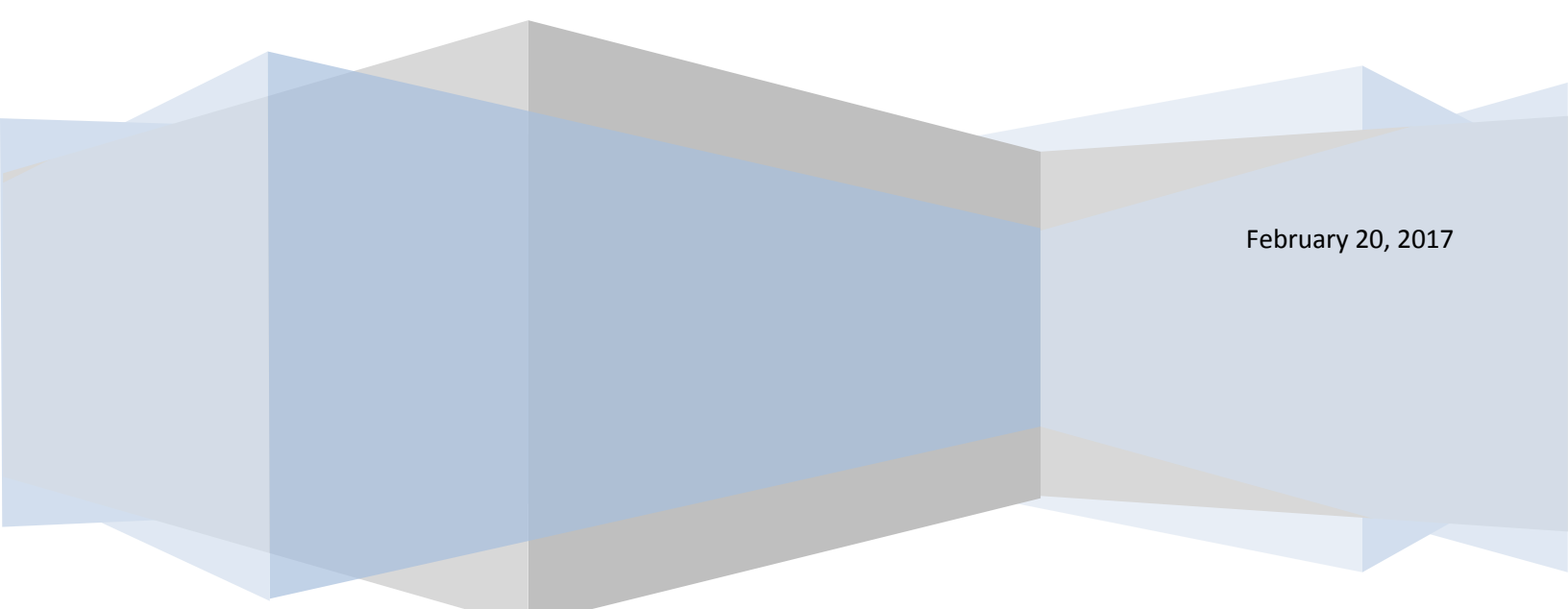


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NewScope-7A Operating Manual

Preliminary



February 20, 2017

NewScope-7A Operating Manual

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1 Introduction

The NewScope-7A 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 70004A Color Display. The kit includes a 7" 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 picture aspect ratio and soft menu alignment
- Compatible with all known 70004A processor board revisions
- Compatible with all firmware versions. No changes to the instrument's original firmware
- Optional analog VGA output at XGA resolution¹

