Series ACPC8630A/8635A Industrial I/O Pack

CompactPCI Bus Non-Intelligent Carrier Board

USER'S MANUAL

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Contents

IMPORTANT SAFETY CONSIDERATIONS

It is very important for the user to consider the possible adverse effects of power, wiring, component, sensor, or software failures in designing any type of control or monitoring system. This is especially important where economic property loss or human life is involved. It is important that the user employ satisfactory overall system design. It is agreed between the Buyer and Acromag, that this is the Buyer's responsibility.

1. GENERAL INFORMATION

The ACPC8630A/8635A card is a Compact Peripheral Component Interconnect (CompactPCI) bus card and a carrier for the Industrial I/O Pack (IP) mezzanine board field I/O modules. The carrier board provides a modular approach to system assembly, since each carrier can be populated with any combination of analog input/output, digital input/output, communication, etc. IP modules. Thus, the user can create a board which is customized to the application. This saves money and space - a single carrier board populated with IP modules may replace several dedicated function CompactPCI bus boards. The ACPC8630A/8635A non-intelligent carrier board provides impressive functionality at low cost.

The ACPC8630A and ACPC8635A models are available in the standard CompactPCI bus 3U size. Up to two IP modules are supported by the carriers. Acromag provides two options for field I/O access to the IP modules. The ACPC8630A supports front I/O access and the ACPC8635A supports rear I/O access to the IP modules

Model	Field I/O Access Port	Supported IP Slots	Operating Temperature Range
ACPC8630A	Front	2(A,B)	0 to +70°C
ACPC8630AE	Front	2(A,B)	-40 to +85°C
ACPC8635A	Rear	2(A,B)	0 to +70°C
ACPC8635AE	Rear	2(A,B)	-40 to +85°C

KEY ACPC8630A / 8635A FEATURES

- **PCI Specification Version 2.2 and PICMG 2.1, R2.0 Compliant Slave Carrier** - Provides a CompactPCI bus interface to control and communicate with industry standard IP modules.
- **Interface for Two IP Modules** - Provides an electrical and mechanical interface for up to two industry standard IP modules. IP Modules are available from Acromag and other vendors in a wide variety of Input/Output configurations to meet the needs of varied applications.
- **Plug-And-Play CompactPCI bus Carrier** - The carrier card contains standard CompactPCI bus configuration memory. Upon power-up the system auto-configuration process assigns the carrier's base address in memory space.
- **Plug-And-Play Interrupt Support** - The personal computer system software will allocate one interrupt line to the carrier. The carrier's interrupt pending register can be used to quickly identify IP module pending interrupts.
- **Supports Two Interrupt Channels per IP** - Up to two interrupt requests are supported for each IP. Additional registers are associated with each interrupt request for control and status monitoring.

- **Full IP Register Access** - Makes maximum use of logically organized programmable registers on the carrier boards to provide for easy configuration and control of IP modules. Supports accesses to IP memory, input/output, interrupt, and ID ROM data spaces. Support for memory space is jumper selectable.
- **IP Module Access Time Out** - Allows access to empty IP slots without system failure. If the IP module accessed does not respond within 32u seconds the bus access is terminated without system failure. This allows each IP slot to be probed to determine if an IP is installed. A control register bit will be set and/or issue of an interrupt request will be made to indicate IP module time out access has occurred.
- **IP Module Selectable Clock** - Allows for each IP module to be individually configured with an 8MHz or 32MHz clock.
- **LED Indicators Simplify Debugging** - Front panel LED's are dedicated to each IP module to give a visual indication of successful IP accesses.
- **Rear Backplane I/O Access for Model ACPC8635A** - Rear backplane connector J2 provides access to field I/O signals. Front Panel I/O Access for Model ACPC8630A – Front panel access to field I/O signals is provided via two 50-pin connectors. A separate connector is provided for each IP module.
- **Supervisory Circuit for Reset Generation** - A microprocessor supervisor circuit provides power-on, power-off, and low power detection reset signals to the IP modules per the IP specification.
- **Individually Filtered Power** - Filtered +5V, +12V, and -12V DC power is provided to the IP modules via passive filters present on each supply line serving each IP. This provides optimum filtering and isolation between the IP modules and the carrier board and allows analog signals to be accurately measured or reproduced on IP modules without signal degradation from the carrier board logic signals.
- **Individually Fused Power** - Fused +5V, +12V, and -12V DC power is provided. A fuse is present on each supply line serving each IP module.
- **ESD Strip on ACPC8630A/8635A Board** - The ACPC8630A/8635A board has been designed to provide electrostatic discharge (ESD) capability by using an ESD strip on the board per ANSI/VITA 1.1-1997 and IEEE1101.10.
- **Injector/Ejector Handle** - The ACPC8630A/8635A uses a modern injector/ejector handle, which pushes the board into the rack during installation and has a positive self-locking mechanism so it cannot be unlocked accidentally. This handle is fully IEEE 1101.10 compliant and is needed to give leverage to install and remove the board.
- **EMC Front Panel** - The ACPC8630A/8635A uses the preferred EMC front panel per IEEE 1101.10 specification.
- **Universal Signaling Voltage** - The ACPC8630A/8635A implements 3.3 Volt signaling and is 5 Volt tolerant

- **Slave Module**- All read and write accesses are implemented as either a 32-bit, 16-bit or 8-bit single data transfer.
- **Immediate Disconnect on Read** - The PCI bus will immediately disconnect after a read. The read data is then stored in a read FIFO. Data in the read FIFO is then accessed by the PCI bus when the read cycle is retried. This allows the PCI bus to be free for other system operations while the read data is moved to the read FIFO.
- **Interrupt Support** - PCI bus INTA# interrupt request is supported. All IP module interrupts are mapped to INTA#. Carrier board software programmable registers are utilized as interrupt request control and status monitors.

SIGNAL INTERFACE PRODUCTS

(See Appendix for more information on compatible products)

This IP carrier board will mate directly to all industry standard IP modules. Acromag provides the following interface products (all connections to field signals are made through the carrier board and transition module which passes them to the individual IP modules):

Cables

Model 5028-372 (SCSI-2 to CHAMP 0.8mm Cable, Shielded): Round shielded cable, 50-wires (SCSI-2 male connector at one end and a CHAMP 0.8mm plug connector at the other end). The cable is used to connect Model 5028-378 SCSI-2 termination panel to the ACPC8630A (E) board. This cable is used for front I/O only.

Model 5025-551-X (Shielded Cable) or Model 5025-550-X (Non-Shielded Cable): A Flat 50-pin cable with female connectors at both ends for connecting Model 5025-552 termination panel to the TRANS-C100 Transition Module. The unshielded cable is recommended for digital I/O, while the shielded cable is recommended for optimum performance with precision analog I/O applications. These cables are used for rear I/O only in conjunction with the ACPC8635A (E) and the TRANS-C100.

Termination Panel:

Model 5028-378 SCSI-2 Termination Panel: DIN-rail mountable panel provides 50 screw terminals for universal field I/O termination. Connects to Acromag ACPC8630A (E) board using SCSI-2 to CHAMP 0.8mm Cable, Shielded (Model 5028-372).

Model 5025-552: DIN-rail mountable panel provides 50 screw terminals for universal field I/O termination. Connects to Acromag ACPC8635A (E) board using the TRANS-C100 and flat ribbon cables (Model 5025-550-X or 5025-551-X).

CompactPCI Transition Module:

Model TRANS-C100: This module plugs into the rear backplane directly behind the ACPC8635A (E) carrier board. The field I/O connections are made through the backplane to the J2 connector of the carrier board and then routed to a 100 pin header (male) condo connector, P1, on the transition module (marked IP module slots “A through B”) for rear exit from the card cage. This module is available for use in card cages which provide rear exit for I/O connections via 80 mm wide transition modules (transition modules can only be used in card cages specifically designed for them). It is a single-height (3U), single-slot module and adheres to the CompactPCI mechanical dimensions and IEEE Standard (1101.11-1998), with a printed circuit board depth of 80mm, which is a standard transition module depth. The transition module connects to Acromag Termination Panel (Model 5025-552) using 50-pin Flat Ribbon Cable, Non-Shielded (Model 5025-550-x) or 50-pin Flat Ribbon Cable, Shielded (Model 5025-551-x) to the rear of the card cage, and to ACPC8635A (E) boards within the card cage

IP MODULE Windows Software

Acromag provides software products (sold separately) to facilitate the development of Windows applications interfacing with Industry Pack modules installed on Acromag PCI carrier cards, PCI Express carrier cards and CompactPCI carrier cards. This software (models IPSW-API-WIN32 and IPSW-API-WIN64) consists of low-level drivers and Dynamic Link Libraries (DLLs) that are compatible with a number of programming environments. The DLL functions provide a high-level interface to boards eliminating the need to perform low-level reads/writes of registers, and the writing of interrupt handlers.

IP MODULE VxWORKS SOFTWARE

Acromag provides a software product (sold separately) consisting of board VxWorks® software. This software (Model IPSW-API-VXW) is composed of VxWorks® (real time operating system) libraries for all Acromag IP modules and Carriers, PCI I/O Cards, and CompactPCI I/O Cards. The software is implemented as a library of “C” functions which link with existing user code to make possible simple control of all Acromag PCI boards.

IP MODULE LINUX SOFTWARE

Acromag provides a software product (available on website) consisting of board Linux® software. This software (Model IPSW-API-LINUX) is composed of Linux® libraries for all Acromag IP modules and carriers including the AVME9670 and AVME9660/9630. The software supports X86 PCI bus only and is implemented as library of “C” functions. These functions link with existing user code to make possible simple control of all Acromag IP CompactPCI BUS INTERFACE FEATURES

2. PREPARATION FOR USE

UNPACKING AND INSPECTION

Upon receipt of this product, inspect the shipping carton for evidence of mishandling during transit. If the shipping carton is badly damaged or water stained, request that the carrier's agent be present when the carton is opened. If the carrier's agent is absent when the carton is opened and the contents of the carton are damaged, keep the carton and packing material for the agent's inspection.

For repairs to a product damaged in shipment, refer to the Acromag Service Policy to obtain return instructions. It is suggested that salvageable shipping cartons and packing material be saved for future use in the event the product must be shipped.

This board is physically protected with packing material and electrically protected with an anti static bag during shipment. It is recommended that the board be visually inspected for evidence of mishandling prior to applying power.

The board utilizes static sensitive components and should only be handled at a static-safe workstation.

CARD CAGE CONSIDERATIONS

Refer to the specifications for loading and power requirements. Be sure that the system power supplies are able to accommodate the power requirements of the carrier board, plus the installed IP modules, within the voltage tolerances specified.

IMPORTANT: Adequate air circulation must be provided to prevent a temperature rise above the maximum operating temperature.

The lack of air circulation within the computer chassis is a cause for some concern. Most, if not all, computer chassis do not provide a fan for cooling of add-in boards. The dense packing of the IP modules to the carrier board alone results in elevated IP module and carrier board temperatures, and the restricted air flow within the chassis aggravates this problem. Adequate air circulation must be provided to prevent a temperature rise above the maximum operating temperature and to prolong the life of the electronics. If the installation is in an industrial environment and the board is exposed to environmental air, careful consideration should be given to air-filtering.

Board Configuration

The carrier board is plug-and-play compatible and, as such, its board addresses are automatically assigned by the system auto-configuration routine upon power-up. The base address of the carrier board's configuration registers in memory space and I/O space is assigned. In addition, the base addresses of the IP modules and carrier board registers are assigned in 32-bit memory space.

Power should be removed from the board when changing jumper configurations or when installing IP modules, cables, termination panels, and field wiring. Refer to Mechanical Assembly Drawing 4501-142 and your IP module documentation for specific configuration and assembly instructions.

See diagram 4502-141 located in the drawings portion of this manual for jumper location and settings. The jumper must be present in one of the two configurations for proper board operation. Factory default is memory space disabled.

IP Memory Space Configuration

A configuration jumperJ3 must be set on the carrier, prior to power-up, to enable IP Memory Space. Setting this jumper will allow each IP module to use up to 8M bytes of Memory Space. Note that the board will request 64M bytes of system memory during PCI configuration. This value cannot be altered.

