Fox Thermal Instruments, Inc.

THERMAL MASS FLOW METER & TEMPERATURE TRANSMITTER

Model FT3
Data Logger

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www.foxthermalinstruments.com | 399 Reservation Road Marina, CA. 93933

Notice

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FOX THERMAL INSTRUMENTS, INC.
399 RESERVATION ROAD
MARINA, CA 93933
TELEPHONE: 831-384-4300
FAX: 831-337-5787
EMAIL: SERVICE@FOXTHERMALINSTRUMENTS.COM

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www.foxthermalinstruments.com

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Fox FT3 Manuals:
- **Model FT3 Instruction Manual**
- **Fox FT3 RS485 Modbus Manual**
- **Calibration Validation User's Guide**
- **Fox FT3 HART Manual**

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Table Of Contents

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

Introduction

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)
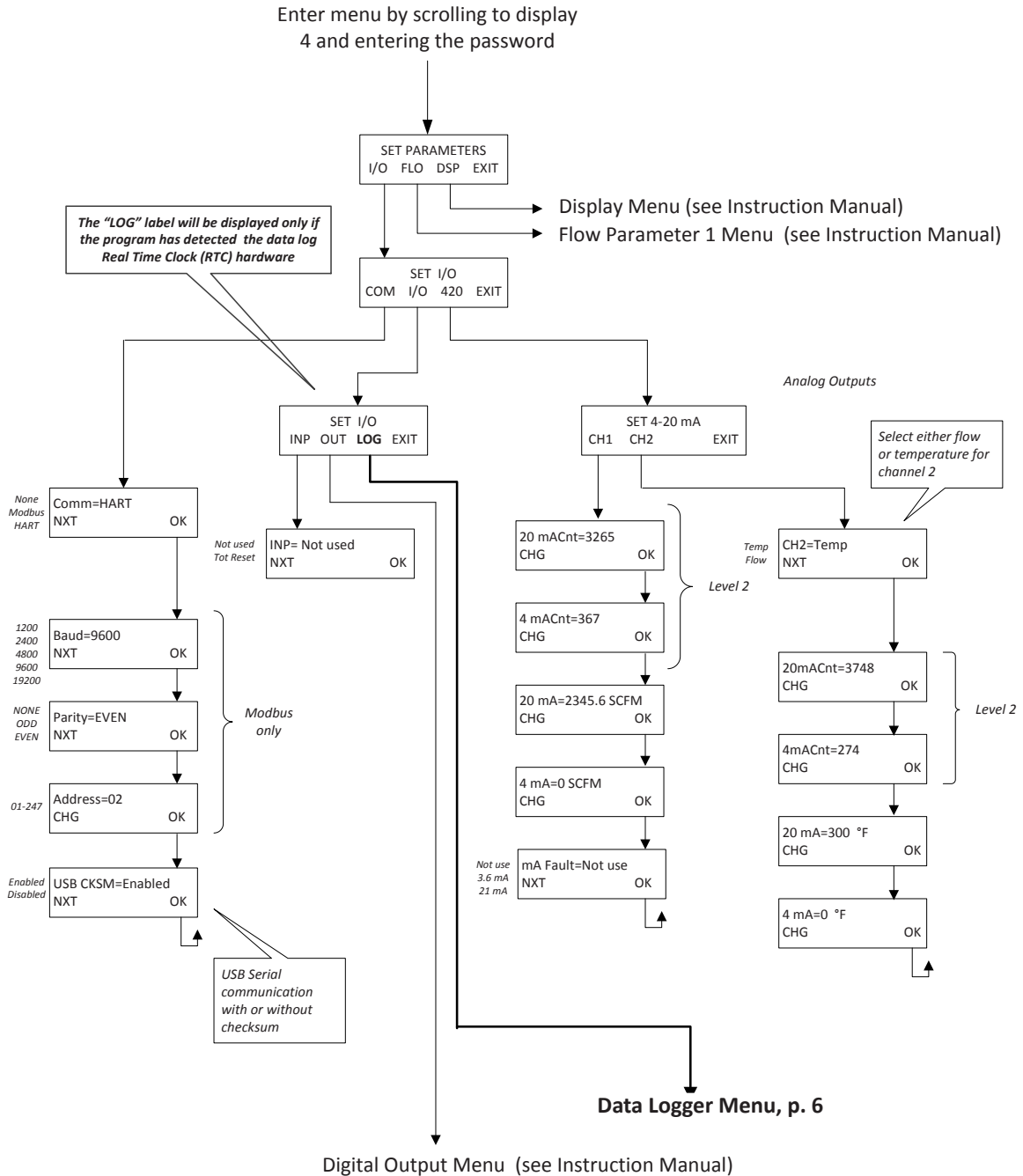
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Menu Trees

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.

