function is on.

Table 2-4: COUNTER Menu

Menu/Selection Choice	Description
Counter ≪ON off≫	Turn the counter function off by selecting **OFF**. When the counter function is on, the signal at the center or marker position is counted with up to 1 Hz resolution at any frequency span.
Set Resolution	Assign the **KEYPAD** (temporarily) to set the counter resolution. The current **KEYPAD** assignment is `Counter Res:` followed by the current counter resolution. The signal must be 20 dB or more above the noise level and above a level that is 60 dB down from the reference level.

Markers (see Figure 2-10)

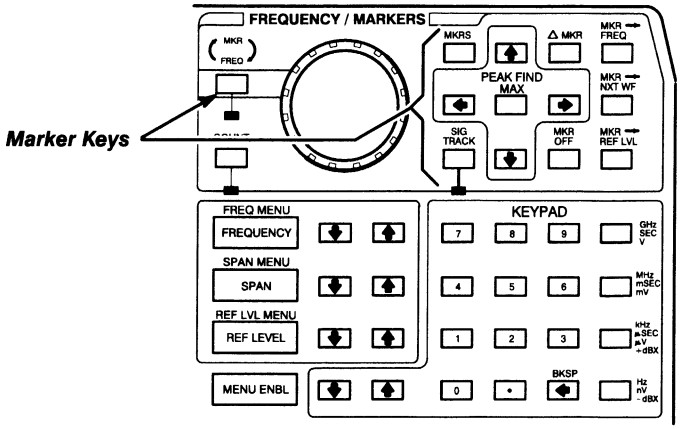


Figure 2-10: Marker Menu Selection

Press **MKRS** to turn on the primary marker, assign the **KEYPAD**, and assign the **FREQUENCY/MARKERS** knob to marker operation. In addition, one of the following messages will be briefly displayed.

Marker on "FULL" waveform.
Marker on "B" waveform.
Marker on "A" waveform.
Marker on "B – SAVE A" waveform.

This calls up the **MARKERS** menu and assigns the **KEYPAD** to marker frequency entry.

Table 2-5: MARKERS Menu

Menu/Selection Choice	Description
Marker ≪on OFF≫	Turn marker function on or off. **Marker ON** turns the primary marker on at center screen and the Mkr readout at the top of the screen displays marker frequency and amplitude. If the primary marker is already on, no action is taken to change the marker setup. **Marker ON** also assigns the **KEYPAD** to marker frequency and the **FREQUENCY/MARKERS** knob to marker operation. The front-panel MKR LED below the **MKR↔FREQ** key will be lit while the **FREQUENCY/MARKERS** knob is assigned to marker operation.
BW Marker Menu	Turn on and control the bandwidth markers.
BW Marker ≪ON off≫	**ON** turns on the bandwidth markers. **OFF** turns off the bandwidth markers and switches to the delta marker mode. The delta markers will occupy the same locations as the bandwidth markers. If the bandwidth markers are turned off using the front-panel **MKR OFF** key, both markers will be turned off.

Table 2-5: MARKERS Menu (Cont.)

Menu/Selection Choice	Description
Set BW Level	Assign the **KEYPAD** (temporarily) for direct entry of the bandwidth level for the bandwidth markers. The **KEYPAD** assignment will be `BW Mkr Lvl:` followed by the current bandwidth level.
Marker XdB Menu	Move the marker by a user-defined amount of dB to the left or right of the current position.
Move Marker XdB Left	Move the primary marker to the left by the number of dB set in with **Set Marker XdB Value**, while staying on the trace. If there is no level to the left of the primary marker that meets threshold parameters, a status message will be displayed.
Move Marker XdB Right	Move the primary marker to the right by the number of dB set in with **Set Marker XdB Value**, while staying on the trace. If there is no level to the right of the primary marker that meets threshold parameters, a status message will be displayed.
Set Marker XdB Value	Assign the **KEYPAD** (temporarily) to set the user-defined amount. The **KEYPAD** assignment will be `Mkr XdB:` followed by the current value. Terminate **KEYPAD** entry with **+dBX** or **−dBX**. Termination with **+dBX** will make the marker move up, while termination with the **−dBX** key will make the marker move down.
dB/Hz ≪on OFF≫	Activate the noise marker, then move it with the **KEYPAD** or the **FREQUENCY/MARKERS** knob, if it is assigned to marker tuning (LED lit).
Peak Find Menu	Allow selection of the signal type used for the front-panel **PEAK FIND** keys.
CW	Search for continuous wave signals and ignore spurious signals and impulses.
Pulse	Search for the peak of pulsed RF lobes.
Spur	Search for all signals, regardless of their frequency width or time present.
Threshold Menu	Select the threshold level used in the peak search process.
Auto ≪ON off≫	**ON** allows the instrument to set the minimum signal height used in the peak search process. **Auto ON** sets the threshold to slightly above the theoretical noise floor. **OFF** allows you to manually set the signal height with **Set Threshold**.
Set Threshold	Manually set the minimum signal height used in the peak search process.

Delta Markers (see Figure 2-10)

Press **ΔMKR** to turn the delta marker function on and call up the **DELTA MKR** menu. An extra line of readouts will be displayed directly below the **REF LEVEL** and **CENTER FREQUENCY** readouts. This line of readouts, enclosed in parentheses, gives the current level and frequency between the two markers.

When **ΔMKR** is pressed while an active waveform is displayed, two markers (a primary and a secondary) will be displayed. When delta markers are turned on, both the primary and secondary marker will be placed at the center frequency position (or tune dot position in max span). The primary marker will be of higher intensity than the secondary marker. Move the primary marker by using either the **KEYPAD** or the **FREQUENCY/MARKERS** knob.

Table 2-6: DELTA MKR Menu

Menu/Selection Choice	Description
Delta Mkr ≪on OFF≫	Turn delta marker function on and off. **OFF** turns off the delta markers mode. The instrument will switch to the single marker mode. The position of the single marker will be at the primary marker position (of the delta markers). If the delta markers are turned off using the front-panel **MKR OFF** key, both markers will be turned off.
Swap Ref Marker	Exchange the primary and secondary markers. The primary is shown as the brighter of the two bright dots on the screen. Only the primary marker is controller by the **KEYPAD** and the **FREQUENCY/MARKERS** knob.
Zoom Delta	Use delta marker end points to define new start/stop frequencies.

Marker Control Keys—The following dedicated keys are associated with marker operation. When any of the dedicated marker keys are pressed, a primary marker will be turned on if none is on.

MKR ↔ FREQ Key—Press this dedicated function key to shift the **FREQUENCY/MARKER** knob between frequency and marker tuning. The MKR indicator is lit when the primary marker can be moved with the **FREQUENCY/MARKERS** knob. When the MKR indicator is not lit, the knob adjusts center frequency and the primary marker does not change screen position. The delta marker (if on) does not change frequency, but it does change screen position. The primary marker frequency can be changed with the **FREQUENCY/MARKERS** knob, **KEYPAD** step keys, **PEAK FIND** keys, or over GPIB when the instrument is under remote control.

MKR OFF—Press to turn all marker functions off and assign the **FREQUENCY/MARKERS** knob to frequency tuning. (The **KEYPAD** will be assigned to center frequency only if it was assigned to marker frequency prior to markers being turned off.) All markers can also be turned off from the **MARKERS** menu with the Marker OFF soft key.

MKR → FREQ—Press to change the center frequency to bring the primary marker frequency to the center frequency. If markers are off, this key will turn the primary marker on at center frequency.

MKR → NXT WF—Press to move the primary marker between waveforms. If this key is pressed and there is only one waveform, a status message is displayed and the action is ignored. If markers are off, this key will turn a primary marker on at center frequency. This allows measurements on any displayed waveform or between any two waveforms.

MKR → REF LVL—Press to change the current reference level value to move the primary marker to the reference level. If markers are off, this key will turn a primary marker on at center frequency and raise it to the reference level.

← —Press the left arrow (marker to peak left) to find the next peak to the left of the current marker position that meets the search criteria established with the **Peak Find** menu (both signal type and above threshold). If there is no signal to the left of the primary marker that meets threshold and signal type parameters, a status message will be displayed on the screen. If markers are off, this key will turn a primary marker on at center frequency before doing the signal find.

→ —Press the right arrow (marker to peak right) to find the next peak to the right of the current marker position that meets the search criteria established with the **Peak Find** menu (both signal type and above threshold). If there is no signal to the right of the primary marker that meets threshold and signal type parameters, a status message will be displayed on the screen. If markers are off, this key will turn a primary marker on at center frequency before doing the signal find.

↑—Press the up arrow (marker to peak higher) to find the next peak above the current marker position that meets the search criteria established with the **Peak Find** menu (both signal type and above threshold). If there is no signal above the primary marker that meets threshold and signal type parameters, a status message will be displayed on the screen. If markers are off, this key will turn a primary marker on at center frequency before doing the signal find.

↓—Press the down arrow (marker to peak lower) to find the next peak below the current marker position that meets the search criteria established with the **Peak Find** menu (both signal type and above threshold). If there is no signal below the primary marker that meets threshold and signal type parameters, a status message will be displayed on the screen. If markers are off, this key will turn a primary marker on at center frequency before doing the signal find.

MAX—Press marker to MAX peak to find the highest amplitude on-screen signal above the threshold and match the type of signal specified (for example CW).

SIG TRACK—Press to perform the equivalent of a marker to peak and marker to frequency at the end of each sweep. This automatically maintains tuning of a drifting signal during a sweep if the drift is less than one half of the distance to the next signal. While signal tracking is on, the light below the key will be lit. A message will be displayed when there is no signal above the threshold. Set the threshold from the **MARKERS Threshold** menu. Excessive drift, turning markers off, or doing an instrument preset will disable signal tracking. As the signal drifts, the center frequency changes automatically to bring the signal and marker to the center of the display.

Tuning Markers

Move the primary marker with the front-panel **FREQUENCY/MARKERS** knob (when the MKR indicator is lit). Only the primary marker can be moved. The delta marker position can be changed only after the delta marker itself is made the primary marker. To change the position of the delta marker, select **Swap Ref Mkr** from the **DELTA MKR** menu to exchange the reference and delta markers. Move what is now the primary marker, and then select **Swap Ref Mkr** again to swap the markers back.

The primary marker normally moves over the fixed screen display. Primary marker tuning (both frequency and position) stops when the screen edge is reached while using the **FREQUENCY/MARKERS** knob. When two markers are displayed (delta marker mode) and the marker frequency, center frequency, and span are changed, the delta marker remains fixed at its original frequency and is allowed to move off the screen. If the primary marker and delta markers are swapped while the delta marker is off the screen, the display is centered on the frequency of the old delta marker (now the new primary marker). (The old primary marker, now the new delta marker, is placed off the screen.) The last amplitude of the delta marker is remembered when it goes off screen.

The marker tuning rate depends on the speed with which the **FREQUENCY/MARKERS** knob is turned. If the knob is turned very slowly, it moves the frequency or marker in small increments. If the knob is turned rapidly, it moves the frequency or marker in larger increments; always in a percent of span.

Resolution Bandwidth (see Figure 2-11)

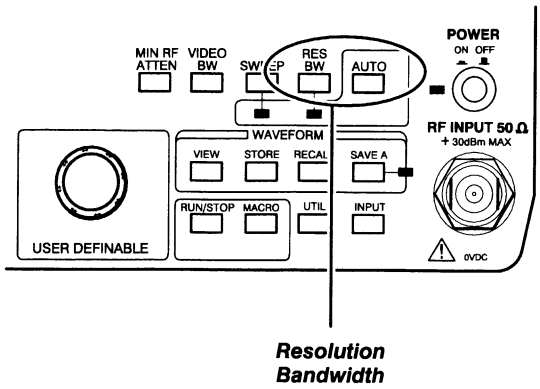


Figure 2-11: Resolution Bandwidth Keys

Press **RES BW** to call up the menu and assign the **KEYPAD** to control resolution bandwidth. The **KEYPAD** assignment will be `Res BW:` Valid selections are 1 kHz to 1 MHz in decade steps, and 3 MHz. In instruments with Option 07, the 100 kHz filter is replaced with a 300 kHz filter. The **KEYPAD** entry of a value not in a 1–10 sequence will use the geometrically nearest correct value. An out-of-range selection will display a status message and round the setting to the nearest valid selection. Sweep time is automatically selected to match the selected bandwidth when **Auto ON** is selected from the **SWEEP** menu. When **Auto ON** is also selected from the **Res BW** menu, resolution bandwidth is automatically selected based on the frequency span. When **Auto OFF** is selected from the **Sweep** menu, **Auto Res BW** picks the smallest resolution bandwidth that will maintain a calibrated display.

Table 2-7: RES BW Menu

Menu/Selection Choice	Description
Assign to User Def	Enable the **USER DEFINABLE** knob to increment and decrement the resolution bandwidth in the 1-10 sequence. Rotate the **USER DEFINABLE** knob clockwise to increase the resolution bandwidth to the next highest value (in the 1-10 sequence). Rotate the **USER DEFINABLE** knob counterclockwise to decrease the resolution bandwidth (in the 1-10 sequence).
Auto ≪ON off≫	Toggle automatic resolution bandwidth on and off. With **Auto ON**, the resolution bandwidth is automatically selected to maintain a calibrated display, if possible, for the selected span, sweep, video filter, and vertical display modes. When **Auto** is **ON** (in the **SWEEP** menu), resolution bandwidth is selected as a function of span only. Auto is turned off if resolution bandwidth is selected with either the **KEYPAD** or the **USER DEFINABLE** knob. The front-panel LED is lit when **Auto** is **ON**.

Table 2-7: RES BW Menu (Cont.)

Menu/Selection Choice	Description
Cal Factor ≪ON off≫	Select whether the calibration factors determined by the instrument should be used (after running the Vertical Cal routine in the **UTIL** menu). To see the current state of the calibration factors, select the **UTIL** menu then select **Corr & Err Menu**. Select **Int Meas Results** to display a table of the internal measurement results.

AUTO—Press to switch the resolution bandwidth and sweep to the automatic mode and illuminate the LEDs under the **RES BW** and **SWEEP** keys.

Minimum RF Attenuation (see Figure 2-12)

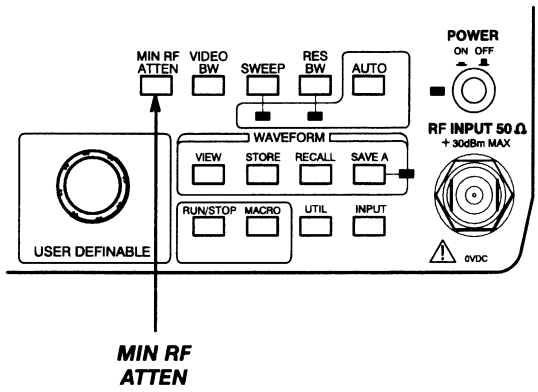


Figure 2-12: Minimum RF Attenuation Key

Press **MIN RF ATTEN** to call up the menu to set minimum RF attenuation, to set the RF attenuation/IF gain trade-off, and assign the **KEYPAD**. The **KEYPAD** assignment will be `Min Atten:` followed by the current value. This value is the lowest value of input attenuation that will be used when the reference level is selected. This allows you to protect the front end of the 2792 against overload or damage from excessive signal level into the 1st mixer. Actual attenuation is set according to the minimum RF attenuation, reference level, minimum noise, and minimum distortion selections and is displayed on the CRT. If the minimum RF attenuation setting is increased, the IF gain is automatically changed to maintain the current reference level, if possible. The normal position is 0 to obtain the best noise level performance. The **KEYPAD** increment and decrement keys will step in 10 dB steps. A value entered with the **KEYPAD** that is not in multiples of 10 dB will be rounded up to the nearest correct value (for example, entering 23 dB will become 30 dB of attenuation).

Table 2-8: MIN ATTEN Menu

Menu/Selection Choice	Description
Assign to User Def	Enable the **USER DEFINABLE** knob to increment and decrement the minimum RF attenuation in 10 dB steps from a minimum of 0 dB to a maximum of 60 dB.
Min Noise ≪ON off≫	Toggles the minimum noise mode on and off. The noise level is reduced by changing the RF attenuation and IF gain used for a particular reference level. Both are reduced 10 dB so noise generated in the IF stages is decreased; however, intermodulation distortion products will increase. RF attenuation must be at least 10 dB more than the minimum RF attenuation setting for this selection to have any effect.
Min Distrn ≪on OFF≫	Toggles the minimum distortion mode on and off. Intermodulation distortion products are minimized.
Redcd Gain ≪on OFF≫	Toggles the reduced gain mode on and off.

Sweep (see Figure 2-13)

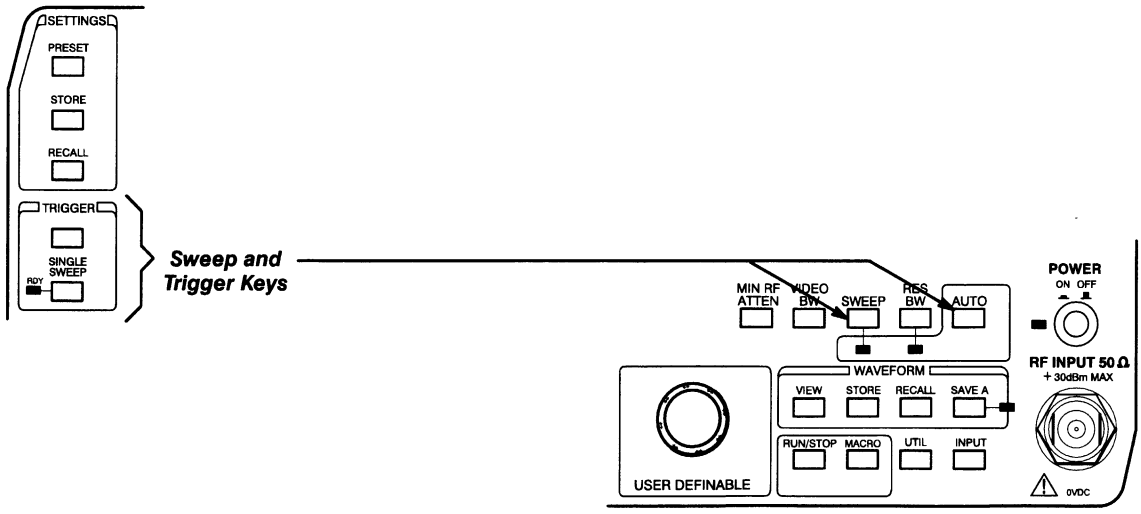


Figure 2-13: Sweep and Trigger Keys

Press **SWEEP** to call up the menu and assign the **KEYPAD** to sweep speed. The **KEYPAD** assignment will be `Sweep:` followed by the current value. The **KEYPAD** increment and decrement keys will step in a 1-2-5 sequence ranging from 200 µs to 100 s. If a **KEYPAD** entry is not in the 1-2-5 sequence, it will be changed to the nearest correct value. Press the **KEYPAD** increment key to select the next fastest sweep speed, and select the **KEYPAD** decrement key to select the next slowest sweep speed.

Table 2-9: SWEEP Menu

Menu/Selection Choice	Description
Assign to User Def	Enable the **USER DEFINABLE** knob to change the sweep speed. Rotate the **USER DEFINABLE** knob clockwise to select the next fastest sweep speed, and rotate the **USER DEFINABLE** knob counterclockwise to select the next slowest sweep speed.
Auto ≪ON off≫	Toggles the automatic sweep mode on and off. **ON** automatically selects the fastest sweep rate to maintain a calibrated display for most span, resolution bandwidth, video filter, and vertical display selections. Select a sweep speed with either the **KEYPAD** or **USER DEFINABLE** knob to turn **Auto OFF**. The front-panel LED is lit when **Auto** is **ON**.
Source ≪INT ext≫	Toggles the source for the sweep signal between internal and external. **EXT** allows the sweep circuit to be driven by a signal applied to the rear-panel HORIZ|TRIG connector. A voltage ramp of 0 to +10 V will sweep 10 divisions of horizontal (X) axis.
Man Sweep ≪on OFF≫	***CAUTION*** *Do not allow a high-intensity dot to remain stationary on the CRT. The CRT phosphor could be permanently damaged.* Toggles the manual sweep mode on and off. When this mode is on, the front-panel **MANUAL SCAN** knob is used to sweep the spectrum.

NOTE

All sweep data entry refers to the entire screen (that is, 50 s sweep corresponds to a sweep speed of 5 s/div).

AUTO—Press to switch the sweep speed to the automatic mode and illuminate the LED under the **SWEEP** key.

Trigger (see Figure 2-13)

Press **TRIGGER** to call up the menu to select the source of the trigger. If the instrument was previously in the Single Sweep mode, it will be removed from Single Sweep mode and placed in the Continuous Sweep mode. The trigger source will remain unaffected.

Table 2-10: TRIGGER Menu

Menu/Selection Choice	Description
≪FREE RUN≫	Allow the sweep to free run without regard to trigger source. Other triggering selections (including single sweep) are cancelled.
≪internal≫	Allow the sweep to be triggered by any signal at the left edge of the display that has an amplitude of 2.0 divisions or more. Other triggering selections (including single sweep) are cancelled.

Table 2-10: TRIGGER Menu

Menu/Selection Choice	Description
≪line≫	Allow a sample of the AC power line voltage to trigger the sweep. Other triggering selections (including single sweep) are cancelled.
≪external≫	Allow the sweep to be triggered by signals that are applied through the rear-panel HORIZ|TRIG (EXT IN) connector. Other triggering selections (including single sweep) are cancelled.

SINGLE SWEEP—Press to place the 2792 in the Single Sweep mode and stop the current sweep. Successive presses will sweep the spectrum once. The RDY light next to **SINGLE SWEEP** is lit while the sweep is either waiting for a trigger or running. Press **TRIGGER** to return to the Continuous Sweep mode and call up the **TRIGGER** menu.

Video Bandwidth (see Fig. 2-14)

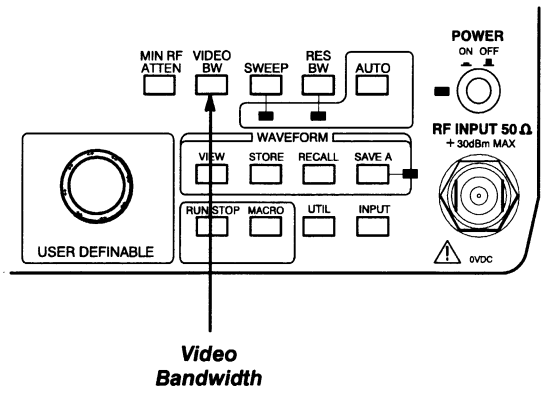


Figure 2-14: Video Bandwidth Key

Press **VIDEO BW** to call up the menu to set the video filter. This will smooth the amount of displayed noise.

Table 2-11: VIDEO BW Menu

Menu/Selection Choice	Description
≪FULL≫	Set the video filter to its maximum value; it will not track the resolution bandwidth. When **FULL** is selected, neither of the other two selections are available.
≪wide≫	Set video filter to $^1/_{33}$ of the resolution bandwidth. **WIDE** reduces video bandwidth and high-frequency components for display noise averaging. When **WIDE** is selected, neither of the other two selections are available.
≪narrow≫	Set video filter to $^1/_{333}$ of the resolution bandwidth. **NARROW** reduces video bandwidth and high-frequency components for display noise averaging. When **NARROW** is selected, neither of the other two selections are available.

AUTO Instrument Operation

Press **RES BW** to call up the menu and assign the **KEYPAD** to control resolution bandwidth. Sweep time is automatically selected to match the selected bandwidth when **Auto ON** is selected from the **SWEEP** menu. When **Auto ON** is also selected from the **RES BW** menu, resolution bandwidth is automatically selected based on the frequency span. When **Auto ON** is selected from the **SWEEP** menu, Auto resolution bandwidth picks the smallest resolution bandwidth that will maintain a calibrated display.

These keys and menus control the frequency span, the zero and max span modes, the resolution bandwidth, and the video bandwidth.

The instrument will maintain a calibrated display when possible if the sweep and resolution bandwidth are in the automatic mode (the AUTO indicators for **RES BW** and **SWEEP** will be lit).

The 2792 performs like a tunable receiver when the frequency span is zero. Time domain characteristics are displayed within the selected resolution bandwidth. Characteristics like modulation pattern and pulse repetition rates can now be analyzed with triggering selections. Resolution bandwidth is usually set to its maximum value of 3 MHz for time domain analysis of the signal. The current state of the zero span mode is highlighted at the Zero Span selection.

Waveform Recall (see Figure 2-15)

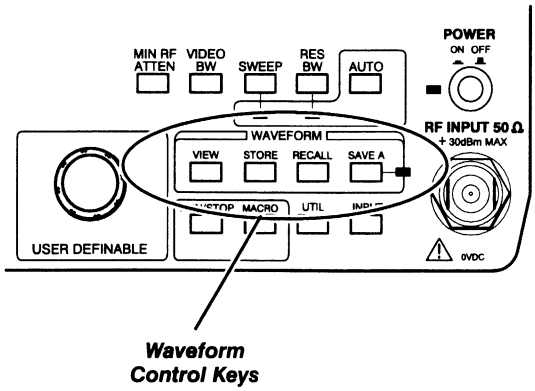


Figure 2-15: Waveform Control Keys

Press **WAVEFORM RECALL** to assign the **KEYPAD** and call up a register list. The **KEYPAD** is assigned to register list (0 to 8) entry. The register list shows the center frequencies and register location of currently stored displays. After a register number is selected, the register list and the menu will be replaced by the previous full-screen display. See Figure 2-16 for an example of the WF STORE and STORE register list.

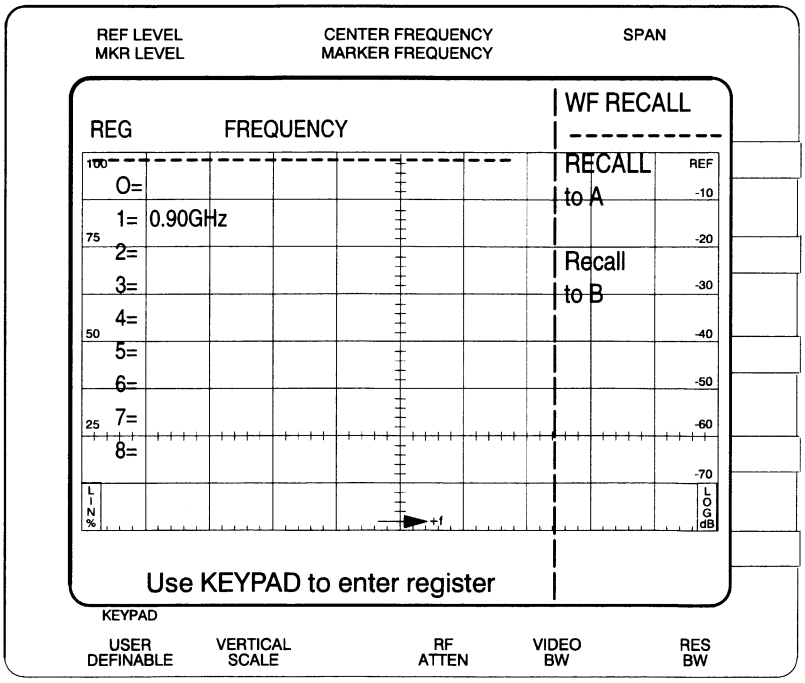


Figure 2-16: Waveform Control Register List

Table 2-12: WF RECALL Menu

Menu/Selection Choice	Description
RECALL TO A	Recall the selected waveform with its readout and marker(s) from the selected register to the A display for viewing. The readout for a recalled A waveform will only be displayed if **View B** and **B – Save A** are **OFF** and **View A** is **ON** (see the **WF VIEW** menu for selections). **SAVE A** is activated (front-panel LED lit) to allow the separate display of the A or B waveform. The marker(s) will only be displayed if markers are turned on.
Recall to B	Recall the selected waveform with its readout and marker(s) from the selected register to the B display for viewing. The readout for a recalled B waveform will only be displayed if **View B** or **B – Save A** are **ON** (see the **WF VIEW** menu for selections) and **SINGLE SWEEP** is selected. **SINGLE SWEEP** must be on before recalling a waveform to B to prevent overwriting by the sweep. The waveform cannot be recalled into B when in manual or external sweep. **SAVE A** is activated (front-panel LED lit) to allow the separate display of the A or B waveform. The marker(s) will only be displayed if markers are turned on.

Waveform Store (see Figure 2-15)

Press **WAVEFORM STORE** to assign the **KEYPAD** and call up a register list. The **KEYPAD** is assigned to register list (0 to 8) entry. The register list shows the center frequencies and register location of stored displays. The number of digits in a center frequency is an indication of the span of that stored display (a larger number of digits indicates a narrower span). After a register number is selected to store the waveform, the register list and the menu will be replaced by the previous full-screen display.

Table 2-13: WF STORE Menu

Menu/Selection Choice	Description
STORE FROM A	This selection will be available only when **SAVE A** is **ON** (front-panel LED lit). Store the A waveform and its associated readout and marker(s) in one of the memory registers. Select a register number from 0 to 8 to store the waveform.
Store from B	This selection will be available only when **SAVE A** is **ON** (front-panel LED lit). Store the B waveform and its associated readout and marker(s) in one of the memory registers. Select a register number from 0 to 8 to store the waveform.

Waveform View (see Figure 2-15)

Press **WAVEFORM VIEW** to call up the **WF VIEW** menu to select waveforms for viewing.

