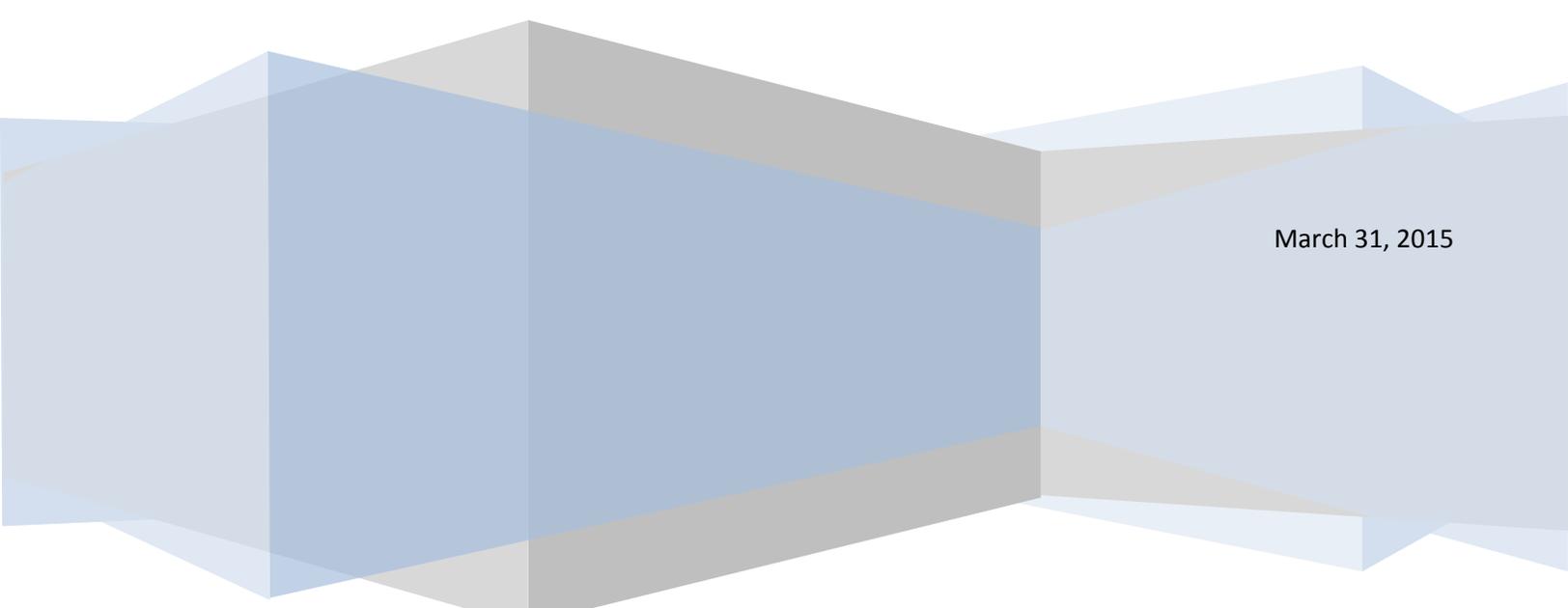


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# NewScope-8 Operating Manual

For Kits with Main Board Serial Number 8001 and above

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, 3D effect.

March 31, 2015

# 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. The Kit may be equipped with 5.7", 6.4", 6.5" or 7" TFT color LCD with VGA (640 x 480), XGA (1024 x 768) or WXGA (1280x800) resolutions. The key features of the Kit include:

- Bitmap font with hand-optimized glyphs 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 that 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.

