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Ⓜ MODEL 175A OSCILLOSCOPE

SWEEP AND GATE OUTPUT MODIFICATION KIT

Ⓜ Stock No. 175A-95A

The Ⓜ Stock No. 175A-95A Modification Kit, when added to the Ⓜ Model 175A Oscilloscope, provides the sweep and gate voltages at the rear panel of the instrument. These outputs may be used to sweep or synchronize external equipment or circuits with the oscilloscope.

The SWEEP OUTPUT voltage provided is approximately 5 volts in amplitude and is centered about 0 volts. The GATE OUTPUT voltage is approximately 4 volts in amplitude and is riding a -2.5 volt level.

The Modification Kit is complete with all necessary components, wire, and hardware. You can install the kit with simple hand tools. Holes for mounting the few components are already provided in the instruments.

INSTALLATION PROCEDURE

1. Remove the horizontal plug-in, top, bottom, and left side covers.
2. Prefabricate coax cables and wires to etched circuit board 175A-65J supplied with kit. Use 24" yellow-white for #1, and 9" yellow-white for #2. (See figure 1.)
3. Install the etched circuit board on left side frame adjacent to the low voltage power supply fuses (see figures 2 and 3). Align board holes with existing holes in side frame. Install board with hardware as shown.
4. Dress leads as shown in figure 3.

PARTS SUPPLIED 175A-95A KIT

<u>Quantity</u>	<u>Description</u>	<u>Ⓜ Stock No.</u>
1	Etched circuit board	175A-65J
1	Cable, coax	175A-16S
1	Cable, coax	175A-16T
2	Connector, RF, UG-1094/U, female BNC	1250-0083
2	Washer, #6, external lock	2190-0008
2	Screws, flat head, 6-32 x 1/2 inch	2370-0003
2	Nut, hex w/lockwasher, 6-32	2420-0001
2	Washer, #6, flat	3050-0016
1	Wire, 22 gauge stranded, black, 2-1/2 inch length	8150-0005
1	Wire, 22 gauge stranded, brown, 4 inch length	8150-0007
1	Wire, 22 gauge stranded, gray, 3 inch length	8150-0027
1	Wire, 22 gauge stranded, yellow-white, 9 inch length	8150-0040
1	Wire, 22 gauge, stranded, yellow-white, 24 inch length	8150-0040

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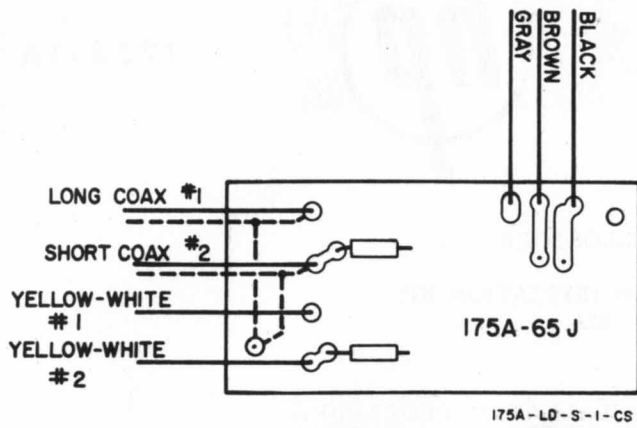


