MURPHY
by ENOVATION CONTROLS

EMS-GC10
Genset Controller

Modbus Communication Mapping Manual

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Section 75

In order to consistently bring you the highest quality, full featured products, we reserve the right to change our specifications and designs at any time. The latest version of this manual can be found at www.fwmurphy.com.

Warranty - A limited warranty on materials and workmanship is given with this Murphy product.
A copy of the warranty may be viewed or printed by going to http://www.fwmurphy.com/warranty.

Please read the following information before installing.

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT:

- Read and follow all installation instructions.
- Please contact Enovation Controls immediately if you have any questions.

WARNING: This document should be read in conjunction with both the EMS-GC10 Unit Operator's Manual (OM) & Installation Manual (IM). The manuals are available to download from: www.fwmurphy.com/emsgc10

WARNING: This document does not explain how to operate a generator set (genset) or the EMS-GC10 controller unit. This document should be read by a subject matter expert such as a qualified technician or engineer.

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Description of Product and Option

Product

This document covers the following:

Product	Description
The EMS-GC10 Controller Unit	With configuration software Version 4.0x.x or later

EMS-GC10 Controller Unit Communication Port

Terminal	Function	Description
49	DATA - (B)	Modbus RTU, RS485
50	DATA GND	
51	DATA + (A)	

Hardware Settings

These are the RS-485 hardware settings and format:

a. Master/Slave communication
b. Baud Rate: 9600 bps (standard), or 19200 bps
c. 8 data bits
d. None parity
e. 1 stop bit
f. No flow control

An RS485 to RS232 serial converter (not supplied) should be connected with the unit for remote communication.

Voltage

As a Reference point:

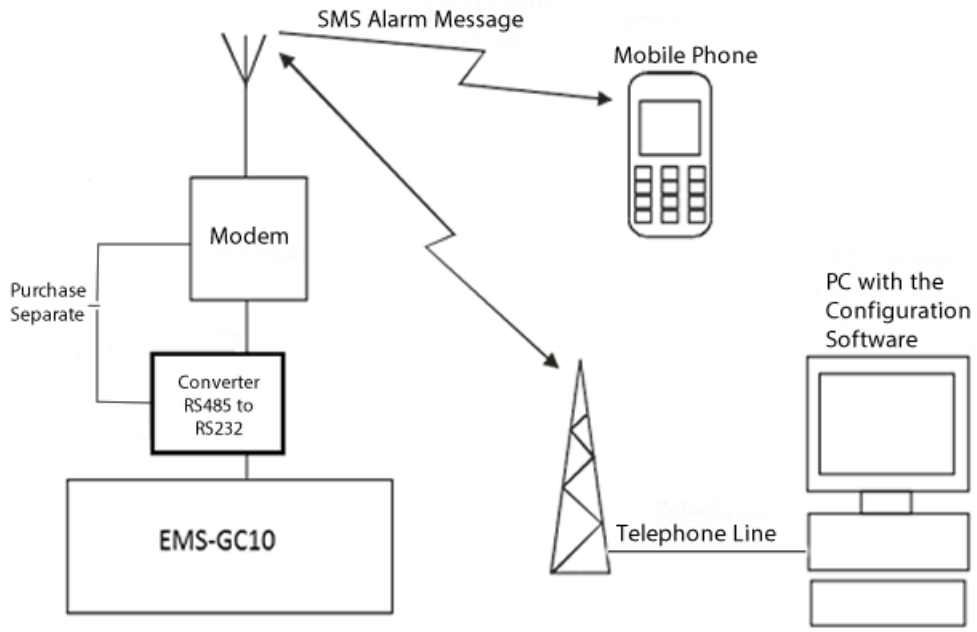
Please note that the "U" symbol is also used in this document as an indication for the voltage.

Functional Description

GSM Communication

The GSM modem communication can send a GSM (Global System for Mobile communication) message to up to 5 cellular telephones when an alarm appears on the display.

Principle Overview



The converter and modem are not supplied from Murphy by Enovation Controls.

IMPORTANT: We recommend using a MOXA OnCell G2150I, Wavecom WMOD2 or Westermo GDW-11 modem terminal, or equivalent, as the application has been tested with these modems.

IMPORTANT: We recommend using a RS485 to RS232 Serial Converter such as the i-7520 model from ICP DAS or equivalent, as the application has been tested with this converter type. (http://www.icpdas-usa.com/i_7520.html)

Basic Parameter Settings:

Basic Parameter Settings			
GSM	GSM PIN code	Set PIN code for GSM modem	None
GSM	12345678901	Set phone no. for SMS to cellular phone 1	None
GSM	12345678901	Set phone no. for SMS to cellular phone 2	None
GSM	12345678901	Set phone no. for SMS to cellular phone 3	None
GSM	12345678901	Set phone no. for SMS to cellular phone 4	None
GSM	12345678901	Set phone no. for SMS to cellular phone 5	None

IMPORTANT: “+ country code” instead of “00” is always required.

IMPORTANT: The phone number can only be dialed using the PC configuration software.

IMPORTANT: The SIM card and the carrier of the cellular telephone must support data transfer.

PIN Code Configuration

After each auxiliary supply power up, the unit will send the required PIN code to the modem when necessary. The PIN code is adjusted in the PC configuration software.

The Configuration Software Communication

We can communicate with the unit via the PC configuration software. Therefore, it is possible to remote-monitor and control the genset application from the PC configuration software if a modem is used.

WARNING: Take all necessary safety precautions to avoid personal injury or death when remote-operating the genset.

Setup

The Modbus protocol type can be changed from RTU to ASCII in menu 7510. This menu can only be reached using the JUMP push-button. When set to 1, the ASCII protocol type is used, and the unit will allow for the slower modem communication.

Safety

If communication fails, the unit will operate according to the received data. For example, if only half of the parameter file has been downloaded when the communication is interrupted, the unit will use this actual data.