Table 2-14: WF VIEW Menu

Menu/Selection Choice	Description
View A ≪ON off≫	Toggle between **View A ON** and **OFF** status. **ON** causes the A waveform to be displayed. If **SAVE A** is on and only the A waveform is being viewed, the CRT readout will show the settings when the A waveform was stored.
View B ≪On off≫	Toggle between **View B ON** and **OFF** status.
Max Hold ≪on OFF≫	Toggle between **Max Hold ON** and **OFF** status. This causes digital storage to retain the maximum signal amplitude at every storage location (500 locations; or 1000 locations if **SAVE A** is **OFF**). If **SAVE A** is on, the A waveform is not affected. Use **MAX HOLD** to measure frequency drift or peak amplitude excursions of a signal.

Table 2-14: WF VIEW Menu (Cont.)

Menu/Selection Choice	Description
B – Save A ≪on OFF≫	Toggle between **B – Save A ON** and **OFF** status. **ON** causes the 2792 to display the difference between the B waveform and the A waveform and automatically turn on **SAVE A**. The factory-set zero reference line is mid-screen, and positive differences are displayed above this line and negative differences below. Refer any change in the position of the zero reference line to authorized service personnel.
Pk/Avg Menu	Set the position of the peak/average cursor.
Assign to User Def	Enable the **USER DEFINABLE** knob to set the position of the peak/average cursor. Video signals above the cursor are peak detected, and video signals below the cursor are digitally averaged. Rotate the **USER DEFINABLE** knob clockwise to move the cursor toward the top of the screen, and rotate the **USER DEFINABLE** knob counterclockwise to move the cursor toward the bottom of the screen.
Set to Average	Set the vertical position of the peak/average cursor to the top of the screen. Video signals below the cursor are digitally averaged.
Set to Peak	Set the vertical position of the peak/average cursor to the bottom of the screen. Video signals above the cursor are peak detected.

SAVE A—Press to save and turn on the A waveform if it is currently off. The LED next to **SAVE A** will be lit when the function is active. When active the A waveform and its readout are saved. The readout stored with the waveform is displayed if both **SAVE A** and **VIEW A** are **ON** and **VIEW B** and **B – SAVE A** are **OFF** (if either **VIEW B** or **B – SAVE A** is **ON**, the readout reflects the current 2792 settings). Turning **SAVE A** off cancels **B – SAVE A**. If **SAVE A** is off and either **VIEW A** or **VIEW B** is **ON**, both waveforms will be displayed. The A waveform is not updated by the sweep if **SAVE A** is on.

Display (see Figure 2-17)

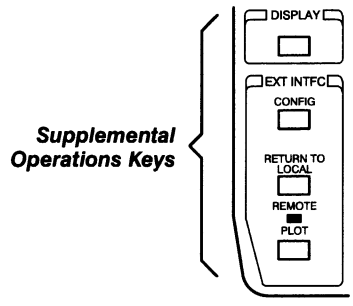


Figure 2-17: Supplemental Operations Keys

Press **DISPLAY** to call up the **DISPLAY** menu to adjust and control the instrument CRT, graticule illumination, readouts, screen blanking, and pulse stretcher function.

Table 2-15: DISPLAY Menu

Menu/Selection Choice	Description
CRT Adjust Menu	Adjust the CRT intensity and horizontal and vertical display position.
Intensity Adjust	Adjust the CRT intensity. Control is assigned to the **USER DEFINABLE** knob. Rotate the **USER DEFINABLE** knob clockwise to increase the intensity or counterclockwise to decrease the intensity. Press **–dBX** when done to terminate the activity and fix the setting in memory, or press **ESC** to abort the activity and leave the intensity as it is.
Dsply Pos Vert Adj	Adjust the CRT vertical position. Control is assigned to the **USER DEFINABLE** knob. Rotate the **USER DEFINABLE** knob clockwise to move the trace up or counterclockwise to move the trace down. Press **–dBX** when done to terminate the activity and fix the setting in memory, or press **ESC** to abort the activity and leave the vertical position as it is.
Dsply Pos Horz Adj	Adjust the CRT horizontal position. Control is assigned to the **USER DEFINABLE** knob. Rotate the **USER DEFINABLE** knob clockwise to move the trace to the right or counterclockwise to move the trace to the left. Press **–dBX** when done to terminate the activity and fix the setting in memory, or press **ESC** to abort the activity and leave the horizontal position as it is.
Grat Illum ≪on OFF≫	Toggle the graticule lights on and off.
Readout ≪ON off≫	Toggle the CRT readouts on and off.
Bsln Clip ≪on OFF≫	Toggle the blanking or unblanking of the bottom one and one-half divisions of the spectrum display.
Pulse Str ≪on OFF≫	Toggle the pulse stretcher function on and off. **ON** causes the fall time of pulse signals to be increased so very narrow pulses can be seen. The effect is most apparent for pulsed RF signals where pulse width is small compared to one division of sweep time. Pulse stretcher operation may be necessary for a digital storage display of such signals to ensure that the correct amplitude is displayed.

External Interface Configuration (Figure 2-17)

Press **CONFIG** to call up the menu to control plotter selection, GPIB, and service request activity.

Table 2-16: CONFIG Menu

Menu/Selection Choice	Description
Plotter Menu	Select the plotter connected to the GPIB port. Only one plotter type can be selected (from either menu 1 or menu 2) at a time. The plotter selection will be saved in memory until a different plotter is selected.
Pltr Type Menu 1	Select the type of Tektronix, Inc. plotter to be connected to the GPIB port.
TEK4662	Select the Tektronix type 4662 color plotter to be connected to the GPIB port.
TEK4662 Opt. 31	Select the Tektronix type 4662 Option 31 color plotter to be connected to the GPIB port.
HC100	Select the Tektronix type HC100 color plotter to be connected to the GPIB port.
Pltr Type Menu 2	Select the type of non-Tektronix plotter to be connected to the GPIB port.
HP7470A	Select the Hewlett-Packard HP7470A plotter to be connected to the GPIB port.
HP7475A	Select the Hewlett-Packard HP7475A color plotter to be connected to the GPIB port.
Set B – Save A Offset	Assign the **KEYPAD** to the **Set B – Save** offset used when plotting the B – Save waveform. The **KEYPAD** assignment will be `Set B-Save Offset:` followed by the current value for the **Set B – Save** Offset. The power-up default value for the **Set B – Save Offset** is 125; the range is 0 to 255.
GPIB Menu	Select instrument operating GPIB functions.
Set GPIB Address	Assign the **KEYPAD** (temporarily) to select the GPIB address. The selected address will be active immediately upon pressing any terminator key. The **KEYPAD** assignment will be `GPIB Address:` followed by the current GPIB address. The factory default (*not* power-up default) GPIB address is 1.
49X Mode ≪on OFF≫	Toggle the 49X mode of operation on and off. This includes some of the commands in the GPIB language; see GPIB Interface Specification in *Section 3, Reference*.
Operation Mode Menu	Change the operating parameters of the GPIB port.
Terminator ≪If EOI≫	Toggle the GPIB string termination between line feed (LF) and end or identify (EOI).
Talk Only ≪on OFF≫	Toggle the GPIB talk-only function on and off.
Listen Only ≪on OFF≫	Toggle the GPIB listen-only function on and off.

Table 2-16: CONFIG Menu (Cont.)

Menu/Selection Choice	Description
Send SRQ	Send an immediate service request over GPIB.

PLOT—Press to send plotting information to the plotter connected to the GPIB port. See the **CONFIG** menu to select the correct plotter interface.

RETURN TO LOCAL—Press to immediately unlock the front panel during GPIB control (unless local lock out is enabled; refer to the ***2790 Series Programmer Manual*** for additional information).

Settings Store (see Figure 2-18)

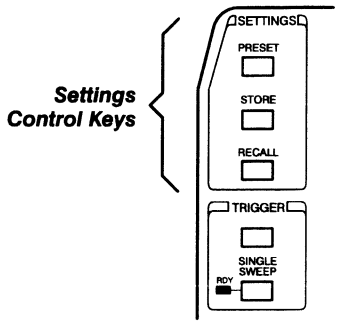


Figure 2-18: Settings Control Keys

Press **SETTINGS STORE** to call up the **SET STORE** menu. There are no menu/selection choices in this menu. A register list is displayed and the **KEYPAD** is assigned to register list entry. The menu area on the right of the register list will be empty.

A list of the currently stored settings will be displayed by register and frequency. In addition, the power-down settings will be stored in register zero at power down. See Figure 2-19 for an example of the SET STORE (and SET RECALL) register list.

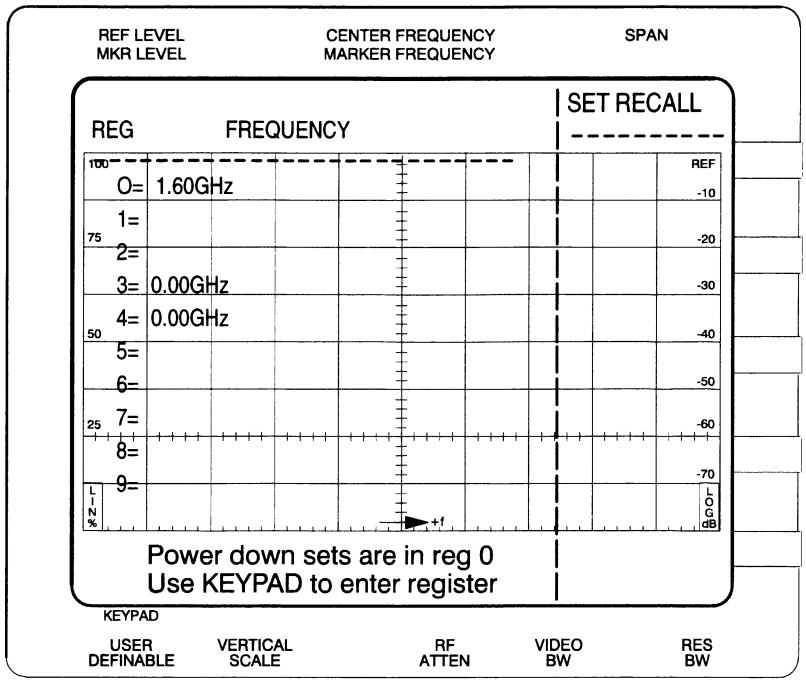


Figure 2-19: Settings Sample Register List

Immediately after a register number is pressed, the message `STORING REGISTER #` will be displayed, where # is the number of the register being stored; then the message, menu, and register will be replaced by the full screen display.

Settings Recall (see Figure 2-18)

Press **SETTINGS RECALL** to call up the **SET RECALL** menu. There are no menu/selection choices in this menu. A register list is displayed and the **KEYPAD** is assigned to register list entry. The menu area on the right of the register list will be empty.

A list of the currently stored settings will be displayed by register and frequency. In addition, the last power-down settings are contained in register zero. See Figure 2-19 for an example of the SET RECALL (and SET STORE) register list.

Immediately after a register number is pressed, the message `RECALLING REGISTER #` will be displayed, where # is the number of the register being recalled; then the message, menu, and register will be replaced by the full screen display.

PRESET—Press to recall the power-up (factory default) settings.

Input (see Figure 2–20)

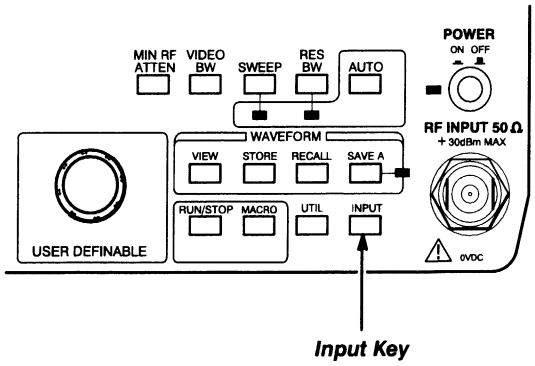


Figure 2-20: Input Key

Press **INPUT** to call up the menu to control the input modes and menu selections listed in Table 2-17.

Table 2-17: INPUT Menu

Menu/Selection Choice	Description
Identify ≪on OFF≫	Toggle the Identify mode on and off to determine real signals from false signals. See Using the Signal Identifier in *Section 3, Reference* for more information. Identify is available in coaxial bands 1 through 5 in spans of 500 kHz or less. For external mixer bands (Option 04 only), Identify is available in bands 1 through 5 for spans of 500 kHz or less and in bands 6 and above for spans of 500 MHz or less. If Identify is turned on at spans where the function is not allowed, the warning message `Identify is not allowed in present span` will be displayed and the Identify function will remain off.
Peak Menu	Select the **Peak** menu to adjust the peaking value for use with external mixers or preselector. The **KEYPAD** is assigned to the peaking number. The **KEYPAD** assignment text will be `Peaking:` followed by the current peaking value. The **Peak** menu is not available in frequency range 1 when using internal mixers. If it is selected under these conditions, or if the instrument is changed to these conditions while **Peak** menu is selected, the error message `Peaking available only for preselector/ext mixer` will be displayed.
Assign to User Def	Allow the peaking value to be changed with the **USER DEFINABLE** knob. Turn the **USER DEFINABLE** knob clockwise to increase the number applied to the peaking DAC. Turn the **USER DEFINABLE** knob counterclockwise to decrease the number applied to the peaking DAC.

Table 2-17: INPUT Menu (Cont.)

Menu/Selection Choice	Description
Auto Peak	Initiate the firmware routine that tries to determine the optimum peak value. While the routine is running, the word `PEAKING` will be displayed on readout line four.
Recall Default	Recall a default value from NVRAM, and use it for the new peaking value.
Store Default	Store a new default value in NVRAM.
50 Ohm In ≪ON off≫	Toggle calibrated 50 Ω measurement capability on and off (instruments with Option 04 or Option 07only).
75 Ohm In ≪on OFF≫	Toggle calibrated 75 Ω measurement capability on and off (instruments with Option 07 only).
Ext Mixer ≪on OFF≫	Toggle external mixer capability on and off (instruments with Option 04 only). When the external mixer capability is **ON**, the RF input is disabled. The **EXTERNAL MIXER** port is the bias source for external mixers, as well as the IF input to the 2792. The external mixer capability is indicated by EXT on the CRT in place of RF ATTEN. Not available in instruments with Option 07 installed.
Ext Mixer Loss Menu	Set external mixer loss/gain of a mixer connected to the **EXTERNAL MIXER** port (instruments with Option 04 only). Not available in instruments with Option 07 installed.
Auto ≪ON off≫	Toggle the automatic external mixer loss/gain selection on and off.
Manual ≪on OFF≫	Toggle the manual external mixer loss/gain selection on and off.
Set Manual Mixer Loss	**KEYPAD** is assigned (temporarily) to manual entry of the loss/gain. The **KEYPAD** assignment will be `Mixer Loss:` followed by the current value of the loss (a positive value is a loss). Terminate the entry with **+dBX** or **−dBX**. Use **+dBX** if the number entered is a loss, and use **−dBX** if the number entered is a gain.

Utility (see Figure 2-21)

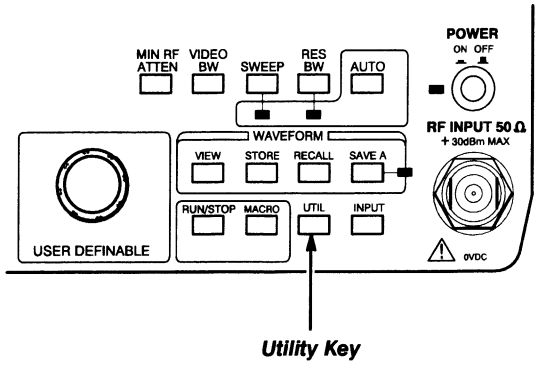


Figure 2-21: Utility Key

Press **UTIL** to call up the menu to adjust and control the instrument special modes and status.

Table 2-18: UTIL Menu

Menu/Selection Choice	Description
Vertical Cal	Call the current front-panel calibration routine. While the routine is running, a screen display will indicate that the routine is continuing, and an abort function is available to halt the routine.
Special Modes Menu	Call up various instrument modes to customize the instrument to your specific application.
Track Gen ≪on OFF≫	Toggle tracking generator mode on and off.
Side Band ≪on OFF≫	Toggle the side band analyzer mode on and off.
EOS Corr ≪on OFF≫	Toggle the end of sweep corrections mode on and off.
Z-Spn Time ≪on OFF≫	Toggle the zero span time mode on and off.
Freq Dsply Menu	Select what is displayed on the CRT in the center frequency readout.
CENTER FREQUENCY	Display current center frequency at readout location.
1st LO	Display 1st LO frequency at center frequency readout location.
2nd LO	Display 2nd LO frequency at center frequency readout location.
3rd IF	Display 3rd intermediate frequency at center frequency readout location.

Table 2-18: UTIL Menu (Cont.)

Menu/Selection Choice	Description
Corr and Error Menu	Display the results of the internal calibration routines and the current instrument status.
Int Meas Results	Display the instrument internal measurement results from the last vertical cal calibration cycle.
Current Status	Display the instrument current status. This includes the instrument type, firmware version, front-panel version, and any status messages that have not been cleared (see Figure 2-22).

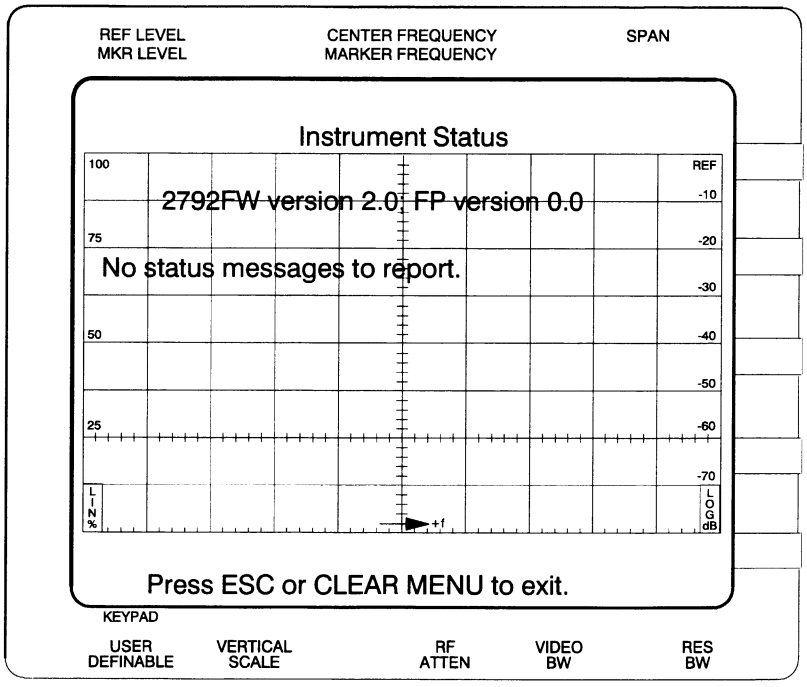


Figure 2-22: Instrument Status Screen Display

Macro (see Figure 2-23)

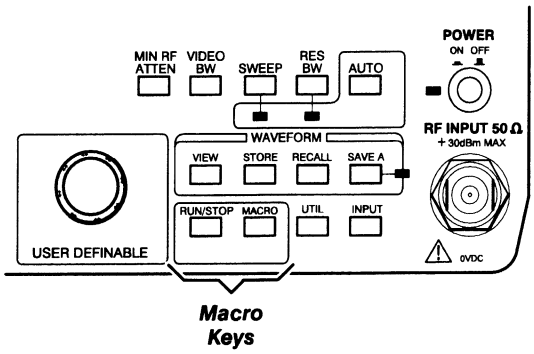


Figure 2-23: Macro Keys

Press **MACRO** to call up the **MACRO** menu and assign the **KEYPAD** for register entry. A register list is displayed, and each register may contain programmed sequences. With the **KEYPAD**, select a number to run the macro stored in that register. When a register number is selected, the message `RUNNING REGISTER #` is displayed. After the register number is selected, the message, register list, and menu are replaced by the previous screen display.

Table 2-19: MACRO Menu

Menu/Selection Choice	Description
Abort Macro	The current macro is stopped. To re-run the macro, select the appropriate register number with the **KEYPAD**.
Restore Readout	Return the screen to the previous waveform display.

RUN/STOP—Press **RUN/STOP** to pause a macro and restart it, or restart a stopped macro.

Input/Output Connectors

Described here are all of the 2792 front- and rear-panel input and output connectors.

Front Panel (see Figure 2-24)

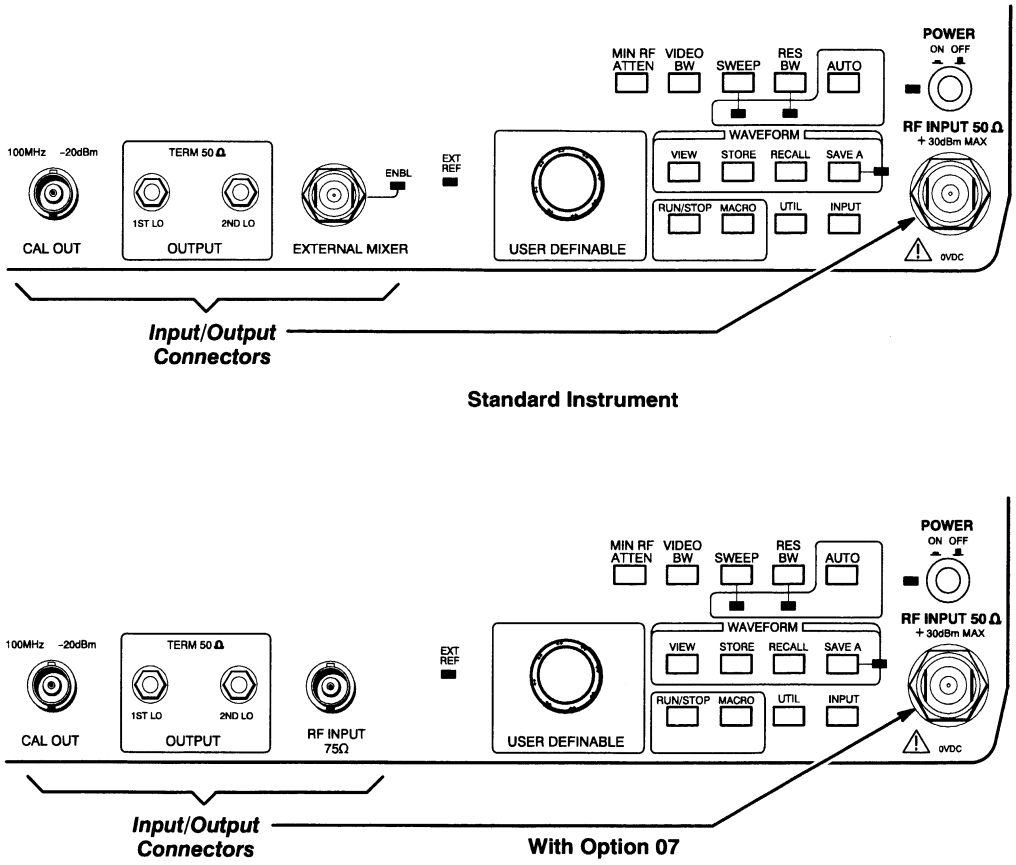


Figure 2-24: Front-panel Input/Output Connectors

RF INPUT 50 Ω—This 50 Ω coaxial input connector is for RF signals to 21 GHz. If the input signal has a DC component, use a blocking capacitor in line with the signal.

CAUTION

The maximum, non-destructive input signal level to the input mixer is +30 dBm to the input of the 2792.

The maximum rating of the RF attenuator is +30 dBm (1 W average, 75 W peak pulse with 1 ms or less, with a duty cycle that does not exceed 0.001). Burn-out occurs above 1 W. If the Minimum Noise mode and/or the Reduced Gain mode is active, the +30 dBm rating may be exceeded if the signal level is increased to a full-screen display. Under these conditions, the full-screen input level may be as much as *+50 dBm. Reduce the level of high-powered signals with external attenuators. Input signals to the mixer must not contain any DC component.*

CAL OUT (Calibrator output)—This connector is the source of a calibrated −20 dBm, ±0.3 dB, 100 MHz signal and a comb of frequency markers 100 MHz apart. This 100 MHz source is the instrument reference frequency. In Option 07 instruments using the 50 Ω input, the signal is the same as the standard instrument, and using the 75 Ω input, the signal is +20 dBmV, ±0.5 dB.

OUTPUT (1st LO/2nd LO)—These connectors are the outputs of the respective local oscillators. The connectors must be terminated into 50 Ω when they are not connected to an external device.

EXTERNAL MIXER—When the External Mixer function is selected (from the **INPUT** menu), this connector is the bias source for external mixers as well as the IF input to the 2792. The External Mixer mode is indicated by EXT on the CRT readout in place of RF attenuation.

RF INPUT 75 Ω—(Option 07 instruments only.) This connector provides calibrated 75 Ω measurement capability.

Rear Panel (see Figure 2-25)

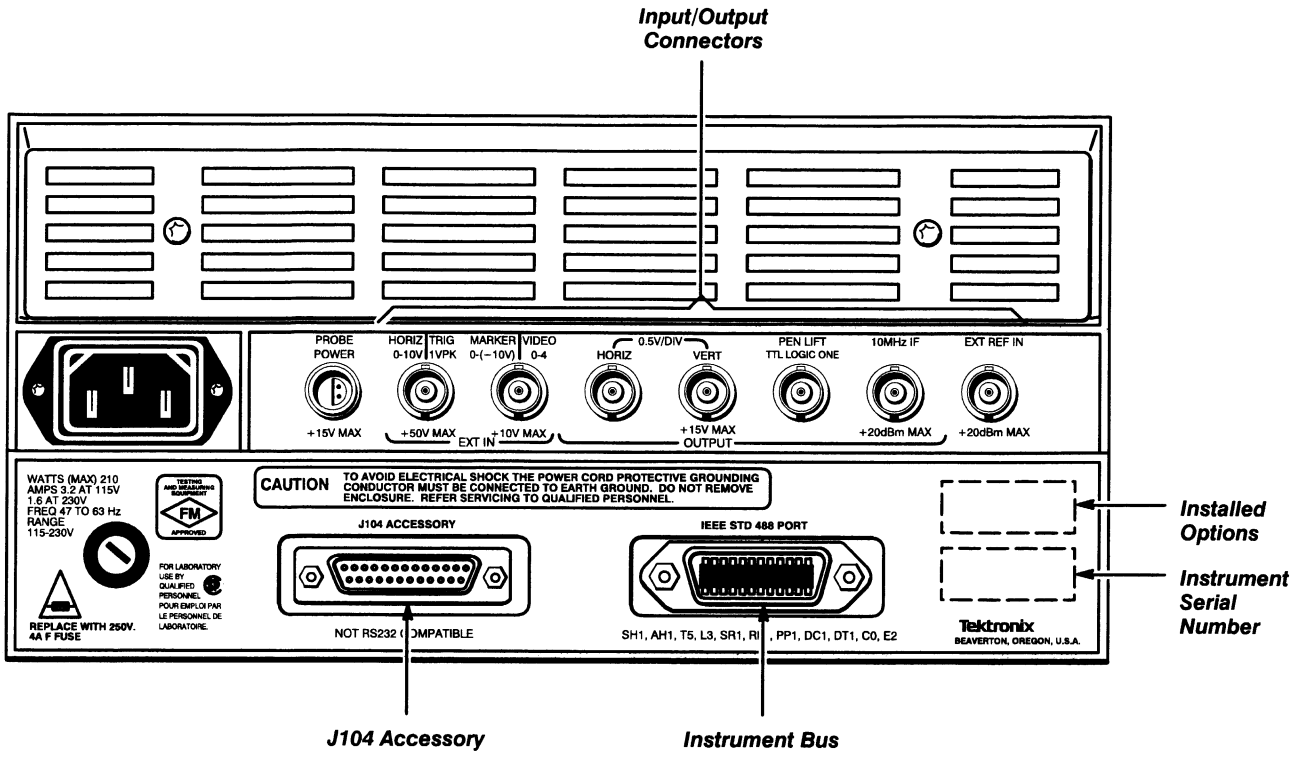


Figure 2-25: Rear-panel Input/Output Connectors

PROBE POWER—This connector provides operating power for active probe systems. This connector should be used only with compatible probes or accessories specifically designed for use with this power source.

HORIZ|TRIG (EXT IN)—Horizontal or triggering modes depend on the triggering and sweep selections. In the External Triggering mode, the connector is an AC coupled input for trigger signals. Trigger amplitudes from 1.0 V to 50 V peak, with a 0.1 μs minimum pulse width or within the frequency range of 15 Hz to 500 kHz, are required for triggering. When the sweep selection is external, the connector is a DC coupled input for horizontal sweep voltages. Deflection sensitivity is 1 V/div. A 0 to +10 voltage will deflect the beam across the screen from left to right.

MARKER|VIDEO (EXT IN)—This connector interfaces the 2792 with a Tektronix 1405 TV Adapter to display an externally generated marker. This connector also receives video signals.

HORIZ (OUTPUT)—This connector supplies a 5 V/div horizontal signal. Full range is −2.5 V to +2.5 V. Source impedance is approximately 1 kΩ.

VERT (OUTPUT)—This connector provides access to the video signal with 0.5 V for each division of displayed video that is above and below the center line. Source impedance is approximately 1 kΩ.

