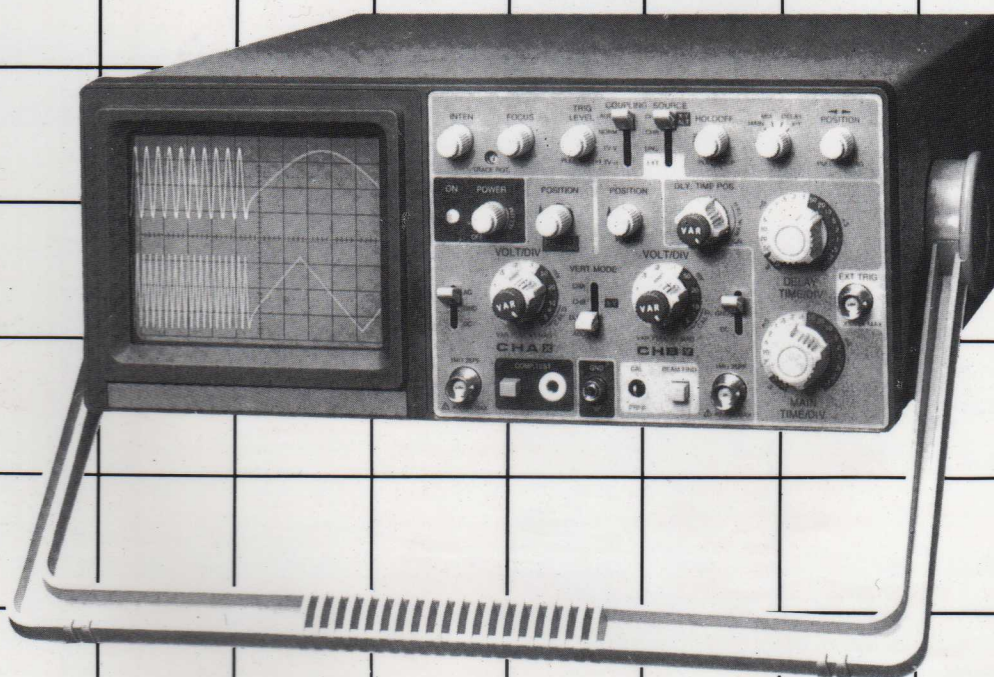


OPERATION-MANUAL

OSCILLOSCOPE



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GENERAL

DESCRIPTION

The model 7000A series oscilloscope is a dual-channel oscilloscope with frequency bandwidth 20–100 MHz at -3db; maximum sweep 10 nS/DIV; maximum sensitivity 1 mV/DIV and 150 mm rectangular CRT with internal graticule.

The oscilloscope is rugged, easy to operate, and highly reliable. It also provides many convenient features and special functions which make itself be an ideal instrument for research, production, education, and development in electronic device or circuitry.

FEATURES

- (1) **Ease of Operation**
All control and function switches are laid out in the most convenient locations making the oscilloscope extremely easy to operate.
- (2) **High Input Impedance**
The input impedance of CH 1, CH 2 is $1M\Omega$ +/- 2%, 25 pF +/- 10 pF.
- (3) **Variable Hold Off Function**
Signals with complex repeating periods which resist triggering can be stably triggered with a simple adjustment of the hold off level.
- (4) **X-Y Operation**
CH 1 can be applied as horizontal deflection (X axis) while CH 2 provides vertical deflection (Y axis).
- (5) **Trigger of TV Sync**
The oscilloscope has a sync separator circuit, which allows triggering for TV-H and TV-V signal.
- (6) **High Sensitivity**
1 mV/DIV maximum vertical sensitivity.
10 nS/DIV maximum sweep rate.
- (7) **Sweep Mix Function (70X6A only)**
The main sweep and the delay sweep can be viewed at the same time.
- (8) **CH 2 Output (70X6A only)**
CH 2 output which on near panel can be connected to frequency counters and other devices.
- (9) **Z Modulation (70X6A only)**
Input terminal is used for external intensity modulation signal.
- (10) **Component Test (70X6A only)**
Capacitor, inductor, diode, transistor and zener can be also viewed on screen.
- (11) **Beam Finder (70X6A only)**
Trace can be returned to CRT viewing area regardless of setting horizontal, vertical or intensity controls when press beam finder button.
- (12) **Illumination Control (70X6A only)**
Graticule illumination can be adjusted according to brightness of circumstance.

