WOODWARD

Using the proconX GCP-MG Communication Gateway with the GCP-30 and LS-4 Controls

Application Note 51306

WARNING—DANGER OF DEATH OR PERSONAL INJURY

WARNING—FOLLOW INSTRUCTIONS

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

WARNING—OUT-OF-DATE PUBLICATION

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, be sure to check the Woodward website:

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The revision level is shown at the bottom of the front cover after the publication number. The latest version of most publications is available at:

www.woodward.com/publications

If your publication is not there, please contact your customer service representative to get the latest copy.

WARNING—OVERSPEED PROTECTION

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

WARNING—PROPER USE

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

CAUTION—POSSIBLE DAMAGE TO EQUIPMENT OR PROPERTY

CAUTION—BATTERY CHARGING

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

CAUTION—ELECTROSTATIC DISCHARGE

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts.

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

IMPORTANT DEFINITIONS

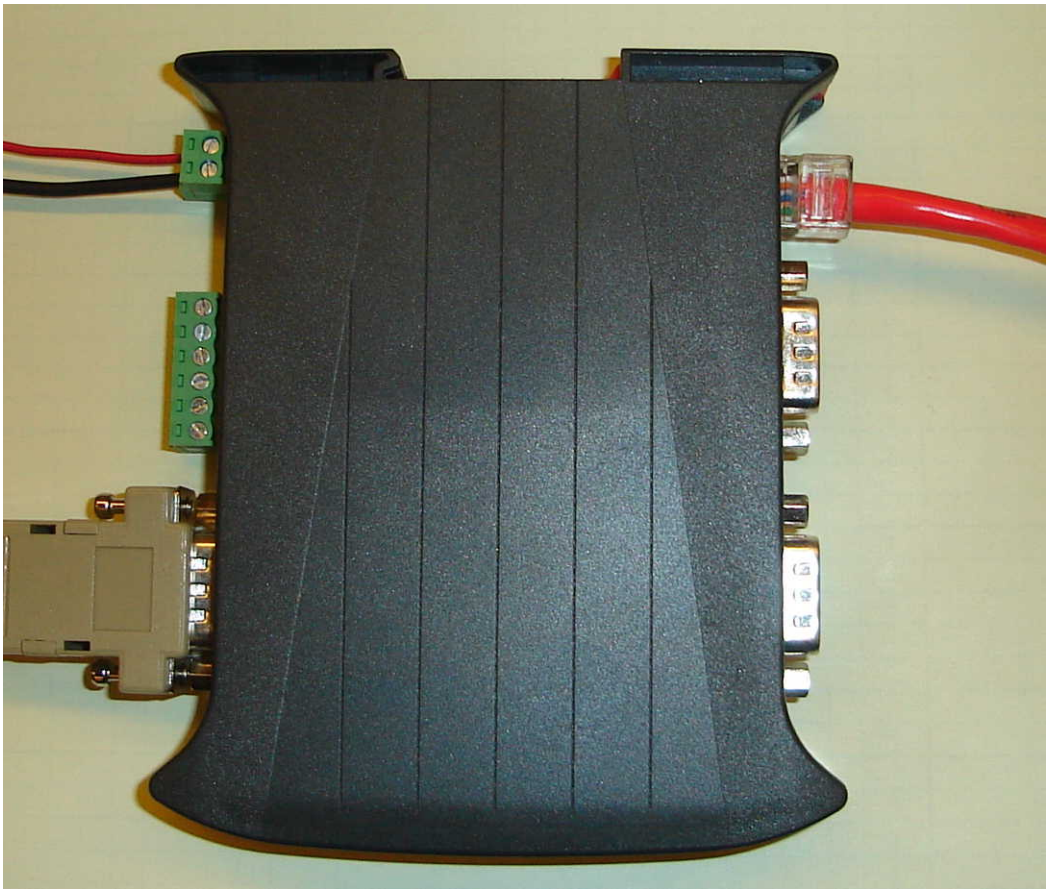
- **A WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**
- **A CAUTION indicates a potentially hazardous situation which, if not avoided, could result in damage to equipment or property.**
- **A NOTE provides other helpful information that does not fall under the warning or caution categories.**

Contents

Chapter 1.
Wiring Connections

Introduction

The GCP-MG from proconX was developed to communicate with the Woodward GCP-30 and LS-4 controls. This application note will discuss the details of using these three products. The GCP-MG takes communication from the Woodward CAN bus and converts this to a Modbus® * RTU protocol.



The GCP-MG offers an RS-232, RS-485, or TCP/IP port for Modbus communication.

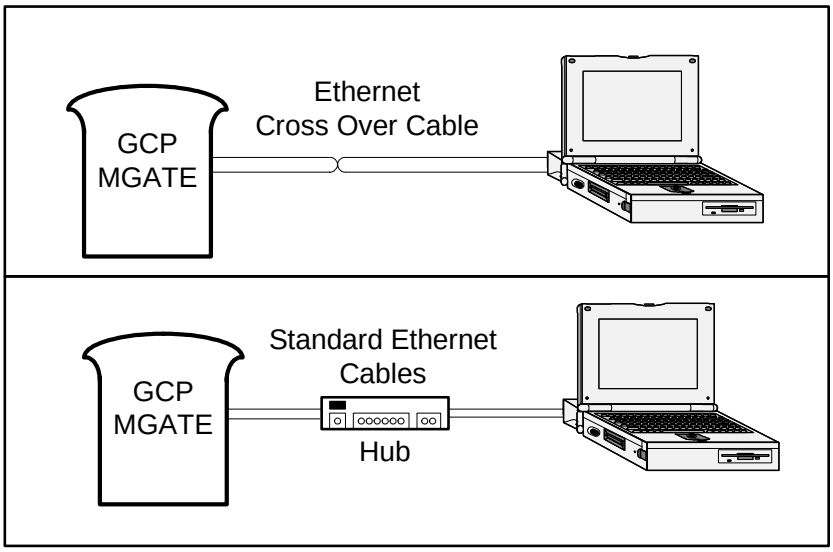
*—Modbus is a trademark of Schneider Automation Inc.

Purchasing the GCP-MG

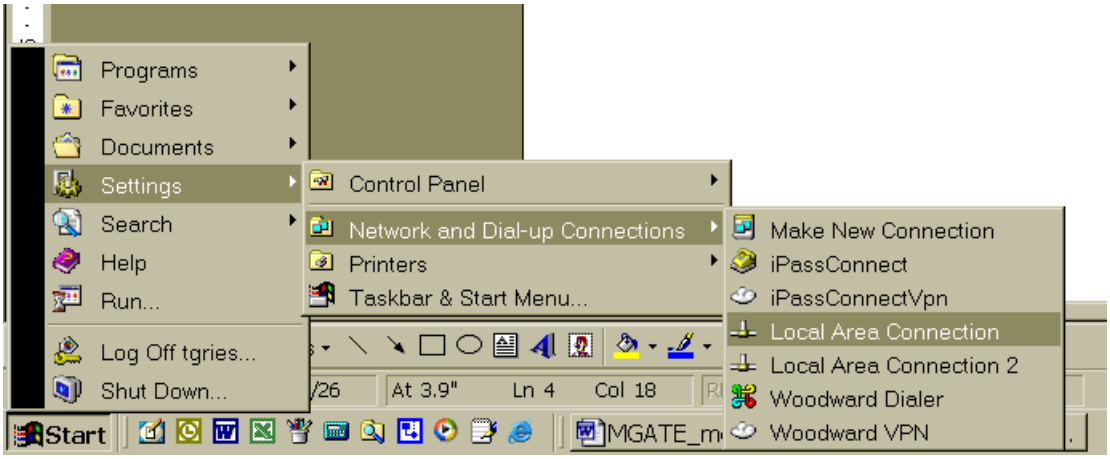
The GCP-MG can be easily purchased from the proconX website (**www.proconx.com**).

Setting up the GCP-MG

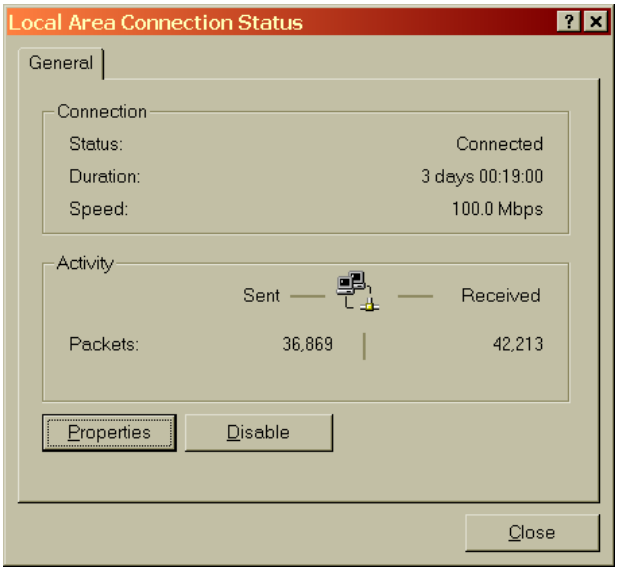
The GCP-MG uses its own web server for configuration. When the unit is shipped it has a default IP address of 169.254.0.10. Then using a PC a network link can be established to the GCP-MG. This can be done in two ways; either with an Ethernet cross-over cable or with a network hub. Some PC Ethernet cards can automatically detect Transmit and Receive lines, and can switch. So with some computers a standard Ethernet cable can be used as well.



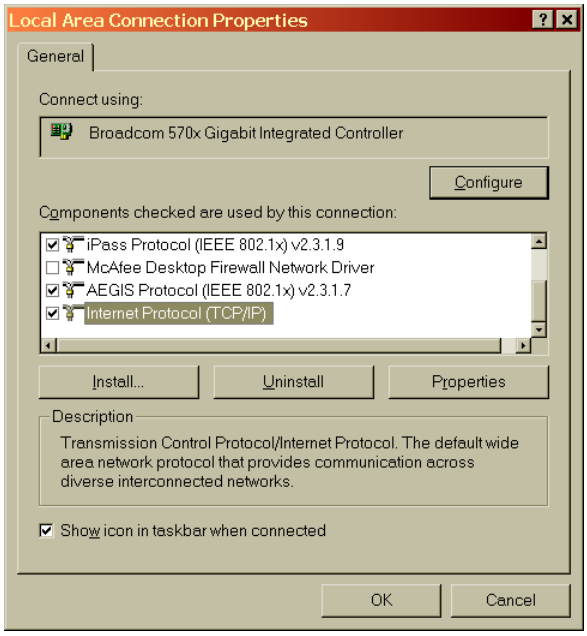
It also may be necessary to change the IP address of the PC in order to communicate with the Gateway. To change the PC address, go to the network and communication settings for the computer.



