

Type 547/RM547

PRODUCT MODIFICATION INDEX

1

POWER SUPPLY

circuit
section — XXX.XX
page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
260	+225V power supply oscillation eliminated by adding capacitor.	8132	101.01	-----	-----
365 108-RM	Capacitor C773 wiring error corrected.	8386	101.02	-----	-----
not given	Electrolytic capacitor assemblies replaced with subparts to eliminate unnecessary part numbers and facilitate replacement.	S8959	101.03	-----	-----
1081 180-RM	V677 tube selection to meet ripple specifications eliminated by rewiring circuitry.	9015	101.04	0.5h	-----
1270 180-RM	Capacitor C709 wiring error corrected.	9073	101.05	-----	-----
2887	V707 tube selection for +225V regulation eliminated by changing shunt resistor value.	10346	101.06	-----	-----
4400	Silicon diode type changed to reduce cost and facilitate layout. D672A, B, C, and D, 152-0047-00, replaced by 152-0066-00.	9973	----	-----	-----
6270	Power cord ground connection improved by addition of spring 214-0698-00.	11292	---- 101.07	----- 0.1h	040-0424-01
6340	Motor base connector changed to facilitate assembly Superseded by M12876.	9271	101.08	-----	-----
6380	High line, low load regulation improved.	12258	101.09	-----	-----

continued

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* series model



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TL:cet

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POWER SUPPLY (continued)

 circuit
 section — XXX.XX
 page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
7480	Power supply diodes changed to standardize usage and reduce cost. D831, 152-0208-00, replaced with 152-0040-00.	12081	----	-----	-----
7980	Line Voltage Selector switch added to facilitate changing of line voltage requirements.	12173-1	101.10	-----	-----
7980	Power cord attached permanently to instrument.	12173-2	101.11	-----	-----
11615	Transformer bracket changed to standardize usage. Bracket 407-0022-00 replaced with 407-0055-00.	13640	----	-----	-----
12110	Diodes changed to increase current rating.	14928	101.12	-----	-----
15340	The power cord SAFETY-EARTH lead length was increased to insure that it would be the last wire to break if the cord were pulled from the instrument. Part number changed from 161-0033-00 to 161-0033-07.	17392	----	-----	-----
##NA	To ensure fan motor availability, the fan motor, pn 147-0026-00 (which is no longer available), was replaced with a new fan motor, pn 147-0001-01. The new fan motor necessitates the use of 6-32 x 2 inch mounting screws, pn 211-0552-00.	S42203	---- 101.13	---- 0.5h	---- 050-1486-00

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CRT CIRCUIT

circuit
section—XXX.XX
page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
not given (also RM)	Polarized light filter replaced with smoke gray filter. See M9022.	8194	102.01	-----	-----
1010 180-RM	CRT vertical sensitivity improved by lowering shield voltage	8584	102.02	-----	-----
1510 210-RM	CRT yield improved by replacing trace rotator coil.	8627	102.03	-----	-----
1880 240-RM	Protective network added to collector of Q373 and a clamping diode added to CRT circuitry to reduce failure rate of Q373 and V393B when CRT circuit arcs.	8950	102.04	0.5h	-----
2070 250-RM	CRT and light piping changed to provide a risetime graticule and facilitate assembly. CRT not included in kit.	8744	102.05 102.06	----- 0.3h	----- 050-0246-01
not given (also RM)	Electrolytic capacitor assemblies replaced with subparts to eliminate unnecessary part numbers and facilitate replacement.	S8959	101.03	-----	-----
2440 270-RM	CRT filter shape and color standardized to reduce cost.	9022	102.07	-----	-----
4080	HV oscillator error amplifier rewired to eliminate overcompensation and trace dimming.	10459	102.08	-----	-----
4080	HV diode heater leads replaced to prevent shorting.	10500	102.09	-----	-----
5830	HV oscillator clamping circuit added to screen grid circuit to prevent transformer damage.	11809	102.10	-----	-----

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CRT CIRCUIT (continued)

 circuit
 section — XXX.XX
 page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
5920	External graticule Mod 172Z changed from custom instruments to production special.	10895	102.11	-----	-----
8140	FOCUS and INTENSITY potentiometers changed to reduce cost, improve quality, and provide better supply.	11639	102.12	-----	-----
10000	Internal Graticule CRT changed from glass to ceramic.	13672	102.13	-----	-----
	P-7 Phosphor:		102.14	1.0h	050-0420-10
	P-11 Phosphor:		102.15	1.0h	050-0420-11
	P-31 Phosphor:		102.16	1.0h	050-0420-12

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 ##Changed since last publication.
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EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
940 180-RM	Type W unit compatibility improved by added damping resistor.	8715	103.01	-----	-----
1010 180-RM	VERTICAL SIGNAL OUT noise and erratic triggering prevented by adding decoupling capacitor.	8682-1	103.02	-----	-----
1272 180-RM	200MHz oscillation and resulting broadening eliminated by adding bypass capacitor.	9141	103.03	-----	-----
2340 260-RM	Output Amplifier protection circuitry added.	9471	103.04 103.05	----- 0.3h	040-0405-00
not given	Toroid core replaced with similar type because of discontinued manufacture. Core (part of T1030, 120-0341-00) 276-0512-00 replaced with 276-0517-00.	10095	----	-----	-----
3380	Vertical oscillation, exhibited as trace widening, eliminated by changing capacitor. Also see M9141.	10557	103.06	-----	-----
4270	Capacitor failures reduced by changing to higher voltage type.	10985	103.07	-----	-----
4750	VERT GAIN potentiometer changed to increase range. Capacitor C1027 changed to variable.	11122	103.08	-----	-----
5680	Output transistor failure causing vertically unstable trace reduced by replacing transistors.	11707	103.09	-----	-----
6730	Vertical DC Balance range and stability improved by changing potentiometer and input tube.	12460	103.10	-----	-----

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VERTICAL AMPLIFIER (continued)

circuit
section — XXX.XX
page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
10730	1-15kHz frequency response improved by changing components.	14194	103.11	-----	-----
11270	+100V supply protection diodes added.	14860	103.12	-----	-----
11890	Vertical Position neon firing insured.	15145	103.13	-----	-----
14640	To prevent possibility of trigger amplifier pick-off oscillating when using Type 1S1 Sampling plug-in, .6 μ H ferramic suppressor cores L1145 and L1155 were added to the bare wires at the bases of Q1145 and Q1154 respectively.	16296	----	-----	-----
15280	Potentiometers, R1076 and R1106 were changed from 250 Ω 1/4W, 311-0442-00, to 250 Ω 1/2W, 311-1223-00, to improve quality and availability.	17667	----	-----	-----

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B SWEEP TRIGGER

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 page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
940 180-RM	Trigger DC stability at low levels improved by adding capacitor.	8525	104.01	-----	-----
1360 220-RM	B Sweep trigger and delay pickoff decoupling capacitors interchanged to correct voltage ratings.	9191	104.02	-----	-----
1770 240-RM	Trigger input transformer changed to prevent insulation short.	9368	104.03	-----	-----
6060	Transistors changed to less expensive type. 2N962, 151-0089-00, replaced with 2N3906, 151-0188-00.	10763	----	-----	-----
6240	Trigger level drift eliminated by changing to aged tubes. V24 and V224, 154-0187-00, replaced with 157-0122-00.	12115	----	-----	-----
6740	Trigger stability improved by rewiring trigger circuits.	12027	104.04 104.05	----- 6.0h	040-0459-00
11890	Tunnel diode power rating increased.	12463	104.06	-----	-----

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EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
1010 180-RM	B Sweep to A Sweep start matching at 50MHz improved.	8683-2	105.01	-----	-----
1160 180-RM	Unblanking gate diode no longer available; circuit changed to facilitate replacement.	8822	105.02 105.03	----- 0.3h	050-0225-00
1970 250-RM	Tunnel diode no longer available; changed to different style. D85, D285, 152-0156-00, replaced with 152-0125-00.	8992	----	-----	-----
1970 250-RM	B Sweep BRIGHTNESS control range increased and control knob replaced.	9039-1	105.04	-----	-----
1970 250-RM	B Sweep unblanking CF cutoff eliminated by adding protective diodes.	9039-2	105.05	-----	-----
3130	Disconnect diode protection diode added. See M15344.	10510	105.06	-----	-----
4170	6AU6 and 12AU6 tubes replaced with premium type 8426 to reduce microphonics, interface, and grid current. V91, 154-0040-00, replaced with 154-0040-05.	10548	----	-----	-----
6060	Transistors changed to less expensive type. 2N962, 151-0089-00, replaced with 2N3906, 151-0188-00.	10763	----	-----	-----
6740	Trigger stability improved by rewiring trigger circuits.	12027	104.04 104.05	----- 6.0h	040-0459-00
7960	Trigger generator tubes changed to checked, aged, and balanced tubes.	13384	105.07	-----	-----

continued



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B SWEEP GENERATOR (continued)

 circuit
 section — XXX.XX
 page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
8420	B Sweep free-running caused by oscillations eliminated by shortening wire leads.	13839	105.08	-----	-----
12480	Gallium Arsenide disconnect diodes replaced with transistor and associated circuitry.	15344	---- 105.09	1.5h	050-0479-01
14790	151-0063-01 (T0-5 case) used as alternate to replace 151-0063-00 (T0-7 case) for Q173 and Q184.	16238	----	-----	-----
15050	Triggering in AUTO mode with low rep rate trigger signals was improved by changing C67 from .2 μ F 25V, 283-0026-00, to .22 μ F 100V, polycarbonate, 285-0835-00.	17182	----	-----	-----

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##Indicates changes made since last publication.

N/A - Not Available yet.



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B SWEEP TIMING SWITCH

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section — XXX.XX
page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
1010 180-RM	Capacitor values lowered to improve slow sweep accuracy.	8858	106.01	-----	-----
5310	Timing capacitors changed to new type for greater stability.	11266	106.02	0.5h	-----
5480	Timing resistors changed to maintain specified tolerance.	11517	106.03 106.04	----- -----	050-0338-02
8290	Timing resistors changed to facilitate selection.	13653	106.05 106.04	----- -----	Included in 050-0338-02
10260	Timing resistors changed to metal film to improve stability.	14095	106.06 106.04	----- -----	Included in 050-0338-02
15300	Timing resistor sets R90D, E, F, G, H and R290D, E, F, G, H, were changed from 312-0641-03 to 312-0641-04 which has a test selected resistor (nominal value 10K) in series with the 1.4M resistor.	20524	-----	-----	-----

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DELAY PICKOFF

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 page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
1010 180-RM	Reliability improved by replacing D433 with higher voltage diode.	8683-1	107.01	-----	-----
1360 220-RM	B Sweep trigger and delay pickoff decoupling capacitors interchanged to correct voltage ratings.	9191	104.02	-----	-----
1770 240-RM	Diode replaced to improve availability. D405, 152-0155-00, replaced with 152-0081-00. See M13967.	8993	----	-----	-----
11490	Tunnel diode changed to improve reliability. D405, 152-0081-00, replaced with 152-0402-00.	13967	----- 107.02	----- 0.2h	050-0425-00
14710	Transistor Q424 was changed from germanium to silicon to improve availability. 151-0063-00 was replaced by 151-0322-00.	16629	-----	-----	-----

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EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
1770 240-RM	Trigger input transformer changed to prevent insulation short.	9368	104.03	-----	-----
3550	High frequency oscillation eliminated by changing resistor values.	10436	108.01	-----	-----
6060	Transistors changed to less expensive type. 2N962, 151-0089-00, replaced with 2N3906, 151-0188-00.	10763	----	-----	-----
6240	Trigger level drift eliminated by changing to aged tubes. V24 and V224, 154-0187-00, replaced with 157-0122-00.	12115	----	-----	-----
6740	Trigger stability improved by rewiring trigger circuits.	12027	104.04 104.05	----- 6.0h	040-0459-00
11890	Tunnel diode power rating increased.	12463	104.06	-----	-----

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EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
1010 180-RM	Fast sweep gain adjustment C299 value changed to increase range.	8682-2	109.01	-----	-----
1010 180-RM	Capacitor values lowered to improve slow sweep accuracy.	8858	106.01	-----	-----
1880 240-RM	Protective network added to collector of Q373 and a clamping diode added to CRT circuitry to reduce failure rate of Q373 and V393B when CRT circuit arcs.	8950	102.04	0.5h	-----
1970 250-RM	Tunnel diode no longer available; changed to different style. D85, D285, 152-0156-00, replaced with 152-0125-00.	8992	----	-----	-----
5680	Resistor added to assure "B" trace is brighter than "A" trace at some sweep speeds.	11722	109.02	-----	-----
6060	Transistors changed to less expensive type. 2N962, 151-0089-00, replaced with 2N3906, 151-0188-00.	10763	----	-----	-----
6740	Trigger stability improved by rewiring trigger circuits.	12027	104.04 104.05	----- 6.0h	040-0459-00
7960	Trigger generator tubes changed to checked, aged, and balanced tubes.	13384	105.07	-----	-----
14790 (Tent)	151-0063-01 (T0-5 case) used as alternate to replace 151-0063-00 (T0-7 case) for Q373.	16238	----	-----	-----
15050	Triggering in AUTO mode with low rep rate trigger signals was improved by changing C267 from .2 μ F 25V, 283-0026-00, to .22 μ F 100V, polycarbonate, 285-0835-00.	17182	----	-----	-----

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A SWEEP TIMING SWITCH

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EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
5310	Timing capacitors changed to new type for greater stability.	11266	106.02	0.5h	-----
5480	Timing resistors changed to maintain specified tolerance.	11517	106.03 106.04	----- 0.3h	050-0338-02
8290	Timing resistors changed to facilitate selection.	13653	106.05 106.04	----- 0.3h	Included in 050-0338-02
10260	Timing resistors changed to metal film to improve stability.	14095	106.06 106.04	----- 0.3h	Included in 050-0338-02
15300	Timing resistor sets R90D, E, F, G, H and R290D, E, F, G, H were changed from 312-0641-03 to 312-0641-04 which has a test selected resistor (nominal value 10K) in series with the 1.4M resistor.	20524	-----	-----	-----

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ALTERNATE SWEEP SWITCHING

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page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
1728 237-RM	Proper Alternate sweep operation at low line assured.	9409	111.01	-----	-----
12470	Sweep Steering Diodes Replacement Kit	---	111.02	0.3h	050-0473-00

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HORIZONTAL DISPLAY SWITCH

circuit
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page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
4270	Drift when switching to EXT HORIZ mode minimized.	10398	112.01	0.5h	-----

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EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
700 140-RM	EXT HORIZ variable potentiometer replaced to provide better part at reduced cost. R511, 311-0418-00, replaced with 311-0491-00.	8179	----	-----	-----
5130	Insufficient range of X10 Cal Adjust potentiometer cured by reducing horizontal amplifier gain.	11212	113.01	-----	-----
5680	CRT burns during turn-on prevented.	11808	113.02	0.5h	-----
14710	Transistor Q554 and Q564 were changed from germanium to silicon to improve availability. 151-0063-00 was replaced by 151-0322-00. Heat sinks 214-0435-00 were removed because they were no longer needed.	16629	----	-----	-----
15300	Transistor Q534 was changed from 151-0121-00 to 151-0124-00. The new transistor is the same as the old except that the voltage rating is 120V instead of 60V.	16587	----	-----	-----

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PLUG-IN CONNECTOR

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EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
1728 237-RM	Proper Alternate sweep operation at low line assured.	9409	111.01	-----	-----

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CALIBRATOR

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page

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
1360 180-RM	Possible short on CALIBRATOR switch eliminated by changing dress of insulated strap between terminals W3-2R and W3-12R.	9089	----	-----	-----
2890	Resistors changed to 1/2% tolerance to facilitate calibration and reduce possible error.	9080	115.01	-----	-----
3150	Zener diode replaced with resistor to improve reliability and reduce cost.	10229	115.02	-----	-----
10200	Resistors changed to improve quality and reduce cost.	12856	115.03	-----	-----

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16 MISCELLANEOUS

EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
390	Sleeves added to graticule lights to prevent illumination of POSITION neons.	8299	116.01	-----	-----
not given (also RM)	Accessories changed to permit patching without adapters.	8313	116.02	-----	-----
1160 180-RM	Transistor sockets changed to snap-in type to facilitate production.	8208	116.03	-----	-----
2500 280-RM	Lever knob material changed to improve environmental characteristics. 366-0215-00 replaced with 366-0215-01.	9262	----	-----	-----
2723 (RM only)	Separate rackmount serial number sequence discontinued to facilitate production. Last serial number of separate sequence was SN 329.	9917	----	-----	-----
4450	Cabinet bottom plate changed to standardize parts and reduce cost. 387-0756-00 replaced with 386-1093-00.	10513	----	-----	-----
4560 (RM only)	Cabinet latch retainer ring replaced for improved reliability.	10740	116.04	-----	-----
6300	Motor base changed to improve ground connection.	12876	116.05	-----	-----
6370	Power ON light color changed to standard green. Jewel 378-0518-00 replaced with 378-0513-00.	12031	----	-----	-----
6730	Anti-slide feet added to bottom rails to prevent sliding.	12130	116.06	0.3h	-----

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16 MISCELLANEOUS (Continued)

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EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
8630	10% and 20% zener diodes changed to standard 5% units.	11191	116.07	-----	-----
8630	Heat-shrinkable sleeve 334-1205-00 added to power cord to identify wires.	13768	----	-----	-----
10430	Diodes changed to provide more reliable part. 1N3605 diodes, 152-0141-00, replaced with 1N4152 diodes, 152-0141-02.	13721	----	-----	-----
12690	Coupling restraints 361-0233-00 and 361-0234-00 added to shafts to eliminate backlash.	14165	----	-----	-----
12800	Cabinet latch changed to a mechanically more reliable assembly.	15322	116.08	-----	-----
15280	3/4" ceramic strips were replaced with 7/16" ceramic strips for standardization.	16795	116.09	-----	-----
15301	To standardize usage of toggle switches, SW601, 260-0785-00 was replaced with SW601, 260-0276-00.	18981	-----	-----	-----
##NA	To ensure fan motor availability, the fan motor, pn 147-0026-00 (which is no longer available), was replaced with a new fan motor, pn 147-0001-01. The new fan motor necessitates the use of 6-32 x 2 inch mounting screws, pn 211-0552-00.	S42203	----- 101.13	----- 0.5h	----- 050-1486-00

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17 MODIFICATION KITS

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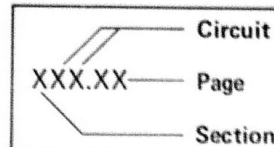
EFF. SN. S.M.*	DESCRIPTION	MOD. NO.	PAGE	LABOR TIME	KIT NO.
ALL	Blank Plug-In Modification Kit.	---	117.01	-----	040-0065-00
ALL	Cradle Mount Modification Kit.	---	117.02	1.5h	040-0281-00
100-2339 100-259RM	Vertical Output Amplifier Protection Modification Kit.	9471	103.05	0.3h	040-0405-00
ALL	3 Wire Power Cord Female Ground Connection Improvement Modification Kit.	11242	101.07	0.1h	040-0424-01
100-6739	'A' and 'B' Triggering Stability Improvement Modification Kit.	12027	104.05	6.0h	040-0459-00

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PARTS REPLACEMENT KITS

EFF. SN.	DESCRIPTION	MOD. NO.	PAGE NO.	LABOR TIME	KIT NO.
100248- 100530	(Guernsey) Air Filter Replacement	-----	118.01	-----	050-0123-01
100-1159 100-179RM	Diode Replacement	8822	105.03	0.3h	050-0225-00
100-2069 100-249RM	CRT Light Reflector Ring Replacement	8722	102.06	0.3h	050-0246-01
100-8289	Timing Resistor Replacement	11517	106.04	0.3h	050-0338-02
100-10000	T5471-7-2 (P-7Phosphor) CRT Replacement	13672	102.14	1.0h	050-0420-10
	T5471-11-2 (P-11 Phosphor) CRT Replacement	13672	102.15	1.0h	050-0420-11
	T5471-31-2 or -2-2 (P-31 or P-2 Phosphor) CRT Replacement	13672	102.16	1.0h	050-0420-12
100-Up	Tunnel Diode Replacement	13967	107.02	0.2h	050-0425-00
100-12470	Sweep Steering Diodes Replacement	-----	111.02	0.3h	050-0473-00
100-12479	Disconnect Diode Replacement	15344	105.09	1.5h	050-0479-01
##ALL	Fan Motor Replacement	S42203	101.13	0.5h	050-1486-00

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##Changed since last publication.



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FOR FULL MOD DETAILS REFER TO MICROFICHE

BEAVERTON MOD. NO.	EFFECTIVE SERIAL NUMBERS				MODIFICATION KIT PART NUMBERS
	STERNSEY	DATE	HEERENVEEN	DATE	
M9973	100642	13. 4.67	-	-	
M10512	100642	28. 4.67	700717	24. 2.67	
M11122	100482	15. 9.66	700689	23.10.66	
M11122	100532	20.12.66	-	-	
M11212	100605	6. 2.67	700630	22.11.66	
M11206	100568	13. 1.67	700706	-	
M11517	100594	7. 3.67	-	3. 3.67	050-0338-01
M11707	100624	23. 3.67	-	-	
M11722	100558	14.12.66	700723	15. 2.67	
M11808	100576	11. 1.67	700693	17. 1.67	MI-11808
M11809	100624	23. 3.67	700723	1. 2.67	
M10763	100699	26. 7.67	700657	2. 1.67	
M12115	100642	28. 3.67	-	-	040-0424-01
M11292	100653	23. 3.67	-	17. 8.67	
M12271	100852	5.12.67	-	-	
M12158	100896	-	-	12. 7.68	
M12130	100852	28.12.67	-	7.12.67	MI-12130
M12460	100726	20. 7.67	701250	19.11.68	MI-12460
M12460	100780	10.10.67	-	-	
M12027	100852	14.12.67	700994	28.12.67	040-0459-00
M12031	100918	13. 3.68	700916	11.10.67	
M12876	100852	5.12.67	700981	14.1.67	MI12876
M12081	100994	28. 4.68	701180	14. 6.68	
M13284	100900	17. 5.68	No S/N	18.12.68	
M12173-1	102576	14. 5.68	701200	2.10.68	
M12345	-	15. 6.67	-	-	
M13639	100877	20. 2.68	-	-	
M13497	100990	17. 5.68	-	-	
M13653	100950	15. 4.68	701245	30.10.68	050-0338-01
M13839	100995	14. 5.68	-	22. 5.68	
M11191	100770	21. 9.67	701180	-	
M11191	100852	18.12.67	-	-	
M11191	100866	17. 2.68	-	-	
M11191	100873	6. 2.68	-	-	
M11191	100896	7. 2.68	-	-	
M13768	101034	12. 8.68	No S/N	-	
M13768	No S/N	23. 5.68	-	22. 8.68	
M13672	101138	31.12.68	701397	14. 3.69	050-0420-00
M12856	101298	20. 5.69	-	5. 7.68	
M12856	101298	11. 6.69	-	-	
M14095	101106	21.11.68	701439	27. 5.69	050-0338-01
M13721	101061	16. 9.68	-	-	
M14660	101223	17. 2.69	-	13. 2.69	
M14195	101245	25. 3.69	701566	28. 5.69	
M14967	101245	25. 3.69	-	-	050-0425-00
M12463	101324	9. 6.69	701551	27. 6.69	
M15145	101368	24. 7.69	701621	8.10.69	

* COPIES OF MODIFICATION INSTRUCTIONS OR MOD KIT. INSTRUCTIONS ARE AVAILABLE FROM BEAVERTON - PLEASE ORDER BY DESCRIPTION - QUOTING MI AND MOD NUMBER



PRODUCT MODIFICATION CROSS REFERENCE

Beaverton Mods-Guernsey/Holland S/Nos.

TYPE

547

Page 3 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	
M14928	101413	18. 8.69	701510	28. 5.69	050-0470-01
M11639	101340	4. 8.69	-	-	
M15344	101538	4. 2.70	-	-	
M16296	101690	10. 7.70	701907	Wk 36 70	
M17182	101690	14.12.70	701991	Wk 02 71	
M16629	101714	24. 2.71	-	-	
M15322 Pt.4	101677	26. 4.71	-	-	
M15346	-	-	701665	13.11.69	
M14165	-	-	701760	15. 1.70	
M14634	-	-	-	12. 2.70	
M16190	-	-	-	4. 5.70	
M16587	101800	23.12.71	-	-	
	100001		700001		040-0065-00
	100001		700001		040-0281-00

* COPIES OF MODIFICATION INSTRUCTIONS OR MOD KIT. INSTRUCTIONS ARE AVAILABLE FROM BEAVERTON - PLEASE ORDER BY DESCRIPTION - QUOTING 'M' AND MOD NUMBER

+225V POWER SUPPLY OSCILLATION ELIMINATED

Effective Prod SN 260

Usable in SN 100-259

C694 was added in parallel with R694 to prevent possible oscillation at the +225V supply caused by adding R694, a 47k resistor in the grid circuit of V707 for the protection of D693.

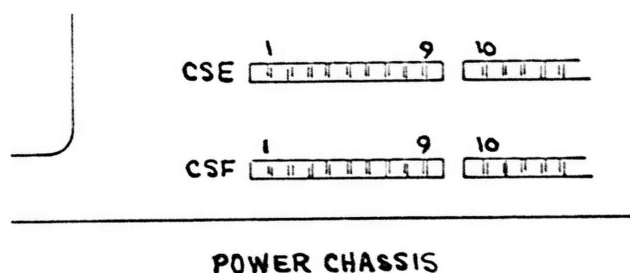
Parts Added:

C694 281-0523-00 Capacitor, 100pF

INSTALLATION

Parts Required: See 'Parts Added.'

Solder C694 in parallel with R694. R694 is located between pin 1 of V707 and CSE-8 on the Power chassis.



CAPACITOR WIRING ERROR CORRECTED

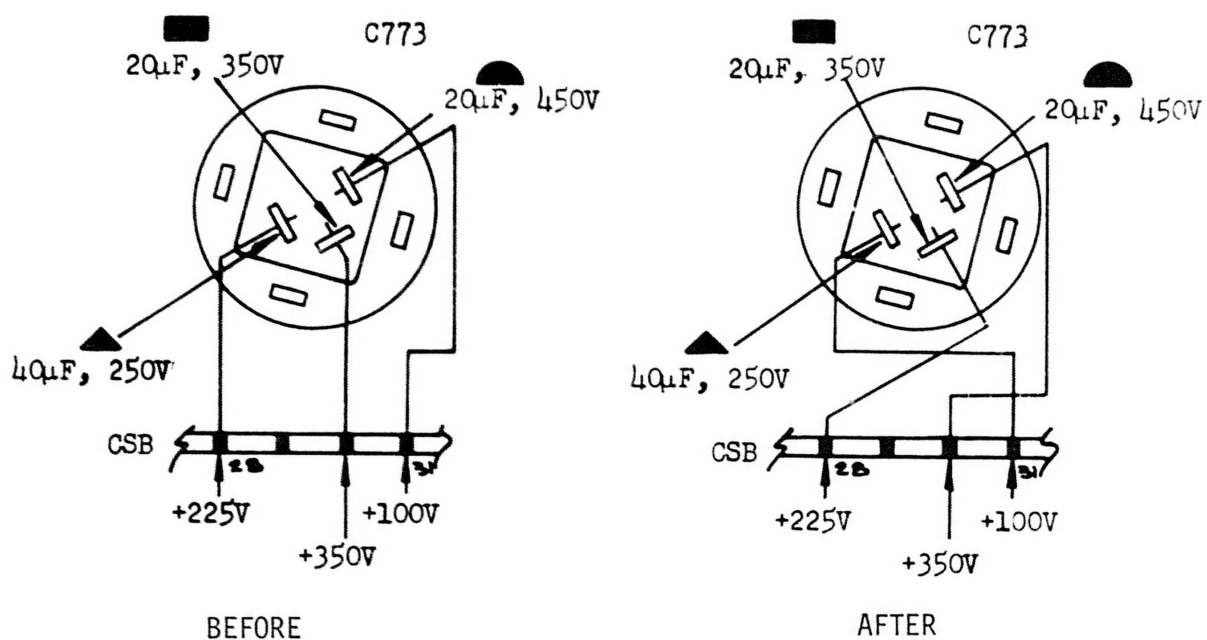
Effective Prod SN 365
108-RM

Usable in SN 100-364
100-107

The VA supply voltages (+100, +225, and +350) are wired to the wrong sections of capacitor C773A, B, and C. Relocate the wire straps to their proper locations.

INSTALLATION

Relocate wiring to C773, using the drawings below for proper location.



ELECTROLYTIC CAPACITOR ASSEMBLIES REPLACED WITH EQUIVALENT CAPACITOR
FLANGE, BASE, OR COVER TO ELIMINATE UNNECESSARY PART NUMBERS AND
TO FACILITATE REPLACEMENT

Effective Prod SN not given
(also RM)

All electrolytic capacitor assemblies were replaced with their equivalent raw capacitor, metal or fiber flange, plastic cover, and DELRIN® base (when required) to eliminate unnecessary part numbers and to facilitate replacement of electrolytic capacitors by customers. For replacement of capacitor assemblies, Customer Service will supply raw capacitors with both metal and fiber flanges and plastic covers when required.

Parts Removed:

C771	290-0229-00	Capacitor, 2 x 40 μ F 250V
C773	290-0237-00	Capacitor, 40/20/20 μ F 250/350/450V
C802	290-0243-00	Capacitor, 40 μ F 400V
C709	290-0238-00	Capacitor, 20/10/10 μ F 250/350/450V
C730	290-0239-00	Capacitor, 125 μ F 250V
C671	290-0240-00	Capacitor, 300 μ F 250V
C701	290-0241-00	Capacitor, 200 μ F 400V
C642	290-0242-00	Capacitor, 250/40 μ F 350/250V

Parts Added:

C771	290-0185-00	Capacitor, 2 x 40 μ F 250V
C773	290-0196-00	Capacitor, 40/20/20 μ F 250/350/450V
C802	290-0190-00	Capacitor, 40 μ F 400V
C709	290-0195-00	Capacitor, 20/10/10 μ F 250/350/450V
C730	290-0179-00	Capacitor, 125 μ F 250V
C671	290-0180-00	Capacitor, 300 μ F 250V
C701	290-0192-00	Capacitor, 200 μ F 400V
C642	290-0197-00	Capacitor, 250/40 μ F 350/250V
	386-0252-00	Flange
	386-0253-00	Flange
	386-0254-00	Flange
	386-0255-00	Flange
	200-0257-00	Cover
	200-0259-00	Cover
	200-0260-00	Cover
	432-0048-00	Base, capacitor mounting
	432-0047-00	Base, capacitor mounting (Type 547 only)

DELRIN Reg. TM E. I. du Pont de Nemours & Co., Inc.

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+100V DC POWER SUPPLY REWIRED TO IMPROVE REGULATION

Effective Prod SN 1081
180-RM

Usable in SN 100-1080
100- 179

The regulation of the +100V DC supply can be improved and the need to select 6080's for V677 can be eliminated by rewiring the circuitry around V677.

Parts Removed:

R663	302-0105-00	Resistor, 1M 1/2W 10%
R667	302-0334-00	Resistor, 330k 1/2W 10%
R677	308-0040-00	Resistor, 1.5k 25W 5% WW

Parts Added:

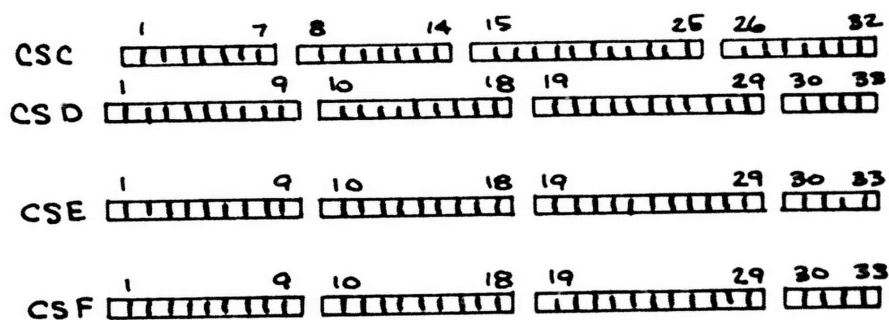
C665	283-0001-00	Capacitor, 0.005 μ F 500V
R663	301-0185-00	Resistor, 1.8M 1/2W 5%
R665	301-0225-00	Resistor, 2.2M 1/2W 5%
R666	301-0226-00	Resistor, 22M 1/2W 5%
R667	301-0304-00	Resistor, 300k 1/2W 5%
R677	308-0065-00	Resistor, 2k 25W 5% WW
	162-0504-00	Tubing, VARGLAS®

INSTALLATION

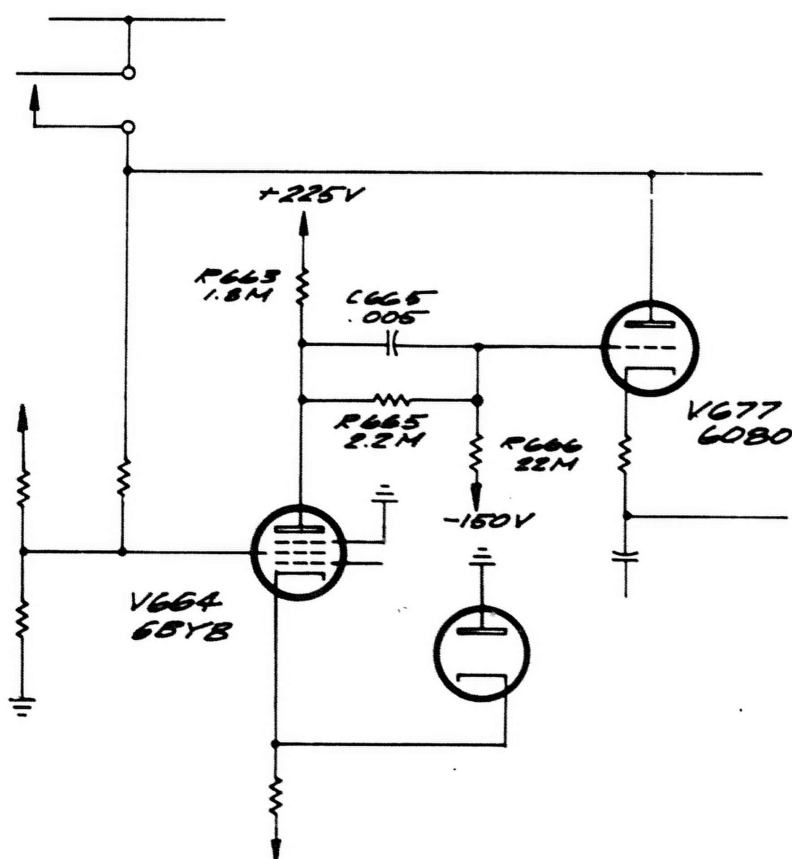
Parts Required: See 'Parts Added.'

- Remove R663, a 1M 1/2W 10% resistor, between CSD-22 and CSE-22.
- Remove R667, a 330k 1/2W 10% resistor, from CSD-21 and CSE-21.
- Remove the bare wire between pin 7 of V664 and pin 4 of V677.
- Connect C665 and R665 in parallel and solder them between CSE-22 and pin 7 of V664.
- Install R663, a 1.8M 1/2W 5% resistor between pin 7 of V664 and CSD-22. Insulate the lead to CSD-22 with a piece of #22 tubing.
- Install R667, a 300k 1/2W 5% resistor, between CSD-21 and CSE-21.
- Replace the #22 wire box strap between CSF-19 and CSF-25 with two #22 box straps between CSF-19/22 and CSF-22/25.
- Solder R666, a 22M 1/2W 5% resistor, between CSF-22 and CSE-22.
- Replace R677, on the shunt resistor bracket, with a 2k 25W 5% resistor.

VARGLAS, Reg. TM of Varflex Corp.



POWER CHASSIS



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POWER SUPPLY FILTER CAPACITOR WIRING ERROR CORRECTED

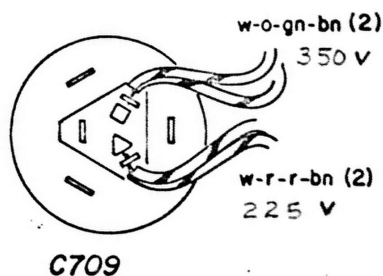
Effective Prod SN 1270
180-RM
modified out of sequence:
1176-89 1220-39

Usable in SN 100-1269
100- 179

Sections A and B of C709 are transposed to place the +225V and +350V supplies to the correct voltage rated sections.

INSTALLATION

Transpose the two white-orange-green-brown wires and the two white-red-red-brown wires on C709, located on the Sweep chassis.



AFTER

+225V POWER SUPPLY REGULATION IMPROVED

Effective Prod SN 2887 modified out of sequence:				Usable in SN 100-2886		
547/RM	2724	2744	2784	2813	2841	2858-9
	2726-7	2749	2789	2822	2843	2861
	2731	2750-2	2792	2830	2846	2863-70
	2733	2759-60	2796	2832	2848	2872-4
	2737	2766-7	2798	2835	2854	2880
	2739	2769-70	2801	2838	2856	2882-5
	2741	2776-7	2810			
547	2142	2358	2541-2	2580	2651	2692
	2262	2468	2546-8	2584-5	2660	2697-8
	2881	2474	2560	2592	2662	2703
	2303	2505	2562-3	2595-6	2664-5	2705-6
	2318	2517	2570	2611	2667-9	2708-9
	2334	2519	2574	2618	2677	2713
	2349	2525-6	2577-8	2634	2683	2722
	2355					

RM547 310 327-9

Excessive selection of 6080 for V707 was necessary to get +225V supply to regulate over line volts range of 102.5V to 127.5V.

R706 was changed from 1.25k to 1.35k to reduce tube selection for V707.

Parts Removed:

R706 308-0102-00 Resistor, WW, 1.25k 25W

Parts Added:

R706 308-0282-00 Resistor, WW, 1.35k 25W

INSTALLATION

Parts Required: See 'Parts Added.'

Replace R706 (1.25k 25W resistor) with a 1.35k 25W WW resistor. R706 is mounted on the power supply shunt resistor bracket at the rear of the instrument.



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.

PARTS INCLUDED IN MODIFICATION KIT:

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

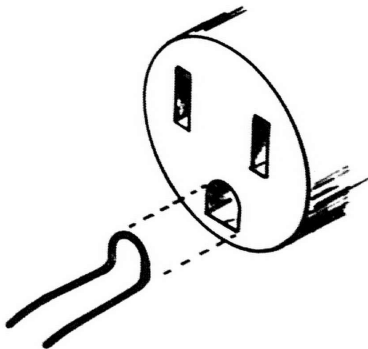
INSTRUCTIONS

- () 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 CONNECTOR CHANGED TO FACILITATE ASSEMBLY AND REDUCE COST

Effective Prod SN 6340

TEKTRONIX®-made motor bases were adapted for automated machinery to reduce cost and facilitate fabrication.

TEKTRONIX-made motor bases 131-0102-00 and 131-0150-00 were replaced with new motor bases 131-0102-01 and 131-0150-01. New and old differ in method used for their assembly and their subparts. Old motor bases use a #4 nut, lockwasher, and screw on one side and a #4 nut, lockwasher, and externally threaded ground post on other side. New motor bases use a #4 self-tapping screw into new internally threaded ground post 129-0041-01 on other side.

This mod is superseded by M12876. The ground connection for the 3-wire motor base installed by this mod proved to be inadequate.

Parts Removed:

131-0102-00	Motor base (Type RM547)
131-0150-00	Motor base (Type 547)

Parts Added:

131-0102-01	Motor base (Type RM547)
131-0150-01	Motor base (Type 547)

POWER SUPPLY V707 PROTECTION CIRCUITRY CHANGED TO
IMPROVE HIGH LINE, LOW LOAD REGULATION

Effective Prod SN 6380

Unstable CRT display occurred. At high line, the plate of V694 tried to go below +100V but D693 became forward biased and functioned as a normal diode clamping the plate to +100V. Also, the μ of 6080's used at V707 was too low (≤ 1).

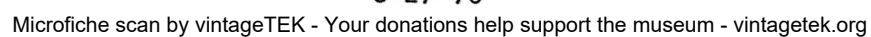
The 6080 manufacturer agreed to build higher μ tubes (≥ 1.8). D693 was removed and new protection circuitry was installed as shown.

Parts Removed:

	179-0764-00	Cable, 150V adjust
D693	152-0288-00	Diode, zener 140V
R729	302-0224-00	Resistor, comp, 220k 1/2W 10%
R728	302-0684-00	Resistor, comp, 680k 1/2W 10%

Parts Added:

	179-0764-01	Cable, 150V adjust
D694	152-0107-00	Diode, silicon, 1N647
R726	301-0204-00	Resistor, comp, 200k 1/2W 5%
R729	301-0224-00	Resistor, comp, 220k 1/2W 5%
R728	301-0474-00	Resistor, comp, 470k 1/2W 5%



POWER SUPPLY LINE VOLTAGE SELECTOR SWITCH ADDED TO
FACILITATE CHANGE OF LINE VOLTAGE REQUIREMENTS

Effective Prod SN 7980

A Line Voltage Selector switch (SW602) was added to the rear panel. The new switch assembly includes a 115V fuse, and a 230V fuse to eliminate the need for a fuse holder. The primaries of the power transformer (T601) were changed to accommodate the Line Voltage Selector switch, and the rear panel power requirement markings were changed.

Parts Removed:

Type 547 only

387-0758-00	Rear subpanel
387-0766-00	Rear overlay

Type RM547 only

437-0073-00	Cabinet, RM
380-0018-00	Filter housing

Type 547/RM only

	200-0582-00	Cap, fuse, 3AG
F601	159-0011-00	Fuse, 6.25A slo, 3AG
	334-0904-00	Tag, voltage, 115V
2 ea	213-0088-00	Screw, Thrd Frm, #4 x 1/4
T601	120-0307-00	Power transformer
	175-0503-00	Wire, #18 solid, 4-N (4-121) 0.167 ft. (2" pc)
SW601	260-0199-00	Switch, toggle, SPST
	352-0010-00	Holder, fuse, 3AG
	210-0873-00	Washer, rubber, fuse holder
	179-0765-00	Cable, 110V
	441-0478-00	Power chassis
	179-0771-00	Cable, Power

Parts Added:

Type 547 only

387-0758-02	Rear subpanel
387-0766-01	Rear overlay

Type RM547 only

387-0859-01	Rear subpanel
380-0018-03	Filter housing
4 ea. 214-1000-00	Corner, filter housing inserts
212-0039-00	Screw, 8-32 x 3/8 THS
437-0073-01	Cabinet, RM

Type 547/RM only

F601	159-0011-00	Fuse, 6.25A slo, 3AG
F602	159-0005-00	Fuse, 3A slo, 3AG
	200-0704-00	Cover, Line Voltage Selector
	179-1214-00	Cable, Line Voltage Selector
2 ea.	210-0407-00	Nut, 6-32 x 1/4
SW602	204-0279-00	Body, Line Voltage Selector
	175-0675-00	Wire, #18 str., black (6" pc)
	175-0567-00	Wire, #18 str., white (4" pc)
	210-0458-00	Nut, Keps, 8-32
T601	120-0521-00	Power transformer
SW601	260-0785-00	Switch, toggle, DPST
	212-0070-00	Screw, 8-32 x 5/16, FHS
	441-0478-01	Power Chassis
	179-0765-01	Cable, 110V
	179-0771-01	Cable, power

REAR PANEL POWER REQUIREMENTS MARKING

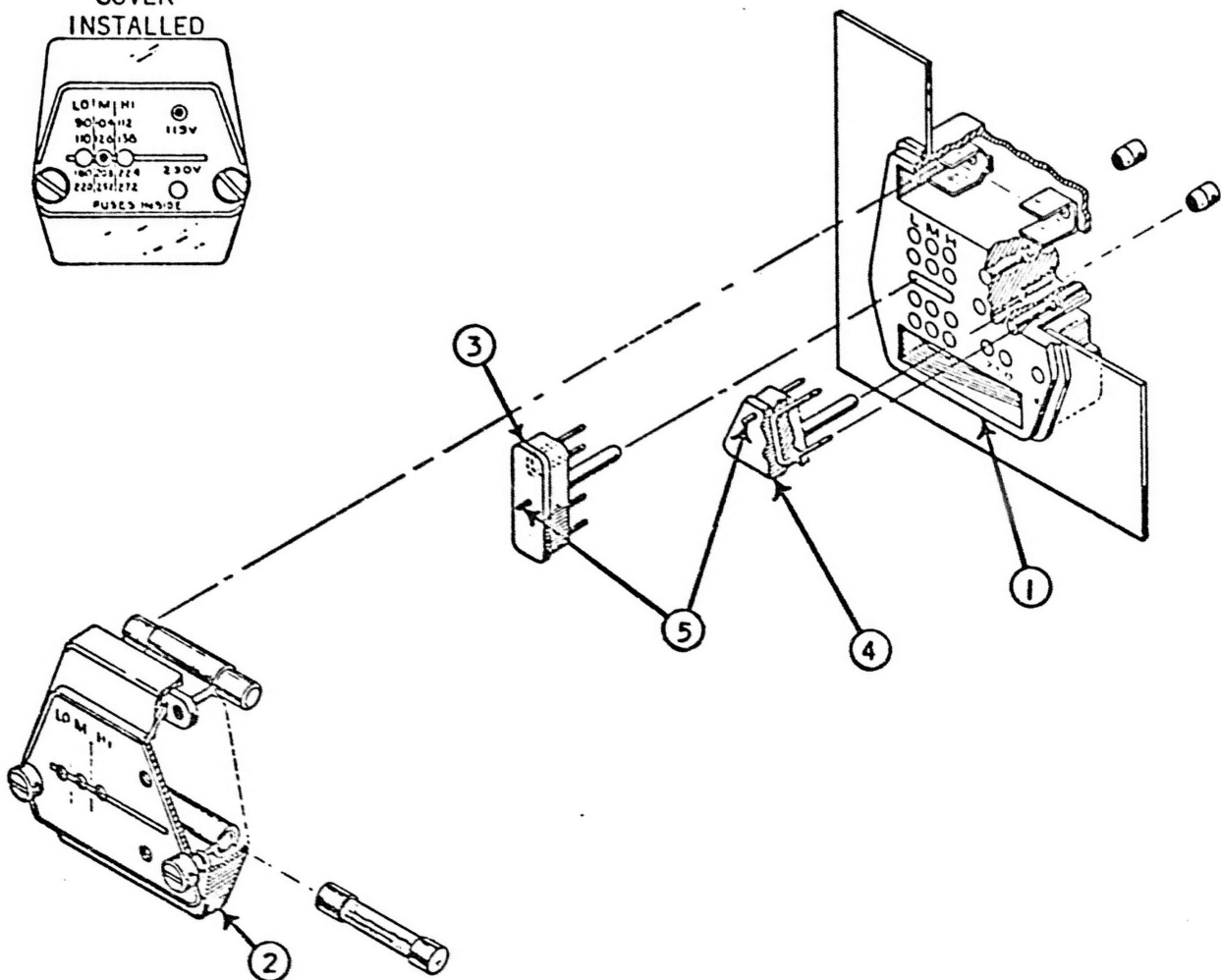
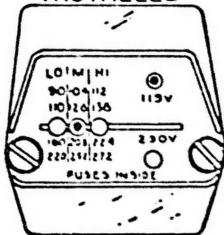
Before

108-122V 6.25A SLOW
216-244V 3A SLOW

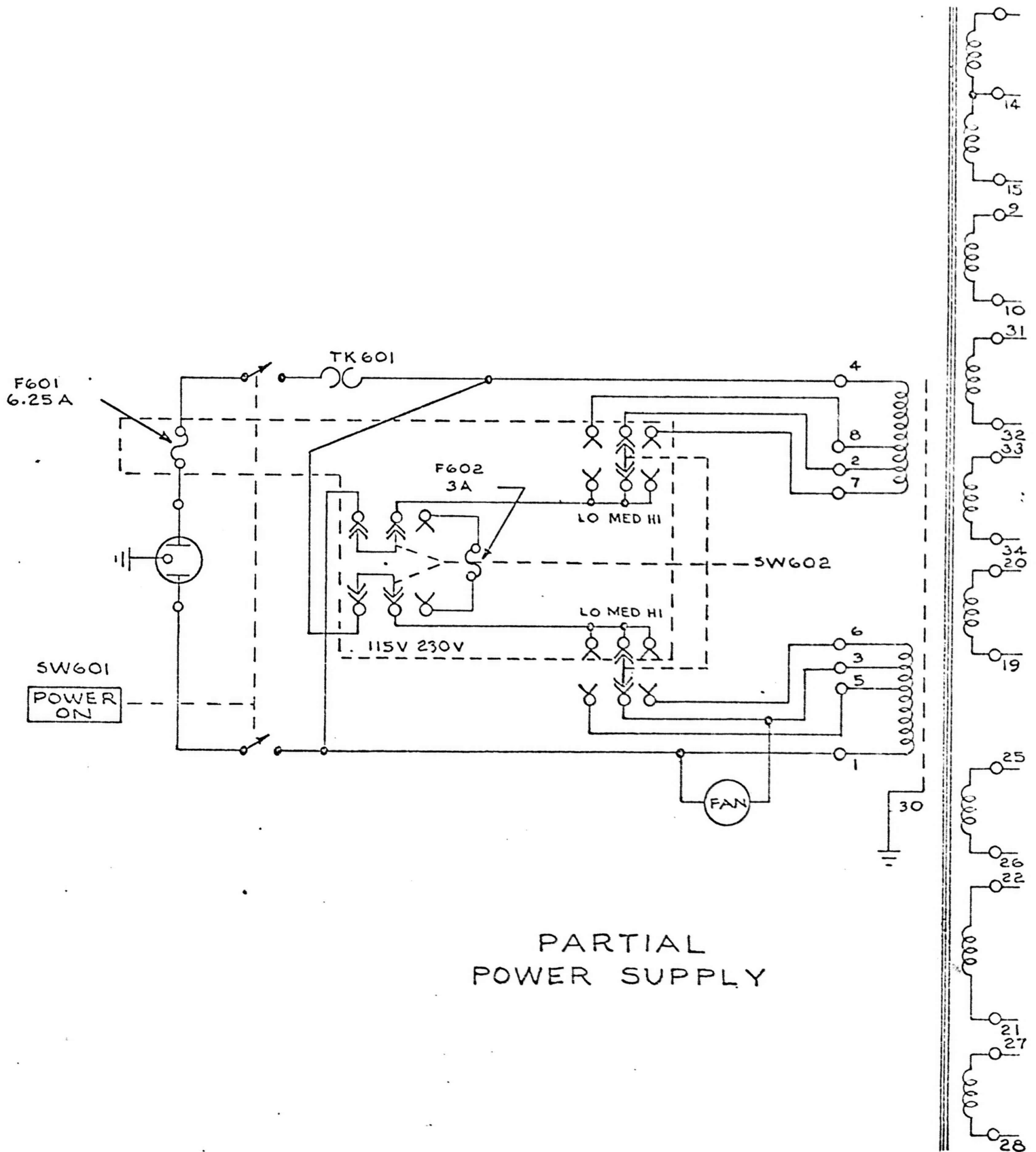
After

WATTS (MAX) 550
AMPS (MAX) 5.5A
AT 115V, 60Hz

115V FUSE 6.25A SLOW
230V FUSE 3A SLOW
FREQ RANGE 50-60Hz

COVER
INSTALLED

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PARTIAL
POWER SUPPLY

POOR COPY

POWER SUPPLY CORD ASSEMBLY ATTACHED PERMANENTLY TO INSTRUMENT

Effective Prod SN 7980 (Type 547 only) Usable in SN 100-7979

The detachable power cord assembly was replaced with a cord assembly which is attached permanently to the instrument.

