

040-1099-01

PC-29, PC-64,
PC-65, PC-66,
PC-70, M51754

TRIGGER SYSTEM IMPROVEMENT

For the following TEKTRONIX® Instruments:

2213 Serial Numbers B010100 - B025773
2215 Serial Numbers B010100 - B025694

This kit contains parts and instructions to provide improved triggering when the TRIGGER MODE switch is set to AUTO or TV FIELD. Components are changed on the Attenuator/Sweep, Alternate Sweep (2215 only) and Main circuit boards.

PARTS INCLUDED IN MODIFICATION KIT:

Ckt. No.	Quantity	Part Number	Description
Q626, Q664* Q676*	3 ea	151-0424-00	Transistor, NPN, Si, TO-92F
C619, C674*	2 ea	281-0808-00	Capacitor, cer, 7pF, 20%, 100V
C647	1 ea	283-0051-00	Capacitor, cer, 3300 μ F, 5%, 100VDC
C645	1 ea	290-0136-00	Capacitor, elctlt, 2.2 μ F, 20%, 20V
R623, R673*	2 ea	315-0331-00	Resistor, cmpsn, 330 Ω , 5%, 0.25W
R619, R674*	2 ea	315-0472-00	Resistor, cmpsn, 4.7k Ω , 5%, 0.25W
	1 ea	670-8026-00	Circuit board, Transistor
	1 ea		Label, 040-kit

INSTRUCTIONS:

WARNING

Before proceeding, position the POWER switch to OFF, then disconnect the power cord from the power source.

CABINET REMOVAL

- () 1. If the instrument has a detachable power cord, disconnect it from the instrument. Remove the screw from the right rear side of the cabinet and the two screws from the rear panel.
- () 2. Remove the rear panel. (On instruments with non-detachable power cords, feed the cord through the cut-out as the rear panel is removed.)
- () 3. Slide the instrument forward out of the cabinet.

*Components used in 2215 only.

ATTENUATOR/SWEEP CIRCUIT BOARD REMOVAL

- () 4. Remove the CH1 and CH2 VOLTS/DIV knobs as follows:
 - () a. Turn the VOLTS/DIV knobs and the red, variable control knobs fully clockwise.
 - () b. Loosen the setscrews securing the two, red, variable knobs to their shafts and remove the knobs.
 - () c. Remove the friction-fit, CH1 and CH2 VOLTS/DIV knobs by pulling straight out from the front panel.
- () 5. Remove the SEC/DIV knobs by performing one of the following:
 - () a. 2213 ONLY. Turn the red variable and the SEC/DIV knob fully clockwise, loosen the setscrews, and remove the knobs.
 - () b. 2215 ONLY. Lock the A and B SEC/DIV knobs together and turn fully clockwise; also, turn the red, variable knob fully clockwise. Loosen the setscrew in the red knob and remove the knob. Use a 1/4 inch nut driver to remove the nut and washers securing the B SEC/DIV knob; pull off the knob and collet from the shaft assembly. Loosen the setscrews in the A SEC/DIV dial and remove the dial.
- () 6. Use a 9/16 inch nut driver to remove the nuts securing the VOLTS/DIV switches to the front panel.
- () 7. Disconnect the following connectors from the Attenuator/Sweep circuit board:
 - () a. P1011, a four-wire connector located behind the CH1 VOLTS/DIV switch assembly.
 - () b. P2011, a four-wire connector located behind the CH2 VOLTS/DIV switch assembly.
 - () c. P7000, a seven-wire connector located near the rear edge of the circuit board.
 - () d. P6000, a ten-wire connector located near the right edge of the circuit board.
- () 8. Set the instrument on its left side (as viewed from the front panel).
- () 9. Remove the three screws from the bottom side of the Main circuit board that secure the metal, Attenuator/Sweep circuit board shield to the Main circuit board.

