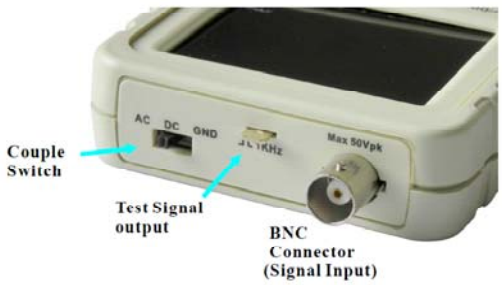
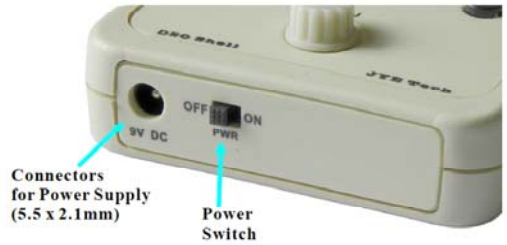
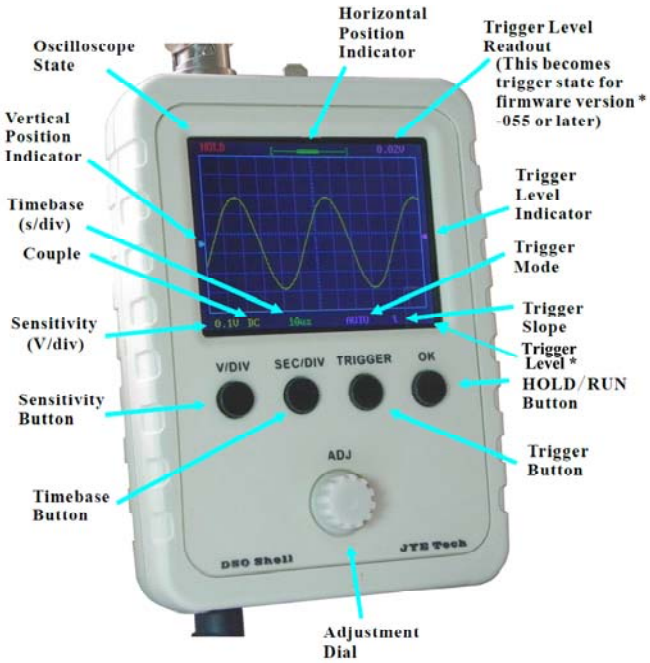
Unofficial DSO150 User Manual

by Daniel F F Ford, Australia [Draft 0.1, 4 March 2018]

Display and Controls







Connections

Attention:

1. Power supply voltage must not exceed 10 V, otherwise it might damage the ICs inside.
2. Allowed maximum signal input voltage is ±50 Vpk with any 1× probe (including the supplied clip probe).

Power Supply: Connect a *regulated* 9 Vdc power supply to the 5.5 × 2.1 mm jack at the bottom (centre positive). Power supply voltage **must** be in the range of 8–10 Vdc. It is recommended that the (–) terminal of the power supply (connected to the outer part of the DC plug) be isolated from mains 'ground/earth', preferably with a double-insulated plug-pack.

Battery operation is also possible – and **recommended** when measuring 'floating' circuits – a rechargeable 9 V battery being ideal. Like this 9.2 V one with in-built USB charger and charge indicator: https://tinyurl.com/9V-USB-charge (or a little cheaper via eBay), which gives over 2½ hours operation per charge. The DSO can also be used while charging this battery, though of course, it then takes longer to charge. [Note that rechargeable Lithium batteries last longer (in years) if only shallow-cycled, so it is suggested you don't run the DSO150 from this battery for more than, say, two hours between charges.]

Probe: Connect the probe to the BNC connector at the top. The red clip is the active signal; black is 'ground' (GND). When the DSO is supplied from a double-insulated plug-pack, do not connect the GND clip to any voltage more than, say, 50 V above mains 'ground' potential, as this might exceed the insulation rating of the plug-pack.

Operations

Basic Button Functions

(Press tact buttons multiple times to cycle through options.)