20 MHz OSCILLOSCOPE SPECIFICATIONS

CATHODE RAY TUBE

6 inch diagonal, rectangular screen with internal graticule 8 x 10 DIV (1 DIV = 1 cm), B31 phosphor, 2kV accel voltage.

VERTICAL DEFLECTION

Bandwidth

DC-20 MHz (-3db).

Sensitivity

1 mV/DIV - 1 V/DIV (5 MHz, -3db), x5 gain selected.
5 mV/DIV - 5 V/DIV.

Attenuator

1-2-5 sequence, 10 step with variable control.

Input Impedance

$1M\Omega$ +/- 2%, 25 pF +/- 10%.

Max. Input Voltage

400V (DC + AC peak).

Rise Time

About 17.5nS.

Over Shoot

Less than 5%.

Operation Mode

CH 1, CH 2, DUAL (ALT, CHOP).

Algebraic Addition

CH 1 + CH 2, CH 1 - CH 2.

Inverter

CH 2 only.

HORIZONTAL DEFLECTION

X-Y Mode switch select
CH 1: X axis.
CH 2: Y axis.

Accuracy

Y-Axis +/- 3%.
X-Axis +/- 6%.

Bandwidth

DC - 1 MHz (-3db).

X-Y Phase Difference

Approximately 3° at 50 kHz

SWEEP SYSTEM

Sweep Display Mode

Main, Mix, Delay (10:20)

Hold Off Time

5:1 continuously variable

MAIN SWEEP

Sweep Speed

0.1 μ S/DIV - 0.2 s/DIV in steps.

Accuracy

+/- 3%.

Variable Time Control

5:1, uncalibrated, continuous steps.

GENERAL

DESCRIPTION

The model 7000A series oscilloscope is a dual-channel oscilloscope with frequency bandwidth 20-100 MHz at -3db; maximum sweep 10 nS/DIV; maximum sensitivity 1 mV/DIV and 150 mm rectangular CRT with internal graticule.

The oscilloscope is rugged, easy to operate, and highly reliable. It also provides many convenient feature and special functions which make itself be an ideal instrument for research, production, education, and development in electronic device or circuitry.

FEATURES

- (1) **Ease of Operation**
All control and function switches are laid out in the most convenient locations making the oscilloscope extremely easy to operate.
- (2) **High Input Impedance**
The input impedance of CH 1, CH 2 is $1M\Omega$ +/- 2%, 25 pF +/- 10 pF.
- (3) **Variable Hold Off Function**
Signals with complex repeating periods which resist triggering can be stably triggered with a simple adjustment of the hold off level.
- (4) **X-Y Operation**
CH 1 can be applied as horizontal deflection (X axis) while CH 2 provides vertical deflection (Y axis).
- (5) **Trigger of TV Sync**
The oscilloscope has a sync separator circuit, which allows triggering for TV-H and TV-V signal.

6 inch diagonal, rectangular screen with internal graticule 8 x 10 DIV (1 DIV = 1 cm), B31 phosphor, 2kV accel voltage.

- (6) **High Sensitivity**
1 mV/DIV maximum vertical sensitivity.
10 nS/DIV maximum sweep rate.

- (7) **Sweep Mix Function (70X6A only)**
The main sweep and the delay sweep can be viewed at the same time.

- (8) **CH 2 Output (70X6A only)**
CH 2 output which on rear panel can be connected to frequency counters and other devices.

- (9) **Z Modulation (70X6A only)**
Input terminal is used for external intensity modulation signal.

- (10) **Component Test (70X6A only)**
Capacitor, inductor, diode, transistor and zener can be also viewed on screen.

- (11) **Beam Finder (70X6A only)**
Trace can be return to CRT viewing area regardless of setting horizontal, vertical or intensity controls when press beam finder button.

- (12) **Illumination Control (70X6A only)**
Graticule illumination can be adjusted according to brightness of circumstance.

20 MHz OSCILLOSCOPE SPECIFICATIONS

CATHODE RAY TUBE

6 inch diagonal, rectangular screen with internal graticule 8 x 10 DIV (1 DIV = 1 cm), B31 phosphor, 2kV accel voltage.

VERTICAL DEFLECTION

Bandwidth
DC-20 MHz (-3db).

Sensitivity
1 mV/DIV - 1 V/DIV (5 MHz, -3db), x5 gain selected.
5 mV/DIV - 5 V/DIV.