- () 10. Loosen (do not remove) two screws securing the front of the shield to a bracket on the front panel. (These screws are accessible from the bottom of the instrument through two holes along the front of the Main circuit board.)
- () 11. Set the instrument right side up.
- () 12. Pull the Attenuator/Sweep assembly straight back from the front panel until the circuit board interconnecting pins along the front edge of the Attenuator/Sweep circuit board are disengaged and the switch shafts are clear of the holes in the Front Panel circuit board. Then lift out the entire assembly through the top of the instrument.

MAIN CIRCUIT BOARD COMPONENT CHANGES

- () 13. Unsolder Q503 and Q504. The transistors are located midway between U460 and U507. Use a vacuum-type desoldering tool to remove excess solder from the transistor pads.
- () 14. Trim off any leads protruding from the solder side of the Transistor circuit board provided in the kit.
- () 15. Solder the six leads on the Transistor circuit board into the pads vacated by Q503 and Q504. The circuit board mounts vertically on its edge with the component side towards the rear of the instrument.

CAUTION

To ensure that C506, a 1 μ F capacitor, does not short to the solder side of the new circuit board, dress the nearest lead of the capacitor away from the added circuit board.

- () 16. 2215 ONLY. Loosen the two screws securing the Alternate Sweep circuit board shield to its mounting posts. Slide the shield up and remove it.
- () 17. Locate W6001. This is where the ten-wire cable with connector P6000 (previously disconnected from the Attenuator/Sweep circuit board) is soldered to the Main circuit board.

- () 18. Replace C645, a $10\mu\text{F}$ capacitor located to the rear of W6001, with the $2.2\mu\text{F}$ capacitor provided in the kit. The lead on the tapered end of the new capacitor connects to the square pad.

NOTE

The silkscreening on the solder side of the Main circuit board indicating the location of C645 is incorrect. Make sure the $2.2\mu\text{F}$ capacitor is installed in the pads vacated by the $10\mu\text{F}$ capacitor.

- () 19. Replace C647, a 4700pF capacitor located in front of W6001, with the provided 3300pF capacitor.
- () 20. Remove R619 (a 620Ω resistor), R623 (a 680Ω resistor), and, if present, C619 (a 270pF capacitor) and discard the parts. These components are located in front of W6001.
- () 21. R619, R623 and C619 (components provided in the kit) are connected in a series-parallel combination between the pads vacated by the removed R623 as follows:
- () a. Trim the leads of R619 and R623 to approximately $1/4$ inch.
 - () b. Solder one lead of R619, a $4.7\text{k}\Omega$ resistor, in the pad vacated by R623 nearest the edge of the Main circuit board.
 - () c. Solder one lead of the new R623, a 330Ω resistor, in the remaining pad vacated previously by R623.
 - () d. Solder the free leads of R619 and R623 together in tepee-fashion.
 - () e. Solder added C619, a 7pF capacitor, in parallel across R619 (the added $4.7\text{k}\Omega$ resistor). Trim the leads as necessary.
- () 22. 2215 ONLY. Remove R674 (a 620Ω resistor) and R673 (a 680Ω resistor) and discard the components. R674 is located in front of the Alternate Sweep circuit board, just below dummy resistors W841 and W842; R673 is located between W6001 and the Alternate Sweep circuit board.
- () 23. 2215 ONLY. R673, R674, and C674 (components provided in the kit) are connected in a series-parallel combination between the pads vacated by the removed R673 as follows:
- () a. Trim the leads of R673 and R674 to approximately $1/4$ inch.
 - () b. Solder one lead of R674, a $4.7\text{k}\Omega$ resistor, in the pad vacated by R673 nearest the edge of the Main circuit board.

- () c. Solder one lead of the new R673, a 330 Ω resistor, in the remaining pad vacated previously by R673.
- () d. Solder the free leads of R673 and R674 together in tepee-fashion.
- () e. Solder added C674, a 7pF capacitor, in parallel across R674 (the added 4.7k Ω resistor). Trim the leads as necessary.
- () 24. Remove R496, a 120k Ω resistor mounted across the top of micro-circuit, U640, between pin 5 and pin 14.

