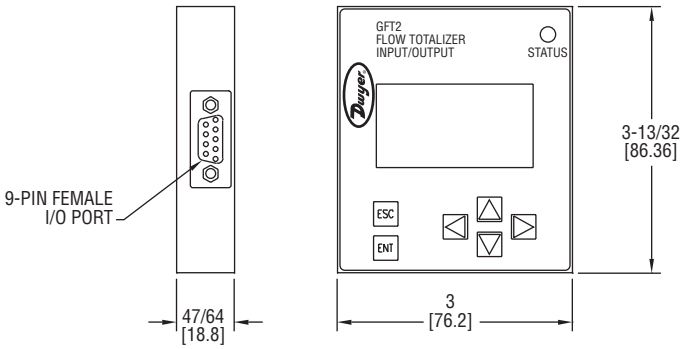
Series GFT2 Flow Totalizer

Specifications - Installation and Operating Instructions



The Series GFT2 Flow Totalizer is a microcontroller driven device designed to linearize the flow meter and controller flow curve plus display the instantaneous flow rate, total, and accumulated total. The totalizer is intended to be used with analog flow meters and controllers with analog 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA interface. RS-232 or RS-485 digital interface is available.

FEATURES

- Up to 47 different volumetric and mass flow engineering units (including user-defined)
- User adjustable LCD back light and contrast level
- Compact design for unit mount, panel mount, wall mount, or field mount applications
- Low and high flow alarms with programmable action delay.
- Free configuration and mounting utility software
- 0.51″ (13 mm) LCD digits

Unpacking the Totalizer

The Totalizer was packed in a sturdy cardboard carton. Inspect the package for possible external damage from shipping. Open the carton carefully and inspect for any sign of concealed shipping damage. When unpacking make sure that all hardware is included. The hardware should include:

(1) GFT2
(1) CD with Utility Software and operating manual
(1) Mounting Bracket with 4 screws

Safety Instructions

The GFT2 is not intended for use in life support applications or where malfunctioning of a device may cause personal injury. When adjusting or servicing the GFT2, take special precaution to prevent inadvertent damage to the integral solid state circuitry.

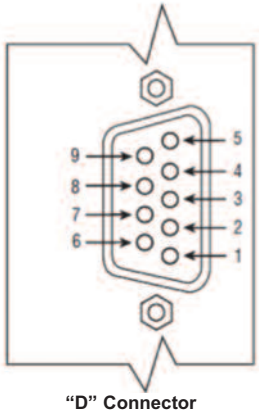
SPECIFICATIONS

Input Analog Range: 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA.
Accuracy: ±0.1% FS.
Operating Temperature: 14 to 158°F (-10 to 70°C).
Power Supply: 12 to 26 VDC.
Weight: 0.3 lbs (125 g)..

Electrical Connection

Pin	Function	Note
1	Power Supply, Common	Power Input
2	Power Supply, Positive	Power Input 12 to 26 VDC
3	RS-232 RX, Optional RS-485 (+)	Communication (RS-232 is input, RS_485 input/output)
v4	Analog Input (+), PV Input	Input
5	Analog Output (+), PV set point	Output
6	RS-232 Signal GND (RS-485 GND Optional)	Communication Reference
7	RS-232 TX, Optional RS-485 (-)	Communication (RS-232 is output, RS-485 input/output)
8	Analog Input/Output reference (common for pins 4 and 5)	
9	+5 VDC reference input (for 5 to 10 VDC interface only)	

Table 1



"D" Connector

DWYER INSTRUMENTS, INC.
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The power supply (PS), process variable (PV) input, set point (SP) control output, and serial communication interface signals are connected to the GFT2 via miniature 9 pin female “D” connector.

Power Supply Connections

The power supply requirements for the GFT2 are: 12 to 26 VDC, (unipolar power supply).

DC Power (+) ---------- Pin 4 of the 9 pin “D” connector

DC Power (-) ---------- Pin 8 of the 9 pin “D” connector

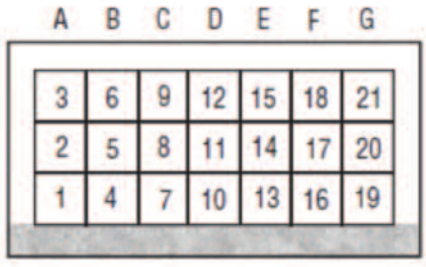
⚠ CAUTION -Do not apply power voltage above 28 VDC. Doing so will cause device damage or faulty operation.

-Make sure power is OFF when connecting or disconnecting any cables or wires in the system.

Power Variable (PV) Input Signal Connections

Depending on jumper J2 configuration, input signal can be set to 0 to 5, 0 to 10VDC, or 4 to 20 mA.

⚠ CAUTION When connecting the external signals to the input terminals, always check actual jumper J2 configuration. Do not exceed the rated values shown in the specifications in Table 2. Failure to do so might cause damage to this device. Be sure to check if the wiring and the polarity of the power supply and PV signals are correct before turning the power ON. Wiring error may cause damage or faulty operation.



Maximum Rated Values for PV Input Signals					
PV Input Type	J2 Jumper Configuration			Maximum Signal Level	Note
	J2D	J2E	J2F		
0 to 5 VDC	10 to 11	14 to 15	17 to 18	≤6 VDC	
0 to 10 VDC	11 to 12	14 to 15	17 to 18	≤11 VDC	
4 to 20 mA	10 to 11	13 to 14	16 to 17	≤25 mA	249 Ω Passive, Not Isolated Current Input

Table 2

DC Power (+) ---------- Pin 4 of the 9 pin “D” connector

DC Power (-) ---------- Pin 8 of the 9 pin “D” connector

Set Point (SP) Output Signal Connections

Set Point (SP) output signal connection is only required if the GFT2 is mated to the flow controller and will be used as a source for Set Point control signal. Depending on the jumper J2 configuration, the SP output signal can be set to 0 to 5, 0 to 10 VDC or 4 to 20 mA.

⚠ CAUTION When connecting the load to the output terminals always check actual jumper J2 configuration. Do not exceed the rated values shown in Table 3. Failure to do so might cause damage to this device. Be sure to check if the wiring and the polarity of the power supply and SP signals are correct before turning the power ON. Wiring error may cause damage or faulty operation. Do not connect external voltage source to the SP output terminals.

Maximum Rated Load Impedence for SP Output Signals					
SP Output Type	J2 Jumper Configuration			Maximum Load Impedence	Note
	J2A	J2B	J2C		
0 to 5 VDC	2 to 3	5 to 6	8 to 9	≤1000 Ω	
0 to 10 VDC	2 to 3	5 to 6	8 to 9	≤5000 Ω	
4 to 20 mA	1 to 2	4 to 5	7 to 8	≤900 Ω	Self powered (non-isolated)

Table 3

DC Power (+) ---------- Pin 5 of the 9 pin “D” connector

DC Power (-) ---------- Pin 8 of the 9 pin “D” connector

⚠ WARNING The 4 to 20 mA current loop output is self-powered (non-isolated). Do NOT connect an external voltage source to the output signals.

RS-232 Serial Communication Interface Connections

The digital interface operates via RS-232 and provides access to all applicable internal configuration parameters and data.

The settings for the RS-232 communication interface are:

Baud rate: default 9600 baud
Stop bit: 1
Data bits: 8
Parity: None
Flow control: None

The RS-232 Communication Interface Connection must establish a crossover connection form the PC host connector to the “D” connector.

RS-232 RX: Pin 2 on the host PC DB9 connector - Pin 7 of the 9 pin “D” connector (TX-)

RS-232 TX: Pin 3 on the host PC DB9 connector - Pin 3 of the 9 pin “D” connector (RX-)

RS-232 Signal GND: Pin 5 on the host PC DB9 connector - Pin 6 of the 9 pin “D” connector

RS-485 Communication Interface Connection:

The RS-485 converter/adaptor must be configured for: multidrop, 2-wire, half duplex mode (see Figure 6). The transmitter circuit must be enabled by TD or RTS (depending on which is available on the converter/adapter). Settings for the receiver circuit should follow the selection made for the transmitter circuit in order to eliminate echo.

RS-485 T(-) or R(+) pin 7 of the 9 pin “D” connector (TX-)
RS-485 T(+) or R(-) pin 3 of the 9 pin “D” connector (RX+)

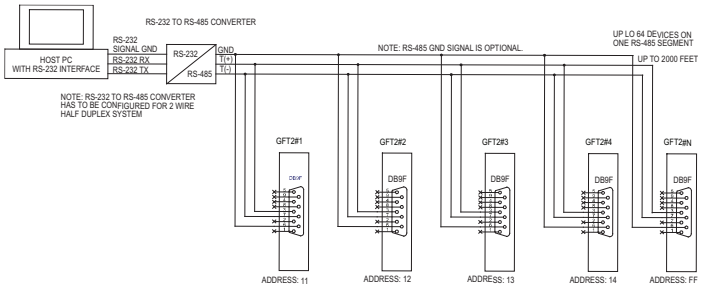


Figure 1 RS-485 Multidrop Half Duplex Two Wire System

RS-485 GND (if available) pin 6 of the 9 pin “D” connector

LCD Key-Pad Operation: Data Entry and Configuration

Display Indications:

Initially, after the power is first turned on, the banner screen is shown for 2 seconds, then the device firmware and EEPROM data base table revisions on the first line, communication interface type on the second line, baud rate and RS-485 hexadecimal address value on the third and fourth lines are shown for another 2 seconds.

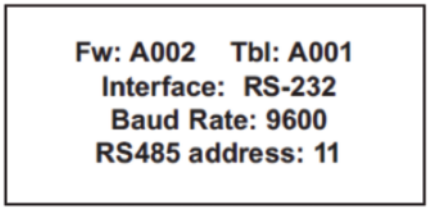


Figure 2

Subsequently, the actual process information (PI) is displayed.

Based on configuration (device function as flow meter or flow controller), different parameters may be displayed in the Process Information (PI) screen by pressing the UP or DN pushbuttons.

Process Information screens can be configured to be static or dynamic. Using the Screen mask settings, the user can enable (unmask) or disable (mask) up to 4 different process information combinations (see Figure 6). In static mode the UP button pages through the PI screens in the forward direction, the DN button pages through the PI screens in the reverse direction. When the last PI screen is reached, the firmware “wraps around” and scrolls to the initial PI once again.

In the Dynamic display mode, firmware initiates automatic screen sequencing with user-adjustable screen Cycle Time. When the last PI screen is reached, the firmware “wraps around” and scrolls to the initial PI screen once again.

NOTE: Actual content of the LCD screen may vary depending on the model and

Figure 3 - Initial PI Screen (Flow Meter)

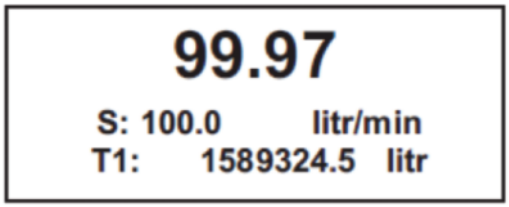


Figure 4 - Initial PI Screen (Flow Controller)

device configuration.
When GFT2 device is set as the last device on the RS-485 bus segment, and 220 Ohm bus termination is required, set jumper J2G to position 19-20. This will result in connection 220 Ohm resistor between RS-485 (+) and (-) terminals.

Digital and Pulse Optically-Isolated Outputs and Connections
GFT2 is equipped with two programmable digital optically-isolated outputs. Each output can be assigned to any one of many different system events or configured as pulse output.

Digital optically-isolated outputs use dedicated 4 position 3.5 mm male terminal block header J1 located on the top side of the GFT2 enclosure . (Mated interface connector: Tyco Electronics P/N 284510-4)

Optocoupler #1 - Terminal J1 (pins 1 and 2):

Plus (+) (passive) Terminal J1 pin 1
Minus (-) (passive) Terminal J1 pin 2

Optocoupler #2 – Terminal J1 (pins 3 and 4):

Plus (+) (passive) Terminal J1 pin 3

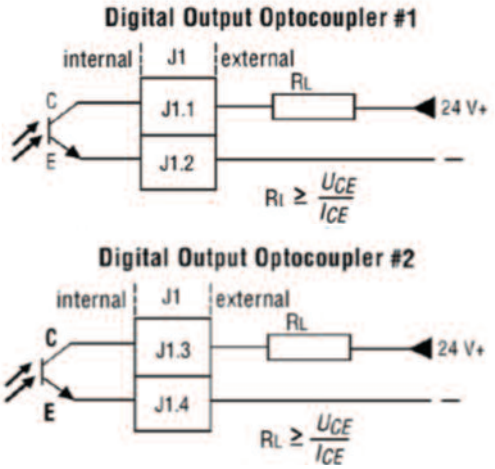


Figure 5

⚠ WARNING Minus (-) (passive) Terminal J1 pin 4
Optically-isolated outputs require application of external DC voltage across terminals. Do not exceed maximum allowed limits for voltage and current: 2V < UCE < 40 V, 0.2 mA < ICE < 150 mA.

Set Point Control (only for devices set as controller)
When the GFT2 is configured as controller it can be used to control the set point value for mated flow controller using the analog output interface. The set point value can be adjusted locally using the LCD/ keypad, remotely via RS-232/RS-485 digital interface, or can be programmed in advance using user preset programs of up to sixteen steps (Program Set Point Mode).

NOTE: Before applying power and process signals, make sure the input/output jumpers are installed in the correct position (see Figure 6).

Adjusting the Set Point using local LCD/Keypad: Current Set Point value is displayed on the second line of the main PI screen, next to the 'S' character. See Figure 7.

Pressing the **ENT** button while in the PI screen will activate Set Point adjustment mode. The first character of the Set Point value will start to flash. Use the **UP** or **DN** button to increase/decrease digit value from 0 to 9. Use **RIGHT** or **LEFT** buttons to move the cursor to another digit position. When desired Set Point value is entered, use the **ENT** button to accept the new Set Point value. If in the end of the Set Point value entry the **ESC** button is pressed instead of **ENT**, the original Set Point value will be restored and Set Point adjustment mode will be deactivated. To exit form the Set Point adjustment mode before Set Point value is accepted, press **ESC** button.

NOTE: Since the Set Point value entered via local LCD/keypad is stored in the non volatile memory (EEPROM), it will be executed on the next device power up event.

NOTE: If Program Set Point mode is enabled and the program is running, the Set Point value can be changed at any moment by the execution of the next active step.

Controlling Set Point value using Program Set Point Mode:
In order to activate the Programmed Set Point:
1. Program Set Point mode has to be enabled.
2. Program Loop parameter has to be set to desired value (On/Off).

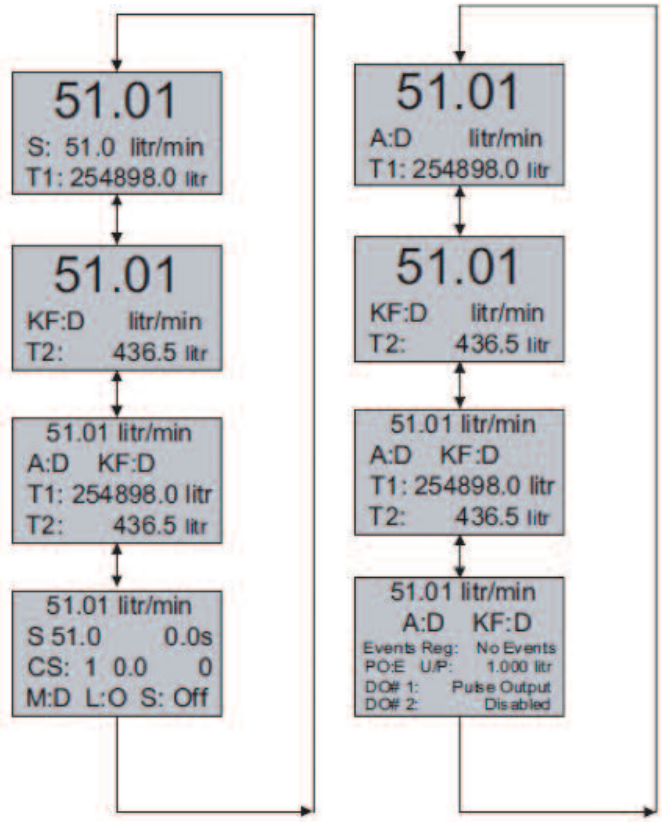


Figure 6

3. Program Run parameter has to be set to "On".

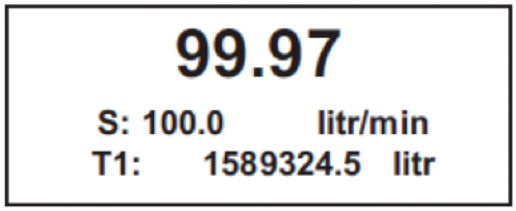
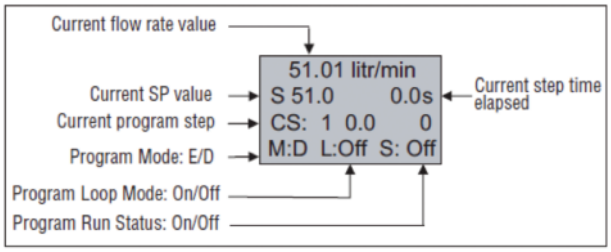


Figure 7



As shown in the above picture, the program run parameter can be toggled “On” and “Off” by pressing **RIGHT** and **LEFT** keypad buttons while PI screen 4 is active. If the Program Run status parameter set to “Off”, the program execution will pause and current SP value will freeze until the Program Run status parameter is set to “On”.

