PERFORMANCE CHECK PROCEDURE

INTRODUCTION

PURPOSE

The Performance Check Procedure is used to verify the instrument's Performance Requirements statements listed in Table 1–1 and to determine the need for calibration. The performance checks may also be used as an acceptance test or as a preliminary troubleshooting aid.

PERFORMANCE CHECK INTERVAL

To ensure instrument accuracy, check its performance after every 2000 hours of operation, or once each year if used infrequently. A more frequent interval may be necessary if the instrument is subjected to harsh environments or severe usage.

STRUCTURE

The Performance Check Procedure is structured in subsections to permit checking individual sections of the instrument whenever a complete Performance Check is not required. At the beginning of each subsection there is an equipment-required list showing only the test equipment necessary for performing the steps in that subsection. In this list, the Item number that follows each piece of equipment corresponds to the Item number listed in Table 4–1.

Also at the beginning of each subsection is a list of all the front-panel control settings required to prepare the instrument for performing Step 1 in that subsection. Each succeeding step within a particular subsection should then be performed, both in the sequence presented and in its entirety, to ensure that control-setting changes will be correct for ensuing steps.

TEST EQUIPMENT REQUIRED

The test equipment listed in Table 4–1 is a complete list of the equipment required to accomplish both the Performance Check Procedure in this section and the Adjustment Procedure in Section 5. Test equipment specifications described in Table 4–1 are the minimum necessary to provide accurate results. Therefore, equipment used must meet or exceed the listed specifications. Detailed operating instructions for test equipment are not given in this procedure. If more operating information is required, refer to the appropriate test equipment instruction manual.

When equipment other than that recommended is used, control settings of the test setup may need to be altered. If the exact item of equipment given as an example in Table 4–1 is not available, check the Minimum Specification column to determine if any other available test equipment might suffice to perform the check or adjustment.

LIMITS AND TOLERANCES

The limits and tolerances given in this procedure are valid for an instrument that is operating in and has been previously calibrated in an ambient temperature between +20°C and +30°C. The instrument also must have had at least a 20-minute warm-up period. Refer to Table 1–1 for tolerances applicable to an instrument that is operating outside this temperature range. All tolerances specified are for the instrument only and do not include test-equipment error.

PREPARATION FOR CHECKS

It is not necessary to remove the instrument cover to accomplish any subsection in the "Performance Check Procedure," since all checks are made using operator-accessible front- and rear-panel controls and connectors.

The most accurate display adjustments are made with a stable, well-focused, low-intensity display. Unless otherwise noted, adjust the INTENSITY, FOCUS, and TRIGGER LEVEL controls as needed to view the display.

Table 4–1

Test Equipment Required

Item and Description	Minimum Specification	Purpose	Example of Suitable Test Equipment
1. Calibration Generator	Standard-amplitude signal levels: 5 mV to 50 V. Accuracy: ±0.3%. High-amplitude signal levels: 1 V to 60 V. Repetition rate: 1 kHz. Fast-rise signal level: 1 V. Repetition rate: 1 MHz. Rise time: 1 ns or less. Flatness: ± 0.5%.	Signal source for gain and transient response checks and adjustments.	TEKTRONIX PG 506 Calibration Generator.[a]
2. Leveled Sine-Wave Generator	Frequency: 250 kHz to above 50 MHz. Output amplitude: variable from 10 mV to 5 V p.p. Output impedance: 50 Ω. Reference frequency: 50 kHz. Amplitude accuracy: constant within 3% of reference frequency as output frequency changes.	Vertical, horizontal, and triggering checks and adjustments. Display adjustments and Z-Axis check.	TEKTRONIX SG 503 Leveled Sine-Wave Generator.[a]
3. Time-Mark Generator	Marker outputs: 10 ns to 0.5 s. Marker accuracy: ± 0.1%. Trigger output: 1 ms to 0.1 μs, time-coincident with markers.	Horizontal checks and adjustments. Display adjustment.	TEKTRONIX TG 501 Time-Mark Generator.[a]
4. Low-Frequency Sine-Wave Generator	Range: 1 kHz to 500 kHz. Output amplitude: 300 mV. Output impedance: 600 Ω. Reference frequency: constant within 0.3 dB of reference frequency as output frequency changes.	Low-frequency trigger checks.	TEKTRONIX SG 502 Oscillator.[a]
5. Screwdriver	Length: 3-in. shaft. Bit size: 3/32 in.	Adjust variable resistors.	Xcelite R-3323.
6. Test Oscilloscope with 10X Probes	Bandwidth: dc to 100 MHz. Minimum deflection factor: 5 mV/div. Accuracy: ±3%.	General troubleshooting, holdoff check.	TEKTRONIX 2235 Oscilloscope.
7. Digital Voltmeter (DMM)	Range: 0 to 140 V. Dc voltage accuracy: ± 0.15%, 4-1/2 digit display.	Power supply checks and adjustments.	TEKTRONIX DM 501A Digital Multimeter.[a]
8. Coaxial Cable	Impedance: 50 Ω. Length: 42 in. Connectors: BNC.	Signal interconnection.	Tektronix Part Number 012-0057-01.
9. Dual-Input Coupler	Connectors: BNC female-to-dual-BNC male.	Signal interconnection.	Tektronix Part Number 067-0525-01.
10. Termination	Impedance: 50 Ω Connectors: BNC.	Signal termination.	Tektronix Part Number 011-0049-01.
11. Termination	Impedance: 600 Ω. Connectors: BNC.	Signal termination.	Tektronix Part Number 011-0092-00.

