DIP-24

24 Channel Digital Input Board

User Manual

DIP-24

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Amendment History

Issue Level	Issue Date	Author	Amendment Details
0.7	08.05.89	LP	First draft
0.8	24.11.97	SEJ	Window front cover and logo. See ECN 97/142

OUTLINE DESCRIPTION

This card provides 24 opto-isolated digital inputs. It is suitable for sensing the presence of DC voltages in the range 5 to 24V. With an on board power inverter it may also be used to detect contact closures on push buttons, relays etc. Full isolation between channels allows any combination of the above inputs to be accommodated.

1.0 SPECIFICATIONS

1.1 Electrical Specification

Number of Inputs	24
Input Logic Levels 'ON'	3.5V to 8V (5V)
'ON'	7V to 21.5V (12V)
'ON'	8V to 34.5V (24V)
'OFF'	<0.8V (All)
Maximum Input Voltage	8V (5V)
	21.5V (12V)
	34.5 (24V)
Power Requirement	5V D.C. @ 150mA
Power Dissipation	750mW

1.2 Physical Specification

Height	107mm
Width	15mm
Depth	132mm

Electromagnetic Compatibility (EMC)

This product meets the requirements of the European EMC Directive (89/336/EEC) and is eligible to bear the CE mark.

It has been assessed operating in a Blue Chip Technology Icon industrial PC. However, because the board can be installed in a variety of computers, certain conditions have to be applied to ensure that the compatibility is maintained. It meets the requirements for an industrial environment (Class A product) subject to those conditions.

- The board must be installed in a computer system which provides screening suitable for the industrial environment.

- Any recommendations made by the computer system manufacturer/supplier must be complied with regarding earthing and the installation of boards.

- The board must be installed with the backplate securely screwed to the chassis of the computer to ensure good metal-to-metal (i.e. earth) contact.

- Most EMC problems are caused by the external cabling to boards. Boards fitted with IDC ribbon cable connectors on the metal mounting bracket require particularly careful installation of the external cabling. The cabling must be totally screened; the type of ribbon cable which is rolled to a round form with a braided wire screen is best. Standard ribbon cable will not be adequate unless it is contained wholly within the cabinetry housing the industrial PC. Keep the unscreened section as short as possible. The mounting bracket of the board includes a captive nut as an screen earth point. Connect the screen of the cable to this by the shortest possible wire.

- To ensure that the board meets the industrial radiated field immunity of 10V/metre, the cable should also be fitted with a ferrite clamp on the external cable as close possible to the connector. The preferred type is the Chomerics clip-on style, type H8FE-1004-AS.

- Ensure that the screen of the external cable is bonded to a good RF earth at the remote end of the cable.

- Cables which connect externally to boards at TTL levels should not exceed two metres in length. This restriction does not apply to opto-isolated boards.

Failure to observe these recommendations may invalidate the EMC compliance.

> Warning
> This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

EMC Specification

A Blue Chip Technology Icon industrial PC fitted with this card meets the following specification:

Emissions:	EN 55022:1995	
	Radiated	Class A
	Conducted	Class A & B
Immunity:	pr EN 50082-2:1991 incorporating	
	Electrostatic Discharge	IEC 801-2:1984 Performance Criteria A
	Radio Frequency Susceptibility	IEC 801-3:1984 Performance Criteria A
	Fast Burst Transients	IEC 801-4:1988 Performance Criteria A

2.0 USER ADJUSTMENTS

2.1 Selecting the Base Address

The board may be located in any 62 pin slot in the PC motherboard but must be set up to appear at a specified position (or 'address') in the port map. Available positions are show in the IBM-PC Technical Reference Guide. However, for those who do not possess a copy of this document, a good place is the location normally allocated to the prototyping card as supplied by IBM. This address is 300 Hex or 768 decimal.

All Blue Chip Technology cards are preset to this address at the factory. However, no two devices should be used while set to the same address since contention will occur and neither board will work. There is one exception to this rule. You may place one DIP-24 an one DOP-24 on the same address boundary as the DIP card is only enabled on read instructions and the DOP card is only enable on write instructions. This is a useful facility if you are short of port map space on your machine.

