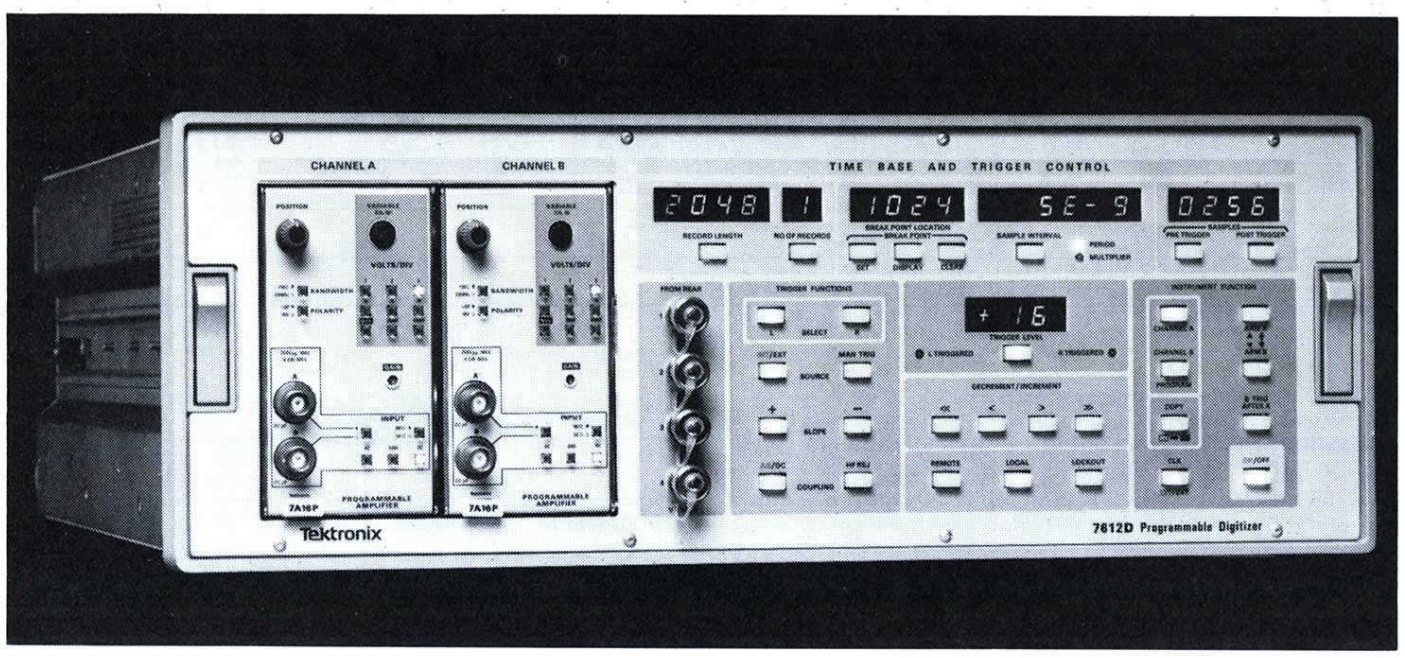
Programmable Waveform Digitizer



SYSTEMS

The 7612D is also available in WP3000 Series Signal Processing Systems. These fully automatic systems are designed, assembled, tested, and documented to satisfy the demand for speed, automation, accuracy, and repeatability in characterizing devices or phenomena which give rise to waveforms in the second to submicrosecond range. For more information on these systems, contact your local Tektronix Field Engineer.

NEW 7612D

200 MHz Maximum Sampling Rate

Two Channels, Two Time Bases

8 Bit Resolution

2048 Words of Memory per Channel

5 ns to 1 s Selectable Sampling Intervals with Interval Switching Allowed During Waveform Acquisition

Pretrigger and Posttrigger Operation

Fully Programmable over IEEE 488 Bus For System Oriented Operation

GPIB Product

The 7612D is designed to comply with IEEE Standard 488-1978, and with Tektronix *Codes and Formats* Standard. GPIB Interface Functions: Talk, Listen.

