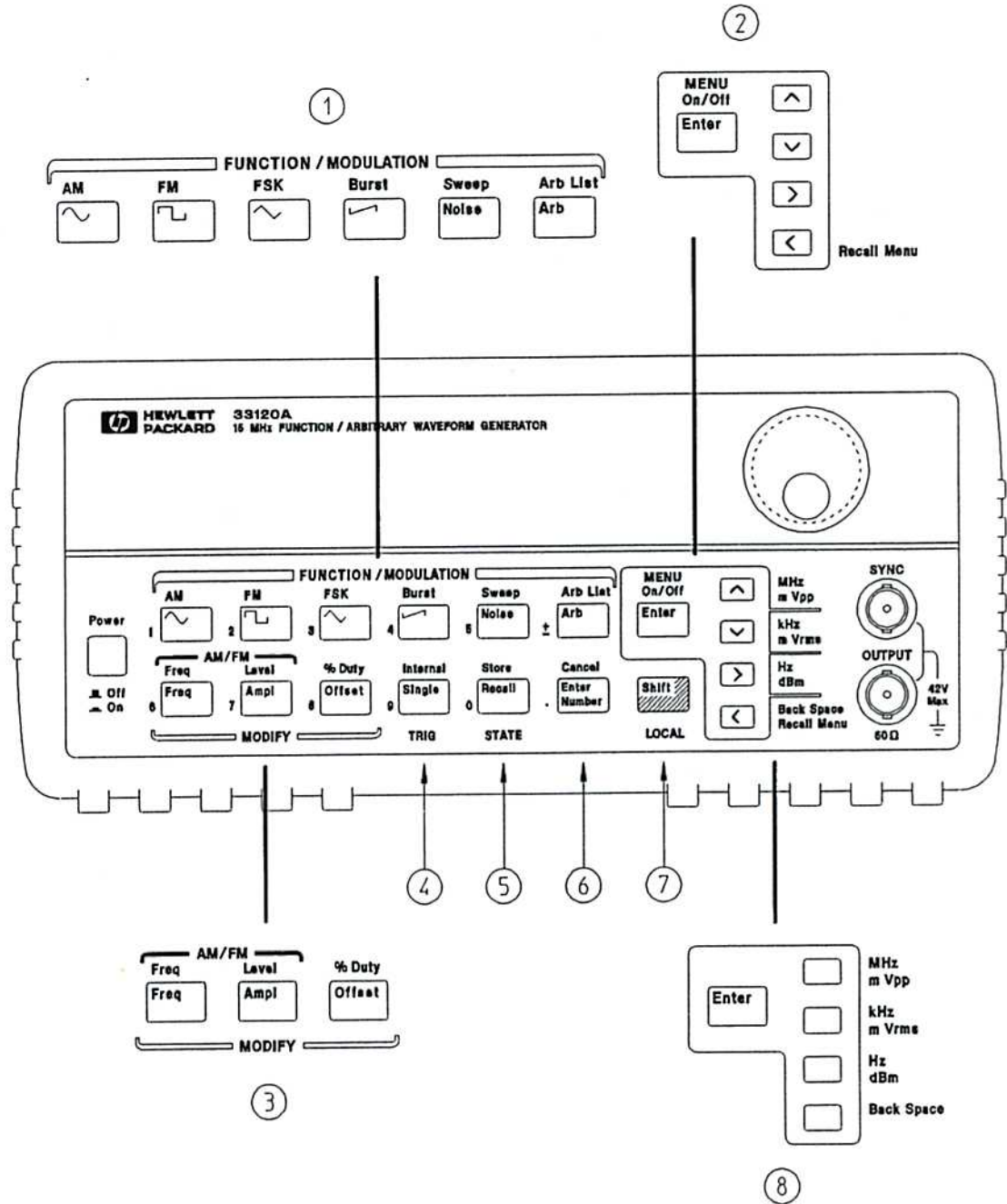


The Front Panel at a Glance

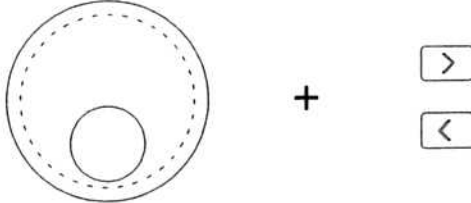


- | | |
|---|---------------------------------------|
| 1 Function / Modulation keys | 5 Recall / Store instrument state key |
| 2 Menu operation keys | 6 Enter Number key |
| 3 Waveform modify keys | 7 Shift / Local key |
| 4 Single / Internal Trigger key
(Burst and Sweep only) | 8 Enter Number "units" keys |

Front-Panel Number Entry

You can enter numbers from the front-panel using one of three methods.