Parts Removed:

131-0572-00	Connector, power receptacle
161-0010-00	Cord, power
213-0104-00	Screw, 6-32 x 3/8 Thrd. Form.
214-0698-00	Spring, power cord ground
380-0018-00	Housing, filter

Parts Added:

	103-0071-01	Adapter, power cord
	161-0033-00	Cord, power
	124-0207-00	Strip, ceramic
	210-0202-00	Lug, solder DE6
	210-0457-00	Nut, Keps 6-32
	211-0537-00	Screw, 6-32 x 5/8 Truss head
	213-0146-00	Screw, #6 x 0.313 Thrd. Form.
2 ea.	213-0166-00	Screw, #6 x 0.75 Thrd. Form.
	214-1000-00	Corner, filter housing
	358-0161-00	Bushing, strain relief
2 ea.	358-0324-00	Bushing, ceramic strip
	380-0018-03	Housing, filter

INSTALLATION

These instructions describe:

- A. How to permanently attach the power cord to an instrument equipped with a power receptacle by replacing the receptacle with a special new power cord assembly, and,
- B. How to install a detachable power cord in an instrument equipped with a permanently attached power cord by replacing the cord assembly with a power receptacle and a new cord.

A. PARTS REQUIRED TO INSTALL ATTACHED POWER CORD:

	161-0033-01	Assembly, power cord
4 ea.	214-1000-00	Corner, filter housing insert
	380-0018-03	Housing, filter (optional)

B. PARTS REQUIRED TO INSTALL DETACHABLE CORD:

	131-0572-00	Connector, receptacle, 3-wire
	161-0010-03	Cord, power, 3-wire, 8 ft.

Type 547/RM547

INSTALLATION (Continued)

A. TO INSTALL ATTACHED POWER CORD: Refer to Fig. 1

Replace the receptacle connector on the rear of the instrument with a new power cord assembly, using the receptacle connector mounting hardware Wire as shown in the drawing.

Optional: A filter housing with notched corners for wrapping the power cord when not in use is available if desired. The new housing with plastic corner inserts is a direct replacement for the old housing.

BOTTOM

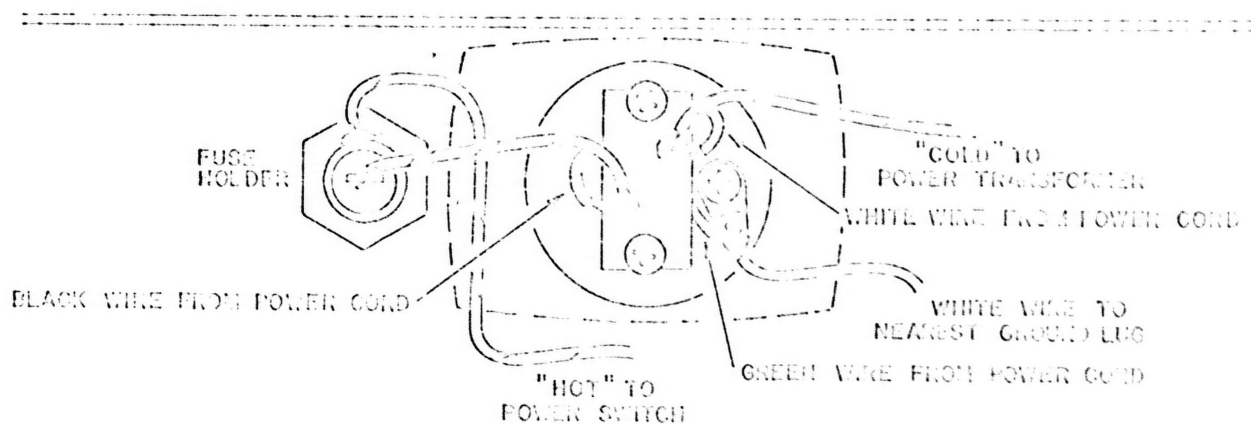


FIG. 1

B. TO INSTALL DETACHABLE CORD: Refer to Fig. 2.

Replace the attached power cord assembly on the rear of the instrument with the 3-wire receptacle connector.

Remove the white wire used for grounding the attached power cord assembly.

Wire the receptacle as shown in the drawing.

BOTTOM

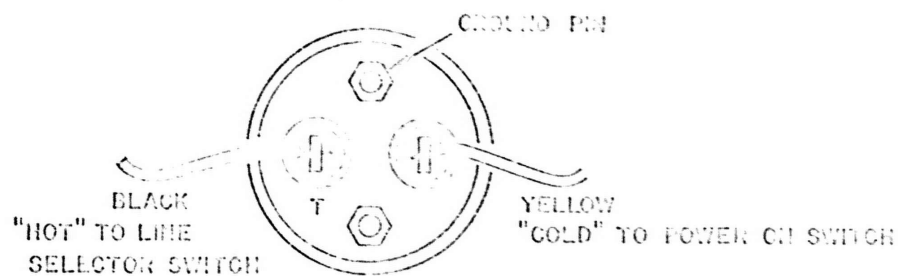


FIG. 2

POOR COPY

POWER SUPPLY RECTIFIER DIODES CHANGED

Effective Prod SN 12110

Power supply rectifier diodes changed to increase current rating.

Surge current was causing the rectifier diodes in the 100V supply to short. Rectifier diodes D672 A, B, C, and D were changed from a 500-750mA diode to a 3A diode. The new diodes have a "top hat" type case requiring that the leads be bent 90° and the diodes dressed differently.

Parts Removed:

D672A, B, C, D	152-0066-00	Diode, 400PIV 500-750mA
----------------	-------------	-------------------------

Parts Added:

D672A, B, C, D	152-0423-00	Diode, 300PIV, 3A
----------------	-------------	-------------------



product modification

050-1486-00

S42203

FAN MOTOR REPLACEMENT

For the following TEKTRONIX® instruments:

Type 127	All Serial Numbers
Type 507	All Serial Numbers
Type 545B	All Serial Numbers
Type 547	All Serial Numbers
Type RM547	All Serial Numbers
Type 549	All Serial Numbers
Type 565	All Serial Numbers
Type RM565	All Serial Numbers

A new fan motor, pn 147-0001-01, replaces previously used fan motors, pn 147-0001-00 and pn 147-0026-00, which are no longer available. Four new mounting screws are required when replacing a pn 147-0026-00 fan motor. If replacing a pn 147-0001-00 fan motor, disregard the instructions and use the new fan motor as a direct replacement.

NOTE

Once this kit has been installed, pn 147-0001-01 may be used as a direct replacement for the fan motor.

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	147-0001-01	MOTOR, FAN:AC, SHADED P, 1350 RPM, 115V, 60HZ
4 ea	211-0552-00	SCREW, MACHINE:6-32 X 2 INCH, PNH STL
1 ea	-----	LABEL:050-KIT

INSTALLATION INSTRUCTIONS:

WARNING

Before proceeding, ensure the POWER switch is in the OFF position, then disconnect the instrument from the power source.

NOTE

If replacing a pn 147-0001-00 fan motor, disregard the following instructions and use the fan motor, included in this kit, as a direct replacement.

- () 1. Replace the four screws holding the front and rear bearing retainers on the new fan motor with the four 6-32 x 2 inch screws included in this kit.

NOTE

The longer screws provided in this kit must be installed in the reverse direction of the screws being removed to allow mounting the fan motor to the fan motor mount.

- () 2. Replace the old fan motor, pn 147-0026-00, with the new fan motor.
- () 3. Remove the protective backing from the 050-kit label, included in this kit, and place the label on a clean flat surface of the instrument near the serial number tag. The label indicates this kit has been installed.
- () 4. For future reference, correct the Replaceable Mechanical Parts List in the Instruction Manual with the information in the parts list of this kit.

JG:ct

050-1486-00

Page 2 of 2
101.13

GRATICULE LIGHT FILTER REPLACED WITH SMOKE GRAY FILTER

Effective Prod SN not given
(also RM)

The polarized light filter is replaced with a smoke gray light filter. The gray filter material seems to be just as effective as the polarized material for most applications, but is considerably less expensive and less susceptible to deterioration from moisture.

Because of excessive stock of the polarized filter, 378-0545-00, the trigger date for M8194 was extended past that of M9022 making this change unnecessary.

Refer to M9022.

Parts Removed:

378-0545-00 Light filter, polarized

Parts Added:

378-0546-00 Light filter, smoke gray

CRT VERTICAL SENSITIVITY IMPROVED

Effective Prod SN 1010
180-RM

The rejection of some T5470 CRT's, caused by Vertical Sensitivity running slightly high (0.2V), was reduced by lowering the shield voltage by 10V. This permitted the return to original upper limit spec of 6.8V/cm. Precision resistors are used and VERT GAIN control is recentered.

Parts Removed:

R863	301-0473-00	Resistor, 47k 1/2W 5%
R862	301-0823-00	Resistor, 82k 1/2W 5%
R1027	315-0121-00	Resistor, 120k 1/4W 5%

Parts Added:

R863	323-0356-00	Resistor, 49.9k 1/2W 1%
R862	323-0395-00	Resistor, 127k 1/2W 1%
R1027	315-0471-00	Resistor, 470 Ω 1/4W 5%

TRACE ROTATOR COIL IMPROVED

Effective Prod SN 1510
210-RM

The trace rotator coil was replaced with a coil causing less distortion at full trace rotation, thereby increasing the yield of T5470 CRT's. The new coil is the same electrically except the winding form is wider, and the connection terminals are reversed, i.e., the white-green and white-violet leads are transposed.

Parts Removed:

L778	108-0265-00	Coil, fixed
------	-------------	-------------

Parts Added:

L778	108-0323-00	Coil, fixed
------	-------------	-------------

UNBLANKING AMPLIFIER CIRCUIT PROTECTION ADDED

Effective Prod SN 1880
240-RM

Usable in SN 100-1879
100- 239

Field failure of Q373 and V393B is possible by arcing in the CRT or CRT circuitry coupling a transient backwards through unblanking CF, V393B, into collector of Q373. A protective network is added to collector of Q373 and a clamping diode is added to the CRT circuitry.

Also see M11722.

Parts Added:

C380	281-0536-00	Capacitor, 1000pF \pm 100pF
D831	152-0208-00	Diode, 1N3195
R380	302-0473-00	Resistor, 47k 1/2W 10%

INSTALLATION

Parts Required: See 'Parts Added' and parts listed below:

R381	316-0470-00	Resistor, 47 Ω 1/4W
	176-0522-00	Wire, #22 solid, white 2-1/2"

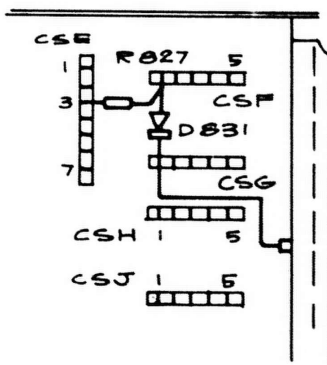
Sweep Chassis:

- a) Lift end of D372 at CSD-43.
- b) Remove #22 bare wire strap between CSD-42 and CSD-43.
- c) Install R380, 47k 1/2W resistor, between CSD-43 and collector of Q373 directly below.
- d) Solder loose end of D372 to CSD-42.
- e) Lift components from CSD-44 thru -47 to gain access to R381, 47 Ω 1/4W resistor between CSD-45 and pin 7 of V393B.
- f) Relocate R381 between pin 7 of V393B and CSD-43 using a new 47 Ω 1/4W resistor.
- g) Reconnect components lifted in step e.
- h) Install C380, a 1000pF capacitor, between CSD-43 and CSE-43.

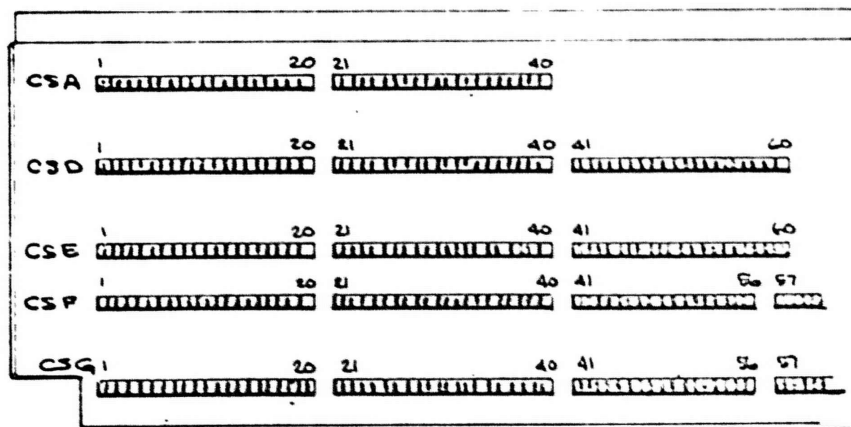
INSTALLATION (continued)

F & I Chassis:

- i) Remove #22 bare wire strap between CSE-6 and CSG-1.
- k) Relocate lead of R827, 33k 1/2W resistor, to CSE-3 from CSG-1.
- m) Install D831, 1N3195 diode, between CSF-1 and CSG-1 (cathode to CSG-1).
- n) Install a #22 white wire between CSG-1 and C802 center terminal. C802 is located on the vertical portion of the F & I chassis.

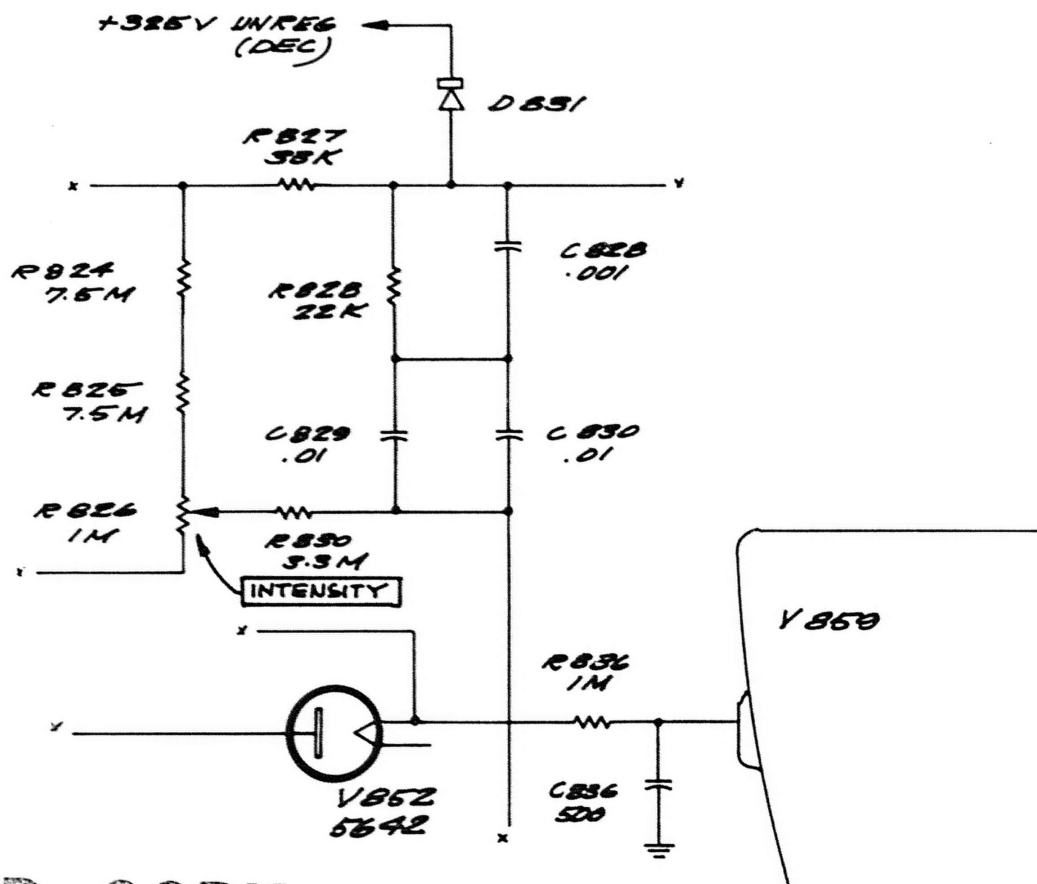
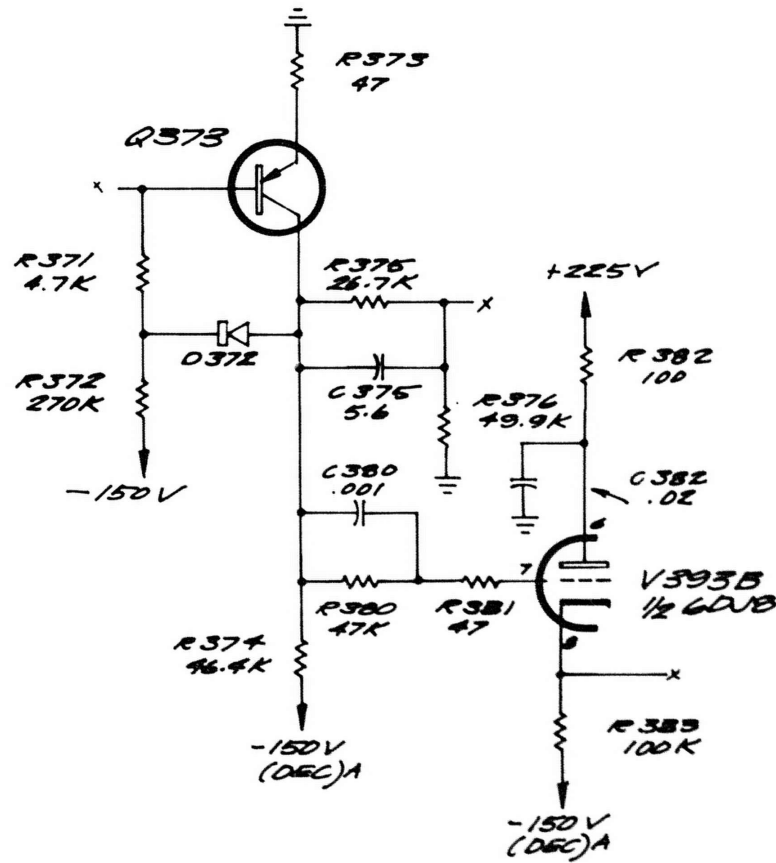


F & I CHASSIS



SWEEP CHASSIS

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3-27-70

3 of 3

102.04

CRT AND LIGHT PIPING CHANGED TO PROVIDE A
RISETIME GRATICULE AND FACILITATE ASSEMBLY

Effective Prod SN 2070
250-RM

The present internal graticule does not provide for risetime measurements and the present graticule illumination method is excessively complex.

The CRT was replaced with a CRT having an internal risetime graticule and the graticule illumination hardware (a light reflector spring, light piping tape, and the light reflector plate) was replaced with an improved light reflector ring.

A Parts Replacement Kit 050-0246-01 consisting of the new graticule illumination hardware is available to facilitate the replacement of the CRT and the reflector ring in pre-mod M8744 instruments.

THIS KIT DOES NOT INCLUDE A CRT.

Parts Removed:

V859	154-0429-00	Tube, T5470-31-2
	214-0433-00	Spring, light reflector
	387-0917-00	Plate, light reflector

Parts Added:

V859	154-0478-00	Tube, T5470-31-2
	354-0262-00	Ring, light reflector
	386-0212-00	Plate, light reflector



product modification

050-0246-01

Types 543B/RM, 544/RM,
545B/RM, 546/RM,
547/RM, 555, 565/RM,
581A, 585A/RM

CRT LIGHT REFLECTOR RING REPLACEMENT

For the following TEKTRONIX® Type Oscilloscopes:

Type 543B	SN 100- 546	Type 547	SN 100- 2069
Type RM543B	SN 100- 139	Type RM547	SN 100- 249
Type 544	SN 100- 319	Type 555	SN 9000-10409
Type RM544	SN 100- 119	Type 565	SN 1000- 1369
Type 545B	SN 100-2187	Type RM565	SN 1000- 1278
Type RM545B	SN 100- 409	Type 581A	SN 5000- 5389
Type 546	SN 100- 449	Type 585A	SN 9000-10204
Type RM546	SN 100- 169	Type RM585A	SN 1000- 1170

Plastic light reflector ring, PN 354-0262-00, replaces light reflector retaining spring, PN 214-0433-00. This eliminates the need for taping the edges of the light pipe plate (fastened to the front of the CRT) and the light reflector plate with white tape.

##This kit plus the light reflector plate, PN 386-0212-00, replaces light reflector plate, PN 386-0917-00. Also this kit will be needed when replacing internal graticule CRT's (shown below) in the Types 555, 565, RM565, 581A, 585A and RM585A oscilloscopes.

##For replacement of CRT's in the Type 540 Series Oscilloscopes listed above, see Parts Replacement Kit, PN 050-0420-00.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions and order PN 354-0262-00, or PN 286-0212-00, or the new CRT as a direct replacement.

<u>CRT Type</u>	<u>Part Number</u>	<u>CRT Type</u>	<u>Part Number</u>
T5550- 2-1	154-0476-00	T5650-11-1	154-0477-02
T5550- 7-1	154-0476-01	T5650-31-1	154-0477-03
T5550-11-1	154-0476-02	T5810- 2-1	154-0479-01
T5550-31-1	154-0476-03	T5810-11-1	154-0479-02
T5650- 2-1	154-0477-00	T5810-31-1	154-0479-00
T5650- 7-1	154-0477-01		

##Indicates change since last publication.

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1-17-72

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Supersedes: 4-9-70

102.06

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

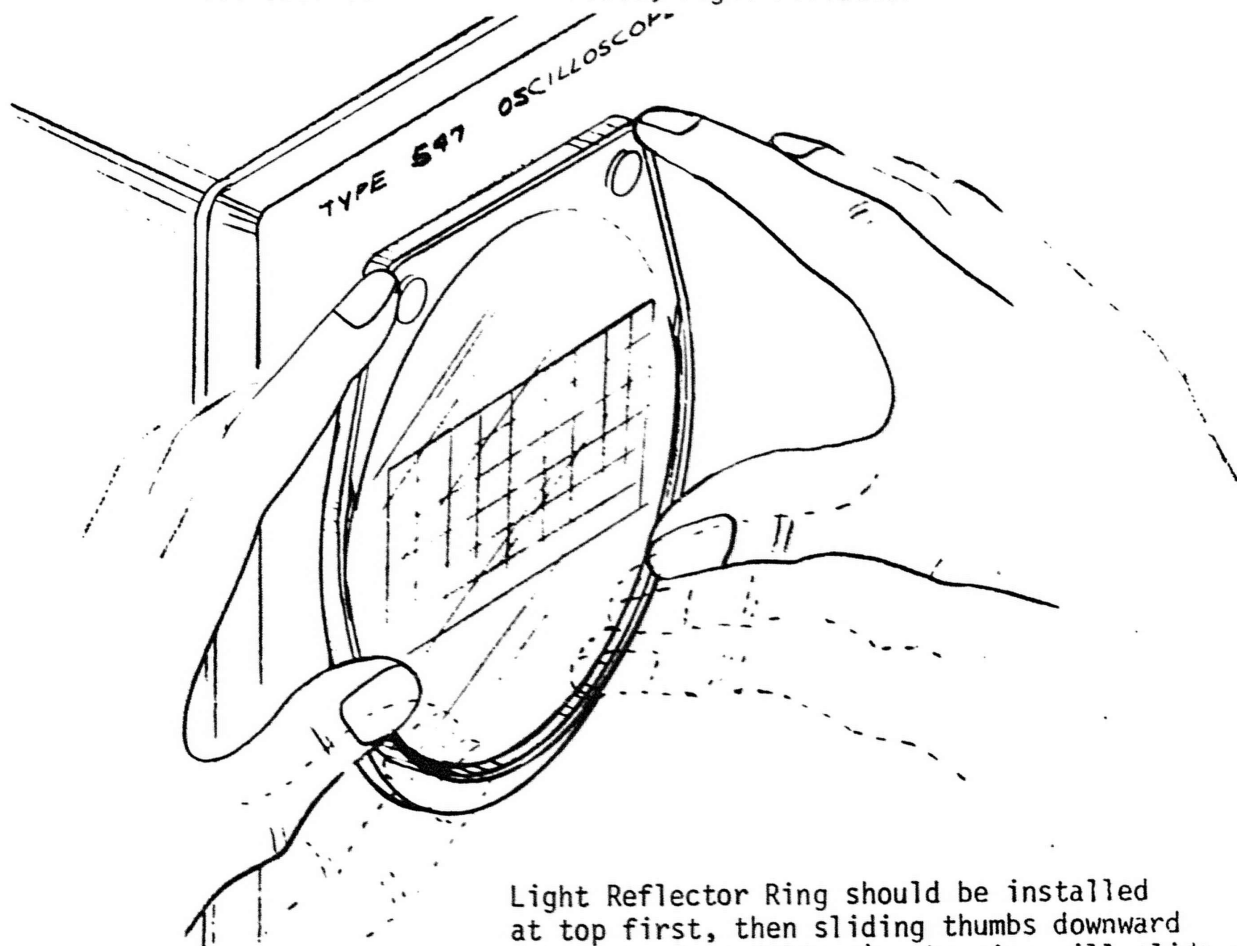
Quantity	Part Number	Description
1 ea	354-0262-00	Ring, light reflector, plastic

INSTRUCTIONS

- () Replace the light reflector retaining spring with the plastic light reflector ring (from kit), installing it as shown in the drawing. (A little "pre-stretching" may help.) Remove any white tape on the edges of the light reflector plate or light pipe plate.
- () Enter the new CRT Part Number (from Table on page 1) in your Instruction Manual Electrical Parts List. Also enter the following new part in the Mechanical Parts List:

354-0262-00
386-0212-00

Ring, light reflector
Plate, light reflector



Light Reflector Ring should be installed at top first, then sliding thumbs downward (shown by dotted lines), the ring will slide on.

CRT FILTER SHAPE AND COLOR STANDARDIZED TO REDUCE COST

Effective Prod SN 2440
270-RM

A cost savings was provided by standardizing the shape and color of CRT light filters. This was accomplished by replacing 0.060" thick green, blue, and amber filters for 5" rectangular and round external graticule instruments and 0.030" thick smoke gray filter for 5" rectangular internal graticule instruments with new 0.030" thick green, blue, amber, and smoke gray filters with configuration acceptable for both internal and external graticule use.

This mod also replaced 0.060" thick green, blue, and amber filters for 3" CRT instruments with new 0.030" thick green, blue, amber, and smoke gray filters with same configurations. Changed the configuration of internal graticule clear scratch plates (5" round and 5" rectangular) to conform to new filter configurations, thereby allowing use of common tooling.

Smoke gray will replace green as standard filter shipped with external graticule instruments. Amber, green, and blue filters in all configurations will be set up as optional filters supplied on customer demand and with special phosphors.

The recommended optional filters for various phosphors is as follows:

Smoke gray filter	P1	P2	P20	P28	P31	P7	
Blue filter	P5	P11	P14	P17	P32		
Amber filter	P12	P13	P19	P25	P26	P27	P7
No filter necessary	P15	P16	P24				

P7 phosphor requires both a smoke gray and an amber filter.

Parts Removed:

378-0545-00 Filter, smoke gray

Parts Added:

378-0567-00 Filter, smoke gray
378-0568-00 Filter, green
378-0569-00 Filter, blue
378-0570-00 Filter, amber

HV OSCILLATOR ERROR AMPLIFIER REWIRED TO ELIMINATE TENDENCY TO OVERCOMPENSATE AND CAUSE TRACE DIMMING

Effective Prod SN 4080

Usable in SN 100-4079

When using 10V CALIBRATOR signal to check CRT cathode intensity modulation the trace would dim and there was no intensity modulation.

The error signal feedback loop in the high voltage oscillator circuit was too sensitive, with the result that high amplitude (10V) intensity modulation signals fed to the CRT cathode entered the feedback loop resulting in cancellation of the modulation signal. Test was selecting V800, R806 in order to obtain acceptable intensity modulation with 10V CALIBRATOR signal.

The HV oscillator error amplifier was rewired as follows: C842, which was wired to pin 2 of V814 and the junctions of C841, R841, and R842 on one end and to the junction of C854, R853, and R857 on the other, was rewired to the junction of R853, C852, and R847.

Parts Removed:

R806	302-0104-00	Resistor, 100k 1/2W 10%
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Parts Added:

R806	302-0823-00	Resistor, 82k 1/2W 10%
------	-------------	------------------------

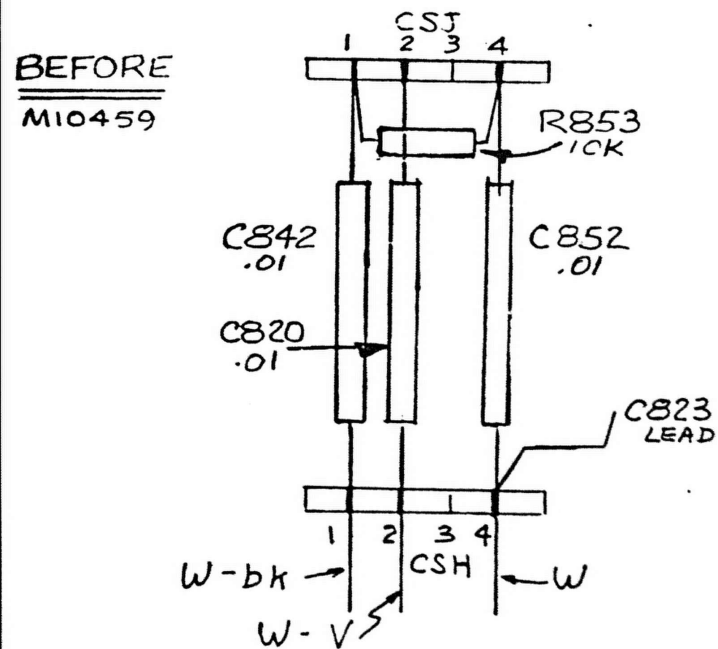
INSTALLATION

Parts Required: See 'Parts Added.'

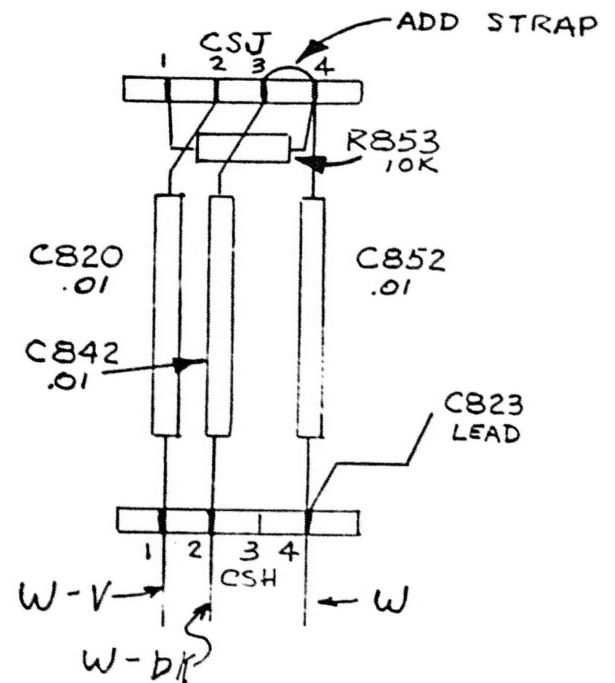
- a) Replace R806, a 100k 1/2W 10% resistor, located between CSJ-4 and CSK-4, with an 82k 1/2W 10% resistor. See Fig. 1.
- b) Rewire the connections of C842 as shown in attached schematic and procedure. See Fig. 2.

To gain access to the bottom of the HV board, proceed as follows:

1. Remove the metal HV shield.
2. Remove two screws from HV assembly cover.
3. Remove three screws that hold HV board in place and unsolder R836, a 1M 1/4W resistor from C836, a 500pF capacitor mounted in the rear outside corner of the HV assembly.
4. Carefully lift out the HV board, rewire as shown in drawing, and reassemble.



AFTER
M10459



H.V. POWER PARTIAL
BOARD (Bottom)

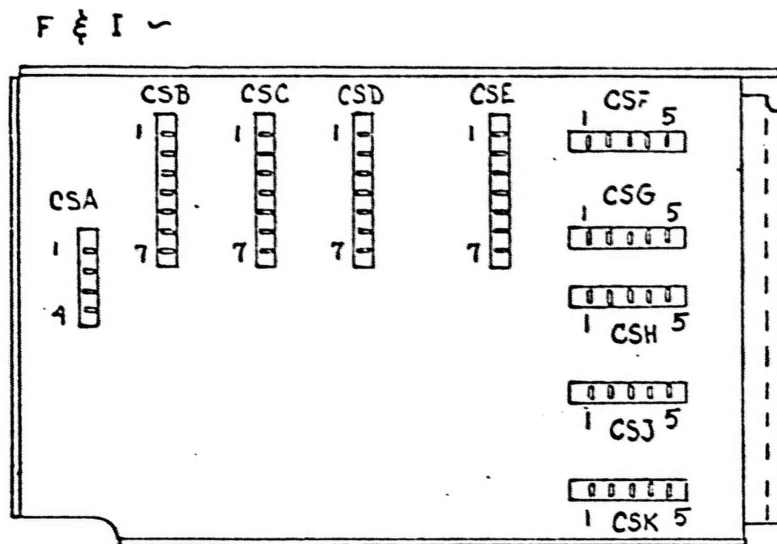


FIG. 1.

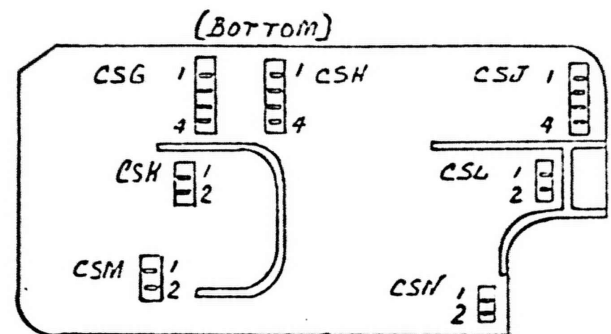
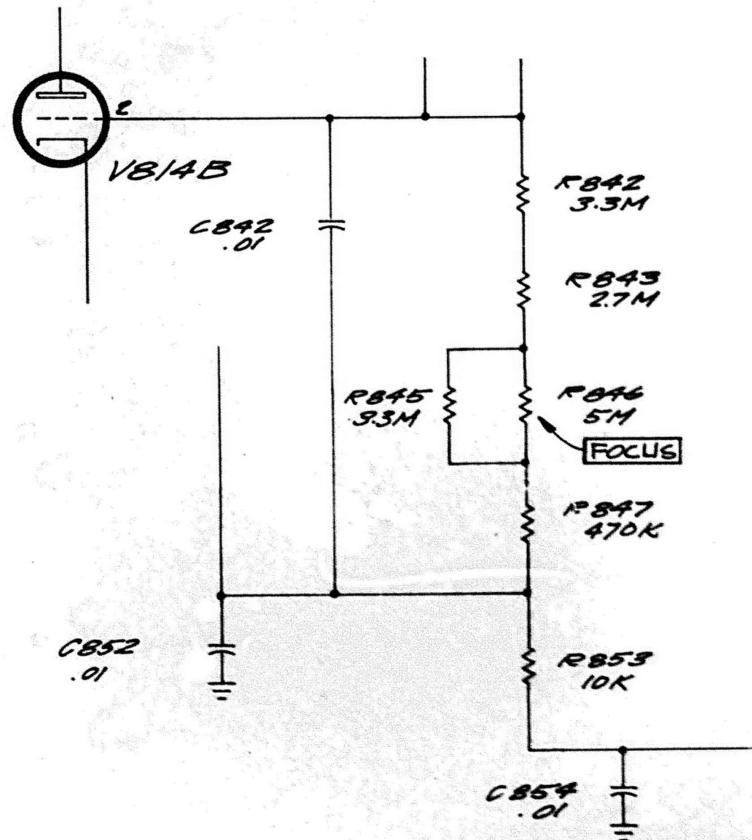


FIG. 2.

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HV DIODE HEATER LEADS REPLACED TO PREVENT MELTING OF INSULATION

Effective Prod SN 4080

Overheating of the HV transformer core melts the insulation on the HV diode heater leads, causing arcing between the leads and core. This overheating results when the HV regulator (V814) fails, causing the oscillator to run at maximum output.

The HV diode heater leads were changed from polyethylene insulated wire to 15kV irradiated polyethylene insulated wire with a temperature rating of 125°C.

Refer to Mod 11809, page 102.10.

Parts Removed:

175-0012-00	Wire, polyethylene, insulated #22 stranded (1.583 ft.)
175-0549-00	Wire, polyethylene, insulated #22 solid (1.250 ft.)

Parts Added:

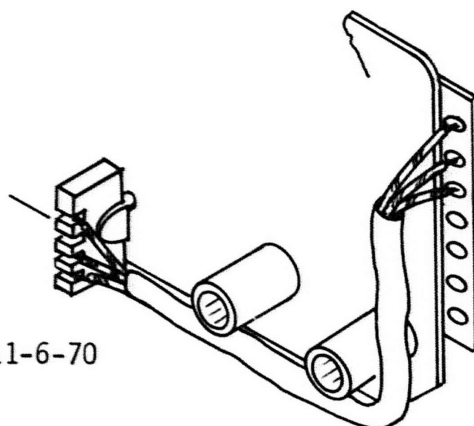
175-0676-00	Wire, irradiated polyethylene insulated #22 stranded, temp. rating 125°C (2.875 ft.)
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INSTALLATION:

Parts Required:

162-0019-00	Tubing, vinyl #2 clear 4-1/2"
-------------	-------------------------------

Add a 4-1/2" length of #2 clear tubing over the three wires (white, white-black and white-violet) which run from the HV transformer terminals to the ceramic strip on the bottom of the HV power supply as shown in the drawing.



HIGH VOLTAGE OSCILLATOR CLAMPING CIRCUIT ADDED TO SCREEN GRID CIRCUIT TO PREVENT DAMAGE TO THE HIGH VOLTAGE TRANSFORMER

Effective Prod SN 5830

Usable in SN 100-5829

When V814 fails, the screen of V800 rises toward +350V. This increases the amplitude of oscillations which increases the voltage across the primary winding of the high voltage transformer. This increase in voltage could result in arcing between windings and transformer damage.

A clamping network was added to the screen circuit of V800. This network prevents the screen from going more positive than approximately +125V thereby limiting the oscillator output amplitude.

Parts Added:

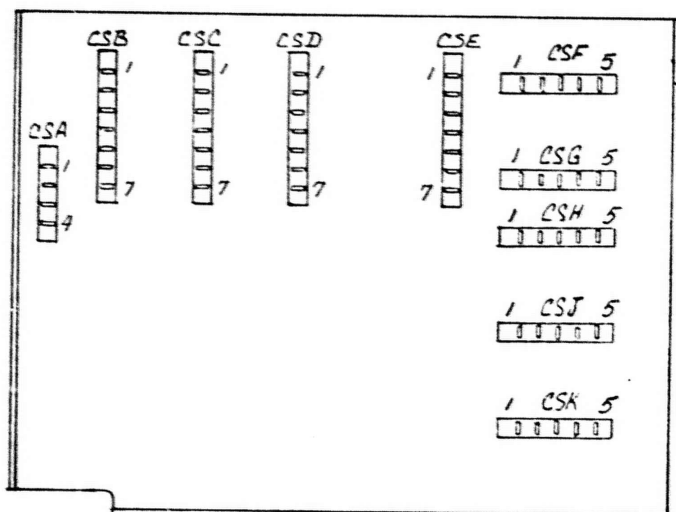
D803	152-0107-00	Diode, silicon 6107
D804	152-0265-00	Diode, zener 1N970B
R804	316-0104-00	Resistor, comp, 100k 1/4W 10%

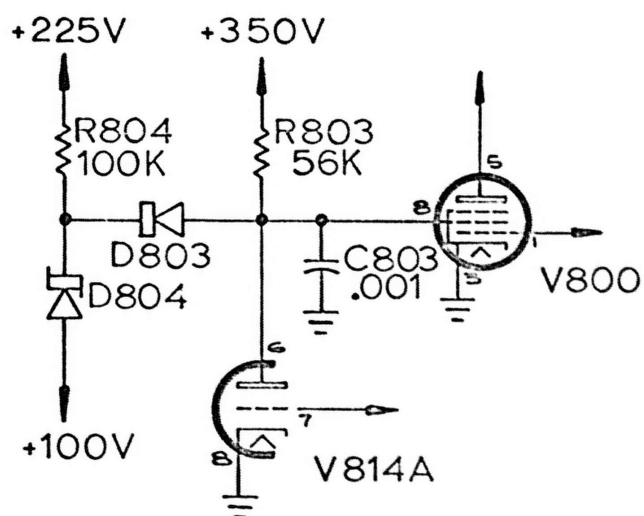
INSTALLATION

Parts Required: See 'Parts Added' and part listed below.

Wire, #22 solid, white-red-red-brown (5 in.)

- Remove the two #22 bare wires from CSK-2 and CSK-4 to the ground solder lug between CSJ and CSK.
- Relocate one lead of C803 from CSK-2 to the ground solder lug.
- Relocate one lead of R806 from CSK-4 to the ground solder lug.
- Install D802 (152-0107-00) between CSJ-2 and CSK-2 with the cathode (banded) lead in CSK-2.
- Install D804 (152-0265-00 zener) between CSK-1 and CSK-2 with the cathode (banded) lead in CSK-2.
- Install R804 (100k 1/4W resistor) between CSK-2 and CSK-4.
- Install a 5 in. piece of #22 solid wire (w-r-r-br) between CSK-4 and CSH-1.





EXTERNAL GRATICULE MOD 172Z CHANGED FROM
CUSTOM INSTRUMENTS TO PRODUCTION SPECIAL

Effective Prod SN 5920

Increased demand for Type 547 Mod 172Z (External Graticule) resulted in its being changed from a Custom Instrument mod to a Production Special.

Parts Added:

Special Mod 172Z final kit, consisting of:

154-0419-00	CRT, T5470-31
331-0037-00	Graticule 6cm Vert. x 10cm Horiz. ruling
401-0004-00	Cam nylon, 3/8 OD, 0.150 High
337-0187-00	Shield, 5" graticule light (acrylic)
386-0451-00	Plate, plexi 1/8 x 5-1/2 x 5-11/16
210-0816-00	Washer, rubber WAN 13-20

FOCUS AND INTENSITY POTENTIOMETERS CHANGED TO REDUCE COST,
IMPROVE QUALITY, AND PROVIDE BETTER SUPPLY

Effective Prod SN 8140

FOCUS and INTENSITY potentiometers were changed as indicated in the remove-add lists. The new potentiometers are smaller, and require smaller potentiometer covers.

Parts Removed:

R846	311-0313-00	Potentiometers, comp, 5M
R826	311-0450-00	Potentiometers, comp, 1M
	200-0269-00	Cover, potentiometer, polypropylene

Parts Added:

R846	311-0313-01	Potentiometers, comp, 5M
R826	311-0450-01	Potentiometers, comp, 1M
	200-0745-00	Cover, potentiometers, polypropylene

CRT CHANGED FROM GLASS TO CERAMIC

Effective Prod SN 10000

Usable in SN 100-9999

The tolerance and availability of the purchased glass CRT funnels are not so easy to control as the TEKTRONIX®-made ceramic funnels, and the graticule illumination is not so good as it could be.

The purchased glass CRT funnels were replaced with TEKTRONIX-made ceramic funnels, the ceramic CRT required a new shockmount, bezel, and illumination hardware.

Parts Removed:

	354-0204-00	Ring, CRT shockmount
V859	154-0478-00	Tube, CRT, T5470-31-2 w/Int. Grat.
	354-0262-00	Ring, reflector, light plate
	386-0212-00	Plate, light reflector
	200-0382-00	Cover, graticule, 200-0382-01

Parts Added:

	354-0321-00	Ring, CRT shockmount
V859	154-0568-00	Tube
	378-0594-00	Ring, reflector, light plate
	386-1459-00	Plate, light conductor
	200-0896-02	Cover, graticule, 200-0896-02
	331-0191-01	Mask, graticule

INSTALLATION

Parts Required: 050-0420-00 Parts Replacement Kit



product modification

050-0420-10

M13672

Type See Below

T5471-7-2 (P-7 PHOSPHOR) CRT REPLACEMENT

For the following TEKTRONIX® Type Oscilloscopes:

Types	543B/RM543B	Serial Numbers	100- 3000
Types	544/RM544	Serial Numbers	100- 2000
Types	545B/RM545B	Serial Numbers	100-11000
Types	546/RM546	Serial Numbers	100- 2000
Types	547/RM547	Serial Numbers	100-10000

CRT with ceramic bulbs T5471-7-2 PN 154-0568-02 replaces CRT with glass bulbs PN 154-0478-02 which is no longer available. The ceramic CRT provides improved illumination of the internal graticule. The increased outer diameter of the ceramic CRT necessitates changing the light plate reflector, the light pipe reflector ring, the graticule mask, and the graticule cover.