NOTE: While Program Set Point mode is running, the current Set Point value also can be changed from local LCD/keypad and digital RS-232 communication interface. In this case, new Set Point value will be kept only until the next successive program step will be executed.

Menu Structure

The diagram on the Figure 10 gives a general overview of the standard top-level display menu structure when running firmware version A001. The **ESC** pushbutton is used to toggle between the Process Mode (PI screens) and the Setup menus.

UP and **DN** buttons must be used to move through the menu items. When the last item in the menu is reached, the menu “wraps around” and scrolls back to the beginning of the menu items list. Similarly when the first menu item is highlighted and **UP** button is pressed, the menu “wraps around” and scrolls down to the end of the menu items list.

All process configuration parameters settings are password protected. In order to access or change them, Program Protection should be disabled. Each time the device is powered up, the Program Protection is enabled automatically. By default ,device is shipped from the factory with Program Protection (PP) password set to Zero (PP Disabled). If PP password is set to Zero (Disabled), entering PP password is not required and a following screen will appear when Program Protection menu

Figure 8

item will be selected. (See Figure 8).

Pressing the **UP** or **DN** button to select the Disabled option and then the ENT button to save settings will disable program protection.

If PP password is set to any value more than Zero, the firmware will prompt with **“Enter PP Password”** (see Figure 9). User must enter up to 3 digits program protection code in order to be able to access password protected menus. Once the correct password is entered, Program Protection is turned off until the unit is

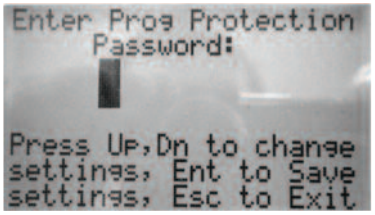


Figure 9

powered up again.

Parameter Entry

There are two methods of data entry:

1. Direct numerical number entry.
2. Tabular Input from a table menu.

If the menu with direct numerical entry is selected, use the **UP** or **DN** button to increase/decrease digit value from 0 to 9. Use the **RIGHT** or **LEFT** button to move the cursor to another digit position. When the desired value is entered, use **ENT** button to accept (save in the EEPROM) the new value.

NOTE: During data entry, the input values are checked for acceptability. If data is not acceptable, it is rejected and a message indicates that the new data has not been accepted.

If the menu with tabular entry is selected, the available menu options can be set with the **UP** or **DN** buttons and are accepted by pressing the ENT button.

Submenu “Change PP Password”

In order to get access to “Change PP Password” menu, program protection must be disabled. If PP password is set to Zero (Disabled), entering PP Password is not required and PP can be disabled from “Program Protection” menu (see Figure 3). If PP Password is set to any value more than Zero, the firmware will prompt with **“Enter PP Password”** (see Figure 9). User must enter program protection code (up to 3 digits). If PP password is lost or forgotten, contact Dwyer Instruments.

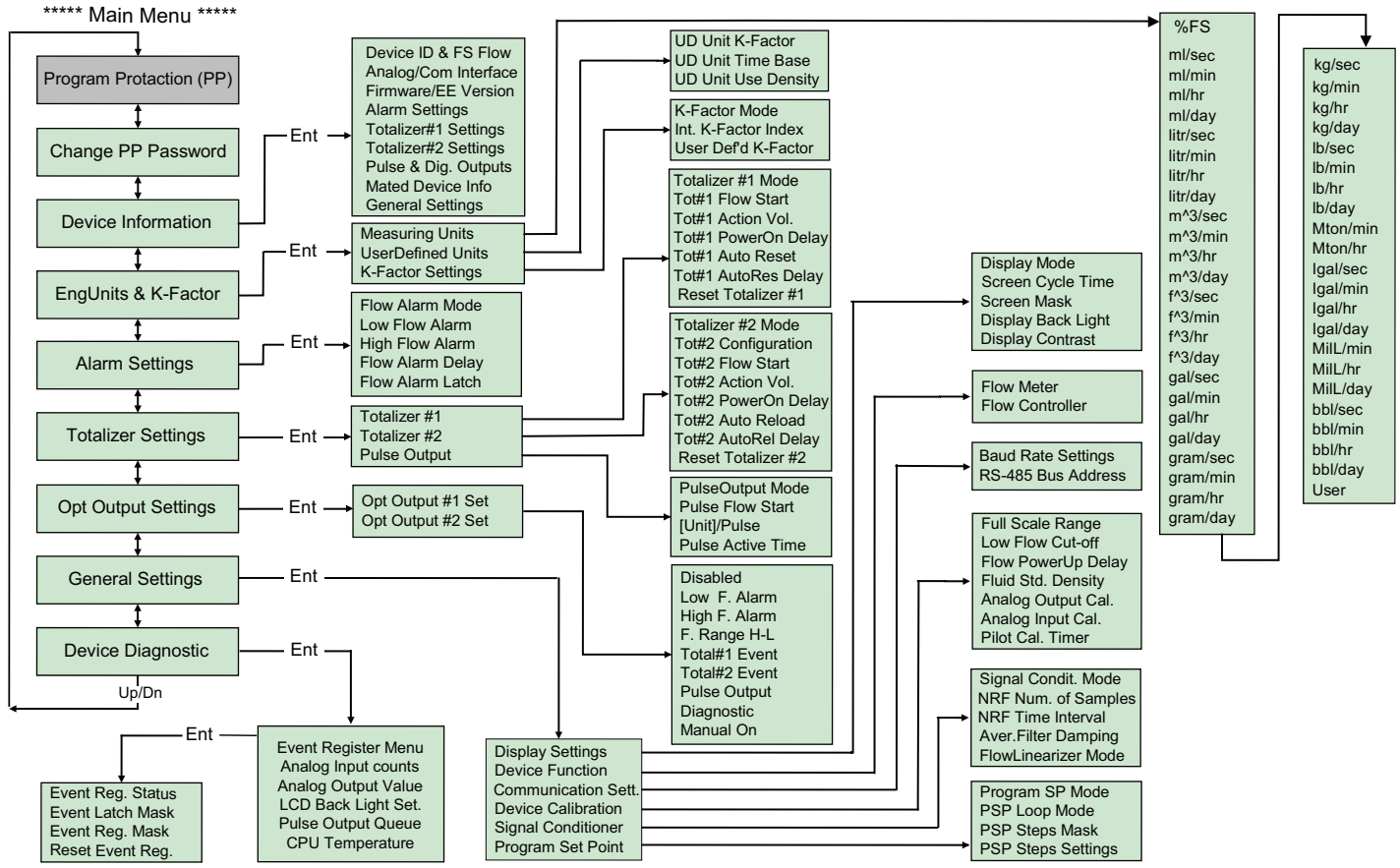


Figure 10

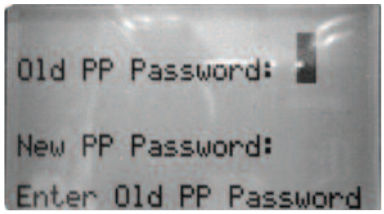


Figure 11

Once "Change PP Password" menu is selected, the following screen will appear: In order to protect device configuration parameters when changing the PP password, the old PP password must be entered.

NOTE: By default, the device shipped from the factory with Program Protection (PP) password set to Zero (PP Disabled).

Once old and new passwords are entered, the firmware will prompt with a

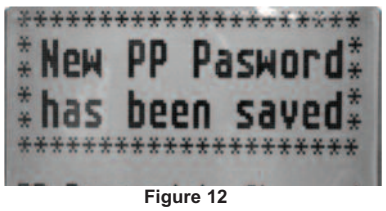


Figure 12

confirmation message (see Figure 12) that the new password has been saved.

Submenu "Device Information"

This submenu contains information about the device's main configuration parameters. These items are informational only, not password-protected, and can

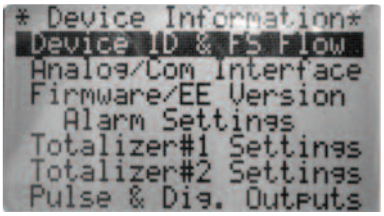


Figure 13

not be changed (read only).

Submenu "Measuring Units"

Use the "Engineering Units and K-Factor Menu" to navigate to "Measuring Units" menu option. This option allows configuration of the flow meter/controller with the desired units of measurement. These are global settings and determine what appears on all process information screens and data log records. Units should be selected to meet each particular metering need. A total of 47 different volumetric and mass based engineering units are supported (See Table 4).

NOTE: Program the Measuring Units first because subsequent menus may be based on the units selected. Once Flow Unit of Measure is changed, the Totalizer's Volume based Unit of Measure will be changed automatically.

Submenu "User-Defined Units"
In addition to conventional flow units, user-defined flow engineering units may be selected. Use the "Engineering Units and K-Factor Menu" to navigate to the "User Defined Units" menu option. This option enables user-defined configuration of any engineering unit required for process measurement.

The following three parameters are available for this function:
1. UD Unit volume K-Factor (defined in Liters)
2. UD Unit time base (defined in Seconds)
3. UD Unit use density (units with or without density support)

Before using User-Defined Unit, make sure the proper conversion factor of the new unit with respect to one liter is set (the default entry is 1.00 Liter). Also, proper time base values for User-Defined Units must be set.

The following selections are available: 1 second, 60 seconds (1 minute), 3600 seconds (1 hour), 86400 seconds (1 day). The default entry is 60 seconds. If a mass based User-Defined Unit is desired, then "UD Unit Use Density" parameter must be set to "YES". The default entry is "NO", so Fluid STD Density parameter is n o t

Number	Flow Rate Engineering Units	Totalizer Engineering Units	Description
1	%FS	%s	Percent of full scale
2	ml/sec	ml	Mililiter per second
3	ml/min	ml	Mililiter per minute
4	ml/hr	ml	Mililiter per hour
5	ml/day	ml	Mililiter per day
6	litr/sec	litr	Liter per second
7	litr/min	litr	Liter per minute
8	litr/hr	litr	Liter per house
9	litr/day	litr	Liter per day
10	m^3/sec	m^3	Cubic meter per second
11	m^3/min	m^3	Cubic meter per minute
12	m^3/hr	m^3	Cubic meter per hour
13	m^3/day	m^3	Cubic meter per day
14	f^3/sec	f^3	Cubic feet per second
15	f^3/min	f^3	Cubic feet per minute
16	f^3/hr	f^3	Cubic feet per hour
17	f^3/day	f^3	Cubic feet per day
18	gal/sec	gal	Gal per second
19	gal/min	gal	Gal per minute
20	gal/hr	gal	Gal per hour
21	gal/day	gal	Gal per day
22	gram/sec	gram	Grams per second
23	gram/min	gram	Grams per minute
24	gram/hr	gram	Grams per hour
25	gram/day	gram	Grams per day
26	kg/sec	kg	Kilograms per second
27	kg/min	kg	Kilograms per minute
28	kg/hr	kg	Kilograms per hour
29	kg/day	kg	Kilograms per day
30	lb/sec	lb	Pounds per second
31	lb/min	lb	Pounds per minute
32	lb/hr	lb	Pounds per hour
33	lb/day	lb	Pounds per day
34	Mton/min	Mton	Metric Ton per minute
35	Mton/hr	Mton	Metric Ton per hour
36	lgal/sec	lgal	Imperial Gal per second
37	lgal/min	lgal	Imperial Gal per min
38	lgal/hr	lgal	Imperial Gal per hour
39	lgal/day	lgal	Imperial Gal per day
40	MilL/min	MilL	Million Litr per minute
41	MilL/hr	MilL	Million Litr per hour
42	MilL/day	MilL	Million Litr per day
43	bbl/sec	bbl	Barrel per second
44	bbl/min	bbl	Barrel per minute
45	bbl/hr	bbl	Barrel per hour
46	bbl/day	bbl	Barrel per day
47	User	User	User Defined

Table 4: Supported Engineering Units List

used for flow rate calculation.

Submenu "K-Factors Settings"
Conversion factors relative to Nitrogen are convenient to use when flow meter/controller mated to GFT2 is calibrated for Nitrogen and another gas is required to be measured/controlled.

Conversion factors relative to Nitrogen, for up to 22 common gases, are stored in the GFT2. In addition, provision is made for a **user-defined** conversion factor. Conversion factors may be applied to all units of measure (except %FS unit) via LCD/Keypad or serial communication interface.

The following three parameters are available for this function:
K-Factor Mode: Disable, Internal Index, User-Defined (default Disabled)
Internal K Factor Index: 1 – 22 (from internal K-Factor table)
User-Defined K-Factor: 0.001 – 999.9 (default value is 1.000)

NOTE: The conversion factors will not be applied for % FS engineering unit.

Submenu "Alarm Settings"
GFT2 provides the user with a flexible alarm/warning system that monitors the Fluid Flow for conditions that fall outside configurable limits, as well as visual feedback for the user via the LCD or via an optically-isolated output. The Flow Alarm has several attributes which may be configured by the user via LCD/Keypad or serial communication interface. These attributes control the conditions which cause the alarm to occur and to specify actions to be taken when the flow rate is outside the specified conditions.

Depending on the GFT2 function configuration (flow meter or controller) there are two Alarm algorithms. If GFT2 is configured as flow meter, flow Alarm conditions become true when the current flow reading is equal to or higher/lower than

corresponding values of high and low flow Alarm levels. If GFT2 is configured as flow controller, flow Alarm conditions become true when difference between Set Point value and current flow reading is equal or higher/lower than corresponding values of High and Low Flow Alarm levels.

Alarm actions can be assigned with preset Delay Interval (0-3600 seconds) to activate the optically-isolated output (separate for High and Low alarm). Latch Mode control feature allows each optical output to be latched on or follow the corresponding alarm status.

The following settings are available for Flow Alarm (see Figure 10):

a) Flow Alarm Mode (Tabular entry)
This function determines whether Flow Alarm is Enabled or Disabled. The following sections are available: Enabled or Disabled. The default entry is Disabled. Alarm Mode selections can be set with the UP and DN buttons and are accepted by pressing **ENT** button.

b) Low Flow Alarm (Numerical entry)
The limit of required Low Flow Alarm value can be entered in increments of 0.1% from 0 – 100% FS.
If a Low Alarm occurs and one of the two optional outputs is assigned to the Low Flow Alarm Event, the optically-isolated output will be activated:
1) For Flow Meter Function: when the flow is less than the Low Flow Alarm value.
2) For flow controller function: when the absolute difference between Set Point value and actual flow reading is equal or more than the Low Flow Alarm value and Actual Flow value is less than Set Point value.

The Low Flow Alarm condition is also indicated on the corresponding Process Information Screen displaying L character.

NOTE: For Flow Meter function, the value of the Low Flow Alarm must be less than the value of the High Flow Alarm

c) High Flow Alarm (Numerical entry)
The limit of required High Flow Alarm value can be entered in increments of 0.1% from 0 – 100% FS. If a High Alarm occurs and one of the two optical outputs is assigned to the High Flow Alarm Event, the optically-isolated output will be activated for:
a) Flow Meter function: when the flow is more than the High Flow Alarm value.
b) Flow Controller function: when absolute difference between Set Point value and Actual Flow reading is equal or more than the High Flow Alarm value and actual flow value is more than Set Point value.

The High Flow Alarm condition is also indicated on the corresponding Process Information Screen by displaying H character.

NOTE: For Flow Meter function, the value of the High Flow Alarm must be more than the value of the Low Flow Alarm.

