SPECIFICATIONS

Number of Output Channels: 2

D.C. Output Characteristics

Output Voltage Range: ±5 V into 50 Ω; ±10 V into >10 kΩ load.

Maximum output current: ±100 mA

Output impedance: 50 ± .5 Ω

Minimum amplitude range: <100 μV full-scale into 50 Ω

D.C. Output Accuracy: (at calibrate time): 0.5% FSR into 50.00 Ω for FS≥500 mV
1.0% FSR ± 500 μV into 50.0 Ω for FS <500 mV. (Accuracy gradually drops from .5% to 1% at 50 mV FS)
0.3% FSR into user supplied load of from 49 Ω to 1 MΩ for FSR ≥10% of Max Output Voltage Range.

Output Temperature Coefficient: <0.01% of FSR/ °C typical

Waveform DAC Resolution: 12 bits

Gain Adjust Resolution: 0.05% Amplitude

Offset Adjust Resolution: 0.05% FSR

Waveform DAC Int. Non-Linearity: ±0.03% typ.; ±0.05% max

Waveform DAC Diff. Non-Linearity: ±0.75 lsb typ; ±1 lsb max, monotonic

Offset Adjust Range: ± Full Scale Amplitude (wrt midscale of waveform); must be within Output Voltage range.

Dynamic Characteristics:

Risetime/Falltime: ≤ 8 nsec (5.5 nsec typ)
Overshoot and Ringing: ≤ 5%, typically 2%
Total Harmonic Distortion: (1 V rms into 50 Ω)
≤ −65 dBc, f < 200 kHz
≤ −55 dBc, f < 1 MHz
≤ −45 dBc, f < 5 MHz
Spurious and non-harmonic distortion:
< −65 dBc, f ≤ 1 MHz
< −60 dBc, f > 1 MHz
excluding the band within 1 kHz of carrier
Settling Time: < 20 nsec to 1% typical, 50 nsec max.
Interchannel Crosstalk: ≤ 0.05%, tested with both channels at 10 V amplitude.
Channel-to-Channel Analog Delay Difference: ≤ 3 nsec

Low Pass Output Filter:

Corner Frquency (-3 dB): 36 MHz
Source Impedance: 50 Ω
Filter Input Impedance: 50 Ω
Filter Load Impedance: 50 Ω
Passband Flatness:
DC to 10 MHz: 0.1 dB
10 MHz to 25 MHz: 0.4 dB
Attenuation at 50 MHz: > 40 dB
Maximum Applied DC Voltage: 7 V
Maximum AC Signal Amplitude: 12 V p-p
Input and Output Connectors: BNC female

Noise

Signal to Noise Ratio (non-coherent): >70 dB rms
P-P Noise: $\leq$ 0.1% FS + $\leq$ 2 mV excluding glitch

Max Glitch Energy: (5 X 10^{-11} V-sec) times FS

Timebase

Max. Waveform Point Rate: 50 Mpoints/sec each channel
Range: 20 nsec/point to 100 sec/point
Resolution: .035%
Accuracy: $\leq$ 5 ppm at achievable setpoints, 23° C, 115 VAC/60 Hz, after 30 minute warmup
Stability: <0.5 ppm per °C

Waveform Memory

Fast Memory Length: 64 Kpoints single channel
Waveform Length Resolution: single channel: 4 pt blocks
dual channel: 2 pt blocks

Analog Output Protection

Protected against application of up to ±40 V DC

Digitial Output Specification

Output Channels: 2 channels with Channel 1 data corresponding to the channel 1 analog output. Channel 2 digital data corresponds to the channel 2 analog output. Digitial data is normalized so that a data value of 4095 (FFF_{16}) on the 12 msbs of the digital word (D15-D4) corresponds to maximum analog amplitude and a data value of 0(000_{16}) on the 12 msbs of the digital word corresponds to the minimum analog output.

Maximum Digital Pattern Length: Same as for Analog Output

Digital Outputs per Channel: 16 data lines, clock, 17 grounds

Maximum Data Output Rates: (Identical to 9112 analog sample rate) Single or Dual channel operation: 50 Msamples/sec (20 nsec per word)

Timing: (All outputs unloaded)
Digitial Clock to Analog Output: Clock preceeds the Analog output by 1 clock period +16 nsec ±3 nsec
Digital Clock to Digital Data: 4 nsec typical
Clock Duty Cycle: 40% min, 60% max
Setup Time Provided: 15 nsec min at 50 Megawords/second
typically setup time = (sample period)−(hold time)
Data to Data Skew Time: ±0.8 nsec max within each channel's data word
Hold time Provided: 2 nsec min, 4 nsec typ
Channel to Channel Skew:
Clock: ± 0.8 nsec max
Data to Data Skew Time: ±1.6 nsec for any data line to data line
Risetime: 5 nsec max (20% - 80%)
Falltime: 3.5 nsec max (20% - 80%)
Both risetime and falltime measured 20%-80% after 3 ft of Twist 'N Flat cable. Load at termination is two LS TTL data inputs plus a probe loading of 5 k Ω in parallel with 2 pF

Logic Levels:
V(high) min: +2.7 V at +1 mA
V(low) max: +0.75 V at -3.2 mA
Absolute max applied voltages: +5.5 v, -0.5 V

TTL Output Connector Configuration

Same pattern for channel 1 and channel 2
All TTL outputs are single ended, back terminted in 75 Ω

Signal	Pin #		Signal
Ground	1	2	Clock
Ground	3	4	D0 (LSB)
Ground	5	6	D1
Ground	7	8	D2
Ground	9	10	D3
Ground	11	12	D4 (LSB of 12 bit waveform)
Ground	13	14	D5
Ground	15	16	D6
Ground	17	18	D7
Ground	19	20	D8
Ground	21	22	D9
Ground	23	24	D10
Ground	25	26	D11
Ground	27	28	D12
Ground	29	30	D13
Ground	31	32	D14
Ground	33	34	D15 (MSB)

NOTE 1: Suggested connector type 3-M Part No. 3421-7034 or equiv. (34 pin .1"X.1" flat cable socket connector with strain relief). 1 required for each channel's output.