NOTE 1: To use a TEKTRONIX camera bezel on an instrument containing a ceramic CRT it is necessary to modify the bezel by replacing the rubber gasket on the bezel with a thicker gasket. Order the vinyl light seal spacer PN 122-0745-00 separately.

NOTE 2: If the serial number of your instrument is above those listed, or if this kit or 050-0420-00 has been installed, disregard the instructions as CRT PN 154-0568-02 is a direct replacement.

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	154-0568-02	Tube, vacuum, CRT T5471-7-2
1 ea	200-0896-02	Bezel, graticule
1 ea	331-0191-01	Mask, graticule
1 ea	354-0321-00	Ring, shockmount
1 ea	378-0594-00	Ring, reflector, light
1 ea	386-1459-00	Plate, light reflector

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.

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

INSTRUCTIONS

Use the following procedure to remove the CRT:

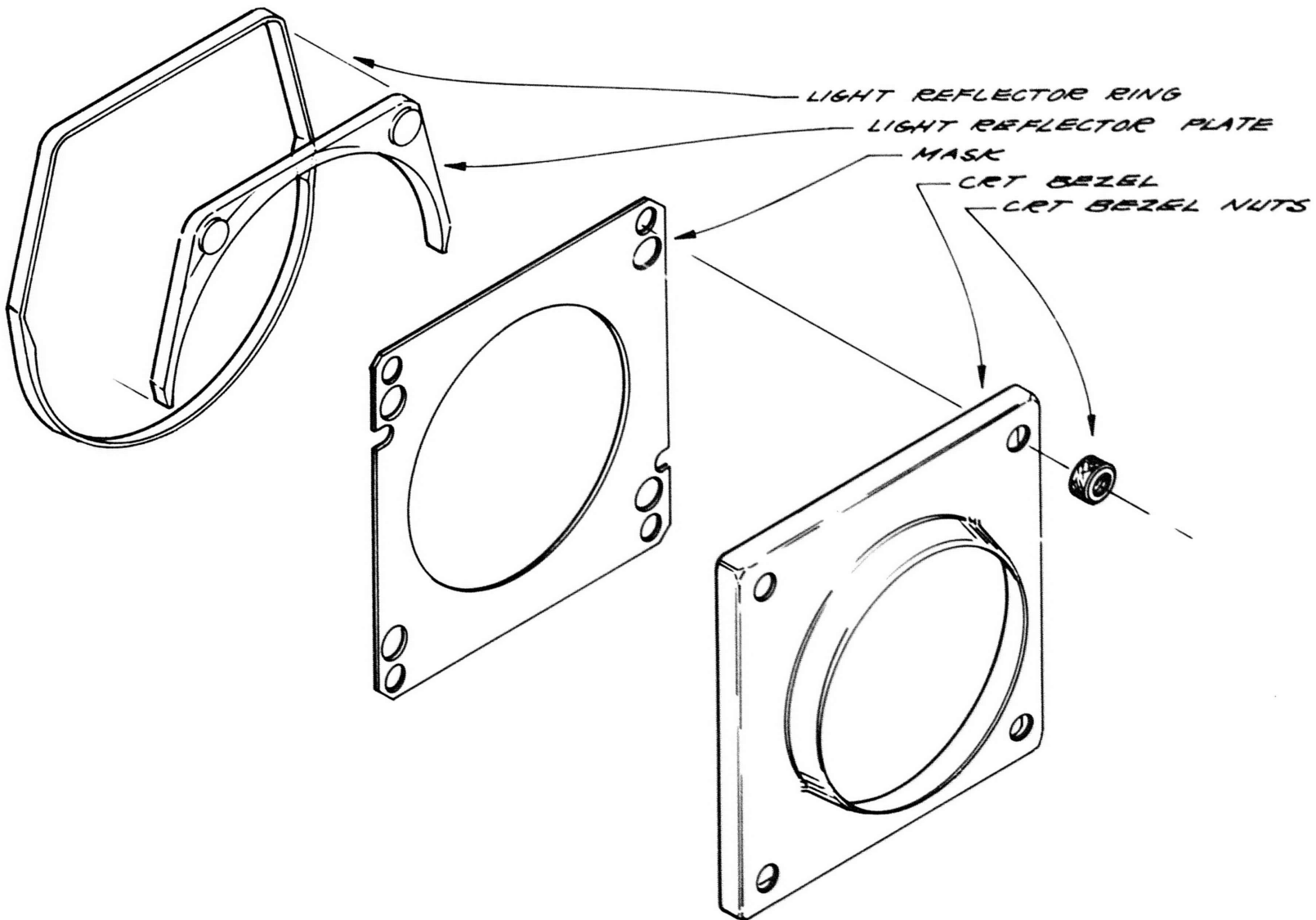
- () 1. Remove the CRT bezel nuts, bezel, and plastic light filter or CRT protector plate.
- () 2. Remove the plastic light reflector plate and retaining spring from the top of the CRT.
- () 3. Remove the CRT anode lead and disconnect all leads from the neck of the CRT.
- () 4. Use a Phillips screwdriver and loosen the CRT base clamp.
- () 5. Use a plastic, or a wooden, dowel to carefully work the CRT socket loose from the base clamp.
- () 6. Grasp the face of the CRT with the right hand. Push the CRT carefully toward the front of the instrument with the left hand. Remove the CRT through the front of the instrument.

Use the following procedure to install the ceramic CRT:

- () 7. Remove the black plastic support bracket from the front of the CRT shield. To do this, it is recommended that this bracket first be cut in two with a knife. Once the bracket is cut, it can easily be removed by hand. Care should be taken not to pry the bracket from the funnel with a screwdriver or similar blunt instrument, as the soft Mu-metal CRT shield or the front panel may be damaged.
- () 8. Install the new support bracket into the CRT shield. This is a force-fit assembly and the installation is similar to installing a car tire on a rim. Put the bottom of the bracket in first, and push on a small portion of the bracket at a time, working around the shield, until the bracket is fully within the shield.
- () 9. Before installing the ceramic CRT, dust talcum powder on the CRT base. This prevents the base of the CRT from sticking to the neoprene bushing inside the base clamp.
- () 10. Carefully insert the ceramic CRT into the shield and the base clamp. Keep the anode button in line with the anode connector hole on the CRT shield so that the button is aligned with the hole when the CRT is fully inserted.
- () 11. Connect the CRT socket to the tube base.
- () Turn the CRT so that the horizontal graticule lines are parallel with the top of the front panel.

NOTE: If the CRT face is not aligned parallel with the front of the oscilloscope, use a 7/64" hexagonal wrench to loosen the two socket head mounting screws that fasten the base clamp to the mounting bracket. Move the base clamp and CRT radially to align the face of the CRT with the front panel of the instrument.

- () 12. Connect the anode and neck-pin leads (observe color-code).
- () 13. Tighten the base clamp.



INSTRUCTIONS (cont)

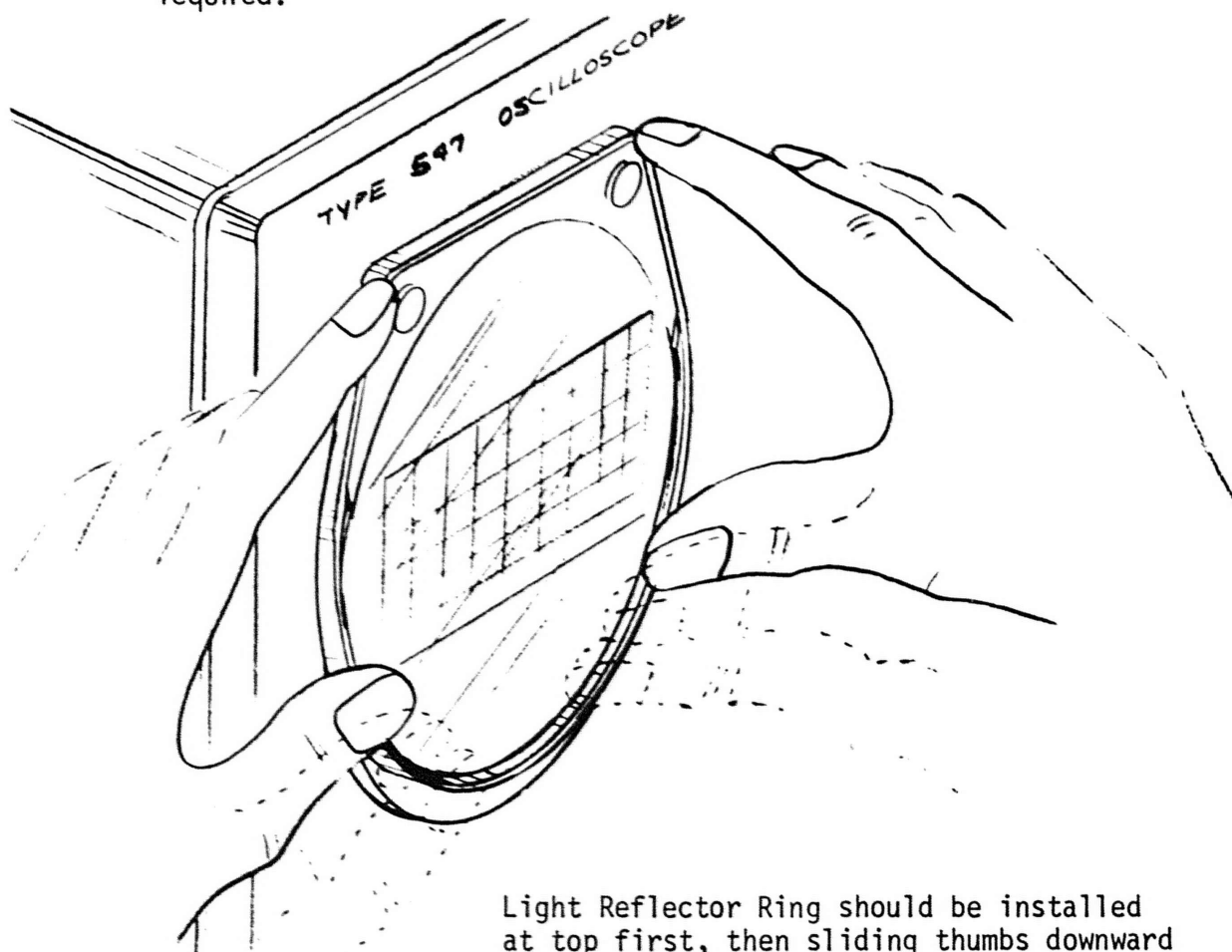
- () 14. Turn on the oscilloscope. Obtain a free-running sweep on the CRT.
- () 15. Check the alignment of the trace with the graticule lines. If the trace is not parallel with the graticule lines, align the trace with the TRACE POSITION control.
- () 16. Install the new light reflector plate, the light reflector ring, the graticule mask, and the graticule bezel. See drawing on pages 4 and 5.

- () Check the operation of the instrument and recalibrate as required.
- () Correct the Electrical and Mechanical Parts List in your Instruction Manual.

Instructions for replacing rubber camera mounting bezel:

If a Tektronix camera is to be used, it will be necessary to replace the rubber gasket on the camera bezel with a gasket having a greater width. Order Tektronix PN 122-0745-00, and slip the original gasket off and replace it with the new gasket. No special tools or adhesives are required for the installation.

If a bezel for mounting commercially available cameras on Tektronix oscilloscopes is used (PN 014-0018-00) the new gasket will not be required.



Light Reflector Ring should be installed at top first, then sliding thumbs downward (shown by dotted lines), the ring will slide on.

DF:ljs



product modification

050-0420-11

M13672

Type See Below

T5471-11-2 (P-11 PHOSPHOR) CRT REPLACEMENT

For the following TEKTRONIX® Type Oscilloscopes:

Types	543B/RM543B	Serial Numbers	100- 3000
Types	544/RM544	Serial Numbers	100- 2000
Types	545B/RM545B	Serial Numbers	100-11000
Types	546/RM546	Serial Numbers	100- 2000
Types	547/RM547	Serial Numbers	100-10000

CRT with ceramic bulbs T5471-11-2 PN 154-0568-03 replaces CRT with glass bulbs PN 154-0478-03 which is no longer available. The ceramic CRT provides improved illumination of the internal graticule. The increased outer diameter of the ceramic CRT necessitates changing the light plate reflector, the light pipe reflector ring, the graticule mask, and the graticule cover.

NOTE 1: To use a TEKTRONIX camera bezel on an instrument containing a ceramic CRT it is necessary to modify the bezel by replacing the rubber gasket on the bezel with a thicker gasket. Order the vinyl light seal spacer PN 122-0745-00 separately.

NOTE 2: If the serial number of your instrument is above those listed, or if this kit or 050-0420-00 has been installed, disregard the instructions as CRT PN 154-0568-03 is a direct replacement.

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	154-0568-03	Tube, vacuum, CRT T5471-11-2
1 ea	200-0896-02	Bezel, graticule
1 ea	331-0191-01	Mask, graticule
1 ea	354-0321-00	Ring, shockmount
1 ea	378-0594-00	Ring, reflector, light
1 ea	386-1459-00	Plate, light reflector

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.

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

INSTRUCTIONS

Use the following procedure to remove the CRT:

- () 1. Remove the CRT bezel nuts, bezel, and plastic light filter or CRT protector plate.
- () 2. Remove the plastic light reflector plate and retaining spring from the top of the CRT.
- () 3. Remove the CRT anode lead and disconnect all leads from the neck of the CRT.
- () 4. Use a Phillips screwdriver and loosen the CRT base clamp.
- () 5. Use a plastic, or a wooden, dowel to carefully work the CRT socket loose from the base clamp.
- () 6. Grasp the face of the CRT with the right hand. Push the CRT carefully toward the front of the instrument with the left hand. Remove the CRT through the front of the instrument.

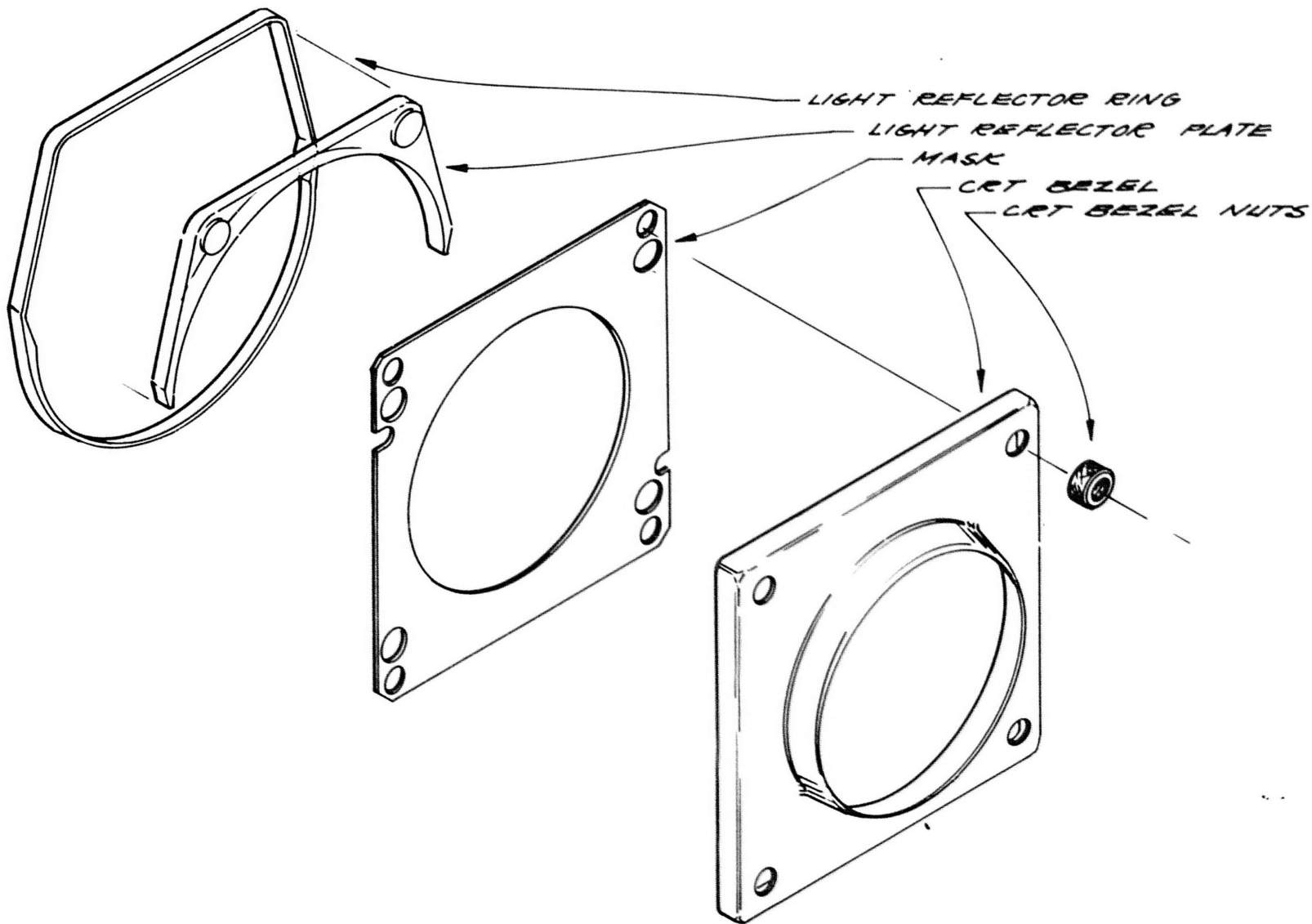
Use the following procedure to install the ceramic CRT:

- () 7. Remove the black plastic support bracket from the front of the CRT shield. To do this, it is recommended that this bracket first be cut in two with a knife. Once the bracket is cut, it can easily be removed by hand. Care should be taken not to pry the bracket from the funnel with a screwdriver or similar blunt instrument, as the soft Mu-metal CRT shield or the front panel may be damaged.
- () 8. Install the new support bracket into the CRT shield. This is a force-fit assembly and the installation is similar to installing a car tire on a rim. Put the bottom of the bracket in first, and push on a small portion of the bracket at a time, working around the shield, until the bracket is fully within the shield.
- () 9. Before installing the ceramic CRT, dust talcum powder on the CRT base. This prevents the base of the CRT from sticking to the neoprene bushing inside the base clamp.
- () 10. Carefully insert the ceramic CRT into the shield and the base clamp. Keep the anode button in line with the anode connector hole on the CRT shield so that the button is aligned with the hole when the CRT is fully inserted.
- () 11. Connect the CRT socket to the tube base.
- () 12. Turn the CRT so that the horizontal graticule lines are parallel with the top of the front panel.

NOTE: If the CRT face is not aligned parallel with the front of the oscilloscope, use a 7/64" hexagonal wrench to loosen the two socket head mounting screws that fasten the base clamp to the mounting bracket. Move the base clamp and CRT radially to align the face of the CRT with the front panel of the instrument.

- () 12. Connect the anode and neck-pin leads (observe color-code).
- () 13. Tighten the base clamp.

INSTRUCTIONS (cont)



050-0420-11

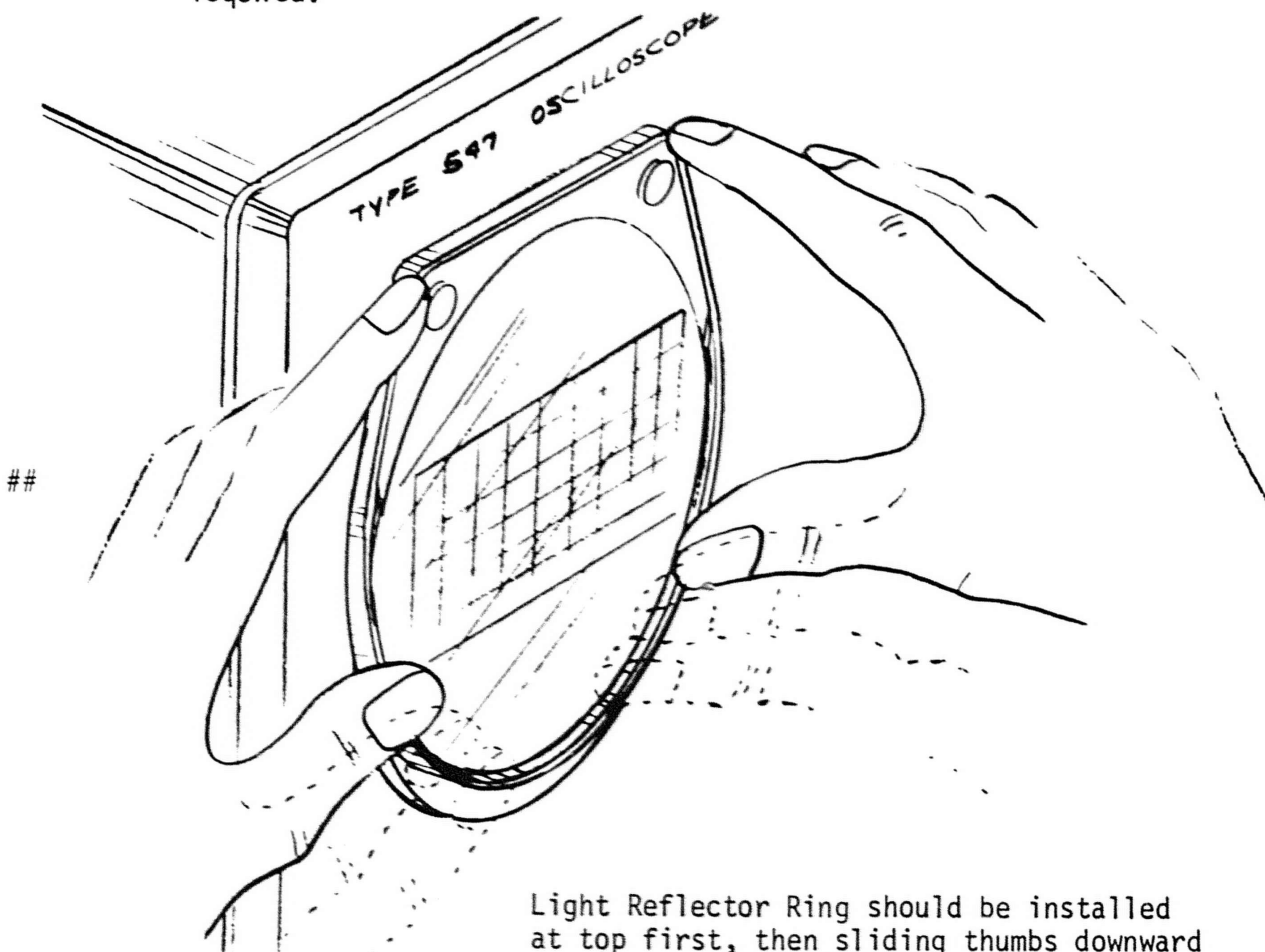
INSTRUCTIONS (cont)

- () 14. Turn on the oscilloscope. Obtain a free-running sweep on the CRT.
- () 15. Check the alignment of the trace with the graticule lines. If the trace is not parallel with the graticule lines, align the trace with the TRACE POSITION control.
- () 16. Install the new light reflector plate, the light reflector ring, the graticule mask, and the graticule bezel. See drawing on pages 4 and 5.
- () Check the operation of the instrument and recalibrate as required.
- () Correct the Electrical and Mechanical Parts List in your Instruction Manual.

Instructions for replacing rubber camera mounting bezel:

If a Tektronix camera is to be used, it will be necessary to replace the rubber gasket on the camera bezel with a gasket having a greater width. Order Tektronix PN 122-0745-00, and slip the original gasket off and replace it with the new gasket. No special tools or adhesives are required for the installation.

If a bezel for mounting commercially available cameras on Tektronix oscilloscopes is used (PN 014-0018-00) the new gasket will not be required.



Light Reflector Ring should be installed at top first, then sliding thumbs downward (shown by dotted lines), the ring will slide on.

DF:ljjs

Indicates change since last publication

Microfiche scan by VintageTEK - Your donations help support the museum. www.vintagetek.org

050-0420-11

102.15

Page 5 of 5



product modification

050-0420-12

M13672

T5471-31-2 or -2-2 (P-31 or P-2 PH) CRT REPLACEMENT

For the following TEKTRONIX® Oscilloscopes:

Types 543B/RM543B	Serial Numbers 100 - 3000
Types 544/RM544	Serial Numbers 100 - 2000
Types 545B/RM545B	Serial Numbers 100 - 11000
Types 546/RM546	Serial Numbers 100 - 2000
Types 547/RM547	Serial Numbers 100 - 10000

Ceramic crt T5471-31-2, pn 154-0568-00, replaces glass crt's T5470-31-2 (P31 phosphor), pn 154-0478-00, and T5470-2-2 (P2 phosphor), pn 154-0468-01, which are no longer available. The ceramic crt provides improved illumination of the internal graticule. The increased outer diameter of the ceramic crt necessitates changing the light plate reflector, the light pipe reflector ring, the graticule mask, and the graticule cover.

NOTE: If the serial number of your instrument is above those listed, or if this kit or 050-0420-00 has been installed, disregard the instructions as pn 154-0568-00 is a direct replacement.

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	154-0568-00	Tube, vacuum, crt T5471-31-2
1 ea	200-0896-02	Bezel, graticule
1 ea	331-0191-01	Mask, graticule
1 ea	354-0321-00	Mount, resilient
1 ea	378-0594-00	Ring, reflector, light
1 ea	386-1459-00	Plate, light reflector

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.

BEFORE STARTING TO REPLACE THE CRT, BE SURE THE INSTRUMENT IS DISCONNECTED FROM THE AC LINE AND THE HIGH-VOLTAGE POWER SUPPLY IS COMPLETELY DISCHARGED.

INSTRUCTIONS:

Use the following procedure to remove the crt:

- () 1. Remove the crt bezel nuts, bezel, and plastic light filter or crt protector plate.
- () 2. Remove the plastic light reflector plate and remaining spring from the top of the crt.

- () 3. Remove the crt anode lead and disconnect all leads from the neck of the crt.
- () 4. Using a Phillips screwdriver, loosen the crt base clamp.
- () 5. Use a plastic or wooden dowel to carefully work the crt socket loose from the base clamp.
- () 6. Grasp the face of the crt with the right hand. Push the crt carefully toward the front of the instrument with the left hand. Remove the crt through the front of the instrument.

Use the following procedure to install the ceramic crt.

- () 7. Remove the black plastic-support bracket from the front of the crt shield. To do this, it is recommended that this bracket first be cut in two with a knife. Once the bracket is cut, it can easily be removed by hand. Care should be taken not to pry the bracket from the funnel with a screwdriver or similar blunt instrument, as the soft Mu-metal crt shield or the front panel may be damaged.
- () 8. Install the new resilient mount into the crt shield. This is a force-fit assembly and the installation is similar to installing a car tire on a rim. Put the bottom of the bracket in first, and push on a small portion of the bracket at a time, working around the shield, until the bracket is fully within the shield.
- () 9. Before installing the ceramic crt, dust talcum powder on the crt base. This prevents the base of the crt from sticking to the neoprene bushing inside the base clamp.
- () 10. Carefully insert the ceramic crt into the shield and the base clamp. Keep the anode button in line with the anode connector hole in the crt shield so that the button is aligned with the hole when the crt is fully inserted.
- () 11. Connect the crt socket to the tube base.
- () Turn the crt so that the horizontal graticule lines are parallel with the top of the front panel.

NOTE: If the crt face is not aligned parallel with the front of the oscilloscope, use a 7/64" hexagonal wrench to loosen the two socket head mounting screws that fasten the base clamp to the mounting bracket. Move the base clamp and crt radially to align the face of the crt with the front panel of the instrument.

- () 12. Connect the anode and neck-pin leads (observe color-code).
- () 13. Tighten the base clamp.

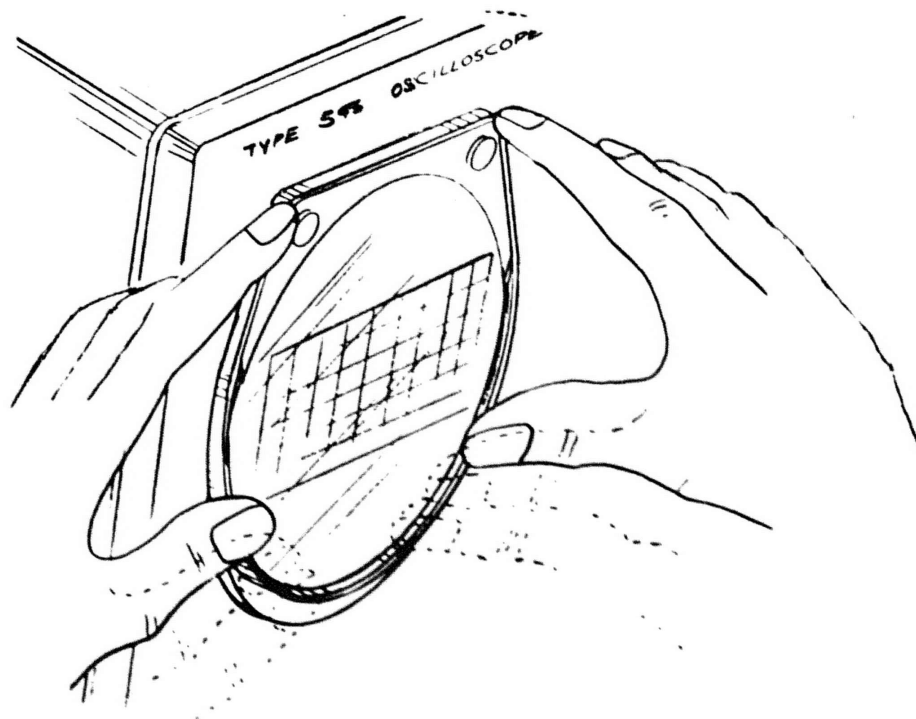


Fig. 1. Installing Light Reflector Ring and Plate.

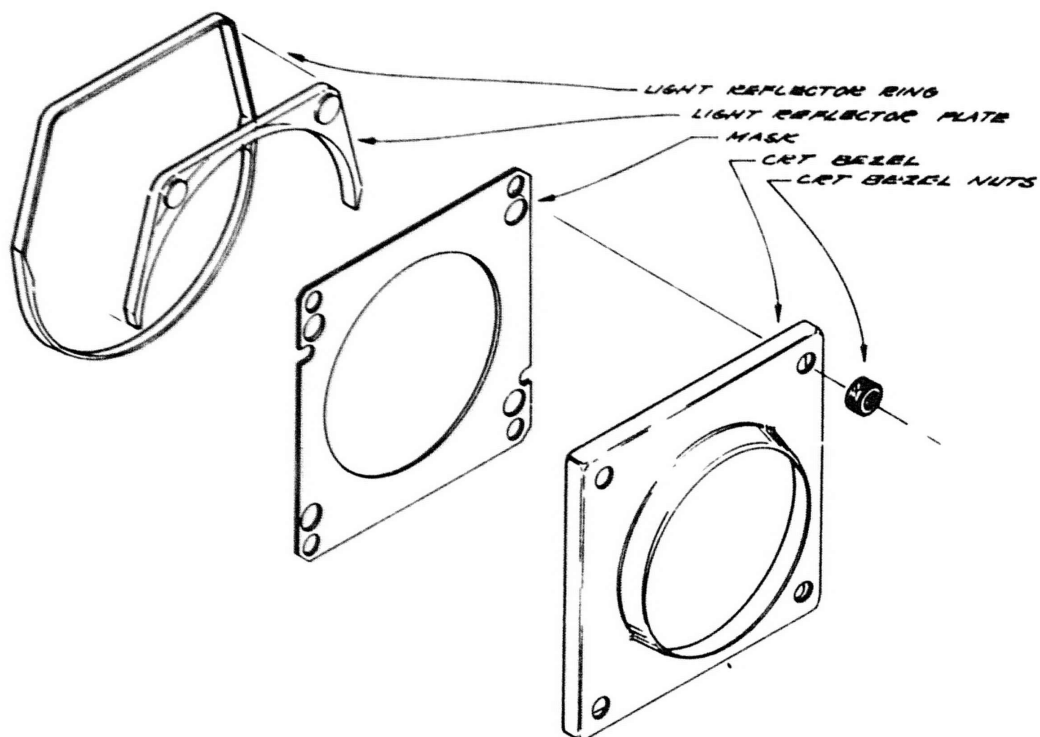


Fig. 2. Installation of CRT Bezel Assembly.

- () 14. Turn on the oscilloscope. Obtain a free-running sweep on the crt.
- () 15. Check the alignment of the trace with the graticule lines. If the trace is not parallel with the graticule lines, align the trace with the TRACE POSITION control.
- () 16. Install the new light reflector plate, the light reflector ring, the graticule mask, and the graticule bezel as shown in Fig. 1 and Fig. 2. To install the light reflector ring and plate, hold the ring in place with the forefingers of both hands as shown in Fig. 1. Then slide the thumbs down to snap the bottom of the ring in place.

Check the operation of the instrument and recalibrate as required.

Correct the Electrical and Mechanical Parts List in your Instruction Manual.

Instructions for replacing rubber camera-mounting bezel:

If a TEKTRONIX® camera is to be used, it will be necessary to replace the rubber gasket on the camera bezel with a thicker gasket, pn 122-0745-00. Slip the original gasket off and replace it with the new gasket. No special tools or adhesives are required for the installation.

If the camera used with the oscilloscope was not supplied by Tektronix, Inc. and bezel pn 014-0018-00 is used, the rubber gasket will not need changing.

KM:cs

VERTICAL AMPLIFIER COMPATIBILITY WITH TYPE W UNIT IMPROVED

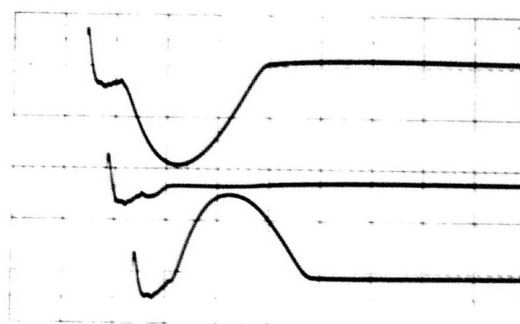
Effective Prod SN 940
180-RM

Usable in SN 100-939
100-179

The wide swing of the Type 'W' unit output causes oscillation in the input amplifier emitter circuit that tends to saturate either transistor of this stage (depending upon the vertical position) when high amplitude (200cm) input signals are used. The exact amount of input signal needed to make this problem occur depends on the signal rep rate.

A damping resistor R1020 is added between the junctions of D1018-R1018 and C1035-R1153 to prevent the oscillations from occurring.

Before Mod



Signal Source:

1 Volt Cal.

Sweep Rate 1 μ s/cm

W Unit Control Settings:

$V_c +11$

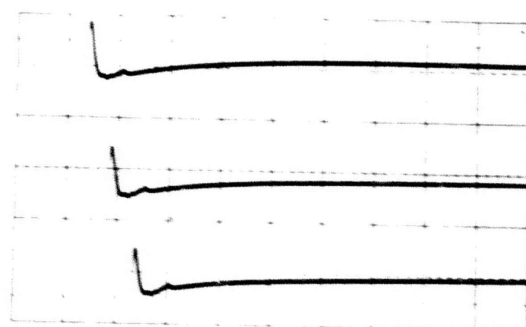
INPUT ATTEN 1

DISPLAY A- V_c

MILLIVOLTS/CM 5

The size of the aberration depends on the vertical position of the waveform.

After Mod



Test conditions same as above.

Parts Added:

R1020

316-0331-00

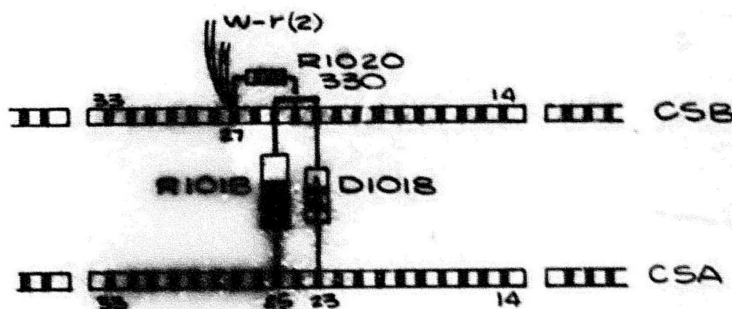
Resistor, 330 Ω 1/4W 10%

INSTALLATION

Parts Required: See 'Parts Added.'

Refer to drawing for component layout.

- a) Relocate the two white-red wires from CSB-24 to CSB-27.
- b) Solder R1020, a 330Ω 1/4W 10% resistor, between CSB-24 and CSB-27.



POOR COPY

VERT AMP DECOUPLING CAPACITOR INCREASED IN VALUE TO REDUCE
VERT SIGNAL OUT NOISE AND PREVENT ERRATIC TRIGGERING

Effective Prod SN 1010
180-RM

Usable in SN 100-1009
100- 179

Replace C1157, a bypass capacitor, with a larger value reduced transients from the power supply getting into the VERTICAL SIGNAL OUT signal. The larger value reduced this noise from as much as 30mV, depending upon the front panel settings, to as low as 5mV.

Also, noise feeding into the trigger circuit was reduced, lessening the possibility of erratic triggering.

Parts Removed:

C1157	283-0067-00	Capacitor, 0.001 μ F cer
-------	-------------	------------------------------

Parts Added:

C1157	283-0057-00	Capacitor, 0.1 μ F cer
-------	-------------	----------------------------

INSTALLATION

Parts Required: See 'Parts Added.'

Replace C1157, an 0.001 μ F capacitor, with an 0.1 μ F capacitor. C1157 is located on the ceramic strips directly above transistor sockets Q1144 and Q1154, on the VA chassis. It is the only capacitor on these first two strips from the front of the instrument.

VERT AMP 200MHz OSCILLATION AND RESULTING TRACE BROADENING ELIMINATED

Effective Prod	SN 1272	Usable in SN	100-1271
	180-RM		100- 179
modified out of sequence:			
561	1167	1186	1222-4
1162	1176	1188	1228
			1230-9
			1270

Overshoot, ringing, and subsequent trace broadening, caused by 200MHz oscillation occurring in the emitter circuit of the input transistors, resulted from the combination of two things: Lower input capacity of Q1014, Q1024, caused by a change to a snap-in transistor socket (M8208) which has lower capacitor, and the possible use of a high FM tube at V1003.

A 6.8pF capacitor, C1019, was added in parallel with R1019.

Also, refer to M10557 which changes the value of C1019 to 12pF 500V.

Parts Added:

C1019	281-0572-00	Capacitor, cer, 6.8pF 500V
-------	-------------	----------------------------

INSTALLATION

Parts Required:

C1019	281-0505-00	Capacitor, cer, 12pF 500V
-------	-------------	---------------------------

Install C1019 across the terminals of R1019 (1.5k 5W resistor), located on the lower VA chassis between Q1014 and Q1024.

OUTPUT AMPLIFIER PROTECTION CIRCUIT ADDED TO PROTECT OUTPUT TRANSISTORS

Effective Prod SN 2340
260-RM

Usable in SN 100-2339
100- 259

It has been found that the +225V 6080 series regulator tube (V707) can momentarily short internally. The resulting rise in output voltage in the supply breaks down the Vertical Output transistors Q1114 and Q1134 causing Vertical to be inoperative.

A transistor Q1109 was added in series with the output amplifier collector supply. The base was returned to 100V through a 150V zener diode D1109 (see schematic). The fixed base voltage limits the collector voltage of the output amplifiers to approximately 250V maximum. The transistor was mounted between the two ventilation holes on the Input Vertical Amplifier chassis.

Parts Removed:

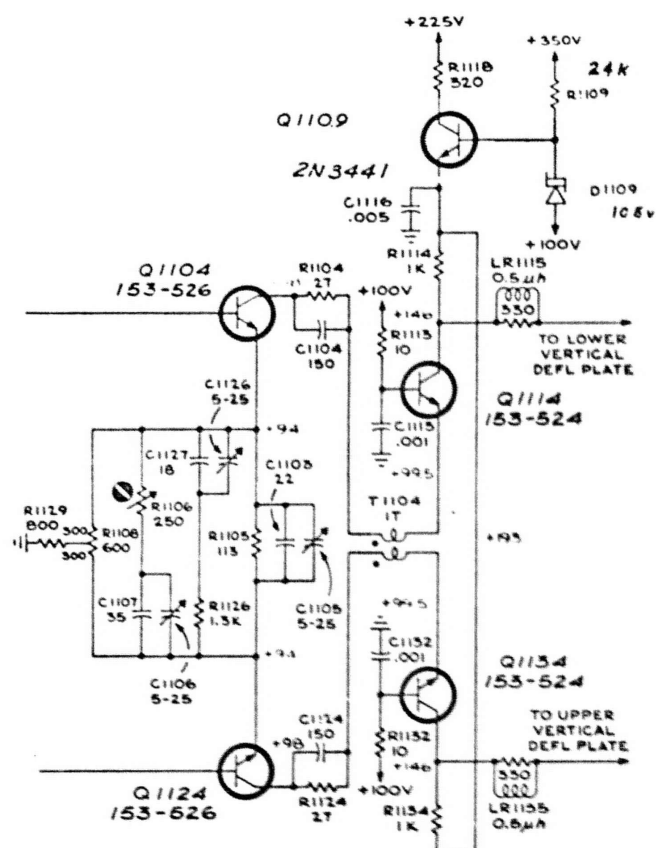
441-0473-00	Chassis, VA
179-0770-00	Cable harness, Lower VA

Parts Added:

	441-0473-01	Chassis, VA
	179-0770-01	Cable harness, Lower VA
	386-0143-00	Plate, mica insulator
R1109	305-0243-00	Resistor, comp, 24k 2W 5%
D1109	152-0228-00	Diode, zener, 105V 1W 10%
Q1109	151-0149-00	Transistor, 2N3441, silicon NPN

INSTALLATION

Parts Required: 040-0405-00 Field Modification Kit



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modification instructions

MI - 040-0405-00

Types 544/RM,
546/RM and 547/RM

VERTICAL OUTPUT AMPLIFIER PROTECTION

For the following Tektronix Oscilloscopes:

Type 544 Serial Numbers 100- 369
Type RM544 Serial Numbers 100- 199
Type 546 Serial Numbers 100- 449
Type RM546 Serial Numbers 100- 169
Type 547 Serial Numbers 100-2339
Type RM547 Serial Numbers 100- 259

Modification Kit, PN 040-0405-00, adds a protective circuit to protect the Vertical Amplifier output transistors, Q1114 and Q1134, from excessive collector voltage caused primarily by grid-to-cathode shorts in the +225V type 6080 series regulator tube, V707.

The protective circuit consists of a transistor (Q1109) in series with the output amplifier collector supply. The base of the transistor is returned to +100V through a 105 V zener diode (D1109). The fixed base voltage of the series transistor limits the output transistor collector voltage to approximately 205 V in the event that the +225 V supply goes out of regulation.

The transistor and associated components are all mounted on a small sub-chassis which is mounted near the rear of the input Vertical Amplifier chassis, using an existing Vertical Amplifier chassis mounting hole.

PARTS REQUIRED

Quantity	Tektronix Part Number	Description
1 ea	040-0405-00	Modification Kit

INSTALLATION

Installation instructions are included in the Modification Kit.

Indicates change since last publication.

CIRCUIT DESCRIPTION

Q1109 is normally saturated, allowing the circuit to function normally. If the +225V supply output voltage rises due to a shorted 6080, the transistor is no longer saturated. Base current requirements are reduced and the base voltage rises until the zener catches it, thus limiting the collector voltage to approximately 205 V.

ELECTRICAL PARTS LIST

Ckt.No.	Part Number	Description
DIODES		
D1109	152-0305-00	Zener 105V 1W ±5%
RESISTORS		
R1109	305-0243-00	Comp 24k 2W 5%
TRANSISTORS		
Q1109	151-0149-00	Silicon 2N3441 NPN

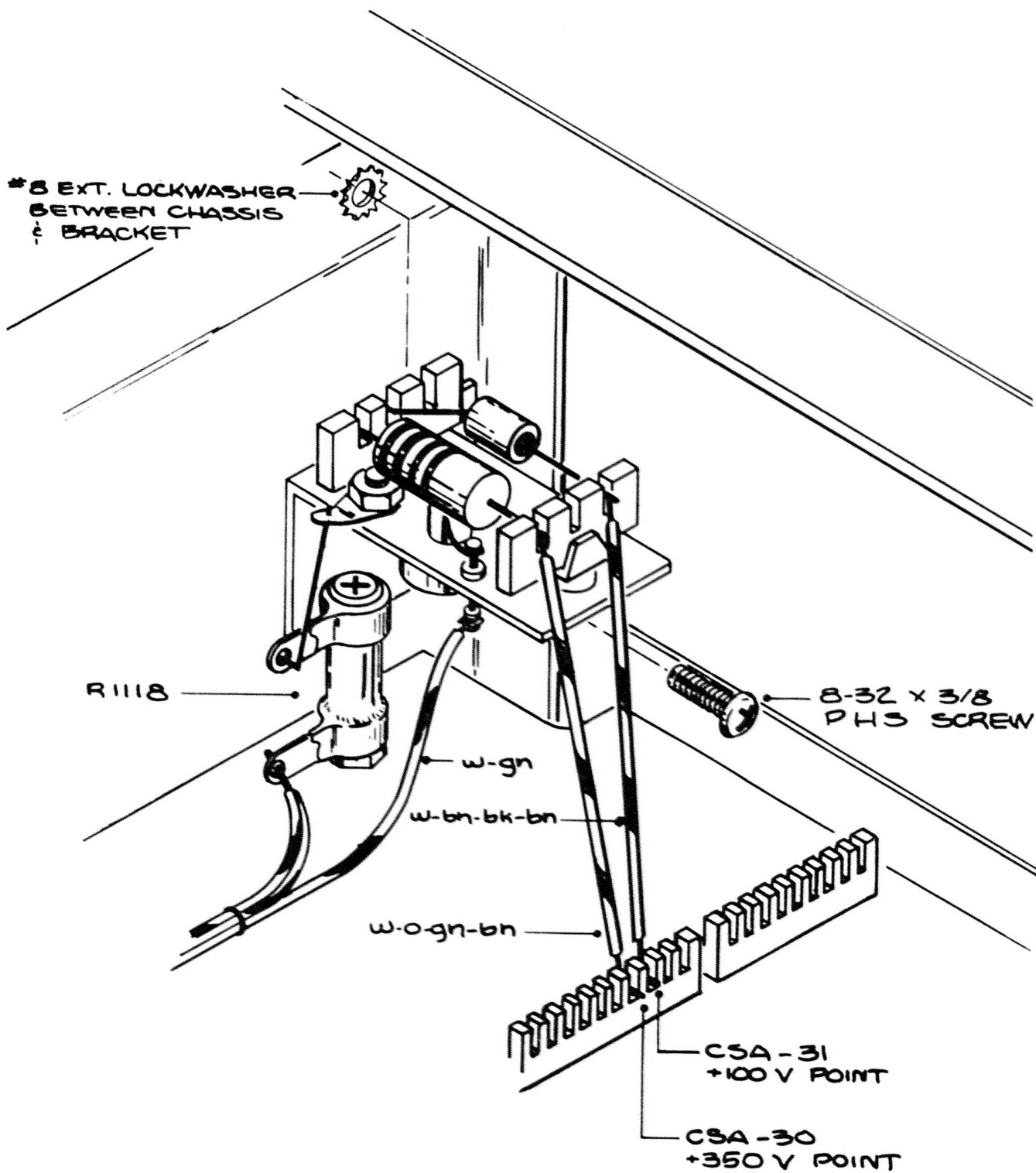
MECHANICAL PARTS LIST

407-0219-00	Bracket
356-0136-00	Bushing, Teflon
131-0183-00	Connector, terminal feed-through
210-0006-00	Lockwasher, int #6
210-0007-00	Lockwasher, ext #8
210-0202-00	Lug, solder, SE-6 w/2 holes
210-0407-00	Nut, 6-32 x 1/4
386-0143-00	Plate, mica insulator
211-0510-00	Screw, 6-32 x 3/8 PHS, Phillips
212-0023-00	Screw, 8-32 x 3/8 PHS, Phillips
361-0007-00	Spacer, nylon molded, 0.063
124-0092-00	Strip, ceramic, 7/16 x 3-notch (large)
210-0935-00	Washer, shoulder, fiber
210-0802-00	Washer, steel, 6S x 5/16 x 0.028

PARTS INCLUDED IN MODIFICATION KIT:

Quantity	Part Number	Description
(1 ea)		Assembly, consisting of:
2 ea	124-0092-00	Strip, ceramic, 7/16 x 3-notch (large)
1 ea	131-0183-00	Connector, terminal feed-through
1 ea	151-0149-00	Transistor, silicon, 2N3441
1 ea	152-0305-00	Diode, zener, 105 V 1W ±5%
1 ea	210-0006-00	Lockwasher, int #6
1 ea	210-0202-00	Lug, solder, SE-6 w/2 holes
2 ea	210-0407-00	Nut, 6-32 x 1/4
2 ea	210-0802-00	Washer, steel, 6S x 5/16 x 0.028
2 ea	210-0935-00	Washer, shoulder, fiber
2 ea	211-0510-00	Screw, 6-32 x 3/8 PHS, Phillips
1 ea	305-0243-00	Resistor, comp, 24 k 2W 5%
1 ea	358-0136-00	Bushing, Teflon*
2 ea	361-0007-00	Spacer, nylon molded, 0.063
1 ea	386-0143-00	Plate, mica insulator
1 ea	407-0219-00	Bracket, angle
1 ea		Wire, #22 solid, 175-0522-00, w-o-gn-bn, 4"
1 ea		Wire, #22 solid, 175-0522-00, w-bn-bk-bn, 4"
1 ea	210-0007-00	Lockwasher, ext #8
1 ea	212-0023-00	Screw, 8-32 x 3/8 PHS, Phillips
1 ea	214-0210-00	Spool, w/3 ft. silver-bearing solder
1 ea	(1-910D)	Tag, MODIFIED INSTRUMENT, gummed back

* DuPont Registered Trademark.



