



product modification

050-2239-03

M62235, M63636
M64682, M67697
M72440

Q935, Q946, Q947, OR Q9070 REPLACEMENT

For the following TEKTRONIX® Oscilloscopes:

2220 Serial Numbers B010100 - B020491
2221 Serial Numbers 200000 - 200070
2230 Serial Numbers B010100 - B023472

This kit provides parts and instructions to replace Q935, Q946, Q947 and Q9070. Because failure of any one of these components may cause excess stress to the others, replacement of all components is recommended.

The new silicon control rectifier, pn 151-0565-01, used to replace Q935 has improved current characteristics. To prevent interference between the new SCR and the electronics module of the fan assembly, the SCR was laid down on the circuit board which required several components to be relocated.

The new field effect transistor, pn 151-1245-00, used to replace Q9070 has a higher voltage rating. Use of the new FET requires changing the value of R908.

To prevent excess stress to VR901, the circuit location for VR901 and R900 are switched.

NOTE

If the instrument serial number is greater than those listed above or if this kit has been previously installed, disregard the instructions and use the new SCR, FET, and inverter transistors as direct replacements.

CAUTION

STATIC SENSITIVE DEVICES

Static discharge can damage any semiconductor component in this instrument. Static voltages of 1kV to 30kV are common in unprotected environments.

TO AVOID DAMAGE, OBSERVE THE FOLLOWING:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
3. Discharge the static voltage from your body by wearing a wrist-strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified service personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by the body, never by the leads.
7. Do not slide the components over any surface.
8. Avoid handling components in areas that have a floor or work-surface covering capable of retaining a static-charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only approved, anti-static type, desoldering tools.

KIT PARTS LIST:

Ckt. No.	Quantity	Part Number	Description
A1W934	1 ea	131-0566-00	Bus, conductor: dummy resistor
A1Q935	1 ea	151-0565-01	Thyristor, SCR: 8A, 200V, sens gate, TO-220
A1Q946	2 ea	151-0852-00	Transistor: NPN, 50V, 150mA, 200mW, Inverter
A1Q947			
A1Q9070	1 ea	151-1245-00	Transistor: MOSEFET, N-Channel, TO-220
A1VR935	1 ea	152-0255-00	Semiconductor, di: Zener, 51V, 5%
A1CR906	2 ea	152-0808-00	Semiconductor, di: rect, Si, 400V, 1.5A, 50nS
A1CR907			
A1C919	1 ea	281-0852-00	Capacitor, cer: 1800pF, 10%, 100V
A6R900	1 ea	301-0474-00	Resistor, fxd, film: 470k Ω , 5%, 0.5W
A6VR901	1 ea	307-0456-00	Resistor, volt sens: 250vac, 20W
A1R941	1 ea	315-0102-00	Resistor, fxd, film: 1k Ω , 5%, 0.25W
A1R935	1 ea	315-0121-00	Resistor, fxd, film: 120 Ω , 5%, 0.25W
A1R908	1 ea	315-0222-00	Resistor, fxd, film: 2.2k Ω , 5%, 0.25W
A1R919	1 ea	322-3285-00	Resistor, fxd, film: 9.09k Ω , 1%, 0.2W
A1R919	1 ea	322-3289-00	Resistor, fxd, film: 10k Ω , 1%, 0.2W
A1R919	1 ea	322-3293-00	Resistor, fxd, film: 11k Ω , 1%, 0.2W
	1 ea	361-0385-00	Spacer, transistor
	1 ea	-----	Label: 050-kit

INSTALLATION INSTRUCTIONS:

WARNING

Dangerous shock hazards may be exposed when the instrument cabinet is removed. Before proceeding, ensure the POWER switch is in the OFF position, then disconnect the instrument from the power source. Disassembly should only be attempted by qualified service personnel.

- () 1. Remove the instrument wrap-around cabinet.
- () 2. Remove the screw used to secure the plastic power supply shield to the solder side of the Main circuit board and set the shield aside.
- () 3. Lift the Storage circuit board up to the service position and secure the board latch into the chassis side rail.
- () 4. Remove the metal power supply shield from the component side of the Main circuit board.
- () 5. Remove the fan motor and electronic module assembly from the instrument.