The 7612D Programmable Digitizer is a dual-channel, dual time base waveform digitizer for use under computer control. It has a maximum sampling rate of 200 MHz. Each channel has its own analog-to-digital converter, a new type designed by Tektronix for accurate, high-speed waveform digitizing. Each channel also has its own time base operating from a single 200 MHz crystal-controlled clock. The result . . . two fully independent channels capable of capturing one waveform each, simultaneously, with the same or different vertical sensitivities and time-base settings.

And there's still more flexibility available. The number of samples per waveform (record length) can be selected, from 256 to 2048. The sample rate can be changed during waveform digtizing, for example, using dense sampling on fast transitions and switching to sparser sampling for slow decays. Also, each channel's local memory can be partitioned into one to eight equal-length records. You have the choice, too, of looking at waveforms before the triggering event (pretrigger), immediately after the trigger, or delayed from the trigger (posttrigger). Or you can choose to operate the channels dependently by triggering one after the other.

All 7612D functions can be selected manually or operated under program control over the IEEE 488 bus. Add two 7A16P Programmable Amplifier plug-ins, one for each channel, and you have program control over every waveform acquisition function.

Extracting information from medium-speed signals is a typical application of 7612D systems.

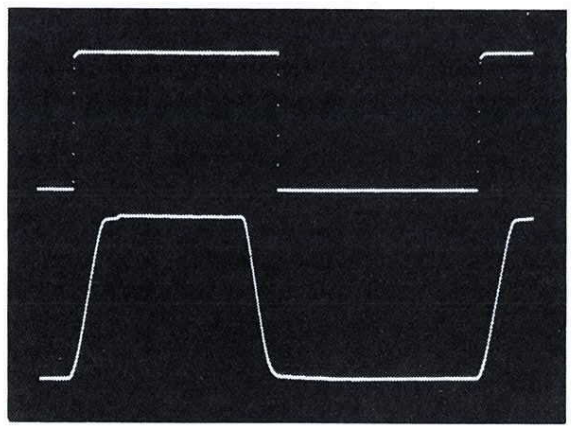


Figure 1. The complete period of a signal (top trace) is recorded at 200 ns; by changing the sample rate to 10 ns during rise and fall times and 800 ns during the plateau (bottom trace), you can measure rise time, fall time, pulse width and interval accurately on a single shot signal.

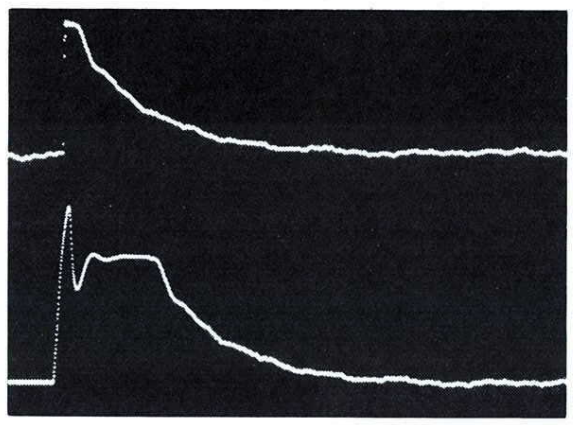


Figure 2. A decaying signal recorded at a 10 µs sampling rate (top trace); the same signal can be recorded at a 100 ns sampling rate during the initial portion and switched back to a 10 µs sampling rate (bottom trace), to capture all information on a single shot signal.

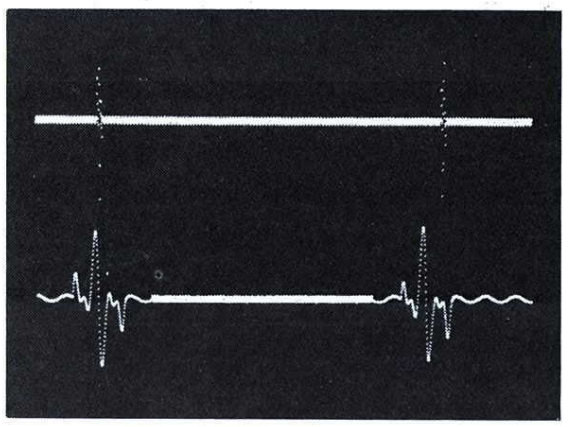


Figure 3. A signal with two echoes recorded at a uniform sampling rate (top trace), the same signal recorded at an increased sampling rate during each echo (bottom trace), to capture each echo with increased resolution.