INSTRUCTIONS

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

- () 1. Remove the left side panel and bottom plate.

REFER TO DRAWING WHILE PERFORMING STEPS 2 THROUGH 7.

- () 2. Remove the rear Power Supply chassis mounting screw on the vertical bulkhead, just to the rear of R1118.
- () 3. Install the assembly (from kit) over the hole vacated in step 2, using the 8-32 screw and lockwasher from the kit. Align the bracket as shown.
- () 4. Relocate the white-green wire from the top terminal of R1118 to the connector terminal on the assembly.
- () 5. Solder the #22 white-orange-green-brown wire, from assembly, to CSA-30.
- () 6. Solder the #22 white-brown-black-brown wire, from assembly, to CSA-31.
- () 7. Solder the bare wire, from solder lug on assembly, to the top terminal of R1118.

THIS COMPLETES THE INSTALLATION.

- () Check wiring for accuracy.
- () Check Vertical Amplifier Gain and High Frequency Compensations, as given in your Manual Calibration Procedure.
- () Replace the side panel and bottom plate.
- () Fasten the insert pages in your Instruction Manual.
- () Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and place it on the Vertical Amplifier schematic in your Instruction Manual.

DW:ls

INSTRUCTION MANUAL

MODIFICATION INSERT

VERTICAL OUTPUT AMPLIFIER PROTECTION

TYPES 544 SN 100- 369	RM544 SN 100-119
TYPES 546 SN 100- 449	RM546 SN 100-169
TYPES 547 SN 100-2339	RM547 SN 100-259

Installed in Type _____ SN _____ Date _____

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

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GENERAL INFORMATION

This instrument has been modified with Modification Kit, PN 040-0405-00, which added a protective circuit to protect the Vertical Amplifier output transistors, Q1114 and Q1134, from excessive collector voltage caused primarily by grid-to-cathode shorts in the +225 V type 6080 series regulator tube, V707.

The protective circuit consists of a transistor (Q1109) in series with the output amplifier collector supply. The base of the transistor is returned to +100V through a 105 V zener diode (D1109). The fixed base voltage of the series transistor limits the output transistor collector voltage to approximately 205 V in the event that the +225V supply goes out of regulation.

The transistor and associated components are all mounted on a small sub-chassis which is mounted near the rear of the input Vertical Amplifier chassis, using an existing Vertical Amplifier chassis mounting hole.

CIRCUIT DESCRIPTION

Q1109 is normally saturated, allowing the circuit to function normally. If the +225V supply output voltage rises due to a shorted 6080, the transistor is no longer saturated. Base current requirements are reduced and the base voltage rises until the zener catches it, thus limiting the collector voltage to approximately 205 V.

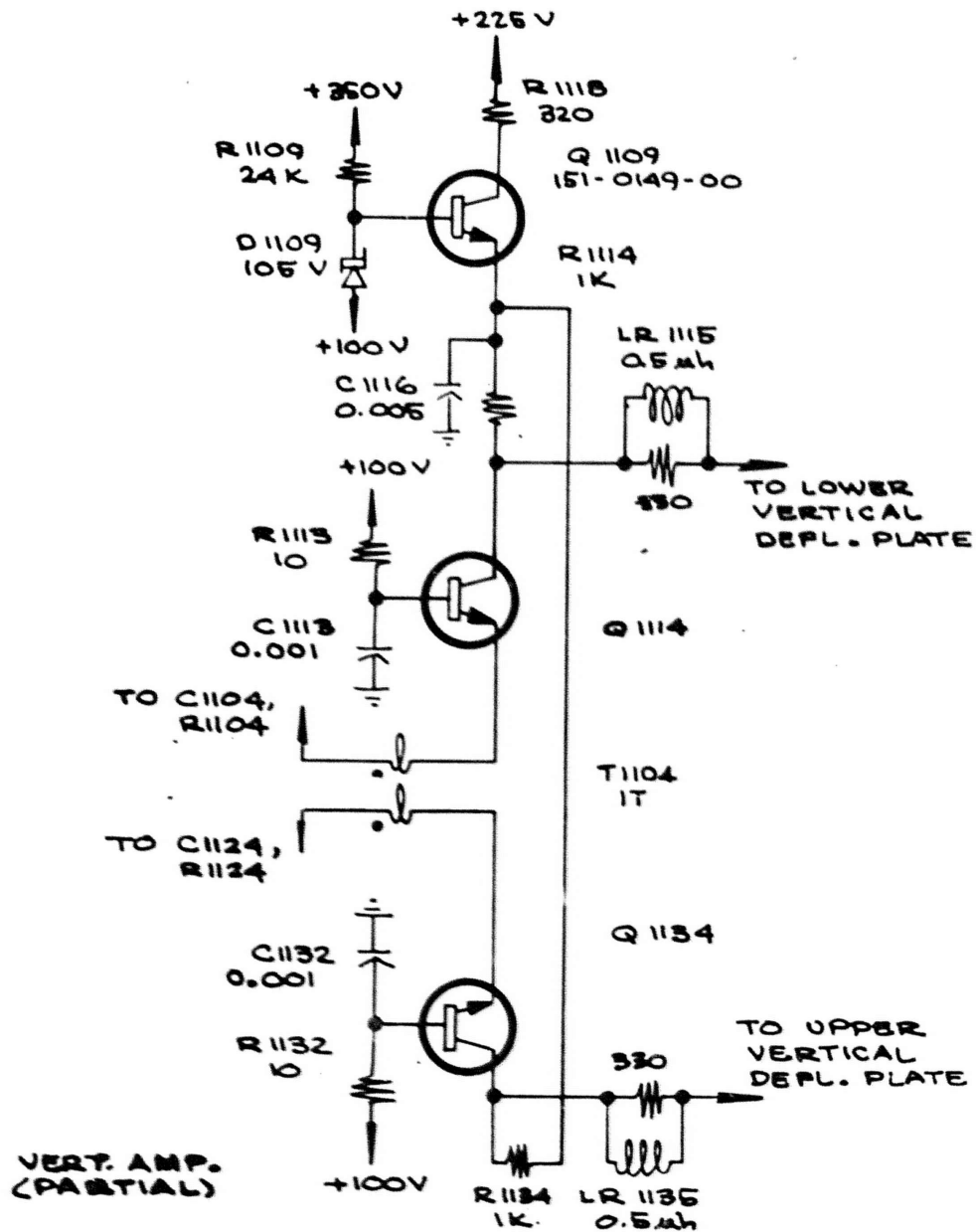
ELECTRICAL PARTS LIST

Ckt.No.	Part Number	Description
DIODES		
D1109	152-0305-00	Zener 105V 1W ±5%
RESISTORS		
R1109	305-0243-00	Comp 24k 2W 5%
TRANSISTORS		
Q1109	151-0149-00	Silicon 2N3441 NPN

MECHANICAL PARTS LIST

407-0219-00	Bracket
356-0136-00	Bushing, Teflon
131-0183-00	Connector, terminal feed-through
210-0006-00	Lockwasher, int #6
210-0007-00	Lockwasher, ext #8
210-0202-00	Lug, solder, SE-6 w/2 holes
210-0407-00	Nut, 6-32 x 1/4
386-0143-00	Plate, mica insulator
211-0510-00	Screw, 6-32 x 3/8 PHS, Phillips
212-0023-00	Screw, 8-32 x 3/8 PHS, Phillips
361-0007-00	Spacer, nylon molded, 0.063
124-0092-00	Strip, ceramic, 7/16 x 3-notch (large)
210-0935-00	Washer, shoulder, fiber
210-0802-00	Washer, steel, 6S x 5/16 x 0.028

SCHEMATICS



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VERTICAL AMPLIFIER CAPACITOR VALUE INCREASED
TO ELIMINATE OSCILLATION WITH SOME 12AT7's

Effective Prod SN 3380

Usable in SN 1272-3379 (Type 547)
180-3379 (Type RM547)

modified out of sequence: 3173

Trace widening occurred from Vertical Amplifier oscillations which were being caused by certain batches of "hot" 12AT7's used for the input cathode follower V1003.

C1019 in the emitter circuit of Q1014-Q1024 was changed from 6.8pF to 12pF to eliminate the oscillation.

Also see M9141 for standard instruments below SN 1272 and rackmount instruments below SN 180.

Parts Removed:

C1019	281-0572-00	Capacitor, cer, 6.8pF 500V
-------	-------------	----------------------------

Parts Added:

C1019	281-0505-00	Capacitor, cer, 12pF 500V
-------	-------------	---------------------------

INSTALLATION

Parts Required: See 'Parts Added.'

Replace C1019, a 6.8pF 500V capacitor, with a 12pF 500V capacitor. C1019 is located between the terminals of R1019 (1.5k 5W resistor) on the lower VA chassis between Q1014 and Q1024.

VERTICAL AMPLIFIER CAPACITORS REPLACED BY HIGHER VOLTAGE TYPE TO PREVENT FAILURE

Effective Prod SN 4270

Usable in SN 100-4269

Catastrophic failure of Vertical Amplifier output components, caused by inadequate voltage rating of C1069, C1071, C1113, and C1132, resulted in an inoperative Vertical accompanied by smoke from the VA Output circuit board.

Capacitors C1035, C1038, C1048, C1069, C1071, C1087, C1113, and C1132, 200V ceramic, were replaced with 500V ceramic capacitors of similar physical size. C1035, C1038, C1048, and C1087 were replaced for conformity only.

Parts Removed:

C1035
C1038
C1048
C1069
C1071
C1087
C1113
C1132

283-0067-00 Capacitor, cer, 0.001 μ F 200V

Parts Added:

C1035
C1038
C1048
C1087
*C1071
*C1069
*C1113
*C1132

283-0078-00 Capacitor, cer, 0.001 μ F 500V

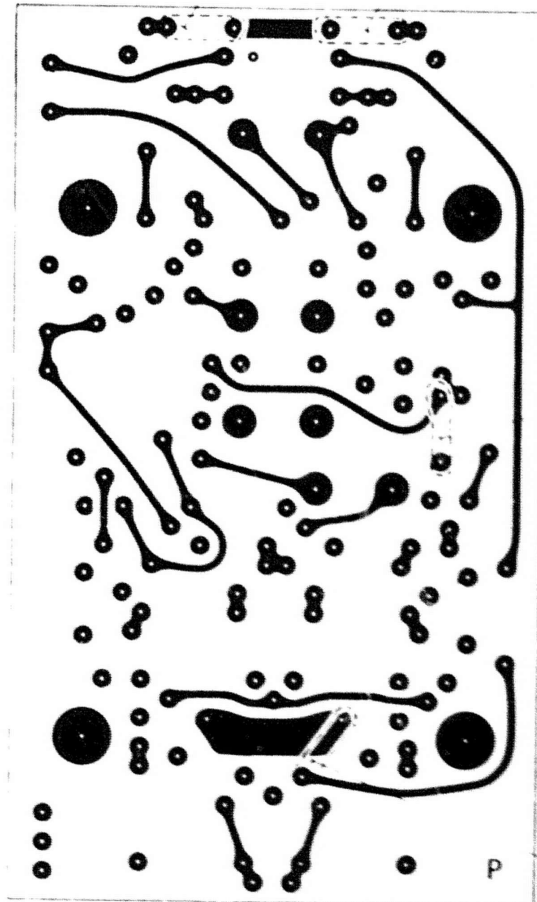
INSTALLATION

Parts Required: See 'Parts Added' with asterisk.

Replace 0.001 μ F 200V ceramic capacitors C1069, C1071, C1113, and C1132 with 0.001 μ F 500V ceramic capacitors.

- C 1132

- C 1113



C1071

- C1069

VERTICAL AMPLIFIER GAIN POTENTIOMETER RANGE INCREASED

Effective Prod SN 4750

The range of Vert Gain potentiometer R1017 was insufficient when the CRT was at the high end of the sensitivity scale. With the potentiometer properly set, less than 10% (the minimum acceptable amount) of range was left at one end of the potentiometer when the potentiometer was at -20% end of tolerance.

R1017 was changed to a 200 Ω potentiometer and C1027 to a variable 5.5-18pF capacitor.

Parts Removed:

C1027	281-0558-00	Capacitor, cer, 15pF 500V NPOA
R1017	311-0258-00	Potentiometer, comp, 100 Ω 1/5W miniature

Parts Added:

C1027	281-0061-00	Capacitor, var, cer, 5.5-18pF NPO
R1017	311-0097-00	Potentiometer, comp, 200 Ω 0.5W miniature

VERTICAL AMPLIFIER OUTPUT TRANSISTORS CHANGED TO REDUCE FAILURES

Effective Prod SN 5680

Usable in SN 100-5679

Vertically unstable trace. When the trace is driven hard off the screen in either vertical directions, some of the matched pair sets of output transistors can be driven into their breakdown region. The minimum breakdown voltages specified for these transistors are too low for the circuit.

The matched pair transistors 153-0524-00 were replaced by new matched pair transistors 153-0548-00. The new transistors are checked for $V_{cbo}=120V$ minimum instead of 80V and $V_{ceo}=80V$ minimum instead of 60V. They also are pulse matched for hrb.

Parts Removed:

Q1114	153-0524-00	Transistor, checked pair of 151-0121-00
Q1134		

Parts Added:

Q1114	153-0548-00	Transistor, matched pair of 151-0124-00
Q1134		

INSTALLATION

Parts Required: See 'Parts Added.'

Replace Q1114 and Q1134 with the 153-0548-00 matched pair transistors.

VERTICAL AMPLIFIER INPUT TUBE AND DC BALANCE POTENTIOMETER
REPLACED TO IMPROVE VERTICAL AMPLIFIER BALANCE

Effective Prod SN 6730

Usable in SN 100-6729

POSITION control of the Vertical plug-in does not have enough range to move the trace off screen. Problem is particularly acute when a Type 1A1 is used.

The two sections of 12AT7's used as V1003 have a difference of bias which exceeds the range of adjustments of the DC Balance control R1004.

The raw 12AT7 tubes used at V1003 were replaced by 12AT7's that have been aged 75 hours and the value of the DC Balance control was increased from 2.5k to 3k.

Parts Removed:

R1004	311-0086-00	Potentiometer, 2.5k \pm 20% 0.5W
V1003	154-0039-00	Tube, vacuum 12AT7

Parts Added:

R1004	311-0629-00	Potentiometer, comp, 3k \pm 10% 0.5W
V1003	157-0118-00	Tube, checked (154-0039-00 12AT7) aged 75 hours

INSTALLATION

Parts Required: See 'Parts Added.'

- a) Replace R1004 with a 3k potentiometer.
- b) If replacement of V1003 is required, replace it with a 157-0118-00 tube.

VERTICAL AMPLIFIER COMPONENTS CHANGED TO IMPROVE 1-15kHz FREQUENCY RESPONSE

Effective Prod SN 10730

When triggered on low frequency squarewaves, the display will not appear flat, but will be trapezoidal because of insufficient compensation in the vertical amplifier.

The following changes were made.

- 1) An adjustable RC time constant was added.
- 2) RC time constant R1077/C1077 was made variable.
- 3) R1126 value was changed.
- 4) C1076 was changed physically (made smaller) but not changed electrically. See schematic on following page.

To accommodate the changes, the etched circuit board was changed. The new etched circuit board assembly is a direct replacement for the old.

Refer to the manual for the new calibration procedure.

Parts Removed:

670-0401-00 Vertical Output Board assembly

Parts Added:

670-0401-01 Vertical Output Board assembly

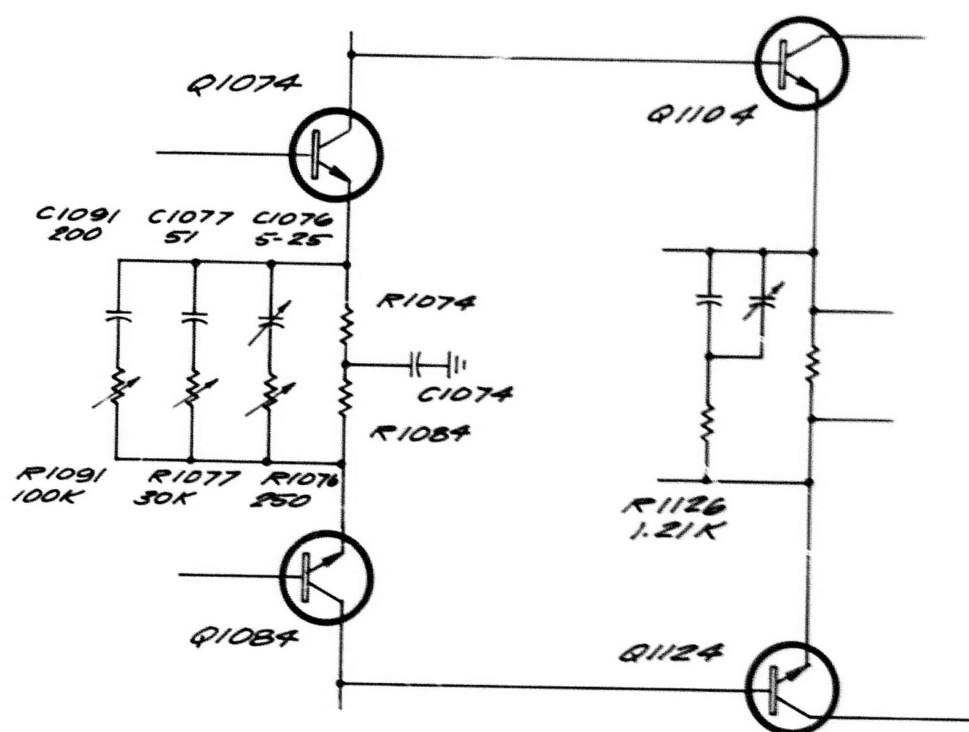
New board assembly is the same as the old except for the following:

Parts Removed:

C1076	281-0075-00	Capacitor, var, cer, 5-25pF
C1077	281-0549-00	Capacitor, cer, 68pF
R1077	315-0163-00	Resistor, comp, 16k 1/4W 5%
R1126	321-0204-00	Resistor, prec, 1.3k 1/8W 1%
	388-0553-00	Circuit board, Vertical Output

Parts Added:

C1076	281-0123-00	Capacitor, var, cer, 5-25pF
C1077	281-0540-00	Capacitor, cer, 51pF
C1091	281-0605-00	Capacitor, cer, 200pF
R1091	311-0613-00	Potentiometer, var, 100k 0.5W
R1077	311-0614-00	Potentiometer, var, 30k 0.5W
R1126	321-0201-00	Resistor, prec, 1.21k 1/8W 1%
	388-0553-01	Circuit board, Vertical Output



VERTICAL AMPLIFIER DIODES ADDED TO PROTECT +100V SUPPLY

Effective Prod SN 11270

Usable in SN 2340-11269

Failures in Q1109 due to contaminated silicon grease, improper seating or mounting of insulating washers, or burrs on the mounting holes can cause catastrophic failures of the +100V supply and possibly in the 225V supply.

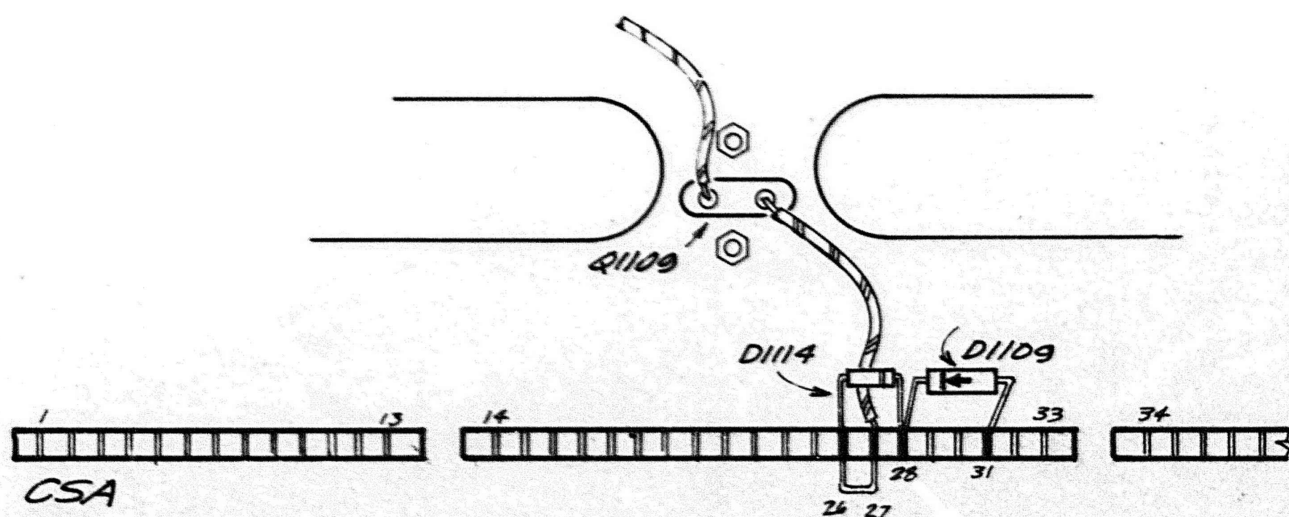
A diode was added in series with D1109, (cathode to cathode). This diode disconnects if Q1109 shorts to ground. R1118 will burn out but other circuitry will be protected.

Parts Added:

D1114 152-0107-00 Diode, silicon 400V PIV

INSTALLATION:

1. Move cathode of D1109 from CSA-27 to CSA-28.
2. Add a bare wire between CSA-26 and CSA-27.
3. Add D1114, 152-0107-00 diode between CSA-26 and CSA-28, (cathode to CSA-28).



RESISTOR CHANGED TO INSURE OPERATION OF VERTICAL POSITION NEON

Effective Prod SN 11890

Vertical indication neons fail to ignite with rotation of VERTICAL POSITIONING control.

Tolerance build up could prevent the neons from reaching firing voltage. R1187 was changed to increase the 1184 plate current, insuring 90V for worst case neons.

Parts Removed:

R1187	301-0334-00	Resistor, fixed composite, 1/2W 330k
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Parts Added:

R1187	323-0431-00	Resistor, precision, 1.2W MF 301k
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'B' TRIGGER DC STABILITY IMPROVED

Effective Prod SN 940
180-RM

Usable in SN 100-939
100-179

DC triggering was unstable at low levels due to noise getting into the Int Trig DC Level dividers, R6 and R7. Increasing the size of the decoupling capacitor C8 filtered out the noise and stabilized the DC triggering.

Parts Removed:

C8	283-0002-00	Capacitor, 0.01 μ F 500V
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Parts Added:

C8	283-0057-00	Capacitor, 0.1 μ F 200V
----	-------------	-----------------------------

INSTALLATION

Parts Required: See 'Parts Added.'

Replace C8, an 0.01 μ F 500V discap capacitor, with an 0.1 μ F 200V discap capacitor. C8 is located between the first notch and a solder lug on the bottom row of ceramic strips on the 'B' Sweep chassis, just to the rear of the 'B' Int Trig DC Level potentiometer.

'B' SWEEP TRIGGER AND DELAY PICKOFF DECOUPLING CAPACITORS
INTERCHANGED TO CORRECT VOLTAGE RATINGS

Effective Prod SN 1360
220-RM

C18 and C424 are physically interchanged to put the 200V capacitor (283-0067-00) at C18 and the 500V capacitor (283-0000-00) at C424. Their values are the same (0.001 μ F). The change is to conform to the Instruction Manual.

SWEEP TRIGGER INPUT TRANSFORMER INSULATION CHANGED TO PREVENT SHORT

Effective Prod SN 1770
240-RM

Usable in SN 100-1769
100- 239

Inoperative sweep occurs because the wire insulation in transformers T52 and T252 is damaged as the wire abruptly bends over the sharp edge of the ferrite core. As a result the primary and secondary can short applying 100V to the primary. This can damage many diodes and transistors.

The insulation on the primary (green) leads of transformers T52 and T252 was changed to TEFLON®.

Parts Removed:

T52	120-0323-00	Transformer, toroid
T252		

Parts Added:

T52	120-0323-01	Transformer, toroid w/TEFLON insulated
T252		primary leads

INSTALLATION

Parts Required: See 'Parts Added.'

- a) Replace T52 on the 'B' Sweep chassis between CSB-12/14 and CSC-1/3 with the TEFLON insulated transformer. Install the green leads in CSB-12/14 and the red leads in CSC-1/3. Refer to Fig. 1.
- b) Replace T252 on the 'A' Sweep chassis between CSE-9/10 and CSF-8/10 with the TEFLON insulated transformer. Install the green leads in CSE-9/10 and the read leads in CSF-8/10. Refer to Fig. 2.

TEFLON, Reg. TM of E. I. du Pont de Nemours & Co., Inc.

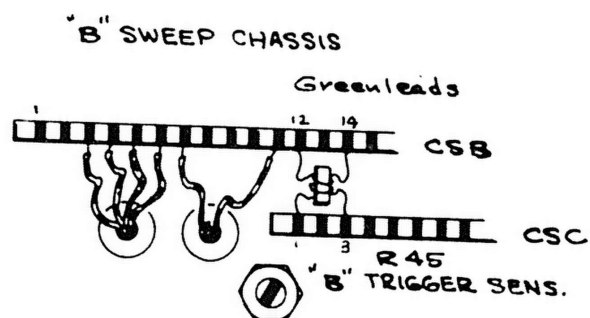


Fig. 1

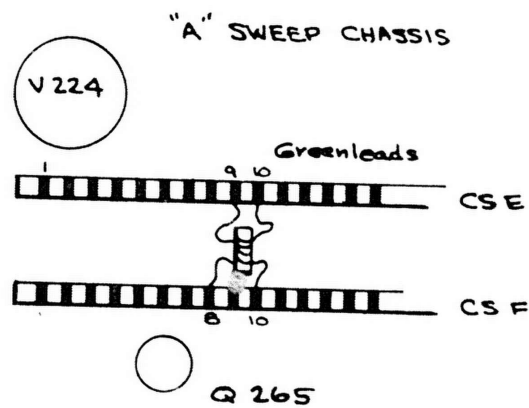


Fig. 2

TRIGGER CIRCUITS REWIRED TO IMPROVE STABILITY

Effective Prod SN 6740

Usable in SN 100-6739

Single-ended Trigger circuits previously used were sensitive to noise causing premature triggering in single-sweep mode of operation.

Trigger circuits were changed to a push-pull configuration. The push-pull circuit tends to cancel common mode noise originating at the input of fluctuations occurring in the +100V power supply. The quiescent current of the Trigger tunnel diode was lowered so that it requires almost twice as much signal current to switch it to its high state. This has the advantage of doubling the amount of noise signal required to cause premature triggering. See Before-After schematics.

Parts Removed:

L252	108-0147-00	Coil, fixed 2.2 μ H
T252	120-0323-01	Transformer, toroid 2T-8T bifilar
L244	276-0507-00	Core, ferramic suppressor
C241	281-0523-00	Capacitor, cer. 100 pF 350 V \pm 20 pF
C243	281-0525-00	Capacitor, cer. 470 pF 500 V \pm 94 pF
C256	281-0576-00	Capacitor, cer. 11 pF 500 V \pm 5 %
C276	290-0187-00	Capacitor, EMT 4.7 μ F 35 V \pm 20 %
R275	301-0513-00	Resistor, comp. 1/2 W 51 k 5 %
R279	302-0152-00	Resistor, comp. 1/2 W 1.5 k 10 %
R276	302-0471-00	Resistor, comp. 1/2 W 470 Ω 10 %
R245	311-0308-00	Pot, comp. 50 Ω \pm 10 % 2 W
R243	316-0100-00	Resistor, comp. 1/4 W 10 Ω 10 %
R281	316-0101-00	Resistor, comp. 1/4 W 100 Ω 10 %
R221, R223, R241	316-0221-00	Resistor, comp. 1/4 W 220 Ω 10 %
R244	323-0001-00	Resistor, prec. 1/2 W 10 Ω 1 %
R282	323-0333-00	Resistor, prec. 1/2 W 28.7 k 1 %
R247, R248	324-0306-00	Resistor, prec. 1 W 15 k 1 %
R236	324-0335-00	Resistor, prec. 1 W 30.1 k 1 %
R256	301-0131-00	Resistor, comp. 1/2 W 130 k 5 %
L52	108-0147-00	Coil, fixed 2.2 μ H
T52	120-0323-01	Transformer, toroid 2T-8T bifilar
L44	276-0507-00	Core, ferramic suppressor

continued

Parts Removed (continued):

C41	281-0523-00	Capacitor, cer, 100pF 350V $\pm 20\text{pF}$
C43	281-0525-00	Capacitor, cer, 470pF 500V $\pm 94\text{pF}$
C56	281-0576-00	Capacitor, cer, 11pF 500V $\pm 5\%$
C76	290-0187-00	Capacitor, EMT, 4.7 μF 35V $\pm 20\%$
R75	301-0513-00	Resistor, comp, 51k 1/2W 5%
R79	302-0152-00	Resistor, comp, 1.5k 1/2W 10%
R57	302-0224-00	Resistor, comp, 220k 1/2W 10%
R76	302-0471-00	Resistor, comp, 470 Ω 1/2W 10%
R43	316-0100-00	Resistor, comp, 10 Ω 1/4W 10%
R81	316-0101-00	Resistor, comp, 100 Ω 1/4W 10%
R21		
R23	316-0221-00	Resistor, comp, 220 Ω 1/4W 10%
R41		
R44	322-0001-00	Resistor, prec, 10 Ω 1/4W $\pm 1\%$
R82	323-0333-00	Resistor, prec, 28.7k 1/2W $\pm 1\%$
R47		
R48	324-0306-00	Resistor, prec, 15k 1W $\pm 1\%$
R36	324-0335-00	Resistor, prec, 30.1k 1W $\pm 1\%$
R45	311-0324-00	Potentiometer, WW, 50 Ω
	179-0763-00	Cable, 'B' sweep
Q34		
Q234		
Q44	151-0188-00	Transistor, 2N3906 Si PNP T092
Q244		

Parts Added:

L250	108-0146-00	Coil, fixed 5 μH
L285	108-0410-00	Coil, fixed 1 μH
T252	120-0500-00	Transformer, toroid 2T-12T bifilar
D221, D222	152-0075-00	Diode, 6075 germanium
C244, C245	281-0578-00	Capacitor, cer. 18pF 500V $\pm 5\%$
C276	290-0175-00	Capacitor, EMT 10 μF 35V $\pm 20\%$
R276	301-0221-00	Resistor, comp. 1/2W 220 Ω 5%
R279	302-0561-00	Resistor, comp. 1/2W 560 Ω 10%
R275	303-0243-00	Resistor, comp. 1W 24k 5%
R233	308-0301-00	Resistor, ww 3W 10k $\pm 1\%$
R240	308-0310-00	Resistor, ww 5W 12k $\pm 1\%$
R236	308-0320-00	Resistor, ww 3W 15.6k $\pm 1\%$
R281	315-0181-00	Resistor, comp. 1/4W 180 Ω 5%
R221, R223, R232, R242	315-0471-00	Resistor, comp. 1/4W 470 Ω 5%
R252	315-0560-00	Resistor, comp. 1/4W 56 Ω 5%
R282	323-0636-00	Resistor, prec. 1/2W 50k $\pm 1\%$
R245	311-0076-00	Pot, comp. 10k $\pm 10\%$ 2W
R256	301-0304-00	Resistor, comp. 1/2W 300k 5%

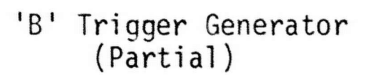
Parts Added (continued):

L50	108-0146-00	Coil, fixed 5 μ H
L85	108-0410-00	Coil, fixed 1 μ H
T52	120-0500-00	Transformer, toroid 2T-12T bifilar
D21, D22	152-0075-00	Diode, 6075 germanium
C44, C45	281-0578-00	Capacitor, cer. 18 pF 500 V $\pm 5\%$
C76	290-0175-00	Capacitor, EMT 10 μ F 35 V $\pm 20\%$
R76	301-0221-00	Resistor, comp. 1/2 W 220 Ω 5%
R57	302-0104-00	Resistor, comp. 1/2 W 100 k 10%
R79	302-0561-00	Resistor, comp. 1/2 W 560 Ω 10%
R75	303-0243-00	Resistor, comp. 1 W 24 k 5%
R33	308-0301-00	Resistor, ww 3 W 10 k $\pm 1\%$
R46	308-0310-00	Resistor, ww 5 W 12 k $\pm 1\%$
R36	308-0320-00	Resistor, ww 3 W 15.6 k $\pm 1\%$
R81	315-0181-00	Resistor, comp. 1/4 W 180 Ω 5%
R21, R23, R32, R42	315-0471-00	Resistor, comp. 1/4 W 470 Ω 5%
R52	315-0560-00	Resistor, comp. 1/4 W 56 Ω 5%
R82	323-0636-00	Resistor, prec. 1/2 W 50 k $\pm 1\%$
R45	311-0405-00	Pot, ww 10 k $\pm 5\%$
	179-0763-01	Cable, "B" sweep
Q34, Q234, Q44, Q244	151-0199-00	Transistor, Si PNP T092 MPS-3640
C1165, C1175	281-0512-00	Capacitor, cer. 27 pF 500 V $\pm 27\%$

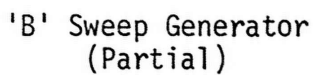
INSTALLATION INSTRUCTIONS:

Parts Required: 040-0459-00 Modification Kit

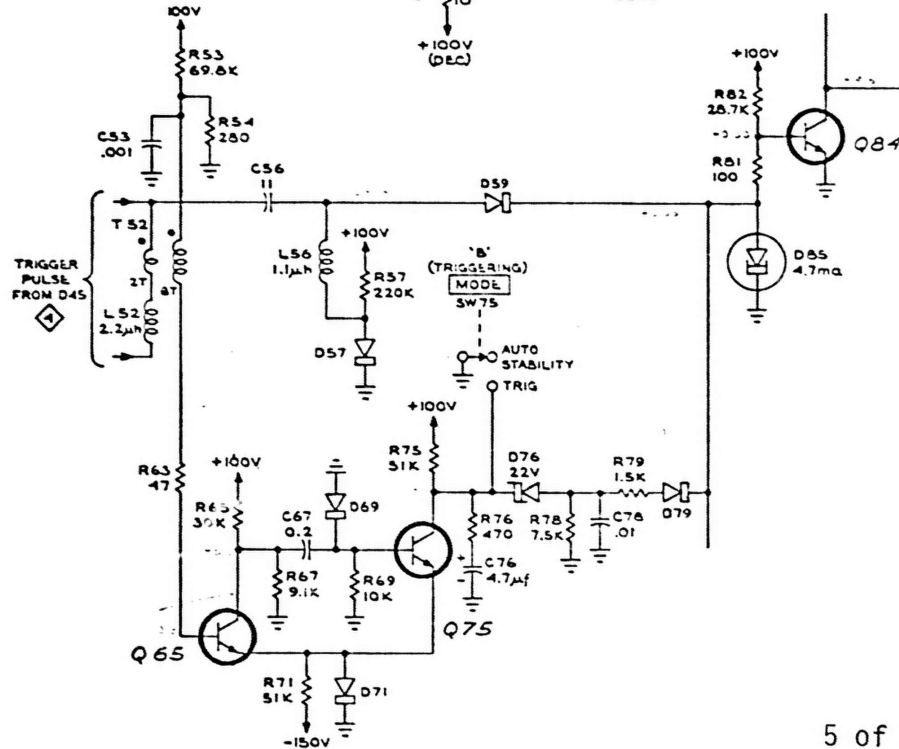




BEFORE



AFTER



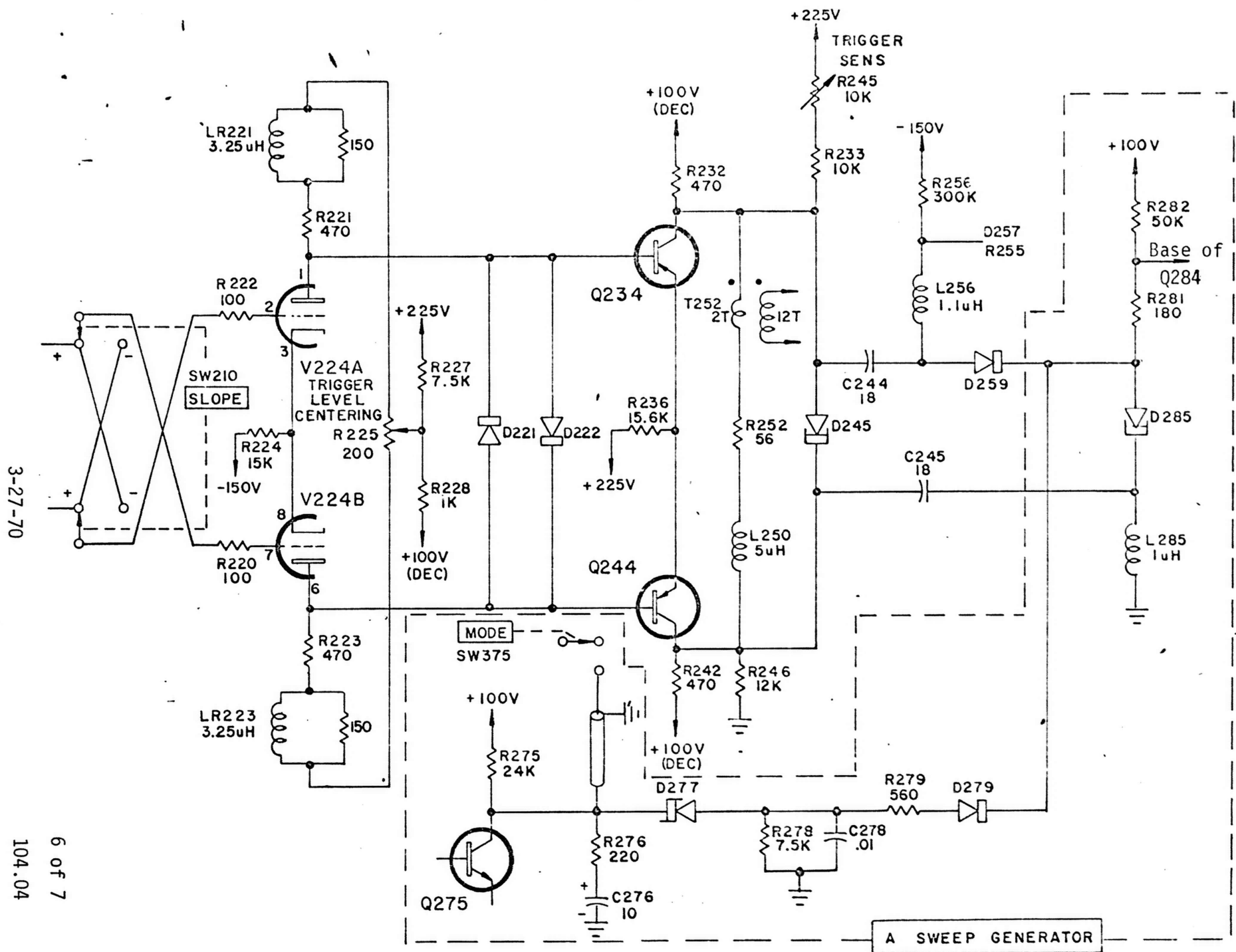
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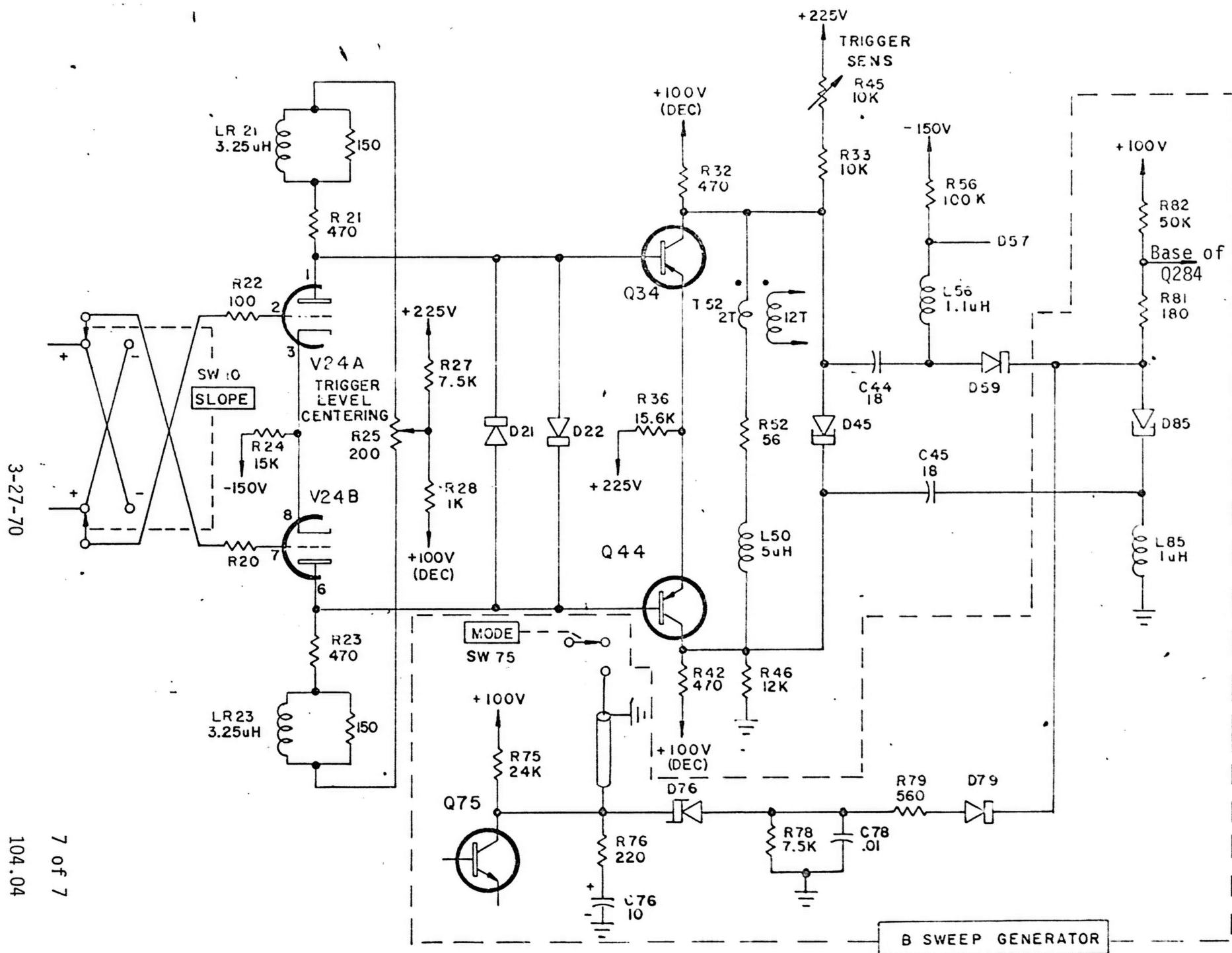
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A SWEEP TRIGGER



M12027 (continued)
Type 547/RM547

B SWEEP TRIGGER



M12027 (continued)
Type 547/RM547



modification instructions

MI - 040-0459-00

Types 546/RM546
547/RM547

'A' AND 'B' TRIGGERING STABILITY IMPROVEMENT

For the following Tektronix Oscilloscopes:

Types 546 Serial Numbers 100- 962
RM546 Serial Numbers 100- 499
547 Serial Numbers 100-6739
RM547 Serial Numbers 100-6739

Modification Kit, PN 040-0459-00, changes the 'A' and 'B' Trigger circuits from a single-ended to a push-pull configuration. The previously used single-ended Trigger circuit configuration was sensitive to noise, causing premature triggering when in the single sweep mode of operation.

The push-pull circuit attenuates the common mode noise originating at the input or originating from fluctuations occurring in the +100V power supply.

The quiescent current of the Trigger circuit tunnel diode was lowered so that it requires almost twice the amount of signal current to switch it to its high state. This has the advantage of doubling the amount of noise signal required to cause premature triggering.

It is recommended that aged 6DJ8 tubes, PN 157-0122-00, be installed in conjunction with this modification if it is necessary to replace V24 or V224 in the Trigger circuit.

The checked 6DJ8 tubes are not provided in this Modification Kit.

The installation of this modification entails extensive rewiring of both Trigger circuits and the addition of two components to the trigger pick-off circuit in the Vertical Amplifier.

PARTS REQUIRED

Quantity	Tektronix Part Number	Description
1 ea	040-0459-00	Modification Kit

INSTALLATION

Installation instructions are included in the Modification Kit.