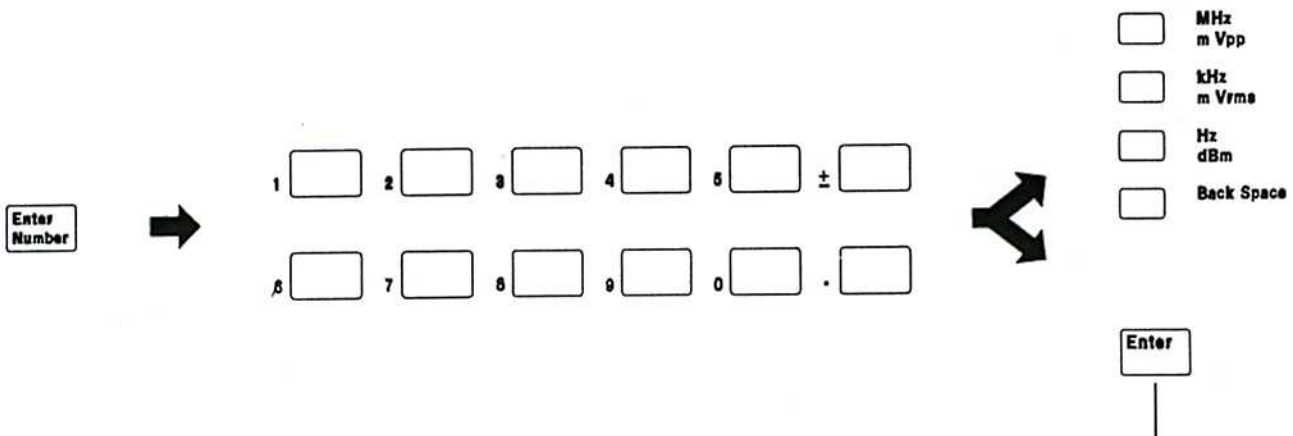
Use the knob and the arrow keys to modify the displayed number.



Use the arrow keys to edit individual digits.

- ^ Increments the flashing digit.
- v Decrements the flashing digit.
- > Moves the flashing digit to the right.
- < Moves the flashing digit to the left.

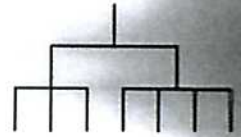
Use the "Enter Number" mode to enter a number with the appropriate units.



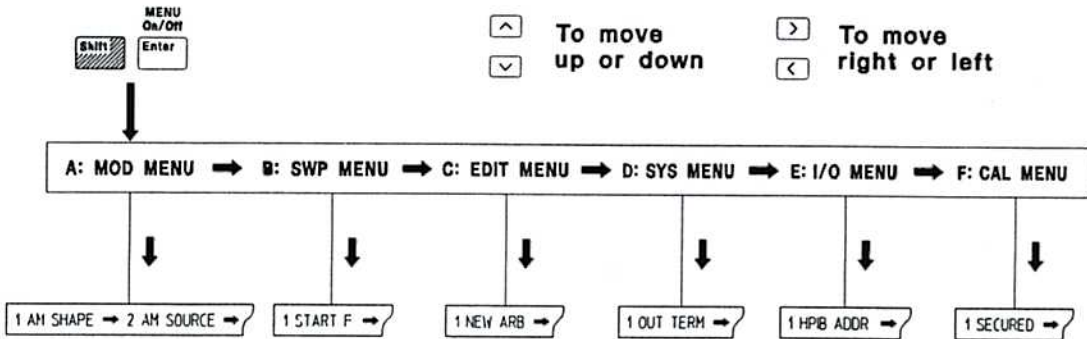
Use "Enter" for those operations that do not require units to be specified (AM Level, Offset, % Duty, and Store/Recall State).

The Front-Panel Menu at a Glance

The menu is organized in a top-down tree structure with three levels.



To turn on menu press:



To enter command press:



A: MODulation MENU

1: AM SHAPE → 2: AM SOURCE → 3: FM SHAPE → 4: BURST CNT → 5: BURST RATE →

↵ 6: BURST PHAS → 7: BURST SRC → 8: FSK FREQ → 9: FSK RATE → 10: FSK SRC

B: SWP (Sweep) MENU

1: START F → 2: STOP F → 3: SWP TIME → 4: SWP MODE

C: EDIT MENU*

1: NEW ARB → [2: POINTS] → [3: LINE EDIT] → [4: POINT EDIT] → [5: INVERT] → [6: SAVE AS] → 7: DELETE

* The commands enclosed in square brackets ([]) are "hidden" until you make a selection from the NEW ARB command to initiate a new edit session.

D: SYStem MENU

1: OUT TERM → 2: POWER ON → 3: ERROR → 4: TEST → 5: COMMA → 6: REVISION

E: Input / Output MENU

1: HPIB ADDR → 2: INTERFACE → 3: BAUD RATE → 4: PARITY → 5: LANGUAGE

F: CALibration MENU*

1: SECURED → [1: UNSECURED] → [2: CALIBRATE] → 3: CAL COUNT → 4: MESSAGE

* The commands enclosed in square brackets ([]) are "hidden" unless the function generator is UNSECURED for calibration.