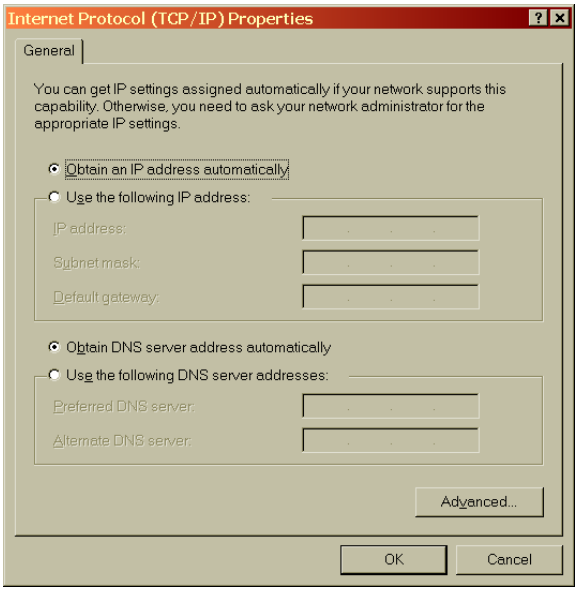
This should bring up a window that shows the network status.

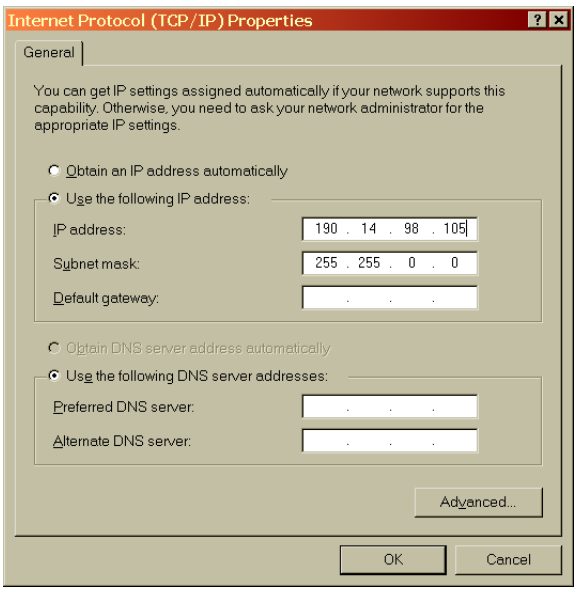


Click on the Properties button. Then highlight the Internet Protocol TCP/IP component.



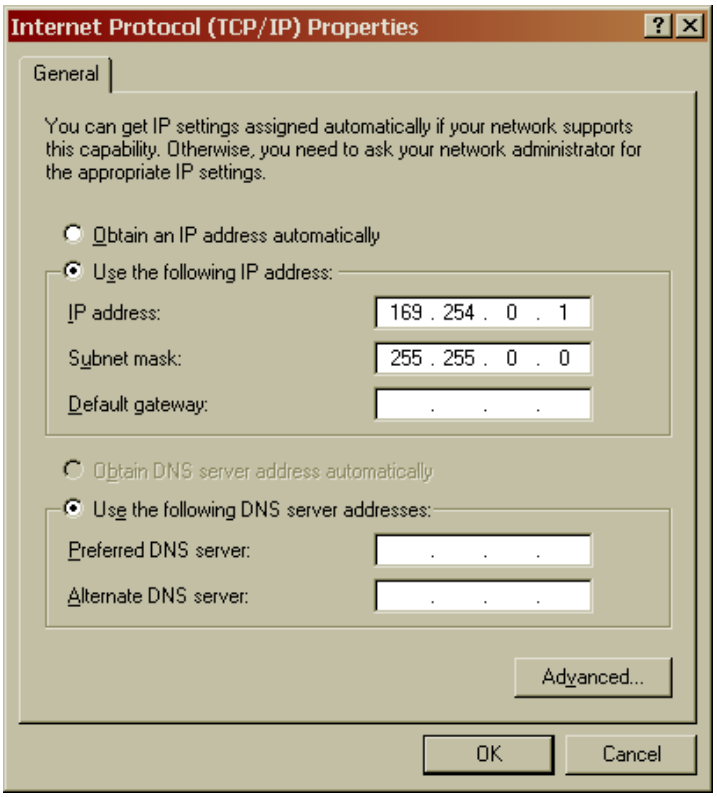
Now click on the Properties button. A window will come up where it is possible to change the IP address of the computer. One of these two screens will appear. Many business networks assign the computer an address when the user logs on, so the “Obtain an IP address automatically is used”. Otherwise a dedicated IP address will be shown, like on the right picture.



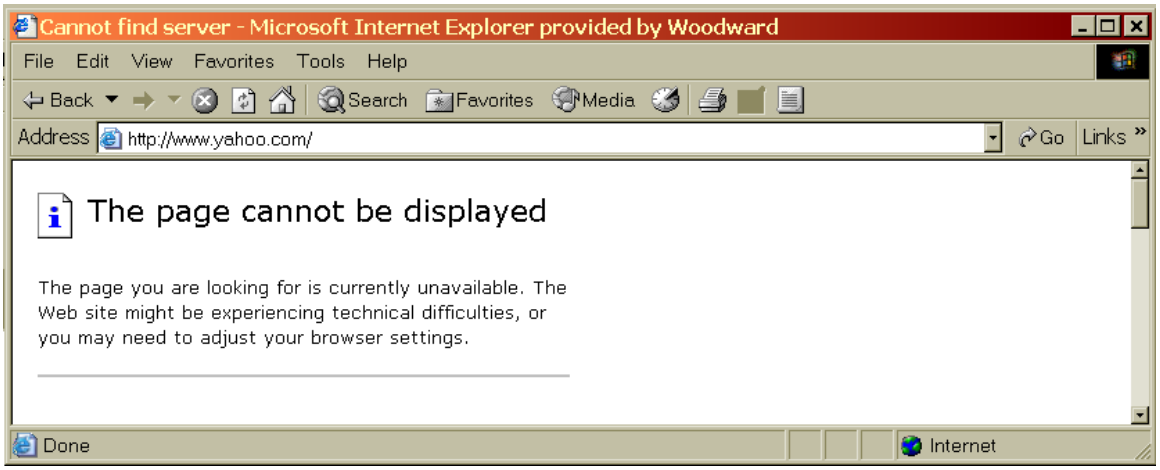


If there is an address already assigned here, be sure to write down these numbers. After the GCP-MG has been configured, the computer should be assigned back to the previous address so that the computer will work with any existing networks.

Change the IP address and Subnet mask to the following address



The next step is to run a web-browsing program like Internet Explorer.



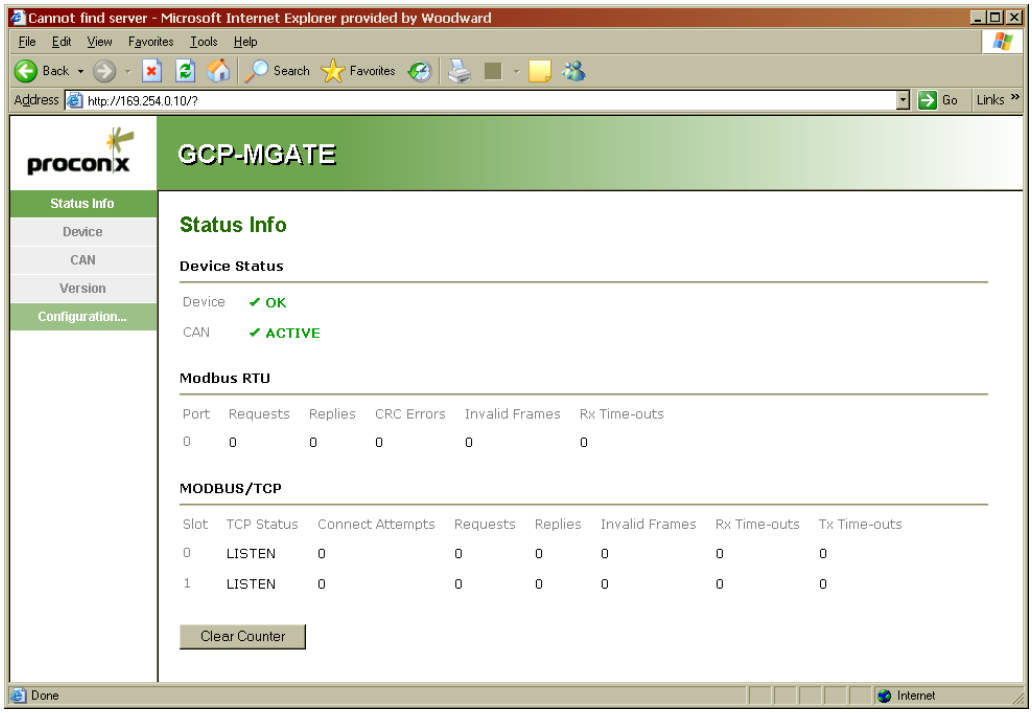
In the address bar type in the following command:
http://169.254.0.10

This should launch the web server of the GCP-MG.

If communication is not established, double check these items.

- The Ethernet cable being used is a cross over cable
- The IP address of the PC is correct.
- The GCP-MG is powered up and connected

GCP-MG Web Server Software

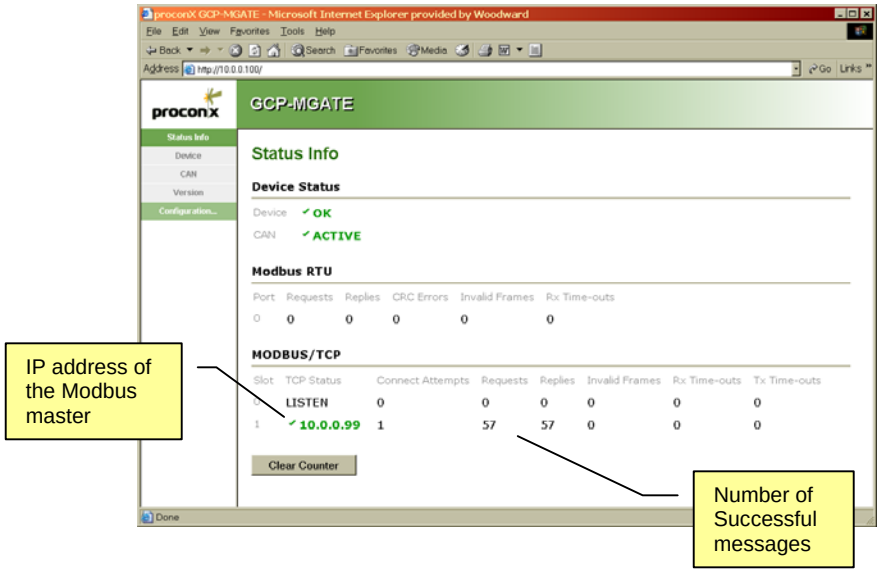


Once communication has been established between the GCP-MG and the computer, a web server page like this one above will be available.

