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Data Sheet

July 28, 2026

TEKTRONIX

Tektronix 2465B Oscilloscope 400MHz 100% TESTED

The 2445B triggers from DC to 250 MHz. The 2455B and 2465B trigger from DC to 500 MHz. Sweep speeds range from 1.5 to 1 ns per division on the 2445B and 2455B and to 500 ps per division on the 2465B, including the effect of the X10 magnifier and the calibrated variable between 1-2-5 steps. Horizontal displays include A-Sweep, B-Sweep (delayed), A alternated with B, and CH 1 (for X/Y displays). The SETUP features, AUTO, SAVE, and RECALL, save time and prevent errors, whether you are a novice operator or a master. AUTO Setup works with almost any signal. For repeating measurements, the Save and Recall functions record and restore as many as 30 instrument setups, including the extended-function options. 2465B/2455B/2445B Operators: The 2465B, 2455B, and 2445B. The WR adds a Word Recognizer Probe connector on the rear panel. The TV enhancement adds LINES, FLD1, and FLD2 Trigger Coupling. The available GPIB interface accesses all controls and digital readings. The interface adds GPIB status indicators, just above the CRT. See the 24X5B/2467B GPIB (Option 10) Instrument Interfacing Guide for information on integrating the instrument into a GPIB system. The 2465BCT includes CTT and WR (Option 9) and GPIB (Option 10).

No photo

MODEL

Tektronix 2465B

CALIBRATION

**N/A — off-catalog
OEM datasheet**

CONDITION

**See OEM
documentation**

STATUS

**Not listed on
Aumictech
inventory**

RFQ / SKU

2465B

LISTING

**Off-catalog — OEM dat
asheet only**

NIST-traceable cal

SAM registered

30-day returns

NAICS 423690 • 811210 • 541380

2465B Characteristics / Specifications

PARAMETER	VALUE
ATTENTION	Refer to manual. viii 2465B/2455B./2445B Operators Operators Safety Summary Power Source This product is intended to operate from a power source that does not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.
EFFECTIVE SERIAL NUMBERS	2445B B0600000 PAGE! Change the first and second paragraphs to: The TEKTRONIX 2465B, 2455B, and 2445B portable oscilloscopes have four vertical channels with DC to 400 MHz, 250 MHz, and 200 MHz bandwidths. . . The trigger systems work automatically for most signals. They operate in various modes, from any channel, with couplings for a wide range of signals.
Change the 2445B Standard Accessories to	Probes (10X, 1.3m) with Accessories P6137 PAGE 7-5 Change the 2445B Standard Accessories to: Probe Package P6137 Page 2 of 2 1 General Information Preparation for Use Safety Before connecting the oscilloscope to a power source, read entirely both this section and the Safety Summary at the front of this manual.
To assign a function to AutoSetup	1. Push MEASURE. 2. If the CTT is present, select MORE from the menu. Otherwise, go to Step 3. NOTE To select items from a menu, simply press the vertical mode button that has the same position as the desired item in the menu. 3. Select
To assign a function to probe ID	1. Push MEASURE 2. If CTT is present, select MORE from the menu. Otherwise, go to Step 3. 2465B/2455B/2445B Operators 2-3 Operation NOTE To select items from a menu, simply press the vertical mode button that has the same position as the desired item in the menu.
To use the TV clamp	1. Apply a composite video signal to CH 2. 2. Select CH 2 Trigger Source and set SLOPE to the displayed polarity of the sync pulses. 3. Set the CH2 input to TV CLAMP by pressing the upper input-coupling button for CH 2 until the readout shows 'TVC'. The "back porch" of the video signal will be locked to a fixed level.
To trigger at the video line rate	1. Select a composite video signal as the trigger source. 2. Select LINE coupling. 3. Set SLOPE to the polarity of the sync. To trigger at a specific video line: 1. Select a composite video signal as the trigger source. 2. Select FLD1, FLD2, or ALT coupling. 3. Set SLOPE to the polarity of the sync. 4. Turn FLD LINE # (A) to the desired line number.

PARAMETER	VALUE
Set the oscilloscope up for automatic voltage measurement by	1. Pressing the MEASURE button. 2. Selecting VOLTS from the menu by pressing button number 2. The +peak, -peak, average, and peak-to-peak volts are measured and displayed in the readout. If the voltage measured has an extremely small peak-to-peak value, only the average volts will be displayed.
To make a time interval measurement	1. Push the MEASURE button. 2. Select TIME from the displayed menu by pushing button 6 in the Vertical mode area. Before making the first measurement using the Time Function, configure the measurement by: 1. Pushing the MEASURE button. 2. If the CTT option is present, select MORE from the menu. Then, select CONFIGURE from the displayed menu.
Without At or 1/At	TRIGAFT DLY BSweep runs at the first trigger after the set delay. With At or 1/At: TRIGAFT DLY and TRIG ADLY {both indicators on} SLOPE and LEVEL settings for triggering at A REF delay and A delay are common. TRIG ADLY SLOPE and LEVEL for A delay can be set independent of the setting for A REF delay.
If the CTT is present	1. Press the MEASURE button. 2. Select COUNTER from the menu. 3. Select FREQUENCY or PERIOD from the menu. 4. Frequency or period measurements will be displayed in the upper right hand corner of the display. Measurements will be updated 3 times per second or once per period whichever is slower. The input frequency must be 150 MHz or less.
c. A	WR Triggers the A sweep upon recognition of the specified digital word for the Word Recognizer. d. B:WR – Triggers the B sweep upon recognition of the specified digital word. 5. Set the A-Trigger and B-Trigger controls or the WR pattern for the desired trigger.
Operation The NAME area will change to MEAS	*FREQ with FREQ underlined by the cursor. To select among the various measurements, turn the A control until the desired measurement is displayed. The TIME measurement is unique in that you may define unique measurements by adding a suffix to the "TIME...."
Section.) Pressing the MEASURE button toggles back to the NAME	format which allows saving instrument setups. Subsequent presses of the MEASURE button toggle between the measurements saving mode and the setup saving mode. 4. Press one of the setup number buttons. In the upper left corner of the CRT, the readout will show the number of the button you pushed and either the new name you defined or the name of the setup previously associated with that setup number.
Applications Frequency Modulation For a modulation index of more than 1%	1. Set SEC/DIV and VAR so the average signal period covers five divisions. 2. If deviation is less than 1 division in one cycle (20%), turn on XI 0 MAG. 3. Align At cursors with the extremes of the deviation. 4. The readout shows the peak-to-peak deviation in percent. If XI 0 MAG is on, divide the reading by 10.