To set the output frequency

At power-on, the function generator outputs a sine wave at 1 kHz with an amplitude of 100 mV peak-to-peak (into a 50Ω termination).
The following steps show you how to change the frequency to 1.2 MHz.

Freq

1 Enable the frequency modify mode.

The displayed frequency is either the power-on value or the previous frequency selected. When you change functions, the same frequency is used if the present value is valid for the new function.

1.000,000,0 KHz



Enter Number



1 . 2

2 Enter the magnitude of the desired frequency. ¹

Notice that the Num annunciator turns on and “ENTER NUM” flashes on the display, indicating that the number mode is enabled.

1.2

To cancel the number mode, press  .

 MHz
 m Vpp

3 Set the units to the desired value.

The units are selected using the arrow keys on the right side of the front panel. As soon as you select the units, the function generator outputs the waveform with the displayed frequency. *To turn off the flashing digit, move the cursor to the left of the display using the arrow keys.*

1.200,000,0 MHz

¹ You can also use the knob and arrow keys to enter a number.
 See “Front-Panel Number Entry” on page 3 for more information.

To set the output amplitude

At power-on, the function generator outputs a sine wave with an amplitude of 100 mV peak-to-peak (into a 50Ω termination).
The following steps show you how to change the amplitude to 50 mVrms.

Ampl

1 Enable the *amplitude modify mode*.

The displayed amplitude is either the power-on value or the previous amplitude selected. When you change functions, the same amplitude is used if the present value is valid for the new function.



100.0 mVPP

Enter Number

2 Enter the magnitude of the desired amplitude. ¹

Notice that the Num annunciator turns on and “ENTER NUM” flashes on the display, indicating that the number mode is enabled.

50


To cancel the number mode, press  .

Shift

3 Set the units to the desired value.

The units are selected using the arrow keys on the right side of the front panel. As soon as you select the units, the function generator outputs the waveform with the displayed amplitude. *To turn off the flashing digit, move the cursor to the left of the display using the arrow keys.*

50.00 mVRMS

 kHz
m Vrms

¹ You can also use the knob and arrow keys to enter a number.
See “Front-Panel Number Entry” on page 3 for more information.

Get Acquainted with the Instrument

Front-Panel Menus and Controls

The front panel has buttons and controls for the functions that you use most often. Use the menu buttons to access more specialized functions.

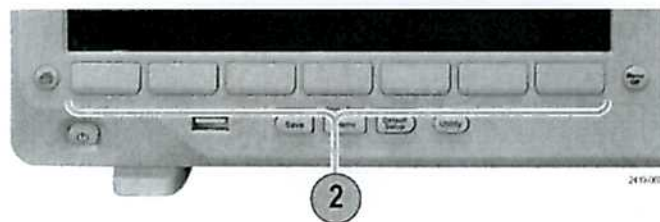
Using the Menu System

To use the menu system:

1. Push a front-panel menu button to display the menu that you want to use.



2. Push a lower-bezel button to select a menu item. If a pop-out menu appears, turn multipurpose knob a to select the desired choice. If a pop-up menu appears, press the button again to select the desired choice.



3. Push a side-bezel button to choose a side-bezel menu item.
If the menu item contains more than one choice, push the side-bezel button repeatedly to cycle through the choices.
If a pop-out menu appears, turn multipurpose knob a to select the desired choice.



4. To remove a side-bezel menu, push the lower-bezel button again or push **Menu Off**.



- 5. Certain menu choices require you to set a numeric value to complete the setup. Use the upper and lower multipurpose knobs **a** and **b** to adjust values.
- 6. Push **Fine** to turn off or on the ability to make smaller adjustments.



Using the Menu Buttons

Use the menu buttons to perform many functions in the oscilloscope.

- 1. **Measure.** Push to perform automated measurements on waveforms or to configure cursors.
- 2. **Search.** Push to search through an acquisition for user-defined events/criteria.
- 3. **Test.** Push to activate advanced or application-specific testing features.
- 4. **Acquire.** Push to set the acquisition mode and adjust the record length.
- 5. **Autoset.** Push to perform an automatic setup of oscilloscope settings.



- 6. Trigger Menu. Push to specify trigger settings.
- 7. **Utility.** Push to activate the system utility functions, such as selecting a language or setting the date/time.

→ For capturing & displaying waveform manually



8. **Save / Recall Menu.** Push to save and recall setups, waveforms, and screen images to internal memory or a USB flash drive.



9. **Channel 1, 2, 3, or 4 Menu.** Push to set vertical parameters for input waveforms and to display or remove the corresponding waveform from the display.



10. **B1** or **B2**. Push to define and display a bus if you have the appropriate module application keys. The DPO3AUTO module supports CAN and LIN buses. The DPO3EMBD module supports I²C and SPI. The DPO3COMP module supports RS-232, RS-422, RS-485, and UART buses. The DPO3AUDIO module supports I²S, Left Justified (LJ), Right Justified (RJ), and TDM buses.