Data Tables

Analog Values

Address	Bit	Content with Applicable Measuring Unit		Software Label
0		U_{L1-L2}	Generator voltage L1-L2 [V]	–
1		U_{L2-L3}	Generator voltage L2-L3 [V]	–
2		U_{L3-L1}	Generator voltage L3-L1 [V]	–
3		U_{L1-N}	Generator voltage L1-N [V]	–
4		U_{L2-N}	Generator voltage L2-N [V]	–
5		U_{L3-N}	Generator voltage L3-N [V]	–
6		f_{L1}	Generator f L1 [Hz/100]	–
7		I_{L1}	Generator current L1 [A]	–
8		I_{L2}	Generator current L2 [A]	–
9		I_{L3}	Generator current L3 [A]	–
10		P_{GEN}	Generator power [kW]	–
11		Q_{GEN}	Generator reactive power [kVAr]	–
12		S_{GEN}	Generator apparent power [kVA]	–
13		Cos-phi	Generator PF [cosPhi/100]	–
14	[Hi]	R_{GEN}	Reactive energy counter [kVArh]	–
15	[Lo]			–
16	[Hi]	E_{GEN}	Active energy counter [kWh]	–
18		$U_{BBL1-L2}$	U BB L1-L2 [V]	–
19		$U_{BBL2-L3}$	U BB L2-L3 [V]	–
20		$U_{BBL3-L1}$	U BB L3-L1 [V]	–
21		U_{BBL1-N}	U BB L1-N [V]	–
22		U_{BBL2-N}	U BB L2-N [V]	–
23		U_{BBL3-N}	U BB L3-N [V]	–
24		F_{BB}	BB f L1 [Hz/100]	–
25		$PHI_{BBL1-L2}$	U BB phase angle L1-L2 [Deg/10]	–
26		$PHI_{BBL1-DGL1}$	U BB L1 - U GEN L1 phase angle [Deg/10]	–
27		Alarms	No. of alarms	–
28		Alarms	No. of unack. Alarms	–
29		Start attempts	Start attempts	–
30	[Hi]	Abs. run Hrs.	Abs. run hours	–
32		GB_{oper}	No. of GB operations	–
33		MB_{oper}	No. of MB operations	–
34		U_{SUPPLY}	DC supply term. 1-2 [V/10]	–
36		RPM	RPM	–
37			Multi-input 6 unscaled	–
38			Multi-input 7 unscaled	–

Address	Bit	Content with Applicable Measuring Unit		Software Label
39			Multi-input 8 unscaled	–
40			Control register address 0	–
41			Control register address 1	–
42			Control register address 2	–
43			Control register address 3	–
44			Control register address 4	–
45			Control register address 5	–
46			Control register address 6	–
47			Control register address 7	–

Alarms

Address	Bit	Parameter	Content with Applicable Measuring Unit	Software Label
48			**Generator/mains/busbar 1/shore connection**	
	0	1000	G P> 1	–
	1	1010	G P> 2	–
	3	1030	G I> 1	–
	4	1040	G I> 2	–
	5	1050	G I> 3	–
	6	1060	G I> 4	–
	9	1130	G I>> 1	–
	10	1140	G I>> 2	–
	11	1150	G U> 1	–
	12	1160	G U> 2	–
	13	1170	G U< 1	–
	14	1180	G U< 2	–
	15	1190	G U< 3	–
49	0	1210	G f> 1	–
	1	1220	G f> 2	–
	2	1230	G f> 3	–
	3	1240	G f< 1	–
	4	1250	G f< 2	–
	5	1260	G f< 3	–
			Busbar/mains	
	6	1270	BB U> 1	–
	7	1280	BB U> 2	–
	8	1290	BB U> 3	–
	9	1300	BB U< 1	–
	10	1310	BB U< 2	–
	11	1320	BB U< 3	–
	12	1330	BB U< 4	–
	13	1350	BB f> 1	–
	14	1360	BB f> 2	–
	15	1370	BB f> 3	–
50	0	1380	BB f< 1	–
	1	1390	BB f< 2	–
	2	1400	BB f< 3	–
	3	1410	BB f< 4	–
			Generator/mains/busbar A/shore	

Address	Bit	Parameter	Content with Applicable Measuring Unit	Software Label
	7	1450	G P> 1	–
	8	1460	G P> 2	–
	9	1470	G P> 3	–
	10	1480	G P> 4	–
	11	1490 1500 1510	G P> 5	–
	12		Unbalance curr.	–
	13		Unbalance volt.	–
	14	1520	G -Q>	–
	15	1530	G Q>	–
51			**Synchronising**	
	3	2150	Phase sequence failure	–
	4	2160	GB open failure	–
	5	2170	GB close failure	–
	6	2180	GB pos. failure	–
	7	2200	MB open failure	–
	8	2210	MB close failure	–
	9	2220	MB pos. failure	–
54	0	3400	Multi-in. alarm	6
	1	3410	Multi-in. alarm	7
	2	3420	Multi-in. alarm	8
	3	3401	Wire fail.	6
	4	3411	Wire fail.	7
	5	3421	Wire fail.	8
	12	3490	Digital alarm input (Emer. stop)	20
57			**Multi-functional input**	
	0	4120	4-20mA	6.1
	1	4130	4-20mA	6.2
	0	4180	VDO/RMI oil	6.1
	1	4190	VDO/RMI oil	6.2
	0	4200	VDO/RMI water	6.1
	1	4210	VDO/RMI water	6.2
	0	4220	VDO/RMI fuel	6.1
	1	4230	VDO/RMI fuel	6.2
	2	4240	W. fail.	6
	3	4250	4-20mA	7.1
	4	4260	4-20mA	7.2
	3	4310	VDO/RMI oil	7.1
	4	4320	VDO/RMI oil	7.2

