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User Manual

Tektronix

VM700A Video Measurement Set
Option 01 (NTSC) & Option 11 (PAL)

070-8166-05

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070-8166-05

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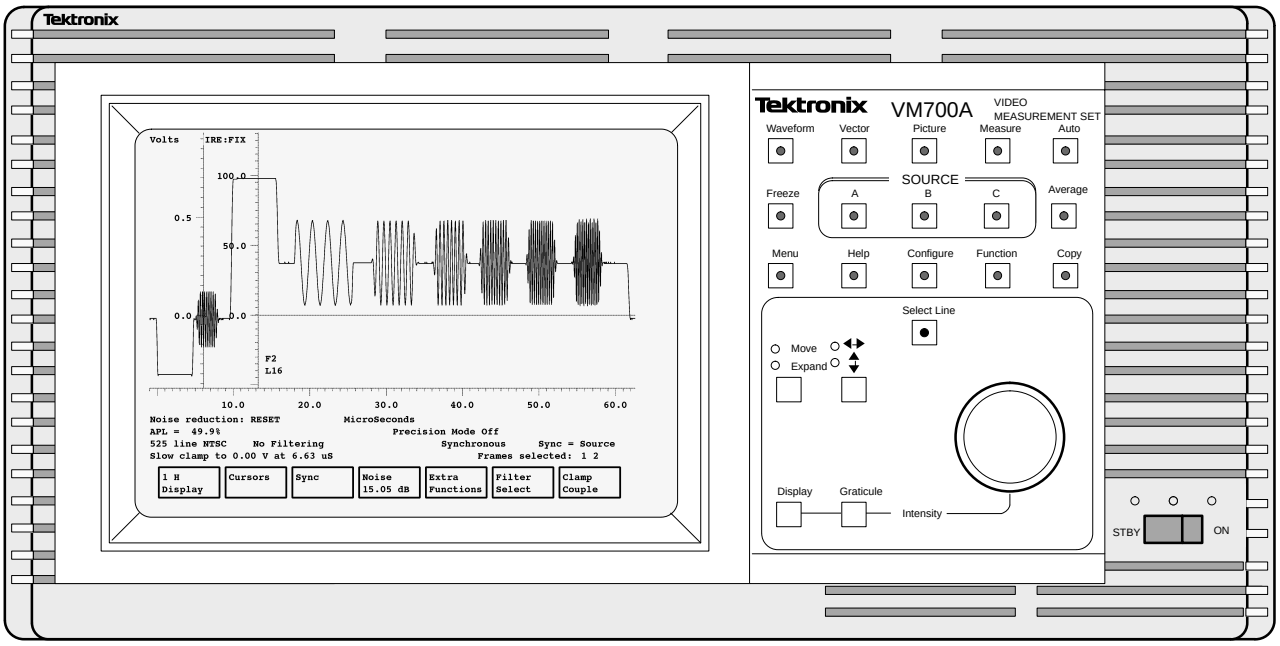
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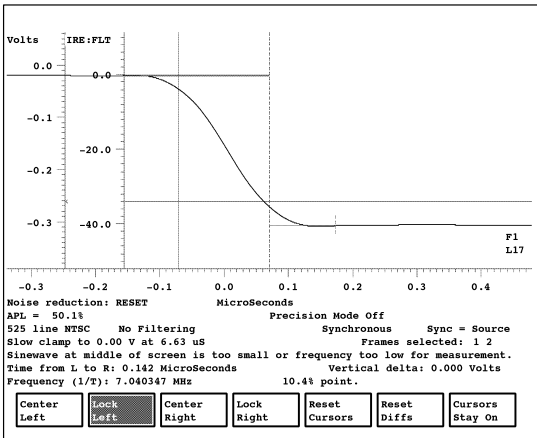
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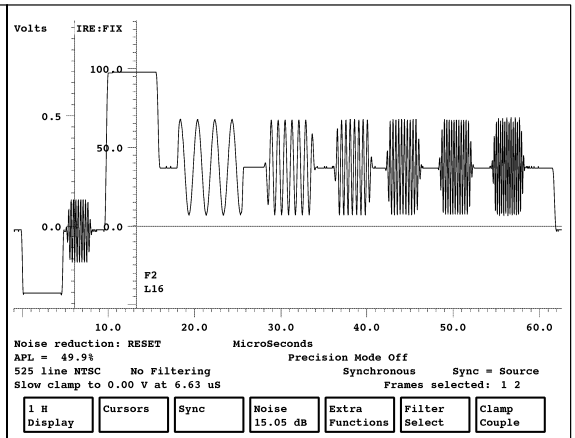
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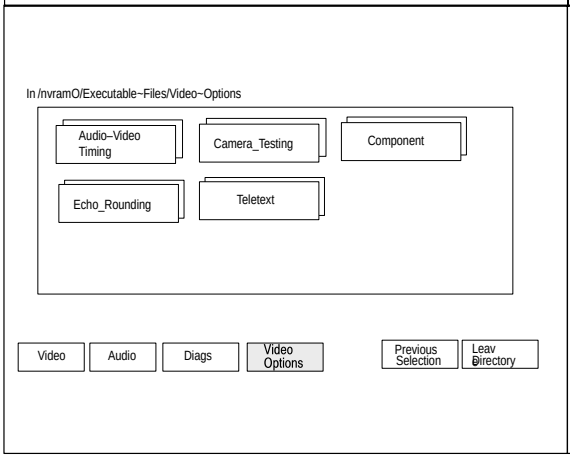
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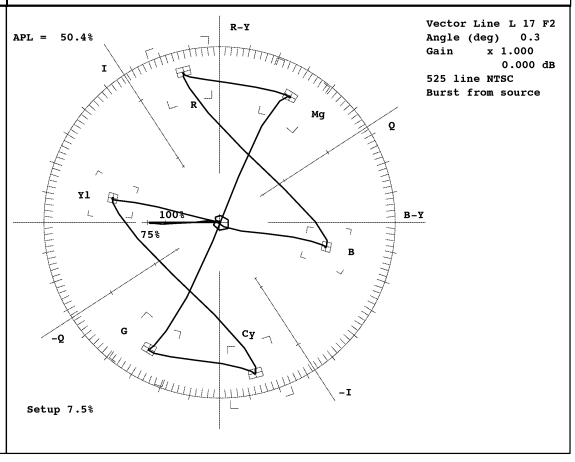
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The VM700A Video Measurement Set

EC Declaration of Conformity

We

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

declare under sole responsibility that the

VM700A

meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 50081-1 Emissions:

EN 55022	Class B Radiated and Conducted Emissions

EN 50082-1 Immunity:

IEC 801-2	Electrostatic Discharge Immunity
IEC 801-3	RF Electromagnetic Field Immunity
IEC 801-4	Electrical Fast Transient/Burst Immunity

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

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Safety Summary

Please take a moment to review these safety precautions. They are provided for your protection and to prevent damage to the product. This safety information applies to all operators.

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.

This symbol appears in manuals:



Static-Sensitive Devices

These symbols appear on equipment:



DANGER
High Voltage



Protective ground
(earth) terminal



ATTENTION
Refer to
manual

Specific Precautions

Power Source

This product is intended to operate from a power source that applies no more than 250 V_{rms} between the supply conductors or between either supply conductor and ground. A protective ground connection, through the grounding conductor in the power cord, is essential for safe system operation.

Grounding the Product

This product is grounded through the power cord. To avoid electric shock, plug the power cord into a properly wired receptacle where earth ground has been verified by a qualified service person. Do this before making connections to the input or output terminals of the product.

Without the protective ground connection, all parts of the monitor are potential shock hazards. This includes knobs and controls that may appear to be insulators.

Use the Proper Power Cord

Use only the power cord and connector specified for this product. Use only a power cord that is in good condition.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for this product, matched by type, voltage rating, and current rating.

Do Not Operate Without a Cabinet

To avoid personal injury, do not operate the AM700 with its cabinet removed. When power is supplied to the AM700 and the rear panel power switch is on, line voltage will be present in the instrument, even when the POWER switch is set to STANDBY.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere.

Do Not Service Alone

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

Section 1:Introduction and Specification

Section 1:Introduction and Specification

Manual Overview

This manual describes the front panel operation of the VM700A Video Measurement Set. Those features that generally apply across the full range of possible options are explained. For specific information on the installed options, see the applicable option manual supplied with this manual set. The VM700A operator's documentation now comprises the following manuals:

VM700A Video Measurement Set Operator Manual
VM700A Programmer Reference Manual
Option 01 NTSC Measurements Operator Manual
Option 11 PAL Measurements Operator Manual
Option 1G Echo and Rounding Error Measurements Operator Manual
Option 20 Teletext Measurements Operator Manual
Option 21 Camera Measurements Operator Manual
Option 22 Video Wander Measurements User Manual
Option 30 Component Measurements Operator Manual
Option 40/41/42 Audio Measurements Operator Manual
Option 48 GPIB Interface Programmer Manual

Your manual set includes the VM700A Video Measurement Set Operator Manual, the VM700A Programmer Reference Manual, and the applicable option manuals for your instrument.

Some additional software packages that may be of special interest to you are:

VMBKUP	Software to assist in backing up the VM700A user-created files. These files can be reloaded to the same instrument or to another VM700A to generate a common set of configuration files.
VMRMGR	This software aids you in handling the graphic displays and transferring them to a personal computer for filing, display, or printing.
VMTerminal	This useful software package assists in remote control of the VM700A via a pc.

Instrument Overview

The VM700A Video Measurement Set is a multifunction television test and measurement device with an easy-to-use interface. The VM700A combines the functions of a waveform monitor, vectorscope, automatic measurement set, and noise measurement set in a single instrument. Input signals can be broadcast or generated by test equipment. The VM700A can be operated by using its front-panel controls or by using one of the rear-panel RS-232C ports, or the GPIB port if Option 48 is installed, to send it commands.

The VM700A can be operated as an NTSC-standard instrument (Option 01), a PAL-standard instrument (Option 11), or as a dual-standard instrument when both options are included.

The VM700A functions as a waveform monitor when its Waveform front-panel button is pressed. Waveform monitor operation is described in Section 4.

The VM700A functions as a vectorscope when its Vector front-panel button is pressed. Vectorscope operation is described in Section 5.

When the Measure front-panel button is pressed, the VM700A displays a list of available measurements. A general description of Measure mode operation is given in Section 6. Detailed information about individual measurements is included in the *VM700A Option 01 NTSC Measurements Operator Manual* and the *VM700A Option 11 PAL Measurements Operator Manual*. Consult either of those manuals for more information about individual measurements. Measurement provided with additional installed options are described in the manuals supplied for the options.

When the Picture front-panel button is pressed, the VM700A functions as a low-resolution picture monitor. This display is to assist you in identifying the input source for other operational modes. Picture mode operation is described in Section 7.

When the Auto front-panel button is pressed, the VM700A cycles through the selected set of automated measurements. A general description of Auto mode operation is given in Section 8. Detailed information about individual auto-mode measurements is included in the *VM700A Option 01 NTSC Measurements Operator Manual* and the *VM700A Option 11 PAL Measurements Operator Manual*. Consult either of those manuals for more information about individual measurements.

The VM700A features a large set of diagnostics, to allow you to verify that the instrument is operating properly, as well as to localize malfunctions if they occur. Diagnostics are described in Section 9

The VM700A features the ability to record sequences of operations (functions) and execute them by touching a “soft key” on the front panel. See the *VM700A Programmer Reference Manual* for details on how to record, edit, and execute functions. The functions can also be called remotely once they have been created.

The VM700A is capable of being remotely controlled. You can operate the instrument via a computer or terminal connected through a rear-panel RS-232C port. See the *VM700A Programmer Reference Manual* for information on remote programming and operation. If Option 48, GPIB interface, is also installed, the VM700A may be operated remotely via the GPIB port. See the *VM700A Option 48 GPIB Interface Programmer Manual* for information about GPIB remote control

An added display option is available for the VM700A. Option 74 provides a display module with a white phosphor CRT instead of the standard green phosphor when a VM700A is ordered with the option.

Instrument Specifications

Table 1-1: Physical Characteristics

Characteristics	Description
Dimensions (WxHxD)	19.0 inches x 8.75 inches x 21.9 inches (483 mm x 222 mm x 556 mm)
Weight	45 lb (20 Kg)

Table 1-2: Power Requirements

Characteristics	Description
Mains Voltage	90 to 132 VAC (115 VAC nominal)
	180 to 250 VAC (230 VAC nominal)
Mains Frequency	47 to 63 Hz
Power Consumption	250 Watts
Fuse	
115 VAC	6 A, 250 V, Slow Blow, 0.250 X 1.250
230 VAC	3 A, 250 V, Slow Blow, 3AG, MSL-3

Table 1-3: Environmental Characteristics

Characteristics	Description
Temperature	
Operating	0 to 50°C ambient
Non-operating (storage)	–55°C to + 75°C
Altitude	
Operating	To 4,570 meters (15,000 feet). Maximum operating temperature decreases 1°C per 1,000 ft above 5,000 ft.
Non-operating	To 15,240 meters (50,000 feet).
EMI	Meets FCC CFR Part 15, Sub-part B, Class A

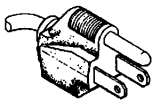
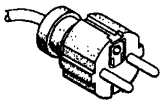
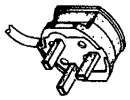
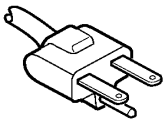
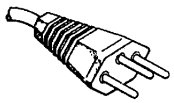
Table 1-4: Remote Relay

Characteristics	Description
Remote Contact Closure Relay	Contacts are not debounced.
Maximum Current	50 mA

Table 1-4: Remote Relay (Cont.)

Characteristics	Description
Maximum Voltage	30 VAC_{RMS} or 30 VDC
Control Logic	set GRLY 1 closes the relay. set GRLY 0 opens the relay.

Table 1-5: Optional Power Cords

Power Plugs	Description	Reference Standards[1]
	Standard North American 120 V plug 15 A	ANSI C73.11 NEMA 5-15-P IEC 83 UL 198.6
	Option A1 Universal Euro 220 V plug 10-16 A	CEE(7) II, IV, VII IEC 83 IEC 127
	Option A2[2] United Kingdom 240 V plug 6 A	BS 1363 IEC 83 IEC 127
	Option A3 Australian 240 V plug 10 A	AS C112 IEC 127
	Option A4 North American 240 V 15 A	ANSI C73.20 NEMA 6-15-P IEC 83 UL 198.6
	Option A5 Switzerland 220 V plug 6 A	SEV IEC 127

[1]Reference Standards Abbreviations:

ANSI—American National Standards Institute

AS—Standards Association of Australia

BS—British Standards Institution

CEE—International Commission on Rules for the Approval of Electrical Equipment

IEC—International Electrotechnical Commission

NEMA—National Electrical Manufacturer's Association

SEV—Schwetzervischer Elektrotechischer Versin

UL—Underwriters Laboratories Inc.

[2]A 6 A, type C fuse is also installed inside the plug of the Option A2 power cord.

Section 2:Installation and Operation

Section 2:Installation and Operation

Power Requirements

The VM700A operates with line frequencies from 48 Hz to 66 Hz, over two line voltage ranges. The nominal setting of the low voltage range is 115 VAC. The nominal setting of the high voltage range is 230 VAC.

There are two power switches on the VM700A, one on the rear panel above the power cord receptacle, and one on the front panel. **Both must be on** to operate the instrument. The rear-panel switch is the master power switch. The switch on the front panel remotely enables the voltage supply outputs.



WARNING. *Dangerous voltages are present within the Power Supply module when the rear-panel power switch is on, regardless of the position of the front-panel power switch. Do not operate the VM700A with any covers removed. Refer all servicing of the instrument to a qualified service person.*

Changing Line Voltage Range and Fuse

The voltage range selection switch and fuse holder are located in the lower left corner of the rear panel (see Figure 2-1). The VM700A is shipped from the factory set for the operating voltage of the destination nation (115 VAC or 230 VAC). If the setting is not correct, it must be changed before connecting the power cord to the power source. Simply set the voltage range selection switch (located on the rear panel of the VM700A) to the correct position for operation.



CAUTION. *When changing the line voltage selector switch you must also change the fuse to provide proper protection for the operating voltage in use. The 3A slow-blow fuse provides the proper protection in the 230 VAC range and the 6A slow-blow fuse provides protection for operation in the 115 VAC range.*

Power Cord

A detachable three-wire power cord with a three-contact plug is provided with each instrument for connecting to both the power source and protective ground. The protective-ground connector in the plug connects (through the protective-ground conductor) to the accessible metal parts of the instrument. For electrical-shock protection, insert this plug only into a power-source outlet that has a properly grounded protective-ground contact.

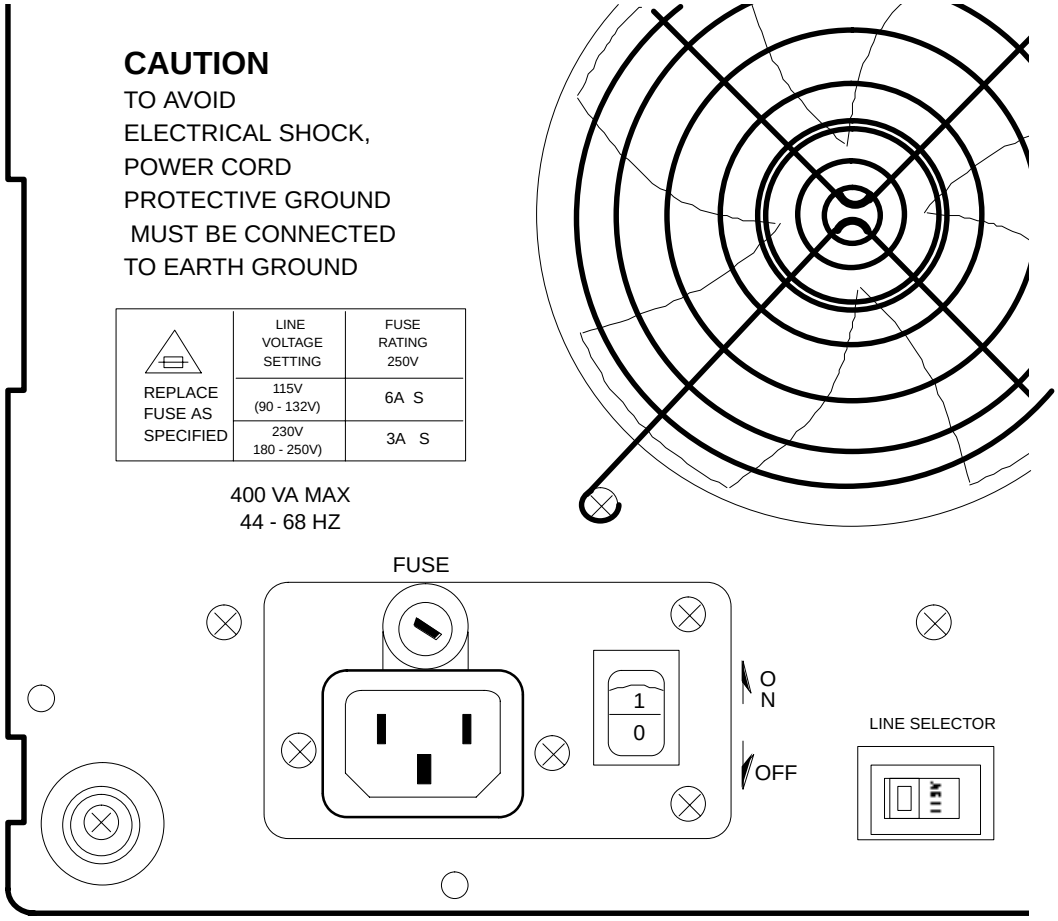


Figure 2-1: Rear-panel fuse, power connector, ON/OFF switch and Line Selector

Instruments are shipped with the power cord required for the country of destination. Available power-cord option information is given in Section 1, *Introduction and Specification*, of this manual. Contact your Tektronix representative or local Tektronix field office for additional power-cord information.

Calibrating the Touch Screen

The VM700A is shipped from the factory with its touch screen fully calibrated. Although it will seldom be necessary, the touch screen can easily be recalibrated.

To calibrate the touch screen:

- Switch off power to the VM700A at the front panel.
- Press and hold the Configure button and switch the power back on.

After about three seconds the VM700A displays the touch screen calibration display. Full instructions for calibration are given on the screen. A small circle with a dot (1 pixel) is lit in each corner, one corner at a time (top left, top right, bottom left, bottom right). Hold your finger on the touch screen directly over the dot until the VM700A beeps, and lights the dot in the next corner. When the calibration is completed, the VM700A finishes the power-up sequence, then the Waveform mode display appears.

Front Panel Operation

The VM700A front panel (Figure 2-2) consists of a touch screen and a 20-button keypad with a control knob.

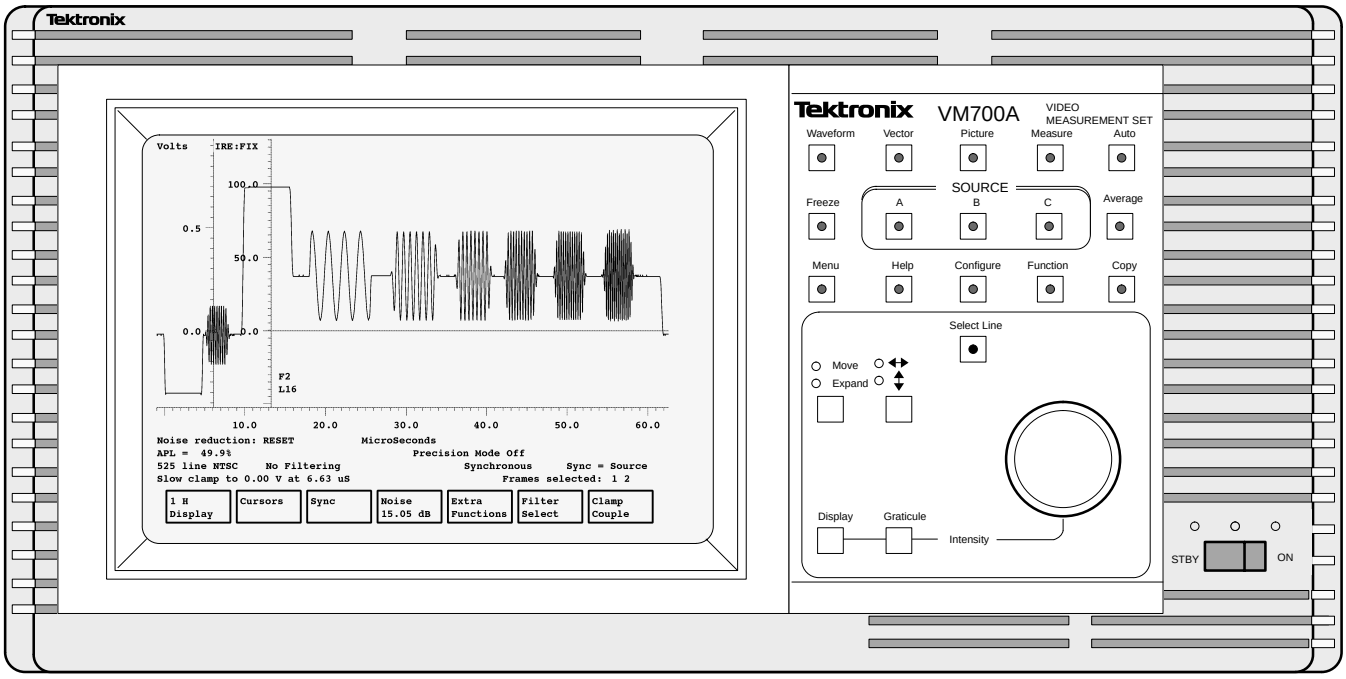


Figure 2-2: VM700A front panel

Touch Screen

The display (CRT) area of the VM700A is also a touch screen for user input. The screen displays input waveform signals, the digital vectorscope, a low-quality television picture of the input signal, graphic measurement displays, and automatic measurement results. Many operations are performed by selecting soft keys (menu-controlled touch screen controls) at the bottom of the display; when applicable, selection values are changed by rotating the control knob.

