913-299A
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MODBUS Communications for the GC868

Introduction

Your Model GC868 hardware and software (GC3E.MBS) have been modified to provide improved MODBUS communications. The MODBUS option card (703-1358) provides an RS485 interface with a host system, while the main circuit board continues to support RS232 communications for use with a PC running PanaView™ software.

To properly set up the instrument, use this addendum along with the standard GC868 flowmeter *User's Manual* (910-226). This document shows how to install the MODBUS option card and how to program the modified GC868 to access this special feature.

When equipped with the optional MODBUS output card, the GC868 flow transmitter can send flow data and diagnostic information to a flow computer (or SCADA) serially, using a Gould-type RTU protocol. In this case, only the MODBUS function command, 3 (read multiple registers), 6 (write multiple registers) is valid. The format for the data exchange is as follows:

- The **send** command (initiated by the host flow computer or controller) comes in the form:
  [time delimiter]<Addr><3><First Register MSB>
  <First Register LSB><Register Count MSB>
  <Register Count LSB><CRC Low><CRC High>[time delimiter]
- The response (initiated by the host flow computer or controller) comes in the form:
  [time delimiter]<Addr><3><Byte count><Data.....>
  <CRC Low><CRC High>[time delimiter]

Introduction (cont.)

The format for the returned data types is as follows:

- Integer (16 bit Integer) <MSB><LSB>
  1 Register - 16 bit integer
- Integer (32 bit IntegerI) <MSB><LSB><LSB><LSB>
  2 Register - 32 bit integer
- Floating Point (FP) <EXP><MAN><MAN><MAN>
  2 Registers - 32 bit IEEE floating point number

Installing the MODBUS Option Card

IMPORTANT: *The installation information presented here supersedes the information in the standard GC868* User's Manual.

The modified GC868 uses the RS485 standard for MODBUS communications. This standard allows up to 32 nodes (drivers and receivers) on one multidrop network, at distances up to 4,000 ft (1,200 m). To connect the instrument(s) to the host system, GE Infrastructure Sensing recommends using a 24-gauge (24 AWG) twisted-pair cable with a characteristic impedance of 120 ohms and a 120-ohm termination at each end of the communications line.

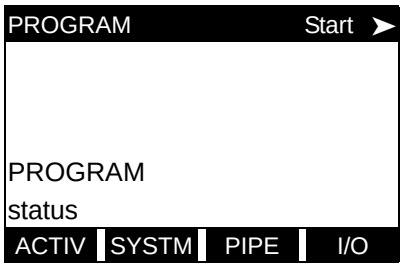
The MODBUS option card must be plugged into either slot 5 or slot 6 of the GC868. On the option card, pin 1 is the [TMT-] inverting or negative connection and pin 2 is the [TMT+] non-inverting or positive connection. To link the GC868 to the control system, connect the two wires of the twisted-pair cable from these terminals to the corresponding terminals at the control system.

Note: *If two MODBUS option cards are installed in the GC868, only the card in slot 5 is activated.*

Setting Up MODBUS Communications

To set up MODBUS communications, enter the *User Program* as described in your *Programming Manual*. Then, refer to the *menu map* in Figure 1 on page 9 and complete the following steps:

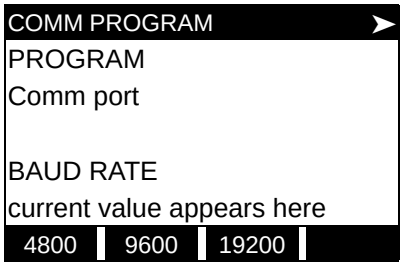
Note: *Any time the following settings are changed, the GC868 must be rebooted to load the new settings into the option card.*



Press the [→] key and then the [F3] key to select the *COMM* submenu. (On a two-channel GC868, pressing the [→] key and the [F3] key accesses the *GLOBL* menu. Then press [F4] to select the *COMM* submenu.)

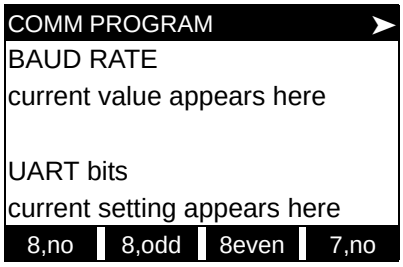
IMPORTANT: *The serial port settings of the GC868 must match those of the MODBUS control system.*

Setting Up MODBUS Communications (cont.)