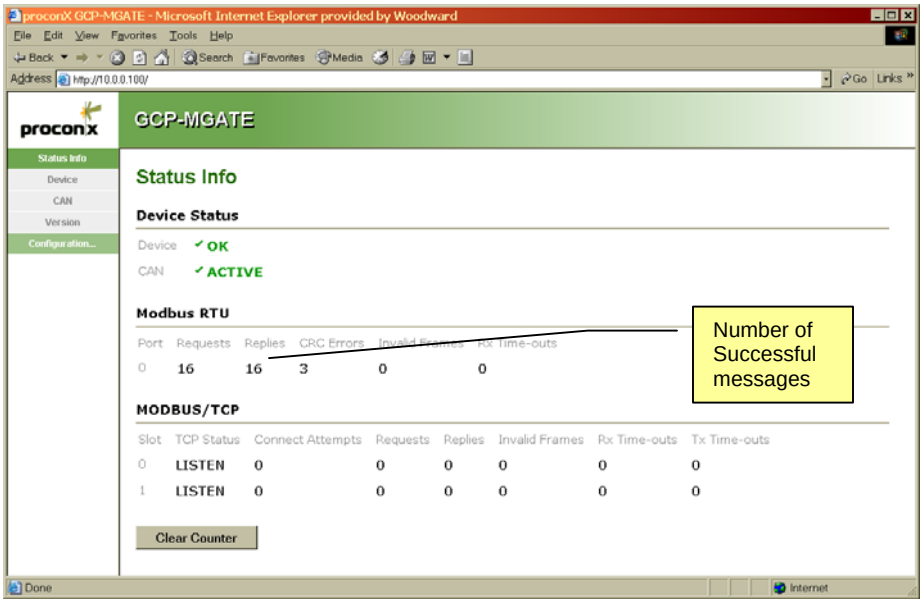
The Device, Can, and Version screens are display screens that show the data requests that are being made and which devices are communicating. Under the configuration TAB, the user can change the configuration like the Baud Rate, and the IP address of the GCP-MG.

Here are some examples of how the screen should look when it is communicating properly.

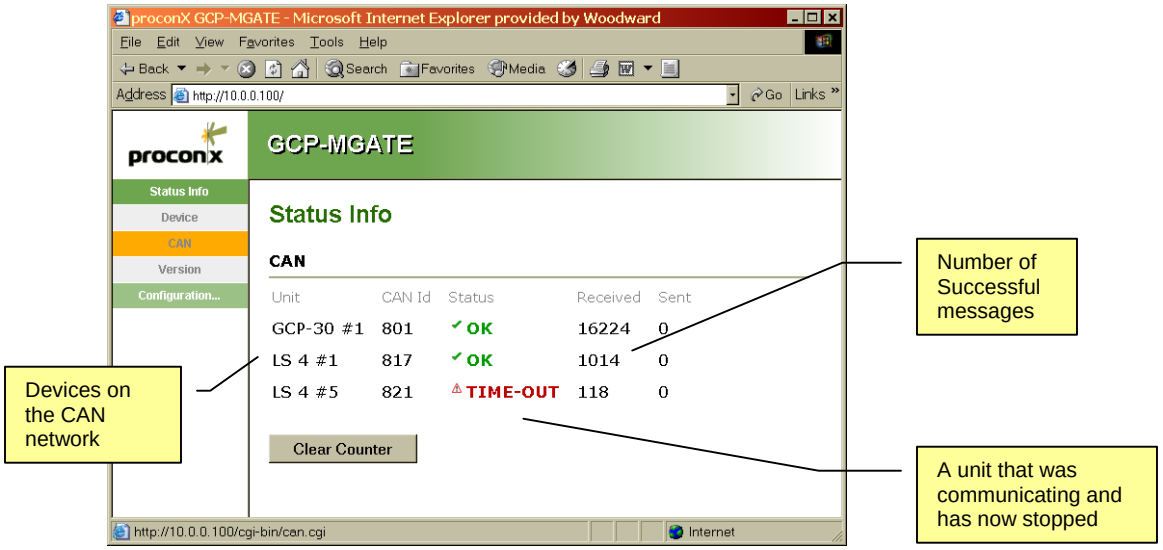
- The Device status info page, Using Modbus TCP/IP communication:



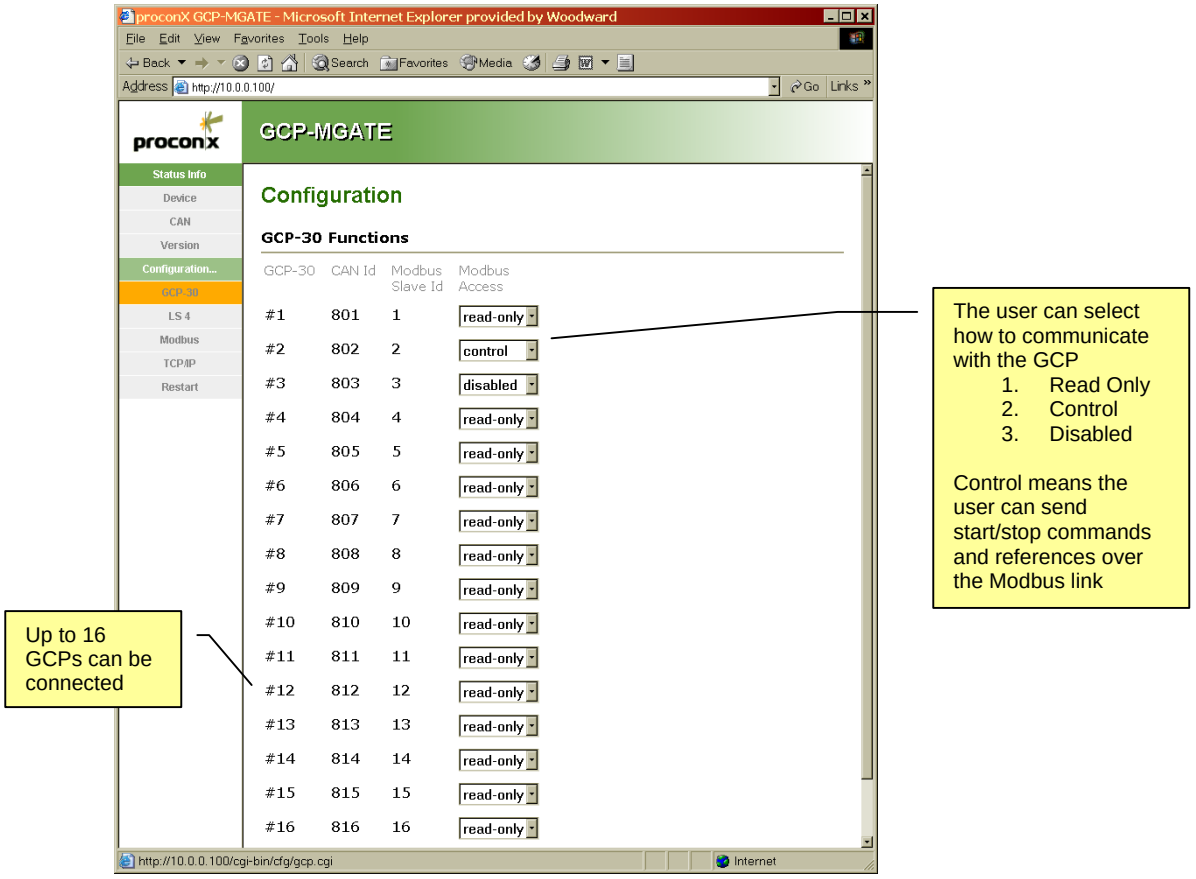
- The Device status info page, Using Modbus RTU Serial communication:



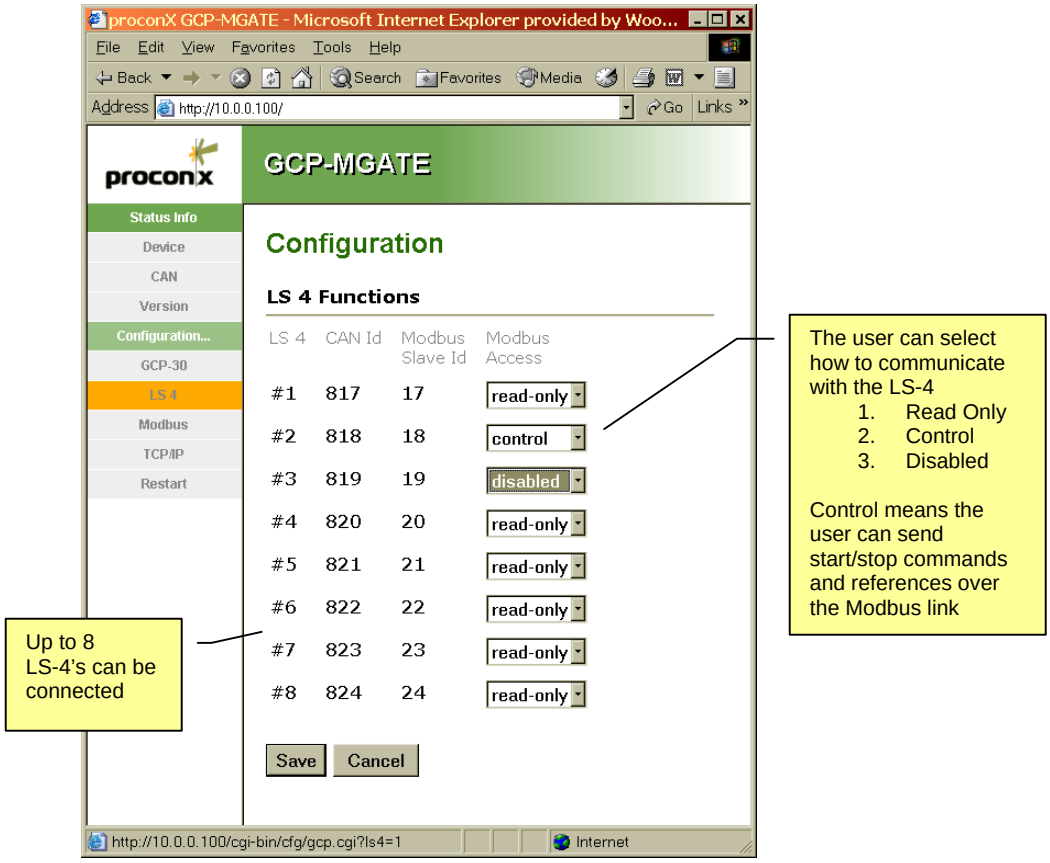
- The Can status info page:



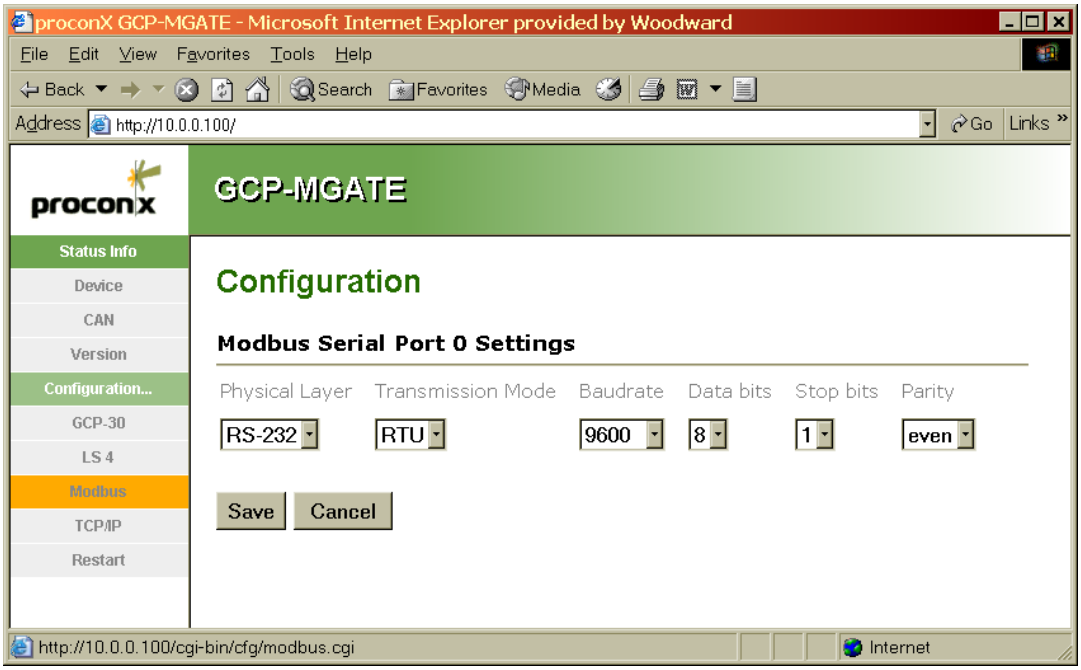
- The GCP-30 configuration page:



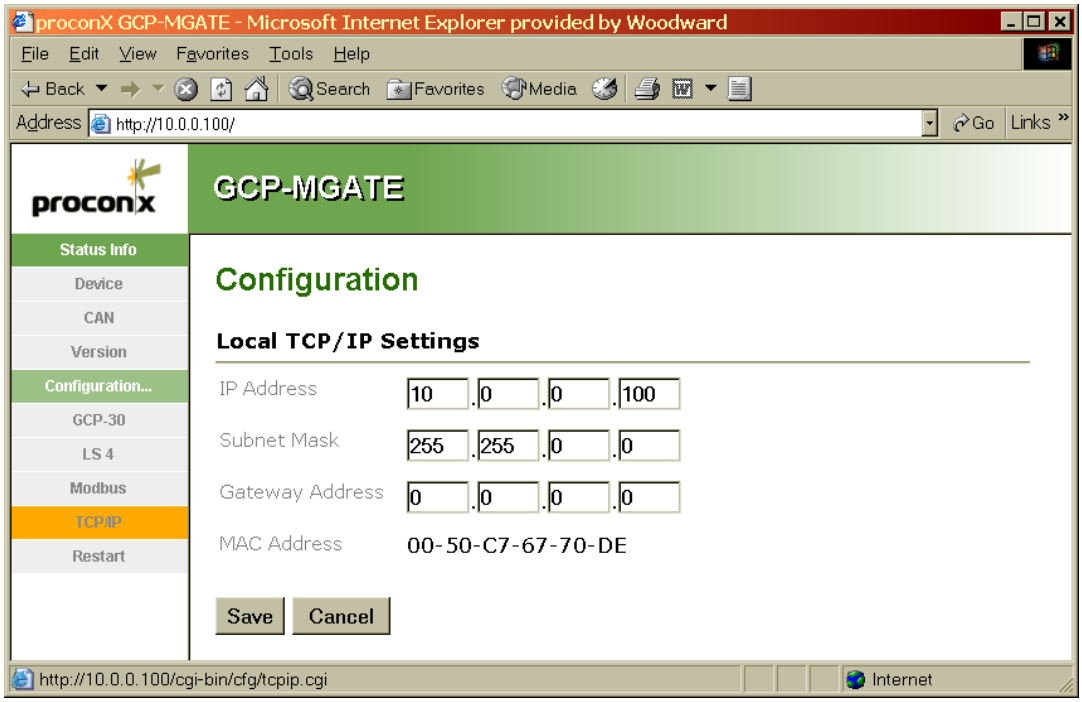
- LS-4 configuration page:



- Modbus Serial Configuration page:

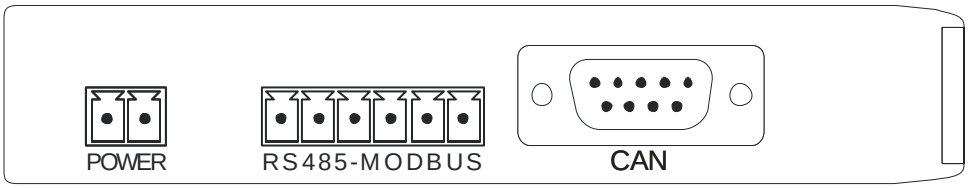


- TCP/IP Configuration page:

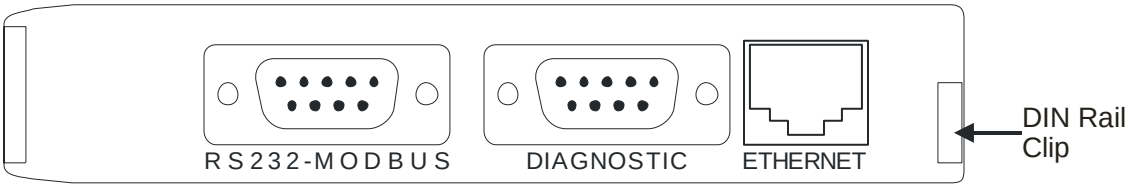


System Wiring

Connections for the GCP-MG



TOP VIEW



BOTTOM VIEW

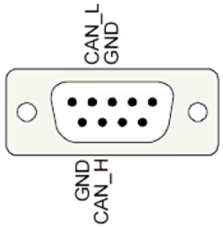
Power Supply Connection

POWER

Pin	Signal	Function
1	V+	Positive voltage supply (10 – 30 V DC)
2	V-	Negative voltage supply, ground

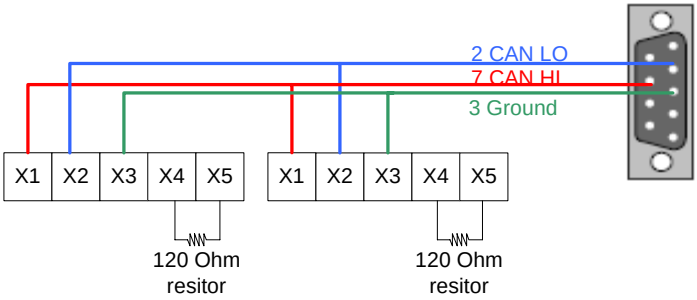
Warning: Make sure that the polarity of the supply voltage is correct before connecting any device to the serial and CAN ports! A wrong polarity can cause high currents on the ground plane between the V- power supply pin and the CAN port and serial port GND pins, which can cause damage to the module.

Can Connection



CAN

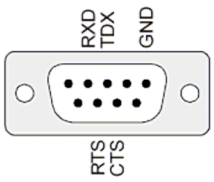
Pin	Signal	Description
1		(not connected)
2	CAN_L	CAN_L bus line
3	GND	CAN Ground
4		(not connected)
5		(not connected)
6	GND	Optional CAN Ground
7	CAN_H	CAN_H bus line
8		(not connected)
9		(not connected)
	FG	Connector shell is internally connected to ground



GCP-30 or LS-4 GCP-30 or LS-4 GCP-MGATE

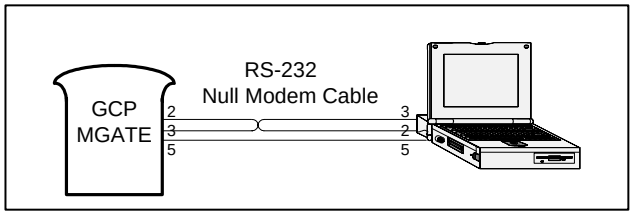
See Woodward GCP-30 manual 37364 for information about the CAN bus wiring.

RS-232 Serial Modbus Connection

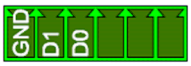


RS232
MODBUS

Pin	Signal	Function
1		(unused, must be left unconnected)
2	RXD	Received Data
3	TXD	Transmitted Data
4		(unused, must be left unconnected)
5	GND	Signal Ground
6		(unused, must be left unconnected)
7	RTS	Request to Send
8	CTS	Clear to Send
9		(unused, must be left unconnected)

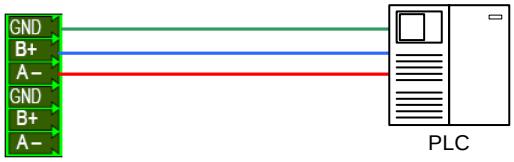


RS-485 Serial Modbus Connection J6



RS485-MODBUS

Pin	EIA-485 Name	Modbus Name	Function
1	C/C'	Common	Signal Common (GND)
2	B/B'	D1	Non-inverting Transceiver terminal 1 (RX/TX+)
3	A/A'	D0	Inverting Transceiver Terminal 0 (RX/TX-)
4			*(unused, must be left unconnected)*
5			*(unused, must be left unconnected)*
6			*(unused, must be left unconnected)*



Depending on the wire length, it may be necessary to add termination resistors to the network. Note that this guideline is provided by B&B electronics RS-422 RS-485 Application Note:

> For example, in a system with 2000 feet (600 m) of data line, the propagation delay can be calculated by multiplying the cable length by the propagation velocity of the cable. This value, typically 66 to 75% of the speed of light (c), is specified by the cable manufacturer.
>
> For our example, a round trip covers 4000 feet (1200 m) of cable. Using a propagation velocity of 0.66 × c, one round trip is completed in approximately 6.2 µs. If we assume the reflections will damp out in three “round trips” up and down the cable length, the signal will stabilize 18.6 µs after the leading edge of a bit. At 9600 baud, one bit is 104 µs wide. Since the reflections are damped out much before the center of the bit, termination is not required.