Also, push the **B1** or **B2** button to display or remove the corresponding bus from the display.

11. **R**. Push to manage reference waveforms, including the display or removal of each reference waveform from the display.

12. **M**. Push to manage the math waveform, including the display or removal of the math waveform from the display.



Using Other Controls

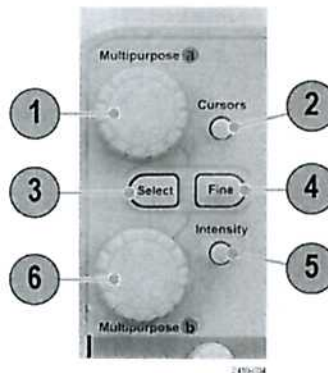
These buttons and knobs control waveforms, cursors, and other data input.

1. Turn the upper multipurpose knob **a**, when activated, to move a cursor, to set a numerical parameter value for a menu item, or to select from a pop-out list of choices. Push the **Fine** button to toggle between coarse and fine adjustment.

Screen icons tell you when **a** or **b** are active.

2. **Cursors**. Push once to activate the two vertical cursors. Push again to turn on the two vertical and two horizontal cursors. Push again to turn off all cursors.

When the cursors are on, you can turn the multipurpose knobs to control their position.



3. **Select.** Push to activate special functions.

For example, when using the two vertical cursors (and no horizontal ones are visible), you can push this button to link or unlink the cursors. When the two vertical and two horizontal cursors are both visible, you can push this button to make either the vertical cursors or the horizontal cursors active.

4. **Fine.** Push to toggle between making coarse and fine adjustments with the vertical and horizontal position knobs, the trigger level knob, and many operations of multipurpose knobs a and b.

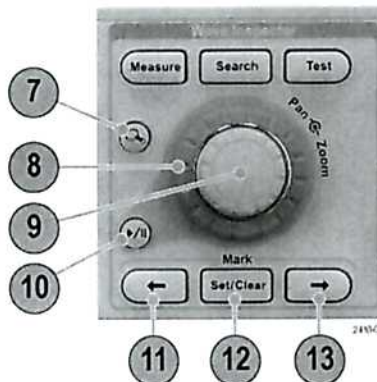
5. **Waveform Intensity.** Push to enable multipurpose knob a to control waveform display intensity and knob b to control graticule intensity.

6. Turn the lower multipurpose knob b, when activated, to move a cursor or set a numerical parameter value for a menu item. Push **Fine** to make adjustments more slowly.

7. **Zoom** button. Push to activate zoom mode.

8. **Pan** (outer knob). Turn to scroll the zoom window through the acquired waveform.

9. **Zoom** (inner knob). Turn to control the zoom factor. Turning it clockwise zooms in further. Turning it counterclockwise zooms out.



10. **Play-pause** button. Push to start or stop the automatic panning of a waveform. Control the speed and direction with the pan knob.

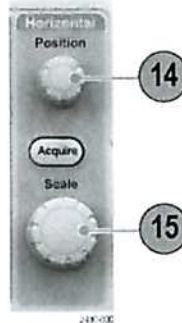
11. **← Prev.** Push to jump to the previous waveform mark.

12. **Set/Clear Mark.** Push to establish or delete a waveform mark.

13. **→ Next.** Push to jump to the next waveform mark.

14. **Horizontal Position.** Turn to adjust the trigger point location relative to the acquired waveforms. Push **Fine** to make smaller adjustments.

15. **Horizontal Scale.** Turn to adjust the horizontal scale (time/division).

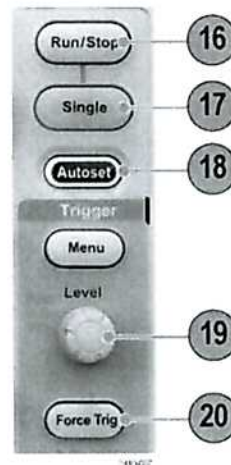


16. **Run/Stop.** Push to start or stop acquisitions.

17. **Single.** Push to make a single acquisition.

18. **Autoset.** Push to automatically set the vertical, horizontal, and trigger controls for a usable, stable display.

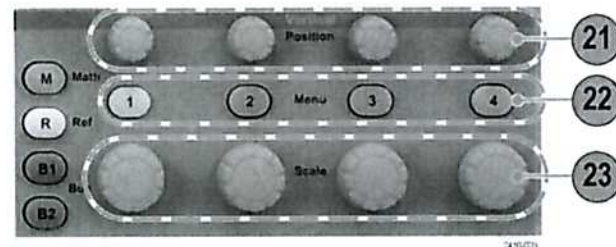
19. **Trigger Level.** Turn to adjust the trigger level.
Push this button to set the trigger level to the midpoint of the waveform.



20. **Force Trig.** Push to force an immediate trigger event.

