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NewScope-T0 Operation Manual

Including NewScope-T0 and NewScope-T0e



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NewScope-T0 Operation Manual

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1 Introduction

The NewScope-T0 Color LCD replacement Kit is designed to replace the monochrome CRT displays¹ used in Tektronix® TDS 500 and TDS 600 A/B/C/D series digital oscilloscopes². The Kit supports 6.5" TFT color LCD at VGA (640 x 480) resolution. The key features of the Kit include:

- Channel indicators are mapped to different colors
- Supports individual intensity adjustment of the display elements
- Supports 16 grayscale levels for DPO acquisition waveform display
- Symmetric mounting bracket to optimize for different viewing directions
- Easy installation
- Does not use the rear VGA output port, free from A-to-D conversion background noise

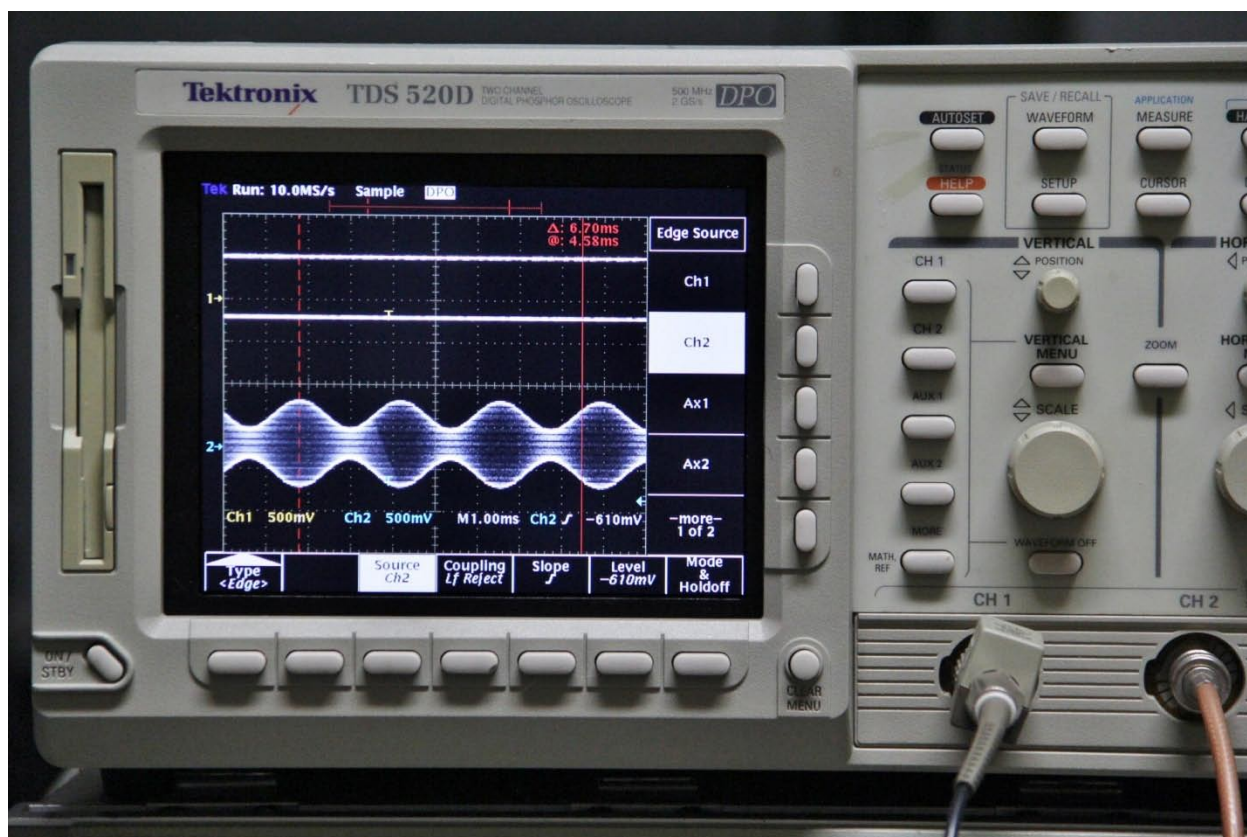


Figure 1 NewScope-T0 Kit shown with DPO acquisition waveform display

The content of this manual applies to both NewScope-T0 and NewScope-T0e, unless specifically noted.

