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Series IP57x Industrial I/O Pack
MIL-STD-1553A/B Bus Interface Module

USER'S MANUAL

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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.

RELATED PUBLICATIONS

The following manuals and part specifications provide the necessary information for in depth understanding of the IP57x Series boards. These documents are available on the Data Device Corporation web site http://www.ddc-web.com/.

- BU-6174X/6184X/6186X ENHANCED MINIATURE ADVANCED COMMUNICATIONS ENGINE data sheet
- Enhanced Miniature Advanced Communications Engine (Enhanced Mini-ACE® Series) Users Guide MN-6186X-001
- MIL-STD-1553 DESIGNER'S GUIDE Sixth Edition

GENERAL INFORMATION

The Industrial I/O Pack 57x series modules provide the interface between the Industrial I/O Pack (IP) bus and the MIL-STD-1553A/B bus. The IP57x series modules are built upon Data Device Corporation's Micro ACE MIL-STD-1553 terminal. The Micro ACE provides Bus Controller (BC), Remote Terminal (RT), and Bus Monitor (BM) functions. The Micro ACE includes 64K words of RAM for message queues. IP57x modules support both direct and transformer coupled applications. A synchronization clock input and output is provided. The RT address lines for each channel are available at the connector to allow setting the RT address with the wire harness.

The IP-57x Series consists of four models with one or two dual redundant 1553 channels in either the commercial or the industrial temperature range.

MODELS

Table 1 IP57x Series Models

Model	Number of Channels	Operating Temperature Range
IP571	1	0 to 70°C
IP572	2	0 to 70°C
IP571E	1	-40 to 85°C
IP572E	2	-40 to 85°C

KEY FEATURES

- One or two dual redundant MIL-STD-1553A/B channels
- Each channel can be independently programmed for Bus Controller, Remote Terminal, or Bus Monitor operation
- Transformer (long stub) or Direct coupled (short stub) bus connection
- 64K words RAM per channel
- External Time-Tag clock input and output
- Software initiated RAM built in self test
- RT address input for each channel
- VITA 4 compliant

INDUSTRIAL I/O PACK INTERFACE FEATURES

Clock Speed – Supports an 8 or 32 MHz IP bus clock speed.
High density - Single-size, industry-standard, IP module footprint. Up to four units may be mounted on a 6U VMEbus carrier board or five units may be mounted on a PCI carrier board.
Local ID - Each IP module has its own 8-bit ID information which is accessed via data transfers in the "ID" space.
16-bit & 8-bit I/O – Control and status register Read/Write is performed through 16 bit or 8 bit data transfer cycles in the IP module I/O space. The u-ACE controllers are located in memory space and are accessed with 16-bit data transfer cycles.
High Speed - Access times for all data transfer cycles are described in terms of "wait" states. For the supplied IP module example, wait states are minimized for all read and write operations (see specifications for detailed information).