PARAMETER	VALUE
The following general precautions should be observed when using Add mode	1. Signal peaks should not exceed ± 8 times the VOLTS/DIV setting. 2. Position both Channel 1 and Channel 2 waveforms near center screen, when viewed separately. This ensures the greatest dynamic range for the Add trace. 3. To obtain similar responses from each channel, set Channel 1 and Channel 2 input couplings the same.
II	1.1; 1-j; itf; (81) RESULTANT SIGNAL as shown in Figure 3-2. Eliminating common-mode signals. 2465B/2455B/2445B Operators 3-7
Figure	Lissajous Patterns 2465B/2455B/2445B Operators REV DEC 1992 3-17A
To cascade CH2 with CH	1. Connect the CH2 output on the rear panel, through a 50- Ω cable, to the CH1 input on the front panel. 2. Set the CH1 input at 1 M Ω DC or AC. 3. Set 20 MHz BW LIMIT on. This will reduce the trace "thickening" caused by wide-band noise and avoid oscillation of the vertical system. If you trigger from CH1 source, you probably need to use HFREJ coupling.
Applications To measure phase shift using XY Mode	Note CH 2, CH 3, or CH 4 can provide the vertical deflection in XY mode. This example shows using CH 2. 1. Connect the signal that you want to provide vertical deflection to the CH 2 input connector. Set the Vertical Mode to CH 2. 2. Connect the signal that you want to provide horizontal deflection to the CH 1 or X input connector.
Match Channel 1 and Channel 2 as follows	1. Connect two 10X probes supplied with the instrument to the CH 1 ORX and CH 2 inputs. 2. Check and adjust, if necessary, the probe's low-frequency compensation. Refer to "Probe Compensation" in this section. 3. Connect both probes via hook tips to the same fast-rise pulse generator output.
CHECK	At reading is 8 times the A SEC/DIV setting, $\pm 0.5\%$. 2465B/2455B/2445B Operators 4-7 5 Controls, Connectors, and Indicators Controls, Connectors, and Indicators Introduction The following descriptions are intended to familiarize the operator with the location and function of the instrument's controls, connectors, and indicators.
The established priority order is	CH 1, CH 2, ADD, CH 3, then CH 4. The algebraic sum of Channel 1 and Channel 2 is displayed when the Add display is selected. When both Add and Invert displays are selected, the waveform displayed is the difference between the Channel 1 and Channel 2 signals.
The readout displays one of two messages	"CH 2 DLY-TURN A" or "CH 2 DLY DISABLED." If the adjustment is enabled, the A control or the A REF control can adjust the apparent delay between the Channel 1 signal and the Channel 2 signal. The adjustment range is sufficient to compensate for propagation delay variations up to ± 500 ps.
The cursor readout is displayed as a percent RATIO under either of the following conditions	1. When the VOLTS/DIV VAR control of the channel determining the scale factor is out of the detent position; 2. When the Add vertical display mode is selected alone and the Channel 1 and Channel 2 VOLTS/DIV

PARAMETER	VALUE
	settings are not the same. Pressing the AV button when the function is active cancels AV.
Pulling SEC/DIV out also cancels the Delta Volts function. 2465B	2455B/2445B Operators 5-15 Controls, Connectors, and Indicators @ At Button Activates the Delta Time measurement function and cancels the AV or 1/At measurement functions. When At is selected with Inten or Alt horizontal display modes, two delay times are defined.
With Available TV Enhancement	Trigger Coupling buttons and indicators select four additional trigger couplings. The readout shows which of these couplings and which line number are selected, in the upper right corner of the CRT. If that corner is occupied, the 7V information is displayed in the upper left corner.
The following examples show various display formats	DC Voltage 15.693V DC SMOOTH 1.4356 ADC /64/ Using a Reference Value A0.9861A DC Reference Display 1,3461V DC=REF Minimum Display 0.5201V AC = MIN Maximum Display (with Reference) A 0.8293 V DC = MAX Continuity Display OPEN >100 SHORT <100 Over-Range Display OVER Display-Mode Interactions Selecting REF SET or SMOOTH cancels any HOLD, REF DISPLAY, or MIN/MAX DISPLAY, but those displays can be reselected and work with reference values or with the SMOOTH display mode. With SMOOTH, MIN/MAX DISPLAY continues to show
DEFLECTION SYSTEM	CHANNEL 1 AND CHANNEL 2 Deflection Factor Range 2 mV/division to 5V/division in a 1 -2-5 sequence of 11 steps. Accuracy + 15°C to + 35°C On-Graticule Accuracy 1MS input, noninverted. Within ±2% at any VOLTS/DIV setting for a four or five-division signal centered on the screen. AV Accuracy (using cursors over entire graticule area) ±(1.25% of reading + 0.03div + signal aberrations).
Output Drive Will supply 400 mA during HI state	will sink 2mA during LO state. 2465B/2455B/2445B Operators REV OCT 1989 6-13 Performance Characteristics Table 6-1 (cont) Characteristics Performance Requirements AC POWER SOURCE Source Voltage Nominal Ranges 115V ± 90 V to 132V.
The points for the various measurements are	Measurement Points Measurement First Second Measurement Measurement point point Frequency 50% amplitude 50% amplitude Width 50% amplitude 50% amplitude Rise, Fall Time 10% amplitude 90% amplitude Time interval Specified by Specified by Time Interval Time Interval Configuration Configuration The algorithms used for the measurements result in the following equation for the total jitter error that must be applied to the accuracy specifications.
The magnitude of the error is given by	Offset Error = $\frac{1}{2} \left(\frac{1}{\text{First Point slew rate}} - \frac{1}{\text{Second Point slew rate}} \right) \times \text{Time Interval}$ Frequency measurements do not suffer from offset errors since measurements are made with the same trigger level and slope, so no offset is introduced. All other timing measurements suffer from offset errors. The slew rates used to calculate offset errors must be measured at the first and second measurement points given in the Measurement Points table. Offset error is calculated as: Offset Error = $\frac{1}{2} \left(\frac{1}{\text{First Point slew rate}} - \frac{1}{\text{Second Point slew rate}} \right) \times \text{Time Interval}$

