



## Optional Accessories

**TPI offers a complete line of...**

**Handheld Oscilloscopes**

**Digital Multimeters**

**Digital Clamp-on Meters**

**Gas Detection Instruments**

**Combustion Analyzers**

**Refrigeration Leak Detectors**

**Digital Manometers**

**Contact and Infrared Temperature Instruments**

**Oscilloscope Probes**

**Surface Mount Test Clips**

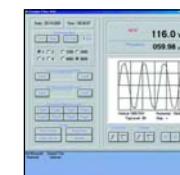
**BNC-BNC Molded Coax Cables**

**F-series Cables**

**Full Line of Accessories**



**Protective Boot**  
**A403**



**PC Software & RS232 Cable**  
**A402**



**Soft Zipper Case**  
**A900**



**Clamp-on Adapters**  
**A251**



**Low Current Adapter**  
**A254**



**Current Shunt Adapter**  
**A130**



**Temperature Adapter**  
**A301**  
Measure -40° to 500° F.  
For K-type thermocouple probes.



**Fused Test Leads**  
**FTLK1**  
Reduce your risk of electrical shocks and/or instrument damage.



**High Voltage Probe**  
**HV40C**  
Measure up to 40 KV DC.



**Test Lead Kits w/Silicone Insulation**  
**TLS2000B**  
Shuttered plug  
**TLS2000RB**  
Right angle plug



**Pressure Adapter**  
**A620**  
Measure up to 500 PSI.  
**A630**  
Measure up to 10,000 PSI.



**Cigarette Lighter DC Adapter**  
**A408**  
Charge the 440 while on the road or in remote locations.



To learn about the entire TPI product line visit [www.tpi-thevalueleader.com](http://www.tpi-thevalueleader.com)

**Distributed By:**

**TRANSCAT®**

Visit us at [Transcat.com!](http://Transcat.com)

35 Vantage Point Drive // Rochester, NY 14624 // Call 1.800.800.5001



# Your Tools at Work

**460 Handheld Oscilloscope**

## Dual Channel, 20MHz Oscilloscope with True RMS DMM.

Technicians appreciate the bright backlight of the 3" x 3" cold cathode fluorescent display and rugged construction inside and out.

### New with the 460

- Cursor Readout
- Decibels
- Pre and Post Triggering
- cULUS 3111

### INCLUDED

Two Test Leads, two Banana to BNC Adapters, one DC-60 MHz x 1 x 10 Passive Oscilloscope Probe, Power Supply and Instruction Manual



### 460 FEATURES

#### 20 MHz Bandwidth

Capture signals from AC/DC drive motors, sensors, actuators, line and control voltages, UPS and industrial machines.

#### Cursor Readout

Measure the width and amplitude of the signal and display it on the screen instead of trying to figure it out manually.

#### Decibels

Accurately measure sound signals.

#### Pre and Post Triggering

View the waveform before and after the point the scope triggers at to find glitches and other anomalies with the signal.

#### Trend Mode

Graph readings over a predetermined time period to check for surges or dropouts.

#### Dual Input

View two waveforms on the display for comparison and troubleshooting.

#### True RMS DMM

Measure AC/DC volts up to 600V, frequency to 20 MHz, and resistance to 20 Meg ohm. Obtain accurate measurements of non-sinusoidal AC voltage and current waveforms found in controls and circuits with True RMS.

#### Real Time Sample Rate

Capture spikes and dropouts of industrial signals with real time sampling of 25 megasamples per second.

#### Bright LCD Backlight

Adjust brightness levels for clarity in any light condition.

#### Optically Isolated RS232 Output

Transfer data safely without a direct connection to your computer's circuitry.

#### Continuous Autoset

Feature automatically determines the correct vertical and horizontal settings for optimum waveform viewing. Autoset provides hands free operation while moving between test points.