[V/DIV]:	Select sensitivity or vertical position. The selected parameter indicator will be 'highlighted' (highlighted = blue rectangle around it). Vertical position is adjusted when the V/DIV text is **not** highlighted.
[SEC/DIV]:	Select timebase or horizontal position. The selected parameter indicator will be highlighted. Horizontal position is adjusted when the SEC/DIV text is **not** 'highlighted'.
[TRIGGER]:	Select trigger mode (AUTOmatic, NORMal, SINGle), trigger level, and trigger edge. The selected parameter indicator will be 'highlighted' with a blue rectangle, or the level pointer will change to blue.
[OK]:	Enter HOLD state (freeze waveform). Pressing it again will de-freeze. (Top-left of display shows 'HOLD' or 'Running' accordingly.)
[ADJ]:	Rotate to adjust the parameter selected (highlighted). A short press toggles **Fast Adjustment** mode. A long press (> 3 secs) enables test-signal voltage (amplitude) setting mode, wherein each short press then toggles between 0.1 V (actually 0.14) and 3.3 Vpp. Another long press reverts to normal ADJ functions.
Couple switch:	Set coupling to DC, AC, or GND. If GND is selected, the scope input is isolated from the input signal and connected to ground (0 V input).

Trigger Modes

AUTO	Triggers are generated internally to provide continuous display updates regardless of signal changes.
NORM	The display will update each time the specified trigger condition (polarity and level) is met.
SING	A single capture/display will occur when the specified trigger condition (polarity and level) is met. Press the [OK] button to arm another single capture.

About Trigger States

The trigger can have three states, namely: Holdoff, Waiting, and Triggered (abbreviated 'Trigged' on the DSO). They are explained below:

Holdoff:	Triggering is disabled until a portion of the sample buffer prior to the trigger point is filled with raw data. Thus the display shows both pre-trigger and post-trigger data.
Waiting:	The trigger is waiting for a valid signal slope.
Trigg(er)ed:	A valid signal slope has been detected and registered.

Rolling Mode

When the timebase is set to 50 ms/div or slower, and trigger mode is set to AUTO, the scope will automatically switch to Rolling Mode, whereby the waveform rolls from right to left continuously. Triggering is disabled in this mode.

More Functions

Functions	Operations
VPos Alignment	Set Couple Switch to GND position. Hold down [V/DIV] button for about 3 seconds.
Measurements ON/OFF	Hold down [OK] button for about 3 seconds. This will turn ON or OFF on-screen display of measurements, including Vmax, Vmin, Vavr, Vpp, Vrms, Freq, Cycle, Pulse-Width, and Duty-Cycle.
Save Waveform	Press [ADJ] & [SEC/DIV] buttons simultaneously. The currently displayed waveform will be saved to EEPROM. The existing data in EEPROM will be overwritten.
Recall Waveform	Press [ADJ] & [Trigger] buttons simultaneously. Recalled waveforms are always displayed in HOLD state.
Default Restore	Hold down [SEC/DIV] and [TRIGGER] buttons simultaneously for about 3 seconds to restore display settings to default values.
Centre HPos	Hold down [SEC/DIV] button for about 3 seconds. This will cause the data at the centre of the capture buffer to be displayed.
Centre Trigger Level	Hold down [TRIGGER] button for about 3 seconds. This will set the trigger level to the median value of the input signal amplitude.
Fast Adjustment	A short press of [ADJ] toggles *Fast Adjustment* mode on and off for VPos, HPos, and Trigger Level. A ">>" sign appearing at the top of the screen indicates *Fast Adjustment* mode is ON.
Data download	To send capture data from the DSO150, first press and hold [ADJ], then also press [V/DIV] and release them both. Note that this requires a modification to the standard DSO150, and appropriate software and driver on a PC (or similar); see Data download below.

Data download

To display (on a PC) data captured by the DSO150, you need to connect the DSO's serial port to the PC, typically via a USB-to-serial adapter. With care and skill, one of these can be fitted inside the DSO150. Then you need, on your PC, (1) a driver for the USB-to-serial adapter, (2) software to handle the data transfer, and (3) software to graphically display the data.

USB-to-serial adapters are widely available on eBay and similar sites, with a variety of USB socket types (type A, mini and micro), and typically based on either a CH340T or a CP2102 IC. Depending on which variety you choose, you'll need to find and download a PC driver for it. (See Firmware updating for more details.)

Thanks to generous fellow-users of the DSO150, there is now third-party software that handles the capture on a PC (and maybe other platforms), and then automatically calls GNUplot to display the captured data on-screen:

https://tinyurl.com/DSO150-downloader

and you'll also want:

https://tinyurl.com/GNUplot522

[In time there might be better download/display software available, so check the jyetech.com/forum from time to time.]

