

**QUICK GUIDE TO USING
THE ELECTRONICS LABORATORY EQUIPMENT**

by

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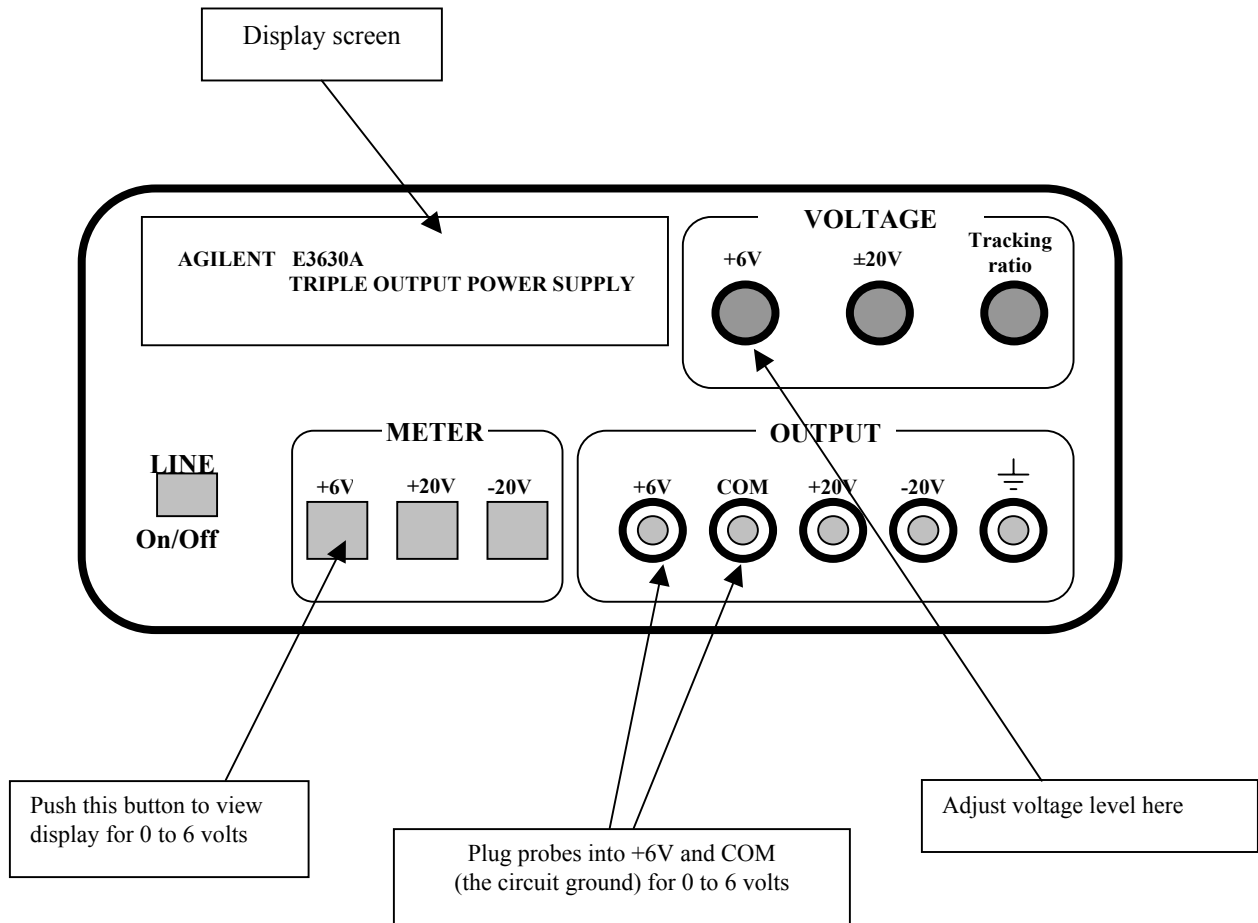
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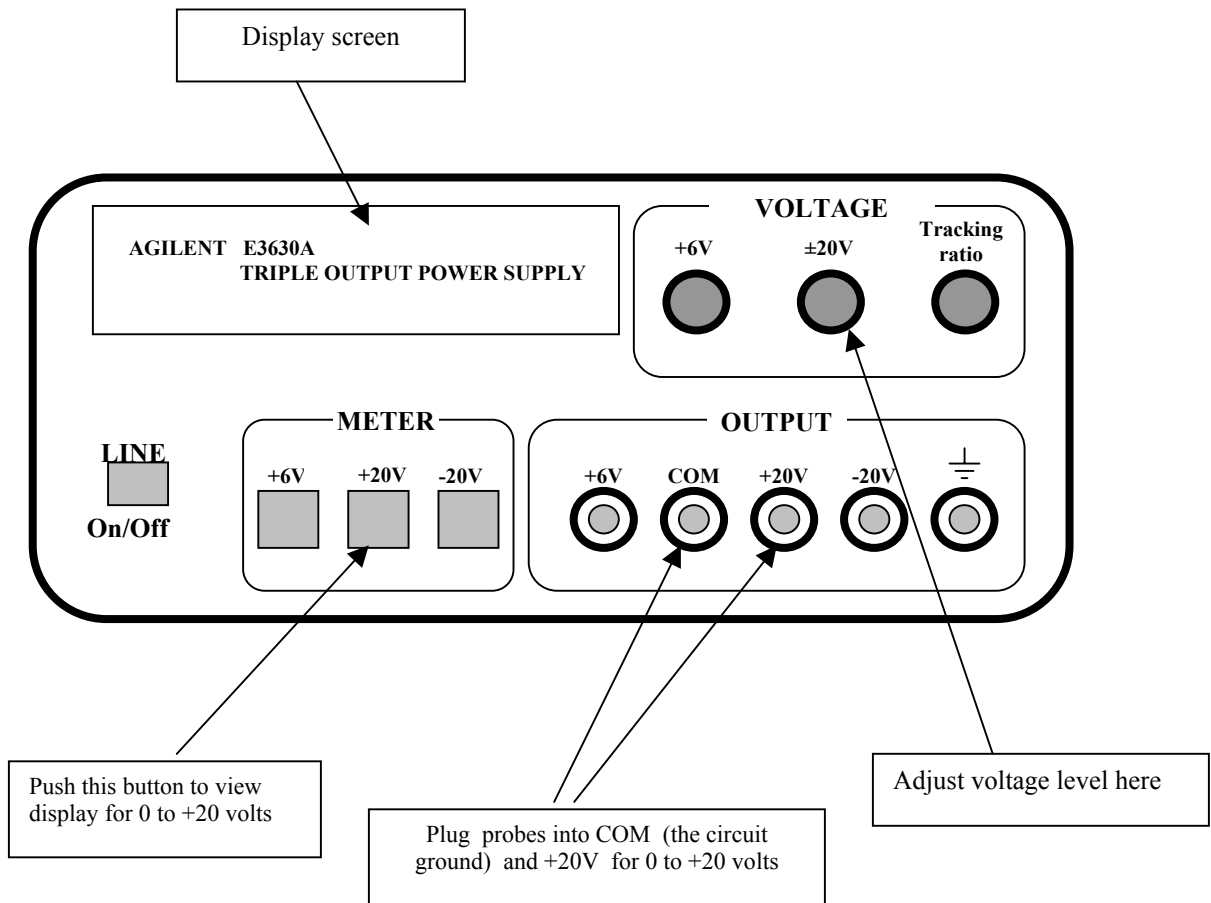
POWER SUPPLY