[a] Requires a TM 500-Series Power Module.

Table 4-1, (cont)

Item and Description	Minimum Specification	Purpose	Example of Suitable Test Equipment
12. 10X Attenuator	Ratio: 10X. Impedance: 50Ω. Connectors: BNC.	Vertical compensation and triggering checks.	Tektronix Part Number 011-0059-02.
13. Adapter	Connectors: BNC male-to-miniature-probe tip.	Signal interconnection.	Tektronix Part Number 013-0084-02.
14. Adapter	Connectors: BNC male-to-tip plug.	Signal interconnection.	Tektronix Part Number 175-1178-00.
15. Low-Reactance Alignment Tool	Length: 1-in. shaft. Bit size: 3/32 in.	Adjust variable capacitors.	J.F.D. Electronics Corp. Adjustment Tool Number 5284.

INDEX TO PERFORMANCE CHECK STEPS

VERTICAL

Equipment Required (See Table 4-1):

Calibration Generator (Item 1)
Leveled Sine-Wave Generator (Item 2)
50-Ω BNC Coaxial Cable (Item 8)
Dual-Input Coupler (Item 9)
50-Ω BNC Termination (Item10)
10X BNC Attenuator (Item 12)
BNC Male-to-Miniature-Probe Tip (Item 13)

INITIAL CONTROL SETTINGS

Vertical

POSITION (both)	Midrange
MODE	CH 1, NORM
VOLTS/DIV (both)	5 mV
VOLTS/DIV Variable (both)	CAL detent
Magnification (both)	X1 (CAL knobs in)
AC-GND-DC	DC

Horizontal

POSITION (COARSE and FINE)	Midrange
MODE	X1
SEC/DIV	0.5 ms
SEC/DIV Variable	CAL detent
MAG	X5

Trigger

SLOPE	Positive (⌐)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	VERT MODE
COUPLING	DC

PROCEDURE STEPS

1. Check Deflection Accuracy and Variable Range

a. Connect a 20-mV standard-amplitude signal from the calibration generator via a 50-Ω BNC coaxial cable to the CH 1 OR X input connector.

b. CHECK—Deflection accuracy is within the limits given in Table 4-2 for each CH 1 VOLTS/DIV switch setting and corresponding standard-amplitude signal. When at the 20-mV VOLTS/DIV switch setting, rotate the CH 1 VOLTS/DIV Variable control fully counterclockwise and check that the display decreases to two divisions or less. Then return the CH 1 VOLTS/DIV Variable control to the CAL detent and continue with the 50-mV check.

c. Move the cable from the CH 1 OR X input connector to the CH 2 OR Y input connector. Set the Vertical MODE switch to CH 2.

d. Set the calibration generator to output 20 mV.

e. Repeat Part b using the Channel 2 controls.

f. Set the calibration generator to 0.1 V.