¹ For Tektronix oscilloscopes using color CRTs such as TDS 5x4/6x4/7x4, please use NewScope-T1 kit.

² Due to a mechanical issue, NewScope-T0 is not suitable for the earlier TDS 520, TDS 540, TDS 620 and TDS 640 oscilloscopes without the A/B/C/D suffix in the model number.

2 Installation

2.1 Initial Inspection

Refer to Table 1 for a list of parts included in the NewScope-T0 or T0e Kit. Verify that all parts listed are included in your kit.

Table 1 NewScope-T0 Kit Content

Item	Qty	Reference	Description	Note
1	1	NewScope-T0	Main board, NewScope LCD Kit	
2	1	PowerPlug-T	Power Supply Board, NewScope LCD Kit	
3	1	18-0001-002	Display Link Cable, TTL, 31 Conductor, Shielded	1
4	1	18-0001-005	Sync Cable, 5 Conductor	
5	1	18-0001-003	Backlight Cable, 2 Conductor	1
6	1	19-0001-008	LCD Mounting Bracket, 6.5 Inch	1
7	1		LCD Panel, 6.5 Inch with LED back light	1
8	1		LCD Panel gasket	1
9	4		M2 x 3mm wafer-head Philips screw	1
10	1		Anti-glare viewing window	

Note:

1. Shipped assembled as LCD panel assembly.

Table 2 NewScope-T0e Kit Content

Item	Qty	Reference	Description	Note
1	1	NewScope-T0e	Main board, NewScope LCD Kit	
2	1	PowerPlug-T	Power Supply Board, NewScope LCD Kit	
3	1	18-0001-002	Display Link Cable, TTL, 31 Conductor, Shielded	1
4	1	18-0001-005	Sync Cable, 5 Conductor	
5	1	18-0001-023	TDS CCFL Back Light Cable, 4 Conductor	
6	1	19-0001-008	LCD Mounting Bracket, 6.5 Inch	1
7	1		LCD Panel, 6.5 Inch with CCFL back light	1
8	1		LCD Panel gasket	1
9	4		M2 x 3mm wafer-head Philips screw	1
10	1		Anti-glare viewing window	
11	1		DF9 Power Adapter	1
12	1		Back Light CCFL Inverter	

Note:

1. Shipped assembled as LCD panel assembly.

2.2 Installation of the NewScope-T0/T0e Kit

Installation should be performed by a qualified technical person who is familiar with the host test equipment.

The Kit installation time is approximately one hour. Please refer to test equipment service manuals for location of the assemblies.

Caution: *CRT could have lethal voltage on the anode. Use proper precautions when handling CRT Assembly.*

Note: *Dispose of display within your state's hazardous materials guidelines for CRT's and electronics.*

2.2.1 Prepare the unit for installation

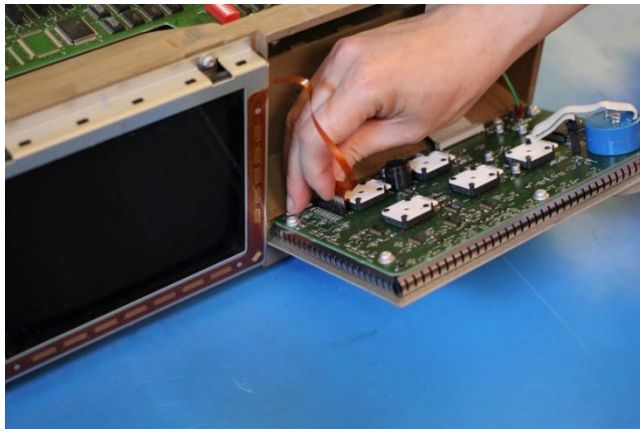
Disconnect AC power cord. Remove the rear cover and cabinet from the equipment. Follow the manufacturer's ESD precaution guidelines in the unit's service manual.

