# Specifications

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

## Product Description

The TDS 500B, 600B and 700A 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 500B, 600B and 700A Oscilloscopes**

| Feature | TDS 600B | TDS 700A |
|---|---|---|
| Digitizing rate, maximum | TDS 684B: 5 GS/s on ea. of 4 ch<br>TDS 680B: 5 GS/s on ea. of 2 ch<br>TDS 644B: 2.5 GS/s on ea. of 4 ch<br>TDS 620B: 2.5 GS/s on ea. of 2 ch simultaneously | TDS 784A: 4 GS/s<br>TDS 540B, 744A: 2 GS/s<br>TDS 520B, 724A: 1 GS/s<br>Opt. 1G, TDS 540B, 744A: 1 GS/s |
| Analog bandwidth | 1 GHz on TDS 680B, 684B, and 784A<br>500 MHz on TDS 520B, 540B, 620B, 644B, 724A and 744A | |
| Channels | Four, each with 8-bit resolution | |
| Record lengths, maximum | 15,000 samples | 50,000 samples<br>(500,000 with option 1M) |
| Acquisition modes | Sample, envelope, peak detect and average | Sample, envelope, average, high-resolution, and peak-detect |
| Trigger modes | Include: edge, logic, and pulse.<br>Video trigger, with option 05, modes include:<br>NTSC, SECAM, PAL, HDTV, and FlexFormat. | |
| Display | TDS 520B, 540B, 620B, 680B: Monochrome<br>TDS 644B, 684B, 724A, 744A, 784A: Color | |
| Storage | 1.44 Mbyte, 3.5 inch, DOS 3.3-or-later floppy disk (optional on TDS 520B, 540B, 620B & 680B).<br>NVRAM storage for saving waveforms, hardcopies, and setups | |
| I/O | Full GPIB programmability.<br>Hardcopy output using GPIB, RS-232, or Centronics ports | |

## 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.

**Table 2–2: Record Length vs. Divisions per Record, Samples per Division and Sec/Div Sequence**

| | Divisions per Record | |
|---|---|---|
| | Sample/Division (Sec/Div Sequence) | |
| Record Length | Fit to Screen OFF 50 (1–2–5) | Fit to Screen ON (Sample/Div & Sec/Div Sequence varies) |
| 500 | 10 divs | 10 divs |
| 1000 | 20 divs | 10 divs |
| 2500 | 50 divs | 10 divs |
| 5000 | 100 divs | 10 divs |
| 15000 | 300 divs | 15 divs |
| 50000 (TDS 500B/700A only) | 1,000 divs | 10 divs |
| 75000 (TDS 500B/700A opt. 1M only) | 1,500 divs | 15 divs |
| 100000 (TDS 500B/700A opt. 1M only) | 2,000 divs | 10 divs |
| 130000 (TDS 500B/700A opt. 1M only) (for TDS 520B & 724A, 1 or 2 channels only) | 2,600 divs | 13 divs |
| 250000 (TDS 520B/724A opt. 1M only, 1 channel, TDS 540B, 744A, 784A opt. 1M only, 1 or 2 channels)) | 5,000 divs | 10 divs |
| 500000 (TDS 540B, 744A, 784A opt. 1M only, 1 channel) | 10,000 divs | 10 divs |

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.

## 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.

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 500B/700A, 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 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 above. 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 500B, 600B and 700A Digitizing Oscilloscopes offer flexible display options. You can customize the following attributes of your display:

- Color (TDS 644B, TDS 684B, and TDS 700A): 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 500B, 600B and 700A 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 540B, 644B, 684B, 744A, 784A: Four, simultaneous<br>TDS 520B, 620B, 680B, 724A: 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[2] | |