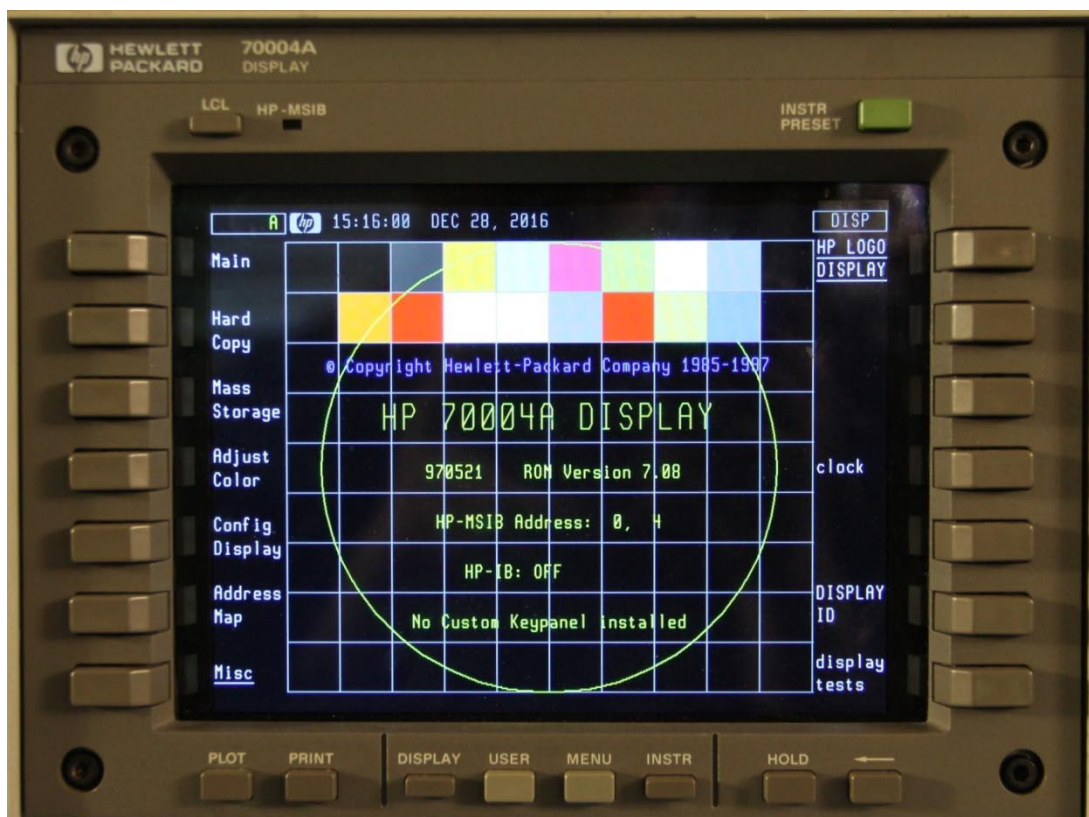


Figure 1-1 NewScope-7A installed on an HP 70004A

1.1 Kit compatibility

NewScope-7A is compatible with all 70004A A5 processor board P/Ns.

2 Initial Inspection

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

¹ Requires advanced installation, and that the external monitor supports sync-on-green.

Table 1 NewScope-7A 7" XGA Kit Content

Item	Qty	Reference	Description	Note
1	1	NewScope-7A	Main board for NewScope-7A kit	
2	1	LCD-7A	Display Board for NewScope-7A kit	1
3	1		7" XGA LCD panel	1
4	1	18-0001-026	NewScope-7 Power cable	
5	1		NewScope-7 FFC cable	
6	1	19-0001-021	NewScope-7A front plate	1
7	1	19-0001-022	NewScope-7A back plate	1
8	7		M3x6 Pan-head Philips screw	1
9	1		IC socket, 22-pin DIP, 0.4"	
10	2		Pin strip	2
11	3		Resistor, metal film 51 Ohm $\pm 1\%$, 1/8W	3
12	1		Resistor, metal film 750 Ohm $\pm 1\%$, 1/4W	3
13	1		Wire tie 0.070" x 2.8"	3
14	3		Cable clamp	

Note:

1. Shipped pre-assembled as LCD panel assembly.
2. 9 pins per strip for standard installation, or 11 pins per strip for advanced installation.
3. Available with VGA option

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 70004A Disassembly

Perform the procedures outlined in the HP 70004A Service Guide (HP P/N 70004-90046) to

- Remove the A3 Monitor/Monitor Bracket
- Remove the A5 processor.

Now the A1 front panel, A5 processor, the monitor and the monitor bracket are separated from the unit.

