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Arbitrary Waveform Generator

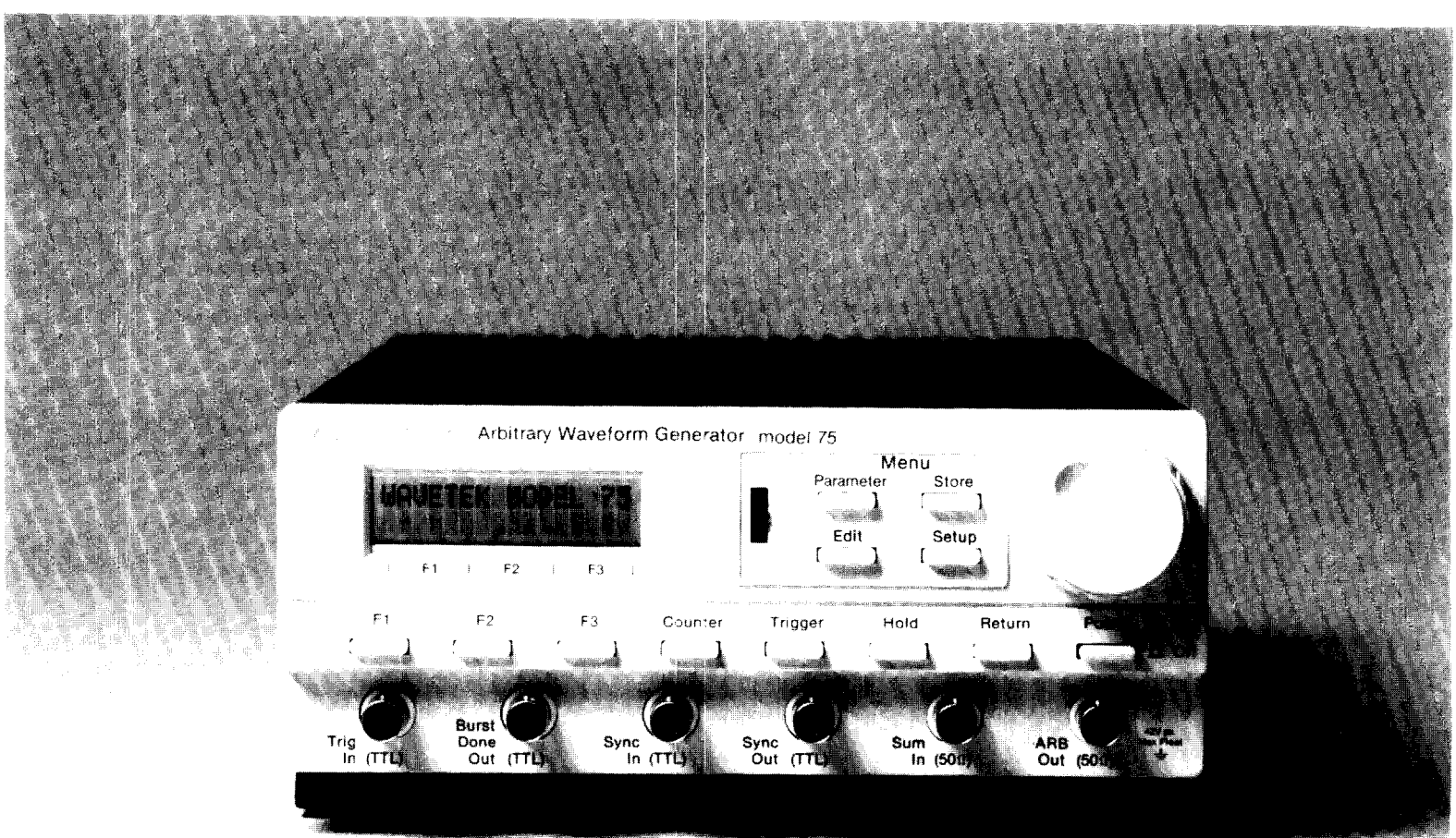
- **Advanced Easy-to-Use Waveform Entry & Editing**
- **Standard & User Defined Waveforms**
- **Up to 8K Horizontal Points**
- **Crystal Controlled Frequency Accuracy**

Model 75 is the solution for bench-top or manually-operated arbitrary waveform generator applications. "User friendly" advanced waveform editing capabilities make it the easiest arbitrary (ARB) generator to use.