21. **Vertical Position.** Turn to adjust the vertical position of the corresponding waveform. Push **Fine** to make smaller adjustments.

22. **1, 2, 3, 4.** Push to display or remove the corresponding waveform from the display and access the vertical menu.



23. **Vertical Scale.** Turn to adjust the vertical scale factor of the corresponding waveform (volts/division).

24. **Print.** Push to print a screen image using the printer selected in the Utility menu. (See page 128, *Printing a Hard Copy.*)

25. **Power switch.** Push to power on or off the instrument.



26. **USB 2.0 host port.** Insert a USB cable here to connect peripherals to the oscilloscope, such as a keyboard, a printer, or a flash drive. There is one more USB 2.0 host port on the rear panel.

27. **Save.** Push to perform an immediate save operation. The save operation uses the current save parameters, as defined in the Save / Recall menu.

28. **Default Setup.** Push to perform an immediate restore of the oscilloscope to the default settings.

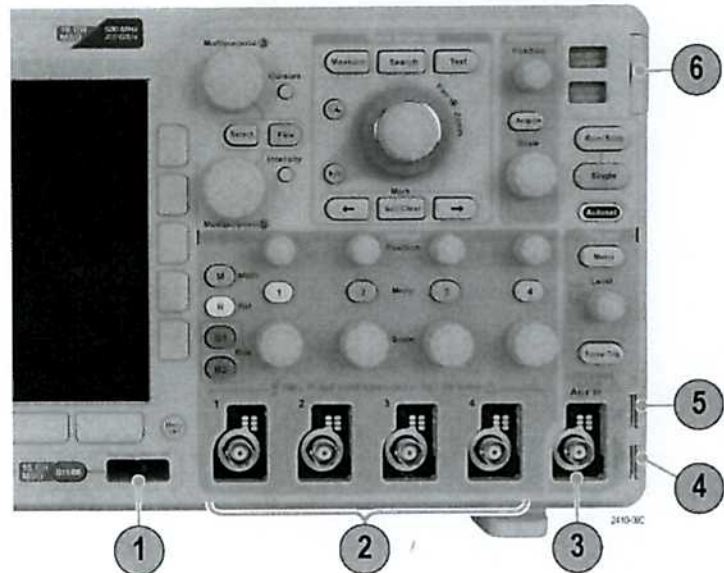
29. **D15 - D0.** Push to display or remove the digital channels from the display, and to access the digital channel setup menu (MSO3000 Series only).

30. *Menu off - push to clear a displayed menu from the screen.*

- ~~18. The bus display shows decoded packet level information for serial buses or for parallel buses (MSO3000 Series only). The bus indicator shows the bus number and bus type.~~

Front-Panel Connectors

1. Input Range +30 V to -20 V connector for the P6316 digital probe on MSO3000 models only.
2. Channel 1, 2, (3, 4). Channel inputs with the TekVPI Versatile Probe Interface.
3. **Aux In.** Trigger level range is adjustable from +8 V to -8 V. The maximum input voltage is 450V peak, 300V RMS. Input resistance is $1\text{ M}\Omega \pm 1\%$ in parallel with $11.5\text{ pF} \pm 2\text{ pF}$.
4. **PROBE COMP.** Square wave signal source to compensate probes. Output voltage: 0 - 2.5V, amplitude $\pm 1\%$ behind $1\text{ k}\Omega \pm 2\%$. Frequency: 1 kHz.
5. Ground.
6. Application Module Slots.



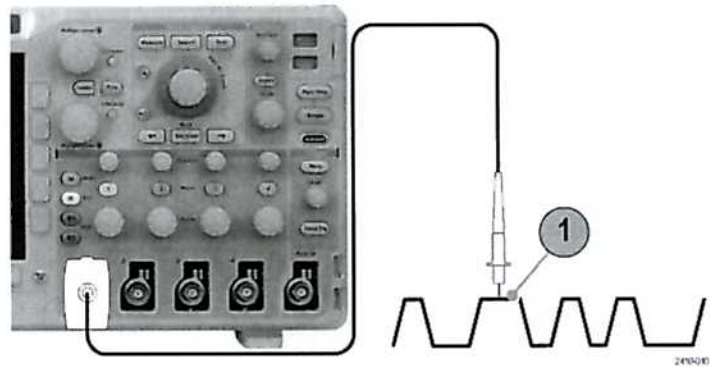
Acquire the Signal

This section describes concepts of and procedures for setting up the oscilloscope to acquire the signal as you want it to.

Setting Up Analog Channels

Use front-panel buttons and knobs to set up your instrument to acquire signals using the analog channels.

