Model PB751-AT
Product Manual

MANUAL NUMBER : 00650-100-10B

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Mission Critical Applied Computing Solutions

FOREWORD

This product manual provides information to install, operate and or program the referenced product(s) manufactured or distributed by ICS Advent. The following pages contain information regarding the warranty and repair policies.

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Customer Comments: If you experience any problems with this manual or just want to provide some feedback, please send us a message using the online "Service Form" on our Web site (*www.icsadvent.com*) under "Support." Detail any errors you find. We will correct the errors or problems as soon as possible and post the revised manual in our online Support Library. Thank you.

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A thirty day money-back guarantee is provided on all **standard** products sold. **Special order products** are covered by our Limited Warranty, *however they may not be returned for refund or credit. EPROMs, RAM, Flash EPROMs or other forms of solid electronic media are not returnable for credit - but for replacement only. Extended Warranty available. Consult factory.*

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Product returned *after* 30 days, and *before* 60 days, of the purchase will be subject to a **minimum** 20% restocking charge and charges for any damaged or missing parts. Products not returned within 60 days of purchase, or products which are not in an as-new and re-saleable condition, are not eligible for credit return and will be returned to the customer.

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Effective April 1, 1998, all products carry a 2-year limited warranty. Within two years of purchase, ICS Advent will repair or replace, at our option, any defective product. ICS Advent will service the warranty for all standard catalog products for the first two years from the date of shipment. Please note: The 2-year warranty may not apply to special promotion items. Please consult the factory for warranty verification.

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No agent, dealer, distributor, service company, or other party is authorized to change, modify, or extend the terms of this Limited Warranty in any manner whatsoever. ICS Advent reserves the right to make changes or improvements in any product without incurring any obligation to similarly alter products previously purchased.

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For any Guarantee or Limited Warranty return, please contact ICS Advent's Customer Service at **800-480-0044** (U.S.) or **858-677-0877** (international) and obtain a Return Material Authorization (RMA) Number. All product(s) returned to ICS Advent for service or credit **must** be accompanied by a Return Material Authorization (RMA) Number. Freight on all returned items **must** be prepaid by the customer who is responsible for any loss or damage caused by common carrier in transit. Returns for Warranty **must** include a Failure Report for each unit, by serial number(s), as well as a copy of the original invoice showing date of purchase.

To reduce risk of damage, returns of product must be in an ICS Advent shipping container. If the original container has been lost or damaged, new shipping containers may be obtained from ICS Advent Customer Service at a nominal cost.

ICS Advent owns all parts removed from repaired products. ICS Advent uses new and reconditioned parts made by various manufacturers in performing warranty repairs and building replacement products. If ICS Advent repairs or replaces a product, its warranty term is not extended.

ICS Advent will normally return your replacement or repaired items via Second Day Air. Overnight delivery or delivery via other carriers is available at an additional charge.

Limitation of Liability

In no event shall ICS Advent be liable for any defect in hardware, software, loss, or inadequacy of data of any kind, or for any direct, indirect, incidental, or consequential damages in connection with or arising out of the performance or use of any product furnished hereunder. ICS Advent liability shall in no event exceed the purchase price of the product purchased hereunder. The foregoing limitation of liability shall be equally applicable to any service provided by ICS Advent or its authorized agent.

Some *Sales Items* and *Customized Systems* are **not** subject to the guarantee and limited warranty. However in these instances , any deviations will be disclosed prior to sales and noted in the original invoice. ***ICS Advent reserves the right to refuse returns or credits on software or special order items.***

Advisories

Three types of advisories are used throughout the manual to stress important points or warn of potential hazards to the user or the system. They are the Note, the Caution, and the Warning. Following is an example of each type of advisory:

Note: The note is used to present special instruction, or to provide extra information which may help to simplify the use of the product.



CAUTION!



A Caution is used to alert you to a situation which if ignored may cause injury or damage equipment.



WARNING!



A Warning is used to alert you of a situation which if ignored will cause serious injury.

Cautions and Warnings are accented with triangular symbols. The exclamation symbol is used in all cautions and warnings to help alert you to the important instructions. The lightning flash symbol is used on the left hand side of a caution or a warning if the advisory relates to the presence of voltage which may be of sufficient magnitude to cause electrical shock.

Use caution when servicing any electrical component. We have tried to identify the areas which may pose a Caution or Warning condition in this manual; however, ICS Advent does not claim to have covered all situations which might require the use of a Caution or Warning.

You must refer to the documentation for any component you install into a computer system to ensure proper precautions and procedures are followed.

