

The 7D20 is used with 7000 Series oscilloscopes, such as the R7603, shown here, for rack installations. See pages 246 through 254 for details.

7D20/7D20T

The 7D20 and 7D20T comply with IEEE Standard 488-1978 and with Tektronix *Standard Codes and Formats*

Digital Storage for 7000 Series Mainframe (7D20)

70 MHz Bandwidth for Repetitive Signals

10 MHz Single-Shot Bandwidth

Two Channels Simultaneous Acquisition

Totally Programmable

Storage of Six Independent Waveforms

Enveloping and Signal Averaging

Cursor Measurements

Pretrigger and Posttrigger

TYPICAL APPLICATIONS

- * Ultrasonics
- * Digital Design
- * RF Modulation
- * Automated Production Testing

The 7D20 brings state-of-the-art digital performance to Tektronix 7000 Series mainframes and rackmounts.

The 7D20 is a GPIB programmable plug-in that is compatible with all 7000 Series mainframes (including the USM 281C) except the 7104. When combined with a 7000 Series mainframe, this plug-in creates a fully programmable digitizing oscilloscope.

The 7D20T is the ideal high performance digitizer for automated systems applications not requiring a complete oscilloscope mainframe.

The 7D20T is supplied with its own power module, but without a display. Rear panel connectors provide X, Y, and Z output data for use with an external X-Y monitor, if desired.

Four feedthrough cables permit routing of input/output signals from the front panel of the 7D20T to the rear in rack-mounted applications. The GPIB cable may be connected to either the front or the rear of the 7D20T.

For those users who already own a 7D20 and would like to convert this 7000 Series plug-in into the 7D20T configuration, the power module itself is available as a 7D20T Option 01.

The capabilities and characteristics described here for the 7D20 also apply to the 7D20T.

The 7D20 can accurately measure the amplitude of a 50 ns wide transient event. Dual samplers simultaneously acquire two channels as if it were a "dual-beam" scope.

Beyond basic acquisition, the 7D20 offers signal averaging to reduce uncorrelated noise, envelope displays to compare dynamic characteristics of changing signals, pretrigger for viewing prior to the trigger event, storage of six independent waveforms plus a reference waveform, cursors for more accurate two-dot measurements, and user prompting and menu displays to improve user interface effectiveness.

Digital Storage

A 40 MHz maximum sampling rate provides approximately 10 MHz single-shot bandwidth and up to 70 MHz bandwidth with repetitive signals.

Storage and Recall Front Panel Settings

Up to six different front panel set-ups can be stored and recalled as desired. These settings, plus the last panel setup, are saved in nonvolatile memory and are restored automatically when power is applied.

Fully Automated Measurements

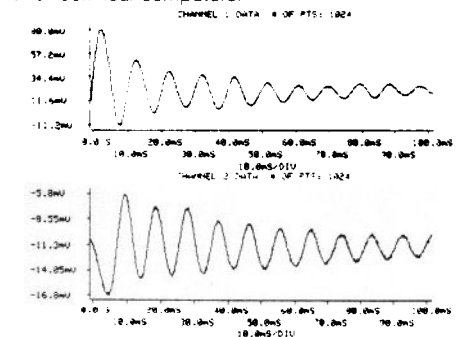
Since the 7D20 is completely programmable, fully automated measurement and testing is possible. Tektronix programmable signal sources, multi-function interface, and RF scanner provide and control the test signals while the 7D20 acquires waveforms for the computer or controller.



The 7D20 is ideal for system applications of all sorts and supports many levels of automation, from menu driven to fully automated.

Software Support

Utility and measurement software is available for the Tek 4041 System Controller to simplify common yet difficult GPIB programming tasks. Waveform processing and graphic ROM packs for the 4041 help to satisfy your data analysis and documentation requirements. Additionally, software support is provided for the Tek 4052A as well as a few selected non-Tektronix instrument controllers and technical computers.



PRESS (RETURN) FOR MENU.

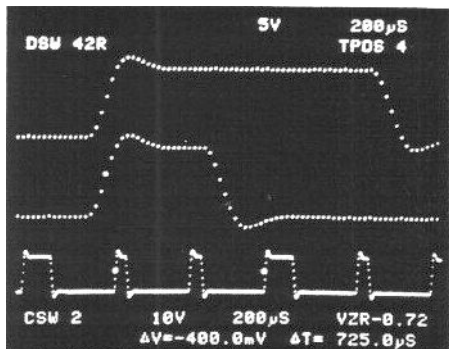
Archival hard copies can be produced by a system consisting of a 7D20 and mainframe, the Tektronix 4041 System Controller, 4105 Computer Display Terminal, and the 4695 Color Graphics Copier.