Remove the front trim ring. When removing the trim ring, grasp its back edge and vigorously flex it upward before pulling it forward.

DO NOT touch the carbon contact points on the menu buttons installed in the trim ring. Also, do not touch the exposed contacts on the flex circuit when you remove the trim ring.

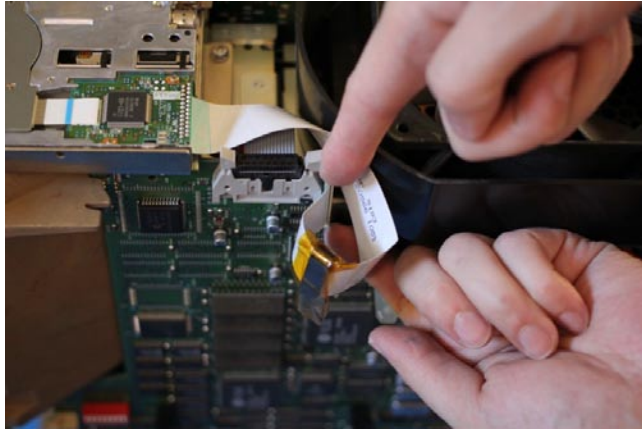
2.2.2 Remove the front-panel assembly

Lift the front-panel assembly out of the front subpanel until you can reach the ribbon cable connecting it to the processor/display board. Disconnect that cable at J2 of the processor/display board.

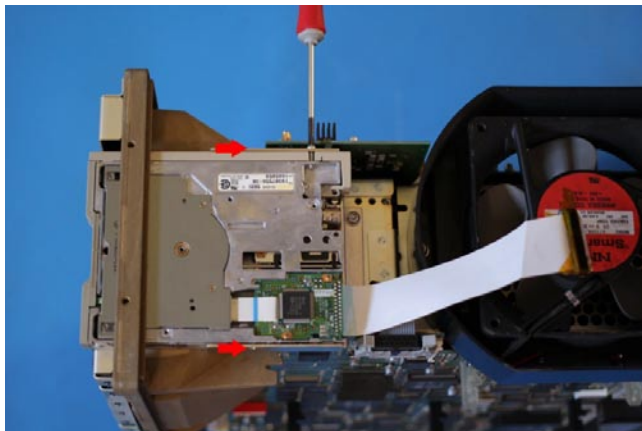


Disconnect the flex-board connector at P3 of the front-panel assembly. Disconnect grounding cable W76. Finally, lift the front-panel assembly out of the front subpanel to complete the removal.

2.2.3 Remove the floppy drive (if equipped)



On the A11 Processor/Display board, lift the slider on the J38 floppy drive connector, and then unplug the ribbon cable to disconnect the disk drive.



Remove the disk drive by unscrewing the two retaining Phillips screws on the sides of the disk (indicated by red arrows in picture). Then pull out the disk drive. On some units, there is only one screw at the screw driver location. Remove the metal shield between the floppy drive and display-frame assembly.

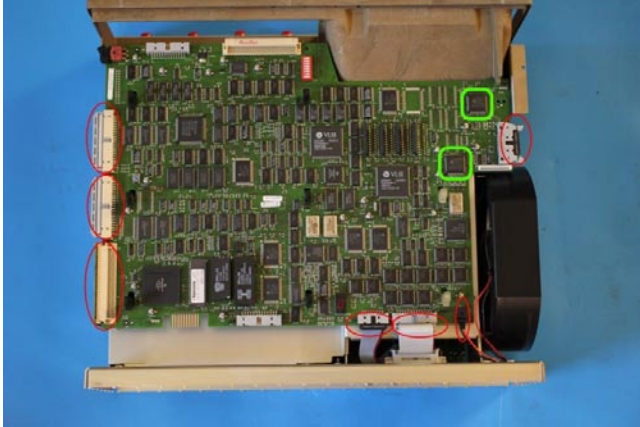
2.2.4 Remove the display-frame assembly

Remove the three screws securing the display-frame assembly to the front subpanel and remove the assembly.

