MultiGard 5000® System Integration

BACNet Gateway Option

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Manufactured by
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MSA Permanent Instrument Warranty

1. Warranty – Seller warrants that this product will be free from mechanical defect or faulty workmanship for a period of eighteen (18) months from date of shipment or one (1) year from installation, whichever occurs first, provided it is maintained and used in accordance with Seller's instructions and / or recommendations. This warranty does not apply to expendable or consumable parts whose normal life expectancy is less than one (1) year such as, but not limited to, non-rechargeable batteries, filament units, filter, lamps, fuses etc. The Seller shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee or representative of the Seller has any authority to bind the Seller to any affirmation, representation or warranty concerning the product. Seller makes no warranty concerning components or accessories not manufactured by the Seller, but will pass on to the Purchaser all warranties of manufacturers of such components. **THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.**

2. Exclusive Remedy – It is expressly agreed that Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of Seller, or for any other cause of action, shall be the repair and / or replacement at Seller's option, of any equipment or parts thereof, which after examination by Seller is proven to be defective. Replacement equipment and /or parts will be provided at no cost to Purchaser, F.O.B. Seller's Plant. Failure of Seller to successfully repair any nonconforming product shall not cause the remedy established hereby to fail of its essential purpose.

3. Exclusion of Consequential Damage – Purchaser specifically understands and agrees that under no circumstances will Seller be liable to Purchaser for economic, special, incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of nonoperation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct or any other cause of action against seller.

1.0   Introduction

This MultiGard 5000 System Integration Manual for the BACNet Gateway Option provides the information necessary for a customer or a third party integrator to successfully connect the system onto a larger industrial network using BACNet protocol. This interface is provided by an Industrial Control Communications, Inc. (ICC) ETH-1000 Ethernet Gateway added into the MultiGard 5000 system along with an Ethernet switch.

This document is intended to cover all six models of the MultiGard 5000 System that are factory configured at MSA from two platforms. The models are 8 point, 16 point, dual 8 point, 24 point, 32 point, and dual 16 point. Keep the purchased model and its size in mind while using this document.

The MultiGard 5000 system shall have the Compact Logix L24 processor installed as a standard offering. The L24 processor is capable of using this BACNet gateway option.

The MultiGard 5000 System is intended to be a complete stand-alone gas detection system and was designed to be the *only point of control* for its many features and user changeable parameters. For safety reasons MSA cannot allow the customer and third parties to have unrestricted access to the MultiGard System programming.

2.0   References

The user of this document should be familiar with BACNet instances and compatible networks. The following references may be used with this manual:

- [MSA]   Field Wiring Diagram, Multigard System (Drawing)
        [Delivered with a MultiGard System; part of the 3-ring binder.]
- [MSA]   MultiGard System Instruction Manual - ASK 3103-35
        [Delivered with a MultiGard System; part of the 3-ring binder.]
- [MSA]   MultiGard System Factory Configuration Sheets
        [Delivered with a MultiGard System; part of the 3-ring binder.]

References not supplied by MSA:

- BACNet protocol documentation and network reference materials
- Instruction Manuals – Appropriate to any third party equipment (hardware and software)

3.0   BACNet Communication Interface

The ICC ETH-1000 Ethernet gateway is configured for the appropriate Multigard 5000 system model at MSA during system assembly and test. This includes both the hardware and gateway configuration.

The gateway updates itself continuously with data from the Compact Logix L24 processor using Ethernet/IP protocol via the Ethernet switch.

Data then becomes available in BACNet protocol from the ICC ETH-1000 Ethernet gateway via the Ethernet switch. The gateway is a multiprotocol device using its single Ethernet port operating per the 10/100Base-T standard.

3.1   Interface Cables

The Multigard system L24 processor and the ICC ETH-1000 gateway are connected to an unmanaged Ethernet switch using patch cables of CAT-5e or better grade. See the Multigard 5000 system drawings for details on the hardware installation.

Also use a CAT-5e or better grade patch cable to connect to the Ethernet switch to the external network providing a BACNet connection from the Multigard system to other customer equipment.

