SN 100-19999

Type 422	PRODUCT MODIFICATION INDEX

circuit section—XXX.XX page

1 CHANNEL 1 INPUT AMPLIFIER

EFF. SN. S.M*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
158	Triggering on chopped transients in CHANNEL 1 mode eliminated. Vertical Amplifier cable changed.	9491-1	101.01	0.4h	-----
158	Vertical aberration caused by sweep start reduced. Vertical Amplifier cable changed.	9491-2	101.02	0.3h	-----
760	Input capacitance adjustment range more nearly centered with new value capacitors. C12 and C112, 1.7-11pF, 281-0102-00, replaced by 1.3-5.4pF, 281-0099-00.	9499-1	----	-----	-----
1550	Reduces trace ripple most noticeable when Step Atten. Bal is adjusted to minimum. Decoupling improved by replacing C22, 3.3pF, 290-0246-00, with 5.6µF, 290-0247-00.	10012	----	0.2h	-----
5700	Ferrite core replaced with more available type. L41, L63 and L73, 0.7µH ferrite core, 276-0532-00, replaced by 0.6µH, 276-0507-00.	10297	----	-----	-----
11370	VARIABLE VOLTS/DIV controls replaced to improve uncal neon switch reliability. R90/SW741, 311-0385-00 replaced by 311-0385-01.	12998	----	-----	-----

DF:jcp

Type 422 | **PRODUCT MODIFICATION INDEX**

circuit section—XXX.XX page

◇2 CHANNEL 2 INPUT AMPLIFIER

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
300	Rough switching action improved by changing X10 GAIN AC switch (SW150) to type without detents. 260-0583-00 replaced by 260-0583-01.	9431-1	----	-----	-----
300	Rough switching action improved by changing Channel 2 INVERT switch to type without detents. 260-0583-00 replaced by 260-0583-01.	9431-2	----	-----	-----
491	Trace ripple when using AC-DC supply reduced. Channel 2 input amplifier decoupling increased.	9798	102.01	0.2h	-----
760	Input capacitance adjustment range more nearly centered with new value capacitors. C12 and C112, 1.7-11pF, 281-0102-00, replaced by 1.3-5.4pF, 281-0099-00.	9499-1	----	-----	-----
1290	Trace noise reduced. Zener diodes changed.	9553	102.02	-----	-----
3347	Potential short circuit of -12V DC supply eliminated. Channel 2 input amplifier circuit board wiring changed. See Mod 10801.	10800	102.03	0.2h	-----
4770	Preamp circuit board redesigned to eliminate wire installed by Mod 10800. Channel 2 Preamp circuit board replaced.	10801	----	-----	-----
5700	Ferrite core replaced with more available type. L141, L163, and L173, 0.7µH ferrite core, 276-0532-00 replaced by 0.6µH, 276-0507-00.	10297	----	-----	-----
11370	VARIABLE VOLTS/DIV controls replaced to improve uncal neon switch reliability. R190/SW743, 311-0385-00 replaced by 311-0385-01.	12998	----	-----	-----
12347	Trace dimming in ALT MODE eliminated.	14061	102.04	0.7h	-----

Type 422 | **PRODUCT MODIFICATION INDEX**

circuit section XXX.XX page

3 ATTENUATORS

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
2440	Mechanical noise reduced by replacing attenuator switches.	9883	103.01	-----	-----
4930	Attenuator switch shaft couplers changed to plated brass for standardization. 103-0049-00 replaced by 103-0049-04 and 103-0050-00 replaced by 103-0050-02.	10621	----	-----	-----
5700	Attenuator accuracy improved. Resistors changed to 1/2% metal film.	9682	103.02	-----	-----
13372	Volts/Div switches replaced to eliminate noise and binding.	13972	103.03	-----	-----

4 VERTICAL SWITCHING AND OUTPUT AMPLIFIER

circuit section—XXX.XX page

EFF. SN. S.M*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
158	Triggering on chopped transients in CHANNEL 1 mode eliminated. Vertical amplifier cable changed.	9491-1	101.01	0.4h	-----
540	HF Compensation (C237) range centered. C238, 5.6pF 500V, 281-0544-00, replaced by 3.3pF 500V, 281-0534-00.	9401	----	0.2h	-----
678	High voltage radiation reduced. Circuit board mounting bracket added.	9537-1	104.01	-----	-----
678	Delay line assembly mounting improved. Length and number of mounting studs increased.	9537-2	104.02	-----	-----
760	Front corner overshoot reduced by changing vertical amplifier compensation resistor, R227, to a selected part. Nominal value 9.1k 1/4W 5%. Selected for less than 0.5% overshoot.	9499-2	----	-----	-----
760	Delay line termination bump reduced by changing vertical amplifier compensation. C242 and C252, 18pF, 281-0542-00 replaced by 4.7pF, 281-0592-00.	9499-3	----	0.3h	-----
2710	Vertical aberrations reduced by changing the delay line and other components.	10432	104.03	-----	-----
3080	Silicon diode type changed to provide tighter specifications. D201, D204, D205 and D208, 6185, 152-0185-00, replaced by 6233, 152-0233-00.	9947	----	-----	-----
8580	Delay line damage prevented by changing delay line cable clamp size. Cable clamp 3/32", 343-0119-00, replaced by 1/8" clamp, 343-0144-00.	12070	----	-----	-----
12347	Trace dimming in Channel 2 ALT MODE eliminated.	14061	102.04	0.5h	-----

CONTINUED.

circuit section—XXX.XX page

4 VERTICAL SWITCHING AND OUTPUT AMPLIFIER (Continued)

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
13011	Resistors installed by Mod 14061 relocated to improve mechanical connection.	14292	104.04	0.2h	-----

circuit section—XXX.XX page

5 SWEEP TRIGGER

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
269	Trigger input amplifier gain increased. Eliminated need to select components.	9676	105.01	0.2h	-----
12820					
12820	Zener diode, D325, voltage tolerance changed from ±10% to ±5% for standardization. 152-0076-00 replaced by 152-0278-00.	11191	-----	-----	-----
13870	1N3605 diodes replaced with 1N4152 diodes. D331, D334, and D363, 152-0141-00, replaced with 152-0141-02.	13721	-----	-----	-----

Type 422 | **PRODUCT MODIFICATION INDEX**

circuit section—XXX.XX page

6 SWEEP GENERATOR

EFF. SN. S.M*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
1040	Nuvistor insulating plate 387-0603-00 removed because of no apparent need.	9661	----	-----	-----
1060	Magnified linearity improved. Plastic insulated wire changed to TEFLON® insulated.	9758-1	106.01	-----	-----
3080	Silicon diode type changed to provide tighter specifications. D435, D436, and D479, 6185, 152-0185-00 replaced by 6233, 152-0233-00.	9947	----	-----	-----
3080	Slow sweep timing error eliminated. Sweep generator disconnect diode was changed.	10311	106.02 106.03	----- 0.2n	050-0290-00

*series model

##Indicates changes made since last publication.

TEFLON Reg. TM of The DuPont Co.

Type 422 | PRODUCT MODIFICATION INDEX

circuit section—XXX.XX page

7 TIMING SWITCH

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
8150	3% to 5% timing error in 50µs and 0.5µs sweep ranges improved by replacing R440F, 1.47M 1/2W 1%, 323-0497-00 with a 1.47M 1/2W 0.1%, 323-0497-07.	11480	----	-----	-----

8 HORIZONTAL AMPLIFIER

circuit section—XXX.XX page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
158	Horizontal jitter when using AC-DC supply reduced. -12V decoupling to Horizontal POSITION control increased.	9491-3	108.01	0.3h	-----
300	Rough switching action improved by changing Horizontal Amplifier X10 MAG switch to type without detents.	9431-3	----	-----	-----
600	Horizontal positioning range improved. Offset current added to Horizontal Amplifier input.	9333	108.02	-----	-----
1055	Reduces need to select Q524 for X10 MAG linearity. D524 added.	10000	108.03	0.2h	-----
1060	To insure adequate gain of External Horizontal Input R501, 330k 1/4W 5%, 315-0334-00 were replaced by 300k 1/4W 5%, 315-0304-00.	9758-2	----	-----	-----
2600	High speed timing stability, at high temperatures, improved by changing capacitor type. C556, 330pF ceramic, 281-0546-00, replaced by 304pF mica, 283-0604-00.	10231	----	-----	-----
2950	Insures adequate range of External Horizontal attenuator. R504, 499Ω 1/8W 1%, 321-0164-00, replaced by 392Ω 1/8W 1%, 321-0154-00.	10491	----	0.2h	-----
4135	Circuit board layout changed to accommodate previous modifications.	10230	108.04	-----	-----
5700	Timing stability at high temperature improved by changing R542, 5.1Ω 1/4W 5% composition resistor, 307-0113-00, replaced by 5.1Ω 1/2W 2% ww, +3400PPM/°C temperature coefficient, 308-0417-00.	10735	----	-----	-----
9563	Timing drift due to aging reduced. Sweep cal potentiometer changed.	11721-1	108.05	-----	-----

CONTINUED.

circuit section—XXX.XX page

8 HORIZONTAL AMPLIFIER (Continued)

EFF. SN. S.M*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
9563	Etched circuit board changed to accommodate mods 11721-1 and 11721-2.	11721-3	108.06	-----	-----
11710	Oscillations eliminated by relocating ferrite cores.	13831	108.07	0.2h	-----
12374	Eliminates oscillation causing the trace length to appear shorter than normal when positioned to the left. Ferrite core 276-0532-00 added to ground lead of C546.	13877	----	-----	-----
12820	Zener diodes D549 and D559 wattage rating changed from 250mW to 400mW for standardization. 152-0031-00 replaced by 152-0243-00.	11191	----	-----	-----

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
320	Calibrator amplitude potentiometer value changed to accommodate specification change on ZZ1000 gas tube. R780, 5k, 311-0463-00 replaced by 10k, 311-0510-00.	9669	----	-----	-----
766	Calibrator roll off reduced and reference to ground improved.	9334	109.01	-----	-----
1290	Trace noise reduced by changing Zener diodes.	9553	102.02	-----	-----
3080	Silicon diode type changed to provide tighter specifications. D735 and D779, 6185, 152-0185-00, replaced by 6233, 152-0233-00.	9947	----	-----	-----
7190	Graticule lamp type changed to extend operating life. 050-0319-00, kit usable in AC supply only.	11053	109.02 109.03	----- 0.2h	----- 050-0319-00
8761	-18V supply nominal voltage stabilized.	12509	109.04	0.2h	-----
13280	UNCAL neons misfiring prevented. R742, R744 and R746 added.	14341	##109.05	-----	-----

PRODUCT MODIFICATION INDEX

10 CRT CIRCUIT

CLASSIFICATIONS
1 Required
2 Recommended
3 Information Only
U Unclassified

XXX.XX — Circuit / Page / Section

EFF. SN.	DESCRIPTION	CL	MOD. NO.	PAGE NO.	LABOR TIME	KIT NO.
158	CRT filament voltage increased. High voltage transformer and filament rectifier capacitor changed.	U	9637	110.01	1.0h	----
563	Graticule lamp socket short circuit prevented. Insulation was added to the lamp holder.	U	9814	110.02	0.3h	----
1060	Unblanking Center potentiometer adjustment range ensured by changing zener diode tolerance. D841, 43V ±20%, pn 152-0167-00, replaced by 43V ±10%, pn 152-0234-00.	U	9758-3	----	----	----
1400	CRT faceplate fogging eliminated by changing cushions from vinyl to silicon sponge. Part number 348-0070-00 replaced by pn 348-0070-01.	U	9993	----	----	----
1890	CRT orthogonality coil added to improve crt yield. For replacement, P31 phosphor crt's use 050-0264-13. Demand Status Kits for various phosphors are: pn 050-0264-10 (P-2), pn 050-0264-11 (P-7) and pn 050-0264-12 (P-11).	U	9763	110.03 110.04 110.05	---- 1.0h 1.0h	---- 050-0264-12 050-0264-13
2070	Mesh filter support improved. Foam support pads replaced with metal spring.	U	9643	110.06	0.2h	----
3080	Silicon diode type changed to provide tighter specifications. D865, D185, pn 152-0185-00, replaced by 6233, pn 152-0233-00.	U	9947	----	----	----
4330	Change in crt deflection sensitivity with varying intensity eliminated. Grid to cathode voltage regulation improved.	U	10517-1	110.07	0.5h	----

(continued)

PRODUCT MODIFICATION INDEX

CLASSIFICATIONS
1 Required
2 Recommended
3 Information Only
U Unclassified

XXX.XX — Circuit / Page / Section

10 CRT CIRCUIT (continued)

EFF. SN.	DESCRIPTION	CL	MOD. NO.	PAGE NO.	LABOR TIME	KIT NO.
4330	Eliminates crt filament voltage variation when changing from AC to AC-DC supply. HV transformer and rectifiers changed.	U	10517-2	110.08	----	----
9563	Failure of Q863 and Q864 reduced. Unblanking circuit resistors added.	U	11721-2	110.09	----	----
11931	Y-Axis Alignment Potentiometer circuit board, pn 388-0678-00, and connector, pn 131-0371-00, removed.	U	13523	----	----	----
12176	CRT filter support spring replaced with improved par. Part number 214-0654-00 replaced by pn 214-0996-00.	U	12971	----	----	----
12350	Trace rotator coil leads changed to prevent damage to coil form Part number 108-0320-00 replaced by pn 108-0320-01.	U	10438	----	----	----
12820	Zener diode, D841, voltage tolerance changed from ±10% to ±5% for standardization. Part number 152-0234-00 replaced by pn 152-0283-00.	U	11191	----	----	----

Type 422 | PRODUCT MODIFICATION INDEX

11 MISCELLANEOUS

circuit section—XXX.XX page

EFF. SN. S.M.*	DESCRIPTION	MOD NO	PAGE	LABOR TIME	KIT NO.
122	Front subpanel gasket 214-0552-00 was replaced with a gasket which is molded into the subpanel casting.	Pilot-2	----	-----	-----
350	Patch cord, 012-0084-00, removed from accessory kit because of no apparent need.	9638	----	-----	-----
3200	Carrying handle changed to simplify assembly and increase strength.	10202	111.01	-----	-----
4000	Squeak in storage compartment door eliminated. Stainless steel hinge pins replaced with plastic hinge pins.	9960	111.02	0.2h	-----
6990	P6006 probe replaced by P6012 to standardize on probe types. 010-0127-00 replaced with 010-0203-00.	11641	----	-----	-----
7190	Graticule lamp type changed to extend operating life. 050-0319-00 kit usable in AC supply only.	11053	109.02 109.03	----- 0.2h	050-0319-00
8580	Solder spool moved to accessory compartment to eliminate short circuit hazard.	11427-1	----	------	-----
8580	Improved latch installed on accessory compartment lid.	11427-2	111.03	0.3h	-----
13870	1N3605 diodes replaced by 1N4152 diodes. D331, D334 and D363, 152-0141-00, replaced with 152-0141-02.	13721	----	-----	-----

TRIGGERING ON CHOPPED TRANSIENTS IN CHANNEL 1 MODE ELIMINATED

Effective Prod SN 158 Usable in SN 100-157

Modified out of sequence: 102-3 107 128 133 141 146-7 154 156

There is a tendendy for the sweep to trigger on the chopped signal with TRIGGER SOURCE switch in CH 1 Only and VERTICAL MODE switch in Chopped.

Wire dress in the cable is such that the chopping transients are fed to the trigger circuit causing the instrument to trigger on the chopping transients.

The breakout points of the Variable Balance potentiometer (R35) wires have been changed in the Vertical cable to reduce feed-through from the chopper.

INSTALLATION:

Parts Required:

5 ea	131-0371-00	Connector, single contact

a) Remove the wires attached to contacts F, G, I, M and K of the Channel 1 Input Amplifier circuit board.

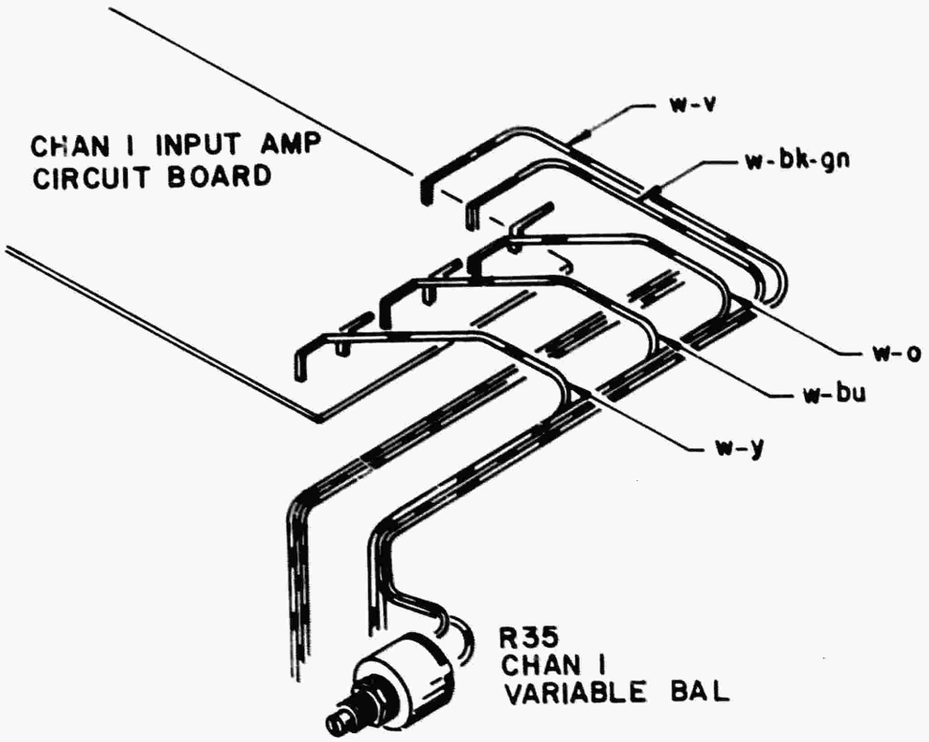
b) Cut the connectors off of the wires just behind the connectors.

c) Pull these five wires out of the cable back to a point adjacent to the Geometry potentiometer. Use caution when removing, as these #26 wires break easily.

d) Remove approximately 3/16" of the insulation from the end of each wire and install new connectors (131-0371-00) either by crimping onto the wire or soldering.

e) Reinstall the wires to the pins from which they were removed, referring to the drawing for the proper dress and connection.

Continued.



VERTICAL ABERRATION CAUSED BY SWEEP START REDUCED

Effective Prod SN 158 Usable in SN 100-157

Modified out of sequence: 102-3 107 128 133 141 146-7 154 156

A vertical aberration which appears near the start of the sweep is caused by sweep start transients being fed into the vertical amplifier by way of the filament wire of V13 and the wire from connector M, Cal Board to connector D, CH 2 Input Amp Board.

The sweep feed-through is reduced by:

a) Removing the filament wire from V13 from the cable and rerouting it.

b) Partially removing from the cable the wire from connector M, Cal Board to connector D, Ch 2 Input Amp board.

INSTALLATION:

Parts Required:

1 ea	131-0371-00	Connector, single contact
1 ea	175-0529-00	Wire, #26 stranded, white-black-red 5-1/2inch

a) Unsolder the white-black-red wire from pin 12 of V13 and ceramic strip notch CSB-10. See Fig. 1.

b) Cut the wire at either end flush with where it enters the cable.

c) Install a new 5-1/2inch #26 stranded white-black-red wire between CSB-10 and pin 12 of V13, referring to Fig. 1 for the proper routing and dress.

d) Remove the #26 white-red-black-black wire from pin M of the Calibrator-Regulator board, located behind the timing switch.

e) Cut the connector off of the wire immediately behind the connector and remove the wire from its cable back to the point where the cable passes below a 3/8" grommet in the instrument chassis near pin Y of the Sweep Trigger/Generator circuit board. See Fig. 2.

f) Remove approximately 3/16" of insulation from the wire and install a new connector (131-0371-00) on the wire, either by crimping it on or soldering.

g) Dress the wire through the 3/8" grommet and along the chassis as indicated in Fig. 2 and reinstall the wire on pin M of the Calibrator-Regulator board.

Continued.

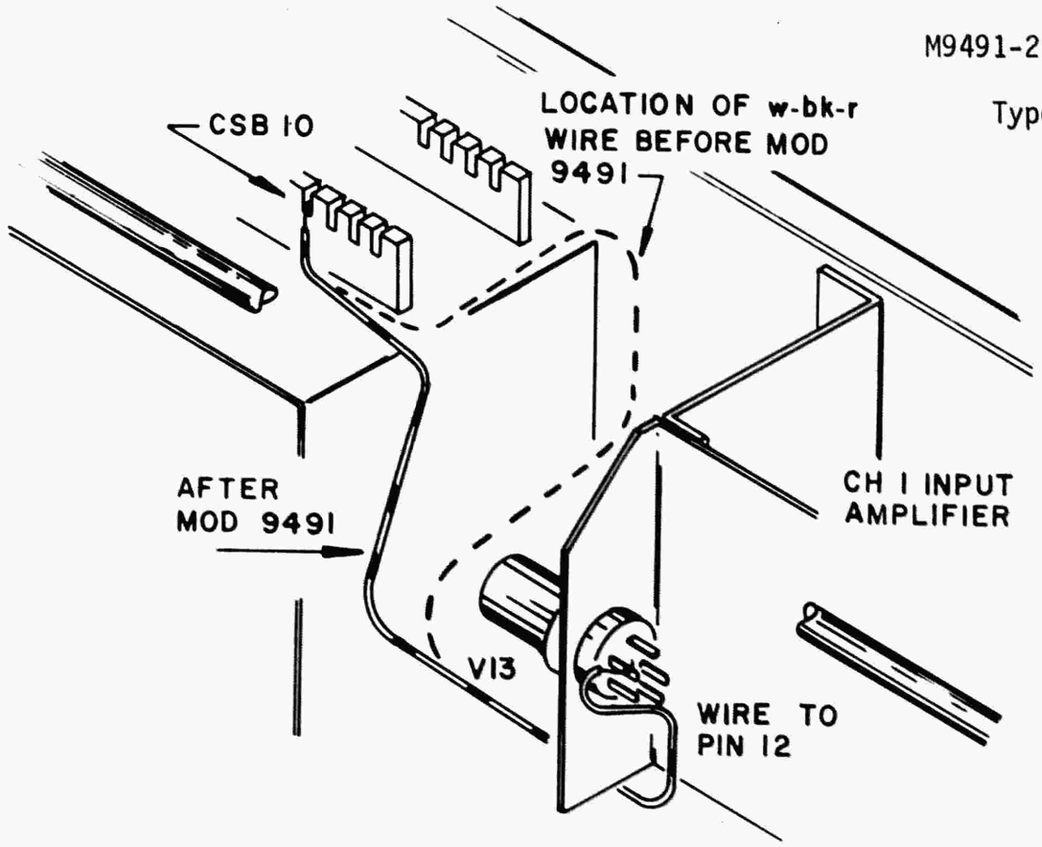


FIG. 1

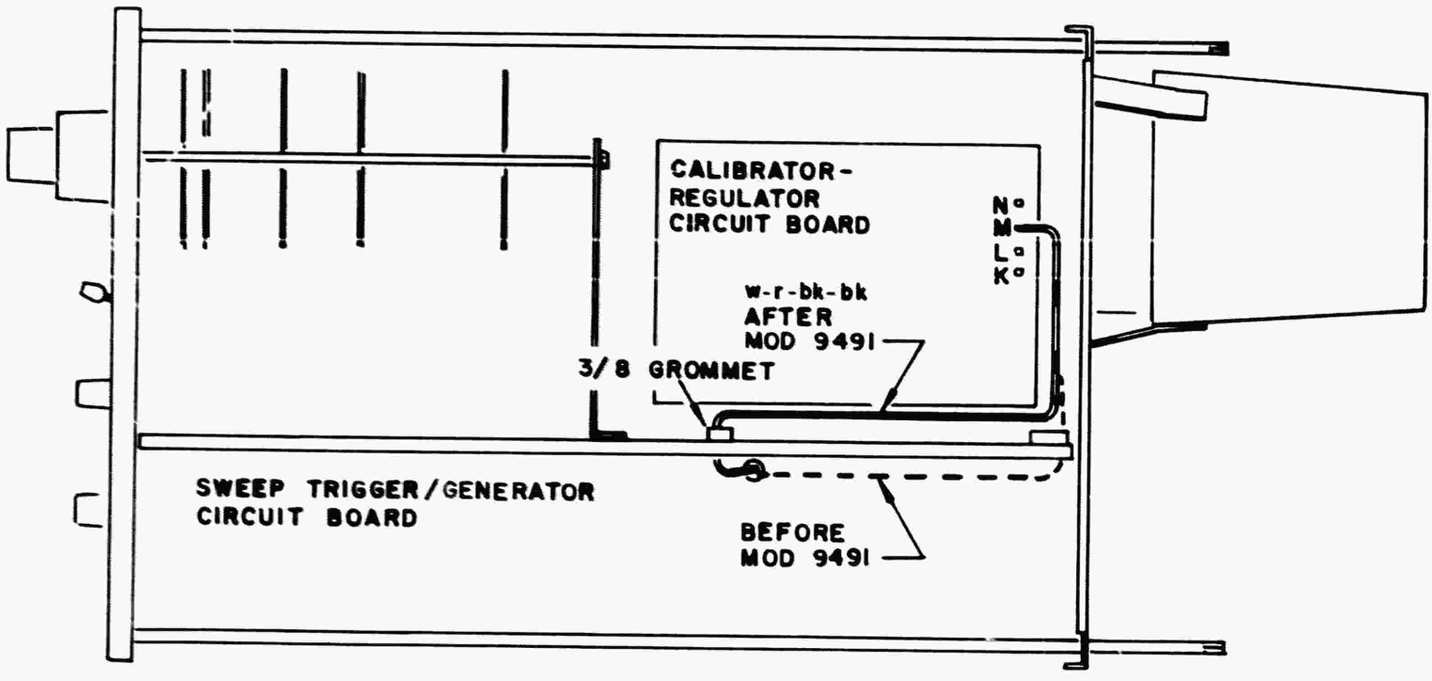


FIG. 2

TRACE RIPPLE WHEN USING THE AC-DC SUPPLY REDUCED

Effective Prod SN 491 Usable in SN 100-490

Modified out of sequence:

146	256	369	386	392	404-6	422	433	449-59	472-9
154	327	376-80	388	398	411-12	427	437	464	481-9
156	366	382	390	401	416	430	445-6	470	

Ripple on trace in the 0.01MV/DIV X10 GAIN mode when using the AC-DC power supply.

The value of C122 was changed from 22µF to 47µF to reduce the 112V supply noise and ripple.

Parts Removed:

C122	290-0134-00	Capacitor, EMT, 22µF 15V ±20%

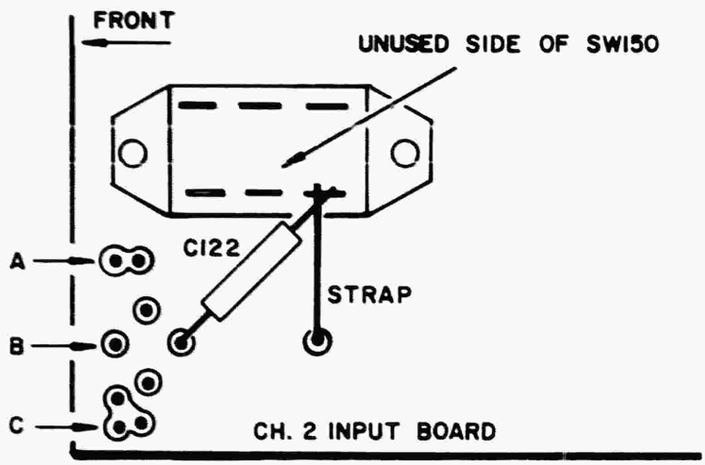
Parts Added:

C122	290-0114-00	Capacitor, EMT, 47µF 6V ±20%

INSTALLATION:

Parts Required: See 'Parts Added'.

Replace C122 with a 47µF capacitor. C122 is a 22µF capacitor located on the terminal side of Channel 2 X10 GAIN switch SW150.



TRACE NOISE REDUCED

Effective Prod SN 1290

It was necessary to select zener diodes D121, D141 and D713 for low noise in order to avoid excessive trace jump and noise in the 1mV position of Channel 2.

Zener diodes D121, D141 and D713 were replaced with diodes having a low noise specifications.

Parts Removed:

D121	152-0195-00	1N751A (5.1V)
D141 D713	152-0166-00	1N753A (6.2V)

Parts Added:

D121	152-0226-00	1N751A (5.1V)
D141 D713	152-0227-00	1N753A (6.2V)

POTENTIAL SHORT CIRCUIT OF -12V DC SUPPLY ELIMINATED

Effective Prod SN 3347 Usable in SN 100-3346

Modified out of sequence:

850	1736	3076	3159	3200-1	3258	3294	3323
1133	2104	3078	3162	3205	3260	3297	3325-29
1475	2841	3092	3169	3212	3268	3301-2	3331-35
1610	2853-5	3106	3171	3218	3274	3306	3340
1647	2875	3124	3178	3236-8	3277	3308-11	3342-44
1724	2997	3132	3185-86	3250	3287-89	3316	
1732	3033	3135	3198	3254	3292	3320	

A possible short circuit exists between the tab on the "INVERT" switch actuator rod (ground) and copper strapping on the Channel 2 INPUT AMPLIFIER circuit board (-12V DC) and could cause destruction of the -12V DC cable wire and circuit board.

The copper strapping on the Channel 2 INPUT AMPLIFIER circuit board was peeled off and replaced with a 2-1/2inch length of #22 solid white-red wire.

See top and bottom view drawings. NOTE: Mod 10801 will soon follow Mod 10800 and will relocate the -12V DC circuit board circuitry away from the switch area.

Parts Added:

175-0522-00 Wire, #22 solid white-red 2-1/2inch

INSTALLATION:

a) Remove the three 4-40 screws and their washers which secure the CH 2 INPUT AMPLIFIER circuit board to the instrument. SAVE.

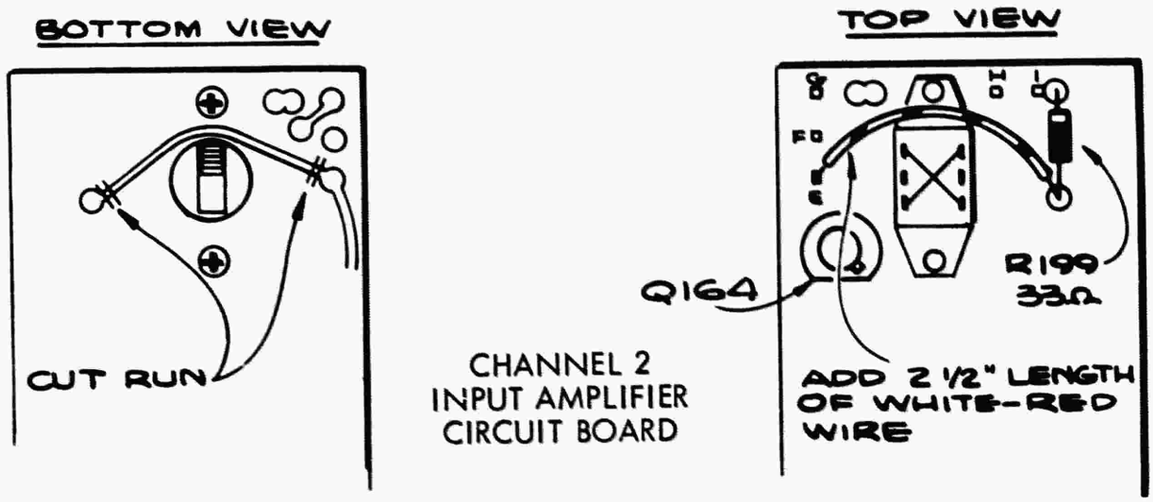
b) Carefully lift up the circuit board so the bottom side is readily accessible.

c) Carefully cut and remove the circuit board conductor as shown in the "BOTTOM VIEW" drawing.

d) Install a 2-1/2" piece of #22 insulated white-red wire as shown in the "TOP VIEW" drawing.

e) Reinstall the circuit board and its hardware as it was removed in steps a and b.

Continued.



CHANNEL 2
INPUT AMPLIFIER
CIRCUIT BOARD

TRACE DIMMING IN ALT MODE ELIMINATED

Effective Prod SN 12347 Usable in SN 100-12346

Modified out of sequence:

*4983	*10935	*11725	11945-46	12068	12162	12231-32	12286-89
*9464	*11115	11762	*11949	12078	12169	12234	12296-97
*10392	*11120	11791	11965	12084	12174	12240	12299-310
10480	*11194	*11812	*11979	12097-09	12179-80	12246-48	12316-17
10551	11207	*11819	*11982	*12100	12182	12250-51	12319-20
10609	11230-39	*11868	11984	12104-05	*12185-91	12253	12322-45
10659	*11304	*11881	11990-92	12110	12198	12257	
10666	11323	*11890	*11995	12123	12200	12261	
10720	11394	11901-02	11997	12126	12209	12268-70	
*10811	11403	11913	12046	12140	12211	12274	
*10865	*11560	*11917	*12048	12146-47	12215	12282	
11094	11608	*11943	12053	12153	12219-29	12284	

Oscillations in Channel 2 cause the trace to dim or disappear when Channel 2 is positioned in the ALT MODE.

A 47Ω resistor (R206) was added in series with the white-red wire and pin C of the Output Amplifier circuit board, and a 47Ω resistor (R207) was added in series with the white-brown wire and pin D of the Output Amplifier circuit board.

A 1.5pF capacitor, C193, was added to the base of Q194 to reduce loop voltage gain at low temperatures. C247, a 0.01μF capacitor, was removed to reduce aberrations and to increase bandwidth.

NOTE: Shortly after production incorporated this mod, it was discovered the mechanical reliability of the circuit board connectors could be improved by relocating R206 and R207 to the CH 2 INVERT switch, SW195. Because of this relocation, the resistors designation became R187 and R197. Instructions following provide for correctly installing the 47Ω resistors (now called R187 and R197) on SW195. See Mod 14292.

*These instruments were corrected at the factory per Mod 14292.

Continued.

Parts Removed:

C247	283-0068-00	Capacitor, ceramic, 0.01µF 500V

Parts Added:

C193	281-0529-00	Capacitor, ceramic, 1.5pF 500V
R206 R207	315-0470-00	Resistor, comp., 47Ω 1/4W 5%

INSTALLATION:

Parts Required: See 'Parts Added'.

a) Separate the power supply from the rear of the instrument and remove the indicator cabinet.

b) Turn the indicator upside down, CRT down and locate INVERT switch, SW195.

c) Unsolder at the switch, both resistor/capacitor combinations that go to the center contacts of the INVERT switch.

d) Install a 47Ω 1/4W resistor between the free ends of the resistor/capacitor combinations removed in step c and the center terminals of the INVERT switch (see Fig. 2).

e) Install C193, a 1.5pF 500V capacitor, between the base of Q194 and ground (see Fig. 2).

f) Set the indicator on its right side, TIME/DIV switch down. The circuit board visible looking down on the indicator is the Vertical Switching and Output Amplifier. Locate circuit board Pin B (see Fig. 1) and remove 0.01µF capacitor, C247.

g) Perform calibration steps 22 and 23 (in your Instruction Manual) as necessary.

h) Reassemble the cabinet and power supply.

Continued.

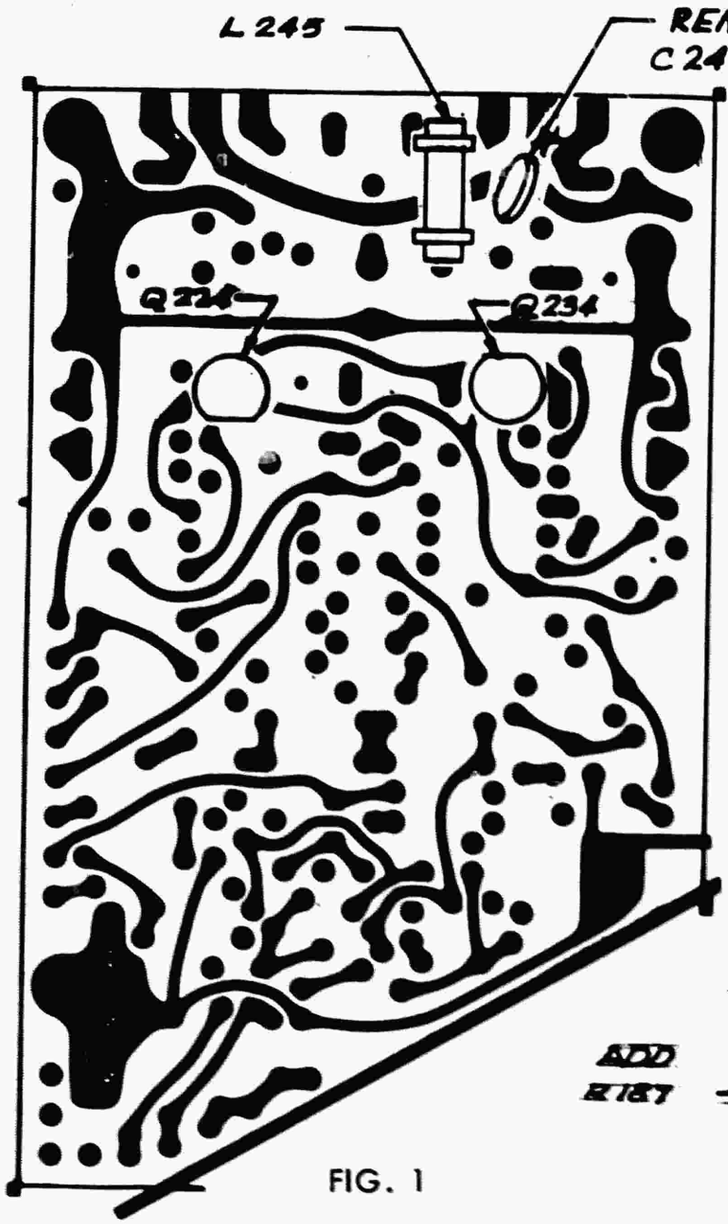


FIG. 1

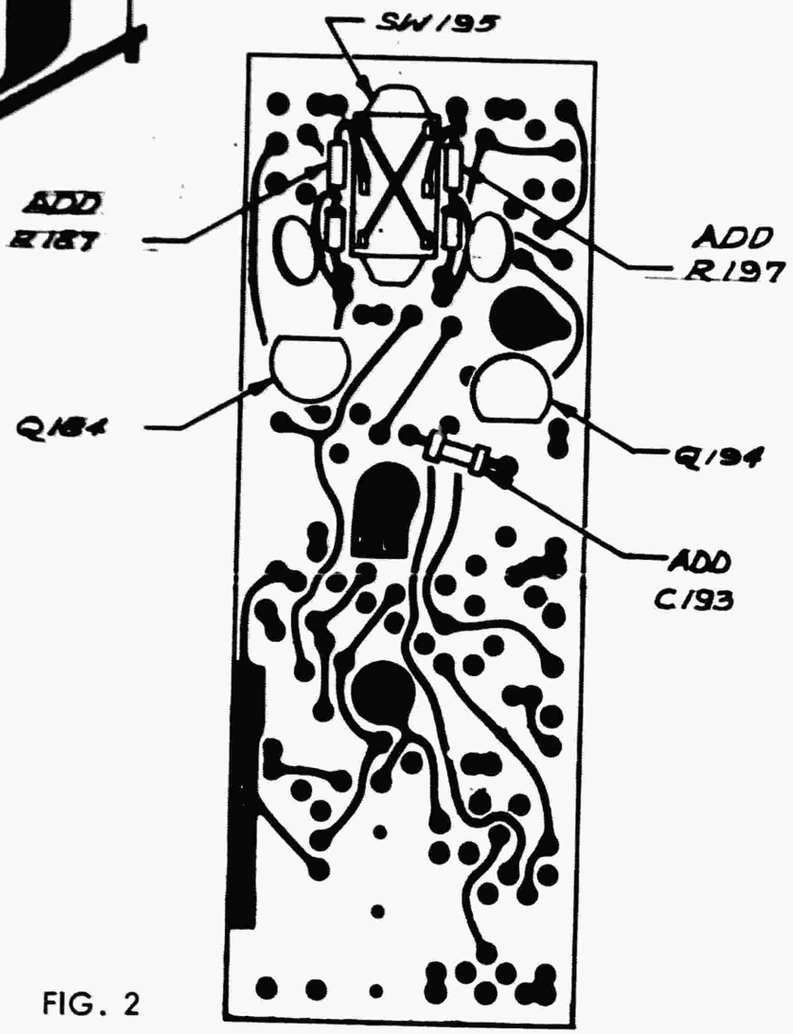


FIG. 2

MECHANICAL NOISE REDUCED BY REPLACING ATTENUATOR SWITCH

Effective Prod SN 2440

A misalignment of the attenuator switch and variable attenuator potentiometer causes interference between the rotor and stator insulators. This results in mechanical noise when the attenuator is rotated.

The variable attenuator mounting and coupling was changed to more properly align the attenuator switch and variable attenuator potentiometer (see sketch). NOTE: Serial numbered instruments 2440-2689 used the old shaft and coupler because of a parts shortage on 103-0049-00 and 103-0050-00.

Parts Removed:

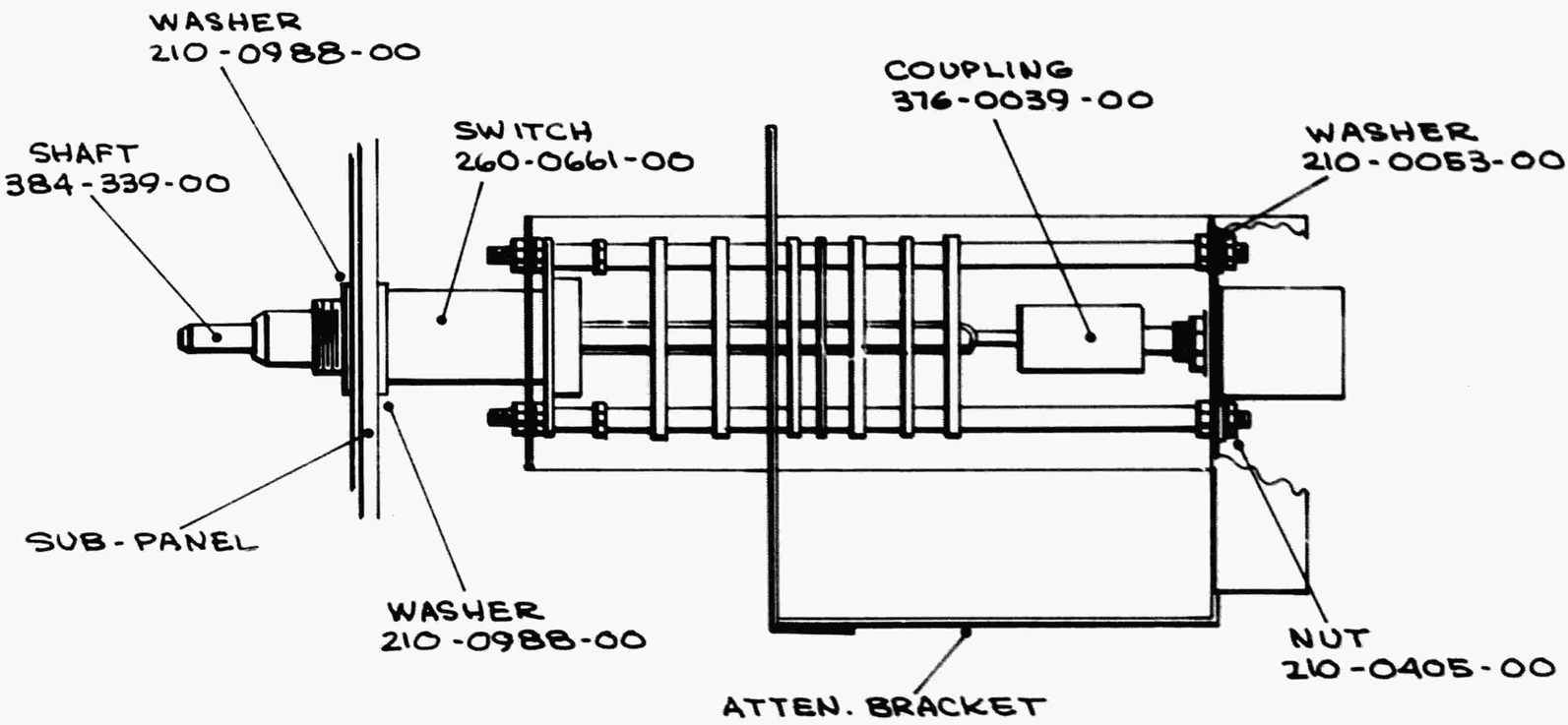
210-0053-00	Lockwasher, #2 split	(2)
210-0405-00	Nut, hex 2-56 x 3/16	
260-0661-00	Switch, rotary, Atten 6sec 12pos.	
376-0039-00	Coupling, shaft	
384-0339-00	Shaft, atten. 4.700" long	
210-0988-00	Washer, spherical 0.562 OD x 406 ID	(4)

Parts Added:

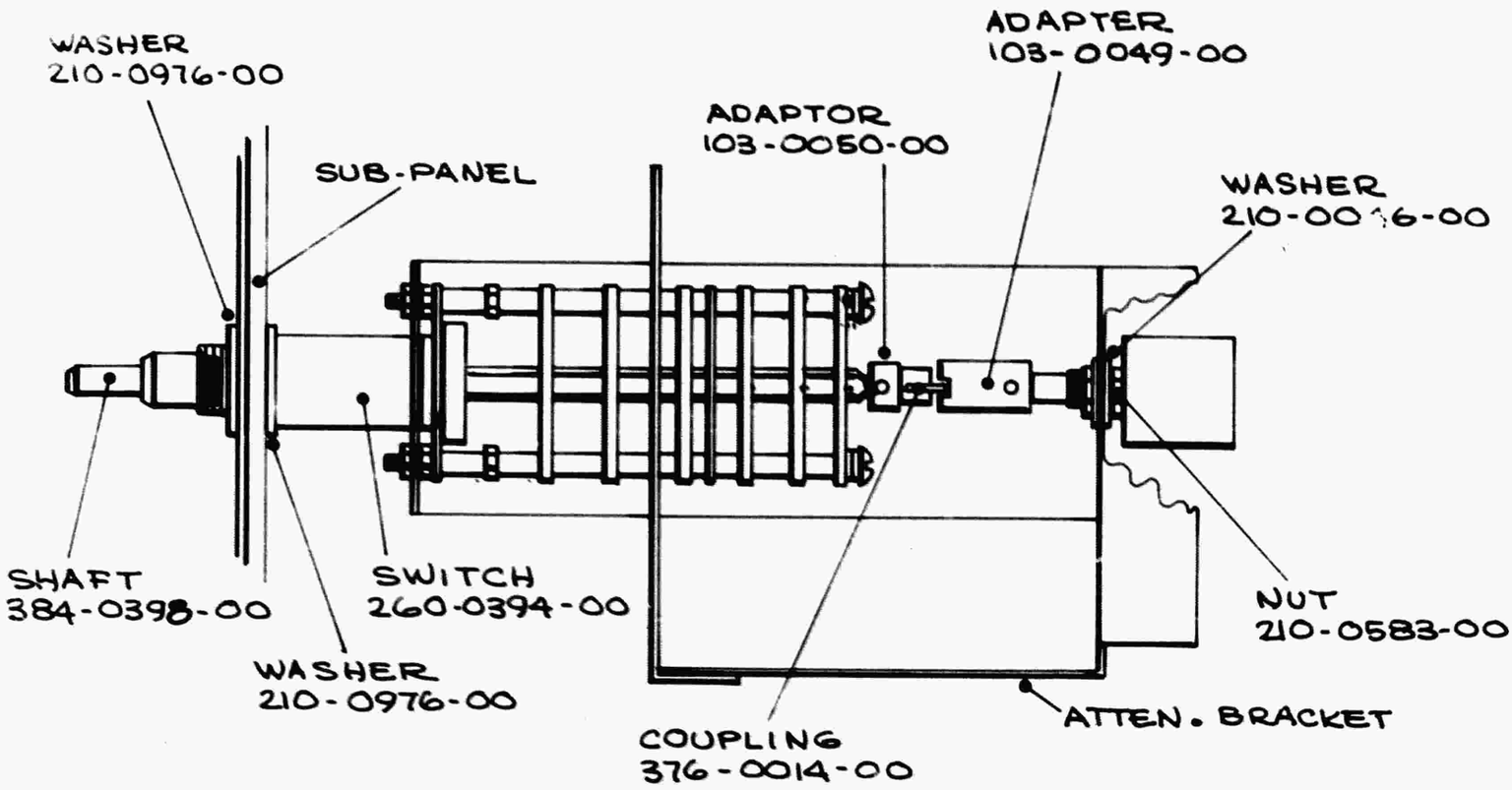
210-0046-00	Lockwasher, shakeproof int	
210-0583-00	Nut, hex 1/4-32 x 5/16	
260-0661-01	Switch, rotary, Atten 6sec 12pos.	
376-0014-00	Coupling, potentiometer, S steel wire	
384-0398-00	Shaft, attenuator 4.460" long	
103-0049-00	Adapter, shaft coupling	
103-0050-00	Adapter, shaft coupling	
210-0976-00	Washer, flat 0.562 OD x 0.390 ID	(4)

Refer to drawings on following pages.

Continued.



422 ATTENUATOR ASSEMBLY
(BEFORE MOD)



422 ATTENUATOR ASSEMBLY
(AS MODIFIED)

M9883 422

ATTENUATOR ACCURACY IMPROVED

Effective Prod SN 5700

To improve calibrator and input attenuator accuracy all critical or wider tolerance resistors in the calibrator and attenuator circuits were replaced with 1/2% metal film resistors of the same value.

Parts Removed:

The following are subparts of ATTENUATOR switches 262-0709-00 and 262-0710-00:

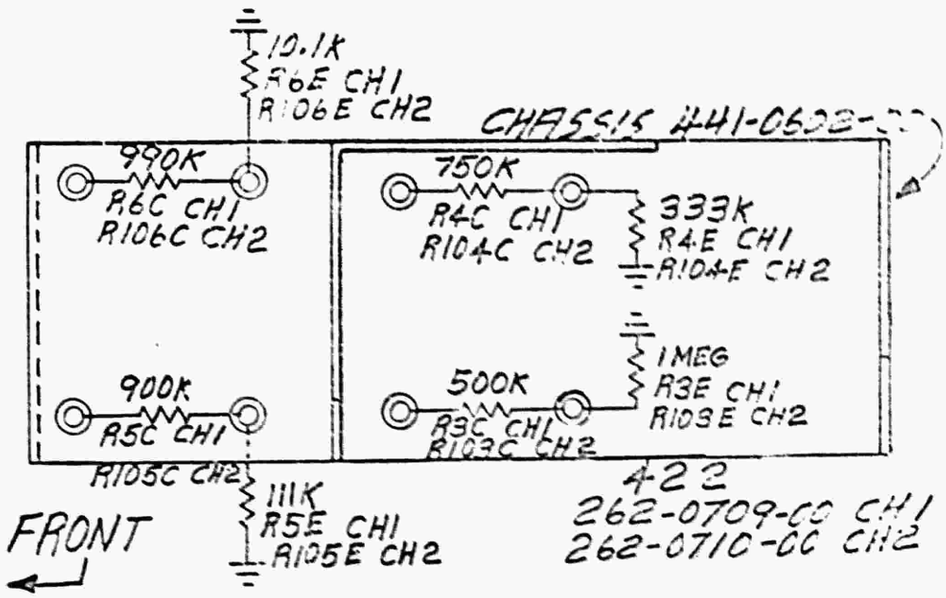
R3C,R103C	322-0610-00	Resistor, 500k 1/4W 1% MF
R4C,R104C	322-0469-00	Resistor, 750k 1/4W 1% MF
R5C,R105C	322-0621-00	Resistor, 900k 1/4W 1% MF
R6C,R106C	322-0624-00	Resistor, 990k 1/4W 1% MF
R3E,R103E R10,R110	322-0481-00	Resistor, 1M 1/4W 1% MF
R4E,R104E	321-0628-00	Resistor, 333k 1/8W 1% MF
R5E,R105E	321-0617-00	Resistor, 111k 1/8W 1% MF
R6E,R106E	321-0614-00	Resistor, 10.1k 1/8W 1% MF

Parts Added:

The following are subparts of ATTENUATOR switches 262-0709-00 and 262-0710-00:

R3C,R103C	322-0610-01	Resistor, 500k 1/4W 1/2% MF
R4C,R104C	322-0469-01	Resistor 750k 1/4W 1/2% MF
R5C,R105C	322-0621-01	Resistor, 900k 1/4W 1/2% MF
R6C,R106C	322-0624-01	Resistor, 990k 1/4W 1/2% MF
R3E,R103E R10,R110	322-0481-01	Resistor, 1M 1/4W 1/2% MF
R4E,R104E	321-0628-01	Resistor, 333k 1/8W 1/2% MF
R5E,R105E	321-1389-01	Resistor, 111k 1/8W 1/2% MF
R6E,R106E	321-1289-01	Resistor, 10.1k 1/8W 1/2% MF

Continued.



VOLTS/DIV SWITCHES REPLACED TO ELIMINATE NOISE AND BINDING

Effective Prod SN 13372

Modified out of sequence: 12185-9, 12369

VOLTS/DIV switches are noisy and subject to binding.

Channel 1 and Channel 2 VOLTS/DIV switches SW10 and SW110 were replaced with smoother operating Diallyl Phthalate switches.

Parts Removed:

SW10	262-0709-00	Channel 1 VOLTS/DIV wired switch kit
SW110	262-0710-00	Channel 2 VOLTS/DIV wired switch kit

Parts Added:

SW10	262-0845-01	Channel 1 VOLTS/DIV wired switch kit
SW110	262-0845-02	Channel 2 VOLTS/DIV wired switch kit

HIGH VOLTAGE RADIATION REDUCED

Effective Prod SN 678

Small amount of high voltage pickup may be seen on CRT at high Vertical sensitivity setting.

High voltage oscillations radiate through the opening where the Vertical Switching and Output Amplifier circuit board mounting tab is formed. This caused a small amount of ripple to appear on the trace at high Vertical sensitivity settings.

The circuit board was mounted with a bracket and thereby eliminated the rise of the tab. The tab was eliminated by changing the chassis design and designing a new bracket to take the place of the tab.

Parts Removed:

441-0601-00	Chassis, main frame	
210-0406-00	Nut, hex, 4-40 x 3/16	(2)

Parts Added:

441-0601-01	Chassis, main frame
407-0205-00	Bracket, angle
211-0008-00	Screw, 4-40 x 1/4 PHS
210-0589-00	Nut, locking, 4-40 x 1/4

DELAY LINE ASSEMBLY MOUNTING IMPROVED

Effective Prod SN 678

The delay line assembly is not adequately held with two captive studs.

The length of the present mounting studs were increased and two additional mounting studs were added to strengthen the mounting of the delay line assembly.

Parts Removed:

Delay Line Assembly:

200-0606-00	Cover, Delay line	
213-0088-00	Screw, 4-40 PHS, thread-forming	(2)
352-0083-00	Holder, Delay line	

Parts Added:

Delay Line Assembly:

200-0606-01	Cover, Delay line	
210-0601-01	Eyelet	(2)
352-0083-01	Holder, Delay line	

VERTICAL ABERRATIONS REDUCED BY CHANGING
THE DELAY LINE AND OTHER COMPONENTS

Effective Prod SN 2710

Excessive Vertical aberrations were resulting from the long preshoot cycle time** of the delay line. Also, Plastics Department was having difficulty meeting the electrical length specification of 160 +10 -5ns because the vendor changed the wire coating specification.

The electrical length specification of the delay line was changed to 150 ±5ns which reduced the preshoot cycle time.** The delay line matching network was changed as shown in the before and after schematics, in order to be compatible with both new and old delay lines.

Parts Removed:

C227 C228	281-0504-00	Capacitor, ceramic, 10pF 500V NPOA	(2)
C235	281-0544-00	Capacitor, ceramic, 5.6pF 500V NPOA	
C238	281-0534-00	Capacitor, ceramic, 3.3pF NPO	
L240	119-0037-00	Delay Line assembly	
R237	311-0496-00	Potentiometer, comp., 2.5k ±20% linear w/etched circuit mtg.	

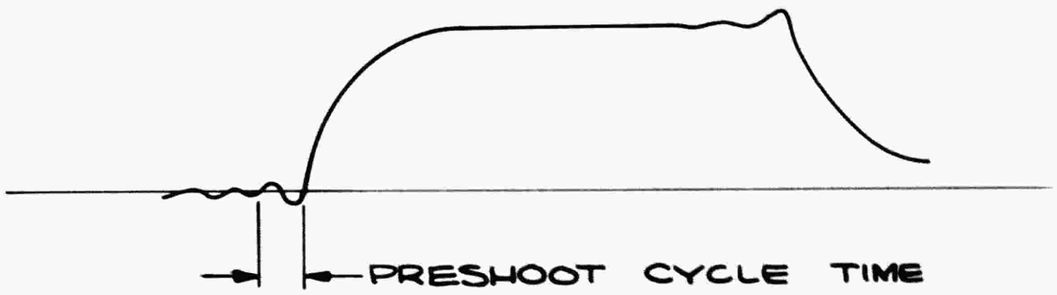
Parts Added:

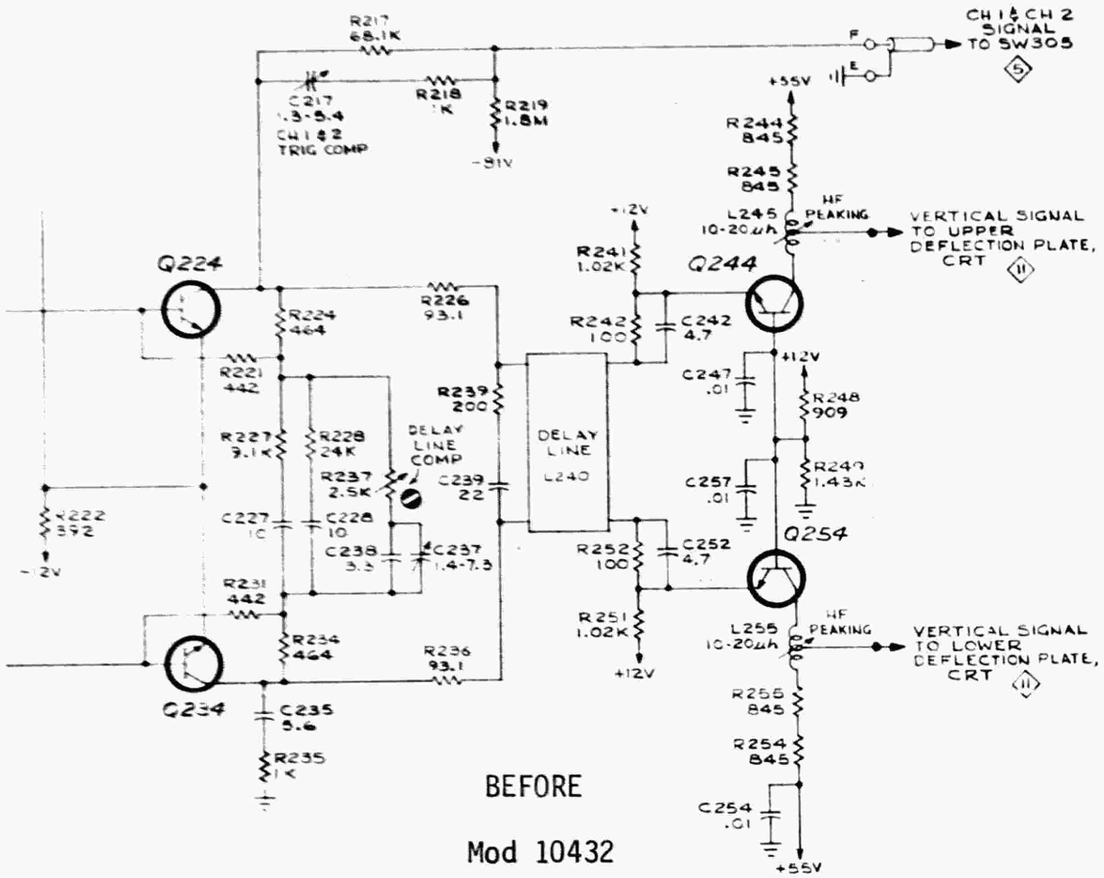
C227 C235	281-0503-00	Capacitor, ceramic, 8pF 500V NPOA	(2)
C228	281-0505-00	Capacitor, ceramic, 12pF 500V NPOA	
L240	119-0037-01	Delay Line assembly	
R237	311-0463-00	Potentiometer, comp., 5k ±20% linear w/etched circuit mtg.	