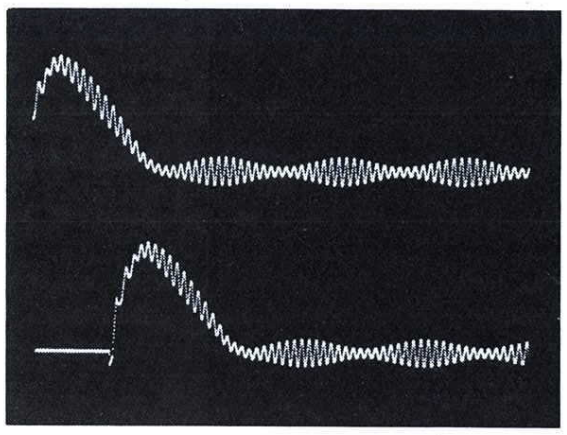


Figure 4. A transient response of a system at power-up recorded with no pre-trigger (top trace); by using the pre-trigger the complete response can be digitized (bottom trace).

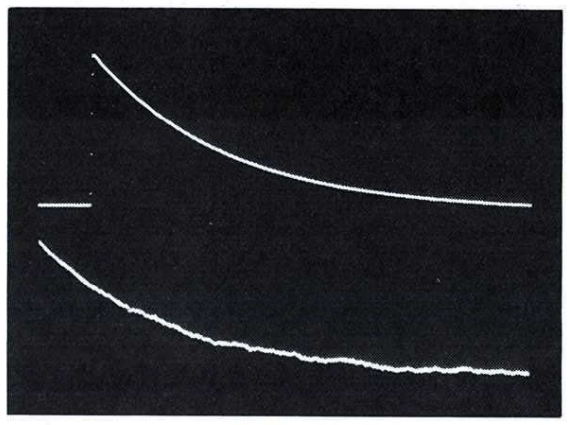


Figure 5. The initial portion of an exponential decay is recorded on Channel A (top trace); Channel B, set at a higher sensitivity and triggered to record after channel A has finished, captures the remaining pulse tail with increased vertical resolution (bottom trace).

7612D SPECIFICATIONS

VERTICAL SYSTEM

Channels — Two left-hand plug-in compartments compatible with all 7000 Series amplifier plug-ins. Fully programmable when 7A16P plug-ins are used.

Bandwidth — 90 MHz. (Mainframe)

Modes of Operation — Left channel with Time Base A and right channel with Time Base B.

TIME BASES A AND B

Type — Two built-in digital time bases with a common crystal-controlled clock.

Clock — Internal: 200 MHz ±0.0035%; stability: of 10 ppm/year. External: from signal source less than or equal to 200 MHz.

Sample Interval — With internal clock: Selectable from 5 ns to 1 s in a 1, 2, 3 . . . 9 sequence (excluding 6, 7, 8 and 9 ns). With external clock: Selectable from 1 to 200 x 10^6 times the external clock period in a 1, 2, 4, 6 . . . 20 sequence.

Interval Switching — Sample interval can be changed up to 13 times per waveform record with preservation of time relationships.

TIME MEASUREMENT ACCURACY

Without sample interval switching: 0.0035% (stability 10 ppm/year). With sample interval switching: 0.0035% (stability 10 ppm/year) for all sample intervals slower than 5 ns.

Modes of Operation — Time Base A with left channel and Time Base B with right channel. Independent or B triggerable after A completes its acquisition.

TRIGGERING A AND B

Source — Left or right plug-in, external, manual by push button.

Mode — Single sweep.

Coupling — Ac, dc, ac Hf REJ, dc Hf REJ.

Slope — Positive or negative.

Level Range — Internal: at least ±128 LSB in 256 steps. External: at least ±1.28 V in 256 steps.

Trigger Jitter (Internal) — 0.1 ns or less, dc to 100 MHz.

Triggering Error — ±1 sample ambiguity in recognizing the trigger, 1 sample maximum recognition error between channels (using same trigger channel for both time bases).

Trigger Sensitivity —

Coupling	Triggering Frequency Range	Minimum Signal Required	
		Internal	Ext
Ac	40 Hz to 50 MHz	20 LSB	50 mV
	50 MHz to 100 MHz	44 LSB	100 mV
Ac Hf REJ	40 Hz to 50 kHz	20 LSB	50 mV
Dc	dc to 50 MHz	20 LSB	50 mV
	50 MHz to 100 MHz	44 LSB	100 mV
Dc Hf REJ	dc to 50 kHz	20 LSB	50 mV

ARMING A AND B

Push button or computer control.

DIGITIZING AND STORAGE

Method — Continuous, sequential digitizing of the input signals with storage of samples selected by instrument settings.

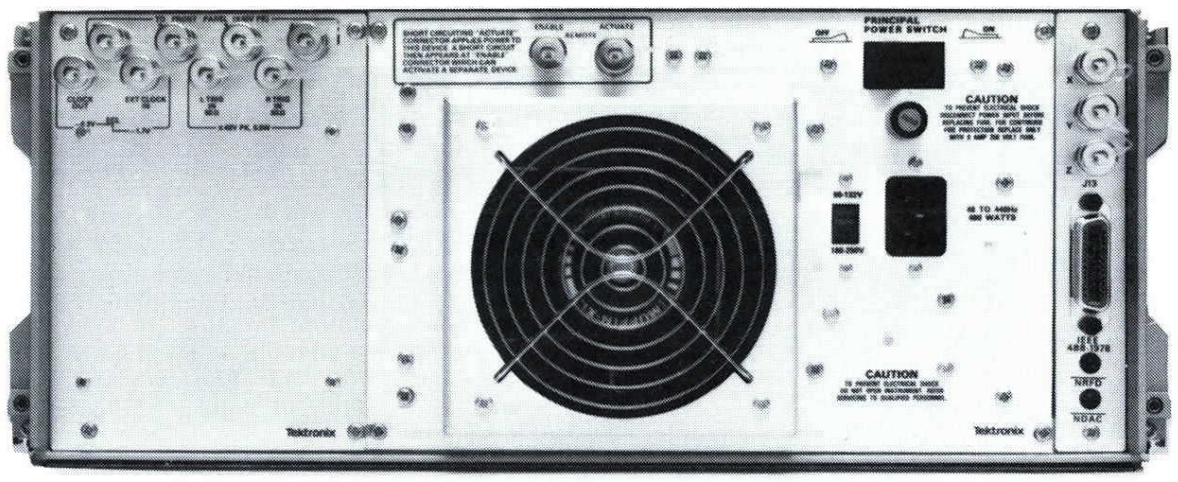
Resolution — 8 bits.

Dynamic Accuracy — Signal to noise ratio and effective bits performance at 25°C for a half scale sine-wave input signal (an ideal 8 bit digitizer would give a S/N ratio of 43.8 dB).

Signal Freq.	S/N Ratio	Effective Bits
300 kHz	42.0	7.8
20 MHz	32.0	6.0
80 MHz	20.0	4.0

Internal Memory — Type: ECL. Size: 2048 8-bit words per channel, total of 4096 8-bit words.

Record Length, A or B — 256, 512, 1024, or 2048 samples. Number of stored records: up to eight 256-word, four 512-word, two 1024-word, or one 2048-word records per channel, each requires a trigger. Trigger is automatically rearmed after each record acquisition.



7612D rear-panel: the GPIB connector and outputs for an X-Y Z monitor (right); clock input/output, trigger inputs, and BNC connectors to feed signals to the front panel (left); remote power ON/OFF is also provided through the two central BNC connectors.

Pretrigger Delay Range — Selectable in multiples of 8 samples. Without sample interval switching: from O up to 16 samples less than the record length. With sample interval switching: from O up to 16 samples less than the position of the first sample interval change.

Posttrigger Delay Range — Selectable in multiples of 8 samples from 8 to the record length (requires selection of only one record).

