Fox Thermal Instruments, Inc.

THERMAL MASS FLOW METER & TEMPERATURE TRANSMITTER

Model FT3
Data Logger
This publication must be read in its entirety before performing any operation. Failure to understand and follow these instructions could result in serious personal injury and/or damage to the equipment. Should this equipment require repair or adjustment beyond the procedures given herein, contact the factory at:

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Firmware/Software Revision Compatibility Record

Manual Revision | FT3 Firmware Version
Rev A | v 3.08 and earlier
Rev B | v 3.09 and later
Introduction

Thank you for purchasing the Model FT3 Thermal Gas Mass Flow Meter and Temperature Transmitter from Fox Thermal Instruments. The Model FT3 is one of the most technically advanced flow meters in the world. Extensive engineering effort has been invested to deliver advanced features, accurate measurement performance, and outstanding reliability.

The Model FT3 offers an option to have a data logger mounted on the Front Panel board that can be used to record FT3 data. Data that may be recorded includes interval totals (i.e. a previous 24-hour total) based on selected flow units (i.e. total mass flow or total volumetric flow). This data may be recorded at a rate specified by the customer ranging from 1 second to 1 month in hour/minute/second intervals.

This Manual contains the operation instructions for the FT3 Data Logger. The FT3 Data Logger supports 31 records with a start/synch time of midnight set as a default. When the number of samples exceeds 31, the old data will be overwritten. Only the most recent 31 records are kept.

Scope
This document describes the operation and configuration of the FT3 data logger along with the Modbus commands to support it. It is divided into the following sections: Introduction, Menu Trees, Setup, Operation, Glossary and Index.

Model FT3 Data Logger Features
The following features are included in the Data Logger option available on the Fox Model FT3 Thermal Gas Mass Flow Meter & Temperature Transmitter:

- 31 separate 24-hour daily totals with date and time stamp
- Data can be accessed over RS485 Modbus and the Engineering Display
- After 31 days, old data will be written over; however, the most recent 31 daily totals will always be available
- The operator may set the start time through the front panel (the default start time for the 24-hour total will be midnight)
- Operator may set the local time through the front panel
- Field retrofits with Data Loggers require exchanging the existing display board for the display board with the data logger feature and upgrading the main FT3 board firmware (upgrade kit available)
Menu Trees

Operation Using Front Panel
When using the Model FT3’s front panel to access the Data Logger functions, follow the path illustrated in the Menu Trees shown in Figures 2.1 - 2.3.

Fig. 2.1: Accessing Data Logger Functions from the Front Panel

Enter menu by scrolling to display 4 and entering the password

Display Menu (see Instruction Manual)
Flow Parameter 1 Menu (see Instruction Manual)

Analog Outputs
Select either flow or temperature for channel 2

Level 2

Level 2

USB Serial communication with or without checksum

USB CKSM=Enabled NXT OK

Modbus only

Parity=EVEN NXT OK

Baud=9600 NXT OK

Comm=HART NXT OK

The “LOG” label will be displayed only if the program has detected the data log Real Time Clock (RTC) hardware

INP= Not used NXT OK

Instruction Manual

Data Logger Menu, p. 6

Digital Output Menu (see Instruction Manual)
Data Logger Settings

The settings of the FT3 Data Logger can be accessed from the front panel of the meter. The menu tree below shows the settings that may be accessed.

Fig. 2.2: Setting the FT3 Data Logger from the Front Panel

All entries in “Set Interval” are converted into a minute interval counter.

When “Start Time” is detected, the interval is reloaded to re-sync in the event that the power has been lost. Day entry set to 0 is the default. For a midnight re-sync, all values should be set to zero.

Time will be set when the YES key is pressed.
Menu Trees

Data Logger Display
Displaying the records from your FT3 Data Logger is quick and easy. Use the short cuts displayed in the menu tree below to view data logger records quickly and easily from the front panel of the meter.

Fig. 2.3: Viewing the FT3 Data Logger Records from the Front Panel

**Data Logger Display**

- Use the F2 key to move to the next record.
- Use the F1 key to move back to the previous one.
- Use the F4 key to exit to normal mode.

**Note:** Seconds displayed only if there is enough room on display.

**Date and Time refreshed every second**

**Data log Record # is displayed for 1 second**

**Record #1 is the latest data, Record #31 the oldest**

**Use the F4 key to exit to normal mode**

**F2 Key**

**F1 Key**

**Record #1**

**Record #31**

**ITot = 7034691.2**

**Date / Time**

8/10/13 8:29:36
Setup

Setup Menu

Using the keypad on the front panel, enter the programming mode:

---

**SET PARAMETERS**

<table>
<thead>
<tr>
<th>I/O</th>
<th>FLO</th>
<th>DSP</th>
<th>EXIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>F2</td>
<td>F3</td>
<td>F4</td>
</tr>
</tbody>
</table>

Press F1 for (I/O). The screen will show:

---

**SET I/O**

<table>
<thead>
<tr>
<th>COM</th>
<th>I/O</th>
<th>420</th>
<th>EXIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>F2</td>
<td>F3</td>
<td>F4</td>
</tr>
</tbody>
</table>

Press F2 for (I/O). The screen will show:

---

**SET I/O**

<table>
<thead>
<tr>
<th>INP</th>
<th>OUT</th>
<th>LOG</th>
<th>EXIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>F2</td>
<td>F3</td>
<td>F4</td>
</tr>
</tbody>
</table>

Note: If the hardware does not detect a real time clock, the LOG menu key will not be displayed.