So, for a 9600-baud network, termination would not be required for up to 2000 feet (600 m) provided that a proper communication cable is used. Typical resistance values are 120 Ω across the A and B lines.

Chapter 2.
Modbus® Communications

GCP-MG Addressing

Each control on the CAN bus will have its own unique Modbus device number. The device number is the same as the unit address.

	Modbus Device No.	Modbus Read Addresses	Modbus Write Addresses	Typical Can ID addresses
GCP 1	1	30001-30070	40001-40003	801
GCP 2	2	30001-30070	40001-40003	802
GCP 3	3	30001-30070	40001-40003	803
GCP 4	4	30001-30070	40001-40003	804
GCP 5	5	30001-30070	40001-40003	805
GCP 6	6	30001-30070	40001-40003	806
GCP 7	7	30001-30070	40001-40003	807
GCP 8	8	30001-30070	40001-40003	808
GCP 9	9	30001-30070	40001-40003	809
GCP 10	10	30001-30070	40001-40003	810
GCP 11	11	30001-30070	40001-40003	811
GCP 12	12	30001-30070	40001-40003	812
GCP 13	13	30001-30070	40001-40003	813
GCP 14	14	30001-30070	40001-40003	814
GCP 15	15	30001-30070	40001-40003	815
GCP 16	16	30001-30070	40001-40003	816
LS-4 1	17	30001-30029	40001	817
LS-4 2	18	30001-30029	40001	818
LS-4 3	19	30001-30029	40001	819
LS-4 4	20	30001-30029	40001	820
LS-4 5	21	30001-30029	40001	821
LS-4 6	22	30001-30029	40001	822
LS-4 7	23	30001-30029	40001	823
LS-4 8	24	30001-30029	40001	824

There is one exception to this. Certain GCP-31's and 32's will have more than 70 Modbus addresses. These are the units that communicate with the Engine Control Modules. For these units, The Modbus address range is expanded to 30001-30100.

Woodward Control part numbers that have additional addresses:

- GCP-31 / XPQ+SC10 8440-1560 and 8440-1561
- GCP-31 / XPQ+SB03 8440-1562 and 8440-1563
- GCP-32 / XPQ+SC10 8440-1576 and 8440-1577
- GCP-32 / XPQ+SB03 8440-1578 and 8440-1579

A single GCP-MG would be able to communicate with up to 24 devices. The GCP-MG will support Modbus commands 03, 04, 06, and 16.

The GCP-MG uses only analog data variables; there are no Booleans. All variables are **signed integers**.

GCP-30 Modbus List

This list shows the addresses for the standard GCP-30.

Address	Description	Multiplier	Units
30002	Generator voltage phase A to B	x10^gen_volt_exp	Vac
30003	Generator frequency	x 100	Hz
30004	Generator real power	x10^gen_kW_exp	W
30005	Generator kW and Volt exponent		
30006	Generator kW setpoint		W
30007	Generator conversion step factor - kW		
30008	Bus voltage A to B	x10^bus_volt_exp	Vac
30009	Mains voltage A to B	x10^main_volt_exp	Vac
30010	Multiplexed alarm class status		
30011	Multiplexed Discrete Input status		
30012	Mains real power	x10^main_kw_exp	W
30013	Multiplexed Alarms Acknowledged		
30014	Multiplexed IKD inputs group 1		
30015	Multiplexed alarms group 6		
30016	Generator voltage phase B to C	x10^gen_volt_exp	Vac
30017	Generator voltage phase C to A	x10^gen_volt_exp	Vac
30018	Generator voltage phase A to N	x10^gen_volt_exp	Vac
30019	Generator voltage phase B to N	x10^gen_volt_exp	Vac
30020	Generator voltage phase C to N	x10^gen_volt_exp	Vac
30021	Generator frequency based on MPU	x256	Hz
30022	Generator speed (RPM) based on MPU		RPM
30023	Generator current phase A	x10^gen_amp_exp	AMPS
30024	Generator current phase B	x10^gen_amp_exp	AMPS
30025	Generator current phase C	x10^gen_amp_exp	AMPS
30026	Generator reactive power	x10^gen_kW_exp	VAR
30027	Generator power factor	x 100	
30028	Reserve Power remaining		kW
30029	System real power		kW
30030	Active number of Can Nodes		
30031	Status of Gen and Mains Bus		
30032	Generator Current Exponent		
30033	Bus Frequency	x 100	Hz
30034	Status of Bus		
30035	Mains voltage B to C	x10^main_volt_exp	Vac
30036	Mains voltage C to A	x10^main_volt_exp	Vac
30037	Mains voltage A to N	x10^main_volt_exp	Vac
30038	Mains voltage B to N	x10^main_volt_exp	Vac
30039	Mains voltage C to N	x10^main_volt_exp	Vac
30040	Mains frequency	x 100	Hz
30041	Mains Amps phase A	x10^main_amp_exp	Amps
30042	Mains reactive power	x10^main_kw_exp	VAR
30043	Mains Power Factor	x 100	
30044	Mains power and voltage exponents		
30045	Mains current and bus voltage exponents		
30046	Engine Running Hours High Word	X 65,536	Hr

30047	Engine Running Hours Low Word		Hr
30048	Engine Service Hours Remaining		Hr
30049	Engine Number of Starts		
30050	Multiplexed Operating Mode		
30051	Gen kW Hours High Word	X 65,536	kWh
30052	Gen kW Hours Low Word		kWh
30053	Battery Voltage	x 10	Vdc
30054	Multiplexed Alarm group 1		
30055	Multiplexed Alarm group 2		
30056	Multiplexed Alarm group 3		
30057	Multiplexed Alarm group 4		
30058	Multiplexed Alarm group 5		
30059	Multiplexed Digital Inputs group 1		
30060	Multiplexed Digital Inputs group 2		
30061	Multiplexed Alarms group 7		
30062	Analog Input 1 value		
30063	Analog Input 2 value		
30064	Analog Input 3 value		
30065	Analog Input 4 value		
30066	Analog Input 5 value		
30067	Analog Input 6 value		
30068	Analog Input 7 value		
30069	Multiplexed IKD inputs group 2		
30070	Generator State Special Display		
40001	Power Setpoint Command		kW
40002	Power Factor Setpoint Command		
40003	Unit Control Command		

Explanation of Variables

Multiplication Factors

The Modbus RTU protocol is limited in sending numbers that are integers. It does not handle decimal points. For certain registers, like frequency for example, a multiplication factor is used. For example if the generator frequency were 59.87 Hz. This number is multiplied by 100 to become 5987 and then it is transmitted over Modbus. On the SCADA end, this number must be divided by 100 to get the correct value.

The Modbus protocol is also limited to numbers no greater than 32,767. This can create a couple of problems. The first is how to handle the difference between kilowatts and megawatts. The second is what to do with numbers like kW hours or engine run hours that may grow bigger than 32,767.

The Multiplication Exponents are used to compensate for these differences in large numbers. Address 30005 contains the exponent for both the power registers and the voltage registers. To explain this, let's look at a typical generator configuration where the generator is carrying 100 kW and operating at 480 Vac. The value of address 30005 would be 768, which doesn't seem to make a lot of sense at first glance. However, it needs to be understood that Modbus uses Hexadecimal numbers instead of the typical base 10 decimal numbers. If we convert 768 to Hex we get the number 300. Address 30005 contains two pieces of information the Power exponent and the voltage exponent so for this example the power exponent is 3 and the voltage exponent is 0.

Address 30005	Power Exponent	Voltage Exponent
768 = 0300 Hex	03	00

So the value that is transmitted for address 30002 which is phase A to B voltage is going to be

value x 10 ^ gen_volt_exp 480 X 10 ^ 0 = 480 V.

The value that is transmitted for address 30004, the real power is going to be

Value x 10 ^ gen_kw_exp 100 x 10 ^ 3 = 100,000 W. or 100 kW.

Some more examples of the power and voltage exponents.

Actual readings		30002	30004	30005 Dec	30005 Hex	Power Exponent	Voltage Exponent
120 V	5 kW	120	50	512	200	2	0
480 V	50 kW	480	50	768	300	3	0
480 V	3000 kW	480	3000	768	300	3	0
4160 V	100 kW	416	100	769	301	3	1
12,470 V	10.0 MW	1247	100	1281	501	5	1

There are five Exponents used for these calculations:

- 30005 Generator Power and Generator Voltage
- 30032 Generator Current
- 30044 Mains Power and Mains Voltage
- 30045 Mains Current and Bus Voltage

NOTE

These exponents are determined by the Rated voltage, power, and current settings in the Measuring menu of the GCP and do not change during operation. Therefore, it is probably not necessary to monitor these addresses. Instead the proper multipliers can be determined as was done in the previous example and table.

Extended Numbers

For the engine running hours and kW hours, it is likely that these numbers will accumulate to more than 65,536, so to handle this situation two addresses are used. For the running hours this is address 30046 and 30047. For the kW hours this is address 30051 and 30052. Every time 65,536 hours is completed address 30046 or 30051 will increase by one. The following example explains this further.

Address 30046	Address 30047	Calculation	Running hours total
2	23045	2 x 65536 + 23045	154,117

Power Factor

Addresses 30027 and 30043 are the generator and mains power factor addresses. For unity power factor the value will read 100. A leading (capacitive) power factor will be negative, and a lagging (inductive) power factor will be positive.

- .84 leading power factor = –84
- .94 lagging power factor = 94
- 1.0 power factor = 100

Frequency and Voltage Status

Addresses 30031 and 30034 are used to determine if the voltage and frequency of the generator, bus, and mains are within range (between the high and low alarm levels).

Address 30031 has four possibilities

Gen Volt and Freq	Mains Volt and Freq	Value of 30031
Out of Range	Out of Range	0
Out of Range	In Range	-256
In Range	Out of Range	255
In Range	In Range	-1

Address 30034 has two possibilities

Bus Volt and Freq	Value of 30034
Out of Range	0
In Range	-256

Modbus Data Packets

All of the Modbus addresses of the GCP-MG are analog values, including several special addresses that contain the actual Boolean (True or False) information. A quick lesson on Binary numbers will help to explain how these variables are used.