Waveforms have a vertical resolution of 4095 points and a horizontal resolution adjustable from 2 to 8192 points. Waveform memory is broken up into four blocks of 2048 points. One waveform of up to 8192 points or four different waveforms (one active and three stored) of up to 2048 points each can be in memory at any one time.

The sample period is crystal controlled and adjustable from 500 nanoseconds to 50 seconds, allowing a waveform period of from 1 microsecond to 113.8 hours. The sample period can also be controlled by an external clock source having a period of 500 nanoseconds or larger.

Waveforms can be stopped and started at any point in the waveform either with an external signal, front panel pushbutton, or preprogrammed breakpoints.



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Battery Backed Memory

Instrument state is stored in a battery backed memory, so that when the instrument is turned on it will contain the same setup and waveforms that it had when it was turned off.

Rubber Band Editing

Rubber band editing allows easy editing of waveforms or portions of the waveforms. The principle of this editing method is similar to stretching a rubber band between two "thumbtacks". A "thumbtack" is placed at each end of a waveform portion to be edited and the cursor is placed between them. (Cursor and thumbtacks are intensified for easy oscilloscope viewing.) The cursor can then be moved either horizontally or vertically, and the waveform will automatically follow in real time.

Additional Editing Features

The standard waveforms are inserted between the thumbtacks and can be edited using the editing features.

The amplitude and offset of a portion of the waveform can be changed by placing the thumbtacks at each end of the portion to be changed and using the digital amplitude and digital offset features.

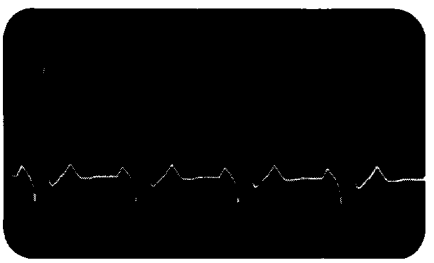
Communications Option

An optional RS-232-C or GPIB port is available for entering the waveform data and for external instrument control.

RS-232-C or GPIB numeric input is entered in free format (fixed, floating, or exponential notation). The parameters may be entered in any order and interactive error checks occur after the execute command.

ARB Applications

Medical production and R&D applications for the 75 include testing of pacemakers and other medical equipment and simulation of heartbeats, nerve responses and EEG brainwave patterns. The high resolution of the 75 along with the ability to vary the time between waveforms make it particularly useful in these applications.



Heartbeat Simulation

Material testing is a traditional application for ARB generators. Hold, return-to-start, waveform counter, and breakpoints are features that make the 75 extremely useful for this application.



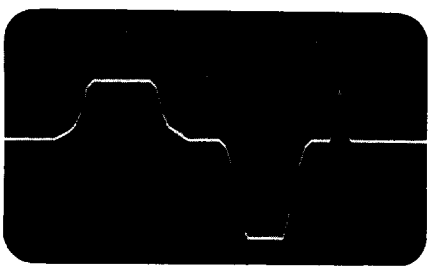
Typical Material Testing Waveform

Simulation of switcher motors, solenoids, and relays require special waveforms which simulate contact bounce. The Model 75 has been used to generate these special types of waveforms.



Contact Bounce Simulation

Disk drive manufacturers are using a modulated magnetic pickup technique to locate certain sync points on a spinning platter. Initial testing of these pickup amplifiers was hazardous, since an actual disk spinning at full speed was required for this precision work. The Model 75 simulates the spinning disk by providing the necessary sync waveforms to the pickup amplifiers. Flexibility of the ARB permits precise timing of waveforms through external triggering, as well as full level control and waveform switching.



