MC³ and Genetix GCM Common Interface Table

All Merrick controller firmware applications released after 2003-01-01 expose a Common Interface Table (CIT), intended for users who want to connect with an industrial network. The format of the data structure is the same for DF-1, Modbus ASCII and Modbus RTU.

The first 16 words are in place for legacy reasons and should not be used. However, reading and displaying words 8 - 15 can sometimes be useful for troubleshooting purposes.

Words 16 - 43 are read only and intended for monitoring. For performance reasons, read a section, starting with word 16, and as far along as you need. The performance penalty for extending the read area length is small; however, you may find that you run out of space in the I/O table if you have many controllers on your network segment.

If you need to conserve I/O table space, first determine how many variables you really need. Typically, for a belt feeder, this would be Feedrate and Subtotal. If this is the case, you can read words 16 – 23. You will then have to enter the register numbers for Feedrate in Tag 1 RegNo and for Subtotal in Tag 2 RegNo. The Tag X RegNo values can be set in the MC³ by going to **Action Menu**, **Settings Menu**, enter the password, **Inputs & Outputs**, **Comm Settings**, **Comm 1 Numeric** (Modbus)or **Comm 2 Numeric**.(DF-1). In the Genetix GCM, use the CIT Monitor Diagnostic page, (P1) or the user interface Advanced Setup, Communications, GCM Port X (X = 1 or 2, typically 2), Numeric Data.

Words 44 - 67 can be written to. Note that the "Tag n W value" (n = 1...5) refers to the same internal register as the "Tag n R value". The "Tag n RegNo" is the internal register number corresponding to the values red from or written to. This Tagging scheme is in place to enable you to get to any variable within the MC³ or GCM. You must have the Register Specification for the application, version and revision you are working with. It is available on http://www2.merrick-inc.com/mct, under “MC³ Firmware Application Overview” or “Genetix Firmware Application Overview”.

There is a risk here, especially with the MC³. You can easily crash the MC³ if you, for example, write a value of zero to a variable used in a divide operation. The only remedy in this case is to Ram Reset the MC³. You will then have to enter all the MC³ parameters again. If you have WinMerik, which can be used to upload and download MC³ parameters with a PC; it is a good idea to upload before you start writing to internal MC³ variables. The situation is somewhat better with the GCM. You can save a backup of your current parameters before starting. It can be restored later. The GCM does not crash on an invalid floating point number or divide by zero, but generates “NaN” (not a number) or “INF” (infinity). These have a tendency so spread along the variable calculation path, so a Ram Reset may become necessary.

Words 60 to 67 are also accessible in the MC³ Comm 1 or 2 Numeric Params screen, or in the GCM CIT diagnostic screen P1. If you write to them, the values set in that screen will be overwritten. Words 60 to 67 are "sticky" and will survive power cycling.

Word formatting and write protection properties are set in words 60 - 62. It is a good idea to have all tagged registers write protected (4095, 0xFFF in word 60) until the floating point transfer method has been checked out. It is possible to transfer an invalid floating point number into a variable that is used in actual calculations, rendering a MC³ software fatal exception, or a NaN in the GCM.

Note that the read and write sections both contain floating point and integer (bit oriented) data. For performance reasons, it is better to read and write the entire sections, and then unpack/pack the different data types.

