Specifications

This section begins with a general description of the traits of the TDS 500C, TDS 600B, and TDS 700C oscilloscopes. Three sections follow, one for each of three classes of traits: *nominal traits, warranted characteristics,* and *typical characteristics.*

Product Description

The TDS 500C, TDS 600B and TDS 700C Digitizing Oscilloscopes are portable, four-channel instruments suitable for use in a variety of test and measurement applications and systems. Table 2–1 lists key features.

Table 2–1: Key features of the TDS 500C, 600B and 700C oscilloscopes

Feature	TDS 600B	TDS 500C & TDS 700C
Digitizing rate, maximum	TDS 684B: 5 GS/s on ea. of 4 ch TDS 680B: 5 GS/s on ea. of 2 ch TDS 644B: 2.5 GS/s on ea. of 4 ch TDS 620B: 2.5 GS/s on ea. of 2 ch	TDS 784C: 4 GS/s TDS 540C, 754C: 2 GS/s TDS 520C, 724C: 1 GS/s
Analog bandwidth	TDS 680B, 684B, and 784C: 1 GHz TDS 520C, 540C, 620B, 644B, 724C and 754C: 500 MHz	
No. of Channels	TDS 644B & 684B: 4 TDS 620B & 680B: 2 + 2[1]	TDS 540C, 754C & 784C: 4 TDS 520C & 724C: 2 + 2[1]
Record lengths, maximum	15,000 samples	50,000 samples (500,000 with option 1M) (8,000,000 with option 2M)
Acquisition modes	Sample, envelope, peak detect and average	Sample, envelope, average, high-resolution, and peak-detect
Trigger modes	Modes include: Edge, logic, and pulse. Video trigger, with option 05, modes include: NTSC, SECAM, PAL, HDTV, and FlexFormat. Communications Trigger with option 2C (available on TDS 500C/700C), modes include: AMI, CMI, and NRZ	
Display	TDS 520C, 540C, 620B, 680B: Monochrome TDS 644B, 684B, 724C, 754C, 784C: Color	

Table 2–1: Key features of the TDS 500C, 600B and 700C oscilloscopes (cont.)

Feature	TDS 600B	TDS 500C & TDS 700C
Storage	Floppy disk drive: 1.44 Mbyte, 3.5 inch, DOS 3.3-or-later floppy disk drive Internal hard disk drive (option HD available on the TDS 500C and 700C) 170 MByte capacity Subject to change due to the fast-moving PC component environment. NVRAM storage for saving waveforms, hardcopies, and setups	
I/O	Full GPIB programmability. Hardcopy output using GPIB, RS-232, or Centronics ports	

1 **Two plus Two channel operation allows up to two of the four channels to be displayed simultaneously. Channels not displayed can be used to couple a triggering signal to the oscilloscope.**

User Interface

Use a combination of front-panel buttons, knobs, and on-screen menus to control the many functions of the oscilloscope. The front-panel controls are grouped according to function: vertical, horizontal, trigger, and special. Set a function you adjust often, such as vertical positioning or the time base setting, directly by its own front-panel knob. Set a function you change less often, such as vertical coupling or horizontal mode, indirectly using a selected menu.

Menus

Pressing one (sometimes two) front-panel button(s), such as vertical menu, displays a *main* menu of related functions, such as coupling and bandwidth, at the bottom of the screen. Pressing a main-menu button, such as coupling, displays a *side* menu of settings for that function, such as AC, DC, or GND (ground) coupling, at the right side of the screen. Pressing a side-menu button selects a setting such as DC.

Indicators

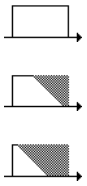
On-screen readouts help you keep track of the settings for various functions, such as vertical and horizontal scale and trigger level. Some readouts use the cursors or the automatic parameter extraction feature (called measure) to display the results of measurements made or the status of the instrument.

General Purpose Knob

Assign the general purpose knob to adjust a selected parameter function. More quickly change parameters by toggling the **SHIFT** button. Use the same method as for *selecting* a function, except the final side-menu selection assigns the

general purpose knob to *adjust* some function, such as the position of measurement cursors on screen, or the setting for a channel fine gain.

GUI



The user interface also makes use of a GUI, or Graphical User Interface, to make setting functions and interpreting the display more intuitive. Some menus and status are displayed using iconic representations of function settings, such as those shown here for full, 250 MHz and 20 MHz bandwidth. Such icons allow you to more readily determine status or the available settings.

Signal Acquisition System

The signal acquisition system provides four, full-featured vertical channels with calibrated vertical scale factors from 1 mV to 10 V per division. All channels can be acquired simultaneously.

Each of the full-featured channels can be displayed, vertically positioned, and offset, can have their bandwidth limited (250 MHz or 20 MHz) and their vertical coupling specified. Fine gain can also be adjusted.

Besides these channels, up to three math waveforms and four reference waveforms are available for display. (A math waveform results when you specify dual waveform operations, such as add, on any two channels. A reference waveform results when you save a waveform in a reference memory).

Horizontal System

There are three horizontal display modes: main only, main intensified, and delayed only. You can select among various horizontal record length settings.

A feature called “Fit to Screen” allows you to view entire waveform records within the 10 division screen area. Waveforms are compressed to fit on the screen. See Table 2–2.

Both the delayed only display and the intensified zone on the main intensified display may be delayed by time with respect to the main trigger. Both can be set to display immediately after the delay (delayed runs after main mode). The delayed display can also be set to display at the first valid trigger after the delay (delayed-triggerable modes).

The delayed display (or the intensified zone) may also be delayed by a selected number of events. In this case, the events source is the delayed-trigger source. The delayed trigger can also be set to occur after a number of events plus an amount of time.

Table 2–2: Record length and divisions per record vs. TDS model

Standard Models	Record length	Divisions per record	
		FTS[1] Off[2]	FTS[1] On[3]
All TDS 500C, TDS600B & TDS 700C All channels[4]	500	10 divs	10 divs
	1,000	20 divs	10 divs
	2,500	50 divs	10 divs
	5,000	100 divs	10 divs
	15,000	300 divs	10 divs
TDS 500C & TDS 700C, All channels	50,000	1,000 divs	10 divs
Models with Option 1M	**Record length**	**Divisions per record**	
		FTS[1] Off[2]	FTS[1] On[3]
TDS 500C & TDS 700C, All channels	75,000	1,500 divs	10 divs
TDS 500C & TDS 700C, All channels	100,000	2,000 divs	10 divs
TDS 500C & TDS 700C, All channels	130,000	2,600 divs	10 divs
	250,000	5,000 divs	10 divs
	500,000	10,000 divs	10 divs
Models with Option 2M	**Record length**	**Divisions per record**	
		FTS[1] Off[2]	FTS[1] On[3]
TDS 520C & TDS 724C One or two channels TDS 540C, TDS 784C & TDS 754C Three or four channels	2,000,000	40, 000 divs	10 divs
TDS 520C & TDS 724C One channel only TDS 540C, TDS 784C & TDS 754C Two channels	4,000,000	80,000 divs	10 divs
TDS 540C, TDS 784C & TDS 754C One channel only	8,000,000	160,000 divs	10 divs

1 **Fit to Screen setting**

2 **Fit to Screen off preserves 50 samples/division in a 1–2–5 sec/division sequence.**