See diagram 4502-141 located in the drawings portion of this manual for the jumper location and settings. **The jumper must be present in one of the two configurations for proper board operation. Factory default is memory space disabled.**

Interrupt Configuration

No hardware jumper configuration is required for interrupts. Interrupt enables and status flags are configured or viewed via programmable registers on the carrier board (see Section 3 for programming details). The carrier board passes interrupt requests from the IP modules to the PCI bus. Refer to the IP modules for their specific configuration requirements.

CONNECTORS

Connectors of the carrier consist of two carrier front field I/O connectors for model ACPC8630A, one carrier rear field I/O connector for model ACPC8635A, and one CompactPCI bus interface connector. In addition, four IP module connectors are also present (two IP module logic connectors and two IP module field connectors). These interface connectors are discussed in the following sections.

Carrier Front Field I/O Connectors Model ACPC8630A

The model ACPC8630A carrier field I/O connections are made through the front via P5 and P6 for IP modules in positions A and B. Front field I/O Connectors P5 and P6 are 50-pin right angle (female) connectors (AMP 6658751). Connectors are high-density, and there is one connector for each IP module marked with A and B on the front carrier panel.

Pin assignments are defined by the IP module employed since the pins for the IP module field side correspond identically to the pin numbers of the front panel connectors.

Carrier Rear Field I/O Connectors Model ACPC8635A

The model ACPC8635A carrier field I/O connections are made through the rear via J2 for IP modules in positions A and B.

Table 2-1 indicates the pin assignments for the CompactPCI I/O signal mapping at the J2 connector. The J2 connector is the second connector from the lower rear corner on the ACP8635A board, as viewed from the front. The connector consists of 22 rows of six pins labeled A, B, C, D, E and F. Pin A1 is located near the center of the board, viewed from the front component side. J2 is used to route IP Modules A and B field signals from the carrier to the backplane.

IMPORTANT: Model ACPC8635A cannot be used in 64 bit cPCI or PXI systems as rear I/O (J2) is mapped to the same connector as the additional control lines for 64-bit cPCI or PXI.

Table 2-1: CompactPCI I/O Signals J2 CONNECTIONS

Pin	Row A	Row B	Row C	Row D	Row E	Row F
1	***+3.3V***	***+3.3V***	***+3.3V***	***+5V***	***+5V***	GND
2	A46	A47	A48	A49	A50	GND
3	A41	A42	A43	A44	A45	GND
4	A36	A37	A38	A39	A40	GND
5	A31	A32	A33	A34	A35	GND
6	A26	A27	A28	A29	A30	GND
7	A21	A22	A23	A24	A25	GND
8	A16	A17	A18	A19	A20	GND
9	A11	A12	A13	A14	A15	GND
10	A6	A7	A8	A9	A10	GND
11	A1	A2	A3	A4	A5	GND
12	B46	B47	B48	B49	B50	GND
13	B41	B42	B43	B44	B45	GND
14	B36	B37	B38	B39	B40	GND
15	B31	B32	B33	B34	B35	GND
16	B26	B27	B28	B29	B30	GND
17	B21	B22	B23	B24	B25	GND
18	B16	B17	B18	B19	B20	GND
19	B11	B12	B13	B14	B15	GND
20	B6	B7	B8	B9	B10	GND
21	B1	B2	B3	B4	B5	GND
22	N/C	N/C	N/C	N/C	N/C	GND

Note: The letter in front of the number identifies the IP Module Slot. The number identifies the I/O pin number of that IP Module.

Example: A46 A = IP Module in Slot “A”
46 = I/O Pin number “46”
(This pin on the IP Module connects to J2, Pin 2, Row A.)

BOLD ITALIC Power Lines are NOT USED by the carrier board.

Pin22 signals are also not connected to IP modules to maintain compatibility with the CompactPCI core specification PICMG2.0 R3.0.

CompactPCI Bus Connections for J1

Table 2-2 indicates the pin assignments for the 32-bit CompactPCI bus signals at the J1 connector. The J1 connector is the lower rear connector on the ACPC8630A/8635A board, as viewed from the front. The connector consists

of 25 rows of six pins labeled A, B, C, D, E and F. Pin A1 is located at the lower right hand corner of the connector if the board is viewed from the front component side.

Refer to the CompactPCI bus specification for additional information on the CompactPCI bus signals.

Table 2-2: CompactPCI bus J1 CONNECTIONS

Pin	Row A	Row B	Row C	Row D	Row E	Row F
1	+5V	-12v	*TRST#*	+12V	+5V	GND
2	*TCK*	+5V	*TMS*	TDO	TDI	GND
3	INTA#	*INTB#*	*INTC#*	+5V	*INTD#*	GND
4	*BR*A4*	GND	V(I/0)	*INTP*	*INTS*	GND
5	*BR*A5*	*BR*B5*	RST#	GND	*GNT#*	GND
6	*REQ#*	GND	+3.3V	CLK	AD[31]	GND
7	AD[30]	AD[29]	AD[28]	GND	AD[27]	GND
8	AD[26]	GND	V(I/O)	AD[25]	AD[24]	GND
9	C/BE[3]#	IDSEL	AD[23]	GND	AD[22]	GND
10	AD[21]	GND	+3.3V	AD[20]	AD[19]	GND
11	AD[18]	AD[17]	AD[16]	GND	C/BE[2]#	GND
12	KEY AREA					GND
13						GND
14						GND
15	+3.3V	FRAME#	IRDY#	GND	TRDY#	GND
16	DEVSEL#	GND	V(I/O)	STOP#	LOCK#	GND
17	+3.3V	*SDONE*	*SBO#*	GND	PERR#	GND
18	SERR#	GND	+3.3V	PAR	C/BE[1]#	GND
19	+3.3V	AD[15]	AD[14]	GND	AD[13]	GND
20	AD[12]	GND	V(I/O)	AD[11]	AD[10]	GND
21	+3.3V	AD[9]	AD[8]	*M66EN*	C/BE[0]#	GND
22	AD[7]	GND	+3.3V	AD[6]	AD[5]	GND
23	+3.3V	AD[4]	AD[3]	+5V	AD[2]	GND
24	AD[1]	+5V	V(I/O)	AD[0]	*ACK64#*	GND
25	+5V	*REQ64#*	*ENUM#*	+3.3V	+5V	GND

Pound (#) is used to indicate an active-low signal.
BOLD ITALIC Logic Lines are NOT USED by the carrier board.

IP Field I/O Connectors (IP modules A and B)

The field side connectors of IP modules A and B mate to connectors P1 and P3 respectively, on the carrier board. IP location is shown in the top copper layer of the board for easy identification. Field and logic side connectors are keyed to avoid incorrect assembly.

P1 and P3 are 50-pin male plug header connectors. These AMP 173280-3 connectors mate to AMP 173279-3 connectors (or similar) on the IP modules. This provides excellent connection integrity and utilizes gold plating in the mating area. Threaded metric M2 screws and spacers (supplied with Acromag

IP modules) provide additional stability for harsh environments (see Drawing 4502-142 for assembly details).

IP Logic Interface Connectors (IP modules A and B)

The logic interface sides of IP modules A and B mate to AMP 173280-3 connectors, on the carrier board. IP locations are labeled on the board for easy identification. Field and logic side connectors are keyed to avoid incorrect assembly.

The AMP 173280-3 connectors mate to AMP 173279-3 connectors (or similar) on the IP modules. This provides excellent connection integrity and utilizes gold plating in the mating area. Threaded metric M2 screws and spacers (supplied with Acromag IP modules) provide additional stability for harsh environments (see Drawing 4502-142 for assembly details).

Pin assignments for these connectors are defined by the IP module specification and are shown in Table 2-3.

Table 2-3 IP Bus Connectors

Pin Description	Number	Pin Description	Number
GND	1	GND	26
CLK	2	+5V	27
Reset*	3	R/W*	28
D00	4	IDSel*	29
D01	5	***DMAReq0****	30
D02	6	MEMSel*	31
D03	7	***DMAReq1****	32
D04	8	IntSel*	33
D05	9	***DMAck0****	34
D06	10	IOSEL*	35
D07	11	***RESERVED***	36
D08	12	A1	37
D09	13	***DMAEnd****	38
D10	14	A2	39
D11	15	ERROR*	40
D12	16	A3	41
D13	17	INTReq0*	42
D14	18	A4	43
D15	19	INTReq1*	44
BS0*	20	A5	45
BS1*	21	STROBE*	46
-12V	22	A6	47
+12V	23	ACK*	48
+5V	24	***RESERVED***	49
GND	25	GND	50

Notes(Table 2-3):

1. Asterisk (*) is used to indicate an active-low signal.
2. ***BOLD ITALIC*** Logic Lines are NOT USED by the carrier board.

DATA TRANSFER TIMING

All CompactPCI bus read or write cycles to the ACPC863xA are typically implemented within 150 n seconds (FRAME# active to TRDY# active). After 150n seconds the PCI bus is available to the system for other PCI bus activity. As the PCI bus is released, the ACPC8630A / 8635A completes the read or write cycle to the targeted IP module or carrier register within the access times given in Table 2-4.

Table 2-4 ACPC8630A / 8635A Write and Read Complete Time

Register	Data Transfer Time
Carrier Registers Write	300ns, Typical[1]
Carrier Register Read	250ns, Typical[1]
8MHz IP Operation	
8 and 16-bit IP Write	525ns, Typical[1,2]
32-bit IP Write	900ns, Typical[1,2]
8 and 16-bit IP Read	500ns, Typical[1,2]
32-bit IP Read	850ns, Typical[1,2]
32MHz IP Operation	
8 and 16-bit IP Write	350ns, Typical[1,3,4]
32-bit IP Write	550ns, Typical[1,3,5]
8 and 16-bit IP Read	300ns, Typical[1,3,4]
32-bit IP Read	500ns, Typical[1,3,5]

Notes (Table 2-4):

1. The data transfer times are measured from the falling edge of FRAME# to the falling edge of READY#. The PCI bus starts a data transfer cycle by driving FRAME# low. The ACPC863xA signals the completion of a read or write cycle by driving READY# low. Note that an additional delay will occur during read cycles as the data is transferred to the PCI Bus. These values may vary up to 125ns due to the asynchronous relationship between the PCI bus clock and the local clock.
2. This access time assumes zero IP module wait states. For each IP module wait state 125n seconds must be added to this value.
3. This access time assumes zero IP module wait states. For each IP module wait state 31.25n seconds must be added to this value.
4. 8 or 16-bit IP Memory Space accesses require an additional 31.25ns when the IP is operating at 32MHz.
5. 32-bit IP Memory Space accesses require an additional 62.5ns when the IP is operating at 32MHz.

FIELD GROUNDING CONSIDERATIONS

Carrier boards are designed with passive filters on each supply line to each IP module. This provides maximum filtering and signal decoupling between the IP modules and the carrier board. However, the boards are considered non-isolated, since there is electrical continuity between the PCI bus and the IP grounds. Therefore, unless isolation is provided on the IP module itself, the

field I/O connections are not isolated from the PCI bus. Care should be taken in designing installations without isolation to avoid ground loops and noise pickup. This is particularly important for analog I/O applications when a high level of accuracy/resolution is needed (12-bits or more). Contact your Acromag representative for information on our many isolated signal conditioning products that could be used to interface to the IP input/output modules.

3. PROGRAMMING INFORMATION

This Section provides the specific information necessary to program and operate the ACPC8630A/8635A non-intelligent carrier board.

This Acromag ACPC8630A/8635A complies with PCI Specification Version 2.1 and CompactPCI Specification PICMG 2.0 R2.1. It is a CompactPCI bus slave carrier board for Industrial I/O Pack mezzanine (IP) modules. The carrier connects a CompactPCI host bus to the IP module's 16-bit data bus per the Industrial I/O Pack logic interface specification on the mezzanine (IP) modules which are installed on the carrier.

The CompactPCI bus is defined to address three distinct address spaces: I/O, memory, and configuration space. The IP modules can be accessed via the CompactPCI bus memory space only.

The CompactPCI card's configuration registers are initialized by system software at power-up to configure the card. The CompactPCI carrier is a Plug-and-Play card. As a Plug-and-Play card the board's base address and system interrupt request line are not selected via jumpers but are assigned by system software upon power-up via the configuration registers. A CompactPCI bus configuration access is used to access a CompactPCI card's configuration registers.

CompactPCI Configuration Address Space

When the computer is first powered-up, the computer's system configuration software scans the CompactPCI bus to determine what CompactPCI devices are present. The software also determines the configuration requirements of the CompactPCI card.