2.2.5 Remove A11 Processor/Display Board

Remove A29 Video Trigger board (if present) following the instructions in the oscilloscope service manual.

Remove the two screws securing the rear plate of the A23 SerPar board assembly (or a place holder), disconnect the cable connector from the processor-display circuit board connector, and pull out the A23 SerPar Board assembly.



Unplug the Analog and Digital Power Cable connectors on the A11 Processor/Display Board.

Remove A12 D1 bus board.

Unplug the fan power cable from J20.

Unplug the GPIB interconnect cable at J35.

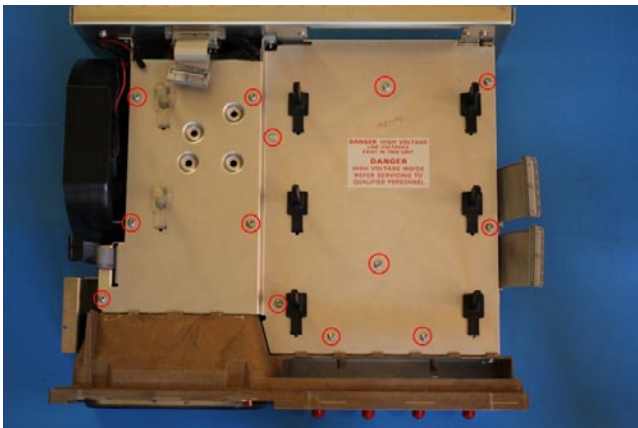
Disconnect the monitor cable at J5.

Unplug J51 rear VGA connector.

The two RAMDACs where the main board is to be installed are marked in green in the picture.

Grasp the board by its left and right sides and pull it towards the rear of the oscilloscope. This will disconnect the processor/display board from the eight board mounts securing the board above the top cover. Lift the board up away from the oscilloscope chassis to complete the removal.

2.2.6 Remove the top cover



Remove the screws securing the top cover to the main chassis (with red circles in picture), and then slide the cover back until its front edge clears the retainers in the front subpanel. Lift the top cover away to complete removal.

2.2.7 Remove A30 Display Assembly

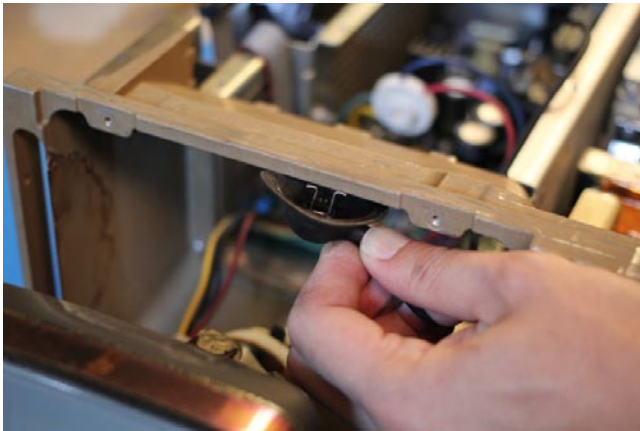
Unplug the display tube connector from the back of the display tube and the display tube yoke connector from the display circuit board (J340).

Remove the two screws that secure the CRT safety band to the front subpanel. Carefully guide display tube forward to partially remove it from the front subpanel and to access the anode lead connected to the display tube.

CAUTION! High-voltage is present on the anode lead.



Before unplugging the anode in the following step, you must discharge it: using a flat-blade screwdriver with an insulated handle, while touching the chassis with the blade, probe under the insulating cap of the anode lead with the tip and touch the lead's metal conductor to discharge. Repeat several times.

