OBSERVING STACK OPERATION WITH SINGLE-OPERAND FUNCTIONS (Cont)

The mathematical functions of $\log_b(x)$, x^y, and $\sqrt[y]{x}$ are not provided as single keystroke commands on the Waveform Calculator, but may be accomplished using the keystroke sequences outlined below:

To compute $\log_b(x)$:

a. Key in the value of x.
b. Press $\boxed{LN}$.
c. Key in the value of b.
d. Press $\boxed{LN}$.
e. Press $\boxed{/}$.

For example, to calculate $\log_2(64)$: press 64 $\boxed{LN}$ 2 $\boxed{LN}$ $\boxed{/}$.

To compute x^y:

a. Key in the value of x.
b. Press $\boxed{LN}$.
c. Key in the value of y.
d. Press $\boxed{*}$.
e. Press ▨ $\boxed{EXP}$.

For example, to calculate 3^4: press 3 $\boxed{LN}$ 4 $\boxed{*}$ ▨ $\boxed{EXP}$.

To compute $\sqrt[y]{x}$:

a. Key in the value of x.
b. Press $\boxed{LN}$.
c. Key in the value of y.
d. Press $\boxed{/}$.
e. Press ▨ $\boxed{EXP}$.

For example, to calculate $\sqrt[7]{128}$: press 128 $\boxed{LN}$ 7 ▨ $\boxed{EXP}$.

USING THE CONSTANT REGISTERS

In addition to accumulation of intermediate results by the stack, fifty constant registers (1ØØ with Option 2D) are accessible for the storage of constants. These constant registers are unaffected by operations occurring within the stack and are referenced with address numbers Ø through 49 (Ø through 99 with Option 2D).

STORING A CONSTANT

To store the number 2.5 in constant register 4: press 2.5, ENTER, 4, ▨, >CNS.

To store a number in a constant register:

a. Key in the constant.

b. Terminate numeric entry by pressing ENTER.

c. Key in the register address number (0 through 49, or 0 through 99 with Option 2D) where the constant is to be stored.

d. Press ▨ >CNS.

>CNS **Operation:** The contents of the Y register are copied into the constant register designated by the address number in the X register, then the X register is popped and the constant is displayed in the X register field.

>CNS **Restriction:** The contents of the X register (constant register address) must be an integer between, and including, Ø through 49 (Ø through 99 with Option 2D).

RETRIEVING A CONSTANT

To copy data from a constant register to the X register: first key in the constant register address, then press CNS. To recall the number 2.5 from register 4: press 4, CNS. The stored constant is retrieved and displayed in the X register field.

CNS Operation: The content of the constant register (designated by the address number in the X register) is copied into the X register.

CNS Restriction: Initially the X register must contain a constant which (when rounded) is an integer between, and including, Ø through 49 (Ø through 99 with Option 2D).

RETRIEVING A CONSTANT (Cont)

When a number is recalled from a constant register, the register address is popped from the stack to the processor, then the contents of the specified constant register are copied into the X register (thereby pushing the stack). Therefore, a constant can be recalled any number of times without altering it, since it is maintained in the constant register until overwritten.

To clear a constant register simply store Ø in it.

NEXT EXERCISE BEGINS WITH POWER-UP

WAVEFORM PROCESSING

The waveform processor provides the computing capability for the 7854 Oscilloscope system including scalar arithmetic and functions on either constants or waveforms, and waveform scalar parameters and vector functions. This subsection demonstrates waveform processing using the Waveform Calculator.

WAVEFORM MEMORIES AND RESOLUTION

The memory space available within the processor for waveform storage is a fixed amount; however, the utilization of this space is selectable by the operator. By setting the points-per-waveform (P/W) value the waveform memories are allocated and the stored waveform resolution is selected. The available P/W values (except on the Option ØD instrument which is set at 512) are 128, 256, 512, and 1Ø24; all stored waveforms are the same resolution at any given time. In addition to determining stored waveform resolution, the selected P/W value also determines the number of waveform memories available at any given time. The higher the P/W value selected, the greater the resolution, but fewer waveforms can then be stored. Table 6-1 summarizes the effects of each P/W value on waveform resolution, waveform memories, and the stored waveforms.

Changing the P/W value initiates a major rearrangement of the waveform memories such that all stored data and status information contained in waveform memory is drastically affected. Prior to a >P/W (Set Points/Waveform) command, each waveform memory contains the vertical coordinates of the waveform points, the vertical zero reference level, and the scale factors associated with the waveform points.

