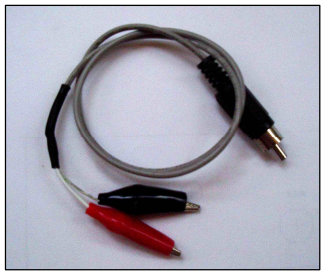
LCD Digital Storage Oscilloscope

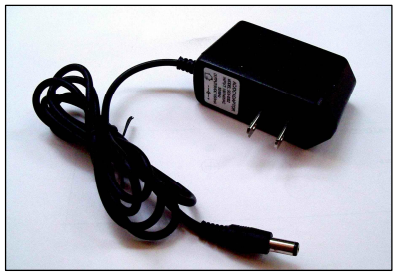
Operating Instructions

Model: 06203P, 06203KP, 06204KP

1. Accessories

1) Simple probe
2) AC/DC Power adapter (universal input voltage range)





2. Precautions

1) Do not apply voltage higher than the specified maximum input voltage to the instrument.

2) Do not attempt to directly measure wall power supply without a transformer.

3) Do not use power supply with voltage higher than 12V (DC or rms)

3. Panel Descriptions

Fig 1 shows the screen and various controls of the front panel. They are explained below.

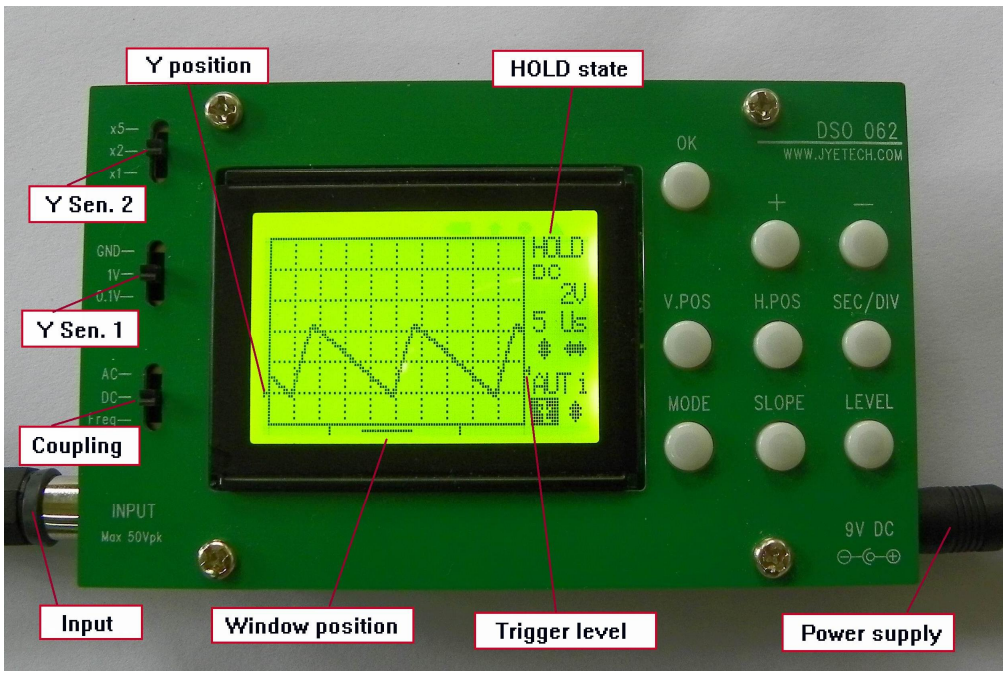


Fig. 1

Screen

1) Y position indicator – the left small triangle – shows 0V position
2) Trig level indicator – the small right triangle – shows trigger threshold voltage level
3) Window position indicator – indicates the displayed portion of sample memory.
4) "HOLD" is displayed when the oscilloscope is in HOLD state, which means capturing is halted until

HOLD state is released.

5) Scope setting indicators – their meanings are shown in Fig. 2.

