



product modification

Scan by Zenith

050-2296-01

M63001

M63157, M63870

M64111, M64135

M64184, M64449

SCHMITT TRIGGER REPLACEMENT

For the following TEKTRONIX® instruments:

2245 Serial Numbers B010100 - B012000

2246 Serial Numbers B010100 - B043000

Schmitt trigger (pn 234-0204-21) quick chips replace earlier versions which are no longer available. Use of the new quick chips requires addition, relocation or replacement of numerous additional components.

NOTE

If kit, pn 050-2282-00, has not been installed previously, then you must install kit, pn 050-2282-02, instead of this kit.

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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
L216 L217	2 ea	108-1339-00	Coll. rf. 330nH
CR802 CR819	2 ea	152-0061-00	Semicond dvc. diode. 100mA. 175V
CR801	1 ea	152-0141-02	Semicond dvc. diode. 150mA. 30V
U421 U431	2 ea	234-0204-21	Quick chip. Schmitt trigger
U802	1 ea	234-0401-21	Quick chip. horizontal preamplifier
C422 C452	2 ea	281-0861-00	Capacitor. cer. 270pF. 5%. 50V
C216 C217	2 ea	281-0909-00	Capacitor. cer. 0.022 μ F
C2517	1 ea	281-0913-00	Capacitor. cer. 0.1 μ F. 50V
R446 R487	2 ea	313-1100-00	Resistor. film. 10 Ω . 5%. 0.2W
R427 R428	2 ea	313-1101-00	Resistor. film. 100 Ω . 5%. 0.2W
R460	1 ea	313-1102-00	Resistor. film. 1k Ω . 5%. 0.2W
R449	1 ea	313-1392-00	Resistor. film. 3.9k Ω . 5%. 0.2W
R450	1 ea	313-1511-00	Resistor. film. 510 Ω . 5%. 0.2W
	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.

Potentially dangerous voltages exist at several points throughout this instrument. If it is operated with the cabinet removed, do not touch exposed connections or components. Before replacing parts or cleaning, disconnect the ac-power source from the instrument and check that the line-rectifier filter capacitors have discharged. Also, check the low voltages at the power-supply/main board interface connector (J1024). If any of the supply-voltage or line-voltage filter capacitors remain charged for more than 20 seconds, discharge them to ground through a 1k Ω , 5 or 6 watt resistor.

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. Unplug the power cord from its rear-panel connector and install the protective front cover.
- () 2. Place the instrument face down on a clean, flat surface.
- () 3. Remove the plastic rear cover, secured with four torx-head screws.
- () 4. Remove the torx-head screw from the right side near the rear of the cabinet.
- () 5. Slide the cabinet housing up and off the instrument.
- () 6. On the Processor circuit board, replace C2517 (0.022 μ F) with the 0.1 μ F capacitor included in the kit.
- () 7. Add CR802 (Included in the kit). Solder the cathode to the +130V end of R801 and the anode to the end of R802 nearest Q801.
- () 8. Add CR819 (Included in the kit). Solder the cathode to the +130V end of R813 and the anode to the end of R819 furthest away from Q805.
- () 9. Refer to the Service Manual and remove the power supply and cage to provide access to the back of the Main circuit board.