Press F3 for (LOG). The screen will show:

---

**Data log = ON**

<table>
<thead>
<tr>
<th>NXT</th>
<th>OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>F2</td>
</tr>
</tbody>
</table>

The default is set with the data logger enabled, press F1 (NXT) to turn the data logger ON or OFF (the default is ON).

Press F4 (OK) to continue.

---

**DATA LOG**

<table>
<thead>
<tr>
<th>CLR</th>
<th>STR</th>
<th>TIM</th>
<th>EXIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>F2</td>
<td>F3</td>
<td>F4</td>
</tr>
</tbody>
</table>
Operation: Configure

Clearing the Data Log

From the data log menu, press F1 (CLR).

The screen will show:

```
Clear Log?
YES NO
```

Press F1 (YES) to confirm or F4 (NO) to cancel.

Setting the Start / Sync Time

The start/sync time is used to start or syncing a data log sample. When a match is detected between the real time clock and the start/sync time, the interval is reloaded. The Data Logger will be set to the default of zero (midnight) and only the hour, minute, and second will be used for the trigger.

For example:
A setting of "day=00, hour=00, minute=00" will reload the interval every day at midnight.

From the data log menu, press F2 (STR). The screen will show:

```
Start Time = ON
NXT OK
```

Press F1 (NXT) to turn ON or OFF the Start/Sync Time and then press F4 (OK):
Operation: Configure

Setting the Start / Sync Time

Day Start = 0
CHG OK
Press F4 (OK).

Hour Start = 0
CHG OK
Press F4 (OK).

Set the Hour for which you want to start/sync time. When the Hour Start is set to zero, the default will be for midnight. Press F4 (OK).

Set the Minute for which you want to start/sync time. Press F4 (OK).

Set Start Time?
YES OK
Press F1 (YES) to set the start/synch time for Day:Hour:Minute.

Note: Make sure that the specified time has not been reached yet.

Setting the Real Time Clock

From the Data Log menu, press F3 (TIM). The screen will show:

Date/Time
SET VIEW EXIT
Operation: Configure

Setting the Real Time Clock

Press **F1 (SET)**:

- **Year Set = 13**
  - CHG
  - OK
  - F1  F2  F3  F4

Press **F1 (CHG)** to change the years, **F4 (OK)** to continue.

- **Month Set = 10**
  - CHG
  - OK
  - F1  F2  F3  F4

Press **F1 (CHG)** to change the month, **F4 (OK)** to continue.

- **Day Set = 28**
  - CHG
  - OK
  - F1  F2  F3  F4

Press **F1 (CHG)** to change the day/date, **F4 (OK)** to continue.

- **Hour Set = 13**
  - CHG
  - OK
  - F1  F2  F3  F4

Press **F1 (CHG)** to change the hours, **F4 (OK)** to continue.

- **Min Set = 45**
  - CHG
  - OK
  - F1  F2  F3  F4

Press **F1 (CHG)** to change the minutes, **F4 (OK)** to continue.
Operation: Configure

Setting the Real Time Clock

Press F1 (CHG) to change the seconds, F4 (OK) to continue.

Press F1 (YES) to set the Date & Time.

Note: All real time clocks on FT3 data loggers are set to a default of California's Pacific Standard Time. To sync the real time clock to your local time exactly, set the time slightly ahead of your local, current time and wait for the current time to reach the set value before pressing the F1 (YES) key to set the time.

Viewing the Real Time Clock

From the Data Log Menu, Press F3 (View) or press F1 and F3 at the same time from the regular mode.

The current real time is displayed on line 2 and is updated every second. Press F4 to exit.

Note: The seconds will only be displayed if there is enough room available to do so.

Note: Time is displayed in military time.
Displaying Data Log Records

The data logger supports 31 records, record #1 being the latest recorded value and 31 being the oldest.
From the normal operating mode, press F1 & F4 keys at the same time:

<table>
<thead>
<tr>
<th>Data Log Rec #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1       F2</td>
</tr>
</tbody>
</table>

Note: Record #1 is the most recent interval total, record #31 is the oldest.

This display screen will appear for only 1 second and will then show:

<table>
<thead>
<tr>
<th>10/07/13   15:54</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITOT = 152345.3</td>
</tr>
</tbody>
</table>

The Date & Time is displayed on line 1 and the interval total on line 2. The interval total is based on the flow units selected in the meter (total mass flow or total volumetric flow).

