



### Important Notice! WaveBook/516E Users

WBK option cards for WaveBook/516E are installed at the factory per customer order. Users are not to remove or install cards for these products as the cards are not “plug-and-play” for these devices and erroneous signal values could result. If you desire to remove or add a card to WaveBook/516E contact the factory or your service representative.



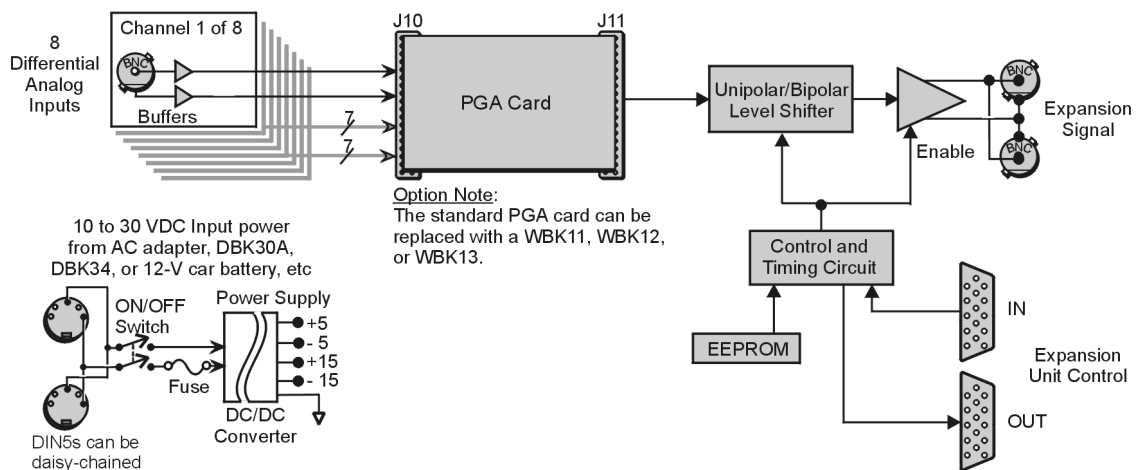
### Important Notice! WaveBook/516, /516A, /512A, and WBK10A Users

With exception of the WBK30 option, WBK option cards for WaveBook/516, /516A, /512A, and WBK10A are installed at the factory per customer order. Users are not to remove or install cards for these products [other than WBK30 series cards] as the cards are not “plug-and-play” for these devices and erroneous signal values could result. If you desire to remove or add a card to these products, contact the factory or your service representative.

The WBK10A Analog Expansion Module can be used to provide WaveBook with 8 additional differential-analog-inputs. The WBK10A is equipped with a programmable gain instrumentation amplifier (PGA) and, like the WaveBook, has a built-in expansion bus.

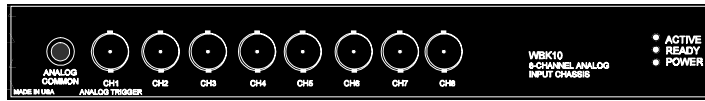
Up to eight WBK10A modules can be cascaded together for a system capacity of 72 differential channels. Each module is capable of supporting a WBK11A, WBK12A, or WBK13A option card.

**Note:** WBK10A can be ordered with a PGA, WBK11A, WBK12A, or a WBK13A card installed.



**WBK10A Block Diagram**

The **front panel** has the following connectors and indicators:



**WBK10A Front Panel**

- 1 Analog Common binding post for reference.
- 8 BNC connectors for analog inputs. Channels are labeled 1 through 8.
- 3 Status LEDs (Active, Ready, Power).

The **rear panel** has a power switch and the following connectors:



**WBK10A Rear Panel**

- 2 DIN5 connectors [one for Power In, one for Power Out]
- 1 HD-15M Expansion Control In
- 1 HD-15F Expansion Control Out
- 2 BNC connectors [one for analog Expansion Signal In, one for analog Expansion Signal Out]



#### Reference Notes:

- Setup information pertaining to power, expansion control, and expansion signal connections is contained in the [System Setup and Power Options](#) chapter of the *WaveBook User's Manual* (p/n 489-0901).
- For detailed WaveView information, refer to the [WaveView Document Module](#) that is included on the data acquisition CD. The document can be accessed using the <View PDFs> button on the CD's opening screen.

