Safety precautions

To ensure safe operation of the equipment and eliminate the danger of serious injury due to short-circuits (arcing), the following safety precautions must be observed.

Damages resulting from failure to observe these safety precautions are exempt from any legal claims whatever.

- prior to connection of the equipment to the mains outlet, check that the available mains voltage corresponds to the voltage setting of the equipment.
- connect the mains plug of the equipment only to a mains outlet with earth connection.
- do not place the equipment on damp or wet surfaces.
- do not subject the equipment to direct sunlight or extreme temperatures.
- do not subject the equipment to extreme humidity or dampness.
- replace a defective fuse only with a fuse of the original rating. **Never** short-circuit fuse or fuse housing.
- do not exceed the maximum permissible input ratings.
- conduct measuring works only in dry clothing and in rubber shoes i.e. on isolating mats.
- comply with the warning labels and other info on the equipment.
- check test leads and probes for faulty insulation or bare wires before connection to the equipment.
- disconnect test leads or probe from the measuring circuit before switching modes or functions.
- do not cover the ventilation slots of the cabinet to ensure that the air is able to circulate freely inside.
- do not insert metal objects into the equipment by way of the ventilation slots.
- do not place water-filled containers on the equipment (danger of short-circuit in case of knockover of the container).
- do not operate the equipment near strong magnetic fields (motors, transformers etc.)
- do not subject the equipment to shocks or strong vibrations.
- keep hot soldering irons or guns away from the equipment.
- allow the equipment to stabilize at room temperature before taking up measurement (important for exact measurements)
- do not modify the equipment in any way.
- do not place the equipment face-down on any table or work bench to prevent damaging the controls at the front.
- opening the equipment and service- and repair work must only be performed by qualified service personnel. Repair work should only be performed in the presence of a second person trained to administer first aid, if needed.

Cleaning the cabinet

Prior to cleaning the cabinet, withdraw the mains plug from the power outlet. Clean only with a damp, soft cloth and a commercially available mild household cleanser. Ensure that no water gets inside the equipment to prevent possible shorts and damage to the equipment.

Measuring instruments don't belong to children's hands

Caution and warning statements

CAUTION	Is used to indicate correct operating or maintenance procedures in order to prevent damage or destruction of the equipment or other property
WARNING	Calls attention to a potential danger that requires correct procedures or practices in order to prevent personal injury.

Symbols

Caution (refer to accompanying documents) and Warning

protective ground (earth) symbol

1. Introduction

Thank you for purchasing this product. This oscilloscope is a high technical product made under strict quality control. We guarante their exceptional precision and utmost reliability. For proper use of the proudct please read this user manual carefully.

1.1 Instructions

1. To maintain the precision and reliability of the product use it in the standard setting (temperature 10° to 35° centigrade, humidity 45 - 85 %).

2. After turning on power, please allow a 20-minute pre-heating period before use.

3. Triple-line power cord is to be used for the product. But when you are using the doubleline cord, make sure for safety.

4. For quality improvement the exterior design and specifications of the product can be changed without prior notice.

5. If you have further questions concerning use, please contact your dealer.

1.2 Specifications

CRT

Configuration	6-inch rectangular tube with internal gratitude;
Effective Surface	8 x 10 division (1 div. = 1 cm), marking for measuring rise and fall time. control axis is graduated in 2 mm subdivisions.
Accelerating Potential	approx. +1.9 kV DC (Cathode basis)
Phosphor	P31 (Standard)
Focussing	possible
Trace rotation	provided
Intensity Control	provided

Z-Axis input (Intensity Modulation)

Input signal	Positive going signal decreases intensity +5 V_{pp} or more signal cases noticeable modulation at normal intensity settings.
Band width	DC-2 MHz (-3 dB)
Coupling	DC
Input impedance	20 k - 30 kΩ

Maximum input voltage	30 V (DC + peak AC)

Vertical Deflection

Band width (-3 dB)	
DC coupled	DC to 20 MHz normal (x 1) DC to 10 MHz magnified (x 5) - only CH 1
AC coupled	10 Hz to 20 MHz normal (x 1) 10 Hz to 10 MHz magnified (x 5) - only CH 1
Modes	CH1, CH2, ADD, DUAL (CHOP: Time/div switch): 0,2 s-1 ms, ALT: Time/div. switch: 0,5 ms-0.2 µs
Deflection Factor	5 mV/div to 20 V/div in 10 calibrated steps of a 1-2-5 sequence. Continuously variable between steps at least 1:2.5 X5 MAG: 1 mV/div. to 1 V div. in 10 calibrated steps (CH 1 only)
Accuracy	Normal: ± 3 %, Magnified: ± 5 % (only CH 1)
Input impedance	approx. 1 MΩ in parallel with 30 pF
Maximum input voltage	Direct: 400 V (DC + peak value AC) Probe: refer to probe specification
Input Coupling	DC-GND-AC
Rise Time	17.5 ns of less (35 ns or less: x 5 MAG)
CH 1 Output	Termination connection 25 mV/div to 50 Ω: 20 Hz to 10 MHz (-3 dB)
Polarity Inversion	CH 2 only

Horizontal Deflection

Display modes	x 1, x10, VARIABLE, X ˙ Y,
Time base	0,2 µs, div to 0.2 s/div in 19 calibrated steps with 1-2-5 sequence uncalibrated continuous control of over 2.5 times is possible
Sweep Magnifications	10 times (maximum sweep rate: 20 ns/div. Note: 50 ns/div of A Time bases are ± 10 %
Accuracy	± 3 %, ± 5 % (0° C to 40° C), ± 2% increase when magnified

Trigger System

Modes	AUTO, NORM, TV-V, TV-H
Source	VERT (DUAL, ALT), CH1, LINE, EXT
Coupling	AC
Slope	+ or -

Senstivity & Frequency Range

AUTO, NORM

	20 Hz - 2 MHz	20 Hz - 20 MHz
INT (VERT)	0.5 div (2.0 div)	1.5 div (3.0 div)
EXT	0.2 V_{p-p}	0.8 V_{p-p}

TV-V, TV-H	at least 1 div. or 1.0 V_{pp}
External trigger input impdance	Capactive of some 30 pF with approx. 1 MΩ in parallel

Max. Input voltage 400 V DC + peak value AC

X-Y Operation

X-axis (Same as CH 1 except for the following)
Deflection Factor: Same as of CH 1
Accuracy: ± 5 %
Frequency Response: DC to 500 kHZ (-3 dB)

Y-axis Same as CH 2
X-Y Phase Difference 3° or less (up to 50 kHz in DC)

Component Test (PeakTech 2030 KT only)
*one test lead is grounded (safety earth

Test voltage approx. 4,5 V_{rms} (open circuit)
Test current max. 6,6 mA_{rms} (short circuit)
Test frequency approx. 60 Hz

Calibrator (Probe Adjustor) approx. 1 kHz ± 20 %, 0.5 V (± 10 %) square wave duty ratio: 40 ~60%

Power Supply

Voltage range	Fuse (250 V)	
	UL 198 G	**IEC 127**
115 (98 – 125 V) AC	1.25 A	1.25 A
230 (198-250 V) AC	0,63 A	0,63 A

Frequency 50/60 Hz
Power Consumption approx. 45 W

Weight/Dimension
Weight 7,8 kg
Dimension 316 mm (W) x 132 mm (H) x 410 mm (L)

Environmental Charac.

Temperature range for rated operation +10° C to + 35° C (+50° F to +95° F)

Max. ambient operating temperature 0° C to +40° C (+32° F to 104° F)

Max. storage temperature -20° C to +70° C (-4° F to 158° F)

Humidity range for rated operation 45 % to 85 % RH

Max. ambient operating humidity 35 % to 85 % RH

Safety EN 61010-1 overvoltage CAT II, degree of polution 2
Approval: TÜV/GS

EMC Interference: EN 50081-1
Susceptability: EN 50082-1, IEC801-2, 3, 4

Caution: Sources like small hand-held radio transceivers, fixed station radio and television transmitters, vehicle radio transmitters and cellular phones generate electromagnetic radiation that may induce voltages in the leads of a test probe in such cases the accuracy of the oscilloscope cannot be guaranteed due to physical reasons. Using the 8 div scale, the oscilloscope radiation can be exceeded the limit.

1.3 Precautions

1.3.1 Line voltage selection

This instrument must be operated with the correct Line Voltage Selector Switch setting and the correct line fuse for the voltage selected to prevent damage. The instrument operates from either a 98 to 125 volts or a 198 to 250 volt line voltage source. Before line voltage is applied to the instrument, make sure the Line Voltage Selector is set correctly.

To change the line voltage selection:

1. Make sure the instrument is disconnected from the power source.

2. Switch the line voltage selector to the desired position.

3. Pull out the Line Fuse Holder containing the fuse for overload protection. Replace the fuse in the holder with the correct fuse from table 1-1 and plug it in.

Table 1-1: Line voltage Selection and Fuse ratings

Line voltage	Arrow Mark Position	Fuse Ratings (250 V)	
		UL198 G	IEC127
98 to 125 volts	115	F 1,25 A	F1.25 A
198 to 250 volts	230	F0.63 A	F0.63 A

1.3.2 Installation and handling precautions

When placing the PeakTech 2020 GN or PeakTech 2030 KT in Service at your workplace, observe the following precautions for best instrument performance and longest service life.

- Avoid placing this instrument in an extremely hot or cold place. Specifically, don't leave this instrument in a close car, exposed to sunlight in midsummer, or next to a space heater.
- Don't use this instrument immediately after bringing it in from the cold. Allow time for it to warm to room temperature. Similiary don't move it from a warm place to a very cold place, as condensation might impair its operation.
- Do not expose the instrument to wet or dusty environments.
- Do not place liquid-filled containers (such as coffee cups) on top of this instrument. A spill could seriously damage the instrument.
- Do not use this instrument where it is subject to severe vibration, or strong blows.
- Do not place heavy objects on the case, or otherwise block the ventilation holes.
- Do not use this oscilloscope in strong magnetic fields, such as near motors.
- Do not insert wires, tools, etc. through the ventilation holes.
- Do not leave a hot soldering iron near the instrument.
- Do not place this scope face down on the ground, or damage to the knobs may result.
- Do not use this instrument upright while BNC cables are attached to the rear-panel connectors. This will damage the cable.
- Do not apply voltages in excess of the maximum ratings to the input connectors or probes.

