



Product
Information

045-0160-01

M67856, M68346

U750 AND U780 (TRIGGER MICROCIRCUITS) REPLACEMENT

For the following TEKTRONIX® instruments:

11302 All Serial Numbers

This kit contains parts and instructions that replaces U750 and U780. Microcircuits (trigger hybrids) located on the Time Base circuit board A14. The new microcircuits requires several component changes on the Time Base circuit board. New firmware (version 2.7) is included with this upgrade.

KIT PARTS LIST:

Ckt. Number	Quantity	Part Number	Description
U1330	1 ea	160-4470-06	Microcircuit, dgtl: EPROM, ver 2.7
U1430	1 ea	160-4471-06	Microcircuit, dgtl: EPROM, ver 2.7
U1400	1 ea	160-4472-06	Microcircuit, dgtl: EPROM, ver 2.7
U1100	1 ea	160-4473-06	Microcircuit, dgtl: EPROM, ver 2.7
U1200	1 ea	160-4474-06	Microcircuit, dgtl: EPROM, ver 2.7
U1300	1 ea	160-4475-06	Microcircuit, dgtl: EPROM, ver 2.7
U1000	1 ea	160-4476-06	Microcircuit, dgtl: EPROM, ver 2.7
U1230	1 ea	160-4477-06	Microcircuit, dgtl: EPROM, ver 2.7
U750	2 ea	165-2265-00	Microcircuit, hybrid: Trigger
U780			
	.083ft	-----	Wire, electrical: 22 awg, bare
	1 ea	-----	Disk, software pkg: 11302, checks/adj
	2 ea	-----	Label: 165-2265-00
	1 ea	-----	Label: 045-kit

INSTRUCTIONS:**WARNING**

Dangerous shock hazards may be exposed when the instrument covers are removed. Before proceeding, ensure the mainframe power switch is in the off position. Then, disconnect the instrument from the power source. Disassembly should only be attempted by qualified service personnel.

CAUTION

Many components within the 11300 Series mainframe are extremely susceptible to static-discharge damage. Service the instrument only in a static-free environment. Observe standard handling precautions for static-sensitive devices while installing this kit. Always wear a grounded wrist strap.

The Following Instructions Are Divided Into three Sections:

- Section A. Trigger microcircuit replacements.
- Section B. EPROM replacements, version 2.7.
- Section C. Trigger cal procedure.

Section A. Trigger microcircuit replacements.

NOTE

Run Enhanced Accuracy and Extended Diagnostics and verify that there are no other failures. Repair all failures before replacing U750/U780 microcircuits.

- () 1. Turn the slotted fasteners on the top and bottom dust covers one quarter turn counter clockwise. Then remove the dust covers by lifting away from the instrument.

NOTE

Position the instrument with the bottom of the instrument (Time Base circuit board A14) is facing up towards the installer. Refer to Figure 1, while performing steps 2 through 8, in this section.

- () 2. Remove the four (4) nuts that secures U750, trigger hybrid (microcircuit/heatsink) to the Time Base circuit. Then remove U750, from the circuit board. Repeat this step for U780, trigger hybrid. Note the microcircuit's index marks before removal, to ensure proper assembly of the new microcircuits.
- () 3. Remove the protective backing from the trigger hybrid microcircuit label and apply the label over the printed part numbers of U750 and U780, located in the center of the sockets.
- () 4. Install U750 and U780, trigger microcircuits (provided in this kit) securing them using the hardware removed in step 2.
- () 5. Remove Q540 and Q541 transistors from the Time Base circuit board.
- () 6. Solder a length of wire (provided in this kit) between the collector and base circuit board pads that was occupied by Q540. The collector circuit board pad is located farthest from U750. The base is the center circuit pad.
- () 7. Solder a length of wire (provided in this kit) between the collector and base circuit board pads that was occupied by Q541. The collector circuit board pad is located farthest from U750. The base is the center circuit pad.
- () 8. Remove R541 and R447, 2.2k Ω , resistors from the Time Base circuit board.
- () 9. Reconnect the instrument to a power source, then switch the power ON/STANDBY switch to the ON position.

- () 10. Check that no error codes are displayed after the self-test is completed. If error codes are displayed, repeat and check all steps in this section.
- () 11. Turn the instrument's ON/STANDBY switch to the STANDBY position. Disconnect the instrument from its power source.

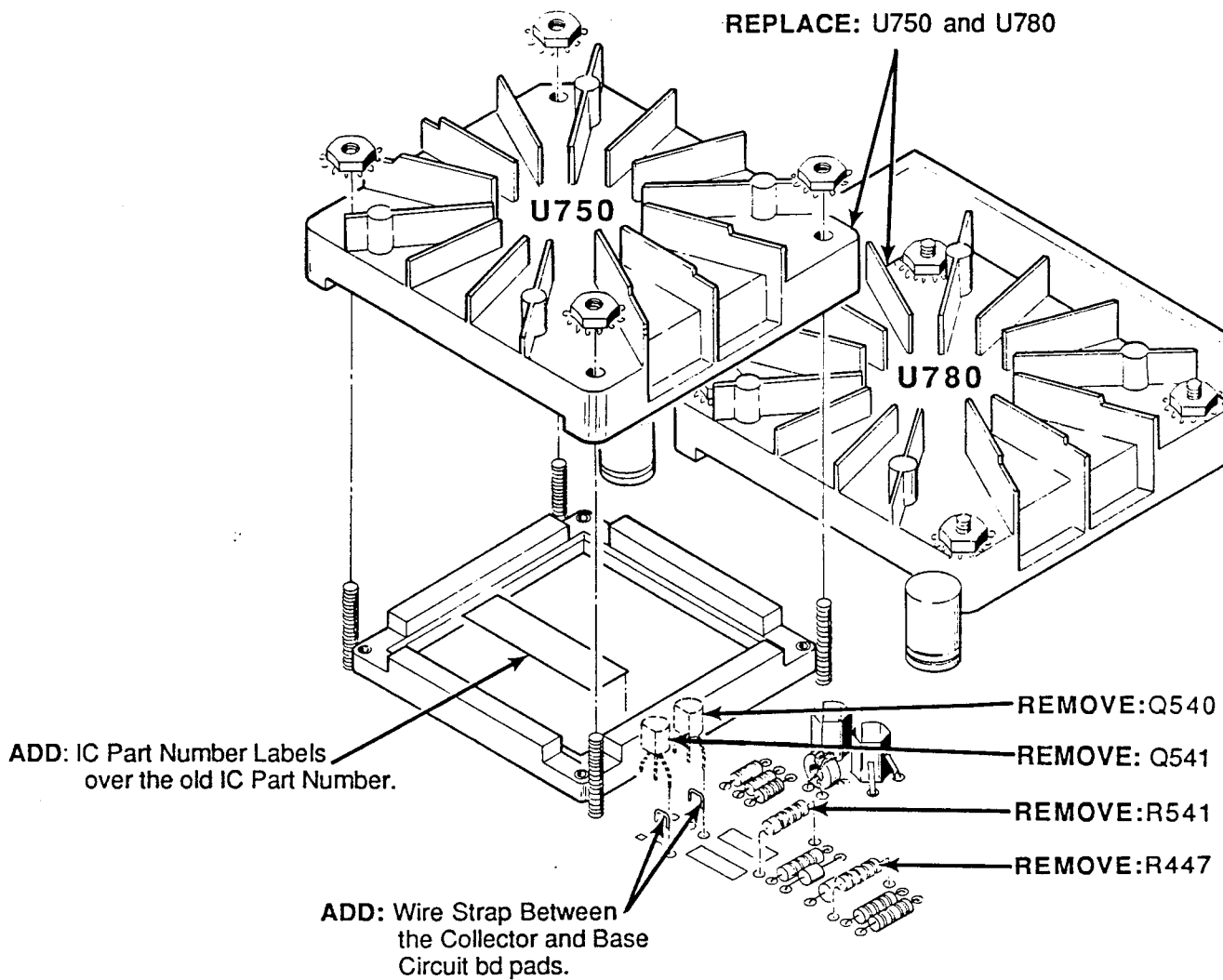


Figure 1. - Partial. Time Base circuit board A14.

