DAQ-PACK SERIES
MULTI-CHANNEL
HIGH-SPEED
ANALOG I/O FAMILY
USER GUIDE

File: MDPK-AIO FAMILY.A1e

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WARNING!!

ALWAYS CONNECT AND DISCONNECT YOUR FIELD CABLING WITH THE COMPUTER POWER OFF. ALWAYS TURN POWER OFF BEFORE CONNECTING AND DISCONNECTING CABLES, FAILURE TO DO SO MAY CAUSE DAMAGE TO THE DAQ-PACK AND WILL VOID ALL WARRANTIES, IMPLIED OR EXPRESSED.

CAUTION!!

THE DAQ-PACK SERIES IS A FULLY FACTORY CONFIGURED AND INTEGRATED INSTRUMENT, DO NOT OPEN THE ENCLOSURE, DOING SO WILL VOID YOUR WARRANTY

Warranty

Prior to shipment, ACCES equipment is thoroughly inspected and tested to applicable specifications. However, should equipment failure occur, ACCES assures its customers that prompt service and support will be available. All equipment originally manufactured by ACCES which is found to be defective will be repaired or replaced subject to the following considerations.

Terms and Conditions

If a unit is suspected of failure, contact ACCES' Customer Service department. Be prepared to give the unit model number, serial number, and a description of the failure symptom(s). We may suggest some simple tests to confirm the failure. We will assign a Return Material Authorization (RMA) number which must appear on the outer label of the return package. All units/components should be properly packed for handling and returned with freight prepaid to the ACCES designated Service Center, and will be returned to the customer's/user's site freight prepaid and invoiced.

Coverage

First Three Years: Returned unit/part will be repaired and/or replaced at ACCES option with no charge for labor or parts not excluded by warranty. Warranty commences with equipment shipment. Following Years: Throughout your equipment's lifetime, ACCES stands ready to provide on-site or in-plant service at reasonable rates similar to those of other manufacturers in the industry.

Equipment Not Manufactured by ACCES

Equipment provided but not manufactured by ACCES is warranted and will be repaired according to the terms and conditions of the respective equipment manufacturer's warranty.

General

Under this Warranty, liability of ACCES is limited to replacing, repairing or issuing credit (at ACCES discretion) for any products which are proved to be defective during the warranty period. In no case is ACCES liable for consequential or special damage arriving from use or misuse of our product. The customer is responsible for all charges caused by modifications or additions to ACCES equipment not approved in writing by ACCES or, if in ACCES opinion the equipment has been subjected to abnormal use. "Abnormal use" for purposes of this warranty is defined as any use to which the equipment is exposed other than that use specified or intended as evidenced by purchase or sales representation. Other than the above, no other warranty, expressed or implied, shall apply to any and all such equipment furnished or sold by ACCES.

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Chapter 1: Introduction and Installation

This guide describes the DAQ-PACK Series of Enclosed Multi-function Data Acquisition Models. These are fully factory configured and integrated into a rugged steel enclosure. The exact configuration (channel count and signal conditioning types) of the unit you have purchased is specified by the model number and table of option codes that follows.

This guide provides all of the information most users will need. For full technical details and specifications, refer to the following comprehensive manuals:

- USB-AIO Series.PDF   USB Multi-Channel High-Speed Analog I/O Family
                                              Models USB-AIO16-xxx and USB-AIO12-xxx
- USB Software Reference.pdf   USB Software Reference Manual

As the DAQ-PACK is factory integrated into the enclosure, there should be no need for users to open the box. Doing so may void your warranty. For technical assistance, please contact us toll-free at 800-326-1649 and a technician will be happy to help you.

Included with your DAQ-PACK Series Module

The following components are included with your shipment depending on model and options ordered. Please take time now to ensure that no items are damaged or missing.