# Specifications - WaveBook/516, /516A, /516E, and WBK10A

## Analog Specifications

For either a stand alone WaveBook, or for a WBK10A with a WaveBook

### Channel Capacity:

**WaveBook/516E:** 8 built-in voltage channels, expandable up to 72 channels via WBK options. In addition, WaveBook/516E can accommodate up to 3 WaveBook/516A, /512A, or WBK40 options, in any combination. Each added on WaveBook can be expanded up to 72 channels. The maximum WBK41 capacity is 224 T/C channels, 4 analog output channels, 272 digital I/O channels, and 6 counter/timer channels.

**WaveBook/516 and /516A:** 8 differential, expandable up to 72 differential

**BNC Input Connectors:** Center conductor is Channel Hi, outer conductor is Channel Low

### Input Voltage Ranges (DC Specifications)

Voltage Range	Standard Unit		With WBK11A (Note 3)			With WBK12A/13A (Note 3)				
	Accuracy (Note 2) One Year, 18-28°C		Input Noise LSB rms DC-500KHz (typical)	Accuracy (Note 2) One Year, 18-28°C		Input Noise LSB rms DC-500KHz (typical)	Accuracy (Note 2) One Year, 18-28°C		Input Noise LSB rms (typical)	
	± % reading	± % range		± % reading	± % range		± % reading	± % range	1KHz Filter	Filter Bypass
0 to +10V	.012%	.008%	2	.012%	.008%	2	.012%	.008%	2.2	2.2
0 to +5V (10A) 0 to +4V (516)	.012%	.009%	2	.012%	.009%	2	.012%	.009%	2.2	2.2
0 to +2V	.012%	.012%	3	.012%	.012%	3	.012%	.012%	2.2	3
0 to +1V (10A only)	.012%	.018%	3	.012%	.018%	3	.012%	.018%	2.2	3
0 to +.5V				.018%	.033%	6	.018%	.033%	2.2	6
0 to +.2V				.018%	.08%	8	.018%	.08%	2.2	12
0 to +.1V				.018%	.16%	15	.018%	.16%	2.2	20
-10 to +10V	.012%	.008%	2	.012%	.008%	2	.012%	.008%	2.2	2.2
-5 to +5V	.012%	.008%	2	.012%	.008%	2	.012%	.008%	2.2	2.2
-2 to +2V	.012%	.009%	2	.012%	.009%	2	.012%	.009%	2.2	3
-1 to +1V	.018%	.012%	3	.018%	.012%	3	.018%	.012%	2.2	3.3
-.5 to +.5V (10A only)	.018%	.018%	5	.018%	.018%	6	.018%	.018%	2.2	6
-.2 to +.2V				.018%	.033%	8	.018%	.033%	2.2	12
-.1 to +.1V				.018%	.08%	15	.018%	.08%	2.2	20
-.05 to +.05V (10A only)				.018%	.16%	26	.018%	.16%	4	40

Notes: 1. Specifications assume differential input scan, unfiltered.

2. Accuracy specification is exclusive of noise.

3. Unipolar ranges are not available for WaveBook/516, /516A, or /516E when a WBK11A, WBK12A, or WBK13A option is installed. Unipolar ranges are available with WBK10A and any option.

### System Performance: one year, 18-28°C unless otherwise noted

**Differential Nonlinearity:** ±2 LSB max

**Total Harmonic Distortion (10Hz-20KHz):** -84dB typical

**Signal to Noise and Distortion (SINAD, 10Hz-20KHz):** -74dB typical

**Temperature Coefficient of Accuracy (0-18 and 28-50°C):**

**With PGA and WBK11A:** ± (.002% + 0.6 LSB)/°C typical, -10 to +10V range

**With WBK12A/13A:** ± (.002% + 1 LSB)/°C typical, -10 to +10V range

**Input Resistance:** 5MΩ (single ended); 10MΩ (differential), in parallel with 30pF

**Bias Current:** <400 nA (0 to 35°C)

**Common Mode Rejection:** >70dB minimum; >80dB typical; DC-20KHz

**Input Bandwidth:** DC to 500KHz

**Hostile Channel-to-channel Crosstalk (5Vrms input signal, DC-100KHz):** -88dB typical

**Over-Voltage Protection:** ±35 V relative to analog common

**Note:** Specifications are subject to change without notice.

## PGA Filter

**Filter Type:** 20KHz low pass, Butterworth, 5-pole filter

## WBK11A Functions

**Input Voltage Ranges:** Software programmable prior to a scan sequence

**Aperture Uncertainty (SSH):** 75ps max

**Voltage Droop (SSH):** 0.01mV/ms typ

## WBK12A, WBK13A Functions

**Input Voltage Ranges:** Software programmable prior to a scan sequence

**Low Pass Filter Type:** Software selectable, 8-Pole elliptic or linear phase

**Anti-Aliasing Filters:** Single-pole pre and post filters, automatically set depending on filter frequency selected

**Low-Pass Filter Frequency Cutoff Range:** 100KHz, 75KHz, 60KHz...400Hz, bypass ( $f_c=300\text{KHz}/N$  where  $N=3$  to 750)

