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Series 255 Flow Averaging Transmitter Operations Guide



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Preface

Overview

This guide provides instructions for operating the Series 255 Flow Averaging Transmitter. The unit should be installed as instructed in the *Series 255 Flow Averaging Transmitter Hardware Guide*.

Before You Begin

Important *Confirm the device has been installed in accordance with the installation requirements specified in the Series 255 Flow Averaging Transmitter Hardware Guide. Incorrect installations will effect the reliability of flow data.*

Series 255 Description

The Kurz Series 255 Flow Averaging Transmitter is designed for gas flow measurements in ducts or stacks where two or more sensing points are required due to a large duct size or where irregular flow profiles are present. The Series 255 is a microprocessor-based flow transmitter that continuously collects process flow and temperature measurements from multiple independent Kurz flow meters and calculates a grand average of the flow and temperature in the duct.

The Series 255 works in conjunction with two or more Kurz Instruments B-Series flow meters – either the Kurz 454FTB, K-BAR 2000B, or K-BAR 2000B-WGF insertion meters. The four models in the Series 255 product line support up to 4, 9, or 16 flow sensors for performing the following functions:

- Provide 24 VDC power to each flow sensor.
- Flow and temperature averaging.
- Kickout from the average any channels in error or being serviced.
- Provide 4-20 mA analog output signal of the averaged flow and temperature.
- Flow totalization – both resettable and non-resettable 30-day log of daily flow totals.

Using this Manual

Kurz Instruments, Inc., documentation includes manuals and product literature, Adobe Acrobat PDF files, and application online Help files. The Kurz Instruments CD contains all the available documentation files. To read PDF files, download the free Adobe Acrobat Reader from www.adobe.com.

The Kurz Instruments Web site provides additional information:

- **World Wide Web:** www.KurzInstruments.com
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You can access device support in the following ways:

- **Main:** 831-646-5911
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Manual Conventions

The following table lists conventions used in the Kurz documentation and provides an example or description of each convention.

Table 1. Conventions used in this manual

Convention / Example	Description
Check the Configuration File checkbox	Text that you type, click, or select (for example, field names, menus, and commands) appear in bold.
PRESS ENTER TO SET METER DATA	Text appearing in a display or window is shown in courier.
Select Start → All Programs → Kurz Instruments → KzComm	An arrow (→) is used to separate a menu name from its submenu commands.
Programs Files\Kurz Instruments\KzComm	Simplified directory structures and path names are used in examples. Your folder names may be different.
Note Information....	Indicates additional information to clarify a procedure, action, event, or concept and ensure appropriate understanding.
Important <i>Information....</i>	Indicates information relevant to proper operation, actions, and responses.
Caution <i>Information....</i>	Indicates an action or procedure can result in incorrect operation or destruction of the device if not performed properly. Comply strictly with the instructions.
Warning <i>Information....</i>	Indicates an action or procedure can result in injury or a safety hazard if not performed properly. Comply strictly with the instructions and proceed with care.

Glossary

Alarms	<p>There are two alarms on the Series 255 that are each linked to an optically coupled solid state relay (SSR). The relays can be used to interface with external warning lamps or audible devices when an alarm event occurs.</p> <p>Note The relays are optically isolated solid-state relays (SPST switching), their non-powered state is an open circuit and must be considered for fail-safe alarm logic configurations.</p> <p>The alarm relays are rated for 0.5 A</p>
Channel	<p>Refers to one of the flow meters or flow sensing units that the Series 255 provides power to and communicates with to obtain velocity, temperature, and status data. There are up to 16 channels assigned letters A through P. Each flow meter or channel is assigned a unique and fixed address starting at address 11 through 26.</p> <p>Kurz multipoint flow meters have two to four flow sensing units Kurz single-point flow meters one flow sensing unit.</p>
Channel Kickout	<p>This specifies when a defective flow meter is removed from the flow and temperature average calculations.</p>
Daily Totalization	<p>The Series 255 accumulates a total flow for each day. The daily total begins accumulating at midnight each day. One month of daily totalization is recorded in the EEPROM and can be downloaded to a text file.</p>
Factory configuration	<p>Default parameter values of the device, usually based on customer order specifications.</p>
Flow Meter / Flow Sensor	<p>The individual flow sensing device also referred to as a channel.</p>
Flow units	<p>The flow units determine whether the Series 255 system engineering units are metric or imperial measurements and the units that appear for velocity and temperature. The flow units can be volumetric rate or mass rate. The flow rate options are NCMH, NLPM, SCFH, SCFM, SCMH, and SLMP. The mass rate options are KGH, KGM, PPH, and PPM.</p>
Haz Loc	<p>Hazardous (and potentially hazardous) Location environment due to the presence or possible presence of flammable gases and vapors, and combustible dusts.</p>
NE-43	<p>NAMUR NE-43 is a German fault detection standard that lets the user know if there is a fault within the instrument by forcing the 4-20 mA output current outside the normal operating range of the instrument.</p>

Output	There are two 4-20 mA analog outputs on the Series 255. Each is user assignable to flow rate, velocity, or temperature, and user scalable to represent the full range or any subset. They are isolated and have fault indication per NAMUR NE-43 guidelines.
Ord Loc	Ordinary Industrial Location environments where rough usage, moisture, dust, dirt, and corrosion are a potential problem and where there is no presence of flammable gases or combustible dusts.
Port	The Series 255 main board has six ports that each provide an isolated RS-485 and 24 VDC to individual channels or channel groups.
RTC	The real-time clock provides a time stamp of date and time for events logged to the event log in the Series 255 non-volatile memory.
Totalizer	The Series 255 keeps a running accumulation of the total flow. There are two records of total flow that the Series 255 maintains – one that is not resettable and one that can be reset by the user.

Panel Display & Operating Modes

Overview

This section describes the display, keypad, and status indicators on the Series 255 Flow Averaging Transmitter, and provides a basic description for each operating mode:

- Run mode
- Display mode (view only)
- Program mode

Important *All option parameters and examples use sample values and measurement units. The actual values and measurement units you see reflect the configuration of the 255.*

This chapter is intended for users accessing the 255 menus using the local keypad and display.

Front Panel

All Series 255 models include a front panel display with four rows of 20 characters and a 20-key keypad (several keys have dual functions).

Display

The large display characters (approximately 8 mm x 5 mm) facilitate easier viewing from a distance. Figure 1-1 shows the display when the Series 255 is in Run Mode.

F	L	O	W			1	2	3	4	5	6	7	.	8		S	C	F	M
T	O	T	A	L		1	2	3	4	5	6	7	8			S	C	F	
T	E	M	P			1	2	3	.	4						D	E	G	F
N	O		E	V	E	N	T	S											

Figure 1-1. Series 255 Display

The first three lines show process data and menu options. The fourth line shows device messages and events.

Keypad

The membrane keypad has 20 function keys. The keys are used for navigating a menu system and for viewing or changing application parameters.

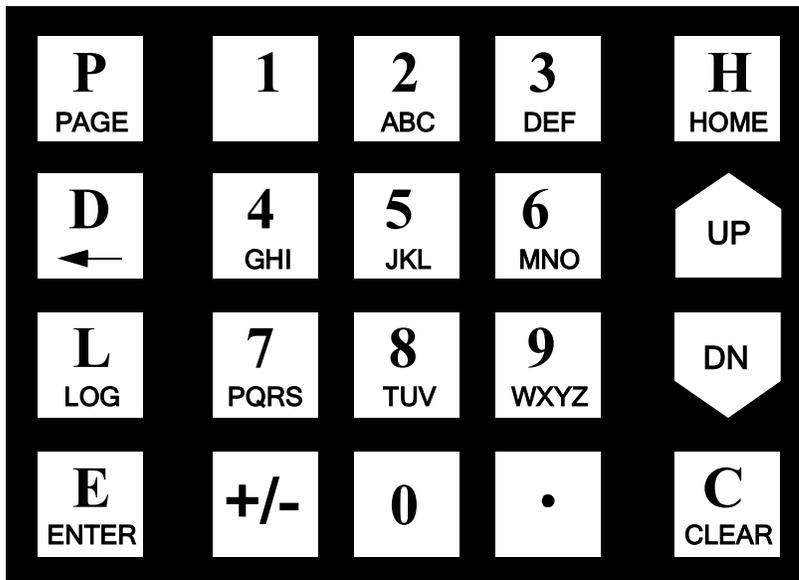


Figure 1-2. Series 255 Keypad

The key functions are as follows:

- The **P** key accesses Program mode for making Basic or Advanced configuration changes to the Series 255. Basic and Advanced setup each have code-specific access. The **P** key also navigates through menu parameter fields or through multiple pages of a menu.
- The **D** key accesses Display mode for view-only flow, velocity, and temperature information. See Chapter 2, Display Mode, for more information.
- The **E** key is used as an Enter key to accept and save changes after entering data.
- The **H** key is used to back out of a Program mode menu and return to the menu option selection without making any changes and to exit out of Program mode and return to Run mode.
- The **C** key is used to clear a data entry field.
- The numeric keys are used for entering number or text data.
- The **UP** and **DN** keys are used to scroll through a menu. The scroll option is available when the symbol ^v appears on the display.
- The **Plus/Minus (+/-)** key is used for entering negative values or a hyphen in a string input.
- The **Dot (•)** key is used for entering a decimal or period.

The numeric keys include 0 through 9, with keys 2 through 9 also being used for letters A to Z. For data entry fields that accept alphabetic/numeric data strings, continue pressing the numeric key to cycle through the letters. For example, pressing the **7** key continuously will cycle through the characters 7, P, Q, R, and S. Press the **E** key to accept the current letter or number and advance to the next character position. Keys 0 and 1 provide symbols, including a space, as defined in Table 1-1 table.

Table 1-1. Keypad Character Map

Key	Character Map
0	0, <sp>, (,), +, ,, <, >
1	1, /, #, :, \$, @, %, &
2	2, A, B, C
3	3, D, E, F
4	4, G, H, I

Key	Character Map
5	5, J, K, L
6	6, M, N, O
7	7, P, Q, R, S
8	8, T, U, V
9	9, W, X, Y, Z

The display/menu navigation is done by selecting an option number. The menu options are listed in Table 1-3, Table 1-4, and Table 1-5.

Status Indicators

There are five status indicators just below the display. These indicators provide an “at-a-glance” overview of the health of the Series 255 System and its components. The indicators are color coded according to NAMUR NE-107 specification.



Figure 1-3. Series 255 Status Indicators

The status indicator category and descriptions are listed in Table 1-2.

Table 1-2. Status Indicator Descriptions

Status Indicator	Description	Device Message/ Event
Failed (red, X mark)	Signal is invalid due to a malfunction in the device, sensor, or actuator.	SYSTEM SENSOR FAIL SYSTEM COMM FAIL
Out of Specification (yellow, question mark)	Permissible ambient or process conditions exceeded, or the measuring uncertainty of sensors or deviations from the set value in actuators is probably greater than expected.	FLOW OUT OF RANGE TEMP OUT OF RANGE CHANNEL KICKOUT AT MIN
Maintenance required (blue, oil can)	Advisory. Although the signal is valid, the remaining life is nearly exhausted or a function will soon be restricted due to operational conditions.	CHANNEL KICKOUT ELECT TEMP HI TOTALIZER ABOVE HI SETPOINT
Check Function (amber/orange, wrench)	Signal temporarily invalid due to on-going work on the device.	SYSTEM MAINTENANCE ZERO-SPAN TEST ACTIVE
Normal (green, check mark)	System is normal, signal is valid.	NO EVENTS

Operating Modes

The Series 255 has three modes:

- Run mode – Normal operational state of the Series 255.
- Display mode – Provides a view-only mode of system data and parameters. No access code is required for Display mode.
- Program mode – There are two levels of Program mode - Basic setup and Advanced setup. Each setup level has a specific access code.

Run Mode

Run mode is the normal operational state of the Series 255 that appears after completing the power-up and system checks. The default Run mode display shows the Series 255 tag name, flow, and temperature, for the duct/pipe that the Series 255 is monitoring. The user can select the process data that appears on the display, including Flow, Temperature, Tag Name, Totalized Flow, and Daily Totalized Flow. Alternatively, all of the process data can scroll on the display.

Display Mode

Display mode provides view-only access to summary information.

Table 1-3. Display Mode Functions

Option #	Function	Option #	Function
1	Channel Velocity Summary	6	Average Velocity Summary
2	Channel Temperature Summary	7	Totalizer and Daily Total Summary
3	Channel Velocity and Temperature Summary	8	Process Gas Information
4	Channel Operational Summary	9	System Information
5	Channel Detail		

To enter into Display mode:

- 1> Press **D**.

```
ENTER DISPLAY OPTION
1-9> 1
```

- 2> Enter a number between **1** and **9**, and then press **E**.

Program Mode

Program mode allows you to make configuration and parameter changes to the Flow Averager. This is an access code-protected mode. The access code determines the amount of access you have in Program mode.

- The default **Basic access code** is **123456**.
Basic access is used to configure the essential Flow Averager parameters.
- The default **Advanced access code** is **654321**.
Advanced access is used for changing advanced Flow Averager parameters.

Before making any configuration changes in Program mode, it is important to remember:

- Any configuration changes are automatically saved to EEPROM when the Flow Averager exits out of Program mode. There are no prompts to confirm changes.

Important *The process flow and temperature values are measured and output while the Series 255 is in Program mode.*

Changing parameters such as Duct Flow Area will influence the output signal and may cause a significant change in the signal immediately after entering the change.

- To back out of a series of menus, continue to press **H** for each level (manual exit).
- If there is no menu activity for 3 minutes, the display automatically exits to Run mode. Any changes made before the auto-exit are saved to EEPROM.
- The configuration is retained through Flow Averager reboots and power cycles.

Important *You should not make any changes to the Flow Averager configuration without a complete understanding of the parameters. Changing a setting incorrectly can cause the Flow Averager to malfunction.*

To enter Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code or Advanced access code.
- 3> Press **E**.
- 4> You can jump to any of the options shown in Table 1-4 and Table 1-5.

Note Not all parameters may appear based on the Flow Averager configuration.

In most cases, when you reach the end of the parameters for a menu, the prompt automatically returns to the main option menu. In instances where you continue to cycle through the parameters, press **H** to exit the menu.

Important *In the event unwanted changes are made, Kurz provides the ability to reset the Series 255 to the original Factory settings, as described in Chapter 4, Program Mode Advanced Access, "Option 27 — Restore Factory Configuration."*

When you want to save a record of customized settings, Kurz provides an option for establishing a restore point. See Chapter 4, Program Mode Advanced Access, "Option 28 — Save to Auxiliary Configuration" and "Option 26 — Restore Auxiliary Configuration."

Program Mode — Basic Access

Before making any configuration changes in Program mode, it is important to remember:

- Any configuration changes are automatically saved to EEPROM when the Series 255 exits out of Program mode. There are no prompts to confirm changes.
- To back out of a menu, press **H** one or more times to return to the function prompt.
- To return to Run mode from the main function prompt, press **H**.
- If there is no keypad activity for 3 minutes, the display automatically exits to Run mode. Any changes made before the auto-exit are saved to EEPROM.

The configuration is retained through power cycles of the Series 255.

To enter Program mode with Basic access:

- 1> Press **P**.

```
ENTER ACCESS CODE
>*****
```

- 2> Enter the Basic access code, and then press **E**.

The default Basic access code is 123456.

```
ENTER PROGRAM OPTION
1-13> 1
```

- 3> Enter the option number as defined in Table 1-4, and then press **E**.