1. Connect the P6139A or TekVPI probe to the input signal source.

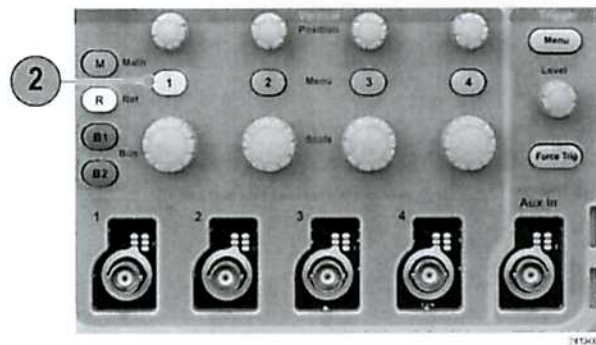


2. Push Default Setup.



3. Select the input channel by pushing the front-panel buttons.

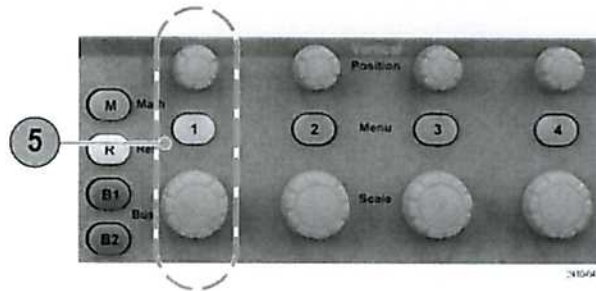
NOTE. If you are using a probe that does not supply probe encoding, set the attenuation (probe factor) on the oscilloscope vertical menu for the channel to match the probe.



4. Push Autoset.



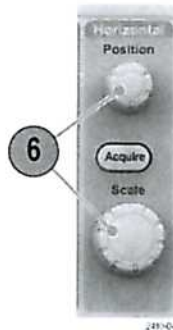
5. Push the desired channel button. Then adjust the vertical position and scale.



6. Adjust the horizontal position and scale.

The horizontal position determines the number of pretrigger and posttrigger samples.

The horizontal scale determines the size of the acquisition window relative to the waveform. You can scale the window to contain a waveform edge, a cycle, several cycles, or thousands of cycles.



Quick Tip

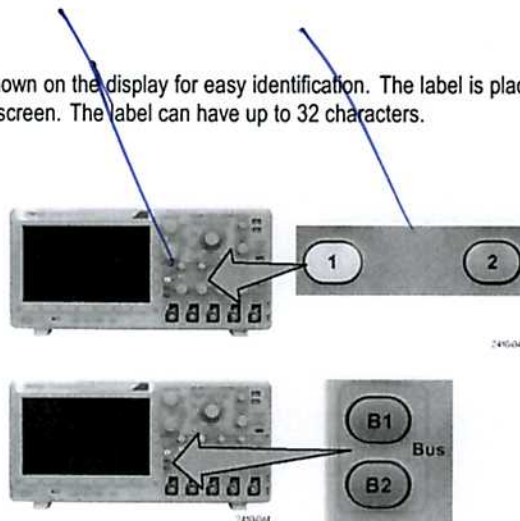
- Use the zoom feature to see multiple cycles of your signal in the upper part of the display, and a single cycle in the lower part of the display. (See page 114, *Using Wave Inspector to Manage Long Record Length Waveforms.*)

Labeling Channels and Buses

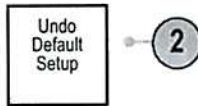
You can add a label to the channels and buses shown on the display for easy identification. The label is placed on the waveform baseline indicator in the left side of the screen. The label can have up to 32 characters.

To label a channel or bus, follow these steps:

1. Push a front panel button for an input channel or a bus.



2. If you change your mind, push **Undo Default Setup** to undo the last default setup.

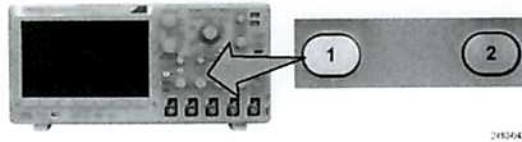


Using Autoset

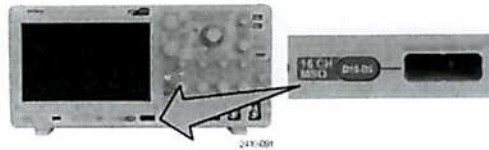
Autoset adjusts the instrument (acquisition, horizontal, trigger, and vertical controls) such that it displays four or five waveform cycles for analog channels with the trigger near the midlevel, and ten cycles for digital channels.

Autoset works with both the analog and digital channels.

1. Connect the analog probe, and then select the input channel. (See page 44, *Setting Up Analog Channels*.)



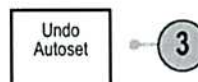
Connect the digital probe and select the input channel. (See page 63, *Setting Up Digital Channels*.)



2. Push **Autoset** to execute an Autoset.



3. If desired, push **Undo Autoset** to undo the last Autoset.



You can also disable the Autoset function if you want to set up a waveform manually. To disable or enable the Autoset function:

1. Push and hold **Autoset**.



2. Push and hold **Menu Off**.



Constant Voltage Operation

To set up the power supply for constant voltage (CV) operation, proceed as follows.