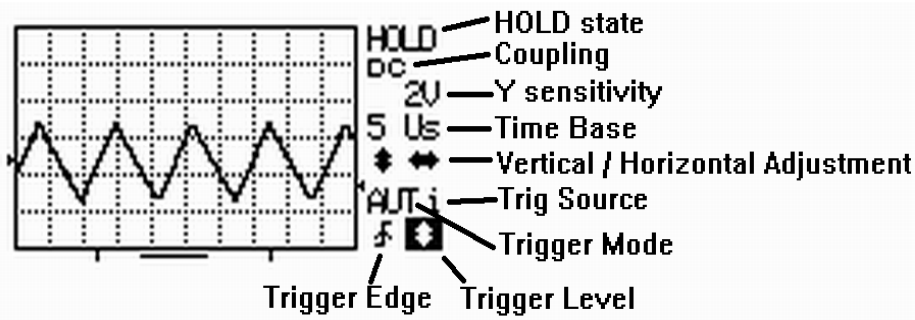


Fig. 2

Power Supply Connector

Located at bottom right of the panel. 9 – 12V DC power supply (minimum 300mA capacity) can be connected to this connector.

Signal Input Connector

Located at bottom left of the panel.

Coupling Select Switch

This switch selects the coupling method to be used, i.e. AC coupling or DC coupling. When "Freq. M." is selected, input is connected to frequency measurement circuit. The input to scope is internally disconnected.

Y Sensitivity Select Switches

There are two switches for Y sensitivity selection. The first one selects base value. The second selects multiplier. The two settings are combined to determine actual Y sensitivity. For example, when switch Y SEN. 1 is put at "0.1V" position and switch Y SEN 2 is placed at "X2" position, this means actual Y sensitivity is 0.2V per division.

SEC/DIV

Selects horizontal timebase. When this button is pressed, timebase display will be highlighted and timebase setting can be adjusted by pressing [+] and [-] buttons.

V.POS

Selects vertical position. When this button is pressed, the vertical position adjustment indicator will be highlighted and vertical position can be adjusted with [+] and [-] buttons.

H.POS

Selects horizontal position. When this button is pressed, horizontal position adjustment indicator will be highlighted and the displayed portion of capture buffer can be adjusted horizontally with [+] and [-] buttons.

MODE

Selects trig modes. When this button is pressed, trig mode adjustment indicator will be highlighted and trig mode can be selected with [+] and [-] buttons.

SLOPE

Selects trigger polarity. When this button is pressed, slope select indicator will be highlighted. Trigger slope will be toggled between rising and falling. Alternatively, trig slope can be changed with [+] and [-] buttons when the indicator is highlighted.

LEVEL

Selects trigger level. When this button is pressed, trig level adjustment indicator will be highlighted and trig level can be adjusted with [+] and [-] buttons. **Pressing this button again will select trig source between internal and external and enable/disable trig output.**

OK

Switches oscilloscope between HOLD and RUN states.

4. Multi-Function Terminal

The Multi-Function Terminal (M.F.T.) locates at the left edge of the main circuit board (see Fig. 3). It serves three purposes:

1) Test Signal output
2) External Trig input
3) Trig Output

The function of M.F.T. is selected by [LEVEL] key and indicated by the small letter at the right of trig mode indicator (see Fig. 2). The table below summarize the usages of M.F.T. and their relations.

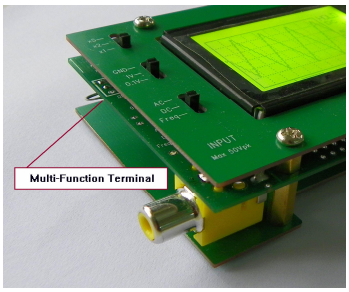


Fig. 3

Indicator	Trigger Source	Test Signal	Trig Output
" i "	Internal	Enabled	Disabled
" e "	External	Disabled	Disabled
" o "	Internal	Disabled	Enabled

5. Slide Switches And Their Indicators

The three slide switches at the left select Y sensitivity and coupling method. Usually their selections are reflected by indicators on screen automatically. **However, this will not happen instantly when NOR or SIG trig mode is selected and the scope is waiting for trig. Under such situation a button push or a trig is required to make indicators updated.**