- DAQ-PACK Series Module installed in an enclosure with an anti-skid bottom
- DAQ-PACK AC to DC Power Supply
- 6' USB 2.0 Type A to B cable
- Software Master CD (PDF reference manuals installed with product package)
- Printed DAQ-PACK Series User Guide

Factory Signal Conditioning Capabilities

Temperature Measurements:
       Thermocouple inputs with optional break detection
       Std RTD (100 ohm)
       Non-Std RTD (1000 ohm or other)
Pressure and Force Measurements:
       Load cells
       Strain gages
Voltage Signal Measurements
       Standard input ranges
       Attenuated inputs (0-20V)
Current Measurements
       4-20mA transducers
       10-50mA transducers
RC Filters, just specify what frequencies you are interested in acquiring or are un-wanted.

Input Signal Assignments per 8 Channel Groups

Signal conditioning types are specified and configured in groups of 8 differential input channels at a time. The method used to specify the signal conditioning type will be to simply print this page as your worksheet and write the type of inputs you intend on connecting to each 8-channel group in the table.

DAQ-PACK JACK#	Channels	Input signal source in your application
J1 (right side encl.)	**7-0** **15-8**	
J2 (left side encl.)	**24-16** **31-25**	
J3 (right side encl.)	**39-32** **47-40**	
J4 (left side encl.)	**55-48** **63-56**	
J5 (right side encl.)	**71-64** **79-72**	
J6 (left side encl.)	**87-80** **95-88**	
J7 (right side encl.)	**103-96** **111-104**	
J8 (left side encl.)	**119-112** **127-120**	

Table 1-1: Input Assignment Worksheet per 8-Channel Group

DAQ-PACK JACK#	Channels	Input signal source in your application
J1 (right side encl.)	**7-0**	Type T thermocouples
	15-8	0-5V sensor inputs, ref. jct sensor LM335 on channel 8
J2 (left side encl.)	**23-16**	Junction Temp diodes (200mV to 700mV)
	31-24	0-20V (20kΩ x 20kΩ attenuator = input sig impedance)
J3 (right side encl.)	**39-32**	RTD's, 1000 ohm, 3-wire
	47-40	RTD's, 1000 ohm, 3-wire
J4 (left side encl.)	**55-48**	RTD's, 100 ohm, 3-wire
	63-56	RTD's, 100 ohm, 3-wire
J5 (right side encl.)	**71-64**	Junction Temp diodes (200mV to 700mV)
	79-72	Junction Temp diodes (200mV to 700mV)
J6 (left side encl.)	**87-80**	Junction Temp diodes (200mV to 700mV)
	95-88	Junction Temp diodes (200mV to 700mV)
J7 (right side encl.)	**103-96**	4-20mA inputs
	111-104	10-50mA inputs
J8 (left side encl.)	**119-112**	+/-10V
	127-120	+/- 5V

