

Transient Waveform Digitizer

RTD 720A

★ Features

RTD 720A

- 2 GS/s Single-channel Mode
- 1 GS/s Dual-channel Mode
- 500 MS/s Four Channel Mode
- Long Waveform Memory – 128 K Standard
 - 512 K Battery Backed-up Memory Option
 - 4 MB Memory Option
- Intelligent Memory Usage
 - User Selection of Memory Size
 - Extremely Fast Multiple Event Capture
- 500 MHz Analog Bandwidth
- 8-Bit Vertical Resolution
- Optional Removable Display with Remote Operation Capability

A Applications

IMPULSE PHENOMENA

- Nuclear Events
- EMP and Radiation Simulators
- Laser Induced Phenomena
- Pulsed Power Sources
- Analysis of Multiple Fast Pulsed Events
- High Energy Physics

PULSE ECHO EVENTS

- Radar and Lidar
- High Frequency Ultrasonics

LONG RECORD LENGTH APPLICATIONS

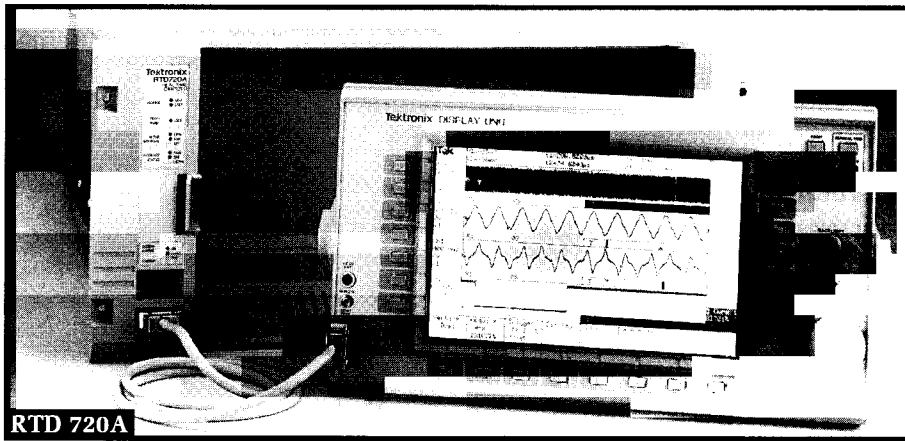
- Intelligence/Electronic Warfare
- Spectroscopy (Time-of-Flight)
- Computer Mass Storage Device and Media Characterization

For your local Tektronix representative see the list in the back of this catalog or outside the U.S. call: 1-503-627-1933, inside the U.S. call: 1-800-426-2200.

GPIB Product(s) complies with IEEE Standard 488.1, and with Tektronix Standard Codes and Formats.

See Tektronix on the World Wide Web: <http://www.tek.com>

ISO 9001 Tektronix Measurement products are manufactured in ISO registered facilities.



Signal Fidelity

The Tektronix RTD 720A Transient Waveform Digitizer provides high fidelity capture of transient events. Signal fidelity is another name for high resolution capture of signals. Base resolution is of little value if the characteristics of the signal are lost. The RTD 720A provides input signal conditioning and Analog to Digital conversion that maintains the characteristics of the signal of interest. Factors affecting signal quality include bandwidth, transient response, accuracy, input range and offset, overdrive recovery, and a measure of the complete digitizing process (i.e., IEEE-1057) Effective Bits measurement. The RTD 720A maintains the high fidelity required without the need for post-acquisition correction, enhancement, filtering, or averaging of the acquired waveform data. This quality of the acquired signal translates directly to the effective resolution that the acquisition system provides.

The digitizing process and the quality of the waveform data provided are the starting point for high resolution and fidelity capture of transient events. Sample rate is another key parameter, since it determines the maximum signal frequency that can be accurately captured. The RTD 720A provides sample rates from 2 GS/s (500 picoseconds/point) to 5 MS/s (200 microseconds/point) for fine time resolution and accurate capture of the signals of interest. With up to four channels of acquisition (requires Opt. 06) the RTD 720A provides high amplitude and time resolution and fidelity signal capture of multiple events. The long record length capability of the RTD 720A provides the needed final characteristic for high resolution and fidelity capture of transient events.