NOTE

Both HORIZ and VERT output signals are driven from digital storage if it is on. Both signals are driven from the 2792 sweep and video amplifier stage if digital storage is off.

PEN LIFT (OUTPUT)—This connector provides access to a TTL compatible signal to lift the pen of a chart recorder during 2792 sweep retrace. This signal is always derived from the 2792 sweep, regardless of the selection of the digital storage.

10 MHz IF (OUTPUT)—This connector provides access to the output of the 10 MHz IF.

EXT REF IN—A 50 Ω input for a 1, 2, 5, or 10 MHz external reference signal, within −15 dBm to +15 dBm level. Phase noise should be no greater than −110 dBc in a 1 Hz bandwidth at 10 Hz offset, referenced to 10 MHz. Input signal must be a sinewave with a duty cycle symmetry of 40% to 60% or ECL or TTL.

J104 ACCESSORY—This connector provides bi-directional access to the instrument bus. It is not RS232 compatible. A TTL 0 applied to pin 1 selects External Video. Video signals, which are applied to rear-panel MARKER|VIDEO, are connected to the video path ahead of the video filters.

IEEE STD 488 PORT (GPIB)—This connector interfaces the 2792 to the selected plotter, and to GPIB. The interface functions provided in the 2792 are listed in Table 2-20.

Table 2-20: Interface Functions

Function	2792
Source Handshake	SH1
Acceptor Handshake	AH1
Talker	T5
Listener	L3
Service Request	SR1
Remote/Local	RL1
Parallel Poll	PP1
Device Clear	DC1
Device Trigger	DT1
Controller	C0

Signal Application

Signal frequencies to 21 GHz can be applied through a short, high-quality, 50 Ω coaxial cable to the **RF INPUT** connector. These signals pass through an internal RF attenuator to the 1st mixer. The 2792 automatically selects either a low-pass filter or tuned preselector (depending on frequency range) between the RF attenuator and the 1st mixer.

An external mixer can be used when Option 04 is installed (not applicable to instruments with Option 07 installed) by connecting it through the diplexer (optional accessory) to the **EXTERNAL MIXER** port. Signals from the external mixer by-pass the internal RF attenuator, preselector, and 1st mixer. External mixers above 21 GHz, and their applications, are described in detail later in this section.

RF INPUT Connector

The nominal input impedance of the coaxial **RF INPUT** is 50 Ω, and 75 Ω on the optional **75 Ω INPUT** (Option 07). Because cable losses can be significant at microwave frequencies, it is important to keep the cables as short as possible. Impedance mismatch between the signal source and the **RF INPUT** will produce reflections that degrade flatness, frequency response, and sensitivity. It may also increase spurious responses. Impedance mismatch can be caused by poor connections, incorrect signal source impedance, and long or low-quality coaxial cable. When optimum flatness or frequency response is desired and signal strength is adequate, set the minimum RF attenuation to 10 dB or more. The addition of the attenuator helps minimize reflections to improve the input characteristics.

CAUTION

*The **RF INPUT** of the 2792 is specified at +30 dBm maximum. It is possible to set the reference level to +50 dBm with minimum noise activated. If the signal level is increased for a full-screen display, the input level will exceed the power rating of the attenuator. Do not apply any DC potential to the **RF INPUT**. Use a DC block if a signal is riding on any DC potential. For DC block ordering information, contact your local Tektronix field office or representative.*

Spurious responses can be minimized if the signal amplitude is kept within the graticule window. A recommended procedure is to select a reference level setting that limits stronger signals to the graticule window.

High-level signals can cause compression (refer to the input compression specification in the Input Signal Characteristics table in *Appendix C, Specification*, of this manual). Excessive high-level signals (above +30 dBm) may destroy the 1st mixer or attenuator. Signals above +30 dBm must be reduced by external attenuators. Ensure that the frequency range of any external attenuator is adequate.

Line impedance stabilizing networks, used for conducting EMI/RF measurements, will often have several volts of 60 Hz signal at the output. To protect the input mixer, use a DC block (contact your local Tektronix field office or representative for ordering information). It is important to be sure that all equipment being tested has power applied through the line stabilizing networks before any RF signal is connected to the 2792 input.

Connecting to a 75 Ω Source

Signals from a 75 Ω source, at the lower frequencies (1 MHz to 1 GHz), can be applied directly to the **75 Ω RF INPUT** if Option 07 is installed or to the **RF INPUT** by using a 75 Ω-to-50 Ω minimum loss attenuator. Refer to the Tektronix catalog or your local Tektronix field office or representative for ordering information. A circuit diagram of a suitable matching pad for this purpose is shown in Figure 3-1.

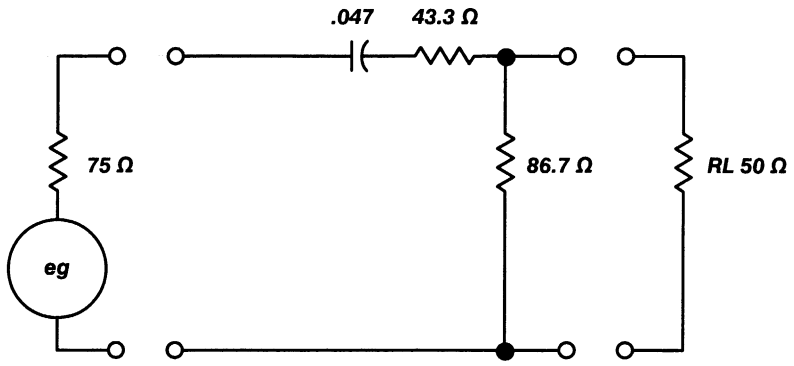


Figure 3-1: Circuit of a 75 Ω-to-50 Ω Matching Pad (AC Coupled)

Sensitivity and power levels are often rated in dBm (dB with reference to 1 mW regardless of impedance). Sensitivity and power levels for 75 Ω systems are usually rated in dBmV (dB with reference to 1 mV across 75 Ω). Figure 3-2 shows the relationship between 50 Ω and 75 Ω units with matching attenuators included. The conversion to alternate reference level units is listed below for 75 Ω and is shown in Table 3-1 for 50 Ω.

- dBmV (75 Ω) = dBm (50 Ω) +54.47 dB:
  for example, −60 dBm (50 Ω) +54.47 dB = −5.5 dBmV (75 Ω)
- dBm (75 Ω) = dBm (50 Ω) +5.72 dB:
  for example, −60 dBm (50 Ω) +5.72 dB = −54.3 dBm (75 Ω)

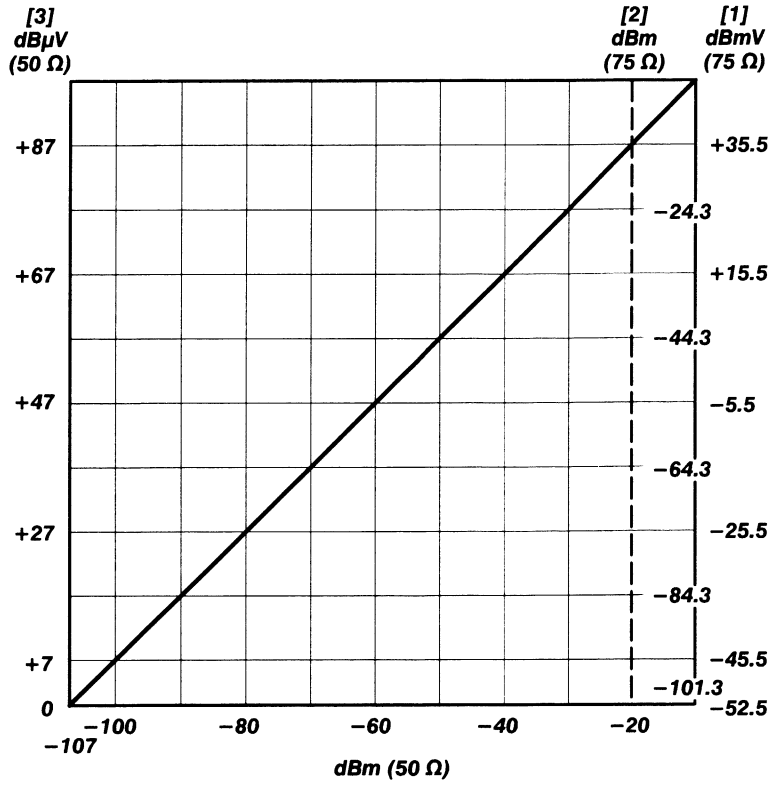


Figure 3-2: Graph Illustrating the Relationship Between dBm, dBmV, and dBµV (Matching Attenuator Included Where Necessary)

Table 3-1: 50 Ω System Reference Level Conversion

To | From	dBm	dBmV	dBµV
dBm	0	+47	+107
dBmV	−47	0	−60
dBµV	−107	+60	0

Input Networks and Reference Level Offset

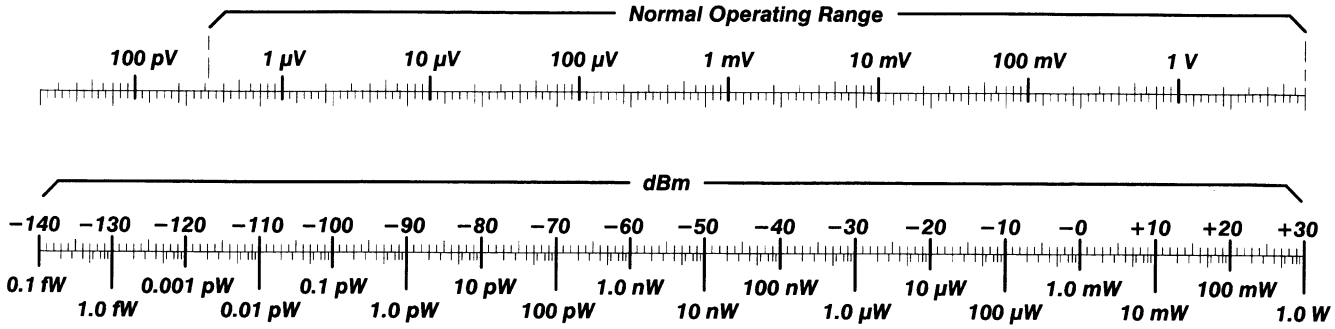
If the measurement system includes any matching pads, attenuators, amplifiers, or other input networks, use the reference level offset feature of the 2792 to compensate for the network. If the gain or loss through the network is entered as an offset, the reference and marker levels will apply to the input of the network rather than to the input of the instrument. Enter attenuation as a positive offset, and enter gain as a negative offset. Some networks have a different offset in the linear (voltage) mode than in the log (power) mode. For example, the matching pad shown in Figure 3-1 has a power attenuation of 5.72 dB, but a voltage attenuation of 7.48 dB. (The voltage

loss in dB is meaningless between points with different impedance. However, 7.48 dB is the offset value needed in the linear mode for the reference and marker levels to be those at the input to the pad.)

For more information, see *Reference Level Offset* later in this section.

Amplitude Conversion

A conversion chart, as shown in Figure 3-3, can be used to convert input signal levels of voltage or power to dBm, dBV, dBmV, and dBμV.



Note: Volts RMS—multiply by 2.8 for peak-to-peak.
0 dBm = 1 milliwatt

Figure 3-3: Volts-dBm-Watts Conversion Chart for 50 Ω Impedance

Resolution Bandwidth, Span, and Sweep Time

Resolution is the ability of the 2792 to display discrete frequency componenets within a span. This ability is a function of the 2792 bandwidth, sweep time, span, and incidental FM. Bandwidth also affects the noise level. As the bandwidth decreases, the sensitivity increases so maximum sensitivity is attained with the narrow resolution bandwidths.

As the 2792 sweep rate is increased, a critical rate is reached where both sensitivity and resolution are degraded. Therefore, sweep time for a calibrated display is dependent on the resolution bandwidth and frequency span.

In the Maximum Span mode, the display represents the full frequency range of a band. The frequency readout on the CRT is indicated on the display by a frequency dot if markers are off or by the primary marker if markers are turned on. This frequency point will shift to center screen when the span is reduced to some setting other than maximum. The span setting depends on the particular measurement application. Wide spans are usually used to monitor a frequency spectrum for spurious signals, or to check harmonic content. When wide spans are used for analog displays (View A and B off), the sweep rate is usually set for minimum flicker, which requires wide resolu-

tion bandwidths to maintain a calibrated display. Narrow spans are used to analyze the characteristics about or near a particular signal, such as modulation side bands, bandwidth, or power line related distortion. Slow sweep rates are required when using narrow spans and narrow resolution to observe signal phenomena.

When **AUTO** is selected (indicators on), the 2792 will choose a sweep rate and resolution bandwidth to maintain a calibrated display if possible when the span is changed. Changing the sweep or resolution bandwidth values with their menus disables the auto function. When the auto function is disabled, and sweep, span, or resolution bandwidth settings are changed to a value outside the calibrated range, a > symbol prefixes the REF LEVEL and MKR LEVEL readout on the CRT display.

To analyze pulsed signals, a wider bandwidth than that provided by the automatic feature is usually required. Set resolution bandwidth to approximately $^1/_{10}$ the side lobe frequency width or the reciprocal of the pulse width, if known, in order to ensure adequate bandwidth. The resolution bandwidth is usually set for optimum main lobe detail after the sweep rate has been selected.

Using the Manual Peak Functions or Automatic Peaking

The peaking function allows you to adjust peaking values for use with external mixers or the preselector.

The peaking menu functions are not available under the following conditions.

- the 2792 is in frequency range 1 and in the internal mixer state
- the 2792 is in transition to frequency range 1 and in the internal mixer state. (If the **KEYPAD,** the **USER DEFINABLE** knob, or both have been assigned to peaking, they will revert to the assignments which they had before being assigned to peaking.)
- external mixers are being disabled when in frequency range 1. (If the **KEYPAD,** the **USER DEFINABLE** knob, or both have been assigned to peaking, they will revert to the assignments which they had before being assigned to peaking.)

To activate the peaking functions, press **INPUT** to call up the **INPUT** menu and select **Peak Menu**. When the Peaking mode is in effect, the **KEYPAD** is assigned to the peaking number.

The following peaking selections are available.

Assign to User Def—The **USER DEFINABLE** knob is assigned to the peaking function to allow peaking value changes. Turn the knob clockwise to increase the value or turn it counterclockwise to decrease the value.

Recall Default—A previously stored peaking value is recalled from memory and is used for the new peaking value.

Store Default—A new default value is stored in memory. The present peaking value is stored at the primary marker frequency if the marker system is on, or at the center frequency if the marker system is off.

Auto Peak—The instrument firmware tries to determine the optimum peak value; PEAKING is displayed on the screen when the Auto Peak mode is in effect. When peaking the preselector, peaking occurs ±1 division on either side of center or marker frequency. If there is no signal at the location to be peaked, an error message displays on the screen and the previous stored value is used. The resulting peaking code is stored in memory.

Using the Video Filters

The video filters restrict the video bandwidth so noise is reduced (see Figure 3-4). When signals are closely spaced, the filter can reduce the modulation between two signals to make it easier to analyze the display. The filters can also be used to average the envelope of pulsed RF spectra that have a relatively high-pulse repetition frequency (PRF); however, because the filter is basically an integrating circuit, the video filter will not be very effective when measuring low PRF spectra.

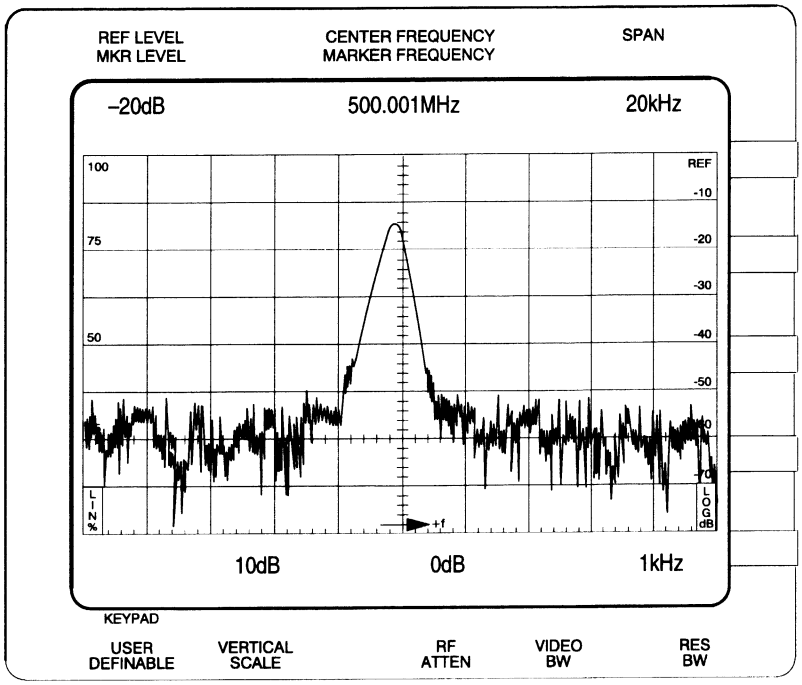
Press **VIDEO BW** to call up the **VIDEO BW** menu. The following video filter selections are available.

Full—The video filter is set to the maximum value and will not track the resolution bandwidth.

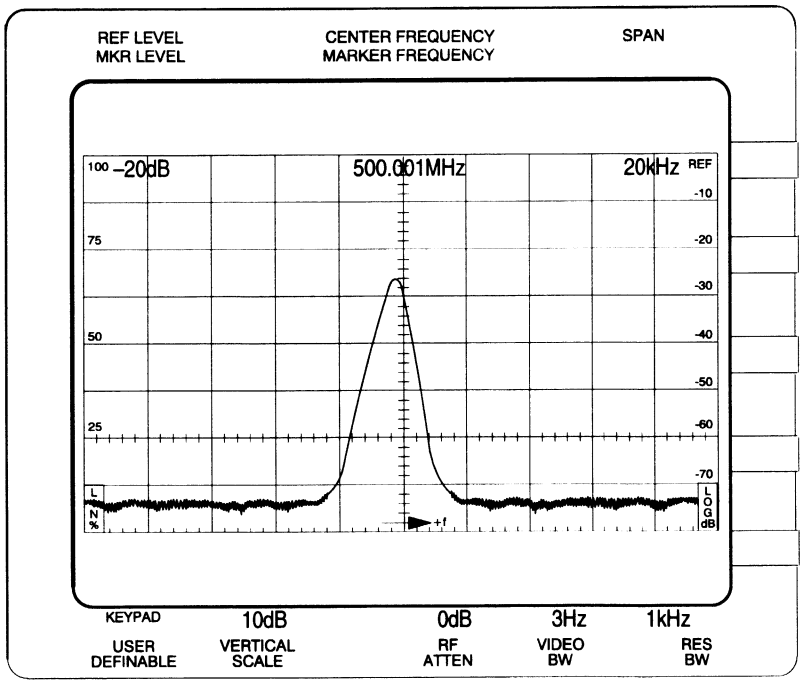
Wide—The video filter reduces the bandwidth to approximately $^1/_{33}$ of the selected resolution bandwidth.

Narrow—The video filter reduces the bandwidth to approximately $^1/_{333}$ of the selected resolution bandwidth.

Use of either the Wide or Narrow filter may require a reduction in the sweep rate to maintain a calibrated display. When either the Wide or Narrow filter is selected, the filter bandwidth is displayed on the CRT lower readout line.



A. Spurii and IM obscured in the noise



B. Same display with Video Filter activated

Figure 3-4: Typical Display of Noise Reduction by the Video Filter

Using Time Domain Operation

When the span is zero (**SPAN** menu, **Zero Span ON**), the 2792 functions as a tunable receiver to display time domain characteristics within the selected resolution bandwidth. Characteristics like modulation pattern and pulse repetition rates can now be analyzed with sweep selections. Resolution bandwidth is usually maximum (3 MHz) for time domain analysis of the signal.

Triggering the Display

The Triggering mode is usually free run for spectrum displays. However, it may be desirable or necessary to trigger the display when the event is time related to some source, or when the frequency span has been reduced to zero for time domain analysis. The following trigger modes are available:

- Free run
- Internal trigger
- Line trigger
- External trigger

Press **TRIGGER** to call up the **TRIGGER** menu; then select the desired triggering mode.

In the Free Run mode, the sweep will not synchronize with any input signal. Internal mode triggers the sweep with the video signal. Line mode triggers the sweep at the AC power line frequency rate. External mode triggers the sweep with an external signal that is applied to the **HORIZ|TRIG EXT IN** connector on the rear panel. The required amplitude for triggering is 2.0 divisions or more for internal triggering and from 1.0 to 50 V maximum (DC + peak AC) for external triggering.

The Single Sweep mode is provided in addition to the triggering source menu selections. In the Single Sweep mode, the sweep will run once after the circuit has been armed and a trigger signal arrives. The **RDY** light is on when the circuit is armed and waiting to be triggered and remains lit during sweep time.

Press **SINGLE SWEEP** once to activate the Single Sweep mode and cancel the current sweep. Press **SINGLE SWEEP** again to arm the trigger circuit so it is ready for a trigger signal (if the instrument is in the Free Run mode, it will not wait for a signal). This mode is useful for viewing single events.

Sweeping the Display

Horizontal sweep voltage for the display may be internally generated, or it may come from an external source. Select the sweep rate and source from the **SWEEP** menu. When auto sweep is selected, the sweep rate is automatically set to maintain a calibrated display, if possible.

NOTE

*When **Source EXT** is selected, a signal source of 0 to 10 V applied to the rear-panel **HORIZ\|TRIG EXT IN** connector will sweep the CRT beam across the 10 division span. The input is DC coupled and sensitivity is 1 V per horizontal division. External input impedance is approximately 10 kΩ.*

The beam can be manually positioned by the **MANUAL SCAN** knob when **Man Sweep ON** is selected from the **SWEEP** menu.

Manual Scan mode is usually used to examine a particular point or sector of a display. For example, this mode may be used for viewing one of the null points of a frequency modulation spectrum. This mode is also useful when slow sweep rates are active, but only a small portion of the display is of interest to the user. With a wide span or a narrow resolution bandwidth, it is possible to manually scan too fast to achieve an accurate display. Best results are obtained with View A and View B off. Digital storage (View A or View B on) can produce unpredictable results when the sweep rate is too fast. The digital storage display is only updated when scanning the screen from left to right.

Reference Level, RF Attenuation, and Vertical Display

When a change is made to the reference level, the gain distribution (IF gain and input RF attenuation) is automatically selected for the reference level. The selection is made according to the settings of vertical scale, minimum RF attenuation, Minimum Noise, Minimum Distortion, and Reduced Gain.

The RF attenuation value is chosen based on the reference level requested and the settings of minimum RF attenuation, Minimum Distortion, and Minimum Noise. The 2792 assumes the minimum RF attenuation selection is the minimum attenuation required for the expected signal levels, and will not reduce RF attenuation below this value. As minimum RF attenuation is increased, the lowest reference level is raised an equal amount. The best ratio of RF attenuation to IF gain is selected according to the Minimum Noise and Minimum Distortion modes (see the description later in this section).

Selecting **Step Size Menu** from the **REF LEVEL** menu allows the step size to be set for the Reference Level increment and decrement keys. The **Auto ON** selection from the **Step Size Menu** (within **REF LEVEL** menu) sets the step size to one vertical division (in Log mode), while the **Set Step Size** selection temporarily assigns the **KEYPAD** to set the reference level step size.

Reference Level Offset

Reference level offset will affect the readout of reference and marker levels. To set an offset to the reference level, select **Set Ref Offset** from the **REF LEVEL** menu. An asterisk (*) on the screen in front of the reference and marker levels indicates that a non-zero offset is in use. (If there currently is

no reference level offset, but the marker is on a saved or stored trace taken with an offset, there will be an * in front of the marker readout only.) The **KEYPAD** increment and decrement keys step in 1 dB steps in either the log or linear mode.

Any offset alters the readouts without affecting instrument settings. For example, if the reference level is 30 dBm without offset and an offset of 30 dB is entered, the reference level will become 60 dBm. However, the RF attenuation, IF gain, and on-screen signal levels will not change.

Reference level and threshold entry must include the offset. For instance, to increase the reference level by 10 dB in the case just described, the value entered should be 70 dBm, not −30 dBm. Select the threshold from the **PEAK FIND** menu within the **MARKERS** menu.

Alternate Reference Level Units Selection

The following discussion assumes the 50 Ω Input is in use. When the 75 Ω Input is used (Option 07 only), different numbers can be expected.

It is easy to select an alternate to dBm reference level units. For example, use the **KEYPAD** to set the REF LEVEL readout to 0 dBm. Press **MENU ENBL** and **REF LEVEL**, then select **Units Menu**. To change to dBV, select **DBV** and the reference level readout changes to −13 dBV. To change to dBmV, select **DBMV** and the readout will change to 47 dBmV. To change to dBμV, select **DBUV** and the readout will change to 107 dBμV. To change back to dBm, select **DBM** and the readout changes back to 0 dBm.

Using Minimum Noise, Minimum Distortion, or Reduced Gain Modes

One of the following modes from the **MIN ATTEN** menu must be selected to control the RF attenuator and IF gain settings:

- **Min Distrn**—minimizes input mixer overload by increasing input attenuation and IF gain by 10 dB
- **Min Noise**—minimizes the noise level by decreasing input attenuation and IF gain by 10 dB

You can also select **Redcd Gain** in conjunction with either of the above choices. Reduced Gain mode uses the identify offset to reduce the effective gain of the 2792 Spectrum Analyzer, lowering the displayed noise level.

Because the identify offset is 1 division and the RF attenuator changes in 10 dB steps, the Reduced Gain mode has an effect only when the 2792 is in 10 dB/div. Although the Reduced Gain mode can be selected when the instrument is set to Vertical Scale values other than 10 dB/div, the following discussion applies only when the instrument is in 10 dB/div.

The Reduced Gain mode reduces the IF gain and RF attenuation by 10 dB for any reference level for which the RF attenuation (in the non-reduced mode) is at least 10 dB greater than the **MIN RF ATTEN** setting.

CAUTION

*With **Min Noise ON** and **MIN RF ATTEN** set to 60 dB, you can set the **REF LEVEL** to +40 dBm. Do not increase input signal level to full screen with a REF LEVEL of +40 dBm, since this exceeds the attenuator rating.*

*In the Reduced Gain mode, the reference level may be set to +40 dBm (with **Min Distrn ON**) or +50 dBm (with **Min Noise ON**). However, the maximum input level of the 2792 is still +30 dBm. Never apply more than +30 dBm to the input of the spectrum analyzer, regardless of the indicated reference level.*

Selecting **Redcd Gain** from the **MIN ATTEN** menu (press **MIN RF ATTEN** key to display) toggles the Reduced Gain mode **ON** or **OFF**.

The Reduced Gain mode can be used with either Minimum Distortion or Minimum Noise modes. When Minimum Distortion mode is turned on, the Reduced Gain mode affects the display in a manner that is similar to activating the Minimum Noise mode (noise decreases by 10 dB). When Minimum Noise mode is active, the Reduced Gain mode will further increase the distortion. Also, on-screen compression may occur. For this reason, any digital storage data that appears above the top of the viewing area (that is, data values of 225 to 250, above the top graticule line) may be inaccurate.

If the Identify mode is used when Reduced Gain mode is active, the identify (alternate) sweep is moved up one division on the screen. It is normally moved down one division.

Using Digital Storage

Digital storage provides a smooth, flicker-free display. You can digitize and store two complete displays. In addition, the **STORE** and **RECALL** functions store up to nine displays in memory (see *Using the Store and Recall Features* later in this section). One of the two digitized waveforms can be saved and compared to later waveforms using the B−Save A mode. The Max Hold feature updates digital storage data only when the input signal amplitude is greater than previous data. This allows monitoring and graphic plotting of display changes (amplitude and frequency) with time.

The display is divided by a horizontal line that is positioned with the **PEAK** or **AVERAGE** selections within the **VIEW** menu, or by the **USER DEFINABLE** knob. Video information that is displayed above this line is peak detected; signal averaging occurs below the line. This feature subdues noise in the portion below the line and allows full peak detection above the line. An intensified spot on the line indicates the horizontal position where memory is being updated. The average (number of samples) is a function of the sweep rate; slow sweep rates acquire more samples.

The digital storage display is divided into an A and B section. Data can be stored in either A or B or in both. There are 500 horizontal locations in A and 500 horizontal locations in B. When both are active, the origin of the B waveform is shifted so the A and B coordinates are interlaced to provide 1000 display increments. Data in memory is continually updated with each sweep, so the display is always current.

SAVE A Mode

When Save A mode is turned on, data in the A section is saved and only the B section of storage is updated. This takes place whether the A waveform is displayed or not. This mode captures an event or waveform, with its readout, for comparison with a subsequent event displayed by the B trace. If **View B** is **ON**, the readout applies to the current B waveform. If **SAVE A** and **View A** are **ON** and **View B** and **B–Save A** are **OFF**, the readout applies to the saved A waveform.

B–Save A Mode

When B–Save A mode is turned on, the arithmetic difference between the B waveform and the Saved A waveform is displayed (see Figure 3-5). This mode can be used to align filters or other devices. The reference waveform is stored in A and the unknown is displayed by B. The reference level is usually set to mid-screen so positive and negative quantities can be observed.