Figure 1. Description and Position of Wires on 175A-65J Board

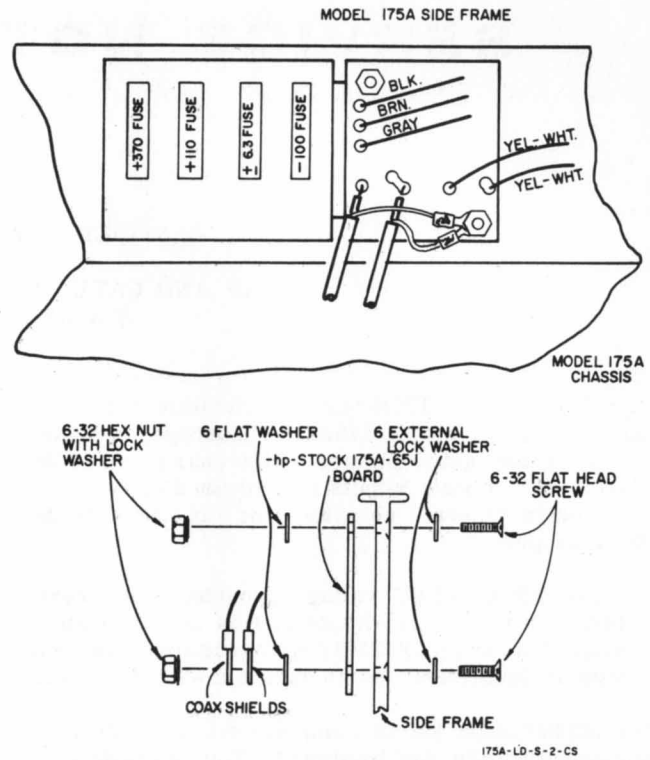


Figure 2. Mounting Position and Sequence of Etched Circuit Board, 175A-65J

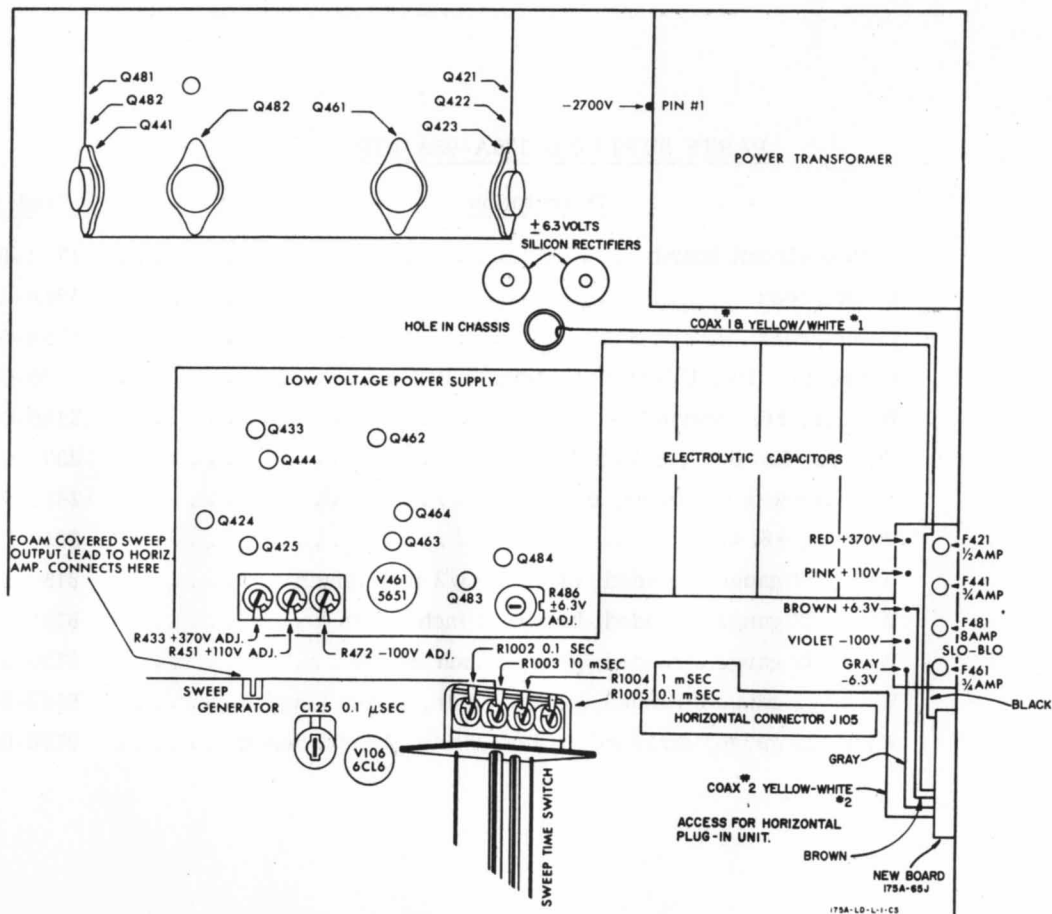


Figure 3. Component Location - Bottom View, Rear Half of Oscilloscope

5. Connect and solder the shortest coaxial lead (coax #2 on figure 1) to pin 1 of the horizontal plug-in connector, J105.

6. Connect and solder the 9 inch yellow-white lead (marked #2 on figure 1) to pin 17 of the horizontal plug-in connector, J105.

7. Connect and solder the gray lead to the -6.3 volt take-off point on the etched circuit board mounted at right angles and adjacent to the fuses. Use the existing vacant hole.

8. Connect and solder the brown lead to the +6.3 volt take-off point.

9. Connect and solder the black lead to the end of the -100 volt fuseholder nearest the chassis. Another black wire is already soldered to this point.

10. Dress the longest coaxial lead (coax #1) and 24 inch yellow-white lead (#1) from the hole in the chassis to the sweep and gate output holes in the rear gusset.

11. Remove plug buttons from the SWEEP and GATE OUTPUT holes.

12. Install the two BNC connectors in these holes.

13. Connect and solder coax #1 to the GATE OUTPUT BNC.

14. Connect and solder yellow-white lead (#1) to the SWEEP OUTPUT BNC.

15. Install the horizontal plug-in.


CAUTION

Dress components on the newly installed etched circuit board to clear the plug-in when installing.

16. Install the left side, top, and bottom covers.

This completes the modification. Calibration is not affected.

OPERATION CHECK

Turn the instrument on and set the SWEEP MODE control to FREE RUN. Check the sweep and gate outputs for agreement with the specifications listed in the  Model 175A Operating and Service Manual.

hp Model 175A Oscilloscope
Serials Below 326-01376

Thermal Switch Assembly Modification Kit
hp Stock No. 175A-95E

This Service Note obsoletes Service Note 175A-2

Installation of Thermal Switch Assembly Modification Kit, hp Stock No. 175A-95E, in hp Model 175A Oscilloscope, serials below 326-01376, will provide component protection from damage due to excessive temperatures.

The thermal switch will turn off the oscilloscope if the fan fails and the instrument starts to overheat. Cutoff temperature can be controlled over a range of a few degrees by positioning of the series regulator shunt resistor in relation to the thermal switch. A new shunt resistor is provided in the kit and is mounted on the thermal switch support bracket.

