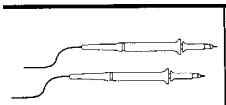
Appendix C: Accessories

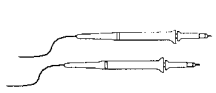
Standard Accessories

P3010 10X passive probes (TDS3012 and TDS3014)



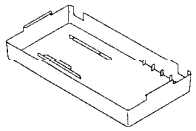
The P3010 10X passive probes have 100 MHz bandwidth and a CAT II voltage rating of 300 V_{RMS}.

P6139A 10X passive probes (TDS3032, TDS3034, TDS3052 and TDS3054)



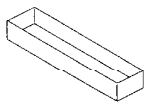
The P6139A 10X passive probes have 300 MHz or 500 MHz bandwidth and a CAT II voltage rating of 300 V_{RMS}.

Front cover



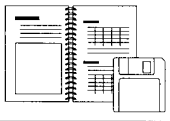
The front cover (200-4416-00) snaps onto the front of the oscilloscope to protect it during transit. The front cover contains a convenient location to store the Reference manual.

Accessory tray



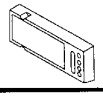
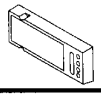
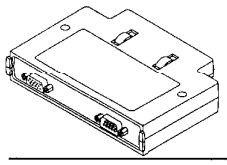
The accessory tray (436-0371-00) fits in the battery compartment when you do not have a battery installed. You can use the tray to store probes and other accessories.

Manuals



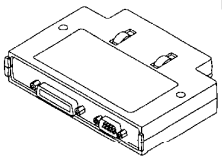
The oscilloscope includes a User Manual, Reference, and Online Tour Disk (020-2263-XX). Insert the disk into the oscilloscope disk drive to see an online tour of the product.

Optional Accessories

TDS3FFT FFT application package (standard with TDS3014, TDS3034, and TDS3054)	
	The FFT application package adds FFT analysis and measurement capability to your oscilloscope. Application packages can be installed by the user.
TDS3TRG Advanced Triggering application package (standard with TDS3014, TDS3034, and TDS3054)	
	The advanced triggering application package adds pulse-width, slew-rate, pattern, state, runt, and edge-delay triggering capability to your oscilloscope. Application packages can be installed by the user.
TDS3VID Extended Video application package	
	The extended video application package adds video trigger, display, and measurement capabilities to your oscilloscope. Application packages can be installed by the user.
TDS3TMT Telecom Mask Test application package	
	The telecom mask test application package adds ITU–T G.703, ANSI T1.102 (up to DS3 data rates), and custom mask testing capabilities to your oscilloscope. Application packages can be installed by the user.
TDS3GM GPIB/RS-232 communication module	
	This communication module adds GPIB and RS-232 ports to your oscilloscope. You can attach a printer to these ports or use them for remote programmability. Communication modules can be installed by the user and include the *TDS3000-Series Programmer Manual* (in English only).

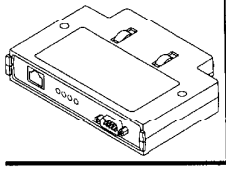
Optional Accessories (Cont.)

TDS3VM VGA/RS-232 communication module



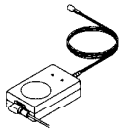
This communication module adds VGA and RS-232 ports to your oscilloscope. You can attach a printer to the RS-232 port or use it for remote programmability. You can attach a monitor to the VGA port to enhance viewing the screen from a distance. Communication modules can be installed by the user and include the *TDS3000-Series Programmer Manual* (in English only).

TDS3EM Ethernet communication module



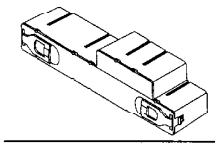
This communication module adds Ethernet 10baseT and RS-232 ports to your oscilloscope. You can attach the oscilloscope to an Ethernet network for remote printing. Communication modules can be installed by the user and include the *TDS3000-Series Programmer Manual* (in English only).