USING THE 6 VOLT ADJUSTABLE SINGLE SUPPLY



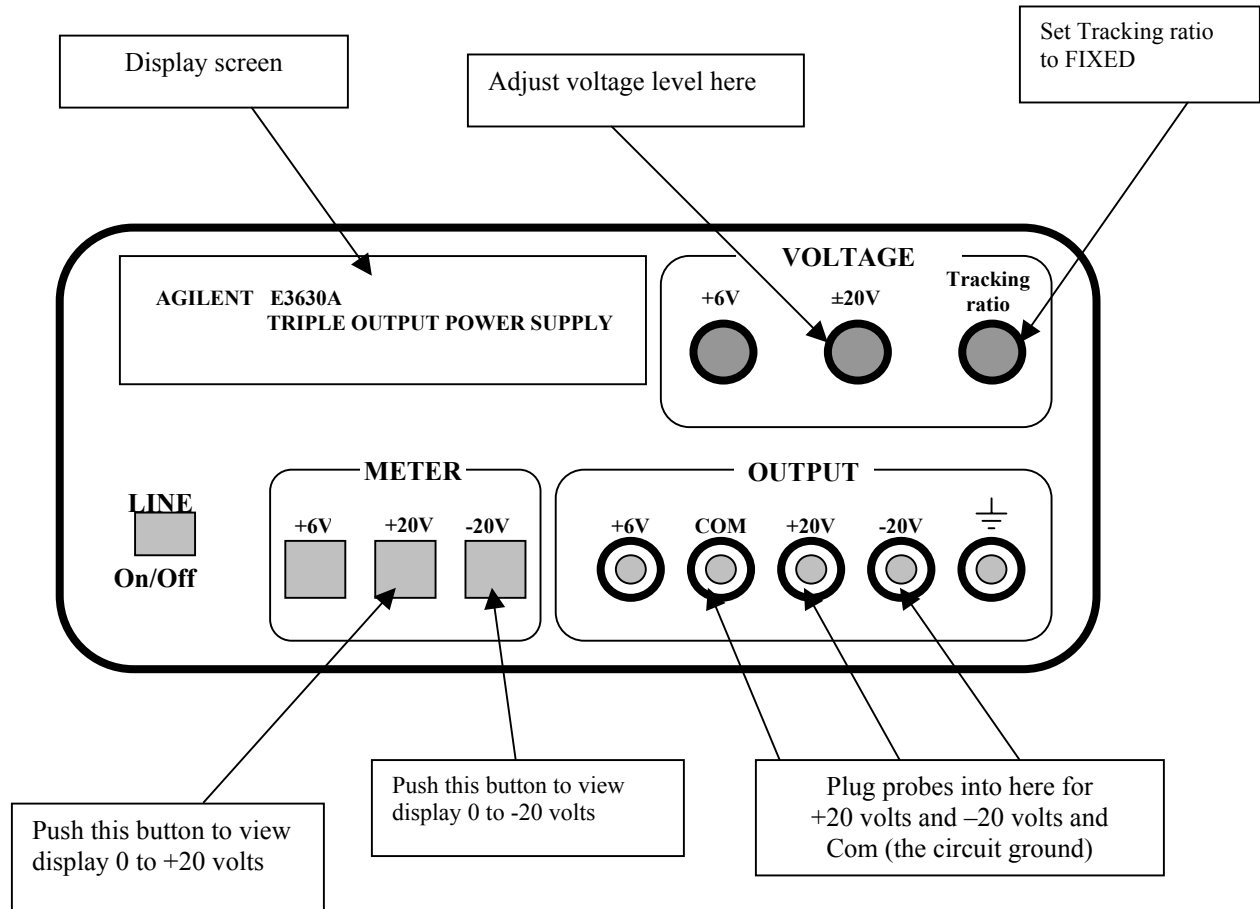
- Plug probes into the **+6V** terminal and the **COM** terminal (the circuit ground) of the **OUTPUT**.
- Push the **+6V** button to enable the 0 to 6 volt power supply.
- Adjust the **+6V** knob for the desired voltage output between 0 and 6 volts.
- View voltage output on display screen.

USING THE 20 VOLT ADJUSTABLE SINGLE SUPPLY



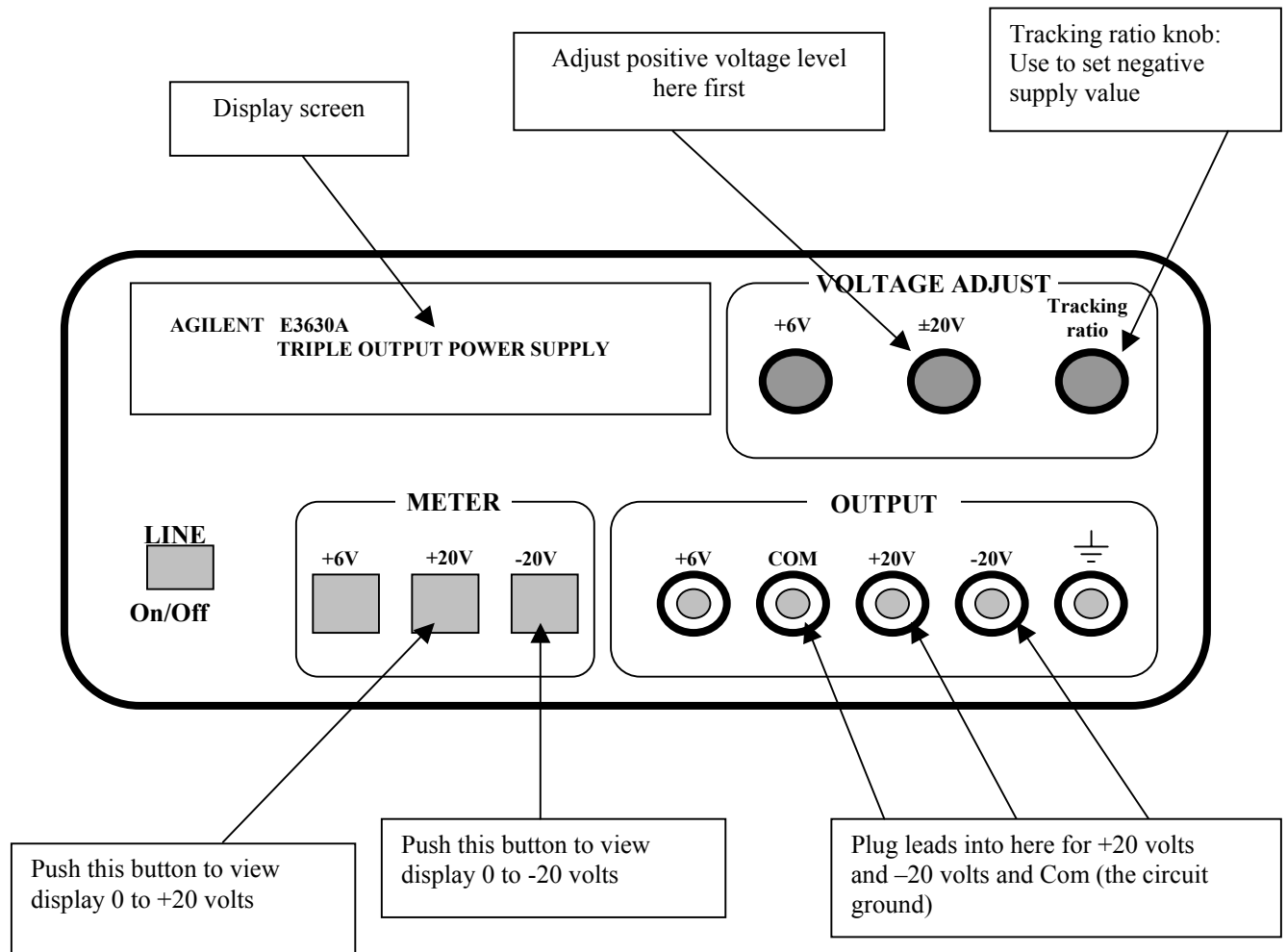
- Plug probes into the **COM** terminal and the **+20V** terminal of the **OUTPUT**.
- Push the **+20V** button to enable the 0 to +20 volt power supply.
- Adjust the **+20V** knob for the desired voltage output between 0 and +20 volts.
- View voltage measurement on display screen.

USING DUAL (± 0 to 20 Volt) POWER SUPPLY with FIXED TRACKING RATIO



- The purpose of having a fixed tracking ratio is to maintain a minus voltage that is the same as the plus voltage with respect to the Common (COM).
- Make sure the **Tracking ratio** knob on the Power Supply is set to **Fixed**, to ensure that the \pm voltage supplies track each other as the voltage is varied.
- Plug three probes into the **+20V** terminal, the **-20V** terminal and the **COM** terminal of the **OUTPUT**.
- Vary the voltage using the **$\pm 20V$** knob.
- View the positive supply by pressing the **+20V** button, then view the negative voltage supply by pressing the **-20V** button; they will be at the same voltage but opposite polarities.