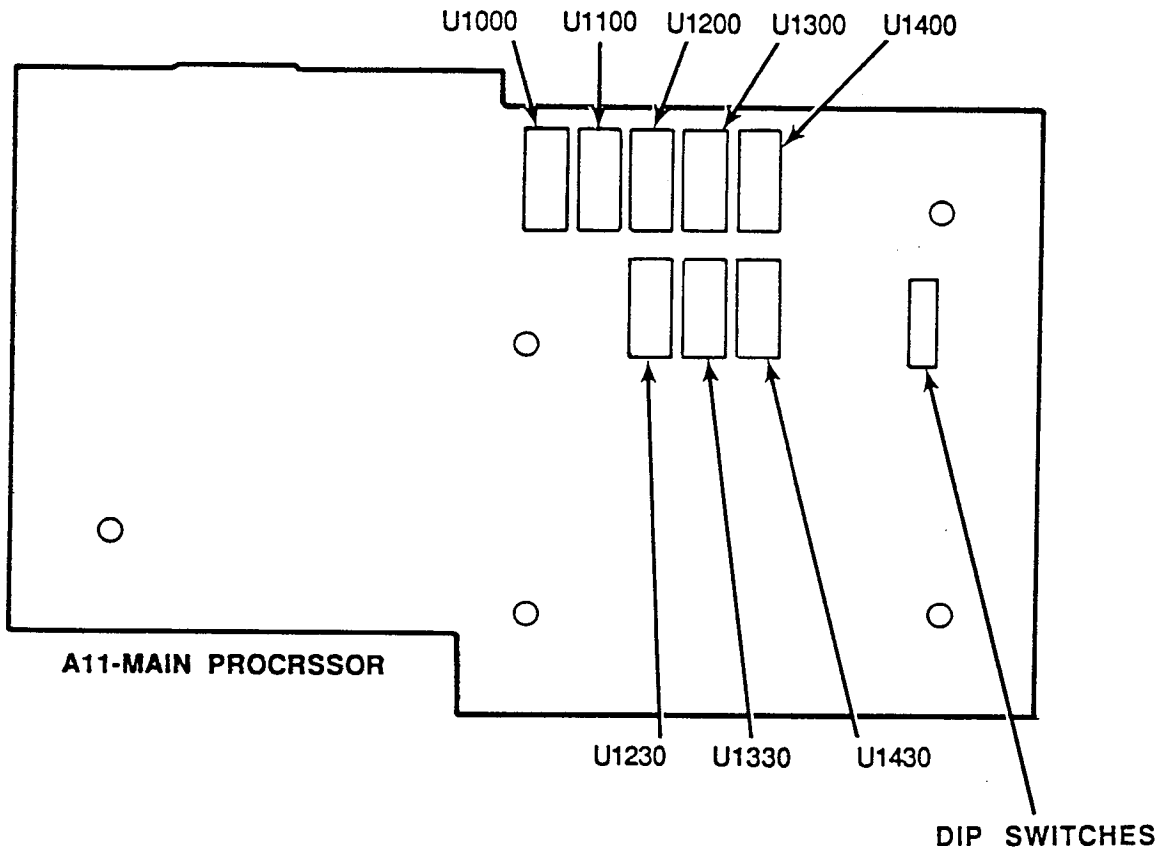


Figure 2. - EPROM locations. Main Processor ckt bd A11.

Section B. EPROM replacements, version 2.7.

NOTE

Refer to Figure 2, while performing steps 1 through 9, in this section.

- () 1. Set number 2, number 4, and number 5 DIP switches on the Main Processor circuit board A11, to their closed positions.

NOTE

Be certain that pin 1 is positioned correctly when replacing the EPROMs.

- () 2. Replace U1000, U1100, U1200, U1230, U1300, U1330, U1400, and U1430 with the new EPROMs that are provided in this kit. Refer to Figure 2, for EPROM locations.
- () 3. Turn the instrument POWER SWITCH to ON. Initially the PROCESSOR diagnostic (BBR Quick) test will fail; this will only occur during the first power-up sequence following the firmware installation.
- () 4. Press the Display Adjust Menu button and wait for the screen message **Diagnostics are complete.**
- () 5. Connect an RS-232-C terminal or a GPIB controller to the instrument.
- () 6. Press the DISP ADJ button and set FOCUS, ASTIGMATISM, and TRACE ROT.
- () 7. Press the ENHANCED ACCURACY button twice.
 - () a. If the instrument passes, proceed to the next step.
 - () b. If the instrument fails, try it again. If it still fails, refer to "Restoring Factory Calibration" and try EA again. If still fails, refer to the Main Processor board information in "Checks After FRU Replacement."
- () 8. Turn the POWER SWITCH to OFF.
- () 9. Set number 2, DIP switch on the Main Processor circuit board A11 to its open position.

Section C. Trigger cal procedure.

NOTE

Power-up the instrument and allow a 20 minute warm-up period before starting the following cal procedure.

