6 PERFORMANCE TEST

6.1 GENERAL INFORMATION

WARNING: Before turning on the instrument, ensure that it has been installed in accordance with the Installation Instructions, outlined in Section 2 of the Operation Guide.

This procedure is intended to:

- Check the instrument's specification.
- Be used for incoming inspection to determine the acceptability of newly purchased instruments and/or recently recalibrated instruments.
- Check the necessity of recalibration after the specified recalibration intervals.

NOTE: The procedure does not check every facet of the instrument's calibration; rather, it is concerned primarily with those parts of the instrument which are essential to measurement accuracy and correct operation. Removing the instrument covers is not necessary to perform this procedure. All tests are made from the outside of the instrument.

If the test is started shortly after turning on the instrument, steps may be out of specification, due to insufficient warm up time. Be sure to allow the full warm up time of 35 minutes (under average conditions).

The tests are made with a stable, well-focused, low-intensity display. Unless otherwise noted, adjust the intensity, position, and trigger level controls as needed.

IMPORTANT NOTES

- The input voltage must be supplied to the CH1 input, unless otherwise stated. Set the MAIN TB TIME/div key pair to a suitable position, unless otherwise stated.
- Tolerances given are for the instrument under test and do not include test equipment error. Bear in mind that the test equipment and connecting cables are properly terminated. In case of high-frequency signals, this termination must be 50Ω. This is achieved with a 50Ω termination at the end of the cable. Such termination is not necessary for the PM3394B (all channels), or CH1, CH2 of the PM3390B; these oscilloscopes feature switchable internal 50Ω input impedance.
- In some tests vertical channels CH2, CH3, CH4 appear in parentheses after CH1, e.g., CH1 (CH2, CH3, CH4). This indicates that the CH1 test should be performed first, followed by the tests for CH2, CH3 and CH4.
- Some of the tests are not necessary for all five oscilloscope types. An example are the channels CH3, CH4 that are not present in PM3370B/80B/90B. This is indicated as necessary. The test step may then be skipped.
- Where required, tests are done in either analog or digital mode. Switching between analog and digital mode is done by pressing the ANALOG key. When you enter either analog or digital mode, the display indicates 'ANALOG MODE' or 'DIGITAL MODE' briefly.
- Test steps where the use of a 10:1 probe is mentioned, must be done with the probe type such as delivered with the oscilloscope.
- The test set-up figures in this section are universal: they indicate the most extensive 4 channel instrument.
  For PM3370B/80B/90B, the CH3 input is not present and the CH4 input socket is an EXTernal TRIGger input.

6.2 RECOMMENDED TEST EQUIPMENT

Note: The FLUKE 5500A has to be equipped with the SCOPE option and is always used in SCOPE mode (SCOPE button active).

Note: The digital multimeter and oscilloscope are not required for this test. they are used for corrective maintenance.

Type of instrument	Required specification	Example of recommended instrument
Function generator	Freq: 10 Hz...100 kHz Sine /square-wave Ampl: 1.8mV...55V (pp)	FLUKE 5500A mode: wavegen
Constant amplitude sine wave generator	Freq: 50kHz...300 MHz Constant pp. amplitude of 5mV to 5.5V.	FLUKE 5500A mode: le sine
Square-wave calibration generator	For ampl. calibration: Freq: 10 Hz...10kHz Ampl: 1.8 mV...2.2V pp For rise time measurements: Freq: 1kHz...1MHz Ampl: 4.5mV...2.75V	FLUKE 5500A mode: volt FLUKE 5500A mode: edge
Time marker generator	Repetition rate: 5 sec...2 nsec	FLUKE 5500A mode: marker
Digital multimeter	Wide voltage and current ranges.	Fluke 29 / 79 with AC, DC and resistance ranges. High voltage probe. Required: 1% accuracy, model 80K40
Variable voltage transformer (VARIAC)	Well insulated output voltage 90...264V	
TV pattern generator	with video output	Fluke PM5418
Oscilloscope	The bandwidth must be the same or higher than the bandwidth of the instrument under test.	PM3394B
50Ω cables, 75Ω cables, 50Ω termination, 75Ω termination, 10:1 attenuator, 2:1 attenuator, T-piece, power splitter	Tektronix and Fluke BNC types for fast rise time square-wave, high frequency sine wave and other applications.	PM9074 PM9075 PM9585 (1W), PM9581 (3W) TEK 011-0055-01 TEK 011-0059-02 TEK 011-0069-02 PM9067 PM9584/02

6.3 TEST PROCEDURE

6.3.1 Preliminary settings

Test equipment:

None

Settings/procedure and requirements:

1 - If not present install 2 penlight (LR6) back up batteries in the holder at the rear panel of the oscilloscope.
2 - Turn on the oscilloscope under test.
3 - Press the STATUS and TEXT OFF keys simultaneously. This assures that the oscilloscope follows the default reaction when the green AUTOSET key is pressed. You can verify that the oscilloscope is in analog mode by pressing the RUN/STOP key. If you are in analog mode, the message 'PLEASE FIRST SWITCH TO DSO' is displayed. The now following steps are applicable for PM3390B and PM3394B.
4 - Press the UTILITY menu key to display the UTILITY menu.
5 - Press softkey AUTOSET to display the UTILITY AUTOSET menu.
6 - Press the relevant softkey to put the oscilloscope in the 'userprog' mode; the text 'userprog' must be intensified.
7 - Press softkey VERT.
8 - Select with softkey '1MΩ / 50Ω / unaffect' the 'unaffect' position.
9 - Check for the instrument settings in the lower part of the viewing area: when not available press TEXT OFF until the maximum amount of information is displayed.

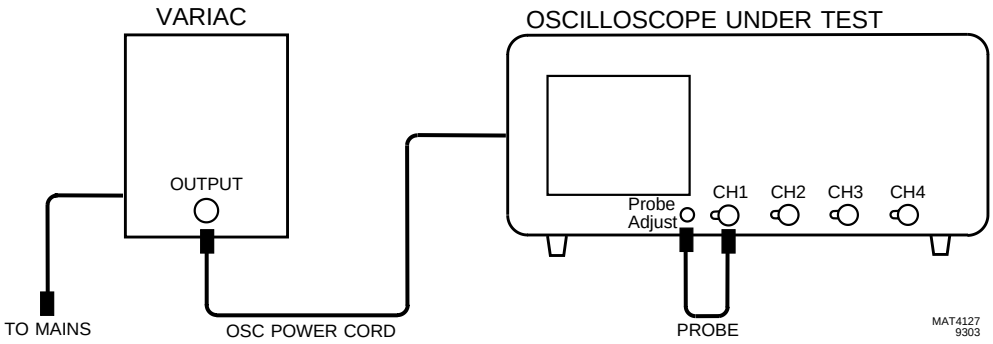
6.3.2 Power supply

This test checks the proper operation of the power supply at all possible line voltages.

Test equipment:

Variable voltage transformer (VARIAC)

Test set-up:



Settings/procedure:

1 - Adjust the input line voltage to the oscilloscope (output from VARIAC) to a desired value between 100 and 240V (rms), frequency 50...400 Hz.
2 - Press POWER ON on the oscilloscope.
3 - Apply the Probe Adjust signal from the front panel of the oscilloscope to input CH1, e.g., by means of a 10:1 probe.
4 - Press the green AUTOSET key.

Requirements:

1 - Verify that the oscilloscope starts at any input voltage between 100 and 240V; in particular the line voltages 100, 120, 220 and 240V must be checked.
2 - Verify that the instrument's performance does not change over the indicated voltage range; and that the displayed Probe Adjust signal is distortion-free and has equal intensity.
3 - Press the ANALOG key ('DIGITAL MODE' is displayed briefly), and verify that the instrument's performance does not change in digital mode at the indicated line voltages (100, 120, 220 and 240V). The displayed Probe Adjust signal must be free from distortion.
4 - Press the ANALOG key ('ANALOG MODE' is displayed briefly) to switch to analog mode.

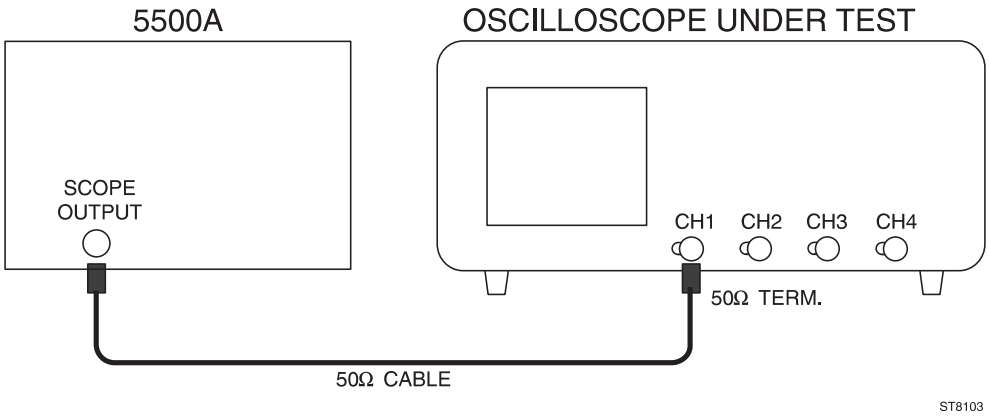
6.3.3 Auto set

This test checks the correct working of the AUTOSET function.

Test equipment:

Fluke 5500A mode levsine (Alternative: Constant amplitude sine wave generator SG 503).

Test set-up:



Settings/procedure:

1 - Apply a 10 MHz sine wave signal of 600 mV (pp into 50Ω) to input CH1;.
2 - Press the green AUTOSET key. Use a 50Ω termination at the end of the coax cable. For instruments with switchable 50Ω input impedance (attainable via VERT MENU key) it is recommended to use the internal termination (when active, the text 'LZ' appears in the lower part of the viewing area). For instruments without internal termination, an external termination should be used.

Requirements:

1 - Verify that the displayed waveform is stable and properly triggered. Amplitude should be within the screen area. Horizontally some signal periods should be displayed.
2 - Repeat the same settings and procedure for CH2, CH3 and CH4. For PM3370B/80B/90B: check CH2 and input EXT TRIG.
3 - Press the ANALOG key to return to digital mode. The message 'DIGITAL MODE' appears briefly.
4 - Repeat the AUTOSET check in the digital mode for CH2, CH3, and CH4. For PM3370B/80B/90B: check CH2 and input EXT TRIG.

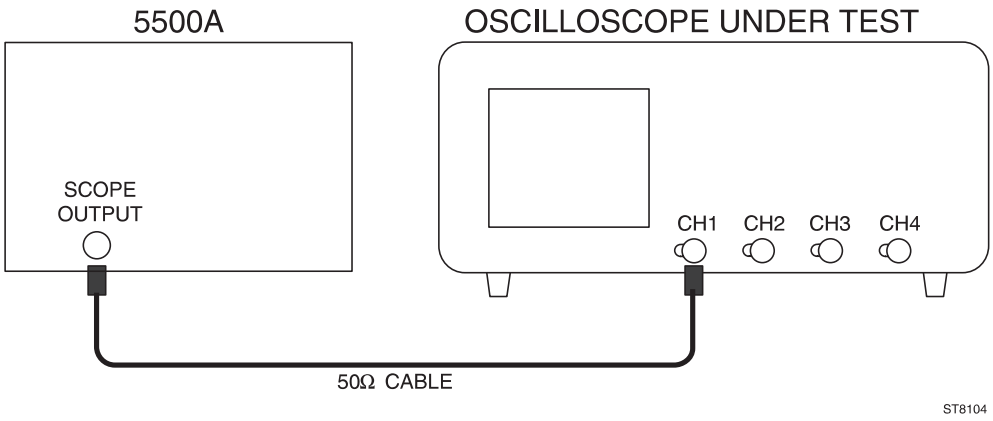
6.3.4 Orthogonality

This test checks the angle between the horizontal and vertical deflection plates (orthogonality).

Test equipment:

Fluke 5500A mode wavegen, wave sine (Alternative: function generator PM5136).

Test set up:



Settings/procedure:

1 - Press the CAL key for a few seconds to start the autocal procedure. This takes approximately 4 minutes. When ready, the oscilloscope is fine tuned to optimal accuracy.
2 - Apply a 50 Hz sine wave signal of 8V (pp) to input CH1;
3 - Press the AUTOSET key and adjust the input signal to a trace- height of 8 div (CH1 in 1V/div).
4 - Activate the GND function and verify that the straight line is exactly parallel to the horizontal graticule lines. If not, readjust the TRACE ROTATION.
5 - Switch the GND function off and verify that a signal of 8 divisions is displayed.
6 - Press the DISPLAY menu key.
7 - Press the X-DEFL softkey.
8 - Select ’on’ and ’ch2’ from the X-DEFL menu.
9 - Use the X POS control to move the vertical line to the center of the screen.

Requirements:

1 - Verify that the vertical line is parallel to the vertical graticule line in the center of the screen.
2 - Verify that the angle with respect to the horizontal graticule lines is 90° ± 0.5° as indicated in the figure.

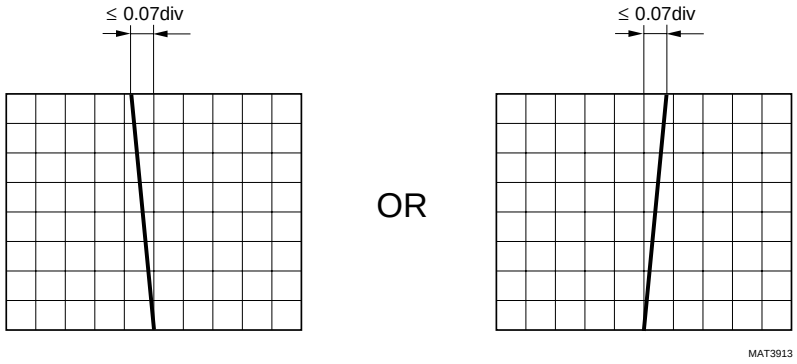


Figure 6.1 Orthogonality

6.3.5 Trace distortion

This test checks the distortion of a horizontal line in the central 6 x 8 divisions of the screen.

Test equipment:

None

Settings/procedure:

1 - Press the AUTOSET key with no input signal applied to the scope.
2 - Use the CH1 POS control to shift the timebase line vertically across the center 6 divisions of the screen.

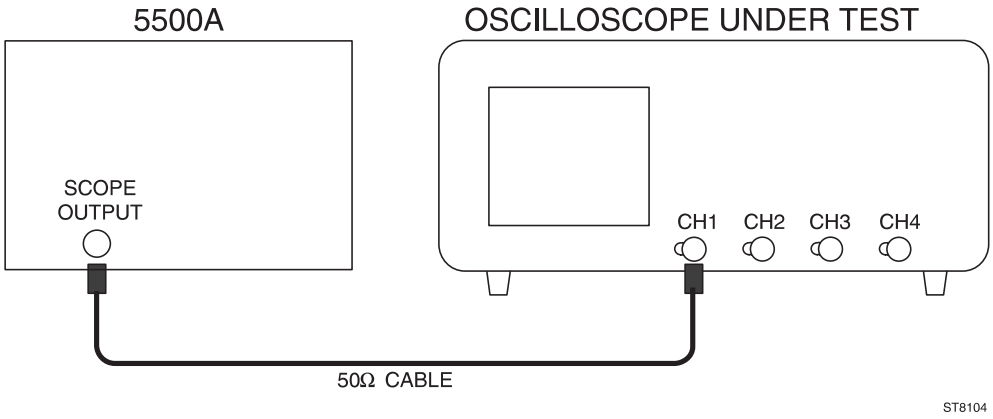
Requirements:

- Verify that the deviation from the ideal straight line does not exceed 0.03 divisions in the center of screen and 0.1 divisions elsewhere.