Address	Bit	Parameter	Content with Applicable Measuring Unit	Software Label
	3	4330	VDO/RMI water	7.1
	4	4340	VDO/RMI water	7.2
	3	4350	VDO/RMI fuel	7.1
	4	4360	VDO/RMI fuel	7.2
	5	4370	W. fail.	7
	6	4380	4-20mA	8.1
	7	4390	4-20mA	8.2
	6	4440	VDO/RMI oil	8.1
	7	4450	VDO/RMI oil	8.2
	6	4460	VDO/RMI water	8.1
	7	4470	VDO/RMI water	8.2
	6	4480	VDO/RMI fuel	8.1
	7	4490	VDO/RMI fuel	8.2
	8	4500	Wire failure	8
			Analog input alarm	
	9	4510	Oversp. 1	–
	10	4520	Oversp. 2	–
	11	4530	Crank failure	–
	12	4540	Running feedback failure	–
	14	4560	Hz/V failure	–
	15	4570	Start failure	–
			Output	
58	0	5000	Relay	3
	1	5010	Relay	21
	2	5020	Relay	22
	3	5030	Relay	23
	4	5040	Relay	24
	5	5050	Relay	26
	6	5060	Relay	45
	7	5070	Relay	47
59			**General**	
	0		Block mode	–
	1		Manual mode	–
	2		Semi auto mode	–
	3		Auto mode	–
	4		Test	–
	5		Island	–
	6		AMF	–
	10		Load takeover	–

Address	Bit	Parameter	Content with Applicable Measuring Unit	Software Label
	15		AMF active	–
			EIC alarm	
60	0	7570	Communication error	–
	1	7580	Warning	–
	2	7590	Shutdown	–
	3	7600	Overspeed	–
	4	7610	Cool water temp. high 1	–
	5	7620	Cool water temp. high 2	–
	6	7630	Oil pressure low 1	–
	7	7640	Oil pressure low 2	–
	8	7650	Oil temp. 1	–
	9	7660	Oil temp. 2	–
	10	7670	Coolant level 1	–
	11	7680	Coolant level 2	–

Multi-Input – Unscaled Values

A short description of the unscaled values and how to interpret these according to the input type selected is made in this document.

The unscaled values have a full range of 0 to 1023 bit.

4-20mA

0mA:	0 bit
4mA:	170 bit
20mA:	853 bit
25mA:	1023 bit

Linearity between the unscaled value and the scaled value yields.

0-40V DC

0V DC:	0 bit
40V DC:	925 bit

Linearity between the unscaled value and the scaled value yields.

Pt100

Linearity between the unscaled value and the input resistance yields according to the following equation:

Ω = (X + 509) x 100/771

X: Unscaled value.

Ω: PT resistance value.

Pt1000

Linearity between the unscaled value and the input resistance yields according to the following equation:

Ω = (X + 519) x10/79

X: Unscaled value.

Ω: PT resistance value.

VDO/RMI

Linearity between the unscaled value and the input resistance yields according to the following equations:

If maximum resistance on the sensor is less than or equal to 90.0Ω:

Ω = ((X x 1000) + 300)/10330

X: Unscaled value.

Ω: VDO/RMI resistance value.

If maximum resistance on the sensor is above 90.0Ω and less than or equal to 190.0Ω:

Ω = ((X x 1000) - 800)/5160

X: Unscaled value.

Ω: VDO/RMI resistance value.

If maximum resistance on the sensor is above 190.0Ω and less than or equal to 490.0Ω:

Ω = ((X x 1000) + 1000)/2070

X: Unscaled value.

Ω: VDO/RMI resistance value.

If maximum resistance on the sensor is above 490.0Ω:

Ω = ((X x 1000) + 294)/520

X: Unscaled value.

Ω: VDO/RMI resistance value.

Binary

Input high: < 50 bit

Input low: ≥ 50 bit

Cable failure:> 950 bit

IMPORTANT: We recommend using the scaled values for Pt100/1000 and RMI/VDO readings.

Measurement Table (Read Only) (Function Code 04h)

Address		Content with the Applicable Measuring Unit		Software Label
501		U_{L1-L2}	Generator voltage L1-L2 [V]	–
502		U_{L2-L3}	Generator voltage L2-L3 [V]	–
503		U_{L3-L1}	Generator voltage L3-L1 [V]	–
504		U_{L1-N}	Generator voltage L1-N [V]	–
505		U_{L2-N}	Generator voltage L2-N [V]	–
506		U_{L3-N}	Generator voltage L3-N [V]	–
507		f_{L1}	Generator f L1 [Hz/100]	–
508		f_{L2}	Generator f L2 [Hz/100]	–
509		f_{L3}	Generator f L3 [Hz/100]	–
510		Phi	U gen. phase angle L1-L2 [Deg/10]	–
511		Phi	U gen. phase angle L2-L3 [Deg/10]	–
512		Phi	U gen. phase angle L3-L1 [Deg/10]	–
513		I_{L1}	Generator current L1 [A]	–
514		I_{L2}	Generator current L2 [A]	–
515		I_{L3}	Generator current L3 [A]	–
516		$P_{GEN\ L1}$	Generator power L1 [kW]	–
517		$P_{GEN\ L2}$	Generator power L2 [kW]	–
518		$P_{GEN\ L3}$	Generator power L3 [kW]	–
519		P_{GEN}	Generator power [kW]	–
520		$Q_{GEN\ L1}$	Generator reactive power L1 [kVAr]	–
521		$Q_{GEN\ L2}$	Generator reactive power L2 [kVAr]	–
522		$Q_{GEN\ L3}$	Generator reactive power L3 [kVAr]	–
523		Q_{GEN}	Generator reactive power [kVAr]	–
524		$S_{GEN\ L1}$	Generator apparent power L1 [kVA]	–
525		$S_{GEN\ L2}$	Generator apparent power L2 [kVA]	–
526		$S_{GEN\ L3}$	Generator apparent power L3 [kVA]	–
527		S_{GEN}	Generator apparent power [kVA]	–
528	[Hi]	$R_{GEN,\ ExP}$	Export, reactive energy counter [kVArh]	–
530	[Hi]	$E_{GEN,\ ExP}$	Export, active energy counter, day [kWh]	–
532	[Hi]	$E_{GEN,\ ExP}$	Export, active energy counter, week [kWh]	–
534	[Hi]	$E_{GEN,\ ExP}$	Export, active energy counter, month [kWh]	–
536	[Hi]	$E_{GEN,\ ExP}$	Export, active energy counter, total [kWh]	–
538		Cos-phi	Generator PF [cosPhi/100]	–
539		$U_{BBL1-L2}$	U BB L1-L2 [V]	–
540		$U_{BBL2-L3}$	U BB L2-L3 [V]	–
541		$U_{BBL3-L1}$	U BB L3-L1 [V]	–
542		U_{BBL1-N}	U BB L1-N [V]	–