Manual and Auto Operational Mode Buttons

The top row of buttons controls the operational modes (the major functions). The VM700A has five operational modes: four “manual” modes and Auto mode. The

manual modes are Waveform, Vector, Picture, and Measure. The power-on default mode is Waveform.

The manual modes perform the specified operation and provide a graphic display with digital readouts plus status information. Auto mode makes measurements automatically and provides a tabular listing of the measurement results. Reporting of measurement results can be performed in both manual and Auto mode.

Parameters such as clamping, sync source, and the displayed line (system line) are common for all the manual modes of operation. However, *manual mode parameters do not carry over to Auto mode*. Parameters for both Auto mode and the manual modes are set through the directory and file structure accessed through the Configure button.

Freeze. Source Selection, and Average Functions

The second row down in the keypad contains the Freeze button, the input channel selection buttons (grouped as SOURCE A, B, and C), and the Average button.

Freeze. When Freeze is selected, signal acquisition is halted. The frozen display may be repositioned or resized according to the application, as described below under Control Knob, but the display is not updated. Starting a new measurement or operation unfreezes the display.

Source and Polarity Selection. For all operational modes, one of the input sources is always selected. Selected sources are indicated by a lighted LED in the panel button.

For some modes, an input source can be *inverted*. This feature may be used to invert a positive-sync video signal to obtain the correct polarity for measurement by the VM700A. To invert a single source, press and hold the source button approximately one second, until the instrument beeps. When a source is inverted, the LED on the source button blinks. To invert a second source and add it to another, press and hold the normal (non-inverted) source and, while holding it, quickly press and release the inverted source. The LED on the inverted source will flash.

In Waveform and Vector modes, an inverted source can be the sole input or it can be added to another input. In Measure mode, an inverted source can only be added to another source.

Average. The Average button enables noise reduction (averaging) on the signal in Waveform, Vector, and Measure modes. The amount of noise reduction (up to 30.10 dB) is set with the **Noise** soft keys. The number of averages (up to 256) is set with the **Average Num** soft keys.

Support Functions

The third row down in the keypad contains support functions: Menu, Help, Configure, Function, and Copy. All of these functions except Copy are toggled

on and off, either by pressing the button twice (that is, press once to turn on; press again to turn off), or by selecting a different operational mode in the top row (except Help which must be pressed a second time to turn it off).

Menu. The Menu button displays a menu of soft keys on screen. In some cases, touching a soft key displays a submenu of additional soft keys when it is selected.

Help. The Help button activates the Help function. When Help is turned on, pressing a button or selecting a soft key displays a brief explanation of the button or soft key; all buttons and soft keys, except Help, lose their normal function. The LED on the Help button flashes while Help is active. Help is turned off by pressing the Help button a second time.

Configure and Function. The Configure button and its usage are discussed in Section 3, *Configuring the VM700A*. The Function button and its usage are discussed in the *VM700A Programmer's Reference Manual*.

Copy. The Copy button sends a copy of the display to the print spooler (temporary memory space) to queue for printing. The LED in the Copy button will flash as long as the copy remains in the spooler. To delete the copy from the spooler, press the Configure button while the Copy LED is flashing and select the **Cancel Copy** soft key. This soft key only appears in the Configure menu when a copy is pending in the spooler.

Control Knob

The specific functions of the control knob in each mode are described in the relevant sections of this manual as the function of the control knob depends on the current mode of operation. Its general operation is described here.

Waveform Expansion and Positioning. In Waveform mode, rotating the control knob affects horizontal or vertical movement of the display or horizontal or vertical expansion of the display, depending on the selections of the Move/Expand button and the Horizontal/Vertical button. In Expand mode, the normal expansion (horizontal or vertical, depending on the arrow button selection) is around the center of the display. A specific point for expansion is selected by touching the screen at the expansion point wanted. Expansion or contraction is around the touched point while the screen is touched. It reverts to the center of the screen when your finger is removed from the touch screen.

Select Line The Select Line button assigns the function of the control knob to video signal line selection. The LED in the Select Line button is on when Select Line is active. To scroll through the field line by line, press the Select Line button and rotate the control knob. Depending on the operational mode, a menu of soft keys may also appear. The **Select Line** soft keys and the specific control knob functions are described in the relevant sections of this manual.

Display and Graticule Intensity Control To change the intensity of the display or the graticule, hold down the Display or Graticule button and rotate the control knob.

Equipment/Signal Sources Required

Most VM700A measurements can only be done using either off-air (live) signals or signals from a generator that have the appropriate test signals in the vertical interval. Without the correct signal being applied, the displays contain no useful information.

Bandwidth

The bandwidth of the VM700A is 0 Hz (DC) to approximately 6.8 MHz.

Connecting Inputs and Outputs

The VM700A has three video loop-through inputs, one external sync loop-through, and two RS-232C DTE ports on its rear panel (Figure 2-3). The audio options (40 and 41) add appropriate connectors for application of the audio signals to the option circuitry. The GPIB Interface (Option 48) add a standard GPIB connector for remote control and GPIB hardcopy output.

Any video signal (of the appropriate format) may be connected to any video input for normal operation. Certain options, Camera and Component being examples, require connections to specific inputs for correct operation. Refer to the option manual when connecting signals to make those option measurements.

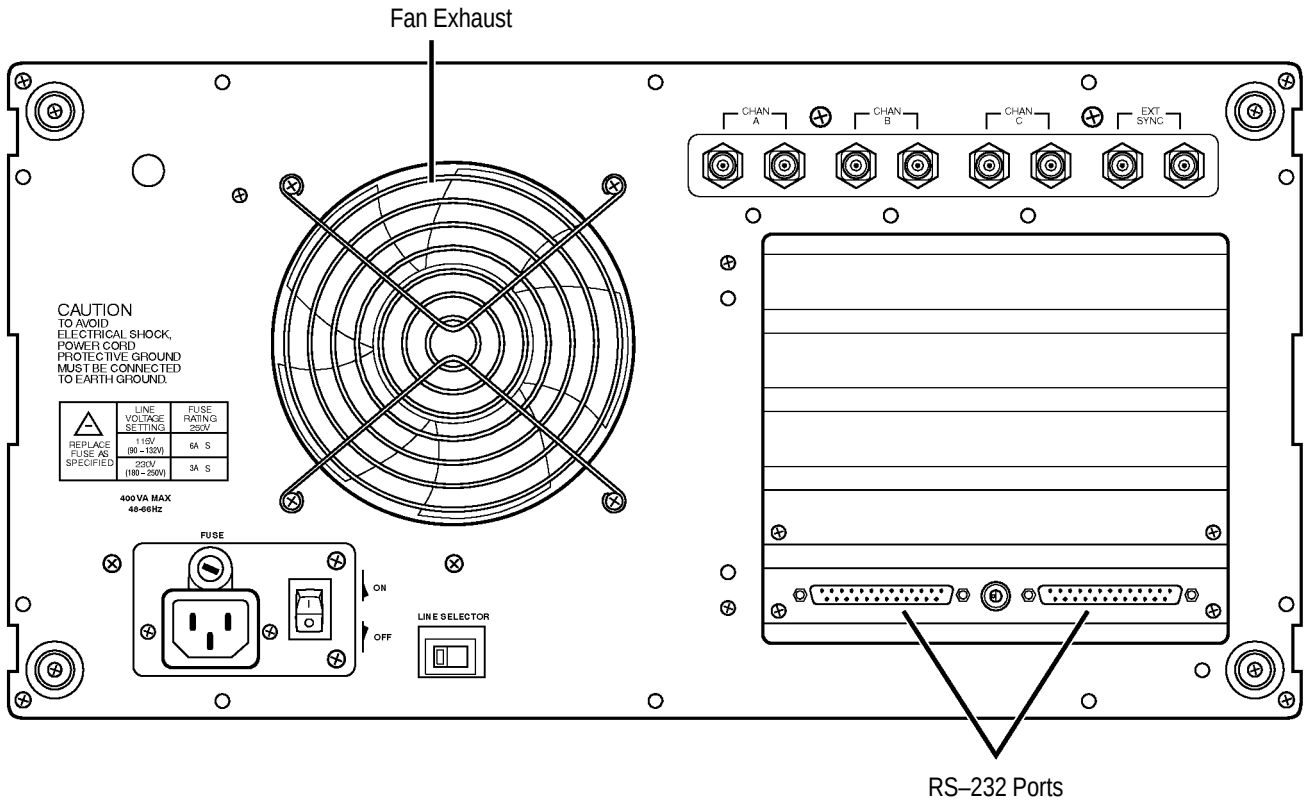


Figure 2-3: VM700A rear panel

RS-232C Connections. The two RS-232C DTE ports of the VM700A are used to output graphics and reports to a printer, as well as for remote operation via a modem or direct serial connection. Both connectors are located on the A5 CPU board and are accessible on the rear panel. Both are 25-pin male “D” connectors. The Communications Setup file is found in the Configure Files directory (press Configure and then touch the Configure Files soft key), and contains parameter settings for both ports. Configuring the Communication Setup file is covered in Section 3, *Configuring the VM700A*.

The following list describes the signals the VM700A outputs and the input signals required on all the active pins of the serial ports:

Pin 1 - Chassis Ground.

Pin 2 - TX (Transmit Data). The VM700A transmits data on this pin.

Pin 3 - RX (Receive Data). The VM700A receives data on this pin.

Pin 4 - RTS (Request To Send [data to the VM700A]).

With Flow Control (CTS/RTS selected), normally RTS connects to the CTS line of a terminal, and the line is active when the VM700A is ready to receive data. When the receive buffers of the VM700A are nearing

capacity, RTS goes inactive, indicating to the sending device to stop transmitting data.

With Flow Control (None or XON/XOFF selected), RTS is always active.

Pin 5 - CTS (Clear To Send).

With Flow Control (CTS/RTS selected), the VM700A is enabled to transmit data by a high level on pin 5, and is disabled by a low level. It is normally connected to the RTS line of a terminal.

With Flow Control (None or XON/XOFF selected), the VM700A transmits data regardless of the CTS level.

Pin 7 - Signal Ground.

Pin 8 - CD (Carrier Detect). This signal typically comes from a modem and indicates that a phone connection is made.

Pin 20 - DTR (Data Terminal Ready). This pin is always high when the VM700A is turned on. Modems typically require this signal to be a high level or they won't answer the phone.

Table 2-1 gives cable configurations that should work in most instances. The pin numbers given for the Terminal (DTE) are the most common locations for the corresponding signals. Note that there is considerable deviation from this "common" configuration and that not all devices use control lines in the manner described under this topic. Refer to the instruction manual of the equipment you are connecting to the VM700A to determine exactly how it should be connected.

Note also that both ends of the DTE to DTE cable are typically female DB-25 connectors. The DTE to DCE cable is female on the VM700A (DTE) end, and typically male on the modem (DCE) end. See the *VM700A Programmer's Reference Manual* for more information on connecting the VM700A for remote operation and cable wiring diagrams.

Table 2-1: Typical RS-232C Cable Wiring

VM700A (DTE) to Terminal (DTE)		VM700A (DTE) to Modem (DCE)	
VM700A Pin No.	**Terminal Pin No.**	**VM700A Pin No.**	**Modem Pin No.**
1	1 (Chassis GND)	1	1
2	3 (RX)	2	2
3	2 (TX)	3	3
4	5 (CTS)	4	4
5	4 (RTS)	5	5
7	7 (Signal GND)	7	7

Table 2-1: Typical RS-232C Cable Wiring (Cont.)

VM700A Pin No.	Terminal Pin No.	VM700A Pin No.	Modem Pin No.
20	6 (DSR, connection possibly not needed)	8	8
		20	20

Connecting Printers

This section discusses connecting an EPSON LQ-570, Apple LaserWriter, HP LaserJet, HP DeskJet, HP ThinkJet, or generic ASCII printer to the VM700A.

Connecting an EPSON LQ-570

The default configuration files are set for use with the EPSON LQ-570 letter quality printer with serial interface C 823051. The default configuration of the LQ-570 printer is adequate for use with the VM700A. Refer to the user's manual for the printer for information on any changes you might wish to make to the printer setup.

With the VM700A and printer power off, connect the serial printer cable from the 25-pin DB-25 female connector on the printer rear panel to PORT 1 on the back of the VM700A (a 25-pin DB-25 male connector). If you have not changed the factory default values in the Communication Setup file, all you need to do now is turn on the VM700A and the printer. If you have changed some factory default values, be sure the file contains the values shown in the following example.

The following partial listing shows the values that should be set in the Communications Setup file in order to use an Epson LQ-570 printer.

Copy
Port: Serial Port 1
Format: Epson LQ

Report
Port: Serial Port 1
Format: Epson LQ

Log
Port: None
Format: Epson LQ

Remote
Port: None/Serial Port 0

Port 1
Protocol: None
Baud Rate: 9600
Flow Control: CTS/RTS
Character Size: 8
Parity: None
Reset Character: None
Carrier Detect: disabled

Making Your Own LQ-570 Cable. If the correct printer cable is not readily available, one can be easily constructed. A male 25-pin DB-25 connector, a

female DB-25 connector, and an appropriate length of four-conductor cable are the materials needed for the cable. Table 2-2 lists the wiring connections for making a cable to use with an LQ-570.

Table 2-2: LQ570 Cable Connections

Male DB-25 Connector Pin Number (LQ-570 end)	Female DB-25 Connector Pin Number (VM700A end)
1 (shield ground)	1 (shield ground)
3 (RXD)	2 (TXD)
20 (DTR)	5 (CTS)
7 (signal ground)	7 (signal ground)

Connecting an Apple Laser Writer

Note the following setups when connecting an Apple LaserWriter to a VM700A serial port.

Setting up the VM700A. In Configure mode, set the Copy Format, Report Format, and Log Format in the Communication Setup file to PostScript. Set the Copy Port and Report Port to Serial Port 0 or Serial Port 1, as appropriate.

Set the selected port's Baud Rate to 9600, Flow Control to XON/XOFF, Character Size to 8, Reset Character to Ctrl-D, and Carrier Detect to Disabled.

Setting up the LaserWriter. Set the rear-panel switch to the 9600 position.

The cable connecting the VM700A and the LaserWriter should be wired as described in Table 2-3. The cable must have a female DB-25 connector on the VM700A end and a male DB-25 connector on the LaserWriter end.

Table 2-3: Apple LaserWriter Connections

Male DB-25 Connector Pin Number (Apple LaserWriter end)	Female DB-25 Connector Pin Number (VM700A end)
1 (shield GND)	1 (shield GND)
3 (RXD)	2 (TXD)
2 (TXD)	3 (RXD)
5 (CTS)	4 (RTS)
4 (RTS)	5 (CTS)
7 (signal GND)	7 (signal GND)

Connecting an HP LaserJet, HP ThinkJet, or HP DeskJet

Setting Up the VM700A. In Configure mode, set the Copy Format, Report Format, and Log Format in the Communication Setup file to HP LaserJet, HP DeskJet, or

HP ThinkJet as appropriate for your printer/plotter. Set the Copy Port and Report Port to Serial Port 0 or Serial Port 1 as needed for your application.

For the selected port, set the Baud Rate to any value from 300 to 19200 (9600 is recommended), set Protocol to None, Flow Control to XON/XOFF, Reset Character to None, Parity to None, Character Size to 8, and Carrier Detect to Disabled.

Setting up the HP LaserJet, ThinkJet, or DeskJet. Set the baud rate to the same as the VM700A. Refer to the appropriate user manual for the printer setups. Connect the serial printer cable between the VM700A and the printer. An optional accessory cable is available from Tektronix. The part number for that cable is 012-1285-00. Should you want, you may wire your printer cable for the HP to VM700A connection. The necessary wiring information is provided in Table 2-4.

Making Your Own Printer Cable. Table 2-4 lists the wiring connections for making a cable to use with an HP LaserJet, ThinkJet, or DeskJet printer/plotter.

Table 2-4: HP LaserJet Cable Connections

Male DB-25 Connector Pin Number (HP LaserJet, ThinkJet, or DeskJet end)	Female DB-25 Connector Pin Number (VM700A end)
1 (shield ground)	1 (shield ground)
3 (RXD)	2 (TXD)
2 (TXD)	3 (RXD)
7 (signal ground)	7 (signal ground)
20 (DTR)	5 (CTS)[1]

[1] **The pin 20 to pin 5 connection is required only for hardware flow control. It may be omitted for XON/XOFF flow control.**

Connecting an ASCII Printer

The VM700A can also be configured to operate with a generic ASCII printer. In the Communication Setup file, set the Report Format and Log Format to ASCII Printer. A generic ASCII printer is assumed to only print text; graphic functions are not supported.

***NOTE**. When Copy Format is set to ASCII Printer, the Copy function is disabled in Waveform, Vector, Picture, and Measure modes; only the text from Auto mode, text from Measurement Results files in Configure mode, and the **Print File** soft key function in Configure mode are enabled.*

Section 3:Configuring the VM700A

Section 3:Configuring the VM700A

The Configure button brings up a display (shown in Figure 3-1) that provides access to utilities that allow you to edit files that control many aspects of the VM700A operating environment and information on the firmware installed in your instrument. This section describes the use of these utilities.

The VM700A gets important operating information from configuration files stored in its non-volatile memory. These files are arranged in a directory structure accessed using the front-panel Configure button and the touch screen menu choice. These files control such areas of VM700A operation as:

Which measurements are performed in Auto mode;

What measurement limits should be in effect for Auto mode measurements (for example, what values should be used as upper and lower bounds before a caution or alarm is triggered);

The timing of Auto mode reports and timed functions;

Which line(s) each Auto or Measure mode measurement will be made on, and (where applicable) at what position within the line(s);

Which output ports to send printouts, screen dumps, periodic reports, or error logs to, and in what formats;

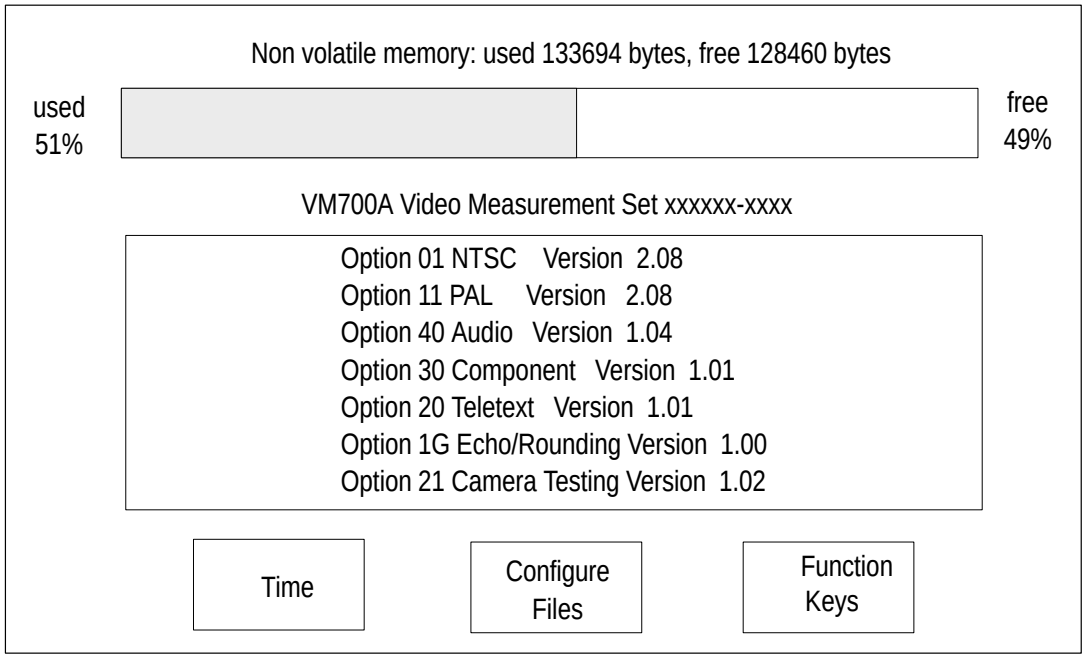


Figure 3-1: Typical main Configure menu

The password (if any) that must be used for controlling access to the configuration files.

The Configure button provides access to utilities that allow you to edit files that control these and other aspects of the VM700A operating environment. Pressing the Configure button brings up the main Configure display, showing the firmware option number and version, the amount of non-volatile memory used and free (in bytes), and three soft keys (menu-controlled touch panel controls), labeled **Time**, **Configure Files**, and **Function Keys**. (If a copy is queued for printing in the printer spooler, another soft key labeled **Cancel Copy** is also displayed.)

These soft keys are defined as follows:

Time: Pressing this soft key brings up a display and submenu that allows you to set the internal clock of the VM700A. (This procedure is described later in this section of the manual.)

Configure Files: Pressing this soft key brings up a display of the /nvram0/ConfigFiles directory, which gives you access to files and directories that control VM700A operations.

Function Keys: Pressing this soft key brings up a display of the /nvram0/FunctionKeys directory, along with a submenu that lets you create, rename, edit, delete, and print out function keys. (Use of the Function Keys feature is fully explained in the *VM700A Programmer's Reference Manual*.)