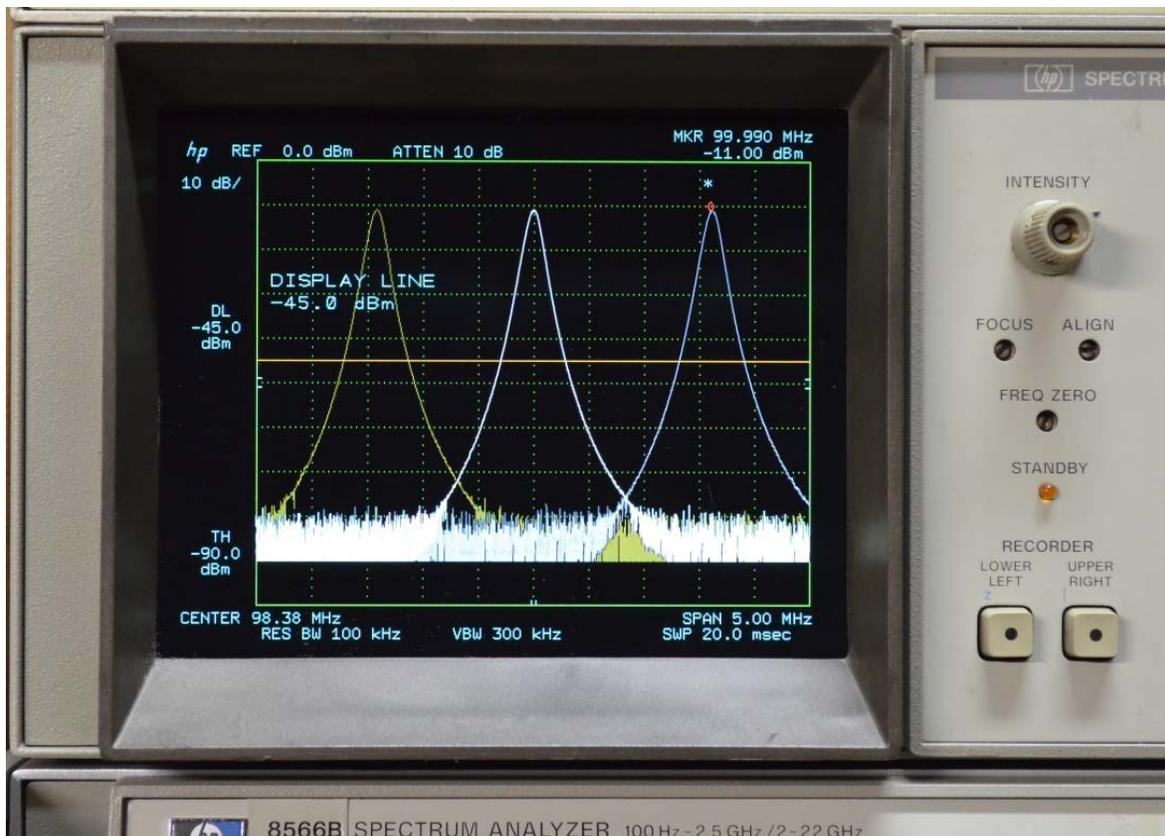


Figure 1 NewScope-8 6.4" VGA Kit shown with default (NewScope) display scheme

## 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 5.7" VGA Kit Content**

Item	Qty	Reference	Description	Note
1	1	NewScope-8	Main board for VGA kit	
2	1	LVDS_ADP	Display Board (LVDS Adapter)	1
3	1	Pwr_plg	Power Plug board	
4	1	85662A_Bridge	85662A Bridge board	
5	1	18-0001-018	Display Link Cable, LVDS, 20-Conductor	1
6	1	18-0001-015	Display Board Control Cable, 6-Conductor	
7	1	18-0001-019	Power Plug Board Control Cable, 3-Conductor	
8	1	18-0001-017	LCD Backlight Cable	1
9	4		#4 x 3/8" Pan-head Philips self-tapping screw	1
10	1		5.7" LCD Panel	1
11	1	19-0001-011	5.7" LCD Panel Bracket	1
12	4		Nylon Flat Washer, 3.5x7x1mm	1
13	2		M3x8 Flat-head Philips screw	
14	2		6-32 x 1/2" Flat-head Philips Screw	
15	2		6-32 KEP® Nut	
16	1		Foam strip w/ adhesive backing, 10mm	
17	2		2" Wire for LRTRC and FS connection	
18	1		14" Wire for CRT_DSBL connection	
19	1		Coax cable for Y connection	
20	2		Nylon wire ties 4"	

Note:

1. Shipped pre-assembled as LCD panel assembly.

**Table 2 NewScope-8 6.5" VGA Kit Content**

Item	Qty	Reference	Description	Note
1	1	NewScope-8	Main board for VGA kit	
2	1	LVDS_ADP	Display Board (LVDS Adapter)	1, For TTL Panels only
3	1	Pwr_plg	Power Plug board	
4	1	85662A_Bridge	85662A Bridge board	
5	1	18-0001-018	Display Link Cable, LVDS, 20-Conductor	1
6	1	18-0001-015	Display Board Control Cable, 6-Conductor	
7	1	18-0001-019	Power Plug Board Control Cable, 3 to 5-Conductor	Cable may differ depending on LCD Panel
8	1		LCD Backlight Cable	Cable may differ

				depending on LCD Panel
9	1		CCFL Backlight Inverter, 12VDC	For 6.5" CCFL Panels only
10	1		6.5" VGA LCD Panel	1
11	1	19-0001-012	LCD Panel Bracket	1
12	1	19-0001-013	Modified 85662A bezel for 6.5" LCD panel	2
13	4		M2 x 3 Pan-head T-6 screw	1
14	2		M3 x 8 Flat-head Philips screw	
15	2		6-32 x ½" Flat-head Philips Screw	
16	2		6-32 KEP Nut	
17	2		2" Wire for LRTRC and FS connection	
18	1		14" Wire for CRT_DSBL connection	
19	1		Coax cable for Y connection	
20	2		Nylon wire ties 4"	

Note:

1. Shipped pre-assembled as LCD panel assembly.
2. The LCD panel assembly is installed on the 85662A bezel for shipping purpose. Please remove the LCD panel assembly from the bezel for installation.

Table 3 NewScope-8 6.5" XGA Kit Content

Item	Qty	Reference	Description	Note
1	1	NewScope-8	Main board for XGA/WXGA kit	
2	1	Pwr_plg	Power Plug board	
3	1	85662A_Bridge	85662A Bridge board	
4	1	18-0001-008	Display Link Cable, LVDS, 20-Conductor	1
5	1	18-0001-015	Display Board Control Cable, 6-Conductor	
6	1	18-0001-019	Power Plug Board Control Cable, 3 to 5-Conductor	Cable may differ depending on LCD Panel
7	1		LCD Backlight Cable, 12 conductor	1, Cable may differ depending on LCD Panel
8	1		LED Backlight driver, 12VDC input	1, For Power Plug board without LED driver
9	1	18-0001-021	LED Backlight driver cable, 6 conductor	1
10	1		6.5" XGA LCD Panel	1
11	1	19-0001-009	LCD Panel Bracket	1
12	1	19-0001-013	Modified 85662A bezel for 6.5" LCD panel	2
13	4		M2 x 3 Pan-head T-6 screw	1
14	2		M3x8 Flat-head Philips screw	
15	2		6-32 x ½" Flat-head Philips Screw	
16	2		6-32 KEP Nut	
17	2		2" Wire for LRTRC and FS connection	
18	1		14" Wire for CRT_DSBL connection	
19	1		Coax cable for Y connection	
20	2		Nylon wire ties 4"	

Note:

1. Shipped pre-assembled as LCD panel assembly.
2. The LCD panel assembly is installed on the 85662A bezel for shipping purpose. Please remove the LCD panel assembly from the bezel 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 85662A unit**

Disconnect 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.