3 **Fit to Screen on lets the samples/division and the sec/division sequence vary.**

4 **All channels means all that may be displayed at one time: four channels for some models, two for others. See Table 2–1 and its footnote on page 2–1.**

Trigger System

The triggering system supports a varied set of features for triggering the signal-acquisition system. Trigger signals recognized include:

- Edge (main- and delayed-trigger systems): This familiar type of triggering is fully configurable for source, slope, coupling, mode (auto or normal), and holdoff.
- Logic (main-trigger system): This type of triggering can be based on pattern (asynchronous) or state (synchronous). In either case, logic triggering is configurable for sources, for Boolean operators to apply to those sources, for logic pattern or state on which to trigger, for mode (auto or normal), and for holdoff. Time qualification may be selected in pattern mode. Another class of logic trigger, setup/hold, triggers when data in one trigger source changes state within the setup and hold times that you specify relative to a clock in another trigger source.
- Pulse (main-trigger system): Pulse triggering is configurable for triggering on runt or glitch pulses, or on pulse widths or periods inside or outside limits that you specify. It can also trigger on a pulse edge that has a slew rate faster or slower than the rate you specify. The timeout trigger will act when events do *not* occur in a defined time period. The pulse trigger is also configurable for source, polarity, mode, and holdoff.
- Video (with option 05: Video Trigger): Video triggering is compatible with standard NTSC, PAL, SECAM, and HDTV formats. An additional feature called FlexFormat™ (flexible format) allows the user to define the video format on which to trigger.
- Comm (with option 2C): is provided for triggering on AMI, CMI, or NRZ communications signals.

You can choose where the trigger point is located within the acquired waveform record by selecting the amount of pretrigger data displayed. Presets of 10%, 50%, and 90% of pretrigger data can be selected in the horizontal menu, or the general purpose knob can be assigned to set pretrigger data to any value within the 0% to 100% limits.

Acquisition Control

You can specify a mode and manner to acquire and process signals that matches your measurement requirements.

- Select the mode for interpolation (linear or sin (x)/x). This can increase the apparent sample rate on the waveform when the maximum real-time rate is exceeded.

- Use sample, envelope, average and peak detect modes to acquire signals. With the TDS 500C/700C, also use high-resolution mode.
- Set the acquisition to stop after a single acquisition (or sequence of acquisitions if acquiring in average or envelope modes) or after a limit condition has been met.
- Select channel sources for compliance with limit tests. You can direct the TDS to signal you or generate hard copy output either to a printer or to a floppy-disk file based on the results. Also, you can create templates for use in limit tests.

On-Board User Assistance

Help and autoset can assist you in setting up the digitizing oscilloscope to make your measurements.

Help Help displays operational information about any front-panel control. When help mode is in effect, manipulating any front-panel control causes the digitizing oscilloscope to display information about that control. When help is first invoked, an introduction to help is displayed on screen.

Autoset Autoset automatically sets up the digitizing oscilloscope for a viewable display based on the input signal.

Measurement Assistance

Once you have set up to make your measurements, the cursor and measure features can help you quickly make those measurements.

Cursor Three types of cursors are provided for making parametric measurements on the displayed waveforms. Horizontal bar cursors (H Bar) measure vertical parameters (typically volts). Vertical bar cursors (V Bar) measure horizontal parameters (typically time or frequency). Paired cursors measure both amplitude and time simultaneously. These are delta measurements; that is, measurements based on the difference between two cursors.

Both H Bar and V Bar cursors can also be used to make absolute measurements. For the H Bars, either cursor can be selected to read out its voltage with respect to any channel's ground reference level. For the V Bars, the cursors measure time with respect to the trigger point (event) of the acquisition. The cursors can also control the portion of the waveform on which automatic measurements are made.

For time measurements, units can be either seconds or hertz (for 1/time).

With the video trigger option installed (Option 05), you can measure the video line number using the vertical cursors. You can measure IRE amplitude (NTSC) using the horizontal cursors with or without the video trigger option installed.

Measure

Measure can automatically extract parameters from the signal input to the digitizing oscilloscope. Any four out of the 25 parameters available can be displayed to the screen. The waveform parameters are measured continuously with the results updated on-screen as the digitizing oscilloscope continues to acquire waveforms.

Digital Signal Processing (DSP)

An important component of the multiprocessor architecture of this digitizing oscilloscope is Tektronix's proprietary digital signal processor, the DSP. This dedicated processor supports advanced analysis of your waveforms when doing such compute-intensive tasks as interpolation, waveform math, and signal averaging. It also teams with a custom display system to deliver specialized display modes (See *Display*, later in this description).

Storage

Acquired waveforms may be saved in any of four nonvolatile REF (reference) memories or on a 3.5 inch, DOS 3.3-or-later compatible disk. Any or all of the saved waveforms may be displayed for comparison with the waveforms being currently acquired.

The TDS 500C/700C instrument with option HD or option 2M can save waveforms to an internal hard disk drive. Any or all of the saved waveforms may be displayed for comparison with the waveforms being currently acquired.

The source and destination of waveforms to be saved may be chosen. You can save any of the four channels to any REF memory or move a stored reference from one REF memory to another. Reference waveforms may also be written into a REF memory location via the GPIB interface.

I/O

The oscilloscope is fully controllable and capable of sending and receiving waveforms over the GPIB interface (IEEE Std 488.1–1987/IEEE Std 488.2–1987 standard). This feature makes the instrument ideal for making automated measurements in a production or research and development environment that calls for repetitive data taking. Self-compensation and self-diagnostic features built into the digitizing oscilloscope to aid in fault detection and servicing are also accessible using commands sent from a GPIB controller.

The oscilloscope can also output copies of its display using the hardcopy feature. This feature allows you to output waveforms and other on-screen information to a variety of graphic printers and plotters from the TDS front panel, providing hard copies without requiring you to put the TDS into a system-controller environment.

You can make hardcopies in a variety of popular output formats, such as PCX, TIFF, BMP, RLE, EPS, Interleaf, and EPS mono or color. You can also save hardcopies in a disk file in any of the formats listed in the I/O section.

The hardcopies obtained are based on what is displayed on-screen at the time hardcopy is invoked. The hardcopies can be stamped with date and time and spooled to a queue for printing at a later time. You can output screen information via GPIB, RS-232C, or Centronics interfaces.

Display

The TDS 500C, TDS 600B and TDS 700C Digitizing Oscilloscopes offer flexible display options. You can customize the following attributes of your display:

- Color (TDS 644B, TDS 684B, and TDS 700C): Waveforms, readouts, graticule, and variable persistence with color coding
- Intensity: waveforms, readouts, and graticule
- Style of waveform display(s): vectors or dots, intensified or nonintensified samples, infinite persistence, and variable persistence
- Interpolation method: Sin(x)/x or Linear
- Display format: xy or yt with various graticule selections including NTSC and PAL to be used with video trigger (option 05)

Zoom

This oscilloscope also provides an easy way to focus in on those waveform features you want to examine up close. By invoking zoom, you can magnify the waveform using the vertical and horizontal controls to expand (or contract) and position it for viewing.

Nominal Traits

This section contains a collection of tables that list the various *nominal traits* that describe the TDS 500C, TDS 600B, and TDS 700C oscilloscopes. Electrical and mechanical traits are included.