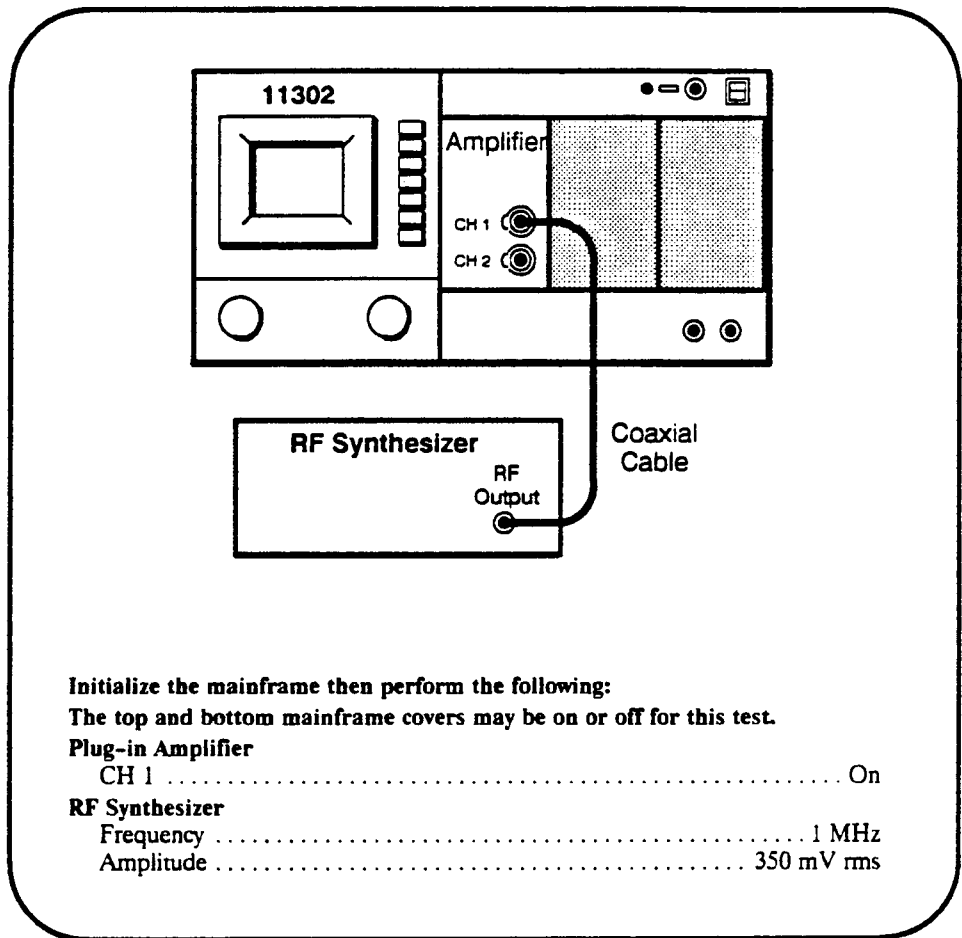
- () 1. Connect an RS-232 terminal or GPIB controller to the instrument.
- () 2. From the terminal or controller send the command MCALCONSTANT 138:100 to the instrument.
- () 3. Check the instrument with the query MCALCONSTANT? 138, which should return MCALCONSTANT 138:100.00000. MCALCONSTANT 138 must be set to 100 before proceeding with the following Cal Procedures.
- () 4. Refer to the following pages in this section, or to Section 2. Checks and Adjustments in the 11302 Service Reference Manual, and perform the following checks and adjustment using the CATS (Computer Aided Test System) Disk included in this kit.
 - () a. Part 23 - Intensity Settings: **autoset bright, Autocal bright, mcp ro limit, and mcp cutoff.**
 - () b. Part ⁽³²⁾₃₃ - Trigger Sensitivity.
 - () c. Part ⁽³³⁾₃₄ - Trigger Accuracy.
 - () d. Part ⁽³⁴⁾₃₅ - Line Trigger.
 - () e. Part ⁽⁴⁰⁾₄₁ - 2 nS Holdoff.
 - () f. Part ⁽⁴²⁾₄₃ - Time Interval Using Sweeps.
 - () g. Part 44 - Store Cal Constants.
 - () h. Reset DIP Switches 4 and 5 to their open positions. Be sure that all DIP Switches are set in the open positions.
- () 5. Replace the top and bottom dust covers removed in step 1, section A.
- () 6. For future reference fasten the attached Manual Modification Insert in the Service Reference manual.
- () 7. Remove the protective backing from the 045-kit label, provided in this kit, and place it on a clean, dry area on the rear of the instrument. This label indicates the kit has been installed.

Part 23 – Intensity Settings

Description

This test checks the Autoset intensity, Enhanced Accuracy intensity, and the default setting for waveform intensity.

Setup



Procedure

Autoset Intensity Check

- a. Press the AUTOSSET button.
- b. Verify that the final waveform intensity is at an acceptable level.



DO NOT proceed with the Autoset Intensity adjustment (step c.) if the intensity level in the verification phase was acceptable. Proceed to the Readout Intensity Limit check.

- c. Start the test **autoset_bright**. Follow the instructions given on the PC. When the test finishes, proceed with the following check.

Readout Intensity Limit Check

- d. Press the **UTILITY** button and initialize the mainframe.
- e. Increase the **CHAR INTENSITY** to its upper limit (the beeper will sound).
- f. **CHECK**—that the intensity of the displayed characters is brighter than required during normal use but not distorted.



DO NOT perform the following adjustment if the maximum readout intensity was satisfactory.

- g. Select the Utility menu for display if not already displayed.
- h. Start the test **mcp_ro_limit** and follow instructions on the PC. When the test finishes, proceed with the following check.

Selfcal Intensity Check

- i. Disconnect the cable from the 11K Amplifier CH 1 input.
- j. During the following test watch the crt for dot intensity levels that are not too dim or too bright (i.e., with a halo). Start the test **autocal_trig** and watch the mainframe oscilloscope crt.
- k. If the intensity is acceptable then proceed to the next check. If no waveforms are visible or they are too bright, then proceed to the following adjustment.



DO NOT attempt adjustment if the verification phase passed.

- l. Start the test **autocal_bright**. Follow the instructions given on the PC. When the test finishes, proceed with the following check.

Writing Rate Check

- m. Connect the coaxial cable from the 11K Amplifier CH 1 input to the front-panel **CALIBRATOR** output. In the following test you will be asked to carefully position the rising edge of a waveform between two cursors. Figure 2-30 shows the correct waveform to cursor alignment.
- n. Start the test **writing_rate** and adjust the Main Intensity when the first PC prompt appears. Follow the instructions given on the PC.



DO NOT attempt adjustment if the verification phase passed.