Typical Disk Sync Waveform

Series Operation

Two or more Model 75's can be connected in series to produce waveforms that are longer than the 8192-point single unit maximum or to produce a sequence of different waveforms such as a burst of "normal" waveforms followed by an "abnormal" waveform.

Parallel Operation

Two or more Model 75's can be connected in parallel to produce multiple waveforms with adjustable phase relationships between them. This can be used in applications such as multi-phase power testing and multi-axis stress and vibration testing.

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WAVEFORMS (FUNCTIONS)

DC, square, triangle, up-ramp, down-ramp, sine, cosine, inverse sine, and haversine waveforms are provided. Each of these waveforms can be stored into the waveform memory between thumbtacks automatically, and then edited with the waveform editing functions if desired.

OPERATIONAL MODES

Continuous
Output runs repetitively from the programmed start address to the programmed stop address.

Triggered
Output quiescent until triggered by external signal or front panel pushbutton, then runs until another break point is encountered. Break points can be inserted anywhere in the waveform with the default break point at the beginning of the waveform.

Gated
Same as triggered mode except that the output is continuous for the duration of the gate signal and until the first break point encountered after the gate signal ends.

Burst
Same as in the triggered mode except that a programmable number of waveforms is counted before the waveforms stop. The maximum burst is 1,048,575 waveforms.

Toggled
The output is quiescent until triggered. It then runs continuously until another trigger stops the waveform at the next break point.

WAVEFORM RESOLUTION

Normal Waveform
2048 points horizontal × 4095 points vertical.

Chained Waveform
8192 points horizontal × 4095 points vertical. Stored waveforms are not available with chained operation.

SAMPLE RATE

Range
0.02 Hz to 2.0 MHz (50 s to 500 ns).

Waveform Period and Frequency
The actual waveform period is the number of horizontal points (from start to stop address) times the sample time. This can range from 1 microsecond for a square wave to 113.8 hours for a waveform using all 8192 points.

Frequency Resolution
4 digits.

Frequency Accuracy
±0.015%.

Repeatability (24 Hr)
±25 ppm.

Temperature Coefficient
≤5 ppm/°C.

OUTPUT SIGNALS

Amplitude
Range: ±0.005 to 5 Vp into 50Ω (0.01 to 10 Vp-p into 50Ω). ±0.01 to 10 Vp into an open circuit (0.02 to 20 Vp-p into an open circuit).
Resolution: 3 digits.
Accuracy: ±1.8% of setting and ±2.5 mV for amplitude + offset ≥0.5V.
±1.8% of setting and ±0.25 mV for 0.5V > amplitude + offset ≥50 mV.
±1.8% of setting and ±25 μV for 50 mV > amplitude + offset.
Repeatability (24 Hr): ±0.1% of setting.
Temperature Coefficient: ≤150 ppm/0°C of setting.

Offset
Range: +5V to −5V into 50Ω (−10V to +10V into an open circuit). Absolute amplitude plus offset may not exceed ±5V into 50Ω (±10V into an open circuit).
Resolution: 3 digits.
Accuracy: 2% of setting and ±15 mV for amplitude + offset ≥0.5V.
2% of setting and ±1.5 mV for 0.5V > amplitude + offset ≥50 mV.
2% of setting and ±0.15 mV for 50 mV > amplitude + offset.
Repeatability (24 Hr): ±5 mV and ±0.1% of setting.
Temperature Coefficient: ≤1 mV/°C and ≤150 ppm/°C of setting.

OUTPUTS

ARB Out (50Ω)
Source of primary waveform output. Maximum amplitude is ±5 Vp into 50Ω. Output is fuse protected.

Sync Out (TTL)
Will drive up to 10 LSTTL loads. This is a pulse 1 sample time wide that is usually used to sync an oscilloscope or another ARB generator. Pulse position is adjustable to any point in the waveform.

