Acromag®

Series 9420/9421/9422/9425/9426/9427

VME Isolated Digital Input Board

USER'S MANUAL

ACROMAG INCORPORATED
30765 South Wixom Road
P.O. BOX 437
Wixom, MI 48393-7037 U.S.A.
Tel: (248) 624-1541
Fax: (248) 624-9234

8500-333-C00M003

Manual No. 8500-333

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 redundancy and comprehensive failure analysis to insure a safe and satisfactory overall system design. It is agreed between the Buyer and Acromag, that this is the Buyer's responsibility.

Acromag, Inc.
30765 South Wixom Road
P.O. Box 437
Wixom, Michigan 48393-7037, USA

Tel: (248) 624-1541
Fax: (248) 624-9234

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1.0 GENERAL INFORMATION

1.1 INTRODUCTION

The AVME9420/9421/9422/9425/9426/9427 Series of VME cards offer a variety of features which make them an ideal choice for many industrial and scientific applications. The AVME9420/9425 contain 32 digital DC voltage input channels, the AVME9421/9426 contain 64 input channels, and the AVME9422/9427 contain 96 input channels. The AVME9420/9421/9422 accept 4-25V DC inputs, while the AVME9425/9426/9427 accept 20-55V DC inputs. In addition, channel status indicators are available on the first 64 channels (P3 and P4) for AVME9421/9426 and AVME9422/9427 models, only.

Model	32 Channel Digital DC Inputs P2 Access	64 Channel Digital DC Inputs P3, P4 access	96 Channel Digital DC Inputs P2, P3, P4 access	Channel On LEDs (Green) 64 Channels at P3 & P4
AVME9420-I	XX			
AVME9421-I		XX		
AVME9421-I-L		XX		XX
AVME9422-I			XX	
AVME9422-I-L			XX	XX
AVME9425-I	XX			
AVME9426-I		XX		
AVME9426-I-L		XX		XX
AVME9427-I			XX	
AVME9427-I-L			XX	XX

GENERAL FEATURES

- All Digital DC Inputs are isolated from the VMEbus for up to 250V AC, or 354V DC on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown).
- All Digital DC Inputs are isolated from each other for up to 125V AC, or 125V DC on a continuous basis (will withstand 1250V AC dielectric strength test for one minute without breakdown).
- PASS/FAIL status indicator LEDs on the front panel.
- Input channel ON indicating green LEDs (with -L option).
- Field connections accessible through connectors P3 and P4 mounted on the front panel (AVME9421/9426 and AVME9422/9427).
- Field connections accessible through connectors mounted on the rear panel (AVME9420/9425 and AVME9422/9427).
- Optional Termination Panel.

1.2 DIGITAL DC INPUT FEATURES

- 32 input channels configured as two 16 bit words (AVME9420/9425).
- 64 input channels configured as four 16 bit words (AVME9421/9426).
- 96 input channels configured as six 16 bit words (AVME9422/9427).
- 4 to 25V DC or 20 to 55V DC range boards are available.
- Bidirectional inputs (polarity can be +/- or -/+ at either input of each channel).
- Buffers on all channels contain hysteresis for noise immunity.
- Adjustable debounce circuitry on eight front Port B or eight rear Port F (jumper selectable) channels 0 through 7.
- Generation of interrupts for Port B or Port F (jumper selectable) channels 0 through 7: input Change Of State (COS), input level (polarity) match, or input pattern detection.
- Can be interfaced to TTL & CMOS logic.
- Input channels contain capacitors for transient voltage suppression.
- Input channels contain LED bypass resistors for faster turn-off response.

1.3 VMEBUS INTERFACE FEATURES

- Slave module A24/A16, D16/D08 (EO).
- Short I/O Address Modifiers 29H, 2DH (H = Hex).
- Standard Address Modifiers 39H, 3DH (H = Hex).
- I(1-7) interrupter D08 (O), jumper programmable interrupt level, software programmable interrupt vectors (for Port B or Port F digital input channels 0-7), interrupt release mechanism is Release On Register Access (RORA) type.
- Decode on 1K byte boundaries.

1.4 FIELD COMPATIBILITY

See APPENDIX A for more information on compatible products.

1.4.1 DIGITAL INPUTS

Directly compatible with Acromag input termination panel.

Cable:

Model 9944-X: Flat 64 pin cable (female connectors at both ends) for connecting the AVME9421/9422/9426/9427 (P3 or P4 connector) to the 6985-32DI termination panel.

Model 9948-X: Flat 64 pin cable (female connectors at both ends) for connecting the AVME9420/9422/9425/9427 (P2 connector) to the 6985-32DI termination panel.

Termination Panel:

Model 6985-32DI: 32 channel input digital termination panel.

2.0 PREPARATION FOR USE

This chapter provides information about preparing the Isolated Digital Input Board for system operation.

2.1 UNPACKING AND INSPECTION

Inspect the shipping carton immediately upon receipt for evidence of mishandling during transit. If the shipping carton is severely 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.

The board is physically protected with foam and electrically protected with an antistatic bag during shipment. It is advisable to visually inspect the board for evidence of mishandling prior to applying power.

The board utilizes static sensitive components and should only be handled at a static safe work station.

2.2 CARD CAGE CONSIDERATIONS

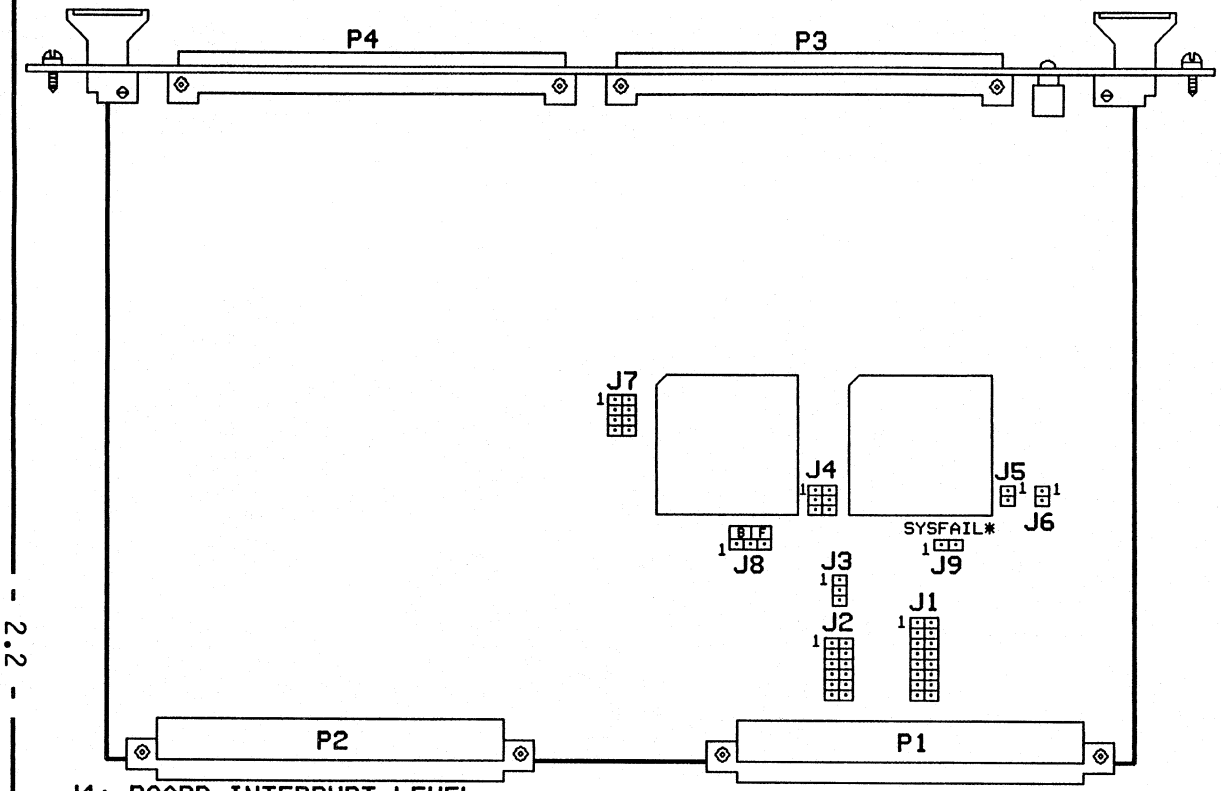
Refer to the specifications for bus loading and power requirements. Be sure that the system power supplies are able to accommodate the additional requirements within the voltage tolerances specified.

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

Adequate air circulation must be provided to prevent a temperature rise above the maximum operating temperature. Large and continuing fluctuations in ambient air temperature should be avoided. If the installation is in an industrial environment and the board is exposed to environmental air, careful consideration should be given to air filtering.

2.3 BOARD CONFIGURATION

The board may be configured in a variety of ways for many different applications. Each possible jumper setting will be discussed in the following sections. The jumper locations are shown in Figure 2.1.



J1: ADDRESS DECODE JUMPER CONFIGURATION

	PINS OF J1							
BASE ADDRESS	A23 15 & 16	A22 13 & 14	A21 11 & 12	A20 9 & 10	A19 7 & 8	A18 5 & 6	A17 3 & 4	A16 1 & 2
00000000H	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT
00010000H	OUT	OUT	OUT	OUT	OUT	OUT	OUT	IN
00020000H	OUT	OUT	OUT	OUT	OUT	OUT	IN	OUT
00030000H	OUT	OUT	OUT	OUT	OUT	OUT	IN	IN
•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•
00FC0000H	IN	IN	IN	IN	IN	IN	OUT	OUT
00FD0000H	IN	IN	IN	IN	IN	IN	OUT	IN
00FE0000H	IN	IN	IN	IN	IN	IN	IN	OUT
00FF0000H	IN	IN	IN	IN	IN	IN	IN	IN

J2: ADDRESS DECODE JUMPER CONFIGURATION

	PINS OF J2					
BASE ADDRESS	A15 11 & 12	A14 9 & 10	A13 7 & 8	A12 5 & 6	A11 3 & 4	A10 1 & 2
00000000H	OUT	OUT	OUT	OUT	OUT	OUT
00000400H	OUT	OUT	OUT	OUT	OUT	IN
00000800H	OUT	OUT	OUT	OUT	IN	OUT
00000C00H	OUT	OUT	OUT	OUT	IN	IN
00001000H	OUT	OUT	OUT	IN	OUT	OUT
•	•	•	•	•	•	•
•	•	•	•	•	•	•
•	•	•	•	•	•	•
0000EC00H	IN	IN	IN	OUT	IN	IN
0000F000H	IN	IN	IN	IN	OUT	OUT
0000F400H	IN	IN	IN	IN	OUT	IN
0000F800H	IN	IN	IN	IN	IN	OUT
0000FC00H	IN	IN	IN	IN	IN	IN

J4: BOARD INTERRUPT LEVEL SELECTION

INTERRUPT LEVEL	J4 5 & 6	J4 3 & 4	J4 1 & 2
NONE	OUT	OUT	OUT
1	OUT	OUT	IN
2	OUT	IN	OUT
3	OUT	IN	IN
4	IN	OUT	OUT
5	IN	OUT	IN
6	IN	IN	OUT
7	IN	IN	IN

J8: INTERRUPT & DEBOUNCE PORT SELECTION

CHANNEL 0 TO 7	J8 1 & 2	J8 2 & 3
PORT B	IN	OUT
PORT F	OUT	IN

J9: SYSFAIL* SELECTION

J9	
IN	OUT
ENABLED	DISABLED

J3, J5, J6: ADDRESS MODIFIER JUMPER CONFIGURATION

PINS OF J3, J4, J5				
J3 1 & 2	J3 2 & 3	J5 1 & 2	J6 1 & 2	ADDRESS MODIFIER CODE/FUNCTION
OUT	IN	OUT	IN	2DH ONLY SHORT SUPERVISORY ACCESS
OUT	IN	IN	IN	2DH & 29H SHORT SUPERVISORY ACCESS AND SHORT NON-PRIVILEGED ACCESS
IN	OUT	OUT	OUT	3DH ONLY STANDARD SUPERVISORY DATA ACCESS
IN	OUT	IN	OUT	3DH & 39H STANDARD SUPERVISORY DATA ACCESS AND STANDARD NON-PRIVILEGED DATA ACCESS

J7: DEBOUNCE DELAY SELECTION

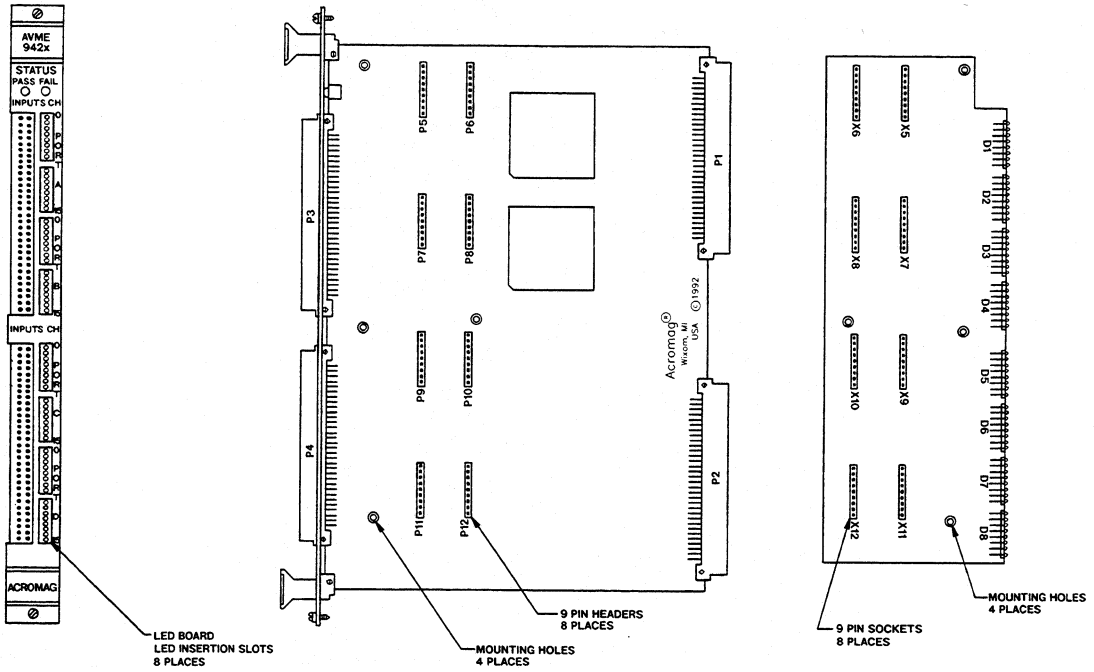
DEBOUNCE DELAY TIME (µS)	J7 1 & 2	J7 3 & 4	J7 5 & 6	J7 7 & 8
7 TO 8	OUT	OUT	OUT	IN
336 TO 384	OUT	OUT	IN	OUT
672 TO 768	OUT	IN	OUT	OUT
1344 TO 1536	IN	OUT	OUT	OUT

FIGURE 2.1: AVME942x JUMPER LOCATION

AcroMag® WIXOM, MICH. — 2 DEC 92 — A — TAV/AIS

TITLE: JUMPER LOCATION

SIZE D DWG — SERIES: AVME942x — SHEET: 1 OF 1 — DRAWING: 4501-281 — REV: A



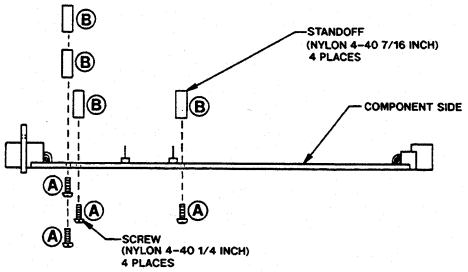
AVME942x FRONT PANEL

AVME942x MAIN BOARD

AVME942x LED BOARD

Acromag WIXOM, MICH.	2 DEC 92 DATE	REV A
TITLE: LED BOARD TO MAIN BOARD MECHANICAL ASSEMBLY		
SIZE D	SERIES AVME942x	SHEET 1 OF 1
		DRAWING 4501-282

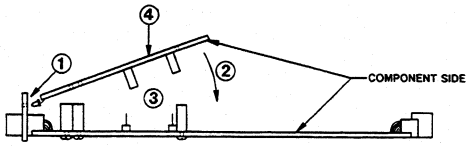
STEP 1.



NOTE:
EJECTOR KNOBS REMOVED FOR CLARITY.

① INSERT NYLON SCREWS, ITEM A, THRU MAIN BOARD INTO SPACERS, ITEM B, (4 PLACES) AND TIGHTEN.

STEP 2.



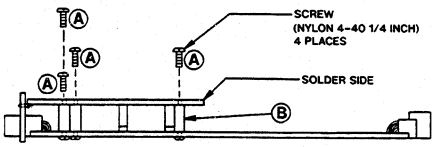
① INSERT LED BOARD'S LEDS INTO FRONT PANEL LED INSERTION SLOTS.

② ROTATE LED BOARD TOWARDS MAIN BOARD.

③ CAREFULLY ALIGN EIGHT (8) 9 PIN SOCKETS TO EIGHT (8) 9 PIN HEADERS.

④ GENTLY PRESS LED BOARD ONTO MAIN BOARD UNTIL SOCKETS AND HEADERS ARE SEATED.

STEP 3.



① INSERT NYLON SCREWS, ITEM A, THRU LED BOARD INTO SPACERS, ITEM B, (4 PLACES) AND TIGHTEN.

FIGURE 2.2: AVME 942x LED BOARD TO MAIN BOARD MECHANICAL ASSEMBLY *

* FOLLOW STEPS IN REVERSE ORDER FOR DISASSEMBLY.

3600-026

2.3.1 DEFAULT JUMPER CONFIGURATION

VMEbus INTERFACE CONFIGURATION

When a board is shipped from the factory, it is configured as follows:

- VMEbus Short I/O Address of 0000H.
- Set to respond to both Address Modifiers 29H and 2DH.
- Sysfail* enabled to respond to a system failure.
- Interrupt Level: none. Therefore, even if interrupts are enabled, no interrupts will be caused.

2.3.1.1 DIGITAL DC VOLTAGE INPUT DEFAULT CONFIGURATION

- 32, 64 or 96 dedicated digital DC input channels (Port A numbered 0 through 15, Port B numbered 0 through 15, Port C numbered 0 through 15, Port D numbered 0 through 15, Port E numbered 0 through 15 and Port F numbered 0 through 15).
- All channels are board specific for 4-25V DC or 20-55V DC input range.
- Port B channels 0 through 7 are selected for interrupt and debounce on models AVME9421/9422/9426/9427.
- Port F channels 0 through 7 are selected for interrupt and debounce on models AVME9420/9425.
- Minimum input debounce selected.

2.4 VMEBUS CONFIGURATION

2.4.1 Address Decode Jumper Configuration

The board interfaces with the VMEbus as a 1K block of address locations in the VMEbus Short I/O Address Space or Standard Address Space. J2 and J1 decode the fourteen most significant address lines A10 through A23 to provide segments of 1K address space. The configuration of the jumpers for different base address locations is shown below. "IN" means that the pins are shorted together with a shorting clip. "OUT" indicates that the clip has been removed. J2 decodes address lines A10 through A15 and J1 decodes Address lines A16 through A23. Therefore, when configured for the Short I/O Address space, only J2 needs to be configured.

Pins of J2						
Base Address	**A15 11 & 12**	**A14 9 & 10**	**A13 7 & 8**	**A12 5 & 6**	**A11 3 & 4**	**A10 1 & 2**
00000000H	OUT	OUT	OUT	OUT	OUT	OUT
00000400H	OUT	OUT	OUT	OUT	OUT	IN
00000800H	OUT	OUT	OUT	OUT	IN	OUT
00000C00H	OUT	OUT	OUT	OUT	IN	IN
00001000H	OUT	OUT	OUT	IN	OUT	OUT
0000EC00H	IN	IN	IN	OUT	IN	IN
0000F000H	IN	IN	IN	IN	OUT	OUT
0000F400H	IN	IN	IN	IN	OUT	IN
0000F800H	IN	IN	IN	IN	IN	OUT
0000FC00H	IN	IN	IN	IN	IN	IN

Pins of J1								
Base Address	**A23 15&16**	**A22 13 & 14**	**A21 11 & 12**	**A20 9 & 10**	**A19 7 & 8**	**A18 5 & 6**	**A17 3 & 4**	**A16 1 & 2**
00000000H	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT
00010000H	OUT	OUT	OUT	OUT	OUT	OUT	OUT	IN
00020000H	OUT	OUT	OUT	OUT	OUT	OUT	IN	OUT
00030000H	OUT	OUT	OUT	OUT	OUT	OUT	IN	IN
00FC0000H	IN	IN	IN	IN	IN	IN	OUT	OUT
00FD0000H	IN	IN	IN	IN	IN	IN	OUT	IN
00FE0000H	IN	IN	IN	IN	IN	IN	IN	OUT
00FF0000H	IN	IN	IN	IN	IN	IN	IN	IN

2.4.2 ADDRESS MODIFIER JUMPER CONFIGURATION

The VMEbus Address Modifier jumpers (J3, J5, and J6) permit the board to respond to the various Address Modifier Codes.

Pins of J3, J5, J6				
J3 1 & 2	**J3 2 & 3**	**J5 1 & 2**	**J6 1 & 2**	**Address Modifier Code/Function**
OUT	IN	OUT	IN	2DH Only Short Supervisory Access
OUT	IN	IN	IN	2DH & 29H Short Supervisory Access and Short Non-privileged Access
IN	OUT	OUT	OUT	3DH Only Standard Supervisory Data Access
IN	OUT	IN	OUT	3DH & 39H Standard Supervisory Data Access and Standard Non-privileged Data Access

2.4.3 INTERRUPT LEVEL SELECT JUMPER CONFIGURATION

The board Interrupt Level is selected by configuring jumper J4 as follows:

Interrupt level	**J4 5 & 6**	**J4 3 & 4**	**J4 1 & 2**
None	OUT	OUT	OUT
1	OUT	OUT	IN
2	OUT	IN	OUT
3	OUT	IN	IN
4	IN	OUT	OUT
5	IN	OUT	IN
6	IN	IN	OUT
7	IN	IN	IN

2.4.4 SYSFAIL* SELECTION JUMPER CONFIGURATION

The AVME942x non-intelligent slave boards assert the SYSFAIL* signal as described in the VMEbus Specification Rev. C.1, when J9 is installed (the pins are shorted together with a shorting clip). Removing jumper J9 will disconnect the SYSFAIL* line from the circuitry on the Acromag board.

2.5 DIGITAL INPUT CONFIGURATION

Board specific, low range or high range, input threshold voltages make the digital input channels adaptable to almost any application. The inputs are designed for use with contact closures, switches, alarm trips, and power supply ON/OFF monitoring. Input channels are optically isolated from each other and from the VMEbus. See Figure 2.3 for the simplified schematic of a digital DC input channel for the AVME942x.

Input channel debounce circuitry with selectable delay is provided for Port B or Port F (jumper selectable) channels 0 through 7 to eliminate glitches from the input signals. These glitches are frequently caused by contact bounce in mechanical relays and switches.

Input channel interrupt functions are provided for Port B or Port F (jumper selectable) channels 0 through 7. Each selected channel can be programmed to interrupt for Change Of State (COS), input level (polarity) match, or input pattern match of the input levels.

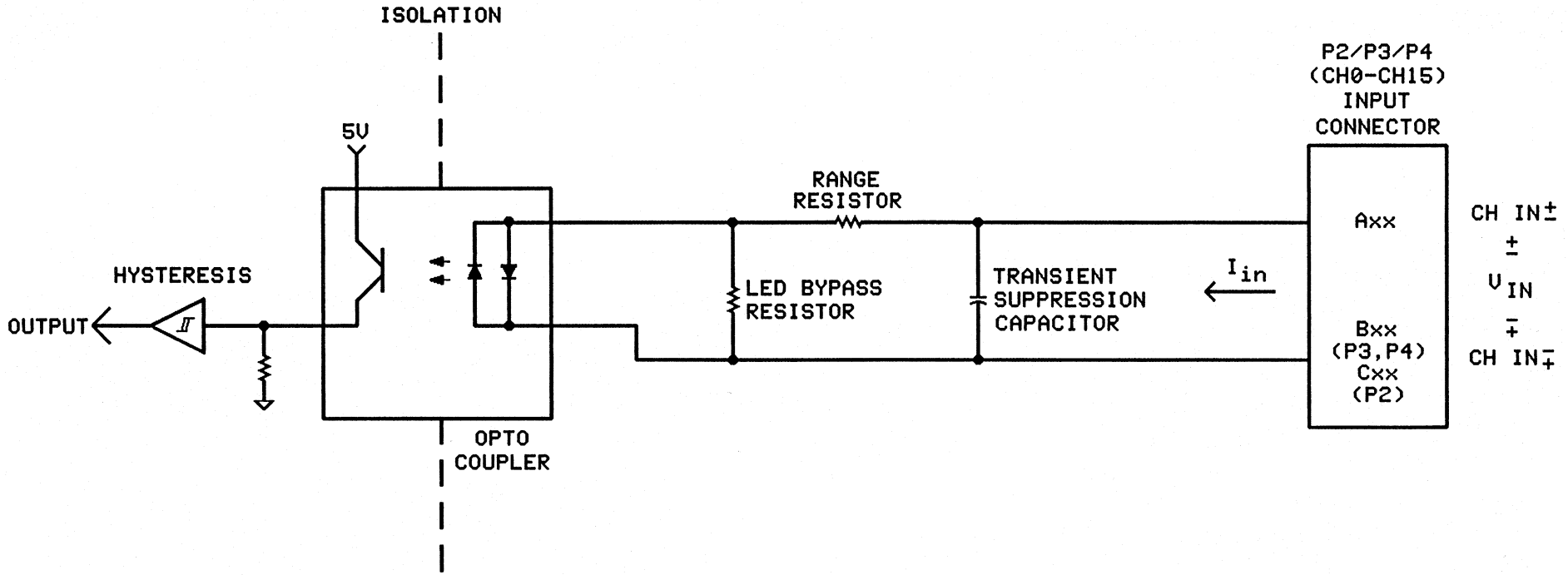
2.5.1 DIGITAL DC INPUT THRESHOLD SELECTION

Two input threshold voltages are available, 4-25V DC or 20-55V DC, on a per board basis, as shown in the following table:

Module	Channel Range	Positive Threshold Voltage (Maximum)
AVME9420/9421/9422	4-25V DC	4V DC
AVME9425/9426/9427	20-55V DC	20V DC

2.5.2 SENSING CONTACT CLOSURES AND SWITCHES

The DC input voltage should be within the range listed in the previous table. See Figure 2.4: Digital DC Input Channel Configurations, for connections for
different input types.