It was mentioned earlier that Modbus communicates in Hexadecimal numbers and the largest of these is 32,767. Modbus will send 4 digits for each address. It is possible to represent each one of these Hexadecimal digits with a group of 4 binary digits. These are the actual 1's and 0's that are transmitted between the PC and the GCP-MG. These are the data bits. Notice in the Binary numbers below that all of the positive numbers start with a zero and all the negative numbers start with a 1. This first bit is called the sign bit and it determines whether a number is positive or negative. That also explains why the biggest number we can use is one less than 2^15, which is 32,768.

Hex	Decimal	Binary
0000	0	0000 0000 0000 0000
0001	1	0000 0000 0000 0001
000A	10	0000 0000 0000 1010
0064	100	0000 0000 1100 0100
03E8	1000	0000 0011 1110 1000
1111	4369	0001 0001 0001 0001
2710	10,000	0010 0111 0001 0000
7FFF	32,767	0111 1111 1111 1111
8000	–32,767	1000 0000 0000 0000
9999	–26,215	1001 1001 1001 1001
A000	–24,576	1010 0000 0000 0000
B000	–20,480	1011 0000 0000 0000
D8F0	–10,000	1101 1000 1111 0000
FC18	–1000	1111 1100 0001 1000
FFF6	–10	1111 1111 1111 0110
FFFF	–1	1111 1111 1111 1111

Multiplexed Variables

Understanding how a Modbus address can be represented as a Binary number will help explain how the GCP-30 handles True/False data like the status of the circuit breaker. In each Modbus number there are 16 bits, that can be set to either zero or one. It would be possible then to use each of those bits to represent a different True/False Item. This is how the GCP handles this type of data.

For about half of the True/False type information the GCP actually uses two bits and they will both be 1 or both be 0. Depending on the Modbus software that is being used, it may not be necessary to monitor both bits.

Looking at address 30010, this address is used to show what level of alarm has occurred and whether or not that alarm has been acknowledged

Address	Bit	Function
30010 Alarm Level and Status	1	Alarm Class 0 active
	2	Alarm Class 0 active
	3	Alarm Class 1 active
	4	Alarm Class 1 active
	5	Alarm Class 2 active
	6	Alarm Class 2 active
	7	Alarm Class 3 active
	8	Alarm Class 3 active
	9	Not Used
	10	Not Used
	11	Alarm is not Acknowledged
	12	Alarm is not Acknowledged
	13	Alarm is a shutdown (class 2 or 3)
	14	Alarm is a shutdown (class 2 or 3)
	15	Alarm has been Acknowledged but not Cleared
	16	Alarm has been Acknowledged but not Cleared

So for example if a Fault Class 0 alarm occurred, then the value of address 30010 would be 3.

Hex	**Decimal**	**Binary**
0003	3	0000 0000 0000 0011

Bits 1 and 2 will be 1 and all the others will be zero.

Here are some of the other possibilities for address 30010:

Alarm State	Decimal	Hex	Binary
No alarms	0	0000	0000 0000 0000 0000
Alarm Class 0	3	0003	0000 0000 0000 0011
Alarm Class 1	3084	C0C	0000 1100 0000 1100
Alarm Class 1 Acknowledged	-16,372	C00C	1100 0000 0000 1100
Alarm Class 2	15,408	3C30	0011 1100 0011 0000
Alarm Class 2 Acknowledged	-4048	F030	1111 0000 0011 0000
Alarm Class 3	15,552	3CC0	0011 1100 1100 0000
Alarm Class 3 Acknowledged	-3904	F0C0	1111 0000 1100 0000

Some of the states not shown would be if there were multiple alarms with different classes occurring at the same time.

Typically the Modbus software being used will be able to separate these values into their individual bits. It is not necessary to read the decimal value and try to convert this.

Multiplexed Variable List

Address	Bit	Function
30010 Alarm Level and Status	1	Alarm Class 0 active
	2	Alarm Class 0 active
	3	Alarm Class 1 active
	4	Alarm Class 1 active
	5	Alarm Class 2 active
	6	Alarm Class 2 active
	7	Alarm Class 3 active
	8	Alarm Class 3 active
	9	Not Used
	10	Not Used
	11	Alarm is not Acknowledged
	12	Alarm is not Acknowledged
	13	Alarm is a shutdown (class 2 or 3)
	14	Alarm is a shutdown (class 2 or 3)
	15	Alarm has been Acknowledged but not Cleared
	16	Alarm has been Acknowledged but not Cleared

Address	Bit	Function
30011 Discrete Input status	1	Unload kW level not reached
	2	Unload kW level reached (bit 2 always opposite of bit 1)
	3	Terminal 6 is high
	4	Terminal 6 is high
	5	Mains Circuit Breaker is Closed
	6	Mains Circuit Breaker is Closed
	7	Generator Circuit Breaker is Closed
	8	Generator Circuit Breaker is Closed
	9	Enable MCB (terminal 53) is high
	10	Enable MCB (terminal 53) is high
	11	Not Used
	12	Not Used
	13	Power Setpoint 2 (terminal 5) is selected
	14	Power Setpoint 2 (terminal 5) is selected
	15	Power Setpoint 1 (terminal 3) is selected
	16	Power Setpoint 1 (terminal 3) is selected

Address	Bit	Function
30013 Alarm class Acknowledged and engine started	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Not Used
	8	Not Used
	9	Alarm Class 1 Acknowledged
	10	Alarm Class 1 Acknowledged
	11	Alarm Class 2 or 3 Acknowledged
	12	Alarm Class 2 or 3 Acknowledged
	13	Not Used
	14	Not Used
	15	Engine Started and breaker closed
	16	Engine Started and breaker closed

Address	Bit	Function
30014 Remote Alarm Status For IKD Module	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Not Used
	8	Not Used
	9	IKD 1 module discrete in 1 High
	10	IKD 1 module discrete in 2 High
	11	IKD 1 module discrete in 3 High
	12	IKD 1 module discrete in 4 High
	13	IKD 1 module discrete in 5 High
	14	IKD 1 module discrete in 6 High
	15	IKD 1 module discrete in 7 High
	16	IKD 1 module discrete in 8 High

Address	Bit	Function
30015 Alarm Group 6	1	Analog Input 1 Out of Range
	2	Analog Input 2 Out of Range
	3	Analog Input 3 Out of Range
	4	Analog Input 4 Out of Range
	5	Analog Input 5 Out of Range
	6	Analog Input 6 Out of Range
	7	Analog Input 7 Out of Range
	8	Analog Input 8 Out of Range
	9	Gen Circuit Breaker Sync Timeout
	10	Mains Circuit Breaker Sync Timeout
	11	Gen Circuit Breaker Fail to Open
	12	Mains Circuit Breaker Fail to Open
	13	Not Used
	14	Gen Circuit Breaker Delay elapsed for Dead Bus Close
	15	Engine Fail to Stop
	16	Speed / Frequency Mismatch

Address	Bit	Function
30050 Operating Mode	1	Not Used
	2	Not Used
	3	Engine Spindown (coasting) completed
	4	Engine Spindown (coasting) completed
	5	Engine Protection (monitoring) is Active
	6	Engine Protection (monitoring) is Active
	7	Emergency Power is Off
	8	Emergency Power is On (8 is always opposite of 7)
	9	Not Used
	10	Not Used
	11	Not Used
	12	Operating Mode is Automatic
	13	Operating Mode is Manual
	14	Operating Mode is Test
	15	Operating Mode is Stop
	16	Operating Mode is Test with load (breaker closed)

Address	Bit	Function
30054 Alarm Group 1	1	Gen Reverse Power
	2	Gen Reverse Power
	3	Gen Overload
	4	Gen Overload
	5	Battery Undervoltage
	6	Battery Undervoltage
	7	Not Used
	8	Not Used
	9	Gen Undervoltage
	10	Gen Undervoltage
	11	Gen Overvoltage
	12	Gen Overvoltage
	13	Gen Underfrequency
	14	Gen Underfrequency
	15	Gen Overfrequency
	16	Gen Overfrequency

Address	Bit	Function
30055 Alarm Group 2	1	Mains Phase/Vector Jump
	2	Mains Phase/Vector Jump
	3	Df/dt fault
	4	Df/dt fault
	5	Not Used
	6	Not Used
	7	Communication Interface X1..X5 Fault
	8	Communication Interface X1..X5 Fault
	9	Mains Undervoltage
	10	Mains Undervoltage
	11	Mains Overvoltage
	12	Mains Overvoltage
	13	Mains Underfrequency
	14	Mains Underfrequency
	15	Mains Overfrequency
	16	Mains Overfrequency

Address	Bit	Function
30056 Alarm Group 3	1	Engine Start Failure
	2	Engine Start Failure
	3	Service Hours Elapsed
	4	Service Hours Elapsed
	5	Communication Interface Y1..Y5 Fault
	6	Communication Interface Y1..Y5 Fault
	7	Gen Overcurrent Level 1
	8	Gen Overcurrent Level 1
	9	Gen Load Imbalance
	10	Gen Load Imbalance
	11	Zero Power Import Not Reached
	12	Zero Power Import Not Reached
	13	Gen Overspeed
	14	Gen Overspeed
	15	Gen Overcurrent Level 2
	16	Gen Overcurrent Level 2

Address	Bit	Function
30057 Alarm Group 4	1	Analog Input 4 reached Level 2 threshold
	2	Analog Input 4 reached Level 2 threshold
	3	Analog Input 4 reached Level 1 threshold
	4	Analog Input 4 reached Level 1 threshold
	5	Analog Input 3 reached Level 2 threshold
	6	Analog Input 3 reached Level 2 threshold
	7	Analog Input 3 reached Level 1 threshold
	8	Analog Input 3 reached Level 1 threshold
	9	Analog Input 2 reached Level 2 threshold
	10	Analog Input 2 reached Level 2 threshold
	11	Analog Input 2 reached Level 1 threshold
	12	Analog Input 2 reached Level 1 threshold
	13	Analog Input 1 reached Level 2 threshold
	14	Analog Input 1 reached Level 2 threshold
	15	Analog Input 1 reached Level 1 threshold
	16	Analog Input 1 reached Level 1 threshold

Address	Bit	Function
30058 Alarm Group 5	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Analog Input 7 reached Level 2 threshold
	6	Analog Input 7 reached Level 2 threshold
	7	Analog Input 7 reached Level 1 threshold
	8	Analog Input 7 reached Level 1 threshold
	9	Analog Input 6 reached Level 2 threshold
	10	Analog Input 6 reached Level 2 threshold
	11	Analog Input 6 reached Level 1 threshold
	12	Analog Input 6 reached Level 1 threshold
	13	Analog Input 5 reached Level 2 threshold
	14	Analog Input 5 reached Level 2 threshold
	15	Analog Input 5 reached Level 1 threshold
	16	Analog Input 5 reached Level 1 threshold