Table 1-2: Input Assignment per 8-Channel Group Completed Example
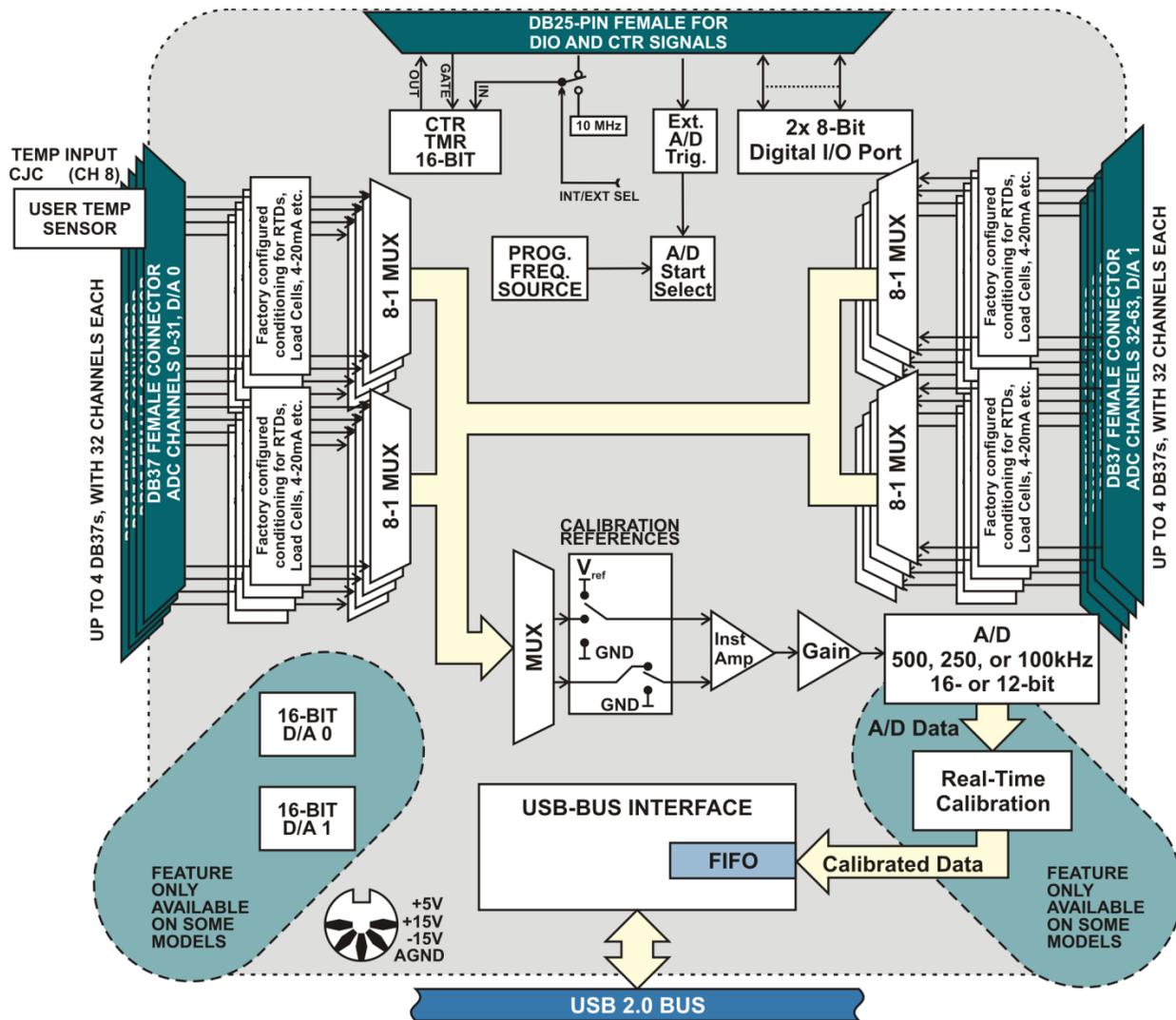
Figure 1-1: Block Diagram

Optional Mounting Accessories

Drawings of these accessories are in Chapter 2 of this guide.

DPK-DIN-CLIP   DIN rail mounting clip w/3 x 8/32 FHP 3/8" SS screws
DPK-MOUNT   Panel mounting plate w/3 x 8/32 FHP 3/8" SS screws

Chapter 2: Mechanical Drawings
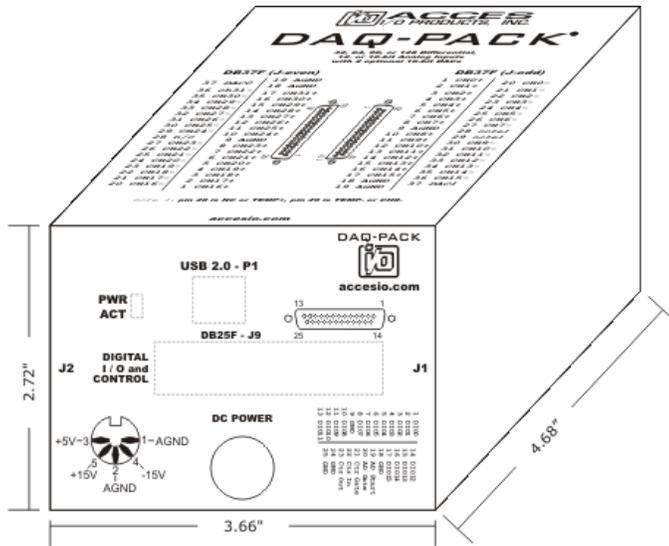
Figure 2-1: DAQ-PACK with one AIMUX-32