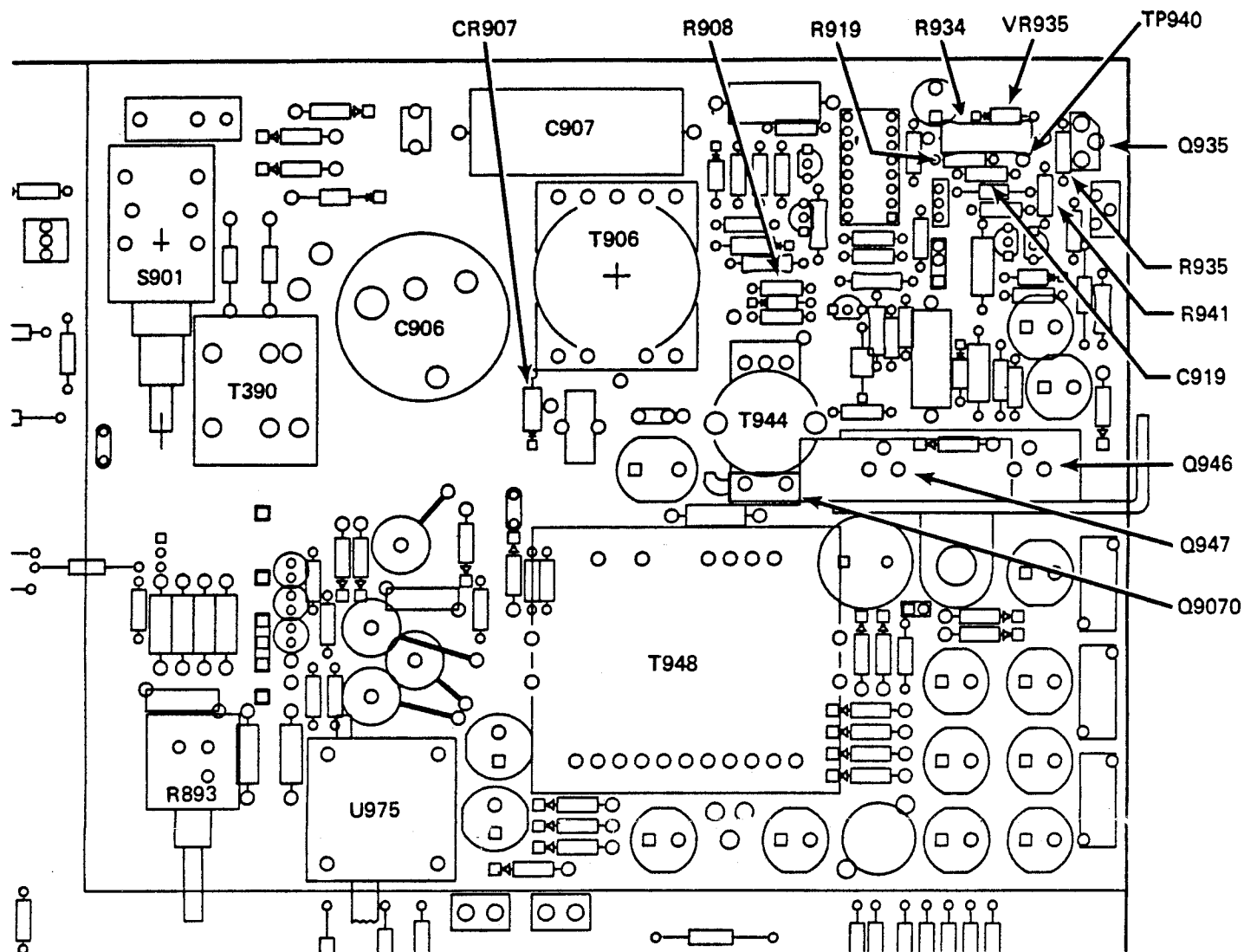


Fig. 1. Component locations on Main board before modifications.

Make the following changes on the A1 Main board. Refer to Fig. 1.

NOTE

New components have been provided in this kit to facilitate relocating the components in the following step. Note that R934 is being replaced with a 0 Ω dummy resistor, W934, and that three resistor values have been provided for R919. At some frequencies the power supply emits an audible noise which may be eliminated by selecting the value of R919.

