



DICO MODULE 16 Digital Output protection C.C.

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This product meets the **EMC** requirements of **EEC Directive 89/336**.

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1. General

The **16 Digital Output MODULE** is a standard unit to be mounted on DICO-series MOTHERBOARD.

The module consists of 16 PNP-type digital outputs.

The outputs are protected against short circuits, overloads and temperature rises. In this case, the output is protected against over temperatures and is disabled.

It is possible to see whether the output is operating correctly or not.

Each output is designed for rated currents of 500 mA.

The main characteristics of the module are listed below:

- **Id. code:** 04H
- **No. of outputs:** 16
- **Type of output:** PNP (opto-isolated)
- **Rated voltage:** 24V
- **Rated output current:** 500 mA
- **Display:** 16 LEDs

2. Specifications

- **No. of outputs:** 16
- **Type of output:** PNP (opto-isolated)
- **Rated voltage:** 24 VDC (1)
- **Max voltage:** 36 VDC
- **Rated current:** 500 mA
- **Insulation:** 500 VDC
- **Excitation delay (max):** 1.5 ms
- **De-energizing delay (max):** 4.5 ms
- **Max output frequency:** 100 Hz
- **Operating temperature:** 0 - 60 °C
- **Relative humidity:** up to 85% without condensate
- **Dimensions:** 68.5 × 114.3 mm

(1) The values are within the limits indicated provided that $V_s = 24 \text{ VDC} \pm 10\%$.

3. Memory map and addressing

Each module comes with 4 jumpers J1 thru J4 for selecting one of the four the module addresses (see DICO System documentation).

WARNING!

NEVER energize more than one addressing switch on the same module at the same time.

The module addresses are as follows:

BLOCK	8044	80C186	188	BUS PC
	Base+	Base+	Base+	Base+
#1	00H-07H	00H-0FH	00H-07H	00H-07H
#2	08H-0FH	10H-1FH	08H-0FH	08H-0FH
#3	10H-17H	20H-2FH	10H-17H	10H-17H
#4	18H-1FH	30H-3FH	18H-1FH	18H-1FH

Table 3.1

Note that the external terminal on the DICO 022, DICO 108, DICO 108/E modules depend on the slot they are fitted into (SLOT 0, 1, 2, 3) while the module addresses are related to the selected jumpers J1 thru J4.

On the other hand, in DICO 028, the slots the modules are fitted into determine the address; therefore the SLOTS and BLOCKS correspond.

Put a cover on jumper J1 if the module is fitted into DICO 028.

3.1 Memory map

Offset		Register function
8044, 188 BUS PC	80C186	
0H	0H	Port "A" (out 1...out 8)
1H	2H	Port "B" (out 9...out 16)
2H	4H	not used
3H	6H	not used
4H	8H	not used
5H	AH	not used
6H	CH	Multiplexer timers + output diagnostics
7H	EH	ID code (04H)

Table 3.1.1

Port "A"

Offset 00h indicates the state of the first 8 module outputs:

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Out 8	Out 7	Out 6	Out 5	Out 4	Out 3	Out 2	Out 1

Table 3.1.2

In particular:

- a bit at "1" means the output is on
- a bit at "0" means the output is off

To set the output state writes at offset 00h; as for read-out:

- a bit at "1" will turn the output on
- a bit at "0" will turn the output off

Port "B"

Offset 00h (for 8044, 188 and BUS PC) and offset 02h (for 186) indicate the state of the last 8 module outputs:

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Out 16	Out 15	Out 14	Out 13	Out 12	Out 11	Out 10	Out 9
Tmr out1	Tmr out0						

Table 3.1.3

In particular:

- a bit at "1" means the output is on
- a bit at "0" means the output is off

To set the output state writes at offset 00h; as for read-out:

- a bit at "1" will turn the output on
- a bit at "0" will turn the output off

Bits 6 and 7 of this port may also indicate the value of tmrout0 and tmrout1 for the DICO bus. The procedure for enabling this function is explained below.

