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NewScope-8 Operating Manual

For LCD Kits with Serial Number above NS82000

March 28, 2021

A decorative graphic at the bottom of the page consisting of several overlapping, semi-transparent geometric shapes in shades of blue and grey, creating a layered, architectural effect.

NewScope-8 Operating Manual

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1 Introduction

The NewScope-8 Color LCD replacement Kit is designed to replace the monochrome CRT in the HP® 85662A spectrum analyzer display used in 8566A, 8566B, 8567A, 8568A and 8568B Spectrum Analyzers. The Kit is equipped with a 6.5" TFT color LCD with VGA (640 x 480) resolution. The key features of the Kit include:

- Bitmap font gives better clarity over the original vector font when rendered on a raster LCD panel.
- Enlarged marker in distinct shape and color.
- Resolution enhancement takes advantage of the 1024 point original resolution of the 85662A display and gives a smooth curve with reduced jaggedness.
- Four display schemes selectable by the align pot
- Sweeps of 10ms and below are now digitized and stored in trace A memory, which can be captured via GPIB. The X axis is timed with a crystal oscillator and requires no adjustment.
- Compatible with existing GPIB automation software.
- The LCD backlight is powered from the source that was used for the CRT high voltage module.

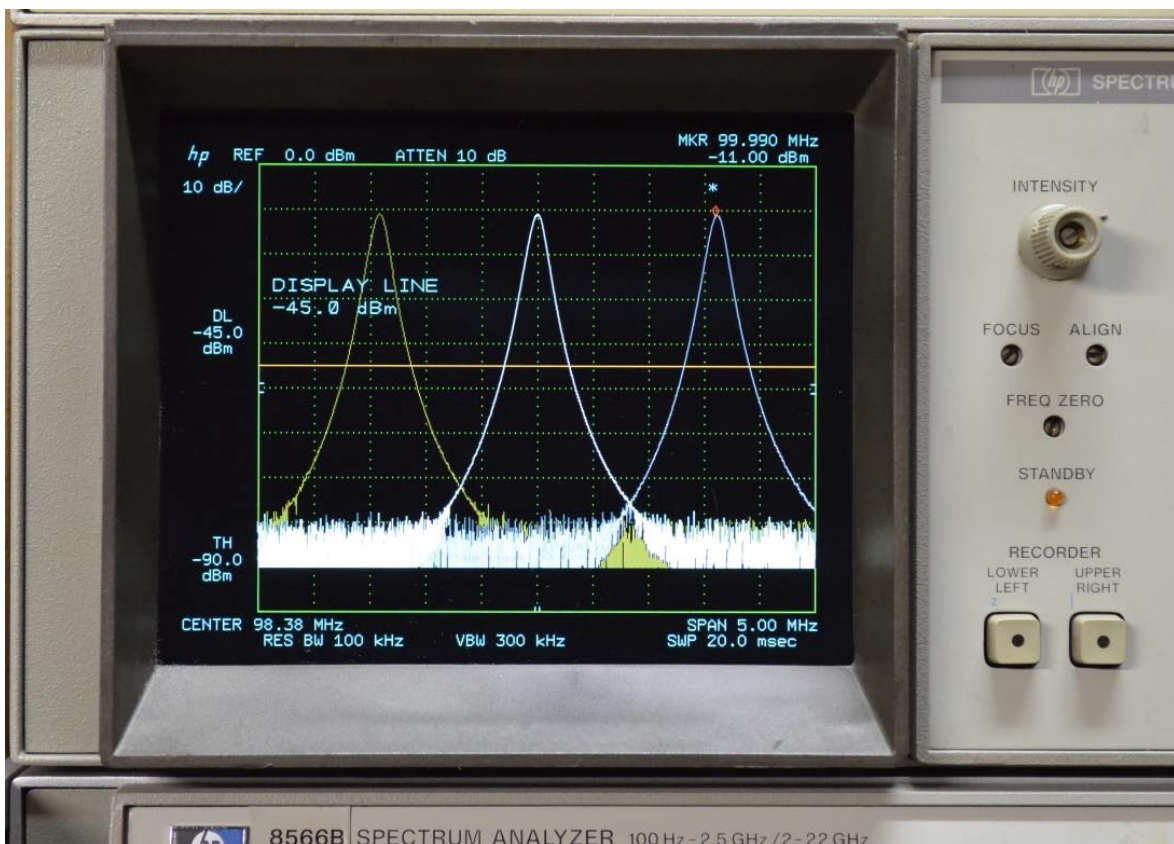


Figure 1 NewScope-8 6.5" VGA Kit shown with default (NewScope) display scheme

2 Installation

2.1 Initial Inspection

Refer to the following tables for a list of parts included in the NewScope-8 Kit. Verify that all parts listed are included in your kit. *Note: items may differ with different LCD panel configurations.*

Table 1 NewScope-8 6.5" VGA Kit Content

Item	Qty	Reference	Description	Note
1	1	NewScope-8	Main board for VGA kit	1
2	1	Pwr_plg	Power Plug board	1
3	1	85662A_Bridge	85662A Bridge board	1
4	1	18-0001-018	Display Link Cable, LVDS, 20-Conductor	2
5	1	18-0001-015	Display Board Control Cable, 6-Conductor	
6	1	18-0001-019	Power Plug Board Control Cable, 3 or 6-Conductor	
7	1	18-0001-030	LCD Backlight Cable, 6-Conductor	2
8	1		6.5" VGA LCD Panel with LED backlight	2
9	1	19-0001-012	LCD Panel Bracket	2
10	1	19-0001-013	Modified 85662A bezel for 6.5" LCD panel	3
11	4		M2 x 3 Flat-head Philips screw	2
12	2		M3 x 8 Flat-head Philips screw	3
13	2		6-32 x 1/2" Flat-head Philips Screw	3
14	2		6-32 KEP Nut	3
15	2		2" Wire for LRTRC and FS connection	
16	1		14" Wire for CRT_DSBL connection	
17	1		Coax cable for Y connection, 6"	
18	2		Nylon wire ties 4"	
19	1		Pin strip, 14-pin or 2x7-pin	
20	1		DIP socket, 14-pin	

Note:

1. Shipped as one panelized PCB assembly.
2. Shipped pre-assembled as the LCD panel assembly.
3. The LCD panel assembly may be installed on the modified 85662A bezel for shipping purpose. Please remove the LCD panel assembly from the bezel and save the fasteners for installation.

2.2 Installation of the NewScope-8 Kit

Installation should be performed by a qualified technical person who is familiar with the 85662A unit.

The Kit installation time is approximately 3 hours. Please refer to spectrum analyzer service manuals for location of the assemblies.