Address	Bit	Function
30059 Configurable Discrete Input Status Group 1	1	Discrete Input 8 is High
	2	Discrete Input 8 is High
	3	Discrete Input 7 is High
	4	Discrete Input 7 is High
	5	Discrete Input 6 is High
	6	Discrete Input 6 is High
	7	Discrete Input 5 is High
	8	Discrete Input 5 is High
	9	Discrete Input 4 is High
	10	Discrete Input 4 is High
	11	Discrete Input 3 is High
	12	Discrete Input 3 is High
	13	Discrete Input 2 is High
	14	Discrete Input 2 is High
	15	Discrete Input 1 is High
	16	Discrete Input 1 is High

Address	Bit	Function
30060 Configurable Discrete Input Status Group 2	1	Discrete Input 16 is High
	2	Discrete Input 16 is High
	3	Discrete Input 15 is High
	4	Discrete Input 15 is High
	5	Discrete Input 14 is High
	6	Discrete Input 14 is High
	7	Discrete Input 13 is High
	8	Discrete Input 13 is High
	9	Discrete Input 12 is High
	10	Discrete Input 12 is High
	11	Discrete Input 11 is High
	12	Discrete Input 11 is High
	13	Discrete Input 10 is High
	14	Discrete Input 10 is High
	15	Discrete Input 9 is High
	16	Discrete Input 9 is High

Address	Bit	Function
30061 Alarm Group 7	1	Immediate Stop
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Gen Circuit Breaker Fail to Close
	8	Mains Circuit Breaker Fail to Close
	9	Not Used
	10	Not Used
	11	Not Used
	12	Not Used
	13	Not Used
	14	Not Used
	15	Not Used
	16	Not Used

Address	Bit	Function
30069 Remote Alarm Status For IKD Module Group 2	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Not Used
	8	Not Used
	9	IKD 2 module discrete in 1 High
	10	IKD 2 module discrete in 2 High
	11	IKD 2 module discrete in 3 High
	12	IKD 2 module discrete in 4 High
	13	IKD 2 module discrete in 5 High
	14	IKD 2 module discrete in 6 High
	15	IKD 2 module discrete in 7 High
	16	IKD 2 module discrete in 8 High

Message on the GCP Display

Address 30070 is a special variable that represents the text messages that appear on the GCP display. There are 49 possible messages, shown in the following table.

Number	Display Text
0	GCB synchronization
1	MCB synchronization
2	GCB dead bus start
3	MCB dead bus start
4	Crank
5	Start pause
6	Cool down 000s (000s: the remaining time is displayed)
7	Engine stop!
8	Preglow
9	Purging operation
10	Initial state
11	Auxiliary prerun
12	Auxiliary postrun
13	Mains settling 000s (000s: the remaining time is displayed)
14	Lambda initial state
15	Sprinkler coasting
16	Ignition
17	--Internal--
18	--Internal--
19	--Internal--
20	--Internal--
21	--Internal--
22	--Internal--
23	--Internal--
24	Phase rotation incorrect!
25	Start without closing GCB and simultaneous emergency power
26	Start without closing GCB
27	Sprinkler operation (critical mode) and simultaneous emergency power
28	Sprinkler operation (critical mode)
29	Emergency power
30	TEST
31	Load TEST
32	--Internal--
33	--Internal--
34	--Internal--
35	--Internal--
36	--Internal--
37	--Internal--
38	--Internal--
39	--Internal--
40	--Internal--
41	--Internal--
42	--Internal--
43	--Internal--
44	--Internal--
45	--Internal--
46	--Internal--
47	Power reduction
255	No message on the display (basic screen)

Command Variables

There are 3 addresses used to control the GCP remotely:

- 40001 Power Setpoint
- 40002 Power Factor Setpoint
- 40003 Remote Command Setpoint

In order for the GCP to be controlled remotely, it must be in the Auto mode, it must have the Auto 2 (terminal 5) input closed, and the Parameter Control Via X1..X5 must be set to YES. These variables can be sent as one-time commands, they do not need to be sent continuously.

The GCP-MG must also have each GCP-30 configured as a control node, not a Read Only node.

On the Power setpoint , this variable will set the kW value that the control will operate at and also will determine what type of control to use. A baseload, import, or export type of control can be selected depending on what value is sent to the GCP. Bits 15 and 16 will determine which of the three control modes is used, and then the remaining 14 bits determine the value. Here are some examples of power setpoints.

Setpoint	Decimal	Hex	Binary
Export 100 kW	100	0064	0000 0000 0110 0100
Import 100 kW	-100	FF9C	1111 1111 1001 1100
Baseload 100 kW	16,484	4064	0100 0000 0110 0100

Basically a positive number between 0 and 16,384 will be an export setting.
A negative number between 0 and –16384 will be an import setting.
And a positive number between 16,384 and 32,767 will be a baseload setting.
For Baseload values add 16,384 to the number that is wanted.

For the Power Factor setting, this variable is formatted the same way as the Power Factor reading, addresses 30027 and 30043. For unity power factor the value will be 100. A leading (capacitive) power factor will be negative, and a lagging (inductive) power factor will be positive.

Setpoint	Decimal	Hex	Binary
.84 leading power factor	-84	FFAC	1111 1111 1010 1100
.94 lagging power factor	94	005E	0000 0000 0101 1110
1.0 power factor	100	0064	0000 0000 0110 0100

The Remote Control Setpoint 40003 is used to start and stop the generator remotely and to acknowledge alarms remotely. This is a multiplexed variable where each bit has a different function.

Address	Bit	Function
40003 Remote Control Command	1	Remote Start
	2	Remote Stop
	3	Always 0
	4	Always 0
	5	Alarm Acknowledge
	6	Not Used
	7	Not Used
	8	Not Used
	9	Not Used
	10	Not Used
	11	Not Used
	12	Not Used
	13	Not Used
	14	Not Used
	15	Not Used
	16	Not Used

The Stop bit has priority over the Start bit, if a 3 is sent. Removing the Start bit will also stop the engine, so sending a value of 0 will remove the Start bit and also call for the engine to stop. This is important to note if you are trying to clear the alarms. If the engine was started remotely and now the operator wants to clear an alarm, a 17 needs to be sent to keep the start command running. If a 16 is sent, this puts a zero in the Start bit and so the engine will stop.
Here are the possible combinations for these bits

Operation	Decimal	Hex	Binary
Engine Start	1	0001	0000 0000 0000 0001
Engine Stop	2	0002	0000 0000 0000 0010
Engine Stop	0	0000	0000 0000 0000 0000
Clear Alarms with engine stopped	16	0010	0000 0000 0001 0000
Clear Alarms with engine running	17	0011	0000 0000 0001 0001

GCP-30 Extended Modbus List

For the GCP controls that communicate with the engine ECMs such as the MTU MDEC or the Caterpillar CCM, there are additional Modbus addresses.

Modbus List for Cat CCM Option SB-03

This list shows the addresses for the GCPs with option SB03, for Caterpillar engines with the CCM module.

Address	Description	Multiplier	Units
30071	Coolant temperature		°C or °F
30072	Oil pressure	x 10	bar or psi
30073	Raw water temperature		°C or °F
30074	Turbo charger intake temperature		°C or °F
30075	Oil temperature		°C or °F
30076	Intake manifold temperature		°C or °F
30077	Throttle Position		%
30078	Engine Speed		RPM
30079	Multiplexed ECU alarms 1		
30080	Multiplexed ECU alarms 2		
30081	Multiplexed ECU alarms 3		
30082	Multiplexed ECU alarms 4		

Address	Bit	Function
30079 ECU Alarm Group 1	1	Sensor Fail : Coolant temperature
	2	Sensor Fail : Oil pressure
	3	Sensor Fail : Overspeed
	4	Sensor Fail : Oil temperature
	5	Sensor Fail : Raw water temperature
	6	Sensor Fail : Turbo charger intake temperature
	7	Sensor Fail : Intake manifold temperature
	8	Not Used
	9	ECU status: Off
	10	Not Used
	11	ECU status: Stop
	12	ECU status: Start
	13	ECU status: Automatic
	14	Not Used
	15	Not Used
	16	Not Used

Address	Bit	Function
30080 ECU Alarm Group 2	1	Alarm: Oil temperature
	2	Alarm: Oil pressure low
	3	Alarm: Coolant temperature low
	4	Alarm: Coolant temperature high
	5	Shutdown: Overspeed
	6	Shutdown: Start failure
	7	Shutdown: Oil pressure low
	8	Shutdown: coolant temperature high
	9	Shutdown: Emergency stop
	10	Shutdown: Coolant loss
	11	Shutdown: Battery voltage
	12	Alarm: Gas pressure low
	13	Alarm: Oil pressure high
	14	Shutdown: Oil pressure high
	15	Shutdown: Coolant loss
	16	Shutdown: Rotation direction

Address	Bit	Function
30081 ECU Alarm Group 3	1	Alarm: Raw water temperature
	2	Shutdown: Raw water temperature
	3	Not Used
	4	Shutdown: Ignition cylinder 1
	5	Shutdown: Ignition cylinder 2
	6	Shutdown: Ignition cylinder 3
	7	Shutdown: Ignition cylinder 4
	8	Shutdown: Ignition cylinder 5
	9	Shutdown: Ignition cylinder 6
	10	Shutdown: Ignition cylinder 7
	11	Shutdown: Ignition cylinder 8
	12	Shutdown: Ignition cylinder 9
	13	Shutdown: Ignition cylinder 10
	14	Shutdown: Ignition cylinder 11
	15	Shutdown: Ignition cylinder 12
	16	Shutdown: Ignition cylinder 13

Address	Bit	Function
30082 ECU Alarm Group 4	1	Shutdown: Ignition cylinder 14
	2	Shutdown: Ignition cylinder 15
	3	Shutdown: Ignition cylinder 16
	4	Alarm: Turbo intake temperature
	5	Shutdown: Turbo intake temperature
	6	Alarm: Oil level
	7	Shutdown: Fuel quality
	8	Shutdown: Oil temperature
	9	Not Used
	10	Not Used
	11	Not Used
	12	Not Used
	13	Not Used
	14	Not Used
	15	Not Used
	16	Not Used

Modbus List for MTU MDEC Option SC-09/10

This list shows the addresses for the GCPs with option SC09 and SC10, for MTU and Detroit Diesel engines with the MDEC control module.