The system software accesses the configuration registers to determine how many blocks of memory space the carrier requires. It then programs the carrier's configuration registers with the unique memory address range assigned.

The configuration registers are also used to indicate that the CompactPCI carrier requires an interrupt request line. The system software then programs the configuration registers with the interrupt request line assigned to the CompactPCI carrier.

Since this CompactPCI carrier is relocatable and not hardwired in address space, this carrier's mapping and IRQ information is stored in the carrier's Configuration Space registers.

Configuration Transactions

The CompactPCI bus is designed to recognize certain I/O accesses initiated by the host processor as a configuration access. Configuration uses two 32-bit I/O ports located at addresses 0CF8 and 0CFC hex. These two ports are:

- 32-bit configuration address port, occupying I/O addresses 0CF8 through 0CFB hex.
- 32-bit configuration data port, occupying I/O addresses 0CFC through 0CFF hex.

Configuration space is accessed by writing a 32-bit long-word into the configuration address port that specifies the CompactPCI bus, the carrier board on the bus, and the configuration register on the carrier being accessed. A read or write to the configuration data port will then cause the configuration address value to be translated to the requested configuration cycle on the CompactPCI bus. Accesses to the configuration data port determine the size of the access to the configuration register addressed and can be an 8, 16, or 32-bit operation.

Any access to the Configuration address port that is not a 32-bit access is treated like a normal computer I/O access. Thus, computer I/O devices using 8 or 16-bit registers are not affected because they will be accessed as expected.

Configuration Registers

The PCI specification requires software driven initialization and configuration via the Configuration Address space. This CompactPCI carrier provides 256 bytes of configuration registers for this purpose. The CompactPCI carrier contains the configuration registers, shown in Table 3-2, to facilitate Plug-and-Play compatibility.

The Configuration Registers are accessed via the Configuration Address and Data Ports. The most important Configuration Registers are the Base Address Registers and the Interrupt Line Register, which must be read to determine the base address, assigned to the carrier and the interrupt request line that goes active on a carrier interrupt request.

Table 3-1 Configuration Address Port

BIT	FUNCTION
31	Enables accesses to Configuration Data to be translated to configuration cycles on the PCI bus.
30-24	Reserved, Return 0 when read.
23-16	Bus Number Choose a specific PCI bus in the system. Zero if only one PCI bus.

BIT	FUNCTION
15-11	Device Number Choose a specific device/PCI board on the bus.
10-8	Function Number Choose a specific function in a device. Function number is zero for the ACPC8630A / 8635A
7-2	Register Number Used to indicate which PCI Configuration Register to access. The Configuration Registers and their corresponding register numbers are given in Table 3-2.
1-0	Read Only bits that return 0.

Table 3-2 Configuration Registers

REG	D31 D24	D23 D16	D15 D8	D7 D0
0	Device ID=1024		Vendor ID= 10B5	
1	Status		Command	
2	Class Code		Rev ID	
3	BIST	Header	Latency	Cache
4	Base Address Memory Mapped Configuration Registers			
5	Base Address for I/O Mapped Configuration Registers			
6	*PCIBar2:* Base Address for Carrier/IO/ID/INT Space			
7	*PCIBar3:* Base Address for Carrier Memory Space [1]			
7-10	Not Used			
11	Subsystem ID		Subsystem Vendor ID	
12	Not Used			
13	Reserved			
14	Reserved			
15	Max_Lat	Min_Gnt	Inter. Pin	Inter. Line

Note (Table 3-2):

1. Optional address space that is enabled/disabled via a jumper prior to power-up.

Memory Map

This board consumes a 1K byte block and an optional 64M byte block that is enabled via configuration jumper prior to power-up. The 1K byte block of memory consumed by the board is composed of blocks of memory for the ID, I/O and INT spaces corresponding to two IP modules. In addition, a small portion of the 1K byte address space contains registers specific to the function of the carrier board. The 64M byte block of memory is composed of the Memory Space for up to two IP modules.

The carrier is configured to map this 1K byte and 64M byte block of memory into 32-bit memory space. The system configuration software will allocate space by writing the assigned addresses into the corresponding Base Address registers of the Configuration Registers. The memory map for ACPC8630A/8635A is shown in Table 3-3.

Table 3-3 ACPC8630A / 8635A Carrier Board Memory Map

PCIBar2 + (Hex)	High Byte D15 D08	Low Byte D07 D00	PCIBar2 + (Hex)
0001	Carrier Board Status / Control Register		**0000**
0003	IP Interrupt Pending Register		**0002**
0005	IP A Interrupt 0 Select Space		**0004**
0007	IP A Interrupt 1 Select Space		**0006**
0009	IP B Interrupt 0 Select Space		**0008**
000B	IP B Interrupt 1 Select Space		**000A**
000D ↓ 0017	Not Used[1]		**000C ↓ 0016**
0019	Clock Control Register		**0018**
001B ↓ 003F	Not Used[1]		**001A ↓ 003E**
0041 ↓ 007F	IP A ID Space	IP A ID Space	**0040 ↓ 007E**
0081 ↓ 00BF	IP B ID Space	IP B ID Space	**0080 ↓ 00BE**
00C1 ↓ 017F	Not Used[1]	Not Used[1]	**00C0 ↓ 017E**
0181 ↓ 01FF	IP A I/O Space	IP A I/O Space	**0180 ↓ 01FE**
0201 ↓ 027F	IP B I/O Space	IP B I/O Space	**0200 ↓ 027E**
0281 ↓ 07FFFFF	Not Used[1]	Not Used[1]	**0280 ↓ 07FFFFE**
0800001 ↓ 0FFFFFF	IP A Memory Space		**0800000 ↓ 0FFFFFE**
1000001 ↓ 17FFFFF	IP B Memory Space		**1000000 ↓ 17FFFFE**

PCIBar2 + (Hex)	High Byte D15 D08	Low Byte D07 D00	PCIBar2 + (Hex)
1800001 ↓ 3FFFFFF	Not Used[1]		1800000 ↓ 3FFFFFE

Notes(Table 3-3):

1. Shaded areas not used by ACPC8630A / 8635A carrier.
2. The board will return "0" for all addresses that are not used.

The ACPC8630A/8635A base addresses are determined through the PCI Configuration Registers. The addresses given in the memory map are relative to the base addresses PCIBar2 of the ACPC8630A/8635A carrier as shown in Table 3-2. The addresses within each IP's own space are specific to that IP module. Refer to the IP module's User Manual for information relating to the IP specific addressing.

The Carrier registers, IP Identification (ID) spaces, IP Input / Output (IO), IP Interrupt spaces, and Memory (MEM) spaces are accessible via the PCI bus space as given in Table 3-3. A 32-bit PCI bus access will result in two 16-bit accesses to the IP module. A 16-bit or 8-bit PCI bus access results in a single 16-bit or 8-bit access to the IP module respectively.

Carrier Status/Control Register - (Read/Write, PCIBar2 + 00H)

The Carrier Board Status Register reflects and controls functions globally on the carrier board. This includes monitoring the IP Error signal, enabling, disabling, or monitoring IP and timeout interrupts and performing software reset including the carrier and IP modules, and identifying if memory space is enabled.

Table 3-4 Carrier Status / Control Register Bit Assignment

BIT	FUNCTION
15-12	Carrier Identification: These bits are used for carrier identification. Writing to these bits will result in the data being stored. Reading these bits will result in the inverse of the stored value. Reset Condition: "1010" if Memory Space is not supported. "1011" if memory space is supported. Memory space support is controlled via a configuration jumper
11-09	Not Used (bits read as logic "0")
08 Write Only	Software Reset Writing a "1" to this bit causes a software reset. Writing a "0" or reading this bit has no effect. When set, the software reset pulse will have duration of 1 microsecond.
07-06	Not Used (bit reads as logic "0")

BIT	FUNCTION
05 Read And Write	IP Module Access Time Out Interrupt Pending This bit will be "1" when there is an IP Module Access Time Out interrupt pending. This bit will be "0" when there is no interrupt pending. Reset condition: Set to "0". Writing a "1" to this bit will release the pending interrupt.
04 Read Only	IP Module Access Time Out Status Indicates the last IP module access has timed out. This bit only reflects the last IP module access. "0" if last IP module access did not time out. "1" if last IP module access did time out.
03 Read And Write	Time Out Interrupt Enable When set to "1", this bit will enable the carrier board to generate an interrupt upon time out of an IP module access. The default setting or reset condition is "0" (interrupt generation upon time out disabled). The interrupt service routine must set this bit to 0 to clear the pending interrupt request.
02 Read And Write	IP Module Interrupt Enable When set to "1", this bit will enable the generation of IP module interrupts. The reset condition is "0", (IP module interrupt generation disabled). Interrupts must also be supported and configured in the IP modules.
01 Read Only	IP Module Interrupt Pending This bit will be "1" when there is an interrupt pending. This bit will be "0" when there is no interrupt pending. Polling this bit will reflect the IP Module's pending interrupt status, even if the IP Module Interrupt Enable bit is set to "0". Reset condition: Set to "0".
00 Read Only	IP Module Error This bit will be "1" when there is an active IP Module Error signal. This bit will be "0" when all IP module Error signals are inactive. This bit allows the user to monitor the Error signals of IP modules A and B. The IP specification states that the error signals indicate a non-recoverable error from the IP (such as a component failure or hard-wired configuration error). Refer to your IP specific documentation to see if the error signal is supported and what it indicates. Reset condition: Set to "0".

IP Interrupt Pending Register - (Read, PCIBar2 + 02H)

The IP Interrupt Pending Register is used to individually identify pending IP interrupts or a pending carrier generated interrupt as a result of IP module access time out. If multiple IP interrupts are pending, software must determine the order in which they are serviced.

MSB D7 -- D4	D3	D2	D1	LSB D0
Not Used (bits read as logic "0")	IP B Int1 Pend	IP B Int0 Pend	IP A Int1 Pend	IP A Int0 Pend

MSB D15 -- D11	D10	LSB D9 -- D8
Not Used (bits read as logic "0")	Time Out Interrupt Pend	Not Used (bits read as logic "0")

A bit will be a "1" when the corresponding interrupt is pending. A bit will be a "0" when its corresponding interrupt is not pending. Polling this bit will reflect the IP module's pending interrupt status, even if the IP interrupt enable bit is set to "0".
Reset Condition: Set to "0". An IP module pending interrupt bit will be cleared if its corresponding interrupt request signal is inactive.

Clock Control Register - (Read/Write, PCIBar2 + 018H)

The Clock Control Register is used to select the clock frequency of the individual IP modules. A "0" (default) selects the 8MHz clock. A "1" selects the 32MHz clock. A reset will set all bits of this register to "0".

MSB D15 -- D4	D1	LSB D0
Not Used	IP B CLK	IP A CLK

IP Module Interrupt Space - (Read Only)

The Interrupt space for each IP module is fixed at two 16-bit words. Interrupt 0 select space is read, typically by an interrupt service routine, to respond to an interrupt request via the IP Module's INTREQ0* signal. Likewise interrupt 1 select space is read to respond to an interrupt request via the IP Module's INTREQ1* signal. An access to an interrupt select space results in the IP module serving up an interrupt vector. In addition, access to the interrupt space will cause some IP modules to release their interrupt request. See each IP module's User Manual for details.

IP Module ID Space- (Read Only)

Each IP contains identification (ID) information that resides in the ID space per the IP specification. This area of memory contains either 32 bytes (Format I ID) or 64 bytes (Format II ID) of information, at most. Format I requires read of only the least significant byte. Format II requires read of a 16-bit value. The carrier will implement 16-bit reads to the ID space to allow support for either Format I or Format II. Both fixed and variable information may be present within the ID ROM. Variable information may include unique information required for the module. The identification Section for each IP module is located in the carrier board memory map per Table 3-3. Refer to

the documentation of your IP module for specific information about each IP module's ID Space contents.

IP Module I/O Space - (Read/Write)

The I/O space on each IP module is fixed at 64, 16-bit words (128 bytes). The two IP module I/O spaces are accessible at fixed offsets from PCIBar2. IP modules may not fully decode their I/O space and may use byte or word only accesses. See each IP module's User Manual for details.