Address		Content with the Applicable Measuring Unit		Software Label
543		U_{BBL2-N}	U BB L2-N [V]	–
544		U_{BBL3-N}	U BB L3-N [V]	–
545		F_{BB}	BB FL1 [Hz/100]	–
548		$PHI_{BBL1-L2}$	U BB phase angle L1-L2 [Deg/10]	–
551		$PHI_{BBL1-DGL1}$	U BB L1 - U GEN L1 phase angle [Deg/10]	–
554	[Hi]	Abs. run hrs.	Absolute. run hours	–
556	[Hi]	Rel. run hrs.	Relative. run hours	–
558		Alarms	No. of alarms	–
559		Alarms	No. of unack. alarms	–
560		Alarms	No. of active acknowledged alarms	–
561		Run. min.	Running min. counter, shutdown override	–
562		Run. hours	Running hour counter, shutdown override	–
563		GB_{oper}	No. of GB operations	–
564		MB_{oper}	No. of MB operations	–
566		Start attempts	Start attempts	–
567		U_{SUPPLY}	DC supply term. 1-2 [V/10]	–
569		Service	Service timer 1 run. hours	–
570		Service	Service timer 1 run. days	–
571		Service	Service timer 2 run. hours	–
572		Service	Service timer 2 run. days	–
573		Cos-phi	Cos-phi [cosPhi/100]	–
574		Cos-phi	Cos-phi Inductive/Capacitive 0=Inductive, 1=Capacitive	–
576		RPM	RPM	–
580			Multi-input 6 unscaled	–
581			Multi-input 7 unscaled	–
582			Multi-input 8 unscaled	–
583			Multi-input 6 scaled	–
584			Multi-input 7 scaled	–
585			Multi-input 8 scaled	–
592		P_{MAINS}	Mains power [kW]	6
593-641				–
642		RegAddr.	Control register address 0	–
643		RegAddr.	Control register address 1	–
644		RegAddr.	Control register address 2	–

Address		Content with the Applicable Measuring Unit		Software Label
645		RegAddr.	Control register address 3	–
646		RegAddr.	Control register address 4	–
647		RegAddr.	Control register address 5	–
648		RegAddr.	Control register address 6	–
649		RegAddr.	Control register address 7	–
650		RegAddr	Control register address 8	–
651		RegAddr	Control register address 9	–
652		RegAddr	Control register address 10	–
655		RegAddr	Control register address 13	–
660		Ext Ain	External Ain 1 (unscaled)	–
661		Ext Ain	External Ain 2 (unscaled)	–
662		Ext Ain	External Ain 3 (unscaled)	–
663		Ext Ain	External Ain 4 (unscaled)	–
664		Ext Ain	External Ain 5 (unscaled)	–
665		Ext Ain	External Ain 6 (unscaled)	–
666		Ext Ain	External Ain 7 (unscaled)	–
667		Ext Ain	External Ain 8 (unscaled)	–
700			Nominal power active (1-4)	–
701			Mains power transducer used	–
790	[Hi]	$R_{GEN, ExP}$	Export reactive energy counter, month [kWh]	–
790	[Hi]	$R_{MAINS, ExP}$	Export reactive energy counter, month [kWh]	–
790	[Hi]	$R_{BA, ExP}$	Export reactive energy counter, month [kWh]	–
792	[Hi]	$R_{GEN, ExP}$	Export reactive energy counter, week [kWh]	–
792	[Hi]	$R_{MAINS, ExP}$	Export reactive energy counter, week [kWh]	–
792	[Hi]	$R_{BA, ExP}$	Export reactive energy counter, week [kWh]	–
794	[Hi]	$R_{GEN, ExP}$	Export reactive energy counter, total [kWh]	–
794	[Hi]	$R_{MAINS, ExP}$	Export reactive energy counter, total [kWh]	–
794	[Hi]	$R_{BA, ExP}$	Export reactive energy counter, total [kWh]	–
796	[Hi]	$E_{GEN, ExP}$	Import active energy counter, total [kWh]	–
796	[Hi]	$E_{MAINS, ExP}$	Import active energy counter, total [kWh]	–
796	[Hi]	$E_{BA, ExP}$	Import active energy counter, total [kWh]	–
798	[Hi]	$E_{GEN, ExP}$	Import active energy counter, month [kWh]	–
798	[Hi]	$E_{MAINS, ExP}$	Import active energy counter, month [kWh]	–
798	[Hi]	$E_{BA, ExP}$	Import active energy counter, month [kWh]	–
800	[Hi]	$E_{GEN, ExP}$	Import active energy counter, week [kWh]	–
800	[Hi]	$E_{MAINS, ExP}$	Import active energy counter, week [kWh]	–
800	[Hi]	$E_{BA, ExP}$	Import active energy counter, week [kWh]	–

Address		Content with the Applicable Measuring Unit		Software Label
802	[Hi]	$E_{GEN, ExP}$	Import active energy counter, day [kWh]	–
802	[Hi]	$E_{MAINS, ExP}$	Import active energy counter, day [kWh]	–
802	[Hi]	$E_{BA, ExP}$	Import active energy counter, day [kWh]	–
804	[Hi]	$R_{GEN, IMP}$	Import reactive energy counter, total [kWh]	–
804	[Hi]	$R_{MAINS, IMP}$	Import reactive energy counter, total [kWh]	–
804	[Hi]	$R_{BA, IMP}$	Import reactive energy counter, total [kWh]	–
806	[Hi]	$R_{GEN, IMP}$	Import reactive energy counter, month [kWh]	–
806	[Hi]	$R_{MAINS, IMP}$	Import reactive energy counter, month [kWh]	–
806	[Hi]	$R_{BA, IMP}$	Import reactive energy counter, month [kWh]	–
808	[Hi]	$R_{GEN, IMP}$	Import reactive energy counter, week [kWh]	–
808	[Hi]	$R_{MAINS, IMP}$	Import reactive energy counter, week [kWh]	–
808	[Hi]	$R_{BA, IMP}$	Import reactive energy counter, week [kWh]	–
810	[Hi]	$R_{GEN, IMP}$	Import reactive energy counter, day [kWh]	–
810	[Hi]	$R_{MAINS, IMP}$	Import reactive energy counter, day [kWh]	–
810	[Hi]	$R_{BA, IMP}$	Import reactive energy counter, day [kWh]	–

Alarm and Status Table (Read Only) (Function Code 04h)

IMPORTANT: Bits 3, 7, 11 and 15 only have significance when one of the color indication bits is high. When bit 3, 7, 11 or 15 is “0”, then the LED is on solid, and when bit 3, 7, 11 or 15 is “1”, the LED is flashing.

