

# Series KPXI-AO

## 1MS/s Analog Output Modules with Waveform Generation



- 4 or 8 analog outputs with waveform generation capabilities
- Simultaneous update rate of up to 1MS/s
- Programmable bipolar or unipolar analog output ranges on per channel basis
- 4 or 8, 400kS/s, single-ended analog inputs
- 24 digital I/O lines
- 2 general purpose 16-bit counter/timers
- KDAQ-DRVR drivers for Visual Basic, Visual C, .NET, and KI-DAQ drivers for LabVIEW®
- Free configuration, calibration, and Code Creator software tools included with drivers

The Series KPXI-AO modules also include up to eight 400kS/s, 14-bit single-ended analog inputs with programmable polarity, 24 programmable digital I/O lines, two 16-bit general-purpose counter/timers, and an auto-calibration feature that adjusts the gains and offsets to a specified accuracy, eliminating the need for external calibration sources.

### Software

The KDAQ-DRVR driver provides example programs, such as a startup application that performs basic functions, updates the auto calibration feature, and verifies board communication. Also included is Code Creator, which lets users program with drop down menus and then displays the equivalent code in C.

Keithley's Series KPXI-AO analog output modules are ideal for waveform generation applications that require high speed and multifunctional capabilities. The high-speed analog outputs make waveform generation available with higher frequency signals than with previous Keithley products, so that more test system needs can be met with a smaller, more flexible system. In hybrid test systems, KPXI-AO modules can provide signals to a device while triggering instruments and monitoring instrument measurements with both digital and analog inputs. This makes the modules well suited to a variety of mixed system production test applications.

These modules are optimized for speed. The analog input and output functions can be performed at full speed simultaneously. The 12-bit analog output channels can be updated simultaneously at a rate of 1MS/s and the analog inputs at up to 400kS/s. While the analog I/O is performing at full speed, the hardware-based waveform generator is functioning free of CPU intervention.

These modules allow you to create complex signals with features such as:

- Per channel configurability of bipolar and unipolar output ranges using external references
- Waveform lengths only limited by onboard FIFOs
- Software, analog, and digital triggering options
- Synchronization of multiple modules through the PXI trigger bus

### Series KPXI-AO Connector Pin Assignments

AO_0	1	35	AGND
AO_1	2	36	AGND
AO_2	3	37	AGND
AO_3	4	38	AGND
AOEXTREF_A/AL_0	5	39	AGND
AL_1	6	40	AGND
EXTTRIG/AL_2	7	41	AGND
AOEXTREF_B/AL_3	8	42	AGND
AO_4/AL_4	9	43	AGND
AO_5/AL_5	10	44	AGND
AO_6/AL_6	11	45	AGND
AO_7/AL_7	12	46	AGND
AO_TRIG_OUT_A	13	47	EXTWFTRG_A
AO_TRIG_OUT_B	14	48	EXTWFTRG_B
GPTC1_SRC	15	49	VCC
GPTC0_SRC	16	50	DGND
GPTC0_GATE	17	51	GPTC1_GATE
GPTC0_OUT	18	52	GPTC1_OUT
GPTC1_UPDOWN	19	53	GPTC1_UPDOWN
RESERVED	20	54	DGND
AF11	21	55	AF10
PB7	22	56	PB6
PB5	23	57	PB4
PB3	24	58	PB2
PB1	25	59	PB0
PC7	26	60	PC6
PC5	27	61	PC4
DGND	28	62	DGND
PC3	29	63	PC2
PC1	30	64	PC0
PA7	31	65	PA6
PA5	32	66	PA4
PA3	33	67	PA2
PA1	34	68	PA0

Pins 9–12 are  
A14–A17 for KPXI-AO-4-1M,  
AO4–AO7 for KPXI-AO-8-1M  
Pins 5, 7, and 9 are shared between  
the external input references and the  
external analog trigger.

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# Series KPXI-AO

## Ordering Information

### KPXI-AO-4-1M

4-Channel, 1MS/s,  
Analog Output,  
Multifunction  
PXI Module

### KPXI-AO-8-1M

8-Channel, 1MS/s,  
Analog Output,  
Multifunction  
PXI Module

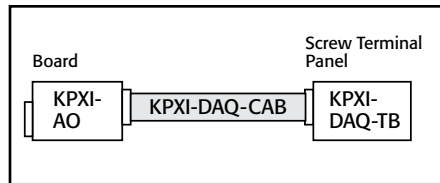
## ACCESSORIES AVAILABLE

KPXI-DAQ-TB	Terminal board with 68-pin SCSI-II connector
KPXI-DAQ-CAB	Cable connecting terminal block KPXI-DAQ-TB to KPXI-SDAQ modules