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<br>TDS 680B: 5 Samples/sec to 5 GSamples/sec on two channels simultaneously<br>TDS 644B: 5 Samples/sec to 2.5 GSamples/sec on four channels simultaneously<br>TDS 620B: 5 Samples/sec to 2.5 GSamples/sec on two channels simultaneously<br>TDS 520B, 724A: 5 Samples/sec to 1 GSamples/sec when acquiring 1 channel, to 500 MSamples/sec when acquiring 2 channels<br>TDS 540B, 744A: 5 Samples/sec to 2 GSamples/sec when acquiring 1 channel to 1 G Sample/sec when acquiring 2 channels, or to 500 MSamples/sec when acquiring 3 or 4 channels (with Opt. 1G, to 1 GSamples/sec when acquiring 1 channel)<br>TDS 540B & 744A both with option 1G: 5 Samples/sec to 1 GSamples/sec when acquiring 1 channel to 1 G Sample/sec when acquiring 2 channels, or to 500 MSamples/sec when acquiring 3 or 4 channels<br>TDS 784A: 5 Samples/sec to 4 GSamples/sec when acquiring 1 channel to 2 G Sample/sec when acquiring 2 channels, or to 1 GSamples/sec when acquiring 3 or 4 channels |
| Range, Interpolated Waveform Rate[2,3] | TDS 600B: 10 GSamples/sec to 250 GSamples/sec<br>TDS 520B, 540B, 724A, 744A: 1 GSamples/sec to 100 GSamples/sec<br>TDS 784A: 2 GSamples/sec to 250 GSamples/sec |
| Range, Seconds/Division | TDS 600B: 0.2 ns/div to 10 s/div<br>TDS 500B, 724A, 744A: 0.5 ns/div to 10 s/div<br>TDS 784A: 0.2 ns/div to 10 s/div |
| Record Length Selection | 500 samples, 1000 samples, 2500 samples 5000 samples, 15000 samples<br>The TDS 520B and 724A also offer: 50000 samples and, with its option 1M, 75000, 100000, 130000 (1 or 2 channels), or 250000 (1 channel) samples<br>The TDS 540B, 744A, and 784A also offer: 50000 samples and, with its option 1M, 75000, 100000, 130000, 250000 (1 or 2 channels), or 500000 (1 channel) 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 700A) 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<br>TDS 500B/700A: 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 | |
| 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.<br>For Hold Time, positive numbers mean a data transition after the clock edge and negative means a transition before the clock edge.<br>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:<br>■ NTSC (525/60) – 2 field mono or 4 field<br>■ PAL (625/50) – 2 field mono or SECAM, 8 field<br>■ HDTV –<br>(787.5/60)<br>(1050/60)<br>(1125/60)<br>(1250/60)<br>■ FlexFormat™ (user definable standards)<br>User can specify: field rate, number of lines, sync pulse width and polarity, line rate, and vertical interval timing. | |

**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<br>TDS 520B, 540B, 620B, 680B: Monochrome display<br>TDS 644B, 684B, 724A, 744A, 784A: Color display |
| Video Display Resolution | 640 pixels horizontally by 480 pixels vertically |
| Waveform Display Graticule | Single Graticule: 401 × 501 pixels, 8 ×10 divisions, where divisions are 1 cm by 1 cm |
| Waveform Display Levels/Colors | TDS 520B, 540B, 620B & 680B: Sixteen levels in infinite-persistence or variable persistence display<br>TDS 644B, 684B, 724A, 744A, 784A: 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)<br>Optional on the TDS 520B and 540B |
| Interface, Centronics | Centronics interface complies with Centronics interface standard C332-44 Feb 1977, REV A |
| 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,<br>(optional on the TDS 520B and 540B) | 3.5 inch, 720 K or 1.44 Mbyte. DOS 3.3-or-later compatible |

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. The amount of lithium is so small in these ICs that they can typically be safely disposed of with ordinary garbage in a sanitary landfill.**

**Table 2–9: Nominal Traits — Mechanical**

| Name | Description |
|---|---|
| Cooling Method | Forced-air circulation with no air filter. Clearance is required. |
| 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. |
| Finish Type | Tektronix Blue vinyl-clad aluminum cabinet |
| Weight | Standard Digitizing Oscilloscope<br>14.1 kg (31 lbs), with front cover.<br>24.0 kg (53 lbs), when packaged for domestic shipment<br>Rackmount Digitizing Oscilloscopes<br>14.1 kg (31 lbs) plus weight of rackmount parts, for the rackmounted Digitizing Oscilloscopes (Option 1R).<br>Rackmount conversion kit<br>2.3 kg (5 lbs), parts only; 3.6 kg (8 lbs), parts plus package for domestic shipping |
| Overall Dimensions | Standard Digitizing Oscilloscope<br>Height: 193 mm (7.6 in), with the feet installed<br>Width: 445 mm (17.5 in), with the handle<br>Depth: 434 mm (17.1 in), with the front cover installed<br>Rackmount Digitizing Oscilloscope<br>Height: 178 mm (7.0 in)<br>Width: 483 mm (19.0 in)<br>Depth: 558.8 mm (22.0 in) |

# Warranted Characteristics

This section lists the various *warranted characteristics* that describe the TDS 500B, 600B, and 700A Digitizing 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 2–23.