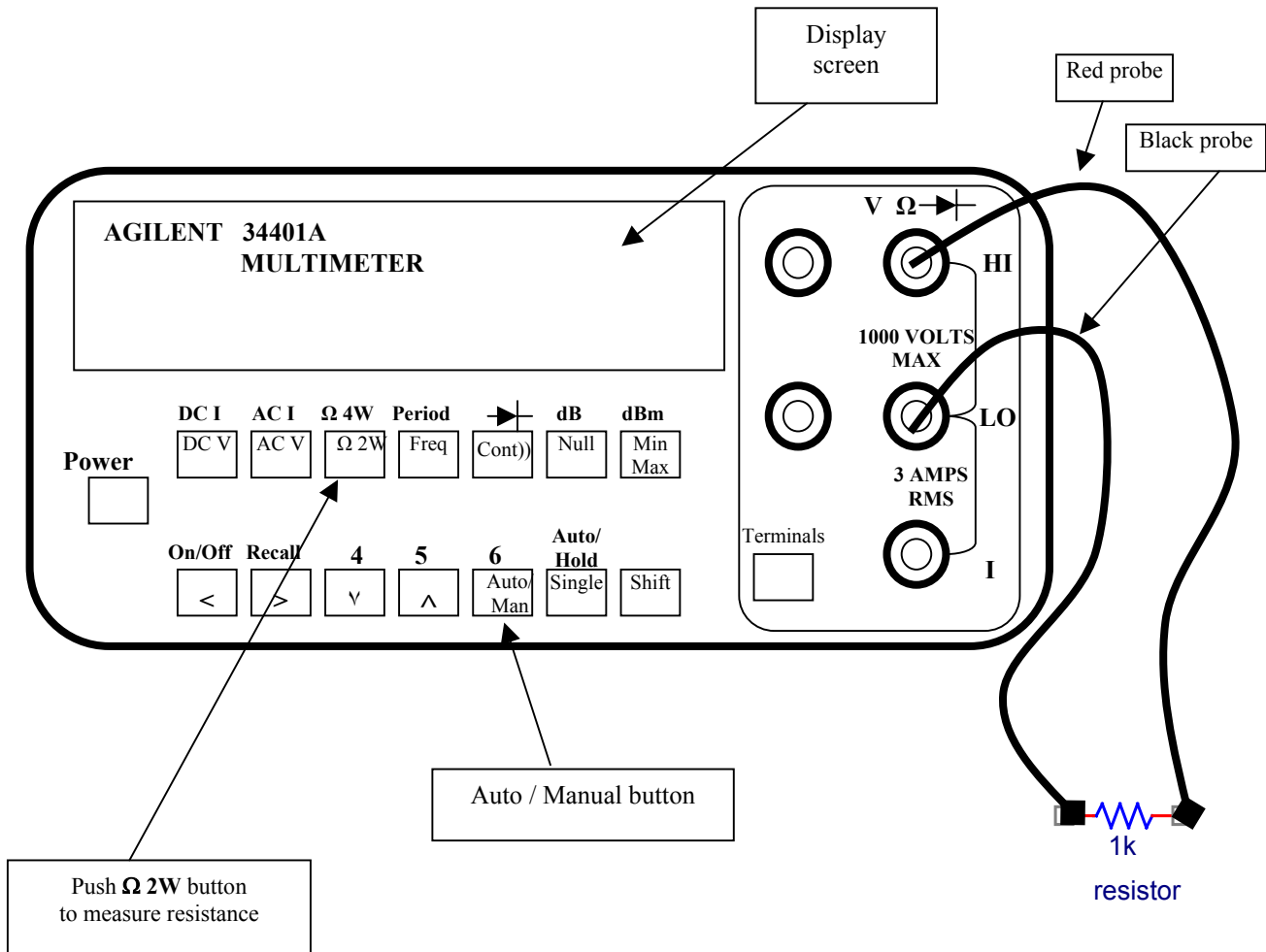
USING DUAL (± 0 to 20 Volt) POWER SUPPLY with TRACKING RATIO



- The **Tracking ratio** knob enables the plus / minus voltage supplies to track each other in a constant ratio as the positive voltage is varied; this is useful when the negative supply is different from the positive supply.
- For example, if the positive voltage supply is set to +20 Volts using the **$\pm 20V$** knob and the negative voltage supply is set to -10 Volts using the **Tracking ratio** knob, then we have established a ratio of 2:1, with the positive voltage equal to twice the negative voltage.
- Without altering the Tracking ratio knob, adjust the positive voltage supply from +20 Volts to +10 Volts using the **$\pm 20V$** knob, and observe (by pressing the **-20V** button) that the negative power supply is now -5 Volts, thus maintaining a ratio of 2:1 with positive voltage supply still twice the negative voltage supply.