Word	Ele	Contains	Data format Bit (Note 2)	Element	Comment
0	8	Physical I/O			Legacy Data, do not use
8	8	Logical I/O			Legacy Data, do not use
16	1	Status/DNI		R 0	See Note 1 below for bit info
17	1	Network Outputs		R 1	
18	1	Warnings		R 2	
19	1	Faults		R 3	
20	2	Tag 1 R Value	0 (0001)	R 4,5	
22	2	Tag 2 R Value	1 (0002)	R 6,7	
24	2	Tag 3 R Value	2 (0004)	R 8,9	
26	2	Tag 4 R Value	3 (0008)	R 10,11	
28	2	Tag 5 R Value	4 (0010)	R 12,13	
30	2	Feedrate	5 (0020)	R 14,15	
32	2	Weight	6 (0040)	R 16,17	
34	2	Speed Info	7 (0080)	R 18,19	Speed, if available, or PID CV
36	2	Subtotal	8 (0100)	R 20,21	
38	2	Total	9 (0200)	R 22,23	
40	1	App/Ver		R 24	App # in hi byte, Ver (ASCII) in low
41	1	Phys Inputs	Note 7	R 25	
42	2	Phys Outputs	Note 8	R 26,27	
44	1	Control/DNI		W 0	See Note 1 below for bit info
45	1	Network Inputs		W 1	
46	2	Primary Setpoint	10 (0400)	W 2,3	
48	2	Sec. Setpoint	11 (0800)	W 4,5	Not used in all applications
50	2	Tag 1 W Value	0 (0001)	W 6,7	
52	2	Tag 2 W Value	1 (0002)	W 8,9	
54	2	Tag 3 W Value	2 (0004)	W 10,11	
56	2	Tag 4 W Value	3 (0008)	W 12,13	
58	2	Tag 5 W Value	4 (0010)	W 14,15	
60	1	Write Protect Bits		W 16	Set for write protection. See note 3
61	1	Word Order Bits		W 17	Set to reverse words. See note 4
62	1	Int/Frac Bits		W 18	Set for Int/Frac. See note 5
63	1	Tag 1 RegNo		W 19	Register number for Tag 1
64	1	Tag 2 RegNo		W 20	Register number for Tag 2
65	1	Tag 3 RegNo		W 21	Register number for Tag 3
66	1	Tag 4 RegNo		W 22	Register number for Tag 4
67	1	Tag 5 RegNo		W 23	Register number for Tag 5

It is possible to read the entire CIT. Normally, reading starts at Word 16. Use DF-1 function 1, “PLC-2 Unprotected Read” or Modbus function 3, “Read Holding Registers”.

It is possible to write to Word 44 – 67. Use DF-1 function 8, “PLC-2 Unprotected Write” or Modbus function 16, “Preset Multiple Registers”.

Note 1 This is the bit assignment for words 16 and 44, corresponding to the first words normally read and written.

Bit	Word 16 Function	Word 44 Function	Comment
0-6	See Note 6		
7	Integrity Check Bit Echo	Integrity Check Bit	Toggle by every write cycle. The controller will echo the bit from word 44 to word 16.
8	Clear Warnings Done	Clear Warnings Command	Used by PLC to clear all warnings. Set the bit in word 44, and wait for the bit in word 16 to set. Then clear the bit in word 44.
9	Clear Subtotal Done	Clear Subtotal Command	Same scheme as for Clear Warnings
10	Lock Touchpad Done	Lock Touchpad Command	Disables all touch-buttons on the MC³, no effect in the GCM.
11	Reserved	Reserved	Planned for Register Download
12	Pacing flag		Low Feedrate Deviation. Used for pacing functions, whereby other feeders in the system will follow a "starving" feeder.
13	Not Serial Setpoint		The controller will ignore sent setpoint. Set when the Setpoint Method is something else than Serial.
14	MC³ in menu		Used for tampering monitoring. This bit is on whenever the MC³ menu system is entered. Always zero in the GCM.
15	Controller recalibrated	Controller recalibration ACK	In place for historical reasons. Set when any calibration procedure is accepted or any parameter is changed. Reset with a Low-to-high transition of Recalibration ACK.

Note 2. This column defines the bit weight for the corresponding variable in the format words 60, 61 and 62. Example: Tag 2 Read and Write values both are governed by bit one (with bit weight 0002 Hex) in the format words 60, 61 and 62. In this way, Write Protection, Word Order and Integer/Fraction representation is individually settable for every floating point variable in the CIT.

Note 3. The write protection property should be set when a register is tagged for monitoring only. When writing to words that are write protected, the corresponding Tag n W value changes accordingly, but the corresponding register (Tag n R Value) is unaffected. This is useful for testing data transfers to the controller before they are implemented, or when you need to change a variable only at certain instances. Typical value is 3071, 0xBFF, which will write protect everything except the Primary Setpoint.

Note 4 The Word Order Bit, when set, reverses the order of the two words that contains floating point value information. Typical values are 4095 (0xFFF) for S5, S7, PLC-5 and SLC PLC's, 0 for the Modicon and ControlLogix family of PLC's.

Note 5. The Integer/Fraction bits are used when the device using the data does not support floating-point numbers. With the corresponding Word Order bit cleared, the first word

will carry the Integer part, and the second the fractional part, multiplied with 10000. (4 implied decimal places). Note that for a negative value, both the integer and fractional parts are negative.

