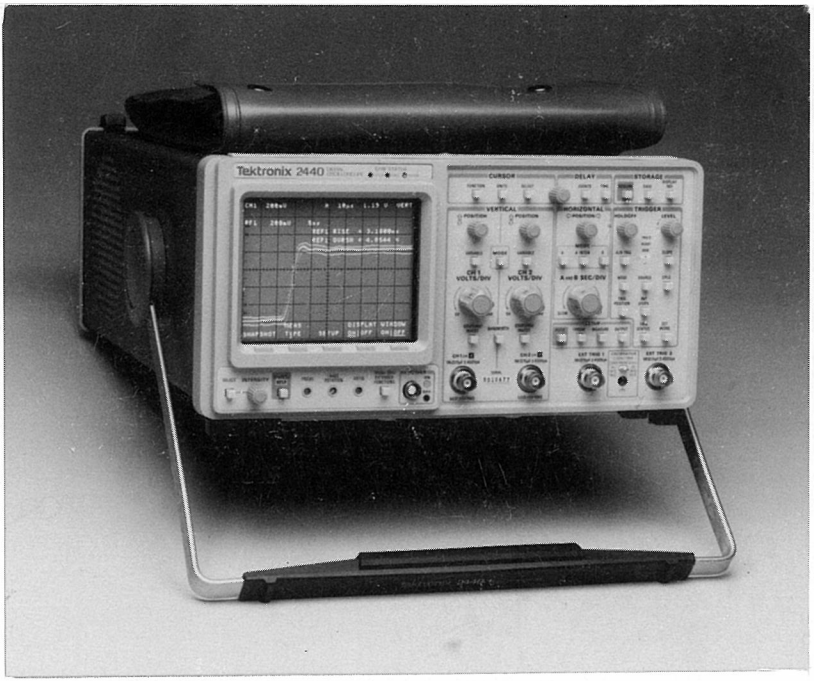
2440
DIGITAL OSCILLOSCOPE USER REFERENCE GUIDE



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INSTRUMENT SERIAL NUMBERS

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

B000000	Tektronix, Inc., Beaverton, Oregon, USA
100000	Tektronix Guernsey, Ltd., Channel Islands
200000	Tektronix United Kingdom, Ltd., London
300000	Sony/Tektronix, Japan
700000	Tektronix Holland, NV, Heerenveen, The Netherlands

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Illustrations

SAFETY NOTE

This manual is a quick reference guide to the 2440 features. *It does not replace the 2440 Operators manual.* The 2440 Operators manual (070-6695-00) contains information related to safe use of this instrument as well as information necessary to prevent damage to the instrument or to other property. *Users should refer to the 2440 Operators manual before operating this instrument.* In particular, read the "Operators Safety Summary" at the beginning of the Operators manual, and "Preparation for Use" in Section 1.

GETTING STARTED

See Front Panel (Figure 1) for locating the controls on the 2440.

Power On

Press the POWER switch, located on the front panel below the CRT.

The 2440 performs a power-on test each time it is turned on. When the test progresses to the point of being able to display, the message "RUNNING SELF TEST" is shown on the CRT. At the end of the self test, the message is removed.

If the 2440 fails the self test, it will enter the extended diagnostics (see "MENU OFF/EXTENDED FUNCTIONS" below for explanation). The 2440 may still be usable if the failed area does not affect the measurements to be made. Press MENU OFF to exit extended diagnostic and enter Scope mode.

The CAL/DIAG menu displays the message "NOT WARMED UP" for ten minutes after each power-on.

Menu Off/Extended Functions

In the CAL/DIAG menu, PASS or FAIL indicates the results of the last calibration or self diagnostic run. No label will appear if calibration has not been run since the last cold start[a]. If an "UNCALD" message appears in the extended diagnostics menu, it may indicate that the last attempt of extended calibration failed. In this case, allow the 2440 to warm up and do a SELF CAL. If the UNCALD message persists after a SELF CAL or some other area has failed, the previous calibration constants will not be overwritten, and the scope may be used. However, calibration should be checked by referring the instrument to a qualified service person. Press MENU OFF to exit extended diagnostics and enter Scope mode. More information on the self test and diagnostics is found in Appendix A of the Operators Manual.

[a]Cold Start is a complete initialization of the system, done only at the factory.

Initialization

Connect a standard accessory probe to the CH 1 input BNC.

Connect the probe tip to the CALIBRATOR loop; connect the probe ground lead to scope ground.

Press the PRGM SETUP button, located below the A AND B SEC/DIV knob.

Select INIT PANEL menu choice by pressing the bezel button directly below the INIT PANEL menu label.

The initial settings for major front-panel controls are as follows:

VERTICAL MODE	CH 1
CH 1 and CH 2 VOLTS/DIV	1V (With 10X probe)
A AND B SEC/DIV	1 ms
TRIGGER MODE	AUTO LEVEL
TRIGGER SOURCE	VERT (CH 1)
Input Coupling	1 MΩ DC
STORAGE MODE	ACQUIRE
ACQUIRE MODE	NORM

Verify that CH 1 Vertical Mode is selected (CH1 VOLT/DIV readout is in upper left corner of CRT). If CH 1 Vertical Mode is not selected, press Vertical MODE button and select CH 1 (See Section 10, Vertical Mode, of this guide.)

Press ACQUIRE button on front panel.

NOTE

Connecting a probe to the signal source and pressing the Auto Setup front-panel button will provide a scaled and triggered display. If no vertical channel is selected AUTO Setup will default to Channel 1. Auto Setup will not change the channel selected if either or both of the two channels are on. If the display intensity is set too low and the scaled display is not easy to see, Auto Setup boosts intensity so the display can be seen. Auto Setup does not affect readout or graticule intensity.

FRONT PANEL

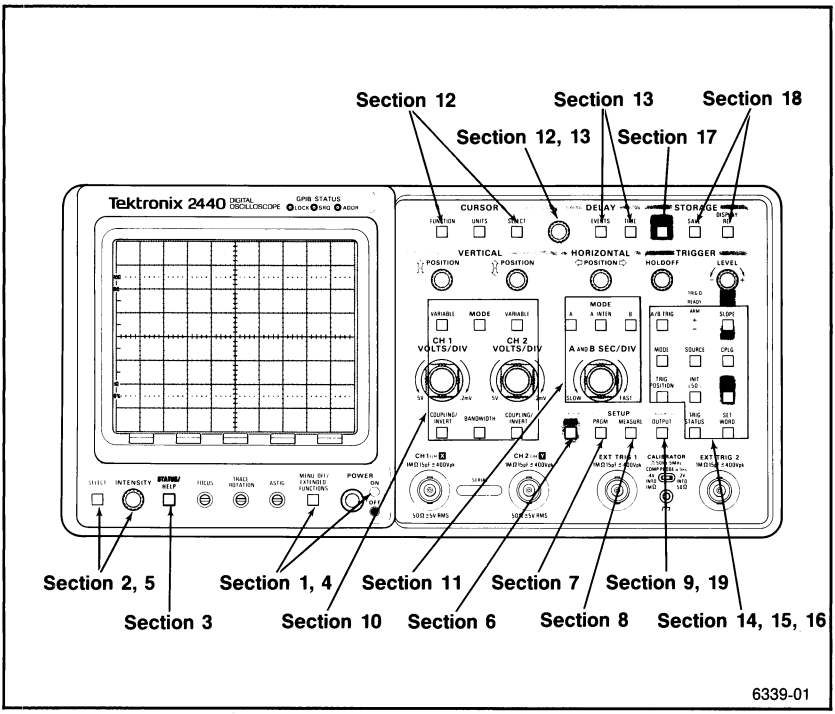


Figure 1. Front Panel buttons and Controls.

CRT READOUT DISPLAY

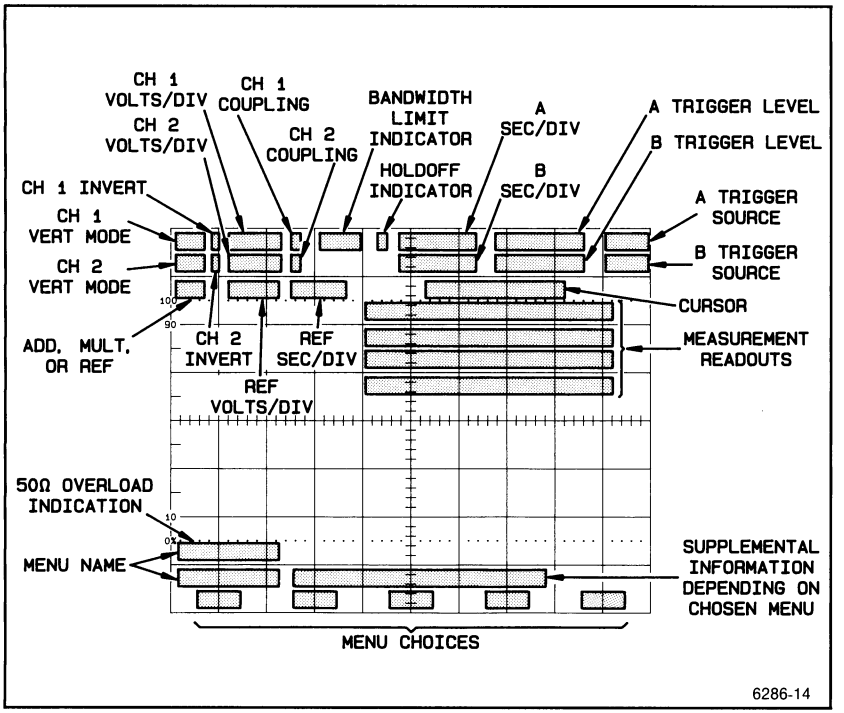


Figure 2. CRT Readout Display.