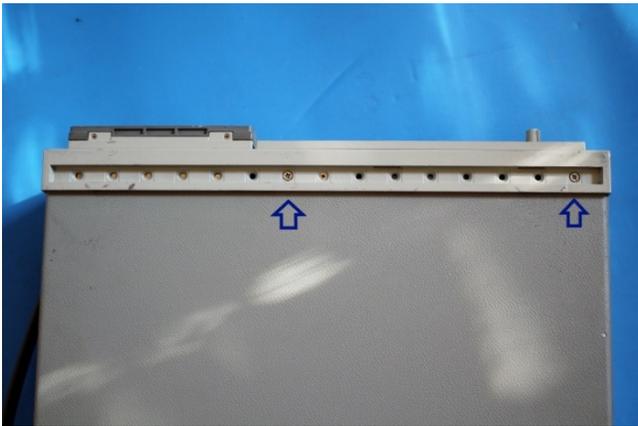
### **2.2.3 Remove the front panel**

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

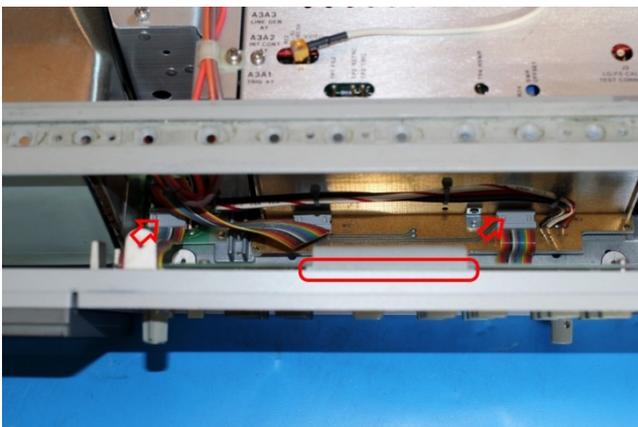


Remove the plastic trim strip on the top of the unit by inserting a small flat screwdriver into the slot and lifting upwards. Remove two screws located under trim strip.

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.

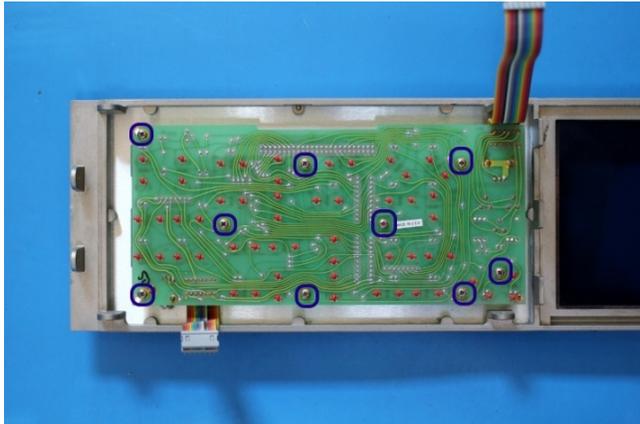
#### 2.2.4 Remove the metalized glass window

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.

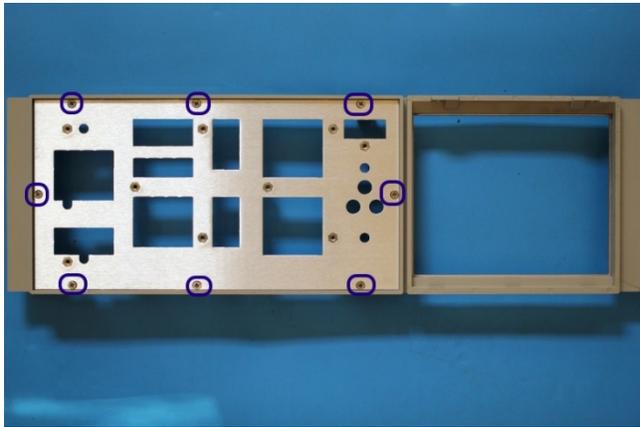
Carefully remove the metalized glass window from the inner bezel casting. Clean the glass with glass cleaner.

## 2.2.5 Replace the Front Bezel (required if the kit comes with a modified 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.



In the kit that you received, the LCD panel assembly is installed in the bezel for shipping purpose. It needs to be removed for installation. (6.5” VGA panel assembly shown)

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 to the Kit vendor to receive the core charge refund.