Table 1-4. Program Mode — Basic Access Functions

Option #	Function	Option #	Function
1	Tag Name	8	Totalizer Setup
2	Flow Units	9	Reset Totalizer
3	Flow Area Setup	10	Field Calibration Correction Factor
4	Analog Output Setup	11	Variable Correction Factor Setup
5	Flow Set Point Setup	12	Run Mode Display Setup
6	Temperature Set Point Setup	13	Clock Setup
7	Alarm Setup		

Program Mode — Advanced Access

Before making any configuration changes in Program mode, it is important to remember:

- Any configuration changes are automatically saved to EEPROM when the Series 255 exits out of Program mode. There are no prompts to confirm changes.
- To back out of a menu, press **H** one or more times to return to the function prompt.
- To return to Run mode from the main function prompt, press **H**.
- If there is no keypad activity for 3 minutes, the display automatically exits to Run mode. Any changes made before the auto-exit are saved to EEPROM.

Advanced access is used for configuring advanced parameters.

To enter Program mode with Advanced access:

- 1> Press **P**.

```
ENTER ACCESS CODE
>*****
```

- 2> Enter the Advanced access code, and then press **E**.

The default Advanced access code is **654321**.

```
ENTER PROGRAM OPTION
1-35> 1
```

- 3> Enter the function number as defined in Table 1-5, and then press **E**.

Table 1-5. Program Mode — Advanced Access Functions

Option #	Function	Option #	Function
1	Tag Name	19	System Operational State
2	Flow Units	20	Number of Channels
3	Flow Area Setup	21	Channel Setup
4	Analog Output Setup	22	User Access Codes
5	Flow Set Point Setup	23	Analog Output Calibration
6	Temperature Set Point Setup	24	Analog Output Test
7	Alarm Setup	25	NE-43 Alarm Test
8	Totalizer Setup	26	Restore Auxiliary Configuration
9	Reset Totalizer	27	Restore Factory Configuration
10	Field Calibration Correction Factor	28	Save to Auxiliary Configuration
11	Variable Correction Factor Setup	29	Output Configuration to USB
12	Run Mode Display Setup	30	USB Data Log Setup
13	Clock Setup	31	Purge Timer Setup
14	Reference Temperature & Pressure	32	Purge Manual Cmd
15	Minimum Kickout Count	33	Zero-Span Sched Setup
16	NE-43 Alarm Level	34	Zero-Span Setup
17	Modbus Baud Rate	35	Zero-Span Manual Cmd
18	Serial USB Baud Rate		

Display Mode

Overview

This chapter provides a description for each Display mode function. The Display mode options are as follows:

- Option 1 — Channel Velocity Summary
- Option 2 — Channel Temperature Summary
- Option 3 — Channel Velocity and Temperature Summary
- Option 4 — Channel Operational Summary
- Option 5 — Channel Detail
- Option 6 — Average Velocity Summary
- Option 7 — Totalizer and Daily Total Summary
- Option 8 — Process Gas Information
- Option 9 — System Information

Display Mode

Pressing the **D** key enters Display mode, which provides view-only access to summary information. Table 2-1 provides a quick reference for Display mode functions.

Table 2-1. Display Mode

Option #	Function	Example	Description / Purpose
1	Channel Velocity Summary	A 2 B 0 SMPS C 2 D 0 E EXCL F OFFL G OFFL H OFFL	Press UP or DN to scroll through available channels.
2	Channel Temperature Summary	A 20 B 20 DEGC C 20 D 20 E EXCL F OFFL G OFFL H OFFL	Press UP or DN to scroll through available channels.
3	Channel Velocity and Temperature Summary	A 2 SMPS 20 C B 0 SMPS 20 C C 2 SMPS 20 C D 0 SMPS 20 C E EXCL SMPS EXCL C F OFFL SMPS OFFL C G OFFL SMPS OFFL C H OFFL SMPS OFFL C	Press UP or DN to scroll through available channels.
4	Channel Operational Summary	CH ABCDEFGH ONL YYYYYY--- INC YYYYY-YYY COM YYYYYY--- KO -----	Provides a summary for each available channel: ONL = online or offline INC = channel is included in the average COM = actively communicating KO = an error kicks out the channel

Table 2-1. Display Mode (continued)

Option #	Function	Example	Description / Purpose
5	Channel Detail	CHA CHAN A 0000 VEL 2.5 NMPS ONL TEMP 20.0 DEGC INC	Shows channel, channel fault status, raw channel data, channel state, channel velocity and temperature, and whether or not the channel is included in the average. Press UP or DN to scroll through available channels.
6	Average Velocity Summary	RAW 5.33 SMPS CORR 4.89 SMPS CORR FACTOR 0.92	Shows the uncorrected average velocity and corrected average velocity and total correction factor
7	Totalizer and Daily Total Summary	TOT NR 118646 SCM TOT RS 117589 SCM DAILY 55799 SCM	Shows the current value for Totalizer data and daily total. TOT NR is the display of the non-resettable totalizer. TOT RS is the display of the resettable totalizer. DAILY is the display of the current day's totalizer.
8	Process Gas Information	DRY AIR MOL.WT 28.960 G/MOL DENSITY 1.184 KG/CM	Gas properties include gas name, molecular weight, and density. The MW is used to calculate mass rate.
9	System Information	255 FLOW AVERAGER VERSION BETA 2.04 06/29/2020 14:49:25	Shows the date/time on the realtime clock and the 255 Firmware version.

Option 1 — Channel Velocity Summary

The units of the velocity data is displayed on the top right of the display

To access the **Channel Velocity Summary** in Display mode:

- 1> Press the **D** key.
- 2> Press **1** for the **Channel Velocity Summary** view.

A	2	B	0	SMPS
C	2	D	0	
E	EXCL	F	OFFL	

The Channel Velocity Summary provides the velocity for up to six channels, with the units of velocity provided in the upper-right. One of the following conditions appears when the velocity is not available:

- KOUT appears when the channel is kicked out of the average.
- EXCL appears when the channel is excluded from the average.
- OFFL appears when the channel is offline.

- 3> If the system has more than six channels then press the **UP** or **DN** key to view additional pages. For example, with a system with eight channels A through H. Press the **UP** key and channel A and B data scrolls out from the top and channels G and H data scrolls in from bottom. Press the **DN** key and channels G and H data scrolls out from the bottom and channels A and B data scrolls in from the top.

Option 2 — Channel Temperature Summary

- 1> Press the **D** key.
- 2> Press **2** for the **Channel Temperature Summary** view.

Channel Temperature displayed in English Units System has 4 Channels

A	68	B	68	DEGF
C	68	D	68	
E	EXCL	F	OFFL	

Channel Temperature displayed in SI Units System has 6 Channels

A	20	B	20	DEGC
C	20	D	20	
E	EXCL	F	OFFL	

The Channel Temperature Summary provides the temperature for up to six channels, with the unit of temperature provided in the upper-right. One of the following conditions appears when the temperature is not available:

- KOUT appears when the channel is kicked out of the average.
- EXCL appears when the channel is excluded from the average.
- OFFL appears when the channel is offline.

- 3> If the system has more than six channels then press the **UP** or **DN** key to view additional pages.

Option 3 — Channel Velocity and Temperature Summary

- 1> Press the **D** key.
- 2> Press **3** for the **Channel Velocity and Temperature Summary** view.

User units in English Units				User units in SI Units			
A	393.7	SFPM	68 F	A	2	SMPS	20 C
B	0	SFPM	68 F	B	0	SMPS	20 C
C	393.7	SFPM	68 F	C	2	SMPS	20 C

The Channel Velocity and Temperature Summary provides the velocity and temperature for up to three channels.

Option 4 — Channel Operational Summary

To access the **Channel Operational Summary** in Display mode:

- 1> Press the **D** key.
- 2> Press **4** for the **Channel Operational Summary** view.
The first screen will show the channels ONLINE and INCLUDE configurations.
- 3> Press the **UP** key to scroll the information and view the channels INCLUDE and COMMUNICATION STATUS.
- 4> Press the **UP** key to scroll the information and view the channels COMMUNICATION STATUS and KICKOUT status.
- 5> Press the **UP** key to scroll the information and view the channels KICKOUT status and ONLINE configuration.

```

CH  ABCDEFGH
ONL  YYYYYYYY
INC  YYYY-YYY
COM  YYYYYY---
KO   -----
    
```

Where:

- CH = The channel letter ID. This example has 10 channels - A through H.
- ONL = Y Indicates a channel is ONLINE; OFFLINE is indicated with a dash (-).
- INC = Y indicates a channel is INCLUDED in the average; EXCLUDED is indicated with a dash (-).
- COM = Y indicates a channel is communicating without errors; communication errors are indicated with a dash (-).
- KO = Y indicates the channel is KICKED OUT of the average due to a channel error; a dash (-) indicates the channel is included in the average.

Option 5 — Channel Detail

Channel Detail provides a view of the information acquired from the individual flow sensor. This information can be used to troubleshoot the possible causes if a sensor is kicked out of the flow average.

To access the **Channel Detail** in Display mode:

- 1> Press the **D** key.
- 2> Press **5** for the **Channel Detail** view.
The detailed view of Channel A meter appears.
- 3> Press the **UP** key to show the next channel (in this case channel B).

```
CHA FD32097A    0000
VEL      2.5 NMPS ONL
TEMP    20.0 DEGC INC
```

Where:

- CHA = The channel letter ID (channels A through P are available).
- FD32097A = Channel Tag ID read from the flow sensor: this is usually the sensor serial number.
- 0000 = Channel fault status; 0000 indicates the channel has no faults.
- NMPS = The raw channel velocity read from the flow meter.
The channel velocity must be in NMPS.
- ONL = Channel ONLINE state; this field shows OFF when the channel is placed OFFLINE.
- DEGC = The raw channel temperature read from the flow meter.
The channel temperature will be shown in DEGC.
- INC = Channel INCLUDE state; this field shows EXC when the channel is EXCLUDED from the average.

Option 6 — Average Velocity Summary

This display mode menu option provides the raw and corrected average velocity. To view the raw and corrected average velocity in Display mode:

- 1> Press D.
- 2> Press 6 to view the Raw and Corrected Velocity .

RAW	1049.21	SFPM
CORR	962.60	SFPM
CORR FACTOR	0.92	

The raw and corrected average velocity appear along with the correction factor. The “RAW” velocity is the calculated average of the included channels before any correction factor is applied. The “CORR” velocity is the average velocity after the correction factor(s) is applied. The correction factor is comprised of the Field Calibration Correction Factor, the velocity dependent Variable Correction Factor and a correction factor for “Normal” vs “Standard” velocity (if applicable).

Option 7 — Totalizer and Daily Total Summary

Flow applications frequently must totalize the flow to know the accumulated volume or mass going through the pipe or duct. The flow averager measures and calculates several process variables including the accumulation of the total flow and daily flow in volume or mass.

- Volume uses standard cubic feet (SCF) or standard cubic meters (SCM)
- Mass uses pounds (lb) or kilograms (kg)

To access the **Totalizer and Daily Total Summary** in Display mode:

- 1> Press the **D** key.
- 2> Press **7** for the **Totalizer and Daily Total Summary** view.

TOT NR	118646	SCM
TOT RS	117589	SCM
DAILY	55799	SCM

Where:

TOT NR	=	Non-resettable flow total
TOT RS	=	Resettable flow total
DAILY	=	Daily flow total

Note When the totalizer value exceeds 1×10^9 , the totalizer value will be displayed appended with MM. For example, 1,365,455,743 SCF will be displayed as 1365 MMSCF.

Option 8 — Process Gas Information

To access the **Process Gas** menu in Display mode:

- 1> Press **D**.
- 2> Press **8** for the **Process Gas** view.

```
DRY AIR
MOL.WT  28.950 G/MOL
DENSITY 1.184 KG/CM
```

The gas name, molecular weight, and density appear.

This information must be the same as the process gas calibrated for the individual flow sensors, as specified at the factory per the customer order (and unchangeable by the user).

Option 9 — System Information

This display mode option gives the 255 Firmware version and the time and date read from the on board real time clock.

To access the System Information menu in Display mode:

- 1> Press **D**.
- 2> Press **9** for the System Information view.

```
255 FLOW AVERAGER
VERSION BETA 2.04
06/29/2020 14:49:25
```

The display will update every 2 seconds.

- 3> Press **E** to exit the menu and return to the main Display Mode option selection.

Program Mode Basic Access

Overview

This chapter provides a description for each Basic access function available in Program mode. The Basic access options are as follows:

- Option 1 — Tag Name
- Option 2 — Flow Units
- Option 3 — Flow Area Setup
- Option 4 — Analog Output Setup
- Option 5 — Flow Set Point Setup
- Option 6 — Temperature Set Point Setup
- Option 7 — Alarm Setup
- Option 8 — Totalizer Setup
- Option 9 — Reset Totalizer
- Option 10 — Field Calibration Correction Factor
- Option 11 — Variable Correction Factor Setup
- Option 12 — Run Mode Display Setup
- Option 13 — Clock Setup

Program Mode — Basic Access

Table 3-1 provide a quick reference to Basic access menus and parameters.

Before making any configuration changes in Program mode, it is important to remember:

Important *You should not make any changes to the configuration without a complete understanding of the parameters. Changing a setting incorrectly can cause malfunctions.*

- A flow meter used in a critical process or feedback control should be taken offline before making configuration changes. Some menu options temporarily suspend flow meter output at the last value before the menu option was invoked.
- To back out of a menu, press **H** to force an exit.
- Any changes are automatically saved when Program mode is exited.
There are no prompts to confirm that you want to make a change.
- If there is no menu activity for 3 minutes, the display automatically exits to Run mode.
- The configuration is retained through flow meter reboots and power cycles.

Table 3-1. Program Mode — Basic Access

Option #	Function	Example	Description / Purpose / Parameters
1	Tag Name (page 3-6)	255 TAG ID UNITNAME	A device name up to 15 characters.
2	Flow Units (page 3-7)	FLOW UNITS > SCMH ^v	Volumetric and mass rate in English or metric units. Flow Unit options: KGH PPH SCMH KGM PPM SLPM NCMH SCFH NLPM SCFM
3	Flow Area Setup (page 3-8)	DUCT PROFILE > RECTANGLE ^v	A round or rectangular dimension automatically calculates the area. Custom allows manual control. Flow Area options: ROUND Inside Diameter automatically calculates the Inside Area RECTANGLE Duct Width and Duct Height automatically calculates the Inside Area CUSTOM Flow Area is entered by the user
4	Analog Output Setup (page 3-9)	ANALOG OUT #1 FLOW RATE AO1 FLOW AT 4MA > 0.0 SLPM AO1 FLOW AT 20MA > 20.0 SLPM VELOCITY AO1 VELO AT 4MA > 6.0 SMPS AO1 VELO AT 20MA > 20.0 SMPS TEMPERATURE AO1 TEMP AT 4MA > 0.0 DEGC AO1 TEMP AT 20MA > 20.0 DEGC	Configure each AO channel for a process variable and range equivalent to 4-20 mA. Analog Output options: 1 2 AO Type options: FLOW RATE VELOCITY TEMPERATURE Specify the low range value corresponding to 4 mA and the high range value corresponding to 20 mA.