### COMPARE

	<b>TPI 460</b>	<b>Fluke 123</b>
Screen Size	<b>76mm x 76mm (3" x 3")</b>	72mm x 72mm (2.8" x 2.8")
Backlight LCD	cold cathode fluorescent	cold cathode fluorescent
Bandwidth	20MHz	20MHz
Cursor Readout	yes	no
Resolution	8 bit	8 bit
True RMS	yes	yes
Charger	yes	yes
Banana to BNC Adapters (2)	yes	no
DC-60 MHz x1x10 Probe	yes	yes

**Included**

Two Test Leads, two Banana to BNC Adapters, one DC-60 MHz X1 X10 Passive Oscilloscope Probe, Power Supply and Instruction Manual

**APPLICATIONS**

**Industrial motor control** View start-up inrush currents, waveform symmetry, SCR trigger pulses, variable frequency drive signals, pulse width modulation, noise, misc. AC/DC speed control signals.

**Power quality** Noise on industrial feeds, AC voltage waveshape, current waveforms, machine start-up/power quality interference and noise.

**Programmable logic controls** PLC input and output signals, control signals, signal conditioning circuits, communications lines and power supplies.

**NC machines** Power quality, sensor outputs, control circuits, safety circuits, calibration and adjustments.

**Uninterruptable power supplies** Sensing and monitoring circuits, switching circuits, output waveforms and current waveforms.

Technicians appreciate the bright backlight of the 3" x 3" cold cathode fluorescent display and rugged construction inside and out.

**Cursor Readout****cULus****FEATURES****20 MHz Bandwidth**

Capture signals from AC/DC drive motors, sensors, actuators, line and control voltages, UPS and industrial machines.

**Cursor Readout**

Allows you to measure the width and amplitude of the signal and display it on the screen instead of trying to figure it out manually.

**Decibels**

Allows you to accurately measure sound signals.

**Pre and Post Triggering**

View the waveform before and after the point the scope triggers at to find glitches and other anomalies with the signal.

**Trend Mode**

Graph readings over a predetermined time period to check for surges or dropouts.

**Dual Input**

View two waveforms on the display for comparison and troubleshooting.

**True RMS DMM**

Measure AC/DC volts up to 600V, frequency to 20 MHz, and resistance to 20 Meg ohm. True RMS allows you to obtain accurate measurements of non-sinusoidal AC voltage and current waveforms found in controls and circuits.

**Real Time Sample Rate**

Capture spikes and dropouts of industrial signals with real time sampling of 25 megasamples per second.

**Bright LCD Backlight**

Adjust brightness levels for clarity under any light condition.

**Optically Isolated RS232 Output**

Transfer data safely without a direct connection to your computer's circuitry.

**Continuous Autoset**

Feature automatically determines the correct vertical and horizontal settings for optimum waveform viewing. Autoset provides hands free operation while moving between test points.

**Audio** Public address feeds, amplifiers, mixers and preamps.

**Video** Horizontal and vertical scan rates, z-axis blanking, sync pulses and luminance.

**Industrial lighting controls** SCR and other solid state designs.

**Factory automation** Robot control signals, machine vision, machine control and sensing circuits, calibration of positioning systems, analog controllers and servo controls.

**Line conditioners** Noise and quality.

**Voltage regulators** Noise and stability.

**Inverters** Waveform quality.

**CERTIFICATION OF CALIBRATION,  
CERTIFICATE OF COMPLIANCE**

For details and related fees, call 800-368-5719.