Burst Done Out (TTL)
Will drive up to 10 LSTTL loads. A TTL low indicates that the waveform is running. TTL high indicates that the instrument is waiting for a trigger in triggered, gated, toggle, or burst modes. Used primarily to start another ARB generator in series operation.

Ref Out (TTL)
Will drive up to 10 LSTTL loads. This pulse train at the sample frequency is used primarily as a reference source for other ARB generators in series operation or in parallel operation.

Z-Axis Out
This signal is a pulse, adjustable in amplitude from 2 to 14 volts, that is used to modulate the Z-axis of an oscilloscope when using the waveform editing features. The logic polarity is also selectable.

INPUTS

Sum In (50Ω)
The signal at this input is added to the arbitrary waveform to produce an output (at waveform out) of the sum of the two. A peak input of ±5V will produce an output equal to the amplitude setting. Input is fuse protected. Accuracy is 4% (2% if fuse is shorted).

Trig In (TTL)
Impedance is 100 KΩ. Signal is used to control the generator in the trigger, gate, toggle, and burst modes. Slope polarity is selectable.

Sync In (TTL)
Impedance is 100 KΩ. A high input causes the waveform to restart at the start address. Primarily used for synchronizing several arbitrary waveform generators in parallel operation.

Ref In (TTL)
Impedance is 100 KΩ. This signal input is used for the sample clock when the external ref is selected.

Hold In
Impedance is 100 KΩ. A TTL low or switch closure at this input causes the generator to stop at the current output level and remain there until released by a TTL high or switch opening.

Return In
Impedance is 100 KΩ. A TTL low or switch closure at this input causes the output level to ramp back to the start value. The ramp rate is front panel selectable from 0 to 100 ms per point.

TRIGGER SOURCES

Manual
Use the Trigger pushbutton switch on front panel to operate internal trigger circuitry. The slope polarity can be set via the display menus.

External
Use the communication ports (GPIB or RS-232-C) or the Trig In connector on front panel. Trig In connector frequency input can be up to 1 MHz. The slope polarity can be set via the display menus.

WAVEFORM CHARACTICS

Horizontal Resolution
Up to 8192 points.

Vertical Resolution
4095 bits (−2047 to +2047).

Rise/Fall Time
<350 ns.

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COMMUNICATION PORTS (OPTIONAL)

IEEE-488 Port (Option 001)

Type: IEEE-488-1978 compatible, non-isolated, double buffered.
Address: 0-30, internal DIP switch selectable or front panel selectable.
Subsets: SH1, AH1, T6, TE0, L4, SR1, RL1, PP0, DC1, C0, E1.

RS-232-C Serial Port (Option 002)

Communication: Full duplex (bi-directional) with CTS/DTR or XON/XOFF handshaking.
Connector: Rear panel mounted DB-25 (female) with DCE or DTE configuration.
Data Format: 8 bits, no parity, one stop bit.
Data Rate: 14 steps internal switch selectable (50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19,200).

GENERAL

Environmental

Temperature Range: +23°C ±5°C for specified operation, operates 0 to +50°C, −20 to +75°C for storage.
Warmup Time: 20 minutes for specified (guaranteed for 1 year) operation.
Vibration: 5 to 55 Hz with maximum of 2g at 55 Hz.
Shock: 30g, 11 ms half sine.
Altitude: Sea level to 10,000 ft. for operation. Sea level to 40,000 ft. for storage.
Relative Humidity: 95% at 25°C and at sea level (non-condensing).
Dimensions: 21 cm (8.27 in.) wide, 10 cm (3.94 in.) high, 32.3 cm (12.72 in.) deep.
Weight: 3.55 kg (7.8 lb) net, 4.68 kg (10.3 lb) shipping.
Power: 90 to 128, 180 to 256 rms; 48 to 66 Hz; single phase; <25 VA.

OPTIONS

001: IEEE-488 (GPIB) Port
For instrument control or entering waveform data.

002: RS-232-C Serial Port
For instrument control or entering waveform data.

NOTE: Options 001 and 002 are mutually exclusive.

FACTORY/FOB

San Diego, CA

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