2. Operating instructions

This section contains the information needed to operate the PeakTech 2020 GN or PeakTech 2030 KT and utilize it in a variety of basic and advanced measurement procedures. Included are the identification and function of controls, connectors, and indicators, startup procedures, basic operation routines, and selected measurement procedures.

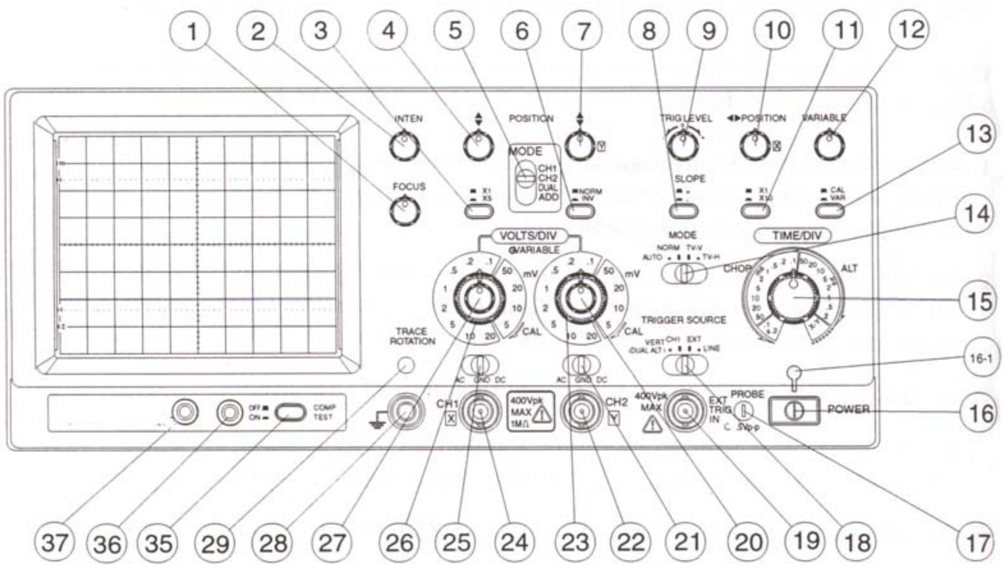


Fig. 2-1 Front Panel Items

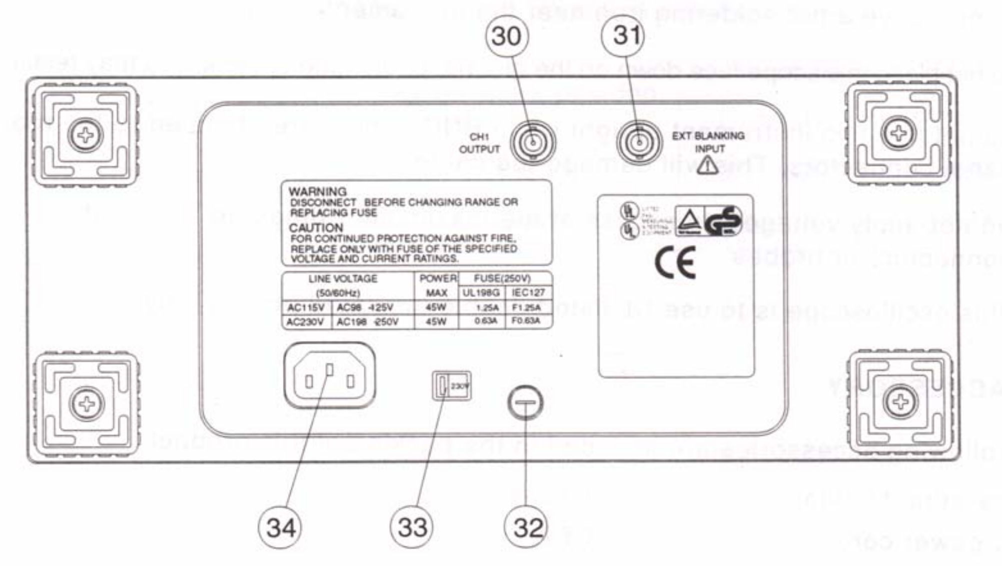


Fig. 2-2 Rear Panel Items

2.1 Function of controls, connectors and indicators

Before turning this instrument on, familiarize yourself with the controls, connectors, indicators, and other features described in this section. The following descriptions are keyed to the items called out in Figures 2-1 and 2-2.

2.1.1 Display and Power Blocks

(16) POWER switch
Push into turn instrument power on and off.

(16-1) POWER lamp
Sights when power is on

(2) INTEN control
Adjusts the brightness of the CRT display. Clockwise rotation increases brightness.

(1) FOCUS control
To obtain maximum trace sharpness.

(29) Rotation control
Allows screwdriver adjustment of trace alignment with regard to the horizontal gratitude lines of CRT.

(32) Fuse holder

(33) Voltage Selector
Permits changing the operating voltage range

(34) Power Connector
Permits removal or replacement of the AC power cord.

2.1.2 Vertical Amplifier Block

(24) CH1 or X IN connector
For applying an input signal to vertical amplifier channel 1, or to the X-axis (horizontal) amplifier during X-Y operation.

Caution:
To avoid damage to the oscilloscope, do not apply more than 400 V (DC + Peak AC) between "CH1" terminal and ground.

(22) CH2 or Y IN connector
For applying an input signal to vertical amplifier channel 2, or to the Y-axis (vertical) amplifier during X-Y operation.

Caution:
To avoid damage to the oscilloscope, do not apply more than 400 V (DC + Peak AC) between "CH" terminal and ground.

(25) CH1 AC/GND/DC switch
To select the method of coupling the input signal to the CH 1 vertical amplifier. AC position inserts a capacitor between the input connector and amplifier to block any DC component in the input signal. GND position connects the amplifier to ground instead of the input connector, so a ground reference can be established.
DC position connects the amplifier directly to its input connector, thus passing all signal components onto the amplifier

(21) CH 2 AC/GND/DC switch
To select the method of coupling the input signal to the CH 2 vertical amplifier.

(26) CH 1 VOLTS/DIV switch
To select the calibrated deflection factor of the input signal fed to the CH 1 vertical amplifier.

(23) CH 2 VOLTS/DIV switch
To select the calibrated deflection factor of the input signal fed to the CH 2 vertical amplifier.

(27)+ VARIABLE controls
(20) Provide continuously variable adjustment of deflection factor between steps of the VOLTS/DIV switches.

VOLTS/DIV calibrations are accurate only when the VARIABLE controls are click-stopped in their fully clockwise position.

(3) X5 MAG switch
The sensibility of vertical axis will become 5 times if the switch is selected at X5 MAG. That's to say, the measuring voltage will be 1/5 of indicator value of volts/div. (in this instance the maximum sensitivity will be 1 mV/div.)

(4) CH 1 POSITION control
For vertically positioning the CH 1 trace on the CRT screen. Clockwise rotation moves the trace upward, counterclockwise rotation moves the trace down.

(7) CH 2 Position control
For vertically positioning the CH 2 trace on the CRT screen. Clockwise rotation moves the trace upward, counterclockwise rotation moves the trace downward.

(6) CH 2 INV switch
Select switch at INV the signal added to CH 2 will be turned over.

(5) V MODE Switch
To select the vertical-amplifier display mode.

CH1 position displays only the channel 1 input signal on the CRT screen.
CH2 position displays only the channel 2 input signal on the CRT screen.
DUAL position displays the CH 1 and CH 2 input signal on the CRT screen simultaneously.

CHOP mode: TIME/DIV 0.2 s-5 ms
ALT mode: TIME/DIV 2 ms-0.2 µs

ADD position displays the algebraic sum of CH 1 & CH 2 signals.

(30) CH 1 OUTPUT connector
Connector provides amplified output of the channel 1 signal suitable for driving a frequency counter or other instrument.

2.1.3 Sweep and Trigger Blocks

(15) TIME/DIV switch
To select either the calibrated sweep rate of the main timebase, the delay-time range for delayed-sweep operation, or X-Y operation

(13) CAL/VAR switch
to change between CALibrated Time/Div steps and VARiable control

(12) VARIABLE control
Provides continuously variable adjustment of sweep rate between steps of the TIME/DIV switch. TIME/DIV calibrations are accurate only when the VARIABLE control is click-stopped fully clockwise.

(11) X10 MAG switch
Placing the switch on X10 MAG sweep time will expanded to 10 times and in this instance sweep time becomes 1/10 of TIME/DIV inicator value.

(10) Horizontal POSITION control
To adjust the horizontal position of the traces displayed on the CRT. Clockwise rotation moves the traces to the right, counterclockwise rotation moves the traces to the left.

(14) Trigger MODE switch
To select the sweep triggering mode. AUTO position selects free-running sweep where a baseline is displayed in the absence of a signal. This condition automatically reverts to triggered sweep when a trigger signal of 25 Hz or higher is received and other trigger controls are properly set.

NORM position produces sweep only when a trigger signal is received and other controls are properly set. No trace is visible if any trigger requirement is missing. This mode must be used when the signal frequency is 25 Hz or lower.

TV-V position is used for observing a composite video signal at the frame rate.
TV-H position is used for observing a composite video signal at the line rate.

(18) Trigger SOURCE switch
To conveniently select the trigger source.

VERT: In case of vertical mode switch is CH 1 which automatically becomes registry source.
In case of vertical mode switch is CH 2 which automatically becomes registry source.

Note:
Measurement of VERT condition will be possible only Time/Div. switch is on 0,5 ms/Div. to 0.2 µs/Div. when it is dual mode. When there is no sign on CH 1 & CH 2 place the vertical mode switch to dual and set TRIGGER SOURCE switch at VERT sweep may flickers but please be careful as it is not out of order.

CH 1: When there is sign on CH 1 you may select trigger source CH 1.

LINE position selects a trigger derived from the AC power line. This permits the scope to stabilize display linearelated components of a signal even they are very small compared to other components of the signal.

EXT position selects the signal applied to the EXT TRIG IN connector.