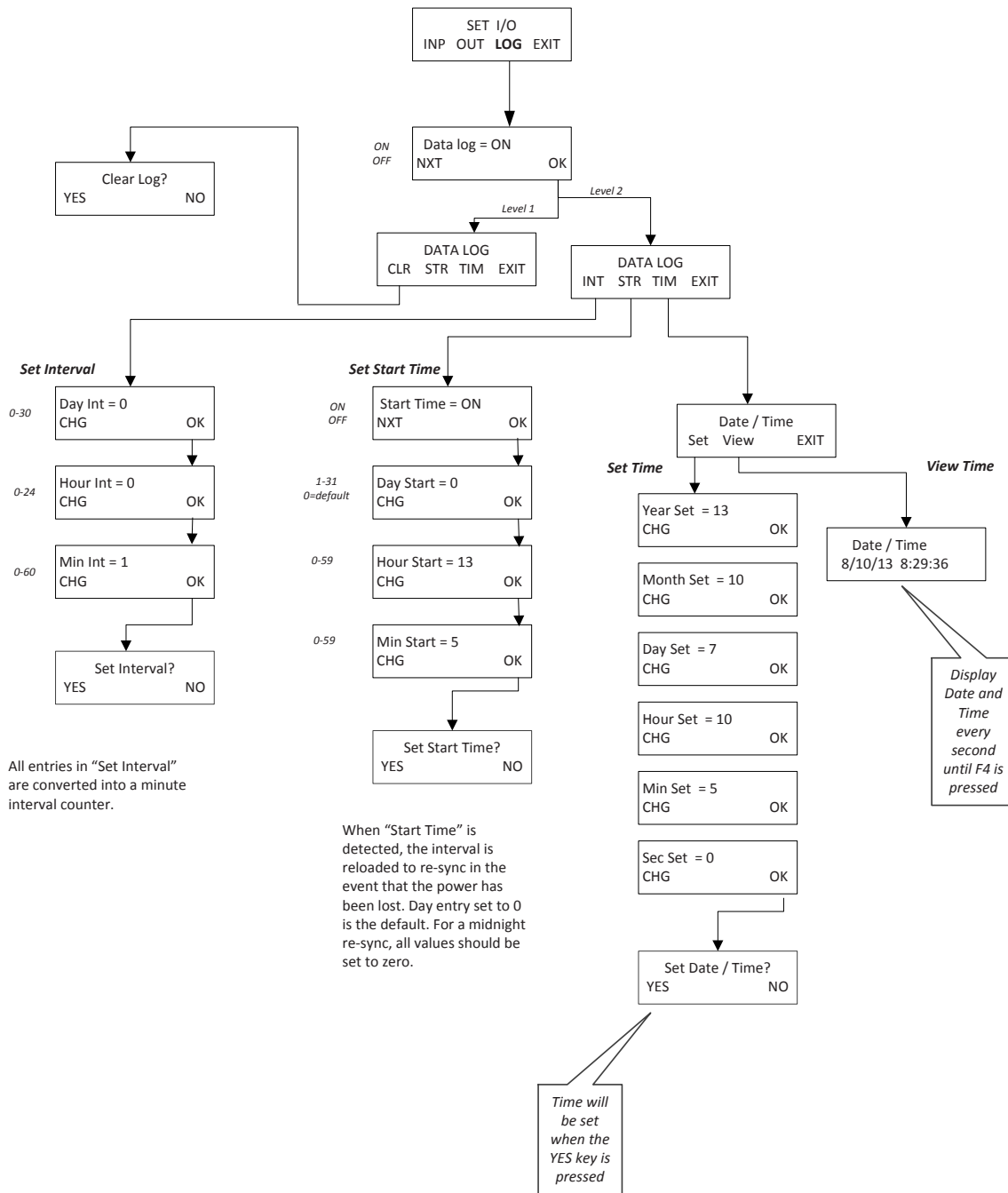*Fig. 2.1: Accessing Data Logger Functions from the Front Panel*

Data Logger Menu, p. 6

Digital Output Menu (see Instruction Manual)

Menu Trees

Data Logger
Settings

MENU TREES

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.