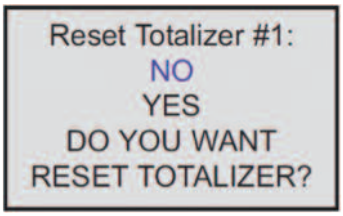


Figure 14

d) Flow Alarm Action Delay (Numerical entry)
The Flow Alarm Action Delay is a time in seconds that the Flow Rate value remain

Figure 15

sabove the high limit or below the low limit before an alarm condition is validated. Valid settings are in the range of 0 to 3600 seconds (default value is 0, no delay).

e) Flow Alarm Action Latch (Tabular entry)
The Flow Alarm Action Latch settings controls the Latch feature. If optically-isolated output is assigned to the Flow Alarm Event, in some cases, the Flow Alarm Latch feature may be desirable.

The following settings are available: Disable or Enable. By default, Flow Alarm is non-latching. That means the alarm is indicated only while the monitored Flow Value exceeds the specified set conditions.

Submenu "Totalizer #1"
GFT2 provides the user with two independent Programmable Flow Totalizers. The total volume of the flowing fluid is calculated by integrating the actual instantaneous fluid flow rate with respect to time. Totalizer #1 (main totalizer) value is stored in the EEPROM and saved every (1) second. In case of power interruption, the last saved Totalizer value will be loaded on the next power on cycle, so main totalizer reading will not be lost. Use the "Totalizer Menu" to navigate to the "Totalizer #1" menu option. The following settings are available for Totalizer #1 (see Figure 10).

a) Totalizer #1 Mode (Tabular entry)
This option determines whether Totalizer #1 is Enabled or Disabled. The following selections are available: Enabled or Disabled. The default entry is Disabled. Totalizer #1 Mode selections can be set with the UP and DN buttons and are accepted by pressing ENT button.

NOTE: Before enabling the Totalizer, ensure that all totalizer settings are configured properly. Totalizer Start values have to be entered in the currently active Volumetric or Mass flow engineering unit. The Totalizer will not totalize until the Process Flow Rate becomes equal to or more than the Totalizer Start value. Totalizer Event values must be entered in currently active volume or mass based engineering units. If the Totalizer Event at preset total volume feature is not required, set Totalizer Event value to zero (default settings).

b) Totalizer #1 Flow Start (Numerical entry)
This option allows the totalizer to start at a present flow rate. The Totalizer #1 will not totalize until the process flow rate becomes equal to or more than the Totalizer #1 Flow Start value. The limit of required Totalizer #1 Flow Start value can be entered in increments of 0.1% from 0 to 100% FS.

c) Totalizer #1 Action Volume (Numerical entry)
This option allows the user to activate preset required action when the totalizer reaches a preset volume. Totalizer #1 Action Volume value must be entered in currently active volume/mass based engineering units. Totalizer #1 action event becomes true when Totalizer #1 reading is more or equal to preset "Totalizer #1 Action Volume". If the Totalizer #1 Action at preset total volume feature is not required, set "Totalizer #1 Action Volume" value to zero (default settings).

d) Totalizer #1 Power On Delay (Numerical entry)
Sometimes it is convenient to start the Totalizer only after specified power up delay interval. Most of the mass flow meters and controllers require some warm up time from the power up event in order to stabilize process variable output and get accurate reading. "Totalizer #1 Power On Delay" option allows set specified time interval which must elapse from the device power up event before Totalizer will be activated. Valid settings are in the range of 0 to 3600 seconds (default value is 0, no delay).

e) Totalizer #1 Auto Reset (Tabular entry)
This option allows to automatically reset Totalizer #1 when it reaches preset Action Volume value. This feature may be convenient for batch processing, when predefined volume of the fluid must be repeatedly dispensed into the process. The following selections are available: Enabled or Disabled.

The default entry is Disabled. Totalizer #1 Auto Reset selections can be set with the UP or DN buttons and are accepted by pressing **ENT** button.

f) Totalizer #1 Auto Reset Delay (Numerical entry)
This option may be desirable when "Totalizer #1 Auto Reset" feature is enabled. Valid settings are in the range of 0 to 3600 seconds (default value is 0, no delay).

g) Reset Totalizer #1 (Numerical entry)
The Totalizers #1 reading can be reset by selecting "Reset Totalizer #1" menu

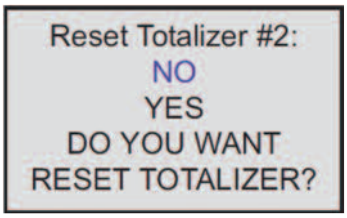


Figure 16

option. A typical display with Totalizer #1 Reset screen is shown in Figure 14.

Figure 17

Once the "YES" option is selected, Totalizer #1 will be reset and the following confirmation screen will appear:

Submenu "Totalizer #2"
The Totalizer #2 (pilot totalizer) value is stored in the flow meter volatile memory (SRAM) and saved every 100 milliseconds (0.1 second). In case of power interruption, the Totalizer #2 volume will be lost (reset to zero). It is preferable to use Totalizer #2 for short term process flow calculation (for example: batch processing). Use the "Totalizer Menu" to navigate to "Totalizer #2" menu option. The following settings are available for Totalizer #2 (see Figure 10):

a) Totalizer #2 Mode (Tabular entry)
This option determines whether Totalizer #2 is Enabled or Disabled. The following selections are available: Enabled or Disabled. The default entry is Disabled. Totalizer #2 Mode selections can be set with the **UP** and **DN** buttons and are accepted by pressing **ENT** button.

NOTE: Before enabling the Totalizer, ensure that all Totalizer settings are configured properly. Totalizer Start values must be entered in currently active Volumetric or Mass flow engineering unit. The Totalizer will not totalize until the process flow rate becomes equal to or more than the Totalizer Start value. Totalizer Event values must be entered in currently active volume or mass based engineering units. If the Totalizer Event at preset total volume feature is not required, then set Totalizer Event value to zero (default settings).

b) Totalizer #2 Configuration (Tabular entry)
Totalizer #2 can be configured to count up or down. When configured to count down, be sure "Totalizer #2 Action Volume" parameter is set to the desired value of more than zero. In this case Totalizer #2 Action Event will be activated when the totalizer counts down to zero. The following selections are available: Count **UP** or Count **DN**. The default entry is Count **UP**. Totalizer #2 configuration selections can be set with the **UP** and **DN** buttons and are accepted by pressing **ENT** button.

c) Totalizer #2 Flow Start (Numerical entry)
This option allows the start of the totalizer at a preset flow rate. The Totalizer #2 will not totalize until the process flow rate becomes equal to or more than the Totalizer #2 Flow Start value. The limit of required Totalizer #2 Flow Start value can be entered in increments of 0.1% from 0 -100%FS.

d) Totalizer #2 Action Volume (Numerical entry)
This option allows the user to activate preset required action when totalizer reaches a preset volume when totalizer configured to count up, or zero value when totalizer configured to count down. Totalizer #2 Action Volume value must be entered in currently active volume/mass based engineering units. When set to count up, Totalizer #2 Action Event becomeS true when the totalizer #2 reading is more or equal to preset "Totalizer #2 Action Volume". If the Totalizer#2 Action at preset total volume feature is not required, set "Totalizer #2 Action Volume" value to zero (default settings).

NOTE: When Totalizer #2 is configured to count down, be sure "Totalizer #2 Action Volume" value is set to any value more than zero.

e) Totalizer #2 Power On Delay (Numerical entry)
Sometimes it is convenient to start Totalizer only after specified power up delay

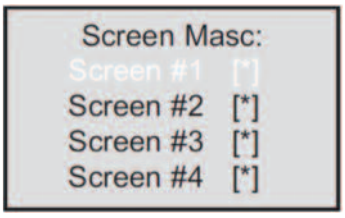


Figure 18

interval. Most of the mass flow meters and controllers require some warm up time from the power up event in order to stabilize process variable output and get accurate reading. "Totalizer #2 Power On Delay" option allows set a specified time interval which must elapse from the device power-up event before Totalizer will be activated. Valid settings are in the range of 0 to 3600 seconds (default value is 0, no delay).

f) Totalizer #2 Auto Reload (Tabular entry)
This option allows to automatically reset/reload Totalizer #2 when it reaches preset Action Volume value (when configured to count UP) or zero value (when configured to count Down). This feature may be convenient for batch processing when predefined volume of the fluid must be repeatedly dispensed into the process. The following selections are available: Enabled or Disabled. The default entry is Disabled. Totalizer #2 Auto Reload selections can be set with the **UP** and **DN** buttons and are accepted by pressing the **ENT** button.

g) Totalizer #2 Auto Reset Delay (Numerical entry)
This option may be desirable when "Totalizer #2 Auto Reload" feature is enabled. Valid settings are in the range of 0 to 3600 seconds (default value is 0, no delay).

h) Reset Totalizer #2 (Numerical entry)
Totalizers #2 reading can be reset by selecting "Reset Totalizer #2" menu option. A typical display with Totalizer #2 Reset screen is shown below.
Once "YES" option is selected, the Totalizer #2 will be reset and the following confirmation screen will appear.

Submenu "Pulse Output"
The flow Pulse Output is operating independently from totalizers and, based on configuration settings (see Figure 10), can provide pulse frequency proportional to instantaneous fluid flow rate.

The LCD/keypad and serial communication interface commands are provided to:
• Enable/Disable Pulse Output
• Start Pulse Output at preset flow rate (0.0 – 100.0%FS.
• Configure the Unit/Pulse value (in current engineering units)
• Configure Pulse Active On Time (10 – 6553 milliseconds)

NOTE: The Pulse Output minimum Active On time is 10 milliseconds (.01 second). The Optical Pulse Output cannot operate faster than one pulse every 100 millisecond (.1 second). A good rule to follow is to set the Unit/Pulse value equal to the maximum flow in the same units per second. This will limit the pulse rate to no faster than one pulse every second.

For example: Maximum flow rate = 1200 kg/min
(1200 kg/min = 20 kg/sec)
If unit per pulse is set to 1200 kg/pulse, the Optical Pulse Output will pulse once every minute.

If unit per pulse is set to 20 kg per pulse, the Optical Pulse Output will pulse once every second.

The Optically-Isolated Pulse Output incorporate Pulse Output queue, which accumulate pulses if the Pulse Output is accumulating process flow faster than the Pulse Output hardware can function. The queue will allow the pulses to "catch up" later if the flow rate decreases. A better practice is to slow down the Pulse Output by increasing the value in the Unit/Pulse setting in the Pulse Output menu (see Figure 10).

NOTE: If Pulse Output feature is required, one of the Digital Optically- solated outputs must be assigned to "Pulse Output" function. Pulse output signal will be accessible via corresponding Digital Optically-Isolated output on the screw terminal header J1 (see Wiring Diagrams).

Submenu "Opt. Outputs Settings"
Two sets of optically-isolated digital outputs are provided to actuate user-supplied equipment. These are programmable via digital interface or LCD/Keypad such that the outputs can be made to switch when a specified event occurs (e.g. when a Low or High Flow Alarm limit is exceeded or when the Totalizer reaches a specified value) or it may be directly controlled by user.

The user can configure each optical output action from 9 different options:
• Disabled: No Action (output is not assigned to any events and is not energized)
• Low Flow Alarm
• High Flow Alarm
• Range between High and Low Flow Alarm settings
• Totalizer #1 reading exceed set limit
• Totalizer #2 reading exceed set limit
• Pulse Output function
• Diagnostic: Output will be energized when any of the Diagnostic or System events are active
• Manual On Control: Output will be energized until Disabled option will be selected.

By default, both optically-isolated outputs are disabled.

NOTE: Optically-isolated outputs are accessible via screw terminal header J1 and require application of external DC voltage across terminals. See Wiring Diagrams.

Submenu "Display Settings"

Process Information screens can be configured to be static (manual control) or dynamic (automatic sequencing). In the static mode pressing the UP button allows the user to page through the PI screens in the forward direction, pressing DN button pages through the PI screens in the reverse direction. When the last PI screen is reached, the firmware "wraps around" and scrolls to the initial PI screen once again.

NOTE: PI screens which are masked in the Screen Mask Register (see below) will be skipped.

Use the "General Settings" menu to navigate to "Display Settings" menu option (see Figure 10).

The following settings are available for LCD Display:
a) Display Mode (Tabular entry)
This option determines whether Display screens are in static (manual control) or dynamic (automatic sequencing) mode. The following selections are available: Static or Dynamic. The default entry is: Static (manual control). Display screens mode parameter can be set with the **UP** and **DN** buttons and are accepted by pressing **ENT** button.

b) Screen Cycle Time (Numerical entry)
This menu selection defines time interval in seconds for each PI screen to be displayed in the dynamic mode (automatic sequencing). Screen Cycle Time can be set to any value in the range between 1 to 3600 seconds (1 hour, numerical entry).

c) Screen Mask (Tabular entry)
Using Screen Mask settings the user can enable (unmask) or disable (mask) up to 4 different process variable combinations (see Figure 1). By default the unit is shipped from the factory with all PI screens enabled. A typical display with Screen Mask selection is shown below.
In the example shown above, all PI screens are enabled. Each PI screen assigned to a corresponding bit in the PI Screen Register. In order to change PI Screen mask settings, the user should select the desired screen using **UP** and **DN** buttons and then press RIGHT button. The asterisk will appear/disappear on the right side of the corresponding screen. The asterisk represents that the screen is enabled. In order to disable the screen, the corresponding asterisk must be removed. Use the **ENT** button to accept and save new PI Screen Mask settings in the device's nonvolatile memory.

NOTE: PI Screen #1 cannot be disabled (unmasked).

d) Display Back Light (Numerical entry)
Using Display Back Light settings the user can adjust the desired level of the LCD back light. The backlight has 19 different levels. Use **UP** and **DN** buttons to adjust back light level and press **ENT** button to accept and save back light level settings in the device's nonvolatile memory.

e) Display Contrast (Numerical entry)
Using Display Contrast settings, the user can adjust the desired level of the LCD contrast. The contrast has 16 different levels. Use **UP** and **DN** buttons to adjust contrast level, and press **ENT** button to accept and save contrast level settings in the device's nonvolatile memory.

NOTE: By default, the contrast level is set to 6, which is the optimal level for room temperature (20°C or 70°F).

Submenu "Device Function"
This menu selection allows the selection of GFT2 function according to the mated device type. If GFT2 is connected to the flow meter, then the **"Meter"** function must be selected. If GFT2 is connected to the flow controller, then "Controller" function must be selected.

NOTE: Based on "Device Function" (device function as flow meter or flow controller) settings, different parameters may be displayed in the Process Information (PI) screen (see Figure 1) and different features of the GFT2 device may be enabled or disabled (set point control only enabled when GFT2 is configured as flow controller). Also, some features (e.g. Flow Alarm) may have different behavior. Make sure the "Device Function" parameter is set according to the actual device being used.

Submenu "Communication Settings"
This menu selection allows the configuration of a serial communication interface speed (Baud rate) and device RS-485 bus address (only applicable for optional RS-485 interface). The following settings are available for "Communication Settings" (see Figure 10).

a) Baud Rate Settings (Tabular entry)

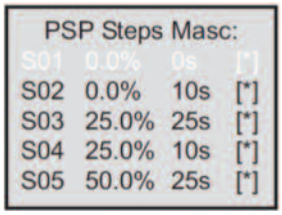


Figure 19

The Baud Rate Settings (Tabular entry) option determines device serial communication interface speed (Baud rate) and can be set to one of the following: 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200.

By default, the device shipped from the factory with Baud rate set to 9600.

NOTE: The Baud rate set on the GFT2 device should always follow the Baud rate of the host PC or PLC it is connected to.

b) RS-485 Bus Address (Numerical entry)
The standard GFT2 comes with an RS-232 interface. The optional RS-485 interface has two hexadecimal characters of the address, which must be assigned.

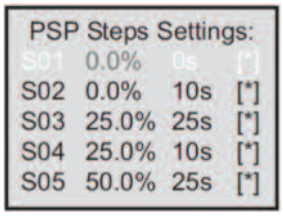


Figure 20

By default, each flow meter is shipped with RS-485 address set to 11 hexadecimal. When more than one device is present on RS-485 bus, each device should have a unique address. The two characters of the address in the hexadecimal representation can be changed from 01 to FF.

NOTE: Address 00 is reserved for global addressing. Do not assign the global address for any device. When command with global address is sent, all devices on the RS-485 bus execute the command, but do not reply with an acknowledge message.

