



050-1782-02

PC-52, PC-73, PC-156
M54262, M61395

HIGH VOLTAGE MULTIPLIER (U1830) REPLACEMENT

For the following TEKTRONIX® instruments:

2445 Serial Numbers B010100 - B028100
2465 Serial Numbers B010100 - B032175

This kit contains parts and instructions to replace the High Voltage Multiplier, U1830, pn 152-0805-00, with a new High Voltage Multiplier. Use of the new multiplier requires the removal of a diode, CR1951, changing the value of a resistor, R1845, and removing a capacitor, C90 (if present), all located on the High Voltage circuit board.

NOTE

If the instrument serial number is greater than those listed above or if this kit has previously been installed, disregard the instructions and use the High Voltage Multiplier included in the kit as a direct replacement for U1830.

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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. Number	Quantity	Part Number	Description
CR1950	1 ea	152-0061-00	Semicond dev, di, Si, 175V, 100mA
U1830	1 ea	152-0805-00	Semicond dev, di, High Voltage Multiplier
R1845	1 ea	315-0302-00	Resistor, cmprsn, 3k Ω , 5%, 0.25W
	1 ea	-----	Label, 050-kit

INSTRUCTIONS:**WARNING**

To avoid electric shock hazard, disconnect the instrument from all other electrical equipment and the power source before proceeding.

The following instructions are for use by qualified service personnel only. to avoid personal injury, do not perform any of the following procedure unless you are qualified to do so.

- () 1. Remove the instrument cabinet by performing the following steps:
 - () a. Unplug the power cord from the rear panel connector.
 - () b. Install the front panel protective cover, place the cabinet handle against the bottom of the cabinet, and set the instrument face down on a flat surface.
 - () c. Unwrap the power cord from the instrument feet.
 - () d. Remove the four screws in the rear panel feet. (See to Fig. 1)
 - () e. Remove the two screws from the top-center and bottom-center of the rear panel.
 - () f. Lift the rear panel and power cord away from the instrument, leaving the rear panel feet attached.
 - () g. Slide the cabinet off the instrument.

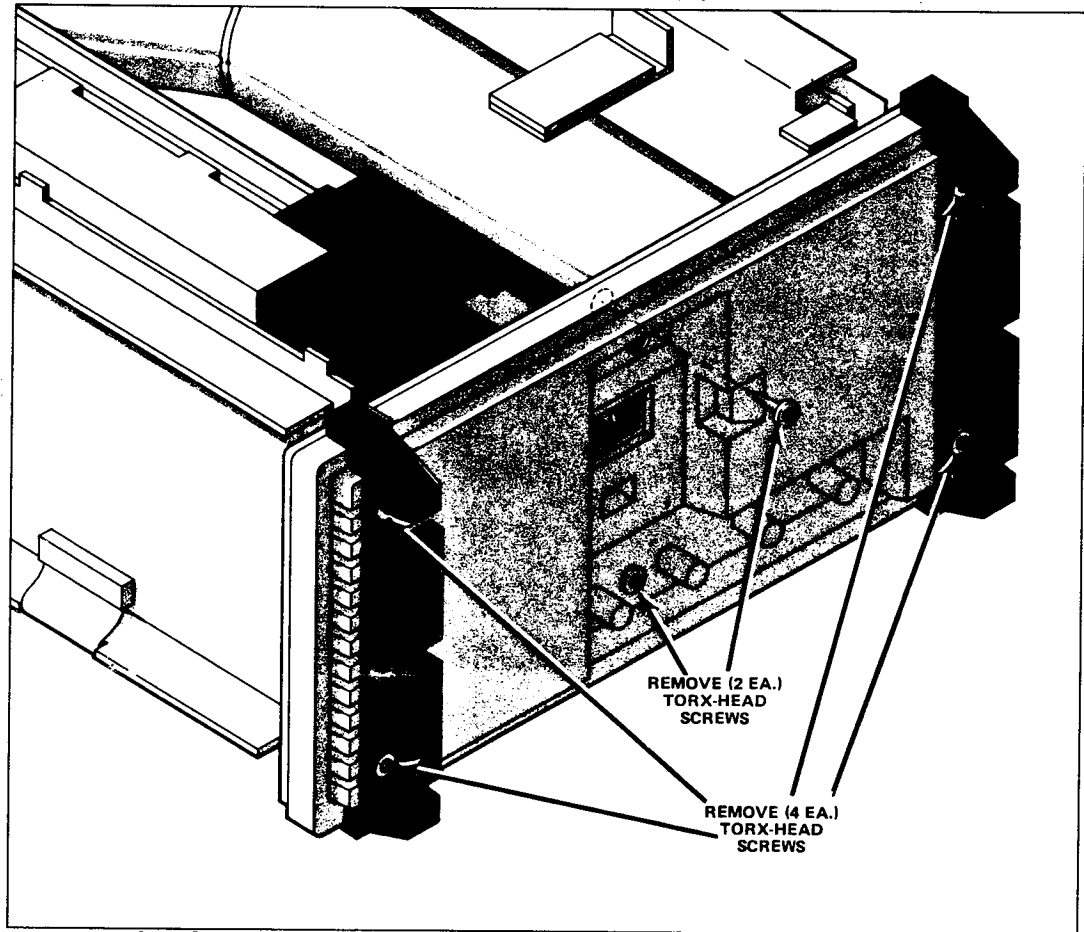


Fig. 1 - Rear Panel Removal

- () 2. Set the instrument, bottom down, on a flat surface.
- () 3. Remove the two screws (which secure the top-cover plate) from the top-edge of the rear-panel chassis.
- () 4. Remove the securing screw from the left side of the chassis.
- () 5. Remove the two top-securing screws at the front edge of the top-cover plate.
- () 6. Remove the top securing nut at the rear of the cover plate.
- () 7. Remove the Top-Cover Plate up and away from the instrument.

