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NewScope-7C Operating Manual

Preliminary

May 13, 2017

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1 Introduction

The NewScope-7C Color LCD replacement Kit is designed to replace the color CRT with HP® part number 2090-0210 (SONY® model number CHM-7501-00) used in HP 85101C (8510C Processor/Display unit).

The kit includes an 8" IPS TFT color LCD with XGA (1024 x 768) resolution. The key features of the kit are:

- Digitally reproduces the original image designed for the CRT display
- Scaling optimized for display picture aspect ratio and soft menu alignment
- Compatible with all firmware versions. No changes to the instrument's original firmware
- High brightness LCD panel
- Optional analog VGA output at XGA resolution¹

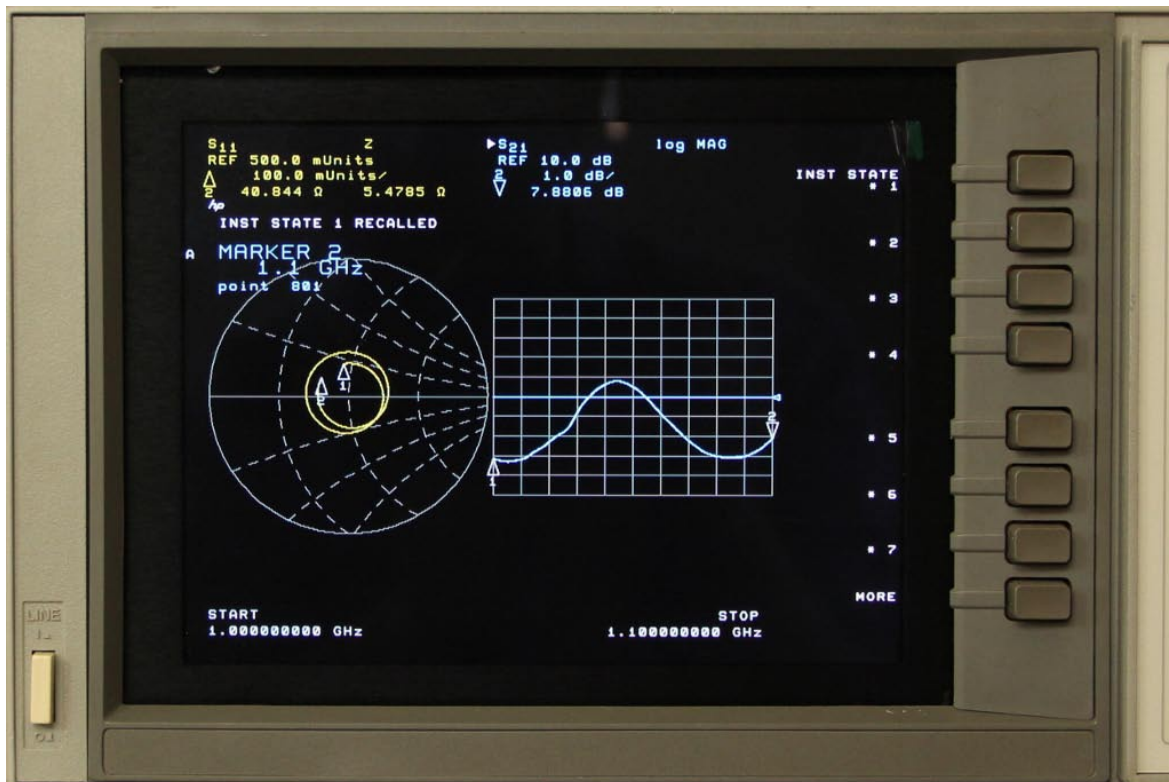


Figure 1-1 NewScope-7C installed on an HP 85101C

1.1 Kit compatibility

The NewScope-7C kit is compatible with the units listed in Table 1. Contact us if your instrument model number is listed, but the GSP board part number is not, or vice versa.

Note: *NewScope-7C is not compatible with units that were originally equipped with LCD display from the factory, or those that have been retrofitted with factory-supplied LCD conversion kit.*

¹ Requires advanced installation.