PARTS INCLUDED IN MODIFICATION KIT:

Quantity	Part Number	Description
2 ea	108-0146-00	Coil, fixed, 5 μ H
2 ea	108-0410-00	Coil, fixed, 1 μ H
2 ea	120-0500-00	Transformer, toroid, 2T-12T bifilar
4 ea	151-0199-00	Transistor, Si, PNP, MPS-3640
4 ea	152-0075-00	Diode, germanium, 6075
1 ea	214-0210-00	Spool, w/3 ft. silver-bearing solder
2 ea	281-0512-00	Capacitor, cer, 27 pF 500 V
4 ea	281-0578-00	Capacitor, cer, 18 pF 500 V
2 ea	290-0175-00	Capacitor, EMT, 10 μ F 35 V 20%
2 ea	301-0221-00	Resistor, comp, 220 Ω 1/2 W 5%
1 ea	301-0304-00	Resistor, comp, 300 k 1/2 W 5%
1 ea	302-0104-00	Resistor, comp, 100 k 1/2 W 10%
2 ea	302-0561-00	Resistor, comp, 560 Ω 1/2 W 10%
2 ea	303-0243-00	Resistor, comp, 24 k 1 W 5%
2 ea	308-0301-00	Resistor, WW, 10 k 3 W 1%
2 ea	308-0310-00	Resistor, WW, 12 k 5 W 1%
2 ea	308-0320-00	Resistor, WW, 15.6 k 3 W 1%
1 ea	311-0076-00	Potentiometer, comp, 10 k 2 W 10%
1 ea	311-0405-00	Potentiometer, WW, 10 k 5%
2 ea	315-0181-00	Resistor, comp, 180 Ω 1/4 W 5%
8 ea	315-0471-00	Resistor, comp, 470 Ω 1/4 W 5%
2 ea	315-0560-00	Resistor, comp, 56 Ω 1/4 W 5%
2 ea	316-0101-00	Resistor, comp, 100 Ω 1/4 W 10%
2 ea	323-0636-00	Resistor, prec, 50 k 1/2 W 1%
4 ea	176-0139-00	Wire, #22 solid, bare, prebent for 5 small notches
1 ea	176-0140-00	Wire, #22 solid, bare, prebent for 7 small notches
2 ea		Tubing, #20 vargas, 162-0504-00, black, 1 in.
6 ea		Wire, #22 solid, 176-0122-00, bare, 12 in.

INSTRUCTIONS

FIG. 1
A SWEEP TRIGGER
Top components before mod

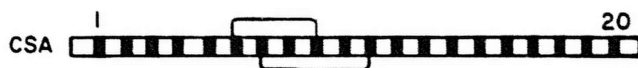
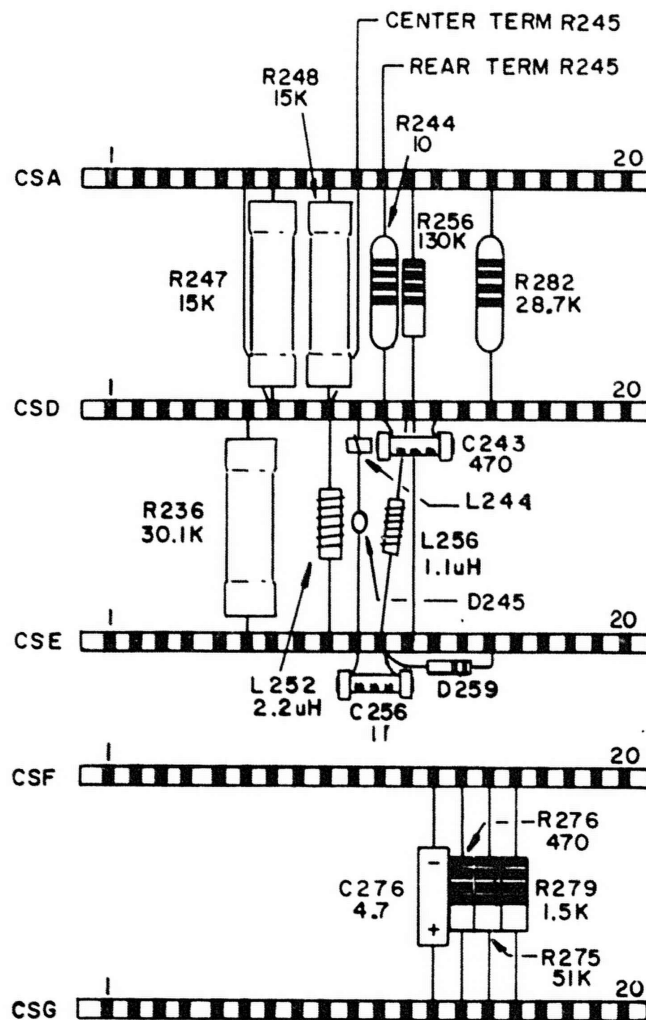
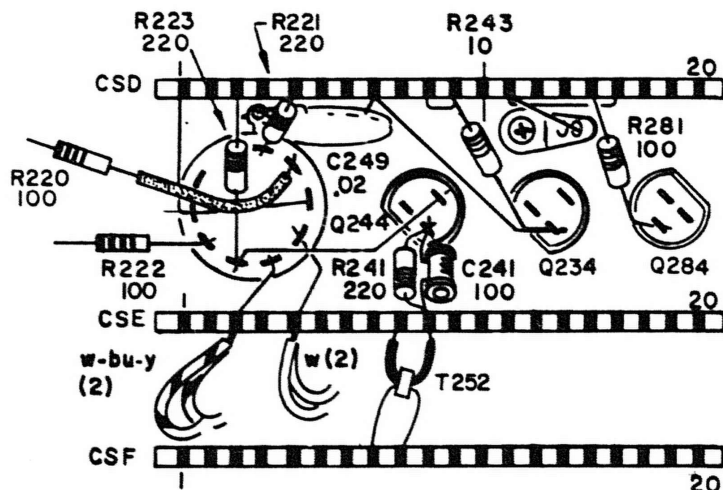


FIG. 2
A SWEEP TRIGGER
Bottom components before mod



INSTRUCTIONS (cont)

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

- () Remove all dust covers from the instrument.

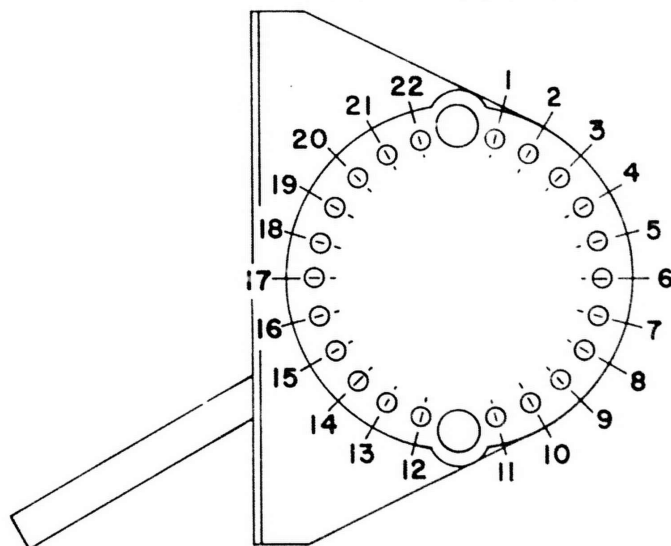
A. TIME BASE 'A' TRIGGER CIRCUIT ONLY

Refer to Figs. 1 and 2 for steps 1 through 46.

- () 1. Remove R247, a 15 k 1 W 1% resistor, located between CSA-7 and CSD-7.
- () 2. Remove R248, a 15 k 1 W 1% resistor, located between CSA-9 and CSD-9.
- () 3. Remove the #22 bare wire between CSA-10 and the center terminal of 'A' Trigger Sens potentiometer R245.
- () 4. Remove the #22 bare wire between CSA-10 and CSD-9.
- () 5. Remove the #22 bare wire between CSA-6 and CSD-7.
- () 6. Remove R244, a 10 Ω 1/2 W 1% resistor, located between CSA-11 and CSD-11.
- () 7. Remove the #22 bare wire between CSA-11 and the rear terminal of 'A' Trigger Sens potentiometer R245.
- () 8. Remove the #22 bare wire between CSA-7 and CSA-11.
- () 9. Remove the #22 bare wire between CSA-6 and CSA-9.
- () 10. Remove R256, a 130 k 1/2 W 5% resistor, located between CSA-12 and CSD-12.
- () 11. Remove C243, a 470 pF 500 V capacitor, located between CSD-11 and CSD-13.
- () 12. Remove R282, a 28.7 k 1/2 W 1% resistor, located between CSA-15 and CSD-15.
- () 13. Remove R236, a 30.1 k 1 W 1% resistor, located between CSD-6 and CSE-6.
- () 14. Remove L252, a 2.2 μ H coil, located between CSD-9 and CSE-9.
- () 15. Remove L244 and D245, located between CSD-10 and CSE-10. Discard the ferramic bead L244, but SAVE tunnel diode D245 for later use.
- () 16. Remove C256, an 11 pF 500 V capacitor, located between CSE-10 and CSE-11.
- () 17. Remove D259, a 6075 diode, located between CSE-11 and CSE-15. SAVE for later use.
- () 18. Remove L256, a 1.1 μ H coil, located between CSD-12 and CSE-11. SAVE for later use.
- () 19. Remove the #22 bare wire, located between CSD-12 and CSE-12.

INSTRUCTIONS (cont)

TYPICAL SWITCH CONFIGURATION



- () 20. Remove R220, a 47Ω (or 100Ω) $1/4W$ 10% resistor, located between pin 2 of V224 and contact F-10 of the SLOPE switch. Refer to switch configuration above for the correct switch contact identification.
- () 21. Remove R222, a 47Ω (or 100Ω) $1/4W$ 10% resistor, located between pin 7 of V224 and contact F-4 of the SLOPE switch. Refer to switch configuration above.
- () 22. Remove R221, a 220Ω $1/4W$ 10% resistor, located between CSD-5 and pin 1 of V224.
- () 23. Remove R223, a 220Ω $1/4W$ 10% resistor, located between CSD-3 and pin 6 of V224.

STEPS 24 THROUGH 38 APPLY ONLY TO TYPE 547/RM OSCILLOSCOPES.

- () 24. Remove the #22 bare wire between CSD-1 and pin 8 of V224.
- () 25. Remove the #22 bare wire between CSE-3 and pin 5 of V224.
- () 26. Remove the #22 bare wire between CSE-5 and pin 4 of V224.
- () 27. Remove the #22 bare wire between pin 6 of V224 and the base of Q244.
- () 28. Remove the #22 bare wire between pin 1 of V224 and the base of Q234.
- () 29. Remove the #22 bare wire from the ground lug of V224 tube socket.
- () 30. Remove C249, a $0.02\mu F$ discap, located between CSD-8 and the ground lug on V224 tube socket. SAVE for later use.
- () 31. Rotate V224 tube socket 180° .
- () 32. Resolder the #22 bare wire from CSD-4 to the solder lug on V224 tube socket.

INSTRUCTIONS (cont)

⊕ Indicates parts from the kit.

- () 33. ⊕ Install a #22 bare wire between CSD-1 and pin 3 of V224.
- () 34. ⊕ Install a #22 bare wire between pin 6 of V224 and the base of Q244.
- () 35. ⊕ Install a #22 bare wire between pin 1 of V224 and the base of Q234.
- () 36. ⊕ Install a #22 bare wire, insulated by a 1 inch piece of varglas tubing, between pin 5 of V224 and CSE-3.
- () 37. ⊕ Install a #22 bare wire, insulated by a 1 inch piece of varglas tubing, between pin 4 of V224 and CSE-5.
- () 38. Install C249, a 0.02 μ F discap removed in step 30, between CSD-4 and CSD-8.
- () 39. Remove the #22 bare wire located between CSD-8 and the collector of Q234.
- () 40. Remove R243, a 10 Ω 1/4 W 10% resistor, located between CSD-11 and the collector of Q234.
- () 41. Remove R241 and C241, located between CSE-10 and the collector of Q244.
- () 42. Remove the #22 bare wire located between CSD-10 and CSD-11.
- () 43. Remove the #22 bare wire located between CSD-13 and the ground solder lug.
- () 44. Remove the #22 bare wire located between CSD-13 and CSD-17.
- () 45. Remove R281, a 100 Ω 1/4 W 10% resistor, located between CSD-16 and the base of Q284.
- () 46. Remove T252, a toroid transformer, located between CSE-9, CSE-10, CSF-8, and CSF-9.

FIG. 3

A SWEEP TRIGGER

Bottom components after mod

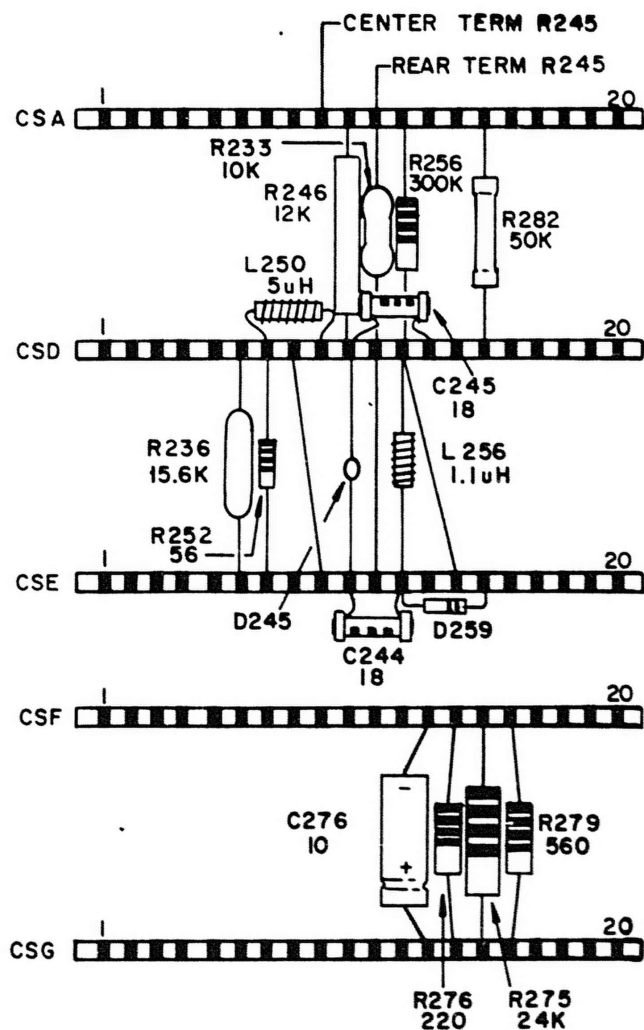
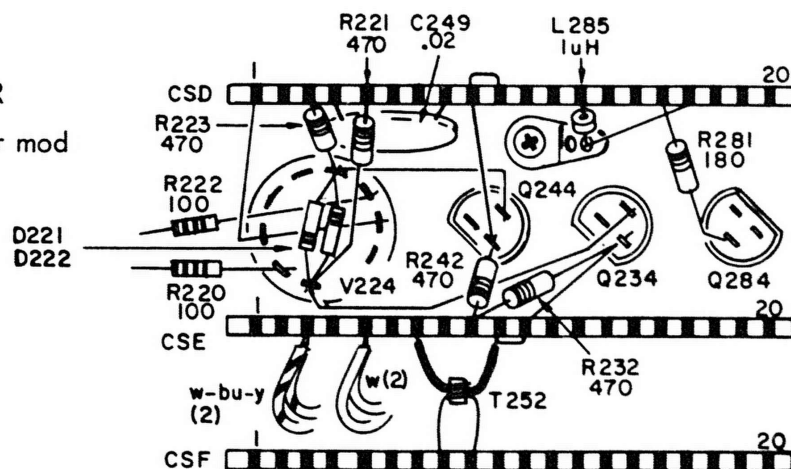


FIG. 4

A SWEEP TRIGGER

Top components after mod

INSTRUCTIONS (cont)

Refer to Figs. 3 and 4 for steps 47 through 86.

- () 47. ⊕ Install a #22 bare wire between CSD-17 and the adjacent ground solder lug.
- () 48. ⊕ Install a #22 bare wire between CSA-10 and the adjacent ground solder lug.
- () 49. ⊕ Install a #22 bare wire between CSD-9 and CSD-10.
- () 50. ⊕ Install a #22 bare wire between CSD-9 and the collector of Q244.
- () 51. ⊕ Install R281, a 180Ω 1/4 W 5% resistor, between CSD-16 and the base of Q284.
- () 52. ⊕ Install L285, a 1 μH coil, between CSD-13 and the ground solder lug.
- () 53. ⊕ Install D221 and D222, two 6075 diodes, between pins 1 and 6 of V224, with the emitter (striped) lead of one in pin 6 and the emitter (striped) lead of the other in pin 1.
- () 54. ⊕ Install a #22 bare wire between CSE-10 and CSE-11.
- () 55. ⊕ Install a #22 bare wire between CSE-11 and the collector of Q234.
- () 56. ⊕ Install R232, a 470Ω 1/4 W 5% resistor, between CSE-9 and the collector of Q234.
- () 57. ⊕ Install R242, a 470Ω 1/4 W 5% resistor, between CSE-9 and the collector of Q244.
- () 58. ⊕ Install R223, a 470Ω 1/4 W 5% resistor, between CSD-3 and pin 6 of V224.
- () 59. ⊕ Install R221, a 470Ω 1/4 W 5% resistor, between CSD-5 and pin 1 of V224.
- () 60. ⊕ Install R222, a 100Ω 1/4 W 10% resistor, between pin 7 of V224 and contact F-10 of the SLOPE switch. Refer to switch configuration on page 6.
- () 61. ⊕ Install R220, a 100Ω 1/4 W 10% resistor, between pin 2 of V224 and contact F-4 of the SLOPE switch. Refer to switch configuration on page 6.
- () 62. ⊕ Install T252, a 2T-12T toroid transformer, between CSE-7, CSE-10, CSF-8, and CSF-9. The green insulated leads should be in CSE-7 and CSE-10.
- () 63. ⊕ Replace A Trigger Sens potentiometer R245 with a new 10k potentiometer.
- () 64. ⊕ Install a #22 bare wire between the middle and front terminals of R245.
- () 65. ⊕ Install a #22 bare wire between the middle terminal of R245 and CSA-9.
- () 66. ⊕ Install a #22 bare wire between the rear terminal of R245 and CSA-11.
- () 67. ⊕ Install a #22 bare wire between CSD-11 and CSE-11.
- () 68. ⊕ Install a #22 bare wire between CSD-8 and CSE-9.
- () 69. ⊕ Install a #22 bare wire between CSD-12 and CSE-14.

INSTRUCTIONS (cont)

- () 70. ⊕ Install R282, a 50k 1/2W 1% resistor, between CSA-15 and CSD-15.
- () 71. ⊕ Install R256, a 300k 1/2W 5% resistor, between CSA-12 and CSD-12.
- () 72. ⊕ Install R233, a 10k 3W 1% resistor, between CSA-11 and CSD-11.
- () 73. ⊕ Install R246, a 12k 5W 1% resistor, between CSA-10 and CSD-10.
- () 74. Install L256, a 1.1μH coil removed in step 18, between CSD-12 and CSE-12.
- () 75. Install D245, a tunnel diode removed in step 15, between CSD-10 and CSE-10.
The emitter (dotted) lead should be in CSD-10.
- () 76. ⊕ Install R252, a 56Ω 1/4W 5% resistor, between CSD-7 and CSE-7.
- () 77. ⊕ Install R236, a 15.6k 3W 1% resistor, between CSD-6 and CSE-6.
- () 78. ⊕ Install L250, a 5μH coil, between CSD-7 and CSD-9.
- () 79. ⊕ Install C245, an 18pF 500V capacitor, between CSD-10 and CSD-13.
- () 80. ⊕ Install C244, an 18pF 500V capacitor, between CSE-10 and CSE-12.
- () 81. Install D259, a 6075 diode removed in step 17, between CSE-12 and CSE-15.
The emitter (striped) lead should be in CSE-15.
- () 82. ⊕ Replace C276, a 4.7μF 35V capacitor located between CSF-13 and CSG-13,
with a 10μF 35V capacitor.
- () 83. ⊕ Replace R276, a 470Ω 1/2W 10% resistor located between CSF-14 and CSG-14,
with a 220Ω 1/2W 5% resistor.
- () 84. ⊕ Replace R275, a 51k 1/2W 5% resistor located between CSF-15 and CSG-15,
with a 24k 1W 5% resistor.
- () 85. ⊕ Replace R279, a 1.5k 1/2W 10% resistor located between CSF-16 and CSG-16,
with a 560Ω 1/2W 10% resistor.
- () 86. ⊕ Replace Q234 and Q244 with 151-0199-00 transistors.

THIS COMPLETES THE MODIFICATION OF TIME BASE A TRIGGER CIRCUIT.

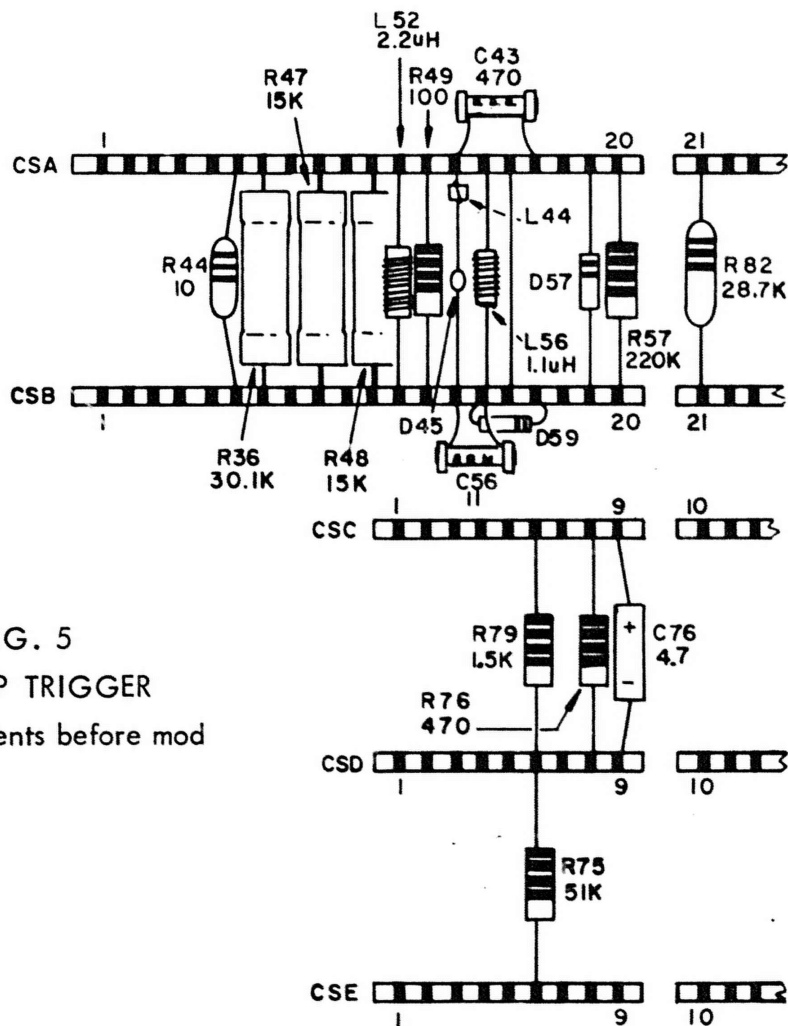


FIG. 5
B SWEEP TRIGGER
Top components before mod

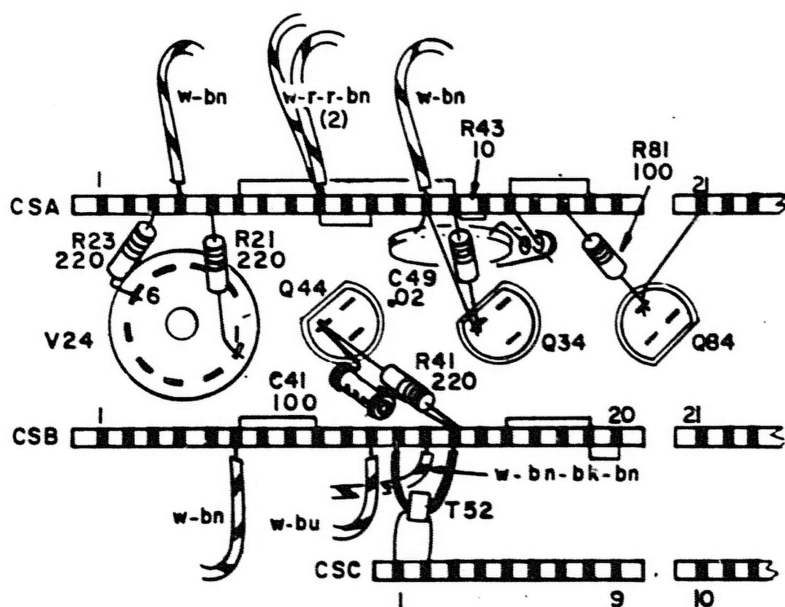


FIG. 6
B SWEEP TRIGGER
Bottom components before mod

INSTRUCTIONS (cont)

B. TIME BASE B TRIGGER CIRCUIT ONLY

Refer to Figs. 5 and 6 for steps 1 through 38.

- () 1. Remove R44, a 10Ω 1/4 W 1% resistor, located between CSA-6 and CSB-6.
- () 2. Remove R36, a 30.1 k 1 W 1% resistor, located between CSA-7 and CSB-7.
- () 3. Remove R47, a 15 k 1 W 1% resistor, located between CSA-9 and CSB-9.
- () 4. Remove R48, a 15 k 1 W 1% resistor, located between CSA-11 and CSB-11.
- () 5. Remove the #22 bare wire located between CSB-11 and CSA-12.
- () 6. Remove L52, a $2.2\mu\text{H}$ coil, located between CSA-12 and CSB-12.
- ## () 7. Remove R49, a 100Ω 1/2 W 10% resistor, located between CSA-13 and CSB-13. SAVE for later use.
- () 8. Remove L44 and D45, located between CSA-14 and CSB-14. Discard the ferramic core L44, but SAVE tunnel diode D45 for later use.
- () 9. Remove C43, a 470 pF capacitor, located between CSA-14 and CSA-17.
- () 10. Remove C56, an 11 pF capacitor, located between CSB-14 and CSB-15.
- () 11. Remove L56, a $1.1\mu\text{H}$ coil, located between CSA-15 and CSB-15. SAVE for later use.
- () 12. Remove D59, a 6075 diode, located between CSB-15 and CSB-17. SAVE for later use.
- () 13. Remove the #22 bare wire located between CSA-16 and CSB-16.
- () 14. Remove D57, a 6075 diode, located between CSA-19 and CSB-19. SAVE for later use.
- () 15. Remove R57, a 220 k 1/2 W 10% resistor, located between CSA-20 and CSB-20.
- () 16. Remove R82, a 28.7 k 1/2 W 1% resistor, located between CSA-21 and CSB-21.
- () 17. Remove R23, a 220Ω 1/4 W 10% resistor, located between CSA-3 and pin 6 of V24.
- () 18. Remove R21, a 220Ω 1/4 W 10% resistor, located between CSA-5 and pin 1 of V24.
- () 19. Remove the white-brown wire from CSB-6.
- () 20. Remove the #22 bare wire between CSB-6 and CSB-9.
- () 21. Remove the white-brown wire from CSA-4 and CSA-13, and remove from the cable.
- () 22. Remove the two white-red-red-brown wires from CSA-9. Use an ohmmeter to determine which wire connects to CSA-46 and remove it from CSA-46. Cut it off where it enters the cable. Pull the remaining wire removed from CSA-9 out of the cable near CSA-46 and trim it so that it may be soldered into CSA-46.

INSTRUCTIONS (cont)

- () 23. Remove the #22 bare wire between CSA-6 and CSA-14.
- () 24. Remove the #22 bare wire between CSA-9 and CSA-11.
- () 25. Remove the #22 bare wire between CSA-13 and the collector of Q34.
- () 26. Remove R43, a 10Ω 1/4 W 10% resistor, located between CSA-14 and the collector of Q34.
- () 27. Move one lead of C49, a $0.02\mu\text{F}$ discap, from CSA-13 to CSA-14.
- () 28. Remove the #22 bare wire between CSA-15 and CSA-16.
- () 29. Remove the #22 bare wire between CSA-17 and the ground solder lug.
- () 30. Remove the #22 bare wire between CSA-17 and CSA-19.
- () 31. Remove the #22 bare wire between CSA-21 and the base of Q84.
- () 32. Remove R81, a 100Ω 1/4 W 10% resistor, located between CSA-21 and the base of Q84.
- () 33. Remove C41 and R41, located between CSB-14 and the collector of Q44.
- () 34. Move the white-blue wire from CSB-11 to CSB-8.
- () 35. Remove toroid transformer T52, located between CSB-12, CSB-14, CSC-1, and CSC-2.
- () 36. Move the white-brown-black-brown wire from CSB-13 to CSB-10.
- () 37. Remove the #22 bare wire between CSB-16 and CSB-19.
- () 38. Remove the #22 bare wire between CSB-19 and CSB-20.

INSTRUCTIONS (cont)

FIG. 7
B SWEEP TRIGGER
Bottom components after mod

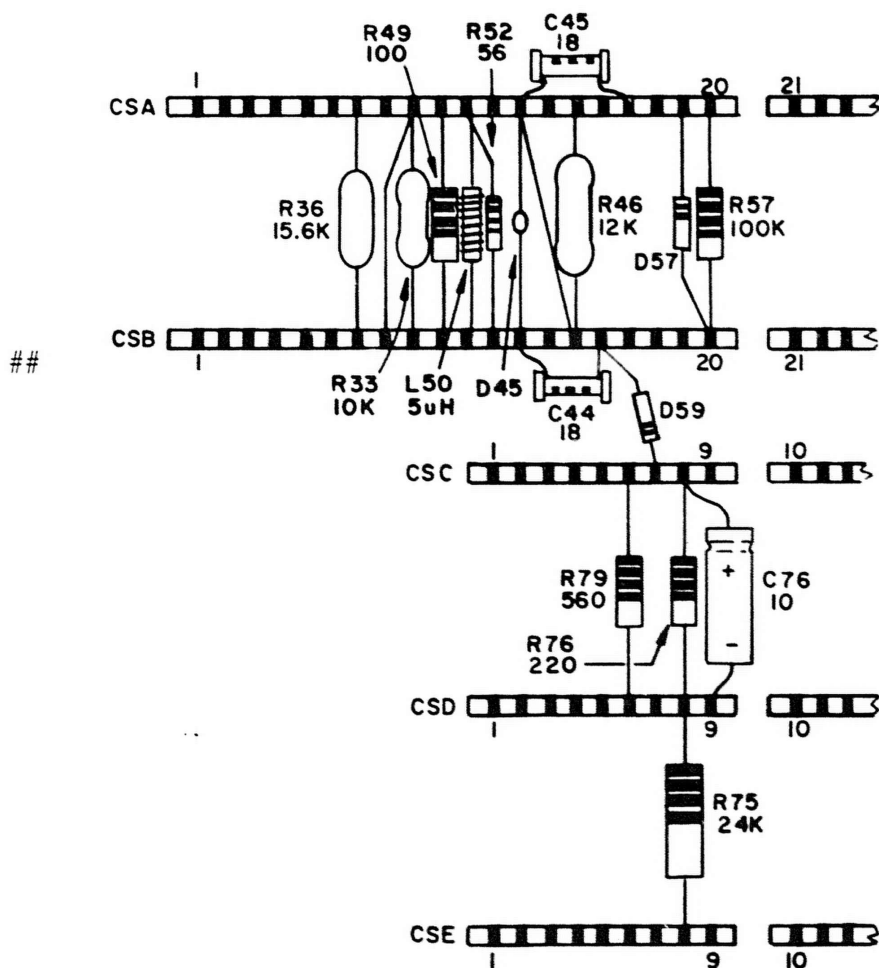
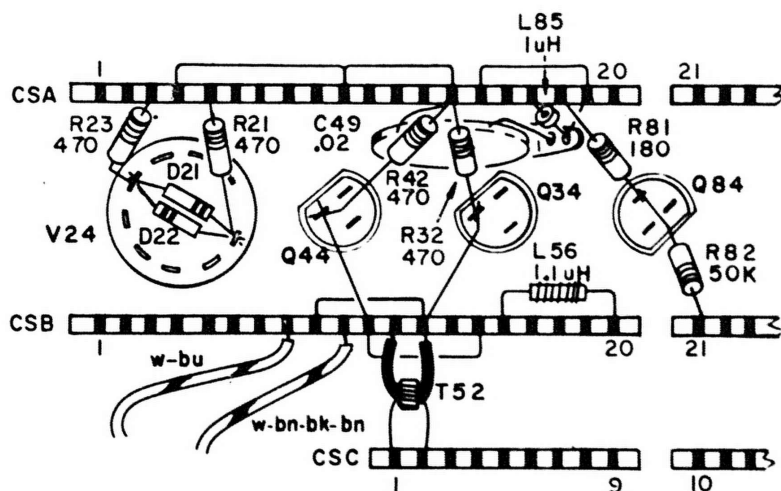


FIG. 8
B SWEEP TRIGGER
Top components after mod

INSTRUCTIONS (cont)

Refer to Figs. 7 and 8 for steps 39 through 74.

- () 39. ⊕ Replace R79, a 1.5k 1/2W 10% resistor located between CSC-6 and CSD-6, with a 560Ω 1/2W 10% resistor.
- () 40. ⊕ Replace R76, a 470Ω 1/2W 10% resistor located between CSC-8 and CSD-8, with a 220Ω 1/2W 5% resistor.
- () 41. ⊕ Replace R75, a 51k 1/2W 5% resistor located between CSD-8 and CSE-8, with a 24k 1W 5% resistor.
- () 42. ⊕ Replace C76, a 4.7μF 35V capacitor, with a 10μF 35V ±20% capacitor. C76 is located between CSC-8 and CSD-9 in Type 546/RM Oscilloscopes and between CSC-9 and CSD-9 in Type 547/RM Oscilloscopes.
- () 43. ⊕ Install two 6075 diodes (152-0075-00) between pins 1 and 6 of V24, with the emitter (striped) lead of one in pin 1 and the emitter (striped) lead of the other in pin 6.
- () 44. ⊕ Install R23, a 470Ω 1/4W 5% resistor, between CSA-3 and pin 6 of V24.
- () 45. ⊕ Install R21, a 470Ω 1/4W 5% resistor, between CSA-5 and pin 1 of V24.
- () 46. ⊕ Install a prebent #22 bare wire between CSA-4 and CSA-10.
- () 47. ⊕ Install a prebent #22 bare wire between CSA-10 and CSA-14.
- () 48. ⊕ Install a prebent #22 bare wire between CSA-15 and CSA-19.
- () 49. ⊕ Install a prebent #22 bare wire between CSB-9 and CSB-13.
- () 50. ⊕ Install a prebent #22 bare wire between CSB-11 and CSB-15.
- () 51. ⊕ Install a #22 bare wire between CSB-11 and the collector of Q44.
- () 52. ⊕ Install a #22 bare wire between CSB-13 and the collector of Q34.
- () 53. ⊕ Install a #22 bare wire between CSA-19 and the adjacent ground solder lug.
- () 54. ⊕ Install R42, a 470Ω 1/4W 5% resistor, between CSA-14 and the collector of Q44.
- () 55. ⊕ Install R32, a 470Ω 1/4W 5% resistor, between CSA-14 and the collector of Q34.
- () 56. ⊕ Install L85, a 1μH coil, between CSA-17 and the ground solder lug.
- () 57. ⊕ Install R81, a 180Ω 1/4W 5% resistor, between CSA-18 and the base of Q84.
- () 58. ⊕ Install R82, a 50k 1/2W 1% resistor, between CSB-21 and the base of Q84.
- () 59. Install L56, a 1.1μH coil removed in step 11, between CSB-16 and CSB-20.
- () 60. ⊕ Install T52, a 2T-12T toroid transformer, between CSB-12, CSB-13, CSC-1, and CSC-2. The green insulated leads should be in CSB-12 and CSB-13.
- () 61. ⊕ Install R36, a 15.6k 3W 1% resistor, between CSA-7 and CSB-7.

INSTRUCTIONS (cont)

- () 62. ⊕ Install a #22 bare wire between CSB-8 and CSA-9.
- () 63. ⊕ Install R33, a 10k 3 W 1% resistor, between CSA-9 and CSB-9.
- () 64. Install R49, a 100Ω 1/2W 10% resistor removed in step 7, between CSA-10 and CSB-10.
- () 65. ⊕ Install L50, a 5μH coil, between CSA-11 and CSB-11.
- () 66. ⊕ Install R52, a 56Ω 1/4W 5% resistor, between CSA-11 and CSB-12.
- () 67. ⊕ Install a #22 bare wire between CSA-13 and CSB-15.
- () 68. ⊕ Install C45, an 18pF 500V capacitor, between CSA-13 and CSA-17.
- () 69. ⊕ Install C44, an 18pF 500V capacitor, between CSB-13 and CSB-16.
- () 70. Install D45, the tunnel diode removed in step 8, between CSA-13 and CSB-13 with the emitter (dotted) lead in CSA-13.
- () 71. ⊕ Install R46, a 12k 5W 10% resistor, between CSA-15 and CSB-15.
- () 72. ⊕ Install R57, a 100k 1/2W 10% resistor, between CSA-20 and CSB-20.
- () 73. Install D57, a 6075 diode removed in step 14, between CSA-19 and CSB-20 with the emitter (banded) lead in CSA-19.
- () 74. Install D59, a 6075 diode removed in step 12, between CSB-16 and CSC-7 with the emitter (banded) lead in CSC-7.

Refer to Fig. 9 for steps 75 through 79.

- () 75. ⊕ Replace B Trigger Sens potentiometer R45 with a 10k 5% potentiometer.
- () 76. ⊕ Install a #22 bare wire between the middle and rear terminals of B Trigger Sens potentiometer R45.
- () 77. ⊕ Install a #22 bare wire between the front terminal of R45 and the bottom terminal of R27.
- () 78. Install the white-blue wire from CSB-8 into the middle terminal of B Trigger Sens potentiometer R45.
- () 79. Remove and discard the white-brown wire previously connected to the old R45.
- () 80. Swap the white-brown and white-red wires at the connectors on the B Sweep support post. White-brown should be on top.
- () 81. ⊕ Replace Q34 and Q44 with 151-0199-00 transistors.

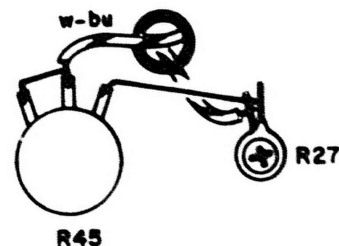


FIG. 9

THIS COMPLETES THE MODIFICATION OF THE TIME BASE B TRIGGER CIRCUIT.

INSTRUCTIONS (cont)

C. LOWER VERTICAL AMPLIFIER CHASSIS

Refer to Fig. 10.

- () 1. ⊕ Install C1165, a 27 pF 500V capacitor, in parallel with R1165 located between CSA-9 and CSB-9.
- () 2. ⊕ Install C1175, a 27 pF 500V capacitor, in parallel with R1167 located between CSA-11 and CSB-11.

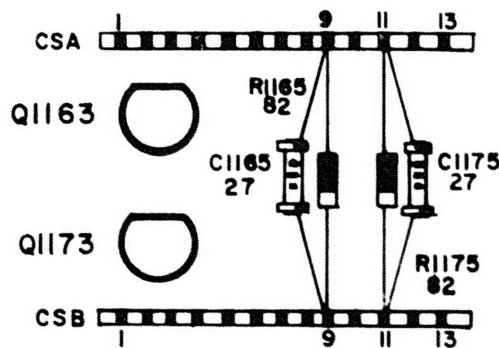


FIG. 10

LOWER VERTICAL AMPLIFIER

THIS COMPLETES THE INSTALLATION.

- () Check wiring for accuracy.
- () Place Manual insert pages in your Instruction Manual.
- () Refer to the Manual insert pages for the proper calibration procedure.
- () Replace all dust covers on the instrument.

BE:ls

INSTRUCTION MANUAL

MODIFICATION INSERT

'A' AND 'B' TRIGGER STABILITY IMPROVEMENT

TYPES 546 -- SN 100- 962 RM546 -- SN 100- 499
TYPES 547 -- SN 100-6739 RM547 -- SN 100-6739

Installed in Type _____ SN _____ Date _____

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

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GENERAL INFORMATION

This instrument has been modified with Modification Kit, PN 040-0459-00, which changed the 'A' and 'B' Sweep Trigger circuits from a single-ended to a push-pull configuration. The previously used single-ended circuit configuration was sensitive to noise, causing premature triggering to occur when in the single sweep mode of operation.

The push-pull circuit tends to cancel common mode noise originating at the input or from fluctuations occurring in the +100V power supply.

The quiescent current of the Trigger circuit tunnel diode was lowered so that it requires almost twice the amount of signal current to switch it to its high state. This has the advantage of doubling the amount of noise signal required to cause premature triggering.

CIRCUIT DESCRIPTION

This description describes the operation of the B Sweep Trigger circuit. The description also applies to the A Sweep Trigger except the circuit numbers are prefixed with a '2'. Example: V224A instead of V24A.

V24A and V24B form a switching comparator. The voltage level at which the comparator switches is set by the B TRIGGERING LEVEL control R15. V24 drives Q34 and Q44, which form a current type switching comparator. Q34 and Q44 drive tunnel diode D45 which in turn drives sweep gating tunnel diode D85.

If no triggering signal is applied to V24 the stage consisting of V24A and V24B is unbalanced. One section (which one depends upon the setting of the B SLOPE and B TRIGGERING LEVEL controls) is conducting more current than the other. The voltages at the plates of V24A and V24B should therefore be different. However, diodes D21 and D22 clamp the two plate voltages to within 0.3 volt of each other, with the plate of the section which is conducting the most current being the most negative.

The second stage, made up of Q34 and Q44, is also unbalanced. The transistor whose base is the most negative conducts most of the current supplied by R36. This current is not sufficient to cause the conducting transistor to saturate. The conducting transistor merely acts as a constant current source.

Tunnel diode D45 is biased to its low voltage state by current through R32, R33, R45, and R42. If the comparator stages are unbalanced in such a manner as to cause Q34 to conduct, an additional current flows through D45. This additional current biases D45 to its high voltage state.

When the current through D45 reaches a total of 10mA the voltage across D45 will suddenly increase to approximately 0.5 volts. This sudden voltage change is coupled to the sweep gating tunnel diode D85 by C44, D59, and C45. C44 differentiates the triggering signal which provides a fast rising pulse for D85. L56 and the low impedance of conducting diode D57 decrease the fall time of the triggering pulse. D59 ensures that D85 is only triggered when D45 turns on, and not when D45 turns off.

CALIBRATION

Substitute the following steps for the Trigger circuits calibration procedures.

12. Adjust A TRIGGERING LEVEL CENTERING R225 and A TRIGGERING SENS R245 (Course Adjustment) -- A Sweep Trigger

- a. Set the AMPLITUDE CALIBRATOR switch to .1 VOLTS.

NOTE: A 100mV peak-to-peak signal is used in this portion of the procedure as an adjustment aid only and is not intended to be interpreted as a trigger-amplitude specification that contradicts the one given in the Characteristics section of this manual.

- b. Disconnect the coaxial cable from the Ext Input connector on the TU-7 and connect it to the oscilloscope A TRIGGER INPUT connector.
- c. Set the front panel controls of the oscilloscope to the positions shown in Table 1 (some of the controls will not need to be changed since they are already set properly).

TABLE 1

Controls not mentioned may be left in any position.

INTENSITY	As required for a visible trace
FOCUS	As required for a focused trace
ASTIGMATISM	As required for a focused trace
SCALE ILLUM	As required for a visible graticule
HORIZONTAL POSITION	As required to position trace to the left edge of the graticule
VERNIER (HORIZONTAL POSITION)	Midrange
AMPLITUDE CALIBRATOR	.1 VOLTS
HORIZONTAL DISPLAY	A
SWEEP MAGNIFIER	X1 OFF
Single Sweep Switch	NORMAL
Time Base A	
TRIGGERING LEVEL	0
TIME/CM	.5mSEC
VARIABLE (TIME/CM)	CALIBRATED
TRIGGERING	
MODE	TRIG
SLOPE	+
COUPLING	AC
SOURCE	EXT

- d. Locate the junction of R217, C218, and R218. Connect a short jumper clip lead between the junction and ground. This jumper disables the A TRIGGERING LEVEL control.
- e. Locate the junction of R252 and L250. Connect a 10X probe from the test oscilloscope to this junction.

CALIBRATION (cont)

12.
 - f. Preset the A TRIGGERING LEVEL CENTERING R225 control to midrange and A TRIG SENS R245 control fully clockwise.
 - g. Adjust the A TRIGGERING LEVEL CENTERING R225 control for a stable display of square waves on the test oscilloscope (the square waves will have an amplitude of approximately 200mV peak-to-peak). Note that there is a range in the adjustment of R225 through which the square wave display will remain stable. Set R225 approximately in the middle of this range.
13. Adjust A TRIGGERING LEVEL CENTERING R225 and A TRIGGER SENS R245 (Fine Adjustment) -- A Sweep Trigger
 - a. Adjust the A TRIGGER LEVEL CENTERING R225 control for a stable square wave display on the test oscilloscope with the A SLOPE switch set to +. Then set the A SLOPE switch to - and readjust R225. Continue alternating the position of the A SLOPE switch and adjusting R225 until the test oscilloscope square wave display is stable at both settings of the A SLOPE switch.
 - b. Rotate the A TRIGGER SENS R245 control counter-clockwise until the square wave on the test oscilloscope breaks up. Leave R245 set at this point.
 - c. Readjust the A TRIGGER LEVEL CENTERING R225 control for a stable square wave display at both settings of the A SLOPE switch. Note that there is a range in the adjustment of R225 over which a stable test oscilloscope square wave display will be obtained. Set R225 in the middle of this range.
 - d. Set the AMPLITUDE CALIBRATOR switch to 50mVOLTS. If the test oscilloscope square wave display remains stable at either or both settings of the A SLOPE switch, return the AMPLITUDE CALIBRATOR switch to .1 VOLTS and repeat steps (b) and (c). If not, continue to the next step.
 - e. Disconnect the 10X probe from the junction of R252 and L250.
14. Adjust A INT TRIG DC LEVEL R209 -- A Sweep Trigger
 - a. Disconnect the coaxial cable from the A TRIGGER INPUT connector and move it to the Ext Input connector on the TU-7.
 - b. Set the TU-7 front panel controls as follows:

Variable	Fully Clockwise
Vertical Position	Centered
Test Function	Low Load
 - c. Set the AMPLITUDE CALIBRATOR switch to .5VOLTS and the A SOURCE switch to NORM INT.
 - d. Adjust the TU-7 Variable control so that the displayed waveform amplitude is 5 mm peak-to-peak.
 - e. Using the TU-7 Vertical Position control, center the display for equal amplitude above and below the center graticule line.
 - f. Set the A COUPLING switch to DC.
 - g. Adjust the A INT TRIG DC LEVEL R209 control to obtain a stable display. (With the A SLOPE switch set to +, the sweep trace should start on the positive-going rise of the calibrator waveform).

CALIBRATION (cont)

15. Check Internal Triggering -- A Sweep Trigger

- a. Set the A COUPLING switch to AC.
- b. Adjust the TU-7 Variable control for a display amplitude of 2 mm peak-to-peak.
- c. Disconnect the jumper clip lead which is grounding the junction of R217, C218 and R218.
- d. Adjust the A TRIGGERING LEVEL control to obtain a stable display.
- e. Check for stable time-base triggering on the - slope when the A SLOPE switch is set to - and stable triggering on the + slope when the A SLOPE switch is set to +. If necessary, readjust the A TRIGGERING LEVEL control to obtain a stable display when making the check for each A SLOPE switch position.

16. Check A TRIGGERING LEVEL Control Zero Set -- A Sweep Trigger

- a. Check that the A TRIGGERING LEVEL control is set to 0 and the A SLOPE switch is set to +.
- b. Connect the VOM between the R217, C218, R218 junction and ground.
- c. Carefully turn the A TRIGGERING LEVEL control to obtain a reading of exactly zero volts on the VOM.
- d. If the A TRIGGERING LEVEL knob is set properly on the control shaft, the white dot on the knob should be directly below the 0 on the front panel. If the white dot does not point exactly to 0, disconnect the VOM, loosen the setscrew in the knob and reposition the knob.
- e. After tightening the knob, set the knob to 0, reconnect the VOM, and recheck the reading. The VOM reading should be zero when the A TRIGGERING LEVEL knob is set to 0.

NOTE: A dc-coupled test oscilloscope with a X10 probe can be used in place of the VOM to perform step 16.

As another method, the TRIGGERING LEVEL knob can be checked for correct position by repeating step 15-e. This method does not require the use of a test oscilloscope or VOM. When performing step 15-e, the TRIGGERING LEVEL knob should point to 0 when stable triggering is obtained.