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

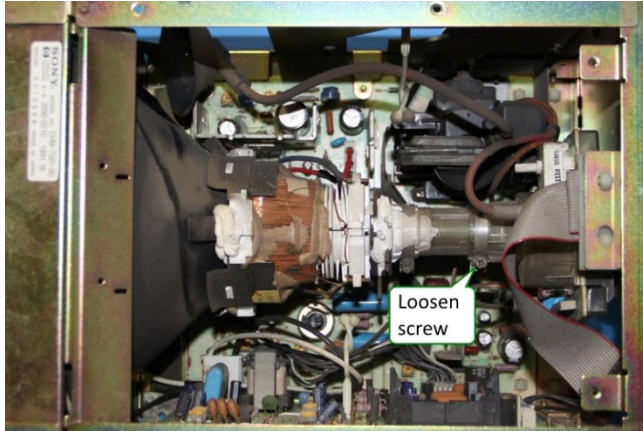


Before unplugging the anode in the following step, you must discharge it: using a flat-blade screwdriver with an insulated handle, while touching the chassis with the blade, probe under the insulating cap of the anode lead with the tip and touch the lead's metal conductor to discharge. Repeat several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



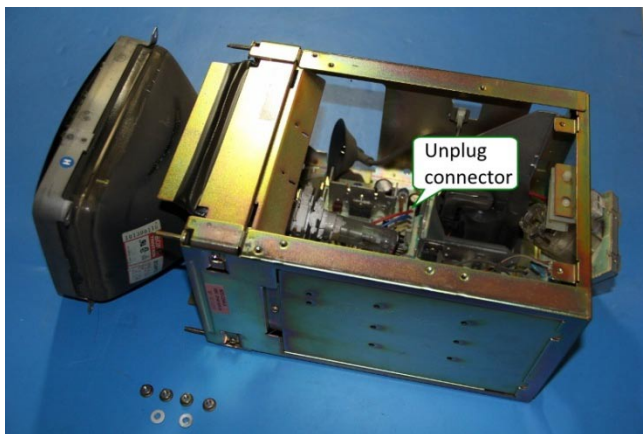
The anode lead has two hooks (see picture). Push the center of the rubber cap downward and sideways to release one hook from the CRT anode, and then push the cap to the other side to release the other hook and the lead will be free.

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



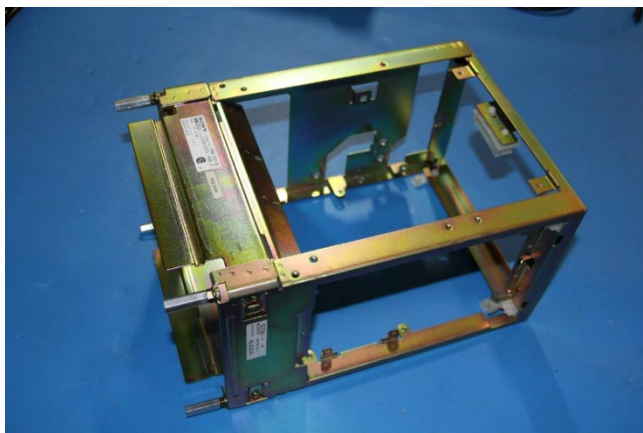
Remove the top cover by removing the two screws on the top of the monitor. Remove the bottom/rear cover by removing the 4 screws on the rear of the monitor. Remove the monitor ribbon cable from the cable clip.

Loosen the screw securing the CRT tail board to the CRT neck. Carefully remove the CRT tail board. Unplug the deflection yoke cable from the PCB.



Remove the standoffs and nuts that secure the CRT safety band to the monitor chassis. Save the hardware for later assembly.

Make sure all cables have been disconnected from the CRT, and then guide the CRT out from the front.



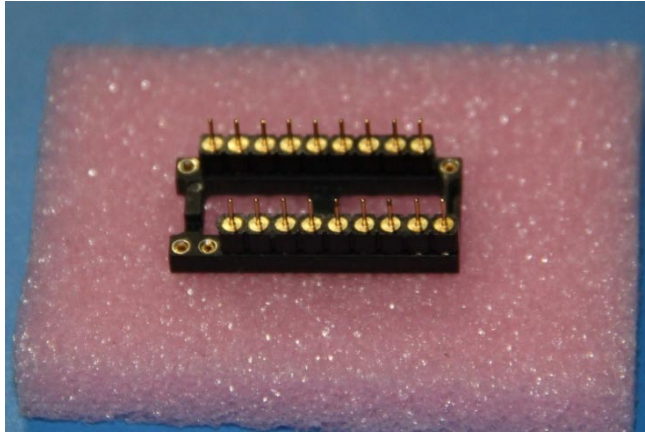
Remove all circuit boards and side covers from the monitor. Remove the degaussing coil taped to the front top and bottom.

Re-install the nuts and then standoffs removed from the previous step **without** the washers. Clean the frame.

