Measurement · Weighing · Control

G4 Multi Channel Weighing Instrument

Program version 1.12.0.0

EtherNet/IP Program Option Technical Manual Supplement

PM/DT/HE/RM types

BLH NOBEL
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Contents

1 Introduction

This manual is a supplement to the Technical Manual of the G4 Multi Channel Weighing Instrument. It covers the EtherNet/IP communication option.

For any information besides EtherNet/IP please refer to the Technical Manual.

To be able to use the EtherNet/IP option an option code must be purchased and entered in the Program Options menu. Contact your supplier for more information. Note that the option code is valid only for the specific G4-CPU S/N it was purchased for.

This manual is aimed at the practical use of the EtherNet/IP interface of the G4 Instrument so the information most likely to be needed during commissioning of the communication is placed first.

The EIP mapping in this G4 SW version (1.12.0.0) differs from the previous G4 SW version (1.10.0.0) requiring an update of the PLC program if the G4 SW is updated to 1.12.0.0. The EtherNet/IP interface of 1.12.0.0 does not support the batching or flow rate functionality of the G4 Instrument. Use 1.10.0.0 if Batching is required.

Contact your supplier for more information.

The EtherNet/IP is intended for process data (weight, status etc.). Configuration of the instrument is done via the front panel or by using a browser connected to the instrument.

Changes from revision 0:

Revision 0 is referring to program version 1.11.0.0 which is an unreleased intermediate version.

Chapter 2: the order of the table is changed for clarity. EDS file was R1 is R3.

Chapter 3.1: Order of column changed for clarity.

Chapters 3.5, 3.6 and 3.7: The tables for the assembly instances 102 to 104 did not list the byte “Instrument state”. Byte numbers for scale 4 corrected (59 was incorrectly 69).

Chapters 3.12 and 3.13: Some clarifications regarding byte no, data order and format added.

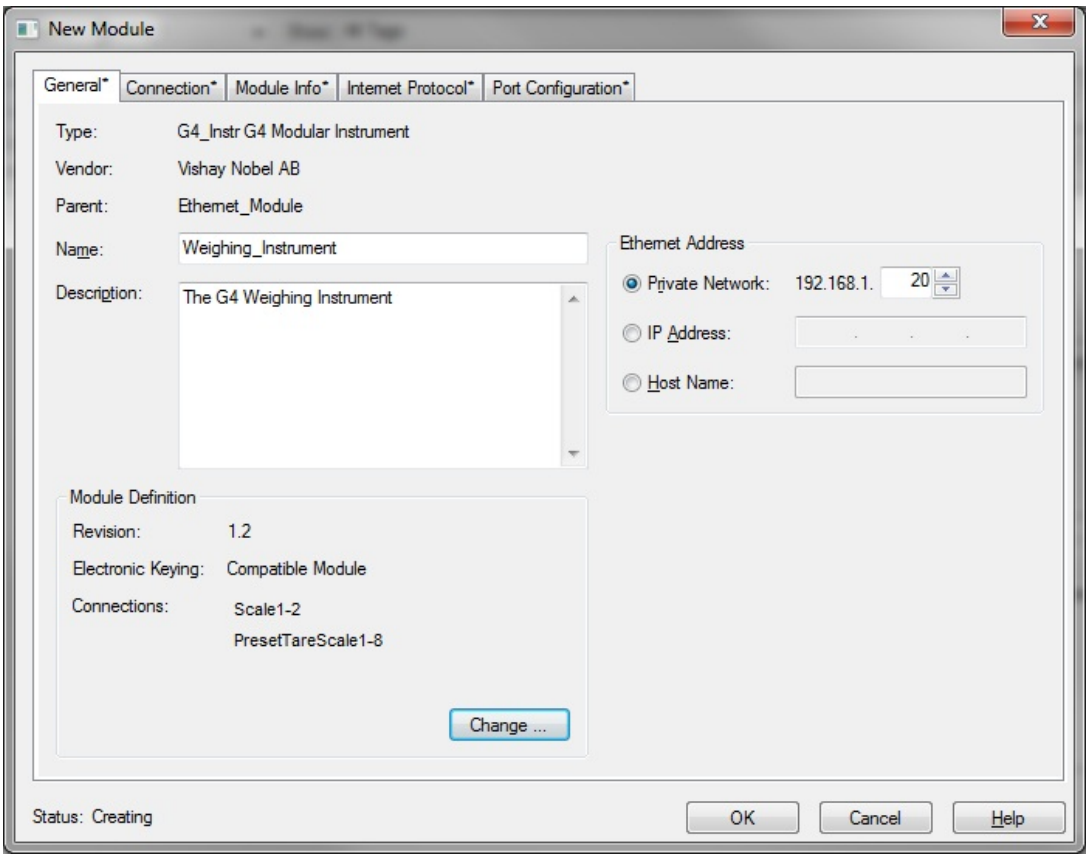
Chapter 5 (general text): Some corrections in first paragraph.

Chapter 5.5: Wrong class name in header (Identity Object instead of Connection Manager).

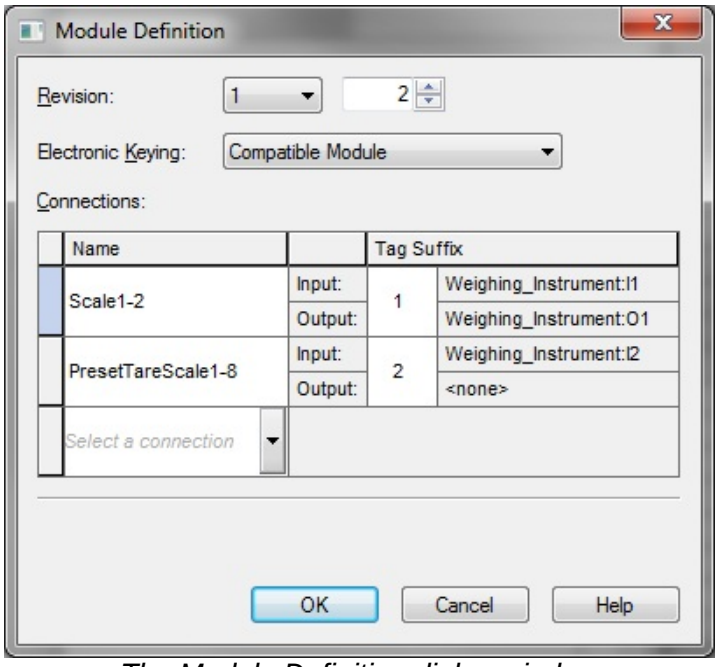
2 Using the EtherNet/IP interface

The EtherNet/IP interface of the G4 instrument lets the user read and write data to the instrument in a variety of ways making it possible to adapt to the specific requirements of the particular application. This chapter gives some guidance how to use the interface in the best way.