- () 6. Relocate C919, R919, R934, R935, R941 and VR935 from the component side of the Main circuit board to the solder side of the circuit board. Note which circuit board pads each component uses to facilitate installation of the components on the solder side of the circuit board.

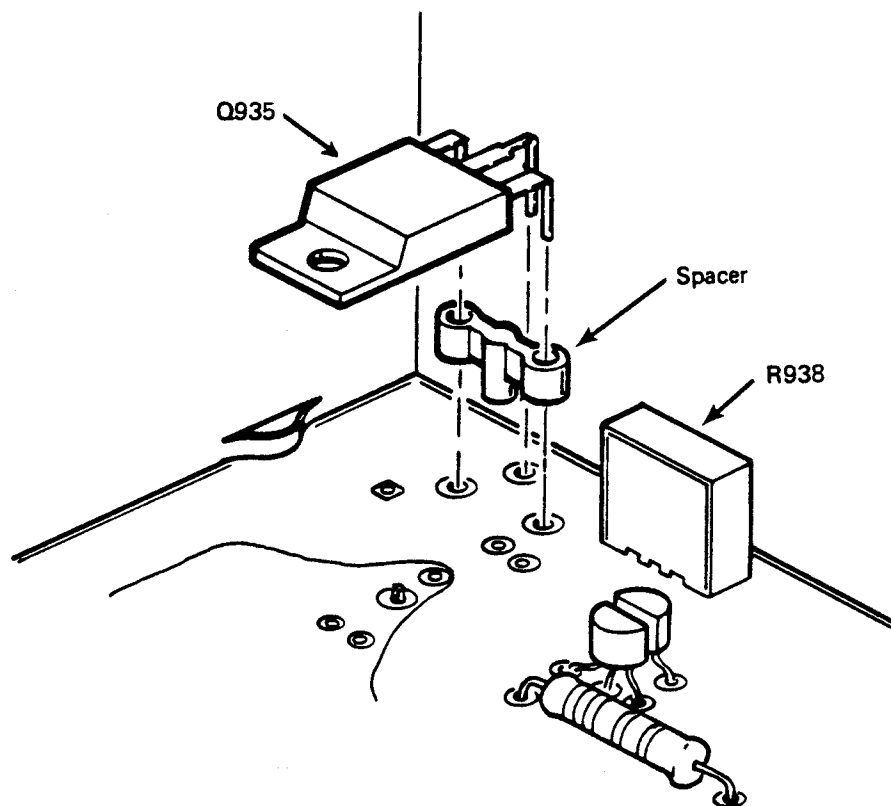


Fig. 2. SCR Installation

- () 7. Remove TP940, the 43V test point. In the future, use the tab of the new SCR as the 43V test point.

NOTE

Steps 8 and 9 do not apply to 2220's above serial number B020476 or 2230 s above serial number B023218.

- () 8. Replace R908, a $3k\Omega$ 0.25W resistor, with the $2.2k\Omega$ resistor included in this kit.
- () 9. Prepare the two diodes included in this kit so that they are in parallel and the cathodes are tied together. Replace CR907 with the pair of diodes, CR906 and CR907.
- () 10. Replace Q946, Q947, and Q9070 with the new components included in this kit. Q946, Q947 and Q9070 are located on the metal bracket attached to the right rear corner of the chassis. Refer to the parts list on page 3 for circuit and part number information.
- () 11. Replace Q935 with the new SCR, included in this kit, using the included spacer as shown in Fig. 2.

- () 12. On the EMI Filter board, replace VR901 and R900 with the new components, included in this kit, swapping their physical locations as the new parts are installed.
- () 13. Install the fan motor and electronic module removed in step 5.
- () 14. Install the two electrical shields, removed in steps 2 and 4, on the Main circuit board.
- () 15. Refer to the Performance Check Procedure in the Service Manual and verify product performance.
- () 16. Remove the protective backing from the 050-kit label, included in this kit, and place the label on a clean, flat surface of the rear panel. The label indicates this kit has been installed.
- () 17. Correct the Replaceable Electrical Parts list and schematic in the Service Manual with the information provided in the parts list of this kit.

JLG