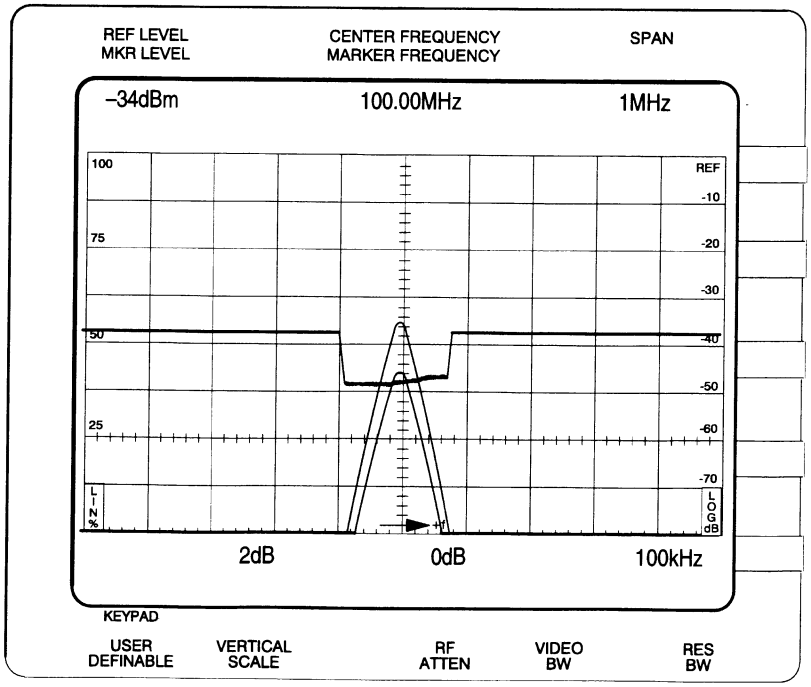


Figure 3-5: Typical Display Using B–SAVE A to Observe the Difference Between SAVE A and B Displays

The zero reference point for plots can be changed to any screen location. To do this press **CONFIG**; then press **Plotter Menu** and select **B–Save A Offset**, and use the **KEYPAD** to enter a value between 25 and 225. A value of 25 places the zero point at the bottom graticule, 125 sets it to the center graticule, and 225 set the reference point to the top graticule line.

The zero reference point for the display is changed by setting an internal switch. Contact qualified service personnel to have the reference level repositioned.

Max Hold Mode

Max Hold mode causes the memory to be updated only if the new input is of higher magnitude than the former (B memory only if Save A mode is active). This allows monitoring of signals that may change with time and provides a graphic record of amplitude or frequency excursions.

Signal Averaging Modes

Signal averaging is useful for suppressing noise. The number of samples averaged per digitized horizontal slot is a function of the 2792 sweep rate. The slower the sweep speed, the more samples averaged per horizontal slot. Resolution bandwidth affects the amplitude difference between peak detected and average levels of CW signals. When the resolution bandwidth is less than $^{1}/_{300}$ of the span (for example, 100 kHz or less with 50 MHz span), there will be significant error in the average amplitude levels of CW signals, especially if only A or B is displayed. The peak value is the true value. When using a narrow resolution bandwidth with wide frequency spans, it is best to run digital storage with View A and View B on and the Peak Mode selected (horizontal line at the bottom of the display).

To measure peak signal amplitude level, press **VIEW** and select **Pk/Avg Menu** and **Set to Peak**. This sets the cursor to the bottom of the screen.

To average noise, select **Assign to User Def** (from the **PK/AVG** menu) and use the **USER DEFINABLE** knob to set the horizontal line at least one division above the noise level. Signals above this line will be peak detected, and signals or noise below the line are averaged. The **Set to Average** selection (from the **PK/AVG** menu) places the cursor at the top of the screen so the entire screen is averaged.

Using the Store and Recall Features

The 2792 features two functions to store up to nine waveforms in memory (with markers and readout) to be recalled later for review or analyses. To save the display currently on the screen, press **WAVEFORM STORE** and then the register number (**0**–**8**) where you want to store the display. To recall this display, press **WAVEFORM RECALL**, and the register menu showing the center frequency of each stored display appears on the screen. Select the register number you want to recall by using the **KEYPAD**. Then select the part of the digital storage (A or B) where you want to place the recalled display.

SAVE A mode is automatically turned on to prevent an overwrite. If location A is selected, **View A** must be **ON** to see the recalled display, and **View B** must be **OFF** to see the readout that applies to the recalled display.

If **View B** and **View A** are **ON**, both the display recalled in A and the current display in B are visible on the screen. The displayed readout applies to the current B display. Turn **View B OFF** to see the readout that applies to the recalled A display.

If location B is selected, the next sweep will overwrite the display unless **SINGLE SWEEP** was activated before selecting B. A message will appear on screen as a reminder of this. **View B** must be **ON** to observe the recalled display. Turn **SINGLE SWEEP** off when leaving this recalled mode.

Using Signal Count

The signal count function provides a way to exactly determine the frequency of an input signal. The advantage of the spectrum analyzer over a counter is that the 2792 will selectively count a particular signal out of several that may be present at its input.

Front-panel Control

The two front-panel controls associated with signal count are the **COUNT** key and the **COUNTER** menu. Press **COUNT** to display the **COUNTER** menu and to turn on the signal counter automatically. When active, the count readout represents one of the following three frequencies.

- frequency of the marker location when a single marker is on an active trace
- frequency difference between marker locations when delta marker mode is on and at least one marker is on an active, on-screen trace.
- center frequency

Select **Counter OFF** from the **COUNTER** menu to turn the counter off.

The letter C appears to the left of the frequency (center or marker) readout to indicate when the counter is on (see Figure 3-6A). This count indicator is in the first readout row when center frequency is counted. It moves to the second readout row when a marker frequency is counted (see Figure 3-6B).

As the frequency of the display is tuned when the counter is on, the frequency readout displays the uncounted frequency (without the "C" count indicator) until a count of the new frequency is completed.

Count Resolution

The frequency counter resolution may be changed to decade values between 1 Hz and 1 GHz. If a non-decade value is entered, the resolution is rounded to the next lower decade. For example, if a count resolution of 23 kHz is entered, the count resolution will be 10 kHz.

To change the count resolution, press **COUNT** and select **Set Resolution**. The desired value can then be entered from the **KEYPAD**. Count resolution values of 1 kHz or less require more time to complete signal counts.

The displayed count may be the difference between counted and uncounted frequencies, or of frequencies counted to different resolutions in delta marker mode. In these cases, the display resolution is the less accurate of the two resolutions.

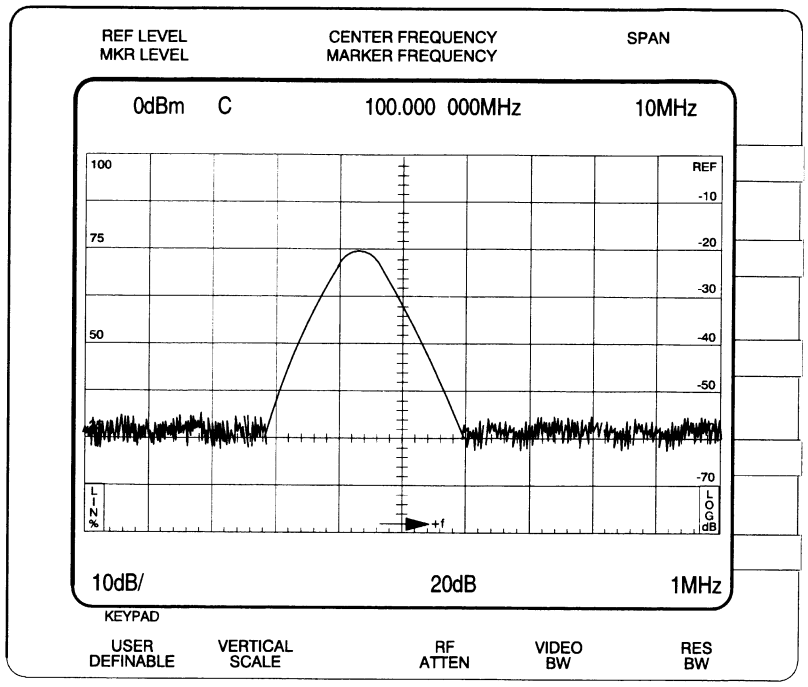
Counted Locations

The 2792 counts at different locations depending upon the status of the marker system. If one or two markers are located on a non-saved trace, the signal count occurs at the marker location(s). Otherwise, counting occurs at the center of the screen. (In MAX SPAN mode, counting occurs at the max span dot location.)

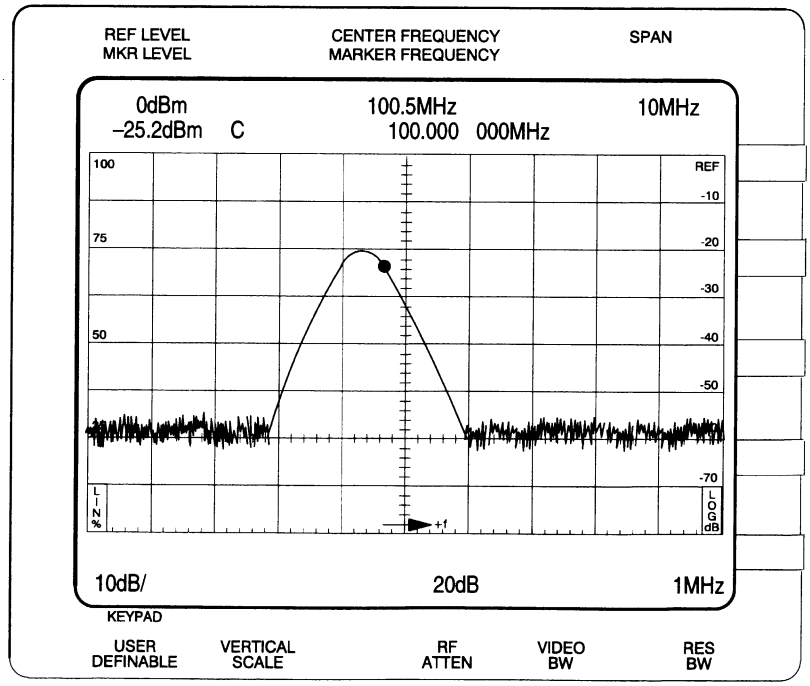
The counted frequency is that frequency at the peak of the selected signal, even when the signal is not exactly centered on the screen (when counting center frequency) or when the marker is not at the signal peak. Accurate signal counts result when the amplitude of the signal to be counted is at least 20 dB above the average noise level and 60 dB or less below the top graticule line. However, there may be an error between the true electrical location of the marker and its on-screen location. This error should be less than 0.1 division, but it can become significant at large span-to-resolution bandwidth ratios. At ratios over 100, the marker or center point should be placed at the signal peak. Inaccurate counts may occur at ratios of 500 or more.

Signal Counting and Stored Traces

Signals cannot be counted on a trace that has been saved with the **SAVE A** key, or a trace that has been stored and recalled with the WAVEFORM **STORE** and **WAVEFORM RECALL** menus. However, if there was a counted frequency on the display when it was saved or stored, that frequency is stored in memory.



A. Typical count of center frequency



B. Typical display when counting marker frequency

Figure 3-6: Typical Displays when Counting Center Frequency (A) and Marker Frequency (B)

The counted center frequency and "C" count indicator are displayed whenever the readout for a saved or stored trace is displayed. However, if a marker is active, the marker readout is scaled from the center frequency point of the displayed trace.

When frequency is counted at a marker location, the marker position, counted frequency, and "C" count indicator are displayed. This occurs when markers are first assigned to a trace or when they are moved back to a trace after being re-assigned (see Figure 3-7A). The "C" count indicator disappears, and the marker frequency resolution is scaled to match the screen parameters when the marker is moved (see Figure 3-7B). If both the Primary and Secondary markers were stored on the trace, the appropriate marker is used for any marker placed on the trace. If only one marker was stored, it is used when either marker is placed on the trace.

Signal Count Tutorial

The following procedure illustrates many of the signal count features. Only the internal **CAL OUT** signal is needed to perform this tutorial.

1. Press the **PRESET** key.
2. Connect the **CAL OUT** signal to the **RF INPUT** connector.
3. Select these control settings:

   FREQUENCY 100MHz
   SPAN 50MHz
   REF LEVEL ..... −20dBm

4. Press the **COUNT** key.

   The COUNTER menu appears on the screen. **Counter ON** is the default mode. The letter "C" to the left of the frequency readout indicates that the counter is active.

5. Select **Set Resolution** from the **COUNTER** menu.
6. Use the **KEYPAD** to enter a value of 1 kHz.

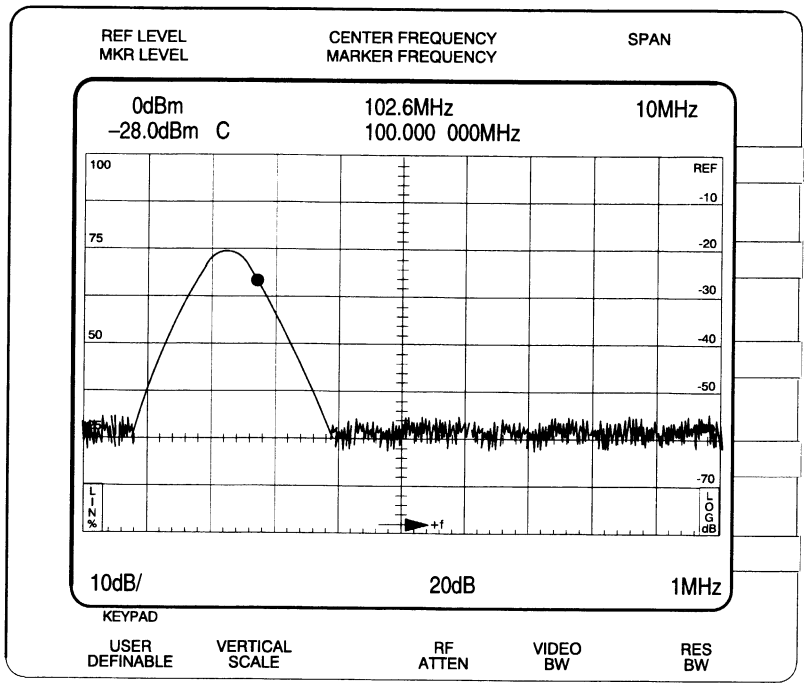
   The counted frequency display is now rounded to kHz.

7. Slowly rotate the **FREQUENCY/MARKERS** knob to tune the signal away from center screen.

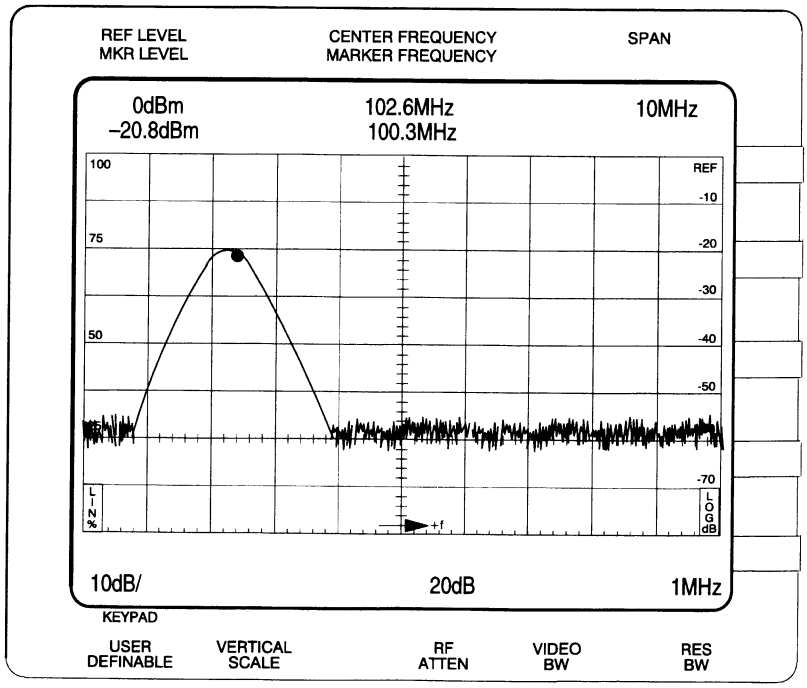
   Notice that when tuning the frequency, the "C" count indicator disappears and the frequency display resolution is equal to that of the standard center frequency display (with the counter off). If a section of the noise floor is positioned at center screen, the counted frequency display changes for each sweep.

8. Press the **PEAK FIND MAX** key to turn on a marker.

   The marker appears at the signal peak. Now the "C" count indicator appears beside the marker frequency readout, and the center frequency readout reverts to its uncounted resolution.



A. Display when the marker has just been assigned or reassigned to the trace.



B. Display after the marker is tuned.

Figure 3-7: Typical Displays of Stored Signals with Signal Counts

9. Press the **MKR ↔ FREQ** key to assign the **FREQUENCY/MARKERS** knob to center frequency.
10. Slowly rotate the **FREQUENCY/MARKERS** knob.

    The marker readout remains at 100 MHz until the signal moves away from the marker, placing the marker on the noise.
11. Press the **PEAK FIND MAX** key to return the marker to the signal peak.
12. Press the **VIEW** key.
13. Select **View A OFF** and **View B OFF**.

    Note the delay between sweeps.
14. Press the **COUNT** key.
15. Select **Set Resolution** and use the **KEYPAD** to enter 1 Hz.

    Notice the increased delay between sweeps. Greater count resolution requires longer count intervals.
16. Press the **VIEW** key and select **View A ON**.
17. Press the **SAVE A** key to save this trace.
18. Press the **MKR ↔ FREQ** key to assign the **FREQUENCY/MARKERS** knob to marker frequency.
19. Slowly rotate the **FREQUENCY/MARKERS** knob.

    The counted marker frequency is remembered, but the marker readout is updated to the new screen location.
20. Select **View A OFF** to display an analog trace, then select **View A ON** once more.

    The counted marker frequency that was remembered when the trace was saved returns, and the marker moves to the signal peak.
21. Press the **PRESET** key.
22. Select these control settings:

    FREQUENCY 900MHz
    SPAN 500MHz
    REF LEVEL ..... −20dBm
23. Press the **PEAK FIND MAX** key to return the marker to the largest signal peak.
24. Press the **Δ MKR** key.

    Delta Mkrs ON is the default mode. It turns on the delta marker mode so that two markers are displayed.
25. Press the **CLEAR MENU** key.
26. Press either the **MKR ←** or the **MKR →** key to move the active marker to another signal peak.

27. Press the **COUNT** key.

    The "C" count indicator appears beside the marker frequency readout. This readout is the frequency difference between the two marker locations. The counted value is a negative number when the active marker is located to the left of the fixed marker. A positive value results when the active marker is located to the right of the fixed marker.

28. Press the **MKR** → **FREQ** key and note the counted frequency readout.

29. Reduce the **SPAN** to 5 MHz.

    The counted frequency difference between the markers remains the same, even though one marker is now located off-screen.

Using the Tracking Generator Mode

For optimum frequency accuracy when using the tracking generator, the Tracking Generator mode disables use of the frequency correction factors for all resolution bandwidth filters wider than 10 kHz. These wide filters may be centered too far from 10 MHz (their nominal center frequency) for the difference to be corrected with the Tracking Adjust control on the tracking generator.

All amplitude correction factors are always used.

For maximum frequency and amplitude accuracy, adjust the Tracking Adjust control to peak the response in the resolution bandwidth filter you are using. Remaining amplitude errors can be corrected by using the B−Save A mode of digital storage.

To turn the Tracking Generator mode on or off, do the following procedure:

1. Press the **UTIL** key to display the **UTIL** menu.
2. Select **Special Modes Menu**.
3. Select **Track Gen** to toggle the Tracking Generator mode **ON** or **OFF**.

Using the Sideband Analyzer Mode

Since the 1405 TV Sideband Analyzer only uses the first local oscillator of the 2792, it is only useful when the first local oscillator is sweeping (not phaselocked). The Sideband mode extends the usefulness of the 1405 by causing the 2792 to phaselock at a span setting of 500 kHz instead of the normal 2 MHz.

To turn the Sideband mode on or off, perform the following steps:

1. Press the **UTIL** key to display the **UTIL** menu.
2. Select **Special Modes Menu**.
3. Select **Side Band** to toggle the Sideband mode **ON** or **OFF**.

Using the EOS Correction Mode

The instrument normally measures the drift rate of its oscillators and corrects them when needed to maintain specified accuracy. When the EOS Correction mode is on, the oscillators are corrected at the end of every sweep.

To turn the EOS Correction mode on or off, perform the following steps:

1. Press the **UTIL** key to display the **UTIL** menu.
2. Select **Special Modes Menu**.
3. Select **EOS Corr** to toggle the EOS Correction mode **ON** or **OFF**.

Using Multiband Sweep Mode

You can sweep a frequency range that covers more than one band if the frequency range is within the 1.7 GHz through 21 GHz range (frequency bands 2, 3, 4, and 5) when using the internal mixer.

The multiband function is also available if the external mixer is in use (Option 04). The sweep range is 1.7 GHz through 21 GHz. The sweep range is restricted to a single band in the waveguide bands (frequencies above 21 GHz), since each band requires a different mixer.

Entering Multiband Sweep Mode

The Multiband Sweep mode is entered automatically when you use the **Set Start/Stop** function in the **FREQUENCY** menu to enter a sweep that covers more than one band. Perform the following steps to enter the Multiband Sweep mode:

1. Press the **MENU ENABLE** key and then the **FREQUENCY** key to display the **FREQUENCY** menu.
2. Select **Set Start/Stop** from the **FREQUENCY** menu.

   The first line of the readout below the graticule area displays a prompt for the start frequency.
3. Enter the start frequency, using the **KEYPAD**.

   When you press the units (terminator) key for the start frequency, the readout prompts you to enter the stop frequency.
4. Enter the stop frequency, using the **KEYPAD**.

   When you press the units key for the stop frequency, a message is displayed to indicate that the multiband sweep is started and the trace is displayed.

Exiting Multiband Sweep

You can exit the Multiband Sweep mode in the following ways:

- Press the **FREQUENCY** key and use the up and down arrows or **KEYPAD** to change the center frequency. The multiband sweep is stopped, even if the frequency is within the multiband range being swept.
- Recall a setting with a span that is within one band.
- Use the **Set Start/Stop** selection in the **FREQUENCY** menu to enter a span that is within one band.
- Use the **Set Freq Band** selection in the **FREQUENCY** menu to select a frequency band.
- Change the span.

If the marker is on when the multiband mode is exited, the center frequency is set to the primary marker frequency. If the marker is not on, the center frequency remains at the center frequency of the multiband sweep. The span is set to the span of the multiband sweep or is defaulted to maximum if the multiband sweep value is larger than the maximum span of the band containing the center frequency. The control change that caused the exit from multiband sweep changes either the center frequency or span or both.

Multiband Sweep Operation

To sweep a range that covers more than one band, the 2792 first determines the bands involved and calculates the center frequency and span required in each band to cover the desired range. Then the microcomputer successively sets the instrument and performs one sweep in each band. The digital data is collected in the B digital display. This data is then compressed to cover the appropriate portion of the screen and is displayed in the A storage display.

Instrument Operating Differences in Multiband Sweep Mode

Because of the method used to obtain a multiband sweep, certain instrument functions are locked out and others operate differently from normal. To remind you of these differences, `Multiband Sweep Started` briefly displays on the screen when the 2792 enters the Multiband Sweep mode. When you exit from the Multiband Sweep mode, `Multiband Sweep Stopped` briefly displays on the screen.

Following are the functional operating differences that are present when in the Multiband Sweep mode:

- To allow data collection in the B display of digital storage while viewing the A display, the storage must be set with View A on and View B and B–Save A off. The 2792 automatically sets these when it enters the Multiband Sweep mode. These settings cannot be changed while the 2792 is in the Multiband Sweep mode. The existing settings are restored when Multiband Sweep mode is exited. If a waveform is saved in the A display, you have the option to save it before the multiband sweep is started. Save A and Max Hold modes operate normally. Since only the A waveform is displayed, Save A stops display updating.
- Displays may be recalled only into the A register. If you try to recall a display into B register, the message `Function Not Available in Multiband Sweep` displays.
- If the Multiband Sweep mode is exited by turning on Max Span or Zero Span mode, the span defaults to MAX (maximum) or, if the span was 0, to zero span. The instrument does not return to the multiband mode.
- The multiband frequency range displayed can only be changed by entering new start and stop frequencies. Changing the span or directly entering a center frequency exits the Multiband Sweep mode. The **FREQUENCY/MARKERS** knob is disabled in the Center Frequency tuning mode. Markers may be tuned over the displayed range only.
- The marker system treats the multiband display as if it were a saved or stored display.
- If **AUTO ON** is selected in the **RES BW** menu, the resolution bandwidth used is the widest value required by the bands being swept.
- If Auto Sweep mode is selected, the speed may vary as each band is swept. Any sweep value refers to a division of the sweep that gathered the data, not to a division of the compressed display.
- If the sweep is not in Free Run mode, the triggering conditions selected are used for only the first (lowest frequency) sweep of the sweep needed to do one complete multiband sweep. After this sweep is triggered, the remaining sweeps are done in Free Run mode. Similarly, once a single sweep is started, the number of sweeps needed to form a complete display will occur. If you interrupt a multiband sweep by pressing the **SINGLE SWEEP** key, the next sweep is the lowest-frequency sweep.
- The Manual Sweep mode cannot be used when sweeping a multiband range, nor can you use EXT as the sweep source. If you select either of these, `Multiband not allowed in Man/Ext Sweep` is briefly displayed on the screen.
- Signal counting cannot be done in the Multiband Sweep mode.
- Auto peaking is done in a two-division window centered on the center or marker frequency. If this range covers more than one band, peaking is done in all bands covered. If there is at least one signal within a band or portion of a band, the peak value of the frequency window that contains the largest signal is updated.

Using the Time Measurement Feature

The 2792 has a special time measurement feature that is available when the instrument is in the Zero-Span Time mode with either one or two markers on.

Perform the following steps to enter the Zero-Span Time mode:

1. Press the **UTIL** key to display the **UTIL** menu.
2. Select **Special Modes Menu**.
3. Select **Z-Spn Time** to toggle the Zero-Span Time mode **ON** or **OFF**.

In the Zero-Span Time mode, the marker frequency readout or delta marker-frequency readout is replaced by a time or delta time readout. The time readout in the single-marker mode is the time to the marker position from the trigger point. This point is $^1/_2$ division to the left of the screen. In the Delta Marker mode, the delta time readout gives the time difference between the two markers. In both cases, the time value is scaled from the marker position(s) and the sweep rate. No actual time measurement is done.

The time measurement feature is available only during certain timing conditions. If the Sweep Source is EXT, or if the Sweep Rate is faster than 10 ms, the message `TIME UNAVAILABLE` is displayed in the location of the normal readout.

When in the Delta Time Readout mode, both markers must be on the same trace for time measurement. If the markers are on different traces when THE Zero Span mode is entered, the secondary marker will move to the trace of the primary marker. (This marker will not move back when leaving zero span.) When either marker is assigned to a new trace, both markers (assuming delta markers are on) will move together.

In frequency mode marker operation, the secondary marker remains at a constant frequency while the primary marker remains at a constant horizontal location. However, in the Time mode, both markers remain at constant horizontal positions as the sweep speed is changed.

The **MKR** → **FREQ** function is not available in Zero Span mode.

Bandwidth and Signal Track modes will go to idle in Zero Span mode. Since the idle message appears in the frequency/time readout location, these functions are turned off so the time display can appear on the screen.

Defining Peak Find Characteristics For Markers

Whether or not a candidate signal is recognized as a signal peak by the marker peak find keys depends upon the peak threshold and peak find mode. The peak threshold can be either user-selected or automatically set to an amount above the specified noise floor. If it is user-selected, it is set in reference level units. Use the **Peak Find Menu** in the **MARKERS** menu to select a mode to recognize one of the three signal types (**CW**, **Pulse**, or **Spur**) and set the threshold value.

Set the manual threshold to reject signals below a specific amplitude. Select **Auto Threshold** and the instrument will reject signals near the noise floor. To set the threshold press the **MKRS** key, select the **Peak Find Menu**, and then select the **Threshold Menu**. User-selected values are entered from the **KEYPAD** by selecting **Set Threshold**. Auto threshold may be turned on or off.

To the instrument peak finding routine, a candidate signal is one with a peak above the threshold and two points that are above the threshold (one on each side of the peak). The location of the peak is the highest amplitude point on the signal.

Setting the Signal Type

Press the **MKRS** key and select the **Peak Find Menu** to select a signal type (**CW**, **Pulse**, or **Spur**).

- When **CW** is chosen, a signal (to be recognized) must be at least half as wide as would be predicted from the resolution bandwidth and span in use.
- When **Spur** is chosen, all candidates are taken to be signals. (Note that if the span is wide in comparison with the resolution bandwidth, there may be no difference between **Spur** and **CW**.)
- When **Pulse** is chosen, two candidate signals are assumed to be either time-related lines or spectral lines belonging to the same pulse if they are separated by no more than 4% of the screen width. This extends to multiple lines. In a group of such lines, the highest-amplitude line will be identified at the center of the signal.

Signal Finding

To the finding routine, a signal consists of a peak above the threshold and two points (one on each side of the peak) that are 3 dB below the peak. The minimum bandwidth criteria for CW is defined as two 3 dB down (from the signal peak) points that must be at least½ of the resolution bandwidth apart.