6. General Measurement

Example 1 Observe the test signal (Practice for basic operations)

1) Connect power supply and probe.
2) Connect the red clip to the Test Signal (M.F.T.). Use [LEVEL] button to set trigger source to internal (letter 'i' is displayed).
3) Set Y sensitivity switch 1 (middle switch) to 1V position.
4) Set coupling switch to DC position.
5) Press [V.POS] button, adjust 0V indicator to the second to last vertical scale as shown in Fig. 4.
6) Press [SEC/DIV] button, set timebase to 1ms.
7) Set Y sensitivity switch 2 (top switch) to X2 position. Waveform similar to that shown in Fig. 4 should be seen.
8) Change position of Y sensitivity switch 2 and you should see that the waveform amplitude changes accordingly.
9) Change timebase setting to 0.5ms, for instance, and you should see the signal waveform is widened accordingly. Experiment with other settings.
10) Now, select AC with the coupling switch and you should see that the waveform is shifted down to a position where the Y Pos. indicator is at its mid point. What you see now is a pure alternating signal.

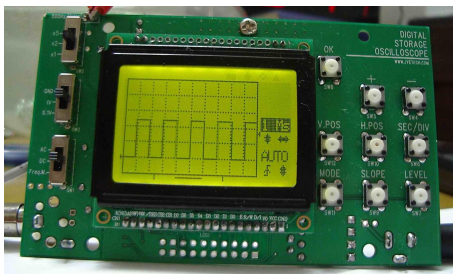


Fig. 4

Example 2 Observe saw signal (Learn how to use trigger modes)

Fig. 5 is a simple saw signal generator. We can use the scope to observe its output. Build the circuit according to Fig. 5 and connect power and scope.

1) Select DC coupling. Set Y sensitivity switch 1 to 1V position and Y sensitivity switch 2 to X2 position. Adjust the 0V point to the second to last vertical scale. Select 0.1ms timebase.
2) Connect probes as shown in Fig. 5. Power the circuit.. You should see a waveform similar to that shown in Fig. 6.
3) Select AUTO trigger mode and change the trigger level. You should be able to observe that the waveform stabilizes itself when it intersects with trigger level (internal trig source should be selected here). Otherwise, waveform would jump.

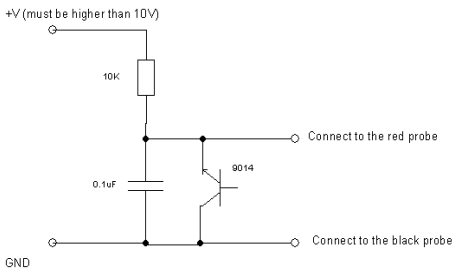


Fig. 5

4) Change the trigger mode to NORM and vary the trigger level. Notice that the waveforms only update when they intersect with the trigger level (internal trig source should be selected here). Otherwise, it remains unchanged.

5) Press [OK] to put the oscilloscope into the HOLD state. "HOLD" is displayed. Now you can shift the waveform back and forth to view the rest of the signal that is not shown before. Pressing [OK] again will release the HOLD state and put oscilloscope back to capture state.

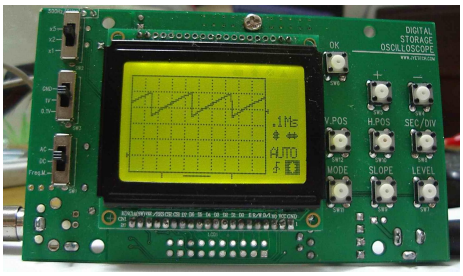


Fig. 6

7. How to Use the Frequency Meter

Place the coupling switch in the "Freq." position. The oscilloscope will automatically enter Frequency Meter mode. Signal frequency will be displayed. Please note that peak signal amplitude should not be less than 3V to ensure measurement is correct.

Place the switch away "Freq." Position will automatically switch the instrument back to Oscilloscope Mode.

8. How to Use External Trig

1) **Select trig source** Press [LEVEL] to highlight the trig level indicator. Press [LEVEL] again to select trig source. For the external trig push [LEVEL] button so that letter "e" is displayed.