**PRESHOOT CYCLE TIME

Because the delay line does not delay 'very high' frequencies, as much as lower frequencies, prering or preshoot appears before the main pulse reflection. The time between the zero crossing of the last cycle of the preshoot is an indication of the quality of the line. The shorter this time, the better the line.

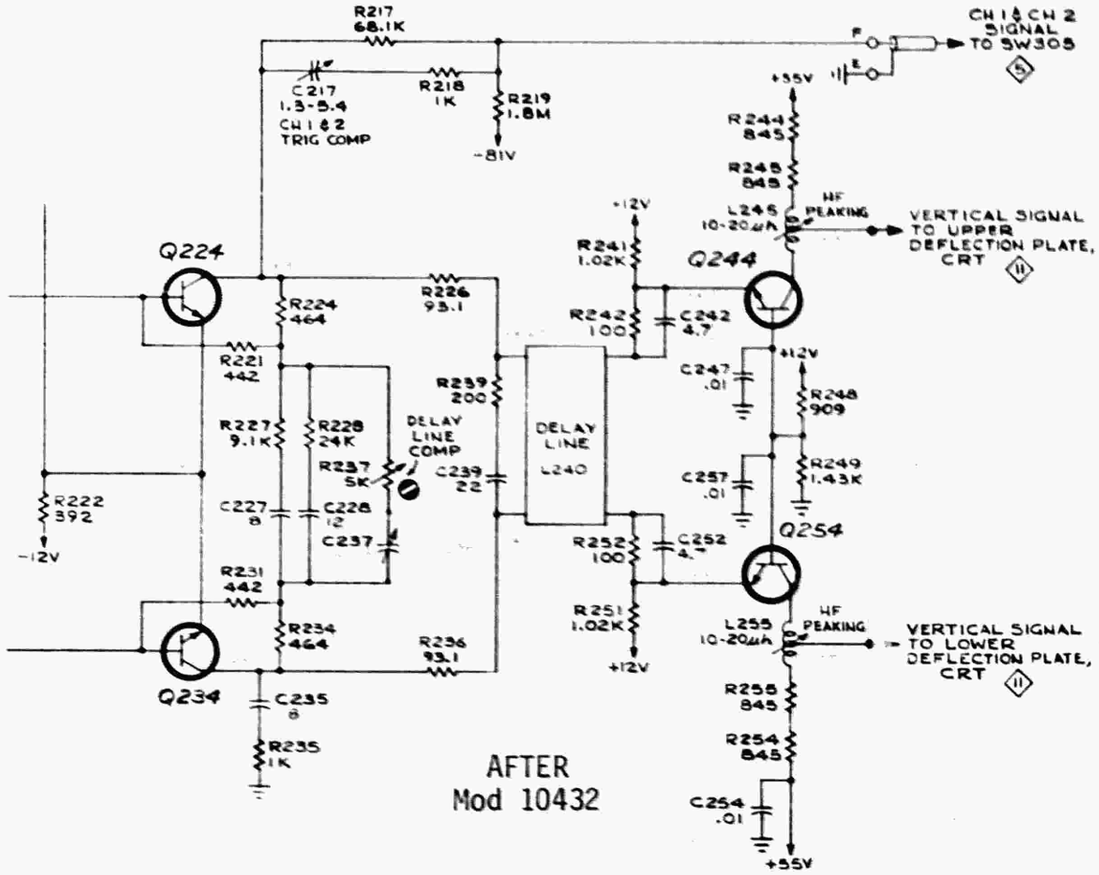
Continued.





BEFORE

Mod 10432



RESISTORS INSTALLED BY MOD 14061 RELOCATED TO IMPROVE MECHANICAL CONNECTION

Effective Prod SN 13011 Usable in SN (See list on following page)

Modified out of sequence:

4983	11890	12324	12543	12717	12820-21	12899-900
9464	11902	12330	12547	12721	12825-26	12902-04
10392	11906	12340	12568	12727	12828	12908-09
10480	11917	12347	12594	12731	12831	12911
10545	11943	12349	12603	12746-47	12834	12913-14
10811	11949	12360-62	12606-10	12755	12837	12917-18
10865	11979	12369	12619	12759	12840-45	12921
10935	11982	12395-96	12626-27	12765	12847-53	12923
11094	11991-92	12414	12630-31	12768	12855	12925-29
11115	11995	12419	12651	12775	12858-64	12932-34
11120	11997	12462	12661	12777	12866-67	12938-39
11194	12048	12465	12666	12779-80	12870	12941-44
11304	12100	12481-82	12674	12786	12873-75	12946
11560	12155	12487	12685-87	12798	12877	12949-51
11725	12185-89	12491	12691-92	12800-01	12879-82	12954-55
11812	12191	12512	12701	12805	12884	12957-60
11819	12198	12532	12706	12808-09	12888	12963-69
11868	12282	12534-35	12711	12811	12890-92	12972-76
11881	12314-15	12538-41	12713	12816	12895-97	12978-84
						12987-13002
						13004-09

Continued.

Usable in SN:

10551	12046	12211	12347-68	12707-10	12822-24	12905-07
10609	12068	12215	12370-94	12712	12827	12910
10659	12078	12219-29	12396-413	12714-16	12829-30	12912
10666	12084	12234	12415-61	12718-20	12832-33	12915-16
10720	12097-98	12240	12463-64	12722-26	12835-36	12919-20
11207	12104-05	12246-48	12466-40	12728-30	12838-39	12922
11230-39	12110	12250-51	12542-46	12732-45	12846	12924
11323	12123	12253	12548-67	12748-54	12854	12930-31
11394	12126	12257	12569-93	12756-58	12856-57	12935-37
11403	12140	12261	12595-602	12760-64	12865	12940
11608	12146-47	12268-70	12604-18	12766-67	12868-69	12945
11662	12153	12274	12620-50	12769-74	12871-72	12947-48
11791	12162	12282	12652-60	12776	12876	12952-53
11891	12169	12284	12662-65	12778	12878	12956
11901	12174	12286-94	12667-73	12781-85	12883	12961-62
11913	12179-80	12296-97	12675-84	12787-99	12885-87	12970-71
11945-46	12182	12299-310	12686	12802-08	12889	12977
11965	12190	12316-17	12688-90	12810	12893-94	12985-86
11984	12200	12319-20	12692-700	12812-15	12898	13003
11990	12209	12322-45	12702-05	12817-19	12901	13010

M14061, in its production form, added R206 and R207 between pins C and D and the respective transmission leads. This connection may cause the resistors to pull loose from the pins.

R206 and R207 were relocated to the center terminals of the INVERT switch and redesignated as R187 and R197. Female pin connectors were added to the free end of the transmission line and connected pins C and D on the Switching and Output Amplifier circuit board.

Parts Removed:

R206 R207	315-0470-00	Resistor, 47Ω 1/4W 5%

Parts Added:

R187 R197	315-0470-00	Resistor, 47Ω 1/4W 5%
2 ea	131-0371-00	Connectors, single contact

Continued.

INSTALLATION:

Parts Required: See 'Parts Added'.

a) Separate the power supply from the rear of the instrument.

b) Remove the three screws which hold the cabinet to the rear of the indicator and slide off the cabinet.

c) Turn the indicator upside down. Locate the INVERT switch, SW195.

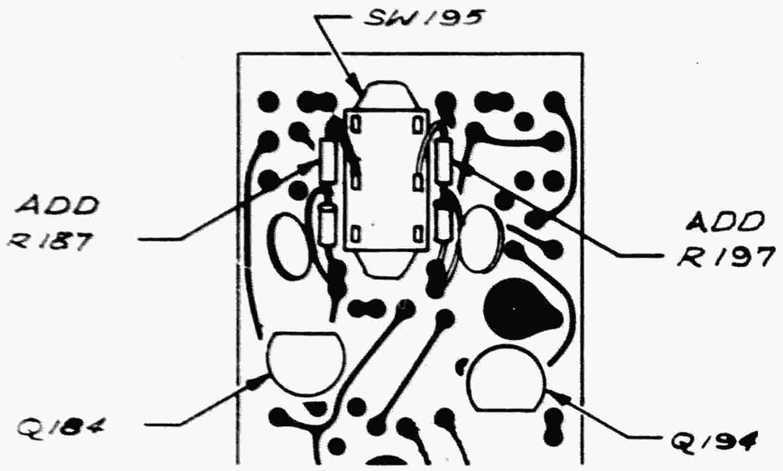
d) Unsolder, at the switch, both resistor/capacitor combinations that go to the center contacts of the INVERT switch.

e) Install a 47Ω 1/4W resistor between the free ends of the resistor/capacitor combinations removed in step d and the center terminal of the INVERT switch.

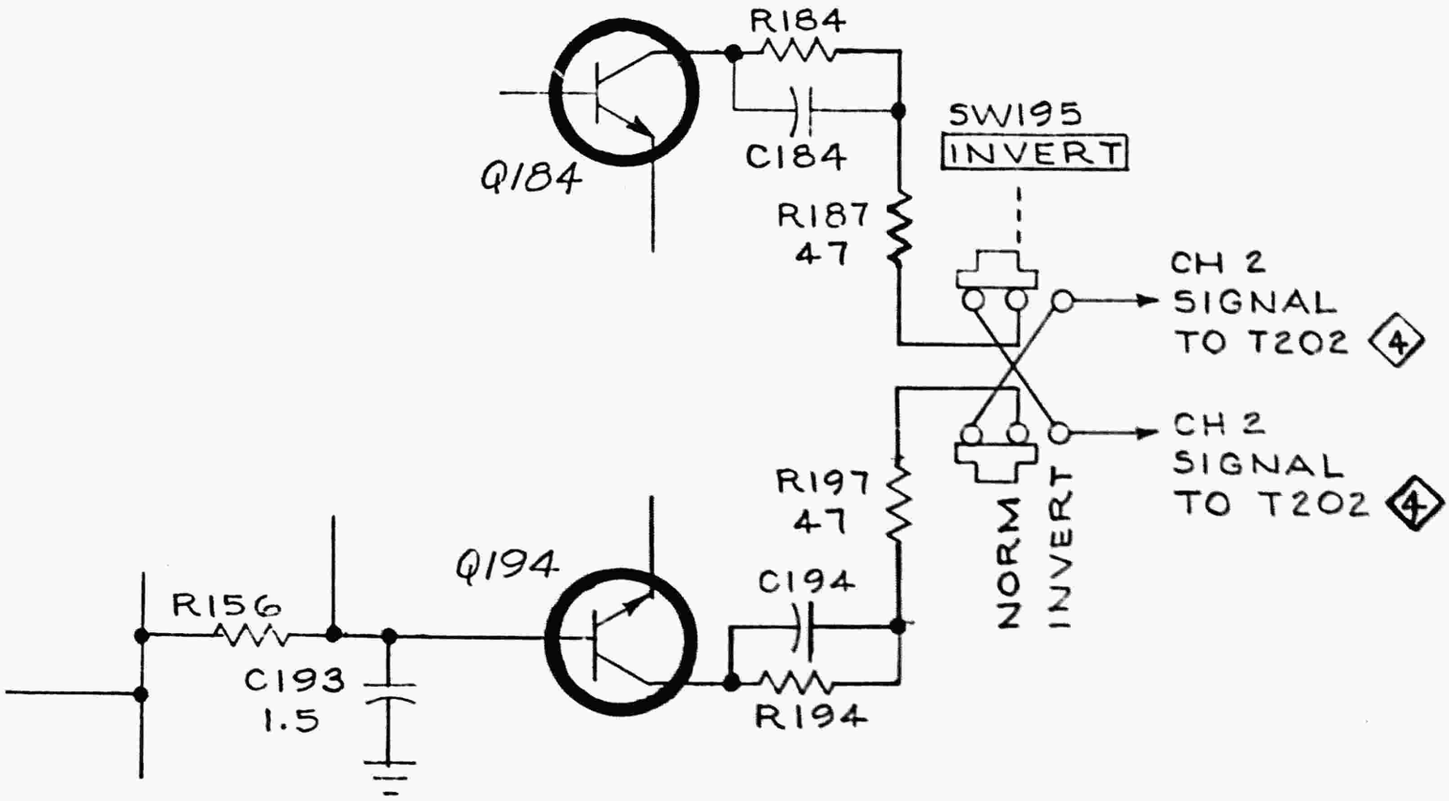
f) Trace the twisted pair of wires soldered to the rear terminal of the INVERT switch over to where they connect to the Vertical Switching and Output Amplifier circuit board. Disconnect the leads with attached resistors from the board, unsolder and discard the resistors and connectors. Using a crimping tool, crimp the new connectors on the wires and reconnect them to the circuit board. If you do not have a crimping tool, solder the wires to the connectors.

g) Perform calibration steps 22 and 23 (in your instruction manual) as necessary.

h) Reassemble the cabinet and power supply.



Continued.



TRIGGER INPUT AMPLIFIER GAIN INCREASED

Effective Prod SN 269 Usable in SN 100-268

Modified out of sequence:

102	128	154	188	209	218-21	231-3	249	260-3
107	143	156	197	212-3	226	240	252-4	265
113	146-7	158	204	215	228-9	244	256	267

To eliminate the necessity to select components to meet the Channel 1 triggering requirement, the trigger input emitter follower (Q323) emitter resistor, R323, was changed from a 16k 1/4W 5% to a 5.6k 1/4W 5% resistor to increase the base current drive to Q324.

Parts Removed:

R323	315-0163-00	Resistor, comp., 16k 1/4W 5%

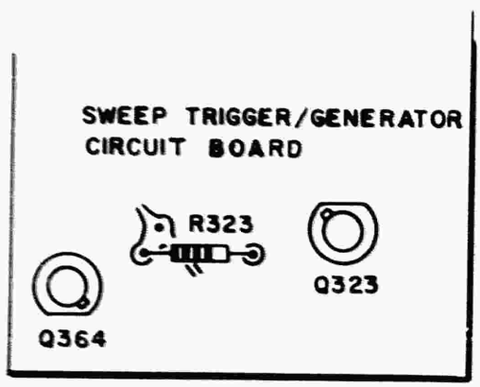
Parts Added:

R323	315-0562-00	Resistor, comp., 5.6k 1/4W 5%

INSTALLATION:

Parts Required: See 'Parts Added'.

Replace R323 with a 5.6k 1/4W 5% composition resistor. R323 is a 16k 1/4W 5% resistor located between Q323 and Q364 on the Sweep Trigger/Generator circuit board.



MAGNIFIED LINEARITY IMPROVED

Effective Prod SN 1060

The 'soak' effect of the plastic insulated wire causes some non-linearity to appear when in the 10µs X10 MAG positions.

Magnifier linearity was improved by changing from plastic to TEFLON® insulation on the wires from connectors 'W' and 'X' on the Sweep Generator board to the TIME/DIV switch.

Parts Removed:

175-0529-00	Wire, #26 plastic stranded, white-brown	
175-0529-00	Wire, #26 plastic stranded, white-green	
175-0529-00	Wire, #26 plastic stranded, white-green w/connector	

Parts Added:

175-0639-00	Wire, #24 TEFLON stranded, brown	10"
175-0640-00	Wire, #24 TEFLON stranded, blue	8"
175-0640-00	Wire, #24 TEFLON stranded, blue w/connector (131-0371-00)	3-1/2"

TEFLON Reg. TM of The Du Pont Co.

SLOW SWEEP TIMING ERROR ELIMINATED

Effective Prod SN 3080 Usable in SN 100-3079

Slow sweep timing error under environmental conditions (high temperatures).

Diode type 152-0173-00 used for D439 caused a slow speed timing error under high ambient temperatures and was also discontinued by the vendor.

D439 was changed from 152-0173-00 to a new diode assembly, 152-0249-00. The new assembly consists of two diodes, 152-0245-00 and 152-0246-00 in series, encapsulated in silicon rubber. To electrically accommodate the new diode, it was necessary to change R424 from 9.35k 1/8W 1% to 10k 1/8W 1%. Parts Replacement Kit 050-0290-00 is available to facilitate the replacement of 152-0173-00 diodes in premodified instruments.

Parts Removed:

D439	152-0173-00	Diode, silicon, Tek Spec.
R424	321-0287-00	Resistor, prec., 9.53k 1/8W 1%

Parts Added:

D439	152-0249-00	Diode, silicon, assembly
R424	321-0289-00	Resistor, prec., 10k 1/8W 1%

INSTALLATION:

Parts Required:

	050-0290-00	Parts Replacement Kit.

Refer to kit instructions.

product modification

050-0290-00

Types 422,453, 503/RM503

SILICON DIODE REPLACEMENT

For the following TEKTRONIX® Type Oscilloscopes:

Type 422	Serial Numbers	100-3079
Type 453 (-210H)	Serial Numbers	100-2589*
Type 503	Serial Numbers	4230-7441*
Type RM503	Serial Numbers	2960-5159*

Silicon diode assembly, PN 152-0249-00, replaces PN 152-0173-00, which is no longer available from the manufacturer. The new assembly consists of two diodes in series, encapsulated in silicone rubber.

Each of the above instruments requires a resistor change to accommodate the new diode.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions as PN 152-0249-00 is a direct replacement.

*Some of the instruments within the serial number range given may have been modified at the factory.

2-11-71
Supersedes: MI-050-0290-00

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	152-0249-00	Diode, silicon, assembly
1 ea	214-0210-00	Spool, w/3ft. silver-bearing solder
1 ea	302-0102-00	Resistor, comp, 1k 1/2W 10%
1 ea	315-0162-00	Resistor, comp, 1.6k 1/4W 5%
1 ea	315-0431-00	Resistor, comp, 430Ω 1/4W 5%
1 ea	321-0289-00	Resistor, prec,10.0k 1/8W 1%

IMPORTANT: When soldering to the ceramic strips, use the silver-bearing solder supplied with this kit.

INSTRUCTIONS

A. TO REPLACE D439 ON TYPE 422:

Replace the following components on the Trigger and Sweep Generator board (right side of instrument) with parts from the kit (see Fig. 1):

( ) R424, 9.53k 1/8W 1%, with 10.0k 1/8W 1% resistor.

( ) D439, single diode, with diode assembly.

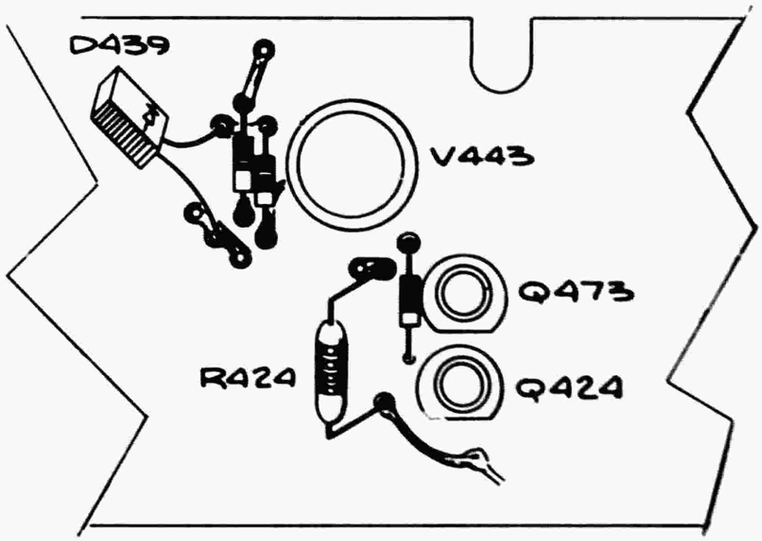


FIG. 1

THIS COMPLETES THE INSTALLATION.

( ) Enter the new part in the Electrical Parts List of your Instruction Manual.

INSTRUCTIONS (cont)

B. TO REPLACE D533 ON TYPE 453 OR 453-210H:

Replace the following components on the 'A' Sweep board (bottom, toward right side of instrument), with parts from the kit (see Fig. 2):

( ) R509, 1k 1/4W 5%, with 430Ω 1/4W 5% resistor.

( ) R546, 1.5k 1/4W 5%, with 1.6k 1/4W 5% resistor.

( ) D533, single diode, with diode assembly.

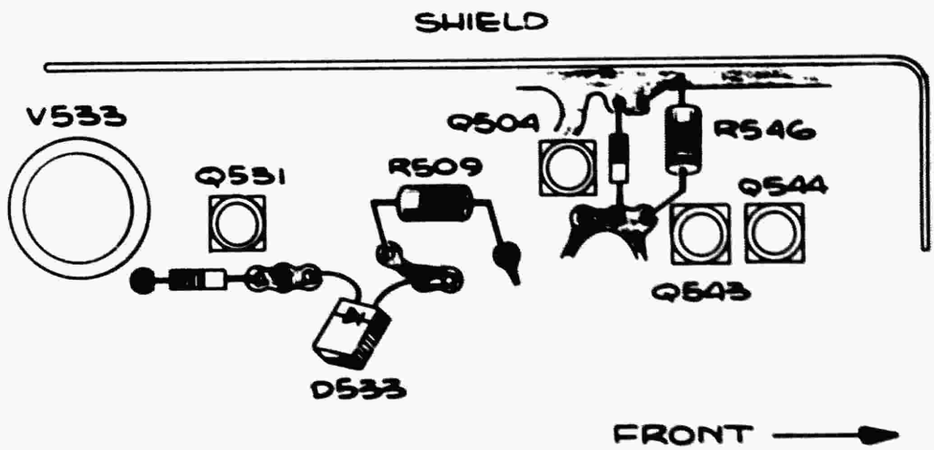


FIG. 2

THIS COMPLETES THE INSTALLATION.

( ) Enter the new parts in the Electrical Parts List of your Instruction Manual.

C. TO REPLACE D742 ON TYPE 453 OR 453-210H:

Replace the following components on the 'B' Sweep board (top of instrument), with parts from the kit (see Fig. 3 on page 5):

( ) R704, 1k 1/4W 5%, with 430Ω 1/4W 5% resistor.

( ) R755, 1.5k 1/4W 5%, with 1.6k 1/4W 5% resistor.

( ) D742, single diode, with diode assembly.

THIS COMPLETES THE INSTALLATION.

( ) Enter the new parts in the Electrical Parts List of your Instruction Manual.

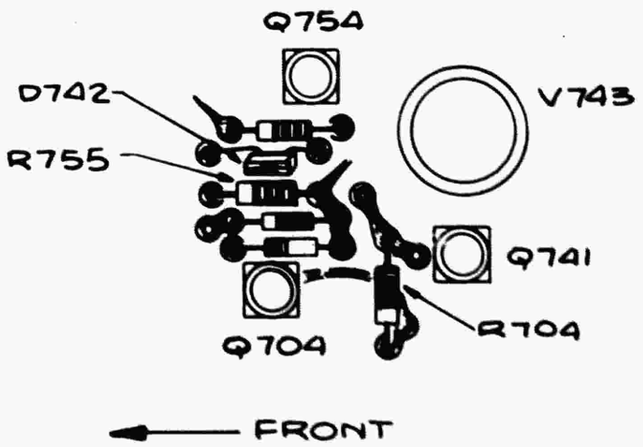


FIG. 3

D. TO REPLACE D152 ON TYPE 503:

Replace the following components with parts from the kit (see Fig. 4):

( ) R147, 1.5k 1/2W 10%, with 1k 1/2W 10% resistor.

( ) D152, single diode, with diode assembly.

THIS COMPLETES THE INSTALLATION.

( ) Enter the new parts in the Electrical Parts List of your Instruction Manual.

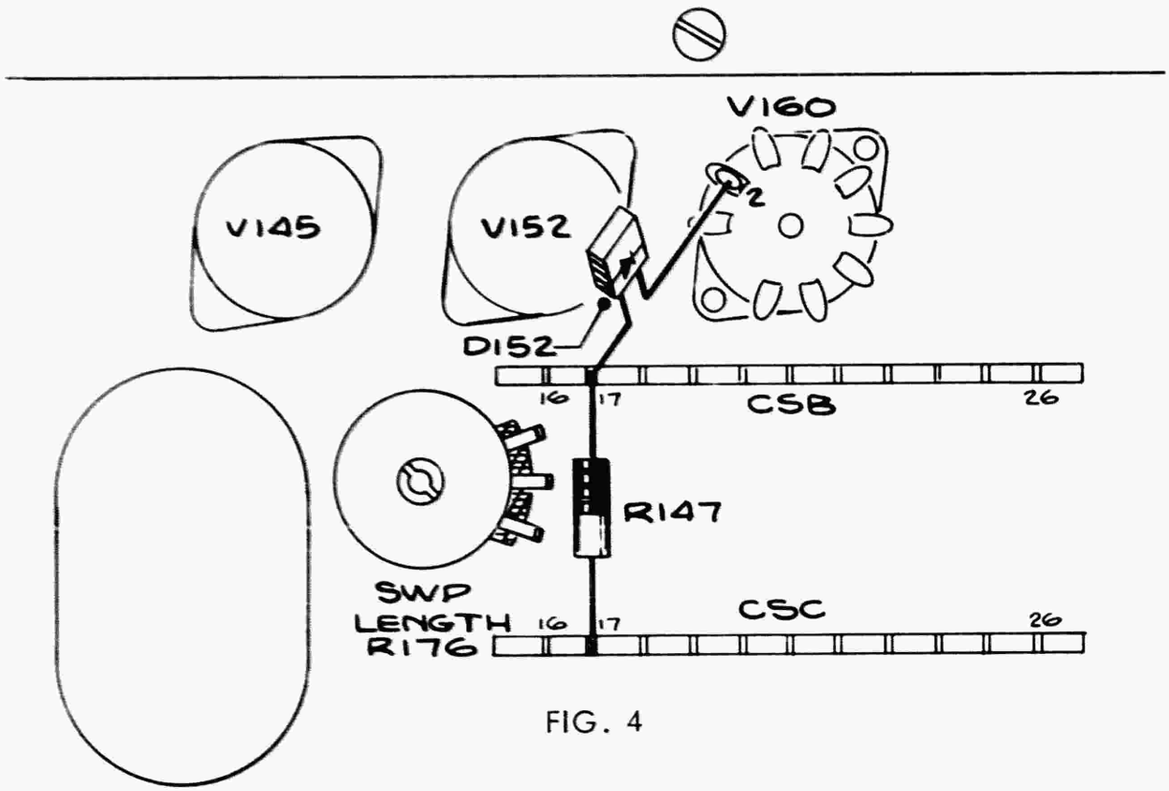


FIG. 4

INSTRUCTIONS (cont)

E. TO REPLACE D152 ON TYPE RM503:

Replace the following components with parts from the kit (see Fig. 5):

NOTE: For access, temporarily lift one end of components on ceramic strips above.

( ) R147, 1.5k 1/2W 10%, with 1k 1/2W 10% resistor.

( ) D152, single diode, with diode assembly.

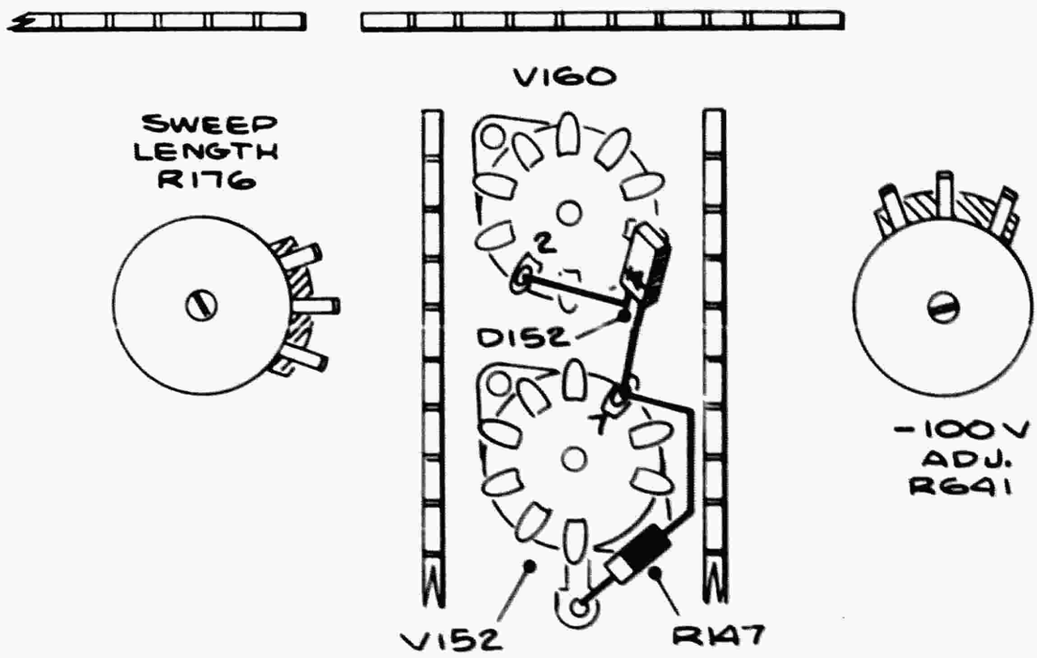


FIG. 5

THIS COMPLETES THE INSTALLATION.

( ) Enter the new parts in the Electrical Parts List of your Instruction Manual.

DF:ls

HORIZONTAL JITTER WHEN USING AC-DC SUPPLY REDUCED

Effective Prod SN 158 Usable in SN 100-157

Modified out of sequence: 102-3 128 141 154
107 133 146-7 156

Noise on the -12 volts from the AC-DC power supply causes horizontal jitter.

The decoupling to the Horizontal POSITION control was improved by increasing R531 to 620Ω and C531 to 22μF.

Parts Removed:

C531	290-0246-00	Capacitor, EMT, 3.3μF 15V
R531	315-0573-00	Resistor, comp., 330Ω 1/4W 5%

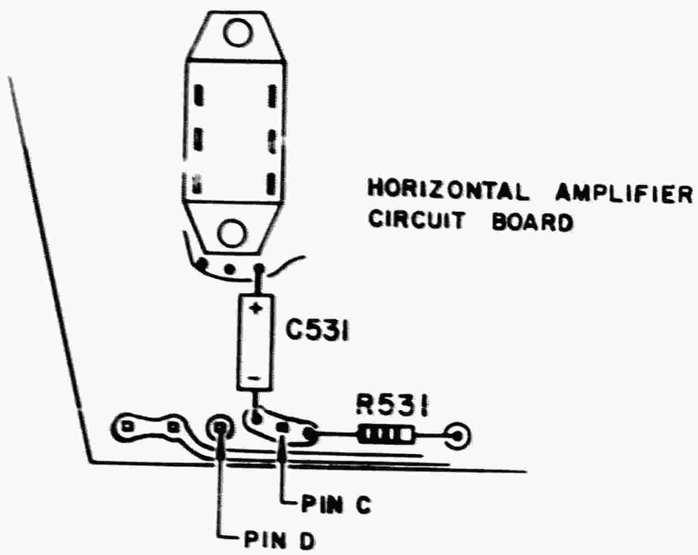
Parts Added:

C531	290-0134-00	Capacitor, EMT, 22μF 15V
R531	315-0621-00	Resistor, comp., 620Ω 1/4W 5%

INSTALLATION:

Replace R531 with a 620Ω 1/4W 5% composition resistor. Refer to the illustration for location.

Replace C531 with a 22μF 15V EMT capacitor. Refer to illustration for location.



HORIZONTAL POSITIONING RANGE IMPROVED

Effective Prod SN 600

An offset current is required in the Horizontal Amplifier Input to position the spot near the center of the CRT when switching from Normal Sweep to External Horizontal Mode.

The offset current was supplied by adding extra switch contacts to ground the base of Q513 through a 100Ω resistor in all positions of the TIME/DIV switch, except the Ext Horiz position. The EC board number was changed because of the resistor change. Parts Replacement Kit 050-0285-00 is available to facilitate the replacement of the HORIZONTAL AMPLIFIER BOARD only.

Parts Removed:

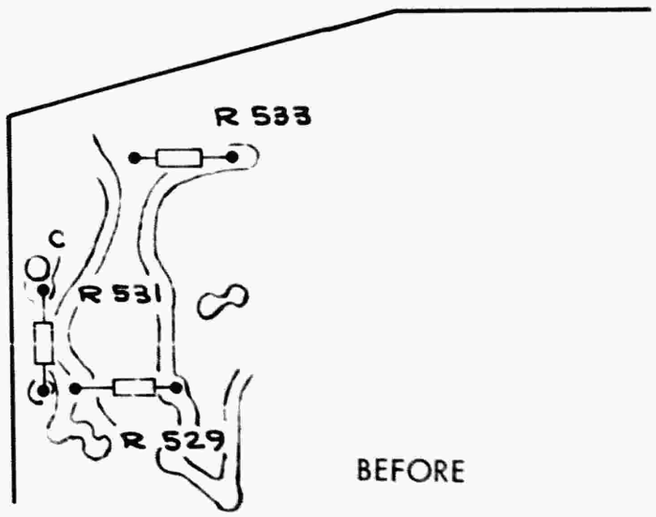
R529	315-0124-00	Resistor, comp., 120k 1/4W 5%	
R533	315-0273-00	Resistor, comp., 27k 1/4W 5%	
SW440	262-0711-00	Switch, TIME/DIV, wired	
	388-0615-00	EC board, Horizontal Amplifier	

Parts Added:

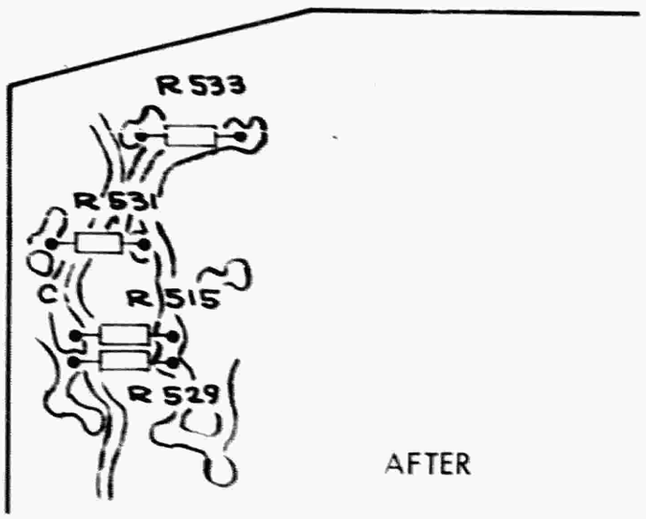
R515 **R516	315-0104-00	Resistor, comp., 100k 1/4W 5%	
R529	315-0334-00	Resistor, comp., 330k 1/4W 5%	
R533	315-0363-00	Resistor, comp., 36k 1/4W 5%	
SW440	262-0722-00	Switch, TIME/DIV, wired	
	388-0615-01	EC board, Horizontal Amplifier	
	175-0529-00	Wire, #26 str., white-yellow	5-3/4"
	175-0529-00	Wire, #26 str., white-brown-red	4-1/4"
	131-0371-00	Connector, single contact	

**Subpart of TIME/DIV switch

Continued.

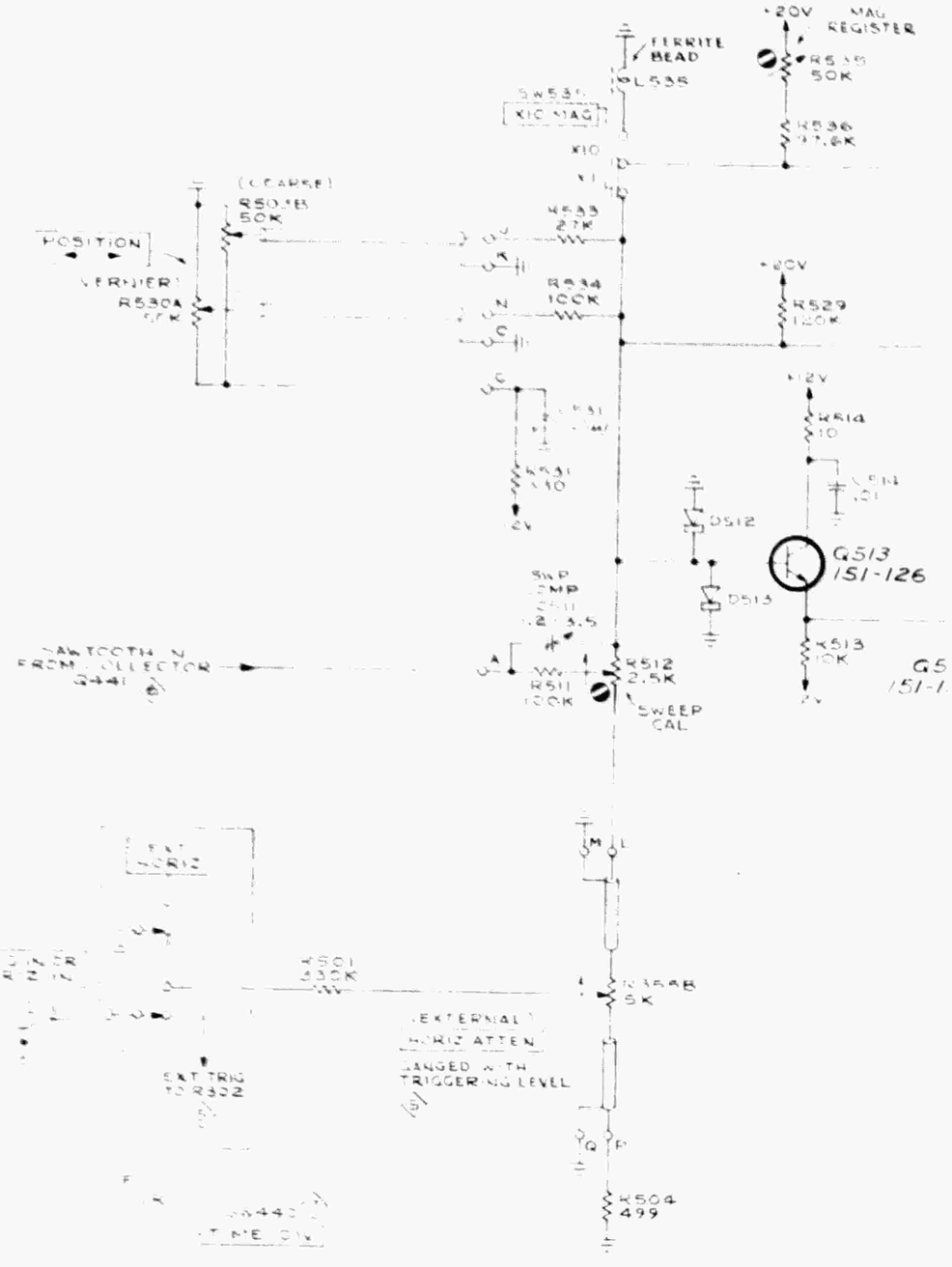


BEFORE



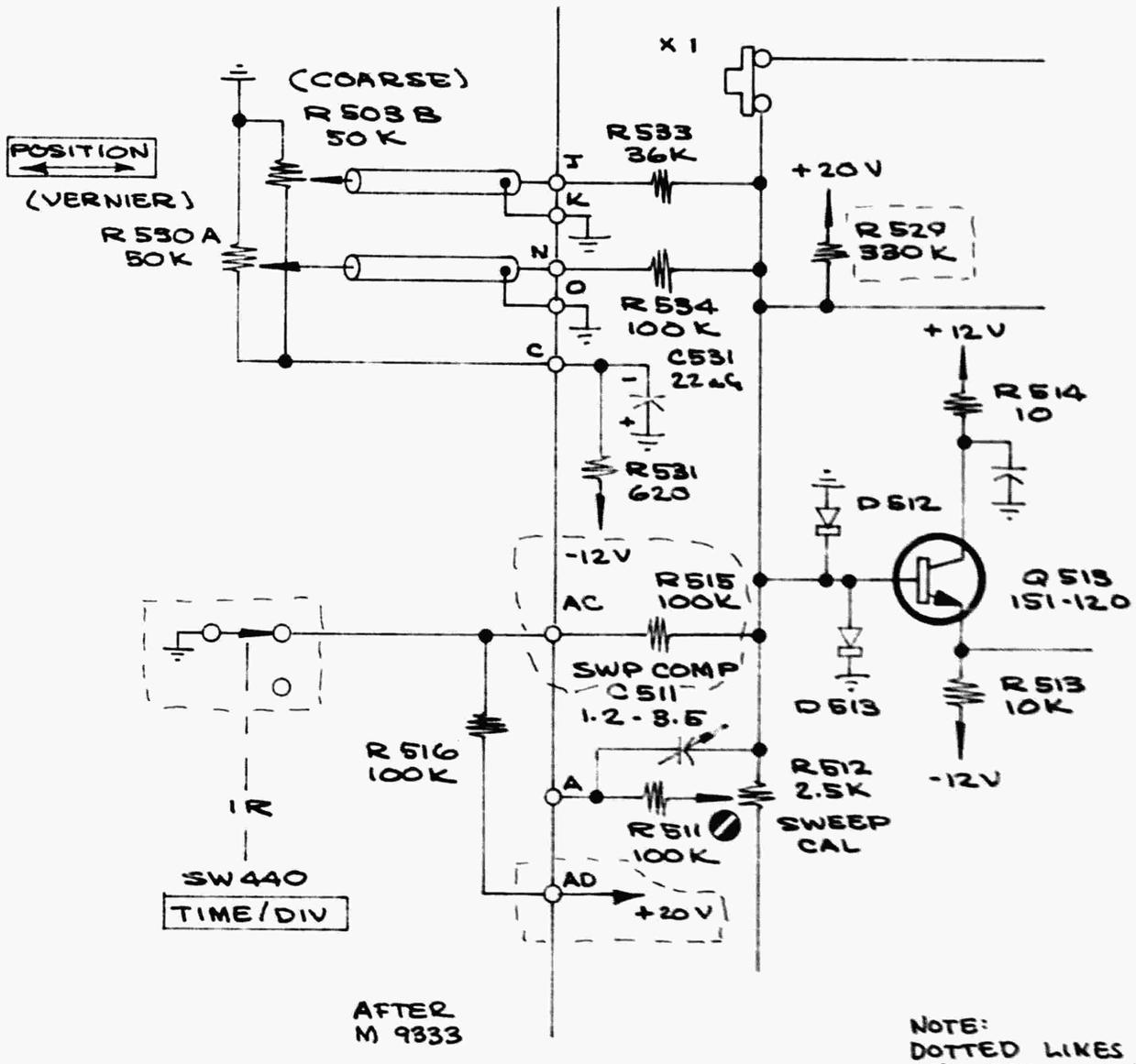
AFTER

Continued.



REFERENCE DIAGRAMS:
- SWEEP TRIGGER
- SWEEP GENERATOR
- TIMING SWITCH
- CRT CIRCUIT

BEFORE
M9333



REDUCES NEED TO SELECT Q524 FOR X10 MAG LINEARITY

Effective Prod SN 1055 Usable in SN 101-1054

Modified out of sequence:

146-7	411	554	566	634	676	838	908	946-8	1007	1037
156	416	556	581	646	762	850	910	950-1	1009	1042-4
369	515	558	617	648	819	858	918	994-5	1010	1048-50
398	546-8	563	622	659	821	892	942	1004	1017	1053

In order to reduce need to select Q524 for low storag time to minimize X10 MAG non-linearity, a diode has been added from base to collector of Q524 with the cathode to Q524 base. This prevents Q524 from saturating. The wiring of protection diode D512 is also changed by connecting the anode to Q513 emitter rather than ground.

Parts Added:

D524	152-0233-00	Diode, silicon, 6233

INSTALLATION:

Parts Required: See 'Parts Added'.

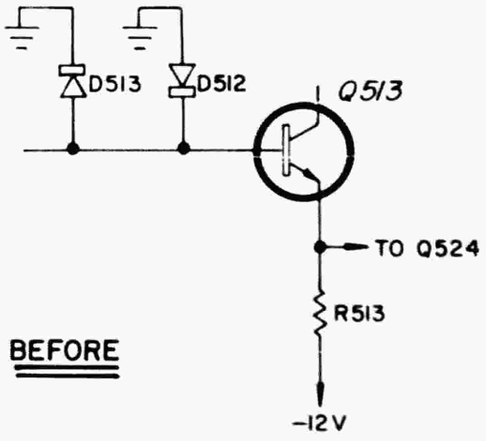
a) Remove D512, a 6185 diode, from its location as shown in Fig. 1.

b) Remove the three mounting screws from the Horizontal Amplifier circuit board and lift the board so the bottom side is readily accessible.

c) Install D512 (removed in step a) between the emitter and base of Q513 as shown in Fig. 2.

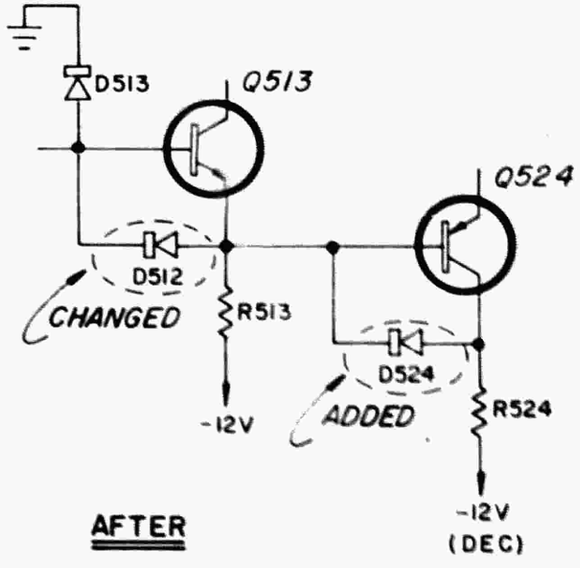
d) Install D524, a 6233 diode, between the base and collector of Q524 as shown in Fig. 2.

Continued.



BEFORE

PARTIAL HORIZ. AMP.



AFTER

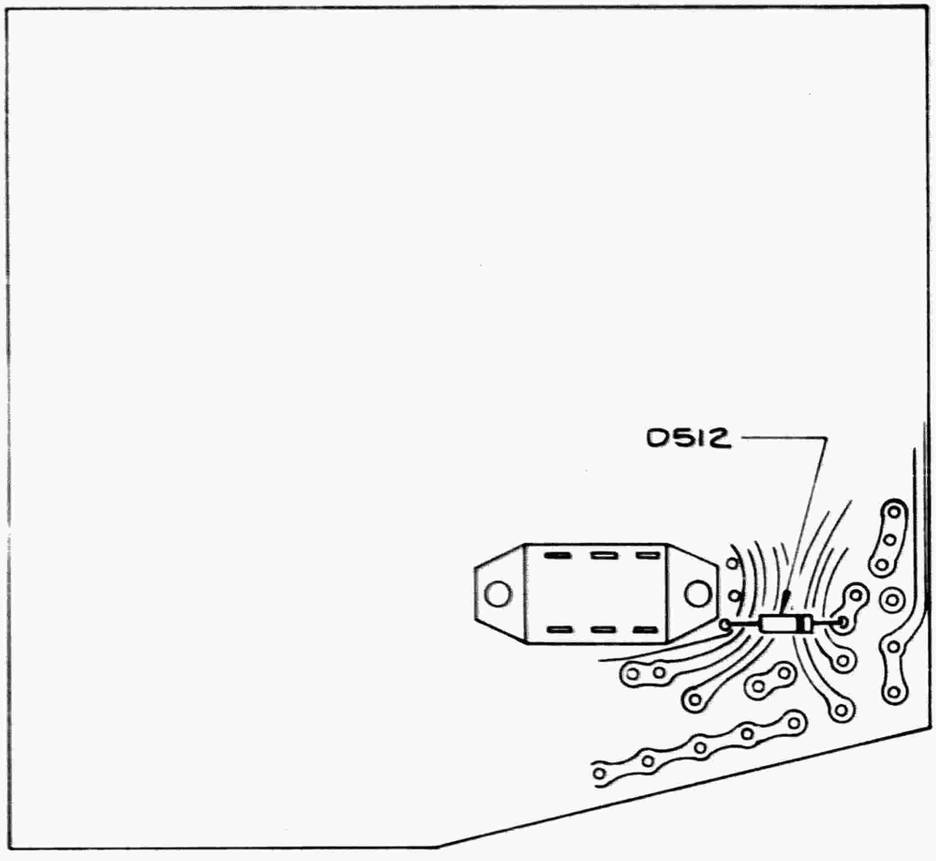


FIG. 1

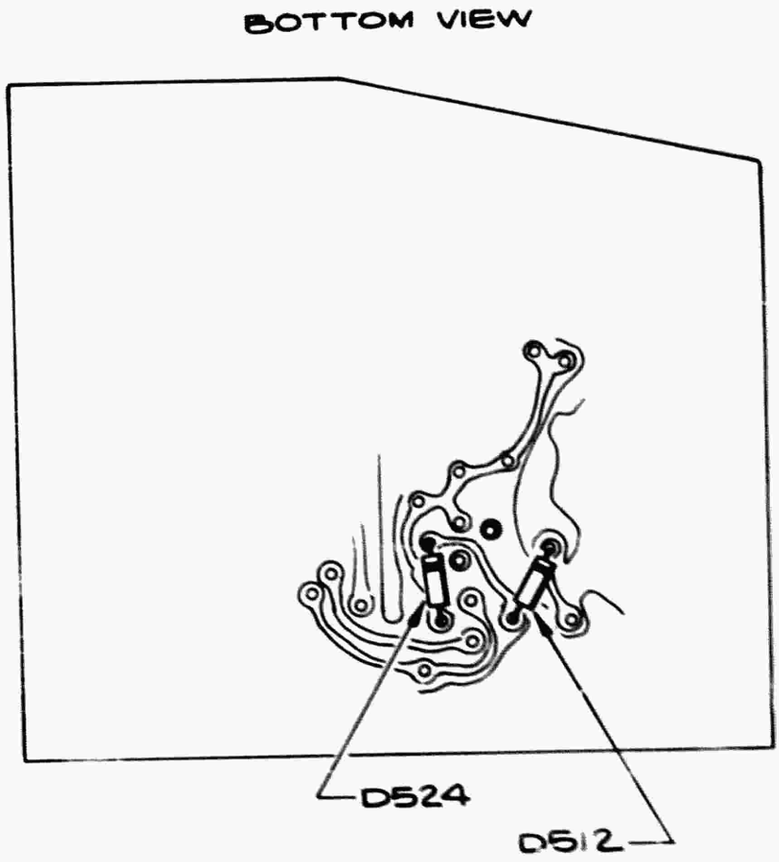


FIG. 2

CIRCUIT BOARD LAYOUT CHANGED TO ACCOMMODATE PREVIOUS MODIFICATIONS

Effective Prod SN 4135

It was necessary to change the Horizontal Amplifier circuit board layout to accommodate the parts location changes and additions made by Mod 9491 and Mod 10000.

D512, D513, D524 and C531 were relocated as shown on before and after drawings. To provide more space for relocated components, transistor sockets for Q513, Q524, and Q543 were changed to a smaller type and the layout of the Horizontal Amplifier board was changed.

Parts Removed:

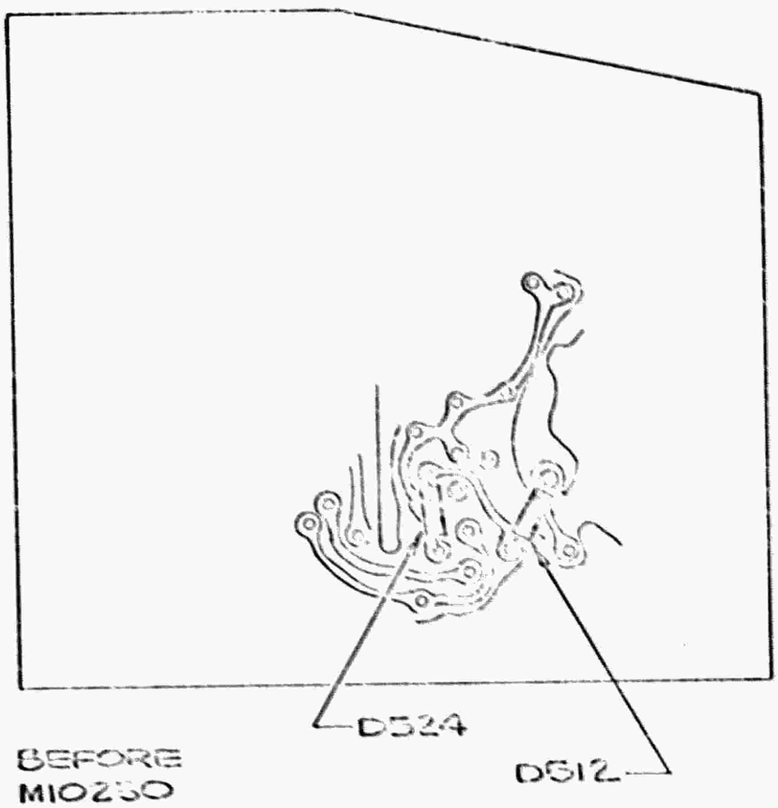
136-0183-00	Socket transistor, 3 pin w/etched circuit contacts	(3)
388-0615-01	Board, circuit, Horiz/Sweep PB	

Parts Added:

136-0220-00	Socket, transistor, 3 pin w/etched circuit contacts	(3)
388-0615-02	Board, circuit, Horiz/Sweep PE	

Continued.

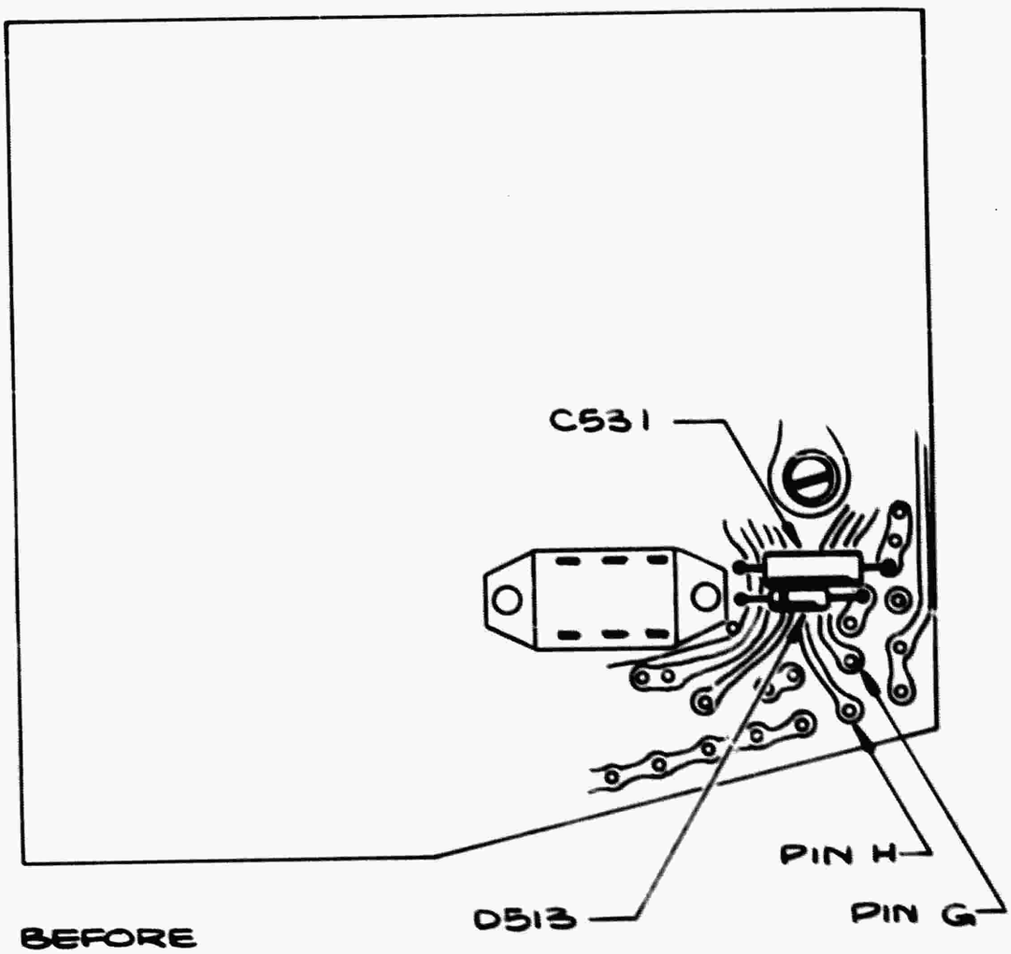
BOTTOM VIEW



BEFORE
M10250

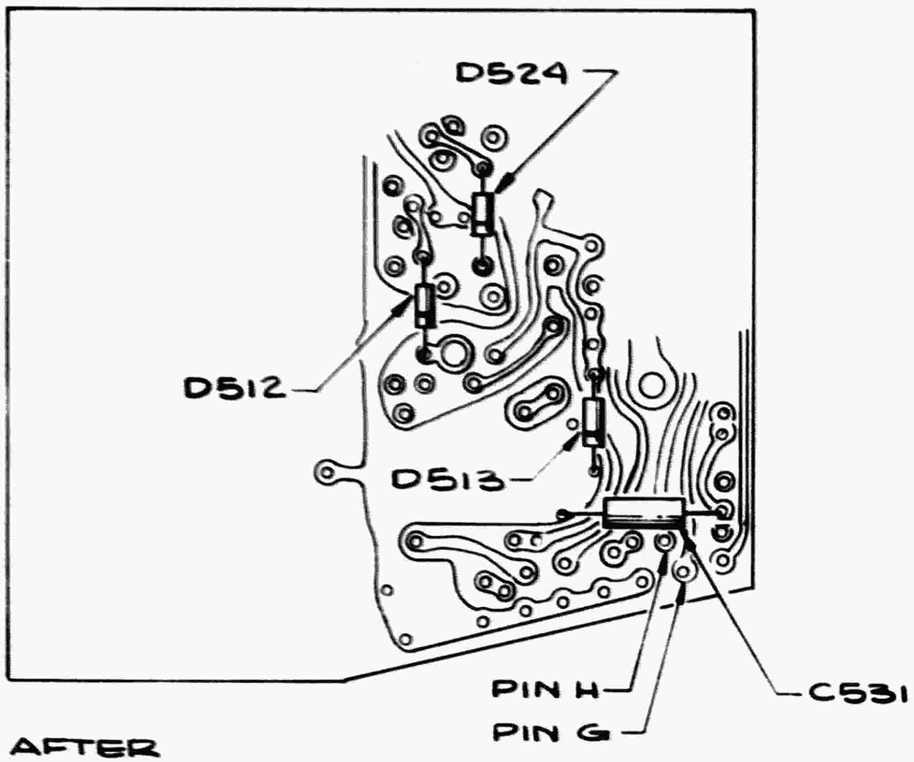
Continued.