Long Acquisition Memory with Intelligent Utilization of the Memory

The waveform memory of the RTD 720A allows capture of even long duration events at the sample rate needed to accurately represent the signal to be captured. The RTD 720A's standard acquisition memory is 128 K waveform data points (131,072 sample or >65 μ sec time window at 2 GS/s). Optional acquisition memory is available for the RTD 720A of 512 K of battery backed-up memory, and 4 MB of memory. Memory can be assigned entirely to one channel or shared equally among the active channels (1, 2, or 4), with simultaneous acquisition on all channels.

Not only does the RTD 720A provide long memory for contiguous acquisition of waveforms, it also provides flexibility in memory usage. Memory can be configured for shorter acquisitions to match the total time of the event of interest. Furthermore, with shorter record length acquisitions, memory can be partitioned to capture multiple independent events.

Using the internal acquisition memory partitioned for the capture of many independent events provides a rapid signal capture capability. Auto-advance mode captures a sequence of up to 1024 events on each channel. Time-of-Arrival of each event is also captured with time resolution as fine as 500 ps.

Further extending the usefulness of the memory is pre-trigger and post-trigger acquisition. With pre-trigger to approximately 100% of the record, it is possible to capture events prior to the triggering event. Post-triggering, to 99,999,999 sample intervals, allows capturing events occurring significantly after the trigger event.

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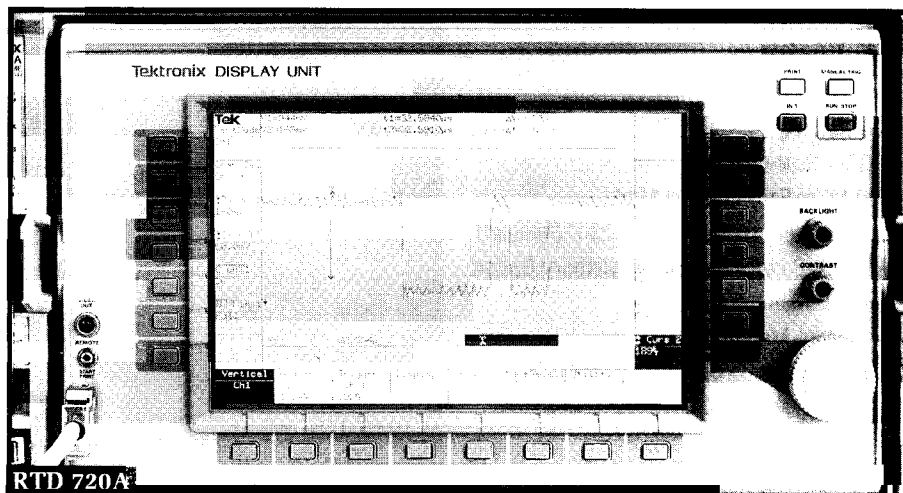
Flexibility in choosing the amount of pre-trigger or post-trigger, coupled with user selection of record length, allows positioning of the acquisition over the event of interest.

High-speed Waveform Data Transfers

Complimenting the high capture rate of the RTD 720A, a fast and efficient data transfer capability is provided by both hardware and instrument firmware. The RTD 720A is designed to transfer data to a computer very rapidly.

The digitizer's GPIB (IEEE 488) computer interface provides efficient instrument control and waveform data transfer. In burst mode (such as when transferring waveform data) the maximum transfer rate is ≥ 500 KB per second (dependent on the transfer speed capability of the computer). For even faster transfer of waveform data a 16-Bit parallel port is provided that is capable of transferring 4 MB per second (two Mwords per second). The parallel port operates with TTL levels supporting both a handshaked and clocked mode of operation.

To take advantage of the hardware speed the RTD 720A's command set is also designed to provide high-speed transfers to a computer. These commands allow defining: which acquired channels are to transfer data; whether the full set of waveform data or part of a record is to be transferred; and how many records to transfer in Auto-advance mode. This capability allows all acquired data to be transferred with a single command, which significantly lessens the time addressing and unaddressing the instrument. For applications requiring repeated transfers (i.e., acquire, transfer, acquire, transfer,...) the RTD 720A provides a command that allows waveform data transfer without the need to issue commands to the instrument for each transfer. Again, this lessens the time required to issue commands and for the instrument to decode the commands, which speeds the data transfer process. These capabilities are available for both the GPIB and parallel ports.