(9) Trigger LEVEL control
To select the trigger-signal amplitude at which triggering occurs. When rotated clockwise, the trigger point moves toward the positive peak of the trigger signal. When its control is rotated counter-clockwise, the trigger point moves toward the negative peak of the trigger signal.

(8) Trigger SLOPE switch
To select the positive or negative slope of the trigger signal for initiating sweep.

(19) EXT TRIG IN connector
For applying external trigger signal to the trigger circuits.

Caution:
To avoid damage to the oscilloscope, do not apply more than 250 V (DC + Peak AC) between "EXT TRIG IN" terminal and ground.

2.1.4 Miscellaneous Features

(31) EXT BLANKING INPUT connector
For applying signal to intersity modulate the CRT. Trace brightness is reduced with a positive signal, and increased with a negative signal.

(17) PROBE ADJUST
Provides a fast-rise square wave of precise amplitude for probe adjustment and vertical amplifier calibration.

(28) Ground connector
Provides an attachment point for separate ground lead.

2.1.5 Component Test Block (only PeakTech 2030 KT)

(35) Component Test switch
Push to test the component. Then the horizontal bar graph of 8 div is displayed on the screen.

(36) Component Test Input (red)
Be used for connecting component to component test circuit with DMM probe (red).

(37) Component Test GND (black)
Be used for grounding component to component test circuit with DMM probe (black)

2.2 Basic Operationg Procedures

The following paragraphs in this section describe how to operate the PeakTech 2020 GN and PeakTech 2030 KT, beginning with the most elementary operating modes, and progressing to the less frequently-used/or complex modes.

2.2.1 Preliminary Control Settings and Adjustments

Before placing the instrument in use, set up and check the instrument as follows:

1. Set the following controls as indicated

POWER Switch (16)	OFF (relaesed)
INTEN control (2)	Fully CCW
FOCUS control (1)	Mid rotation
AC/GND/DC switches (25) (21)	AC
VOLTS/DIV switches (26) (23)	20 mV
X5 MAG switch (3)	X1
Vertical POSITION controls (4) (7)	Mid rotation
INV switch (6)	Norm
VARIABLE controls (27) (20)	Fully CW
V MODE switch (5)	CH1
TIME/DIV switch (15)	5 µs
VARIABLE control (13)	CAL
Horizontal POSITION conrol (10)	Mid rotation
X10 MAG switch (11)	X1
Trigger MODE switch (14)	AUTO
Trigger SOURCE switch (18)	INT, VERT
Trigger LEVEL control (9)	Mid rotation
SLOPE switch (8)	"+"

2. Connect the AC power cord to the power connector (34), then plug the cord into a convenient AC outlet.

3. Press in the POWER switch (16). The POWER lamp (16-1) should light immediately. About 30 seconds later, rotate the INTEN control (2) clockwise until the trace appears on the CRT screen. Adjust brightness to your liking.

Caution: A burn resistant material is used in the CRT. However if the CRT is left with an extremely bright dot or trace for a very long time, the screen may be damaged. Therefore, if a measurement requires high brightness, be certain to turn down the INTEN control immediately afterward. Also, get in the habit of turning the brightness way down if the scope is left unattended for any period of time.

4. Turn the FOCUS control (1) for a sharp trace.

5. Turn the CH 1 Vertical POSITION control (4) to move the CH 1 trace to the center horizontal gratitude line.

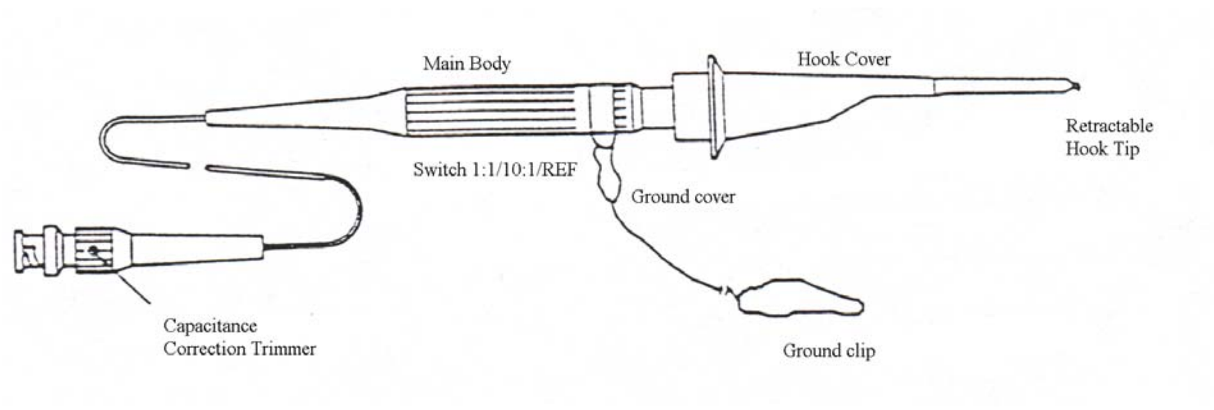
6. See if the trace is precisely parallel with the gratitude line. If it is not, adjust the Rotation control (29) with a small screwdriver.

7. Turn the Horizontal POSITION control (10) to align the left edge of the trace with the leftmost gratitude line.

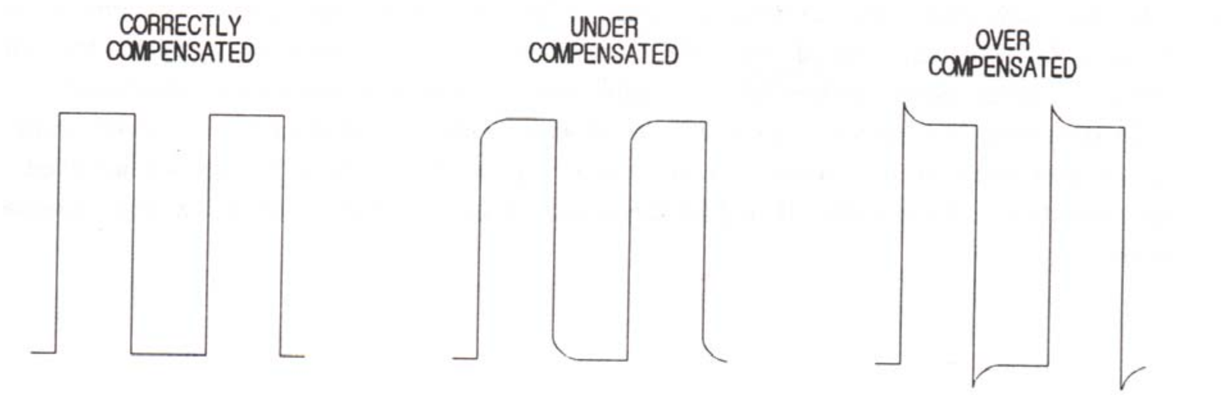
8. Set one of the supplied probes for 10 X attuation. Then, connect its BNC end to the CH 1 or X IN connector (24) and its tip the PROBE ADJUST connector (17). A square-wave display, two and a half divisions in amplitude, should appear on the CRT screen.

9. If the tops and bottoms of the displayed square waves are tilted or peaked, the probe must be compensated (matched to the scope input capacitance). Adjust the capacitance correction trimmer of the probe with small screwdriver. See figure 2-2 (b).

10. Set the V MODE switch (5) to CH 2, and perform steps 8 and 9 with the other probe on channel 2.



(a) Probe



(b) PROBE compensation by Correction Square-Wave

Abb. 2.2 Probe compensation

2.2.2 Signal Connections

There are three methods of connecting an oscilloscope to the signal you wish to observe. They are: a simple wire lead, coaxial cable, and scope probes.

A simple lead wire may be sufficient when the signal level is high and the source impedance low (such as TTL circuitry), but is not often used. Unshielded wire picks up hum and noise; this distorts the observed signal when the signal level is low.

Also, there is the problem of making secure mechanical connection to the input connectors. A binding post to BNC adapter is advisable in this case.

Coaxial cable is the most popular method of connecting an oscilloscope to signal sources and equipment having output connectors. The outer conductor of the cable shields the central signal conductor from hum and noise pickup. These cables are usually fitted with BNC connectors of each end, and specialized cable and adaptors are readily available for mating with other kinds of connectors.

Scope probes are the most popular method of connecting the oscilloscope to circuitry. These probes are available with 1 X attenuation (direct connection) and 10 X attenuation. The 10 X attenuator probes increase the effective input impedance of the probe/scope combination to 10 MΩ shunted by a few picofarads, the reduction in input capacitance is the most important reason for using attenuator probes at high frequencies, where capacitance is the major factor in loading down a circuit and distorting the signal. When 10 X attenuator probes are used, the scale factor (VOLTS/DIV switch setting) must be multiplied by ten.

Despite their high input impedance, scope probes do not pickup appreciable hum or noise. As was the case with coaxial cable, the outer conductor of the probe cable shields the central signal conductor. Scope probes are also quite convenient from a mechanical standpoint.

To determine if a direct connection with shielded cable is permissible, you must know the source impedance of the circuit you are connecting to, the highest frequencies involved, and the capacitance of the cable. If any of these factors are unknown, use a 10 X low-capacitance probe.

An alternative connection method at high frequencies is terminated coaxial cable. A feed-thru terminator have an impedance equal to that of the signal-source impedance is terminated coaxial cable. A feed-thru terminator having an impedance equal to that of the signal-source impedance is connected to the oscilloscope input connector. A coaxial cable of matching impedance connects the signal source to the terminator. This technique allows using cables of nearly and practical length without signal loss.

If a low-resistance ground connection between oscilloscope an circuit is not established, enormous amounts of hum will appear in the displayed signal. Generally, the outer conductor of shielded cable provides the ground connection. If you are using plain lead wire, be certain to first connect a ground wire between the oscilloscope Ground connector (28) and the chassis or ground bus of the circuit under observation.

WARNING!
The oscsilloscope has an earth-grounded chassis (via the 3-prong power cord). Be certain the device to which you connect the scope is transformer operated. Do not connect this oscilloscope or any other test equipment to "AC/DC", "hot chassis", or "transformerless" devices.

Similary, do not connect this scope directly to the AC power line or any circuitry connected directly to the power line. Damage to the instrument and severe injurt to the operator may result from failure to heed this warning.