RANGES:

MODULE	V_{IN}	I_{in} @MAX VIN
9420/1/2	4-25VDC	15.8mA DC
9425/6/7	20-55VDC	6.5mA DC

FIGURE 2.3: AVME942x SIMPLIFIED DIGITAL DC INPUT CHANNEL SCHEMATIC

AcroMag® MIXOM, MICH.								
2 DEC 92	A	——	TAV	ATS	—			
DATE	RV	ECN	DR	ENG	ELP			
TITLE: SIMPLIFIED DIGITAL DC INPUT CHANNEL SCHEMATIC								
SIZE D	SERIES AVME942x		SHEET 1 OF 1		DRAWING 4501-283			REV A

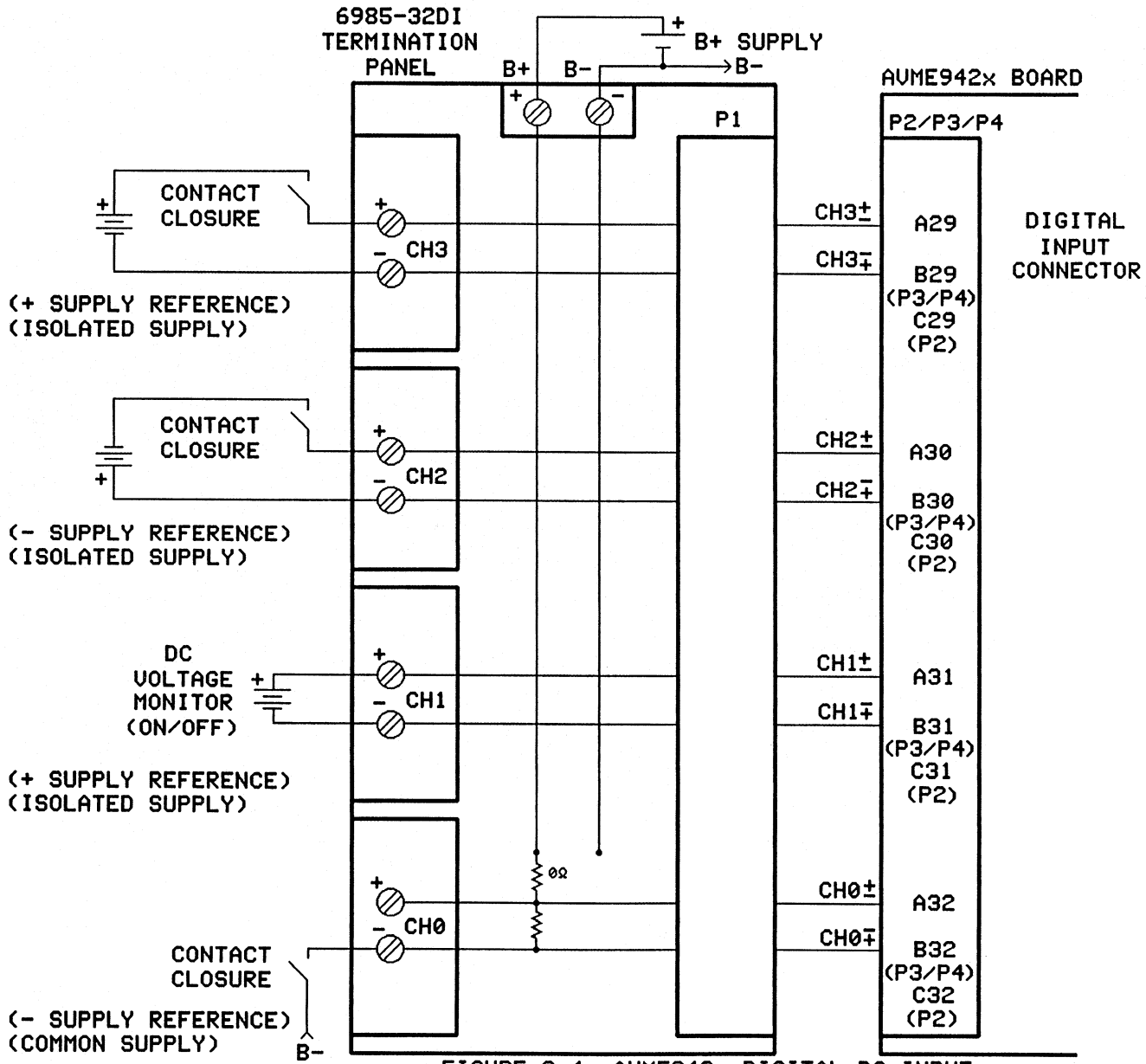


FIGURE 2.4: AVME942x DIGITAL DC INPUT CHANNEL CONFIGURATIONS

AcroMag® WIXOM, MICH.

					TAV	ATS
2 DEC 92	A	——			BR	ENG
DATE	REV	ECN				CLP

TITLE: DIGITAL DC INPUT CHANNEL CONFIGURATIONS

SIZE	SERIES	SHEET	DRAWING	REV
D PMS	AVME942x	1 OF 1	4501-284	A

2.5.3 DEBOUNCE DELAY SELECTION

If mechanical relay contacts (or switches) are used as inputs, then the Port B or Port F channels 0 through 7 should be selected to take advantage of the debounce circuitry on the port. Also, it is strongly recommended that a debounce delay longer than the maximum expected bounce time be used. If the bounce time cannot be determined, then the maximum debounce delay should be selected.

The debounce delay time is jumper programmable (J7) on a global basis for all Port B or Port F input channels 0 through 7 (i.e. all selected input channels will have the same delay), as shown in the following table:

Debounce Delay Time (uS)	J7 1 & 2	J7 3 & 4	J7 5 & 6	J7 7 & 8
7 to 8	OUT	OUT	OUT	IN
336 to 384	OUT	OUT	IN	OUT
672 to 768	OUT	IN	OUT	OUT
1344 to 1536	IN	OUT	OUT	OUT

NOTE: One of the debounce delay times must be selected. If none or more than one delay time is selected, the Port B or Port F channels 0 through 7 input signals will not pass through the debounce circuit.

2.5.4 INTERRUPT AND DEBOUNCE PORT SELECTION

The interrupt and debounce port is jumper selectable (J8) on a global basis for all Port B or Port F input channels 0 through 7 (i.e. all port selected input channels will be able to cause interrupts and will have the same delay), as shown in the following table:

Channels (0-7)	J8 1 & 2	J8 2 & 3
Port B	IN	OUT
Port F	OUT	IN

NOTE: One of the interrupt and debounce ports must be selected. If none is selected, the Port B or Port F channels 0 through 7 input signals may not pass through the interrupt and debounce circuit.

2.5.5 DIGITAL INPUT INTERFACE TO TTL AND CMOS SIGNALS

Logic level inputs can be interfaced to the board by the use of common logic elements such as the 74LS05 (or 74HC05) open collector (or drain) inverter gates. See Figure 2.5: AVME942x Interface to TTL and CMOS Signals, for connection information. Applying a logic "1" to the input of the inverter gate sinks the current required to turn the opto-coupler ON (using the lowest input voltage range) and yields a logic "1" for the corresponding input channel register bit position.

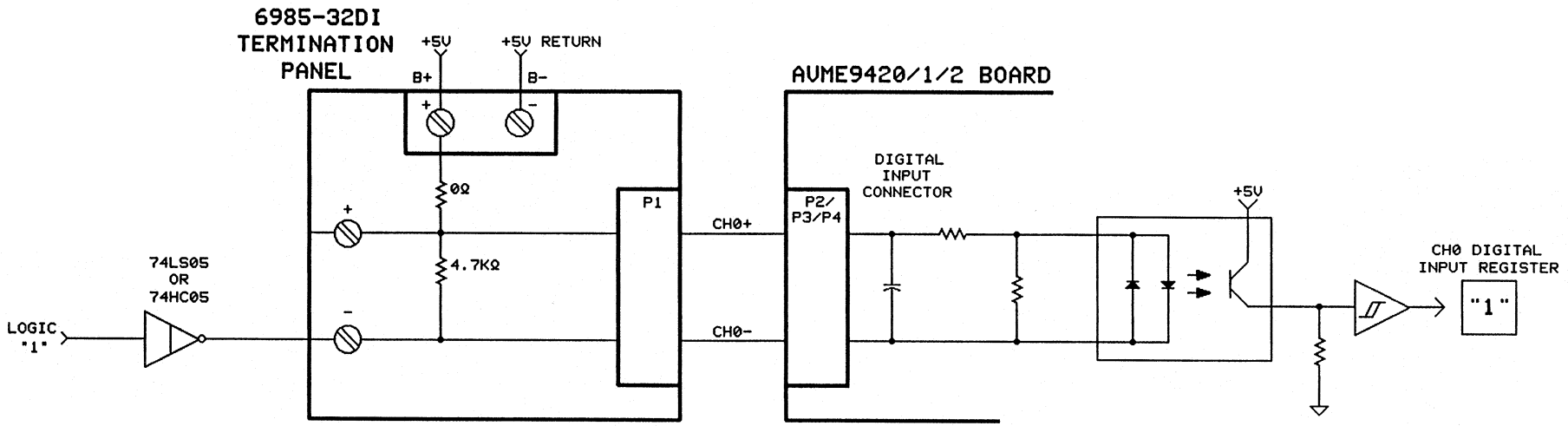


FIGURE 2.5: AVME942x INTERFACE TO
TTL AND CMOS SIGNALS

AcroMag® WIXOM, MICH.			2 DEC 92	A	——	TAV	ATS	—
			DATE	AV	ECN	DR	ENG	ELP
TITLE: INTERFACE TO TTL AND CMOS SIGNALS								
SIZE D DWG	SERIES: AVME942x		SHEET: 1 OF 1		DRAWING: 4501-285			REV: A

2.6 CONNECTORS

2.6.1 DIGITAL INPUT CONNECTOR (PORT A & PORT B)

The first group of 32 digital inputs (Port A channels 0 through 15 and Port B channels 0 through 15) are connected to the AVME9421/9422/9426/9427 board via connector P3 (upper connector as viewed from the front). Table 2.1 defines the assignment. These connections are easily accommodated through the use of Acromag termination panels and flat cable assemblies or through the use of a user defined termination panel.

P3: DIN 41612 Type B Level II, 64 Pin Male Connector. Panduit No. 100-064-033B or equiv.

Table 2.1: P3 CONNECTOR (PORT A & B)

Port	Pin Number	Mnemonic	Pin Number	Mnemonic
	32A	CH0 +/-	32B	CH0-/+
	31A	CH1+/-	31B	CH1-/+
	30A	CH2+/-	30B	CH2-/+
	29A	CH3+/-	29B	CH3-/+
	28A	CH4+/-	28B	CH4-/+
P	27A	CH5+/-	27B	CH5-/+
O	26A	CH6+/-	26B	CH6-/+
R	25A	CH7+/-	25B	CH7-/+
T	24A	CH8+/-	24B	CH8-/+
	23A	CH9+/-	23B	CH9-/+
A	22A	CH10+/-	22B	CH10-/+
	21A	CH11+/-	21B	CH11-/+
	20A	CH12+/-	20B	CH12-/+
	19A	CH13+/-	19B	CH13-/+
	18A	CH14+/-	18B	CH14-/+
	17A	CH15+/-	17B	CH15-/+
	16A	CH0+/-	16B	CH0-/+
	15A	CH1+/-	15B	CH1-/+
	14A	CH2+/-	14B	CH2-/+
	13A	CH3+/-	13B	CH3-/+
	12A	CH4+/-	12B	CH4-/+
P	11A	CH5+/-	11B	CH5-/+
O	10A	CH6+/-	10B	CH6-/+
R	9A	CH7+/-	9B	CH7-/+
T	8A	CH8+/-	8B	CH8-/+
	7A	CH9+/-	7B	CH9-/+
B	6A	CH10+/-	6B	CH10-/+
	5A	CH11+/-	5B	CH11-/+
	4A	CH12+/-	4B	CH12-/+
	3A	CH13+/-	3B	CH13-/+
	2A	CH14+/-	2B	CH14-/+
	1A	CH15+/-	1B	CH15-/+

2.6.2 DIGITAL INPUT CONNECTOR (PORT C & PORT D)

The second group of 32 digital inputs (Port C channels 0 through 15 and Port D channels 0 through 15) are connected to the AVME9421/9422/9426/9427 board via connector P4 (lower connector as viewed from the front). Table 2.2 defines the assignment. These connections are easily accommodated through the use of Acromag termination panels and flat cable assemblies or through the use of a user defined termination panel.

P4: DIN 41612 Type B Level II, 64 Pin Male Connector. Panduit No. 100-064-033B or equiv.

Table 2.2: P4 CONNECTOR (PORT C & D)

Port	Pin Number	Mnemonic	Pin Number	Mnemonic
	32A	CH0+/-	32B	CH0-/+
	31A	CH1+/-	31B	CH1-/+
	30A	CH2+/-	30B	CH2-/+
	29A	CH3+/-	29B	CH3-/+
	28A	CH4+/-	28B	CH4-/+
P	27A	CH5+/-	27B	CH5-/+
O	26A	CH6+/-	26B	CH6-/+
R	25A	CH7+/-	25B	CH7-/+
T	24A	CH8+/-	24B	CH8-/+
	23A	CH9+/-	23B	CH9-/+
C	22A	CH10+/-	22B	CH10-/+
	21A	CH11+/-	21B	CH11-/+
	20A	CH12+/-	20B	CH12-/+
	19A	CH13+/-	19B	CH13-/+
	18A	CH14+/-	18B	CH14-/+
	17A	CH15+/-	17B	CH15-/+
	16A	CH0+/-	16B	CH0-/+
	15A	CH1+/-	15B	CH1-/+
	14A	CH2+/-	14B	CH2-/+
	13A	CH3+/-	13B	CH3-/+
	12A	CH4+/-	12B	CH4-/+
P	11A	CH5+/-	11B	CH5-/+
O	10A	CH6+/-	10B	CH6-/+
R	9A	CH7+/-	9B	CH7-/+
T	8A	CH8+/-	8B	CH8-/+
	7A	CH9+/-	7B	CH9-/+
D	6A	CH10+/-	6B	CH10-/+
	5A	CH11+/-	5B	CH11-/+
	4A	CH12+/-	4B	CH12-/+
	3A	CH13+/-	3B	CH13-/+
	2A	CH14+/-	2B	CH14-/+
	1A	CH15+/-	1B	CH15-/+

2.6.3 DIGITAL INPUT CONNECTOR (PORT E & PORT F)

The third group of digital inputs (Port E channels 0 through 15 and Port F channels 0 through 15) are connected to the AVME9420/9422/9425/9427 board via connector P2 (lower rear connector as viewed from the front). Table 2.3 defines the assignment. These connections are easily accommodated through the use of Acromag termination panels and flat cable assemblies or through the use of a user defined termination panel.

P2: DIN 41612 Type C Level II, 64 Pin Male Connector. Panduit No. 100-964-033B or equiv.

Table 2.3: P2 CONNECTOR (PORT E & F)

Port	Pin Number	Mnemonic	Pin Number	Mnemonic
	32A	CH0+/-	32C	CH0-/+
	31A	CH1+/-	31C	CH1-/+
	30A	CH2+/-	30C	CH2-/+
	29A	CH3+/-	29C	CH3-/+
	28A	CH4+/-	28C	CH4-/+
P	27A	CH5+/-	27C	CH5-/+
O	26A	CH6+/-	26C	CH6-/+
R	25A	CH7+/-	25C	CH7-/+
T	24A	CH8+/-	24C	CH8-/+
	23A	CH9+/-	23C	CH9-/+
E	22A	CH10+/-	22C	CH10-/+
	21A	CH11+/-	21C	CH11-/+
	20A	CH12+/-	20C	CH12-/+
	19A	CH13+/-	19C	CH13-/+
	18A	CH14+/-	18C	CH14-/+
	17A	CH15+/-	17C	CH15-/+
	16A	CH0+/-	16C	CH0-/+
	15A	CH1+/-	15C	CH1-/+
	14A	CH2+/-	14C	CH2-/+
	13A	CH3+/-	13C	CH3-/+
	12A	CH4+/-	12C	CH4-/+
P	11A	CH5+/-	11C	CH5-/+
O	10A	CH6+/-	10C	CH6-/+
R	9A	CH7+/-	9C	CH7-/+
T	8A	CH8+/-	8C	CH8-/+
	7A	CH9+/-	7C	CH9-/+
F	6A	CH10+/-	6C	CH10-/+
	5A	CH11+/-	5C	CH11-/+
	4A	CH12+/-	4C	CH12-/+
	3A	CH13+/-	3C	CH13-/+
	2A	CH14+/-	2C	CH14-/+
	1A	CH15+/-	1C	CH15-/+

2.6.4 VMEBUS CONNECTIONS

Table 2.4 indicates pin assignments for the VMEbus signals at the P1 connector. The P1 connector is the upper rear connector on the AVME942x board as viewed from the front. The connector consists of 32 rows of three pins labeled A, B, and C. Pin A1 is located at the upper left hand corner of the connector.

TABLE 2.4: P1 BUS CONNECTIONS

PIN NUMBER	MNEMONIC	PIN NUMBER	MNEMONIC	PIN NUMBER	MNEMONIC
1A	D00	1B	BBSY*	1C	D08
2A	D01	2B	BCLR*	2C	D09
3A	D02	3B	ACFAIL*	3C	D10
4A	D03	4B	BGOIN*	4C	D11
5A	D04	5B	BG0OUT*	5C	D12
6A	D05	6B	GB1IN*	6C	D13
7A	D06	7B	BG1OUT*	7C	D14
8A	D07	8B	BG2IN*	8C	D15
9A	GND	9B	BG2OUT*	9C	GND
10A	SYSCLK	10B	BG3IN*	10C	SYSFAIL*
11A	GND	11B	BG3OUT*	11C	BERR*
12A	DS1*	12B	BRO*	12C	SYSRESET*
13A	DS0*	13B	BR1*	13C	LWORD*
14A	WRITE*	14B	BR2*	14C	AM5
15A	GND	15B	BR3*	15C	A23
16A	DTACK*	16B	AM0	16C	A22
17A	GND	17B	AM1	17C	A21
18A	AS*	18B	AM2	18C	A20
19A	GND	19B	AM3	19C	A19
20A	IACK*	20B	GND	20C	A18
21A	IACKIN*	21B	SERCLK	21C	A17
22A	IACKOUT*	22B	SERDAT*	22C	A16
23A	AM4	23B	GND	23C	A15
24A	A07	24B	IRQ7*	24C	A14
25A	A06	25B	IRQ6*	25C	A13
26A	A05	26B	IRQ5*	26C	A12
27A	A04	27B	IRQ4*	27C	A11
28A	A03	28B	IRQ3*	28C	A10
29A	A02	29B	IRQ2*	29C	A09
30A	A01	30B	IRQ1*	30C	A08
31A	-12V	31B	+5V STDBY	31C	+12V
32A	+5V	32B	+5V	32C	+5V

- Indicates that the signal is active low.

Refer to the VMEbus specification for additional information on the VMEbus signals.

2.7 POWER-UP TIMING AND LOADING

The AVME942x board uses a Logic Cell Array to handle the bus interface and control logic timing. Upon power-up, the Logic Cell Array automatically clocks in configuration vectors from a local PROM to initialize the logic circuitry for normal operation. This time is measured as the first 145 mS (typical) after the +5 Volt supply raises to +2.5 Volts at power-up. If a data transfer is attempted during this time, it will simply be ignored and the board will not respond. This should not be a problem because the VME specification requires that the bus master drive the system reset for the first 200 mS after power-up, thus inhibiting any data transfers from taking place.

Port A, Port B, Port C, Port D, Port E and Port F Digital input channels are reset to the OFF state following a power-up sequence. External input signals above threshold levels can then drive inputs ON.

2.8 DATA TRANSFER TIMING

Data transfer time is measured from the falling edge of DSx* to the falling edge of DTACK* during a normal data transfer cycle.

REGISTER	DATA TRANSFER TIME
All Registers	600nS, typical

2.9 FIELD GROUNDING CONSIDERATIONS

The board is designed to isolate every input channel from each other as well as from the VMEbus. This is intended to protect each channel and the VMEbus from voltage spikes and transients such as those caused by ground currents and "pick-up". The isolation provides the ability to earth ground the field wiring without the concern of ground currents damaging the card cage electronics.

3.0 PROGRAMMING INFORMATION

This chapter provides the specific information necessary to operate the AVME942x Isolated Digital Input Board.

3.1 MEMORY MAP

The board is addressable on 1K byte boundaries in the Short I/O Address Space or Standard Address Space. All Acromag VMEbus non-intelligent slaves have a standard interface configuration which consists of a 32 byte board ID PROM and a Board Status register. The rest of the 1K byte address space contains registers or memory specific to the function of the board. The memory map is shown in Figure 3.1 (Addresses in Hex).

Figure 3.1: Board Memory Map

Address Base +	D15 Even D8	D7 Odd D0	Address Base +
00 3E	Undefined	R – Board ID PROM	01 3F
40 7E	Undefined		41 7F
80	Undefined	R/W – Board Status	81
82 9E	Undefined		83 9F
A0	Undefined	R/W –Int Vector Port B&F CHO	A1
A2		R/W –Int Vector Port B&F CH1	A3
A4		R/W –Int Vector Port B&F CH2	A5
A6		R/W –Int Vector Port B&F CH3	A7
A8		R/W –Int Vector Port B&F CH4	A9
AA		R/W –Int Vector Port B&F CH5	AB
AC		R/W –Int Vector Port B&F CH6	AD
AE		R/W –Int Vector Port B&F CH7	AF
B0 BE	Undefined		B1 BF
C0	Undefined	R/W – Digital Input Channel Interrupt Status Register CH7 Port B & Port F CH0	C1
C2	Undefined	R/W – Digital Input Channel Interrupt Enable Register CH7 Port B & Port F CH0	C3

Board Memory Map continued on page 3.2

Board Memory Map continued

C4	Undefined	R/W – Digital Input Channel Interrupt Polarity Register CH7 Port B & Port F CH0	C5
C6	Undefined	R/W – Digital Input Channel Interrupt Type Select Register CH7 Port B & Port F Ch0	C7
C8	Undefined	R/W – Digital Input Channel Int. Pattern Enable Register CH7 Port B & Port F Ch0	C9
CA	R – Port A Digital Input Channel Data Register CH15 CH0		CB
CC	R – Port B Digital Input Channel Data Register CH15 CH0		CD
CE	R – Port C Digital Input Channel Data Register CH15 CH0		CF
D0	R – Port D Digital Input Channel Data Register CH15 CH0		D1
D2	R – Port E Digital Input Channel Data Register CH15 CH0		D3
D4	R – Port F Digital Input Channel Data Register CH15 CH0		D5
D6 3EF	Undefined		D7 3FF

3.1.1 BOARD IDENTIFICATION PROM - (READ ONLY) - 01H THROUGH 3FH (ODD)

The board contains an identification section. This section of data describes the board model number, the manufacturer, and the product revision level. The identification section starts at the board's base address plus 1 and is 32 bytes in length. Bytes are addressed using only the odd addresses between 1 and 63. The PROM contents are shown in Figure 3.2 for an AVME9422-I-L (each model has a unique PROM).

Figure 3.2: AVME9422-I-L Board Identification PROM

Offset From Board Base Address	Value		Descriptions
	ASCII Character	Numeric	
01H	V	56H	All Boards have “VMEID”
03H	M	4DH	
05H	E	45H	
07H	I	49H	
09H	D	44H	
0BH	A	41H	Manufacturer’s I.D., “ACR” for Acromag
0DH	C	43H	
0FH	R	52H	
11H	9	39H	Board Model Number (6 characters and
13H	4	34H	1 trailing “blank”)
15H	2	32H	
17H	2	32H	(Each model has a unique number)
19H	I	49H	
1BH	L	4CH	
1DH		20H	
1FH	1	31H	Number of KILOBYTES of address Space used.
21H		20H	
23H	Undefined	41H	Reserved
25H	Undefined		
27H	Undefined		
29H	Undefined		Reserved
2BH	Undefined		
2DH	Undefined		
2FH	Undefined		
31H	Undefined		
33H	Undefined		
35H	Undefined		
37H	Undefined		
39H	Undefined		
3BH	Undefined		
3DH	Undefined		
3FH	Undefined		

3.1.2 BOARD STATUS REGISTER - (READ/WRITE) - 81H

The Board Status Register reflects and controls functions globally on the board.

MSB 7	6	5	4	3	2	1	0
◄——	Reserved	——►	Software Reset	Global Int. Enable	Global Int. Pending	Green LED	Red LED

Where:

Bits 7,6,5: Reserved for future use - equal "0" if read.

Bit 4: Software Reset (W) - writing a "1" to this bit causes a software reset. Writing "0" or reading the bit has no effect. The effect of a software reset on the various registers is described in the description of each register.

Reset Condition: Set to "0".

Bit 3: Global Interrupt Enable (R/W) - writing a "1" to this bit enables interrupts to be serviced, provided the interrupt level (IRQx*) is selected. A "0" disables servicing interrupts.

Reset Condition: Set to "0", interrupts disabled.

Bit 2: Global Interrupt Pending (R) - this bit will be a "1" when there is an interrupt pending. This bit will be "0" when there is no interrupt pending. Polling this bit will reflect the board's pending interrupt status, even if the Global Interrupt Enable bit is set to "0".

Reset condition: Set to "0".

Bit 1: Green LED (R/W) - when written, this bit will control the state of the green LED on the front panel. A "1" will turn it on, a "0" will turn it off. Reading it will reflect its current state.

Reset Condition: Set to "0", green LED off.

Bit 0: Red LED (R/W) - when written, this bit will control the state of the red LED on the front panel and the state of the VMEbus SYSFAIL* signal. A "1" will turn the LED off and set SYSFAIL* high, a "0" will turn the LED on and set SYSFAIL* low. Reading it will reflect its current state. (See Section 5.2 for additional information on using SYSFAIL*.)

Reset Condition: Set to "0", red LED lit, and SYSFAIL* is set low.