2) **Connection of external trig signal** Connect external trig signal to M.F.T. pin 1 (or pin 2). Don't forget the ground connection which should be connected to pin 3 of M.F.T. Note: external trig signal amplitude should not exceed the allowed range of 0 - +15V.

3) Connect signal to be viewed to the scope input.

4) Adjust trig level to generate trigging.

Note: The trig level for external trig is independent of that for internal trig and does not relate to any Y sensitivity settings. Its minimum level is close to 0V (when the triangle is at the bottom position) and the maximum level is close to +5V (when the triangle is at the top position). To effectively use the external trig, users should have some idea about the frequency and amplitude of the external trig signal to be used.

9. How to Use Trig Output

The oscilloscope reuses the Test Signal output terminal as trig output terminal. When trig output is enabled the Test Signal is automatically disabled.

1) Enable trig output Press [LEVEL] so that trig level indicator is highlighted. Press [LEVEL] repeatedly so as the letter 'o' is displayed at the right of trig mode indicator (This is the same spot where trig source indicator displays). **Please note that when trig output is enabled trig source will be set to use internal and the Test Signal is disabled automatically.**

2) Use the signal The trig output is a signal with 5V in amplitude. Its normal (i.e. no trig happening) state is HIGH (+5V). It jumps to LOW (0V) at the moment when trig happens. So its negative going edge marks the time when trig is generated. This can be used as synchronous signal to trig another oscilloscope so as multi-channel measurement is fulfilled. The LOW level output will be kept to the start of next capture cycle.

10. How to Save Captures

Captured waveforms can be stored to on-chip EEPROM for later use. This can be done by:

1) Freeze the waveform you want to save by pressing [OK] (enter HOLD state).

2) Press [VPOS] and use [+] or [-] to select one of the 6 buffers.

3) Press [OK] to save the frozen waveform to the buffer selected.

11. How to Display Saved Captures

1) Enter HOLD state by pressing [OK].

2) Press [SLOPE] and use [+] or [-] to select the buffer to be displayed.

3) Press [OK] to display the waveform in the buffer selected.

12. How to Send Screen to PC as Bitmap File

The oscilloscope screen can be transferred to a PC as a bitmap file through a serial connection. The transfer protocol is Xmodem. Communication format is 38400bps, 8 data bits, 1 stop bit, no parity, no flow control. To do this, follow the steps below:

1) Connect the scope to PC. For connecting to a traditional serial port an TTL-to-RS232 level converter is needed. (Please refer to related documents and products at www.jyetech.com website for how to make a simple TTL-to-RS232 level converter). Or you can use an USB-Uart converter to connect the DSO to a virtual serial port via USB.

   Note: USB-Uart converter is available from JYE Tech (part number: 07301 or 08101). For these converters connection scheme is shown below. Only three connections are needed. Please note that TXD at one end is connected to RXD at the other end, and vice verse.

2) Launch Windows HyperTerminal (or any other communication tool that can handle the Xmodem protocol) and prepare it for file reception. Please make sure that the filename of received file has ".bmp" extension.

3) Put scope into HOLD state and display the waveform of interest on screen.

4) Press [LEVEL] then [OK]. Scope screen will be sent to PC as a bitmap file.

13. How to Use FFT

1) Enter FFT mode by holding [MODE] for 2 – 3 seconds under normal oscilloscope mode.

2) Use [HPOS] to select FFT size (256 or 512).

3) Use [+] or [-] to select sampling rate.

4) Push [MODE] to exit FFT mode and return back to oscilloscope mode.

14. How to Upgrade Firmware

The MCU firmware can be upgraded via connector J4 by an AVR serial programmer. The figure left shows the pin-out of J4. It is important to ensure the programmer you use have a compatible pin-out. If they are different you need to re-route the signals to make them match.