Register of multiplexer timers and output diagnostics

This register is laid out according to the following table:

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
TSEL 1	TSEL 0			DIAGN 4	DIAGN 3	DIAGN 2	DIAGN 1

Table 3.1.4

Where DIAGN1, DIAGN2, DIAGN3 and DIAGN4 are read-only bits that indicate whether the outputs are working properly or not. In particular "0" indicates that there are no problems, while "1" indicates that the output driver has been protected against over temperature due a short circuit or an overload or even because the part itself has overheated.

DIAGN1 refers to outputs out1, out2, out3, out4

DIAGN2 refers to outputs out5, out6, out7, out8

DIAGN3 refers to outputs out9, out10, out11, out12

DIAGN4 refers to outputs out13, out14, out15, out16

TSEL0 and TSEL1 are the flag bits used to multiplex outputs out15 and out16 with the values set for port "B" or signals TMROUT0 and TMROUT1 coming from CPU 8044 (these signals are only present with DICO 102 MOTHERBOARD).

In particular:

- TSEL0 = "1" indicates that TMROUT at out15 is enabled
- TSEL1 = "1" indicates that TMROUT at out16 is enabled
- TSEL0 = "0" indicates that the bit6 setting of port "B" on output out15 is enabled
- TSEL1 = "0" indicates that the bit6 setting of port "B" on output out16 is enabled.

ID Code

Read offset 07h to determine the module id. code. Writing at offset 07h will not have any effect.

3.2 Mode of operation with 1 separate output

For this module, output out2 may have a supply (COM and REF) separate from the other outputs. In this case, point COM of output out2 is the terminal COM <N> B where <N> indicates the slot which the module is fitted into, while point REF is the terminal for output out1. With this mode, output out1 is disabled and only 15 outputs can be used, 14 of which (out3, out4, ..., out16) are supplied from COM <N> A and REF <N>, while 1 (out2) is supplied from COM <N> B and from the terminal related to out1.

The operating modes can be selected via hardware by using jumpers J5, J6 and J7, as indicated in the following table:

JUMPER	Standard mode	Out2 separate	Default
J5	ON	OFF	ON
J6 1-2	ON	OFF	ON
J6 2-3	OFF	ON	OFF
J7 1-2	ON	OFF	ON
J7 2-3	OFF	ON	OFF

Table 3.2.1

4. Installation and connection

4.1 Installation

The I/O modules come with unifilar connectors, located on the edge on the soldered side, which are to be fitted into the selected slot on the MOTHERBOARD.

There is no polarization or guide for plugging in the connector, therefore make sure:

- the connector pins are inserted into the respective female fittings
- the module is properly positioned in relation to the MOTHERBOARD by referring to the connector numbering and the reference mark, as shown below:

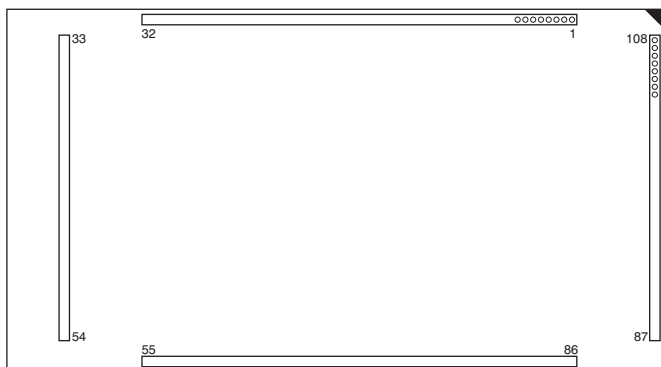


Figure 4.1.1 Module positioning

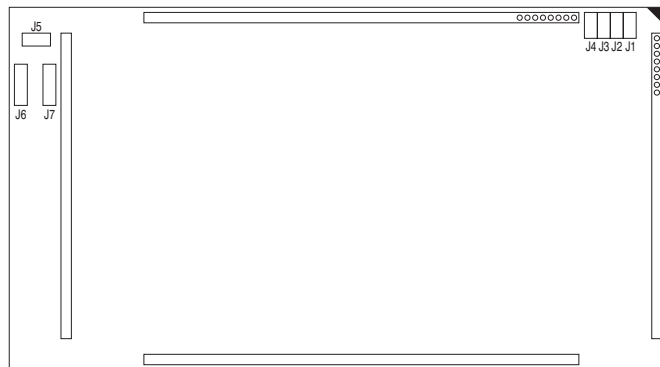


Figure 4.1.2 Jumper location

All the terminals shown in Figure 4.1.3 are indicated with the following notation:

<N> IO - <n>

where:

N number of slots (shown on the MOTHERBOARD, from 1 to 3 for 64-pin terminal blocks and 1 to 6 for 128-pin terminal blocks) the terminal in question is connected to;

n output index related to the module fitted into slot N.