IP Module Memory Space - (Read/Write)

Each IP module may contain up to 8M bytes of Memory Space arranged into 16-bit words. The two IP module Memory spaces are accessible at fixed offset from PCIBar3. IP modules may not fully decode their Memory space and may use only byte or word accesses. See each IP module's User Manual for details.

GENERATING INTERRUPTS

Interrupt requests originate from the carrier board in the case of an access time out and from the IP modules. Each IP may support 0, 1, or 2 interrupt requests. Upon an IP module interrupt request the carrier passes the interrupt request on to the host, provided that the carrier board is enabled for interrupts within the Carrier Board Status Register.

Sequence of Events for Processing an Interrupt

1. Write interrupt vector to the location specified on the IP and perform any other IP specific configuration required - do for each supported IP interrupt request.
2. Set the interrupt enable bit in the Carrier Board Status Register by writing a "1" to bit 2.
3. The IP asserts an interrupt request to the carrier board (asserts interrupt request line IntReq0* or IntReq1*).
4. The carrier drives PCI bus interrupt request signal INTA# active.
5. The interrupt service routine determines which IP module caused the interrupt by reading the carrier interrupt pending register. If multiple interrupts are pending the interrupt service routine software determines which IP module to service first. In a PC interrupts are shared and can be from any slot on the backplane or from the mother board itself. The driver must first check that the interrupt came from the PCI carrier by reading the carrier interrupt pending register.
6. The interrupt service routine accesses the interrupt space of the IP module selected to be serviced. Note that the interrupt space accessed must correspond to the interrupt request signal driven by the IP module.
7. The carrier board will assert the INTSEL* signal to the appropriate IP together with (carrier board generated) address bit A1 to select which interrupt

request is being processed (A1 low corresponds to INTREQ0*; A1 high corresponds to INTREQ1*).

8. The IP module receives an active INTSEL* signal from the carrier and supplies its interrupt vector to the host system during this interrupt acknowledge cycle. An IP module designed to release its interrupt request on acknowledge will release its interrupt request upon receiving an active INTSEL* signal from the carrier. If the IP module is designed to release its interrupt request on register access the interrupt service routine must access the required register to clear the interrupt request.
9. If the IP interrupt stimulus has been removed and no other IP modules have interrupts pending, the interrupt cycle is completed (i.e. the carrier board negates its interrupt request INTA#).

4. THEORY OF OPERATION

This section describes the basic functionality of the circuitry used on the carrier board. Refer to the Block Diagram shown in the Drawing 4502-143 as you review this material.

CARRIER BOARD OVERVIEW

The carrier board is a CompactPCI bus slave/target board providing two industry standard IP module interfaces. The carrier board's CompactPCI bus interface allows an intelligent single board computer (CompactPCI bus Master) to control and communicate with IP modules that are present on the CompactPCI bus carrier. IP module field I/O connections link to the field I/O connections of the carrier, which in turn are used to connect field electronic hardware to the carrier board via ribbon cable.

The CompactPCI bus and IP module logic commons have a direct electrical connection (i.e., they are not electrically isolated). However, the field I/O connections can be isolated from the CompactPCI bus if an IP module that provides this isolation (between the logic and field side) is utilized. A wide variety of IP modules are currently available (from Acromag and other vendors) that allow interface to many external devices for digital I/O, analog I/O, and communication applications.

PCI Bus Interface

The carrier board's CompactPCI bus interface is used to program and monitor carrier board registers for configuration and control of the board's documented modes of operation (see section 3). In addition, the CompactPCI bus interface is also used to communicate with and control external devices that are connected to an IP module's field I/O signals (assuming an IP module is present on the carrier board).

The CompactPCI bus interface is implemented in the logic of the carrier board's CompactPCI bus target interface chip. The CompactPCI bus interface chip implements PCI specification version 2.2 as an interrupting slave

including 8-bit and 16-bit data transfers to the IP modules. 32-bit IP data transfers will be treated as two 16-bit data transfers.

Note that the ACPC8630A/APC8635A is not hot-swappable.

The carrier board's CompactPCI bus data transfer rates are shown in Table 2-4.

Carrier Board Registers

The carrier board registers (presented in section 3) are implemented in the logic of the carrier board's FPGA. An outline of the functions provided by the carrier board registers includes:

- Identifying if memory space is enabled in the **Carrier Identification Bits**.
- Selecting either an 8MHz or 32MHz clock for each IP module in the Clock Control Register.
- Monitoring the error signal received from each IP module is possible via the IP Error Bit.
- Enabling of PCI bus interrupt requests from each IP module is possible via the IP Module Interrupt Enable Bit.
- Enabling of interrupt generation upon an IP module access time out is implemented via the Time Out Interrupt Enable Bit.
- Monitoring an IP module access time out is possible via the IP Module Access Time Out Status Bit.
- Identify pending interrupts via the carrier's IP Module Interrupt Pending Bit.
- Lastly, pending interrupts can be individually monitored via the IP Module Interrupt Pending register.

IP Logic Interface

The IP logic interface is also implemented in the carrier board's FPGA. The carrier board implements the ANSI/VITA 4 1995 Industrial I/O Pack logic interface specification and includes two IP logic interfaces. The CompactPCI bus address and data lines are linked to the address and data of the IP logic interface. This link is implemented and controlled by the carrier board's FPGA.

The CompactPCI bus to IP logic interface link allows a CompactPCI bus master to:

- Access up to 64 ID Space bytes for IP module identification via 8-bit or 16-bit data transfers using the PCI bus.
- Access up to 128 I/O Space bytes of IP data via 8-bit or 16-bit data transfers.
- Access up to 8M byes of IP Memory Space data via 8-bit or 16-bit data transfers.
- Access IP module interrupt space via 8-bit or 16-bit PCI bus data transfers.

- Respond to two IP module interrupt requests per IP module.
- When an IP module places data on the bus, for all data read cycles, any undriven data lines are read by the PCI bus as high because of pull-up resistors on the carrier board's data bus.

Carrier Board Clock Circuitry

A 32MHz clock, obtained from a multiplied by four 8MHz clock, is used to control the FPGA and the local bus. Clocks are then driven to each IP module via a high speed transceiver to allow for a module independent selectable clock. All clock lines include series damping resistors to reduce clock overshoot and undershoot.

PCI Interrupter

Interrupts are initiated from an interrupting IP module. However, the carrier board will only pass an interrupt generated by an IP module to the PCI bus if the carrier board has been first enabled for interrupts. Each IP module can initiate two interrupts which can be individually monitored on the carrier board. After interrupts are enabled on the carrier board via the Interrupt Enable Bits (see section 3 for programming details), an IP generated interrupt is recognized by the carrier board and is recorded in the carrier board's Interrupt Pending Register.

A carrier board pending interrupt will cause the board to pass the interrupt to the PCI bus provided the Interrupt Enable bits of the carrier's Status Register have been enabled (see section 3 for programming details). The PC interrupt request line assigned by the system configuration software will then be asserted. The Host CPU will respond to the asserted interrupt line by executing the interrupt service routine corresponding to the interrupt line asserted. The interrupt service routine is executed only if the IRQ on the Host computer's interrupt controller has been previously unmasked (see section 3 for programming details).

The interrupt service routine should respond to an interrupt by accessing IP Interrupt Select (INTSEL*) space. The interrupt service routine should also conclude the interrupt routine by writing the "End-Of-Interrupt" command to the Host's interrupt controller (see section 3 for more details).

Power Failure Monitor

The carrier board contains a 5 volts undervoltage monitoring circuit which provides a reset to the IP modules when the 5 volt power drops below 4.38 volts typical / 4.31 volts minimum. This circuitry is implemented per the Industrial I/O Pack specification.

Power-On Reset

The carrier board will provide an asynchronous reset signal to all IP modules for at least 200ms following power-up. The IP reset signal will remain active until the FPGA is initialized.

Power Supply Fuses

The +5V, supply lines to each of the IP modules are individually fused with a current limit of, at minimum, 2 amps imposed by the fuses. In addition, the +12, and -12 supply lines to each of the IP modules are individually fused with a current limit of, at minimum, 1 amp imposed by the fuses. A blown fuse can be identified by visible inspection or by use of an ohm meter. The fuses are located under each IP slot near the "logic connectors" (see figure 4502-141) Note that fuse type and current limit may vary. Contact Acromag for further details.

Power Supply Filters

Power line filters are dedicated to each IP module for filtering of the +5, +12, and -12 volt supplies. The power line filters are a "T" type filter circuit comprising ferrite bead inductors and a feed-through capacitor. The filters provide improved noise performance as is required on precision analog IP modules.

Software Compatibility with the APC8630/APC8635

To provide backwards compatibility with all software for the APC8630/8635, the APC8630A/8635A has the same PCI Device and Vendor ID and the option to disable IP Memory space. A jumper, set prior to power-up, is used to select between one of two configurations to load into the PCI interface chip. Note that 32MHz clock support is available with both of the APC8630A/8635A configurations. In order to determine the current configuration of the hardware use either the PCI configuration register PCIBar3 address and/or the Carrier Identification Register as outlined in Table 4-1. The default factory jumper configuration is memory space disabled.

Table 4-1

Model / Configuration	PCIBar3	Carrier Identification Register PCI Bar2 + 0H bits 15 - 12
ACPC8630 / ACPC8635	0x00000000 (not used)	Write : no effect Read : undefined Reset : undefined
ACPC8630A / ACPC8635A without memory support	0x00000000 (not used)	Write : register data Read : return inverse of register data Reset : set to "A"

Model / Configuration	PCIBar3	Carrier Identification Register PCI Bar2 + 0H bits 15 - 12
ACPC8630A / ACPC8635A with memory support	Valid addresses	Write : register data Read : return inverse of register data Reset : set to "B"

5. SERVICE AND REPAIR

SERVICE AND REPAIR ASSISTANCE

Surface-Mounted Technology (SMT) boards are generally difficult to repair. It is highly recommended that a non-functioning board be returned to Acromag for repair. The board can be damaged unless special SMT repair and service tools are used. Further, Acromag has automated test equipment that thoroughly checks the performance of each board. When a board is first produced and when any repair is made it is tested before shipment.

Please refer to Acromag's Service Policy Bulletin or contact Acromag for complete details on how to obtain parts and repair.

PRELIMINARY SERVICE PROCEDURE

Before beginning repair, be sure that all of the procedures in Section 2Preparation for Use, have been followed. Also, refer to the documentation of your carrier board to verify that it is correctly configured. Verify that there are no blown fuses. Replacement of the carrier and/or IP with one that is known to work correctly is a good technique to isolate a faulty board.

CAUTION: POWER MUST BE TURNED OFF BEFORE REMOVING OR INSERTING BOARDS

WHERE TO GET HELP

If you continue to have problems, your next step should be to visit the Acromag worldwide web site at www.acromag.com. Our web site contains the most up-to-date product and software information.

Go to the "Support" tab to access:

- Application Notes
- Frequently Asked Questions (FAQ's)
- Product Knowledge Base
- Tutorials

- Software Updates/Drivers

An email question can also be submitted from within the Knowledge Base or directly from the “Contact Us” tab.

Acromag’s application engineers can also be contacted directly for technical assistance via telephone or FAX through the numbers listed below. When needed, complete repair services are also available.

Phone: 248-295-0310
Fax: 248-624-9234
Email: solutions@acromag.com

6. SPECIFICATIONS

PHYSICAL

Physical Configuration .....3U CompactPCI 5V/3.3V
Length .....3.937 inches (100.0 mm)
Height .....6.299 inches (160.0 mm)
Board thickness .....0.063 inches (1.60 mm)
Max component height .....0.380 inches (9.65 mm)
Max component height under IP modules
0.180 inches (4.57 mm)
Recommended Card Spacing....0.800 inches (20.32 mm)

Connectors

J1 (CompactPCI Bus) .....CompactPCI Specification PICMG 2.0 R2.1 5 V Board Type “A” right-angle female connector, 110 contacts with upper shield.
J2 (CompactPCI Rear Field I/O compatible with Model ACPC8635) CompactPCI Core Specification PICMG 2.0 R3.0. Utilizes Type “B” right angle female connector, 88 contacts with upper shield.
Not compatible with 64 bit CompactPCI or PXI.