Cancel Copy: Pressing this soft key clears all copies in the spooler.

The **Cancel Copy** soft key appears as a choice in the Configure menu only if there are files in the printer queue. Touching it deletes the files from the queue.

Configure mode, like other modes, may be selected at any time. When the Configure button is pressed again to deselect Configure, the VM700A returns to the mode or application (for example, measurement) that was active when Configure was selected.

The remainder of this section is divided into two parts. The first part describes the operations available in Configure mode; it tells you how to create or delete files in a directory, how to edit files, etc. The second part describes the Configure mode directory structure and the files it contains.

Configure Operations

This section covers basic information on how to traverse directories and edit files in Configure mode.

The Configure Directory Structure

After you press the Configure button and touch the **Configure Files** soft key, the VM700A displays the files and sub-directories in the /nvram0/ConfigFiles directory (see Figure 3-2). Files and directories are displayed as icons enclosing the file or directory name. Directory icons consist of two overlapping rectangles; file icons consist of single rectangles. Below the directory display is the path line, indicating the displayed directory's location in the directory structure, and two soft keys, **Print File** and **Leave Directory**. A dual-standard instrument also has the additional soft key of **Switch NTSC/PAL** displayed with the selected choice identified as either NTSC Files or PAL Files.

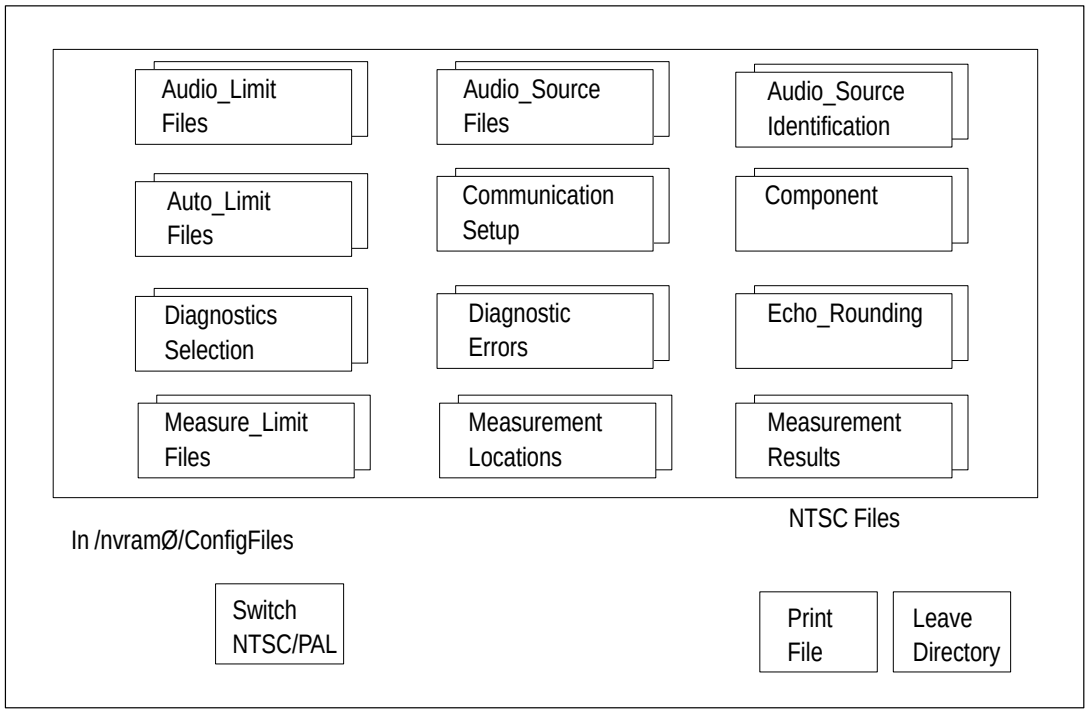


Figure 3-2: Configure Directory

If there are more directories or files than can be displayed in the window area of the screen designated for directory icon displays, use the control knob to scroll up or down to display the remaining choices. The exact number of directories and their names depends on the installed options. All the directories are given in alphabetical order from left to right, top to bottom. Each of the VM700A option manuals provides details on configuring the files for the options.

If you are unfamiliar with the terms “file” and “directory,” the following may help: A file is a collection of information. A directory is a structure that can contain zero or more files or other directories.

Directories are organized in a “tree” structure. Touching the icon of a directory displayed in a window opens that directory. This is also known as “going down the directory tree.” Pressing the **Leave Directory** soft key closes the directory and displays the next higher directory in the directory structure. This is also known as “climbing up the directory tree.”

To Enter a Directory. Touch the icon showing the name of the directory you wish to enter.

Whenever a directory is open, another soft key, labeled **Leave Directory**, appears below the directory window.

To Leave a Directory. Select the **Leave Directory** soft key. This closes the current directory and opens the next higher directory in the directory structure.

When you open a directory, a line appears below the directory window (but above the soft keys), indicating the path (the directory or file location in the directory structure) to the displayed directory. For example, if you were viewing the contents of the Measure_Limit~Files directory, the path line would read:

In /nvram0/ConfigFiles/Measure_Limit~Files

This indicates that the path from the “root” of the directory structure (designated by the initial ‘/’) goes through directory nvram0, then through a subdirectory of nvram0 named ConfigFiles, to the current directory, which is a sub-directory of ConfigFiles named Measure_Limit~Files.

When editing a limits file for the Measure mode named “User’s_Measure~Limits_File,” the path line would read:

Editing User’s_Measure~Limits_File

The ~ (tilde) in a directory or file name represents a carriage return, and is used to join the first and second lines of directory, function key, or file names.

VM700A Video Measurement Sets equipped with both Option 01, NTSC, and Option 11, PAL (dual-standard) provide a soft key labeled **Switch NTSC/PAL** in many of the Configure mode menus. Touching this key toggles between the NTSC and PAL configuration file structures. A read-out below the directory window indicates which standard (NTSC or PAL) files you are currently viewing or editing.

Supplied Directories and Files

All the directories and most of the files supplied with the VM700A are read-only; they cannot be edited, renamed, or deleted. However, files can be copied to create new, editable files. Only files that you have created can be renamed or deleted.

Supplied read-only files can be viewed by selecting them, which displays the file contents. All read-only files are stored in ROM, while all editable files are stored in non-volatile memory (NVRAM).

Six files supplied with the VM700A can be edited without first copying them. Five of these are in the main Configure Files directory: Communication Setup, Diagnostics Selection, Password (if enabled in hardware), Video_Source Identification, and Video Source. The sixth file is the IpConfig file in the /nvram0 directory, one level higher than the main Configure Files directory. The IpConfig file contains system addresses used for remote file transfer (FTP) and is discussed in the *VM700A Programmer's Reference Manual*.

Creating and Deleting Files

You create a file in the Configure Files directory by copying the contents of one file to another named file. Since the factory-installed default files are not editable, you must create your own file to make a configuration change.

To Create a File. Enter the Configure Files directory by pressing the Configure button, followed by the **Configure Files** soft key, then touch the icon corresponding to the directory in which you want to add the new file.

Press the **Create File** soft key. Doing so displays the prompt **Please select a file as template** at the top of the display. Touch the icon corresponding to the file you want to copy. This copies the contents of the selected file. To allow you to name the new copy, a box appears in the center of the directory window and a keyboard appears below it. The characters you select (type) appear in this box.

Type the new file name, observing the following rules and noting the special uses of some characters and keys:

1. Spaces are not allowed in file or directory names; use an _ (underline) or . (dot) to separate words in a name.
2. Pressing the **Set1** soft key allows you to enter numerals and punctuation characters. Pressing the **Set2** soft key allows you to enter various special characters. Pressing the **Shift** soft key allows you to enter uppercase characters or more punctuation characters (in the case of the shifted version of **Set1**).

   Both the **Set1** and **Set2** character keys and the **Shift** soft key "lock" when selected. **Set1** and **Set2** are unlocked by touching the same key again or touching the un-selected key of the pair. **Shift** is unlocked by touching **Shift** again.

3. A maximum of 31 characters are allowed in a file or directory name.

4. Use only uppercase and lowercase letters, numbers, and the following punctuation characters: _ (underline), . (dot), — (minus sign), + (plus sign), : (colon), and ~ (tilde) in names. Avoid using punctuation characters other than those mentioned above in a directory or file name.

5. Multi-line directories and file names can be entered using the RETURN key. Touch RETURN on the touch-screen keyboard to get to the second line.

   When the VM700A is in remote mode, the return character becomes a tilde (~) character for purposes of file name reference. Thus, a directory whose name is displayed as:

   JOHN
   SMITH

   in the directory display becomes JOHN~SMITH when referred to in a remote operation.

6. After typing the name, touch **Done** to complete the creation of the file, or press **Cancel** to quit the process and not create the file.

To Delete a File. Press the **Delete** soft key. The VM700A prompts you to select a file.

Select (touch) the icon corresponding to the file to be deleted. Note: only user-created files can be deleted.

The icon containing the name of the selected file switches to reverse video and begins to disintegrate from the display, while the VM700A beeps at one second intervals. The disintegration/deletion process lasts six seconds. It can be stopped by touching the screen inside the directory window or by touching the **Delete** soft key a second time. Halting the deletion process before its completion has no effect on the file.

Editing Files

To edit a file, simply touch the icon corresponding to the file you wish to edit. This displays the contents of the file for editing. Within the file there are only certain fields that a user may change the value of (edit). You can view the contents of the file by rotating the control knob to scroll the file lines up or down. The line in the center of the window should appear highlighted. If it is not, increase the Display Intensity until it is brighter than the other lines.

To edit a line within a file, turn the control knob until the item you wish to edit is highlighted, then touch the line on the screen. There are four possible responses to this touch:

1. If the item that you touch is not editable, the VM700A produces a “click” sound, but the screen is not changed.
2. If the item that you touch is to be edited alphabetically, a keyboard appears on the lower half of the VM700A display screen.
3. If you are to choose a new value for the item that you touch from a limited number of choices, a box appears around the element to be edited. You can then cycle through the available choices by turning the control knob.
4. If you are editing a file that specifies whether elements are “selected” or “unselected” (such as the Selected~Measurements file), you edit the file by touching the screen next to an element to place the element in the “selected” or “unselected” group.

***NOTE**. The first line of a file is often an title line. You may edit this line to provide a more descriptive identifier about the content or purpose of the file you are creating. Editing the title line of a file does not change the file name.*

To Change a Text Line. Touch the line. A box appears around the line and the soft key keyboard appears below the directory window.

Type the new text, keeping the following things in mind:

- **a.** Typing always inserts characters at the cursor position. The cursor can be moved left or right by turning the control knob.
- **b.** To delete characters, move the cursor to the right of the character to be deleted, then press the **Back Space** key.
- **c.** Pressing the **Set1** soft key allows you to enter numerals and punctuation characters. Pressing the **Set2** soft key allows you to enter various special characters. Pressing the **Shift** key allows you to enter uppercase characters or more punctuation characters (in the case of the shifted versions of **Set1**). Both the **Set1** and **Set2** character keys and the **Shift** key lock when selected. **Set1** and **Set2** are unlocked by touching the same key again or touching the unselected key of the pair. Shift is unlocked by touching **Shift** again.
- **d.** Touch **Cancel** to quit the editing process without entering the new text.
- **e.** Touch **Done** when you are finished to enter the new title line text.

To Change a Parameter in a File. Use the control knob to scroll the line containing the parameter use wish to change to the center of the display window. The active line to edit is highlighted (made brighter).

Touch the parameter in the highlighted line you wish to change. A box appears around the selected parameter.

Rotate the control knob to scroll through the values or selections available for that parameter.

Touch the **Accept Input** soft key, or touch the screen anywhere inside the directory window, to accept the new selection.

NOTE. *In the Selected Measurements file(s) and the Diagnostics Selection file, parameters are either Selected (on the left side of the display) or Not Selected (on the right side of the display).*

To Select/Unselect a Paramter. Touch the line that the parameter appears on, on either the Selected (left) or Unselected (right) side of the display.

To Save Changes to a File and Exit. Touch the **Update & Exit** soft key.

To Exit Without Saving Changes. Touch the **No Change & Exit** soft key. If the file has been modified, a message box appears, warning you that the file has been modified. Press **No Change & Exit**, or any hardkey, to exit without saving the file; press **Update & Exit** to save changes to the file and exit the edit session.

Printing Files

Any VM700A file can be printed by selecting the **Print File** soft key and selecting the file. The file is printed from the serial port designated as the Copy Port. The LED in the Copy button lights continuously while the VM700A creates a print file, and flashes until the entire print file has been sent to the printer.

To Start File Printing. Display the directory containing the file you want to print.

Press the **Print File** soft key.

Press the icon containing the name of the file you want to print.

To Stop File Printing. Press the Configure button twice.

Touch the **Cancel Copy** soft key. This soft key only appears when the Copy button LED is flashing. Touching this soft key cancels printouts in progress and deletes all files queued for printing (including printouts generated by pressing the Copy button or the **Print File** soft key).

To View the Contents of the Spooler. From the main Configure directory, touch **Leave Directory** twice to move to the top directory window.

Select the Spooler directory. If any copies are pending, they will appear as numbered files.

Touch the icon representing the file to view it on the display. The file cannot be edited, but can be scrolled through using the control knob.

Setting the Internal Clock

The Time function allows you to set the VM700A internal calendar and clock (shown in Figure 3-3) to the current time and date. The time and date are placed on all printouts generated by the VM700A. Perform any or all the following steps to enter the correct time and date into your VM700A.

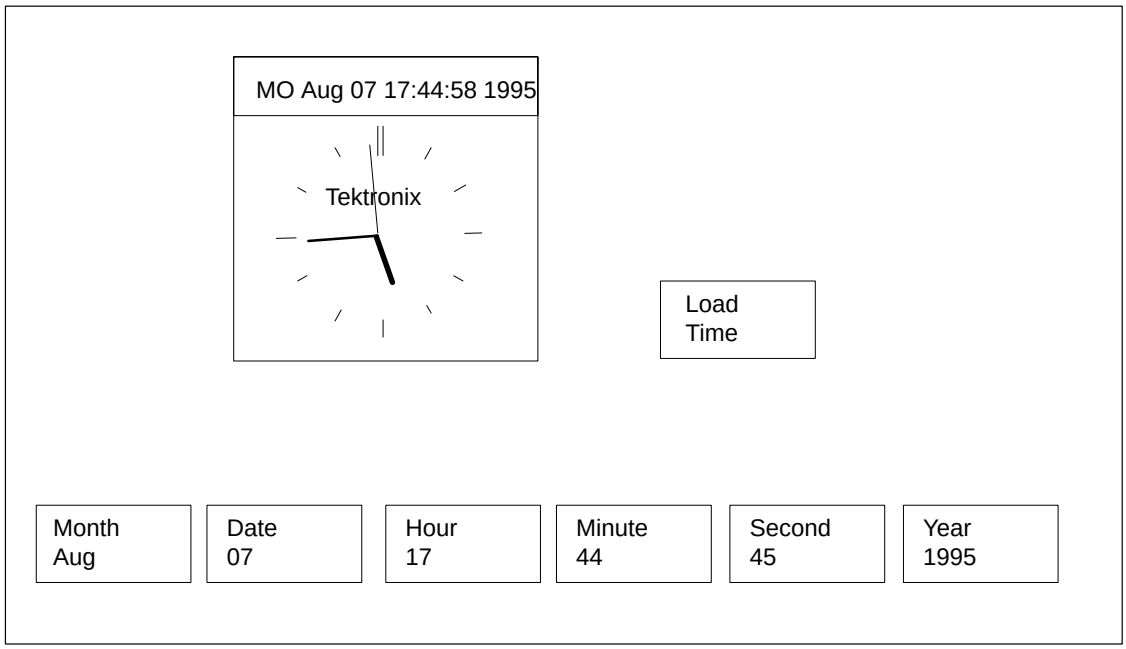


Figure 3-3: Time Configure menu

To Set the Time and Date. Select (touch) the **Time** soft key to display the VM700A calendar and clock. The clock continues to run, but the numbers in the soft keys do not advance with the time and display the time that was present when the Time Configure menu was selected.

Select the **Year**, **Month**, **Date**, **Hour**, **Minute**, or **Second** soft key. Rotate the control knob to set the year, month, date, hour, minute, or second. Set the minute and second time (30 seconds or so) slightly ahead of the reference clock time so that you can set the time exactly to your reference time.

Select the **Load Time** soft key to enter the new time and date at the exact time you have set for the clock. This enters the time and restarts the clock at that time.

After the new time and date have been loaded, press the Configure button to exit the Time display and return to the mode previously in effect. Press Configure again to return to the top Configure display.

Directory Structure

VM700A operations are controlled by means of a hierarchy of files and directories that starts with the Video Source file in the /nvram0/ConfigFiles directory, and extends to other files in sub-directories of /nvram0/ConfigFiles. You can customize the operation of the VM700A to suit your specific measurement requirements, and switch quickly between VM700A setups as needed to perform different operations by varying the contents of these files and sub-directories.

All ConfigFiles sub-directories except Measurement Results contain a file named System Defaults. System Defaults files are used as templates to create new files in a directory. (For more information about creating customized files for a directory, see the discussion of “Configure Operations,” earlier in this section.)

The following pages describe the /nvram0/ConfigFiles hierarchy and how it controls VM700A operation. The Source_Selection~Video file and the Video_Source~Files subdirectory are discussed first. This is followed by a description of the contents and function of the other files and sub-directories in /nvram0/ConfigFiles.

Source_Selection~Video (File)

The Source_Selection~Video file assigns a file in the Video_Source Files directory to each of the VM700A signal sources (A, B, and C). When a given source is selected (that is when its front-panel Source button is on), the VM700A gets parameter information from the file in the Video_Source Files directory pointed to by the corresponding entry in the Source_Selection~Video file. Figure 3-4 illustrates the relationship between the current signal source (as indicated on the VM700A front panel), the Source_Selection~Video file, and the contents of the Video_Source~Files directory.

The following text is an example of a typical Source_Selection~Video file:

```
Station XYZ’s video source file

Channel A Video Source:          tx1
Channel B Video Source:          tx2
Channel C Video Source:          studio1

Timed Events: My_Events
```

With the text of the example Source_Selection~Video file, the VM700A reads the file named “tx1” in the Video_Source~Files directory for parameter information when Channel A is selected, the file “tx2” when Channel B is selected, and the file “studio1” when Channel C is selected. The occurrence of

timed events (periodically scheduled reports and functions) is determined by the contents of file “My_Events” in the Timed Events subdirectory.

When the VM700A is shipped, all three channel parameters and the Timed Events parameter are set to System Default.

For a dual-standard VM700A (those equipped with both Option 01, NTSC, and Option 11, PAL), the Source_Selection~Video file is a little different. For each channel, it indicates the current standard in effect, along with a separate file from the Video_Source~Files directory for each of NTSC and PAL.

When the NTSC standard is in effect, the file listed under the NTSC column is used; when the PAL standard is in effect, the file listed under the PAL standard is used. To change the standard in effect for a channel, rotate the control knob until that channel’s line is highlighted (intensified), then select the entry under the “Video Std.” column by touching it. Rotate the control knob until the desired standard appears. Touch the **Update & Exit** soft key to enter the change into the file.

In Figure 3-4, the current video source (as indicated by the front-panel Source button) determines which entry is read from the Source_Selection~Video file. This, in turn, determines which file is read from the Video_Source~Files directory. This file determines which files to use to get operating information from each of several directories.

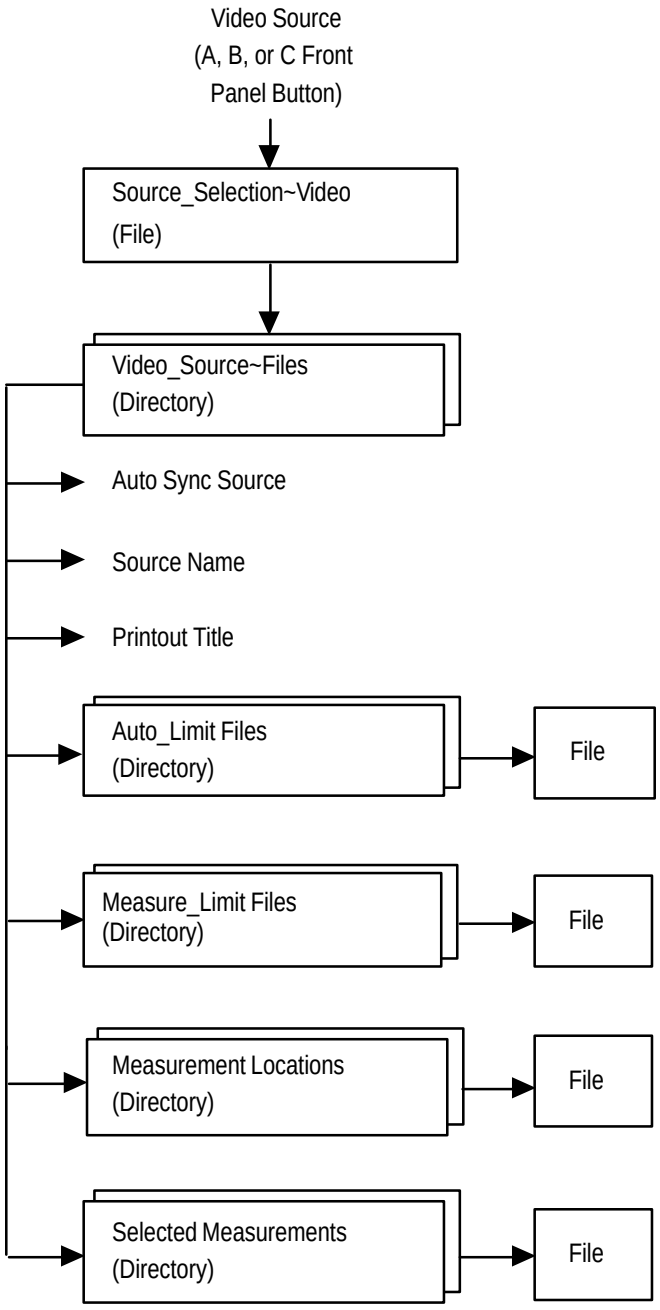


Figure 3-4: How the VM700A gets parameter information

Video_Source~Files (Directory)

Files in the Video_Source~Files directory tell the VM700A where to find important parameter information. These files contain the following entries:

Auto Limits File: the name of the file in the Auto_Limits directory that specifies the limits used for Auto mode measurements.