Table 4-2
Deflection Accuracy Limits

VOLTS/DIV Switch Setting	STANDARD Amplitude Signal	ACCURACY Limits (Divisions)
5 mV	20 mV	3.88 to 4.12
10 mV	50 mV	4.85 to 5.15
20 mV	0.1 V	4.85 to 5.15
50 mV	0.2 V	3.88 to 4.12
0.1 V	0.5 V	4.85 to 5.15
0.2 V	1 V	4.85 to 5.15
0.5 V	2 V	3.88 to 4.12
1 V	5 V	4.85 to 5.15
2 V	10 V	4.85 to 5.15
5 V	20 V	3.88 to 4.12

2. Check Position Range

a. SET:

VOLTS/DIV (both)	10 mV
AC-GND-DC (both)	AC
SEC/DIV	0.2 ms

b. Adjust the CH 2 VOLTS/DIV Variable control to produce a 5.25-division display.

c. Set CH 2 VOLTS/DIV to 5 mV.

d. Set the calibration generator to 0.2 V.

e. CHECK—The bottom and top of the trace may be positioned above and below the center horizontal graticule line by rotating the CH 2 POSITION control fully clockwise and counterclockwise respectively.

f. Move the cable from the CH 2 OR Y input connector to the CH 1 OR X input connector.

g. Set the Vertical MODE switch to CH 1.

h. Repeat Parts b through e using the Channel 1 controls.

i. Return both VOLTS/DIV Variable knobs to their detent positions.

j. Disconnect the test equipment from the instrument.

3. Check TRACE SEP Range

a. SET:

SEC/DIV	10 μs
Trigger SOURCE	EXT, EXT

b. Position the trace to the center horizontal graticule line using the Channel 1 POSITION control.

c. Set the Horizontal MODE to ALT.

d. CHECK—That the magnified trace can be positioned three divisions or more above the unmagnified trace. For instruments below serial number 202908, check that the magnified trace can also be positioned three divisions or more below the unmagnified trace.

4. Check High Frequency Compensation

a. SET:

AC-GND-DC (both)	DC
SEC/DIV	0.2 μs
Horizontal MODE	X1
Trigger SOURCE	VERT MODE

b. Connect the positive-going, fast-rise, square-wave output via a 50-Ω BNC coaxial cable, a 10X BNC attenuator, and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce a 1-MHz, five-division display.

d. Position the bottom of the display to the bottom horizontal graticule line using the CH 1 POSITION control and position the leading edge of a pulse on the center vertical graticule line.

e. Check for aberrations at the top of the waveform of ±6% (0.3 division) or less.

f. Set CH 1 VOLTS/DIV to 10 mV.

g. Set the generator to produce a 1-MHz, five-division display.

h. Check for aberrations of ±4% (0.2 division) or less.

i. Repeat Parts g and h for each of the following CH 1 VOLTS/DIV switch settings: 20 mV through 0.2 V. Adjust the generator output and add or remove the 10X attenuator as necessary to maintain a five-division display at each VOLTS/DIV switch setting.

j. Move the cable from the CH 1 OR X input connector to the CH 2 OR Y input connector. Set the Vertical MODE switch to CH 2.

k. Repeat Parts c through i for Channel 2.

l. Disconnect the test equipment from the instrument.

5. Check Bandwidth

a. SET:

VOLTS/DIV (both)	5 mV
Vertical MODE	CH 1
SEC/DIV	10 μs

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce a 50-kHz, six-division display.

d. Increase the signal frequency until a 4.2-division display is obtained.

e. CHECK—That the frequency is greater than 50 MHz.

f. Repeat Parts c through e for all VOLTS/DIV settings from 10 mV to 1 V.

NOTE

For the 1-V-per-division VOLTS/DIV settings, use a five-division display of the 50-kHz reference frequency; use 3.5 divisions peak-to-peak as the -3 dB reference point of the bandwidth.

g. SET:

CH 1 VOLTS/DIV	5 mV
CH 1 Vertical Magnification	X10 (pull CH1 CAL knob out)

h. Set the generator to produce a 50-kHz, six-division display.

i. Increase the signal frequency until a 4.2-division display is obtained.

j. CHECK—That the frequency is greater than 5 MHz.

k. Repeat Parts h through j for all ranges from 10 mV to 0.2 V.

l. Set the CH 1 Vertical Magnification to X1 (push CAL knob in).

m. Set Vertical MODE to CH 2.

n. Repeat Parts b through l for CH 2 using the Channel 2 controls.