3.1.2.1 STATUS BITS USAGE

The status register bits 1 and 0 along with the green and red LEDs provide the user with a means of keeping track of a board's functionality in the system. Since there is no intelligence on the board, the host computer controls these bits. The following paragraphs and summary table describe possible uses of the bits in the status register and the LEDs on the front panel.

On power-up the bits in the status register read low, with the green LED off, the red LED lit, and SYSFAIL* low. This indicates that the board has failed or that it has not been tested yet.

If the status register bit 1 reads low and Bit 0 reads high, the LEDs will both be off and SYSFAIL* high. This indicates an inactive board.

If the status register bit 1 reads high and Bit 0 reads low, the LEDs will both be lit and SYSFAIL* low. This indicates the board is undergoing a diagnostic checkout.

If the status register bits 1 and 0 read high, the green LED will be lit with the red LED off and SYSFAIL* high. This indicates the board is fully functional.

Status Bits - Possible Usage

Bit 0 (Red LED)	Bit 1 (Green LED)	SYSFAIL *	Description
0, (on)	0, (off)	Low	Failed or reset condition
1, (off)	0, (off)	High	Inactive board
0, (on)	1, (on)	Low	Diagnostics are running
1, (off)	1, (on)	High	Normal operation

3.1.3 INTERRUPT VECTOR REGISTERS - (READ/WRITE) - A1H TO AFH (ODD ADDRESSES)

The interrupt vector registers maintain the 8 bit interrupt vector numbers for each of the 8 digital input channel interrupt lines. Note that interrupts can only be generated for Port B or Port F digital input channels 0-7. Also note that Port B and Port F of the same channel would use the same interrupt vector register. The appropriate vector is provided to the VMEbus Interrupt Handler when an interrupt is being serviced. This allows each digital input channel interrupt (Port B ch. 0-7 or Port F ch. 0-7) to be serviced by its own software handler. If desired, a single handler can be used by making all of the vectors the same. In this case, the handler will have to determine the interrupting channel by examining the interrupt status register.

The register content is undefined upon reset.

3.1.4 Digital Input Channel Interrupt Status Register (read/write) - C1H

The digital input channel interrupt status register reflects the status of the 8 input channels (Port B or Port F ch. 0-7). A "1" in a bit position indicates an interrupt is pending for the corresponding channel. Each bit is derived from the logical AND of its associated interrupt input and enable bits. Hence, an input channel that does not have interrupts enabled will never have its interrupt pending bit set to a "1".

An individual channel's interrupt can be cleared by writing a "1" to its bit position in the interrupt status register. However, if the condition which caused the interrupt remains or reappears, a new interrupt will be generated. To permanently disable a channel's interrupt, the corresponding bit in the channel interrupt enable register must be cleared, followed by writing a "1" to the channel's bit position in the channel interrupt status register (to clear the interrupt). This is known as the "Release On Register Access" (RORA) method as defined in the VME system architecture.

Bit 7 of this register has a dual purpose. In addition to indicating an interrupt for channel 7, it is also used to indicate an input channel bit pattern match (see the digital input channel interrupt pattern enable register).

MSB							LSB
7	6	5	4	3	2	1	0
CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

All interrupts are cleared following a reset.

NOTE: Interrupts are prioritized via hardware within the card. Channel 7 is the highest priority and channel 0 is the lowest. If multiple input channel interrupts become pending simultaneously, the vector corresponding to the highest numbered channel will be delivered first. After the highest channel's interrupt is serviced and cleared, an additional interrupt will be generated for the next highest priority interrupt (pending) channel.

NOTE: Input channel bandwidth should be limited to reduce the possibility of missing channel interrupts. For a specific input channel this could happen if multiple changes occur before the channel's interrupt is serviced.

3.1.5 Digital Input Channel Interrupt Enable Register (read/write) - C3H

The digital input channel interrupt enable register provides a mask bit for each of the 8 input channels (Port B or Port F ch. 0-7). A "0" in a bit position will prevent the corresponding input channel from causing an external interrupt. A "1" will allow the input channel to cause an interrupt.

MSB							LSB
7	6	5	4	3	2	1	0
CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

All input channel interrupts are masked ("0") following a reset.

3.1.6 DIGITAL INPUT CHANNEL INTERRUPT POLARITY REGISTER (READ/WRITE) - C5H

The digital input channel interrupt polarity register determines the level that will cause a channel interrupt for each of the 8 input channels (Port B or Port F ch. 0-7). A "0" in a bit position means an interrupt will occur when the input channel is below threshold (i.e. a "0" in the digital input channel data register). A "1" in a bit position means an interrupt will occur when the input channel is above threshold (i.e. a "1" in the digital input channel data register).

Note that interrupts will not occur unless they are enabled. The interrupt polarity register will have no effect if Change Of State (COS) interrupts are selected (see the digital input channel interrupt type select register).

MSB							LSB
7	6	5	4	3	2	1	0
CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

All bits are set to "0" following a reset which means that the inputs will cause interrupts when they are below threshold.

3.1.7 DIGITAL INPUT CHANNEL INTERRUPT TYPE SELECT REGISTER (READ/WRITE) - C7H

The digital input channel interrupt type select register determines the type of input channel behavior that will cause a channel interrupt for each of the 8 input channels (Port B or Port F ch. 0-7). A "0" in a bit position means an interrupt will be generated when the input channel level specified by the digital input channel interrupt polarity register occurs. A "1" in a bit position means an interrupt will occur when a Change Of State (COS) occurs at the input channel (either low to high, or high to low).

Note that interrupts will not occur unless they are enabled.

MSB							LSB
7	6	5	4	3	2	1	0
CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

All bits are set to "0" following a reset which means that the inputs will cause interrupts for the input channel levels specified by the digital input channel interrupt polarity register.

3.1.8 DIGITAL INPUT CHANNEL INTERRUPT PATTERN ENABLE REG. (READ/WRITE) - C9H

The digital input channel interrupt pattern enable register provides a mask bit for each of the 8 input channels (Port B or Port F ch. 0-7). A "0" in a bit position will prevent the corresponding input channel from being part of a pattern of channels (bits) which can cause an interrupt. A "1" will allow the input channel to be a component of a pattern which can cause an interrupt. Note that an interrupt will only be generated if all enabled channels (at least 1 and up to 8 channels) forming the pattern meet the level requirements specified in the digital input channel interrupt polarity register. Note that when pattern interrupts are desired, the digital input channel interrupt type select register bits must be set to "0" (interrupt on input level, not on change of state).

Note also that the interrupt generated will result in setting the status bit in the digital input channel interrupt status register which corresponds to channel 7 (i.e. the highest priority channel).

MSB							LSB
7	6	5	4	3	2	1	0
CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

All input channel pattern enable bits are masked ("0") following a reset.

3.1.9 PORT A DIGITAL INPUT CHANNEL DATA REGISTER (READ) - CAH & CBH

The Port A digital input channel data register represents the actual state of the 16 Port A digital input channels at the time the register is read (note that the debounce circuit is not available for Port A, and consequently does not introduce any additional delay). A "0" means that the signal across the board's input channel connector is below threshold. A "1" means that the signal is above threshold. Note that the threshold voltage (i.e. range) is not user selectable.

MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

3.1.10 PORT B DIGITAL INPUT CHANNEL DATA REGISTER (READ) - CCH & CDH

The Port B digital input channel data register represents the actual state of the 16 Port B digital input channels at the time the register is read (note that the debounce circuit will insert a delay, channel 0-7 only, dependent on the degree of debounce selected). A "0" means that the signal across the board's input channel connector is below threshold. A "1" means that the signal is above threshold. Note that the threshold voltage (i.e. range) is not user selectable.

MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

3.1.11 PORT C DIGITAL INPUT CHANNEL DATA REGISTER (READ) - CEH & CFH

The Port C digital input channel data register represents the actual state of the 16 Port C digital input channels at the time the register is read (note that the debounce circuit is not available for Port C, and consequently does not introduce any additional delay). A "0" means that the signal across the board's input channel connector is below threshold. A "1" means that the signal is above threshold. Note that the threshold voltage (i.e. range) is not user selectable.

MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

3.1.12 PORT D DIGITAL INPUT CHANNEL DATA REGISTER (READ) - D0H & D1H

The Port D digital input channel data register represents the actual state of the 16 Port D digital input channels at the time the register is read (note that the debounce circuit is not available for Port D, and consequently does not introduce any additional delay). A "0" means that the signal across the board's input channel connector is below threshold. A "1" means that the signal is above threshold. Note that the threshold voltage (i.e. range) is not user selectable.

MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

3.1.13 PORT E DIGITAL INPUT CHANNEL DATA REGISTER (READ) - D2H & D3H

The Port E digital input channel data register represents the actual state of the 16 Port E digital input channels at the time the register is read (note that the debounce circuit is not available for Port E, and consequently does

not introduce any additional delay). A "0" means that the signal across the board's input channel connector is below threshold. A "1" means that the signal is above threshold. Note that the threshold voltage (i.e. range) is not user selectable.

MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

-

3.1.14 PORT F DIGITAL INPUT CHANNEL DATA REGISTER (READ) - D4H & D5H

The Port F digital input channel data register represents the actual state of the 16 Port F digital input channels at the time the register is read (note that the debounce circuit will insert a delay, channel 0-7 only, dependent on the degree of debounce selected). A "0" means that the signal across the board's input channel connector is below threshold. A "1" means that the signal is above threshold. Note that the threshold voltage (i.e. range) is not user selectable.

MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

3.2 GENERAL PROGRAMMING CONSIDERATIONS

3.2.1 BOARD DIAGNOSTICS

The board is a non-intelligent slave and does not perform self diagnostics. It does, however, provide a standard interface architecture which includes a Board Status Register useful in system diagnostics.

Status bits, control of front panel LEDs, and control of the SYSFAIL* signal are provided through the Board Status Register. Bits 0 and 1 may be used as follows:

Board Status Register		Leds		SYSFAIL*	
Bit 1	Bit 0	Green	Red	SIGNAL	Condition
0	0	Off	On	On	Board failed test or has not been tested.
1	0	On	On	On	Board is being tested.
1	1	On	Off	Off	Board has passed test.
0	1	Off	Off	Off	Board is inactive.

At power up, the system diagnostic software can test each non-intelligent Slave, sequencing the status bits to indicate "undergoing test" and then to "passed" or "failed".

After testing each board, the system software records which boards have failed and sets their status to indicate "inactive". By setting the board's status to inactive, the SYSFAIL* signal is released and may then be useful for an on-line indication of failure by other boards.

Alternatively, the system software could simply set the bits and therefore front panel LEDs, to "passed test" as a visual indication that the presence of the board is recognized.

3.3 GENERATING INTERRUPTS

Port B or Port F Digital input channels 0-7 can cause interrupts (for the jumper selected port only) to be generated for a wide variety of conditions. These include interrupts for:

- Change Of State (COS) of selected input channels.
- Input level (polarity) match of selected input channels.
- Input pattern match of the levels of multiple input channels.

The interrupt level (IRQx*) associated with the card is programmable via a jumper on the board. The interrupt release mechanism is the Release On Register Access (RORA) type. This means that the interrupter will release the interrupt request line (IRQx*) after the interrupt has been cleared by writing a "1" to the appropriate bit position in the input channel interrupt status register.

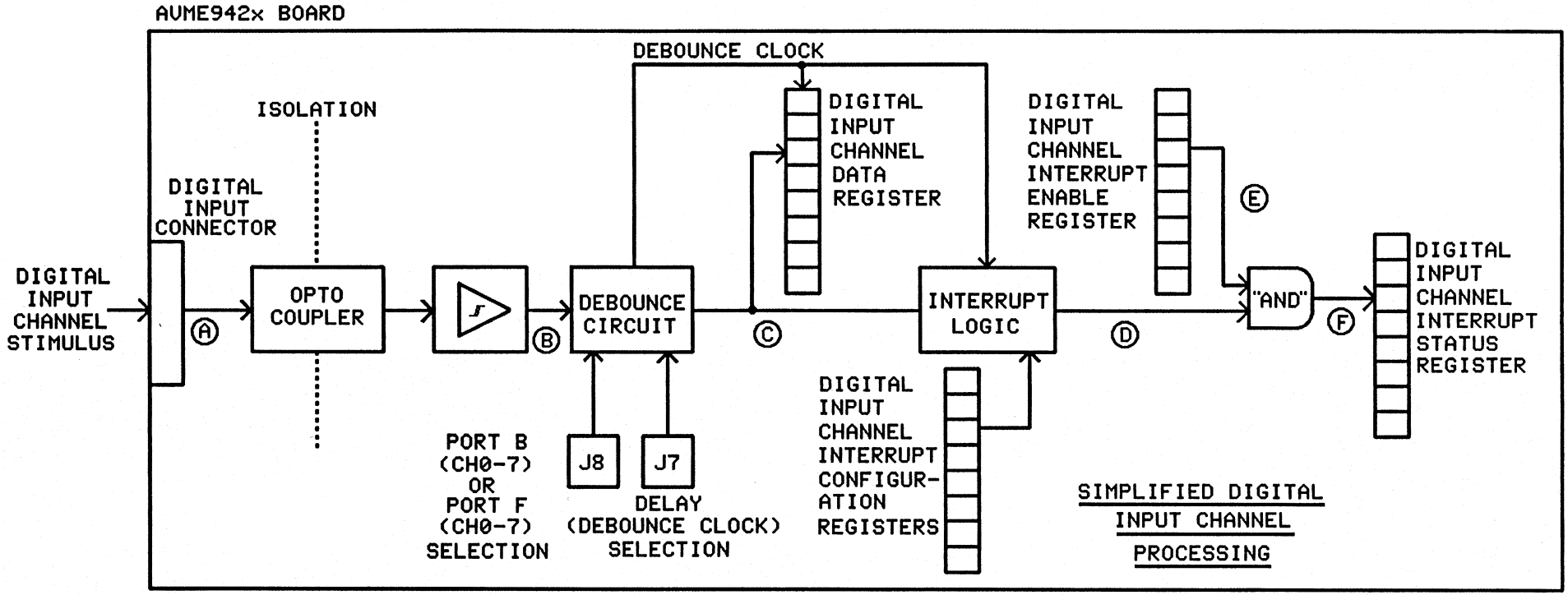
The user has the option of having a single interrupt handler for the entire board or having each channel serviced by a separate software handler. This is determined by what is written into the interrupt vector registers. There is a unique register for each Port B or Port F digital input channel (0-7). Note that Port B and Port F of the same channel would use the same interrupt vector register. However, if the user programs the same vector into all of the vector registers, then the board will have a single interrupt handler.

The digital input channels are prioritized with respect to their interrupts. Channel 7 is the highest priority and channel 0 is the lowest. If multiple input channel interrupts become pending simultaneously, the vector corresponding to the highest numbered channel will be delivered first. After the highest channel's interrupt is serviced and cleared, an additional interrupt will be generated for the next highest priority interrupt (pending) channel. If an input channel pattern match is generated, the interrupt will appear in the channel 7 (i.e. the highest priority) position in the interrupt status register.

Input channel bandwidth should be limited to reduce the possibility of missing channel interrupts. For a specific input channel this could happen if multiple changes occur before the channel's interrupt is serviced.

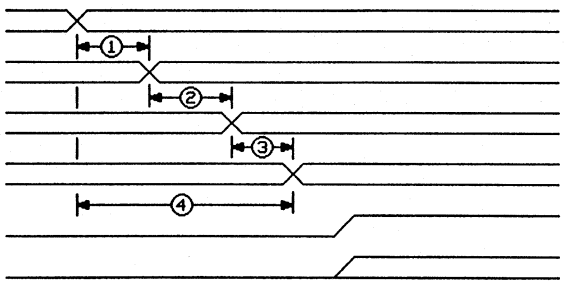
When configuring and enabling interrupts, the response time of Port B or Port F input channels 0 through 7 should be considered. The digital input channel response time is the sum of the response times of the optocoupler (Turn-ON time of 6uS. typical and Turn-OFF time of 60uS. typical at 25 deg. C), the debounce circuit (7uS. to 1.54mS., user selected), and the interrupt logic circuit (1uS. to 192uS., follows debounce selection) as illustrated in Figure 3.3. The total response time must pass before an input channel stimulus (matching an interrupt condition) will be recognized.

Likewise, if an input channel stimulus is programmed to the polarity (level) which should not cause an interrupt, the board user should wait for the response time to pass before enabling interrupts from the channel (see Figure 3.3). To do otherwise will capture an "old" signal which has not completely propagated through the circuit and cause an unwanted interrupt.



SIGNAL	DESCRIPTION
Ⓐ	DIGITAL INPUT CHANNEL STIMULUS (ISOLATED)
Ⓑ	DIGITAL INPUT SIGNAL BUFFERED (NON-ISOLATED)
Ⓒ	DEBOUNCED DIGITAL INPUT SIGNAL
Ⓓ	DIGITAL INPUT CHANNEL INTERRUPT LOGIC SIGNAL
Ⓔ	DIGITAL INPUT CHANNEL INTERRUPT ENABLE
Ⓕ	DIGITAL INPUT CHANNEL INTERRUPT FLAG

INPUT RESPONSE AND INTERRUPT TIMING



	AVME942x	
① INPUT RESPONSE TIME	t_{ON} =6µS TYP. @ 25°C	t_{OFF}=60µs TYP. @°25 C
② DEBOUNCE DELAY	7µS TO ~1.54mS (USER SELECTABLE)	
③ INTERRUPT LOGIC DELAY	1µS TO 192µS (FOLLOWS DEBOUNCE CLOCK)	
④ TOTAL INPUT RESPONSE TIME	14µS TYP. @ 25°C	1.78mS TYP. @ 25°C

FIGURE 3.3: AVME942x INPUT RESPONSE AND INTERRUPT TIMING DIAGRAM

Acromag® WIXOM, MICH.

2 DEC 92	A	——	TA/VATS	—
DATE	RV	ECN	DR	ENG	ELP

TITLE: INPUT RESPONSE AND INTERRUPT TIMING DIAGRAM

SIZE D DWG	SERIES AVME942x	SHEET 1 OF 1	DRAWING 4501-286	REV A

3.3.1 INTERRUPT EXAMPLE FOR CHANGE OF STATE (COS)

1. Set interrupt level (IRQx*) associated with the board via jumper (J4), and select interrupt Port B or Port F via jumper (J8).
2. Clear the global interrupt enable bit in the Board Status Register by writing a "0" to bit 3.
3. Write vectors into the Digital Input Channel Interrupt Vector Registers.
4. Select COS interrupts for channels by writing "1" to each channel's associated bit in the Digital Input Channel Interrupt Type Select Register.
5. Disable input pattern detection interrupts by writing "0" to each channel's associated bit in the Digital Input Channel Interrupt Pattern Enable Register.
6. Enable individual input channel interrupts by writing "1" to each channel's associated bit in the Digital Input Channel Interrupt Enable Register.
7. Clear pending interrupt inputs by writing "1" to each channel's associated bit in the Digital Input Channel Interrupt Status Register.
8. Enable interrupts from the board by writing a "1" to bit 3 (the global interrupt enable bit) in the Board Status Register.

Interrupts may now occur from the selected port from the board.

3.3.2 INTERRUPT EXAMPLE FOR INPUT LEVEL (POLARITY) MATCH

1. Set interrupt level (IRQx*) associated with the board via jumper (J4), and select interrupt Port B or Port F via jumper (J8).
2. Clear the global interrupt enable bit in the Board Status Register by writing a "0" to bit 3.
3. Write vectors into the Digital Input Channel Interrupt Vector Registers.
4. Select polarity (level) interrupts for channels by writing "0" to each channel's associated bit in the Digital Input Channel Interrupt Type Select Register.
5. Select the desired polarity (level) for input channel interrupts by writing "0" or "1" to each channel's associated bit in the Digital Input Channel Interrupt Polarity Register.
6. Disable input pattern detection interrupts by writing "0" to each channel's associated bit in the Digital Input Channel Interrupt Pattern Enable Register.
7. Enable individual input channel interrupts by writing "1" to each channel's associated bit in the Digital Input Channel Interrupt Enable Register.
8. Clear pending interrupt inputs by writing "1" to each channel's associated bit in the Digital Input Channel Interrupt Status Register.
9. Enable interrupts from the board by writing a "1" to bit 3 (the global interrupt enable bit) in the Board Status Register.

Interrupts may now occur from the selected port from the board.

3.3.3 INTERRUPT EXAMPLE FOR INPUT PATTERN MATCH (OF MULTIPLE CHANNEL LEVELS)

1. Set interrupt level (IRQx*) associated with the board via jumper (J4), and select interrupt Port B or Port F via jumper (J8).
2. Clear the global interrupt enable bit in the Board Status Register by writing a "0" to bit 3.
3. Write vector into the Digital Input Channel Interrupt Vector Register associated with channel 7.
4. Select polarity (level) interrupts for channels by writing "0" to each channel's associated bit in the Digital Input Channel Interrupt Type Select Register.
5. Select the desired polarity (level) for input channel interrupts by writing "0" or "1" to each channel's associated bit in the Digital Input Channel Interrupt Polarity Register.
6. Disable individual input channel interrupts by writing "0" to each channel's associated bit in the Digital Input Channel Interrupt Enable Register.
7. Enable input pattern detection interrupts by writing "1" to each channel's associated bit in the Digital Input Channel Interrupt Pattern Enable Register.
8. Clear pending interrupt inputs by writing "1" to each channel's associated bit in the Digital Input Channel Interrupt Status Register.
9. Enable interrupts from the board by writing a "1" to bit 3 (the global interrupt enable bit) in the Board Status Register.

Interrupts may now occur from the selected port from the board.

3.3.4 SEQUENCE OF EVENTS FOR AN INTERRUPT

1. The AVME942x (interrupter) board makes an interrupt request (asserts IRQx*).
2. The host (interrupt handler) asserts IACK* and the level of the interrupt it is seeking on A01-A03.
3. When the asserted IACKIN* signal (daisy chained) is passed to the AVME942x, the board will put the appropriate interrupt vector on the bus (D00-D07), if the level of the interrupt matches that sought by the host. Note that IRQx* remains asserted.
4. The host uses the vector to point at which interrupt handler to execute and begins its execution.
5. Example of Generic Interrupt Handler Actions:
   A. Disable the interrupting channel(s) by writing a "0" to the appropriate bits in the interrupt enable register.

   B. Clear the interrupting channel(s) by writing a "1" to the appropriate bits in the interrupt status register.

   C. Enable the interrupting channel(s) by writing a "1" to the appropriate bits in the interrupt enable register.

6. If the input stimulus has been removed and no other channels have interrupts pending, the interrupt cycle is completed (i.e. the board negates its interrupt request, IRQx*).
   A. If the input stimulus remains, a new interrupt request will immediately follow. If the stimulus cannot be removed, then the channel should be disabled or reconfigured (e.g. for the opposite polarity).

   B. If other channels have interrupts pending, then the interrupt request (IRQx*) will remain asserted. This will start a new interrupt cycle.

4.0 THEORY OF OPERATION

This chapter describes the circuitry that is used on the board. A block diagram is shown in Figure 4.1. Parts lists are in chapter 5, and the schematic & part location drawings are in Chapter 7.

4.1 VMEBUS INTERFACE

The VMEbus interface is composed of three functional circuit areas.

- Data buffers (U38, U39)
- Interrupter (U40, U42, U47, U48, U49)
- Address decode and bus control logic (U43, U44, U45, U47)

4.1.1 VMEBUS CONTROL LOGIC

The Data Transfer Acknowledge (DTACK*) signal is generated by the logic/timing circuitry (U45, U47) on the board for handshaking with the bus master during data transfer cycles. The DTACK* signal will be asserted after the card address has been properly decoded and either of the data strobes (DS1*, DS0*) is asserted. The amount of delay before DTACK* is asserted is controlled by circuitry within U47 which uses the SYSCLK (16MHz.) provided on the VMEbus to derive a fixed time delay.

The AVME942x does not use (assert) the VME BERR* signal (as permitted in the VMEbus specification). If the bus master improperly addresses the board, it will not get a response, however the VMEbus Bus Timer located in the System Controller will time-out and cause an end to the cycle.

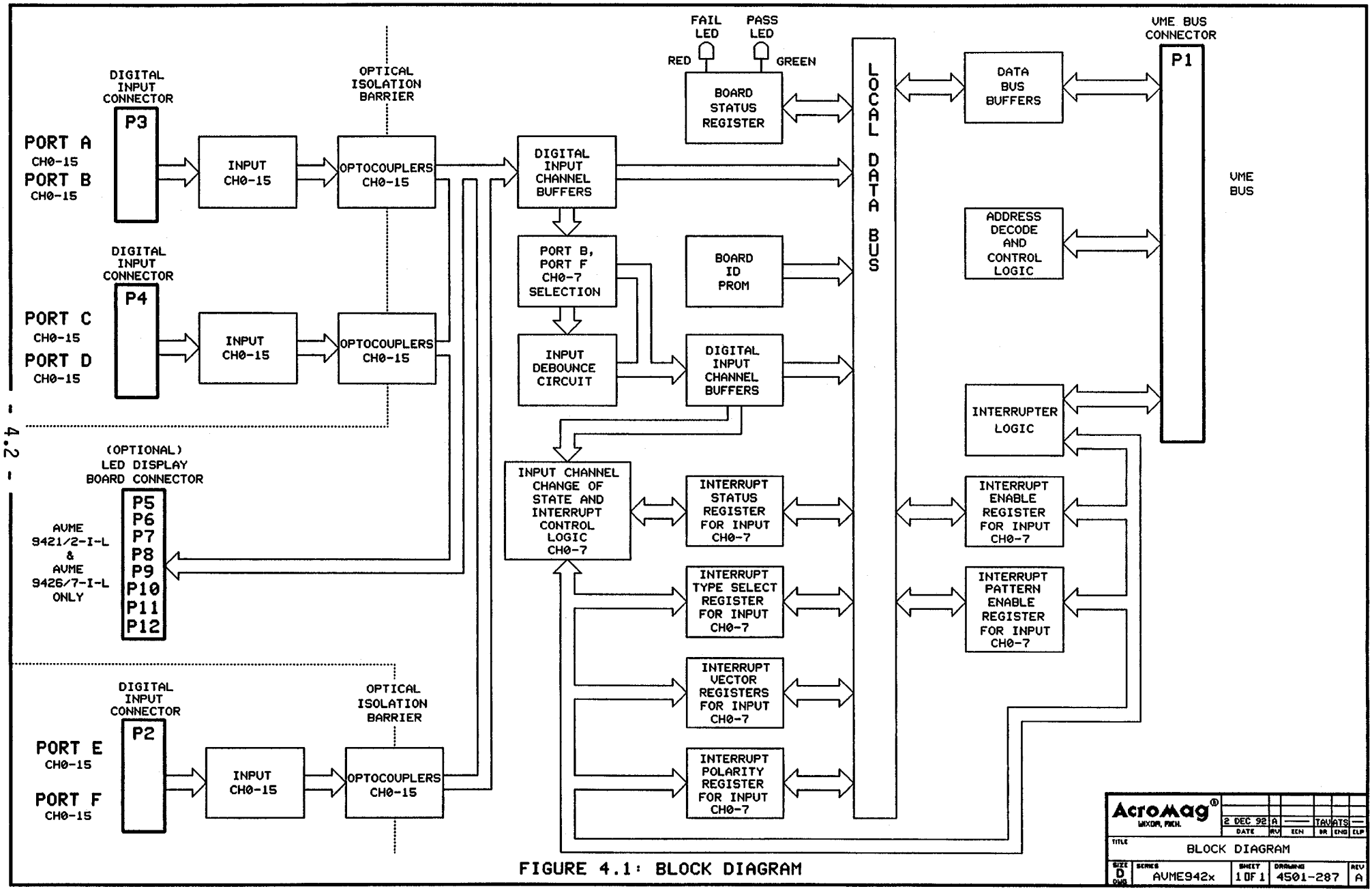


FIGURE 4.1: BLOCK DIAGRAM

Acromag® WIXOM, MICH.		2 DEC 92	A		TAV/ATS			
		DATE	RV	ECN	DR	ENG	ELP	
TITLE: BLOCK DIAGRAM								
SIZE: D DWG	SERIES: AVME942x	SHEET: 1 OF 1	DRAWING: 4501-287	REV: A				

4.1.2 VME INTERRUPTER

The interrupt level (IRQx*) associated with the card is programmable via a jumper on the board. The card will return an 8-bit interrupt vector during the interrupt acknowledge cycle. Each interrupting channel can have its own interrupt vector. The interrupt release mechanism is the Release On Register Access (RORA) type. This means that an interrupter will release the interrupt request line (IRQx*) after the interrupt has been cleared by writing a "1" to the appropriate bit position in the input channel interrupt status register.

