Product Bulletin

Analog and Digital I/O Module For PC/104

PB7638

ADIO-104

FEATURES

- Analog I/O and Digital I/O in an inexpensive PC/104 module
- Sixteen 12-bit multi-range analog inputs (±10V, ±5V, +5V, +10V)
- Over 50ksps analog input throughput, self-timed or user-controlled acquisition
- Eight 12-bit multi-range analog outputs (+5V, +10V, -5V, -10V, ±5V, ±10V)
- 24 digital I/O channels, four of which are 50Vdc open-drain outputs
- One 8-bit binary Pulse Accumulator (counter)
- Interrupt fully supports sharing and access to all PC/104 bus IRQs
- Single +5 volt power requirement

APPLICATIONS

- Industrial Automation and Process Control
- Scientific Apparatus and Instrumentation
- Embedded SCADA Systems
- Automated Test Equipment

PRODUCT DESCRIPTION

The ADIO-104 is an 8-bit analog and digital input/output module designed to satisfy a broad range of applications. Its generous assortment of functions and capabilities will, in many instances, make the ADIO-104 the only peripheral module required. It conforms to the PC/104 (IEEE-996.1) standard and operates on a single +5V power supply. For improved signal integrity analog signals are routed to 50-Position IDC header featuring alternating grounds signals. All digital I/O connections are routed to a separate 26-Position IDC header.

Analog Inputs: Sixteen 12-bit resolution single-ended analog inputs are provided, each with software programmable input ranges of ±10V, ±5V, +5V, +10V. This capability effectively increases the dynamic range to 14-bits when employing software range-switching techniques. Input protection handles applied voltages up to ±16.5V and continues to function even when power is off. In addition, a fault condition on any input channel will not affect the operation of the remaining channels. A special feature of the analog-to-digital converter is its ability to allow the separate acquisition and conversion times to be individually controlled by the user's software or automatically sequenced by the ADIO-104 hardware. Conversions are initiated by writing a control byte to the converter which configures the input channel, range, and other parameters. The ADIO-104 hardware also permits the simultaneous conversion on pairs of similarly configured analog inputs, ideal for phase-coherent data acquisition. The host can determine when a conversion is complete using one of three methods: by simply waiting longer than the conversion time, by polling a status bit, or by having the status bit interrupt the host when it becomes set. Throughput greater than 50ksps is possible, controlled by the speed of the host computer. A resulting 12-bit value is read as two bytes in an 8+4 format.

Analog Outputs: The eight 12-bit analog outputs share an identical range, which is hardware programmable for several popular values: +5V, +10V, -5, -10, ±5V, and ±10V. An on-board DC/DC converter enables the bipolar and 10V ranges to be achieved while operating from only +5V. At reset, the outputs are automatically initialized to ZERO or MID scale (RZ and RM models respectively). Data is pre-loaded into the DACs using an 8+4 bit format. Upon receipt of a single update command, those with new data change, while the remaining channels maintain their previous output voltages glitch-free. This simultaneous update feature is particularly useful in applications which can not tolerate phasing errors between the analog outputs such as servo-motor controls. All analog output channels feature read-back capability.

Digital I/O: The ADIO-104 features 24 digital I/O channels in the form of three 8-bit ports. PORTA is bi-directional and can be configured on a nibble basis for input or output operations. PORTB has six bi-directional channels and two dedicated input channels. Pull-up resistors are present on the lower nibble which simplifies interfacing to switches and contact closures. PORTC has eight dedicated outputs. Four of the channels directly drive on-board 50Vdc open-drain MOSFETs, each with 165ma sink capability. During a hardware reset all ADIO-104 bi-directional channels resort to input mode, dedicated output channels are cleared to zero, and open drain outputs go to a high impedance (non-conducting) state. All digital I/O signals meet TTL/CMOS voltage and current requirements. Open-drain outputs can be made TTL/CMOS compatible with appropriate external pull-up resistors.