Table 3-1. Program Mode — Basic Access (continued)

Option #	Function	Example	Description / Purpose / Parameters
5	Flow Set Point Setup (page 3-12)	<pre>FLOW SETPOINT LOW > 0.0 SCMH HIGH 925000.0 SCMH FLOW SETPOINT LOW 0.0 SCMH HIGH > 925000.0 SCMH</pre>	Enter low and high Flow Set Points.
6	Temperature Set Point Setup (page 3-13)	<pre>TEMPERATURE SETPOINT LOW > -25.0 F HIGH 650.0 F TEMPERATURE SETPOINT LOW 25.0 F HIGH > 650.0 F</pre>	Enter low and high Temperature Set Points.
7	Alarm Setup (page 3-14)	<pre>ALARM #1 > ENABLED ^v TYPE> ZER/SPN CHK ^v</pre>	<p>Set the trigger for each alarm based on an event.</p> <p>Alarm number options: 1 2</p> <p>Alarm options: ENABLED DISABLED</p> <p>Alarm types: SYS FAILURE CHAN KO MIN ZER/SPN CHK MAINT MODE FLOW OOR TEMP OOR</p>
8	Totalizer Setup (page 3-15)	<pre>TOTALIZER SETUP RESET>AUTO COUNT> 10000 SCM RESET>MANUAL CONFIRM> NO ^v</pre>	<p>Totalizer options: AUTO MANUAL</p> <p>AUTO prompts for a maximum totalizer value to accumulate before resetting the totalizer.</p> <p>Manual options: YES NO</p>

Table 3-1. Program Mode — Basic Access (continued)

Option #	Function	Example	Description / Purpose / Parameters
9	Reset Totalizer (page 3-15)	RESET TOTALIZER CONFIRM> NO ^v	Resets the totalizer. Confirmation options: YES NO
10	Field Calibration Correction Factor and Filter Time Constant (page 3-16)	FIELD CALIBRATION CF > 1.000 FILTER TIME CONSTANT > 0.50 SEC	Correction Factor applied to the averaged velocity measurements. Filter time constant is used to filter out measurement noise.
11	Variable Correction Factor Setup (page 3-17)	# CF DATA SET> 1 VCF DATA #1 REF< / MEAS SMPS 0.01/ 0.01	Up to eight velocity-dependent correction factors can be programmed. The VCF are obtained by performing a velocity traverse.
12	Run Mode Display Setup (page 3-18)	RUNMODE DISPLAY TYPE > SCROLLED ^v STATIC ^v LINE1> TAG ^v LINE2> FLOW RATE ^v LINE3> VELOCITY ^v	Variables that appear in Run mode. Run Mode options: SCROLLED STATIC Static variables: TEMPERATURE VELOCITY FLOW RATE DAILY TOTFL TOTAL FLOW TAG
13	Clock Setup (page 3-19)	SET CLOCK <MON> 10 / 20 / 2018 12 : 45	Sets the internal clock. Press P to advance to the next field. Press UP or DN to change the date and time field values.

Option 1 — Tag Name

The tag name is the Series 255 transmitter name. The name (up to 15 characters) can indicate the location, process, or company naming convention.

To access the **Tag Name** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **1** for the **Tag Name** menu, and then press **E**.

A prompt appears for the tag name.

```
255 TAG ID
>AVERAGINGTM1
```

The name should follow company naming conventions.

- 4> Press **H** to exit without making changes.
To change the flow meter name.
 - a> Press **C** to clear the tag name field.
 - b> Use the alphanumeric keys to enter letters and numbers.
Press **E** to advance to the next character position.
 - c> Press **E** to accept the new name.

Option 2 — Flow Units

The 255 provides a flow rate measurement as either mass flow rate or volumetric flow rate. The mass flow rate is the mass of the gas flowing through a pipe per time with units such as kilograms per hour (KGH), kilograms per minute (KGM), pounds per hour (PPH). The volumetric flow rate is the volume of gas flow through the pipe per time with units such as standard cubic feet per hour (SCFH), standard cubic feet per minute (SCFM). The flow units selected determine the units that appear for velocity and temperature.

To access the **Flow Units** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **2** for the **Flow Units** menu, and then press **E**.

A prompt appears for selecting the flow units.

```
FLOW UNITS
>SCMH    ^V
```

The volumetric flow rate options are NCMH, NLPM, SCFH, SCFM, SCMH, and SLMP.

The mass flow rate options are KGH, KGM, PPH, and PPM.

- 4> Press **H** to exit without making changes.

Option 3 — Flow Area Setup

To access the **Flow Area Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **3** for the **Flow Area Setup** menu, and then press **E**.

A prompt appears for selecting a duct profile.

```

DUCT PROFILE
>ROUND    ^v

```

The duct profile options are round, rectangle, and custom.

- 4> Use the arrow keys to select the duct profile, and then press **E**.
Depending on the duct profile selection, the duct width, inside diameter, or flow area prompt appears.

Rectangle duct profile

For rectangular ducts:

- a> Enter the first dimension, and then press **E** to go the second dimension prompt.

```

RECT      38.48 SQM
DIM1>    6.20 M
DIM2      6.20 M

```

- b> Enter the second dimension, and then press **E** again.

```

RECT      1.00 SQM
DIM1      1.00 M
DIM2>    1.00 M

```

- c> The flow area is automatically calculated.

Round duct profile

For round ducts:

- a> Enter the inside diameter of the duct and then press **E**.

```

ROUND     38.48 SQM
DIAM>    7.00 M

```

- b> The flow area is automatically calculated.

Custom duct profile

For an irregular duct profile, enter the specific duct flow area:

- a> Enter the flow area using the number and decimal keys.

```
FLOW AREA
>      38.48 SQM
```

- b> Press E.

Option 4 — Analog Output Setup

The output and signal range for process variables measured by the flow meter are configured through the Analog Output Setup menu in Program mode. The receiving device must be programmed for the same range.

The flow meter supports up to two analog output (AO) channels. Each analog output channel (AO1 and AO2) can report flow rate, temperature, or velocity.

Table 3-2. 4-20 mA Output Functions

Analog Output Functions	Process Measurement
Flow rate	KGH, KGM, NCMH, NLPM, PPH, PPM, SCFH, SCFM, SCMH, SLPM
Temperature	Fahrenheit or Celsius
Velocity	SFPM, SMPS, NMPS

To access the **Analog Output Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **4** for the **Analog Output Setup** menu, and then press **E**.

A prompt appears for the analog output channel number.

```
ANALOG OUT #1
```

- 4> Press the numeric keys to enter either **1** or **2** for the channel number, and then press **E**.

Note The prompts are the same for Analog Output #2.

A prompt appears for defining the type. The options are flow rate, temperature, or velocity.

Flow Rate

- a> Select **Flow Rate**, and then press **E**.

```
AO1 TYPE
> FLOW RATE      ^v
```

A prompt appears for setting the flow rate at the 4 mA value for Analog Output #1.

```
AO1 FLOW AT 4MA
>          6.0 SLPM
```

- b> Use the number and decimal keys to change the flow rate, and then press **E**.

A prompt appears for setting the flow rate at the 20 mA value for Analog Output #1.

```
AO1 FLOW AT 20MA
>          20.0 SLPM
```

- c> Use the number and decimal keys to change the flow rate, and then press **E**.

Temperature

- a> Select **Temperature**, and then press **E**.

```
AO2 TYPE
> TEMPERATURE  ^v
```

A prompt appears for setting the temperature at the 4 mA value for Analog Output #2.

```
AO2 TEMPERATURE AT 4MA
>          6.0 DEGC
```

- b> Use the number and decimal keys to change the temperature, and then press **E**.

A prompt appears for setting the temperature at the 20 mA value for Analog Output #2.

```
AO2 TEMPERATURE AT 20MA
>      20.0 DEGC
```

- c> Use the number and decimal keys to change the temperature range, and then press E.

Velocity

- a> Select **Velocity**, and then press E.

```
AO1 TYPE
> VELOCITY ^v
```

A prompt appears for setting the velocity at the 4 mA value for Analog Output #1.

```
AO1 VELO AT 4MA
>      6.0 SMPS
```

- b> Use the number and decimal keys to change the velocity, and then press E.

A prompt appears for setting the velocity at the 20 mA value for Analog Output #1.

```
AO1 VELO AT 20MA
>      20.0 SMPS
```

- c> Use the number and decimal keys to change the velocity, and then press E.

Option 5 – Flow Set Point Setup

The 255 continuously checks the flow measurement against a user specified low and high set point and alerts if the flow measurement is out of the user specified range. Option 5 is used to enter the Flow Set Points.

- 1> Press P
- 2> Enter the Basic access code, and then press E.
- 3> Press 5 for the Flow Set Point setup

A prompt appears to enter the flow set points. The arrow prompt indicates the active field. In the example below, the active field is the low set point.

```
FLOW SETPOINT
LOW >          0.0 SCMH
HIGH          925000.0 SCMH
```

- 4> Use the number and decimal keys to change the low flow set point, and then press E.
- 5> The arrow prompt will move to the high set point to indicate it is the active field.

```
FLOW SETPOINT
LOW          0.0 SCMH
HIGH >      925000.0 SCMH
```

- 6> Use the number and decimal keys to change the high flow set point, and then press E.

Option 6 – Temperature Set Point Setup

The 255 continuously checks the temperature measurement against a user specified low and high set point and alerts if the temperature measurement is out of the user specified range. Option 6 is used to enter the Temperature Set Points.

- 1> Press P
- 2> Enter the Basic access code, and then press E.
- 3> Press 6 for the Temperature Set Point setup

A prompt appears to enter the temperature set points. The arrow prompt indicates the active field. In the example below, the active field is the low set point.

```
TEMPERATURE SETPOINT
LOW >      -25.0 F
HIGH      650.0 F
```

- 4> Use the number and decimal keys to change the low temperature set point, and then press E.
- 5> The arrow prompt will move to the high set point to indicate it is the active field.

```
TEMPERATURE SETPOINT
LOW      25.0 F
HIGH >   650.0 F
```

- 6> Use the number and decimal keys to change the high temperature set point, and then press E.

Option 7 — Alarm Setup

The Series 255 supports up to two alarms.

To access the **Alarm Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **7** for the **Alarm Setup** menu, and then press **E**.

The prompt to enable or disable Alarm #1 appears.

```
ALARM #1
```

- 4> Use the number keys to select **1** or **2**, and then press **E**. (Alarm #1 is used for this example.)

The prompt to enable or disable Alarm #1 appears.

```
ALARM #1
> ENABLED          ^v
```

- 5> Press **UP** or **DN** to enable or disable the alarm, and then press **E**.
- 6> If enabled, press UP or DN to select the alarm trigger, and then press E. The alarm triggers available for selection are:

SYS FAIL — System failure

MAINT MODE — Maintenance mode (this trigger is related to Option 19)

CHAN KO MIN — Channel kickout minimum value

ZER/SPN CHK — Zero/span check

FLOW OOR — Flow rate out of range

TEMP OOR — Temperature out of range

```
ALARM #1
> ENABLED
TYPE> ZERO/SPN CHK ^v
```

- 7> Press **E** to go to the Alarm #2 prompt.
The trigger options for Alarm #2 are the same as Alarm #1
- 8> Press **E** to go through the Alarm #2 options, or press **H** to return to the main prompt.

Option 8 — Totalizer Setup

To access the **Totalizer Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **8** for the **Totalizer Setup** menu, and then press **E**.

A prompt appears for setting up the totalizer to **AUTO** reset or **MANUAL** reset.

When you choose **AUTO**, a prompt appears for setting an totalizer reset based on a maximum totalized flow limit.

```
TOTALIZER SETUP
RESET>AUTO      ^v
COUNT>1000000000 SCM
```

- 4> Use the number and decimal keys to enter a maximum totalized flow value, and then press **E**.
- 5> When you choose **MANUAL**, a prompt appears for resetting the totalizer.
Note Resetting the totalizer deletes all recorded data.
It is a good idea to backup collected data before resetting the totalizer.
- 6> Press **UP** or **DN** to select the **Yes** or **No**, and then press **E**.

Option 9 — Reset Totalizer

To access the **Reset Totalizer** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **9** for the **Reset Totalizer** menu, and then press **E**.

A prompt appears for resetting the totalizer.

```
RESET TOTALIZER
CONFIRM> NO  ^v
```

- 4> Press **UP** or **DN** to select the **Yes** or **No**, and then press **E**.

Option 10 — Field Calibration Correction Factor

This menu option (#10) is used to enter the Field Calibration Correction Factor (FCCF) and the Flow Filter Time Constant. The Field Calibration Correction Factor is a multiplier that is used as a bias correction on the flow average. The Flow Filter Time Constant is a digital filter time constant that is used to control the flow average response to a flow change.

To access the **Field Calibration Correction Factor** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **10** for the **Field Calibration Correction Factor** menu, and then press **E**.

A prompt appears for changing the field calibration correction factor.

```
FIELD CALIBRATION CF
> 1.0000
```

- 4> Use the number and decimal keys to change the field calibration correction factor, and then press **E**. The FCCF can be a number between 0.01 and 10.00.
- 5> Next, a prompt appears for changing the filter time constant.

```
FILTER TIME CONSTANT
> 0.50 SEC
```

- 6> Use the number and decimal keys to change the filter time constant, and then press **E**. The filter time constant has a unit of seconds and can be 0.00 to 600.00 seconds. A filter time constant of 0.00 seconds means there is no filtering of the calculated flow average.

Option 11 — Variable Correction Factor Setup

The Variable Correction Factor (VCF) is a velocity-dependent correction factor applied to the velocity average to account for velocity dependent deviations. Its value depends on the current velocity. VCF data is obtained by performing a field traverse or field calibration of the duct.

To access the **Variable Correction Factor (VCF) Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **11** for the **VCF Setup** menu, and then press **E**.

A prompt appears for entering the number of correction factor data sets.

```
# CF DATA SET> 1
```

Up to eight correction factor data sets are allowed.

- 4> Use the number keys to specify the number of VCF data sets, and then press **E**.

The VCF Data #1 set prompt appears.

```
VCF DATA #1
  REF  / MEAS  SMPS
  1.00/    1.00
```

- 5> Press **C** to clear the current VCF data set, use the number keys to specify a different VCF data set, and then press **E**.

A less-than symbol (<) appears by the REF field.

```
VCF DATA #1
  REF< / MEAS  SMPS
  1.00/    1.00
```

- 6> Press **C** to clear the reference value, and then use the number and decimal keys to change the value.
- 7> Press **E** to accept the change, **P** to skip the field, or **H** to return to the main prompt.

A less-than symbol (<) appears by the MEAS field.

```
VCF DATA #1
  REF  / MEAS< SMPS
  1.00/    1.00
```

- 8> Press **C** to clear the measured value, and then use the number and decimal keys to change the value.
- 9> Press **E** to accept the change, **P** to skip the field, or **H** to return to the main prompt.

Repeat the process for each additional VCF data set.

Option 12 — Run Mode Display Setup

Run mode is the normal operational state of the Series 255. You can setup the information that appears on the display during Run mode. The default display information in Run mode is tag name, flow rate, and temperature.

To access the **Run Mode Display Type** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **12** for the **Run Mode Display Type** menu, and then press **E**.
A prompt appears for SCROLLED or STATIC.
- 4> Press the **UP** or **DN** key to select either **SCROLLED** or **STATIC**, then press **E**.
- 5> Selecting **SCROLLED** returns to the main Advanced mode menu.
For this setup, the display scrolls through TAG NAME, TEMPERATURE, FLOW RATE, DAILY TOTAL, and TOTALIZED FLOW.

```
RUNMODE DISPLAY TYPE
> SCROLLED      ^v
```

- 6> Selecting **STATIC** prompts for a selection of process data options.

```
RUNMODE DISPLAY TYPE
> STATIC        ^v
```

- 7> Press the **UP** or **DN** key to select the process data you want to appear in Line 1 of Run Mode, and then press **E**.

```
LINE1> TAG          ^v
LINE2  FLOW RATE
LINE3  VELOCITY
```

Options for each line are as follows:

Tag	Meter name
Temperature	Fahrenheit or Centigrade, based on English or metric flow units
Velocity	NMPS, SFPM, or SMPS, based on English or metric flow units
Flow Rate	PPM, SLPM, SCFM, PPH, SCMH, SCFH, NLPM, KGM, NCMH, KGH
Daily TOTFL	Continuous 24-hour data rolling log of daily total flow units
Total FL	Accumulated flow since the variable was last reset

- 8> Repeat the steps for Lines 2 and 3. The active field is identified by the ^ v characters that indicate making a selection using the **UP** or **DN** key. Press **P** to move to the next active field.

The prompt returns to the main Advanced mode menu after specifying Line 3.

Option 13 — Clock Setup

To access the **Set Clock** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **13** for the **Set Clock** menu, and then press **E**.

A prompt appears for the changing the date and time.

```
SET CLOCK <MON>
  09 / 26 / 2018
  14 : 29
```

- 4> Press **UP** or **DN** to change the month <MON>, and then press **P**.
- 5> Press **UP** or **DN** to change the day <DAY>, and then press **P**.
- 6> Press **UP** or **DN** to change the year <YR>, and then press **P**.
- 7> Press **UP** or **DN** to change the hour <HR>, and then press **P**.
- 8> Press **UP** or **DN** to change the minute <MIN>, and then press **P**.
- 9> Pre **E** to save any changes.