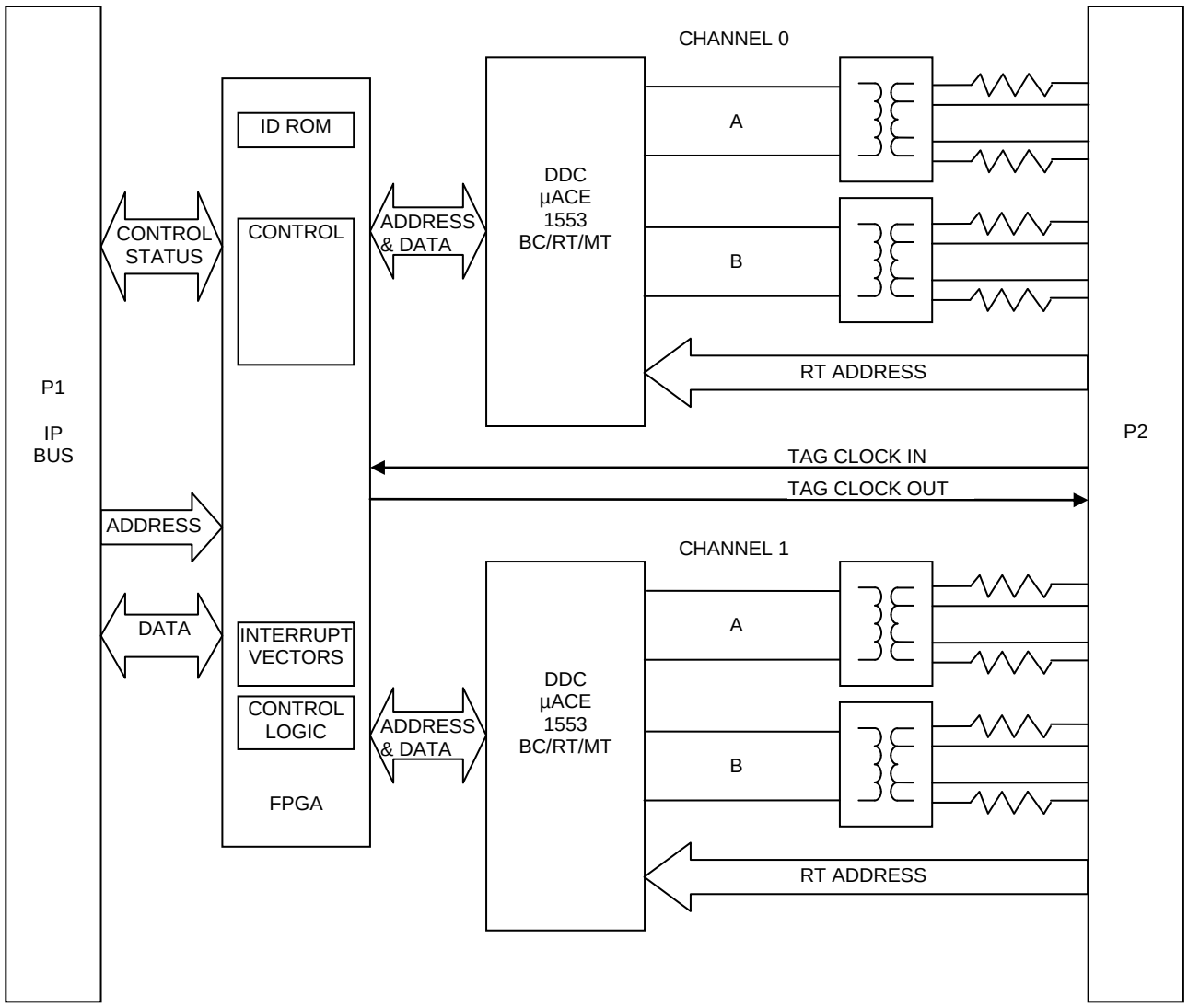


Figure 1 IP572 Block Diagram

IP MODULE WINDOWS SOFTWARE

Acromag provides a software product (sold separately) to facilitate the development of Windows (2000/XP/Vista/7®) applications accessing Acromag Industry Pack models installed on Acromag PCI Carrier Cards and CompactPCI Carrier Cards. This software (Model IPSW-API-WIN) consists of low-level drivers and Windows 32 Dynamic Link Libraries (DLLs) that are compatible with a number of programming environments including Visual C++™, Visual Basic .NET® and others. 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 modules and carriers.

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. However, it is recommended that the board be visually inspected for evidence of mishandling prior to applying power.

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 dense packing of the IP modules to the carrier board restricts air flow within the card cage and is cause for concern. If the installation is in an industrial environment and the board is exposed to environmental air, careful consideration should be given to air-filtering.

INSTALLATION

Power should be removed from the board when installing IP modules, cables, termination panels, and field wiring. Refer to the IP Mechanical Assembly Drawing located in the Drawings Section of this manual and assembly instructions.

CONNECTORS

IP Logic Interface Connector (P1)

P1 of the IP module provides the logic interface to the mating connector on the carrier board. This connector is a 50-pin female receptacle header (AMP 173279-3 or equivalent) which mates to the male connector of the carrier board (AMP 173280-3 or equivalent). This provides excellent connection integrity and utilizes gold-plating in the mating area. Threaded metric M2 screws and spacers are supplied with the IP module to provide additional stability for harsh environments (see Drawing 4501-434 for assembly details). Field and logic side connectors are keyed to avoid incorrect assembly. The pin

assignments of P1 are standard for all IP modules according to the Industrial I/O Pack Specification (see Table 2). However some logic signals not used for the IP interface are reserved for factory programming.

Table 2 Standard Logic Interface Connections (P1)

Pin Description	Number	Pin Description	Number
GND	1	GND	26
CLK	2	+5V	27
Reset#[1]	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[3]	36
D08	12	A1	37
D09	13	DMAEnd*	38
D10	14	A2	39
D11	15	Reserved[3]	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[2]	22	A6	47
+12V[2]	23	ACK#	48
+5V	24	Reserved[3]	49
GND	25	GND	50

Notes :(Table 2)

1. An Asterisk (#) is used to indicate an active-low signal
2. Not Used by this IP Module
3. Reserved for factory programming

IP Field I/O Connector (P2)

P2 provides the field I/O interface connections for mating IP modules to the carrier board. P2 is a 50-pin female receptacle header which mates to the male connector of the carrier board. This provides excellent connection integrity and utilizes gold-plating in the mating area. Threaded metric M2 screws and spacers are supplied with the module to provide additional stability for harsh environments (see Mechanical Assembly Drawing 4501-434). The field and logic side connectors are keyed to avoid incorrect assembly.