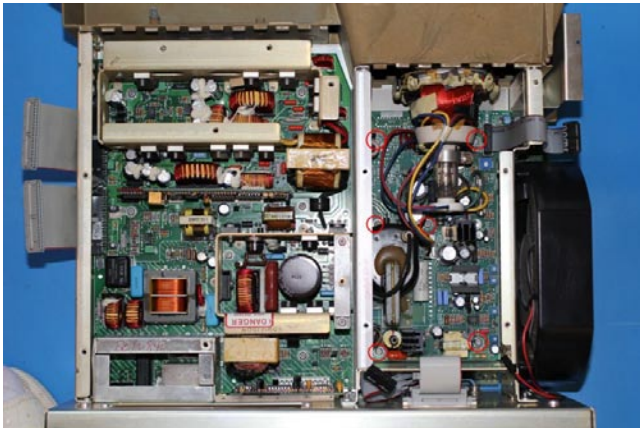


The anode lead has two hooks (see picture). Push the center of the rubber cap downward and sideways to release one hook from the CRT anode, and then push the cap to the other side to release the other hook and the lead will be free.

After unplugging the anode lead, touch its metal conductor to the chassis a few times to further ensure discharge.

Pull the display tube out through the front subpanel.

Note: Dispose of CRT within your state's hazardous materials guidelines for CRT's and electronics.



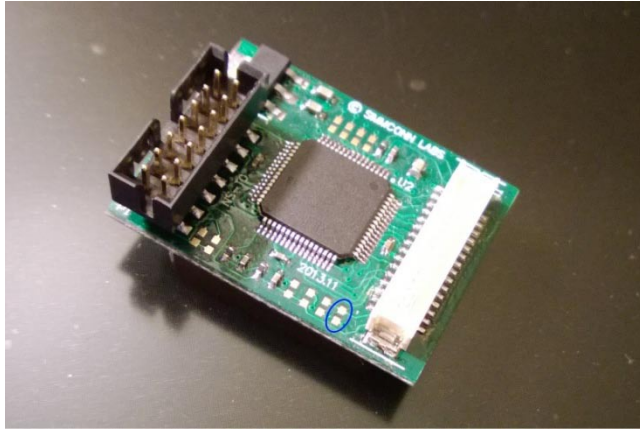
Remove the six screws that mount the display-driver board to the main chassis (with red circles in picture). Grasp the display driver board. Work from the front and top to tilt the board so its right edge is up and its left side is down and lift it out of the chassis.

Now it is a good time to clean the inside of the front-subpanel off of the accumulated dust with isopropyl alcohol. Follow the cleaning instructions in the service manual if the unit needs further cleaning.

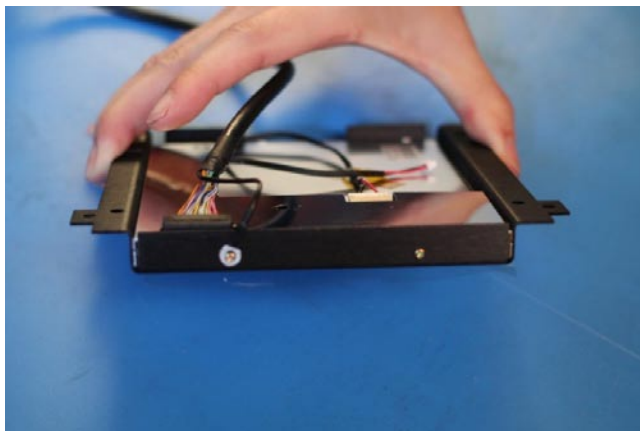
2.2.8 Install the LCD panel

The LCD panel should come pre-installed in the LCD bracket. If not, apply the LCD gasket to the inside of the LCD bracket, then mount the LCD panel to the bracket using four M2x3mm screws.

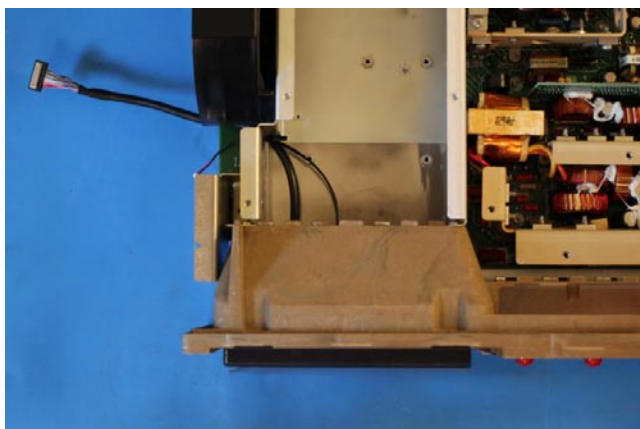
The LCD bracket is symmetrical. By default, the LCD panel is installed upright (wider edge on the floppy drive side) for best contrast when viewed head-on or from above the screen (12 o'clock). If the oscilloscope is viewed from below the screen (6 o'clock) most of the time, the LCD panel together with the bracket should be turned 180 degrees.