Interrupts can be generated by any of 8 digital inputs (Port B or Port F channels 0-7). Interrupt on selected input channel COS or polarity (level) match can be selected. Alternatively, interrupts on a pattern match of selected input channel polarities (levels) can be programmed. Interrupts occur on a first come first served basis, unless they occur at the same time. If two or more interrupts occur at the same time, then channel 7 has the highest priority (channel 0 has the lowest). If an input channel pattern match is generated, the interrupt will appear in the channel 7 (highest priority) position.

Input channel bandwidth should be limited to reduce the possibility of missing channel interrupts. For a specific input channel this could happen if multiple changes occur before the channel's interrupt is serviced.

When an input channel interrupt condition is satisfied, the interrupter logic will assert the pre-programmed interrupt request level (IRQ7* - IRQ1*) and then monitor the Interrupt Acknowledge Input (IACKIN*) signal. When IACKIN* is asserted the logic compares the VMEbus address lines (A1 - A3) to the pre-programmed board interrupt level. If the lines are not equal, it will pass the signal along by asserting IACKOUT*. If the lines are equal, it will then drive the data bus D08(O) with the vector associated with the interrupting channel and assert the DTACK* signal.

The interrupt vector registers are contained in U49. Both U47 and U48 control the addressing of the vector registers. The board status register is in U47. All other interrupt configuration and status registers, as well as input channel interrupt logic and priority encoding, are in U48. U40 performs the board interrupt level decoding, and U42 checks for a match of the bus interrupt level to the board interrupt level. The IACKIN* signal is monitored by U47, which controls both IACKOUT* and DTACK* signals.

4.2 REGISTER LOCATION SUMMARY

Local memory locations are implemented in various data registers on board. The registers are located in the following devices:

- Board Identification PROM (U41)
- Board Status Register (U47)
- Interrupt Vector Registers (U49)
- Digital Input Channel Interrupt Status Register (U48)
- Digital Input Channel Interrupt Enable Register (U48)
- Digital Input Channel Interrupt Polarity Register (U48)

- Digital Input Channel Interrupt Pattern Enable Register (U48)
- Digital Input Channel Interrupt Type Select Register (U48)
- Port A Digital Input Channel Data Control Buffer (U25, U26)
- Port B Digital Input Channel Data Control Buffer (U48, U28)
- Port C Digital Input Channel Data Control Buffer (U29, U30)
- Port D Digital Input Channel Data Control Buffer (U31, U32)
- Port E Digital Input Channel Data Control Buffer (U33, U34)
- Port F Digital Input Channel Data Control Buffer (U48, U36)

4.3 ISOLATION BARRIER

Optical isolation is used to isolate all digital input channels from each other (channel to channel) and from the logic and VMEbus circuits.

4.4 DIGITAL INPUT SECTION

There are 32, 64, or 96 digital input channels (16-Port A, 16-Port B, 16-Port C, 16-Port D, 16-Port E and 16-Port F) available on the board. All channels contain input capacitors to suppress transient overvoltages. The AVME9420/1/2 models provide an input voltage range of 4 to 25V DC for each channel. The AVME9425/6/7 models provide an input voltage range of 20 to 55V DC for each channel. Input channel optocouplers (U1-U24) detect the input state providing data directly to Port A, Port B, Port C, Port D, Port E, and Port F Digital Input Channel Data Buffers. The interrupt selected port, Port B (ch 0-7) or Port F (ch 0-7), input data is indirectly (through the debounce circuitry) provided to the interrupt selected Port B or Port F Digital Input Channel Data Buffer.

Input channel debounce circuitry (U48) is jumper selectable (J8) for Port B or Port F channels 0-7 to eliminate glitches from the input signals. These glitches are frequently caused by contact bounce in mechanical relays and switches. Eliminating these glitches is desirable to prevent erroneous channel data and spurious interrupts. The debounce delay time is jumper programmable (J7) on a global basis for Port B or Port F input channels 0-7 (i.e. selected Port B or Port F input channels 0-7 will have the same delay).

Note that the jumper selection (J8) for the interrupt and debounce circuitry, for Port B (ch 0-7) or Port F (ch 0-7), are selected together.

5.0 SERVICE AND REPAIR INFORMATION

This chapter provides instructions on how to obtain service and repair assistance, service procedures, and component parts lists.

5.1 SERVICE AND REPAIR ASSISTANCE

It is highly recommended that a non-functioning board be returned to Acromag for repair. Acromag uses tested and burned-in parts, and in some cases, parts that have been selected for characteristics beyond that specified by the manufacturer. 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.

5.2 PRELIMINARY SERVICE PROCEDURE

Before beginning repair, be sure that all of the procedures in Chapter 2, Preparation For Use, have been followed. The procedures are necessary since the board has jumpers that must be properly configured.

CAUTION POWER MUST BE OFF BEFORE REMOVING OR INSERTING BOARDS

Note: It has been observed that on occasion, a "boot" program for a disk operating system will "hang" waiting for the VMEbus SYSFAIL* signal to be released by an intelligent disk controller board. Acromag's non-intelligent slave boards assert the SYSFAIL* signal as described in the VMEbus Specification Rev. C.1 and therefore, the disk operating system will remain "hung". The best solution to this problem is to correct the boot program so that it is no longer dependent upon the SYSFAIL* signal. When this solution is not practical, it is possible to disconnect the SYSFAIL* from the circuitry on the AVME942x Acromag board by removing the SYSFAIL* selection jumper at J9. If further assistance is needed, call Acromag's Applications Engineering Department.

5.3 PARTS LISTS

Parts Lists are provided as an aid to the user in troubleshooting the Board (also reference the schematic and part location drawings of chapter 7). Tables 5.1A to 5.1G list the parts installed on the main board for the various models; similarly Table 5.2 lists parts for the LED expansion board. Replacement parts and repair services are available from Acromag.

Changes are sometimes made to improve the product, to facilitate delivery, or to control cost. It is therefore important to include the Component Reference Number, the Acromag Part Number, the Board Model Number, and the Board Serial Number when providing information to order parts.

TABLE 5.1A: PARTS LIST FOR MODEL AVME942x-I (MAIN BOARD – PARTS COMMON TO ALL MODELS)

Component Reference Number	Acromag Part Number	Description
U37	1033-670	IC 74LS174N
U38, 39	1033-627	IC 74LS645-1ND
U40	1033-048	IC 7445N
U42	1033-719	IC 74LS136N3
U43, 44	1033-626	IC AM25LS2521PCB
U45	1033-623	IC 74F38N
U46	5025-121	Programmed part
U47	1033-578	IC XC3030-70PC84C
U48	1033-577	IC XC3042-70PC84C
U49	1033-417	IC TMM2015AP-15
R65, 66	1100-630	RES NET 2% 9-COM 10K
R67	1100-268	RES NET 2% 9-COM 4.7K
R68	1000-822	RES FILM 5% .25W 180 OHM
R69, 70	1100-494	RES NET 2% 7-COM 1K
R71	1000-825	RES FILM 5% .25W 330 OHM
R72, 73	1000-839	RES FILM 5% .25W 4.7K
R74	1000-836	RES FILM 5% .25W 2.7K
C121	1002-314	CAP TAN 15OUF 15V
C134-146	1002-530	CAP MONO 0.1UF 100V Z5U
D1	1001-197	LED BILEVEL RED/GRN
D2	1001-113	DIODE IN914B
X1-2	1004-606	CHIP CARRIER, 84 PIN
P1	1004-733	CONN. C/96P/A,B,C HARPOON
J1	1004-379	HEADER 16 POST 2 ROW
J2	1004-383	POST 2 ROW 12 POSITION
J3, 8	1004-333	HEADER 3 PIN POST
J4	1004-374	HEADER 6 POST 2 ROW
J5, 6, 9, & P13	1004-410	POSTS 1 ROW 2 POS
J7	1004-377	HEADER 8 POST 2 ROW
ITEM	1004-332	CLIP BUCK SHORTING

TABLE 5.1B: PARTS LIST FOR MODEL AVME9420-I (MAIN BOARD – PARTS UNIQUE TO THIS MODEL)

Component Reference Number	Acromag Part Number	Description
U17-24	1033-617	IC TLP626 OPTOCOUPLER
U33-36	1033-814	IC SN74LS541N
U41	5025-110	Programmed part
R17-24	1100-801	RES NET 2% 4-ISO HP 1.5K
R33-36	1100-640	RES NET 2% 9-COM 1.2K
R57-64	1100-390	RES NET 2% 4-ISO 4.7K
C65-96	1002-442	CAP MONO 0.01UF 100V Z5U
C113-120, 130-133	1002-530	CAP MONO 0.1UF 100V Z5U
P2	1004-732	CONN. C/64P/A,C HARPOON

TABLE 5.1C: PARTS LIST FOR MODEL AVME9421-I (MAIN BOARD – PARTS UNIQUE TO THIS MODEL)

Component Reference Number	Acromag Part Number	Description
U1-16	1033-617	IC TLP626 OPTOCOUPLER
U25-32	1033-814	IC SN74LS541N
U41	5025-111 (-112)	Programmed part (-L option)
R1-16	1100-801	RES NET 2% 4-ISO HP 1.5K
R25-32	1100-640	RES NET 2% 9-COM 1.2K
R41-56	1100-390	RES NET 2% 4-ISO 4.7K
C1-64	1002-442	CAP MONO 0.01UF 100V Z5U
C97-112, 122-129	1002-530	CAP MONO 0.1UF 100V Z5U
P3, 4	1004-734	CONN. B/64P/A, B HARPOON
P5-12	1004-626	HEADER 9 POST SHORT

TABLE 5.1D: PARTS LIST FOR MODEL AVME9422-I
(MAIN BOARD – PARTS UNIQUE TO THIS MODEL)

Component Reference Number	Acromag Part Number	Description
U1-24	1033-617	IC TLP626 OPTOCOUPLER
U25-36	1033-814	IC SN74LS541N
U41	5025-113 (-114)	Programmed part (-L option)
R1-24	1100-801	RES NET 2% 4-ISO HP 1.5K
R25-36	1100-640	RES NET 2% 9-COM 1.2K
R41-64	1100-390	RES NET 2% 4-ISO 4.7K
C1-96	1002-442	CAP MONO 0.01UF 100V Z5U
C97-120, 122-133	1002-530	CAP MONO 0.1UF 100V Z5U
P2	1004-732	CONN. C/64P/A,C HARPOON
P3, 4	1004-734	CONN. B/64P/A,B HARPOON
P5-12	1004-626	HEADER 9 POST SHORT

TABLE 5.1E: PARTS LIST FOR MODEL AVME9425-I
(MAIN BOARD – PARTS UNIQUE TO THIS MODEL)

Component Reference Number	Acromag Part Number	Description
U17-24	1033-617	IC TLP626 OPTOCOUPLER
U33-36	1033-814	IC SN74LS541N
U41	5025-115	Programmed part
R17-24	1100-802	RES NET 2% 4-ISO HP 8.2K
R33-36	1100-640	RES NET 2% 9-COM 1.2K
R57-64	1100-547	RES NET 2% 4-ISO 1.2K
C65-96	1002-442	CAP MONO 0.01UF 100V Z5U
C113-120, 130-133	1002-530	CAP MONO 0.1UF 100V Z5U
P2	1004-732	CONN. C/64P/A, C HARPOON

TABLE 5.1F: PARTS LIST FOR MODEL AVME9426-I
(MAIN BOARD –PARTS UNIQUE TO THIS MODEL)

Component Reference Number	Acromag Part Number	Description
U1-16	1033-617	IC TLP626 OPTOCOUPLER
U25-32	1033-814	IC SN74LS541N
U41	5025-116 (-117)	Programmed part (-L option)
R1-16	1100-802	RES NET 2% 4-ISO HP 8.2K
R25-32	1100-640	RES NET 2% 9-COM 1.2K
R41-56	1100-547	RES NET 2% 4-ISO 1.2K
C1-64	1002-442	CAP MONO 0.01UF 100V Z5U
C97-112, 122-129	1002-530	CAP MONO 0.1UF 100V Z5U
P3, 4	1004-734	CONN. B/64P/A, B HARPOON
P5-12	1004-626	HEADER 9 POST SHORT

TABLE 5.1G: PARTS LIST FOR MODEL AVME9427-I
(MAIN BOARD –PARTS UNIQUE TO THIS MODEL)

Component Reference Number	Acromag Part Number	Description
U1-24	1033-617	IC TLP626 OPTOCOUPLER
U25-36	1033-814	IC SN74LS541N
U41	5025-118 (-119)	Programmed part (-L option)
R1-24	1100-802	RES NET 2% 4-ISO HP 8.2K
R25-36	1100-640	RES NET 2% 9-COM 1.2K
R41-64	1100-547	RES NET 2% 4-ISO 1.2K
C1-96	1002-442	CAP MONO 0.01UF 100V Z5U
C97-120, 122-133	1002-530	CAP MONO 0.1UF 100V Z5U
P2	1004-732	CONN. C/64P/A, C HARPOON
P3, 4	1004-734	CONN. B/64P/A, B HARPOON
P5-12	1004-626	HEADER 9 POST SHORT

TABLE 5.2: PARTS LIST FOR MODEL AVME942x-I-L
(LED EXPANSION BOARD – PARTS COMMON TO ALL MODELS)

Component Reference Number	Acromag Part Number	Description
U1-8	1033-277	IC SN74LS640N
R1-8	1100-490	RES NET 2% 9-COM 1K
C1-8	1002-530	CAP MONO 0.1UF 100V Z5U
D1-8	1001-209	LED ARRAY GREEN
X5-12	1004-645	SOCKET 9-PIN SINGLE ROW
J1-3	2002-232	JUMPER, WHT TEFLON 0.50

6.0 SPECIFICATIONS

Operating Temperature	0 to +70 deg. C
Relative Humidity	5-95% non-condensing
Storage Temperature	-25 to +85 deg. C
Physical Characteristics:	(Double Eurocard)
Length	9.187 in. (233.3 mm)
Width	6.299 in. (160.0 mm)
Board Thickness	0.062 in. (1.59 mm)
Component Height	0.550 in. (13.97 mm)
Recommended Card Spacing	0.800 in. (20.32 mm)

Connectors:

P1	DIN 41612 96 pin Type C, Level II
P2	DIN 41612 64 pin Type C, Level II Rows A+C
P3, P4	DIN 41612 64 pin Type B, Level II

Power Requirements:

+ 5 Volts (+/-5%)	1.0A typical (All channels OFF with LEDs) 2.0A maximum (All channels ON with LEDs)
+ 12 Volts	0.0mA (no load)

ISOLATION VOLTAGE

Between all digital channels and the VMEbus:
250VAC or 354V DC on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown). Complies with test requirements outlined in ANSI/ISA-S82.01-1988 for the voltage rating specified.

Between all digital channels:
125VAC or 125V DC on a continuous basis (will withstand 1250V AC dielectric strength test for one minute without breakdown). Complies with test requirements outlined in ANSI/ISA-S82.01-1988 for the voltage rating specified.

VME COMPLIANCE

Meets or exceeds all written VME specifications per revision C.1 dated October, 1985 and IEC 821-1987.

Data Transfer Bus	A24/A16:D16/D08 (EO) DTB slave
VMEbus Access Time	600nS typical (all registers) (Measured from the falling edge of DSx* to the falling edge of DTACK*.)
Address Modifier Codes	29H, 2DH, 39H, 3DH
Memory Map	Standard or short address space; Supervisory or non-privileged access; Occupies 1K byte; Base address jumper-selectable

Interrupts	I(1-7) request levels; single or multiple interrupt vectors; D08 (O) interrupter; Release On Register Access type (RORA); user control of priority, sense and enable

DIGITAL DC VOLTAGE INPUTS

Input Channels per Card	32 P2 only (AVME9420/AVME9425) 64 P3 and P4 (AVME9421/AVME9426) 96 P2, P3 and P4 (AVME9422/AVME9427)
Input Voltage Range (4-25V DC):	(AVME9420/AVME9421/AVME9422)
Input ON/OFF Threshold	2V DC typical, 4V DC maximum
Input Current	15.8mA DC typical @ 25V DC
Input Voltage Range (20-55V DC):	(AVME9425/AVME9426/AVME9427)
Input ON/OFF Threshold	12V DC typical, 20V DC maximum
Input Current	6.5mA DC typical @ 55V DC
Input Optocoupler Response Time	(4-25V DC and 20-55V DC Voltage Ranges)
TURN-ON Time	6uS. typical @ 25 deg. C
TURN-OFF Time	60uS. typical @ 25 deg. C
Interrupt Channels with Debounce	2 Selectable Ports (via jumper): Port B channels 0 thru 7 or Port F channels 0 thru 7
Input Debounce Time (See Note 1)	4 Selectable Ranges (via jumper): 7-8uS. (1 MHz. debounce clock) 336 to 384uS. (20.83KHz. clock) 672 to 768uS. (10.415KHz. clock) 1.344 to 1.536mS. (5.208KHz. clock)
Input Data Register Response Time	1uS. to 192uS. (See Note 2)
Total Input Channel Response Time	14uS. to 1.78mS. (See Note 3)
Logic Compatibility	Can be interfaced to TTL and CMOS (See Section 2.5.5)
Input "ON" Indicating LEDs	64 green LEDs (front panel AVME9421/2/6/7) (driven by the optocoupler outputs) (with -L option only)

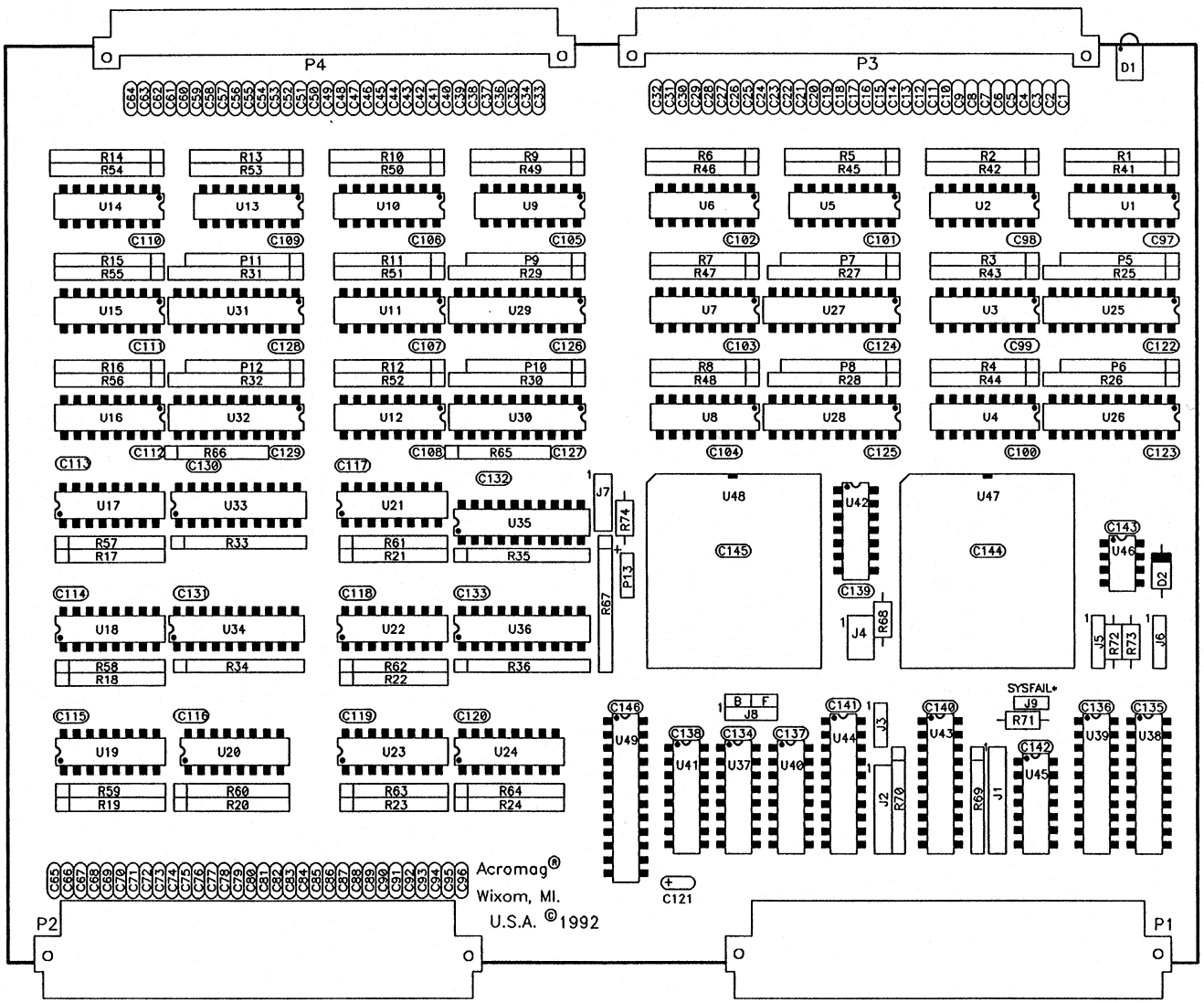
NOTE 1: Port B or Port F Input Debounce times are derived by multiplying the period of the selected debounce clock by 7 to 8 (i.e. 1 tick of uncertainty).

NOTE 2: Port B or Port F Input Data Register Response time is derived by multiplying the period of the selected debounce clock by one.

NOTE 3: Port B or Port F Total Input Channel Response time is calculated by summing the input optocoupler, debounce, and data register response times for the debounce clock selected.

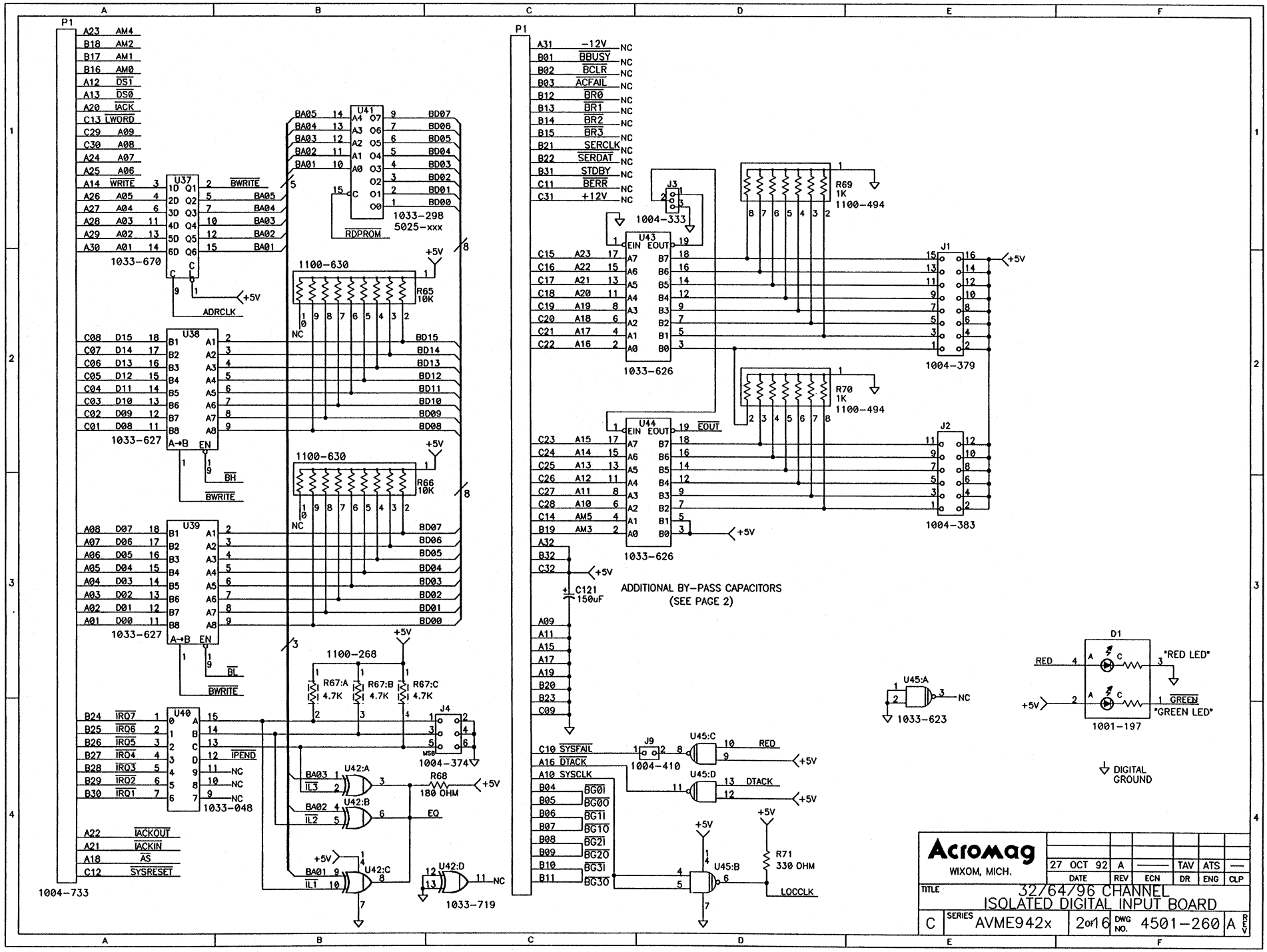
7.0 SCHEMATIC AND PART LOCATION DRAWINGS

The following sheets contain the schematic and part location drawings for both the AVME942x main board and the optional LED expansion board.