PARAMETER	VALUE
Probe Tip MeasurementRange	62°C to +230°C in one range. Resolution 0.1 °C or 0.1°F. ADDITIONAL CHARACTERISTICS Warmup time to Meet Electrical Specification 45 minutes. Maximum Voltage between Inputs from either Input to Ground DC to 20 kHz 500V rms; 700V peak.
SYNCHRONOUS MODE Data Setup Time D	D 15 and Q 25ns.
Data Hold Time D	D 15 and Q 0ns. Minimum Clock Pulse Width High 20ns. Low 20 ns. Minimum Clock Period 50 ns. Delay from Selected Clock Edge to Word Out from C/T/T = 55 ns. ! ASYNCHRONOUS MODE Maximum Trigger Frequency 10MHz. Minimum Coincidence Between < 85ns. Data Inputs (D 0 – D 15 & 0) Resulting in a Trigger Maximum Coincidence Between > 20ns.
Data Inputs (D	D 15 & Q) Without Producing a Trigger Delay from Input Word Coincidence to Word Out * 5140 ns. 2465B/2455B/2445B Operators 6-35 Performance Characteristics Table 6-5(cont) Characteristics Performance Requirements INPUTS AND OUTPUTS Input Voltages Minimum Input Voltage $V_{in} = -0.5$ V.
Temperature Operating	15°C to + 55°C. For rack mounted instrument, ambient temperature should be measured at the instrument's air inlet. Fan exhaust temperature should not exceed . 65 °C, Nonoperating (Storage) – 62°C to -85°C. Altitude Operating To 15,000 feet. Maximum operating temperature decreases 1 °C for each 1000 feet above 5000 feet.
REPLACE STEP	nn REPLACE BEGIN:nn REPLACE END :nn NAME:xxxxxxx NAME:xxxxxxx NAMEi xxxxxx Bottom Rows - PUSH STEP TO REPLACE SETUP PUSH SAVE FOR HELP. A REF moves a cursor to the definition mode field, the step attribute field, the setup number field, or any character in the NAME argument.
Top Row or or REPLACE STEP	nn REPLACE BEGIN :nn REPLACE END :nn NAME:xxxxxxx NAMEi xxxxxx NAMEi xxxxxx Bottom Rows- PUSH STEP TO REPLACE SETUP. PUSH SAVE FOR HELP. or - TURN A REF TO FIELD, THEN- TURN TO DESIRED SETTING. or " PUSH MEASURE TO SAVE A MEASUREMENT. PUSH RECALL TO CANCEL THIS MODE.
Top Row DELETE STEP	nn NAMEi xxxxxx or DELETE BEGIN :nn NAMEi xxxxxx or DELETE END :nn NAMEi xxxxxx Bottom Rows- PUSH STEP TO DELETE SETUP (or MEASUREMENT) PUSH SAVE FOR HELP. or- TURN A REF TO FIELD, THEN- TURN TO DESIRED SETTING. or " PUSH RECALL TO CANCEL THIS MODE.
Bandwidth	2445B +15°C to +35°C DC to 200MHz. ® – 15°C to +15°C and DC to 175 MHz. +35°C to +55°C -4.7 dB Bandwidth 2445B +15°C to +35°C DC to 200 MHz. a – 15°C to +15°C and DC to 175 MHz. +35°C to +55°C Step Response Rise Time 2445B < 1.75 ns. Page 1 of 2
Rise Time	(3832 - 16) 5854-14 Figure 3-3.

PARAMETER	VALUE
Aberrations	+ 11 nncf nirtit/ICPII i– goO tOiyilin^aiuLXiyu -15°Cto +15°C and + 35°Cto +55°C Add (1 .5 mV ' probe attenuation).
Attenuation	effects are included in scale factors, trigger levels, and delta volts readouts,if you use the standard accessory probes or other compatible probes.
Operating temperature	decreases 1 °C for each 1000 feet above 5000feet.
Humidity	andtemperature requirements definedin paragraphs 3.9.2.2 392 3 and 3.

1. 4. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument, allowing three inches on each side.
2. 5. Seal the carton with shipping tape or with an industrial stapler. 6. Mark the address of the Tektronix Service Center and your return address on the carton in one or more prominent locations.
3. 2. Select the channel using the Vertical MODE buttons. You may select any combination of vertical channels.
4. 3. Press AUTO Setup to initialize vertical, horizontal, trigger, and display intensity for a usable display.
5. 5. Finally, select the function to be performed with each probe ID by pressing the appropriate MODE button.
6. 2. Select LINE Scoupling. 3. Set SLOPE to the polarity of the sync. To trigger at a specific video line: 1. Select a composite video signal as the trigger source.
7. 2. Select VERT Trigger Source, and ALT field trigger coupling. 3. The CH1 display triggers on field 1 and the CH2 display triggers on field 2.
8. 2. Align the cursors with points of interest, such as waveform peaks, using the AREF and A knobs.
9. 3. The readout shows the voltage between the points marked by the cursors.
10. 4. Press AV to turn off the AV cursors and readout. Measure Time , with A-Sweep or B-Sweep Alone (SEC/DIV in) 1 . Turn on the At cursors and readout with the At button.
11. 2. Align the cursors with points of interest, such as waveform zero- crossings, using the AREF and A knobs, 3. The readout shows the time between the points marked by the cursors.
12. 4. Press At to turn off the At cursors and readout. 2465B/2455B/2445B Operators 2-13
13. 2. Align the cursors with identical points, such as zero crossings, on adjacent cycles of the waveform, using the AREF and A knobs.
14. 3. Press AV to measure voltage ratio, At for time ratio, or AV and At together for phase. The VAR must be counter-clockwise from the detent position to turn on the RATIO or PHASE readout.
15. 6. Press the same AV or At button, or both, to turn off the cursors and readout.
16. 6. Select A V, At, or 1/At when the SEC/DIV knob is pushed in to measure waveform details with cursors.
17. 2. Select TRIG AFT DLY Mode. 3. Set SOURCE, COUPLING, SLOPE, INIT@50%, and LEVEL controls as required.
18. 2. Alternatively, choose RUN AFT DLY B-Trigger mode and momentarily press A/B TRIG, then adjust A Trigger.
19. 2. Pull SEC/DIV out to activate B Sweep and light the A SWP and B SWP indicators (INTEN mode). (If you inadvertently chose the fastest A-Sweep speed, the CH2 Delay Match function will be active.
20. 4. Select At or 1/At while the SEC/DIV knob is out. 5. Adjust

Environmental Characteristics

PARAMETER	VALUE
Humidity	andtemperature requirements definedin paragraphs 3.9.2.2 392 3 and 3.

General Specifications & Supplementary Characteristics

PARAMETER	VALUE
ATTENTION	Refer to manual. viii 2465B/2455B./2445B Operators OperatorsSafety Summary Power Source This product is intended to operate from a power source that does not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.
EFFECTIVE SERIAL NUMBERS	2445B B0600000 PAGE! Change the first and second paragraphs to: The TEKTRONIX 2465B, 2455B, and 2445B portable oscilloscopes have four vertical channels with DC to 400 MHz, 250 MHz, and 200 MHz bandwidths. . . The trigger systems work automatically for most signals. They operate in various modes, from any channel, with couplings for a wider range of signals.

Full OEM specifications

Complete technical content extracted from the manufacturer datasheet

(https://archive.org/download/tektronix_2465bOper_Oct90/2465bOper_Oct90_text.pdf). Structured tables above summarize key parameters; this appendix preserves the full OEM text.

performance of service.

Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid.

Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located.

Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care.

Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; or c) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product. THIS WARRANTY IS GIVEN BY

TEKTRONIX WITH RESPECT TO THIS

PRODUCT IN LIEU OF ANY OTHER WARRANTIES,

EXPRESSED OR IMPLIED.

TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED

WARRANTIES OF

MERCHANTABILITY OR FITNESS

FOR A PARTICULAR PURPOSE. TEKTRONIX'

RESPONSIBILITY TO REPAIR OR REPLACE

DEFECTIVE PRODUCTS IS THE SOLE AND

EXCLUSIVE

REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY

TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR

CONSEQUENTIAL DAMAGES

IRRESPECTIVE OF WHETHER

TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE

POSSIBILITY OF SUCH DAMAGES.

Certificate of the Manufacturer/Importer We hereby certify that the 04Re;n/0/ir;c;n/o/Mc;n ncrnincrnocaKinm c-rwv>wit.-rvuu/c--r-TK/Lj luuovuii_r>nii_r ni complies with the RF Interference Suppression requirements of Amtsbl.-Vfg 1046/1984.

The German Postal Service was notified that the equipment is being marketed. The German Postal Service has the right to re-test the series and to verify that it complies.

TEKTRONIX Bescheinigung des Herstellers/Importeurs Hiermit wird bescheinigt, daß der/die/das

2465B/2455B/2445B

OSCILLOSCOPE AND ALL

INSTALLED OPTIONS in Übereinstimmung mit den Bestimmungen der Amtsblatt-Verfügung 1046/1384 funktionstüchtig ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

TEKTRONIX

NOTICE to the user/operator: The German Postal Service requires that Systems assembled by the operator/user of this instrument must also comply with Postal Regulation, Vfg.

1046/1984, Par. 2, Sect. 1. HINWEIS für den Benutzer/Betreiber: Die vom Betreiber zusammengestellte Anlage, innerhalb derer dies Gerät eingesetzt wird, muß ebenfalls den Voraussetzungen nach Par.

2, Ziff. 1 der Vfg. 1046/1984 genügen. NOTICE to the user/operator: The German Postal Service requires that this equipment, when used in a test setup, may only be operated if the requirements of Postal Regulation, Vfg.

1046/1984, Par. 2, Sect. 1.7.1 are complied with. HINWEIS für den Benutzer/Betreiber: Dies Gerät darf in Meßaufbauten nur betrieben werden, wenn die Voraussetzungen des Par.

2, Ziff. 1.7.1 der Vfg. 1046/1984 eingehalten werden.

The 2465B, 2455 B, and 2445B The TEKTRONIX 2465B, 2455B, and 2445B portable oscilloscopes have four vertical channels with DC to 400 MHz, 250 MHz, and 150 MHz bandwidths.

Deflection factors run from 2 mV to 5 V per division, in a 1-2-5 sequence, with either 1 MΩ or 50 Ω input resistance, in channels 1 and 2. Either AC or DC input coupling is available at 1 Mil.

Channels 3 and 4 give 0.1 V or 0.5 V per division, with 1 M Ω input resistance, and DC coupling. With the standard 10X probes, channels 1 and 2 display 20 mV to 50 V/division and channels 3 and 4 display 1 V or 5 V/division. The trigger system works automatically for most signals. They operate in various modes, from any channel, with optimum couplings for wide range of signals.

The 2445B triggers from DC to 250 MHz. The 2455B and 2465B trigger from DC to 500 MHz. Sweep speeds range from 1.5 to 1 ns per division on the 2445B and 2455B and to 500 ps per division on the 2465B, including the effect of the $\times 10$ magnifier and the calibrated variable between 1-2-5 steps. Horizontal displays include A-Sweep, B-Sweep (delayed), A alternated with B, and CH 1 (for X/Y displays).

The SETUP features, AUTO, SAVE, and RECALL, save time and prevent errors, whether you are a novice operator or a master. AUTO Setup works with almost any signal. For repeating measurements, the Save and Recall functions record and restore as many as 30 instrument setups, including the extended-function options. Setups can be recalled either immediately or sequentially. Digital readouts of time, voltage, scale factors, trigger levels, and auxiliary information also save time and reduce errors.

With Parametric Measurements, common measurements such as frequency, period, amplitude, pulse width, duty factor, rise time, fall time, and propagation delay can be made automatically.

Each measurement activation displays the results in the CRT readout. Measurement results remain on-screen until any other button is pressed.

For instruments with serial numbers B049999 and below with firmware Version 11 and above or for instruments serial numbers B050000 and above with firmware Version 2 and above the following function is available. The RECALL button resets the instrument into the mode of operation it was in prior to performing the parametric measurement or AUTO Setup.

With the available Counter/Fimer/Trigger (CTT), Option 06 or Option 09, measurements require even less effort and give better accuracy.

The CTT increases trigger selectivity, especially in digital systems. Option 09 includes the CTT and a 17-bit Word Recognizer (WR). The available Television A'ideo (TV) enhancement, Option 05, can trigger at any desired point in a frame and it can reduce the effects of accoupling and hum in a video signal. The available Digital Multimeter (DMM) measures dc voltage, dc current, ac rms current, resistance, and temperature with floating inputs.

2465B/2455B/2445B Operators: The 2465B, 2455B, and 2445B The WR adds a Word Recognizer Probe connector on the rear panel. The TV enhancement adds LINES, FLD1, and FLD2 Trigger Coupling.

The available GPIB interface accesses all controls and digital readings. The interface adds GPIB status indicators, just above the CRT. See the 24X5B/2467B GPIB (Option 10) Instrument Interfacing Guide for information on integrating the instrument into a GPIB system.

The 2465BCT includes CTT and WR (Option 9) and GPIB (Option 10).

The 2465BDM adds DMM (Option 01) and also includes CTT and WR (Option 9) and GPIB (Option 10). The 2465BDV adds TV (Option 05) to the features of the 2465B DM.

Illustrations at the back of the manual show the instrument front and rear panels.

2455B/2455B/2445B Operators

wifi^ifia Preface Illustrations Tables Operators Safety Summary "jGenera! information Preparation for Use Safety Line Voltage Selection Line Fuse Power Cord Instrument Cooling Start-up Repackaging For Shipment 2 Operation Fundamentals Parametric Measurements Getting a Display Assigning Parametric Measurements to Auto Setup Vertical Horizontal Trigger Controls Video Triggering Readout Measurements with Cursors Voltage Measurements Display Operation Signal Connections Magnify Waveform Details with Delayed-Sweep B-Trigger Operation Delta-Delay-Time Single-Delay-Time Measurements Time Interval Measurement Precision Timing Triggered Delta-Delay-Time Measurements Time Interval Resolution Measurement Updating Frequency. Period, and Totalize Counting Frequency Measurement with External Reference (Option 1 E) Delay Sweeps by Event Counts Logic Triggering Word Recognizer Operation The Word Out Signal Frequency Limit for Auto Level or Parametric Measurements..

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Operators Safety Summary Operators Safety Summary The general safetyinformation in this partof the summary is for both operating and servicing personnel.