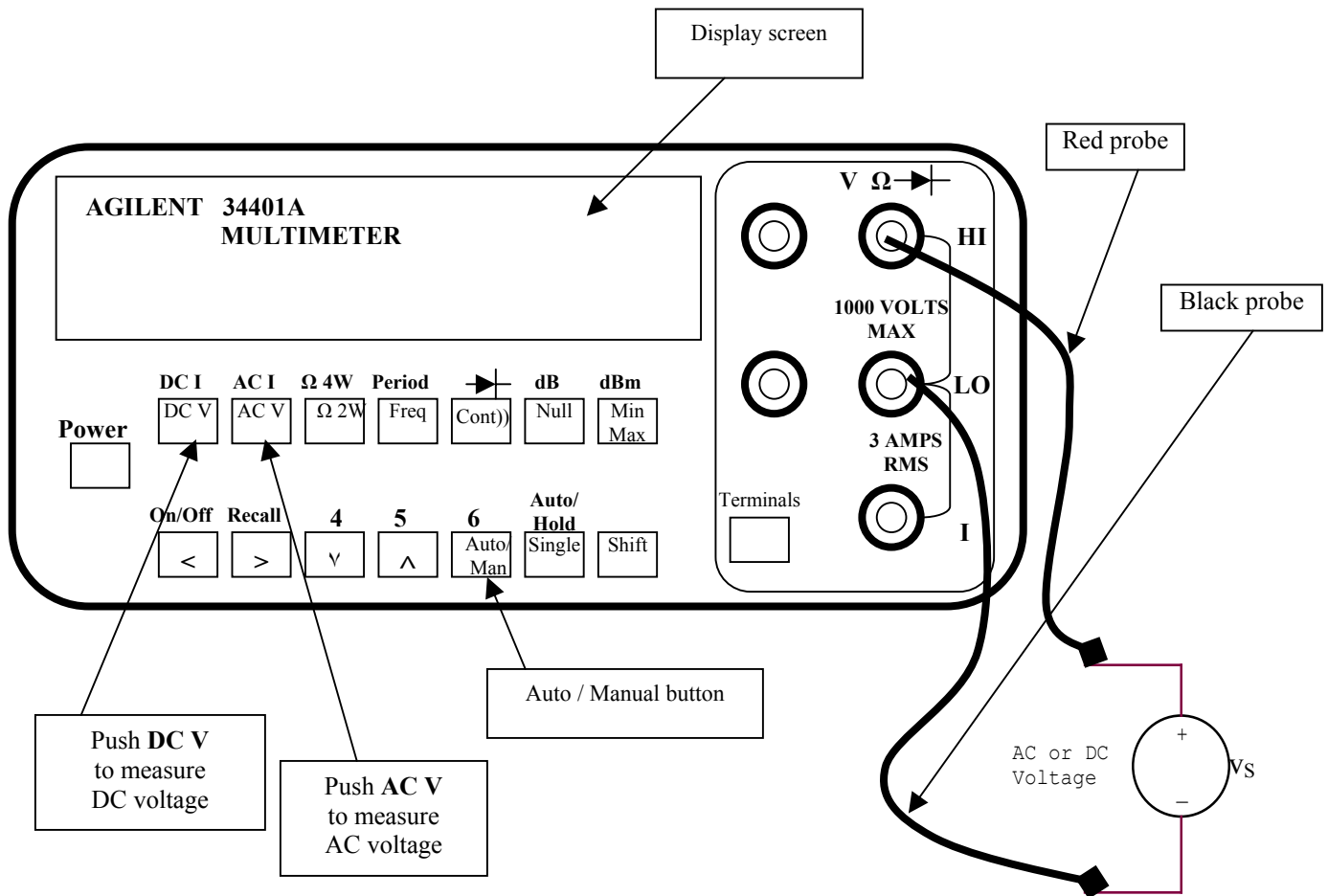
MULTIMETER

MEASURING RESISTANCE



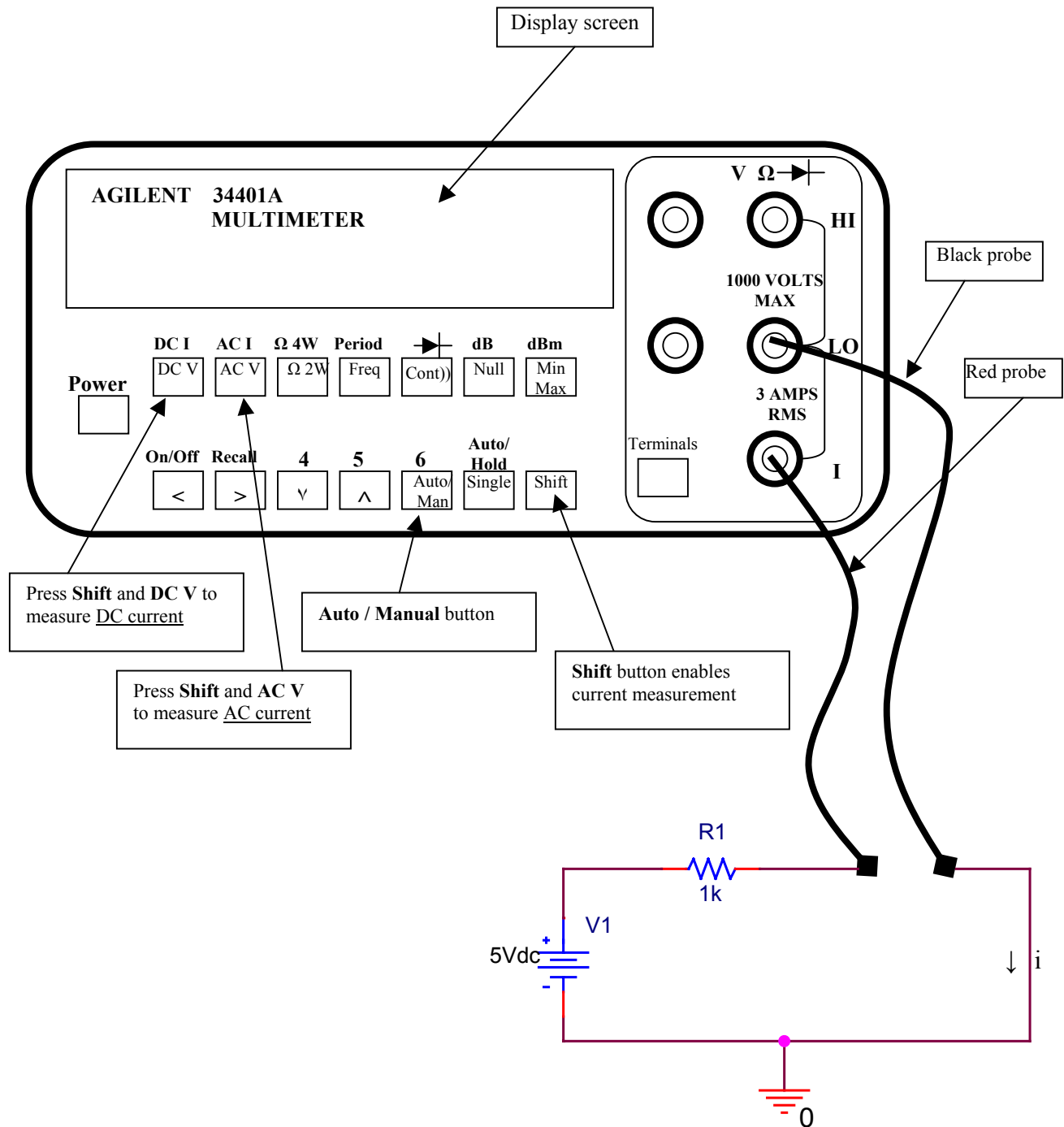
- Plug the red probe into the red terminal **V Ω** labeled **HI** and the black probe into the black terminal labeled **LO**.
- Make sure **Terminals** button is set to the “Out” position for front connecting terminals.
- Press **Ω 2W** button to measure resistance.
- Press **Auto / Man** button so that the “**Man**” disappears from the display; the automatic mode is now in effect.
- Place probes across resistor, then view the resistance value on the display screen.

MEASURING VOLTAGE



- Plug the red probe into the red terminal **VΩ** labeled **HI** and the black probe into the black terminal labeled **LO**.
- Make sure **Terminals** button is set to the “Out” position for front connecting terminals.
- Press **DC V** button to measure DC voltage (or press **AC V** button to measure AC voltage).
- Press **Auto / Man** button so that the “**Man**” disappears from the display; the automatic mode is now in effect.
- Measure the power source with the probes, then view the voltage measurement on the display screen.

MEASURING CURRENT

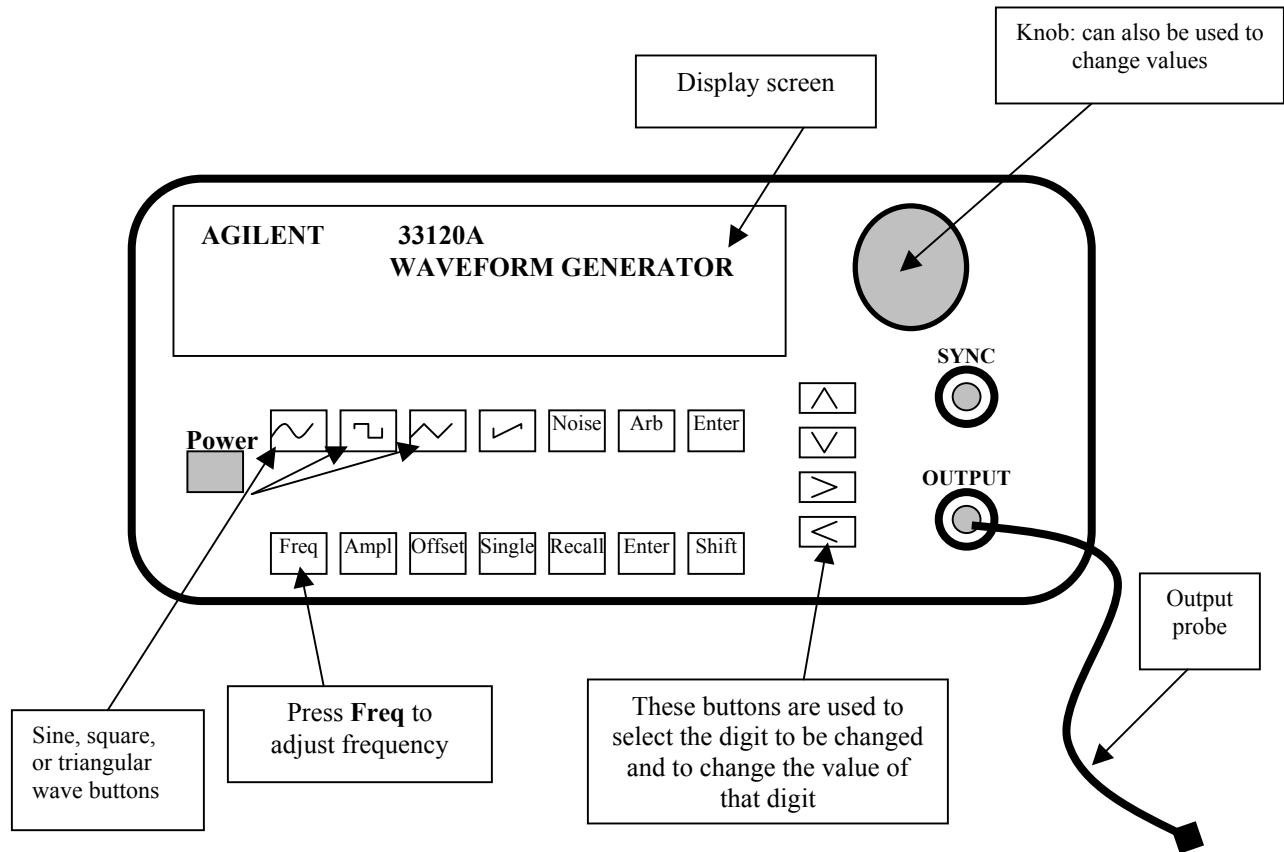


CAUTION: For current measurements, the probes must be in series with the load only and current limited to less than 3 amps. If the circuit draws 3 amps or more, a fuse will blow and disable the instrument.