2.2.1 Read before installation

Please treat the parts and assemblies with care during installation. Take the following guidelines when installing the kit:

1) 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.

2) The connectors are fragile. If you meet resistance when trying to make a connection, wiggle the connector gently left and right, let it find its way and then gradually plug in. Do the same when disconnecting a cable.

3) 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.

4) Before you try 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.

2.2.2 Prepare the boards

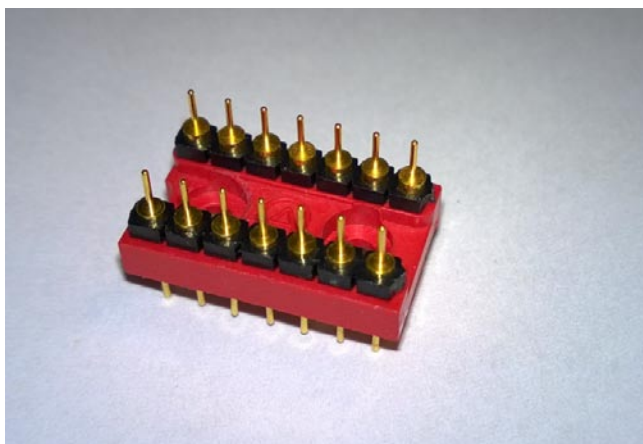
2.2.2.1 De-panelize the PCB assembly

The panelized PCB assembly needs to be separated. This can be done either before or after the next step, 85662A Bridge board assembly.

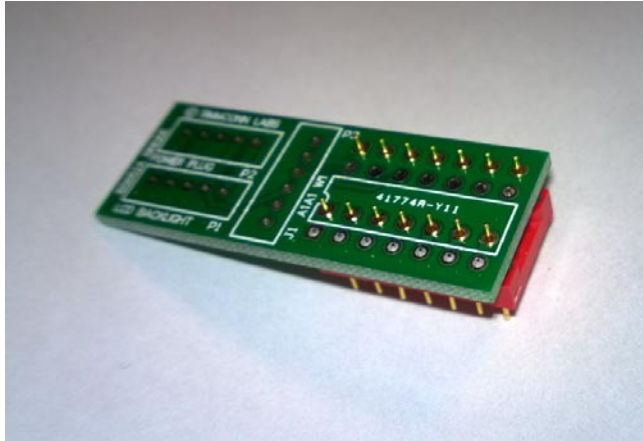
First, remove the 5-mm wide processing edges on the left and right of the PCB panel with pliers by bending the edges up and down. Then break the 85662A Bridge board and the Power Plug board away from the main board along the perforated tabs. Remove any tabs that are left on the main board. Tabs left on the other two boards will not affect their installation.

2.2.2.2 85662A Bridge board assembly

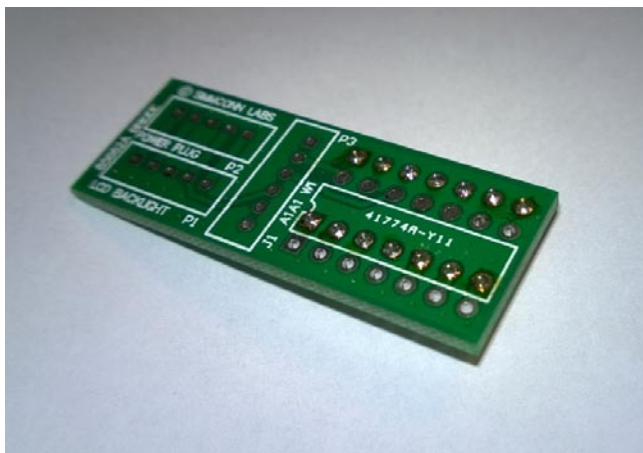
Some assembly on the 85662A Bridge board is required.



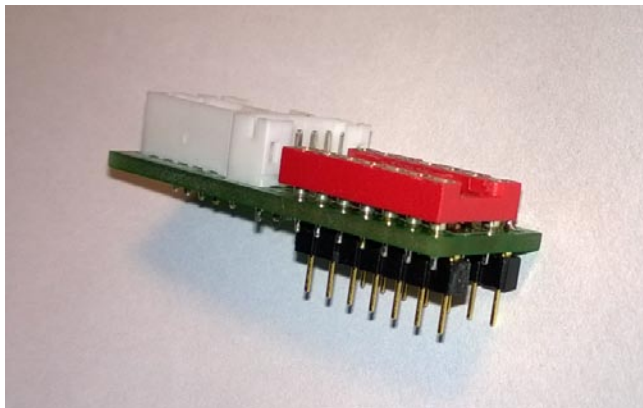
Break the pin strip into two 7-pin sections. The pins have a flange with a flat side and a cone-shaped side. Plug the flat side into the DIP socket.



Insert the pins from the bottom side of the 85662A Bridge board. A bare board is shown here for clarity.



Solder the pins on the 85662A Bridge board. Trim the excess lengths as much as possible.



Remove the DIP socket from the pin strips and install it from the top side of the 85662A Bridge board. The DIP socket pins don't need to be trimmed.

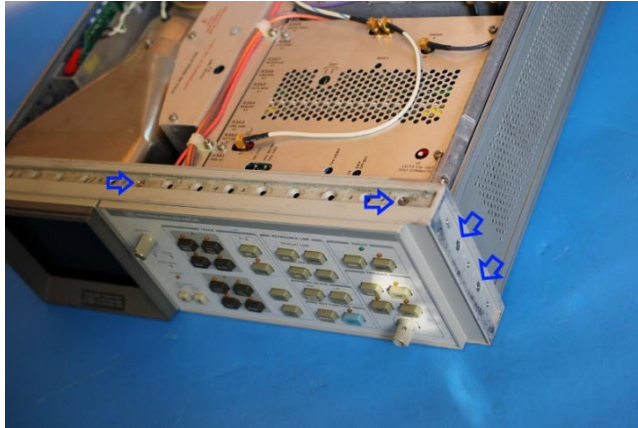
The 85662A Bridge board is now ready for installation.

2.2.3 Prepare the 85662A unit

Disconnect the AC power cord. Remove all cables connecting the 85662A IF section to the 8566/67/68 RF section, separate the IF section from the RF section. Remove the top and bottom covers from the 85662A.