The current clock settings appear.

```
CURRENT DATE/TIME
  10 / 20 / 2018
  09 : 30 : 55
```

- 10> Press **E** to exit and return to the main prompt.

Program Mode Advanced Access

Overview

This chapter provides a description for each Advanced access option. The Advanced access options are as follows:

- Option 1 — Tag Name
- Option 2 — Flow Units
- Option 3 — Flow Area Setup
- Option 4 — Analog Output Setup
- Option 5 — Flow Set Point Setup
- Option 6 — Temperature Set Point Setup
- Option 7 — Alarm Setup
- Option 8 — Totalizer Setup
- Option 9 — Reset Totalizer
- Option 10 — Field Calibration Correction Factor
- Option 11 — Variable Correction Factor Setup
- Option 12 — Run Mode Display Setup
- Option 13 — Clock Setup
- Option 14 — Reference Temperature & Pressure
- Option 15 — Minimum Kickout Count
- Option 16 — NE-43 Alarm Level
- Option 17 — Modbus Communication
- Option 18 — Serial USB Baud Rate
- Option 19 — System Operational State
- Option 20 — Number of Channels
- Option 21 — Channel Setup
- Option 22 — User Access Codes
- Option 23 — Analog Output Calibration
- Option 24 — Analog Output Test
- Option 25 — NE-43 Alarm Test
- Option 26 — Restore Auxiliary Configuration
- Option 27 — Restore Factory Configuration
- Option 28 — Save to Auxiliary Configuration
- Option 29 — Output Report to USB
- Option 30 — USB Data Log Setup
- Option 31 — Purge Timer Setup
- Option 32 — Purge Manual Command
- Option 33 — Zero-Span Schedule Setup
- Option 34 — Zero-Span Test Parameters Setup
- Option 35 — Zero-Span Manual Command

Program Mode — Advanced Access

Table 4-1 provide a quick reference to Advanced access menus and parameters.

Before making any configuration changes in Program mode, it is important to remember:

Important *You should not make any changes to the configuration without a complete understanding of the parameters. Changing a setting incorrectly can cause malfunctions.*

- A flow meter used in a critical process or feedback control should be taken offline before making configuration changes. Some menu options temporarily suspend flow meter output at the last value before the menu option was invoked.
- To back out of a menu, press **H** to force an exit.
- Any changes are automatically saved when Program mode is exited.
There are no prompts to confirm that you want to make a change.
- If there is no menu activity for 3 minutes, the display automatically exits to Run mode.
- The configuration is retained through flow meter reboots and power cycles.

Table 4-1. Program Mode — Advanced Access

Option #	Function	Example	Description / Purpose / Parameters
1	Tag Name (page 4-10)	255 TAG ID UNITNAME	A device name up to 15 characters.
2	Flow Units (page 4-11)	FLOW UNITS > SCMH ^v	Volumetric and mass rate in English or metric units. Flow Unit options: KGH PPH SCMH KGM PPM SLPM NCMH SCFH NLPM SCFM
3	Flow Area Setup (page 4-12)	DUCT PROFILE > RECTANGLE ^v	A round or rectangular dimension automatically calculates the area. Custom allows manual control. Flow Area options: ROUND Inside Diameter automatically calculates the Inside Area RECTANGLE Duct Width and Duct Height automatically calculates the Inside Area CUSTOM Flow Area is entered by the user
4	Analog Output Setup (page 4-13)	ANALOG OUT #1 FLOW RATE AO1 FLOW AT 4MA > 0.0 SLPM AO1 FLOW AT 20MA > 20.0 SLPM VELOCITY AO1 VELO AT 4MA > 6.0 SMPS AO1 VELO AT 20MA > 20.0 SMPS TEMPERATURE AO1 TEMP AT 4MA > 0.0 DEGC AO1 TEMP AT 20MA > 20.0 DEGC	Configure each AO channel for a process variable and range equivalent to 4-20 mA. Analog Output options: 1 2 AO Type options: FLOW RATE VELOCITY TEMPERATURE Specify the low range value corresponding to 4 mA and the high range value corresponding to 20 mA.

Table 4-1. Program Mode — Advanced Access (continued)

Option #	Function	Example	Description / Purpose / Parameters
5	Flow Set Point Setup (page 4-16)	<pre>FLOW SETPOINT LOW > 0.0 SCMH HIGH 925000.0 SCMH FLOW SETPOINT LOW 0.0 SCMH HIGH > 925000.0 SCMH</pre>	Enter low and high Flow Set Points.
6	Temperature Set Point Setup (page 4-17)	<pre>TEMPERATURE SETPOINT LOW > -25.0 F HIGH 650.0 F TEMPERATURE SETPOINT LOW 25.0 F HIGH > 650.0 F</pre>	Enter low and high Temperature Set Points.
7	Alarm Setup (page 4-18)	<pre>ALARM #1 > ENABLED ^v TYPE> ZER/SPN CHK ^v</pre>	<p>Set the trigger for each alarm based on an event.</p> <p>Alarm number options: 1 2</p> <p>Alarm options: ENABLED DISABLED</p> <p>Alarm types: SYS FAILURE CHAN KO MIN ZER/SPN CHK MAINT MODE FLOW OOR TEMP OOR</p>
8	Totalizer Setup (page 4-19)	<pre>TOTALIZER SETUP RESET>AUTO COUNT> 10000 SCM RESET>MANUAL CONFIRM> NO ^v</pre>	<p>Totalizer options: AUTO MANUAL</p> <p>AUTO prompts for a maximum totalizer value to accumulate before resetting the totalizer.</p> <p>Manual options: YES NO</p>

Table 4-1. Program Mode — Advanced Access (continued)

Option #	Function	Example	Description / Purpose / Parameters
9	Reset Totalizer (page 4-19)	RESET TOTALIZER CONFIRM> NO ^v	Resets the totalizer. Confirmation options: YES NO
10	Field Calibration Correction Factor (page 4-20)	FIELD CALIBRATION CF > 1.000 FILTER TIME CONSTANT > 0.50 SEC	Correction Factor applied to the averaged velocity measurements. Filter time constant is used to filter out measurement noise.
11	Variable Correction Factor Setup (page 4-21)	# CF DATA SET> 1 VCF DATA #1 REF< / MEAS SMPS 0.01/ 0.01	Up to eight velocity-dependent correction factors can be programmed. The VCF are obtained by performing a velocity traverse.
12	Run Mode Display Setup (page 4-22)	RUNMODE DISPLAY TYPE > SCROLLED ^v STATIC ^v LINE1> TAG ^v LINE2> FLOW RATE ^v LINE3> VELOCITY ^v	Variables that appear in Run mode. Run Mode options: SCROLLED STATIC Static variables: TEMPERATURE VELOCITY FLOW RATE DAILY TOTFL TOTAL FLOW TAG
13	Clock Setup (page 4-23)	SET CLOCK <MON> 10 / 20 / 2018 12 : 45	Sets the internal clock. Press P to advance to the next field. Press UP or DN to change the date and time field values.
14	Reference Temperature & Pressure (page 4-24)	REF TEMP PRESS FAC 25.0C 101.32KPA USR>25.0C 101.32KPA	USR is the customer site-specific reference temperature and pressure. Change only if different than the factory reference temperature and pressure.
15	Minimum Kickout Count (page 4-24)	MIN KICKOUT COUNT > #	Minimum number of channels left to average before triggering a kickout alarm.

Table 4-1. Program Mode — Advanced Access (continued)

Option #	Function	Example	Description / Purpose / Parameters
16	NE-43 Alarm Level (page 4-25)	NE-43 ALARM LEVEL > LOW OUTPUT ^V	NE-43 Alarm Level options: LOW OUTPUT HIGH OUTPUT
17	Modbus Baud Rate (page 4-26)	MODBUS BAUD RATE > 38400 ^V	Allows you to setup up Modbus communications. The baud rate is typically 38400. Must be in Maintenance mode, Option 17. Modbus Baud rates: 9600 19200 57600 14400 38400 115200
18	Serial USB Baud Rate (page 4-27)	SERIAL USB BAUD RATE > 38400 ^V	Serial Baud rates: 9600 19200 57600 14400 38400 115200
19	System Operational State (page 4-27)	SYSTEM OP STATE > OPERATE ^V	Operating State options: OPERATE MAINTENANCE
20	Number of Channels (page 4-28)	NUMBER OF CHANNELS > #	The maximum number of configurable channels is based on the Series 255 model.
21	Channel Setup (page 4-29)	CHANNEL> A SELECT ONLINE > YES ^V INCLUDE> YES ^V	Assigns a flow sensing channel ONLINE or OFFLINE, and to include or exclude its velocity and temperature from the calculated average.
22	User Access Codes (page 4-30)	USER ACCESS CODE BASIC > 123456 ADV > 654321	Allows you to change the basic and advanced access codes (6 digits).

Table 4-1. Program Mode — Advanced Access (continued)

Option #	Function	Example	Description / Purpose / Parameters
23	Analog Output Calibration (page 4-31)	ANALOG OUT #1 CAL AO1 to 4.000 mA USE ^v TO ADJUST OUT OUT = 4.000 mA CAL AO1 to 20.000 mA USE ^v TO ADJUST OUT OUT = 20.000 mA SLOPE OFFST CUR 0.887 0.010 NEW 0.887 0.010	Analog Output options: 1 2
24	Analog Output Test (page 4-32)	ENTER OUPUT > 12.4000 mA	The entered mA is sent to both AO channels to test or check AO channel calibration.
25	NE-43 Alarm Test (page 4-33)	LOW ALARM CHECK ANALOG OUT <= 3.6 mA	Tests the NE-43 Alarm output levels. The low alarm check outputs 3.6 mA to both AO channels. The high alarm check outputs 21.0 mA to both AO channels.
26	Restore Auxiliary Configuration (page 4-33)	RESTORE AUX CONFIG CONFIRM> NO ^v	Restores the configuration from a previously saved configuration. Confirmation options: YES NO
27	Restore Factory Configuration (page 4-34)	RESTORE FACTORY CFG CONFIRM> NO ^v RESTORE FACTORY CFG PRESS E TO CONTINUE	Restores the configuration from the Factory configuration. Confirmation options: YES NO Selecting Yes prompts to affirm.
28	Save to Auxiliary Configuration (page 4-34)	SAVE TO AUX CONFIG CONFIRM> NO ^v	Saves the current configuration to an Auxiliary EEPROM memory used as a restore point should configuration changes need to be undone. Confirmation options: YES NO

Table 4-1. Program Mode — Advanced Access (continued)

Option #	Function	Example	Description / Purpose / Parameters
29	Output Report to USB (page 4-35)	SELECT OUTPUT TO USB > CURR CFG ^v SELECT OUTPUT TO USB PRESS E TO CONTINUE	Used to download a selected report in a readable text format to the USB port. Data or report options: CURR CFG – Configuration data set currently in use AUX CFG – The auxiliary configuration data set in non-volatile memory FACT CFG – The factory configuration data set ZERO/SPAN – The results from the last Zero/Span check
30	USB Data Log Setup (page 4-38)	USB LOGGING > COR+RAW VEL&TMP ^v	USB logging options: OFF - Data logging is turned off COR+RAW VEL&TMP - Corrected and Uncorrected values of average velocity and temperature is logged RAW VEL&TEMP - Uncorrected values of average velocity and temperature is logged
31	Purge Timer Setup	PURGE SETUP TIMER > ON ^v INTERVAL > 60 MIN	Setup timer for automatic purge. If set to ON, purge cycle will execute on specified interval.
32	Purge Manual Command	MANUAL PURGE START PURGE > NO ^v	User can start a purge cycle on-demand
33	Zero-Span Sched Setup	ZERO/SPAN CHECK AUTOMATIC > YES ^v ZERO/SPAN CHECK INTERVAL > 1 DAYS TOD > 5:00 AM	The Zero-Span (Drift Check) can be setup to be automatically run. The user can specify the interval in DAYS and the Time of Day.
34	Zero-Span Setup	CFG FOR ZERO CHECK % FULLSCALE > 10 SEC DURATION > 60	Each of the drift check levels has a % of fullscale and duration parameter to setup.

Table 4-1. Program Mode — Advanced Access (continued)

Option #	Function	Example	Description / Purpose / Parameters
35	Zero-Span Manual Command	SELECT DRIFT TEST >ZERO DRIFT CHECK ^v	User can start a drift test on-demand. Any of the drift test levels can be selected or the complete cycle can be selected - ZERO/MID/SPAN/CYCLE

Option 1 — Tag Name

The tag name is the Series 255 transmitter name. The name (up to 15 characters) can indicate the location, process, or company naming convention.

To access the **Tag Name** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **1** for the **Tag Name** menu, and then press **E**.

A prompt appears for the tag name.

```
255 TAG ID
>AVERAGINGTM1
```

The name should follow company naming conventions.

- 4> Press **H** to exit without making changes.

To change the flow meter name.

- a> Press **C** to clear the tag name field.
- b> Use the alphanumeric keys to enter letters and numbers.
Press **E** to advance to the next character position.
- c> Press **E** to accept the new name.

Option 2 — Flow Units

The 255 provides a flow rate measurement as either mass flow rate or volumetric flow rate. The mass flow rate is the mass of the gas flowing through a pipe per time with units such as kilograms per hour (KGH), kilograms per minute (KGM), pounds per hour (PPH). The volumetric flow rate is the volume of gas flow through the pipe per time with units such as standard cubic feet per hour (SCFH), standard cubic feet per minute (SCFM). The flow units selected determine the units that appear for velocity and temperature.

To access the **Flow Units** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **2** for the **Flow Units** menu, and then press **E**.

A prompt appears for selecting the flow units.

```
FLOW UNITS
>SCMH    ^V
```

The volumetric flow rate options are NCMH, NLPM, SCFH, SCFM, SCMH, and SLPM.
The mass flow rate options are KGH, KGM, PPH, and PPM.

- 4> Press **H** to exit without making changes.

Option 3 — Flow Area Setup

To access the **Flow Area Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **3** for the **Flow Area Setup** menu, and then press **E**.

A prompt appears for selecting a duct profile.

```

DUCT PROFILE
>ROUND    ^v
    
```

The duct profile options are round, rectangle, and custom.

- 4> Use the arrow keys to select the duct profile, and then press **E**.

Depending on the duct profile selection, the duct width, inside diameter, or flow area prompt appears.

Rectangle duct profile

For rectangular ducts:

- a> Enter the first dimension, and then press **E** to go the second dimension prompt.

```

RECT      38.48 SQM
DIM1>    6.20 M
DIM2      6.20 M
    
```

- b> Enter the second dimension, and then press **E** again.

```

RECT      1.00 SQM
DIM1      1.00 M
DIM2>    1.00 M
    
```

- c> The flow area is automatically calculated.

Round duct profile

For round ducts:

- a> Enter the inside diameter of the duct and then press **E**.

```

ROUND     38.48 SQM
DIAM>    7.00 M
    
```

- b> The flow area is automatically calculated.

Custom duct profile

For an irregular duct profile, enter the specific duct flow area:

- a> Enter the flow area using the number and decimal keys.

```
FLOW AREA
>      38.48 SQM
```

- b> Press E.

Option 4 — Analog Output Setup

The output and signal range for process variables measured by the flow meter are configured through the Analog Output Setup menu in Program mode. The receiving device must be programmed for the same range.

The flow meter supports up to two analog output (AO) channels. Each analog output channel (AO1 and AO2) can report flow rate, temperature, or velocity.

Table 4-2. 4-20 mA Output Functions

Analog Output Functions	Process Measurement
Flow rate	KGH, KGM, NCMH, NLPM, PPH, PPM, SCFH, SCFM, SCMH, SLPM
Temperature	Fahrenheit or Celsius
Velocity	NMPS, SFPM, NMPS

To access the **Analog Output Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **4** for the **Analog Output Setup** menu, and then press **E**.