Enclosure Model	Dimension A	Dimension B
DPK-x-32x	2.715"	0.300"
DPK-x-64x	3.159"	0.500"
DPK-x-96x	3.847"	0.900"
DPK-x-128x	4.535"	1.200"
DPK-x-64M	2.715"	0.300"

8/32" PEM Nut

Mounting screw
threads not to
penetrate more
than 3/16"
inside enclosure

back panel - mounting provision
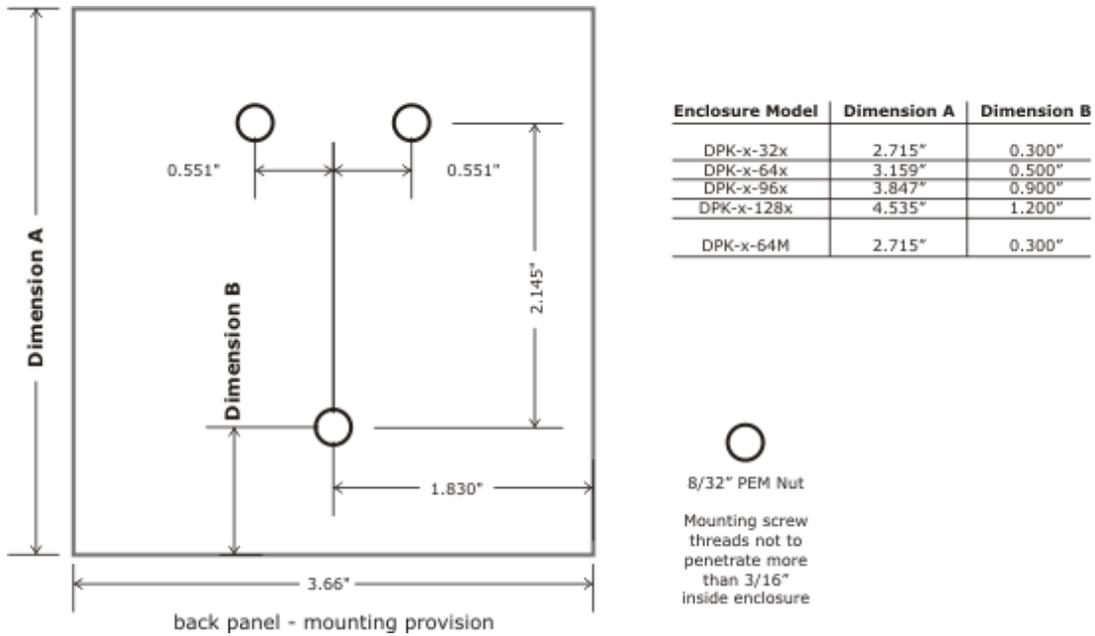
Figure 2-2: DAQ-PACK Mounting Provisions