P2 pin assignments are unique to each IP model (see Table 3) and normally correspond to the pin numbers of the field I/O interface connector on the carrier board (you should verify this for your carrier board).

Table 3 IP57x Field I/O Pin Connections (P2)

Pin Description	Number	Pin Description	Number
CH0_RT_ADDR0	1	CH1_RT_ADDR0	26
CH0_RT_ADDR1	2	CH1_RT_ADDR1	27
CH0_RT_ADDR2	3	CH1_RT_ADDR2	28
CH0_RT_ADDR3	4	CH1_RT_ADDR3	29
CH0_RT_ADDR4	5	CH1_RT_ADDR4	30
CH0_RT_PARITY	6	CH1_RT_PARITY	31
GND	7	TAG_CLOCK_OUT	32
TAG_CLOCK_IN	8	GND	33
GND	9	GND	34
GND	10	CH1B_DIRECT_N	35
CH1B_XFMR_N	11	CH1B_DIRECT_P	36
CH1B_XFMR_P	12	GND	37
GND	13	GND	38
GND	14	CH1A_DIRECT_N	39
CH1A_XFMR_N	15	CH1A_DIRECT_P	40
CH1A_XFMR_P	16	GND	41
GND	17	GND	42
GND	18	CH0B_DIRECT_N	43
CH0B_XFMR_N	19	CH0B_DIRECT_P	44
CH0B_XFMR_P	20	GND	45
GND	21	GND	46
GND	22	CH0A_DIRECT_N	47
CH0A_XFMR_N	23	CH0A_DIRECT_P	48
CH0A_XFMR_P	24	Reserved[1]	49
GND	25	Not connected	50

Note: (Table 3)

1. Reserved for factory programming

CABLE

A cable, model number 5028-570 is available when an IP-57x module is installed on the VME carrier board model AVME9668. The cable includes Twin-ax connectors for each of the four transformer coupled channels: CH0A, CH0B, CH1A, CH1B, and a 15 pin DSUB connector for access to the remote terminal address lines and TAG clock I/O.



Figure 2 5028-570 Cable

Table 4 5028-570 Cable 15 Pin DSUB pin assignments

Pin Description	Number
CH0_RT_ADDR0	1
CH0_RT_ADDR1	2
CH0_RT_ADDR2	3
CH0_RT_ADDR3	4
CH0_RT_ADDR4	5
CH0_RT_PARITY	6
GND	7
TAG_CLOCK_IN	8
CH1_RT_ADDR0	9
CH1_RT_ADDR1	10
CH1_RT_ADDR2	11
CH1_RT_ADDR3	12
CH1_RT_ADDR4	13
CH1_RT_PARITY	14
TAG_CLOCK_OUT	15

Non-Isolation Considerations

The board is non-isolated, since there is electrical continuity between the logic and field I/O grounds. As such, the field I/O connections are not isolated from the system. Care should be taken in designing installations without isolation to avoid noise pickup and ground loops caused by multiple ground connections.

PROGRAMMING INFORMATION

This Section provides the specific information necessary to program and operate the board.

IP IDENTIFICATION PROM

Each IP module contains identification (ID) information that resides in the ID space per the IP module specification. This area of memory contains 32 bytes of information at most. Both fixed and variable information may be present within the ID space. Fixed information includes the "IPAH" identifier, model number, and manufacturer's identification codes. Variable information includes unique information required for the module. The IP57x ID information does not contain any variable (e.g. unique calibration) information. ID space bytes are addressed using only the odd addresses in a 64 byte block (on the "Big Endian" VMEbus). Even addresses are used on the "Little Endian" PC PCI bus. The IP57x ID space contents are shown in Table 5. Note that the base-address for the IP module ID space (see your carrier board instructions) must be added to the addresses shown to properly access the ID space. Execution of an ID space read requires 1 wait state.

