MODBUS Communications for the DF868

Your Model DF868 hardware and software have been modified to provide 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 Panametrics' IDM software.

To properly set up the instrument, use this addendum along with the standard DF868 flowmeter *User's Manual*. This document shows how to install the MODBUS option card and how to program the modified DF868 to access this special feature.

Installing the MODBUS Option Card

IMPORTANT: *The installation information presented here supersedes the information in the standard DF868* User's Manual.

The modified DF868 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, Panametrics 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 DF868. 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 DF868 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 DF868, 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 *User's Manual*. Then, refer to the *Menu Map* in Figure 1 on page 7 and complete the following steps:

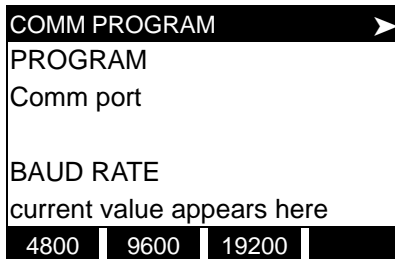**Note:** *Any time the following settings are changed, the DF868 must be rebooted to load the new settings into the option card.*
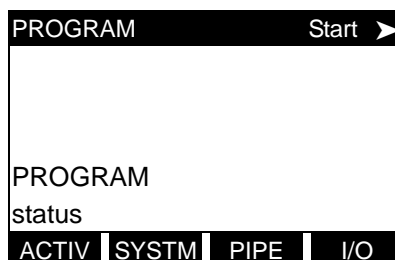
Press the [→] key and then the [F3] key to select the *COMM* submenu. (On a two-channel DF868, pressing the [→] key and the [F3] key accesses the *GLOBL* menu. Then press [F4] to select the *COMM* submenu.)
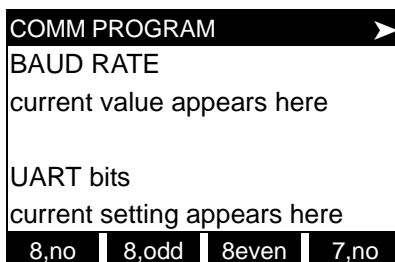
```
PROGRAM                Start ➤



PROGRAM
status
 ACTIV  SYSTM   PIPE     I/O
```

Setting Up MODBUS Communications (cont.)

IMPORTANT: *The serial port settings of the DF868 <u>must</u> match those of the MODBUS control system.*

```
COMM PROGRAM              ➤
PROGRAM
Comm port


BAUD RATE
current value appears here
  4800   │  9600  │  19200  │
```

[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.

```
COMM PROGRAM              ➤
BAUD RATE
current value appears here


UART bits
current setting appears here
 8,no  │ 8,odd  │ 8even │  7,no
```
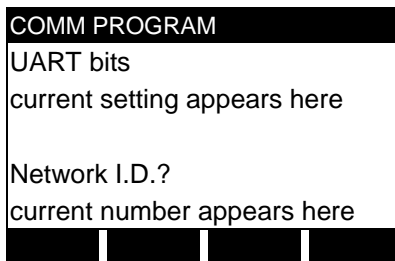
[The UART bits setting applies only to the RS232 serial port.] Press the [→] until the desired RS232 UART bits setting appears on the option bar and then press the appropriate [Fx] function key to select it.

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

```
COMM PROGRAM
UART bits
current setting appears here


Network I.D.?
current number appears here
       │        │        │
```

[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.)**

```
COMM PROGRAM
Network I.D.?
current number appears here


MODBUS BAUD RATE
current value appears here
  2400      4800      9600
```

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

```
COMM PROGRAM
MODBUS BAUD RATE
current value appears here


MODBUS PARITY
current setting appears here
  none      odd      even
```

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

```
COMM PROGRAM
MODBUS PARITY
current setting appears here


MODBUS STOP BITS
current setting appears here
    1        2
```

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

```
COMM PROGRAM
MODBUS STOP BITS
current setting appears here


MODBUS Address?
current address appears here
```

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 DF868 via the MODBUS, the control system must access the appropriate register number, as shown in Table 1 below. Only registers 1–84 are available with the DF868 for MODBUS communications. Registers 508–512 are used by the DF868 to store the MODBUS parameters.