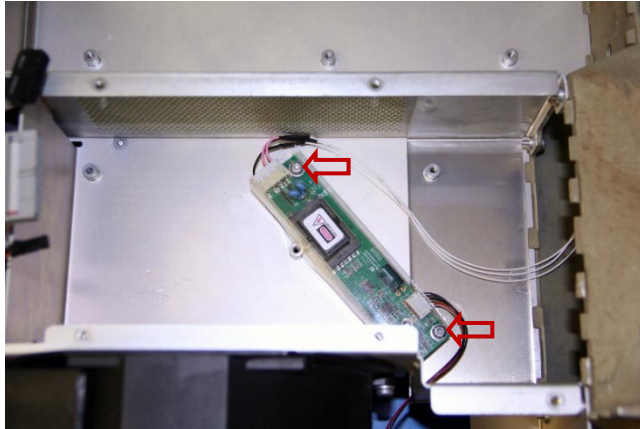
Note: R2 (circled in blue in picture) should be installed or shorted with a blob of solder for the LCD panel to display properly if installed upside-down. Use a zero ohm, 0402 resistor.



Connect the backlight cable and the display link cable to the LCD panel. The display link cable has on one end a drain wire for shielding. Connect this end to the LCD panel and use the nearby mounting screw to secure the wire lug.



Mount the LCD panel assembly to the front subpanel using two screws at the bottom. Route the backlight cable and display link cable through the opening behind the front subpanel near the fan.



For T0e kit only:

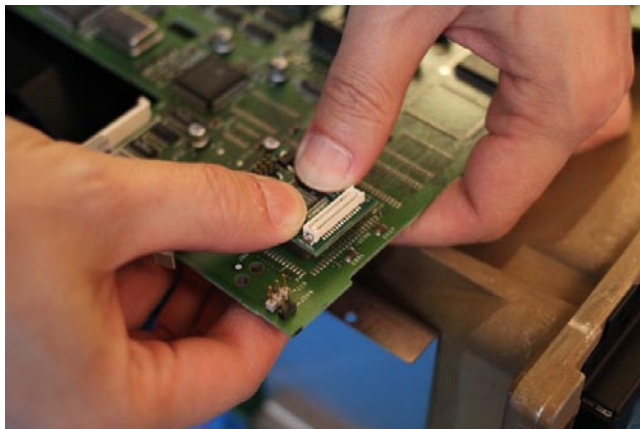
Connect the LCD panel back light cable and TDS CCFL Back Light Cable to the Back Light CCFL Inverter as shown in the picture.

Mount the Back Light CCFL Inverter to the chassis using two 6-32 screws removed from previous steps.

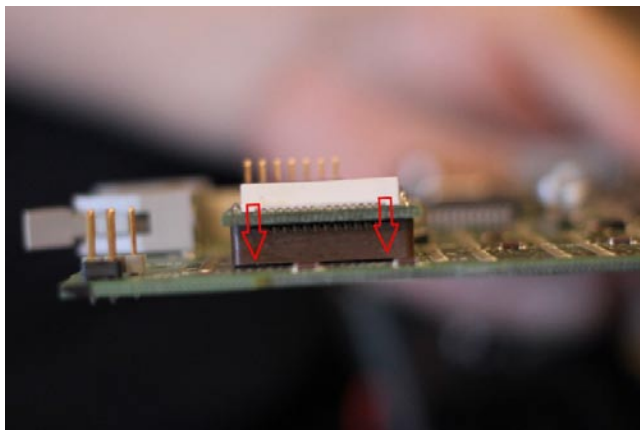
2.2.9 Install the LCD kit boards

Reinstall the top cover removed in section 2.2.6.