With compliments

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Measurement Flexibility

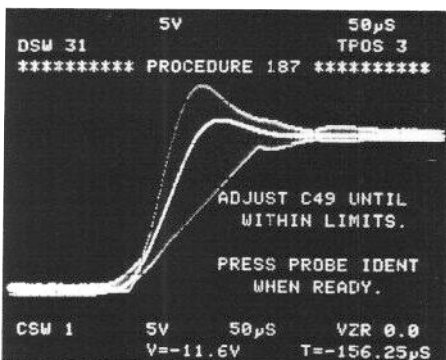


View and compare two different portions of the same waveform or of two different waveforms. All of these waveforms have been repositioned and vertically compressed. The two upper waveforms, two pulses from a single pulse train, are magnified portions of the lowest waveforms. The time (ΔT) between the two cursors indicates the time between the leading edges of two pulses in the pulse train.

Hands Off Operation With Probe Identify Feature

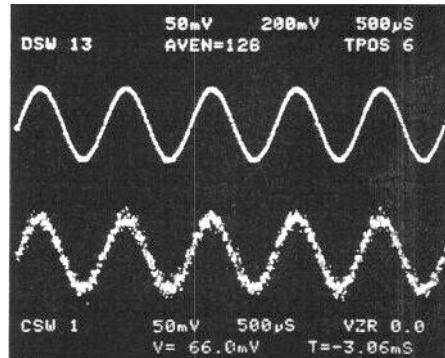
Recommended for use in interactive, computer-coordinated tasks, the Tektronix P6053B Probe allows computer routines to be sequentially activated at the 7D20's probe tip. This probe's "Identify" button signals the GPIB interface via an input channel coded request. This capability allows the operator to work at a short distance from the 7D20 without the need to touch front panel controls. Two such probes may be used, one for each vertical channel.

Automated Testing



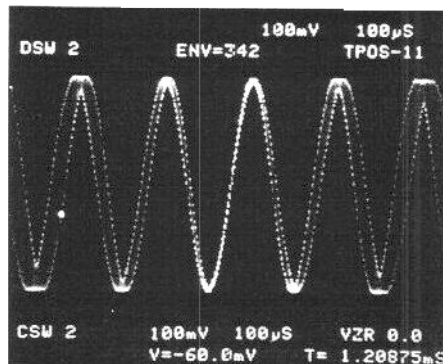
For interactive test procedures, text messages, waveforms, and front panel set-ups may be transmitted and received from the 7D20 to a controller or computer. The procedure in this display informs the operator of the next task. Upper and lower tolerance limits are displayed as a single envelope. This envelope was initially constructed using the 7D20's envelope feature while a test signal was varied to its allowable limits. The waveform was then transferred and saved by the controller to serve as the test reference or overlay.

Signal Averaging



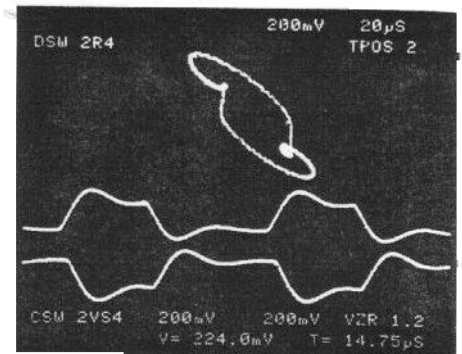
Averaging reduces uncorrelated noise to improve measurement accuracy and display quality. Continuous and self-terminating averaging are provided. The self-terminating averaging processes a fixed number (N) of waveforms and then holds the result in memory. The N value is selectable from 8 to 256 in powers of 2. The top waveform in this display is the result of averaging the bottom waveform 128 times.

Enveloping



Enveloping reveals subtle variations in signals by recording maximum and minimum values of recurring sweeps while vectors "paint" in the envelope. The effects of frequency shift are dramatically displayed.

X-Y Waveform Display and Time Reference

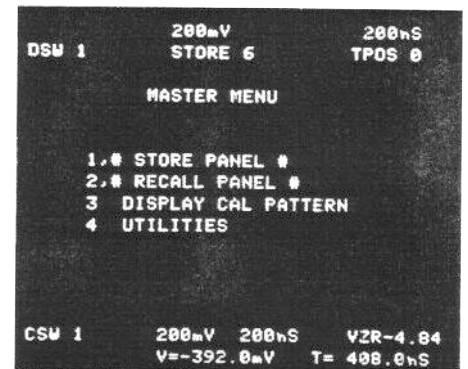


Unique display capability allows viewing Y versus X events and Y versus time simultaneously. X - Y channels are matched at 10 MHz with $<2^\circ$ of phase shift.

Cursor Measurements

Accurate amplitude measurements (referenced to ground) and time measurements (referenced to trigger position) are made using one cursor. Point-to-point difference (Δ) measurements are made using two cursors.