## 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<br>+ 2.0% at 1 mV/div sensitivity<br>TDS 500B, 700A: ±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))<br>TDS 500B, 700A: ±((1.0% × \| reading – Net Offset[1] \|) + Offset Accuracy + 0.06 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)<br>TDS 500B, 700A: ±((1.0% × \| reading \|) – 0.1 div + 0.3 mV) |
| **Accuracy, Offset** | **Volts/Div Setting** | **TDS 600B Offset Accuracy** | **TDS 500B/700A 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 setting)) |
| | 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 setting)) |
| | 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 setting)) |
| **Analog Bandwidth, DC-50 Ω Coupled and Bandwidth selection is FULL, TDS 600B** | **Volts/Div** | **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 |

**Table 2–10: Warranted Characteristics — Signal Acquisition System (Cont.)**

| Name | Description | | |
|---|---|---|---|
| **Analog Bandwidth, DC-50 Ω Coupled and Bandwidth selection is FULL, TDS 500B/700A** | **Volts/Div** | **520B, 540B, 724A, 744A Bandwidth[2]** | **784A 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 | | |
| **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<br>TDS 500B/700A: ≤50 ps for any two channels with equal Volts/Div and Coupling settings | | |
| 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: ±400 V (DC + peak AC); derate at 20 dB/decade above 1 MHz<br>TDS 500B/700A: ±300 V (DC + peak AC), 400 V peak; derate at 20 dB/decade above 1 MHz, category II | | |
| 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 500B/700A 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<br>TDS 500B/700A: ±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 500B, 724A, 744A: 0.35 division from DC to 50 MHz, increasing to 1 division at 500 MHz |
| | | TDS 784A: 0.35 division from DC to 50 MHz, increasing to 1 division at 1 GHz |
| | Auxiliary | TDS 600B or 784A: 250 mV from DC to 50 MHz, increasing to 500 mV at 100 MHz |
| | | TDS 500B, 724A, 744A: 400 mV from DC to 50 MHz, increasing to 750 mV at 100 MHz |
| | | TDS 784A: 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;<br>10 mV/division ±20% into a 50 Ω load<br><br>For TDS 500B/700A:<br>22 mV/division ±20% into a 1 MΩ load;<br>11 mV/division ±20% into a 50 Ω load | |
| Source Voltage | 90 to 250 $VAC_{RMS}$, continuous range<br><br>TDS 500B/700A: category 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 diskette in floppy drive):<br><br>TDS 600B: Operating: +4° C to +45° C<br><br>TDS 500B/700A: Operating: –4° C to +50° C<br><br>Nonoperating: –22° C to +60° C<br><br>Relative humidity (no diskette in floppy drive):<br><br>Operating: 20% to 80%, at or below +32° C,<br>upper limit derates to 30% relative humidity at +45° C<br><br>Nonoperating: 5% to 90%, at or below +41° C,<br>upper limit derates to 30% relative humidity at 60° C<br><br>Altitude:<br><br>To 4570 m (15,000 ft.), operating<br><br>To 12190 m (40,000 ft.), nonoperating |
| Dynamics | Random vibration (floppy diskette not installed):<br><br>0.31 g rms, from 5 to 500 Hz, 10 minutes each axis, operating<br>3.07 g rms, from 5 to 500 Hz, 10 minutes each axis, nonoperating |

**Table 2–14: Warranted Characteristics — Environmental (Cont.)**

| Name | Description |
|---|---|
| Emissions (TDS 500B/700A) [1, 2] | Meets or exceeds the requirements of the following standards:<br>Vfg. 243/1991 Amended per Vfg. 46/1992<br>FCC Code of Federal Regulations, 47 CFR, Part 15, Subpart B, Class A<br>European Community Requirements<br>EN 55011 Class A Radiated Emissions<br>EN 55011 Class A Conducted Emissions<br>EN 50081–1<br>EN60555–2 Power Line Harmonic Emissions |
| Emissions (TDS 600B)[1, 2] | Meets or exceeds the requirements of the following standards:<br>Vfg. 243/1991 Amended per Vfg. 46/1992<br>FCC Code of Federal Regulations, 47 CFR, Part 15, Subpart B, Class A<br>EN 50081–1 European Community Requirements<br>EN 55022 Radiated Emissions Class B<br>EN 55022 Class B Conducted Emissions<br>EN60555–2 Power Line Harmonic Emissions |
| Susceptibility[1, 2] | Meets or exceeds the EMC requirements of the following standards:<br>EN 50082–1 European Community Requirements<br>IEC 801-2 Electrostatic Discharge Performance Criteria B<br>IEC 801-3 Radiated Susceptibility 3 V/meter from 27 MHz to 500 MHz unmodulated<br>IEC 801-4 Fast Transients Performance Criteria B<br>IEC 801-5 AC Surge Performance Criteria B |