1. Activate the EtherNet/IP option code. Note that it is tied to the G4-CPU S/N. This is the only action needed in the G4 to activate EtherNet/IP. All other setup will be done in the PLC.
2. Setup the IP-address of the instrument and connect it to the network.
3. Install the EDS file for the G4 Instrument in the PLC program development system. The file name is “601093R3_G4_EIP.eds. Create a G4 Instrument in the PLC project and select the connections necessary in the properties window for the new module. See examples below.
4. Choose how many scales are used in the instrument? Select one of connection 1 to connection 4. Only one can be chosen. These connections contain both input and output data. See chapter 3 Connections for details.
5. Decide if any extra data is needed. Select one or more of connection 5 to connection 9. These connections contain only input data. See chapter 3 Connections for details.
6. Ready.

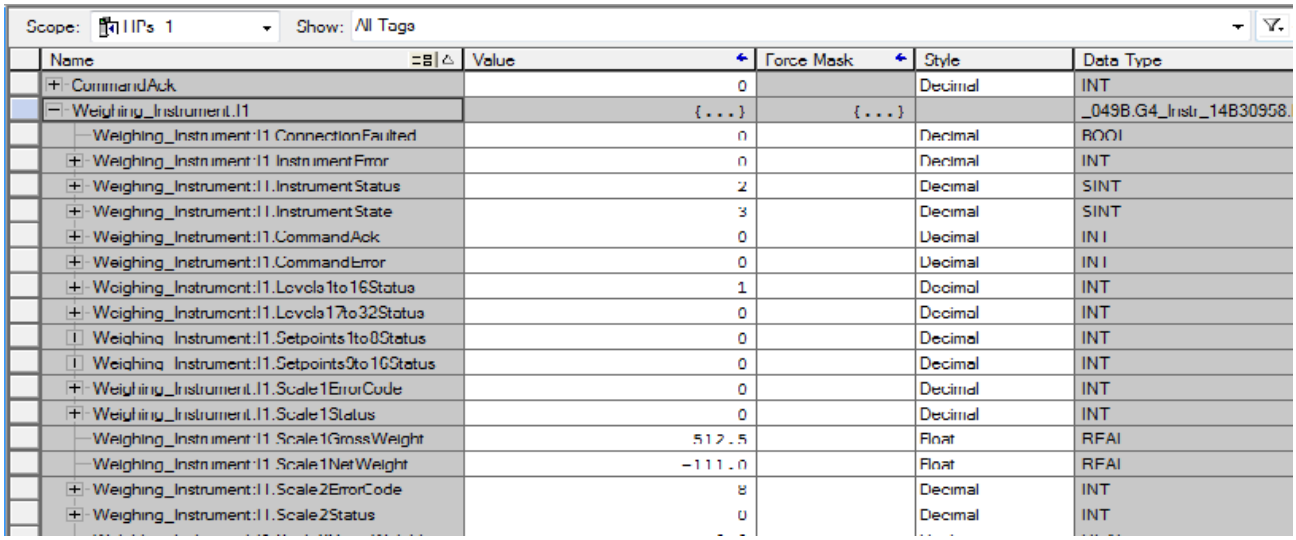


The New Module dialog window



The Module Definition dialog window

In the 2 figures above a 2 scale system is shown and besides scale information (connection 1) Preset Tare info is also read (connection 6). The IP-address of the G4 Instrument is 192.168.1.20. Below is the Controller Tags windows shown with tag names in plain text and the data in correct format.



The Controller Tags window

3 Connections

3.1 Overview

No.	Input Assembly	Size (bytes)	Output Assembly	Size (bytes)	Name	Default RPI
1	101	40	100	8	Scales 1 - 2.	100
2	102	64	100	8	Scales 1 - 4.	100
3	103	88	100	8	Scales 1 - 6.	100
4	104	112	100	8	Scales 1 - 8.	100
5	105	38	198	0	Analog out, dig I/O status, clock	1000
6	106	32	198	0	Preset Tare values, scales 1 – 8	1000
7	107	128	198	0	Level 1 – 32 values	1000
8	108	64	198	0	Setpoint 1 – 16 values	1000
9	109	64	198	0	Accumulated weights, scales 1 – 8	1000

Default RPI (Requested Package Interval) is given in ms and is possible to change between 10 ms and 20 s for connection 1 to 4 and between 100 ms and 20 s for connection 5 to 9. Avoid an unnecessary low RPI since it will slow down other functionality in the instrument.

3.2 Connection 1 – 4 Output data

The output data of connections 1 to 4 is the Assembly Instance 100 (Consuming instance). Output data is 8 bytes as described in table below. Least significant byte is always first.

Bytes	Contents	Size
0 – 1	Command	2 byte
2 – 3	Parameter ID	2 byte
4 – 7	Data to write (floating point)	4 bytes

Bytes 0 - 1: The command byte is used when writing data to the instrument and to issue various scale related commands such as taring, zeroing etc.

Note that a new command is detected when the content of the command register is changed. If the same command is used more than once another command e.g. 0 must be used in between.

The response to a given command is the ‘Command acknowledge’ and the ‘Command error’ bytes in the input data of the connection.

See the Technical Manual for detailed information on Scale functions, levels, setpoints etc.

Bytes 2 - 3: The number of the preset Tare (1 - 8) to set, the Level (1 - 32) to set, the Setpoint (1 - 16) to set or the Acc. Weight (1 - 8) to reset. The data in byte 2 and 3 are disregarded for any other commands than 220 – 223.

Bytes 4 to 7: The value of the Preset tare, Level or the Setpoint to set in floating point format. The data in bytes 4 to 7 are disregarded for any other commands than 220 – 222.