TOP VIEW



BEFORE
M10230

TOP VIEW



AFTER
M10230

TIMING DRIFT DUE TO AGING REDUCED

Effective Prod SN 9563

Modified out of sequence: 9544-49 9555

Timing error of 3% to 5% appears as the instrument ages.

The Sweep Cal potentiometer, R512, was changed from 2.5k to 10k and a 3.3k 1/4W 5% resistor, R510, was installed in parallel with it. The network reduces the effect of any change that may now occur in R512.

Parts Removed:

R512	311-0496-00	Potentiometer, comp., 2.5k ±20% EC mounting

Parts Added:

R510	315-0332-00	Resistor, comp., 3.3k 1/4W 5%
R512	311-0510-00	Potentiometer, comp., 10k ±20% EC mounting

ETCHED CIRCUIT BOARD CHANGED TO ACCOMMODATE MOD 11721-1 AND Mod 11721-2

Effective Prod SN 9563

Modified out of sequence: 9544-49 and 9555

The parts layout of the Horizontal Amplifier etched circuit board was changed and additional holes provided to mount R510, R860 and R862 added in production mod 11721-1 and mod 11721-2.

The board changes from PE to PG.

Parts Removed:

388-0615-02	Circuit board, Horiz Sweep Amp

Parts Added:

388-0615-03	Circuit board, Horiz Sweep Amp

OSCILLATIONS ELIMINATED BY RELOCATING FERRITE CORES

Effective Prod SN 11710 Usable in SN 100-11709

Modified out of sequence:

4983	10659	10826	11115	11323	11433	11560	11647-48
9464	10666	10829	11120	11327	11439	11567	11650-52
9713	10720	10831	11207	11336	11441	11581	11656-60
10161	10744	10850	11209	11339	11459	11587-88	11662-71
10280-81	10748	10865	11213	11351	11462	11590-91	11674-79
10283	10750	10901	11218	11356	11493	11595	11682-84
10392	10753	10910	11221	11394	11501	11597	11686-91
10480	10759-61	10935	11224	11403	11509	11608-10	11693-97
10522	10763-64	10989	11230-39	11410-11	11543	11612	11699-701
10545	10786	11068	11265	11417	11545	11631	11703-08
10551	10811	11090-91	11277	11425	11549	11636-37	
10609	10824	11094	11304	11427	11557	11642	

If Q543 is replaced, the Horizontal Amplifier may oscillate. The vendor of this transistor (2N3251, 151-0133-00) has apparently improved the bandpass capability of the transistor, and this increased capability is conducive to oscillation.

L535, on the Horizontal Amplifier circuit board was relocated from the end strap to the center strap of "X10 MAG" switch, SW535.

INSTALLATION:

a) Separate the front section of the oscilloscope from the rear. Remove front section cover (see Instruction Manual). Locate X10 MAG switch, SW535.

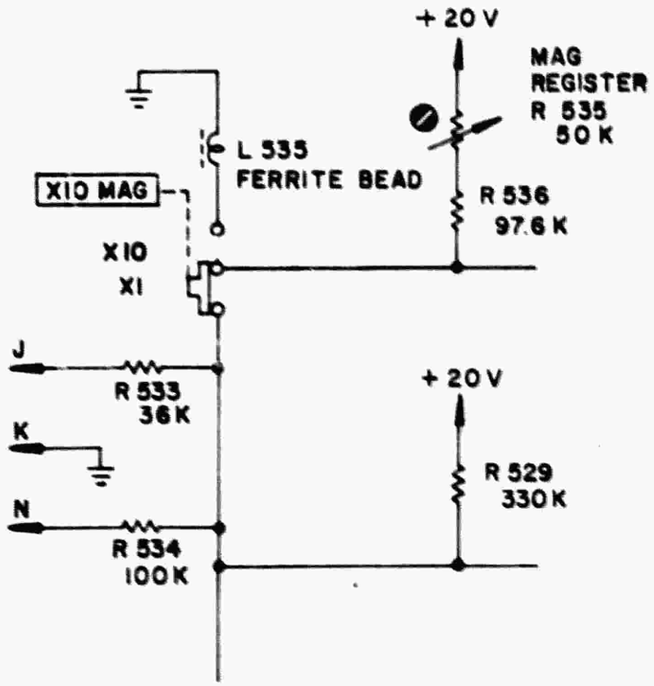
b) The ferrite bead, L535, is the black donut shaped disc around the end wire connecting SW535 to the circuit board. Unsolder this wire from the switch. Unsolder the wire connecting the center of the switch to the circuit board.

c) Transfer L535 to the center wire.

d) Resolder the wires to their original positions on the switch.

e) Reinstall the instrument cover and rear section.

Continued.



CALIBRATOR ROLL OFF REDUCED AND REFERENCE TO GROUND IMPROVED

Effective PROD SN 766

The front of the Calibrator Waveform rolled off and the starting base line of the Calibrator Waveform is not referenced to ground when the input is in DC.

R775 was removed and the circuit board was changed to complete its circuit. The EC board was redesigned to conveniently relocate all components. See before and after drawings.

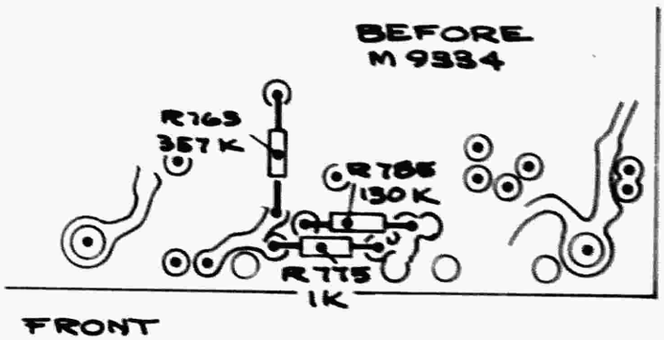
Parts Removed:

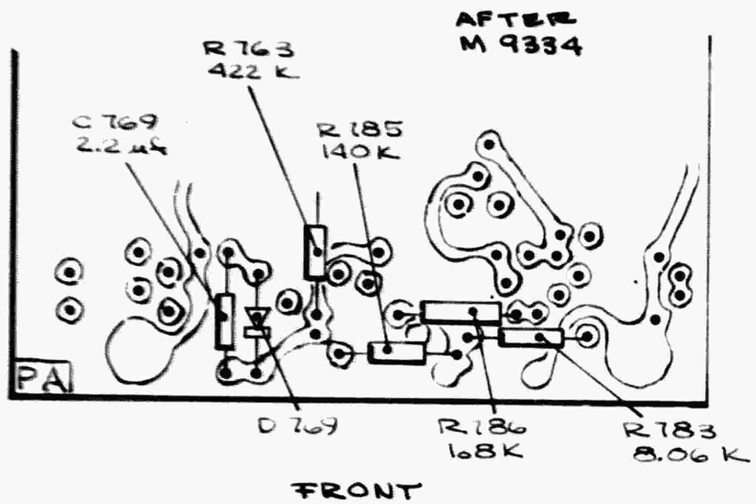
R763	321-0438-00	Resistor, prec., 357k 1/8W 1%
R775	315-0102-00	Resistor, comp., 1k 1/4W 5%
R785	315-0134-00	Resistor, comp., 130k 1/4W 5%
	388-0617-00	EC board, Calibrator

Parts Added:

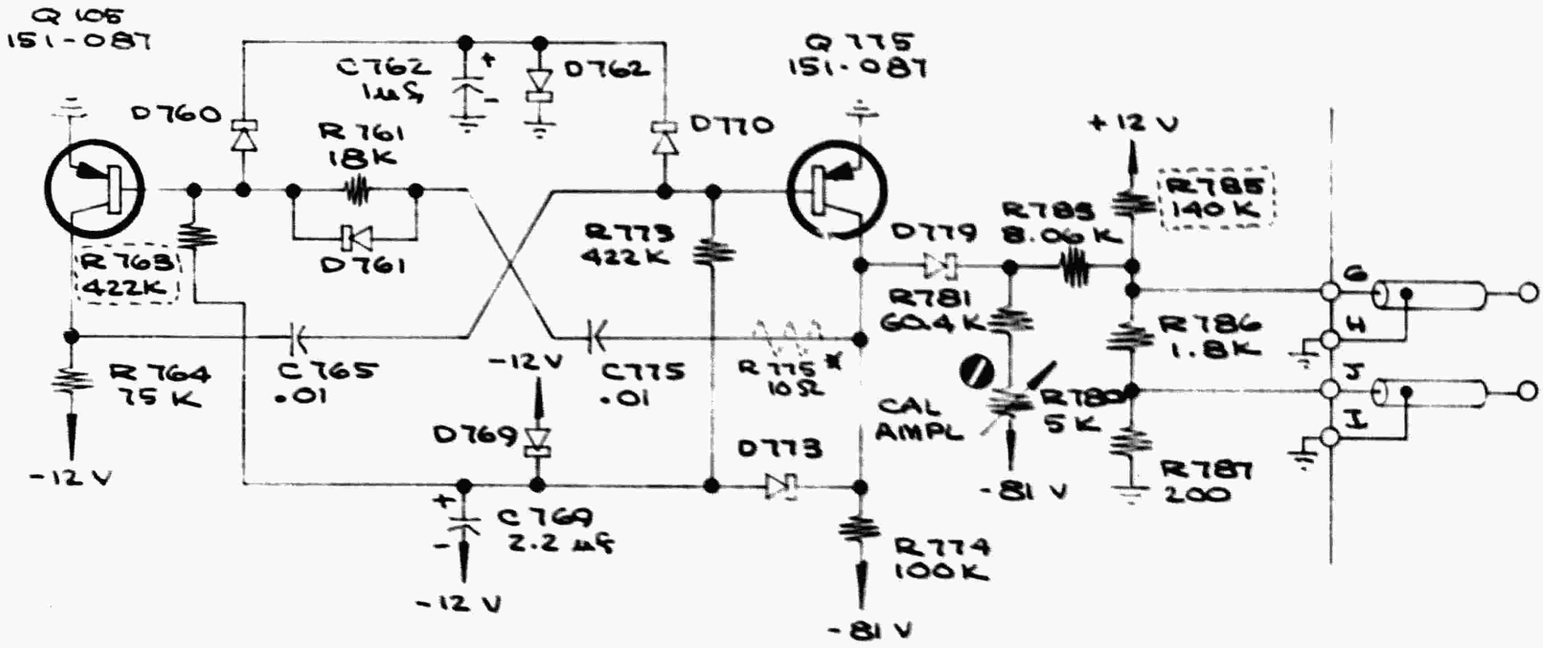
R763	321-0445-00	Resistor, prec., 422k 1/8W 1%
R785	321-0399-00	Resistor, prec., 140k 1/8W 1%
	388-0617-01	EC board, Calibrator

See before and after drawings, and partial schematic of Calibrator and Regulators.





Continued.



PART OF CALIBRATOR AND REGULATORS

*NOTE: Mod 9334 deletes R775 field installations. Replace it with a 10Ω 1/4W 5% resistor. Dotted lines indicate resistor value changes.

GRATICULE LAMP TYPE CHANGED TO EXTEND OPERATING LIFE

Effective Prod SN 7190 Usable in SN 100-7189

Modified out of sequence:

5184-5	5291-2	5417	5482	5571	5628	5805-9	5871	5953
5195-6	5337	5445	5515	5587	5646	5825	5874	
5201	5395-7	5467	5517	5589	5740	5852	5876-7	
5288-9	5410-1	5476	5530	5608-9	5753-4	5869	5923	

Graticule illumination reduced, or not present, after approximately 1500 hours of operation.

The 150-0044-00 lamps have a filament life of only 1500 hours at 95% rated voltage applied. The new 150-0059-00 lamps have a life of 10,000 hours at 115% rated voltage applied. Both lamps illuminate with the same brightness.

Graticule lamps B725 and B726 were replaced with 150-0059-00 lamps. To accommodate this change, series resistor R657 was decreased in value from 27Ω to 15Ω. The AC circuit board part numbers were changed as follows: Board with plug-in components from 670-0412-00 to 670-0412-03, and board without plug-in components from 670-0412-01 to 670-0412-02.

This modification applies only to the Type 422 type power supply. When the new graticule lamps are used in conjunction with the AC-DC type supply. They are a direct replacement.

Parts Removed:

B725 B726	150-0044-00	Bulb, incandescent, 14V T1, 3/4 bulb #336
R657	303-0270-00	Resistor, comp., 27Ω 1W 5%

Parts Added:

B725 B726	150-0059-00	Bulb, incandescent, 14V T1, 3/4 bulb #386
R657	303-0150-00	Resistor, comp., 15Ω 1W 5%

INSTALLATION:

Parts Required:

050-0319-00	Parts Replacement Kit

Refer to kit instructions.

product modification

050-0319-00

Type 422

GRATICULE BULB REPLACEMENT

For Tektronix Type 422 Oscilloscopes
with AC Power Supplies only

Serial Numbers 100-7189

Incandescent light bulb 150-0059-00 replaces the old 150-0044-00 light bulb previously used for graticule illumination.

The new light bulb has a longer life expectancy than the old bulb.

The installation involves removing the AC Power Supply and instrument cabinet to replace the two graticule bulbs B725, B726, and series resistor R657.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions and use bulb part number 150-0059-00 as a direct replacement.

3-5-70
Supersedes: January 1967

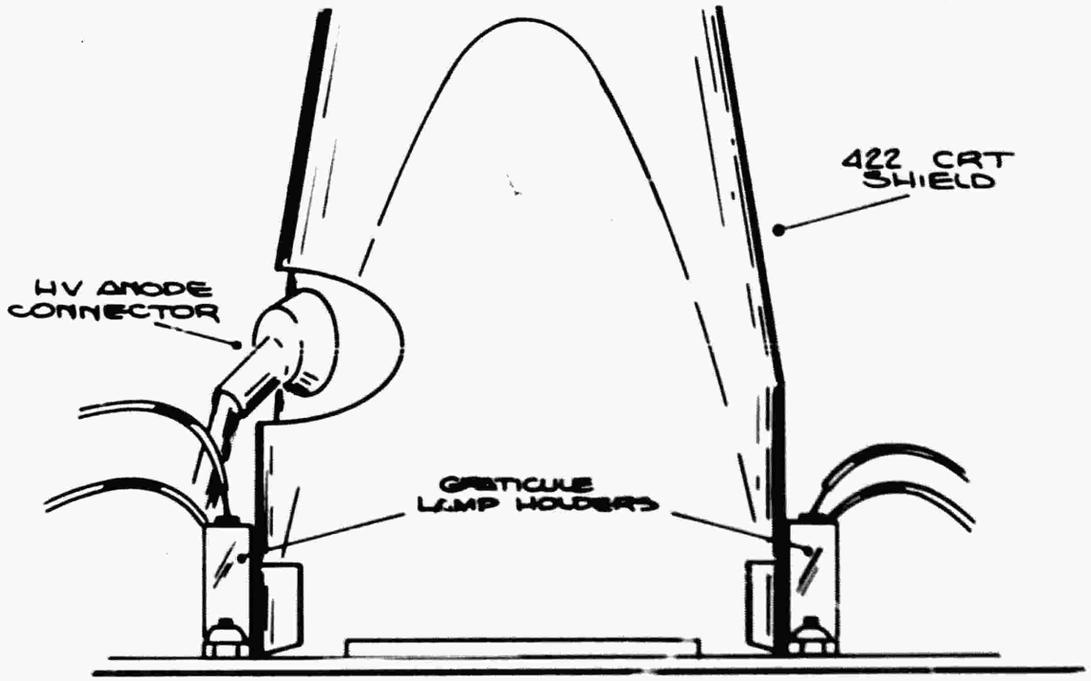


FIG. 1

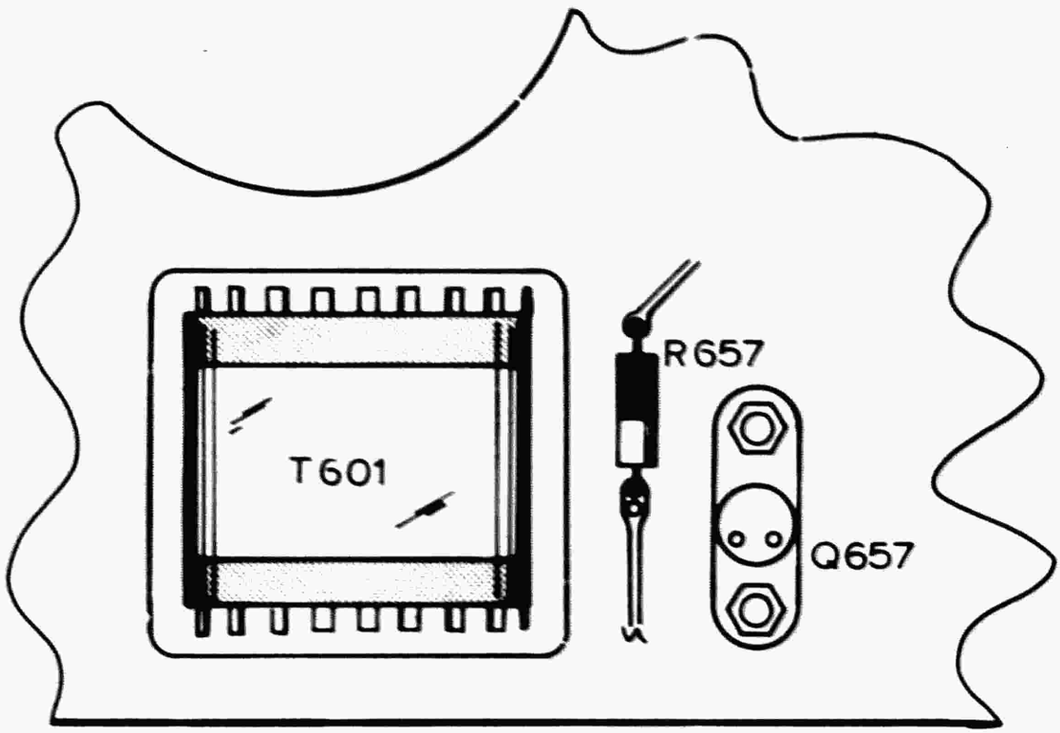


FIG. 2

AC POWER SUPPLY CIRCUIT BOARD
(Partial Diagram)

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
2 ea	150-0059-00	Bulb, incandescent 14V T-1 3/4 bulb #386
1 ea	303-0150-00	Resistor, comp, 15Ω 1W 5%

INSTRUCTIONS

( ) 1. Remove the instrument's AC Power Supply and cabinet.

Refer to Fig. 1 while performing steps 2 through 4.

( ) 2. Remove the graticule lamp holder nut located above the CRT shield.

( ) 3. Replace graticule lamps B725 and B726 with the new lamps from the kit.

( ) 4. Reinstall the graticule lamp holders.

( ) 5. Replace R657 located on the AC Power Supply circuit board between T601 and Q657 with a 15Ω 1W 5% resistor from the kit. See Fig. 2.

( ) 6. Reinstall the instrument cabinet and AC Power Supply.

THIS COMPLETES THE INSTALLATION.

( ) Change your Manual Parts List to read as follows:

B725	150-0059-00	Incandescent #386
B726	150-0059-00	Incandescent #386
R657	303-0150-00	15Ω 1W 5%

( ) Change value of R657 on the "AC POWER SUPPLY" schematic page to 15Ω.

( ) Change B725 and B726 bulb type #336 on the "CALIBRATOR AND REGULATOR" schematic page to #386.

TL:ls

-81V SUPPLY MODIFIED TO STABILIZE NOMINAL VOLTAGE

Effective Prod SN 8761 Usable in SN 100-8760

Modified out of sequence:

4983	7603	8123	8597	8629	8678	8700	8722
5364	7717	8136	8600-1	8651	8680	8702-5	8725-6
6638	7728	8453	8606	8654-5	8684	8707-8	8728-30
7348	7746	8471	8609	8660	8687	8711	8733-6
7455	8036-7	8541	8624	8666	8693-4	8713	8738
7546	8045	8583	8626	8675	8697	8717-8	8740-59

Timing shift of approximately 2% from one power application to the next.

The supply reference element does not always reference to the same voltage and circuit conditions exceed the base-to-emitter voltage rating of the transistor type used at Q737.

A 0.01µF capacitor was added to insure sufficient ignition current for V739. Q737 was changed from a 2N2905 to a 2N4036 type transistor.

Parts Removed:

Q737	151-0134-00	Transistor, 2N2905

Parts Added:

C735	283-0068-00	Capacitor, ceramic, 0.01µF 500V
Q737	151-0208-00	Transistor, 2N4036

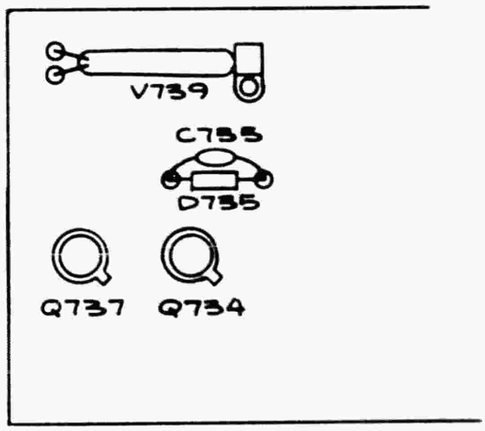
INSTALLATION:

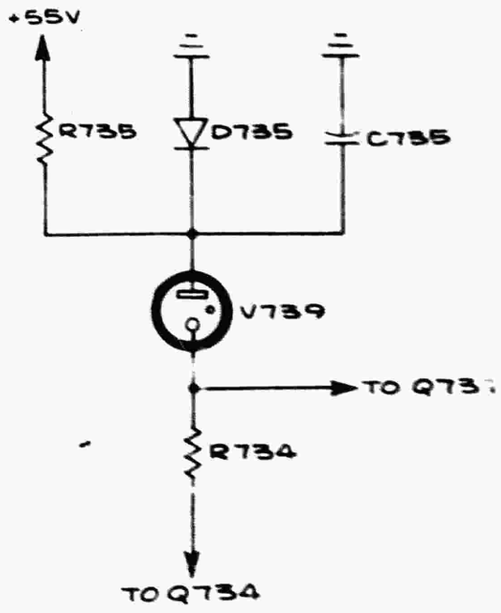
Parts Required: See 'Parts Added'.

a) Replace Q737 with a 2N4036 (151-0208-00) transistor. See drawing for location.

b) Install C735 (0.01µF 500V capacitor) in parallel with D735. See drawing.

Continued.





UNCAL NEONS MISFIRING PREVENTED

Effective Prod SN 13280

Modified out of sequence:

10811	11819	12314	12805	13159	13220	13264
11094	11902	112465	12900	13163	13237	13267
11115	11991-92	12798	12966	13166	13242	

UNCAL neons on the front panel blink randomly and sometimes trigger the sweep in the absence of an input signal.

Surface leakage in the CH 1 and 2 VOLTS/DIV and TIME/DIV switch insulating material cause random firing of the UNCAL neons.

R742, R744, and R746, 10m 1/4W 5% resistors, were added in parallel with the UNCAL neons, B741, B743 and B745 respectively.

Parts Added:

R742	315-0106-00	Resistor, 10m 1/4W 5%

CRT FILAMENT VOLTAGE INCREASED

Effective Prod SN 158 Usable in SN 100-157

Modified out of sequence: 102-3 126 128 133 136 141 146-7 154 156

Due to a slower than normal CRT writing rate, the CRT filament voltage was increased, the filament supply rectifier, D849, was changed to one with faster turn-on, and filter capacitor, C849, was changed to one with lower AC resistance.

Parts Removed:

C849	290-0248-00	Capacitor, EMT, 150µF 15V w/ins sleeve
D849	153-0007-00	Diode, 152-0047-01, checked
T801	120-0378-00	Transformer, HV

Parts Added:

C849	290-0248-01	Capacitor, EMT, 150µF w/ins sleeve (Sprague)
D849	152-0179-00	Diode, rectifier, transitron, Unitrode
T801	120-0378-01	Transformer, HV

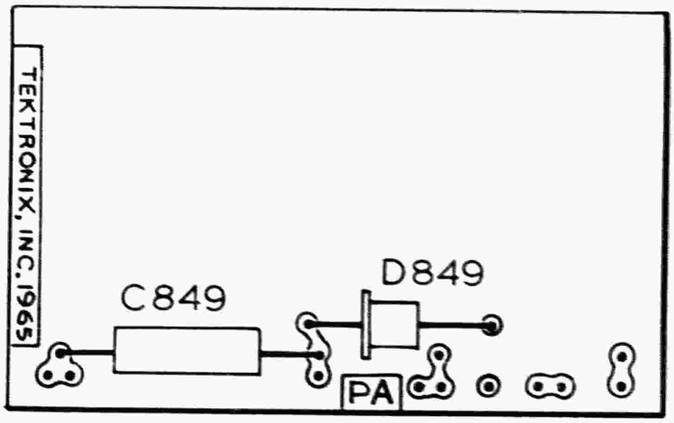
INSTALLATION:

Parts Required: See 'Parts Added'.

a) Replace T801 with a 120-0378-01 transistor.

b) Replace C849 on the High Voltage Regulator board with a 290-0248-01 capacitor, carefully noting the proper polarity. See drawing for location.

c) Replace D849 on the High Voltage Regulator board with a 152-0179-00 diode, carefully noting the proper polarity. See drawing for location.



GRATICULE LAMP SOCKET SHORT CIRCUIT PREVENTED

Effective Prod SN 563 Usable in SN 100-562

Modified out of sequence:

146	156	376	392	411	446	479	494-5	505	546-8
147	327	379	398	412	449-59	488	499	508	551-2
154	369	390	406	416	476	491	500	510-19	554-61

Graticule lamp sockets may short to the CRT shield. This may overheat R657 in the AC power supply, and may damage D1214 and D1215 in the AC-DC power supply.

The graticule lamp holder was insulated (inside) with 3/16 inch of clear #7 vinyl tubing, to prevent the center electrode spring from buckling and causing a short circuit to the inside of the shell terminal.

The graticule lamp holder was insulated (outside) with a 1/2 inch length of #2 clear vinyl tubing, to prevent the outside of the shell terminal from shorting to the CRT shield.

Parts Added:

162-0012-00	Tubing, clear vinyl, #7 5/32 inch	(2)
162-0019-00	Tubing, clear vinyl, #2 1/2 inch	(2)

INSTALLATION:

Parts Required: See 'Parts Added'.

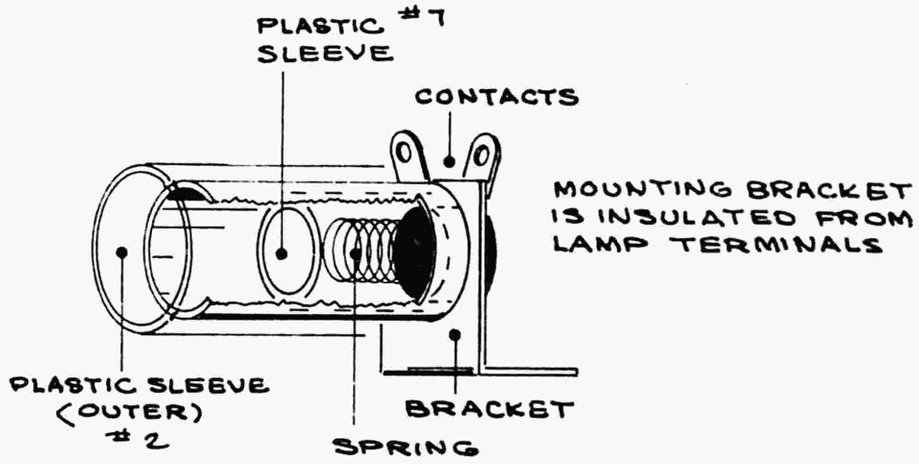
a) Remove the light sockets from the front casting and remove the bulbs from the sockets.

b) Install the 5/32 inch #7 clear vinyl tubing inside the sockets over the contact springs.

c) Install the 1/2 inch #2 clear vinyl tubing over the outside of each lamp socket.

d) Reinstall the bulbs in the sockets and then install the sockets onto the front casting.

Continued.



CRT ORTHOGONALITY COIL ADDED TO IMPROVE CRT YIELD

Effective Prod SN 1890 Usable in SN 100-1889

In the past, CRT's have been selected to minimize any orthogonality deviation.

A Y-Axis alignment coil and adjustment potentiometer were added to the CRT shield for adjusting CRT orthogonality (see drawing on following page).

Parts Removed:

V859	154-0466-00	Tube, CRT, T4220-31-1 w/graticule	
	154-0466-01	T4220-1-1 w/graticule	
	154-0466-02	T4220-2-1 w/graticule	
	154-0466-03	T4220-7-1 w/graticule	
	154-0466-04	T4220-11-1 w/graticule	
	124-0170-00	Strip, liner, CRT clamp	(2)
	337-0669-00	Shield, CRT, painted	
	407-0105-00	Bracket, shield, CRT	

Parts Added:

L856	108-0350-00	Coil, Y-Axis alignment assembly	
R856	311-0579-00	Potentiometer, comp., 20k ±20% model G	
V859	154-0466-05	Tube, CRT, T4220-31-1 w/graticule	
	154-0466-06	T4220-1-1 w/graticule	
	154-0466-07	T4220-2-1 w/graticule	
	154-0466-08	T4220-7-1 w/graticule	
	154-0466-09	T4220-11-1 w/graticule	
	124-0170-01	Strip, liner, CRT clamp	(2)
	337-0669-01	Shield, CRT, painted	
	407-0105-01	Bracket, shield, CRT	
	388-0678-00	Board, etched circuit	
	131-0371-00	Connector, single contact	

INSTALLATION:

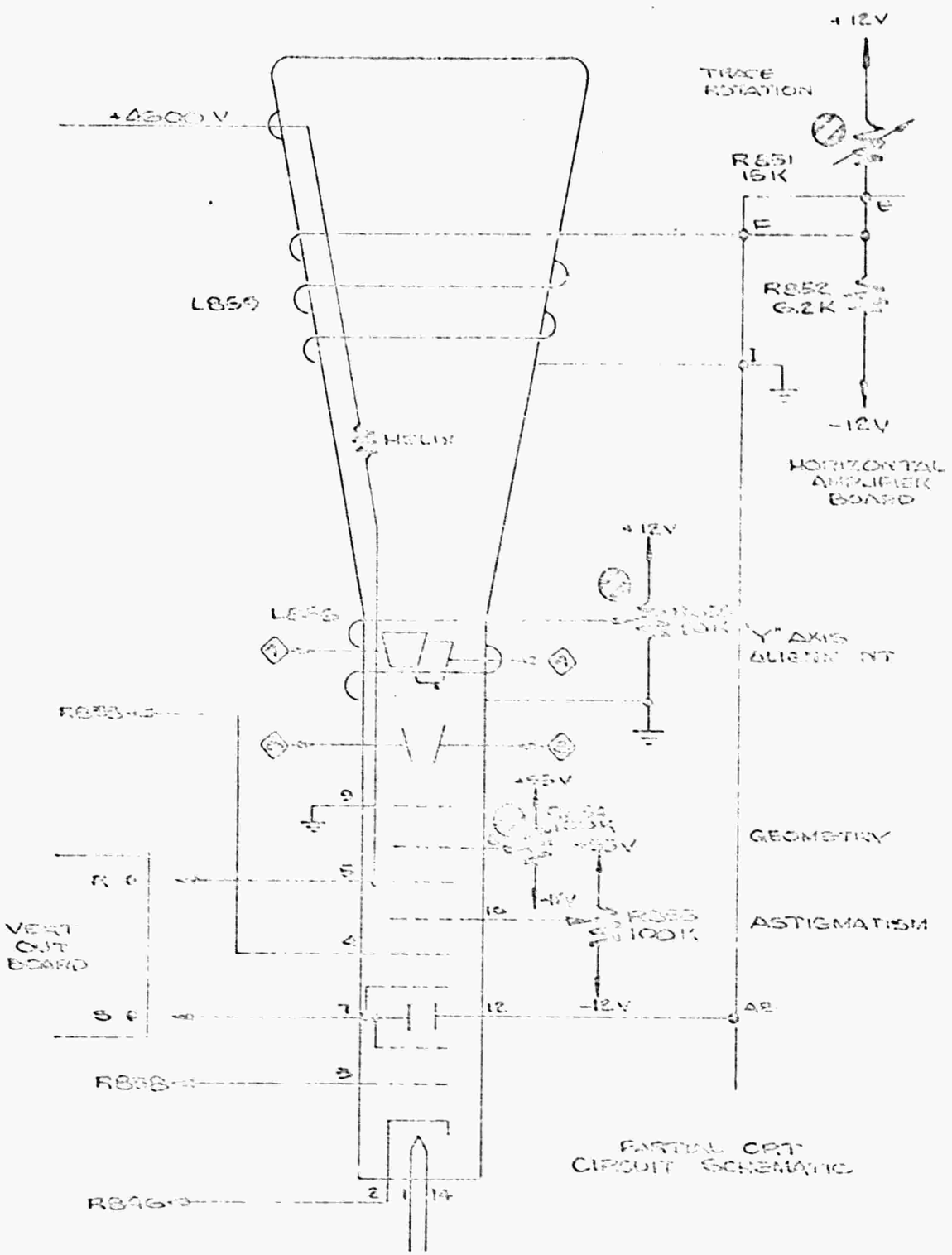
Parts Required:

	050-0264-00	Parts Replacement Kit

Refer to kit instructions.

NOTE: The new CRT silicon cushions installed by Mod 9993 are included in 050-0264-00.

Continued.



product modification

050-0264-12

M9763, M17774

T4220-11-1 (P-11 PHOSPHOR) CRT REPLACEMENT

For TEKTRONIX® Type 422 Oscilloscopes:

Serial Numbers 100 - 1889

Cathode ray tube, pn 154-0517-09, replaces pn 154-0466-04 and pn 154-0466-09, which are no longer available.

Installation of the new crt necessitates replacing the crt shield assembly with a new assembly which provides a Y-Axis Alignment coil and adjustment circuit.

NOTE: If the serial number of your instrument is above those listed, or if this kit or 050-0264-00 has been installed, disregard these instructions and use pn 154-0517-09 as a direct replacement.

PARTS INCLUDED IN PARTS REPLACEMENT KIT

Ckt No.	Quantity	Part Number	Description
V859	1 ea	154-0517-09	Electron tube, crt, P-11 phosphor
	1 ea		Assembly, crt shield, consisting of:
L859	1 ea	108-0320-01	Coil, crt, Trace Rotator
L856	1 ea	108-0350-00	Coil, crt, Y-Axis Alignment
	2 ea	124-0170-01	Liner, crt clamp, polypropylene strip
	6 ea	210-0003-00	Lockwasher, steel, ext. #4
	1 ea	210-0223-00	Lug, solder, 0.25 ID
	1 ea	210-0583-00	Nut, hex, 0.25 x 0.312
	1 ea	210-0980-00	Washer, flat, 0.40 OD x 0.254 ID x 0.005 thick
	2 ea	211-0012-00	Screw, 4-40 x 0.375 PNH
	2 ea	211-0117-00	Screw, 4-40 x 0.312 FLH
	4 ea	220-0438-00	Nut, hex, 4.40 x 0.25
R856	1 ea	311-0579-00	Resistor, var. cmpsn, 20kΩ 20% 0.5W
	1 ea	334-1379-00	Label, crt warning
	1 ea	337-0669-01	Shield, crt, 422
	1 ea	343-0115-00	Clamp, crt rear mount, bottom half
	1 ea	343-0116-00	Clamp, crt rear mount, top half
	4 ea	348-0070-01	Cushion, crt, silicone sponge
	1 ea	407-0105-01	Bracket, crt shield
	1 ft	----	Wire, 26AWG stranded, wht-brn-red-blk

WARNING

High vacuum cathode ray tubes are dangerous to handle. To prevent personal injury from flying glass in case of tube breakage, wear a face mask or safety goggles, and gloves.

Handle any crt with extreme care. Do not strike or scratch it. Never subject it to more than moderate force or pressure when removing or installing.

Always store spare crt's in original protective cartons. Save cartons to dispose of used crt's.

INSTRUCTIONS

WARNING

BEFORE REPLACING THE CRT, BE SURE THE INSTRUMENT IS DISCONNECTED FROM THE POWER SOURCE AND THE HIGH-VOLTAGE POWER SUPPLY IS COMPLETELY DISCHARGED.

( ) 1. Remove the instrument from the cabinet.

( ) 2. Carefully remove the crt light filter (or protective plate) from the instrument.

( ) 3. Remove the three screws securing the rear crt shield and remove the shield.

( ) 4. Remove the two bottom screws which secure the crt shield bracket to the chassis. (SAVE)

5. Disconnect the following square-pin connector wires which connect to the Horizontal Amplifier circuit board and the crt:

( ) White to Terminal I, Horizontal Amplifier circuit board

( ) White-orange to Terminal F, Horizontal Amplifier circuit board

( ) White-red to "LEFT" crt deflection plate pin

( ) White-green to "RIGHT" crt deflection plate pin

( ) White-blue to "UPPER" crt deflection plate pin

( ) White-brown to "LOWER" crt deflection plate pin

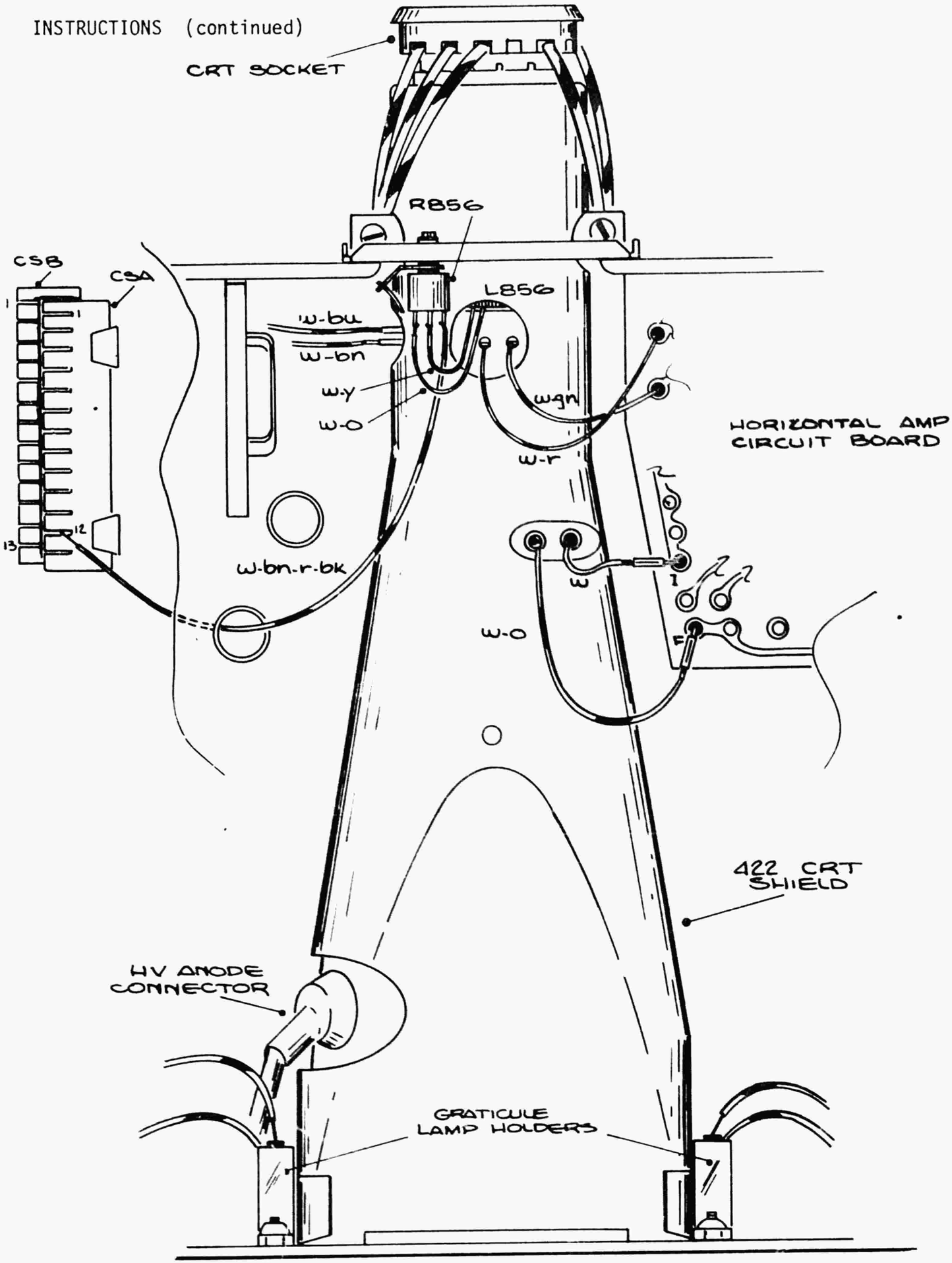
( ) 6. Disconnect the high-voltage lead from the crt anode connector. Ground the lead and the connector to discharge any stored charge.

( ) 7. Disconnect the crt socket from the crt base.

( ) 8. Remove both crt graticule-lamp holders from the crt shield. (SAVE HARDWARE AND HOLDERS.)

( ) 9. Carefully push the crt and shield assembly toward the rear of the instrument until it clears the front sub-panel. Tilt the front of the crt shield assembly up and remove from the instrument.

( ) 10. Loosen the two crt clamp screws on the new crt shield assembly (from kit), install the new crt in the shield, and tighten the two crt clamp screws.



( ) 11. Install the new crt and shield assembly in the instrument.

( ) 12. Reinstall the two bottom crt bracket screws removed in Step 4.

( ) 13. Check the crt base pins to make sure none are bent; then install the crt socket on the base of the new crt.

( ) 14. Reinstall the rear crt shield using the three screws removed in Step 3.

( ) 15. Reinstall both crt graticule-lamp holders removed in Step 8.

16. Connect the following square-pin connector wires from the Horizontal Amplifier circuit board and the crt: (Refer to the drawing for wire and terminal locations.)

( )	White	to Terminal I, Horizontal Amplifier circuit board
( )	White-orange	to Terminal F, Horizontal Amplifier circuit board
( )	White-red	to "LEFT" crt deflection-plate pin
( )	White-green	to "RIGHT" crt deflection-plate pin
( )	White-blue	to "UPPER" crt deflection-plate pin
( )	White-brown	to "LOWER" crt deflection-plate pin

( ) 17. Dress the white-brown-red-black wire from R856 through the chassis grommet and solder to CSA-12.

( ) 18. Reconnect the crt high-voltage anode connector removed in Step 6.

( ) 19. Reinstall the crt light filter (or protector plate) removed in Step 2.

( ) Recalibrate the instrument as directed in the Instruction Manual Modification Insert.

( ) Fasten the insert pages in your Instruction Manual.

( ) Reinstall the instrument in the cabinet.

INSTRUCTION MANUAL

MODIFICATION INSERT

T4220 CATHODE RAY TUBE

Type 422 Oscilloscopes -- SN 100-1889

Installed in Type 422 SN _____ Date _____

This modification insert is provided to supplement the Instruction Manual for the above listed products. The information given in this insert supersedes that given in the Manual.

GENERAL INFORMATION

Cathode ray tube, pn 154-0517-09, replaces pn 154-0466-04 and pn 154-0466-09, which are no longer available.

Installation of the new crt necessitates replacing the crt shield assembly with a new assembly which provides a Y-Axis Alignment coil and adjustment circuit.

CALIBRATION

A complete recalibration of the modified instrument is recommended to ensure that the performance requirements are satisfied.

Use the calibration procedure in the Instruction Manual, except add the following after the step titled "Adjust Trace Rotation."

NOTE: If the Trace Rotation adjustment does not have enough range to bring the trace parallel with the horizontal graticule line, reverse the white and white-orange wire terminals connected to pins F and I on the Horizontal Amplifier circuit board.

ADJUST Y AXIS ALIGNMENT

a. Connect the time-mark generator to the INPUT 1 connector through the 50-ohm coaxial cable.

b. Set the time-mark generator for 1 msec and 0.1 msec markers.

c. Set the Channel 1 VOLTS/DIV switch so the large markers extend beyond the top and bottom of the graticule area.

d. Set the TRIGGERING controls for a stable display.

e. ADJUST - Y Axis Align adjust, R856, to align the center marker parallel with the center vertical line on the graticule.

NOTE: If R856 does not have enough range to bring the marker parallel to the center line, reverse the white-orange and white-yellow wire terminals connected to R856 and repeat the adjustment.

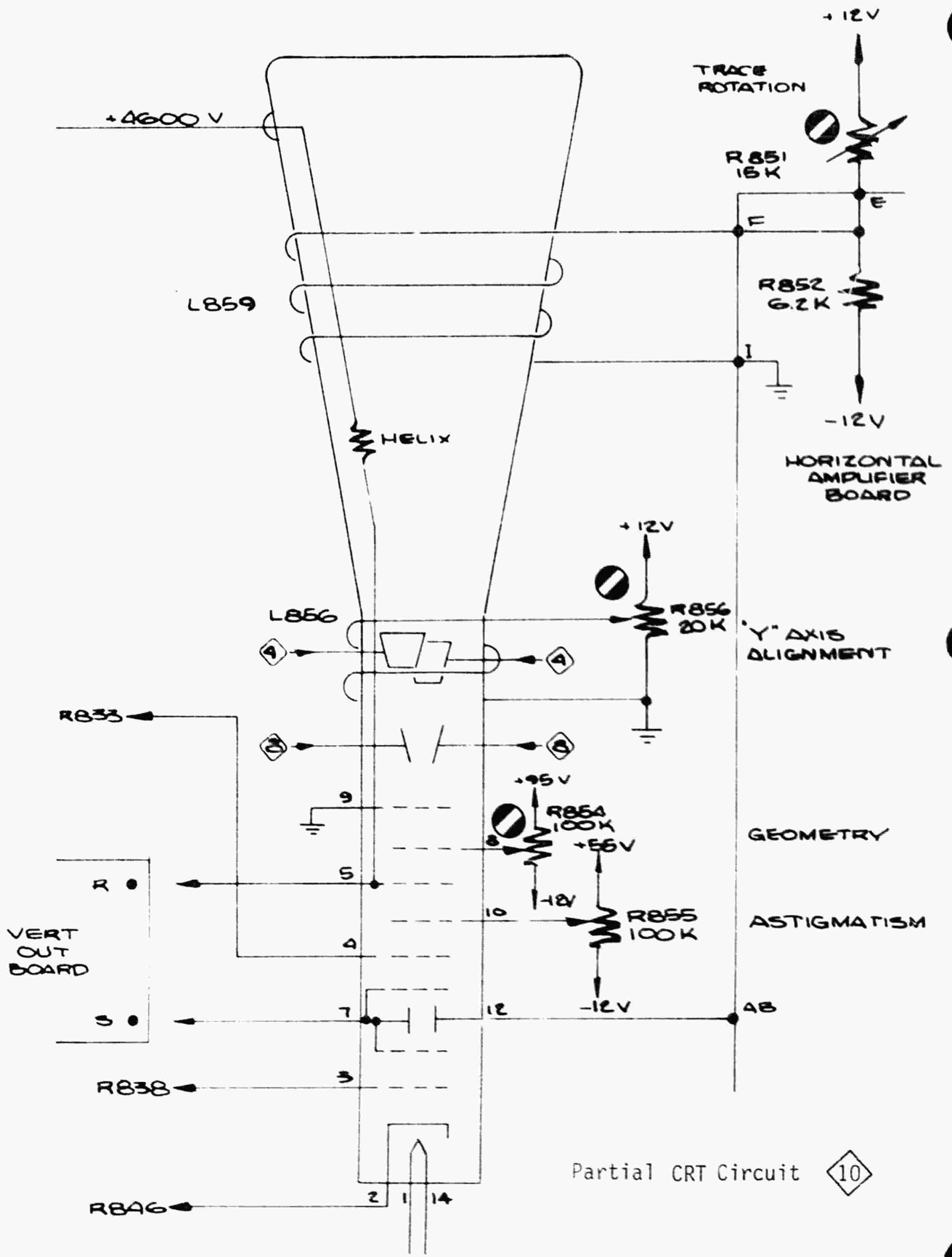
f. Interaction may occur between the Trace Rotation, Y Axis Alignment, and Geometry adjustments. Therefore, repeat these three adjustments until the settings are correct.

ELECTRICAL PARTS LIST CHANGES

Ckt No.	Part Number	Description
		INDUCTORS
L856	108-0350-00	Y AXIS ALIGNMENT
		RESISTORS
R856	311-0579-00	20kΩ cmpsn ±20% Y AXIS ALIGNMENT
		CRT
V859	154-0517-09	P11

MECHANICAL PARTS LIST CHANGES:

337-0669-01	Shield, crt
348-0070-01	Cushion, crt
124-0170-01	Liner, crt clamp
407-0105-01	Bracket, crt shield
	Resistor, var., mounting hardware:
210-0223-00	Lug, solder, 0.250 ID
210-0583-00	Nut, hex, 0.250-32 x 0.312
210-0980-00	Washer, flat, 0.400 OD x 0.254 ID



Partial CRT Circuit 10

product modification

050-0264-13

M9763, M17774

Type 422

T4220-31-1 (P-31 PHOSPHOR) CRT REPLACEMENT

For TEKTRONIX® Type 422 Oscilloscopes:

Serial Numbers 100 - 1889

The orthogonality specifications for Type T4220 Cathode Ray Tubes have been modified. CRT PN 154-0517-05 replaces CRT's PN 154-0466-00 and 154-0466-05 which are no longer available.

To assure orthogonal X-Y deflection, the new Cathode Ray Tubes must be used with a "Y" axis alignment coil and adjustment potentiometer. These are included in this kit as part of the new CRT shield assembly. The CRT's are manufactured with P31, P2, P7, and P11 phosphors.

The installation consists of replacing the old CRT shield assembly with the new CRT shield assembly and soldering one wire to a +12V ceramic strip terminal. A partial Calibration procedure is included for making the orthogonality adjustments.

NOTE: If the serial number of your instrument is above those listed, or if this kit or 050-0264-00 has been installed, disregard these instructions as the new CRT listed above is a direct replacement.

8-2-76

Supersedes: 050-0264-00

PARTS INCLUDED IN PARTS REPLACEMENT KIT

Quantity	Part Number	Description
1 ea		Assembly, CRT shield, consisting of:
1 ea	108-0320-01	Coil, fixed, Trace Rotator
1 ea	108-0350-00	Coil, fixed, "Y" Axis Alignment, assembly
2 ea	124-0170-01	Strip, liner, CRT clamp, polypropylene
6 ea	210-0003-00	Lockwasher, steel, ext. #4
1 ea	210-0223-00	Lug, solder, 1/4" hole
1 ea	210-0583-00	Nut, hex, brass 1/4-32 x 5/16
1 ea	210-0980-00	Washer, flat, steel, 0.400 OD x 0.254 ID x 0.006 thick
2 ea	211-0012-00	Screw, 4-40 x 3/8 PHS
2 ea	211-0117-00	Screw, 4-40 x 5/16 FH stainless steel
4 ea	220-0438-00	Nut, 4-40 hex, stainless steel
1 ea	311-0579-00	Potentiometer, comp. 20k ±20% Model G
1 ea	334-1379-00	Label, CRT warning
1 ea	337-0669-01	Shield, CRT, painted blue
1 ea	343-0115-00	Clamp, CRT rear mount, bottom
1 ea	343-0116-00	Clamp, CRT rear mount, top, w/2 mtg. ears
4 ea	348-0070-01	Cushion, CRT silicone sponge, adhesive back
1 ea	407-0105-01	Bracket, shield, CRT
1 ea		Wire, #26 stranded, 8-1/2" wht-brn-red-blk (175-0529-00)
1 ea	154-0517-05	Tube, vacuum, CRT
1 ea	000-1910-00	Tag, MODIFIED INSTRUMENT, gummed back

WARNING

High vacuum cathode ray tubes are dangerous to handle. To prevent personal injury from flying glass in case of tube breakage, wear a face mask or safety goggles, and gloves.

Handle the CRT with extreme care. Do not strike or scratch it. Never subject it to more than moderate force or pressure when removing or installing.

Always store spare CRT's in original protective cartons. Save cartons to dispose of used CRT's.

INSTRUCTIONS

BE SURE TO DISCONNECT THE INSTRUMENT FROM ITS POWER SOURCE & THAT THE HI VOLTAGE POWER SUPPLY IS COMPLETELY DISCHARGED BEFORE REPLACING THE CRT!

INSTRUCTIONS (cont'd)

( ) 1. Remove the instrument from the cabinet.

( ) 2. Carefully remove the CRT screen from the instrument to prevent any possible damage while performing mod.

( ) 3. Remove the three screws and rear CRT shield. (SAVE)

( ) 4. Remove the two bottom screws which secure the CRT shield bracket to the chassis. (SAVE)

5. Disconnect the following square pin connector wires which connect to the CRT and Horizontal Amplifier board:

( )	white	to Horizontal Amplifier circuit board terminal I
( )	white-orange	to Horizontal Amplifier circuit board terminal F
( )	white-red	to "LEFT" CRT deflection plate pin
( )	white-green	to "RIGHT" CRT deflection plate pin
( )	white-blue	to "UPPER" CRT deflection plate pin
( )	white-brown	to "LOWER" CRT deflection plate pin

( ) 6. Disconnect the CRT HV anode connector from the CRT.

( ) 7. Disconnect the CRT socket from the CRT.

( ) 8. Remove both CRT graticule lamp holders from the CRT shield. (SAVE HARDWARE AND HOLDERS.)

( ) 9. Carefully push the CRT and shield toward the rear of the instrument until it clears the rear front panel casting. Tilt the front of the CRT up and remove from the instrument.

( ) 10. Loosen the two CRT clamp screws which secure the CRT to the shield and remove the CRT from the shield.

( ) 11. Loosen the two CRT clamp screws on the new CRT shield assembly (from kit), install the new CRT in shield, and tighten the two CRT clamp screws.

( ) 12. Install the new CRT and shield assembly in the instrument.

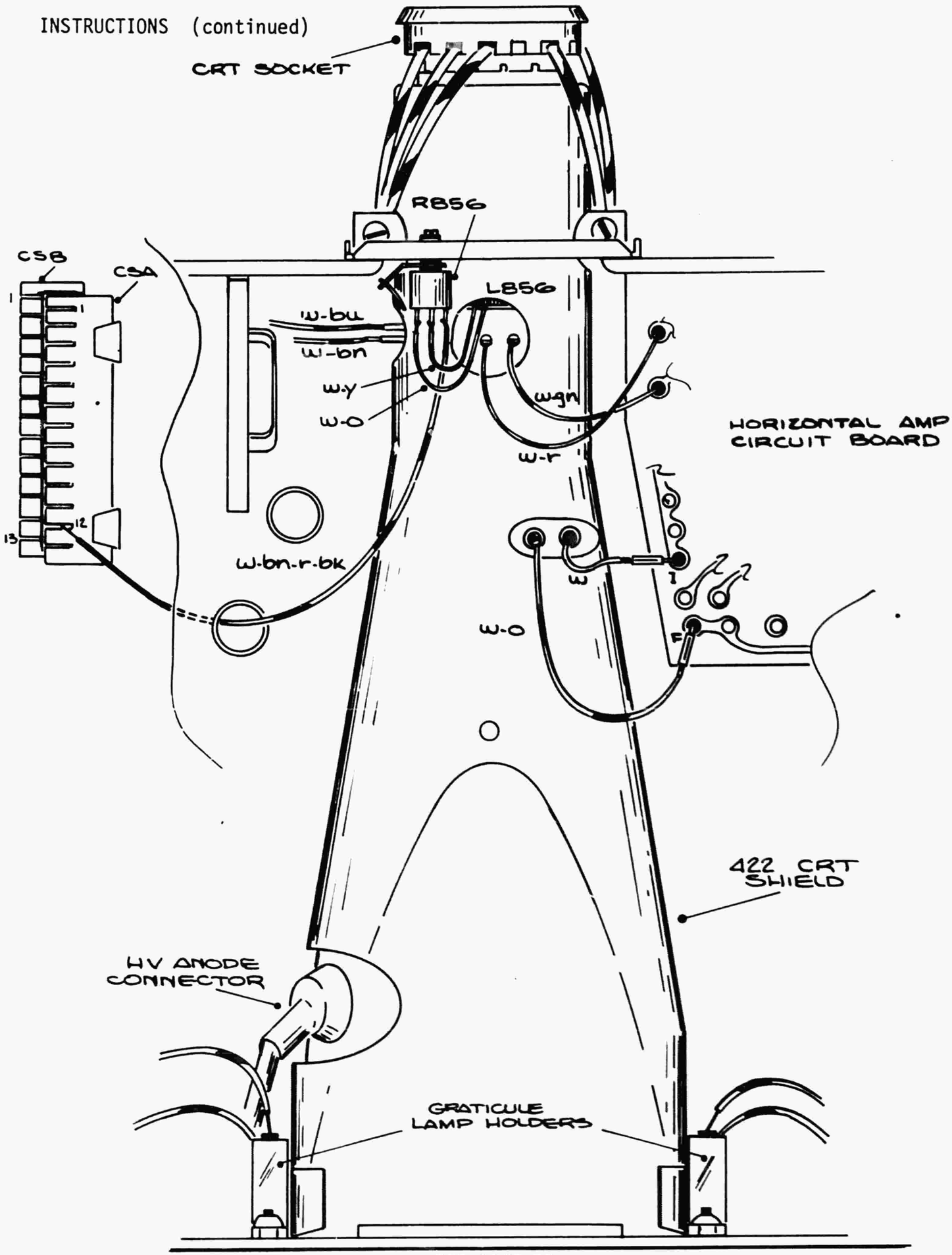
( ) 13. Reinstall the two bottom CRT bracket screws removed in step 4.

IMPORTANT: Check the rear CRT socket pins to make sure none are bent.

( ) 14. Reinstall the rear CRT socket on the CRT.

( ) 15. Reinstall the rear CRT shield using the three screws removed in step 3.

( ) 16. Reinstall both CRT graticule lamp holders removed in step 8.



INSTRUCTIONS (continued)

Refer to the drawing for the following CRT wire locations:

17. Connect the following square pin connector wires from the CRT assembly and Horizontal Amplifier board:

( ) white to Horizontal Amplifier circuit board terminal I

( ) white-orange to Horizontal Amplifier circuit board terminal F

( ) white-red to "LEFT" CRT deflection plate pin

( ) white-green to "RIGHT" CRT deflection plate pin

( ) white-blue to "UPPER" CRT deflection plate pin

( ) white-brown to "LOWER: CRT deflection plate pin

( ) Dress the white-brown-red-black wire from R856 through the chassis grommet and solder to CSA-12.

( ) 18. Reconnect the CRT HV anode connector removed in step 6.

( ) 19. Reinstall the CRT screen removed in step 2.

( ) Adjust "Y" Axis Alignment potentiometer, R856, as described in the Manual Insert Recalibration section.

( ) Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and place it on the CRT Circuit Manual schematic page affected by this modification.

( ) Fasten the insert pages in your Instruction Manual.

( ) Reinstall the instrument in the cabinet.

INSTRUCTION MANUAL

MODIFICATION INSERT

T4220 CATHODE RAY TUBE

Type 422 Oscilloscopes -- SN 100-1889

Installed in Type 422 SN_____Date_____

This modification insert is provided to supplement the Instruction Manual for the above listed products. The information given in this insert supersedes that given in the Manual.