Table 5 IP57x ID ROM

Hex Offset From ID PROM Base Address	ASCII Character Equivalent	Numeric Value (Hex)	Field Description
01	I	49	Format I ID ROM supports 8 or 32 MHz IP bus clock frequency
03	P	50	
05	A	41	
07	H	48	
09		A3	Acromag ID Code
0B			IP Model Code[1]
		52	IP571
		53	IP572
0D		00	Not Used (Revision)
0F		00	Reserved
11		00	Not Used (Driver ID Low Byte)
13		00	Not Used (Driver ID High Byte)
15		0C	Total Number of ID PROM Bytes
17			CRC
		8F	IP571
		EE	IP572
19 to 3F		yy	Not Used

Notes (Table 5):

1. The IP model number is represented by a two-digit code within the ID space (the IP571 model is represented by 52H, the IP572 is represented by 53H).

ADDRESS MAP

Table 6 IP57x Address Map

Description	IP Address Space	Access Type	Address Offset from base
Control Register	I/O	16 bit only	0
Status Register	I/O	16 bit only	2
Channel 0 Interrupt Vector	I/O	8 bit	5
Channel 1 Interrupt Vector	I/O	8 bit	7
ID ROM	ID	8 bit	0x01 – 0x17
Channel 0 uACE registers	Memory	16 bit only	0x00000 – 0x0003E
Channel 0 uACE RAM	Memory	16 bit only	0x20000 – 0x3FFFE
Channel 1 uACE registers	Memory	16 bit only	0x40000 – 0x4003E
Channel 1 uACE RAM	Memory	16 bit only	0x60000 – 0x7FFFE

I/O SPACE ADDRESS MAP

This board is addressable in the Industrial Pack I/O space to provide access to control registers, a status register, and interrupt vector registers.

The I/O space may be as large as 64, 16-bit words (128 bytes) using address lines A1 to A6, but the IP57x uses only a portion of this space. The I/O space address map for the IP7x is shown in Table 6. Note that the base address for the IP module I/O space (see your carrier board instructions) must be added to the addresses shown to properly access the I/O space.

Table 7 Control Register Read / Write I/O base address + 0

Bit	Description	Reset State
15 - 14	IP bus clock	0
13	Channel 1 Transceiver Inhibit A	0
12	Channel 1 Transceiver Inhibit B	0
11	Channel 1 Master Clear	0
10	Channel 1 Built In Self Test Enable	0
9	Channel 1 Remote Terminal Address Latch	0
8	Channel 1 Interrupt Enable	0
7	Tag Clock Source	0
6	Not used	0
5	Channel 0 Transceiver Inhibit A	0
4	Channel 0 Transceiver Inhibit B	0
3	Channel 0 Master Clear	0
2	Channel 0 Built In Self Test Enable	0
1	Channel 0 Remote Terminal Address Latch	0
0	Channel 0 Interrupt Enable	0

IP bus clock: A phase locked loop is used to generate the module clock from the IP bus clock. The IP bus clock must remain constant after setting the appropriate bits in this register. The module clock is not enabled until the IP bus clock frequency is specified by writing the following bit pattern:

00 – module clock disabled
01 – IP bus clock 8 MHz, enable module clock
10 – IP bus clock 32 MHz, enable module clock
11 – module clock disabled

Transceiver Inhibit A:
0 - transceiver enable
1 – transceiver disabled

Transceiver Inhibit B:
0 - transceiver enable
1 – transceiver disabled

Master Clear: is a write only bit, always reads as 0
0 – normal operation
1 – hardware reset

Built In Self Test Enable:

0 – disables both the power up and user initiated built in self test
1 – built in self test will be enabled after hardware reset

Remote Terminal Address Latch: controls the µ-ACE's internal RT address latch. (see µ-ACE hardware manual for further description)

Interrupt enable:
0 – interrupts disabled
1 – interrupts enabled

Tag Clock Source:
0 – internal (FPGA 100 KHz clock)
1 – external (P2 connector)

Table 8 Status Register Read I/O base address + 2

Bit	Description
15	Module Clock Ready
14	Not used
13	Not used
12	Not used
11	Not used
10	Not used
9	Not used
8	Channel 1 Interrupt Pending
7	Not used
6	Not used
5	Not used
4	Not used
3	Not used
2	Not used
1	Not used
0	Channel 0 Interrupt Pending

Module Clock Ready – Indicates the status of the phase locked loop that generates the 16 MHz module clock from the IP bus clock:
0 - not ready
1 - ready

Interrupt Pending
0 – no interrupts pending
1 – interrupt pending

Channel 0 interrupt is connected to IRQ0
Channel 1 interrupt is connected to IRQ1

MEMORY SPACE ADDRESS MAP

This board is addressable in the Industrial Pack memory space to access the Micro ACE 1553 controllers. The IP571 uses the lower 256K bytes of this memory space to access channel 0 registers and memory. The IP572 uses the lower 512K bytes of this memory space to access channels 0 and 1 registers and memory.