A prompt appears for the analog output channel number.

```
ANALOG OUT #1
```

- 4> Press the numeric keys to enter either **1** or **2** for the channel number, and then press **E**.

Note The prompts are the same for Analog Output #2.

A prompt appears for defining the type. The options are flow rate, temperature, or velocity.

Flow Rate

- a> Select **Flow Rate**, and then press **E**.

```
AO1 TYPE
> FLOW RATE      ^v
```

A prompt appears for setting the flow rate at the 4 mA value for Analog Output #1.

```
AO1 FLOW AT 4MA
>          6.0 SLPM
```

- b> Use the number and decimal keys to change the flow rate, and then press **E**.

A prompt appears for setting the flow rate at the 20 mA value for Analog Output #1.

```
AO1 FLOW AT 20MA
>          20.0 SLPM
```

- c> Use the number and decimal keys to change the flow rate, and then press **E**.

Temperature

- a> Select **Temperature**, and then press **E**.

```
AO2 TYPE
> TEMPERATURE  ^v
```

A prompt appears for setting the temperature at the 4 mA value for Analog Output #2.

```
AO2 TEMPERATURE AT 4MA
>          6.0 DEGC
```

- b> Use the number and decimal keys to change the temperature, and then press **E**.

A prompt appears for setting the temperature at the 20 mA value for Analog Output #2.

```
AO2 TEMPERATURE AT 20MA
>      20.0 DEGC
```

- c> Use the number and decimal keys to change the temperature range, and then press E.

Velocity

- a> Select **Velocity**, and then press E.

```
AO1 TYPE
> VELOCITY ^v
```

A prompt appears for setting the velocity at the 4 mA value for Analog Output #1.

```
AO1 VELO AT 4MA
>      6.0 SMPS
```

- b> Use the number and decimal keys to change the velocity, and then press E.

A prompt appears for setting the velocity at the 20 mA value for Analog Output #1.

```
AO1 VELO AT 20MA
>      20.0 SMPS
```

- c> Use the number and decimal keys to change the velocity, and then press E.

Option 5 – Flow Set Point Setup

The 255 continuously checks the flow measurement against a user specified low and high set point and alerts if the flow measurement is out of the user specified range. Option 5 is used to enter the Flow Set Points.

- 1> Press P
- 2> Enter the Advanced access code, and then press E.
- 3> Press 5 for the Flow Set Point setup

A prompt appears to enter the flow set points. The arrow prompt indicates the active field. In the example below, the active field is the low set point.

```
FLOW SETPOINT
LOW >          0.0 SCMH
HIGH          925000.0 SCMH
```

- 4> Use the number and decimal keys to change the low flow set point, and then press E.
- 5> The arrow prompt will move to the high set point to indicate it is the active field.

```
FLOW SETPOINT
LOW          0.0 SCMH
HIGH >      925000.0 SCMH
```

- 6> Use the number and decimal keys to change the high flow set point, and then press E.

Option 6 – Temperature Set Point Setup

The 255 continuously checks the temperature measurement against a user specified low and high set point and alerts if the temperature measurement is out of the user specified range. Option 6 is used to enter the Temperature Set Points.

- 1> Press P
- 2> Enter the Advanced access code, and then press E.
- 3> Press 6 for the Temperature Set Point setup

A prompt appears to enter the temperature set points. The arrow prompt indicates the active field. In the example below, the active field is the low set point.

```
TEMPERATURE SETPOINT
LOW >      -25.0 F
HIGH      650.0 F
```

- 4> Use the number and decimal keys to change the low temperature set point, and then press E.
- 5> The arrow prompt will move to the high set point to indicate it is the active field.

```
TEMPERATURE SETPOINT
LOW      25.0 F
HIGH >   650.0 F
```

- 6> Use the number and decimal keys to change the high temperature set point, and then press E.

Option 7 — Alarm Setup

The Series 255 supports up to two alarms.

To access the **Alarm Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Basic access code, and then press **E**.
- 3> Press **7** for the **Alarm Setup** menu, and then press **E**.

The prompt to enable or disable Alarm #1 appears.

```
ALARM #1
```

- 4> Use the number keys to select **1** or **2**, and then press **E**. (Alarm #1 is used for this example.)

The prompt to enable or disable Alarm #1 appears.

```
ALARM #1
> ENABLED          ^v
```

- 5> Press **UP** or **DN** to enable or disable the alarm, and then press **E**.
- 6> If enabled, press UP or DN to select the alarm trigger, and then press E. The alarm triggers available for selection are:

SYS FAIL — System failure

MAINT MODE — Maintenance mode (this trigger is related to Option 17)

CHAN KO MIN — Channel kickout minimum value

ZER/SPN CHK — Zero/span check

FLOW OOR — Flow rate out of range

TEMP OOR — Temperature out of range

```
ALARM #1
> ENABLED
TYPE> ZERO/SPN CHK ^v
```

- 7> Press **E** to go to the Alarm #2 prompt.

The trigger options for Alarm #2 are the same as Alarm #1

- 8> Press **E** to go through the Alarm #2 options, or press **H** to return to the main prompt.

Option 8 — Totalizer Setup

To access the **Totalizer Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **8** for the **Totalizer Setup** menu, and then press **E**.

A prompt appears for setting up the totalizer to **AUTO** reset or **MANUAL** reset.

When you choose **AUTO**, a prompt appears for setting an totalizer reset based on a maximum totalized flow limit.

```
TOTALIZER SETUP
RESET>AUTO      ^v
COUNT>1000000000 SCM
```

- 4> Use the number and decimal keys to enter a maximum totalized flow value, and then press **E**.
- 5> When you choose **MANUAL**, a prompt appears for resetting the totalizer.

Note Resetting the totalizer deletes all recorded data.
It is a good idea to backup collected data before resetting the totalizer.

- 6> Press **UP** or **DN** to select the **Yes** or **No**, and then press **E**.

Option 9 — Reset Totalizer

To access the **Reset Totalizer** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **9** for the **Reset Totalizer** menu, and then press **E**.

A prompt appears for resetting the totalizer.

```
RESET TOTALIZER
CONFIRM> NO  ^v
```

Note Resetting the totalizer deletes all recorded data.
It is a good idea to backup collected data before resetting the totalizer.

- 4> Press **UP** or **DN** to select the **Yes** or **No**, and then press **E**.

Option 10 — Field Calibration Correction Factor

This menu option (#10) is used to enter the Field Calibration Correction Factor (FCCF) and the Flow Filter Time Constant. The Field Calibration Correction Factor is a multiplier that is used as a bias correction on the flow average. The Flow Filter Time Constant is a digital filter time constant that is used to control the flow average response to a flow change.

To access the **Field Calibration Correction Factor** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **10** for the **Field Calibration Correction Factor** menu, and then press **E**.

A prompt appears for changing the field calibration correction factor.

```
FIELD CALIBRATION CF
> 1.0000
```

- 4> Use the number and decimal keys to change the field calibration correction factor, and then press **E**. The FCCF can be a number between 0.01 and 10.00.
- 5> Next, a prompt appears for changing the filter time constant.

```
FILTER TIME CONSTANT
> 0.50 SEC
```

- 6> Use the number and decimal keys to change the filter time constant, and then press **E**. The filter time constant has a unit of seconds and can be 0.00 to 600.00 seconds. A filter time constant of 0.00 seconds means there is no filtering of the calculated flow average.

Option 11 — Variable Correction Factor Setup

The Variable Correction Factor (VCF) is a velocity-dependent correction factor applied to the velocity average to account for velocity dependent deviations. Its value depends on the current velocity. VCF data is obtained by performing a field traverse or field calibration of the duct.

To access the **Variable Correction Factor (VCF) Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **11** for the **VCF Setup** menu, and then press **E**.

A prompt appears for entering the number of correction factor data sets.

```
# CF DATA SET>1
```

Up to eight correction factor data sets are allowed.

- 4> Use the number keys to specify the number of VCF data sets, and then press **E**.

The VCF Data #1 set prompt appears.

```
VCF DATA #1
  REF  / MEAS  SMPS
    1.00/    1.00
```

- 5> Press **C** to clear the current VCF data set, use the number keys to specify a different VCF data set, and then press **E**.

A less-than symbol (<) appears by the REF field.

```
VCF DATA #1
  REF< / MEAS  SMPS
    1.00/    1.00
```

- 6> Press **C** to clear the reference value, and then use the number and decimal keys to change the value.
- 7> Press **E** to accept the change or **P** to skip the field.

A less-than symbol (<) appears by the MEAS field.

```
VCF DATA #1
  REF  / MEAS< SMPS
    1.00/    1.00
```

- 8> Press **C** to clear the measured value, and then use the number and decimal keys to change the value.
- 9> Press **E** to accept the change or **P** to skip the field.

Repeat the process for each additional VCF data set.

Option 12 — Run Mode Display Setup

Run mode is the normal operational state of the Series 255. You can setup the information that appears on the display during Run mode. The default display information in Run mode is tag name, flow rate, and temperature.

To access the **Run Mode Display Type** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **12** for the **Run Mode Display Type** menu, and then press **E**.
A prompt appears for SCROLLED or STATIC.
- 4> Press the **UP** or **DN** key to select either **SCROLLED** or **STATIC**, then press **E**.
- 5> Selecting **SCROLLED** returns to the main Advanced mode menu.
For this setup, the display scrolls through TAG NAME, TEMPERATURE, FLOW RATE, DAILY TOTAL, and TOTALIZED FLOW.

```
RUNMODE DISPLAY TYPE
> SCROLLED      ^v
```

- 6> Selecting **STATIC** prompts for a selection of process data options.

```
RUNMODE DISPLAY TYPE
> STATIC        ^v
```

- 7> Press the **UP** or **DN** key to select the process data you want to appear in Line 1 of Run Mode, and then press **E**.

```
LINE1> TAG      ^v
LINE2  FLOW RATE
LINE3  VELOCITY
```

Options for each line are as follows:

Tag	Meter name
Temperature	Fahrenheit or Centigrade, based on English or metric flow units
Velocity	NMPS, SFPM, or SMPS, based on English or metric flow units
Flow Rate	PPM, SLPM, SCFM, PPH, SCMH, SCFH, NLPM, KGM, NCMH, KGH
Daily TOTFL	Continuous 24-hour data rolling log of daily total flow units
Total FL	Accumulated flow since the variable was last reset

- 8> Repeat the steps for Lines 2 and 3. The active field is identified by the ^ v characters that indicate making a selection using the **UP** or **DN** key. Press **P** to move to the next active field.

The prompt returns to the main Advanced mode menu after specifying Line 3.

Option 13 — Clock Setup

To access the **Set Clock** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **13** for the **Set Clock** menu, and then press **E**.

A prompt appears for the changing the date and time.

```
SET CLOCK  <MON>
           09 / 26 / 2018
           14 : 29
```

- 4> Press **UP** or **DN** to change the month <MON>, and then press **P**.
- 5> Press **UP** or **DN** to change the day <DAY>, and then press **P**.
- 6> Press **UP** or **DN** to change the year <YR>, and then press **P**.
- 7> Press **UP** or **DN** to change the hour <HR>, and then press **P**.
- 8> Press **UP** or **DN** to change the minute <MIN>, and then press **P**.
- 9> Pre **E** to save any changes.

The current clock settings appear.

```
CURRENT DATE/TIME
           10 / 20 / 2018
           09 : 30 : 55
```

- 10> Press **E** to exit and return to the main prompt.

Option 14 — Reference Temperature & Pressure

To access the **Reference Temperature & Pressure** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **14** for the **Reference Temperature & Pressure** menu, and then press **E**.

A prompt appears for the changing the reference temperature and pressure.

```
REF TEMP    PRESS
FAC  25.0C  101.32KPA
USR> 25.0C  101.32KPA
```

The arrow prompt indicates the active field.

Note The Factory reference temperature and pressure cannot be changed.

- 4> Use the number and decimal keys to change the reference temperature, and then press **E**.
- 5> Use the number and decimal keys to change the reference pressure, and then press **E**.

Option 15 — Minimum Kickout Count

The minimum kickout value determines the minimum number of flow channels that must remain to calculate the average before triggering a kickout alarm.

To access the **Minimum Kickout Count** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **15** for the **Minimum Kickout Count** menu, and then press **E**.

A prompt appears for the setting the minimum kickout count.

```
MIN KICKOUT COUNT
> 2
```

The number of configured channels determines the range of values.

- 4> Press **C** to clear the field.
- 5> Use the number keys to enter a kickout count, and then press **E**.

Option 16 — NE-43 Alarm Level

The NE-43 alarm level sets the 4-20 mA outputs low level (3.6 mA) or high level (21.0 mA) to indicate an alarm or fault conditions.

To access the **NE-43 Alarm Level** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **16** for the **NE-43 Alarm Level** menu, and then press **E**.

A prompt appears for the setting the NE-43 alarm to the low output value or high output value.

```
NE-43 ALARM LEVEL
> LOW OUTPUT    ^v
```

- 4> Press **UP** or **DN** to select the low output or high output, and then press **E**.

Option 17 — Modbus Communication

The Series 255 communicates with the flow sensors using the Modbus RTU protocol over RS-485. The system can communicate with up to 16 flow sensors based on the Series 255 model. The flow sensors are designated as Channels A through P. Each flow sensor channel has a unique Modbus address that has been preset/predefined in the Series 255 and cannot be changed. The channel IDs and corresponding Modbus addresses are listed in Table 4-3.

Table 4-3. Channel IDs and Corresponding Modbus Addresses

Channel ID	Modbus Address	Channel ID	Modbus Address
Ch A	11	Ch I	19
Ch B	12	Ch J	20
Ch C	13	Ch K	21
Ch D	14	Ch L	22
Ch E	15	Ch M	23
Ch F	16	Ch N	24
Ch G	17	Ch O	25
Ch H	18	Ch P	26

For the Series 255 to communicate with the flow sensors, the Series 255 must be set to the same Modbus baud rate as all sensors. To access the **Modbus Baud Rate** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **17** for the **Modbus Baud Rate** menu, and then press **E**.

Note The system must be in Maintenance mode (Option 17) to change the Modbus baud rate.

A prompt appears for the selecting the Modbus baud rate.

```

MODBUS BAUD RATE
> 38400      ^v
  
```

Modbus baud rate options are 9600, 14400, 19200, 38400, 57600, or 115200.

Important *The baud rate that the Series 255 uses to communicate with the flow sensors can be changed. However, changing the baud rate in the Series 255 requires that the baud rate is the same for all flow sensors.*

Intermittent communication failures with the flow sensors may require setting the Modbus baud rate to a slower rate. Longer distances between the Series 255 and the flow sensors requires a slower baud rate.

- 4> Press **UP** or **DN** to select the Modbus baud rate, and then press **E**.

Option 18 — Serial USB Baud Rate

Note A computer running a terminal emulator program (such as Tera Term) must be connected to the USB port to capture the data before using this option. Refer to Chapter 5 for information on using a terminal emulator and the USB port.

To access the **Serial USB Baud Rate** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **18** for the **Serial USB Baud Rate** menu, and then press **E**.

A prompt appears for the selecting the serial USB baud rate.

```
SERIAL USB BAUD RATE
> 38400                ^v
```

Serial USB baud rate options are 9600, 14400, 19200, 38400, 57600, or 115200.

- 4> Press **UP** or **DN** to select the serial USB baud rate, and then press **E**.

Option 19 — System Operational State

To access the **System Operational State** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **19** for the **System Operational State** menu, and then press **E**.

A prompt appears for the selecting the system operational state.

```
SYSTEM OP STATE
> OPERATE             ^v
```

System operational state options are Operate or Maintenance.

Important *While the Series 255 is in Maintenance state, it will not communicate with the flow sensors.*

- 4> Press **UP** or **DN** to select the operational state, and then press **E**.