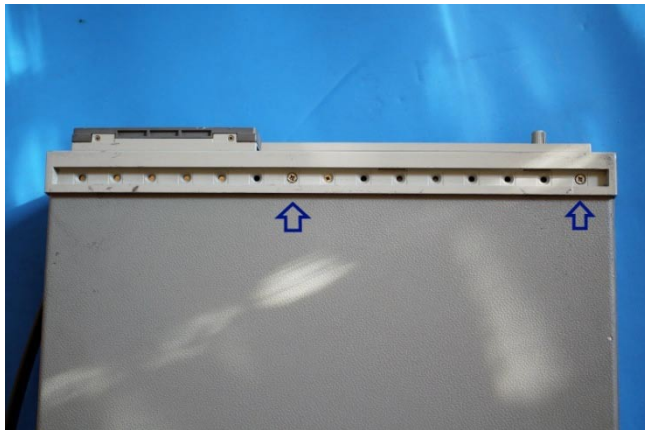
2.2.4 Remove the front panel

Refer to the 85662A service manual (HP part # 85662-90085) section A1A1 for procedures to remove the front panel:

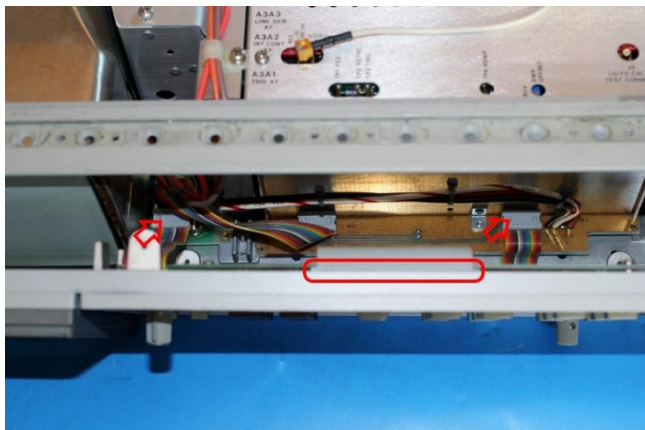


Remove the plastic trim strip on the top of the unit by inserting a small flat screwdriver into the slot and lifting upwards. Remove two screws located under trim strip.

Remove adhesive trim strips from both sides of instrument. Remove two screws located under each trim strip. Remove all four screws, two on each side.



Remove two screws from bottom of instrument used to secure front panel to frame.



Pull front panel forward to separate from the frame.

Disconnect the two 14-pin DIP ribbon cable connectors from the motherboard sockets. Disconnect the 50-pin ribbon cable connector from the top edge of the A1A1 keyboard. Front panel is now loose from instrument.

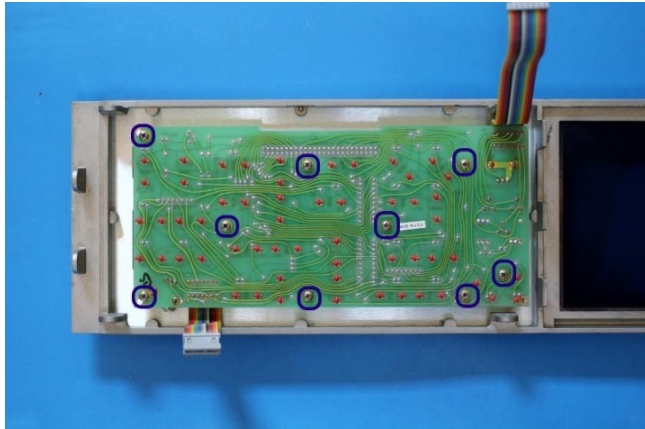
2.2.5 Remove the metalized glass window

Remove the two small screws from the bottom of the plastic CRT bezel.

With the front panel assembly on its back so the glass cannot fall out, gently pull the plastic CRT bezel bottom forward until it clears the mounting tabs on the inner bezel casting, then slide it downward to free its upper retaining tabs and remove it.

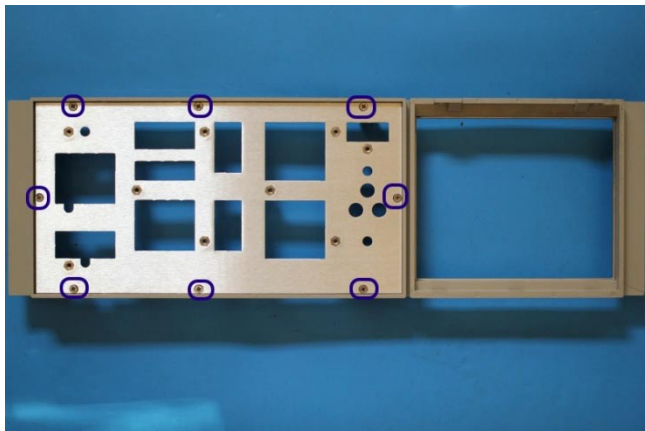
Carefully remove the metalized glass window from the inner bezel casting. Clean the glass with glass cleaner or mild soapy water and let dry completely.

2.2.6 Replace the Front Bezel



Loosen the set screws on the “Level” and “Intensity” knobs using 0.050” hex wrench. Remove the knobs and the retaining nuts underneath them. Lift the front dress panel and set it aside.

On some units, the front dress panel is taped to the front subpanel. Remove the nine 4-40 pan-head Philips screws and remove the front panel PCB. Slowly separate the front dress panel from the subpanel by pushing from the PCB side.

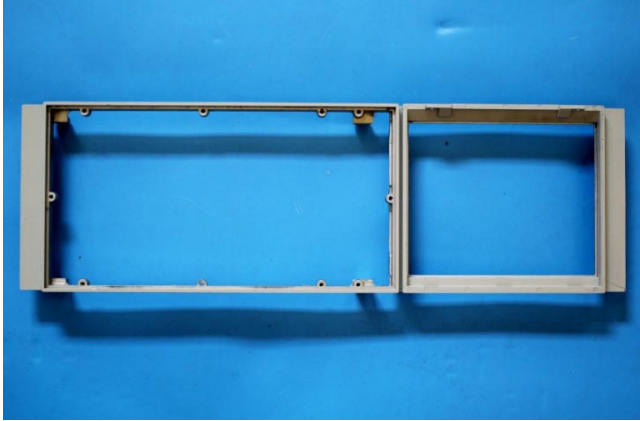


Remove the eight 4-40 flat-head screws on the front of the front subpanel. Remove the subpanel from the front bezel.



If the kit is ordered with a modified bezel, the LCD panel assembly is installed in the bezel for shipping purpose, and needs to be removed for installation.

Undo the four screws on the top, bottom and side of the bezel. Remove the LCD panel assembly. Save the fasteners for installation.



Replace the original bezel with the modified bezel. Install the subpanel and keyboard PCB A1A1 to the new bezel. Replace the front dress panel, retaining nuts, “Level” knob, and “Intensity” knob.