ATTENUATOR/SWEEP CIRCUIT BOARD COMPONENT CHANGES

- () 25. Remove the screws in three corners of the component side of the Attenuator/Sweep circuit board that secure the metal, circuit board shield to the circuit board. Turn the circuit board over and remove the two screws securing the shield to the circuit board ground bracket and remove the shield.
- () 26. Remove diodes CR626 and CR630 from the right front corner of the Attenuator/Sweep circuit board. Clean the excess solder from the vacated pads.
- () 27. Bend the center lead (base) of Q626, an NPN transistor provided in the kit, away from the flat side of the transistor. Solder the transistor into the pads vacated by the two diodes as follows:
 - () a. Solder the base lead to the round pad vacated by the anode lead of CR630.
 - () b. Solder the collector lead to the square pad vacated by the cathode lead of CR630.
 - () c. Solder the emitter lead to the square pad vacated by the cathode lead of CR626.
 - () d. Trim off the transistor leads close to the solder side of the circuit board.
- () 28. 2215 ONLY. Remove diodes CR676 and CR680 from the right front corner of the Attenuator/Sweep circuit. Clean the excess solder from the vacated pads.
- () 29. 2215 ONLY. Bend the center lead (base) of Q676, provided in the kit, towards the flat side of the transistor. Solder the transistor into the pads vacated by diodes, CR676 and CR680, as follows:

- () a. Solder the base lead to the round pad vacated by the anode lead of CR680.
- () b. Solder the collector to the square pad vacated by the cathode of CR680.
- () c. Solder the emitter lead to the square pad vacated by the cathode of CR676.
- () d. Trim off the transistor leads close to the solder side of the circuit board.

ALTERNATE SWEEP CIRCUIT BOARD COMPONENT CHANGE

- () 30. 2215 ONLY. Replace Q664 on the Alternate Sweep circuit board with the NPN transistor provided in the kit. Q664 is the transistor closest to the soldered-in edge of the circuit board.
- () 31. 2215 ONLY. Replace the Alternate Sweep circuit board shield removed in step 16.

INSTRUMENT REASSEMBLY

- () 32. Reassemble the instrument by performing the reverse of the procedure in step 4 through 12.

NOTE

When reinstalling the Alternate/Sweep circuit board be sure the interconnecting pins on the Front Panel circuit board are aligned with the pin terminal sockets on the front edge of the Attenuator/Sweep circuit board.

PERFORMANCE CHECK AND CABINET INSTALLATION

- () 33. Refer to the Performance Check/Adjustment sections of the appropriate Service Manual and make any necessary checks and adjustments. Especially check the triggering system.
- () 34. Remove the protective backing from the O40-kit label, provided in the kit, and apply the label to a clean, dry area on the plastic rear cover. The label indicates this kit has been installed.
- () 35. Perform the reverse of the procedures in steps 1 through 3 to reinstall the cabinet and rear cover.

- () 36. For future reference, fasten the attached Instruction Manual Modification Insert into the Service Manual.