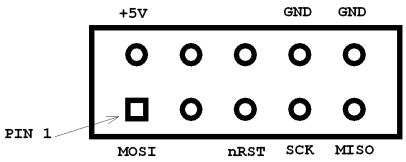


Fig. 7 J4 pin-out

If JYE Tech's USB AVR Programmer (PN: 07302) is used to program the oscilloscope remember to connect programming ribbon cable to header J5 on the programmer board (see fig. 8 below). Do not connect to J8, which is for the old 062 models only. The first conductor of ribbon cable (usually marked with red paint at one edge) should aligned to PIN 1 of headers at both boards.

Upgrading opterations should follow instructions of respective programmers.

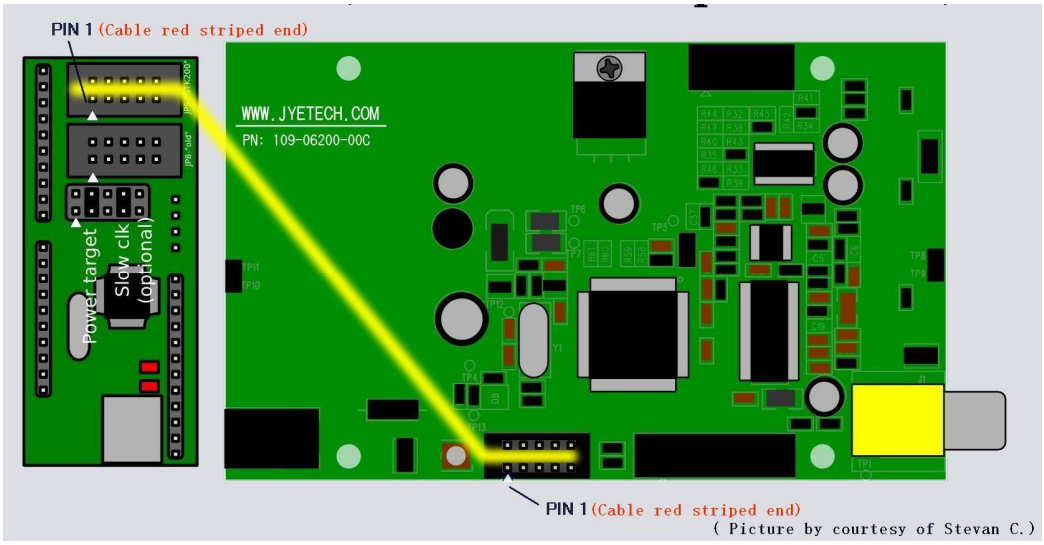


Fig. 8

15. Features & Specifications

Oscilloscope	Max Equivalent-Time Sample Rate	20MSa/s
	Max Real-time Sample Rate	2M samples/second
	Time-base Range	0.2us/Div – 10minute/Div
	Resolution	8 bits
	Sample Memory Depth	256 bytes
	Analog Bandwidth	1MHz
	Vertical Sensitivity	100mV/Div – 5V/Div
	Input Impedance	1MΩ
	Max Input Voltage	50Vpp
	Coupling	DC/AC
	Trigger Modes	Auto, Normal, and Single
	Trigger Polarity	Rising/Falling
	Trig position	1/4 of sample buffer (fixed)
	External Trig Input Range	0 – 15V
	Trig output amplitude	5V
	Trig output polarity	Falling edge
	Save up to 6 captures to EEPROM	
	Display saved captures	
	Transfer screen as bitmap file to PC via serial port	
	Backlit LCD display	
	Power Supply Voltage	9 DC
	Power Supply Current	< 200mA
Frequency Meter	Frequency Range	5MHz
	Sensitivity	3Vpp
	Max Input Voltage	15Vpp
FFT	FFT Size	256 points and 512 points selectable
	FFT Sampling Rate	1Ksps – 2Msps (in 1 – 2 – 5 style)
	Window	Hamming
Overall	Dimension	110mm X 65mm X 25mm
	Weight	70 grams (board & probe)

16. Revision History

Version	Date	Summary
v01	2010.04.20	First created
v02	2010.10.16	1) Added the section “How to Upgrade Firmware”. 2) Updated specifications to reflect the newly added feature of 20MSa/s equivalent-time sampling.
V03	2010.12.15	Added serial connection drawing for using 07301(or 08101) with DSO 062.