3.2   Ethernet Addresses

The Ethernet addresses associated with the MultiGard 5000 System and the ICC ETH-1000 gateway must be set at MSA during factory configuration.

The addresses that will be set into the processor and gateway are from customer (or responsible third party) supplied information as follows:

- IP Address for the ICC ETH-1000 Gateway
- IP Address for the Multigard system Allen-Bradley L24 processor
- Subnet Mask common to this Ethernet network
- Default Gateway common to this Ethernet network
  NOTE: To satisfy the ETH-1000 the Default Gateway address must begin with 1-223 and it cannot consist of all zeros. If there is no desire to communicate over a default gateway, then the address provided should not physically exist on the network.

The addresses will be placed onto labels located inside the MultiGard 5000 System enclosure for easy reference as well as in the system configuration document (part of the 3-ring binder).

4.0   Guidelines For Accessing BACNet Instances

Remember the following key items about the MultiGard 5000 System when using these tables to decide what is applicable:

- All BACNet data is read-only except for the acknowledge items listed in Table 6
- Model: 8 point, 16 point, dual 8 point, 24 point, 32 point, or dual 16 point
- Single or Dual: Single sequencer MultiGard 5000 Systems can have 4 sensors (#1 - #4) installed. Dual sequencer MultiGard 5000 Systems can have 2 sensors (#1, #2) on Sequencer A and 2 sensors (#3, #4) on Sequencer B. *Note that in the following tables reference to Single Sequencer is identical to Dual Sequencer A. In the tables this is represented as "Sequencer (A)".*
- Options: The User Configured Outputs (UCO) can be supplied as UCO #1 only or both UCO #1 & UCO #2 together.
- Additional information necessary to properly decode the data is supplied under each table if applicable.
- All analog data will automatically be in engineering units based on the MultiGard 5000 System factory configuration. No additional scaling is required.
- It may be desirable to read blocks instances out of the gateway instead of only the specific instances listed in the tables. This depends on the interfacing requirements and the software capabilities of the third party product. If this is done, be sure to only use the instances listed in this document for presentation purposes.

⚠ **CAUTION**
Use only data table instances defined in this manual. The use of undefined instances will produce an incorrect presentation. Instances not defined are reserved for MSA use only.

- Customers who use bi-directional communications with the controller must avoid writing into instances not referenced in this document.

⚠ **WARNING**
Do not write into undefined instances. Doing so may prevent the system from detecting gas. Data table instances not defined are reserved for MSA use only. **Failure to follow this warning can result in serious personal injury or death.**

- The end user must verify all data transfers following the system integration effort.

- See Table 1 below, and its associated warning, for important information about setting up an end user watchdog function to monitor the communications integrity

between the Multigard 5000 System and the ETH-1000 gateway.

Table 1: Multigard 5000 System to ETH-1000 Communication Status

Gateway	Instance	Comments
Communications Status:	40555	Changing Value** – Normal Stopped Value** – Failed

** This value changes from 0 to 59 and is the seconds from the processor clock buffered through the Multigard program. The absolute value of the instance has no direct significance to its use as a watchdog function.

In the end user's system, monitor this instance for continuous activity. If it stops changing for a predetermined amount of time, declare a communications failure and flag all other data coming through this gateway as outdated.

Only when the above instance is continuously changing can the other data presented via the gateway be considered current.

⚠ **CAUTION**
To ensure communications integrity between the Multigard 5000 System and the ICC ETH-1000 gateway the instance must be monitored and logically implemented as a watchdog function by the end user. Failure to implement the watchdog function can result in the presentation of outdated data.

5.0   Multigard System Instances

The most useful MultiGard 5000 System data will be defined in Tables 2 through 8 along with corresponding BACNet instances. These instances will allow for the presentation of gas detection information and other status.