- Insert the black probe into the black terminal labeled **LO**; then insert the red probe into the red terminal labeled **I** (at the bottom of the right-hand corner) for current measurements.
- Make sure **Terminals** button is set to the “Out” position for front connecting terminals.
- Press the **Shift** button and the **DC V** button to measure DC current.
- Press the **Shift** button and the **AC V** button to measure AC current.
- Press **Auto / Man** button so that the “**Man**” disappears from the display; the automatic mode is now in effect.
- Measure the current with probes in series with the load; then view the current measurement on the display screen.

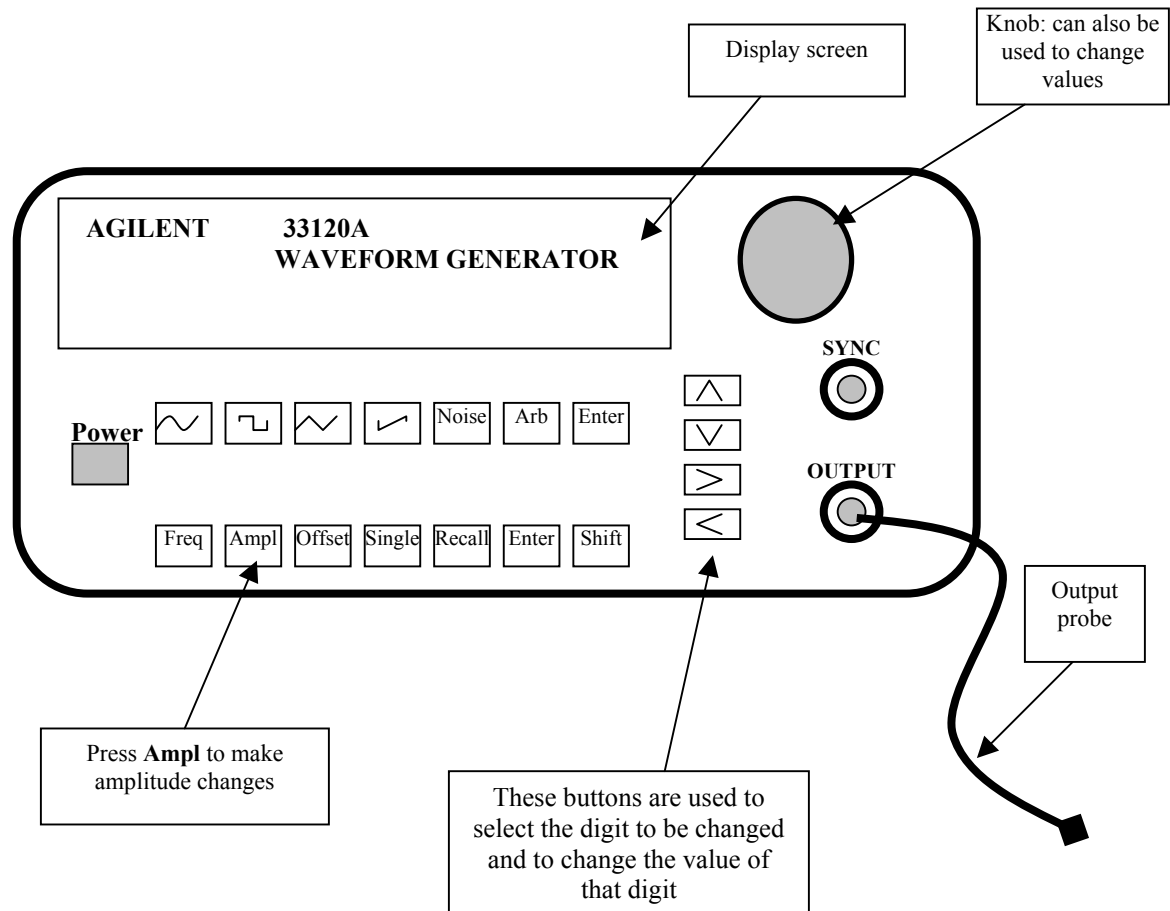
WAVEFORM GENERATOR

WAVEFORM TYPE AND FREQUENCY



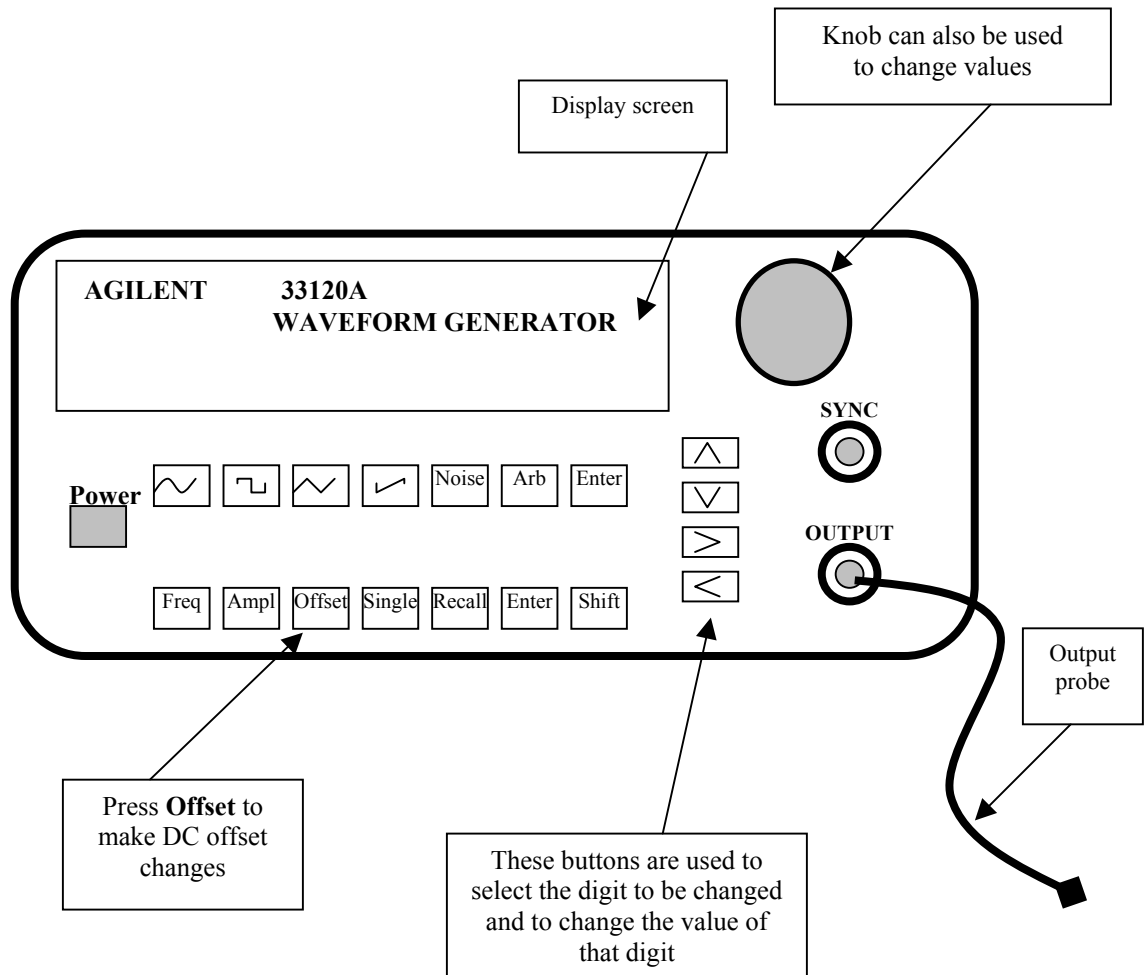
- Press the **sinewave** figure for a sine wave, or press **squarewave** figure for square wave, or press **triangularwave** figure for triangle wave. Press the **Freq** button to adjust frequency.
- Change the frequency digit by using the < or > button to highlight (blink) the digit to be changed. Use the ^ or v to change the value of the digit. You can also rotate the **knob** to change the value of the digit.
- Change the frequency range by using the < or > button to highlight the Hz, KHz, or MHz letters. Use the ^ or v to change the range.
- To turn off the flashing digit, move the cursor to the left of the display by using the < button. When the digit stops flashing, the frequency is “locked” which means that the knob no longer will change the frequency.