Examples

Tare Scale 3:

Command = 30, Parameter ID = no significance, Data = no significance

Set Preset Tare Scale 7 to 65.4:

Command = 220, Parameter ID = 7, Data = 65.4

Clear Acc. Weight Scale 1:

Command = 223, Parameter ID = 1, Data = no significance

Enter remote operation:

Command = 1, Parameter ID = no significance, Data = no significance

Important:

Data must be set when the command is transmitted. Do not set command during one scan cycle and data during next or similar that can give an unintended result.

3.3 Connection 1 – 4 Commands

Miscellaneous Commands:

Cmd	Description	
0	No action	
1	Start operation	When the instrument is in 'Wait for start state', this command can be used to start up the instrument.
2	Enter Remote operation	This command disables the keys on the instrument. This means that an external computer is controlling the instrument or the instrument is controlled using digital inputs.
3	Exit Remote operation	This command enables the keys and leaves the remote operation.
220	Set Preset Tare value	Parameter ID = Scale number (1 – 8). Data to write = Desired Preset Tare value.
221	Set Level value	Parameter ID = Level number (1 – 32). Data to write = Desired Level value.
222	Set Setpoint value	Parameter ID = Setpoint number (1 – 16). Data to write = Desired setpoint value.
223	Clear Accumulated Weight	Parameter ID = Scale number (1 – 8). No data to write
252	Clear the Program reset bit in the Instrument Status register.	Parameter ID = don't care No data to write

Scale related Commands

Auto tare	
Set to zero	Used to set the gross weight to zero.
Select gross mode	Show net weight on the display.
Select net mode	Show gross weight on the display.
Weight display	Show weight on the display.
Flow rate display	Show flow rate on the display.
Print command	Initiate a weight printout

Command numbers per scale

Command	**Scale 1**	**Scale 2**	**Scale 3**	**Scale 4**	**Scale 5**	**Scale 6**	**Scale 7**	**Scale 8**
Auto tare	10	20	30	40	50	60	70	80
Set to zero	11	21	31	41	51	61	71	81
Select gross mode	12	22	32	42	52	62	72	82
Select net mode	13	23	33	43	53	63	73	83
Weight display	14	24	34	44	54	64	74	84
Flow rate display	15	25	35	45	55	65	75	85
Print command	16	26	36	46	56	66	76	86

Setpoint related Commands

Setpoint no	**Activate**	**Deactivate**
1	100	101
2	102	103
3	104	105
4	106	107
5	108	109
6	110	111
7	112	113
8	114	115

Setpoint no	**Activate**	**Deactivate**
9	116	117
10	118	119
11	120	121
12	122	123
13	124	125
14	126	127
15	128	129
16	130	131
1 – 16	132	133

3.4 Connection 1 input data

The input data of connections 1 is the Assembly Instance 101 (Producing instance). Connection 1 input data consists of 40 bytes as described in table below. This instance contains the gross and net weights of Scales 1 and 2. Least significant byte is always first.

Bytes	Contents	Size	
0 – 1	Instrument error	2 bytes	
2	Instrument Status	1 byte	
3	Instrument State	1 byte	
4 – 5	Command acknowledge	2 bytes	
6 – 7	Command error	2 bytes	
8 – 9	Level 1 – 16, status	2 bytes	
10 – 11	Level 17 – 32, status	2 bytes	
12 – 13	Setpoint 1 – 8, status	2 bytes	
14 – 15	Setpoint 9 – 16, status	2 bytes	
16 – 17	Error code	2 bytes	Scale 1
18 – 19	Scale status	2 bytes	
20 – 23	Gross weight	4 bytes	
24 – 27	Net weight	4 bytes	
28 – 29	Error code,	2 bytes	Scale 2
30 – 31	Scale status	2 bytes	
32 – 35	Gross weight	4 bytes	
36 – 39	Net weight	4 bytes	

3.5 Connection 2 Input data

The input data of connections 2 is the Assembly Instance 102 (Producing instance). Connection 2 input data consists of 64 bytes as described in table below. This instance contains the gross and net weights of Scales 1 to 4. Least significant byte is always first.

Bytes	Contents	Size	
0 – 1	Instrument error	2 bytes	
2	Instrument Status	1 byte	
3	Instrument State	1 byte	
4 – 5	Command acknowledge	2 bytes	
6 – 7	Command error	2 bytes	
8 – 9	Level 1 – 16, status	2 bytes	
10 – 11	Level 17 – 32, status	2 bytes	
12 – 13	Setpoint 1 – 8, status	2 bytes	
14 – 15	Setpoint 9 – 16, status	2 bytes	
16 – 17	Error code	2 bytes	Scale 1
18 – 19	Scale status	2 bytes	
20 – 23	Gross weight	4 bytes	
24 – 27	Net weight	4 bytes	
28 – 29	Error code,	2 bytes	Scale 2
30 – 31	Scale status	2 bytes	
32 – 35	Gross weight	4 bytes	
36 – 39	Net weight	4 bytes	
40 – 41	Error code	2 bytes	Scale 3
42 – 43	Scale status	2 bytes	
44 – 47	Gross weight	4 bytes	
48 – 51	Net weight	4 bytes	
52 – 53	Error code,	2 bytes	Scale 4
54 – 55	Scale status	2 bytes	
56 – 59	Gross weight	4 bytes	
60 – 63	Net weight	4 bytes	

3.6 Connection 3 Input data

The input data of connections 3 is the Assembly Instance 103 (Producing instance). Connection 3 input data consists of 88 bytes as described in table below. This instance contains the gross and net weights of Scales 1 to 6. Least significant byte always first.