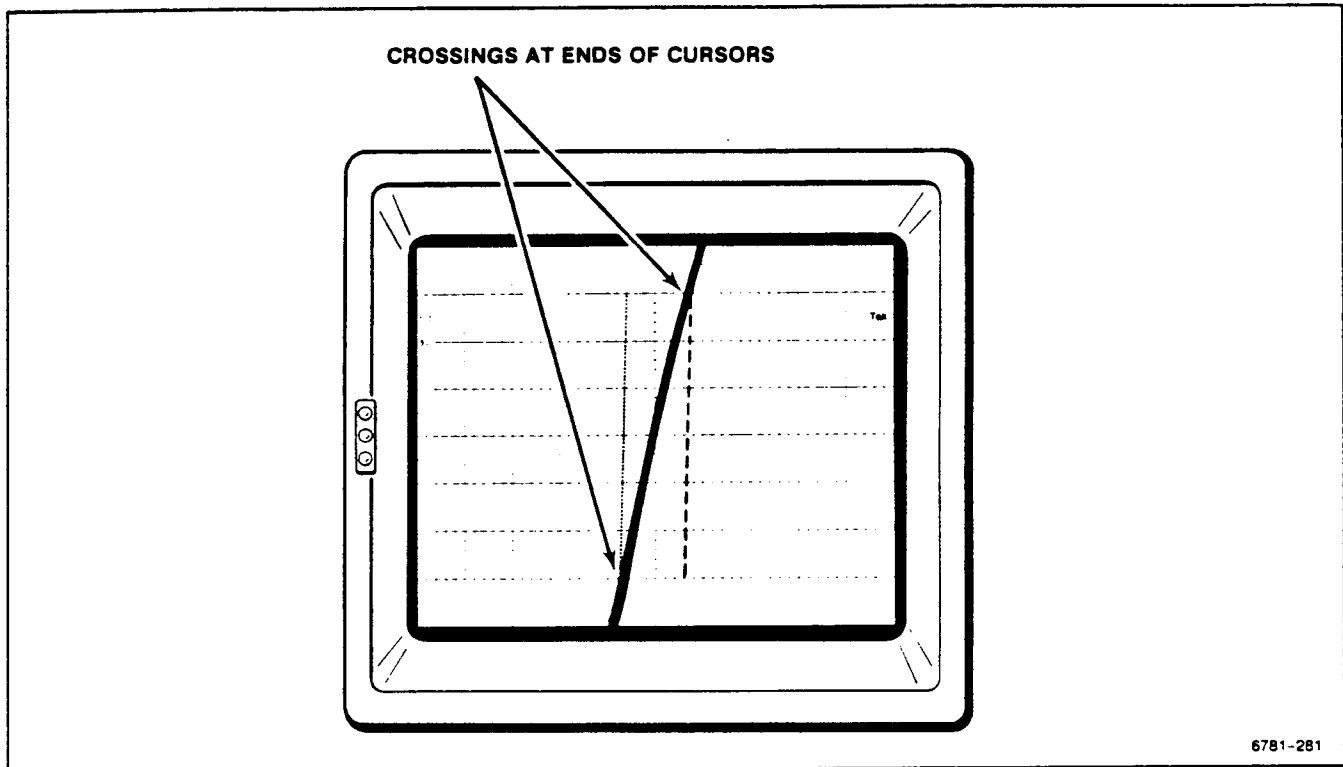


Figure 2-30. Display showing proper alignment of rising edge to Cursors.

Trace Intensity Limit Check

- o. Press the **UTILITY** button and select **INIT** to initialize the mainframe. When initialization is complete, exit the Utility menu by pressing the **UTILITY** button again.
- p. Remove any signals from the plug-in amplifier and press the **CH1** display button.
- q. Set the Main Horizontal Size to 5 ms/div.
- r. Increase the **MAIN INTENSITY** just until the warning **MAIN intensity exceeds limit** appears and remains on screen.
- s. **CHECK**—that the intensity of the trace is brighter than required in normal use.
- t. Set the Main Horizontal Size to 10 ns/div and adjust the Horizontal Position so that the trace spans the full width of the screen.
- u. Increase the **MAIN INTENSITY** just until the warning **MAIN intensity exceeds limit** appears and remains on screen.
- v. **CHECK**—that there is a “halo” on each side of the trace and that there is little, if any, background illumination of the entire screen.

- w. Connect a coaxial cable from the front-panel CALIBRATOR output to the CH1 input of the plug-in amplifier unit.
- x. Press the UTILITY button and select Cal Sig then 100 Hz from the Utility menu. Exit the Utility menu.
- y. Set the Main Horizontal Size to 10 ns/div.
- z. Set the Main Intensity to its maximum level (fully clockwise until the beeper sounds).
- aa. **CHECK**—that the trace is visible and that a warning message for excessive intensity is not *constantly* displayed.



DO NOT perform the following adjustment if all the checks performed for Trace Intensity were acceptable.



Do not alter any front panel settings during the following adjustment test unless the PC specifically requests you to do so.

DO NOT halt this test while it is running. Doing so will corrupt the AutoSet Intensity setting which was set earlier. If the test is halted, run test `autoset_bright` as described at the beginning of this procedure part.

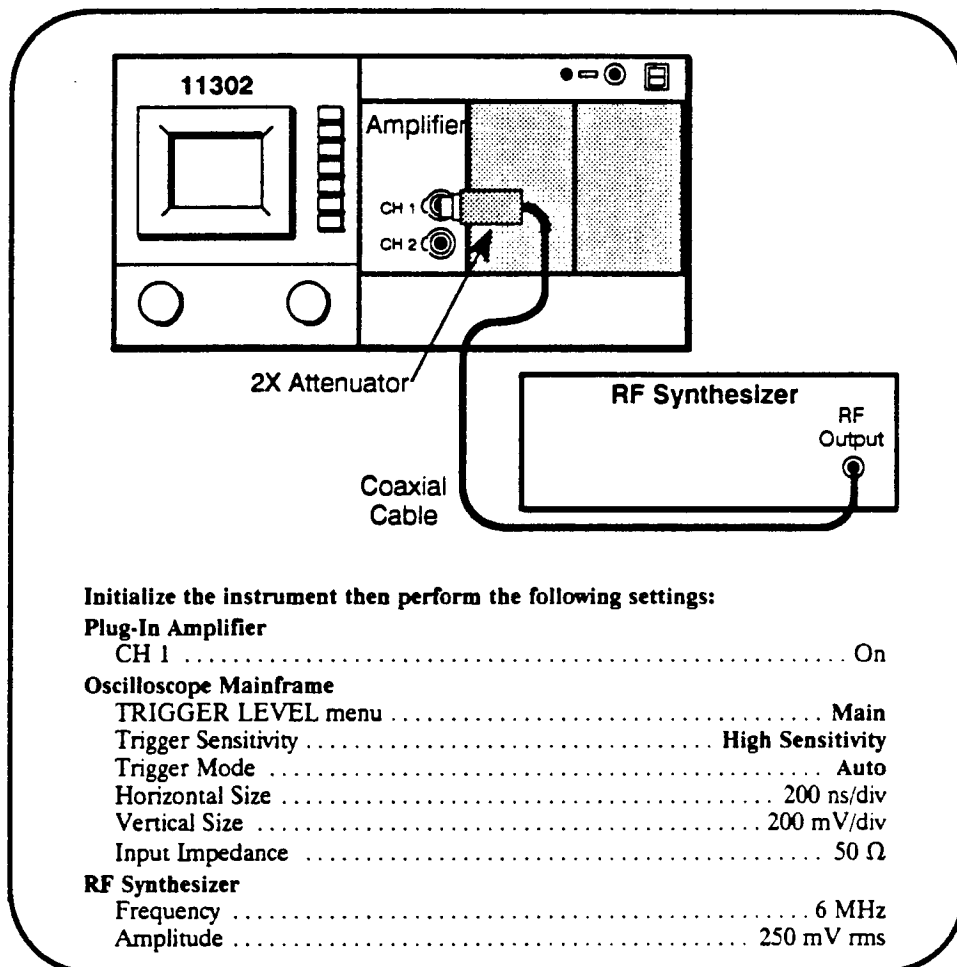
- ab. Start the test `mcp_cutoff`. Follow the instructions given on the PC.

Part 32 – Trigger Sensitivity

Description

This test checks for proper operation of the High, Medium, and Low trigger sensitivity selections.

Setup



Procedure

- a. Adjust the RF Synthesizer Amplitude for a waveform height of 1.75 divisions (350 mV p-p).

Throughout this test, be precise in establishing waveform heights as nearly as possible to the specification. One way this can be accomplished is by using the Vertical Cursor controls. Set **On Tracking** and adjust the Δ VERT readout to the voltage specification of the adjustment. Then, by simultaneously using the VERTICAL POS control and adjusting the Amplitude of the RF Synthesizer, the waveform can be matched to the cursor size.

- b. Set **Window 1** on and adjust **Delay 1** to 0 s.
- c. Using the VERTICAL POS control, position the Main trace in the top half of the screen and the Window trace in the bottom half. You may need to increase the intensity of the Main and Delayed traces to see the waveforms.