Test equipment:

Fluke 5500A mode: wavegen, wave sine (Alternative: function generator PM5136).

Test set-up:



Settings/procedure:

1 - Apply a 50 Hz sine wave signal of 8V (pp) to input CH1;
2 - Press the AUTOSET key and adjust the input signal to an amplitude of 8 divisions (CH1 in 1V/div).
3 - Using the CH1 POS control, adjust the display around the center of the screen.
6 - Press the DISPLAY menu key.
7 - Press the X-DEFL softkey.
8 - Select ’on’ and ’ch2’ from the X-DEFL menu.
9 - Use the X POS control to shift the vertical line across the middle eight divisions of the screen.

Requirements:

- Verify that the deviation from the ideal straight line does not exceed 0.03 divisions in the center of screen and 0.1 divisions elsewhere.

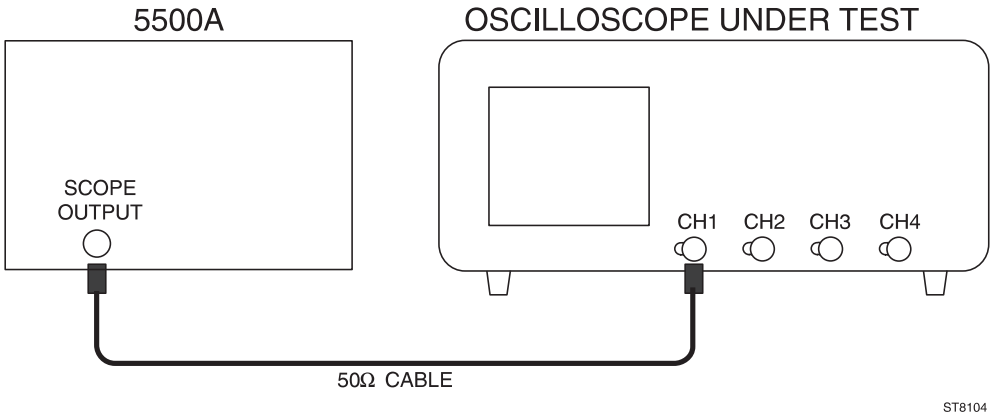
6.3.6 Vertical deflection; deflection coefficients

The vertical deflection coefficients of channels CH1, CH2, CH3, and CH4 are checked by means of a calibrated signal. PM3370B/80B/90B: the channels CH1, CH2 and TRIG VIEW via input EXT TRIG are checked.

Test equipment:

Fluke 5500A mode: volt (Alternative: Square-wave calibration generator PG 506).

Test set up:



Settings/procedure:

1 - Apply a 1 kHz square-wave signal of 30 mV to input CH1. Set the generator in 'volt' mode. The generator must not be terminated with 50Ω (the text 'LZ' must not be visible in the lower part of the viewing area).
2 - Press the green AUTOSET key.
3 - Set CH1 to 5 mV/div and to DC input coupling. The waveform must be in the vertical middle of the screen.
4 - Press the ACQUIRE menu key.
5 - Select BW LIMIT 'on' from the VERT MENU key.
6 - Press the TRIGGER menu key.
7 - Select noise 'on' and 'hf-rej' from the TRIGGER MAIN TB menu.
8 - Change the input voltage and the setting of CH1 according to table I and verify that the amplitude of the signal agrees with this table. The signal should remain positioned in the vertical center of the screen.

Note: Only the input sensitivities essential for input accuracy are checked.

Requirements:

table I.

Input voltage (pp)	Setting	Requirements analog mode	Requirements digital mode
30 mV	5 mV	5.92...6.08 div (±1.3%)	5.88...6.12 div (±2%)
60 mV	10 mV	5.92...6.08 div (±1.3%)	5.88...6.12 div (±2%)
1.2V	0.2V	5.92...6.08 div (±1.3%)	5.88...6.12 div (±2%)
6V	1V	5.92...6.08 div (±1.3%)	5.88...6.12 div (±2%)

Repeat the settings/procedure in table I for CH2, CH3 and CH4. Use table II for PM3370B/80B/90B to test TRIG VIEW via input EXT TRIG. Select AC input coupling to center the trace on the screen.

table II.

Input voltage (pp)	Setting	Requirements analog mode	Requirements digital mode
0.6V	0.1V	5.82...6.18 div (±3%)	5.82...6.18 (±3%)
6V	1V	5.82...6.18 div (±3%)	5.82...6.18 (±3%)

- Press the ANALOG key ('DIGITAL MODE' is displayed briefly), and repeat the tests in this chapter for the digital mode.
- Press the ANALOG key ('ANALOG MODE' is displayed briefly) to return to analog mode.

6.3.7 Vertical deflection; variable gain control range (continuation of 6.3.6)

This test checks the vertical VARiable gain control.

Settings/procedure:

1 - Apply a square-wave signal of 0.2V to input CH1 and press AUTOSET.
2 - Set CH1 to 50 mV/div and input coupling to DC. Using the CH1 POS control, center the waveform in the screen.
3 - Select the VARiable mode by simultaneously pressing both AMPL keys. The readout changes into 50.0 mV/div.
4 - Press the mV key to adjust an input sensitivity of 40.0 mV/div.

Requirements:

1 - Verify that the displayed amplitude is between 4.86 and 5.14 divisions (+/- 2.8%).
2 - Repeat the settings and procedure for CH2. For the PM3394B and PM3384B repeat the same steps for CH3 and CH4.

6.3.8 Vertical deflection; input coupling (continuation of 6.3.7)

This test verifies the operation of the AC input coupling. Also, the operation of the ground (GND) function is checked.

Settings/procedure:

1 - Switch the CH1 VARiable mode off by simultaneously pressing both AMPL/VAR keys. The readout changes to 50 mV.
2 - CH1 sensitivity is 50 mV/div; the vertical deflection is now 4 divisions.

Requirements:

1 - Activate the CH1 GND function and verify that a horizontal line is displayed.
2 - Select the AC input coupling and verify that a 4 divisions square-wave signal is displayed. Center this signal in the middle of the screen.
3 - Select the DC input coupling and verify that the 4 divisions square-wave signal moves up. This shift is caused by the signal's positive dc component: this component is not blocked in DC coupled mode.

Repeat the settings and procedure for CH2, CH3, and CH4. PM3370B/80B/90B: check CH2 and TRIG VIEW via EXT TRIG input for AC and DC coupling.

6.3.9 Vertical cursor accuracy (continuation of 6.3.8.)

This test verifies the accuracy of the voltage cursors

Settings/procedure:

1 - Change the generator output voltage to 0.1V.
2 - Apply this voltage to CH1.
3 - Switch CH1 to ON, and switch the other channels off.
4 - Select DC coupled input and 20 mV/division for CH1.
5 - Select CH1 as trigger source (TRIG 1).
6 - Use the POS control to center the 5 division square wave on the dotted horizontal lines of the graticule.
7 - Press the CURSORS menu key.
8 - Select 'on' and volt cursors (=) from in the CURSORS menu.
9 - Select Δ V from the READOUT menu.

Requirements:

1 - Use the TRACK and Δ controls to position both cursor lines exactly on top and bottom of the signal. Check for a cursor readout between 98.4 and 101.6 mV.
2 - Press the ANALOG key ('DIGITAL MODE' is displayed briefly) and repeat the check in this chapter for the digital mode.
3 - Press the ANALOG key ('ANALOG MODE' is displayed briefly) to return to analog mode.

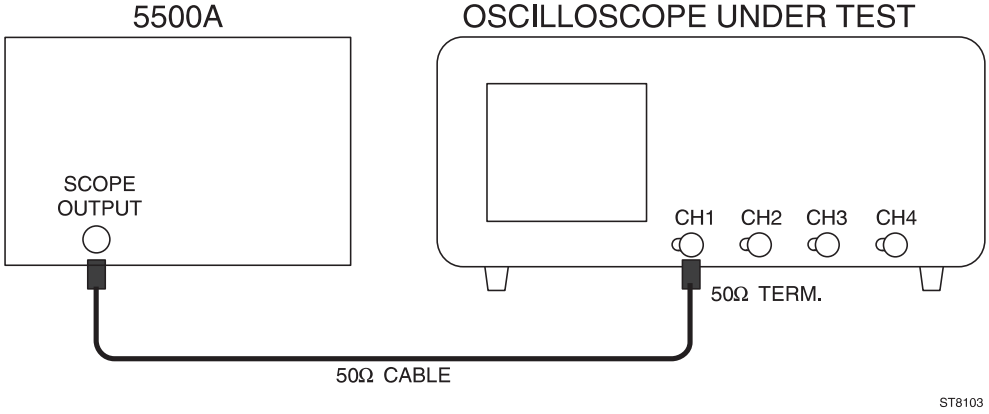
6.3.10 Vertical deflection; high-frequency response

This test verifies the upper transition point of the vertical bandwidth.

Test equipment:

Fluke 5500A mode: levsine (Alternative: constant amplitude sine wave generator SG 503).

Test set-up:



Settings/procedure:

1 - Apply a 50 kHz sine wave signal of 600 mV (pp into 50Ω) to input CH1, and press the AUTOSET key.
2 - Use an external 50Ω termination. Use the internal termination of the oscilloscope, when available (if active, the text 'LZ' is visible in the lower part of the viewing area). Internal 50Ω termination is attainable via the VERT MENU key (PM3390B/94B).
3 - Set CH1 to 0.1V/div.
4 - Adjust the input signal to an amplitude of exactly 6 divisions.
5 - Slowly increase the frequency to 200 MHz (PM3390B, PM3394B), 100 MHz (PM3384B, PM3380B) or 60 MHz (PM3370B) and verify that the displayed amplitude does not drop below 4.2 divisions.
6 - Switch the frequency of the sine wave signal back to 50 kHz.

7 - Press the ACQUIRE menu key.
8 - Select BW LIMIT 'on' via the VERT MENU key.
9 - Slowly increase the frequency to 20 MHz and verify that the vertical deflection has decreased to 4.2 div approximately at 20 MHz.
10 - Switch the bandwidth limiter to 'off'.

Requirements:

- The vertical deflection must be 4.2 divisions or more. For the bandwidth limiter the requirement is 4.2 div approximately at 20 MHz.

Repeat the above settings and procedure for CH2, CH3 and CH4. PM3370B/80B/90B: check CH2 and TRIG VIEW via EXT TRIG input. Oscilloscope in 1V/div and generator voltage 5 Vpp into 50Ω. Termination resistor directly at generator output. Use a BNC / probe tip adapter between termination and 10:1 probe. Adjust the amplitude at 50 kHz to 5 divisions. Check that the amplitude at higher frequencies does not drop below 3.5 div.

- Press the ANALOG key ('DIGITAL MODE' is displayed briefly) and repeat the tests in this section for the digital mode. Adjust the MAIN TB TIME/DIV if required.

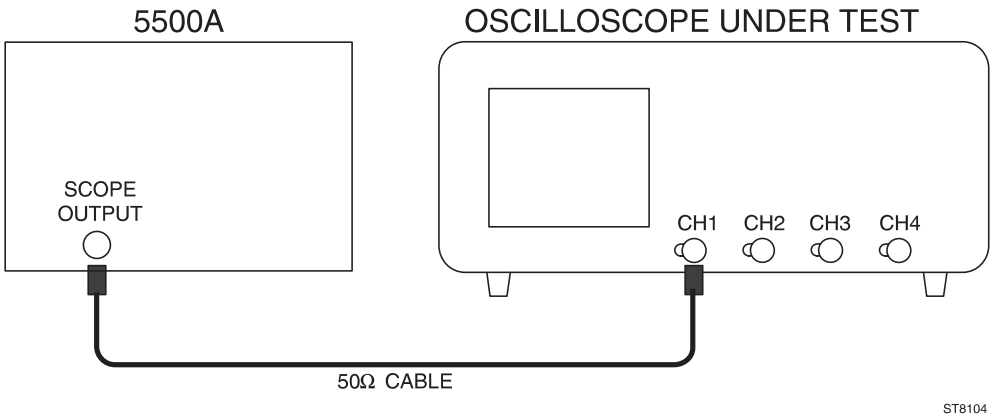
6.3.11 Vertical deflection; low-frequency response

This test verifies the lower transition point of the vertical bandwidth.

Test equipment:

Fluke 5500A mode: wavegen, wave sine (Alternative: function generator PM5136).

Test set up:



Settings/procedure:

1 - Apply a 5 kHz sine wave signal of 600 mV (pp into 50Ω) to input CH1, and press the AUTOSET key.
2 - Set CH1 to 0.1V/div.
3 - Adjust the input signal to an amplitude of exactly 6 divisions.
4 - Lower the frequency to 10 Hz and verify that the displayed amplitude does not drop below 4.2 divisions.

Requirements:

- The vertical deflection must be 4.2 divisions or more.

Repeat the above settings and procedure for CH2, CH3, and CH4. PM3370B/80B/90B: check CH2 and TRIG VIEW via EXT TRIG input.

Press the ANALOG key ('ANALOG MODE' is displayed briefly) to return to analog mode.

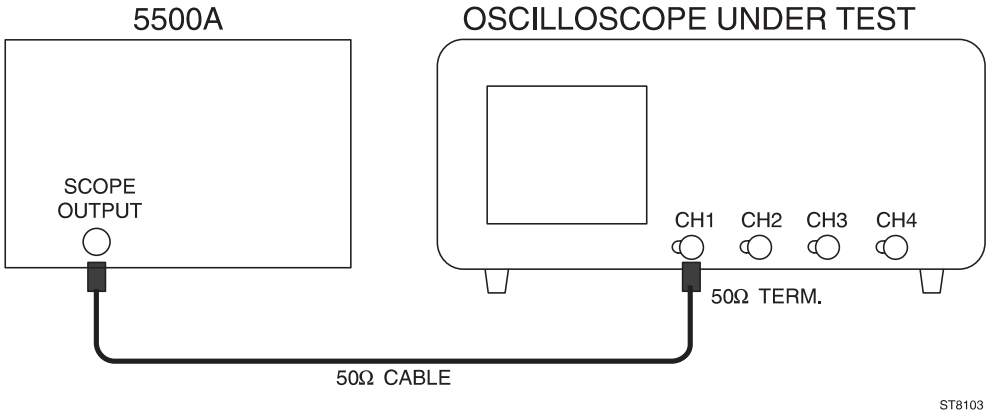
6.3.12 Vertical deflection; dynamic range at 15/25/50 MHz

The oscilloscope must be capable of displaying signal amplitudes that are larger than the screen. In practice, a low frequency signal with an amplitude equivalent to 24 divisions must be displayed with no distortion.

Test equipment:

Fluke 5500A mode: levsine (Alternative: constant amplitude sine wave generator SG 503).

Test set up:



Settings/procedure:

1 - Apply a 50 MHz (PM3390B/94B), 25 MHz (PM3380B/84B) or 15 MHz (PM3370B) sine wave signal of 2.4 V(pp into 50Ω) to input CH1 and press the AUTOSET key.
2 - Use a 50Ω termination. Use the internal termination when avaialble.
3 - Set CH1 to 0.1V/div.
4 - Using the CH1 POS control, shift the sine wave vertically over the screen.