[This baud rate applies only to the RS232 serial port.] Press the [→] until the desired RS232 baud rate appears on the option bar and press the appropriate [Fx] function key to select it.

The available RS232 baud rates are 300, 600, 1200, 2400, 4800, 9600, and 19200.

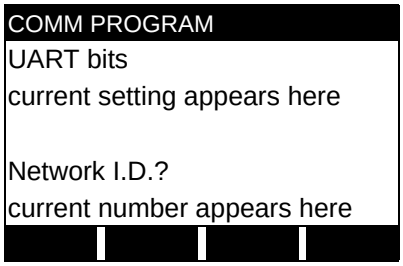


[The UART bits setting applies only to the RS232 serial port.] Press the [→] until the desired RS232 UART bits setting appears on the option bar and then press the appropriate [Fx] function key to select it.

See Table 1 below for a description of the options available at the above prompt.

Table 1: UART Bits Options

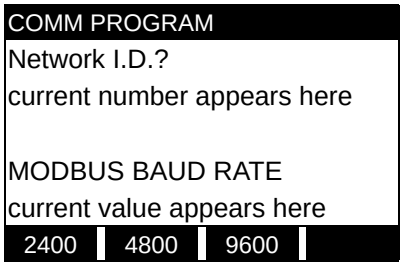
Option Bar	# Data Bits	# Stop Bits	Parity
8,no	8	0	None
8,odd	8	0	Odd
8even	8	0	Even
7,odd	7	1	Odd
7even	7	1	Even



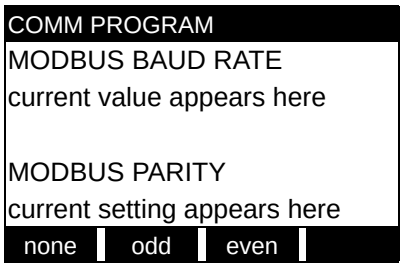
[The Network ID number is used by the IDM software only.] Enter a Network ID number between 1 and 254 and then press [ENT]. The default ID number is 1.

Note: *If more than one meter is connected to a network, each meter must have a unique* Network I.D.

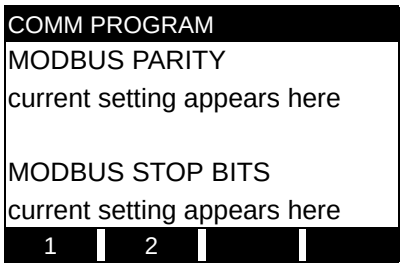
Setting Up MODBUS Communications (cont.)



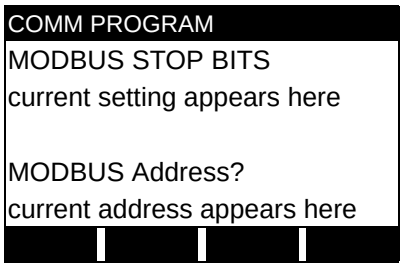
Press the appropriate [Fx] function key to select [2400], [4800], or [9600] for the MODBUS baud rate.



Press the appropriate [Fx] function key to select [NONE], [ODD], or [EVEN] for the MODBUS parity setting.



Press the appropriate [Fx] function key to select [1] or [2] for the MODBUS stop bits setting.



Enter a MODBUS Address number between 1 and 247. Then, press [ENT].

Press [EXIT] until you return to RUN mode and the screen resumes the display of data measurements. Then reboot the meter to load the new settings into memory.

MODBUS Register Map

To request specific parameters from the GC868 via the MODBUS, the control system must enter the appropriate register number. Only registers 1 through 90 are available for MODBUS communications, while registers 508 through 512 are used by the GC868 to store the MODBUS parameters. For details, see Table 2 on the next page for a 1-Channel meter or Table 3 on page 6 for a 2-Channel meter.

