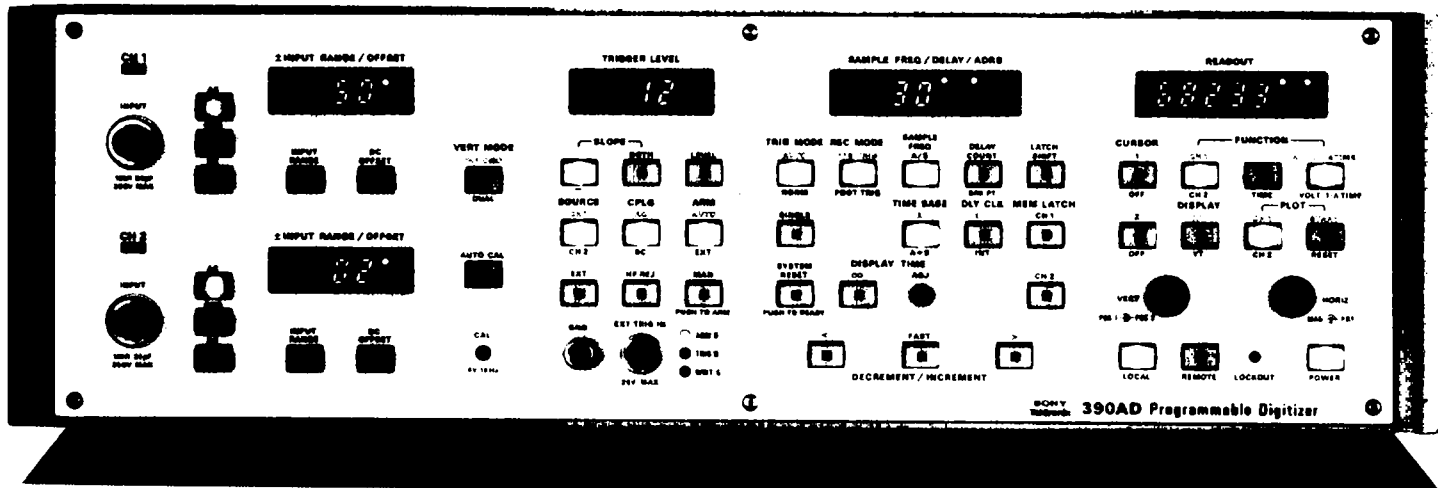


# SONY/TEKTRONIX PROGRAMMABLE WAVEFORM DIGITIZER

**GP/IB**



## 390AD

**GP/IB**  
IEEE 488

The 390AD complies with IEEE Standard 488-1978 and with Tektronix Standard Channels and Formats.

**True Dual Channel 30 MHz Sampling Rate (60 MHz in Single Channel Mode)**

**10-Bit Resolution**

**2048 Word Memory Per Channel (4096 Single Channel Mode)**

**Cursor-Based Measurements**

**Sample-Rate Switching**

**Direct Plotter Output Capability**

### TYPICAL APPLICATIONS

- \* Extracting Information from Signals Containing Components from dc to 15 MHz
- \* Ultrasonics/Stress/Strain
- \* Mechanical/Vibration
- \* Audio
- \* ATE
- \* Laser Spectroscopy
- \* Biomedical Research
- \* LIDAR
- \* Geo-Seismic

Used for low-to-medium-speed signals, the 390AD Programmable Waveform Digitizer provides crystal-controlled, 30 MHz sampling on two channels. Or, a single channel of data may be digitized at up to 60 megasamples per second.

Features include 10 bit vertical resolution, dual-channel synchronized digitizing, pretriggering and posttriggering, sample-

rate switching during acquisition, internal cursors for two-point time or voltage measurements and 2048 words of memory per channel. Excellent dynamic accuracy is achieved using a two-stage flash-conversion process.

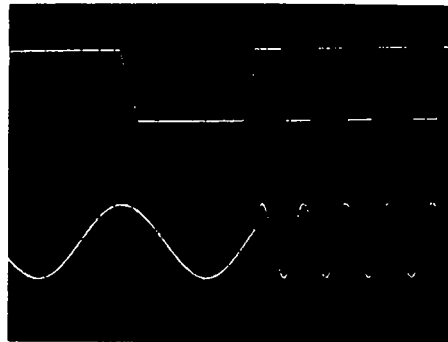


Figure 1. Photo showing sample of Rate Switching. In this example switching occurs at the 1024th sample, to extend the display window. The sample rate can be either increased or decreased at the trigger point. A minor time discontinuity may occur at the trigger point under some conditions.

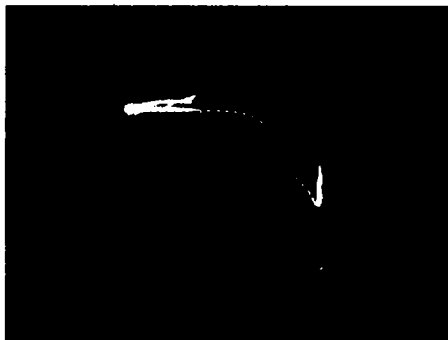


Figure 2. The 390AD display is set to X vs Y mode.