NOTE: Do not assign the same RS-485 address for two or more devices on the same RS-485 address for two or more devices on the same RS-485 bus. If two or more devices with the same address are connected to the one RS-485 network, a communication collision will take place on the bus, and communication errors will occur.

Submenu "Device Calibration"

Event Number	Diagnostic and Alarm Events Description	LCD BIT Code
1	CPU Temperature Too High	0
2	High Flow Alarm	1
3	Low Flow Alarm	2
4	Range Between High and Low	3
5	Totalizer #1 Exceed Set Event Volume Limit	4
6	Totalizer #2 Exceed Set Event Volume Limit	5
7	Optical Pulse Output Queue Overflow	6
8	Flow Rate Above Limit	7
9	Vcc Power Voltage Out of Range	8
10	Serial Communication Error	9
11	EEPROM Error	A
12	Power On Event (Power On Delay Time > 0)	B
13	Password Event	C
14	Fatal Error	D

Table 5

The Calibration Menu contains the parameters, which have to be set according to flow meter/controller being used and according to required process conditions. These values should be changed only by properly trained personnel. Device Analog Output and Input calibration was performed on the factory and should not be initiated unless recommended by factory personnel. Following settings are available for "Device Calibration" menu selection:

a) Full-Scale Range (Numerical Entry)
The Full-Scale Range value in liter per minute (L/min) should be set equal to the full-scale range (converted to L/min) of the device mated to GFT2. The analog input and output will be scaled automatically to this value. For example, if Full-Scale Range value set to 10.0 L/min and device is configured for 0-5 VDC analog input, when 5.0 VDC is applied to GFT2 analog input the PI flow rate will indicate 100.0% FS. (if %FS units of measure is selected).

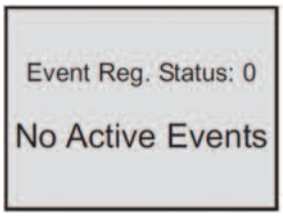


Figure 21

NOTE: Failure to set Full-Scale Range parameter in L/min equal to the full-scale

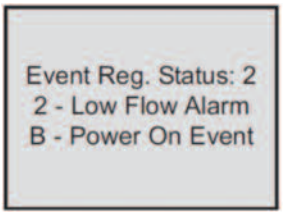


Figure 22

range (converted to L/min) of the device mated to GFT2 may cause erroneous readings and unexpected device behavior.

b) Low Flow Cut-Off (Numerical entry)
The low flow cut-off can be selected between 0.0 and 10.0 % of the full-scale range. Flows less than the cut-off value are internally driven to zero and not totalized. Default value of the "Low flow Cut-Off" parameter is zero (disabled).

c) Flow Power Up Delay (Numerical entry)
Sometimes it is convenient to start the process of the input signals after the specified power up delay interval. Most mass flow meters and controllers require some warm up time from the power up event in order to stabilize process variable

Figure 23

output and get accurate reading. “Flow Power UP Delay” option allows set specified time interval, which has to elapse from the device power up event before processing of the input signals will be activated. During active faze of the Power Up Delay, the flow rate will be internally driven to zero and not totalized. Valid settings are in the range of 0 to 3600 seconds (1 hour, default value is 0, no delay).

d) Fluid Std. Density (Numerical entry)
The density of the flowing fluid at standard temperature and pressure conditions should be in g/L. This parameter is used only when mass-based engineering units are selected. Valid settings are in the range of 0.000001 to 10000.0 g/L. Factory set default value is 1.25 g/L (Nitrogen).

e) Analog Output Calibration

NOTE: The analog outputs available on the GFT2 were calibrated at the factory. There is no need to perform analog output calibration unless the DAC IC, output

Figure 24

amplifier IC, or passive components from analog output circuitries were replaced. Any alteration of the analog output scaling variables in the EEPROM table will VOID calibration warranty supplied with the instrument.

The GFT2 analog output calibration involves calculation and storing the off set and span variables in the EEPROM based on two calibration points (0 and 100%FS). The 0 to 5 (0 to 10) VDC output has only scale variable and 4 to 20 mA output has offset and scale variables.

Power up the GFT2 instrument for at least 15 minutes prior to commencing the calibration procedure. Observe analog output jumper position (see GFT2

Figure 25

Input/Output Configuration Jumpers) and connect the corresponding type of measurement device to pins 5 (+) and 8 (-) of the 9-pin D-connector. Follow

Figure 26

firmware prompts and adjust calibration point values according to measurement device reading. If calibration must be aborted, press **ESC** button. When calibration is completed, firmware will display new offset and span values and ask, “Press **ENT** button to save new calibration variables to EEPROM or **ESC** to abort calibration and exit without saving.” In the end, the firmware will prompt the confirmation message.

f) Analog Input Calibration

NOTE: The analog inputs available on the GFT2 were calibrated at the factory. There is no need to perform analog input calibration unless the CPU IC, input amplifier IC, or passive components from analog input circuitries were replaced. Any alteration of the analog input scaling variables in the EEPROM table will VOID calibration warranty supplied with the instrument.

The GFT2 analog output calibration involves calculation and storing the offset and span variables in the EEPROM based on two calibration points (0 to 100% FS.). The 0 to 5 (0 to 10) VDC output has only scale variables and the 4 to 20 mA output has offset and scale variables.

NOTE: Check the actual input jumper configuration before applying any input signal to the GFT2. Make sure the input signal does not exceed maximum allowed

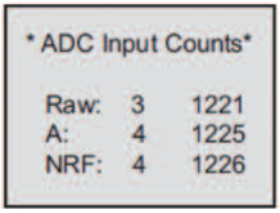


Figure 27

level for corresponding input type (see Table 2). Do not apply voltages above 5.0 VDC unless GFT2 input was specifically configured on the factory for 0 to 10 VDC (check actual model number and specification). Exceeding maximum allowed input level may cause inadvertent damage to the device circuitry.

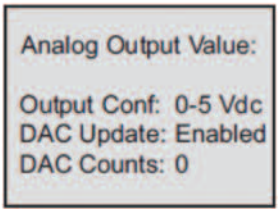


Figure 28

Power up the GFT2 instrument for at least 15 minutes prior to commencing the calibration procedure. Observe the analog jumper position (see GFT2 Input/Output Configuration Jumpers) and the connect corresponding type of calibration signal

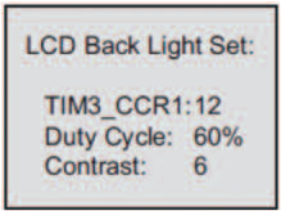


Figure 29

source device to pins 4 (+) and 8 (-) of the 9-pin D-connector. Follow firmware prompts and apply calibration point values according to the on-screen instructions. If calibration has to be aborted, press **ESC** button. When calibration is completed,

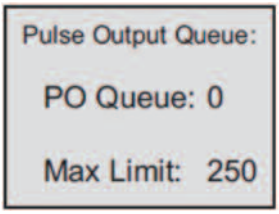


Figure 30

firmware will display new offset and span values and ask, “Press **ENT** button to save new calibration variables to EEPROM or **ESC** to abort calibration and exit without saving.” In the end, the firmware will prompt a confirmation message.

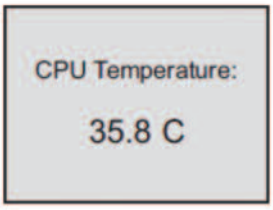


Figure 31

g) Pilot Calibration Timer
The Pilot Calibration timer accumulates operational hours since the last time the unit was calibrated. The smallest increment value is 0.1 hour (6 minutes). The value of the timer may be reset by the user by pressing RIGHT button. Once RIGHT button is pressed, the confirmation screen will appear with the “Yes” or “No” menu. Selecting “Yes” will reset the pilot calibration timer back to zero.

Submenu "Signal Conditioner"
A noise reduction filter algorithm (Running Average or Noise Reduction Filter) is now available in the flow meter when pulsating flow or especially noisy signals are encountered. The Flow Linearizer algorithm is also available when flow linearity must be improved.

The following settings are available for "Program Set Point" (see Figure 10):

a) Program Set Point Mode (Tabular entry)
This function determines whether the Program Set Point is Enabled or Disabled. The following selections are available: Enabled or Disabled. The default entry is Disabled. Program Set Point Mode selections can be set with the **UP** and **DN** buttons and are accepted by pressing **ENT** button.

b) Program Set Point Loop Mode (Tabular entry)
This function determines whether Program Set Point Loop is Enabled or Disabled. If Loop is enabled, when program reaches the last step it wraps around and again starts execution from the first enabled step. The following selections are available: Enabled or Disabled. The default entry is Disabled. Program Set Point Loop Mode selections can be set with the **UP** and **DN** buttons and are accepted by pressing **ENT** button.

c) PSP Steps Mask (Tabular entry)
Using PSP Steps Mask settings, the user can enable (unmask) or disable (mask) any step in the program. If the step is masked, the program will skip it and move to the next enabled step. By default the unit is shipped from the factory with all program steps enabled (unmasked). A typical display with PSP Steps Mask selection is shown below.
In the example shown above, all PSP Steps are enabled. Each PSP Step assigned to a corresponding bit in the PSP Steps Register. In order to change PSP Step mask settings, the user should select desired stop using **UP** and **DN** buttons and then press RIGHT button. The asterisk will appear/ disappear on the right side of the corresponding step. The asterisk represents that step is enabled. In order to disable step, the corresponding asterisk has to be removed. Use **ENT** button to accept and save new PSP Steps mask settings in device non volatile memory.

d) PSP Steps Settings (Numerical entry)
Using PSP Steps Settings menu selection, the user can assign required set point and time values for each step in the program. A typical display with PSP Steps Settings selection is shown below.
In the example shown above, Step 01 is selected. For each step there are two parameters: set point value in % FS and time interval in seconds. In order to change PSP Step settings user should select desired step using **UP** and **DN** buttons and then press **ENT** button. The cursor in the selected (highlighted) parameter will start flashing. Use **UP**, **DN**, **LEFT**, **RIGHT** buttons to adjust desired value and then press **ENT** button to accept and save new PSP Step Settings in the device's nonvolatile memory.

Submenu "Event Register Menu"
GFT2 is equipped with a self-diagnostic Alarm Event Register which is available via digital interface and on screen LCD indication. Use the "Diagnostic Menu" to navigate to "Event Register Menu" menu option.

The following diagnostic events are supported:
NOTE: Any Alarm or Diagnostic events that may have occurred (Event 0 to Event D) are stored in the internal status register. All detected events (if corresponding bit in the latch register is not masked) remain stored until the register is manually reset (by keypad or by means of the serial communication interface). If event

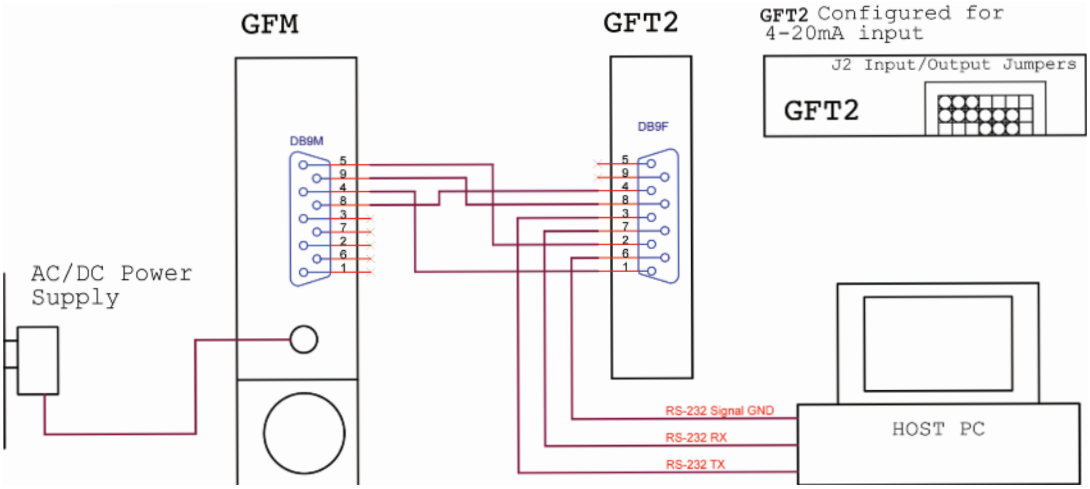


Figure 32: Connecting GFT2 to the GFM using 4-20mA output from DB9 connector.

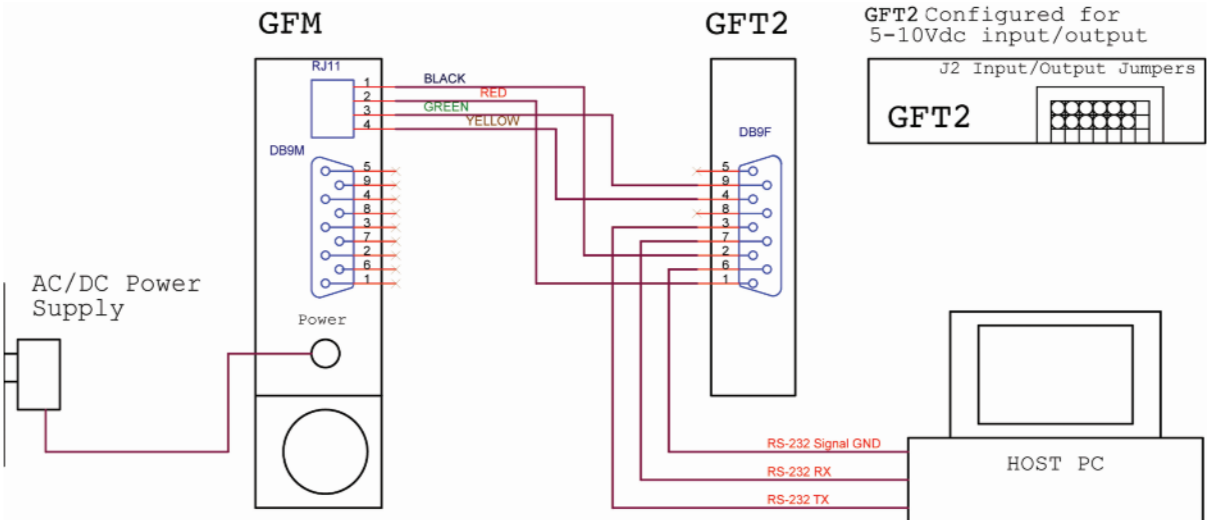


Figure 33: Connecting GFT2 to the GFM using 5 to 10 VDC output from RJ11 connector.

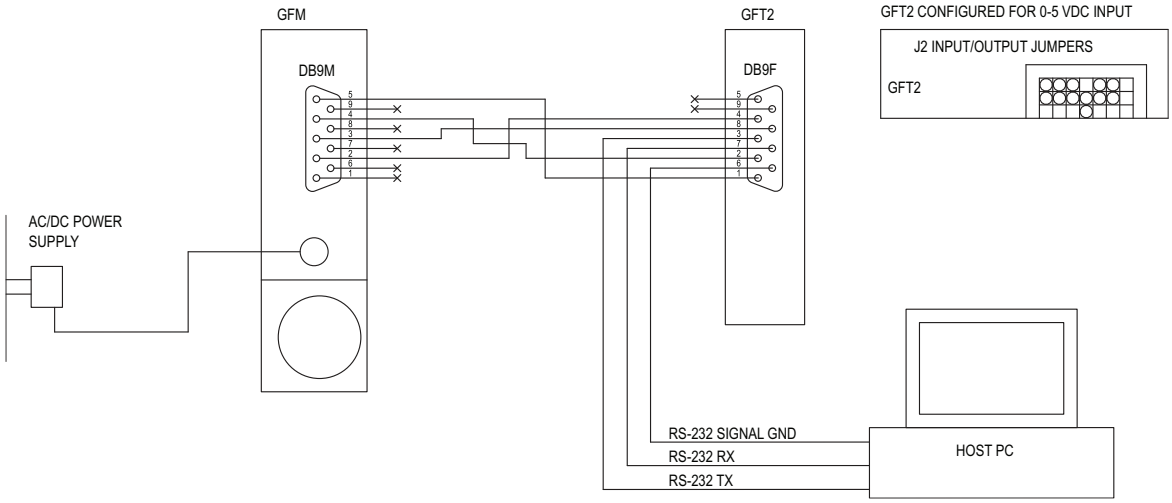


Figure 34: Connecting GFT2 to the GFM using 5 to 10 VDC output from DB9 connector.

corresponding bit in the latch register is masked (disabled), the event will be indicated as long as it is active (no latching). The status Alarm Event Register is mapped to the SCRAM (volatile memory). In case of power interruption, the status Event Register will be automatically reset.

