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NewScope-6 Operating Manual

Preliminary

May 25, 2021

NewScope-6 Operating Manual

- 1 Introduction 3
 - 1.1 Kit compatibility 3
- 2 Initial Inspection..... 4
- 3 Installation 5
 - 3.1 Read before installation..... 5
 - 3.2 Prepare the unit for installation..... 5
 - 3.3 Install the LCD panel 6
 - 3.4 Install the NewScope-6 main board..... 7
 - 3.5 Finishing installation 11
- 4 Operations 12
 - 4.1 Intensity control..... 12
 - 4.2 Focus control..... 12
 - 4.3 LEDs..... 12
 - 4.4 Jumpers..... 12
 - 4.5 Other Onboard Connectors 13
- 5 Adjustment..... 13
 - 5.1 Zero-Span Fast Sweep Vertical Adjustment..... 13
 - 5.1.1 Equipment Needed 13
 - 5.1.2 Adjustment Procedure..... 14

1 Introduction

The NewScope-6 Color LCD replacement Kit is designed to replace the monochrome CRT displays used in HP® 8560A and 8560E series portable spectrum analyzers. The kit supports 5.7" TFT color LCD with VGA (640 x 480) resolution. The key features of the kit include:

- Bitmap font with better clarity over the original vector font on an LCD screen
- Display items are differentiated by colors, similar to later models of the same test equipment family
- Four display schemes selectable by the Focus adjustment
- Enlarged marker in distinct shape and color
- Resolution enhancement takes advantage of the 600 point original resolution of the 8560A/E display and gives a smooth curve with reduced jaggedness.
- Zero span fast sweeps <30ms are digitized. The X axis is timed with a crystal oscillator that requires no adjustment.
- The LCD display is powered from the source that was used for the CRT high voltage module

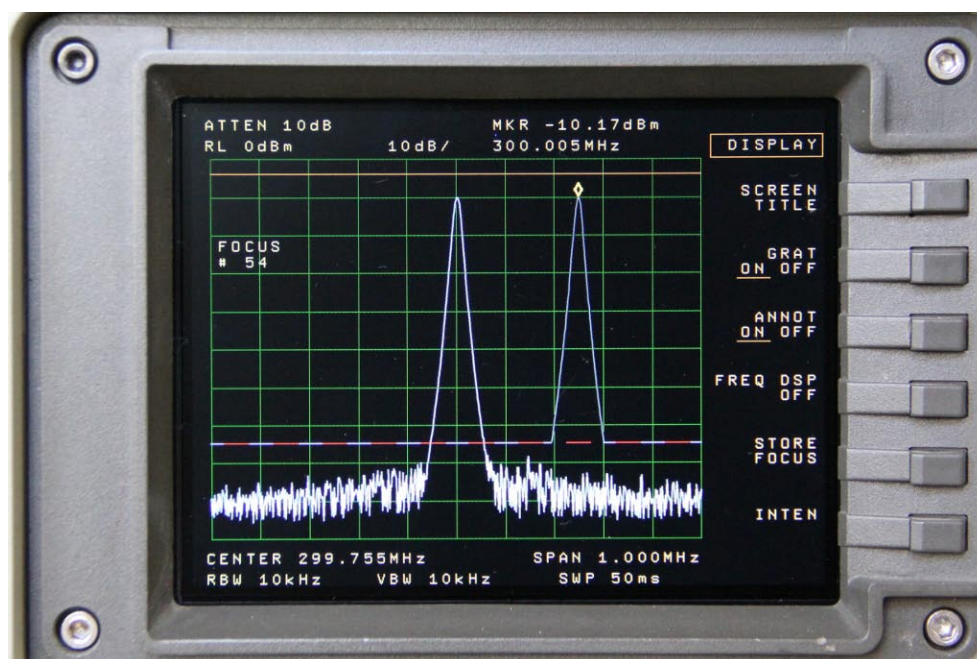


Figure 1 NewScope-6 Kit shown with default (NewScope) display scheme

1.1 Kit compatibility

The NewScope-6 kit is compatible with the spectrum analyzer controller (A2) boards listed in Table 1. Contact us if your instrument's controller board part number is not listed.

Note: NewScope-6 is not compatible with units that were originally equipped with LCD display from the factory (the 8560EC series), or those that have been retrofitted with LCD conversion kit from other manufacturers.