1 Connect a load to the desired output terminals.

With power-off, connect a load to the desired output terminals.

Power

2 Turn on the power supply.

The power supply will go into the *power-on / reset* state; all outputs are disabled (the **OFF** annunciator turns on); the display is selected for the +6V supply (the +6V annunciator turns on); and the knob is selected for *voltage* control.

Output On/Off

3 Enable the outputs.

The **OFF** annunciator turns off and the +6V and CV annunciators are lit. The *blinking* digit can be adjusted by turning the knob. Notice that the display is in the meter mode. "Meter mode" means that the display shows the actual output voltage and current.


To set up the power supply for +25V supply or -25V supply operation, you should press the (+25V) or (-25V) key to select the display and adjust for +25V supply or -25V supply before proceeding to the next step.

Display Limit


4 Set the display for the limit mode.

Notice that the **Lmt** annunciator blinks, indicating that the display is in the limit mode. When the display is in the *limit* mode, you can see the voltage and current limit values of the selected supply.

In constant voltage mode, the voltage values between the meter mode and limit mode are the same, but the current values are not. Further if the display is in the meter mode, you cannot see the change of current limit value when adjusting the knob. We recommend that you should set the display to "limit" mode to see the change of current limit value in the constant voltage mode whenever adjusting the knob.

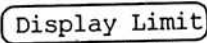
5 Adjust the knob for the desired current limit.  ¹

Check that the **Lmt** annunciator still blinks. Set the knob for *current* control. The second digit of ammeter will be *blinking*. Adjust the knob to the desired current limit.

6 Adjust the knob for the desired output voltage.  ¹

Set the knob for *voltage* control. The second digit of the voltmeter will be *blinking*. Adjust the knob to the desired output voltage.

7 Return to the meter mode.

Press the  key or let the display time-out after several seconds to return to the meter mode. Notice that the **Lmt** annunciator turns off and the display returns to the meter mode. In the *meter* mode, the display shows the actual output voltage and current of the selected supply.

8 Verify that the power supply is in the constant voltage mode.

If you operate the +6V supply in the constant voltage (CV) mode, verify that **CV** and **+6V** annunciators are lit. If you operate the power supply for the +25V supply or the -25V supply, the **+25V** or **-25V** annunciator will turn on. If the **CC** annunciator is lit, choose a *higher* current limit.

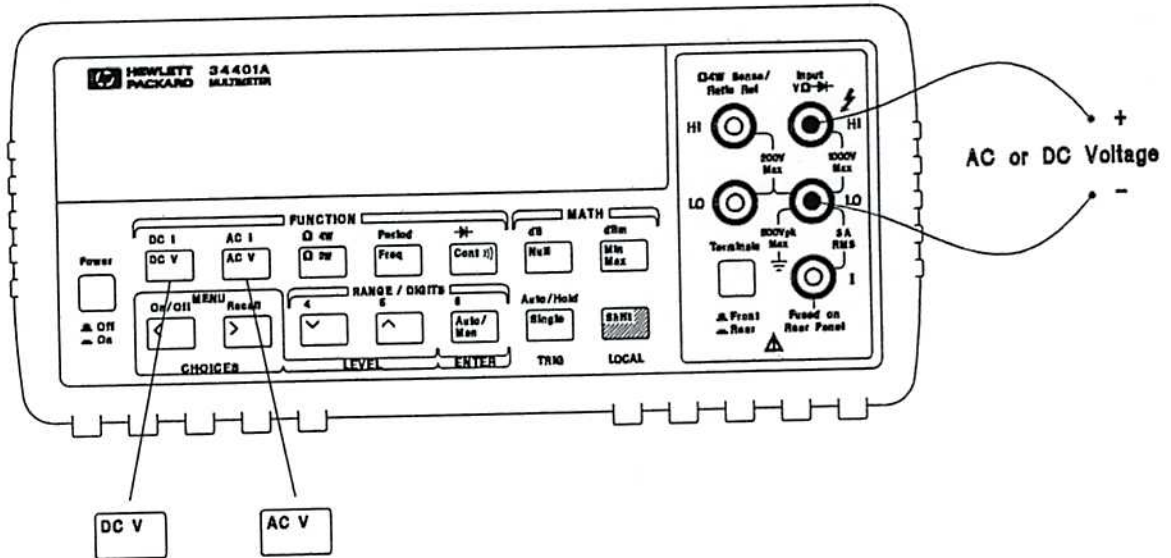
Note

During actual CV operation, if a load change causes the current limit to be exceeded, the power supply will automatically crossover to the constant current mode at the preset current limit and the output voltage will drop proportionately.

¹You can use the resolution selection keys to move the blinking digit to the right or left when setting the voltage and current.