Return the undamaged original bezel shown on the left to the Kit vendor to receive the modified bezel.

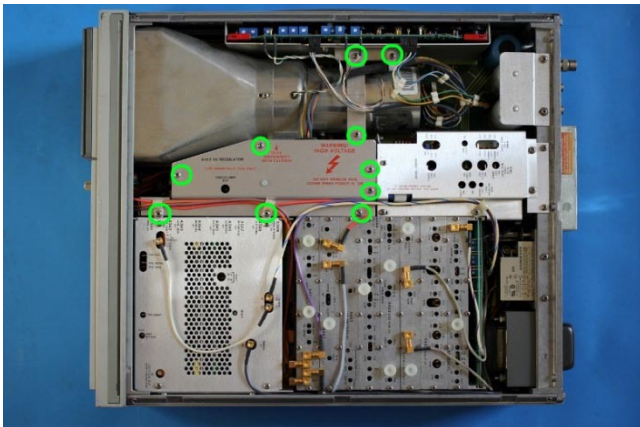
2.2.7 Remove the XYZ driver boards (Optional)

NOTE: If the XYZ output function is no longer needed, A1A2, A1A4 and A1A5 boards may be removed from the unit. On some later model 85662A units, a single board replaces the A1A2, A1A4, and A1A5 boards. To retain the XYZ output function, no action is required to the above boards.

2.2.8 Remove the CRT and high voltage module

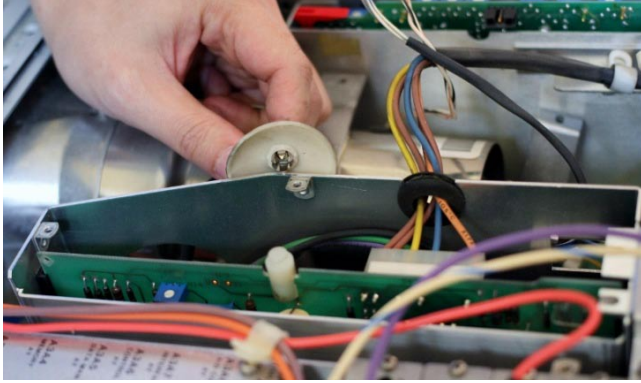
Warning! Potentially Lethal Voltages Present!

Review the 8566/67/68 service manual for safety guidelines, CRT warnings and high voltage power supply warnings before proceeding.

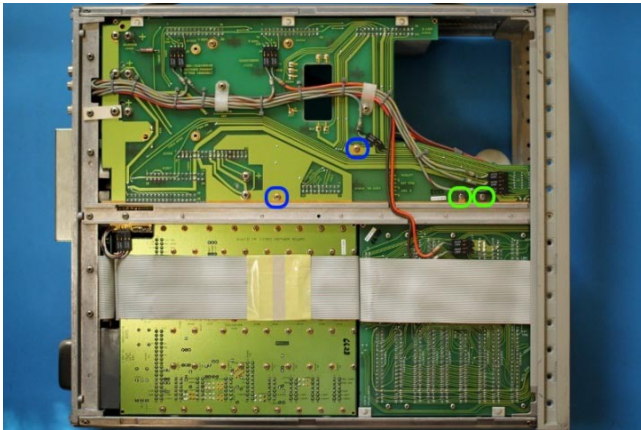


Remove the A1A3 shielding cage cover. In older 85662A units, the A1A6/A7/A8 cage cover and the A1C3 capacitor cover may also need to be removed. They will be reinstalled later.

Remove the rear CRT mount.



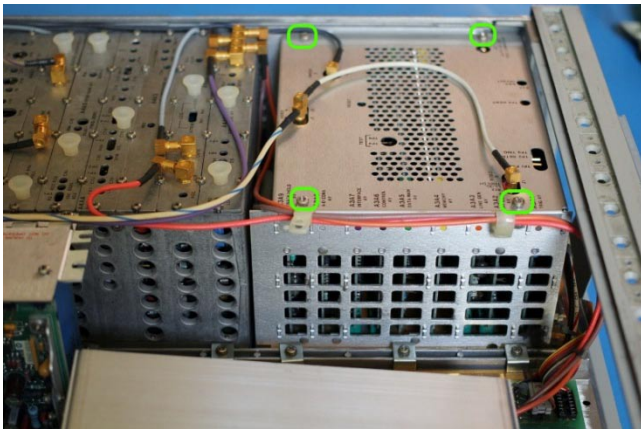
Carefully discharge the CRT and high voltage power supply.
Disconnect and remove the CRT as per the 8566/67/68 service manual.



Remove the four 6-32 screws securing the A1A3 high voltage power supply and the shielding cage to the motherboard. Remove the A1A3 high voltage power supply.

Separate the high voltage power supply from the shielding cage. The A1A3 shielding cage can be left loose in the unit with cable clips attached. It will be installed later.

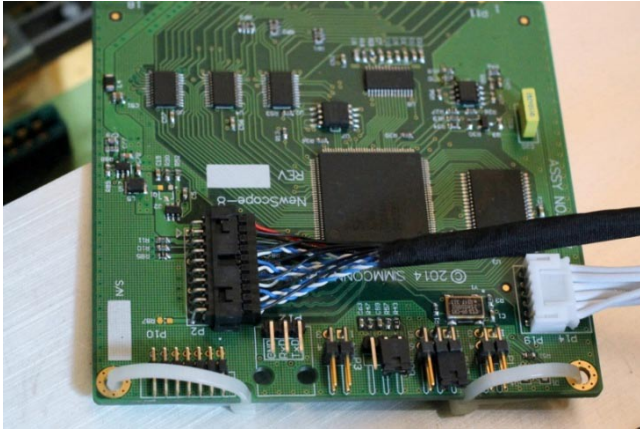
2.2.9 Install the NewScope-8 main board



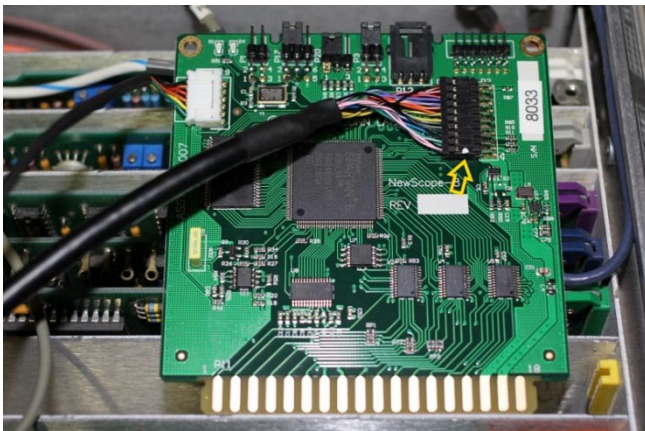
On the top cover of the A3 card cage near the SMB connectors, mark the color of the cables for later installation.