TDS3CHG external battery charger



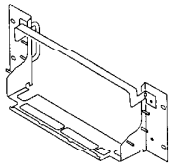
The battery charger recharges the oscilloscope battery pack in approximately 3 hours.

TDS3BAT rechargeable battery pack



An extra rechargeable battery pack provides a high-capacity spare battery for extended portable operation.

Optional Accessories (Cont.)

AC3000 soft case	
	The soft case protects the oscilloscope when not in use. The soft case provides compartments for probes, one spare battery, battery charger, and the User Manual.
RM3000 rack mount kit	
	The rack mount kit contains all the hardware necesary to mount your oscilloscope in a standard rack. The kit requires 7 in of vertical space in the rack.
WSTRO WaveStar Software for Oscilloscopes	
	WaveStar is a Microsoft Office 97-compatible application that connects your oscilloscope to your PC. You can upload and download waveforms and setups. You can drag and drop acquired data into spreadsheets for further analysis, into word processors to integrate with your documentation, or to printers and plotters to make hard copies.
Manuals	
	Service Manual (071-0382-XX) provides information about maintenence and module-level repair.

Appendix A: Specifications

This appendix contains specifications for the TDS3000 Series oscilloscopes. All specifications are guaranteed unless noted as "typical." Typical specifications are provided for your convenience but are not guaranteed. Specifications that are marked with the ✓ symbol are checked in *Appendix E: Performance Verification*.

All specifications apply to all TDS3000 models unless noted otherwise. To meet specifications, two conditions must first be met:

- The oscilloscope must have been operating continuously for ten minutes within the operating temperature range specified.
- You must perform the Compensate Signal Path operation described on page 1–4. If the operating temperature changes by more than 10° C, you must perform the Compensate Signal Path operation again.

Specifications

Acquisition		
Acquisition modes	Sample (Normal), Peak detect, Envelope, and Average	
Single Sequence	*Acquisition mode*	*Acquisition stops after*
	Sample, Peak Detect	One acquisition, all channels simultaneously
	Average, Envelope	N acquisitions, all channels simultaneously, N is settable from 2 to 256 (or ∞ for Envelope)

Specifications (Cont.)

Inputs				
Input coupling	DC, AC, or GND Channel input remains terminated when using GND coupling.			
Input impedance, DC coupled	1 MΩ ±1% in parallel with 13 pF ±2 pF, TekProbe compatible 50 Ω ±1%; VSWR ≤ 1.5:1 from DC to 500 MHz, typical			
Maximum voltage at input BNC (1 MΩ)	*Overvoltage category*	*Maximum voltage*		
	CAT I Environment (refer to page A–12)	150 V_{RMS} (400 V_{pk})		
	CAT II Environment (refer to page A–12)	100 V_{RMS} (400 V_{pk})		
	For steady-state sinusoidal waveforms, derate at 20 dB/decade above 200 kHz to 13 V_{pk} at 3 MHz and above.			
Maximum voltage at input BNC (50 Ω)	5 V_{RMS} with peaks ≤ ±30 V			
Maximum floating voltage	0 V from chassis (BNC) ground to earth ground, or 30 V_{RMS} (42 V_{pk}) only under these conditions: no signal voltages >30 V_{RMS} (>42 V_{pk}), all common leads connected to the same voltage, no grounded peripherals attached			
Channel-to-channel crosstalk, typical	Measured on one channel, with test signal applied to another channel, and with the same scale and coupling settings on each channel			
	Frequency range	*TDS3012 TDS3014*	*TDS3032 TDS3034*	*TDS3052 TDS3054*
	≤ 100 MHz	≥ 100:1	≥ 100:1	≥ 100:1
	≤ 300 MHz	—	≥ 50:1	≥ 50:1
	≤ 500 MHz	—	—	≥ 30:1
Differential delay, typical	100 ps between any two channels with the same scale and coupling settings			

Specifications (Cont.)