Note: Follow your state's hazardous materials guidelines for CRTs and electronics when disposing of CRT and monitor circuit boards.

3.3 Standard installation on A5 processor board

Note: Use procedures in this section for standard kit without the VGA output option. For kit with VGA output option, skip to section 3.4.



Insert the strip pins to the DIP IC socket, occupying pins 3 thru 11 and 13 thru 21. Make sure the shouldered pins are fully inserted.



Flip the DIP IC socket on top of the RAMDAC U81 located near A5J3. Check that pins are on U81 pins 2 thru 10 and 12 thru 20.

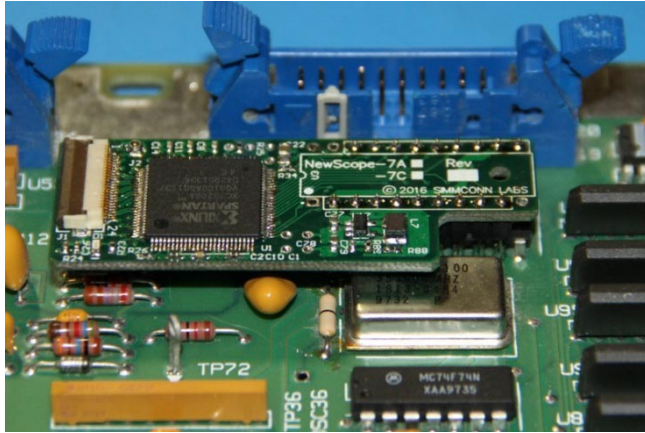
Align the strip pins to the horizontal centers of each of the above RAMDAC pins. Push the pins down until the plastic strips touch the top of the RAMDAC chip.



Solder pins at both ends of the strip first. A thin, bent soldering tip is recommended for this job, especially for the hard-to-reach pins close to A5J3.

Carefully remove the IC socket from the strip pins using a small screw driver. Solder the rest pins.

Bend down the tantalum capacitor near U81 pin 1.

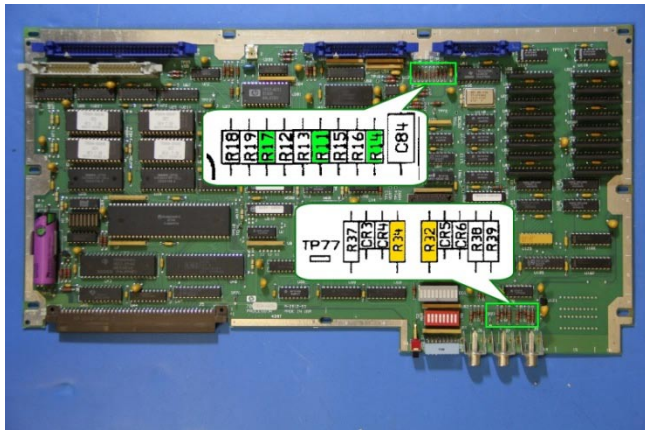


Place the NewScope-7A board on top of the strip pins and let the pins through U3 pins 2 thru 10 and 12 thru 20 (marked with long rectangles on the side of the U3 silkscreen). First solder the pins at the end of the strips in a criss- cross pattern while holding the board level, then solder the rest pins. Alternatively, the DIP socket can be soldered on the bottom side of the NewScope-7A board and then plugged onto the strip pins.

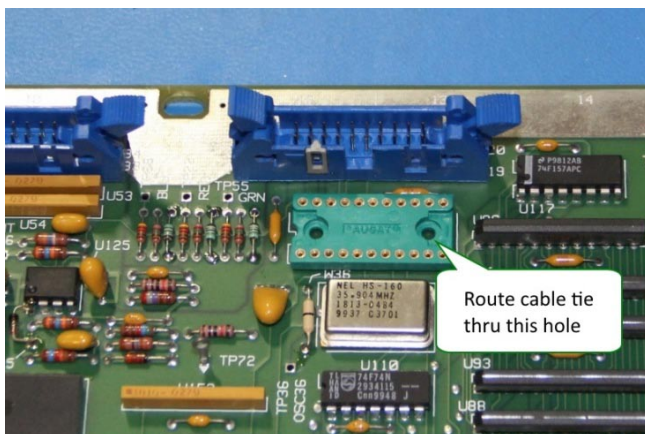
Now skip to section 3.5 70004A Assembly

3.4 Advanced installation on A5 processor board

Note: If you ordered a NewScope-7A kit with VGA output option, but decided not to enable the feature, you may break the strip pins until 9 pins are left on each strip, and then follow the installation procedure in section 3.3 instead.