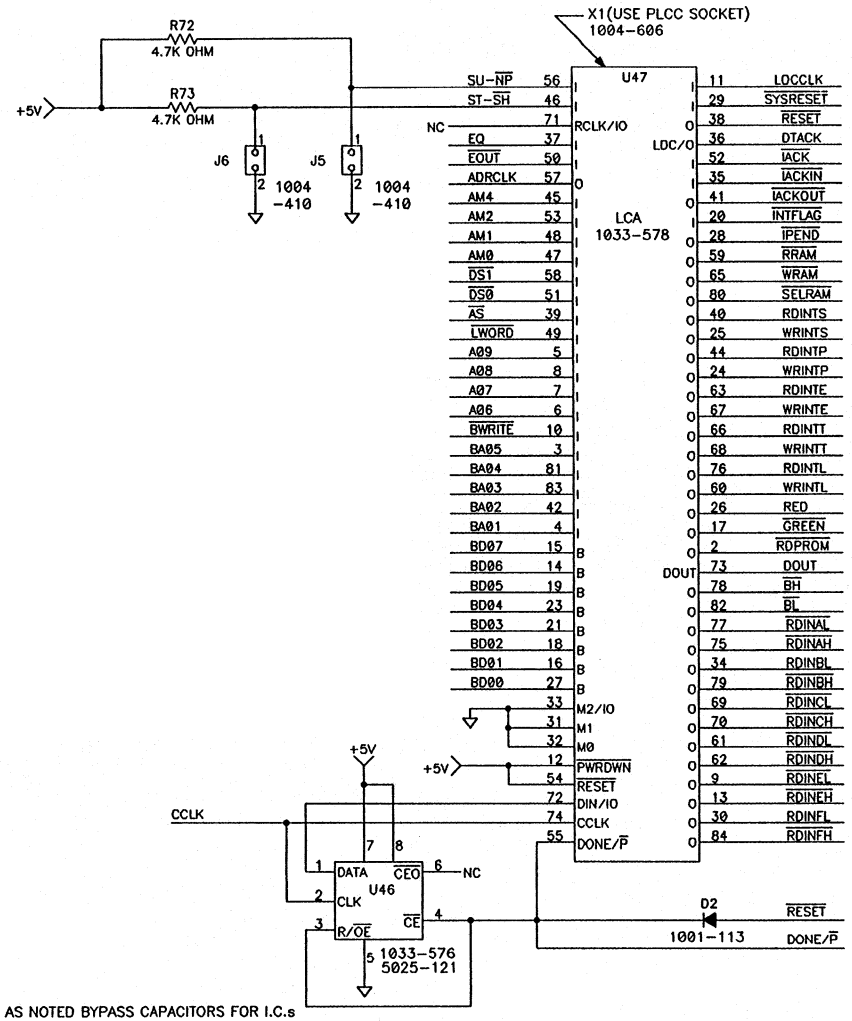


P.C. BOARD 1018-568

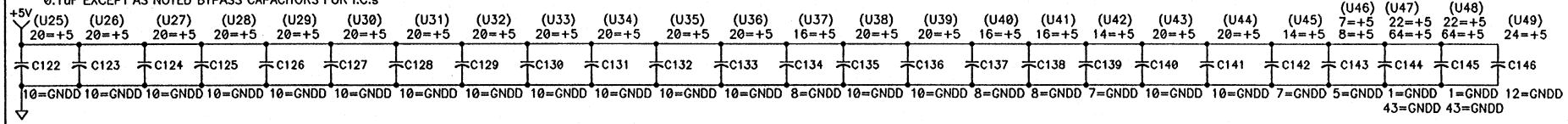
Acromag WIXOM, MICH.						
	27 OCT 92	A	——	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP
TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD						
C	SERIES: AVME942x	1 of 16	DWG NO. 4501-260		A	REV


P1
1004-733
1033-670
1033-627
1033-627
1033-048
1033-298
5025-xxx
RDPROM
ADRCLK
1100-630
R65
10K
1100-630
R66
10K
1100-268
R67:A
4.7K
R67:B
4.7K
R67:C
4.7K
1004-374
R68
180 OHM
EQ
1033-719
P1
1033-626
1033-626
1004-333
R69
1K
1100-494
R70
1K
1100-494
1004-379
1004-383
C121
150uF
ADDITIONAL BY-PASS CAPACITORS
(SEE PAGE 2)
1004-410
1033-623
1001-197
"RED LED"
"GREEN LED"
DIGITAL
GROUND
R71
330 OHM
LOCCLK
Acromag
WIXOM, MICH.
27 OCT 92
32/64/96 CHANNEL
ISOLATED DIGITAL INPUT BOARD
AVME942x
2of16
4501-260

VME I/F & ADDRESS DECODE FPGA



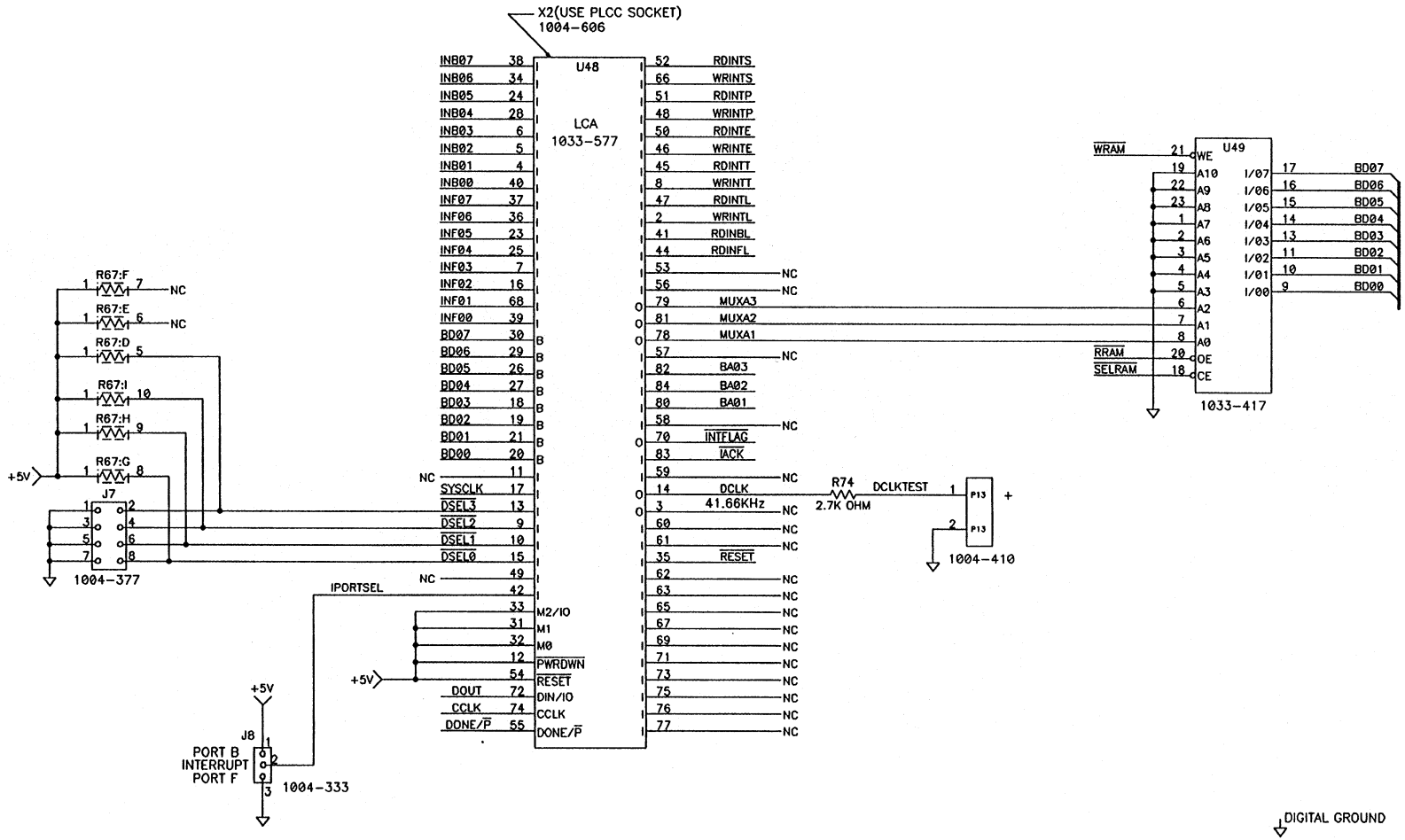
0.1uF EXCEPT AS NOTED BYPASS CAPACITORS FOR I.C.s



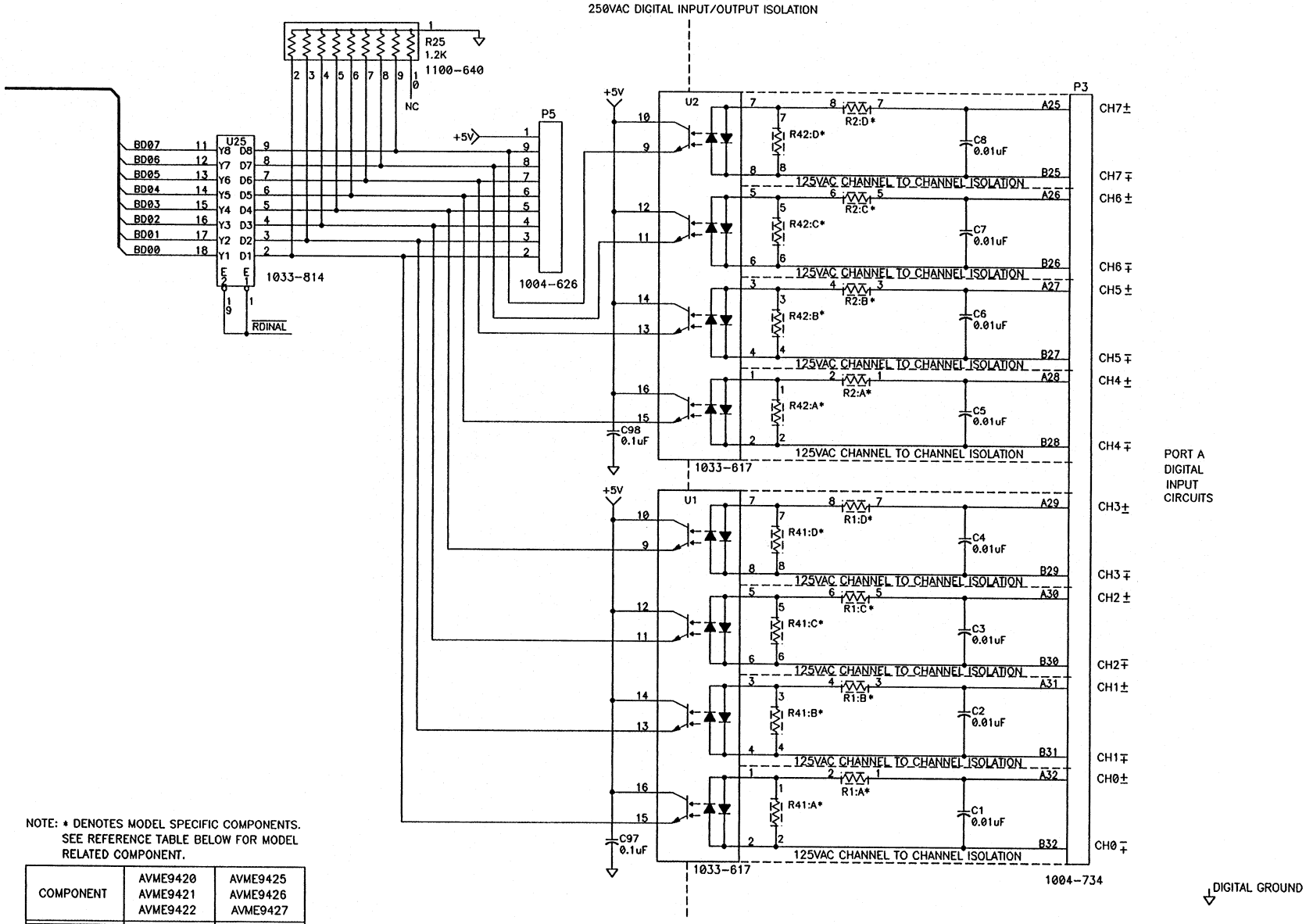
LAST: R74, C146, D2, U49, X2, P13, J9
NOT USED: R37, R38, R39, R40

Acromag WIXOM, MICH.							
	27 OCT 92	A	———	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP
TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD						
C	SERIES: AVME942x	3 of 6	DWG NO. 4501-260	A REV		

DIGITAL INPUT CHANNEL
DEBOUNCE & INTERRUPT
LOGIC FPGA



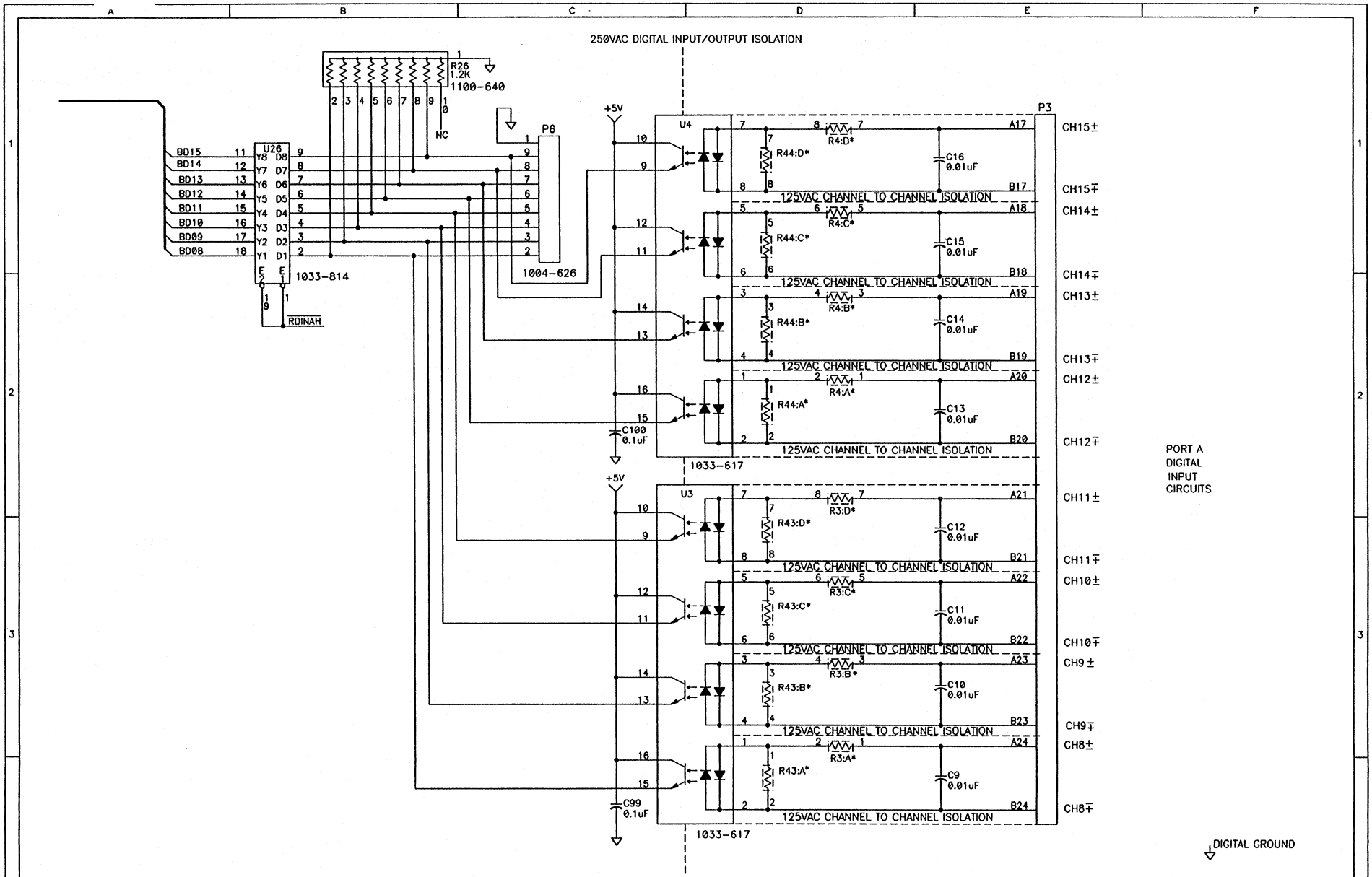
Acromag WIXOM, MICH.						
	27 OCT 92	A	———	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP
TITLE 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD						
C	SERIES AVME942x	4of16	DWG NO. 4501-260			A REV



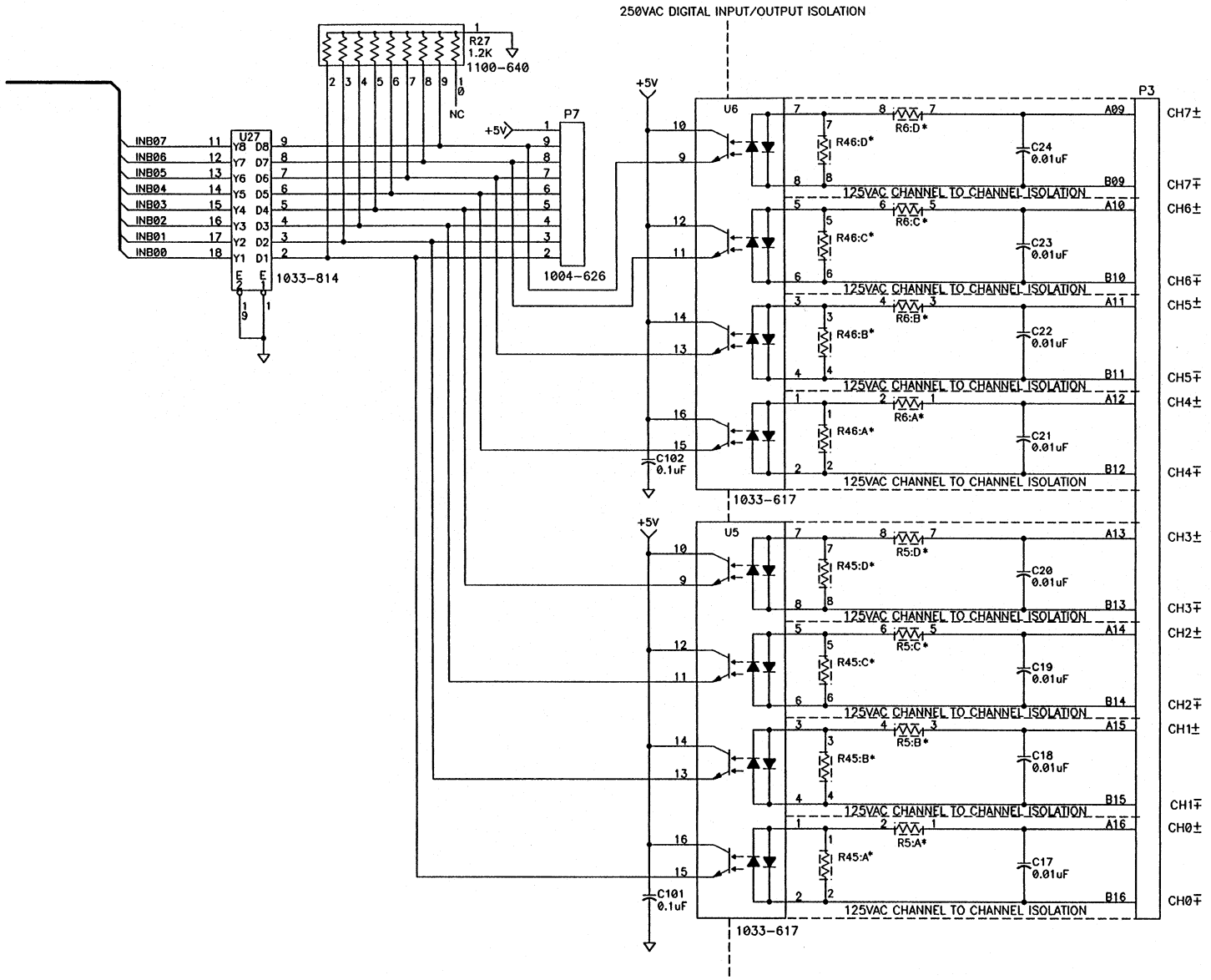
NOTE: * DENOTES MODEL SPECIFIC COMPONENTS. SEE REFERENCE TABLE BELOW FOR MODEL RELATED COMPONENT.

COMPONENT	AVME9420 AVME9421 AVME9422	AVME9425 AVME9426 AVME9427
R1–R24	1.5K OHM 1100–801	8.2K OHM 1100–802
R41–R64	4.7K OHM 1100–390	1.2K OHM 1100–547

Acromag WIXOM, MICH.							
	27 OCT 92	A	———	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP
TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD							
C	SERIES: AVME942x	5 of 6	DWG NO. 4501-260			REV A	



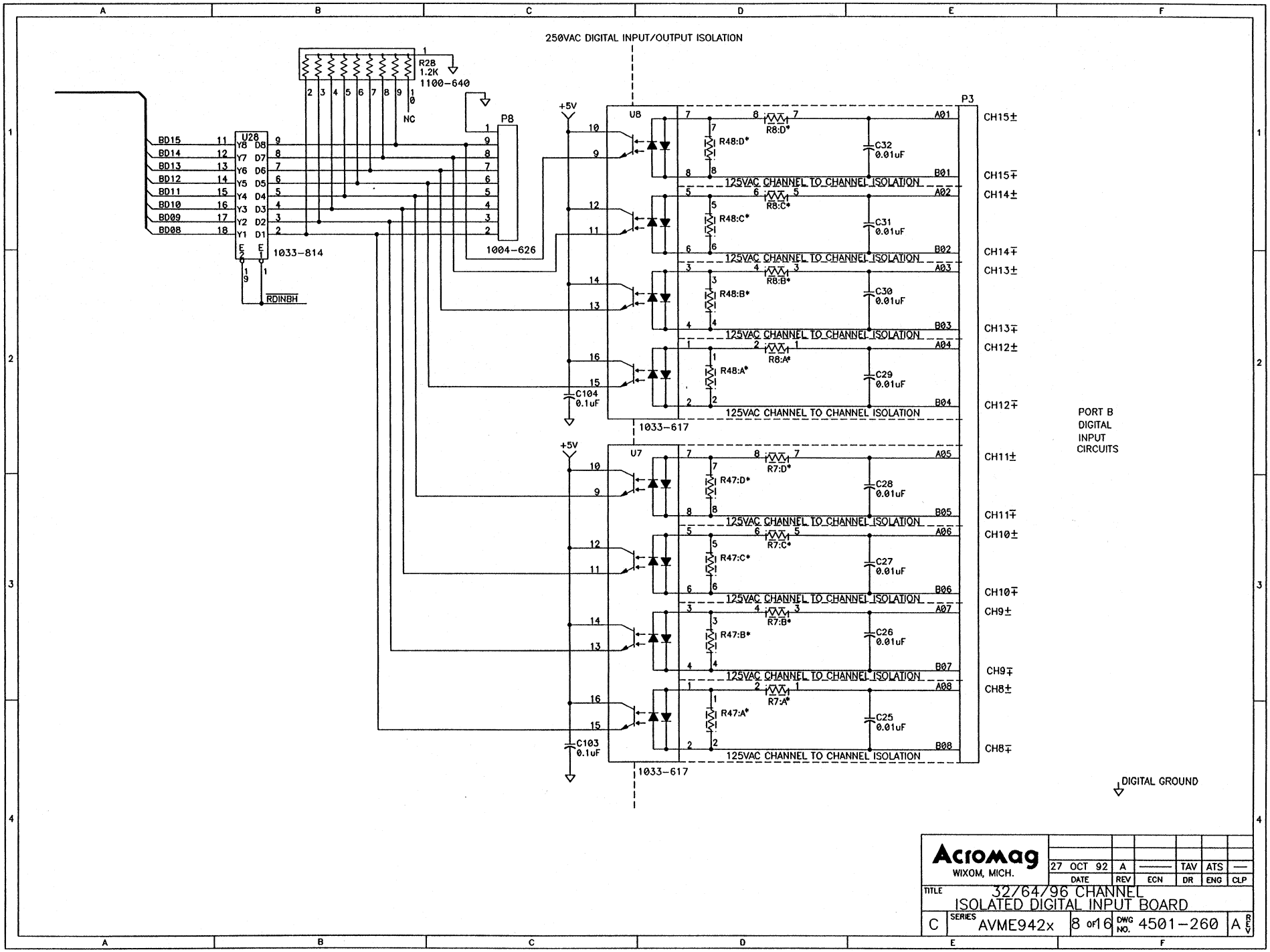
Acromag WIXOM, MICH.						
	27 OCT 92	A	——	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP
TITLE 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD						
C	SERIES AVME942x	6of16	DWG NO. 4501-260			REV A



Acromag WIXOM, MICH.	27 OCT 92	A	——	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP

TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD

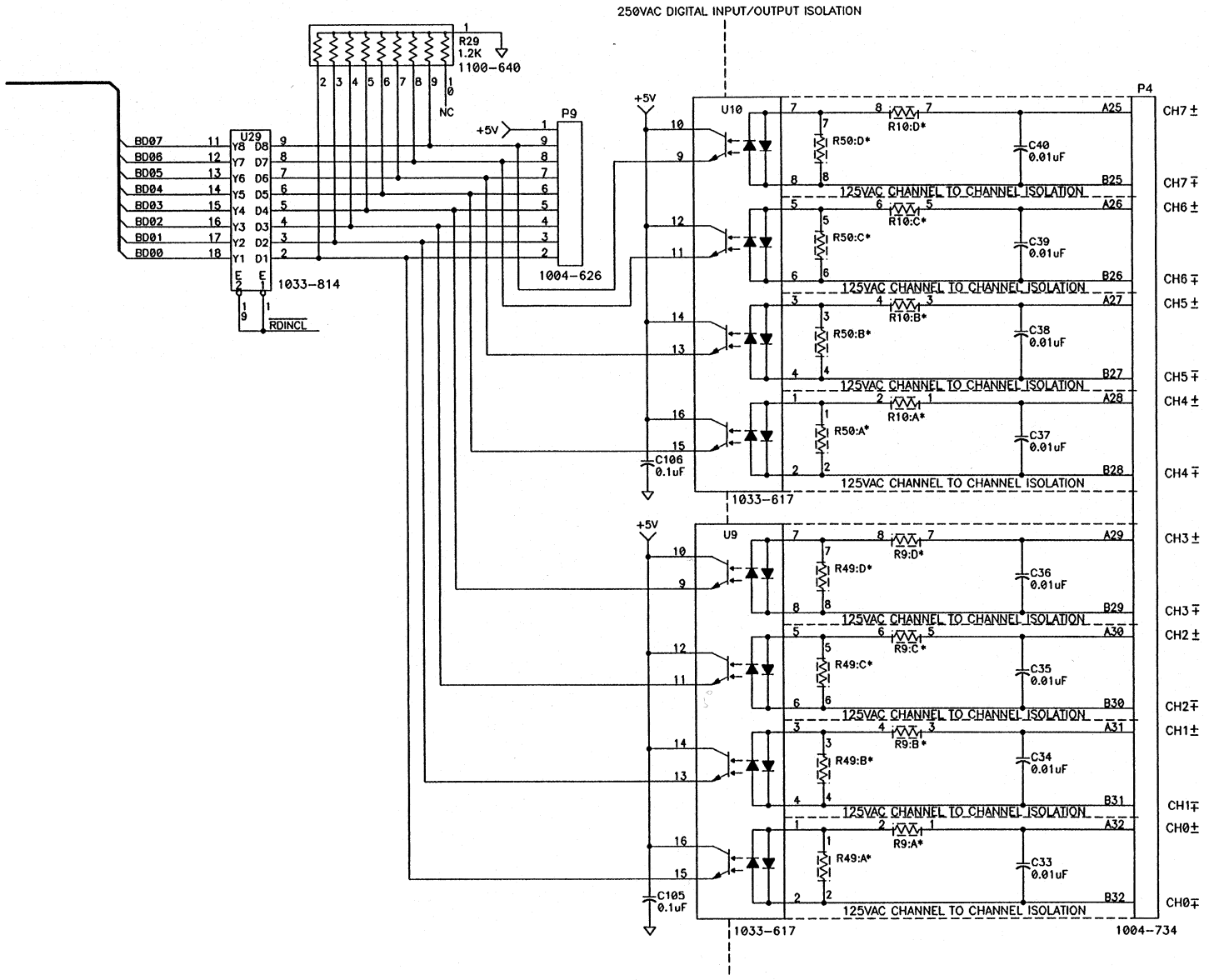
C	SERIES AVME942x	7of16	DWG NO. 4501-260	A REV



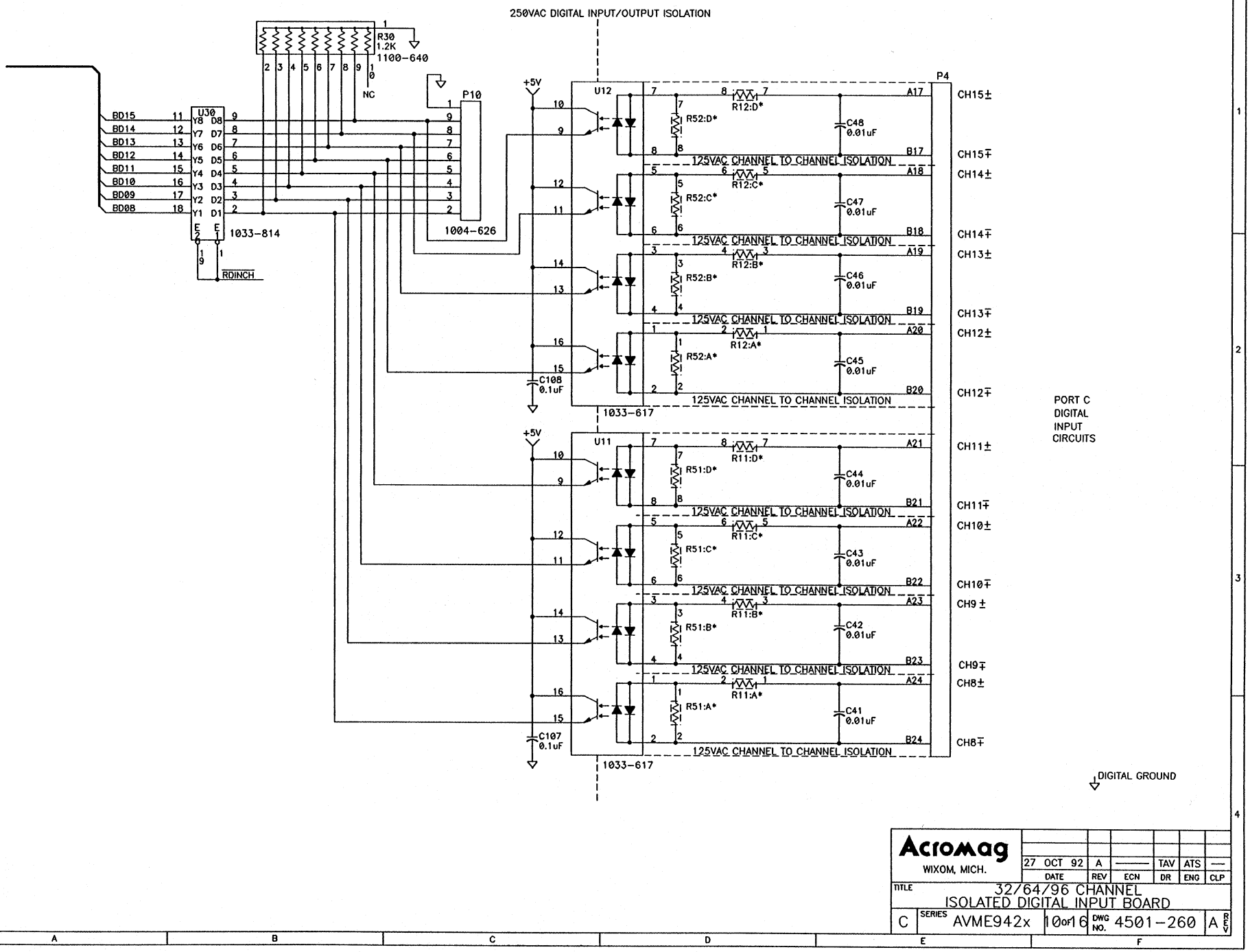
Acromag WIXOM, MICH.						
27 OCT 92	A	———	TAV	ATS	—	
DATE	REV	ECN	DR	ENG	CLP	

TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD

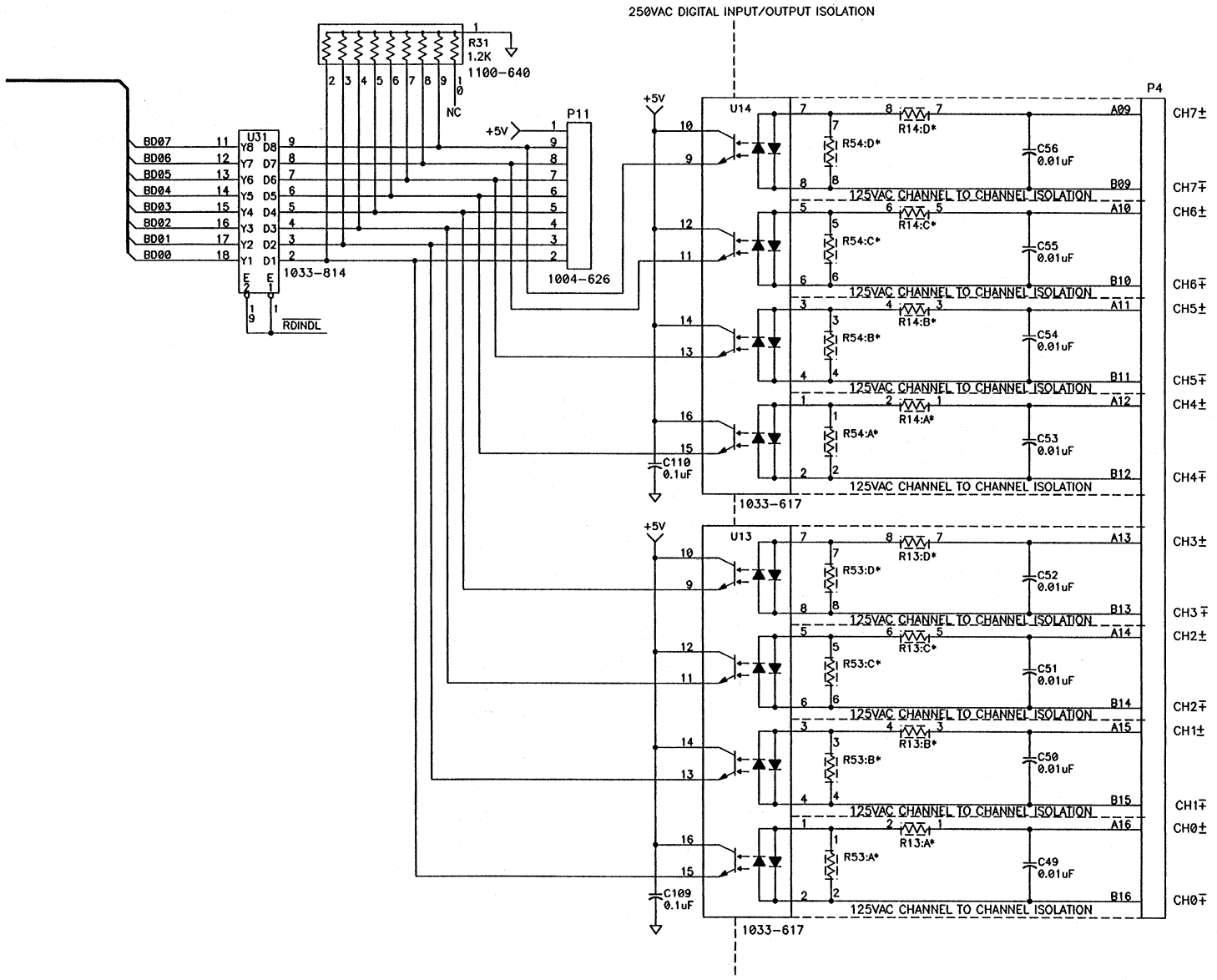
C	SERIES AVME942x	8 of 16	DWG NO. 4501-260	A REV



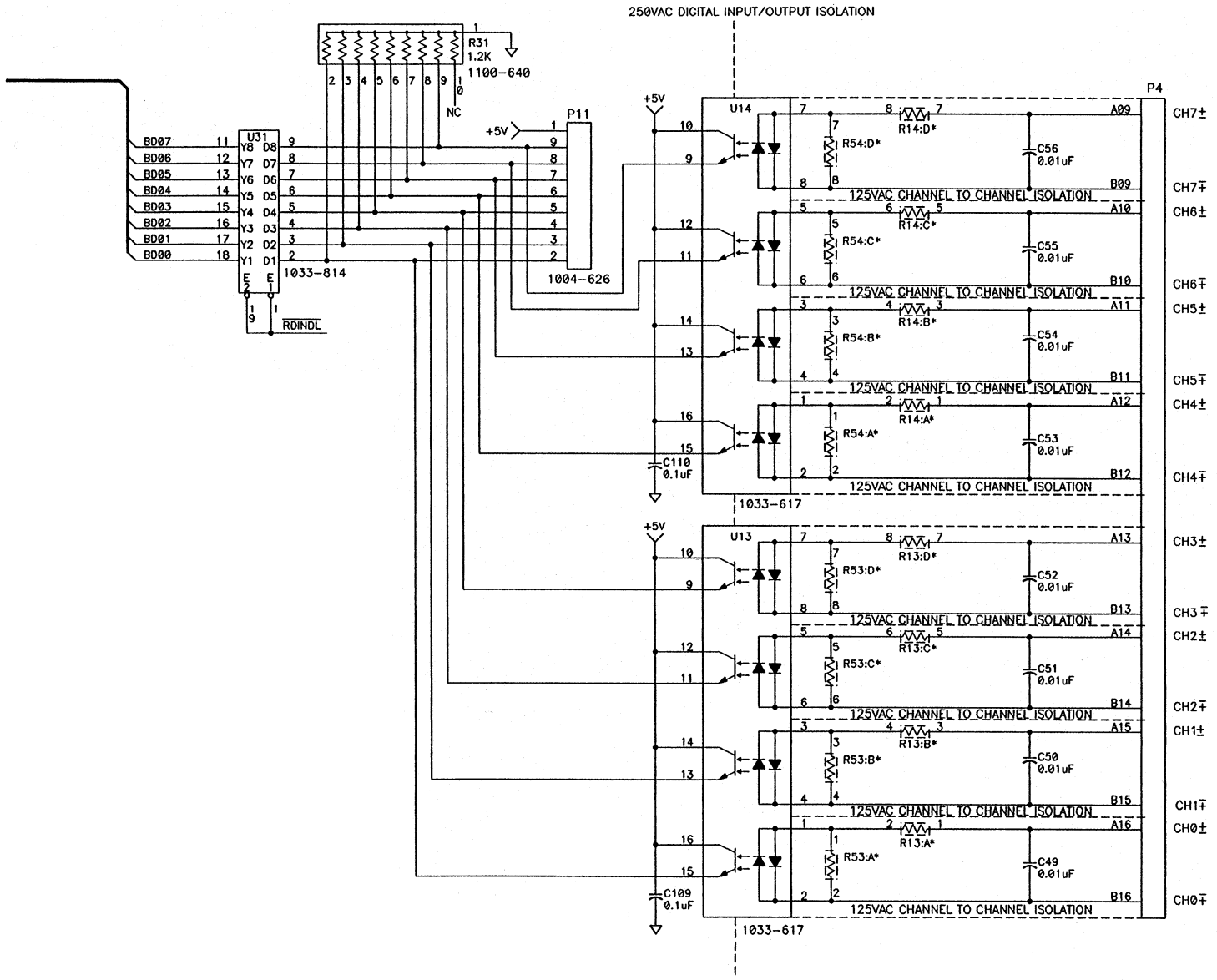
Acromag WIXOM, MICH.							
	27 OCT 92	A	——	TAV	ATS	—	
	DATE	REV	ECN	DR	ENG	CLP	
TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD							
C	SERIES: AVME942x	9 of 16	DWG NO. 4501-260				A REV



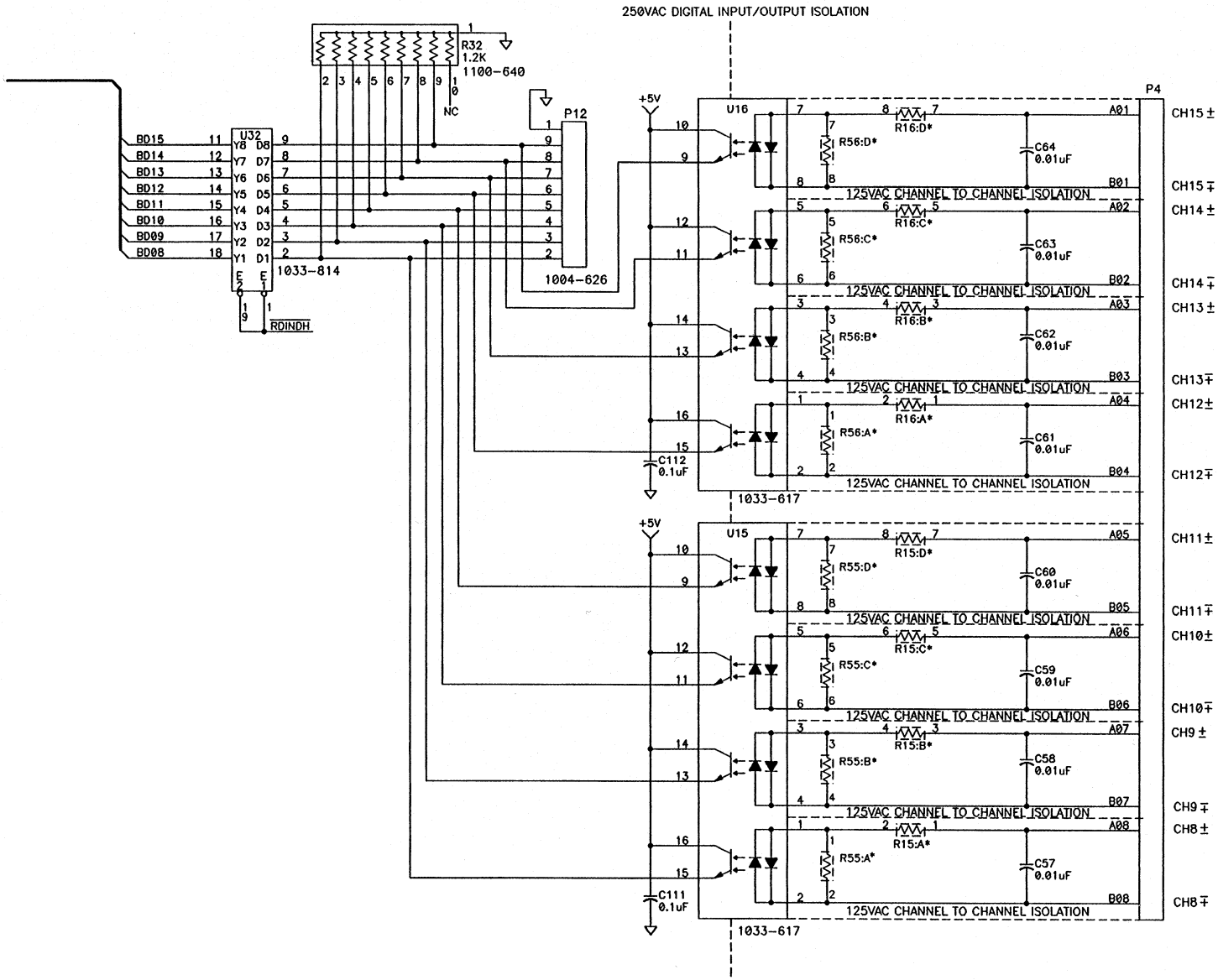
Acromag WIXOM, MICH.						
27 OCT 92	A	———	TAV	ATS	—	
DATE	REV	ECN	DR	ENG	CLP	
TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD						
C	SERIES: AVME942x	10of16	DWG NO. 4501-260		REV: A	



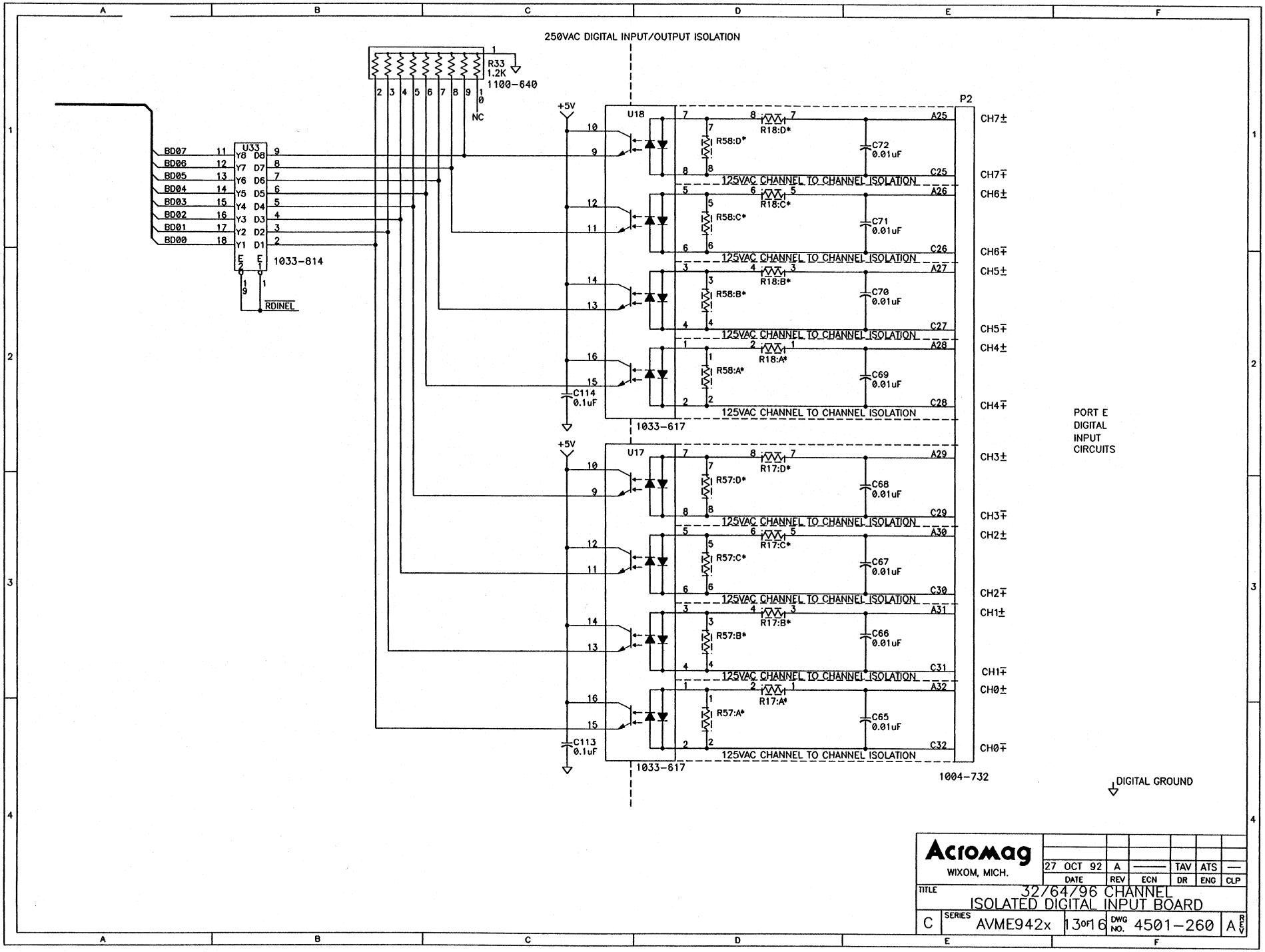
Acromag WIXOM, MICH.						
	27 OCT 92	A	——	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP
TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD						
C	SERIES: AVME942x	11 of 16	DWG NO. 4501-260			REV A



Acromag WIXOM, MICH.						
	27 OCT 92	A	——	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP
TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD						
C	SERIES: AVME942x	11 of 16	DWG NO. 4501-260			REV A



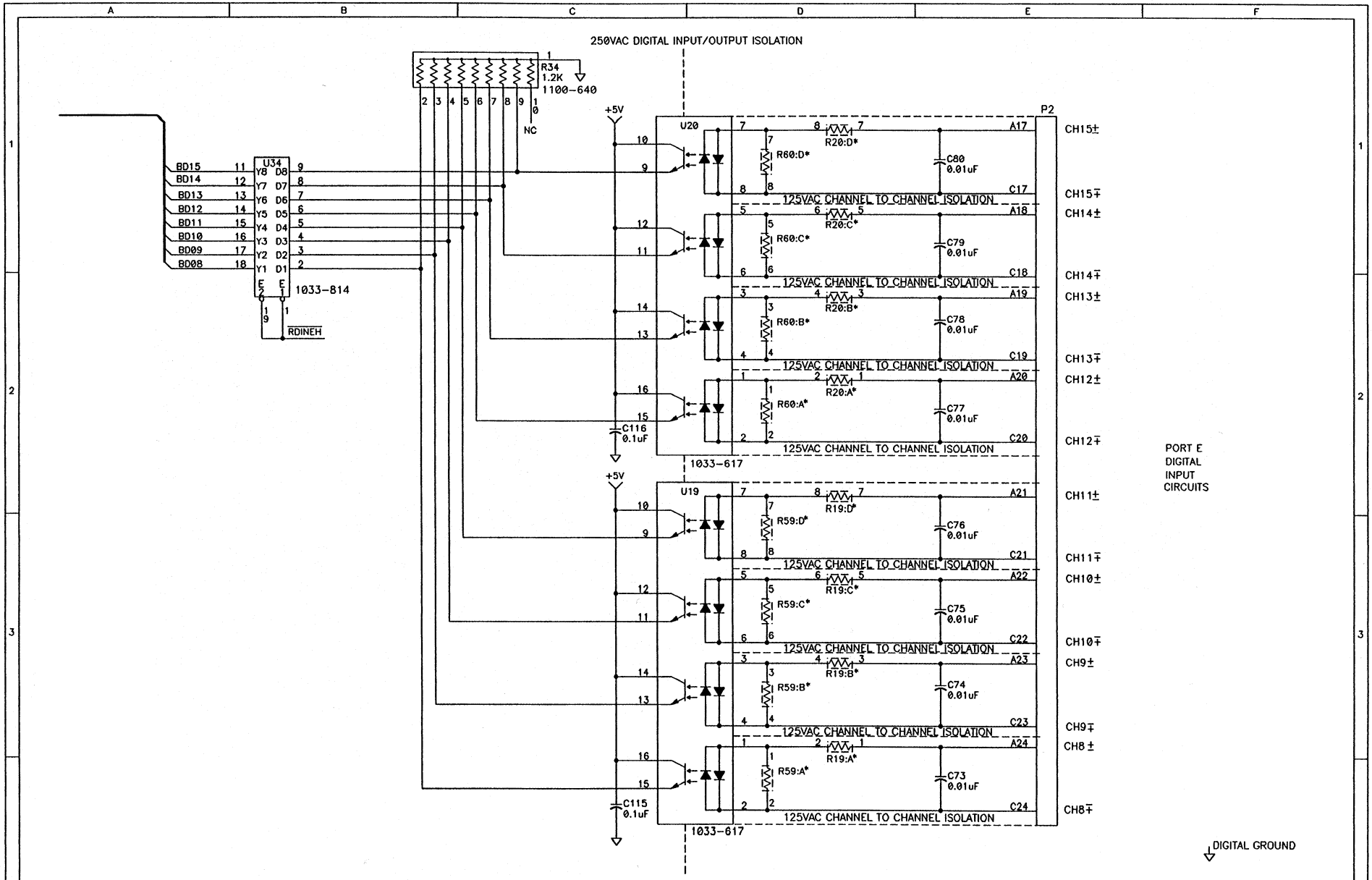
Acromag WIXOM, MICH.							
	27 OCT 92	A	——	TAV	ATS	—	
	DATE	REV	ECN	DR	ENG	CLP	
TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD							
C	SERIES: AVME942x	12of16	DWG NO. 4501-260			A	REV