Installation of the Thermal Switch Assembly Kit involves some component and wiring changes. It also requires drilling of two small holes in the oscilloscope main frame. Except for a hand drill, special tools are not required.

After completing the installation, an operating check of your oscilloscope should be made, but calibration or adjustment is not required.

Material Furnished in hp 175A-95E Kit

<u>Qty</u>	<u>Description</u>	<u>hp Stock No.</u>
1	Thermal Switch Assembly	175A-19H
1	Cable	175A-16AC
1	Terminal Board, two tie-points and ground	0360-0015
1	Terminal Board, right-hand tiepoint and ground	0360-0014
	Wire, 6 inch, white, 18 gauge	8150-0081

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Material Furnished in hp 175A-95E Kit (contd)

<u>Qty</u>	<u>Description</u>	<u>hp Stock No.</u>
4	Wire, 6 inch, slate, 18 gauge	8150-0087
	Machine Screw, #6-32, SS,	2360-0005
	Round Heat, 3/8" long	
2	Nut, Hex, with external	2420-0001
	lockwasher	
3	Lockwasher, external #6	2190-0007

INSTALLATION PROCEDURE

1. The 2.3 ohm, 45 watt resistor located on the bracket of Thermal Switch Assembly, stock no. 175A-19H, is a replacement for R482. Position this resistor 1/16 - 1/8 inch below the thermal switch and rotate its terminals to the rear (away from the neon lamp) and tighten its mounting screws.
2. Connect and solder the 6 inch white wire to one terminal and the 6 inch slate wire to the other terminal.
3. Place the Model 175A Oscilloscope upside-down. Remove the screws that secure the Low Voltage Power Supply Board (175A-65D).
4. Remove the white, blue, and black leads by removing the edge-on connectors from the front edge of the board.
5. Lay back the board toward the rear of the instrument to fully expose the electrolytic capacitors.
6. Without disconnecting any leads, remove and lay back the three capacitors nearest L481. These capacitors are C441, C442, and C443.
7. Notice that the capacitor mounting bracket ends before reaching the inductor L481. Center-punch a mark in line with the center of this mounting bracket and about 3/8" from L481. (About halfway between L481 and the edge of the mounting bracket)
8. Center-punch another mark 3-1/8" from the first and centered on the capacitor mounting bracket.

9. Drill the holes with a #20 drill.
10. Install the thermal switch assembly on the top of the main deck behind the vertical plug-in slot, and positioned with the neon bulb forward. Use the hardware provided.
11. Replace the electrolytic capacitors and the low voltage power supply board.
12. Reconnect the white, blue, and black leads to front edge of board.
13. Locate, remove and discard the old R482. It may be found to the right and rear of the newly installed thermal assembly. Cut the attached wires close to the resistor terminals.
14. Install the terminal strip with the two tiepoints and ground in place of resistor R482. Use one of the #6-32 screws and an external lockwasher.
15. Solder the white lead from the new R482 and three white leads removed in step 13 to one of the tiepoints.
16. Solder the gray lead from the new R482 and the gray leads removed in step 13 to the other tiepoint. (The ground lug is not used at this time.)
17. Strip the leads and feed the shielded cable through the chassis hole located forward of Diodes CR481 and CR482.

Note

The end of the cable having the longest exposed leads should be on the bottom side of the oscilloscope, and will connect to the fuseholder.

18. Remove the protective cover from the top of the terminal switch assembly.
19. The exposed terminals are marked 1, 2, and 3. Terminal 2 has a white wire connected to it.

19. (contd)

- a. Connect and solder the black conductor to terminal 1.
- b. Connect and solder the white conductor to terminal 3. (The neon is attached here.)
- c. Connect and solder the black shield wire to the center tie-point on the terminal strip.

20. Recheck solder connections and replace protective cover.

21. Route the shielded cable along the bottom of the chassis to the line fuseholder.

22. Mount the terminal board, stock no. 0360-0014, with the convenient chassis screw located forward of rear panel.

23. Connect and solder the black shield wire to the ground terminal.

24. Connect the white conductor to the tiepoint.

25. Remove the black lead from the side terminal of the fuseholder and connect it to the tiepoint with the white conductor (step 24). Solder connections.

26. Connect and solder black conductor from shielded cable to the side terminal of the fuseholder.

OPERATIONAL CHECK

An operational check of your Model 175A Oscilloscope completes the procedure.

MODEL 175A OSCILLOSCOPE
Serials Below 413-02326

Modification of 175A for 1784A Recorder Plug-in

This modification is necessary if the 1784A Recorder plug-in is to be used with these 175A Oscilloscopes.

The installation of a twisted pair of wires between the power transformer and the horizontal plug-in jack provides the 115VAC necessary for the operation of the 1784A Recorder Plug-in.

Two 11" long #22 (1 kv) wires are required, they should be wht/gry and wht/blk/gry in color.

Modification Procedure

1. Remove bottom cover of 175A.
2. Connect the twisted pair of 11" long #22 (1 kv) wire from terminals 10 and 12 of transformer T401 to terminals 30 and 31 of J105 such that the wht/gry wire connects transformer terminal 12 and terminal 31 of J105.

This modification requires no recalibration or additions to the Replaceable Parts List.