Note 6. Bits 0 - 3 are used to signal problems with Tag Register Numbers as follows:

Bit 0 Attempt to write to a conditionally write-protected register while the “Extended Access” logical input is OFF.
Bit 1 Attempt to write to a write-protected register.
Bit 2 Attempt to write to a non-existing register.
Bit 3 Attempt to read from a non-existing register. Zero returned.

Note 7 Physical Inputs. For MC³ controllers:

Bit	Input	Bit	Input	Bit	Input	Bit	Input
41:0	Rack 1 In 1	41:4	Rack 2 In 1	41:8	Rack 3 In 1	41:12	Rack 4 In 1
41:1	Rack 1 In 2	41:5	Rack 2 In 2	41:9	Rack 3 In 2	41:13	Rack 4 In 2
41:2	Rack 1 In 3	41:6	Rack 2 In 3	41:10	Rack 3 In 3	41:14	Rack 4 In 3
41:3	Rack 1 In 4	41:7	Rack 2 In 4	41:11	Rack 3 In 4	41:15	Rack 4 In 4

For GCMs:

Bit	Input	Bit	Input	Bit	Input	Bit	Input
41:0	Always 0	41:4	Dip Sw 1	41:8	Dig In 1	41:12	Tacho 1A
41:1	Always 1	41:5	Dip Sw 2	41:9	Dig In 2	41:13	Tacho 1B
41:2	DNA key in	41:6	Dip Sw 3	41:10	Dig In 3	41:14	Tacho 2A
41:3	XDC conn.	41:7	Dip Sw 4	41:11	Dig In 4	41:15	Tacho 2B

Note 8 Physical Inputs and Outputs. For MC³ controllers:

Bit	Output	Bit	Output	Bit	Output	Bit	Output
42:0	Rack 1 Out 1	42:8	Rack 2 Out 1	43:0	Rack 3 Out 1	43:8	Rack 4 Out 1
42:1	Rack 1 Out 2	42:9	Rack 2 Out 2	43:1	Rack 3 Out 2	43:9	Rack 4 Out 2
42:2	Rack 1 Out 3	42:10	Rack 2 Out 3	43:2	Rack 3 Out 3	43:10	Rack 4 Out 3
42:3	Rack 1 Out 4	42:11	Rack 2 Out 4	43:3	Rack 3 Out 4	43:11	Rack 4 Out 4
42:4	Rack 1 Out 5	42:12	Rack 2 Out 5	43:4	Rack 3 Out 5	43:12	Rack 4 Out 5
42:5	Rack 1 Out 6	42:13	Rack 2 Out 6	43:5	Rack 3 Out 6	43:13	Rack 4 Out 6
42:6	Rack 1 Out 7	42:14	Rack 2 Out 7	43:6	Rack 3 Out 7	43:14	Rack 4 Out 7
42:7	Rack 1 Out 8	42:15	Rack 2 Out 8	43:7	Rack 3 Out 8	43:15	Rack 4 Out 8

For GCMs:

Bit	I/O	Bit	I/O	Bit	Input	Bit	Input
42:0	Orange LED	42:8	Dig Out 1	43:0	XIO 1 Out 1	43:8	XIO 1 Out 9
42:1	Green LED	42:9	Dig Out 2	43:1	XIO 1 Out 2	43:9	XIO 1 Out 10
42:2	Red LED	42:10	Dig Out 3	43:2	XIO 1 Out 3	43:10	XIO 1 Out 11
42:3	Reserved	42:11	Dig Out 4	43:3	XIO 1 Out 4	43:11	XIO 1 Out 12
42:4	ADC1 In 1	42:12	ADC2 In 1	43:4	XIO 1 Out 5	43:12	XIO 1 Out 13
42:5	ADC1 In 2	42:13	ADC2 In 2	43:5	XIO 1 Out 6	43:13	XIO 1 Out 14
42:6	ADC1 In 3	42:14	ADC2 In 3	43:6	XIO 1 Out 7	43:14	XIO 1 Out 15
42:7	ADC1 In 4	42:15	ADC2 In 4	43:7	XIO 1 Out 8	43:15	XIO 1 Out 16