Table 1 NewScope-7B Kit Compatibility

Kit Model #	LCD Panel	Compatible HP Model #	Compatible A2 board P/N
NewScope-6	5.7" VGA	8560A, 8561A, 8561B, 8562A, 8562B, 8563A, 8560E, 8561E, 8562E, 8563E, 8564E, 8565E	08562-60032, 08562-60051, 08562-60110, 08563-60010, 08563-60014, 08563-60017, 08563-60024, 08563-60025, 08563-60031, 08563-60065, 08564-60010, 08564-60022, 08564-60025

2 Initial Inspection

Refer to Table 2 for the list of parts included in the NewScope-6 Kit. Verify that all parts listed in the table are present. **Note: items may differ with different LCD panel configurations.**

Table 2 NewScope-6 Kit Content (5.7" VGA Kit)

Item	Qty	Reference	Description	Note
1	1	NewScope-6	Main board, NewScope-6 LCD Kit	
2	1	18-0001-018	Display Link Cable, LVDS, 20 Conductor, Shielded	1
3	1	18-0001-010	LCD Back Light Cable, 5 Conductor	1
4	1	LVDS_ADP	Display Board, NewScope LCD Kit	1
5	1	18-0002-001	FFC cable, 33 conductor, 0.5mm pitch, 30mm	1
6	1	19-0001-023	8560 LCD Bracket for 5.7 inch Panel	1
7	1		LCD Panel, 5.7 Inch	1
8	5		M3 x 6mm Pan-head Philips screw with washer	1
9	3		M4 x 12mm Socket Cap screw	
10	2		M4 x 6mm Pan-head Philips screw	
11	1		M4 x 6mm Flat-head (100°) Philips screw	
12	2		M4 x 16mm Flat-head (100°) Philips screw	
13	1		M4 x 6mm Hex Spacer	
14	1		M4 x 8mm Hex Spacer	
15	1		M4 x 10mm Hex Spacer	
16	1		4mm ID Flat washer	
17	2		M4 Lock Nut	
18	2		M3 Lock Nut	
19	2		DIP-16 IC socket	
20	2		DIP-18 IC socket	
21	1		DIP-20 IC socket	
22	12		Solder Pin	2
23	3		Solder wires, 1.25" to 1.5"	
24	1	18-0001-029	Power cable, NewScope-6, 2 conductor	

Note:

1. Shipped pre-assembled as LCD panel assembly.
2. In two 6-pin strips.

3 Installation

3.1 Read before installation

Installation should be performed by a qualified technical person who is familiar with the host test equipment. **Note: Due to soldering required on the multi-layer PCB, professional installation is highly recommended.**

The Kit installation time is approximately 2.5 hours. Please refer to test equipment service manuals for location of the assemblies.

Please treat the parts and assemblies with care during installation. 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 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.

3.2 Prepare the unit for installation

Perform the procedures outlined in the instrument service manual to

- Remove the A1 Front Frame and A18 CRT
- Remove A2 controller board
- Remove A6A1 High Voltage Assembly. Use supplied M3x6mm screws to secure the A6 PCB.
- Remove A17 CRT Driver Assembly. Use supplied M3 nuts to secure the A16 assembly.

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

3.3 Install the LCD panel

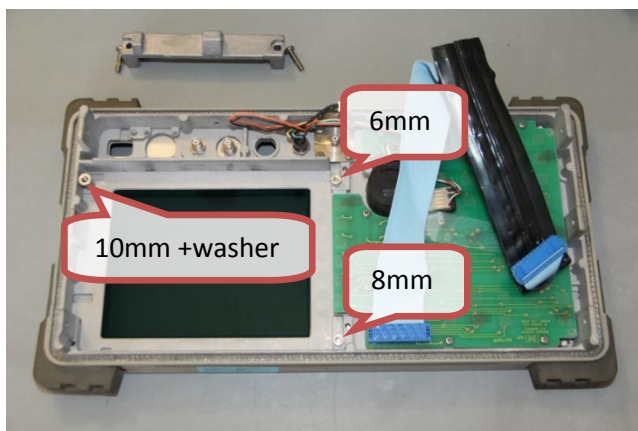
If the LCD panel is shipped pre-assembled with the bracket, display board and cables, skip the following 4 steps.