Bytes	Contents	Size	
0 – 1	Instrument error	2 bytes	
2	Instrument Status	1 byte	
3	Instrument State	1 byte	
4 – 5	Command acknowledge	2 bytes	
6 – 7	Command error	2 bytes	
8 – 9	Level 1 – 16, status	2 bytes	
10 – 11	Level 17 – 32, status	2 bytes	
12 – 13	Setpoint 1 – 8, status	2 bytes	
14 – 15	Setpoint 9 – 16, status	2 bytes	
16 – 17	Error code	2 bytes	Scale 1
18 – 19	Scale status	2 bytes	
20 – 23	Gross weight	4 bytes	
24 – 27	Net weight	4 bytes	
28 – 29	Error code,	2 bytes	Scale 2
30 – 31	Scale status	2 bytes	
32 – 35	Gross weight	4 bytes	
36 – 39	Net weight	4 bytes	
40 – 41	Error code	2 bytes	Scale 3
42 – 43	Scale status	2 bytes	
44 – 47	Gross weight	4 bytes	
48 – 51	Net weight	4 bytes	
52 – 53	Error code,	2 bytes	Scale 4
54 – 55	Scale status	2 bytes	
56 – 59	Gross weight	4 bytes	
60 – 63	Net weight	4 bytes	
64 – 65	Error code	2 bytes	Scale 5
66 – 67	Scale status	2 bytes	
68 – 71	Gross weight	4 bytes	
72 – 75	Net weight	4 bytes	
76 – 77	Error code,	2 bytes	Scale 6
78 – 79	Scale status	2 bytes	
80 – 83	Gross weight	4 bytes	
84 – 87	Net weight	4 bytes	

3.7 Connection 4 Input data

The input data of connections 4 is the Assembly Instance 104 (Producing instance). Connection 4 input data consists of 112 bytes as described in table below. This instance contains the gross and net weights of Scales 1 to 8.

Bytes	Contents	Size	
0 – 1	Instrument error	2 bytes	
2	Instrument Status	1 byte	
3	Instrument State	1 byte	
4 – 5	Command acknowledge	2 bytes	
6 – 7	Command error	2 bytes	
8 – 9	Level 1 – 16, status	2 bytes	
10 – 11	Level 17 – 32, status	2 bytes	
12 – 13	Setpoint 1 – 8, status	2 bytes	
14 – 15	Setpoint 9 – 16, status	2 bytes	
16 – 17	Error code	2 bytes	Scale 1
18 – 19	Scale status	2 bytes	
20 – 23	Gross weight	4 bytes	
24 – 27	Net weight	4 bytes	
28 – 29	Error code,	2 bytes	Scale 2
30 – 31	Scale status	2 bytes	
32 – 35	Gross weight	4 bytes	
36 – 39	Net weight	4 bytes	
40 – 41	Error code	2 bytes	Scale 3
42 – 43	Scale status	2 bytes	
44 – 47	Gross weight	4 bytes	
48 – 51	Net weight	4 bytes	
52 – 53	Error code,	2 bytes	Scale 4
54 – 55	Scale status	2 bytes	
56 – 59	Gross weight	4 bytes	
60 – 63	Net weight	4 bytes	

Bytes	Contents	Size	
64 – 65	Error code	2 bytes	Scale 5
66 – 67	Scale status	2 bytes	
68 – 71	Gross weight	4 bytes	
72 – 75	Net weight	4 bytes	
76 – 77	Error code,	2 bytes	Scale 6
78 – 79	Scale status	2 bytes	
80 – 83	Gross weight	4 bytes	
84 – 87	Net weight	4 bytes	
88 – 89	Error code	2 bytes	Scale 7
90 – 91	Scale status	2 bytes	
92 – 95	Gross weight	4 bytes	
96 – 99	Net weight	4 bytes	
100 – 101	Error code,	2 bytes	Scale 8
102 – 103	Scale status	2 bytes	
104 – 107	Gross weight	4 bytes	
108 – 111	Net weight	4 bytes	

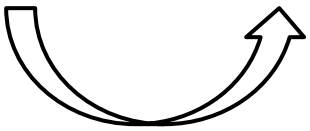


Table continues in right column

3.8 Connection 1 - 4 Instrument info

Least significant byte is always first.

Bytes 0 and 1:

Contains the actual instrument error information (the value 0 means no error). Please refer to the Technical Manual for details on error codes.

Byte 2:

Instrument Status

Bit	Function	Description
0	Remote operation	'1' = On / '0' = Off
1	Program reset	The bit is set each time the program starts, and it indicates that volatile data is lost. To reset this bit with fieldbus interface the reset command must be used. Care must be taken if more than one interface is used to communicate with the instrument and the Program reset bit is to be used.
2-7	Not used	

Byte 3:

Instrument State

Code	State	Description
00	Starting up	The instrument is starting up after a reset or power on.
01	Wait for start	The instrument is waiting for a start command to go in process.
02	Warming up	The parameter 'Warm up time' is set to a value other than zero, and the instrument is waiting for the warming up time to pass.
03	Normal	There are no parameter errors in the system. **Note:** Weight errors still indicate normal state.
04	Error	An error has been detected during start-up of the instrument.
05	Fatal error	An error has been detected during start-up of the instrument. It's not possible to enter any other state from here.
06	Power fail	A power fail has been detected and the instrument will respond to communication for a short moment until the power supply reserves are empty (this is normally just a few ms). Weight values should be regarded as invalid.

3.9 Connection 1 - 4 Command response

Least significant byte is always first.

Byte 4 and 5:

The ‘Command acknowledge’. It will be equal to the command number if the command was successfully executed. If the command failed the value 240 (hex F0) is returned.

Byte 6 and 7:

These bytes return the ‘Command error’ code. The error code is explained in chapter ‘Troubleshooting – Error codes’ in the Technical manual. This byte will be zero if a command is correctly executed.

3.10 Connection 1 - 4 Level status

A set bit indicates that the weight is above the corresponding level.

Bytes 8 and 9:

These bytes show the status of levels 1 – 16.

Bit 0 to bit 7 in byte 8 is status of level 1 to level 8.

Bit 0 to bit 7 in byte 9 is status of level 9 to level 16.

Bytes 10 to 11:

These bytes show the status of levels 17 – 32.

Bit 0 to bit 7 in byte 10 is status of level 17 to level 24.

Bit 0 to bit 7 in byte 11 is status of level 25 to 32.