Note: *If you request Ch2 or AVE data from a 1-Channel meter, the values will all be zero.*

Table 2: MODBUS Registers for a 1-Channel GC868

MODBUS Reg #	DPR Hex Addr	Description	Scaling (decimal places)	Size in Bytes
1	0	[1]"Clear Ch1 Totalizers"	--	2 (16 bit signed)
2	2	Not Used	--	2 (16 bit signed)
3	4	Velocity	2	4 (2 16-bit int)
5	8	[2]Act Volumetric	#Q DIGITS	4 (IEEE 32 bit)
7	C	[2]Std Volumetric	#Q DIGITS	4 (IEEE 32 bit)
9	10	[3]Fwd Totals	#T DIGITS	4 (2 16 bit int)
11	14	[3]Rev Totals	#T DIGITS	4 (2 16 bit int)
13	18	#Tot Digits	0	2
14	1A	[2]Mass Flow	#M DIGITS	4 (IEEE 32 bit)
16	1E	[4]Fwd Mass Totals	#MT DIGITS	4 (2 16-bit int)
18	22	[4]Rev Mass Totals	#MT DIGITS	4 (2 16-bit int)
20	26	#Mass Tot Digits	0	2
21	28	Timer	2	4 (2 16-bit int)
23	2C	Error Code	0	2
24	2E	Sound Speed	3	4 (2 16-bit int)
26	32	Density	4	4 (2 16-bit int)
28	36	Signal Strength Upstream	1	4 (2 16-bit int)
30	3A	Signal Strength Downstream	1	4 (2 16-bit int)
32	3E	Temperature	2	4 (2 16-bit int)
34	42	Pressure	3	4 (2 16-bit int)
36	46	Signal Quality Up	--	4 (IEEE 32 bit)
38	4A	Signal Quality Down	--	4 (IEEE 32 bit)
40	4E	Amp Discriminator Up	--	4 (IEEE 32 bit)
42	52	Amp Discriminator Down	--	4 (IEEE 32 bit)
44	56	SNR Up	--	4 (IEEE 32 bit)
46	5A	SNR Down	--	4 (IEEE 32 bit)
508	3F6	[6]MODBUS baud rate	0	2
509	3F8	[7]MODBUS parity	0	2
510	3FA	[8]MODBUS stop bits	0	2
511	3FC	MODBUS meter addr	0	2
512	3FE	RESERVED	---	---

Table 3: MODBUS Registers for a 2-Channel GC868

MODBUS Reg #	DPR Hex Addr	Description	Scaling (decimal places)	Size in Bytes
1	0	[1]"Clear Ch1 Totalizers"	--	2 (16 bit signed)
2	2	[1]"Clear Ch2 Totalizers"	--	2 (16 bit signed)
3	4	Ch1 Velocity	2	4 (2 16-bit int)
5	8	[2]Ch1 Act Volumetric	#Q DIGITS	4 (IEEE 32 bit)
7	C	[2]Ch1 Std Volumetric	#Q DIGITS	4 (IEEE 32 bit)
9	10	[3]Ch1 Fwd Totals	#T DIGITS	4 (2 16 bit int)
11	14	[3]Ch1 Rev Totals	#T DIGITS	4 (2 16 bit int)
13	18	Ch1 #Tot Digits	0	2
14	1A	[2]Ch1 Mass Flow	#M DIGITS	4 (IEEE 32 bit)
16	1E	[4]Ch1 Fwd Mass Totals	#MT DIGITS	4 (2 16-bit int)
18	22	[4]Ch1 Rev Mass Totals	#MT DIGITS	4 (2 16-bit int)
20	26	Ch1 #Mass Tot Digits	0	2
21	28	Ch1 Timer	2	4 (2 16-bit int)
23	2C	Ch1 Error Code	0	2
24	2E	Ch1 Sound Speed	3	4 (2 16-bit int)
26	32	Ch1 Density	4	4 (2 16-bit int)
28	36	Ch1 Sig Strength Upstream	1	4 (2 16-bit int)
30	3A	Ch1 Sig Strength Downstream	1	4 (2 16-bit int)
32	3E	Ch1 Temperature	2	4 (2 16-bit int)
34	42	Ch1 Pressure	3	4 (2 16-bit int)
36	46	Ch2 Velocity	2	4 (2 16-bit int)
38	4A	Ch2 Act Volumetric	#Q DIGITS	4 (IEEE 32 bit)
40	4E	Ch2 Std Volumetric	#Q DIGITS	4 (IEEE 32 bit)
42	52	Ch2 Fwd Totals	#T DIGITS	4 (2 16 bit int)
44	56	Ch2 Rev Totals	#T DIGITS	4 (2 16 bit int)
46	5A	Ch2 #Tot Digits	0	2
47	5C	Ch2 Mass Flow	#M DIGITS	4 (IEEE 32 bit)
49	60	Ch2 Fwd Mass Totals	#MT DIGITS	4 (2 16-bit int)
51	64	Ch2 Rev Mass Totals	#MT DIGITS	4 (2 16-bit int)
53	68	Ch2 #Mass Tot Digits	0	2
54	6A	Ch2 Timer	2	4 (2 16-bit int)
56	6E	Ch2 Error Code	0	2
57	70	Ch2 Sound Speed	3	4 (2 16-bit int)
59	74	Ch2 Density	4	4 (2 16-bit int)
61	78	Ch2 Sig Strength Upstream	1	4 (2 16-bit int)