- 1) Install the 33-pin FFC ribbon cable to the LCD panel with metal contacts facing **down**. Install the backlight cable to the LCD panel.
- 2) Install the LCD bracket on the back of LCD panel. Align the cutout on the bracket with the connectors on the LCD panel. Fasten the bracket to the LCD panel using #2 self-tapping screws.
- 3) Install the display board on the PCB mounting posts using two M3 x 6 pan-head screws. Secure the cable shielding wire lug under the PCB through one of the screws. Connect the 33-pin FFC cable and the display link cable to the display board.
- 4) Position the cable clamp over the heat-shrink tubing section of the cable. Remove the paper backing on the adhesive tape and secure the cable clamp on the LCD bracket.



Place the A1 front frame assembly on a flat surface with outside facing up. Remove the four socket cap screws at the corners of the CRT bezel. Be careful to retain the O-rings on the screw. Remove the bezel and RFI glass. Clean the RFI glass with display cleaner and a lint-free cloth.

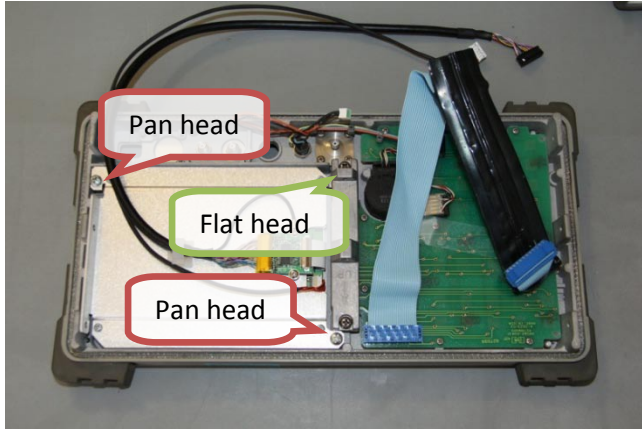
Substitute the screws with supplied M4x12mm socket cap screws **except** the one at the top-left corner. Reassemble the RFI glass and CRT bezel.



Turn the front frame over with its inside facing up. Remove the center support by removing the two M4 screws.

Install the hex spacers on the replaced CRT bezel screws: (positions as seen from the front)

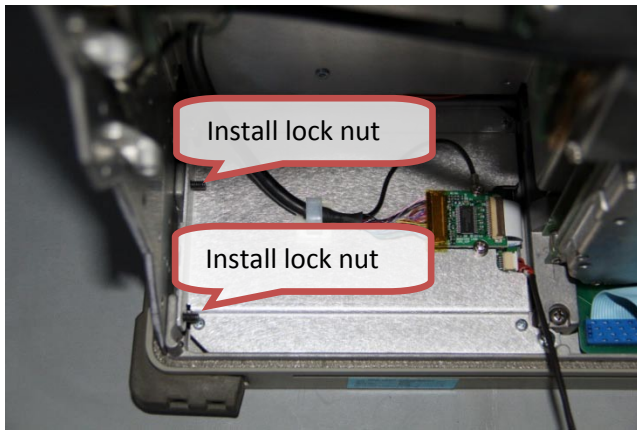
- 6mm spacer at the lower-right position
- 8mm spacer at the upper-right position
- 10mm spacer at the lower-left position with the supplied 4mm ID flat washer on top



Remove the protective shipping film from the LCD screen. Place the LCD panel assembly in the front frame. Secure the LCD bracket using supplied screws:

- M4 x 6mm flat-head screw at the lower-right position (under the center support)
- M4 x 6mm pan-head screws at the upper-right and the lower-left position

Reinstall the center support using the original M4 screws. Pay attention to the 'UP' arrow.



Reinstall the front frame assembly. Use supplied M4 x 16mm Flat-head screws to replace the original ones at the two upper locations when securing the left side panel to the front frame.

After the screws are fastened, add two lock nuts to the extended thread and tighten with an open-ended wrench.