Vertical				
Number of channels	*TDS3012, TDS3032, TDS3052*	*TDS3014, TDS3034, TDS3054*		
	2 plus external trigger input	4		
Digitizers	9-bit resolution, separate digitizers for each channel sample simultaneously			
SCALE Range (at BNC)	*1 MΩ*	*50 Ω*		
	1 mV/div to 10 V/div	1mV/div to 1 V/div		
Fine SCALE	Adjustable with ≥ 1% resolution			
Polarity	Normal and Invert			
Position range	±5 divisions			
⩘ Analog bandwidth, 50 Ω (also typical at 1 MΩ with standard probe)	Bandwidth limit set to Full, operating ambient ≤30 °C, derate 1%/°C above 30 °C			
	Scale range	*TDS3012 TDS3014*	*TDS3032 TDS3034*	*TDS3052 TDS3054*
	5 mV/div to 1 V/div	100 MHz	300 MHz	500 MHz
	2 mV/div to 4.98 mV/div	100 MHz	250 MHz	300 MHz
	1 mV/div to 1.99 mV/div	90 MHz	150 MHz	175 MHz
Calculated rise time, typical	—	3.5 ns	1.2 ns	0.7 ns
Analog bandwidth limit, typical	Selectable between 20 MHz, 150 MHz (not available on TDS3012 or TDS3014), or Full			
Lower frequency limit, AC coupled, typical	7 Hz for 1 MΩ, reduced by a factor of ten when using a 10X passive probe; 140 kHz for 50 Ω			

Specifications (Cont.)

Vertical		
Peak detect or Envelope pulse response, typical	Minimum width of pulse with amplitude of ≥2 div to capture 50% or greater amplitude	
	Sample rates ≤125 MS/s	*Sample rates ≥250 MS/s*
	1 ns	1/sample rate
DC gain accuracy	± 2%, derated at 0.07%/°C for temperatures below +18° C and above +28° C, in Sample or Average acquisition mode	
DC measurement accuracy	*Measurement type*	*DC Accuracy (in volts)*
Sample acquisition mode, typical	Absolute measurement of any waveform point, and High, Low, Max, and Min measurements.	± [0.02[1] × | reading – (offset – position) | + offset accuracy + 0.15 div + 0.6 mV]
	Delta voltage between any two points on a waveform, and all other automatic measurements.	± [0.02[1] × | reading | + 0.15 div + 1.2 mV]
Average acquisition mode (≥16 averages)	Absolute measurement of any waveform point, and High, Low, Max, and Min measurements.	± [0.02[1] × | reading – (offset – position) | + offset accuracy + 0.1 div]
	Delta voltage between two points on a waveform, and all other automatic measurements.	± [0.02[1] × | reading | + 0.05 div]
Offset range	*Scale range*	*Offset range*
	1 mV/div to 9.95 mV/div	±100 mV
	10 mV/div to 99.5 mV/div	±1 V
	100 mV/div to 995 mV/div	±10 V
	1 V/div to 10 V/div	±100 V
Offset accuracy	± (0.005 × | offset – position | + 0.1 div)	

1 0.02 term (gain component) derated at 0.00025/°C above 30° C

Specifications (Cont.)

Horizontal				
Acquisition (horizontal) resolution	*Normal*		*Fast trigger*	
Record length	10,000 points		500 points	
Acquisition rate, maximum	Up to 450 waveforms/s		Up to 3,000 waveforms/s	
Sample rate range	*Acquisition resolution*	*TDS3012 TDS3014*	*TDS3032 TDS3034*	*TDS3052 TDS3054*
	Normal	100 S/s to 1 GS/s	100 S/s to 2.5 GS/s	100 S/s to 5 GS/s
	Fast trigger	5 S/s to 1.25 GS/s	5 S/s to 2.5 GS/s	5 S/s to 5 GS/s
Seconds/division range	—	4 ns/div to 10 s/div	2 ns/div to 10 s/div	1 ns/div to 10 s/div
✓ Sample rate and delay time accuracy	±200 ppm over any ≥1 ms time interval			
Trigger				
External trigger input, typical	1 MΩ in parallel with 17 pF, TekProbe compatible (TDS3012, TDS3032, TDS3052 only)			
External trigger maximum voltage	*Overvoltage category*		*Maximum voltage*	
	CAT I Environment (refer to page A–12)		150 V_{RMS} (400 V_{pk})	
	CAT II Environment (refer to page A–12)		100 V_{RMS} (400 V_{pk})	
	For steady-state sinusoidal waveforms, derate at 20 dB/decade above 200 kHz to 13 V_{pk} at 3 MHz and above.			
External trigger maximum floating voltage	0 V from chassis (BNC) ground to earth ground, or 30 V_{RMS} (42 V_{pk}) only under these conditions: no signal voltages >30 V_{RMS} (>42 V_{pk}), all common leads connected to the same voltage, no grounded peripherals attached			