**Filter Grouping:** 4 Channels each in two programmable banks

**Aperture Uncertainty (SSH):** 75ps max

**Voltage Droop (SSH):** 0.01mV/ms typ

## Triggering

### Channel 1 Analog Trigger

**Input Signal Range:** -10 to +10V

**Input Characteristics and Protection:** Same as channel inputs

**Latency:** 300ns

### Multi-Channel Analog Trigger (up to 72 channels):

**Range:** Selectable per channel to input range

**Latency:** 2us/channel, plus 4us maximum

### TTL Trigger:

**Input Signal Range:** 0-5V

**Input Characteristics:** TTL-compatible with 10K ohm pull-up resistor

**Input Protection:** Zener clamped -0.7 to +5V

**Latency:** 300ns

### Software Trigger

**Latency:** 100us typical

### Pulse Trigger

**Input Signal Range:** 0-5V

**Input Characteristics:** 75 ohms

**Input Protection:**  $\pm 10\text{V}$  maximum

**Minimum Pulse Width:** 100ns

**Latency:** 300ns

## External Clock

**Connector:** Available on DB25 digital input

**Input Signal Range:** 5V TTL compatible

**Input Characteristics:** 50K ohms pull up (to +5V) in parallel with 50pF

**Input Protection:** Zener clamped -0.7 to +5V

**Delay:** 200ns

**Signal Slew Rate Requirement:** 20V/us minimum

**Rate:** Up to 1MHz

**Divisor ratio:** Divide by 1 through 255, selectable

**Clock Counter Accuracy:** <0.02% error

**Clock Counter Range:** 0.01Hz to 100KHz

## Sequencer

**Operation:** Programmable for channel, gain, and for unipolar/bipolar range in random order

**Depth:** 128 location

**Channel-to-Channel Rate:** 1.0-1.1us/channel, all channels equal

**Maximum Repeat Rate:** 1MHz

**Minimum Repeat Rate:** 100 seconds per scan

**Expansion Channel Sample Rate:** Same as on-board channels

## High-Speed Digital Inputs/General-Purpose Outputs

**Connector:** DB25 Female

**Configuration:** 16 TTL-compatible pins, selectable for input or output

**Input Characteristics:** TTL-compatible

**Output Characteristics:** ALS TTL output in series with 33 ohms

**Output Updates:** Outputs may be changed via program control

**Input/Output Protection:** Diode clamped to ground and +5V

## Period Counter

**Operation:** Internal counter calculates and reports the external clock's period; counter can be read with each scan

**Clock Counter Accuracy:** <0.02% error

**Clock Counter Range:** 0.01 Hz to 100 kHz

## General Specifications

**Warm-up:** 30 minutes to rated specifications

**Environment:**

**Operating:** 0-50°C, 0-95% RH (non-condensing)

**Storage:** -20 to 70°C

**Power Consumption:**

**/516E:** 1.8A max @ 15 VDC

**/516, /516A & /512A:** 1.4A max @ 15VDC

**Input Power Range:** 10 VDC to 30 VDC

**Input Power Fuse F201:** 4A MINI ATO; See chapter 9 for fuse replacement instructions.

**Vibration:** MIL STD 810E, Category 1 and 10

**PC Communication:**

**/516E:** 10/100BaseT Ethernet

**/516, /516A & /512A:** Enhanced Parallel Port (EPP)

**Channel Capacity:**

**/516E:** 8 built-in voltage channels, expandable up to 72 channels via WBK options. In addition, WaveBook/516E can accommodate up to 3 WaveBook/516A, /512A, or WBK40 options, in any combination. Each added on WaveBook can be expanded up to 72 channels. The maximum WBK41 capacity is 224 T/C channels, 4 analog output channels, 272 digital I/O channels, and 6 counter/timer channels.

**/516, /516A & /512A:** 8 built-in voltage channels, expandable up to 72 channels via WBK options

**Dimensions:**

**/516E:** 285 mm wide x 220 mm deep x 70 mm high (11 x 8.5 x 2.70 inches)

**/516, /516A & /512A:** 285 mm wide x 220 mm deep x 45 mm high (11 x 8.5 x 1.75 inches)

**Weight:**

**/516E:** 1.9 kg (4.2 lbs)

**/516, /516A & /512A:** 1.5 kg (3.3 lbs)