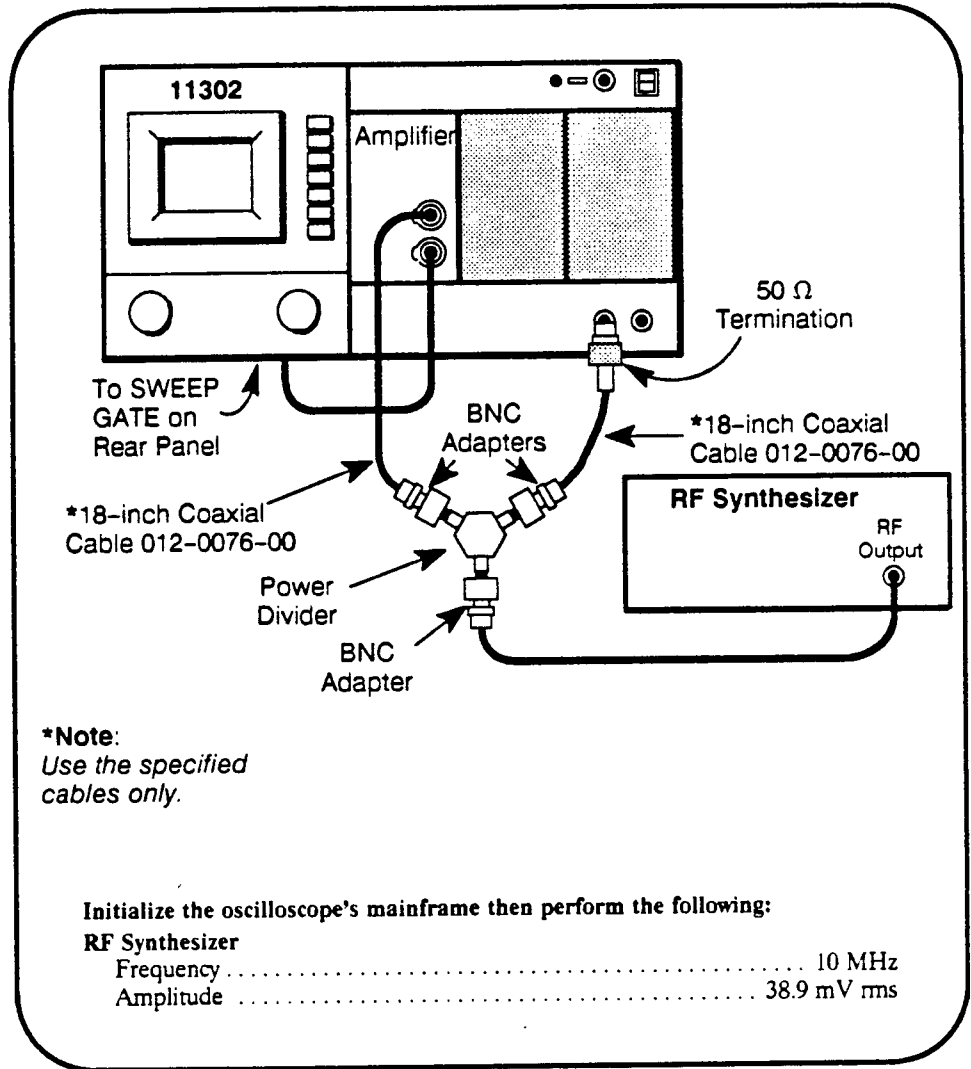
- d. For the Delay 1 Trigger, select **Trig'd After Dly** and **High Sensvty**.
- e. Install a 5X attenuator in series with the 2X attenuator at the plug-in amplifier input.
- f. Adjust the TRIGGER LEVEL of both the Main and Delay 1 triggers.
CHECK—to verify that stable traces can be established on the screen. You will need to use the FINE knob settings. Also, the M TRIG'D and D TRIG'D lights next to the TRIGGER LEVEL button show whether the Main and Delay triggers are active.
- g. Remove the 5X attenuator leaving the 2X attenuator in the signal path.
- h. Adjust the RF Synthesizer for a vertical amplitude of 3.5 divisions, 490 mV rms, for each waveform. If using the cursors, the amplitude is 700 mV p-p.
- i. Reinstall the 5X attenuator in the signal path.
- j. Change the trigger sensitivity of both the Main and Delay 1 triggers to **Medium Sensvty**.
- k. Adjust the TRIGGER LEVEL of both the Main and Delay 1 triggers.
CHECK—to verify that stable traces can be established on the screen.
- l. Remove the 5X attenuator leaving the 2X attenuator in the signal path.
- m. Adjust the RF Synthesizer for a vertical Amplitude of 5.25 divisions, or 742 mV rms. If using the cursors, the amplitude is 1.05 V p-p.
- n. Reinstall the 5X attenuator in the signal path.
- o. Change the trigger sensitivity of both the Main and Delay 1 triggers to **Low Sensvty**.
- p. Adjust the TRIGGER LEVEL of both the Main and Delay 1 triggers.
CHECK—to verify that stable traces can be established on the screen.
- q. Change the trigger sensitivity of both the Main and Delay 1 triggers to **High Sensvty**.
- r. Adjust the Main Horizontal Size to 10 ns. This will force the Delayed Horizontal Size to match.
- s. Remove the 5X attenuator leaving the 2X attenuator in the signal path.
- t. Press the VERTICAL POS button below the screen. Observe the system bandwidth in the **HF Limit** readout at the bottom of the screen and adjust the RF Synthesizer Frequency to match.
- u. Adjust the RF Synthesizer to obtain a vertical trace amplitude of 5.00 divisions, or 700 mV rms.
- v. Reinstall the 5X attenuator in the signal path.
- w. Adjust the TRIGGER LEVEL of both the Main and Delay 1 triggers.
CHECK—to verify that stable traces can be established on the screen.



DO NOT adjust the Trigger Sensitivity if all the verification checks passed. Proceed to the next procedure Part.