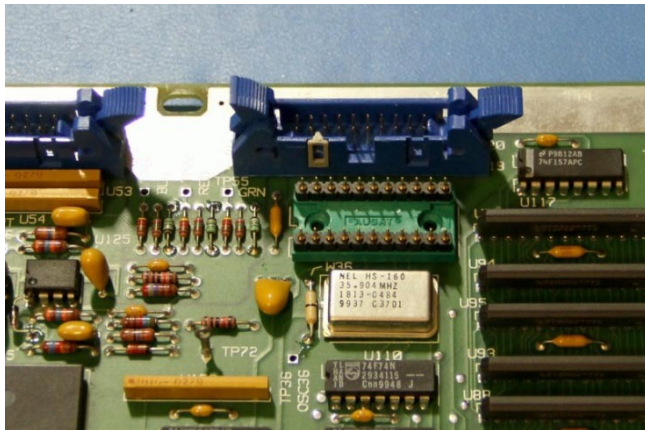


Replace R11, R14 and R17 (26.1 Ohm) with 51 Ohm 1/8W resistors.
Remove R32 (316 Ohm).
Replace R34 (2.15k) with 750 Ohm 1/4W resistor.

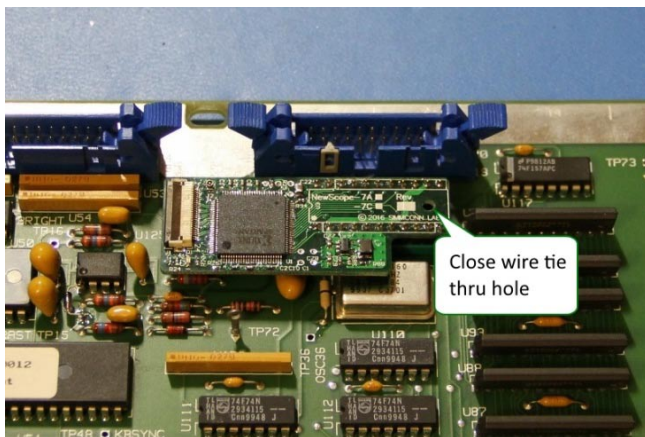


De-solder the RAMDAC chip U81 from the A5 processor board. A temperature-controlled, ESD-safe vacuum de-soldering gun is recommended for this job. Clean the through-hole pads.

Route the tail of the wire tie from the right side, under the socket and then come up through the opening. Solder the DIP socket to the U81 location.

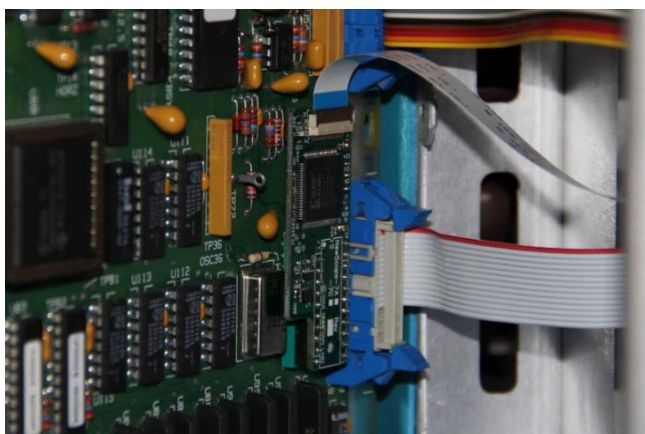


Insert the strip pins to the DIP socket. Make sure the pins are fully inserted and the plastic strips sit flat on top of the IC socket, with 'shouldered' pins on top.
Place the NewScope-7A board on top of the strip pins and let the pins through the U3 footprint.