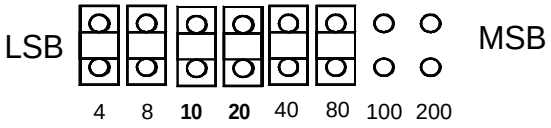
A set of links is provided on the board to set the base address of the board within the IBM-PC port map. The address is in binary with the presence of a link representing a 0 and the absence of a link representing a 1.

To set the base address to 768 Decimal (300 Hex) set the following pattern on the links as indicated below:

Figure 1 - Selecting the Base Address

Note: View board with back panel on RHS

Middle 8 Bits of port address on links.



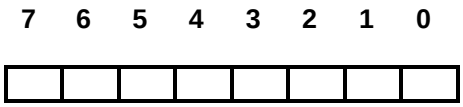
More example addresses are shown in Appendix A.

Note: No two cards must occupy the same address.

2.2 Port Map

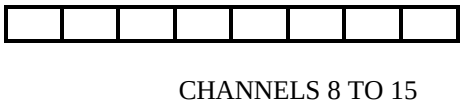
The DIP board provides three 8 bit ports. Each bit can be read by software to sense the state of inputs connected to the card. The card occupies four 8 bit ports although only three are used as shown below.

Address	Read	Write
Base + 0	Channels 0-7	N/A
Base + 1	Channels 8-15	N/A
Base + 2	Channel 16-23	N/A
Base + 3	Not used on card.	



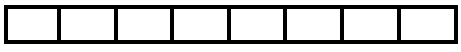
ADDRESS XX0H (R/O)

CHANNELS 0 TO 7 (Bit 0 = Channel 0 etc.)
(Base + 0)



ADDRESS XX1H (R/O)

CHANNELS 8 TO 15 (Bit 0 = Channel 8 etc.)
(Base + 1)



ADDRESS XX2H (R/O)

CHANNELS 16 TO 23 (Bit 0 = Channel 16 etc.)
(Base + 2)

3.0 ELECTRICAL OPTIONS

3.1 Input Conditioning

3 DIL resistor packs (RP5, RP6 and RP7) are provided on the front of the board to condition the input current to a suitable level for the opto-isolators. The value of these resistors must be calculated to ensure that the current passed through the opto-isolator is limited to 10mA. The opto-isolator will drop 1.5V constantly.

$$\text{REQUIRED RESISTANCE} = \frac{(\text{INPUT VOLTAGE} - 1.5\text{V})}{0.01}$$

The following table gives some common examples using the preferred resistor values:

Input Voltage	Resistor Value
5V	330R fitted as standard
10V	820R
12V	1K
24V	2K2

Note: Resistor type - 16 pin DIL package, 8 individual resistor elements. Farnell type 149-014 [1K].

3.2 Input Connections

A 50 way insulation displacement connector (IDC) is provided on the PC rear panel of the board for input signal connection. If access to individual channels is required, a 50 way IDC ribbon cable may be used to connect the inputs to a 50 way screw terminal block available from Blue Chip Technology as part number ST-24. The pins are numbered as shown in the following diagram.

Pins 1-48 contain the input channels and pins 49 and 50 are the output of the power inverter to provide an isolated 5 volts contact wetting supply. The input opto-isolators are AC and therefore connection polarity is not usually important. However, it is company policy to call the even numbered pins positive and the odd numbered pins negative on the DIP-24 to conform with the other cards in the range.

When the connector is viewed from the back of the system, odd numbered pins are on the left and even numbered pins are on the right with pin 1 at the top of the connector.

Pin Detail

Pin	1	O	O	Pin	2
Pin	3	O	O	Pin	4
O		O	O	.	
.		O	O	.	
.				.	
.				.	
.				.	
.		O	O	.	
.		O	O	.	
Pin	47	O	O	Pin	48
Pin	49	O	O	Pin	50

View with gold edge connectors downwards.