ADJUSTING THE AMPLITUDE OF THE WAVEFORM



- On the **Waveform Generator**, press the **Ampl** button for amplitude readings.
- Use the < or > button to highlight (blink) the digit to be changed. Use the ^ or v to change the value. The **knob** can also be rotated to change the value.
- Change to the desired amplitude.
- To turn off the flashing digit, move the cursor to the left of the display by using the < button. When the digit stops flashing, the amplitude is “locked” which means that the knob no longer will change the amplitude.

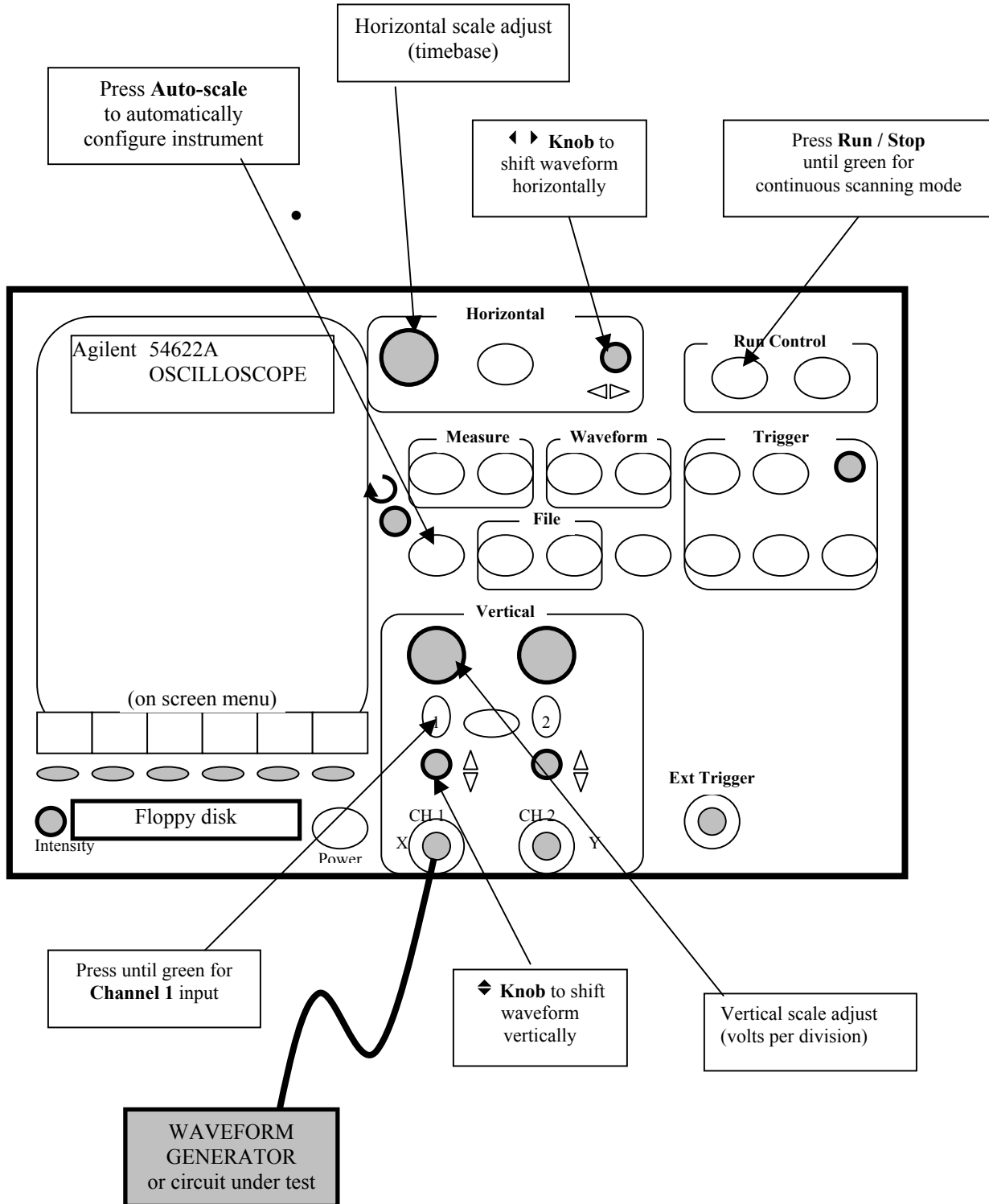
ADJUSTING THE DC OFFSET OF THE WAVEFORM



- Press the **Offset** button for DC offset readings.
- Use the < or > button to highlight (blink) the digit to be changed. Use the ^ or v to change the value. You can also rotate the **knob** to change the value.
- Change the DC offset as needed.
- To turn off the flashing digit, move the cursor to the left of the display by using the < button. When the digit stops flashing, the offset is “locked” which means that the knob no longer will change the offset.