Option 20 — Number of Channels

To access the **Number of Channels** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **20** for the **Number of Channels** menu, and then press **E**.

A prompt appears for setting the number of channels.

```
NUMBER OF CHANNELS
>
```

The maximum number of channels is based on the Series 255 model number.

Table 4-4. Channels Per Series 255 Model

Series Model	Maximum Number of Channels
Model 255A	Up to 4 sensors
Model 255B	Up to 9 sensors
Model 255C	Up to 16 sensors
Model 255DC	Up to 16 sensors

- 4> Use the number keys to change the number of channels, and then press **E**.

Option 21 — Channel Setup

The Channel Setup menu allows assigning a flow sensing channel ONLINE or OFFLINE, and to INCLUDE or EXCLUDE its velocity and temperature measurement from the calculated average.

To access the **Channel Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **21** for the **Channel Setup** menu, and then press **E**.

```
CHANNEL> A   SELECT
ONLINE > YES   ^v
INCLUDE> YES   ^v
```

Note The word “SELECT” is part of the prompt for making a channel selection.

The channels are numbered from A through P.

- 4> Use the number keys to scroll through the letters for the specific channel.

For example, repeatedly pressing the **2** key scrolls through A, B, C.

- 5> Press **E**.

The ^v symbol appears next to ONLINE.

- 6> Press the **UP** or **DN** key to select **YES** or **NO**.

For example, selecting YES places the channel ONLINE and includes the channel data on every update cycle. Selecting NO places the channel OFFLINE and excludes the channel data.

Note When the channel is OFFLINE, it is also excluded from the average calculation. When the channel is ONLINE, the v^ symbol appears next to INCLUDE.

- 7> Press **E**.

- 8> Press the **UP** or **DN** key to select **YES** or **NO**.

For example, YES includes the velocity and temperature channel data in the average. Selecting NO excludes the channel data in the average calculation.

- 9> Press **E**.

Option 22 — User Access Codes

To access the **User Access Codes** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **22** for the **User Access Codes** menu, and then press **E**.

A prompt appears for setting the Basic and Advanced access codes.

```
USER ACCESS CODE
BASIC> 123456
ADV  > 654321
```

- 4> Use the number keys to enter six digits for the Basic access code, and then press **E**.
- 5> Use the number keys to enter six digits for the Advanced access code, and then press **E**.

Option 23 — Analog Output Calibration

The 4-20 mA outputs are calibrated per the customer's initial order. However, it may be necessary to recalibrate the outputs after the system has been operating to ensure the output correctly represents the process measurements on a 4-20 mA scale.

An external ammeter must be connected to the Series 255 analog outputs to accurately measure the 4.0mA and 20.0mA signals generated by the Series 255. The **UP** and **DN** keys are used to adjust the Series 255 output during the calibration process.

The Series 255 supports up to two analog output (AO) channels. Each analog output channel (AO1 and AO2) can report flow rate, temperature, or velocity.

The output and signal range for process variables provided by the Series 255 transmitter are configured through the **Analog Output Setup** menu in Advanced mode. The receiving device must be programmed for the same range.

To access the **Analog Output Calibration** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **23** for the **Analog Output Calibration** menu, and then press **E**.

A prompt appears for the analog output channel number.

```
ANALOG OUT #1
```

- 4> Press the numeric keys to enter either **1** or **2** for the analog output channel, and then press **E**.
The prompt appears for calibrating the low level (4 mA) for Analog Output #1.

```
CAL AO1 to 4.000 mA
>USE ^v TO ADJUST OUT
OUT = 4.0000 mA
```

- 5> Press the **UP** or **DN** key until the ammeter measures 4.000 mA.
For larger increments, press the **L** key and then continue pressing the **UP** or **DN** key.
Press **E** when the ammeter measures 4.000 mA.

The prompt appears for calibrating the high level (20 mA) for Analog Output #1.

```
CAL AO1 to 20.000 mA
>USE ^v TO ADJUST OUT
OUT = 20.0000 mA
```

- 6> Press the **UP** or **DN** key until the ammeter measures 20.000 mA.
For larger increments press the **L** key and then continue pressing the **UP** or **DN** key.
Press **E** when the ammeter measures 20.000 mA.

	SLOPE	OFFST
CUR	0.888	0.008
NEW	0.888	0.008

The current line for the slope and offset indicate the previous settings, while the new settings for slope and offset indicate any changes that will be applied after exiting the prompt.

- 7> Press **E** to return to the main prompt.
- 8> To calibrate Analog Output #2, enter **21**, and then enter **2** to specify Analog Output #2.

Option 24 — Analog Output Test

To access the **Analog Output Test** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **24** for the **Analog Output Test** menu, and then press **E**.

A prompt appears for entering the current output (mA) for the AO channels.

```
ENTER OUTPUT
> 12.4000 mA
```

Valid entries are between 3.4 mA and 22.0 mA.

- 4> Press **C** to clear the field.
- 5> Use the number and decimal keys to change the output number, and then press **E**.

Option 25 — NE-43 Alarm Test

To access the **NE-43 Alarm Check** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **25** for the **NE-43 Alarm Check** menu, and then press **E**.

A prompt appears for the NE-43 low alarm level for the analog output.

```
LOW ALARM CHECK
ANALOG OUT <= 3.6 mA
```

The Series 255 will output 3.6 mA to both analog output channels.

- 4> Verify that the DCS is measuring 3.6 mA.
- 5> Press **P**.

```
HIGH ALARM CHECK
ANALOG OUT <= 21.0 mA
```

The Series 255 will output 21.0 mA to both analog output channels.

- 6> Verify that the DCS is measuring 21.0 mA.
- 7> Press **H** to exit.

Option 26 — Restore Auxiliary Configuration

After using Option 26, **Save to Auxiliary Configuration**, use **Restore Auxiliary Configuration** to use the previously saved configuration data set.

Note When the Series 255 leaves Kurz, the Auxiliary configuration data set is the same as the Factory configuration data set.

To access the **Restore Auxiliary Configuration** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **26** for the **Restore Auxiliary Configuration** menu, and then press **E**.

A prompt appears for restoring the auxiliary configuration.

```
RESTORE AUX CONFIG
CONFIRM> NO ^V
```

- 4> Press **UP** or **DN** to select **YES** or **NO**, and then press **E**.

Option 27 — Restore Factory Configuration

Restoring the Factory configuration data set makes it the active configuration.

Important *Restoring the Factory configuration erases any custom settings that have been implemented.*

To access the **Restore Factory Configuration** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **27** for the **Restore Factory Configuration** menu, and then press **E**.

A prompt appears for restoring the Factory configuration.

```
RESTORE FACTORY CFG
CONFIRM> NO  ^V
```

- 4> Press **UP** or **DN** to select the **Yes** or **No**, and then press **E**.

```
RESTORE FACTORY CFG
PRESS E TO CONTINUE
```

- 5> Press **E** to restore the factory configuration.

Option 28 — Save to Auxiliary Configuration

To access the **Save to Auxiliary Configuration** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **28** for the **Save to Auxiliary Configuration** menu, and then press **E**.

A prompt appears for saving your current configuration as a restore point.

```
SAVE TO AUX CFG
CONFIRM> NO  ^V
```

Note Saving the configuration information to the auxiliary EEPROM memory allows you to retain a configuration with current settings. There is no need to save the configuration with the default factory settings, which are permanently stored.

- 4> Press **UP** or **DN** to select the **Yes** or **No**, and then press **E**.

Option 29 — Output Report to USB

This option downloads a selected report in a readable text format to the USB port. The available reports that can be downloaded are:

CURR CFG – Configuration data set currently in use

AUX CFG – The auxiliary configuration data set in non-volatile memory

FACT CFG – The factory configuration data set

ZERO/SPAN – The results from the last Zero/Span check

Note A computer running a terminal emulator program (such as Tera Term) must be connected to the USB port to capture the data before using this option. Refer to Chapter 5 for information on using a terminal emulator and the USB port.

To access the **Output Report to USB** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **29** for the **Output Report to USB** menu, and then press **E**.

A prompt appears for the selecting the report to download.

```
SELECT OUTPUT TO USB
> CURR CFG    ^v
```

- 4> Press **UP** or **DN** to select the report, and then press **E**.

The following prompt appears.

```
SELECT OUTPUT TO USB
PRESS E TO CONTINUE
```

- 5> Press **E** to send the data to the USB port. The data will immediately be displayed on the connected terminal emulator program. The text on the terminal emulator window/screen can be copied and saved to a text file for printing or electronic archiving.

An example of each report is shown in Figure 4-1 and Figure 4-2

```

MODEL 255C Configuration - EEPROM Memory 255CONFIG
Serial Number 10000
Firmware Version BETA 2.04

Tag_ID PRIMARY AIR
User Flow Unit SCMh
Flow Area 1.00 SQM

Gas Name AIR
Gas Mol Wt 28.96 G/MOL

          Ref Pres      Ref Temp
          KPA          DEGC
Factory  101.32        25.00
User     101.32        25.00

Analog Out Setup
          Type(Units)      Low Scale  High Scale  Cal 1  Cal 2
AO1 FLOW RATE (SCMH)      0.00     9500.00  0.0000 1.0000
AO2 TEMPERATURE(DEGC)    0.00     250.00  0.0000 1.0000

Number of Channels 10  Max Channels 16
  A  B  C  D  E  F  G  H  I  J
ONL Y  Y  Y  Y  N  N  N  N  N  N
INC Y  Y  Y  Y  Y  Y  Y  Y  Y  Y
ADR 11 12 13 14 15 16 17 18 19 20

Modbus BAUD 38400  USB BAUD 38400

Alarm Setup
          Enabled Type
Alarm1   Y  MAINT MODE
Alarm2   Y  SYS FAIL

NE43 Out <3.6 mA
Kickout Min 2 Channels

Zero-Span Setup
Automatic Schedule is OFF MANUAL or DI2 Trigger
          Zero  Mid  Span
Percent  10    50  90  %
Duration 60    60  60  sec

Purge Enabled YES
Purge Timer is ON set for every 60 Minutes

Field Cal CF 1.000
Number of VCF 1
          Vref  Vavg
          0.01  0.01

```

Figure 4-1. Sample Configuration Output

```
ZERO-SPAN REPORT 01/01/2018 15:18:32
255 SERIAL NUMBER 10148

ZERO-SPAN TEST RUN ON 01/01/2018 15:16:23

SYSTEM HAS ONE OR MORE FAULTS, ERROR CODE IS 0100

SYSTEM HAS 4 CHANNELS
NUMBER OF CHANNELS IN AVERAGE 3
ONE OR MORE CHANNELS FAULTED OR UNUSED

OUTPUT CHECK
      PERCENT   DATA   OUTPUT
              SCFH     MA
ZERO         10    20000.0    5.60
MID          50   100000.0   12.00
SPAN         90   180000.0   18.40

_____  
TECHNICIAN NAME                               _____  
DATE
```

Figure 4-2. Sample Zero-Span Report

Option 30 — USB Data Log Setup

This option activates and deactivates data logging to the USB port. A computer/laptop running a terminal emulator program (such as Tera Term) must be connected to the USB port to capture the data. The data is logged on a fixed 1 second interval. This interval cannot be changed.

Note A computer running a terminal emulator program (such as Tera Term) must be connected to the USB port to capture the data before using this option. Refer to Chapter 5 for information on using a terminal emulator and the USB port.

To access the **USB Data Log Setup** menu in Program mode:

- 1> Press **P**.
- 2> Enter the Advanced access code, and then press **E**.
- 3> Press **30** for the **USB Data Log Setup** menu, and then press **E**.

A prompt appears for selecting the USB logging option.

```

USB LOGGING
> COR+RAW VEL&TMP  ^v
  
```

The USB Logging options are:

- OFF – no data is logging to the USB port
- COR+RAW VEL&TMP – comma separated values as follows:
 - MM/DD/YYYY, HH:MM:SS
 - Averaged velocity (value in user units with correction factors applied)
 - Raw averaged velocity (value in SMPS without correction factors)
 - Averaged temperature (value of mass weighted temperature in user units)
 - Raw averaged temperature (value in DegC, mathematical average of the temperatures)
- RAW VEL&TEMP – comma separated values as follows:
 - MM/DD/YYYY, HH:MM:SS
 - Raw averaged velocity (value in SMPS without correction factors)
 - Raw averaged temperature (value in DegC, mathematical average of the temperatures)

- 4> Press UP or DN to select the data logging format, and then press E.

When a logging option is selected (other than OFF), the data will immediately start streaming to the USB port and continue whether or not it is being captured.

Options 31 and 32 – Sensor Purge Cleaning

In applications with dust and dirt in the process gas stream, material can build up on the flow sensor creating an insulating layer around the sensing element. This dirt build up will cause the sensor to lose less heat and read lower than when it was calibrated. This problem can be avoided by performing periodic purge cycles on the flow sensors.

The Purge feature can be ordered on the 255 Flow Averager and the connected flow elements. The system must be ordered with the purge capability, since the flow elements must have the specifically built probe support and electronics for sensor purge cleaning and the 255 must have the corresponding factory programming to manage the purge control.

There are several ways the purge cycle can be initiated through the 255:

- A specified time interval
- An external contact closure through digital input #2
- A menu option in Program Mode
- Through A HART command

You can specify whether the purge cycles are automatically controlled and the time interval of the purge cycles. These purge parameters can be changed in Program Mode using Option #31. The user can use Program Mode Option #32 to initiate a manual purge cycle. If the 255 does not have the purge feature, the following will be displayed when accessing these purge menu options:

PURGE NOT ENABLED

Option 31 – Purge Timer Setup

To access the Purge Timer Setup menu in Program mode:

- 1> Press P
- 2> Enter the Advance access code, and then press E.
- 3> Press 31 for the Purge Timer setup

A prompt appears for selecting if the Purge cycle timer is OFF or ON

```
PURGE SETUP
TIMER > OFF  ^v
```

- 4> Press UP or DN to select OFF or ON, and then press E
- 5> When you choose ON, a prompt appears to enter the purge interval in minutes.

```
PURGE SETUP
TIMER > ON   ^v
INTERVAL > 60 MIN
```

- 6> Use the number keys to enter the purge interval and then press E. The interval can be 3 minutes and up to 1440 minutes (24 hours).

Option 32 – Purge Manual Command

You can use Program Mode Option #32 to initiate a manual purge cycle as follows:

- 1> Press P
- 2> Enter the Advance access code, and then press E.
- 3> Press 32, and then press E for the Purge Manual Command
- 4> If a purge cycle is currently active, a prompt appears to indicate that a purge cycle is in progress. You must wait for the active purge cycle to complete before you can start the purge cycle.

```
PURGE IN PROGRESS
ANY KEY TO CONTINUE
```

- 5> If there is no purge cycle active, a prompt appears to start the purge cycle

```
MANUAL PURGE
START PURGE > NO ^v
```

- 6> Press UP or DN to select NO or YES, and then press E.

Options 33 Thru 35 - Zero/Mid/Span Check

The Zero/Mid/Span Check is a standard feature in the Series 255 that provides system wide checks of the connected flow elements and the drift characteristics of the 255 output signals.

The test sequence is summarized below.

- 1> Get the time stamp for the test
- 2> Read the Event Codes from each of the flow elements and check that there are no errors on 100% of the included sensors
- 3> Record if any flow elements are kicked out of the flow rate and temperature average calculation
- 4> Check and record if the 255 is indicating any fault codes
- 5> Substitute an output signal that tests the 4-20 mA signals at the low end of the output range. The duration and value is specified by the user
- 6> After the low scale test duration has elapsed, substitute an output signal that tests the 4-20 mA signals at the middle of the output range. The duration and value is specified by the user.
- 7> After the mid- scale test duration has elapsed, substitute an output signal that tests the 4-20 mA signals at the high end of the output range. The duration and value is specified by the user.
- 8> After the high scale test duration has elapsed, save the test data and end the test.