Figure 2-3: DPK-DIN-CLIP

8*32 FLAT HEAD (100°) 7 EA
PHILIPS CLEARANCE HOLE
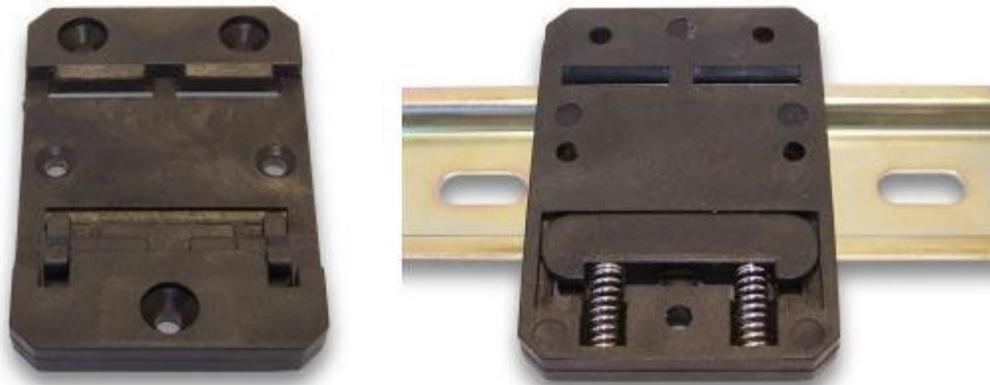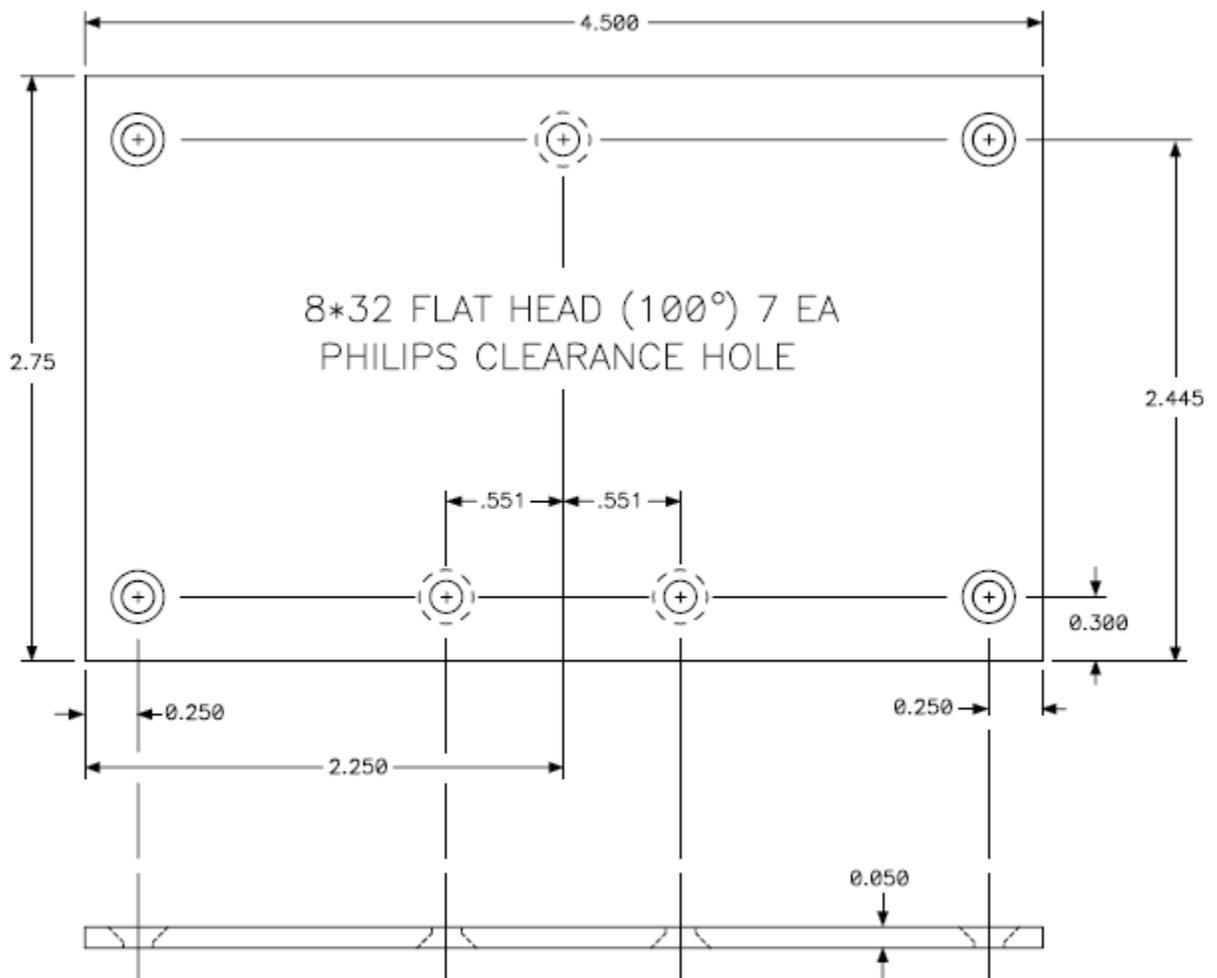
Figure 2-4: DPK-MOUNT