Requirements:

- Verify that top and bottom of the sine-wave signal of 24 divisions in amplitude can be displayed with no distortion.

Repeat the above settings and procedure for CH2, CH3, and CH4. PM3370B/80B/90B: check CH2.

6.3.13 Vertical deflection; dynamic range at 60/100/200 MHz (continuation of 6.3.12)

In this test, the dynamic range of the amplifier is checked at a high frequency.

Settings/procedure:

1 - Apply a 200 MHz (PM3390B/94B), 100 MHz (PM3380B/84B) or 60 MHz (PM3370B) sine-wave signal of 0.8 V(pp into 50Ω) to input CH1.
2 - Press the AUTOSET key, and set CH1 to 0.1V/div.
3 - Use a 50Ω termination. Use the internal termination when available.
4 - Set the amplitude to exactly 8 divisions.

Requirements:

- Verify that the sine wave of 8 divisions in amplitude is displayed with no distortion.

Repeat the above settings and procedure for CH2, CH3, and CH4. PM3370B/80B/90B: check CH2.

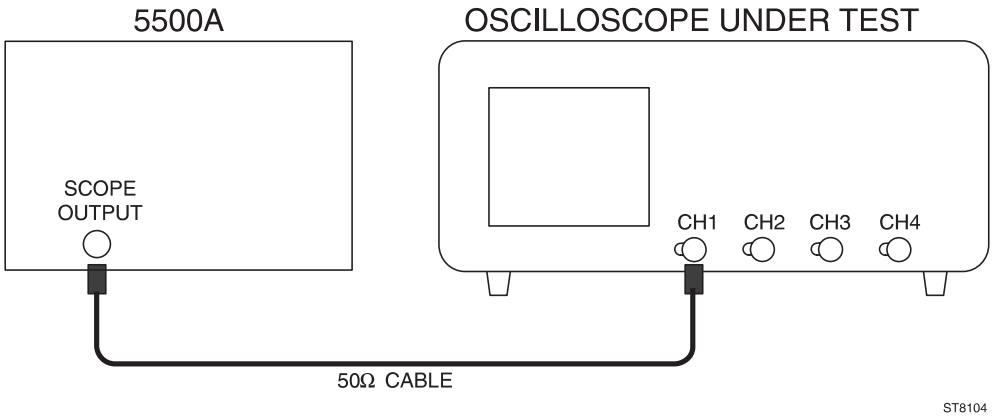
6.3.14 Vertical deflection; position range

The range of the vertical shift is checked with a sine-wave signal of 8 divisions in amplitude.

Test equipment

Fluke 5500A mode: wavegen, wave sine (Alternative function generator PM5136).

Test set up:



Settings/procedure:

1 - Apply a 1 kHz sine wave signal with an amplitude of 0.8 V (pp) to input CH1.
2 - Press the AUTOSET key and set CH1 to 0.1V/div.
3 - Adjust the generator so that the displayed amplitude is exactly 8 divisions.

Requirements

- Turn the CH1 POS control fully clockwise and counterclockwise and verify that top and bottom of the 8 divisions signal can be positioned outside the graticule.

Repeat the above settings and procedure for CH2, CH3, and CH4. PM3370B/80B/90B: check CH2.

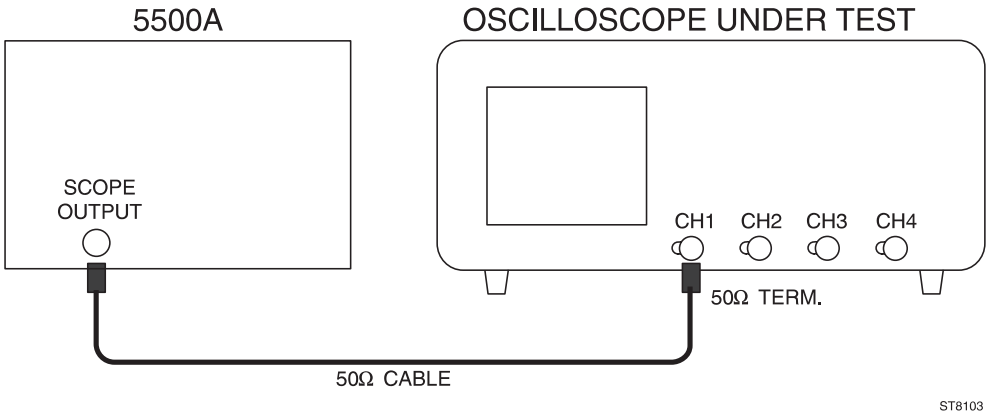
6.3.15 Vertical deflection; crosstalk between channels at 60/100/200 MHz

At higher frequencies there exists some crosstalk between any two channels. In the following test, crosstalk is verified at a high frequency.

Test equipment:

Fluke 5500A mode: levsine (Alternative constant amplitude sine wave generator SG 503).

Test set up:



Settings/procedure:

1 - Apply a 200 MHz (PM3390B/94B), 100 MHz (PM3380B/84B) or 60 MHz (PM3370B) sine-wave signal of 0.8 V(pp into 50Ω) to input CH1.
2 - Press the AUTOSET key.
3 - Use a 50Ω termination. Use the internal termination when available.
4 - Switch all channels ON. PM3370B/80B/90B: switch CH2 on.
5 - Set all channels to 0.1 V/div.
6 - Adjust the generator to a signal amplitude of 8 div.
7 - Activate the GND function of CH2, CH3, and CH4. PM3370B/80B/90B: activate GND of CH2.

Requirements:

- Verify that the displayed amplitude the channels with no input signal applied is less than 0.16 divisions, (better than 50:1).

Repeat the above settings and procedure for PM3384B/94B:
- Input signal applied to CH2. CH1, CH3, and CH4 input GND.
- Input signal applied to CH3. CH1, CH2, and CH4 input GND.
- Input signal applied to CH4. CH1, CH2, and CH3 input GND.

Repeat the above settings and procedures for PM3370B/80B/90B:
- Input signal applied to CH2. CH1 input GND.

For all models:
- Press the ANALOG key (’DIGITAL MODE’ is displayed briefly) and repeat the tests in this chapter for the digital mode.
- Press the ANALOG key (’ANALOG MODE’ is displayed briefly) to return to analog mode.

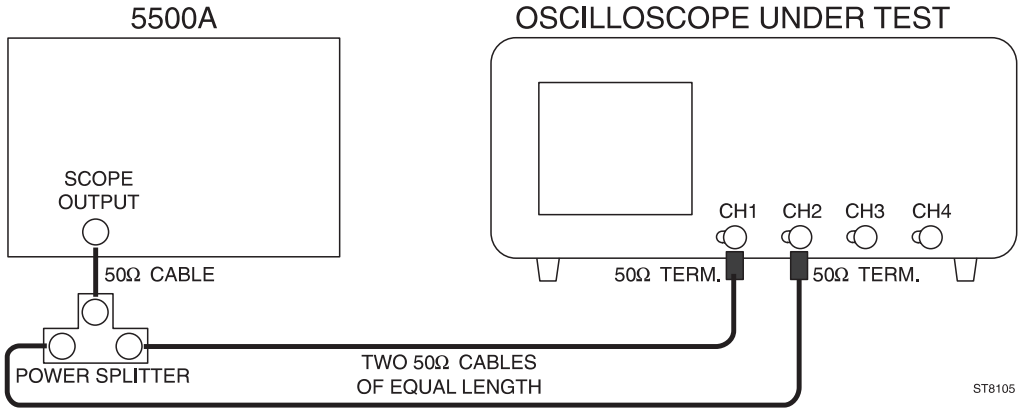
6.3.16 Vertical deflection; common mode rejection ratio at 1 MHz

The common mode rejection ratio (CMRR) is a measure of susceptibility to common mode signals. This susceptibility is verified in this test.

Test equipment:

Fluke 5500A mode: levsine (Alternative: HF constant amplitude sine wave generator SG 503)
Power splitter

Test set up:



Settings/procedure:

1 - Use a power splitter and two cables of equal length to CH1 and CH2.
Apply a 2 MHz sine-wave signal of 1.6 V(pp into 50Ω) to inputs CH1 and CH2.
2 - Press the AUTOSET key.
3 - Use 50Ω terminations. Use the internal terminations when available (via VERT MENU key).
4 - Set CH1 and CH2 to 0.1V/div and adjust the generator voltage for a deflection of 8 divisions.
5 - Set CH1 and CH2 to DC input coupling.
6 - Press the CH1+CH2 key to activate the 'added' mode.
7 - Press the INV key of CH2; the result is the display of CH1-CH2.
8 - Press the ON keys of CH1 and CH2; this switches CH1 and CH2 off and only the differential signal (CH1 CH2) is now visible.
9 - Readjust the VAR function of CH1 or CH2 for minimum amplitude.

Requirements

- Verify that the trace-height of the CH1-CH2 differential signal is less than 0.08 divisions.

Repeat the above settings and procedure for CH3 and CH4 (for PM3384B and PM3394B only).

6.3.17 Vertical deflection; common mode rejection ratio at 50 MHz (continuation of 6.3.16)

The common mode rejection ratio (CMRR) indicates the susceptibility to common mode signals at higher frequencies. The susceptibility is verified in this test.

Settings/procedure:

1 - Use a power splitter and two cables of equal length to CH1 and CH2. Apply a sine-wave signal of 50 MHz with an amplitude of 0.6 V(pp into 50Ω) to inputs CH1 and CH2.
2 - Press the AUTOSET key.
3 - Use a 50Ω termination. Use the internal termination when available.
4 - Set CH1 and CH2 to 0.1 V/div and adjust the generator voltage for a deflection of 6 divisions.
5 - Set CH1 and CH2 to DC input coupling.
6 - Press the CH1+CH2 key; to activate the added mode.
7 - Press the INV key of CH2; the result is the display of the differential signal of CH1-CH2.
8 - Press the ON keys of CH1 and CH2; this switches CH1 and CH2 off and only the differential signal of CH1 CH2 display is now visible.
9 - Readjust the VAR function of CH1 or CH2 for minimum amplitude.

Requirements:

- Verify that the amplitude of the CH1-CH2 differential signal is less than 0.24 divisions.

Repeat the above settings and procedure for CH3 and CH4 (for PM3384B and PM3394B only).

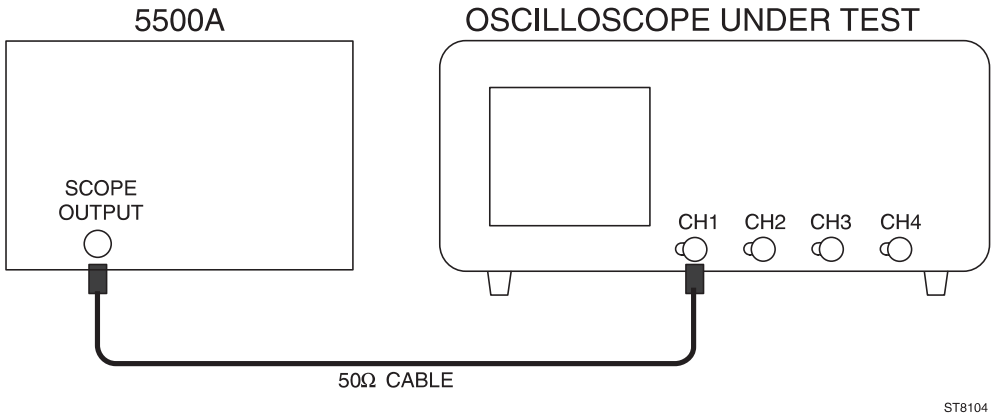
6.3.18 Vertical deflection; LF linearity

The linearity of the vertical amplifier is checked by moving a signal with a fixed amplitude vertically over the entire screen area.

Test equipment

Fluke 5500A mode: wavegen, wagve square (Alternative: function generator PM5136).

Test set up:



Settings/procedure

1 - Apply a 50 kHz square-wave signal of 200 mV(pp into 50Ω)to input CH1.
2 - Press the AUTOSET key and set CH1 to 0.1V/div.
3 - Move the square-wave signal to the vertical center of the screen.
4 - Adjust the generator output so that the displayed amplitude is exactly 2 divisions.
5 - Use the CH1 POS control to shift the signal upwards and downwards within the central 6 divisions of the screen.

Requirements

- Verify that the amplitude of the sq. wave in the central 6 divisions screen area is between 1.96 ...2.04 divisions (+ or - 2%).

  Repeat the above settings and procedure for CH2, CH3 and CH4. PM3370B/80B/90B: repeat this for CH2.

  Press the ANALOG key (’DIGITAL MODE’ is displayed briefly) and repeat the check in this chapter for the digital mode. The requirement for the digital mode is that the sq. wave amplitude in the central 6 div. screen area is between 1.94 ... 2.06 divisions (+ or 3%).

  Press the ANALOG key (’ANALOG MODE’ is displayed briefly) to return to analog mode.

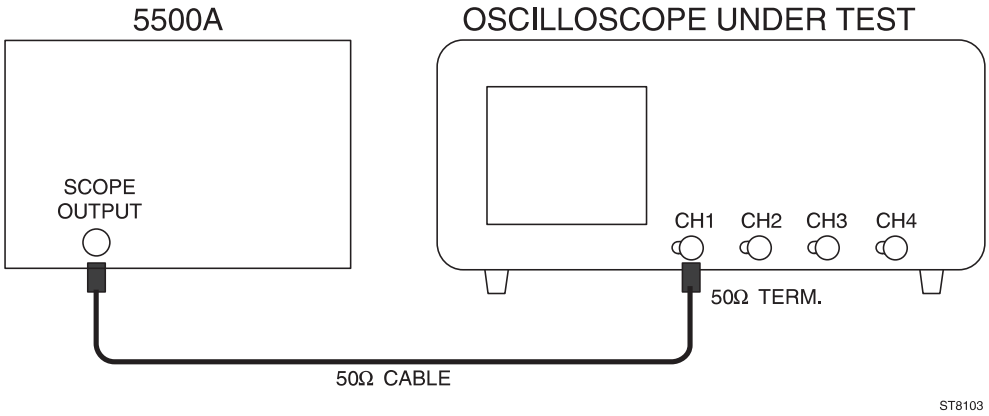
6.3.19 Vertical deflection; visual signal delay

Many applications require that the leading edge of a fast pulse triggering the oscilloscope be made visible. A fixed amount of signal delay is introduced in the vertical channels of this instrument to allow the timebase to start before the triggering leading edge causes vertical deflection to occur.
This delay is verified in the following test.

Test equipment

Fluke 5500A mode: edge (Alternative: Square-wave calibration generator PG 506).

Test set-up:



Settings/procedure:

1 - Apply a signal with a fast rise time of less than 1 ns and an amplitude of 0.5V (into 50Ω), and a frequency of 1 MHz, to input CH1.
2 - Press the AUTOSET button and set CH1 to 0.1V/div.
3 - Use a 50Ω termination. Use the internal termination when provided (via VERT MENU key).
4 - Set the MAIN TB TIME/DIV to 50.0 ns/div.
5 - Press the MAGNIFY key and turn the X POS control to display the leading edge.
6 - Turn the TRACE INTENSITY control clockwise for maximum intensity.
7 - Press the TRIGGER menu key.
8 - Select level pp 'off' and 'dc' trigger coupling from the TRIGGER MAIN TB menu.
9 - Adjust TRIGGER LEVEL for a triggered display and maximum visible signal delay.