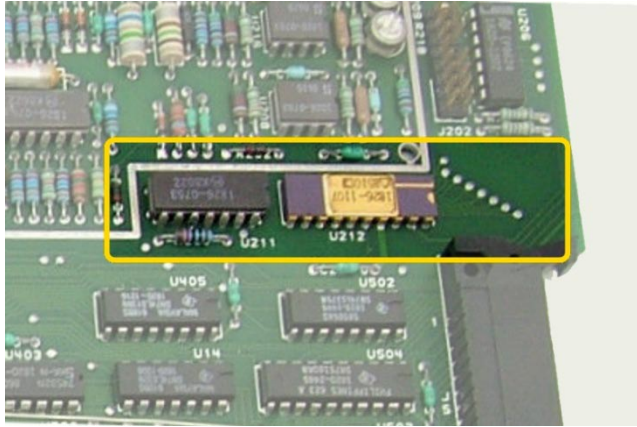
3.4 Install the NewScope-6 main board

Remove the NewScope-6 main board from the ESD bag. Identify the type of the A2 controller board base on the part number in Table 3 and the pictures below. Contact us if your A2 controller board part number is not listed, or its layout near U212 is different from all three types.

Table 3 8560A/E series A2 controller board part numbers

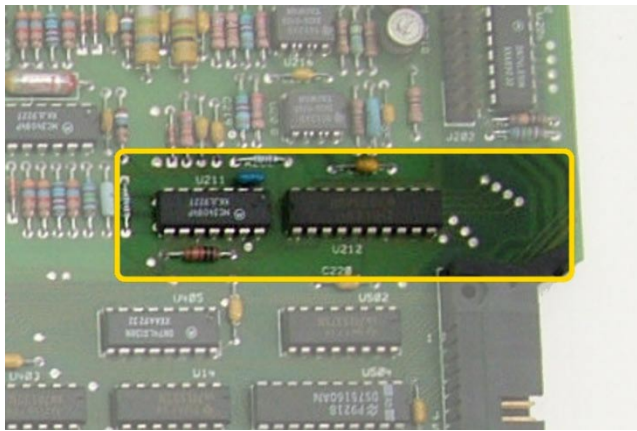
Type:	1	2	3
A2 board P/N:	08562-60032 08562-60051 08562-60110	08563-60005, 08563-60014 08563-60017, 08563-60024 08563-60025, 08563-60031	08563-60065 08564-60010 08564-60022, 08564-60025

Note: The goal is to install pins on NewScope-6 board U212 at locations corresponding to pins 5 through 16 of U212 on the A2 controller board.

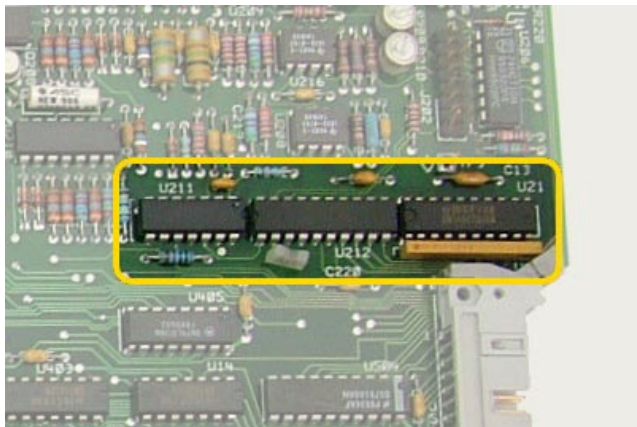


Type 1: Early production.
U212 pin 1 mark is facing rear of the unit. There is no IC between U212 and the rear edge of the board.

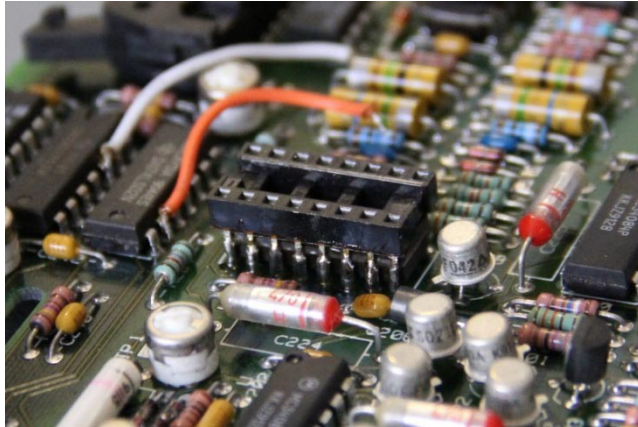
IMPORTANT: Cover the metal cap on U212 using Kapton tape to prevent short in later steps.