Specific warnings and cautions will befound throughout themanual where they apply and do not appear in thissummary.

Terms In This Manual

CAUTION statements identify conditions or practicesthat could resultin damage tothe equipment or other property.

WARNING statements identify conditions orpractices that could resultin personal injury or loss oflife.

Markedon Equipment

CAUTION indicates apersonal injury hazardnot immediately accessible asone readsthe markings, orahazard to property, including the equipmentitself.

DANGER indicatesapersonalinjury hazard immediately accessible as one reads themarking. Symbols In This Manual This symbol indicates where applicable cautionary orother information isto be found.

Formaximum inputvoltage seeTable 6-1. As Marked on Equipment ff DANGER - High voltage.

Protective ground (earth) terminal.

ATTENTION -Refer tomanual. viii 2465B/2455B./2445B Operators

OperatorsSafety Summary Power Source This productis intended to operatefrom apower source that doesnot applymore than 250volts rmsbetween the supply conductors or between either supply conductor and ground.A protective ground connection bywayof the grounding conductor inthe power cordis essentialfor safe operation. Grounding theProduct This productisgrounded through thegrounding conductor of thepower cord.To avoidelectrical shock, plug the powercord into aproperly wired receptacle before connecting tothe product input oroutput terminals.

A protective ground connection bywayofthe grounding conductor in the power cordis essential for safeoperation.

Danger Arising From Lossof Ground Uponloss of the protective-ground connection, all accessible conductive parts (including knobs andcontrols that may appear to beinsulating) canrender an electric shock.

UseetheProper Power Cord Useonly thepower cordand connector specifiedfor your product.

Useonlyapower cord thatisin good condition. Fordetailed information onpower cords and connectors seeTable 1-1.

Useethe Proper Fuse Toavoid firehazard, useonly afuse of thecorrect type,voltage rating and current rating asspecifiedin the parts list foryour product.

DoNotOperate in Explosive Atmospheres Toavoid explosion, donotoperate thisproduct inan explosive atmosphere unless ithasbeen specifically certifiedfor such operation.

Do Not Remove Covers or Panels To avoid personalinjury, do not remove the product coversor panels.

Do not operate theproduct without the covers and panelsproperly installed.

2465B/2455B/2445B Operators IX ISAMist HIGH f • idown .»*!DCVAC VdBV CONT HIJ1 KIN- WAXREF HOLD OISPIAYDISPLAYId'p'n OCAAC AdBm Tektronix 2465B4oomhz 0'b»«« wmmmm 130 READOUTTN1CNSITYSCAU: ILLUM ffiACforelRillAIKIN „ , , .ASUf.

r. ! # wmf ! 'scau \ z~r scauifAtrons^'^actors] .?!LOUVArh iTTUPVERTICAL STEP/ .

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1988 Product: 2445B/2455B/2465B Operators Revised OCT1990 Manual Insert Status Date Phanne RabranroQfafu*
JUL90 M73008 Effective Page 1 of 1

Tektronix* MANUAL CHANGE iNt-GHMAliuN (XMMTlCDia£3CZUCNce Date: 07-05- 90 Change Reference: M73Q06 Product:
2465B/2455B/2445B Operators Manual Part Number: 070-6860-00

DESCRIPTION ProductGroup 38

EFFECTIVE SERIAL NUMBERS: 2445B B06000000 PAGE! Change thefirstandsecond paragraphs to: The

TEKTRONIX 2465B,2455B, and 2445Bportable oscilloscopes have four vertical channels withDCto400 MHz,250
MHz,and200 MHz bandwidths.

. . Thetrigger systems workautomatically formostsignals. They operate invarious modes,fromanychannel, with
couplings forawiderange ofsignals.

The2445B triggers fromDC to300MHz.The 2455Band 2465BtriggerfromDC to500MHz. PAGE 6-3,6-5,and 6-6 Change the
2445BVerticalDeflection System -Channel 1and Channel 2, andVertical Deflection System- Channel3 and Channel
4specificationsto: -3 dBBandwidth 2445B +15°Cto+35°C DCto 200MHz.* - 15°Cto+15°Cand DCto175 MHz.

+35°Cto +55°C -4.7 dBBandwidth 2445B +15°Cto +35°C DCto200 MHz. a - 15°Cto+15°Cand DCto175 MHz.

+35°Cto +55°C StepResponseRiseTime 2445B <1.75 ns. Page 1of2

PAGE6-7 and 6-8 Chang* the 2445B Triggering specifications to: Minimum P-P Signal Amplitude for Stable
Triggering from Channel 1or Channel 2 Source 2445B DC Coupled NOISE REJ Coupled 0.35 division from dcto 50
MHz; increasing to 1 .0division at 200 MHz and 1 .5 divisions at 300 MHz.

<1 .2 divisions from dcto 50 MHz; increasing to3.0 divisions at 200 MHs and 4.5 divisions at300 MHz.

ACCoupled LFREJ Coupled 0.35 division from 60 Hzto50 MHz; increasing to 1.0division at200 MHz and 1.5
divisions at 300 MHz.

Attenu- atesignals below 60 Hz. 0.50 division from 80 kHzto 50 MHz; increasing to 1.0 division at 200MHz and
1.5divisions at300 MHz.

2445B PAGE 7-3 <100 ps with5 divisions of 200 MHz at 1ns/division.

Change the 2445B Standard Accessories to: Probes (10X, 1.3m) with Accessories P6137 PAGE 7-5 Change the 2445B
Standard Accessories to: Probe Package P6137 Page 2 of2

1 General Information

Preparation for Use Safety Before connectingthe oscilloscope toapower source, read entirely both this
sectionandtheSafety Summaryatthe frontofthis manual.

Be sureyouhave the trainingrequired tosafelyconnectthe instrument inputstothesignals you will be
measuring.Refer totheSafetySummary forpower source, grounding,andother safety considerationspertaining
totheuseof theinstrument.

LineVoltage Selection Thisinstrument maybedamaged ifoperatedwith theLINE VOLTAGE SELECTORswitchsetfor
thewrongapplied ac input- source voltageor if thewronglinefuseis installed.

Theoscilloscope operatesfrom either a1 15-Vor a230-Vnominal acpower- line withanyfrequency from 48 Hzto440Hz.

Beforeconnecting the powercordtoapowersource, verify thatthe LINE VOLTAGE SELECTOR switch, locatedonthe rear
panel(seeFigure 1-1), is setcorrectly (seeTable 1-1)andthattheline fuseis correct.Toconvert theinstrument
foroperation ontheotherline-voltage range, movetheLINEVOLTAGE SELECTOR switch tothecorrect nominal ac source-
voltage setting.Thedetachable power cordmay haveto bereplacedto match the particular power source.

Line Fuse To verifythe instrument power-input fuserating, dothefollowingsteps: 1. Pressthe fuse-holdercap
andrelease it withaslight counterclockwise rotation.