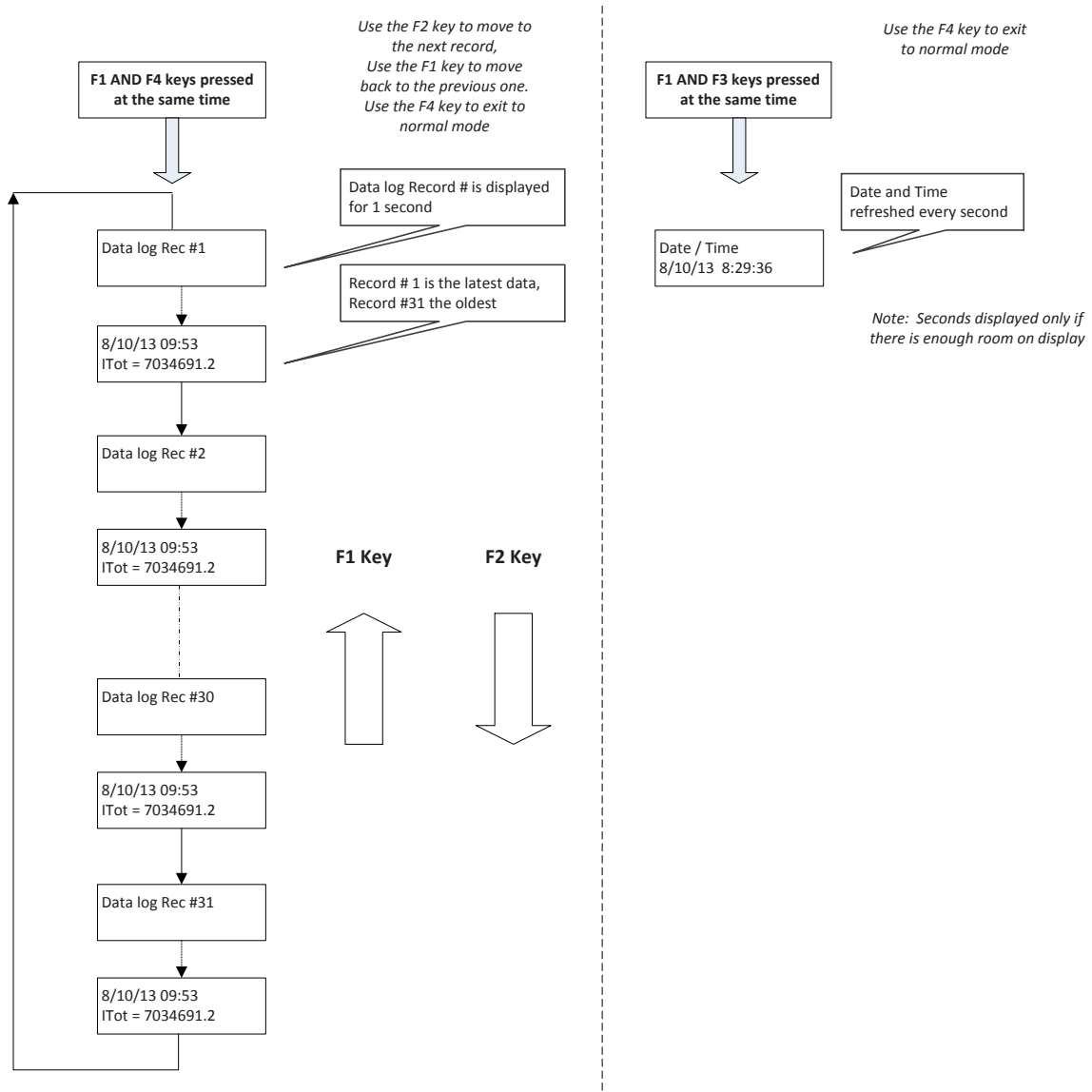*Fig. 2.2: Setting the FT3 Data Logger from the Front Panel*

SET I/O
INP OUT **LOG** EXIT

ON
OFF
Data log = ON
NXT   OK

Clear Log?
YES   NO

Level 1   *Level 2*

DATA LOG
CLR STR TIM EXIT

DATA LOG
INT STR TIM EXIT

Set Interval

0-30
Day Int = 0
CHG   OK

0-24
Hour Int = 0
CHG   OK

0-60
Min Int = 1
CHG   OK

Set Interval?
YES   NO

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

Set Start Time

ON
OFF
Start Time = ON
NXT   OK

1-31
0=default
Day Start = 0
CHG   OK

0-59
Hour Start = 13
CHG   OK

0-59
Min Start = 5
CHG   OK

Set Start Time?
YES   NO

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.

Date / Time
Set   View   EXIT

Set Time

Year Set = 13
CHG   OK

Month Set = 10
CHG   OK

Day Set = 7
CHG   OK

Hour Set = 10
CHG   OK

Min Set = 5
CHG   OK

Sec Set = 0
CHG   OK

Set Date / Time?
YES   NO

Time will be set when the YES key is pressed

View Time

Date / Time
8/10/13 8:29:36

Display Date and Time every second until F4 is pressed

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Menu Trees

Data Logger
Display

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

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

Use the F4 key to exit
to normal mode

**F1 AND F4 keys pressed
at the same time**

**F1 AND F3 keys pressed
at the same time**

Data log Record # is displayed
for 1 second

Date and Time
refreshed every second

Data log Rec #1

Date / Time
8/10/13 8:29:36

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

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

8/10/13 09:53
ITot = 7034691.2

Data log Rec #2

8/10/13 09:53
ITot = 7034691.2

F1 Key   **F2 Key**

Data log Rec #30

8/10/13 09:53
ITot = 7034691.2

Data log Rec #31

8/10/13 09:53
ITot = 7034691.2

SETUP

Setup

Setup Menu

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

```
   SET  PARAMETERS
I/O    FLO    DSP    EXIT
```
[F1] [F2] [F3] [F4]