3.11 Connection 1 - 4 Setpoint status

Bytes 12 and 13:

These bytes show the status of setpoint 1 – 8. Bits set to 1 in these bytes have the following meaning:

Bit no	Function
0	Setpoint 1 activated
1	Setpoint 1 cycle done
2	Setpoint 2 activated
3	Setpoint 2 cycle done
4	Setpoint 3 activated
5	Setpoint 3 cycle done
6	Setpoint 4 activated
7	Setpoint 4 cycle done

Bit no	Function
8	Setpoint 5 activated
9	Setpoint 5 cycle done
10	Setpoint 6 activated
11	Setpoint 6 cycle done
12	Setpoint 7 activated
13	Setpoint 7 cycle done
14	Setpoint 8 activated
15	Setpoint 8 cycle done

Bytes 14 to 15:

These bytes show the status of setpoint 9 – 16. Bits set to 1 in these bytes have the following meaning:

Bit no	Function
0	Setpoint 9 activated
1	Setpoint 9 cycle done
2	Setpoint 10 activated
3	Setpoint 10 cycle done
4	Setpoint 11 activated
5	Setpoint 11 cycle done
6	Setpoint 12 activated
7	Setpoint 12 cycle done

Bit no	Function
8	Setpoint 13 activated
9	Setpoint 13 cycle done
10	Setpoint 14 activated
11	Setpoint 14 cycle done
12	Setpoint 15 activated
13	Setpoint 15 cycle done
14	Setpoint 16 activated
15	Setpoint 16 cycle done

3.12 Connection 1 - 4 Scale data

Error code

The bytes Error Code for scale ‘N’ holds the error code for the scale. Normally this register should contain ‘0’ which means no error. Error codes 0 to 255 are valid in this register. Please refer to the Technical Manual for details on error codes.
The error code consists of 2 bytes of data. Scale 1 is bytes 16 and 17, scale 2 is bytes 28 and 29 etc. Least significant byte is always first.

Scale status

Status for scale ‘N’ (1 – 8). Bits set to 1 in this register have the following meaning:

The status consists of 2 bytes of data. Scale 1 is bytes 18 and 19, scale 2 is bytes 30 and 31 etc. Least significant byte is always first.

Bit no	Function	Comment
0	Not used	
1	Not used	
2	Not used	
3	Good zero (disp. weight)	
4	Good zero Gross	
5	Good zero Net	
6	Net Mode	'1' = Net mode ‘0' = Gross mode
7	Motion	Unstable weight
8	Not used	
9	Not used	
10	Not used	
11	Flow rate display	Flow rate is shown in the display.
12	Net weight > 6 digits	The net weight value is out of precision and should normally not be used.
13	Gross weight > 6 digits	The gross weight value is out of precision and should normally not be used.
14	Not used	
15	Not used	

Gross and net weight

The gross and net weight are only valid when the ‘Scale X:Error Code’ equals 0. Any other error code indicates that the weight is invalid.
The weight consists of 4 bytes of data in floating point format. Scale 1 gross weight is bytes 20 to 23, scale 2 gross weight is bytes 32 to 35 etc. Least significant byte is always first.

3.13 Connection 5 Input data

The input data of connections 5 is the Assembly Instance 105 (Producing instance). Connection 5 input data consists of 38 bytes as described in table below. This instance contains the output value of analog outputs 1 to 4, digital input status, digital output status and real time clock data. Least significant byte is always first.

Bytes	Contents	Size
0 – 3	Analog output 1	4 bytes
4 – 7	Analog output 2	4 bytes
8 – 11	Analog output 3	4 bytes
12 – 15	Analog output 4	4 bytes
16	Status of Inputs Slot 1	1 byte
17	Status of Inputs Slot 2	1 byte
18	Status of Inputs Slot 3	1 byte
19	Status of Inputs Slot 4	1 byte
20	Status of Inputs Slot 5	1 byte
21	Status of Inputs Slot 6	1 byte
22	Status of Outputs Slot 1	1 byte
23	Status of Outputs Slot 2	1 byte
24	Status of Outputs Slot 3	1 byte
25	Status of Outputs Slot 4	1 byte
26	Status of Outputs Slot 5	1 byte
27	Status of Outputs Slot 6	1 byte
28 – 29	Clock, Year	2 bytes
30 – 31	Clock, Month	2 bytes
32 – 33	Clock, Day	2 bytes
34 – 35	Clock, Hour	2 bytes
36 – 37	Clock, Minute	2 bytes

The Analog output is represented of a floating point value rounded to 3 decimals. It can be either a current value or a voltage value depending on how the module is configured.
A set bit in an Input or Output status Byte indicates that the corresponding input or output is activated. The number of inputs or outputs for a specific slot depends on the type of I/O module in that slot. Bit 0 correspond to input/output 1, bit 1 to input/output 2 etc.

Clock information consists of 2 bytes integer format per group (year, month etc.). The least significant byte is first.

3.14 Connection 6 Input data

The input data of connections 6 is the Assembly Instance 106 (Producing instance). Connection 6 input data consists of 32 bytes as described in table below. This instance contains the Preset Tare values of scales 1 to 8. The data is in floating point format. Least significant byte is always first.

Bytes	Contents	Size
0 – 3	Preset Tare Scale 1	4 bytes
4 – 7	Preset Tare Scale 2	4 bytes
8 – 11	Preset Tare Scale 3	4 bytes
12 – 15	Preset Tare Scale 4	4 bytes
16 – 19	Preset Tare Scale 5	4 bytes
20 – 23	Preset Tare Scale 6	4 bytes
24 – 27	Preset Tare Scale 7	4 bytes
28 – 31	Preset Tare Scale 8	4 bytes

3.15 Connection 7 Input data

The input data of connections 7 is the Assembly Instance 107 (Producing instance). Connection 7 input data consists of 128 bytes as described in table below. This instance contains values of Level 1 to 32. The data is in floating point format. Least significant byte is always first.

Bytes	Contents	Size
0 – 3	Level 1	4 bytes
4 – 7	Level 2	4 bytes
8 – 11	Level 3	4 bytes
12 – 15	Level 4	4 bytes
16 – 19	Level 5	4 bytes
20 – 23	Level 6	4 bytes
24 – 27	Level 7	4 bytes
28 – 31	Level 8	4 bytes
32 – 35	Level 9	4 bytes
36 – 39	Level 10	4 bytes
40 – 43	Level 11	4 bytes
44 – 47	Level 12	4 bytes
48 – 51	Level 13	4 bytes
52 – 55	Level 14	4 bytes
56 – 59	Level 15	4 bytes
60 – 63	Level 16	4 bytes

Bytes	Contents	Size
64 – 67	Level 17	4 bytes
68 – 71	Level 18	4 bytes
72 – 75	Level 19	4 bytes
76 – 79	Level 20	4 bytes
80 – 83	Level 21	4 bytes
84 – 87	Level 22	4 bytes
88 – 91	Level 23	4 bytes
92 – 95	Level 24	4 bytes
96 – 99	Level 25	4 bytes
100 – 103	Level 26	4 bytes
104 – 107	Level 27	4 bytes
108 – 111	Level 28	4 bytes
112 – 115	Level 29	4 bytes
116 – 119	Level 30	4 bytes
120 – 123	Level 31	4 bytes
124 – 127	Level 32	4 bytes

3.16 Connection 8 Input data

The input data of connections 8 is the Assembly Instance 108 (Producing instance). Connection 8 input data consists of 64 bytes as described in table below. This instance contains the Setpoint 1 to 16 values. The data is in floating point format. Least significant byte is always first.