2.2.3 Single-trace Operation

Single-trace operation with single timebase and internal triggering is the most elementary operating mode of the PeakTech 2020 GN or PeakTech 2030 KT. Use this mode when you wish to observe only a single signal, and not be disturbed by other traces on the CRT. Since this is fundamentally a two-channel instrument, you have a choice from your single channel. Channel 1 has an output terminal; use channel 1 if you also want to measure frequency with a counter while observing the waveform. Channel 2 has a polarity inverting switch. While this adds flexibility, it is not too useful in ordinary single-trace operation.

The PeakTech 2020 GN/PeakTech 2030 KT is set up for single-trace operation as follows:

1. Set the following controls as indicated below. Note that the trigger source selected (CH 1 or CH 2 Source) must match the single channel selected (CH 1 or CH 2 V MODE)

POWER switch (16)	ON (pushed in)
AC/GND/DC switches (25) (21)	AC
Vertical POSITION controls (4) (17)	Mid rotation
VARIABLE controls (27) (20)	Fully CW
V MODE switch (5)	CH 1 (CH 2)
VARIABLE control (13)	CAL
Trigger MODE switch (14)	AUTO
Trigger SOURCE switch (18)	VERT
Trigger LEVEL control (9)	Mid rotation

2. Use the corresponding Vertical POSITION control (4) or (7) to set the trace near mid screen.

3. Connect the signal to be observed to the corresponding IN connector (24) or (22) and adjust the corresponding VOLTS/DIV switch (26) or (23) so the displayed signal is totally on screen.

   Caution: Do not apply a signal greater than 250 V (DC + peak AC)

4. Set the TIME/DIV switch (15) so the desired number of signal cycles are displayed. For some measurements just 2 of 3 cycles are best; for other measurements 50-100 cycles appearing like a solid band works best. Adjust the Trigger LEVEL control (9) if necessary for a stable display

5. To set X5 MAG switch at x5 in case motif is not made or difficult to measure as the sign to be measured is too small despite VOLT/DIV, switch was placed at 5 mV.

   In this instance if VOLT/DIV. switch ist 5 mV, become to 1 mV/DIV and frequency oscillation reduces to 10 MHz and noise will be increased by the revolution.

6. To set X10 MAG switch at X 10 MAG (11) when too many cycles appear on even the TIME/DIV switch was put on 0.2 µs position as the sign try to be measured is a high frequency.

   Then, it will be 0.2 µs 20 ns/DIV because of sweep width increases by 10 times and in case of 0.5 µs it will be 50 ns/Div.

7. If the signal you wish to observe is either DC or low enough in frequency that AC coupling attenuates of distorts the signal, flip the AC/GND/DC switch (25) or (21) to DC.

   Caution: If the observed waveform is low-level AC, make certain it is not riding on a high-amplitude DC voltage.

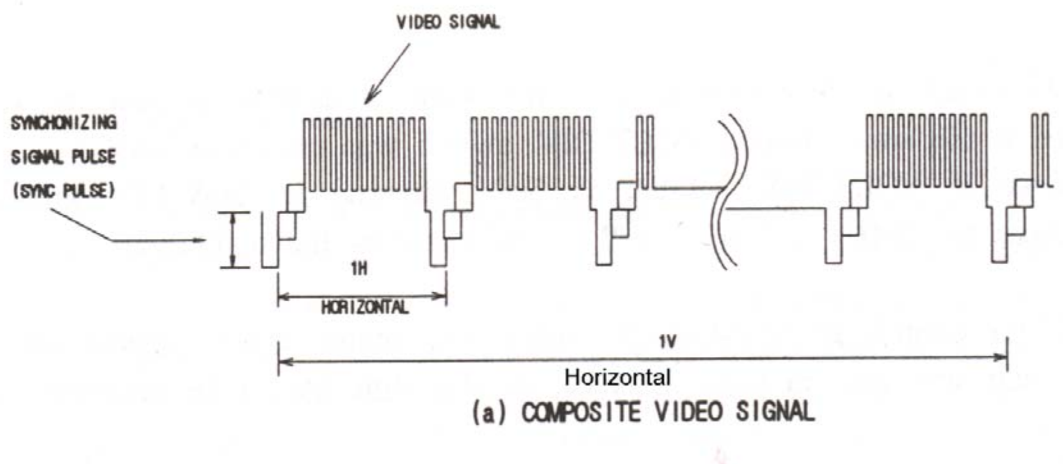
   You will also have to reset the Trigger MODE switch (14) to NORM if the signal frequency is below 25 Hz, and possibly readjust the Trigger LEVEL control (9).

2.2.4 Dual-trace operation

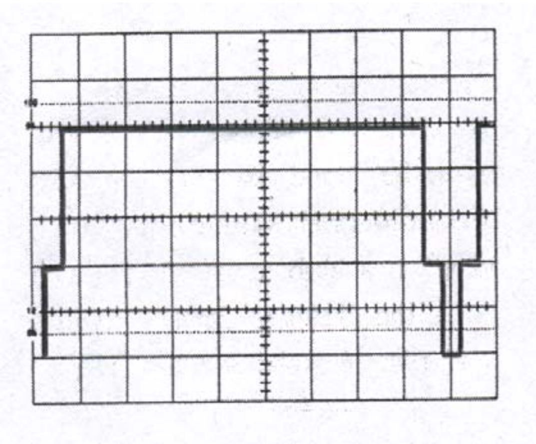
Dual-trace operation is the major operating mode of the PeakTech 2020 GN and PeakTech 2030 KT. The setup for dual-trace operation is identical to that of 2.3.2 Single-trace operation with the following exceptions:

1. Set the V MODE switch (5) to either DUAL. Select ALT for relatively high frequency signals (A TIME/DIV switch set to 0.5 ms or faster). Select CHOP for relatively low-frequency signals (TIME/DIV switch set to 1 ms or slower).

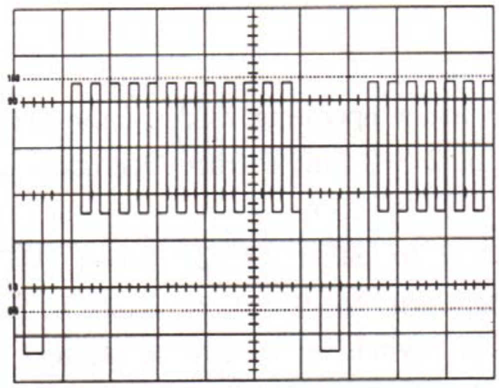
2. If both channels are displaying signals of the same frequency, set the Trigger SOURCE switch (18) to the channel having the steppest-slope waveform. If the signals are different but harmonically related, trigger from the channel carrying the lowest frequency. Also, remember that if you disconnect the channel serving as the trigger source, the entire display will free run.



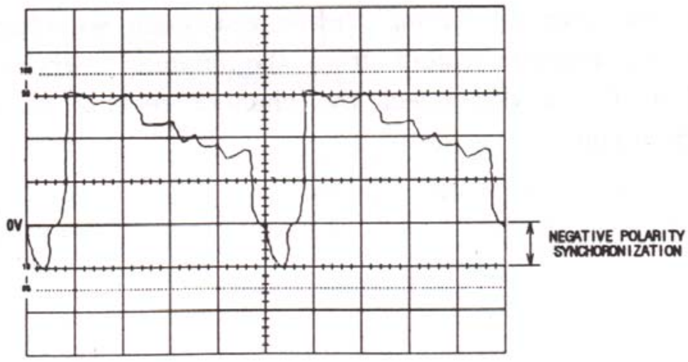
(a) Composite Video Signal



(b) TV-V Coupling



(c) TV-H Coupling



(d) Sync Polarity

Fig. 2-3 Using the TV SYNC Separator

2.2.5 Trigger Options

Triggering is often the most difficult operation to perform on an oscilloscope because of the many options available and the exacting requirements of certain signals.

<u>Trigger Mode Selection</u>:
When the NORM trigger mode is selected, the CRT beam is not swept horizontally across the face o the CRT until a sample of the signal being observed, or another signal harmonically related to it, triggers the timebase. However, this trigger mode is inconvenient because no baseline appears on the CRT screen in the absense of a signal, or if the trigger controls improperly set. The AUTO trigger mode solves this problem by causing the timebase to automatically free run when not triggered. This yields a single horizontal line with no signal, and a vertically-deflected but non-synchronized display when vertical signal is present but the trigger controls are improperly set. This immediately indicates what is wrong. The only hitch with AUTO operation is that signals below 25 Hz cannot, and complex signals of any frequency may not realiably trigger the timebase. Therefore, the usual practice is to leave the trigger MODE switch (14) set to AUTO, but reset it to NORM if any signal (particulary one below 25 Hz) fails to produce a stable display.

The TV-V and TV-H positions of the Trigger MODE switch insert a TV sync separator into the trigger chain, so a clean trigger signal at either the vertical-or horizontal-repetition rates can be removed from a composite video signal (Fig. 2-3 a). To trigger the scope at the vertical rate (Fig. 2-3 b), set the Trigger MODE switch to TV-V. To trigger the scope at the horizontal (line) rate (Fig. 2-3 c) set the trigger Mode switch to TV-H. For best results, the TV sync polarity should be negative (Fig. 2-3 d) when the sync separator is used.

Triggerpoint selection
The SLOPE switch determines whether the sweep will on a positive-going or negative-going transition of the trigger signal (See fig. 2-4). Always select the steepest and most stable slope or edge. For example, small changes in the amplitude of the sawtooth shown in Figure 2-4 a will cause jittering if the timebase is triggered on the positive (ramp) slope, but have no effect if triggering occurs on the negative slope (a fast-fall edge).

In the example shown in Figure 2-4b, both leading and trailing edges are very steep trace to jitter, making observation difficult. Triggering from the stable leading edge (+ slope) yields a trace that has only the trailing -edge jitter of the original signal. If you are ever in doubt, or have an unsatisfactory display, try both slopes to find the best way.