This memory map reflects byte accesses using the "Big Endian" byte ordering format. Big Endian is the convention used in the Motorola 68000 microprocessor family and is the VMEbus convention. In Big Endian, the lower-order byte is stored at odd-byte addresses. The Intel x86 family of microprocessors uses the opposite convention, or "Little Endian" byte ordering. Little Endian uses even-byte addresses to store the low-order byte. As such, installation of this module on a PC carrier board will require the use of the even address locations to access the lower 8-bit data while on a VMEbus carrier use of odd address locations are required to access the lower 8-bit data.

Micro ACE access

The address space for each Micro ACE is divided into two regions: register and memory. The 32 Micro ACE registers are located at IP memory space base address + (channel * 0x40000) + (register address * 2). The Micro ACE also includes 64 K 16 bit words of memory. The memory region is located at IP memory space base address + (channel *

0x40000) + 0x20000 + memory address. The Micro ACE is a 16 bit device and should be accessed in 16 bit mode. See Table 9 for a brief overview of the Micro ACE registers and their addresses in IP memory space. See the Enhanced Mini-ACE® Series Users Guide for a detailed description of the registers and their functions.

Table 9 Micro ACE Register descriptions

Mem base + Address (Hex)	Description
CHANNEL 0	
00000	Interrupt Mask Register #1 (RD/WR)
00002	Configuration Register #1 (RD/WR)
00004	Configuration Register #2 (RD/WR)
00006	Start/Reset Register (WR)
00006	Non-Enhanced BC/RT Command Stack Pointer / Enhanced BC Instruction List Pointer Register (RD)
00008	BC Control Word /RT Subaddress Control Word Register (RD/WR)
0000A	Time Tag Register (RD/WR)
0000C	Interrupt Status Register #1 (RD)
0000E	Configuration Register #3 (RD/WR)
00010	Configuration Register #4 (RD/WR)
00012	Configuration Register #5 (RD/WR)
00014	RT / Monitor Data Stack Address Register (RD)
00016	BC Frame Time Remaining Register (RD)
00018	BC Time Remaining to Next Message Register (RD)
0001A	Non-Enhanced BC Frame Time / Enhanced BC Initial Instruction Pointer / RT Last Command / MT Trigger Word Register(RD/WR)
0001C	RT Status Word Register (RD)
0001E	RT BIT Word Register (RD)
00020	Test Mode Register 0
00022	Test Mode Register 1
00024	Test Mode Register 2
00026	Test Mode Register 3
00028	Test Mode Register 4
0002A	Test Mode Register 5
0002C	Test Mode Register 6
0002E	Test Mode Register 7
00030	Configuration Register #6 (RD/WR)
00032	Configuration Register #7 (RD/WR)
00034	RESERVED
00036	BC Condition Code Register (RD)
00036	BC General Purpose Flag Register (WR)
00038	BIT Test Status Register (RD)
0003A	Interrupt Mask Register #2 (RD/WR)
0003C	Interrupt Status Register #2 (RD)
0003E	BC General Purpose Queue Pointer /RT-MT Interrupt Status Queue Pointer Register (RD/WR)
20000 ↓ 3FFFE	Channel 0 RAM first word Channel 0 RAM last word

Mem base + Address (Hex)	Description
CHANNEL 1	
40000	Interrupt Mask Register #1 (RD/WR)
40002	Configuration Register #1 (RD/WR)
40004	Configuration Register #2 (RD/WR)
↓	repeat of Channel 0 register descriptions
4003E	BC General Purpose Queue Pointer /RT-MT Interrupt Status Queue Pointer Register (RD/WR)
60000 ↓ 7FFFE	Channel 1 RAM first word Channel 1 RAM last word

PROGRAMMING INTERRUPTS

Interrupts generated by the IP57x modules use interrupt request lines INTREQ0* (Interrupt Request 0) for 1553 channel 0 and INTREQ1* (Interrupt Request 1) for 1553 channel 1.

The IP57x Interrupt Vector register can be used as a pointer to an interrupt handling routine. The vector is an 8-bit value and can be used to point to any one of 256 possible locations to access the interrupt handling routine.

To enable 1553 channels to generate interrupts set the appropriate interrupt enable bit in the IP I/O space Control Register for each 1553 channel. Set bit 3 in the Micro ACE Configuration Register #2 to select LEVEL type interrupt signaling for each channel. This will enable the FPGA to pass the Micro ACE interrupt signal through to the IP bus INTREQx interrupt. See the Enhanced Mini-ACE® Series Users Guide for details on configuring the many Micro ACE interrupt options.