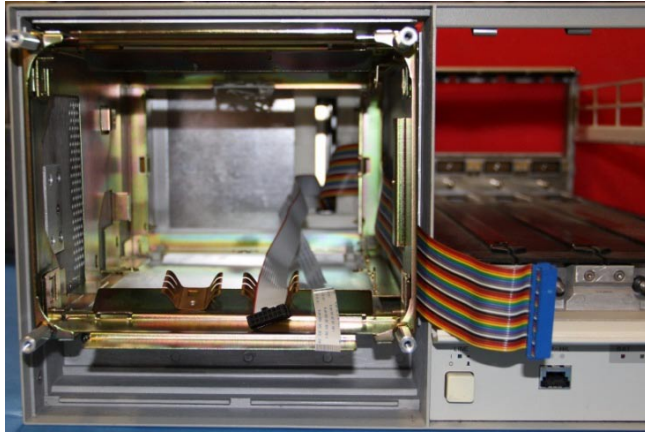


Solder the board to the pins while keeping the board level.
Close the wire tie loop through the hole and over the right edge of the board. Tighten the wire tie and trim the excess.

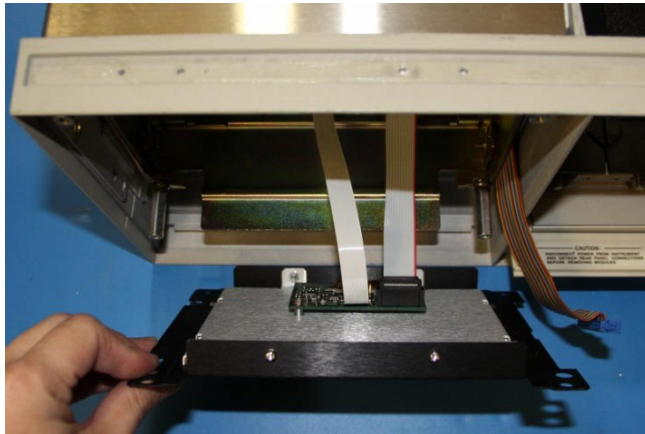
3.5 70004A Assembly



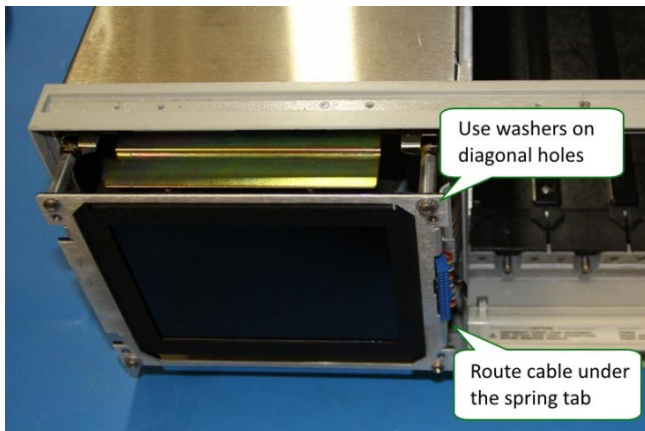
Connect the FFC cable to J1 on the NewScope-7A board. First open the lever, insert the FFC cable end fully into the connector with contacts facing **DOWN**, and then close the lever.
Connect the 20-pin end of the NewScope-7 Power cable to A5J3.
Replace A5 board following the 'To Replace the A5 Processor' procedure step 2 through 5 described in the HP 70004A Service Guide.



Route both NewScope-7 cables through the opening behind the monitor.
Slide the stripped monitor chassis into position while being careful not to pinch the ribbon cables. Remove the plastic film on the adhesive backing of the cable clamps. Place the clamps inside the monitor chassis along the cable route and secure the cables.
Route the front panel ribbon cable outside the monitor chassis.



Connect NewScope-7 Power cable to P1 on the LCD-7A board. Trim the protective tubing for the FFC cable and leave as much length as possible.
Connect FFC cable to J1 on the LCD-7A board. When connecting the FFC cable, first open the lever, insert the FFC cable end fully into the connector with contacts facing **UP**, and then close the lever.



Secure the monitor bracket to the monitor chassis with the LCD panel assembly sandwiched in between. Use the two shouldered washers saved from the CRT removal process to help centering the mounting screws to the oversized holes on the bracket.
Remove the protective shipping film from the LCD panel.

Install the four screws for the monitor chassis to the main deck but do not tighten.
Replace the A1 front panel as described in "A1 front panel Replacement" steps 1 through 6 in the HP 70004A Service Guide.
Replace the instrument cover.
Replace all modules.
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 out of 19 possible intensity settings. This is normal.