- f. Disconnect the VOM or X10 probe, whichever is used.

17. Adjust B TRIGGER LEVEL CENTERING R25 and B TRIGGER SENS R45 (Coarse Adjustment) -- B Sweep Trigger

- a. Set the AMPLITUDE CALIBRATOR switch to .1 VOLTS.

NOTE: A 100mV peak-to-peak signal is used in this portion of the procedure as an adjustment aid only and is not intended to be interpreted as a trigger-amplitude specification that contradicts the one given in the Characteristics section of this manual.

- b. Disconnect the coaxial cable from the TU-7 Ext Input connector and connect it to the oscilloscope B TRIGGER INPUT connector.
- c. Set the HORIZONTAL DISPLAY switch to B.
- d. Set the B TRIGGERING LEVEL control to 0 and the B SOURCE switch to EXT. Check that the B MODE switch is set to TRIG and that the B COUPLING switch is set to AC.

CALIBRATION (cont)

17.
 - e. Locate the junction of R17, C18 and R18. Connect a short jumper clip lead between the junction and ground. This jumper disables the B TRIGGERING LEVEL control.
 - f. Locate the junction of R52 and L50. Connect a 10X probe from the test oscilloscope to this junction.
 - g. Preset the B TRIGGERING LEVEL CENTERING R25 control to midrange and B TRIG SENS R45 control fully clockwise.
 - h. Adjust the B TRIGGERING LEVEL CENTERING R25 control for stable display of squarewaves on the test oscilloscope (the squarewaves will have an amplitude of approximately 200 mV peak-to-peak). Note that there is a range in the adjustment of R25 through which the squarewave display will remain stable. Set R25 approximately in the middle of this range.
18. Adjust B TRIGGER LEVEL CENTERING R25 and B TRIGGER SENS R45
(Fine Adjustment) -- B Sweep Trigger
 - a. Adjust the B TRIGGER LEVEL CENTERING R25 control for a stable squarewave display on the test oscilloscope with the B SLOPE switch set to +. Then set the B SLOPE switch to - and readjust R25. Continue alternating the position of the B SLOPE switch and adjusting R25 until the test oscilloscope squarewave display is stable at both settings of the B SLOPE switch.
 - b. Rotate the B TRIGGER SENS R45 control counterclockwise until the squarewave on the test oscilloscope breaks up. Leave R45 set at the point where the squarewave breaks up.
 - c. Readjust the B TRIGGER LEVEL CENTERING R25 control for a stable squarewave display at both settings of the B SLOPE switch. Note that there is a range in the adjustment of R25 over which a stable test oscilloscope squarewave display will be obtained. Set R25 in the middle of this range.
 - d. Set the AMPLITUDE CALIBRATOR switch to 50 mVOLTS. If the test oscilloscope squarewave display remains stable at either or both settings of the B SLOPE switch, return the AMPLITUDE CALIBRATOR switch to .1 VOLTS and repeat steps (b) and (c). If not, continue to the next step.
 - e. Disconnect the 10X probe from the junction of R52 and L50.
19. Adjust B INT TRIG DC LEVEL R9 -- B Sweep Trigger
 - a. Disconnect the coaxial cable from the B TRIGGER INPUT connector and move it to the Ext Input connector on the TU-7.
 - b. Set the AMPLITUDE CALIBRATOR switch to .5 VOLTS and the B SOURCE switch to NORM INT.
 - c. Adjust the TU-7 Variable control so that the displayed waveform amplitude is 5 mm peak-to-peak.
 - d. Using the TU-7 Vertical Position control, center the display for equal amplitude above and below the center graticule line.
 - e. Set the B COUPLING switch to DC.
 - f. Adjust the B TRIG DC LEVEL R9 control to obtain a stable display. (With the B SLOPE switch set to +, the sweep trace should start on the positive-going rise of the calibrator waveform).

CALIBRATION (cont)

20. Check Internal Triggering -- B Sweep Trigger
 - a. Set the B COUPLING switch to AC.
 - b. Adjust the TU-7 Variable control for a display amplitude of 2 mm peak-to-peak.
 - c. Disconnect the jumper clip lead which is grounding the junction of R17, C18, and R18.
 - d. Adjust the B TRIGGERING LEVEL control to obtain a stable display.
 - e. Check for stable time-base triggering on the - slope when the B SLOPE switch is set to - and stable triggering on the + slope when the B SLOPE switch is set to +. If necessary, readjust the B TRIGGERING LEVEL control to obtain a stable display when making the check for each B SLOPE switch position.
21. Check B TRIGGERING LEVEL control Zero Set -- B Sweep Trigger
 - a. Check that the B TRIGGERING LEVEL control is set to 0 and the SLOPE switch is set to +.
 - b. Connect the VOM between the R17, C18, R18 junction and ground.
 - c. Carefully adjust the B TRIGGERING LEVEL control to obtain a reading of exactly zero volts on the VOM.
 - d. If the B TRIGGERING LEVEL knob is set properly on the control shaft, the white dot on the knob should be directly below the 0 on the front panel. If the white dot does not point exactly to 0, disconnect the VOM, loosen the setscrew in the knob, and reposition the knob.
 - e. After tightening the knob, set the knob to 0, reconnect the VOM, and repeat steps (c) and (d).

NOTE: A DC-coupled test oscilloscope with a X10 probe can be used in place of the VOM to perform this step, if desired.

As another method, the TRIGGERING LEVEL knob can be checked for correct position by repeating step 20-e. This method does not require the use of a test oscilloscope or VOM. When performing step 20-e, the TRIGGERING LEVEL knob should point to 0 when stable triggering is obtained.

- f. Disconnect the VOM or X10 probe, whichever is used.
- g. Disconnect the coaxial cables, T connector, and set the AMPLITUDE CALIBRATOR switch to OFF.

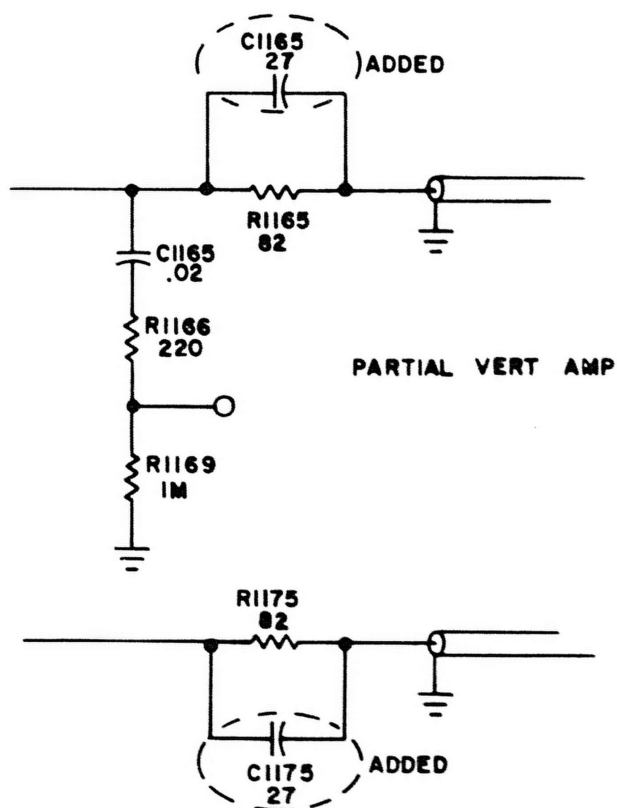
ELECTRICAL PARTS LIST (cont)

Ckt. No.	Part Number	Description				
RESISTORS						
R21	315-0471-00	470Ω	1/4 W	5%		
R23	315-0471-00	470Ω	1/4 W	5%		
R32	315-0471-00	470Ω	1/4 W	5%		
R33	308-0301-00	10 k	3 W	1%	WW	
R36	308-0320-00	15.6 k	3 W	1%	WW	
R41	Delete					
R42	315-0471-00	470Ω	1/4 W	5%		
R43	Delete					
R44	Delete					
R45	311-0405-00	10 k		5%	WW	variable
R46	308-0310-00	12 k	5 W	1%	WW	
R47	Delete					
R48	Delete					
R52	315-0560-00	56Ω	1/4 W	5%		
R57	302-0104-00	100 k	1/2 W	10%		
R75	303-0243-00	24 k	1 W	5%		
R76	301-0221-00	220Ω	1/2 W	5%		
R79	302-0561-00	560Ω	1/2 W	10%		
R81	315-0181-00	180Ω	1/4 W	5%		
R82	323-0636-00	50 k	1/2 W	1%		
R221	315-0471-00	470Ω	1/4 W	5%		
R223	315-0471-00	470Ω	1/4 W	5%		
R232	315-0471-00	470Ω	1/4 W	5%		
R233	308-0301-00	10 k	3 W	1%	WW	
R236	308-0320-00	15.6 k	3 W	1%	WW	
R241	Delete					
R242	315-0471-00	470Ω	1/4 W	5%		
R243	Delete					
R244	Delete					
R245	311-0076-00	10 k	2 W	10%		variable
R246	308-0310-00	12 k	5 W	1%	WW	
R247	Delete					
R248	Delete					
R252	315-0560-00	56Ω	1/4 W	5%		
R256	301-0304-00	300 k	1/2 W	5%		
R257	Delete					
R275	303-0243-00	24 k	1 W	5%		
R276	301-0221-00	220Ω	1/2 W	5%		
R279	302-0561-00	560Ω	1/2 W	10%		
R281	315-0181-00	180Ω	1/4 W	5%		
R282	323-0636-00	50 k	1/2 W	1%		

TRANSFORMERS

T52	120-0500-00	Toroid	2T-12T	bifilar
T252	120-0500-00	Toroid	2T-12T	bifilar

SCHEMATICS



ELECTRICAL PARTS LIST

Values fixed unless marked variable.

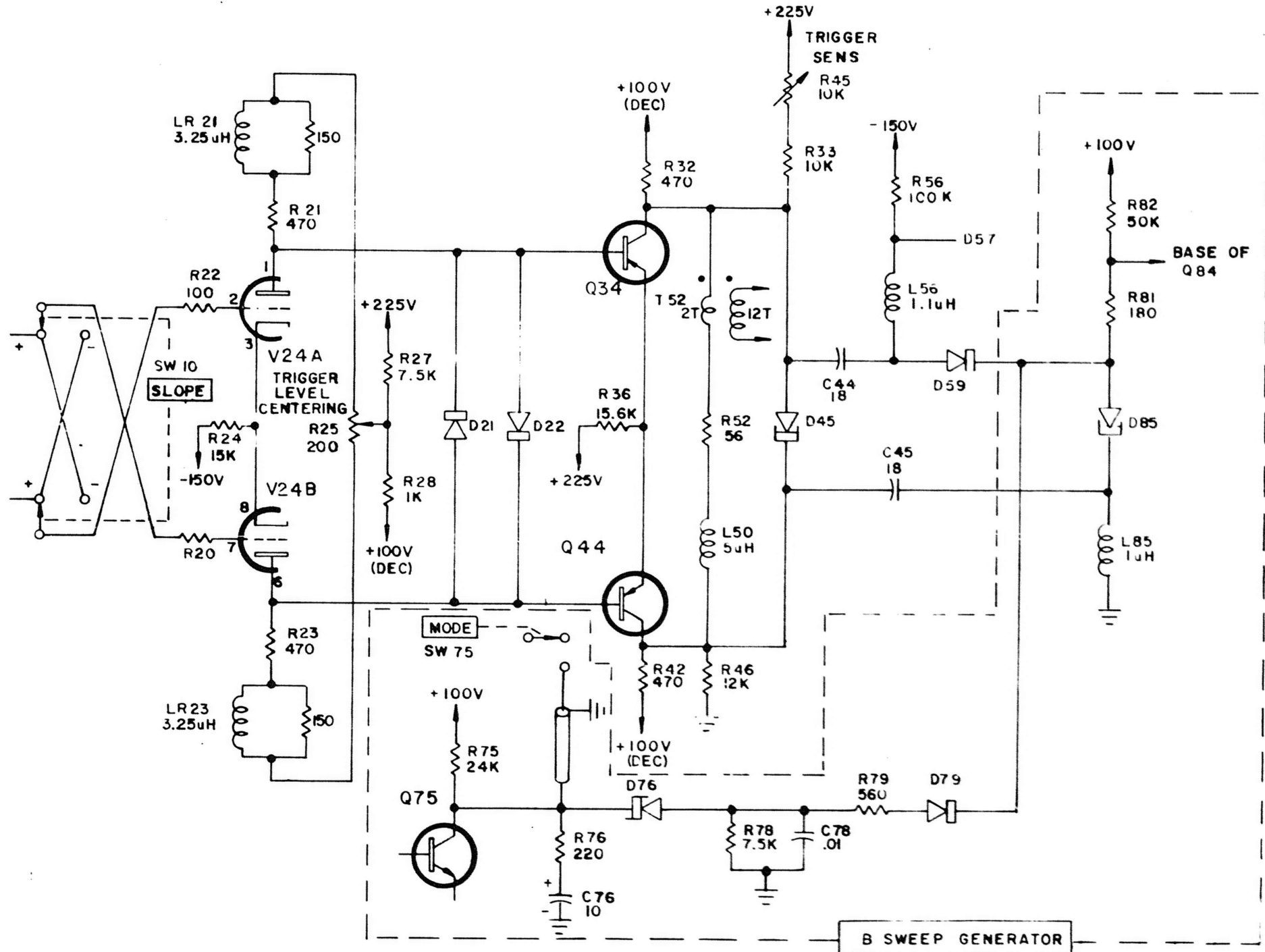
Ckt. No.	Part Number	Description				
CAPACITORS						
C41	Delete					
C43	Delete					
C44	281-0578-00	18 pF	500 V	±5%		
C45	281-0578-00	18 pF	500 V	±5%		
C56	Delete					
C76	290-0175-00	10 μF	35 V	±20%	EMT	
C241	Delete					
C243	Delete					
C244	281-0578-00	18 pF	500 V	±5%		
C245	281-0578-00	18 pF	500 V	±5%		
C256	Delete					
C276	290-0175-00	10 μF	35 V	±20%	EMT	
C1165	281-0512-00	27 pF	500 V			
C1175	281-0512-00	27 pF	500 V			
DIODES						
D21	152-0075-00	6075				
D22	152-0075-00	6075				
D221	152-0075-00	6075				
D222	152-0075-00	6075				
COILS						
L44	Delete					
L50	108-0146-00	5 μH				
L52	Delete					
L85	108-0410-00	1 μH				
L244	Delete					
L250	108-0146-00	5 μH				
L252	Delete					
L285	108-0410-00	1 μH				
TRANSISTORS						
Q34	151-0199-00	MPS-3640				
Q44	151-0199-00	MPS-3640				
Q234	151-0199-00	MPS-3640				
Q244	151-0199-00	MPS-3640				

040-0459-00



B SWEEP TRIGGER

SCHEMATICS (cont)



TUNNEL DIODES REPLACED TO INCREASE POWER RATING

Effective Prod SN 11890

Usable in SN 100-11889

No trigger. Tunnel diodes are being over-dissipated when operating at high ambient temperatures with tolerance build up.

D45 and D245 were replaced with higher wattage rated diodes.

Parts Removed:

D245	152-0154-00	Diode, germanium tunnel
D45		

Parts Added:

D245	152-0140-01	Diode, tunnel
D45		

INSTALLATION:

Parts Required: See 'Parts Added'.

- a) Replace D245, located on the ceramic strips above Q234, with a 152-0140-01 tunnel diode.
- b) Replace D45, located on the ceramic strips above Q234, with a 152-0140-01 tunnel diode.

'B' SWEEP TO 'A' SWEEP START MATCHING AT 50MHz IMPROVED

Effective Prod SN 1010

180-RM

Usable in SN 100-1009

100- 179

The Sweep start matching at 50MHz was, in some cases, exceeding its 1cm specifications. Increasing the value of C98 assures the sweep starting within 1cm, when operating in the ALT mode.

Parts Removed:

C98	281-0557-00	Capacitor, 1.8pF
-----	-------------	------------------

Parts Added:

C98	281-0604-00	Capacitor, 2.2pF
-----	-------------	------------------

INSTALLATION

Parts Required: See 'Parts Added.'

Replace C98 on the 'B' Sweep chassis, located just beneath C99, a variable ceramic capacitor. C99 is the only variable ceramic capacitor on the 'B' Sweep chassis.

'B' SWEEP GENERATOR UNBLANKING GATE DIODE REPLACED

Effective Prod SN 1160

180-RM

Usable in SN 100-1159

100- 179

Diode D182, 1N3728, was replaced with a 1N3605 diode. Vendor could no longer supply diode to the required specs. Components are changed to meet circuit requirements.

Parts Replacement Kit 050-0225-00 is available to facilitate the replacement of D182 in premodified instruments.

Parts Removed:

D182	152-0128-00	Diode, 1N3728
R481	301-0154-00	Resistor, 150k 1/2W 5%
R181	301-0363-00	Resistor, 36k 1/2W 5%
R182	302-0274-00	Resistor, 270k 1/2W 10%

Parts Added:

D182	152-0141-00	Diode, 1N3605
R481	304-0273-00	Resistor, 37k 1W 10%
R181	323-0280-00	Resistor, 8.06k 1/2W 1%
R182	323-0356-00	Resistor, 49.9k 1/2W 1%

INSTALLATION

Parts Required: 050-0225-00

Parts Replacement Kit



product modification

050-0225-00

Type 547/RM547

DIODE REPLACEMENT

For the following Tektronix Oscilloscopes:

Type 547 Serial Numbers 100-1159
RM547 Serial Numbers 100- 179

This Parts Replacement Kit, PN 050-0225-00, replaces diode PN 152-0128-00, 1N3728, which is no longer available, with diode PN 152-0141-02, a 1N4152

Use of the new diode requires that some of the associated component values be changed.

NOTE: If this kit has been installed, disregard the instructions as PN 152-0141-02 is a direct replacement.

PARTS LIST

Quantity	Part Number	Description
1 ea	152-0141-02	Diode, 1N4152
1 ea	214-0210-00	Spool, w/3 ft. of silver-bearing solder
1 ea	304-0273-00	Resistor, comp, 27k 1W 10%
1 ea	323-0280-00	Resistor, prec, 8.06k 1/2W 1%
1 ea	323-0356-00	Resistor, prec, 49.9k 1/2W 1%

INSTRUCTIONS

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

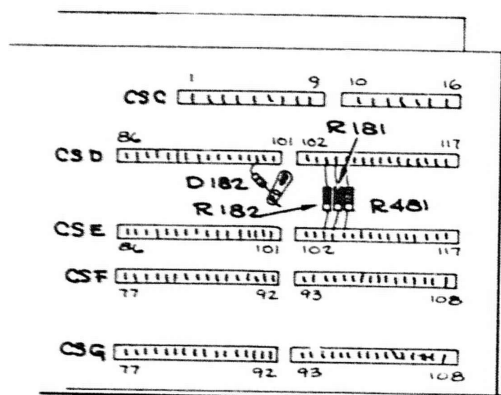
Replace the following components on the 'A' Sweep chassis with the components from the kit. Use the drawing for the locations.

- () D182 with a 1N4152 diode between CSD-99 and a solder lug below it. The banded end goes toward CSD-99.
- () R182 with a precision 49.9k 1/2W 1% resistor between CSD-104 and CSE-104.
- () R181 with a precision 8.06k 1/2W 1% resistor between CSD-105 and CSE-105.
- () R481 with a composition 27k 1W 10% resistor between CSD-106 and CSE-106.

THIS COMPLETES THE INSTALLATION.

- () Check wiring for accuracy.
- () Correct your Instruction Manual parts list and schematics as necessary.

JT:ls



'B' SWEEP BRIGHTNESS CONTROL RANGE INCREASED AND CONTROL KNOB REPLACED

Effective Prod SN 1970
250-RM

Usable in SN 100-1969
100- 249

The BRIGHTNESS control knob is replaced with a longer type knob for improved operational convenience. The BRIGHTNESS control range is increased about 10V by changing R185 and R187 values in the control circuit.

This increase in control range enables the equalizing of brightness of A and B traces up to about 100,000:1 difference in sweep rates and/or duty cycle as compared to present limit of about 20,000:1.

Parts Removed:

R185	309-0447-00	Resistor, 6.19M
R187	309-0448-00	Resistor, 9.31M
	366-0261-00	Knob, gray DELRIN®

Parts Added:

*R185	309-0451-00	Resistor, 3.92M 1/2W
R187	309-0447-00	Resistor, 6.19M 1/2W
*	366-0283-00	Knob, gray DELRIN

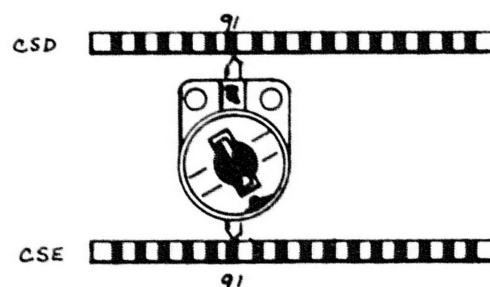
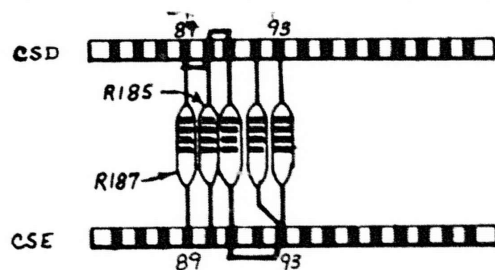
INSTALLATION

Parts Required: See 'Parts Added' with asterisk.

DELRIN, Reg. TM of E. I. du Pont de Nemours & Co., Inc.

INSTALLATION (continued)

- a) Replace BRIGHTNESS control on front panel by pulling off present one and pushing on the new long type knob.
- b) Temporarily remove C186, a variable capacitor, between CSD-91 and CSE-91.
- c) Unsolder R187 between CSD-89 and CSE-89.
- d) Relocate R185 from CSD-90/CSE-90 to CSD-89/CSE-89. This will now be R187.
- e) Install new R185, 3.92M resistor, between CSD-90 and CSE-90. Dress resistor down like old R185.
- f) Reinstall C186 between CSD-91 and CSE-91.



'B' SWEEP UNBLANKING CF CUTOFF ELIMINATED WITH ADDED PROTECTIVE DIODES

Effective Prod SN 1970
250-RM

Usable in SN 100-1969
100- 249

The addition of D194 in the 'B' Sweep Unblanking CF V193B, prevents it from being cut off by the 'A' Sweep unblanking waveform when BRIGHTNESS control is set at maximum intensity.

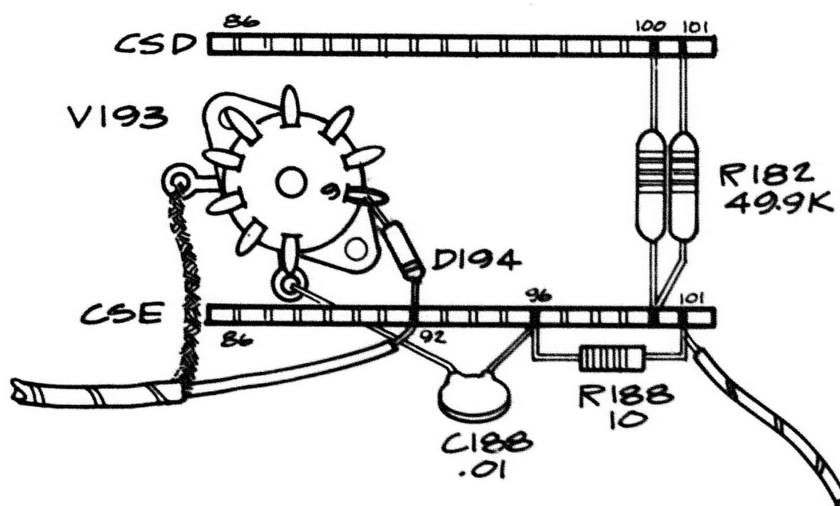
Parts Added:

D194 152-0061-00 Diode, silicon 6061

INSTALLATION

Parts Required: See 'Parts Added.'

- a) Temporarily remove C186, a variable capacitor, between CSD-91 and CSE-91.
- b) Unsolder the three resistors at CSE-91, -92, and -93.
- c) Remove bare wire strap between CSE-91, -92, and -93.
- d) Install a box strap between CSE-91 and CSE-93 (outside).
- e) Relocate the gray-orange-orange coax from pin 9 of V193B to CSE-92.
- f) Install D194, silicon 6061 diode, between CSE-92 and pin 9 of V193 (cathode to CSE-92).
- g) Reinstall R186 (750k) to CSE-91.
- h) Solder R183 (41.3k) and R184 (46.4k) to CSE-93.
- i) Reinstall C186, a variable capacitor, between CSE-91 and CSD-91.



'B' SWEEP GENERATOR DIODE ADDED TO PROTECT DISCONNECT DIODE

Effective Prod SN 3130 modified out of sequence:				Usable in SN 100-3129			
2142	2515-7	2595-6	2709-9	2782	2848	2951	3039-42
2342	2527	2611	2724	2784	2861	2957-8	3044-7
2344	2540	2618	2726-8	2789-90	2870	2990	3051
2376	2542	2636-7	2730-3	2796	2873	2997	3053
2378	2544	2660-2	2739	2798	2880	2999	3067
2383-5	2546-8	2664-9	2741	2801	2882	3005	3074-7
2388	2562	2681	2847	2808	2884	3010	3082-3
2395	2570	2683	2749	2810	2886	3012-4	3085
2412	2573	2690	2751-4	2812-3	2912	3016-20	3111
2420	2575-6	2692	2759	2822	2914-5	3028-9	3113-5
2457	2581	2698	2770	2830	2918-9	3032	3117
2468	2583-4	2702-3	2773	2832	2933	3034-5	3123-4
2470	2587	2705-6	2776-7	2835	2936	3037	3128
2475	2592						

Excessive 'B' sweep jitter, excessive 'B' sweep non-linearity, or excessive Delay Trigger jitter occurred. D86 was being subjected to excessive reverse voltage transients which were generated by switching-in uncharged timing capacitors when V91 (Miller tube) filaments were cold or not fully warmed up.

A diode was added from the grid (pin 1) of the Miller tube V91 and ground (cathode to ground) to protect D86 from transients.

Parts Added:

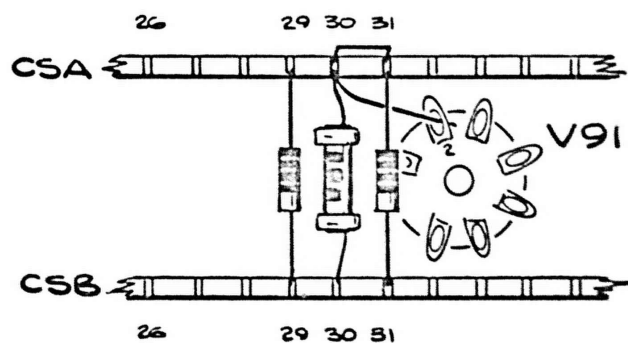
D90 152-0165-00 Diode, Tek-made special

INSTALLATION

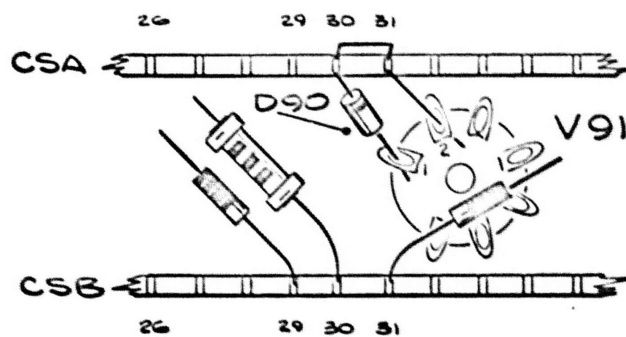
Parts Required: See 'Parts Added.'

INSTALLATION (continued)

- a) Lift components above V91 at CSA-29, -30, and -31.
- b) Relocate the wire strap at CSA-30 to -31.
- c) Install D90 between CSA-30 and pin 1 of V91. (Banded end to CSA-30.)
- d) Reinstall components to CSA-29, -30, and -31.



BEFORE



AFTER

SWEEP TRIGGER GENERATOR AMPLIFIER TUBES CHANGED
TO CHECKED, AGED, AND BALANCED TUBES

Effective Prod SN 7960

The aged 6DJ8's used as trigger amplifiers were changed to 6DJ8's, aged 75 hours, and balanced.

Parts Removed:

V24	157-0122-00	Tube, checked, 154-0187-00 (6DJ8) aged 75 hours
V224		

Parts Added:

V24	157-0125-00	Tube, 154-0187-00 (6DJ8) aged 75 hours and
V224		balanced
	334-1085-00	Tag, label: 1 x 5/8 alum. w/adhesive backing

'B' SWEEP CHASSIS WIRE MODIFICATION INCORPORATED TO ELIMINATE SWEEP FREE-RUNNING

Effective Prod SN 8420

'B' Sweep will free-run when the TRIGGER MODE switch is in the trigger position, no signal applied. 'B' Sweep trigger circuit is oscillating.

The wire strap to the collector of Q44 was relocated, and the leads to C44 and C45 were shortened.



product modification

050-0479-01
M15344
M14338
Type 544/RM, 546/R546
547/RM, 556/R556

DISCONNECT DIODE REPLACEMENT

For the following TEKTRONIX® Type Oscilloscopes:

Type 544	Serial Numbers	100-2239
Type R544	Serial Numbers	100-2239
Type 546	Serial Numbers	100-2409
Type R546	Serial Numbers	100-2409
Type 547	Serial Numbers	100-12479
Type R547	Serial Numbers	100-12479
Type 556	Serial numbers	100-2000 w/exceptions
Type R556	Serial number	100-2465 w/exceptions

Gallium Arsenide diodes, PN 152 0161-00, are no longer available and are replaced with a transistor and associated circuitry in the circuit positions listed below. This kit provides parts to modify only one sweep; order two kits to modify both sweeps in the 546, 547 and 556.

Type 544/R	D285	
Type 546/R	D86	D286
Type 547/R	D86	D286
Type 556/R	D640	D840

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions and use the components contained herein as direct replacements.

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	136-0235-00	Socket, 6-contact
1 ea	151-0190-00	Transistor, 2N3904
1 ea	101-0277-00	Transistor, silicon RCA 2N310
1 ea	152-0165-00	Diode, silicon
1 ea	152-0185-00	Diode, silicon
1 ea	214-0210-00	Spool w/5 ft. silver-bearing solder
1 ea	308-0400-00	Resistor, WW 18k 5W 5%
1 ea	315-0272-00	Resistor, comp. 2.7k 1/4W 5%
1 ea	315-0102-00	Resistor, comp. 1k 1/4W 5%
1 ea	354-0234-00	Ring, Transistor Socket mounting
1 ea		Tubing, #20 black 162-0604-00 4 in.
1 ea		Wire, #22 solid 176-0122-00 bare 12 in.
1 ea	1-910D	Tag, MODIFIED INSTRUMENT, gummed back

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

This kit is divided into four parts:

A.	Types 544, RM544 546, RM546 547, RM547	D285	Page 5
B.	Types 546, RM546 547, RM547	286	Page 9
C.	Types 556, RM556	D640	Page 13
D.	Types 556, RM556	D840	Page 17

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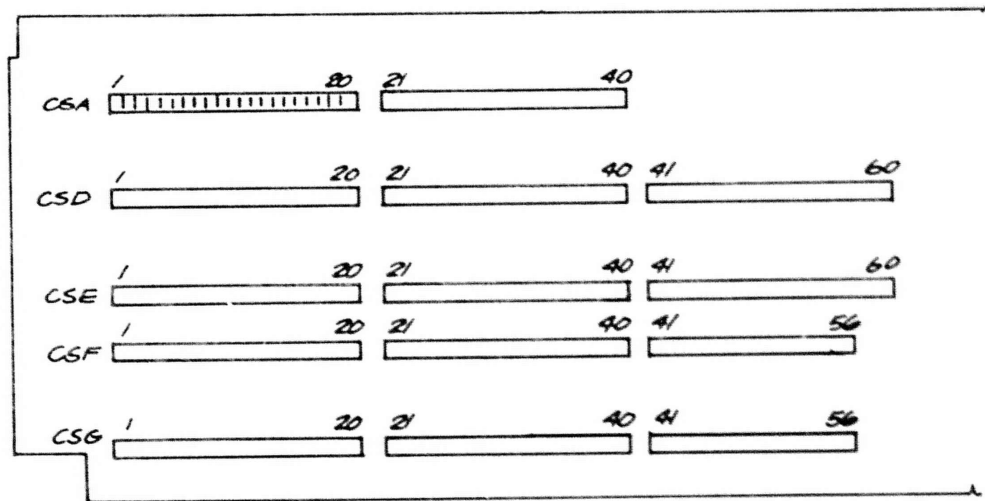
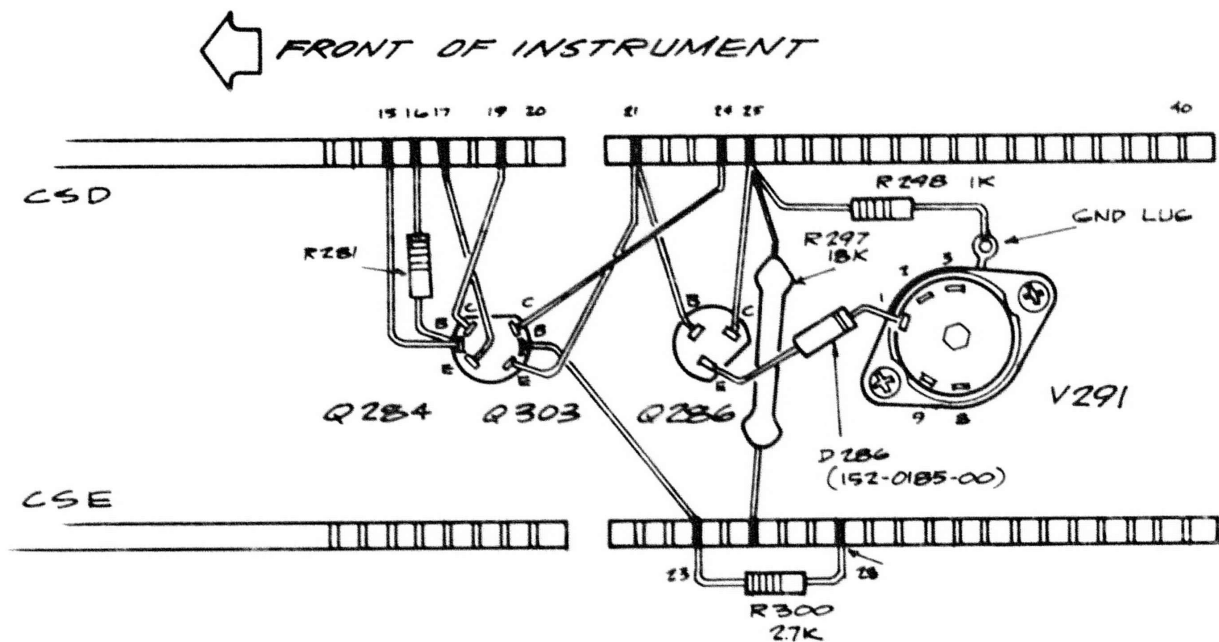


FIG. 1

A. TYPE 544, RM544 D286
546, RM546
547, RM547

Refer to Fig. 1 for ceramic strip locations.

- () 1. Unsolder D286, a diode connected between CSD-22 (CSD-21 in type 544) and CSD-25, or pin 1 of V291.
- () 2a. If D286 was connected to pin 1 of V291, relocate the end of the resistor from CSD-25 to CSD-26 and remove the bare wire between CSD-25 and CSD-26.
- () 2b. If D286 was soldered to CSD-25, remove the bare wire between CSD-25 and pin 1 of V291.
- () 3. Remove the bare wire between CSD-24 and Q303 collector.
- () 4. Remove the bare wire between CSD-21 and Q303 emitter.
- () 5. Remove the bare wire between CSE-23 and Q303 base.
- () 6. Replace the bare wire between CSE-23 and CSE-28 with the 2.7k resistor (R300) from the kit.
- () 7. Unsolder the leads from Q284 socket.
- () Remove Q284, 151-0108-00 and replace the three-pin Q284 socket with the six-pin socket from the kit. The key goes toward CSD. In early instruments with screw-mounted transistor sockets, use the plastic transistor socket mounting ring from the kit. (See Fig. 2)
- () 8. Relocate the leads from CSE-26 to CSE-25 and the leads from CSE-25 to CSE-26.




NOTE: THIS VIEW IS FROM TRANSISTOR SIDE
 OF CHASSIS
 FRONT OF INSTRUMENT 

FIG. 3

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- () 9. Remove the "Q303" silkscreening from both sides of the chassis using lacquer thinner or similar solvent. When modification is completed Q303 will share the Q284 socket, and Q286 will occupy the former Q303 socket. The chassis may be marked accordingly if desired. (See Figs 2 and 3).

REFER TO FIG. 2 FOR STEPS A-10 THROUGH A-19.

10. Solder the leads to the six-pin socket as indicated below and in fig. 2:
- () Bare wire from CSD-19 to Q284 collector.
 - () Bare wire from CSD-15 to Q284 base.
 - () 100 or 180 Ω resistor (R281, unsoldered in step A-7) from CSD-16 to Q284 base.
 - () Bare wire from CSD-17 to Q284 emitter.
- () 11. Solder a 152-0185-00 diode (D286, from kit) between pin 1 of V291 (cathode end) and Q286 emitter. (See fig. 2).
- () 12. If not already present, solder a 152-0165-00 diode (D291, from kit) between a ground lug on V291 socket (cathode end) and pin 1 of V291 (not shown in fig. 2).
- () 13. Solder a 1k 1/4W resistor (R298, from kit) from a ground lug on the V291 socket to CSD-25.
- () 14. Solder a bare wire from Q286 collector to CSD-25.
- () 15. Solder a bare wire from Q286 base to CSD-21.
- () 16. Solder a bare wire from Q303 collector to CSD-24.
- () 17. Solder a bare wire from Q303 emitter to CSD-21.
- () 18. Solder a bare wire from Q303 base to CSE-23.
- () 19. Solder an 18k resistor (R297, from kit) between CSD-25 and CSE-25.
- () 20. Remove transistor Q303 from its former socket.
- () Install transistors Q303 (removed above) and Q284 (151-0190-00, from kit) in the six-pin socket as indicated in Fig. 3.
- () 21. Install transistor Q286 (151-0277-00, from kit) as indicated in Fig. 3. If the transistor has four leads, clip off the fourth (case) lead.

THIS COMPLETES THE INSTALLATION.

- () Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and attach it to the proper Sweep Generator Schematic.
- () Fasten the Insert pages in your Instruction Manual.
- () Recalibrate the sweep timing as indicated in your Instruction Manual.

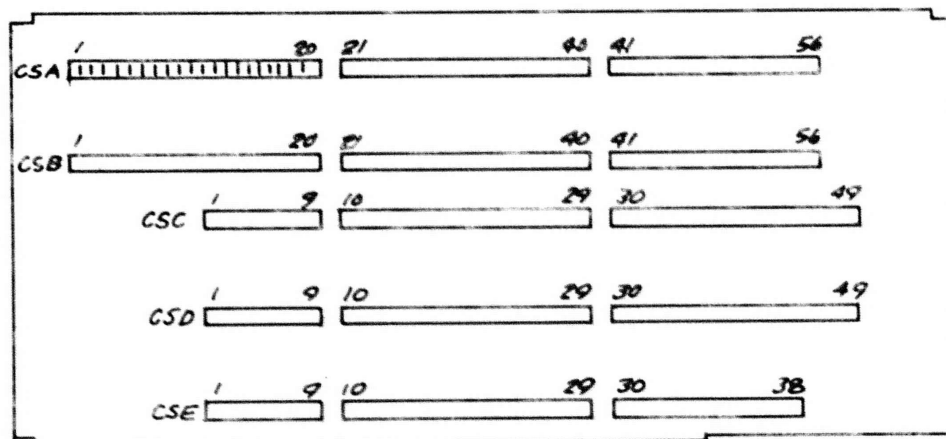


FIG. 4

B. TYPE 546, RM546
547, RM547

D86

Refer to Fig. 4 for ceramic strip location.

- () 1. Unsolder and remove D86 located between CSA-28 and CSA-30 or between CSA-27 or CSA-28 and pin-1 of V91.
- () If D86 was connected between CSA-28 and CSA-30 remove the bare wire between CSA-30 and pin-1 of V91.
- () 2. For Types 546 SN 100-962, RM546 SN 100-499 and 547 or RM547 SN 100-6739. Unsolder the end of R32 at CSA-21 (to be reconnected in later step to new Q84 socket) and remove the bare wire between CSA-21 and Q84 base.
- () 3. Unsolder and remove the following bare wires:
 - () Between CSA-27 and Q103 emitter.
 - () Between CSA-29 and Q103 base.
 - () Between CSP-31 and Q103 collector.
- () 4. Unsolder the leads from Q84 socket

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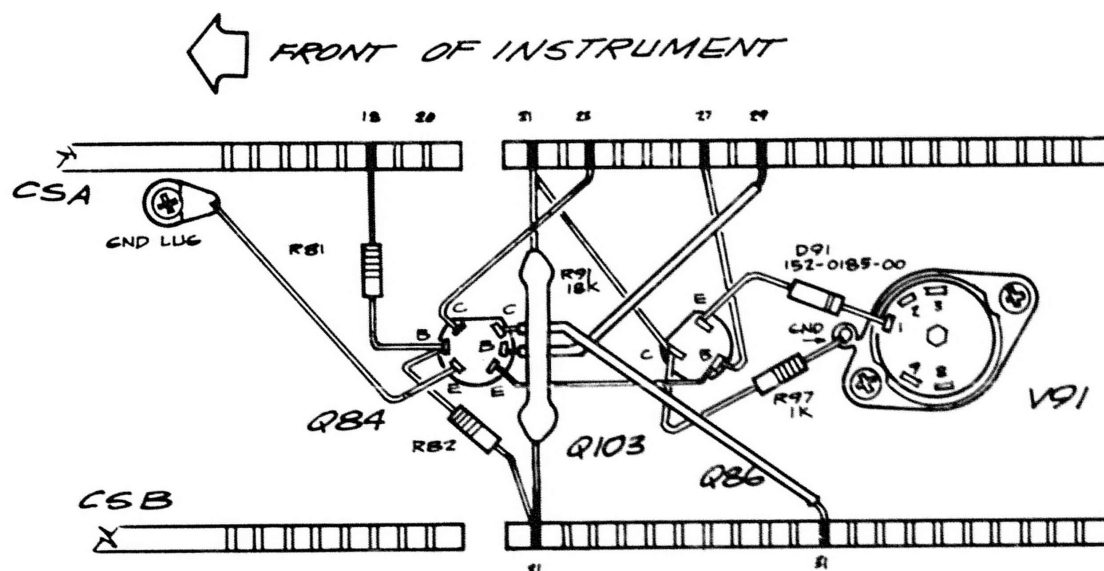
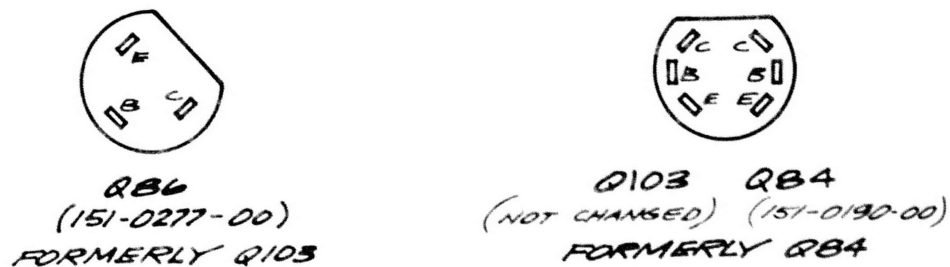


FIG. 5

REFER TO FIG. 5 FOR STEPS B-5 THROUGH B-19.

- () 5. Remove Q84, and replace the 3 pin Q84 socket with the six pin socket from the kit. The key goes toward CSA. In early instruments with screw mounted transistor sockets, use the plastic transistor socket mounting ring from the kit. (See Fig. 5)
- () 6. Remove the "Q103" silkscreening from both sides of the chassis using lacquer thinner or similar solvent. When the modification is completed Q103 will share the six-pin Q84 socket, and Q86 will occupy the former Q103 socket. The chassis may be marked accordingly if desired. (See Figs. 5 and 6).
- () 7. Solder a 152-0185-00 diode (D86, from kit) between Q86 emitter and pin 1 of V91 (cathode end).
- () 8. If not already present, solder a 152-0165-00 diode (D91, from kit) between a ground lug on V91 socket (cathode end) and pin 1 of V91 (not shown on Fig. 5).
- () 9. Solder a bare wire between CSA-27 and Q86 base.
- () 10. Solder a bare wire between CSA-21 and Q86 collector.
- () 11. Solder a 1k resistor (R97, from kit) between Q86 collector and a ground lug on the D91 socket.
- () 12. Solder bare wire (from kit) between Q103 emitter and Q86 base.
- () 13. Solder a sleeving-covered wire (from kit) between Q103 base and CSA-29.
- () 14. Solder a sleeving-covered wire (from kit) between Q103 collector and CSB-31.
- () 15. Solder the end of 100 or 180 Ω resistor (R81, unsolder in step B-4) to Q84 base.
- () 16. Solder the end of the 28.7k or 50k resistor R82, (unsoldered in steps 2 or 4) to Q84 base (other end to CSB-21).
- () 17. Solder the bare wire from the ground lug near Q84 to Q84 emitter.
- () 18. Solder the bare wire (from kit) from CSA-23 to Q84 collector.
- () 19. Solder an 18k resistor (R91, from kit) between CSA-21 and CSB-21.



NOTE: THIS VIEW IS FROM TRANSISTOR SIDE
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FIG. 6

- () 20. Remove transistor Q103 from its former socket.
- () Install transistors Q103 (removed above) and Q84 (151-0190-00, from kit) in the six-pin socket as indicated in Fig. 6.
- () 21. Install transistor Q86 (151-0277-00, from kit) as indicated in Fig. 6. If the transistor has four leads, clip off the fourth (case) lead.

THIS COMPLETES THE INSTALLATION.

- () Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and attach it to the proper Sweep Generator Schematic.
- () Fasten the Insert pages in your Instruction Manual.
- () Recalibrate the sweep timing as indicated in your Instruction Manual.

Refer to Fig. 7 for ceramic strip locations.

Remove the rail and components as necessary to gain access to the transistor sockets.

- () 1. Unsolder and remove D640, located between CSG-43 and CSH-47, or pin 1 of V661. Remove the rail and capacitor C681 as necessary to gain access.
- () 2. If D640 was connected between CSG-43 and pin 1 of V661, add a bare wire between CSH-47 and pin 1 of V661.
3. Unsolder and remove the following bare wires:
 - () Between CSG-43 and Q643 emitter.
 - () Between CSH-49 and Q643 base (SN 100-2137, 556 or 100-1067, R556).
 - () Between CSG-46 and Q643 base.
 - () Between CSG-47 and Q643 collector.
 - () Between CSG-43 and CSG-52.
- () 4. Unsolder the 0.001 μ F capacitor (C643) from Q643 collector (leave end connected to the ground lug on V661 socket).