The INTREQ0* or INTREQ1* line is released when the INTERRUPT STATUS REGISTER(s) for the appropriate channel are read. See the Enhanced Mini-ACE® Series Users Guide for details on AUTO CLEAR options for the pending interrupts.

THEORY OF OPERATION

This section contains information regarding the hardware of the IP57x series of modules. A description of the functions of the circuitry used on the board is also provided. Refer to Figure 1, IP572 block diagram as you review this material.

LOGIC/POWER INTERFACE

The logic interface to the carrier board is made through connector P1 (refer to Table 2). The P1 interface also provides +5V power to the module. Note that the DMA control, ERROR∗, and STROBE∗ signals are not used.

A Field Programmable Gate-Array (FPGA) installed on the IP Module provides an interface to the carrier board. The interface to the carrier board allows complete control of all IP57x functions.

IP INTERFACE LOGIC

IP interface logic of the IP57x is included in the FPGA. This logic includes: address decoding, I/O and ID read/write control circuitry, and ID PROM implementation.

Address decoding of eighteen of the IP address signals A (1:18) is implemented in the FPGA, in conjunction with the IP select signals, to identify access to the IP modules MEM, INT, ID or I/O spaces. In addition, the byte strobes BS0∗ and BS1∗ are decoded to identify low byte, high byte, or double byte data transfers.

The carrier to IP module interface implements access to MEM, INT, ID and I/O space via 16 or 8-bit data transfers. Read only access to ID space provides the identification for the module (as given in Table 1) per the IP specification. Read and write access to the I/O space provides a means to control the IP57x and monitor status. Reads and writes to MEM space provide access to the Micro ACE 1553 controllers.

The timing for access to the various address spaces is shown in Table 10.

Table 10 Access Times

Address Space	Wait States	
	Read	Write
INT	1	0
ID	1	N/A
I/O	1	0
MEM (8 MHz IP clock)	3	3
MEM (32 MHz IP clock)	8	8

IP57xCONTROL LOGIC

All logic to provide access to the Micro ACE 1553 controllers is imbedded in the module's FPGA. Once the IP57x FPGA has been configured, the control logic provides the following functions:

- Source of the 16 MHz clock to the Micro ACE.
- Issues interrupt requests to the carrier.
- Controls the Micro ACE master clear (reset) signal
- Source of the 100 KHz tag clock output signal used to synchronize the IP57x with external devices
- Accepts an external TTL level tag clock input signal to synchronize the IP57x with external devices
- Provides mode control (inhibit) to each of the Micro ACE dual redundant transceivers.

TAG CLOCK Input / Output

The TAG clock for each 1553 channel can be selected from three possible sources:

- Micro ACE internal time tag clock, selectable 2µs, 4µs, 8µs, 16µs, 32µs, 64µs resolution.
- FPGA generated 100 KHz clock, provides 10 µs resolution. This clock is also an output on the P2 connector.
- External (P2 connector) tag clock input.

To select the Micro ACE internal time tag clock: write bits TTR2:0 in configuration register #2 for each 1553 channel with the appropriate pattern for the resolution desired.

To select the FPGA generated 100 KHz clock as the Micro ACE time tag clock: write bits TTR2:0 in configuration register #2 with the bit pattern "111". Write the tag clock source (bit 7) of the IP I/O space control register with the value 0.

To select the external time tag clock input as the Micro ACE time tag clock: write bits TTR2:0 in configuration register #2 with the bit pattern "111". Write the tag clock source (bit 7) of the IP I/O space control register with the value 1.

Note: the selection of tag clock source in the IP I/O space control register will affect both 1553 channels of an IP572 module.

STATIC MICRO ACE INPUTS

The SUBSYSTEM/EXT_TRIG Micro ACE input signal is permanently connected to logic 1 in the FPGA. The functions controlled by this static input signal have alternate methods of control through host writes to Micro ACE registers. The subsystem flag bit can be set by the host writing to bit 8 of Configuration Register #1 in RT mode. In BC mode, a frame can be started by writing bit 1 of the Start/Reset Register with the value 1.

REMOTE TERMINAL ADDRESS

The RT address and parity signals for each of the 1553 channels are available at the P2 connector. Each of the signals has an adjacent ground signal on the connector for convenient programming of the RT address through an attached wire harness. Each of the address lines and parity bit has a pull up resistor on it. An unconnected input results in that bit reading as logic 1. Grounding the input causes the bit to read as logic 0. The RT address parity is odd, so the sum of the RT address input bits and the RT parity bit must be odd. The RT address may be latched in the Micro ACE. The RT address latch signal is controlled by the IP I/O control register. Bit 9 controls the RT address latch signal for channel 1, bit 1 controls the RT address latch signal for channel 0.