Type 2: Mid-term production.
U212 pin 1 mark is facing U211. There is no IC between U212 and the rear edge of the board.

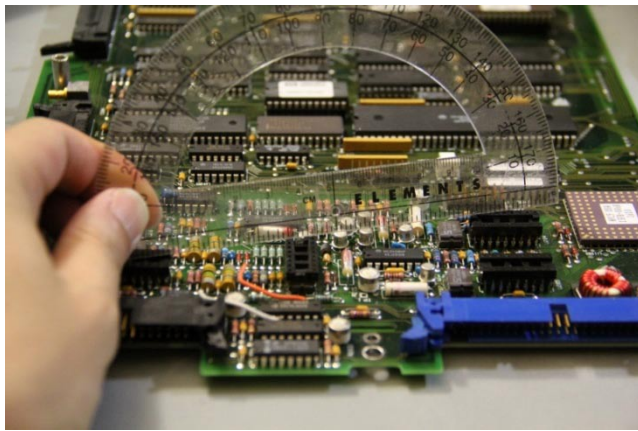


Type 3: Late production.
U212 pin 1 mark is facing U211. There is U21 between U212 and the rear edge of the board.

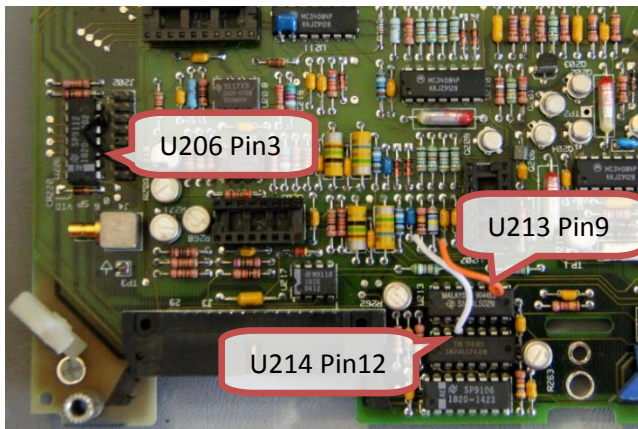


Install DIP sockets with matching number of pins on top of the following ICs on the A2 controller board: U204, U205, U207, U209, U212

Align the socket pins to the horizontal centers of the IC pins. Push the socket down until it is seated on top of the IC. Use an object with a flat surface or a straight edge as a guide to ensure level and co-planarity of the DIP sockets. Solder the DIP socket pins to the IC pins.

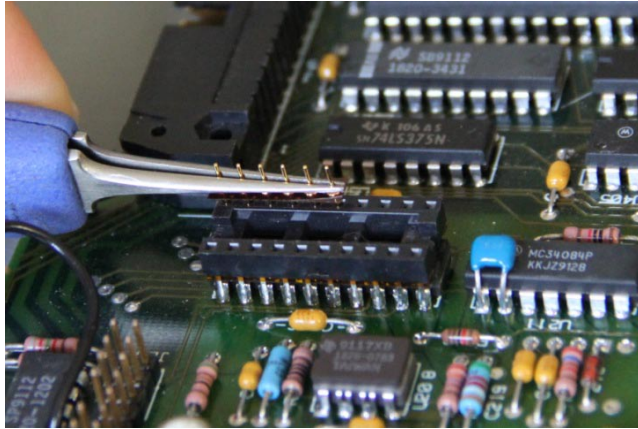


Use the guide to check the clearance of the components on the A2 controller board. Make sure all components are below the top surface of the DIP sockets, which will become the seating plane for the NewScope-6 board. If any component is too tall, it needs to be lowered.