Attenuator

1-2-5 sequence, 10 step with variable control.

Input Impedance

$1M\Omega$ +/- 2%, 25 pF +/- 10%.

Max. Input Voltage

400V (DC + AC peak).

Rise Time

About 17.5nS.

Over Shoot

Less than 5%.

Operation Mode

CH 1, CH 2, DUAL (ALT, CHOP).

Algebraic Addition

CH 1 + CH 2, CH 1 - CH 2.

Inverter

CH 2 only.

HORIZONTAL DEFLECTION

X-Y Mode switch selectable using X-Y switch
CH 1: X axis.
CH 2: Y axis.

Accuracy

Y-Axis +/- 3%.
X-Axis +/- 6%.

Bandwidth

DC - 1 MHz (-3db).

X-Y Phase Difference

Approximately 3° at 50 kHz.

SWEEP SYSTEM

Sweep Display Mode

Main, Mix, Delay (7026A only).

Hold Off Time

5:1 continuously variable.

MAIN SWEEP

Sweep Speed

0.1 μ S/DIV - 0.2 s/DIV in 1-2-5 sequence, 20 steps.

Accuracy

+/- 3%.

Variable Time Control

5:1, uncalibrated, continuously variable between steps.

Sweep Magnification
10X, +/- 10%, extend sweep speed up to 10 nS/DIV.

DELAY SWEEP (7026A only)

Sweep Speed
0.1 μ S/DIV - 0.2 s/DIV in 1-2-5 sequence, 20 steps.

Accuracy
+/- 3%.

Sweep Magnification

10X, +/- 10%, extend sweep speed up to 10 ns/DIV.

Delay Time Position

Variable control to locate desirable waveform for extending.

TRIGGERING

Trigger Coupling

AUTO, NORM, TV-V, TV-H.

Trigger Source

CH 1, CH 2, ALT, LINE, EXT.

Slope

+/-

TRIGGER SENSITIVITY

COUPLING	BANDWIDTH	INT	EXT
TV-V	DC - 1 kHz	1.0 DIV	0.5 Vp-p
TV-H	1 kHz - 100 kHz	1.0 DIV	0.5 Vp-p
AUTO	100 Hz - 20 MHz	1.5 DIV	0.5 Vp-p
NORM	100 Hz - 20 MHz	1.5 DIV	0.5 Vp-p

Dimensions

324 (W) x 398 (D) x 132 (H) mm.

Net Weight

Approx. 7.6 kg.

Rated Range of Use

10°C-35°C, 10-80% R.H.

COMPONENT TEST (7026A only)

Test Voltage

Max. 6 Vrms (open circuit).

Test Current

Max. 11 mA (shorted).

Test Frequency

Line Frequency.

Components

Capacitor, Inductor, Diode, Transistor, Zener etc.

CH 2 OUTPUT (7026A only)

Output level

100 mV/DIV (no load).
50 mV/DIV (with 50 Ω load).

Bandwidth

20 Hz-20 MHz (-3db).

Graticule Illumination (7026A only)

Adjustable.

Calibrator

Square wave about 1 kHz, 2 Vp-p \pm 3%.

Z-Modulation (7026A only)

Positive TTL signal, low level blank intensity at any intensity, high level unblank any intensity.

Trace Rotation

Adjustable on front panel.

Power Source

110V, 125V, 220V, 240VAC, 50/60 Hz.

Power Consumption

Approx. 38 Watts.

Limits of Operation

0°C-50°C, 10-80% R.H.

Storage Environment

-30°C-70°C, 10-90% R.H.

40 MHz OSCILLOSCOPE SPECIFICATIONS

CATHODE RAY TUBE

6 inch diagonal, rectangular screen with internal graticule 8 x 10 DIV (1 DIV = 1 cm), B31 phosphor.

HOIZONTAL DEFLECTION

X-Y Mode switch selectable using X-Y switch
CH 1: X axis.
CH 2: Y axis.

VERTICAL DEFLECTION

Accuracy
Y-Axis +/- 3%.
X-Axis +/- 6%.

Bandwidth

DC-40 MHz (-3db).

Sensitivity

1 mV/DIV - 1 V/DIV (10 MHz, -3db), x5 gain selected.
5 mV/DIV - 5 V/DIV.

Attenuator

1-2-5 sequence, 10 step with variable control.

Input Impedance

1M Ω +/- 2%, 25 pF +/- 10%.

Max. Input Voltage

400V (DC + AC peak).