GENERAL INFORMATION

The orthogonality specifications for Type T4220 Cathode Ray Tubes have been modified. CRT PN 154-0517-05 replaces CRT's PN 154-0466-00 and 154-0466-05 which are no longer available.

RECALIBRATION

NOTES

EQUIPMENT REQUIRED

1 Type 180 or 184 Time Mark Generator

NOTE: With exception of the Geometry control, this calibration procedure assumes that all other adjustments have remained the same and do not require further adjustment.

TYPE 422 BASIC FRONT PANEL SETTINGS

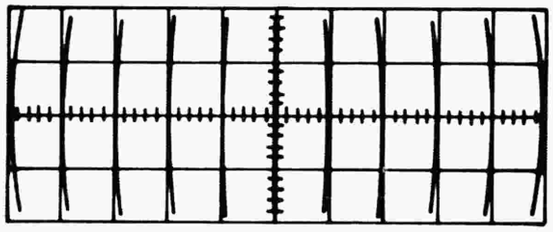
CH 1 input switch	-- DC
VOLTS/CM	-- 1
POSITION	-- midscreen
MODE	-- CH 1
TRIGGERING	-- CH 1
TRIG LEVEL	-- AUTO
TIME/DIV	-- 1 mSEC
TRACE ROTATION	-- to align with center horizontal graticule line

From a Type 180 or 184, apply 1 msec and 100 µsec time markers to CH 1 input. Set the POSITION, VOLTS/SM, and VARIABLE to appropriate position so that the markers cover the entire graticule area. Set the ASTIGMATISM, FOCUS, and INTENSITY controls for a sharp display.

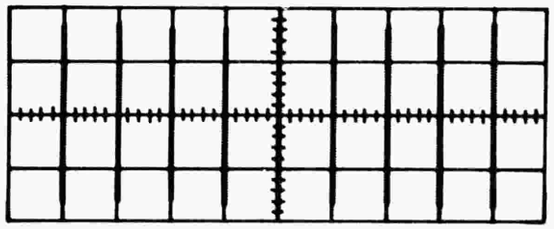
RECALIBRATION

NOTES

1) Adjust the Geometry control for minimum bowing of vertical lines.

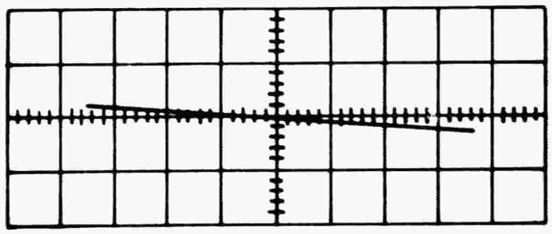


INCORRECT

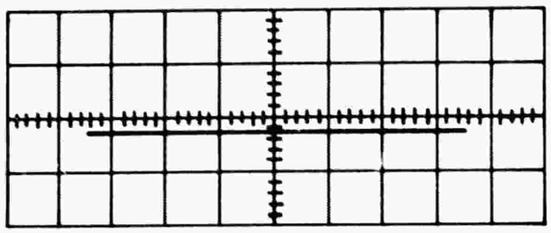


CORRECT

2) Remove vertical signal and free run sweep to produce a single line along the center Horizontal axis. Adjust the trace rotation control, R851, so that the trace is parallel to the center Horizontal graticule line.



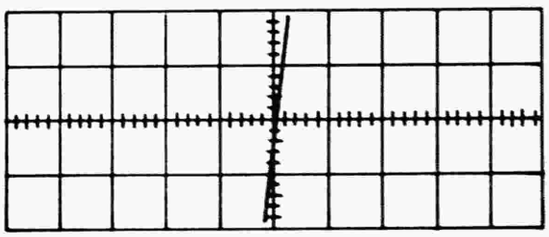
INCORRECT



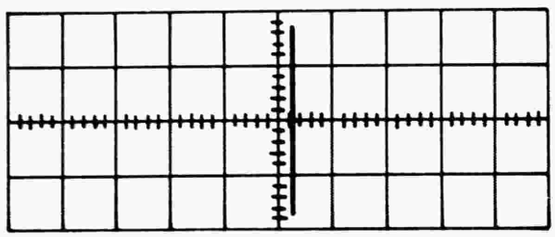
CORRECT

3) Remove sweep and connect vertical signal to produce a single line along the center Vertical Axis. Adjust the "Y" Axis alignment control, R856, so that the trace is parallel to the Vertical graticule line.

If it is not possible to properly adjust R856 so that the trace is parallel to the Vertical center graticule line, then reverse the white-orange and white-yellow wire terminals connected to the R856 and repeat steps 1 and 2.



INCORRECT



CORRECT

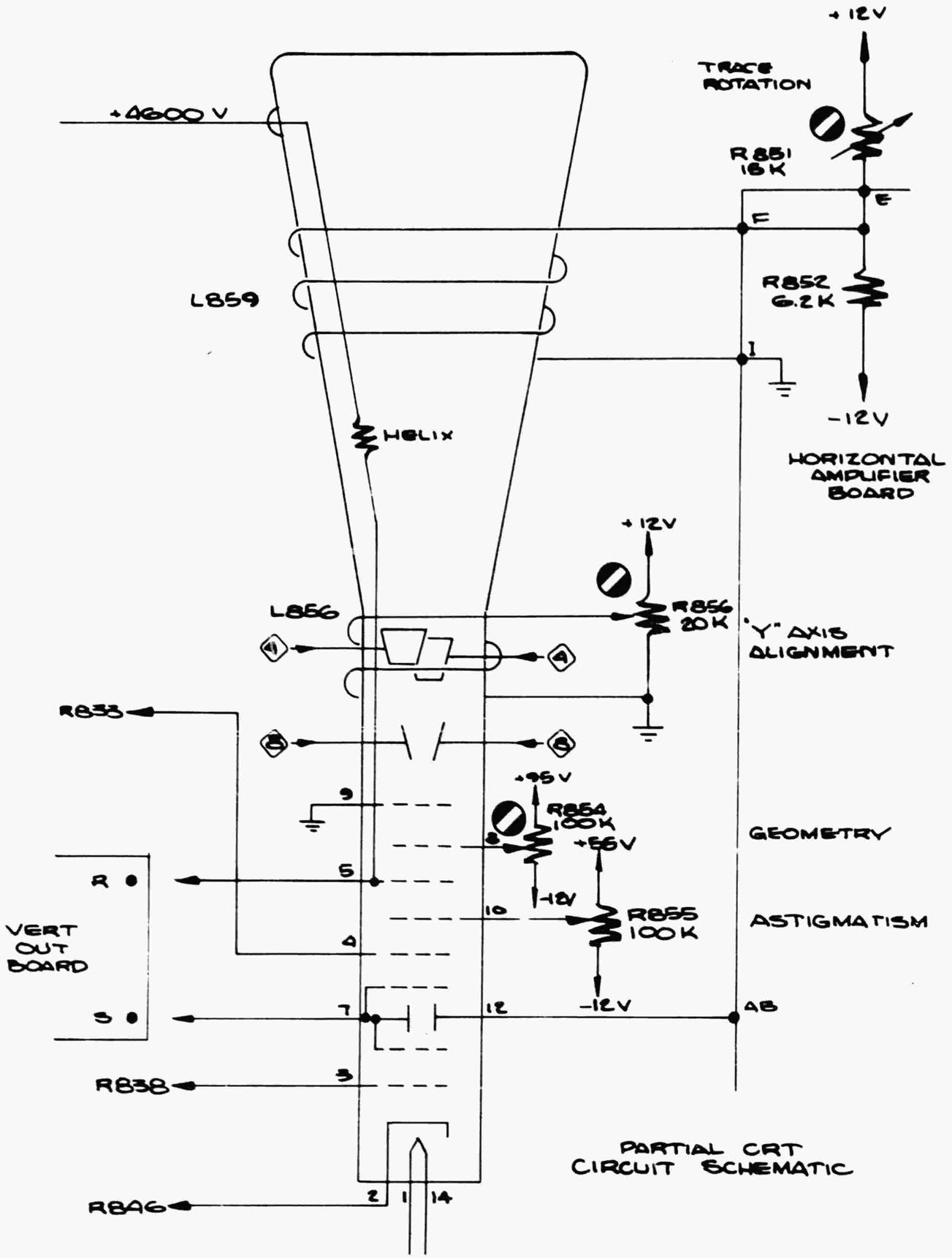
4) Interaction may occur between the Geometry, Trace Rotation and "Y" Axis alignment controls. Therefore, it may be necessary to repeat steps 1, 2 and 3 until the adjustments are accurate.

ELECTRICAL PARTS LIST

Ckt.No.	Part Number	Description
		COILS
L856	108-0350-00	"Y" AXIS ALIGNMENT
L859	108-0320-00	TRACE ROTATION
		RESISTORS
R856	311-0579-00	20k comp ±20% "Y" AXIS ALIGNMENT
		TUBES
V859	154-0517-05	Tube, vacuum, CRT

MECHANICAL PARTS LIST:

407-0105-01	Bracket, shield, CRT
343-0115-00	Clamp, CRT rear mount, bottom
343-0116-00	Clamp, CRT rear mount, top, w/2 mtg. ears
348-0070-01	Cushion, CRT silicone sponge, adhesive back
210-0003-00	Lockwasher, steel, ext #4
210-0223-00	Lug, solder, 1/4" hole
210-0583-00	Nut, hex, brass 1/4-32 x 5/16
220-0438-00	Nut, 4-40 hex, stainless steel
211-0117-00	Screw, 4-40 x 5/16 FH
211-0012-00	Screw, 4-40 x 3/8 PHS
337-0669-01	Shield, CRT, painted
124-0170-01	Strip, liner, CRT clamp, polypropylene
210-0980-00	Washer, flat steel, 0.400 OD x 0.254 ID x 0.006 thick



MESH FILTER SUPPORT IMPROVED

Effective Prod SN 2070 Usable in SN 100-2069

The NEOPRENE foam tape pads do not provide adequate support for the mesh filter and have been replaced with a filter spring. See Mod 12971.

Parts Removed:

253-0069-00	Tape, NEOPRENE®, 1/2inch

Parts Added:

214-0654-00	Spring, filter

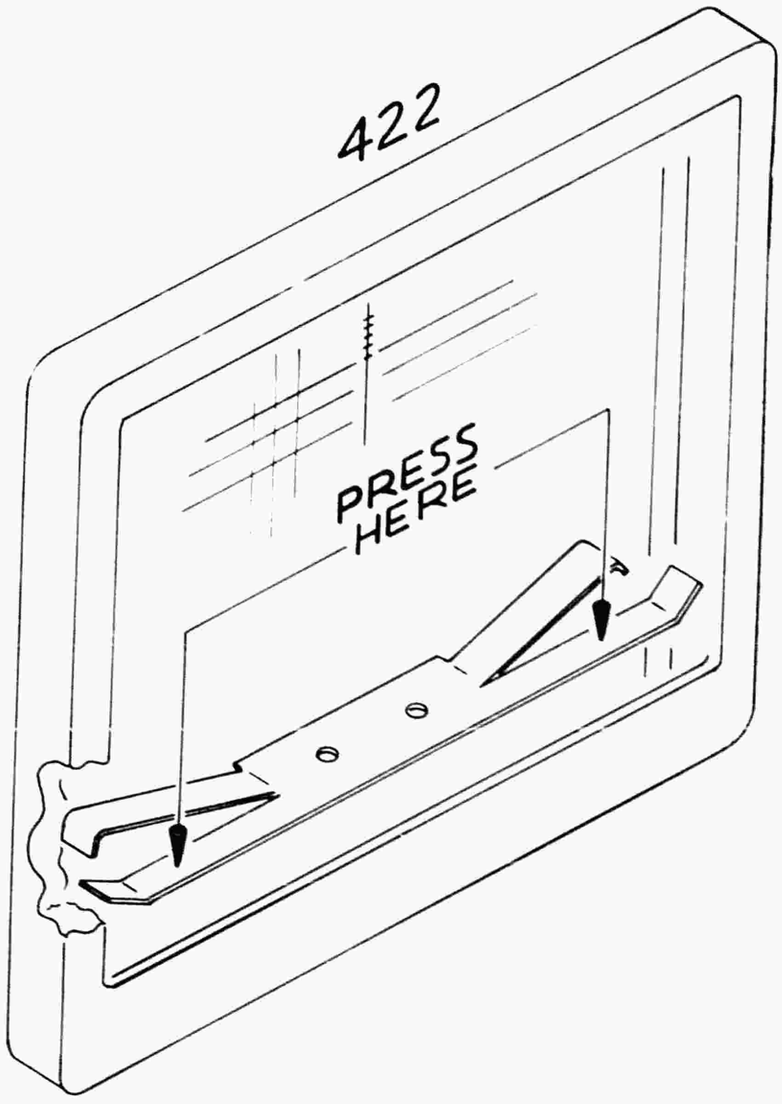
INSTALLATION:

Remove the adhesive backed foam pads from in front of the CRT and press in the new support spring as shown in the illustration.

Continued.

NEOPRENE Reg. TM of the Carboline Co.

Type 422



CHANGE IN CRT DEFLECTION SENSITIVITY WITH VARYING INTENSITY ELIMINATED

Effective Prod SN 4330 Usable in SN 100-4329

Deflection sensitivity changes of approximately 1% occur when the INTENSITY control was rotated from dim to fairly bright. The CRT grid to cathode voltage regulation was not optimum over this range of INTENSITY settings.

A 51 volt Zener diode and a 221k resistor were added as shown in the after schematic, to improve the CRT grid to cathode voltage regulation. This reduced the CRT sensitivity changes caused by intensity variations to approximately 0.3%.

Parts Removed:

	388-0619-00	Board, circuit HV Regulator

Parts Added:

*D839	152-0255-00	Diode, Zener, 51V 5% 400mW
*R839	321-0418-00	Resistor, prec., 221k 1/8W 5%
	388-0619-01	Board, circuit HV Regulator

INSTALLATION:

Parts Required: See 'Parts Added' with asterisks and parts listed below.

210-0629-00	Eyelet, (Tek #210-0663-00) gold plated, small
210-0632-00	Eyelet, (Tek #210-0617-00) gold dipped, large

a) Remove the HV Power Supply assembly from the instrument.

b) Remove the metal shield and the plastic lid from the Power Supply assembly.

NOTE: For future reference, observe how the HV circuit boards and HV transformer are mounted in the plastic container.

c) Remove the HV circuit boards and HV transformer from the plastic container.

d) Cut and remove approximately 3/16" of the circuit run on the High Voltage Regulation circuit board as shown in Fig. 1.

e) Drill two holes, using a #41 drill, in the location on the circuit board as shown in Fig. 1.

Continued.

INSTALLATION: (Continued)

f) Install, from the Fig. 1 side of the circuit board, the two large eyelets into the holes drill in step 5 and solder to the runs. Do not crimp the eyelets or fill them with solder.

g) Install a 51V zener diode (D839) and a 221k 1/8W 5% resistor (R839) in parallel between the two eyelets as shown in Fig. 2. The cathode (striped) lead of D839 should be toward C829. Solder to the eyelets.

h) Drill a hole, using a #51 drill, in the location shown in Fig. 1.

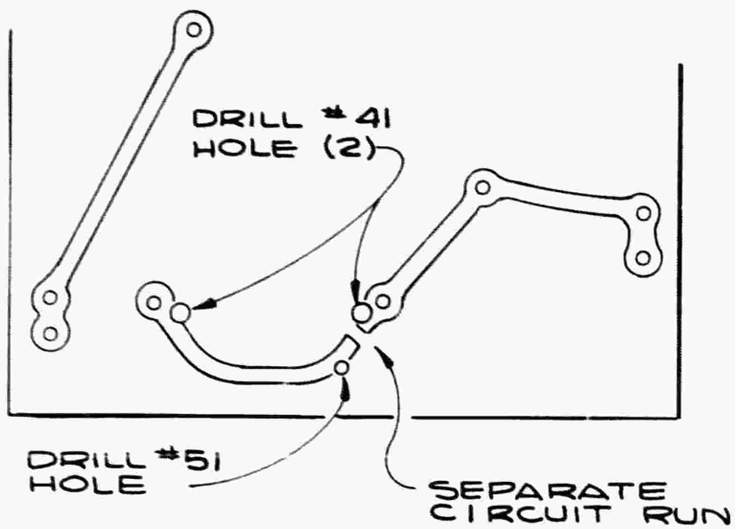
i) Install the small eyelet into the hole from the Fig. 1 side of the board. Crimp the eyelet, using a pair of rivet pliers from the FMS switch repair kit, and solder the rivet to the run. Do not fill the eyelet with solder.

j) Unsolder the two white-orange wires from "Board Reference A". See Fig. 2.

k) Use an ohmmeter to determine which of the white-orange wires goes to pin 3 of the CRT socket and solder this wire into the rivet installed in step i.

l) Resolder the remaining white-orange wire to the "Board Reference A" as shown in Fig. 2.

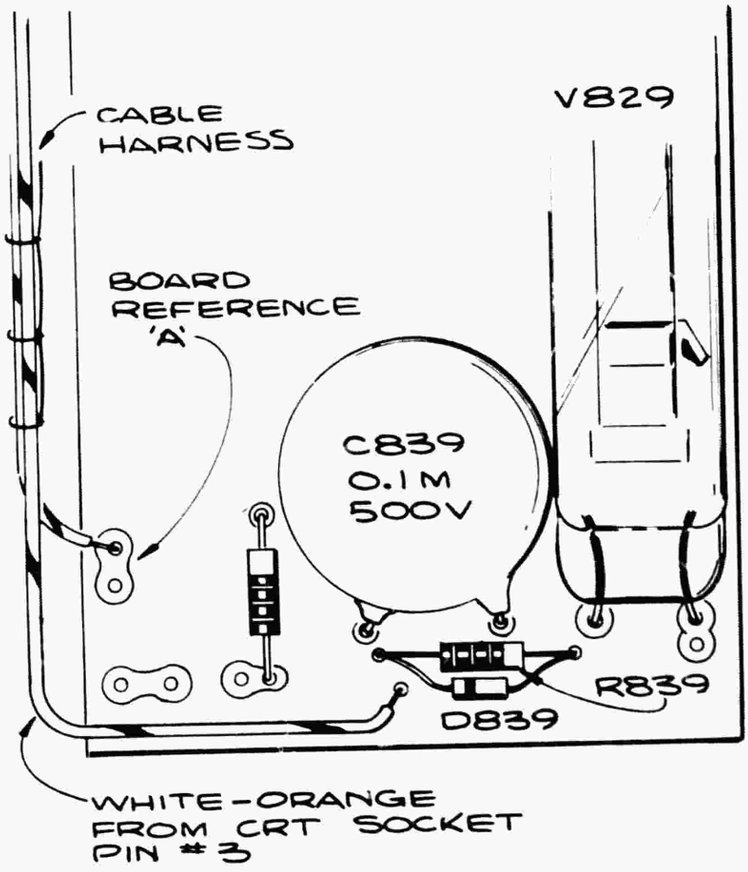
m) Perform steps a through c in reverse order.



BOTTOM VIEW

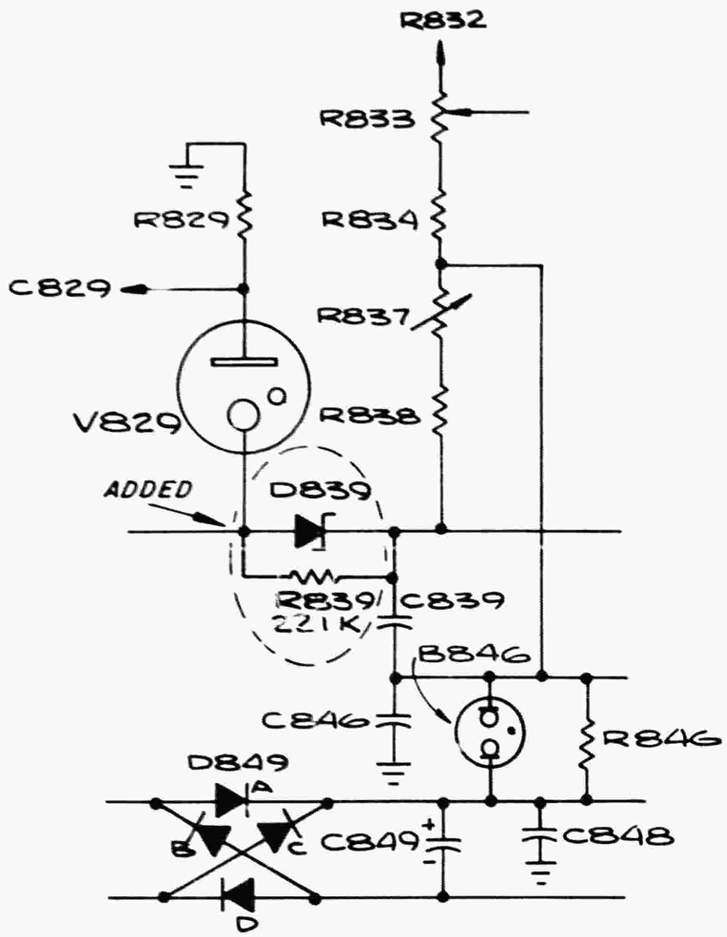
FIG. 1

Continued.



TOP VIEW

FIG. 2



ELIMINATES CRT FILAMENT VOLTAGE VARIATION
WHEN CHANGING FROM AC TO AC-DC SUPPLY

Effective Prod SN 4330

The CRT filament voltage was approximately 10% high than the nominal 6.3V when the Type 422 Oscilloscope was powered with the AC Power Supply. The input squarewave drive for T801 is 8kHz from the AC-DC supply, and 20kHz from the AC supply. Because of this, the CRT filament half-wave rectifier was supplying as much as 7V when used with the AC supply.

The CRT filament half-wave rectifier was replaced with a capsulated full-wave bridge rectifier 'package' to make the CRT filament voltage equal when used with either type power supply. Secondary winding 9-10 of HV transformer T801 changes from 12 to 13 turns and from 7.6 to 8.3 volt. Primary center taps (2 and 5) are relocated one turn, changing windings 1-2 and 5-6 from 38 to 39 turns, respectively and winding 2-3 and 4-5 from 4 to 3 turns respectively.

Parts Removed:

D849	152-0179-00	Diode, rectifier, unitrode
T801	120-0378-01	Transformer, HV
	179-0961-00	Cable, HV

Parts Added:

D849A-D	152-0260-00	Diode, rectifier, molded bridge assy UBR 261
T801	120-0378-02	Transformer, HV
	179-0961-01	Cable, HV

FAILURE OF Q863 AND Q864 REDUCED

Effective Prod SN 9563

Modified out of sequence: 9544-49 9555

Excessive voltage pulses are coupled to Q863 from the CRT unblanking plates causing failure of Q863 and Q864.

A 1.5k 1/4W 5% resistor was added in series with Q863's collector and a 300Ω 1/4W 5% resistor was added between the unblanking pulse output terminal and the junction of D864 and the emitter of Q863.

Parts Added:

R860	315-0152-00	Resistor, comp., 1.5k 1/4W 5%
R862	315-0301-00	Resistor, comp., 300Ω 1/4W 5%

CARRYING HANDLE CHANGED TO SIMPLIFY ASSEMBLY AND INCREASE STRENGTH

Effective Prod SN 3200

It was possible to simplify the assembly and increase the strength of the carrying handle by manufacturing it differently.

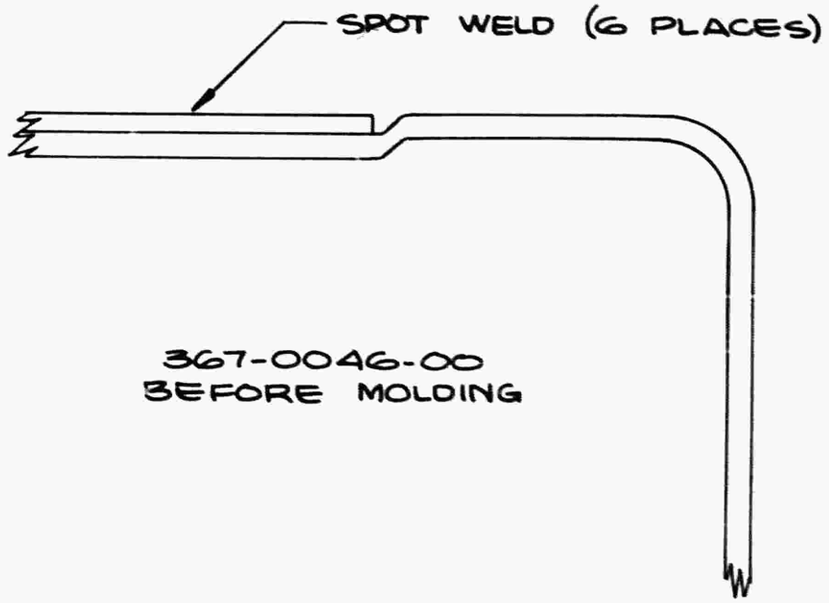
The carrying handle assembly was replaced with a new assembly that is identical in appearance but will use the Type 453 stainless steel left and right sides with a new cross tie, rather than cold rolled steel with overlapping joint. The finish was changed from chrome plate satin to type C-1 satin. See before and after drawings.

Parts Removed:

367-0046-00	Handle, carrying assembly	

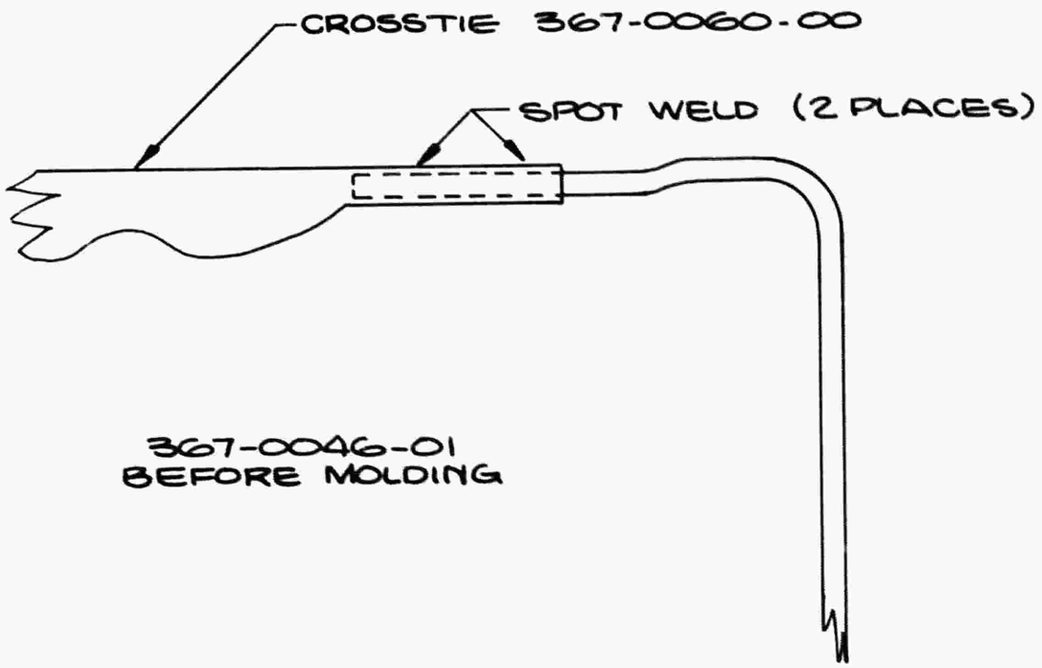
Parts Added:

367-0046-01	Handle, carrying assembly	
214-0515-00	Index hub	(2)
214-0513-00	Index ring	(2)
211-0512-00	Screw, 6-32 x 0.500 FH	(4)
214-0516-00	Index spring	(2)
200-0602-00	Cover	



Continued.

BEFORE CHANGE



AFTER CHANGE

SQUEAK IN STORAGE COMPARTMENT DOOR ELIMINATED

Effective Prod SN 4000 Usable in SN 100-3999

Noisy hinges on the front cover Accessory Compartment Door and R422 Storage Compartment Door.

Stainless steel hinge pins used on front cover Accessory Compartment Door and R422 Storage Compatment Door cause noise when operated.

The stainless steel pin hinges were replaced with new DELRIN® hinge pins to eliminate noise when door is operated.

422, 422-125B

Parts Removed:

2 ea	214-0518-00	Pin, hinge, 0.095 dia s.s. rod, 1.718" long

Parts Added:

2 ea	214-0756-00	Pin, hinge, 0.095 dia DELRIN, 1.785" long

R422

Parts Removed:

2 ea	214-0631-00	Pin, hinge, 0.095 dia s.s. rod, 1.220" long

Parts Added:

2 ea	214-0755-00	Pin, hinge, 0.092 dia DELRIN, 1.295" long

INSTALLATION:

Parts Required: See 'Parts Added'.

Replace steel pins with the DELRIN pins.

DELRIN Reg. TM of The Du Pont Co.

IMPROVED LATCH INSTALLED ON ACCESSORY COMPARTMENT LID

Effective Prod SN 8580 Usable in SN 100-8579

The previously used latch assembly was difficult to engage and frequently broke.

A new improved latch assembly was installed consisting of latch stem, 214-0787-00, and latch body, 204-0282-00. The addition of the new latch assembly caused the front cover assembly to be changed to 200-0604-02.

Parts Removed:

	200-0604-00	Cover, front assembly

Parts Added:

	200-0604-02	Cover, front assembly

INSTALLATION:

A set of two special chassis punches, part number 003-0506-00, are required to install the new latch in the field.

Parts Required:

1 ea	204-0282-00	Body, latch
1 ea	214-0787-00	Stem, latch

a) Remove the front cover assembly from the instrument.

b) Open the accessory compartment and remove the latch assembly from the kit.

To perform steps c and d, a set of two chassis punches, part number 003-0506-00, is required.

c) Using the smaller chassis punch marked 'LID', assemble the punch on the lid as shown in Fig. 1. and punch a rectangular hole, keeping the hole as parallel to the lid edge as possible.

d) Using the larger chassis punch marked 'LIP', assemble the punch in the same order as used in step c substituting the latch lip for the accessory compartment lid. Again keep the hole as parallel as possible to the lip edge.

Continued.

INSTALLATION: (Continued)

e) Insert the latch stem into the latch body as shown in Fig. 2 making certain the latch stem is inserted completely by squeezing the flexible wings together. together.

f) Install the latch assembly in the accessory compartment lid. Make certain the latch body is inserted through the hole in the lid far enough to allow the lid to seat in the recessed groove of the latch body.

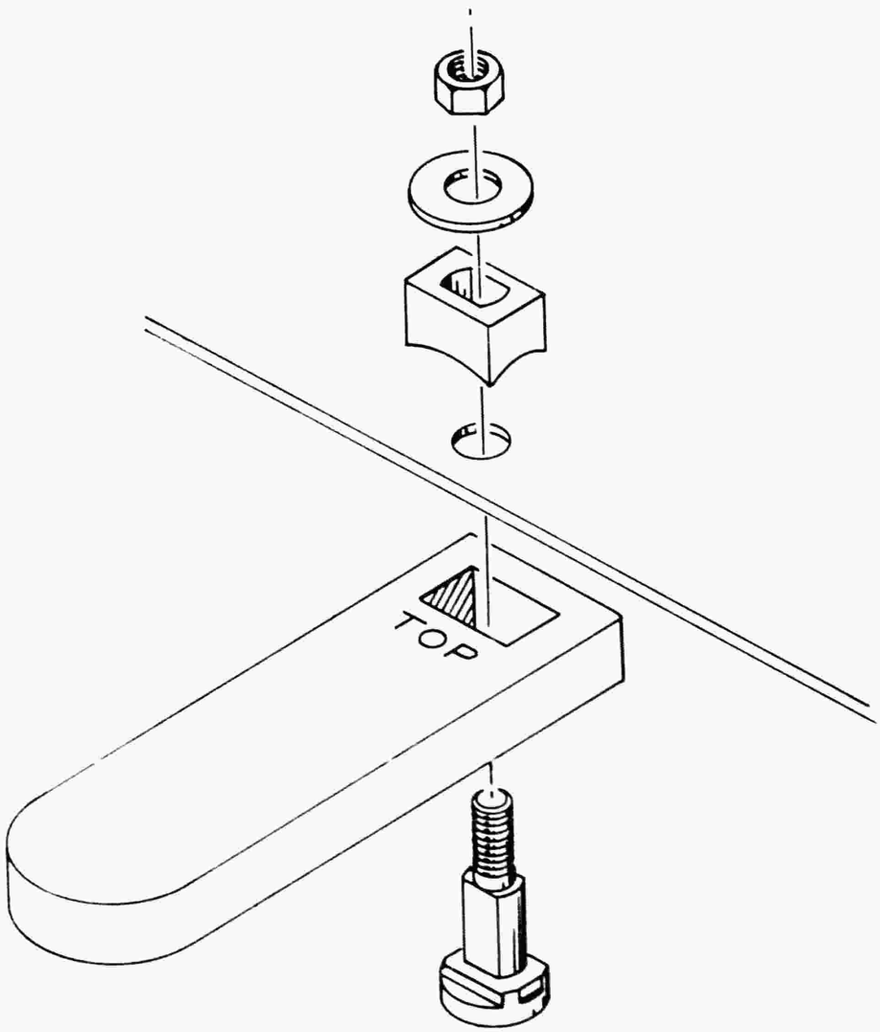


FIG. 1

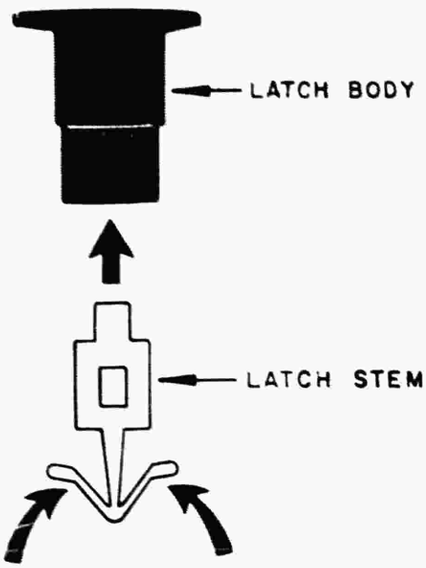


FIG. 2

SN 20,000 UP
Type 422

PRODUCT MODIFICATION INDEX

circuit section—XXX.XX page

1 CHANNEL 1 INPUT AMPLIFIER

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
20079	Input capacitors C10 and C110, 1.5pF, 281-0429-00, added when needed to properly adjust input capacitance at time of original capacitance.	14889	-----	-----	-----
22750-28630	Shortage of Dual FET, Q14A,B, 151-1011-00, was relieved by changing to 151-1011-01 which has a slightly different I_g specification.	15660	-----	-----	-----
25130	VARIABLE VOLTS/DIV potentiometers and CAL switches R90/SW743 were changed to improve reliability and availability.	16158	201.01 201.02	----- 1.0h	----- 050-0489-00
28000	The Channel 1 and Channel 2 Preamp circuit boards were redesigned to eliminate excessive vertical trace shift under high humidity operating conditions.	16004-1	201.03	-----	-----
30400	High frequency "Hash" from AC-DC supply caused trigger jitter when looking at a signal in Channel 1 and triggering in the Channel 1 and 2 MODE. Two wires from CH 1 VERT POSITION potentiometer were removed from the cable and rerouted.	16953	201.04	-----	-----
30640	AC-GND-DC switch SW1 insulating material was changed from phenolic to silicone glass to prevent moisture absorption which caused DC offset or hooky trace. @60-0665-00 was replaced by 260-1168-00.	16516	----- 201.05	----- 0.5h	----- 050-0520-00
30640	R35, 250Ω potentiometer, was changed from 311-0827-01 to 311-0827-00 and R57, 5k potentiometer, was changed from 311-0836-01 to 311-0836-00. The new potentiometers are less noisy and easier to adjust.	16978	-----	-----	-----

2 CHANNEL 2 INPUT AMPLIFIER

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
20079	Input capacitors, C10 and C110, 1.5pF, 281-0529-00, added when needed to properly adjust input capacitance at time of original capacitance.	14889	----	-----	-----
22750-28630	Shortage of Dual FET Q114A,B, 151-1011-00, was relieved by changing to 151-1011-01 which has a slightly different I_g specification.	15660	----	-----	-----
25130	VARIABLE VOLTS/DIV potentiometers and CAL switches, R90/SW741 and R190/SW743, were changed to improve reliability and availability.	16158	201.01 201.02	----- 1h	050-0489-00
28000	The Channel 1 and Channel 2 Preamp circuit boards were redesigned to eliminate excessive vertical trace shift under high humidity operating conditions.	16004-1	201.03	-----	-----
29774	R152 and R153 made selected parts to insure Channel 2 X10 Gain specifications. R152 was changed from 8.66k 1/8W 1%, 321-0283-00, to a nominal installed value of 8.45k 1/8W 1%, 321-0282-00. R153 was changed from 2.87k 1/8W 1%, 321-0237-00, to a nominal installed value of 2.80k 1/8W 1%, 321-0236-00.	16747	----	-----	-----
30640	AC-GND-DC switch SW101 insulating material was changed from phenolic to silicone glass to prevent moisture absorption which caused DC offset or hooky trace. 260-0665-00 was replaced by 260-1168-00.	16516	---- 201.05	----- 0.5h	050-0520-00
30640	R135, 250Ω potentiometer, was changed from 311-0827-01 to 311-0827-00, which is less noisy and easier to adjust.	16978	----	-----	-----

*series model
N/A - Not Available yet.
##Indicates changes made since last publication.

SN 20,000-UP

Type 422 | **PRODUCT MODIFICATION INDEX**

circuit
section — XXX.XX
page

◇3 ATTENUATORS

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
	NONE				

4 VERTICAL SWITCHING AND OUTPUT AMPLIFIER

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
21966	Channel 2 trace tilt eliminated. Components relocated.	15283	204.01	-----	-----
25000	Instrument performance under high humidity conditions improved by changing to sealed delay line.	15311-1	204.02	-----	-----
28000	Transient response was improved by making C227 a selected part. The nominal installed value will change from 4.7pF, 500V N330, 281-0501-00, to 4.7pF NPO, 281-0592-00. If selection is necessary, C227 will be one of the following: 3.9pF, 281-0593-00; 5.6pF, 281-0544-00; 6.8pF, 281-0572-00; or 8.0pF, 281-0503-00.	16004-3	----	-----	-----

SN 20,000-UP

Type 422 | **PRODUCT MODIFICATION INDEX**

circuit
section — XXX.XX
page

5 SWEEP TRIGGER

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.

NONE

7-15-70

*series model

circuit section—XXX.XX page

6 SWEEP GENERATOR

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
21354	Tunnel diode, D405 changed to improve reliability. 152-0081-00 changed to 152-0402-00.	13967	---- 206.01	0.2h	050-0425-00

circuit section—XXX.XX page

7 TIMING SWITCH

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
21350	Timing accuracy improved by changing value and tolerance of R440E, 590k 1/2W 1%, 323-0459-00, replaced by 588k 1/2W 0.5%, 323-0773-01.	14711	----	-----	-----
21940	Timing error and sweep linearity improved by changing components.	15273	207.01	-----	-----

circuit section—XXX.XX page

8 HORIZONTAL AMPLIFIER

EFF. SN. S.M*	DESCRIPTION	MOD NO	PAGE	LABOR TIME	KIT NO.
21142	Linearity improved by replacing horizontal amplifier diode.	15185	208.01	-----	-----
21940	Timing error and sweep linearity improved.	15273	207.01	-----	-----
25000	Timing match between X1 and X10M sweep operation improved by changing R532 to a test selected part.	15311-3	208.02	-----	-----

9 CALIBRATOR & REGULATOR

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
28000	The Calibrator/Regulator board was redesigned to provide an adjustable solid state -81V supply. The new supply replaces V739 to eliminate timing error problems associated with ZZ1000 regulator tubes.	16004-2	209.01	-----	-----
30640	R732, 5k potentiometer, was changed from 311-0836-01 to 311-0836-00, which is less noisy and easier to adjust.	16978	----	-----	-----

10 CRT CIRCUIT

EFF. SN. S.M*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
25000	Diode, D841, damage due to arcing in high voltage supply eliminated by adding resistors.	15311-4	210.01	-----	-----
30660 (Approx. Actual)	Vibrations of V829 could cause sweep reset tunnel diode to trigger and show on the trace as intermittent sweep length. To prevent the vibration, a 1/2" x 3/4" piece of polyurethane foam tape (253-0056-00) was added to the High Voltage Regulator circuit board under V829.	17444	----	0.2h	-----
31760	CRT, V859, was changed from glass to ceramic type to improve availability of raw material.	17774	210.02	-----	-----

SN 20,000-UP

Type 422 | **PRODUCT MODIFICATION INDEX**

circuit section XXX.XX page

11 AC POWER SUPPLY

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.

SEE SECTION 3

circuit section—XXX.XX page

12 MISCELLANEOUS

	EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
	20000	Complete instrument extensively modified to incorporate FETs and other improvements.	13111	----	-----	-----
	25200	Mesh filter improved. 378-0571-00 replaced by 378-0648-00.	15369	----	-----	-----
	30520	Because of customer preference for blue CRT filters, smoke gray filter, 378-0549-00, was replaced by blue filter, 378-0664-00 in Standard Accessories shipped with the instrument. Mesh filter, 378-0648-00 and BNC to binding post adapter, 103-0033-00 were removed.	16765	----	-----	-----
	32470	All standard circuit board mounted potentiometers were replaced to permit using alternate sources and to improve component availability. Refer to your Instruction Manual for part numbers.	17667	----	-----	-----
	34030	Latch mechanism for the carrying handle was redesigned.	20371	212.01 212.02	----- 0.5h	Included In 050-0663-02
##	35670	To provide new modular probes, the standard accessory P6012 probe packages (010-0203-00) were replaced with new P6108 modular probe packages (010-6108-01).	24852	-----	-----	-----

VARIABLE VOLTS/DIV POTENTIOMETERS IMPROVED

Effective Prod SN 25130 Usable in SN 11370-25129

Reliability and availability of the VARIABLE VOLTS/DIV potentiometers and CAL switch R90/SW741 and R190/SW743 was improved by changing from 311-0385-01 to 311-0385-02. Replacement kit 050-0489-00 is available to facilitate the replacement of R90/SW741 or R190/SW743 in premodified instruments.

Parts Removed:

R81 R181	315-0101-00	Resistor, comp., 100Ω 1/4W 5%
R90/SW741 R190/SW743	311-0385-01	Resistor, var., comp., 250Ω ±10% .5W SPST Sw.
R91 R191	315-0102-00	Resistor, comp., 1k 1/4W 5%

Parts Added:

R81 R181	315-0221-00	Resistor, comp., 220Ω 1/4W 5%
R90/SW741 R190/SW743	311-0385-02	Resistor, comp., var., 250Ω ±10% .5W SPST Sw. A. B.

product modification

050-0489-00
M16158

Type 422/R422

VARIABLE VOLTS/DIV POTENTIOMETER REPLACEMENT

For TEKTRONIX® Type 422/R422 Oscilloscopes
Serial Numbers 11370-25129

Potentiometer 311-0385-01 is no longer available and is replaced with 311-0385-02 in the above listed instruments. The new potentiometer has a different contact configuration, a different taper and also offers improved reliability.

In addition, R91 or R191 (1k padding resistor) is removed and R81 or R181 is changed to 220Ω which improves the range of the VARIABLE VOLTS/DIV and GAIN potentiometers.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions as PN 311-0385-02 is a direct replacement.

7-30-70
Supersedes: 4-30-70

201.02

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Ckt.No.	Quantity	Part Number	Description
R90 OR R190	1 ea	311-0385-02	Potentiometer, comp. 250Ω
R81 OR R181	1 ea	315-0221-00	Resistor, comp. 220Ω 1/4W 5%

INSTRUCTIONS

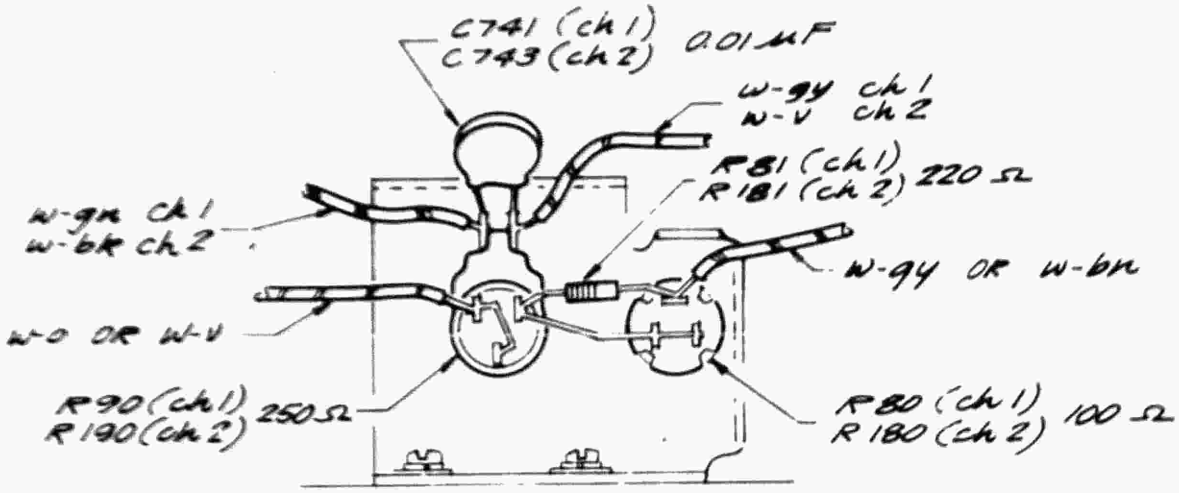
A. To replace the VARIABLE VOLTS/DIV potentiometer, R90, in channel 1:

( ) 1. Unsolder the leads from the VARIABLE VOLTS/DIV potentiometer, R90. Loosen the shaft coupling and mounting nut and remove the potentiometer from the instrument.

( ) 2. Remove the 1k resistor, R91, and the 100Ω resistor R81 which were connected between the VARIABLE VOLTS/DIV potentiometer and the GAIN potentiometer.

( ) 3. Mount the new potentiometer (from kit) using the old mounting hardware.

( ) 4. Install a new R81, 220Ω 1/4W 5% resistor (from kit) and wire the new potentiometer. See drawing.



Indicates change since last publication.

INSTRUCTIONS (continued)

B. To replace the VARIABLE VOLTS/DIV potentiometer, R191, in channel 2:

( ) 1. Unsolder the wire from the AC-GND-DC switch that goes to the VOLTS/DIV switch and the ground lead from the BNC connector.

( ) 2. Remove the VARIABLE and the VOLTS/DIV knobs, and remove the VOLTS/DIV switch and the GAIN control mounting nuts.

( ) 3. Disconnect all the leads from the circuit board.

( ) Remove the circuit board from the instrument.

( ) 4. Remove the 1k resistor, R191 and the 100Ω resistor, R181 which were connected between the VARIABLE VOLTS/DIV potentiometer and the GAIN potentiometer.

( ) 5. Unsolder the remaining leads from the VARIABLE VOLTS/DIV potentiometer R190. Remove the potentiometer and replace it with a new one (from kit), using the old mounting hardware.

( ) 6. Install a new R181, 220Ω 1/4W 5% resistor (from kit) and wire the potentiometer. See drawing.

( ) 7. Reinstall the etched circuit board-switch assembly by reversing the removal procedure.

THIS COMPLETES THE INSTALLATION.

( ) Make the following changes to your Manual schematic and parts list:

Delete R91 or R191, 1k 1/4W 5%	315-0102-00
Change R81 or R181 to 220Ω 1/4W 5%	315-0221-00
Change R90-SW741 or R190-SW743 to	311-0385-02

DF:ls

EXCESSIVE VERTICAL TRACE SHIFT ELIMINATED

Effective Prod SN 28000

To eliminate excessive vertical trace shift under high humidity operating conditions, and to allow instrument to meet new operating humidity specifications the circuitry on Channel 1 and Channel 2 PreAmp circuit boards, 670-0404-02 and 670-0405-03 respectively, were redesigned to reduce surface leakage. See Mod 15311-1 on page 204.02.

Parts Removed:

	670-0404-02	Circuit Board, Channel 1 PreAmp
	670-0405-03	Circuit Board, Channel 2 PreAmp

Parts Added:

	670-0404-03	Circuit Board, Channel 1 PreAmp
	670-0405-04	Circuit Board, Channel 2 PreAmp

New Channel 1 PreAmp board 670-0404-03 is identical to the old board 670-0404-02 except as follows:

Parts Removed:

C15	283-0068-00	Capacitor ceramic, .01µF 500V
C22	283-0059-00	Capacitor, ceramic, 1µF 25V
R23	315-0103-00	Resistor, comp., 10k 1/4W 5%
R35	311-0827-00	Resistor, variable, cermet 250Ω .5W
R57	311-0836-00	Resistor, variable, cermet 5k .5W
	136-0329-00	Socket, Tran. 6 pin TEFLON®

Parts Added:

C15	283-0059-00	Capacitor, ceramic, 1µF 25V
C22	283-0111-00	Capacitor, ceramic, disc., .1µF 50V
R23	315-0474-00	Resistor, comp., 470k 1/4W 5%
R35	311-0827-01	Resistor, variable, 250Ω .5W Spectrol only
R57	311-0836-01	Resistor, variable, cermet, 5k .5W Spectrol only
	136-0235-01	Socket, Semicon Device, 136-0235-00 w/TEFLON ins.

TEFLON Reg. TM of The DuPont Co.

Continued.

New Channel 2 PreAmp board 670-0405-04 is identical to old board 670-0405-03 except as follows:

Parts Removed:

C122	283-0059-00	Capacitor, ceramic, 1μF 25V
R123	315-0103-00	Resistor, comp., 10k 1/4W 5%
R135	311-0827-00	Resistor, variable, cermet 250Ω .5W
	136-0329-00	Socket, Trans. 6 pin TEFLON

Parts Added:

C122	283-0111-00	Capacitor, ceramic, disc., .1μF 50V
R123	315-0474-00	Resistor, comp., 470k 1/4W 5%
R135	311-0827-01	Resistor, variable, 250Ω .5W Spectr only
	136-0235-01	Socket, semicon device, 136-0235-00 w/TEFLON ins.

TRIGGER JITTER ELIMINATED

Effective Prod SN 30400

High Frequency "Hash" from the AC-DC supply caused trigger jitter when looking at a signal in Channel 1, and triggering in the Channel 1 and 2 Mode.

Vertical cable was changed from 179-0941-02 to 179-0941-03. New cable has wires connecting R60, CH 1 VERT POSITION potentiometer, to pins L and J on Channel 1 Input Amp board removed. The above wires were replaced outside of cable as follows: A white-orange #26 str. wire 7-1/2" long with connector 131-0371-00 one end was added from rear center terminal R60 to pin L CH 1 Input Amp board. A white-yellow #26 str. wire 8-3/4" long with connector 131-0371-00 one end was added from front center terminal R60 to pin J CH 1 Input Amp board. Wires were dressed along the top of the board.

Parts Removed:

179-0941-02	Cable, Vertical	(1)

Parts Added:

131-0371-00	Connector, terminal	(2)
175-0529-00	8-3/4" wire #26 str. white-yellow	
175-0529-00	7-1/2" wire #26 str. white-orange	
179-0941-03	Cable, Vertical	(1)

product modification

050-0520-00
M16516
Types 3A9,422/R,
491/R

LEVER SWITCH REPLACEMENT

For the following TEKTRONIX® Type Instruments:

Type 3A9	Serial Numbers B010100-B061869
Type 422 and R422	Serial Numbers 100-30640
Type 491 and R491	Serial Numbers B010100-B231609

Lever switch, PN 260-1168-00, replaces lever switch, PN 260-0665-00.

The new switch has a slightly different contact configuration and uses silicone glass insulating material which eliminates problems caused by moisture absorbtion under high humidity conditions.

12-1-70

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

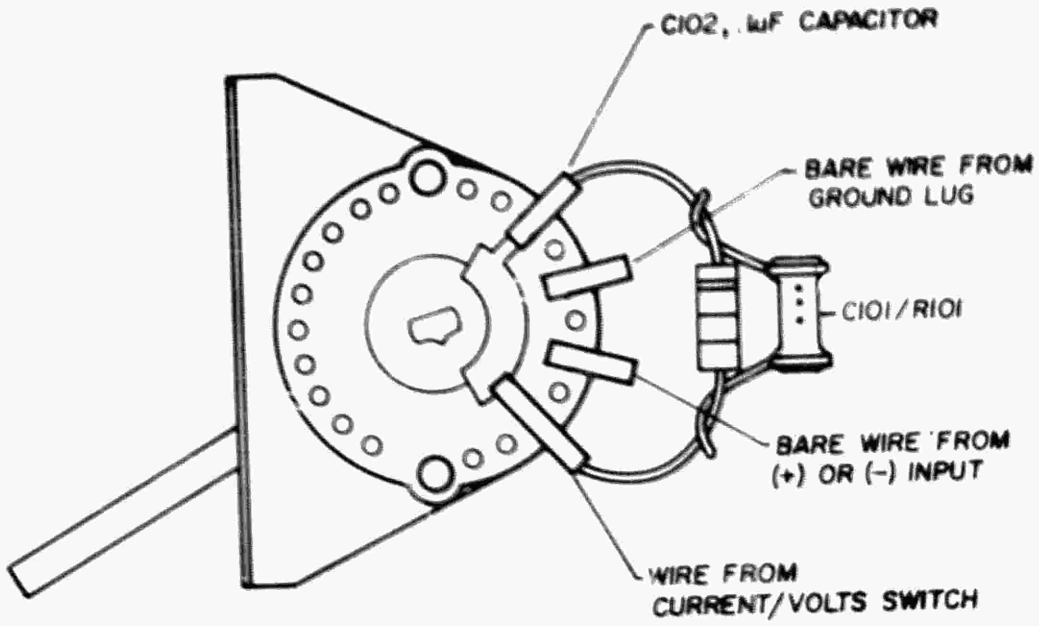
Quantity	Part Number	Description
1 ea	260-1168-00	Switch, lever
1 ea		Wire, #22 Bare 3"

INSTRUCTIONS

Refer to the appropriate drawing and replace the 260-0665-00 lever switch with the new 260-1168-00 lever switch, from the kit.

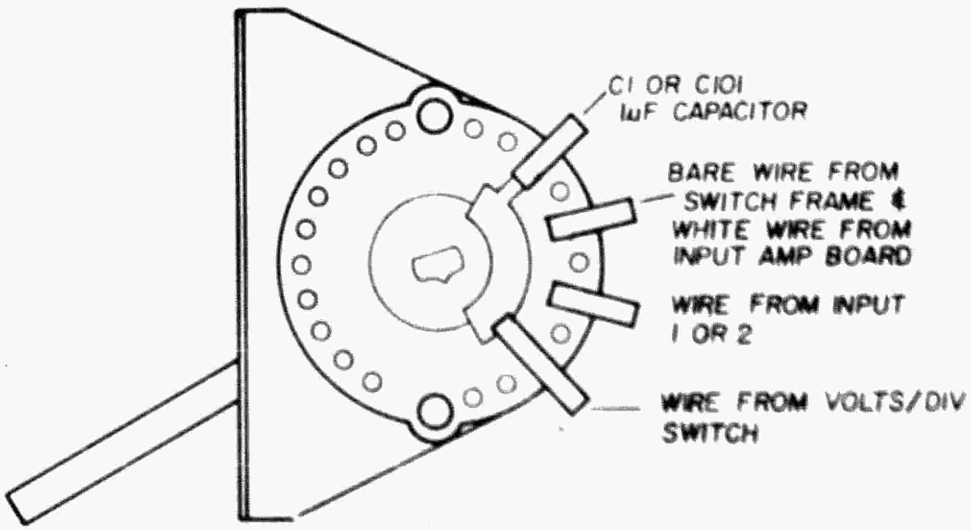
Correct the Electrical Parts List in your Instruction Manual.

DF:ls



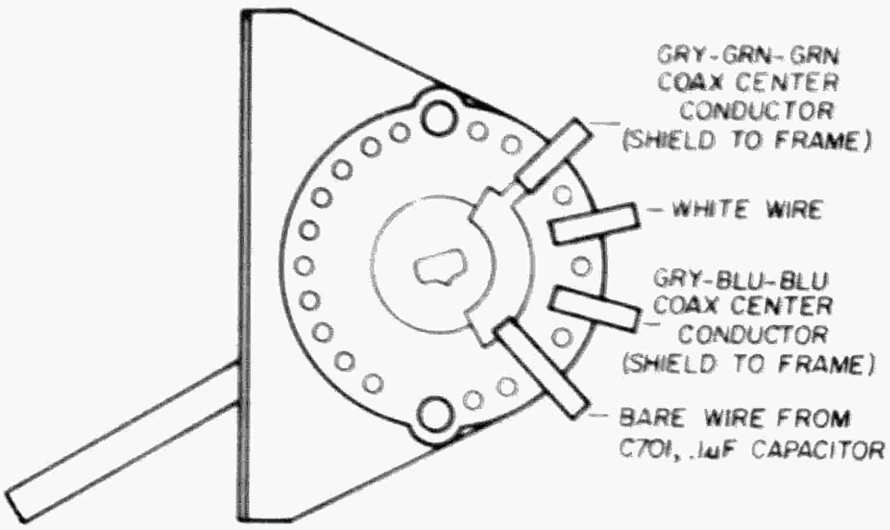
3A9

SW 101 - AC-GND-DC (+) input
SW 201 - AC-GND-DC (-) input



422 - R422

SW 1 - AC-GND-DC CH 1
SW 101 - AC-GND-DC CH 2



491 - R491

SW 700 - Source

CHANNEL 2 TRACE TILT ELIMINATED

Effective Prod SN 21966

Modified out of sequence:

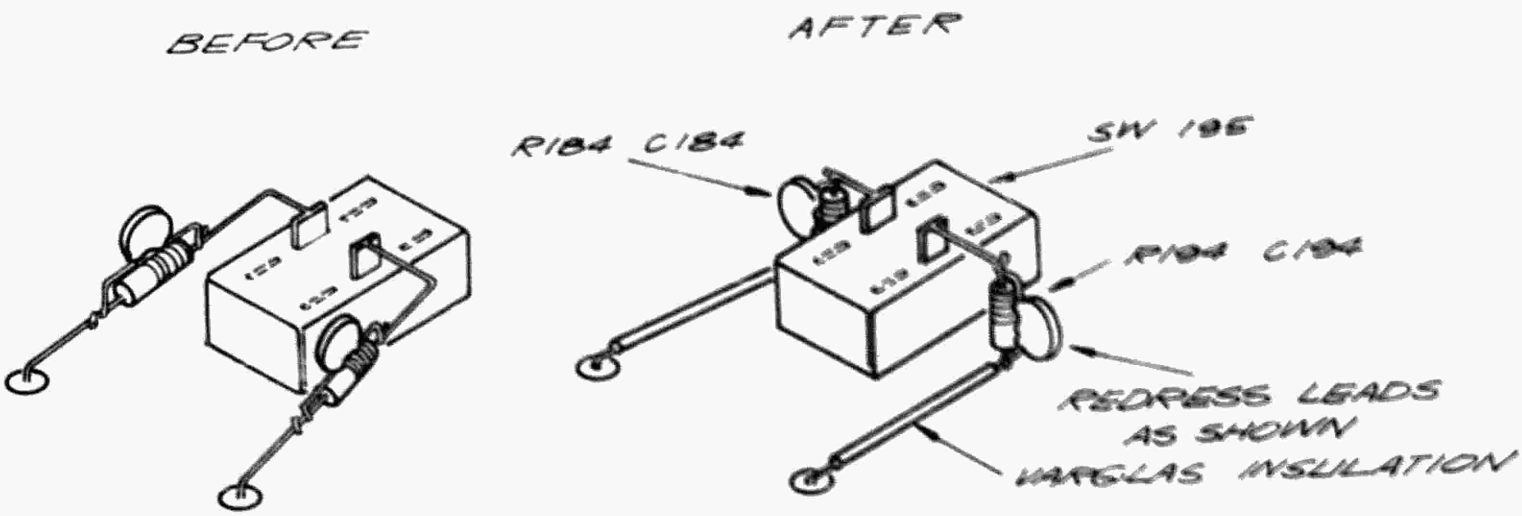
20000	20094	20337	20719	21100	21339
20003-05	20098-99	20414	20730	21121	21444
20007-13	20107	20454	20741	21134-35	21449
20018	20110	20459	20762	21142	21523
20052	20112	20473	20766	21145	21535
20054-55	20114	20477	20796	21152	21663
20057	20116	20482	20811	21171	21695
20059	20118	20489	20826	21176	21707
20062-63	20121	20495	20957	21213	21738
20065	20127	20502	20985	21221	21740-41
20071	20129	20523	21007	21256	21757
20073-74	20132-34	20541	21030	21271	21795
20080	20138	20556	21034	21298-99	21805
20082	20145	20563	21052	21304	21871
20084	20160	20569	21058	21309	21873
20086	20196	20584	21070	21319	21875
20088	20301-02	20620	21091	21321-22	21880
20090	20333	20645	21097	21334	21888
					21933

In Alternate mode with no signal in Channel 2 baseline may tilt slightly at 1mV/Div with input switch in DC at 10µs/Div.