Table 1 NewScope-7C Kit Compatibility

Kit Model #	LCD Panel	Compatible HP Model #	Compatible GSP board P/N
NewScope-7C	8" XGA	85101C (8510C display unit with CRT)	85101-60243

2 Initial Inspection

Refer to the Table 2 for a list of parts included in the NewScope-7C Kit. Verify that all parts listed are included in your kit. **Note: items may differ with different LCD panel configurations.**

Table 2 NewScope-7C 8" XGA Kit Content

Item	Qty	Reference	Description	Note
1	1	NewScope-7C	Main board for NewScope-7C kit	
2	1	LCD-7B	Display Board for NewScope-7B/C/D kit	
3	1		8" XGA LCD panel	1
4	1	18-0001-026	NewScope-7 Power cable	
5	1		NewScope-7 FFC cable	2
6	1	18-0001-027	NewScope-7C V-sync cable	3
7	1	18-0001-028	NewScope-7C H-sync cable	3
8	1	19-0001-006	NewScope-7B/C front plate	1
9	1	19-0001-019	NewScope-7B/C/D back plate	1
10	6		M3x6 Pan-head Philips screw	1
11	4		6-32 3/8" flat-head Philips screw	
12	1		DIP IC socket, 22-pin, 0.4"	
13	6		Resistor, metal film 68 Ohm $\pm 1\%$, 1/8W	3
14	3		Resistor, metal film 62 Ohm $\pm 1\%$, 1/8W	4
15	2		Pin strip	5
16	1		Wire tie 0.070" x 2.8"	3
17	1		Cable clamp	
18	1		Rubber foam seal, D-type, 9mmx5mm	

Note:

1. Shipped pre-assembled as LCD panel assembly.
2. Shipped in protective tubing.
3. Available in kits with VGA option.
4. Available in kits without VGA option.
5. 9 pins per strip for standard installation, or 11 pins per strip for advanced installation.

3 Installation

3.1 Read before installation

Installation should be performed by a qualified technical person who is familiar with the instrument.

Note: Due to soldering and de-soldering required on the multi-layer PCB, professional installation is highly recommended.

The Kit installation time is approximately 2.5 hours. Please refer to instrument service manuals for location of the assemblies and their removal procedures.

Please take the following guidelines when installing the kit:

- 1) Obtain a copy of the factory service manual for the instrument you will be working on. Read through the procedures for replacing major assemblies. Pay attention to the notes and warnings in the factory service manual.
- 2) Take precautions for ESD discharge, high-voltage hazard from the CRT, and use a Ground Fault Interrupter (GFI) protected mains supply for personal safety.
- 3) Do not use power tools to fasten screws. Use a manual screwdriver so that you can see and feel if something is not well aligned. If you meet considerable resistance when fastening a screw, back off and try again.
- 4) The FFC cable and connectors are fragile. When making connections, first open the lever, insert the FFC cable end fully into the connector following the installation instructions, and then close the lever. Do not pull the FFC cable when the lever is closed.
- 5) Do not force anything into position. If something doesn't seem to fit, give it a little wiggle room and it will likely correct itself.
- 6) Before trying to modify some part that doesn't seem to fit, take a short break and read the manual one more time. Chances are some steps in the manual may not be very clear or well understood. Ask questions and we'll get back to you as soon as we can.

3.2 Installation on 85101C with GSP P/N 85101-60243

3.2.1 85101C Disassembly

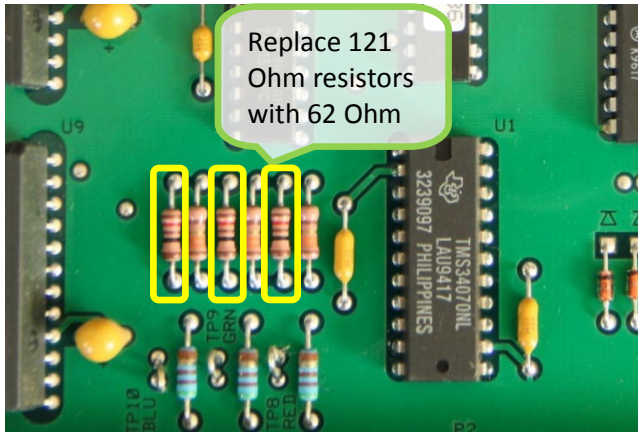
Perform the procedures outlined in the instrument service manual to