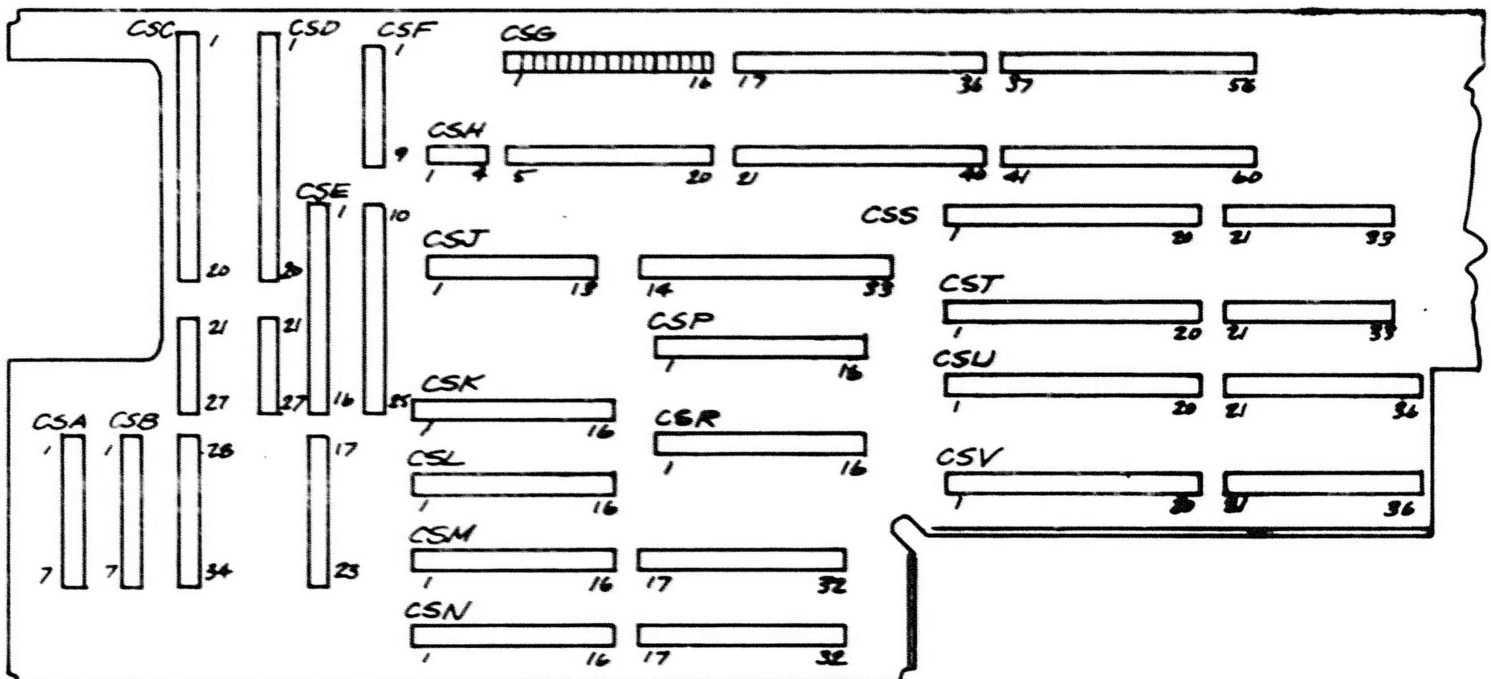


FIG. 7

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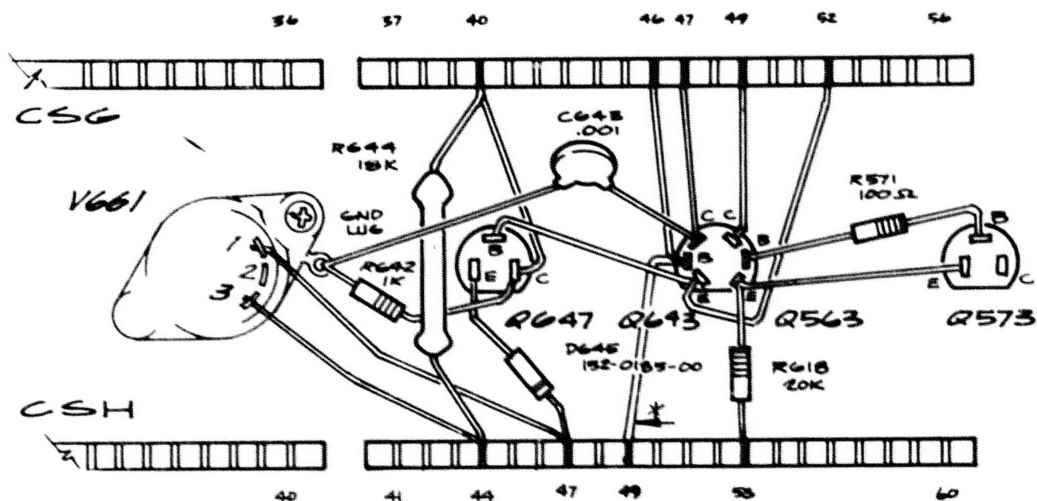
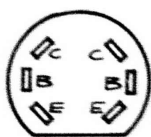


FIG. 8

* S/N 100-2137, 556 OR 100-1067, R556



Q563 Q643

FORMERLY Q563



Q647
(151-0277-00)

FORMERLY Q643

NOTE: THIS VIEW IS FROM TRANSISTOR SIDE
OF CHASSIS

← FRONT OF INSTRUMENT

FIG. 9

- () 5. Remove Q563 and unsolder the leads from the three-pin Q563 socket. Remove the socket, and replace it with the six-pin socket from the kit. The flat side goes toward CSH.
- () 6. Remove the Q643 silk-screening from both sides of the chassis, using lacquer thinner or similar solvent. When the modification is completed Q563 and Q643 will share the six-pin Q563 socket, and Q647 will occupy the old Q643 socket. The chassis may be marked accordingly if desired (see Figs. 8 and 9).
- 7. Solder the following wires and components as indicated in Fig. 8.
 - () Bare wire (from kit) from Q643 emitter to Q647 and to CSG-52.
 - () Bare wire (from kit) from Q643 base to CSH-49 (SN 100-2137, 556 or 100-1067, R556).
 - () Bare wire (from kit) from Q643 base to CSG-46.
 - () 0.001 μ F capacitor (C643, unsoldered in step C-4) from Q643 collector to ground lug on the V661 socket.
 - () Bare wire (from kit) from Q643 collector to CSG-47.
 - () Bare wire (from kit) from Q563 collector to CSG-49.
 - () 100 Ω resistor (R571) from Q563 base to Q573 base.
 - () 20k Ω resistor (R618) from CSH-53 to Q563 emitter.
 - () Bare wire from Q573 emitter to Q563 emitter.
- () 8. Solder an 18k 5W resistor (R644, from kit) between CSG-40 and CSH-44.
- () 9. Solder a 1k resistor (R642, from kit) between Q647 collector and a ground lug on V661 socket.
- () 10. Solder a 152-0185-00 diode (D645, from kit) between Q647 emitter and CSH-47 (cathode to CSH-47).
- () 11. Solder a bare wire (from kit) between pin 3 of V661 and CSH-44.
- () 12. Solder a bare wire (from kit) between Q647 collector and CSG-40.
- () 13. Remove transistor Q643 from its former socket.
 - () Install transistors Q563 (removed in step C-5) and Q643 (removed above) in the six-pin socket as indicated in Fig. 9.
- () 14. Install transistor Q647 (151-0277-00, from kit) as indicated in Fig. 9. If the transistor has four leads, clip off the fourth (case) lead.

THIS COMPLETES THE INSTALLATION.

- () Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and attach it to the proper Sweep Generator Schematic.
- () Fasten the Insert pages in your Instruction Manual.
- () Recalibrate the sweep timing as indicated in your Instruction Manual.

Refer to Fig. 10 for ceramic strip locations.

Remove the rail and components as necessary to gain access to the transistor sockets.

- () 1. Unsolder and remove D840, locate between CSA-14 and CSB-14, or pin 1 of V861.
- () 2. If D640 was connected between CSA-14 and pin 1 of V861, add a bare wire between CSB-14 and pin 1 of V861.
3. Unsolder and remove the following bare wires:
 - () Between CSA-5 and CSA-14.
 - () Between Q763 emitter and Q773 emitter.
 - () Between CSB-12 and Q843 base. (SN 100-2137, 556 or 100-1067, R556)
 - () Between CSB-11 and Q843 base. (SN2138-up, 556 or 1068-up R556.)
 - () Between CSA-10 and Q843 collector.
 - () Between CSA-5 and Q843 emitter.
 - () Between CSA-3 and Q763 collector.
- () 4. Unsolder the 0.001 μ F capacitor (C843) from Q843 collector (leave other end connected to ground lug on V861 socket).

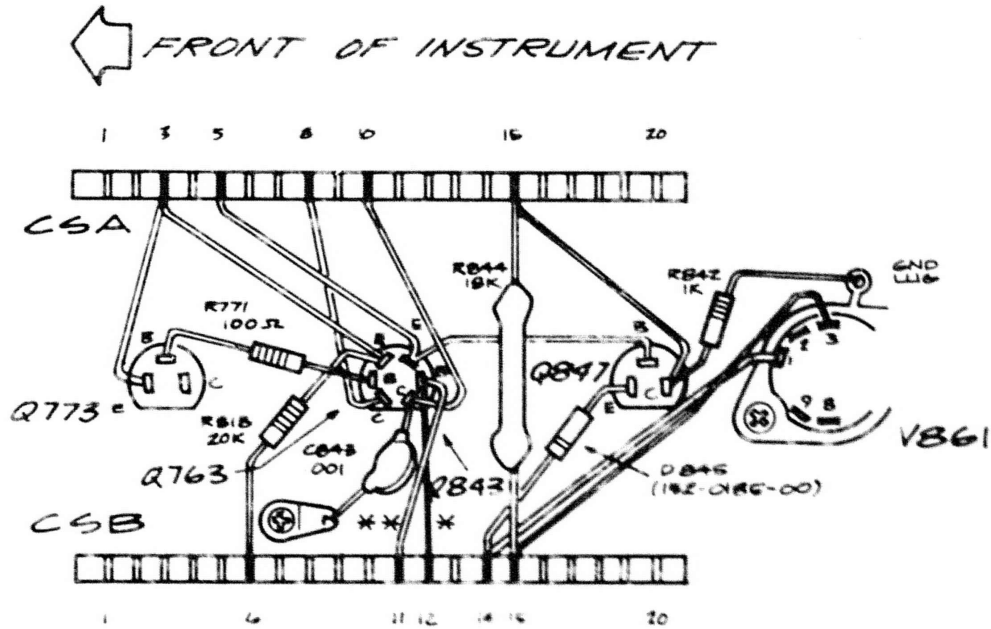


FIG. 11

* S/N 100-2137, 556 OR 100-1067, R556

** S/N 2138-UP, 556 OR 1068-UP, R556



NOTE: THIS VIEW IS FROM TRANSISTOR
SIDE OF CHASSIS

FRONT OF INSTRUMENT ▶

FIG. 12

Indicates change since last publication.

- () 5. Remove Q763, unsolder the leads from the three-pin Q763 socket, and replace it with the six-pin socket from the kit. The key goes toward CSB.
- () 6. Remove the Q843 silk-screening from both sides of the chassis using lacquer thinner or similar solvent. When the modification is completed Q763 and Q843 will share the six-pin Q763 socket and Q847 will occupy the old Q843 socket. The chassis may be marked accordingly if desired (see Figs. 11 and 12).
- () 7. Solder the following wires and components as indicated in Fig. 11.
 - # () A bare wire from Q773 emitter to CSA-3.
 - () A bare wire from Q763 collector to CSA-8.
 - () A 100Ω resistor (R771, unsoldered in step D-5) from Q763 base to Q773 base.
 - () A 20kΩ resistor (R818) from Q763 emitter to CSB-6.
 - () A bare wire from Q763 emitter to CSA-3.
 - () A bare wire from Q847 base and Q843 emitter to CSA-5.
 - () A bare wire from Q843 to CSB-12 (SN 100-2137, 556 or 100-1067, R556.)
 - () A bare wire from Q843 base to CSB-11 (SN 2138-up, 556 or 1068-up, R556.)
 - () A bare wire from Q843 collector to CSA-10.
 - () The 0.001μF capacitor (C843, unsoldered in step D-4) to Q843 collector.
 - () Diode D845 (152-0185-00, from kit) between Q847 emitter and CSB-14 (cathode end).
- () 8. Solder the 18k resistor (R884, from kit) between CSA-15 and CSB-15.
- () 9. Solder the 1k resistor (R842, from kit) between Q847 collector and a ground lug on the V861 socket.
- () 10. Solder a bare wire between CSB-15 and pin 3 of V861.
- () 11. Solder a bare wire between CSA-15 and Q847 collector.
- () 12. Remove transistor Q843 from its former socket.
- () Install Q763 (removed in step D-5) and Q843 (removed above) as indicated in Fig. 12.
- () 13. Install transistor Q847 (151-0277-00, from kit) as indicated in Fig. 12. If the transistor has four leads, clip off the fourth (case) lead.

THIS COMPLETES THE INSTALLATION.

- () Moisten the back of the MODIFIED INSTRUMENT tag (from kit) and attach it to the proper Sweep Generator Schematic.
- () Fasten the Insert pages in your Instruction Manual.
- () Recalibrate the sweep timing as indicated in your Instruction Manual.

DF:ls

INSTRUCTION MANUAL

MODIFICATION INSERT

DISCONNECT DIODE REPLACEMENT

Type 544 -- SN 100-2239
Type R544 -- SN 100-2239
Type 546 -- SN 100-2409
Type R546 -- SN 100-2409
Type 547 -- SN 100-12479
Type R547 -- SN 100-12479
Type 556 -- SN 100-2989 w/exceptions
Type R556 -- SN 100-2980 w/exceptions

Installed in Type _____ SN _____ Sweep Generator _____ Date _____

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

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GENERAL INFORMATION

Gallium Arsenide diodes, PN 152-0161-00, are no longer available and are replaced with a transistor and associated circuitry in the circuit positions listed below.

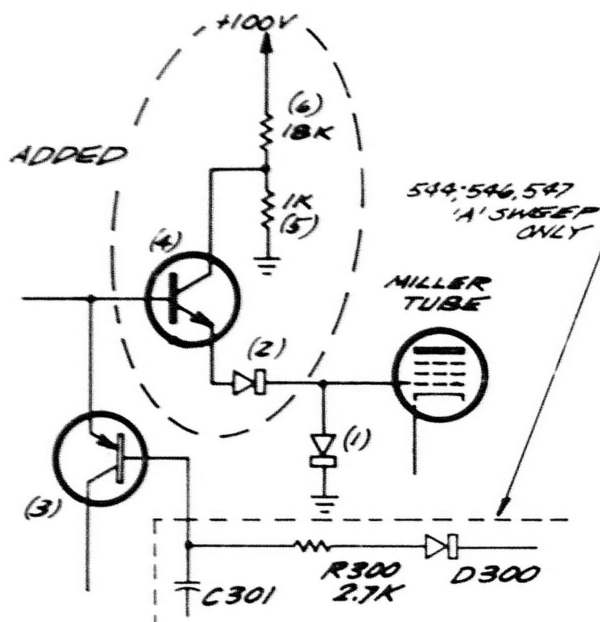
Type 544/R	D286	
Type 546/R	D86	D286
Type 547/R	D86	D286
Type 556/R	D640	D840

CIRCUIT DESCRIPTION:

The circuitry is basically unchanged except that a transistor is used in place of the disconnect diode. When its base goes negative, the transistor cuts off, initiating a sweep. A voltage divider in the collector circuit establishes the collector voltage during cut off. At the end of the sweep, the transistor is turned on and discharges the timing capacitor.

ELECTRICAL PARTS LIST:

	Ckt.No. Types 544,546 547,/R's	Ckt.No. Types 556	Part Number	Description
DIODES				
		D640	Delete	
(1)	D90	D641	152-0165-00	
(2)	D86	D645	152-0185-00	Silicon Replaceable by 1N4152
		D840	Delete	
(1)	D291	D841	152-0165-00	
(2)	D286	D845	152-0185-00	Silicon Replaceable by 1N4152
TRANSISTORS				
	Q84		151-0190-00	2N3904
(3)	Q103	Q643	*	
(4)	Q86	Q647	151-0277-00	RCA 38520
	Q284		151-0190-00	2N3904
(3)	Q303	Q843	*	
(4)	Q286	Q847	151-0277-00	RCA 38520
RESISTORS				
(6)	R91	R644	308-0400-00	18k 5W 5%
(5)	R97	R642	315-0102-00	1k 1/4W 5%
(6)	R297	R844	308-0400-00	18k 5W 5%
(5)	R298	R842	315-0102-00	1k 1/4W 5%
	R300		315-0272-00	2.7k 1/4W 5%



*Not changed

SWEEP TIMING CAPACITORS VALUES LOWERED TO IMPROVE SLOW SPEED ACCURACY

Effective Prod SN 1010
180-RM

The design center of Sweep Timing capacitor 290-0040-00 was changed from $10\mu\text{F} \pm 3.5\%$ to $9.975\mu\text{F} \pm 3.5\%$ to correct a slow speed timing error caused by a characteristic of MYLAR® capacitors at low frequencies. Under maximum tolerance conditions (both timing resistors and capacitors at maximum tolerances) the timing on the 1, 2, and 5sec positions could be out of spec.

MYLAR, Reg. TM of E. I. du Pont de Nemours & Co., Inc.

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3-27-70

106.01

'A' AND 'B' TIMING SWITCH TIMING CAPACITORS CHANGED FOR GREATER STABILITY

Effective Prod SN 5310

Usable in SN 100-5309

Timing changes occurred with temperature variations of 0° to 50°C. This was because impregnated MYLAR[®] timing capacitors returned to a different value after being heated or cooled to the environmental limits of the instrument.

The worst problem for stock capacitors occurred at 0°C. Information taken by the capacitor department indicates approximately 0.2% capacitance change after warming to 80°C and cooling to 25°C. If such a change happened every time the capacitor was heated, timing would change drastically. Even if the capacitor changed only once, this was enough to disrupt the 0.25% matching of the set (all values in the set didn't return to same level--it varied depending on value of capacitor). Also, reports from the field indicate some capacitors have changed by 2%.

Matched timing series capacitors C90E, F, G, H, J, and C290E, F, G, H, J were changed to a dry polycarbonate type, which returns to the same value after undergoing temperature extremes. The new capacitors also more closely match the temperature coefficient of the timing resistors.

Parts Removed:

C90E,F,G,H,J	295-0073-00	Capacitor, checked assembly of 285-0608-00,
C290E,F,G,H,J		285-0607-00, 285-0614-00, 285-0631-00,
		and 291-0040-00.

Parts Added:

C90E,F,G,H,J	295-0104-00	Capacitor, checked assembly of 285-0669-00,
C290E,F,G,H,J		285-0668-00, 285-0726-00, 285-0739-00,
		and 291-0040-00.

NOTE: Part number of the wired 'A' TIME/CM switch (SW290) changed from 262-0595-00 to 262-0595-01; part number of 'B' TIME/CM switch (SW90) changed from 262-0596-00 to 262-0596-01.

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INSTALLATION

Parts Required: See 'Parts Added.'

- a) Replace the entire set of MYLAR timing capacitors on the 'A' TIME/CM switch (C290E-J) with the new set of capacitors.
- b) Replace the entire set of MYLAR timing capacitors on the 'B' TIME/CM switch (C90E-J) with the new set of capacitors.

A AND B TIMING RESISTORS CHANGED TO MAINTAIN SPECIFIED TOLERANCE

Effective Prod SN 5480

Usable in SN 100-5479

Component selection is unable to provide sufficient quantities of 312-0641-00 timing resistor sets.

A selectable value 1/4W 10% resistor was added in series with the 2.8M timing resistor (nominal value 47k).

Parts Removed:

R90D-F	312-0641-00	Resistors, checked set
R290D-F	312-0641-00	Resistors, checked set

Parts Added:

R90D-F	312-0641-01	Resistors, checked set
R290D-F	312-0641-01	Resistors, checked set

INSTALLATION

Parts Required: 050-0338-01 Parts Replacement Kit



product modification

050-0338-02
M11517, M13653
M20524
Types 544/RM, 546/RM,
547/RM, 556/R556

TIMING RESISTOR REPLACEMENT

For the following TEKTRONIX® Oscilloscopes:

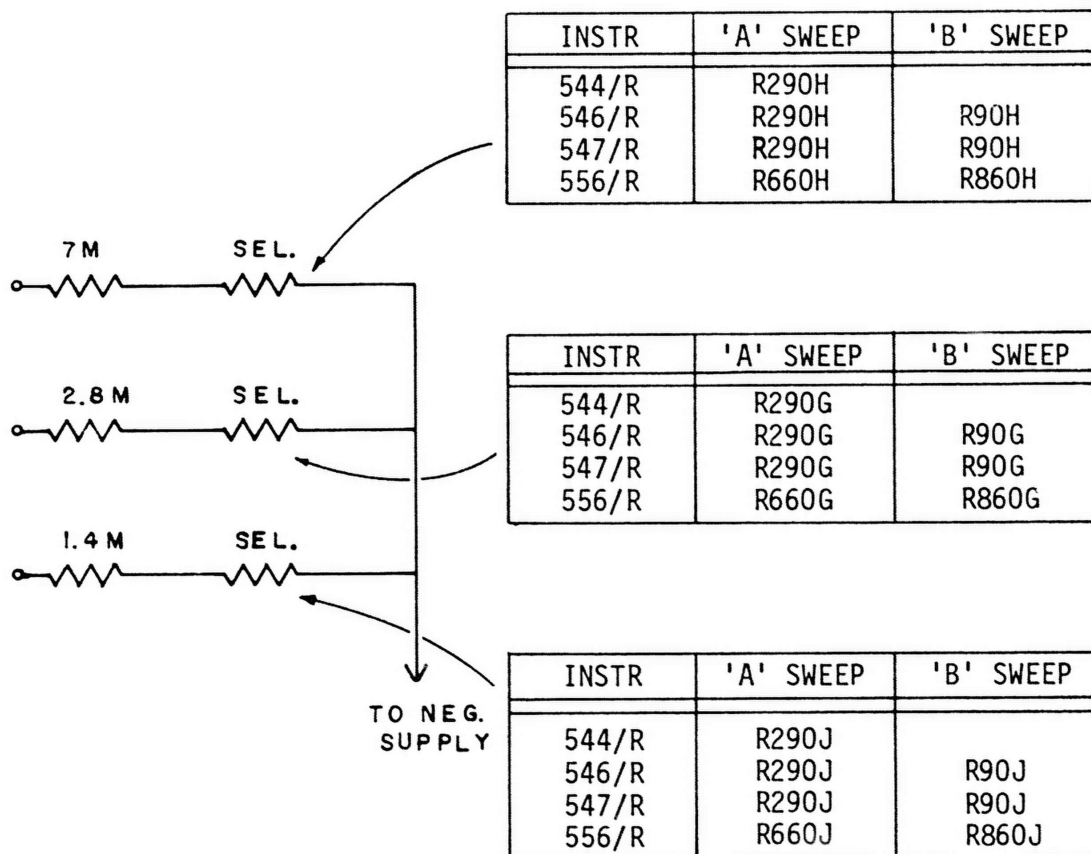
Types 544/RM544	Serial Numbers 100-1159
546/RM546	Serial Numbers 100-1369
547/RM547	Serial Numbers 100-8289
556	Serial Numbers 100-2409
R556	Serial Numbers 100-1109

Timing resistor set, pn 312-0641-04, replaces timing resistor sets, pn 312-0641-00, 312-0641-01, 321-0641-02 and 312-0641-03 which are no longer available. The 312-0641-04 set uses metal-film precision resistors in place of the carbon-film resistors for improved yield and stability. Pn 312-0641-04 may also include selected 10% resistors to be installed in series with the appropriate precision resistors.

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Ckt. No.	Quantity	Part Number	Description
	1 ea	312-0641-04	Resistor, checked set

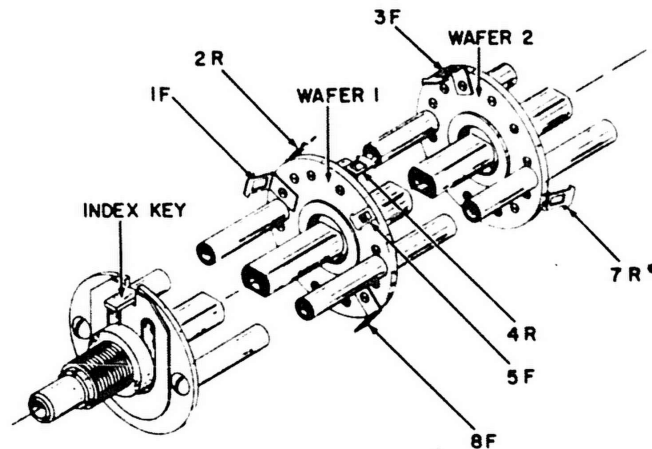
SCHEMATICS



Partial - Sweep Timing Switch diagram

INSTRUCTIONS:

(TYPICAL SWITCH CONFIGURATION)



NOTE: The following method is used to identify the TIMING switch terminals:

The wafers are numbered from the front to the rear.

The contact mounting holes are numbered relative to the index key as shown in the sample drawing. (The number of contact mounting holes will vary from switch to switch, but the method of numbering them is the same.)

The contacts have an 'F' or 'R' suffix which denotes that they are on the front or the rear of the wafer.

Example: W2-7R (denoted by * on drawing) is contact #7 on the rear of wafer #2.

Refer to the Drawing while performing the following steps.

- () 1. If a 10% resistor is taped to the $7M\Omega$ resistor in the kit, use it to replace the bare wire** between TIMING switch contacts W7-4R and W7-7R, located to the rear of the $7M\Omega$ timing resistor.
- () 2. Replace the $7M\Omega$ timing resistor with the $7M\Omega$ resistor from the kit.
- () 3. If a 10% resistor is taped to the $2.8M\Omega$ resistor in the kit, use it to replace the bare wire** between contacts W7-5R and W7-8R, located to the rear of the $2.8M\Omega$ timing resistor.
- () 4. Replace the $2.8M\Omega$ timing resistor with the $2.8M\Omega$ resistor from the kit.

**or resistor, if pn 050-0338-00 or 050-0338-01 was previously installed.

INSTRUCTIONS (cont'd)

- () 5. If a 10% resistor is taped to the 1.4M Ω resistor in the kit, use it to replace the bare wire** between contacts W7-6R and W7-9R located to the rear of the 1.4M Ω timing resistor.
- () 6. Correct the applicable parts list and schematic diagrams in your Instruction Manual.

**or resistor, if pn 050-0338-00 or 050-0338-01 was previously installed.

SWEEP TIMING SWITCH RESISTORS CHANGED TO FACILITATE TIMING RESISTOR SELECTION

Effective Prod SN 8290

Timing resistors must be $\pm 1/8\%$ value. The resistors received from vendors are $\pm 1\%$ value. Therefore a very large number of resistors must be purchased to get a few useful ones.

A selected series resistor was added in series with the 7M timing resistor on the Sweep Timing switch.

Parts Replacement Kit 050-0338-01 is available to facilitate the replacement set PN 312-0641-00 and 312-0641-01 in pre-modified instruments.

Parts Removed:

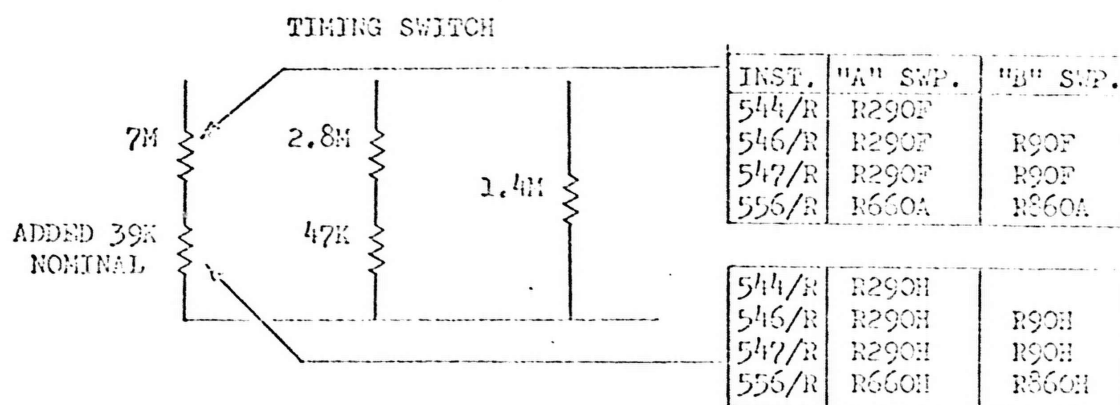
R290D,E,F,G
R90D,E,F,G 312-0641-01

Resistors, checked set (1) 309-0438-00,
(1) 309-0443-00, (1) 309-0446-00 with
series pad resistor 47k nominal value.
Resistors matched within 0.25%

Parts Added:

R290D,E,F,G,H 312-0641-02

Resistor, checked set (1) 309-0438-00,
(1) 309-0443-00 with series pad resistor
39k nominal value, (1) 309-0446-00 with
series pad resistor 47k nominal value.
Resistors matched within 0.25%



SWEEP GENERATOR TIMING RESISTORS CHANGED TO
METAL FILM TO IMPROVE OHMIC STABILITY

Effective Prod SN 10260

The currently used carbon timing resistors vary in value for varying load, shelf life, and temperature.

The carbon film timing resistors were changed to metal film. Parts Replacement Kit 050-0338-01 is available to facilitate the replacement of timing resistors 312-0641-03 in pre-modified instruments.

Parts Removed:

R290D,E,F,G,H	312-0641-02	Resistor, checked set (1) 309-0438-00,
R90D,E,F,G,H		(1) 309-0443-00 w/series pad resistor
		39k nominal value, (1) 309-0446-00
		w/series pad resistor 47k nominal value.
		Resistors matched within 0.25% spread.

Parts Added:

R290D,E,F,G,H	312-0641-03	Resistor, checked set (1) 323-0495-00,
R90D,E,F,G,H		(1) 323-0756-00 w/series pad resistor
		39k nominal value, (1) 323-0524-00
		w/series pad resistor 47k nominal value.
		Resistors matched within 0.25% spread.

DELAY PICKOFF RELIABILITY IMPROVED

Effective Prod SN 1010
180-RM

Usable in SN 100-1009
100- 179

The PIV of D433 was insufficient to withstand the reverse DC bias and trigger of the External Delay Input. D433 was changed from a 30V PIV diode 152-0141-00 to a 200V PIV diode 152-0061-00.

Parts Removed:

D433 152-0141-00 Diode, 1N3605

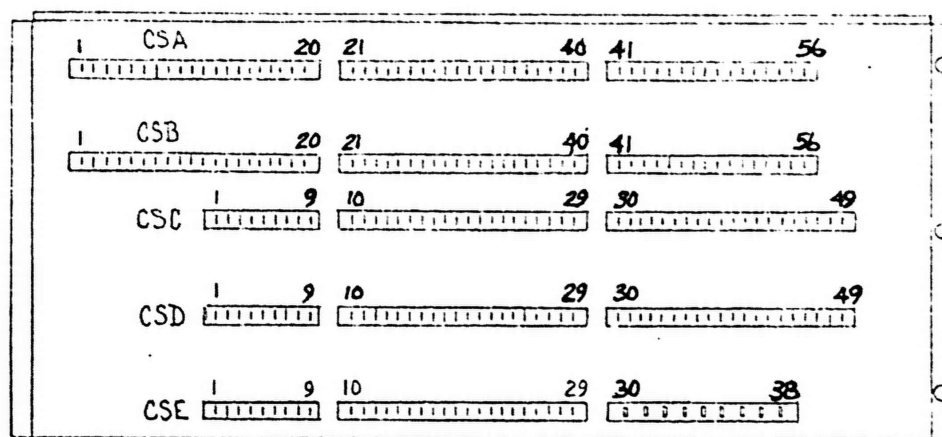
Parts Added:

D433 152-0061-00 Diode, 1N6061

INSTALLATION

Parts Required: See 'Parts Added.'

Replace D433 on the 'B' Sweep chassis with a 1N6061, 152-0061-00, diode. D433 is located between CSD-49 and CSC-49.





product modification

050-0425-00

M13967

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

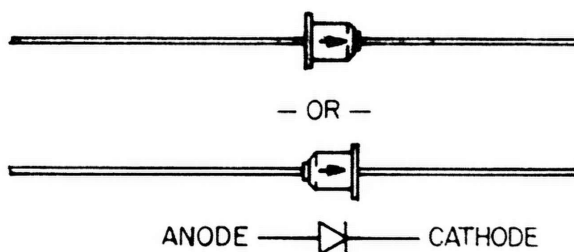
Tunnel Diode, pn 152-0402-00, replaces Tunnel diodes, pn 152-0081-00 and pn 152-0402-00. The new diode is identical in all respects with the diode being replaced except that the anode and cathode configuration may be reversed.

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
1 ea	152-0402-00	Diode, tunnel, 2.2mA, 25pF

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.

'A' SWEEP TRIGGER RESISTOR VALUES INCREASED
TO ELIMINATE HIGH FREQUENCY OSCILLATION

Effective Prod SN 3550

Usable in SN 100-3549

With a 20V signal from a high impedance source (such as the Calibrator) applied through patch cords to 'A' External trigger input and the vertical plug-in, oscillations appear to ride on top of the vertical signal.

The 'A' Sweep Trigger circuit was generating high frequency oscillations with a 20V signal applied to the External trigger input via high capacity leads (patch cords) and from a high impedance generator (Calibrator).

R220 and R222 were changed from 47Ω to 100Ω to eliminate the high frequency oscillation.

INSTALLATION

Parts Required: See 'Parts Added.'

- a) Replace R220 (47Ω 1/4W), located between pin 2 of V224 and the lower terminal of the 'A' + or - SLOPE switch, with a 100Ω 1/4W resistor.
- b) Replace R222 (47Ω 1/4W), located between pin 7 of V224 and the 'A' + or - SLOPE switch, with a 100Ω 1/4W resistor.

'A' SWEEP GENERATOR FAST SWEEP GAIN ADJ CENTERED AND V1184 SOCKET REWIRED

Effective Prod SN 1010
180-RM

The 'A' Sweep Generator fast sweep gain adjustment C299 was adjusting near high capacity end. The C299 value was increased from 3-12pF to 4.5-25pF to allow adjustment closer to mid-range.

Sections A and B of the Position-Indicator amplifier tube V1184 on the VA chassis were rewired to ease production wiring of the chassis only.

Parts Removed:

C299	281-0007-00	Capacitor, 3-12pF cer
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Parts Added:

C299	281-0010-00	Capacitor, 4.5-25pF cer
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TIME BASE 'A' UNBLANKING CIRCUIT RESISTOR ADDED TO ASSURE
'B' TRACE IS BRIGHTER THAN 'A' TRACE AT SOME SWEEP SPEEDS

Effective Prod SN 5680

Usable in SN 1880-5679 (Type 547)
240-5679 (Type RM547)

Also usable below the above-listed serial numbers if M8950 is installed.

In some instruments 'B' intensity is less than 'A' when sweep speeds are identical and brightness is maximum.

Variation of bias voltages in 6DJ8 tubes used in the 'A' and 'B' sweep unblanking cathode follower circuits.

A 1k metal film resistor was added between the collector of Q373 and the junction of C380, R380, and R374.

Parts Added:

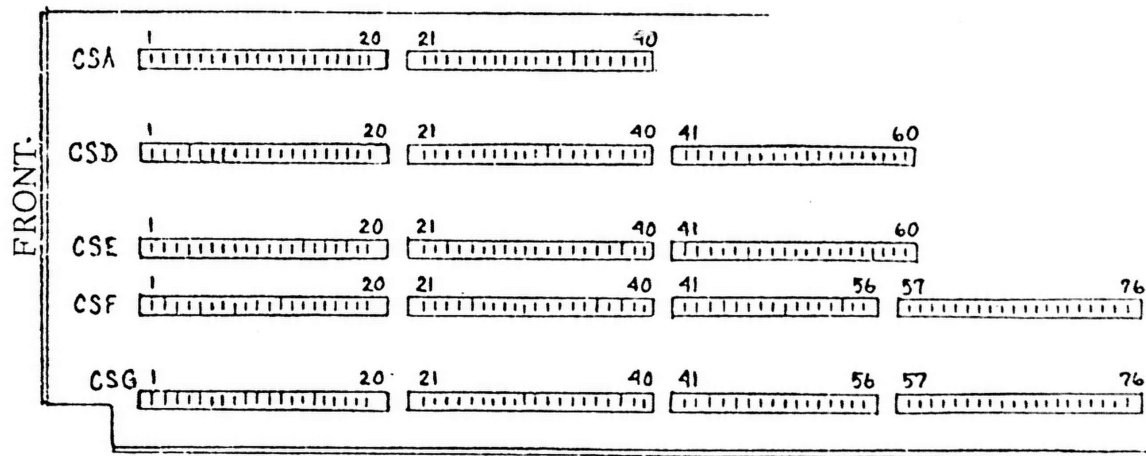
R377	321-0193-00	Resistor, prec, 1k 1/8W 1% metal film
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INSTALLATION

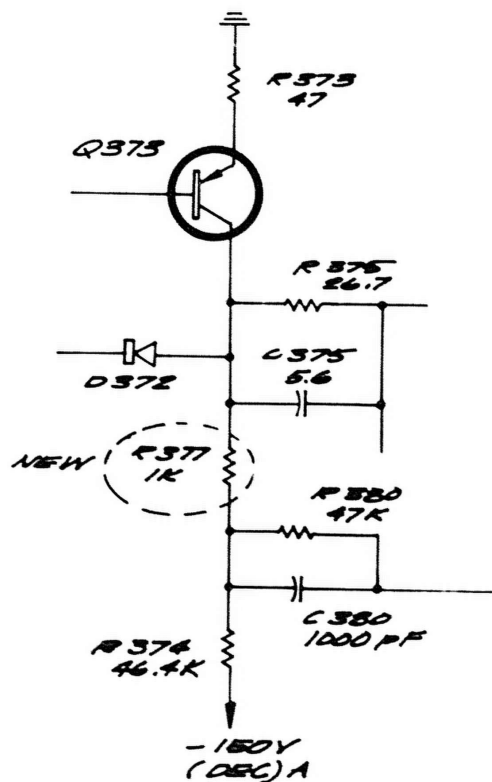
Parts Required: See 'Parts Added' and part listed below

R380	302-0473-00	Resistor, comp, 47k 1/2W 10%
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- a) Remove the #22 bare wire between the collector of Q373 and CSE-44.
- b) Move the anode (unbanded) lead of D372 to CSD-45.
- c) Remove R380 (47k 1/2W 10%) located between the collector of Q373 and CSD-43 and install a new R380 between CSE-43 and CSD-43.
- d) Install R377 (1k 1/8W 1%) between the collector of Q373 and CSE-44.



'A' SWEEP CHASSIS LAYOUT (partial)



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109.02

ALTERNATE TRACE SYNC AMPLIFIER MODIFIED TO ASSURE
PROPER ALT SWEEP OPERATION AT LOW LINE

Effective Prod SN 1728 237-RM			Usable in SN 100-1727 100- 236			
modified out of sequence:						
561	1131	1262	1399	1570	1647-9	1695-7
812	1140	1302	1411	1572-3	1655	1699
941	1143	1352	1413	1575-6	1657	1704-6
1040	1148	1355	1454-6	1578-9	1676	1708-9
1045	1190-1	1360	1458	1600	1680-1	1712-3
1072-3	1197	1362-3	1493	1602-8	1686	1715
1075	1210	1391-2	1495-6	1640	1688	1717-26
1078	1219	1397	1498	1642-4	1693	

If a Type 1A1 is used in the Type 547, the Type 1A1 will not always alternate when 'B' INTENSIFIED BY 'A' ALT mode is used. The plug-in may be operating properly, but the fault is with the Type 547 as follows:

The fast-falling trailing edge of the sync pulse from the sweep switching multi causes L760 (plug-in connector schematic) to kick back a high enough positive pulse to overcome the cutoff bias on V764B. This generates a second sync pulse which switches the plug-in back to its original state so fast that it appears not to have switched at all.

With a Type 547/1A2 combination, a slightly different situation exists. The problem here is centered around the bias condition of V764B. When this same trouble is encountered with the Type 1A2 it is probably not alternating at all. Differences in line voltage, V764 bias resistors, and V764B are the basic reasons for the difficulty.

To correct these difficulties, the bias on V764 is centered and the tolerance is tightened by changing R761 to 4.75k and R762 to 69.8k. The additional switching pulse resulting from the stored energy in L760 is eliminated by adding a diode (D760) across L760.

Parts Removed:

R761	315-0475-00	Resistor, 4.7k 1/4W 5%
R762	301-0683-00	Resistor, 68k 1/2W 5%

Parts Added:

D760	152-0075-00	Diode, silicon
R761	321-0258-00	Resistor, 4.75k 1/8W prec.
R762	232-0370-00	Resistor, 69.8k 1/2W prec.

INSTALLATION

Parts Required: See 'Parts Added.'

- a) Replace R671, a 4.7k 1/4W resistor located between the rear ground lug of V764 and the ceramic strip just above it, with a 4.75k 1/8W 1% resistor.
- b) Replace R762, a 68k 1/2W 5% resistor located between the ceramic strips above V764, with a 69.8k 1/2W 1% resistor.
- c) Solder D760, a 6075 germanium diode across and in parallel with the coil L760, located next to R762. Solder the cathode end toward outside of the instrument.



modification instructions

MI - 050-0473-00

Type 547/RM

SWEEP STEERING DIODES

For Tektronix Types 547 and R547 Oscilloscopes
Serial Numbers 100-12470

Gallium Arsenide diodes, PN 152-0161-00, are no longer available and are replaced in the D462 and D472 positions with silicon diodes, PN 152-0153-00. When replacing either D462 or D472 it is necessary to replace the other diode in order to maintain circuit symmetry.

NOTE: If the Serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions as PN 152-0153-00 is a direct replacement.

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Ckt.No.	Description
2 ea	152-0153-00	D462,D472	Diode, silicon
1 ea	214-0210-00		Spool, w/3 ft silver-bearing solder

INSTRUCTIONS

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

- () 1. Unsolder and remove the D462 and D472, located near Q543 and connected between a ceramic strip notch and a terminal post.
- () 2. Install the diodes from the kit in the same position. The cathode ends go to the post.

THIS COMPLETES THE INSTALLATION

- () Change the part numbers for D462 and D472 in your Instruction Manual.

TL:ls

HORIZONTAL DISPLAY SWITCH CHANGED TO MINIMIZE DRIFT WHEN SWITCHING TO EXTERNAL HORIZONTAL MODE

Effective Prod SN 4270

Usable in SN 100-4269

Horizontal drift occurred after switching to the EXT HORIZ mode. Thermal drift was occurring because the plate dissipation of V514A was not the same in the EXT HORIZ mode as it was in the other HORIZONTAL DISPLAY modes.

An extra wafer was added to the rear HORIZ DISPLAY switch to ground the junction of R524-R525 in all positions of the HORIZ DISPLAY switch except EXT HORIZ X1 and X10. This allows V514A plate dissipation to remain the same in all HORIZ DISPLAY modes. See 'After' schematic on following pages.

NOTE: Wafers of rear HORIZ DISPLAY switch in the manual schematic are now numbered 5 to 11 and 1 to 2 (mag section). These will be renumbered 1 to 10.

This method proves to be impractical as a field solution. An alternate method, outlined in the installation procedure below, provides a suitable field installation.

Parts Removed:

SW530	260-0535-00	Switch, raw, rotary, HORIZ DISPLAY, 7 sec.
	(subpart of	8 position, 30° type F w/concentric 2 sec.,
	262-0601-00)	4 position, 30° type F

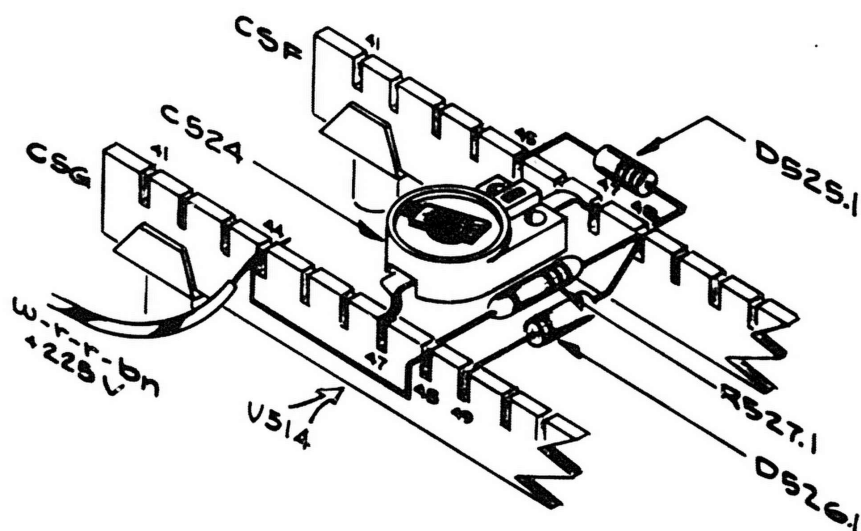
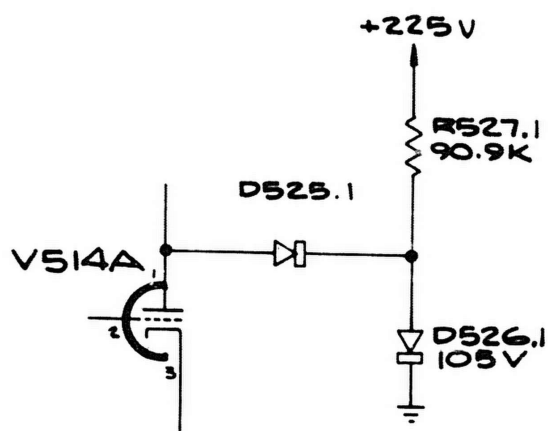
Parts Added:

SW530	260-0796-00	Switch, raw, rotary, HORIZ DISPLAY, 8 sec.
		8 position, 30° type F w/concentric 2 sec.,
		4 position, 30° type F

INSTALLATION

Parts Required:

D525.1	152-0061-00	Diode, silicon, 100mA 175PIV
D526.1	152-0032-00	Diode, zener, 105V 1/4W ±10%
R527.1	321-0381-00	Resistor, prec, 90.9k 1/8W ±1% metal film



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HORIZONTAL AMPLIFIER R545 CHANGED TO REDUCE GAIN

Effective Prod SN 5130

Usable in SN 100-5129

X10 timing was too long. Too much gain through the Horizontal Amplifier, resulting in insufficient range of adjustment for X10 Cal Adjust.

R545 was changed from 8.87k to 8.25k.

Parts Removed:

R545	323-0284-00	Resistor, 8.87k 1/2W 1%
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Parts Added:

R545	323-0281-00	Resistor, 8.25k 1/2W 1%
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INSTALLATION

Parts Required: See 'Parts Added.'

Replace R545 with an 8.25k 1/2W 1% resistor.

HORIZONTAL AMPLIFIER RC NETWORK ADDED TO PROTECT CRT PHOSPHOR FROM POSSIBLE 'TURN-ON-FLASH' BURNS

Effective Prod SN 5680

Usable in SN 100-5679

Bright flash occurs on the CRT face when time delay relay turns on the regulated power supplies.

The CRT high voltages are delayed after the regulated supplies come on, but the three voltages, namely: cathode, grid and anode voltages come on in sequence. Because of the RC time constant of the control grid circuit, it comes on later than cathode voltage, so momentarily grid No. 2 (first anode), grid No. 1 (control grid), and cathode form a triode that causes the control grid to draw grid current, thus creating an electron cloud near the first anode region. When the anode accelerating voltage comes on, it attracts this electron cloud and forms an electron beam which causes the CRT turn-on-flash and associated phosphor burns. This situation is aggravated by the 'high-contrast' phosphor, which is much more susceptible to burning than conventional phosphors.

An RC charging circuit consisting of R562 and C562 was added in series with the base of Q564 and -150V. This will bias the base in a negative voltage region for approximately 4s during turn-on, causing the electron beam to strike the horizontal plate, thus scattering and diffusing it, resulting in no harm to the phosphor. D542 and D561 were changed from 6075 germanium to 6061 silicon diodes to avoid reverse breakdown during turn-on. An additional feature of the added circuit is that the base voltage of Q564 is more constant, making it a better grounded base situation and improving the Sweep linearity.