Address	Bit	Channel	Content with the Applicable Measuring Unit	Software Label
			Generator/mains/busbar A/shore connection	
1000	0	1000	G -P> 1	–
	1	1010	G -P> 2	–
	3	1030	G I> 1	–
	4	1040	G I> 2	–
	5	1050	G I> 3	–
	6	1060	G I> 4	–
	7	1080	G I> inv.	–
	9	1130	G I>> 1	–
	10	1140	G I>> 2	–
	11	1150	G U> 1	–
	12	1160	G U> 2	–
	13	1170	G U< 1	–
	14	1180	G U< 2	–
	15	1190	G U< 3	–
1001	1	1220	G f> 2	–
	2	1230	G f> 3	–
	3	1240	G f< 1	–
	4	1250	G f< 2	–
	5	1260	G f< 3	–
			BB/mains	
	6	1270	BB U> 1	–
	7	1280	BB U> 2	–
	8	1290	BB U> 3	–
	9	1300	BB U< 1	–
	10	1310	BB U< 2	–
	11	1320	BB U< 3	–
	12	1330	BB U< 4	–
	13	1350	BB f> 1	–
	14	1360	BB f> 2	–

Address	Bit	Channel	Content with the Applicable Measuring Unit	Software Label
	15	1370	BB f> 3	–
1002	1	1390	BB f< 2	–
	2	1400	BB f< 3	–
	3	1410	BB f< 4	–
			Generator/mains/busbar A/shore	
	7	1450	G P> 1	–
	8	1460	G P> 2	–
	9	1470	G P> 3	–
	10	1480	G P> 4	–
	11	1490	G P> 5	–
	12	1500	Unbalance curr.	–
	13	1510	Unbalance volt.	–
	14	1520	G -Q>	–
	15	1530	G Q>	–
			Busbar/mains	
1003	6	1620	BB unbalance U	–
1004	6	1960	Uq< 1	–
	7	1970	Uq< 2	–
	8	1980	GB ext. trip	–
	9	1980	MB ext. trip	–
			Synchronizing	
1005	3	2150	Phase seq. failure	–
	4	2160	GB open failure	–
	5	2170	GB close failure	–
	6	2180	GB pos. failure	–
	7	2200	MB open failure	–
	8	2210	MB close failure	–
	9	2220	MB pos. failure	–
			Digital alarms	
1007	0	3000	Digital alarm input	10
	1	3010	Digital alarm input	11
	2	3020	Digital alarm input	12
	3	3030	Digital alarm input	13
	4	3040	Digital alarm input	14
	5	3050	Digital alarm input	15
1010	1	3410	Multi-in. alarm	7
	2	3420	Multi-in. alarm	8
	3	3401	Wire fail.	6
	4	3411	Wire fail.	7

Address	Bit	Channel	Content with the Applicable Measuring Unit	Software Label
	5	3421	Wire fail.	8
	12	3490	Digital alarm input (Emergency stop)	20
1011	7	3570	M-Logic alarm 1	–
	8	3580	M-Logic alarm 2	–
	9	3590	M-Logic alarm 3	–
	10	3600	M-Logic alarm 4	–
	11	3610	M-Logic alarm 5	–
			Multi-functional input	
1013	0	4120	4-20 mA	6.1
	1	4130	4-20 mA	6.2
	0	4180	VDO/RMI oil	6.1
	1	4190	VDO/RMI oil	6.2
	0	4200	VDO/RMI water	6.1
	1	4210	VDO/RMI water	6.2
	0	4220	VDO/RMI fuel	6.1
	1	4230	VDO/RMI fuel	6.2
	2	4240	W. fail.	6
	3	4250	4-20 mA	7.1
	4	4260	4-20 mA	7.2
	3	4310	VDO/RMI oil	7.1
	4	4320	VDO/RMI oil	7.2
	3	4330	VDO/RMI water	7.1
	4	4340	VDO/RMI water	7.2
	3	4350	VDO/RMI fuel	7.1
	4	4360	VDO/RMI fuel	7.2
	5	4370	W. fail.	7
	6	4380	4-20 mA	8.1
	7	4390	4-20 mA	8.2
	6	4440	VDO/RMI oil	8.1
	7	4450	VDO/RMI oil	8.2
	6	4460	VDO/RMI water	8.1
	7	4470	VDO/RMI water	8.2
	6	4480	VDO/RMI fuel	8.1
	7	4490	VDO/RMI fuel	8.2
	8	4500	W. fail.	8
			Analog input alarm	
	9	4510	Overspeed 1	–
	10	4520	Overspeed 2	–
	11	4530	Crank failure	–