Nominal traits are described using simple statements of fact such as “Four, all identical” for the trait “Input Channels, Number of,” rather than in terms of limits that are performance requirements.

Table 2–3: Nominal traits — Signal acquisition system

Name	Description	
Bandwidth Selections	20 MHz, 250 MHz, and FULL	
Samplers, Number of	TDS 540C, 644B, 684B, 754C, and 784C: Four, simultaneous TDS 520C, 620B, 680B, and 724C: Two, simultaneous	
Digitized Bits, Number of	8 bits[1]	
Input Channels, Number of	Four	
Input Coupling	DC, AC, or GND	
Input Impedance Selections	1 MΩ or 50 Ω	
Ranges, Offset	**Volts/Div setting**	**Offset range**
	1 mV/div – 100 mV/div	±1 V
	101 mV/div – 1 V/div	±10 V
	1.01 V/div – 10 V/div	±100 V
Range, Position	±5 divisions	
Range, 1 MΩ Sensitivity	1 mV/div to 10 V/div[2]	
Range, 50 Ω Sensitivity	1 mV/div to 1 V/div[5]	

1 Displayed vertically with 25 digitization levels (DLs) per division and 10.24 divisions dynamic range with zoom off. A DL is the smallest voltage level change of the oscilloscope input that can be resolved by the 8-bit A-D Converter. Expressed as a voltage, a DL is equal to 1/25 of a division times the volts/division setting.

2 The sensitivity ranges from 1 mV/div to 10 V/div (for 1 MΩ) or to 1 V/div (for 50 Ω) in a 1–2–5 sequence of coarse settings with Fit-to-Screen off. Between coarse settings, the sensitivity can be finely adjusted with a resolution equal to 1% of the more sensitive coarse setting. For example, between 50 mV/div and 100 mV/div, the volts/division can be set with 0.5 mV resolution.

Table 2–4: Nominal traits — Time base system

Name	Description
Range, Sample-Rate[1,3]	TDS 684B: 5 Samples/sec to 5 GSamples/sec on four channels simultaneously
	TDS 680B: 5 Samples/sec to 5 GSamples/sec on two channels simultaneously
	TDS 644B: 5 Samples/sec to 2.5 GSamples/sec on four channels simultaneously
	TDS 620B: 5 Samples/sec to 2.5 GSamples/sec on two channels simultaneously
	TDS 520C and 724C: 5 Samples/sec to 1 GSamples/sec when acquiring 1 channel, to 500 MSamples/sec when acquiring 2 channels
	TDS 540C: 5 Samples/sec to 2 GSamples/sec when acquiring 1 channel, to 1 GSample/sec when acquiring 2 channels, or to 500 MSamples/sec when acquiring 3 or 4 channels
	TDS 754C: 5 Samples/sec to 2 GSamples/sec when acquiring 1 or 2 channels, to 1 GSamples/sec when acquiring 3 or 4 channels
	TDS 784C: 5 Samples/sec to 4 GSamples/sec when acquiring 1 channel, to 2 GSample/sec when acquiring 2 channels, or to 1GSamples/sec when acquiring 3 or 4 channels
Range, Interpolated Waveform Rate[2,3]	TDS 600B: 10 GSamples/sec to 250 GSamples/sec
	TDS 520C, 540C, 724C, and 754C: 1 GSamples/sec to 100 GSamples/sec
	TDS 784C: 2 GSamples/sec to 250 GSamples/sec
Range, Seconds/Division	TDS 600B: 0.2 ns/div to 10 s/div
	TDS 500C, 724C, and 754C: 0.5 ns/div to 10 s/div
	TDS 784C: 0.2 ns/div to 10 s/div

Table 2–4: Nominal traits — Time base system (cont.)

Name	Description
Record Length Selection	TDS 500C & TDS 700C: 500, 1,000, 2,500, 5,000, 15,000 and 50,000 samples In addition to the record lengths previously listed, the following record lengths are available with the following options: TDS 520C & TDS 724 with option 1M: 1-channel: up to 250,000 samples 2-channels: up to 130,000 samples TDS 520C & TDS 724 with option 2M: 1-channel: up to 4,000,000 samples 2-channels: up to 2,000,000 samples TDS 540C, TDS 754C & TDS 784C with option 1M: 1-channel: up to 500,000 samples 2-channels: up to 250,000 samples 3 or 4-channels up to 130,000 samples TDS 540C, TDS 754C & TDS 784C with option 2M: 1-channel: up to 8,000,000 samples 2-channels: up to 4,000,000 samples 3 or 4-channels up to 2,000,000 samples

1 **The range of real-time rates, expressed in samples/second, at which a digitizer samples signals at its inputs and stores the samples in memory to produce a record of time-sequential samples.**

2 **The range of waveform rates for interpolated (or equivalent-time on the TDS 700C) waveform records.**

3 **The Waveform Rate (WR) is the equivalent sample rate of a waveform record. For a waveform record acquired by real-time sampling of a single acquisition, the waveform rate is the same as the real-time sample rate; for a waveform created by interpolation of real-time samples from a single acquisition or, on applicable products, the equivalent-time sampling of multiple acquisitions, the waveform rate created is faster than the real time sample rate. For all these cases, the waveform rate is 1/(Waveform Interval) for the waveform record, where the waveform interval (WI) is the time between the samples in the waveform record.**

Table 2–5: Nominal traits — Triggering system

Name	Description
Range, Delayed Trigger Time Delay	16 ns to 250 s
Range, Events Delay	TDS 600B; 2 to 10,000,000 TDS 500C/700C: 1 to 10,000,000
Range (Time) for Pulse-Glitch, Pulse-Width, Time-Qualified Runt, Timeout, or Slew Rate Trigger, Delta Time	1 ns to 1 s

Table 2–5: Nominal traits — Triggering system (cont.)

Name	Description	
Ranges, Setup and Hold for TimeSetup/Hold Violation Trigger	**Feature**	**Min to max**
	Setup Time	–100 ns to 100 ns
	Hold Time	–1 ns to 100 ns
	Setup + Hold Time	2 ns
	For Setup Time, positive numbers mean a data transition before the clock edge and negative means a transition after the clock edge. For Hold Time, positive numbers mean a data transition after the clock edge and negative means a transition before the clock edge. Setup + Hold Time is the algebraic sum of the Setup Time and the Hold Time programmed by the user.	
Ranges, Trigger Level or Threshold	**Source**	**Range**
	Any Channel	±12 divisions from center of screen
	Auxiliary	±8 V
	Line	±400 V
Video Trigger Modes of Operation (Option 05 Video Trigger)	Supports the following video standards: ■ NTSC (525/60) – 2 field mono or 4 field ■ PAL (625/50) – 2 field mono or SECAM, 8 field ■ HDTV – (787.5/60) (1050/60) (1125/60) (1250/60) ■ FlexFormat™ (user definable standards) User can specify: field rate, number of lines, sync pulse width and polarity, line rate, and vertical interval timing.	

Table 2–5: Nominal traits — Triggering system (cont.)