STATUS MENU

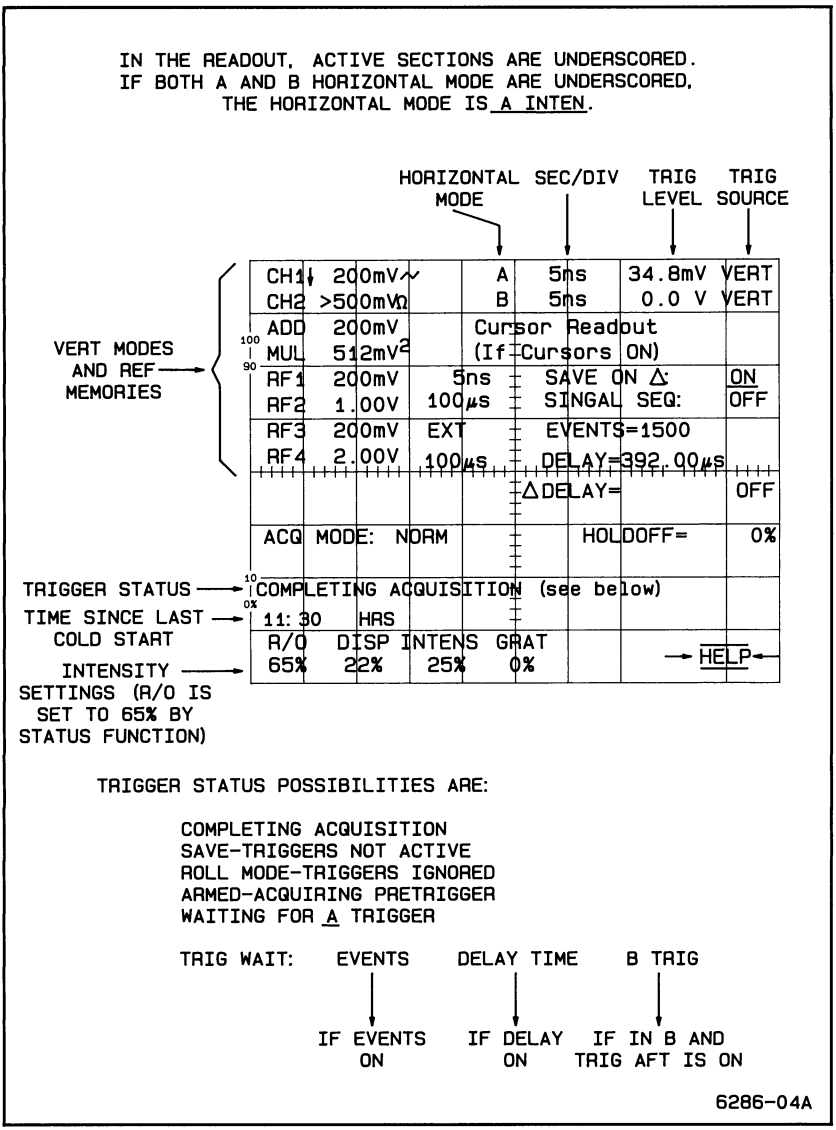


Figure 3. Status Menu Display.

The Status Menu display will appear on screen when the STATUS/HELP front-panel button is selected. It provides an overview of instrument configuration at the time the selection is made. This menu will enable you to determine if you are currently operating in the desired modes, or if you are set in a conflicting mode (causing the instrument to appear to operate incorrectly). Special attention should be paid to the TRIGGER STATUS comment and the ACQ MODE statement in the lower-left quadrant of the screen, which enables you to determine the instrument's current activity.

You should become very familiar with this entire menu and the location and meaning of the readout characters. They will help you determine the cause of possible operational difficulties.

POWERING UP

(1)	**POWER Button**	Does a power-on self test with each turn on. (See Section 1 for a more detailed description of POWER.)
(2)	**MENU OFF/EXTENDED FUNCTIONS Button**	Turns off any displayed menu or turns on the EXTENDED FUNCTIONS menu if a menu is not being displayed. When pressed to remove a menu display, all the scope hardware is reset to match the soft front-panel settings. Messages sent via GPIB will be erased. (See Section 1 for more a detailed description of MENU OFF/EXTENDED FUNCTIONS.)

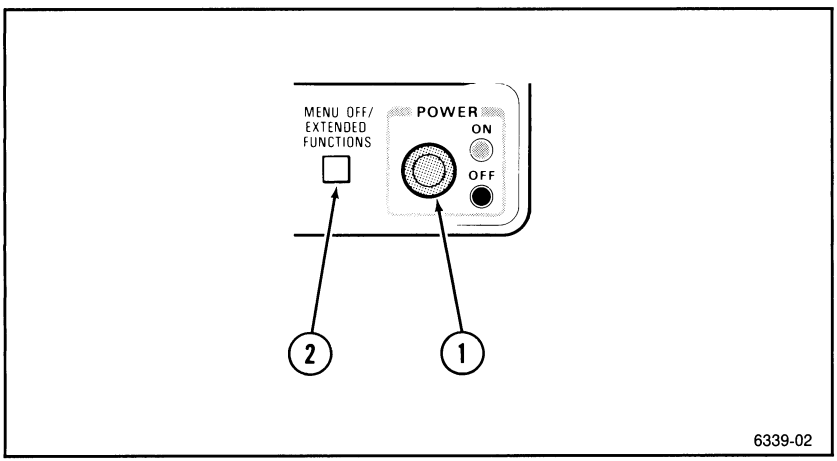


Figure 4. POWER and MENU OFF Button.

Menu Off/Extended Functions Menu

2. MENU OFF/EXTENDED FUNCTIONS	Turns off any menu being displayed or, if none is on, calls up the EXTENDED FUNCTIONS menus. See Appendix A in the Operators Manual for the Extended Functions Calibration and Diagnostics menus. EXT FUNCT SYSTEM SPECIAL CAL/DIAG
	Second-level menu for SYSTEM. PREFLT PANEL MISC ON¦OFF VIDEO OPT
	Third-level menu for PANEL. PWR ON LAST¦INIT ↑
	Third-level menu for MISC. BELL TRIG T AUTO ON¦OFF ON¦OFF PROBE ↑
	Fourth-Level menu for AUTO PROBE. AUTO STEP SETUP PRGM INIT50% ↑
	Third-level menu for SYSTEM VIDEO OPT. TV SYS CNT RST M¦NON/M BOTH¦F1 ↑
	Second-level menu for SPECIAL. WARNING: SERVICE ONLY—SEE MANUAL (if enabled) DISABLED—SEE MANUAL (if disabled) COLD CCD CCD CAL PATH FORCE START CH1 CH2 ON¦OFF DAC
	Second-level menu for CAL/DIAG. <status> <status> <status> NOT WARMED UP SELF EXT SELF EXT CAL CAL DIAG DIAG

CRT DISPLAY MENUS

① **INTENSITY Control** — A continuous rotating pot, the Intensity control adjusts the intensity of any of four screen elements (readout, display, A INTEN zone, and graticule). It always controls the element last selected in the Select menu, except when STATUS is selected. It then controls the readout intensity.

② **SELECT Button** — Toggles between readout and display after turning on the menu.

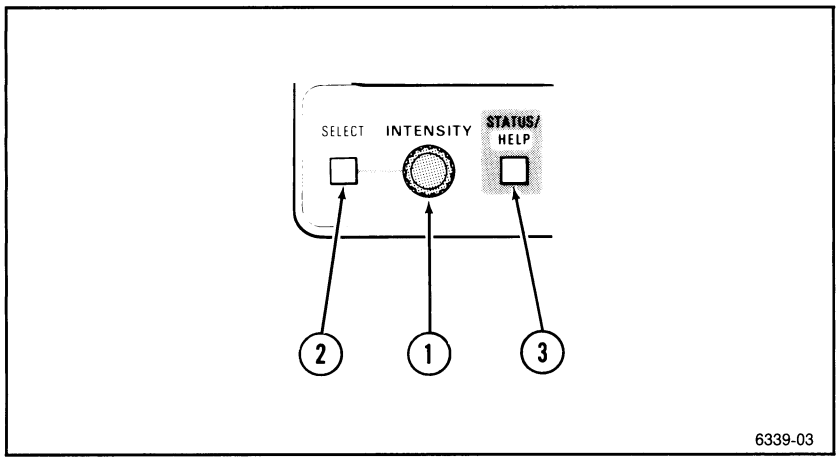


Figure 5. INTENSITY Control, SELECT and STATUS/HELP Buttons.

③ **STATUS/HELP Button** — Pressing this button displays a Status menu (see page 5) which can help you determine why a display is not seen or triggering is not occurring. Some common conditions to check for are:

Channel called up?

Display intensity setting?

Ground indicator (+) and trigger position (T) at top or bottom edge (vertical position)?

Common triggering conditions:

Single sequence on?
Save Mode?
Events on?
Delay on?
Trig wait state?
Ext clk on?

Top three lines of status menu update with front control changes. Remaining lines are updated with a press of the status button.

Pushing MENU OFF or calling up another menu turns off the status display.

HELP (see below).

CRT Display On-Screen Menus

2. SELECT	INTENSITY VECTORS READOUT DISP INTENS GRAT ON¦OFF INTENS: Controls brightness of intensified zone in A Intensified. GRAT: Controls graticule intensity.
3. STATUS/HELP	Presents an instrument status display (see page 5) and increases the readout intensity to 65% to ensure visibility. Intensity adjustment will now control readout intensity. Intensity control will return to function selected before entering STATUS menu mode when the STATUS menu is removed. Pressing MENU OFF or any other front-panel control that requires a menu display removes the STATUS display from the CRT. When HELP mode is selected, operating any front-panel knob or button will cause a screen full of information to be displayed. If -MORE- appears at the lower-left corner of the screen, selection of MORE will cause additional information to be displayed. Press EXIT MENU to return to normal operation.

AUTO SETUP

① **AUTO SETUP Button** Selecting this button will cause the scope to set the vertical, horizontal, and triggers to display the input signal on the selected vertical channel or channels.

View Mode Selects sweep speed for 2-5 cycles on screen.

Other modes optimize scaling for selected signal type.

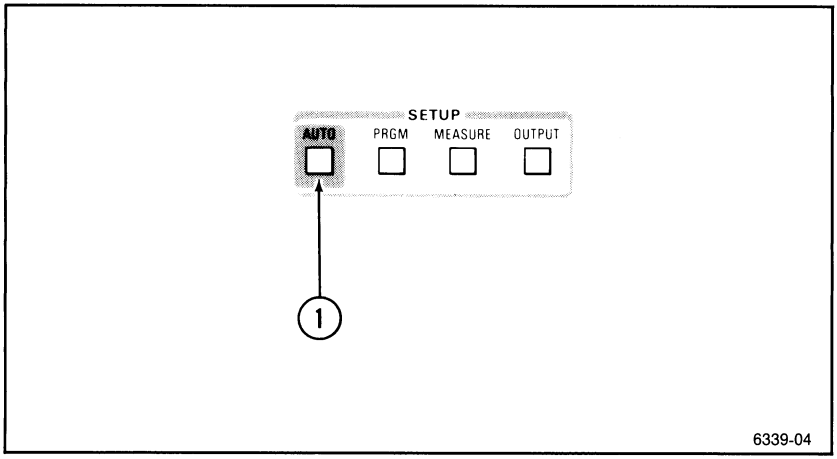
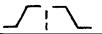


Figure 6. AUTO SETUP Button.

Auto Setup On-Screen Menus

1. AUTO SETUP	VIEW	PERIOD	PULSE	EDGE 	RES HI:LO

NOTE

RES HI:LO only appears when in Measurement Modes, (i.e., PERIOD, PULSE, or EDGE).

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PRGM AUTOSTEP

(2) **PRGM Button** Selecting PRGM displays the AUTOSTEP SEQUENCER menu. This menu lets you save and recall typically 50 to 200 front-panel setups, and associated control and I/O actions, in up to 40 named test or measurement procedures.

To save a single front panel:

1. Press PRGM (Program) on front panel.
2. Select SAVE bezel button.
3. Select SAVE bezel button in second level menu.
4. Set up front panel that you want to save.
5. Press PRGM (Program) button on front panel.
6. Press SAVE SEQ bezel button.

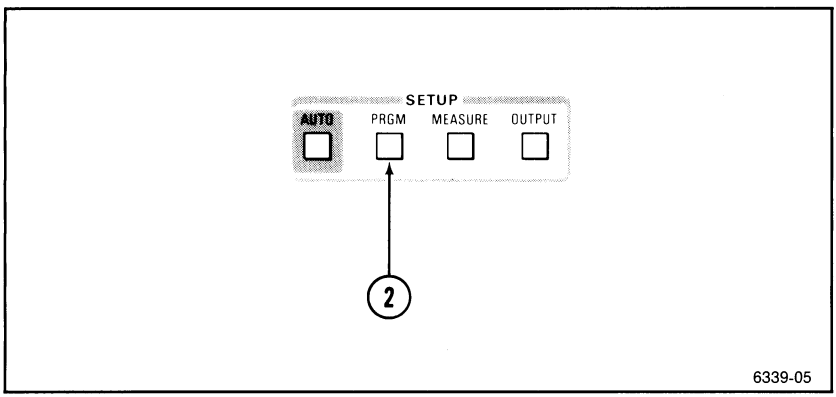

Figure 7. PRGM Button.

AutoStep Sequencer Control Menus

2. PRGM

----------AUTOSTEP SEQUENCER---------- MEMORY nn%

SAVE RECALL DELETE EDIT INIT PANEL

Second-level menu for SAVE.

USE ARROW KEYS TO CHANGE NAME:

ROLL-CHARS CURSOR

↑ ↓ < > SAVE EXIT

Instruction message displayed after pushing SAVE. (This message is displayed any time the user is expected to setup the front-panel controls.)

SETUP CONTROLS, PUSH PRGM TO CONTINUE

SEQUENCE <name> STEP <num> MEMORY <%>

Third-level menu for second-level SAVE. This menu is displayed after pushing PRGM as directed in the instruction message.

SEQUENCE <name> STEP <num> MEMORY <%>

BEGIN STEP			
REPEAT	<N>		
SELF-CAL	<N>	PRINT/PLOT	<N>
SELF-TEST	<N>	BELL	<N>
LOAD PANEL		SRQ	<N>
AUTOSETUP	<N>	PAUSE	<N>
MEASUREMENTS		PROJECT	<N>
		END STEP	

SET STEP ACTIONS

↑ ↓ Y¦N NEXT STEP SAVE SEQ

AutoStep Sequencer Control Menus (cont)

Second-level menu for RECALL.

First Labeled Sequence
Second Labeled Sequence
nth Labeled Sequence

---------SELECT----------

↑ ↓ RECALL EXIT

Second-level menu for DELETE.

First Labeled Sequence
Second Labeled Sequence
nth Labeled Sequence

----------SELECT----------

↑ ↓ DELETE EXIT

Second-level menu for EDIT.

First Labeled Sequence
Second Labeled Sequence
nth Labeled Sequence

----------SELECT----------

↑ ↓ EDIT COPY EXIT

Third-level menu for EDIT.

----------SELECT---------- DELETE

↑ ↓ TO BUF ADD EXIT

Third-level menu for COPY.

USE ARROW KEYS TO CHANGE NAME:

ROLL-CHARS CURSOR
↑ ↓ < > SAVE EXIT

Fourth-level menu for ADD.

LOAD
BUFFER EXIT

MEASURE

(3) MEASURE Button (Waveform Parameter Extraction)

Pressing this front panel button displays MEASURE menu on screen.

Provides selects for measurement type, setup and snapshots.

NOTE

In MEASURE menu, MARK ON selection turns on "X" markers that indicate measurement locations, i.e., 10%-90% risetime locations.

NOTE

If WINDOW menu is selected, time cursors must be manually selected. The cursors can then be set to bracket the portion of the waveform to be measured.