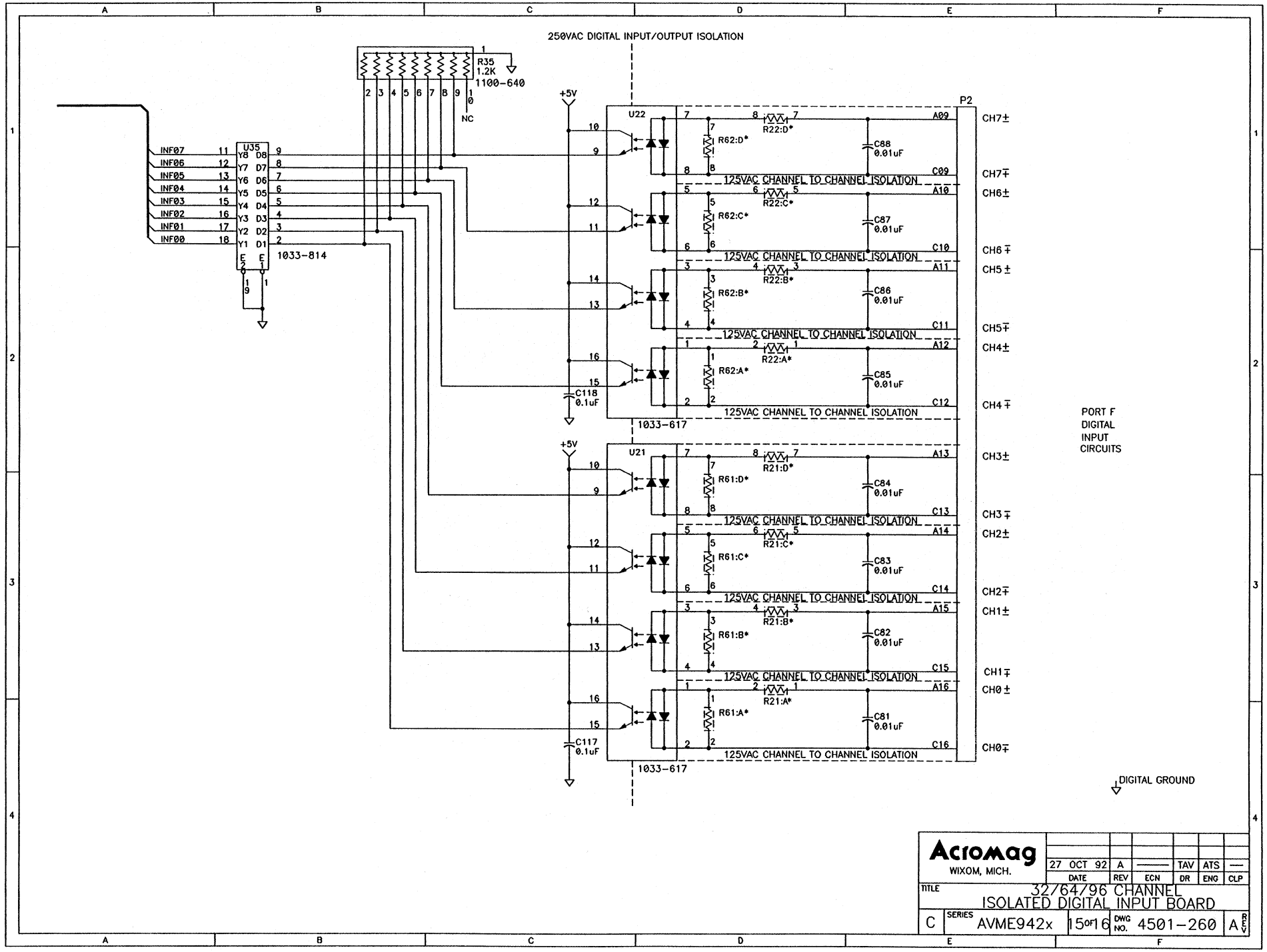
Acromag WIXOM, MICH.	27 OCT 92	A	———	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP

TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD

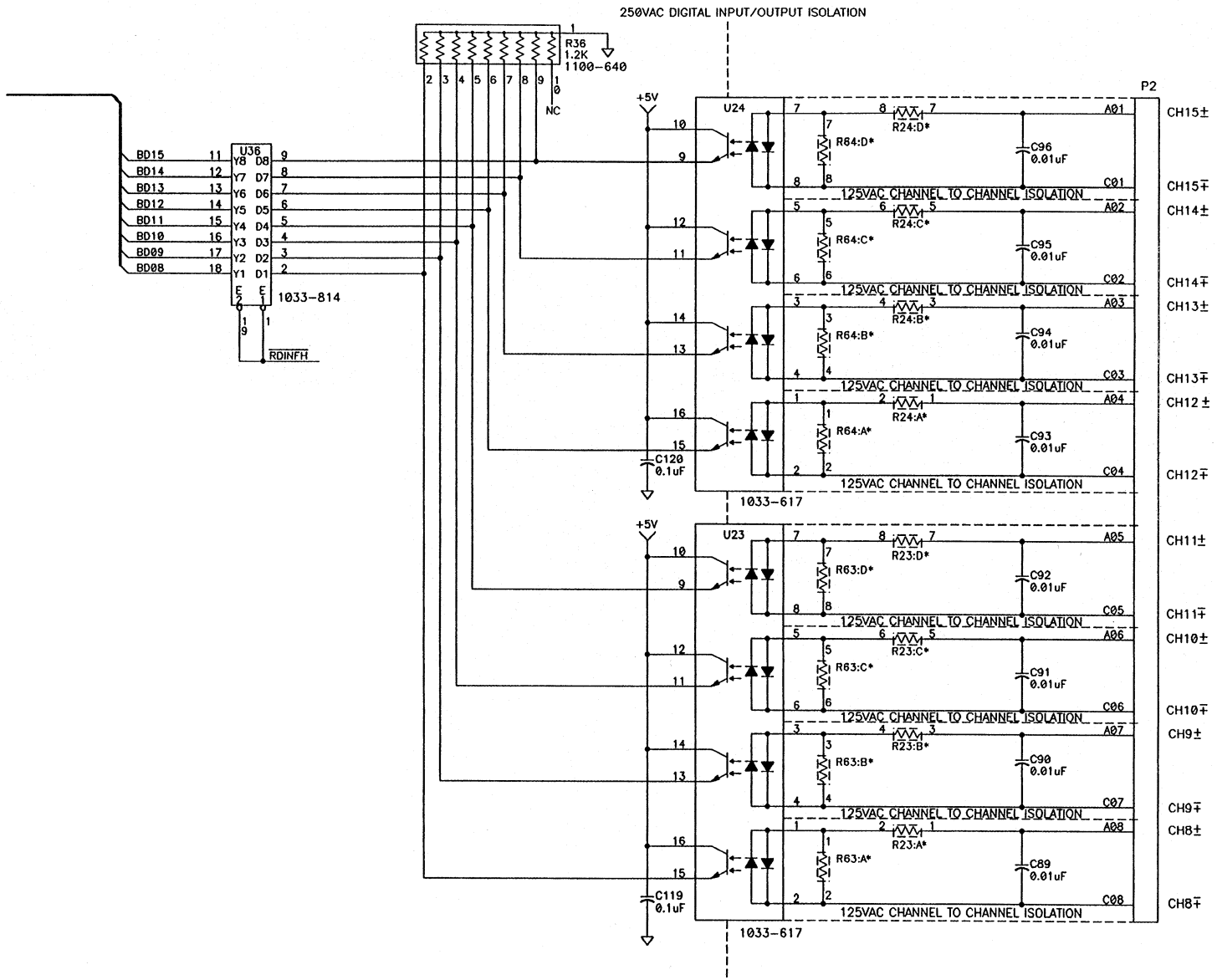
C	SERIES AVME942x	13 OF 16	DWG NO. 4501-260	A REV



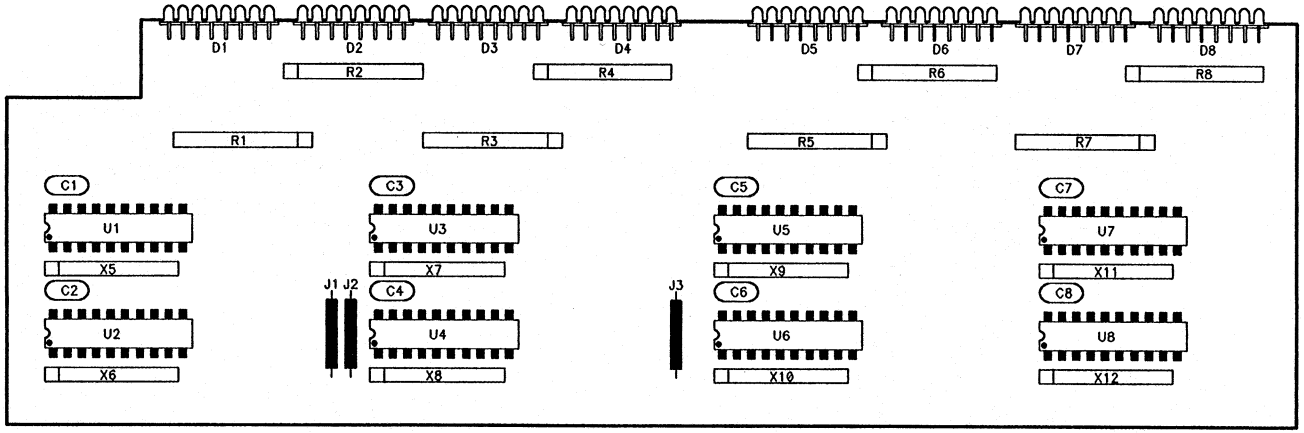
Acromag WIXOM, MICH.						
27 OCT 92	A	——	TAV	ATS	—	
DATE	REV	ECN	DR	ENG	CLP	
TITLE 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD						
C	SERIES AVME942x	14 OF 16	DWG NO. 4501-260		A	REV



Acromag WIXOM, MICH.							
	27 OCT 92	A	——	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP
TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD						
C	SERIES: AVME942x	15 OF 16	DWG NO. 4501-260			REV A

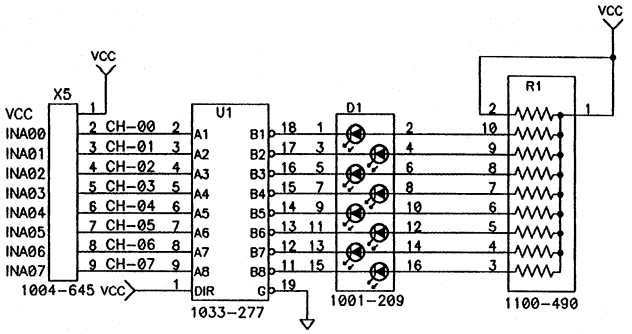


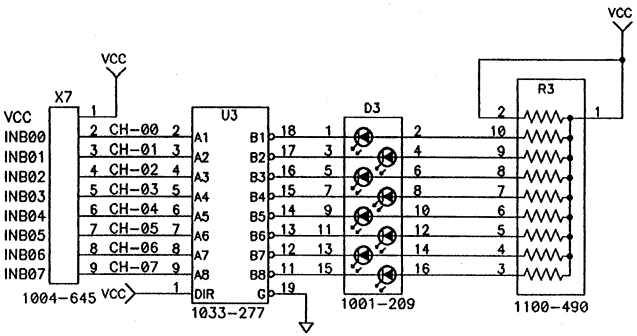
Acromag WIXOM, MICH.						
27 OCT 92	A	——	TAV	ATS	—	
DATE	REV	ECN	DR	ENG	CLP	
TITLE: 32/64/96 CHANNEL ISOLATED DIGITAL INPUT BOARD						
C	SERIES: AVME942x	16of16	DWG NO. 4501-260	REV: A		

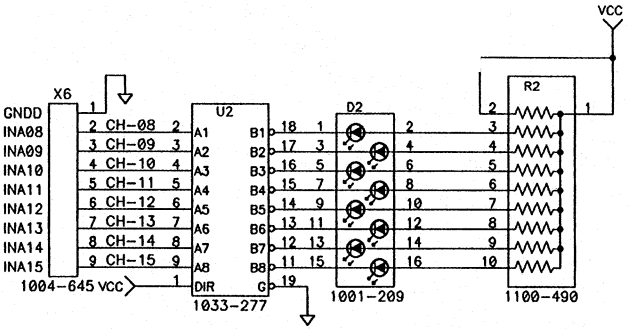


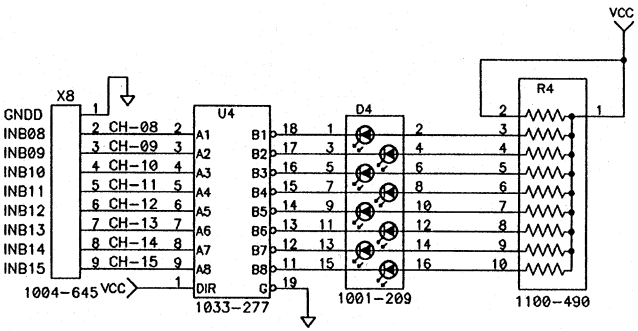
P.C. BOARD 1018-567

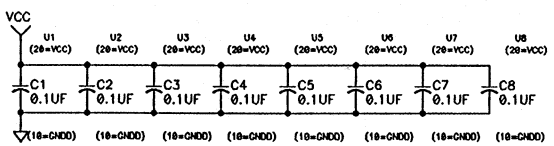
Acromag® WIXOM, MICH.							
	27 OCT 92	A	———	TAV	ATS	—	
	DATE	REV	ECN	DR	ENG	CLP	
TITLE: 64 CHANNEL LED OPTION BOARD							
C	SERIES: AVME942x	1 OF 3	DWG NO. 4501-259			A	REV

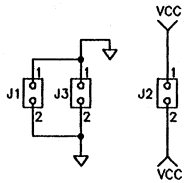








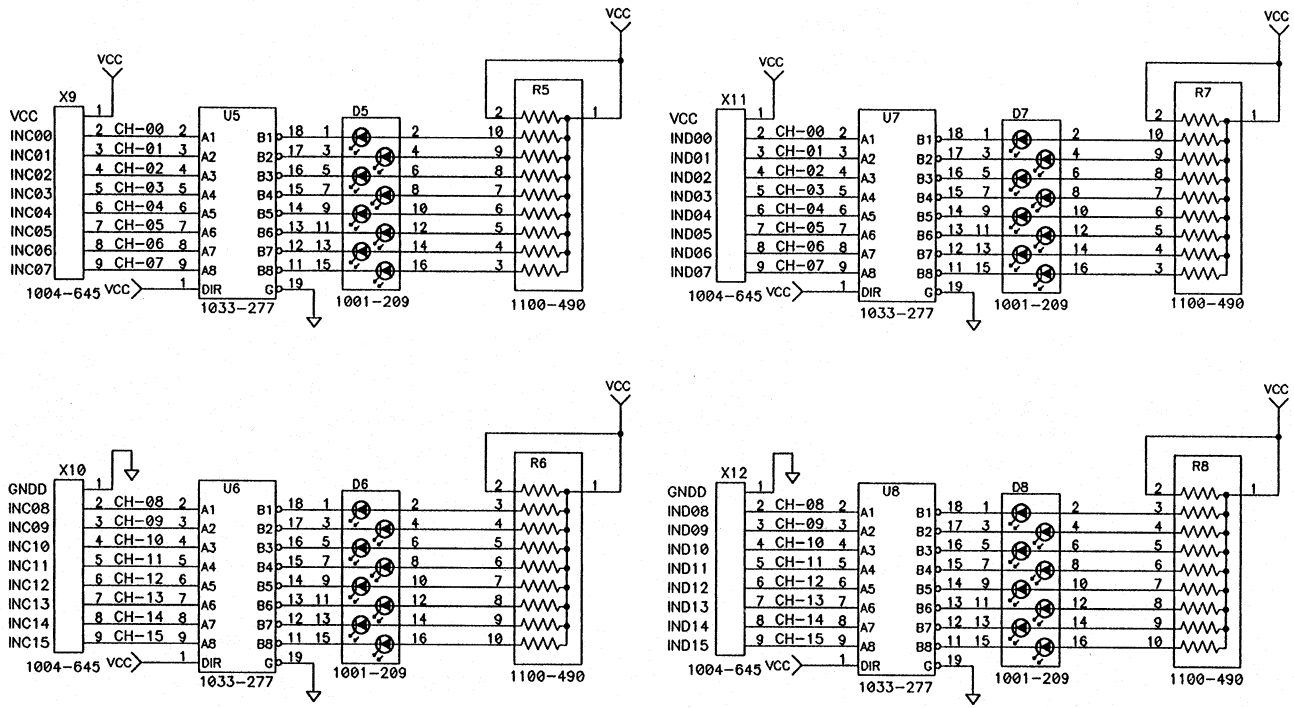




NOTES:

1. PRINTED CIRCUIT BOARD IS 1018-567A.
2. ALL SEVEN DIGIT PART NUMBERS ARE ACROMAG PART NUMBERS.

Acromag® WIXOM, MICH.						
	27 OCT 92	A	———	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP
TITLE: 64 CHANNEL LED OPTION BOARD						
C	SERIES: AVME942x	2 OF 3	DWG NO. 4501-259			REV A



Acromag® WIXOM, MICH.	27 OCT 92	A	———	TAV	ATS	—
	DATE	REV	ECN	DR	ENG	CLP

TITLE: 64 CHANNEL LED OPTION BOARD

C	SERIES AVME942x	3 OF 3	DWG NO. 4501-259	REV A

A.0 CABLE AND TERMINATION PANELS

A.1 CABLE: MODEL 9944-x

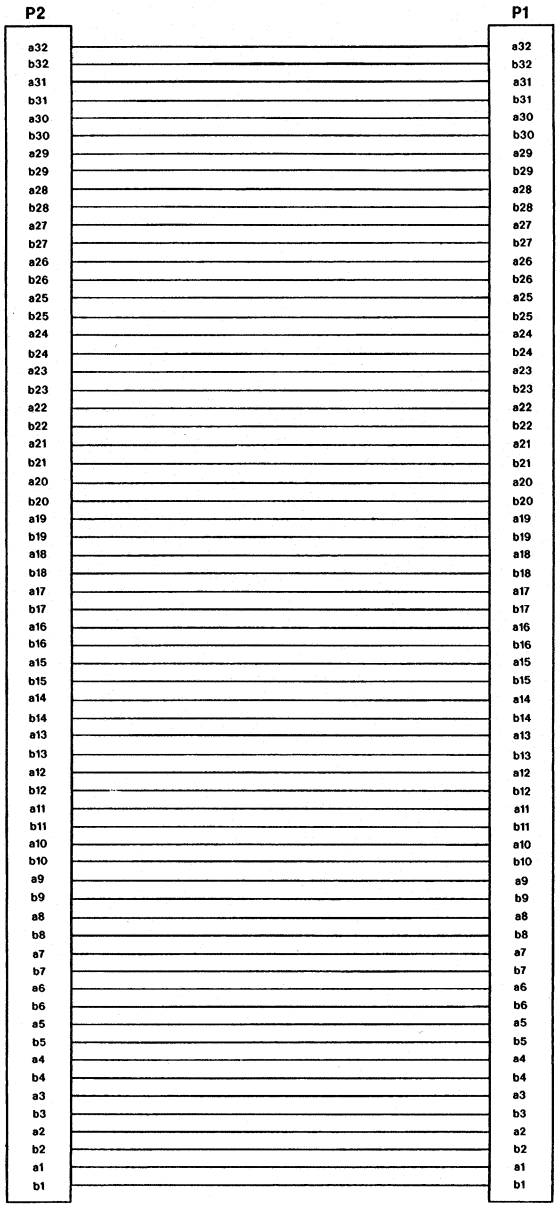
Type: Ribbon Cable, 64 wire (Header - Header)

This cable connects the 6985-32DI termination panel to the AVME942x boards (P3 and/or P4 connectors only). The length of the cable in feet is indicated by the "x" in the model number (9944-x), 12 feet maximum. It is recommended that this length be kept to a minimum to reduce noise pickup and power loss.

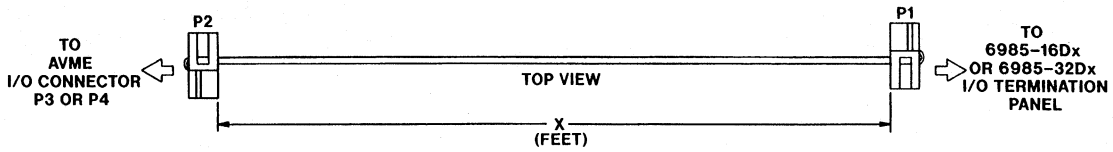
Part numbers are given below for the various cable components. Use these references if you wish to assemble your own cables.

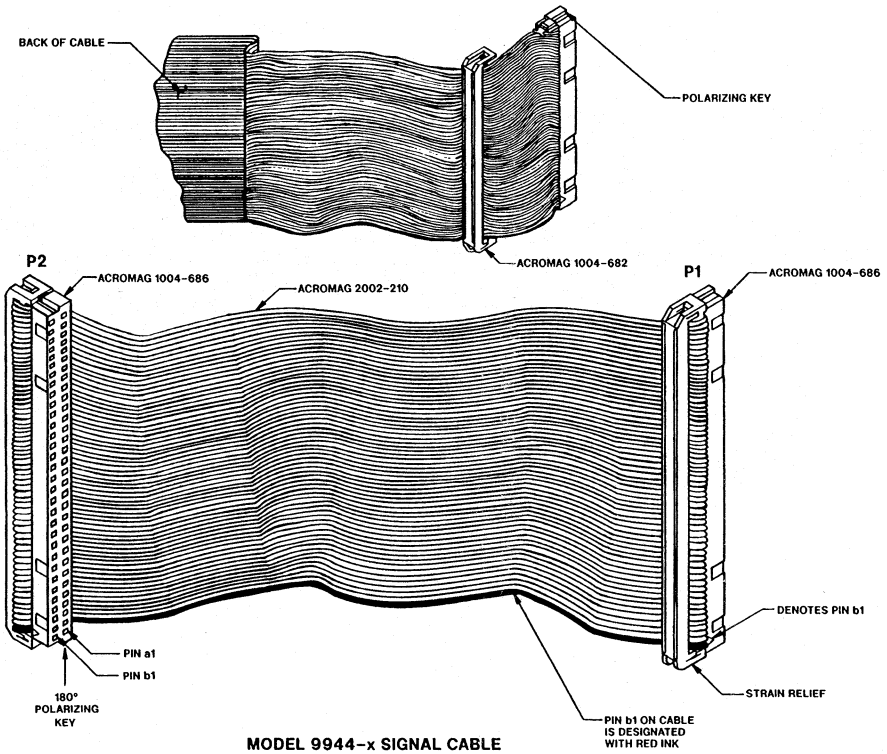
MODEL: 9944-x

Application	Use to connect 6985-32DI termination panel to the AVME942x boards P3 and/or P4 connectors. (both have 64 pin connectors).
Cable	64 wire flat ribbon cable, 28 gauge. Acromag Part 2002-210 (3M Type C3365/64 or equivalent).
Length	Last field in part number designates length in feet, specified by user (12 feet maximum).
Headers (Both Ends)	64-pin header, female, includes strain relief. *Header:* Acromag Part 1004-686 (Panduit Type 120-064-435 or equiv.). *Strain Relief:* Acromag Part 1004-682 (Panduit Type 120-000-032 or equiv.).
Keying	Headers, both ends, have polarizing key to prevent improper installation.
Schematic and Mech. Dimensions	See Drawing 4501-135.
Shipping Weight	1.0 pounds (0.5Kg) packed.



MODEL 9944-x SCHEMATIC





MODEL 9944-x SIGNAL CABLE
FRONT VIEW

Acromag® WIXOM, MICH.	18 DEC 92	A	10362	TAV	ATS	TH
	8 NOV 91	–	——	TAV	ATS	—
	DATE	REV	CO	DR	ENG	CLP
TITLE: CABLE: MODEL 9944-x						
SIZE D DWG	SERIES AVME	SHEET 1 OF 1	DRAWING 4501-135	REV A		

3400-026

A.2 CABLE: MODEL 9948-x

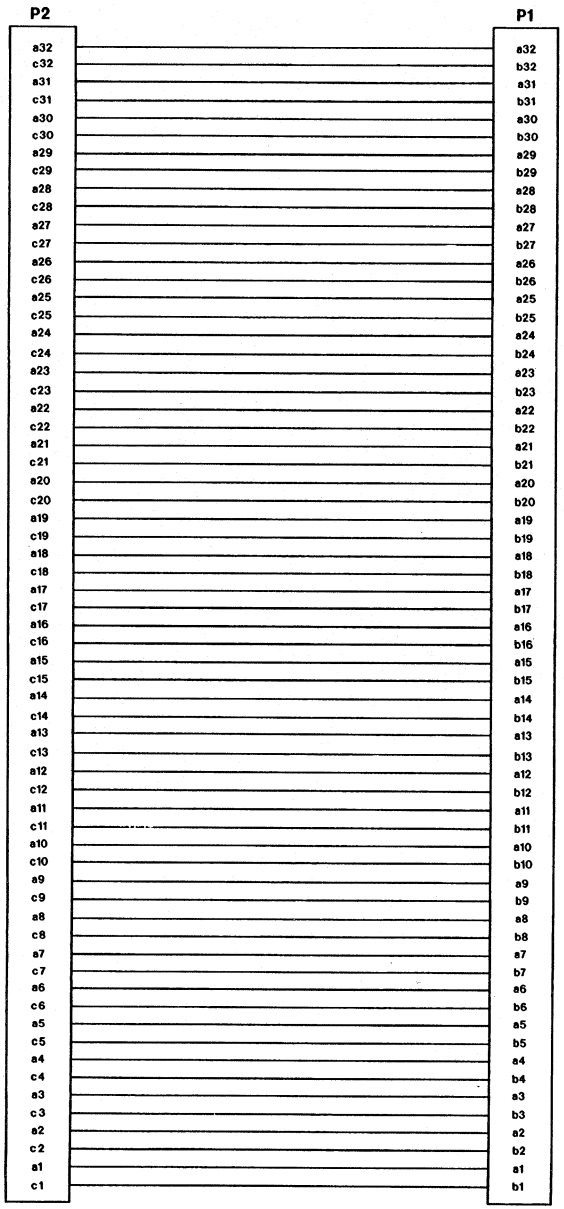
Type: Ribbon Cable, 64 wire (Header - Header)

This cable connects the 6985-32DI termination panel to the AVME942x boards (P2 connector only). The length of the cable in feet is indicated by the "x" in the model number (9948-x), 12 feet maximum. It is recommended that this length be kept to a minimum to reduce noise pickup and power loss.