Name	Description		
Communication Trigger Modes of Operation (Option 2C Comm Trigger)	Standard Name	Code[1]	Bit Rate
	OC1/STM0	NRZ	51.84 Mb/s
	OC3/STM1	NRZ	155.52 Mb/s
	OC12/STM4	NRZ	622.08 Mb/s
	DS0 Sgl	Masks[2]	64 kb/s
	DS0 Dbl	Masks[2]	64 kb/s
	DS0 Data Contra	Masks[2]	64 kb/s
	DS0 Timing	Masks[2]	64 kb/s
	E1	AMI	2.048 Mb/s
	E2	AMI	8.44 Mb/s
	E3	AMI	34.368 Mb/s
	E4	CMI	139.26 Mb/s
	E5 (CEPT)	NRZ	565 Mb/s
	STM1E	CMI	155.52 Mb/s
	DS1	AMI	1.544 Mb/s
	DS1A	AMI	2.048 Mb/s
	DS1C	AMI	3.152 Mb/s
	DS2	AMI	6.312 Mb/s
	DS3	AMI	44.736 Mb/s
	DS4NA	CMI	139.26 Mb/s
	STS-1	AMI	51.84 Mb/s
	STS-3	CMI	155.52 Mb/s
	FC133	NRZ	132.8 Mb/s
	FC266	NRZ	265.6 Mb/s
	FC531	NRZ	531.2 Mb/s
	FC1063	NRZ	1.0625 Mb/s
	D2	NRZ	143.18 Mb/s
	D1	NRZ	270 Mb/s
	FDDI	NRZ	125 Mb/s

1 **AMI = Alternate Mark Inversion. CMI = Code Mark Inversion. NRZ = Non-return to Zero.**

2 **These Telecom DS0 standards are automatically selected from the Mask Menu. The trigger uses Pulse/Width trigger.**

Table 2–6: Nominal traits — Display system

Name	Description
Video Display	7 inch diagonal, with a display area of 5.04 inches horizontally by 3.78 inches vertically TDS 520C, 540C, 620B, and 680B: Monochrome display TDS 644B, 684B, 724C, 754C, and 784C: Color display
Video Display Resolution	640 pixels horizontally by 480 pixels vertically

Table 2–6: Nominal traits — Display system (cont.)

Name	Description
Waveform Display Graticule	Single Graticule: 401 × 501 pixels, 8 ×10 divisions, where divisions are 1 cm by 1 cm
Waveform Display Levels/Colors	TDS 520C, 540C, 620B, and 680B: Sixteen levels in infinite-persistence or variable persistence display TDS 644B, 684B, 724C, 754C, and 784C: Sixteen colors in infinite-persistence or variable persistence display

Table 2–7: Nominal traits — GPIB interface, output ports, and power fuse

Name	Description
Interface, GPIB	GPIB interface complies with IEEE Std 488-1987
Interface, RS-232	RS-232 interface complies with EIA/TIA 574 (talk only) Optional on the TDS 520C, 540C, 620B, and 680B
Interface, Centronics	Centronics interface complies with Centronics interface standard C332-44 Feb 1977, REV A Optional on the TDS 520C, 540C, 620B, and 680B
Interface, Video	VGA video output with levels that comply with EIA RS 343A standard. DB-15 connector
Logic Polarity for Main- and Delayed-Trigger Outputs	Negative TRUE. High to low transition indicates the trigger occurred.
Fuse Rating	Either of two fuses[1] may be used: a 0.25″ × 1.25″ (UL 198.6, 3AG): 6 A FAST, 250 V or a 5 mm × 20 mm (IEC 127): 5 A (T), 250 V.

1 **Each fuse type requires its own fuse cap.**

Table 2–8: Nominal traits — Data handling and reliability

Name	Description
Time, Data-Retention, Nonvolatile Memory[1, 2]	Battery life ≥ 5 years
Floppy disk drive	3.5 inch, 720 K or 1.44 Mbyte, DOS 3.3-or-later compatible
Internal hard disk drive (option HD and 2M available on the TDS 500C and 700C)	170 MByte capacity

1 **The times that reference waveforms, stored setups, and calibration constants are retained.**

2 **Data is maintained by small lithium-thionyl-chloride batteries internal to the memory ICs. At the time of manufacture, no special disposal requirements were in effect for these batteries as the amount of hazardous material contained was below the regulated threshold. Consult your local waste disposal agency for proper disposal.**

Table 2–9: Nominal traits — Mechanical

Name	Description
Cooling Method	Forced-air circulation with no air filter. Clearance is required. Refer to the *TDS 500C, TDS 600B & TDS 700C User Manual* for minimum clearance dimensions.
Construction Material	Chassis parts constructed of aluminum alloy; front panel constructed of plastic laminate; circuit boards constructed of glass laminate. Cabinet is aluminum and is clad in Tektronix Blue vinyl material.
Weight	Standard Digitizing Oscilloscope 14.1 kg (31 lbs), with front cover. 24.0 kg (53 lbs), when packaged for domestic shipment Rackmount Digitizing Oscilloscopes 14.1 kg (31 lbs) plus weight of rackmount parts, for the rackmounted Digitizing Oscilloscopes (Option 1R). Rackmount conversion kit 2.3 kg (5 lbs), parts only; 3.6 kg (8 lbs), parts plus package for domestic shipping
Overall Dimensions	Standard Digitizing Oscilloscope Height: 193 mm (7.6 in), with the feet installed Width: 445 mm (17.5 in), with the handle Depth: 434 mm (17.1 in), with the front cover installed Rackmount Digitizing Oscilloscope Height: 178 mm (7.0 in) Width: 483 mm (19.0 in) Depth: 558.8 mm (22.0 in)

Warranted Characteristics

This section lists the various *warranted characteristics* that describe the TDS 500C, TDS 600B and TDS 700C oscilloscopes. Electrical and environmental characteristics are included.

Warranted characteristics are described in terms of quantifiable performance limits which are warranted.

NOTE. *In these tables, those warranted characteristics that are checked in the procedure* Performance Verification *appear in* ***boldface type*** *under the column* **Name**.

As stated above, this section lists only warranted characteristics. A list of *typical characteristics* starts on page 2–25.

Performance Conditions

The performance limits in this specification are valid with these conditions:

- The oscilloscope must have been calibrated/adjusted at an ambient temperature between +20° C and +30° C.
- The oscilloscope must be in an environment with temperature, altitude, humidity, and vibration within the operating limits described in these specifications.
- The oscilloscope must have had a warm-up period of at least 20 minutes.
- The oscilloscope must have had its signal-path-compensation routine last executed after at least a 20 minute warm-up period at an ambient temperature within ±5° C of the current ambient temperature.