The X versus Y display mode coupled with the shift mode function provides a powerful tool for visual comparison of related phenomena.

To ensure reliable operation and high accuracy, the 390AD includes Auto Cal (self-calibration) and self-test features during operation.

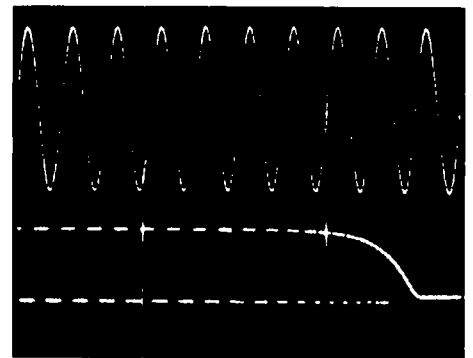


Figure 3. Two cursors may be positioned by the user or controller, at points of interest on either waveform. The voltage difference, time difference, or 1/time difference, as well as the absolute values may be directly read from the LED display, or sent to a controller. Positioning may be precisely accomplished with the aid of the "zoom" feature.

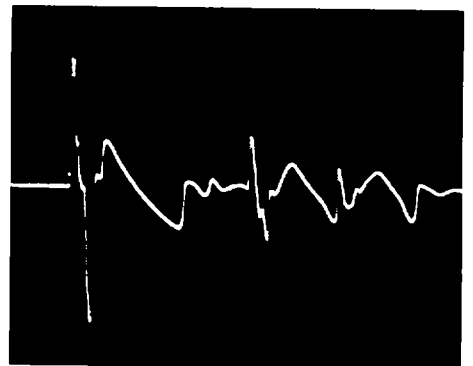


Figure 4. Complex manual setups may be avoided by recording the desired instrument settings for a particular measurement on a system peripheral device, then sending the English-like command string to the 390AD.

**PROGRAMMABLE DIGITIZERS**



Figure 5. The 390AD can be easily integrated into wide range of GPIB systems. Shown above is a 4695 Color Hard Copy Unit and a 4105A Color Terminal which is connected to a Tektronix 4041 System Controller

## CHARACTERISTICS

### VERTICAL

**Input Channels** — Two, single ended.

**Sensitivity** —  $\pm 100$  mV to  $\pm 50$  V full scale (200 mV p-p to 100 V p-p) 9 steps, 1-2-5 sequence.

**Input R and C** —  $1\text{M}\Omega \pm 2\%$ ; paralleled by  $\approx 24$  pF.

**Maximum Input Voltage** — Dc Coupled: 250 V (dc + peak ac). Ac Coupled: 500 V (dc + peak ac).

**Bandwidth** — Dc to 15 MHz ( $-3$  dB). Lower  $-3$  dB point. Ac Coupled: 10 Hz.

**Input Dc Offset Voltage** — 0 to  $\pm 99\%$  full scale, 1% step. Accuracy:  $< 0.5\%$ .

**Automatic Calibration** — Gain Accuracy:  $\pm 0.4\%$ . Dc Drift Accuracy:  $< \pm 0.1\%$

### TIME-BASE A AND B

**Sample Rate** — Internal: CH 1 Only: 5 Hz to 60 MHz, 23 steps, 1-2-5 sequence except 30 MHz and 60 MHz. Dual: 5 Hz to  $\approx 30$  MHz, 22 steps. External: Dc to 60 MHz.

**Clock** — 60 MHz  $\pm 10$  ppm, crystal-controlled.

### TRIGGERING

**Sources** — Internal CH 1 and CH 2 or external.

**Coupling** — Ac, dc, HF Rej.

**Slope** — Positive, negative, both.

**Level Range** — Internal: 0 to  $\pm 99\%$  full scale, 1% step. External:  $\pm 4.95$  V, 0.05 V step.

### Trigger Sensitivity

Coupling	Trigger Frequency Range	Minimum Signal Required	
		Internal	External
Ac	25 Hz to 15 MHz	30 LSB	300 mV p-p
HF Rej	25 Hz to 50 kHz	30 LSB	300 mV p-p
Dc	Dc to 15 MHz	30 LSB	300 mV p-p

**Arming** — Auto, Manual, External.

### DIGITIZING

**Vertical Resolution** — 10 bits ( $1/1024$ ).

**Sample Rates** — Dual Channel Mode: 30 MHz. CH 1 Only Mode: 60 MHz.

**Aperture Jitter (Including Internal Clock)** — 150 ps, nominal.

### Dynamic Accuracy\*1

Signal Frequency	Effective Bits
$\leq 1$ MHz	$\geq 8.75$
$\leq 10$ MHz	$\geq 8.25$
$\leq 14$ MHz	$\geq 7.75$

\*1 Sampling frequency at 30 MHz. For further information refer to HANDSHAKE Vol 5 No 1, 33-A-4463