6. Check Channel Isolation

a. SET:

VOLTS/DIV (both)	0.5 V
CH1 AC-GND-DC	GND
SEC/DIV	0.05 μs

b. Set the generator to produce a 20-MHz, five-division display.

c. Set Vertical MODE to CH 1.

d. Check that the CH 1 trace amplitude is less than 0.1 division.

e. Move the test-signal cable from the CH 2 OR Y input connector to the CH 1 OR X input connector.

f. SET:

Vertical MODE	CH 2
CH 1 AC-GND-DC	DC
CH 2 AC-GND-DC	GND

g. Check that the display amplitude is less than 0.1 division.

h. Disconnect the test equipment from the instrument.

7. Check Common Mode-Rejection Ratio

a. SET:

VOLTS/DIV (both)	10 mV
AC-GND-DC (both)	DC

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and dual-input coupler to the CH1 OR X and CH 2 OR Y input connectors.

c. Set the generator to produce a 20-MHz, five-division display.

d. SET:

Vertical MODE	BOTH, CH2 INVERT, and ADD

e. CHECK—That the ADD trace is 0.6 division or less.

f. Disconnect the test equipment from the instrument.

HORIZONTAL

Equipment Required (See Table 4-1):

Calibration Generator (Item 1)
Leveled Sine-Wave Generator (Item 2)
Time-Mark Generator (Item 3)
Test Oscilloscope (Item 6)
50-Ω Coaxial Cable (Item 8)
50-Ω BNC Termination (Item 10)

INITIAL CONTROL SETTINGS

Vertical

POSITION (both)	Midrange
MODE	CH 1, NORM
VOLTS/DIV (both)	0.5 V
VOLTS/DIV Variable (both)	CAL detent
Magnification (both)	X1 (CAL knobs in)
AC-GND-DC (both)	DC

Horizontal

POSITION (COARSE and FINE)	Midrange
MODE	X1
SEC/DIV	0.05 μs
SEC/DIV Variable	CAL detent
MAG	X5

Trigger

SLOPE	Positive (⌐)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	CH 1
COUPLING	AC

PROCEDURE STEPS

1. Check Timing Accuracy and Linearity

a. Connect 50-ns time markers from the time-mark generator via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

b. Adjust the Trigger LEVEL control for a stable, triggered display.

c. Use the Horizontal POSITION controls to align the second time marker with the second vertical graticule line.

d. CHECK—Timing accuracy is within 3% (0.24 division at the tenth vertical graticule line), and linearity is within 5% (0.10 division over any two of the center eight divisions).

NOTE

For checking the timing accuracy of the SEC/DIV switch settings from 50 ms to 0.5 s, watch the time marker tips only at the second and tenth vertical graticule lines while adjusting the COARSE and FINE Horizontal POSITION controls to line up the time markers.

e. Repeat Parts b through d for the remaining SEC/DIV and time-mark generator setting combinations shown in Table 4-3 under the Normal column.

Table 4-3

Settings for Timing Accuracy Checks

SEC/DIV Switch Setting	Time-Mark Generator Setting			
	Normal	X5 Mag	X10 Mag	X50 Mag
0.05 µs	50 ns	10 ns		
0.1 µs	0.1 µs	20 ns	10 ns	
0.2 µs	0.2 µs	0.1 µs	20 ns	10 ns
0.5 µs	0.5 µs	0.1 µs	50 ns	10 ns
1 µs	1 µs	0.2 µs	0.1 µs	20 ns
2 µs	2 µs	1 µs	0.2 µs	0.1 µs
5 µs	5 µs	1 µs	0.5 µs	0.1 µs
10 µs	10 µs	2 µs	1 µs	0.2 µs
20 µs	20 µs	10 µs	2 µs	1 µs
50 µs	50 µs	10 µs	5 µs	1 µs
0.1 ms	0.1 ms	20 µs	10 µs	2 µs
0.2 ms	0.2 ms	0.1 ms	20 µs	10 µs
0.5 ms	0.5 ms	0.1 ms	50 µs	10 µs
1 ms	1 ms	0.2 ms	0.1 ms	20 µs
2 ms	2 ms	1 ms	0.2 ms	0.1 ms
5 ms	5 ms	1 ms	0.5 ms	0.1 ms
10 ms	10 ms	2 ms	1 ms	0.2 ms
20 ms	20 ms	10 ms	2 ms	1 ms
50 ms	50 ms	10 ms	5 ms	1 ms
0.1 s	0.1 s	20 ms	10 ms	2 ms
0.2 s	0.2 s	0.1 s	20 ms	10 ms
0.5 s	0.5 s	0.1 s	50 ms	10 ms