Disconnect the three SMB cables that are connected to the top of the A3 card cage.

Remove the top cover of the A3 card cage. Remove A3A4 from the A3 card cage (the card with **YELLOW** extraction levers).



Make two loops with wire ties. These will be the extraction aid should you need to remove the board later. Rest the loop in the PCB notch.



Feed the display link cable and display board control cable through the venting holes into the A3 card cage.

Plug the display board control cable (6-conductor) to the NewScope-8 Main board P19.

Plug the display link cable to the NewScope-8 Main board P2. Note the end with a white dot aligns with the triangle on the PCB.



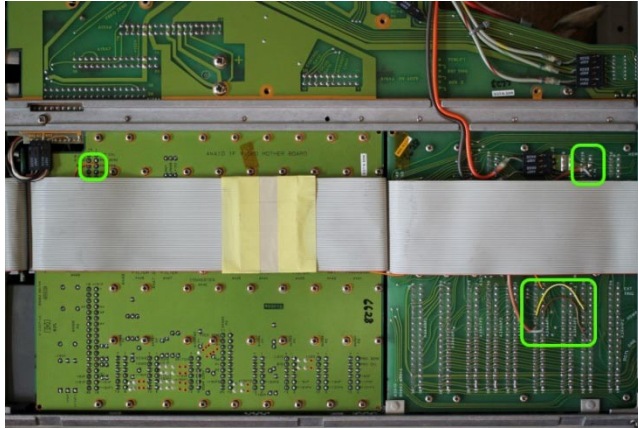
Install the main board into the A3A4 card cage slot, route the display link cable and the display board control cable between the A3 card cage and the A1A3 shielding cage to the LCD panel area.

Replace the A3 card cage top cover.

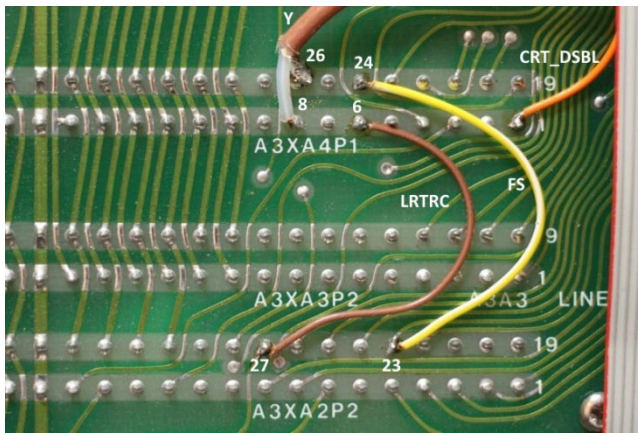
Reconnect the three SMB cables that were connected through the top cover of the A3 card cage.

2.2.10 Wire connections on the 85662A main board

Note: The signal names provided in parenthesis () in this section are for referencing to the HP service manual. They may or may not be labeled on the PCB.



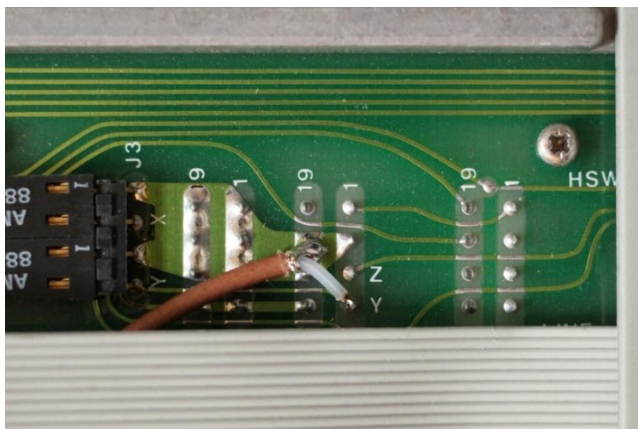
This is the overview of the wiring locations from bottom of the unit.



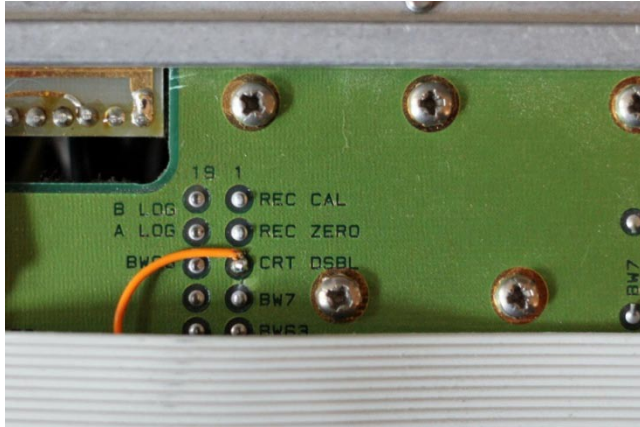
Solder a 2" wire between A3XA2P2 pin 27 and A3XA4P1 pin 6 (signal name LRTRC) on the underside of the A3 motherboard.

Solder a 2" wire between A3XA2P2 pin 23 and A3XA4P1 pin 24 (signal name FS).

Route a coax cable under the 50-pin ribbon cable and solder the center conductor to A3XA4P1 pin-8 (signal name Y) and the shield (GND) to A3XA4P1 pin-26.



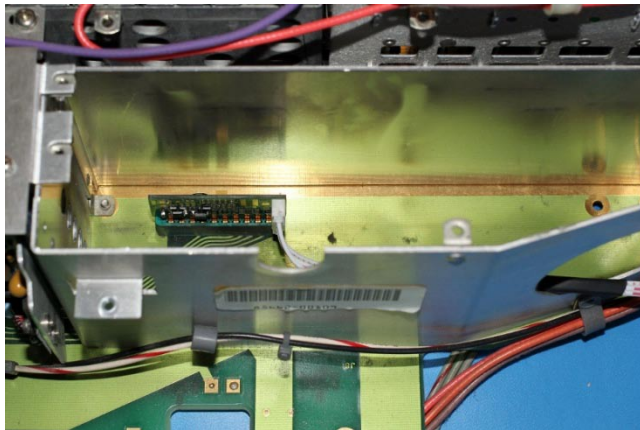
On the other end of the cable, solder the center conductor to A3XA2P1 pin-4 and the shield to A3XA2P1 pin-21 (located diagonally from pin-4).