Pulithecap(with theattached fuseinside) outofthefuseholder. 2. Verify that the fuse isofthe typelistedonthe
backoftheinstrument.

Then installtheproper fuseandreinstall the properfuse-holder cap. The two typesoffuseslistedarenot directly
interchangeable; theyrequiredifferent typesoffuse caps.Forinternational power cordoptions, a5x20mmfuse
holdercapisincluded inthe accessory pouchforusewith 1 ,6A,250V, 5x20 mm(IEC 127) fuses(notsupplied).

2465B/2455B/2445BOperators 1-1

General Information

Table 1-1 Power Cord and Voltage Data Plug Configuration Option Power Cord/ Plug Type Line Voltage Selector
Reference Standards 11 U.S.

Std. U.S. 120 V 115V ANSI C73.11 NEMA5-1 5-P IEC 83 UL 198.6 A1 EURO 220 V 230V CEE(7), II,IV,VII IEC 83 IEC
127 A2 UK B 240 V 230V BS 1363 IEC 83 IEC 127 A3 Australian 240 V 230V AS C112 IEC 127 A4 North American 240V
230V ANSI C73.20 NEMA6-1 5-P IEC

83 UL 198.6 'W&K " A5 Switzerland 220 V 230V SEV IEC 127 a A 6A > *type Cfuseis also installed inside the plug
ofthe Option A2 power cord.

^Reference Standards Abbreviations: ANSI- American National Standards Institute AS -Standards Association of
Australia BS- British Standards Institution CEE- International Commission on Rulesfor the Approval of

Electrical Equipment IEC- International Electrotechnical Commission NEMA- National Electrical Manufacturer's Association SEV - Schweißeiserverein Elektrotechnischer Verein UL- Underwriters Laboratories Inc.

1-2 2465B/2455B/2445B Operators

General Information LINEFUSE

POWERCORD LINE SELECTOR

RECEPTACLE SWITCH 6014-01

Figure 1-1. Lineselector switch, line fuse, and detachable power cord. Power Cord This instrument has a detachable, three-wire power cord with a three-contact plug for connection to both the power source and protective ground.

The power cord is secured to the rear panel by a cord-set-securing clamp. The protective-ground contact on the plug connects through the power-cord to the external metal parts of the instrument. For electrical-shock protection, insert this plug into a power-source outlet that has a properly grounded protective-ground contact.

Instruments are shipped with the required power cord as ordered by the customer. Available power-cord information is presented in

Table 1-1, and part numbers are listed in "Options and Accessories" (Section 7). Contact your Tektronix representative or local Tektronix Field Office for additional power-cord information.

2465B/2455B/2445B Operators 1-3

General Information Instrument Cooling To prevent instrument damage from internally generated heat, adequate airflow must be maintained.

Before turning on the power, verify that the spaces around the air-intake holes on the bottom of the cabinet and the fan-exhaust holes in the rear panel are free of any obstruction to airflow.

Start-up The oscilloscope automatically performs a set of diagnostic tests each time the instrument is turned on.

These tests warn the user of any available indication that the instrument may not be fully functional.

The tests run for several seconds after power is applied. If no faults are encountered, the instrument operates normally.

A failure of any of the power-up tests will be indicated by either a flashing TRIG'D indicator on the instrument front panel or a bottom-line readout on the CRT in the form: TEST XX FAIL YY (where XX is the test number and YY is the failure code of the failed test).

If a failure of any power-up test occurs, the instrument may still be usable for some applications.

To operate the instrument after a power-up test failure, press the A/B TRIG button.

Even if the instrument then functions for your particular measurement requirement, it should be repaired by a qualified service technician at the earliest convenience.

Additional information on the power-up tests may be found in Appendix C at the rear of this manual.

Consult your service department, your local Tektronix Service Center, or nearest Tektronix representative if additional assistance is needed.

1-4 2465B/2455B/2445B Operators

General Information Repackaging For Shipment If this instrument is to be shipped by commercial transportation, it should be packaged in the original manner.

The carton and packaging material in which your instrument was shipped to you should be retained for this purpose.

If the original packaging is unfit for use or is not available, repackage the instrument as follows: 1. Obtain a corrugated cardboard shipping carton having inside dimensions at least six inches greater than the instrument dimensions and having a carton test strength of at least 275 pounds.

2. If the instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag to the instrument showing the following: owner of the instrument (with address), the name of a person at your firm who can be contacted, complete instrument type and serial number, and a description of the service required.

3. Wrap the instrument with polyethylene sheeting or equivalent to protect the outside finish and prevent entry of packing materials into the instrument.

4. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument, allowing three inches on each side.

5. Seal the carton with shipping tape or with an industrial stapler. 6. Mark the address of the Tektronix Service Center and your return address on the carton in one or more prominent locations.

2465B/2455B/2445B Operators 1-5

2 Operation

Operation Operation Fundamentals Like any oscilloscope, this instrument draws a graph of voltage as a function of time. The VERTICAL controls, marked off by a heavy gray line, define the voltage axis of the display

RFft/DIV VldMACanrl hnri7r.n*?l oncmnM - -- - vvrv- ; * t . ' v ' V MWi itviiQiiI IIV1 1 WlIIIVr-xl **>*%.

tir-ns-.nw, lA UICUIIC QAI0 the display. The TRIGGER controls, marked off by a green box, define the signals required to initiate sweeps across the time axis.

The controls under the CRT affect the display but not the waveform.

Parametric Measurements The Parametric Measurement function provided in the instrument gives quick access to the parameters of your input signal.

To obtain a parametric measurement, simply press the MEASURE button and select the desired function from the displayed menu.

The function is selected by pressing the button in the VERTICAL MODE area that occupies the same relative position as the desired menu selection.

The measurement function will automatically scale the input signal before making the measurement.

Parametric measurements require repetitive signals for reliable results. Measurements on non-repetitive signals will produce unpredictable results.

Repetitive signals that have periodic bursts of signal transitions will also produce unpredictable results.

Parametric measurements can only be performed on signals in CH1 or CH2. An error message will be displayed if CH 3, CH 4, or ADD are selected for parametric measurements.

2465B/2455B/2445B Operators REV NOV 1988-1

Operation Getting a Display 1. Connect a probe from the input of a vertical channel to a signal.

2. Select the channel using the vertical MODE buttons. You may select any combination of vertical channels.

(If you are using the standard accessory probes, make sure the CH 1 and CH2 input are not set at 50 fl.)

3. Press AUTO Setup to initialize vertical, horizontal, trigger, and display intensity for a usable display.

(If STEP is illuminated, first push RECALL to extinguish it.) 4. If the resulting display isn't exactly what you want, adjust the appropriate VOLTS/DIV, SEC/DIV, POSITION, or Trigger controls.