Model	Description
A-646	Flow Meter Mounting Kit, No Cables

The following settings are available for “Event Register Menu” (see Figure 10):

a) Event Register Status (Read Only)

Input/Output Jumper Configuration Options for GFM Series Flow Meters							
PV Input Type (GFT2 Input)	J2 Jumper Configuration						Note
	J2A	J2B	J2C	J2D	J2D	J2F	
0 to 5 VDC	2 to 3	5 to 6	8 to 9	10 to 11	14 to 15	17 to 18	
0 to 10 VDC	2 to 3	5 to 6	8 to 9	11 to 12	14 to 15	17 to 18	
4 to 20 mA	2 to 3	5 to 6	8 to 9	10 to 11	13 to 14	16 to 17	249 Ω passive, not isolated current output

Table 6

Each active Alarm event will be indicated on the LCD screen. Also, the total number of currently active events will be displayed on the first line (header). A typical display without active diagnostic and Alarm Events is shown below.
A typical display with two active events is shown below.
If more than 7 events are displayed, the user can use **UP** and **DN** buttons to scroll and see all indicated events. If event is not latched in the Event Latch Mask register, it may appear and disappear from the status screen, so it will be indicated as long as the actual event is taking place.

b) Event Latch Mask (Tubular entry)

Using Event Latch Mask settings, the user can enable (unmask) or disable (mask) latch feature individually for each event. The event is enabled if there is an asterisk sign [*] set on the right across corresponding event. If event is not latched (no asterisk across corresponding event) it may appear and disappear from the status screen, so it will be indicated as long as the actual event is taking place. By default, the unit is shipped from factory with only one event active: 0 – CPU Temperature too high. For all other events, the latch feature is disabled. A typical display with Event Latch Mask selection is shown below.

In Figure 23, latch features for all events are disabled except event #0. In order to change Event Latch Mask Settings the user should select desired event using **UP** and **DN** buttons and then press **RIGHT** button. The asterisk will appear/disappear on the right side of the corresponding event. The asterisk represents that the latch feature is enabled. In order to disable latch feature, the corresponding asterisk has to be removed. Use the **ENT** button to accept and save new Event Latch mask settings in the device's non volatile memory.

c) Event Register Mask (Tabular entry)

Using Event Register Mask Settings user can individually enable (unmask) or disable (mask) each event. The event is enabled if an asterisk sign [*] is set on the right across from corresponding event. If the event is disabled, it will not be processed or indicated in the Events Status Register, even if actual conditions for event have occurred. By default the unit is shipped from the factory with only one event active: "0 – CPU Temperature too high". All other events are disabled. A typical display with Event Register Mask selection is shown below.

In the example shown above, all events are disabled except event #0. In order to change Event Register Mask Settings, the user should select the desired event using **UP** and **DN** buttons and then press the **RIGHT** button. The asterisk will appear/disappear on the right side of the corresponding event. The asterisk represents that the event is enabled. In order to disable the event, the corresponding asterisk has to be removed. Use the **ENT** button to accept and save

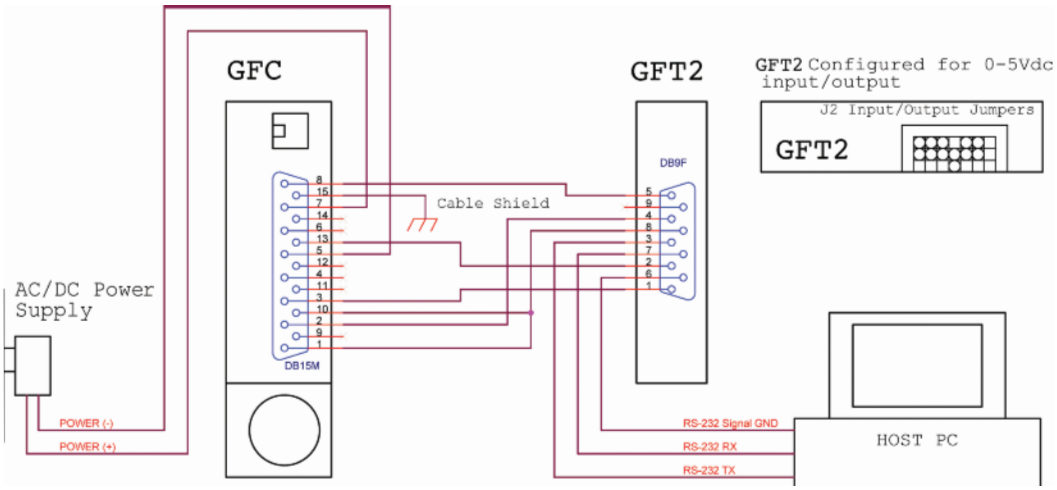


Figure 35: Connecting GFT2 to the GFC Using 0 to 5 VDC Input/Output from DB15 Connector.

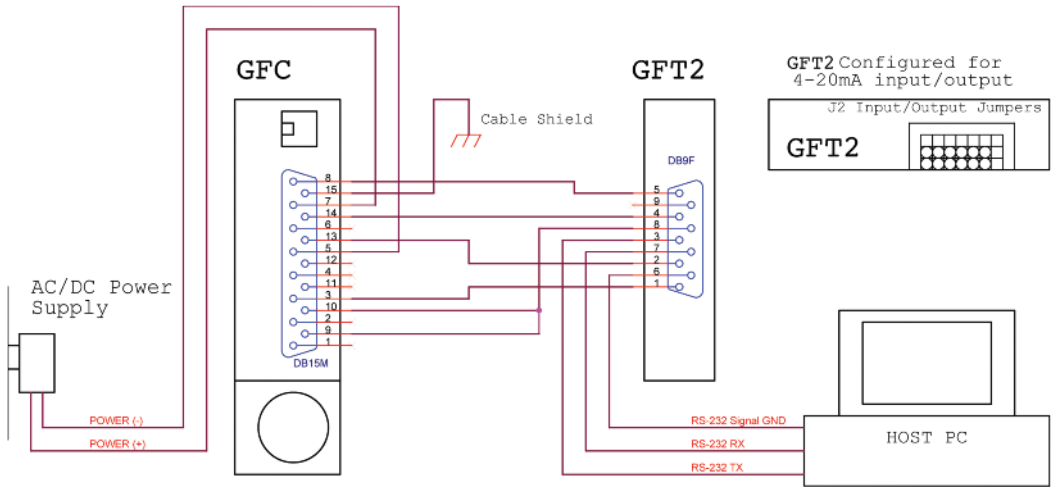


Figure 36: Connecting GFT2 to the GFC Using 4 to 20 mA Input/Output from DB15 Connector.

the new Event Register Mask Settings in the device's nonvolatile memory.

d) Reset Event Register (Tabular entry)

Optional GFC Power Supply/Cables and Mounting Kit Assemblies				
Kit Part Number	**Description**	**GFT2 Input/Output**	**Communication Interface Cable**	**GFC Power Supply Option**
GFT2-20C	Shielded cable with plug 110 VAC to 12 VDC power supply, communication branch	0 to 5 VDC	Yes	12 VDC Only
A-645	GFC flow controller mounting kit, no cables, no power supply	N/A	N/A	N/A

Table 7

The Event Register can be reset by selecting "Reset Event Register" menu option. A typical display with the Reset Event Register screen is shown below.
Once the "YES" option is selected, the Event Register will be reset and the following confirmation screen will appear.

Submenu "Diagnostic Menu"

The Diagnostics Menu can be used for troubleshooting purposes and provides information about the device's internal variables. These items (except the Events Register submenu described above) are informational only and may not be changed (read only).

Input/Output Jumper Configuration Options for GFC Series Flow Controllers								
GFT2 PV Type		**J2 Jumper Configuration**						
Output	**Input**	**J2A**	**J2B**	**J2C**	**J2D**	**J2D**	**J2F**	**GFC Cable Kit**
0 to 5 VDC	0 to 5 VDC	2 to 3	5 to 6	8 to 9	10 to 11	14 to 15	17 to 18	GFT2-20C or A-645
4 to 20 mA	4 to 20 mA	1 to 2	4 to 5	7 to 8	10 to 11	13 to 14	16 to 17	Not supported by GFC cable kits
0 to 10 VDC	0 to 10 VDC	2 to 3	5 to 6	8 to 9	11 to 12	14 to 15	17 to 18	Not supported by GFC

Table 8

a) ADC Input Counts (Read Only)

This menu selection provides raw, average, and filtered values of the ADC counts for analog input circuitry (read only). A typical display with the ADC Input Counts screen is shown below.

b) Analog Output Values (Read Only)

This menu selection provides information about currently selected analog output configuration and DAC counts for analog output circuitry (read only). A typical display with DAC Output Values screen is shown below.

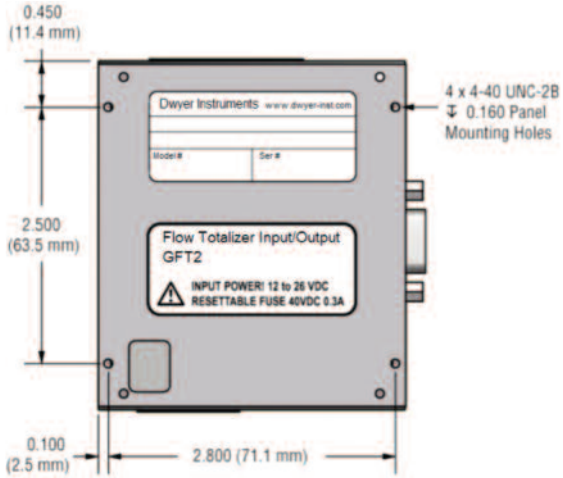


Figure 37

c) LCD Back Light Settings (Read Only)

This menu selection provides information about the LCD back light level, PWM duty cycle, and contrast (read only). A typical display with the LCD Back Light Settings screen is shown below.

d) Pulse Output Queue (Read Only)

This menu selection provides information about the Pulse Output Queue. A typical display with the Pulse Output Queue screen is shown below.

e) CPU Temperature (Read Only)

This menu selection provides the current value of the PCB and CPU temperature in °C (read only). A typical display with the CPU Temperature reading is shown below.

Installation

General Directions

• Mounting, electrical installations, parameters configuration, startup, and maintenance of this instrument may only be performed by trained personnel. Personnel must read and understand this operating manual before performing any installation or configuration steps.

• The GFT2 device should only be operated by trained personnel. All instructions in this manual are to be observed.

• Ensure that power and all input/output signals are correctly wired up according to the wiring diagram provided in this manual. The housing of the device should only be opened by trained personnel.

Hardware Installation

NOTE: Electrostatic discharge may cause permanent damage to the electronic circuitry. Before installing or connecting any wires, the installer must discharge himself by touching the building's protective Earth ground.

The GFT2 Totalizer Input/Output Flow Monitor/Controller can be attached (mounted) to the Dwyer GFM series flow meters, GFC series controllers, or used stand alone (panel mounted or table-top installation).

Connecting GFT2 to GFM Series Flow Meter

a) Mounting

Use the GFM mounting kit (See Table 4) to attach GFT2 to the GFM flow meter.

b) Electrical Connection

GFM flow meters have three different output interfaces (0 to 5, 5 to 10 VDC, 4 to 20 mA), which can be used to provide flow input signal to the GFT2.

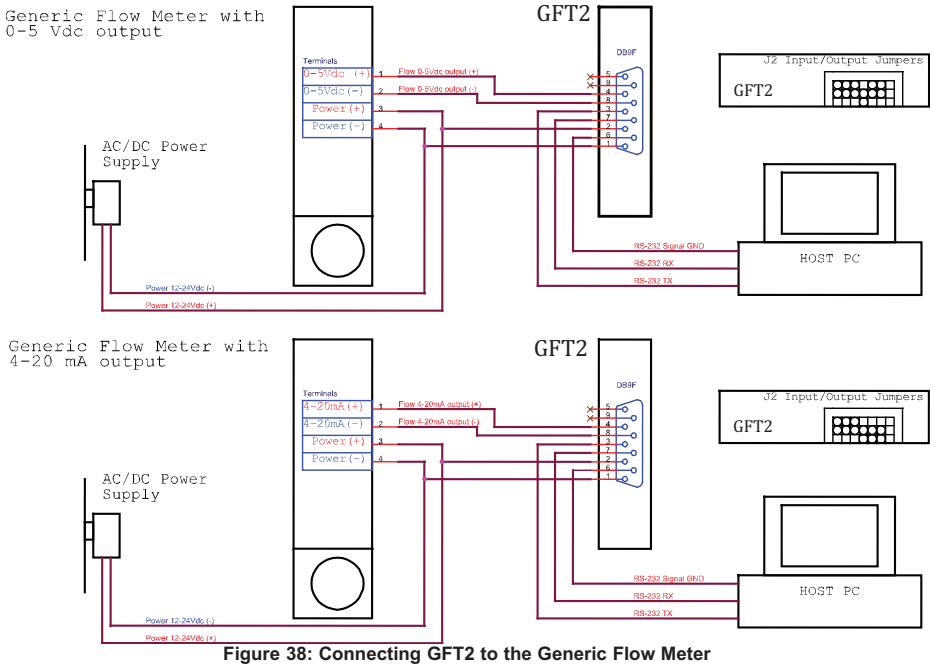


Figure 38: Connecting GFT2 to the Generic Flow Meter

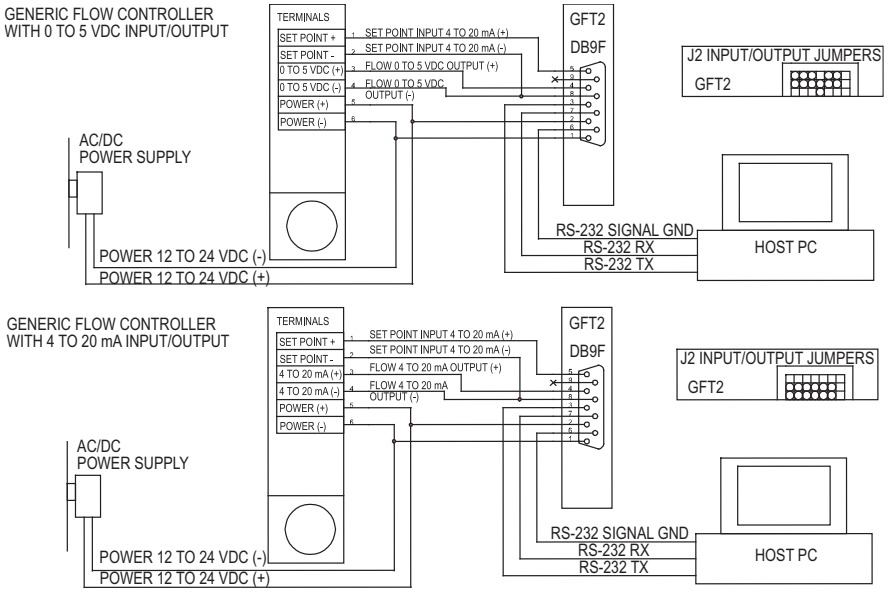


Figure 39: Connecting GFT2 to the Generic Flow Controller

An optional cables kit assembly is available for order:

c) Input/Output Jumper Configuration

NOTE: The GFT2 device input/output jumpers were configured at the factory according to the order. There is no need to change input/output jumpers configuration unless a different input is being used. Before applying power and process signals, make sure the input/output jumpers are installed in the correct positions. See Table 6.

d) Parameters Configuration

The following parameters must be configured:

• Device Function (see Submenu “Device Function”). “Meter function has to be selected.

• Full-Scale Range (see Submenu “Device Calibration”). Full-Scale Range parameter has to be set equal to the GFM full-scale flow rate in L/min.

• Fluid Std. Density (see Submenu “Device Calibration”). This parameter is required only when mass-based engineering units are selected.

NOTE: If “Full-Scale Range”, “Device Function”, and “Fluid Std. Density” parameters are not set properly, the device may have erroneous readings and unpredictable behavior.

User may configure other parameters according to individual preferences and application requirements.