Note: Also follows IP field I/O mapping to CompactPCI field I/O (CompactPCI Specification PICMG 2.4 R1.0) for Pins 1-11. Pins 12-22 were changed to maintain compatibility with the CompactPCI core specification PICMG 2.0 R3.0.
P5, P6 (Carrier Front Panel Field I/O Model ACPC8630A)
50-pin female connectors AMP 787096-1 or equivalent high density right angle.
Compatible with 64-bit CompactPCI or PXI.
P1, P3 (IP Field I/O).....50-pin male plug header
(AMP 173280-3 or equivalent).
P2, P4 (IP Logic) .....50-pin male plug header
(AMP 173280-3 or equivalent).

Power

Board power requirements are a function of the installed IP modules. This specification lists currents for the carrier board only. The carrier board provides +5V, +12V and -12V power to each IP from the CompactPCI bus. Each IP module supply line is individually filtered and fused

Fuses

+5 volts, 2 amps (minimum) per slot
±12 volts, 1 amp (minimum) per slot

The power failure monitor circuit provides a reset to IP modules when the 5 volt power drops below 4.38 volts typically / 4.31 volts minimum.

Currents specified are for the carrier board only for Model ACPC8630A / 8635A, add the IP module currents for the total current required from each supply.

+3.3 Volts (±10%).....225 mA Typical
300 mA Maximum
+5 Volts (±10%).....21 mA Typical
30 mA Maximum
+12 Volts (±5%).....0mA (not used)
-12 Volts (±5%) .....0mA (not used)

CompactPCI BUS COMPLIANCE

Specification .....This device meets or exceeds all written PCI Specification Version 2.2 & CompactPCI Specification PICMG 2.0 R2.1.

Data Transfer Bus .....Slave with 32-bit, 16-bit, and 8-bit data transfer operation. 32-bit read or write accesses are implemented as two 16 bit transfers to the IP modules.

PCI bus Write Cycle Time.....150nS Typical measured from falling edge of FRAME# to the falling edge of TRDY#.

PCI bus Read Cycle Time.....150nS Typical; the carrier issues a RETRY which frees the PCI bus while the read request is completed. The PCI bus will repeat the same read request until it completes with the requested data.

Write Complete Time .....Time from FRAME# active until LRDYi# active. All values assume 0 IP module wait states
300nS Typical carrier register
525nS Typical 8MHz 8-bit and 16-bit IP module write.
900nS Typical 8MHz 32-bit IP module write.
350nS Typical 32MHz 8-bit and 16-bit IP module write.
550nS Typical 32MHz 32-bit IP module write.

Read Complete Time .....Time from FRAME# active until LRDYi# active. All values assume 0 IP module wait states
250nS Typical carrier register
500nS Typical 8MHz 8-bit and 16-bit IP module read.
850nS Typical 8MHz 32-bit IP module read.

300nS Typical 32MHz 8-bit and 16-bit IP module read.
500nS Typical 32MHz 32-bit IP module read.

Interrupts.....PCIbus INTA# interrupt signal
Up to two requests sourced from each IP mapped to INTA#. Interrupt vectors come from IP modules via access to IP module INT space. Upon power-up the system auto- configuration process (plug & play) maps the carrier's base addresses (for a 1K byte and 64M byte blocks of memory) into the PCI bus 32-bit Memory Space.

INDUSTRIAL I/O PACK COMPLIANCE

Specification .....This device meets or exceeds all written Industrial I/O Pack specifications per ANSI/VITA 4 1995 for 8MHz and 32MHz operation with a maximum of two IP modules. Supports Type I and Type II ID space formats.

Mechanical Interface.....Carrier supports two single size IP modules (A, B) 32-bit IP modules are not supported.

Electrical Interface.....Carrier drivers use 5V CMOS logic

IP Clocks.....Support 8MHZ (default) or 32MHz IP clocks that are independently selected per each IP slot.

I/O Space .....16-bit and 8-bit: Supports 128 byte values per IP module.

ID Space .....16 and 8-bit; Supports Type 1 32 bytes per IP (consecutive odd byte addresses). Also supports Type II 32 words per IP via D16 data transfers.

Memory Space.....16 and 8-bit: Supports up to 8M bytes per IP.

Interrupts.....Supports two interrupt requests per IP and interrupt acknowledge cycles via access to IP INT space.

ENVIRONMENTAL

Operating Temperature.....0 to +70°C (ACPC8630A / ACPC8635A)
-40 to +85°C (ACPC8630AE / ACPC8635AE)

Relative Humidity .....5-95% non-condensing

Storage Temperature .....-55 to +125°C.

Non-Isolated .....CompactPCI bus and IP module commons have a direct electrical connection. As such unless the IP module provides isolation between the logic and field side, the field I/O signals are not isolated from the CompactPCI bus.

Radiated Field Immunity (RFI)
Designed to comply with EN61000-4-3 (3V/m, 80 to 1000MHz and 1.4GHz to 2.0GHz, 1V/m, 2.0GHz to 2.7GHz.) and European Norm EN61000-6-1 with no register upsets.

Conducted RF Immunity (CRFI)
Complies with EN61000-4-6 (3V/rms, 150KHz to 80MHz) and European Norm EN61000-6-1 with no register upsets.

Electrostatic Discharge Immunity (ESD)
Complies with EN61000-4-2 Level 3 (8KV enclosure port air discharge) and Level 2 (4KV enclosure port contact discharge) and European Norm EN61000-6-1.

Surge Immunity ....Not required for signal I/O per European Norm EN61000-6-1.

Electric Fast Transient Immunity (EFT)
Complies with EN61000-4-4 Level 2 (0.5KV at field I/O terminals) and European Norm EN61000-6-1.

Radiated Emissions.....Meets or exceeds European Norm EN61000-6-3 for class B equipment. Shielded cables with I/O connections in a shielded enclosure are required to meet compliance.

7. APPENDIX

ACPC8630A Cables and Transition Modules

CABLE: MODEL 5028-372 (SCSI-2 to CHAMP 0.8mm Cable, Shielded)

Type: .....Round shielded cable, 50-wires (SCSI-2 male connector at one end and a CHAMP 0.8mm plug connector at the other end). The cable length is 2 meters (6.56 feet). This shielded cable is recommended for all I/O applications (both digital I/O and precision analog I/O).

Application:.....Used to connect Model 5028-378 SCSI-2 termination panel to the ACPC8630A (E) board. This cable is used for front I/O only.

Length: .....Standard length is 2 meters (6.56 feet). Consult factory for other lengths. It is recommended that this length be kept to a minimum to reduce noise and power loss.

Cable: .....50 conductors (25 pairs), 30 AWG with a foil/braided shield inside a PVC jacket.

Connectors:.....(One End): SCSI-2, 50-pin male connector with backshell and spring latch hardware.
(Other End): CHAMP 0.8mm 50-pin plug connector with backshell and screw latch hardware.

Keying: .....Both connectors have a “D Shell” to prevent improper installation.

Schematic and Physical Attributes: See Drawing 4501-890.

Electrical Specifications: .....30 VAC. 0.3 ampere 100% energized (per CHAMP 0.8mm connector specifications).

Operating Temperature:.....-40°C to +85°C.

Storage Temperature: .....-40°C to +85°C.

Shipping Weight: .....1.0 pound (0.5Kg), packed.

SCSI-2 TERMINATION PANEL: MODEL 5028-378

Type: .....Termination Panel for ACPC8630A (E) Boards

Application:.....To connect field I/O signals to the Industrial I/O Pack (IP). *Termination Panel:* Acromag Part 4001-041 (Conta-Clip, Inc. Type SCS-50/GRN). The 5028-378 SCSI-2 termination panel facilitates the connection of up to 50 field I/O signals and connects to the ACPC8630(E) 3U non-intelligent carrier boards (A-B connectors only) via a SCSI-2 to CHAMP 0.8mm Cable (Model 5028-372). The A-B connectors on the front panel of the carrier board connect the field I/O signals to the P2 connector on each of the Industrial I/O Pack modules. Field signals are accessed via screw terminal strips. The terminal strip markings on the termination panel (1-50) correspond to P2 (pins 1-50) on the Industrial I/O

Pack (IP). Each Industrial I/O Pack (IP) has its own unique P2 pin assignments. Refer to the IP module manual for correct wiring connections to the termination panel.

Schematic and Physical Attributes: See Drawing 4501-891.
Field Wiring:.....50-position terminal blocks with screw clamps. Wire range 12 to 26 AWG.
Connections to ACPC8630(E):...J1, SCSI-2, 50-pin female connector with latch blocks. Use Acromag Model 5028-372 cable to connect panel to carrier board. Keep cable as short as possible to reduce noise and power loss.
Mounting: .....Termination panel is snapped on the DIN mounting rail.
Printed Circuit Board: .....Military grade FR-4 epoxy glass circuit board, 0.063 inches thick.
Operating Temperature:.....-40°C to +85°C.
Storage Temperature: .....-40°C to +85°C.
Shipping Weight: .....1.25 pounds (0.6kg) packed.

ACPC8635A Cables and Transition Modules

CompactPCI TRANSITION MODULE: MODEL TRANS-C100

Type: .....Transition module for ACPC8635A (E) boards.
Application:.....To repeat field I/O signals of IP modules A through B for rear exit from CompactPCI card cages. This module is available for use in card cages which provide rear exit for I/O connections via 80 mm wide transition modules (transition modules can only be used in card cages specifically designed for them). It is a single-height (3U), single-slot module and adheres to the CompactPCI mechanical dimensions and IEEE Standard (1101.11-1998), with a printed circuit board depth of 80mm, which is a standard transition module depth. The transition module connects to Acromag Termination Panel (Model 5025-552) using 50-pin Flat Ribbon Cable, Non-Shielded (Model 5025-550-x) or 50-pin Flat Ribbon Cable, Shielded (Model 5025-551-x) to the rear of the card cage, and to ACPC8635A (E) boards within the card cage.
Schematic and Physical Attributes: See Drawing 4501-883.
Electrical Specifications: .....Each foil/pin rated at 1 Amp. DC. Foil spacing permits up to 60 volts DC channel differential.
Field Wiring:.....100 pin header (male) condo connector P1 (3M No. 3433-D302), employing long ejector latches and 30u" gold in mating area (per MIL-G-45204, Type II, Grade C). Connects to Acromag termination panel 5025-552 from the rear of the card cage via flat 50 pin ribbon cables model 5025-550-x or 5025-551-x.
Connections to ACPC8635A (E): Connections are made though the PC board connector J2 (110 signals, female right angle with upper ground shield). The transition module plugs directly behind the ACPC8635A (E) board into the 3U CompactPCI bus backplane within the card cage system.
Mounting: .....Transition module is inserted into a 3U-size, 80 mm width slot at the rear of the CompactPCI bus card cage. (Directly behind ACPC8635A (E) board)
Printed Circuit Board: .....Eight-layer, military-grade FR-4 epoxy glass circuit board, 0.063 inches thick.
Operating Temperature:.....-40°C to +85°C.
Storage Temperature: .....-40°C to +85°C.
Shipping Weight: .....0.30 pounds (0.14Kg) packed.

CABLE: MODEL 5025-550-x (Non-Shielded)
MODEL 5025-551-x (Shielded)

Type: .....Flat Ribbon Cable, 50-wires (female connectors at both ends). The '-x' suffix designates the length in feet (12 feet maximum). Choose shielded or unshielded cable according to model number. The unshielded cable is recommended for digital I/O, while the shielded cable is recommended for optimum performance with precision analog I/O applications.

Application:.....Used to connect Model 5025-552 termination panel to the TRANS-C100 Transition Module. The transition module then connects to all IP module slots to the rear of the ACPC8635A (E) (Slots A-B).

Length: .....Last field of part number designates length in feet (user-specified, 12 feet maximum). It is recommended that this length be kept to a minimum to reduce noise and power loss.

Cable: .....50-wire flat ribbon cable, 28 gage. Non-Shielded cable model uses Acromag Part 2002-211 (3M Type C3365/50 or equivalent). Shielded cable model uses Acromag Part 2002-261 (3M Type 3476/50 or equivalent).

Headers (Both Ends): .....50-pin female header with strain relief. Header - Acromag Part 1004-512 (3M Type 3425-6600 or equivalent). Strain Relief - Acromag Part 1004-534 (3M Type 3448-3050 or equivalent).

Keying: .....Headers at both ends have polarizing key to prevent improper installation.

Schematic and Physical Attributes: For Non-Shielded cable model, see Drawing 4501-462. For Shielded cable model, see Drawing 4501-463.