- Remove the color CRT display unit
- Clean the glass filter
- Remove the graphics signal processor (GSP) board

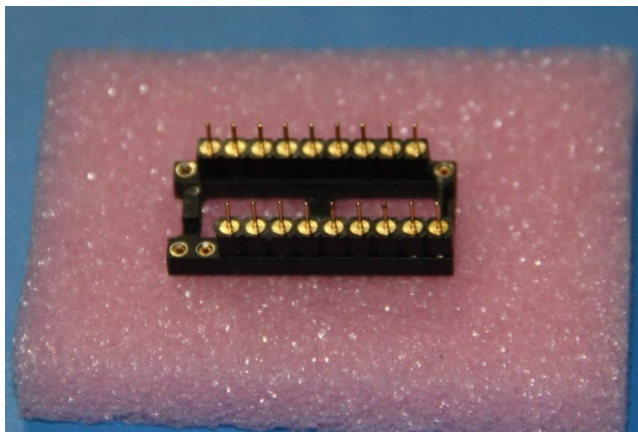
Note: Follow your state's hazardous materials guidelines for CRTs and electronics when disposing of CRT display unit.

3.2.2 Standard installation on GSP board 85101-60243

Note: Use procedures in this section for standard kit without the VGA output option. For kit with VGA output option, skip to section 3.2.3.

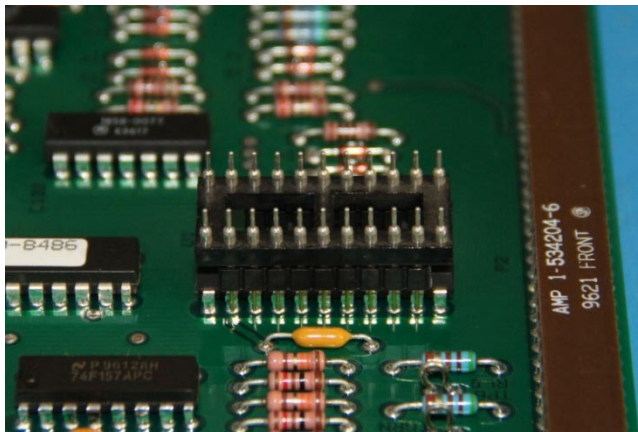


OPTIONAL: On the GSP board near U1, replace three 121 Ohm resistors with 62 Ohm $\pm 1\%$ resistor. These are for the Video DAC RGB test, which is not part of the power-on self test and if fails, would not affect normal operation of the instrument.



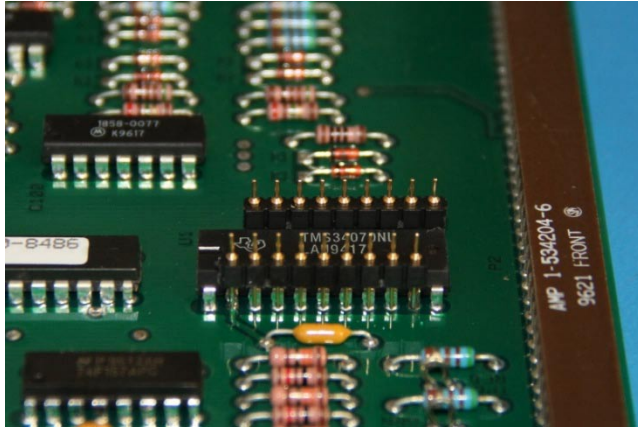
Insert the strip pins to the DIP IC socket, occupying pins 3 thru 11 and 13 thru 21.

The pins have 'shoulders' on one side of the plastic strip. Insert pins on this side into the socket until the plastic strips sit flat on top of the IC socket.



