

The 7D20 is used with 7000-Series oscilloscopes, such as the R7603 shown above in a rackmount configuration. See 7000-Series Instruments for details.

## 7D20

**GPIB  
 IEEE-488**

The 7D20 complies with IEEE Standard 488-1978 and with Tektronix Standard Codes and Formats.

- Digital Storage for 7000-Series Mainframe
- 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

See 7000-Series Instruments for available Application Notes.

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

The 7D20 accurately measures amplitudes of 50-ns-wide transient events. Dual samplers simultaneously acquire two channels like a "dual beam" scope.

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

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. These settings, plus the last panel set-up, are saved in nonvolatile memory and are restored automatically when power is applied.

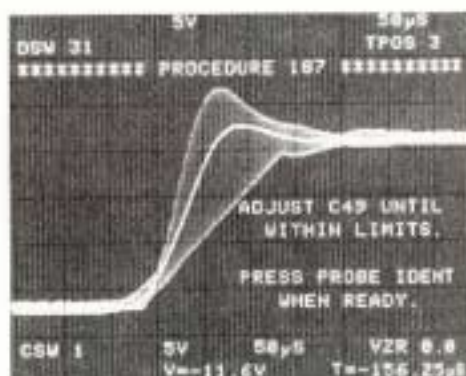
### Fully Automated Measurements

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

### TekMAP Software Support

For the Tek 4041, IBM PC, or HP Series 200 computers, Tektronix Measurement and Application Programs (TekMAP) tap the full potential of the 7D20. The 7D20/Tek 4041 software package supports the 7D20 when used in conjunction with the Tek 4041 Controller. It provides automated pulse-parameter analysis and storage and retrieval of waveforms on DC-100 tape. Data results are available in graphic or tabular form.

The 7D20/HP Series 200 software package supports the 7D20 when used with the HP Series 200 (216, 226, 236) Technical Computers. It provides automated pulse-parameter analysis, propagation-delay measurements, FFT, and storage and retrieval of front-panel settings and waveforms. Data results are available in graphic or tabular form.



### Automated Testing

Interactive test procedures, test messages, waveforms, and front panel set-ups may be transmitted and received from the 7D20 to a controller or computer. 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.

## 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, 0.01 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*1/ RMS Noise	% of Full Scale*1
5 mV	52 dB	0.25
10 mV to 5 V	55 dB	0.18

\*1 Full scale=10.24 divisions.

**Phase Match XY**—<2° from dc to 10 MHz.

### HORIZONTAL SYSTEM

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

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

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

**Time-Measurement Accuracy**—One Cursor: 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 ns to 500 μs	1024	100
20 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**

Trigger: 0 to 10 div in 1-div increments. Post-trigger (delay): 0 to 1500 div in 1-div increments (disabled during Roll with Envelope as Average).

**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

**PHYSICAL CHARACTERISTICS**

Dimensions	mm	in.
Width	206	8.1
Height	127	5.0
Depth	371	14.6
<b>Weight—</b>	<b>kg</b>	<b>lb</b>
Net	3.6	8.1
Shipping	8.0	17.8

**ORDERING INFORMATION**

**7D20 Programmable Digitizer (Plug-In)**

**Includes:** Instruction manual (070-3857-01); pocket reference guide (070-3205-01).

**TekMAP SOFTWARE**

**S42P201** 7D20/IBM PC Software

**Includes:** Operator manual.

**Option 01**—5 1/4 in. double-sided, dual density.

**S42H201** 7D20/HP Series 200 Software

**Includes:** Operator manual.

**Option 01**—5 1/4 in. double-sided, dual density.

**Option 02**—3 1/2 in. double-sided, dual density.

**7D20/Tek 4041 Software DC-100 Tape.** Order 062-7732-00

**Includes:** Operator manual.

**UTILITY SOFTWARE**

**(7D20/4041)** Order 062-6959-01

**(7D20/4052A)** Order 062-4961-01

See System Support for description and ordering information.

**RECOMMENDED PROBE**

**P6053B** Identify Probe For remote service request via probes "Identify" button. 10X attenuation; 200-MHz bandwidth; scale factor coding; 6 fl.

**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 1/2-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.

**OPTIONAL ACCESSORIES**

**R7603 Field Kit**—Adds Option 20 to a previously purchased standard R7603. This kit provides parts to connect the 7D20's GPIB Interface to the R7603 mainframe. Order 040-1093-00

**HC100 Plotter**—See Accessories section.

	Frequency Range**	Sensitivity	
		Internal	External
Normal	DC to 30 MHz	0.4 div	60 mV
DC Coupling)	30 to 70 MHz	1.0 div	150 mV
P-P and Auto	30 to 200 Hz	2.0 div	300 mV
	200 Hz to 30 MHz	0.6 div	90 mV
	30 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 processes "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 AVE N, then additional waveforms are weighted at 1/N. In Roll mode, a running average (smooth) is available to provide high-frequency filtering.

**Enveloping**

**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 1** (Vertical Position Up), **VPDN 1** (Vertical Position Down): Provide vertical positioning control of any stored waveforms.

**VCMP 1** (Vertically Compress), **VXPD 1** (Vertically Expand): Provide vertical display expansion or compression. Two expansions or compressions in 1-2.5 calibrated steps from the original V/div are available.

**HMAG** (Horizontal Magnify): Displays the cursor waveform horizontally magnified by a factor of 10.

**Programmable Functions**—All instrument settings 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. Use with the 7104 will void the 7104 warranty.