3.3 Connector Pin Details

Pin Number	Port	Bit	Function
1	Base + 0	0	+ve signal
2	Base + 0	0	-ve signal
3	Base + 0	1	+ve signal
4	Base + 0	1	-ve signal
5	Base + 0	2	+ve signal
6	Base + 0	2	-ve signal
7	Base + 0	3	+ve signal
8	Base + 0	3	-ve signal
9	Base + 0	4	+ve signal
10	Base + 0	4	-ve signal
11	Base + 0	5	+ve signal
12	Base + 0	5	-ve signal
13	Base + 0	6	+ve signal
14	Base + 0	6	-ve signal
15	Base + 0	7	+ve signal
16	Base + 0	7	-ve signal
17	Base + 1	0	+ve signal
18	Base + 1	0	-ve signal
19	Base + 1	1	+ve signal
20	Base + 1	1	-ve signal
21	Base + 1	2	+ve signal
22	Base + 1	2	-ve signal
23	Base + 1	3	+ve signal
24	Base + 1	3	-ve signal
25	Base + 1	4	+ve signal
26	Base + 1	4	-ve signal
27	Base + 1	5	+ve signal
28	Base + 1	5	-ve signal
29	Base + 1	6	+ve signal
30	Base + 1	6	-ve signal
31	Base + 1	7	+ve signal
32	Base + 1	7	-ve signal
33	Base + 2	0	+ve signal
34	Base + 2	0	-ve signal
35	Base + 2	1	+ve signal
36	Base + 2	1	-ve signal
37	Base + 2	2	+ve signal
38	Base + 2	2	-ve signal
39	Base + 2	3	+ve signal

Pin Number	Port	Bit	Function
40	Base + 2	3	-ve signal
41	Base + 2	4	+ve signal
42	Base + 2	4	-ve signal
43	Base + 2	5	+ve signal
44	Base + 2	5	-ve signal
45	Base + 2	6	+ve signal
46	Base + 2	6	-ve signal
47	Base + 2	7	+ve signal
48	Base + 2	7	-ve signal
49	Power inverter negative output 5 volts DC		
50	Power inverter positive output 5 volts DC		

Note: Maximum current that can be drawn from pins 49 and 50 = 74mA max.

4.0 OPERATING GUIDE

4.1 Using the Device

A total of 24 input signals may be connected to the DIP-24 board providing opto-isolation. These appear as three 8 bit ports. Each signal is connected to one bit within one of these ports i.e.

Ports	Bit	Hex	Decimal
	0	01	1
	1	02	2
	2	04	4
	3	08	8
Base + 0	4	10	16
	5	20	32
	6	40	64
	7	80	128
	0	01	1
	1	02	2
	2	04	4
	3	08	8
Base + 1	4	10	16
	5	20	32
	6	40	64
	7	80	128
	0	01	1
	1	02	2
	2	04	4
	3	08	8
Base + 2	4	10	16
	5	20	32
	6	40	64
	7	80	128

4.2 Programming Guide

The state of the input lines may be determined by using either of the following methods:

(a) Microsoft BASIC A or GW BASIC

```
X=INP (P)
```

Returns the byte from port P and assigns this value to the variable, x.

(b) 8088/8086 Assembly language

```
PORT EQU 0300H

GETDAT:

        MOV     DX,PORT
        IN      AL,DX
        RET
```

4.3 Example Program

The following program written in Microsoft Basic will run under the BASIC A or GW BASIC interpreter and is intended to display the bit inputs of the three DIP-24 ports on the screen in binary. This enables the user to see each input channel as it is activated.

The base address used for the program is 300 Hex or 768 decimal which is the default factory setting for link A.

```
10  CLS  :KEY OFF
20  LOCATE 1,20  :PRINT"DIP-24 Port Status"
30  LOCATE 4,1
40  FOR  P=&H300 TO &H302
50  PRINT"PORT  : - ";HEX$ (P) ;"   ";
60  PRINT"[";
70  GOSUB 110
80  PRINT"]      ";
90  NEXT
100  GOTO 30
110  M=1
120  FOR C=1 TO 8
130  D=INP (P)
140  D  =  D AND  M
150  IF D=0 THEN GOSUB 1000
160  IF D>0 THEN GOSUB 2000
170  M=M*2
180  NEXT C
190  RETURN
200  STOP
1000  PRINT "0";
1010  RETURN
2000  PRINT"1";
2010  RETURN
```

The program cycles continuously and has to be stopped by pressing control-break on the PC keyboard.