WARNING

The line-rectifier filter capacitors normally retain a charge for a short period (approximately 15 to 20 seconds) after the instrument is turned off and can remain charged for a longer period if a bleeder-resistor or power-supply problem occurs. Before beginning work on the internal circuitry of the oscilloscope, verify that the capacitors have discharged to 24V or less. Measurement is made at the three points indicated on the plastic primary input shield at the rear of the instrument. If the capacitors retain charges of greater than 24V for more than 20 seconds, discharge them using a 1k Ω , 5-watt resistor connected point-to-point across the capacitors (through the access holes). Ensure that the capacitors are discharged before commencing repairs.

WARNING

The crt anode lead may retain a high voltage charge after the instrument is turned off. To avoid electrical shock, ground the crt anode lead to the chassis after disconnecting the plug. Reconnect and disconnect the anode-lead plug several times, grounding the anode lead to chassis ground each time it is disconnected to fully dissipate the charge.

- () 8. Free the high voltage anode jack from the clip securing it to the chassis.
- () 9. Unplug the crt anode lead from the jack and discharge to chassis ground.
- () 10. Remove the nut securing the high voltage lead cable clamp to the chassis and remove the clamp.
- () 11. Disconnect the single conductor connector from the ceramic termination network.
- () 12. Unplug the two leads from the ceramic termination network to the crt neck pins. Use long-nose pliers to pull the connectors straight away from the crt neck pins. Do not bend the crt neck pins as this may crack the metal-to-glass seal.

- () 13. Raise the neck pin connectors and slide the high voltage lead sideways under the ceramic termination network.
- () 14. Loosen the two screws securing the left side of the crt rear cover (as viewed from the rear). Remove the screw from the lower right corner of the cover.
- () 15. Lift the right side of the cover slightly, slide the cover to the right, and lift away from the instrument.
- () 16. Remove the five screws securing the High Voltage circuit board shield and remove the shield.
- () 17. Unplug the crt base socket by gently prying evenly on both sides of the socket until the socket can be disengaged from the crt pins. Do not apply excessive side pressure on the socket.
- () 18. Free the high voltage lead from the grommet at the rear of the chassis.
- () 19. Disconnect P902, P903, and P904 from the upper front corner of the High Voltage circuit board (A9), noting orientation and locations for later reassembling.
- () 20. Remove the four mounting posts securing the High Voltage circuit board to the chassis.
- () 21. Tilt the top of the High Voltage circuit board out to clear the left side frame and pull the board up to disengage the pin connectors from the Main circuit board.
- () 22. Lift the board from the chassis while carefully feeding the crt socket, cabling, and high voltage lead through the slot in the chassis.
- () 23. Unsolder the following from the high voltage multiplier module, noting color codes (if applicable) and locations for later reassembling:
 - () a. The five crt socket wires.
 - () b. The lead of C91, a 270pf capacitor.
 - () c. The leads of neon bulbs, DS90 and DS91. Set bulbs aside for later reassembly.
 - () d. The lead of R1830 (not present in all instruments), a 3Ω resistor connected to a brown lead on the high voltage transformer, T1970
 - () e. The brown lead of T1970.
 - () f. C90, a 47pf capacitor, which should be discarded since the new module does not require it.

- () 24. Unsolder the two high voltage multiplier leads connected to the high voltage transformer, T1970.
- () 25. Turn the High Voltage circuit board solder side up and unsolder seven connections securing the high voltage multiplier module to the circuit board. Use a vacuum-type solder extractor to remove excess solder from the pads. When all seven leads are free in the pads, remove the multiplier.
- () 26. Solder the new multiplier onto the new High Voltage circuit board.
- () 27. Connect wires and components to the high voltage multiplier by performing the reverse of the procedure in steps 23 and 24.
- () 28. Locate R1945, a 100k Ω resistor, on the High Voltage circuit board. If it has a 4.7M Ω resistor in parallel with it, remove the 4.7M Ω resistor.
- () 29. Unsolder the junction of CR1950 and CR1951. The diodes are connected in tepee-fashion and are located above U1956 (not all instruments have the CR1951 diode, if your instrument does not have CR1951, skip ahead to step 32).
- () 30. Unsolder the remaining lead of CR1951 (the white, ceramic diode) and remove the diode from the circuit board.
- () 31. Solder the free lead of CR1950 to the pad vacated by CR1951. If the lead of CR1950 has been trimmed too short to reach the pad, replace CR1950 with the new diode provided in the kit. Ensure the cathode lead (banded end) of the diode is connected to the square pad.
- () 32. Locate R1895, a 12k Ω resistor, on the High Voltage circuit board. Replace R1895 with the 3k Ω resistor supplied in the kit.
- () 33. Reassemble the instrument by performing the reverse of the procedure in steps 3 through 17.
- () 34. Refer to the Adjustment Procedure in the instrument Service Manual and make any necessary checks and adjustments.
- () 35. Reinstall the top-cover plate and cabinet by performing the reverse of the procedure in steps 1 and 2.
- () 36. Remove the protective backing from the 050-kit label, included in the kit, and apply the label to a clean, dry area on the rear cover, to indicate installation of this kit.
- () 37. For future reference, update the instrument Service Manual to reflect the changes made by this kit.

RH: rh