Table 2: Sensor Gas Levels

These instances are discoverable

Point #	Sensor 1	Sensor 2	Sensor 3	Sensor 4
1	101	201	301	401
2	102	202	302	402
3	103	203	303	403
4	104	204	304	404
5	105	205	305	405
6	106	206	306	406
7	107	207	307	407
8	108	208	308	408
9	109	209	309	409
10	110	210	310	410
11	111	211	311	411
12	112	212	312	412
13	113	213	313	413
14	114	214	314	414
15	115	215	315	415
16	116	216	316	416
17	117	217	317	417
18	118	218	318	418
19	119	219	319	419
20	120	220	320	420
21	121	221	321	421
22	122	222	322	422
23	123	223	323	423
24	124	224	324	424
25	125	225	325	425
26	126	226	326	426
27	127	227	327	427
28	128	228	328	428
29	129	229	329	429
30	130	230	330	430
31	131	231	331	431
32	132	232	332	432

Table 3: Points 1-32 Alarm States

Point #	Sensor 1 Trouble	Sensor 1 Warning	Sensor 1 Alarm	Sensor 2 Trouble	Sensor 2 Warning	Sensor 2 Alarm	Sensor 3 Trouble	Sensor 3 Warning	Sensor 3 Alarm	Sensor 4 Trouble	Sensor 4 Warning	Sensor 4 Alarm
1	4097	4098	4099	4609	4610	4611	5121	5122	5123	5633	5634	5635
2	4129	4130	4131	4641	4642	4643	5153	5154	5155	5665	5666	5667
3	4161	4162	4163	4673	4674	4675	5185	5186	5187	5697	5698	5699
4	4193	4194	4195	4705	4706	4707	5217	5218	5219	5729	5730	5731
5	4225	4226	4227	4737	4738	4739	5249	5250	5251	5761	5762	5763
6	4257	4258	4259	4769	4770	4771	5281	5282	5283	5793	5794	5795
7	4289	4290	4291	4801	4802	4803	5313	5314	5315	5825	5826	5827
8	4321	4322	4323	4833	4834	4835	5345	5346	5347	5857	5858	5859
9	4353	4354	4355	4865	4866	4867	5377	5378	5379	5889	5890	5891
10	4385	4386	4387	4897	4898	4899	5409	5410	5411	5921	5922	5923
11	4417	4418	4419	4929	4930	4931	5441	5442	5443	5953	5954	5955
12	4449	4450	4451	4961	4962	4963	5473	5474	5475	5985	5986	5987
13	4481	4482	4483	4993	4994	4995	5505	5506	5507	6017	6018	6019
14	4513	4514	4515	5025	5026	5027	5537	5538	5539	6049	6050	6051
15	4545	4546	4547	5057	5058	5059	5569	5570	5571	6081	6082	6083
16	4577	4578	4579	5089	5090	5091	5601	5602	5603	6113	6114	6115
17	6145	6146	6147	6657	6658	6659	7169	7170	7171	7681	7682	7683
18	6177	6178	6179	6689	6690	6691	7201	7202	7203	7713	7714	7715
19	6209	6210	6211	6721	6722	6723	7233	7234	7235	7745	7746	7747
20	6241	6242	6243	6753	6754	6755	7265	7266	7267	7777	7778	7779
21	6273	6274	6275	6785	6786	6787	7297	7298	7299	7809	7810	7811
22	6305	6306	6307	6817	6818	6819	7329	7330	7331	7841	7842	7843
23	6337	6338	6339	6849	6850	6851	7361	7362	7363	7873	7874	7875
24	6369	6370	6371	6881	6882	6883	7393	7394	7395	7905	7906	7907
25	6401	6402	6403	6913	6914	6915	7425	7426	7427	7937	7938	7939
26	6433	6434	6435	6945	6946	6947	7457	7458	7459	7969	7970	7971
27	6465	6466	6467	6977	6978	6979	7489	7490	7491	8001	8002	8003
28	6497	6498	6499	7009	7010	7011	7521	7522	7523	8033	8034	8035
29	6529	6530	6531	7041	7042	7043	7553	7554	7555	8065	8066	8067
30	6561	6562	6563	7073	7074	7075	7585	7586	7587	8097	8098	8099
31	6593	6594	6595	7105	7106	7107	7617	7618	7619	8129	8130	8131
32	6625	6626	6627	7137	7138	7139	7649	7650	7651	8161	8162	8163

Each instance will present either a "0" or "1". Where, 0 = Normal and 1 = Condition Exists!