Pressing F2 will display the next record, F1 will display the previous record.

Press F4 to exit to the normal mode at any time.
Operation: MODBUS Data Log Support

Select Record

**Select Record (command 06, Preset Register, Modbus Address 40214)**

This command is used to select the next record that is going to be read from the data log buffer using command 03

Address register = 40214
Data = xx. (xx = record select (hex 0-1e, decimal 0-30)

Note: Record 0 is the latest and 30 is the oldest.

**Request:**

\(<\text{Meter Address}> <\text{Function code}=06> <\text{Register address high}=0x00> <\text{Register address low}=0xd5> <\text{Register data high}=0x00> <\text{Register data low}=0xx> <\text{CRC high}> <\text{CRC low}>\)

**Response:**

\(<\text{Meter Address}> <\text{Function code}=06> <\text{Register address}=0x00> <\text{Register address}=0xd5> <\text{Register data}=0x00> <\text{Register data}=0xx> <\text{CRC high}> <\text{CRC low}>\)

Read Record

**Read Record (command 03, Read Holding register)**

These registers are used to get the data for a single record. Before issuing that command, a preset command has to be sent to select the record to be read.

<table>
<thead>
<tr>
<th>Register Address</th>
<th>Modbus Address</th>
<th>Data Type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0xc7</td>
<td>40200</td>
<td>Record Number (16 bits integer)</td>
<td>Record Number</td>
</tr>
<tr>
<td>0xc8</td>
<td>40201</td>
<td>Year /Month(16 bits integer, BCD format yyyy mmmm)</td>
<td>Record Year/Month</td>
</tr>
<tr>
<td>0xc9</td>
<td>40202</td>
<td>Day/Hour (16 bits integer, BCD format dddd hhhh)</td>
<td>Record Day/Hour</td>
</tr>
<tr>
<td>0xca</td>
<td>40203</td>
<td>Minute/Second (16 bits integer, BCD format mmmm 0000)</td>
<td>Record Minute/sec=0</td>
</tr>
<tr>
<td>0xcb</td>
<td>40204</td>
<td>Data Index (16 bits integer, 0x00FA))</td>
<td>Data Index = 250</td>
</tr>
<tr>
<td>0xcc</td>
<td>40205</td>
<td>Interval Total (16 bits unsigned integer, high register)</td>
<td>Interval Total (int)</td>
</tr>
<tr>
<td>0xcd</td>
<td>40206</td>
<td>Interval Total (16 bits unsigned integer, low register)</td>
<td>Interval Total (int)</td>
</tr>
<tr>
<td>0xce</td>
<td>40207</td>
<td>Interval Total (float upper 16 bits)</td>
<td>Interval Total (float)</td>
</tr>
<tr>
<td>0xcf</td>
<td>40208</td>
<td>Interval Total (float lower 16 bits)</td>
<td>Interval Total (float)</td>
</tr>
</tbody>
</table>

Note: The Record Number is an unsigned integer (0-65535) that is incremented every time a new record is stored and is not the same as the request record number (0-30).
Operation: MODBUS Data Log Support

Read Record

Example:
Request:

Request data register at starting address 40200 and specifying 9 register to read the complete record

<0x01>  <0x03>   <0x00> <0xc7> <0x00> <0x09> <0x34>
<0x31>

Response:

<0x01>  <0x03>  <0x12>  <rec nb> <rec nb> <year><month><day><hour><min><sec><data index><data index><total val int><total val int><total val int><total val int><total val fp><total val fp><total val fp><total val fp><CRC high> <CRC low>

Clear Data Log

Clear Data Log (command 06, Preset Register, Modbus Address 40213)
This command is used to clear all records in the log.
Address register = 40213
Data = 0x57.

Request:

<Meter Address> <Function code=06> <Register address high=0x00> <Register address low=0xd4>
<Register data high=0x00> <Register data low =0x57> <CRC high> <CRC low>

Response:

<Meter Address> <Function code=06> <Register address =0x00> <Register address =0xd4>
<Register data=0x00> <Register data =0x57> <CRC high> <CRC low>
## Definitions

### Glossary of Terms and Definitions

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM</td>
<td>Communication</td>
</tr>
<tr>
<td>CSV</td>
<td>Current Sense Voltage</td>
</tr>
<tr>
<td>DMM</td>
<td>Digital Multimeter</td>
</tr>
<tr>
<td>ITOT</td>
<td>Interval Total: Total flow for the interval selected (based on flow units selected to measure flow in meter), total mass flow or total volumetric flow</td>
</tr>
<tr>
<td>mA</td>
<td>Milliamps</td>
</tr>
<tr>
<td>PC</td>
<td>Personal Computer</td>
</tr>
<tr>
<td>RTC</td>
<td>Real Time Clock</td>
</tr>
</tbody>
</table>
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Caution

Definition of Terms