Chapter 3: USB Address Information

Use the provided driver to access the DAQ-PACK. This driver will allow you to determine how many supported USB devices are currently installed, and each device's type. This information is returned as a Vendor ID (VID), Product ID (PID) and Device Index.

The VID is "0x1605" and the PID is listed in the following table.

8040	DPK-AI16-16A	8140	DPK-AIO16-16A
8041	DPK-AI16-16E	8141	DPK-AIO16-16E
8042	DPK-AI12-16A	8142	DPK-AIO12-16A
8043	DPK-AI12-16	8143	DPK-AIO12-16
8044	DPK-AI12-16E	8144	DPK-AIO12-16E
804A	DPK-AI16-32A	814A	DPK-AIO16-32A
804B	DPK-AI16-32E	814B	DPK-AIO16-32E
804C	DPK-AI12-32A	814C	DPK-AIO12-32A
804D	DPK-AI12-32	814D	DPK-AIO12-32
804E	DPK-AI12-32E	814E	DPK-AIO12-32E
804F	DPK-AI16-64A	814F	DPK-AIO16-64A
8050	DPK-AI16-64E	8150	DPK-AIO16-64E
8051	DPK-AI12-64A	8151	DPK-AIO12-64A
8052	DPK-AI12-64	8152	DPK-AIO12-64
8053	DPK-AI12-64E	8153	DPK-AIO12-64E
8054	DPK-AI16-96A	8154	DPK-AIO16-96A
8055	DPK-AI16-96E	8155	DPK-AIO16-96E
8056	DPK-AI12-96A	8156	DPK-AIO12-96A
8057	DPK-AI12-96	8157	DPK-AIO12-96
8058	DPK-AI12-96E	8158	DPK-AIO12-96E
8059	DPK-AI16-128A	8159	DPK-AIO16-128A
805A	DPK-AI16-128E	815A	DPK-AIO16-128E
805B	DPK-AI12-128A	815B	DPK-AIO12-128A
805C	DPK-AI12-128	815C	DPK-AIO12-128
805D	DPK-AI12-128E	815D	DPK-AIO12-128E

Table 3-1: Product ID to Model Number

Chapter 4: Programming

The driver software provided with the board uses a 32-bit .dll front end compatible with any Windows programming language. Samples provided in Borland C++Builder, Borland Delphi, Microsoft Visual Basic, and Microsoft Visual C++ demonstrate the use of the driver.

The easiest way to begin taking analog input data is using the following API call, but often can't achieve more than several hundred Hz, slower depending on options.

unsigned long **ADC_GetScanV**(- This simple function takes one scan of A/D data and converts it to voltage. It also averages oversamples for each channel. The array must contain one entry per A/D channel on the board, though only entries [start channel] through [end channel] are altered. On boards with A/D that don't support ADC_SetConfig(), it scans all channels, without oversampling.
unsigned long DeviceIndex - number from 0-31 indicating from which device you wish to get a scan of data
double *pBuf - a pointer to the first of an array of double precision IEEE floating point numbers which will each receive the value read from one channel
)

For full programming details see the USB Software Reference Manual installed on your system along with the product software package.