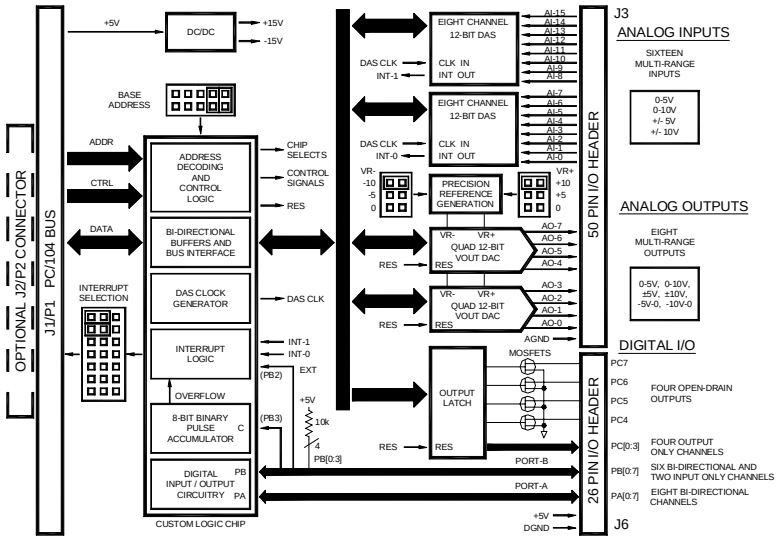
Pulse Accumulator: A single 8-bit binary Pulse Accumulator is provided for general purpose use. It may be freely written to and read from at anytime. It's input clock is shared with the dedicated input channel PORTB.3. Positive going edges on this channel will increment the count. A count overflow (ie; 255...0) sets a status bit which can optionally interrupt the host. The counter is cleared to zero during hardware reset.

External Interrupt: Dedicated digital input PORTB.2 also serves as an external interrupt input. A negative edge transition is recorded by a flip/flop which can optionally generate a host interrupt.

BENEFITS

The ADIO-104 is targeted at satisfying mainstream and cost-sensitive applications by combining the most requested peripherals while offering specifications and capabilities exceeding those of often more expensive but less complete solutions.

Simplified Block Diagram



J3 Analog I/O Header Connections			
Signal	Pin		Signal
Analog Ground	▼ 1	2	AICH15
Analog Ground	3	4	AICH14
Analog Ground	5	6	AICH13
Analog Ground	7	8	AICH12
Analog Ground	9	10	AICH11
Analog Ground	11	12	AICH10
Analog Ground	13	14	AICH9
Analog Ground	15	16	AICH8
Analog Ground	17	18	AICH7
Analog Ground	19	20	AICH6
Analog Ground	21	22	AICH5
Analog Ground	23	24	AICH4
Analog Ground	25	26	AICH3
Analog Ground	27	28	AICH2
Analog Ground	29	30	AICH1
Analog Ground	31	32	AICH0
Analog Ground	33	34	AOCH7
Analog Ground	35	36	AOCH6
Analog Ground	37	38	AOCH5
Analog Ground	39	40	AOCH4
Analog Ground	41	42	AOCH3
Analog Ground	43	44	AOCH2
Analog Ground	45	46	AOCH1
Analog Ground	47	48	AOCH0
Analog Ground	49	50	N.C.

J6 Digital I/O Header Connections			
Signal	Pin		Signal
PORTA.7	▼ 1	2	PORTA.6
PORTA.5	3	4	PORTA.4
PORTA.3	5	6	PORTA.2
PORTA.1	7	8	PORTA.0
PORTB.7	9	10	PORTB.6
PORTB.5	11	12	PORTB.4
PORTB.3	13	14	PORTB.2
PORTB.1	15	16	PORTB.0
PORTC.7	17	18	PORTC.6
PORTC.5	19	20	PORTC.4
PORTC.3	21	22	PORTC.2
PORTC.1	23	24	PORTC.0
+5V (Unfused)	25	26	Digital Ground