Solder a 14" wire between A4XA9P1 pin 3 (signal name CRT_DSBL) and A3XA4P1 pin 1. Run the wire under the 50-pin ribbon cable.

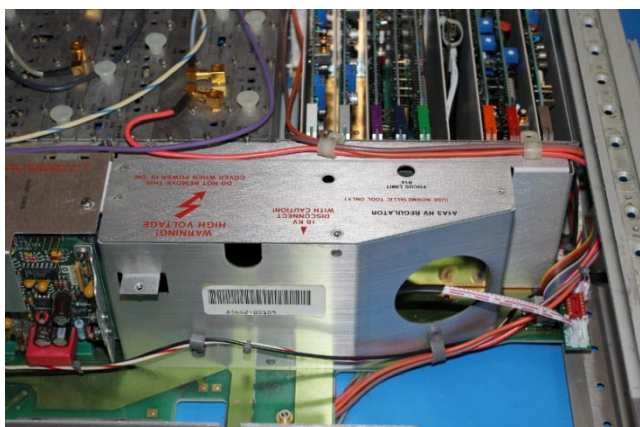
De-solder and discard the eight L-shaped pins that the CRT plugged into on the motherboard. This step helps to prevent the pins from shorting to the instrument cover.

2.2.11 Install the Power Plug board



Plug the 6-pin end of the Power Plug Board control cable on the Power Plug board. Install the Power Plug board in A1XA3P1. Note that pin 1 is facing the front of the unit.

Route the cable through the large round opening on the A1A3 high voltage power supply shielding cage. For older units without the large round hole, work the connector through one of the small round holes in the front and install the grommet.



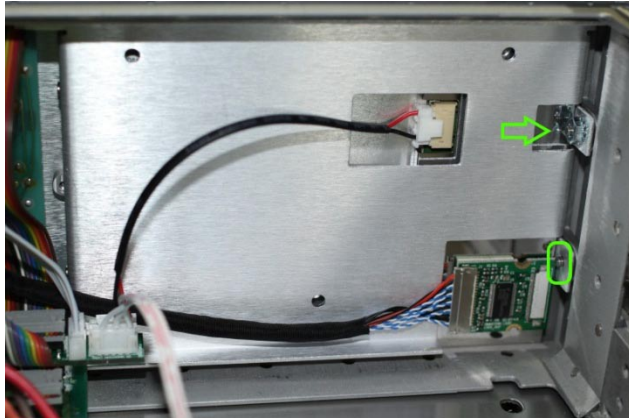
Reinstall the A1A3 shielding cage cover. Ensure the display link cable and the display board control cable pass in front of the A1A3 cage.

Engage cards A1A7 and A1A8 into their guide slots if removed. Reinstall the A1C3 and A1A6/A7/A8 covers if removed in step 2.2.8.

Reconnect all cable clamps that were disconnected from the A1A3 and A1A6/A7/A8 assemblies.

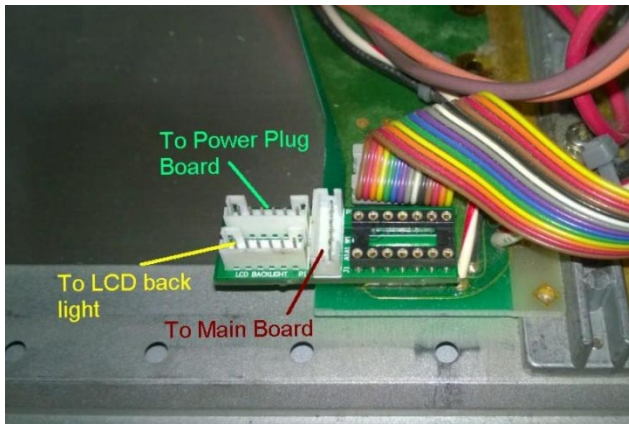
2.2.12 Install LCD panel and 85662A Bridge board

Apply foam strips to four edges on the front side of the LCD panel. Remove the protective plastic shipping film from the front of the LCD screen. Be careful not to scratch the LCD screen.



Place the LCD panel assembly face down into the front bezel cavity for the CRT.

Connect the LCD panel backlight cable to the LCD Panel.

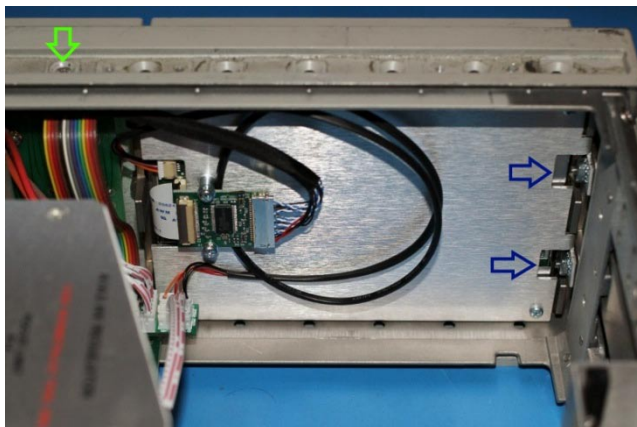


Connect the Power Plug Board Control Cable, Display Board Control Cable and LCD Backlight Cable to the 85662A Bridge Board. Refer to section 3.10 for more details.

Plug the 85662A Bridge Board to the motherboard A1J1.

Connect A1A1W1 to the 14-pin DIP socket on top of the 85662A Bridge Board.

Re-connect the remaining front panel cables to the 85662A by connecting the 50-pin ribbon cable to the keyboard and the remaining 14-pin DIP cable from the keyboard to A3J1.



Fit the front bezel back into the front frame. Fasten the LCD mounting bracket using M3 flat-head Philips screws on top and bottom (Green Arrow in picture).

Fasten the front bezel using the 1/2" 6-32 screws from the left side of the unit. Engage the KEP nuts while feeding the screw. Tighten the screws first, then the KEP nuts.

Install the remaining frame screws that were removed in step 2.2.4. Be careful not to pinch any cables between the front panel and the frame.

Turn the unit face-up. Replace the EMI glass and the plastic CRT bezel removed in step 2.2.5.

2.2.13 Finishing installation

Replace the bottom cover.

Turn the front panel intensity knob to the 12 o'clock position.

Reconnect the 85662A to the spectrum analyzer RF section with the interconnect cables. Reconnect AC power.

Turn on spectrum analyzer and verify correct operation.

Replace top cover.

3 Operations

3.1 Intensity control

The intensity knob works as before. A noisy intensity pot may cause surges in the backlight operating current. It should be cleaned or replaced.

3.2 Focus control

The Focus control does not have any effect to the NewScope display.