Measure Limits File: the name of the file in the Measure_Limits directory that specifies the limits used for Measure mode measurements.

Measurements Location File: the name of the file in the Measurements_Location directory that specifies the default frame lines and intra-line positions from which to make measurements, as well as other measurement-related information.

Selected Measurements File: the name of the file in the Selected Measurements directory that defines which measurements are to be monitored (i.e., potentially generate Caution and Alarm messages) when the VM700A is in Auto mode.

Auto Sync Source: specifies the synchronization source for Auto mode. Possible values are: Channel A, Channel B, Channel C, External, or Locked to Source. The first four use the specified sources for synchronization; Locked to Source uses whichever source is selected when the VM700A goes into Auto mode.

Source Name: specifies text to be printed across the top of printouts generated by Auto mode or the Copy button. This text may be set to any appropriate string (up to 33 characters) that helps identify the source.

Printout Title: specifies text to be printed (above the Source Name text) across the top of printouts generated by pressing Copy. This text may be set to any appropriate string (up to 49 characters) that helps identify the source.

Taken together, the file names and parameter values contained in files in the Video_Source Files directory define a complete measurement and reporting environment. This environment is usually associated with a particular configuration of equipment being monitored. Thus, for example, you might create a file in the Video_Source Files directory called “tx1,” which would define a measurement environment associated with the signal from your primary transmitter. To avoid confusion, you should give all the files associated with this environment the same name. (They reside in different directories, so there is no risk of name collision.)

This arrangement, whereby the file in the Video_Source Files directory defines the measurement environment while the Video Source file assigns the environment to a channel, gives the VM700A maximum flexibility in meeting a variety of signal monitoring needs. Pre-defining a number of different environments (one for each configuration of equipment to be monitored) allows you to set up the VM700A for different measurement assignments by simply changing entries in the Video Source file.

Auto_Limit Files (Directory)

The Auto_Limit Files directory contains limit files used by Auto mode. A limit file lists all the measurements available for the Auto mode. Each measurement has limits that, when exceeded, produce Caution or Alarm messages on the display and can generate error logging. Both Caution and Alarm limits can be set for every measurement.

The Auto Limit file in use is specified by the active file in the Video_Source Files directory. A file from the Selected Measurements directory is used in conjunction with a file from the Auto_Limit Files directory to provide Auto mode with a list of measurements to be made, as well as the limits for those measurements.

The first line of each file in the Auto_Limit Files directory is the title line for identification of the file. The second line sets the number of consecutive times the VM700A must find a value outside either of its Alarm limits before sending a report of the error to the Log Port.

NOTE. *All Cautions and Alarms encountered in Auto mode are displayed on the VM700A screen, but only Alarms equal to or exceeding the consecutive errors number specified in the active Auto Limits file are sent to the Log port.*

To Change the Consecutive Error(s) Before Logging Value. Rotate the control knob to scroll the screen until the “consecutive error(s) before logging” line is highlighted.

Touch the number at the front of the line.

Rotate the control knob to select either 1, 2, or 3.

Select the **Accept Input** soft key or touch the screen anywhere inside the directory window to return the control knob to its scrolling function.

The next two lines after the “consecutive errors before logging” line contain non-editable label information. Each line of the rest of the file lists the name of an Auto mode measurement, along with its lower and upper Caution limits and its lower and upper Alarm limits.

To Change the Lower or Upper Limit of a Caution or Alarm. Rotate the control knob to scroll the screen until the line with the limit you wish to change is highlighted.

Touch the limit you wish to change or remove.

Scroll the control knob to display the desired value or select **Make it undefined** if you wish to remove the limit.

Select the **Accept Input** soft key or touch the screen anywhere inside the directory window to return the control knob to its scrolling function.

Setting a pair of limits “backwards” (setting an upper limit lower than its lower limit) always generates an alarm flag on the Auto mode display.

Alarm limits may be set inside Caution limits, but then only Alarm limit violations are flagged.

Communication Setup (File)

The VM700A has two RS-232-C serial ports. Either port can be attached to an ASCII, Epson, HP LaserJet, or PostScript printer, or to a modem or terminal for serial communication during remote operation. The Communication Setup file tells the VM700A how the RS-232-C ports are configured. The factory default settings are the proper settings for an Epson LQ-570 printer connected to Serial Port 1.

NOTE*. Option 48, the GPIB Interface option, adds a parallel GPIB port. Any or all of the logical ports may be set to GPIB when the option is installed.*

Port and Format Assignments. The VM700A has two physical ports:

Serial Port 0

Serial Port 1

and five “logical” ports:

Copy: the port to which screen dumps generated by pressing the Copy button, as well as printouts generated by the Configure mode’s Print File soft key, are sent.

Report: the port to which Timed Event reports are sent.

Log: the port to which error reports are sent. Errors are logged when the VM700A, running in Auto mode, measures a parameter as being out of specification for more than the number of consecutive times designated in the active Auto Limits file.

Control: the port used to connect a device to be controlled by the VM700A. A typical example is the ASG 100 audio signal generator under control of the VM700A running Function Key commands that generate test signals for the Option 40 audio measurements.

Remote Control: the port used to connect the VM700A to a modem, terminal, or PC for remote operation. See the *VM700A Programmer’s Reference Manual* for details on remote operation. Copy/Report/Log Format should be set to match to type of printer connected.

The first five groups of lines of the Communication Setup file (after the title line) assign a physical port and a format to each logical port.

Possible Port settings for the Copy, Report, Log, Control, and Remote Control ports are Serial Port 0, Serial Port 1, and None. Giving a port a setting of None disables the logical port's function (e.g., setting the Copy port to None means that no screen dump will be produced when you press the Copy button).

Possible format settings for the Copy, Report, Log, and Remote Control ports are Epson LQ, PostScript, ASCII Printer, HP LaserJet, HP DeskJet, and HP ThinkJet. If you have an Epson LQ, PostScript-compatible, or HP LaserJet printer, you can use the Copy function to capture any VM700A display from the Waveform, Vector, Picture, Measure, or Auto modes.

If you have only an ASCII printer available, set Copy Format to ASCII Printer. Then the Copy function is enabled only in Auto mode, which displays only text. If the Copy button is pressed in Waveform, Vector, Picture, or Measure modes when Copy Format is set to ASCII Printer, the VM700A will beep, indicating the Copy function is not available.

To change a Port or Format Assignment. Select the parameter you wish to change by rotating the knob until the parameter is highlighted, then touching the screen over the parameter value.

Rotate the control knob until the desired parameter value appears.

Press the **Accept Input** soft key, or

Touch the screen anywhere inside the window, then press the **Update & Exit** soft key to save the changes.

Port Configuration. Two groups of eight lines appear in the Communication Setup file after the lines that control port and format assignments. These two groups constitute the port configuration lines of the Communication Setup file. These lines control the formatting of data when the VM700A is being operated remotely and when it is being used to control a remote device on the Control port.

The configuration parameters for Serial Port 0 and Serial Port 1 and their possible values are as follows:

Protocol: can be set to None or SLIP (serial line internet protocol).

Baud Rate: can be set to 300, 600, 1200, 2400, 4800, 9600, 19200, or 38400.

Flow Control: can be set to XON/XOFF (software handshaking to control data flow), CTS/RTS (hardware handshaking to control data flow) or NONE (no flow control).

Character Size: can be set to 7 or 8 bits.

Parity: can be set to None, Odd, Even, Zero, or One.

Reset Character: can be set to None or Ctrl-A through Ctrl-Z. (Note: the Reset Character for an Apple LaserWriter is Ctrl-D.)

Carrier Detect: can be enabled or disabled.

The default Port 1 settings are suitable for an Epson LQ-570 printer.

To Change a Port Configuration Oarameter Value. Select the parameter you wish to change by rotating the knob until the parameter is highlighted, then touching the screen over the parameter value.

Rotate the control knob until the desired parameter value appears.

Press the **Accept Input** soft key, or

Touch the screen anywhere inside the window, then press the **Update & Exit** soft key to save the changes.

Diagnostic Errors (File)

When high-level diagnostics are run, any errors detected are written to the Diagnostic Errors file. The contents of this file can be printed using the **Print File** soft key, or the file can be deleted using the **Delete** soft key.

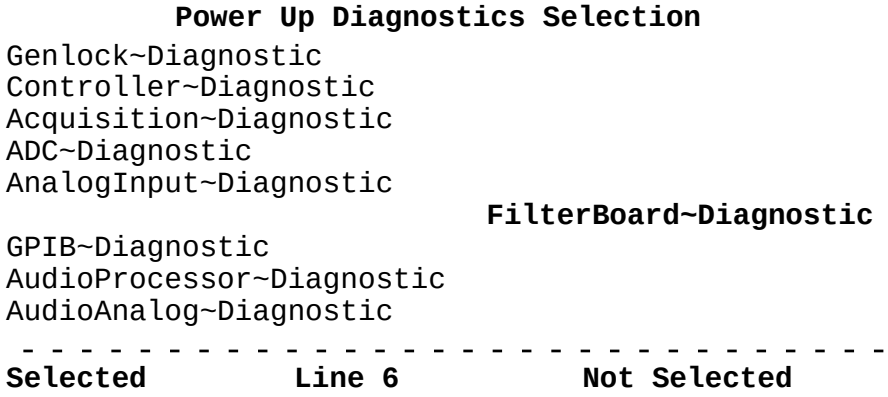
When diagnostic errors appear, refer to the appropriate servicing information to locate the possible cause of the problem. (This information may be found in the *VM700A Service Manual*.)

The maximum capacity for the Diagnostic Errors file is 100 lines in a circular file (scrolling past the last entry returns to the top line of the file). If the number of errors detected causes the file to exceed this length, the earlier results are scrolled out of the file buffer. When this occurs, the Diagnostic Errors file includes a message stating that some of the text has been scrolled out of the file.

Diagnostics Selection (File)

The Diagnostics Selection file lists the diagnostics the VM700A can perform at power up. If installed options require additional diagnostics, those are also listed. As received from the factory, all diagnostics are performed by default. Any diagnostic can be deselected by rotating the control knob until the diagnostic is highlighted, then touching the right side of the highlighted line (above the words Not Selected).

In the following example, the FilterBoard Diagnostic routine will not be performed.



See Section 9, *Diagnostics*, for more information on using and controlling the diagnostic choices.

Measure_Limit Files (Directory)

The Measure_Limit Files directory contains limit information for Measure mode (manual) measurements. The limits in these files perform two functions:

1. They place graphic limit markers on the screen in measurements (where applicable), and
2. They appear on printouts from the Measurement Results directory when the measurement exceeds the limits.

The measurement limits file used by Measure mode is designated in the active file in the Video_Source Files directory.

Measurement Locations (Directory)

The file(s) in the Measurement Locations directory contain information used by both Auto and Measure modes. The measurement locations file for each channel is designated in the active file in the Video_Source Files directory.

For PAL, the SIS Present parameter tells the VM700A whether Sound in Sync is present (yes) or absent (no). When SIS Present is yes, measurements are made using Synchronous sampling. The Measure mode parameter determines whether manual measurements are made with Asynchronous (the default) or Synchronous sampling.

NOTE. *Measure mode (manual) measurements normally use Asynchronous sampling. Auto measurements always use Synchronous sampling. Synchronous sampling is available for manual measurements in the case of very noisy signals, negative-going pulses, or other conditions that prevent using Asynchronous sampling. However, Synchronous sampling cannot be used to measure VCR/VTR devices.*

The Line parameter contains the default line on which the measurement is made. The Line value is used in the **Default Line Sel.** soft key in the Select Line menu in Measure mode. For PAL, the Time offset from leading edge of sync parameter defines the actual measurement position. The numeric Line values and Time

values can be changed by highlighting the desired line and selecting the parameter you want to change. Rotate the control knob to obtain the new value, then select the **Accept Inpu**t soft key or touch the screen anywhere inside the directory window. Finish by selecting the **Update & Exit** soft key.

For PAL, two of the measurement descriptors can also be modified. The 20T value on the Modulated Pulse (F) HAD line can be changed to 10T by selecting the parameter and rotating the control knob. The 40% value of the 5-Riser Chroma Amplitude line can be changed to 20% by selecting the parameter and rotating the control knob.

Measurement Results (Directory)

Files are written into the Measurement Results directory:

when you exit a measurement in Measure mode,

when you exit Auto mode (assuming that Auto mode has had time to go through one complete cycle of selected measurements),

when a **getresults** command has been sent from a remote, or

when a **getresults** request is part of a Function Key operation.

One file with an appropriate name (“Auto,” “Bar LineTime,” etc.) is written for each Measure mode measurement or for Auto mode when it is exited. If a file with that name existed previously, the old file is overwritten.

Once a Measurement Results file contains results, it can be printed (by selecting the **Print File** soft key), renamed, deleted, or viewed.

Password (File)

The VM700A can be configured to require a password for permission to create, rename, edit and delete directories, function keys, and files. When the Password function is enabled, a Password file appears in the Configure_Files directory.

To initially set a Password. Select (touch) the Password file.

Touch the screen to the right of the text Password.

Type in the new password (up to 15 characters).

Press **Return** or **Done** and select the **Update & Exit** soft key to put the new password into effect, or press **Cancel** or **Exit** to leave without changing the new password.

NOTE. *Enabling the Password function requires partial removal of the left side cover of the VM700A. Refer the instrument to a qualified service person to either change the Password enabled/disabled state or to reset the password should it become unknown for some reason.*

To Enable or Reset the Password Function. Turn off the VM700A and remove the holding screws for the left side panel. Slide the left side cover of the VM700A back to expose the 6-section DIP switch on the A5 circuit board. To enable Password, set position 3 (from the front of the DIP switch) UP. When power is turned on again, the Password function is enabled, and you can set a password using the procedure given previously.

To either reset the password, if it should become unknown for some reason, or disable the function, set position 3 of the DIP switch DOWN, turn on the VM700A, and let it complete its power-up routine. The Password function is now disabled, and the unknown password is visible in the Password file and may be edited.

To re-enable Password, turn off the VM700A and set position 3 of the DIP switch UP. Close the side panel and replace the holding screws for the panel.

To Change the Current Password. Select (touch) the Password file icon.

Type in the current password and press **Done** or **Return**.

Touch the current password.

Type in the new password (up to 15 characters).

Press **Return** or **Done** and select the **Update & Exit** soft key to put the new password into effect, or press **Cancel** or **No Change & Exit** to keep the old password.

When the Password function is first enabled, the default password is null; no password is needed to Update & Exit, Rename, Delete, or Create a directory or file. Once a password is set, it will be requested when you attempt to Update & Exit, Rename, Delete, or Create a directory or file (i.e., every time you change the contents of non-volatile memory). If the correct password is entered, the requested action is completed. The VM700A allows three unsuccessful attempts to enter a password before displaying the message **No Password, no access!** and canceling the requested action.

Changing the password to null has the same effect as disabling the Password function with the DIP switches.

Selected Measurements (Directory)

File(s) in the Selected Measurements directory contain a list of all the measurements Auto mode can perform. They allow you to select a subset of measurements for the VM700A to perform. The current Selected Measurements file provides Auto mode with a list of measurements to perform, while the current Auto Limit file provides the limits at which those measurements generate Caution and Alarm messages.

The Selected Measurements System Default file is the only file available for selection when the instrument is shipped. This file cannot be edited and all the

measurements within it are Selected. You must use the **Create File** function to copy the contents of the System Default file into a new file, and then select the new file before you can select a subset from the measurements available.

To Select or Unselect a Measurement. Open the Selected Measurements file for editing by touching its icon in the display of the /nvrar0/ConfigFiles/ Selected_Measurements directory.

Scroll the file using the knob until the desired measurement is highlighted. Note that the labels Selected and Not Selected are printed below the directory window.

Touch the highlighted line on the Selected side of the screen to select the measurement, or on the Not Selected side of the screen to deselect the measurement.

If you wish to select only a small subset of the available measurements, press the **Select None** soft key and then make your measurement selections.

If you wish to unselect only a small subset of the available measurements, press the **Select All** soft key, then unselect the measurements of your choice.

Timed Events (Directory)

Files in the Timed Events directory provide a facility for producing scheduled reports of Auto mode measurements, and performing operations (in the form of functions to be played back) at specified times. Events occur at times specified by the current Timed Events file. The Report Port setting in the Communication Setup file must be set to Port 0 or Port 1, (not None) for reports to be generated.

Consider the following lines from a user-generated Timed Events file named "daily_events":

```
Timed Events File: daily_events

Time        Channel     Type        Selected File Name
9:30        B           function    mid_morn
15:30       B           report      mid_pm
```

Timed Events files use a 24-hour clock to specify event occurrences. When this file is the current Timed Events file, the following events are set to occur daily:

1. A function called "mid_morn" is executed at 9:30 a.m., and
2. A report is generated at 3:30 p.m., using the Video Source file named "mid_pm."

Two kinds of timed events can occur: a report can be generated (designated as event type "report" in the Timed Events file), or a function can be executed (designated as event type "function" in the Timed Events file). For "report" events, the VM700A looks in the /nvram0/ConfigFiles/ Video_Source~Files directory for the file named in the Timed Events file.

For "function" events, the VM700A looks for the function named in the Timed Events file in directory /nvram0/FunctionKeys/Timed~Functions. The function selected as a Timed function must reside in the Timed~Functions subdirectory (displayed by the **Function Keys** soft key in the Configure menu). The parameters for the Auto report (selected measurement limits, measurement locations, etc.) are specified by the selected file in the Source_Selection~Video file.

When a report time occurs, the VM700A screen shows the Timed Report display (unless the VM700A is in remote mode; see note below). The Timed Report display includes a status line showing the channel and the Selected Measurements file in use, a soft key labeled **Cancel Report**, and the measurements being made. Pressing the **Cancel Report** soft key halts the timed report execution. Once the report is complete, the VM700A returns to the mode it was in when the report began. The Copy button flashes until the report is either printed or canceled with the **Cancel Copy** soft key in the initial Configure menu.

When a function time occurs, the VM700A executes the function. When the function has been executed, the VM700A remains in the state specified by the body of the function; it does not return to the state it was in when function execution began.

NOTE. *If the VM700A is in remote mode during a scheduled timed event, the scheduled event is not performed.*

To Create a Timed Events File

1. Press the Configure button.
2. Touch the **Configure Files** soft key.
3. Touch the icon for Timed Events.
4. Touch the **Create File** soft key.
5. Touch the icon of an existing file to use as a template.
6. Give the new file a name using the on-screen keyboard (press **Done** when you have finished entering the name).

The contents of the new file appear on the screen, ready for editing.

To Setup Timed Events

1. Create a Timed Events file
2. If any reports are to be generated, make sure the Report Port in the Communication Setup file has a value other than “None.”
3. If a function is to execute a screen copy, make sure that the Copy Port in the Communication Setup file has a value other than “None.”

To Delete a Timed Events File

1. Press the Configure button.
2. Touch the **Configure Files** soft key.
3. Touch the icon for Timed Events.
4. Touch the **Delete File** soft key.
5. Touch the icon containing the name of the file you wish to delete.

The icon of the selected file “disintegrates” over a period of five seconds. To stop file deletion, touch the screen anywhere inside the directory window before the disintegration completes. Stopping the disintegration part way through has no effect on the file.

To Add a Report or Function to a Timed Events File. Touch the icon of the file to display it for editing, if it is not displayed already. With the file opened, turn the knob so that the insertion point of the file is highlighted; touch either the **Enter Report** or **Enter Function** soft key as required.

The VM700A inserts a copy of the selected type above the highlighted line. That may then be edited for the new event or function to be timed.

To Remove an Event From a Timed Events File. Touch the icon of the file to display it for editing, if it is not displayed already; turn the knob to highlight the line you wish to delete; press the **Delete Line** soft key.

To Edit an Event in a Timed Events File. Touch the icon of the file to display it for editing, if it is not displayed already.

Turn the knob to highlight the line you wish to edit.

Touch the item (time, channel, type, or file name) on the line you wish to edit.

Turn the knob until the desired value appears.

Press the **Accept Input** soft key or touch the screen anywhere within the window.

You can enter a time of "Undefined" for an event by pressing the **Enter undefined** soft key when the event's time field is highlighted. An event with a time of "undefined" is ignored. This function is handy when you want to skip an event temporarily, but don't want to re-enter its associated values later.

To Create a Function for Timed Execution. Press the Configure button; press the **Function Keys** soft key; press the Timed~Functions icon; press the **Create Function** soft key; give the new function a name using the on-screen keyboard (press **Done** when you have finished entering the name).

From this point, you can define a timed function. The steps for defining a timed function are found in the *VM700A Programmer's Reference Manual*. Basically, creating a function is a learn mode operation that records into the named file, all the front-panel button presses, soft key presses, and delay times used to create the function. Once created, the Function Key file is then available for playback.

To Cancel a Timed Report in Progress. Press the **Cancel Report** soft key.

To Cancel a Timed Function Execution in Progress. Press the Function button. This leaves the VM700A in whatever state it was in during function execution when you pressed the button.

Video Source Identification (File)

The Video Source Identification file contains a series of number and text string pairs used to identify signal sources in Auto mode. The number is encoded in binary format onto the line of the frame specified by the Source ID line in the Measurement Locations file; the default Source ID video line is line 16.

During Auto mode operation, if an encoded ID number is found on the Source ID line, the VM700A decodes the number and searches the Video Source Identification file for a matching number entry. If a match is found, the accompanying text string is printed on the line labeled Source ID in the Auto mode display. If no match is found, the message “Not Found” is printed.

The Video Source Identification file can contain multiple lines. The range for identifying numbers is 0 to 16383 (14 bits). The text string that accompanies each number can be up to 20 characters long.

Inserting a Video Source Identification Number. The Video Source Identification number is inserted using a 148 Insertion Test Signal Generator, a VITS 201 PAL Insertion Generator, or similar device. Pulses 1 µsec wide and 1 µsec apart represent binary 1’s. The encoding begins with a start bit (pulse) at the default location of 26 µsec after the leading edge of sync. (You can change the start value in the Measurement Locations file, but it should be an even number between 26 and 52 µsec.) When a start pulse is found, the VM700A checks that no part of the waveform preceding the start pulse is more than one-half the bar amplitude. If part of the waveform preceding the start pulse is more than one-half the bar amplitude, the encoded number is rejected. Encoding always ends with a stop pulse whose trailing edge is at 57 µsec.

The start and stop pulses are not used in the encoding scheme. There are a maximum of 14 pulses between the start pulse and end pulse, which are used to represent a binary number. The pulse following the start pulse is the least significant bit and the pulse preceding the stop pulse is the most significant bit.