Rise Time

About 8.8 nS.

Over Shoot

Less than 5%.

Operation Mode

CH 1, CH 2, DUAL (ALT, CHOP).

Algebraic Addition

CH 1 + CH 2, CH 1 - CH 2.

Inverter

CH 2 only.

Hold Off Time

5:1 continuously variable.

MAIN SWEEP

Sweep Speed

0.1 μ S/DIV - 2.0 s/DIV in 1-2-5 sequence, 23 steps.

Accuracy

+/- 3%.

Variable Time Control

5:1, uncalibrated, continuously variable between steps.

Sweep Magnification

10X, +/- 10%, extend sweep speed up to 10 nS/DIV.

DELAY SWEEP (7046A only)

Sweep Speed

0.1 μ S/DIV - 2.0 s/DIV in 1-2-5 sequence, 23 steps.

Accuracy

+/- 3%.

Sweep Magnification

10X, +/- 10%, extend sweep speed up to 10 ns/DIV.

Delay Time Position

Variable control to locate desirable waveform for extending.

TRIGGERING

Trigger Coupling

AUTO, NORM, TV-V, TV-H.

Trigger Source

CH 1, CH 2, ALT, LINE, EXT.

Slope

+/-

TRIGGER SENSITIVITY

COUPLING	BANDWIDTH	INT	EXT
TV-V	DC - 1 kHz	1.0 DIV	0.5 Vp-p
TV-H	1 kHz - 100 kHz	1.0 DIV	0.5 Vp-p
AUTO	100 Hz - 40 MHz	1.5 DIV	0.5 Vp-p
NORM	100 Hz - 40 MHz	1.5 DIV	0.5 Vp-p

Dimensions

1324 (W) x 398 (D) x 132 (H) mm.

Net Weight

Approx. 7.6 kg.

Rated Range of Use

10°C-35°C, 10-80% R.H.

COMPONENT TEST (7046A only)

Test Voltage

Max. 6 Vrms (open circuit).

Test Current

Max. 11 mA (shorted).

Test Frequency

Line Frequency.

Components

Capacitor, Inductor, Diode, Transistor, Zener etc.

CH 2 OUTPUT (7046A only)

Output level

100 mV/DIV (no load).
50 mV/DIV (with 50 Ω load).

Bandwidth

20 Hz- 40 MHz (-3db).

Graticule Illumination (7046A only)

Adjustable.

Calibrator

Square wave about 1 kHz, 2 Vp-p \pm 3%.

Z-Modulation (7046A only)

Positive TTL signal, low level blank intensity at any intensity, high level unblank any intensity.

Trace Rotation

Adjustable on front panel.

Power Source

110V, 125V, 220V, 240VAC, 50/60 Hz.

Power Consumption

Approx. 38 Watts.

Limits of Operation

0°C-50°C, 10-80% R.H.

Storage Environment

-30°C-70°C, 10-90% R.H.

60 MHz OSCILLOSCOPE SPECIFICATIONS

CATHODE RAY TUBE

6 inch diagonal, rectangular screen with internal graticule 8 x 10 DIV (1 DIV = 1 cm), B31 phosphor, 12kV accel voltage.

VERTICAL DEFLECTION

Bandwidth
DC- 60 MHz (-3db).

Sensitivity

1 mV/DIV - 1 V/DIV (15 MHz, -3db), x5 gain selected.
5 mV/DIV - 5 V/DIV.

Attenuator

1-2-5 sequence, 10 step with variable control.

Input Impedance

1M Ω +/- 2%, 25 pF +/- 10%.

Max. Input Voltage

400V (DC + AC peak).

Rise Time

About 5.8 ns.

Over Shoot

Less than 5%.

Operation Mode

CH 1, CH 2, DUAL (ALT, CHOP).

Algebraic Addition

CH 1 + CH 2, CH 1 - CH 2.

Inverter

CH 2 only.

HORIZONTAL DEFLECTION

X-Y Mode switch selectable using X-Y switch
CH 1: X axis.
CH 2: Y axis.

Accuracy

Y-Axis +/- 3%.
X-Axis +/- 6%.

Bandwidth

DC - 1 MHz (-3db).

X-Y Phase Difference

Approximately 3° at 50 kHz.

SWEEP SYSTEM

Sweep Display Mode

Main, Mix, Delay (7066A only).

Hold Off Time

5:1 continuously variable.