**Table 2–14: Warranted Characteristics — Environmental (Cont.)**

| Name | Description |
|---|---|
| Third Party Certification | Conforms to and is certified where appropriate to:<br>TDS 500B/700A: UL 3111–1[3]<br>TDS 600B: UL 1244<br>TDS 500B/700A: CSA 22.2 no. 1010.1[3]<br>TDS 600B: CSA–C22.2 No. 231 |

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 IEC 1010, UL 3111, CSA 1010 Safety Certification Compliance:
Temperature (operating) 5 to +40 C
Altitude (maximum operating): 200 meters
Equipment Type: Test and Measurement
Safety Class: Class I (as defined in IEC 1010–1, Annex H) – grounded product
Overvoltage Catregory: 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

# Typical Characteristics

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

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

**Table 2–15: Typical Characteristics — Signal Acquisition System**

| Name | Description | | |
|---|---|---|---|
| **Analog Bandwidth, DC-50 Ω Coupled with P6243 or P6245 Probe and Bandwidth selection is FULL, TDS DS 520B, 540B, 724A & 744A** | **Volts/Div as Read Out on Screen** | **520B, 540B, 724A & 744A Bandwidth[1]** | |
| | 10 mV/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 | |
| **Analog Bandwidth, DC-50 Ω Coupled with P6243 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 mV/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 2–15: Typical Characteristics — Signal Acquisition System (Cont.)**

| Name | Description | | |
|---|---|---|---|
| **Analog Bandwidth, DC-50 Ω Coupled with P6245 Probe and Bandwidth selection is FULL, TDS 784A** | **Volts/Div as Read Out on Screen** | **784A Bandwidth[1]** | |
| | 10 mV/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** | **Volts/Div as Read Out on Screen** | **520B, 540B, 724A, 744A Bandwidth[1]** | **784A Bandwidth[1]** |
| | 10 mV/div – 100 V/div | 500 MHz | 500 MHz |
| | 100 mV/div – 10 V/div | 500 MHz | 500 MHz |
| | 50 mV/div – 99.5 mV/div | 500 MHz | 500 MHz |
| | 20 mV/div – 49.8 mV/div | 500 MHz | 500 MHz |
| | 10 mV/div – 19.9 mV/div | 450 MHz | 500 MHz |
| **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 700A, 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. | | |
| | **Conditions** | **Time Measurement Accuracy** | |

**Table 2–15: Typical Characteristics — Signal Acquisition System (Cont.)**

| Name | Description | | |
|---|---|---|---|
| | Single Shot or Sample mode (or HiRes mode on the TDS 500B/700A), Full Bandwidth selected | TDS 600B: ±( (0.20 × sample interval) + (100 ppm × \| Reading \|) + (0.05 × $W_i$ ) )<br>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.<br>TDS 500B/700A: ±≥ 0.15 sample interval + (25 ppm × \| Reading \|) + t/div/1000<br>TDS 500B/700A example: at 4 Gs/s, accuracy = 37.5 ps | |
| | ≥ 100 Averages, Full Bandwidth selected. TDS 500B/700A: repetitive | TDS 600B: ±( 10 ps + (100 ppm × \| Reading \|) + (0.25 × $W_i$ ) )<br>TDS 500B/700A: 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 ns |
| Calculated Rise Time, TDS 500B/700A[2] | **Volts/Div Setting** | **520B, 540B, 724A, 744A Rise Time** | **784A 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 ns |
| | 1 mV/div – 1.99 mV/div | 890 ps | 800 ns |
| Effective Bits — TDS 600B<br>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: | **Input Frequency** | **Effective Bits** | |
| | 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 2–15: Typical Characteristics — Signal Acquisition System (Cont.)**

| Name | Description | | |
|---|---|---|---|
| Effective Bits — TDS 520B, 724A<br>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 | **Input Frequency** | **Sample Rate** | |
| | | **1 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 540B, 744A<br>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 | **Input Frequency** | **Sample Rate** | |
| | | **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 784A<br>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 | **Input Frequency** | **Sample Rate** | |
| | | **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 | Volts/Div Setting | ⊥ Step Amplitude | Settling Error (%)[3] at 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 500B/700A 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:**

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

**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 2–16: 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 | |

**Table 2–16: Typical Characteristics — Triggering System (Cont.)**

| Name | Description | | | |
|---|---|---|---|---|
| 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 |
| Width, Minimum Pulse and Rearm, for Pulse Triggering<br><br>The minimum pulse widths and rearm widths and transition times[8] required for Pulse-Type triggering. | For vertical settings > 10 mV/div. and ≥ 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<br>TDS 700A: 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<br>TDS 700A: 8.5 ns + 5% of Delta Time Setting | |
| **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.**

Table 2–16: Typical Characteristics — Triggering System (Cont.)

| Name | Description |
|---|---|
| 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.) |
| 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. |