Table 4: Flow Status

Point #	System A		System B	
	Sample	Bypass	Sample	Bypass
1	8192	8256	8320	8352
2	8193	8257	8321	8353
3	8194	8258	8322	8354
4	8195	8259	8323	8355
5	8196	8260	8324	8356
6	8197	8261	8325	8357
7	8198	8262	8326	8358
8	8199	8263	8327	8359
9	8200	8264	8328	8360
10	8201	8265	8329	8361
11	8202	8266	8330	8362
12	8203	8267	8331	8363
13	8204	8268	8332	8364
14	8205	8269	8333	8365
15	8206	8270	8334	8366
16	8207	8271	8335	8367
17	8224	8288		
18	8225	8289		
19	8226	8290		
20	8227	8291		
21	8228	8292		
22	8229	8293		
23	8230	8294		
24	8231	8295		
25	8232	8296		
26	8233	8297		
27	8234	8298		
28	8235	8299		
29	8236	8300		
30	8237	8301		
31	8238	8302		
32	8239	8303		

Each instance will present either a "0" or "1". Where, 0 = Normal and 1 = Condition Exists!

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Table 5: Miscellaneous

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	Instance	Comments
System A Position:	5144	Integer value = Point #
System B Position:	5146	Integer value = Point #
System A Operation Mode:	5148	0 = Sampling 1 = Manual Calibration 2 = Auto-Standardization
System B Operation Mode:	5150	0 = Sampling 1 = Manual Calibration 2 = Auto-Standardization
Factory Defaults Forced:	8847	0 = Normal 1 = Forced!
Sensor 1 Gas Level:	100 *	Uncorrected, scaled, continuous
Sensor 2 Gas Level:	200 *	Uncorrected, scaled, continuous
Sensor 3 Gas Level:	300 *	Uncorrected, scaled, continuous
Sensor 4 Gas Level:	400 *	Uncorrected, scaled, continuous

* These instances are discoverable

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Table 6: Common Alarming

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	System A	System B	
Horn Relay Image:	8583	8611	Fixed/Non-failsafe 0=Open 1=Closed
Trouble Relay Image:	8576	8608	Fixed/failsafe 0=Closed 1=Open
Warning Relay Image:	8577	8609	Default Non-failsafe* 0=Open 1=Closed
Alarm Relay Image:	8578	8610	Default Non-failsafe* 0=Open 1=Closed

* User Changeable Parameter - State may need to be reversed depending on usage.

<p align="center">**Table 7: Horn & Condition Acknowledges**</p>

	Sequencer (A)	Sequencer B	Comments
Horn Acknowledge: (Push Button)	8905	8940	Write (Momentary action is necessary.)
Condition Acknowledge: (Push Button)	8655	8682	Write (Momentary action is necessary.)

<p align="center">**Table 8: User Configured Output (UCO) Relay Images**</p>

Output #	UCO#1	UCO#2	Output #	UCO#1	UCO#2
1	8704	8768	17	8736	8800
2	8705	8769	18	8737	8801
3	8706	8770	19	8738	8802
4	8707	8771	20	8739	8803
5	8708	8772	21	8740	8804
6	8709	8773	22	8741	8805
7	8710	8774	23	8742	8806
8	8711	8775	24	8743	8807
9	8712	8776	25	8744	8808
10	8713	8777	26	8745	8809
11	8714	8778	27	8746	8810
12	8715	8779	28	8747	8811
13	8716	8780	29	8748	8812
14	8717	8781	30	8749	8813
15	8718	8782	31	8750	8814
16	8719	8783	32	8751	8815

In the table above: 0 = Open   1 = Closed   (Default Non-failsafe*)
* User Changeable Parameter - State may need to be reversed depending on usage.

<p align="center">**Table 9: Particulate Status for AQGard**</p>

	Sequencer (A)	Comments
Particulate Status:	9312	AQGard Users Only

0 = Normal , 1 = Flow Ok, Laser Bad, 2 = Flow Bad, Laser Ok, 3 = Flow Bad, Laser Bad, 4 = Error