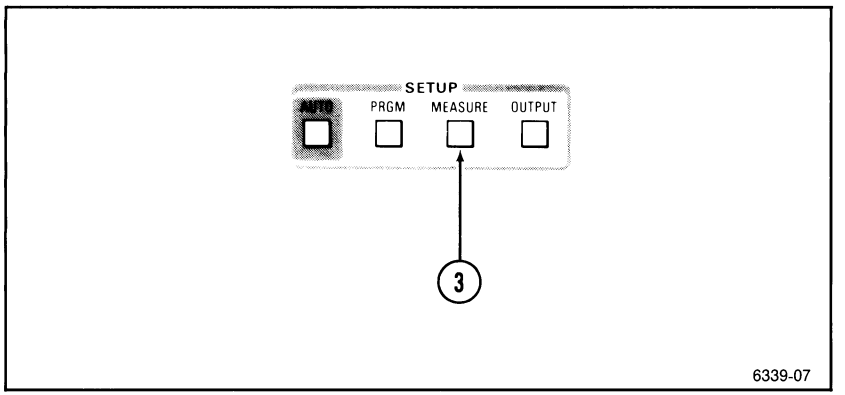

Figure 8. MEASURE Button.

3. MEASURE

	MEAS	SETUP	DISPLAY	WINDOW
SNAPSHOT	TYPE		ON¦OFF	ON¦OFF

Second-level menu for SNAPSHOT when more than one display source is displayed.

TARGET:

CH1	CH2	MULT/ADD	REF

Resulting display when either SNAPSHOT is pressed and only one display source is on screen or when the TARGET waveform is selected.

SNAPSHOT READOUT:

SNAPSHOT OF CHx USING MIN/MAX METHOD:

DIS=4.35 V	TOP=5.01 V	WID=20.3 μS
MES=2.12V	BASE=2.00 mV	DUTY=50%
PRX=-1.23 mV	MEAN=2.32 V	FREQ=24.6 kH
MAX=5.15 V	OVRS=2.0%	PER=40.6 μS
MID=2.47 V	UNDS=1.0%	RISE=28.4 nS
MIN=21.4 mV	RMS=2.65 V	FALL=18.3 nS
P-P=5.36 V	AREA=47.5 nVs	
DIST=90.0%	MES=50.0%	PROX=10.0%
AGAIN		↑

↑: Returns the scope to the MEASURE Menu.

AGAIN: Initiates another snapshot.

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Second-level menu for SETUP.

.....METHOD.....		MARK
MIN/MAX HIST CURSOR	LEVEL	ON¦OFF

This menu is used to set up criteria for extraction of LEVEL. Pushing the menu button labeled LEVEL displays a third level menu which allows the DISTAL, MESIAL, and PROXimal levels on the waveform to be specified.

Third-level menu for LEVEL.

ADJUST LEVELS WITH CURSOR/DELAY KNOB

nn%	nn%	n.nV	nn%	
DISTAL	MESIAL	PROXIMAL	MESIAL2	%¦VOLT

Second-level menu for MEAS TYPE.

MEAS TYPE: The continuous parameter extraction function is executed by selecting up to four parameters for display from a parameter matrix. Pushing the menu button labeled MEAS causes the Parameter Selection menu to be displayed:

DISTAL	MESIAL	PROX	MAX	MID
MIN	PK-PK	TOP	BASE	MEAN
OVRSHT	UNDRSHT	RMS	AREA	WIDTH
DUTY	FREQ	PERIOD	RISE	FALL
DELAY				
←	→	↓	ON	OFF

	Third-level menu for MEAS TYPE when more than one display source is displayed and DELAY is not selected in the parameter matrix. TARGET: CH1 CH2 MULT/ADD REF Selection of DELAY as the parameter to be extracted causes a different third- and fourth-level TARGET menu to be displayed:
	Third-level menu for MEAS TYPE when more than one display source is displayed and DELAY is selected in the parameter matrix. DELAY FROM TARGET: CH1 CH2 MUL/ADD REF
	Fourth-level menu for MEAS TYPE when more than one display source is displayed and DELAY is selected in the parameter matrix. DELAY TO TARGET: CH1 CH2 MUL/ADD REF

OUTPUT

④ OUTPUT Button

Calls up the OUTPUT menu for configuring the GPIB.

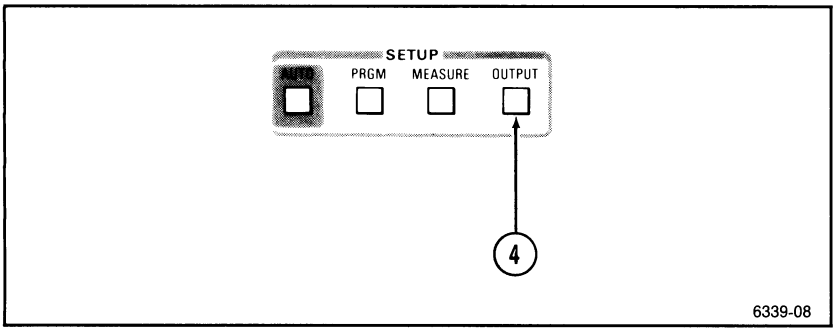

Figure 9. OUTPUT Button.

OUTPUT Control Menus

4. OUTPUT	STATUS SETUP DEBUG TRANSMIT/(PRINT) STATUS calls up an on-screen display of most GPIB parameters in which a system user might be interested. TRANSMIT/PRINT/PLOT switches to ABORT when transmitting, printing, or plotting. TRANSMIT/PRINT/PLOT disappears in OFF BUS mode.
	Second-level menu for GPIB SETUP. OUTPUT SETUP MODE TERM ADDR ENCDG
	Third-level menu for GPIB MODE. T/ONLY L/ONLY T/L DEVICES OFF BUS Selecting DEVICES changes TRANSMIT to PRINT (or PLOT) in the OUTPUT control menu. Selecting OFF BUS turns off the TRANSMIT/PRINT/PLOT choice.
	Fourth-level menu for DEVICES. HPGL THINKJET PLOTTER PRINTER SETUP

OUTPUT Control Menus (cont)

Fifth-level menu for SETUP.

SETTINGS	TEXT	GRAT	WFM	PGSIZE
ON¦OFF	ON¦OFF	ON¦OFF	ON¦OFF	US¦A4

Fourth-level menu for GPIB T/ONLY.

	..... SEND CURVE	
ONLY	WFMPRE/CURVE	SEND PRGM

Third-level menu for GPIB TERM.

EOI	LF/EOI

Third-level menu for GPIB ADDR.

GPIB ADDRESS = nn
↑ ↓

Third-level menu for GPIB ENCDG.

.....WHOLE WFMS.....			PARTIAL WFMS	
ASCII	RP	RI	RP	RI

RI encoding is a two's-complement format. RP is positive-integer format. At power-on the scope assumes that the data is formatted RI. The user must select RP (or send ENCDG RP via GPIB) to get positive-integer formats interpreted correctly.

Second-level menu for GPIB DEBUG.

DEBUG	.... MONITOR		-SCREEN UPDATE-	
ON¦OFF	BUS¦SCOPE	IN¦OUT	SLOW	PAUSE

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VERTICAL

(1) VERTICAL POSITION Controls

CH 1 is the HORIZONTAL POSITION control in XY mode.

(2) VARIABLE Buttons

CH 1 VARIABLE uncalibrates the ADD mode readout, but the CH 2 VARIABLE does not. This feature lets you input a sample of an unwanted signal into CH 2 and adjust the CH 2 VARIABLE to cancel the unwanted signal in the ADD display. See Section 3 of the Operators Manual for use of this feature.

Arrow (↑ and ↓) menu button functions are continuous when held down. CAL returns V/D to calibrated setting.

(3) VOLTS/DIV Switches

Readouts automatically adjust to the correct readout scale factor when 1X, 10X, 100X, and 1000X TEK coded-attenuator probes are attached.

VOLTS/DIV is the vertical expansion control in SAVE storage mode and the extended range control in AVG ACQUIRE mode.

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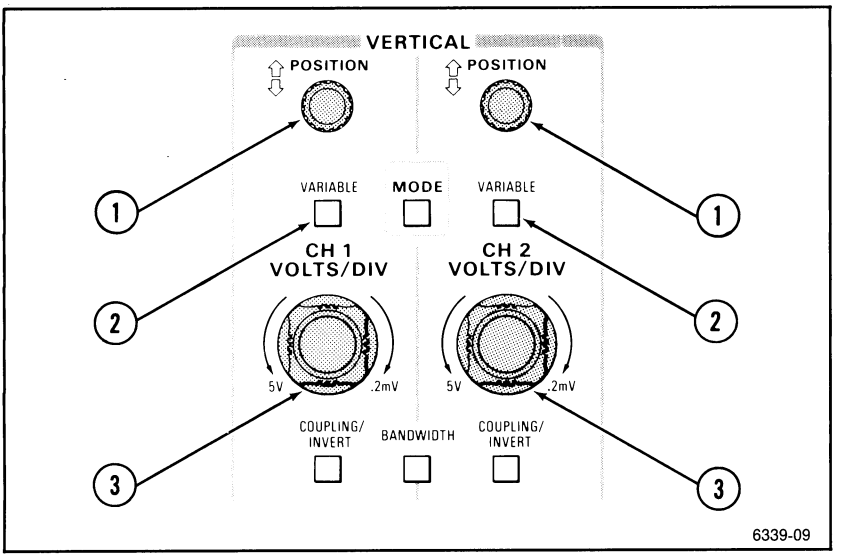

Figure 10a. Vertical Buttons and Controls.