Chapter 5: Connector Pin Assignments

The DAQ-PACK is available in four basic flavors, always consisting of the USB interface and A/D board and at least one AIMUX-32 signal conditioning multiplexer board. The A/D board may also have two 16-bit analog outputs (specify at time of ordering). If your version has the analog outputs, the same signals will be present on the same pins of each DB37 on pins 37 and 18. The first AIMUX-32 board will have one DB25F and two DB37F's. Units with two, three or four AIMUX-32 boards will have additional DB37F's, two per AIMUX-32 boards. Signals present on these connectors are as follows:

Connectors

P1	USB Type B	High Retention Connector for reliable USB Interface
J1	DB37 Female	Channels 0-15 analog inputs and temp sensor
J2	DB37 Female	Channels 16-31 analog inputs
J3	DB37 Female	Channels 32-47 analog inputs
J4	DB37 Female	Channels 48-63 analog inputs
J5	DB37 Female	Channels 64-79 analog inputs
J6	DB37 Female	Channels 80-95 analog inputs
J7	DB37 Female	Channels 96-111 analog inputs
J8	DB37 Female	Channels 112-127 analog inputs
J9	DB25 Female	A/D control and digital I/O

DC POWER
Circular 5-pin DIN   ±15VDC and 5VDC from provided AC/DC Power Supply

Pin	Signal Name	Pin	Signal Name
1	CH0+	20	CH0-
2	CH1+	21	CH1-
3	CH2+	22	CH2-
4	CH3+	23	CH3-
5	CH4+	24	CH4-
6	CH5+	25	CH5-
7	CH6+	26	CH6-
8	CH7+	27	CH7-
9	AGND	28	TEMP+ (LM335 / CH8+)
10	CH8+	29	TEMP- (AGND / CH8-)
11	CH9+	30	CH9-
12	CH10+	31	CH10-
13	CH11+	32	CH11-
14	CH12+	33	CH12-
15	CH13+	34	CH13-
16	CH14+	35	CH14-
17	CH15+	36	CH15-
18	AGND / DAC1 return	37	DAC1
19	AGND		

Table 5-1: J1 Connector Pin Assignments (DB37F)

Pin	Signal Name	Pin	Signal Name
1	CH16+	20	CH16-
2	CH17+	21	CH17-
3	CH18+	22	CH18-
4	CH19+	23	CH19-
5	CH20+	24	CH20-
6	CH21+	25	CH21-
7	CH22+	26	CH22-
8	CH23+	27	CH23-
9	AGND	28	N/C
10	CH24+	29	CH24-
11	CH25+	30	CH25-
12	CH26+	31	CH26-
13	CH27+	32	CH27-
14	CH28+	33	CH28-
15	CH29+	34	CH29-
16	CH30+	35	CH30-
17	CH31+	36	CH31-
18	AGND / DAC0 return	37	DAC0
19	AGND		

Table 5-2: J2 Connector Pin Assignments (DB37F)

Signal Name	I/O	Description
CH0+ to CH15+	I	Channel 0 through 15 differential non-inverting input
CH0- to CH15-	I	Channel 0 through 15 differential inverting input
CH16+ to CH 31+	I	Channel 16 through 31 differential non-inverting inputs
CH16- to CH31-	I	Channel 16 through 31 differential inverting inputs
AGND	x	Analog Ground, All single-ended *AND* differential signals must have a ground reference connected on one of these pins.
TEMP+ (LM335) (CH8+)	I	Temperature sensor input circuit (LM335 + lead) when TEMP1 jumper is installed. Connected to channel 8 differential non-inverting input
DAC0 / DAC1	O	Digital to Analog Output 0 / 1
AGND / DAC0 / DAC1 return	x	DAC0 or 1's ground when installed. Otherwise, Analog Ground