 MODEL 175A OSCILLOSCOPE
Serial Prefix Below 450-

New Vertical Output Printed Circuit Board 175A-65W

The 175A-65W is a direct replacement for the 175A-65T.

Add the 175A-65W to the Replaceable Parts List in your 175A Operating and Service Manual.

Recalibration of the vertical amplifiers will be necessary after the installation of this Printed Circuit Board. See Paragraphs 5-53 thru 5-57 of your Operating and Service Manual.

02522-1

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 MODEL 175A OSCILLOSCOPE
All Serials


Improved Sweep Operation

For improved sweep operation in the 175A Oscilloscope V106 should be a 6CL6 (1923-0066).


Change the stock number in the Replaceable Parts List from 1923-0030 to 1923-0066. This is a special 6CL6.

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 MODEL 175A OSCILLOSCOPE
Serial Prefixes Below 436-


INCREASED VERTICAL DC STABILITY

The DC stability of the main vertical amplifier in the above instruments may be improved by installing the  Part No. 175A-65V input amplifier circuit board. This modification eliminates the small amount of trace drift that occurs over a period of one or two minutes after a DC voltage step is applied to the vertical input. This is the only advantage of the new board so the modification is worthwhile only if the slight drift poses a problem.


The new board is a direct replacement and no special tools are needed for the modification.

Recalibration is necessary after completing the modification.

Note

The  Model 1750A Dual Trace Vertical Amplifier has the same type of drift as above. This modification will eliminate the drift caused by the 175A. To eliminate the drift caused by the 1750A, it should be operated with the vernier turned fully ccw.

Parts Required


Quantity	Description	 Part No.
1	Vertical Input Assembly	175A-65V
1	Resistor: 1K ohms, 5%, 1/2W	0758-0003

MODIFICATION PROCEDURE

1. Remove top cover.
2. Replace Vertical Input Assembly A1 with new 175A-65V board. All connections remain the same.
3. Replace R46 on circuit board A2 with 1K ohms resistor.

Recalibrate the vertical amplifier as described in the Model 175A Operating and Service Manual except for the Adjustment Procedure change as follows: In the Hi Freq Response step of the Pulse Response Adjustment paragraph in the Maintenance Section of your Operating and Service Manual, substitute C53 for L7 and L8.

REVISION TO TABLE OF REPLACEABLE PARTS

Ckt Ref	Description	 Part No.
CHANGE:	TO:	
A1	Assy: vertical input	175A-65V
L13	Coil: fxd, rf, .68 μ h	9140-0094
R15	R: fxd, metal oxide, 750 ohms, 2%, 2W	0763-0009
R23, R24	R: fxd, comp, 330 ohms, 5%, 1/4W	0683-3315
DELETE:		
C7, C8	C: fxd, cer, 0.05 μ f, 20% 400VDCW	0150-0052
L7, L8	Coil: var, rf	175A-60F
R16	R: fxd, comp, 1.5K, 1%, 1/2W	0727-0110
R19, R20	R: fxd, comp, 68 ohms, 5%, 1/4W	0683-6805
R21, R22	R: fxd, metal film, 6.5K, 5%, 3W	0767-0006
* ADD:		
C12, C13	C: fxd, cer, 1000 pf, 600VDCW	0150-0050
C53	C: var, cer, 5-25 pf	0130-0016
C54	C: fxd, mica, 30 pf, 5%, 500VDCW	0140-0203
Q1, Q2	Transistor: 2N708	1854-0005
R1	R: fxd, comp, 120 ohms, 10%, 1/4W	0684-1211
R2	R: fxd, comp, 6.8K, 5%, 1/4W	0683-6825
R27, R28	R: fxd, comp, 1.5K, 10%, 1/2W	0687-1521
R29	R: fxd, comp, 2.7K, 5%, 3W	0767-0021
R98	R: fxd, comp, 91K, 5%, 1/2W	0686-9135
R99, R100	R: fxd, comp, 15K, 5%, 1/4W	0684-1535
R101	R: fxd, comp, 56 ohms, 10%, 1/4W	0684-5601
R102, R103	R: fxd, comp, 220 ohms, 10%, 1/4W	0684-2211
* Refer to Figure 1.		



Note: Incorporate Figure 1, Adjustment Procedure Change, and Revisions to Table of Replaceable Parts with your Operating and Service Manual for future reference.