Address	Description	Multiplier	Units
30071	Woodward ST-3 control Lambda Setpoint	X 100	
30072	Woodward ST-3 control Lambda Reading	X 100	
30073	Woodward ST-3 control Actuator Position	X 100	%
30074	Engine Speed (software vers. 4.3010 or greater)		RPM
	Engine Speed (software vers. 4.3009 or earlier)	X10	RPM
30075	Oil Pressure	X100	Bar or PSI
30076	Alarm Code		
30077	Operating Hours		h
30078	Coolant Temperature	X10	°C or °F
30079	Oil Temperature	X10	°C or °F
30080	Fuel Temperature		°C or °F
30081	Speed Reply (software vers. 4.3010 or greater)		RPM
	Speed Reply (software vers. 4.3009 or earlier)	X10	RPM
30082	Multiplexed ECU Alarm Group 1		
30083	Multiplexed ECU Alarm Group 2		
30084	Reserved MDEC bit 11		
30085	Reserved MDEC bit 12		
30086	Reserved MDEC bit 13		
30087	Reserved MDEC bit 14		
30088	Reserved MDEC bit 15 *		
30089	Reserved MDEC bit 16		
30090	Reserved MDEC bit 17		
30091	Reserved MDEC bit 18		

* address 30088 bit 9 is communication failure

Address	Bit	Function
30082 ECU Alarm Group 1	1	Alarm: ECU defective
	2	Alarm: Coolant temperature
	3	Shutdown: Coolant temperature
	4	Alarm: Oil temperature high
	5	Sensor Fail: Coolant level
	6	Sensor Fail: Coolant charging air
	7	Not Used
	8	Not Used
	9	Shutdown: Overspeed
	10	ECU Red alarm
	11	Alarm: Oil pressure low
	12	Shutdown: Oil pressure low
	13	ECU Yellow alarm
	14	Alarm: Coolant level
	15	Alarm: Coolant present
	16	Shutdown: Coolant charging air

Address	Bit	Function
30083 ECU Alarm Group 2	1	Shutdown: Speed request
	2	Reserved MDEC bit 1
	3	Reserved MDEC bit 2
	4	Reserved MDEC bit 3
	5	Reserved MDEC bit 4
	6	Reserved MDEC bit 5
	7	Reserved MDEC bit 6
	8	Reserved MDEC bit 7
	9	Reserved MDEC bit 8
	10	Sensor Fail: Engine speed
	11	Sensor Fail: Oil pressure
	12	Sensor Fail: Alarm codes
	13	Sensor Fail: Operating hours
	14	Sensor Fail: Coolant temperature
	15	Sensor Fail: Oil temperature
	16	Sensor Fail: Fuel temperature

Modbus List for Engines with J-1939 Communications Option SC-09/10

This list shows the addresses for the GCPs with option SC09/10, for Volvo, John Deere and other engines with the J-1939 communications.

Address	Description	Multiplier	Units
30071	Woodward ST-3 control Lambda Setpoint	X 100	
30072	Woodward ST-3 control Lambda Reading	X 100	
30073	Woodward ST-3 control Actuator Position	X 100	%
30074	Engine Speed (software vers. 4.3010 or greater)		RPM
	Engine Speed (software vers. 4.3009 or earlier)	X10	RPM
30075	Oil Pressure	X100	Bar or PSI
30076	Alarm Code SPN (active alarms DM1)		
30077	Operating Hours		h
30078	Coolant Temperature	X10	°C or °F
30079	Oil Temperature	X10	°C or °F
30080	Fuel Temperature		°C or °F
30081	Alarm Code FM1 (active alarms DM1)		
30082	Multiplexed ECU Alarm Group 1		
30083	Multiplexed ECU Alarm Group 2		
30084	Reserved		
30085	Reserved		
30086	Coolant level		
30087	Reserved		
30088	Reserved *		

* address 30088 bit 9 is communication failure

Address	Bit	Function
30082 ECU Alarm Group 1	1	Not Used
	2	Alarm: Coolant temperature
	3	Shutdown: Coolant temperature
	4	Not Used
	5	Sensor Fail: Coolant level
	6	Not Used
	7	Shutdown: Oil level
	8	Shutdown: Engine Protection
	9	Not Used
	10	Not Used
	11	Alarm: Oil pressure low
	12	Shutdown: Oil pressure low
	13	Not Used
	14	Alarm: Coolant level
	15	Not Used
	16	Shutdown: Coolant charging air

Address	Bit	Function
30083 ECU Alarm Group 2	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Not Used
	8	Not Used
	9	Not Used
	10	Sensor Fail: Engine speed
	11	Sensor Fail: Oil pressure
	12	Not Used
	13	Not Used
	14	Sensor Fail: Coolant temperature
	15	Sensor Fail: Oil temperature
	16	Sensor Fail: Fuel temperature

LS-4 Modbus List

This list shows the addresses for the LS-4.

Address	Description	Multiplier	Units
30002	Device Type “1600”		
30003	System A voltage phase A to B	x10^gen_volt_exp	Vac
30004	System A voltage phase B to C	x10^gen_volt_exp	Vac
30005	System A voltage phase C to A	x10^gen_volt_exp	Vac
30006	System A voltage phase A to N	x10^gen_volt_exp	Vac
30007	System A voltage phase B to N	x10^gen_volt_exp	Vac
30008	System A voltage phase C to N	x10^gen_volt_exp	Vac
30009	System A Frequency	x 100	Hz
30010	System A current phase A	x10^gen_amp_exp	AMPS
30011	System A current phase B	x10^gen_amp_exp	AMPS
30012	System A current phase C	x10^gen_amp_exp	AMPS
30013	System A Power Factor	x 100	
30014	System A Real Power	x10^gen_kW_exp	W
30015	System A Reactive power	x10^gen_kW_exp	VAR
30016	System B voltage phase A to B	x10^gen_volt_exp	Vac
30017	System B voltage phase B to C	x10^gen_volt_exp	Vac
30018	System B voltage phase C to A	x10^gen_volt_exp	Vac
30019	System B Frequency	x 100	Hz
30020	System A voltage and current exponents		
30021	System A power and Sys B volt exponents		
30022	Multiplexed Alarm group 1		
30023	Multiplexed Alarm group 2		
30024	Multiplexed Alarm group 3		
30025	Multiplexed Alarm group 4		
30026	Multiplexed Alarm group 5		
30027	Multiplexed Alarm group 6		
30028	Multiplexed Alarm group 7		
30029	Multiplexed Digital Inputs group 1		
40001	Unit Control Command		

Explanation of Variables

Multiplexed Variable List

Address	Bit	Function
30022 Alarm Group 1	1	Not used
	2	Not used
	3	Not used
	4	Not used
	5	Not used
	6	Not used
	7	Not used
	8	Not Used
	9	Under voltage Level 2
	10	Not Under voltage Level 2
	11	Over voltage Level 2
	12	Not Over voltage Level 2
	13	Under frequency Level 2
	14	Not Under frequency Level 2
	15	Over frequency Level 2
	16	Not Over frequency Level 2

Address	Bit	Function
30023 Alarm Group 2	1	Phase/Vector jump alarm
	2	Not Phase/Vector jump alarm
	3	Asymmetry
	4	Not Asymmetry
	5	df/dt alarm
	6	Not df/dt alarm
	7	Not used
	8	Not Used
	9	Under voltage Level 1
	10	Not Under voltage Level 1
	11	Over voltage Level 1
	12	Not Over voltage Level 1
	13	Under frequency Level 1
	14	Not Under frequency Level 1
	15	Over frequency Level 1
	16	Not Over frequency Level 1

Address	Bit	Function
30024 Alarm Group 3	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Not Used
	8	Not Used
	9	Not Used
	10	Not Used
	11	Not Used
	12	Not Used
	13	Not Used
	14	Not Used
	15	Not Used
	16	Not Used

Address	Bit	Function
30025 Alarm Group 4	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Not Used
	8	Not Used
	9	Not Used
	10	Not Used
	11	Not Used
	12	Not Used
	13	Not Used
	14	Not Used
	15	Not Used
	16	Not Used

Address	Bit	Function
30026 Alarm Group 5	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Not Used
	8	Not Used
	9	Not Used
	10	Not Used
	11	Not Used
	12	Not Used
	13	Not Used
	14	Not Used
	15	Not Used
	16	Not Used

Address	Bit	Function
30027 Alarm Group 6	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Not Used
	8	Not Used
	9	Not Used
	10	Not Used
	11	Not Used
	12	Not Used
	13	Not Used
	14	Not Used
	15	Not Used
	16	Not Used

Address	Bit	Function
30028 Alarm Group 7	1	Not Used
	2	Not Used
	3	Not Used
	4	Not Used
	5	Not Used
	6	Not Used
	7	Not Used
	8	Not Used
	9	Not Used
	10	Not Used
	11	Not Used
	12	Not Used
	13	Source Rotation Mismatch
	14	Not Source Rotation Mismatch
	15	Not Used
	16	Not Used

Address	Bit	Function
30029 Discrete Input status	1	Open CB command is closed (Terminal 75)
	2	Open CB command is closed (Terminal 75)
	3	Open CB command is closed (Terminal 75)
	4	Open CB command is closed (Terminal 75)
	5	Disconnector breaker B cont status (Terminal 74)
	6	Disconnector breaker B cont status (Terminal 74)
	7	Disconnector breaker B cont status (Terminal 74)
	8	Disconnector breaker B cont status (Terminal 74)
	9	Enable CB input closed (Terminal 31)
	10	Enable CB input closed (Terminal 31)
	11	Enable CB input closed (Terminal 31)
	12	Enable CB input closed (Terminal 31)
	13	Circuit Breaker B cont status (Terminal 32)
	14	Circuit Breaker B cont status (Terminal 32)
	15	Circuit Breaker B cont status (Terminal 32)
	16	Circuit Breaker B cont status (Terminal 32)

The Remote Control Command 40001 is used to start and stop the generator remotely and to acknowledge alarms remotely. This is a multiplexed variable where each bit has a different function.

Address	Bit	Function
40001 Remote Control Command	1	Open CB
	2	Close CB
	3	Always 0
	4	Always 0
	5	Alarm Acknowledge
	6	Not Used
	7	Not Used
	8	Not Used
	9	Not Used
	10	Not Used
	11	Not Used
	12	Not Used
	13	Not Used
	14	Not Used
	15	Not Used
	16	Not Used

The Open CB bit has priority over the Close CB bit, if a 3 is sent.

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WOODWARD

PO Box 1519, Fort Collins CO 80522-1519, USA
1000 East Drake Road, Fort Collins CO 80525, USA
Phone +1 (970) 482-5811 • Fax +1 (970) 498-3058

Email and Website—www.woodward.com

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