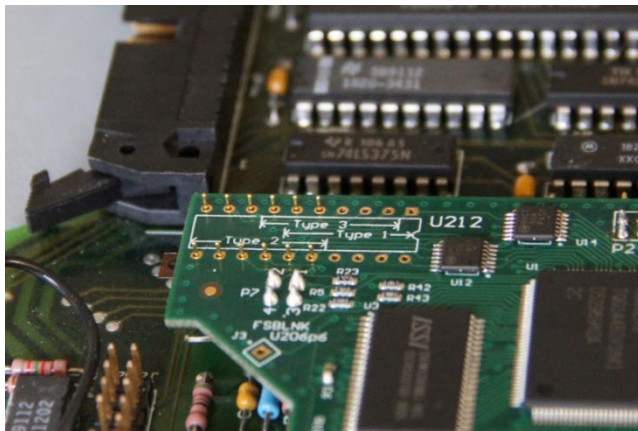
Solder the supplied wires to the following IC pins on the A2 controller board:

- U206 pin 3 (signal name HSCAN)
- U214 pin 12 (signal name BLANK)
- U213 pin 9 (signal name VECTOR)



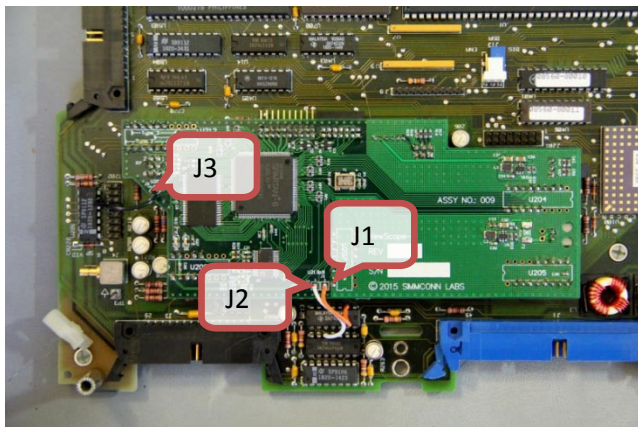
Install two rows of 6 pins each to the socket pins 5 thru 10, and 11 thru 16 on U212 on the A2 controller board. Use tweezers to install one strip at a time to keep the pins in the retainer tape.

A type 2 controller board is shown in the picture. Due to the orientation of U212, pin locations may look different on other types of controller boards.



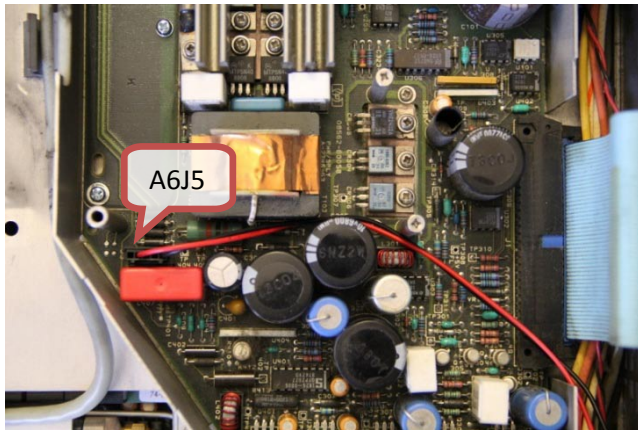
Gently plug the NewScope-6 board to the installed DIP sockets. Pay attention to the alignment of the pins, and make sure the pins pre-installed on the board are fully plugged into the sockets.

IMPORTANT: Verify against the silkscreen on the NewScope-6 board, that the U212 pins match the type of the A2 controller board. Damage to the A2 board and/or the NewScope-6 board may occur if they don't match.

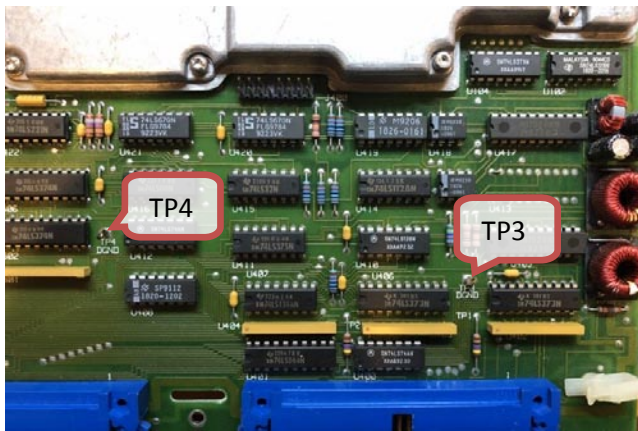


Solder the pins installed in the previous step to the NewScope-6 board U212.