(4) MODE Button Initiates Vertical MODE menu on screen. Active selections are underscored.

The resultant signal of a MULT display is scaled down by a factor of 5.12 to maintain the display within the graticule area.

ADD and MULT are not displayed in ENVELOPE mode.

XY mode automatically turns on the CH 1 and CH 2 signals REF 1 vs REF 2, may be displayed as XY REF.

NOTE

In this menu, CH 1, CH 2, ADD and MULT buttons are push/push; one push turns the mode on, another turns it off. Also, selecting ADD turns MULT off and visa-versa. Pushing YT/XY toggles the mode between YT and XY. Functions are underscored when turned on.

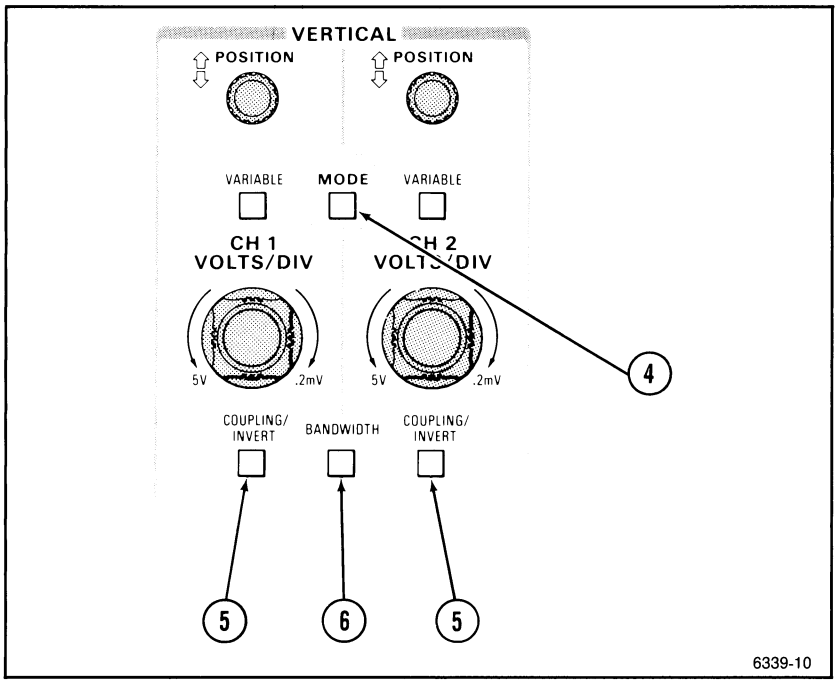

Figure 10b. Vertical Buttons and Controls.

(5) **COUPLING/ INVERT Buttons**

May be used to switch through the available coupling choices after menu is called up.

AC coupling and 50 Ω termination are mutually exclusive.

(6) **BANDWIDTH Button**

May be used to scroll through menu choices after menu is called up.

Vertical On-Screen Menus

2. VARIABLE	CH1 VARIABLE CAL ↓ ↑
	CH2 VARIABLE CAL ↓ ↑
4. VERTICAL MODE	In YT Mode. VERTICAL MODE CH1 CH2 ADD MULT YT¦XY
	In XY Mode. VERTICAL MODE CH1 vs CH2 YT¦XY
5. COUPLING INVERT	CH1 COUPLING 50 Ω INVERT AC DC GND ON¦OFF ON¦OFF
	CH2 COUPLING 50 Ω INVERT AC DC GND ON¦OFF ON¦OFF
6. BANDWIDTH	USB=xxxxHz USR=xxxx s .....BANDWIDTH..... SMOOTH 20 MHz 100 MHz FULL ON¦OFF The number xxxx depends on the Acquisition Mode, the SEC/DIV setting, and the bandwidth selected.

HORIZONTAL

(1)	**A Button**	Selects A Horizontal Mode. SEC/DIV switch (2) will control A SEC/DIV.
(2)	**A AND B SEC/DIV Switch**	Determines sweep rate for A and B sweep functions. Used in SAVE mode to horizontally expand display. Do not change horizontal mode after entering SAVE storage mode if using horizontal expansion. ROLL mode replaces AUTO Mode in the A TRIGGER mode menu for A SEC/DIV settings ≤ 100 ms/div.
(3)	**A INTEN Button**	Selects A INTENsified Horizontal mode. SEC/DIV switch (2) will control the B SEC/DIV.
(4)	**B Button**	Selects B Delayed sweep operation. SEC/DIV switch will now control B sweep rate.

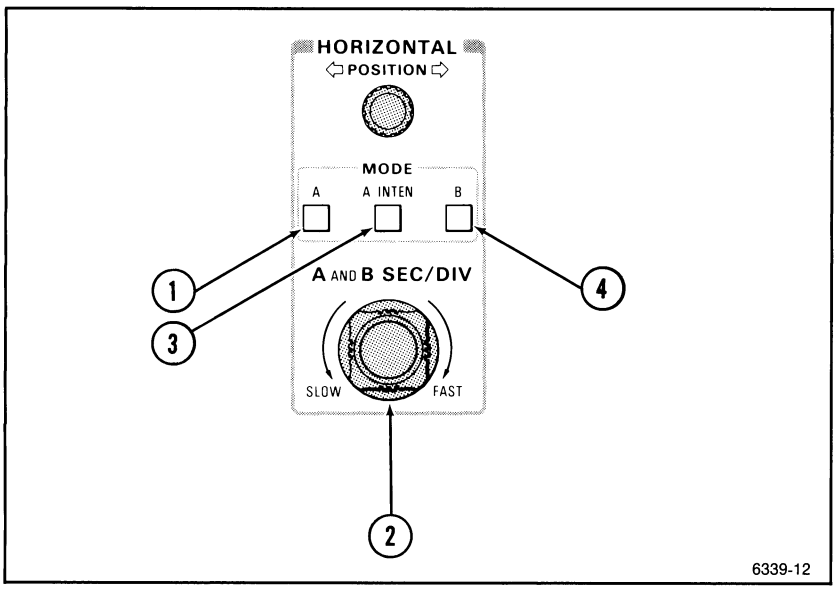

Figure 11. Horizontal Buttons and Controls.

CURSORS

① **FUNCTION Button**	Displays CURSOR FUNCTION menu on screen. Selecting a cursor function (VOLTS, etc.) from the menu advances to the second level ATTACH cursors menu. When neither the CURSOR FUNCTION or ATTACH CURSORS menu is displayed, pressing CURSOR FUNCTION twice steps through the CURSOR FUNCTION menu to the ATTACH CURSOR menu. Turning a cursor function off and back on also displays the ATTACH CURSOR menu.
② **UNITS Button**	Displays UNITS menu on screen.
③ **SELECT Button**	Selects which cursor the CURSOR/DELAY knob (4) controls.

NOTE

No cursor, regardless of type, can be positioned off screen; all cursors are bound at the screen perimeter. For cursor functions displaying time cursors, attempting to move either cursor past either edge of the screen causes the display to horizontally reposition. Pressing SELECT moves the bound cursor to center screen.

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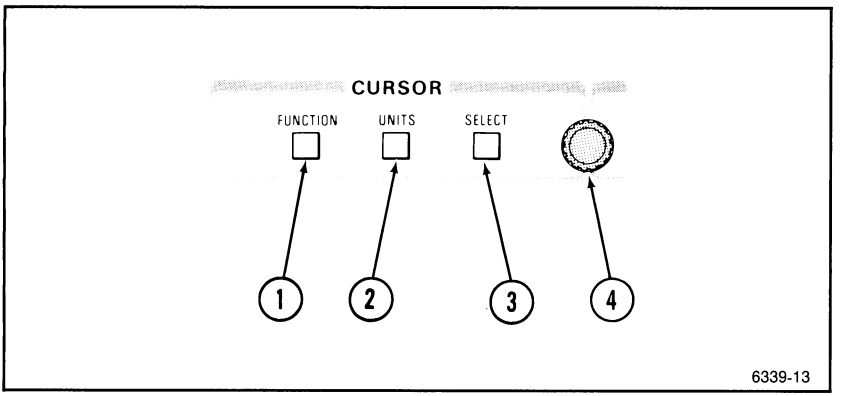

Figure 12. Cursor Buttons and Controls.

④ **CURSOR/DELAY Control** Controls active cursor positioning, adjusts DELAY TIME or DELAY EVENTS.

When time cursors are displayed and active, the CURSOR/DELAY knob may be used to scroll through the entire record length. Cursors will operate similarly for a reference waveform when attached to that displayed reference waveform.

CURSOR/DELAY knob is a shared control. It positions cursors for cursor functions and sets delay times or delay events number for DELAY functions.