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CHAPTER 1

INSTALLATION

Before installing this card carefully read the Address Selection and Option Selection sections of this manual and configure the card according to your requirements. Be especially careful with address selection. If the addresses of two installed functions overlap, you will experience unpredictable computer behavior.

To install the card:

1. Remove power from the computer.

2. Remove the computer cover.

3. Remove the blank I/O backplate if you are going to make I/O connections to this prototype card.

4. Select the base address of the card. (See Address Selection section of this manual.)

5. Install jumpers for selection as either an I/O card or as a Memory card. (See Option Selection section of this manual.)

6. Install the card in an expansion slot.

7. Inspect for proper fit of the card and cables and tighten screws.

8. Replace the computer cover.

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CHAPTER 2

FUNCTIONAL DESCRIPTION

Prototype card PB751-AT provides means for development of custom cards for use in IBM PC/XT and PC/AT or compatible computers. The card buffers all address lines, data lines, and some of the control signals. It also provides address decoding for I/O addresses 000 through 3FF hex and for memory addresses 00000 through FF000 and, allows setup of the selected address block size.

The PB751-AT card provides approximately 35 square inches of breadboard area for custom circuit development. This breadboard area contains over 2600 plated-through holes for easy component soldering. The holes are 0.035" in diameter with 0.100" spacing. The breadboard area is surrounded by heavy buses for ground and +5VDC power.

The card is supplied with a 37-pin sub-D right angle connector and matching mounting bracket. The properly spaced holes at the right end of the card will accommodate either one 37-pin sub-D connector, or one 25-pin and one 9-pin sub-D connector, or one 40, 50, or 60 pin flat cable connector.

PC BUS PIN CONNECTIONS AND SIGNAL LIST

62-PIN CONNECTOR
Bracket End of Card

	Ground		B1	A1	<	-IOCHCK		
	Reset	<	B2	A2	<>	SD7		
	+5VDC		B3	A3	<>	SD6		
	IRQ2	>	B4	A4	<>	SD5		
	-5VDC		B5	A5	<>	SD4		
	DRQ1	>	B6	A6	<>	SD3		
	-12VDC		B7	A7	<>	SD2		
	-OWS	>	B8	A8	<>	SD1		
	+12VDC		B9	A9	<>	SD0		C
S	Ground		B10	A10	<	IO CH RDY		O
O	-SMEMW	<	B11	A11	<	AEN		M
L	-SMEMR	<	B12	A12	<>	SA19		P
D	-IOW	<	B13	A13	<>	SA18		O
E	-IOR	<	B14	A14	<>	SA17		N
R	-DACK3	<	B15	A15	<>	SA16		E
	DRQ3	>	B16	A16	<>	SA15		N
S	-DACK1	<	B17	A17	<>	SA14		T
I	DRQ1	>	B18	A18	<>	SA13		
D	-REFRESH	<	B19	A19	<>	SA12		S
E	CLK	<	B20	A20	<>	SA11		I
	IRQ7	>	B21	A21	<>	SA10		D
	IRQ6	>	B22	A22	<>	SA9		E
	IRQ5	>	B23	A23	<>	SA8		
	IRQ4	>	B24	A24	<>	SA7		
	IRQ3	>	B25	A25	<>	SA6		
	-DACK2	>	B26	A26	<>	SA5		
	T/C	<	B27	A27	<>	SA4		
	BALE	<	B28	A28	<>	SA3		
	+5VDC		B29	A29	<>	SA2		
	OSC		B30	A30	<>	SA1		
	Ground		B31	A31	<>	SA0		

36-PIN CONNECTOR

End Nearest to 62-Pin Connector

	-MEM CS16	>	D1	C1	>	SBHE	
	-I/O CS16	>	D2	C2	<>	LA23	C
S	IRQ10	>	D3	C3	<>	LA22	O
O	IRQ11	>	D4	C4	<>	LA21	M
L	IRQ12	>	D5	C5	<>	LA20	P
D	IRQ15	>	D6	C6	<>	LA19	O
E	IRQ14	>	D7	C7	<>	LA18	N
R	-DACK0	<	D8	C8	<>	LA17	E
	DRQ0	>	D9	C9	>	-MEMR	N
S	-DACK5	<	D10	C10	>	-MEMW	T
I	DRQ5	>	D11	C11	<>	SD08	
D	-DACK6	<	D12	C12	<>	SD09	S
E	DRQ6	>	D13	C13	<>	SD10	I
	-DACK7	<	D14	C14	<>	SD11	D
	DRQ7	>	D15	C15	<>	SD12	E
	+5VDC		D16	C16	<>	SD13	
	-MASTER		D17	C17	<>	SD14	
	Ground		D18	C18	<>	SD15	

NOTES

1. > : Symbols pointing toward the connector designate signals into the card from devices on the bus.