While a zero/mid/span check is running

- A warning event will be active on the event line
- If an alarm is programmed, the alarm output will be actuated during the zero/mid/span check
- The AMBER panel light will be on, indicating that the output signal is temporarily invalid

A test report can be downloaded from the USB port and saved or printed. The figure below shows an example of the Zero/Mid/Span Test Report.

ZERO-SPAN REPORT 01/01/2018 14:55:28
255 SERIAL NUMBER 10148

ZERO-SPAN TEST RUN ON 01/01/2018 14:52:01

SYSTEM HAS ONE OR MORE FAULTS, ERROR CODE IS 0108

SYSTEM HAS 4 CHANNELS
NUMBER OF CHANNELS IN AVERAGE 3
ONE OR MORE CHANNELS FAULTED OR UNUSED

OUTPUT CHECK	PERCENT	DATA SCFM	OUTPUT MA
ZERO	10	950.0	5.60
MID	50	4750.0	12.00
SPAN	90	8550.0	18.40

TECHNICIAN NAME	DATE
-----------------	------

There are four ways to initiate the Zero/Mid/Span test

- A specified time schedule (Automatic/Scheduled Test)
- An external contact closure through digital input #1 (On-Demand)
- A menu option in Program Mode (On-Demand)
- Through a HART command (On-Demand)

The Zero/Mid/Span parameters can be changed in Program Mode using Options #33 and #34.

Option 33 – Zero-Span Schedule Setup

The Zero/Mid/Span test can be setup to run automatically at a user defined time of day + number of days schedule. To access the Zero-Span Schedule Setup menu in Program mode:

- 1> Press P
- 2> Enter the Advanced access code, and then press E.
- 3> Press 33 for the Zero-Span Schedule setup

A prompt appears for selecting if the Zero-Span Check will be run on a timed schedule (automatically).

```
ZERO/SPAN CHECK
AUTOMATIC > NO  ^v
```

- 4> Press UP or DN to select Yes or No, and then press E.
- 5> When you choose YES, a prompt appears for setting the number of days interval

```
ZERO/SPAN CHECK
INTERVAL >  1 DAYS
```

- 6> Use the number keys to enter the Zero/Span number of days interval, and then press E. The interval can be 1 (daily) to 30 (once a month; every 30 days).
- 7> Next, a prompt appears to set the time of day.

```
ZERO/SPAN CHECK
INTERVAL >  1 DAYS
TOD       >  5:00 AM
```

- 8> Press UP or DN to scroll through the time of day options of MIDNIGHT through 11:00 PM.
- 9> Press E to select the time of day option.

Option 34 – Zero-Span Test Parameters Setup

The Zero/Mid/Span test is a multi-stage test that checks the operational status of the flow elements as well as the drift characteristics of the 255 output signals. The 255 4-20 mA output signals are tested by driving a user specified low, mid-range, and high (Zero/Mid/Span) signal to both analog output channels. The user specifies the amplitude and duration of the output signals at each test stage. The amplitude is given as a percent of the full scale of the Analog Out #1. Running the Zero/Mid/Span test periodically can determine if the 255 outputs are drifting and need to be recalibrated. The periodic test can also check for any unauthorized configuration changes or if the memory holding the 255 configuration parameters has been corrupted.

Option 34 is used to enter the Percent and Duration for each test level.

- 1> Press P.
- 2> Enter the Advanced access code, and then press E.
- 3> Press 34 for the Zero-Span Test Parameter setup

A prompt appears to enter the percent (amplitude) for the Zero Check

```
CFG FOR ZERO CHECK
% FULLSCALE > 10
```

- 4> Use the number keys to enter the percent of the Analog Out #1 high range to drive the low range test, and then press E.

For example, if Analog Out #1 is assigned to output flow rate in the range 0-12,000 SCFM and 10% is entered, the Zero Check amplitude would be 10% of 12,000 SCFM or 1200 SCFM. On the 4-20 mA scale 1200 SCFM is 5.6 mA.

- 5> Next, a prompt appears to enter the duration of the Zero Check Test.

```
CFG FOR ZERO CHECK
% FULLSCALE > 10
SEC DURATION > 60
```

- 6> Use the number keys to enter the duration, in seconds, of the Zero Check test, and then press E.
- 7> Next, a prompt appears to enter the percent (amplitude) of the mid range test.

```
CFG FOR MID CHECK
% FULLSCALE > 50
```

- 8> Use the number keys to enter the percent of the Analog Out #1 high range to drive the mid range test, and then press E.

For example, if Analog Out #1 is assigned to output flow rate in the range 0-12,000 SCFM and 50% is entered, the Mid Check amplitude would be 50% of 12,000 SCFM or 6000 SCFM. On the 4-20 mA scale 6000 SCFM is 12.0 mA.

- 9> Next, a prompt appears to enter the duration of the Mid Check Test.

```
CFG FOR MID CHECK
% FULLSCALE > 50
SEC DURATION > 60
```

- 10> Use the number keys to enter the duration, in seconds, of the Mid Check test, and then press E.
11> Next, a prompt appears to enter the percent (amplitude) of the span test.

```
CFG FOR SPAN CHECK
% FULLSCALE > 90
```

- 12> Use the number keys to enter the percent of the Analog Out #1 high range to drive the span test, and then press E.

For example, if Analog Out #1 is assigned to output flow rate in the range 0-12,000 SCFM and 90% is entered, the Span Check amplitude would be 90% of 12,000 SCFM or 10,800 SCFM. On the 4-20 mA scale 10,800 SCFM is 18.4 mA.

- 13> Next, a prompt appears to enter the duration of the Span Check Test.

```
CFG FOR SPAN CHECK
% FULLSCALE > 90
SEC DURATION > 60
```

- 14> Use the number keys to enter the duration, in seconds, of the Span Check test, and then press E.

Option 35 – Zero-Span Manual Command

The user can initiate a Zero/Mid/Span test manually in Program mode:

- 1> Press P.
- 2> Enter the Advanced access code and then press E
- 3> Press 35, and then press E.

If a test is currently active, a prompt appears to indicate that a test is in progress and prompt you to abort it.

```
TEST IN PROGRESS
ABORT IT > NO  ^v
```

- 4> Press UP or DN to scroll between YES and NO and press E.
- 5> If no Zero/Mid/Span test is active, a prompt appears to select a drift test

```
SELECT DRIFT TEST
>ZERO DRIFT CHECK ^v
```

- 6> Press UP or DN to scroll through drift test options, and then press E. The drift test options are ZERO DRIFT CHECK, MID DRIFT CHECK, SPAN DRIFT CHECK or CYCLE DRFT CHECK. The CYCLE DRFT CHECK option cycles through the three test levels.

USB Connection for Terminal Emulators

Overview

This chapter provides an example of connecting a terminal emulator (in this case Tera Term) to the USB port for capturing data.

USB Connection

The Series 255 includes a USB cable located behind the microprocessor board. The USB cable provides a direct connection between the Series 255 and a computer USB port.

Note A terminal emulator program (such as Tera Term) must be running on the computer connected to the Series 255.

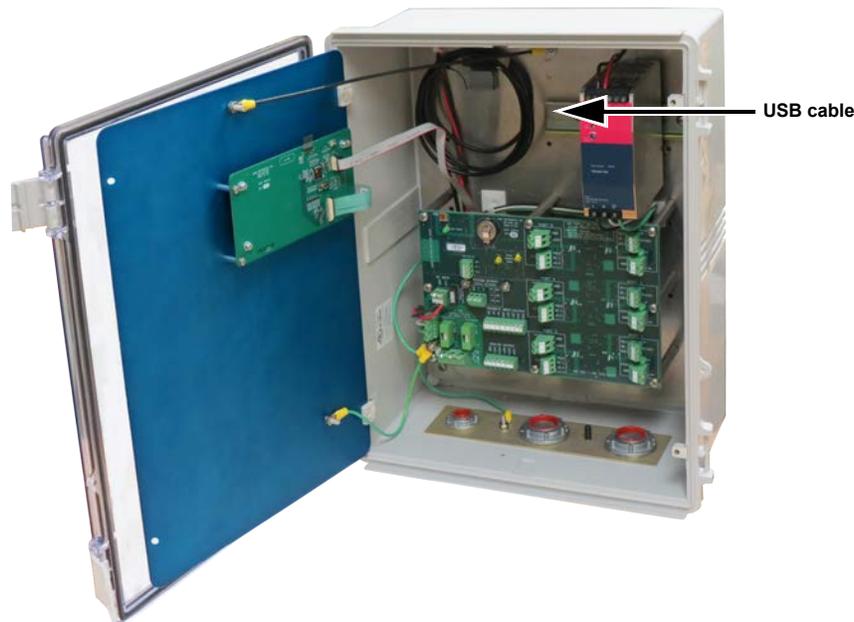


Figure 5-1. USB Cable on Microprocessor Board

Program mode Options 29 and 30 (available through Advanced access) are used with the USB port. Before you can use these options make sure that the serial port settings on your terminal emulator program matches the serial port settings on the Series 255.

The required settings for the Series 255 serial port associated with the USB port are as follows:

- Data bits: **8 bit**
- Parity: **none**
- Stop bits: **1 bit**
- Flow control: **none**

Using Program mode option 18, the baud rate can be configured to 9600, 14400, 19200, 38400 (default), 57600, or 115200. The terminal emulator program serial port settings must be the same as the Series 255 USB serial port settings for successful communication.

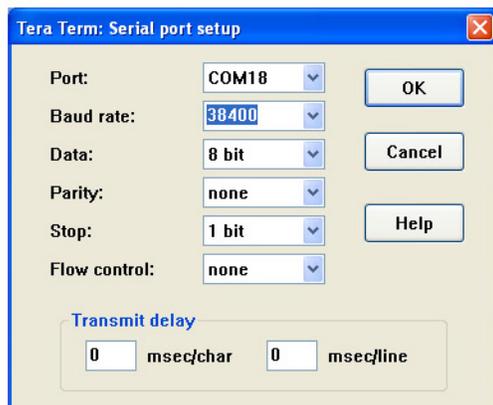
Configuring Tera Term

Before using a terminal emulator (such as Tera Term), the Series 255 must be turned on and connected to the computer.

- 1> Start **TeraTerm**.
- 2> Open a Serial Connection on the computer.
The New Connection dialog box appears.

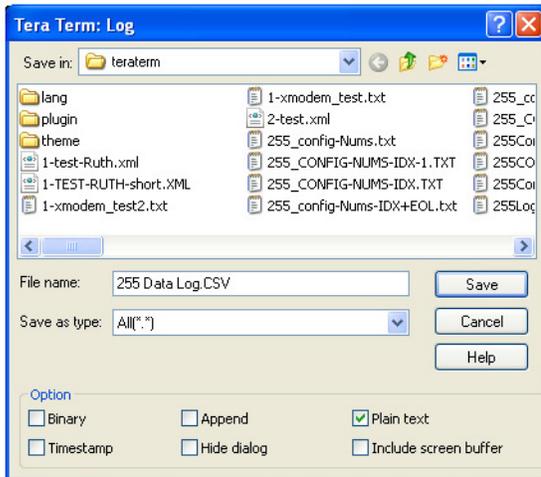


- 3> Select **Serial** and click **OK**.
- 4> Select **Setup**→**Serial Port**.



- 5> Set the serial port properties as follows and then click **OK**.
 - Baud rate: **38400**
 - Data: **8 bit**
 - Parity: **none**
 - Stop: **1 bit**
 - Flow control: **none**

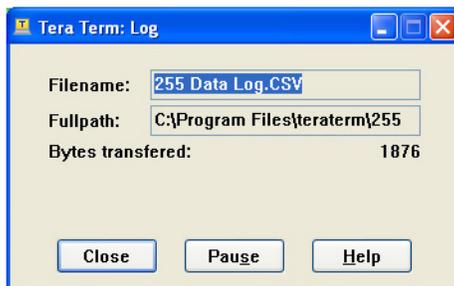
- 6> Select **File**→**Log** to capture the logged data to a file.



- 7> Enter a filename with a CSV extension and check **Plain text**.

- 8> Click **Save**.

Tera Term pushes the data appearing in the Tera Term window to a data file.



- 9> To stop data logging to the file, click **Close** to save the file.

It can be opened and analyzed using a spreadsheet application (such as Microsoft Excel).

Modbus RS-485 Service Port

The Series 255 features two Modbus ports for a convenient communication connection to individual flow sensing devices, as shown in Figure 5-2. Both connection cannot be used at the same time.

- The RS-485 USB mini-B female port connects directly to a computer with a USB A-Type port. This connection provides the built-in conversion from RS-485 to USB to communicate directly with the flow meter sensors for service, troubleshooting, or programming changes. The computer must have a Modbus master application installed, such as the Kurz application KzComm (see the *KzComm User's Guide* for additional information).
- The RS-485 3-pin terminal block for a twisted pair cable supports connecting to a Modbus master.

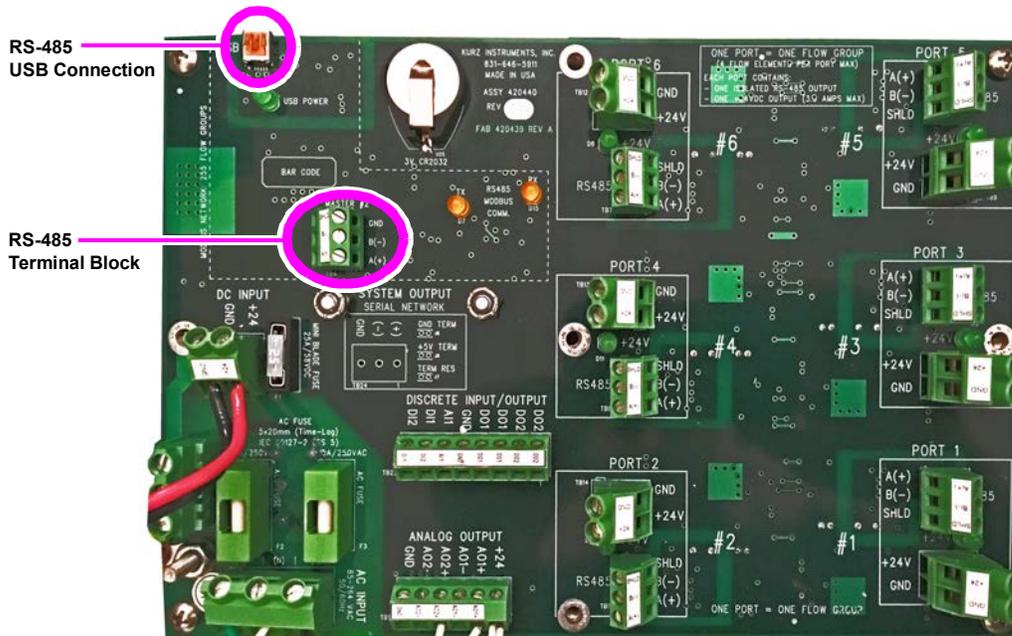


Figure 5-2. Service Port Locations

Diagnostics & Troubleshooting

Overview

This chapter provides diagnostic and troubleshooting for the Series 255 Flow Averaging Transmitter.

The error handling of the Series 255 is designed to support the following alarm specifications:

- NAMUR Specification NE-43
- NAMUR Specification NE-107
- EN 15267 – Certification of AMS (QAL1)

The troubleshooting section provides information for the most common operating problems. There is also guidance in troubleshooting communication issues between the Series 255 and the flow sensor channels.

Event Notification

There are several methods that the Series 255 uses to notify the user of system abnormalities:

- Messages appear on the local display as a text string.
- Activating an alarm output.
- Indicating as a low/high level on the 4-20 mA outputs (NE-43).
- Indicating as a status indicator on the front panel (NE-107).
- Associating with data quality status of the process variables.

Local Display Event Line

Line four on the Series 255 front panel display provides system messages and events.

- System messages are momentary prompts that appear for three seconds and then automatically clear. These messages are usually triggered by user interaction with the system via the local keypad.
- System events are triggered by irregular or abnormal system states or system events. The event text appears as long as the event is active. If there is more than one event, all active events will scroll.