NOTE

Bezel buttons operate in a push/push mode, selecting and deselecting the function. Selection of alternate function will deselect a previous mode.

Cursor On-Screen Menus

1. FUNCTION	CURSOR FUNCTION VOLTS TIME V@T SLOPE 1/TIME
	Second-level menu for a CURSOR FUNCTION selection. In YT Mode. ATTACH CURSORS TO: No Δ delay CH1 CH2 (func) (func)Δ REF n Δ delay—CH1 on CH1 CH1Δ (func) (func)Δ REF n Δ delay—CH1 and CH2 on CH1 CH2Δ (func) (func)Δ REF n Function is either ADD or MULT; they are mutually exclusive. Pressing REF rolls through the displayed reference waveforms. Only waveforms called up for display are included in the ATTACH CURSORS menu.
	In XY Mode (with CH1 vs CH2 and XYREF selected). ATTACH CURSORS TO: CH1 vs CH2 XYREF

Cursor On-Screen Menus (cont)

2. UNITS	In VOLTS or V@T. UNITS VOLTS CURS REF=xxxxxx VOLTS % dB NEW REF Δ¦ABS
	In SLOPE. UNITS SLOPE CURS REF=xxxxxx SLOPE % DEGREES NEW REF
	In 1/TIME. UNITS 1/TIME CURS REF=xxxxxx Hz % DEGREES NEW REF Δ¦ABS
	In TIME. UNITS TIME CURS REF=xxxxxx SEC % DEGREES NEW REF Δ¦ABS

DELAY FUNCTIONS

(1) **CURSOR/DELAY Control** — Sets delay times or delay event number for Delay functions. It defaults to cursors control when neither Delay function menu is displayed.

(2) **EVENTS Button** — Selects DELAY by EVENTS function and directs the CURSOR/DELAY knob (1) to control the events count.

(3) **TIME Button** — Selects DELAY by TIME, and switches between Main Delay and Delta Delay functions. CURSOR/DELAY control knob (1) is used to set time delay.

Triggers must be supplied via the B trigger circuitry to obtain Event triggering when EVENTS is on. A delayed by B events and B delayed by time may be used sequentially.

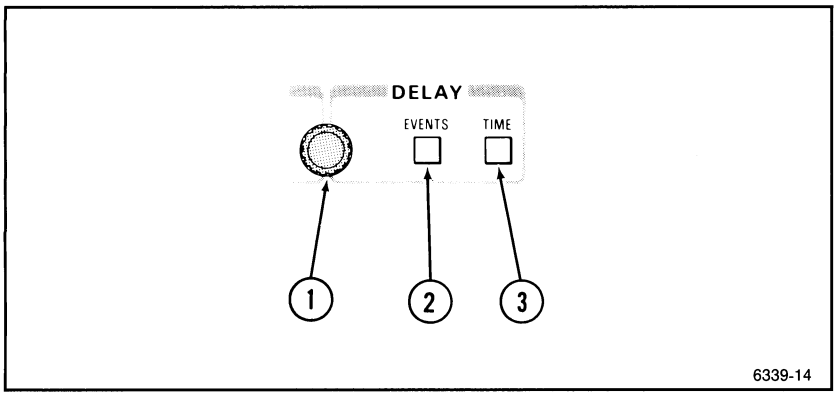

Figure 13. Delay Buttons and Controls.

Delay On-Screen Menus

2. DELAY by EVENTS	EVENTS START AT A TRIG EVENTS COUNT = xxxxx B TRIGS	EVENTS ON¦OFF
3. DELAY by TIME	With Δ TIME OFF. DELAY TIME = xxxxxx B	 ΔTIME ON¦OFF
	With ΔTIME ON. DELAY TIME = xxxxxx B ΔDELAY TIME = xxxxxx B DELAY by TIME button is pressed to switch the CURSOR/DELAY position knob between the Main DELAY TIME and the Δ (delta) DELAY TIME when ΔTIME is ON.	 ΔTIME ON¦OFF

(1)	**CPLG Button**	Switches through the menu choices (except VIDEO) when pushed repeatedly.
(2)	**SET VIDEO Button**	Displays A VIDEO COUPLING menu (on scopes equipped with Video trigger only). Video coupling is selected via the A TRIGGER COUPLING menu; mode (or type) of video coupling is selected via the A VIDEO COUPLING menu. Video signal must be interlaced for field 2 to appear in on-screen readout.
(3)	**SET WORD Button**	Displays the Word Recognizer Probe configuration menu.

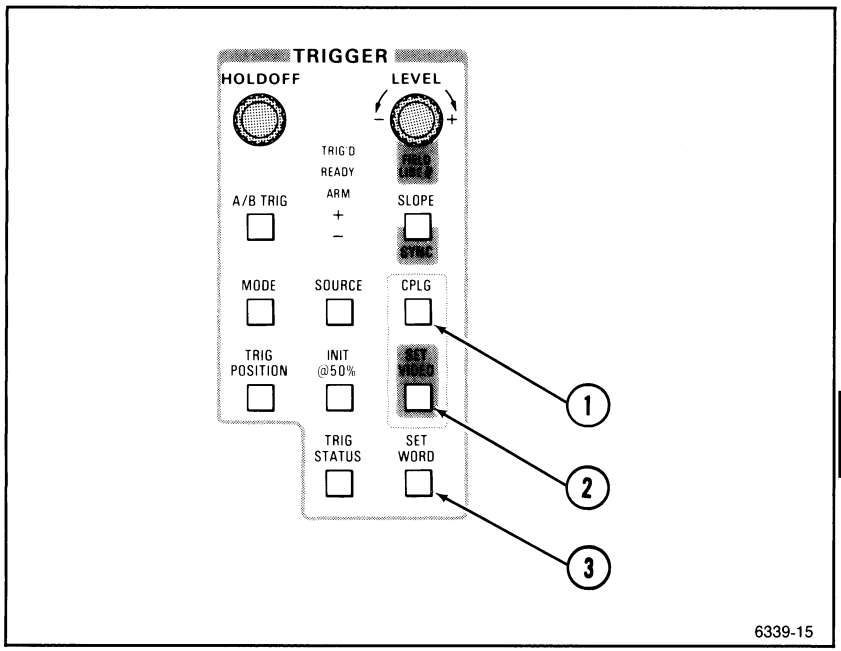

Figure 14. Trigger CPLG, SET VIDEO, and SET WORD Buttons.

Trigger On-Screen Menus

1. TRIGGER CPLG	Without the Video Option. A COUPLING ------REJECT------ DC AC NOISE HF LF
	With the Video Option installed. A COUPLING ------REJECT------ DC¦AC VIDEO NOISE HF LF
2. SET VIDEO	Video Option only (for interlaced signals). A VIDEO COUPLING CLAMP FIELD 1 FIELD 2 ALT TVLINE ON¦OFF
	Video Option only (for non-interlaced signals). A VIDEO COUPLING CLAMP FIELD 1 TVLINE ON¦OFF
3. SET WORD	RADIX -----CLOCK----- SET OCT¦HEX _/‾ ‾_ ASYNC BITS
	Second-level menu for SET BITS. In HEXadecimal: TRIG WORD: CLK=* HHHH x xxxx xxxx xxxx xxxx 1 0 X ← →
	*Setting for clock in the first-level menu appears here.
	In OCTal: TRIG WORD: CLK=* OOOOOO x xxx xxx xxx xxx xxx 1 0 X ← →
	*Setting for clock in the first-level menu appears here.

④ **SOURCE Button**

Toggles between 1 and 2 if channel or external trigger is the selected source.

A and B trigger conditions must be met to obtain a trigger in A 'AND' B. as the trigger source without a WORD Recognizer Probe attached displays the message "WORD PROBE FAULT". SOURCE remains as the last valid choice. EXTernal GAIN selection is made from second-level of Trigger SOURCE menu.

⑤ **INIT @50% Button**

Causes the 2440 to do a single Auto Level Trigger cycle automatically, setting the trigger level at 50% of peak-to-peak signal value.

⑥ **TRIG STATUS Button**

Activates the TRIGGER STATUS menu, which shows the current Trigger mode, Source, Coupling and Trigger position selection for the A and B triggers.