2. < : Symbols pointing away from the connector designate signals from the card to devices on the bus.

3. <>: Double symbols indicate bi-directional signals.

4. A "minus" sign before the signal name signifies active low.

5. In the PC and PC/XT, the bus consists only of the 62-pin portion. Some of the signal names are different but the functionality remains the same.

BUS SIGNAL LIST

The signal names used in this listing are for the AT Bus. When appropriate, the older names used for the PC/XT are included in parenthesis. "I" indicates that the signal is an input from the bus to the card and "O" signifies an output from the card to the bus. See the AT technical manual for a more detailed description of these signals.

SIGNAL	I/O	DESCRIPTION
-OWS (or -ENDXFR)	I	Zero Wait State. Fast bus devices pull this line low to prevent the CPU from inserting extra wait cycles. The OWS signal tells the microprocessor that it can complete the present bus cycle without inserting any additional wait cycles.
AEN	O	Address Enable. When this line is high, the DMA controller has control of the address lines, data lines, memory read/write, and I/O read/write.

BALE (ALE)	O	Address Latch Enable. This line is used to latch valid addresses and memory decodes from the microprocessor. It's available to the I/O channel as an indicator of a valid microprocessor or DMA address (when used with AEN). Microprocessor addresses SA0 through SA19 are latched with the falling edge of BALE. BALE is forced high during DMA cycles.
CLK	O	System Clock. This clock signal may vary from 6 MHz to 8.33 MHz or higher.
-DACK1-7 (-DACK0-3)	O	DMA acknowledge lines used to acknowledge DMA requests (DRQ). Active low.
DRQ0-7 (DRQ1-3)	O	DMA Request lines from devices on the bus that need DMA service. The line must be held high until the corresponding DACK line goes active (low). These lines are prioritized. DRQ0 has highest priority and DRQ7 has lowest priority. DRQ0 through DRQ3 perform 8-bit transfers and DRQ5 through DRQ7 perform 16 bit transfers. DRQ4 is not available on the I/O channel.
-I/O CH CHKI	I/O	Channel Check. When low, a device on the bus has detected a parity error.
I/O CH RDY	I	I/O Channel Ready. Pulled low (not ready) by a memory or I/O device on the bus that needs more time. Never hold low for more than 10 clock cycles (XT) or 2.5 usec (AT). Cycles are extended in integral multiples of CLK cycles.
-I/O CS16	I	I/O 16-bit Chip Select. Signals a 16-bit one-wait-state I/O cycle. This signal is active low and should be driven with an open collector or tri-state driver capable of sinking 20 mA.
-IOR	O	I/O Read command. This line tells an I/O device on the bus to drive its data onto the data bus. Active low.
-IOW	O	I/O Write command. This line instructs an I/O device on the bus to read the data present on the data lines.
IRQ2-7, IRQ9-12, & IRQ14-15	I	Interrupt Request lines used by peripherals when they need attention. Interrupt requests are prioritized with IRQ9 through IRQ12 and IRQ14 through IRQ15 having the highest priority (IRQ9 is the highest) and IRQ2 through IRQ7 having the lowest priority (IRQ7 is the lowest). An interrupt line must be held high until the microprocessor acknowledges the interrupt request (Interrupt Service routine). Interrupt 8 is used for the real time clock. Interrupt 13 is not available on the I/O channel.
LA17-23	I/O	Unlatched address lines valid when BALE is high. I/O devices should latch these signals when BALE falls. Used for one wait-state memory cycles.
-MASTER	I	A processor on the I/O channel may use this signal with a DRQ