Trigger Level Control
The LEVEL control determines the point on the selected slope at which the main (A) timebase will be triggered. The effect of the LEVEL control on the displayed trace is shown in figure 2-4 c. The "-","0", and "+" panel-markings for this control refer to the waveform's zero crossing and points more positive (+) and more negative (-) than this. If the trigger slope is very steep, as with square waves or digital pulses, there will be no apparent change in the displayed trace until the LEVEL control is rotated past the most positive or most negative trigger point, whereupon the display will free run (AUTO Sweep mode) or disappear completely (NORM sweep mode). Try to trigger at the mid point of slow-rise waveforms (such as sine and triangular waveforms), since these are usually the cleanest spots on such waveforms.

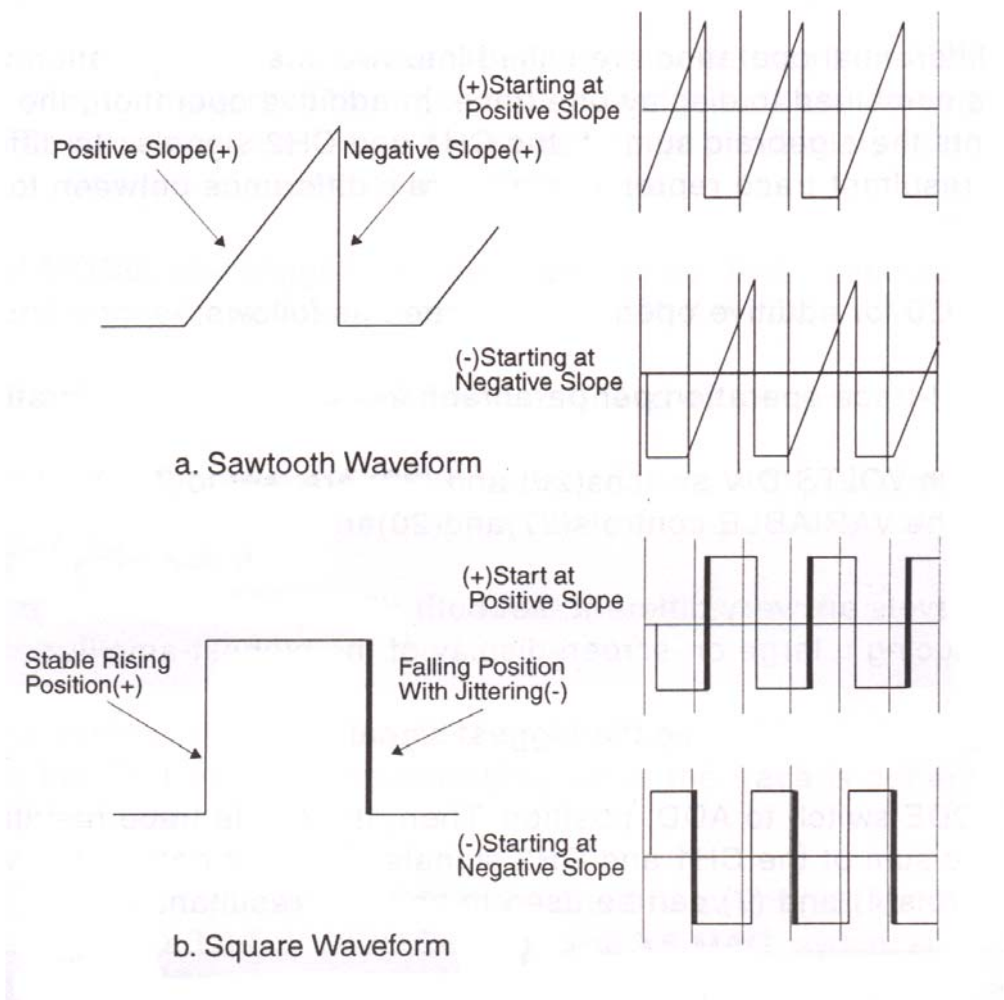


Fig. 2-4: Trigger-Slope Selection

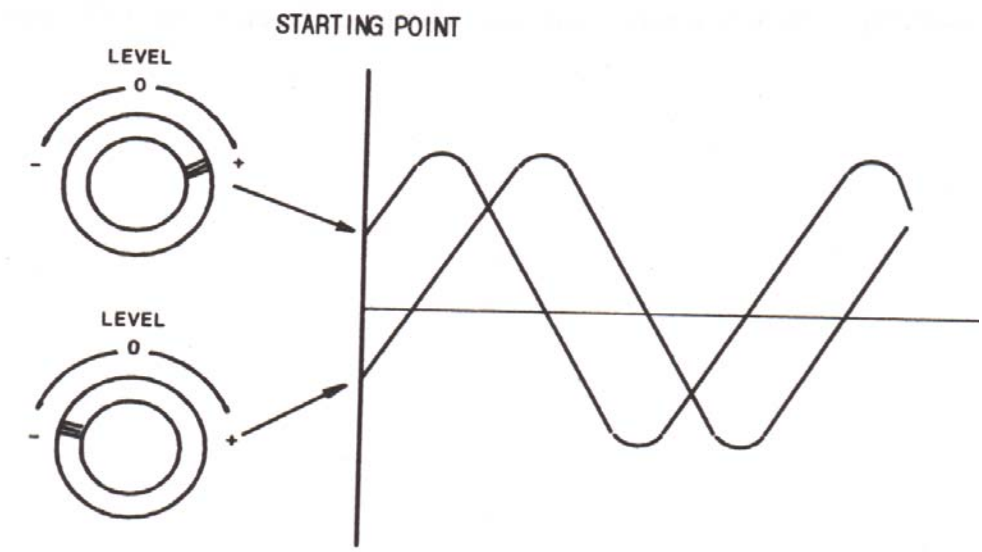


Fig. 2-5: Trigger Level Control

2.2.6 Measurement of different frequency

1. In case of two input signs of CH 1 & CH 2 is the same frequency or frequency with a certain times or a sign has a certain time difference, to select Trigger Source switch (18) in option to CH 1. The sign is triggered based CH 1 for CH 1 sign respectively.

2. But if you try to trigger two signs which have different frequency to set Trigger Source switch to VERT.

   In this instance, two waveforms trigger stabilized as the motif sign input to each sign source in shift.

2.2.7 Additive and Differential Operation

Additive and differential operation are forms two-channel operation where two signals are combined to display one trace. In additive operation, the resultant trace represents the algebraic sum of the CH 1 and CH 2 signals. In differential operation, the resultant trace represents the algebraic difference between the CH 1 and CH 2 signals.

To set the PeakTech 2020 GN / PeakTech 2030 KT for additive operation, proceed as follows:

1. Set up for dual-trace operation per paragraph 2-3-4 Dual-trace Operation.

2. Make sure both VOLTS/DIV switches (26) and (23) are set to the same position and the VARIABLE controls (27) and (20) are click-stopped fully clockwise. Are the signal levels are very different, set both VOLTS/DIV switches to the position producing a large on-screen display of the highest-amplitude signal.

3. Trigger from the channel having the best signal.

4. Set the V MODE switch (19) to ADD position. Then, the single trace resulting is the algebraic sum of the CH 1 and CH 2 signals. Either of both of the Vertical POSITION controls (4) and (7) can be used to shift the resultant trace.

   Note: If the input signals are in-phase, the amplitude of the resultant trace will be the arithmetic sum of the individual traces (eg. 4.2 div + 1.2 div = 5.4 div). If the input signals are 180° out-of-phase, the amplitude will be the difference (eg. 4.2 div - 1.2 div = 3.0 div).

5. If the p-p amplitude of the resultant trace is very small, turn both VOLTS/DIV switches to increase the display height. Make sure both are set to the same position.

There is another method to measure the sum of two signs for this product. It is the method to select INV switch to INV concurrently. When input sign is on the equal phase by selection of INV switch the waveform of

ADD will be difference in amplitude of the two signs. (EX: 4.2 Div - 1.2 Div = 3.0 Div.). When input sign has phase difference of 180° two signs become sum of amplitude.

2.2.8 X-Y Operation

The internal timebase of the PeakTech 2020 GN / PeakTech 2030 KT are not utilized in X-Y Operation; deflection in both the vertical and horizontal directions is via external signals. Vertical channel 1 serves as the X-axis (horizontal) signal processor, so horizontal and vertical axes have identical control facilities.

All of the V MODE, and trigger switches, as sell as thire associated controls and connectors, are inoperative in the X-Y mode.

To set up the PeakTech 2020 GN / PeakTech 2030 KT for X-Y operation, proceed as follows:

1. Turn the TIME/DIV switch (15) fully clockwise to its X-Y positions.

   Caution: Reduce the trace intensity, lest the undelected spot damage the CRT phosphor.

2. Apply the vertical signal to the CH 2 or Y IN connector (22), and the horizontal signal to the CH 1 or X IN connector (24). Once the trace is deflected, restore normal brightness.

3. Adjust the trace height with the CH 2 VOLTS/DIV switch (23) and the trace width with the CH 1 VOLTS/DIV SWITCH (27). The x5 MAG switch (3) on the VARIABLE controls can be used if greater is necessary, so leave the VARIABLE control (27) knob set CAL.

4. Adjust the trace position vertically (Y-axis) with the CH2 Vertical POSITION control (7). Adjust the trace position horizontally (X-axis) with the Horizontal POSITION control (10); the CH 1 Vertical POSITION control has no effect during X-Y operation.

5. Vertical (Y-axis) sign may change the phase by 180° setting CH 2 INV switch.

2.2.9 Component Test Operation (Only PeakTech 2030 KT)

The component test board delivers a sine voltage (60 Hz) which is applied across the component under test. The sine voltage across the test object is used for the horizontal deflection (V) and voltage-drop (current through the test object) is used for vertical deflection (I) of the oscilloscope.

By this V-I characteristic curve, the good or fault of component is measured.

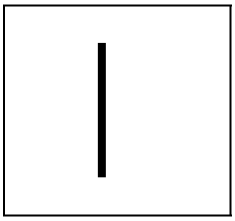
To set up the PeakTech 2030 KT for component test operation, proceed as follows:

1. Push the component test switch.
   Then the horizontal bar graph of 8 div. is displayed on the screen. The position of bar graph is controlled with CH2 V-POSITION (7) and H-POSITION (10).