Master Menu



The master menu offers a convenient way to enable special functions such as the Store and Recall of front panel settings and also allows you to branch-out to other menus.



The 7D20T consists of the 7D20 and its own dedicated power module, for use in applications not requiring local visual display of acquired signals.

CHARACTERISTICS VERTICAL SYSTEM

Input — Two channels, simultaneous sampling, BNC connectors.

Acquire Modes — CH 1, CH 2, Add, Both (dual channel).

Sensitivity — 5 mV to 5 V/div; 1-2-5 sequence.

Bandwidth — 70 MHz maximum. (Ac Coupled Low Frequency Response: 10 Hz or less.)

Step Response — 5 ns or less.

Input Impedance — 1 MΩ paralleled by ≈20 pF

Maximum Input Voltage — Dc Coupled: 250 V, 1 kHz or less (dc + peak ac). Ac Coupled: 400 V, 1 kHz or less (dc + peak ac).

Signal Isolation — 100:1 dc to 20 MHz.

Vertical Resolution — 8 bits, 256 levels, 0.04 div/level.

Gain Ratio Accuracy — <2% Maximum error throughout the V/div range with acquire gain calibrated at 10 mV/div. Measurement valid with Cursors or GPIB.

Noise — Mean value of 50 measurements taken at 0.02 div increments.

Volts/Div	Full Scale/RMS Noise	Percent of Full Scale
5 mV	52 dB	0.25
10 mV to 5 V	55 dB	0.18

NOTE: Full scale = 10.24 divisions.

Phase Match X-Y — <2° from dc to 10 MHz.

HORIZONTAL SYSTEM

Time Division Range — External Clock, 20 s/div to 50 ns/div in 1-2-5 sequence.

Digitizing Technique Versus Time/Division — Real Time (Rolling Display): External Clock, 20 s/div to 0.1 s/div. Real Time: 50 ns/div to 500 μs/div. Extended Real Time: 200 μs/div to 2 s/div. Equivalent Time: 1 μs/div to 50 ns/div.

Note: Single events can be captured as fast as 2 μs/div. For 1 μs/div to 50 ns/div, repetitive events are required to build a complete waveform.

Time Measurement Accuracy — One Cursor: 0.1% of reading -0, -1 sample interval ±300 ps. Two Cursors: 0.1% of reading ±600 ps

Horizontal Resolution

Time/Division	Points/Waveform	Resolution Points/Division
External, 20 s to 500 μs	1024	100
200 μs to 2 μs	820**	80**
1 μs to 50 ns	1024	100

** Waveform interpolation to 1024 points is available for transfer over the GPIB interface.

Trigger Position

Pretrigger: 0 to 10 div in 1 div increments. **Posttrigger (delay):** 0 to 1500 div in 1 div increments (disabled during Roll with Envelope or Average).

	Frequency Range**	Sensitivity	
		Internal	External
Normal (Dc Coupling)	dc to 30 MHz	0.4 div	60 mV
	30 MHz to 70 MHz	1.0 div	150 mV
P-P and Auto	30 Hz to 200 Hz	2.0 div	300 mV
	200 Hz to 30 MHz	0.6 div	90 mV
	30 MHz to 70 MHz	1.2 div	200 mV

** The ac coupling low frequency limit is 30 Hz. In Time/Div settings of 1 μs to 50 ns, when using P-P or Auto, low-frequency limit is 300 Hz.

SIGNAL PROCESSING

Cursors Readout — With one cursor (ΔOff), vertical and horizontal coordinate values are referenced to zero volts and the trigger position as zero time. With two cursors (ΔOn), vertical and horizontal coordinate values are the difference between the two cursors.

Signal Averaging

AVE N: A self-terminating, stable average processing "N" number of waveforms and then holds the result in memory. The "N" value may be selected using the SET N function (N = 8, 16, 32, 64, 128, 256).

AVE: A continuous, stable averaging process. N waveforms are averaged as in AVEN, then additional waveforms are weighted at 1/N. In Roll mode a running average (smooth) is available to provide high frequency filtering.

Envelopeing

ENV N: A self-terminating recording of waveform maxima and minima. When N waveforms are processed, the result is held in memory.

ENV: A continuous (infinite) recording of waveform maxima and minima.

Waveform Modifiers

VPUP ↑ (Vertical Position Up), **VPDN** ↓ (Vertical Position Down): Provide vertical positioning control of any stored waveforms.

VCMP ↓ (Vertically Compress), **VXPD** ↑ (Vertically Expand): Provide vertical display expansion or compression. Two expansions or compressions in 1.25 calibrated steps, from the original V/div are available.

HMAG (Horizontal Magnify): Displays the cursor waveform horizontally magnified by a factor of 10. **HMAG ALL** (Horizontally Magnify All Waveforms): Displays all waveforms at 10 times horizontal magnification.