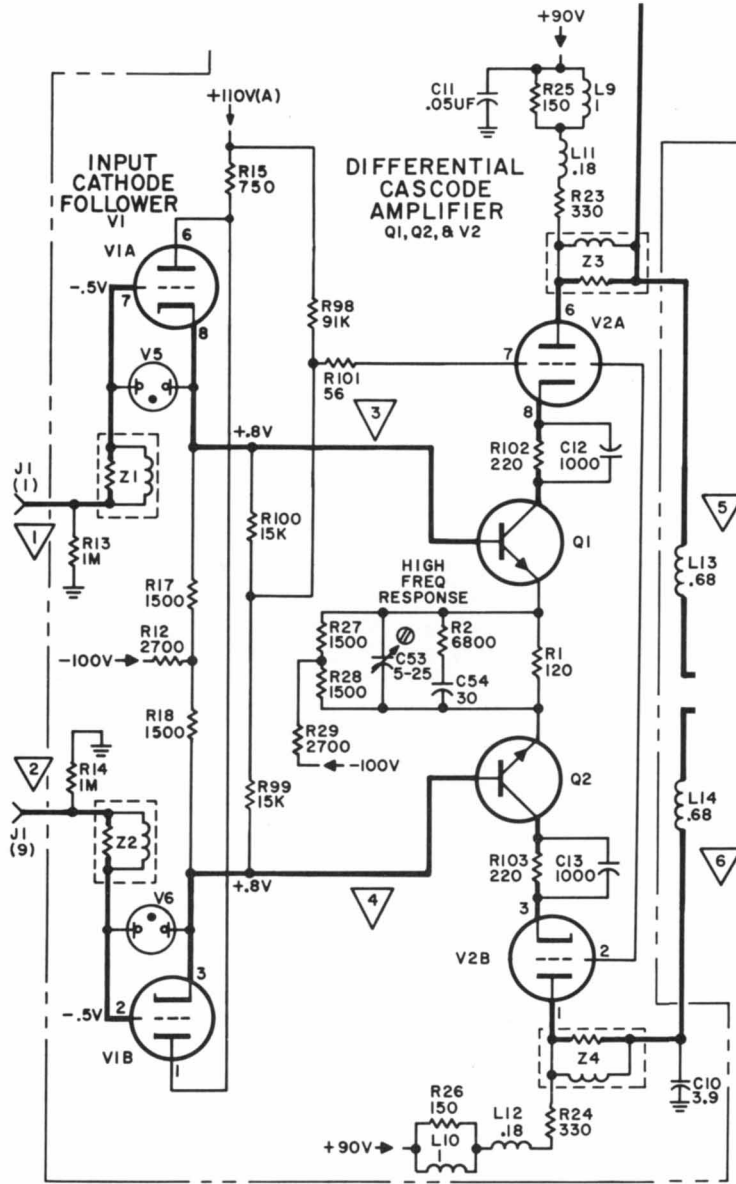


Figure 1. HP Model 175A Oscilloscope, Schematic of Modified Circuit

hp MODEL 175A OSCILLOSCOPE
All Serials

Improved Trigger Circuit Stability

The preferred replacement for V101 is an aged tube which has improved drift characteristics. The aged tube eliminates the need to adjust trigger sensitivity several times, after a period of time, as the replaced tube settles down. Order hp Part No. 5080-0411 for replacement of V101.

Change the Part No. of V101 in your hp Model 175A Operating and Service Manual to insure proper replacement in the future.

hp MODEL 175A OSCILLOSCOPE
Serials Prefixed Below 326-

Fan Filter Replacement Kit
00175-69501

The fan filter (hp Part No. 3150-0023) is no longer available. It is replaced by an improved filter which has different physical dimensions.

Parts Included in Filter Replacement Kit

Quantity	Description	hp Part No.
1	Filter	3150-0027
2	Filter Bracket	175A-12U
4	Stand off	0380-0012
4	Screws 6-32 x 1/4"	2370-0009
1	Service Note	175A-10

Replacement Procedure

- a. Remove old style fan filter by removing screws, stand-offs, and brackets.
- b. Install new filter using supplied hardware. The new hardware mounts in the same manner as the old style filter.
- c. Change the Replaceable Parts List in your hp Model 175A Operating and Service Manual to incorporate the above changes.

hp MODEL 175A OSCILLOSCOPE
Serials Below 530-04101

IMPROVED HIGH FREQUENCY TRIGGERING

The following modification improves high frequency triggering in the above instruments by eliminating radiated signals in the Trigger Source switch and Trigger Level switch.

This modification entails the installation of a coaxial lead, two jumper wires and the removal of one switch contact.

The coaxial lead improves triggering when the 1782A Display Scanner or 1784A Recorder plug-in is used. The jumper wires provide a reliable signal path which replaces rivets as conductors. The rivets have been known to make poor contact. Removal of the switch contact reduces high frequency trigger jitter and eliminates radiated internal trigger signals from overriding low level external trigger signals.

Modification Procedure

- a. Remove bottom cover from Oscilloscope and locate Trigger Source switch and Trigger Level switch.
- b. Solder two jumper wires (bare wire 1/4" long) as shown in Figure 1.
- c. Remove switch contact located on Trigger Source switch as shown in Figure 1.
- d. Install 7" coaxial lead (hp Part No. 175A-16AT) in place of green/orange wire as shown in Figure 1. Ground coaxial shield to ground lug on Trigger Level switch.
- e. Recalibration is not necessary after modification.