Requirements

- Verify that the visible signal delay is at least 15 ns (3 divisions).

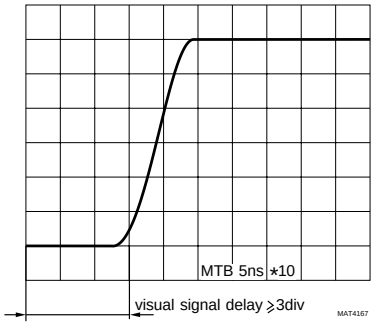


Figure 6.2 Visual signal delay

6.3.20 Vertical deflection; base line instability

In the following test, several adjustments of balance, offset and jump, are checked.

Test equipment

None

Settings/procedure and requirements:

1 - Press the AUTOSET key (no input signal) and set CH1 to 5V/div.
2 - Use the CH1 POS control to position the trace in the vertical middle of the screen.
3 - Press both CH1 AMPL keys simultaneously to select the VARiable mode. The readout changes to 5.00V. The input sensitivity can be adjusted now in very fine steps between 2 mV and 12.5V/div.
4 - Press the 'V' key and verify that the base line jump is not more than 0.2 divisions between 5.00V to 12.5V/div.
5 - Press the 'mV' key and verify that the base line jump is not more than 0.2 divisions between 12.5V/div to 5 mV/div.
6 - Press the ON keys of CH2 and CH1; CH2 is now on and CH1 is off.
7 - Using the CH2 POS control, position the trace in the vertical middle of the screen.
8 - Press both CH2 AMPL keys simultaneously to select the VARiable mode. The readout changes to 5.00V. The input sensitivity can be adjusted now in very fine steps between 2 mV and 12.5V/div.
9 - Press the 'V' key and verify that the base line jump is not more than 0.2 divisions between 5.00V to 12.5V/div.
10 - Press the 'mV' key and verify that the base line jump does not 0.2 divisions between 12.5V/div to 5 mV/div.
11 - Press the INV key repeatedly and verify that the base line jump is not more than 0.2 divisions.

For the PM3394B and PM3384B repeat the above procedure for CH3 and CH4. The CH3 settings are equal to those of CH1; the CH4 settings are equal to CH2.

For PM3390B, PM3380B and PM3370B no further steps required.

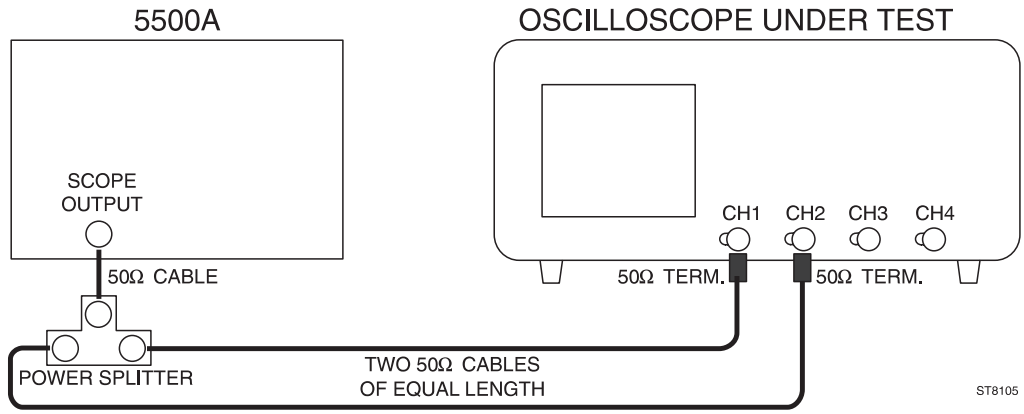
6.3.21 Delay difference between vertical channels

The delay difference between CH1, CH2, CH3, and CH4 is checked here.

Test equipment:

Fluke 5500A mode: edge (Alternative: Square wave calibration generator PG 506).
Power splitter

Test set up:



Settings/procedure:

1 - Apply a square-wave signal with a fast rise time of less than 1 ns, and an amplitude of 1V (into 50Ω), with a frequency of 1 MHz, to inputs CH1 and CH2.
Use a power splitter and two cables of equal length to CH1 and CH2.
2 - Press the AUTOSET key.
3 - Use 50Ω terminations. Use the internal terminations when available on both channels (via VERT MENU key).
4 - Set CH1 and CH2 to 0.1V/div and input coupling to DC.
5 - Press the MAGNIFY keys and set the MAIN TB TIME/DIV to 2.00 ns/div (PM3390B/94B) or to 5.00 ns/div (PM3370B/80B/84B).
6 - Press the TRIGGER menu key.
7 - Select level-pp 'off' and 'dc' trigger coupling from the related menu.
8 - Press the TB MODE menu key.
9 - Select 'trig' from the related menu.
10 - Adjust TRIGGER LEVEL for a triggered display of the leading edge.
11 - Using the X POS control, position the leading edges of the signals in the horizontal center of the screen.
12 - Using both CH1 and CH2 POS controls, adjust the vertical position of each trace between the dotted 0% and 100% lines. The signals appear to be superimposed.

Requirements

- Verify that the delay difference between the two displayed signals is less than 0.25 ns. This equals 0.13 divisions in PM3390B/94B or 0.05 divisions in PM3370B/80B/84B.

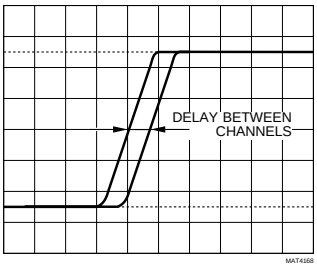


Figure 6.3 Delay difference ≤ 0.13 div in PM3390B/94B or ≤ 0.05 div in PM3370B/80B/84B.

Repeat the above settings and procedure for CH3 and CH4 (not necessary for PM3370B/80B/90B).

Press the ANALOG key ('DIGITAL MODE' is displayed briefly) and repeat the tests in this chapter for the digital mode. In digital mode, it is not necessary to activate the MAGNIFY function since the timebase ranges up to
2.00 ns/division (PM3390B/94B) or 5.00 ns/division (PM3370B/80B/84B).
Press the ANALOG key ('ANALOG MODE' is displayed briefly) to return to analog mode.

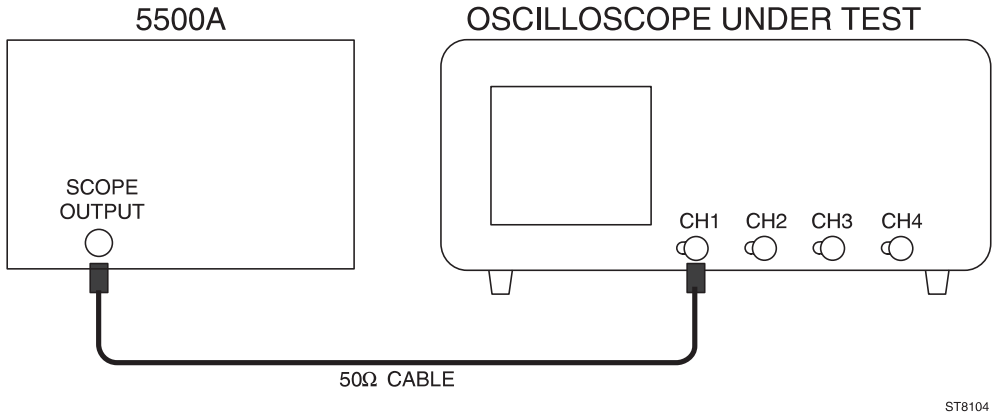
6.3.22 Horizontal deflection; display modes and trace separation

The correct working of main timebase (MAIN TB), delayed timebase (DELAYED TIME BASE) and the trace separation is checked.

Test equipment:

Fluke 5500A mode: wavegen, wave sine (Alternative: function generator, PM5136).

Test set-up:



Settings/procedure and requirements:

1 - Apply a 2 kHz sine-wave signal of 400 mV(pp into 50Ω) to input CH1.
2 - Press the AUTOSET key and set CH1 to 0.1V/div.
3 - Adjust the generator signal to a trace height of 4 divisions.
4 - Set MAIN TB to 500 µs.
5 - Press the DTB menu key.
6 - Set DEL'D TB to 'on' in the DELAYED TIMEBASE menu.
7 - Set MAIN TB to 'on' in the DELAYED TIMEBASE menu.
8 - Set the DELAYED TIMEBASE to 50.0 µs.
9 - Turn the DELAY control (in the DELAYED TIMEBASE section), and verify that the intensified part can be shifted horizontally along the MAIN TB display.
10 - Operate the TRACK control and check that the DEL'D TB and MAIN TB display can be shifted so that they do not cover each other.

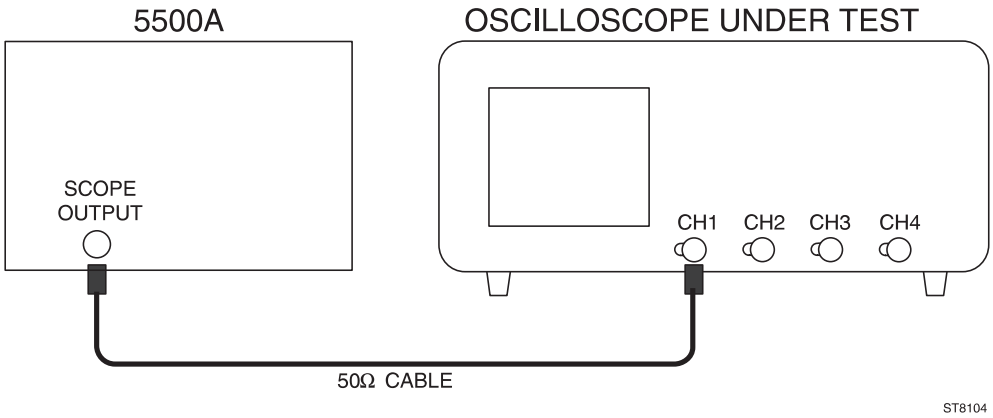
6.3.23 Horizontal deflection; X deflection

The correct working of the X Y mode (X-DEFL 'on') is tested.

Test equipment:

Fluke 5500A mode: wavegen, wave sine (Alternative: function generator, PM5136)

Test set-up:



Settings/procedure:

1 - Apply a 2 kHz sine-wave signal of 800 mV (pp) to input CH1.
2 - Press the AUTOSET key and set CH1 to 0.1V/div.
3 - Adjust the generator signal to a trace height of 8 divisions.
4 - Press the DISPLAY menu key.
5 - Press the X-DEFL softkey in the DISPLAY menu.
6 - Select 'on' and 'ch1' as X-SOURCE in the X-DEFL menu.
7 - Use the CH1 POS and X POS controls to obtain the display shown in the figure below.

Requirements:

- Verify that a line with an angle of 45° is displayed.

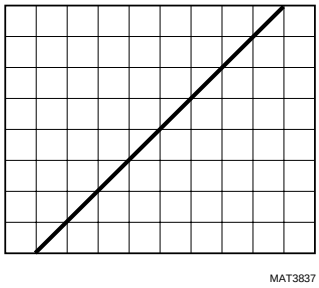


Figure 6.4 X deflection

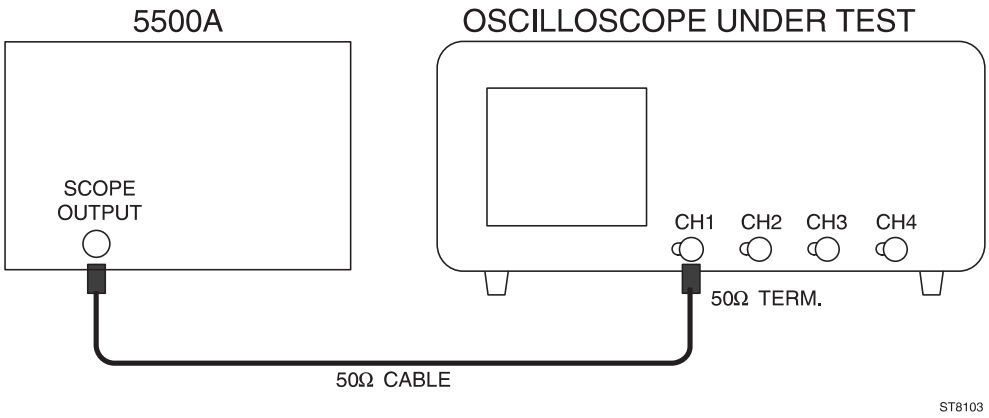
6.3.24 Horizontal deflection; MAIN TB deflection coefficients

The deflection coefficients of the main timebase generator (MAIN TB) are verified by means of a calibration signal.

Test equipment:

Fluke 5500A mode: marker (Alternative: time marker generator TG 501).

Test set-up:



Settings/procedure:

1 - Apply a 50.0 ns time marker signal to input CH1.
2 - Press the AUTOSET key.
3 - Use a 50Ω termination. For instruments with switchable 50Ω input impedance it is recommended to make use of this feature (via VERT MENU key).
4 - Press the TRIGGER menu key.
5 - Select level-pp 'off' and 'dc' from the TRIGGER MAIN TB menu.
6 - Press the TB MODE menu key.
7 - Select 'trig' from the TB MODE menu.
8 - Adjust the TRIGGER LEVEL control for a correctly triggered display.
9 - Verify the deflection coefficients of MAIN TB with MAGNIFY off (*1) and MAGNIFY on (*10) according to the requirements in the tables. Use the deflection error facility of the time marker generator.

Note:

- *Error limits must be measured between the 2nd and the 10th graticule line (there are 11 graticule lines). These are the central 8 divisions.*
- *With MAGNIFY on (*10), the central 10 divisions of the expanded 100 divisions of MAIN TB are measured.*
- *Only the timebase positions essential for instrument accuracy are checked.*

  Press the ANALOG key ('DIGITAL MODE' is displayed briefly) to perform the tests for the digital mode. Press the TEXT OFF key for full visibility of the time marker pulses in the central 8 divisions. Press the ANALOG key ('ANALOG MODE'is displayed briefly) to return to analog mode.