VS (Versus): Creates a Y versus X display of any two waveforms.

GPIB INTERFACE

Interface Function Subsets Implemented:

SH1	Complete source handshake
AH1	Complete acceptor handshake
T5	Complete talker — no secondary address
L3	Complete listener — no secondary address
SR1	Complete service request
RL1	Complete remote local
DC1	Complete device clear
DT1	Complete device trigger
PP0	No parallel poll
C0	No controller
E2	Three state

Programmable Functions — All instrument setting and operating modes are programmable except for Variable V/Div and Horizontal Position. However, these uncalibrated controls can be overridden and forced into the "CAL" position on command from the GPIB Interface. The display of Menu and ID is selectable from the front panel only.

Format — Device dependent commands in ASCII. Waveform data points selectable as BINARY or ASCII.

Waveform Output Time — 250 ms minimum for BINARY and 2.5 s minimum for ASCII. Actual transfer times depend upon the speed of the receiving device.

INPUTS

External Trigger (Front Panel) — Maximum Input Voltage: 250 V (dc + peak ac).

Signal Input Impedance — 1 MΩ, paralleled by ≈20 pF.

Hold Next (Mainframe Rear Panel) — Initiates Hold Next condition; connected to Single Sweep Reset connector.

OUTPUTS

Hold Next Ready — High level indicates unit is in Hold Next condition; output level remains low when unit is not in Hold Next condition; connected to Single Sweep Ready connector.

+Gate Out — Provides high level output signal for duration of waveform/character readout.

PLUG-IN COMPATIBILITY

The 7D20 is compatible with all 7000 Series mainframes with the exception of the 7104 mainframe. Use with the 7104 will void the 7104 warranty.

PHYSICAL CHARACTERISTICS

Dimensions	7D20		7D20T	
	mm	in	mm	in
Width	206	8.1	216	8.5
Height	127	5.0	183	7.2
Depth	371	14.6	566	22.3
Weight	kg	lb	kg	lb
	3.6	8.1	10.4	23.0
Shipping	8.0	17.8	12.0	26.6

Included Accessory — Instruction manual.

ORDERING INFORMATION

7D20 Programmable Digitizer (Plug-in) \$8,055
7D20T Programmable Digitizer \$9,655
7D20T Option 01 Power Module (Converts Existing 7D20 to 7D20T) - \$8,055

Utility Software

For 7D20/7D20T/4041 Order 062-6959-01 \$150
 For 7D20/7D20T/4052A. Order 062-6961-01 \$150
 Refer to page 323 for description and ordering information.

INTERNATIONAL POWER CORD AND PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz

Option A2 — UK 240 V/13 A, 50 Hz

Option A3 — Australian 240 V/10 A, 50 Hz

Option A4 — North American 240 V/15 A, 80 Hz

Option A5 — Switzerland 220 V/10 A, 50 Hz

RECOMMENDED PROBE (7D20 and 7D20T)

P6053B Identify Probe — For remote service request via probes "Identify" button. 10X attenuation; 200 MHz bandwidth; scale factor coding; 6 ft. Order 010-6053-13 \$170

RECOMMENDED MAINFRAME FOR 7D20

R7603 Option 20 — The R7603 mainframe provides a 6-inch diagonal CRT display and three-wide plug-in compartment in a 5.25 inch high rackmount configuration. Option 20 permits rear panel access to the 7D20's GPIB Interface and includes cable 175-7151-00 required inside 7D20. See page 240 for further information. Order R7603 Option 20 Mainframe \$3,635

OPTIONAL ACCESSORY (R7603)

A field installable kit adds Option 20 to the standard R7603. Intended for use with a previously purchased R7603, this kit provides parts to connect the 7D20's GPIB Interface to the R7603 mainframe.

Order 040-1093-00 \$380

CONVERSION KITS

Cabinet-to-Rackmount — Equipped with slide-out assembly to rackmount a 7D20T to the left of a 4041 or another 7D20T. Order 040-1147-00 \$200

Cabinet-to-Rackmount — Equipped with slide-out assembly to rackmount a 7D20T to the left of a TM 5003. Order 040-0984-01 \$190

Cabinet-to-Rackmount — Equipped with slide-out assembly to rackmount a 7D20T to the left of a blank plug-in compartment.

TIME AND AMPLITUDE MEASUREMENT SOFTWARE

This software package is available on a 5¼ inch flexible disk which supports the 7D20 in combination with either the HP9826 or HP9836 technical computers. Order part number 062-7618-01. Order may be placed through Central Parts Ordering (CPO) for your area. See page 12 \$950

COMPLETE PACKAGE CONFIGURATION

For a complete 7D20T with 4041 System Controller and accessories configuration, see the MP 2401 page 349.