Solder the open ends of the wires installed in the previous step to the NewScope-6 board marked locations J1 through J3.

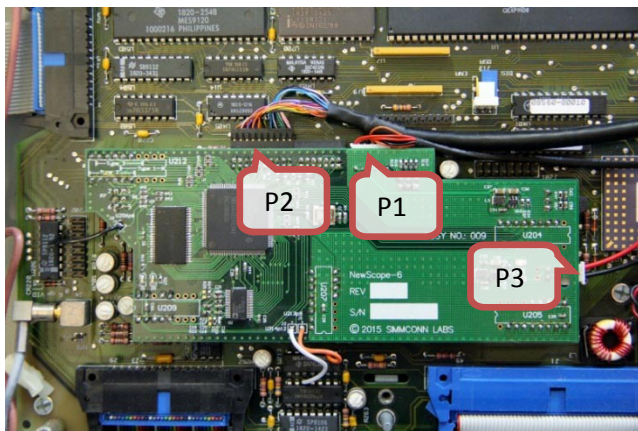


Plug the Power cable to A6J5 and route it out of A6 power supply cage through the opening for the ribbon cable and then between A2 and A3 assemblies. Reinstall the cover to the A6 Power Supply cage.



On the Interface board that's facing the Processor board in the spectrum analyzer, locate ground test points TP3 and TP4. Remove (unsolder) them from the component side. This reduces the risk of them shorting to the NewScope-6 board.

Trim the excess length of the pins on the NewScope-6 board P3 (see picture below).



Attach the A2 controller board to the chassis hinges following the service manual.

Plug the cables to the NewScope-6 board:

- Display link cable (pin 1 indicated by a white dot on connector) to P2
- LCD Back Light Cable to P1
- Power cable to P3

Perform fast-sweep Y-axis gain and offset adjustments following the steps outlined in section 5.1.

3.5 Finishing installation

Reinstall all fold-out assemblies following the service manual. Make sure no cable is pinched between assemblies or the hinges.

Reinstall the instrument cover.

4 Operations

4.1 Intensity control

The intensity control works as before, controlled by the Intensity setting on the second page of the Display menu.

4.2 Focus control

There are four preset display schemes. Use the Focus setting in the Display menu to select the desired display scheme, and save the focus setting to make it non-volatile. The preset display schemes are listed in Table 4. Focus setting 0~63 selects NewScope scheme, 64~127 selects 8560EC scheme, and so on.

Table 4 Default Display Schemes for NewScope-6

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
Menu and Label text	Ivory	White	Green	Black
Display Line	Orange	Orange	White	Purple
Marker (Bitmap)	Yellow	White	White	Red
Resolution Enhancement	Yes	No	No	No
Trace A	White	Yellow	Green	Blue
Trace B	66% White	Magenta	75% Green	Teak
Graticule Lines	Dark Green	Dark Cyan	Dark Green	Dark Green
Regular Text	Bitmap font	Bitmap font	Vector font	Bold font
Highlighted Text	Bold, Yellow	Bold, White	Vector font, White	Bold, Red

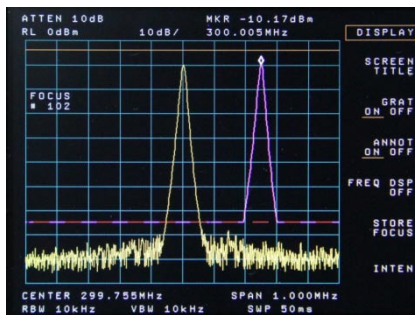


Figure 2 8560EC Display Scheme

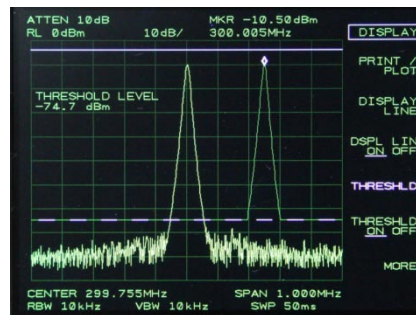


Figure 3 Original Display Scheme

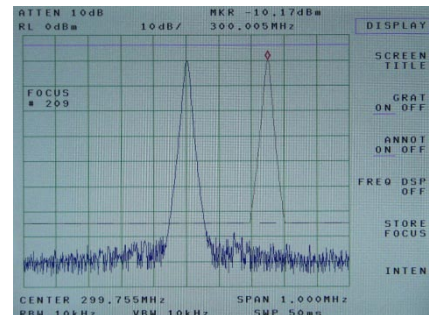


Figure 4 Inverted Display Scheme

4.3 LEDs

There are two LEDs on the main board, D1 and D5. D1 serves as 'activity' LED. Its duty ratio roughly indicates the display CPU utilization. The longer it stays on, the lower the utilization. D5 serves as 'FPGA configuration done', indicating the board is initialized properly.