Section 4:Waveform Mode

Section 4:Waveform Mode

Introduction

This chapter describes the capabilities of the VM700A as a waveform monitor and how the user interface controls its operation. It is divided into three topics:

Display features, which discusses basic characteristics of a Waveform mode display.

Menu, which contains information on all the functions and controls accessed through the Menu button.

Select Line, which describes the operation of the digital line selection feature.

Display

Figure 4-1 shows a typical Waveform display. Refer to this figure as you read the descriptions that follow.

Waveform

The VM700A Waveform mode can present a real-time Waveform display (with 25 updates per second) when half a video line or less is displayed. With a greater number of lines, a very full display, or a display of VITS on the first field in a frame, the display is slowed slightly from real-time.

For NTSC, the VM700A may display any part of the two frames of two fields each. Select the frame displayed by selecting Field 1 or Field 2 for frame 1 or Field 3 or Field 4 for frame 2. The default display is both frames. Use the Select Line menu (discussed later in this section) to move to the desired field within a frame.

For PAL, the VM700A may display any part of the four frames of an eight-field color sequence. You can select which frames are displayed in the Select Line menu; the default is all four frames displayed. There is no implicit field selection. Again, use the Select Line menu (discussed later in this section) to move to the desired field within a frame.

Graticule

The Waveform mode graticule scale tracks as the waveform expands, contracts, or moves in both the horizontal and vertical directions. This ensures the graticule scale is always calibrated regardless of the gain (expansion) factor.

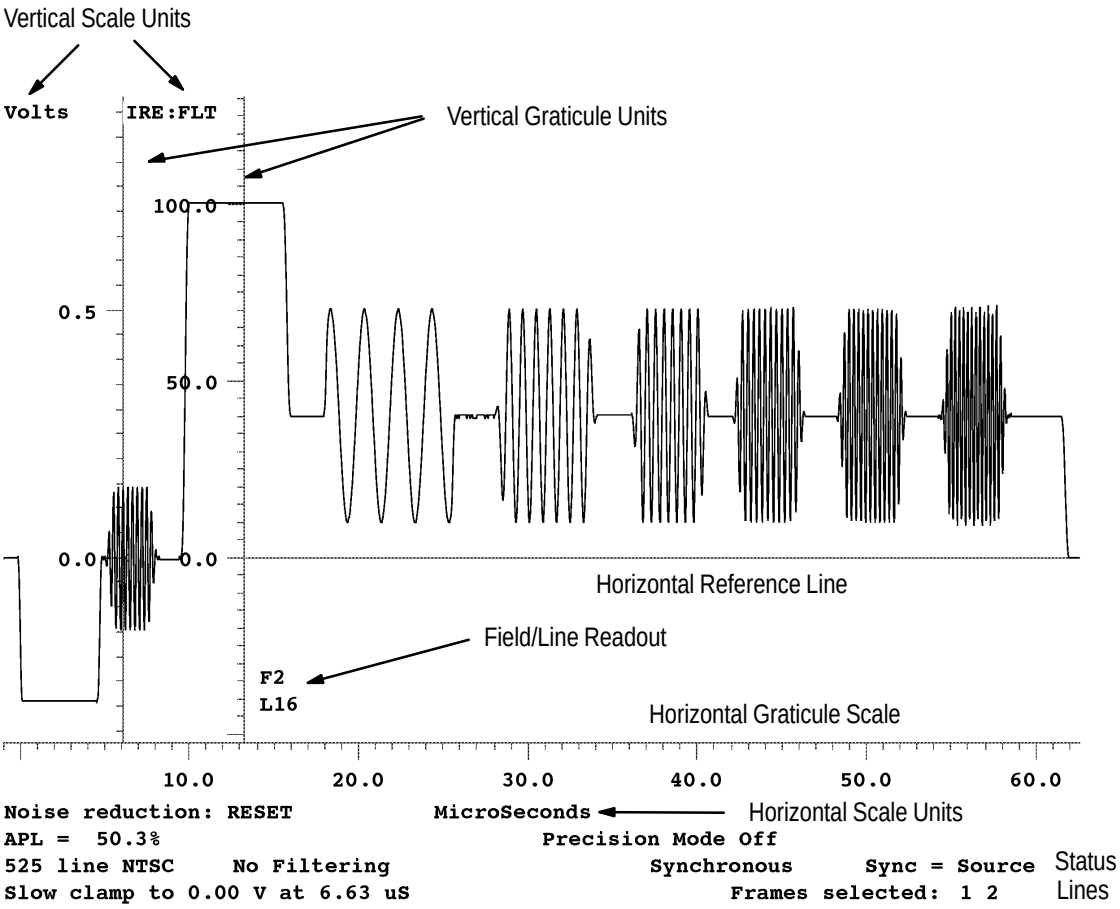


Figure 4-1: Typical NTSC Waveform display

The Waveform mode vertical graticule scale is in mV or Volts, depending on the vertical gain setting.

The horizontal graticule scale is calibrated in µs (microseconds) or ns (nanoseconds), as appropriate for the horizontal gain setting. The horizontal scale units indication is centered in the topmost status line, just below the horizontal scale.

Line Identification

A readout of the displayed line number is always shown. If a single line or a fraction of a line of video is displayed, the readout is located just above the horizontal graticule scale and somewhere to the right of the vertical scale, wherever it fits best. If more than one line is displayed, the indicator is found to the right of sync tip for each line.

When multiple lines are displayed, the leftmost line number is the system line. The system line is the line that will be displayed when switching between the manual modes (Waveform, Picture, Measure, and Vector mode when System Line is selected).

Horizontal Reference Line

The horizontal reference line is a stationary line across the display provided for checking and comparing signal levels. It also provides a reference for measuring amplitudes in Cursors mode, and can be used to get a quick measure of tilt on a bar top.

Status Lines

The lines of text directly below the horizontal graticule scale are referred to as the status lines. The first line of text displays the units for the horizontal graticule scale (microseconds or nanoseconds). This line also indicates when the VM700A is performing self-calibration. The second line gives the APL (Average Picture Level), and the on/off status of Precision mode and Sound-In-Sync (PAL only). The third line shows the television standard in use, the type of Filtering in effect or No Filtering if none is in effect, the method of sampling in use (Synchronous/Asynchronous), and the selected Sync source. The fourth line describes the clamping status and which frames are currently selected. Two additional lines appear with cursors showing the cursor measurements. Any menu called up will appear below the status lines and will cause the status lines to move upward to make room for the menu selections.

Control Knob

The control knob is used with the toggling Move/Expand and Vertical/Horizontal buttons to control waveform positioning and gain and with the Graticule and Display Intensity buttons to set the brightness of the display. When the end of range for a control knob assignment is reached, a slight clicking noise will be heard if the knob rotation is continued in the out-of-range direction. Display and Graticule intensity adjustment is controlled by the knob only when either of those buttons is held. When the intensity buttons are released, the control knob assignment reverts back to the Move/Expand positioning function.

Move/Expand

When entering Waveform mode, the control knob's default function is Horizontal Move (positions left and right). When Expand is selected by pressing the Move/Expand button, the waveform expands around the center of the screen. Expand is also selected when the active area of the screen is touched. (The active area of the screen is that area above the horizontal graticule scale line.) The point touched becomes the point about which the display expands. To move or expand the display vertically, be sure the direction button indicator is Vertical and then rotate the control knob.

Note that selecting Expand with the button is only necessary for one-handed operation. Using the two-hand "touch and zoom" method is much easier. The

"touch and zoom" method makes use of the switching to Expand from Move feature. Leave the Move/Expand choice in Move and select the direction, either vertical or horizontal. Move the waveform to the point of interest, then touch the screen at the point about which you wish the waveform to expand or compress. The function of the control knob switches to Expand while the screen is touched and defaults back to Move when you lift your finger from the screen.

Expand (Gain) Range

The horizontal gain of the default 1H Waveform display can be continuously compressed or expanded to display from 10 ns to 704 µs (11 lines) across the screen. Vertically, the Volts scale ranges from 1 mV full scale to 10 V full scale. The calibrated graticule scale tracks the waveform as it expands, compresses, or moves, both vertically and horizontally.

***NOTE**. Using the Expand function to change the display gain does not affect the analog processing of the signal. Signals of up to 4V peak-to-peak may be received.*

Display and Graticule Intensity

Display and Graticule intensity adjustments are also made with the control knob. While the Display button is depressed, the control knob varies the intensity of the waveform, menu information, and any other text on the display not associated with the graticule. While the Graticule button is held in, the control knob varies only the intensity of the graticule and the background text displays.

Freeze

When Freeze is selected by pressing the Freeze button, the VM700A acquires consecutive frames of 50 lines each and holds that information in the display memory. Therefore, it is not possible to scroll through the entire field when Freeze is selected, only the acquired lines may be displayed.

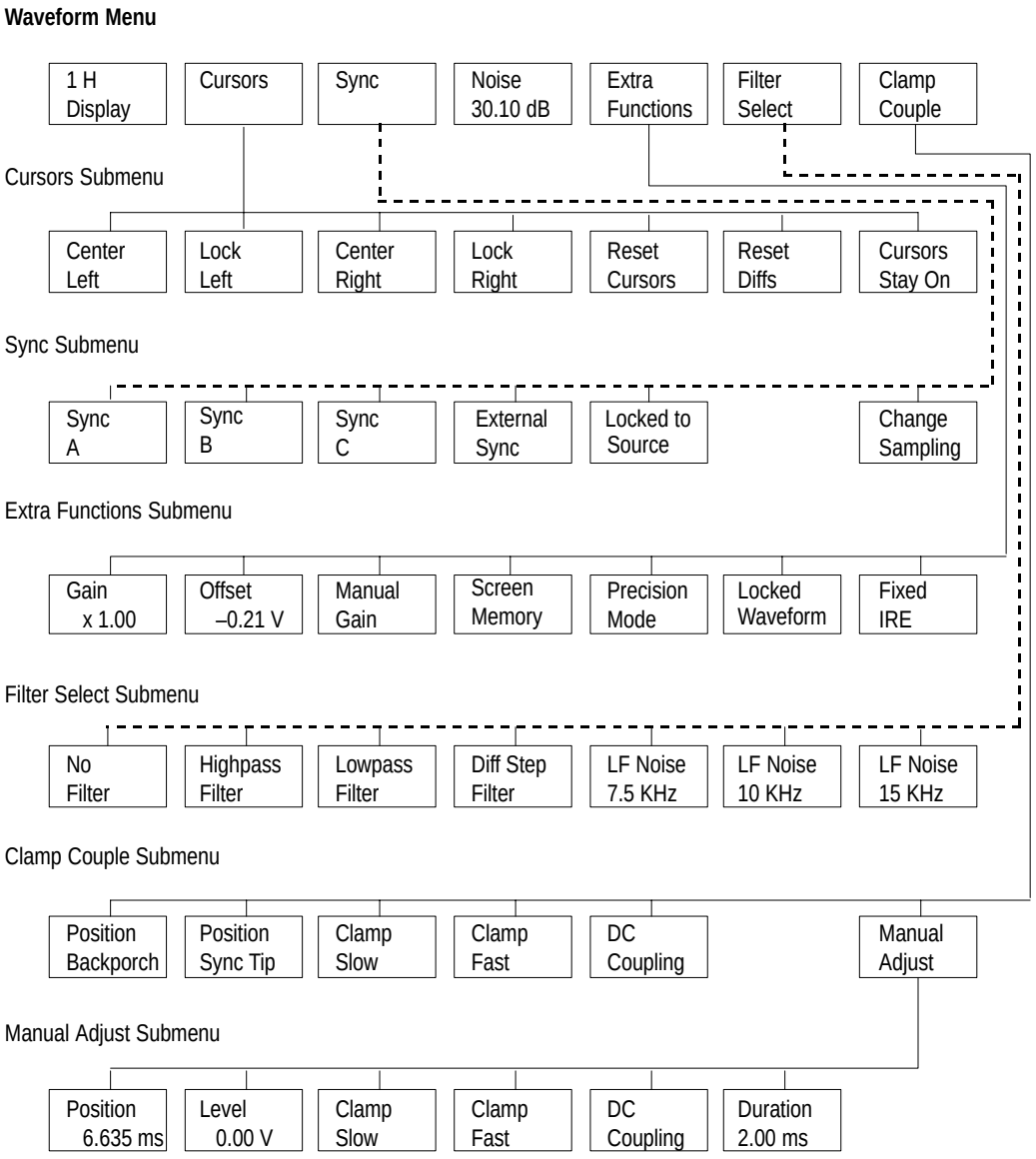


Figure 4-2: Waveform menu tree

***NOTE**. The LED in the Menu button is on when the Waveform menu is displayed. If the Menu button is pressed when the Menu LED is on, the menu is unselected (removed from the display), and the Menu LED goes off.*

Menu

Pressing the Menu button while in the Waveform mode displays a row of soft keys along the bottom of the display. This row of soft keys is known as the Waveform menu. The entire Waveform mode menu tree is shown in Figure 4-2.

Pressing the Menu button when the VM700A is in Waveform mode displays the Waveform menu, which is structured as follows:

[**1-11**] **H Display:** resets the Waveform display to fit a specified number of lines [1 to 11] into the display. When possible, it aligns the front porch of the system line to the left edge of the display, and 0 volts is aligned with the horizontal reference line. To select the number of lines to display, hold the soft key while turning the knob.

Cursors

This choice provides a set of cursors centered on the waveform display. To position the cursors, move the waveform over the cursor and lock the cursor to the desired point of the waveform. When cursors are on, the lower part of the display contains three additional status lines for cursor measurement results.

Pressing the **Cursors** soft key brings up the following submenu:

Center Left/Right: centers the left or right vertical cursor on the screen. If the cursor is locked to the waveform, the two will move together. If the left and right cursors overlie each other, they appear together as a single dotted line. The vertical amplitude reference marker positions are reset if the cursor is unlocked.

Lock Left/Right: locks the left or right vertical cursor to the waveform so that the cursor and waveform move together. The cursor may be moved anywhere within a frame. The “Time from L to R:” reading indicates the time interval between the left (solid) cursor and right (dashed) cursor. The “Frequency” reading is the reciprocal of the time (1/T) and is useful when the cursors are aligned to exactly one period of a waveform. The amplitude reference markers associated with the cursors are not displayed when both cursors are locked to the waveform.

NOTE. *If you position the left (solid) cursor to the right of the right (dashed) cursor, you will be measuring the time from one frame to the next.*

Reset Cursors: unlocks the left and right vertical cursors from the waveform, and positions both at the center of the display. The amplitude reference markers are also reset, so moving the waveform to the 0% and 100% positions of the waveform again pushes the amplitude reference markers back to those positions on the waveform. You can then adjust the cursor on the waveform to the “% point” (as indicated by the % of waveform readout)

between the 0 and 100% points required for the cursor measurement (e.g., 50% or 10% and 90%).

Reset Diffs: resets the Vertical Delta readout to 0.0 at the current vertical position. Any subsequent vertical displacement from the knob is displayed. This capability is useful for measuring signal amplitudes. The horizontal marker line (across the middle of the active waveform area) provides a useful reference level to align the waveform for voltage difference measurements.

Cursors Stay On: keeps the cursor graphics up even when not in the Cursors submenu. This is useful for keeping up sine-wave measurement results, which measure the amplitude, frequency, and offset of a sine wave in the center of the displayed area.

Sync This choice allows selection of Sync source: A, B, C, External or "Locked to Source" sync mode. Also selects Sound in Sync mode and genlock mode selection between synchronous, asynchronous, and free-run modes. If incorrectly set for the input signal, the waveform display may be replaced by the message "<Loss of sync>".

Pressing the **Sync** soft key brings up the following submenu:

Sync A/B/C: sets the sync source to input channel A, B, or C, and clears (un-highlights) the **Locked to Source** soft key.



WARNING. *If the **Locked to Source** soft key is not highlighted, the sync source will NOT change with changing input selections, resulting in erratic behavior if the relative timing between the two inputs is not close.*

External Sync: sets the sync source to external sync. This input cannot be displayed or measured.

Locked to Source: When highlighted, indicates that the sync source and the input source are the same. Changing the signal source also switches the sync to the new signal source.

Sound in Sync (PAL only, not shown in Figure 4-2): enables the VM700A to lock or sync to signals that contain digitally-encoded sound information in the sync pulse. When sound information is contained in the sync pulse, Sound In Sync must be selected or else the VM700A will display the message "Loss of sync." When Sound In Sync is selected, less of the sync pulse is available for synchronization, which makes the signal timing more susceptible to noise and jitter.

The **Sound In Sync** soft key only affects Waveform mode. For all other manual modes, Sound In Sync is enabled with the SIS Present "yes" parameter in the active Measurement Locations file.

Change Sampling: toggles between synchronous, asynchronous, and free-run sampling. For a stable source, use synchronous mode; for an unstable source (VCRs, etc.), first use asynchronous mode, and if this does not work, use free-run mode. In free-run mode, line or field syncs are not used, and you lose TV timing references.

Noise [0 dB - 30.10 dB]

The Noise choice sets the decibel value for noise reduction. Highlight the soft key and rotate the knob to change the decibel value. Noise reduction is enabled with the Average button. Noise reduction up to 30.1 dB in 3.01-dB steps is available. Larger noise reduction settings require a longer settling period.

Extra Functions

Pressing the **Extra Functions** soft key brings up the following submenu:

Gain: allows direct control of the hardware used in acquisition. Gains of 0.25 to 7.75 in steps of 0.25 are available. A larger gain gives a smaller input range, but more resolution. The input range is indicated by two horizontal cursors. Signals beyond these cursor levels are clipped.

Offset: used to bring the signal inside the cursors that appear when the Manual Gain mode is on. Otherwise, hard clipping may occur.

Manual Gain: selects control of the input gain and offset used from the other soft keys in this submenu. When deselected, normal automatic gain control is in effect. When highlighted, two horizontal cursors appear in the waveform area, showing the limits of the input range before hard clipping occurs.

Screen Memory: When highlighted, causes screen erasures to cease, allowing a “build-up” of displayed waveforms. This is useful for looking at eye-heights, jitter, or abnormal excursions of the signal over a period of time. The screen is cleared if the waveform is moved by the knob.

NOTE. *Calibration is suppressed in Screen Memory mode.*

Precision Mode: provides a higher-accuracy display for waveforms with rise times between 5 MHz and 6 MHz. However, the system update rate is slowed when Precision mode is on. This mode is useful for cursor measurement of fast edges, 1T pulses, etc.

Locked Waveform: When highlighted, this key disengages knob movement. Moving the knob resets the calculation when accumulating averages, and resets the screen when in Screen Memory mode. This soft key prevents this from happening accidentally. It also changes cursor mode to make the knob move the cursors if they are unlocked from the waveform.

Fixed IRE (NTSC Only): When highlighted, overrides the Zero Carrier Pulse and Bar Reference selections in the current Measurement Locations file, and fixes the IRE scale to 0 IRE = 0 Volts, 140 IRE per Volt.

Filter Select

This choice provides soft keys to select any of six filter characteristics or no filter. When filters are engaged, measurement or timing information may become less reliable.

Pressing the **Filter Select** soft key brings up the following submenu:

No Filter: displays the waveform without any filtering (default).

High-pass Filter: removes luminance from the signal. The pass band is approximately 2.5 MHz to 6 MHz.

Low-pass Filter: removes chrominance from the signal. The pass band is approximately 0 MHz to 1 MHz.

Diff Step Filter: removes chrominance from the signal, then displays the direction and relative size of signal transitions.

LF Noise 7.5 kHz/10 kHz/15 kHz: removes all signal information above the specified frequency.

Clamp Couple

Pressing the **Clamp Couple** soft key brings up the following submenu:

Position Backporch: sets the clamp position to the back porch and the clamp level to 0.0 Volts.

Position Sync Tip: sets the clamp position to the sync tip and the clamp level to –0.3 Volts (–0.29 V for NTSC).

Clamp Slow: selects slow clamp speed. This allows hum effects to be visible, but is useful for coping with large DC offsets on an input signal.

Clamp Fast: selects fast clamp speed. This removes DC offset, hum, and bounce effects from the signal.

DC Coupling: selects DC coupling (no clamping).

Manual Adjust: brings up the following submenu:

Position: adjusts the horizontal clamp position within a line.

Level: adjusts the clamp voltage level from –1.28 V to 1.27 V in 10 mV steps. Adjustments outside ±300 mV may cause APL measurement problems.

Clamp Slow: selects slow clamp speed. This allows hum effects to be visible, but is useful for coping with large DC offsets on an input signal.

Clamp Fast: selects fast clamp speed. This removes DC offset, hum, and bounce effects from the signal.

DC Coupling: selects DC coupling (no clamping).

Duration: selects 0.5 ms, 0.67 ms, 1.0 ms, or 2.0 ms clamp gating widths. Wide gating widths provide better noise immunity, but signal distortions may not provide a wide enough sustained level.

Select Line

In Waveform mode, pressing the Select Line button switches the control knob to a digital line select function. When either no menu or the Waveform menu is displayed, pressing Select Line also displays the Select Line menu, which is structured as follows

Field Toggle: toggles the system line to the other field (for PAL, +313 lines if the system line was from 1 to 313, –313 lines if the system line was from 314 to 625). In freeze mode, the change is limited to the acquired area.

Field n Line nn (NTSC)/Line nn (PAL): displays the system line specified by the soft key. To change the line number, select and hold the soft key to be changed, turn the knob until the new line number is found, and release the soft key. In Freeze mode, the change is limited to the acquired area.

Field 1 or 2/Field 3 or 4 (NTSC): When selected (default), color frame 1 (fields 1 or 2) or color frame 2 (fields 3 or 4) are displayed.

Frame 1/2/3/4 (PAL): When selected, the corresponding frame is included in the display. The default is all four frames selected.

Although the Select Line button responds in all submenus, the Select Line menu will not replace any submenus, only the main Waveform menu. Select Line always disables the Move/Expand function of the control knob, but does not disable the Display and Graticule Intensity control functions.

System Line

Changing the displayed line in Waveform mode or any of the manual modes (Waveform, Vector, Picture, and Measure), changes the current line for all the manual modes. This line is referred to as the “system line.” The leftmost line number on the display is the system line.

However, both Vector mode and Measure mode can operate independently of the system line. In Vector mode, you can select an independent Vector Line (found in the Select Line menu in Vector mode). See Section 5 for more information on the Vector Line. In individual measurements, the **Default Line Sel.** soft key changes the displayed line to the measurement line specified in the Measurement Locations file.