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

```
        SET  I/O
COM    I/O    420    EXIT
```
[F1] [F2] [F3] [F4]

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

```
        SET  I/O
INP    OUT    LOG    EXIT
```
[F1] [F2] [F3] [F4]

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
NXT                  OK
```
[F1] [F2] [F3] [F4]

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.
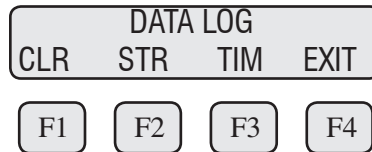
```
        DATA LOG
CLR    STR    TIM    EXIT
```
[F1] [F2] [F3] [F4]

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Operation: Configure

Clearing the Data Log

Clearing the Data Log
From the data log menu, press **F1 (CLR)**.

```
         DATA LOG
CLR     STR     TIM    EXIT
```

```
[ F1 ]   [ F2 ]   [ F3 ]   [ F4 ]
```

The screen will show:

```
         Clear Log?
YES                      NO
```

```
[ F1 ]   [ F2 ]   [ F3 ]   [ F4 ]
```
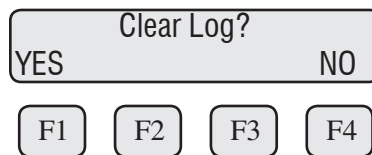
Press **F1 (YES)** to confirm or **F4 (NO)** to cancel.

Setting the Start / Sync Time

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 settting 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
```

```
[ F1 ]   [ F2 ]   [ F3 ]   [ F4 ]
```
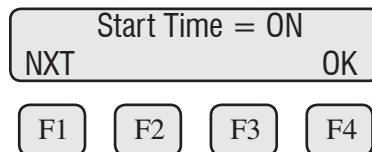
Press **F1 (NXT)** to turn ON or OFF the Start/Sync Time and then press **F4 (OK)**:

Operation: Configure

OPERATION

Setting the Start /
Sync Time

```
Day Start = 0
CHG                OK
```

F1	F2	F3	F4

Press **F4 (OK)**.

```
Hour Start = 0
CHG                OK
```

F1	F2	F3	F4

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).**

```
Min Start = 0
CHG                OK
```

F1	F2	F3	F4

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

```
Set Start Time?
YES                OK
```

F1	F2	F3	F4

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

Setting the Real Time Clock
From the Data Log menu, press **F3 (TIM)**. The screen will show:

```
          Date/Time
SET     VIEW        EXIT
```

F1	F2	F3	F4

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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

OPERATION

Operation: Configure

Setting the Real Time Clock

```
Sec Set = 55
CHG              OK
```

| F1 | F2 | F3 | F4 |

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

```
Sec Date/Time
YES              NO
```

| F1 | F2 | F3 | F4 |

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.

View the Real Time Clock

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.

```
       Date/Time
   10/28/13   13:45:55
```

| F1 | F2 | F3 | F4 |

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.

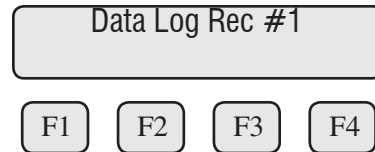Note: Time is displayed in military time.

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Operation: Configure

Displaying Data Log
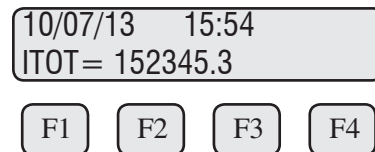Records

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:

> Data Log Rec #1

| F1 | F2 | F3 | F4 |

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:

> 10/07/13   15:54
> ITOT= 152345.3

| F1 | F2 | F3 | F4 |

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

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:

<Meter Address> <Function code=06> <Register address high=0x00>
<Register address low=0xd5>
<Register data high=0x00> <Register data low =0xx> <CRC high>
<CRC low>

Response:

<Meter Address> <Function code=06> <Register address =0x00>
<Register address =0xd5>
<Register data=0x00> <Register data =0xx> <CRC high> <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.

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

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).

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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

COM	Communication
CSV	Current Sense Voltage
DMM	Digital Multimeter
ITOT	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
mA	Milliamps
PC	Personal Computer
RTC	Real Time Clock

DEFINITIONS

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Caution

Definition of Terms