Bytes	Contents	Size
0 – 3	Setpoint 1	4 bytes
4 – 7	Setpoint 2	4 bytes
8 – 11	Setpoint 3	4 bytes
12 – 15	Setpoint 4	4 bytes
16 – 19	Setpoint 5	4 bytes
20 – 23	Setpoint 6	4 bytes
24 – 27	Setpoint 7	4 bytes
28 – 31	Setpoint 8	4 bytes
32 – 35	Setpoint 9	4 bytes
36 – 39	Setpoint 10	4 bytes
40 – 43	Setpoint 11	4 bytes
44 – 47	Setpoint 12	4 bytes
48 – 51	Setpoint 13	4 bytes
52 – 55	Setpoint 14	4 bytes
56 – 59	Setpoint 15	4 bytes
60 – 63	Setpoint 16	4 bytes

3.17 Connection 9 Input data

The input data of connections 9 is the Assembly Instance 109 (Producing instance). Connection 9 input data consists of 64 bytes as described in table below. This instance contains the Accumulated Weights of Scales 1 to 8 values. Note that the accumulated weight is composed of 2 floating point values for each scale. Least significant byte is always first.

Bytes	Contents	Size
0 – 3	Accumulated Weight Scale 1 (low part)	4 bytes
4 – 7	Accumulated Weight Scale 1 (high part)	4 bytes
8 – 11	Accumulated Weight Scale 2 (low part)	4 bytes
12 – 15	Accumulated Weight Scale 2 (high part)	4 bytes
16 – 19	Accumulated Weight Scale 3 (low part)	4 bytes
20 – 23	Accumulated Weight Scale 3 (high part)	4 bytes
24 – 27	Accumulated Weight Scale 4 (low part)	4 bytes
28 – 31	Accumulated Weight Scale 4 (high part)	4 bytes
32 – 35	Accumulated Weight Scale 5 (low part)	4 bytes
36 – 39	Accumulated Weight Scale 5 (high part)	4 bytes
40 – 43	Accumulated Weight Scale 6 (low part)	4 bytes
44 – 47	Accumulated Weight Scale 6 (high part)	4 bytes
48 – 51	Accumulated Weight Scale 7 (low part)	4 bytes
52 – 55	Accumulated Weight Scale 7 (high part)	4 bytes
56 – 59	Accumulated Weight Scale 8 (low part)	4 bytes
60 – 63	Accumulated Weight Scale 8 (high part)	4 bytes

Accumulated weights are updated when a print command is issued. The accumulated values can also be read in the ‘Accumulated Weights’ menu in the ‘Main menu’. In this menu it is also possible to zero or set the values.

An accumulated weight is represented by two values (HIGH, LOW). To get the resulting value multiply value HIGH by 10000 and add value LOW. LOW is a value between ±9999.999 with 3 decimals. HIGH is a value without decimals between ±999999.

Use command 223 (0xDF) together with the scale number to zero an accumulated weight.

4 Diagnostics

4.1 General

This chapter describes the EtherNet/IP related diagnostics functions when handled from the local display or via Remote Access.

These screens give the possibility to study the contents in used instances (data to or from the scanner). The function is very useful for advanced trouble shooting in case of problems with the communication.

The contents of the selected instance are displayed in hexadecimal form with up to six lines on the display. On each line eight byte values are displayed, preceded by the address of the first byte.

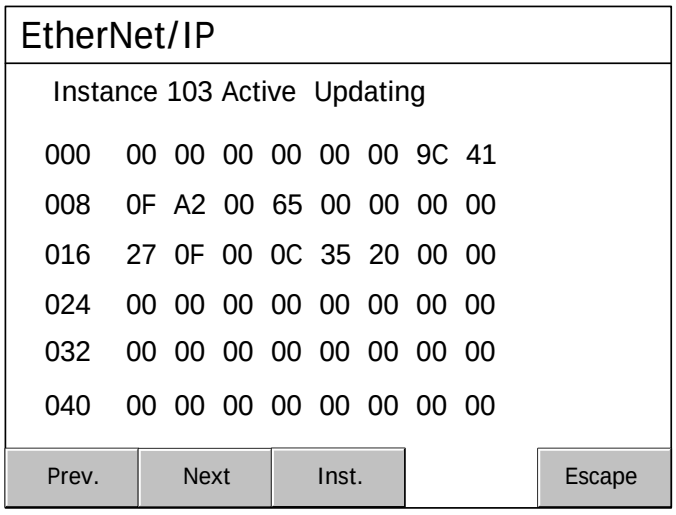
See Connection 1 to 9 for details on data mapping.

4.2 PM display

Keys F1 (Prev.) and F2 (Next) are used to scroll data if there is not enough room for all data on one screen.

Use key F3 (Inst.) to display next instance (100 – 101 – 102 – 103 – …… – 100 etc).

If a scanner is connected to this instance Active is shown otherwise Inactive is shown. No data is shown if instance is inactive.



PM local display

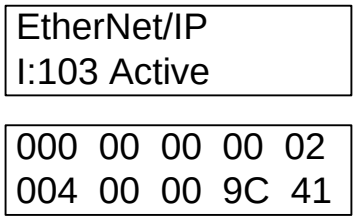
4.3 RM display

The content in the selected instance are displayed in hexadecimal form with two lines on the display. On each line four byte values are displayed, preceded by the address of the first byte.

The first screen show selected instance. If a scanner is connected to the shown instance Active is show else is Inactive shown. No data is shown if the instance is inactive.

The '+' and '–' keys are used to step the displayed addresses forwards / backwards.

Use key '↵' to' to display next instance (100 – 101 – 102 – 103 – 100 etc).