Parts Removed:

D542	152-0075-00	Diode, germanium 6075
D561		

Parts Added:

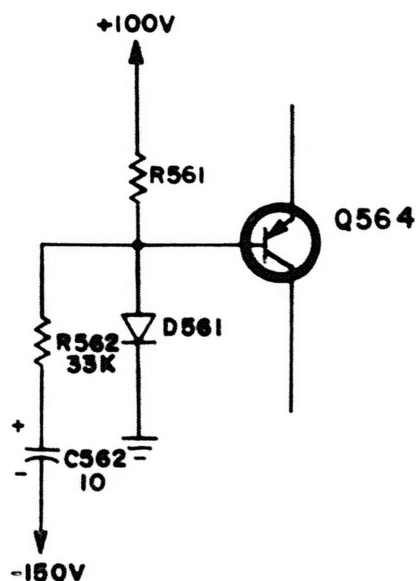
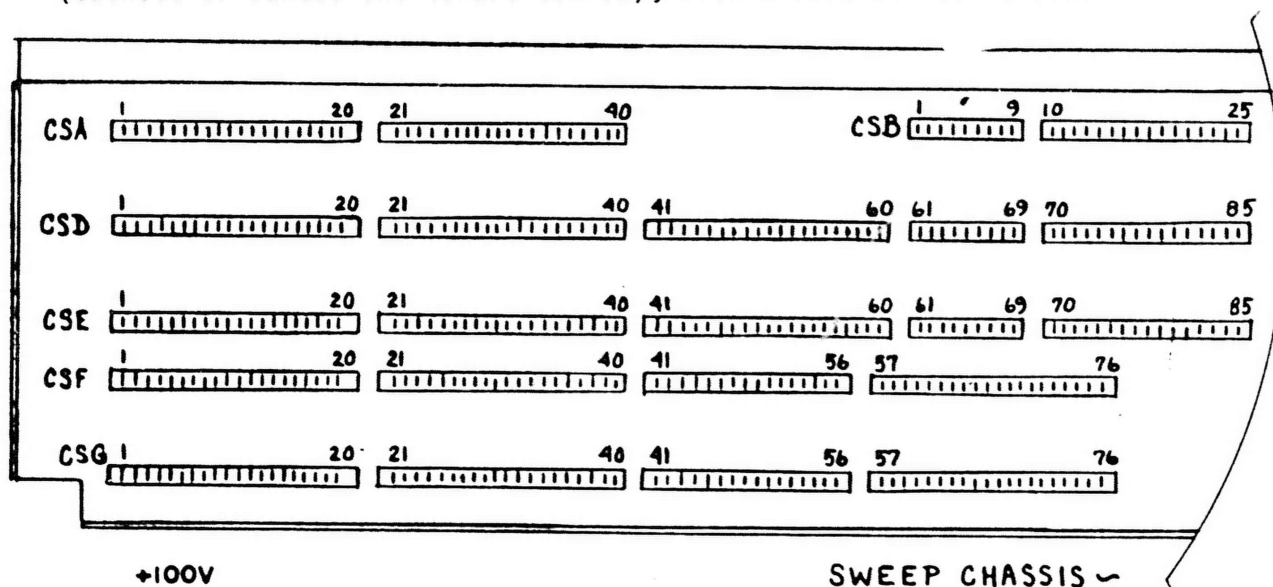
D542	152-0061-00	Diode, silicon 6061
D561		
C562	290-0214-00	Capacitor, EMT 100 μ F 250V
R562	302-0333-00	Resistor, comp, 33k 1/2W 10%
		Wire, solid, #22 white-orange 6" (175-0522-00)

INSTALLATION

Parts Required: See 'Parts Added.'

INSTALLATION (continued)

- a) Disconnect one lead of D541, a zener diode, and the white-brown wire from CSG-77 and reconnect to CSG-78.
- b) Disconnect the two (2) white-brown-black-brown wires from CSF-77 and reconnect to CSF-78.
- c) Add a 6" length of white-orange #22 solid wire between CSE-76 and CSG-77.
- d) Relocate R540, an 8.2k 1W resistor, by removing from between CSF-77 to CSG-77 and reinstalling between CSF-78 to CSG-78.
- e) Add R562, a 33k 1/2W resistor, between CSE-76 and the base of Q564.
- f) Add C562, a 10 μ F 250V capacitor, between CSE-86 and CSG-77, with positive end of capacitor at CSG-77.
- g) Replace D542, a 6075 germanium diode, located between CSD-64 and CSE-64 (cathode or banded end toward CSE-64), with a 6061 silicon diode.
- h) Replace D561, a 6075 germanium diode, located between CSD-82 and CSE-82 (cathode or banded end toward CSE-82), with a 6061 silicon diode.



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CALIBRATOR RESISTORS CHANGED TO 1/2% TOLERANCE TO FACILITATE CALIBRATION AND REDUCE POSSIBLE ERROR

Effective Prod SN 2890

The combined possible error of the $\pm 3\%$ Calibrator and the $\pm 3\%$ plug-in attenuator was felt to be greater than was necessary.

The $\pm 1\%$ Calibrator divider resistors were replaced with $\pm 1/2\%$ resistors.

Parts Removed:

SW950 262-0599-00 Switch, wired, CALIBRATOR

The following are subparts of the wired CALIBRATOR switch:

R950	323-0289-00	Resistor, prec,	10k	1/2W	1%
R951	323-0635-00	Resistor, prec,	6.66k	1/2W	1%
R952	323-0634-00	Resistor, prec,	1.789k	1/2W	1%
R953	323-0633-00	Resistor, prec,	801 Ω	1/2W	1%
R954	323-0632-00	Resistor, prec,	452 Ω	1/2W	1%
R955	323-0631-00	Resistor, prec,	146.1 Ω	1/2W	1%
R956	323-0630-00	Resistor, prec,	72.4 Ω	1/2W	1%
R957	323-0629-00	Resistor, prec,	43.1 Ω	1/2W	1%
R958	323-0628-00	Resistor, prec,	28.6 Ω	1/2W	1%
R962	323-0627-00	Resistor, prec,	21.4 Ω	1/2W	1%

Parts Added:

SW950 262-0731-00 Switch, wired, CALIBRATOR

The following are subparts of the wired CALIBRATOR switch:

R950	323-0709-01	Resistor, prec,	10.048k	1/2W	$\pm 1/2\%$
R951	323-0708-01	Resistor, prec,	6.628k	1/2W	$\pm 1/2\%$
R952	323-0707-01	Resistor, prec,	1.782k	1/2W	$\pm 1/2\%$
R953	323-0706-01	Resistor, prec,	800 Ω	1/2W	$\pm 1/2\%$
R954	323-0705-01	Resistor, prec,	452 Ω	1/2W	$\pm 1/2\%$
R955	323-0704-01	Resistor, prec,	146 Ω	1/2W	$\pm 1/2\%$
R956	323-0703-01	Resistor, prec,	72.4 Ω	1/2W	$\pm 1/2\%$
R957	323-0702-01	Resistor, prec,	43.1 Ω	1/2W	$\pm 1/2\%$
R958	323-0701-01	Resistor, prec,	28.6 Ω	1/2W	$\pm 1/2\%$
R962	323-0700-01	Resistor, prec,	21.4 Ω	1/2W	$\pm 1/2\%$

CALIBRATOR ZENER DIODE REPLACED WITH RESISTOR TO IMPROVE RELIABILITY AND REDUCE COST.

Effective Prod SN 3150

Usable in SN 100-3149

D948, a 7V zener diode, was failing occasionally resulting in an inoperative or erroneous Calibrator.

D948 was replaced with a 6.8k 1/4W 5% resistor to improve reliability and reduce cost. The advertised Calibrator risetime was not changed, however, the test risetime limits were changed from 0.3 μ s to 0.4 μ s maximum (0.2mV to 5V) and from 0.5 μ s to 0.6 μ s maximum (10V to 100V).

Parts Removed:

D948	152-0004-00	Diode, zener type 1N707 (Hoffman), type 1N763 (Transitron)
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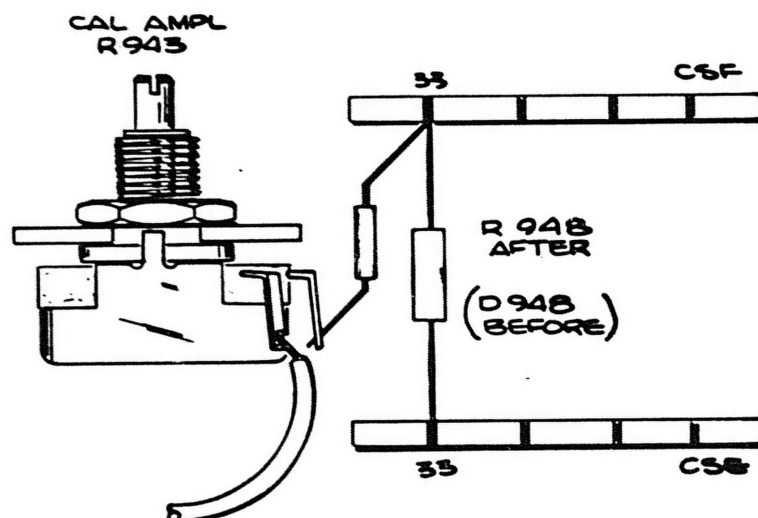
Parts Added:

R948	315-0682-00	Resistor, comp, 6.8k 1/4W 5%
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INSTALLATION

Parts Required: See 'Parts Added.'

Replace D948 (7V zener diode) with resistor R948 (6.8k 1/4W). D948 is located on the power supply chassis just behind the Cal. Ampl. potentiometer R943.



CALIBRATOR RESISTORS CHANGED TO REDUCE COST

Effective Prod SN 10200

Higher quality and lower cost resistors were made available to replace the 1/2W, 1/4% resistor used in the Calibrator.

R964 and R965 were changed from a TC-5 to a TC-9. Temperature coefficient T5 is ± 25 PPM, 25°C to +145°C, and TC-9 is ± 25 PPM, -55°C to +165°C.

Parts Removed:

R964	323-0638-00	Resistor, 50k 1/2W 1/4%
R965	323-0637-00	Resistor, 50 Ω 1/2W 1/4%

Parts Added:

R964	323-0638-06	Resistor, 50k 1/2W 1/4%
R965	323-0637-06	Resistor, 50 Ω 1/2W 1/4%

POSITION NEON ILLUMINATION DUE TO GRATICULE LIGHTS ELIMINATED

Effective Prod SN 390

Usable in SN 100-389

The position neons appear lighted due to the light from the graticule filtering through the neon holders. Add two insulating graticule light sleeves.

Parts Added:

2 ea. 166-0328-00 Sleeves, graticule light

INSTALLATION

Parts Required: See 'Parts Added.'

- 1) Loosen the graticule light mounting nuts and slide the graticule lights back and to the side.
- 2) Install the new light sleeves over the graticule lights.
- 3) Reinstall the graticule lights, making sure they stick out no further than the indentations in the CRT eyebrow will allow.

ACCESSORIES CHANGED TO PERMIT PATCHING WITHOUT ADAPTERS

Effective Prod 2-26-65
(also RM)

The present patch cords and/or adapters were changed/added as indicated below to permit patching from BNC to BNC connectors, or from BNC to UHF (or banana jack) connectors without the use of adapters.

Also, these patch cords are set up as optional accessories:

6 inch red BNC to BNC	012-0085-00
6 inch red BNC to banana plug	012-0089-00
6 inch black BNC to BNC	012-0084-00
6 inch black BNC to banana plug	012-0088-00
18 inch black BNC to BNC	012-0086-00
18 inch black BNC to banana plug	012-0090-00

Parts Removed:

131-0033-00	Adapter, binding post
012-0031-00	Patch cord

Parts Added:

012-0087-00	Patch cord, BNC to BNC
012-0091-00	Patch cord
012-0092-00	Jack, BNC post

TRANSISTOR SOCKETS CHANGED

Effective Prod SN 1160
180-RM

A better and more economical way to mount transistor sockets was provided by replacing sockets with new snap-in type. Also see M9141.

Parts Removed:

35 ea. 136-0095-00 Socket, 4-pin transistor

Parts Added:

29 ea. 136-0181-00 Socket, 3-pin transistor
6 ea. 136-0182-00 Socket, 4-pin transistor
35 ea. 354-0234-00 Ring, transistor socket

CABINET LATCH RETAINER RING REPLACED FOR IMPROVED RELIABILITY

Effective Prod SN 4560 (RM Only)

Usable in SN 100-4559

Cabinet latch screws pull loose from the front panel. This problem is caused by the phosphor bronze split retainer ring coming off the cabinet latch screw. It could occur, for example, if screw is pulled while being turned, or screw is used to pull instrument from cabinet.

The phosphor bronze retainer rings were replaced by stainless steel split retainer rings. The new rings are bent slightly to facilitate installation.

Parts Removed:

4 ea. 354-0236-00 Ring, retainer, split, 0.344 OD x 0.213 ID x 0.013 phosphor bronze

Parts Added:

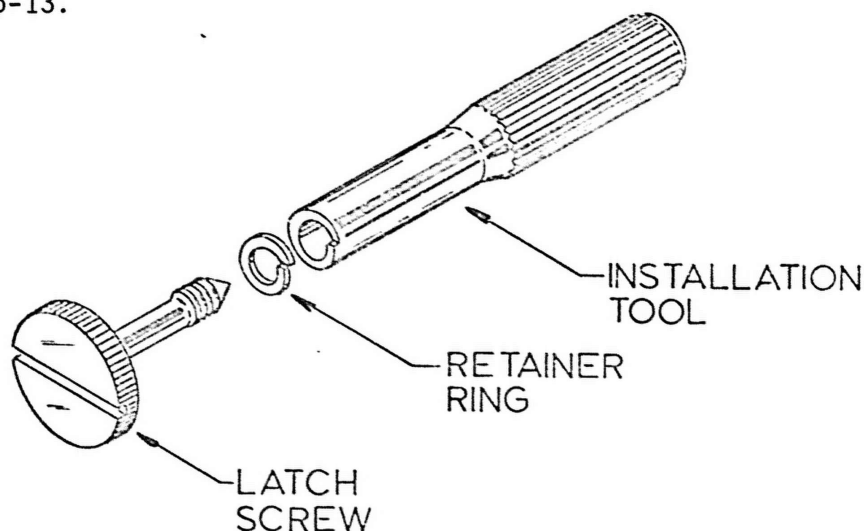
4 ea. 354-0294-00 Ring, retainer, split, 0.375 OD x 0.209 ID x 0.025 stainless steel

INSTALLATION

Parts Required: See 'Parts Added.'

Replace the phosphor bronze split retainer ring on each of the four cabinet latch screws with a stainless steel retainer ring. Carefully "screw" the ring over the threads with your fingers (or gently with your pliers). Don't force the ring over the threads, as this may spread it too much.

NOTE: If you have a number of retainer rings to install, you may order a special tool from Southco Corp. (see drawing below). The part number is 1/4-20-58-0-4586-13.



MOTOR BASE CHANGED TO IMPROVE GROUND CONNECTION

Effective Prod SN 6300

Usable in SN 100-6299

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 new ground post and mounting plate, the plate was changed from etched aluminum to cad-plated steel.

Parts Removed:

131-0150-01	Motor base,+Type 547
131-0102-01	Motor base, Type RM547

Parts Added:

131-0572-00	Motor base, Type 547
131-0102-02	Motor base, Type RM547

INSTALLATION

Parts Required: See 'Parts Added.'

Replace the motor base connector with the new type.

BOTTOM RAIL ANTI-SLIDE FEET ADDED TO PREVENT SLIDING OFF OF SCOPE-MOBILES®

Effective Prod SN 6730

Usable in SN 100-6729

Instrument can slide off SCOPE-MOBILE when shelf is tilted in extreme forward position.

Two anti-slide feet were added to each bottom rail and the transformer mounting bracket was modified to allow clearance for the mounting hardware.

Parts Removed:

2 ea.	122-0108-00	Angle, rail bottom
	210-0010-00	Lockwasher, int. #10
	212-0509-00	Screw, 10-32 x 5/8 BHS pozidriv
	406-0928-00	Bracket, transformer, 0.063 al.

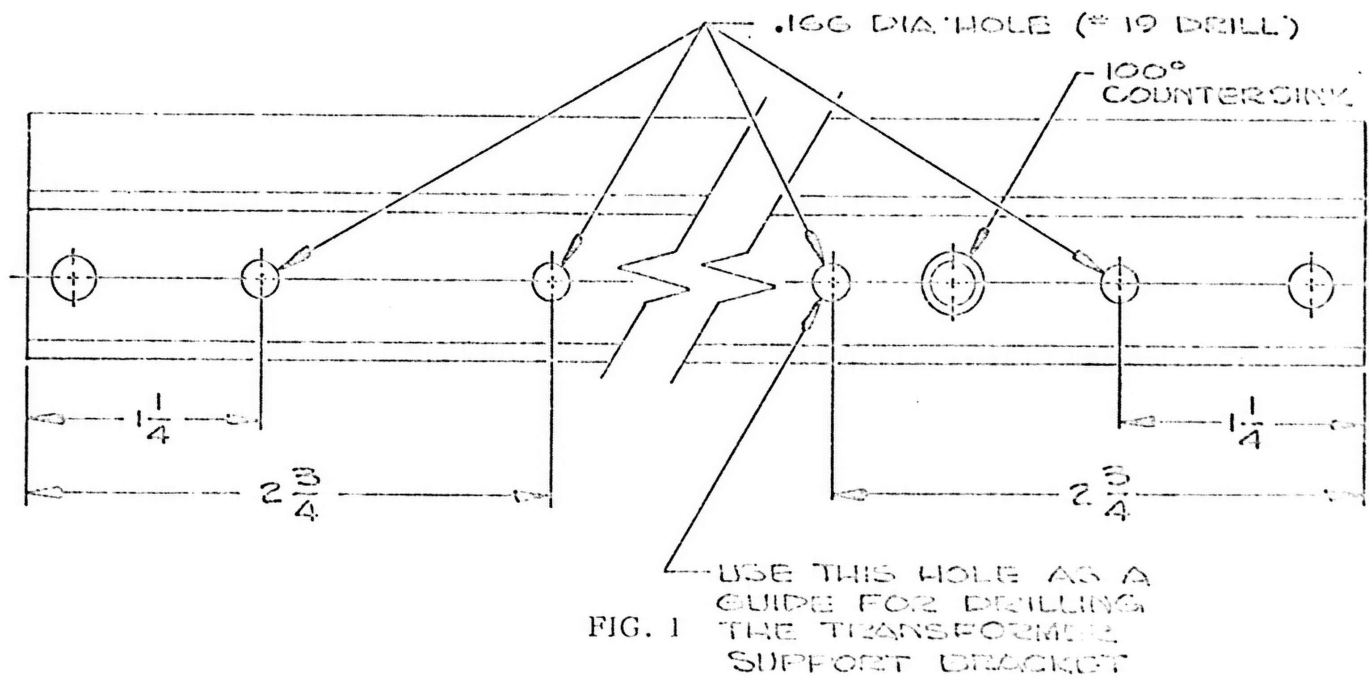
Parts Added:

8 ea.	212-0071-00	Screw, 8-32 x 1" Fil-HS pozidriv
4 ea.	348-0052-00	Foot, anti-slide molded neoprene

INSTALLATION

Parts Required: See 'Parts Added.'

- a) Remove the bottom rails from the instrument.
- b) Drill four holes in each rail in the locations shown in Fig. 1 using a #19 drill.
- c) Tap these holes using an 8-32 tap.
- d) Countersink the existing hole indicated in Fig. 1 with a 100° countersink. Do this only on the rail to be installed over the power transformer.
- e) Temporarily hold the rail with the countersunk hole in place over the transformer. Using one of the holes drill in step 2 as a guide, mark the transformer support and drill a 1/4" clearance hole for the foot-mounting hardware. See Fig. 1.
- f) Reinstall the bottom rails and then install the anti-slip feet.



POOR COPY

10% AND 20% ZENER DIODES CHANGED TO STANDARD 5% UNITS

Effective Prod SN 8630

NOTE: All diodes in any one instrument will not necessarily change at the same time. The effective SN furnished will be when the final diode in the particular instrument is changed.

Zener diode values are at present widely scattered in both voltage and tolerance. The proposed modifications will standardize all 400mW, 1W, 1.5W, and 10W zeners, now listed as 10% and 20%, to 5% tolerance, and change the majority of non-standard parts to standard JEDEC units. One of these changes is to minimize the number of active part numbers. There will be no increase in cost for the 5% zeners.

Voltage tolerance for 10% and 20% zener diodes was changed to 5% for all uses. At the same time, all 250mW zener diodes were changed to 400mW. Refer to parts removed and added list for details.

Parts Removed:

D541	152-0067-00	Diode, 1M25Z10 25V $\pm 10\%$
D297 D97	152-0118-00	Diode, 1N3033 36V $\pm 20\%$
D277 D76	152-0119-00	Diode, 1N969A 22V $\pm 10\%$
D693	152-0157-00	Diode, .4M140Z10 140V $\pm 10\%$
D1109	152-0228-00	Diode, 1M105Z10 105V $\pm 10\%$

Parts Added:

D541	152-0022-00	Diode, 1N25Z5 25V $\pm 5\%$
D297 D97	152-0294-00	Diode, 1N3033B 36V $\pm 5\%$
D277 D76	152-0281-00	Diode, 1N969B 22V $\pm 5\%$
D693	152-0288-00	Diode, .4M105Z5 105V $\pm 5\%$
D1109	152-0305-00	Diode, 1N3045B 110V $\pm 5\%$

See M12258.

CABINET LATCH ASSEMBLY CHANGED TO A MECHANICALLY MORE RELIABLE ASSEMBLY

Effective Prod SN 12800

The panel holes were changed to accommodate the new latches.

Parts Removed:

387-0761-00	Plate, cabinet side, left
387-0762-00	Plate, cabinet side, right
386-1093-00	Plate, cabinet bottom

Parts Added:

387-0761-04	Plate, cabinet side, left
387-0762-04	Plate, cabinet side, right
386-1093-03	Plate, cabinet bottom

CERAMIC STRIPS CHANGED

Effective Prod SN 15280

All 3/4" wide ceramic strips were replaced by 7/16" wide strips for standardization.

Ceramic strips were replaced where used as follows:

Parts Removed:

3/4" ceramic strips

Notches

124-0100-00	1
124-0086-00	2
124-0087-00	3
124-0088-00	4
124-0089-00	7
124-0090-00	9
124-0091-00	11

Parts Added:

7/16" ceramic strips

124-0118-00
124-0119-00
124-0092-00
124-0120-00
124-0094-00
124-0095-00
124-0106-00

To maintain approximately the same height between the chassis and the top of the ceramic strips, replace spacers used to mount 3/4" ceramic strips with spacers listed below:

Spacer used with 3/4" strip

Height

361-0007-00	.093
361-0008-00	.156
361-0009-00	.281

Replacement spacer used with
7/16" stripHeight

361-0039-00	.406
361-0039-00	.406
361-0392-00	.593

To provide adequate stud length on the 7/16" strips for the longer replacement spacers, the 7/16" ceramic strips listed above were modified by replacing the cera-mount studs, 355-0046-00 (.777 overall length) with new longer studs, 355-0158-00 (1.108 overall length).



product modification

040-0065-00.

See Below

BLANK PLUG-IN

For all Tektronix Oscilloscopes using Letter or '1' Series Plug-Ins -- including Types 581/A, 585/A, and RM585A with a Type 81 Adapter.

Modification Kit, PN 040-0065-00, with the enclosed information allows the construction of special plug-in units for the above instruments.

Format change since last publication.

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5-5-69
Supersedes: 12-5-68

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117.01

PARTS INCLUDED IN MODIFICATION KIT:

Quantity	Part Number	Description
1 ea	131-0017-00	Connector, amphenol, 16-pin
1 ea	210-0004-00	Lockwasher, int #4
1 ea	210-0201-00	Lug, solder, SE #4
2 ea	210-0406-00	Nut, hex, 4-40 x 3/16
1 ea	210-0812-00	Washer, fiber
2 ea	211-0097-00	Screw, 4-40 x 5/16 PHS, Phillips
4 ea	212-0043-00	Screw, 8-32 x 1/2 FHS, Phillips, 100°
4 ea	212-0008-00	Screw, 8-32 x 1/2 PHS, Pozidrive
1 ea	333-0150-00	Panel, front, special blank plug-in
1 ea	354-0025-00	Ring, retaining
1 ea	366-0125-00	Knob, retaining, gray
1 ea	384-0510-00	Rod, securing, RS53
4 ea	384-0631-00	Rod, spacer, plug-in
1 ea	386-0423-00	Plate, sub-panel, special blank plug-in
1 ea	387-0549-00	Plate, blank, FP53 special
1 ea	441-0108-00	Chassis, special blank, CH53

continued

GENERAL INFORMATION:

The following chart is intended as a guide to the voltages and signals supplied by the various oscilloscopes at the plug-in connector. It lists the approximate load current requirements necessary to keep each power supply in regulation. In addition, it lists the inputs used by the oscilloscopes.

PIN NO.	DESCRIPTION	INSTRUMENTS	VOLTAGE	MAX LOAD CURRENT	MIN LOAD CURRENT	NOTES
1 3	Vertical Signal Input	All	See *Note			
2	Ground	All				Grounded in oscilloscope
4 5	Int Trig Sig Input	544, 546 547, 555** only	(See Manual)			These pins blank in all other oscilloscopes
6	Blank Pin	All				
7	Slave Pulse Output	547 only	(See Manual)			This pin blank in all other oscilloscopes
8 16	Alt Trace Sync Pulse Output	All	(See Manual)			Pin 8 grounded by Types CA, M, etc, in Alt Trace mode.
9	-150v Supply	All	-150v DC	60ma	3.8ma	
10	+100v Supply	All	+100v DC	50ma	4.5ma	
11	-225v Supply	All	+225v DC	75ma	16.0ma	
12	+350v Supply	All	+350v DC	20ma	0 ma	
13 14	Heater Supply	All	6.3v AC	2.8amp	0 ma	Elevated to +100v in some oscilloscopes (see Manuals). Do not ground either pin.
15	Series Heater String Supply	All	+ 75v DC	150ma	150ma	Instrument should not be operated without loading this supply.

*NOTE: Bias required at both pins is +67.5v ($\pm 2\%$). Signal Amplitude limited by sensitivity of oscilloscope (100mv/cm).

** Used on Type 555 SN 7000-up, or Type 555 modified with Field Modification Kits 040-0328-00 or 040-0328-01.

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product modification

040-0281-00

Instrument Types
See Below

CRADLE MOUNT

For the following TEKTRONIX® Type Oscilloscopes:

Type	524AD	Serial Numbers	5001-up
Type	531	Serial Numbers	5001-up
Type	531A	Serial Numbers	All Serial Numbers
Type	532	Serial Numbers	5001-up
Type	533A	Serial Numbers	All Serial Numbers
Type	535	Serial Numbers	5001-up
Type	535A	Serial Numbers	All Serial Numbers
Type	536	Serial Numbers	All Serial Numbers
Type	541	Serial Numbers	5001-up
Type	541A	Serial Numbers	All Serial Numbers
Type	543	Serial Numbers	All Serial Numbers
Type	543A	Serial Numbers	All Serial Numbers
Type	543B	Serial Numbers	All Serial Numbers
Type	544	Serial Numbers	All Serial Numbers
Type	545	Serial Numbers	5001-up
Type	545A	Serial Numbers	All Serial Numbers
Type	545B	Serial Numbers	All Serial Numbers
Type	546	Serial Numbers	All Serial Numbers
Type	547	Serial Numbers	All Serial Numbers
Type	549	Serial Numbers	All Serial Numbers
Type	570	Serial Numbers	5001-up
Type	575	Serial Numbers	All Serial Numbers
Type	581	Serial Numbers	All Serial Numbers
Type	581A	Serial Numbers	All Serial Numbers
Type	585	Serial Numbers	All Serial Numbers
Type	585A	Serial Numbers	All Serial Numbers
Type	661	Serial Numbers	All Serial Numbers

Modification Kit, PN 040-0281-00, enables the above TEKTRONIX Type instruments to be rackmounted in a standard 19 inch relay rack. A vertical front panel space of 17-1/2 inches is required.

Future instruments with the same front panel dimensions may also be used with this kit, providing they have bottom rails similar to those on the above listed instruments. This kit directly replaces 040-0182-00.

PARTS INCLUDED IN MODIFICATION KIT

Quantity	Part Number	Description
1 ea.	426-0208-00	Assembly, cradle mount, oscilloscope, including:
2 ea.	(211-0025-00)	Screw, 4-40 x 3/8 FHS
4 ea.	(212-0023-00)	Screw, 8-32 x 3/8 PHS, Phillips
1 ea.	(381-0198-00)	Bar, stiffening, 1/4 x 5/8 x 16-5/8
2 ea.	(381-0211-00)	Bar, mounting, 1/4 x 1/2 x 8-1/8
1 ea.	105-0013-00	Stop, instrument
2 ea.	210-0008-00	Lockwasher, int #8
2 ea.	210-0409-00	Nut, hex, 8-32 x 5/16
2 ea.	210-0804-00	Washer, flat, 8S x 3/8
8 ea.	210-0833-00	Washer, cup, #10
2 ea.	210-0852-00	Washer, spacer, 3/16ID x 3/8OD x 0.091
6 ea.	211-0025-00	Screw, 4-40 x 3/8 FHS
2 ea.	212-0004-00	Screw, 8-32 x 5/16 PHS, Phillips
8 ea.	212-0008-00	Screw, 8-32 x 1/2 PHS, Phillips
8 ea.	212-0512-00	Screw, 10-32 x 1/2 OHS
1 ea.	333-0491-00	Panel, front, mask for rackmounting
2 ea.	381-0202-00	Bar (guide rail), aluminum, angle, 18 in.
2 ea.	387-0636-00	Plate (slide), BAKELITE®, 1-1/8 x 18 in.
1 ea.	406-0424-00	Bracket, hold-down

INSTRUCTIONS

- () 1. Mount the two guide rails and BAKELITE slides (from kit) on the cradle assembly, with the rail lip on the outside (Fig. 1A). Use the threaded holes in the cradle, spaced according to the lengths listed for the kits in Fig. 1B. Mount the rails with the 4-40 x 3/8 FHS screws from the kit.
- () 2. Fasten each side of the cradle assembly to the front flange of the relay rack, with three 8-32 x 1/2 PHS screws from the kit (see Figs. 2 and 6). Each mounting bar is fastened to the cradle by a single 4-40 screw, allowing it to be adjusted for slight variations in rack width.

NOTE: To install the cradle assembly in channel-type racks, it will be necessary to tilt the assembly sideways, while bending one side inward.

- () 3. Remove the voltage tag on the rear right hand side of the instrument.
- () 4. Relocate the voltage tag on the middle left hand side of the instrument, use a #43 drill (see Fig. 3).
- () 5. Mount the hold-down bracket (from kit) on the rear panel of the instrument, as near to the vertical center line as possible (see Fig. 3).
- () a. Drill and tap the two holes in the rear panel shown in Fig. 3. Use a #29 drill and an 8-32 tap.

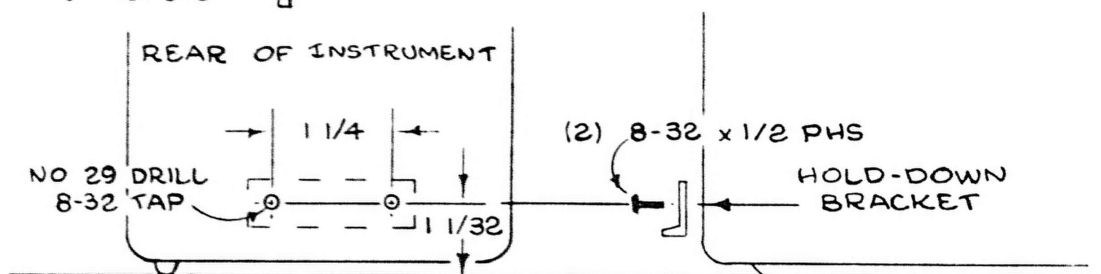
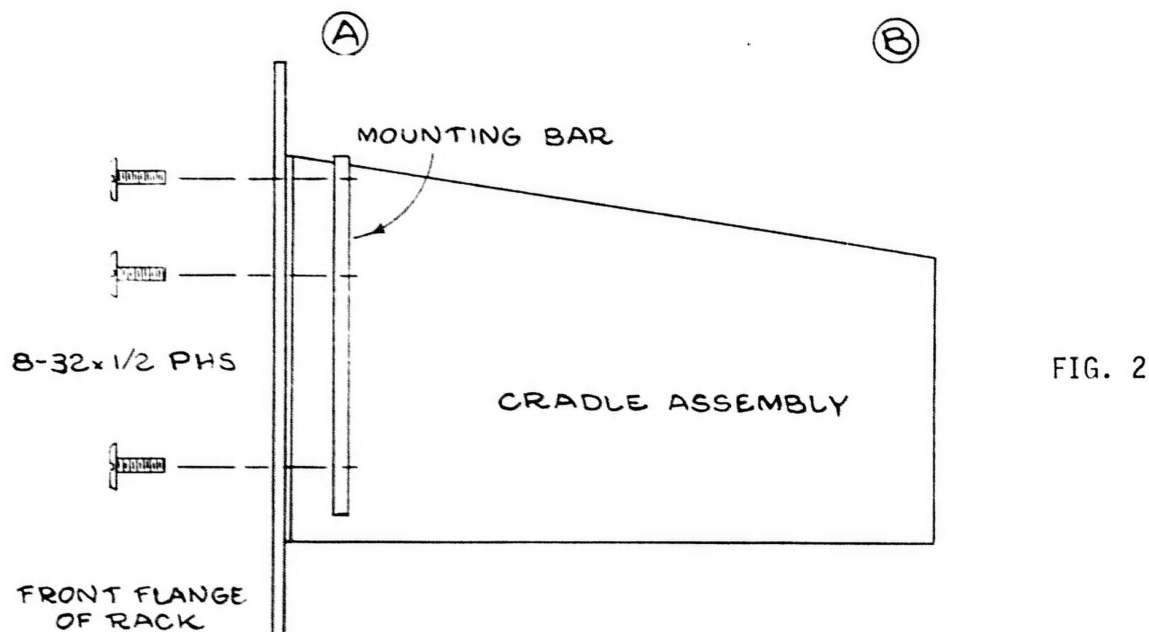
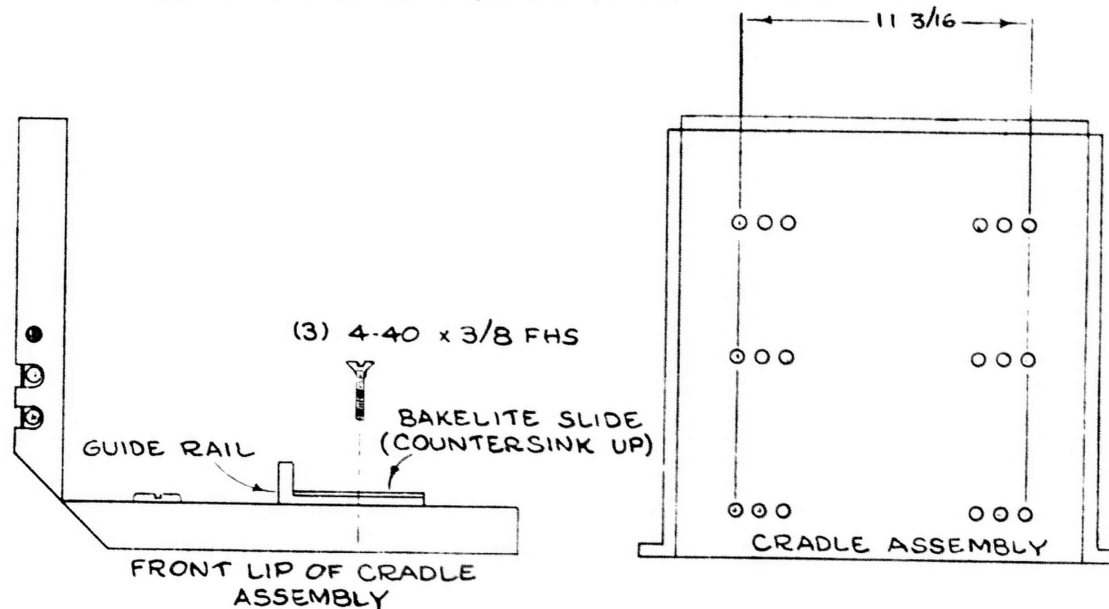
CAUTION: BE CAREFUL NOT TO DRILL INTO COMPONENTS MOUNTED BEHIND THE REAR SUB-PANEL.

- () b. Mount the hold-down bracket, using two 8-32 x 1/2 PHS screws from the kit.

BAKELITE, Reg. TM of Union Carbide Corp.

INSTRUCTIONS (cont)

- () c. If the instrument will be subject to excessive vibration, the 8-32 nuts (from kit) should be added.
- () 6. Place the instrument on the cradle guide rails and slide it into place.
- () 7. Temporarily mount the mask (from kit) on the front of the relay rack, over the instrument front panel, and hold it in place with three or four of the 10-32 x 1/2 OHS screws from the kit.



INSTRUCTIONS (cont)

- () 8. Position the instrument so that the stainless steel ring touches the mask all the way around the instrument (see Fig. 4).
- () 9. Place the instrument stop (from kit) on the cradle so that it meshes with the hold-down bracket on the instrument (see Fig. 5). If necessary, the hold-down bracket may be adjusted up or down.
- () Mark the exact location of the stop on the cradle.
- () 10. Remove the mask and the instrument.
- () 11. Place the instrument stop in the location marked in step 7. Select two of the tapped holes in the stop, and mark and drill $11/64$ in. holes in the cradle at these points.
- () 12. Mount the stop, using the 8-32 x $5/16$ PHS screws, flat washers and lock-washers from the kit (see Fig. 5).
- () 13. Replace the instrument. Make sure the hold-down bracket and instrument stop come together properly.
- () 14. Replace the mask, using the 10-32 x $1/2$ OHS screws, the #10 cup washers, and the two spacer washers from the kit (see Fig. 6).

THIS COMPLETES THE INSTALLATION

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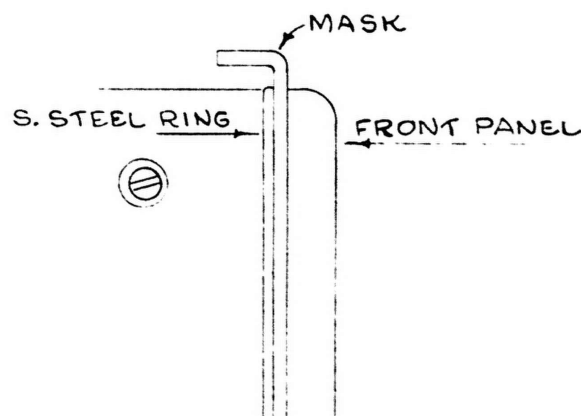


FIG. 4

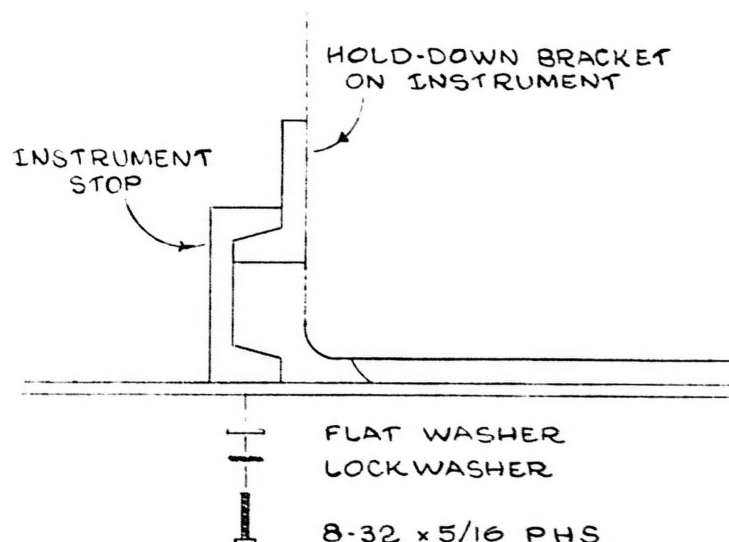
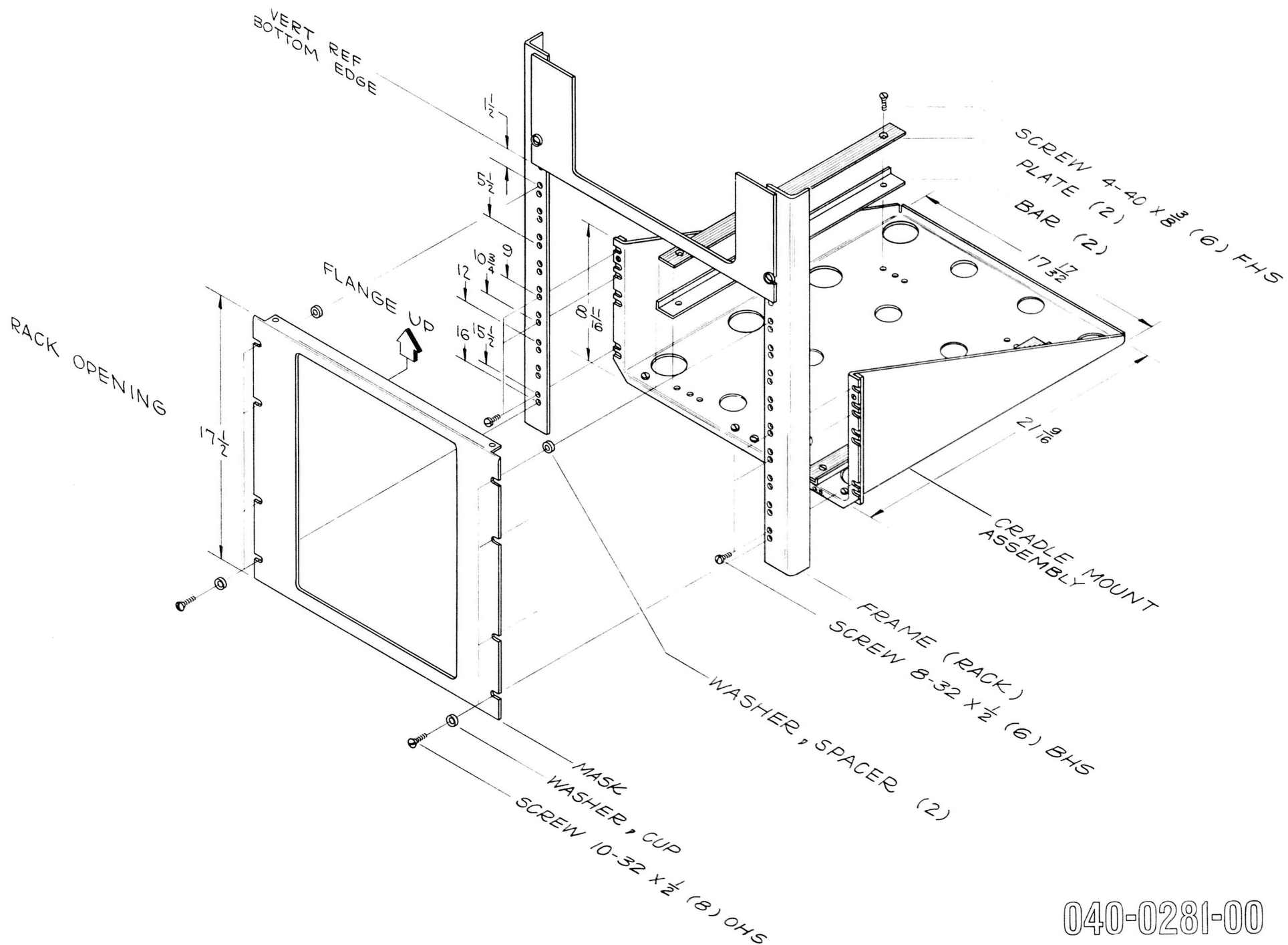


FIG. 5



040-0281-00



product modification

050-0123-01

M7009

Instrument Type
See Below

AIR FILTER REPLACEMENT

For the Following Tektronix Oscilloscopes:

Type 531	Serial Numbers	101-20000	(Guernsey)
Type 531A	Serial Numbers	20001-25609 and	100025-100477
Type 532	Serial Numbers	101-Up	
Type 533	Serial Numbers	101-3000	
Type 533A	Serial Numbers		100001-100778
Type 535	Serial Numbers	101-20000	
Type 535A	Serial Numbers		101250-102117
Type 536	Serial Numbers	101-2969	
Type 541	Serial Numbers	101-20000	
Type 541A	Serial Numbers	20001-Up	100166
Type 543	Serial Numbers	101-3000	
Type 543A	Serial Numbers	3001-Up	
Type 543B	Serial Numbers		100023-100128
Type 544	Serial Numbers		100013-100043
Type 545	Serial Numbers	101-20000	
Type 545A	Serial Numbers	20001-Up	
Type 545B	Serial Numbers		100057-101593
Type 546	Serial Numbers		100015-100038
Type 547	Serial Numbers		100248-100530
Type 567	Serial Numbers	101-749	
Type 581	Serial Numbers	101-Up	
Type 581A	Serial Numbers		100013-100063
Type 585	Serial Numbers	101-Up	
Type 585A	Serial Numbers		100038-100181
Type 551	Ind Serial Numbers	101-5299 and	100001-100468
Type 555	Ind Serial Numbers	101-4859 and	100159-100352
Type RM31	Serial Numbers	101-1000	Type RM41A Serial Numbers 1001-Up
Type RM31A	Serial Numbers	1001-2509	Type RM43 Serial Numbers 101-1000
Type RM32	Serial Numbers	101-Up	Type RM43A Serial Numbers 1001-Up
Type RM33	Serial Numbers	101-1000	Type RM45 Serial Numbers 101-1000
Type RM35	Serial Numbers	101-Up	Type RM45A Serial Numbers 1001-Up
Type RM41	Serial Numbers	101-1000	Type RM567 Serial Numbers 101-239

Plastic-foam air filter 378-0023-00 replaces aluminum air filters 378-0011-00, 378-0011-01 and nylon air filter 378-0011-02 (for Guernsey).

An aluminum grille, 378-0762-00 is included to maintain clearance between the fan blade and the filter.

NOTE: If the serial number of your instrument is above those listed, or if this kit has been installed, disregard the instructions as PN 378-0023-00 is a direct replacement.

This Parts Replacement Kit replaces 050-0123-00, which replaced the air filter in the Types 551 and 555 only.

PARTS INCLUDED IN PARTS REPLACEMENT KIT:

Quantity	Part Number	Description
4 ea	213-0054-00	Screw, 6-32 x 0.312, pnh, thread-forming
1 ea	378-0023-00	Filter, air, plastic foam, 10.375 square
1 ea	378-0762-00	Grille, fan

INSTRUCTIONS

A. TO REPLACE THE FILTER ON THE FOLLOWING INSTRUMENTS BELOW SN 5000:

Types 531, 532, 535, 541 and 545

- () 1. Remove the filter and filter housing.
- () 2. Center the fan grille (from kit) over the fan opening in the cabinet.
- () Mark and drill four 0.11-inch-diameter (#36) holes in the cabinet for mounting the screen.
- () Mount the new fan grille, using the four 6-32 thread-forming screws from the kit.
- () 3. Place the new air filter over the grille, and between the two mounting screws.
- () 4. Replace the filter housing.
- () Record the part numbers of the new parts in your Instruction Manual.

B. TO REPLACE THE FILTER ON ALL REMAINING INSTRUMENTS LISTED ON PAGE 1:

- () 1. Remove the filter and filter housing.
 - () 2. Loosen the two right hand (viewing from rear) fan ring mounting screws.
 - () 3. Remove the two left hand fan ring mounting screws.
 - () 4. Install the fan grille (from kit) under the two loosened screws, using the two notches provided.
- NOTE: Mount with the curved area away from fan.
- () 5. Replace the two screws removed in step B-3.
 - () 6. Tighten all four mounting screws securing the fan ring and filter screen.
 - () 7. Place the new air filter (from kit) over the screen and between the four mounting screws.
 - () 8. Replace the filter housing.
 - () Record the part numbers of the new parts in your Instruction Manual.

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