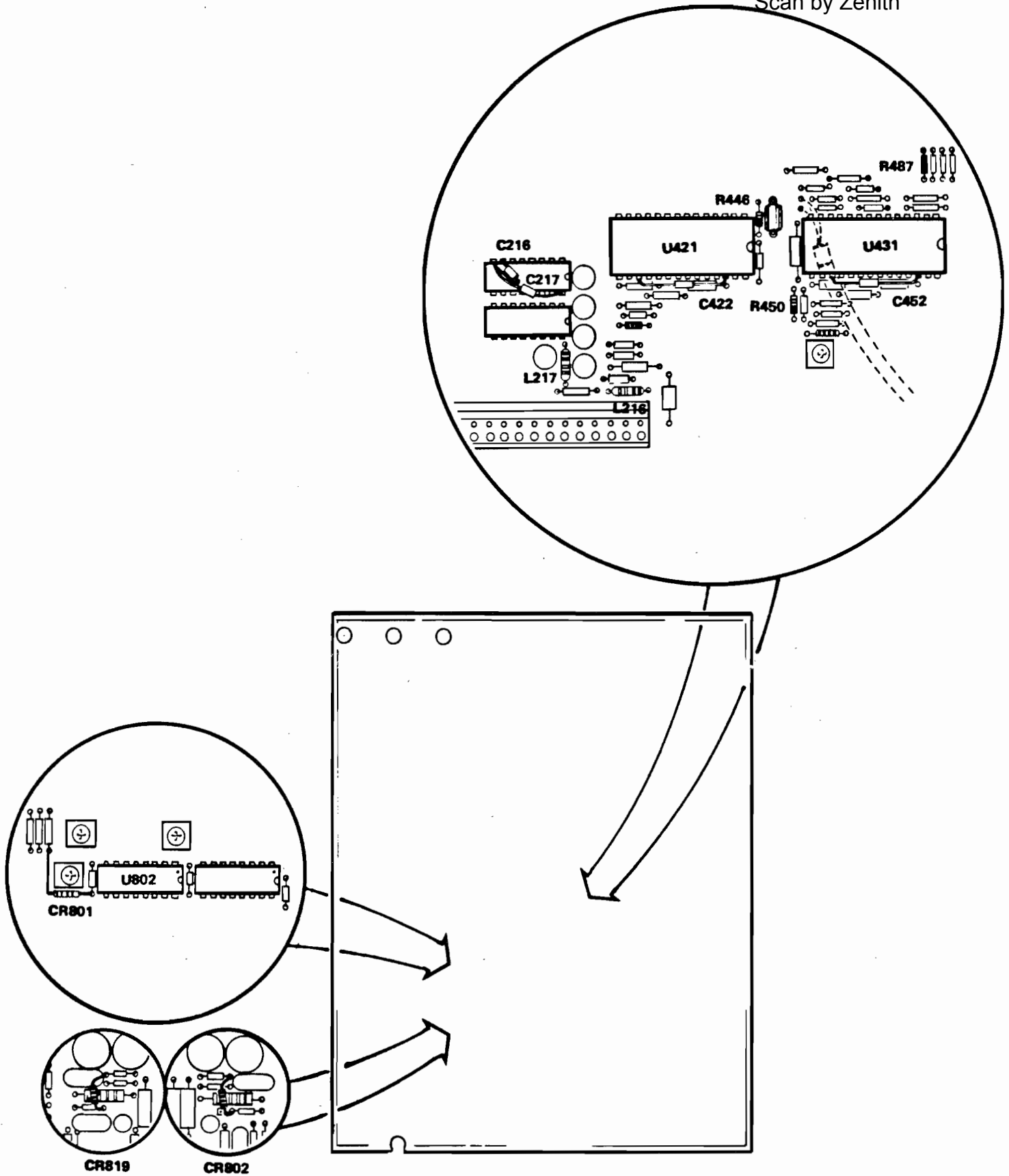


Fig. 2 - Main Board Modifications

- () 10. Replace U421 as follows:
 - () a. Remove U421.
 - () b. If a 100pF capacitor (C489) is present between pins 9 and 12, transfer it to the new microcircuit.
 - () c. If a 3.9k Ω resistor (R449) is present between pins 6 and 28, replace it with the new 3.9k Ω resistor included in the kit.
 - () d. If a 200 Ω or 750 Ω resistor (R446) is present between pins 27 and 28, replace it with the 10 Ω resistor in the kit. Otherwise, replace R446 at its regular location with the 10 Ω resistor.
 - () e. Solder one end of R427 (100 Ω resistor from the kit) into the solder pad vacated by U421, pin 5.
 - () f. Solder one end of R428 (100 Ω resistor from the kit) into the the solder pad vacated by U421, pin 7.
 - () g. Bend up pins 5 and 7 of U421 and after inserting it into the board solder pins 5 and 7, respectively, to the free leads of R427 and R428.
- () 11. Replace U431 as follows:
 - () a. If pin 28 of U431 is connected via a jumper wire to a tepee assembly consisting of R476 (5.9k Ω) and R487 (750 Ω), remove the jumper from pin 28 and replace R487 with the remaining 10 Ω resistor from the kit. Otherwise, replace R487 with the 10 Ω resistor at its regular location.
 - () b. Install U431 and reinstall the jumper removed above.
- () 12. If the 2245 is below B010546 or the 2246 is below B041457, replace R460 (270 Ω) with the 1k Ω resistor included in the kit.
- () 13. Add CR801 (may already be present on 2245's above B010374 or 2246's above B040932): cathode to W804 and anode to the end of C816 going to -5V (see Fig. 2).
- () 14. Replace U802 with the microcircuit included in the kit.
- () 15. Replace R216 and R217 with the two 330nH coils (L216 and L217) included in the kit.
- () 16. Relocate C422 and C452 (fresh components are provided in the kit): C422 to U421, pins 17 to 26 and C452 to U431, pins 17 to 26 (see Fig. 2). Please note that this is not an electrical change; schematically C422 and C452 are in the same location.