Address	Bit	Channel	Content with the Applicable Measuring Unit	Software Label
	12	4540	Running feedback failure	–
	13	4550	MPU wire failure	–
	14	4560	Hz/V failure	–
	15	4570	Start failure	–
1014	1	4960	U< aux. term.	1
	2	4970	U> aux. term.	1
	5	4590	Underspeed 1	–
1015	1	6120	Service timer 2	–
	3	6280	Internal communication failure	–
	4	6330	Engine heater 1	–
	5	6410	Battery test	–
	8	6470	Max. ventilation 1	–
	9	6480	Max. ventilation 2	–
	10	6500	Blk. swbd. error	–
	11	6510	Stp. swbd. error	–
	12	6540	Unit not in auto	–
	13	6550	Fuel pump logic	–
			Output	
1016	0	5000	Relay	3
	1	5010	Relay	21
	2	5020	Relay	22
	3	5030	Relay	23
	4	5040	Relay	24
	5	5050	Relay	26
	6	5060	Relay	45
	7	5070	Relay	47
1017	12		Run. coil relay	–
	13		Start prepare	–
	14		Start relay	–
	15		Stop coil relay	–
			Status	
1018	0		Mains failure	–
	1		MB pos. ON	–
	4		GB pos. ON	–
	6		Engine running	–
	7		Running detects. timer expired	–
	8	4560	DG Hz/V OK, timer expired	–
	9	6410	Battery test	–
	11		GB position OFF	–

Address	Bit	Channel	Content with the Applicable Measuring Unit	Software Label
	12		MB position OFF	–
	13		BB Hz/V OK	–
			General/Modes	
1019	0		Block mode	–
	1		Manual mode	–
	2		Semi auto mode	–
	3		Auto mode	–
	4		Test	–
	5		Island	–
	6		AMF	–
	10		Load takeover	–
	15		AMF active	–

Address	Bit	Channel	Function	Software Label
			Internal communications	
1033	2		Communication error ext.	–
	External inputs			
1036	0	12000	Analog in. 1.1	1.1
	1	12010	Analog in. 1.2	1.2
	2	12020	W. fail. Analog 1	1
	3	12030	Analog in. 2.1	2.1
	4	12040	Analog in. 2.2	2.2
	5	12050	W. fail. Analog 2	2
	6	12060	Analog in. 3.1	3.1
	7	12070	Analog in. 3.2	3.2
	8	12080	W. fail. Analog 3	3
	9	12090	Analog in. 4.1	4.1
	10	12100	Analog in. 4.2	4.2
	11	12110	W. fail. Analog 4	4
	12	12120	Analog in. 5.1	5.1
	13	12130	Analog in. 5.2	5.2
	14	12140	W. fail. Analog 5	5
	15	12150	Analog in. 6.1	6.1
1037	0	12160	Analog in. 6.2	6.2
	1	12170	W. fail. Analog 6	6
	2	12180	Analog in. 7.1	7.1
	3	12190	Analog in. 7.2	7.2
	4	12200	W. fail. Analog 7	7
	5	12210	Analog in. 8.1	8.1
	6	12220	Analog in. 8.2	8.2
	7	12230	W. fail. Analog 8	8
1038	0	12540	External digital input	1
	1	12550	External digital input	2
	2	12560	External digital input	3
	3	12570	External digital input	4
	4	12580	External digital input	5
	5	12590	External digital input	6
	6	12600	External digital input	7
	7	12610	External digital input	8
	8	12620	External digital input	9
	9	12630	External digital input	10
	10	12640	External digital input	11
	11	12650	External digital input	12

Address	Bit	Channel	Function	Software Label
	12	12660	External digital input	13
	13	12670	External digital input	14
	14	12680	External digital input	15
	15	12690	External digital input	16
1039	0	12790	External digital output	1
	1	12800	External digital output	2
	2	12810	External digital output	3
	3	12820	External digital output	4
	4	12830	External digital output	5
	5	12840	External digital output	6
	6	12850	External digital output	7
	7	12860	External digital output	8
	8	12870	External digital output	9
	9	12880	External digital output	10
	10	12890	External digital output	11
	11	12900	External digital output	12
	12	12910	External digital output	13
	13	12920	External digital output	14
	14	12930	External digital output	15
	15	12940	External digital output	16
1051	0		Virtual event 1	–
	1		Virtual event 2	–
	2		Virtual event 3	–
	3		Virtual event 4	–
	4		Virtual event 5	–
	5		Virtual event 6	–
	6		Virtual event 7	–
	7		Virtual event 8	–
	8		Virtual event 9	–
	9		Virtual event 10	–
	10		Virtual event 11	–
	11		Virtual event 12	–
	12		Virtual event 13	–
	13		Virtual event 14	–
	14		Virtual event 15	–
	15		Virtual event 16	–
1052	0		Virtual event 17	–
	1		Virtual event 18	–
	2		Virtual event 19	–

Address	Bit	Channel	Function	Software Label
	3		Virtual event 20	–
	4		Virtual event 21	–
	5		Virtual event 22	–
	6		Virtual event 23	–
	7		Virtual event 24	–
	8		Virtual event 25	–
	9		Virtual event 26	–
	10		Virtual event 27	–
	11		Virtual event 28	–
	12		Virtual event 29	–
	13		Virtual event 30	–
	14		Virtual event 31	–
	15		Virtual event 32	–
1054	4	1710	G unbalance I 2	–
	5	7480	Avg U BB > 1	–
	6	7490	Avg U BB > 2	–
1055	0		LED 1 Red color	–
	1		LED 1 yellow color	–
	2		LED 1 Green color	–
	3		LED 1 Flash	–
	4		LED 2 Red color	–
	5		LED 2 yellow color	–
	6		LED 2 Green color	–
	7		LED 2 Flash	–
	8		LED 3 Red color	–
	9		LED 3 yellow color	–
	10		LED 3 Green color	–
	11		LED 3 Flash	–
	12		LED 4 Red color	–
	13		LED 4 yellow color	–
	14		LED 4 Green color	–
	15		LED 4 Flash	–

Control Register Table Read (03h)/Write (10h)

IMPORTANT: Control commands must only be used to send a command. They cannot be used to monitor bit status.