Table 2–10: Warranted characteristics — Signal acquisition system

Name	Description		
Accuracy, DC Gain	TDS 600B: ±1.5% for all sensitivities from 2 mV/div to 10 V/div ± 2.0% at 1 mV/div sensitivity TDS 500C, 700C: ±1% for all sensitivities from 1 mV/div to 10 V/div with offset from 0 V to ±100V		
Accuracy, DC Voltage Measurement, Averaged (using Average mode)	**Measurement type**	**DC Accuracy**	
	Average of ≥ 16 waveforms	TDS 600B: ±((1.5% × | reading – Net Offset[1] |) + Offset Accuracy) + (0.06 div × V/div)) TDS 500C, 700C: ±((1.0% × | reading – Net Offset[1] |) + Offset Accuracy + (0.06 div x V/div))	
	Delta volts between any two averages of ≥ 16 waveforms acquired under the same setup and ambient conditions	TDS 600B: ±((1.5% × | reading |) + (0.1 div × V/div) + 0.3 mV) TDS 500C, 700C: ±((1.0% × | reading |) + (0.1 div x V/div) + 0.3 mV)	
Accuracy, Offset	**Volts/Div setting**	**TDS 600B Offset accuracy**	**TDS 500C/700C Offset accuracy**
	1 mV/div – 100 mV/div	±((0.2% × | Net Offset[1] |) + 1.5 mV + (0.6 div x V/div))	±((0.2% × | Net Offset[1] |) + 1.5 mV + (0.1 div x V/div))
	101 mV/div – 1 V/div	±((0.25% × | Net Offset[1] |) + 15 mV + (0.6 div x V/div))	±((0.25% × | Net Offset[1] |) + 15 mV + (0.1 div x V/div))
	1.01 V/div – 10 V/div	±((0.25% × | Net Offset[1] |) + 150 mV + (0.6 div x V/div))	±((0.25% × | Net Offset[1] |) + 150 mV + (0.1 div x V/div))
Analog Bandwidth, DC-50 Ω Coupled and Bandwidth selection is FULL, TDS 600B	**Volts/Div**	**TDS 620B & 644B Bandwidth[2]**	**TDS 680B & 684B Bandwidth[2]**
	10 mV/div – 1 V/div	DC – 500 MHz	DC – 1 GHz
	5 mV/div – 9.95 mV/div	DC – 450 MHz	DC – 750 MHz
	2 mV/div – 4.98 mV/div	DC – 300 MHz	DC – 600 MHz
	1 mV/div – 1.99 mV/div	DC – 250 MHz	DC – 500 MHz
Analog Bandwidth, DC-50 Ω Coupled and Bandwidth selection is FULL, TDS 500C/700C	**Volts/Div**	**TDS 520C, 540C, 724C & 754C Bandwidth[2]**	**TDS 784C Bandwidth[2]**
	10 mV/div – 1 V/div	DC – 500 MHz	DC – 1 GHz
	5 mV/div – 9.95 mV/div	DC – 500 MHz	DC – 750 MHz
	2 mV/div – 4.98 mV/div	DC – 500 MHz	DC – 600 MHz
	1 mV/div – 1.99 mV/div	DC – 450 MHz	DC – 500 MHz
Crosstalk (Channel Isolation)	≥100:1 at 100 MHz and ≥30:1 at the rated bandwidth for the channel's Volt/Div setting, for any two channels having equal Volts/Div settings		

Table 2–10: Warranted characteristics — Signal acquisition system (cont.)

Name	Description
Delay Between Channels, Full Bandwidth	TDS 600B: ≤100 ps for any two channels with equal Volts/Div and Coupling settings and both channels' deskew values set to 0 TDS 500C/700C: ≤50 ps for any two channels with equal Volts/Div and Coupling settings and both channel deskew values set to 0.0 μs.
Input Impedance, DC–1 MΩ Coupled	1 MΩ ±0.5% in parallel with 10 pF ±3 pF
Input Impedance, DC–50 Ω Coupled	50 Ω ±1% with VSWR ≤1.3:1 from DC – 500 MHz, ≤1.5:1 from 500 MHz – 1 GHz
Input Voltage, Maximum, DC–1 MΩ, AC–1 MΩ, or GND Coupled	TDS 600B: ±300 V CAT II, 400 V peak; derate at 20 dB/decade above 1 MHz TDS 500C/700C: ±300 V CAT II, 400 V peak; derate at 20 dB/decade above 1 MHz
Input Voltage, Maximum, DC-50 Ω or AC–50 Ω Coupled	5 V_{RMS}, with peaks ≤ ±30 V
Lower Frequency Limit, AC Coupled	≤10 Hz when AC–1 MΩ Coupled; ≤200 kHz when AC–50 Ω Coupled[3]

1 Net Offset = Offset – (Position × Volts/Div). Net Offset is the nominal voltage level at the oscilloscope input that corresponds to the center of the A-D converter's dynamic range. Offset Accuracy is the accuracy of this voltage level.

2 The limits given are for the ambient temperature range of 0°C to +30°C. Reduce the upper bandwidth frequencies by 5 MHz for the TDS 600B or by 2.5 MHz for the TDS 500C/700C for each °C above +30°C.

3 The AC Coupled Lower Frequency Limits are reduced by a factor of 10 when 10X passive probes are used.

Table 2–11: Warranted characteristics — Time base system

Name	Description
Accuracy, Long Term Sample Rate and Delay Time	TDS 600B: ±100 ppm over any ≥1 ms interval TDS 500C/700C: ±25 ppm over any ≥1 ms interval

Table 2–12: Warranted characteristics — Triggering system

Name	Description	
Sensitivity, Edge-Type Trigger, Coupling set to "DC"[1]	**Trigger source**	**Sensitivity**
	Any Channel	TDS 620B & 644B: 0.35 division from DC to 50 MHz, increasing to 1 division at 500 MHz
		TDS 680B & 684B: 0.35 division from DC to 50 MHz, increasing to 1 division at 1 GHz MHz
		TDS 500C, 724C, & 754C: 0.35 division from DC to 50 MHz, increasing to 1 division at 500 MHz
		TDS 784C: 0.35 division from DC to 50 MHz, increasing to 1 division at 1 GHz
	Auxiliary	TDS 600B: 250 mV from DC to 50 MHz, increasing to 500 mV at 100 MHz
		TDS 500C, 724C, & 754C: 400 mV from DC to 50 MHz, increasing to 750 mV at 100 MHz
		TDS 784C: 250 mV from DC to 50 MHz, increasing to 500 mV at 100 MHz
Accuracy (Time) for Pulse-Glitch or Pulse-Width Triggering	**Time range**	**Accuracy**
	1 ns to 1 μs	±(20% of setting + 0.5 ns)
	1.02 μs to 1 s	±(100 ns + 0.01% of Setting)
Input Signal Sync Amplitude for Stable Triggering, NTSC and PAL modes (Option 05 Video Trigger)	Field selection "Odd", "Even", or "All": 0.6 division to 4 divisions	
	Field selection "Numeric": 1 division to 4 divisions (NTSC mode)	
Jitter (Option 05 Video Trigger)	60 ns_{p-p} on NTSC or PAL signal	

1 **The minimum sensitivity for obtaining a stable trigger. A stable trigger results in a uniform, regular display triggered on the selected slope. The trigger point must not switch between opposite slopes on the waveform, and the display must not "roll" across the screen on successive acquisitions. The TRIG'D LED stays constantly lighted when the SEC/DIV setting is 2 ms or faster but may flash when the SEC/DIV setting is 10 ms or slower.**

Table 2–13: Warranted characteristics — Output ports, probe compensator, and power requirements

Name	Description	
Logic Levels, Main- and Delayed-Trigger Outputs	**Characteristic**	**Limits**
	Vout (HI)	≥2.5 V open circuit; ≥1.0 V into a 50 Ω load to ground
	Vout (LO)	≤0.7 V into a load of ≤4 mA; ≤0.25 V into a 50 Ω load to ground

Table 2–13: Warranted characteristics — Output ports, probe compensator, and power requirements (cont.)