System Support

The RTD 720A is designed as a system product. Besides the hardware and firmware capabilities described above, the RTD 720A has additional features addressing system applications. These include:

- Fiducial Input
- External Arming
- External Clocking
- External Triggering
- Trigger Out Signal
- Optional Display Unit that can be moved from instrument to instrument and can be used for controlling the instrument and waveform viewing

These capabilities are further supported with an "Engineering English-like" command set that eases the task of software development. The optional Display Unit also has a Debug mode that allows viewing of the GPIB traffic to the instrument with error and event condition reporting.

Another important system capability is maintaining highest accuracy and signal fidelity. The RTD 720A provides a Standardize function, instrument diagnostics, and power-on diagnostics (power-on diagnostics can be turned off by the user) to meet these requirements. The Standardize function (executing only upon user request either over the GPIB or from the Display Unit) is used to maintain the highest accuracy. Power-on and instrument diagnostics are used to verify the proper functioning and performance of the instrument.

For benchtop use the RTD 720A Display Unit provides waveform viewing and full instrument control. There is hardcopy capability using

either a video copier attached to the Display Unit or to a plotter using the GPIB (Talk Only mode) initiated from the Display Unit. The RTD 720A also supports Tektronix TEKPROBE® I/F, allowing the use of active (FET) and optical probes, as well as passive probes.

High Fidelity Waveform Capture

The RTD 720A provides high fidelity capture of transient events, offering an unmatched combination of signal quality, sample rates, and record lengths, providing the performance needed for the capture of fast transient signals.

Characteristics

VERTICAL

Input Channels – Two (optionally four) single-ended BNC's with Tektronix TEKPROBE® Interface. Simultaneous digitizing on all channels, in Dual and Quad modes of operation. Four input channels (Quad Mode) require Option 06.

Input Ranges, Offsets – 50 mV full scale to 12.5 V full scale in 25 ranges with each range 1.25 times the previous range. Each range provides an independent $\pm 100\%$ offset capability with fast overdrive recovery (≤ 20 ns from a two times overdrive signal).

Bandwidth (-3 dB) – DC coupling: DC to ≥ 500 MHz; AC coupling: ≤ 1.5 kHz to ≥ 500 MHz.

Input Accuracy (after Standardization) – Mean Value: $-\Delta$ DC Volts: $\pm(1\%$ of Signal $+1\%$ of Full Scale Input Range); Offset: $\pm(1\%$ of Full Scale Input Range $+0.5\%$ of Offset Range $+1\%$ of Offset Value).

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Maximum Input Voltage and Input Protection – DC coupled 5 V RMS (0.5 W into 50 Ω) or 0.25 Watt-second pulses not to exceed 25 V peak. AC coupled same as DC with ± 100 V DC + peak AC.

Fiducial Input – BNC signal input in parallel with CH 1 for providing a time marker allowing cross timing references between multiple units.

Vertical Resolution – 8-Bits providing 256 discrete levels (≈ 50 dB dynamic range).

Sample Rates – 2 GS/s (500 ps/point) to 5 MS/s (200 ms/point).

ACQUISITION MEMORY

Standard instrument 128 K waveform data points.

Opt. 10: 512 K waveform data point with battery backed-up.

Opt. 15: 4 MB waveform data points.

All memory is shared equally among active channels (1, 2, or 4) with user selection of active channels. User also has control of record size selection from 512 waveform data points to the full memory available, in a binary sequence (i.e., 512, 1024, 2048, ...).

Multiple Records (Auto-advance) – Memory can be further segmented in up to 1024 records per channel. Maximum number of records equals: Total Acquisition Memory \div (# of Active Channels \times Record length). Re-arm time between records in Auto-advance Mode is 6.5 to 25 μ sec plus pre-trigger fill time.

TRIGGERING

Sources – Internal from any channel (active or inactive) or External.

Trigger Coupling and Impedance – DC and AC. Impedance for Internal is the same as input channel coupling (50 Ω); for External 50 $\Omega \pm 5\%$.

Trigger Slope – Positive or Negative.

Trigger Modes – Normal (unit will wait indefinitely until a valid trigger occurs) and Auto (a trigger will be generated after approximately 60 Ms if a valid trigger does not occur).