Locate the RAMDAC. There are two of them close to J5 on the A11 board (see picture in section 2.2.5). The NewScope-T0 main board can be installed on either of them, shown in the following pictures.



Align the PLCC connector on the NewScope-T0 main board with the RAMDAC using the chamfered corner. Put thumbs on top of the main board. With other fingers supporting the A11 processor- display board from the back, apply even force and snap the NewScope-T0 main board onto the RAMDAC. Install the main board firmly until you feel a 'click' when the RAMDAC reaches the bottom of the PLCC socket. Do not apply excessive force beyond that.

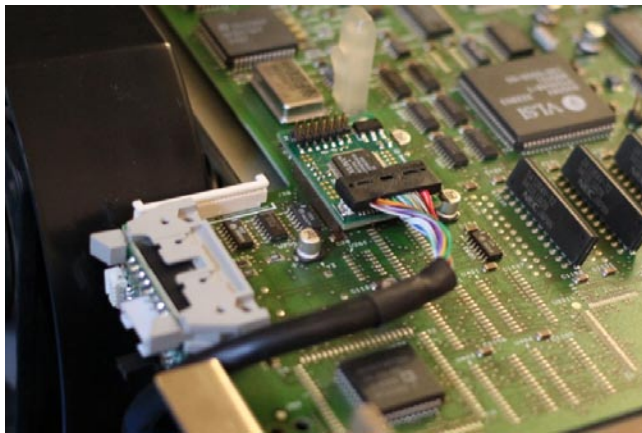


A correctly installed main board should have even gaps on each and all sides of the PLCC socket. If the gap is uneven, pop out the main board and reinstall.

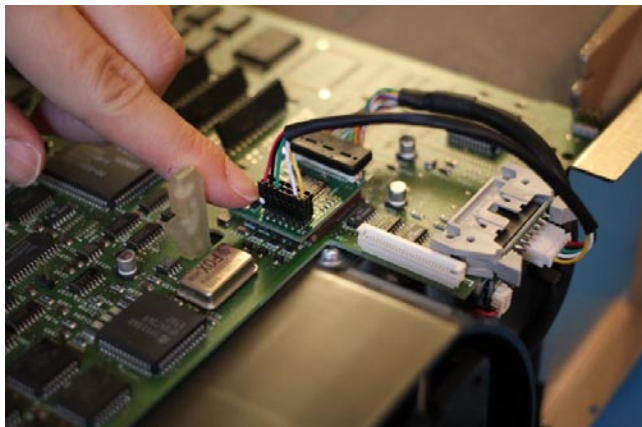
Reinstall the A11 processor- display board by reversing steps in section 2.2.5.



Connect the back light cable to P1 on the Power Supply board. When installing the Power Supply board to J5 of the A11 display-processor board, first close the locking levers half-way. Make sure the receptacle is aligned with the header pins in J5, and then push the receptacle into J5. Close the locking levers to complete installation.

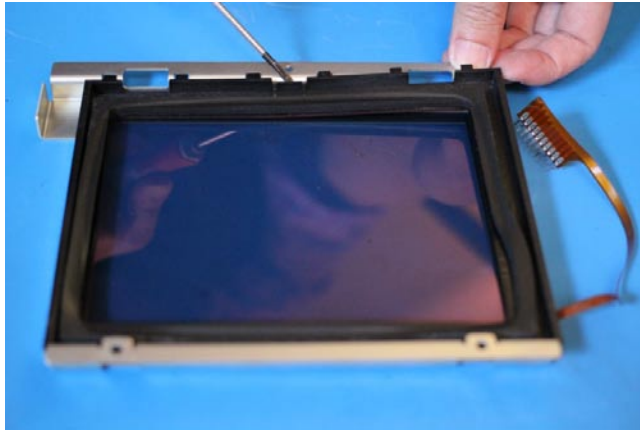


Connect the display link cable to J1 on the main board.



Connect the Sync Cable from Power Supply board P2 to main board P1. Note pin 1 of main board P1 is near U1.