Requirements for analog mode MAGNIFY off (*1):

MAIN TB setting	Marker pulse	Max. error
20.0 ns (PM3390B/94B)	20 ns	1.8%
100 ns	0.1 µs	1.8%
500 ns	0.5 µs	1.8%
1.00 µs	1 µs	1.8%
5.00 µs	5 µs	1.8%
20.0 µs	20 µs	1.8%
500 µs	0.5 ms	1.8%
1.00 ms	1 ms	1.8%
10.0 ms	10 ms	1.8%

Requirements for analog mode MAGNIFY on (*10):

MAIN TB setting	Marker pulse	Max. error
2.00 ns (PM3390B/94B)	2 ns	3.3%
5.00 ns	5 ns	3.3%
10.0 ns	10 ns	2.3%
100 ns	0.1 µs	2.3%

Requirements for digital mode:

MAIN TB setting	Marker pulse	Max. error
2.00 ns (PM3390B/94B)	2 ns	1.8%
5.00 ns	5 ns	1.8%
250 ns	0.5 µs	1.3%
500 ns	0.5 µs	1.3%
20.0 ms	20 ms	1.3%
1.00 s	1 s	1.3%

Check for an undistorted display of the time marker pulses. Timing accuracy should not show a noticeable error. In the MAIN TB setting 250 ns/division, the interval between successive time marker pulses should be 2 div.‘

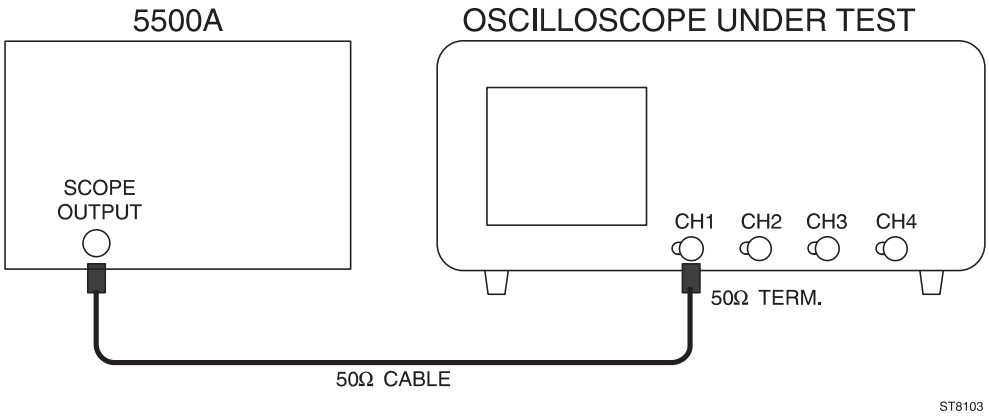
6.3.25 Horizontal deflection; VARiable mode accuracy MAIN TB.

The horizontal MAIN TB deflection coefficients can be varied in steps such as done in 6.3.24. A range of much finer steps can also be selected. Here, the accuracy of this range is checked.

Test equipment:

Fluke 5500A mode: marker (Alternative time marker generator TG 501).

Test set-up:



Settings/procedure:

1 - Apply a 5 us time marker signal to input CH1.
2 - Press the AUTOSET key.
3 - Use a 50Ω termination. For instruments with switchable 50Ω input impedance it is recommended to make use of this feature.
4 - Press the TRIGGER menu key.
5 - Select level-pp 'off' and trigger coupling 'dc' from the TRIGGER MAIN TB menu.
6 - Adjust the TRIGGER LEVEL control for a correctly triggered display.
7 - Set the MAIN TB TIME/DIV to 5.00 us.
8 - Select the MTB VARiable mode by pressing both MAIN TB TIME/DIV keys at a time: the message; 'VARIABLE TIMEBASE' is displayed briefly.
9 - Press the 'ns' key and adjust the readout to 2.50 us.

Requirements:

- Verify that the horizontal distance between the time markers equals 2 divisions.
- Use the X POS control to align the marker pulses with the graticule.
- Now check (across the central 8 divisions) if the timebase accuracy is ±2.8%: make use of the deflection error facility of the time marker generator to check this.

6.3.26 Time cursor accuracy (continuation of 6.3.25)

This test verifies the accuracy of the time cursors.

Settings/procedure:

1 - Switch the MAIN TB VARiable mode off by pressing both MAIN TB TIME/DIV keys at a time. The message '1-2-5 STEPS'.
2 - Select 5.00 µs/division for the MAIN TB.
3 - Switch off the deflection error facility of the time marker generator.
4 - Press the CURSORS menu key.
5 - Select 'on' and time cursors (//) from the CURSORS menu.
6 - Select Δ T in the READOUT menu.

Requirements:

- Position one cursor line exactly on the 2nd time marker on the screen and the other cursor on the 10th time marker. The distance between both cursors is now 8 time marker intervals. Check for a cursor readout between 39.5 and 40.5 µs.

  Press the ANALOG key ('DIGITAL MODE' is displayed briefly) and repeat the check in this section for the digital mode. Press the TEXT OFF key to have the full screen width available to display the time markers.

  Press the ANALOG key ('ANALOG MODE' is displayed briefly) to return to analog mode.

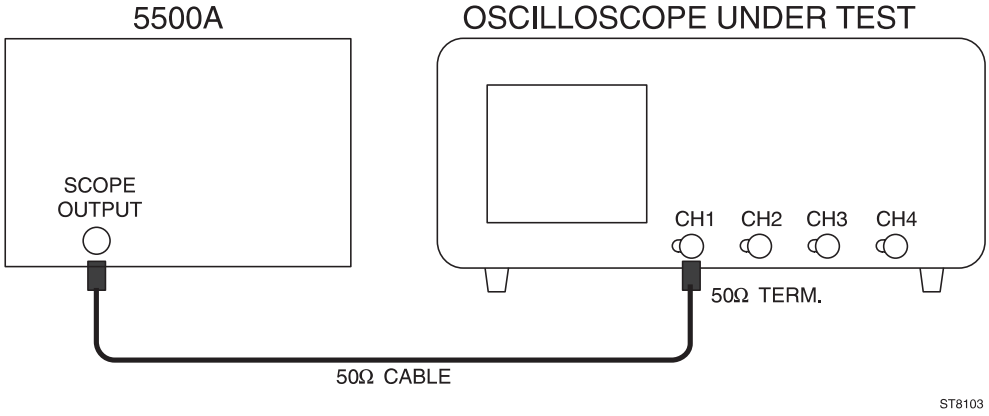
6.3.27 Horizontal deflection; DELAYED TIME BASE deflection coefficients

The deflection coefficients of the delayed timebase generator (DEL'D TB) are verified by means of a calibration signal.

Test equipment:

Fluke 5500A mode: marker (Alternative: time marker generator TG 501).

Test set-up:



Settings/procedure:

1 - Apply a 0.5 ms time marker signal to input CH1.
2 - Press the AUTOSET key.
3 - Use a 50Ω termination. For instruments with switchable 50Ω input impedance it is recommended to make use of this feature (via VERT MENU key).
4 - Press the TRIGGER menu key.
5 - Select level-pp 'off' and 'dc' trigger coupling from the TRIGGER MAIN TB menu.
6 - Press the TB MODE menu key and select 'trig' from the related menu.
7 - Adjust TRIGGER LEVEL for a correctly triggered display.
8 - Set the trace height to about 4 divisions.
9 - Press the DTB menu key and select DEL'D TB 'on' and MAIN TB 'on' from the related menu .
10 - Set MAIN TB to 1.00 ms and DELAYED TIME BASE to 5.00 μs.
11 - Use the DELAY control (in the DELAYED TIMEBASE SECTION to set the time delay to about 0 seconds.
12 - Adjust the vertical position of the MAIN TB display with the CH1 POS control in the top half of the viewing area.
13 - Adjust the vertical position of the DELAYED TIMEBASE display with the TRACK control.
14 - Verify the DELAYED TIMEBASE deflection coefficients with MAGNIFY off (*1) and MAGNIFY on (*10) according to the requirements in the tables. Use the deflection error facility of the time marker generator.

Note:

- *Error limits must be measured between the 2nd and the 10th graticule line (there are 11 graticule lines). These are the central 8 divisions.*
- *With MAGNIFY on (*10), the central 10 divisions of the expanded 100 divisions of DEL'D TB are measured.*
- *Only the timebase positions that are essential for instrument accuracy are checked.*
- *DEL'D TB TIME/DIV is electrically coupled to MAIN TB TIME/DIV; to check the settings in the table press only the MAIN TB TIME/DIV VAR keys.*

Requirements for analog mode MAGNIFY off (*1):

DEL'D TB setting	MAIN TB setting	Marker pulse	Max. error
500 µs	500 µs	0.5 ms	1.8%
20.0 µs	20.0 µs	20 µs	1.8%
5.00 µs	5.00 µs	5 µs	1.8%
1.00 µs	1.00 µs	1 µs	1.8%
500 ns	500 ns	0.5 µs	1.8%
100 ns	100 ns	0.1 µs	1.8%
50.0 ns	50.0 ns	50 ns	1.8%
20.0 ns (PM3390B/94B)	20.0 ns	20 ns	1.8%

Requirements for analog mode MAGNIFY on (*10):

DEL'D TB setting	MAIN TB setting	Marker pulse	Max. error
100 ns	100 ns	0.1 µs	2.3%
10.0 ns	10.0 ns	10 ns	2.3%
5.00 ns	5.00 ns	5 ns	3.3%
2.00 ns (PM3390B/94B)	2.00 ns	2 ns	3.3%

6.3.28 Horizontal deflection; delay time multiplier

In this test the minimum and maximum delay time is checked.

Test equipment:

None

Settings/procedure and requirements:

1 - Press the AUTOSET key.
2 - Press the DTB menu key and select DEL'D TB 'on' and MAIN TB 'on' from the appropriate menu .
3 - Set MAIN TB to 500 ns.
4 - Set DEL'D TB to 50.0 ns.
5 - Separate the MAIN TB and DEL'D TB traces with the TRACK control.
6 - Adjust the delay time to 500.0 ns using of the DELAY control (in the DELAYED TIMEBASE section).
7 - Adjust the start of the MAIN TB display exactly on the first graticule line by using the X POS control (at maximum TRACE INTENSITY).
8 - Verify that the difference between the start of MAIN TB and the start of the intensified part is between 0.9 to 1.1 divisions.
9 - Adjust the delay time to 5.00 µs with the DELAY control (in the DELAYED TIMEBASE section).
10 - Verify that the difference between the start of MAIN TB and the start of the intensified part is between 9.9 and 10.1 divisions.

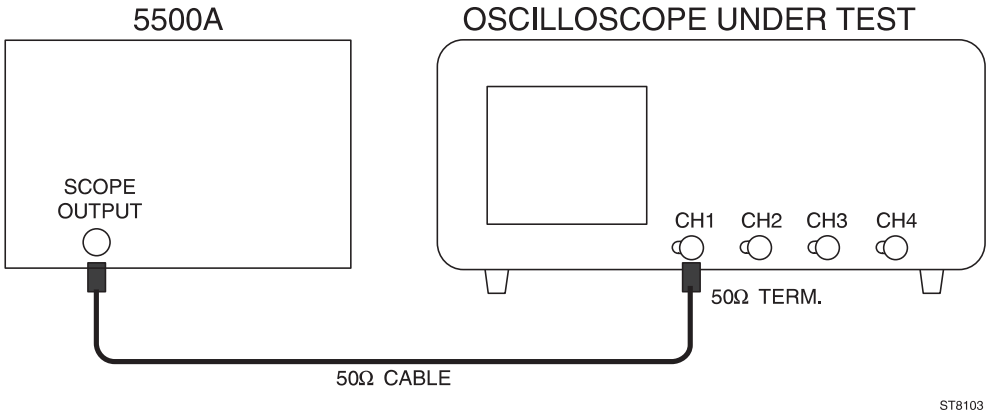
6.3.29 Horizontal deflection; delayed timebase jitter

There is a certain instability in the starting point, the so called jitter, of the DEL'D TB. The maximum allowed jitter is checked in this test.

Test equipment:

Fluke 5500A mode: levsine (Alternative: function generator PM5136).

Test set-up:



Settings/procedure:

1 - Apply a 1 MHz sine-wave signal of 120 mV(pp into 50Ω) to input CH1.
2 - Press the AUTOSET key and set for a trace-height of 6 divisions.
3 - Use a 50Ω termination. For instruments with switchable 50Ω input impedance it is recommended to make use of this feature (via VERT MENU key).
4 - Press the DTB menu key and select DEL'D TB 'on' and MAIN TB 'on' from the appropriate menu.
5 - Set MAIN TB to 500 µs.
6 - Set DEL'D TB to 500 ns.
7 - Adjust the delay time to 0s using the DELAY control (in the DELAYED TIMEBASE section).
8 - Switch the MAIN TB display to 'off' in the DELAYED TIMEBASE menu; only the DEL'D TB is displayed now.

Requirements:

- Verify that the jitter of the DEL'D TB is not more than 0.4 divisions (1 part per 25000).

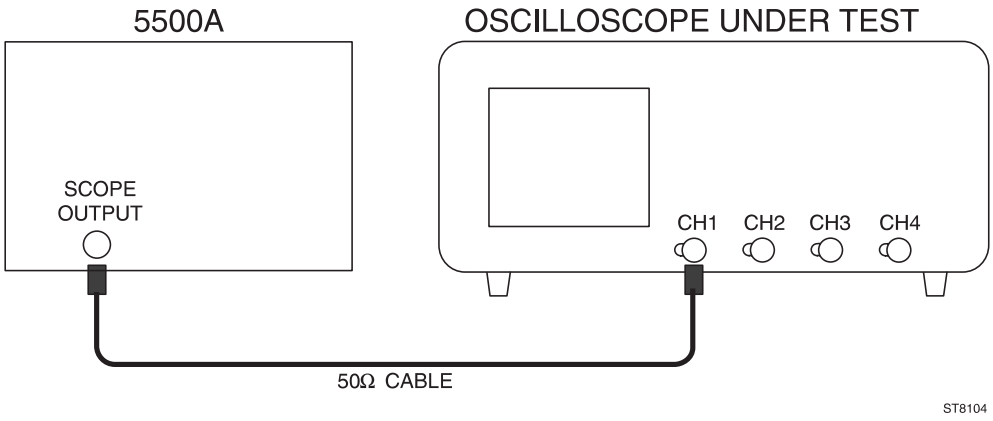
6.3.30 Horizontal deflection; X deflection coefficient via CH1

The amplification of the horizontal amplifier via the vertical input amplifier is checked.

Test equipment:

Fluke 5500A mode: volt (Alternative: Square-wave calibration generator PG 506).

Test set-up:



Settings/procedure:

1 - Apply a 1 kHz square-wave signal of 0.1V to input CH1. Output not terminated into 50Ω ('LZ' must not appear in lower part of viewing area).
2 - Press the AUTOSET key.
3 - Set CH1 to 20 mV and DC coupled input.
4 - Press the DISPLAY menu key.
5 - Press X-DEFL softkey.
6 - Select 'on' and 'ch1' from the X-DEFL menu.
7 - Press the CH2 ON key and then the CH1 ON key; the result is that CH2 is on and CH1 is off.

Requirements:

- Verify that two dots with a horizontal distance of 4.7 ... 5.3 divisions are displayed.

6.3.31 Horizontal deflection; X deflection coefficient via 'line'

The amplification of the horizontal amplifier via the line trigger signal is checked. Do this test only when 220V line voltage is available.

Test equipment:

None

Settings/procedure:

1 - Press the AUTOSET key.
2 - Press the DISPLAY menu key.
3 - Press X-DEFL softkey.
4 - Select 'on' and 'line' from the X-DEFL menu.

Requirements:

- Verify that a horizontal line of 4.3 to 7.7 divisions is displayed when the line voltage is 220V (rms).