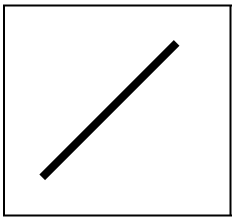
2. Connect the component test input (36) and GND (37) to both terminals of component with DMM Probe. Then V-I characteristic curve is displayed on the screen (see figure 2-6).

CAUTION!
Using the component test function, don't apply the signal to CH 1 and CH2 input because the oscilloscope doesn't operate in the component test mode.

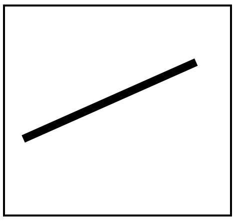
Don't push x10 switch because the bar will be fatted. Don't test the live circuit (operating the power signal) component.



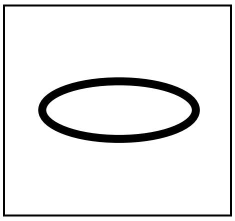
a) Short circuit



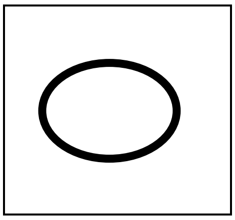
b) Resistor 600 Ohm



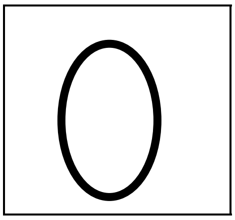
c) Resistor 1,3 kOhm



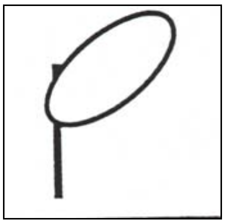
d) A1. Capacitor 1µF



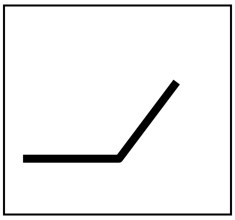
e) A1. Capacitor 4,7 µF



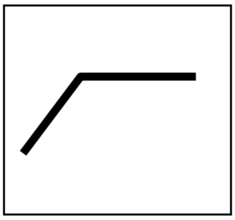
f) A1. Capacitor 100 µF



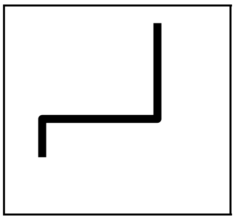
g) Zener+Capacitor 1 µF



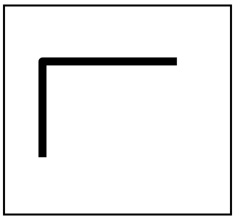
h) Resistor + Zener (Forward) Diode



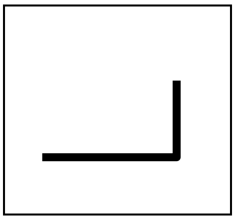
i) Resistor+Zener (Reverse)



j) Zener Diode below 7 V



k) Zener Diode beyond 7 V



l) Silicon Diode

2.3 Measurement Applications

This section contains instructions for using your PeakTech 2020 GN / PeakTech 2030 KT for specific measurement procedures. However, this is but a small sampling of the many applications possible for this oscilloscope. These particular applications were selected to demonstrate certain controls and features not fully covered in BASIC OPERATING PROCEDURES, to clarify certain operations by example, or for their importance and universality.

2.3.1 Amplitude Measurements

The modern triggered sweep oscilloscope has two major measurement functions. The first of these is amplitude. The oscilloscope has an advantage over most other forms of amplitude measurement in that complex as well as simply waveforms can be totally characterized (i. e. complete voltage information is available).

Oscilloscope voltage measurement generally fall into one of two types: peak-to-peak or instantaneous peak-to-peak (p-p) measurement simply notes the total amplitude between extremes without regard to polarity reference. Instantaneous voltage measurement indicates the exact voltage from each every point on the waveform to a ground reference. When making either type of measurement, make sure that the VARIABLE controls are click-stopped fully clockwise.

Peak-to-Peak Voltages
To measure peak-to-peak voltage, proceed as follows:

1. Set up the scope for the vertical mode desired per the instructions in 2-3 BASIC OPERATING PROCEDURES.

2. Adjust the TIME/DIV switch (15) for two or three cycles of waveform, and set the VOLTS/DIV switch for the largest-possible totally-on-screen display.

3. Use the appropriate Vertical POSITION control (4) or (7) to position the negative signal peaks on the nearest horizontal gratitude line below the signals peaks, per Figure 2-5.

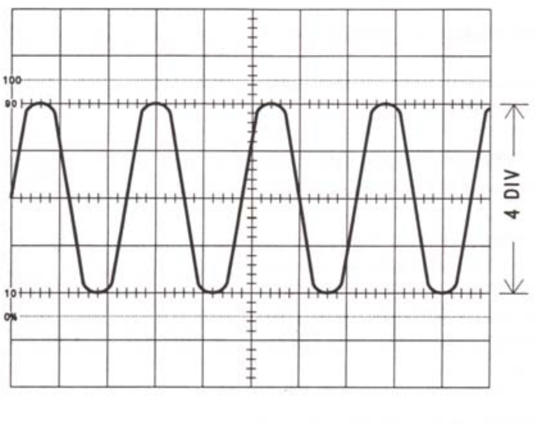
4. Use the Horizontal POSITION control (10) to position one of the positive peaks on the central vertical gratitude line. This line has additional calibration marks equal to 0.2 major division each.

5. Count the numer of division from the gratitude line touching the negative signal peaks to the intersection of the positive signal peak with the central vertical gratitude line. Multiply this number by the VOLTS/DIV switch setting to get the peak-to-peak voltage of the waveform. For example, if the VOLTS/DIV switch were set to 2 V, the waveform shown in Figure 2-5 would be 8.0 V_{pp} (4.0 div x 2 V).

6. If x 5 vertical magnification is used, divide the step 5 voltage by 5 to get the correct p-p voltage. However if 10 x attenuator probes are used, multiply the voltage by 10 to get the correct p-p voltage.

7. If measuring a sine wave below 100 Hz, or a rectangualar wave below 1000 Hz, flip the AC/GND/DC switch to DC.

   Caution: Make certain the waveform is not riding on a higher-amplitude DC voltage.



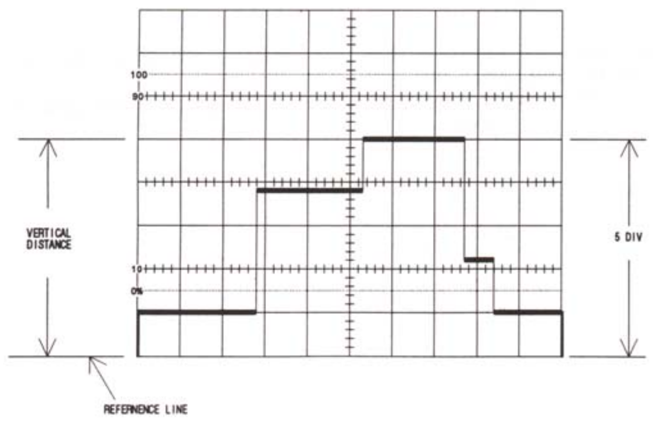


Fig. 2.5: Peak-To-Peak Voltage Measurement **Fig. 2.6: Instantaneous Voltage Measurements**

Instantaneous Voltages:
To measure instantaneous voltage, proceed as follows:

1. Set up the scope for the vertical mode desired per the instructions in 2.3 BASIC OPERATING PROCEDURES.

2. Adjust the TIME/DIV switch (15) for one complete cycle of waveform and set the VOLTS/DIV switch for a trace amplitude of 4 to 6 divisions (see Figure 2.6)

3. Flip the AC/GND/DC switch (25) or (21) to GND.

4. Use the appropriate Vertical POSITION control (4) or (7) to set the baseline on the central horizontal gratitude line. However, if you know the signal voltage is wholly positive, use the bottommost gratitude line. If you know the signal voltage is wholly negative, use the uppermost gratitude line.

5. Flip the AC/GND/DC switch to DC. The polarity of all points above the ground reference line is positive; all points below the ground-reference line are negative.

   Caution: Make certain the waveform is not riding on a high-amplitude DC voltage before flipping the AC/GND/DC switch.

6. Use the horizontal POSITION control (10) to position any point of interest on the central vertical gratitude line. This line has additional calibration marks equal to 0.2 major division each. The voltage relative to ground at any point selected is equal to the number of divisions from that point to the ground reference line multiplied by the VOLTS/DIV setting. In the example used for figure 2-6, the voltage for a 0.5 V/div scale is 2.5 V (5.0 div x 5 V).

7. If x 5 vertical magnification is used, divide the step 6 voltage by 5. However, if 10 x attenuator probes are used, multiply the voltage by 10.

2.3.2 Time Interval Measurements

The second major measurement function of the triggered-sweep oscilloscope is the measurement of time interval. This is possible because the calibrated time base results in each division of the CRT screen representing a known time interval.

Basic Technique
The basic technique for measuring time interval is described in the following steps. This same technique applies to the more specific procedures and variations that follow:

1. Set up scope as described in 2.3.2 Single-trace operation.

2. To settle Time/Div (15) larger as much as possible so that it may appear on the screen.
   To place VAR switch (13) at CAL. Please be careful as the measured value may be incorrect if you do not follow this instructions.

3. Use the vertical POSITION control (4) or (7) to position the trace to the central horizontal gratitude line passes through the points on the waveform between which you want to make the measurement.

4. Use the Horizontal POSITION control (10) to set the left-most measurement point on a nearly vertical gratitude line.

5. Count the number of horizontal gratitude divisions between the Step 4 gratitude line and the second measurement point. Measure to a tenth of a major division. Note that each minor division on the central horizontal gratitude line is 0.2 major division.

6. To determine the time interval between the two measurement point, multiply the number of horizontal divisions counted is Step 5 by the setting of the TIME/DIV switch. If the X10 MAG (11) is X 10 (x10 magnification), be certain to divide the TIME/DIV switch setting by 10.

Period, Pulse, Width and Duty Cycle

The basic technique described in the preceeding paragraph can be use to determine pulse parameters such as period, pulse width, duty cycle, etc.

The period of a pulse or any other waveform is the time it takes for one full cycle of the signal. In Figure 2-7, the distance between points (A) and (C) represent one cycle; the time interval of this distance is the period. The time scale for the CRT display of figure 2-7 A is 10 ms/div, so the period is 70 milliseconds in this example.