MAIN SWEEP

Sweep Speed

0.1 μ S/DIV - 2.0 s/DIV in 1-2-5 sequence, 23 steps.

Accuracy

+/- 3%.

Variable Time Control

5:1, uncalibrated, continuously variable between steps.

COMPONENT TEST (7066A only)

Test Voltage

Max. 6 Vrms (open circuit).

Test Current

Max. 11 mA (shorted).

Test Frequency

Line Frequency.

Components

Capacitor, Inductor, Diode, Transistor, Zener etc.

CH 2 OUTPUT (7066A only)

Output level

100 mV/DIV (no load).
50 mV/DIV (with 50Ω load).

Bandwidth

20 Hz-60 MHz (-3db).

Graticule Illumination (7066A only)

Adjustable.

Calibrator

Square wave about 1 kHz, 2 Vp-p ±3%.

Z-Modulation (7066A only).

Positive TTL signal, low level blank intensity at any intensity, high level unblank any intensity.

Trace Rotation

Adjustable on front panel.

Power Source

110V, 125V, 220V, 240VAC, 50/60 Hz.

Power Consumption

Approx. 38 Watts.

Limits of Operation

0°C-50°C, 10-80% R.H.

Storage Environment

-30°C-70°C, 10-90% R.H.

7

Sweep Magnification

10X, +/- 10%, extend sweep speed up to 10 nS/DIV.

DELAY SWEEP (7066A only)

Sweep Speed
0.1 μs/DIV - 2.0 s/DIV in 1-2-5 sequence, 23 steps.

Accuracy

+/- 3%.

Sweep Magnification

10X, +/- 10%, extend sweep speed up to 10 nS/DIV.

Delay Time Position

Variable control to locate desirable waveform for extending.

TRIGGERING

Trigger Coupling

AUTO, NORM, TV-V, TV-H.

Trigger Source

CH 1, CH 2, ALT, LINE, EXT.

Slope

+/-

TRIGGER SENSITIVITY

COUPLING BANDWIDTH INT EXT

TV-V	DC - 1 kHz	1.0 DIV	0.5 Vp-p
TV-H	1 kHz - 100 kHz	1.0 DIV	0.5 Vp-p
AUTO	100 Hz - 60 MHz	1.5 DIV	0.5 Vp-p
NORM	100 Hz - 60 MHz	1.5 DIV	0.5 Vp-p

Dimensions

324 (W) x 398 (D) x 132 (H) mm.

Net Weight

Approx. 7.6 kg.

Rated Range of Use

10°C-35°C, 10-80% R.H.

PRECAUTION BEFORE OPERATING

Unpack the oscilloscope

Upon receipt of the instrument, please unpack and inspect it for any damage which might have been sustained during transportation. If any sign of damage is found, please notify the dealer.

Environments

The normal ambient temperature range of this oscilloscope is 5 C to 40 C, and the maximum relative humidity 80% for temperatures up to 31 C, decreasing linearly to 50% relative humidity at 40 C. This instrument is for INDOOR USE ONLY.

This equipment has been evaluated to INSTALLATION CATEGORY (OVERVOLTAGE CATEGORY) II. POLLUTION DEGREE 2.

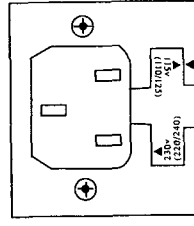
Check the Line Voltage

The oscilloscope can operate on any one of the line voltages shown in the below table, by inserting the line voltage selector plug in the corresponding position on the rear panel. Before connecting the power plug to an AC line outlet, be sure to check that the voltage selector plug is set in the correct position corresponding to the line voltage. Note the oscilloscope may not properly operate or may be damaged if it is connected to a wrong AC line voltage.

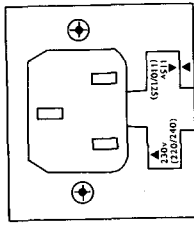
When line voltage are changed, replace fuses also as required.

SELECTOR	LINE VOLTAGE	FUSE
115V	100-130V 50/60 Hz	800mA
230V	200-260V 60/60 Hz	600mA

Voltage selector plug on rear panel of instrument it shown below.