Shipping Weight: .....1.0 pound (0.5Kg), packed.

TERMINATION PANEL: MODEL 5025-552

Type: .....Termination Panel for ACPC8635A (E) boards.

Application:.....To connect field I/O signals to the Industrial I/O Pack (IP). Termination Panel: Acromag Part 4001-040 (Phoenix Contact Type FLKM 50). The 5025-552 termination panel facilitates the connection of up to 50 field I/O signals and connects to the TRANS-C100 transition module via a flat ribbon cable (Model 5025-550-x or 5025-551-x). Field signals are accessed via screw terminal strips. The terminal strip markings on the termination panel (1-50) correspond to P2 (pins 1-50) on the Industrial I/O Pack (IP). Each Industrial I/O Pack (IP) has its own unique P2 pin assignments. Refer to the IP module manual for correct wiring connections to the termination panel.

Schematic and Physical Attributes: See Drawing 4501-464.

Field Wiring:.....50-position terminal blocks with screw clamps. Wire range 12 to 26 AWG.

Connections to TRANS-C100 Transition Module: P1, 50-pin male header with strain relief ejectors. Use Acromag 5025-550-x or 5025-551-x cable to connect panel and TRANS-C100 transition module. Keep cable as short as possible to reduce noise and power loss.

Mounting: .....Termination panel is snapped on the DIN mounting rail.

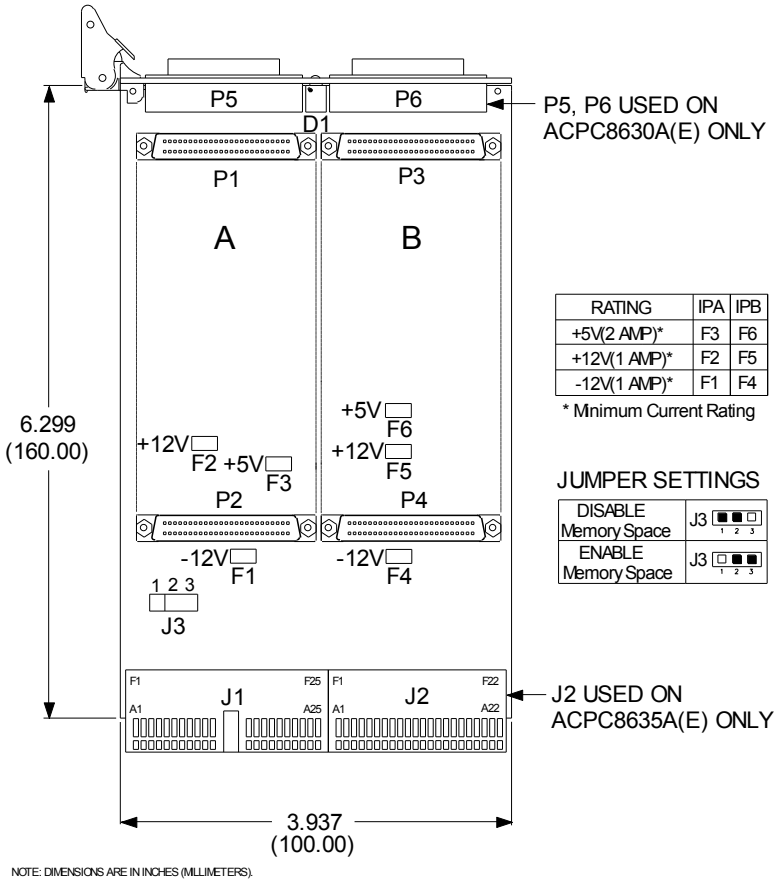
Printed Circuit Board: .....Military grade FR-4 epoxy glass circuit board, 0.063 inches thick.

Operating Temperature:.....-40°C to +100°C.

Storage Temperature: .....-40°C to +100°C.

Shipping Weight: .....1.25 pounds (0.6kg) packed.

DRAWINGS



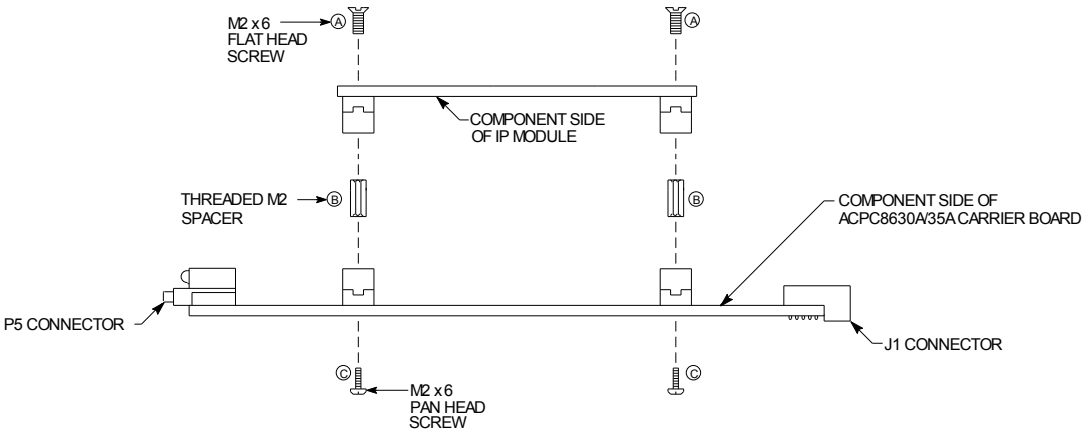
RATING	IPA	IPB
+5V(2 AMP)*	F3	F6
+12V(1 AMP)*	F2	F5
-12V(1 AMP)*	F1	F4

* Minimum Current Rating

JUMPER SETTINGS

DISABLE Memory Space	J3
ENABLE Memory Space	J3

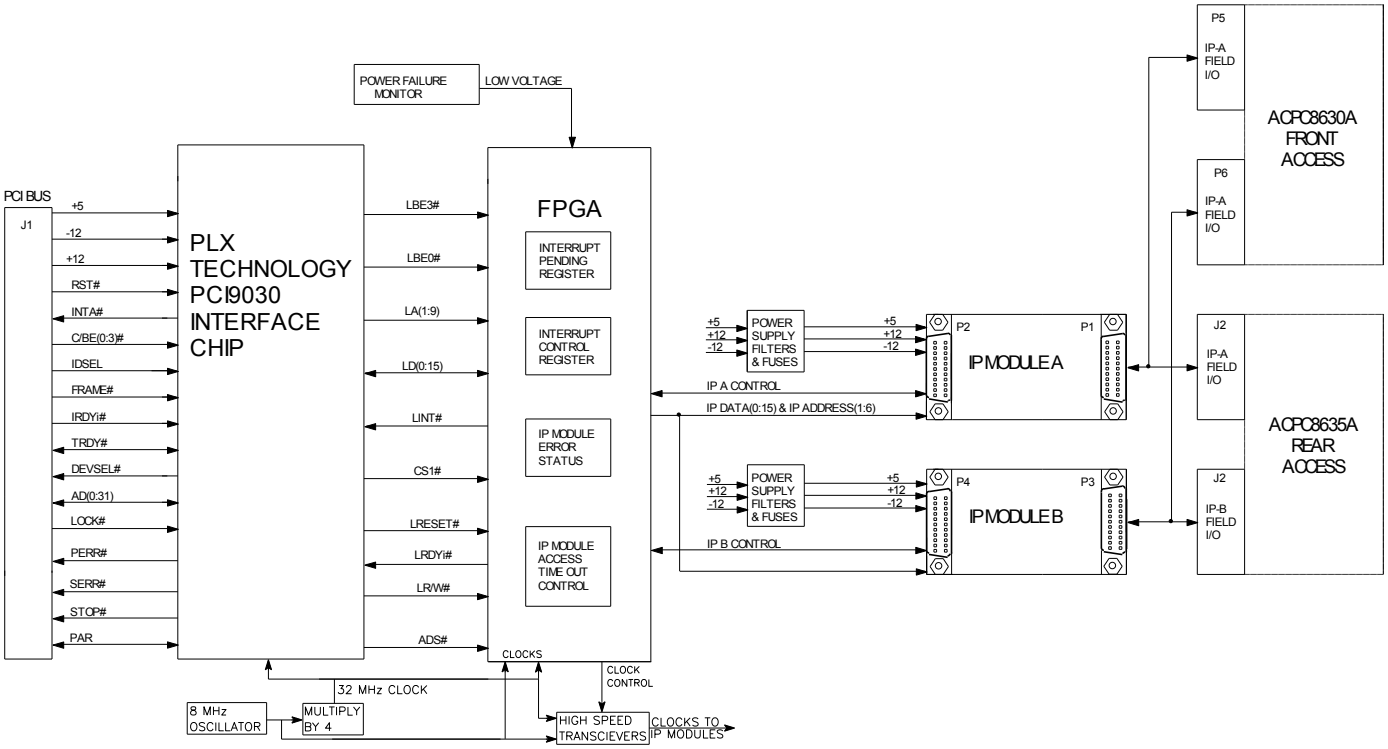
ACPC8630A/35A(E) 3U JUMPER, FUSE AND IP LOCATIONS 4502-141A



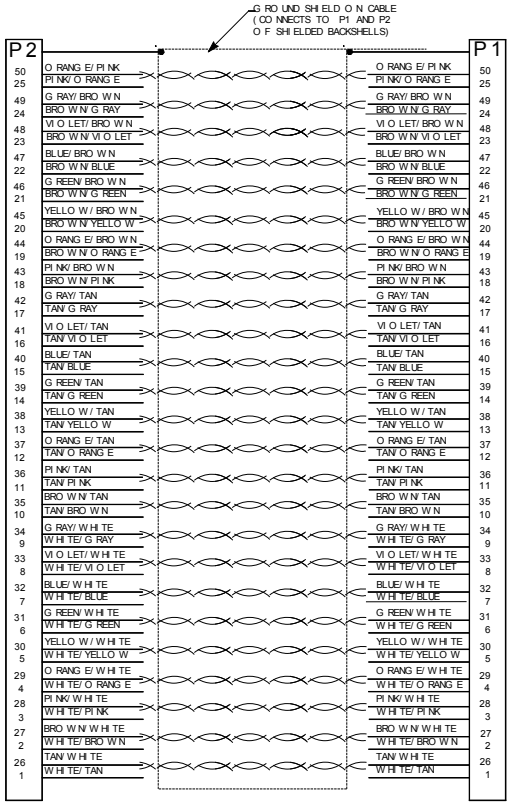
ASSEMBLY PROCEDURE:

1. THREADED SPACERS ARE PROVIDED IN TWO DIFFERENT LENGTHS. THE SHORTER LENGTH IS FOR USE WITH ACPC8630A/35A CARRIER BOARD (SHOWN). CHECK YOUR CARRIER BOARD TO DETERMINE ITS REQUIREMENTS. MOUNTING HARDWARE PROVIDED MAY NOT BE COMPATIBLE WITH ALL TYPES OF CARRIER BOARDS.
2. INSERT FLAT HEAD SCREWS (ITEM A) THROUGH SOLDER SIDE OF IP MODULE AND INTO HEX SPACERS (ITEM B) AND TIGHTEN (4 PLACES) UNTIL HEX SPACER IS COMPLETELY SEATED.
3. CAREFULLY ALIGN IP MODULE TO CARRIER BOARD AND PRESS TOGETHER UNTIL CONNECTORS AND SPACERS ARE SEATED.
4. INSERT PAN HEAD SCREWS (ITEM C) THROUGH SOLDER SIDE OF CARRIER BOARD AND INTO HEX SPACERS (ITEM B) AND TIGHTEN (4 PLACES).