Trigger Sensitivity Adjustment: Main

Setup

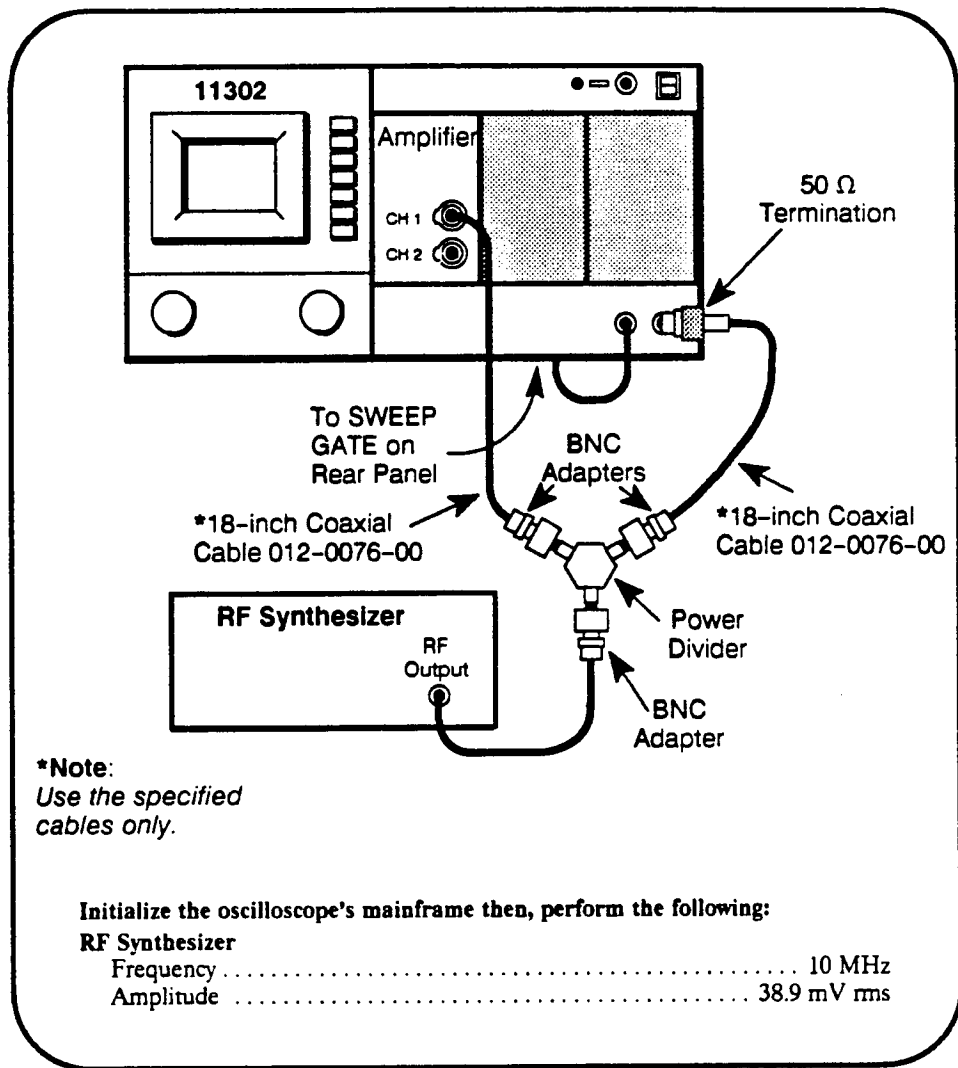


Procedure

- Start the test `trig_sens_main`. Follow the instructions given on the PC.

Trigger Sensitivity Adjustment: Delayed

Setup



Procedure

- a. Start the test `trig_sens_delay`. Follow the instructions given on the PC.

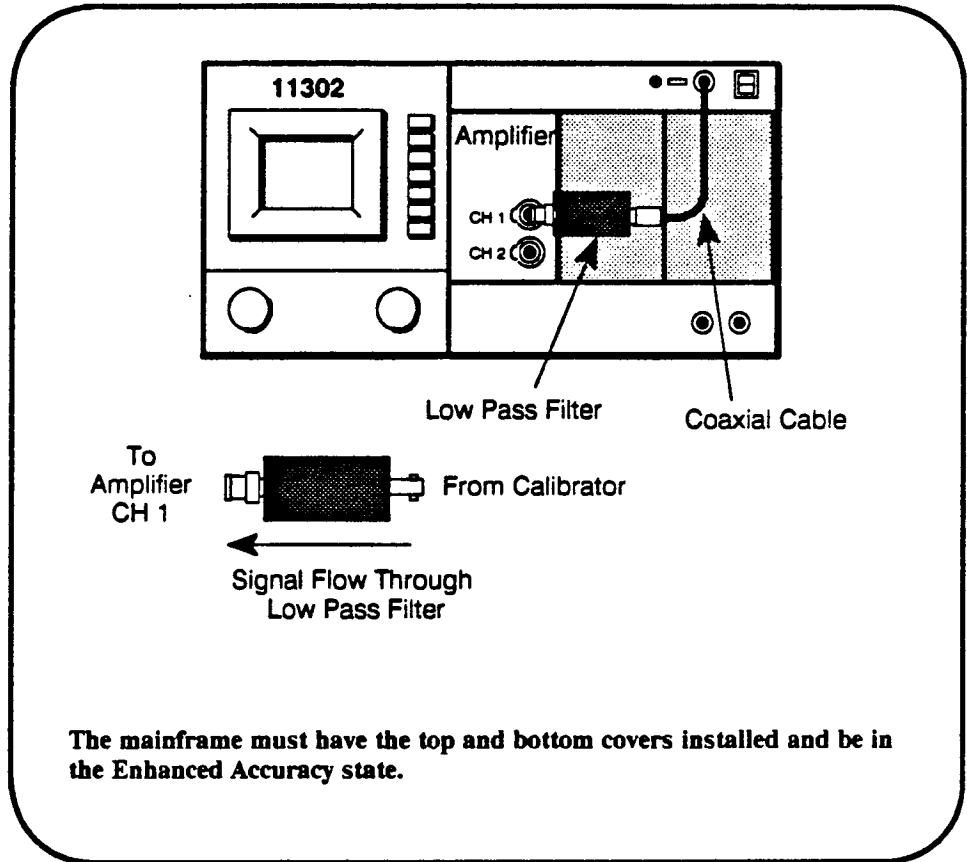
Part 33 – Trigger Accuracy

Description

This test checks the accuracy of the plug-in trigger path and the two external paths as sources to the External Trigger and to the Counter Timer.

Internal Trigger Accuracy

Setup

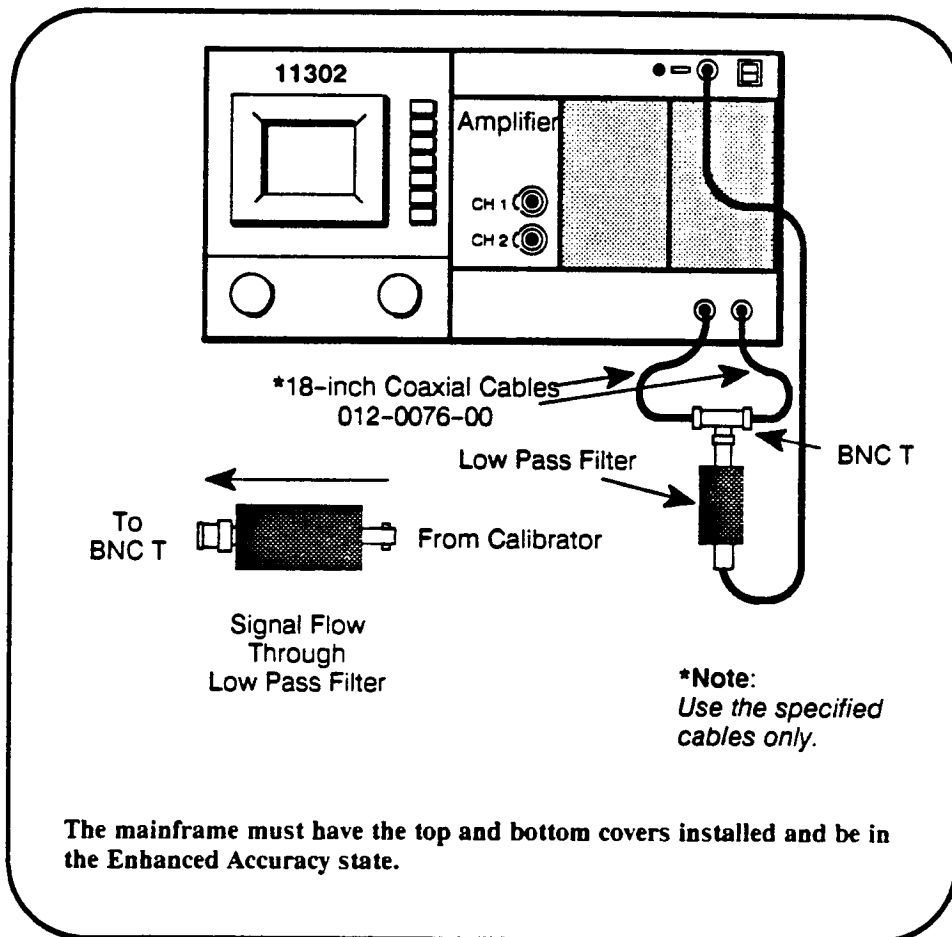


Procedure

- Start the test `int_trig_acc_pc`. Follow the instructions given on the PC.