NOTE

In X5 and X50 magnification in all "2" decade switch settings, the associated time marker settings give only five markers per ten divisions instead of the customary ten. When checking these ranges, position the markers on the second and ninth vertical graticule lines.

f. SET:

SEC/DIV	0.05 µs
Horizontal MODE	MAG
Horizontal MAG	X5

g. Select 10 ns time markers from the time-mark generator.

h. Use the Horizontal POSITION controls to align the first time marker that is 50 ns beyond the start of the sweep with the second vertical graticule line.

i. CHECK—Timing accuracy is within 4% (0.32 division at the tenth vertical graticule line), and linearity is within 7% (0.14 division over any two of the center eight divisions). Exclude any portion of the sweep past the 50th magnified division.

j. Repeat Parts h and i for the remaining SEC/DIV and time-mark generator setting combinations shown in Table 4-3 under the "X5 Magnified" column.

k. SET:

SEC/DIV	0.1 μs
Horizontal MAG	X10

l. Select 10-ns time markers from the time-mark generator.

m. Use the Horizontal POSITION controls to align the first time marker that is 50 ns beyond the start of the sweep with the second vertical graticule line.

n. CHECK—Timing accuracy is within 4% (0.32 division at the tenth vertical graticule line), and linearity is within 7% (0.14 division over any two of the center eight divisions). Exclude any portion of the sweep past the 50th magnified division.

o. Repeat Parts m and n for the remaining SEC/DIV and time-mark generator setting combinations shown in Table 4-3 under the "X10 Magnified" column.

p. SET:

SEC/DIV	0.5 μs
Horizontal MAG	X50

q. Select 10 ns time markers from the time-mark generator.

r. Use the Horizontal POSITION controls to align the first time marker that is 100 ns beyond the start of the sweep with the second vertical graticule line.

s. CHECK—Timing accuracy is within 5% (0.40 division at the tenth vertical graticule line), and linearity is within 9% (0.18 division over any two of the center eight divisions). Exclude any portion of the sweep past the 100th magnified division.

t. Repeat Parts r and s for the remaining SEC/DIV and time-mark generator setting combinations shown in Table 4-3 under the X50 Magnified column.

2. Check Sweep Length

a. SET:

SEC/DIV	0.1 ms
Horizontal MODE	X1

b. Select 0.1 ms time markers from the time-mark generator.

c. Position the start of the sweep at the first vertical graticule line using the Horizontal POSITION controls.

d. CHECK—That the sweep length is between 10.2 and 12 divisions.

3. Check COARSE and FINE Horizontal POSITION Range

a. CHECK—That the start of the sweep can be positioned to the right of the center vertical graticule line by rotating the COARSE Horizontal POSITION control fully clockwise.

b. CHECK—That the tenth time marker can be positioned to the left of the center vertical graticule line by rotating the COARSE Horizontal POSITION control fully counterclockwise.

c. CHECK—That the FINE Horizontal POSITION control can move the trace 0.4 division or more.

4. Check SEC/DIV Variable Range

a. Select 0.5-ms time markers from the time-mark generator.

b. Set the SEC/DIV Variable control fully counterclockwise.

c. CHECK—That the spacing between time markers is two divisions or less.

d. Return the SEC/DIV Variable knob to the CAL detent position.

e. Disconnect the test equipment from the instrument.

5. Check X Gain

a. SET:

VOLTS/DIV (both)	10 mV
SEC/DIV	X-Y (fully ccw)

b. Connect a 50-mV, standard-amplitude signal from the calibration generator via a 50-Ω BNC coaxial cable to the CH 1 OR X input connector.

c. CHECK—That the display is between 4.85 and 5.15 divisions.

d. Disconnect the test equipment from the instrument.