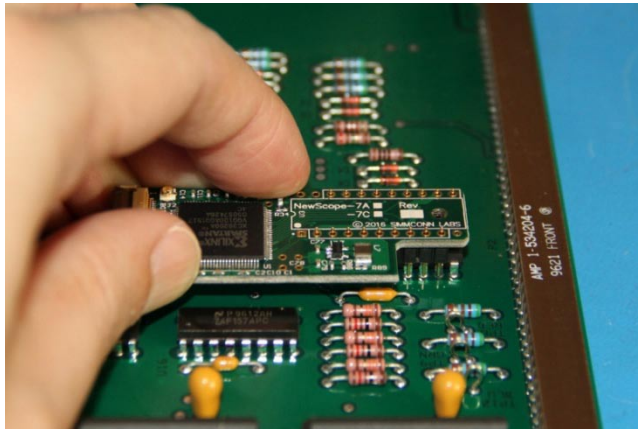
Flip the DIP IC socket on top of the RAMDAC U1. Make sure pins are on U1 pins 2 thru 10 and 12 thru 20.

Align the strip pins to the horizontal centers of each of the RAMDAC pins. Push the pins down until they stop.



Solder the strip pins to the RAMDAC pins. A thin, bent soldering tip works well for this job.

Carefully remove the IC socket from the strip pins using a small screw driver. Verify again that the pins are on U1 pins 2 thru 10 and 12 thru 20.



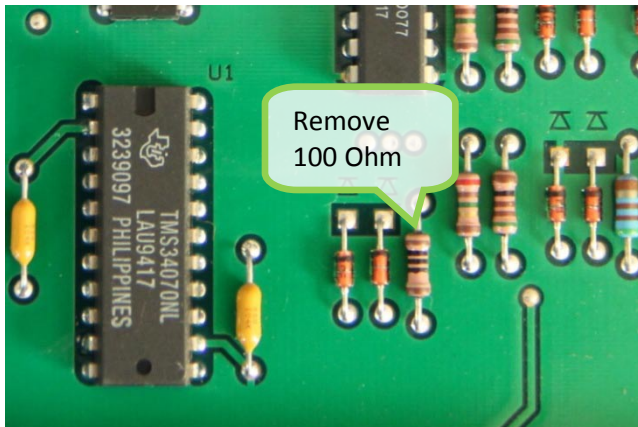
Place the NewScope-7C board on top of the strip pins and let the pins through U3 pins 2 thru 10 and 12 thru 20 (marked with long rectangles on the side of the U3 silkscreen). Solder the board to the pins while keeping the board level.

Connect the FFC cable to J1 on the NewScope-7C board. First open the lever, insert the FFC cable end fully into the connector with contacts facing **DOWN**, and then close the lever.

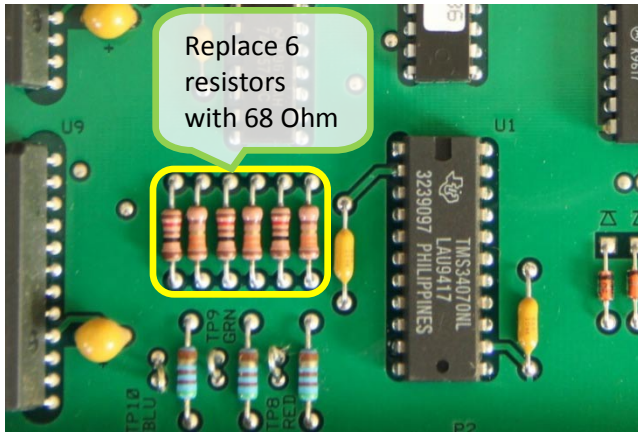
Skip to section 3.2.4 85101C Assembly

3.2.3 Advanced installation on GSP board 85101-60243

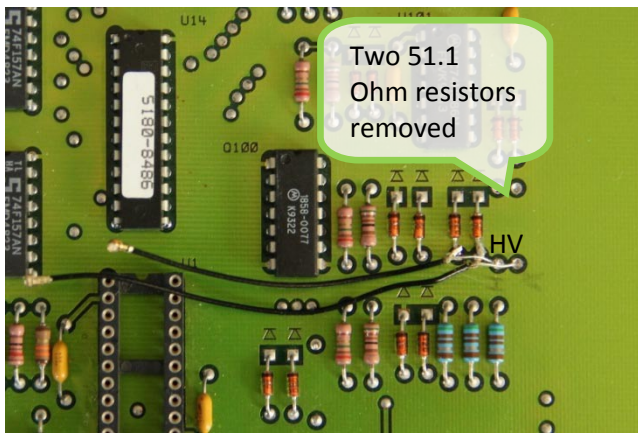
Note: If you ordered a NewScope-7C kit with VGA output option, but decided not to enable the feature, you may break the strip pins till 9 pins left on each strip, and then follow the installation procedure in section 3.2.2 instead.