Input/Output Jumper Configuration Options for Generic Flow Meters and Controllers							
GFT2		J2 Jumper Configuration					
Output	Input	J2A	J2B	J2C	J2D	J2D	J2F
0 to 5 VDC	0 to 5 VDC	2 to 3	5 to 6	8 to 9	10 to 11	14 to 15	17 to 18
4 to 20 mA	4 to 20 mA	1 to 2	4 to 5	7 to 8	10 to 11	13 to 14	16 to 17
0 to 10 VDC	0 to 10 VDC	2 to 3	5 to 6	8 to 9	11 to 12	14 to 15	17 to 18

Number	Indication	Likely Reason	Solution
1	LCD Display remains blank when unit is powered up. Status LED is OFF.	Power Supply is bad, or polarity is reversed.	Measure voltage on pins 2 and 1 of the DB9 interface terminal connnector. If voltage is out of specified range, then replace power supply with a new one. If polarity is reversed (reading is negative), make correct connection.
		PC board is defective.	Return device to factory for repair.
2	LCD Displays flow reading, but 4 to 20 mA Set Point output signal does not change.	Wrong configuration of J2 Input/Output Jumpers.	Check J2 jumper configuration (see Table 9).
		External loop is open, or load resistance is more than 600 Ohm.	Check for external connections to pins 5 and 6 of the DB9 interface terminal connector. Make sure the loop resistance is less than 400 Ohm for 12 VDC power supply option and 900 Ohm for 24 VDC power supply option.
		External loop is open, or load resistance is more than 600 Ohm.	Using Key Pad, navigate to submenu "Device Diagnostic" and select submenu "Analog Output Value". Record the DAC counts values and consult the factory with findings.
3	Fluid flows throught he flow meter/controller, but the LCD Display and/or Totalizer reading does not respond to the flow.	The fluid flow rate is below set Low Flow Cut-Off value.	Check settings for Low Flow Cut-Off value and make required adjustment (see Submenu "Low Flow Cut-Off").
		Wrong configuration of J2 Input/Output Jumpers.	Check J2 input jumper configuration (see Table 9). If necessary, contact factory for additional help.
		PC board is defective.	Using ESD precautions, measure voltage on pins 4 and 6 of the DB9 interface terminal connector. If voltage correlates with flow meter/controller output signal, check ADC counts. Using Key Pad, navigate to Submenu "Device Diagnostic" and selet Submenu "ADC Input Counts". Record the ADC counts values and consult the factory with findings.
4	Fluid flows through the flow meter/controller and LCD Display Flow Rate reading responds to flow, but Totalizer reading is not changing.	The fluid flow rate is below set "Totalizer #1 Flow Start" parameter value.	Check settings for "Totalizer #1 Flow Start" value and make required adjustment (see Submenu "Totalizer #1 Flow Start").
		Totalizer mode is disabled.	Check settings for "Totalizer #1 Mode" parameter. Make sure Totalizer Mode is set to "Enabled" (see Submenu "Totalizer #1 Mode").
		Totalizer Power On Delay parameter is set to high value and Totalizer is disabled by firmware.	Check settings for "Totalizer Power On Delay" (see Submenu "Totalizer #1 Power On Delay"). If settings are too high, make required adjustment.
5	Erratic Flow Rate reading.	Wrong configuration of J2 Input/Output Jumpers.	Check J2 input jumper configuration (see Table 9). If necessary, contact factory for additional help.
		GFT2 "Full-Scale Flow" parameter value (in L/min) is not equal to the mated device full-scale range.	Check settings for "Full Scale Range" (see Submenu "Device Calibration"). Full Scale Range parameter has to be set equal to the mated device full scale flow rate in L/min.
		GFT2 "Fluid Std. Density" parameter is not set according to fluid being used and mass based engineering units are selected.	Check settings for "Fluid Std. Density" (see Submenu "Device Calibration"). This parameter is required only when mass-based engineering units are selected.
6	Totalizer reading is wrong.	Wrong configuration of J2 Input/Output Jumpers.	Check J2 input jumper configuration (see Table 9). If necessary, contact factory for additional help.
		GFT2 "Full -cale Flow" parameter value (in L/min) is not equal to the mated device full-scale range.	Check settings for "Full Scale Range" (see Submenu "Device Calibration"). Full Scale Range parameter has to be set equal to the mated device full scale flow rate in L/min.
7	LCD Displays flow reading, but communication interface does not work.	Wrong host PC interface or wiring connection.	Make sure interface type (RS-232 or RS-485) on the host PC is the same as on the GFT2 device. Check communication wiring connection according to "Digital Communication Interface Connections".
		GFT2 has RS-485 interface but device address does not match addressed used by host PC.	Change GFT2 RS-485 address to match host PC software settings.
8	The Device Diagnostic Alarm Event with code 0 - "CPU Temp. High" is active.	MCU/PCB temperature is too high (overload).	Disconnect power from the GFT2. Make sure the ambient temperature is within specified range (below 158°F or 70°C). Let the device cool down for at least 15 minutes. Apply power to the device and check Diagnostic Alarm Event. If overload connection will be indicated again, the unit has to be returned to the factory for repair.
9	The Device System Event with code D - "Fatal Error" is active.	Fatal Error (EEPROM or SRAM corrupted).	Cycle the power on the GFT2. If System Event with code D indicates again, the unit must be returned to the factory for repair.

Connecting GFT2 to GFC Series Flow Controller

a) Mounting

Use GFC mounting kit (see Table 7) to attach GFT2 to the GFC flow controller (see Figure 35).

b) Electrical Connection

GFC flow controllers have two output interfaces: 0 to 5 VDC and 4 to 20 mA which can be used to provide flow input signal to GFT2. They also support two analog input signals: 0 to 5 VDC and 4 to 20 mA (jumper selectable on the GFC PC board). Based on interface being used and power supply option, optional cable kit assemblies are available for order. See Table 7 for optional GFC cable kit assemblies.

c) Input/Output Jumper Configuration

NOTE: The GFT2 device input/output jumpers were configured at the factory according to the order. There is no need to change the input/output jumper configuration unless a different input is being used. Before applying power and process signals, make sure the input/output jumpers are installed in the correct

position. See Table 8.

d) Parameters Configuration

Index	Name	Data Type	Notes
0	BlankEEPROM[10]	char[10]	Do not modify. Table Revision [PROTECTED]
1	SerialNumber[20]	char[20]	Serial Number [PROTECTED]
2	ModelNumber[20]	char[20]	Model Number [PROTECTED]
3	SoftwareVer[10]	char[10]	Firmware Version [PROTECTED]
4	ManufReservedF1	float	Manufacture Specific float data [PROTECTED]
5	ManufReservedF2	float	Manufacture Specific float data [PROTECTED]
6	ManufReservedF7	float	Manufacture Specific float data [PROTECTED]
7	ManufReservedF8	float	Manufacture Specific float data [PROTECTED]
8	ReservedText[12]	char[12]	Reserved for Manufacture Specific Text Info [PROTECTED]
9	ManufReservedF3	float	Manufacture Specific float data [PROTECTED]
10	ManufReservedF4	float	Manufacture Specific float data [PROTECTED]
11	ManufReservedF5	float	Manufacture Specific float data [PROTECTED]
12	ManufReservedF6	float	Manufacture Specific float data [PROTECTED]
13	ManufReservedUI1	uint	Manufacture Specific float data [PROTECTED]
14	ManufReservedUI2	uint	Manufacture Specific float data [PROTECTED]
15	ManufReservedUI3	uint	Manufacture Specific float data [PROTECTED]
16	ManufReservedUI4	uint	Manufacture Specific float data [PROTECTED]
17	ManufReservedSI1	int	Manufacture Specific float data [PROTECTED]
18	ManufReservedSI2	int	Manufacture Specific float data [PROTECTED]
19	ManufReservedSI3	int	Manufacture Specific float data [PROTECTED]
20	TimeSinceCalHr	float	Time elapsed since last calibration in hours
21	TProtectionCode	uint	Program Parameters Protection Code [0-255]
22	DeviceFunction	uint	Device Function: 0-FlowMeter,1-FlowController
23	BaudRate	uint	Comm. Interface Baud Rate Index [0-7]
24	Address485	char[4]	Two hexadecimal characters address for RS485 only [01-FF]
25	FlowUnits	int	Current Units of Measure [0-46]
26	UDUnitKfactor	float	Current Units of Measure [0-46]
27	UDUnitTimeBase	int	User defined Unit Time base index:[0-3]
28	UDUnitDensity	uint	User defined Unit use density flag 1-'Y', 0-'N'
29	KfactorMode	uint	o-Disabled, 1-Internal, 2-User Defined
30	KfactorIndex	uint	Internal K-Factor Index [0-21]
31	UserDefKfactor	float	User defined K-Factor
32	DiagEventMask	uint	Mask for Diagnostic Events: Clear bit -> mask
33	PSP_Mode	uint	Mode for Program SP: 0-disabled, 1-enabled
34	SetPointPFS	float	Set Point value in %FS fraction notation [0.0 - 1.1]
35	DiagEventLatchMask	uint	Diagnostic Events Latch Mask register: Clear bit -> mask
36	Reserved3	float	Device General Reserved Settings
37	Reserved4	float	Device General Reserved Settings
38	OptOut1_Config	uint	Optical Output #1 Configuration (function)
39	OptOut2_Config	uint	Optical Output #2 Configuration (function)
40	GLCD_Mode	uint	Main Process screen mode: 0-Static, 1-Dynamic
41	GLCD_Static_Mode	uint	Type of the static LCD screen: [0-3]
42	GLCD_AUTO_Mode_Mask	uint	Type of the AUTO LCD screen: keeps mask for each variable
43	Cycle_Time	uint	Time in seconds for each screen to be displayed in Dynamic mode
44	GLCD_Contrast	uint	GLCD Contrast settings [1 - 16]
45	GLCD_Reserved	uint	GLCD reserved settings
46	GLCD_LED_PWM	uint	GLCD LED backlight PWM Duty cycle [1 - 16]
47	PSP_StepMasc	uint	GLCD reserved settings
48	PSP_LoopMode	uint	Program SP Loop mode:0-disabled, 1-enabled
49	Out_Scale_mA	float	Analog 4-20 mA Out Scale
50	Out_Offset_mA	float	Analog 4-20 mA Out Offset
51	In_mA_Mode	uint	Reserved Input parameter
52	In_mA_Reserved	uint	Reserved Input parameter
53	In_Scale_mA	float	Analog 4-20 mA Out Scale
54	In_Offset_mA	float	Analog 4-20 mA Out Offset
55	OutScaleV	float	Flow Analog 0-5/0-10 VDC Out Scale
56	OutOffsetV	float	Flow Analog 0-5/0-10 VDC Out Offset
57	InScaleV	float	Flow Analog 0-5/0-10 VDC Input Scale
58	InOffsetV	float	Flow Analog 0-5/0-10 VDC Input Offset
59	F_AlarmMode	uint	Flow Alarm Mode (0=Disabled, 1=Enabled)
60	F_LowAlarmPFS	float	Low Flow Alarm in PFS [0-1.0 fraction notation %F.S.]
61	F_HiAlarmPRS	float	High Flow Alarm in PFS [0-1.0 fraction notation %F.S.]
62	F_AlmDelay	uint	Delay in seconds 0-3600 for Flow Alarm action
63	F_AlarmLatch	uint	Flow Alarm Latch
64	F_AlarmSpare	uint	Flow Alarm Spare settings
65	Total1_Mode	uint	Totalizer #1 mode (0-Disabled, 1-Enabled)
66	Total1_Config	uint	Totalizer #1 configuration (0-Count Up)
67	Total1_FlowStart	float	Start tot. at flow [0-1.0 fraction notation %F.S.]
68	Total1_VolStop	float	Limit volume in %s, 0 = disable
69	Total1_PowOnDelay	uint	Totalizer #1 power on delay in second [0-3600]
70	Total1_ValueLock	uint	Lock Totalizer #1 value (0-can be reset, 1-can not be reset)
71	Total1_Volume_BkUp	float	Totalizer #1 backup volume in %s (saved every 6 minutes)
72	Total1_AutoReset	uint	Reset Total. Volume value when Totalizer value equals Limit volume 0 - No, 1 - Yes
73	Total1_AtoResetDelay	uint	Delay in seconds before AutoReset will reset Totalizer#1 volume reading to zero [0-3600]
74	Total1_Reserved	uint	Totalizer#1 reserved
75	Total2_Mode	uint	Totalizer#2 mode: (0-Disabled, 1-Enabled)
76	Total2_Config	uint	Totalizer#2 configuration (0-Count Up, 1-Count Down)
77	Total2_FlowStart	float	Start tot. at flow [0-1.0 fraction notation %F.S.]
78	Total2_VolStop	float	Limit volume in %s, 0 = disable
79	Total2_PowOnDelay	uint	Totalizer#2 power on delay in seconds [0-3600]
80	Total2_Volume_BkUp	float	Totalizer#2 backup volume in %s (saved every 6 minutes)

The following parameters have to be configured:

• **Device Function** (see Submenu "Device Function"). "Controller" function has to be selected.

• **Full-Scale Range** (see Submenu "Device Calibration"). Full-Scale Range parameter must be set equal to the GFC full-scale flow rate in L/min.

• **Fluid Std. Density** (see Submenu "Device Calibration"). This parameter is required only when mass-based engineering units are selected.

NOTE: If "Full-Scale Range", "Device Function", and "Fluid Std. Density" parameters are not set properly, device may have erroneous reading and unpredictable behavior.

User may configure other parameters according to individual preferences and application requirements.

Connecting GFT2 to Flow Meters/Controllers From Other Manufacturers (Stand Alone)

a) Mounting

When GFT2 is connected to flow meters/controllers from other manufacturers, it can be used as stand alone table top or panel mounted (See Figure 37). On the back side of the GFT2 enclosure, there are 4 tapped holes which are designated to be used for panel-mounted option.

b) Electrical Connection

GFT2 can be used with any generic flow meter/controller which can support 0 to 5 VDC and/or 4 to 20 mA input/output interfaces. It can also be ordered for 0 to 10 VDC input/output interface (special order, not supported