Name	Description	
Output Voltage and Frequency, Probe Compensator	**Characteristic**	**Limits**
	Output Voltage	0.5 V (base-top) ±1% into a ≥50 Ω load
	Frequency	1 kHz ±5%
Output Voltage, Signal Out (CH 3[1])	For TDS 600B: 20 mV/division ±20% into a 1 MΩ load; 10 mV/division ±20% into a 50 Ω load For TDS 500C/700C: 22 mV/division ±20% into a 1 MΩ load; 11 mV/division ±20% into a 50 Ω load	
Source Voltage	90 to 250 VAC_{RMS}, continuous range, CAT II	
Source Frequency	45 Hz to 440 Hz	
Power Consumption	≤300 W (450 VA)	

1 **CH 3 signal out is present at the rear panel if CH 3 (AUX 1 on the TDS 620B or 680B) is selected as the trigger source for the main and/or delayed trigger systems. It is not available when a channel other than CH3 (AUX 1 on the TDS 620B or 680B) is the source for the Video Trigger when Option 05 is installed.**

Table 2–14: Warranted characteristics — Environmental

Name	Description
Atmospherics	Temperature (no disk in floppy drive): TDS 600B: Operating: +4° C to +45° C Floppy disk drive: Operating: +10° C to +45° C Nonoperating: –22° C to +60° C TDS 500C/700C: Operating: +0° C to +50° C Floppy disk drive: Operating: +10° C to +50° C Nonoperating: –22° C to +60° C Relative humidity (no disk in floppy drive): Operating: 20% to 80%, at or below +32° C, upper limit derates to 30% relative humidity at +45° C Nonoperating: 5% to 90%, at or below +31° C, upper limit derates to 20% relative humidity at 60° C Altitude: To 4570 m (15,000 ft.), operating (excluding hard disk drive) To 3048 m (10,000 ft.), operating (including hard disk drive) To 12190 m (40,000 ft.), nonoperating
Dynamics	Random vibration (floppy disk not installed): 0.31 g rms, from 5 to 500 Hz, 10 minutes each axis, operating 3.07 g rms, from 5 to 500 Hz, 10 minutes each axis, nonoperating
Emissions (TDS 500C/700C) [1, 2]	Meets or exceeds the requirements of the following standards: FCC Code of Federal Regulations, 47 CFR, Part 15, Subpart B, Class A European Community Requirements EN 55011 Class A Radiated Emissions EN 55011 Class A Conducted Emissions EN 50081–1 EN60555–2 Power Line Harmonic Emissions
Emissions (TDS 600B)[1, 2]	Meets or exceeds the requirements of the following standards: FCC Code of Federal Regulations, 47 CFR, Part 15, Subpart B, Class A EN 50081–1 European Community Requirements EN 55022 Radiated Emissions Class B EN 55022 Class B Conducted Emissions EN60555–2 Power Line Harmonic Emissions

Table 2–14: Warranted characteristics — Environmental (cont.)

Name	Description
Susceptibility[1, 2]	Meets or exceeds the EMC requirements of the following standards:
	EN 50082–1 European Community Requirements
	IEC 801-2 Electrostatic Discharge Performance Criteria B
	IEC 801-3 Radiated Susceptibility 3 V/meter from 27 MHz to 500 MHz unmodulated
	IEC 801-4 Fast Transients Performance Criteria B
	IEC 801-5 AC Surge Performance Criteria B
Approvals	Conforms to and is certified where appropriate to:
	UL 3111–1[3] – Standard for electrical measuring and test equipment
	CAN/CSA C22.2 no. 1010.1[3] – Safety requirements for electrical equipment for measurement, control and laboratory use

1 VGA output cable needs to be terminated, if connected at all, for the Instrument to meet these standards. The test will pass with LCOM part # CTL3VGAMM–5.

2 The GPIB cable connected to the instrument for certain of the emissions tests must be "low EMI" having a high-quality outer shield connected through a low impedance to both connector housings. Acceptable cables are Tektronix part numbers 012-0991-00, -01, -02, and -03. In order to maintain the EMI performance conforming to the above regulations, the following cables, or their equivalent, should be used: a shielded Centronics cable, 3 meters in length, part number 012-1214-00, and a shielded RS-232 cable, 2.7 meters in length, CA part number 0294-9.

3 UL 3111, CSA 22.2 no.1010 Safety Certification Compliance:
Temperature (operating) 5 to +40 C
Altitude (maximum operating): 2000 meters
Equipment Type: Test and Measurement
Safety Class: Class I (as defined in IEC 1010–1, Annex H) – grounded product
Overvoltage Category: Overvoltage Category II (as defined in IEC 1010–1, Annex J)
Pollution Degree: Pollution Degree 2 (as defined in IEC 1010–1)
Note – Rated for indoor use only

Table 2–15: Certifications and compliances

EC Declaration of Conformity (TDS 500C and TDS 700C)	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: EMC Directive 89/336/EEC: EN 55011 Class A Radiated and Conducted Emissions EN 50081-1 Emissions: EN 60555-2 AC Power Line Harmonic Emissions EN 50082-1 Immunity: IEC 801-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity IEC 801-4 Electrical Fast Transient/Burst Immunity IEC 801-5 Power Line Surge Immunity
Australian Declaration of Conformity – EMC (TDS 500C and TDS 700C)	Conforms with the following standards in accordance with the Electromagnetic Compatibility Framework: AS/NZS 2064.1/2 Class A radiated and Conducted Emissions
EC Declaration of Conformity (TDS 600B)	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: EMC Directive 89/336/EEC: EN 50081-1 Emissions: EN 55022 Class B Radiated and Conducted Emissions EN 60555-2 AC Power Line Harmonic Emissions EN 50082-1 Immunity: IEC 801-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity IEC 801-4 Electrical Fast Transient/Burst Immunity IEC 801-5 Power Line Surge Immunity
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 EN 61010-1:1993 Safety requirements for electrical equipment for measurement, control, and laboratory use

Typical Characteristics

This subsection contains tables that list the various *typical characteristics* which describe the TDS 500C, TDS 600B and TDS 700C oscilloscopes.

Typical characteristics are described in terms of typical or average performance. Typical characteristics are not warranted.