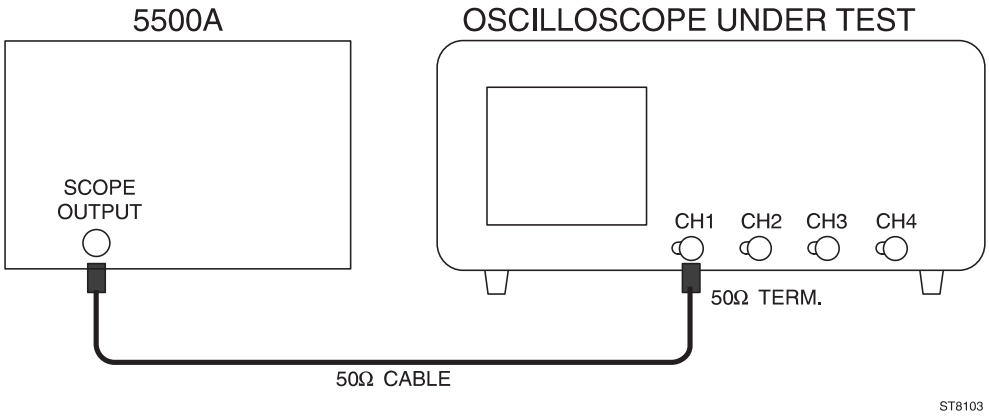
6.3.32 Horizontal deflection; high frequency response

In this test, the bandwidth of the horizontal amplifier is checked.

Test equipment:

Fluke 5500A mode: levsine (Alternative: constant amplitude sine wave generator SG 503).

Test set-up:



Settings/procedure:

1 - Apply a 50 kHz sine-wave signal of 30 mV(pp into 50Ω) to input CH1.
2 - Press the AUTOSET key and set CH1 to 5 mV.
3 - Use a 50Ω termination. For instruments with switchable 50Ω input impedance it is recommended to make use of this feature (’LZ’ must be visible in lower part of viewing area).
4 - Press the DISPLAY menu key and then press the X-DEFL softkey.
5 - Select ’on’ and ’ch1’ from the X-DEFL menu.
6 - Press the CH2 ON key and then the CH1 ON key: the result is that CH2 is on and CH1 off.
7 - Adjust the input voltage for exactly 6 divisions horizontal deflection.
8 - Increase the input frequency up to 2 MHz.

Requirements:

- Verify that the trace width is at least 4.2 divisions over the complete bandwidth range.

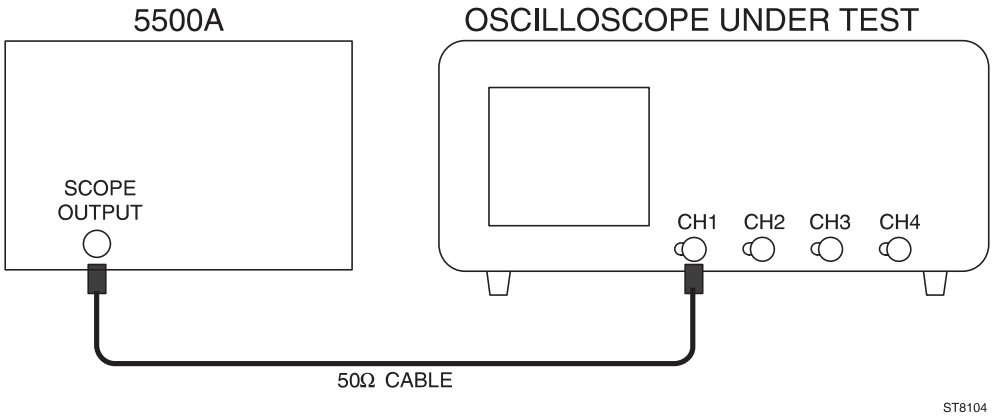
6.3.33 Maximum phase shift between horizontal and vertical deflection

There will be a certain phase shift between the horizontal and vertical amplifier. The value of this shift is measured here.

Test equipment:

Fluke 5500A mode: wavegen, wave sine (Alternative: function generator, PM 5136).

Test set-up:



Settings/procedure:

1 - Apply a 2 kHz sine-wave signal of 1.2 V(pp into 50Ω) to CH1.
2 - Press the AUTOSET key and set CH1 to 0.2V/div.
3 - Adjust the generator to a trace height of exactly 6 divisions.
4 - Press the DISPLAY menu key and then press the X-DEFL softkey.
5 - Select ’on’ and ’ch1’ from the X-DEFL menu.
6 - Increase the input frequency to 100 kHz.

Requirements:

- Verify that the phase shift is less than 3°, ≤0.32 div, see figure).

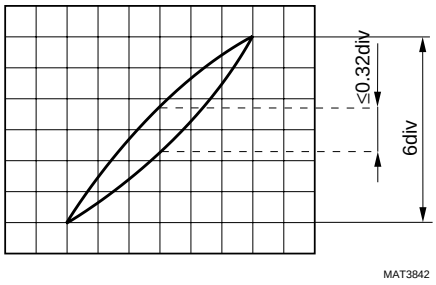


Figure 6.5 Phase shift between horizontal and vertical channel

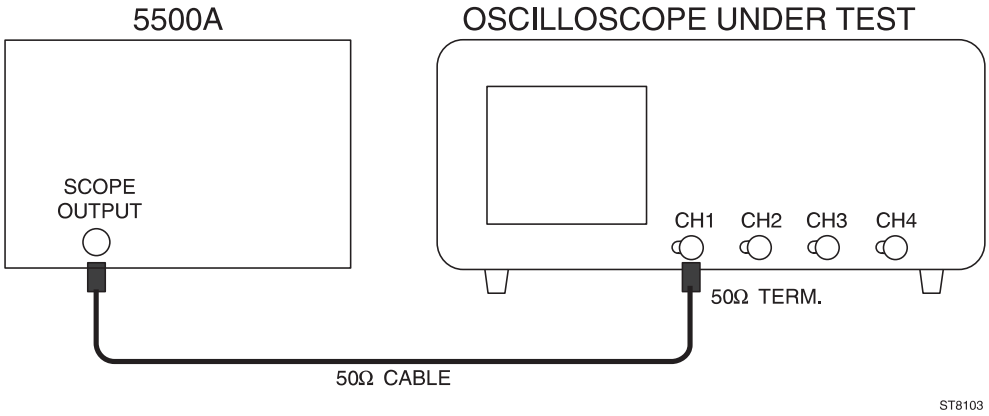
6.3.34 MAIN TB triggering PM3390B/3394B; trigger sensitivity via CH1, CH2, CH3 and CH4 (EXT)

The trigger sensitivity depends on the amplitude and frequency of the trigger signal. In this test the main timebase trigger sensitivity via the CH1, CH2, CH3 and CH4 inputs is checked. For the PM3390B, this is checked for CH1, CH2 and EXTernal TRIGger input.

Test equipment:

Fluke 5500A mode: levsine
(Alternative: constant amplitude sine wave generators SG 503 + SG 504).

Test set-up:



Settings/procedure and requirements:

1 - Apply a 100 MHz sine-wave signal of 1 V(pp into 50Ω) from the SG 503 to input CH1.
2 - Press the AUTOSET key and set CH1 to 0.5V/div.
3 - Use a 50Ω termination. For instruments with switchable 50Ω input impedance it is recommended to make use of this feature (via VERT MENU key).
4 - Set the input coupling of CH1 to DC and POSition the signal in the vertical center of screen.
5 - Select 'trig' from in the menu under the TB MODE mode key.
6 - Press the TRIGGER menu key and select level-pp 'off' and 'dc' trigger coupling from the TRIGGER MAIN TB menu
7 - Adjust TRIGGER LEVEL for a correctly triggered display.
8 - Decrease the amplitude of the input signal.
9 - Verify that the signal is well-triggered at amplitudes of 0.6 divisions and more.
10 - Decrease the input frequency to 50 kHz.
11 - Verify that the signal stays well-triggered at amplitudes of 0.6 divisions and more.
12 - Increase the input frequency to 200 MHz.
13 - Increase the input voltage to 1.2 division.
14 - Turn TRIGGER LEVEL.
15 - Verify that the signal is well-triggered at amplitudes of 1 division and more.
16 - Apply a 300 MHz sine-wave signal of 2V (pp into 50Ω) from the SG 504 to input CH1.
17 - Adjust the input voltage to 2 divisions. Signal must be in vertical center of screen.
18 - Verify that the signal is well-triggered at amplitudes of 2 divisions and more; adjust TRIGGER LEVEL when necessary.

PM3394B: repeat the procedure for CH2, CH3 and CH4 for the frequencies 50 kHz (0.6 division input signal) and 300 MHz (2 division input signal)
PM3390B: repeat the procedure for CH2 and the EXTTRIG input for the frequencies 50 kHz (0.6 division input signal) and 300 MHz (2 division input signal)
Press the ANALOG key ('DIGITAL MODE' is displayed briefly), then repeat the tests in this chapter for the digital mode.
Press the ANALOG key ('ANALOG MODE' is displayed briefly) to return to analog mode.

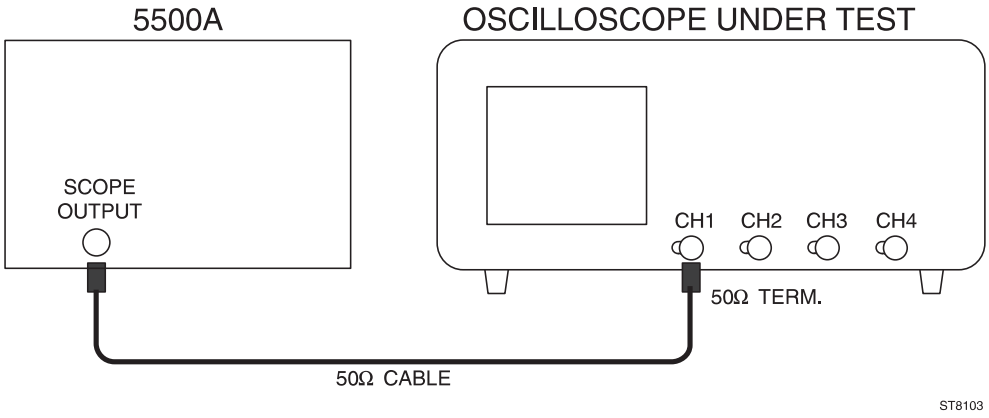
6.3.35 MAIN TB triggering PM3370B/3380B/3384B; trigger sensitivity via CH1, CH2, CH3 and CH4 (EXT).

The trigger sensitivity depends on the amplitude and frequency of the trigger signal. In this test the main timebase trigger sensitivity via the CH1, CH2, CH3 and CH4 inputs is checked. For PM3370B and PM3380B, this is checked for CH1, CH2 and the EXTernal TRIGger input. For PM3370B; frequency setting between ().

Test equipment.

Fluke 5500A mode: levsine (Alternative: constant amplitude sine wave generator (SG 503)

Test set-up:



Settings/procedure and requirements:

1 - Apply a 50 MHz (30 MHz) sine-wave signal of 1 V(pp into 50Ω) to input CH1.
2 - Press the AUTOSET key and set CH1 to 0.5V/div.
3 - Use a 50Ω termination.
4 - Set the input coupling of CH1 to DC and POSition the signal in the vertical center of screen.
5 - Select 'trig' from the menu under the TB MODE menu key.
6 - Press the TRIGGER menu key and select level-pp 'off' and 'dc' trigger coupling from the TRIGGER MAIN TB menu
7 - Adjust TRIGGER LEVEL for a correctly triggered display.
8 - Decrease the amplitude of the input signal.
9 - Verify that the signal is well-triggered at amplitudes of 0.6 divisions and more.
10 - Decrease the input frequency to 50 kHz.
11 - Verify that the signal stays well-triggered at amplitudes of 0.6 divisions and more.
12 - Increase the input frequency to 100 MHz (60 MHz).
13 - Increase the input voltage to 1.2 division.
14 - Turn TRIGGER LEVEL.
15 - Verify that the signal is well-triggered at amplitudes of 1.2 division and more.
16 - Increase the input frequency to 200 MHz (150 MHz).
17 - Adjust the input voltage to 2 divisions. Signal must be in vertical center of screen.
18 - Verify that the signal is well-triggered at amplitudes of 2 divisions and more; adjust TRIGGER LEVEL when necessary.

PM3384B: repeat the procedure for CH2, CH3 and CH4 for the frequencies 50 kHz (0.6 division input signal) and 200 MHz (2 division input signal).
PM3370B/80B: repeat the procedure for CH2 and the EXT TRIG input for the frequencies 50 kHz (0.6 division input signal) and 200 MHz (150 MHz) (2 division input signal).
Press the ANALOG key ('DIGITAL MODE' is displayed briefly) and repeat the tests in this chapter for the digital mode.
Press the ANALOG key ('ANALOG MODE is displayed briefly) to return to analog mode.

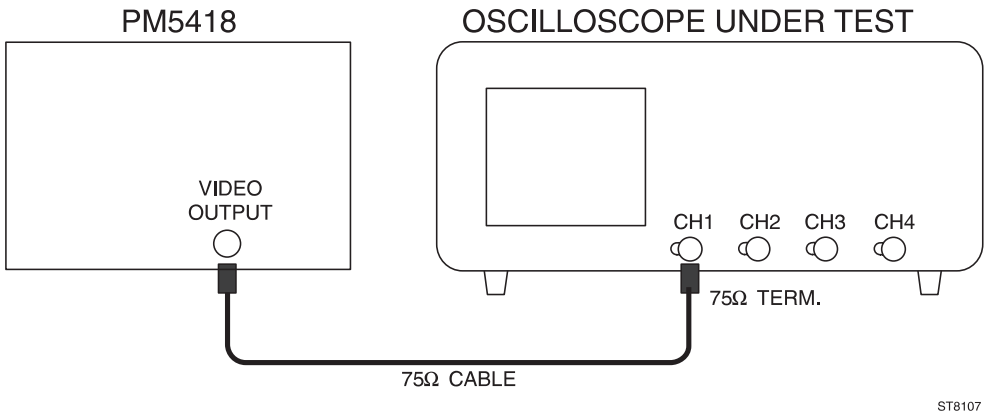
6.3.36 MAIN TB/DEL'D TB triggering; trigger sensitivity TVL-TVF

This test checks the trigger sensitivity for television line- and field synchronization pulses.

Test equipment:

TV pattern generator with video output (PM 5418)

Test set-up:



Note: the number a various tests to be performed is numerous. Therefore it is recommended only to check the tv system(s) as used in your country. The number of tests is also limited by the available TV pattern generator.

1 - Apply a video signal to input CH1 with an amplitude of about 1V synchronization pulse amplitude; use a 75Ω termination instead of internal or external 50Ω.
2 - Press the AUTOSET key.
3 - Press menu key TRIGGER and select 'tv' in the related menu.
4 - Select field 1 or field 2 in the menu.
5 - Select a line number (e.g. 25) by means of the TRACK control.
6 - Select pos or neg (depending on the available TV pattern generator).
7 - Select in the VIDEO SYSTEM submenu hdtv, ntsc, pal or secam (depending on the available TV pattern generator). The maximum number of lines for hdtv can be selected if hdtv is active.

Requirements:

- Decrease the amplitude of the input signal and verify that the signal is well-triggered on the tv pulses, at sync pulse amplitudes of 0.7 divisions and more.