Index	Name	Data Type	Notes
81	Total2_ReloadVolStop	uint	Reload VolStop value when Totalizer reading counts down to zero 0 - No, 1 - Yes
82	Total2_ReloadDelay	uint	Delay in seconds before Reload VolStop value when Totalizer reading counts down to zero [0-3600]
83	Total2_10SecBackUp	uint	Enable or Disable every 10 seconds EEPROM backup (reserved for future version release)
84	Total2_Reserved	uint	Totalizer #2 reserved
85	Flow_Pulse_Mode	uint	Flow Pulse Output Mode (0=Disabled, 1=Enabled)
86	PulseFlowStart	float	Start pulse output at flow [0-1.0 fraction notation %F.S.]
87	Units_Per_Pulse	float	Units per pulse scaling
88	Active_Low_Time	uint	Number of ms output will be activated when pulse is developed
89	Flow_Pulse_Reserved	uint	Pulse Output Reserved
90	FlowCondMode	uint	0 - No conditioning, 1 - NRF, 2 - Running Average
91	Flow_NRF_NSample	uint	Flow NRF Number of Samples [1 - 32]
92	Flow_NRF_ErrLimit	float	Flow NRF Error Value [0.05 10.0] %F.S. (FN)
93	Flow_NRF_TimeLimit	uint	Flow NRF Time Interval [0-199], 0-disabled
94	Flow_Damping	uint	Reading Damping 0-500 ms
95	Flow_Window	uint	Flow running average window [0-32] 0 - disable
96	FlowLinearizer	uint	Flow Linearizer: On (1), off (0)
97	Flow_SC_Reserved	uin	Flow Signal Conditioner reserved
98	FlowTbl[0]. FlowPFSIn	float	Flow Linearizer Index 0 PFS In (must be 0.0)
99	FlowTbl[0]. FlowPFSOut	float	Flow Linearizer Index 0 PFS Out (must be 0.0)
100	FlowTbl[1]. FlowPFSIn	float	Flow Linearizer Index 1 PFS In [0.0 - 1.0]
101	FlowTbl[1]. FlowPFSOut	float	Flow Linearizer Index 1 PFS Out [0.0 - 1.0]
102	FlowTbl[2]. Flow PFSIn	float	Flow Linearizer Index 2 PFS In [0.0 - 1.0]
103	FlowTbl[2]. Flow PFSOut	float	Flow Linearizer Index 2 PFS Out [0.0 - 1.0]
104	FlowTbl[3]. Flow PFSIn	float	Flow Linearizer Index 3 PFS In [0.0 - 1.0]
105	FlowTbl[3]. Flow PFSOut	float	Flow Linearizer Index 3 PFS Out [0.0 - 1.0]
106	FlowTbl[4]. FlowPFSIn	float	Flow Linearizer Indes 4 PFS In [0.0 - 1.0]
107	FlowTbl[4]. FlowPFSOut	float	Flow Linearizer Indes 4 PFS Out [0.0 - 1.0]
108	FlowTbl[5]. FlowPFSIn	float	Flow Linearizer Indes 5 PFS In [0.0 - 1.0]
109	FlowTbl[5]. FlowPFSOut	float	Flow Linearizer Indes 5 PFS Out [0.0 - 1.0]
110	FlowTbl[6]. FlowPFSIn	float	Flow Linearizer Indes 6 PFS In [0.0 - 1.0]
111	FlowTbl[6]. FlowPFSOut	float	Flow Linearizer Indes 6 PFS Out [0.0 - 1.0]
112	FlowTbl[7]. FlowPFSIn	float	Flow Linearizer Indes 7 PFS In [0.0 - 1.0]
113	FlowTbl[7]. FlowPFSOut	float	Flow Linearizer Indes 7 PFS Out [0.0 - 1.0]
114	FlowTbl[8]. FlowPFSIn	float	Flow Linearizer Indes 8 PFS In [0.0 - 1.0]
115	FlowTbl[8]. FlowPFSOut	float	Flow Linearizer Indes 8 PFS Out [0.0 - 1.0]
116	FlowTbl[9]. FlowPFSIn	float	Flow Linearizer Indes 9 PFS In [0.0 - 1.0]
117	FlowTbl[9]. FlowPFSOut	float	Flow Linearizer Indes 9 PFS Out [0.0 - 1.0]
118	FlowTbl[10]. FlowPFSIn	float	Flow Linearizer Indes 10 PFS In [0.0 - 1.0]
119	FlowTbl[10]. FlowPFSOut	float	Flow Linearizer Indes 10 PFS Out [0.0 - 1.0]
120	MDSerialNumber	float	Serial Number for Mated Device
121	MeterFSRange	float	Device FS range in Std. L/min
122	LowFlowCutOff	float	Must be between [0 and 0.1] fraction %F.S. notation [0-1.0]
123	FlowPowerUpDelay	float	Flow Power Up delay [0-1200] sec.
124	Density	float	Fluid Density g/L
125	FluidName[20]	float	Name of the Fluid used for Calibration
126	CalibratedBy[20]	float	Name of person meter was calibrated by
127	CalibratedAt[20]	float	Name of the Calibration Lab
128	DateCalibrated[12]	float	Calibration date
129	DateCalibratedDue[12]	float	Date Calibration due
130	UserTagName	float	User Defined Device Tag Name or Number
131	PSPTbl[0].PFS	float	PSP Table Index 0 Set Point PFS (0.0-1.0)
132	PSPTbl[0].Time	float	PSP Table Index 0 Time (sec)
133	PSPTbl[1].PFS	float	PSP Table Index 1 Set Point PFS (0.0-1.0)
134	PSPTbl[1].Time	float	PSP Table Index 1 Time (sec)
135	PSPTbl[2].PFS	float	PSP Table Index 2 Set Point PFS (0.0-1.0)
136	PSPTbl[2].Time	float	PSP Table Index 2 Time (sec)
137	PSPTbl[3].PFS	float	PSP Table Index 3 Set Point PFS (0.0-1.0)
138	PSPTbl[3].Time	float	PSP Table Index 3 Time (sec)
139	PSPTbl[4].PFS	float	PSP Table Index 4 Set Point PFS (0.0-1.0)
140	PSPTbl[4].Time	float	PSP Table Index 4 Time (sec)
141	PSPTbl[5].PFS	float	PSP Table Index 5 Set Point PFS (0.0-1.0)
142	PSPTbl[5].Time	float	PSP Table Index 5 Time (sec)
143	PSPTbl[6].PFS	float	PSP Table Index 6 Set Point PFS (0.0-1.0)
144	PSPTbl[0].Time	float	PSP Table Index 6 Time (sec)
145	PSPTbl[7].PFS	float	PSP Table Index 7 Set Point PFS (0.0-1.0)
146	PSPTbl[7].Time	float	PSP Table Index 7 Time (sec)
147	PSPTbl[8].PFS	float	PSP Table Index 8 Set Point PFS (0.0-1.0)
148	PSPTbl[8].Time	float	PSP Table Index 8 Time (sec)
149	PSPTbl[9].PFS	float	PSP Table Index 9 Set Point PFS (0.0-1.0)
150	PSPTbl[9].Time	float	PSP Table Index 9 Time (sec)
151	PSPTbl[10].PFS	float	PSP Table Index 10 Set Point PFS (0.0-1.0)
152	PSPTbl[10].Time	float	PSP Table Index 10 Time (sec)
153	PSPTbl[11].PFS	float	PSP Table Index 11 Set Point PFS (0.0-1.0)
154	PSPTbl[11].Time	float	PSP Table Index 11 Time (sec)
155	PSPTbl[12].PFS	float	PSP Table Index 12 Set Point PFS (0.0-1.0)
156	PSPTbl[12].Time	float	PSP Table Index 12 Time (sec)
157	PSPTbl[13].PFS	float	PSP Table Index 13 Set Point PFS (0.0-1.0)
158	PSPTbl[13].Time	float	PSP Table Index 13 Time (sec)
159	PSPTbl[14].PFS	float	PSP Table Index 14 Set Point PFS (0.0-1.0)
160	PSPTbl[14].Time	float	PSP Table Index 14 Time (sec)
161	PSPTbl[15].PFS	float	PSP Table Index 15 Set Point PFS (0.0-1.0)
162	PSPTbl[15].Time	float	PSP Table Index 15 Time (sec)
163	EEMagicNumber	uint	Number used to verify EEPROM integrity

NOTE: Do not connect GFT2 input/output circuitry to voltages above 5.5 VDC unless GFT2 was specifically by generic models).

ordered for 0-10 VDC input/output interface. Check device part number or contact Dwyer Instruments customer service for device input.

Index	Actual Gas	K Factor Relative to N_2	Cp [Cal/g]	Density [g/L]
1	Argon Ar	1.4573	0.1244	1.782
2	Arsine AsH3	0.6735	0.1167	3.478
3	Boron Triflouride BF3	0.5082	0.1778	2.025
4	Bromine Br2	0.8083	0.0539	7.13
5	Acetylene D2H2	0.5829	0.4036	1.162
6	Cyanogen C2N2	0.61	0.2613	3.322
7	Methane CH4	0.7175	0.5328	0.715
8	Chlorine Cl_2	0.86	0.114	3.163
9	Carbon Dioxide CO_2	0.7382	0.2016	1.964
10	Carbonyl Fluoride CoF_2	0.5428	0.171	2.945
11	Carbonyl Sulfide COS	0.6606	0.1651	2.68
12	Carbon Disulfide CS_2	0.6026	0.1428	3.397
13	Fluorine F2	0.9784	0.1873	1.695
14	Hydrogen H_2	1.0106	3.419	0.0899
15	Helium He	1.454	1.241	0.1786
16	Nitrous Oxide	0.7128	0.2088	1.964
17	Ammonia NH3	0.731	0.492	0.76
18	Neon NE	1.46	0.246	0.9
19	Nitric Oxide O2	0.99	0.2328	1.339
20	Sulfur Dioxide SO2	0.9926	0.2193	1.427
21	Xenon Xe	0.69	0.1488	2.858
22		1.44	0.0378	5.858

c) Input/Output Jumper Configuration

NOTE: The GFT2 device input/output jumpers were configured at the factory according to the order. There is no need to change input/output jumpers'configuration unless a different input is being used. Before applying power and process signals, make sure the input/output jumpers are installed in the correct position. See Table 9.

d) Parameters Configuration

The following parameters have to be configured

• **Device Function** (see Submenu "Device Function"). If GFT2 is connected to flow controller, then "Controller" function has to be selected. If GFT2 is connected to the flow meter, then "Meter" function has to be selected

• **Full-Scale Range** (see Submenu "Device Calibration"). Full-Scale Range parameter must be set equal to the mated device full-scale flow rate in L/min.

• **Fluid Std. Density** (see Submenu "Device Calibration"). This parameter is required only when mass-based engineering units are selected.

NOTE: If "Full-Scale Range", "Device Function", and "Fluid Std. Density" parameters are not set properly, device may have erroneous reading and unpredictable behavior

User may configure other parameters according to individual preferences and application requirements.

Troubleshooting

Common Conditions

The GFT2 Totalizer Input/Output Flow Monitor/Controller was thoroughly checked at numerous quality control points during and after manufacturing and assembly operations. It was calibrated according to the input and output configuration. It was carefully packaged to prevent damage during shipment. If instrument is not functioning properly, please check for the following common conditions:

• Are all cables connected correctly?
• Were the connector pin outs matched properly?
• Are J2 input/output jumpers configured correctly?
• Is the power supply correctly selected according to requirements?

When several devices are used, a power supply with appropriate current rating should be selected. When interchanging with other manufacturers' equipment, cables and connectors must be carefully wired for correct pin configuration.

NOTE: AN "*" INDICATES POWER UP DEFAULT SETTINGS.
AN "**"INDICATES OPTIONAL FEATURE NOT AVAILABLE ON ALL MODELS.

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
Flow	Requests the current flow reading in current EU	1	F					<Value> (Actual flow in current engineering units)
Set Point	Set point value in current EU (Read, Write) With Argument #2 = 'S' set point value will be saved in the EEPROM	2	S	NO ARGUMENT (read status)				S:<Value> (Set Point in current engineering units) Example: S:20.5
				<Value> (write, not saved in EEP-ROM memory)				S:<Value> (Set Point in current engineering units) Example: S:20.5
				<Value>(write, saved in EEPROM memory)	S			S:<Value> ,S (Set Point in current engineering units) Example: S:20.5,S
Density	Read / Set Fluid Density for standard conditions in g/litr [0.000001-10000.0] g/litr	3	D	NO ARGUMENT (read current value)				D:<Value> (Actual density in g/litr) Example: D:1.25
				<Value> (write and save new value)				D:<Value> (Actual density in g/litr) Example: D:1.56
Diagnostic Events Register	Read/Reset current status of Diagnostic Events Register See list of the Diagnostic Events below.	4	DE	NO ARGUMENT (read status)				DE:0x10 0x10 – diagnostic word (16 bits wide)
				R (reset Event Log register to 0x0000)				DE:0x0

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
Diagnostic Events Mask	Display/Set Diagnostic Events Mask register See list of the Diagnostic Events below.	5	DM	NO ARGUMENT (read current Diagnostic Events Mask register)				DM:0x9FFF 0x9FFF – diagnostic mask (16 bits wide). Set bit - Enable Clear bit - Disable
				<Value> 0x0000 - 0xFFFF Set new value NOTE: all 6 characters are required				DM:0x9FFF
Diagnostic Events Latch Mask	Display/Set Diagnostic Events Latch Mask register See list of the Diagnostic Events below.	6	DL	NO ARGUMENT (read current Diagnostic Events Latch Mask register)				DL:0x100F 0x100F – diagnostic latch mask (16 bits wide). Set bit - Enable Clear bit - Disable
				<Value> 0x0000 - 0xFFFF Set new value to Diagnostic Events Latch Mask register. NOTE: all 6 characters are required				DL:0x100F 0x100F – diagnostic latch mask (16 bits wide). Set bit - Enable Clear bit - Disable
Device Info	Read device configuration info: - full scale range (L/min) - device function (M/C) - input settings (V,C) - output settings (V,C) - low flow cut off (%F.S.) - power up delay (sec.)	7	DI					DI: 100.0,M,V,V,2.0,2 100.0 – full scale L/min M – device function (meter) V – input (0-5 Vdc) V – output (0-5 Vdc) 2.0 – low flow cut off (%F.S.) 2 – flow power on delay (sec.)

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
Flow Alarms	Sets / reads the parameters of the flow alarms. Note: If device function is set to "Meter" the High alarm value has to be more than Low alarm value. Meter Alarm conditions: Flow ≥ High Limit = H Flow ≤ Low Limit = L Low < Flow < High = N Controller Alarm conditions: Flow-SP High Limit = H SP-Flow Low Limit = L Low > SP-Flow < High = N	8	A	C (set alarm configuration)	<Value> (high limit, %F.S.)	<Value> (low limit, %F.S.)		AC:40.1,20.5
				A (action delay in sec.)	<Value> [0-3600]			AA:<Value (sec)>
				E (enable alarm)				A:E
				D (disable alarm)*				A:D
				R (read current status)				AR:N (no alarm) AR:H (high alarm) AR:L (low alarm)
				S (Read current settings)				AS:M,H,L,D,B where: M – mode (E/D) H – High settings value L – Low settings value D – Action Delay (sec) B – Latch mode (0-1) Example: AS:E,40.0,20.0,2,0
				L (Latch mode)	<Value> (0-disabled*) (1-enabl'd)			AL:<Value> where: Value = 0 – 1 Example: AL:0

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
Optical Outputs	Assigns action of the two optical outputs. The optical outputs can be assigned to: D – no action (disabled*) AL – low flow alarm AH – high flow alarm AR – Range between High & Low alarms T1 – Tot#1 reading > limit T2 – Tot#2 reading > limit PO – Pulse Output DE – Diagnostic Events M – Manual On (enabled)	9	O	1 (output #1) 2 (output #2)	D*			O1:D or O2:D
					AL			O1:AL or O2:AL
					AH			O1:AH or O2:AH
					AR			O1:AR or O2:AR
					T1			O1:T1 or O2:T1
					T2			O1:T2 or O2:T2
					PO			O1:PO or O2:PO
					DE			O1:DE or O2:DE
					M			O1:M or O2:M
					S (read current settings)			O1:D or O2:PO
Device Function	Sets / Reads Device Function Device Function: M – Flow Meter C – Flow Controller	10	DF	<Value> M – Flow Meter C – Flow Controller				DF:<Value> Example: DF:M DF:<Value> Example: DF:M
				No Argument (Returns Current Device Function)				

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
Totalizers	Sets and controls action of the flow Totalizers. NOTE: Start totalizer at Flow value has to be entered for in %FS (0.0 – 100.0). Limit volume has to be entered in currently selected EU. If Totalizer hit limit event is not required, set "Limit Volume" value (argument 4) to zero. Totalizer#1 can be configured to Count Up only (argument M is not supported). Totalizer#2 can be configured to Count Up or Count Down mode. When configured to count down mode, limit volume has to be more than zero. Totalizer#1 reading is stored in EEPROM (non volatile) memory. Power cycle will not affect Totalizer#1 reading.Totalizer#2 reading is backed up in EEPROM with 6 minutes interval. Power cycle may affect Totalizer#2 reading. Totalizer#1 can not be reset if ResetLock (EE index 70) value set to 1.	11	T	1 (Totalizer #1) 2 (Totalizer #2)	Z (Reset to zero)			T1Z or T2Z
					C Start flow and Event Condition	<value> (start totalizer at flow) %FS [0.0 – 100.0]	<value> (Limit volume In current volume based EU)	T1C:2.5, 0.0 or T2C:2.0,20580.5
					P Power On Delay	<value> (0-3600 sec.)		T1P:10 or T2P:20
					D (disable totalizer)*			T1:D or T2:D
					E (enable totalizer)			T1:E or T2:E
					R (read current totalizer volume)			T1R:<value> or T2R:<value> (in current EU)
					S (read current settings status)			T1S:Mode,Direction,Start Flow,LimitVolume, PowOnDelay,AutoResetMode, AutoResetDelay Example: T1S:E,0,0.5, 2045.2,10,0.5
					A Set Auto Reset/Reload mode	<value> [0-1] 0 – Disable 1 – Enable		T1A:0 - disabled Or T2A:1 - enabled
					I Set Auto Reset/Reload Interval delay	<value> [0-3600 sec.]		T1I:2 Or T2I:0
					B Restore Totalizer#1 value from EE backup			T1B Not supported by Totalizer #2.
					M Totalizer#2 counting direction configuration	<value> [0-1] 0- Count Up 1-Count Down		T1M:0 Not supported by Totalizer #1.