See section 6.29 RT Address Inputs of the Enhanced Mini-ACE® Series Users Guide for a complete description of the options available for setting the RT address.

BUS CONNECTION

The IP57x modules may be connected to the1553 bus using either of two methods: direct coupled (short stub) or transformer coupled (long stub). Both of these connection methods are provided for both of the dual redundant (A and B) channels of each of the 1553 channels (0 and 1).

DIRECT COUPLING METHOD

Using the direct coupling method the IP57x module may be connected to the 1553 bus without any additional components. The transformer and isolation resistors are included on the IP57x. The stub length may not exceed 1 foot. The distance the signals travel across a carrier board must be subtracted from the 1 foot maximum length.

TRANSFORMER COUPLING METHOD

Using the transformer coupling method, stub lengths may be up to 20 feet. With this method the IP57x does not connect directly to the 1553 bus. The IP57x must connect to the bus through a bus coupler.

SERVICE AND REPAIR

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 easily 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, placed in a burn-in room at elevated temperature, and retested 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 2, Preparation for Use, have been followed. Also, refer to the documentation of your carrier/CPU board to verify that it is correctly configured. Replacement of the module with one that is known to work correctly is a good technique to isolate a faulty module.

Acromag's Applications Engineers can provide further technical assistance if required. When needed, complete repair services are also available from Acromag.

CAUTION: POWER MUST BE TURNED OFF BEFORE REMOVING OR INSERTING

WHERE TO GET HELP

If you continue to have problems, your next step should be to visit the Acromag worldwide web site at http://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 at the bottom of this page. If needed, complete repair services are also available.

SPECIFICATIONS

PHYSICAL

Physical Configuration	**Single Industrial Pack Module**
Length	3.880 in. (98.5 mm)
Width	1.780 in. (45.2 mm)
Board Thickness	0.062 in. (1.59 mm)
Max Component Height	0.290 in. (7.37 mm)

Connectors

- IP Logic Interface: 50-pin female receptacle header (AMP 173279-3 or equivalent).
- Field I/O: 50-pin female receptacle header (AMP 173279-3 or equivalent).

Operating Temperature:	Standard Unit 0 to +70°C.
	E Version -40 to 85°C.
Relative Humidity:	5-95% Non-Condensing.
Storage Temperature:	-55°C to +125°C.
Non-Isolated:	Logic and field commons have a direct electrical connection.

Resistance to RFI: Complies with IEC 6100-4-3: 2006 (80MHz to 1000 MHz, 10 Volts/meter, No digital upset allowed)

Conducted R F Immunity (CRFI):
Complies with EN61000-4-6 (3V/rms, 150kHz to 80MHz) and European Norm EN50082-1 with no digital upsets.

Surge Immunity: Not required for signal I/O per European Norm EN50082-1.

Electric Fast Transient Immunity EFT:
Complies IEC 6100-4-4: 2007

Electrostatic Discharge (ESD) Immunity:
Complies with IEC 61000-4-2: 2001, (8KV enclosure port air discharge) Level 3, (4KV enclosure port contact discharge) Level 2, (2KV I/O terminal contact discharge).

Radiated Emissions: Meets or exceeds CISPR 16-2-3 for class B equipment. Shielded cable with I/O connections in a shielded enclosure is required to meet compliance.

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 or 32MHz operation for Type I Modules.

Electrical/Mechanical Interface:
Single-Size IP Module.

I/O Space: 16-bit and 8-bit

ID Space: 16 and 8-bit; Supports Type 1, 32 bytes per IP (consecutive odd byte addresses). IPAH is used to indicate 32MHz operation (8MHz operation is also supported).