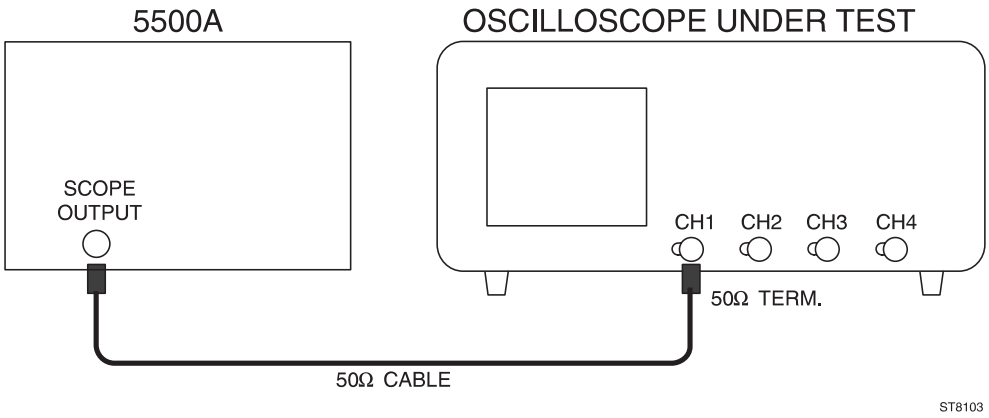
6.3.37 DEL'D TB triggering PM3390B/94B; trigger sensitivity via CH1, CH2, CH3 and CH4 (EXT)

The trigger sensitivity depends on the amplitude and frequency of the trigger signal. In this test the main timebase trigger sensitivity via the CH1, CH2, CH3 and CH4 inputs is checked. For the PM3390B, this is checked for CH1, CH2 and the EXTernal TRIGger input.

Test equipment:

Fluke 5500A mode: levsine
(Alternative: constant amplitude sine wave generators SG 503 + SG 504).

Test set-up:



Settings/procedure and requirements:

1 - Apply a 100 MHz sine-wave signal of 1 V(pp into 50Ω) from the SG 503 to input CH1.
2 - Press the AUTOSET key and set CH1 to 0.5V/div.
3 - Use a 50Ω termination. For instruments with switchable 50Ω input impedance it is recommended to make use of this feature (via VERT MENU KEY).
4 - Set the input coupling of CH1 to DC and POSition the signal in the vertical center of screen.
5 - Select 'trig' from the menu under the TB MODE menu key.
6 - Press the TRIGGER menu key and select level-pp 'off' and 'dc' trigger coupling from the TRIGGER MAIN TB menu.
7 - Adjust TRIGGER LEVEL for a correctly triggered display.
8 - Press the DTB menu key and select DEL'D TB 'on' and MAIN TB 'on' in the related menu.
9 - Set MAIN TB to 200 ns/division and DELAYED TIMEBASE to 20.0 ns/division.
10 - Adjust the DELAY control in the DELAYED TIMEBASE section to a delay time of 1.000 μs.
11 - Select 'trig'd' and 'dc' coupling from the DELAYED TIME BASE menu, and press the front panel key TRIG1. Or TRIG2 (if CH2 on), TRIG3 (if CH3 on), TRIG4 (if CH4 on).
12 - Adjust the DEL'D TB trigger level via the Δ control for a well- triggered signal (intensified part must be visible).
13 - Operate the TRACK control to separate MAIN TB and DEL'D TB for clearly visible displays.
14 - Decrease the amplitude of the input signal.
15 - Verify that the DEL'D TB is well triggered at signal amplitudes of 0.6 divisions and more.
16 - Decrease the input frequency to 50 kHz. Set the MAIN TB to 50.0 μs/division and DEL'D TB to 20.0 μs/division.
17 - Verify that the DEL'D TB stays well triggered at signal amplitudes of 0.6 divisions and more.
18 - Increase the input frequency to 200 MHz.
19 - Increase the input voltage to 1.2 division.
20 - Operate the Δ control (controls DEL'D TB trigger level).
21 - Verify that the DEL'D TB is well triggered at all amplitudes of 1.2 divisions or more.
22 - Apply a 300 MHz sine-wave signal of 2V (pp into 50 ohm) from the SG504 generator to input CH1.
23 - Adjust the input voltage to 2 divisions. Signal must be in vertical center of screen.
24 - Verify that the DEL'D TB is well triggered at signal amplitudes of 2 divisions and more: adjust the Δ control (DEL'D TB trigger level) if necessary.

PM3394B: repeat the procedure for CH2, CH3 and CH4 for the frequencies 50 kHz (0.6 division input signal) and 300 MHz (2 division input signal).
PM3390B: repeat the procedure for CH2 and the EXTTRIG input for the frequencies 50 kHz (0.6 division input signal) and 300 MHz (2 division input signal).
Press the ANALOG key ('DIGITAL MODE' is displayed briefly) and repeat the tests in this chapter for the digital mode.
Then press the ANALOG key ('ANALOG MODE' is displayed briefly) to return to analog mode.

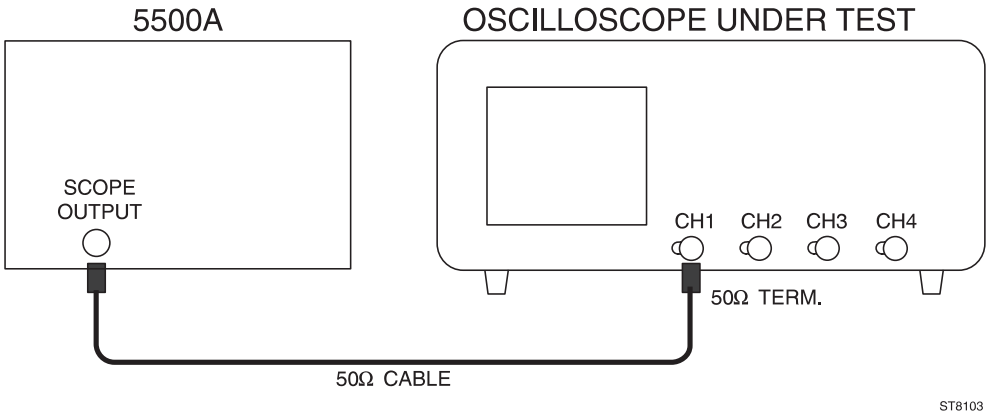
6.3.38 DEL'D TB triggering PM3370B/80B/84B; trigger sensitivity via CH1, CH2, CH3 and CH4 (EXT).

The trigger sensitivity depends on the amplitude and frequency of the trigger signal. In this test the main timebase trigger sensitivity via the CH1, CH2, CH3 and CH4 inputs is checked. For PM3370B/80B, this is checked for CH1, CH2 and the EXTernal TRIGger input. For PM3370B; frequency setting between ().

Test equipment:

Fluke 5500A mode: levsine (Alternative: constant amplitude sine wave generator SG 503)

Test set-up:



Settings/procedure and requirements:

1 - Apply a 50 MHz (30 MHz) sine-wave signal of 1 V(pp into 50Ω) from the SG 503 to input CH1.
2 - Press the AUTOSET key and set CH1 to 0.5V/div.
3 - Use a 50Ω termination.
4 - Set the input coupling of CH1 to DC and POSition the signal in the vertical center of screen.
5 - Select 'trig' from the menu under the TB MODE menu key.
6 - Press the TRIGGER menu key and select level-pp 'off' and 'dc' trigger coupling from the TRIGGER MAIN TB menu
7 - Adjust TRIGGER LEVEL for a correctly triggered display.
8 - Press the DTB menu key and select DEL'D TB 'on' and MAIN TB 'on' from the related menu.
9 - Set the MAIN TB to 200 ns/division and DELAYED TIMEBASE to 50.0 ns/division.
10 - Adjust the DELAY control in the DELAYED TIMEBASE section to a delay time of 1.000 µs.
11 - Select 'trig'd' and 'dc' coupling from the DELAYED TIMEBASE menu and press the front panel key TRIG1. Or TRIG2 (if CH2 on), TRIG3 (if CH3 on), TRIG4 (if CH4 on).
12 - Adjust the DEL'D TB trigger level via the Δ control for a well- triggered signal (intensified part must be visible).
13 - Operate the TRACK control to separate the MAIN TB and DEL'D TB for clearly visible displays.
14 - Decrease the amplitude of the input signal.
15 - Verify that the DEL'D TB is well triggered at signal amplitudes of 0.6 divisions and more.
16 - Decrease the input frequency to 50 kHz. Set the MAIN TB to 50.0 µs/division and DEL'D TB to 20.0 µs/division.
17 - Verify that the DEL'D TB stays well triggered at signal amplitudes of 0.6 divisions and more.
18 - Increase the input frequency to 100 MHz (60 MHz).
19 - Increase the input voltage to 1.2 division.
20 - Operate the Δ control (controls the DEL'D TB trigger level).
21 - Verify that the DEL'D TB is well triggered at all amplitudes of 1.2 division or more.
22 - Increase the input frequency to 200 MHz (150 MHz).
23 - Adjust the input voltage to 2 divisions.
24 - Verify that the DEL'D TB is well-triggered at signal amplitudes of 2 divisions and more. Signal must be in vertical center of screen. Adjust the Δ control (DEL'D TB trigger level) if necessary.

PM3384B: repeat the procedure for CH2, CH3 and CH4 for the frequencies 50 kHz (0.6 division input signal) and 200 MHz (2 division input signal).
PM3370B/80B: repeat the procedure for CH2 and the EXT TRIG input for the frequencies 50 kHz (0.6 division input signal) and 200 MHz (150 MHz) (2 division input signal).
Press the ANALOG key ('DIGITAL MODE' is displayed briefly), and repeat the tests in this chapter for the digital mode.
Then press the ANALOG key ('ANALOG MODE' is displayed briefly) to return to analog mode.

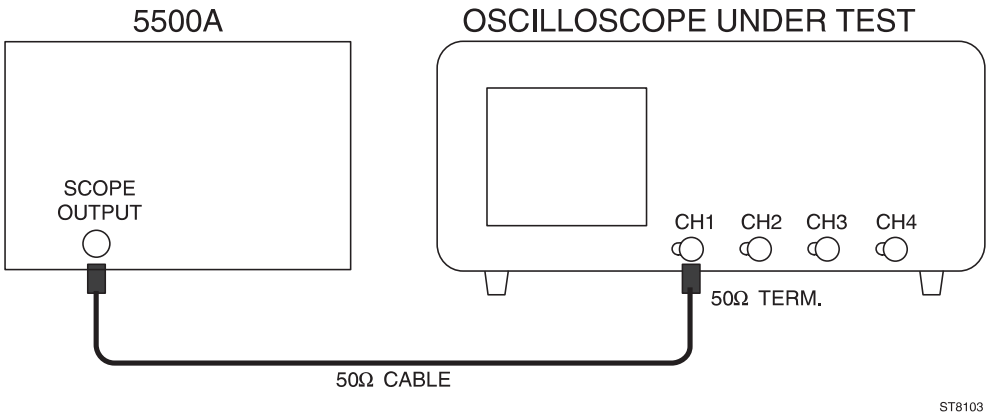
6.3.39 Trigger sensitivity in logic mode PM3394B

The trigger sensitivity in the logic mode 'pattern' depends on the amplitude and frequency of the trigger signal. In this test, the trigger sensitivity is tested with a sine wave via the CH1, CH2, CH3, and CH4 inputs.

Test equipment:

Fluke 5500A mode: levsine (Alternative: constant amplitude sine wave generator SG 503).

Test setup:



1 - Press the ANALOG key ('DIGITAL MODE' is displayed briefly) to activate the digital mode.
2 - Apply a 100 MHz sine-wave signal of 1 V(pp into 50 ohm) from the constant amplitude sine-wave generator to input CH1.
3 - Press the AUTOSET key, and set CH1 to 0.5V/division.
4 - Use a 50 ohm termination. For instruments with switchable 50 ohm input impedance it is recommended to make use of this feature (via VERT MENU key).
5 - Set the input coupling to DC and POSition the signal in the vertical center of the screen.
6 - Select 5.00 ns/division for MAIN TB.
7 - Press the TRIGGER menu key and select 'logic', 'pattern', and 'enter' from the related menu.
8 - Operate the front panel keys TRIG1, TRIG2, TRIG3 and TRIG4 to obtain the trigger pattern Hxxx (x = don't care) in the menu.
9 - Press the TB MODE menu key and select 'trig' from the related menu.
10 - Decrease the amplitude of the generator voltage to 1 division.
11 - Turn the TRIGGER LEVEL control and check that a well-triggered signal is obtained.
12 - Apply a 300 MHz sine-wave signal of 2 V(pp into 50Ω) from the SG 504 to input CH1.
13 - Adjust the input voltage to 2 divisions.
14 - Verify that the signal is well triggered at amplitudes of 2 divisions and more; adjust TRIGGER LEVEL when necessary.
15 - Press the ANALOG key ('ANALOG MODE' is displayed briefly) to return to analog mode.

Repeat the procedure for CH2 with trigger pattern xHxx
Repeat the procedure for CH3 with trigger pattern xxHx
Repeat the procedure for CH4 with trigger pattern xxxH

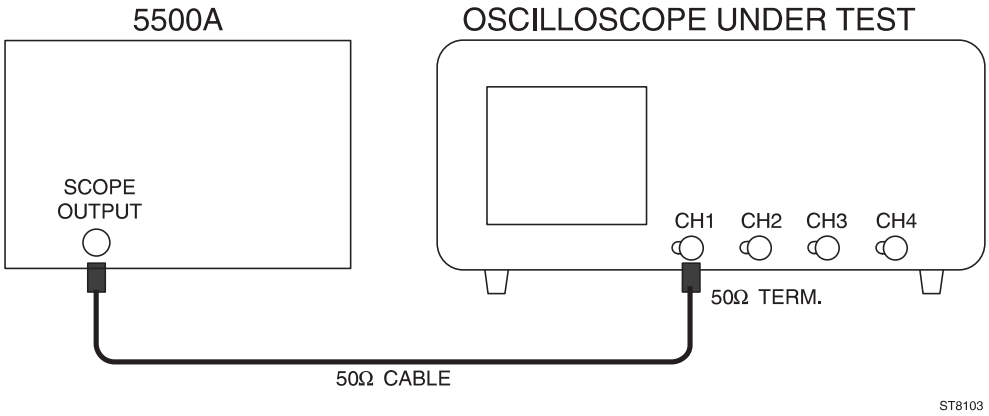
6.3.40 Trigger sensitivity in logic mode PM3384B

The trigger sensitivity in the logic mode 'pattern' depends on the amplitude and frequency of the trigger signal. In this test, the trigger sensitivity is tested with a sine wave via the CH1, CH2, CH3, and CH4 inputs.

Test equipment:

Fluke 5500A mode: levsine: (Alternative: constant amplitude sine wave generator SG 503).

Test setup:



1 - Press the ANALOG key ('DIGITAL MODE' is displayed briefly) to activate the digital mode.
2 - Apply a 50 MHz sine-wave signal of 1 V(pp into 50 ohm) from the constant amplitude sine-wave generator to input CH1.
3 - Press the AUTOSET key, and set CH1 to 0.5V/division.
4 - Use a 50 ohm termination.
5 - Set the input coupling to DC and POSition the signal in the vertical center of the screen.
6 - Select 5.00 ns/division for MAIN TB.
7 - Press the TRIGGER menu key and select 'logic', 'pattern', and 'enter' from the related menu.
8 - Operate the front panel keys TRIG1, TRIG2, TRIG3 and TRIG4 to obtain the trigger pattern Hxxx (x = don't care) in the menu.
9 - Press the TB MODE menu key and select 'trig' from the related menu.
10 - Decrease the amplitude of the generator voltage to 1 division.
11 - Turn the TRIGGER LEVEL control and check that a well-triggered signal is obtained.
12 - Increase the input frequency to 200 MHz.
13 - Increase the input voltage to 2 division.
14 - Turn the TRIGGER LEVEL control, and check that a well-triggered signal is obtained.
15 - Press the ANALOG key ('ANALOG MODE' is displayed briefly) to return to analog mode.