Characteristics of AUTO Setup With one channel. Auto Setup centers the 0-volt level and makes the vertical display as large as possible, within the graticule.

With more than one channel, the 0-volt levels of CH 1, CH 2, CH 3, and CH 4 are set at +2, 0, -2, and -3 divisions from center, respectively.

When ADD is displayed, the 0-volt level of CH 2 is set at -2 divisions.

AUTO sets Sec/Div within the range from 20 ns to 2 ms, to show two to five cycles of most signals.

With narrow, low repetition-rate pulses, the sweep runs faster to stretch out the display, with the appropriate trigger slope.

AUTO Setup sets the trigger for Auto Lvl Mode, Vert Source, DC Coupling, and Min Holdoff, with level at the midpoint between signal peaks.

The

STEP/AUTO EXT SWITCH connector on the rear panel produces the same functions as the

STEP/AUTO button, in response to a switch closure or TTL-low signal. The following function is available for

instruments with serial numbers B049999 and below with firmware version 11 and above or for instruments with serial numbers B050000 and above with firmware version 2 and above (see

Appendix A - EXER04 to determine firmware version). AUTO Setup can also be activated by pressing any probe ID button if configured to perform an AUTO Setup using the PROBE Configure menu.

The operator can configure the probe ID to perform one of four possible outcomes (1 DENI AUTO Setup.

INIT@50%, or STEP). Once configured, the instrument will maintain the selection until modified again by the operator.

The following function is available for instruments with serial numbers B049999 and below with firmware version 10 and below or for instruments with serial numbers B050000 and above with firmware version 1 and below (see

Appendix A - EXER04 to determine firmware version). AUTO Setup can also be activated by pressing any probe ID button twice in 0.5 second.

See "Save and Recall Operation" for the sequence function of Step/Auto.

2-2 2465B/2455B/2445B Operators

Operation Assigning Parametric Measurements to the Auto Setup Function Any of the Parametric Measurements can be assigned to the Auto Setup function.

When Auto Setup is activated, the assigned function is performed as well as the Auto Setup.

To assign a function to Auto Setup: 1. Push MEASURE. 2. If the CTT is present, select MORE from the menu.

Otherwise goto Step 3.

NOTE To select items from a menu, simply press the vertical mode button that has the same position as the desired item in the menu.

3. Select

CONFIGURE from the menu. 4. Select AUTO from the menu. 5. Select the function to be performed with each Auto Setup by pushing the appropriate MODE button.

Activating AUTO Setup from the Probe The following function is available for instruments with serial numbers B049999 and below with firmware version 11 and above or for instruments with serial numbers B050000 and above with firmware version 2 and above (see

Appendix A - EXER04 to determine firmware version). Pressing the probe identification button on any Tektronix, Inc. probe will shift the associated trace and replace the associated scale factor with ID, PROBE

CONFIGURE menu. AUTO Setup, INIT@50% or STEP can also be assigned to the probe ID function.

To assign a function to probe ID: 1. Push MEASURE 2. If CTT is present, select MORE from the menu.

Otherwise, goto Step 3. 2465B/2455B/2445B Operators 2-3

Operation

NOTE To select items from a menu, simply press the vertical mode button that has the same position as the desired item in the menu.

3. Select

CONFIGURE from the menu. 4. Select PROBE from the menu.

5. Finally, select the function to be performed with each probe ID by pressing the appropriate MODE button. If AUTO Setup function is selected, any measurement assigned to the AUTO Setup is also performed. The following function is available for instruments with serial numbers B049999 and below with firmware version 10 and below or for instruments with serial numbers B050000 and above with firmware version 1 and below (see

Appendix A - EXER04 to determine firmware version). Pressing the probe identification button on any Tek probe will shift the associated trace and replace the associated scale factor with ID. If the probe identification is pressed twice in 0.5 second, the Auto Setup function is activated.

Any measurement assigned to the Auto Setup function is also performed.

Vertical For voltage measurements, set

VOLTS/DIV VAR fully clockwise. For best accuracy set

VOLTS/DIV for the largest display possible. Input Coupling Use 1M Ω DC input mode for most applications.

This mode is compatible with the standard accessory, high-impedance probes and it displays logic levels and dc levels of static signals.

Use the pair of buttons near the CH 1 and CH 2 inputs to select input coupling, CH 3 and CH 4 inputs are fixed at 1M Ω DC.

GND input mode shows where the 0-volt level will be displayed with DC coupling.

Use AC coupling for the special cases where you need to see small signals on large dc voltages.

Use the 50 Ω XT DC input mode for the best possible vertical performance with active probes, 50-fs signal sources, and low-impedance passive probes.

A low-impedance probe can present less than 2 pF load to the signal-source, in parallel with 500 Ω or 5000 Ω XT with 10X or 100X attenuation.

2-4 2465B/2455B/2445B Operators

Operation Input Conditioning for Video Signals Video signals can be distorted by ac coupling or by low-frequency interference.

The available Television/Video (TV) enhancement adds a TVCLAMP to the CH 2 input to eliminate such distortion. To use the TV clamp: 1. Apply a composite video signal to CH 2. 2. Select CH 2 Trigger Source and set SLOPE to the displayed polarity of the sync pulses.

3. Set the CH 2 input to TV CLAMP by pressing the upper input-coupling button for CH 2 until the readout shows "TVC". The "backporch" of the video signal will be locked to a fixed level.

Keep the TV clamp turned off when the trigger source is not composite video or composite sync, to preserve normal operation of Channel 2. Leave the rear-panel

CH 2 SIGNAL OUT unloaded to avoid a minor distortion in the video signal when TV Clamp is on.

Channel Selection Using the Vertical MODE buttons, you can display any combination of the four vertical channels. To manually switch between CH 1 and another channel, with minimum button pushing, deselect CH 1 and press the button for the other channel to turn it on and off; CH 1 is displayed when all other verticals are off.

ADD and INVERT Press ADD to display the algebraic sum of CH 1 and CH 2. Select INVERT to change the sense of the CH 2 waveform or to see the difference between CH 1 and CH 2 on the ADD trace. If you use ADD, the CH 1 and CH 2 VOLTS/DIV settings should be equal.

Parametric measurements will not work if ADD is selected. Choosing CHOP or ALT With two or more channels, the display is time-shared.

Chop mode displays each channel for a short time and multiplexes during the sweep to give the appearance of displaying all channels at once. Chop works better than Alt for sweeps slower than 1 ms/division and for low repetition-rate signals that make the display flicker, up to 2 j/s/division.

Alt mode displays each channel for the duration of a complete sweep.

Alt gives a "cleaner" display of multiple channels than Chop does and is usually preferred at moderate to high sweep speeds.

20 MHz BW Limit This mode can give you a sharper trace by eliminating high-frequency interference. Before using it, check to make sure it doesn't distort the waveform.

2465B/2455B/2445B Operators 2-5

Operation Horizontal The ASweep is the only horizontal function you need for most applications.

