



Application Note #1439

Description of the DB-14064

Description:

- Provides 64 I/O points directly controllable through standard Galil commands
- I/O can be configured as inputs or outputs, in groups of eight bits
- Compatible with the DMC-14x5, DMC-34x5, DMC-18x2, DMC-1700*, DMC-1800*, and DMC-18x6* controllers
- I/O connections directly compatible with the Galil IOM-1964 opto-isolation module, or Grayhill and Opto-22 I/O interface racks
- Dimensions: 4.5" by 5"

The DB-14064 daughter board offers 64 extended I/O points that can be used with the DMC-1415 and DMC-1425 Ethernet controllers. This board can also be used with the DMC-1700, DMC-1800, DMC-18x6 and DMC-18x2 bus-based controllers*. These I/O points can be configured as inputs or outputs in 8 bit increments through software. They are accessed through two 50-pin IDC connectors, each with 32 I/O points. These connections can be interfaced to Grayhill and OPTO-22 I/O mounting racks.

This card is roughly 4.5" by 5" and mounts to the back of the controller card. It will require approximately 1" of space on the back of the card, or approximately 1 card slot.

Configuring the I/O of the DB-14064:

The 64 extended I/O points of the DB-14064 series controller can be configured in blocks of 8. The extended I/O is denoted as blocks 2-9 or bits 17-80.

The command, CO, is used to configure the extended I/O as inputs or outputs. The CO command has one parameter:

CO n

where n is a decimal value which represents a binary number. Each bit of the binary number represents one block of extended I/O. When set to 1, the corresponding block is configured as an output.

The least significant bit represents block 2 and the most significant bit represents block 9. The decimal value can be calculated by the following formula: $n = n_2 + 2*n_3 + 4*n_4 + 8*n_5 + 16*n_6 + 32*n_7 + 64*n_8 + 128*n_9$ where n_x represents the block. If the n_x value is a one, then the block of 8 I/O points is to be configured as an output. If the n_x value is

a zero, then the block of 8 I/O points will be configured as an input. For example, if Blocks 4 and 5 are to be configured as outputs, CO 12 is issued.

8-BIT I/O BLOCK	BLOCK	BINARY REPRESENTATION	DECIMAL VALUE FOR BLOCK
17-24	2	2^0	1
25-32	3	2^1	2
33-40	4	2^2	4
41-48	5	2^3	8
49-56	6	2^4	16
57-64	7	2^5	32
65-72	8	2^6	64
73-80	9	2^7	128

The simplest method for determining n:

Step 1. Determine which 8-bit I/O blocks will be configured as outputs.

Step 2. From the table, determine the decimal value for each I/O block to be set as an output.

Step 3. Add up all of the values determined in Step 2. This is the value to be used for n.

For example, if Blocks 2 and 3 are to be outputs, then n is 3 and the command, CO3, should be issued. Note: This calculation is identical to the formula: $n = n_2 + 2*n_3 + 4*n_4 + 8*n_5 + 16*n_6 + 32*n_7 + 64*n_8 + 128*n_9$ where n_k represents the block.

***Using the DB-14064 with the DMC-1700:** The DMC-17x8 series controller is obsolete. The DB-14064 daughter board can be mated to all DMC-1700 series controllers to provide extended I/O.

***Using the DB-14064 with the DMC-1750-1780, 1850-1880, 1856-1886:**

The 5 to 8 axis versions of the DMC-1700/1800/18x6 are equipped with 24 inputs and 16 outputs (an increase from 8 inputs and 8 outputs on 1 to 4 axis models). Since the numbering system for accessing the extended I/O ranges from 17 to 80, there will be an overlap of inputs from 17 to 24. When configuring the I/O, note that the first bank of extended I/O (17-24) will only be accessible as outputs. Configuring the first block (17-24) as inputs renders them as “no connection” inputs, since these inputs are already accessible through the general I/O on the main board.

The procedure for configuring and accessing the extended I/O on the 5-8 axis versions is then similarly done as described in the previous section. Except, when using the OP command, the argument “m” is a decimal number from 0 to 65535, which refers to the first 16 general I/O.

Saving the State of the Outputs in Non-Volatile Memory:

The configuration of the extended I/O and the state of the outputs can be stored in the EEPROM with the BN command. If no value has been set, the default of CO 0 is used (all blocks are inputs).

Accessing extended I/O:

When configured as an output, each I/O point may be defined with the SBn and CBn commands (where n=1 through 8 and 17 through 80)¹. Outputs may also be defined with the conditional command, OBn (where n=1 through 8 and 17 through 80)¹.

The command, OP, may also be used to set output bits, specified as blocks of data. The OP command accepts 5 parameters. The first parameter sets the values of the main output port of the controller - Outputs 1-8, block 0 (and Outputs 9-16, Block 1 on 5+ axes). The additional parameters set the value of the extended I/O as outlined:

OP m,a,b,c,d

where m is the decimal representation of the bits 1-8 (values from 0 to 255) or bits 1-16 on 5+ axes boards (values from 0 to 65535). Parameters a,b,c,d represent the extended I/O in consecutive groups of 16 bits. (values from 0 to 65535). Arguments that are given for I/O points which are configured as inputs will be ignored. The following table describes the arguments used to set the state of outputs.