3.3 Align control

The Align control is used by the NewScope display to switch between display schemes. There are four preset schemes, *NewScope*, *8560EC*, *Original Mono* and *Inverted*. Turning the pot clockwise with a screw driver or a tuning tool will change the display scheme from 1 to 4. The display schemes are listed in Table 2.

Table 2 Display Schemes

Display Items	NewScope	8560EC	Original Mono	Inverted
Sample picture	See Figure 1	See Figure 2	See Figure 3	See Figure 4
Background	Black	Black	Black	White
Label	Cyan	White	Green	Black
Display Line	Orange	Orange	89% Green	Orange
Marker	Red (Bitmap)	Red	White	Red (Bitmap)
Resolution Enhancement	Yes	No	No	No
Trace A	White	Yellow	Green	50% Green
Trace B	66% White	75% Cyan	75% Green	Magenta
Trace C	50% Yellow	75% Magenta	63% Green	Blue
Graticule Lines	Green	50% Cyan	50% Green	Green
Graticule Style	Dotted*	Solid	Solid	Solid
Small Font (D1)	Bitmap+Vector	Bitmap+Vector	Bitmap+Vector	Bitmap+Vector
Medium Font (D2)	Bitmap	Bitmap	Vector	Bitmap, Bold
Large Font (D3)	Bitmap+Vector	Bitmap+Vector	Vector	Bitmap+Vector
Large Font (Bex)	Vector	Vector	Vector	Vector

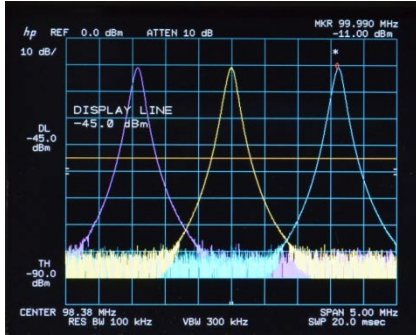


Figure 2 8560EC Display Scheme

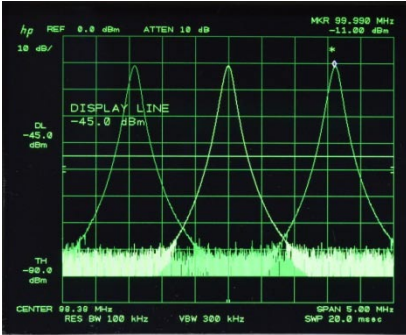


Figure 3 Original Display Scheme

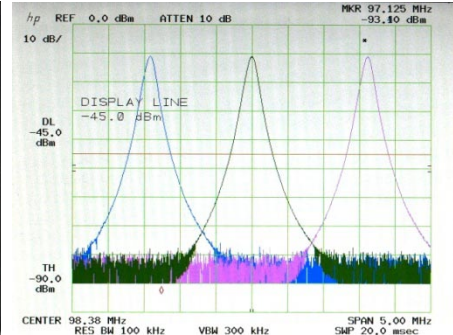


Figure 4 Inverted Display Scheme

3.4 Display on/off control

Display-off and -on (shift-g and shift-h) still work as before. The backlight is turned off and the LCD outputs a blank screen when shift-g is pressed. Except for the display, the instrument operation is not affected.

When shift-h is pressed, the NewScope display firmware is reinitialized. Shift-g and shift-h can be used to reset the NewScope display in case of malfunction.

3.5 LCD panel configuration

LCD panel configuration is done with jumper P1 pin 1-3 and P3 pin 1-3. The NewScope-8 Kit is shipped with the jumper setting that matches with the LCD panel in the same package.

3.6 LEDs

There are two LEDs on the main board, D1 and D4. D1 serves as ‘activity’ LED. Its duty ratio roughly indicates the display CPU utilization. The longer it stays on, the lower the utilization. D4 serves as ‘FPGA configuration done’, indicating a successful FPGA configuration.

3.7 Jumpers

There are four jumpers on the NewScope-8 main board. Their usage is explained in Table 3

Table 3 Jumper Settings

Jumper	Position	On	OFF	Note
P1	1-3	LCD Panel configuration	LCD Panel configuration	Set LCD panel configuration
	2-4	Reserved	Reserved	
P3	1-3	LCD Panel configuration	LCD Panel configuration	Set LCD panel configuration
	2-4	Return to factory setting	Normal operation	Used for recovery from unsuccessful firmware update only
P17*	1-2	LCD image scan direction line #1 High	LCD image scan direction line #1 Low	Change LCD image scan direction. If image rotation is desired, try both jumpers until display image is satisfactory.
	3-4	LCD image scan direction line #2 High	LCD image scan direction line #2 Low	

*P17 pin 5 and 6 are reserved for factory use. Do not change the factory setting.

3.8 Other Main Board Connectors Pin Out

Table 4 P2 LVDS Output

Pin #	Signal Name	Pin #	Signal Name
1	PWR_PNL (3.3V)	2	PWR_PNL (3.3V)
3	R/L	4	U/D
5	GND	6	LCD_D3_P
7	GND	8	LCD_D3_N
9	LCD_CK_P	10	GND
11	LCD_CK_N	12	LCD_D2_P
13	GND	14	LCD_D2_N
15	LCD_D1_P	16	GND
17	LCD_D1_N	18	LCD_D0_P
19	NC	20	LCD_D0_N

Table 5 P19 Backlight control

Pin #	Signal Name	Note
1	+5V	
2	INT_IN	Intensity control input, 0V (min) to 1V (max)
3	CLR_IN	Color control input, -15V (min) to +15V (max)
4	LCD_EN	0: backlight OFF, 3.3V: backlight ON
5	GND	
6	INT_OUT	PWM back light control output, default frequency = 200Hz

Other onboard connectors such as P10 and P12 are reserved for factory use.