Pulse width is the distance between points (A) and (B). In our example it is conveniently 1.5 divisions, so the pulse width is 15 milliseconds. However, 1.5 division is a rather small distance for accurate measurements, so it is advisable to use a faster sweep speed for this particular measurement. Increasing the sweep speed to 2 ms/div as in Figure 2-7 gives a large display, allowing more accurate measurement.

If it is seen small with the TIME/DIV switch you may measure X 10 is expanded condition by putting X10 MAG switch to X10 MAG. The duty cycle may be calculated by knowing pulse breadth and cycle.

The distance between points (B) and (C) is then called offtime. This can be measured in the same manner as pulse width.

When pulse width and period are known, duty cycle can be calculated. Duty cycle is the percentage of the period (or total of on and off times) represented by the pulse width (on time).

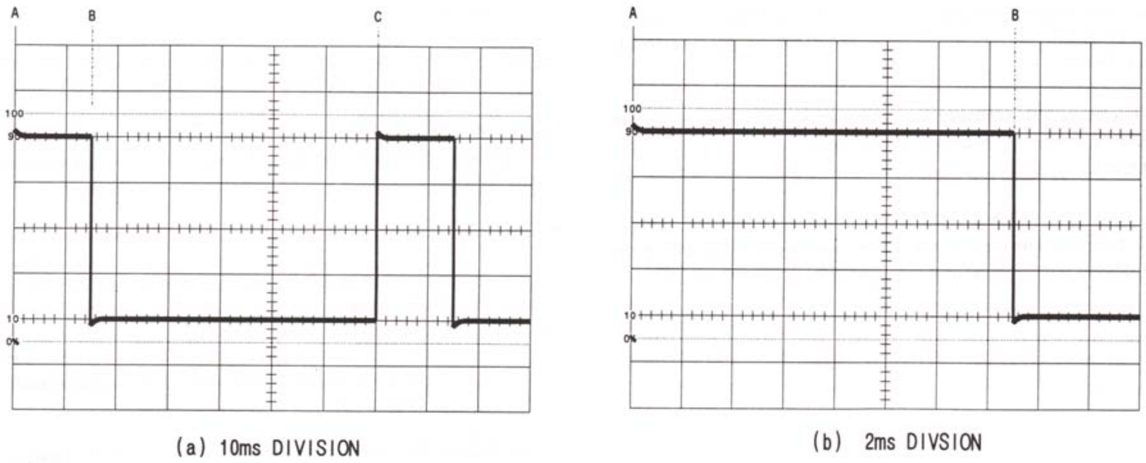
$$\text{Duty cycle (\%)} = \frac{\text{PW (100)}}{\text{Period}} = \frac{\text{A -> B (100)}}{\text{A-> C}}$$

$$\text{Duty cycle of example} = \frac{\text{15 ms x 100}}{\text{70 ms}} = 21{,}4\ \%$$

2.3.3 Frequency Measurement

When a precise determination of frequency is needed, a frequency counter is obviously the first choice. A counter can be connected to the CH 1 OUTPUT connector (30) for convenience when both scope and counter are used. However, and oscilloscope alone can be used to measure frequency when a counter is not available, or modulation and/or noise makes a counter unusable.

Frequency is the reciprocal of period. Period in seconds (s) yields frequency in Hertz (Hz); period in millisecond (ms) yields frequency in kilohertz (kHz); period in microseconds (µs) yields frequency in megahertz (MHz). The accuracy of his technique is limited by the timebase calibration accuracy (see Table of Specifications.)



(a) 10 ms Division (b) 2 ms Division

Figure 2-7: Time Interval Measurement

2.3.4 Phase Difference Measurements

Phase difference or phase angle between two signals can be measured using the dual-trace feature of the oscillocope, or by operating the oscilloscope in the X-Y mode.

Dual-trace Method

This method works with any type of waveform. In fact, it will often work even if different waveforms are being compared. This method is effective in measuring large or small differences in phase, at any frequency up to 20 MHz.

To measure phase difference by the dual-trace method, proceed as follows:

1. Set up the scope as described in 2.3.3 Dual-trace Operation, connecting one signal to the CH 1 IN connector (24) and the other to the CH 2 IN connector (22).

   Note:
   At high frequencies use identical and correctly-compensated probes, or equal lengths of the same type of coaxial cable to ensure equal delay times.

2. Position the Trigger Source Switch (18) to the channel with the cleanest and most stable trace. Temporarily move the other channel's trace off the screen by means of it Vertical POSITION control.

3. Center the stable (trigger source) trace with its Vertical POSITION control, and adjust its amplitude to exactly 6 vertical divisions by means of its VOLTS/DIV switch and VARIABLE control.

4. Use the Trigger LEVEL control (9) to ensure that the trace crosses the central horizontal gratitude line at or near the beginning of the sweep. See Figure 2-10.

5. Use the TIME/DIV switch (15), A VARIABLE control (12) and the Horizontal POSTION control (10) to display one cycle o trace over 7.2 divisions. When this is done, each major horizontal division represents 50, and each minor division represents 10°.

6. Move the off-screen trace back on the CRT with its Vertical POSITION control, precisely centering it vertically. Use the associated VOLTS/DIV switch and VARIABLE control to adjust its amplitude to exactly 6 vertical divisions.

7. The horizontal distance between corresponding points of the waveform is the phase difference. For example, in the Figure 2-10 illustration the phase difference is 6 minor divisions, or 60°.

8. If the phase difference is less than 50° (one major division), set the x10 MAG switch is x10, and use the Horizontal POSITION control (if needed) to position the measurement area back on screen. With 10 x magnification, each major division is 5° and each minor division is 1°.

Lissajous Pattern Method

This method is used primarily with sine waves. Measurements are possible at frequencies up to 500 kHz, the bandwith of the horizontal amplifier. However, for maximum accuracy, measurements of small phase difference should be limited below 50 kHz.

To measure phase difference by the Lissajous pattern method, proceed as follows:

1. Rotate the TIME/DIV switch fully clockwise to its X-Y position.

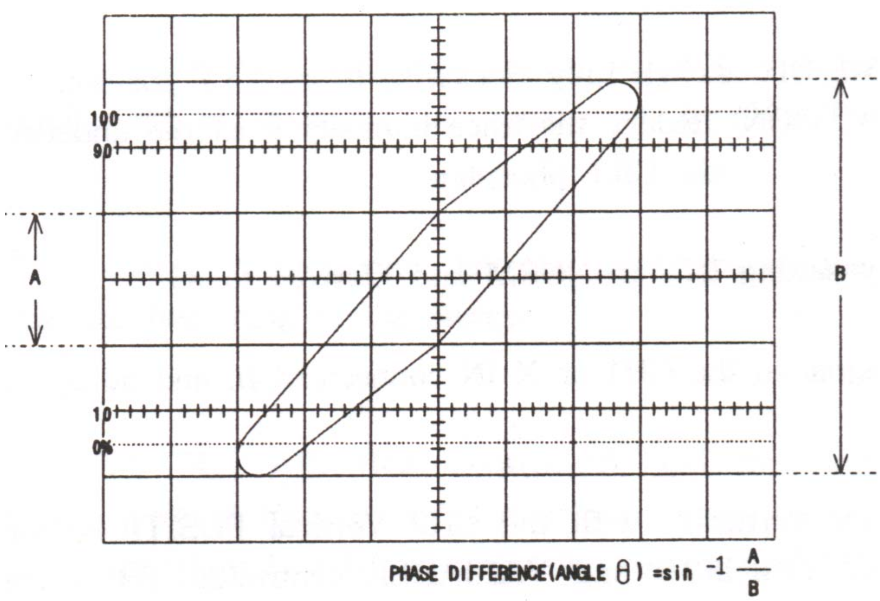
   Caution: Reduce the trace intensity least the undeflected spot damage the CRT phosphor.

2. To measure by setting INV to NORM and X5 MAG to X1.

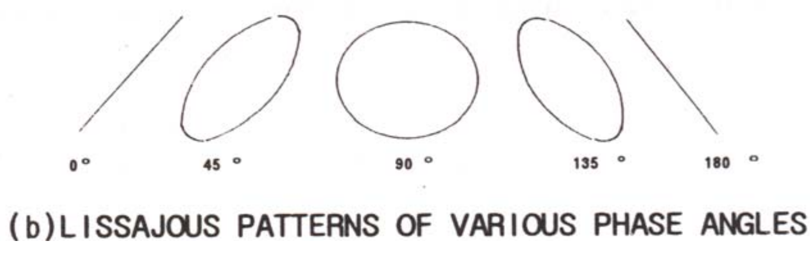
3. Connect one signal to the CH 1 or X IN connector (24), and the other sight to the CH 2 or Y IN connector (22).

4. Center the trace vertically with the CH2 Vertical POSITION control (7) and adjust the CH 2 VOLTS/DIV switch (23) and VARIABLE control (20) for a trace height of exactly 6 divisions (the 100 % and 0 % gratitude linestangent to the trace).

5. Adjust the CH 1 VOLTS/DIV Switch (26) for the largest-possible on-screen display.



(a) Phase Angle Calculation



(b) Lissajous-Patterns of various Phase Angles

Fig. 2-10: Lissajous Method of Phase Measurement

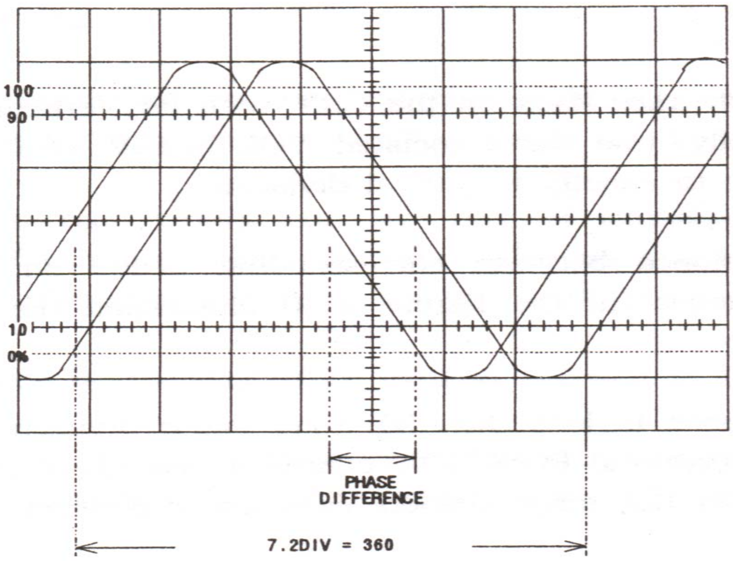


Figure 2-11: Dual-Trace Method of Phase Measurement

6. Precisely center the trace horizontally with the Horizontal POSITION control (10).

7. Count the number of divisions subtended by the trace along the central vertical gratitude line (dimension B). You can now shift the trace vertically with CH 2 POSITION control to a major division line for easier counting.