Table 2–16: Typical characteristics — Signal acquisition system

Name	Description		
Analog Bandwidth, DC-50 Ω Coupled with P6243 or P6245 Probe and Bandwidth selection is FULL TDS 520C, 540C, 724C & 754C	**Volts/Div as read out on screen**	**520C, 540C, 724C & 754C Bandwidth[1]**	
	10 V/div – 100 V/div	Not Applicable	
	100 mV/div – 10 V/div	DC – 500 MHz	
	50 mV/div – 99.5 mV/div	DC – 500 MHz	
	20 mV/div – 49.8 mV/div	DC – 500 MHz	
	10 mV/div – 19.9 mV/div	DC – 450 MHz (P6243) DC – 500 MHz (P6245)	
Analog Bandwidth, DC-50 Ω Coupled with P6245 Probe and Bandwidth selection is FULL TDS 784C	**Volts/Div as read out on screen**	**TDS 784C**	
	10 V/div –100 V/div	(Not Applicable)	
	100 mV/div – 10 V/div	DC – 1 GHz	
	50 mV/div – 99.5 mV/div	DC – 750 MHz	
	20 mV/div – 49.8 mV/div	DC – 600 MHz	
	10 mV/div – 19.9 mV/div	DC – 500 MHz	
Analog Bandwidth, DC-1M Ω Coupled with P6139A Probe and Bandwidth selection is FULL TDS 520C, 540C, 724C, 754C & 784C	**Volts/Div as read out on screen**	**520C, 540C, 724C, 754C & 784C Bandwidth[1]**	
	10 V/div – 100 V/div	500 MHz	
	100 mV/div – 10 V/div	500 MHz	
	50 mV/div – 99.5 mV/div	500 MHz	
	20 mV/div – 49.8 mV/div	500 MHz	
	10 mV/div – 19.9 mV/div	500 MHz	
Analog Bandwidth, DC-50 Ω Coupled with P6139A Probe (TDS 620B & 644B) or P6245 Probe (TDS 680B & 684B) and Bandwidth selection is FULL TDS 600B	**Volts/Div as read out on screen**	**620B & 644B Bandwidth[1]**	**680B & 684B Bandwidth[1]**
	10 V/div – 100 V/div	(Not Applicable)	(Not Applicable)
	100 mV/div – 10 V/div	DC – 500 MHz	DC – 1 GHz
	50 mV/div – 99.5 mV/div	DC – 450 MHz	DC – 750 MHz
	20 mV/div – 49.8 mV/div	DC – 300 MHz	DC – 600 MHz
	10 mV/div – 19.9 mV/div	DC – 250 MHz	DC – 500 MHz

Table 2–16: Typical characteristics — Signal acquisition system (cont.)

Name	Description		
Accuracy, Delta Time Measurement	The limits are given in the following table for signals having amplitude greater than 5 divisions, reference level = 50%, filter set to (sinX/X), acquired at 5 mV/div or greater. For the TDS 700C, pulse duration < 10 div. Channel skew not included. For the Single Shot condition, $1.4 \leq T_r/S_i \leq 4$, where S_i is the sample interval and T_r is the displayed rise time. TDS 600B: For the averaged condition, $1.4 \leq T_r/W_i \leq 40$, where W_i is the Waveform Interval, as described elsewhere in these specifications. TDS 600B: Extra error in the measurement will occur for two-channel measurements due to channel-to-channel skew. This is described elsewhere in these specifications.		
	Time measurement accuracy		
Conditions for accuracy listed at right are: Single Shot or Sample mode (or HiRes mode on the TDS 500C/700C), with Full Bandwidth selected.	TDS 600B: $\pm($ (0.20 × sample interval) + (100 ppm × | Reading |) + (0.05 × W_i)) TDS 600B example: at 5 GS/s, 5 ns/div, measuring a 40 ns wide pulse, accuracy = ±(40 ps + 4 ps + 5 ps) = ±49 ps. TDS 500C/700C: ±0.15 sample interval + (25 ppm × | Reading |) + t/div/1000 TDS 500C/700C example: at 4 Gs/s, accuracy = 37.5 ps		
Conditions for accuracy listed at right are: ≥ 100 Averages, will Full Bandwidth selected, and for TDS 500C/700C, repetitive mode.	TDS 600B: ±(10 ps + (100 ppm × | Reading |) + (0.25 × W_i)) TDS 500C/700C: 20 ps + (25 ppm × | Reading |) + t/div/1000		
Calculated Rise Time, TDS 600B[2]	**Volts/Div setting**	**620B & 644B Rise time**	**680B & 684B Rise time**
	10 mV/div – 1 V/div	900 ps	450 ps
	5 mV/div – 9.95 mV/div	1 ns	600 ps
	2 mV/div – 4.98 mV/div	1.5 ns	750 ps
	1 mV/div – 1.99 mV/div	1.8 ns	900 ps
Calculated Rise Time, TDS 500C/700C[2]	**Volts/Div setting**	**520C, 540C, 724C, & 754C Rise time**	**784C Rise time**
	10 mV/div – 1 V/div	800 ps	400 ps
	5 mV/div – 9.95 mV/div	800 ps	530 ps
	2 mV/div – 4.98 mV/div	800 ps	600 ps
	1 mV/div – 1.99 mV/div	890 ps	800 ps
Effective Bits — TDS 600B	**Input frequency**	**Effective bits**	
The chart on the right gives the typical effective bits for a 9-division p-p sine-wave input, 50 mV/div, 10 ns/div (5 GS/s), with a record length of 1000 points	98 MHz	6.3 bits	
	245 MHz	6.0 bits	
	490 MHz	5.5 bits	
	990 MHz	5.2 bits (TDS 680B & 684B only)	

Table 2–16: Typical characteristics — Signal acquisition system (cont.)

Name	Description				
Effective Bits — TDS 520C & 724C The chart on the right gives the typical effective bits for a sine wave adjusted to 9.2 divisions at 1 MHz, 50 mV/div @ 25° C.		**Sample rate**			
	Input frequency	**1 GS/s**	**10 MS/s & HiRes**		
	1 MHz – 9.2 divs	6.8 bits	9.7 bits		
	490 MHz – 6.5 divs	6.5 bits	N/A		
Effective Bits — TDS 540C & 754C The chart on the right gives the typical effective bits for a sine wave adjusted to 9.2 divisions at 1 MHz, 50 mV/div @ 25° C.		**Sample rate**			
	Input frequency	**2 GS/s**	**10 MS/s & HiRes**		
	1 MHz – 9.2 divs	6.8 bits	9.7 bits		
	500 MHz	6.8 bits	N/A		
Effective Bits — TDS 784C The chart on the right gives the typical effective bits for a sine wave adjusted to 9.2 divisions at 1 MHz, 50 mV/div @ 25° C.		**Sample rate**			
	Input frequency	**4 GS/s**	**10 MS/s & HiRes**		
	1 MHz – 9.2 divs	6.6 bits	9.7 bits		
	1 GHz – 6.5 divs	5.5 bits	N/A		
Frequency Limit, Upper, 250 MHz Bandwidth Limited	250 MHz				
Frequency Limit, Upper, 20 MHz Bandwidth Limited	20 MHz				
Step Response Settling Errors			**Settling error (%)[3] at**		
	Volts/Div setting	**± Step amplitude**	**20 ns**	**100 ns**	**20 ms**
	1 mV/div – 100 mV/div	≤2 V	≤0.5%	≤0.2%	≤0.1%
	101 mV/div – 1 V/div	≤20 V	≤1.0%	≤0.5%	≤0.2%
	1.01 V/div – 10 V/div	≤200 V	≤1.0%	≤0.5%	≤0.2%

1 **The limits given are for the ambient temperature range of 0° C to +30° C. Reduce the upper bandwidth frequencies by 5 MHz for the TDS 600B or by 2.5 MHz for the TDS 500C/700C for each ° C above +30° C.**

2 **The numbers given are valid 0° C to +30° C and will increase as the temperature increases due to the degradation in bandwidth. Rise time is calculated from the bandwidth. It is defined by the following formula:**

$$TDS\ 600B\ Rise\ \ Time\ \ (ns) = \frac{450}{BW\ \ (MHz)} \qquad TDS\ 500C/700C\ Rise\ \ Time\ \ (ns) = \frac{400}{BW\ \ (MHz)}$$