NOTE 2: Normal flat cables may be utilized, however best performance may be achieved with Twisted Pair Flat cable such as Spectra Strip #455-248-34 (17 pair Twist N' Flat, 28 AWG).

Indicators

Power on LED - ON when power is applied to the instrument

Trigger Armed LED - ON when awaiting a trigger signal.

Waveform Active LED's: Channel 1: ON when Channel 1 is turned on; **Chan 2**: ON when Channel 2 is turned on.

GPIB: Talk LED - ON when the instrument is in the talk mode.

Listen LED - ON when the instrument is in the listen mode.

SRQ LED - ON when the SRQ line is asserted and the instrument is awaiting action from a GPIB controller.

Remote - This word is spelled out in the hand-held control panel display whenever the instrument is put into remote by a GPIB controller.

Local LED – Indicates when the instrument is in the LOCAL mode and the hand-held control panel is operative. When it is not ON, the instrument is in the GPIB remote state.

Self Test LED – ON when a self test or calibrate is in progress

Test Fault LED – Flashes for 10 seconds when a self test or calibrate determines there is a fault or steady ON in the event of a microprocessor failure.

Battery Low LED – ON when the RAM Disk memory back-up battery is too low.

Channel 1, Invert LED – ON when Ch 1 output is inverted.

Channel 2, Invert LED – ON when Ch 2 output is inverted.

Rear Panel Connectors and Switches

Connectors: GPIB: IEEE 488-1978 compatible; RS-232 Port: DB 25 S Power Connector

Switches: GPIB Address Switch; RS-232 Port Configuration Switch, Line voltage selector and fuses

Waveform Creation and Editing

LeCroy's EASYWAVE® software package is available for PC-DOS compatible computers*. It provides for waveform creation and editing in a menu driven environment. Waveform creation can be accomplished by any of the following methods:

1. Equation entry
2. Selecting and combining simple waveform elements.
3. Waveforms can be acquired over the GPIB from the LeCroy 9400 Series Digital Oscilloscopes and then edited.

Editing may be accomplished as follows:

1. Modifying individual points from the keyboard.
2. Modifying the equation describing the waveform.
3. Deleting, moving and rescaling blocks of data.

* Minimum hardware configuration of host computer 640K RAM, 10 Mbyte Hard Disk, Graphics (CGA,HGA, or EGA) Display and National Instruments PC2A GPIB Interface Card.

Other GPIB Compatible Controllers: Waveforms can be created and edited on other controllers using user supplied software.

Instrument Control

PC-DOS Compatibles: The same software package used for waveform editing also can be used for controlling the 9112.

Local Control Panel: Once the waveforms have been loaded to RAM Disk, an optional, detachable control panel with a four line LCD display may be used for controlling the 9112.

Other GPIB or RS-232 Compatible Controllers: Other computers or terminals may be used to control the instrument using the remote commands.

General

GPIB Interface Functions: IEEE 488-1978 compatible. SH1, AH1, T5, TE0, L3, LE0, SR1, RL1, PP0, DC1, DT1, C0

GPIB DMA Rates: Typically >200 kbytes/sec

RS-232C: Implemented as data communications Equipment (DCE)
Baud Rates: 300, 600, 1200, 2400, 4800, and 9600.
Data Bits: 7 or 8.
Stop Bits: 1 or 2.
Parity: None, Even, or Odd.
Protocol: Full Duplex, Xon/Xoff (DC1/DC3) handshake.
Data Formats: #I Arbitrary length ASCII #L ASCII HEX "00" to "FF" (double the length of internally stored binary data files)

Commands: Full Conversational same as GPIB plus: RS_SRQ, Define character equivalent to SRQ in GPIB. Default is "Bell", ESC commands ECHO on/off Trig remote/local

Temperature Range: 15° C. to 35° C., full specification; 0° C. to 40° C., operating

Humidity: 40° C., 10% to 95% relative, non-condensing.

Power: 115/220 +/- 20% VAC,47-63 Hz. approximately 147 watts

Size: 5-1/4" H X 19" W X 15" D.

Weight: 26 lbs. (approximately)

Standard Accessories

1 each Operator's Manual
1 each 36 MHz Low-Pass Output Filter

Ordering Information

9112 Arbitrary Function Generator

Optional Accessories

9100/CP	Detachable Hand-held Control Panel
9100/EC	6' Extender Cable (Control Panel)
9112/OM	Operator's Manual
9112/SM	Service Manual
9100/SW	EASYWAVE Software
9100 GPIB2	GPIB interface card and software (National Instruments PCII Card and GPIB-PC Software)
DC/GPIB2	GPIB Cable, 2 meters
Filter/36 MHz	Additional 36 MHz Low-Pass Output Filter