		to gain control of the address, data, and control lines of the bus. The controlling processor may need to assume responsibility to refresh system memory every 15 usec.
-MEM CS16	I	Memory 16-Bit Chip Select signals a 16-bit, one-wait-state memory cycle. This signal is active low and should be driven with an open collector or tri state driver capable of sinking 20 mA.
-MEMR	O	Memory Read (AT). This signal tells bus memory devices to put data onto the data bus. See -SMEMR to follow.
-MEMW	O	Memory Write (AT). This signal tells bus memory devices to put the data onto the data bus. See -SMEMW to follow.
OSC	O	A 50% duty cycle clock signal with a frequency of 14.31818 MHz
-REFRESH	O	This line is used in the AT to signal a memory refresh cycle. -DACK0 is used for this purpose in the PC/XT. Active low.
RESET DRV	O	Used to reset or initialize system logic on power-up or during low line voltage. Synchronized to the falling edge of CLK.
SA0-19 (A0-19)	O	Address lines for the first 1 MB of memory. SA0 is the least significant bit (LSB).
SBHE	O	Bus High Enable (system) indicates a 16 bit transfer of data.
SD0-15	I/O	Data bits. SD0 is the least significant bit (LSB).
-SMEMR	O	Memory Read. This command tells memory on the bus to drive its data onto the data bus. Used only with the lower 1 MB of memory. Active low.
-SMEMW	O	Memory Write. This command instructs memory devices on the bus to store the data present on the data bus. Used only on the lower 1 MB of memory. Active low.
T/C	O	Terminal Count. This signal provides a pulse when the terminal count for a DMA cycle is reached.

I/O ADDRESS MAP

The PB751-AT card address can be selected anywhere within the I/O address range 000-3FF hex or the Memory address range 00000-FF000 providing that the address does not over lap that of other installed functions. It is intended that I/O base addresses be selected at four-byte intervals and that memory base address be selected at 4096 byte intervals.

Table 1 lists standard I/O address assignments.

TABLE 1.

Hex Range	Usage
000-00F	DMA Chip 8237A-5
020-021	Interrupt 8259A
040-043	Timer 8253-5
060-063	PPI 8255A-5
080-083	DMA Page Register
0AX	NMI Mask Register
0CX	Reserved
0EX	Reserved
100-1FF	Not Usable
200-20F	Game Control
210-217	Expansion Unit
220-24F	Reserved
278-27F	Reserved
2F0-2F7	Reserved
2F8-2FF	Asynchronous Communication (secondary)
300-31F	Prototype Card
320-32F	Fixed Disk
378-37F	Printer
380-38C**	SDLC Communications
380-389**	Binary Synchronous Comm. (secondary)
3A0-3A9	Binary Synchronous Comm. (primary)
3B0-3BF	IBM Monochrome Display/Printer
3C0-3CF	Reserved
3D0-3DF	Color/Graphics
3E0-3E7	Reserved
3F0-3F7	Diskette
3F8-3FF	Asynchronous Communication (primary)

** These options can not be used together - addresses over lap

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CHAPTER 3

ADDRESS SELECTION

The PB751-AT card address is set by DIP switch SW1. That switch controls I/O address bits A2 through A9 if jumpers are installed between pins 1 and 2 of W1, W2, W3, W4, W5, W6, W7, and W8. If those jumpers are installed between pins 2 and 3 at those locations, then the DIP switch controls memory address bits A12 through A19.

In order to set the base address, first convert the desired hex address to binary form. Then, for each "1" of the binary address, set the corresponding DIP switch to OFF and for each "0" of the binary number, set the corresponding DIP switch to ON.

For example, to program a base address of hex 300 (11000000 binary) set switches A9 and A8 to the OFF position and switches A7 through A2 to the ON position.

NOTE

Carefully review the Address Selection reference table on the previous page before selecting the card address. If the address of two installed functions overlaps you will experience unpredictable computer behavior.

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CHAPTER 4

OPTION SELECTION

You can use the card as an I/O Card or as a Memory Card. Also, you can select the size of a block of addresses reserved for this card. Base Address is set by DIP switches as described in the previous section.

I/O Card or Memory Card

If the card will be used as an I/O card, place the jumper between the leftmost pins at the location labeled **I/O MEM**. If the card is going to be used as a memory card, place that jumper between the rightmost pins.

Jumpers W1, W2, W3, W4, W5, W6, W7, and W8 select either address lines A2 through A9 (if the card is going to be an I/O card) or address lines A12 through A19 (if the card is going to be a memory card) as input for the address decoding circuit. If the eight jumpers are installed between the upper two pins, then I/O card addresses A2 through A9 are selected. If the jumpers are installed between the lower two pins, then Memory addresses A12 through A19 are activated.