Address	Content	Description		Software Label
5	Control command	Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored.	–
		Bit 1	Remote start	–
		Bit 2	Remote GB ON	–
		Bit 3	Remote GB OFF	–
		Bit 4	Remote stop	–
		Bit 7	Alarm inhibit 1	–
		Bit 8	Alarm inhibit 2	–
		Bit 9	Alarm inhibit 3	–
		Bit 10	Alarm ack. This bit is automatically reset	–
		Bit 11	Nominal setting 1	–
		Bit 12	Nominal setting 2	–
		Bit 13	Nominal setting 3	–
		Bit 14	Nominal setting 4	–
6	Control command	Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored.	–
		Bit 1	Island	–
		Bit 2	Automatic mains failure (AMF)	–
		Bit 6	Load takeover (LTO)	–
		Bit 11	Auto start/stop	–
		Bit 12	Manual mode	–
		Bit 13	Auto mode	–
		Bit 14	Semi-auto mode	–
		Bit 15	Test mode	–
7		Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored.	–
		Bit 9	Application 1	–
		Bit 10	Application 2	–
		Bit 11	Application 3	–
		Bit 12	Application 4	–
		Bit 13	Battery test	–

Address	Content	Description		Software Label
8		Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored	–
		Bit 1	Virtual 1	–
		Bit 2	Virtual 2	–
		Bit 3	Virtual 3	–
		Bit 4	Virtual 4	–
		Bit 5	Virtual 5	–
		Bit 6	Virtual 6	–
		Bit 7	Virtual 7	–
		Bit 8	Virtual 8	–
		Bit 9	Virtual 9	–
		Bit 10	Virtual 10	–
		Bit 11	Virtual 11	–
		Bit 12	Virtual 12	–
		Bit 13	Virtual 13	–
		Bit 14	Virtual 14	–
		Bit 15	Virtual 15	–
9		Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored.	–
		Bit 1	Virtual 16	–
		Bit 2	Virtual 17	–
		Bit 3	Virtual 18	–
		Bit 4	Virtual 19	–
		Bit 5	Virtual 20	–
		Bit 6	Virtual 21	–
		Bit 7	Virtual 22	–
		Bit 8	Virtual 23	–
		Bit 9	Virtual 24	–
		Bit 10	Virtual 25	–
		Bit 11	Virtual 26	–
		Bit 12	Virtual 27	–
		Bit 13	Virtual 28	–
		Bit 14	Virtual 29	–
		Bit 15	Virtual 30	–
10		Bit 0	This bit must be 1 when writing the command word. If the bit is 0, the control command is ignored.	–
		Bit 1	Virtual 31	–
		Bit 2	Virtual 32	–

Address	Content	Description	Software Label
		Bit 4 Clear log	–
58000	Year	2003-2099	–
58001	Month	1-12	–
58002	Date	1-31	–
58003	Day	1…7 (Monday…Sunday)	–
58004	Hour	0-23	–
58005	Min.	0-59	–
58006	Sec.	0-59	–

IMPORTANT: All control bits are automatically reset by the EMS-GC10 unit except for “Auto start/stop” (register 6, bit 11).

Command Flags Table (Write Only) (Function Code 0Fh)

Address	Content	Software Label
0	Remote start	–
1	Remote GB ON	–
2	Remote GB OFF	–
3	Remote stop	–
4	Alarm inhibit 1	–
5	Alarm inhibit 2	–
6	Alarm inhibit 3	–
9	Alarm ack.	–
10	Nominal setting 1	–
11	Nominal setting 2	–
12	Nominal setting 3	–
13	Nominal setting 4	–
16	Island	–
17	Automatic mains failure (AMF)	–
21	Load takeover (LTO)	–
26	Auto start/stop	–
27	Manual mode	–
28	Semi-auto mode	–
29	Auto mode	–
30	Test mode	–
40	Application 1	–
41	Application 2	–
42	Application 3	–
43	Application 4	–
44	Battery test	–
48	Virtual event 1	–
49	Virtual event 2	–
50	Virtual event 3	–
51	Virtual event 4	–
52	Virtual event 5	–
53	Virtual event 6	–
54	Virtual event 7	–
55	Virtual event 8	–
56	Virtual event 9	–
57	Virtual event 10	–
58	Virtual event 11	–
59	Virtual event 12	–
60	Virtual event 13	–

Address	Content	Software Label
61	Virtual event 14	–
62	Virtual event 15	–
63	Virtual event 16	–
64	Virtual event 17	–
65	Virtual event 18	–
66	Virtual event 19	–
67	Virtual event 20	–
68	Virtual event 21	–
69	Virtual event 22	–
70	Virtual event 23	–
71	Virtual event 24	–
72	Virtual event 25	–
73	Virtual event 26	–
74	Virtual event 27	–
75	Virtual event 28	–
76	Virtual event 29	–
77	Virtual event 30	–
78	Virtual event 31	–
79	Virtual event 32	–

IMPORTANT: All flags are automatically reset by the EMS-GC10 unit except for “Auto start/stop” (flag, address 26).

Status Flags Table (Read Only) (Function Code 02h)

Address	Content	Software Label
0	GB position ON	–
1	MB position ON	–
3	Running	–
4	Generator voltage/frequency OK	–
5	Mains failure/main busbar failure	–
6	Block mode	–
7	Manual mode	–
8	Semi-auto mode	–
9	Auto mode	–
10	Test mode	–
13	Island	–
14	Automatic mains failure (AMF)	–
18	Load takeover (LTO)	–
29	Battery test	–

Digital Input Table (Read Only 02h)

Address	Description	Software Label
22500	Digital input	10
22501	Digital input	11
22502	Digital input	12
22503	Digital input	13
22504	Digital input	14
22505	Digital input	15
22516	Emergency stop	20
22591	Multi-func. input cable fail.	8
22592	Multi-func. input cable fail.	7
22593	Multi-func. input cable fail.	6
22594	External digital input	1
22595	External digital input	2
22596	External digital input	3
22597	External digital input	4
22598	External digital input	5
22599	External digital input	6
22600	External digital input	7
22601	External digital input	8
22602	External digital input	9
22603	External digital input	10
22604	External digital input	11
22605	External digital input	12
22606	External digital input	13
22607	External digital input	14
22608	External digital input	15
22609	External digital input	16

Digital Output Table (Read Only 02h)

Address	Description	Software Label
23000	Relay	3
23001	Relay	21
23002	Relay	22
23003	Relay	23
23004	Relay	24
23005	Relay	26
23006	Relay	45
23007	Relay	47
23049	Run. coil	–
23050	Start prepare	–
23051	Start relay (crank)	–
23052	Stop coil	–
23056	External digital output	1
23057	External digital output	2
23058	External digital output	3
23059	External digital output	4
23060	External digital output	5
23061	External digital output	6
23062	External digital output	7
23063	External digital output	8
23064	External digital output	9
23065	External digital output	10
23066	External digital output	11
23067	External digital output	12
23068	External digital output	13
23069	External digital output	14
23070	External digital output	15
23071	External digital output	16

Parameter Setting

Parameter Reading and Writing

The entire setting of parameters can be made using the Modbus. The combination of function and address areas used is described below:

Function 01(01hex) Read/Write Flag Status

This function reads the ON/OFF status of discrete flags in the slave unit.