Figures 3-8 through 3-12 illustrate the use of the peak finding routine. All of the figures use the same signal processing function key (**MKR** →; move to next right peak). Any of the other marker function keys work similarly.

Figures 3-8, 3-9, and 3-10—If **CW** is selected from the **PEAK FIND** menu, the 2792 will not identify any signal because none of the displayed signals meet the minimum bandwidth criteria. If **Pulse** is selected, the signals labeled D, E, and F would be identified because the other signals in the display are less than 2 minor divisions apart. If the signals were greater than 2 minor divisions apart, **Pulse** would identify all labeled signals (A, B, C, etc.). If **Spurs** is selected, all signals would be identified (A, B, C, etc.).

Figure 3-11—The **MKR** → function begins at the left screen margin. With this display, all signals are identified by **CW**, **Pulse**, and **Spurs** modes because the signals meet the minimum bandwidth criteria (the selections would be A, B, C, D, and E).

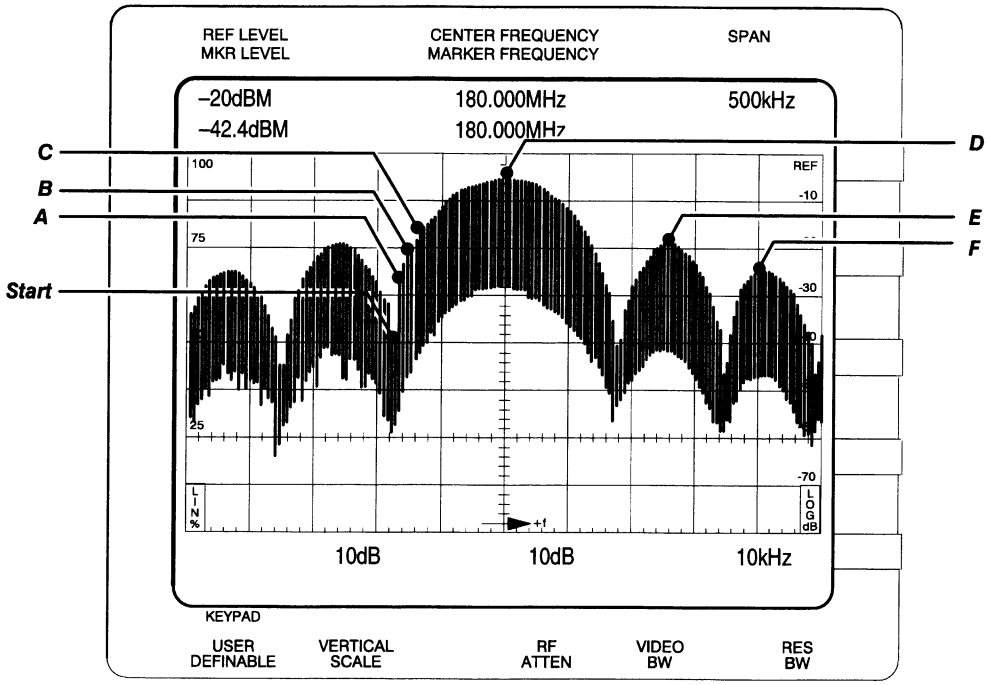


Figure 3-8: Signal Finding Example #1

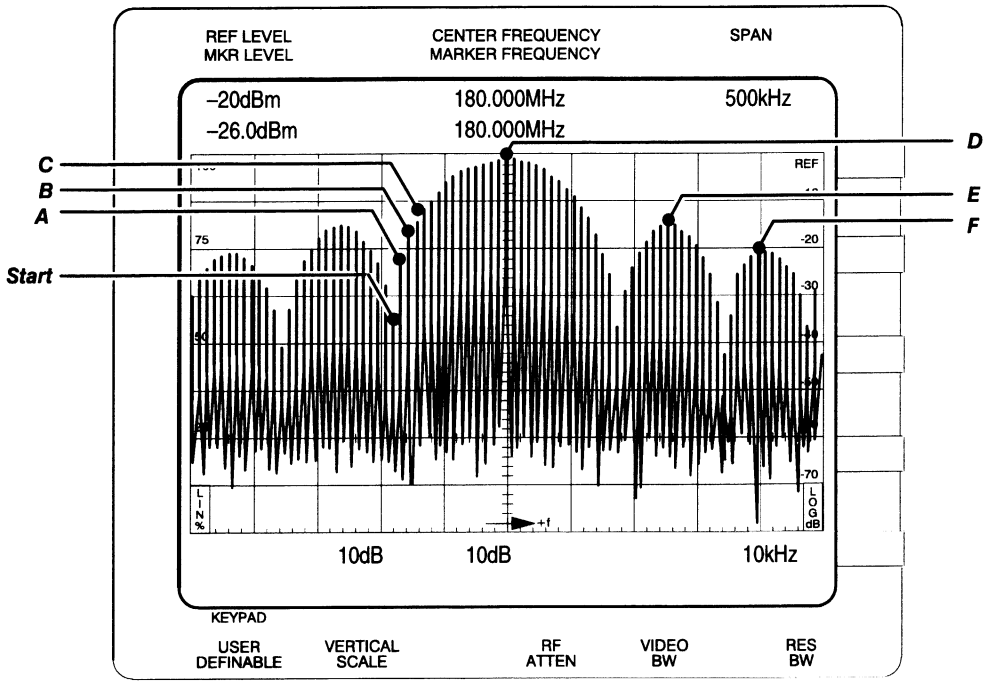


Figure 3-9: Signal Finding Example #2

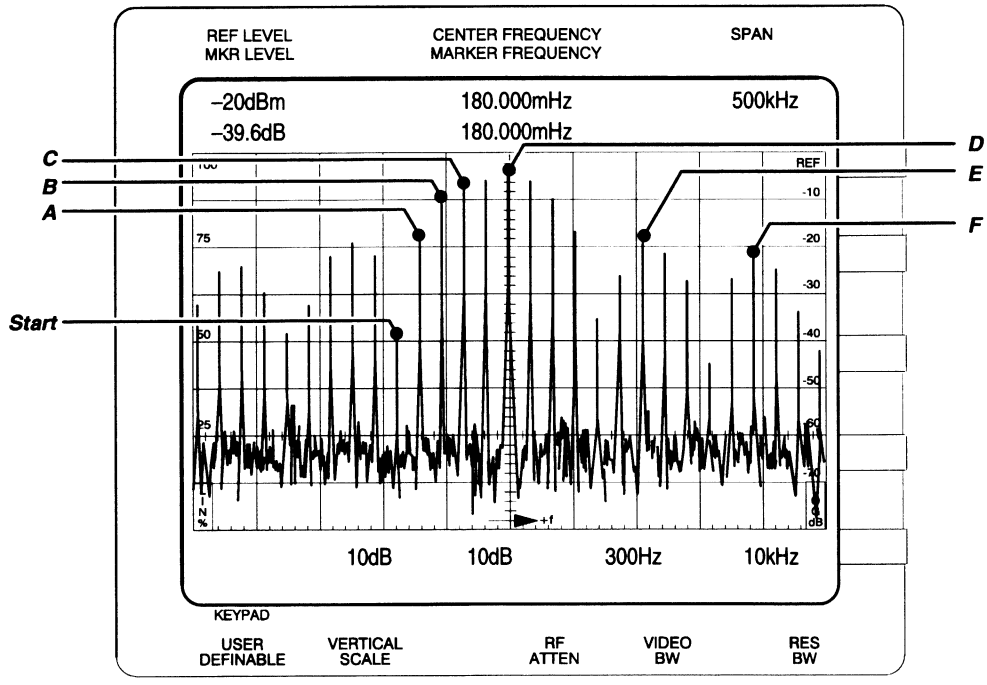


Figure 3-10: Signal Finding Example #3

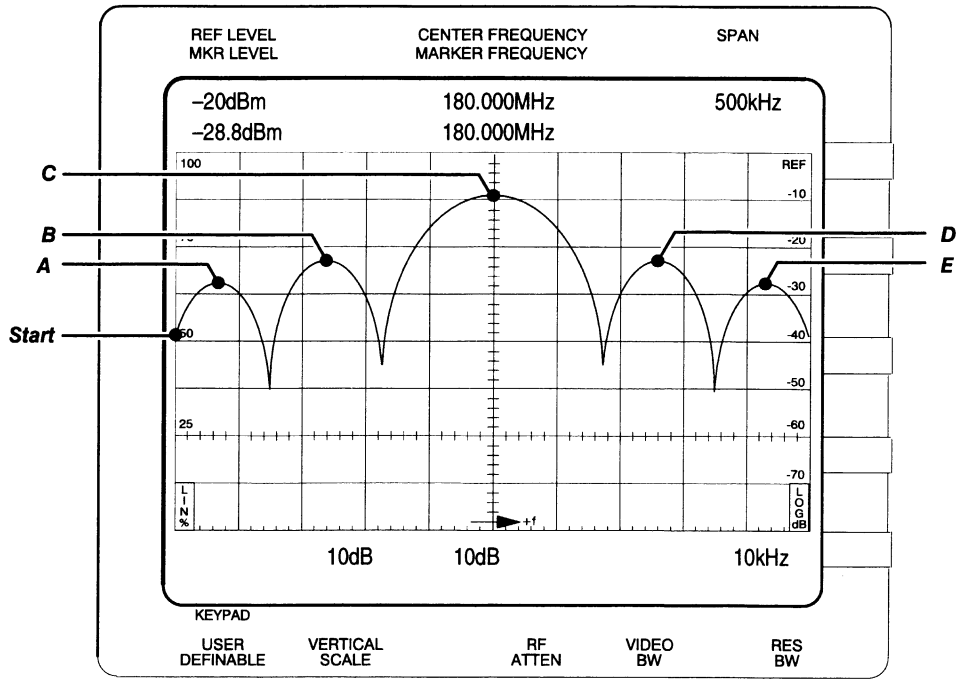


Figure 3-11: Signal Finding Example #4

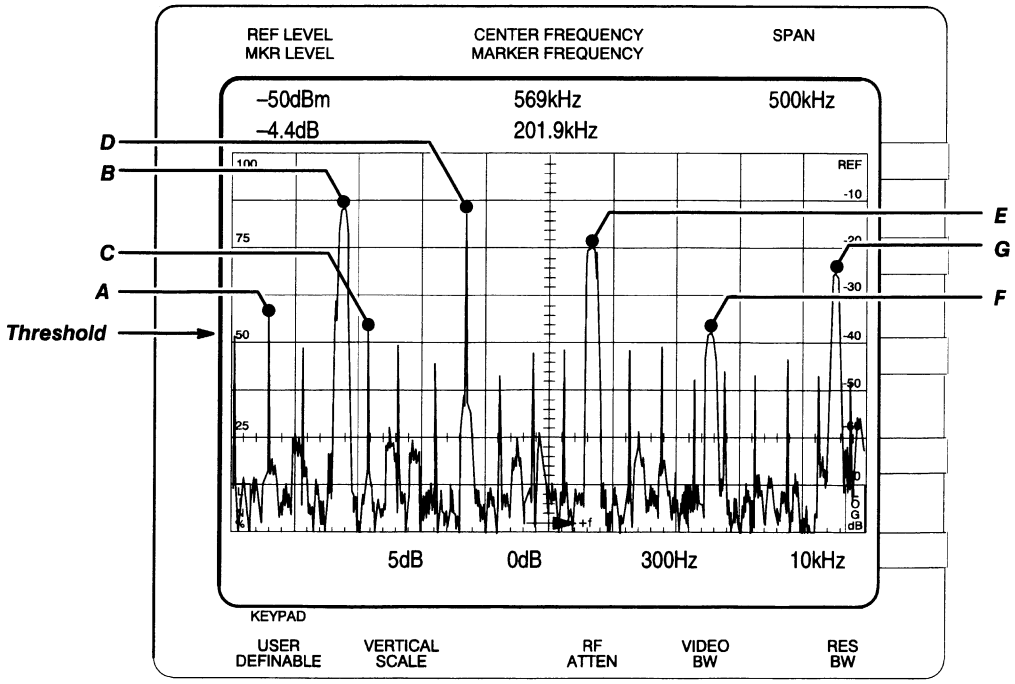


Figure 3-12: Signal Finding Example #5

Figure 3-12—In this example, assume that the threshold is −70 dBm. If **CW** is selected, signals B, E, F, and G would be identified. The other signals do not meet the minimum bandwidth criteria, and would be ignored. If **Pulse** is selected, signals A, B, D, E, F, and G would be identified. Signal C would be skipped because it is located within 2 minor divisions of signal B. The **Pulse** mode would not be able to identify signals B and C separately. If **Spurs** is selected, all signals would be identified.

Using the Instrument with External Mixers

External mixers are usually the waveguide type that extend the frequency range above that of the internal coaxial mixer. When Option 04 is installed, the 2792 external mixer input range is capable of extending to 325 GHz.

Tektronix high-performance waveguide mixers are two-port, broad-band mixers that cover the 18 GHz to 325 GHz range. The mixers cover both microwave and millimeter wave frequency bands. The 18 GHz to 40 GHz frequency ranges are considered microwave bands; frequencies above 40 GHz are considered millimeter wave bands. See Table 3-2 for the frequency characteristics of the Tektronix waveguide mixers.

Refer to the manual for your external mixers for operating instructions.

Table 3-2: Tektronix Waveguide Mixers

Mixer	Frequency Range
WM780K	18 GHz to 26.5 GHz
WM780A	26.5 GHz to 40 GHz
WM780Q	33 GHz to 50 GHz
WM780U	40 GHz to 60 GHz
WM780V	50 GHz to 75 GHz
WM780E	60 GHz to 90 GHz
WM780W	75 GHz to 110 GHz
WM780F	90 GHz to 140 GHz
WM780D	110 GHz to 170 GHz
WM780G	140 GHz to 220 GHz
WM780J	175 GHz to 325 GHz

Using the Signal Identifier

When external mixers are used (Option 04), there is no preselection ahead of the mixer. Many spurious responses are generated in the 1st mixer. This is due to multiple harmonics of the local oscillator and incoming signals converting to intermediate frequencies that are within the bandpass of the 1st IF. These responses may pass through the IF bandpass and appear as signals on the screen.

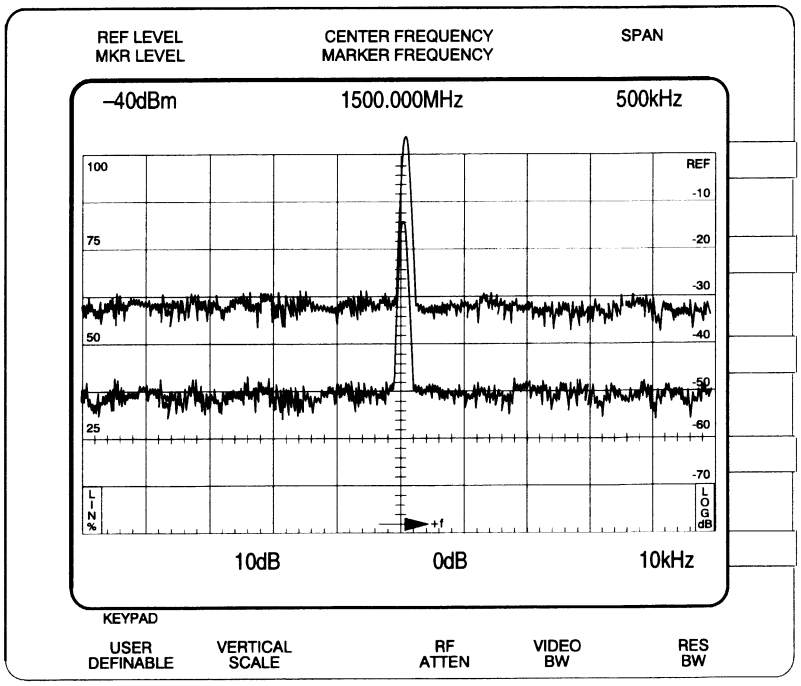
The 2792 features a Signal Identify mode to help identify true signals from false signals. When in this mode, the frequency of the local oscillators is shifted on alternate sweeps. At the same time, the sweeps are vertically offset approximately one division. True signals shift horizontally on the screen only a small amount on alternate sweeps. False signals or spurious responses will shift their horizontal screen position at least 1 division.

Press **INPUT** to call up the **INPUT** menu, then select **Identify ON**. This mode can only be activated when the span is 500 kHz or less for the 0 to 21 GHz bands (internal or external mixer) and 500 MHz or less for the external mixer bands that extend beyond 21 GHz (18 GHz to 325 GHz, Option 04 only).

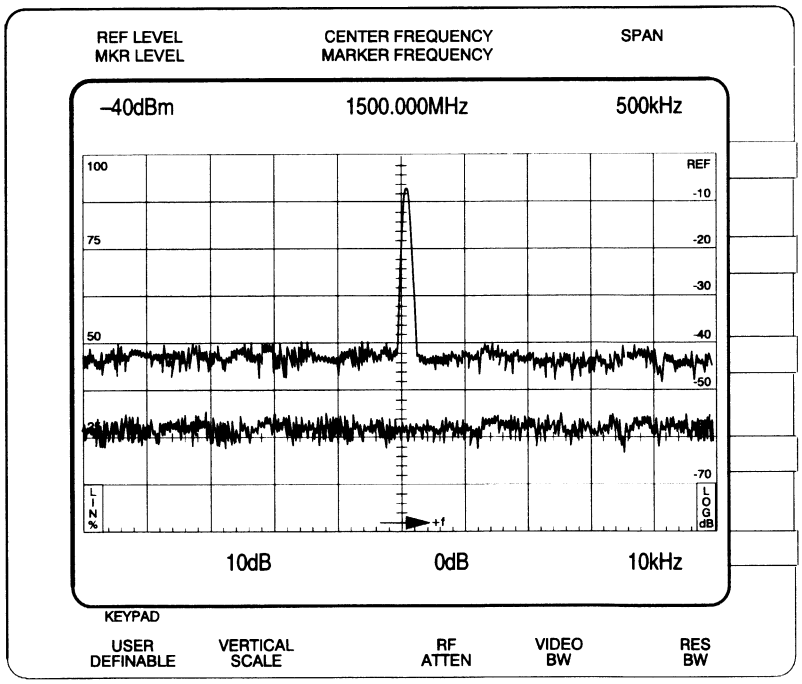
The 1st LO is not phase locked when the span is 2.1 MHz or more in the waveguide bands. Therefore, true or real signals can shift a slight amount between sweeps, due to limits of the oscillator setting accuracies. True signals can shift up to 2 MHz, but false signals will shift 70 MHz or more. If there is any question as to whether the signal is true or false, decrease the span setting to 2 MHz or less so the oscillator is phase locked.

In the millimeter wave bands, the oscillator frequency is shifted far enough so that the mixer may require different bias on alternate sweeps. If no signal is visible for the alternate sweep, readjust manual peaking so that the signal will appear on both sweeps if it is true.

Figure 3-13 illustrates two typical examples of signal identification. The amount of horizontal offset depends on the band and the harmonic number of the oscillator fundamental.



A. Typical response of a true or real signal



B. Typical response from a false signal. Signal for bottom sweep is off screen

Figure 3-13: Typical Example of Identifier Mode Displays

External Interfacing

An IEEE Standard 488-1978 GPIB cable is required to connect devices. For ordering information contact your local Tektronix Field Office or representative.

Interface Functions — Each interface function is a system element that provides basic operational facility for the instrument to receive, process, or send messages over the GPIB.

The instrument implements the following IEEE Standard 488-1978 interface function subsets.

Source Handshake	SH1
Acceptor Handshake	AH1
Talker	T5
Listener	L3
Service Request	SR1
Device Clear	DC1
Parallel Poll	PP1
Device Trigger	DT1
Remote/Local	RL1
Controller	C0

For a description of these functions, see the ***2790 Series Programmer Manual***.

Device Status—The GPIB interface allows the instrument to accurately communicate digital data to various external devices; talkers, listeners, and controllers. The instrument itself can be a talker or a listener.

Bus Address—The GPIB address must be set to a unique number address. The address can be any number from 0 to 30, except that 0 cannot be used when the instrument is being remotely controlled with a Tektronix controller. A controller can talk to and listen to many different devices at the same time, so each device must have its own address. When the instrument uses the address in communication with the controller, the controller knows immediately which device is sending information, asking for information, or in need of assistance.

Bus Management—The GPIB interface allows the instrument to send a request for service to an external controller. If the instrument has insufficient data to complete a process or has a problem, it can request the controller's attention with a service request (SRQ). When the controller routine checks all devices connected to it and finds one requesting service, control can be transferred to a service routine for that device. There is also a provision to tell when the instrument is turned on to join an already functioning system.

Plotting the Display

Use the PLOT function to send all displayed screen information (except menus) over the GPIB interface to drive plotters such as the Tektronix HC100 or the Hewlett-Packard HP7475A. Prepare the instrument and the plotter with the following procedure.

1. Press the **CONFIG** to activate the **GPIB** menu.

2. Select **GPIB Menu**, **Operation Mode Menu**, and then set **Talk Only** .to **ON**. Use the **−dBX** or **+dBX** terminator keys from the **KEYPAD** to set the plotter address. (The plotter address and the GPIB address are the same. The factory default address is 1, but the new selection will remain in effect once the address is changed.)
3. Press the **ESC** key to return to the **CONFIG** menu. Select **Plotter Menu**.
4. Select **Pltr Type Menu 1** (for Tektronix plotters) or **Pltr Type Menu 2** (for Hewlett-Packard plotters), and then select the desired plotter.
5. Connect a GPIB cable between the plotter GPIB connector and the 2792 GPIB connector.
6. Set the plotter interface switches for Listen Only operation. Use the documentation that came with the plotter for instructions.
7. Select the screen display you wish to plot, and press **PLOT**.

NOTE

Once a plot is started, it cannot be terminated.

*To plot the CRT graticule, turn on the graticule lights (press **DISPLAY** and select **Grat Illum ON**) before plotting the display.*

The 2792 remains fully functional while plotting, and can be used for any other normal operation. The screen information is buffered when **PLOT** is pressed, so the screen display can be changed during the plot.

User Adjustments

Several user adjustments are available on the 2792 to set up the following display parameters:

- Viewing intensity
- Vertical position
- Horizontal position
- **LOG CAL** and **AMPL CAL** adjustments

Viewing Intensity

Perform the following steps to set the viewing intensity (trace and readout).

CAUTION

Do not allow a high-intensity dot to remain stationary on the CRT. The CRT phosphor could be permanently damaged.

1. Press the **DISPLAY** key to show the **DISPLAY** menu.
2. Select the **CRT Adjust Menu** from the **DISPLAY** menu.

3. Select **Intensity Adjust**.
4. Use the **USER DEFINABLE** knob to set the display intensity as desired.
5. Press the **−dBX** key to store this setting.

Once the intensity setting has been stored (**−dBX** key pressed), this value is used until the spectrum analyzer is powered off and back on. Intensity is always set to a moderate viewing level at power up.

Vertical Position

Set the vertical position of the display (trace and readout) by performing the following steps. Vertical position is normally set when completing the built-in Vertical Cal routine to set up the display.

1. Press the **DISPLAY** key to show the **DISPLAY** menu.
2. Select the **CRT Adjust Menu** from the **DISPLAY** menu.
3. Select **Dsply Pos Vert Adj** from the **CRT ADJUST** menu.
4. Use the **USER DEFINABLE** knob to set the vertical position as desired.
5. Press the **−dBX** key to store this setting.

Once the vertical position setting has been stored in memory (**−dBX** key pressed), the stored value is used until it is changed by the user.

Horizontal Position

Set the horizontal position of the display (trace and readout) by performing the following steps. Horizontal position is normally set when completing the built-in Vertical Cal routine to set up the display.

1. Press the **DISPLAY** key to show the **DISPLAY** menu.
2. Select the **CRT Adjust Menu** from the **DISPLAY** menu.
3. Select **Dsply Pos Horz Adj** from the **CRT ADJUST** menu.
4. Use the **USER DEFINABLE** knob to set the horizontal position as desired.
5. Press the **−dBX** key to store this setting.

Once the horizontal position setting has been stored in memory (**−dBX** key pressed), the stored value is used until it is changed by the user.

Vertical Cal

The screen parameters (except viewing intensity) are usually adjusted by performing a simple Vertical Cal routine that is built into the 2792. To begin the Vertical Cal routine, press the **UTIL** key and select **Vertical Cal**. The 2792 then performs a center frequency and reference level calibration. Prompts appear on the screen to guide the user through each procedure

step. The routine optimizes horizontal and vertical position, center frequency, reference level, and dynamic range. This procedure sets the absolute reference level for the 3 MHz resolution bandwidth filter.

This front-panel adjustment should be performed at regular intervals so the 2792 can meet its center frequency and reference level accuracy performance specifications. It should also be performed any time the instrument ambient temperature is substantially different from the last adjustment. An explanation of reference level accuracy with respect to ambient temperature is described in *Appendix C, Specification*.

NOTE

Do not attempt to complete the Vertical Cal routine until the 2792 has been able to warm up for several minutes. The instrument may not be able to set correction factors for narrow resolution bandwidth settings until a short warm-up period has elapsed.

1. To begin the calibration procedure, press the **UTIL** key.
2. Select **Vertical Cal** from the **UTIL** menu.

   A prompt message `Connect CAL OUT to RF INPUT` appears on the screen.

NOTE

*This adjustment routine will fail if the **CAL OUT** signal is not connected to the **RF INPUT**.*

3. Connect a Type N-to-BNC adapter (standard accessory) to the **RF INPUT** connector.
4. Connect a short 50 Ω, BNC coaxial cable (standard accessory) between the **CAL OUT** and **RF INPUT** connectors.
5. Select **Continue** from the **VERTICAL CAL** menu.
6. Follow the on-screen prompts to set vertical and horizontal position, and the front-panel **AMPL CAL** and **LOG CAL** adjustments. After each parameter is set, select **Continue** from the **VERTICAL CAL** menu to proceed to the next step.
7. Next the 2792 performs an automatic calibration that measures and corrects for the absolute frequency and amplitude errors of the filters (relative to 3 MHz). This takes approximately 60 seconds.

The correction factors are held in memory. They are stored there until a subsequent Vertical Cal routine is successfully completed.

Vertical Cal Results

The results of the most recent Vertical Cal routine can be displayed. This information may be used to determine whether internal adjustments or repairs are needed to optimize performnce.

View the Vertical Cal results by completing the following steps.

1. Press the **UTIL** key.
2. Select **Corr & Err Menu** from the **UTIL** menu.
3. Select **Int Meas Results** from the **CORR & ERR** menu.

A table appears on the screen that shows the correction factors (see Figure 3-14). The **Freq Error** column indicates the frequency offset values used to center the resolution bandwidth filters. This offset produces a calibrated center frequency. The **Ampl Error** column shows the correction that was used to bring the amplitude of each filter within 0.4 dB of the 3 MHz filter. These values are usually 1 dB or less.

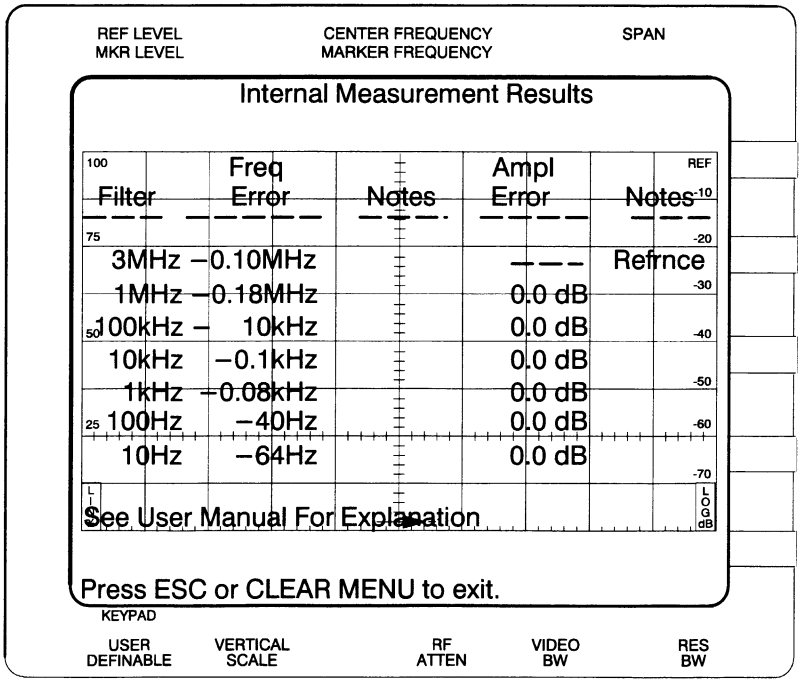


Figure 3-14: Vertical Cal Results Display

Status Message Register

The 2792 has a status message register that stores a list of the most recent status messages. This register also displays the firmware version that is installed in the 2792 (see Figure 3-15).

To display the status message register, perform the following steps.

1. Press the **UTIL** key.
2. Select **Corr & Err Menu** from the **UTIL** menu.
3. Select **Current Status** from the **CORR & ERR** menu.