Specifications

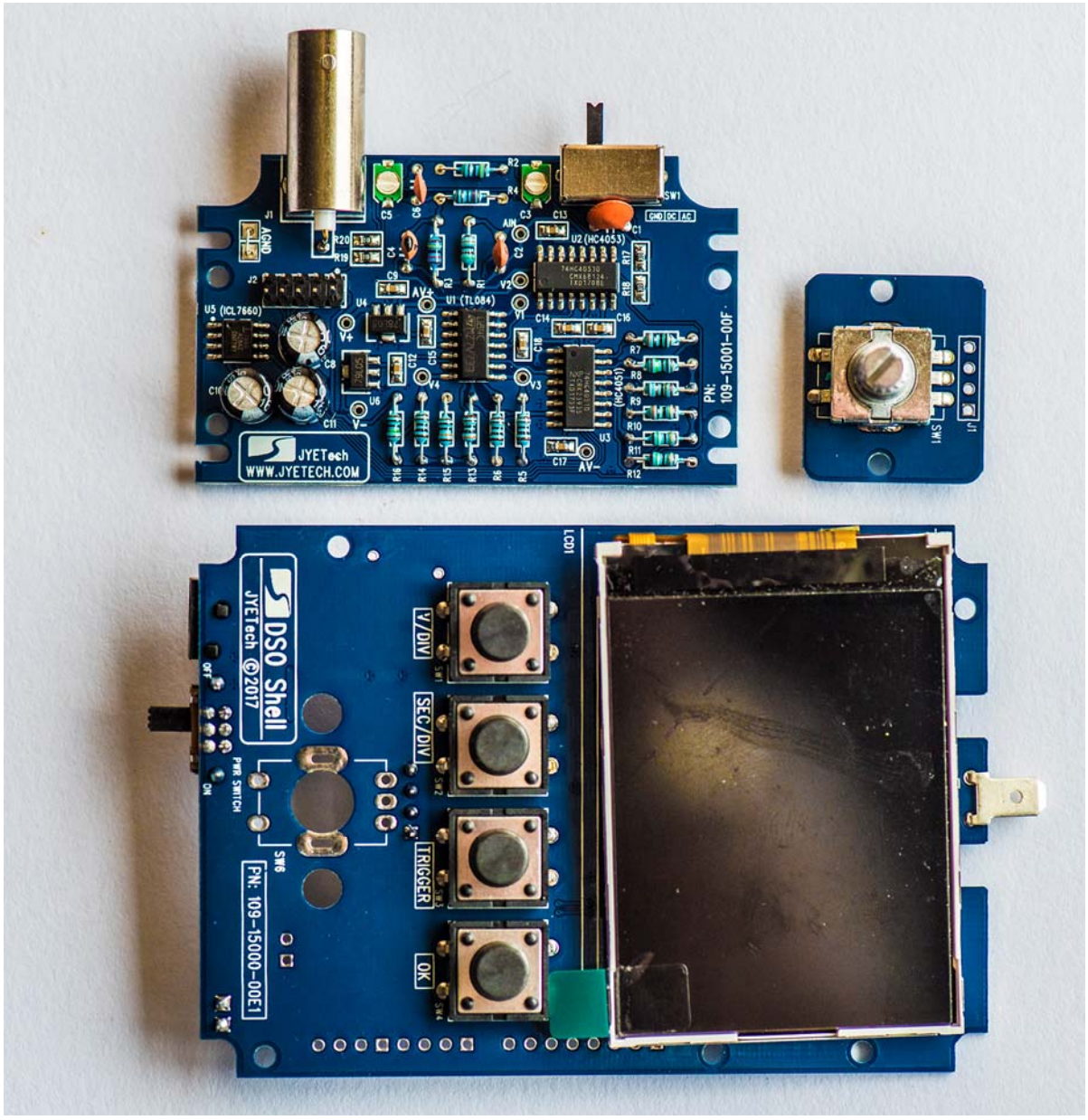
Max real-time sample rate	1 MSa/s
Timebase range	10 µs/Div–500 s/Div
Analogue bandwidth	0–200 kHz
Trigger modes	Auto, Normal, and Single
Sensitivity range	5 mV/div–20 V/div
Trigger position	Centre of buffer
Max input voltage	50 Vpk (with 1× probe)
Power supply	9 Vdc (8–10 V)
Input impedance	1 MΩ//20 pF
Current consumption	~120 mA @ 9 V
Resolution	12 bits
Dimension	105 × 75 × 22 mm
Record length	1024 points
Weight	100 g (without probe and PS)