Table 3: MODBUS Registers for a 2-Channel GC868 (Continued)

MODBUS Reg #	DPR Hex Addr	Description	Scaling (decimal places)	Size in Bytes
63	7C	Ch2 Sig Strength Downstream	1	4 (2 16-bit int)
65	80	Ch2 Temperature	2	4 (2 16-bit int)
67	84	Ch2 Pressure	3	4 (2 16-bit int)
69	88	Avg Velocity	2	4 (2 16-bit int)
71	8C	Avg Act Volumetric	#Q DIGITS	4 (IEEE 32 bit)
73	90	Avg Std Volumetric	#Q DIGITS	4 (IEEE 32 bit)
75	94	Avg Fwd Totals	#T DIGITS	4 (2 16 bit int)
77	98	Avg Rev Totals	#T DIGITS	4 (2 16 bit int)
79	9C	Avg #Tot Digits	0	2
80	9E	Avg Mass Flow	#M DIGITS	4 (IEEE 32 bit)
82	A2	Avg Fwd Mass Totals	#MT DIGITS	4 (2 16-bit int)
84	A6	Avg Rev Mass Totals	#MT DIGITS	4 (2 16-bit int)
86	AA	Avg #Mass Tot Digits	0	2
87	AC	Avg Timer	2	4 (2 16-bit int)
89	B0	[5]Avg Error Code	0	2
90	B2	Avg Sound Speed	3	4 (2 16-bit int)
92	B6	CH1 Signal Quality Up	--	4 (IEEE 32 bit)
94	BA	CH1 Signal Quality Down	--	4 (IEEE 32 bit)
96	BE	CH1 Amp Discriminator Up	--	4 (IEEE 32 bit)
98	C2	CH1 Amp Discriminator Down	--	4 (IEEE 32 bit)
100	C6	CH1 SNR Up	--	4 (IEEE 32 bit)
102	CA	CH1 SNR Down	--	4 (IEEE 32 bit)
104	CE	CH2 Signal Quality Up	--	4 (IEEE 32 bit)
106	D2	CH2 Signal Quality Down	--	4 (IEEE 32 bit)
108	D6	CH2 Amp Discriminator Up	--	4 (IEEE 32 bit)
110	DA	CH2 Amp Discriminator Down	--	4 (IEEE 32 bit)
112	DE	CH2 SNR Up	--	4 (IEEE 32 bit)
114	E2	CH2 SNR Down	--	4 (IEEE 32 bit)
508	3F6	[6]MODBUS baud rate	0	2
509	3F8	[7]MODBUS parity	0	2
510	3FA	[8]MODBUS stop bits	0	2
511	3FC	MODBUS meter addr	0	2
512	3FE	RESERVED	---	---

Notes:

1. **Clear Totalizers:**
   flag from the 8051 to clear either the Channel 1 or Channel 2 totalizers.
2. **Values in these registers are floating point numbers and require no scaling. The number of decimal digits is set in meter programming.**
3. **Require scaling by value in register 13.**
4. **Require scaling by value in register 20.**
5. **AVG Error Code:**
   0=Both Ch1 and Ch2 are in error.
   1=Ch1 only is in error
   2=Ch2 only is in error
   3=Both channels are error free
6. **MODBUS baud rate:**
   5 = 2400, 6 = 4800, 7 = 9600
7. **MODBUS parity:**
   0 = none, 1 = odd, 2 = even
8. **MODBUS stop bits:**
   1 = 1 stop bit, 2 = 2 stop bits