EXAMPLE:

if a 16-digital output module has been fitted into slot 4 of a DICO 028, notation 4 IO-6 refers to output OUT6 of the above-mentioned module.

REF <N> is connected to an external reference potential (0V).

COM <N> is connected to an external positive potential ranging from 16V to 30V in relation to REF <N>. Note that this voltage is supplied to all devices controlled by the outputs.

This potential codes the high level of the general digital output at terminal <N> IO-<n>.

The source of a power MOSFET, type n, corresponds to each terminal <N> IO-<n>, the drain of which is connected to COM <N>.

TERMINAL BLOCK 108

WD-B	1	2	WD-A
0 IO-16	3	4	0 IO-14
0 IO-15	5	6	COM 0
REF 0	7	8	REF 1
1 IO-1	9	10	1 IO-2
1 IO-3	11	12	1 IO-4
1 IO-5	13	14	1 IO-6
1 IO-7	15	16	1 IO-8
1 IO-9	17	18	1 IO-10
1 IO-11	19	20	1 IO-12
1 IO-13	21	22	1 IO-14
1 IO-15	23	24	1 IO-16
COM 1A	25	26	COM 1B
2 IO-1	27	28	2 IO-2
2 IO-3	29	30	2 IO-4
2 IO-5	31	32	2 IO-6
2 IO-7	33	34	2 IO-8
2 IO-9	35	36	2 IO-10
2 IO-11	37	38	2 IO-12
2 IO-13	39	40	2 IO-14
2 IO-15	41	42	2 IO-16
COM 2A	43	44	COM 2B
REF 2	45	46	REF 3
3 IO-1	47	48	3 IO-2
3 IO-3	49	50	3 IO-4
3 IO-5	51	52	3 IO-6
3 IO-7	53	54	3 IO-8
3 IO-9	55	56	3 IO-10
3 IO-11	57	58	3 IO-12
3 IO-13	59	60	3 IO-14
3 IO-15	61	62	3 IO-16
COM 3A	63	64	COM 3B

Figure 4.1.3 Terminal Block 108.

TERMINAL BLOCK 028

127 128	1 2	3 4
125 126		
6 IO 15	6 IO 16	COM 1A
6 IO 13	6 IO 14	REF 1
6 IO 11	6 IO 12	1 IO 1
6 IO 9	6 IO 10	1 IO 3
6 IO 7	6 IO 8	1 IO 5
6 IO 5	6 IO 6	1 IO 7
6 IO 3	6 IO 4	1 IO 9
6 IO 1	6 IO 2	1 IO 11
REF 6	COM 6B	1 IO 13
COM 6A	COM 6A	1 IO 15
5 IO 15	5 IO 16	COM 2A
5 IO 13	5 IO 14	REF 2
5 IO 11	5 IO 12	2 IO 1
5 IO 9	5 IO 10	2 IO 3
5 IO 7	5 IO 8	2 IO 5
5 IO 5	5 IO 6	2 IO 7
5 IO 3	5 IO 4	2 IO 9
5 IO 1	5 IO 2	2 IO 11
REF 5	COM 5B	2 IO 13
COM 5A	COM 5A	2 IO 15
4 IO 15	4 IO 16	COM 3A
4 IO 13	4 IO 14	REF 3
4 IO 11	4 IO 12	3 IO 1
4 IO 9	4 IO 10	3 IO 3
4 IO 7	4 IO 8	3 IO 5
4 IO 5	4 IO 6	3 IO 7
4 IO 3	4 IO 4	3 IO 9
4 IO 1	4 IO 2	3 IO 11
REF 4	COM 4B	3 IO 13
COM 4A	COM 4A	3 IO 15

Figure 4.1.4 Terminal Block 028.