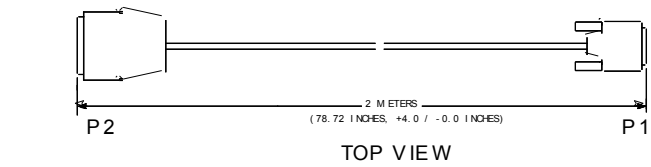
IP MODULE TO ACPC8630A/35A(E) CARRIER BOARD MECHANICAL ASSEMBLY 4502-142A



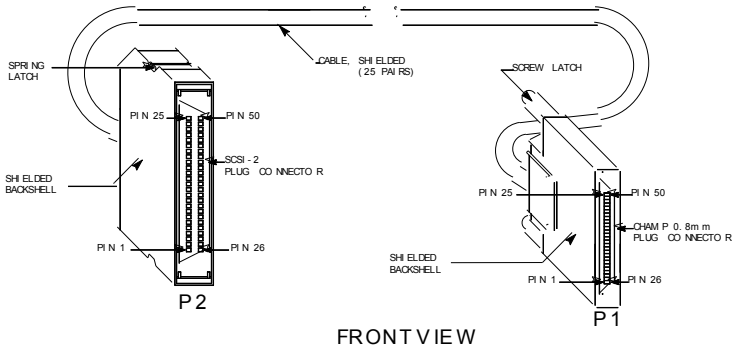
ACPC8630A/35A BLOCK DIAGRAM 4502-143A



SCHEMATIC



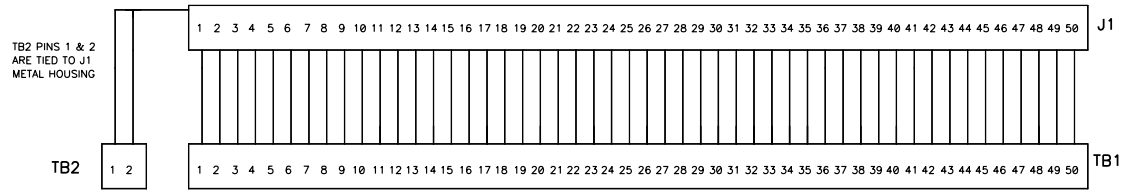
TOP VIEW



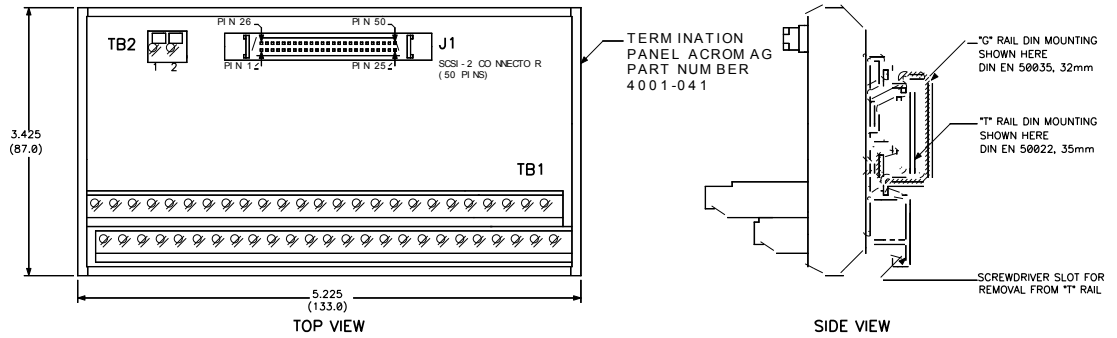
FRONT VIEW

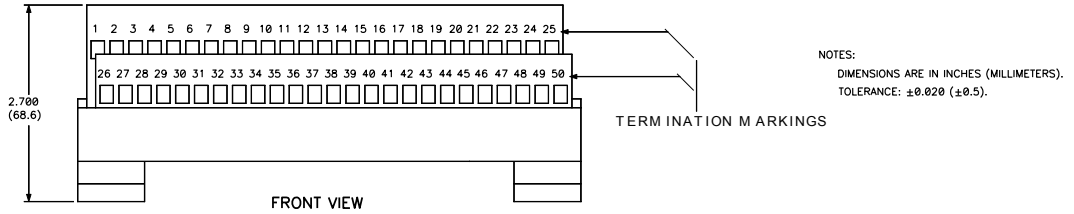
MODEL 5028-372, SCSI-2 TO CHAMP 0.8mm CABLE, SHIELDED

4501-890A

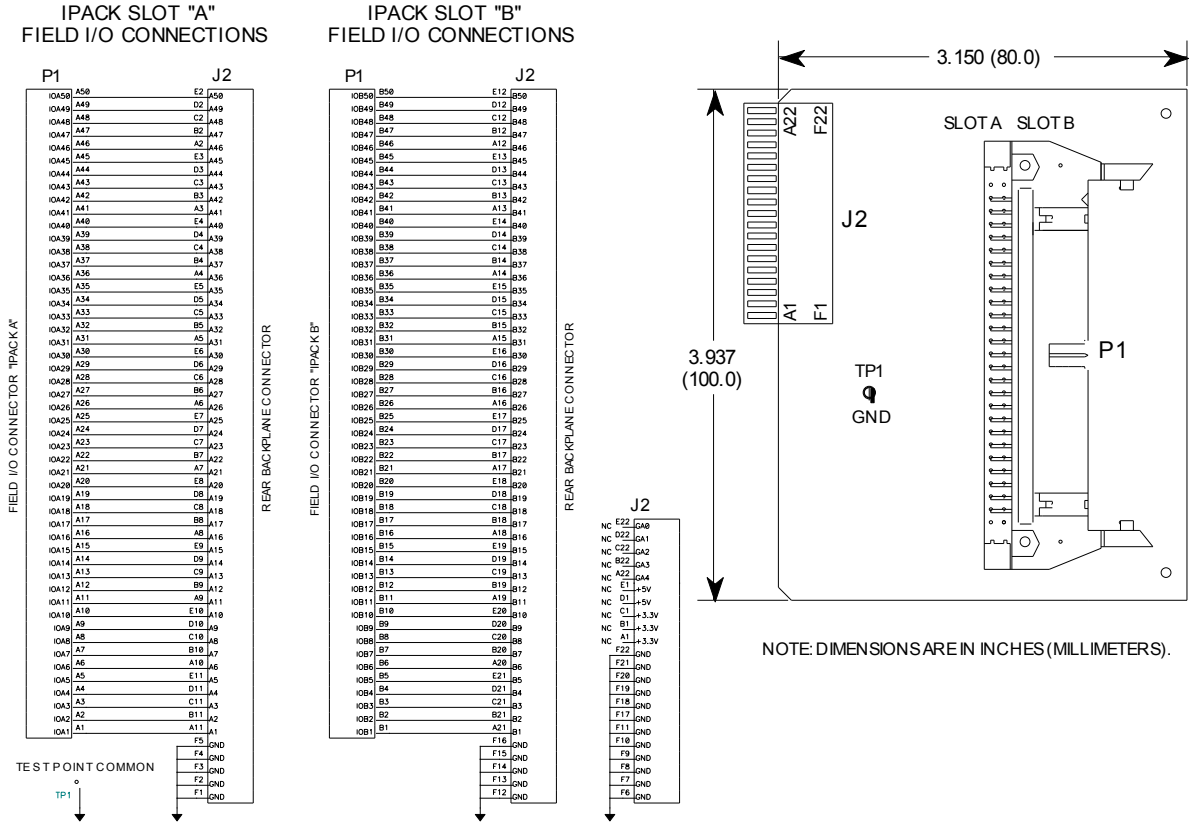


MODEL 5028-378 SCSI-2 TERMINATION PANEL SCHEMATIC



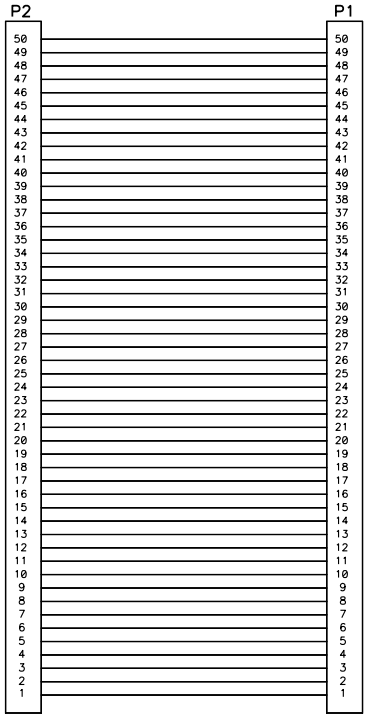


MODEL 5028-378 SCSI-2 TERMINATION PANEL 4501-891A

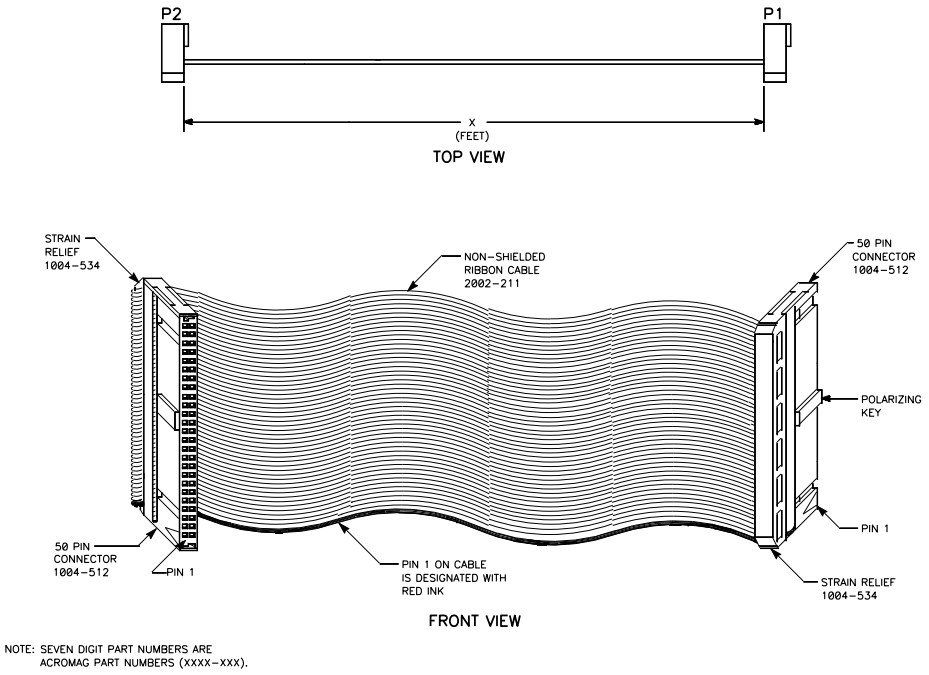


NOTE: DIMENSIONS ARE IN INCHES (MILLIMETERS).

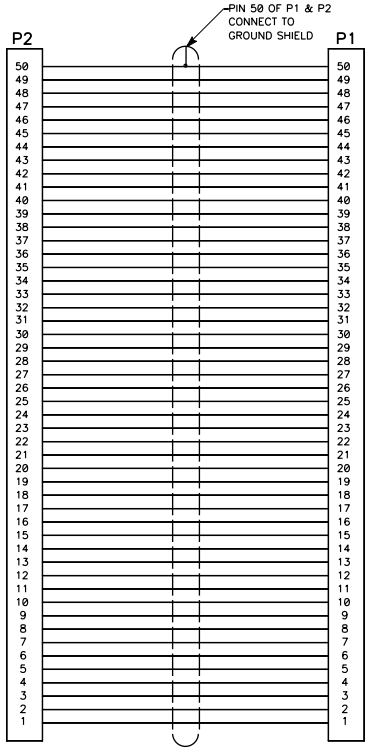
TRANS-C100, 3U CompactPCI TRANSITION MODULE 4501-883A