Repeat the procedure for CH2 with trigger pattern xHxx
Repeat the procedure for CH3 with trigger pattern xxHx
Repeat the procedure for CH4 with trigger pattern xxxH

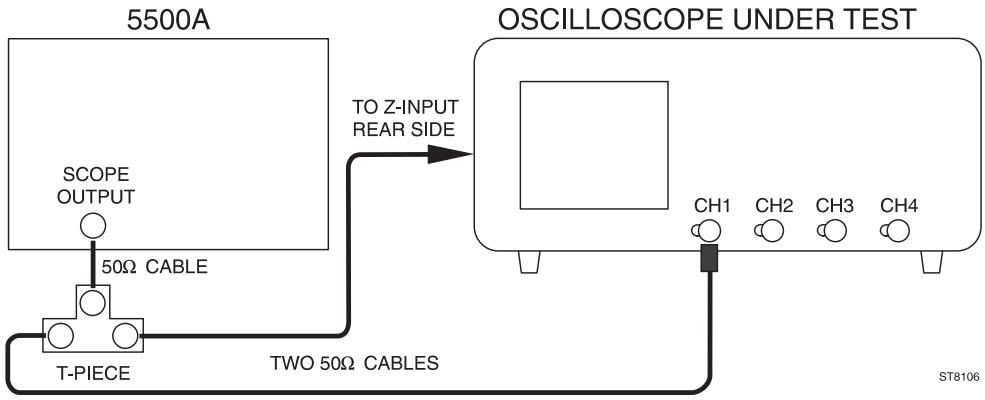
6.3.41 Z-MOD sensitivity

This test checks the sensitivity of the Z modulation facility.

Test equipment:

Fluke 5500A mode: wavegen, wave square (Alternative: function generator PM 5136).
T-piece.

Test set-up:



Settings/procedure and requirements:

1 - Apply a 1 kHz square-wave signal, duty cycle 50%, amplitude between 0 to +2.5V, to input CH1. Adjust the generator to a signal of 2.5 Vpp with an offset of 1.25V.
2 - Press the AUTOSET key.
3 - Set MTB to 0.5 ms/div.
4 - Set the trace of CH1 in mid position with the CH1 POS control.
5 - Apply the same signal by means of the T-piece to the Z input (rear side).
6 - Adjust TRACE INTENSITY so that only the bottom half of the squarewave is displayed. The top half must be invisible (0.5 ms light on; 0.5 ms light off).
7 - Decrease the input signal to 0.5 Vpp with an offset of 0.25V.
8 - Set CH1 to 0.5V/division.
9 - Verify that the top half of the square wave is visible at full intensity.

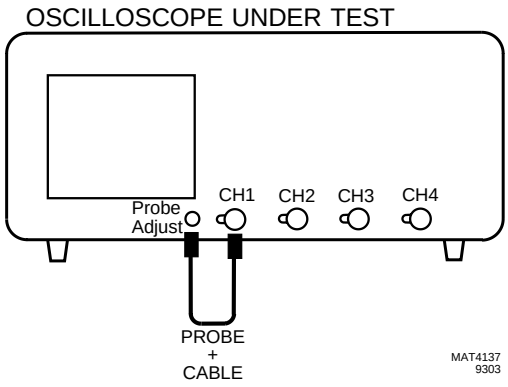
6.3.42 Probe Adjust signal; frequency and output voltage

The Probe Adjust signal is a calibration signal with fixed frequency and voltage. In this test, the values of frequency and voltage are checked.

Test equipment:

None

Test set-up:



Settings/procedure:

1 - Connect the Probe Adjust signal to input CH1 and press the AUTOSET key.
2 - Select GND of CH1.
3 - Set the trace in the center of the screen.
4 - Select DC input coupling for CH1.

Requirements:

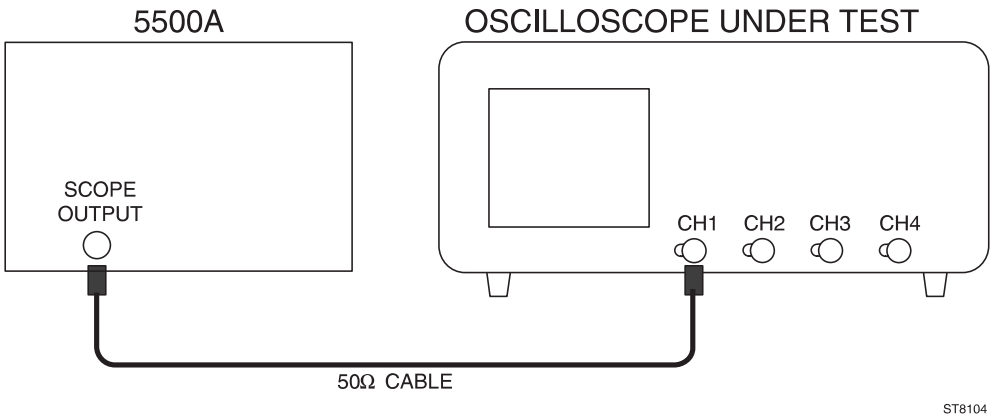
1 - Verify that a positive going square-wave signal of 0.6 V(pp) is displayed, i.e. 3 divisions vertical at 0.2V.
2 - Verify that the frequency of the displayed signal is about 2 kHz, i.e. a period time between 4.0 … 6.0 divisions horizontal at MTB 100 µs/div.

6.3.43 Auto range functions

The AUTO RANGE function of the vertical channels automatically selects the input sensitivity. The result is that the input signal is displayed with 2 to 6.4 divisions amplitude.
The AUTO RANGE function of the main time base (MAIN TB) adjusts the time base automatically so that approximately 2 to 6 waveform periods are displayed.

Test equipment:

Fluke 5500A mode: wavegen, wave sine (Alternative: function generator, PM5136)



Settings/procedure:

1 - Apply a 50kHz sine-wave signal of 2 V(pp) to CH1.
2 - Press the AUTOSET key.
3 - Adjust the generator output voltage to maximum (20 ... 30 V approximately). The signal amplitude now exceeds the 8 div screen height.
4 - Press the ANALOG key (’DIGITAL MODE’ is displayed briefly) to switch the digital mode to on.
5 - Press the CH1 AUTO RANGE key. Check that the vertical amplitude is automatically adjusted to between 2 and 6.4 divisions.
6 - Vary the generator output voltage from maximum to 100 mV.

Requirements:

- Check that the signal amplitude stays between 2 and 6.4 divisions.
- Repeat this procedure for the other vertical channels that have an AUTO RANGE key.

Settings/procedure:

1 - Adjust the generator to a 1 kHz sine-wave of 2 V(pp) applied to CH1.
2 - Press the AUTOSET key.
3 - Press the AUTO RANGE key of the main time base MAIN TB.
4 - Vary the generator output frequency between 1kHz and maximum (10 MHz approxinately).

Requirement:

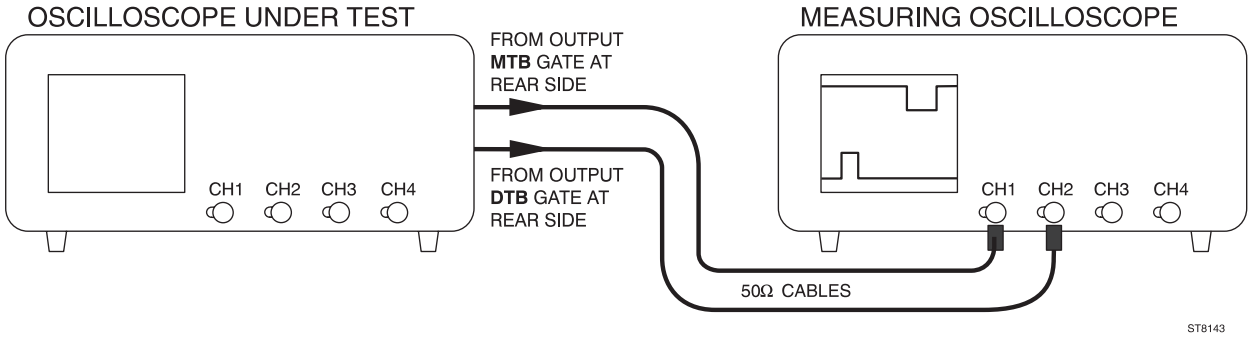
- Check that between 2 and 6 waveform periods are displayed.

6.3.44 Testing the optional auxiliary outputs

MTB-GATE and DTB-GATE outputs.

Test equipment: measuring oscilloscope.

Test set up:



Settings/procedure:

Oscilloscope under test:
- Take care that no input signal is applied to the oscilloscope inputs.
- Press the STATUS and TEXT OFF keys simultaneously. This assures that the oscilloscope occupies its default position.
- Press the DTB menu key to display the DELAYED TIME BASE menu. Select the ‘on’ position of the DEL’D TB softkey. The result is that MTB is in 1.00 ms/div and that DTB is in 100 µs/div and that both time bases are on.
- Apply a 50Ω coaxial cable to rear panel output ‘MTB-GATE’.
- Apply another 50Ω coaxial cable to rear panel output ‘DTB-GATE’.

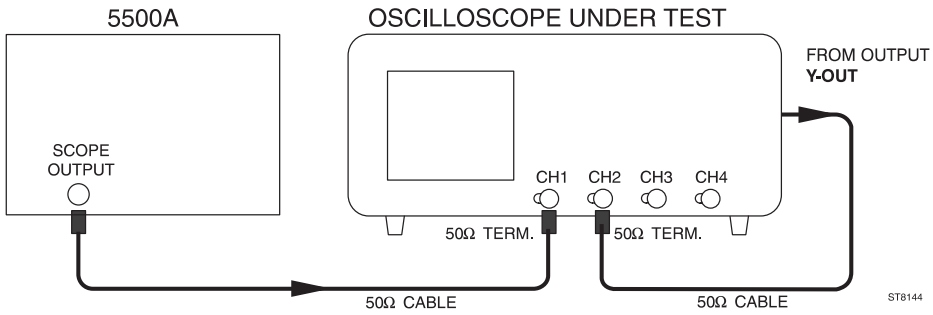
Measuring oscilloscope:
- Apply the coaxial cable from signal ‘MTB GATE’ of the oscilloscope under test to input CH1 of the measuring oscilloscope.
- Apply the coaxial cable from signal ‘DTB GATE’ of the oscilloscope under test to input CH2 of the measuring oscilloscope.
- Press the green AUTOSET key.
- Adjust CH1 and CH2 to DC input coupling; if the ocilloscope is in 50Ω (‘LZ’) position, select an input impedance of 1MΩ.
- Adjust CH1 and CH2 to 2 V/div.
- Select 2 ms/div for MTB.

Requirements:
- Verify that two square-wave signals are displayed via CH1 and CH2 of the measuring oscilloscope.
- Verify that the ‘low’ level of both square-waves is between 0 .. 0.4 V.
- Verify that the ‘high’ level of both square-waves is between 2.4 .. 5 V.
- Verify that the ‘MTB GATE’ signal (is displayed via CH1) is high during 10 ms or more.
- Verify that the ‘DTB GATE’ signal (is displayed via CH2) is high during 1 ms or more.

Y-OUTput signal.

Test equipment: Fluke 5500A mode: levsine (Alternative: constant amplitude sine-wave generator SG503).

Test set up:



Settings/procedure:
- Apply a 50 kHz sine-wave signal of 600 mV (pp into 50Ω) to input CH1 and press the green AUTOSET key.
- Use external 50Ω termination at the CH1 input. Use the internal termination of the oscilloscope, when available (if active, the text ‘LZ’ is visible in the lower part of the viewing area).
- Set CH1 to 0.1 V/div.
- Adjust the generator signal to an amplitude of exactly 6 divisions.
- Connect the rear side output Y-OUT via a coaxial cable with the CH2 input. Use external 50Ω termination at the CH2 input. Use the internal termination of the oscilloscope, when available (if active, the text ‘LZ’ is visible in the lower part of the viewing area).
- Switch CH2 to on and CH1 to off.
- Put CH2 in 10 mV/div.

Requirement:
Check for a vertical amplitude of the 50 kHz sine-wave signal between 5.3 .. 6.7 divisions.

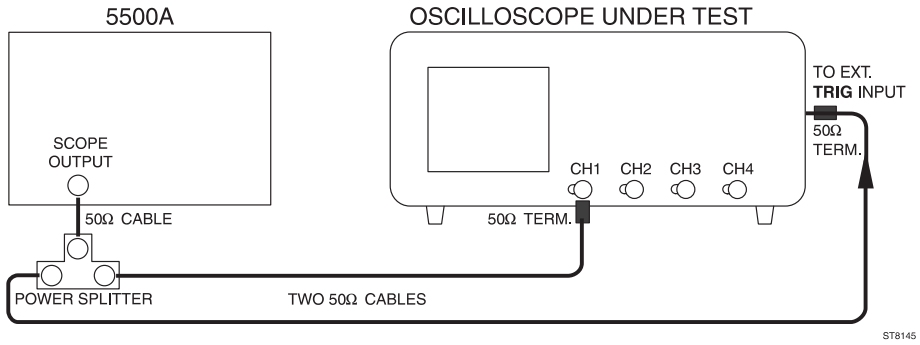
Settings/procedure:
- Adjust the 50 kHz sine-wave signal to an amplitude of exactly 6 divisions.
- Slowly increase the frequency of the generator to 60 MHz (PM3370B) or 100 MHz (PM3380B/84B) or 200 MHz (PM3390B/94B).

Requirement:
Verify that the displayed sine-wave does not drop below an amplitude of 3 divisions across the frequency range 50 kHz .. full bandwidth. The observed bandwidth curve is that of CH1 and CH2 in cascade.

EXT TRIGger input.

Test equipment:
- Fluke 5500A mode: levsine (Alternative: constant amplitude sine-wave generator SG503).
- Power splitter.

Test set up:



Settings/procedure:
- Use a power splitter and two coaxial 50Ω cables to apply the generator output signal to input CH1 and the rear panel input ‘EXT TRIG’.
- Use an external 50Ω termination at the end of each cable. When available, use the internal termination of input CH1 (if active, the text ‘LZ’ is visible in the lower part of the viewing area).
- Adjust the generator output signal for a 50 kHz sine-wave of 200 mV (pp output amplitude into 50Ω).
- Press the green AUTOSET key.
- Press the TRIGGER menu key to display the TRIGGER MAIN TB menu. Select with softkey ‘ch1, extern, line’ the ‘extern’ trigger source.
- Put CH1 in 50 mV/div and adjust the generator output voltage to a vertical display of 2 divisions.
- Slowly increase the frequency of the generator signal from 50 kHz to 5 MHz.

Requirement:
Check that the signal diplayed via CH1 stays well triggered across the indicated frequency range (the ‘ARM’D LED must stay dimmed).

Settings/procedure:
- Adjust the generator output voltage to a vertical display of 4 divisions.
- Slowly increase the frequency of the generator signal from 5 MHz to 10 MHz.

Requirements:
Check that the signal diplayed via CH1 stays well triggered across the indicated frequency range (the ‘ARM’D LED must stay dimmed).