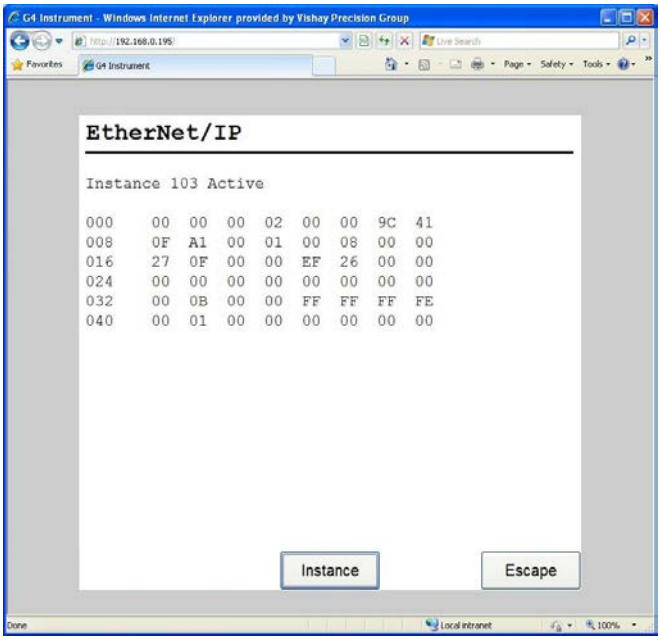


RM local display

4.4 Remote

Use key F3 (Inst.) to display next instance (100 – 101 – 102 – 103 – …… – 100 etc).

If a scanner is connected to this instance Active is shown otherwise Inactive is shown. No data is shown if instance is inactive.



Remote display

4.5 Data format

This section describes data format of the EtherNet/IP interface with a few examples. Data is transmitted with the least significant byte first. When studying the diagnostics screen data is therefore shown least significant byte first. This is important when converting between floating point and integer data to hex representation.

Example Tare Scale 3 command:

Command = 30, Parameter ID = no significance, Data = no significance

Byte no	Format	Diagn. Screen (hex)	Actual value	Description
0 – 1	16 bit integer	1E 00	30	Command
2 – 3	16 bit integer	–	–	Parameter ID
4 – 7	32 bit float	–	–	Float value

Complete message on diagnostics screen: 1E 00 XX XX XX XX XX XX

XX means no significance.

Example Set Preset Tare Scale 7 to 65.4 command:

Command = 220, Parameter ID = 7, Data = 65.4

Byte no	Format	Diagn. Screen (hex)	Actual value	Description
0 – 1	16 bit integer	1E 00	220	Command
2 – 3	16 bit integer	07 00	7	Parameter ID
4 – 7	32 bit float	CD CC 82 42	65.4	Float value

Complete message on diagnostics screen: 1E 00 07 00 CD CC 82 42

Example Clear Acc. Weight Scale 1 command:

Command = 223, Parameter ID = 1, Data = no significance

Byte no	Format	Diagn. Screen (hex)	Actual value	Description
0 – 1	16 bit integer	DF 00	223	Command
2 – 3	16 bit integer	01 00	1	Parameter ID
4 – 7	32 bit float	–	–	Float value

Complete message on diagnostics screen: 1E 00 DF 00 01 00 XX XX

XX means no significance.

Example Enter remote operation command:

Command = 1, Parameter ID = no significance, Data = no significance

Byte no	Format	Diagn. Screen (hex)	Actual value	Description
0 – 1	16 bit integer	01 00	1	Command
2 – 3	16 bit integer	–	–	Parameter ID
4 – 7	32 bit float	–	–	Float value

Complete message on diagnostics screen: 01 00 XX XX XX XX XX XX

XX means no significance.

In a PLC data can be shown in different ways. Either it’s shown as actual values in correct floating point format, integer format etc. Data can also be shown in hexadecimal format either as the bytes are transmitted or as they are interpreted i.e. least significant byte to the right.

Example.

Float value	65.4
Hex format in G4 diagnostics screen: (this is the order that the bytes are transmitted in).	CD CC 82 42
PLC showing the data in hex format: (16# means hexadecimal representation)	16#4282CCCD

The provided EDS file also includes AOP (Add On Profile) information that will simplify the use regarding parameter names and format.

5 Details of EtherNet/IP

The optional EtherNet/IP interface of the G4 Instrument enables Ethernet communication using the EtherNet/IP protocol. It is intended for accessing weight data, scale status, input and output status, level status, set-point status and analog output data. Commands for e.g. taring, zeroing etc. can be issued over the EtherNet/IP interface.

The interface is not intended for set-up of the instrument. Use the instrument front panel user interface or the web interface for set-up.

The G4 Instrument EtherNet/IP interface have been tested and approved for conformance by the ODVA.

Information about EtherNet/IP and the ODVA can be obtained from the ODVA web site: www.odva.org

The G4 Instrument is classified as a CIP Adapter Class device of Generic Device Type.

The EtherNet/IP interface of the instrument supports three types of transports:

1. Unconnected messaging
2. Class 3 connected messaging
3. Class 1 connected real-time data transfer (I/O connection)

Class 1 I/O connections can be set to a RPI (Requested Packet Interval) of 10 ms. It's strongly recommended to not set the RPI lower than needed or lower than the actual instrument update rate setting. Choosing lower than necessary RPI will only affect (degrade) the performance of the instrument specifically the user interface responsiveness and communication response delays.

The EDS file (Electronic Data Sheet) article number for the EtherNet/IP interface of the G4 Instrument is 601093. Revision 3 or later applies to program version 1.12.0.0.

5.1 CIP Object definitions

The following CIP objects are defined in the instrument.

1. Identity Object.
2. Message Router.
3. Assembly Object.
4. Connection Manager Object.
5. TCP/IP Interface Object.
6. Ethernet Link Object.

5.2 Identity Object

The Identity Object class code is 0x01.

Supported Class Attributes:

No.	Attribute name	Value
1	Revision	1
2	Max Instance	1
3	Number of Instances	1
4	Optional Attribute list	0, Not supported
5	Optional Service list	0, Not supported
6	Max Class Attribute No	0, Not supported
7	Max Instance Attribute No	7

Supported Instance Attributes:

No.	Attribute name	Value
1	Vendor ID	1179
2	Device Type	Generic Device Type
3	Product Code	1
4	Revision	2.1
5	Status	
6	Serial Number	CPU module serial number
7	Product name	“G4 Modular Instrument”

Supported Services:

Code	Name	Class	Instance
0x01	Get_Attribute_All	Yes	Yes
0x0E	Get_Attribute_Single	Yes	Yes
0x05	Reset	Yes	Yes

The Reset Service support type 0 reset only. This is a power cycle type of reset.