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
Pulse Output	Sets and controls action of the programmable Pulse Output circuitry. NOTE: Unit/Pulse value has to be entered in currently selected EU. EU has to be not time based It is recommended to set the unit/pulse value equal to the maximum flow in the same units per second. This will limit the pulse to no faster than one pulse every second. Example: Maximum flow rate: 600 liter/min (600 liter/min = 10 liters per second) If Unit/Pulse is set to 10 liters per pulse, the output will pulse once every second (F=1 Hz). Pulse active time in ms has to be at least twice less than pulse period (1/F).	12	P	U Set Units Per Pulse Parameter.	<Value> (Unit/Pulse) In current E.U. (example: 10 litr/pulse)			PU:<value> Example: PU:10
				T Set Pulse active Time in ms	<value> [10 -6553 ms]			PT:<value> Example: PT:100
				D (disable pulse output)*				P:D
				E (enable pulse output)				P:E
				Q (read current pulse output Queue value)				PQ:<value> (number of pulses in Queue)
				F Set Flow Start value	<value> (0.0–100.0%FS)			PF:1.0
				S (read setting status)				PS:Mode,FlowStart, Unit/Pulse,PulseTime Interval Example: PS:E,1.0,1.666,100

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
Units of measure	Set units of measure for flow rate and totalizer reading. Note: The units of the totalizer output are not per unit time. For user defined units: k-Factor value represents conversion value from L/min. Time base argument: S – seconds M – minutes H – hours D – days Density argument: Y – use density N – do not use density Igal – Imperial Gal MilL – million liters Mton – Ton (metric) Bbl – Barrels	13	U	%FS*				U:%
				ml/sec				U: ml/sec
				ml/min				U: ml/min
				ml/hr				U: ml/hr
				ml/day				U: litr/day
				litr/sec				U: litr/sec
				litr/min				U: litr/min
				litr/hr				U: litr/hr
				litr/day				U: litr/day
				m^3/sec				U: m^3/sec
				m^3/min				U: m^3/min
				m^3/hr				U: m^3/hr
				m^3/day				U: m^3/day
				f^3/sec				U:f^3/sec
				f^3/min				U:f^3/min
				f^3/hr				U:f^3/hr
				f^3/day				U:f^3/day
				gal/sec				U: gal/sec
				gal/min				U: gal/min
				gal/hr				U: gal/hr
				gal/day				U: gal/day
				gram/sec				U: gram/sec
				gram/min				U: gram/min
				gram/hr				U: gram/hr
				gram/day				U: gram/day
				kg/sec				U: kg/sec
				kg/min				U: kg/min
				kg/hr				U: kg/hr
				kg/day				U: kg/day
				lb/sec				U: lb/sec
				lb/min				U: lb/min
				lb/hr				U: lb/hr
				lb/day				U: lb/day

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
				Mton/min				U: Mton/min
				Mton/hr				U: Mton/hr
				lgal/sec				U: lgal/sec
				lgal /min				U: lgal/min
				lgal /hr				U: lgal/hr
				lgal/day				U: lgal/day
				MilL/min				U: MilL/min
				MilL/hr				U: MilL/hr
				MilL/day				U: MilL/day
				bbl/sec				U: bbl/sec
				bbl/min				U: bbl/min
				bbl/hr				U: bbl/hr
				bbl/day				U: bbl/day
				USER (user defined)	<k-factor value> [>0.0]	<Time Base> S-second M-Minute H-Hour D-Day	<Use Density> [Y or N]	U:user,K-Factor, TimeBase,UseDensity Example: U:USER,1.5,M,N
				No Argument (status)				U:<EU name> Example: U:litr/min

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
K-Factor	Read and set K-Factor relative to N2 Mode: D – Disabled (K-Factor = 1.0) I – Internal U – User Defined	14	K	S (read current settings) Returns current mode, index and UD value				KS:Mode,Index, UDvalue Example: KS:U,1,0.91200
				D (Set Mode: Disabled)				KD
				I (Set Mode: Internal Index)	<Index> [1-22]			KI:Index,GasName Example: KI:1,Ar
				U (Set Mode: User Defined Value)	<Value> [0.00001-999.9]			KU:Value Example: KU:0.91200
Calibration Settings	Sets/Reads Calibration related variables. Argument 1 = T Hours since last time unit was calibrated. NOTE: has to be reset to zero after calibration.	15	C	P Flow Power Up Delay [seconds]	<Value> [seconds]			CP:<value> Example: CP:3
					No Argument (Returns Current Power Up Delay)			CP:<value> Example: CP:3
				F Device Full Scale Range in liter/min	<Value> [liter/min]			CF:<value> Example CF:1000.0
					No Argument (Returns Current Meter FS Range)			CF:<value> Example: CF:1000.0
				L Device Low Flow Cut Off in % of full scale	<Value> (%FS)			CL:<value> Example: CL:5.0
					No Argument (Returns Current value)			CL:<value> Example: CL:5.0
				T Read/Reset Calibration/ Maintenance Timer	No Argument (read timer)			CT:<value> Example: CT:1024.2
				Z Set Cal. Timer to Zero				CT:Z

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
Signal Conditioner Settings	Sets/Reads Signal Conditioner Parameters Argument1 = F: Display/Change NR Filter Parameters: NRF Sample Number [1-32] NRF Time Limit [0-199] NRF Error Limit [0.0-10.0%]	16	SC	M Read/Change Device Signal Conditioner Mode N – No Conditioning F – NRF Filter A – Running Average	<New Mode> [N, F, A]			SCM:<value> Example: SCM:F
					No Argument (Returns Current Mode)			SCM:<value> Example: SCM:F
				D Flow Running Average Damping [0-500 ms] 0 - Disabled	<new value> in ms [0-500]			SCD:<value> Example: SCD:50
					No Argument (Returns Current set.)			PWD:<value> Example: SCD:50
				F NR Filter Settings: NRF Sample Numb. NRF Time Limit NRF Error Limit	<new value> Sample# [1-32]	<new val.> Time Limit [0-199]	<new val.> Error Limit [0.0-10%]	Example: PWF:4,8,0.0
					No Argument (Returns Current set.)			Example: PWF:4,8,0.0
				L Device Flow Linearizer E- Enable D- Disable	<New Value> E or D			SCL:<value> Example: SCL:E
					No Argument (Ret. Current settings)			SCL:<value> Example: SCL:E

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
LCD and Process Screens Settings	Sets/Reads LCD related parameters. Argument 1 = S Process Screens Mask register: 0x00FF – screen mask (8 bits wide). Set bit – Enable Clear bit – Disable See list of the Process Screens below: 0x01 – Flow/Set Point, Tot#1 0x02 – Flow, Tot#2 0x04 – Flow,Tot#1, Tot#2	17	L	M LCD Process Screen Mode: S – Static D – Dynamic	<New Value> S or D			LM:<value> Example: LM:S
					No Argument (Ret. Current settings)			LM:<value> Example: LM:S
				C LCD Contrast Level: [0-16]	<new value> [1-16]			LC:<value> Example: LC:6
					No Argument (Ret. Current settings)			LC:<value> Example: LC:6
				B LCD Back Light Level: [0-19]	<new value> [1-19]			LB:<value> Example: LB:16
					No Argument (Ret. Current settings)			LB:<value> Example: LB:16
				T Process Screen Time Interval in sec. (for dynamic mode)	<New Value> [1-3600]			LT:<value> ExampleLT:5
					No Argument (Ret. Current settings)			LT:<value> ExampleLT:5
				S Process Screens Mask register	No Argument (read current Screen Mask register)			LS:0x03 0x00FF – screen mask (8 bits wide). Set bit – Enable Clear bit – Disable
					<Value> 0x0000 - 0x00FF Set new value NOTE: all 6 characters are required			LS:0x03

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
Process Information	Read Process Information Returns: Flow Rate (in current EU) Totalizer #1 (in current EU) Totalizer #2 (in current EU) Flow Alarm Status (D,N,L,H) Diagnostic Events Register	18	PI	No Argument				F,T1,T2,FA,DE Example: 24.5,1254.2,12.0,N,0x0
Program Set Point	Sets/Reads Program Set Point parameters	19	PS	M Read/Change Device PSP Mode	<New Value> E or D			PSM:<value> Example: PSM:D
					No Argument (Ret. Current settings)			PSM:<value> Example: PSM:D
				L Read/Change Device PSP Loop Mode	<New Value> E or D			PSL:<value> Example: PSL:D
					No Argument (Ret. Current settings)			PSL:<value> Example: PSL:D
				P Read/Change Device PSP Step Parameters Read: only one argument is required. Change: all 3 arguments are required.	<Step Number> [1-16]	No Argument (Ret. Current settings)		PSP<step>:<SP>,<Time> Example: PSP02: 50.0,25
					<Step Number> [1-16]	<Set Point> [0-100%FS]	<Time> [0-86400 s.]	PSP<step>:<SP>,<Time> Example: PSP02: 50.0,25
				A Read/Change Device PSP Mask Register	No Argument (read current PSP Mask register)			PSA:0xFFFF 0x00FF – screen mask (8 bits wide). Set bit – Step Enabled Clear bit – Step Disabled
					<Value> 0x0000 - 0xFFFF Set new value NOTE: all 6 characters are required			PSA:0xFFFE

COMMAND NAME	DESCRIPTION	NO.	COMMAND SYNTAX					
			COMMAND	ARGUMENT 1	ARGUMENT 2	ARGUMENT 3	ARGUMENT 4	RESPONSE
				C Read/Change Device PSP Run/Stop Control Program Set Point Control can be set to: R – Run S – Stop	No Argument (Ret. Current settings)			PSC:<Value> Example: PSC:S
					<Settings> R – Run S - Stop			PSC:<Value> Example: PSC:R
Read EEPROM Memory	Reads the value in the specified memory location.	20	MR	0 to 163 (Memory Table Index)				<memory value>
Write EEPROM Memory	Writes the specified value to the specified memory location. **Use Carefully, can cause unit to malfunction.** (Note: Some addresses are write protected!)	21	MW	20 to 163 (Memory Table Index)	<Value>			MW,XXX,<Value> where: XXX=Table Index Example: MW,105,101.3

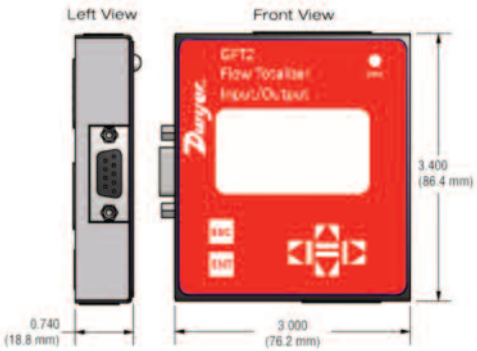
APPENDIX A

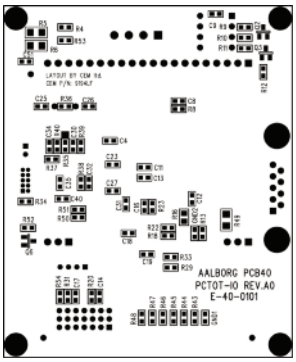
GFT2 Totalizer Input/Output Flow Monitor/Controller EEPROM Variables

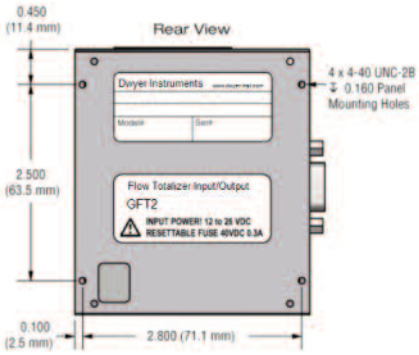
UART Error Codes	
1	Not supported command or back door is not enabled
2	Wrong number of arguments
3	Address is out of range (MR or MW commands)
4	Wrong number of the characters in the argument
5	Attempt to alter Write Protected area in the EEPROM
6	Proper command or argument not found
7	Wrong value of the argument
8	Reserved
9	Manufacture specific into EE KEY (wrong key or key is disabled)

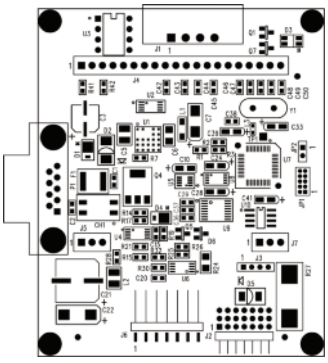
Diagnostic and System Events Codes and Bit Position		
Code	**Event Description**	**Bit Position**
0	CPU Temp. High	0x0001
1	High Flow Alarm	0x0002
2	Low Flow Alarm	0x0004
3	Range betwen H-L	0x0008
4	Tot#1 > Limit	0x0010
5	Tot#2 > Limit	0x0020
6	OptPulse Queue	0x0040
7	Flow OverLimit	0x0080
8	Vcc OutOfRange	0x0100
9	SerComm. ERROR	0x0200
A	EEPROM ERROR	0x0400
B	Power on Event	0x0800
C	Password Event	0x1000
D	Fatal Error	0x2000

Internal K-Factor Table List		
Index	**Gas**	**K-Factor**
1	Ar	1.4573
2	AsH3	0.6735
3	BF3	0.5082
4	Br2	0.8083
5	C2H2	0.5829
6	C2N2	0.6100
7	CH4	0.7175
8	Cl2	0.8600
9	CO2	0.7382
10	COF2	0.5428
11	COS	0.6606
12	CS2	0.6026
13	F2	0.9784
14	H2	1.0106
15	He	1.4540
16	N20	0.7128
17	NH3	0.7310
18	NE	1.4600
19	NO	0.9900
20	O2	0.9926
21	SO2	0.6900
22	Xe	1.4400









APPENDIX B
Internal K-Factors Table

⚠ CAUTION This product is not intended to be used in life support applications!

APPENDIX C
GFT2 ASCII Commands Set

RS-232/RS-485

The standard GFT2 comes with an RS-232 interface. The protocol described below allows communication with the unit using either a custom software program or a “dumb” terminal. All values are set as printable ASCII characters. For RS-232 interface, the start character and two characters of address have to be omitted. For the RS-485 interface, the start character is always ‘!’, and two characters of address follow. The command string is terminated with a carriage return (line feeds are automatically stripped out by the GFT2):

RS-485 !<Addr>,<Cmd>,Arg1,Arg2,Arg3,Arg4<CR> Example: !12,F<CR>

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RS-232 Cmd,Arg1,Arg2,Arg3,Arg4<CR> Example: F<CR>

Where:	!	Start character **
	Addr	RS-485 device address in the ASCII representation of hexadecimal (00 through FF are valid). **
	Cmd	The one or two character command from the table below.
	Arg1 to Arg4	The command arguments from the table below. Multiple arguments are comma delimited.
	CR	Carriage return character

****Default address for all units is set to 11 hex. Do not submit start character and device address for RS-232 option.**

Several examples of commands follow. All assume that the GFT2 has been configured for address 18 (12 hex) on the RS-485 bus:

1. To get a flow reading:	!12,F<CR>
The device will reply:	!12,50.0<CR> (Assuming the flow is at 50.0% FS)
2. To get current Flow Alarm status:	!12,A,S<CR>
The device will reply:	!12,AS:N<CR> (Assuming no alarm conditions)
3. To get Totalizer#1 reading:	!12,T,1,R<CR>
The device will reply:	!12,T1R:93.5<CR> (Assuming the Totalizer#1 reading is 93.5)
4. Set the flow high and low alarm limit to 90% and 10% of full-scale flow rate:	!12,A,C,90.0,10.0<CR>
The device will reply:	!12,AC:90.0,10.0<CR>

APPENDIX D
Mechanical Drawings

APPENDIX E
Circuit Layout Diagrams
Circuit Layout Top
Circuit Layout Bottom
Mirror

APPENDIX F
Warranty

GFT2 Totalizer Input/Output Flow Monitor/Controller is warranted against parts and workmanship for a period of one year from the date of purchase. It is assumed that equipment selected by the customer is constructed of materials compatible with the environment in which the GFT2 is being used. Proper selection is the responsibility of the customer. It is understood that power supply voltage and external signals should not exceed allowable limits provided in this manual, and it is deemed the responsibility of the customer that only operators with basic knowledge of the equipment and its limitations are permitted to control and operate the equipment covered by this warranty. Anything to the contrary will automatically void Dwyer's liability and the provisions of this warranty. Defective products will be repaired or replaced at no charge solely at the discretion of Dwyer. Shipping charges are borne by the customer. This warranty is void if the equipment is damaged by accident or misuse, or has been repaired or modified by anyone other than Dwyer or factory authorized service facility. This warranty defines the obligation of Dwyer and no other warranties expressed or implied are recognized.

MAINTENANCE/REPAIR
Upon final installation of the Series GFT2 no routine maintenance is required. The Series GFT2 is not field serviceable and should be returned if repair is needed. Field repair should not be attempted and may void warranty.

WARRANTY/RETURN
Refer to "Terms and Conditions of Sales" in our catalog and on our website. Contact customer service to receive a Return Goods Authorization number before shipping the product back for repair. Be sure to include a brief description of the problem plus any additional application notes.