OUTPUTS/INPUTS

X, Y, Z Analog Output — Provides for analog display of data in memory. X and Y level is 1 V p-p into 100 kΩ or greater; adjustable from 0.75 V to 1.3 V.

Z level is 0 to 1 V (full white) into 100 kΩ or greater.

Clock Out — Provides internal clock signal at ECL level.

External Clock In — ECL levels. Less than or equal to 1 ns rise and fall time. 2.5 ns minimum pulse width and less than or equal to 200 MHz.

L and R TRIG IN. — Provide external trigger input to the left and right trigger channels (50 Ω terminated).

1, 2, 3, 4 — Four feed-through connections to the front panel.

Digital Interface — Conforms to IEEE Standard 488-1978.

IEEE 488 INTERFACE

Standard — Conforms to IEEE 488-1978 standard.

Interface Functions Subset Implemented:

SH 1 Complete source handshake.
AH1 Complete acceptor handshake.
TE6 Extended talker function.
LE4 Extended listener function.
SR 1 Complete service request capability.
RL 1 Complete remote/local function.
PPØ No parallel poll.
DC1 Complete device clear capability.
CØ No controller function.
DTØ No device trigger capability.

Response to Interface Control Messages — The 7612D responds to the following interface control messages:

GTL — Go to local.

LLO — Local lockout.

SDC-DCL — Selected device clear and device clear.

SPE-SPD — Serial poll enable and disable.

IFC — Interface clear.

IEEE 488 Bus Addresses — Mainframe and programmable plug-ins share a common primary address and are differentiated through the use of secondary addresses.

Programmable Functions — All instrument settings and operating modes are programmable.

Format — Commands in ASCII, waveform data in binary (range 0 to 377_8).

Transfer rate — 710 K bytes/second maximum.

Waveform Transfer Time — To an infinitely fast controller: 8.35 ms for one 2048 points record. Actual transfer time depends on controller and software speed.

ENVIRONMENTAL

Temperature Range — Operating: 0-40°C. Non-operating: −62°C to +85°C.

Altitude — Operating: −250 to +15,000 feet (−76 to +4570 meters).

Non-operating: −250 to +50,000 feet (−76 to +15,200 meters).

POWER REQUIREMENTS

Line Voltage Range — 90 V to 132 V ac and 180 V to 250 V ac.

Line Frequency — 48 to 440 Hz.

Power Consumption (including plug-ins) — Maximum 400 watts, 5 A at 115 V 60 Hz.

Remote Control — Remote power ON/OFF capability is provided.

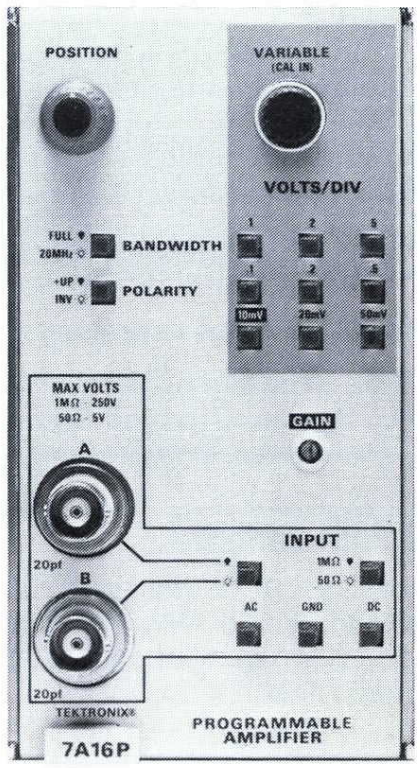
PHYSICAL CHARACTERISTICS

Size — Fits 19 inch rack. Height: 7 in (17.8 cm). Width: 19 in (48.3 cm). Length: 26.75 in (67.9 cm).

Weight — 55 lbs. (25 kg).

STANDARD ACCESSORIES

Operators and Service Manuals, set of rack slides, power cord, IEEE 488 bus cable.



GPIB Product

The 7A16P is a fully programmable vertical amplifier used in the 7612D. For further information, see plug-in specifications in the 7000 Series Plug-in section pages 111-132.

ORDERING INFORMATION

(Plug-ins not included)

7612D Programmable Digitizer $25,700