5.3 Message Router Object

The Message Router Object class code is 0x02.

Supported Class Attributes:

No.	Attribute name	Value
1	Revision	1
2	Max Instance	1
3	Number of Instances	1
4	Optional Attribute list	2, 1, 2. 2 Optional attributes, no 1 and 2
5	Optional Service list	1, 0x0A
6	Max Class Attribute No	7
7	Max Instance Attribute No	2

Supported Instance Attributes:

No.	Attribute name	Value
1	Object list	6, 0x01, 0x02, 0x04, 0x06, 0xF5, 0xF6
2	Max number of connections	16

Supported Services:

Code	Name	Class	Instance
0x01	Get_Attribute_All	Yes	Yes
0x0A	Multiple_Service_Packet	No	Yes
0x0E	Get_Attribute_Single	Yes	Yes

5.4 Assembly Object

The Assembly Object class code is 0x04.

The Assembly object is used to receive and transmit data to and from the G4 instrument. This data is measurements, status, input and output status etc. Any communication regarding this type of instrument data is done through the Assembly object.

Note that the Assembly Object is defined as a static assembly meaning that it cannot be configured.

For convenience the instrument ignores any reference to any configuration instance. It will not generate an error response to a connection attempt that includes a configuration instance.

Supported Class Attributes:

No.	Attribute name	Remark
1	Revision	2
2	Max Instance	109
3	Number of Instances	10
6	Max Class Attribute No	7
7	Max Instance Attribute No	4

Supported Instance Attributes:

No.	Attribute name	Remark
3	Data	
4	Size of Instance	See table below

Supported Services:

Code	Name	Class	Instance
0x0E	Get_Attribute_Single	Yes	Yes
0x10	Set_Attribute_Single	No	Yes (Instance 100 data only)

Assembly Object Instances

No.:	Direction of data	Size (bytes)	Description
100	Consumer	8	G4 control (data to the G4)
101	Producer	40	Scale 1 and scale 2.
102	Producer	64	Scale 1 to scale 4.
103	Producer	88	Scale 1 to scale 6.
104	Producer	112	Scale 1 to scale 8.
105	Producer	38	Analog out, dig I/O status, clock
106	Producer	32	Scale 1 – 8 Preset Tare values
107	Producer	128	Level 1 – 32 values
108	Producer	64	Setpoint 1 – 16 values
109	Producer	64	Scale 1 – 8 Accumulated weights

5.5 Connection Manager

The Connection Manager class code is 0x06.

The minimum RPI (Requested Packed Interval) for all Class-1 connections is 10 ms.

The 32 Run/Idle-Header for Originator to Target Connection (Scanner to device) is required. The system supports Unicast and Multicast.

Supported Class Attributes:

No.	Attribute name	Value
1	Revision	1
2	Max Instance	1
3	Number of Instances	1
4	No. of instance attributes + list of attributes	8, 1, 2, 3, 4, 5, 6, 7, 8 (8 attributes, attributes 1 – 8 supported)
5	Optional Service List	0, Not supported
6	Max Class Attribute No	7
7	Max Instance Attribute No	8

Supported Instance Attributes:

No.	Attribute name	Value
1	Open requests	Actual counts
2	Open format rejects	Actual counts
3	Open resource rejects	Actual counts
4	Open other rejects	Actual counts
5	Close request	Actual counts
6	Close format rejects	Actual counts
7	Close other rejects	Actual counts
8	Connection timeouts	Actual counts

Supported Services:

Code	Name	Class	Instance
0x01	Get_Attribute_All	Yes	Yes
0x02	Set_Attribute_All	No	Yes
0x0E	Get_Attribute_Single	Yes	Yes
0x10	Set_Attribute_Single	No	Yes
0x4E	Forward_Close	No	Yes
0x54	Forward_Open	No	Yes
0x5A	Get_Connection_Owner	No	Yes

5.6 TCP/IP Interface Object

The TCP/IP Interface Object class code is 0xF5.

Supported Class Attributes:

No.	Attribute name	Value
1	Revision	3
2	Max Instance	1
3	Number of Instances	1
4	No. of instance optional attributes + list	2, 8, 9 (2 attributes, attributes 8 and 9 supported)
5	Optional Service List	0, Not supported
6	Max Class Attribute No	7
7	Max Instance Attribute No	9

Supported Instance Attributes:

No.	Attribute name	Remarks
1	Status	1
2	Configuration Capability	No configuration capability over EtherNet/IP
3	Configuration Control	No configuration control support
4	Physical Link Object	Ethernet Link Object
5	Interface Configuration	See EIP spec.
6	Host name	“VishayG4”
7	Safety network Number	0, Not supported
8	TTL Value	See EIP spec.
9	Mcast Config	See EIP spec.

Supported Services:

Code	Name	Class	Instance
0x0E	Get_Attribute_Single	Yes	Yes
0x01	Get_Attribute_All	Yes	Yes

5.7 Ethernet Link Object.

The Ethernet Link Object class code is 0xF6.

Supported Class Attributes:

No.	Attribute name	Value
1	Revision	3
2	Max Instance	1
3	Number of Instances	1
4	No. of instance optional attributes + list	4, 7, 8, 9, 10 (4 attributes, attributes 7 to 10 supported)
5	Optional Service List	0, Not supported
6	Max Class Attribute No	7
7	Max Instance Attribute No	10

Supported Instance Attributes:

No.	Attribute name	Remarks
1	Interface Speed	Value 0 (Speed indeterminate)
2	Interface Flags	See EIP spec.
3	Physical Address	MAC Address
4	Interface Counters	0, Not supported
5	Media Counters	0, Not supported
6	Interface Control	0, Not supported
7	Interface Type	2, Twisted pair
8	Interface State	See EIP spec.
9	Admin State	-
10	Interface Label	IP address string

Supported Services:

Code	Name	Class	Instance
0x01	Get_Attribute_All	Yes	Yes
0x0E	Get_Attribute_Single	Yes	Yes

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