Block of Addresses Reserved

The size of a block of addresses reserved for the PB751-AT card is selected by the combination of DIP switch settings just mentioned and jumpers marked 8, 16, 32, 32K, 64K, 128K, and 256K. The jumper positions marked 8, 16, and 32 are primarily used to set I/O address space required by the card. The remaining jumper positions are primarily used to set memory space to be occupied by the card. If no jumpers are installed, then the block size is 4 Bytes for an I/O card and 2K Bytes for a memory card. Refer to the following table:

I/O Card Address Space	Memory Card Address Space	Install Jumpers
8 bytes	4K bytes *	8
16 bytes	8K bytes *	16
32 bytes	16K bytes *	32
64 bytes *	32K bytes	32K
128 bytes *	64K bytes	64K
256 bytes *	128K bytes	128K
512 bytes *	256K bytes	256K

Note: Selections marked "*" are infrequently used.

Base Address Selection When Address Blocks Are Reserved

As described in the previous section of this manual, DIP switches A2 through A9 are used to set the base address. The A2 position corresponds to the least significant bit of the address in hexadecimal code and the A9 position corresponds to the most significant bit. If a block size of four bytes is selected for an I/O card application (or 2K bytes for memory operation), then all eight switches are available to set the base address. If one or more block reserving jumpers are installed, then certain DIP switches MUST be placed in the off position as follows:

8 Bytes I/O or	4KB Memory:	A2 must be OFF
16 Bytes I/O or	8KB Memory:	A2 AND A3 must be OFF
32 Bytes I/O or	16KB Memory:	A2, A3 AND A4 must be OFF
64 Bytes I/O or	32KB Memory:	A2, A3, A4 AND A5 must be OFF
128 Bytes I/O or	64KB Memory:	A2, A3, A4, A5, AND A6 must be OFF
256 Bytes I/O or	128KB Memory:	A2, A3, A4, A5, A6 AND A7 must be OFF
512 Bytes I/O or	256KB Memory:	A2, A3, A4, A5, A6, A7 AND A8 must be OFF

Eight or 16-bit Operation

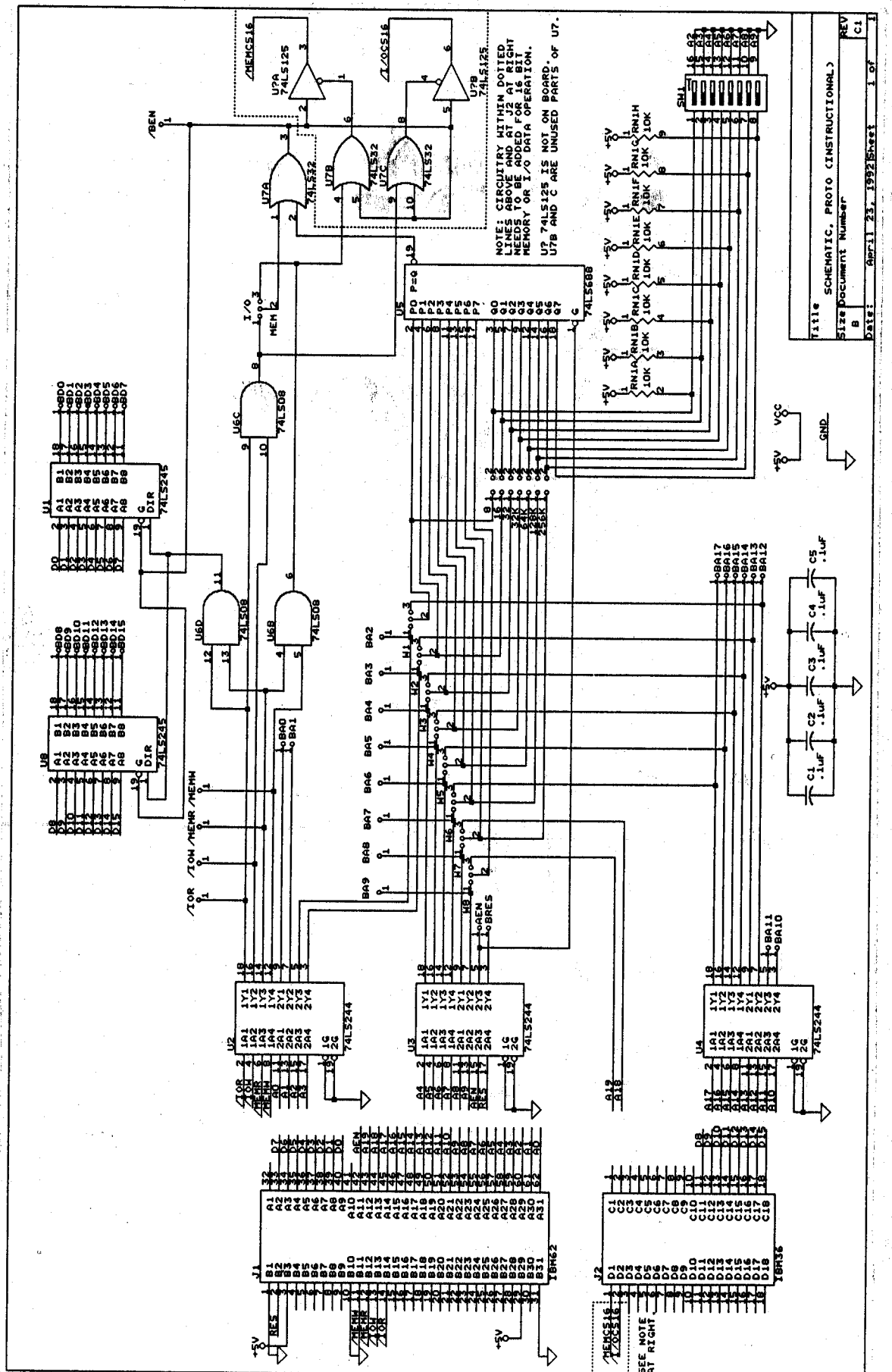
For 16-bit operation, it is necessary to complete wiring on IC U7 and to add a 74LS125 as shown within dotted lines on the schematic. Further, you may require different or additional circuitry depending on how you wish this card to interface to the computer I/O bus.