NOTES:

1) PORTA is bi-directional
2) PORTB has six bi-directional and two input only channels. PORTB.2 is shared with External Interrupt. PORTB.3 is shared with Pulse Accumulator clock input. PORTB[0:3] have 10k pull-up resistors.
3) PORTC is output only. PORTC[4:7] are open drain MOSFET's

SPECIFICATIONS

Analog Inputs:

General:	Two MAX197 DAS chips provides sixteen multi-range single-ended analog input channels
A/D resolution:	12-bit (1 in 4096 of full-scale), 14-bit effective dynamic range using software range-switching techniques
Input ranges:	Each channel has software programmable input range: ±10V, ±5V, +5V or +10V
Input current:	Unipolar: 750 µA max. Bipolar: 1200 µA max.
Overvoltage:	±16.5V protection. A fault condition on any channel will not affect readings on other channels
Nonlinearity:	±1LSB
Sampling:	50,000 samples/sec max. (Host dependent), self-timed or user controlled acquisition. Capable of simultaneous sampling on identically configured pairs; AICH0:AICH8, AICH1:AICH9 and so on.

Analog Outputs:

General:	Two DAC8412/DAC7724 chips provide eight multi-range analog output channels. Supports simultaneous updates
D/A resolution:	12-bit (1 in 4096 of full scale)
Output range:	Jumper selectable output range: +5V, +10V, -5V, -10V, ±5V or ±10V
Reset state:	Depends on model purchased. RZ = DACs value set to zero ($0x000_{16}$), RM = DACs value set to mid scale ($0x800_{16}$)
Output current:	±5mA max. per output
Settling time:	10 µs max. to within ±½LSB of final value
Relative accuracy:	±1LSB
Nonlinearity:	Less than ±1LSB, guaranteed monotonic

Digital I/O:

General: 24 digital I/O channels across three 8-bit ports. Unless specified otherwise all channels meet TTL/CMOS signal levels, ±5ma. PORTA is bi-directional. PORTB has six bi-directional channels and two input only channels functionally shared with the Pulse Accumulator and External Interrupt. PORTB[0:3] feature 10k pull-up resistors. PORTC is output only. PORTC [4:7] are 50V/165ma open-drain MOSFETs.

Pulse Accumulator: Presetable 8-bit binary up counter. Clock input is shared with PORTB.3 and is positive edge sensitive. Overflows are recorded and can optionally generate interrupts. 250khz maximum count rate.

External Interrupt: Input is shared with PORTB.2. Negative edge sensitive. Transitions are recorded and can optionally generate interrupts.

Addressing: 8-bit PC/104 bus. Can be jumpered for any 32 byte block in hosts I/O map, $0x000_{16}$ through $0x3E0_{16}$

Interrupt: Optionally uses one interrupt, jumper selectable IRQ 3, 4, 5, 6, 7, 9, (10, 11, 12, 14, 15)* or Disable. Supports interrupt sharing with other PC/104 modules. Maskable sources: Analog input DAS chips, Pulse Accumulator, and External Interrupt.
*Access to these interrupts require optional J2/P2 stack-through connector.

Power Requirement: +5Vdc ±5% @ 385mA typical, user circuitry excluded.

Dimensions: PC/104 compliant, 3.55"W x 3.775"L. 8-bit stack-through, optional 16-bit stack-through

Environmental: Operating temperature: 0°C to 65°C (Standard) Non-condensing relative humidity: 5% to 95%

Ordering Information:

100-7638,	ADIO-104, General Purpose I/O Module for PC/104. Please Specify RZ or RM model when ordering
104-0025,	Optional 20-Position J2/P2 stack-through connector * Required for upper IRQs
100-7625/50,	IDC-STB/50, 50-Position IDC ribbon cable to Screw-Terminal-Board
100-7625/26	IDC-STB/26, 26-Position IDC ribbon cable to Screw-Terminal-Board

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