Line Voltage Range: 100-130
Fuse 800mA
Selector: 115V



Line Voltage Range: 200-260
Fuse 600mA
Selector: 230V

Hints for operating oscilloscope

Observe the following suggestions for successful instrument operation:

- * NEVER place heavy objects on oscilloscope.
- * NEVER place a hot soldering iron on or near the cabinet or especially near the CRT screen.
- * Do not insert wires, pins, or other metal objects into ventilation holes.
- * Do not move or pull oscilloscope with power cord or input probe cord. Especially never move instrument when power cord or signal input leader is connected to a circuit.
- * If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

8

CONTROL AND INDICATORS

OPERATING CONTROLS, INDICATORS, AND CONNECTORS

FRONT PANEL

Fig 1, 2, 3 show the model 7000A series oscilloscope front panel operating controls, indicators, and signal input connectors.

CRT CIRCUIT

POWER (30)
Main power switch of the instrument. When this switch is turned on, the LED (29) above the switch is also turned on.

ILLUM. (30)
Graticule illumination adjustment (70X6A only).

INTENSITY control (31)
Controls brightness of display. Clockwise rotation increases brightness.

FOCUS control (28)
After obtaining appropriate brightness with **INTENSITY**, adjust **FOCUS** for clearest line.

BEAM FIND pushbutton (12)
Brings beam trace to center area of screen regardless of location (70X6A only).

TRACE ROTATION (29)
Semi-fixed potentiometer for aligning the horizontal trace in parallel with graticule lines.

VERTICAL DEFLECTION

CH 1 (X) input (1)
Vertical input terminal of CH1. During X-Y operation, this becomes X-axis (abscissa) input terminal.

CH 2 (Y) input (13)
Vertical input terminal of CH2. During X-Y operation, this becomes Y-axis (ordinate) input terminal.

DC/GND/AC switches (2) (14)
Selects following input coupling options for CH1, CH2 (13):

DC: dc coupling, all signal are directly connected to attenuator.
GND: input signal is switched off and attenuator is grounded.
AC: blocks dc signal component allowing only AC signal to pass into attenuator.

CH1/CH2 VOLT/DIV switches (4) (10)
CH1 (X)/CH2 (Y) attenuator. Selects deflection factor from 5v/div to 5mv/div (1-2-5 sequence, 10 positions).

VARIABLE (5) (1)
Fine adjustment of sensitivity, with a factor of 1/3 or lower of the panel-indicated value. At the CAL position, sensitivity is calibrated to the panel-indicated value. When this knob is pulled out (x5 MAG state), the amplifier sensitivity is multiplied by 5 times.

POSITION (25)
CH2 vertical positioning control of trace or spot. Pulling up position is inverter.

POSITION (27)
CH1 vertical positioning control of trace or spot. Pulling up position is ALT TRIG.

VERT MODE (7)
Selects the operation mode of the vertical DEFLECTION.
CH1: CH1 operates alone.
CH2: CH2 operates alone and (X-Y) switch.

DUAL: Dual-channel operation with CH1 and CH2 swept alternately. Suitable for observation with fast sweep speeds.
CHOP: The operation between channels chopped at a frequency of approximately 500 kHz of displayed channels. Suitable for observation with slow sweep speeds. When use chop, pull up **HOLD OFF** switch.

ADD: For measurement of algebraic sum or difference of CH1 and CH2 signals, employing the function of CH2 **PULL INV** switch.

TRIGGERING

TRIGGER SOURCE switch (23)
Selects the trigger source by setting switch to
CH1: The CH1 signal become the trigger source regardless of

the **VERTICAL MODE** selection.
CH2: The CH2 signal become the trigger source.
LINE: AC line signal is used as trigger source.
EXT: Trigger signal is obtained from EXT TRIG connector.

EXT TRIG input terminal (16)
Signal from EXT TRIG connector becomes trigger source. To use this function, set **TRIGGER SOURCE** switch (23) to the EXT position.

TRIGGER COUPLING switch (24)

Selects trigger mode
AUTO: In automatic triggering mode, sweep is generated in absence of adequate trigger signal; automatically reverts to triggered sweep operation when adequate triggered signal is present.

NORM: In normal triggering mode, sweep is only generated when adequate trigger signal is present.

TV-V: Trigger bandwidth range is DC - 1kHz
TV-H: Trigger bandwidth range is 1kHz - 100kHz

SLOPE AND TRIG LEVEL (26)

Selects triggering slope:
“+” Triggering occurs when trigger signal crosses trigger level in a positive-going direction. Push down to be slop “+”.
“-” Triggering occurs when trigger signal crosses trigger level in a negative-going direction. Pull up to be slop “-”.