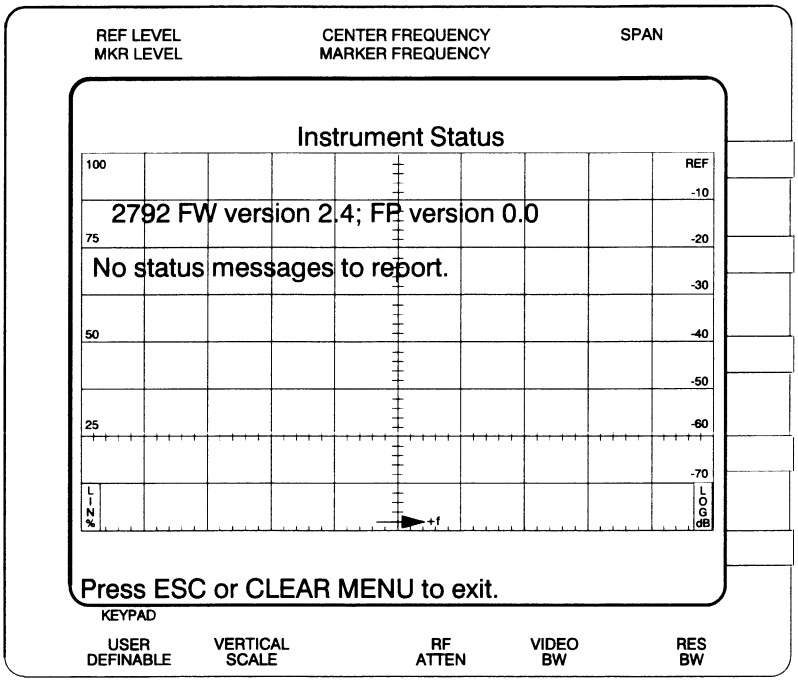


Figure 3-15: Status Register

Appendix A: Options

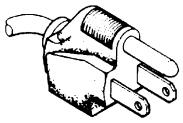
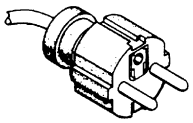
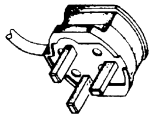
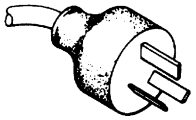
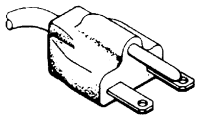
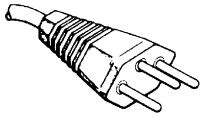
This section describes the options available at this time for the 2792. Changes in specifications, if any, are described in this section. Contact your local Tektronix field office or representative for additional information and ordering instructions (unless otherwise indicated).

Options are usually factory installed. However, field kits are available for some options. Contact your local Tektronix field office or representative for information on field kits and their installation.

Options A1, A2, A3, A4, and A5 (Power Cord Options)

There are five international power cord options available for the 2792 (see Table A-1). For ordering purposes, contact your local Tektronix Field Office or representative.

Table A-1: Power-Cord and Plug Identification

Plug Configuration	Nominal Usage	Option #
	North America 125 V	Standard
	Europe 230 V	A1
	United Kingdom 230 V	A2
	Australia 230 V	A3
	North America 230 V	A4
	Switzerland 230 V	A5

Option B1 (Service Manuals)

This option provides a set of service manuals with the instrument. Service manuals contain the instrument performance check, adjustment procedure, maintenance procedure, theory of operation, parts lists, and schematic diagrams.

Option B2 (Second Manual Set)

This option provides two of each type of manual that is available for the instrument. This includes two each of the User, Programmer, Service Volume 1, and Service Volume 2 manuals.

Options M7 and M9 (Extended Service and Warranty Options)

There are two extended service and warranty options offered for the 2792 (see Table A-2) that go beyond the basic one-year coverage. Contact your local Tektronix Field Office or representative for additional information to satisfy your specific requirements.

Table A-2: Extended Service and Warranty Options

Option	Service Provided	
M7	Year 1	■ One year product warranty coverage
	Years 2 and 3	■ One in-house calibration each for years 2 and 3 of product ownership
M9	Year 1	■ One year product warranty coverage
	Years 2 and 3	■ One in-house remedial coverage each for years 2 and 3 of product ownership

Option 03 (EXT REF Input and Precision Reference Oscillator)

This option provides an EXT REF input at the rear-panel and a more precise internal reference oscillator. See Table A-3 for details.

Table A-3: Electrical Characteristics for Option 03

Characteristic	Performance Requirement	Supplemental Information
Reference Frequency Error		Warm up time (after 24 hours with power off) is <72 hours to meet aging rate specifications—otherwise (after power down indefinitely) 30 days to meet aging rate specifications
Aging Rate		$\leq 2 \times 10^{-9}$/day
Short Term		$\leq 1.4 \times 10^{-8}$/week
First 6 months		$\leq 3.5 \times 10^{-7}$ in first 6 months
After first 6 months		$\leq 5 \times 10^{-7}$/year
Accuracy During Warmup at +25°C, 30 Minutes After Power Up		Within 5×10^{-6} of the frequency after 24 hours
Temperature Sensitivity		Within 1.5×10^{-5} over the instrument operating temperature range of −15°C to +55°C (referenced to +25°C)
Setability	$\leq 1 \times 10^{-6}$	+20°C to +30°C temperature range. 100 MHz CAL OUT Reference
EXT REF IN		
Frequency	1, 2, 5, or 10 MHz ±5 PPM	
Power	−15 dBm to +15 dBm	
Waveshape		Sinewave, ECL, or TTL, with a duty cycle of 40%−60%
Input Impedance		AC=50 Ω, DC=500 Ω

Option 04 (External Mixer Capability)

This option provides external mixer capability for extended frequency coverage through 325 GHz. See Table A-4 for details. Option 04 is not available when Option 07 is installed.

Table A-4: Electrical Characteristics for Option 04

Characteristic	Performance Requirement		Supplemental Information
Center/Marker Frequency			
Range (Internal Mixer)			10 kHz to 21 GHz
Range (External Mixer)			10 kHz to 325 GHz
Frequency Response and In-band Flatness			Frequency response is measured with 10 dB of RF attenuation and peaking optimized for each frequency setting (when applicable)
With Tektronix Waveguide Mixers (WM780K Series)	**In-band Flatness**	**Referenced to 100 MHz**	
Band and Frequency Range			
Band 6 (18 – 27 GHz)	±2.0 dB	±6.0 dB	
Band 7 (26 – 40 GHz)	±2.0 dB	±6.0 dB	
Band 8 (33 – 60 GHz)	±2.0 dB	±6.0 dB	
(40 – 60 GHz)	±2.5 dB	±6.0 dB	
Band 9 (50 – 90 GHz) Band 10 (75 – 140 GHz) Band 11 (110 – 220 GHz) Band 12 (170 – 325 GHz)			Typically range ±3.0 dB over any 5 GHz range for Bands 9 – 12

Sensitivity	Specified using external Tektronix Waveguide Mixers.					Equivalent maximum input noise for each resolution bandwidth Measured at 25°C with: ■ 0 dB RF attenuation (Min Atten 0 dB) ■ Narrow Video Filter On ■ Vertical Display 2 dB/Div ■ Digital Storage On ■ Max Hold Off ■ Peak/Average in Average ■ 10 sec Time ■ Zero Span ■ Input Terminated in 50 Ω
	Equivalent input noise in dBm versus resolution bandwidth					
	1 kHz	**10 kHz**	**100 kHz**	**1 MHz**	**3 MHz**	
Band 6 18 GHz to 27 GHz	−100	−90	−80	−70	−65	
Band 7 & 8 26.5 GHz to 60 GHz	−95	−85	−75	−65	−60	
Band 9 50 GHz—90 GHz (1 kHz Bandwidth)						Typically −95 dBm at 50 GHz, degrading to −85 dBm at 90 GHz
Band 10 75 GHz—140 GHz (1 kHz Bandwidth)						Typically −90 dBm at 75 GHz, degrading to −75 dBm at 140 GHz

Table A-4: Electrical Characteristics for Option 04 (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Sensitivity (Cont.) Band 11 110 GHz—220 GHz (1 kHz Bandwidth)		Typically −80 dBm at 110 GHz, degrading to −65 dBm at 220 GHz
Band 12 170 GHz—325 GHz (1 kHz Bandwidth)		Typically −70 dBm at 170 GHz, degrading to −55 dBm at 325 GHz
EXTERNAL MIXER CONNECTOR		Input for an IF signal from an external mixer When EXT MIXER is selected, provides bias from a 70 Ω source for an external mixer (press **INPUT**; then select **Peak Menu** to set the bias)
Bias Range		+1.0 to −2.0 V (default) or −1.0 to +2.0 V (internally selectable)

Option 07 (75 Ω Input)

This option provides a 75 Ω input and +20 dBmV calibrator in addition to the standard 50 Ω input and calibrator. See Table A-5 for details.

Table A-5: Electrical Characteristics for Option 07

Characteristic	Performance Requirement	Supplemental Information
Frequency		
Center Frequency Operating Range		1 MHz to 1000 MHz on the readout
Static Resolution Bandwidth	Within 20% of 300 kHz bandwidth	Measured at 6 dB down 300 kHz filter replaces the standard 100 kHz filter
Frequency Response		
5 MHz to 1000 MHz (75 Ω RF Input)	±2.0 dB	Frequency response is measured about the midpoint between two extremes with ≥10 dB RF attenuation The response figure includes the effects of: ■ Input VSWR ■ Mixer ■ Gain variations
1 MHz to 5 MHz		Typically <3 dB down from the 5 MHz response
Amplitude		
Reference Level Range (with 0 Reference Level Offset)		−68 dBmV to +99 dBmV +89 dBmV is achievable in Minimum Noise or Reduced Gain mode +99 dBmV is achievable with Minimum Noise on and with Reduced Gain mode activated
Calibrator Output		
CAL OUT Level	+20 dBmV ±0.5 dB	100 MHz comb of markers provide amplitude calibration at 100 MHz
CAL OUT Impedance		75 Ω nominal

Table A-5: Electrical Characteristics for Option 07 (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Sensitivity		Measured at 25° C with: ■ 0 dB RF Attenuation (Min Atten 0 dB ■ Narrow Video Filter On ■ Vertical Display 2 dB/Div ■ Digital Storage On ■ Max Hold Off ■ Peak/Average in Average ■ 10 s Time ■ Zero Span ■ Input Terminated in Characteristic Impedance
Equivalent Input Noise Sensitivity		
5 MHz to 1000 MHz, 75 Ω RF INPUT		
1 kHz Filter	−66 dBmV	
10 kHz Filter	−56 dBmV	
300 kHz Filter	−41 dBmV	
1 MHz Filter	−36 dBmV	
3 MHz Filter	−31 dBmV[a]	
50 Ω RF INPUT Sensitivity for the 300 kHz Resolution Bandwidth		
Band 1	−85 dBm[b]	
Band 2	−83 dBm	
Band 3	−83 dBm	
Band 4 (5.4 GHz to 12 GHz)	−69 dBm	
Band 4 (12 GHz to 18 GHz)	−64 dBm	
Band 5	−63 dBm	
Input		
Input Impedance		75 Ω
Return Loss 5 MHz to 800 MHz		17 dB (1.35:1 VSWR)
Return Loss 800 MHz to 1000 MHz		13 dB (1.6:1 VSWR) with ≥10 dB attenuation
Maximum Input Level		
With 0 dB Attenuation		+78 dBmV
With 20 dB or More Attenuation		+78 dBmV, 100 VDC maximum (DC + Peak AC)
Physical		
Weight		Option 07 adds 0.2 kg (7 ounces) to the standard instrument

a Above 10 MHz.

b Above 1 MHz.

Option 30 (Cradlemount)

This option provides a cradlemount adapter for 19-inch rackmounting.

Option 39 (Silver Battery)

This option provides silver batteries for battery-powered memory.

Option 41 (Digital Radio)

This option provides these enhanced measurement capabilities for Digital Microwave Radio:

- Wider bandwidth preselector filter
- Narrow video filter for the 100 kHz resolution bandwidth filter
- Improved span accuracy at 50 MHz span

See Table A-6 for details.

Table A-6: Electrical Characteristics for Option 41

Characteristic	Performance Requirement	Supplemental Information
Span Accuracy at Center Frequency of 6 GHz and 11 GHz	50 MHz is within ±1% over the center 6 divisions of the display	
Video Filter		30 Hz ($^1/_{3000}$) when Resolution Bandwidth is 100 kHz and the Narrow filter is selected
Preselector Filter Bandwidth		30 MHz minimum from 1.7 GHz to 5 GHz 35 MHz minimum from 5 GHz to 16 GHz 45 MHz minimum from 16 GHz to 21 GHz

Option 42 (110 MHz IF Output)

This option provides a 110 MHz IF output with bandwidth greater than 4.5 MHz for broadband, swept receiver applications. Table A-7 lists the changes from the standard instrument.

Table A-7: Electrical Characteristics for Option 42

Characteristic	Performance Requirement	Supplemental Information
Center Frequency	108.5 MHz to 111.5 MHz	
3 dB Bandwidth	≥4.5 MHZ	
Bandpass Ripple	≤0.5 dB	
Symmetry about 110 MHz center frequency	±1.0 MHz	
Power Out with −30 dBm Input and Signal at Full Screen		Nominal output impedance is 50 Ω 1 dB compression of approximately ≥0 dBm, in the Minimum Distortion mode only
Band 1	≤0 dBm	
Band 5	≥ −40 dBm	

Appendix B: Menu Selectable Functions

Use this appendix as an aid in locating instrument functions.

The first part of the section is an alphabetized function listing that locates all currently available instrument functions and shows the direct selection path. The list is prepared in a logical manner and cross-referenced where necessary.

The second part of the section shows the same information as the first part, only this time in a graphic representation of the menus in an exploded-view format.

Both the alphabetized listing and the graphic representation will allow you to quickly locate instrument functions and the direct path to use to access those functions. Use whichever format is most convenient for you.

Alphabetized Function Listing

The following list contains all of the functions currently available in the 2792 through menu selection.

The Level columns shows at what level in the menu structure the selection is located.

Table A-8: Alphabetized Function Listing

Screen Display	First Level	Second Level	Third Level
1st LO (Display of 1st LO frequency)	UTIL	FREQ DSPLY	
2nd LO (Display of 2nd LO frequency)	UTIL	FREQ DSPLY	
3rd IF (Display of 3rd IF frequency)	UTIL	FREQ DSPLY	
49X Mode (Sets some GPIB commands to 49X mode)	CONFIG	GPIB	
50 Ohm Input	INPUT		
75 Ohm Input	INPUT		
Abort Macro	MACRO		
Assign Function to **USER DEFINABLE** Knob			
Abort Macro	MACRO		
Minimum Attenuation	MIN ATTEN		
Peak Average	WF VIEW	PK/AVG	

Table A-8: Alphabetized Function Listing (Cont.)

Screen Display	First Level	Second Level	Third Level
Peaking Values	INPUT	PEAK	
Reference Level	REF LEVEL		
Resolution Bandwidth	RES BW		
Span	SPAN		
Sweep Speed	SWEEP		
Vertical Scale	REF LEVEL	VERT SCALE	
Auto Frequency Step Size On/Off	FREQUENCY	STEP SIZE	
Auto Peak (Peaks preselector or external mixer)	INPUT	PEAK	
Auto Peak Search	MKRS	PEAK FIND	THRESHOLD
Auto Reference Level Step Size	REF LEVEL	STEP SIZE	
Auto Resolution Bandwidth	RES BW		
Auto Sweep	SWEEP		
Automatic Peaking Routine	INPUT	PEAK	AUTO PEAK
B – Save A Offset (see Set B – Save A Offset)			
B – Save A Waveform	WF VIEW		
Bandwidth Level (see Set Bandwidth Level)			
Bandwidth Marker Control	MKRS		
Baseline Clip (Blanks trace within bottom graticule area)	DISPLAY		
Cal Factors, Resolution Bandwidth (see Resolution Bandwidth Cal Factor Control)			
Center Frequency	UTIL	FREQ DSPLY	
Corrections/Status	UTIL		
Counter Control	COUNTER		
Counter Resolution	COUNTER		
CRT Adjustments	DISPLAY		
CW Signal Type Peak Search	MKRS	PEAK FIND	
dB/Hz	MKRS		
Delta Marker Control	DELTA MKR		

Table A-8: Alphabetized Function Listing (Cont.)

Screen Display	First Level	Second Level	Third Level
Delta Zoom (see Zoom Delta)			
Display Control (Controls screen parameters such as viewing intensity, vert/horiz position, CRT readout)	DISPLAY		
Display Position, Vertical/Horizontal Adjustment	DISPLAY	CRT ADJUST	
EOI/LF (see Terminator)			
EOS (End Of Sweep) Corrections	UTIL	SPEC MODES	
External Mixer	INPUT		
External Mixer Loss (see Set External Mixer Loss)			
External Trigger Sweep (see Trigger Source)			
External Sweep Source (see Sweep Source)			
Free Run Sweep (see Trigger Source)			
Frequency Corrections	FREQUENCY		
Frequency Display	UTIL		
Frequency to Center Frequency (see Set Frequency to Center Frequency)			
Frequency to Marker (see Set Frequency to Marker)			
Full Video Filter	VIDEO BW		
GPIB Address (see Set GPIB Address)			
GPIB Termination (see Terminator)			
Graticule Illumination	DISPLAY		
HC100 Plotter Selection	CONFIG	PLOTTER	TYPE 1
HP7470A Plotter Selection	CONFIG	PLOTTER	TYPE 2
HP7475A Plotter Selection	CONFIG	PLOTTER	TYPE 2
Identify Mode	INPUT		
Intensity Adjustment	DISPLAY	CRT ADJUST	

Table A-8: Alphabetized Function Listing (Cont.)

Screen Display	First Level	Second Level	Third Level
Internal Measurement Results	UTIL	CORR/STAT	
Internal Sweep (see Trigger Source)			
Internal Sweep Source (see Sweep Source)			
LF/EOI (see Terminator)			
Line Sweep (see Trigger Source)			
Linear Mode	REF LEVEL	VERT SCALE	
Listen Only	CONFIG	GPIB	OP MODE
Log Mode	REF LEVEL	VERT SCALE	
Macro Abort (see Abort Macro)			
Manual Sweep	SWEEP		
Marker Control	MKRS		
Marker XdB Control	MKRS		
Max Hold Waveform	WF VIEW		
Max Span Mode	SPAN		
Minimum Distortion Control	MIN ATTEN		
Minimum Noise Control	MIN ATTEN		
Minimum RF Attenuation	MIN ATTEN		
Move Marker XdB Left	MKRS	MARKER XDB	
Move Marker XdB Right	MKRS	MARKER XDB	
Narrow Video Filter	VIDEO BW		
Operation Mode (Selects terminator; talk/listen only)	CONFIG	GPIB	
Peak/Average Control	WF VIEW		
Peak/Average Cursor (see Set Peak/Average Cursor)			
Peak Find	MKRS		
Peak Menu	INPUT		

Table A-8: Alphabetized Function Listing (Cont.)

Screen Display	First Level	Second Level	Third Level
Peaking Value (see Recall Default or Store Default)			
Plotter Selection (see Select Plotter Type)			
Pulse Signal Type Peak Search	MKRS	PEAK FIND	
Pulse Stretcher	DISPLAY		
Readout Display	DISPLAY		
Recall Default (Recalls default peaking value)	INPUT	PEAK	
Recall Settings	SET RECALL		
Recall Waveform (see Waveform Recall)			
Recall Waveform To A	WF RECALL		
Recall Waveform To B	WF RECALL		
Reduced Gain Control	MIN ATTEN		
Reference Level Step Size (see Set Reference Level Step Size)			
Reference Level Units	REF LEVEL	UNITS	
Resolution Bandwidth, Auto (see Auto Resolution Bandwidth)			
Resolution Bandwidth Cal Factor Control	RES BW		
Select Non-Tektronix Plotter (see HP7470A or HP7475A)			
Select Plotter Type	CONFIG	PLOTTER	
Select Tektronix Plotter (see TEK4662, TEK4662 Opt. 31, or HC100)			
Send SRQ	CONFIG		
Set B – Save A Offset	CONFIG	PLOTTER	
Set Bandwidth Level	MKRS	BW MARKER	
Set Counter Resolution (see Counter Resolution)			
Set External Mixer Loss	INPUT		
Set Frequency to Center Frequency	FREQUENCY	STEP SIZE	
Set Frequency to Marker	FREQUENCY	STEP SIZE	

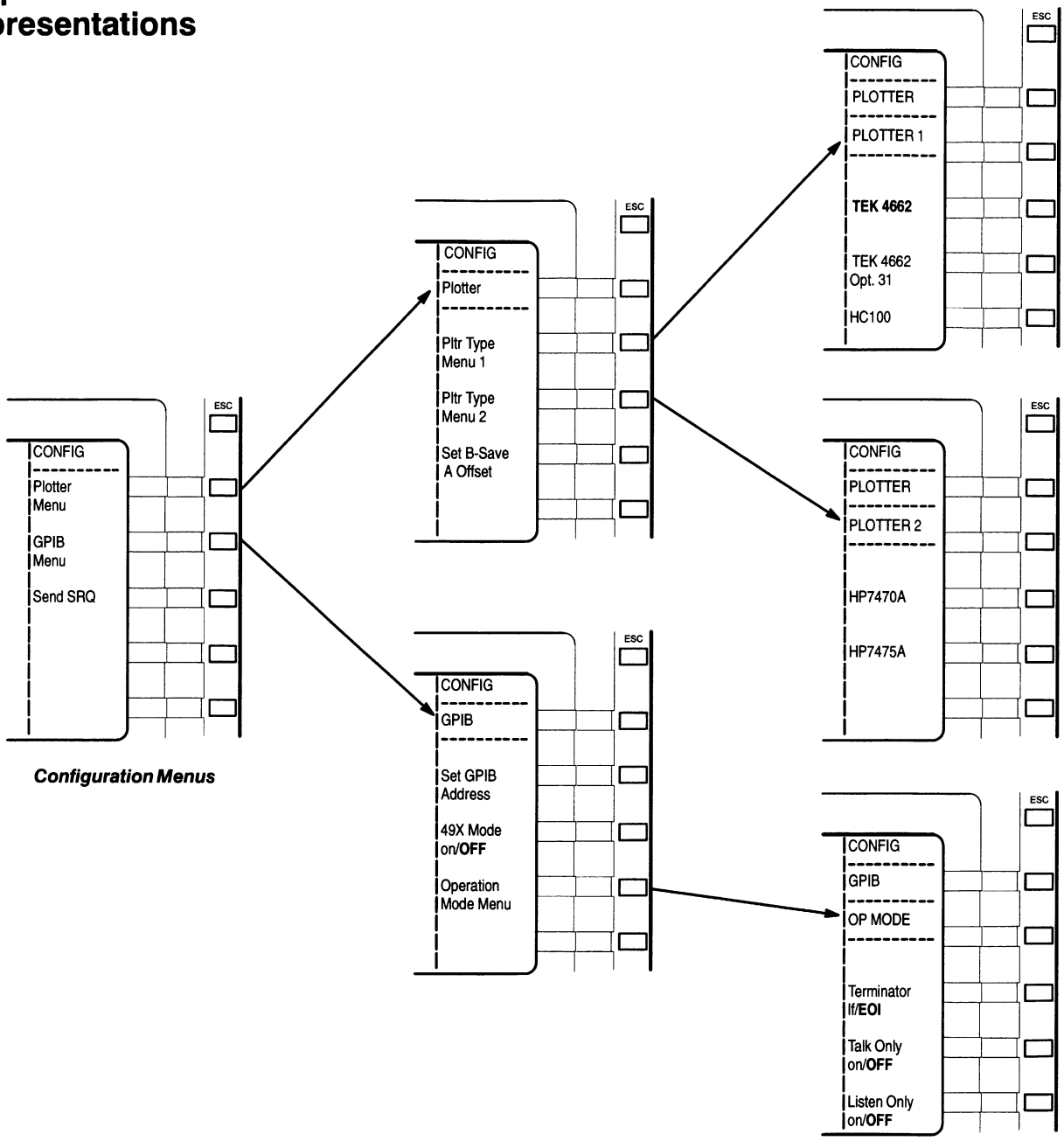
Table A-8: Alphabetized Function Listing (Cont.)

Screen Display	First Level	Second Level	Third Level
Set Frequency Step Size in Hertz	FREQUENCY	STEP SIZE	
Set GPIB Address	CONFIG	GPIB	
Set Marker XdB Value	MKRS	MARKER XDB	
Set Peak/Average Cursor	WF VIEW	PK/AVG	
Set Reference Level Offset	REF LEVEL		
Set Reference Level Step Size	REF LEVEL	STEP SIZE	
Set Start Frequency	FREQUENCY		
Set Step Size	FREQUENCY	STEP SIZE	
Set Stop Frequency	FREQUENCY		
Set Threshold	MKRS	PEAK	THRESHOLD
Settings Recall (see Recall Settings)			
Settings Store (see Store Settings)			
Side Band (Operation with Tektronix 1405 Sideband Analyzer)	UTIL	SPEC MODES	
Special Modes (Track Gen, Side Band, EOS Corr, Z-Spn Time)	UTIL		
Spur Signal Type Peak Search	MKRS	PEAK FIND	
SRQ (see Send SRQ)			
Status/Corrections (see Corrections/Status)			
Store Default (Peaking value)	INPUT	PEAK	
Store Settings	SET STORE		
Store Waveform (see Waveform Store)			
Store Waveform From A	WF STORE		
Store Waveform From B	WF STORE		
Swap Reference Marker	DELTA MKR		
Sweep, Auto (see Auto Sweep)			

Table A-8: Alphabetized Function Listing (Cont.)