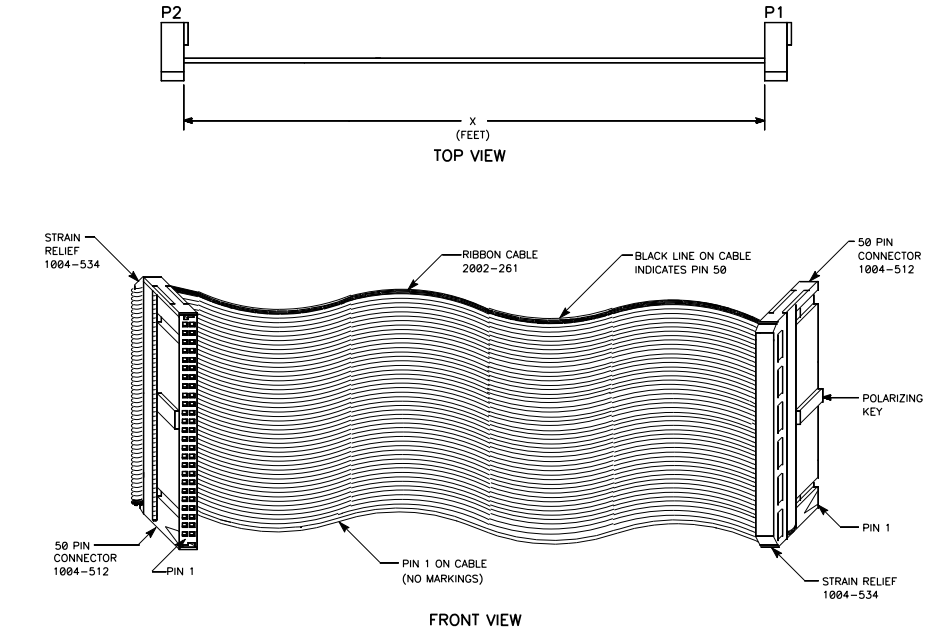
MODEL 5025-550-x SCHEMATIC



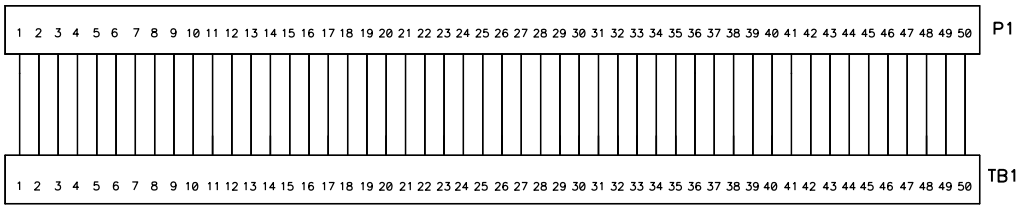
MODEL 5025-550-x SIGNAL CABLE, NON-SHIELDED 4501-462A



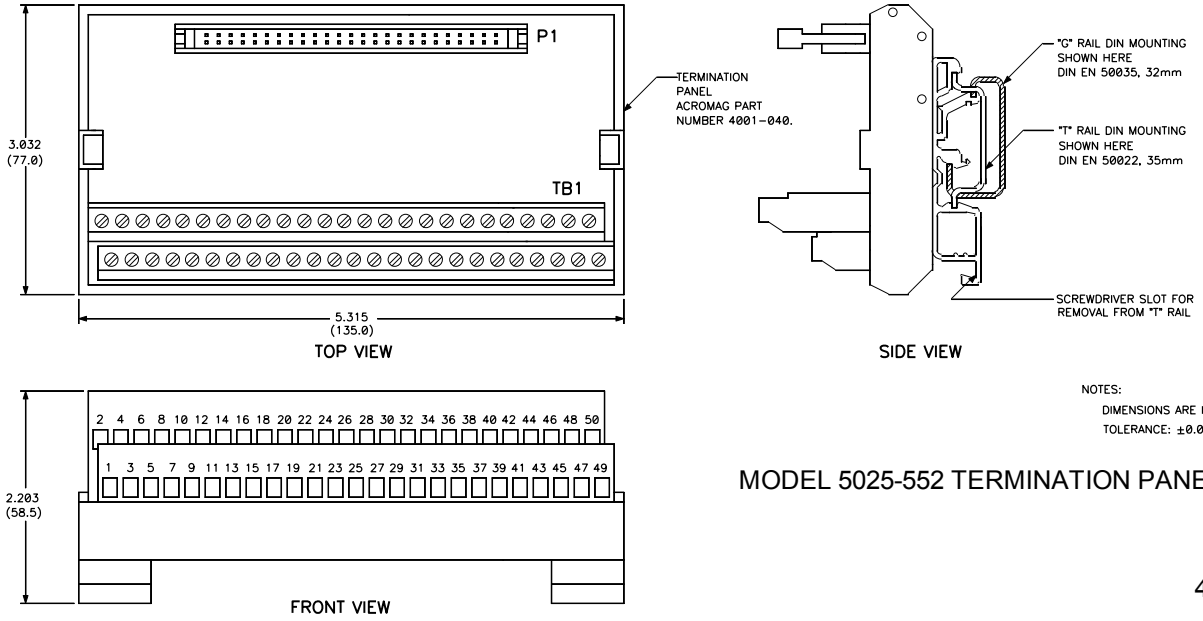
MODEL 5025-551-x SCHEMATIC



MODEL 5025-551-x SIGNAL CABLE, SHIELDED 4501-463A



MODEL 5025-552 TERMINATION PANEL SCHEMATIC



NOTES:
DIMENSIONS ARE IN INCHES (MILLIMETERS).
TOLERANCE: ±0.020 (±0.5).

MODEL 5025-552 TERMINATION PANEL

4501-464A

TRANSITION MODULE: MODEL TRANS-C100

Type: Transition Module for ACPC8635(E) Boards

The TRANS-C100 transition module plugs into the rear backplane directly behind the carrier board. The field I/O connections are made through the backplane to J2 connector of the carrier board and then routed to one condo connector P1 on the transition module (marked IP module slots “A” and “B”) for rear exit from the card cage. It is available for use in 3U CompactPCI bus card cages which provide rear exit for I/O connections via transition modules (transition modules can only be used in card cages specifically designed for them). It is a single-height (3U), single-slot module with a printed circuit board depth of 80mm, which is a standard transition module depth. The transition module connects to Acromag Termination Panel (Model 5025-552) using 50-pin Flat Ribbon Cable, Non-Shielded (Model 5025-550-x) or 50-pin Flat Ribbon Cable, Shielded (Model 5025-551-x) to the rear of the card cage, and to ACPC8635(E) boards within the card cage.

Application	To repeat field I/O signals of IP modules A through B for rear exit from 3U CompactPCI card cages.
Schematic and Physical Attributes	See Drawing 4501-883 (Over).
Electrical Specifications	Each foil/pin rated at 1 Amp. DC. Foil spacings permit up to 60 volts DC channel differential.
Field Wiring	100 pin header (male) condo connector P1. Connects to Acromag termination panel 5025-552 from the rear of the card cage via flat 50 pin ribbon cables model 5025-550-x or 5025-551-x.
Connections to ACPC8635	Connections are made though the PC board connector J2 (110 signals, female right angle with upper ground shield). The transition module plugs directly behind the ACPC8635(E) board into the 3U CompactPCI bus backplane within the card cage system.
Mounting	Transition module is inserted into a 3U-size, 80 mm width slot at the rear of the 3U CompactPCI bus card cage. (Directly behind ACPC8635(E) board)
Printed Circuit Board	Eight-layer, military-grade FR-4 epoxy glass circuit board, 0.063 inches thick.
Operating Temperature	-40°C to +85°C.
Storage Temperature	-40°C to +85°C.
Shipping Weight	0.30 pounds (0.14Kg) packed.

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Wixom, MI 48393-2417 U.S.A.
Tel: (248) 624-1541
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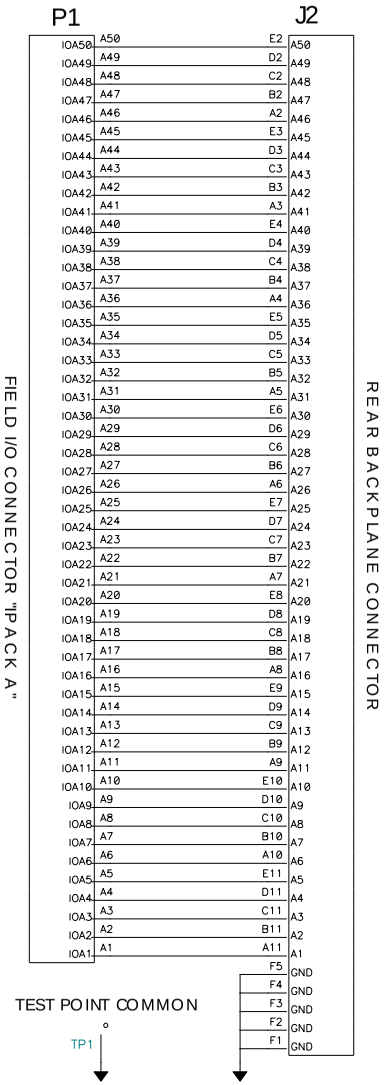
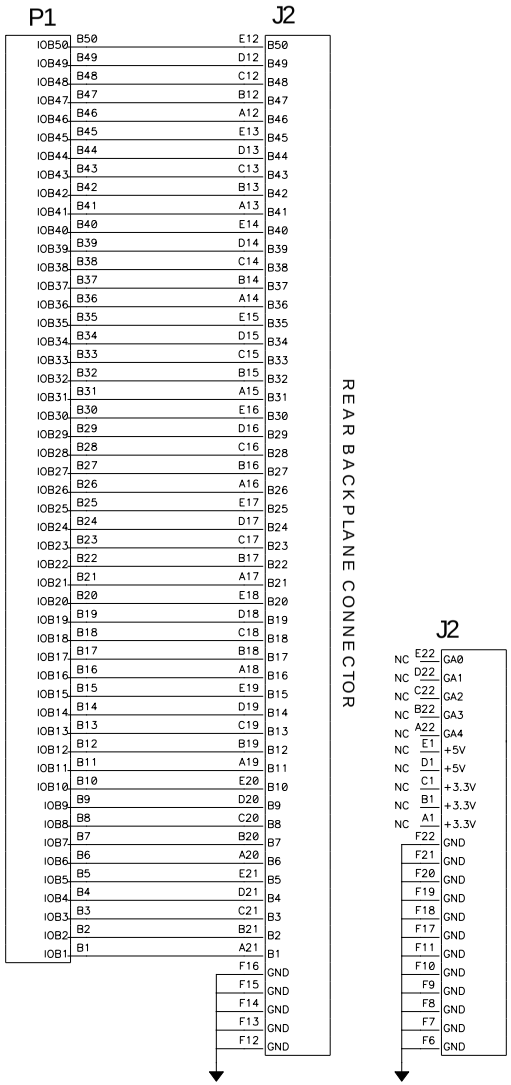
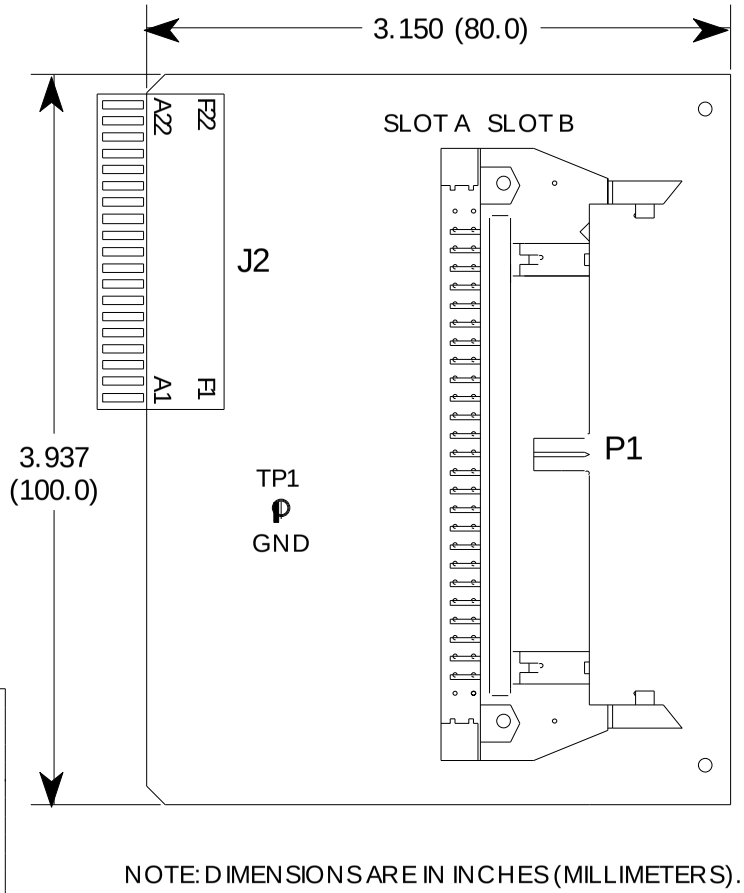
IPACK SLOT "A" FIELD I/O CONNECTIONS



IPACK SLOT "B" FIELD I/O CONNECTIONS





NOTE: DIMENSIONS ARE IN INCHES (MILLIMETERS).

TRANS-C100, 3U CompactPCI TRANSITION MODULE

4501-883A