CM:kp

MANUAL

MODIFICATION INSERT

TRIGGER SYSTEM IMPROVEMENT

for

2213 Oscilloscopes SN B010100 - B025773
2215 Oscilloscopes SN B010100 - B025694

Installed in Type _____ SN _____ Date _____

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

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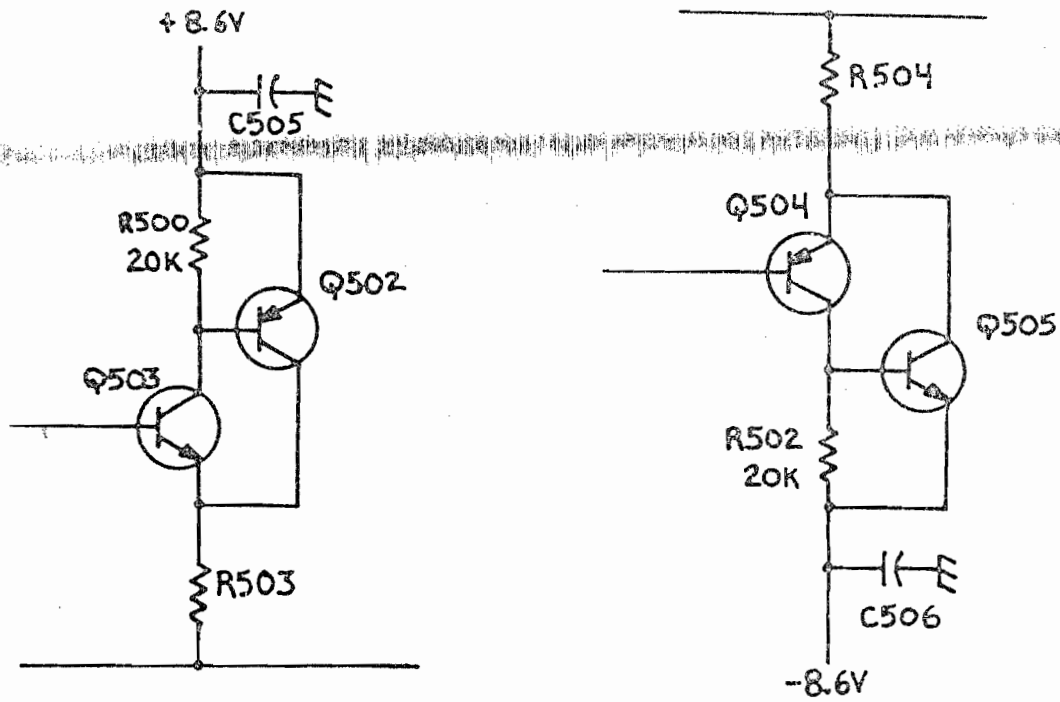
GENERAL INFORMATION

This kit contained parts and instructions to provide improved triggering when the TRIGGER MODE switch is set to AUTO or TV FIELD. Components were changed on the Attenuator/Sweep, Alternate Sweep (2215 only) and Main circuit boards.

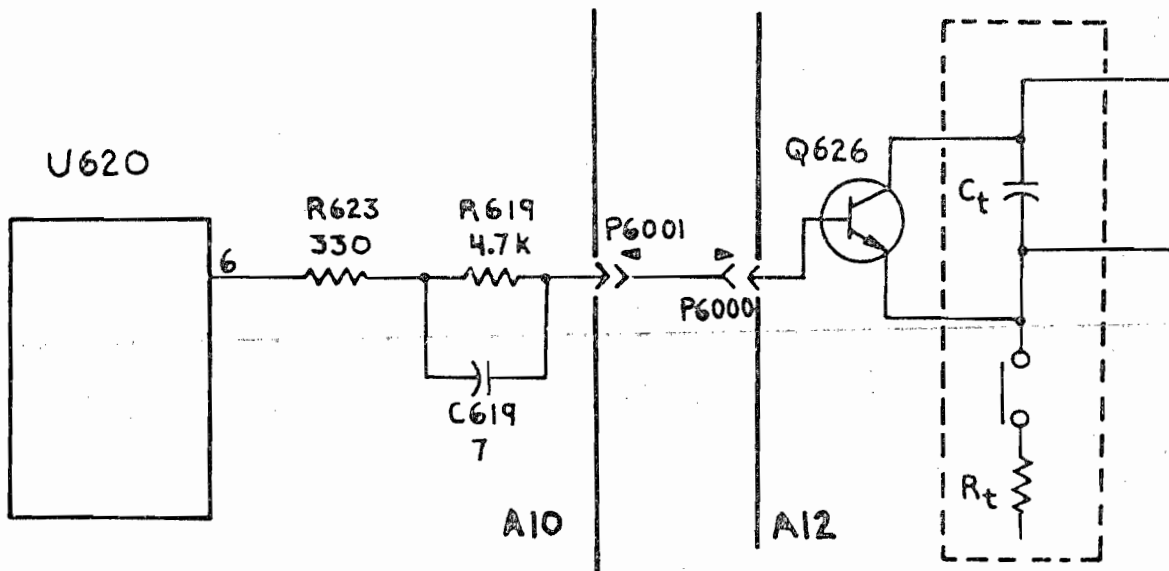
REPLACEABLE ELECTRICAL PARTS:

Ckt. No.	Part Number	Description
A10C619	281-0808-00	Capacitor, cer, 7pF, 20%, 100V
A10C645	290-0136-00	Capacitor, elctlt, 2.2 μ F, 20%, 20V
A10C647	283-0051-00	Capacitor, cer, 3300pF, 5%, 100VDC
A10C674*	281-0808-00	Capacitor, cer, 7pF, 20%, 100V
A10Q502	151-0199-00	Transistor, PNP, Si, T0-92
A10Q505	151-0424-00	Transistor, NPN, Si, T0-92F
A10R496	DELETE	
A10R500	315-0203-00	Resistor, cmprsn, 20k Ω , 5%, 0.25W
A10R502	315-0203-00	Resistor, cmprsn, 20k Ω , 5%, 0.25W
A10R619	315-0472-00	Resistor, cmprsn, 4.7k Ω , 5%, 0.25W
A10R623	315-0331-00	Resistor, cmprsn, 330 Ω , 5%, 0.25W
A10R673*	315-0331-00	Resistor, cmprsn, 330 Ω , 5%, 0.25W
A10R674*	315-0472-00	Resistor, cmprsn, 4.7k Ω , 5%, 0.25W
	670-8026-00	Circuit board, Transistor
A12CR626	DELETE	
A12CR630	DELETE	
A12CR676	DELETE	
A12CR680	DELETE	
A12Q626	151-0424-00	Transistor, NPN, Si, T0-92F
A12Q676*	151-0424-00	Transistor, NPN, Si, T0-92F
A13Q664*	151-0424-00	Transistor, NPN, Si, T0-92F

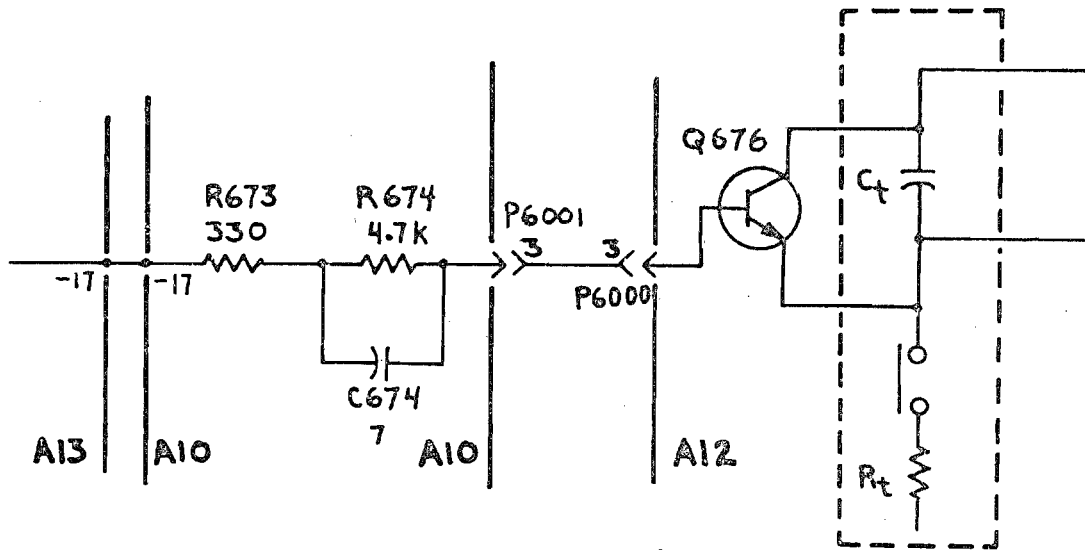
*Components used in 2215 only.




Partial-TRIGGER 4



Partial-SWEEP GENERATOR & LOGIC 5



Partial-ALTERNATE B SWEEP 
 (2215 Only)