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

4.2 Display scaling

The original display image on the 70004A is scaled up in the vertical direction. The scaling ratio is chosen to optimize for both the soft menu text alignment and the original display aspect ratio on the 70004A.

4.3 Analog VGA output

With Advanced installation, analog VGA output is available through the R-G-B RCA jacks on the rear panel of the unit. Horizontal and vertical sync signals are embedded in the green signal and are not available separately. The external monitor is required to support sync-on-green in order to display the video.

The video output timing of NewScope-7A 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 on performing the adjustments.

4.4 Jumpers

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

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	Both settings are the same on the NewScope-7A

4.5 VCOM adjustment

Trim pot R19 on the LCD-7A 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 **Error! Reference source not found.** below.

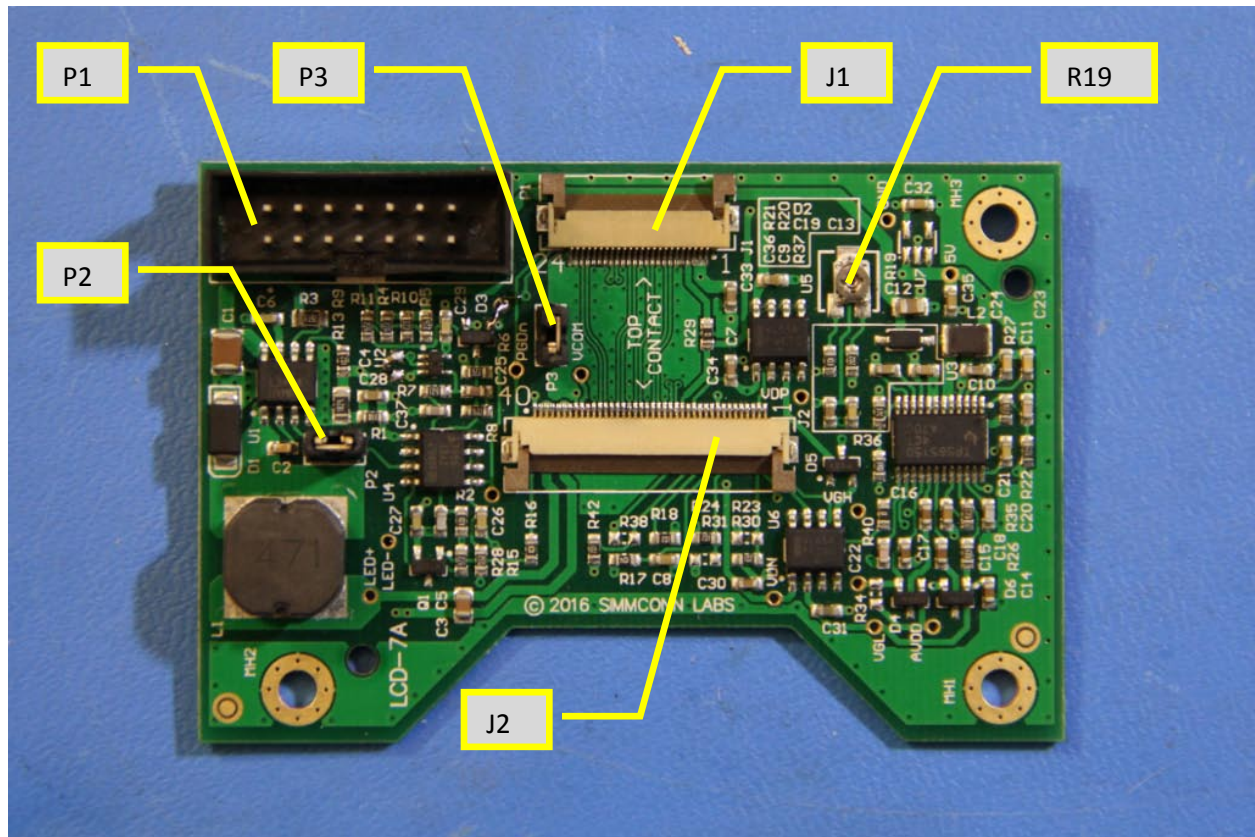


Figure 4-1 Component Locations on LCD-7A

Revision History

Revision	Date	Notes
0.1	12/30/2016	Initial version for pre-production units
0.2	2/20/2017	Changed section 1.1 to 'Kit compatibility' Changed jumper P3 descriptions Added VCOM adjustment and component locations