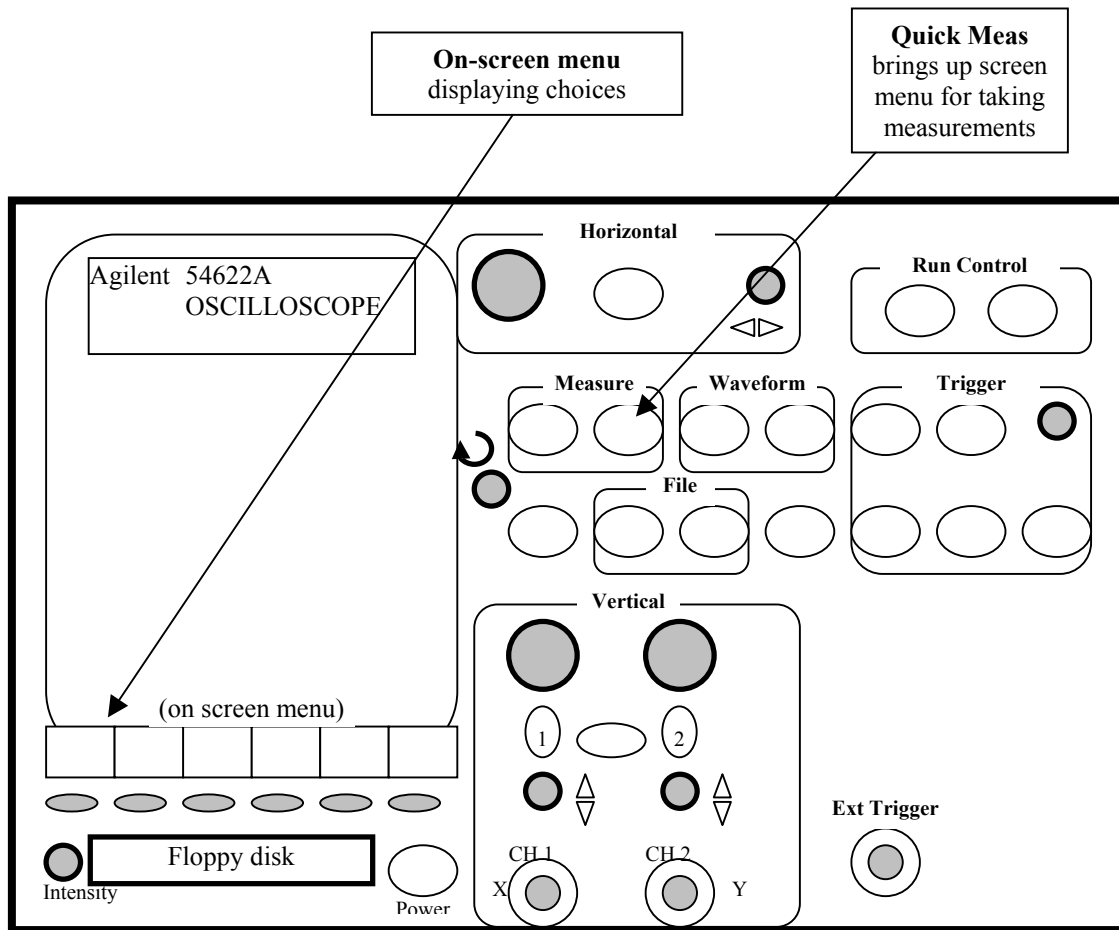
OSCILLOSCOPE

VIEWING A WAVEFORM USING CHANNEL 1



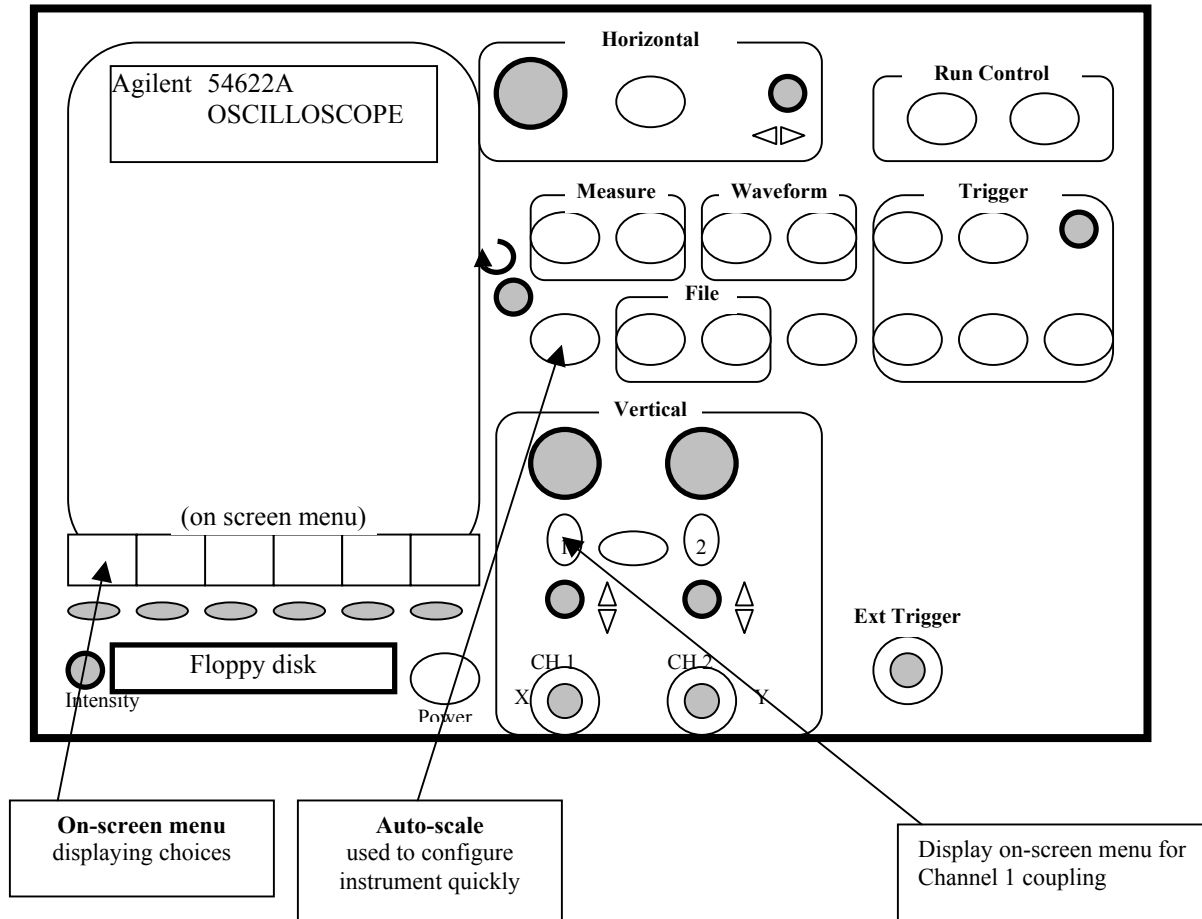
- Connect waveform generator or test circuit to Channel 1 input.
- To configure for continuous scanning mode, press **Run / Stop** button in the Run Control section so that it is green. Green indicates continuous scan. Red indicates stopped scan (waveform is “captured” and does not update).
- In the Vertical section of the controls, press the “**1**” button to enable Channel 1 input. It will turn green when enabled. Likewise for the Channel 2 button. To disable either Channel 1 or Channel 2, press the appropriate button until the green light goes out to disable that channel. Both channels can function at the same time, if dual trace is needed.
- To automatically set the amplitude and time scaling, press the **Auto-scale** button. The waveform should now be visible on the screen.
- The vertical scale (volts per division) of the waveform can be manually adjusted with the **5V 1mV** knob. The volts per division status is displayed at the top of the display screen.
- The horizontal scale (timebase) of the waveform can be manually adjusted with the **50s 5ns** knob. The time per division status is displayed at the top of the display screen.
- The waveform can be moved horizontally left and right with the ◀ ▶ knob and/or moved vertically up and down using the ⬆ knob. This is especially useful when using both Channel 1 and Channel 2 at the same time. Channel 1 can be moved up toward the top section of the display screen while Channel 2 can be moved toward the lower section of the display screen.

MEASURING A WAVEFORM USING QUICK MEAS



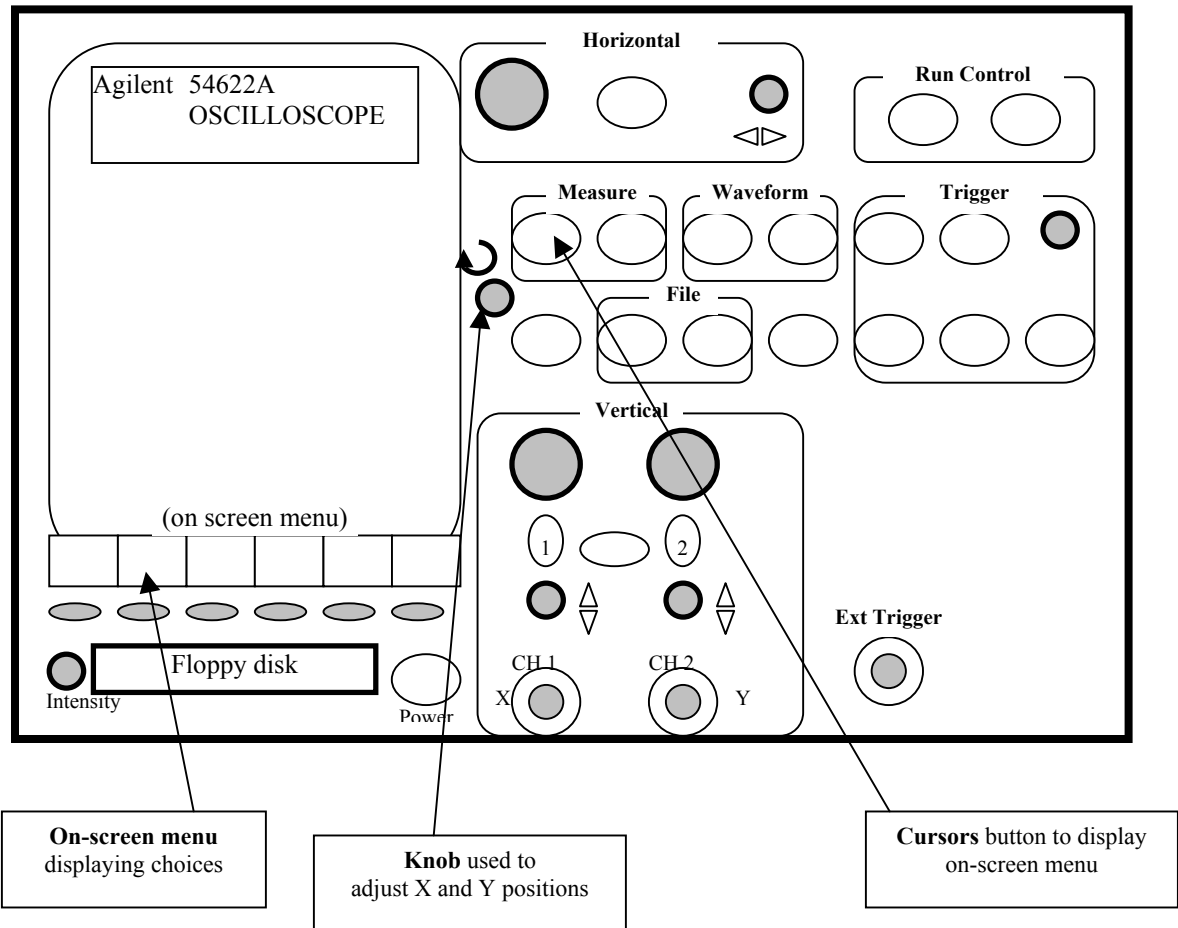
- When a waveform is displayed, measure the waveform by pressing the **Quick Meas** button to display the measurement options in the on-screen menu. In the on-screen menu, press the **Clear Meas** button to clear any previous measurements.
- Only three measurements can be displayed at a time. For example, in the on-screen menu, press **Frequency**, **Period**, and **Peak-Peak** to display those waveform measurements on the screen just above the on-screen menu.
- Second example: to display the frequency, risetime, and RMS voltage instead, first press **Clear Meas**. Then press **Frequency**. Go to next menu by pressing the arrow **➡**. Press **Rise Time**. Go to next menu by pressing the arrow **➡**. Press the **RMS** button. The three measurements desired are now displayed. Press the button **Quick Meas** to return to the first menu.