- () 10. Replace U421 as follows:
 - () a. Remove U421.
 - () b. If a 100pF capacitor (C489) is present between pins 9 and 12, transfer it to the new microcircuit.
 - () c. If a 3.9k Ω resistor (R449) is present between pins 6 and 28, replace it with the new 3.9k Ω resistor included in the kit.
 - () d. If a 200 Ω or 750 Ω resistor (R446) is present between pins 27 and 28, replace it with the 10 Ω resistor in the kit. Otherwise, replace R446 at its regular location with the 10 Ω resistor.
 - () e. Solder one end of R427 (100 Ω resistor from the kit) into the solder pad vacated by U421, pin 5.
 - () f. Solder one end of R428 (100 Ω resistor from the kit) into the the solder pad vacated by U421, pin 7.
 - () g. Bend up pins 5 and 7 of U421 and after inserting it into the board solder pins 5 and 7, respectively, to the free leads of R427 and R428.
- () 11. Replace U431 as follows:
 - () a. If pin 28 of U431 is connected via a jumper wire to a tepee assembly consisting of R476 (5.9k Ω) and R487 (750 Ω); remove the jumper from pin 28 and replace R487 with the remaining 10 Ω resistor from the kit. Otherwise, replace R487 with the 10 Ω resistor at its regular location.
 - () b. Install U431 and reinstall the jumper removed above.
- () 12. If the 2245 is below B010546 or the 2246 is below B041457, replace R460 (270 Ω) with the 1k Ω resistor included in the kit.
- () 13. Add CR801 (may already be present on 2245's above B010374 or 2246's above B040932): cathode to W804 and anode to the end of C816 going to -5V (see Fig. 2).
- () 14. Replace U802 with the microcircuit included in the kit.
- () 15. Replace R216 and R217 with the two 330nH coils (L216 and L217) included in the kit.
- () 16. Relocate C422 and C452 (fresh components are provided in the kit): C422 to U421, pins 17 to 26 and C452 to U431, pins 17 to 26 (see Fig. 2). Please note that this is not an electrical change; schematically C422 and C452 are in the same location.

- () 17. Relocate C216 (a new capacitor is included in the kit) to U202, pins 7 to 8 (see Fig. 2).
- () 18. Add C217 (0.022 μ F capacitor from the kit) from U202, pin 8 to pin 16 (see Fig. 2).
- () 19. Replace R450 with the 510 Ω resistor include in the kit.
- () 20. Reassemble the instrument.
- () 21. Refer to the Performance Check Section of the Service Manual and, for 2246's only, the corrected calibration step included in the Manual modification insert and verify performance.
- () 22. Remove the protective backing from the 050-kit label and attach it to a clean, dry area of the rear panel. The label indicates installation of this kit for future reference.
- () 23. Correct the electrical parts list of the Instruction Manual with the information included in the kit parts list.

RH: rh

TEKTRONIX

MANUAL MODIFICATION INSERT

VERTICAL & HORIZONTAL PREAMP AND SCHMITT TRIGGER REPLACEMENT for

2245 Serial Numbers B010100 - B011047
2246 Serial Numbers B010100 - B042911

Installed in SN _____ Date _____

This modification insert is provided to supplement the 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

Schmitt trigger (pn 234-0204-21) quick chips replaced earlier versions which are no longer available. Use of the new quick chips required addition, relocation or replacement of numerous additional components.