4.4 Fast Sweep

Fast Sweep (zero-span with sweep speed less than 30ms) is digitized by the on-board ADC. The X-axis of the fast sweep is timed by an on-board crystal oscillator and requires no adjustment. Because the

NewScope-6 is at the end of the display signal chain, the Fast Sweep waveform data is only available for the LCD display. It is not accessible via HPIB.

By default, the NewScope-6 determines the Fast Sweep speed from the “SWP <time>” annotation on the screen. There is some delay between parsing of the annotation and the ADC sampling the video signal at the desired speed. As a result, the waveform may appear “rubber banding” when changing the Fast Sweep speed continuously with the knob. This is normal.

If the annotation is turned off, the NewScope-6 utilizes the HSCAN signal on the A2 controller board to determine the sweep speed. Because the width of the HSCAN pulse is not constant, the displayed waveform will be jittery. Therefore it is highly recommended to leave the annotations turned on when observing a signal with Fast Sweep.

With CRT display, single-sweep or rarely triggered signals under Fast Sweep are displayed very briefly, making them difficult to observe. The NewScope-6 keeps the last triggered waveform on the screen for approx 2 seconds (or indefinitely) until a new trigger occurs or user exits the Fast Sweep mode. The persistent waveform display is in trace B color, so as to distinguish from real-time waveforms. The persistence can also be disabled, making the NewScope-6 Fast Sweep behavior similar to the CRT display.

Jumper P7 on NewScope-6 main board configures the Fast Sweep behavior. Its usage is explained in Table 5.

Table 5 Jumper Settings

Jumper	Position	On	OFF (Default)	Note
P7	1-3	Disables fast sweep persistence timeout (infinite persistence)	Enables fast sweep persistence timeout (approx 2s persistence)	Fast sweep persistence timeout setting has effect only when the persistence is enabled.
	2-4	Disables fast sweep persistence	Enables fast sweep persistence	

4.5 Other Onboard Connectors

Other onboard connectors such as P4, P6 and P20 are reserved for factory use.

5 Adjustment

5.1 Zero-Span Fast Sweep Vertical Adjustment

The zero-span with sweep speed <30ms is digitized. 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 8560A/E.

5.1.1 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.

5.1.2 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 span. Set sweep speed to 50ms, 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.

Adjust the Focus control on the second page of Display menu to the max value of 255. Two display lines appear on the screen holding the positive and negative peak values of the waveform.

Press SWEEP button, set sweep speed to 20ms using the down arrow STEP button. The display lines remain on the screen at the positive and negative peak values of the previous, 50ms sweep.

Adjust A2 R268 (VIDEO GAIN) and A2 R218 (VIDEO OFFSET) such that the display lines match with the positive and negative peaks of the fast sweep waveform.

Adjust the Focus control away from the max value of 255. The display lines should disappear and the adjustment is now complete.

Revision History

Revision	Date	Notes
0.1	6/27/2017	Initial revision for alpha release
0.11	7/2/2017	Updated screen pictures and power cable routing
0.12	7/23/2017	Changed J3 wire connection to U206 Pin 3 (HSCAN)
0.2	8/21/2017	Added pin installation picture on U212 in section 3.4 Updated section 4.2. Changed section 4.4 to Fast Sweep
0.3	9/10/2017	Added pictures and procedures for U212 pin strip installation.
0.4	11/15/2017	Added that pin 1 location of the display link cable is indicated by a white dot
0.41	12/06/2017	Changed KEP nut to lock nut. Regenerate pdf to fix callout rendering issue
0.5	4/25/2021	Added steps in section 3.4 to avoid conflict between Interface board and NewScope-6
0.51	5/25/2021	Added back the power cable installation step that was removed by mistake