DC AND AC INPUT CHANNEL COUPLING



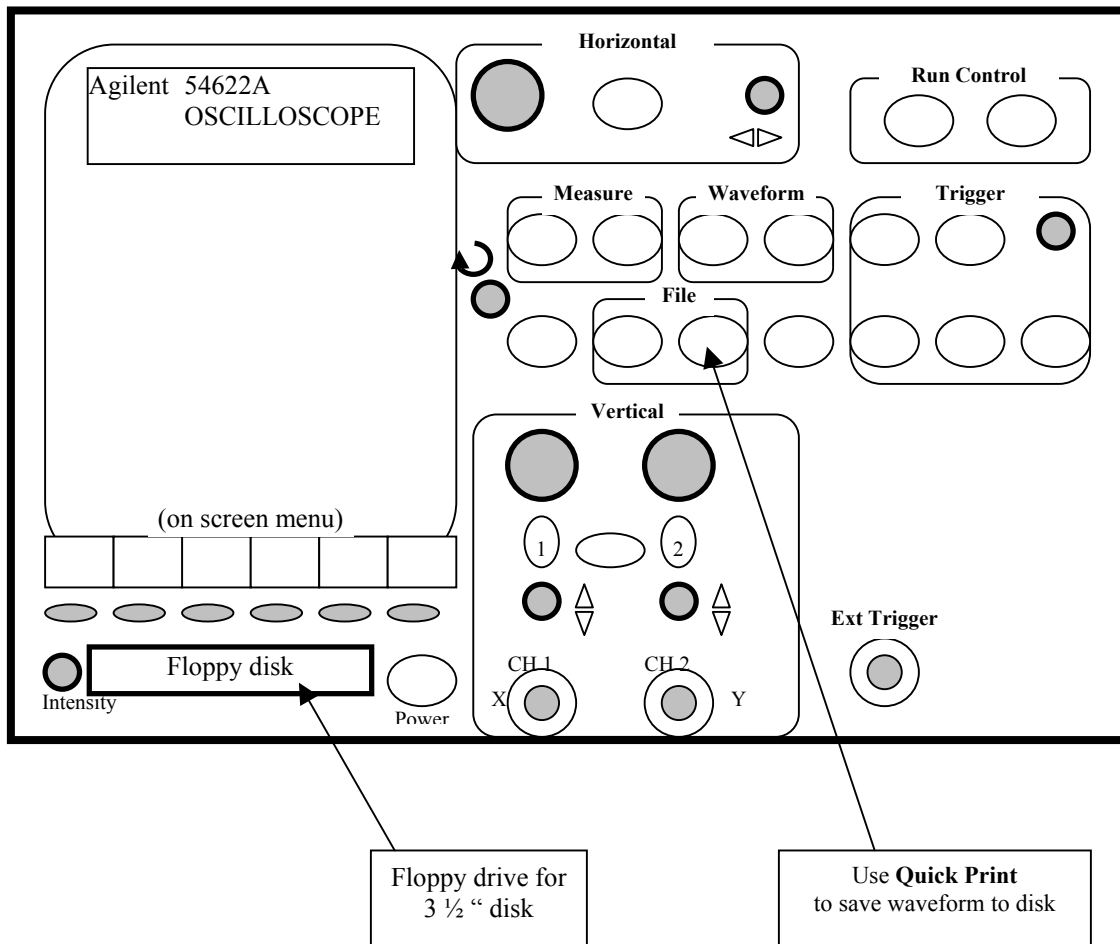
- Press the **1** button to display the Channel 1 menu. Press the **Coupling DC** button in the on-screen menu. Change to **Coupling AC** if desired by pressing the same button again.
- The procedure is the same for Channel 2 by pressing the **2** button.
- Press **Auto-scale** button to center the waveform on the screen regardless of the coupling.

USING CURSORS FOR CUSTOM VOLTAGE OR TIME MEASUREMENTS



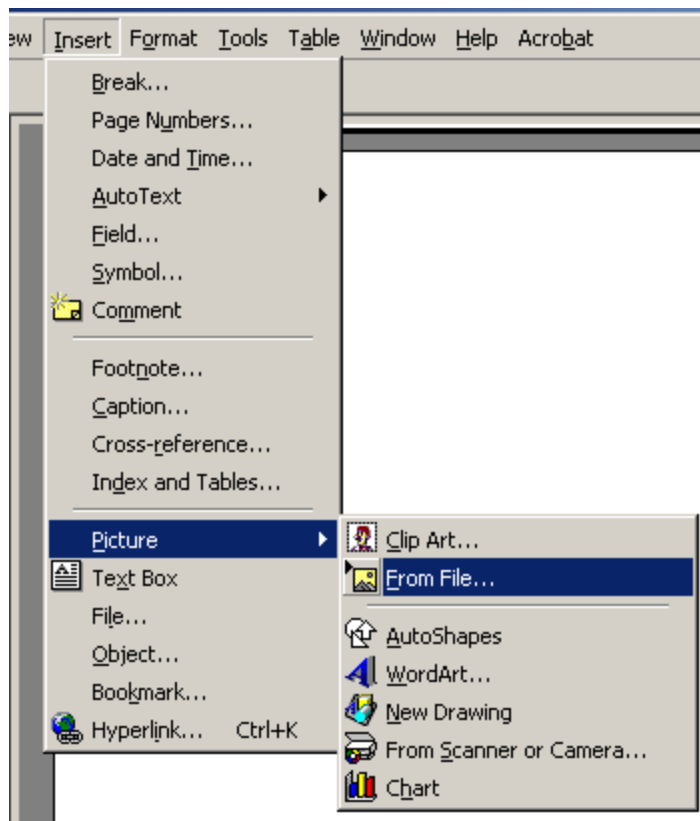
- Press the **Cursors** button to display the cursor menu.
- Press **X Y** button in the on-screen menu so that a check mark is displayed by the **X**. Press the button at the bottom of the menu for **X1**. Next use the knob ↻ to move the X1 cursor. Press the **X2** button and use the ↻ knob to move the X2 cursor.
- Press the button at the bottom of the on-screen menu so that a check mark is displayed by the **Y**. Y1 and Y2 can now be moved using the ↻ knob.
- The values **X1**, **X2**, **ΔX**, **1/ΔX**, and **ΔY** are displayed above the on-screen menu.

SAVING WAVEFORM TO DISK



- Initial setup to select the floppy disk and picture format.
 - Press the **Utility** button. In the on-screen menu, press **Print Config**. Press **Print to:** and choose **Disk** if it is not already chosen. Press **Format** button on the menu and choose **TIF image** if it is not already chosen.
- Before saving waveform to disk, it is a good idea to display the relevant measurements on the screen using the **Quick Meas** first, which will copy onto the floppy disk also.
- Insert disk into floppy drive.
- Press the **Quick Print** button to save the waveform to disk.
 - The file is automatically named PRINTS_xx.TIF, where xx starts with 01 and increments automatically for subsequent saves.

INSERTING WAVEFORM INTO WORD DOCUMENT



- Insert disk from the oscilloscope and put into your computer.
- Create a Word document. In the open Word document, go to the menu and **Insert** → **Picture** → **From File**.
- In the next screen it asks for a file name. Choose the floppy drive and select the file that has PRINTS_xx.tif, where xx is a number that was automatically assigned by the oscilloscope.
- Press **Insert**. The waveform will now be placed into your Word document. The figure can be resized by selecting the image with the cursor and dragging the corner “handle” inward toward the center to make the image smaller, or outward to make the image larger.