ARGUMENT	BLOCKS	BITS	DESCRIPTION
m	0,1	1-8,9-16	General Outputs ¹
a	2,3	17-32	Extended I/O
b	4,5	33-48	Extended I/O
c	6,7	49-64	Extended I/O
d	8,9	65-80	Extended I/O

¹Bank 1 is available on 5+ axes controllers

For example, if block 8 is configured as an output, the following command may be issued:

OP 7,,,,7

This command will set bits 1,2,3 (block 0) and bits 65,66,67 (block 8) to 1. Bits 4 through 8 and bits 68 through 80 will be set to 0. All other bits are unaffected.

When accessing I/O blocks configured as inputs, use the TIn command. The argument 'n' refers to the block to be read (n=0,2,3,4,5,6,7,8 or 9). The value returned will be a decimal representation of the corresponding bits.

Individual bits can be queried using the @IN[n] function (where n=1 through 8 or 17 through 80). If the following command is issued;

MG @IN[17]

the controller will return the state of the least significant bit of block 2 (assuming block 2 is configured as an input).

Connector Description:

The DB-14064 controller has two 50-pin IDC header connectors. The connectors are compatible with I/O mounting racks such as Grayhill 70GRCM32-HL and OPTO-22 G4PB24.

Visual Display of Extended I/O command usage

Output Port	OP m		OP, a		OP,,b		OP,,,c		OP,,,,d	
	}		}		}		}		}	
Bank I/O range	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9
	1-8	9-16	17-24	25-32	33-40	41-48	49-56	57-64	65-72	73-80
Configure Outputs	CO n =	Σ	1+	2+	4+	8+	16+	32+	64+	128

**If corresponding bank (B2 thru B9) should be configured as an Output Bank, then include above number in SUM and use in CO command

Note for interfacing to OPTO-22 G4PB24: When using the OPTO-22 G4PB24 I/O mounting rack, the user will only have access to 48 of the 64 I/O points available on the controller. Block 5 and Block 9 must be configured as inputs and will be grounded by the I/O rack.

J6 DB-14064 50 PIN IDC

PIN	SIGNAL	BLOCK	BIT @IN[N], @OUT[N]	BIT NO
1.	I/O	4	40	7
3.	I/O	4	39	6
5.	I/O	4	38	5
7.	I/O	4	37	4
9.	I/O	4	36	3
11.	I/O	4	35	2
13.	I/O	4	34	1
15.	I/O	4	33	0
17.	I/O	3	32	7
19.	I/O	3	31	6
21.	I/O	3	30	5
23.	I/O	3	29	4
25.	I/O	3	28	3
27.	I/O	3	27	2
29.	I/O	3	26	1
31.	I/O	3	25	0
33.	I/O	2	24	7
35.	I/O	2	23	6
37.	I/O	2	22	5
39.	I/O	2	21	4
41.	I/O	2	20	3
43.	I/O	2	19	2
45.	I/O	2	18	1
47.	I/O	2	17	0
49.	+5V	-	-	-
2.	I/O	5	41	0
4.	I/O	5	42	1
6.	I/O	5	43	2
8.	I/O	5	44	3
10.	I/O	5	45	4
12.	I/O	5	46	5
14.	I/O	5	47	6
16.	I/O	5	48	7
18.	GND	-	-	-
20.	GND	-	-	-
22.	GND	-	-	-
24.	GND	-	-	-
26.	GND	-	-	-
28.	GND	-	-	-
30.	GND	-	-	-
32.	GND	-	-	-

34.	GND	-	-	-
36.	GND	-	-	-
38.	GND	-	-	-
40.	GND	-	-	-
42.	GND	-	-	-
44.	GND	-	-	-
46.	GND	-	-	-
48.	GND	-	-	-
50.	GND	-	-	-

J8 DB-14064 50 PIN IDC

PIN	SIGNAL	BLOCK	BIT @IN[N], @OUT[N]	BIT NO
1.	I/O	8	72	7
3.	I/O	8	71	6
5.	I/O	8	70	5
7.	I/O	8	69	4
9.	I/O	8	68	3
11.	I/O	8	67	2
13.	I/O	8	66	1
15.	I/O	8	65	0
17.	I/O	7	64	7
19.	I/O	7	63	6
21.	I/O	7	62	5
23.	I/O	7	61	4
25.	I/O	7	60	3
27.	I/O	7	59	2
29.	I/O	7	58	1
31.	I/O	7	57	0
33.	I/O	6	56	7
35.	I/O	6	55	6
37.	I/O	6	54	5
39.	I/O	6	53	4
41.	I/O	6	52	3
43.	I/O	6	51	2
45.	I/O	6	50	1
47.	I/O	6	49	0
49.	+5V	-	-	-
2.	I/O	9	73	0
4.	I/O	9	74	1
6.	I/O	9	75	2
8.	I/O	9	76	3
10.	I/O	9	77	4
12.	I/O	9	78	5

14.	I/O	9	79	6
16.	I/O	9	80	7
18.	GND	-	-	-
20.	GND	-	-	-
22.	GND	-	-	-
24.	GND	-	-	-
26.	GND	-	-	-
28.	GND	-	-	-
30.	GND	-	-	-
32.	GND	-	-	-
34.	GND	-	-	-
36.	GND	-	-	-
38.	GND	-	-	-
40.	GND	-	-	-
42.	GND	-	-	-
44.	GND	-	-	-
46.	GND	-	-	-
48.	GND	-	-	-
50.	GND	-	-	-

There may be an additional charge if Galil must retrofit an already purchased controller with this board; otherwise, add the cost to the controller price and specify '-DB14064' after the controller model when ordering.

Board Layout:

