GUIDANT

Electronic Gas Flow Computer System

Smith Meter® microFlow.net™ Gas

Operations Manual

Caution

The default or operating values used in this manual and in the program of the microFlow.net™ Gas are for factory testing only and should not be construed as default or operating values for your metering system. Each metering system is unique and each program parameter must be reviewed and programmed for that specific metering system application.

Disclaimer

Guidant hereby disclaims any and all responsibility for damages, including but not limited to consequential damages, arising out of or related to the inputting of incorrect or improper program or default values entered in connection with the microFlow.net Gas.

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Product Description

The Smith Meter® microFlow.net™ Gas is a micro-processor based single meter, single product electronic flow computer instrument that monitors continuous gas flow applications. The unit can operate either as a stand-alone instrument or part of a SCADA system.

Optimum measurement accuracy is attained through continuous linearization of the meter factor with changes in flow rates. Volumetric correction and energy are calculated using published AGA/ISO equations providing precise measurement results.

The dynamic real-time display of the current actual operating conditions of the system provides the operator with valuable system information while the system is operating.

The microFlow.net Gas provides several features:

- Ethernet Connectivity
- Three Multi-Drop Serial Communications Ports
- Event Logging / Audit Trail
- User Configurable I/O
- Three Security Levels
- Optional Battery Backed Display per OIML
- Programmable Language/Messages
- Sampler Control
- Smith Meter MPU Gas Ultrasonic Meter Interface

How To Use This Manual

This manual is to be used as an operators guide for the microFlow.net Gas.

This manual is divided into the following sections: Introduction, Display and Controls, Run Mode, Program Mode, Diagnostics, and Index.

The "Display and Controls" section describes the microFlow.net Gas's physical display screen and keypad as well as some of the basic messages that would initially occur.

The "Run Mode" section describes the typical operation of a microFlow.net Gas and the read only "Diagnostics".

The "Program Mode" section describes the mechanics of marking configuration changes to a microFlow.net Gas using the integral display and keypad. See the Reference Manual for details of the parameters that are affected in the Program Mode.

The "Index" is a comprehensive listing, with page numbers, of all subjects covered in this manual.

The examples presented in this manual are for clarity and operator convenience. The values might vary for specific installations and/or operations.

microFlow.net™ Gas Display and Controls

Figure 1. microFlow.net Gas Display and Controls

The user interfaces with the microFlow.net Gas through either through one of its several communications ports or via the display and keypad found on the face of the instrument. The display and keypad alter the format and function based upon the mode (Run Mode, Programming Mode…) that the instrument is currently operating in. The following provides previews to the various screens as well as the keypad functions associated with the various modes.

Power Up

The following describes the events which occur when the power is applied to a microFlow.net Gas. Upon power up the microFlow.net Gas goes through a start up sequence. The start up screen will be displayed while a RAM test is being performed.
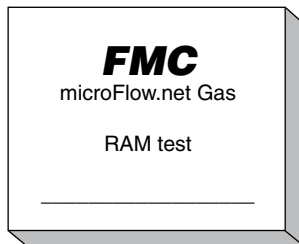
Figure 2. Power Up Screen

After initialization, the microFlow.net Gas will display the default screen based on the configuration set by the user. See the Operator Reference Manual (MNFG002) for more detail regarding the selection of the default display.
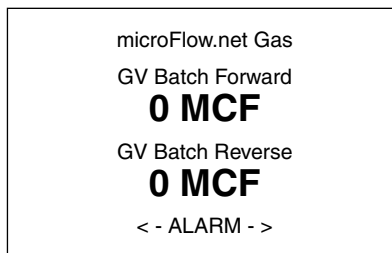
The "ALARM" message will blink at the bottom of all run-time screens if an alarm conditions exists. Otherwise, the "MORE" message will be present at the bottom of all run-time screens.

Once the initial screen is displayed, the operator can scroll through other run-time screens by pressing the right/left cursor buttons. This will sequence through the following screens. If the programming calls for a user configured display to be the initial run-time screen shown at power-up, it will be included in the following sequence of displays.
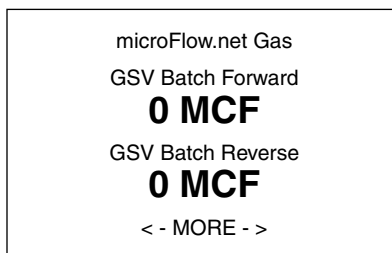
```
microFlow.net Gas

Mass Batch Forward
0 kg

Mass Batch Reverse
0 kg

< - MORE - >
```

```
microFlow.net Gas

Energy Batch Forward
0 MMBtu

Energy Batch Reverse
0 MMBtu

< - MORE - >
```

```
GSV Flow Rate

Current Forward Flow Rate
0.0 MSCF/h

Current Reverse Flow
0.0 MSCF/h

< - MORE - >
```

```
GSV Flow Rate

Average Forward Flow
+XXXX MSCF/h

Average Reverse Flow
+XXXX MSCF/h

< - MORE - >
```

```
Energy Flow Rate

Current Forward Flow
0.0 MMBtu/h

Current Reverse Flow
0.0 MMBtu/hF

< - MORE - >
```

```
Energy Flow Rate

Average Forward Flow
0.0 MMBtu/h

Average Reverse Flow
0.0 MMBtu/h

< - MORE - >
```

```
Batch #XXXX
METHANE

Batch Start Time
XX/XX/XX    XX:XX:XX

Current Date/Time
XX/XX/XX    XX:XX:XX

< -  MORE  - >
```

```
Batch Forward

GV        0.00 MCF
GSV       0.00 MSCF
MASS      0.00 kg
ENERGY    0.00 MMBtu


< -  MORE  - >
```

```
Batch Reverse

GV        0.00 MCF
GSV       0.00 MSCF
MASS      0.00 kg
ENERGY    0.00 MMBtu
```

```
Non-Resets Forward

GV        0.00 MCF
GSV       0.00 MSCF
MASS      0.00 kg
ENERGY    0.00 MMBtu


< -  MORE  - >
```

```
Non-Resets Reverse

GV        0.00 MCF
GSV       0.00 MSCF
MASS      0.00 kg
ENERGY    0.00 MMBtu


< -  MORE  - >
```

```
Current Temperature
+XXX.X  'F

Average Temperature
+XXX.X  'F
< -  MORE  - >
```

Note: This screen will not be displayed if a temperature input is not configured.

```
┌─────────────────────────────────┐
│       Current Ref. Density      │
│     +XXX.X  kg/m3               │
│       Average Ref. Density      │
│     +XXX.X  kg/m3               │
│        < -  MORE  - >            │
└─────────────────────────────────┘
```

Note: *This screen will not be displayed if temperature compensation is not configured.*

```
┌─────────────────────────────────┐
│         Density (kg/m³)         │
│                                 │
│   Cur Ref Dens       0.0000     │
│   Cur Obs Dens       0.0000     │
│   Average Ref Dens   0.0000     │
│   Average Obs Dens   0.0000     │
│   Average Rel Dens   0.0000     │
│                                 │
│        < -  MORE  - >            │
└─────────────────────────────────┘
```

```
┌─────────────────────────────────┐
│        Current Pressure         │
│        0.00 bar                 │
│        Average Pressure         │
│        0.00 bar                 │
│        < -  MORE  - >            │
└─────────────────────────────────┘
```

Note: *This screen will be displayed only if live pressure is configured.*

Run Mode

The "RUN" Mode is the normal operator-controlled mode of operation where a batch volumes are displayed.

All control operations can be performed either locally through the keypad or through communications. The operation described in this section assumes that the microFlow.net Gas is being operated locally through the keypad. For information on operating through communications, refer to the microFlow.net Gas Communications and Reference Manuals.

Overview

The "RUN" Mode permits the operator to observe the dynamic variables such as flow rate, temperature, volume correction factors, and transaction (batch) totals.

Resetting/Starting a New Batch

Batching in the microFlow.net Gas allows the operator to reset or start whenever needed. Batching will not stop flow and restart when reset, but will "on the fly" allow for a new batch totalization while allowing for flow rate control. The following steps are required to reset a batch:

Resetting a Batch

Step 1
Press the "ENTER" key from the "RUN" Mode.

Step 2
The Main Menu will appear. With the cursor (arrow) beside the "RESET BATCH" press "ENTER".

Step 3
When prompted for the passcode, enter the programmed passcode set in the programming.

Step 4
A new batch will now begin as the "RUN MODE" totalizers reset to zero (0) and begin incrementing as flow is present.

Stopping the Flow Using the Keypad

The only way to stop the flow locally at the keypad using the digital control valve, is to enter the program mode and set the flow rate to zero (0). This operation is not practiced in normal pipeline applications, but is available if needed. To prevent the operator from performing this operation the flow rate parameter is under passcode protection.

Keypad Functions

The push-buttons on the keypad perform the following preset functions in the Run Mode:

0 – 9	Used for entering numeric data.
↑	Used to navigate backwards through the menu to get into the displays. When in the dynamic displays, the up arrow also moves backward through displays.
←	Once in the dynamic displays, this works like the up and down arrow to move forward through the displays.
→	Once in the dynamic displays, this works like the down arrow to move forward through the displays.
↓	Used to navigate forward through the menu to get into the displays. When in the dynamic displays, the down arrow also moves forward through the displays.
CLEAR	Used to exit the Dynamic Display.
ENTER	Used to enter the Dynamic Display menu and to enter the dynamic displays from the menu.

Program Mode

The microFlow.net Gas has a significant number of customizable features which are selectable by the user. The process of selecting these features and customizing the microFlow.net Gas to each application is performed in the Program Mode. All programming information is entered via the keypad or through communications. This section will describe the procedure for entering via the keypad. The program codes for microFlow.net Gas are divided into several main directories plus Diagnostics. The main directories and their contents are discussed in detail in the microFlow.net Gas Operator Reference Manual MNFG002.

Keypad Data Entry

The push buttons on the keypad perform the following functions while the instrument is in the Program Mode:

0 – 9	Used to enter the access code and data entries.
CLEAR	Used for clearing incorrect entries or for getting to an exit point.
ENTER	Used to enter the Program Mode security access code, to enter the subdirectory, and to enter program data.
START	Not used in Program Mode.
SET	Page Scrolling.
PRINT	Used to access Help Messages.
STOP	Used to set the security level.
F1	Not used in Program Mode.
F2	Not used in Program Mode.
↑	Used to move up through the menus and rows for alphanumeric entries.
↓	Used to move down through the menus and rows for alphanumeric entries.
+ / -	Used for adding signs to values being programmed.
.	Decimal point, for values requiring one.
← →	Used for alphanumeric entries.

Entry to Main Directories

1. Assert the security input if configured. This will provide the first step for access to program codes.

```
microFlow.net Gas
GV Batch Forward
    0 MCF
GV Batch Reverse
    0 MCF
  < - MORE - >
```
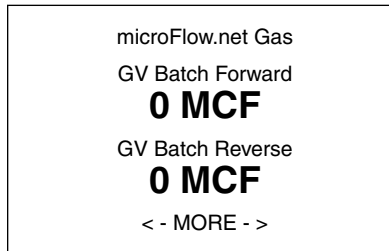
2. Press "ENTER." This displays the main menu.

```
    Main Menu
microFlow.net Gas
Reset Batch
Dynamic Displays
Print Menu
Program Mode Menu
Diagnostics Menu
```
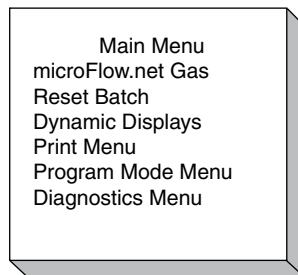
Figure 5. Accessing Main Menu

3. Move the arrow to the Program Mode Menu and press "ENTER." This will display the "Enter Pass Code" screen.

4. Enter the access code. (The access code preset at the factory is "0".) For security, any digit entered will be displayed as an "X". (Access codes can be up to four digits long.)

5. Press "ENTER." This procedure checks for the proper access code. If it is correct, the following will be displayed.

6. If an incorrect access code was entered, an "Access Denied, CLEAR = re-enter" message will appear. Press CLEAR to return the display to the "Enter Pass code Screen" in Step 3. Repeat Steps 3, 4, and 5 to re-enter Program Mode.

```
Enter Pass code

    >_____
```

```
Program Mode Menu

Configuration Dir
Gen Purpose Dir
Meter Dir
Product Dir

      more...
```

```
Program Mode Menu

Alarm Dir
Communications Dir
Diagnostics
Exit w/o saving

      more...
```

Figure 6. Opening Program Mode

Changing Program Mode Parameters

The program codes represent parameters that can be changed either to enhance the performance of the microFlow.net Gas or to accommodate application changes. There are three types of parameters in microFlow.net Gas: codes that require numerical data, codes where an opt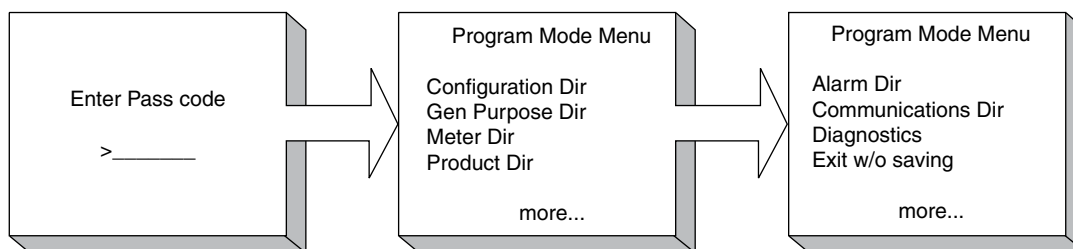ion can be selected from a list, and codes where alphanumeric data is entered. Once a code has been selected, change the programmed contents by entering a new value through the keypad.

Numeric Data

The numeric data is entered into the program codes via the keypad just as numbers are entered into a calculator.

Alphanumeric Data

The parameters that require alphanumeric data are the codes that display Product Messages, Prompt Messages, or Permissive Messages on the displays of microFlow.net Gas, or provide information to be printed out on the Bill of Lading Emulation. When adding or changing information in these alphanumeric program codes, the keys listed below perform the following functions:

KEY	DESCRIPTION
ENTER	Moves the character from the character set to the ID line. Also enters the data into the instrument's memory after END has been selected from the character set.
SET	Moves the cursor six positions to the right.
→	Moves the cursor one position to the right each time it is pressed.
←	Moves the cursor one position to the left each time it is pressed.
↑ **and** ↓	Selects the next block of characters. An example of this is changing from uppercase letters to lowercase letters.

The blocks of characters available in microFlow.net Gas are as follows:

• A B C D E F G H I J K L M N O P Q R S T U V W X Y Z # *
• a b c d e f g h i j k l m n o p q r s t u v w x y z & @
• 0 1 2 3 4 5 6 7 8 9 < > ( ) ? ! . , ' - " / + = _ END

Main Menu Diagnostics

Main Menu Diagnostics allow the operator to review current configurations, identify causes of system errors, and analyze data collected by the microFlow.net Gas. Selecting "Diagnostics" from the main menu, and then choosing a specific diagnostic, usually results in the screen shown directly below. Position the cursor beside the appropriate selection, and then press ENTER to reach the desired diagnostic screen.

```
Diagnostics Menu

- > Active Alarms
    Alarm History
    Event Log
    Batch Record Log
    Audit Trail
    Digital Inputs
                    more...
```
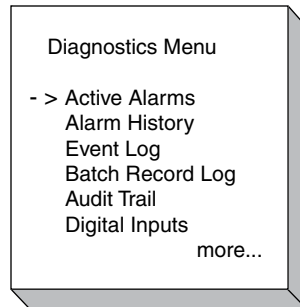
Note: The diagnostics available through the Main Menu are run-time diagnostics only. Program mode diagnostics are accessed from the Program Mode Main Menu.

The Diagnostics menu available through the Main Menu consists of the following:

- Active Alarms
- Alarm History
- Event Log
- Batch Record Log
- Audit Trail
- Digital Inputs
- Digital Outputs
- Analog Inputs
- Pulse Inputs
- Communications Monitor
- Download Directory
- Boolean/Algebraic
- Batch Log Stats
- Summary Data
- Software Version
- Ultrasonic Data
- Contrast Adjust

Active Alarms

The Diagnostics menu provides the selection "Active Alarms" where all active alarms for the load arm can be viewed with the arrow in front of "Active Alarms." Press ENTER, and one of the following will be displayed. If no alarms are active, the following screen will be displayed.

```
No Active Alarms

  Press Any Key
```
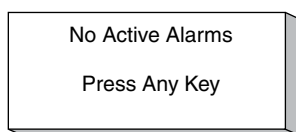
If there are active alarms, they will be displayed as follows:

```
            Active Alarms

    - >   PA: Power Fail Alarms
```

The active alarms can be cleared from this display by moving the arrow to the alarm and pressing "ENTER." The microFlow.net Gas will then ask for the passcode. When the passcode is entered, the alarm will clear.

Pressing the CLEAR key will return the system to the Diagnostic menu.

Alarm History

The Diagnostics menu provides the selection "Alarm History" where the most recent alarms can be viewed. With the arrow in front of "Alarm History," press ENTER, and the historical alarms will be displayed. The alarms will be listed in order of occurrence.
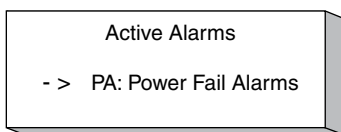
This is an alarm history for the transaction. For a more complete history of alarms, please access the Event Log.

Pressing the up and down arrow keys will allow the operator to page through the Alarm History displays. If "More…" is not displayed, then there is only one screen of alarms in the alarm history.

Pressing the CLEAR key will revert to the Diagnostic menu.

```
            Alarm History

    PA: Power Fail Alarm
    DA: Mtr Program Error
    PA: Power Fail Alarm
```
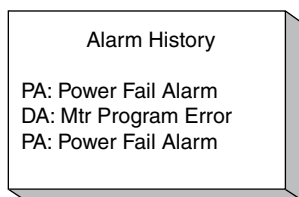
Event Log

The View Only Diagnostics menu displays "Event Log" where past events can be viewed. With the arrow in front of "Event Log," pressing ENTER will display the last event that occurred in the microFlow.net Gas. The "Event Log" includes alarms, transaction start and end, and program mode parameter changes.

```
            Event #621

    03/12/99              0:59:02
    Alarm Cleared -
    DA: Mtr Program Error
```
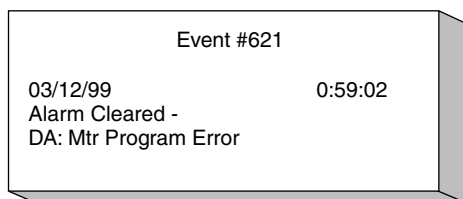
From the display, the operator can go back through the events using the up and down arrow keys. Pressing the CLEAR key will display the Diagnostics menu.

Batch Record Log

This diagnostic shows the selected batch data such as Batch Volumes, Averages and Non-Resettable Totalizers.

```
            Batch Record Log

    Enter # of Batches Back
            -->  [        ]
```
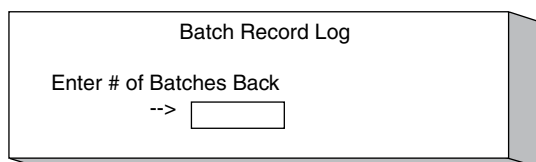
Press Clear to return to the Diagnostics Menu.

Entering the number of batches back, the microFlow.net Gas will display the following screen:

```
- >   Batch Totals

        Boolean/Algebraic
```
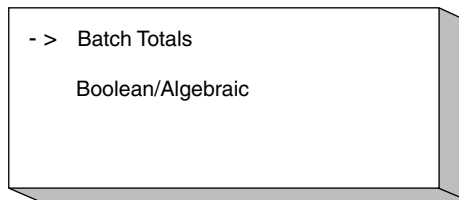
From this display, the operator can choose either "Batch Totals" or "Boolean Algebraic." The following information is displayed for Batch Totals.

```
              Batch #16
Batch Start Time
         09/03/99        9:58:59 AM
Batch End Time
         09/03/99        10:02:24 AM
Pulse Batch (Fwd)
         0
          Press PRINT for help
```

```
              Batch #16
IV Batch (Fwd/MCF)
         0.0000
GV Batch (Fwd)
         0.000 MCF
GST Batch (Fwd)
         0.000 MCF
GSV Batch (Fwd)
         0.0000 MCF
          Press PRINT for help
```

```
              Batch #16
Energy Batch (Fwd)
         MMBtu 0.0000
Mass Batch (Fwd)
         kg 0.0000
Pulses Batch (Rev)
         0
          Press PRINT for help
```

```
              Batch #16
IV Batch (Rev)
         0.00 MCF
GV Batch (Rev)
         0.00 MCF
GSV Batch (Rev)
         0.00 MCF
          Press PRINT for help
```

```
              Batch #16
Energy Batch (Rev)
         0.00 MMBtu
Mass Batch (Rev)
         0.00 kg
Avg MTR Factor
         1.00000
          Press PRINT for help
```

```
                Batch #16
Avg Temp
        0.00 C
Avg Obs Dens
        0.0000 kg/m³
Avg Rel Dens
        0.0000 kg/m³
        Press PRINT for help
```

```
                Batch #16
Avg Rel Dens
        0.0000
Avg Press
        0.00 bar
Avg Wobbe Index
        0.00
        Press PRINT for help
```

```
                Batch #16
Avg Heat Value
        0.000
Avg Mole % Methane
        100.00
Avg Mole % Ethane
        0.0000
        Press PRINT for help
```

```
                Batch #16
Avg Mole % Propane
        0.0000
Avg Mole % n-Butane
        0.0000
Avg Mole % i-Butane
        0.0000
        Press PRINT for help
```

```
                Batch #16
Avg Mole % n-Pentane
        0.0000
Avg Mole % i-Pentane
        0.0000
Avg Mole % n-Hexane
        0.0000
        Press PRINT for help
```

```
                Batch #16
Avg Mole % n-Heptane
        0.0000
Avg Mole % n-Octane
        0.0000
Avg Mole % n-Nonane
        0.0000
        Press PRINT for help
```

```
            Batch #16
Avg Mole % n-Decane
          0.0000
Avg Mole % Nitrogen
          0.0000
Avg Mole % H2S
          0.0000
        Press PRINT for help
```

```
            Batch #16
Avg Mole % CO2
          0.0000
Avg Mole % Water
          0.0000
Avg Mole % Hydrogen
          0.0000
        Press PRINT for help
```

```
            Batch #16
Avg Mole % CO
          0.0000
Avg Mole % Oxygen
          0.0000
Avg Mole % Helium
          0.0000
        Press PRINT for help
```

```
            Batch #16
Avg Mole % Argon
          0.0000
Prompt #1 Response
          0
Prompt #2 Response
          0
        Press PRINT for help
```

```
            Batch #16
Prompt #3 Response
          0
Prompt #4 Response
          0
Prompt #5 Response
          0
        Press PRINT for help
```

```
            Batch #16
Strt IV Non Reset (F)
          0 MCF
Strt GV Non Reset (F)
          0 MCF
Strt GSV Non Reset (F)
          0 MCF
        Press PRINT for help
```

```
                    Batch #16
        Strt Energy Non Reset (F)
                    0 MMBtu
        Strt Mass Non Reset (F)
                    0 kg
        IV Non Reset (Fwd)
                    0 MCF
                    Press PRINT for help
```

```
                    Batch #16
        GV Non Reset (Fwd)
                    0 MCF
        GSV Non Reset (Fwd)
                    0 MCF
        Energy Non Reset (Fwd)
                    0 MMBtu
                    Press PRINT for help
```

```
                    Batch #16
        Mass Non Reset (Fwd)
                    0 kg
        Strt IV Non Reset (R)
                    0 MCF
        Strt GV Non Reset (R)
                    0 MCF
                    Press PRINT for help
```

```
                    Batch #16
        Strt GSV Non Reset (R)
                    0 MCF
        Strt Energy Non Reset (R)
                    0 MMBtu
        Strt Mass Non Reset (R)
                    0 kg
                    Press PRINT for help
```

```
                    Batch #16
        IV Non Reset (Rev)
                    0 MCF
        GV Non Reset (Rev)
                    0 MCF
        GSV Non Reset (Rev)
                    0 MCF
                    Press PRINT for help
```

```
                    Batch #16
        Energy Non Reset (Rev)
                    0 MMBtu
        Mass Non Reset (Rev)
                    0 kg
                    Press PRINT for help
```

When "Boolean/Algebraic" is selected from the previous menu, the following data will be displayed.

```
                    Batch #16

                 Boolean/Algebraic

    #46              0               0
    #47              0               0
    #48              0               0
    #49              0               0
    #50              0               0
```

The first column is the last 5 (#46-50) USERBOOL valves and the second column is the last 5 (#46-50) USERFLOAT valves recorded at the time the batch was reset. Press CLEAR until the "Diagnostics Menu" is displayed.

Audit Trail

The View Only Diagnostics menu provides the selection "Audit Trail" where audit trail data is available for viewing. With the arrow in front of "Audit Trail," pressing ENTER will display the last audit trail entry that occurred in the microFlow.

```
               Audit Trail Entry #13

    02/12/99    11:43:32
    Flow Simulator
    Enabled
```

The audit trail provides the date, time, and description of Program Mode changes. Note that only changes to parameters secured at the two highest security levels programmed are logged in the audit trail. Pressing the up and down arrows on the keypad will allow the operator to step through the audit trail.

```
                    Audit #478

    02/12/99    11:36:13AM
    Program Mode exit
        thru keypad
    Calculated CRC 0xC515
    Flash address 29f580
```

Pressing the CLEAR key will display the Diagnostic menu.

Digital Inputs

The Diagnostics menu provides for the selection of "Digital Inputs" where the current status of the digital inputs can be viewed. With the arrow in front of "Digital Input," pressing ENTER will display the digital inputs, the programmed function, and their status.

```
                  Digital Inputs

    #1 Permissive 1              ON
    #2 NA                        OFF
    #3 Permissive 2              OFF
```

Viewing the above displays provides information on digital input #1. It is used as a permissive and the current status is ON. Likewise, the functions and status of digital inputs #2 and #3 are also available. Pressing the CLEAR key will display the Diagnostics menu.

Digital Outputs

The Diagnostics menu provides the selection "Digital Outputs" where the function and status of the digital outputs can be viewed. With the arrow key in front of "Digital Outputs," pressing ENTER will display all six digital outputs and their status.

```
                    Digital Outputs

        #1 N/A                      OFF
        #2 N/A                      OFF
        #3 N/A                      OFF
        #4 N/A                      OFF
        #5 N/A                      OFF
        #6 N/A                      OFF
```

Pressing the CLEAR key will display the Diagnostics menu.

Analog Inputs

The Diagnostics menu provides the selection "Analog Inputs," where the function and status of the analog inputs can be viewed. With the arrow in front of "Analog Inputs," pressing ENTER will display the two analog inputs, their current reading in engineering units, current, or voltage, and raw analog input value.

```
                    Analog Inputs
        #1: M1 Temp In              15.0 C
                14.062 mA           36863
        #2: M1 Pressure            6.2 Kg/cm²
                16.170 mA           42388

           #1 Cal:0131072   0917504
           #2 Cal:0131072   0917504
```

Pressing the CLEAR key will display the Diagnostics menu.

Pulse Inputs

The Diagnostics menu provides the selection "Pulse Inputs" where the meter pulses and the metered injector pulses are displayed. With the arrow in front of "Pulse Inputs," pressing ENTER will display the pulse inputs.

```
                    Pulse Inputs

            Fwd Count           0
            Rev Count           0
            Err Count           0
```

Pressing the CLEAR key will display the Diagnostics menu.
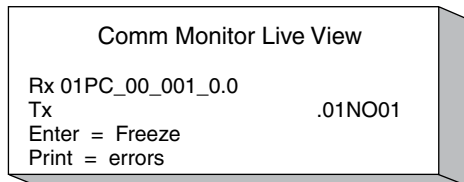
Communications Monitor

The Diagnostics menu provides the selection "Comm Monitor" to review messages being sent and received across the communications lines. With the arrow in front of "Comm Monitor," pressing ENTER will display the following:
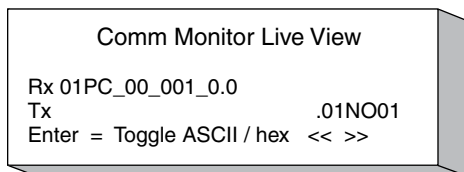
```
                  Comm Monitor Live

        - >         comm 1
                    comm 2
                    comm 3
```

This display allows the operator to choose the communication port to be viewed. Pressing the ENTER key when the arrow is in front of the desired communications port will display the data that is being received by the microFlow.net Gas and the response of the microFlow.net Gas.

```
            Comm Monitor Live View

Rx 01PC_00_001_0.0
Tx                              .01NO01
Enter  =  Freeze
Print  =  errors
```

This display indicates that microFlow.net Gas address 01 received a PC command from the host and responded with a "no response," indicating that it is in Program mode. To freeze a command or response for further viewing, press "ENTER."

```
            Comm Monitor Live View

Rx 01PC_00_001_0.0
Tx                              .01NO01
Enter  =  Toggle ASCII / hex   <<  >>
```

On this display, the operator can toggle the message between the ASCII and hex characters. The decimal point key allows toggling between page scrolling ("<< >>") and character scrolling ("< >"). To return to the previous display, press CLEAR.

Pressing the PRINT key in the live view will display the following screen.

```
                Comm Error Counts

Overruns:           00000
Parity:             00000
Framing:            00000
```
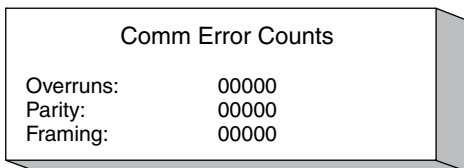
From this display, the overrun errors, parity errors, and framing errors can be viewed. Pressing CLEAR will return to the Live View display.

When completed, press CLEAR until the Diagnostics menu is displayed.

Download Directory

This directory will give a listing of all files that have been downloaded from the Flowmate. Some examples would be Translations, Configurable Batch Reports (factory default also), html web pages, Boolean Equations, etc. Simply press ENTER on the menu to view the listing and use the up and down arrows to navigate all downloads if they exist. Press CLEAR to get back to the Diagnostics Menu.

Boolean Algebraic

The Diagnostics menu provides the selection "Boolean Algebraic" to view Boolean/Algebraic registers and their results. General-purpose timers can also be viewed from this screen. With the arrow in front of "Boolean Algebraic," pressing ENTER will display the Boolean/Algebraic Processing menu.
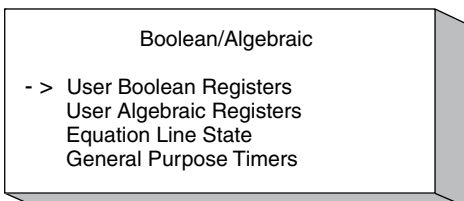
```
                Boolean/Algebraic

- >  User Boolean Registers
      User Algebraic Registers
      Equation Line State
      General Purpose Timers
```

User Boolean Registers

The User Boolean Registers display indicates the registers and their current True or False value, where 0 is False and 1 is True.

```
                    User Boolean Regs

            #1      0       #7      0
            #2      0       #8      0
            #3      0       #9      0
            #4      0       #10     0
            #5      0       #11     0
            #6      0       #12     0
                        More...
```

Using the up and down arrows, the 50 User Boolean Registers can be viewed. Pressing CLEAR will return to the Boolean/Algebraic Processing menu.

User Algebraic Registers

The User Algebraic Registers display the current values of the variables in the register. This display is read-only, but the registers can be modified via Boolean/Algebraic equations or via communications. These registers are used to check the values of the variables that have been set up and/or downloaded from the Flowmate.

```
                    User Algebraic Regs

            #1                      0
            #2                      0
            #3                      0
            #4                      0
            #5                      0
            #6                      0
                        More...
```

Using the up and down arrow keys, all fifty User Algebraic Registers can be viewed. Pressing CLEAR will return to the Boolean/Algebraic Processing menu.

Equation Line State

The Equation Line Status displays the current status of the equations, where "D" indicates that the equation is disabled, "T" is True, and "F" is False. All equations without an "IF" statement will have a "True" status. Those with an "IF" will indicate the result of the "IF" expression: either "True" or "False."

```
                    Equation Line State

            1                       7
            2                       8
            3                       9
            4                       10
            5                       11
            6                       12
                        More...
```

Using the up and down arrow keys, view all 50 equations. Pressing CLEAR will return to the Boolean/Algebraic Processing menu.

General Purpose Timers

The General Purpose Timers display the current time on the timers. The timers are broken down as follows:

Timer Numbers	Resolution	Range
1-2	0.1 second	109 minutes
3-4	1.0 second	18.2 hours
5-6	1.0 minute	45.5 days
7-8	1 hour	7.5 years

Clear the timer by writing a zero to the database location of the desired timer.

General Purpose Timers

#1	0	#7	0
#2	0	#8	0
#3	0		
#4	0		
#5	0		
#6	0		

Using the up and down arrow keys will display the remaining timers. Pressing CLEAR will return to the Boolean/Algebraic Processing menu. Pressing CLEAR again will return the display to the Display menu.

Batch Log Stats

This diagnostic shows the actual number of Batch Records currently stored and the maximum number that can be stored.

Batch Log Stats

Actual # Stored	16
Max # Stored	2047

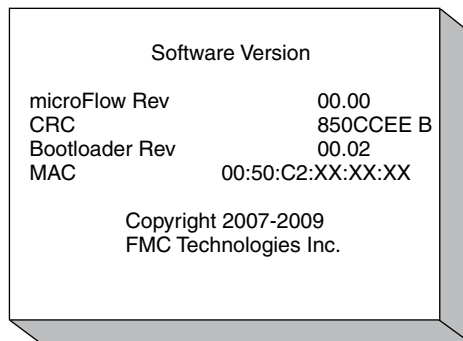Pressing CLEAR will return to the Diagnostics menu.

Summary Data

This menu gives the totals for the batch running. It displays how much was delivered and the associated pulses from the meter for the batch in progress. If a new batch is started, only the current batch information will be shown.

Summary Data

GV	0.0 MCF
GSV	0.0 MCF
Temp IN	0.00 C
Mtr Count	0
Error Count	0
Alarm Occurred	

Software Version

The Diagnostics menu provides the selection "Software Version," which allows the operator to view the version of software that is running in the microFlow.net Gas. With the arrow in front of "Software Version," pressing ENTER will display the software version, CRC, and MAC address.

```
┌─────────────────────────────────────┐
│           Software Version          │
│                                     │
│  microFlow Rev          00.00       │
│  CRC                    850CCEE B   │
│  Bootloader Rev         00.02       │
│  MAC                 00:50:C2:XX:XX:XX │
│                                     │
│          Copyright 2007-2009        │
│          FMC Technologies Inc.      │
│                                     │
└─────────────────────────────────────┘
```
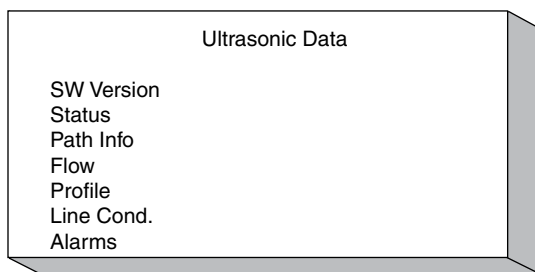
Pressing CLEAR will return to the Diagnostics menu.

Ultrasonic Diagnostics
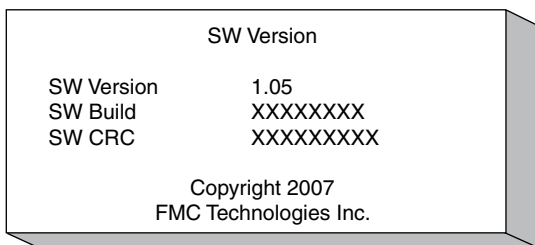
Ultrasonic Data

The values shown on these screens are provided by the ultrasonic meter. The microFlow.net Gas collects this information from the ultrasonic meter via communication on a periodic basis.

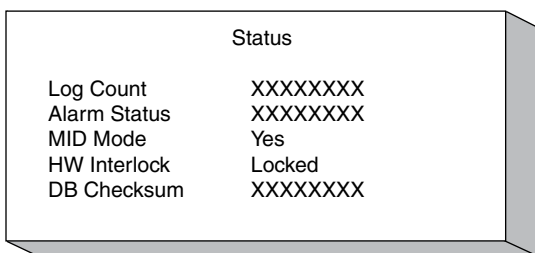For all of these screens, if communications to the Ultrasonic meter fails, the values shown will be all XXX's.

```
┌─────────────────────────────────────┐
│           Ultrasonic Data           │
│                                     │
│  SW Version                         │
│  Status                             │
│  Path Info                          │
│  Flow                               │
│  Profile                            │
│  Line Cond.                         │
│  Alarms                             │
└─────────────────────────────────────┘
```

Using the Up and Down arrow keys select the diagnostic:

SW Version – Identifies the software running in the ultrasonic meter.

```
┌─────────────────────────────────────┐
│              SW Version             │
│                                     │
│  SW Version         1.05            │
│  SW Build           XXXXXXXX        │
│  SW CRC             XXXXXXXXX        │
│                                     │
│          Copyright 2007             │
│          FMC Technologies Inc.      │
│                                     │
└─────────────────────────────────────┘
```

Press Clear to return to the Ultrasonic Data Diagnostic Menu.

Status – This screen indicates the following statuses:

```
┌─────────────────────────────────────┐
│                Status               │
│                                     │
│   Log Count          XXXXXXXX       │
│   Alarm Status       XXXXXXXX       │
│   MID Mode           Yes            │
│   HW Interlock       Locked         │
│   DB Checksum        XXXXXXXX       │
│                                     │
└─────────────────────────────────────┘
```

Where:

Log Count	XXXXXXXX - Incremented by the meter each calculation cycle
Alarm Status	XXXXXXXX - Bit encoded, if zero no alarms present on meter
MID Mode	Yes/No - European MID mode indicator
HW Interlock	Locked/Unlocked - Sealing jumper installed
DB Checksum	XXXXXXXX - Configuration database checksum

Press Clear to return to the Ultrasonic Data Diagnostic Menu.

Path Info – Indicates current data from the paths of the Ultrasonic Meter

Provides the flow velocity of the fluid at each path of the ultrasonic meter:

```
                    Path Info

        - >  Flow Velocity
             VOS
             SIG % 1-3
             SIG % 4-6
             GAIN 1-3
             GAIN 4-6
```

Press CLEAR to return to the Path Info display.

Provides the velocity of sound for each path of the ultrasonic meter.

```
                  Flow Velocity

         Path 1              00000000
         Path 2              00000000
         Path 3              00000000
         Path 4              00000000
         Path 5              00000000
         Path 6              00000000
```

Press CLEAR to return to the Path Info display.

Provides the velocity of sound for each path of the ultrasonic meter.

```
                      VOS

         Path 2              00000000
         Path 2              00000000
         Path 3              00000000
         Path 4              00000000
         Path 5              00000000
         Path 6              00000000
```

Press CLEAR to return to the Path Info display.

Provides the signal strength of the paths of the ultrasonic meter.

```
                    Sig Path Info

        Signal 1A%              000000
        Signal 1B%              000000
        Signal 2A%              000000
        Signal 2B%              000000
        Signal 3A%              000000
        Signal 3B%              000000
```

Press CLEAR to return to the Path Info display.

```
                    Sig Path Info

        Signal 4A%              000000
        Signal 4B%              000000
        Signal 5A%              000000
        Signal 5B%              000000
        Signal 6A%              000000
        Signal 6B%              000000
```

Press CLEAR to return to the Path Info Display.

Provides the gain readings for the paths of the Ultrasonic Meter.

```
                    Gain 1-3

        Gain 1A              00000000
        Gain 1B              00000000
        Gain 2A              00000000
        Gain 2B              00000000
        Gain 3A              00000000
        Gain 3B              00000000
```

Press Clear to return to the Path Info Display.

```
                    Gain 4-6

        Gain 4A              00000000
        Gain 4B              00000000
        Gain 5A              00000000
        Gain 5B              00000000
        Gain 6A              00000000
        Gain 6B              00000000
```

Press Clear until the Ultrasonic Data is displayed.

Flow – Indicates current flow parameters

```
                      Flow

        Velocity        00000000000
        Vos             00000000000
        Flowrate        00000000000
        Forward         00000000000
        Reverse         00000000000
```

Press Clear to return to the Ultrasonic Data Diagnostic Menu.

Profile – Indicates current meter profiles

```
                          Profile

        Flatness          00000000
        Symmetry          00000000
        Swirl             00000000
        Cross             00000000
```

Press Clear to return to the Ultrasonic Data Diagnostic Menu.

Line Cond. – Indicates current temperature and pressure

```
                       Line Cond.

        Temperature       XXX.XX
        Pressure          XXXXX.XX
```

Press Clear to return to the Ultrasonic Data Diagnostic Menu.

Alarms – Indicates current meter alarms; if no alarms are present the display will indicate:

```
                         Alarms

        --> No Alarms Present
```

Alarms available:
HIGH_FLOW
ELECTRONICS FAILURE
TRANSDUCER FAILURE
CALCULATION ERROR
SIGNAL LOW ALARM
GAIN ERROR ALARM
VOS DIFFERENCE ALARM
PATH SUBSTITUTION ALARM
PARAMETER ERROR
SOUND TO NOISE RATIO LOW
HIGH TURBULENCE ALARM
PROFILE DEVIANCE ALARM
Press Clear to return to the Ultrasonic Data Diagnostic Menu.
Press Clear to return to the Diagnostic Menu.

Contrast Adjust
This diagnostics menu provides for adjusting the display contrast.

```
               Screen Contrast Adjustment
               [████████        ]

        Press Up/Down Arrows to adjust contrast
```
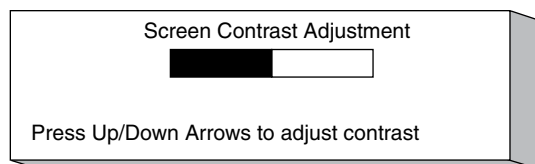
Press CLEAR to return to the Diagnostics Menu.
Press CLEAR to return to the Main Menu.

Technical Support

Contact Information:
Field Service Response Center
24/7 Technical Support/Schedule
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