**SPECIFICATIONS****VERTICAL**

Bandwidth 20 MHz w/SP60B 10:1 Probe  
10 MHz w/Shielded Test Leads

**Sample Rate**

Real Time 25 Megasamples per Second up to 2 MHz

Equivalent Time 500 Megasamples per Second > 2 MHz

**Sensitivity**

50mV TO 200V/div 1,2,5 Sequence

**Coupling**

AC, DC, GND

**Resolution**

8 bits

**Accuracy**

$\pm (3\% + 0.05 \text{ range/div})$

**HORIZONTAL**

Modes Single, Normal, Auto

**Samples per Division**

25

**Accuracy**

Equivalent Time:  $\pm (0.5\% + 0.08 \text{ time/div})$

Real Time:  $\pm (0.1\% + 0.04 \text{ time/div})$

**TRIGGER**

Source Internal

**Modes**

Free Run, Normal

**Sensitivity**

Equivalent Time: 3 divisions or more

Real Time: 2 divisions or more

**TREND MODE**

Plot Time 30 sec/div to 1 hour/div

**Plot Data Type**

Max/Min Selectable

**Memory**

2 Screens

**TRUE RMS DMM**

DCV (CH1, CH2) 400mV, 4, 40, 400, 600V

Basic Accuracy:  $\pm (0.5\% + 5 \text{ digits})$

ACV (CH1, CH2) 400mV, 4, 40, 400, 600V

Basic Accuracy:  $\pm (1\% + 10 \text{ digits})$

Frequency (CH1, CH2)

Basic Accuracy: 1 Hz to 20 MHz

$\pm (0.5\% + 5 \text{ digits})$

Ohm (CH1 only)

Basic Accuracy: 400, 4k, 40k, 400k, 4M, 20M

$\pm (0.5\% + 5 \text{ digits})$

Continuity (CH1 only) Sounds < 0.1k ohm,  $\pm (2\% + 5 \text{ digits})$

**International Version**

220V 50/60Hz AC/DC adapter is included when specifying model no. 460X.

**FAQ****Why do you need a 20 MHz oscilloscope?**

To measure signals and voltage anomalies, and to look for glitches that may damage or even shut down electronic machinery. View sine waves on power supplies, motors, and bread board circuitry. Pinpoint certain glitches on the sine wave to zero in on the problem and monitor changing patterns or distortion in electrical currents.

**What are the different waveform patterns displayed on your handheld oscilloscopes?**

An AC waveform known as **sine wave** displays voltage against time in the shape of a sine curve. The **saw tooth** waveform displays a ramped angle and a sharp downward return to its earlier value. (Its display pattern resembles the cutting edge of a saw.) A **square waveform** graphically plots a series of vertical square shapes repeated with spacing between peaks.

**Why is it important to have Trend Mode?**

Trend Mode is great for monitoring sudden intermittents caused by loose connections, dirt, or damaged wires. By setting the minimum and maximum parameters, you can monitor, even record the changes.

**What is the purpose of triggering?**

Simply zoom in on certain parts of the sine wave and "hold" to measure and monitor that particular part you are reading. A must have when searching for glitches and distortion on all measurements.

**OPTIONAL ACCESSORIES****Temperature Adapter****A301**

Measure -40° to 500° F. For K-type thermocouple probes, refer to pages 18-19.

**Clamp-on Adapters****A251**

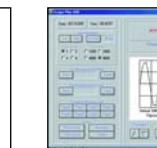
Measure up to 400 AC amps.

**Clamp-on Adapter****A256**

Measure up to 400 AC/DC amps.

**Clamp-on Adapter****A296**

Measure up to 2,000 AC/DC amps.

**PC Software &****RS232 Cable****A404**

Measure up to 400 AC/DC amps. Download data and waveforms from the 460 to any PC using Microsoft® Windows®.

**Low Current Adapter****A254**

Measure below one amp AC/DC.

**Current Shunt Adapter****A130**

Extend amp range to 30 amps.

**Soft Zipper Case****A905**

Protect and organize your 460.

**Protective Boot****A405**

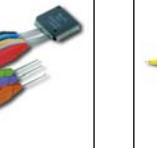
Guard against inevitable impacts. Unique rear cut-out design allows deployment of 460's rear tilt stand.

**Pressure Adapter****A620**

Measure up to 500 PSI.

**Surface Mount Test Clips**

Multicolored clips to access 0.3 pitch leads. See page 26.

**High Voltage Probe**

Measure accurately up to 15KV DC. See page 11.