Address Area for Reading of Status Flags		
Data To Request	**Table**	**Address Area**
Enable	Parameter table	2000-3999

IMPORTANT: The maximum number of data queries is limited by the length of the actual table.

Function 02 (02hex) Read Flag Status

This function reads the On/Off status of discrete flags in the slave unit.

Address Area for Reading of Status Flags		
Data to Request	**Table**	**Address Area**
Alarm active	Parameter table	4000-5999
Alarm acknowledge	Parameter table	6000-7999
Timer output	Parameter table	8000-9999
Timer running	Parameter table	10000-11999

IMPORTANT: The maximum number of data queries is limited by the length of the actual table.

Function 03 (03hex) Read Registers

This function reads the binary of registers in the slave unit.

Address Area For Reading Of Registers		
Data to Request	**Table**	**Address Area**
Timers used	Parameter table	2000-3999
Values used	Parameter table	4000-5999
Values minimum	Parameter table	6000-7999
Values maximum	Parameter table	8000-9999
Output a	Parameter table	10000-11999
Output b	Parameter table	12000-13999
Fail class used	Parameter table	14000-15999
Enable	Parameter table	16000-17999
Inhibit	Parameter table	18000-19999

IMPORTANT: The maximum number of data queries is limited by the length of the actual table.

Function 04 (04hex) Read Registers

This function reads the binary of registers in the slave unit.

Address Area for Reading of Registers		
Data to Request	**Table**	**Address Area**
Timers minimum	Parameter table	2000-3999
Timers maximum	Parameter table	4000-5999
Output a minimum	Parameter table	6000-7999
Output a maximum	Parameter table	8000-9999
Output b minimum	Parameter table	10000-11999
Output b maximum	Parameter table	12000-13999
Fail class minimum	Parameter table	14000-15999
Fail class maximum	Parameter table	16000-17999
Timers elapsed time	Parameter table	20000-21999

IMPORTANT: The maximum number of data queries is limited by the length of the actual table.

Function 15 (0Fhex) Write Multiple Flags, Function 5 (05hex) Write Single Flag

This function writes each flag (0 x references) in a sequence of flags to either ON or OFF.

Address Area for Writing of Status Flags		
Data to Request	**Table**	**Address Area**
Enable	Parameter table	2000-3999
Ack. alarm	Parameter table	6000-7999

Function 16 (10hex) Write Multiple Register, Function 6 (06hex) Write Single Register

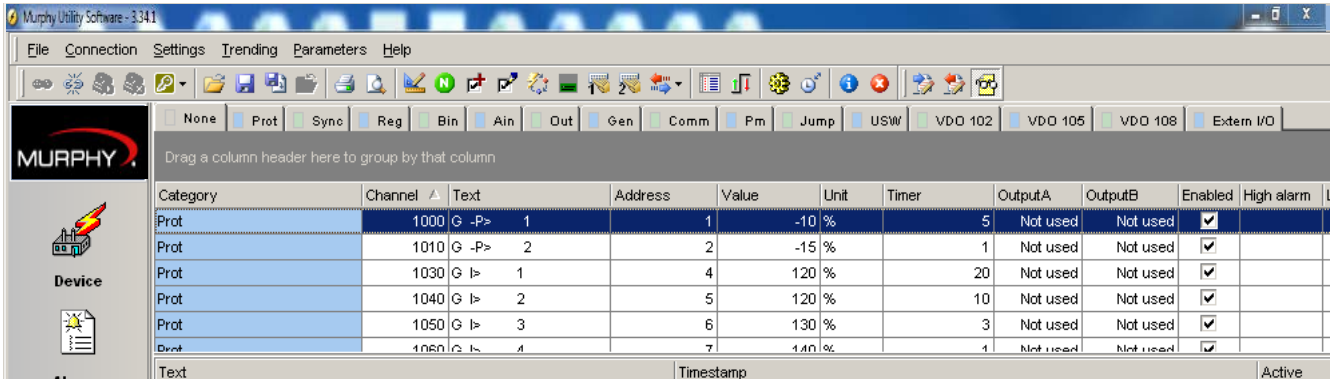
This function writes values into a sequence of registers.

Address Area for Writing of Registers		
Data to Request	**Table**	**Address Area**
Timers used	Parameter table	2000-3999
Values used	Parameter table	4000-4999
Output a	Parameter table	10000-11999
Output b	Parameter table	12000-13999
Fail class used	Parameter table	14000-15999
Enable	Parameter table	16000-17999
Inhibit	Parameter table	18000-19999

IMPORTANT: The maximum number of data queries is limited by the length of the actual table.

Parameters Addresses

Channel and Modbus address numbers can be found in the utility software parameter list for the unit in question.



Limitations

It is possible to write to channels where the option is not activated. It is not possible to enable the channel. E.g. if an attempt is made to write a ”1” to the enable flag, then the ”1” will be discarded, and the enable flag remains ”0”. It is not possible to write to offset address 0.

Examples

Write nominal frequency (6011), offset 258, 60Hz

ID = 1, 60Hz = 600Hz/10 = 0258h
Address 4000 + 258 = 4258d = 10A2h
Tx: 01h 10h 10h A2h 00h 01h 02h 02h 58h AEh 49h
Rx: 01h 10h 10h A2h 00h 01h A4h EBh

Read nominal frequency (6011) offset 258, 60Hz

Tx: 01h 03h 10h A2h 00h 01h 21h 28h
Rx: 01h 03h 02h 02h 58h B8h DEh
Read 0258h = 600d

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