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

Table 1: Model DF868 MODBUS Registers

MODBUS Reg #	DPR Hex Addr	Description	Units	Scaling (decimal places)	Size in Bytes
1		[1]Clear Totalizers	none	--	2 (16 bit signed)
2		CH1 Velocity	ft/s or m/s	2	4 (32 bit integer)
4		CH1 Volumetric	VOL_U	--	4 (IEEE 32 bit)
6		CH1 +Totals	TOT_U	Register 10	4 (32 bit integer)
8		CH1 -Totals	TOT_U	Register 10	4 (32 bit integer)
10		CH1 #T Digits	none	0	2 (16 bit integer)
11		CH1 Totalizer Time	sec	2	4 (32 bit integer)
13		[2]CH1 Error Value	none	0	2 (16 bit integer)
14		CH 1 SSUP	none	1	4 (32 bit integer)
16		CH 1 SSDN	none	1	4 (32 bit integer)
18		CH 1 SNDSP	ft/s or m/s	0	4 (32 bit integer)
20		CH 2 Velocity	ft/s or m/s	2	4 (32 bit integer)
22		CH 2 Volumetric	VOL_U	--	4 (IEEE 32 bit)
24		CH 2 +Totals	TOT_U	Register 28	4 (32 bit integer)
26		CH 2 -Totals	TOT_U	Register 28	4 (32 bit integer)
28		CH2 # T Digits	none	0	2 (16 bit integer)
29		CH2 Totalizer Time	sec	2	4 (32 bit integer)
31		[2]CH2 Error Value	none	0	2 (16 bit integer)
32		CH 2 SSUP	none	1	4 (32 bit integer)
34		CH 2 SSDN	none	1	4 (32 bit integer)
36		CH 2 SNDSP	ft/s or m/s	0	4 (32 bit integer)
38		[3]AVG Velocity	ft/s or m/s	2	4 (32 bit integer)
40		[3]AVG Volumetric	VOL_U	--	4 (IEEE 32 bit)

Table 1: Model DF868 MODBUS Registers (cont.)

MODBUS Reg #	DPR Hex Addr	Description	Units	Scaling (decimal places)	Size in Bytes
42		[3]AVG+Totals	TOT_U	Register 46	4 (32 bit integer)
44		[3]AVG-Totals	TOT_U	Register 46	4 (32 bit integer)
46		AVG #T Digits	none	0	2 (16 bit integer)
47		[3]AVG Totalizer Time	sec	2	4 (32 bit integer)
49		[4]AVG Error Value	none	0	2 (16 bit integer)
50		[3]AVG SSUP	none	1	4 (32 bit integer)
52		[3]AVG SSDN	none	1	4 (32 bit integer)
54		[3]AVG SNDSP	ft/s or m/s	0	4 (32 bit integer)
56		CH 1 Power	Power_u	--	4 (IEEE 32 bit)
58		CH 1 +Energy	Energy_u	Register 62	4 (32 bit integer)
60		CH 1 -Energy	Energy_u	Register 62	4 (32 bit integer)
62		CH 1 # Energy Digits	none	0	2 (16 bit integer)
63		CH 1 TempS	°F or °C	2	4 (32 bit integer)
65		CH 1 TempR	°F or °C	2	4 (32 bit integer)
67		CH 1 TS-TR	°F or °C	2	4 (32 bit integer)
69		CH 1 DELTH	Btu/lb or J/gm	2	4 (32 bit integer)
71		CH 2 Power	Power_u	--	4 (IEEE 32 bit)
73		CH 2 +Energy	Energy_u	Register 77	4 (32 bit integer)
75		CH 2 -Energy	Energy_u	Register 77	4 (32 bit integer)
77		CH 2 # Energy Digits	none	0	2 (16 bit integer)
78		CH 2 TempS	°F or °C	2	4 (32 bit integer)
80		CH 2 TempR	°F or °C	2	4 (32 bit integer)
82		CH 2 TS-TR	°F or °C	2	4 (32 bit integer)
84		CH 2 DELTH	Btu/lb or J/gm	2	4 (32 bit integer)
508	3F6	[5]MODBUS baud rate	none	0	2 (16 bit integer)
509	3F8	[6]MODBUS parity	none	0	2 (16 bit integer)
510	3FA	[7]MODBUS stop bits	none	0	2 (16 bit integer)
511	3FC	MODBUS meter addr	none	0	2 (16 bit integer)
512	3FE	RESERVED	none	---	---

MODBUS Register Map (cont.)

Notes:

1. **Clear Totalizers:** flag from the 8051 to clear totalizers in the 68332 memory.

2. **Error Value:** see table in DF868 manual for error codes

3. **Average:**
   average of channel 1 and channel 2 if both channels out of error,
   channel 1 value if channel 2 is in error,
   channel 2 value if channel 1 is in error,
   <u>zero</u> if both channels in error.

4. **Average Error Status:**
   0 = both in error
   1 = chan 2 in error,
   2 = chan 1 in error,
   3 = both ok

5. **MODBUS baud rate:**
   5 = 2400, 6 = 4800, 7 = 9600

6. **MODBUS parity:**
   0 = none, 1 = odd, 2 = even

7. **MODBUS stop bits:**
   1 = 1 stop bit, 2 = 2 stop bits

8. General:
   Registers are written if corresponding functions are actuated by the user. Registers for unactuated functions are initialized to zero at startup.

```
                            ┌────────┐
                            │  PROG  │
                            └────────┘
                                │
                    1-Ch Meter ─┴─ 2-Ch Meter
                    ◄─────────────────────►
                                          │
                                      ┌───────┐
                                      │ GLOBL │
                                      └───────┘
                                          │
                                     ┌─────────┐
                                     │  COMM   │
                                     └─────────┘
```

Baud Rate (RS232)

F1	F2	F3	F4	F1	F2	F3
300	600	1200	2400	4800	9600	19200

UART Bits (RS232)

F1	F2	F3	F4	F1
8,no	8,odd	8even	7,odd	7even

Network I.D.?