CHAPTER 5

SPECIFICATIONS

Computer Connector:	Gold edge connector for IBM PC/XT,PC/AT, or compatible computers.
Breadboard Area:	Approximately 35 square inches with 0.035" plated-through holes spaced 0.100" apart. Heavy ground and +5VDC buses surround the breadboard area.
Address Signals:	Address lines are buffered by type 74LS244 line drivers, labeled, and available at assigned pads. See Schematic.
Data Signals:	Data lines D0 through D15 are buffered by two type 74LS245 transceiver, and are available at assigned pads. See Schematic.
Address Decode:	Decoding provided for either I/O addresses or for Memory addresses. Card address is DIP switch selectable.
Card Address Block:	Jumper selectable; 8, 16, or 32 bytes for I/O card use and 32K, 64K,128K, or 256K for Memory card use.
Output Connector:	A 37-pin Sub-D right angle connector and mounting bracket are included. Properly spaced holes are provided for other combinations of connectors such as 9-pin Sub-D plus 25-pin Sub-D. The card will also accept 50-pin ribbon cable connectors.
Bracket:	Mounting bracket for standard 37-pin Sub-D connector included.
Card Size:	Full size PC/XT card (13.25" x 3.87")
Operating Temperature:	0 to +60°C.
Storage Temperature:	-20 to +85°C.
Humidity:	5% to 95% RH, non-condensing.

SCHEMATIC


NOTE: CIRCUITRY WITHIN DOTTED LINES ABOVE AND AT RIGHT NEEDS TO BE ADDED FOR 16 BIT MEMORY OR I/O DATA OPERATION.
U7 74LS125 IS NOT ON BOARD. U7B AND C ARE UNUSED PARTS OF U7.
Title SCHEMATIC, PROTO (INSTRUCTIONAL)
Size B Document Number REV C1
Date: April 23, 1992 Sheet 1 of 1
74LS245
74LS244
74LS08
74LS32
74LS125
74LS688
IBM36
IBM62
.1uF
10K

Declaration of Conformity

Information Technology Equipment

6260 Sequence Drive
San Diego, CA 92121-4371
(800) 523-2320 / (858) 677-0877

The product(s) covered by this declaration:

PB751-AT

The European Union directives covered by this declaration:

EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC

The basis on which conformity is declared:

EN 50081-1:1992 Emissions, Generic Requirements
-EN 55022 Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment

EN 50082-1:1992 Immunity, Generic Requirements
-EN61000-4-2:1995 Electrostatic Discharge (ESD) Immunity
-EN61000-4-3:1995 Radiated RF Field Immunity
-EN61000-4-4:1995 EFT Immunity for AC and I/O Lines

EN 60950:1992 Safety of Information Technology Equipment

The technical documentation required to demonstrate this product meets the requirements of the EMC Directive and the Low Voltage Directive has been compiled by ICS Advent and is available for inspection by the relevant enforcement authorities.

Attention

The attention of the specifier, purchaser, installer, or user is drawn to special measures and limitations for use which must be observed when the product is taken into service to maintain compliance with the above directives. Details of these special measures and limitations are in the product manual.

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