Alternate switching signal radiates into Gate of Q114A from parallel combinations of R184-C184 and R194-C194.

The combinations were relocated as shown in drawings on page 2.

Continued.



INSTRUMENT PERFORMANCE IMPROVED

Effective Prod SN 25000

Under conditions of high humidity the transient response may be degraded due to moisture absorption by the delay line core material. To prevent this the open delay line was replaced by a sealed delay line.

Component values were changed to optimize compensation and termination of the delay line. See Mod 16004-1, page 201.03.

Parts Removed:

C22 C122	283-0081-00	Capacitor, ceramic, 0.1uF, 25V
L240	119-0037-01	Delay Line Assembly
R23 R123	315-0474-00	Resistor, comp., 470k 1/4W 5%
	136-0220-00	Socket, transistor, 3 pin
2 ea	136-0235-00	Socket, transistor, 6 pin
	343-0144-00	Clamp, plastic, loop
	441-0601-03	Chassis, main
	670-0407-02	Vertical Switching and Output Amplifier circuit board

Parts Added:

C22 C122	283-0059-00	Capacitor, ceramic, 1.0uF, 25V
L240	119-0209-00	Delay Line Assembly
R23 R123	315-0103-00	Resistor, comp., 10k 1/4W 5%
2 ea	136-0329-00	Socket, transistor, 6 pin TEFLON®
	136-0331-00	Socket, transistor, 3 pin TEFLON
	343-0257-00	Delay Line Clamp
	441-0601-05	Chassis, main
	670-0407-03	Vertical Switching and Output Amplifier circuit board kit

TEFLON Reg. TM of the Du Pont Co.

Continued.

New Vertical Switching and Output Amplifier circuit board kit 670-0407-03 is the same in all respects as 670-0407-02 except for the following:

Parts Removed:

C227	281-0503-00	Capacitor, ceramic, 8pF, 500V
C228	281-0505-00	Capacitor, ceramic, 12pF 500V
C239	281-0504-00	Capacitor, ceramic, 10pF 500V
R227	315-0912-00	Resistor, comp., 9.1k 1/4W 5%
R228	315-0243-00	Resistor, comp., 24k 1/4W 5%
R242 R252	321-0097-00	Resistor, prec., 100Ω 1/8W 1% MF

Parts Added:

C227	281-0501-00	Capacitor, ceramic, 4.7pF 500V
C228	281-0541-00	Capacitor, ceramic, 6.8pF 500V
C239	281-0505-00	Capacitor, ceramic, 12pF 500V
R227	315-0273-00	Resistor, comp., 27k 1/4W 5%
R228	315-0822-00	Resistor, comp., 8.2k 1/4W 5%
R242 R252	321-0091-00	Resistor, prec., 86.6Ω 1/8W 1% MF

product modification

050-0425-00
M13967

Type - See Below

TUNNEL DIODE REPLACEMENT

For the following TEKTRONIX® Type Instruments:

Type 3B1 Time-Base Unit	-- Serial Numbers	101-up
Type 3B2 Time-Base Unit	-- Serial Numbers	100-up
Type 3B3 Time-Base Unit	-- Serial Numbers	100-up
Type 21A Time-Base Unit	-- Serial Numbers	7000-up
Type 22A Time-Base Unit	-- Serial Numbers	7000-up
Type 283/R283 Real-Time Adapters	-- Serial Numbers	B010100-up
Type 422/R422 Oscilloscopes	-- Serial Numbers	100-up
Type 491/R491 Spectrum Analyzers	-- Serial Numbers	B010100-up
Type 546/RM546 Oscilloscopes	-- Serial Numbers	100-up
Type 547/RM547 Oscilloscopes	-- Serial Numbers	100-up
Type 556/R556 Oscilloscopes	-- Serial Numbers	100-up

Tunnel Diode Replacement Kit, PN 050-0425-00, replaces Tunnel diodes, PN 152-0081-00 and PN 152-0402-00. The new 152-0402-00 diode supplied with this kit is identical in all respects with the diode being replaced except that the anode and cathode configuration may be reversed.

Indicates change made since last publication.

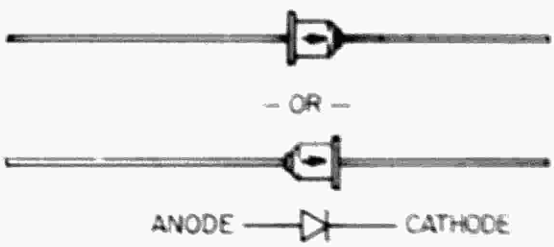
11-12-70
Supersedes: 7-16-70

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	152-0402-00	Diode, tunnel

INSTRUCTIONS

( ) Replace the defective diode with the new one from the kit, noting the direction of the cathode as indicated by the arrow on the case. See drawing.



( ) Correct the Electrical Parts List in your Instruction Manual.

DF:ls

HORIZONTAL AMPLIFIER COMPONENTS CHANGED TO IMPROVE LINEARITY

Effective Prod SN 21940

Modified out of sequence:

20000	20112	20495	21034	21319	21677	21880
20003-05	20114	20502	21052	21321-22	21688	21888
20007-13	20116	20523	21058	21334	21695	21898
20018	20118-19	20541	21070	21339	21707	21912-13
20052	20121	20556	21091	21403-04	21738	21923
20054-55	20127	20563	21097	21415	21740-41	21933
20057	20129	20569	21100	21442	21756-57	21935
20059	20132-34	20584	21121	21444	21760	
20062-63	20138	20620	21134-35	21449	21779	
20065	20145	20645	21142	21517	21789	
20071	20160	20719	21145	21523	21795	
20073-74	20196	20730	21152	21535	21805	
20080	20301-02	20741	21171	21544	21816	
20082	20333	20762	21176	21557	21822	
20084	20337	20766	21213	21568	21842	
20086	20414	20796	21221	21574	21844	
20088	20454	20811	21256	21578-80	21846	
20090	20459	20826	21271	21584-96	21849-50	
20094	20473	20957	21298	21598-600	21860	
20098-99	20477	20985	21299	21606	21871	
20107	20482	21007	21304	21663	21873-75	
20110	20489	21030	21309	21675	21878	

Timing error and sweep linearity out of specifications at 0.5µs x 10 Mag and components were being selected for a compromise between geometry and linearity.

Horizontal Amplifier collector resistors were changed to achieve balance. Other component values were changed to correct gain and improve timing. R532 was added in parallel with R440C (through a previously unused section of SW535) when the X10 Mag is pulled.

Parts Removed:

SW440	262-0722-01	Switch, wired TIME/DIV
	670-0413-02	Circuit board, wired Horiz. amp

Parts Added:

SW440	262-0722-02	Switch, wired TIME/DIV
	670-0413-03	Circuit board, wired, Horiz. amp

Continued.

TIME/DIV switch 262-0722-02 is the same as the 262-0722-01 except for the following:

Parts Added:

	175-0639-00	4 inch wire, TEFLON®, #24 stranded brown
	175-0640-00	7 1/4 inch wire, TEFLON, #24 stranded blue

Horiz. Amp. circuit board 670-0413-03 is the same as the old 670-0413-02 except for the following:

Parts Removed:

C556	281-0543-00	Capacitor, ceramic, 270pF 500V ±10%
C561	281-0513-00	Capacitor, ceramic, 27pF 500V ±5.4pF
R544	310-0669-00	Resistor, ww, 8.5k ±1% 4W
R554	310-0668-00	Resistor, ww, 12.4k ±1% 4W
R556	321-0181-00	Resistor, 1/8W MF 750Ω 1%
R561	321-0208-00	Resistor, 1/8W MF 1.43k 1%
R562	321-0148-00	Resistor, 1/8W MF 340Ω 1%

Parts Added:

C556	283-0598-00	Capacitor, mica 253pF ±5% 300V DC
R532	317-0106-00	Resistor, comp., 10M 1/8W 5%
R544	310-0688-00	Resistor, ww, 9.5k ±1% 4W
R554	310-0689-00	Resistor, ww, 10k ±1% 4W
R556	321-0168-00	Resistor, 1/8W MF 549Ω 1%
R562	321-0154-00	Resistor, 1/8W MF 392Ω 1%

TEFLON Reg. TM of The Du Pont Co.

HORIZONTAL AMP DIODE REPLACED TO IMPROVE LINEARITY

Effective Prod SN 21142

Modified out of sequence:

12198	20112	20459	20639	20814	20956-57	21068
20000-05	20114	20473	20645-46	20824	20962	21070
20007-13	20116-19	20477	20660	20826	20969-72	21072
20018	20121-25	20482	20668	20828	20980-85	21074-76
20050-55	20127	20489	20688	20836	20989-99	21078-80
20057	20129	20495	20710-11	20855	21001	21083-86
20059-65	20131-34	20502	20714	20860-61	21006-07	21088
20068	20138	20523	20719	20868	21010-11	21091-93
20070-71	20145	20541	20725-26	20872	21013-14	21095-98
20073-74	20160	20556	20730	20878	21017	21100-09
20078	20183	20563	20741	20900	21021-26	21111
20080	20211	20567	20743	20902	21030-32	21113-16
20082-84	20227	20569-70	20756	20906	21034	21118-19
20086	20254	20584	20762	20918	21036	21121-31
20088-90	20301-02	20588	20766	20929	21040-41	21133-40
20094	20332-33	20593	20768	20940	21046	
20096	20337	20598	20791	20944	21051-54	
20098-99	20414	20609	20796	20946	21058	
20107	20450	20620	20805	20949-51	21060-61	
20110	20454	20631	20810-11	20954	21064	

Non-linearity between fifth and sixth division of the 100 division 0.5µs x 10 Mag. timing range caused by charge storage in collector catching diode D524.

Diode D524 was changed from a silicon diode to a hot carrier diode.

Parts Removed:

D524	152-0233-00	Diode, silicon type CDC 1128

Parts Added:

D524	152-0322-00	Diode, 10W leakage, Hot carrier IR 100nA Max at 10V, microglass case

TIMING MATCH BETWEEN X1 AND X10M SWEEP OPERATION IMPROVED

Effective Prod SN 25000

R532, 10M resistor added at SN 21960 by Mod 15273, was changed to a test selected part. The nominal installed value is 6.8M.

Parts Removed:

R532	317-0106-00	Resistor, comp., 10 Meg, 1/8W 5%

Parts Added:

R532	317-0685-00	Resistor, comp., 6.8 Meg 1/8W 5%

ZZ1000 REGULATOR TUBE ELIMINATED

Effective Prod SN 28000

The Calibrator/Regulator board was redesigned to provide an adjustable solid state -81V supply. The new supply eliminates V739 to correct parts shortage and timing error problems associated with ZZ1000 regulator tubes.

Parts Removed:

	670-0420-02	Circuit Board, Cal and Reg.

Parts Added:

	670-0420-03	Circuit Board, Cal and Reg.

New Cal and Reg. board 670-0420-03 is identical to the old board 670-0420-02 except as follows:

Parts Removed:

C735 C737	283-0068-00	Capacitor, ceramic, .01µF 500V
C739	290-0188-00	Capacitor, EMT .1µF 35V DC
D735	152-0333-00	Semiconductor Device, Diode, Signal
D739	152-0166-00	Semiconductor Device, Diode 6.2V Zener
Q734	151-0136-00	Transistor, Silicon
R733	315-0182-00	Resistor, comp., 1.8k 1/4W 5%
R734	315-0432-00	Resistor, comp., 4.3k 1/4W 5%
R735	315-0474-00	Resistor, 470k 1/4W 5%
R738	315-0102-00	Resistor, comp., 1k 1/4W 5%
V739	154-0370-00	Tube, Vacuum Type ZZ1000
	136-0183-00	Socket, Transistor, 3 pin
	343-0088-00	Clamp, Cable Size (C) DELRIN® Snap

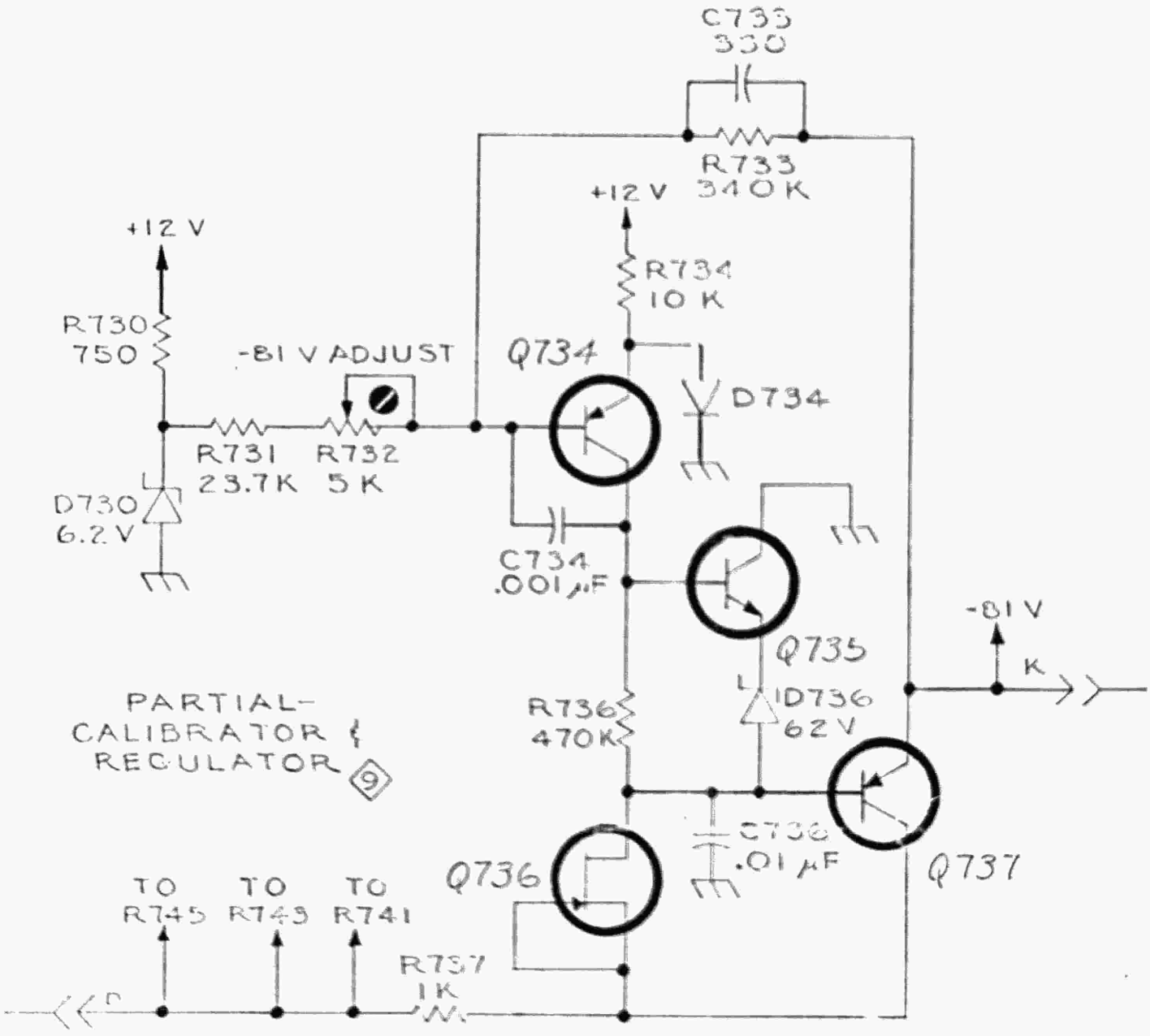
DELRIN Reg. TM of The DuPont Co.

Continued.

Parts Added:

C733	281-0546-00	Capacitor, ceramic, 330pF 500V
C734	283-0067-00	Capacitor, ceramic, .001uF 200V
D730	152-0461-00	Semiconductor Device, Diode 6.2V Zener ±5% .01%/°c
D734	152-0185-00	Semiconductor Device, Diode DO-35
D736	152-0285-00	Semiconductor Device, Diode 62V DO-7 Zener
Q734	151-0220-00	Transistor, silicon, PNP TO-18
Q735	151-0224-00	Transistor, silicon, NPN TO-18
Q736	151-1005-00	Transistor, FE TO-18
R730	323-0181-00	Resistor, metal film 750Ω 1/2W 1%
R731	321-0325-00	Resistor, fixed film 23.7k 1/8W 1%
R732	311-0836-01	Resistor, variable, cermet 5k Spectrol only
R733	321-0436-00	Resistor, fixed film 340k 1/8W 1%
R734	315-0103-00	Resistor, comp., 10k 1/4W 5%
R736	315-0474-00	Resistor, comp., 470k 1/4W 5%
R737	315-0102-00	Resistor, comp., 1k 1/4W 5%
	136-0220-00	Socket, 3 pin Transistor TO-18 W/EC pins

Continued.



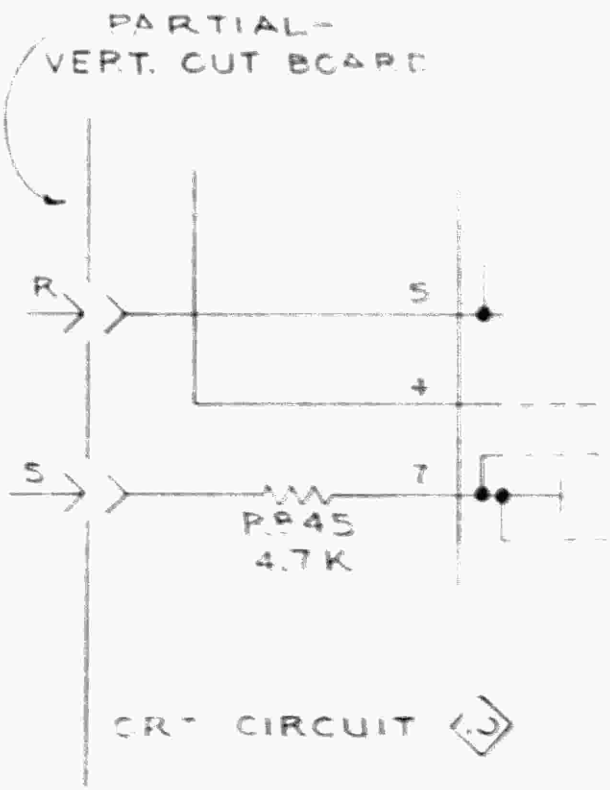
DIODE DAMAGE DUE TO ARCING IN HIGH VOLTAGE SUPPLY ELIMINATED

Effective Prod SN 25000

Resistor R845, 4.7k, was added as indicated below.

Parts Added:

R845	315-0472-00	Resistor, comp., 4.7k 1/4W 5%



Partial Diagram

CRT CHANGED FROM GLASS
TO CERAMIC TYPE

Effective Prod SN 31760

CRT, V859, was changed from glass to ceramic type to improve availability of raw material.

Parts Removed:

V859	154-0466-05	CRT assembly, finished T4220-31-1

Parts Added:

V859	154-0517-05	CRT assembly, finished T4221-31-2

The optional phosphor glass CRT's were replaced with ceramic as indicated below:

OLD

CRT assembly, finished	T4220-1-1	154-0466-06
	T4220-2-1	154-0466-07
	T4220-7-1	154-0466-08
	T4220-11-1	154-0466-09

NEW

CRT assembly, finished	T4221-1-2	154-0517-06
	T4221-2-2	154-0517-07
	T4221-7-2	154-0517-08
	T4221-11-2	154-0517-09
	T4221-31-1	154-0517-00

product modification

M20371

Type 422

LATCH MECHANISM REDESIGNED

Effective Prod SN 34030

The latch mechanism for the carrying handle was redesigned. The handle ring index 214-0513-00 was changed to 214-0513-04 and the handle hub index was changed from 214-0515-00 to 214-0515-02. The new hub and ring are not interchangeable with the old parts and must be replaced as an assembly. Also, due to differences in detent position, both ring and hub index on both left and right side of the handle must be changed when the old parts are replaced.

Parts Removed:

214-0513-00	Index, handle ring	(2)
214-0515-00	Index, handle hub	(2)

Parts Added:

214-0513-04	Index, handle ring	(2)
214-0515-02	Index, handle hub	(2)

11-2-73

product modification

050-0663-02

M20371,M24922

See Below

HANDLE HUB & RING INDEX REPLACEMENT

For the following TEKTRONIX® Instruments

Type	422	Dual Trace Oscilloscopes	SN 100 - 34029
Type	432	Dual Trace Oscilloscopes	SN B010100 - B242109
Type	434	Bistable Storage Oscilloscopes	SN B010100 - B242689
Type	465	Dual Trace Oscilloscopes	SN B010100 - B130599
Type	475	Dual Trace Oscilloscopes	SN B010100 - B143599
Type	485	Dual Trace Oscilloscopes	SN B010100 - B081609
Type	491	Spectrum Analyzers	SN B010100 - B262239

Handle Ring Index, pn 214-0513-04 and Handle Hub Index, pn 214-0515-02, replace part numbers 214-0513-00 and 214-0515-00, which are no longer available.

Both handle ring indexes and both handle hub indexes must be changed to the new versions at the same time.

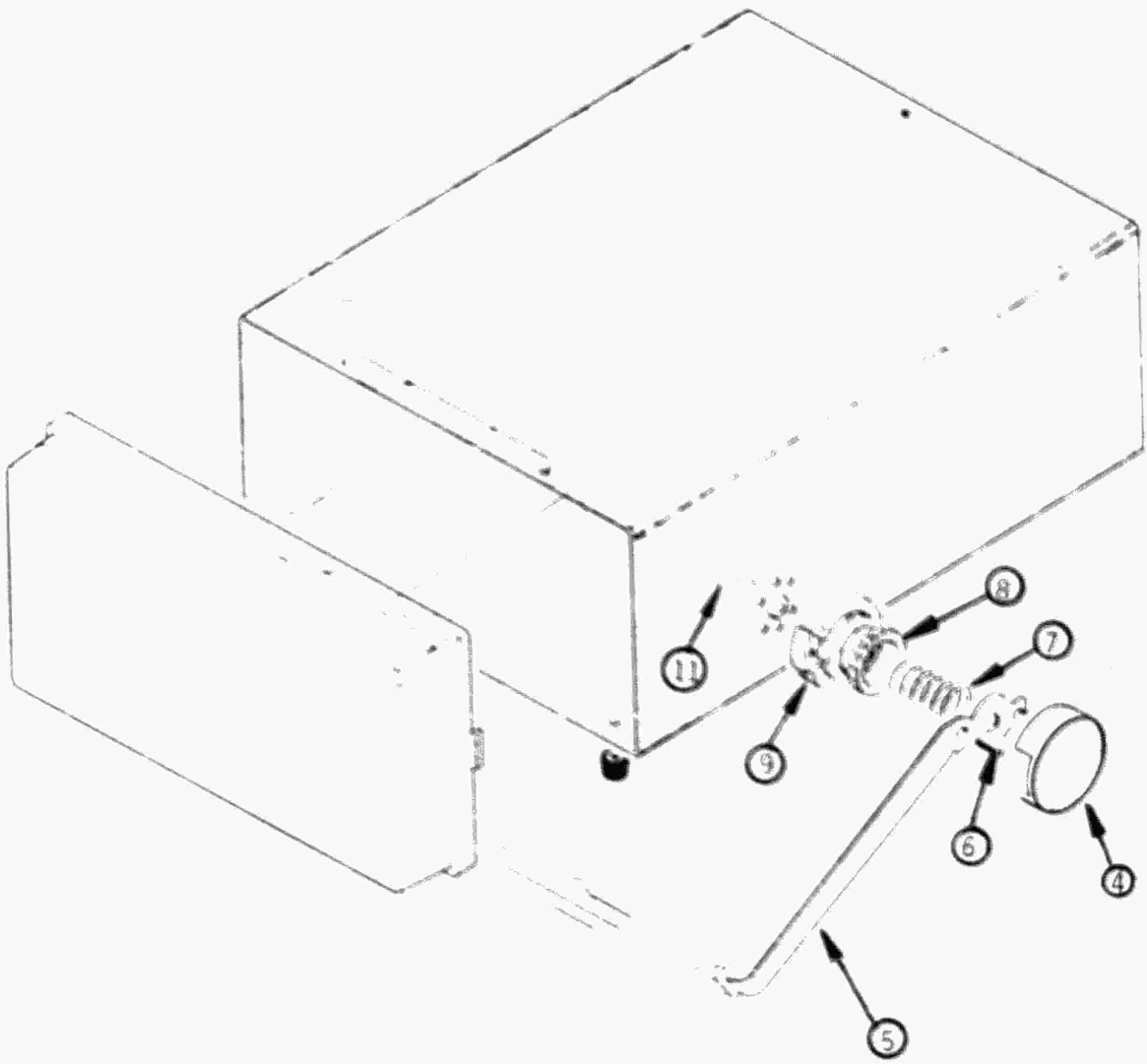
NOTE: If the serial number of your instrument is above those listed, or if this kit or one of the following kits has been installed:
1) 050-0673-XX for 491 Spectrum Analyzers,
2) 050-0674-XX for 432, 434, 465, 475 Oscilloscopes,
3) 050-0675-XX for 485 Oscilloscopes,
4) 050-0676-XX for 422 Oscilloscopes,

disregard the instructions and use either Handle Ring Index pn 214-0513-04 or Handle Hub Index pn 214-0515-02 as a direct replacement.

2-21-80
Supersedes: 5-4-76

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

	Quantity	Part Number	Description
⑨	2 ea	214-0513-04	Index, handle ring
⑧	2 ea	214-0515-02	Index, handle hub



INSTRUCTIONS:

WARNING

Before starting to remove the cabinet, be sure the instrument power cord is disconnected from the power source.

( ) 1. Remove the cabinet as directed in the Instruction Manual.

( ) 2. Remove the handle hub covers ④ by carefully prying them off with a screw driver.

( ) 3. Carefully remove the two screws ⑥ from each side of the handle assembly and remove the handle ⑤, and both handle hub springs ⑦.

( ) 4. Remove both handle ring indexes ⑨ and both handle hub indexes ⑧ by removing the screws ⑪.

( ) 5. Use the original hub-mounting screws ⑪ to install the new ring indexes ⑨ and hub indexes ⑧, oriented in the same manner as the old ones.

( ) 6. Insert the handle hub springs ⑦ and orient the handle ⑤ to align with screw mounting holes and reinstall the two screws ⑥ into each side of the handle.

( ) 7. Snap the hub covers in place.

( ) 8. Reinstall the cabinet.

( ) For future reference, correct the Mechanical Parts List in your Instruction Manual.

KH:cs

Type 422	PRODUCT MODIFICATION INDEX

◇ AC POWER SUPPLY - All Serial Numbers

circuit section—XXX.XX page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
158	+12V supply resistor value changed to reduce the effect of tolerance build up.	9613	301.01	-----	-----
589	-12V supply components changed to provide greater reliability under environmental changes.	9303	301.02	30min	-----
699	RFI shielding improved by removing paint from cabinet edge.	9872	301.03	15min	-----
2520	-12V oscillation eliminated by changing capacitor.	10075	301.04	-----	-----
Not Given	AC and AC-DC power supplies scheduled separately with separate serial number sequences to facilitate production.	10411	----	-----	-----
3080	Silicon diode type changed to provide tighter specifications.	9947	301.05	-----	-----
4640	Possible circuit board damage eliminated by changing resistors.	10273	301.06	15min	-----
5706	1% wire wound resistors changed to more dependable part.	11558	301.07	-----	-----
6280	Power supply capacitor replaced to eliminate selection for low dissipation factor.	10498	301.08	15min	-----
6990	Power switch actuator changed to eliminate pivot pin failure.	11487	301.09 301.10	----- 15min	 040-0439-00
7190	Graticule lamps changed to extend operating life.	11053	301.11 109.03	----- 10min	 050-0319-00

Continued.

DF:jcp

circuit section—XXX.XX page

AC POWER SUPPLY - All Serial Numbers (Continued)

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
7400	Possible short eliminated by replacing +12V and -12V supply transistor mounting hardware.	10723	301.12	-----	-----
8580	Power cord spring added to improve ground connection.	11292	301.13 301.14	----- 5min	040-0424-01
9340	Zener diode D655 Voltage tolerance changed from ±10% to ±5% for standardization. 152-0119-00 was replaced by 152-0281-00.	11191	-----	-----	-----
9530	Motor base connector changed to facilitate assembly. Superseded by Mod 12876.	9271	----	-----	-----
10650	Motor base changed to improve ground connection.	12876	301.15	10min	-----
12610	Power cord identification tag added to identify wiring color code. Primarily for foreign customers.	13768	301.16	-----	-----
21833	Power cord clearance increased by replacing rear feet.	14781	301.17	-----	-----
25000	Line voltage selector added.	15311-2	301.18	-----	-----
28900	To eliminate a potential shock hazard, a yellow-black wire was removed from between the upper terminal of the thermal cutout switch TK601 and the top center terminal of the power switch SW601. The AC Power Supply did not turn off as it should when separated from the Indicator Unit.	16758	----	-----	-----

(Continued)

Type 422 **PRODUCT MODIFICATION INDEX**

circuit section—XXX.XX page

AC POWER SUPPLY - ALL SERIAL NUMBERS (Continued)

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
34310	To increase component availability, Q624 and Q634 on the AC Power Supply circuit board were changed from 151-0151-00's to 151-0126-00's.	20137	-----	-----	-----
35670	To increase component availability, C639 and C659 on the AC Power Supply circuit board (670-0412-02) were changed from 15µF 20V (290-0135-02) to 15µF 20V (290-0135-01).	24031	-----	-----	-----

(Continued)

*series model

Indicates changes made since last publication.

RESISTOR VALUE CHANGED TO REDUCE EFFECT OF TOLERANCE BUILDUP

Effective Prod SN 158

Modified out of sequence: 102-3 128 133 136 141 146-47 154 156

Due to the buildup of tolerances it was sometimes necessary to select resistors to maintain the proper voltage output.

Several resistor values have been changed to reduce the need of selecting parts.

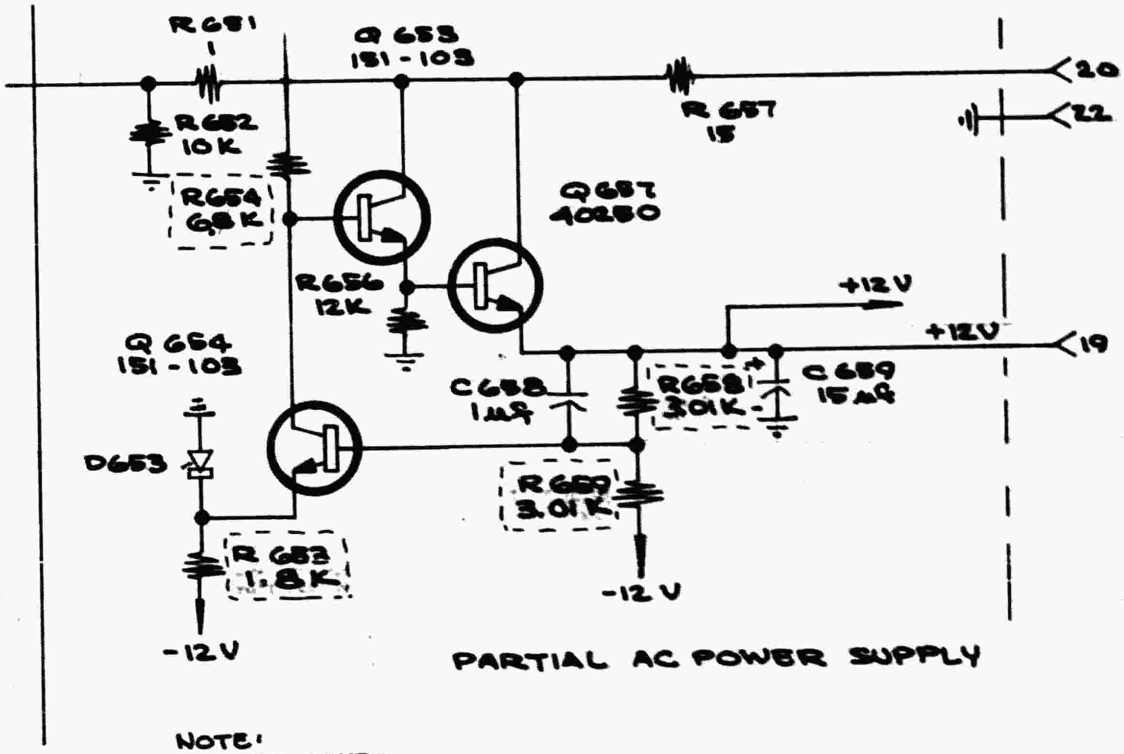
Parts Removed:

R653	315-0202-00	Resistor, comp., 2k 1/4W 5%
R654	315-0622-00	Resistor, comp., 6.2k 1/4W 5%
R658	321-0259-00	Resistor, prec., 4.87k 1/8W
R659	321-0260-00	Resistor, prec., 4.99k 1/8W

Parts Added:

R653	315-0182-00	Resistor, comp., 1.8k 1/4W 5%
R654	315-0682-00	Resistor, comp., 6.8k 1/4W 5%
R658 R659	321-0239-00	Resistor, prec., 3.01k 1/8W

Continued.



PARTIAL AC POWER SUPPLY

NOTE:
DOTTED LINES
INDICATE CHANGES

COMPONENTS CHANGED TO PROVIDE GREATER RELIABILITY

Effective Prod SN 589 Usable in SN 100-588

Modified out of sequence: 412 shipped w/modified AC Power Supply
697 shipped w/unmodified AC Power Supply

The -12V reference Zener diode D622 is no longer available with the desired temperature range compensation. The resistor R639 (-12V) is prone to change resistance under humid conditions.

D622 was changed from a 1N752A (5.6V) to a 1N9369 (9V) diode. R639 was changed from a 2.5k resistor to a 1.5k potentiometer. This also made it necessary to change the following resistors. R622, R624, R634, R637 and R638. The -12V power supply transistors Q264 and Q634 were changed from 2N2219 to special Tek made 151-0151-00 transistors.

Parts Removed:

D622	152-0175-00	Diode, 1N752A
Q624 Q634	151-0103-00	Transistor, 2N2219
R622	315-0102-00	Resistor, comp., 1k 1/4W 5%
R624	315-0621-00	Resistor, comp., 620Ω 1/4W 5%
R634	315-0242-00	Resistor, comp., 2.4k 1/4W 5%
R637	321-0270-00	Resistor, prec., 6.34k 1/8W 1%
R638	321-0251-00	Resistor, prec., 4.02k 1/8W 1%
R639	311-0496-00	Potentiometer, comp., 2.5k ±20%

Parts Added:

*D622	152-0212-00	Diode, 1N936
Q624 Q634	151-0151-00	Transistor silicon, NPN TO5 B=100 at 0.5mA GP low current
*R622	315-0391-00	Resistor, comp., 390Ω 1/4W 5%
*R624	315-0102-00	Resistor, comp., 1k 1/4W 5%
*R634	315-0272-00	Resistor, comp., 2.7k 1/4W 5%
*R637	321-0191-00	Resistor, prec., 953Ω 1/8W 1%
*R638	321-0227-00	Resistor, prec., 2.26k 1/8W 1%
*R639	311-0532-00	Potentiometer, ww, 1.5k ±5%

*Parts Required for field installation.

Continued.

INSTALLATION:

Parts Required: See 'Parts Added' with asterisks.

Refer to drawing and perform the following component changes:

a) Change R639 from a 2.5k composition potentiometer to a 1.5k wirewound potentiometer.

b) Change R622 from 1k 1/4W 5% to 390Ω 1/4W 5%.

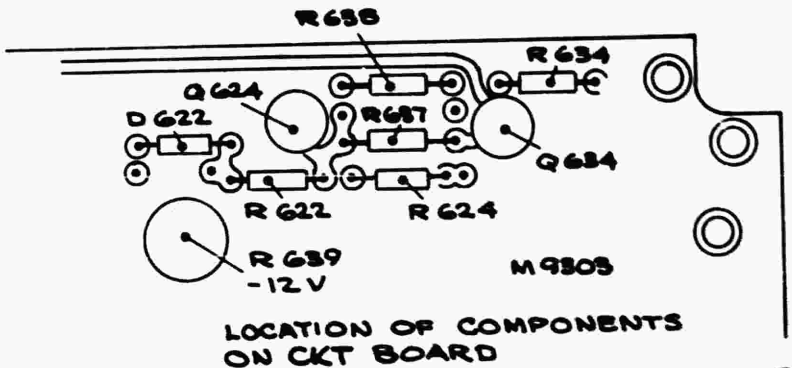
c) Change R634 from 2.4k 1/4W 5% to 2.7k 1/4W 5%.

d) Change R624 from 620Ω 1/4W 5% to 1k 1/4W 5%.

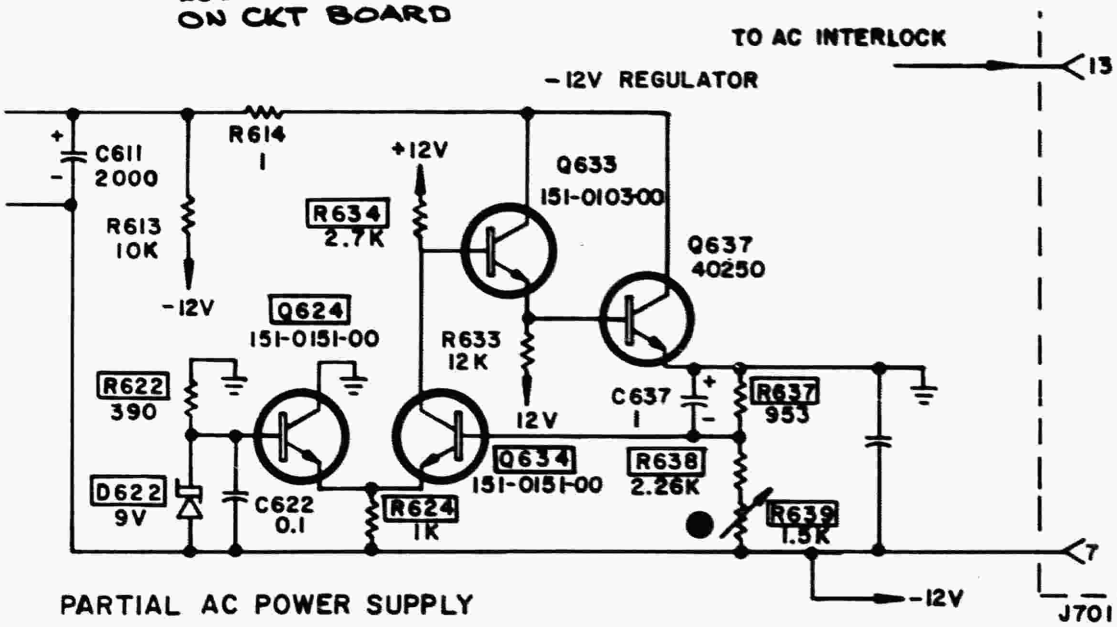
e) Change R638 from 4.02k 1/8W 1% to 2.26k 1/8W 1%

f) Change R637 from 6.34k 1/8W 1% to 953Ω 1/8W 1%.

g) Replace D622 with a 1N936 zener diode as needed.



LOCATION OF COMPONENTS ON CKT BOARD



PARTIAL AC POWER SUPPLY

INDICATES CHANGE

POWER SUPPLY RFI SHIELDING IMPROVED

Effective Prod SN 699 Usable in SN 100-698

In applications where RFI is critical, the Type 422 may cause excessive RF radiation.

Incomplete contact between the AC power supply and indicator cabinets (in 125B AC-DC power supply assembly housing, indicator cabinet and battery pack box) was allowing radiated RFI in excess of specification limits. The problem is caused by an insulating layer of paint on the forward edge of the AC power supply housing.

Paint is no longer applied to front edges of the power supply cabinets, power supply assembly housing and battery pack box.

INSTALLATION:

Carefully sand the front edge of the AC Power Supply cabinet, or AC-DC battery pack box and assembly housing where they mate with the Indicator cabinet and pack box, respectively.

-12V POWER SUPPLY CAPACITOR CHANGED TO ELIMINATE OSCILLATION

Effective Prod SN 2520

The -12V supply was sometimes breaking into oscillation because of the high internal resistance of C639. The supply would oscillate at about 15mHz, damp out and reoccur at about 20kHz rate. The problem increased as temperature was lowered.

C639 was changed from a 15µF 10V capacitor to a 15µF 20V capacitor which has lower internal resistance.

Parts Removed:

C639	290-0135-00	Capacitor, EMT, 15µF 10V

Parts Added:

C639	290-0135-01	Capacitor, EMT, 15µF 20V

SILICON DIODE TYPE CHANGED TO PROVIDE
TIGHTER FORWARD VOLTAGE CONDUCTION SPECIFICATIONS

Effective Prod SN 3080

Certain critical circuits were designed to use silicon diodes with tighter forward voltage conduction specifications than was provided by 152-0185-00.

Silicon diodes D201, D204, D205, D208, D401, D430, D435, D436, D479, D653, D735, D779 and D865 were changed from 152-0185-00 to 152-0233-00.

Parts Removed:

D201,D204,D205 D208,D401,D430 D435,D436,D479 D735,D779,D865 D653	152-0185-00	Diode, silicon

Parts Added:

D201,D204,D205 D208,D401,D430 D435,D436,D479 D735,D779,D856 D653	152-0233-00	Diode, silicon

RESISTORS CHANGED TO ELIMINATE POSSIBLE CIRCUIT BOARD DAMAGE

Effective Prod SN 4640 Usable in SN 100-4639

Over-heating of R614, R651 and R689 (1Ω 1/2W 5% ww resistors), when mounted in close proximity to the circuit board, was causing damage to the circuit board.

R614, R651 and R689 were changed from 1/2W to 1/4W, and the mounting was changed so that the resistor body is not as close to the circuit board. The lower wattage rating allows the resistor to open before enough heat is generated to damage the circuit board. Superseded by M11558.

Parts Removed:

R614 R651 R689	308-0141-00	Resistor, ww, 1Ω 1/2W ±5%

Parts Added:

R614 R651 R689	308-0415-00	Resistor, ww, 1Ω 1/4W ±5%

INSTALLATION:

Parts Required:

3 ea	308-0433-00	Resistor, ww, 1Ω 1/4W 10%

NOTE: Also see page 4-16 of the Type 422 Manual for additional component location information.

a) Replace R614, located on the AC Power Supply circuit board near D645, with a 1Ω 1/4W ±5% resistor (308-0433-00).

b) Replace R651, located on the AC Power Supply circuit board near D610, with a 1Ω 1/4W ±5% resistor.

c) Replace R689, located on the AC Power Supply circuit board near D655, with a 1Ω 1/4W ±5% resistor.

1Ω WIREWOUND RESISTORS CHANGED TO MORE DEPENDABLE 10% PART

Effective Prod SN 5706

The 1Ω 5% resistors must by 'tailored' by filing the resistive wire to achieve 5% tolerance. This filing causes a localized hot-spot resulting in early resistor failure.

The 1Ω ww Tek-made resistors were changed from a 5% part to a 10% part.

Parts Removed:

R614 R651 R689	308-0415-00	Resistor, ww, 1Ω 1/4W 5%

Parts Added:

R614 R651 R689	308-0433-00	Resistor, ww, 1Ω 1/4W 10%

CAPACITOR REPLACED TO ELIMINATE SELECTION FOR LOW DISSIPATION FACTOR

Effective Prod SN 6280 Usable in SN 100-6279

C639 and C659 require a low dissipation factor that could not be guaranteed by the vendor. (Only capacitors with low dissipation factor were used in instruments).

C639 and C659 were replaced with a selected 290-0135-02 capacitor.

Parts Removed:

C639	290-0135-01	Capacitor, EMT 15µF 20V
C659	290-0135-00	Capacitor, EMT 15µF 20V

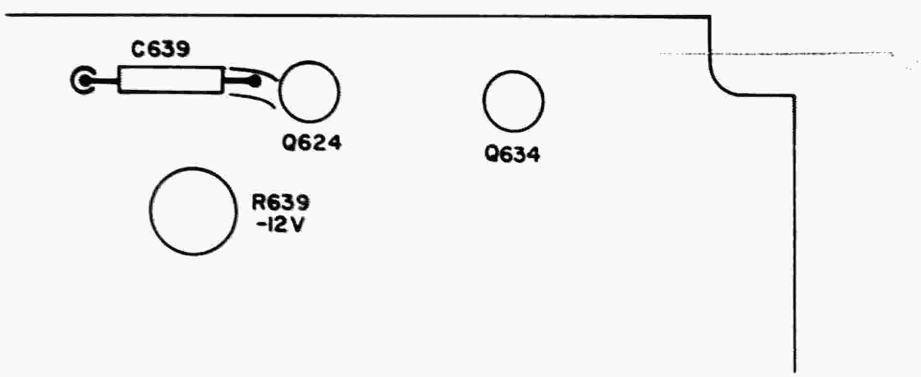
Parts Added:

C639 C659	290-0135-02	Capacitor, 290-0135-01 selected to 10% max D-F at 1kHz

INSTALLATION:

Parts Required: See 'Parts Added'.

Replace C639, located on the AC Power circuit board near Q624 and D622, with the 15µF 20V capacitor. See drawing. C659 is located below and to the right of connector J701.



POWER SWITCH ACTUATOR CHANGED TO ELIMINATE PIVOT PIN FAILURE

Effective Prod SN 6990 Usable in SN 100-6989

Pivot pin used to hold the actuator rod to the switch actuator is too short and will not retain a 'press' fit.

The Power switch actuator pivot pin was replaced by a stainless steel 'spiral' spring pin, which necessitates the changing of the pin mounting hole in the Power switch rod from a 'clearance' to a 'press fit' hole, and changing the mounting hole in the Power switch actuator from a 'press fit' to a 'clearance' hole.

Parts Removed:

214-0526-00	Actuator, toggle switch
214-0533-00	Pin, escutcheon
384-0336-00	Rod, Power switch assembly, w/molded gray nylon knob

Parts Added:

214-0526-01	Actuator, toggle switch
214-0863-00	Pin, spiral spring, stainless steel
384-0336-01	Rod, Power Switch assembly, w/molded gray nylon knob

INSTALLATION:

Parts Required:

040-0439-00	Modification Kit

Refer to mod kit instructions.

product modification

040-0439-00
M11487

Type 422/R422

IMPROVED POWER SWITCH ACTUATOR

For the following TEKTRONIX® Type Oscilloscopes:

Type 422	Serial Numbers	100-6989
Type 422-125B	Serial Numbers	100-6989
Type R422	Serial Numbers	100-6989

Modification Kit, PN 040-0439-00, provides an improved POWER switch actuator assembly, which eliminates failure of the 'press-fit' pivot pin.

The switch actuator and actuator rod have been modified to use a spiral spring pin.

The installation consists of replacing the POWER switch actuator, actuator rod, and pivot pin.

This kit replaces the following parts:

Actuator, switch	214-0526-00
Pin, excutcheon	214-0533-00
Rod, ass'y, POWER switch	384-0336-00

11-29-71
Supersedes: 9-25-69 format change

PARTS INCLUDED IN MODIFICATION KIT:

Quantity	Part Number	Description
1 ea	214-0526-01	Actuator, toggle switch, DELRIN®, 0.650 x 1.050 x 1.260
1 ea	214-0863-00	Pin, spiral spring, 0.062 x 0.375
1 ea	384-0336-01	Rod, Power switch assembly, w/molded gray nylon knob

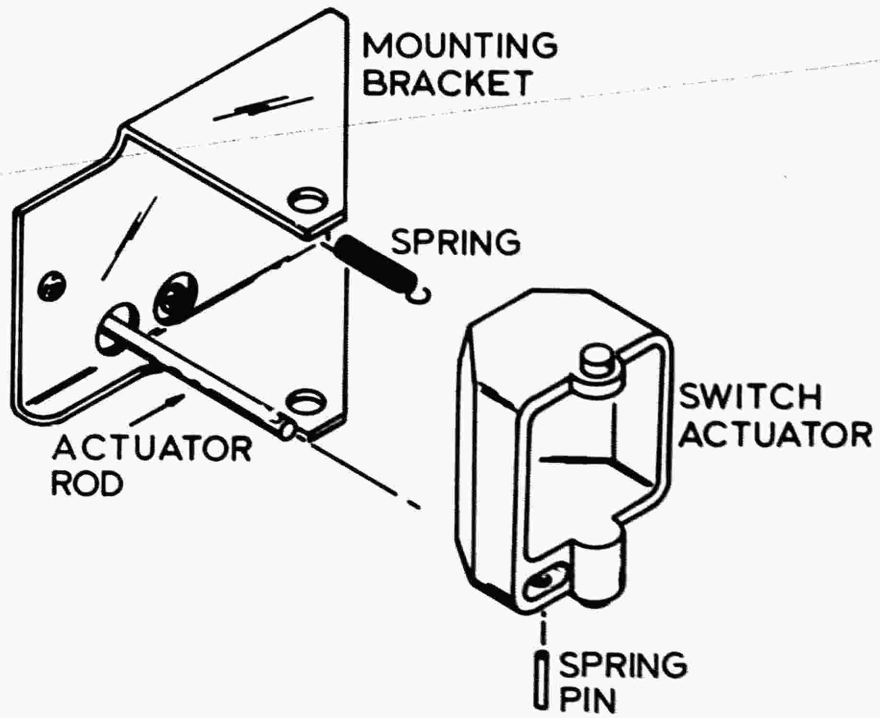
INSTRUCTIONS

( ) 1. Disconnect the power supply and remove from the rear of the instrument.

( ) 2. Remove the cabinet.

( ) 3. Replace the POWER switch actuator, actuator rod and pivot pin, located on the rear of the instrument, with those from the kit. Refer to drawing.

NOTE: The 'spiral' spring pin can be easily installed, using a pair of pliers. 'Compress gently' and insert pin into the actuator rod. Refer to drawing.



( ) 4. Replace cabinet.

( ) 5. Replace the power supply and check operation of the new POWER switch actuator.

( ) Correct the Mechanical Parts List section of the Instruction Manual as required.

DELRIN, Reg. TM of the DuPont Co.

DF:ljs

GRATICULE LAMP TYPE CHANGED

Effective Prod SN 7190 Usable in SN 100-7189

Modified out of sequence:

5184-5	5337	5445	5515	5587	5646	5825	5874
5195-6	5395-7	5467	5517	5589	5740	5852	5876-7
5201	5410-1	5476	5530	5608-9	5753-4	5869	5923
5288	5417	5482	5571	5628	5805-9	5871	5953
5291-2							

Graticule illumination reduced, or not present, after approximately 1500 hours of operation.

The 150-0044-00 lamps have a filament life of only 1500 hours at 95% rated voltage applied. The new 150-0059-00 lamps have a life of 10,000 hours at 115% rated voltage applied. Both lamps illuminate with the same brightness.

Graticule lamps B725 and B726 were replaced with 150-0059-00 lamps. To accommodate this change, series resistor R657 was decreased in value from 27Ω to 15Ω. The AC circuit board part numbers were changed as follows: Board with plug-in components from 670-0412-00 to 670-0412-03, and board without pulg-in components from 670-0412-01 to 670-0412-02.

This modification applies only to the Type 422 AC power supply. When the new graticule lamps are used in conjunction with the AC-DC type supply, they are a direct replacement.

Parts Removed:

B725 B726	150-0044-00	Bulb, incandescent, 14V T1, 3/4 bulb #386
R657	303-0270-00	Resistor, comp., 27Ω 1W 5%

Parts Added:

B725 B726	150-0059-00	Bulb, incandescent, 14V T1, 3/4 bulb #386
R657	303-0150-00	Resistor, comp., 15Ω 1W 5%

INSTALLATION:

Parts Required:

050-0319-00	Parts Replacement Kit.

Refer to kit instructions.

TRANSISTOR MOUNTING HARDWARE CHANGED

Effective Prod SN 7400

The possibility exists that Q637 or Q657 transistors in the +12 and -12V power supply could be shorted to the chassis if the mounting screw breaks the anodized coating of the aluminum insulating washers used to mount the transistors.

The mounting washers of Q637 and Q657 were changed from anodized aluminum washers to shouldered fiber washers.

Parts Removed:

210-0983-00	Washer, shouldered alum., w/#6 hole black anodized	(4)

Parts Added:

210-0811-00	Washer, fiber #6 shouldered	(4)

3-WIRE POWER CORD GROUND CONNECTION IMPROVED

Effective Prod SN 8580 Usable in SN 100-8579

Inadequate ground connection between power cord and instrument motor base.

A ground spring was added to the non-current carrying ground receptacle on the female connector end of the power cord.

Parts Added:

214-0698-00	Spring, power cord ground (subpart of power cord 161-0024-01)

INSTALLATION:

Parts Required: See 'Parts Added', or part listed below.

040-0424-01	Modification Kit

Refer to mod kit instructions.

product modification

040-0424-01
M11292

General

3-WIRE POWER CORD FEMALE GROUND CONNECTION IMPROVEMENT

For 3-Wire Power Cords
Used on TEKTRONIX® Type Instruments

Modification Kit, PN 040-0424-01, improves the non-current carrying ground contact on the 3-wire power cords, used on TEKTRONIX Type instruments, by adding a spring to the female contact.

The kit includes enough springs to modify twenty-five power cords.

6-2-71
Supersedes: April 1967 (format change)

PARTS INCLUDED IN MODIFICATION KIT:

Quantity	Part Number	Description
25 ea	214-0698-00	Spring, power cord ground

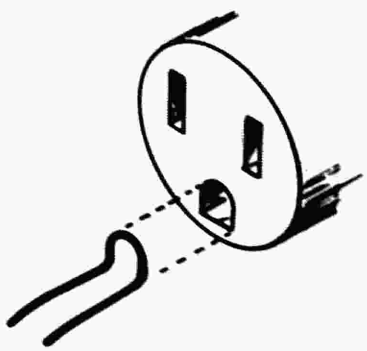
INSTRUCTIONS

( ) Insert the spring (from kit) as indicated in the drawing below, and push it in by plugging the male end of the power cord into the female end.

THIS COMPLETES THE INSTALLATION.

( ) Add the spring to the Mechanical Parts List of your Instruction Manual (if applicable).

DF:ls



MOTOR BASE CHANGED TO IMPROVE GROUND CONNECTION

Effective Prod SN 10650 Usable in SN 100-10649

The present motor base grounding is not adequate, due to cold flow of the plastic between the ground post and the mounting plate.

The method used to attach the ground post in the motor base assemblies was changed. The new mounting eliminates plastic between the ground post and the mounting plate and provides a metal to metal ground connection. To insure a good fit between mating parts, the size of the mounting screws was changed from #4 to #6, and the clearance holes in the mounting plate and shell were increased to #6.

To prevent corrosion between the new ground post and mounting plate, the plate was changed from etched aluminum to cadmium plated steel.

Parts Removed:

131-0150-01	Motor base

Parts Added:

131-0572-00	Motor base

INSTALLATION:

Parts Required: See 'Parts Added'.

Replace the motor base connector with the new type.

POWER CORD IDENTIFICATION TAG ADDED

Effective Prod SN 12610

Foreign customers may change the power plug, and wiring color code may not agree with the U.S. wiring code.

A heat shrinkable sleeve was added to the power cord to identify the function of the individual wires.

Parts Added:

334-1205-00	Identification Sleeve

POWER SUPPLY REAR FEET REPLACED

Effective Prod SN 21833

Modified out of sequence:

12048	20098-99	20473	20985	21597-99	21719
12198	20107	20477	21006	21604	21727-28
14083	20110	20482	21091	21608	21731
20000	20112	20489	21107	21612	21734
20002-05	20114	20495	21171	21620-21	21738-41
20007-13	20116-19	20502	21299	21643	21744-45
20018	20121-25	20523	21309	21646	21749
20050-55	20127	20541	21404	21652-53	21752-54
20057	20129	20556	21441	21663	21756-761
20059-65	20132-34	20563	21488	21665	21764
20070-71	20138	20569	21497	21675-76	21766-68
20073-74	20145	20584	21510	21679	21770-75
20078	20160	20620	21519	21691	21778-93
20080	20301-02	20645	21523	21694-95	21795-800
20082-84	20333	20719	21535	21699	21804-05
20086	20337	20730	21574	21702	21810-24
20088-90	20414	20741	21577-78	21706-08	21826-30
20094	20454	20762	21586-87	21710	
20096	20459	20766	21594-95	21712	

Insufficient clearance for power cord when rear feet wear down. Also, more clearance is needed for future line selector mod.

The feet were changed from 0.600 high to 0.765 high. The power cord was changed to one with a longer female connector.

Parts Removed:

348-0068-00	Foot, rear
161-0024-00	Cord, power

Parts Added:

348-0068-01	Foot, rear
161-0024-03	Cord, power

NOTE: Manual parts list and standard accessory list will call out 161-0024-03 as the replacement for 161-0024-02. 161-0024-03 consists of 161-0024-02 with spring 214-0698-00 installed.

LINE VOLTAGE SELECTOR ADDED

Effective Prod SN 25000

The line voltage selector assembly was added to the AC power supply to allow changing the instrument operation voltage range without removing the power supply from the indicator to change transformer connections.