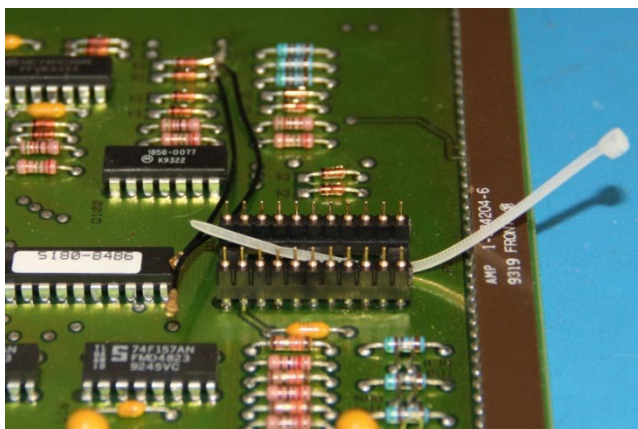
On the GSP board, remove the 100 Ohm resistor. This is required for the analog VGA-compatible video output option.



OPTIONAL: On the GSP board near U1, replace three 13.3 Ohm and three 121 Ohm resistors with 68 Ohm $\pm 1\%$ resistor. These are for the Video DAC RGB test, which is not part of the power-on self test and if fails, would not affect normal operation of the instrument.

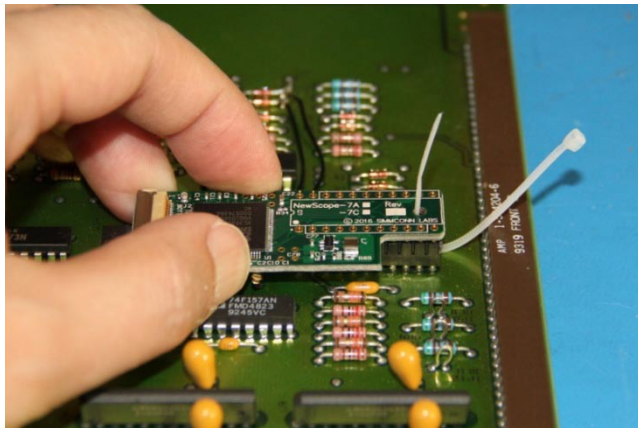


OPTIONAL: On the GSP board, remove two 51.1 Ohm resistors. Solder the V-sync and H-sync cables with the center conductors to their lower pad, and the shields to the anode of the diodes nearby (GND). **Do not short any signal to the top layer copper plane.** These cables provide separate H-sync and V-sync signals on the rear panel VGA output, for better compatibility with external monitors.

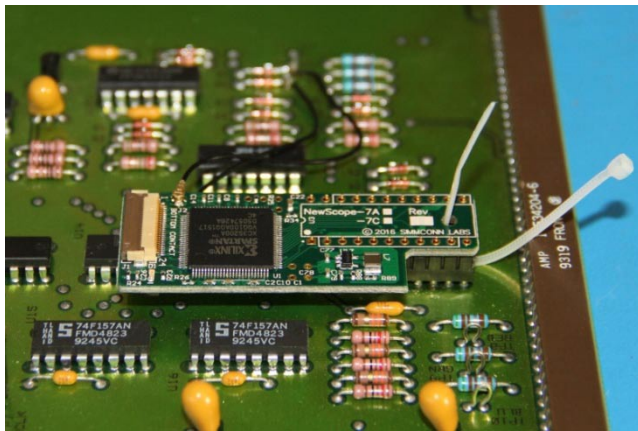


De-solder the RAMDAC chip U1 from the GSP board. A temperature-controlled, ESD-safe vacuum de-soldering gun is recommended for this job. Clean the through-hole pads.