5.0 COMMERCIAL DATA ACQUISITION PACKAGES

The Blue Chip Technology DIP-24 can be used with almost any data acquisition package that can read information directly from a PC input port.

5.1 Use of the DIP-24 Board with ASYST

The board has been tested with and is installable as an IO.PORT digital device in the ASYST scientific software package by Macmillan Software Company.

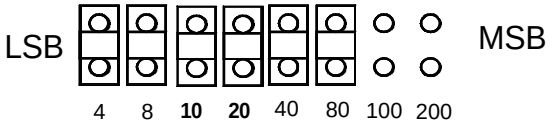
For more details about this package and other PC data acquisition software please contact Blue Chip Technology.

Whilst every effort has been taken to ensure that the information provided is accurate, Blue Chip Technology cannot assume responsibility for any errors in this manual or their consequences. Should any errors be detected, the company would greatly appreciate being informed of them. A policy of continuous product development is operated, resulting in the contents of this document being subject to change without notice.

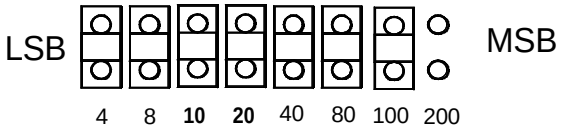
APPENDIX A

Note: View board with back panel on RHS.

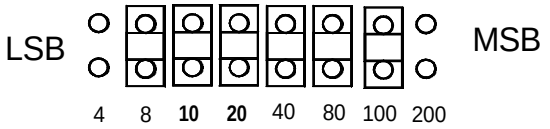
Address Settings for Port 300H



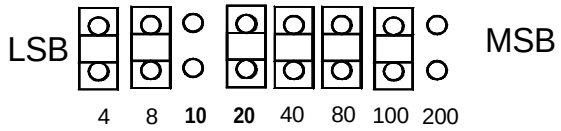
Address Settings for Port 200H



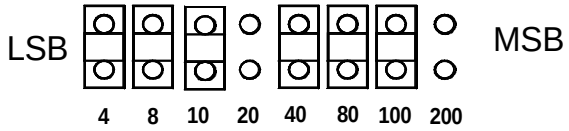
Address Settings for Port 204H



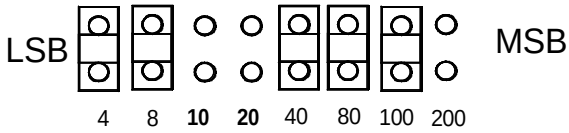
Address Settings 210H



Address Settings for Port 220H



Address Settings for Port 230H



APPENDIX B - PC MAPS

PC/XT/AT I/O Address Map

Address	Allocated to:
000-01F	DMA Controller 1 (8237A-5)
020-03F	Interrupt Controller 1 (8259A)
040-05F	Timer (8254)
060-06F	Keyboard Controller (8742) Control Port B
070-07F	RTC and CMOS RAM, NMI Mask (Write)
080-09F	DMA Page Register (Memory Mapper)
0A0-0BF	Interrupt Controller 2 (8259)
0F0	Clear NPX (80287) Busy
0F1	Reset NPX (80287)
0F8-0FF	Numeric Processor Extension (80287)
1F0-1F8	Hard Disk Drive Controller
200-207	Reserved
278-27F	Reserved for Parallel Printer Port 2
2F8-2FF	Reserved for Serial Port 2
300-31F	Reserved
360-36F	Reserved
378-37F	Parallel Printer Port 1
380-38F	Reserved for SDLC Communications, Bisync 2
3A0-3AF	Reserved for Bisync 1
3B0-3BF	Reserved
3C0-3CF	Reserved
3D0-3DF	Display Controller
3F0-3F7	Diskette Drive Controller
3F8-3FF	Serial Port 1