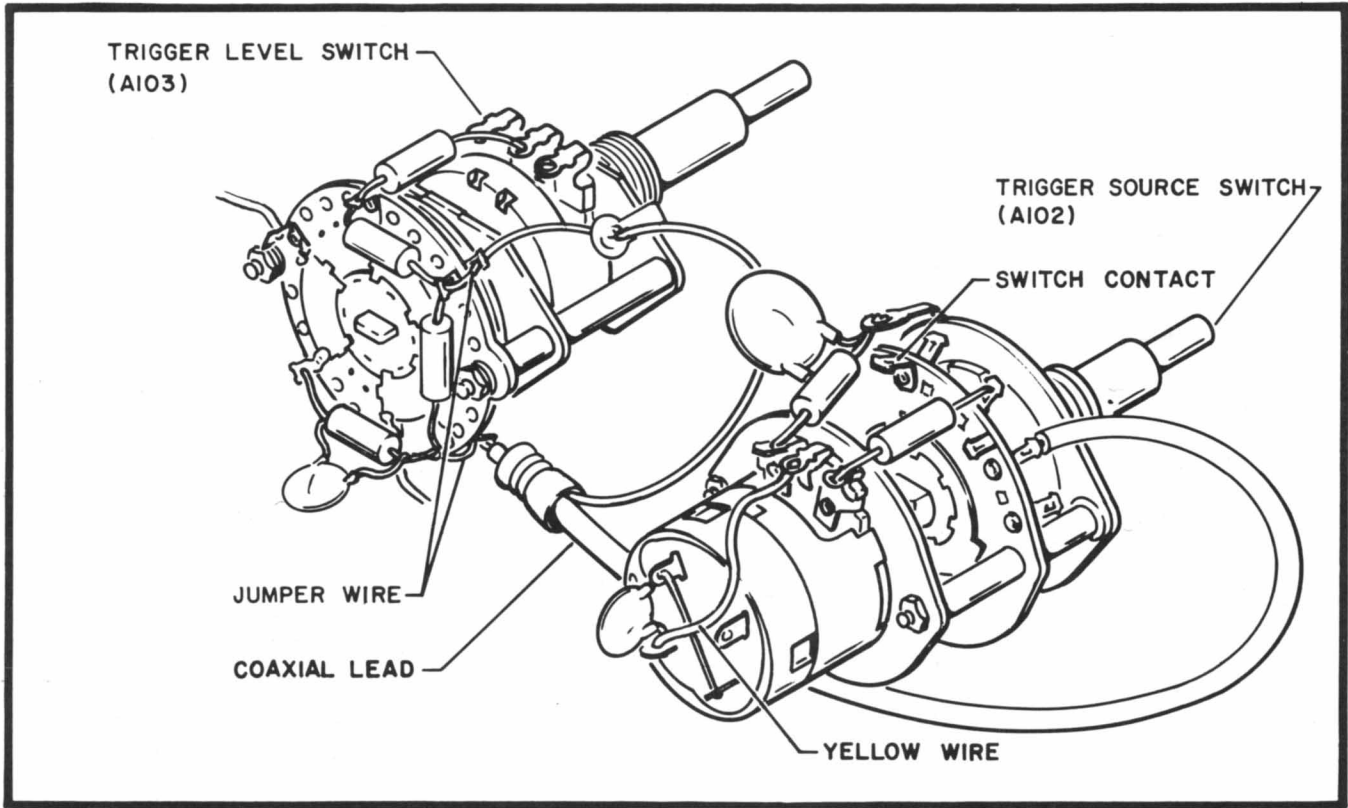


FIGURE 1. MODIFICATION LOCATIONS

hp Model 175A Oscilloscope
Serial Prefix 530- and Below

Improved Complex Waveform Triggering
Parts Kit # 00175-69502

This modification improves the complex waveform triggering in the above instruments.

Improvement is accomplished by installing a new trigger source switch which has a pot on it which allows selection of hold-off time. Varying the hold-off time sets the Rep Rate of the sweep so the oscilloscope triggers on the same part of the waveform every time, therefore, eliminating multiple triggering. One situation which shows multiple triggering is a gated pulse train waveform in which all trigger signals have the same amplitude. After modification the sweep mode control will have the following functions:

a. At clockwise, in detent, the sweep will free-run.

b. At all points out of detent, the trigger circuit will be preset, while rotation counterclockwise will reduce the hold-off time. Most waveforms will be observed at a counterclockwise setting of the sweep mode potentiometer. Observation will be improved because the trace will be brighter at this setting.

Parts included in Kit # 00175-69502

Description	hp Part No.
Trigger Source Switch	175A-19J
24" white/yellow wire 22 ga	NSN
16" white/violet wire 22 ga	NSN
Service Note	175A-12

MODIFICATION PROCEDURE

Step 1: Remove bottom cover from oscilloscope and locate the trigger source switch.

Step 2: Locate resistors R1001, 1006, 1007, and 1008. They are soldered at one end, in pairs, to two switch contacts. With cutters, remove the portion of the switch contacts that touches the wiper of the sweep time switch. Contact is made on both sides of the wiper. Make sure that both contact sides are removed on both contacts. See Figure 5-4 of the Operating and Service Manual for resistor location.

Step 3: Remove and discard R158 (1 megohm) and C129 (47 pf).

Step 4: Remove V101 for access to trigger source switch.

Step 5: Remove knobs and locknut from switch.

Step 6: Unsolder all wires from existing trigger source switch.

Step 7: Remove and discard old switch.

Step 8: Solder the Black/White wire just removed from the old switch to the ungrounded end of the 20k resistor on the new switch.

Step 9: Install the new trigger source switch such that the potentiometer terminals point toward the bottom of the oscilloscope. Loosely attach the nut to hold the new switch in place.

Step 10: Install a 24-inch White/Yellow wire from pin 21 of the horizontal plug-in jack. Run it along the existing cable beside the plug-in compartment to the Trigger Source Switch location.