Troubleshooting

Problems	Possible Causes
No display (black)	Check that your power supply's DC plug is **centre-positive**, and the voltage is **between 8 and 10 Vdc**.
Bad V+	(1) Connector 37 defective. (2) Diode D2 open or damaged.
Bad V–	(1) Bad C12 and/or C13. (2) U5 (7660) bad soldering or defective. **Hint:** Check with R27 disconnected to determine if the issue is caused by load or source.
Bad AV–	(1) R27 bad soldering or wrong value. (2) Shorts between AV– and ground.
Bad AV+	(1) R26 bad soldering or wrong value. (2) Shorts between AV+ and ground.
V1 does not close to 0 V	(1) SW1 not set to GND position. (2) Bad soldering on R1 and/or R2. (3) Bad soldering on U1.
V2 does not close to 0 V	(1) SW1 not set to GND position. (2) Bad soldering on R3 and/or R4. (3) Bad soldering on U1.
V3 does not close to 0 V	(1) Bad soldering on U1 and/or U2. (2) Bad soldering on R5 and/or R6.
Bad V4	Bad soldering on R13, R14, or R15.
No Trace	(1) Incorrect V4. If V4 is correct, perform factory default restore as described in (2) (2) Make sure trigger mode is AUTO and timebase is 1ms. Hold down [SEC/DIV] and [TRIGGER] buttons simultaneously for 3 seconds.
Rotating ADJ rotary-encoder does nothing	Check for shorts (or open-circuit/'dry' solder joints) between pins 1 and 3 of the encoder, pins 1 and 2 of the J2 connector, or an open/'dry' solder joint at pin 2 of the encoder.

One of the issues that can cause final-assembly problems is mounting parts on the wrong side of the PCBs. To help you avoid this, I have included photographs on the following pages of my completed board assemblies.

Though not included in the JYE Tech instructions, I have soldered a loop of bare wire to each of the Main PCB's DGND and the Analogue PCB's AGND test points. This just makes it easier to clip a multimeter probe to the respective 'grounds' when doing voltage measurements during the final-test phase of the assembly process.