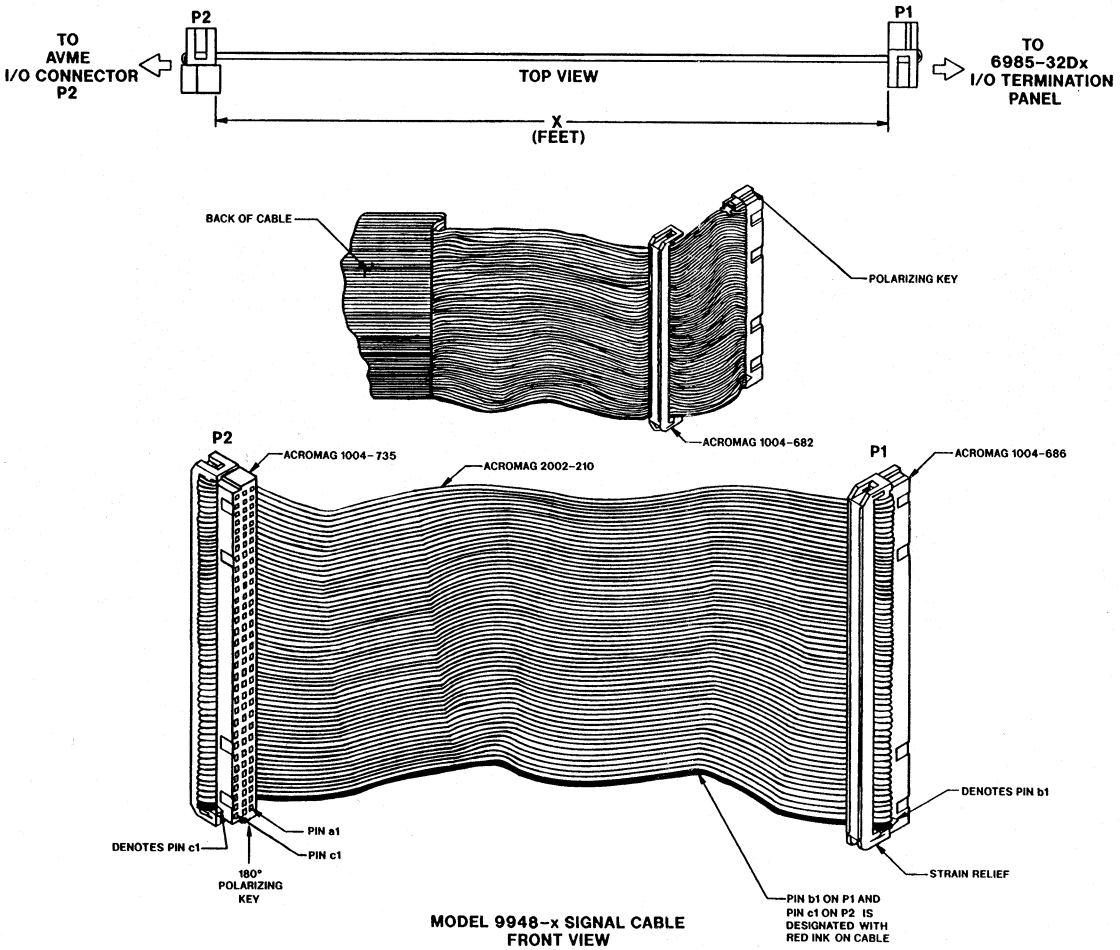
Part numbers are given below for the various cable components. Use these references if you wish to assemble your own cables.

MODEL: 9948-x

Application	Use to connect 6985-32DI termination panel to the AVME942x boards P2 connector. (both have 64 pin connectors).
Cable	64 wire flat ribbon cable, 28 gauge. Acromag Part 2002-210 (3M Type C3365/64 or equivalent).
Length	Last field in part number designates length in feet, specified by user (12 feet maximum).
Socket (AVME942x P2 END)	64-pin socket, female, includes strain relief. *Socket:* Acromag Part 1004-735 (Panduit Type 120-964-435 or equiv.). *Strain Relief:* Acromag Part 1004-682 (Panduit Type 120-000-032 or equiv.).
Header (6985-32DI END)	64-pin header, female, includes strain relief. *Header:* Acromag Part 1004-686 (Panduit Type 120-064-435 or equiv.). *Strain Relief:* Acromag Part 1004-682 (Panduit Type 120-000-032 or equiv.).
Keying	Headers, both ends, have polarizing key to prevent improper installation.
Schematic and Mech. Dimensions	See Drawing 4501-291.
Shipping Weight	1.0 pounds (0.5Kg) packed.



MODEL 9948-x SCHEMATIC



MODEL 9948-x SIGNAL CABLE
FRONT VIEW

Acromag® WIXOM, MICH.								
	2 DEC 92	A	—	TAV	AT's	—		
	DATE	REV	CO	DR	ENG	CLP		
TITLE: CABLE: MODEL 9948-x								
SIZE D DWG	SERIES AVME	SHEET 1 OF 1	DRAWING 4501-291	REV A				

A.3 TERMINATION PANELS: MODELS 6985-32DI

Type: Termination Panels For AVME9420/9421/9422/9425/9426/9427 Boards

The 6985-32DI panel facilitates the connection of up to 32 field input signals and connects to the AVME9420/9421/9422/9425/9426/9427 boards via a flat ribbon cable (Model 9944-x or Model 9948-x). Field signals are accessed via screw terminal strips.

Optionally, the user may connect a +5 to +55V DC supply to the B+ and B- power (screw) terminals to provide a common supply reference for input channels (e.g. a +5V DC supply would be useful for interfacing to TTL signals as shown in Figure 2.5). The panels have slots to add pull-up/down resistors (or jumpers) or protection diodes from each channel to the B+ and B- terminals. See Drawing 4501-272: 6985-32Dx Schematic and Part Location Drawing for specifics. Typical input channel configurations are shown in Figure 2.4. If the application requires that channel to channel isolation be maintained, then do not compromise this by making connections to a common supply (i.e. the B+ and B- terminals).

Before connecting the 6985-32DI termination panel to the AVME942x boards, connect a wire from chassis ground to the ground (GND) screw terminal on the panel (see Drawing 4501-274: 6985-32DI Mounting, Clearance & Electrical Connections). This wire ties the input transient protection circuitry to ground.

MODELS: 6985-32DI

FEATURES:

Digital Input Channels	Up to 32 channels with 6985-32DI.
Wiring Connections	See Drawing 4501-274.
Power	Optional user supply terminals (B+ and B-); do not use if channel to channel isolation is required. Supply Range: +5 to +55V DC. (3 Amps maximum for pc board foil traces)
Power On LED	Illuminates if a +5 to +55V DC supply is connected to the B+ and B- power (screw) terminals.
User Configurable Panel Circuits	See Drawing 4501-272. Slots to add pull-up/down resistors (or jumpers) or protection diodes from each channel to the B+ and B- terminals.
Isolation	Between individual digital channels and the ground terminal: 250VAC or 354V DC on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown). Complies with test requirements outlined in ANSI/ISA-S82.01-1988 for the voltage rating specified. Between all digital channels: 125VAC or 125V DC on a continuous basis (will withstand 1250V AC dielectric strength test for one minute without breakdown). Complies with test requirements outlined in ANSI/ISA-S82.01-1988 for the voltage rating specified.

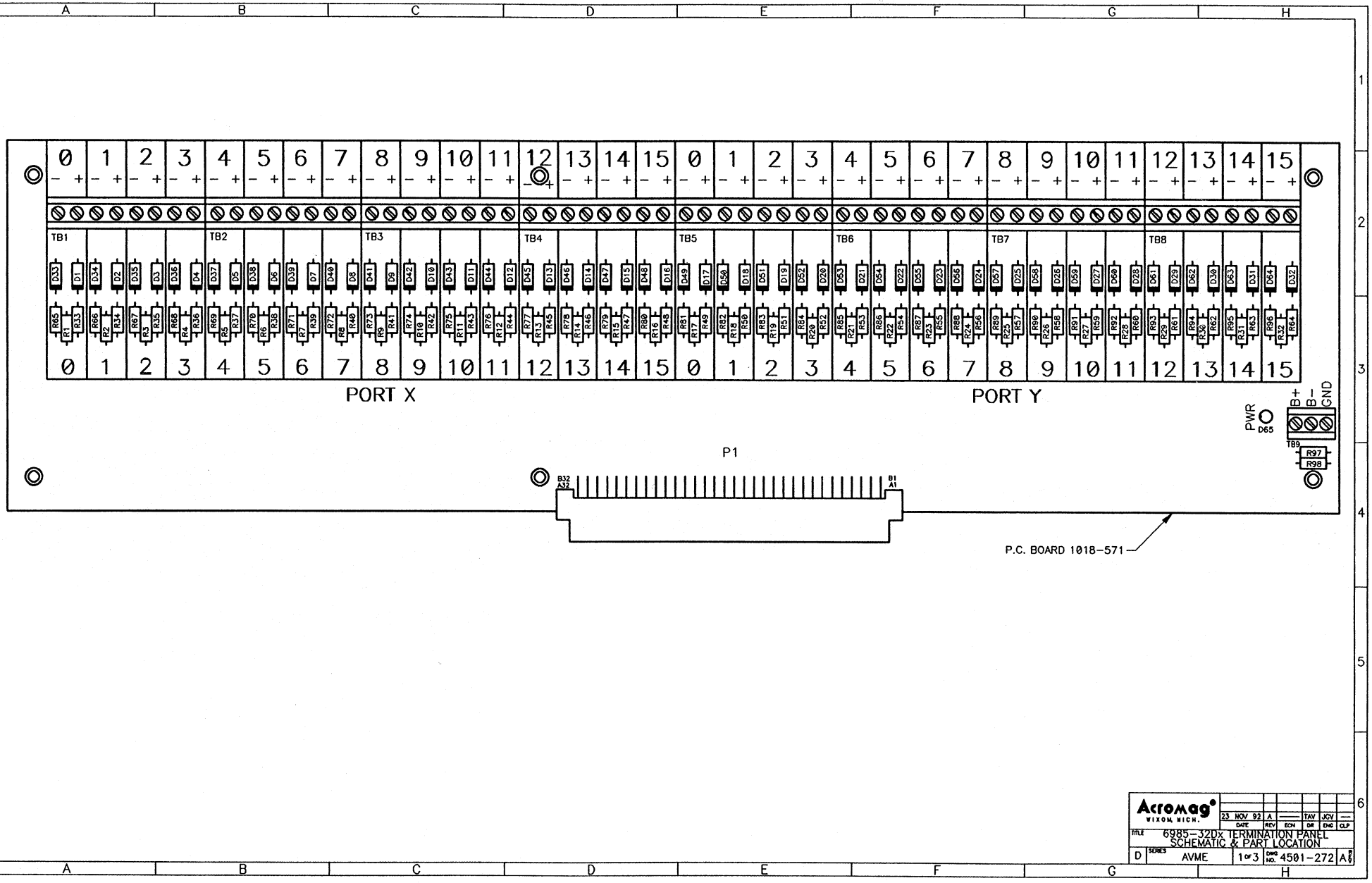
Input Transient Protection ..... See Drawing 4501-274.
Connect a wire from chassis ground to the ground (GND) screw terminal on the panel.

PHYSICAL CHARACTERISTICS:

Shipping Weight.....1.25 pounds (0.6Kg) packed.
Mounting.....Surface mounting. Leave sufficient space around the termination panel for wiring.
Mounting Hardware.....The termination panel is supplied with 0.375 inch standoffs. All standoffs should be secured using No. 6 hardware to provide maximum physical strength.
Field/Power Wiring.....Terminal blocks with screw clamps. Wire range 14 to 26 AWG.
Connections to AVME942x.....P1; Panduit No. 100-064-033B; Type B Male Connector, rows A & B equipped, (64 pins total). Use Acromag 9944-x or 9948-x cable (keyed) to connect panel to VME board. Keep cable short to reduce power loss and noise.
Mechanical Dimensions.....See Drawing 4501-274.
Printed Circuit Board.....Military grade FR-4 epoxy glass circuit board. Thickness: 0.063 inches.

OPERATING CONDITIONS:

Operating Temperature.....0 to 70 deg. C.
Storage Temperature.....-25 to +85 deg. C.



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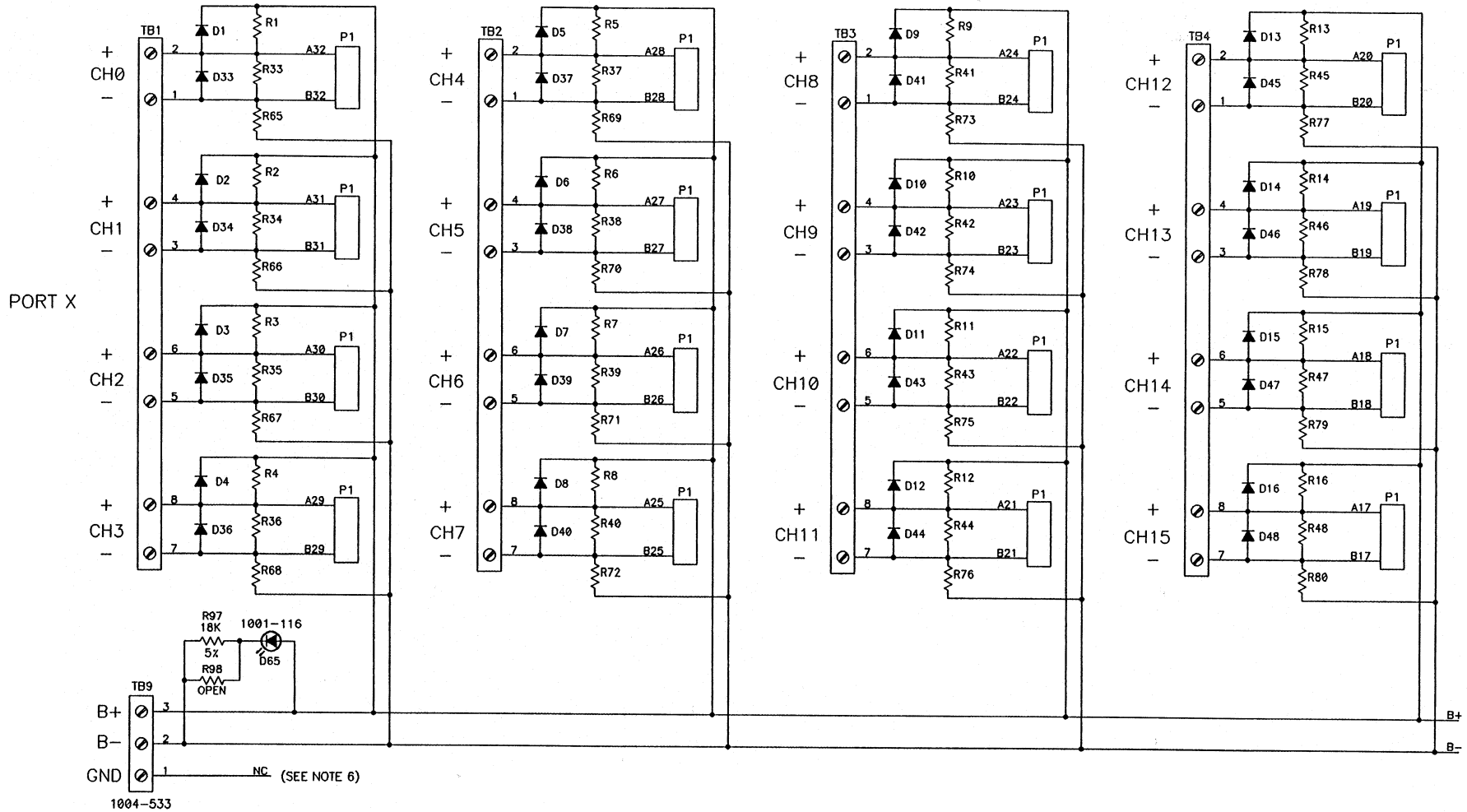
	DATE	REV	ECN	DR	ENG	CLP

TITLE: 6985-32Dx TERMINATION PANEL SCHEMATIC & PART LOCATION

D | SERIES: AVME | 1 of 3 | DWG NO. 4501-272 | A



NOTES:

1. ALL SEVEN DIGIT NUMBERS ARE ACROMAG PART NUMBERS.
2. TB1 THROUGH TB8 ARE ACROMAG 1004-531.
3. R1 THROUGH R96 ARE 1/4W.
4. R98 IS OPTIONAL.
5. D1 THROUGH D64 ACCEPT TS2 LEADS.
6. EACH CHANNELS' (+) AND (-) INPUT CONTAINS A 0.064" SPARK GAP TO GND OF TB9.
7. P.C. BOARD IS 1018-571.

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DATE	REV	ECN	DR	ENG	CLP
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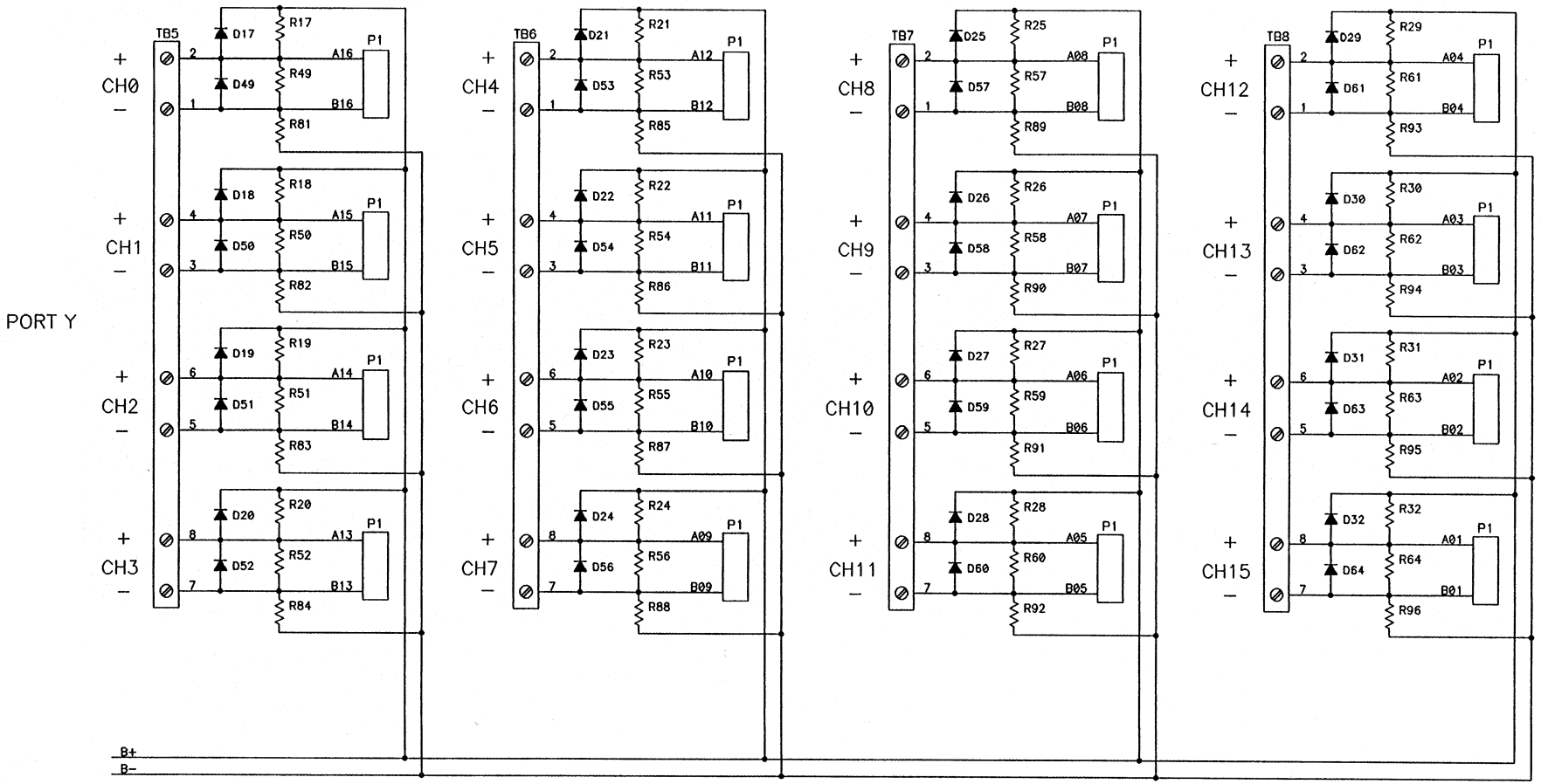
TITLE: 6985-32Dx TERMINATION PANEL SCHEMATIC & PART LOCATION

SIZE	SERIES		DWG NO.	REV
C	AVME	2 OF 3	4501-272	A



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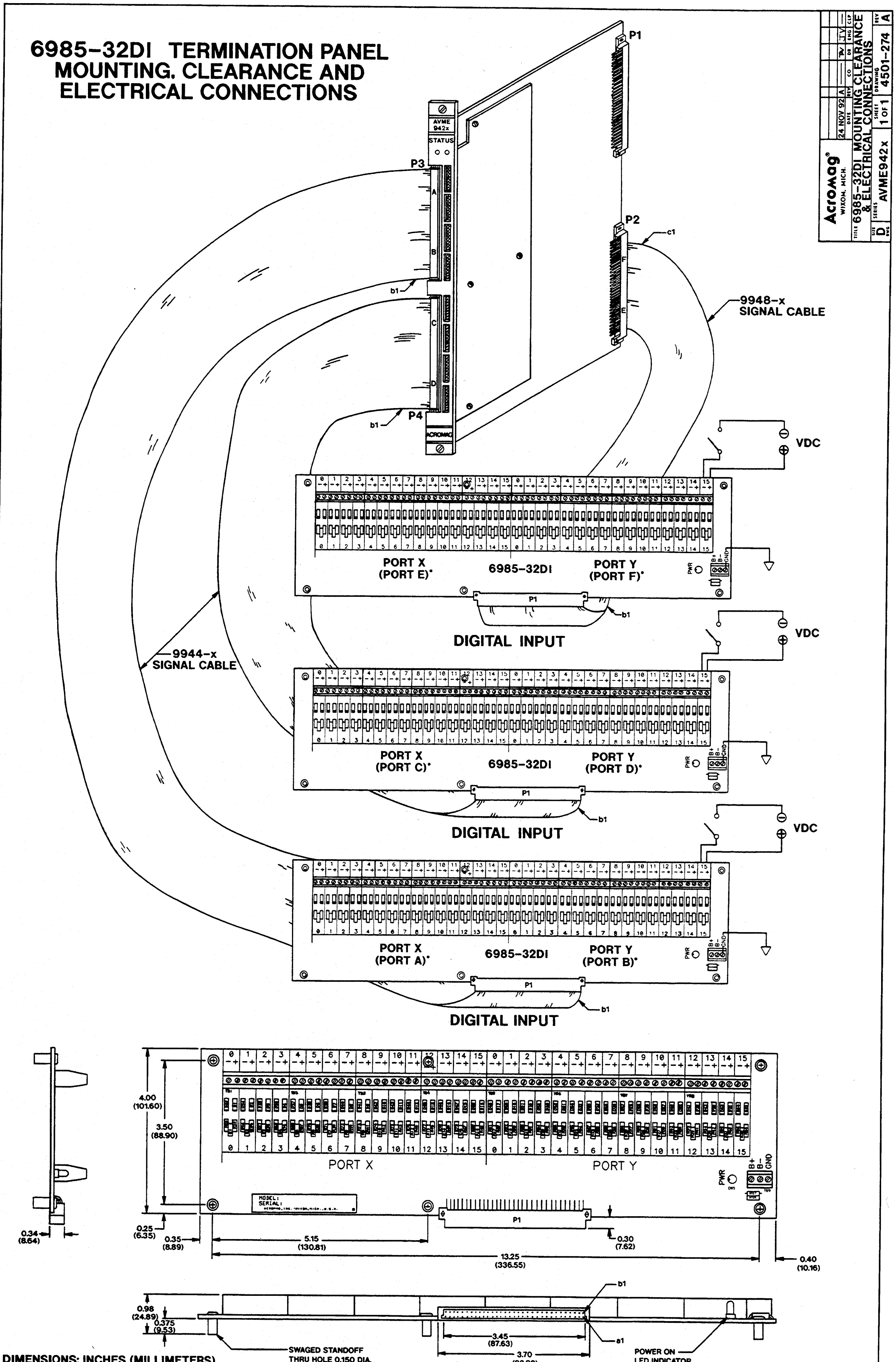
	DATE	REV	ECN	DR	ENG	CLP	
TITLE 6985-32Dx TERMINATION PANEL SCHEMATIC & PARTS LOCATION							
C	SERIES AVME	3 OF 3	DWG NO. 4501-272			A	REV

6985-32DI TERMINATION PANEL MOUNTING. CLEARANCE AND ELECTRICAL CONNECTIONS



DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.5)

* PORT ASSIGNMENT PER THIS INSTALLATION