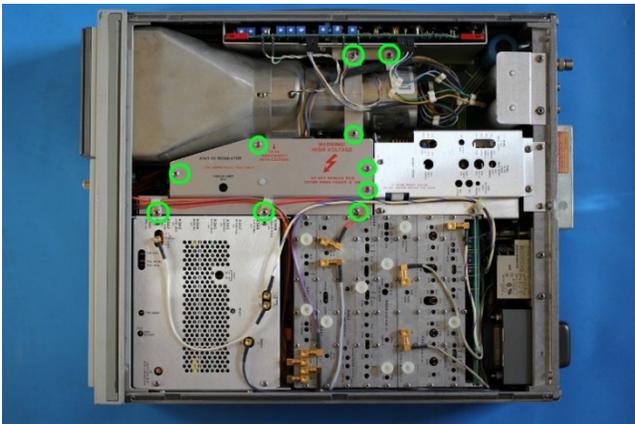
### 2.2.6 Remove the XYZ driver boards (Optional)

*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 change is required to the above boards.*

### 2.2.7 Remove the CRT and high voltage module

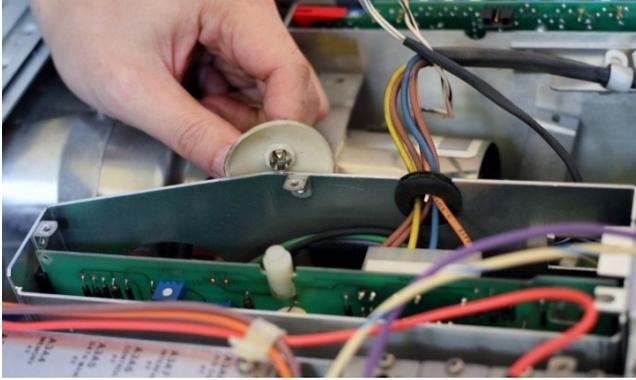
**Warning!** Potentially Lethal Voltages Present!

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

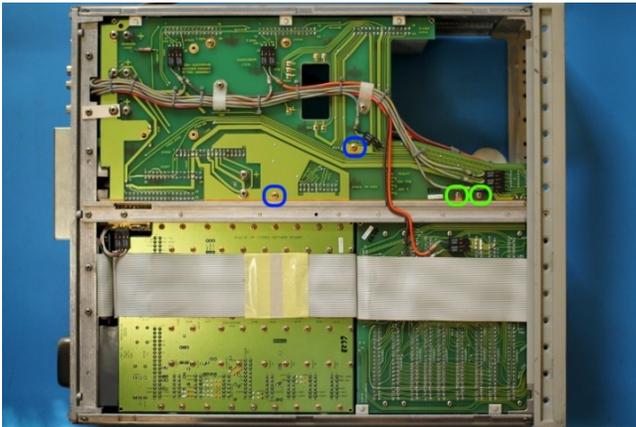


Remove the A1A3 shielding cage cover. In older 85662A units, the A1A6/A7/A8 cage cover and the A1C3 capacitor cover may also need to be removed. They will be reinstalled later.

Remove the rear CRT mount.



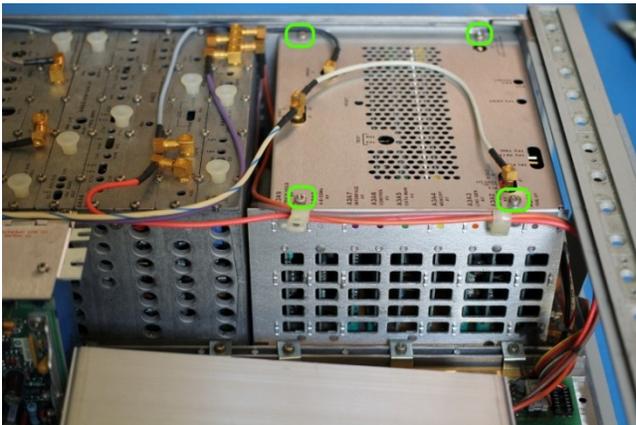
Carefully discharge the CRT and high voltage power supply.  
Disconnect and remove the CRT as per the 8566/67/68 service manual.