8. The phase difference (angle z) between the two signals is equal to the arc sine of dimension A ÷ B (the Step 7 number divided by 6). For example, the Step 7 value of the figure 2-9 a pattern is 2. Dividing this by 6 yields .3334, whose arcsine is 19.5°.

9. The simple formula in Figure 2-9 a works for angles less than 90°. For angles over 90° (leftward tilt), and 90° to the angle flound in Step 7.

   Figure 2-9 b shows the Lissajous patterns of various phase angles; use this as guide in determining wether or not to add the additional 90°.

   Note: The sine-to-angle conversion can be accomplished by using trig tables or a trig calculator.

2.3.5 Risetime Measurement

Risetime is the time for the leading edge of a pulse to rise from 10 % to 90 % of the total pulse amplitude.

Falltime is the time required for the trailing edge of a pulse to drop form 90 % of total pulse amplitude to 10 %. Risetime and falltime, which may be collectively called transition time, are measured in essentially the same manner.

To measure rise and fall time, proceed as follows:

1. Connect the pulse to be measured to the CH 1-IN connector (24), and set the AC/GND/DC switch (25) to AC.

2. Adjust the TIME/DIV switch (15) to display about 2 cycles of the pulse. Make certain the VAR switch (12) is rotated fully clockwise.

3. Center the pulse vertically with the cannel 1 Vertical Position control (4).

4. Adjust the channel 1 VOLTS/DIV switch (26) to make the positive pulse peak exceed the 100 % gratitude line, and the negative pulse peak exceed the 0 % line, then rotate the VARIABLE control (27) counterclockwise until the positive and negative pulse peeks rest exactly on the 100 % and 0 % gratitude lines (See Figure 2.12).

5. Use the Horizontal POSITION control (10) to shift the trace so the leading edge passes through the intersection of the 10 % and central vertical gratitude lines.

6. If the risetime is slow compared to the period, no further control manipulations are necessary. If the risetime is fast (leading edge almost vertical), to set x10 MAG to the X10 MAG position and reposition the trace as in Step 5 (See Figure 2-10 b).

7. Count the number of horizontal divisions between the central vertical line (10 % point) and the intersection of the trace with the 90 % line.

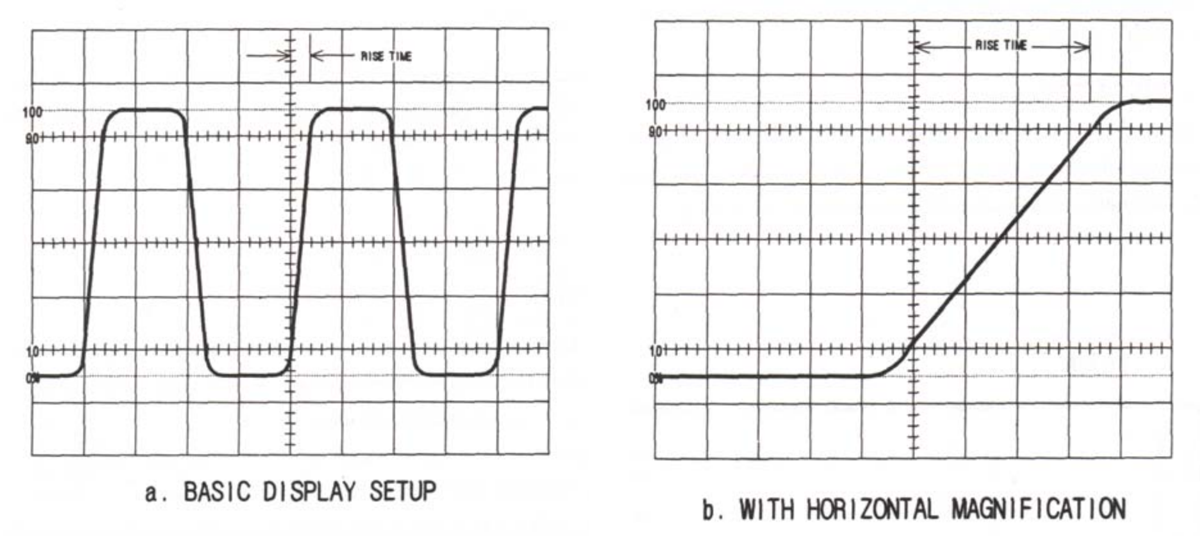
8. Multiply the number of divisions counted in step 7 by the setting of the TIME/DIV switch to find the measured risetime. If 10 x magnification was used, divide the TIME/DIV setting by 10. For example, if the timebase setting in Figure 2-10 was 1 s/div (1000 ns), the risetime would be 360 nanoseconds (1000 ns ÷ 10 = 100 ns, 100 ns x 3.6 div = 360 ns)

9. To measure falltime, simply shift the trace horizontally until a trailing edge passes through the 10 % and central vertical gratitude lines, and repeat Steps 7 and 8.

10. When measuring the rise and fall time, note that 17.5 ns-Rise time (tr) = 0.35/f-3dB which is transition time is contained in the PeakTech 2020 GN oneself. Therefore the real transition time (tc) is composed of measure transistion time (tm) and tr. The above all is explained with the following formula:

$$tc = \sqrt{tm^2 - tr^2}$$

tc = Real transition time
tm = Measured transition time
tr = Rise time of oscilloscope



a) Basic Display Setup

b) With horizontal Magnification

Figure 2-12: Risetime Measurement

3. User Maintenance Routines

Maintenance routines performable by the PeakTech 2020 GN/PeakTech 2030 KT operator are listed in this section. More advanced routines (i. e. procedures involving repairs or adjustments within the instrument) should be referred to qualified service personnel.

3.1 Cleaning

If the outside of the case becomes dirty or stained, carefully wipe the soiled surface with a rag moistened with detergent, then wipe the cleaned surface with a dry cloth. In case of severe stain, try a rag moistened with alcohol.

Do not use powerful hydrocarbons such as benzene or paint thinner.

Dust and/or smudges can be removed from the CRT screen. First remove the front case and filter (see Figure 3-1). Clean the filter (and the CRT face, if necessary) by wiping carefully with a soft cloth or commercial wiping tissue moistened with a mild cleaning agent. Take care not to scratch them. Do not use abrasive cleanser or strong solvents. Let the cleaned parts air dry thoroughly and blur the waveforms. Be particulary careful not to get fingerprints on the filter of CRT face.

3.2 Calibration interval

To maintain the accuracy specifications of the PeakTech 2020 GN/PeakTech 2030 KT, calibration checks and procedures should be performed after every 1000 hours of service. However, if the instrument is used infrequently, the calibration checks should be performed every six months.

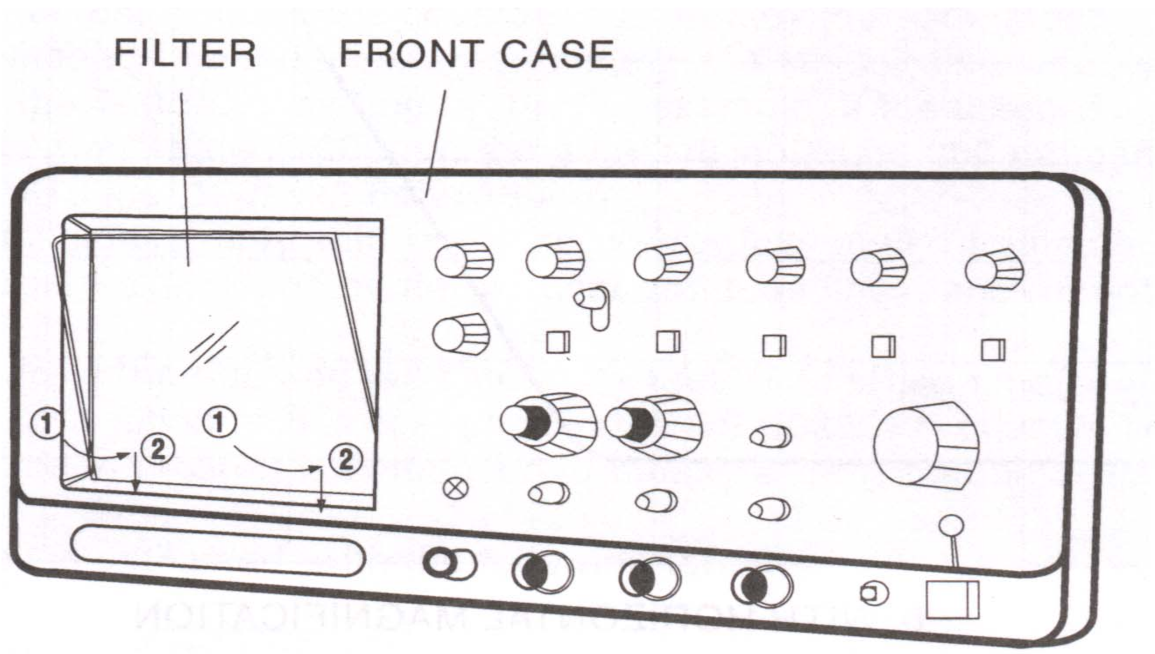


Fig. 3-1 Front Case and Filter

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Contents

PeakTech® - Spitzentechnologie, die überzeugt

20 MHz Analog - Oszilloskop /
20 MHz analogue oscilloscope

PeakTech® 2020 GN /
PeakTech® 2030 KT

Bedienungsanleitung /
Operation Manual