**Record Length** — Dual Channel Mode: 2048 words/channel. CH 1 Only Mode: 4096 words.

**Modes** — Auto, Norm, Single.

**Pretrigger Range** — CH 1 Only Mode: 0 to 4092. Dual Channel Mode: 0 to 2046.

### Posttrigger Range

Time Base	Vertical Mode	Range
A	Dual	0 to 9998
	CH 1 only	0 to 9998
A+B	Dual	0 to 2046
	CH 1 only	0 to 4092

**A Time Base** — Recording is taken at one rate (sample frequency A) continuously.

**A+B Time Base** — Pretrigger Mode: Sample frequency A is switched to B at trigger. Recording stops at delayed trigger. The transition point (switch point) is well defined. Posttrigger Sample frequency A is switched to B at delayed trig and recording stops after total of 2048 (or 4096) samples.

Stored digital data are addressable by key entry while monitoring cursors on the waveform.

**Readout Display** — Five digit LED (Reads voltage difference on the same waveform or between CH 1 and CH 2, absolute voltage, time interval, and 1/T.

### OUTPUTS

**CRT Display** — X: 1 V p-p Ramp (changeable to 5 V p-p by internal strap), 8 ms: Dual. 16 ms: CH 1 only. Mag gain X1 to X10 variable. Y: 1 V p-p (changeable to 5 V p-p by internal strap). Z: 0 to 1 V (changeable to 0 to 5 V by internal strap), selectable polarity. X-Y Plot. Output Voltage is 0 to 5 V. Plot Speed is 20, 50, 100 ms/word: Auto Slow, or Auto Fast modes. (Modes are selected by internal strap)

**Voltage Calibrator** — Rectangular 1 kHz ( $\pm 10^{-5}$ ), 4 V ( $\pm 1\%$ )

**Rear Panel Connectors** — CRT-X, CRT-Y, CRT-Z, INT CLK-OUT, EXT CLK-IN, EXT ARM-IN, EXT DLY CLK-IN, PLOT-X, PLOT-Y, PLOT-PEN, WRITE END, GPIB

## GPIB INTERFACE

**Standard** — Conforms to IEEE Standard 488-1978.

Interface Function Subsets Implemented:

SH1	Complete source handshake
AH1	Complete acceptor handshake
T6	Basic talker
L4	Basic listener
SR1	Complete service request capability
RL1	Complete remote/local capability
PP0	No parallel poll
DC1	Complete device clear capability
C0	No controller function
DT1	Complete device trigger capability

**Interface Control Message** — GTL, LLO, SDC-DCL, GET, SPE-SPD, IFC.

**Programmable Functions** — All instrument setting and operating modes are programmable, except power switch, vertical/horizontal position, horizontal mag, and external clock switch.

**Format** — Commands in ASCII, Waveform data in 2 byte/point high byte first.

### POWER REQUIREMENTS

**Line Voltage Range** — 90 V ac to 132 V ac (115 V); 180 V to 250 V ac (230 V).

**Line Frequency** — 48 Hz to 440 Hz.

**Maximum Power Consumption** — 240 W.

### ENVIRONMENTAL AND SAFETY

**Temperature Range** — Operating:  $0^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ . Nonoperating:  $-25^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .

**Altitude** — Operating: Sea level to 4600 m (15,000 ft). Nonoperating: Sea level to 15,000 m (50,000 ft).

### PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Width	446	17.6
Height	152	6.0
Depth	540	21.3
Weights	kg	lb
Net (without accessories)	15.5	34.0

## ORDERING INFORMATION

**390AD Programmable Digitizer** **\$11,400**

**Includes:** Power cord (161-0066-00); two 4 A fast-blow fuses (159-0017-00); GPIB cable (012-0630-03); 390AD Programming Aid (070-4467-00); operator manual (070-4450-00).

**Option 10** — Rackmount 390AD **+\$250**

### Utility Software

For 390AD/4041. Order 062-6959-01 **\$150**

For 390AD/4052A. Order 062-6960-01 **\$150**

See page 297 for description and ordering information.

### INTERNATIONAL POWER 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, 60 Hz.

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

The 620 monitor is recommended for use with the 390AD.

### OPTIONAL ACCESSORIES

**GPIB Cable** — Low EMI

1m. Order 012-0991-01 **\$135**

2m. Order 012-0991-00 **\$150**

4m. Order 012-0991-02 **\$175**

For floating measurements order A6902B Isolator. See page 437 for complete description. Contact your local sales engineer for details.

**Recommended Probes** — See page 426.

**Service Manual** — To order, contact your local sales office.

The SONY®/TEKTRONIX® 390AD is manufactured and marketed in Japan by Sony/Tektronix Corporation, Tokyo, Japan. Outside of Japan, the 390AD is available from Tektronix, Inc., its marketing subsidiaries and distributors.

GPIB

PROGRAMMABLE DIGITIZERS