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

## 2.2.8 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.



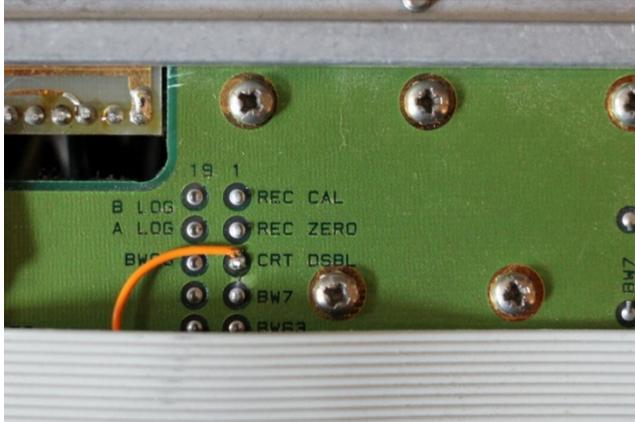
Install the main board into the A3A4 card cage slot, route the display link cable and the display board control cable between the A3 card cage and the A1A3 shielding cage to the LCD panel area.

Set Main board jumper P1 base on the orientation of the LCD panel. See section 3.5 LCD panel pixel geometry.

Replace the A3 card cage top cover.

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





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.

### 2.2.10 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.



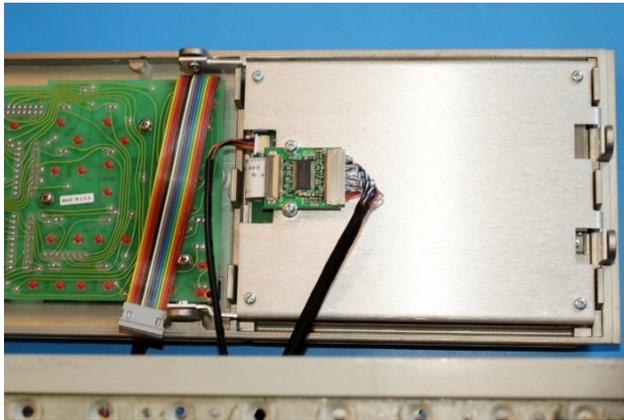
Reinstall the A1A3 shielding cage cover. Ensure the display link cable and the display board control cable pass in front of the A1A3 cage.

Engage cards A1A7 and A1A8 into their guide slots if removed. Reinstall the A1C3 and A1A6/A7/A8 covers if removed in step 2.2.6.

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

### 2.2.11 Install LCD panel and 85662A Bridge board (5.7" VGA Kit)

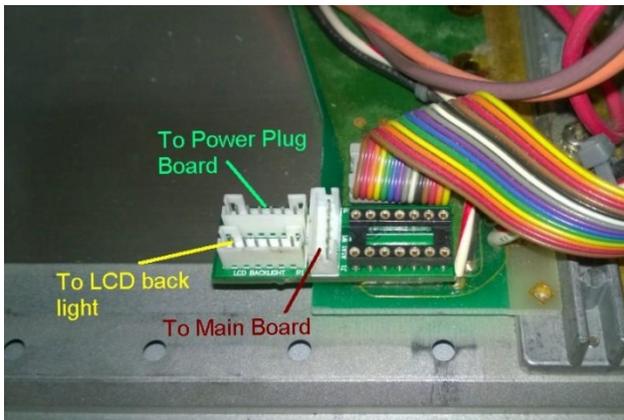
Apply foam strips to four edges on the front side of the LCD panel. Remove the protective plastic shipping film from the front of the LCD screen. Be careful not to scratch the LCD screen.



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 Display Link Cable to the Display Board (LVDS Adapter) mounted on the back of the LCD panel.

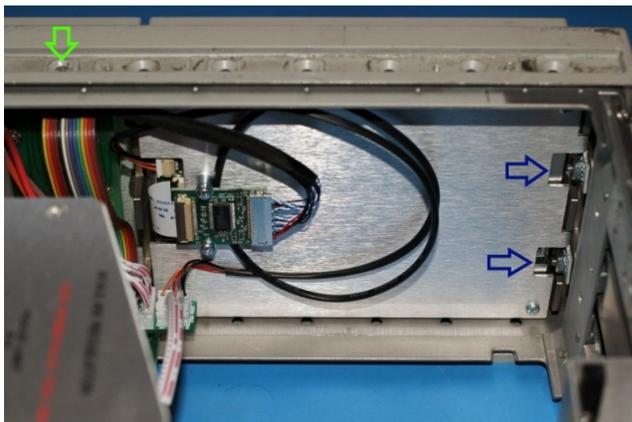


Connect the Power Plug Board Control Cable, Display Board Control Cable and LCD Backlight Cable to the 85662A Bridge Board.