2.2.10 Finishing installation



Remove the plastic frame and the tinted glass it holds by releasing the latch on the display-frame assembly. The plastic frame and the tinted glass are not used with the LCD display.



Remove the protective shipping film from the LCD panel assembly. Remove the protective backings from the anti-glare acrylic sheet. Put the acrylic sheet on top of the LCD panel bracket. The matte side should be on the outside facing the user. Reinstall the display-frame assembly by reversing the steps in section 2.2.4.

Reinstall the floppy drive (if equipped), the front-panel assembly and the trim ring by reversing the steps in sections 2.2.3 and 2.2.2.

When reinstalling the cabinet, be careful not to catch or pinch the Sync Cable.

Reinstall the cabinet and the rear cover to complete the installation.

3 Operations

3.1 Intensity controls

Most of the intensity controls work as before. On NewScope-T0, the back light intensity is determined by the higher brightness of waveform or text. By reducing the back light intensity, the life of the backlight LED may be extended. On NewScope-T0e, the back light intensity is fixed, while the intensity of the display elements can still be adjusted separately.

3.2 Display Colors

The indicators of each channel are now mapped to different colors. Due to the limitation of the monochrome TDS oscilloscopes, waveform display remains the same color for all channels. In normal acquisition mode, waveform is in green. In DPO mode, waveform is displayed in 16 grayscales. The preset display colors are listed in Table 3. Note that 'Indicators' in the table include waveform reference symbol, vertical/horizontal scales, trigger level, measurement, cursors, as well as position of waveform record relative to the screen and display.

Table 3 Display Colors for NewScope-T0

Display Items	Color	Display Items	Color
Background	Black	Ch3/Aux1 Indicators	Magenta
Vector or dot, Normal	Green	Ch4/Aux2 Indicators	Green
Vector or dot, Intensified	Yellow	Math Indicators	Red
FastAcq or DPO	16-level Grayscale	Ref Indicators	Blue
Intensified Samples	Red	Graticules	Light Yellow
Infinite/Variable Persistence	White	Menu Text/Highlight	White
Ch1 Indicators	Yellow	Help Screen Text	Maroon
Ch2 Indicators	Cyan	Help Screen background	Gold

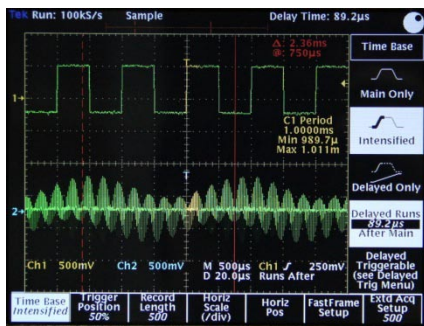


Figure 2 Vector/Intensified Waveform

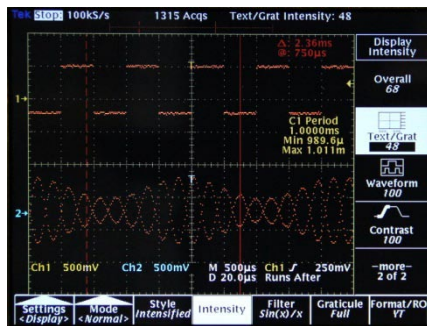


Figure 3 Intensified samples

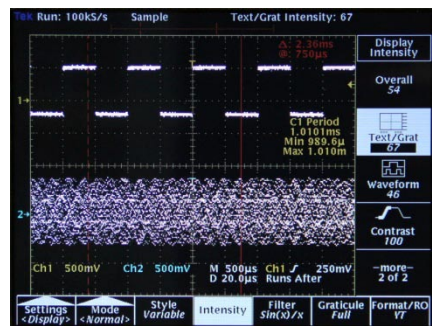


Figure 4 Variable/Infinite Persistence

Revision History

Revision	Date	Notes
1.0	5/26/2014	Initial revision for serial numbers G01 and above
1.1	5/17/2015	Updated CRT anode lead removal procedure Added anti-glare acrylic sheet installation procedure
1.2	2/26/17	Clarified supported TDS oscilloscope models in section 1 Added information about T0e in section 2.1 and section 2.2.8