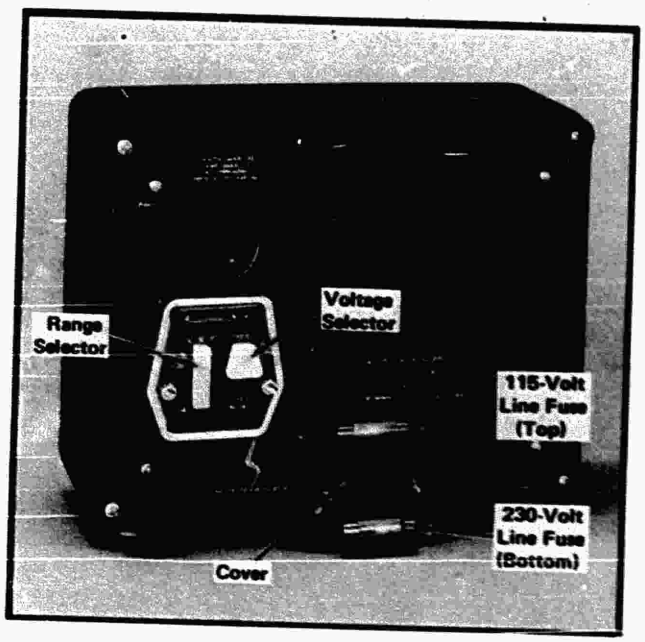
Parts Removed:

T601	120-0377-00	Transformer, Low Voltage Power
	179-0944-00	Cable harness, Power
	214-0519-00	Gasket, fuse holder
	334-0948-00	Tag, voltage, 115V
	334-0949-00	Tag, voltage, 230V
	352-0014-00	Fuseholder assembly
	387-0999-00	Plate, rear
	407-0090-00	Bracket, Low Voltage Transformer
	407-0091-00	Bracket, transistor
	437-0075-00	Power Supply Cabinet

Parts Added:

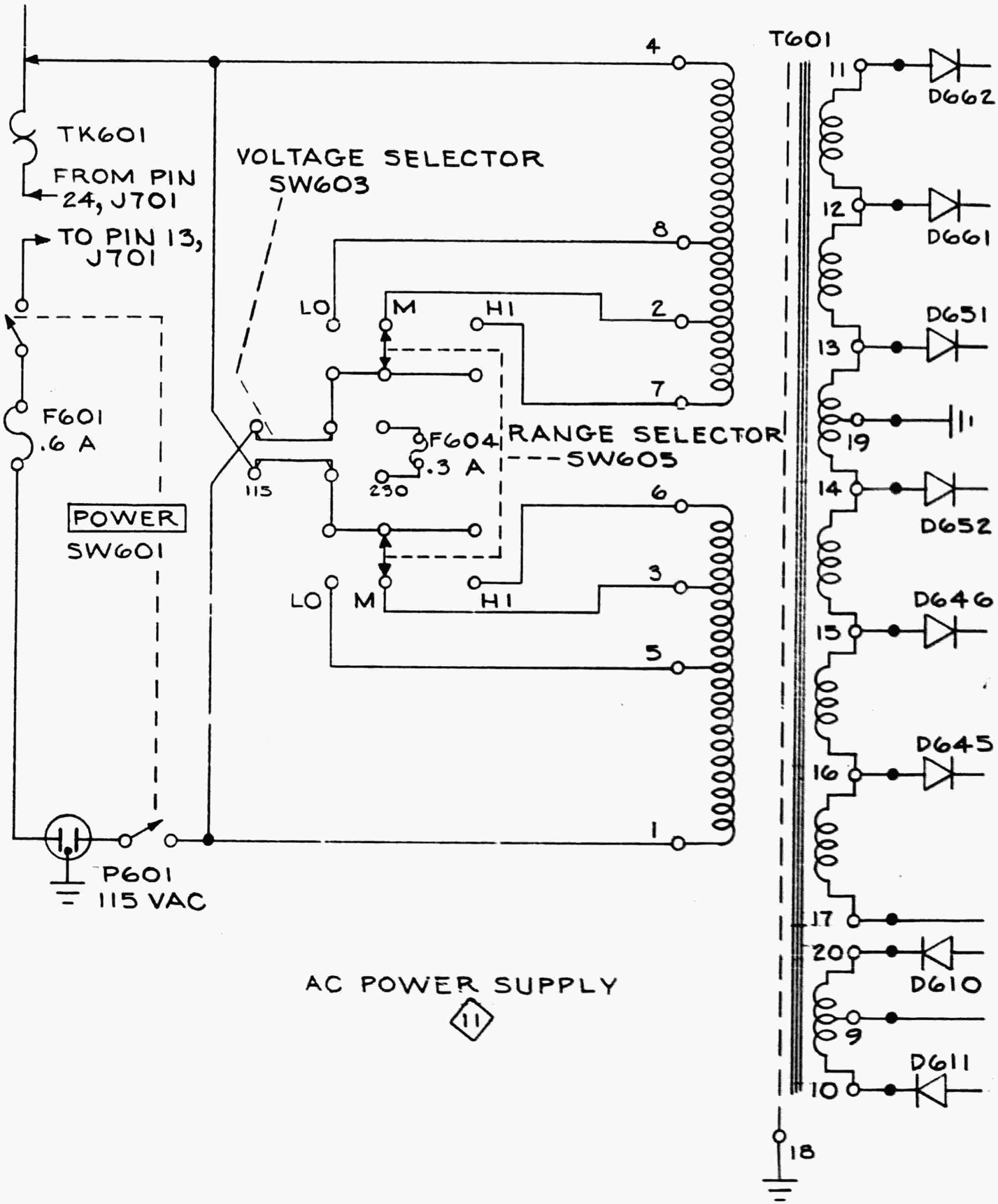
F604	159-0029-00	Fuse, 0.3A
T601	120-0621-00	Transformer, Line Voltage Power
	179-0944-01	Cable Harness, power
	200-0762-00	Cover, Line Voltage Selector
	204-0279-00	Body, Line Voltage Selector
	361-0293-00	Bar, spacer, transformer
	387-0999-02	Plate, rear
	407-0091-01	Bracket, transistor
	437-0075-02	Power Supply Cabinet

Continued.



Line Voltage Selector assembly on the rear of the AC Power Supply (shown with the cover removed).

Continued.



AC POWER SUPPLY

11

Type 422	PRODUCT MODIFICATION INDEX

AC-DC POWER SUPPLY - All Serial Numbers

circuit section—XXX.XX page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
Not Given	Battery pack retaining knobs changed to stainless steel to facilitate battery pack installation.	9975	401.01	10min	-----
595 (only)	Low line regulation improved by changing transistor. See Mod 13796.	9860	401.02	-----	-----
595	RFI reduced by changing ground lead connecting point.	9992	401.03	25min	-----
699	RFI shielding improved by removing paint from cabinet edge.	9872	401.04	15min	-----
2540	Cadmium plated hardware replaced with nickel plated to reduce corrosion in high humidity atmosphere.	9877	401.05	-----	-----
Not Given	AC and AC-DC power supplies scheduled separately with separate serial number sequences to facilitate production.	10411	----	-----	-----
2680	Power supply ripple reduced by changing power selector circuit capacitor.	10080	401.06	-----	-----
2831	Power regulator lock-up prevented by adding resistor.	10122-1	401.07	-----	-----
2831	RFI reduced by adding power regulator high frequency shunt capacitor.	10122-2	401.08	10min	-----
2831	RFI reduced by increasing line filter capacitor value.	10122-3	401.09	10min	-----
3080	Silicon diode type changed to provide tighter specifications.	9947	401.10	-----	-----

Continued.

DF:jcp

AC-DC POWER SUPPLY - All Serial Numbers

circuit section—XXX.XX page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
3195	Transistor short to ground prevented by adding insulating washer to Q1194.	10684	401.11	30min	-----
3912	Supply rewired to place fuse and switch in hot side of the line.	10808	401.12	25min	-----
Not Given	Battery vendor and part number changed to obtain increased ampere hour capacity.	10708	401.13	-----	-----
4043	DC power converter circuit board changed to provide better parts layout.	10132-1	401.14	-----	-----
4043	DC power control circuit board changed to eliminate possibility of power lead connections shorting.	10132-2	401.15	-----	-----
4530	Zener diode changed to eliminate selection of switching transistors. Superseded by Mod 11373.	11365	401.16	-----	-----
5700	Potential short prevented by changing converter side bracket.	11526	401.17	-----	-----
6230	Zener diode changed to more readily available part.	11373	401.18	-----	-----
6990	Transistor breakdown prevented by changing power regulator transistor.	11387	401.19	15min	-----
7400	Potential short eliminated by changing transistor mounting hardware.	10723	401.20	-----	-----
11682	Transistors changed to improve stability and reduce ripple.	13796	401.21	-----	-----

Continued.

◇ AC-DC POWER SUPPLY - All Serial Numbers (Continued)

circuit section—XXX.XX page

EFF. SN. S.M*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
21833	Rear feet replaced to improve power cord clearance.	14781	301.17	-----	-----
N/A	To eliminate the possibility of the transformer mounting screws shorting to solder connections on the DC Power Control circuit board, when the supply is attached to a 422 indicator, rubber spacers were added to the back of the circuit board.	S20987	401.22	-----	------
34900	To increase the availability of components, Q1174 and Q1184 (151-0163-00) were replaced by 151-0469-00 which required a change in the mounting.	21021	401.23	-----	------
34900	To increase the reliability, C1224 on the DC Power Control circuit board was changed from 8.2µF 60V Tantalum(290-0270-00) to 8.22µF 74V Tantalum(290-0716-00).	21625	------	-----	------

BATTERY PACK RETAINING NUTS CHANGED

Effective Prod SN Not Given

Difficulty in removing and installing battery pack retaining screws.

The plating on the retaining screw flakes off and binds up when used with cadmium plated brass nuts. It is sometimes very difficult to remove and install the screws a second time.

The cadmium plated retaining nuts were replaced with stainless steel nuts, which do not bind as badly.

Parts Removed:

210-0407-00	Nut, hex, brass, 6-32 x 1/4	(9)

Parts Added:

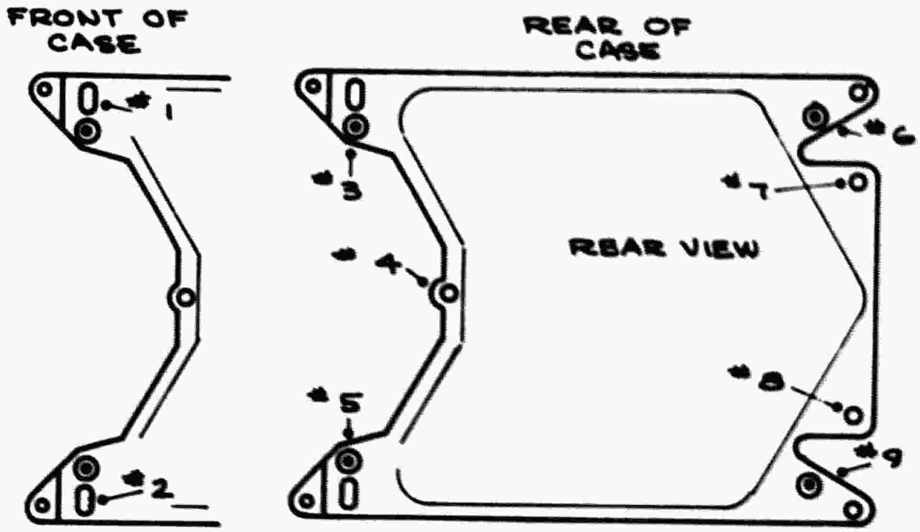
220-0456-00	Nut, hex, stainless steel 6-32 x 1/4	(9)

INSTALLATION:

NOTE: Without having the brass and stainless steel nuts together, it is difficult to identify the differences. The replacement criteria should be based upon the above paragraph concerning the plating of the retaining screw.

Replace the nine 6-32 x 1/4 cadmium plated brass nuts, used for assembling the battery pack, with nine 6-32 x 1/4 stainless steel nuts.

Continued.



422 BATTERY CASE
(NUT LOCATIONS)

POWER REGULATOR ERROR AMPLIFIER TRANSISTOR CHANGED

Effective Prod SN 595

If Q1154 does not have high enough beta, poor power supply regulation at low line results.

Q1154 has been changed from 2N2219 to a 2N2219 selected for a minimum beta of 150.

Parts Removed:

Q1154	151-0103-00	Transistor, 2N2219 NPN

Parts Added:

Q1154	153-0539-00	Transistor, 2N2219 (151-0103-00 selected for minimum beta of 150)

GROUND LEAD CONNECTING POINT CHANGED TO REDUCE RFI

Effective Prod SN 595 Usable in SN 100-594

Modified out of sequence: 160-164

The Type 422-2 (AC-DC power supply) may have excessive RF radiation.

The ground lead connecting point for the AC-DC power connector is not located in the best place for low RFI.

The power connector ground lead tie-point was changed from the converter etched circuit board to a ground lug adjacent to the power connector.

Parts Removed:

175-0522-00	Wire, #22 solid, white	10 in.

Parts Added:

210-0201-00	Lug, solder, SE4
210-0406-00	Nut, hex, 4-40 x 3/16
**355-0055-00	Stud, pem, 4-40 x 1/4

**subpart of 407-0123-00

INSTALLATION:

Parts Required:

210-0223-00	Lug, solder, 1/4"
176-0122-00	Wire, #22 solid, bare, 12 in.

a) Temporarily remove the foam rubber protector encircling the fuse holders.

b) Temporarily remove the #10 hex nut securing the long hex rod to the circuit board. See drawing A.

Mount a 1/4" solder lug between the hex rod and chassis, reinstall and tighten the #10 hex nut. See drawing B.

c) Unsolder the #22 solid white wire between the circuit board and the AC-DC power connector. See drawings A and B.

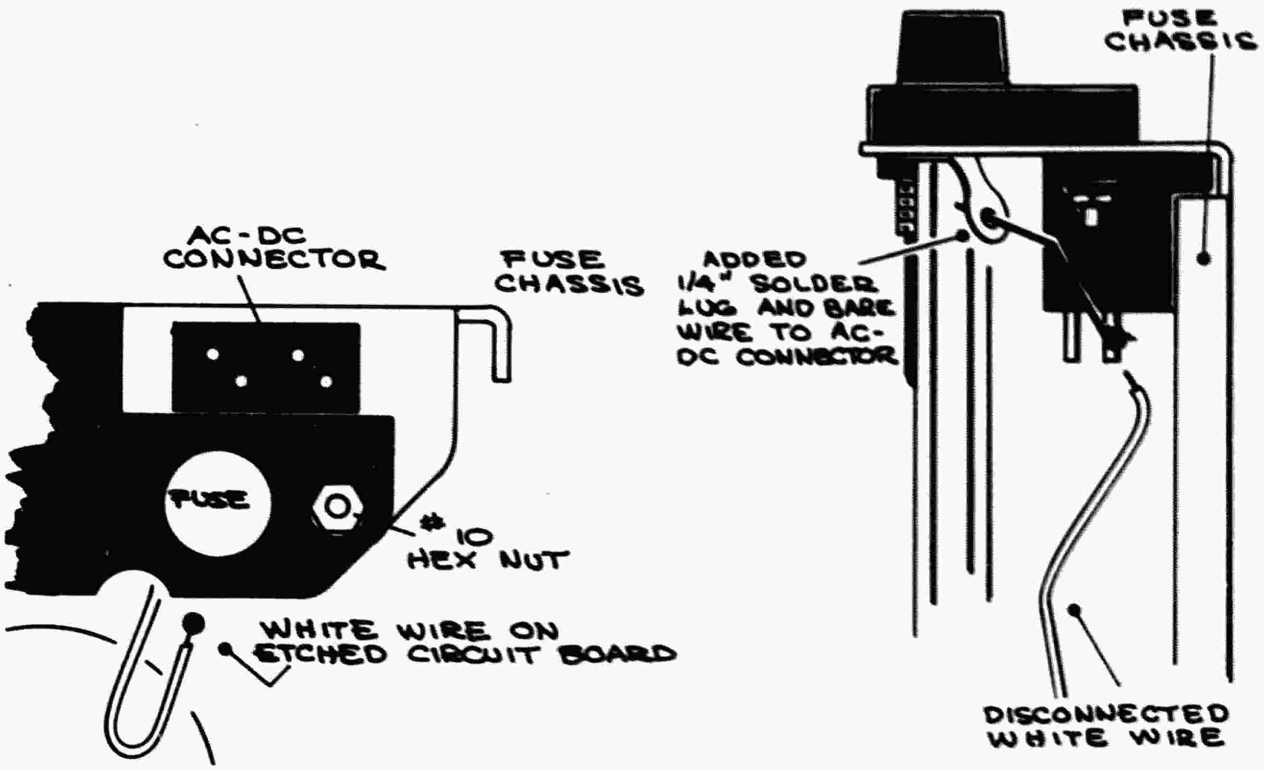
Cut the ends of the white wire flush at the cable breakout points.

Continued.

INSTALLATION: (Continued)

d) Solder a #22 solid wire between the solder lug and the AC-DC power connector, terminals nearest chassis. See drawing B.

e) Reinstall the fuse holder foam rubber protector.



RFI SHIELDING IMPROVED

Effective Prod SN 699 Usable in SN 100-698

In applications where RFI is critical the Type 422 may cause excessive RF radiation.

Incomplete contact between the AC power supply and indicator cabinets (in 125B AC-DC power supply assembly housing, indicator cabinet and battery pack box) was allowing radiated RFI in excess of specification limits. The problem is caused by an insulating layer of paint on the forward edge of the AC power supply housing.

Paint is no longer applied to front edges of the power supply cabinets, power supply assembly housing and battery pack box.

INSTALLATION:

Carefully sand the front edge of the AC power supply cabinet, or AC-DC battery pack box and assembly housing where they mate with the Indicator cabinet and pack box, respectively.

CADMIUM PLATED HARDWARE REPLACED WITH NICKEL PLATE

Effective Prod SN 2540

Cadmium plated hardware used for securing components to gold pads on circuit board was corroding in high humidity atmosphere, resulting in unreliable electrical connections. Also, a lockwasher was needed under the head of battery terminal securing screws to assure good electrical contact.

The hex nut and flatwasher for securing Q1174 and Q1184 were changed from cadmium plated steel to nickel plated brass. The purchase spec for the split lockwasher was changed from cadmium plated steel to nickel plated phosphor-bronze. The solder lug was changed from purchased cadmium plated brass to Tek-made albaloy plate over purchased raw brass lug.

The securing hardware on positive and negative battery pack terminals was changed by adding a #10 flatwasher (nickel plated brass) and a #10 split lockwasher under the head of the securing screw. The purchase spec on this #10 split lockwasher was changed from cadmium plated steel to nickel plated phosphor-bronze.

See before and after drawings on the following page.

Parts Removed:

210-0524-00	Nut, hex, steel, 5/16-24 x 1/2 cad plated	(2)
210-0807-00	Washer, flat, steel, 5/16 ID x 5/8 OD x 0.050 cad plated	(2)
210-0217-00	Lug, solder, brass, 5/16 cad plated	

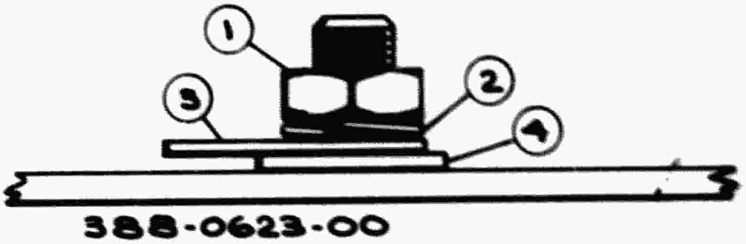
Parts Added:

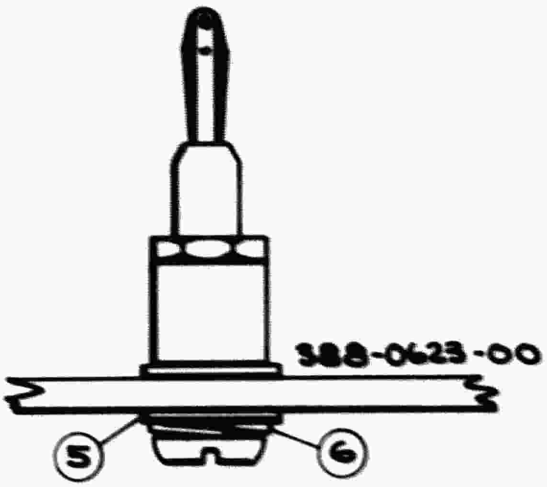
210-0524-01	Nut, hex, brass, 5/16-24 X 1/2 nickel plated	(2)
210-0807-01	Washer, flat, brass, 5/16 ID x 5/8 OD x 0.050 nickel plated	(2)
210-0217-00	Lug, solder, 210-0217-01 albaloy plated	(2)
210-1003-00	Washer, flat, #10 brass, nickel plated	(2)
210-0056-00	Washer, split, lock, #10 brass, nickel plated	(2)

Continued.

INSTALLATION:

1) Replace 210-0524-00 with 210-0524-01.
2) Changes from cadmium plated steel to nickel plated phosphor-bronze Part number remains 210-0057-00.
3) Changes from purchased cadmium plated to Tek-made albaloy plated brass. Part number remains 210-0217-00.
4) Replace 210-0807-00 with 210-0807-01.
5) Add one 210-1003-00 per terminal.
6) Change purchase spec of 210-0056-00 from cad plated to nickel plated phosphor-bronze and add one per terminal.





CAPACITOR VALUE INCREASED TO REDUCE POWER SUPPLY RIPPLE

Effective Prod SN 2680

The capacitance of C1003 and C1004 was not adequate for circuit requirements when at the minimum tolerance value. The result was excessive ripple on the plus and minus 12 volt supplies. Test has been selecting the 1200µF capacitors to meet 1300µF.

C1003 and C1004 were changed from 1200µF +75% -10% to 1300µF +75% -10% to assure adequate capacitance.

Parts Removed:

C1003 C1004	290-0275-00	Capacitor, EMT, 1200µF +75% -10%

Parts Added:

C1003 C1004	290-0300-00	Capacitor, EMT, 1300µF, +75% -10%

POWER REGULATOR STEERING SWEEP LOCKUP PREVENTED

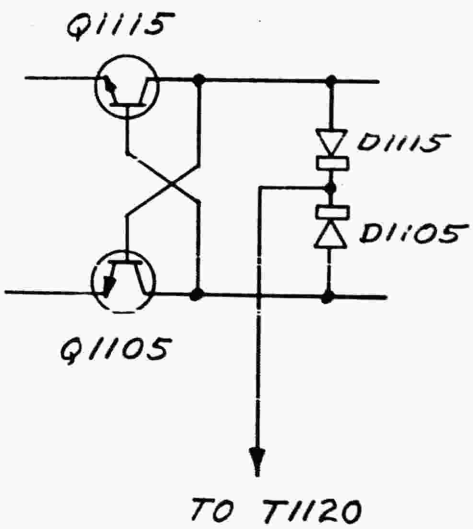
Effective Prod SN 2831

It was necessary to sometimes select Q1104 and Q1114 in order to prevent lockup of the steering switch. Problem was caused because the 151-0087-00 has undergone a change and is now a faster transistor.

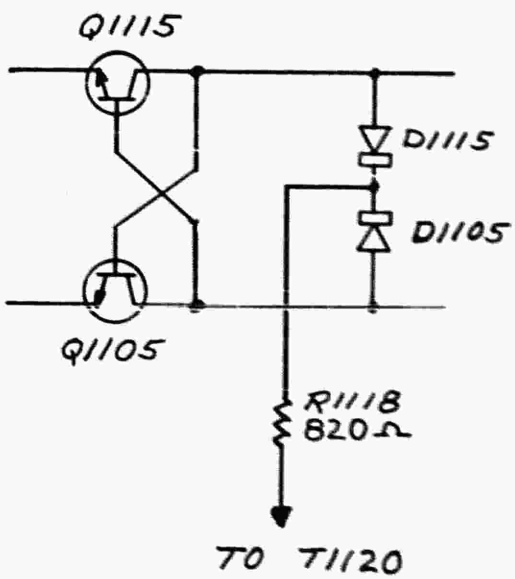
An 820Ω resistor was added in line from T1120 to the junction of D1105 and D1115. This will prevent lockup by adding some phase shift. See Before and After drawings.

Parts Added:

R1118	315-0821-00	Resistor, comp., 820Ω 1/4W 5%



BEFORE



AFTER

HIGH FREQUENCY SHUNT CAPACITOR ADDED TO REDUCE RFI

Effective Prod SN 2831 Usable in SN 100-2830

Approximately 80MHz RF radiating out power cord.

The AC-DC power supply had about 80MHz RF present and it was being coupled out through the line cord. The impedance of C1171, C1172 is too high at 80MHz to effectively shunt the unwanted signal.

A 0.1µF capacitor was added in parallel with C1171 and C1172 to provide better high frequency coupling. M10122-3 should also be installed if Mod 10122-2 is used. See before and after schematic.

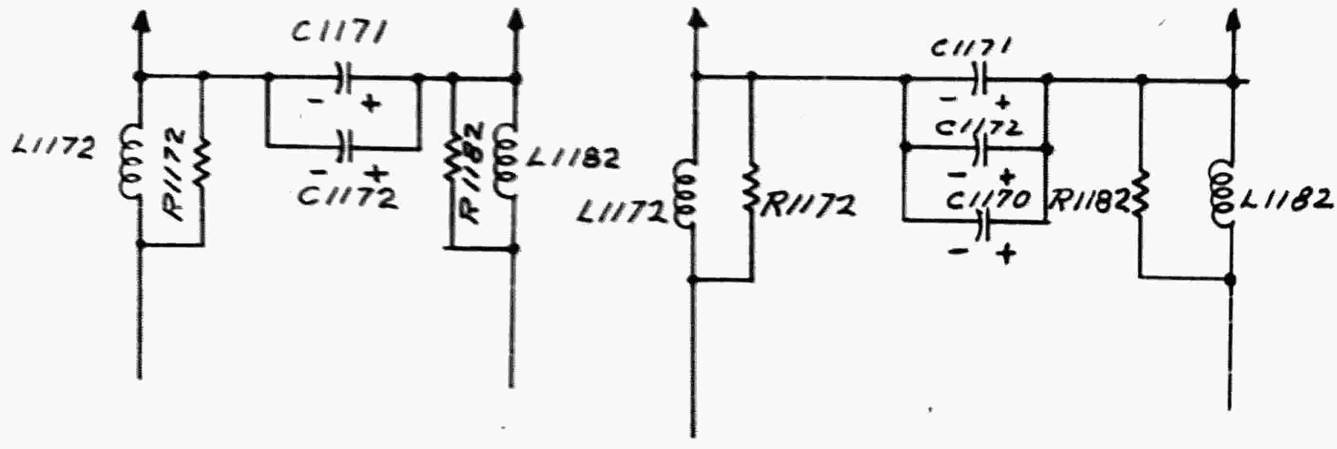
Parts Added:

C1170	283-0111-00	Capacitor, ceramic, 0.1µF 50V discap

INSTALLATION:

Parts Required: See 'Parts Added'.

Add C1170, a 0.1µF 50V capacitor, in parallel with C1171 and C1172 located on the lower left hand corner of the DC power connector circuit board. "C1171" and "C1172" are stamped on the board. Also, see the AC-DC power supply instruction manual (page 4-3) for additional locational information.



BEFORE AFTER

CAPACITOR VALUE INCREASED TO REDUCE RFI

Effective Prod SN 2831 Usable in SN 100-2830

Approximately 80MHz RF radiating out power cord.

C1011 was too small to provide a good RFI line filter to 80MHz RF described in Mod 10122-2.

C1011 was changed from 0.1µF to 0.56µF to improve the RFI line filter performance. If Mod 10122-3 is installed, Mod 10122-2 should also be used. Refer to schematic with Mod 10122-2.

Parts Removed:

C1011	283-0008-00	Capacitor, ceramic, 0.1µF 500V discap

Parts Added:

C1011	283-0129-00	Capacitor, ceramic, 0.56µF 100V

INSTALLATION:

Parts Required: See 'Parts Added'.

Replace C1011, located on the right hand corner of the DC Power Converter circuit board (C1011 is the one nearest the large circuit board hole) with a 0.56µF 100V ceramic capacitor. Also see AC-DC power supply instruction manual (page 4-3) for additional locational information.

SILICON DIODE TYPE CHANGED

Effective Prod SN 3080

Certain critical circuits were designed to use silicon diodes with tighter forward voltage conduction specifications than was provided by type 6185 (152-0185-00).

Silicon diodes D201, D204, D205, D208, D401, D430, D435, D436, D479, D653, D735, D779 and D865 were changed from type 6185 (152-0185-00) to type 6233 (152-0233-00).

Parts Removed:

D201,D204 D205,D208 D401,D430 D435,D436 D479,D735 D779,D865 D653	152-0185-00	Diode, silicon, 6185

Parts Added:

D201,D204 D205,D208 D401,D430 D435,D436 D479,D735 D779,D865 D653	152-0233-00	Diode, silicon, 6233

INSULATION ADDED TO TRANSISTOR MOUNTING TO PREVENT SHORTING TO GROUND

Effective Prod SN 3195 Usable in SN 100-3194

The anodized heat sink for Q1194 was sometimes shorting to ground. This was a result of burring the anodizing on the threads when the securing nut was installed. If the fuse does not blow, the power supply will go out of regulation making the instrument inoperative.

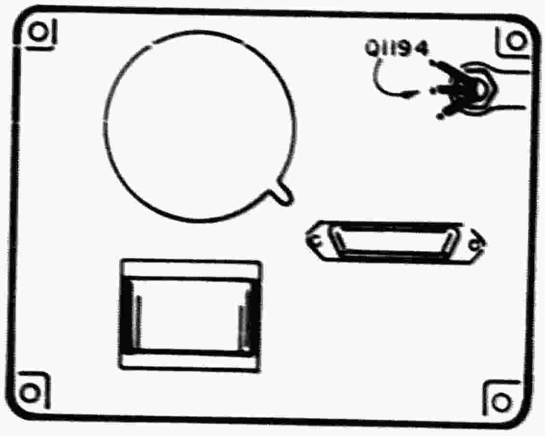
The heat sink for Q1194 was insulated from ground by adding a mica washer between the circuit board and the flat washer of the heat sink.

Parts Added:

210-0909-00	Washer, mica, silicon, 0.625 OD x 0.196 ID x 0.002 thick

INSTALLATION:

Install the mica washer between the DC POWER CONTROL circuit board and the flat washer of the heat sink on transistor Q1194. Refer to the illustration for the location of Q1194.



WIRE COLOR-CODING CHANGED AND REWIRED TO PLACE FUSE AND SWITCH IN HOT SIDE OF LINE

Effective Prod SN 3912 (Interim**) Usable in SN 100-3911
4467 (Permanent)

Modified out of sequence: 3800 3827 3859 3879 3890
3822 3842 3874 3887 3900

The fuse (F1000) and Power switch (SW1001) are wired in the cold side of the AC line; the connectors to Thermal Cutouts (TK1000 and TK1039) are interchanged; and, the wire color-coding used is not standard.

**As an interim measure the Power plug, fuse, RFI Inductor, and Thermal Cutouts were rewired as described below in the "Installation Procedure". The wire color-coding was not changed.

These changes, along with a change in the wire color-coding, was made a permanent change at SN 4467. See before and after schematics on following pages.

Parts Replacement kit 050-0328-00 was made available to facilitate the replacement of the DC Power Converter assembly (670-0082-00) in premodified instruments.

Parts Removed:

179-0977-00	Cable harness, B POWER SUPPLY
179-0978-00	Cable harness, AC-DC

Parts Added:

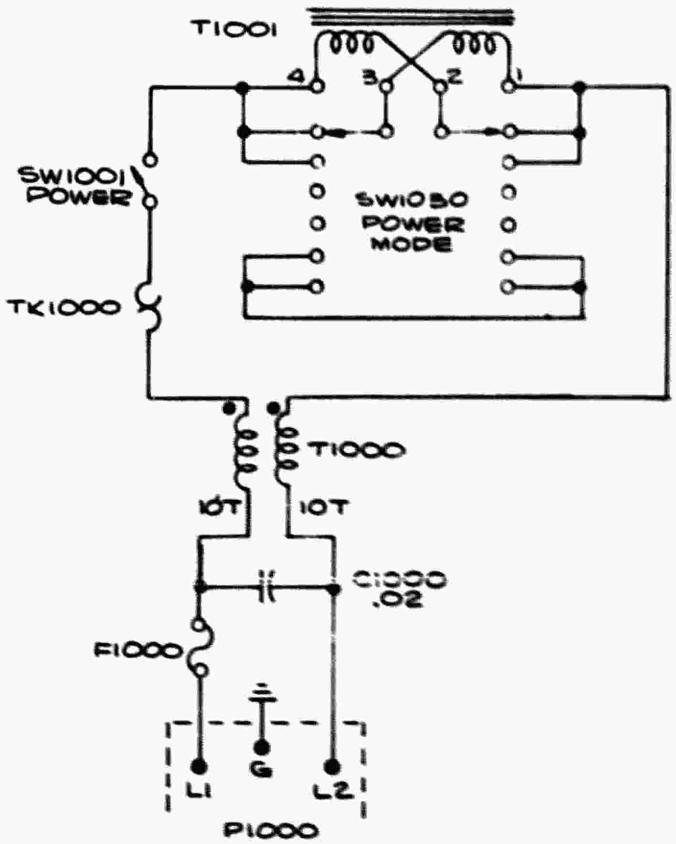
179-0977-01	Cable harness, B POWER SUPPLY
179-0978-01	Cable harness, AC-DC
*175-0523-00	Wire, #22 stranded black 2in. (interim change only)

INSTALLATION:

Parts Required: See 'Parts Added' with asterisk.

Continued.

INSTALLATION: (Continued)

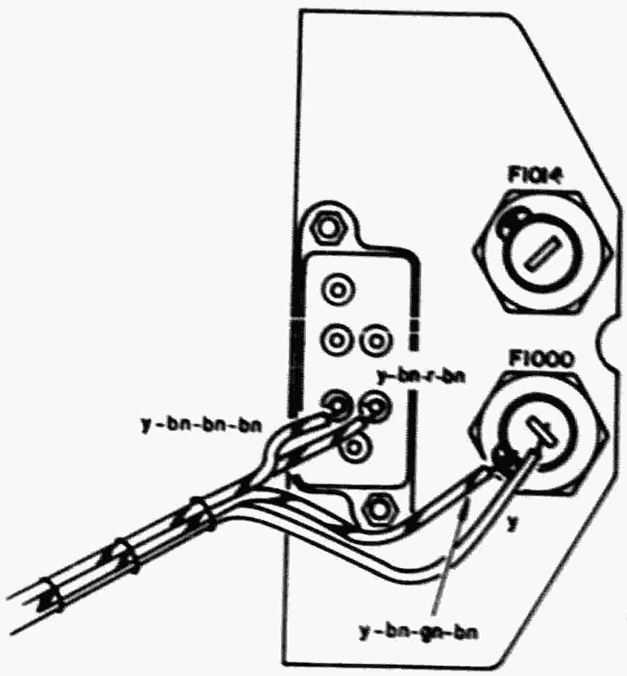


Continued.

INSTALLATION: (Continued)

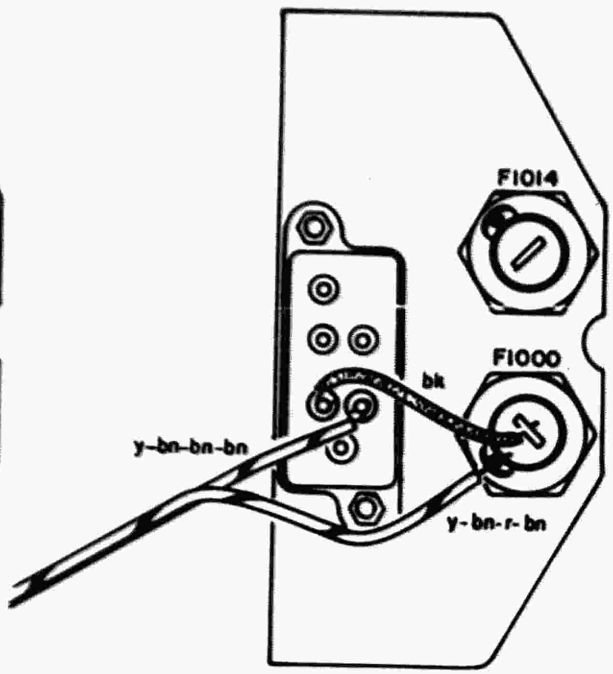
Refer to Figs. 1 and 2 and perform steps 1 through 6.

1) Remove the AC-DC POWER SUPPLY from the power supply housing.
2) Remove the 4" yellow wire, located between fuse F1000 (end connection) and thermo cutout TK1039 (inboard connection), from the cable.
3) Unsolder the yellow-brown-green-brown wire from the fuse holder F1000 (side terminal). Cut off where it enters the cable.
4) Relocate the yellow-brown-red-brown wire from the AC line plug P1000 (terminal 12), to fuse F1000 (side terminal).
5) Relocate the yellow-brown-brown-brown wire from the AC line plug P1000 (terminal L1) to terminal L2.
6) Add a 2" length of #22 stranded black wire between P1000 (terminal L1) and F1000 (end terminal).



BEFORE

FIG. 1



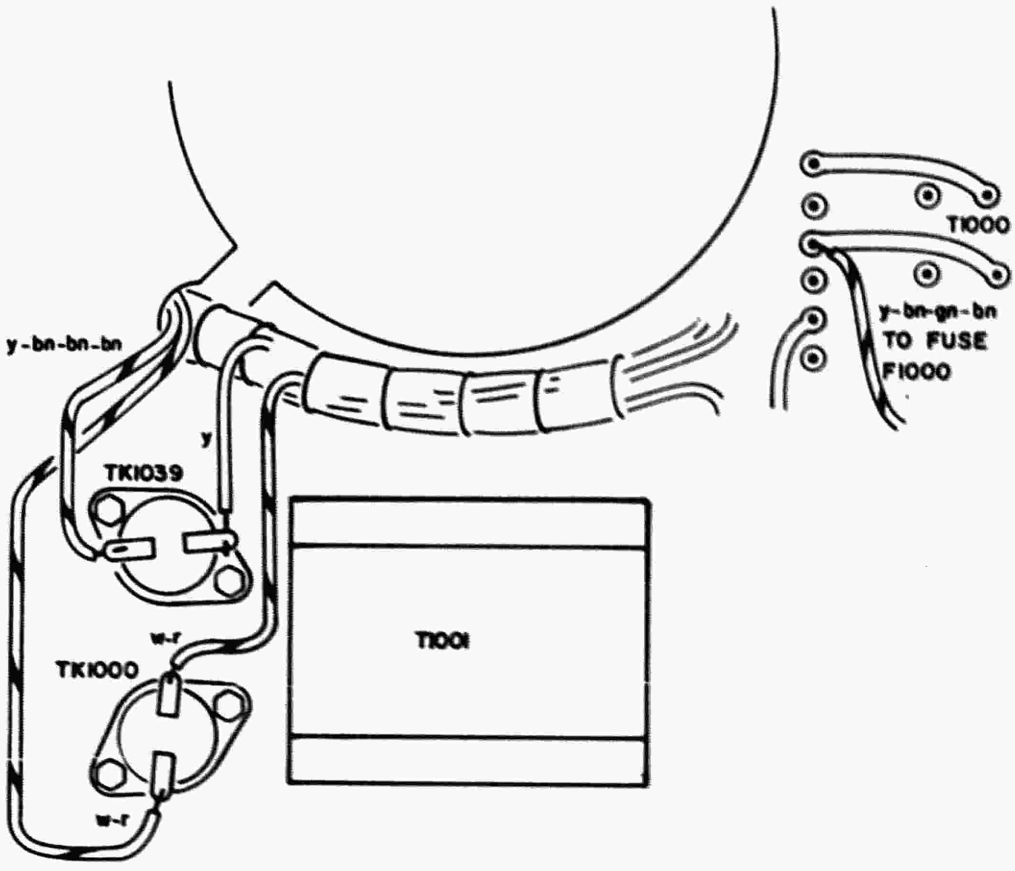
AFTER

FIG. 2

Continued.

INSTALLATION: (Continued)

7) Refer to Fig. 3 and remove the yellow brown-green-brown wire connecting to T1000, from the circuit board. Cut off where it enters the cable.



BEFORE

FIG. 3

Continued.

INSTALLATION: (Continued)

8) Install a new 6" piece of yellow-brown-green-brown wire and dress along the existing calbe above transformer T1001 as shown in Fig. 4.

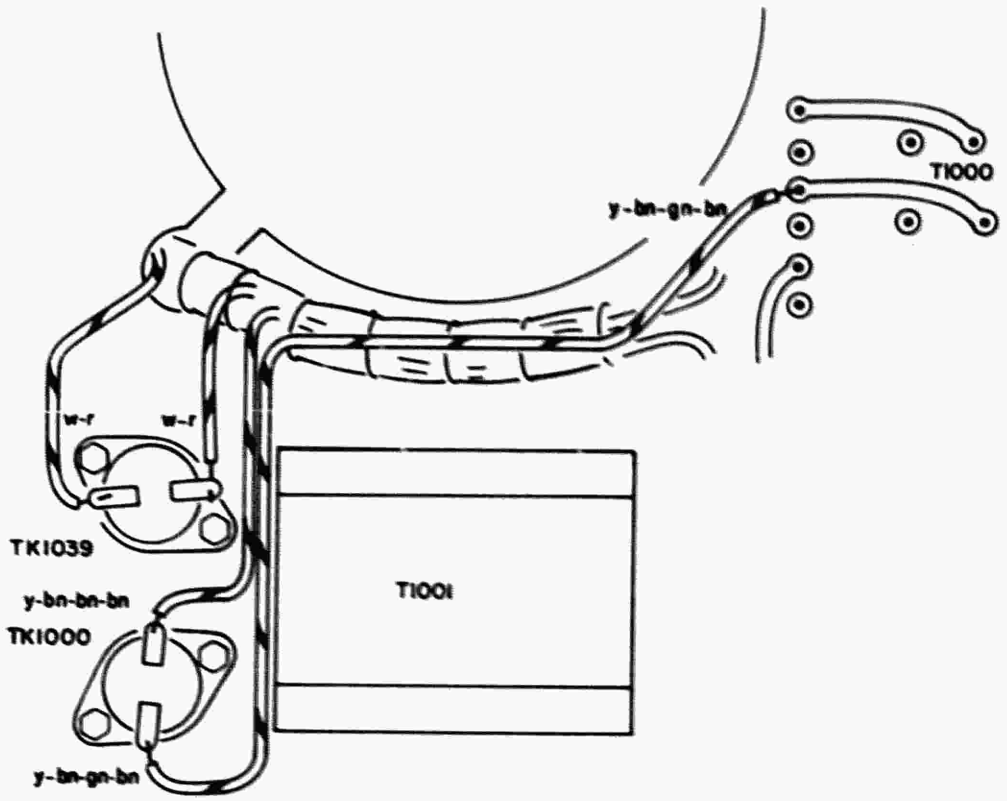
9) Unsolder the yellow-brown-brown-brown wire connected to thermo cutout TK1039.

10) Relocate the two white-red wires connected to TK1000 to TK1039 (inboard and outboard terminals respectively.

11) Solder the yellow-brown-brown-brown wire (installed in step 9) to TK1000 (inboard terminal nearest TK1039) as shown in Fig. 4.

12) Solder the yellow-brown-green-brown wire (installed in step 8) to the outboard terminal of thermo cutout TK1000 as shown in Fig. 4.

13) Reinstall the AC-DC POWER SUPPLY in the housing.



AFTER

FIG. 4

BATTERY VENDOR AND BATTERY PART NUMBER CHANGED

Effective Prod SN Not Given

The source of supply and part number of the nickel cadmium batteries were changed to provide more reliable operation at high temperatures. This change should also extend battery life at normal temperatures.

Parts Removed:

146-0008-00	Batter, nickel cadmium w/solder tabs	(20)
407-0128-00	Bracket, spring	

Parts Added:

146-0010-00	Battery, 4.0 amp hours for high temperature application w/solder tabs.	(20)
407-0128-01	Bracket, spring	

DC POWER CONVERTER CIRCUIT BOARD CHANGED TO PROVIDE BETTER PARTS LAYOUT

Effective Prod SN 4043

C1231 and C1242 were touching the case of Q1193 and mounting holes were needed to install R1118. R1118 was added by Mod 10122.

The mounting holes for C1231 and C1242 were relocated to the left of Q1193. This required a slight change in the location of D1232 and D1233 mounting holes. The new holes were added to install R1118 between the junction of D1105-D1115 and connection of T1171.

DC POWER CONTROL CIRCUIT BOARD CHANGED

Effective Prod SN 4043

The plant was painting the power lead connections to avoid a possible short circuit and mounting holes were required for C1170, which was added by Mod 10122.

The power lead connections were staggered to eliminate possible short circuit. Two holes were added in parallel with C1172 and C1174 to mount C1170.

ZENER DIODE VOLTAGE SPECIFICATION INCREASED

Effective Prod SN 4530

Modified out of sequence: 4453 4474-9 4485-6 4496 4500-1
4462-3 4482-3 4488-92 4499 4504-5

V_{bc} of some energy storage switch transistors (Q1174 and Q1184) is at upper limit and voltage of Zener diode D1192 is at lower limit. This results in insufficient voltage on the bases of Q1174 and Q1184 to start the supply oscillating.

D1192 voltage rating was increased from 7.5V to 8.2V to assure proper biasing of transistors Q1174 and Q1184.

This modification is superseded by Mod 11373.

Parts Removed:

D1192	152-0127-00	Diode, Zener, 1N755A 7.5V 5%

Parts Added:

D1192	152-0217-00	Diode, Zener, 1N756 8.2V 5%

SIDE BRACKET MODIFIED TO PREVENT OCCASIONALLY SHORTING OF DC CIRCUITRY

Effective Prod SN 5700

One of the mounting tabs on the side bracket occasionally shorts to the adjacent circuitry on the DC Power Converter circuit board.

A notch of 45° x 0.200" was made in the inside corner of the mounting tab, without the captive nut.

Parts Removed:

407-0125-00	Bracket side, 0.040 alum.

Parts Added:

407-0125-01	Bracket side, 0.040 alum.

ZENER DIODE CHANGED TO NOMINAL VALUE PART NOW AVAILABLE

Effective Prod SN 6230

Proper value part was not available.

D1192 was changed from an 8.2V Zener diode to a 9.1V Zener. This mod supersedes Mod 11365. See Mod 11365 for additional details.

Parts Removed:

D1192	152-0217-00	Diode, Zener, 1N756A, 8.2V 5%

Parts Added:

D1192	152-0306-00	Diode, Zener, 1N960B, 9.1V 5%

POWER REGULATOR TRANSISTOR CHANGED TO PREVENT TRANSISTOR BREAKDOWN

Effective Prod SN 6990 Usable in SN 100-6989

The power supply will not regulate because starting voltage exceeds the rating of some brands of transistors presently used at Q1194.

Transistor J3138, used at Q1194, was replaced with a 2N4036 transistor to prevent transistor breakdown.

Parts Removed:

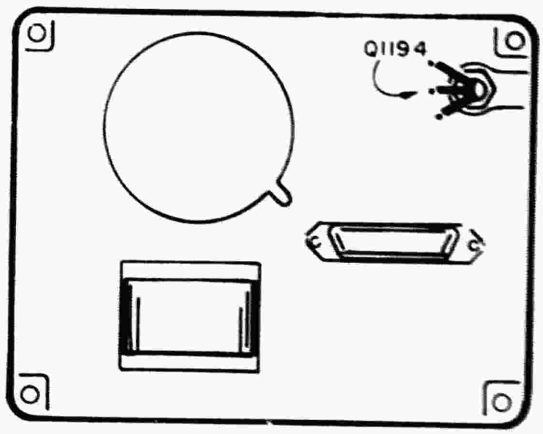
Q1194	151-0087-00	Transistor, silicon, J3138 PNP TO-5

Parts Added:

Q1194	151-0208-00	Transistor, silicon, 2N4036 PNP TO-5

INSTALLATION:

Replace Q1194 with a 2N4036 transistor. In instruments below serial number 3195 add a mica washer between the circuit board and the flat washer on the Q1194 heat sink.



TRANSISTOR MOUNTING HARDWARE CHANGED TO ELIMINATE POSSIBLE SHORT

Effective Prod SN 7400

The possibility exists that Q637 or Q657 transistors in the +12 and -12 volt power supply could be shorted to the chassis if the mounting screw breaks the anodized coating of the aluminum insulating washers used to mount the transistors.

The mounting washers of Q637 and Q657 were changed from anodized aluminum washers to shouldered fiber washers.

Parts Removed:

210-0983-00	Washer, shouldered alum., w/#6 hole black anodized	(4)

Parts Added:

210-0811-00	Washer, fiber, #6 shouldered	(4)

TRANSISTORS CHANGED TO PROVIDE MORE STABLE OPERATION AND REDUCE RIPPLE

Effective Prod SN 11682

Modified out of sequence: 10919 11304 11384 11558 11300 11314 11431 11619

Transistors presently being used cause unstable operation and failure to meet ripple specifications.

The following transistors were changed: Q1104, Q1114, Q1134, Q1144, Q1154, Q1163, and Q1164. Changing these transistors necessitated a change in the gain of the error amplifier which resulted in a change of C1133, C1245, C1246, R1136, R1136, and R1161.

Parts Removed:

C1133	290-0273-00	Capacitor, EMT, 68µF, 60V
C1245 C1246	290-0248-01	Capacitor, EMT, 150µF, 15V
Q1104,Q1114 Q1144,Q1163	151-0087-00	Transistor, J3138
Q1134	151-0133-00	Transistor, 2N2156
Q1154	153-0539-00	Transistor, 2N2219 (Selected 151-0103-00)
Q1164	151-0103-00	Transistor, 2N2219
R1134	315-0103-00	Resistor, comp., 10k 1/4W 5%
R1136	315-0330-00	Resistor, comp., 33Ω 1/4W 5%
R1161	315-0752-00	Resistor, comp., 7.5k 1/4W 5%

Parts Added:

C1133	290-0272-00	Capacitor, EMT, 47µF, 50V
C1245 C1246	290-0323-00	Capacitor, Elect., 270µF 15V
Q1104 Q1114 Q1163	151-0208-00	Transistor, 2N4036
Q1134 Q1144	151-0220-00	Transistor, 2N4122
Q1154 Q1164	151-0224-00	Transistor, 2N3692
R1134	315-0512-00	Resistor, comp., 5.1k 1/4W 5%
R1136	315-0390-00	Resistor, comp., 39Ω 1/4W 5%
R1161	315-0822-00	Resistor, comp., 8.2k 1/4W 5%

product modification

S20987

Type 422

RUBBER SPACERS ADDED

Effective Prod SN N/A

To eliminate the possiblity of the transformer mounting screws shorting to solder connections on the DC Power Control circuit board, when the supply is attached to a 422 indicator rubber spacers were added to the back of the circuit board.

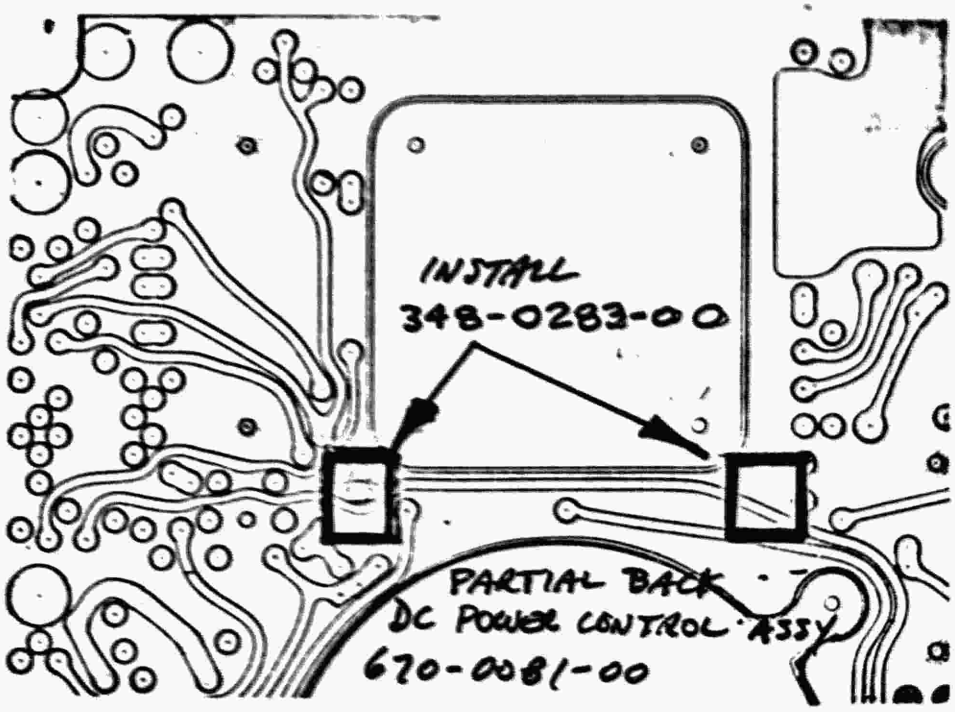
See diagram for location of installed spacers.

PARTS REMOVED:

NONE

PARTS ADDED:

QNTY	PART NUMBER	DESCRIPTION
2	348-0283-00	Rubber Spacer



12-18-74

product modification

M21021

Type 422

Q1174 AND Q1184 REPLACED

Effective Prod SN 34900

To increase the availability of components, Q1174 and Q1184(151-0163-00) were replaced by 151-0469-00 which required a change in the mounting.

In order to mount the new transistors, two transistor heat sinks and two screws with lockwashers, in addition to the mounting hardware used to mount the old transistors, are required. See detail for additional mounting information.

The collector or center lead of the new transistor was removed as the collector connection is made through the heat sink and a solder lug.

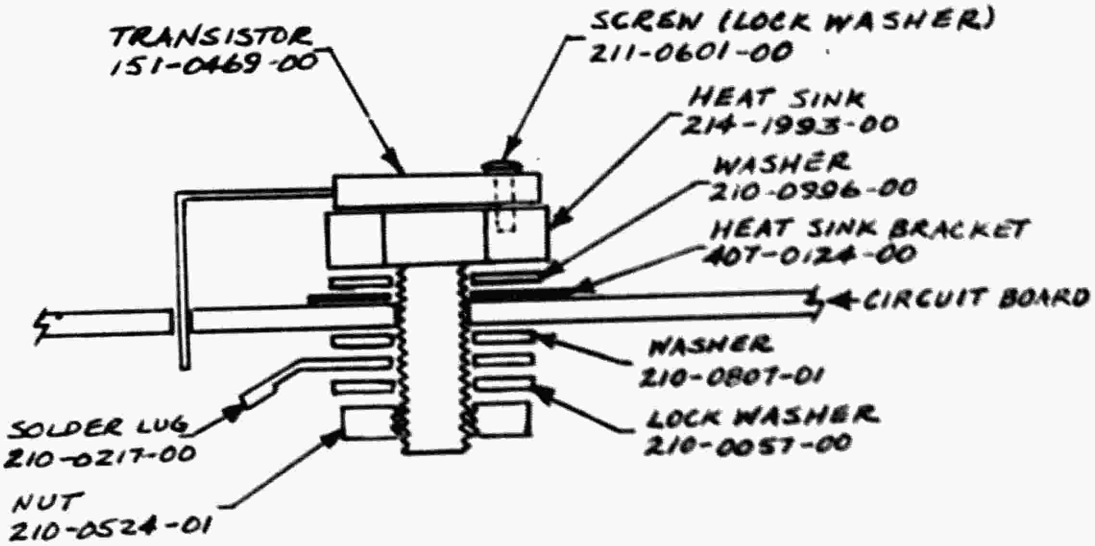
PARTS REMOVED:

CKT NO.	PART NUMBER	DESCRIPTION
Q1174,Q1184	151-0163-00	Transistor, Silicon NPN

PARTS ADDED:

CKT NO.	PART NUMBER	DESCRIPTION
Q1174,Q1184	151-0469-00	Transistor, Silicon NPN
	214-1993-00	Heat Sink (Transistor) (2)
	211-0601-00	Screw, 6-32 X .312 long w/2 lockwashers (2)

12-18-74



DETAIL FOR MOUNTING TRANSISTOR

Type 422 **PRODUCT MODIFICATION INDEX**

circuit section XXX.XX page

◇ 1 MODIFICATION KITS

EFF. SN. S.M*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
100 - +	Portable to Rackmount Conversion Modification Kit	-----	501.01	2 Hrs.	040-0419-00
100 - +	Rackmount to Portable Conversion Modification Kit	-----	501.02	2 Hrs.	040-0421-00
ALL	3-Wire Power Cord Femal Ground Connection Improvement Modification Kit	11487	301.14	5 Min	040-0424-01
100-6989	Improved Power Switch Actuator Modification Kit	11292	301.10	15 Min	040-0439-00

PRODUCT MODIFICATION INDEX

Type 422

◇ 2 PARTS REPLACEMENT KITS

CLASSIFICATIONS
1 Required
2 Recommended
3 Information Only
U Unclassified

XXX.XX — Circuit / Page / Section

EFF. SN.	DESCRIPTION	MOD. NO.	PAGE NO.	LABOR TIME	KIT NO.
100-594	-12V ZENER DIODE PARTS REPLACEMENT	----	502.01	0.3h	050-0257-00
100-1889	T4220-11-1 (P-11 PHOSPHOR) CRT REPLACEMENT	9763 17774	110.04		050-0264-12
100-1889	R4220 CATHODE RAY TUBE PARTS REPLACEMENT	9763	110.05	0.5h	050-0264-13
100-599	HORIZONTAL AMPLIFIER BOARD PARTS REPLACEMENT	----	502.02	0.25h	050-0285-00
100-3079	SILICON DIODE REPLACEMENT	10311	106.03	0.25h	050-0290-00
100-2709	DELAY LINE ASSEMBLY	----	502.03	1.0h	050-0291-00
100-4329	HIGH VOLTAGE REGULATOR BOARD	----	502.04	1.5h	050-0309-00
100-7189	GRATICULE BULB REPLACEMENT	12509	109.03	0.2h	050-0319-00
100-7189	AC POWER SUPPLY CIRCUIT BOARD	10517	502.05	1.0h	050-0320-00
100-4466	AC-DC POWER CONVERTER ASSEMBLY	10808	502.06	2.0h	050-0328-00
ALL	TUNNEL DIODE REPLACEMENT	13967	206.01	5.0h	050-0425-00
ALL	CATHODE RAY TUBE REPLACEMENT	----	502.07	0.2h	050-0432-00
12347-13010	CH 2 VOLTS/DIV SWITCH ASSEMBLY REPLACEMENT	----	502.08	1.0h	050-0441-00
12347-13010	CH 2 INPUT AMPLIFIER BOARD REPLACEMENT	----	502.09	0.3h	050-0442-00

(continued)

2 PARTS REPLACEMENT KITS (continued)

CLASSIFICATIONS
1 Required
2 Recommended
3 Information Only
U Unclassified

XXX.XX — Circuit / Page / Section

EFF. SN.	DESCRIPTION	MOD. NO.	PAGE NO.	LABOR TIME	KIT NO.
100-21832	REAR FOOT REPLACEMENT	14781	502.10	0.2h	050-0461-00
11370-25129	VARIABLE VOLTS/DIV POTENTIOMETER REPLACEMENT	16158	201.02	1.0h	050-0489-00
100-30640	LEVER SWITCH REPLACEMENT	16516	201.05	----	050-0520-00
25000-33199	POWER TRANSFORMER REPLACEMENT	----	502.11	1.0h	050-0608-00
100-34029	HANDLE HUB AND RING INDEX REPLACEMENT	20371	212.02	0.5h	050-0663-02
100-34899	Q1174 AND Q1184 REPLACEMENT	21021	502.12	----	050-0697-00

##Changed since last publication.

product modification

040-0419-00

Type 422

PORTABLE TO RACKMOUNT CONVERSION

For TEKTRONIX® Type 422 Oscilloscopes
with AC Power Supplies only

Serial Numbers 100-up

This modification supplies an R422 rackmount assembly for rackmounting the above-listed instruments. Rear support installation instructions are included in Manual Insert section supplied with this kit.