Cursors

The VM700A provides a set of cursors that enable you to make custom measurements manually with a high degree of accuracy. You can use the cursors to:

Measure time duration

Measure frequency

Measure luminance or chrominance amplitudes

Measure rise or fall times

Toggle quickly between any two points in a frame

Primarily, cursors are used to make measurements not automatically made in Auto mode or Measure mode. They can also be used to verify some of the automated measurements, should the need arise. The accuracy of the cursors is limited by the one percent vertical accuracy of the VM700A display. Accuracy may be improved (at the expense of update speed) if Precision mode is on.

Cursor Appearance

The cursors, which are displayed when the **Cursors** soft key is selected, are two vertical bars. The Left cursor is a solid vertical line and the Right cursor is a dashed vertical line. When both cursors are on the same point, they appear as a dotted vertical line. The default position for the cursors is the center of the display.

Each cursor has a pair of horizontal “amplitude reference markers” that extend from the cursor to the furthest left or right point the cursor touched on the waveform. The anchor point of each amplitude reference marker is a short vertical line on the waveform. The amplitude reference markers are cleared and reset when the **Reset Cursors**, **Center Left**, or **Center Right** soft keys are selected. Amplitude reference markers are used to establish 0% and 100% reference levels so that the cursor can be positioned at a specific level (e.g., 50%) as needed for a measurement.

Cursor Status Lines

Selecting the **Cursors** soft key displays the cursors and the submenu shown in Figure 4-3. When cursors are on, three additional status lines appear: (1) Sine pk-pk (mV), freq (MHz), and offset (mV); (2) Time from L to R, and Vertical Delta; and (3) Frequency (1/T), and % point (% point appears as **UNDEFINED point** when cursors are first turned on or when the **Reset Cursors** soft key is touched).

The values in the first Cursor status line are measured at the center of the display. The message **`Sine wave at middle of screen has frequency above 1.5 x Subcarrier: not measurable`** is displayed when no sine wave is found at the center. This condition occurs when measuring noise

and when the signal frequency is actually too high to measure. The formula used for calculating the Sine pk-pk (mV), freq (MHz), and offset (mV) values is:

$$f(t) = A \sin(\Sigma t) + B$$

where A = pk-pk/2, $\Sigma = 2\pi$freq, and B = offset. The second and third cursors status lines display values relative to the cursor positions and to the horizontal reference line.

Moving Cursors-Lock Left, Lock Right, Center Left, and Center Right

When cursors are displayed, a cursor can be moved from its default position in the middle of the display by locking it to a point on the waveform. Use the control knob to position the waveform under the cursors, then lock one of the cursors with the **Lock Left** or **Lock Right** soft key. You can now move both cursor and waveform horizontally.

If the Left or Right cursor is moved off the screen and lost from view, it can be easily brought back on the display by selecting the **Center Left** or **Center Right** soft key, as appropriate. With a cursor locked to the waveform, selecting the corresponding **Center** soft key will horizontally center the cursor and the point on the waveform to which it is locked. This technique may be used to toggle between any two points in a frame.

Using Cursors to Measure Timing

Cursors can help you make extremely accurate time measurements over short or very long intervals. For example, you can measure rise times or the length of up to two fields of video. To familiarize you with cursors, the following text explains how to measure the rise time of the leading edge of horizontal sync. While learning to use cursors, you'll find it much easier to use the stable output of a test signal generator than live video. You can also select Freeze to stabilize the signal.

Note that the VM700A bandwidth limits the signal to 6 MHz. To accurately display rise times of signals with significant frequency components between 5 MHz and 6 MHz, select Precision mode.

To Use Cursors to Measure a Rise Time. First, use the control knob and the Vertical/Horizontal buttons to position the leading edge of a sync pulse in the center of the screen and then expand the sync edge to fill ≈80% of the screen. Select the **Reset Cursors** soft key to center the cursors, reset the amplitude reference markers, and turn off any previously selected cursor **Lock** soft keys.

Attach the left amplitude reference marker to a stable spot on the blanking level prior to the leading edge of sync by moving the waveform to the right until the blanking level reaches the cursor. This establishes the 100% point of sync. Then attach the right amplitude reference marker to a stable spot on the sync tip by moving the waveform to the left until the sync tip reaches the cursor. This establishes the 0% point of sync. Live video may require moving the sync edge a little further in both directions to find an average or stable level for the 100% and

0% points. When the sync edge is now moved past the cursors, the % point readout is calibrated, and indicates the sync edge % point that intersects the cursors.

NOTE. *If the waveform point that the amplitude reference marker is attached to is moved off the display, the amplitude reference marker does not remain attached to the waveform. Instead, it locks to the vertical scale at the point where the waveform left the display.*

So if the level of the signal at the point where the amplitude reference marker was formerly anchored (which is now off screen) changes, the amplitude reference marker will not track that change. It may sometimes be necessary to decrease the horizontal expansion to keep both amplitude reference markers on the display when trying to find a stable point on live video to anchor them.

Position the sync edge under the cursors so the % point readout is 90% and select the **Lock Left** soft key. This locks the left cursor to the 90% point of the sync edge. Now when you move the sync edge horizontally the left cursor moves with it. Notice that the left cursor is a solid vertical line, and the right cursor, which is still centered in the display, is a dashed line. Now simply move the waveform so the % point readout indicates 10%. The Time from L to R readout now indicates the rise time of the leading edge of sync. Figure 4-3 illustrates the right cursor sitting at the 10% point and the left cursor locked to the 90% point of the sync edge.

Note that touching either the **Center Left** or **Center Right** soft key will move the corresponding cursor to the center of the display.

From this point, to measure sync width from the leading edge 90% point (10% down from blanking) to the trailing edge 90% point (10% down from blanking), you will need to locate the 90% point on the trailing edge by repeating the above procedure. First, move the waveform to the left until the trailing edge of sync is in the center of the screen. Next touch the **Center Right** soft key. Move the waveform to the left and right to position the amplitude reference markers on the 100% point and 0% point of sync. Position the trailing sync edge so the % point readout indicates 90%. The Time from L to R: readout now indicates sync width from the 10% point of the leading edge of sync to the 10% point on the trailing sync edge.

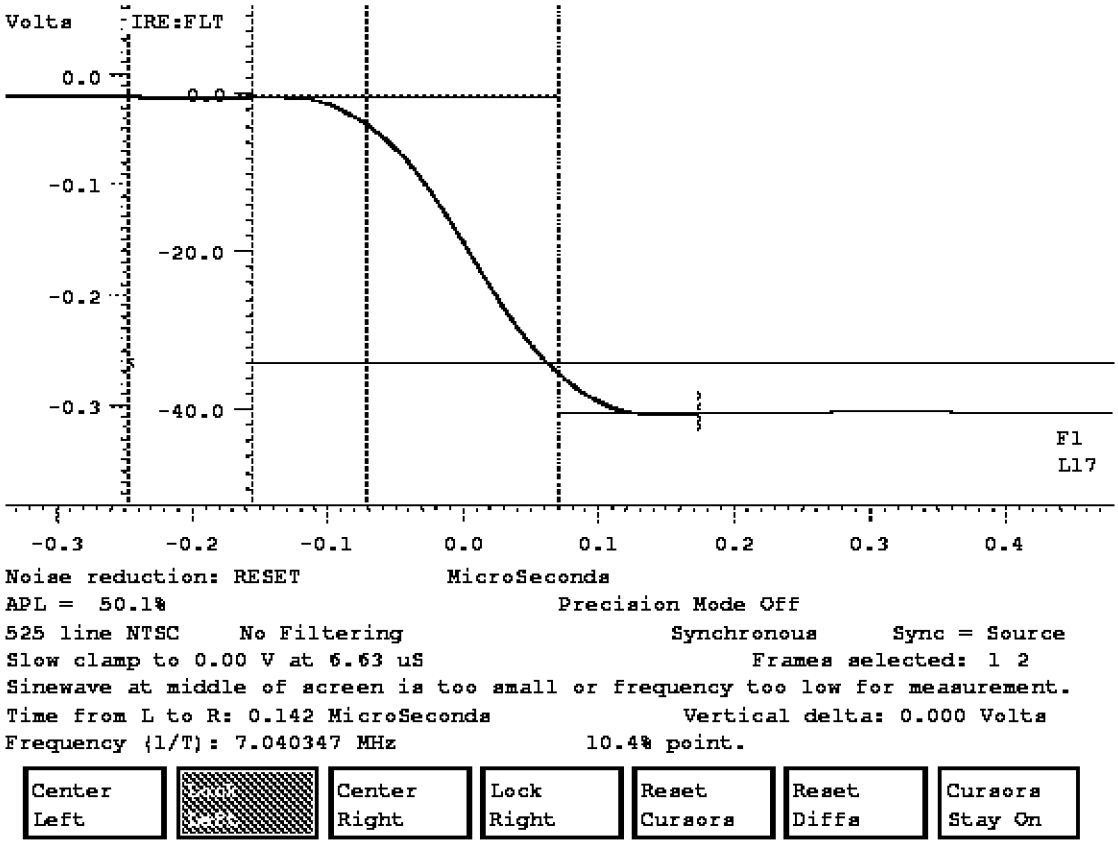


Figure 4-3: Left cursor locked to 90% point of sync edge, right cursor to 10% point

***NOTE**. Always make sure the **Left** cursor is to the left of the **Right** cursor. If it is not, the **Time from L to R**: readout will indicate the time duration of a frame of video minus the time interval between the cursors. Also, measuring time durations with cursors is not limited to a single line width or a field. Cursors can measure up to one full frame before they wrap around.*

Using Cursors to Measure Frequency

Sine-wave frequencies can be easily measured with cursors. The following procedure produces the best accuracy using asynchronous sampling and with averaging on to reduce the noise.

To Measure a Sine-Wave Frequency. Expand the desired sine wave (for example, color burst) so two cycles fill the majority of the screen.

Position the sine-wave zero crossings to occur at the horizontal reference line.

Select the **Cursors** soft key and position a zero crossing on the cursors.

Select **Lock Left** and move the waveform to the left one full cycle (two zero crossings) and position the zero crossing on the right cursor. Select **Lock Right**. The sine wave frequency is now displayed in the Frequency (1/T) readout. Compare this value with the freq (MHz) = value in the first cursor status line (third line from the bottom in the status area).

Using Cursors to Measure Amplitude

The Cursors mode provides a quick tool to make amplitude measurements and indicates measurement results in the same units as the vertical scale, to three decimal places. The following example discusses the Vertical delta: readout, and its use in measuring amplitude of the color burst.

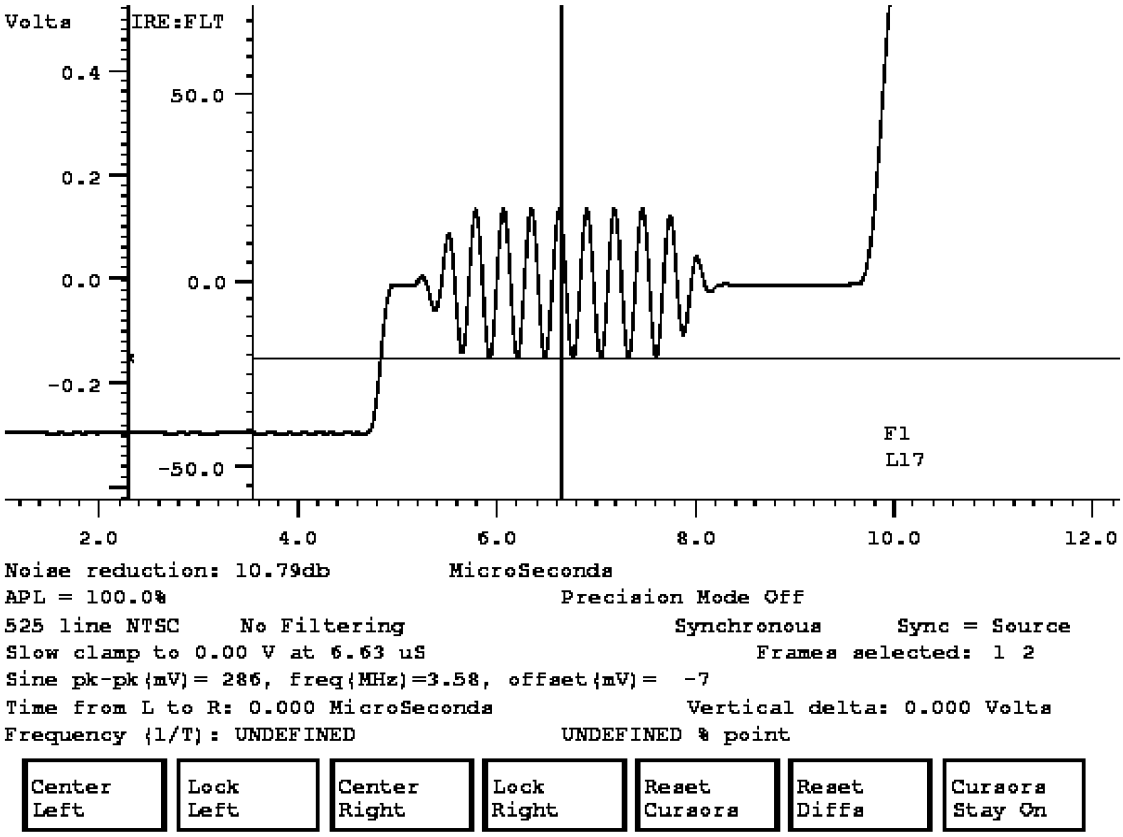


Figure 4-4: Color burst aligned with horizontal reference line

To Make an Amplitude Measurement. Vertically expand the desired portion of the signal to give adequate resolution.

Use the control knob to position the bottom (or top) of the portion of the waveform to be measured on the horizontal reference line. See Figure 4-4.

Select the **Reset Diffs** soft key to reset the Vertical delta: readout to 0.000 Volts.

Use the control knob to position the top of the portion of the waveform to be measured on the horizontal reference line. See Figure 4-5.

The Vertical delta readout now indicates the absolute amplitude of the waveform.

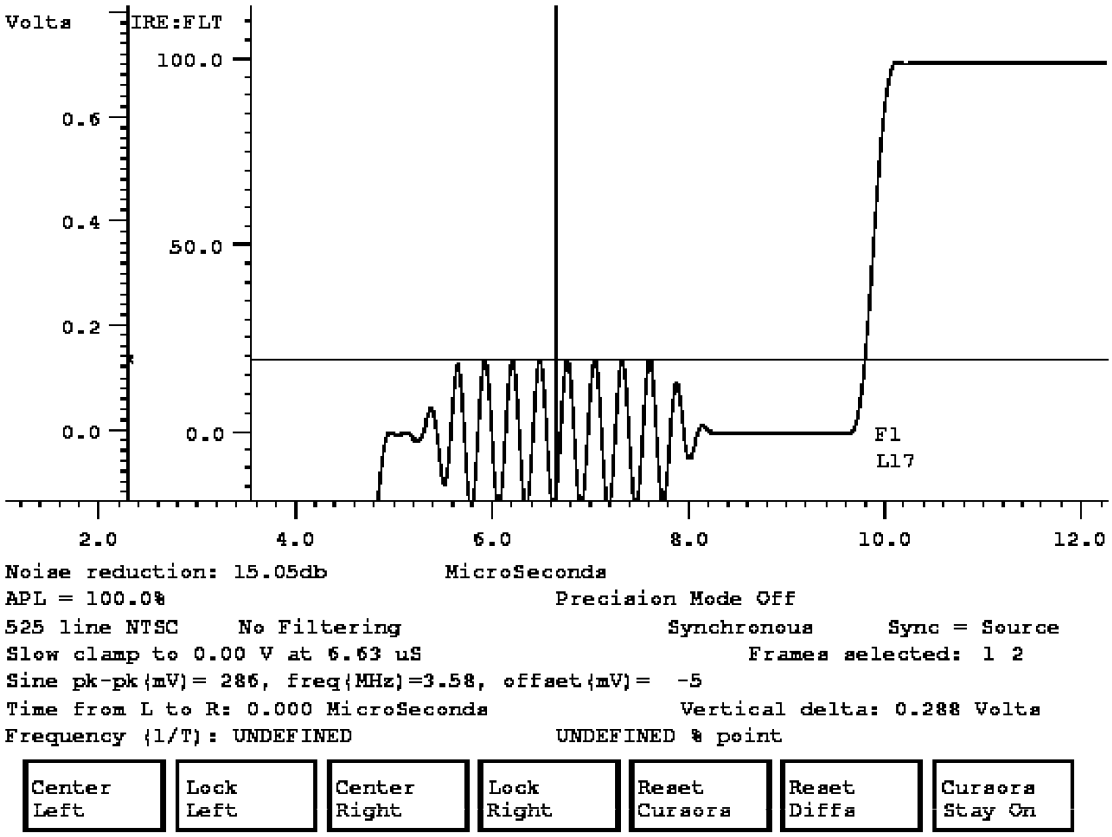


Figure 4-5: Cursors mode indicating color burst amplitude

Section 5:Vector Mode

Section 5:Vector Mode

Introduction

This section provides a detailed description of the capabilities of Vector mode, and tells how to operate the VM700A as a vectorscope.

Display

Vector mode provides a conventional vector display. Because the display is digitally derived, a single line is displayed with full brightness. The Vector mode has an electronic graticule accompanied by digital readouts of the line selection mode (System Line or Vector Line, which are explained at the end of this section), displayed field and line number, phase Angle (in degrees), Gain (in both dB and times gain), APL level, and Setup level. Figure 5-1 shows a typical color bar signal on a vertical interval line of an NTSC test signal.

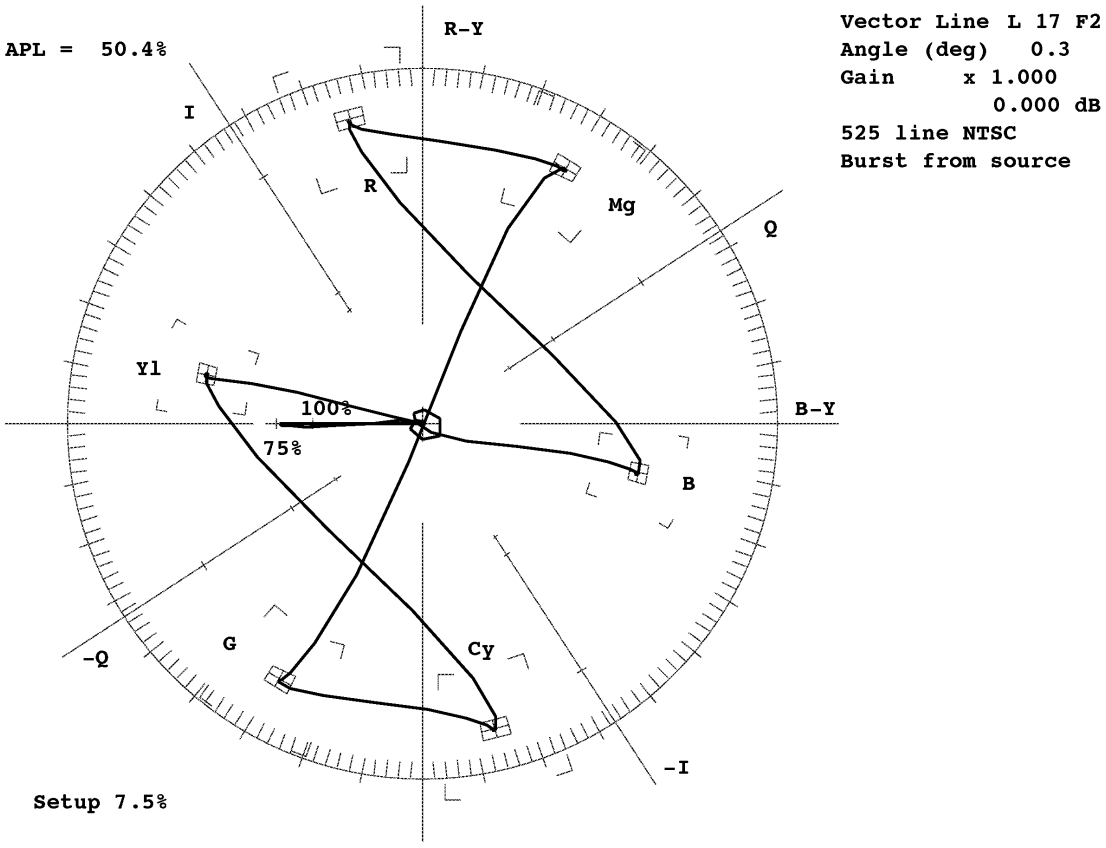


Figure 5-1: Vector display of a color bar signal

Additional information is included on the left side of the display to indicate the noise reduction if Average is on; and, for the PAL vector display, if Sound-in-Sync is ON or OFF. Also, for the PAL vector display, there is a line added to the information on the right side of the display to indicate the V-axis being displayed.

Control Knob

The control knob is used in conjunction with the Move/Expand button to vary the display phase Angle and Gain, and with the Display and Graticule buttons to set the display's Intensity. When the Select Line button is pressed, the control knob performs a digital line select function.

Display Phase Angle

When entering Vector mode, the default function of the control knob is to vary the display phase Angle (the Move LED is on). As a phase shifter, the control knob rotates the display in one-tenth degree increments, as indicated by the Angle (deg) readout in the upper right corner of the display.

Expand (Gain) Range

When the Expand button is pressed, the control knob becomes a calibrated vector Gain control. Expand is also temporarily selected when the screen is touched inside or near the graticule. The Gain readout in the upper right corner of the display indicates the current Gain setting with a multiplier (x) and in dB.

The default Vector Gain is x1.000 (0.000 dB), and can be compressed or expanded from x0.250 (–12.195 dB) to x50.000 (34.055 dB) in 0.023 dB increments.

Display and Graticule Intensity

Display and graticule intensity adjustments are also made with the control knob. While the Display button is held in, the control knob varies the intensity of the vector, menu information, and any other text on the display not associated with the graticule. While the Graticule button is held in, the control knob varies only the intensity of the graticule.

Menu

Pressing the Menu button either displays the Vector menu or toggles it off (if it is already displayed). The Vector Menu is shown in Figure 5-2.

V-Axis Switch (PAL only): inverts the vector around the V-axis for a line with a –V-axis burst. It has no effect on lines with a +V-axis burst.

Display Select V (PAL only): toggles between display of lines with a +V-axis, a –V-axis, or both axes (default).