Step 11: Solder one end of the 16-inch White/Violet wire to both contacts from which parts were removed in Step 2. Run wire along cabling of Step 10 to Trigger Source Switch location.

Step 12: Solder all remaining wires removed in Step 6 and both of the new wires of Steps 10 and 11, as shown in Figure 1.

Step 13: Reinsert V101 and tighten the switch in place. Add the knobs. The red knob should point to 5:00 o'clock when the potentiometer is rotated clockwise into the detent position.

Step 14:

a: Make the Adj described in Paragraph 5-49 on Page 5-10 in the Operating and Service Manual, with the following changes.

Step 5-49c Rotate Sweep Mode out of detent.

Step 5-49d Rotate R170 slowly cw while watching voltmeter. Meter will jump when sweep free-runs.

Step 5-49e Note voltage at which sweep generator free-runs (maximum negative reading).

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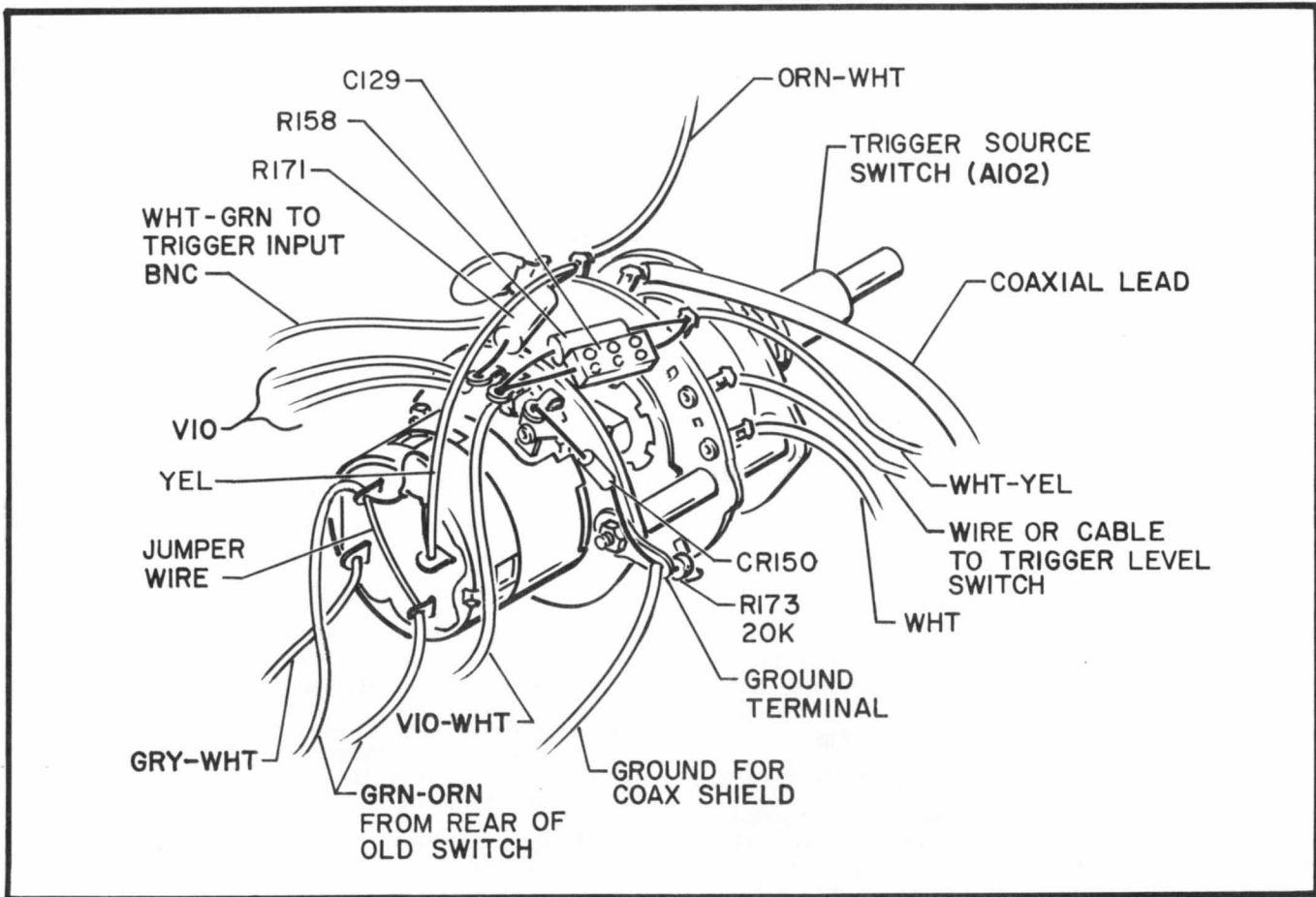


Figure 1. Modification Locations

Change the above adjustment steps to insure proper adjustment in future.

b. Make Trigger Sensitivity and Symmetry Adjustments as described in paragraph 5-50 of Operating and Service Manual.

Step 15: Make the following changes to the Replaceable Parts Lists in your Model 175A Operating and Service Manual.

Add	CR150	1902-3356
	R150/S103	2100-1794
Change	A102	175A-19J
	A101	175A-19K
	A1002	175A-65Y

Step 16: Insert the following schematic with the Sweep Generator Schematic Figure 5-22 in the Operating and Service Manual.