Note that if you measure rise time, you must take into account the rise time of the test equipment (signal source, etc.) that you use to provide the test signal. That is, the measured rise time (RT_m) is determined by the instrument rise time (RT_i) and the rise time of the test signal source (RTgen) according to the following formula:

$$RT_m^{\ 2} = RT_i^{\ 2} + RT_{gen}^{\ 2}$$

3 **The values given are the maximum absolute difference between the value at the end of a specified time interval after the midlevel crossing of the step and the value one second after the midlevel crossing of the step, expressed as a percentage of the step amplitude.**

Table 2–17: Typical characteristics — Triggering system

Name	Description			
Accuracy, Trigger Level or Threshold, DC Coupled (for signals having rise and fall times ≥ 20 ns)	**Trigger source**		**Accuracy**	
	Any Channel		±((2% × | Setting – Net Offset |) + (0.3 div × Volts/div Setting) + Offset Accuracy)	
	Auxiliary		Not calibrated or specified	
Input, Auxiliary Trigger	The input resistance is ≥1.5 kΩ; the maximum safe input voltage is ±20 V (DC + peak AC).			
Trigger Position Error, Edge Triggering	**Acquisition mode**		**Trigger-position error[1,2]**	
	Sample, Average		±(1 Waveform Interval + 1 ns)	
	Envelope		±(2 Waveform Intervals + 1 ns)	
Holdoff, Variable, Main Trigger	For all Time/Division ranges, the minimum holdoff is 250 ns and the maximum holdoff is 12 seconds. The minimum resolution is 8 ns for settings ≤ 1.2 µs.			
Lowest Frequency for Successful Operation of "Set Level to 50%" Function	30 Hz			
Sensitivity, Edge Trigger, Not DC Coupled[3]	**Trigger source**		**Typical signal level for stable triggering**	
	AC		Same as the DC-coupled limits for frequencies above 60 Hz. Attenuates signals below 60 Hz.	
	Noise Reject		Three times the DC-coupled limits.	
	High Frequency Reject		One and one-half times the DC-coupled limits from DC to 30 kHz. Attenuates signals above 30 kHz.	
	Low Frequency Reject		One and one-half times the DC-coupled limits for frequencies above 80 kHz. Attenuates signals below 80 kHz.	
Sensitivities, Logic Trigger and Events Delay, DC Coupled[4]	1.0 division, from DC to 500 MHz, at vertical settings > 10 mV/div and ≤ 1 V/div at the BNC input			
Sensitivities, Pulse-Type Runt Trigger[5]	1.0 division, from DC to 500 MHz, at vertical settings > 10 mV/div and ≤ 1 V/div at the BNC input			
Sensitivities, Pulse-Type Trigger Width and Glitch[6]	1.0 division, at vertical settings > 10 mV/div and ≤ 1 V/div at the BNC input			
Width, Minimum Pulse and Rearm, for Logic Triggering or Events Delay	For vertical settings > 10 mV/div and ≤ 1 V/div at the BNC input			
	Triggering type	**Minimum pulse width**	**Minimum re-arm width**	**Minimum time between channels[7]**
	Logic	Not Applicable	1 ns	1 ns
	Events Delay	1 ns (for either + or – pulse widths)	Not Applicable	2 ns

Table 2–17: Typical characteristics — Triggering system (cont.)

Name	Description		
Width, Minimum Pulse and Rearm, for Pulse Triggering The minimum pulse widths and rearm widths and transition times[8] required for Pulse-Type triggering.	For vertical settings > 10 mV/div. and 3 1 V/div at the BNC input		
	Pulse class	**Minimum pulse width**	**Minimum re-arm width**
	Glitch	1 ns	2 ns + 5% of Glitch Width Setting
	Runt	2 ns	2 ns
	Time-Qualified Runt	2 ns	TDS 600B: 7 ns + 5% of Width Setting TDS 700C: 8.5 ns + 5% of Width Setting
	Width	1 ns	2 ns + 5% of Width Upper Limit Setting
	Timeout	1 ns	2 ns + 5% of Width Upper Limit Setting
	Slew Rate	600 ps[8]	TDS 600B: 7 ns + 5% of Delta Time Setting TDS 700C: 8.5 ns + 5% of Delta Time Setting
Setup/Hold Time Violation Trigger, Minimum Clock Pulse Widths	For vertical settings > 10 mV/div and ≤ 1 V/div at the BNC input, the minimum requirements are:		
	Minimum Pulsewidth, Clock High		**Minimum Pulsewidth, Clock Low**
	Users Hold Time + 2.5 ns [9]		2 ns
Input Signal Sync Amplitude for Stable Triggering, HDTV and FLEXFMT modes (Option 05 Video Trigger)	All field selections: 0.6 division to 4 divisions		
Jitter for HDTV mode (Option 05 Video Trigger)	17 ns_{p-p}		
Sync Width Flex Format and HDTV modes (Option 05 Video Trigger)	min. 400 ns		
Sync Duty Cycle, Flex Format and HDTV modes (Option 05 Video Trigger)	min. 50 to 1		
Hum Rejection (Option 05 Video Trigger)	NTSC and PAL: –20 dB without any trigger spec deterioration. Triggering will continue down to 0 dB with some performance deterioration.		

1 The trigger position errors are typically less than the values given here. These values are for triggering signals having a slew rate at the trigger point of ≥ 0.5 division/ns.

2 The waveform interval (WI) is the time between the samples in the waveform record. Also, see the footnote for the characteristics *Sample Rate Range or Interpolated Waveform Rates* in Table 2–4, on page 2–10.

3 The minimum sensitivity for obtaining a stable trigger. A stable trigger results in a uniform, regular display triggered on the selected slope. The trigger point must not switch between opposite slopes on the waveform, and the display must not "roll" across the screen on successive acquisitions. The TRIG'D LED stays constantly lighted when the SEC/DIV setting is 2 ms or faster but may flash when the SEC/DIV setting is 10 ms or slower.

4 The minimum signal levels required for stable logic or pulse triggering of an acquisition, or for stable counting of a DC-coupled, events-delay signal. Also, see the footnote for *Sensitivity, Edge-Type Trigger, DC Coupled* in this table. (Stable counting of events is counting that misses no events and produces no extra, phantom events).

Table 2–17: Typical characteristics — Triggering system (cont.)

Name	Description
5	The minimum signal levels required for stable runt pulse triggering of an acquisition. Also, see the footnote for *Sensitivity, Edge-Type Trigger, DC Coupled* in this table. (Stable counting of events is counting that misses no events).
6	The minimum signal levels required for stable pulse width or glitch triggering of an acquisition. Also, see the footnote for *Sensitivity, Edge-Type Trigger, DC Coupled* in this table. (Stable counting of events is counting that misses no events).
7	For Logic, time between channels refers to the length of time a logic state derived from more than one channel must exist to be recognized. For Events, the time is the minimum time between a main and delayed event that will be recognized if more than one channel is used.
8	For Slew Rate Triggering, this is the minimum transition time, defined to be the time the user's signal spends between the two trigger threshold settings.
9	User Hold Time is the number selected by the user in the Hold Time Menu.