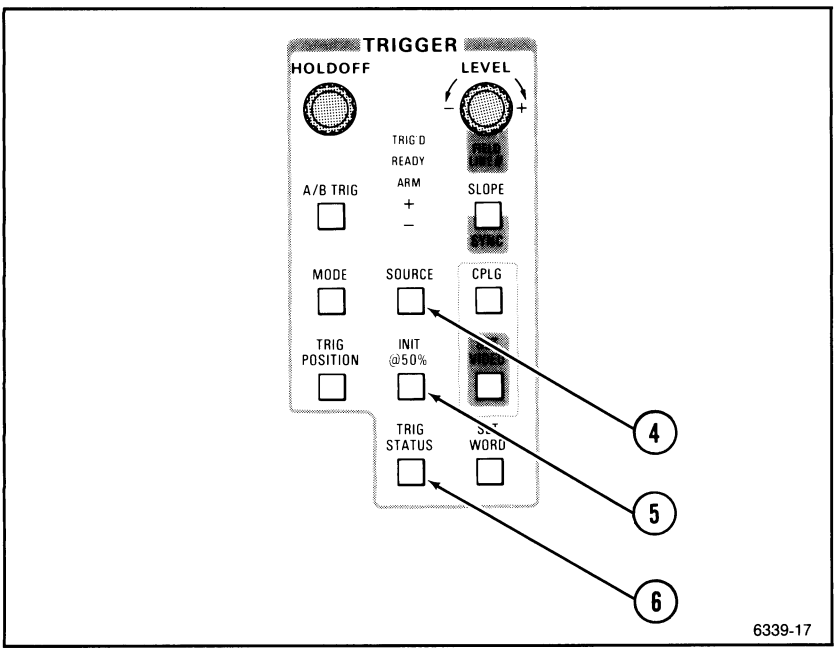

Figure 15. Trigger SOURCE, INIT @50%, and TRIG STATUS Buttons.

Trigger On-Screen Menus (cont)

4. TRIGGER SOURCE	A TRIG SOURCE 0 CHAN EXT CH1 1:2 1:2 LINE A*B:WORD CH2 ADD
	Second-level menu for A EXT. A EXT SOURCE --------A AND B EXT GAIN-------- 1:2 EXT 1 EXT 1/5 EXT 2 EXT2/5
6. TRIG STATUS	TRIG STATUS A*B MODE SOURCE CPLG TRIG POS ---- ------ ---------- ---- ---- ---- A (Setup conditions for the A Trigger Controls.) B (Setup conditions for the B Trigger Controls.)

A TRIGGERING

(7)	**MODE Button**	Displays TRIGGER MODE menu. Steps through the mode choices in menu, except SINGLE SEQ, when pushed repeatedly.
(8)	**TRIG POSITION Button**	Displays TRIGGER POSITION MENU. Steps through the menu choices when pushed repeatedly.
(9)	**A/B TRIG Button**	Selects between A and B Trigger menu displays for configuration, SLOPE, MODE, SOURCE, CPLG, LEVEL and TRIG POSITION controls are shared by A and B trigger system.

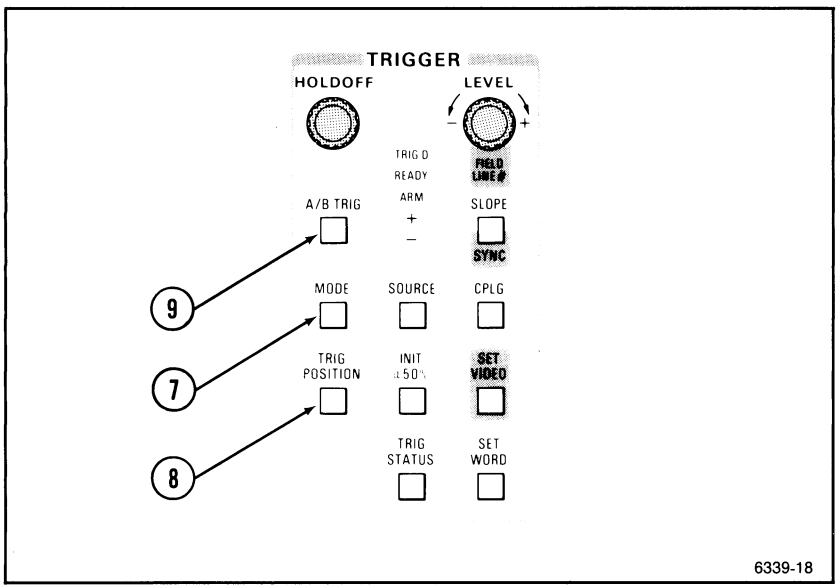

Figure 16. A Trigger MODE, TRIG POSITION, A/B TRIG Buttons.

A Trigger On-Screen Menus

7. TRIGGER MODE	A TRIG MODE AUTO SINGLE LEVEL AUTO NORMAL SEQ AUTO switches to ROLL at 100 ms/div and slower.
8. TRIGGER POSITION	A TRIGGER POSITION 1/8 1/4 1/2 3/4 7/8

NOTE

If a position other than 1/8, 1/4, 1/2, 3/4, 7/8 is selected over GPIB, then no on-screen selection will be underlined.

B TRIGGERING

(9) **A/B TRIG Button** — Toggles the trigger controls between controlling the A and B trigger systems.

(10) **CPLG Button** — Displays TRIGGER COUPLING menu. Switches through the menu choices when pushed repeatedly.

(11) **INIT 50% Button** — Causes the 2440 to do a single Auto Level Trigger cycle automatically, setting the trigger level at 50% of peak-to-peak signal value.

(12) **MODE Button** — Toggles between RUNS AFTER and TRIG AFTER when pressed repeatedly.

EXT CLK ON sets the time cursor readouts and the delay time numbers to CLK (clock) units. A clock signal must be provided via the B trigger circuitry to obtain triggering.

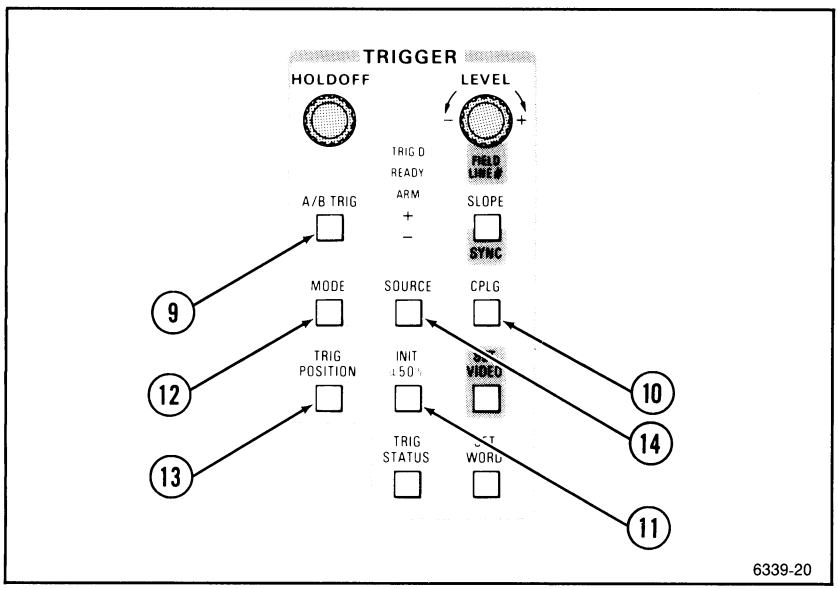

Figure 17. B Trigger A/B TRIG, CPLG, INIT @50%, MODE, TRIG POSITION, SOURCE Buttons.

(13) **TRIG POSITION Button** — Displays the control menu used to select the Record Trigger position in the waveform display.

(14) **SOURCE Button** — Displays the B TRIGGER SOURCE menu.

B Trigger On-Screen Menus

10. TRIGGER CPLG	In B TRIG AFTER Delay Mode. B COUPLING B, EXT CLK CPLG (with EXT CLOCK ON) B, EVENTS CPLG (with DELAY by EVENTS ON) B, CLK, EVENTS (with both ON) DC AC NOISE -----REJECT----- HF LF In B RUNS AFTER Delay Mode. B COUPLING EXT CLK CPLG (with EXT CLOCK ON) EVENTS COUPLING (with DELAY by EVENTS ON) EVENTS, CLK (with both ON) DC AC NOISE -----REJECT----- HF LF				
12. TRIGGER MODE	B TRIG	RUNS AFTER	TRIG AFTER	EXT CLK ON¦OFF	
13. TRIG POSITION	B TRIGGER POSITION 1/8	1/4	1/2	3/4	7/8

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B Trigger On-Screen Menus (cont)

14. TRIGGER SOURCE	In B TRIG AFTER Delay Mode. B TRIG SOURCE B, EXT CLOCK SOURCE (with EXT CLOCK ON) B, EVENTS SOURCE (with DELAY by EVENTS ON) B, EXT CLK, EVNT SOURCE (with both ON) SOURCE 0 CHAN EXT CH1 1:2 1:2 WORD CH2 ADD In B RUNS AFTER Delay Mode. B TRIG SOURCE EXT CLK SOURCE (with EXT CLOCK ON) EVENTS SOURCE (with DELAY by EVENTS ON) EVENTS, EXT CLK SOURCE (with both ON) SOURCE 0 CHAN EXT CH1 1:2 1:2 WORD CH2 ADD
	Second-Level menu for B EXT. B EXT SOURCE --------A AND B EXT GAIN-------- 1:2 EXT 1 EXT 1/5 EXT 2 EXT 2/5

ACQUISITION

(1) ACQUIRE Button

Starts/restarts the acquisition from SAVE mode.