Step 17: Check Oscilloscope operation by performing Performance Check steps 5-14 through 5-17 Page 5-2 in the manual.

Delete R172/S103 2100-0348

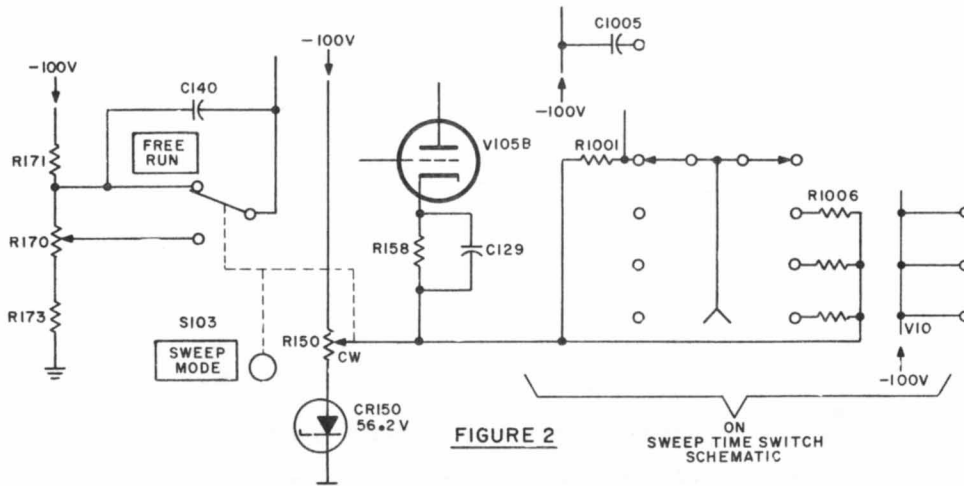


FIGURE 2

hp Model 175A Oscilloscope
Serial Numbers 633-04850 and Below

Improved Triggering Stability

This Service Note obsoletes Service Note 175A-13.

Model 175A triggering may be improved by utilizing more stable components in the trigger circuit. Potentiometer R120 and resistor R118 can be changed to elements with lower temperature coefficients which significantly improve trigger sensitivity stability.

Parts Required

<u>Quantity</u>	<u>Description</u>	<u>hp Part No.</u>
1	Potentiometer	2100-1768
1	Resistor	0698-6047

After replacing R118 and R120, turn the Model 175A power on, allow at least 15 minutes for temperature stabilization, and perform the Trigger Sensitivity and Symmetry Adjustment, paragraph 5-50 in the Operating and Service Manual.

Change the Replaceable Parts List in your hp Model 175A Operating and Service Manual to incorporate the above changes.

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-hp- Model H12-175A Oscilloscope
Serial No. 633-06036 and Below

Thermal Switch Assembly Modification Kit
hp Stock No. 175A-95F

The standard automatically resetting thermal overload switch may be replaced by Thermal Switch Assembly Modification Kit, Stock No. 175A-95F, which employs a thermal switch which must be manually reset following power cutoff due to thermal overload of the Oscilloscope.

This modification may be performed with only a slot screw driver, diagonal cutting pliers, and a soldering iron.

After completing the installation an operating check of your oscilloscope should be made, but calibration or adjustment is not required.

Material Furnished in -hp- 175A-95F Kit

<u>Qty</u>	<u>Description</u>	<u>hp Stock No.</u>
1	Switch, Thermal	0440-0062
1	Plate, Insulation	175A-41D
2	Screw, 6-32 x 1-1/16"	2360-0014
2	Lockwasher, No. 6 split lock	2190-0046

MODIFICATION PROCEDURE

1. Remove the two 1-1/16" screws, stock no. 2360-0014, which fasten the Insulator Plate, stock no. 175A-41A, to the thermal switch bracket. Discard the insulator plate and mounting screws and the two 3/4" spacers. (The replacement insulator plates have spacers factory mounted.)

2. Find the gray shielded cable that terminates at the thermal switch assembly and cut the black and white wires close to the terminals to which they are soldered.

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3. Remove the thermal switch, neon lamp, 18K ohm resistor and terminal strip by lifting them out of the mounting bracket.
4. Place the new thermal switch, Stock No. 0440-0062 into the hole provided in the thermal switch bracket. Align its mounting holes with those in the thermal switch mounting bracket and with terminal No. 1 forward.
5. Strip 1/4" of insulation from the ends of the two wires out from the old thermal switch and connect the white wire to terminal No. 1 and the black wire to the other terminal of the new thermal switch by soldering.
6. Place a lockwasher, Stock No. 2190-0046 on each of the two thermal switch mounting screws, Stock No. 2360-0014, and pass the screws through the mounting holes of the Insulator Plate, Stock No. 175A-41D and then through the mounting holes of the thermal switch and fasten this assembly to the thermal switch mounting bracket.
7. The 2.3 ohm, 45 watt resistor mounted under the thermal switch must be spaced between 1/16" and 1/8" below the thermal switch. Carefully make this adjustment as greater than 1/8" separation may result in failure of the thermal switch to function; but, if the resistor makes contact with the thermal switch a 60 Hz ripple will be induced into the oscilloscope circuitry.

OPERATIONAL CHECK

An operational check of your Model H12-175A Oscilloscope completes this procedure.