The ASWP indicator is on when the A-Sweep is displayed. To make sure the A-Sweep is displayed, press AUTO Setup and push SEC/DI V in.

You can also restore the A-Sweep display by pushing the SEC/DIV knob in and turning it counterclockwise until the ASWP indicator lights.

If both A SWP and B SWP indicators are off, push SEC/DIV in and turn it clockwise to escape the X/Y display mode.

The X10 MAGnifier expands the center of the unmagnified waveform. For best measurement accuracy, set SEC/DIV for the fastest sweep that will display the interval of interest and set VAR fully clockwise.

See "Delayed Sweep Operation" for more information about B Sweep, B Trigger and trace separation.

Trigger Controls For "hands-off" triggering with most signals, select Auto Lvl Mode, Vert Source DC Coupling, and MINimum Holdoff.

Auto Lvl mode, with LEVEL in the center half of its range, sets the trigger point near the midpoint between signal peaks.

When LEVEL is set to the - or + end of its range, this mode initiates triggering near the 10% or 90% point between signal peaks.

You can select a level anywhere in about the middle 80% of the signal amplitude. Once set, the level doesn't change unless the signal ceases to trigger the sweep. The sweep free-runs without a trigger signal. With signals below 50 Hz, AUTO LVL may not find the correct level.

If the signal is below 50 Hz but greater than 10 Hz, you can change the minimum frequency at which Auto Level will work by using the MINFREQ entry under the measurement CONFIGURE menu. See "Frequency Limit for Auto Level or Parametric Measurements" for more information. With Auto Lvl mode and Vert Source, the displayed channel or the first one of a multichannel display supplies the trigger signal.

Auto mode maintains the trigger level setting and the sweep free-runs if the signal doesn't meet the triggering requirements.

2-6 2465B/2455B/2445B Operators

Operation Use Auto for monitoring logic signals. Set the LEVEL control to the mean threshold of the logic system, +1.4V for TTL.

The sweep then triggers on valid transitions and free-runs to show static highs and lows.

Normal mode produces a sweep only when the trigger signal meets the Level and Slope criteria. Use Normal mode for infrequent events and erratic signals.

Sgl Seq mode accepts one trigger for each sweep in the display. Press the lower Mode button to arm the trigger and illuminate the READY indicator for each sequence.

With a multi-trace display, a sequence comprises up to sixteen sweeps. Use Sgl Seq to detect a rare event or to eliminate all but the first one of a chaotic burst of pulses.

Set the trigger for the signal of interest in Normal mode. Then press the lower Mode button to select Sgl Seq and illuminate the READY indicator. To detect the occurrence of a rare event, display a single trace and arm Sgl Seq with the trigger set for the event. Periodically check to see if READY is on. If a burst of trigger events occurs, the sweep runs once for each trace displayed and READY extinguishes.

Trigger Source Choose a single trigger source to correctly display the timing relationships among multiple channels.

Choose the channel with the lowest-frequency signal to avoid ambiguous displays. With Vert trigger source, Auto Lvl trigger mode or Chop vertical mode automatically selects a single trigger source, the first one of the displayed channels.

Use a composite A-Trigger source to compare asynchronous signals. To generate a composite trigger, select Vert trigger source, a trigger mode other than Auto Lvl, and Alt vertical mode.

Trigger Coupling For noisy signals or signals with strongly interfering components. Noise Reject, HF Reject, and LF Reject coupling give added selectivity.

AC coupling continues triggering when the dc level of the signal changes. 2465B/2455B/2445B Operators 2-7

Operation Trigger Slope Press SLOPE to select the rising (+) or falling (-) edge of the signal to trigger the sweep.

Trigger Level INIT@50% sets the trigger level near the midpoint between signal peaks, in any mode.

Some signals below 50 Hz may not produce the correct level setting.

LEVEL gives you complete freedom to choose the most appropriate threshold voltage on a signal to initiate sweeps, in case neither the Auto Lvl mode nor INIT@50% provides a suitable threshold.

Trigger Holdoff With irregular signals such as bursts, the Trigger HOLDOFF setting can improve display stability.

Also, if the signal has a fixed pattern of variation from cycle to cycle, some modes of the signal may be omitted from the display.

Changing the Holdoff setting can force the instrument to display all the modes of the signal.

Normally, HOLDOFF should be set at MIN. If you must use HOLDOFF to achieve a stable display, parametric measurements will not function correctly.

2-8 2465B/2455B/2445B Operators

Operation Video Triggering The available Television/Video (TV) enhancement adds TV LINES, FLD1, and FLD2 Coupling to the A-Trigger. See Appendix A to change the line-number format and the sync polarity automatically selected when you select TV triggering.

To trigger at the video line rate: 1. Select a composite video signal as the trigger source.

2. Select LINES coupling. 3. Set SLOPE to the polarity of the sync. To trigger at a specific video line:

1. Select a composite video signal as the trigger source.

2. Select FLD1, FLD2, or ALT coupling. 3. Set SLOPE to the polarity of the sync. 4. Turn FLD LINE # (A) to the desired line number.

When you increment or decrement the line number outside the range of the selected field, the other field is automatically selected.

With ALT field coupling, the line number is referred to the beginning of both fields. The trigger level can be adjusted to vary the actual sync trigger point. This can be useful when triggering on noisy video signals, INIT@50% resets the trigger point to mid-range.

To compare two video signals with the same format that are not perfectly synchronized, such as from a camera and a VCR or from the input and output of a time base corrector: 1. Display the signals on CH1 and CH2, with Alt Vertical mode.

2. Select VERT Trigger Source, and ALT field trigger coupling. 3. The CH1 display trigger on field 1 and the CH2 display triggers on field 2.

TV Lines trigger coupling with multiple vertical channels, Alt Vertical mode, and Vert Trigger source produce unpredictable results.

A "A" symbol with the line number display shows when the

A/FLD LINE # control can change the line number. If AV, At, or 1/At is on, press a trigger coupling button to redirect the control to line number selection.

Press AV or At to redirect the control to cursor or delay adjustment. The first push redirects the control.

A second push will change the A function or trigger coupling. 2465B/2455B/2445B Operators 2-9

Operation If you magnify the vertical display beyond the graticule, the trigger may be degraded.

To avoid trigger overload, use one channel for display and another channel with an appropriate video signal as the trigger source.

A composite sync signal can be used for the trigger source as well as composite video.

Readout To aid waveform interpretation, the readout shows scale factors, delta

Ordering Information

OPTION	DESCRIPTION
Includes	8, 16, 24,32, 40,48, 56, or64.

Available from Aumictech

Used and refurbished unit evaluated in-house. Calibration: N/A — off-catalog OEM datasheet. See OEM documentation · Not listed on Aumictech inventory.

Request a quote: **sales@aumictech.com** · +1 (484) 841-9341

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