## SERVICES AVAILABLE

KPXI-AO-4-1M-5Y-EW	1-year factory warranty extended to 5 years from date of shipment
KPXI-AO-8-1M-5Y-EW	1-year factory warranty extended to 5 years from date of shipment
TRN-RCMI-1-C	Course: Integrating Mixed Instruments with a Single Software Interface

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## Configuration Guide

### ANALOG OUTPUTS

**NUMBER OF CHANNELS:** KPXI-AO-4-1M: 4.  
KPXI-AO-8-1M: 8.

**RESOLUTION:** 12 bits.

**OUTPUT RANGES:** 0–10V,  $\pm 10V$ , 0–AOEXTREF,  $\pm$ AOEXTREF.

**MAXIMUM UPDATE RATE:** 1MS/s.

**SLEW RATE:** 20V/ $\mu$ s.

**SETTING TIME:** 5 $\mu$ s to  $\pm 0.5$  LSB accuracy (10%–90%).

**OFFSET ERROR:**  $\pm 2$ mV.

**GAIN ERROR:**  $\pm 0.02\%$  of output value.

**DRIVING CAPACITY:**  $\pm 5$ mA.

**STABILITY:** Any passive load, up to 1500pF.

**TRIGGER SOURCES:** Software, external digital/analog trigger, PXI trigger bus.

**TRIGGER MODES:** Post-trigger, delay-trigger, and repeated trigger.

**FIFO BUFFER SIZE:** KPXI-AO-4-1M: 8k samples.  
KPXI-AO-8-1M: 16k samples.

**DATA TRANSFERS:** Programmed I/O, scatter-gather DMA.

### ANALOG INPUTS

**RESOLUTION:** 14 bits.

**NUMBER OF CHANNELS:** KPXI-AO-4-1M: 8 single-ended.  
KPXI-AO-8-1M: 4 single-ended.

**MAXIMUM SAMPLING RATE:** 400kS/s.

**GAIN:** 1.

**BIPOLAR INPUT RANGES:**  $\pm 10V$ .

**UNIPOLAR INPUT RANGES:** 0–10V.

**OFFSET ERROR:**  $\pm 3$ mV.

**GAIN ERROR:**  $\pm 0.01\%$  of reading.

**INPUT COUPLING:** DC.

**OVERVOLTAGE PROTECTION:** Power on: continuous  $\pm 30V$ ,  
Power off: continuous  $\pm 15V$ .

**INPUT IMPEDANCE:** 1G $\Omega$ /6pF.

**TRIGGER SOURCES:** Software, external digital/analog trigger, PXI trigger bus.

**TRIGGER MODES:** Pre-trigger, post-trigger, middle-trigger, delay-trigger, and repeated trigger.

**FIFO BUFFER SIZE:** 2k samples.

**DATA TRANSFERS:** Polling, scatter-gather DMA.

### DIGITAL I/O

**NUMBER OF CHANNELS:** 24-CH 8255 programmable input/output.

**COMPATIBILITY:** 5V/TTL.

**DATA TRANSFERS:** Programmed I/O.

### COUNTER/TIMERS

**NUMBER OF CHANNELS:** 2.

**RESOLUTION:** 16 bits.

**COMPATIBILITY:** 5V/TTL.

**BASE CLOCK AVAILABLE:** 40MHz, external clock up to 10MHz.

### AUTO CALIBRATION

**ON-BOARD REFERENCE:** +5V.

**TEMPERATURE DRIFT:**  $\pm 2$ ppm/ $^{\circ}$ C.

**STABILITY:**  $\pm 6$ ppm/1000 hours.

## GENERAL SPECIFICATIONS

**DIMENSIONS (not including connectors):** 160mm  $\times$  100mm (6.3 in  $\times$  3.9 in).

**CONNECTOR:** 68-pin VHDCI female.

**OPERATING TEMPERATURE:** 0 $^{\circ}$  to 55 $^{\circ}$ C.

**STORAGE TEMPERATURE:** –20 $^{\circ}$  to 80 $^{\circ}$ C.

**HUMIDITY:** 5 to 95%, non-condensing.

**POWER REQUIREMENTS:**  
KPXI-AO-4-1M: +5V, 1.53A typical.  
KPXI-AO-8-1M: +5V, 2.12A typical.

**EMC:** Conforms to European Union Directive 89/336/EEC, EN 55022, EN 55024.

**SAFETY:** Conforms to European Union Directive 73/23/EEC, EN 60950.

Use KDAQ-DRVR Windows<sup>®</sup> device driver for all programming languages. LabVIEW users should additionally install the KI-DAQ LabVIEW driver. Both drivers are on the KPXI software CD included with the module.

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