External Trigger Accuracy

Setup



Procedure

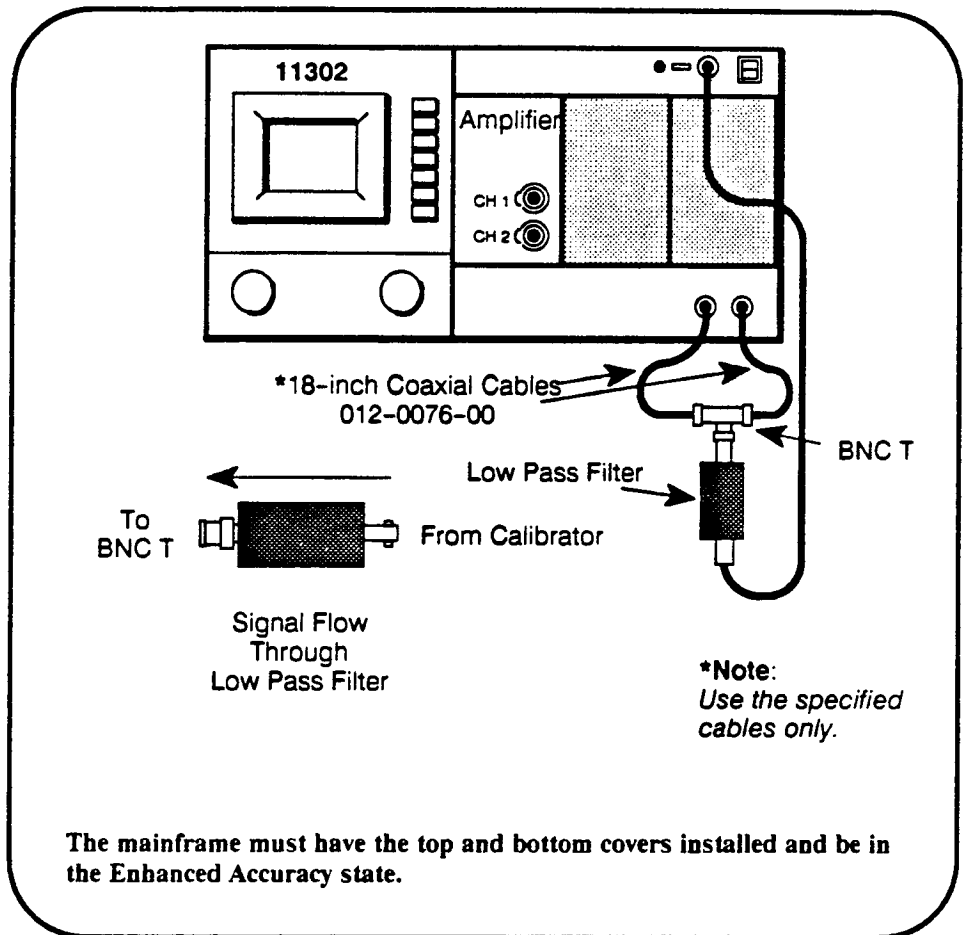
- a. Start the test `ext_trig`. Follow the instructions given on the PC.



DO NOT adjust the External Trigger Accuracy if all the verification checks passed. Proceed to the External Counter Timer Accuracy check.

External Counter Timer Trigger Accuracy

Setup



Procedure

- Start the test ext_ct. Follow the instructions given on the PC.



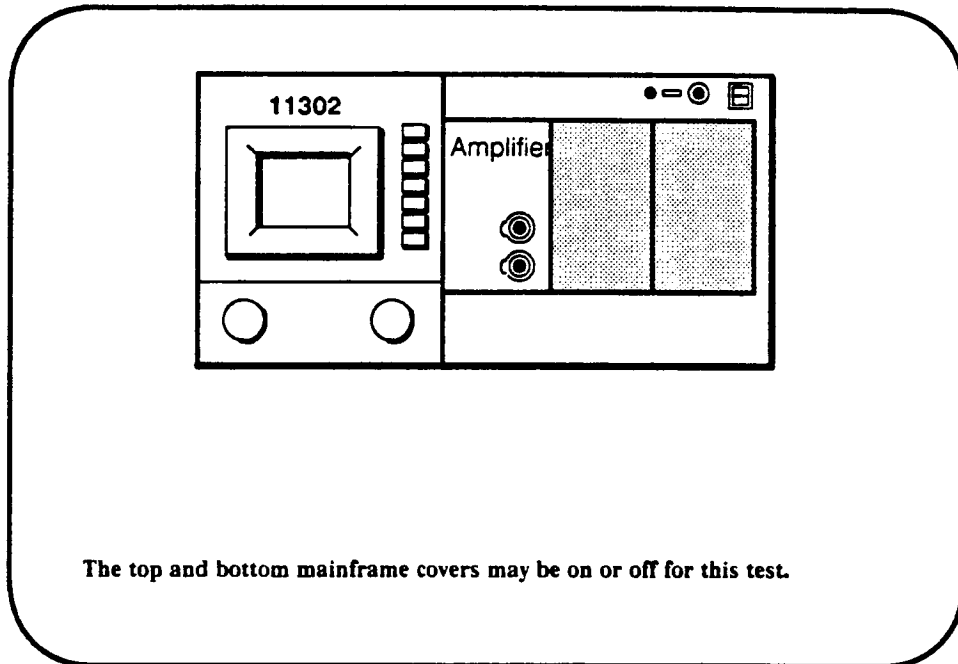
DO NOT adjust the External Counter Timer Trigger Accuracy if all the verification checks passed. Proceed to the next procedure Part.

Part 34 – Line Trigger

Description

This test checks the range of the trigger level adjustment for a line trigger source.

Setup



Procedure

- a. Start the `line_trig` test and follow the PC instructions. Verification is automatic.



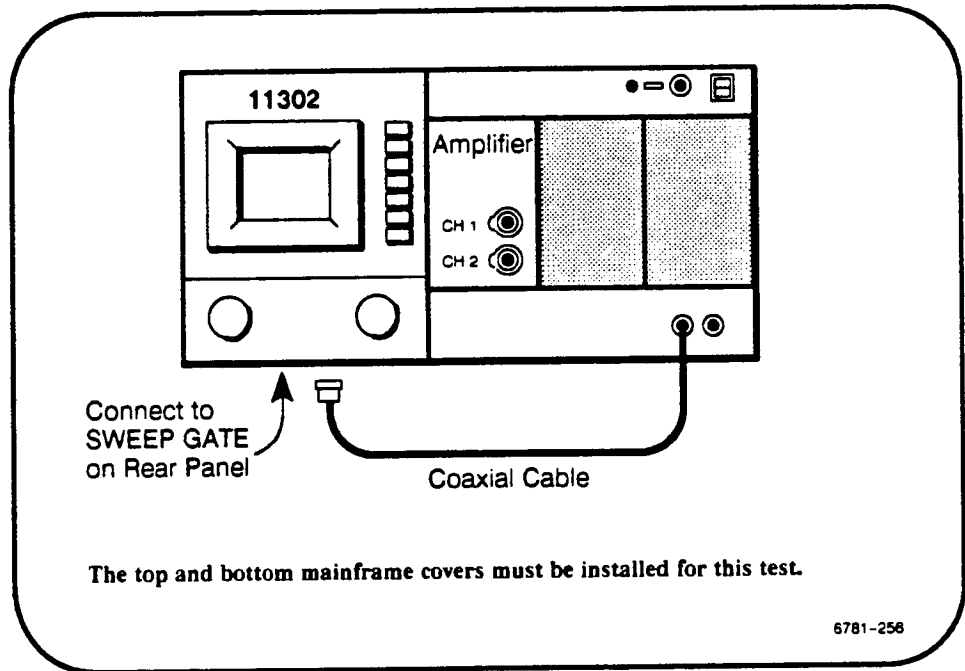
DO NOT proceed with adjustment unless the verification phase failed.