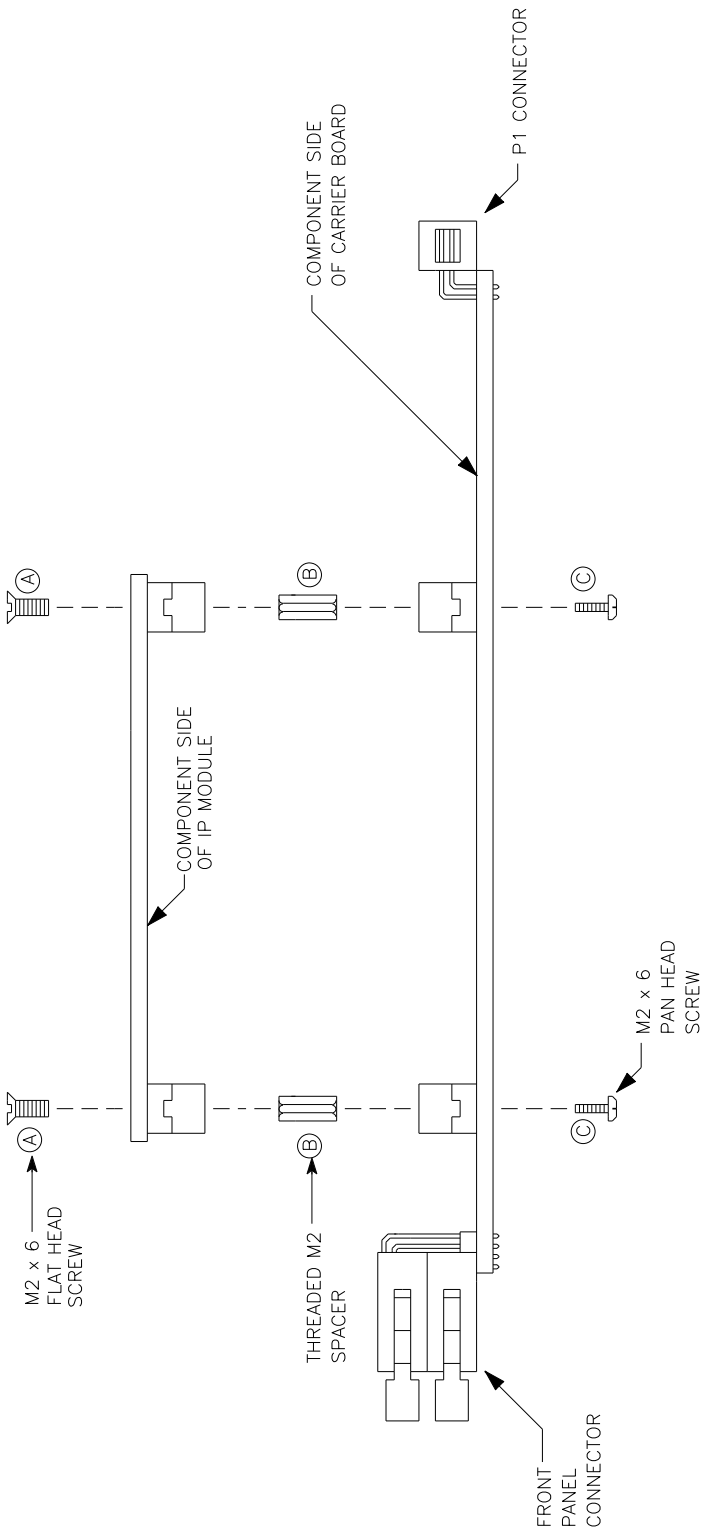
Memory Space: 16-bit and 8-bit.

Interrupts: The INTREQ0 and INTREQ1 signals are used to request interrupts provided by the Micro ACE.

DMA: Not implemented.

Table 11 Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
CHx_RT_ADDRx, CHx_RT_PARITY						
V_{IL}	low-level input voltage				0.6	V
V_{IH}	high-level input voltage		2.0		3.3	V
I_{IL}	low level current	V_{IL} = 0 V			-330	µA
TAG_CLK_IN						
V_{IL}	low-level input voltage				0.8	V
V_{IH}	high-level input voltage		2.0		3.3	V
I_{IN}	maximum leakage current	0 <= V_{IN} <= 3.3 V			+/- 1	uA
TAG_CLK_OUT						
V_{OL}	low-level output voltage	I_{OL} = 50 µA			0.1	V
V_{OH}	high-level output voltage	I_{OH} = -2 mA	2.9			V
	output frequency			100		kHz
Power Requirements						
+5V		Model IP571		0.3	0.6	A
		Model IP572		0.6	1.2	A
+12V	not used				0	A
-12V	not used				0	A



ASSEMBLY PROCEDURE:

1. THREADED SPACERS ARE PROVIDED FOR USE WITH AVME 9630/9660 CARRIER BOARDS (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. THE RECOMMENDED TORQUE IS 0.226 NEWTON METER OR 2 INCH POUNDS. OVER TIGHTENING MAY DAMAGE CIRCUIT BOARD.
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). THE RECOMMENDED TORQUE IS 0.226 NEWTON METER OR 2 INCH POUNDS. OVER TIGHTENING MAY DAMAGE CIRCUIT BOARD.

IP MODULE TO CARRIER BOARD MECHANICAL ASSEMBLY 4501-434C

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