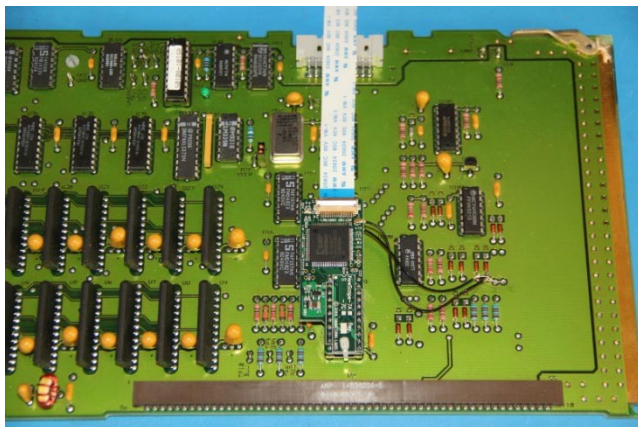
Route the wire tie through the lower end of the socket (pin 11 and 12) or the hole near the lower end. Solder the DIP socket to the U1 location.



Insert the strip pins to the DIP socket with 'shouldered' pins on top.
Solder the NewScope-7C board on the strip pins.



Unplug the NewScope-7C board from the DIP socket. Carefully connect the V-sync (top side) and H-sync cable (bottom side) to the coaxial jacks on the NewScope-7C board. Keep the cable plug parallel to the board as much as possible when making connections.
Plug the board back to the socket and close the wire tie through the un-plated hole to secure the board.



Connect the FFC cable to J1 on the NewScope-7C board. First open the lever, insert the FFC cable end fully into the connector with contacts facing **DOWN**, and then close the lever.

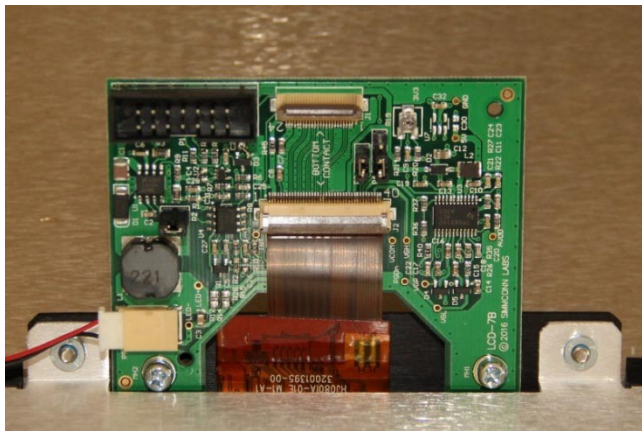
Tape the FFC cable temporarily to prevent it from getting caught when replacing the GSP into the shielding cage. Arrange the cable such that it escapes on top of J3.

3.2.4 85101C Assembly



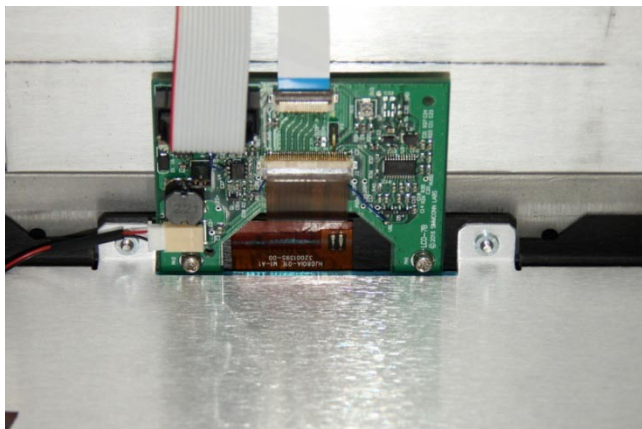
You may choose to leave the FFC cable in its own protective tubing, or thread it through the protective tubing of the power cable for a cleaner look.

Connect the 20-pin end of the NewScope-7 Power cable to the CRT monitor connector on the GSP board. Replace GSP board following the instrument service manual, being careful not to pinch the FFC cable. Route the cables through the opening on the back of the CRT display shield.