Table 5-3: J1 and J2 Signal Names and Descriptions

Pin	Signal Name	Pin	Signal Name
1	DIO0	14	DIO12
2	DIO1	15	DIO13
3	DIO2	16	DIO14
4	DIO3	17	DIO15
5	DIO4	18	GND
6	DIO5	19	External Trigger
7	DIO6	20	A/D Start Enable
8	DIO7	21	Counter Gate
9	GND	22	Counter Clock
10	DIO8	23	Counter Output
11	DIO9	24	GND
12	DIO10	25	GND
13	DIO11		

Table 5-4: J9 Connector Pin Assignments (DB25F)

Signal Name	I/O	Description
DIO0 – DIO15	I/O	Digital Input and Digital Output lines (SW configurable, pulled-up)
AGND	x	Analog Ground
GND	x	Ground (power and digital signaling)
Counter Gate	I	External A/D Enable / Counter Gate Input (pulled-up, active-high)
External Trigger	I	Ext A/D Conversion Start Trigger (pulled-up, SW selectable for rising or falling edge)
A/D Start Enable	I	External A/D Conversion Start Enable (pulled-up, active-high)
Counter Clock	I	8254 Counter/Timer Clock Input (pulled-up)
Counter Output	O	8254 Counter/Timer Output (pulled-up)

Table 5-5: J9 Signal Names and Descriptions

Chapter 6: Primary Specifications

PRIMARY SPECIFICATIONS (full specs in DAQ-PACK manual)

Analog Inputs	Successive approximation
Resolution	16-bit or 12-bit
Sampling rate	100k - 500ksps, depending on model
Channels	Up to 128 differential
Uni, Bipolar(±) ranges	100mV, 200mV, 400mV, 500mV, 1V, 2V, 2.5V, 5V, 10V
	Uni-, bipolar ranges of 1mV, 5mV, 10mV, 20mV, 50mV
Calibration Hardware	
"16-, 12-A" versions	Two on-board ref's + calibrated real-time output
"16-E" version	Two on-board references
"12-xxx" version	Two on-board references
"12-xxxE" version	None
System Calibration	Program provided to calibrate entire system
Accuracy	Uncalibrated 0.094% Full-Scale (FS)
	Calibrated[1] 0.0015% FS
Input impedance	1MΩ
A/D Start Sources	Software, Timer, External Start Trigger

[1] For best accuracy, one must calibrate to their own standard.

Analog Outputs	2
Type / Resolution	Single-ended, 16-bit
Uni, Bipolar(±) Ranges	5V, 10V (factory installed)
Conv. / Settling	4kHz / 4us typ, 7us max; ¼-¾ scale to ±2LSBs
Drive Current	±25mA per channel

Digital I/O	16 inputs or outputs in groups of 8 (pulled-up)	
Input volts/current	Logic low:	0V(min) to 0.8V(max) ±20µA
	Logic high:	2V(min) to 5V(max) ±20µA
Output volts/current	Logic low:	0V(min) to 0.55V(max) 64mA sink
	Logic high:	2V(min) to 5V(max) 32mA source

Counter/Timer	82C54 programmable interval counter
Available Counters	CTR0 (CTR1, CTR2 dedicated to A/D starts)
Input Frequency	10MHz (max)
Counter size	16-bit
Clock	Internal 10MHz or Externally supplied

Environmental	
Operating Temp.	0° to +70°C, optional -40° to +85°C
Storage Temp.	-40° to +105°C
Humidity	5% to 90% RH, without condensation

Enclosure Dimensions	(L x W x H) in inches
-32 (channels)	4.680 x 3.660 x 2.820
-64	4.680 x 3.660 x 3.260
-96	4.680 x 3.660 x 3.950
-128	4.680 x 3.660 x 4.640

Power Required	+5V at 320mA, +15V at 39mA, -15V at 21mA (typical per AIMUX-32 board)

Customer Comments

If you experience any problems with this manual or just want to give us some feedback, please email us at: *manuals@accesio.com.* Please detail any errors you find and include your mailing address so that we can send you any manual updates.

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