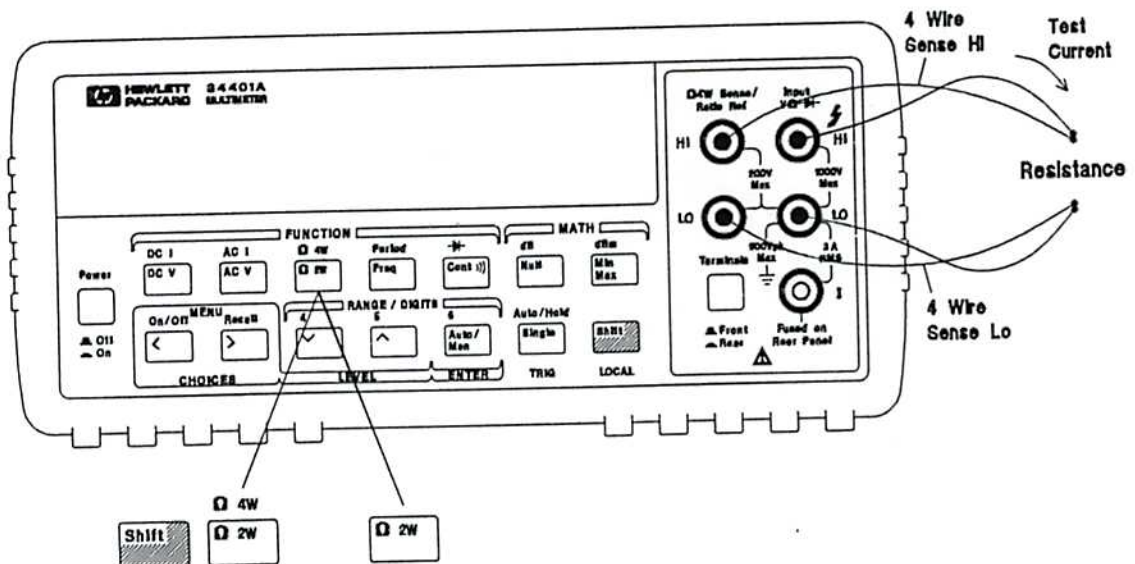
To Measure Voltage

Ranges: 100 mV, 1 V, 10 V, 100 V, 1000 V (750 Vac)
 Maximum resolution: 100 nV (on 100 mV range)
 AC technique: true RMS, ac-coupled



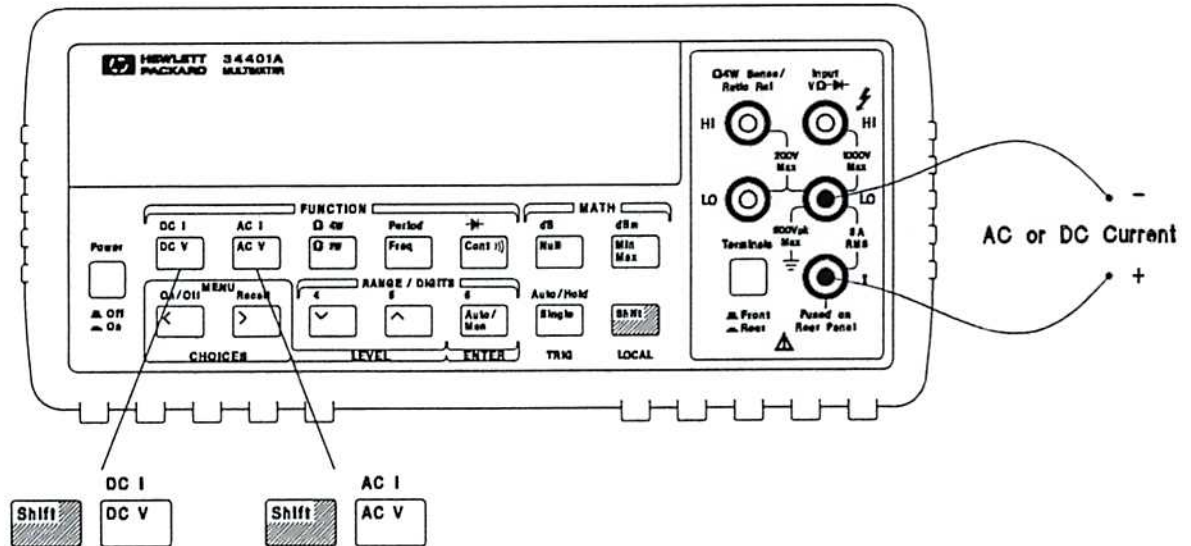
To Measure Resistance

Ranges: 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ, 10 MΩ, 100 MΩ
 Maximum resolution: 100 μΩ (on 100 ohm range)



To Measure Current

Ranges: 10 mA (dc only), 100 mA (dc only), 1 A , 3 A
Maximum resolution: 10 nA (on 10 mA range)
AC technique: true RMS, ac-coupled



To Measure Frequency (or Period)

Measurement band: 3 Hz to 300 kHz (0.33 sec to 3.3 μ sec)
Input signal range: 100 mVac to 750 Vac
Technique: reciprocal counting