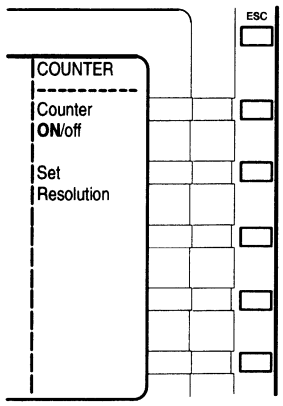
Screen Display	First Level	Second Level	Third Level
Sweep, Manual (see Manual Sweep)			
Sweep Source	SWEEP		
Talk Only	CONFIG	GPIB	OP MODE
TEK4662 Opt. 31 Plotter Selection	CONFIG	PLOTTER	TYPE 1
TEK4662 Plotter Selection	CONFIG	PLOTTER	TYPE 1
Terminator	CONFIG	GPIB	OP MODE
Threshold Control (see also Set Threshold)	MKRS	PEAK FIND	
Tracking Generator	UTIL	SPEC MODES	
Trigger Source	TRIGGER		
Units Menu	REF LEVEL		
Vertical Calibration	UTIL		
Vertical Scale Menu	REF LEVEL		
Video Bandwidth Control	VIDEO BW		
Video Filter; Full, Narrow, Wide (see Full Video Filter, Narrow Video Filter, or Wide Video Filter)			
Waveform Recall	WF RECALL		
Waveform Store	WF STORE		
Waveform View	WF VIEW		
Wide Video Filter	VIDEO BW		
View A Waveform	WF VIEW		
View B Waveform	WF VIEW		
View Waveform (see Waveform View)			
Zero Span Mode	SPAN		
Zero–Span Time	UTIL	SPEC MODES	
Zoom Delta (Scale span and center frequency to Delta Marker locations)	DELTA MKR		

Graphic Menu Representations

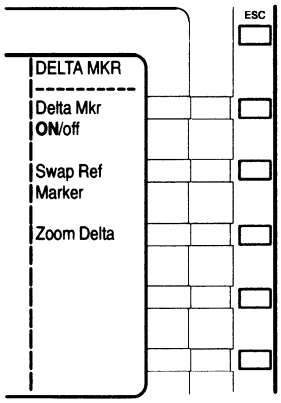


Configuration Menus

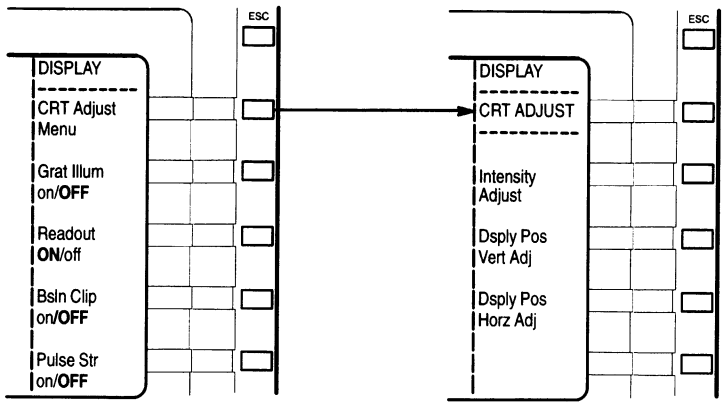
Configuration Menus



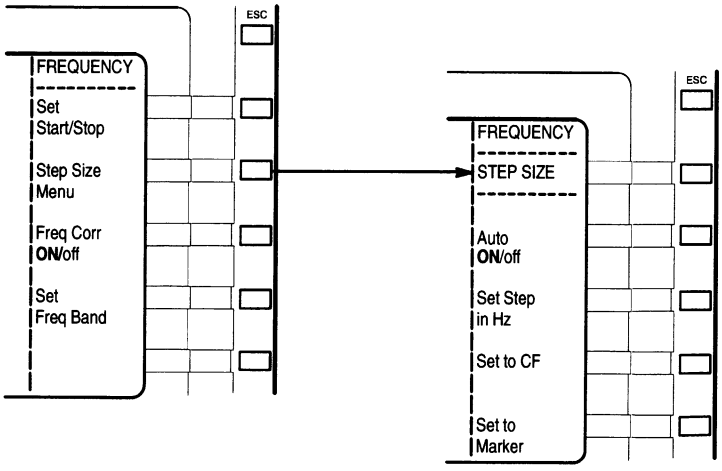
Counter Menu



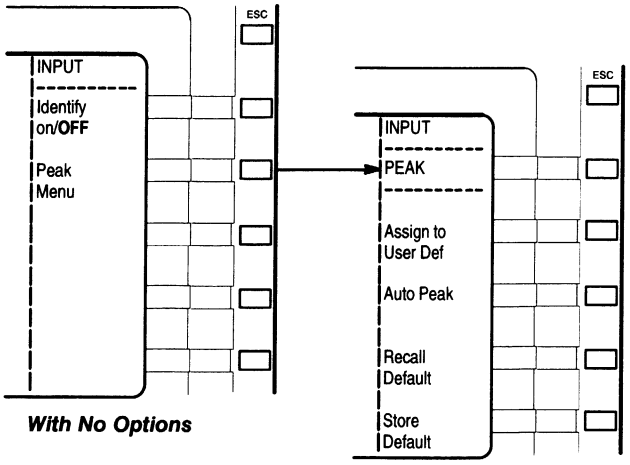
Delta Marker Menu



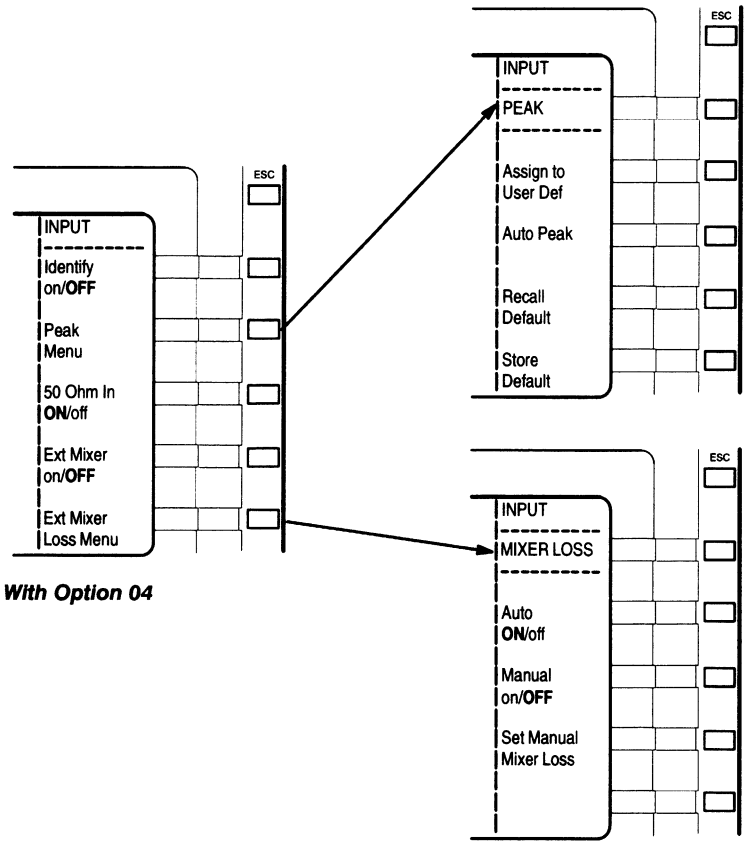
Display Menus



Frequency Menus

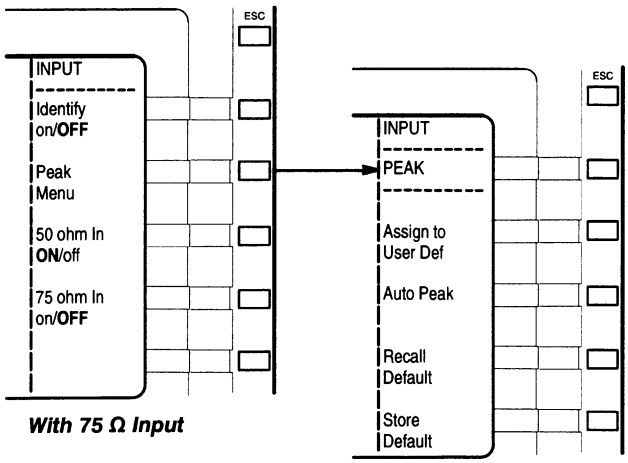


With No Options

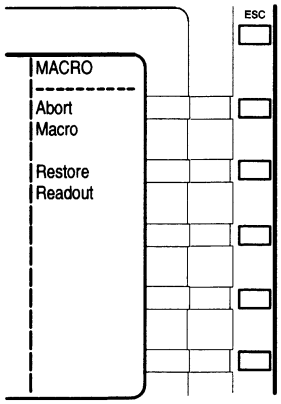


With Option 04

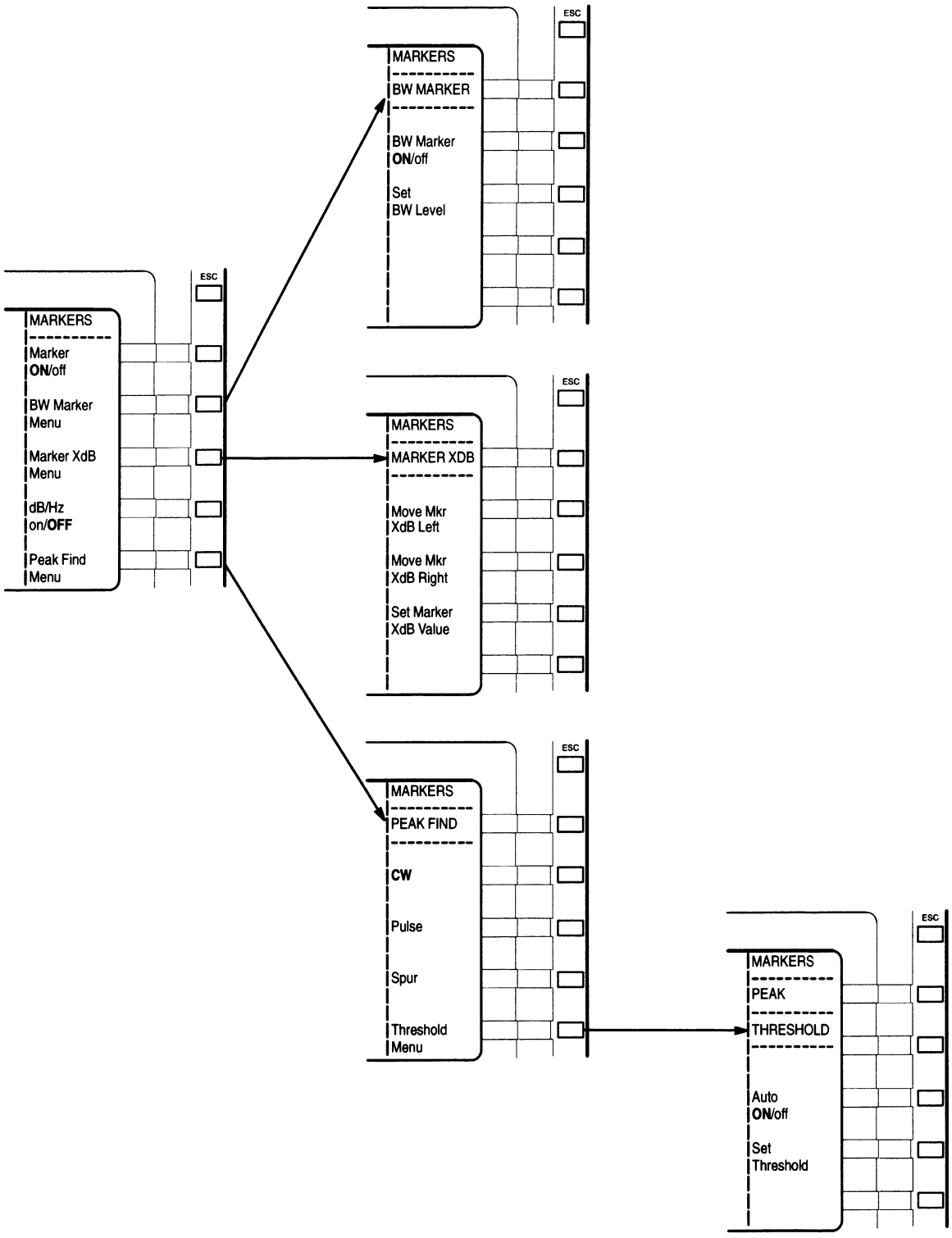
Input Menus



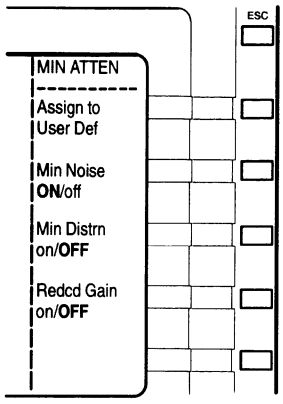
Input Menus (Continued)



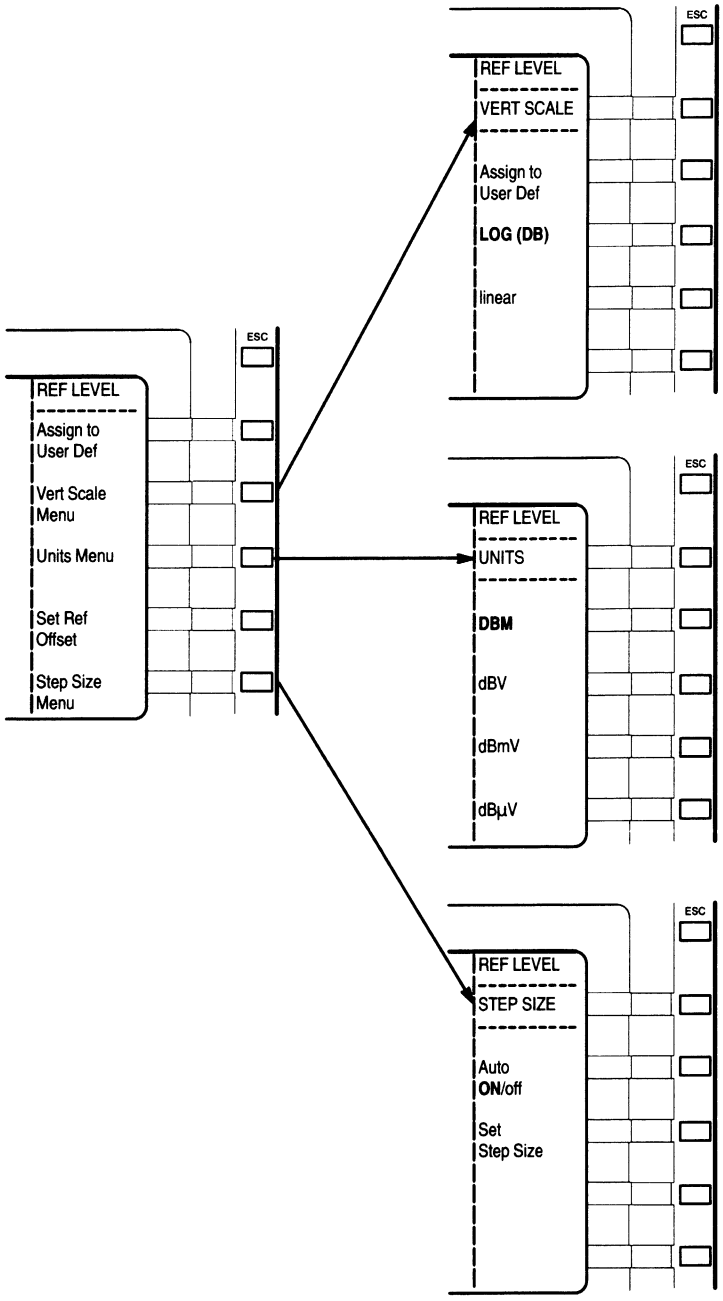
Macro Menu



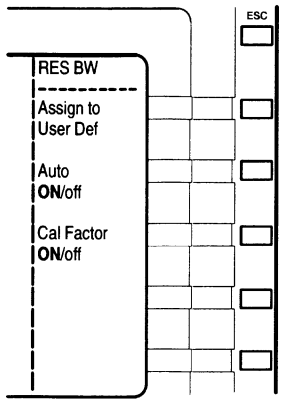
Markers Menus



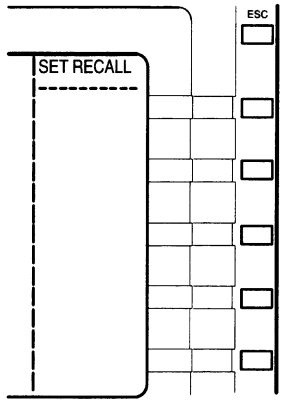
Minimum RF Attenuation Menu



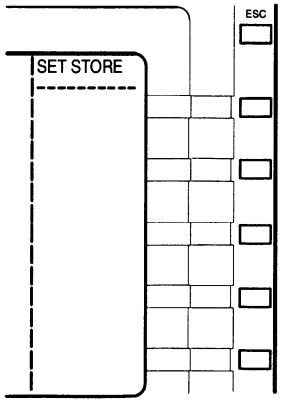
Reference Level Menus



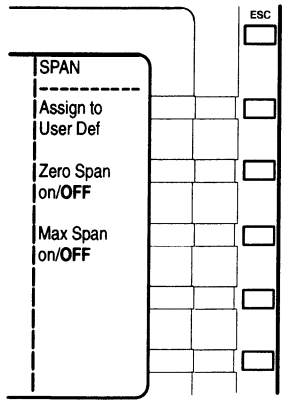
Resolution Bandwidth Menu



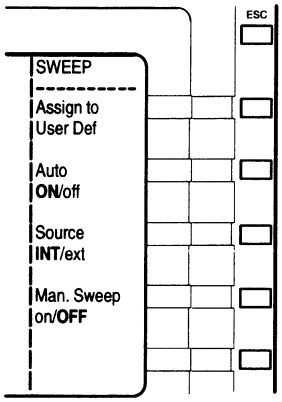
Settings Recall Menu



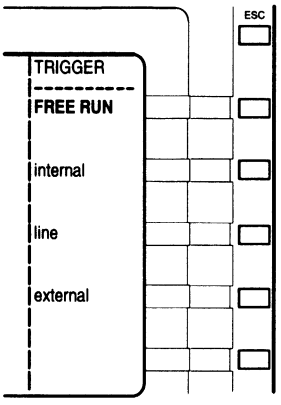
Settings Store Menu



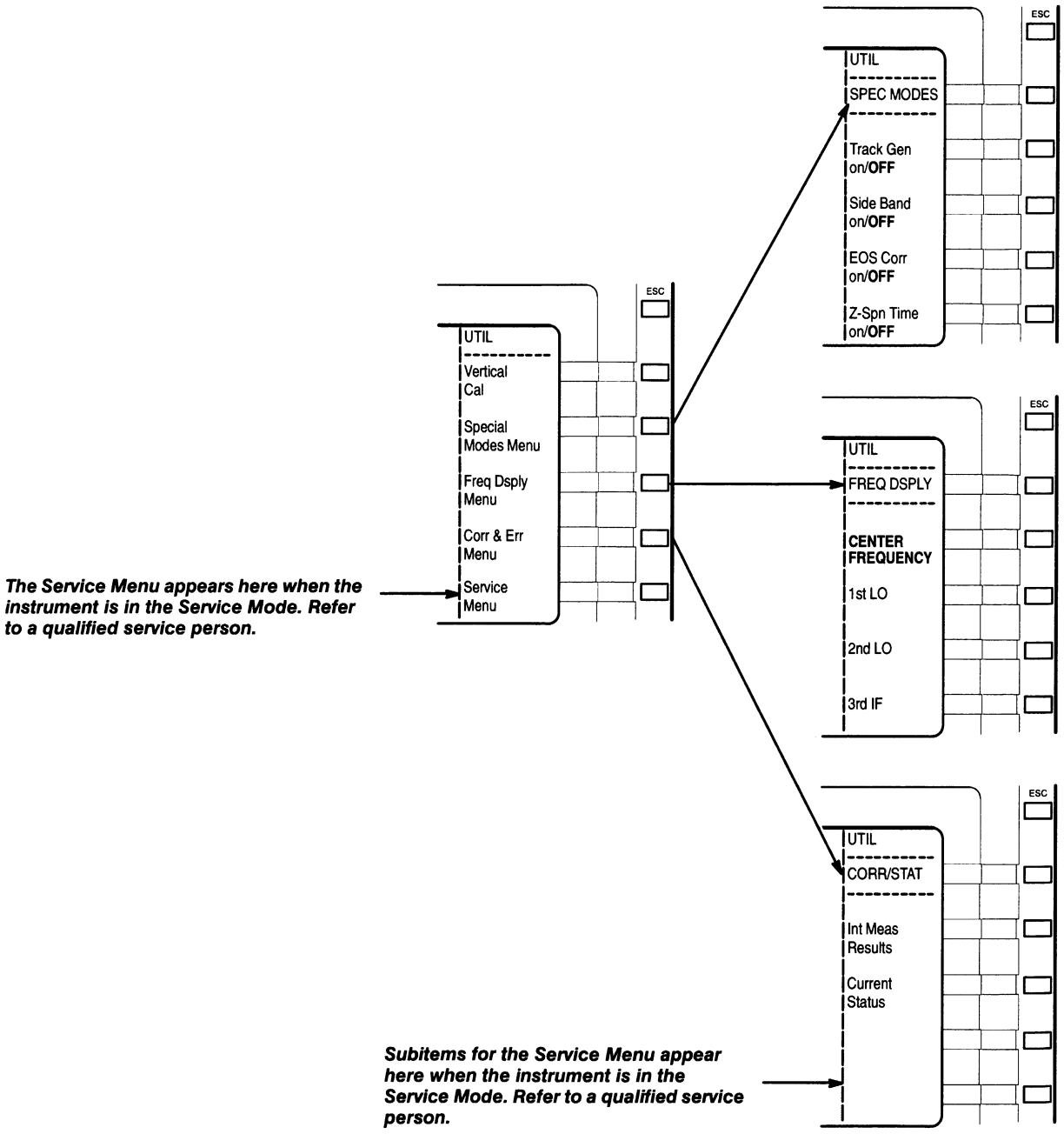
Span Menu



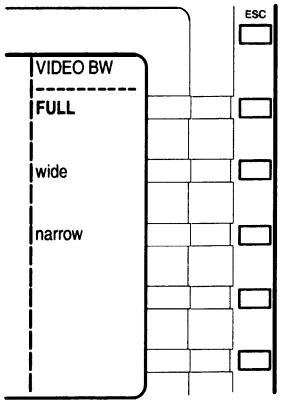
Sweep Menu



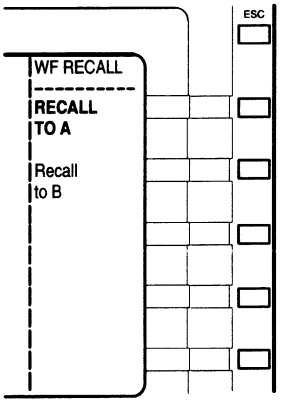
Trigger Menu



Utility Menus

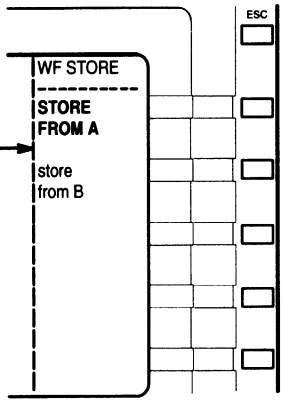


Video Bandwidth Menu

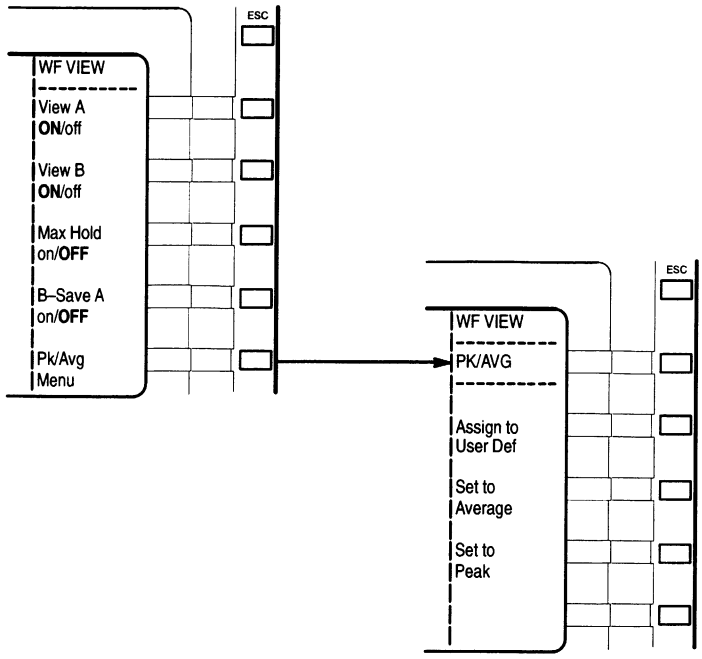


Waveform Recall Menu

These selections appear only when Save A mode is active.



Waveform Store Menu



Waveform View Menus

Appendix C: Specification

This section includes the electrical, physical, and environmental characteristics of this instrument. Any instrument specification changes due to options are listed in *Appendix A, Options*.

Electrical Characteristics

The following tables of electrical characteristics and features apply to the spectrum analyzer after a 30-minute warm-up, and after performing the Vertical Cal adjustments in the **UTIL** menu, except as noted.

- The Performance Requirement statements define characteristics that are essential to the intended application of the product. Performance Requirement characteristics are normally verifiable by following the *Performance Check* procedure in the ***2792 Service Manual, Volume 1***.
- The Supplemental Information column provides more explanation about related Performance Requirements, or describes typical performance for characteristics not ordinarily verified by the *Performance Check* procedure.

The 2792 performs an internal processor system check each time power is turned on. A *Functional Check* procedure is provided in *Section 1, Getting Started* of this manual. This procedure satisfies most incoming inspections and will help to familiarize the user with the instrument capabilities. It does not require external test equipment or technical expertise.

Verification of Tolerance Values

Perform compliance tests of specified limits, listed in the Performance Requirement column, only after a 30-minute warm-up time (except as noted) and after doing the Vertical Cal procedure under the **UTIL** menu. Use measurement instruments that do not affect the values measured. Measurement tolerance of test equipment should be negligible when compared to the specified tolerance. When the tolerance of test equipment is not negligible, the error of the measuring device should be added to the specified tolerance.

Table A-9: Frequency Related Characteristics

Characteristic	Performance Requirement	Supplemental Information
Center/Marker Frequency		
Range		10 kHz to 21 GHz Tuned by the **FREQUENCY/ MARKERS** control or the ↑ (increment) and ↓ (decrement) keys, or the **KEYPAD** (when assigned)
Drift		With constant ambient temperature and fixed center frequency Refer to *IF Frequency, LO Range, and Harmonic Number (N)* for the value of N
After 30 minute warmup		
1st LO Unlocked[a]		Typically ≤25 kHz(N) per minute
1st LO Locked[b]		Typically ≤150 Hz per minute
After 1 hour warmup		
1st LO Unlocked[a]		Typically ≤5 kHz(N) per minute Not significant when compared to residual FM per minute of sweep time
1st LO Locked[b]	≤50 Hz per minute	Correction will occur at the end of sweep for sweep times ≥50 seconds
Readout Resolution		At least 1% of Span to a minimum of 1 kHz
Initial Accuracy (After **UTIL Vertical Cal** is completed)	±[E + (CF × REF) + 15(N) kHz] where: E=2% of Span or 20% of Resolution Bandwidth, whichever is greater CF=Center Frequency REF=Reference Frequency Error N=Harmonic Number	Allow a settling time of one second for each GHz change in CF Refer to *IF Frequency, LO Range, and Harmonic Number (N)* in this table for the value of N
1st LO Unlocked[a]		

[a](SPAN >2 MHz Bands 1 and 5) and (SPAN >1 MHz Bands 2 through 4).

b(SPAN ≤2 MHz Bands 1 and 5) and (SPAN ≤1 MHz Bands 2 through 4).

Table A-9: Frequency Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Initial Accuracy (Continued)		
1st LO Locked[a]	±[E + (CF × REF) + (2N + 25) Hz] where: E=2% of Span or 20% of Resolution Bandwidth, whichever is greater CF=Center Frequency REF=Reference Frequency Error N=Harmonic Number	Refer to *IF Frequency, LO Range, and Harmonic Number (N)* in this table for the value of N
Reference Frequency Error		
Accuracy During Warmup at +25°C 30 Minutes After Power Up		Within 1×10^{-5}
Temperature Sensitivity		Within 1.5×10^{-5} over the instrument operating temperature range of −15°C to +55°C (referenced to +25°C)
Setability	$\leq 1 \times 10^{-5}$	+20°C to +30°C temperature range. 100 MHz CAL OUT Reference

a(SPAN ≤2 MHz Bands 1 & 5) and (SPAN ≤1 MHz Bands 2 — 4).

Table A-9: Frequency Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Signal Counter		
Accuracy With Span to Resolution Bandwidth Ratio ≤100:1 (After 30 Minute Warm-up)	±(CF × REF) + (10 + 2N)Hz + 1 LSD where: CF=Center Frequency REF=Reference Frequency Error LSD=Least Significant Digit N=Harmonic Number	Count at center, marker, or Δ markers Refer to *IF Frequency, LO Range, and Harmonic Number (N)* in this table for the value of N
Sensitivity	Signal level, at center screen or at marker, must be 20 dB or more above the average noise level and within 60 dB of the reference level	
Readout Resolution		1 Hz to 1 GHz in decade steps, selectable with the COUNTER menu
Residual FM		Short term, after 1 hour warm-up
1st LO Unlocked[a]	≤ (7 kHz)N total excursion in 20 ms	Refer to *IF Frequency, LO Range, and Harmonic Number (N)* in this table for the value of N
1st LO Locked[b]	≤ (10 + 2N) Hz total excursion in 20 ms	
Static Resolution Bandwidth (6 dB down)	Within 20% of selected bandwidth	1 kHz to 1 MHz in decade steps, and 3 MHz.
Shape Factor (60 dB/6 dB)	7.5:1 or less	
Bandwidth Filter Centering		The instrument filter-centering routine defines the left-most high point of the filter response curve as the filter center—this point must be used for all measurements referencing filter center

[a](SPAN >2 MHz Bands 1 & 5) and (SPAN >1 MHz Bands 2 — 4).

b(SPAN ≤2 MHz Bands 1 & 5) and (SPAN ≤1 MHz Bands 2 — 4).