APPENDIX C

PC/XT Interrupt Map

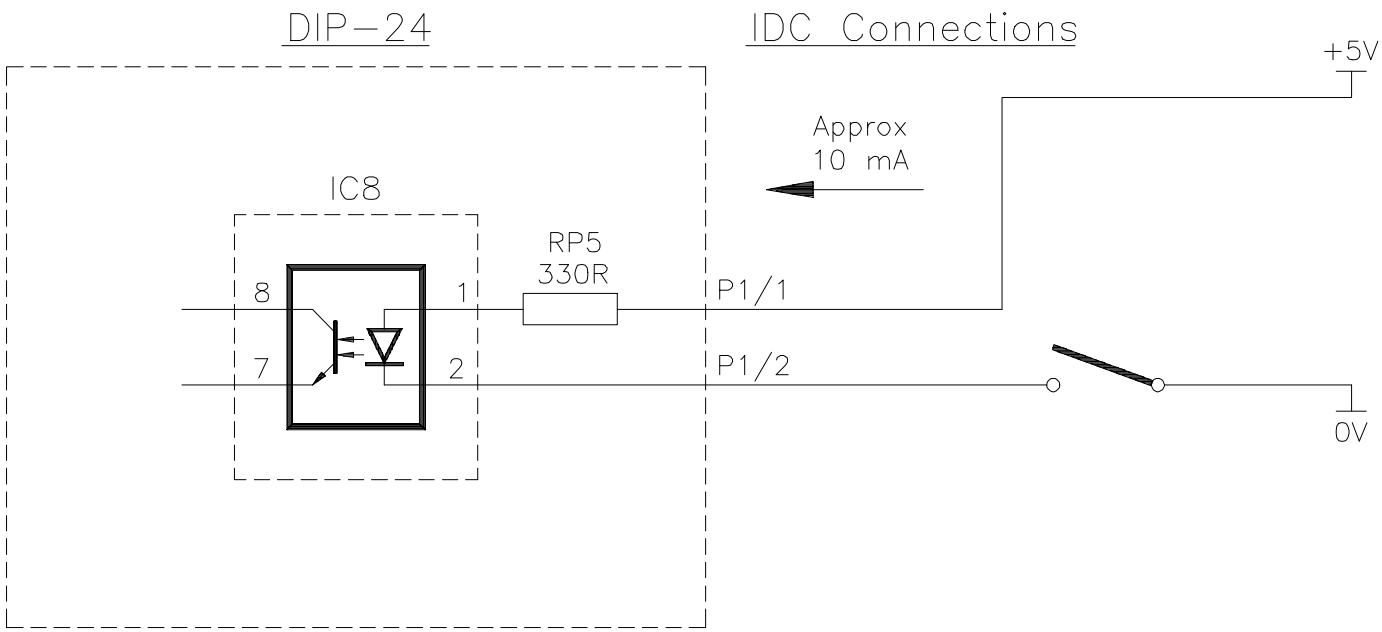
Number	Allocated to:
NMI	Parity
0	Timer
1	Keyboard
2	Reserved
3	Asynchronous Communications (Secondary) SDLC Communications
4	Asynchronous Communications (Primary) SDLC Communications
5	Fixed Disk
6	Diskette
7	Parallel Printer

APPENDIX D

PC/AT Interrupt Map

Level		Function
Microprocessor NMI		Parity or I/O Channel Check
Interrupt Controllers		
CTLR 1	CTLR 2	
IRQ 0		Timer Output 0
IRQ 1		Keyboard (Output Buffer Full)
IRQ 2		Interrupt from CTLR 2
	IRQ 8	Real-time Clock Interrupt
	IRQ 9	Software Redirected to INT 0AH (IRQ 2)
	IRQ 10	Reserved
	IRQ 11	Reserved
	IRQ 12	Reserved
	IRQ 13	Co-processor
	IRQ 14	Fixed Disk Controller
	IRQ 15	Reserved
IRQ 3		Serial Port 2
IRQ 4		Serial Port 1
IRQ 5		Parallel Port 2
IRQ 6		Diskette Controller
IRQ 7		Parallel Port

A Typical Connection To A DIP-24



(NB: ALL LINKS VIEWED WITH CONNECTORS ON RHS)