3.9 Power Plug Board Connector Pin Out

Table 6 P9 Power Plug Board Output

Pin #	Signal Name	Note
1	+12V	
2	+12V	
3	GND	
4	GND	
5	LCD_EN	0: backlight OFF, 3.3V: backlight ON
6	NC	

3.10 Wiring Diagram

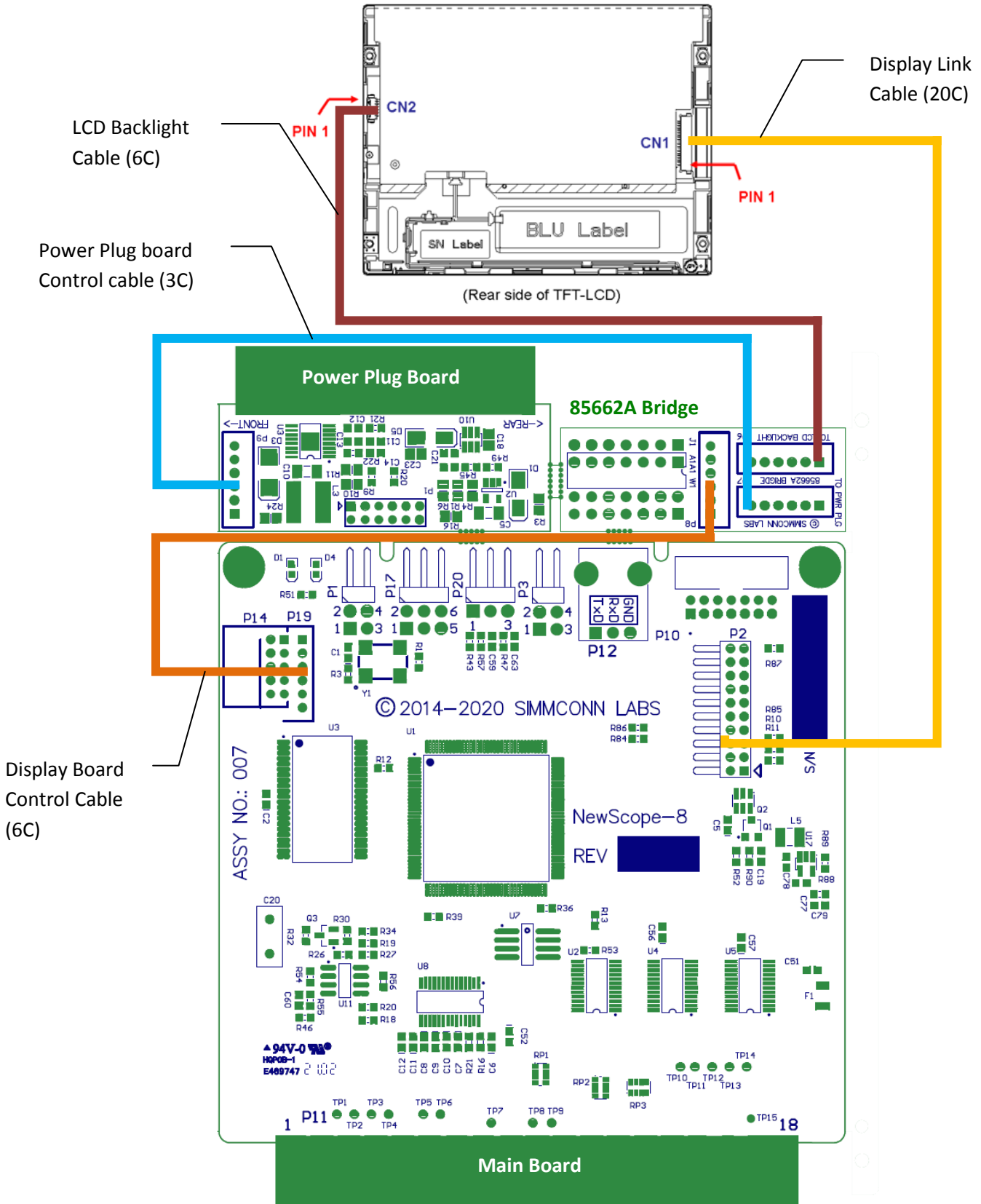


Figure 5 Wiring Diagram

4 Adjustment

4.1 Zero-Span Fast Sweep Vertical Adjustment

The zero-span with sweep speed 10ms or below is digitized and stored in the trace memory. The horizontal sweep of the digitizing system is timed by a crystal oscillator and requires no adjustment. The vertical gain and offset need to be adjusted in order to be consistent with the ADC in the 85662A.

The Zero-Span Fast Sweep Vertical adjustment should be performed after the Track and Hold adjustments in the 8568/8566 Performance Tests and Adjustments Manual.

4.1.1 Equipment Needed

Any RF signal generator that is capable of generating AM modulated signal up to 90% modulation depth, with output carrier frequency within the frequency range of the spectrum analyzer, such as HP® 8656B. The modulating signal needs to be between 400Hz and 1kHz. It can be any kind of repetitive signal, such as sine wave or square wave. An external audio signal generator is needed if the RF signal generator does not have an internal modulation source.

4.1.2 Adjustment Procedure

Connect the output of the RF signal generator to the input of the spectrum analyzer. Set RF carrier frequency to any frequency (100MHz for example), level to -10dBm, AM modulation depth to 90% and audio frequency to 400Hz or 1KHz. Turn on the AM modulation and RF output.

Set the spectrum analyzer center frequency to the RF carrier frequency. Set frequency span to zero Hz.

Set sweep speed to 20ms, linear scale, video trigger. Set RBW and VBW high enough (>10KHz) to not attenuate the modulating signal. Adjust reference level and trigger level for a stable modulation waveform display.

Adjust reference level such that the positive peak is within the top division of the graticule, AND the negative peak is within the bottom division. Set the sweep speed back and forth between 10ms and 20ms; adjust reference level and modulation depth as needed, such that the above condition is met at both sweep speeds.

Set sweep speed to 20ms, press CF step size button. The trace color should change to the reference line color (orange by default), and the active function readout should display 'CAL START', indicating CAL procedure begins.

Set sweep speed to 10ms, press CF step size button. The trace color should change back to normal, and the active function readout should display 'CAL OK', indicating CAL procedure complete. The gain and offset values are calculated automatically and saved in the on-board flash memory. They are in effect until the next adjustment.

If the active function readout displays 'CAL FAIL', check the position of the positive and negative peaks on the displayed modulation waveform and repeat the procedure.

Revision History

Revision	Date	Notes
1.0	11/3/2014	Initial revision for serial numbers 8001 and above
1.1	11/23/2014	Updated kit content table with pre-assembly information Added pictures in section 2.2.10 Wire connections on the 85662A main board Updated jumper P17 pin positions in jumper settings table
1.2	3/30/2015	Added kit content table for 6.5" VGA and XGA kits Added section 2.2.1 Read before installation. Added LCD assembly removal picture in section 2.2.6 Removed the resistor changes in section 2.2.7 as they are no longer needed. Replaced the 85662A Bridge board installation picture in section 2.2.12 Other minor edits to text
1.3	2/18/2016	Added kit content table for 6.5" XGA kits with serial numbers NS80050 and above Added 6.5" XGA LCD backlight wiring picture and instructions for serial numbers NS80050 and above
1.4	3/28/2021	Updated for LCD kit serial number NS82000 and above. Removed contents for 5.7" VGA and 6.5" XGA kits. Added PCB assembly preparation steps (section 2.2.2 Prepare the boards).