Part 40 – 2 ns Holdoff

Description

This test verifies the agreement between the holdoff settings and the sweep repetition rate.

Setup



Procedure

- a. Start the test `ct_2ns_ho`. Follow the instructions given on the PC.



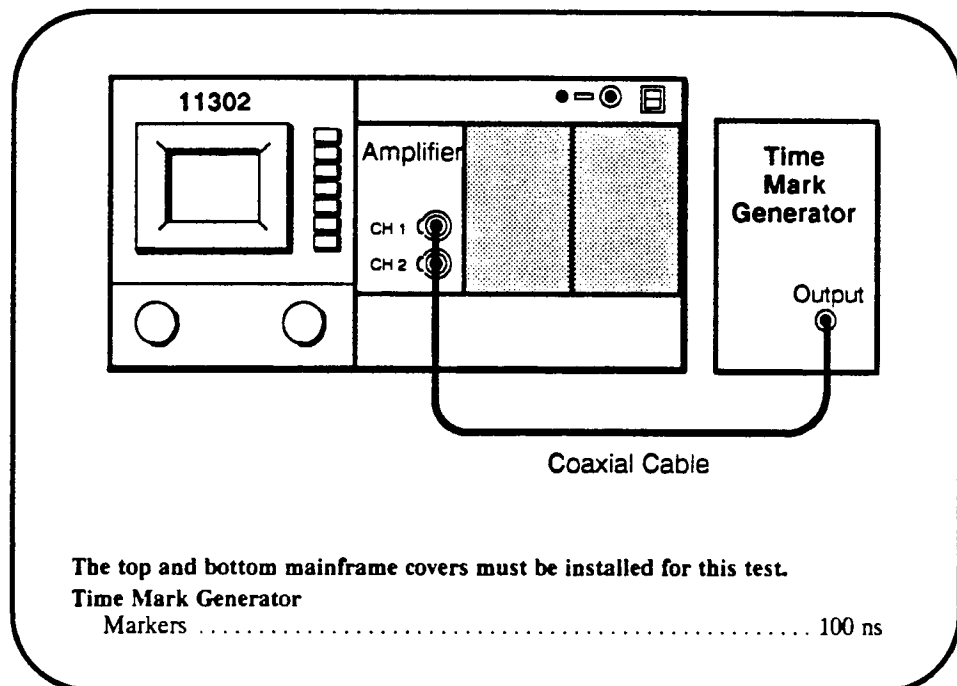
DO NOT proceed with adjustment unless the verification phase failed.

Part 42 – Time Interval Using Sweeps

Description

This test checks the accuracy of the Time Interval mode of the Counter Timer.

Setup



Procedure

Main to Delayed Time Interval (Runs After)

- a. Start the test `m_d_runs`. Follow the instructions given on the PC.

STOP DO NOT proceed with adjustment unless the verification phase failed.

Main to Delayed Time Interval (Triggered After)

- b. Start the test `m_d_trig`. Follow any instructions on the PC.

STOP DO NOT proceed with adjustment unless the verification phase failed.

- c. When the test `m_d_trig` finishes proceed to step d.

Delay 1 to Delay 2 Time Interval (Triggered After)

- d. Start the test `d1_d2_trig`. Follow any instructions on the PC.

STOP DO NOT proceed with adjustment unless the verification phase failed.

Part 44 – Store Cal Constants

Description

This test permanently stores the calibration constants developed in previous procedure Parts. Calibration constants are stored in BBRAM (battery backed-up RAM) during the CATS testing. For reliable operation of the instrument these calibration constants must be moved into the EEROM. The test `save_factory` should be run whenever CATS testing is complete for a mainframe or when you expect a long delay before returning to complete the procedure on a mainframe.

Procedure



Do not touch any oscilloscope controls or turn off the instrument during this test. Disturbing the instrument during this test could cause loss of all calibration constant information and a non-functional instrument.

- a. Start the test `save_factory`. Do not adjust any mainframe control during the test. The PC will indicate test completion.

PRODUCT MODIFICATION KIT SUGGESTION/CORRECTION FORM

DATE _____

KIT NUMBER _____ STEP/PAGE _____

FIGURE NUMBER _____ PUBLICATION DATE _____

DISCREPANCY _____

SUGGESTED CORRECTION/COMMENTS _____

SUGGESTED BY: NAME/ORGANIZATION _____

___ REPLY REQUESTED

(PLEASE TYPE OR PRINT LEGIBLY)

RETURN TO LOCAL FIELD OFFICE/SERVICE CENTER

FIELD OFFICE/SERVICE CENTER/DEL. STA. _____

SERVICE CENTER: RETURN TO FIELD MODS 39-283

REPLY

___ WILL MAKE CHANGE IMMEDIATELY

___ WILL MAKE CHANGE AT NEXT PRINTING

___ OTHER _____

SIGNED _____ DATE _____

TEKTRONIX

MANUAL MODIFICATION INSERT

U750 AND U780 TRIGGER REPLACEMENT

for

11302 Programmable Oscilloscope All Serial Numbers

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

This kit contained parts and instructions that replaced U750 and U780 microcircuits (trigger hybrids) located on the Time Base circuit board A14. The new microcircuits required several component changes on the Time Base circuit board. New firmware (version 2.7) was installed with this upgrade.

REPLACEABLE ELECTRICAL PARTS

CKT. NO.	PART NUMBER	DESCRIPTION
R447	DELETED	
R541	DELETED	
Q540	DELETED	
Q541	DELETED	
U750	165-2265-00	Microcircuit, hybrid: Trigger
U780	165-2265-00	Microcircuit, hybrid: Trigger
U1000	160-4476-06	Microcircuit, dgtl: EPROM, ver 2.7
U1100	160-4473-06	Microcircuit, dgtl: EPROM, ver 2.7
U1200	160-4474-06	Microcircuit, dgtl: EPROM, ver 2.7
U1230	160-4477-06	Microcircuit, dgtl: EPROM, ver 2.7
U1300	160-4475-06	Microcircuit, dgtl: EPROM, ver 2.7
U1330	160-4470-06	Microcircuit, dgtl: EPROM, ver 2.7
U1400	160-4472-06	Microcircuit, dgtl: EPROM, ver 2.7
U1430	160-4471-06	Microcircuit, dgtl: EPROM, ver 2.7
W540	176-0122-00	Wire, elec: 22 awg, bare
W541	176-0122-00	Wire, elec: 22 awg, bare