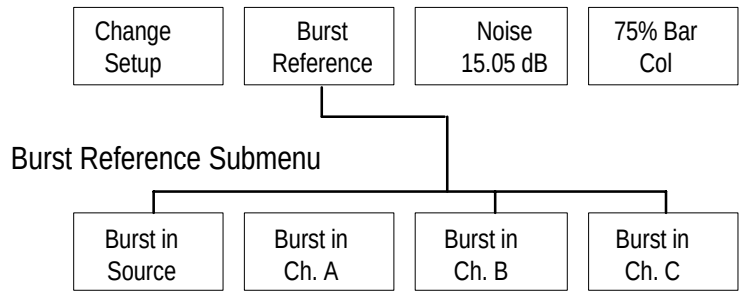


Figure 5-2: Vector mode menu

Change Setup (NTSC only): toggles the graticule for a proper display of a color bar signal with either 7.5% setup (Setup 7.5%) or no setup (Setup 0%).

Burst Reference: brings up the following submenu to select the reference source for color burst:

Burst in Source: sets the color burst reference to the current signal source.

Burst in Ch. A/B/C: the color burst reference is set to the specified channel.

When a color burst reference is set to a channel other than the source channel, an additional readout is provided at the top of the vector display screen. The timing difference between the two channels is provided in time and degrees. The two channels must have a common burst reference to provide any useful information about the time difference between channels. A typical readout is this case is:

```
ChA after ChB: xx ns
(degrees)  xx
```

where xx represents the measured timing difference.

Noise: sets the amount of noise reduction in decibels when the Average button is pressed. For PAL, each V-axis is averaged separately. The higher the noise reduction requested, the longer it takes to settle.

75% Bar Cal: Rotating the knob in Vector mode changes the gain or phase angle, which can leave the VM700A uncalibrated for angle or amplitude. Touching this softkey returns Vector mode to a default calibrated state, with phase angle set to 0.0 degrees, gain to 1.000 (0.0 dB).

Select Line

In the Vector mode, pressing the Select Line button changes the control knob function to digital line select and displays the following menu:

Field Toggle: displays the system line in the other field. For PAL, if the current line is between 1 and 313, it adds 313; if the current line is between 314 and 625, it subtracts 313.

Find Colorbars: searches from the system line through the frame for a line containing color bars, and displays it if found.

Vector Line: when highlighted, changes the Vector mode line independently of the system line.

Field n Line nn (NTSC)/Line n (PAL): displays the line specified by the softkey. To change the line number, select and hold the softkey to be changed, turn the knob until the new line number is found, and release the softkey.

Section 6:Measure Mode

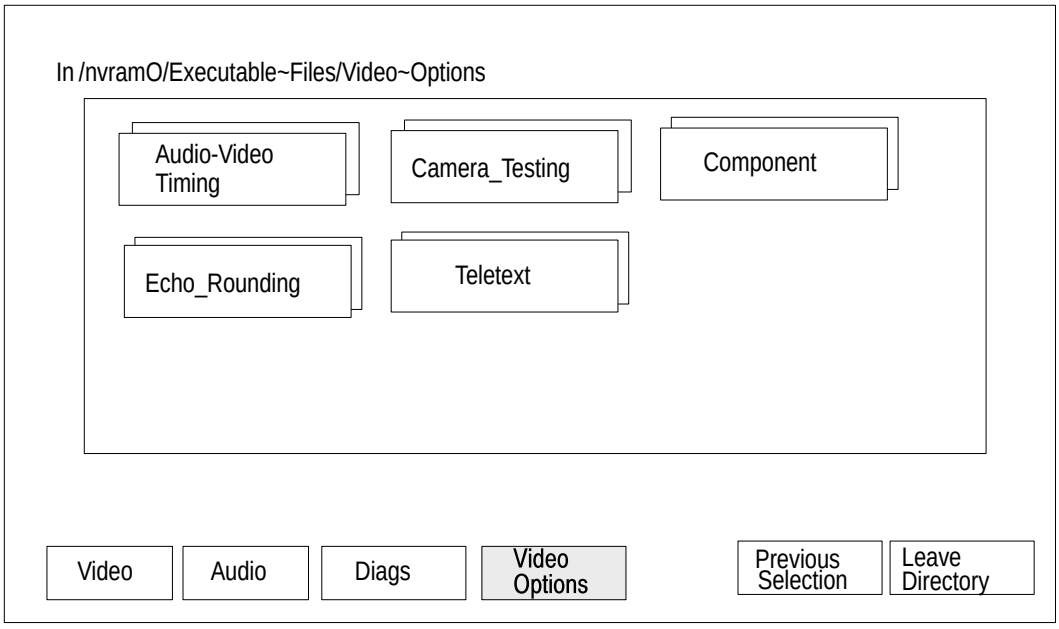
Section 6:Measure Mode

Pressing the Measure button on the front panel puts the VM700A into Measure mode. In this mode, the VM700A provides interactive control of measurement parameters, as well as graphical display and digital readouts of measurement results.

Measure Mode Menu Operation

Measure mode is used for making interactive measurements of NTSC and PAL signal properties, and accessing the measurements of any installed options as shown in Figure 6-1. This is different from Auto Mode, which is used for automatic, non-interactive, and continuous execution of user-specified measurements.

NTSC and PAL video measurements available through Measure mode are described in detail in the *VM700A Option 01 (NTSC) Measurements Manual* and the *VM700A Option 11 (PAL) Measurement Manual*. The Video Option and Audio Option measurements are described in the individual option operator's manuals.



Note: In the first Measure mode menu display, the Video soft key is visible when Video Options are selected, and the Video Options soft key is visible when when Video is selected. The Audio soft key is seen only if Audio Options are installed.

Figure 6-1: Typical Measure Mode menu choices

Video Option Measurement Menu Operation

Figure 6-1 shows the Measure mode menu with Video Options selected. Notice that a directory for each installed Video option is displayed. This menu feature was added in the Version 2.08 firmware release to assist a user in making a option measurement choice. Previous versions of firmware provided a complete list of all the installed option measurements in an alphabetical arrangement. This arrangement allowed menu choices for the measurements of the different options to be intermingled. The new arrangement separates the option measurements to assist the user in making a selection from a shorter list of measurements for a single option as illustrated in Figure 6-2.

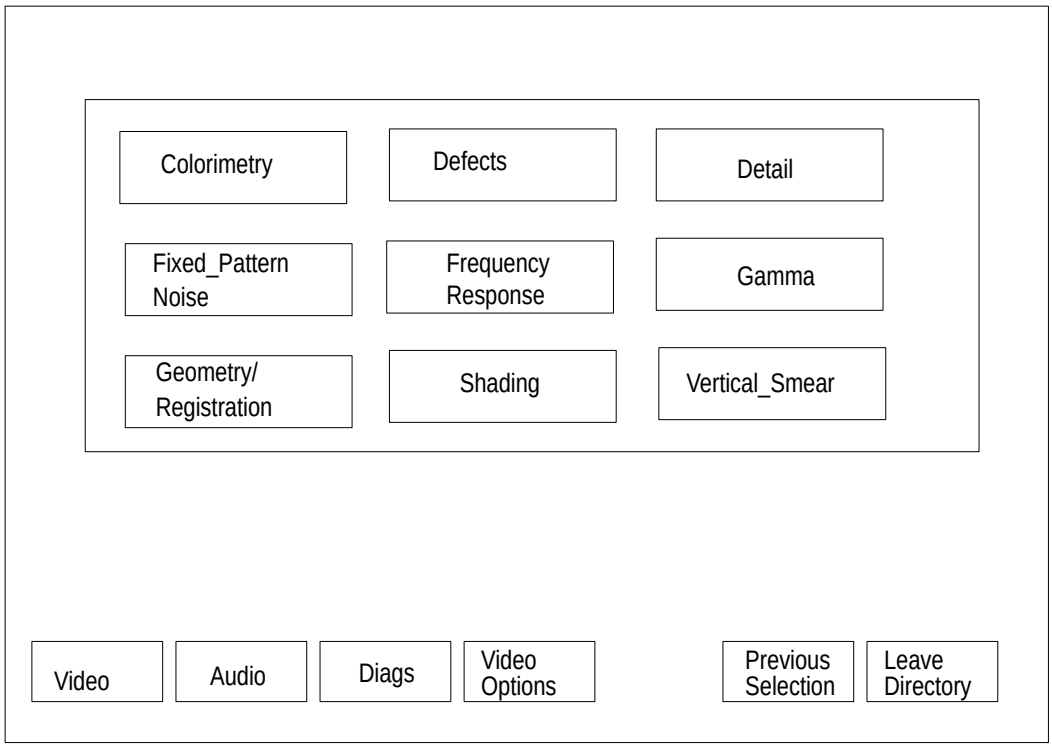


Figure 6-2: Measure menu of Camera Video Option

The menu choice of Previous Selection returns the VM700A back to the previously selected measurement. The menu choice of Leave Directory displays the next higher level of the menu hierarchy. The directories and files in the higher-level menu displays are not accessed via this route in normal operation. They are normally accessed by the appropriate front panel button or softkey as needed for the application in use.

Section 7:Picture Mode

Section 7:Picture Mode

Picture mode is intended solely to assist in input source identification of TV video (picture) signals. If non-picture test signals are viewed, the signal patterns will be displayed, but no meaningful information may be extracted from the display.

Pressing the Picture button brings up a low-resolution TV display with a software generated pseudo-gray-scale. The number of the system line is always displayed, and Select Line is always on. A bright line indicates the position of the system line on the display. You may quickly set the line selection to a visual reference point in the picture display and then switch to the waveform mode to view the contents of that line.

Two soft keys are available for use in adjusting the display. When Picture mode is active the Display and Graticule hard keys change their action. Turning the knob while holding the Display button in adjusts the picture brightness. When the Graticule hardkey is held in, turning the control knob adjusts the picture contrast. Both brightness and contrast can be reset to their default values using the **Adjust/Default Brightness** and **Adjust/Default Contrast** soft keys.

Section 8:Auto Mode

Section 8:Auto Mode

Introduction

Auto mode of the VM700A executes a configurable list of continuously performed measurements. Whereas Measure mode makes individual measurements that are graphically displayed, Auto mode performs all the selected measurements and generates the measurement results in tabular format. The measurements to be made and the limits to measure to are obtained from the configuration files. The Auto mode measurements provide a large amount of information about the signals being measured and indications of violations of user-selectable measurement limits. This section discusses Auto mode operation and how to configure it.

Display

When you press the Auto button, the VM700A displays the measurements being made in Auto mode. Due to the large number of measurements made by Auto mode, not all of them can be displayed on the screen at once. The control knob is used to scroll the display to view all of the list of measurements and results. As each measurement is made, the measurement's name, the measured value, measurement units, and the limit values for the measurement are highlighted. When the complete list of measurements has been made, the highlighted text returns to normal display.

The Auto mode measurements are not affected by the sync and clamping parameters set in Waveform mode for the manual measurements.

Measurement Identification

In Auto mode, the VM700A lists measurement names on the left-hand side of the display. Each name is followed by the measurement result, and a notation of the measurement's reference where applicable.

Violated Limits Indication

When the user definable limits are violated, the violated limits are printed on the screen, and an indicator appears between the measurement result readout and the Violated Limits — Lower column. If the indicator is a single "*" (asterisk), a Caution Limit has been violated. If the indicator is a "**" (double asterisk), an Alarm Limit has been violated.

If a measurement cannot be made for some reason, the result readout is replaced with a line of dashes and is considered a limit violation.

Setting the Caution and Alarm Limits is discussed later in this section.

Comments Column

Beyond the Violated Limits columns, Auto mode prints messages primarily for measurements that cannot be performed. The comment describes the nature of the problem the VM700A has in making the measurement to assist you in rectifying the problem. If the measurement is one that will not normally be available from the signal being measured, a new Selected Measurement file can be created to customize the measurements list to those of interest in your application.

Timed Events

Auto mode has a utility for generating reports of specified measurements at specified times, or for automatically executing functions at specified times. The report is in the same format as the Auto mode display. Configuring the report generation/function execution process is discussed in detail later in this section.

Violated Limits Logging

The VM700A can be set to log (print) limit violations. A one-line report from the Auto mode display is logged any time a measurement result crosses the Alarm Limit boundary a specified consecutive number of times, both when the measurement goes outside the limit or comes back within the limit.

Enabling/Disabling Logging. The automatic logging of violated limits can be enabled or disabled by setting the Serial And Printer Setup file (found in Configure mode) Log Port entry to Port 0 or Port 1 (enabled) or None (disabled, the default setting). If Option 48, the GPIB Interface, is installed, the logging port may be set to GPIB.

Remote Operation

The VM700A Auto mode measurements may be executed individually or as reports while in remote operation. Details of making Auto mode measurements remotely are discussed in the *VM700A Programmer's Reference Manual*.

Configuring Auto Mode

Each input SOURCE (channels A, B, and C) has a file assigned to it in the Video_Source Files directory that specifies other files to use for defining measurement limits, measurement signal locations, and selected measurements.

System default files are provided that may be used as templates to create customized measurement configuration files. Basic information on each of these files and how to use the Configure mode directory structure is found in Section 3, *Configuring the VM700A*.

The following aspects of Auto mode can be configured by the user:

Caution and Alarm Limits can be user defined (Auto Limit Files).

Locations of test signals on VITS lines and presence of zero carrier should be defined (Measurement Locations file).

A subset of the available measurements may be selected (Selected Measurements file).

A Timed Events file containing times for reports to be generated and the Selected Measurements file to be used at each report time can be specified.

Setting Alarm Limits

Limit files for Auto mode are located in the Auto_Limit Files directory. This directory is accessed by pressing the Configure button, selecting the **Configure Files** softkey, and then selecting the Auto_Limit Files directory. There are five limits file in the directory when the instrument is shipped from the factory.

Each limit file contains a list of all the measurements available for the Auto mode. Each measurement can have limits that, when exceeded, produce caution or alarm messages on the display. Both Caution and Alarm Limits can be set for each measurement. The supplied limit files cannot be edited. Their contents can be viewed by selecting (touching) a file. Only the **Exit** softkey is available to close these files. Use the **Create File** softkey to copy the contents of one of the supplied files to create a limit file you can customize.

The first line of the file is the title line. The second line of the file, ”2 consecutive error(s) before reporting,” sets the number of times the VM700A must make consecutive measurements of a value that is outside the Alarm Limits before logging the error to the printer.

To change the consecutive error(s) before reporting value:

1. Rotate the control knob to scroll the screen and highlight the 2 consecutive error(s) before reporting line.
2. Touch the number at the front of the line.
3. Rotate the control knob to select either 1, 2, or 3.
4. Select the **Accept Input** softkey or touch the screen inside the directory window other than the selected parameter box to return the control knob to its scrolling function.

To change a Caution or Alarm Lower or Upper Limit:

1. Rotate the control knob to scroll the screen and highlight the line with the limit you wish to change.
2. Touch the limit you wish to change or remove.
3. Scroll the control knob to display the desired value or select **Make it undefined** if you wish to remove the limit.

4. Select the **Accept Input** softkey or touch the screen anywhere inside the directory window other than the selected parameter box to return the control knob to its scrolling function.

Note that setting a pair of limits backward (setting an upper limit lower than its lower limit) will always display an error flag on the Auto mode display. Alarm Limits may be set inside Caution Limits, but then only Alarm Limit violations will be flagged.

The limit file used by Auto mode is designated in the configuration file (Channel_A/B/C Configuration) for each channel. A file from the Selected Measurements directory is used in conjunction with a file from the Auto_Limit Files directory to provide Auto mode with a list of desired measurements and limits for those measurements.

Defining Measurement Locations

You can specify the zero carrier pulse location and/or whether or not you wish to use it as a reference and define the locations of test signals on VITS lines (or in a full field signal) within a file in the Measurement Locations directory. The files found in this directory contain information used by both Auto and Measure modes. The measurement locations file used by Auto and Measure modes is designated in the configuration file (Channel_A/B/C Configuration) for each channel. The System Default file is the only file available for selection when the instrument is shipped. Any additional files you create to customize your applications will be available for selection.

Selecting a Group of Measurements

The files used to designate which subset of measurements you wish Auto mode to perform are found in the Selected Measurements directory.

The files found in this directory contain a list of all the measurements Auto mode can perform. The purpose of the files is to allow you to select a subset of measurements you wish to perform from the entire list of measurements available. A selected measurements file is used in conjunction with an auto limit file to provide Auto mode with a list of desired measurements and the limits at which those measurements generate caution and alarm messages.

Note that the mnemonic of each measurement name used in remote operation is listed to the left of the measurement name.

The Selected Measurements system default file is the only file available for selection when the instrument is shipped. Use the **Create File** softkey to create a new file you can customize.

Selecting or deselecting a particular measurement is simple. After opening the desired file, use the control knob to scroll the file so the desired measurement is highlighted. Note that the labels Selected and Not Selected are printed below the directory window. Touch the highlighted line on the Selected side of the screen

to select a measurement, or on the Not Selected side of the screen to deselect a measurement.

If you wish to select a small subset of the available measurements, select the **Select None** softkey and then make your measurement selections. Touching the **Select All** softkey selects all measurements.

Setting Event Times

Files in the Timed Events directory provide a facility for producing scheduled reports of Auto mode measurements, or executing functions at specified times. Reports consist of a set of measurements designated by a selected measurements file. A few lines from a user-generated “New Timed Events” file follow:

New Timed Events file:

```
Time    Type       Channel   Standard   Selected File Name
12:00   report     A         NTSC       System~Default
23:00   function   B         PAL        Night_reset
```

The active Timed Events file is specified on the last line of the Video Source file. When the VM700A senses an event time specified in the active Timed Events file, it does one of two things:

If the event is a report, it selects the channel and standard, then runs the measurements included in the Selected Measurements file specified by the active Timed Events file.

If the event is a function, it selects the channel and standard, then executes the function specified by the active Timed Events file.

The Report Time is entered in 24-hour format. Any file in the Selected Measurements directory may be specified at any Report Time.

At any Event Time, regardless of what mode it is in, the VM700A screen will blank and display a message indicating that a Timed Event is occurring. You will see the LED in a SOURCE (channel) button light when measurements are being made for a report on that channel. Report generation can also be overridden only by entering Remote Operation mode.

The Event Times System Default file is the only file available for selection when the instrument is shipped. Any additional files you create to provide time events for your application are also available for selection.

Section 9:Diagnostics

Section 9:Diagnostics

Introduction

The VM700A self-diagnostic routines evaluate each of the instrument's major hardware components. The primary intent of the diagnostics is to provide a high degree of confidence that measurement results produced by the instrument are correct. The diagnostics can also supply useful information for board-level fault isolation. The diagnostic description and operation is provided here to assist in determining the need for servicing and aid in configuring the diagnostic tests files. Refer all servicing to a qualified service person.

There are three groups of diagnostic routines on the VM700A:

Low-level diagnostics run during the instrument's power-up cycle and test basic elements of the hardware (specifically, the CPU, EPROM board, and Display Memory board) needed to ensure the validity of the remaining diagnostics.

Individual diagnostics test other VM700A hardware components. The tests in this group can be selected to run at power up (after the low-level diagnostics), in a continuous loop, or one at a time.

Diagnostic measurements measure various VM700A operating parameters. The tests in this group always run one at a time.

The remainder of this section lists and describes the diagnostics in each of the three groups, then discusses how diagnostics are run at instrument power up, how to run individual diagnostics and diagnostic measurements, and concludes with other diagnostic-related information.

Low-Level Diagnostics

Low level diagnostics perform basic tests on the operation of the A5 CPU board, the A6 EPROM board, and the A9 Display Memory board.

Table 9-1 lists and describes the VM700A low-level diagnostics.

Table 9-1: VM700A Power Up Diagnostics

Board Tested	Test Name	Description
CPU	Math Co-processor	Checks for exception errors when the math co-processor performs floating-point computations.
	CPU NVRAM[a] Decoding Segment Size Address Lines Data Lines Valid Memory	Standard RAM test. Checks decoded address space size. Checks the size of the RAM segment. Checks address integrity. Checks data bus integrity. Performs checkerboard pattern to test RAM.
Display/Front Panel	Shared RAMa Decoding Segment Size Address Lines Data Lines Valid Memory	Standard RAM test. Checks decoded address space size. Checks the size of the RAM segment. Checks address integrity. Checks data bus integrity. Performs checkerboard pattern to test RAM.
EPROM/NVRAM	Probe Board Type Board Type Parts in Set	Determines type of board. Possible board types are: 1.5, 3.0, 6.0, or 12.0 Mbyte. Information contained in each EPROM determines quantity of EPROMs on the board.
	Total CRC Check	Runs 32-bit CRC check on ROM space and compares the result with a CRC stored in the CPU board's NVRAM.
	Part CRC Check	Runs only if total CRC check fails. This test runs a 16-bit CRC check of each EPROM on the board. Test also checks for correct part location on board.
	Total CRC Store	Runs only if total CRC check fails. If total CRC check fails but part CRC check passes, this test computes a 32-bit CRC (based on the results of the 16-bit CRCs for each PROM) and stores it in the CPU board's NVRAM.

[a] Contents of RAM are copied to main system RAM before the test runs. This preserves the contents of RAM. If main system RAM is bad, the test returns ???, indicating it did not run.

Individual Diagnostics

Table 9-2 lists and describes the VM700A individual diagnostics.

Table 9-2: Individual Diagnostics

Board Tested	Test Name	Description
Genlock Successful completion of these tests requires that the Controller (A8) be operating correctly.	Status Checks	Verifies that the Genlock status register correctly represents the hardware configuration. *These tests must pass to run the lock tests*.
	NTSC (or PAL) VCO Lock	Checks the board's ability to acquire and hold lock using each VCO. The test forcefully breaks lock by toggling rapidly between internal and external sync with the genlock configured for the opposite standard. Then the genlock is configured for the standard being tested and time-to-lock is measured.
Controller	Control Registers	Checks mode, Genlock configuration, Genlock status, and filter control registers with 8-bit walking-1 and walking-0 patterns. Checks analog input register for writeability (no bus errors). Checks DVM readback register for readability.
	Overrange Detector	Checks bit 4 of the Controller interrupt register. ADC output is latched high to force the bit to set, and latched low to clear it.
	Clock Detector	Checks bit 2 of the Controller interrupt register. Disables the sample clock to cause the bit to set, then re-enables the sample clock to clear the bit.
	Clamp Counters (A—C) and Acq Sig Counters (Sig0—Sig2)	Checks the counter chips. Performs walking-1 and walking-0 tests (read and write) and checks countdown over several reads.
	Register File	Runs only on later Controller/Acquisition boards.
	State Machine Settings, Trigger, and Sequence RAM	Checks SRUN and TRUN lines of the settings RAM; control, data, and address lines of the trigger RAM. Runs a checkerboard pattern test on the trigger RAM. Tests state machine sequence RAM.
Acquisition Successful completion of these tests requires that Genlock (A2) and Controller (A8) boards be operating correctly.	RAM	Fills RAM with psuedo-random sequence, then reads and verifies it.
	FIFO	Checks that data moves through the FIFO without overflow, even with processor bus contentions.
	Load/Looping	Checks that acquisition state machine can be programmed to write the contents of temporary store into acquisition memory locations, and that it can process acquisition program GOTO instructions.
	Optional Hardware	"Pass" indicates hardware present and working; "NA" indicates hardware not available.