The R422 rackmount assembly has two oscilloscope compartments. This feature permits the rackmounting of two instruments, side by side, in the same relay rack. If it is desired that only one instrument be rackmounted, then either the left or right compartment may be chosen. The remaining compartment may then be used as an instrument storage compartment. A convenient pull-down door is provided for the storage compartment to retain all accessories. Two rear support brackets are provided with the kit for the purpose of supporting two instruments in the same rack. If only one instrument is rackmounted, then support to the storage compartment is not necessary. The assembled R422 rackmount assembly may be installed into any standard 19 inch open or closed relay rack on slide-out tracks.

The slide-out tracks used on the Type 422 consist of two assemblies, one each for the right and left sides. Each assembly consists of three sections. The stationary section attaches to the rack, the chassis section attaches to the surrounding instrument frame, and the intermediate section fits between the other two sections to allow the instrument to extend out of the rack.

When properly installed, the Rackmount Rear Support assembly permits the R422 to withstand and environmental shock or vibration as described in Characteristics section of the 422 Manual. If the 422 is not properly supported at the rear, then the instrument will not meet the given environmental characteristics.

The assembly consists of: 1) Removing the instruments from the cabinets. 2) Assembling the instruments into the R422 rackmount assembly. 3) Installing the rear support bracket assembly. 4) Rackmounting and providing rear support in a standard relay rack as described in the Manual Insert section.

PARTS INCLUDED IN MODIFICATION KIT:

Quantity	Part Number	Description
(1 ea)		Hardware, R422 Rackmounting, consisting of:
2 ea	210-0410-00	Nut, hex, 10-32 x 5/16
4 ea	210-0458-00	Nut, Keps, 8-32 x 11/32
2 ea	210-0805-00	Washer, flat, 0.204 ID x 0.438 OD
4 ea	213-0090-00	Screw, 10-32 x 1/2, HHS
1 pr	351-0104-00	Guide, chassis track
2 ea	367-0022-00	Handle
1 ea	436-0065-00	Compartment, storage assembly
1 ea	437-0082-00	Cabinet, rackmount assembly
(1 ea)		Hardware, Relay Rack and Rear Support, consisting of:
2 ea	210-0011-00	Washer, 1/4 int
4 ea	210-0803-00	Washer, #6
4 ea	210-0805-00	Washer, #10
4 ea	210-0833-00	Washer, finishing #10
4 ea	210-0866-00	Washer, 0.264 ID x 1-1/8 OD x 0.1106
4 ea	210-0917-00	Washer, plastic, 0.191 ID x 5/8 OD
2 ea	210-0984-00	Washer, support, NEOPRENE®
2 ea	210-0985-00	Washer, 7/8 OD x 0.512 ID x 0.054
4 ea	211-0517-00	Screw, 6-32 x 1 PHS
4 ea	212-0520-00	Screw, 10-32 x 1-1/4 hex head
4 ea	212-0567-00	Screw, 10-32 x 7/8 OHS
2 ea	213-0134-00	Screw, 1/4-20 x 3/4 hex head
2 ea	214-0502-00	Pin, support
4 ea	220-0410-00	Nut, Keps, 10-32 x 3/8 hex
1 pr	351-0100-00	Track, slide, stationary and inter-section w/mounting hardware
4 ea	361-0118-00	Spacer, sleeve
2 ea	361-0119-00	Spacer, block
2 ea	386-1066-00	Plate, retaining shaft
2 ea	407-0073-00	Bracket, angle support

NEOPRENE, Reg. TM of Carboline Co.

INSTRUCTIONS

NOTE: It is important that all mechanical components and hardware be saved for future use, especially if the instrument is re-assembled into its original cabinet.

A. TO REMOVE THE INSTRUMENT FROM THE PORTABLE CABINET.

Refer to Fig. 1 for steps 1-4

( ) 1. Remove the front cover assembly from the instrument.

( ) 2. Unscrew the four 10-32 screws, located in the four rear rubber feet, which secure the AC Power Supply to the instrument.

( ) 3. Remove the AC Power Supply from the instrument.

( ) 4. Remove the three 4-40 x 5/16 screws which secure the wrap-around cabinet to the instrument. SAVE.

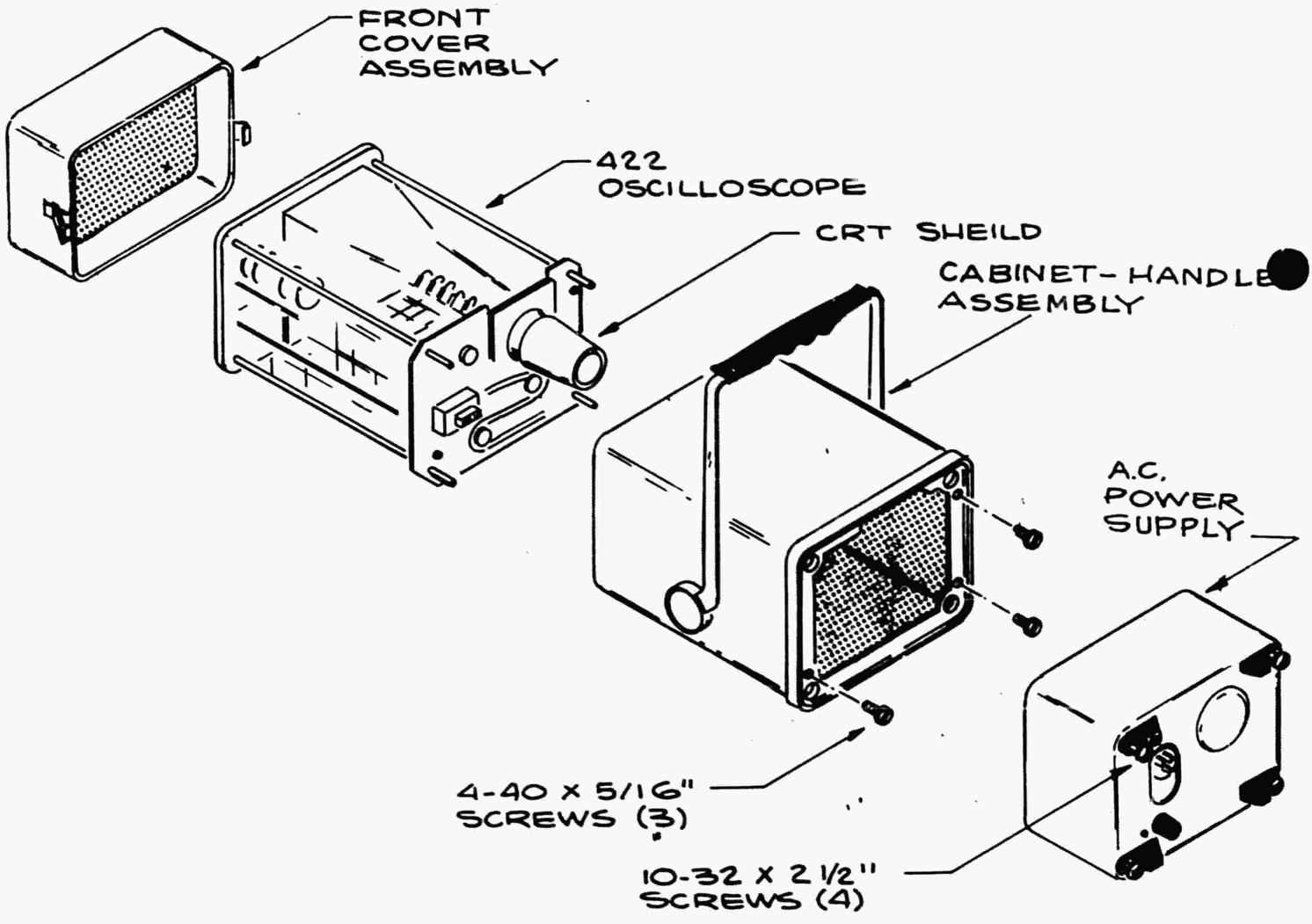


FIG. 1

INSTRUCTIONS (A. continued)

( ) 5. Remove the wrap-around cabinet from the instrument. (Refer to Fig. 2.)

NOTE: The R422 Rackmount assembly was designed with two 422 Oscilloscope compartments. The right-hand compartment is supplied with a convenient accessory storage unit with a pull-down door. Two 422 Oscilloscopes may be mounted in the R422 Rackmount assembly, side by side, or one 422 Oscilloscope may be mounted in either the left or right compartment. This can be accomplished by removing or transferring the storage compartment. The storage compartment is secured to the R422 rear panel with two 10-32 flat washers and nuts.

B. TO INSTALL THE OSCILLOSCOPES INTO THE R422 RACKMOUNT:

Refer to Fig. 2 for steps 1 and 2.

( ) 1. Slide the 422 Oscilloscope into the chosen compartment.

( ) 2. Secure the oscilloscope to the R422 Rackmount assembly, using the three 4-40 x 5/16 screws removed in step 4.

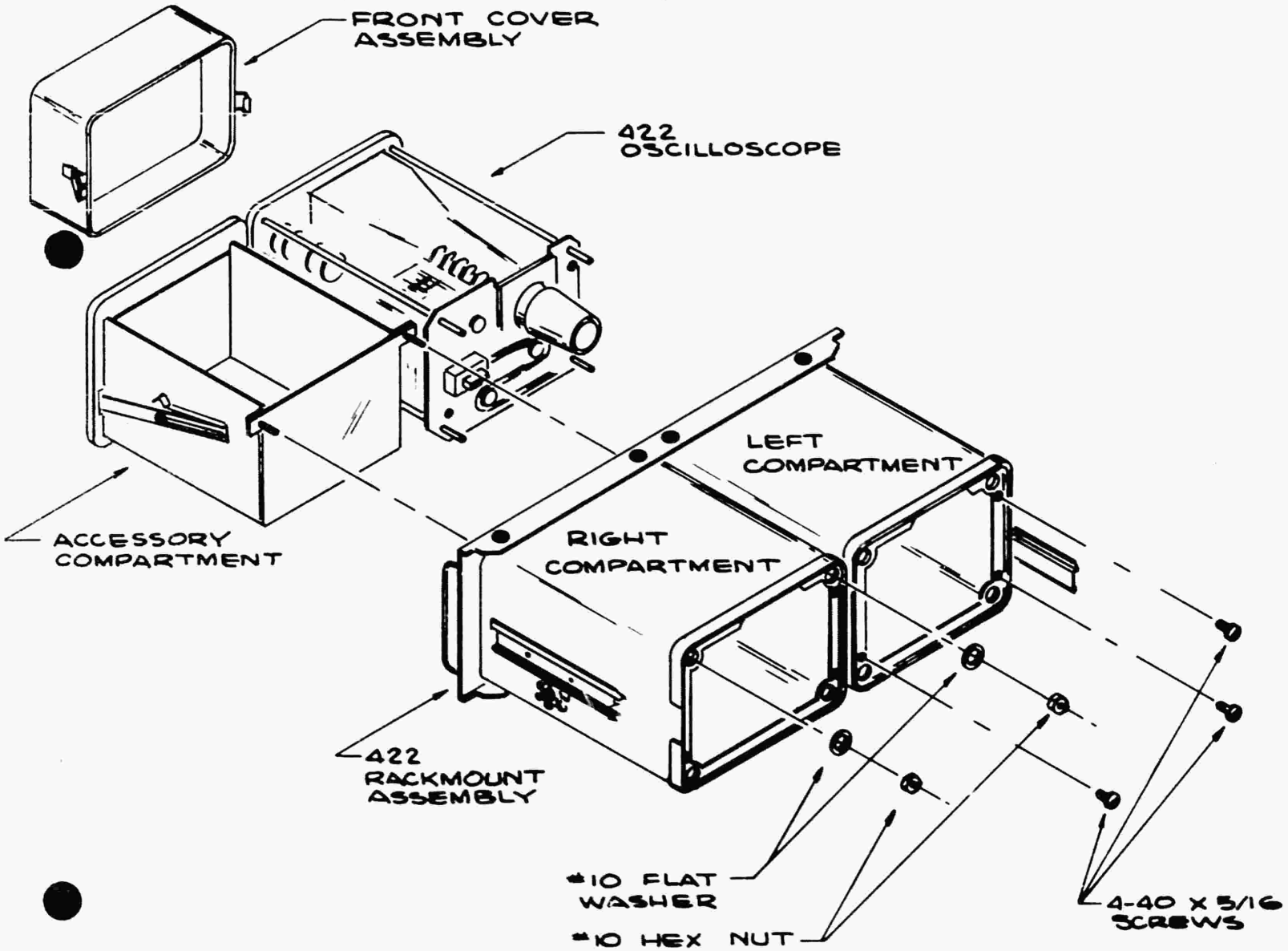
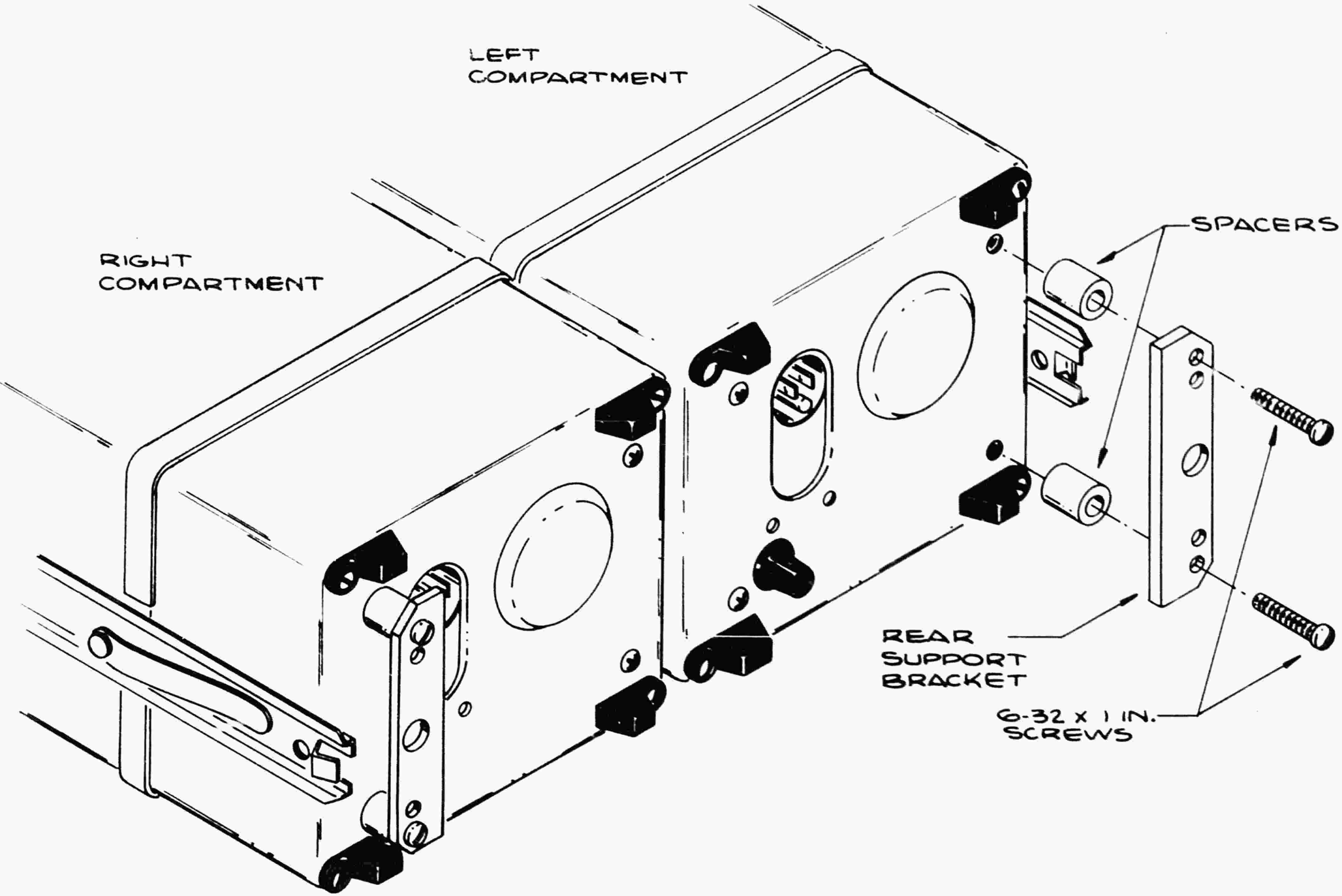


FIG. 2



TWO 422 OSCILLOSCOPES WITH A.C. POWER SUPPLIES IN THE R422 RACKMOUNT ASSEMBLY (REAR VIEW)

FIG. 3

INSTRUCTIONS (B. continued)

( ) 3. Secure the AC Power Supplies to their respective oscilloscopes. (See Fig. 3)

C. TO INSTALL THE REAR SUPPORT BRACKETS ON THE AC POWER SUPPLIES:

Refer to Fig. 3 for steps 1 through 4.

LEFT COMPARTMENT ONLY

( ) 1. Remove the two 6-32 x 1/4 screws, located on the right side (rear view) of the AC Power Supply.

( ) 2. Install the rear support bracket, spacers, and 6-32 x 1 screws on the right side (rear view) of the AC Power Supply.

RIGHT COMPARTMENT ONLY

( ) 3. Remove the two 6-32 x 1/4 screws, located on the left side (rear view) of the AC Power Supply.

( ) 4. Install the rear support bracket, spacers, and 6-32 x 1 screws on the left side (rear view) of the AC Power Supply.

THIS COMPLETES THE INSTALLATION

( ) Fasten the Manual Insert section to the front of your 422 Manual.

NOTE: See the R422 Manual Insert Section for relay rack and rear support installation instructions.

TL:ls

MODIFICATION KIT

RACKMOUNT TO PORTABLE CONVERSION

040-0421-00

For Tektronix Type R422 Oscilloscopes
Serial numbers 100-up

DESCRIPTION

This modification kit supplies a cabinet-handle assembly and front cover assembly for converting a single 422 Oscilloscope, which is contained within an R422 Rackmount assembly, to a standard 422 portable oscilloscope.

The conversion to a portable instrument consists of:

1) Removing the 422 Oscilloscope and AC Power Supply from the R422 Rackmount.
2) Installing the 422 into the cabinet-handle assembly.
3) Installing the AC Power Supply on the 422 Oscilloscope.
4) Replacing the Rear Support Bracket assembly with two 6-32 screws.
5) Installing the front cover assembly.

Publication:
Instructions for 040-0421-00
August 1967

Supersedes:
April 1966

PARTS LIST

Quantity	Part Number	Description
(1 ea)		Assembly, cabinet-handle, consisting of:
2 ea	210-0805-00	Washer, flat
2 ea	213-0139-00	Screw, 10-24 x 3/8 HHS
1 ea	367-0063-00	Handle assembly
1 ea	437-0076-00	Cabinet assembly
1 ea	200-0604-02	Cover, front, assembly
2 ea	211-0565-00	Screw, 6-32 x 1/4 THS, Phillips

INSTRUCTIONS

NOTE: It is important that all mechanical components and hardware be saved for future use, especially if the instrument is to be reassembled into the R422 cabinet.

( ) 1. Remove the R422 Rackmount assembly from the relay rack.

( ) 2. Loosen the four 10-32 screws in the AC Power Supply rear feet and remove the power supply from the instrument.

REFER TO FIG 1 FOR STEPS 3 AND 4

( ) 3. Remove the three 4-40 x 5/16 screws that secure the 422 oscilloscope to the R422 cabinet. Save screws.

( ) 4. Remove the 422 Oscilloscope from the R422 cabinet.

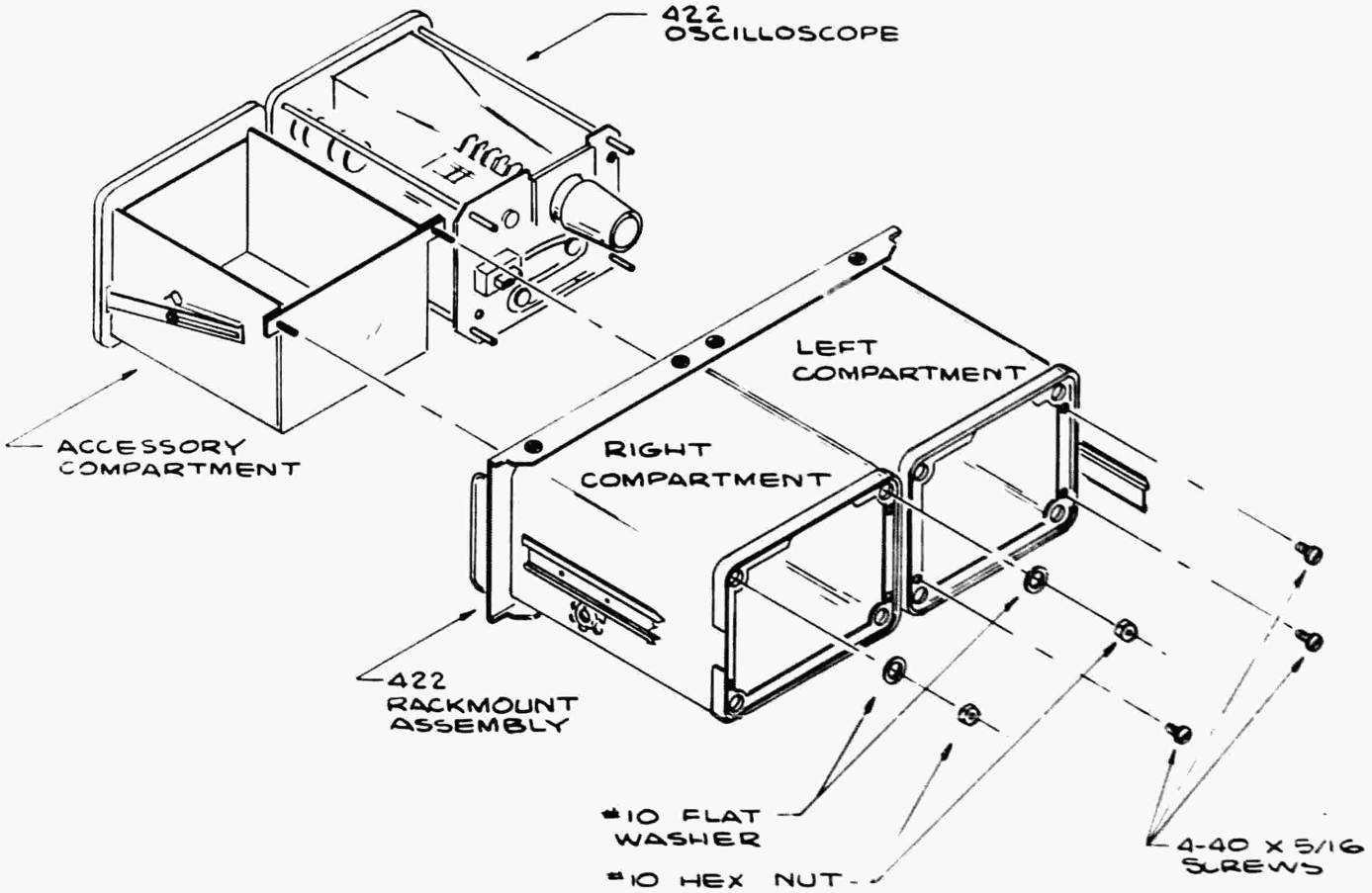


Fig 1

INSTRUCTIONS (cont)

REFER TO FIG 2 FOR STEPS 5 THROUGH 9

( ) 5. Slide the 422 Oscilloscope into the cabinet-handle assembly (from kit) and secure the cabinet to the instrument using the three 4-40 x 5/16 screws removed in step 3.

( ) 6. Place the AC Power Supply on the rear of the 422 Oscilloscope.

( ) Secure the power supply to the instrument by tightening the four 10-32 screws in the AC Power Supply rear feet.

( ) 7. Remove the rear support bracket, spacers, and hardware from the AC Power Supply.

( ) 8. Install two 6-32 x 1/4 THS Phillips screws (from kit) in the holes vacated by the rear support hardware.

( ) 9. Secure the front cover (from kit) on the front of the 422 Oscilloscope.

THIS COMPLETES THE INSTALLATION.

NOTE: The parts included in this kit are already listed in your Manual Parts List.

BE:ls

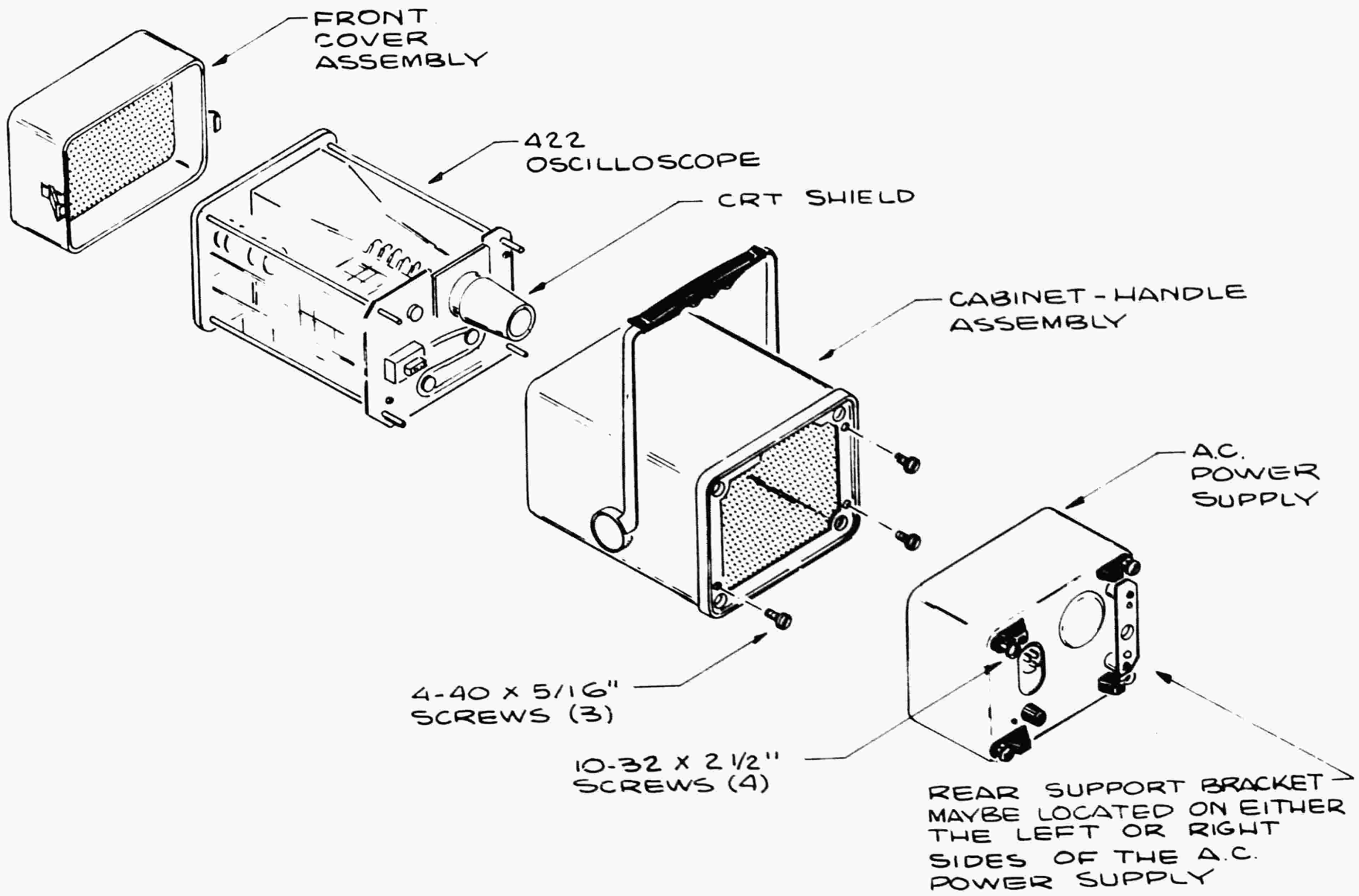


Fig 2

product modification

050-0257-00

Type 422

-12V SUPPLY ZENER DIODE REPLACEMENT

For TEKTRONIX® Type 422 Oscilloscopes:

AC Power Supply SN 100-589

1N936, 9V Zener diode (152-0212-00) replaces 1N752A, 5.6V Zener diode (152-0175-00) which is no longer available.

To install the new diode, it is necessary to change the values of several components in the -12V power supply.

NOTE: If the serial number of your instrument is above those listed or if this kit has been installed, disregard the instructions as PN 152-0212-00 is a direct replacement.

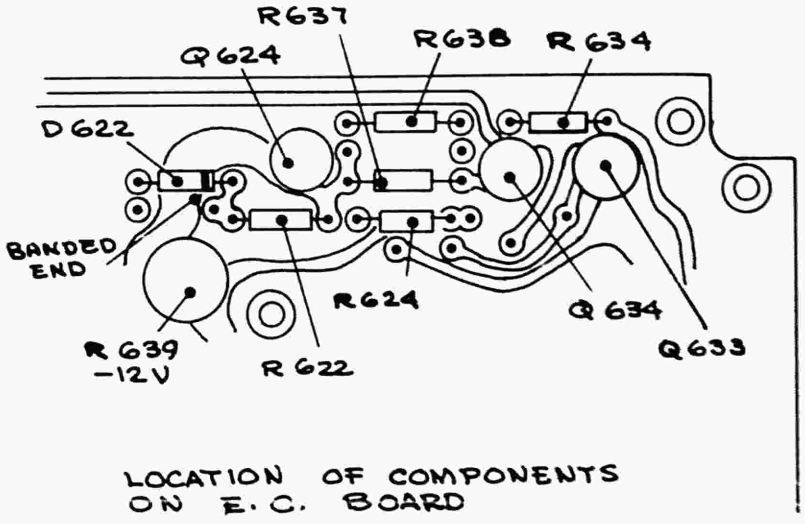
7-30-70

Supersedes: August 1965

502.01 ##

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description		
1 ea	152-0212-00	Diode, Zener, 1N936	9V	±5%
1 ea	311-0532-00	Potentiometer, WW	1.5k	5%
1 ea	315-0102-00	Resistor, comp.	1k 1/4W	5%
1 ea	315-0272-00	Resistor, comp.	2.7k 1/4W	5%
1 ea	315-0391-00	Resistor, comp.	390Ω 1/4W	5%
1 ea	321-0191-00	Resistor, prec.	953Ω 1/8W	1%
1 ea	321-0227-00	Resistor, prec.	2.26k 1/8W	1%
1 ea	1-910D	Tag, MODIFIED INSTRUMENT, gummed back		



LOCATION OF COMPONENTS ON E.C. BOARD

FIG. 1

INSTRUCTIONS

( ) 1. Remove the six Phillips head screws that fasten the Power Supply cover in place and remove the cover.

( ) 2. Temporarily unsolder the negative wire of C642 from the etched circuit board and remove the capacitor from the clip.

3. Refer to Fig. 1 and replace the following parts with the new parts from the kit:

( ) R639: Remove a 2.5k potentiometer (-12V), and install a 1.5k WW potentiometer. (Reinstall C642, removed in step 2.)

( ) D622: Remove a 1N752A and install a 1N936, banded end toward Q624.

( ) R622: Remove a 1k 1/4W 5% resistor and install a 390Ω 1/4W 5% resistor.

( ) R624: Remove a 620Ω 1/4W 5% resistor and install a 1k 1/4W 5% resistor.

( ) R634: Remove a 2.4k 1/4W 5% resistor and install a 2.7k 1/4W 5% resistor.

( ) R637: Remove a 6.34k 1/8W 1% resistor and install a 953Ω 1/8W 1% resistor.

( ) R638: Remove a 4.02k 1/8W 1% resistor and install a 2.26k 1/8W 1% resistor.

THIS COMPLETES THE INSTALLATION.

( ) Check wiring for accuracy.

( ) Fasten the insert pages in your Instruction Manual.

( ) Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and place it on the AC Power Supply schematic.

( ) Refer to the Calibration Section of your Instruction Manual and recalibrate as required.

( ) Replace the Power Supply cover, removed in step 1.

DF:ls

INSTRUCTION MANUAL

MODIFICATION INSERT

-12V SUPPLY ZENER DIODE REPLACEMENT

Type 422 AC Power Supply -- SN 100-589

Installed in Type 422 AC Power Supply SN_____Date_____

This insert has been written to supplement the Instruction Manual for this instrument. The information given in this insert will supersede that given in the manual.

GENERAL INFORMATION

1N936, 9V Zener diode (152-0212-00) replaces 1N752A, 5.6V Zener diode (152-0175-00) which is no longer available.

ELECTRICAL PARTS LIST

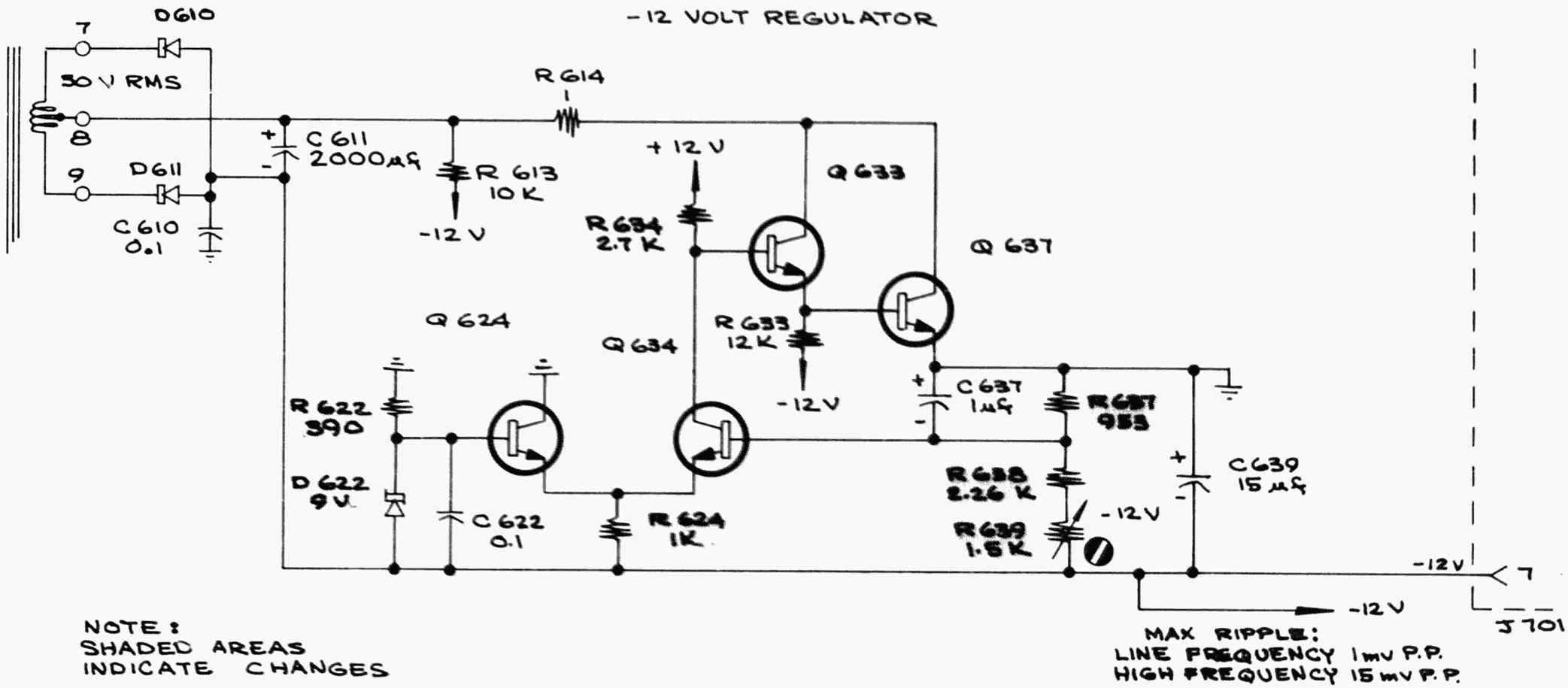
Values fixed unless marked variable.

Ckt.No.	Part Number	Description				
			DIODES			
D622	152-0212-00	Zener	1N936	9V	±5%	
			RESISTORS			
R622	315-0391-00	390Ω	1/4W	comp.		5%
R624	315-0102-00	1k	1/4W	comp.		5%
R634	315-0272-00	2.7k	1/4W	comp.		5%
R637	321-0191-00	953Ω	1/8W	prec.		1%
R638	321-0227-00	2.26k	1/8W	prec.		1%
R639	311-0532-00	1.5k		WW	var.	5%

ELECTRICAL PARTS LIST

Values fixed unless marked variable.

Ckt.No.	Part Number	Description				
			DIODES			
D622	152-0212-00	Zener	1N936	9V	±5%	
			RESISTORS			
R622	315-0391-00	390Ω	1/4W	comp.		5%
R624	315-0102-00	1k	1/4W	comp.		5%
R634	315-0272-00	2.7k	1/4W	comp.		5%
R637	321-0191-00	953Ω	1/8W	prec.		1%
R638	321-0227-00	2.26k	1/8W	prec.		1%
R639	311-0532-00	1.5k		WW	var.	5%



TYPE 422 OSCILLOSCOPE

PART OF AC POWER SUPPLY

PARTS REPLACEMENT KIT

HORIZONTAL AMPLIFIER BOARD

For Tektronix Type 422 Oscilloscopes
Serial numbers 100-599

DESCRIPTION

Horizontal Amplifier circuit board kit assembly 670-0413-00 replaces assembly 670-0406-00.

The new board incorporates changes necessitated by a modification to the Type 422 at s/n 600. The changes include the addition of two square-pin male connectors (AC and AD), the relocation of R531 and connector pin "C", the addition of R515, and an increase in the value of R529 and R533.

The changes have no effect on the performance of instruments below s/n 600. If the serial number of your instrument is above those listed, or if this kit has already been installed, disregard the instructions and use part number 670-0413-00 as a direct replacement.

050-0285-00

Publication:
Instructions for 050-0285-00
March 1966

PARTS LIST

Quantity	Description	Part Number
1 ea	Board, circuit, Horizontal Amplifier	670-0413-00

INSTRUCTIONS

NOTE: It is not necessary to make connections to the new Horizontal Amplifier board square-pin connectors "AC" and "AD".

( ) Replace the old Horizontal Amplifier board with the new board from the kit.

THIS COMPLETES THE INSTALLATION

( ) Change the part number for the Horizontal Amplifier circuit board, listed in the Manual Parts List, to 670-0413-00.

JB:cet

product modification

050-0291-00

M10432

Type 422

DELAY LINE ASSEMBLY REPLACEMENT

For TEKTRONIX® Type 422 Oscilloscopes

Serial Numbers 100 - 2709

Delay Line Assembly, pn 119-0037-01, replaces Delay Line Assembly, pn 119-0037-00, previously used.

A change in the Delay Line wire insulation caused a long preshoot cycle time which resulted in excessive vertical-trace aberrations. Delay specifications were changed from 160 +10-5 nanoseconds to 150 ±5 nanoseconds, which reduced the preshoot cycle time and increased the Delay Line impedance.

To compensate for the new delay line characteristics, several components in the delay line input network must be changed.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions and use pn 119-0037-01 as a direct replacement.

9-17-80
Supersedes: 2-19-69

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Ckt. No.	Quantity	Part Number	Description
L240	1 ea	119-0037-01	Assembly, Delay Line, 150 nS
C227,C235	2 ea	281-0503-00	Capacitor, cer, 8±0.5pF 500V
C228	1 ea	281-0505-00	Capacitor, cer, 12pF 10% 500V
R237	1 ea	311-0463-00	Resistor, var, nonww, 5kΩ 0.25W

INSTRUCTIONS:

1. Remove the following (refer to Fig. 1):

( ) a. Front cover assembly.
( ) b. AC Power Supply (four screws).
( ) c. Cabinet assembly (three screws).
( ) d. The five screws which secure the rear crt shield and bracket.
( ) e. The rear crt shield.

Refer to Fig. 2 for Steps 2 through 5:

( ) 2. Disconnect the crt socket from the crt base.

( ) 3. Disconnect the following wires from the crt shield assembly:

( ) a. White-red and white-green wires from the Horizontal plates.
( ) b. White-brown-red-black wire (+12V lead) from Y-Axis Align control (R856).
( ) c. White wire from pin I.
( ) d. White-orange wire from pin F.
( ) e. White-brown and white-blue wires from the Vertical plates.
( ) f. Trace Rotation Adj wire (if present) from pin F.
( ) g. CRT HV Anode lead.

( ) 4. Remove both graticule lamp holders.

( ) 5. Remove the crt shield assembly from the instrument.

Refer to Fig. 3 for Steps 6 and 7:

6. Replace the following components (located on the VERTICAL SWITCHING & OUTPUT AMPLIFIER circuit board):

( ) a. C227, with one of the 8pF ceramic capacitors from the kit.
( ) b. C228, with the 12pF ceramic capacitor from the kit.
( ) c. C235, with the other 8pF ceramic capacitor from the kit.
( ) d. R237, with the 5kΩ variable resistor from the kit.

( ) 7. Remove C238 from the circuit board and discard.

Refer to Fig. 4 for Steps 8 through 12:

( ) 8. Unsolder the four Delay Line wires from the circuit board.

( ) 9. Remove the Delay Line lead clamp and four nuts which secure the Delay Line to the instrument.

( ) 10. Replace the Delay Line with the new Delay Line from the kit.

( ) 11. Re-install the Delay Line lead clamp, removed in step 9.

( ) 12. Connect the Delay Line input and output leads.

( ) 13. Reassemble the instrument by performing Steps 1d through 5 in reverse.

( ) Check the High-Frequency Compensation and the Vertical Bandwidth as directed in the Performance Check/Calibration Procedure in your Instruction Manual; adjust as necessary.

( ) For future reference, place the Instruction Manual Modification Insert in your 422 Instruction Manual.

KM:cs

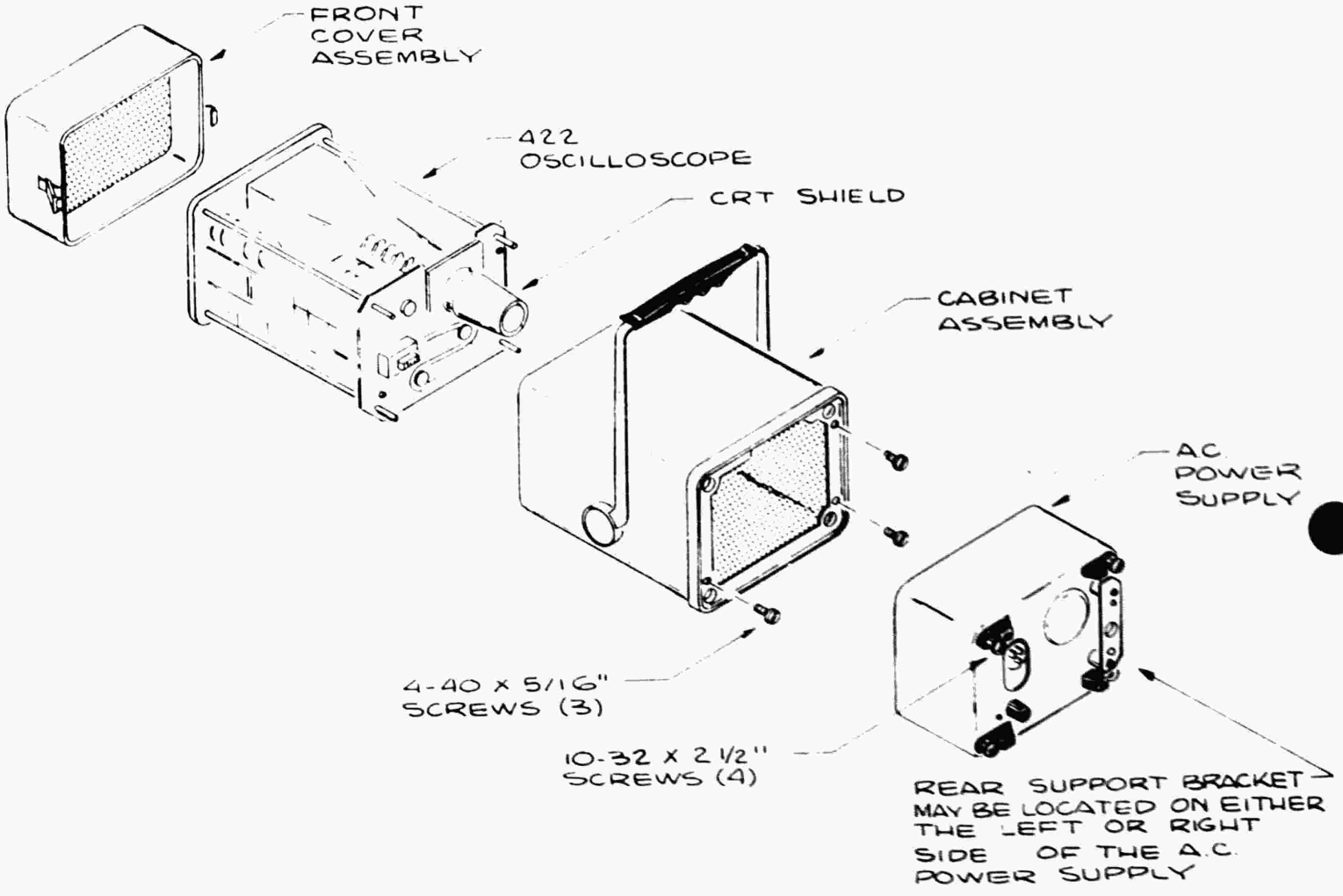


Fig. 1. Cover Removal

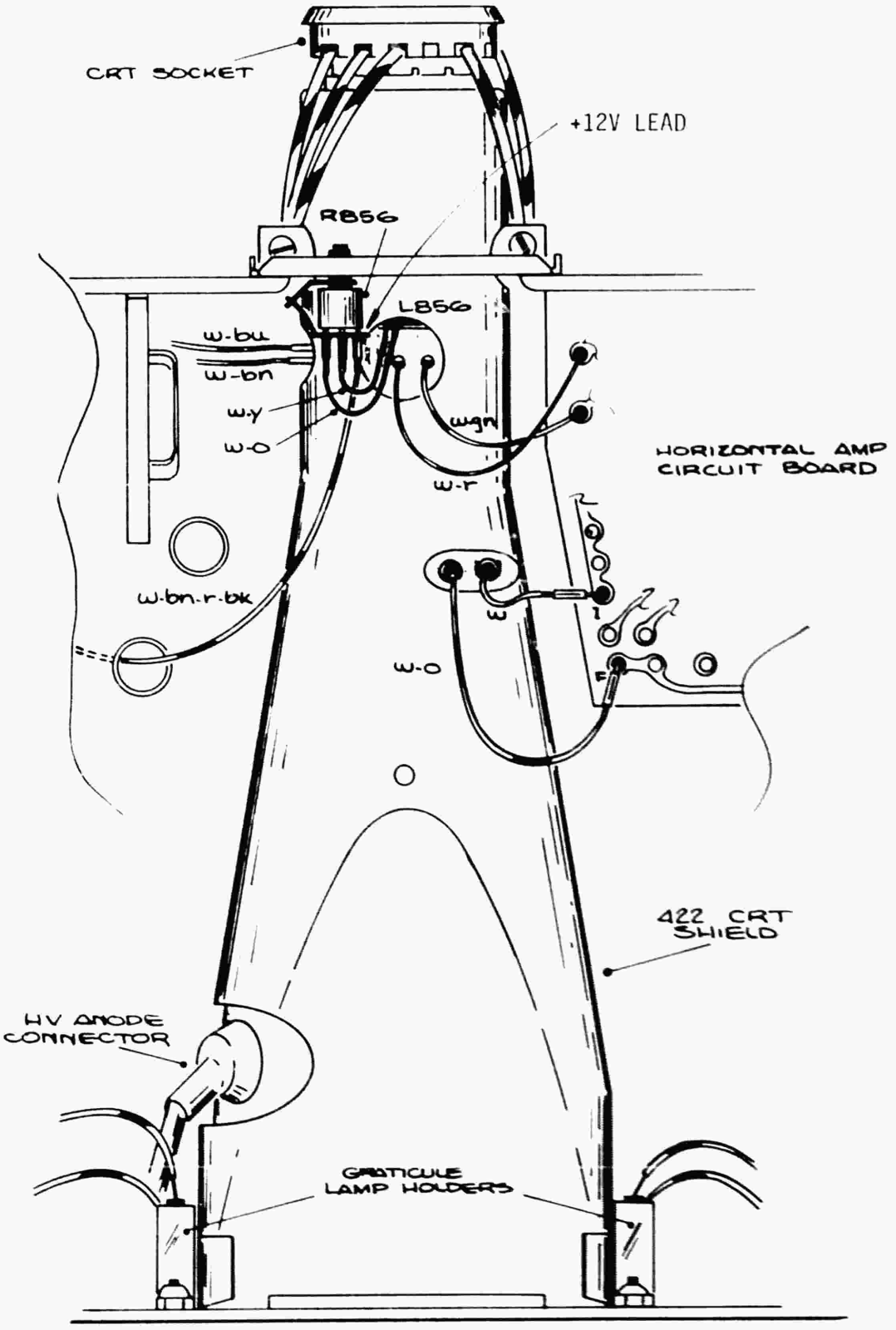


Fig. 2. Connections to CRT Assembly.

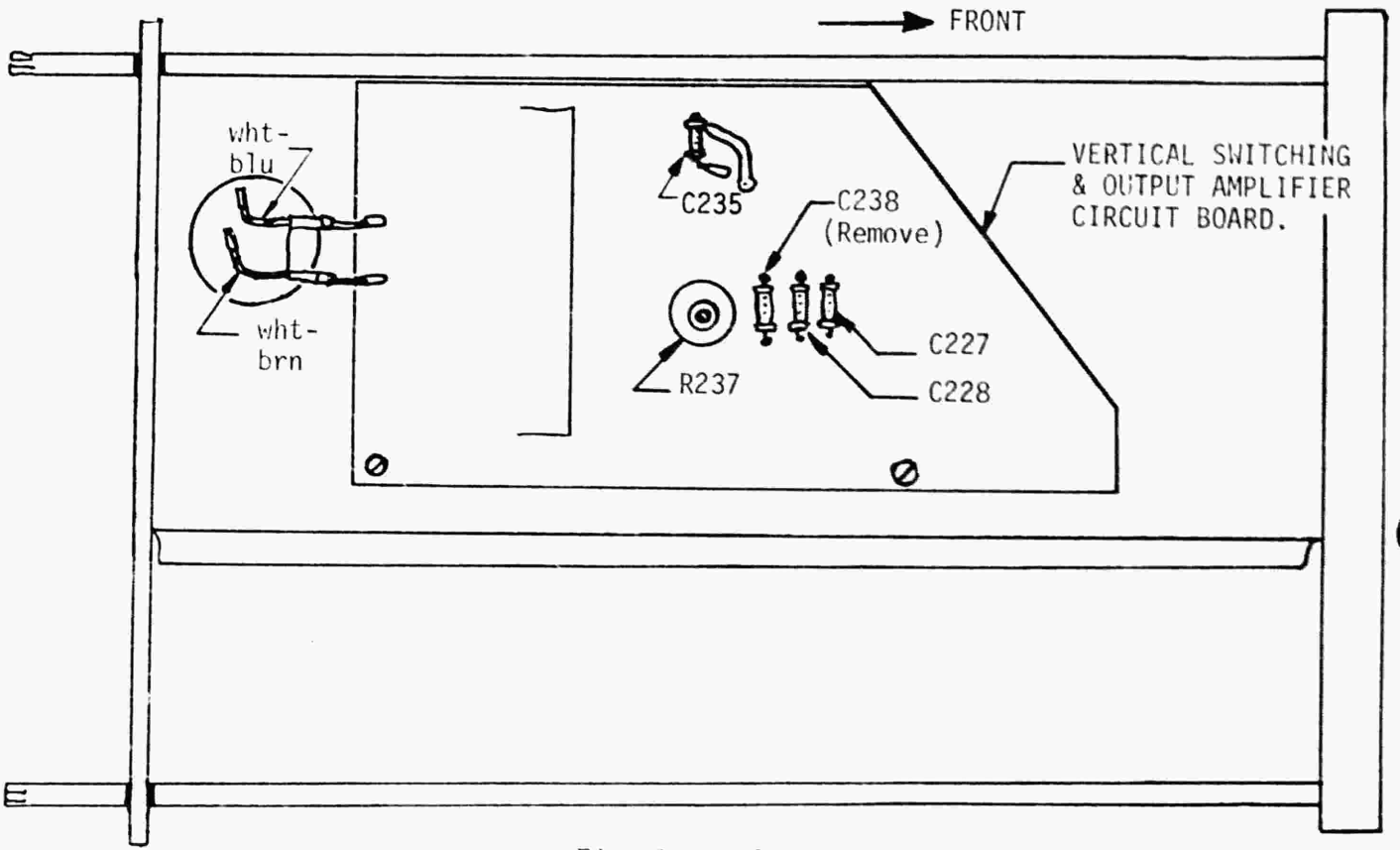


Fig. 3. Left Side View.

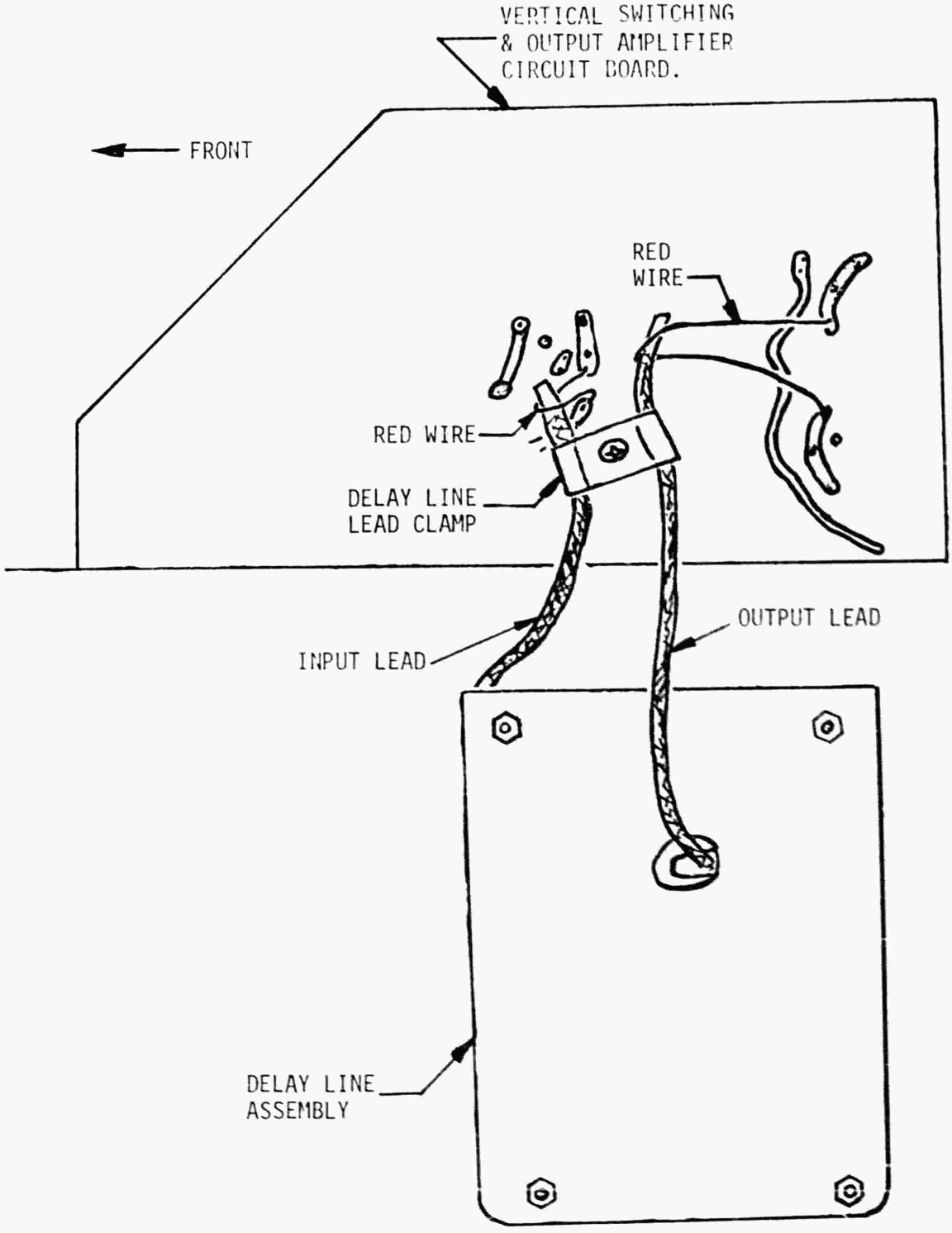


Fig. 4. Delay Line Installation

INSTRUCTION MANUAL

MODIFICATION INSERT

DELAY LINE ASSEMBLY REPLACEMENT

422 SN 100 - 2709

Installed in SN_____Date_____

This modification insert is provided to supplement the Instruction Manual for the above listed products. The information given in this insert supersedes that given in the Manual.

GENERAL INFORMATION

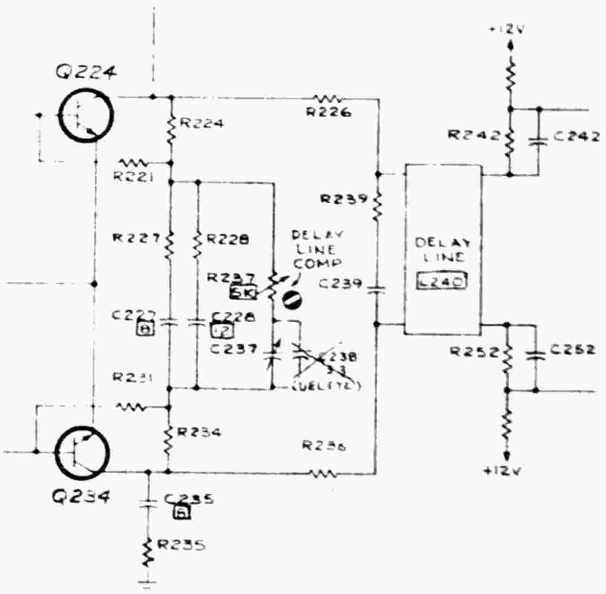
Delay Line Assembly, pn 119-0037-01, replaces Delay Line Assembly, pn 119-0037-00, previously used.

A change in the Delay Line wire insulation caused a long preshoot cycle time which resulted in excessive vertical-trace aberrations. Delay specifications were changed from 160 +10-5 nanoseconds to 150 ±5 nanoseconds, which reduced the preshoot cycle time and increased the Delay Line impedance.

To compensate for the new delay line characteristics, several components in the delay line input network must be changed.

ELECTRICAL PARTS LIST CHANGES:

Ckt. No.	Part Number	Description
C227	281-0503-00	Capacitor, cer, 8pF 500V ±0.5pF
C228	281-0505-00	Capacitor, cer, 12pF 500V 10%
C235	281-0503-00	Capacitor, cer, 8pF 500V ±0.5pF
C238	DELETE	
L240	119-0037-01	Delay Line Assembly



Partial - VERTICAL SWITCHING & OUTPUT AMPLIFIER ◇4

product modification

050-0309-00
M10517
Type 422,
422-125B

HIGH VOLTAGE REGULATOR BOARD

For TEKTRONIX® Types 422 and 422-125B Oscilloscopes
Serial Numbers 100-4329

The High Voltage Regulator board assembly, 670-0411-01, replaces assembly 670-0411-00. The new assembly includes a Zener diode and resistor to decrease changes in CRT sensitivity with changes in INTENSITY settings, and it also includes an encapsulated full-wave bridge rectifier in place of the half-wave rectifier in the CRT filament supply to improve the regulation of the CRT filament voltage when using the AC Power Supply.