Table A-9: Frequency Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Noise Sidebands	≤ −73 dBc at 30X the selected bandwidth for all resolution bandwidths	
Video Filter		RES BW / WIDE / NARROW 3 MHz / 30 kHz / 3 kHz 1 MHz / 30 kHz / 3 kHz 100 kHz / 3 kHz / 300 Hz 10 kHz / 300 Hz / 30 Hz 1 kHz / 30 Hz / 3 Hz
Pulse Stretcher Fall-Time		30 µs/div of pulse amplitude (typical)
Frequency Span		
Range		2 kHz to 10 GHz (in a 1−2−5 sequence with the **USER DEFINABLE** knob (when selected) or the ↑ (Increment) and ↓ (Decrement keys keys, or 2 kHz to 12 GHz (from the **KEYPAD**) to two significant digits In addition, the **SPAN** menu provides Maximum Span and Zero Span modes. Maximum Span provides a full-band display. Zero Span provides a 0 Hz display where the horizontal axis is calibrated in time instead of frequency
Multiband Mode		In bands 2 through 5 press **MENU ENBL FREQUENCY**; then select **Start/Stop** to enter a start frequency in one band and the stop frequency in another band (Multiband Mode). Maximum range is 1.7 GHz to 21 GHz Start and stop frequencies are limited to a single band in Band 1

Table A-9: Frequency Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Frequency Span (Continued)		
Accuracy/Linearity	Within 5% of the selected Span	Measured over the center 8 divisions Specification does not apply to Multiband mode
Maximum Span		**With USER DEFINABLE Knob** / **With Data Entry KEYPAD** Band 1 (0 — 1.8 GHz): 1 GHz / 1.7 GHz Band 2 (1.7 — 5.5 GHz): 2 GHz / 3.7 GHz Band 3 (3 — 7.1 GHz): 2 GHz / 4 GHz Band 4(5.4 — 18 GHz): 10 GHz / 12 GHz Band 5 (15 — 21 GHz): 5 GHz / 5.9 GHz
IF Frequency, LO Range, and Harmonic Number (N)		**1st IF (MHz)** / **LO Range (MHz)** / **(N)** Band 1 (0 — 1.8 GHz): 2072 / 2072-3872 / 1– Band 2 (1.7 — 5.5 GHz): 829 / 2529-6329 / 1– Band 3 (3 — 7.1 GHz): 829 / 2171-6271 / 1+ Band 4(5.4 — 18 GHz): 829 / 2076-6276 / 3– Band 5 (15 — 21 GHz): 2072 / 4309-6309 / 3+
Marker(s)		When activated, the marker is a bright dot positioned by the **FREQUENCY/MARKERS** knob or the **KEYPAD**
Normal Accuracy/Resolution	Identical to Center Frequency accuracy	For the active trace
Δ MKR Accuracy	±1% of the Span	**ΔMKR** activates a second marker at the position of the single marker on the trace (parentheses appear on the marker display line indicating that the delta mode is active) 5% on multiband and stored displays
Δ MKR Resolution		≤1% of Span 5% on multiband and stored displays

Table A-10: Amplitude Related Characteristics

Characteristic	Performance Requirement	Supplemental Information
Vertical Display Modes		Logarithmic and Linear modes Any integer between 1 through 15 dB/div can also be selected using the **KEYPAD** or the **USER DEFINABLE** knob (when selected)
Display Dynamic Range		80 dB maximum for Log Mode 8 divisions for Linear Mode
Accuracy		
10 dB/Div Mode	±1.0 dB/10 dB to a maximum cumulative error of ±2.0 dB over 80 dB range	
2 dB/Div Mode	±0.4 dB/2 dB to a maximum cumulative error of ±1.0 dB over 16 dB range	
LIN Mode	±5% of full scale	
Marker(s) Accuracy		Identical to Reference Level accuracy plus cumulative error of display scale (dependent on vertical position)
Reference Level (Top of the graticule)		
Range		
Log Mode		From −117 dBm to +50 dBm with no reference offset; +50 dBm includes 20 dB of IF gain reduction (+30 dBm is the maximum safe input) Alternate reference levels are: ■ dBV (−130 dBV to +37 dBV) ■ dBmV (−70 dBmV to +97 dBmV) ■ dBμV (−10 dBμV to +157 dBμV)
Linear Mode		Entry is via the **KEYPAD**, the **USER DEFINABLE** knob (when selected), or the **REFERENCE LEVEL** ↑ (increment) and ↓ (decrement) keys The range is 39.6 nV/div to 2.8 V/div (1 W CW or 10 V_{peak} maximum safe input

Table A-10: Amplitude Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Reference Level (Continued)		
Log Mode Steps		**USER DEFINABLE** knob changes the REFERENCE LEVEL in one-division steps. The **REFERENCE LEVEL** ↑ (Increment) and ↓ (Decrement) key step size is user selectable
Accuracy		Dependent on the following characteristics: ■ RF Attenuation Accuracy ■ IF Gain Accuracy ■ Resolution Bandwidth ■ Display Mode ■ Calibrator Accuracy ■ Frequency Response ■ Frequency Band ■ Calibration routine reduces error between resolution bandwidths at −20 dBm reference level. Other reference levels may have larger errors ■ Ambient Temperature Change (±0.15 dB/°C maximum, typically ±0.05 dB/°C) The input RF attenuator steps 10 dB for reference level changes above −30 dBm (−20 dBm when Minimum Noise mode is active) unless the **MIN RF ATTEN** dB control setting is greater than zero The IF gain increases 10 dB for each 10 dB reference level change below −30 dBm (−20 dBm when MIN NOISE mode is active)
RF Attenuator		
Range		0−60 dB in 10 dB steps
Accuracy DC to 1.8 GHz	Within 0.5 dB/10 dB to a maximum of 1 dB over the 60 dB range	
Accuracy 1.8 GHz to 18 GHz	Within 1.5 dB/10 dB to a maximum of 3 dB over the 60 dB range	
Accuracy 18 GHz to 21 GHz	Within 3.0 dB/10 dB to a maximum of 6 dB over the 60 dB range	

Table A-10: Amplitude Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Gain Variation Between Resolution Bandwidths		Measured conditions: ■ Measured at −20 dBm ■ Without Reduced Gain mode ■ Minimum Distortion mode ■ After calibration routine at ambient temperature
With Respect to 3 MHz Filter	≤±0.4 dB	
Between Any Two Filters	≤0.8 dB	
Frequency Response and In-band Flatness		Frequency response is measured with 10 dB of RF attenuation and Peaking optimized for each frequency setting (when applicable)
Coaxial (Direct) Input **Band and Frequency Range** Band 1 (10 kHz — 1.8 GHz) Band 2 (1.7 — 5.5 GHz) Band 3 (3 — 7.1 GHz) Band 4 (5.4 — 18 GHz) Band 5 (15 — 21 GHz)	**In-band Flatness** / **Referenced to 100 MHz** ±2.0 dB / ±3.0 dB ±3.0 dB / ±4.0 dB ±3.0 dB / ±4.0 dB ±4.0 dB / ±5.0 dB ±5.5 dB / ±7.0 dB	Response is affected by: ■ Input VSWR ■ Gain variation ■ Mixer conversion ■ Preselector ■ Harmonic number (N) Refer to *Appendix A, Options* for variations to this specification
IF Gain Range		87 dB of gain increase, 20 dB of gain decrease (Minimum Noise and Reduced Gain modes activated), in 10 dB and 1 dB steps
Accuracy 1 dB Step	≤0.2 dB/dB step to 0.5 dB/9 dB steps except at the decade transitions	
Decade Transitions −19 to −20 dBm −29 to −30 dBm −39 to −40 dBm −49 to −50 dBm −59 to −60 dBm	0.75 dB or less	Maximum 1 dB cumulative error over 10 dB
Maximum Deviation Over the Range	±2 dB	

Table A-10: Amplitude Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Spurious Responses		
All Input-related Spurs Except As Noted Below	≤−70 dBc	Mixer level ≤−30 dBm
Harmonic Distortion		Measured across the entire band, with −40 dBm input and 0 dB attenuation
10 kHz to 21 GHz (Bands 1 through 5)	−60 dBc or less	
Residual	−95 dBm or less	With no input signal, 0 dB RF attenuation, and fundamental mixing (Bands 1, 2, and 3) Terminate input into 50 Ω
3rd Order Intermodulation Products (Bands 1 through 5)	−70 dBc or less	From any two on-screen signals within any frequency span In Minimum Distortion mode Without Reduced Gain mode
LO Emission	−70 dBm or less to 21 GHz	With 0 dB RF Attenuation
Sensitivity	Equivalent input noise in dBm versus resolution bandwidth	Typical sensitivity 1 kHz to 10 kHz is −60 dBm at 1 kHz Resolution Bandwidth Equivalent maximum input noise for each resolution bandwidth Measured at 25°C with: ■ 0 dB RF attenuation (Min Atten 0 dB) ■ Narrow Video Filter On ■ Vertical Display 2 dB/Div ■ Digital Storage On ■ Max Hold Off ■ Peak/Average in Average ■ 10 sec Time ■ Zero Span ■ Input Terminated in 50 Ω

	1 kHz	10 kHz	100 kHz[a]	1 MHz	3 MHz
Band 1 10 kHz to 100 kHz	−70				
100 kHz to 1 MHz	−90	−80			
1 MHz to 1.8 GHz	−110	−100	−90	−80[b]	−75[c]
Band 2 & 3 1.7 GHz—7.1 GHz	−108	−98	−88	−78	−73
Band 4 5.4 GHz—12 GHz	−94	−84	−74	−64	−59
Band 4 12 GHz—18 GHz	−89	−79	−69	−59	−54
Band 5 15 GHz—21 GHz	−88	−78	−68	−58	−53

[a] Replaced with 300 kHz filter for Option 07. See Option 07 specifications.

[b] Above 5 MHz.

[c] Above 10 MHz.

Table A-11: Input Signal Characteristics

Characteristic	Performance Requirement	Supplemental Information
RF INPUT		Type N female connector (see Option 07 characteristics *Appendix A, Options* for supplemental specifications concerning an additional 75 Ω input)
Impedance		50 Ω
VSWR with ≥ 10 dB RF Attenuation		
10 kHz — 2.5 GHz		1.3:1 maximum (typically 1.2:1)
2.5 GHz — 6 GHz		1.7:1 maximum (typically 1.5:1)
6 GHz — 18 GHz		2.3:1 maximum (typically 1.9:1)
18 GHz — 21 GHz		3.5:1 maximum (typically 2.7:1)
VSWR with 0 dB RF Attenuation		
10 kHz — 6 GHz		Typically 1.9:1
6 GHz — 18 GHz		Typically 2.3:1
18 GHz — 21 GHz		Typically 3.0:1
Maximum Non-destructive Input Ratings (With 0 dB RF Attenuation)		+30 dBm (1 W) continuous or 75 W peak, pulse width of 1 µs or less with a maximum duty factor of 0.001 (attenuator limited) Do not apply DC voltage to the RF INPUT connector
1 dB Compression Point (Minimum) for Bands 1 through 5 (10 kHz to 21 GHz)	0 dBm	Measured in Minimum Noise mode with no RF Attenuation

Table A-11: Input Signal Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
HORIZ | TRIG (rear panel)		DC-coupled input for external horizontal drive for external sweep and AC-coupled input for external trigger signals for internal sweep
Sweep Input Voltage Range		0 to +10 V (DC + Peak AC) for full-screen deflection
Trigger Input Voltage Range		
Minimum	At least 1.0 V_{peak} from 15 Hz to 500 kHz	Typically 1.5 V_{peak} at 1 MHz.
Maximum		
DC + Peak AC		50 V
AC		30 V_{RMS} to 10 kHz, then derate linearly to 3.5 V_{RMS} at 100 kHz and above
Pulse Width		0.1 µs minimum
MARKER | VIDEO (rear panel)		External Video input or External Video Marker input, switched by pin 1 of the ACCESSORIES connector
VIDEO Input Level		0 to +4 V for full-screen display with pin 1 of the ACCESSORIES connector low
MARKER Input Level		0 to −10 V Interfaces with Tektronix 1405 TV Sideband Adapter
ACCESSORY Connector J104		25-pin connector (not RS-232 compatible) Provides bidirectional access to the instrument bus and provides External Video select and external preselector drive—except for the external preselector drive, all lines are TTL compatible Maximum voltage on all lines is ±15 V
Pin 1		External Video Select Low selects External VIDEO Input High (default) selects Video MARKER Input

Table A-11: Input Signal Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
ACCESSORY Connector J104 (Continued)		
Pin 2		External Preselector Drive—Drive signal for an external preselector. Output voltage is proportional to Center Frequency
Pin 3		External Preselector Return—Ground return for the External Preselector signal
Pin 4		Internal Control High (default) selects internal control Low selects External control Instrument bus lines at the ACCESSORIES connector accept input from an external controller
Pin 5		Chassis Ground
Pins 6–13[a]		Instrument Bus Address Lines 7-0
Pin 14[a]		Instrument Bus Data Valid signal
Pin 15		Instrument Bus Service Request signal
Pin 16[a]		Instrument Bus Poll signal
Pin 17		Data Bus Enable input signal for external controller High (unasserted) disables external data bus Low enables external data bus
Pins 18–25		Instrument Bus Data lines 0 through 7 Active when External Data Bus Enable (pin 17) is low

[a]Output when internally controlled (pin 4 high) and input when externally controlled (pin 4 low).

Table A-12: Output Signal Characteristics

Characteristic	Performance Requirement	Supplemental Information
Calibrator (CAL OUT)	−20 dBm ±0.3 dB at 100 MHz ±10 PPM	100 MHz comb of markers provide amplitude calibration at 100 MHz Phase locked to the reference oscillator when Option 03 is installed
1st LO and 2nd LO OUTPUTs		Provide access to the output of the respective local oscillators *These ports must be terminated in 50 Ω at all times*
1st LO OUTPUT Power		+7.5 dBm to +20 dBm
2nd LO OUTPUT Power		−12 dBm ±5 dB
VERT Output		Provides 0.5 V ±5% (open circuit) of signal per division of video that is above and below the center line Full range is −2.0 V to +2.0 V 250 mV maximum ripple Source impedance is approximately 1 kΩ
HORIZ Output		Provides 0.5 V/div (open circuit) either side of center Full range −2.5 V to +2.5 V Source impedance is approximately 1 kΩ
PEN LIFT		TTL compatible, nominal +5 V to lift plotter pen
10 MHz IF output		Output level is approximately −5 dBm for a full-screen signal at −30 dBm reference level Nominal impedance is approximately 50 Ω
IEEE STD 488 PORT		In accordance with IEEE 488−78 standard and Tektronix Codes and Formats standard (version 81.1) Implemented as SH1, AH1, T5, L3, SR1, RL1, PP1, DC1, DT1, and C0
PROBE POWER (rear panel)		Provides operating voltages for active probes
Outputs		
Pin 1		+5 V at 100 mA maximum
Pin 2		Ground
Pin 3		−15 V at 100 mA maximum
Pin 4		+15 V at 100 mA maximum

Table A-12: Output Signal Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
ACCESSORIES Connector J104		All inputs and outputs are listed in Table A-11, Input Signal Characteristics

Table A-13: General Characteristics

Characteristic	Performance Requirement	Supplemental Information
Sweep		Auto, manual, single sweep, and external
Sweep Time	200 µs to 100 s	
Accuracy	±5% over center 8 divisions	
Marker Time Accuracy		10% of measurement for single marker 5% of measurement for Δ markers Available only when zero span is activated
Triggering		Internal, external, free run, and line
Internal Trigger Level	2 divisions or more of signal	
External Trigger Input Level	1.0 V_{peak} minimum	External is AC coupled (15 Hz to 500 kHz) Maximum external trigger input is 50 V (DC + Peak AC)
CRT Readout		Displays all parameters listed on the CRT bezel, plus operating messages and menus
Battery-powered Memory		Instrument settings, macros, displays, calibration offsets, and peaking codes are stored in battery-powered non-volatile RAM
Battery LIfe		
At +55°C Ambient Temperature		1–2 years
At +25°C Ambient Temperature		
Lithium (Standard)		At least 5 years
Silver (Option 39)		2 years
Temperature Range for Retaining Data		

Table A-13: General Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Battery-powered Memory, Battery Life (Continued)		
Operating		−15°C to +55°C
Nonoperating		−30°C to +85°C

Table A-14: Power Requirements

Characteristic	Performance Requirement	Supplemental Information
Line Frequency Range		47 to 63 Hz[a]
Line Voltage Range	90 VAC to 132 VAC	115 V nominal
	180 VAC to 250 VAC	230 V nominal
Line Fuse		
115 V Nominal		4A Fast-Blow
230 V Nominal		2A Slow-Blow
Input Power	210 W maximum (3.2 A)	At 115 V and 60 Hz
Leakage Current		
47 to 63 Hz		3.5 mA maximum[a]

[a] Tested for operation up to 440 Hz; leakage current exceeds 3.5 mA at frequencies greater than 63 Hz.

Table A-15: Environmental Characteristics

Characteristic	Description	
Meets MIL-T-28800C, type III class 3, style C specifications as follows:		
Temperature		
Operating	−15°C to +55°C	
Nonoperating[a]	−62°C to +85°C	
Humidity		
Operating	95% (+5%, −0%) relative humidity	
Nonoperating	MIL-T-28800C Para 4.5.5.1.1 Temperature-Humidity Test	
Altitude		
Operating	15,000 feet, tested to 25,000 feet	
Nonoperating	40,000 feet, tested to 50,000 feet	
Vibration, Operating (instrument secured to a vibration platform during test)	MIL-Std-810D, Method 514 Procedure I (modified) Resonant searches in all three axes from 5 Hz to 15 Hz at 0.060 inch displacement for 7 minutes, 15 Hz to 25 Hz at 0.040 inch displacement for 3 minutes, and 25 Hz to 55 Hz at 0.020 inch displacement for 5 minutes (tested to 0.025 inch) Dwell for an additional 10 minutes in each axis at the frequency of the major resonance or at 55 Hz if none was found Resonance is defined as twice the input displacement Total vibration time is 75 minutes	
Shock (Operating and Nonoperating)	Three guillotine-type shocks of 30 g, one-half sine, 11 ms duration each direction along each major axis; total of 18 shocks; tested to 50 g	
Transit Drop (free fall)	8 inch, one per each of six faces and eight corners	
Electromagnetic Interference (EMI)		
Radiated & Conducted Emissions	Vfg 243/1991 (Amended by Vfg 46/1992) Class B and FCC Part 15, subpart Class A	
Conducted Emissions	Meets requirements described in MIL-Std-461C Part 2, except as noted	
	Test Method	**Remarks**
	CE01−60 Hz to 15 kHz	Full limits
	CE03−15 kHz to 50 MHz power leads	15 kHz to 20 kHz relaxed by 10 dB

[a] After storage at temperatures below −15°C, the instrument may not reset when power is first turned on. If this happens, allow the instrument to warm up for at least 15 minutes, then turn POWER OFF for 5 seconds and back ON.

Table A-15: Environmental Characteristics (Cont.)

Characteristic	Description	
Electromagnetic Interference (Continued)	**Test Method**	**Remarks**
Conducted Susceptibility	CS01—30 Hz to 50 kHz power leads	Full limits
	CS02—50 kHz to 400 MHz power leads	Limited to 100 MHz
	CS06—spike power leads	Part 4 full limit
Radiated Emissions	RE01—30 Hz to 50 kHz magnetic field	Relaxed by 10 dB for fundamental to 10th harmonic of power line Exceptioned, 30 kHz to 36 kHz Part 5, probe at 15 cm, front and rear searches excluded
	RE02—14 kHz to 10 GHz	Curve #2 + 10 dB full limit
Radiated Susceptibility	RS03—14 kHz to 10 GHz	Up to 1 GHz

Table A-16: Physical Requirements

Characteristic	Description
Weight	46 lbs 7 oz (20.9 kg) maximum Including cover and standard accessories, except manuals See *Appendix A, Options* for alternate specifications
Dimensions	
Without Front Cover, Handle, or Feet	6.9 × 12.88 × 19.65 inches (17.5 × 32.7 × 49.9 cm)
With Front Cover, Feet, and Handle	
Handle Folded Back Over the Instrument	9.15 × 15.5 × 19.5 inches (23.2 × 39.4 × 49.5 cm)
Handle Fully Extended	8.0 × 15.5 × 24.25 inches (20.3 × 39.4 × 61.6 cm)

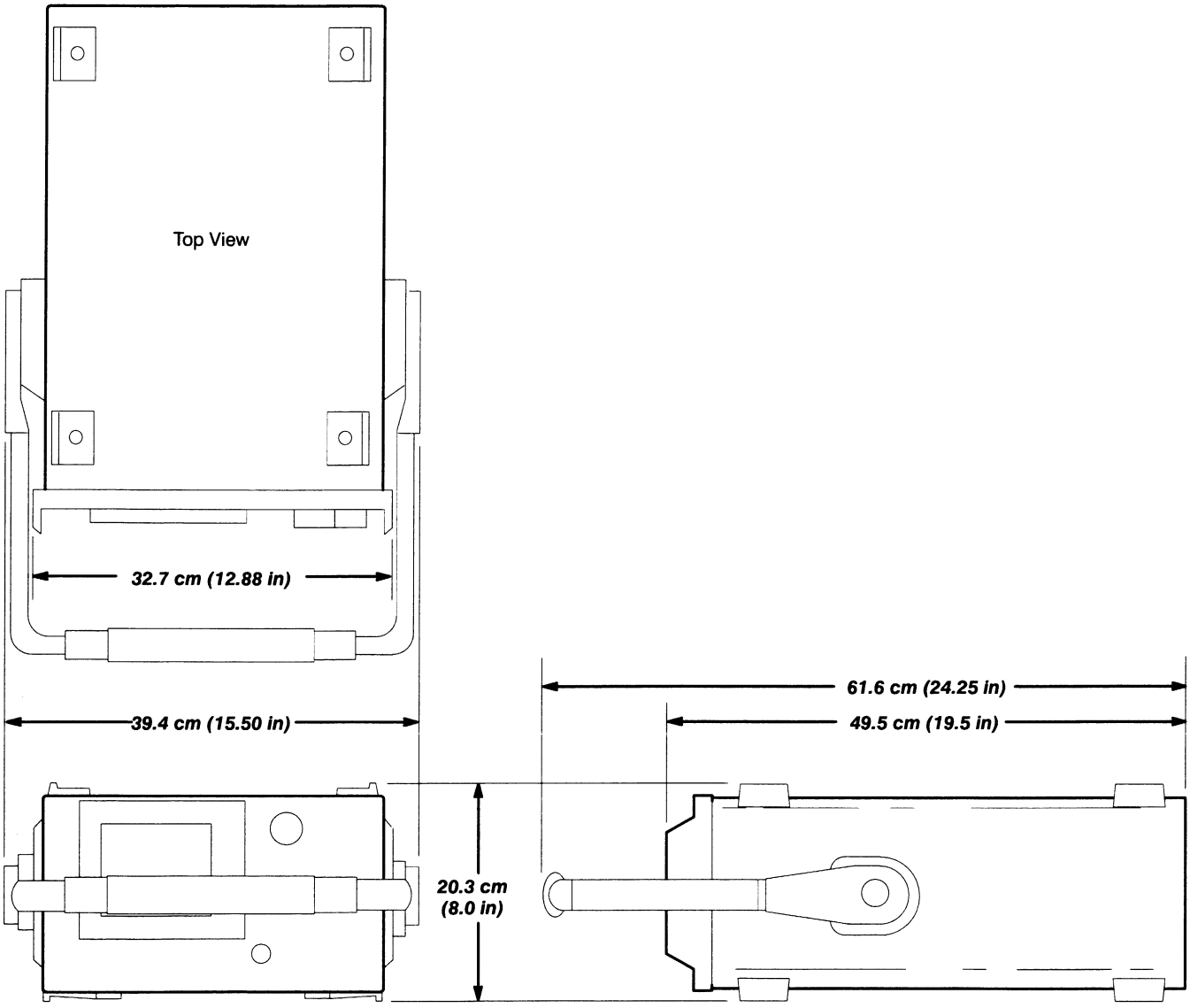


Figure A-1: Dimensions

Glossary

The following glossary is presented as an aid to better understand the terms as they are used in this document and with reference to spectrum analyzers.

General Terms

Center Frequency
That frequency which corresponds to the center of a frequency span, expressed in hertz.

Baseline Clipper (Intensifier)
A means of increasing the brightness of the signal relative to the baseline portion of the display.

dBc
Decibels referenced to carrier level.

dBm
A unit to express power level in decibels referenced to 1 milliwatt.

dBmV
A unit to express voltage levels in decibels referenced to 1 millivolt.

dBμV
A unit to express voltage levels in decibels referenced to 1 microvolt.

Effective Frequency Range
That range of frequency over which the instrument performance is specified. The lower and upper limits are expressed in hertz.

Envelope Display
The display produced on a spectrum analyzer when the resolution bandwidth is greater than the spacing of the individual frequency components.

Frequency Band
A continuous range of frequencies extending between two limiting frequencies, expressed in hertz.

Full Span (Maximum Span)
A mode of operation in which the spectrum analyzer scans an entire frequency band.

Intermodulation Spurious Response (Intermodulation Distortion — IMD)
An unwanted spectrum analyzer response resulting from the mixing of the nth order frequencies, due to non-linear elements of the spectrum analyzer. The resultant unwanted response are displayed.

Line Display

The display produced on a spectrum analyzer when the resolution bandwidth is less than the spacing of the signal amplitudes of the individual frequency components.

Line Spectrum

A spectrum composed of signal amplitudes of the discrete frequency components.

Markers

The instrument uses three types of markers:

Update Marker

Marks the current sweep position in a digital storage display as the display is being updated.

Video Markers

Marker signals applied to the external VID | MARKER input from a Tektronix 1405 Television Sideband Analyzer. The Video Markers mark frequencies of interest on the television signal.

Waveform Markers

When the Marker function is enabled, it provides a movable cursor with readout of frequency and amplitude at the marker position. When the delta marker mode is enabled, a second marker allows operations and readout between the two marker positions. (Also see Waveform Marker Terms.)

Maximum Safe Input Power

WITHOUT DAMAGE

The maximum power applied at the input which will not cause degradation of the instrument characteristics.

WITH DAMAGE

The minimum power applied at the input which will damage the instrument.

Pulse Stretcher

A pulse shaper that produces an output pulse, whose duration is greater than that of the input pulse, and whose amplitude is proportional to that of the peak amplitude of the input pulse.

Scanning Velocity

Frequency span divided by sweep time and expressed in hertz per second.

Signal Identifier

A means to identify the spectrum of the input signal when spurious responses are possible.

Video

The term is used here generally to mean a signal after the detector stage. It can also be used more specifically to mean a base-band (zero carrier frequency) television signal.

Video Filter
A post detection low-pass filter.

Zero Span
An operating mode in which the frequency span is reduced to zero.

Frequency Terms

Display Frequency
The input frequency as indicated by the spectrum analyzer and expressed in hertz.

Frequency Drift
Gradual shift or change in displayed frequency over the specified time due to internal changes in the spectrum analyzer, where other conditions remain constant. Expressed in hertz per second.

Frequency Linearity Error
The error of the relationship between the frequency of the input signal and the frequency displayed (expressed as a ratio).

Frequency Span (Dispersion)
The magnitude of the frequency band displayed; expressed in hertz or hertz per division.

Impulse Bandwidth
The displayed spectral level of an applied pulse divided by its spectral voltage density level assumed to be flat within the pass-band.

Residual FM (Incidental FM)
Short term displayed frequency instability or jitter due to instability in the spectrum analyzer local oscillators. Given in terms of peak-to-peak frequency deviation and expressed in hertz or percent of the displayed frequency.

Shape Factor (Skirt Selectivity)
The ratio of the frequency separation of the two (60 dB/6 dB) down points on the response curve to the static resolution bandwidth.

Static (Amplifier) Resolution Bandwidth
The specified bandwidth of the spectrum analyzer's response to a CW signal, if sweep time is kept substantially long. This bandwidth is the frequency separation of two points on the response curve, usually 6 dB down, if it is measured either by manual scan (true static method) or by using a very low speed sweep (quasi-static method).

Zero Pip (Response)
An output indication which corresponds to zero input frequency.

Amplitude Terms

Deflection Coefficient

The ratio of the input signal magnitude to the resultant output indication. The ratio may be expressed in terms of volts (rms) per division, decibels per division, watts per division, or any other specified factor.

Display Dynamic Range

The maximum ratio of the levels of two non-harmonically related sinusoidal signals each of which can be simultaneously measured on the screen to a specified accuracy.

Display Flatness

The unwanted variation of the displayed amplitude over a specified frequency span, expressed in decibels.

NOTE

Display flatness is closely related to frequency response. The main difference is that the spectrum display is not moved to center screen.

Display Law

The mathematical law that defines the input-output function of the instrument. The following cases apply:

Linear

A display in which the scale divisions are a linear function of the input signal voltage.

Square law (power)

A display in which the scale divisions are a linear function of the input signal power.

Logarithmic

A display in which the scale divisions are a logarithmic function of the input signal voltage.

Display Reference Level

A designated vertical position representing a specified input level. The level may be expressed in dBm, volts, or any other units.

Dynamic Range

The maximum ratio of the levels of two signals simultaneously present at the input which can be measured to a specified accuracy.

Frequency Response

The unwanted variation of the displayed amplitude over a specified center frequency range, measured at the center frequency, expressed in decibels.

Gain Compression

Effect seen at an input level where the analyzer circuits have less gain than their small signal values. This is usually specified at the 1 dB compression point in terms of the input level required to reduce the gain by 1 dB.

Hum Sidebands

Undesired responses created within the spectrum analyzer, appearing on the display, that are separated from the desired response by the fundamental or harmonic of the power line frequency.

Input Impedance

The impedance at the desired input terminal. Usually expressed in terms of VSWR, return loss, or other related terms for low impedance devices and resistance-capacitance parameters for high impedance devices.

Noise Sidebands

Undesired response caused by noise internal to the spectrum analyzer appearing on the display around a desired response.

Relative Display Flatness

The display flatness measured relative to the display amplitude at a fixed frequency within the frequency span, expressed in decibels.

Residual Response

A spurious response in the absence of an input signal. (Noise and zero pip are excluded.)

Sensitivity

Measure of a spectrum analyzer's ability to display minimum level signals, expressed in volts or decibels. Intermediate frequency (IF) bandwidth, display mode, and any other influencing factors must be given.

Spurious Response

A response of a spectrum analyzer wherein the displayed frequency is not related to the input frequency.

Digital Storage Terms

Clear (Erase)

Presets memory to a prescribed state, usually that denoting zero.

Digitally Averaged Display

A display of the average value of digitized data computed by combining serial samples.

Digitally Stored Display

A display method whereby the displayed function is held in a digital memory. The display is generated by reading the data out of memory.

Max Hold (Peak Mode)
Digitally stored display mode which, at each frequency address, compares the incoming signal level to the stored level and retains the greater. In this mode, the display indicates the peak level at each frequency after several successive sweeps.

Multiple Display Memory
A digitally stored display having multiple memory sections which can be displayed separately or simultaneously.

Save
A function which inhibits storage update, saving existing data in a section of a multiple memory (e.g., Save A).

Scan Address
A number representing each horizontal data position increment on a directed beam type display. An address in a memory is associated with each scan address.

View (Display)
Enables viewing of contents of the chosen memory section (e.g., "View A" displays the contents of memory A; "View B" displays the contents of memory B).

Volatile/Non-volatile Storage
A volatile storage system is one where any total loss of power to the system will result in a loss of stored information. Non-volatile memory is not subject to the instrument power supply for its storage.

Waveform Marker Terms

Active Trace
Live Trace or the B-SAVE A trace (a trace recalled into B is not an active trace).

Inactive Trace
SAVE A trace or a trace recalled into the B display before the sweep is started.

Live Trace
Any combination of the A trace and/or the B trace when SAVE A is off.

Primary Marker
The marker displayed in the Single Marker mode whose frequency and/or position is changed when tuning with the CENTER/MARKER FREQUENCY control. When two markers are displayed, the brightest marker is the Primary marker.

Secondary Marker
The "second" marker; displayed only in the Delta Marker mode.

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