Table 9-2: Individual Diagnostics (Cont.)

Board Tested	Test Name	Description
Acquisition (cont.)	External Triggers	Checks that Controller trigger RAM can be used to recognize when certain bits in the ADC data stream ar e set. Causes signal interrupts that are counted by the Controller's Sig0, Sig1, Sig2 counters.
	Long Acquisitions	Runs long acquisitions to verify interaction of the Controller and the Acquisition state machines.
	Sample Dropping	Uses Controller state machine to toggle offset level (a dynamic setting on the Analog Input board), while a long acquisition runs. Analyzes the acquired data to detect missing samples.
ADC Successful completion of these tests requires that Genlock (A2), Controller (A8), and Acquisition (A7) boards be operating correctly. Tests involving the Calibration DAC require that the Analog Input (A1) board be operating correctly.	Mode Checks	Output latches in all zeros, all ones, normal, and overflow-bit modes and checks the ADC output by running an acquisition and scanning acquired data. The overflow bit test generates a drive level to overrange the board, then acquires data and checks to verify that the board's overrange bit was set.
	Bit Patterns	Generates a calibration DAC drive level that produces an ADC level corresponding to the bit pattern shown in the individual test. The diagnostic runs a long acquisition and searches the acquired data for the individual test's bit pattern.
Analog Input Successful completion of these tests requires that Genlock (A2), Controller (A8), and Acquisition (A7) boards be operating correctly.	DVM	Calibrates the DVM to the standard gating patterns for both TV standards (and the gating pattern that enables the DVM for all video lines) using a precise 1.000 volt reference and ground.[a]
	DC Paths	Checks that a nominal DC voltage can be routed through each input channel to the ADC.
	Gain Control	Checks gain control range and bit weights.[b]
	Calibration DAC	Checks the range and bit weights of the calibration DAC.
	Offset Control	Checks the range and bit weights of the offset-control DAC.
	Input Selection	Checks the input selection switch by setting the channel bias DACs to different levels on each channel and measuring the net bias for each switch setting.
	Bias Control Range (for each channel)	Checks each channel's bias control DAC for range and bit weights. Verifies each DAC for independence by changing the other two and monitoring the one being tested to verify that its range and bit weight remain unchanged.

Table 9-2: Individual Diagnostics (Cont.)

Board Tested	Test Name	Description
Analog Input (cont.)	Clamp (for each channel)	Checks each channel's clamp level DAC for range and bit weights. Verifies each DAC for independence by changing the other two and monitoring the one being tested to verify that its range and bit weight remain unchanged. Measures fast- and slow-clamp response time by timing a 100 mV clamp-level change. Verifies fast clamping at each possible clamp-pulse width.
Filter	Times 8 Gain	Using the ADC, two Cal DAC DC levels are measured with x8 gain off, two more with it on, and the gain is calculated from the ratio of the differences.
Successful completion of these tests requires that Genlock (A2), Controller (A8), Acquisition (A7), and Analog Input (A1) boards be operating correctly.	Filter Slot *n* (for slots 0 through 5)	Slot 0 is a bypass path, rather than a filter slot. These tests include filter ID and frequency response sub-tests. The filter ID sub-test checks instrument firmware to determine the TV standard and release version. This information is used by the diagnostic to determine valid filter IDs for each slot. The frequency response sub-test generates a psuedo square-wave signal by switching channel input between A and B, with each channel input clamped to a different DC level. The signal is routed through the filter slot under test to the ADC, acquired, and analyzed. Discrepancies are displayed on screen. When an empty slot is correctly identified, this test displays NA.

[a] Each gating pattern has a different number of active video lines, so the ratio of the NTSC-pattern cal factor to always-on pattern equals the ratio of NTSC pattern active lines to the always-on pattern number. Likewise for PAL.

[b] Range is the arithmetic sum of the measured bit weights, and bit weights are measured as the effect of toggling only the indicated bit.

Diagnostic Measurements

Table 9-3 lists and describes the VM700A diagnostic measurements. These measurements can only be run individually.

Table 9-3: Diagnostic Measurements

Test Name	Description
AdcGain~Adjustment	Verifies that the Genlock status register correctly represents the hardware configuration. *These tests must pass to run the lock tests*.
CalDac Adjustment	Adjusts gain of internal CalDac. Used as reference for internal self-calibration.
Measure~Sinewave	Allows you to input external sine waves and measure them. Used for verifying system flatness. See the *VM700A Video Measurement Set Service Manual* for details.
Measure~Squarewave	Allows you to input a chopped, calibrated square wave and measure it. Used for verifying system DC accuracy. See the *VM700A Video Measurement Set Service Manual* for details.
Measure~Temperature	Measures internal instrument temperature. Can be used to relate instrument internal temperature to ambient temperature.
Warm_Reboot	Simulates cycling power. Can be used to copy contents of console buffer (which may contain useful diagnostic information) from main memory into file/console, where it can be accessed, printed, etc.

Power-Up Diagnostics

When the VM700A is powered up normally, it first runs the low-level diagnostics, then runs the individual diagnostics selected in the Diagnostics~Selection file in directory /nvram0/ConfigFiles.

While running low-level diagnostics, the VM700A displays the name of each low-level test in progress. When low-level diagnostics are completed, the VM700A displays the message:

```
-*-*-LOW LEVEL DIAGNOSTICS COMPLETE -*-*-
```

Power-Up Diagnostic Errors

When a low-level diagnostic routine detects an error, the VM700A displays the message:

```
- Press any Front Panel Button or -
- Toggle 1 of 3 CPU "MODE" switches to CONTINUE -
-- AUTOMATICALLY continues in XX seconds --
```

then counts down from 60 seconds. The procedure continues when the countdown is complete or when a response from the user is detected in the form of a front-panel button press or the toggling of a CPU mode switch (see below). The

first line of the message (“Press any Front Panel Button”) only appears if the VM700A has passed enough tests that the front-panel buttons are operative.



CAUTION. *The following procedure involves opening the instrument cabinet to access internal switches. It should be performed only by a qualified service person.*

If the front-panel buttons do not operate, you can use the following procedure to allow the VM700A to continue powering up:

1. Switch the VM700A power off.
2. Remove the VM700A from the equipment rack (if rack mounted).
3. Remove the two screws from the rear panel that retain the left side cover (as viewed from the front of the instrument).
4. Slide the left side cover about two-thirds of the way back.
5. On the A5 CPU board (the bottom board) locate the six-section DIP switch with the markings “FAC|MODE|” printed on the circuit board in front of it.
6. Power the VM700A back on.
7. When the error message is displayed, click any of the three switches above the word MODE (the three closest to the front of the instrument) up, then back down to continue.

After following either of these procedures, refer to the appropriate servicing information to locate the source of the malfunction.

Individual Diagnostics

In addition to the low-level diagnostics, any combination of individual diagnostics can be made to run automatically at power up. In order for an individual diagnostic to run automatically at power up, the diagnostic must be designated as “selected” within the Diagnostics Selection file, located in directory / nvram0/ConfigFiles.

When the VM700A is powered up, the diagnostic applications selected in the Diagnostics Selection file are automatically executed after the low-level diagnostics are completed. Results of individual diagnostics are displayed in Power-Up mode; each line in the display summarizes a group of tests performed by the diagnostic.

Diagnostics Selection File. When the VM700A is powered on, the diagnostic routines selected in the Diagnostics Selection file are executed. The contents of the Diagnostics Selection file are shown in Figure 9-1.

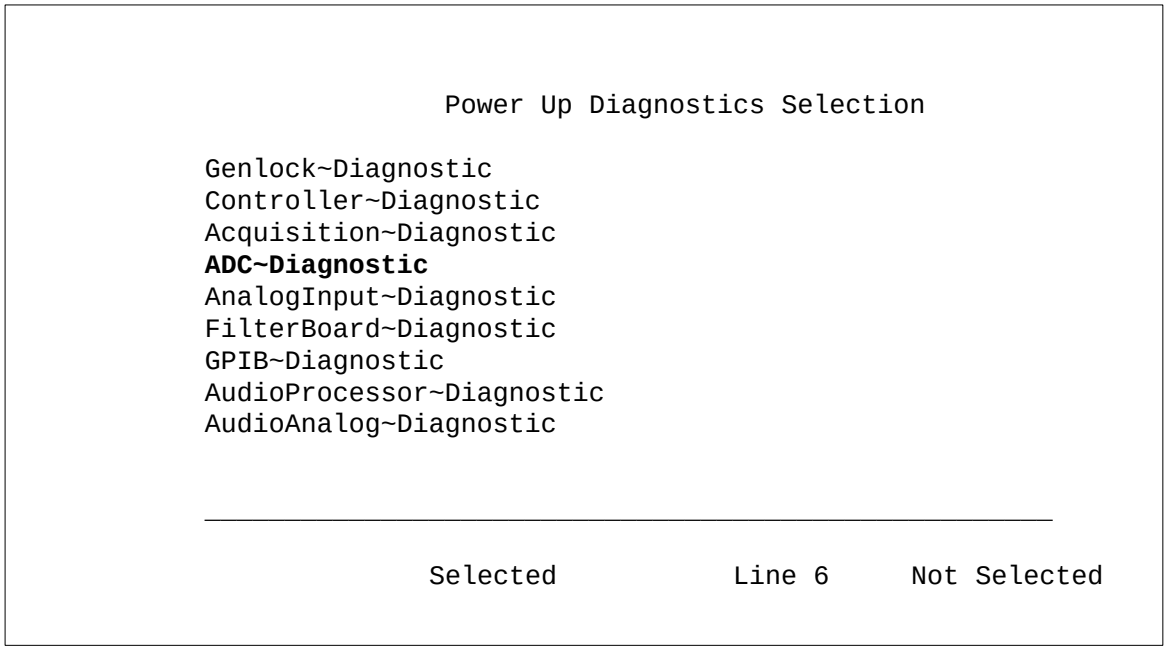


Figure 9-1: Power-Up Diagnostics Selection display[1]

All diagnostic routines on the “Selected” side execute at power up.

To select or unselect a diagnostic from the Diagnostics Selection file:

1. Press the Configure button.
2. Press the **Configure Files** softkey.
3. Select the **Diagnostics Selection** file.
4. Turn the knob until the diagnostic’s name is highlighted. Touching the vertical center of the left half of the screen selects the highlighted diagnostic; touching the vertical center of the right half unselects it.
5. Press the **Update & Exit** softkey to write out (save) any changes to the file; press the **No change & Exit** softkey to leave the file as it was when it was last saved.

Bypassing Power-Up Diagnostics

To bypass all power-up diagnostics (both low-level and high-level), press and hold the Waveform button when you switch the VM700A on. (If the VM700A is being started cold, hold the button for three to five seconds; if the VM700A is already warmed up, one or two seconds should do it.)

[1] **The AudioProcessor~Diagnostic and AudioAnalog~Diagnostic selections are available only with the VM700A Audio option. GPIB~Diagnostic is available only when Option 48, the GPIB Interface, is installed. Refer to the Option 48 Programmer’s Reference manual for diagnostic information.**

The VM700A displays the message:

```
-* -* -INITIALIZING IN QUICK START MODE -* -* -
```

then proceeds with system initialization.

To bypass individual diagnostics running at power up, touch the **Abort** softkey when the diagnostic is running. The VM700A proceeds to the next diagnostic selected in the Diagnostics~Selection file. If you abort the last selected diagnostic, the VM700A proceeds with system initialization.

Individual Diagnostics and Measurements

Individual diagnostics and diagnostic measurements can be run at any time.

Running Individual Diagnostics and Measurements

To run an individual diagnostic or measurement:

1. Press the Measure button
2. Touch the **Diags** softkey (if the diagnostics directory is not already displayed)
3. Touch the icon of the diagnostic or measurement you want to run

Diagnostic measurements simply display the value of the item they are measuring until you press a front-panel button. Individual diagnostics, however, have a few more options. When running, individual diagnostics behave as follows:

1. The display shows the name of the diagnostic, the message **SELECT RUN MODE**, and two soft keys labeled **PowerUp Mode** and **Interactive Mode**.
2. Touching **PowerUp Mode** runs the diagnostic in the same way as if the machine were powering up. There is no user interaction, and each line written to the display summarizes the results of a group of tests. A softkey appears at the bottom of the display to allow you to change the Run mode while the diagnostic is running, if you so choose. When the diagnostic is complete, the **SELECT RUN MODE** screen appears again. Press the Measure button to select a different diagnostic or Measure-mode measurement. Press any other major mode button to put the VM700A into a different mode.
3. Touching **Interactive Mode** runs the diagnostic, one group at a time. Results of individual tests, as well as a summary for each group of tests, appear on the display. Four soft keys, labeled **Continue**, **Loop On Test**, **Rerun Test**, and **Change Run Mode**, respectively, appear at the bottom of the display.

   Continue runs the next group of tests.

Loop On Test loops on the latest group of tests, and displays the number of times the test group has been run, as well as the total number of failures found. Touching the **Change Run Mode** softkey when looping on a diagnostics test halts the test and returns the **SELECT RUN MODE** display.

Rerun Test re-runs the latest group of tests.

Change Run Mode returns you to the **SELECT RUN MODE** display.

Diagsloop

The Diagsloop diagnostic runs each diagnostic selected in the Diagnostics Selection file in PowerUp mode. The diagnostics are run consecutively and continuously, looping back to the first diagnostic after the last is completed. The current loop number appears in the upper right corner of the display.

The message **FAIL FOUND** appears in the upper left corner of the display if a failure is found by any of the selected diagnostics. You can either monitor the Diagsloop execution to spot the failure, or (if the failure is intermittent), examine the contents of the Diagnostic~Errors file in the /nvram0/ConfigFiles directory.

To exit Diagsloop, touch the **Abort Looping** softkey.

Running Diagnostics Remotely

If the VM700A display is not operating or is operating improperly, you will not be able to view diagnostic results. The VM700A supplies a method, known as Debug mode, to view diagnostic results on a terminal or PC should the display be malfunctioning.

In Debug mode, the VM700A redirects low-level power-up diagnostic display output to the rear-panel PORT 0 serial connector by default.

Connecting a Terminal or PC

See Section 2, *Installation and Operation*, for information about connecting a terminal or PC to the PORT 0 connector of the VM700A. In particular, see the text entitled *Connecting Outputs* for details on the required cable wiring.

If you are connecting a PC to the VM700A, you will also have to run a terminal emulator program in order to read the information output by the VM700A.

Entering Debug Mode

To enter Debug mode:

1. Switch the VM700A power off.
2. Press and hold the Help button and switch the VM700A power on.
3. After about 5 seconds, release the Help button.

The terminal now displays the same menu as when Debug mode is forced.

CAUTION. *The following procedure involves opening the instrument cabinet to access internal switches. It should be performed only by a qualified service person.*

To force Debug mode when front panel buttons are inoperative:

1. Switch the VM700A power off.
2. Remove the VM700A from the equipment rack (if rack-mounted).
3. Remove the two screws from the rear panel that retain the left side cover (viewed from the front of the instrument).
4. Slide the left side cover about two-thirds of the way back.
5. On the A5 CPU board (bottom board) locate the six-section DIP switch with the markings “FAC|MODE|” printed on the circuit board in front of it.
6. Set the three rightmost switches (nearest the front of the instrument) to the UP position to enable Debug mode.
7. Power up the VM700A.

Diagnostic information is redirected to serial port 0.

To change Debug mode output to PORT 1:

Set the switch above the “C” on the “FAC|MODE|” DIP switch to the UP position.

Running Remote Diagnostics in Debug Mode

When the VM700A first enters Debug mode, the following menu appears on the terminal screen as shown in Figure 9-2.

The following options are available from within Debug mode by pressing the indicated key:

N - Normal (Power Up) mode: causes the VM700A to initialize as though the instrument was just powered up. This mode runs the low-level diagnostics, starts the operating system, then runs all high-level diagnostics specified in the Diagnostics Selection file.

A - Auto Reset mode: executes all user-selectable diagnostic routines, regardless of the state of the Diagnostics Selection file. This mode operates just like Normal (Power Up) Mode, except all high-level diagnostics are run.

Q - Quick start mode: initializes the VM700A (or attempts to) without running any diagnostics, low- or high-level.

T - Calibrate the Touch Panel: runs a routine that calibrates the touch screen to compensate for changes in thermal environment.

```
-- LOW LEVEL DEBUG MODE --

Key     Selection (Press one of the indicated keys)
---     ------------------------------------------
(N) ... Run Instrument in -NORMAL- (Power Up) mode
(A) ... Run Instrument in -AUTO RESET- mode
(Q) ... Run Instrument in -QUICK START- mode
(T) ... Calibrate -TOUCHPANEL-
(D) ... Run -DEBUGGER-
(C) ... -CLEAR- FileSystem Nvram

(1) ... Do -CPU BOARD- Diagnostic
(2) ... Do -DISPLAY/FP BOARD- Diagnostic
(3) ... Do -MAIN EPROM/NVRAM BOARD- Diagnostic

(H) ... Run Instrument in -HIGH LEVEL DEBUG- mode

(=) ... Reprint Menu

*** Press on of the indicated keys ***
```

Figure 9-2: Debug mode terminal screen display

D - Run the Debugger: runs a troubleshooting aid. Intended for qualified service personnel only.

C - Clear the Filesystem NVRAM: restores file system to original factory condition.



WARNING. *The Clear NVRAM Filesystem option deletes all user-created files: functions, timed events, setup files, the works! Any files you may wish to use later should be backed up to a PC disk (using remote operations capability of the VM700A and a utility such as VMBACKIT) before this option is invoked.*

When you choose the Clear NVRAM Filesystem option, the following message appears on the computer/terminal screen:

```
-- CLEAR NVRAM FILESYSTEM --

Ready to clear /nvram0 filesystem on EPROM/NVRAM board at
base address 0x44000000

*** Reset instrument to Abort, or ***

*** Press a Terminal key to Continue ***
```

Powering down the VM700A at this point aborts the Clear NVRAM Filesystem procedure.

Pressing any key on the computer/terminal keyboard clears the NVRAM file system.

1 (CPU board), 2 (Display/FP board), 3 (Main ROM board): these selections run the specified low-level diagnostics, in a manner similar to the Interactive mode of user-selectable diagnostics. Upon completion of each test, the VM700A pauses with the prompt message

```
*** Press a Terminal key to continue ***
```

While each low-level diagnostic runs in Debug mode, the terminal display is nearly identical to the corresponding VM700A display during a normal (non-Debug mode) power up. When the diagnostic routine completes all its tests, the terminal displays the Debug mode main menu once more.

H - High-Level Debug mode: powers up the VM700A without running any diagnostics, and takes you straight to the /nvram0/VM700A Diagnostics directory. From this point, you can run any diagnostic, or use the soft keys to get to the Console or Diagnostic Error files.

***NOTE**. If you want to use the VM700A after running it in High-Level Debug mode, power the instrument down and start it back up again normally to guarantee that all internal constants set during the power-up procedure are correct.*

Serial Port Setup for Low-Level Diagnostics, Debug Mode

In Debug mode, the low-level diagnostics use the four possible settings of two jumpers on the A5 CPU board to determine the transmit and receive baud rates when the instrument is initialized. Table 9-4 specifies the baud rates available with these jumpers.

Table 9-4: A5 CPU Board Jumper Settings

Jumper 1 (J308)	Jumper 2 (J307)	Transmit Baud Rate	Receive Baud Rate
On	On	If settings are stored in non-volatile memory (Communication Setup file), they are used. Otherwise, both transmit and receive default to 19200 baud.	
On	Off	19200	19200
Off	On	300	19200
Off	Off	300	300

Note that whenever you use one of the non-default jumper states (such as J307 or J308 set to OFF), the following communication parameter settings are used:

```
Protocol:                None
Character size:          8
Flow control:XON/XOFF
Parity:                  None
Reset character:         None
```

Start-Up Shortcuts

Several shortcuts are available to power up the VM700A and put it immediately into a specific mode. Each of these shortcuts involves powering up the VM700A while pressing certain combinations of front-panel keys. To use a shortcut, power down the instrument, press and hold the indicated key(s) on the VM700A, and power up. Hold the keys for approximately 3 seconds after powering up to select the desired mode. Table 9-5 summarizes shortcuts and the keys that enable them.

Table 9-5: Start-Up Shortcuts

Front Panel Key(s)	Mode	Effect
Waveform	Quick Start	Ignores all diagnostics
Auto	Auto Reset	Forces all diagnostics to run
Help	Low-Level Debug	Allows serial interface with low-level diagnostics
Measure	High-Level Debug	Allows access to individual diagnostics and diagnostic measurements, and to Configure
Configure	Cal T-Pnl	Runs Touch Panel Calibration
Display, Waveform, Auto (all 3)	Clear File System	Clears NVRAM file system

When you start up in Clear Filesystem mode, this message appears:

```
-- CLEAR NVRAM FILESYSTEM --

Ready to clear /nvram0 filesystem on EPROM/NVRAM board at
base address 0x44000000

*** Reset instrument to Abort, or ***

*** Press "C" key to Continue ***
```

Powering down the VM700A at this point aborts the Clear NVRAM Filesystem procedure.

Pressing the “C” front-panel button clears the NVRAM file system.

Getting Technical Support

If the VM700A diagnostics detect a problem, the Console and the Diagnostic Errors files may contain information that could be of use to service personnel.

Console File

Whenever the VM700A initializes, information is stored in the console file, located in the / (topmost) directory. If the VM700A performs an auto reset due to a malfunction, the console file may contain information useful to a service person. You can use the **Print File** softkey to make a copy of the console file. The contents of this file are overwritten each time the VM700A is powered on.

Diagnostic Errors File

When user-selectable diagnostics are run at power up or during DiagsLoop, all errors detected are written to the Diagnostic Errors file, found in directory /nvram0/ConfigFiles. The Diagnostic Errors file is automatically created when an error is detected by user-selectable diagnostics. Its contents may be printed using the **Print File** softkey.

The maximum capacity for the Diagnostic Errors file is 100 lines. If the number of errors detected produces a file whose length exceeds this limit, the earliest results are scrolled out of the file. When this occurs, the file includes a message stating that some of the text has been scrolled out.

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