MODBUS Baud Rate

F1	F2	F3
2400	4800	9600

MODBUS Parity

F1	F2	F3
NONE	ODD	EVEN

MODBUS Stop Bits

F1	F2
1	2

MODBUS Address

NOTE: Plain text represents prompt area messages and boxed text represents option bar choices.
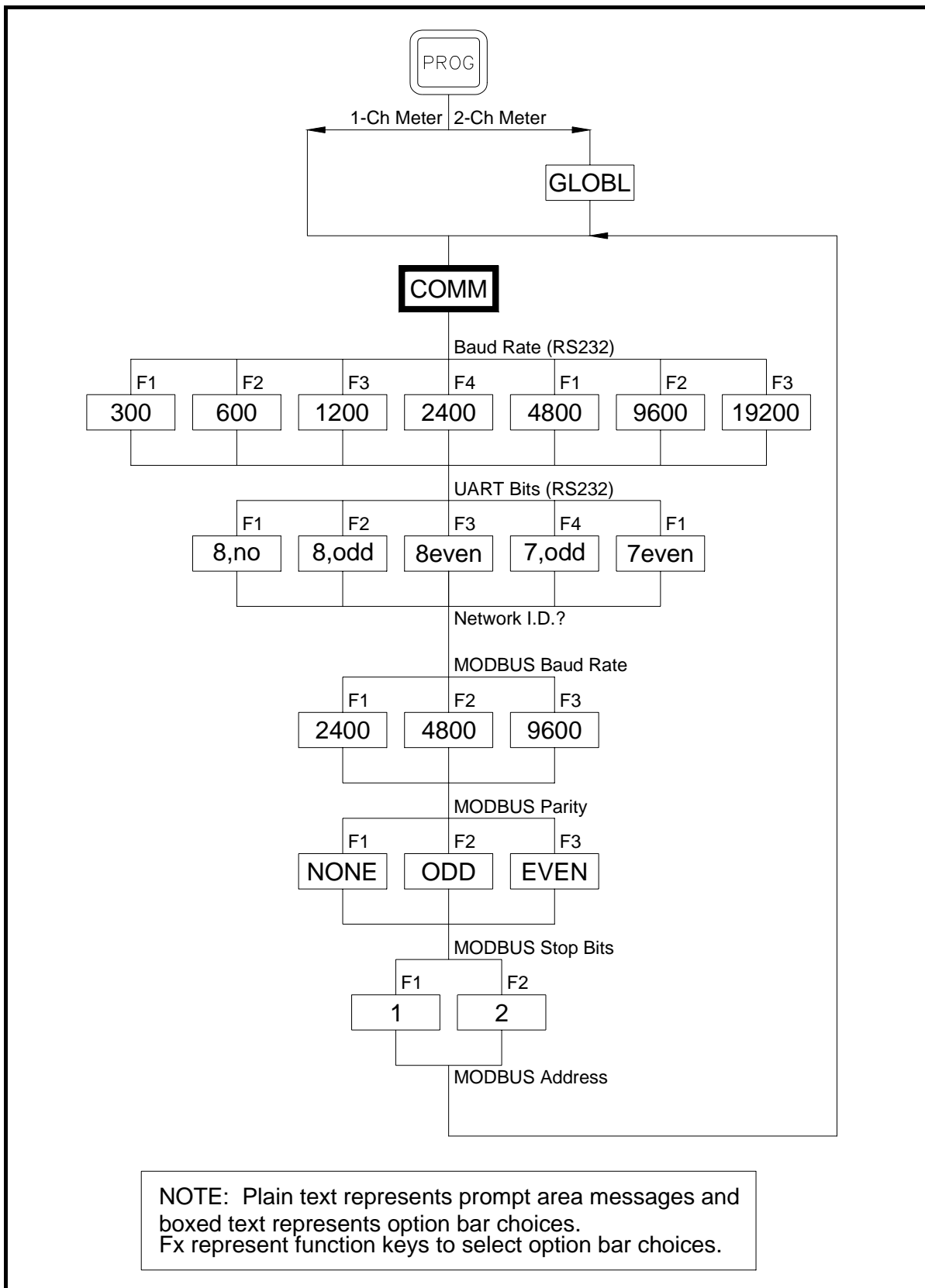Fx represent function keys to select option bar choices.

Figure 1: MODBUS Menu Map