Trigger Time Accuracy (Including jitter) –

CH 1: 1 sample interval RMS;
Dual Channel: 0.5 sample interval RMS;
Quad Channel: 0.25 sample interval RMS.

Pre-Trigger Capture (Waveform data captured prior to the Trigger event) –

From $\approx 100\%$ of the Record Length to 0% in increments of 64 sample intervals.

Post-Trigger Capture (Waveform data captured after the Trigger event) –

From 0% of the Record Length to 99,999,999 sample intervals after the trigger. For post-trigger mode, acquisition begins after the post-trigger delay set and captures the full defined record length.

Arming – Internal or External. Triggers are not recognized until the unit is armed. External Arm is a BNC input that arms on a switch closure to ground (internal pull-up provided to 5 V).

Trigger Out Signal – A TTL low level (≤ 0.8 V) output at the BNC after trigger and remains low during the acquisition cycle.

COMPUTER INTERFACES

GPIB – IEEE 488-1 interface is standard for instrument control and waveform data transfer. Maximum transfer rate ≥ 500 KB/sec.

Parallel Port – A waveform data output only 16-Bit wide TTL level parallel port is provided capable of two Mwords (4 MB) data transfer rates.

DISPLAY AND INSTRUMENT CONTROL

Optional Display – Provides for waveform viewing and instrument control. Display can be remotely mounted and moved from instrument to instrument by simply moving the connecting cable.

Hardcopy – The display also supports a video hardcopy capability (EGA compatible) and with the Display Unit plotter output over the GPIB is available without the need for a controller/ computer.

ENVIRONMENTAL (STANDARD INSTRUMENT)

Temperature Range – Operating: -10°C to $+55^{\circ}\text{C}$; Nonoperating: -51°C to $+71^{\circ}\text{C}$.

Humidity – 0% to 95% relative humidity (non-condensing).

Altitude – Operating to 4.5 km (15,000 ft.) max; Nonoperating to 15 km (50,000 ft.) max.

POWER REQUIREMENTS

Line Frequency – 48 to 440 Hz.

Voltage Range – Selected by rear panel switch 90 to 132 V RMS or 180 to 250 V RMS.

Power Consumption – ≤ 500 W fully optioned (typical ≤ 350 W).

Warranty – The RTD 720A carries a standard Tektronix one-year warranty covering labor and replacement parts for the instrument.

PHYSICAL CHARACTERISTICS

Dimensions	mm	In.
Width	482.6	19
Height	225.25	8.75
Depth	635	25
Weight \approx	kg	lb.
Net	19	49

ORDERING INFORMATION

For price information: Outside the U.S. contact your local Tektronix representative, inside the U.S. see the price list in the back of this catalog.

RTD 720A

Transient Event Digitizer.

Includes: Two Input Channels and 128 K Acquisition Memory; Power Cord; Fuses; User's Manual (070-8516-00); Programmer's Manual (070-8518-00); Quick Reference Guide (070-8517-00); and Rackmount Kit.

Opt. 06 – Four (4) Acquisition Channels (adds two additional full function channels).

Opt. 10 – 512 K Battery Backed-up Acquisition Memory.

Opt. 15 – 4 MB Acquisition Memory.

Opt. 19 – Optional remote mountable display for waveform viewing and instrument control.

INTERNATIONAL POWER PLUG OPTIONS

Opt. A1-A5 – See General Customer Information.

RECOMMENDED ACCESSORIES – Also see page 434.

PROBES

Active – 1 GHz, 1.9 pF/10 M Ω , 1.5 m. Order P6204. 10X, 1.5 GHz, 1 pF/1 M Ω , 1.3. Order P6245. 750 MHz, 2 pF/1 M Ω , 1.5 m. Order P6205. 4 GHz, 0.4 pF/100 k Ω . Order P6217.

Differential – 100 MHz, Active Differential. Order P6046.

50 Ω Divider (Zo) – 53.5 GHz, 1 pF/500 Ω , 10X; 3 GHz, 1 pF/5000 Ω , 100X, 1.5 m. Order P6156 with Opt. 25.

Current – DC – 50 MHz System. Includes AM503A, A6302, TM502A. Order AM503S.

CAMERAS/PLOTTERS/PRINTERS/CART

Plotter – Order HC100 with Opt. 01.

Cart – Order K475.

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