Route the LCD panel FPC cable through the opening to J2 on the LCD-7B board. When connecting the FPC cable, first open the lever, insert the FPC cable end fully into the connector with contacts facing **DOWN**, and then close the lever. Install jumper on P4 pin 1-2.

Mount the LCD-7B board to the front plate using two M3 screws. Secure the LCD back light cable with electric tape. Connect the cable to P8 on the LCD-7B board.



Connect NewScope-7 cables to the LCD-7B board. When connecting the FFC cable, first open the lever, insert the FFC cable end fully into the connector with contacts facing **DOWN**, and then close the lever.



OPTIONAL: If the glass filter has a tendency to fall out of the CRT bezel from the bottom, cut the rubber foam seal to 1/2" long pieces, remove the paper backing and attach to the slanted edges of the LCD front plate on the bottom.

If the glass is also loose on the top, the foam seal can be applied to the top as well. Keep them small as they will be visible through the glass.



Remove the plastic film on the adhesive backing of the cable clamps. Place the clamps inside the monitor cavity along the cable route and secure the cables.

Secure the LCD panel assembly to the instrument chassis front frame **with the LCD-7B board on the top**. Use the provided 6-32 flat-head screws, two on the top and two on the bottom.

Remove the protective shipping film from the LCD panel.

Following the procedures outlined in the instrument service manual to

- Replace the CRT bezel with the glass filter.
- Replace the PC board spacer and top RFI gasket.
- Replace the instrument cover.
- Reconnect the line cord.

4 Operation

Power up the unit, the LCD display should work the same way as the CRT display.

4.1 Intensity and contrast control

The intensity control works as before. There are approximately 10 visible intensity steps across the intensity adjustment range. This is normal.

The contrast control is no longer available and the contrast is always set to max. Picture contrast can be changed by configuring the background color in the display menu.

4.2 Display scaling

The active display area of the 8" LCD panel is slightly larger than that of the original 7.5" CRT. The graticule area of the original picture is scaled up vertically to take advantage of the larger display area,

while maintaining its original aspect ratio. This is important such that the polar chart and smith chart are rendered with round circles.

The soft menu area, on the other hand, is scaled up in a smaller ratio so as to maintain the visual alignment between the soft menu text and push buttons. This dual-scaling capability is enabled automatically by detecting a picture with distinct graticule and soft menu areas. It can be forced disabled by installing jumper P3 on the LCD-7B board. See section 4.4 for details.

4.3 Analog VGA output

With Advanced installation, analog VGA output is available through the DB-15 External Display connector on the rear panel of the unit. Horizontal and vertical sync signals are present if the H-sync and V-sync cables are connected during installation. With separate sync, the external monitor is not required to support sync-on-green in order to display the video.

The video output timing of NewScope-7C is close to, but not an exact match to the industrial standard XGA format. Most VGA monitors can achieve a satisfactory display through their auto adjustment procedure in the on-screen display (OSD) menu, and ‘remember’ the timing settings. Manual adjustment may be needed on some monitors for best results. Please refer to the monitor’s manual for details about performing the adjustment.

4.4 Jumpers

There are 3 jumpers on the LCD-7B board. Their usage is described in the table below:

Table 3 Jumpers on LCD-7B when used with NewScope-7C

Jumper	Position	When Installed	When Removed	Note
P2	1-2	Enable backlight Intensity control	Backlight always at max intensity	Max intensity setting results in nominal backlight LED current specified by the LCD manufacturer
P3	1-2	Default image scaling settings	Fail-safe image scaling settings	Fail-safe setting disables dual-scaling and uses the graticule scaling ratio for the entire picture
P4	1-2	Reversed scan direction		Reversed scan should be used for NewScope-7C
	2-3	Normal scan direction		

4.5 VCOM adjustment

Trim pot R19 on the LCD-7B board is used to adjust VCOM for the LCD panel. Each panel may have slightly different optimum VCOM voltage for an artifact-free image with best contrast. This pot has been adjusted with the matched LCD panel before shipping. If the LCD seems to have uneven background intensity around the perimeter, R19 may need adjustment. Turn the trim pot with an insulated adjusting tool (such as one designed for oscilloscope probe frequency compensation adjustment) when the

system is powered on. Be extremely careful not to let the exposed circuit touch the metal part of the chassis.