Specifications (Cont.)

Trigger		
⌐ Edge trigger sensitivity	*Source*	*Sensitivity*
	Any channel, DC coupled	0.35 div from DC to 50 MHz, increasing to 1 div at oscilloscope bandwidth
Edge trigger sensitivity, typical	External trigger	100 mV from DC to 50 MHz, increasing to 500 mV at 300 MHz
	External/10 trigger	500 mV from DC to 50 MHz, increasing to 3 V at 300 MHz
	Any channel, NOISE REJ coupled	3.5 times the DC-coupled limits
	Any channel, HF REJ coupled	1.5 times the DC-coupled limit from DC to 30 kHz, attenuates signals above 30 kHz
	Any channel, LF REJ coupled	1.5 times the DC-coupled limits for frequencies above 80 kHz, attenuates signals below 80 kHz
Trigger level range	*Source*	*Sensitivity*
	Any channel	±8 divisions from center of screen, ±8 divisions from 0 V if LF REJ trigger coupled
	External external	±800 mV
	External/10 trigger	±8 V
	Line	Fixed at the midlevel of the AC line
SET LEVEL TO 50%, typical	Operates with input signals ≥45 Hz	

Specifications (Cont.)

Trigger		
Trigger level accuracy, typical	*Source*	*Sensitivity*
	Any channel	±0.2 divisions
	External trigger	±20 mV
	External/10 trigger	±200 mV
	Line	N/A
Trigger holdoff range	250.8 ns to 10 s	
Video trigger sensitivity, typical	Triggers on negative sync of NTSC, PAL, or SECAM signal	
	Source	*Sensitivity*
	Any channel	0.6 to 2.5 divisions of video sync tip
	External trigger	150 mV to 625 mV of video sync tip
	External/10 trigger	1.5 V to 6.25 V of video sync tip
B Trigger	*Trigger After Time*	*Trigger After B Events*
Range	13.2 ns to 50 s	1 event to 9,999,999 events
Minimum time between arm and trigger, typical	5ns from the end of the time period and the B trigger event	5 ns between the A trigger event and the first B trigger event
Minimum Pulse Width, typical	—	B event width, 2 ns
Maximum Frequency, typical	—	B event frequency, 250 MHz

Specifications (Cont.)

Display	
Display screen	6.5 in (165 mm) diagonal color liquid crystal
Display resolution	640 horizontal by 480 vertical pixels
Backlight intensity, typical	200 cd/m^2
Display color	Up to 16 colors, fixed palette
External display filter	Scratch-resistant tempered glass
I/O ports	
Parallel printer port	Centronics compatible, DB-25 female connector
GPIB interface	Available as optional accessory TDS3GM
RS-232 interface	Available as optional accessory TDS3GM or TDS3VM, DB-9 male connector
VGA signal output	Available as optional accessory TDS3VM, DB-15 female connector, 31.6 kHz sync rate, EIA RS-343A compliant
Probe compensator output, typical	5.0 V into ≥1 MΩ load, frequency = 1 kHz
Miscellaneous	
Nonvolatile memory	Typical retention time ≥ 5 years for front-panel settings, unlimited for saved waveforms and setups
Floppy disk	3.5 in, DOS format, 720 KB or 1.44 MB compatible
Internal clock	Provides date/time stamp for stored data and the current time and date to the front panel, if enabled. Year-2000 compliant.
Radiated immunity	Per methods of EN50082-1 and EN61000-4-3, the increase in trace noise is not to exceed four major divisions peak-to-peak. Ambient RF fields may induce triggering when trigger threshold is offset less than two major divisions from ground reference.