TABLE 6-1
>P/W Effects

7854 Version	P/W Value	Total Waveform Memories	Waveform Memory Addresses	Waveform Point Numbers	Number of Points Per Horizontal Graticule Division
7854 With Option ØD	512	2	Ø-1	Ø-511	51.2
Standard 7854	128	16	Ø-5	Ø-127	12.8
	256	8	Ø-7	Ø-255	25.6
	512	4	Ø-3	Ø-511	51.2
	1Ø24	2	Ø-1	Ø-1Ø23	1Ø2.4
With Option 2D	128	4Ø	Ø-39	Ø-127	12.8
	256	2Ø	Ø-19	Ø-255	25.6
	512	1Ø	Ø-9	Ø-511	51.2
	1Ø24	5	Ø-4	Ø-1Ø23	1Ø2.4

NOTE

Each vertical division of the stored waveform contains a minimum of 1Ø2.4 incremental levels at which the waveform points can be set.

The effects of a >P/W command are the following:

1. Although the vertical coordinate of each point is retained in storage, the rearrangement of the waveform memories may have made these values meaningless in relation to the headers (scale factors, vertical zero reference, and operational waveform number) with which they are now associated.

2. The operational waveform (OPW) number of the displayed waveform is set to Ø.

3. All stack registers are set to Ø.

4. An implicit TIME command is executed by the processor.

5. An implicit CLD (Clear Display) command is executed by the processor.

NOTE

The TIME and CLD commands are described under Stored Waveform Display later in this section.

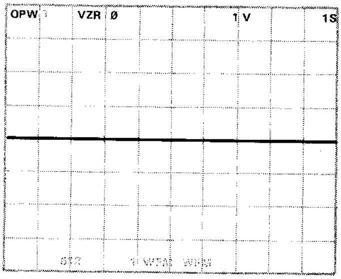
OBSERVING THE WAVEFORM MEMORIES AT POWER-UP (Cont)

NOTE

Waveform memories Ø and 1 (Ø WFM and 1 WFM) should be used only for transitory storage of waveforms since 1 WFM is used for working storage during Average commands and both memories are used to store newly acquired waveforms with dual-trace acquisition. In addition, computed waveforms are always stored in Ø WFM.

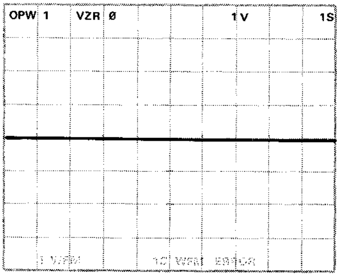
Press | **Display** | **Comments**

1 (WFM)



The power-up condition of 1 WFM is displayed. The OPW reading has changed to reflect that 1 WFM is now displayed even though the change is not perceptible since the information in each waveform memory is identical at this time.

1Ø (WFM)



WFM ERROR is issued because 1Ø WFM is not a valid waveform memory address with the present conditions.

WFM Restrictions: The X register must contain a constant which (when rounded) is an integer from Ø to the maximum waveform memory address available with the present system conditions prior to executing the WFM command. WFM ERROR is issued if the restriction is violated.

SETTING THE GROUND REFERENCE

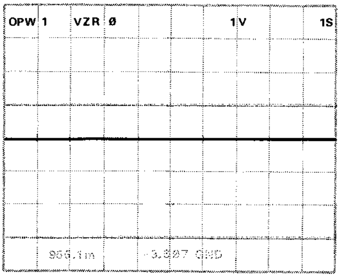
The Waveform Calculator allows setting one or two separate ground reference levels, one for waveforms acquired into Ø WFM and another for waveforms acquired into 1 WFM, with a single GND command (see Setting the Ground Reference in section 5 for further details).

To set the ground reference level for waveforms subsequently stored into Ø WFM and 1 WFM, first return to SCAN display mode by pressing [illegible].

Set the VERTICAL MODE switch to ALT.

Set the input coupling switch of both amplifier units to ground.

Position the LEFT VERT trace to three divisions below the center horizontal graticule line, and the RIGHT VERT trace to one division above the center horizontal graticule line:

Press	Display	Comments
GND		The ground reference (vertical zero reference) has been set for waveforms subsequently stored into Ø WFM and 1 WFM. The ground reference setting for Ø WFM is displayed in the X register and the ground reference setting for 1 WFM is in the Y register. These values apply only to waveforms acquired hereafter. (Perform the next exercise, Acquiring Two Waveforms, to see how these ground references are used.) GND WARNING is issued if the command is prematurely terminated with a STOP, or if more than 5% contiguous points are unfilled.

Exercise continues on next page

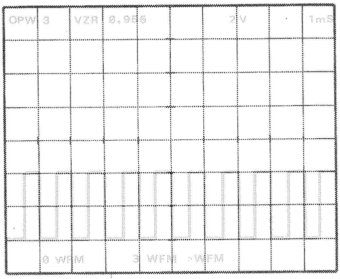
COPYING STORED WAVEFORMS

The >WFM command allows duplicating waveforms between waveform memories. To copy the waveform from 1 WFM to another storage location within waveform memory:

Press

3 f >WFM

Display



Comments

The waveform point values (with scale factors and vertical zero reference) are copied into 3 WFM. Notice that the OPW has changed to reflect that the waveform now displayed is from 3 WFM, although the information is retained in 1 WFM until a command is issued which causes the processor to place new information in 1 WFM.