6. Check X Bandwidth

a. Set both channels VOLTS/DIV switches to 50 mV.

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

c. Set the generator to produce an eight-division horizontal display at an output frequency of 50 kHz.

d. Increase the output frequency until the X-Axis (horizontal) deflection amplitude is 5.7 divisions.

e. CHECK—That the frequency is 2 MHz or greater.

f. Disconnect the test equipment from the instrument.

TRIGGER

Equipment Required (See Table 4-1):

Leveled Sine-Wave Generator (Item 2)
Low-Frequency Sine-Wave Generator (Item 4)
50-Ω BNC Coaxial Cable (Item 8)
Dual-Input Coupler (Item 9)
50-Ω BNC Termination (Item 10)
600-Ω BNC Termination (Item 11)

INITIAL CONTROL SETTINGS

Vertical

POSITION (both)	Midrange
MODE	CH 1
CH 1 VOLTS/DIV	0.1 V
CH 2 VOLTS/DIV	1 V
VOLTS/DIV Variable (both)	CAL detent
Magnification (both)	X1 (CAL knobs in)
AC-GND-DC (both)	DC

Horizontal

POSITION (COARSE and FINE)	Midrange
MODE	X1
SEC/DIV	0.2 µs
SEC/DIV Variable	CAL detent
MAG	X5

Trigger

SLOPE	Positive (⌐)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	VERT MODE
COUPLING	DC

PROCEDURE STEPS

1. Check Trigger Sensitivity

a. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable and a 50-Ω BNC termination to the CH 1 OR X input connector.

b. Set the generator to produce a three-division display at an output frequency of 5 MHz.

c. Set channel 1 VOLTS/DIV switch to 1 V.

d. CHECK—That a stable display can be obtained by adjusting the Trigger LEVEL control for each switch combination given in Table 4-4 in both positive and negative slope. Ensure that the TRIG'D light comes on when triggered.

Table 4-4
Switch Combinations for Triggering Checks

Trigger MODE	Trigger SLOPE
NORM	Positive ⌐
NORM	Negative ¬
P-P AUTO	Positive ⌐
P-P AUTO	Negative ¬

e. Move the test-signal cable from the CH 1 OR X input connector to the CH 2 OR Y input connector. Set the Vertical MODE switch to CH 2.

f. Repeat Part d.

g. SET:

SEC/DIV	0.05 μs
Horizontal MODE	MAG

h. Set the generator output to produce a 50-MHz, one-division display.

i. Repeat Part d.

j. Move the test-signal cable from the CH 2 OR X input connector to the CH 1 OR Y input connector. Set the VERTICAL MODE switch to CH 1.

k. Repeat Part d.

l. Disconnect the test equipment from the instrument.

m. SET:

CH 1 VOLTS/DIV	20 mV
SEC/DIV	0.2 μs
Horizontal MODE	X1
Trigger MODE	P-P AUTO
Trigger SOURCE	EXT, EXT

n. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X input connector and EXT INPUT OR Z input connectors.

o. Set the generator to produce a four-division (80 mV) horizontal display at an output frequency of 5 MHz.

p. Repeat Part d.

q. SET:

CH 1 VOLT/DIV	50 mV
SEC/DIV	0.05 μs
Horizontal MODE	MAG

u. Set the generator to produce a five-division (250 mV) horizontal display at an output frequency of 50 MHz.

v. Repeat Part d.

w. Disconnect the test equipment from the instrument.

2. Check LF P-P AUTO Trigger

a. SET:

CH 1 VOLTS/DIV	0.1 V
SEC/DIV	20 ms
Horizontal MODE	X1
Trigger MODE	P-P AUTO
Trigger SOURCE	CH 1
Trigger SLOPE	Positive (⌐)

b. Connect the low-frequency, sine-wave generator output via a 50-Ω cable and a 600-Ω termination to the CH 1 OR X input connector.

c. Set the low-frequency generator output to produce a 20-Hz, one-division display.

d. CHECK—For stable triggering in both positive and negative slopes. Ensure that the TRIG'D light comes on when triggered.

e. Disconnect the test equipment from the instrument.