At the completion of a single sequence acquisition, the scope switches to SAVE storage mode and displays the SAVE menu. Pushing ACQUIRE button momentarily switches to ACQUIRE menu, but a fast-completing single sequence will switch it back to SAVE menu before ACQUIRE menu can be used. Turn SINGLE SEQ off in TRIGGER MODE menu before pushing ACQUIRE to use ACQUIRE menu.

Save-On-Delta causes scope to enter SAVE (Save-On-Delta switches to off) when a live waveform exceeds boundary limits set by a reference envelope waveform. If GPIB mode is set for PRINTER output, screen data will be printed. Then Save-On-Delta will be turned back on to continue monitoring the incoming live waveforms (not done in ROLL mode).

If GPIB mode is selected for the talk/listen mode, the 2440 will issue an SRQ notifying the Controller of the SAVE event.

Average and Envelope acquisitions in progress will be restarted by any of the following front-panel control changes:

1. Any vertical or horizontal mode change.
2. A volts/div setting change of either channel.
3. A vertical position change of either channel. (Average but not Envelope.)
4. Input coupling changes to either channel.
5. Changes in the Trigger mode.

6. Pressing the MENU/OFF button to turn off menus.

7. Delay-by-Events or Delay-by-Time changes (Average only).

8. Changing the trigger slope.

These results are seen on screen:

ENVELOPE turns off ADD or MULT vertical mode choices. REPET mode extends bandwidth to 300 MHz for repetitive waveforms.

Storage On-Screen Menus

1. ACQUIRE	ACQUIRE	nnn	nnn	REPET	SAVE ON Δ
	NORMAL	ENVELOPE	AVG	ON¦OFF	ON¦OFF
	nnn selections:				
	ENVELOPE—1,2,4,8,16,32,64,128,256,CONT				
	AVG—2,4,8,16,32,64,128,256				

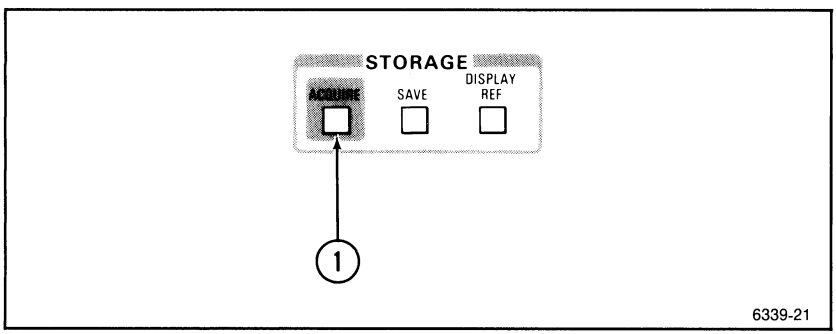


Figure 18. Storage ACQUIRE Button.

SAVE AND DISPLAY REFERENCE

(1) **SAVE Button** — Displays the SAVE menu and "freezes" waveforms on screen. SAVE mode is also entered when a single sequence completes, or Save-On-Delta occurs on an out-of-limits waveform. It also occurs momentarily during plotting or printing via the GPIB.

Pressing STACK REF in the SAVEREF SOURCE menu treats the reference memories as a stack; waveforms are stored in predetermined reference memories, depending on what source (CH 1, ADD, etc.) they are displayed in.

(2) **DISPLAY REF Button** — Toggles between DISPLAY and HORIZontal position selection menus.

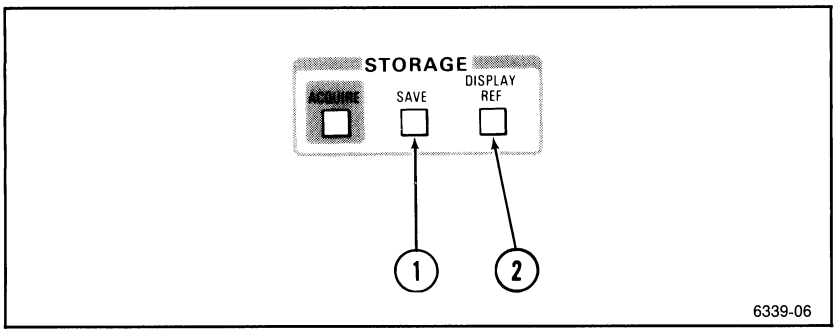


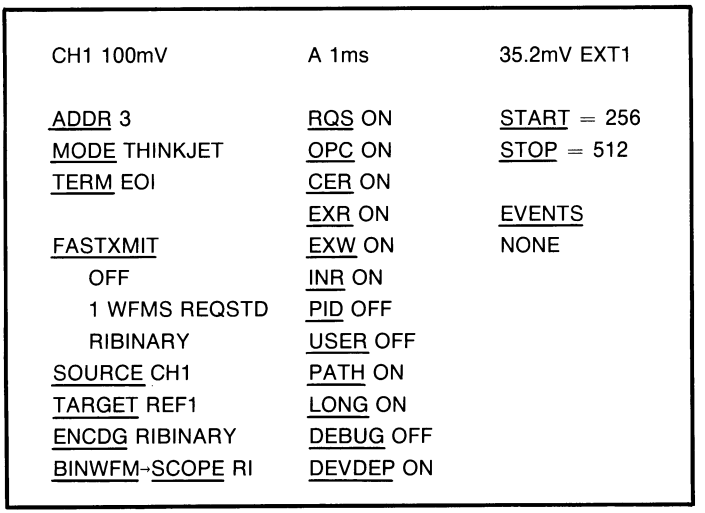
Figure 19. Storage SAVE and DISPLAY REF Button.

Storage On-Screen Menus (cont)

1. SAVE	----------SAVEREF SOURCE---------- STACK CH1 CH2 (function) REF REF
	Second-level menu for a SAVEREF SOURCE selection (except REF or STACK REF). If REF is selected, or Δ DELAY TIME is turned on while B is the HORIZONTAL MODE setting, this menu becomes a third-level menu. --------SAVEREF DESTINATION-------- SAVEREF REF1 REF2 REF3 REF4 SOURCE
	Second-Level menu for SAVEREF SOURCE in Δ (delta) DELAY by TIME. SAVEREF SOURCE—(channel) DELAY 1 DELAY 2
	Second-Level menu for REF. SAVEREF SOURCE—REF SAVEREF REF1 REF2 REF3 REF4 SOURCE
2. DISPLAY REF	In YT Mode. DISPLAY REF REF1 REF2 REF3 REF4 POS REF EMPTY appears above reference menu choice if no valid waveform is stored.
	In XY Mode. HORIZ XYREF POS REF
	Second-level menu for HORIZ POS REF. (In YT Mode.) ----HORIZONTAL POSITION---- REF HPOS REF1P REF2P REF3P REF4P IND¦LOCK
	Second-level menu for HORIZ POS REF. (In XY Mode.) ----HORIZONTAL POSITION---- REF HPOS XY REFP IND¦LOCK

GPIB STATUS

GPIB Status On-Line Screen



The GPIB Status menu is displayed on screen when STATUS is selected from the OUTPUT menu. Each underscored item is a GPIB-related function and the adjacent non-underlined item(s) is the setting(s) for the function. The listing "ADDR 3" means the scope's address (a function) is set to 3. The remaining listings at the top of the screen vary with current instrument setup.

Interpretation of GPIB STATUS menu listings:

ADDR =	ADDRESS SELECTION	RQS =	ASSERT SRQ IF PENDING EVENT
MODE =	MODE SELECTION	OPC =	ASSERT SRQ ON OPERATION COMPLETE
TERM =	TERMINATION	CER =	ASSERT SRQ ON COMMAND ERROR
SOURCE =	WAVEFORM DATA SOURCE	EXR =	ASSERT SRQ ON EXECUTION ERROR
TARGET =	WAVEFORM DATA TARGET	EXW =	ASSERT SRQ ON EXECUTION WARNING
ENCDG =	ENCODING	INR =	ASSERT SRQ ON INTERNAL ERROR
BINWFM =	INCOMING BINARY WAVEFORM INTERPRETATION MODE	PID =	ASSERT SRQ ON PROBE IDENTIFICATION
		USER =	ASSERT SRQ ON BEZEL BUTTON PUSH
		PATH =	SEND COMPLETER PATH IN QUERY RESPONSE
		LONG =	USE LONG FORM IN QUERY RESPONSE
		DEBUG =	TURN ON DEBUG MODE
		DEVDEP =	ASSERT SRQ IF TRANSMIT PUSHED
		401 =	POWER ON SRQ (TYPICAL EVENT)