The installation consists of replacing the High Voltage Transformer and High Voltage Rectifier board assembly. Some wiring changes are also required.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions as PN 670-0411-01 is a direct replacement.

10-31-73
Supersedes: June, 1968

502.04 ##

PARTS LIST

Quantity	Part Number	Description
1 ea	120-0378-02	Transformer, HV (T801)
1 ea	670-0411-01	Assembly, HV Regulator, with attached 14" #18 str., 15KV wht-brn-yel wire, pn 175-0649-00

INSTRUCTIONS

( ) 1. Remove the instrument from the cabinet.

( ) Locate the High Voltage assembly mounted in the lower rear of the instrument.

( ) 2. Loosen the two corner mounting screws, and remove the assembly.

( ) 3. Remove the assembly from the plastic housing.

( ) 4. Replace the High Voltage transformer, T801, with the High Voltage transformer from the kit.

( ) 5. Unsolder the leads from the High Voltage assemble that is to be replaced.

( ) 6. Loosen the three screws and remove the rear shield from around the base of the CRT.

( ) Unplug the CRT socket and pry off the plastic socket cap.

( ) 7. Locate the brown-yellow on white wire (wire 6, Fig. 1) that is connected between the HV assembly and pin 14 of the CRT. (There are two brown-yellow on white wires, so use an ohmmeter to determine the proper wire.) Unsolder this wire from pin 14 of the CRT socket, loosen the cable harness clamp, and pull the wire out of the cable harness.

( ) 8. Solder the brown on white (1), white (2), white (3), red on white (4) and brown-yellow on white (5) wires to the new board, as shown in Fig. 2. See Fig. 1 for previous connections of wires to the old board.

( ) 9. Locate the yellow on white wire (7), pull it back through the cable harness, trim it to length, and solder it to the terminal shown in Fig. 2.

( ) 10. Locate the heavy insulated orange on white wire (11 or 12) that connects to R825 (560k 2W) on the High Voltage Rectifier/Multiplier board, and solder this wire to the location indicated for wire (11) in Fig. 2.

( ) 11. Solder the brown on white (8), the red on white (9), the red on white (10), the orange on white (12), the orange on white (13), and the green on white (14) to the new assembly as shown in Fig. 2.

( ) 12. Dress the brown-yellow on white wire (6) from the new assembly), along the cable harness, through the cable clamp and solder it to pin 14 of the CRT.

( ) 13. Replace the plastic cap on the CRT socket, reinstall the CRT socket and rear CRT shield, and tighten the cable harness clamp.

INSTRUCTIONS (cont)

( ) 14. Reinstall the High Voltage assemblies and High Voltage transformer back in the plastic housing and install it in the instrument.

THIS COMPLETES THE INSTALLATION.

( ) Check wiring for accuracy.

( ) Fasten the Modification Insert pages in your Instruction Manual.

( ) Refer to the Instruction Manual Calibration Procedure and recalibrate as necessary.

DW:ls

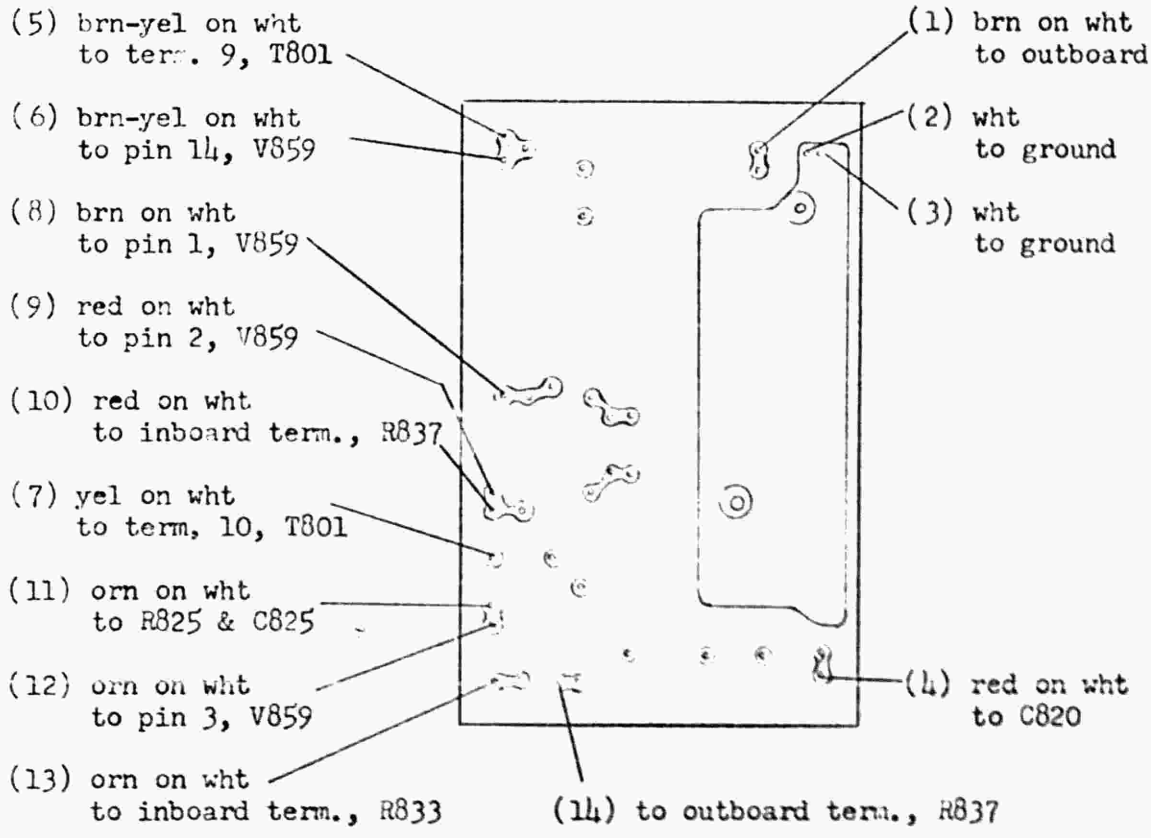


FIG. 1 OLD ASSEMBLY, PN 670-0411-00

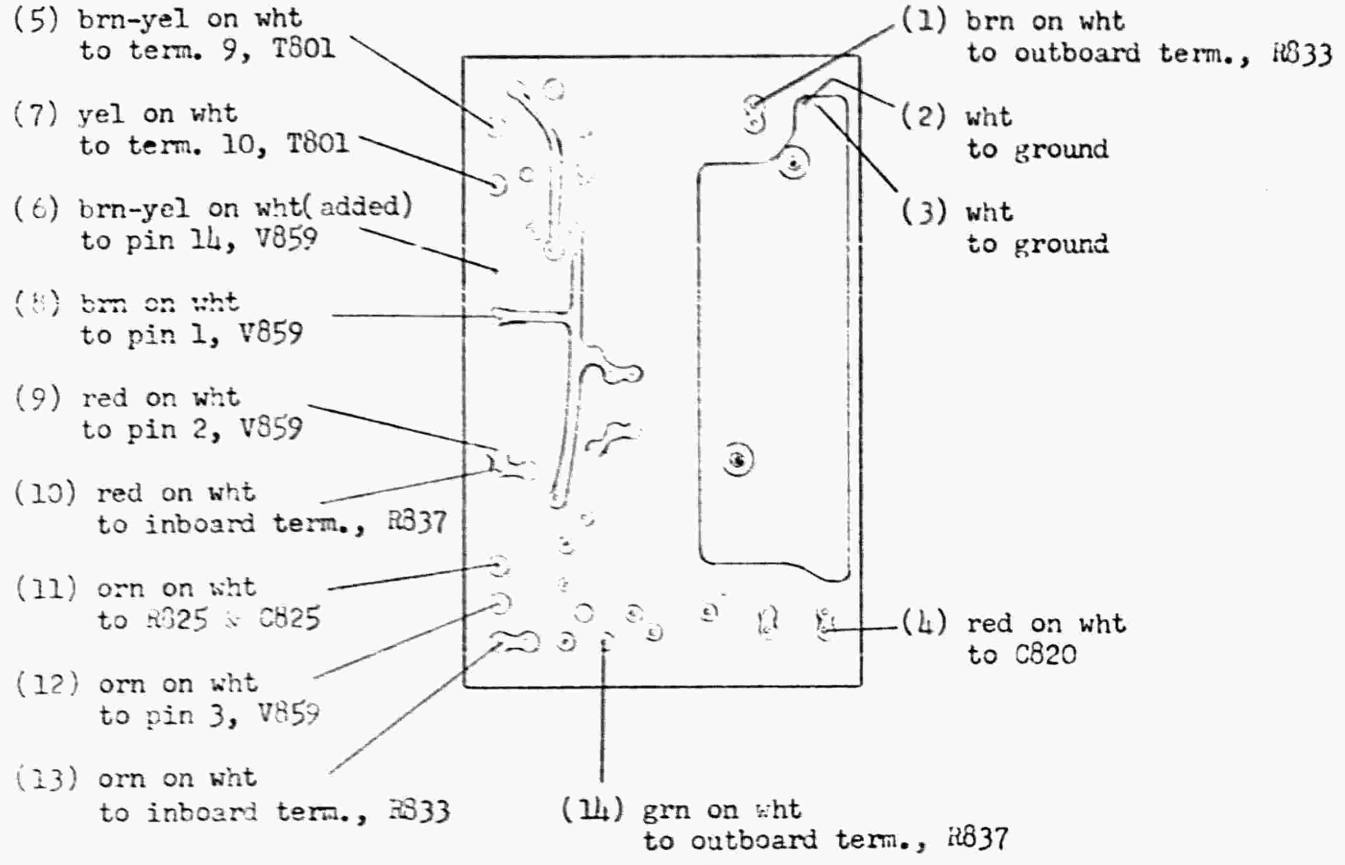


FIG. 2 NEW ASSEMBLY, PN 670-0411-01

INSTRUCTION
MANUAL
MODIFICATION INSERT

HIGH VOLTAGE REGULATOR BOARD

TYPE 422 -- SN 100-4329

Installed in Type 422 SN_____ Date_____

This insert has been written to supplement the Instruction Manual for this instrument. The information given in this insert will supersede that given in the manual.

GENERAL INFORMATION

The High Voltage Regulator board assembly, PN 670-0411-01, replaces assembly PN 670-0411-00. The new assembly includes a zener diode and resistor to decrease changes in CRT sensitivity with changes in INTENSITY settings, and it also includes an encapsulated full-wave bridge rectifier in place of the half-wave rectifier in the CRT filament supply to improve the regulation of the CRT filament voltage when using the AC Power Supply.

The installation consists of replacing the High Voltage Transformer and High Voltage Rectifier board assembly. Some wiring changes are also required.

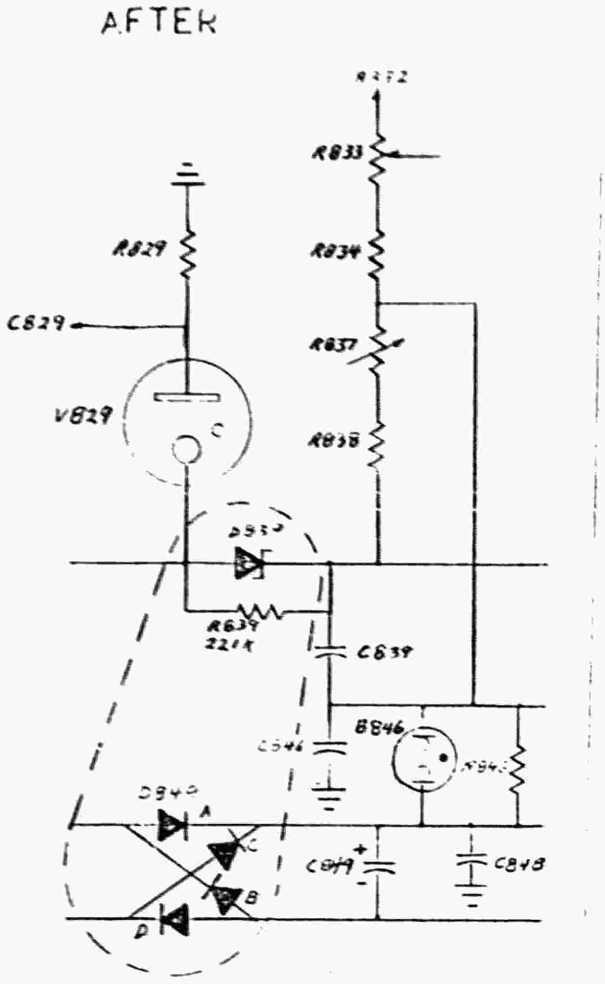
ELECTRICAL PARTS LIST

Ckt. No.	Part Number	Description
		DIODES
D839	152-0255-00	Zener 51V 5% 400MW
D849A,B,C,D	152-0260-00	Rectifier molded bridge assembly
		RESISTORS
R839	321-0418-00	221k 1/8W 5%
		TRANSFORMERS
T801	120-0378-00	High Voltage

MECHANICAL PARTS LIST

	670-0411-01	HV Regulator Assembly

SCHEMATICS



PARTIAL CRT CIRCUIT

PARTS REPLACEMENT KIT

AC POWER SUPPLY CIRCUIT BOARD

050-0320-00

For Tektronix Type 422 AC Power Supplies
Serial numbers 100-7189

DESCRIPTION

AC Power Supply wired circuit board with transistors, 670-0412-02, replaces 670-0412-00 previously used.

Circuit board resistor R657 was also changed in value to permit the use of new graticule light bulbs which offer a longer life expectancy than the old bulbs.

The installation involves removing the AC Power Supply and instrument cabinet to replace the circuit board and two graticule bulbs, B725 and B726. The new value of R657 is present on the new board and does not require replacement.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions and use circuit board PN 670-0412-02 as a direct replacement.

Publication:
Instructions for 050-0320-00
February 1967

502.05 #2.

PARTS LIST

Quantity	Part Number	Description
2 ea	150-0059-00	Bulb, incandescent, 14V T - 1-3 4, bulb #386
1 ea	670-0412-02	Board, circuit, AC Power Supply w/plug-in components

INSTRUCTIONS

A. TO REPLACE THE GRATICULE BULBS

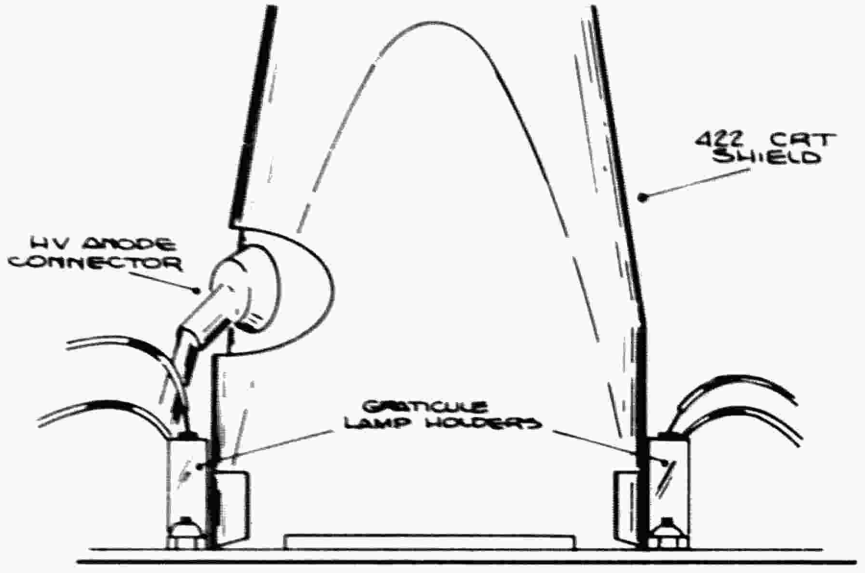
( ) 1. Remove the instrument AC Power Supply and cabinet.

Refer to drawing while performing steps 2 through 4.

( ) 2. Remove the graticule lamp holder nuts, located above the CRT shield.

( ) 3. Replace graticule lamps B725 and B726 with the new lamps from the kit.

( ) 4. Reinstall the graticule lamp holders.



INSTRUCTIONS (cont)

B. TO REPLACE THE AC POWER SUPPLY CIRCUIT BOARD

( ) 1. Remove the six AC Power Supply cabinet screws and blue cabinet.

( ) 2. Replace the old circuit board with the new one from the kit.

( ) 3. Reinstall the AC Power Supply in the blue cabinet with the six screws removed in step B-1.

( ) 4. Reinstall the instrument cabinet and AC Power Supply.

THIS COMPLETES THE INSTALLATION

Change your Manual Parts List to read:

( )	B725	150-0059-00	Incandescent #386
( )	B726	150-0059-00	Incandescent #386
( )	R657	303-0150-00	15 Ω 1W 5%
( )		670-0412-02	AC Power Supply Circuit Board

( ) Change value of R657 on the "AC POWER SUPPLY" schematic page to 15 Ω

( ) Change B725 and B726 bulb type #336 on the "CALIBRATOR AND REGULATOR" schematic page to #386.

BE:ls

product modification

050-0328-00
M10808
Type 422

AC-DC POWER CONVERTER ASSEMBLY

For Tektronix Type 422 Oscilloscopes
Serial Numbers 100-4466

The wiring and color-code of wires in the AC-DC Power Converter Assembly (670-0082-00) were changed to place the fuse (F1000 and Power switch (SW1001) in the 'hot' side of the line, to correct the wiring of the Thermal cutouts (connections to TK1000 and TK1039 were interchanged) and to standardize the wire color-coding.

These instructions will explain how to wire the new assembly and correct the diagram in you Instruction Manual.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed previously, the assembly (670-0082-00) will be a direct replacement. However, the instructions may still be used to aid in its replacement.

10-31-73
Supersedes: 9-25-69

502.06 ##

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	670-0082-00	Assembly, AC-DC Power Converter

INSTRUCTIONS

( ) 1. Unsolder and remove the AC-DC Power Converter assembly (including cable harnesses) from the instrument.

( ) 2. Install the new assembly, using Figs. 1 through 4 as a guide to resoldering the cable harness wires.

THIS COMPLETES THE INSTALLATION.

( ) Check wiring for accuracy.

( ) Fasten the Manual Insert page in your Instruction Manual.

( ) Refer to your Instruction Manual and check the instrument for proper operation.

JT:ls

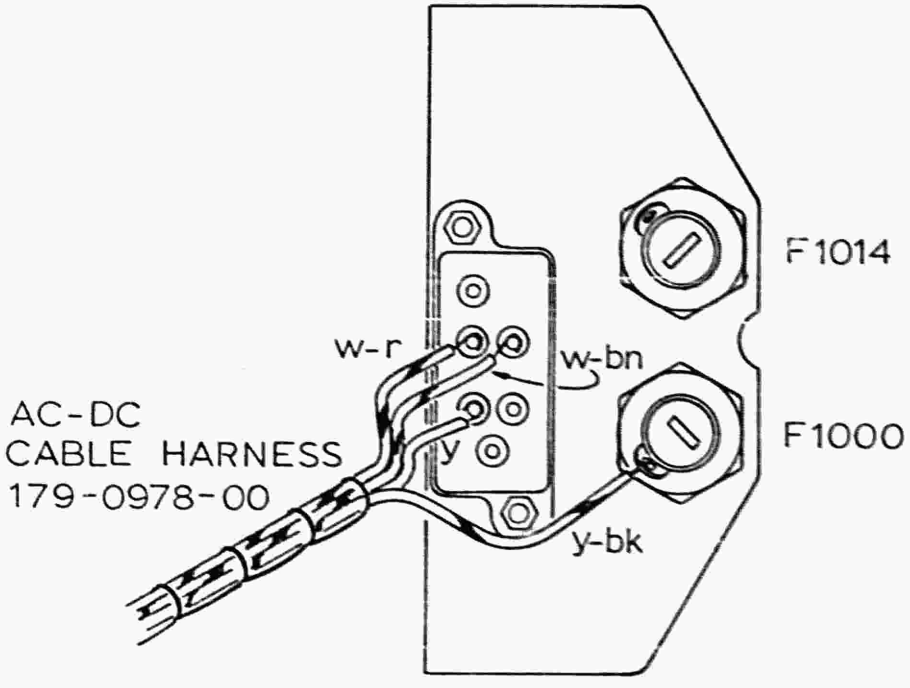


FIG. 1

Switch Wiring Detail

Cont. No.	Color Code
1	y-bn-r-bn
2	y-bn-bn-bn
3	w-v
4	w-gn
5	y-bn-o-bn
6	w-bk-r
7	w-bu
8	w-bk-r
9	w-bk
10	w-y
11	w (2)
12	w-bk
13	w-bk
14	w-r
15	w-bu
16	w-o
17	w-gn
18	No Connection
19	No Connection
20	w-r
21	w-bk
22	y-bn-gn-bn (2)

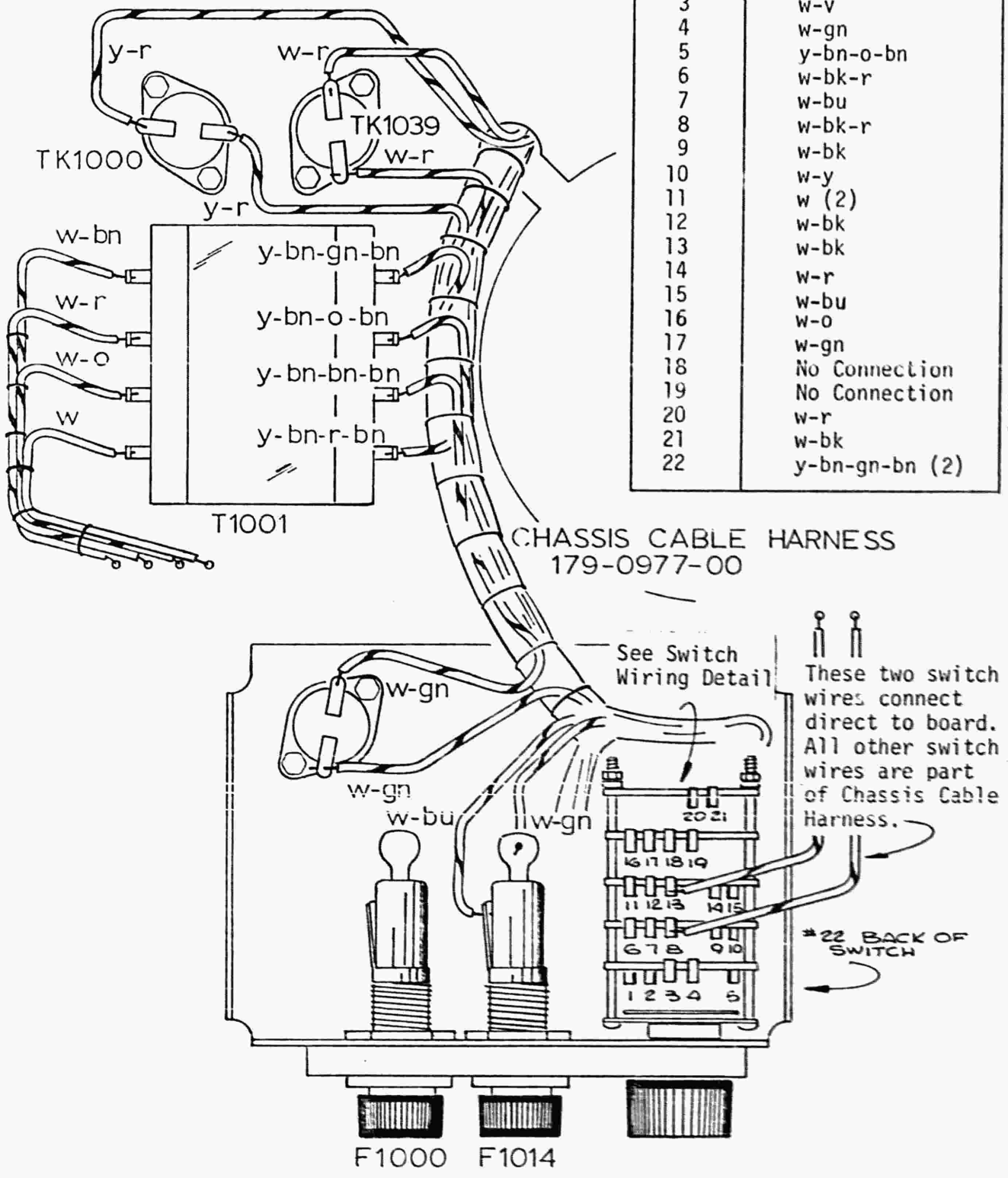


FIG. 2

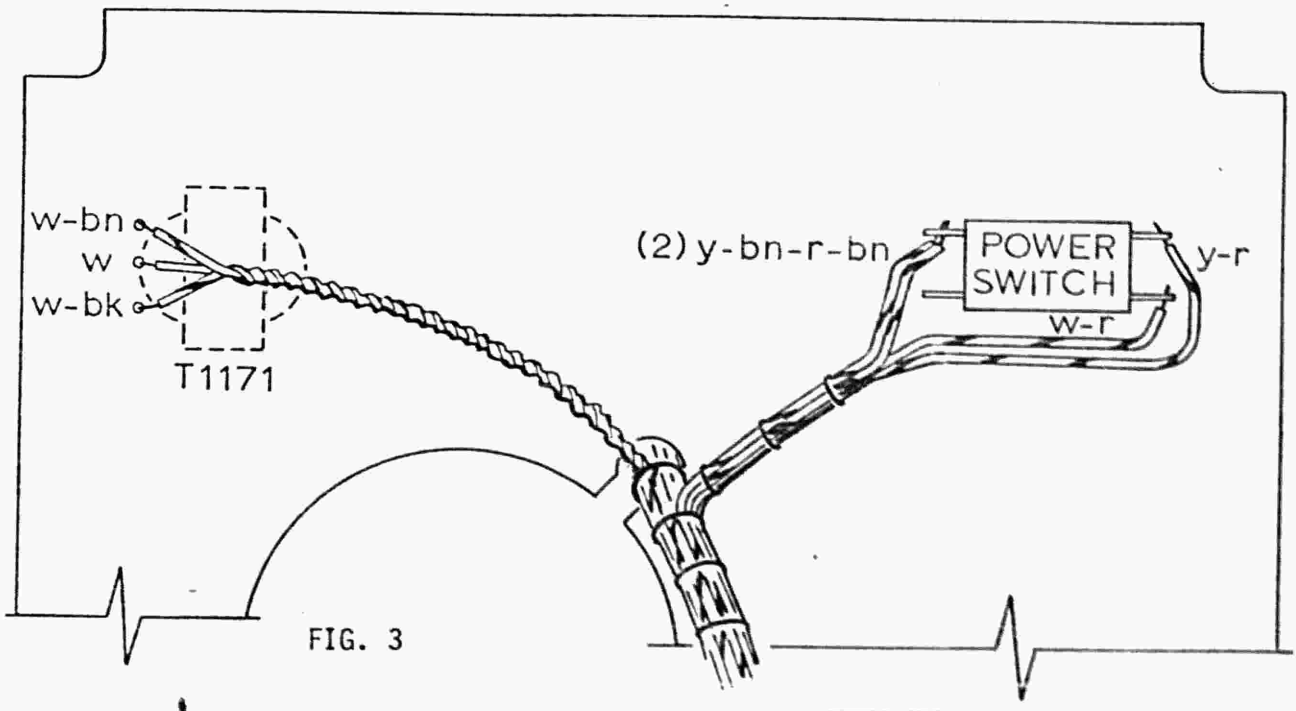


FIG. 3

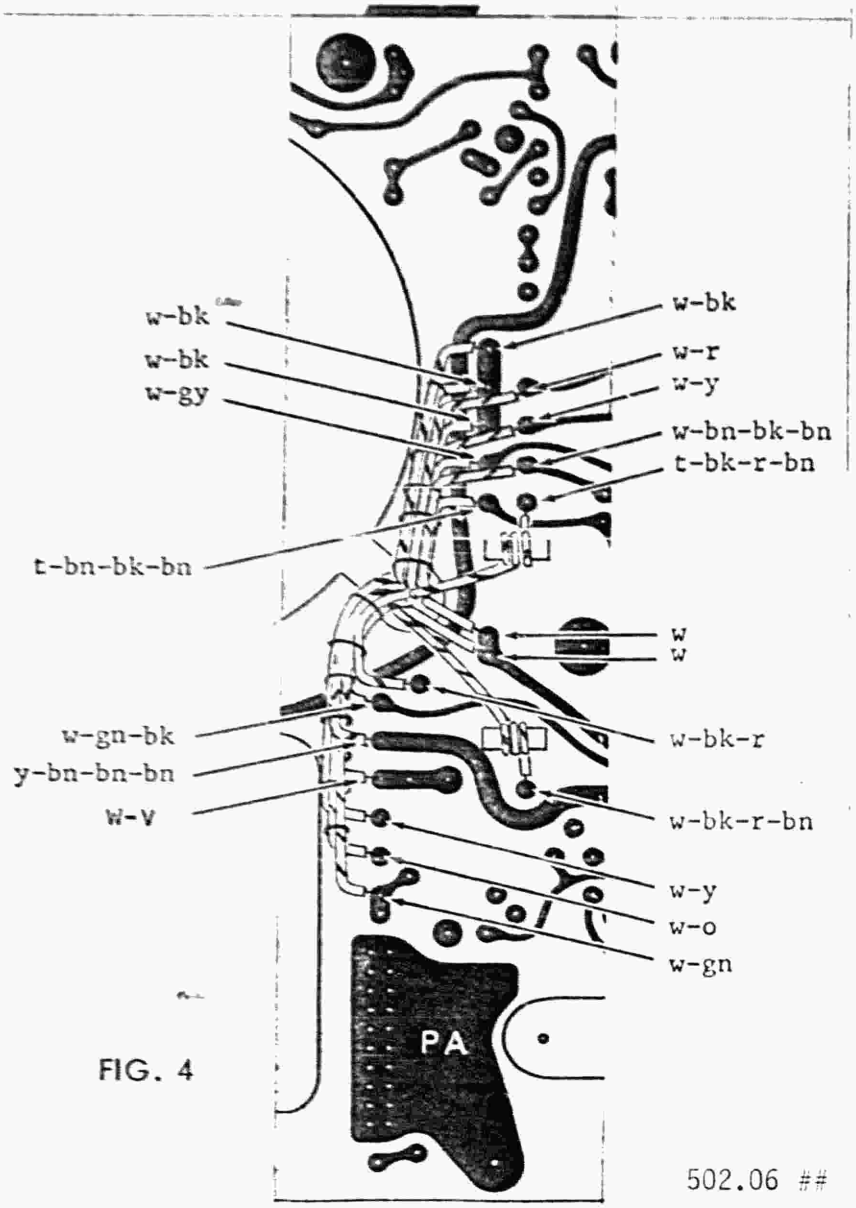


FIG. 4

INSTRUCTION
MANUAL

MODIFICATION INSERT

AC-DC POWER CONVERTER ASSEMBLY

Type 422 -- SN 100-4466

Installed in Type 422 SN_____Date_____

This insert has been written to supplement the Instruction Manual for this instrument. The information given in this insert will supersede that given in the manual.

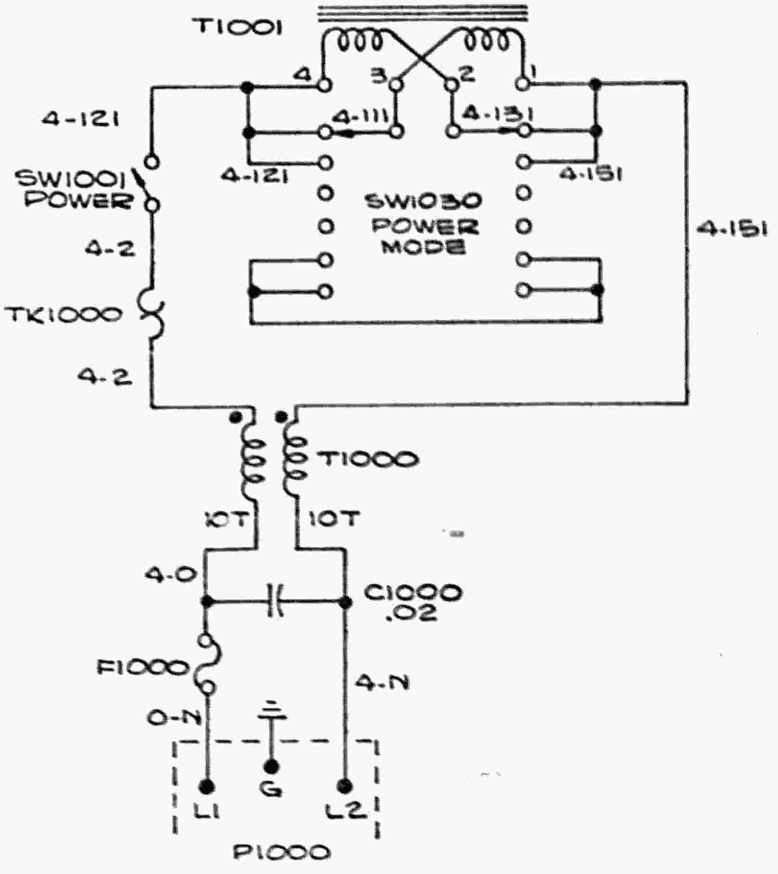
GENERAL INFORMATION

The wiring and color-code of wires in the AC-DC Power Converter Assembly (670-0082-00) were changed to place the fuse (F1000) and Power switch (SW1001) in the 'hot' side of the line, to correct the wiring of the Thermal cutouts (connections to TK1000 and TK1039 were interchanged) and to standardize the wire color-coding.

MECHANICAL PARTS LIST

Part Number	Description
179-0978-01	Cable harness, AC-DC Power Supply
179-0977-01	Cable harness, chassis

SCHEMATICS



product modification

050-0432-00
M14185,M14742,
S15757
Type 422/R422
453/R453,454/R454.
491/R491

CATHODE RAY TUBE REPLACEMENT

For the following TEKTRONIX© Type Oscilloscopes:

Type 422/R422	All Serial Numbers
Type 453/R453	All Serial Numbers
Type 454/R454	All Serial Numbers
Type 491/R491	All Serial Numbers

Replacement Kit, PN 050-0432-00, provides replacement CRT support cushions to be used when replaceing CRT's in the above listed instruments. To accomodate various types of CRT's (ceramic, glass and two piece glass) the cushions must be mounted 3/8 to 1/2 inch from the front of the CRT shield.

If the CRT support cushions are located the proper distance from the front of the CRT shield, the use of this kit is optional.

10-26-70
Supersedes: 5-22-70

502.07 ##

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
4 ea	348-0070-01	Cushion, CRT

INSTALLATION

( ) 1. Remove the old CRT from the instrument as explained in the Maintenance section of your Instruction Manual.

( ) 2. Remove the CRT cushions from inside the CRT shield.

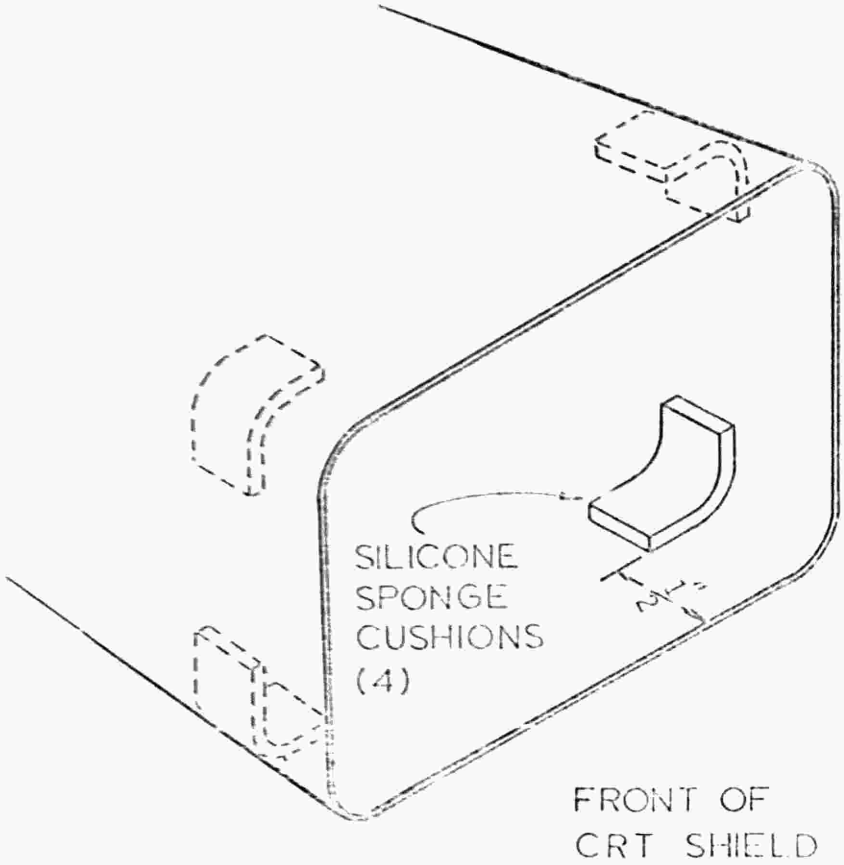
( ) 3. Remove the backing from the CRT cushions and install the four cushions inside the shield, in each corner 1/2 inch from the CRT shield opening. See drawing.

( ) 4. Install the new CRT as explained in your Manual.

THIS COMPLETES THE INSTALLATION.

( ) If the part number of the CRT you received is different from the number called out in your Instruction Manual, make the necessary change for future reference.

DF:ls



502.07 ##

modification instructions

MI - 050-0441-00

TYPE 422

CH 2 VOLTS/DIV SWITCH ASSEMBLY REPLACEMENT

Tektronix Type 422 Oscilloscope
Serial Numbers 12347-13010

Channel 2 VOLTS/DIV switch assembly, PN 262-0710-00, is replaced with an improved switch assembly. The part number of the switch does not change. When installing the new switch, two 47Ω resistors must be removed from the Vertical Switching and Output Amplifier circuit board, because they are now included in the switch assembly.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions as PN 262-0710-00 is a direct replacement.

PARTS LIST

Quantity	Tektronix Part Number	Description
2 ea	131-0371-00	Connector, single contact
1 ea	262-0710-00	Switch, VOLTS/DIV wired assembly

INSTRUCTIONS

( ) 1. Separate the Power Supply from the rear of the instrument as follows:

a) Loosen the four securing screws located in the rear feet of the Power Supply.
b) Separate the two units by sliding the Power Supply to the rear, off the support rods.

( ) 2. Remove the three screws that hold the cabinet to the rear of the Indicator.

( ) 3. Slide the cabinet to the rear and off the support rods.

( ) 4. Turn the Indicator upside down, exposing the Channel 2 Vertical Preamp Board. Locate the Channel 2 AC-GND-DC switch, and notice the three neoprene covered wires on this switch. Unsolder only the center neoprene covered wire.

( ) 5. Unsolder the braided ground strap on the Channel 2 Input BNC Connector.

( ) 6. Remove the front panel VOLTS/DIV and VARIABLE knobs.

( ) 7. Remove the securing nut on the VOLTS/DIV switch and remove the GAIN control Allen screw.

( ) 8. Remove and save the two PHS screws located in back of the Attenuator chassis.

( ) 9. Disconnect all pin connectors on the circuit board. Do not unsolder the soldered connections.

( ) 10. Lift up the rear of the switch assembly and slide it out of the instrument.

( ) 11. Install the new switch assembly.

( ) 12. Reassemble the instrument by performing steps 4-9 in reverse order. Be sure the INVERT and X10 GAIN AC switches fit properly in the actuating assemblies.

( ) 13. Position the instrument on its right side, TIME/DIV switch down. The circuit board seen looking down on the instrument is the Vertical Switching and Output Amplifier Circuit Board. Remove the 47Ω resistors from pins C and D of this board.

continued

INSTRUCTIONS (continued)

( ) 14. Unsolder the resistors removed in Step 13 from their respective wires. Install the female square pin connectors in place of the resistors.

NOTE: The female square pin connectors are designed to be installed with a special crimping tool. If such a tool is not available, solder the female connector directly to the wire.

( ) 15. Install the white-red wire on pin C and the white-brown wire on pin D of the Output Board.

( ) 16. Recalibrate the instrument as necessary.

( ) 17. Reassemble the cabinet and Power Supply by performing Steps 1-3 in reverse order.

THIS COMPLETES THE INSTALLATION.

Correct CH 2 Input Amplifier schematic, the CH 2 Switching and Output Amplifier schematic, and the Electrical Parts List in your Instruction Manual as follows:

Delete the 47Ω resistors on pins C and D of the Vertical Switching and Output Amplifier schematic, and add these resistors to the center terminal of INVERT switch SW195 (between the switch and RC combinations R184/C184 and between R194/C194) on the Channel 2 Input Amplifier schematics.

BD:jb

502.08##

modification instructions

MI - 050-0442-00

TYPE 422

CHANNEL 2 INPUT AMPLIFIER BOARD REPLACEMENT

Tektronix Type 422 Oscilloscope
Serial Numbers 12347-13010

Channel 2 Input Amplifier Board, 670-0405-02, replaces amplifier board, 670-0405-00. Installation of the new board necessitates removing two 47Ω resistors from the Vertical Amplifier Output Board. These resistors have been incorporated on the new board.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions as PN 670-0405-02 is a direct replacement.

Page 2 of 4 left Blank.

PARTS LIST

Quantity	Tektronix Part Number	Description
2 ea	131-0371-00	Connector, single contact
1 ea	670-0405-02	Circuit Board, CH 2 Input Amp

INSTRUCTIONS

( ) 1. Separate the Power Supply from the rear of the instrument as follows:

a) Loosen the four securing screws located in the rear feet of the Power Supply.
b) Separate the two units by sliding the Power Supply to the rear, off the support rods.

( ) 2. Remove the three screws that hold the cabinet to the rear of the Indicator.

( ) 3. Slide the cabinet to the rear and off the support rods.

( ) 4. Turn the Indicator upside down, CRT down.

Replace the Channel 2 Input Amplifier Board as follows:

a) Remove all of the square pin wire connections on the board. (NOTE: Be sure to note the location of the wires for replacement.)
b) Remove the three screws securing the Amplifier Board to the chassis.
c) Install the new board. Secure the new board with the screws removed in b).
d) Replace all of the wires removed in a).

( ) 5. Position the instrument on its right side, TIME/DIV switch down. The circuit board seen looking down on the instrument is the Vertical Switching and Output Amplifier circuit board. Remove the 47Ω resistors from pins C and D of this board.

( ) 6. Unsolder the resistors removed in Step 5 from their respective wires. Install in place of the resistors, female square pin connectors.

NOTE: The female square pin connector is designed to be installed with a special crimping tool. If such a tool is not available, solder the female connector to the wire.

( ) 7. Install the white-red wire on pin C and the white-brown wire on pin D of the Output Board.

( ) 8. Recalibrate the instrument as necessary.

continued

INSTRUCTIONS (continued)

( ) 9. Reassemble the cabinet and Power Supply.

THIS COMPLETES THE INSTALLATION

Correct the CH 2 Input Amplifier schematic, the CH 2 Switching and Output Amplifier schematic and the Electrical Parts List in your Instruction Manual as follows:

Delete the 47Ω resistors on pins C and D of the Vertical Switching and Output Amplifier schematic, and add these resistors to the center terminal of the INVERT switch SW195 (between the switch and R/C combination R184/C184 and between R194/C194) on the Channel 2 Input Amplifier schematic.

BD:jb

product modification

050-0461-00
M14781
Type 422

REAR FOOT REPLACEMENT

For TEKTRONIX® 422 Oscilloscope AC Power Supply
Serial Numbers 100-21832

For TEKTRONIX 422 Oscilloscope AC-DC Power Supply
Serial Numbers 100-21832

Rear foot, 348-0068-00, has been replaced by a longer foot, 348-0068-01, to increase the power cord clearance when the feet wear down. It is necessary to replace all four feet to keep the instrument level.

1-7-74

502.10 ##

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
4 ea	348-0068-01	Foot, rear

INSTRUCTIONS:

( ) Remove the power supply cover as indicated in your Instruction Manual Maintenance section, replace the four feet, and reassemble.

JT:mh

product modification

050-0608-00

Type 422

POWER TRANSFORMER REPLACEMENT

For TEKTRONIX® Type 422 Oscilloscopes

Serial Numbers 25000 - 33199

This replacement kit provides a connector extracting tool to facilitate replacement of the 422 power transformer, PN 120-0621-00, which has the Line Selector block connectors connected directly to the transformer leads.

11-22-72

502.11 ##

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Ckt. No.	Quantity	Part Number	Description
	1 ea	003-0707-00	Tool,connector extracting
T601	1 ea	120-0621-00	Transformer, AC Power

INSTRUCTIONS:

( ) 1. Remove the AC Power Supply unit from the instrument. Disconnect the interconnecting cable.

( ) 2. Remove the cover from the line voltage selector block.

( ) 3. Remove the cabinet cover from the power supply chassis (held with six screws).

( ) 4. Unsolder the cable wires from the secondary of the transformer.

( ) 5. Remove the two nuts and washers holding the line voltage selector block.

( ) 6. Pull the line voltage selector block away from the back plate and remove the keps nut near the transformer.

( ) 7. Remove all the screws (except the four holding the transformer) holding the rear plate.

( ) 8. Separate the front and rear halves of the power supply as far as possible.

( ) 9. Unsolder the gray-brown-white transformer wire from the ON-OFF switch.

( ) 10. Unsolder the gray-black-yellow transformer wire from the thermal switch.

( ) 11. Remove the transformer wire connectors (six) from the line voltage selector block using the tool from the kit as follows:

a. Insert the extractor tool into the connector opening. While keeping the tool as straight as possible, push the tool inward firmly (considerable pressure may be needed) to snap the connector out of the holder. Rotating the tool slightly may help in removing stubborn connectors.

CAUTION: Excessive lateral pressure may break the thin tube on the end of the tool.

( ) 12. Remove the transformer (held with four bolts).

( ) 13. Install the new transformer.

( ) 14. Solder the gray-brown-white wire to the ON-OFF switch with the other wire of same color.

( ) 15. Solder the gray-black-yellow wire to the thermal switch with the other wire of the same color.

( ) 16. Insert the six wires with connectors into the line voltage selector block. See Fig. 1 for location. Connectors are seated properly when they are nearly flush with the back of the block.

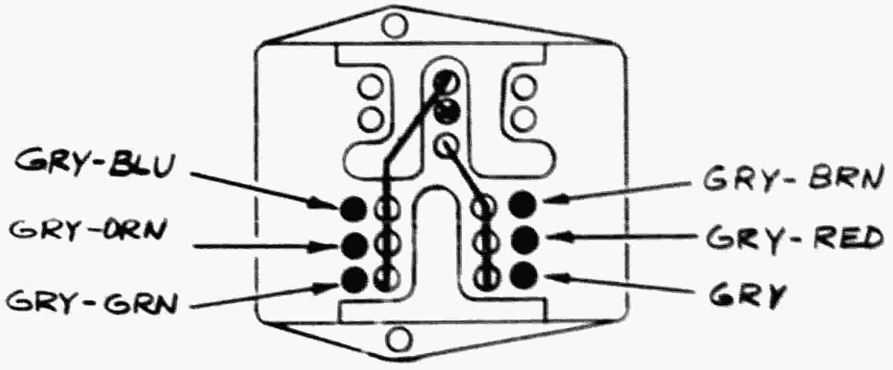


Fig. 1

( ) 17. Reassemble front and back halves of the power supply.

( ) 18. Solder the cable wires to the secondary of the transformer as follows:

Terminal	Wire Color
#9	White-gray
#10	White-black-green
#11	White-brown
#12	White-black-violet
#13	White-black-red
#14	White-black
#15	White-orange
#16	White-green
#17	White-yellow
#18	Bare wire to #19
#19	White
#20	White-violet

( ) 19. Check wiring for accuracy

( ) 20. Replace cabinet cover.

( ) 21. Reconnect interconnecting plug and install power supply onto the instrument.

( ) 22. Check for proper electrical operation.

product modification

050-0697-00

M21021

Type 016-0073-00

Q1174 AND Q1184 REPLACEMENT

For TEKTRONIX® 422 AC-DC Power Supplies

Type 016-0073-00 Serial Numbers 100 - 34899

Power Control transistors Q1174 and Q1184, PN 151-0469-00, heat sinks PN 214-1993-00 and mounting screws PN 211-0601-00 replace Power Control transistors PN 151-0163-00 which are no longer available.

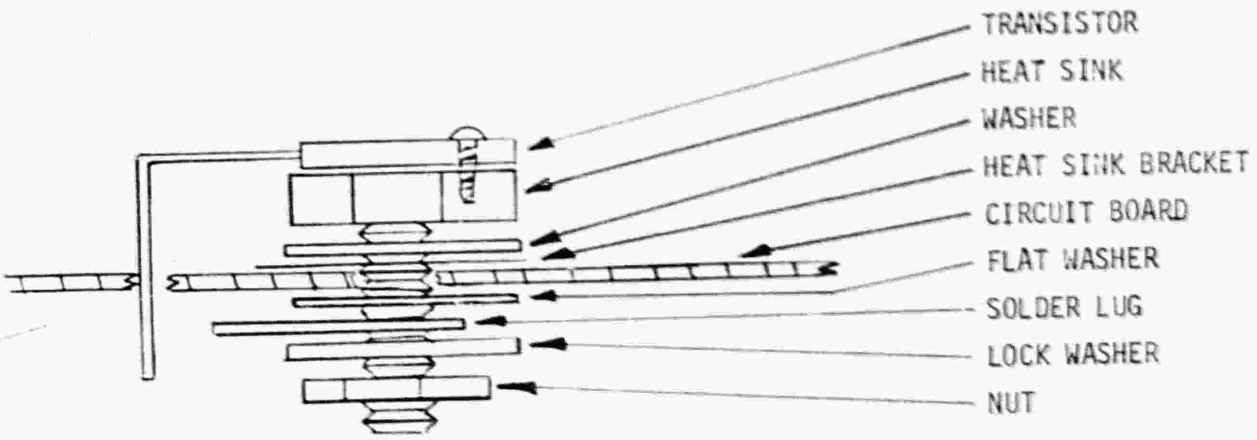
Due to differences in electrical characteristics between the 151-0163-00 transistors and the 151-0469-00 transistors, Q1174 and Q1184 must both be the same type.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions and use 151-0469-00 as a direct replacement for Q1174 or Q1184.

12-17-79
Supersedes 12-20-74

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Ckt. No.	Quantity	Part Number	Description
	2 ea	-----	Assembly, transistor, consisting of:
Q1174 Q1184		151-0469-00	Transistor, NPN, Si w/center lead cut off
----	1 ea	211-0601-00	Screw, 6-32 x 0.312 w/2 lockwashers
----	1 ea	214-1993-00	Heat sink, transistor
----	1 ea	-------	Marker, identification



Q1174 AND Q1184 MOUNTING DETAIL

INSTRUCTIONS:

WARNING

DISCONNECT THE INSTRUMENT FROM THE POWER SOURCE.

Make the following changes on the AC-DC Power Supply circuit board, pn 670-0082-00.

( ) 1. Replace Q1174 and Q1184 with the transistor assemblies from the kit. Wire as follows:

( ) 2. Connect the white-black wire to the base of Q1174.

( ) 3. Connect the emitter of Q1174 to the bare wire from the anode of D1174.

( ) 4. Connect the cathode of D1174 to the collector of Q1174 through the solder lug on the Q1174 transistor assembly.

( ) 5. Connect the white-brown wire to the base of Q1184.

( ) 6. Connect the emitter of Q1184 to the bare wire from the anode of D1184.

( ) 7. Connect the cathode of D1184 to the collector of Q1184 through the solder lug on the Q1184 transistor assembly.

( ) 8. Check the operation of the AC-DC Power Supply module as directed in the 422 Instruction Manual.

( ) 9. Fasten the identification marker (included in the kit) to the rear surface of the AC-DC Power Supply to indicate this modification has been installed.

( ) Change the Power Supply Parts Lists in the Instruction Manual as follows:

ELECTRICAL PARTS LIST

Transistors

Q1174	1 ea	151-0469-00	Silicon, Selected
Q1184	1 ea	151-0469-00	Silicon, Selected

MECHANICAL PARTS LIST

-----	2 ea	214-1993-00	Heat sink, Transistor
-----	2 ea	211-0601-00	Screw, 6-32 x 0.312 w/2 lockwashers

Beaverton Mods-Guernsey/Holland S/Nos.

TYPE 422 125B Page 1 of 3 November,19

PRODUCED BY FIELD SUPPORT, TEKTRONIX LTD. FOR FULL MOD DETAILS REFER TO MICROFICHE

BEAVERTON MOD. NO.	EFFECTIVE SERIAL NUMBERS				MODIFICATION KIT PART NUMBERS
	GUERNSEY	DATE	HEERENVEEN	DATE	
M10684	100001	-	700001	14. 7.66	
M10727	N/A	-	700001	18. 7.66	
M10800	100001	1. 8.66	700001	14. 7.66	
M10132-1-2	100001	28. 7.66	700001	-	
M10230	100001	8. 8.66	N/A	-	
M10517-1-2	100005	6. 9.66	700102	11.10.66	
M10808	100001	6. 9.66	N/A	-	
M11365	100001	26. 9.66	N/A	-	
M10273	100033	26. 9.66	N/A	-	
M10801	100046	26. 9.66	N/A	-	
M10521	100005	19. 9.66	700166	7.11.66	
M9682	100005	6. 9.66	N/A	-	Except R4 & R104
M9682	100072	21.11.66	700249	14. 2.67	
M10297	100225	12. 6.67	N/A	-	
M10735	100096	13. 1.67	N/A	-	
M11526	100001	2.11.66	700230	1. 2.66	
M11526	-	-	700230	21.11.66	
M11553	100001	11.11.66	N/A	-	
M11373	100001	26. 9.66	700009	15. 9.66	
M10498	100250	20. 9.67	N/A	-	
M11387	100171	5. 4.67	700246	14. 2.67	040-0439-00
M11487	100096	13. 1.67	N/A	16. 1.67	
M11641	100225	27. 7.67	N/A	31. 3.67	
M11053	100218	30. 5.67	700327	11. 5.67	050-0319-00 050-0320-00
M10733	100060	14.11.66	N/A	22.11.66	
M10723	100053	14.11.66	N/A	-	
M11480	100225	27. 6.67	N/A	-	
M11292	100250	2. 6.67	N/A	-	
M11427-1	100096	22.12.66	N/A	-	
M11427-2	No S/N	3.11.67	N/A	-	
M12070	100246	23. 8.67	700346	11. 5.67	
M12509	100193	14. 6.67	700470	8. 6.67	

* COPIES OF MODIFICATION INSTRUCTIONS OR MOD KIT. INSTRUCTIONS ARE AVAILABLE FROM BEAVERTON - PLEASE ORDER BY DESCRIPTION - QUOTING 'M' AND MOD NUMBER

PRODUCED BY FIELD SUPPORT, TEKTRONIX LTD. FOR FULL MOD DETAILS REFER TO MICROFICH

BEAVERTON MOD. NO.	EFFECTIVE SERIAL NUMBERS				MODIFICATION KIT PART NUMBERS
	GUERNSEY	DATE	HEERENVEEN	DATE	
M9271	100359	5.12.67	N/A	-	
M11721-1-2-3	100335	13.11.67	700529	30.10.67	
M12879	100359	5.12.67	No S/N	14.12.67	
M12993	100525	14. 6.68	701116	9. 8.68	
M13790	186 Internal	12. 6.68	N/A	26. 4.68	
M13831	No S/N	19. 5.69	No S/N	26. 4.68	
M13523	100692	5. 8.68	701063	5. 7.68	
M12971	100748	2. 8.68	N/A	18.10.68	
M10438	100221	15. 5.67	-	-	
M13877	100604	24. 5.68	701000	22. 5.68	
M13768	No S/N	23. 5.68	No S/N	22. 8.68	
M13768	213 Internal	5. 8.68	N/A	-	
M11191	100379	18.12.67	N/A	-	
M11191	100417	17. 1.68	N/A	-	
M11191	100539	8. 5.68	N/A	-	
M14061	100693	23. 7.68	701000	28. 6.68	
M14292	100780	16. 9.68	No S/N	18. 9.68	
M14741	100790 100849	11.10.68	-	-	
M13972	101001	-	- -	-	
M13721	100730	16. 9.68	-	-	
M13721	101001	25. 2.69	-	-	
M13429	-	-	-	13. 9.68	
M12213	101001	25. 2.69	701724	27. 3.69	
M13967	101001	25. 3.69	-	-	050-0425-00
M14389	101001	28. 3.69	-	13. 2.69	
M14711	101104	28. 5.69	701652	20. 3.69	
M15283	101114	5. 6.69	-	13. 6.69	
M15242	101133	8. 9.69	702079	19. 9.69	
M14721	101137	9.10.69	-	19. 9.69	
M15185	101259	19.11.69	-	-	
M13185	-	-	701768	28. 5.69	
M13124	-	-	-	23.10.69	

* COPIES OF MODIFICATION INSTRUCTIONS OR MOD KIT. INSTRUCTIONS ARE AVAILABLE FROM BEAVERTON - PLEASE ORDER BY DESCRIPTION - QUOTING 'M' AND MOD NUMBER

PRODUCED BY FIELD SUPPORT, TEKTRONIX LTD. FOR FULL MOD DETAILS REFER TO MICROFICH

BEAVERTON MOD. NO.	EFFECTIVE SERIAL NUMBERS				MODIFICATION KIT PART NUMBERS
	GUERNSEY	DATE	HEERENVEEN	DATE	
M15124	-	-	-	23.10.69	
M14766	-	-	-	7.11.69	
M15741	-	-	-	4.12.69	
M15885	-	-	-	16.12.69	
M15823	-	-	702893	1970	
M15311	102000	20. 5.70	702854	Wk 27 70	
M16158	102000	2. 7.70	-	-	
M15369	102044	2. 7.70	702764	Wk 20 70	
M16153	102131	11.11.70	-	18. 5.70	050-0489-00
M14004	103000	16.11.70	-	Wk 36 70	
M16747	103054	14.12.70	-	-	
M14516	103154	7.4. 71	703718	Wk 04 72	
M16765	103139	19. 4.71	703810	Wk 23 72	
M16953	103177	29. 4.71	703529	-	
M16765	103225	28. 7.71	-	-	
M16978-1	103239	31. 8.71	-	-	
M16978	103260	15. 9.71	-	Wk 35 71	
M17444	103239	21. 9.71	33647	-	
M16809	-	-	-	Wk 15 71	
M17054	-	-	-	1971	
M16587	103325	23.12.71	-	-	
M17067-2	103377	3. 3.72	-	-	
M17067-3		27. 3.72			
M17067-5		25. 4.72			
M17067-7	Not recorded	13. 7.72			
M1774	103398	10. 8.72			
	100001		700001		040-0419-00
	100001		700001		040-0421-00

* COPIES OF MODIFICATION INSTRUCTIONS OR MOD KIT. INSTRUCTIONS ARE AVAILABLE FROM BEAVERTON - PLEASE ORDER BY DESCRIPTION - QUOTING 'M' AND MOD NUMBER.