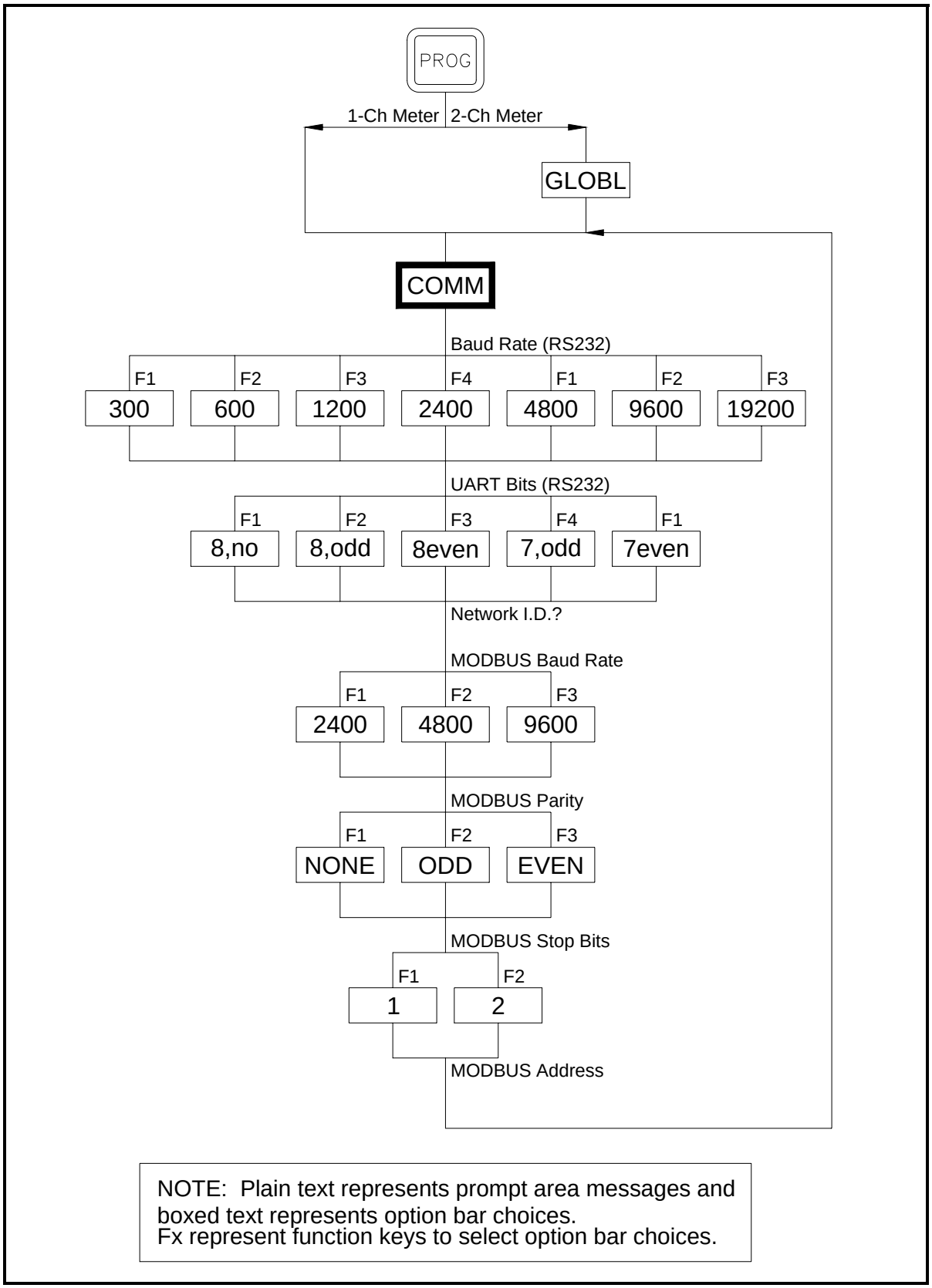


Figure 1: MODBUS Menu Map