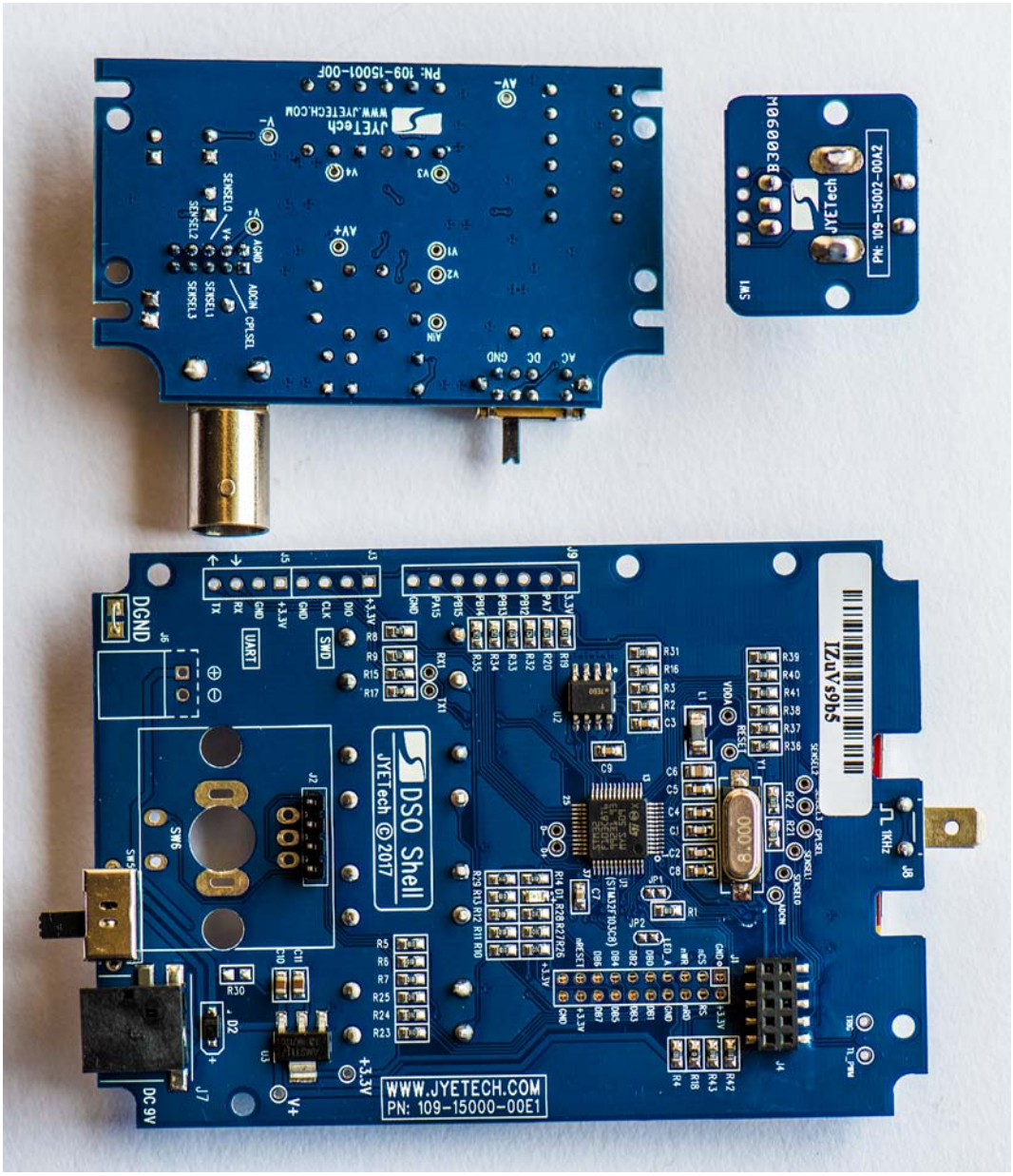


During initial assembly of the Main PCB components, it helps to tape the ‘unattached’ side of the LCD (bottom in the above photo) to the PCB using ordinary adhesive tape, or similar, to stop it flopping around and potentially damaging the thin flex-PCB connections on the other side.

Note especially that the test spade-connector (J8) is fitted to the **display** side of the Main PCB.

Note also the *optional* AGND raised wire loop on the Analogue board, for testing.

When assembly and final test are all complete and correct, don’t forget to peel off the LCD protective plastic film (use the green tab) before attaching the Main PCB to the front panel via the rotary-encoder PCB posts and screws.



Take special care with the BNC connector (J1) soldering on the Analogue PCB. So it will fit easily through the top-panel hole provided for it, it should be 'square' to the Analogue PCB's edge (i.e. at right angles). Due to the 'slop' in the mounting holes, it is easy to accidentally solder it slightly crookedly.

But due to the massive amount of heat required from the soldering iron to solder the body pins to the PCB, the whole BNC body gets very hot, so don't try 'squaring' its orientation with your fingers! Use a pair of tweezers or small pliers to position it while the solder is still liquid. Solder the two body pins (with the body 'square') before soldering J1's signal (middle) wire to the PCB, and then trim off the surplus signal wire.

Note the *optional* DGND raised wire loop on the Main board, for testing.

Firmware updating

Should JYE Tech release updated firmware for the DSO150, or you wish to install custom firmware (there are third-party versions already available with added features, or you can write your own, starting from the published open-source firmware source code from JYE Tech), the following web resources might be useful (some time in the distant future these links will 'break', but hopefully the text descriptions will then help you find the items elsewhere):

DSO150 firmware updating tutorial: https://www.youtube.com/watch?v=PUEimY59vaU

How to Upgrade DSO150 Firmware (.pdf): https://goo.gl/vtria7

Flash Boot-loader Demonstrator by ST: https://goo.gl/QaX8hx

DSO150 firmware: https://goo.gl/JujNni

CH340G USB To Serial Module: https://goo.gl/9cZnjD

CP2102 USB To Serial Module: https://tinyurl.com/CP2102-USB-TTL

CP2102 drivers (multi-platform): https://tinyurl.com/CP210x-Drivers

JYE Tech DSO150 ('DSO Shell') on BangGood China site: https://goo.gl/KDiJR8

While much of the material in this manual has been lifted from JYE Tech's User Manual rev.07, these third-party instructions and tips were not published or authorised by…

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