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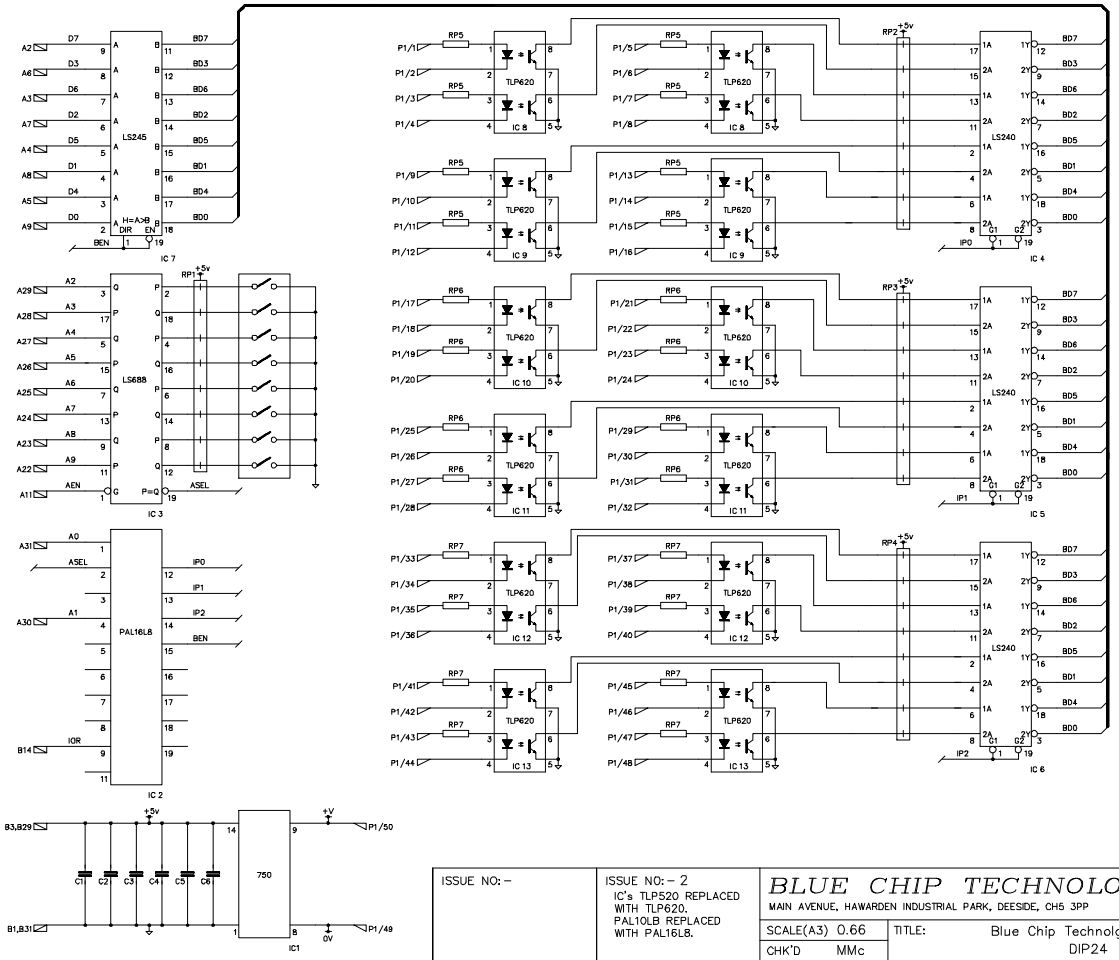

ISSUE NO:-	ISSUE NO:- 2 IC's TLP520 REPLACED WITH TLP620. PAL10LB REPLACED WITH PAL16L8.	BLUE CHIP TECHNOLOGY LIMITED MAIN AVENUE, HAWARDEN INDUSTRIAL PARK, DEESIDE, CH5 3PP TEL: (0244) 520222 TELEX: 61471		
		SCALE(A3) 0.66	TITLE: Blue Chip Technolgy Limited DIP24	
		CHK'D MMc		
DWN. APPD. DATE	DWN. APPD. DATE	DRAWN S.E.	REV B	
	GM MMc 17/10/91	DATE: 19/3/87	DRAWING NUMBER: DIP24D01	ISS: 2