4.6 Component locations

The locations of components mentioned in this document are shown in Figure 4-1 below.

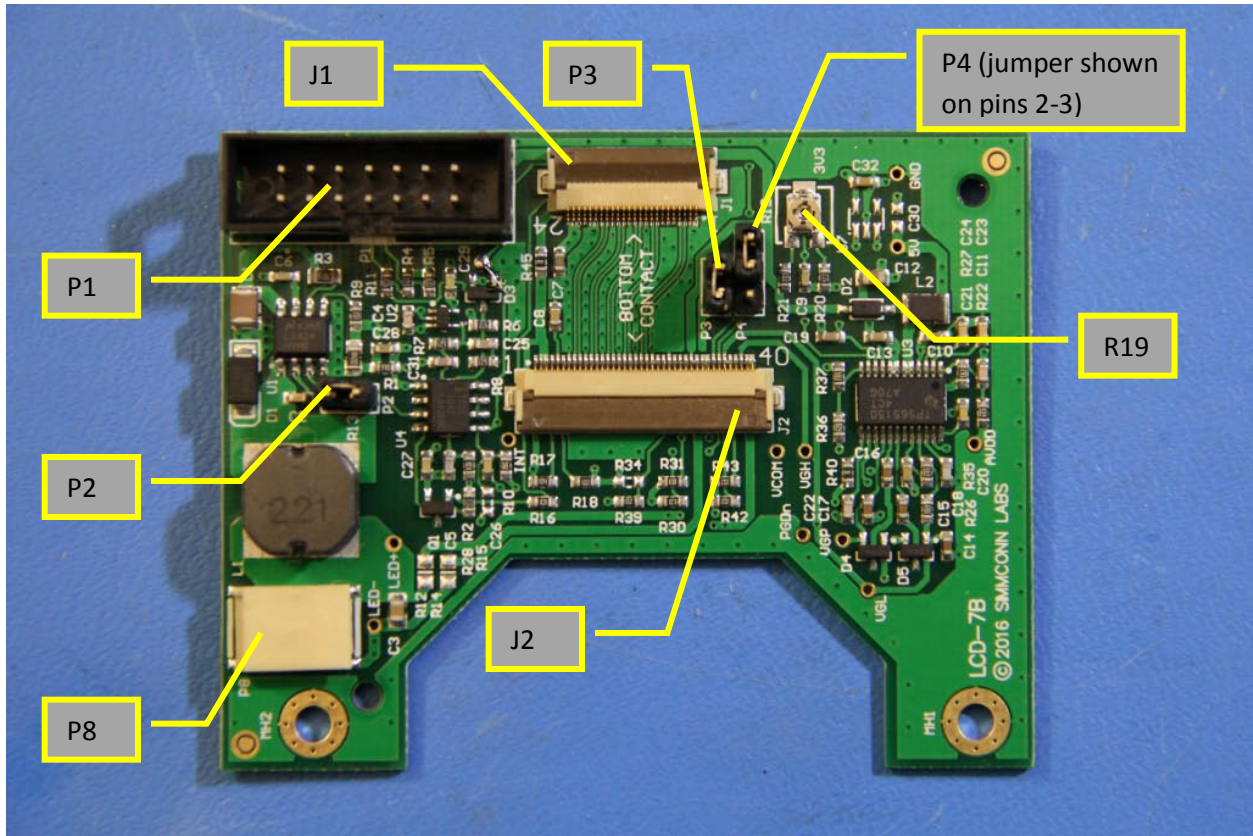


Figure 4-1 Component Locations on LCD-7B

Revision History

Revision	Date	Notes
0.1	12/29/2016	Initial revision for pre-production units
0.2	04/02/2017	Up Changed section 1.1 to 'Kit compatibility' Changed kit content to add misc mechanical parts Changed jumper P3 descriptions Added VCOM adjustment and component locations
0.3	05/13/2017	Clarified shouldered pins on the pin strip Changed 'LCD-7A' board number in VCOM adjustment to 'LCD-7B'