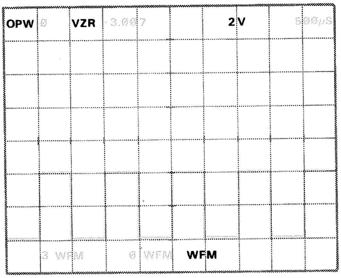
>WFM **Restrictions**: The Y register must contain the waveform memory address of the waveform to be moved, and the X register must contain a constant which, when rounded to an integer, is the address of a valid waveform memory where the waveform is to be duplicated, prior to execution of the >WFM command. >WF ERROR is issued if either restriction is violated.

To copy the contents of Ø WFM to more permanent storage within waveform memory:

Press

Ø WFM

Display

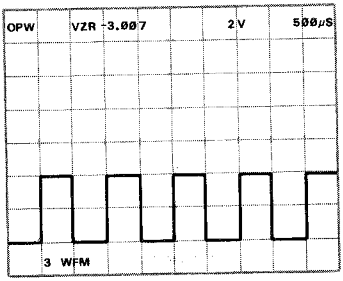


Comments

Ø WFM is entered into the stack and its contents are displayed.

@

COPYING STORED WAVEFORMS (Cont)

Press	Display	Comments
2		The contents of Ø WFM are duplicated into 2 WFM; 2 WFM is displayed and reflected by the number.

To copy the contents of one waveform memory into another:

a. First recall the waveform to be copied using the WFM command.

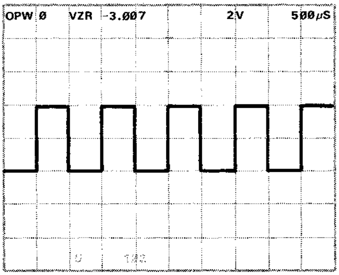
b. Enter the number of the new waveform memory location.

c. Press to copy the data.

RECALLING AND SETTING THE VALUE OF A POINT (Cont)

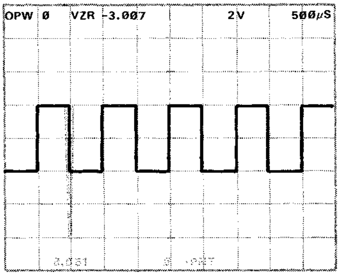
Press **Display** **Comments**

1Ø2



The point number which we are going to set at the Ø-volt level is entered into the X register.

▨ >PNT



Point 1Ø2 is set at the designated vertical level. (If necessary, adjust the STORED INTensity.)

>PNT **Restrictions:** The Y register must contain a constant which, when divided by the vertical scale factor, results in a number within the vertical range limits of +2Ø and -2Ø divisions from the center horizontal graticule line. Also, the X register must contain a constant which (when rounded) is an integer from Ø to the maximum waveform point number inclusive. >PN ERROR is issued if any of these restrictions are violated.

To set a specific point to a designated vertical value:

a. Key the vertical value at which the point is to be set.

b. Press ENTER.

c. Key in the number of the point to be set.

d. Press ▨ >PNT.

DISPLAYING THE READOUT SETTING

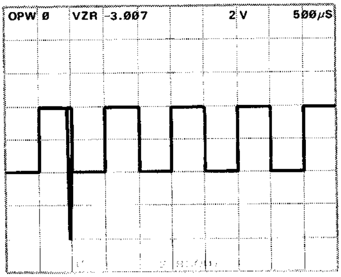
The real-time readout value generated by the selected plug-in units can be displayed individually in the X register by using the RDOUT command.

For example, to display the readout value of readout word Ø (see Fig. 4-1):

Press

Ø RDOUT

Display



Comments

The numeric value of the real-time readout of the LEFT VERT channel 1 is displayed in the X register. Norice that the unit symbol V is not displayed with the value. RDG WARNING is issued if the designated readout position is blank or contains no numerals in the SCOPE display mode.

NOTE

Although this command is available as the shift function of the GND key on the measurement keyboard, it is only useful if the Waveform Calculator commands are available to the processor, since the RDOUT command requires an operand to be entered into the X register prior to command execution.

RDOUT **Restriction:** The X register must contain a constant which (when rounded) is an integer from Ø to 7 (inclusive) prior to execution of the RDOUT command. RDG ERROR is issued if the restriction is violated.

NEXT EXERCISE BEGINS WITH POWER-UP