Specifications (Cont.)

Power sources	
AC line power	Operates the oscilloscope and charges the optional internal battery
Source voltage	90 V_{RMS} to 250 V_{RMS}, continuous range (CAT II)
Source frequency	47 Hz to 440 Hz
Power consumption	75 W maximum
Battery power	Optional accessory TDS3BAT, rechargeable NiCad battery pack
Operating time, typical	2 hours, depending on operating conditions
Battery charge time, typical	18 hours in the oscilloscope, 3 hours in the optional external charger TDS3CHG
Line fuse	Internal, not user replaceable
Environmental	
Temperature	Operating range (no disk installed): +5 °C to +50 °C Nonoperating range (no disk installed): –20 °C to +60 °C Typical operating range for floppy disks: +10 °C to +50 °C
Humidity	Operating range (no disk installed): 20% to 80% RH below 32 °C, derate upper limit to 21% RH at 50 °C Nonoperating range (no disk installed): 5% to 90% RH below 41 °C, derate upper limit to 30% RH at 60 °C Typical operating range for floppy disks: 20% to 80% RH below 32 °C, derate upper limit to 21% RH at 50 °C
Pollution Degree	Pollution Degree 2: Typical home or office environment.

Specifications (Cont.)

Environmental	
Altitude	Operating limit: 3000 m Nonoperating limit: 15,000 m
Random vibration	Operating: 0.31 g_{RMS} from 5 Hz to 500 Hz, 10 minutes on each axis Nonoperating: 2.46 g_{RMS} from 5 Hz to 500 Hz, 10 minutes on each axis
Drop resistance, typical	Survives a 152 mm (6 in) drop onto concrete with only cosmetic damage
Mechanical	
Size	Height: 176 mm (6.9 in), 229 mm (9.0 in) including handle Width: 375 mm (14.75 in) Depth: 149 mm (5.9 in)
Weight	Oscilloscope only: 3.2 kg (7.0 lbs) With accessories and carry case: 4.1 kg (9.0 lbs) When packaged for domestic shipment: 5.5 kg (12.0 lbs) Optional battery pack: 2 kg (4.5 lbs)

Specifications (Cont.)

EMC certifications and compliances	
EMC Compliance: European Union	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities: EN 55011 Class A Radiated and Conducted Emissions EN 50082-1 Immunity
EMC Compliance: Australia/New Zealand	Meets the intent of Australian EMC Framework as demonstrated to the following specification: AS/NZS 2064.1/2
EMC Compliance: Russia	This product was certified by the GOST ministry of Russia to be in compliance with all applicable EMC regulations.
FCC Compliance: U.S.A.	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits

Specifications (Cont.)

Safety certifications and compliances	
EC Declaration of Conformity – Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC as ammended by 93/68/EEC
(TDS3000 Series and P3010)	EN 61010-1/A2:1995 Safety requirements for electrical equipment for measurement, control, and laboratory use
(P3010)	EN 61010-2-031:1995 Particular requirements for hand-held probe assemblies for electrical measurement and test equipment
(P6139A)	HD401 S1 Safety requirements for electronic apparatus
Approvals	
(TDS3000 Series and P3010)	UL3111-1 – Standard for electrical measuring and test equipment CAN/CSA C22.2 No. 1010.1 – Safety requirements for electrical equipment for measurement, control and laboratory use
(P3010)	EN 61010-2-031:1995 – Particular requirements for hand-held probe assemblies for electrical measurement and test equipment
(P6139A)	UL1244, Third Edition – Electronic measuring and test equipment CAN/CSA C22.2 No. 231.1-M89 – Test probes
Installation Category Descriptions	Terminals on this product may have different installation category designations. The installation categories are: CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location CAT II Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected CAT I Secondary (signal level) or battery operated circuits of electronic equipment