REPLACEABLE ELECTRICAL PARTS

Ckt. No.	Part Number	Description
A10	670-9400-03	CKT BD ASSY: MAIN
C422	281-0909-00	CAPACITOR, CER: 270PF, 5%, 50V
C452	281-0909-00	CAPACITOR, CER: 270PF, 5%, 50V
C216	281-0909-00	CAPACITOR, CER: 0.022 μ F
C217	281-0909-00	CAPACITOR, CER: 0.022 μ F
CR801	152-0141-02	SEMICON DVC, DIODE: 150mA, 30V
CR802	152-0061-00	SEMICON DVC, DIODE: 100mA, 175V
CR819	152-0061-00	SEMICON DVC, DIODE: 100mA, 175V
L216	108-1339-00	COIL, RF: 330nH
L217	108-1339-00	COIL, RF: 330nH
R427	313-1101-00	RESISTOR, FILM: 100 Ω , 5%, 0.2W
R428	313-1101-00	RESISTOR, FILM: 100 Ω , 5%, 0.2W
R446	313-1100-00	RESISTOR, FILM: 10 Ω , 5%, 0.2W
R449	313-1392-00	RESISTOR, FILM: 3.9K Ω , 5%, 0.2W
R450	313-1511-00	RESISTOR, FILM: 510 Ω , 5%, 0.2W
R460	313-1102-00	RESISTOR, FILM: 1K Ω , 5%, 0.2W
R487	313-1100-00	RESISTOR, FILM: 10 Ω , 5%, 0.2W
U421	234-0204-21	QUICK CHIP, SCHMITT TRIGGER
U431	234-0204-21	QUICK CHIP, SCHMITT TRIGGER
U802	234-0401-21	QUICK CHIP, HORIZONTAL PREAMPLIFIER
A16	671-0212-00	CKT BD ASSY: PROCESSOR (2245)
A16	670-9401-02	CKT BD ASSY: PROCESSOR (2246)
C2517	281-0913-00	CAPACITOR, CER: 0.1 μ F, 50V

Use the following Measurement Bandwidth Adjustment procedure instead of the one supplied in the Service Manual.

MEASUREMENT BANDWIDTH AND SELF CHARACTERIZATION

Equipment Required (see Table 4-1 in the Service Manual):

Leveled Sine-Wave Generator	50-Ω Precision Coaxial Cable
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INITIAL CONTROL SETTINGS

1. Run MAKE FACTORY SETTINGS from the SERVICE MENU. See Factory Control Settings in the Introduction subsection in the Adjustment section of Service manual.

2. SET:

A INTEN	10 o'clock
READOUT	12 o'clock
FOCUS	For well defined display
SCALE ILLUM	Fully CCW
HOLDOFF	Min (CCW)
TRIGGER SOURCE	VERT
TRIGGER LEVEL	12 o'clock
VERTICAL POSITION Controls	12 o'clock

PROCEDURE

After Step 1 (Volts Cal adjustment) in the Service Manual, use the following procedure instead of the one given.

2. B Trigger Bandwidth (R455) and Mid-Frequency Flatness (R469)

a. Set:

VERTICAL MODE	CH 2 (CH 1 off)
CH 2 VOLTS/DIV	20 mV
SEC/DIV	50 μs

b. Preset potentiometers R455 and R469 to midrange.

c. Run the SELF CAL routine. Press CH 1/CH 2 VOLTMETER button and select SELF CAL.

- d. Connect leveled the sine-wave generator output to the CH 2 input connector via a 50- Ω BNC precision coaxial cable and a 50- Ω BNC termination. Set the generator for a 5-division display at 50 kHz.
- e. Set CH1/CH2 VOLTMETER for PK-PK voltage measurement. Set the Leveled Sine-Wave Generator for a peak-to-peak readout display of 100 mV \pm 0.5 mV. Then set the sine-wave generator to 115 MHz.
- f. ADJUST—B Trigger Bandwidth (R455) for a peak-to-peak readout of 80 mV \pm 1 mV.
- g. Set the leveled sine-wave generator to 12 MHz.
- h. ADJUST—Mid-Frequency Flatness (R469) for the minimum peak-to-peak readout.
- i. Set the leveled sine-wave generator to the frequency between 12 and 16 MHz that produces the lowest peak-to-peak readout.
- j. ADJUST—Mid-Frequency Flatness (R469) for a peak-to-peak readout of 100 mV or greater.
- k. CHECK—The peak-to-peak readout remains between 95 mV and 105 mV when the generator frequency is varied from 5 MHz to 25 MHz. If the readout goes out of range, readjust R469 (at that frequency) for a slightly higher or lower value as necessary, and recheck from 5 MHz to 25 MHz.
- l. INTERACTION—Between B Trigger Bandwidth and Mid-Frequency Flatness adjustments. Recheck the B trigger bandwidth. If necessary, readjust R455 and repeat the complete procedure (except presetting the controls) until the readout remains within 95 to 105 mV in the frequency range of 5 MHz to 25 MHz.
- m. Disconnect test equipment.
- o. Continue with the Self Characterization procedure given in the Service Manual.