3. Check External Trigger Range

a. SET:

CH 1 VOLTS/DIV	0.5 V
SEC/DIV	20 μs
Trigger COUPLING	AC
Trigger SLOPE	Positive (⌐)

b. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X and the EXT INPUT OR Z input connectors.

c. Set the leveled sine-wave generator to produce a 50-kHz, five-division display.

d. Position the waveform equally about the center horizontal graticule line.

e. SET:

Trigger MODE	NORM
Trigger SOURCE	EXT, EXT

f. CHECK—That the display is not triggered at either extreme of rotation of the Trigger LEVEL control.

g. Set the Trigger COUPLING switch to DC.

h. CHECK—That the display can be untriggered at either extreme or rotation of the Trigger LEVEL control.

i. Set the Trigger SOURCE switch to EXT/10.

j. CHECK—That the display can be triggered about the midrange of the Trigger LEVEL control.

k. Set the Trigger SLOPE switch to negative (⌝⌞) and repeat Part j.

l. Disconnect the test equipment from the instrument.

4. Check Single Sweep Operation

a. SET:

CH 1 VOLTS/DIV	10 mV
SEC/DIV	0.5 ms
Trigger SOURCE	CH 1
Trigger COUPLING	AC
Trigger SLOPE	Positive (⌞⌜)

b. Connect 50-mV, standard-amplitude signal from the calibration generator via a 50-Ω BNC coaxial cable to the CH 1 OR X input connector.

c. Adjust the Trigger LEVEL control to obtain a stable display.

d. SET:

CH 1 AC-GND-DC	GND
Trigger MODE	SGL SWP

e. Press the SGL SWP RESET button. The READY light should light up and remain on.

f. Set the Channel 1 AC-GND-DC switch to DC.

NOTE

The INTENSITY control may require adjustment to observe the single-sweep trace.

g. CHECK-READY light goes out and a single sweep occurs.

h. Press the SGL SWP RESET button several times.

i. CHECK—A single-sweep trace occurs, and the READY light comes on briefly every time the SGL SWP RESET button is pressed.

j. Disconnect the test equipment from the instrument.

EXTERNAL Z-AXIS AND PROBE ADJUST

Equipment Required (See Table 4-1):

- Leveled Sine-Wave Generator (Item 2)
- Two 50-Ω BNC Coaxial Cable (Item 8)
- Dual-Input Coupler (Item 9)
- 50-Ω BNC Termination (Item10)
- 10X Probe (provided with instrument)
- Low-Reactance Alignment Tool (Item 15)

INITIAL CONTROL SETTINGS

Vertical

CH 1 POSITION	Midrange
MODE	CH 1, NORM
CH 1 VOLTS/DIV	1 V
CH 1 VOLTS/DIV Variable	CAL detent
Magnification	X1 (CH 1 CAL knob in)
Channel 1 AC-GND-DC	DC

Horizontal

POSITION (COARSE and FINE)	Midrange
Horizontal MODE	X1
SEC/DIV	20 μs
SEC/DIV Variable	CAL detent

Trigger

SLOPE	Positive (⎍)
LEVEL	Midrange
MODE	P-P AUTO
HOLDOFF	MIN
SOURCE	EXT, EXT=Z
COUPLING	DC

PROCEDURE STEPS

1. Check External Z-Axis Operation

a. Connect the leveled sine-wave generator output via a 50-Ω BNC coaxial cable, a 50-Ω BNC termination, and a dual-input coupler to the CH 1 OR X and the EXT INPUT OR Z connectors.

b. Set the generator to produce a 5-V, 50-kHz signal.

NOTE

The INTENSITY level may need adjustment to view the intensity modulation on the displayed waveform.

c. CHECK—For noticeable intensity modulation. The positive part of the sine wave should be of lower intensity than the negative part.

d. Disconnect the test equipment from the instrument.

2. Check Probe Adjust Operation

a. SET:

CH 1 VOLTS/DIV	10 mV
SEC/DIV	0.5 ms
Trigger SOURCE	CH 1

b. Connect the 10X Probe to the CH 1 OR X input connector and clip the probe tip to the PROBE connector on the instrument front panel. If necessary, adjust the probe compensation for a flat-topped square-wave display.

c. CHECK-Display amplitude is 4.75 to 5.25 divisions.

d. Disconnect the probe from the instrument.