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.



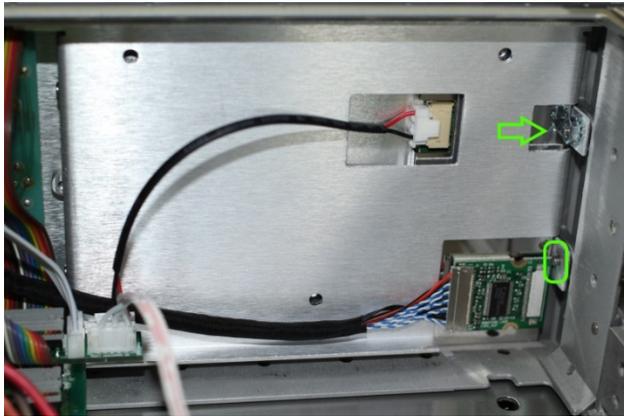
Fit the front bezel back into the front frame. Fasten the LCD mounting bracket using M3 flat-head Philips screws on top and bottom (Green Arrow in picture).

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 2.2.2. 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 2.2.3.

### 2.2.12 Install LCD panel (6.5" VGA Kit)

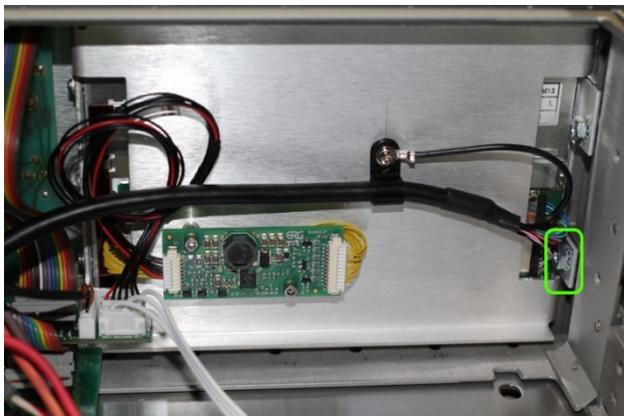


On the 6.5" TTL panel, the Display Board (LVDS Adapter) is very close to the lower side mounting hole. Use the original mounting screw and do not install the KEP nut at this location.

Use the supplied 1/2" 6-32 screw and install the KEP nut at the upper side mounting hole only.

Refer to previous section 2.2.11 for other installation steps.

### 2.2.13 Install LCD panel (6.5" XGA Kit)



On the 6.5" XGA panel, the LVDS cable is very close to the lower side mounting hole. Use caution not to damage the wires when installing the KEP nut.

Refer to previous section 2.2.11 for other installation steps.

### 2.2.14 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. You may not be able to completely dim the backlight with the intensity knob with LCD panels using CCFL backlight, due to the minimum operating current requirement of the CCFL tube.

A noisy intensity pot may cause surges in the backlight operating current. It should be cleaned or replaced. The intensity is set to max for the original CRT circuit.

### 3.2 Focus control

The Focus control does not have any effect to the NewScope display. The Focus pot voltage is forwarded to the main board.

### 3.3 Align control

The Align control is used by the NewScope display to switch between display schemes. There are four preset, user configurable display schemes. Turning the pot clockwise with a screw driver or a tuning tool will change the display scheme from 1 to 4. The preset display schemes are listed in Table 2. The Align control is set to center (0V) for the original CRT circuit.

Table 4 Default Display Schemes for 6.4" VGA Kit

Display Items	NewScope	8560EC	Original Mono	Inverted
Sample picture	See Figure 1	See Figure 3	See Figure 4	See Figure 5
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

\*Dotted graticule is not available on 5.7" or 7" LCD Panels

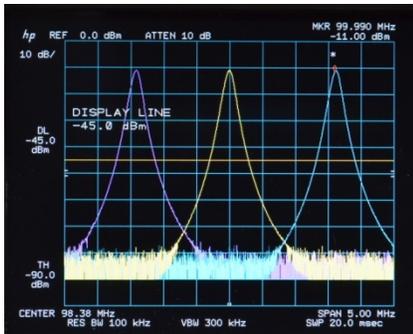


Figure 2 8560EC Display Scheme

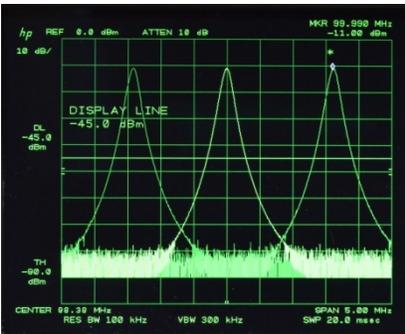


Figure 3 Original Display Scheme

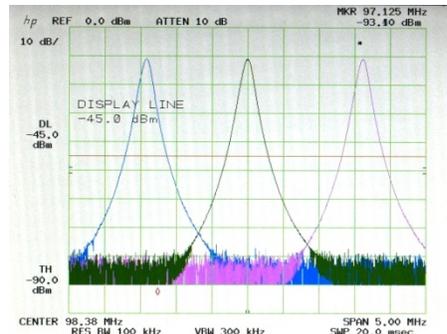


Figure 4 Inverted Display Scheme

### 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 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 pixel geometry

The Resolution Enhancement in the NewScope display scheme is sensitive to the LCD panel pixel geometry. The jumper P1 pin 1-3 selects matching geometry for the best result. When the jumper block is not installed, the NewScope display expects an R-G-B pixel order (from left to right). A jumper block should be installed if the panel is installed with B-G-R pixel order.

The NewScope-8 Kit is shipped with correct jumper setting. If the user is not sure about the pixel order, he/she should try a different setting if apparent color fringes appear on the sides of the graphic curves.

### 3.6 LEDs

There are two LEDs on the main board, D1 and D2. D1 serves as 'activity' LED. Its duty ratio roughly indicates the display CPU utilization. The longer it stays on, the lower the utilization. D2 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 5 Jumper Settings

Jumper	Position	On	OFF	Note
P1	1-3	Use alternate pixel geometry	Use default pixel geometry	Refer to section 3.5
	2-4	Reserved	Reserved	
P3	1-3	5.7" LCD Panel	6.5" LCD Panel	Set LCD panel configuration

	2-4	Return to factory setting	Normal operation	Used for recovery from unsuccessful firmware update only
<b>P17*</b>	1-2	LCD image scan direction line #1 High	LCD image scan direction line #1 Low	Change LCD image scan direction. Some LCD panels require installing both jumpers to rotate image 180°. Other LCD panels require only one jumper. 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	
<b>P20</b>	1-2	Jumper installed on the right side		Use Digital (PWM) dimming
	2-3	Jumper installed on the left side		Use Analog dimming. Dimming type (PWM/Analog) is set at the factory to the LCD panel requirement.

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

### 3.8 Other Onboard Connectors

Other onboard connectors such as P10 and P12 are reserved for factory use. P12 may be used by advanced users to update firmware and/or communicate to the main board. Its usage is described in the *NewScope-8 Programming Manual*

## 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 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, free run, 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 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
<b>1.0</b>	11/3/2014	Initial revision for serial numbers 8001 and above
<b>1.1</b>	11/23/2014	Updated kit content table with pre-assembly information Added section 2.2.12 Install LCD panel (6.5" VGA Kit) Added pictures in section 2.2.9 Wire connections on the 85662A main board Updated jumper P17 pin positions in jumper settings table
<b>1.2</b>	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 2.2.5 Removed the resistor changes in section 2.2.6 as they are no longer needed. Added section 2.2.13 Install LCD panel (6.5" XGA Kit) Replaced the 85662A bridge board installation picture in section 2.2.11 Other minor edits to text