If no events are active then “NO EVENTS” appears on line 4. Whenever a new event is triggered, it is added to the event log with a time stamp. Table 6-1 lists the triggers for system events.

Table 6-1. System Events and Triggers

Bit Code	Event Text	Trigger
0x00	NO EVENTS	Normal – no errors
0x01	ALL CHANNELS FAILED	All channels have fault (SYSTEM SENSOR FAIL).
0x02	MODBUS COMM FAIL	All channels have communication fault (SYSTEM COMM FAIL).
0x04	SYSTEM OFFLINE/MAINT	Flow averaging transmitter put in MAINTENANCE MODE (SYSTEM MAINTENANCE) or Zero Span check is active.
0x08	WRN-FLOW OUT OF RANGE	A flow average is calculated but it is out of range low or high.
0x10	WRN-TEMP OUT OF RANGE	A temperature average is calculated but it is out of range low or high.
0x20	WRN-CHAN KO AT MIN	Number of channels left is at minimum.
0x40	WRN-TOTAL AT HIGH SP	Flow Totalizer has reached a user-specified maximum.

Table 6-1. System Events and Triggers (continued)

Bit Code	Event Text	Trigger
0x80	WRN-ELEC TEMP OV LIM	Electronics temperature of Series 255 board is over limit.
0x100	WRN-CHANNEL KICKOUT	One or more channel is kicked out of the average.

The Event Log contains a historical record of the last 260 fault events reported by the Series 255. The Event Log is stored in nonvolatile memory (EEPROM) on the Series 255. Each event record contains the event error code and a timestamp (date and time) when the error code was triggered.

Series 255 Alarm Outputs

There are two alarms on the Series 255 that are each linked to an optically coupled solid state relay (SSR). Each SSR is rated for 0.5A, 24 VDC. The relays can be used to interface with external audible alarms or warning lamps. Alarm 1 is linked to DO1 and Alarm 2 is linked to DO2. By default, the system is shipped so that Alarm 1 triggers on a SYSTEM FAIL event and Alarm 2 triggers on a SYSTEM OFFLINE event. Each of the alarms can be configured to trigger on the events listed in Table 6-2.

Table 6-2. Alarm Triggers

Alarm Event	Description
System Fail	SYSTEM SENSOR FAIL or SYSTEM COMM FAIL
System OFFLINE	SYSTEM MAINTENANCE
Channel Kickout	CHANNEL KICKOUT AT MIN
Zero/Span Check Active	ZERO SPAN CHECK CYCLE IS ACTIVE
Flow out of range	FLOW OUT OF RANGE (low or high)
Temp out of range	TEMPERATURE OUT OF RANGE (low or high)

NAMUR NE-43

Namur NE-43 specifies how a sensor fault is indicated using the 4-20 mA output signal. The fault indicators can be configured to be either low (3.6 mA) or high (21.0 mA). An NE-43 alarm indication is triggered under the following conditions:

- SYSTEM SENSOR FAIL
- SYSTEM COMM FAIL
- SYSTEM MAINTENANCE

In all cases, both 4-20 mA signals (AO1 and AO2) will indicate with NE-43 alarm low or high, and the values of the process variables (flow, velocity, temperature) will be set to NOT_A_ NUMBER (9,876,543).

Channel Kickout

There are several faults that can cause a flow sensor channel to be kicked out of the average.

A flow sensor channel is kicked out of the average if its status error code from the Modbus query is non-zero. A non-zero status error code indicates there is a problem with the channel's flow sensor. The status error code for the channel can be viewed on the Channel Detail (Display mode, Option 5). The channel's velocity unit can be changed using KzComm and the RS-485 service ports on the Series 255 main board.

A channel is kicked out if its engineering unit is not in metric (SI units). When the Series 255 powers up it requests configuration information from each of the flow sensing channels including the velocity and temperature engineering units. This information is also requested when a channel is placed ONLINE. If the velocity unit is not NMPS, the Series 255 kicks out the channel from the average. A channel's unit configuration can be viewed on the Channel Detail (Display mode, Option 5).

A communication fault on a flow channel occurs if the flow sensor does not respond to Series 255 Modbus commands or if the response packet is not readable. The communication fault causes the flow channel data to be kicked out of the average. When a communication fault occurs, the Series 255 does not perform a retry on a flow sensor but will continue to send cyclic commands. The channel's communication status can be viewed on the Channel Detail (Display mode, Option 5).

Note If a flow sensor is not responding, it should be placed OFFLINE. It will cause the total communication cycle time to be longer.

NAMUR NE-107

Namur NE-107 provides a status signal that summarizes the health of the device. Table 6-3 shows the control panel event triggers that correspond to the NE-107 categories.

Table 6-3. Front Panel Status LEDs Description

Category	Description	Device Message/ Event
Normal (green, check mark)	System is normal, signal is valid.	NO EVENTS
Failed (red, X mark)	Signal is invalid due to a malfunction in the device, sensor, or actuator.	SYSTEM SENSOR FAIL SYSTEM COMM FAIL
Out of Specification (yellow, question mark)	Permissible ambient or process conditions exceeded, or the measuring uncertainty of sensors or deviations from the set value in actuators is probably greater than expected.	FLOW OUT OF RANGE TEMP OUT OF RANGE

Table 6-3. Front Panel Status LEDs Description

Category	Description	Device Message/ Event
Maintenance required (blue, oil can)	Advisory. Although the signal is valid, the remaining life is nearly exhausted or a function will soon be restricted due to operational conditions.	CHANNEL KICKOUT ELECT TEMP HI
Check Function (amber/orange, wrench)	Signal temporarily invalid due to on-going work on the device.	SYSTEM MAINTENANCE ZERO-MID-SPAN TEST IS ACTIVE

The Series 255 Flow Averaging Transmitter uses easy to understand NAMUR NE-107-compliant colored status indicators on the front panel for five primary device diagnostic categories including System Normal, when there are no events active on the system. The status indicators are color coded according to the NE-107 recommendations.

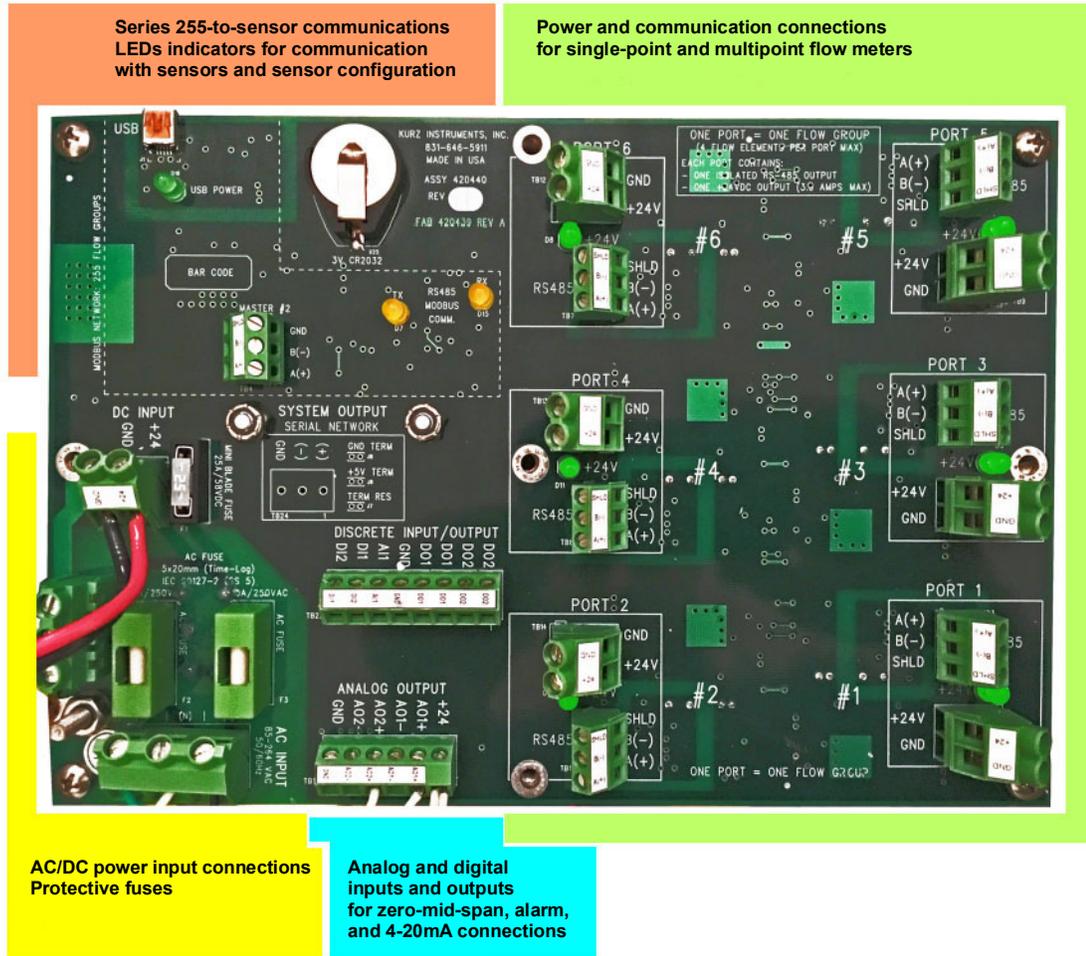
Data Quality Status Byte

Each of the process variables provided by the Flow Averaging Transmitter (flow, velocity, temperature) have a corresponding data quality status that indicates:

- GOOD = the value is useful
- UNCERTAIN = the quality of the value is suspect
- BAD = the value is not useful

The data quality status is passed through to fieldbus protocols that support this additional process variable information.

Series 255 Main Board Overview



Series 255-to-sensor communications LEDs indicators for communication with sensors and sensor configuration

Power and communication connections for single-point and multipoint flow meters

AC/DC power input connections Protective fuses

Analog and digital inputs and outputs for zero-mid-span, alarm, and 4-20mA connections

Figure 6-1. Series 255 Motherboard Overview

AC Power Connections

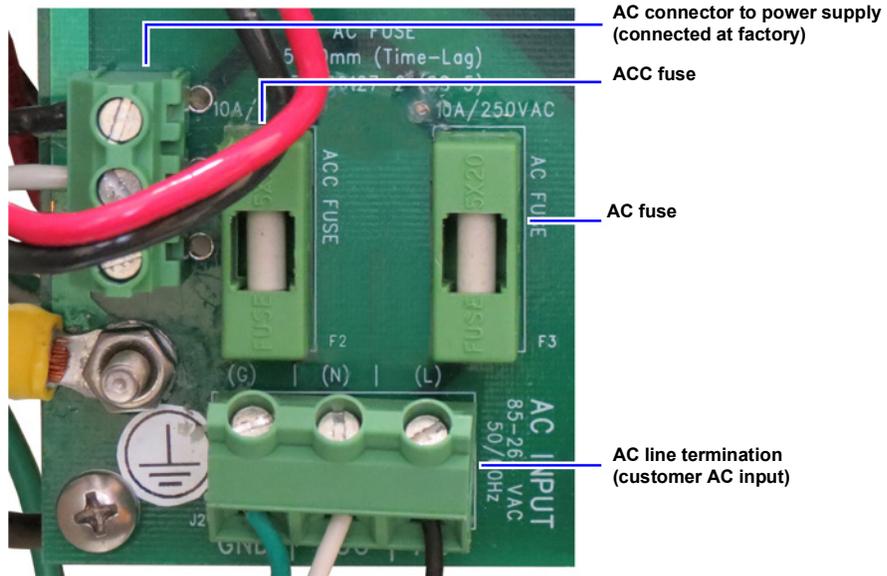


Figure 6-2. AC Power Connections

DC Power Connections

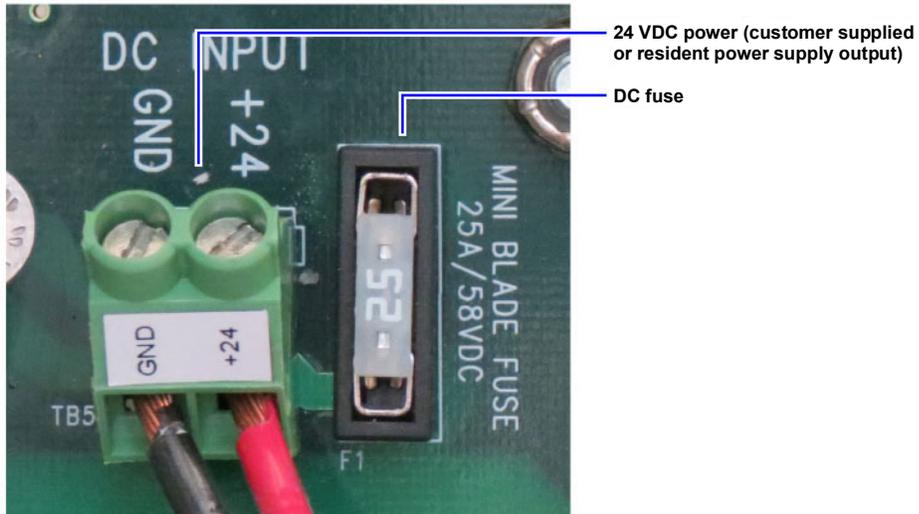


Figure 6-3. DC Power Connections

System Input and Output Communications

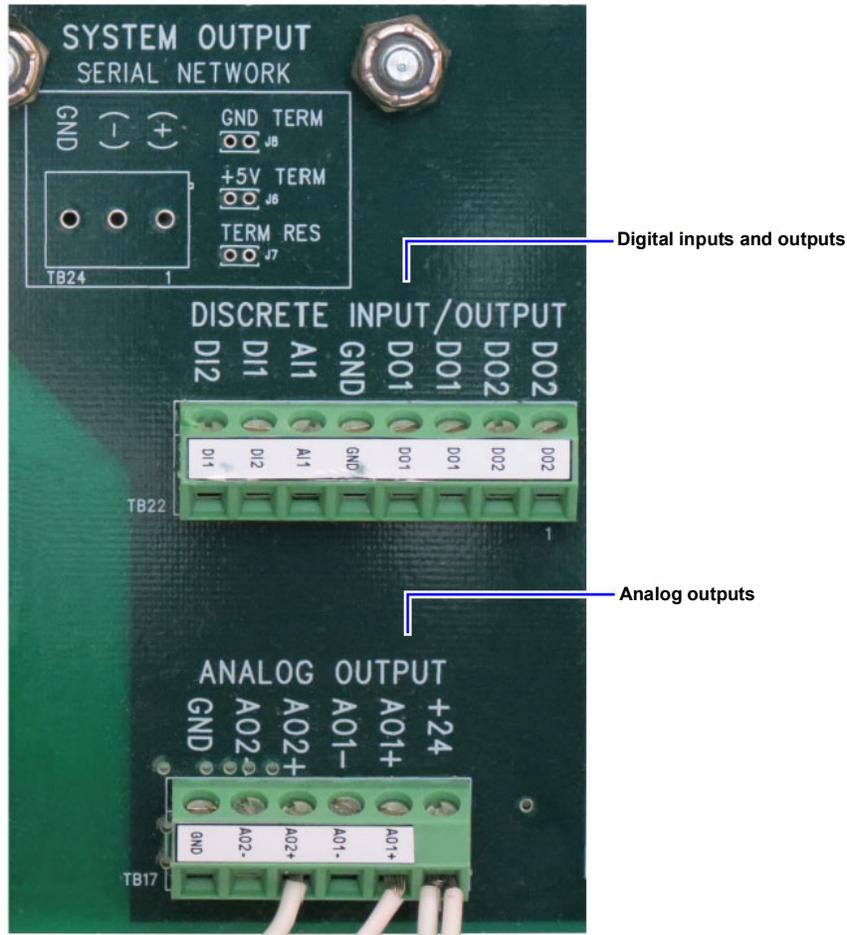


Figure 6-4. System Input and Output Communications

System Communications Area

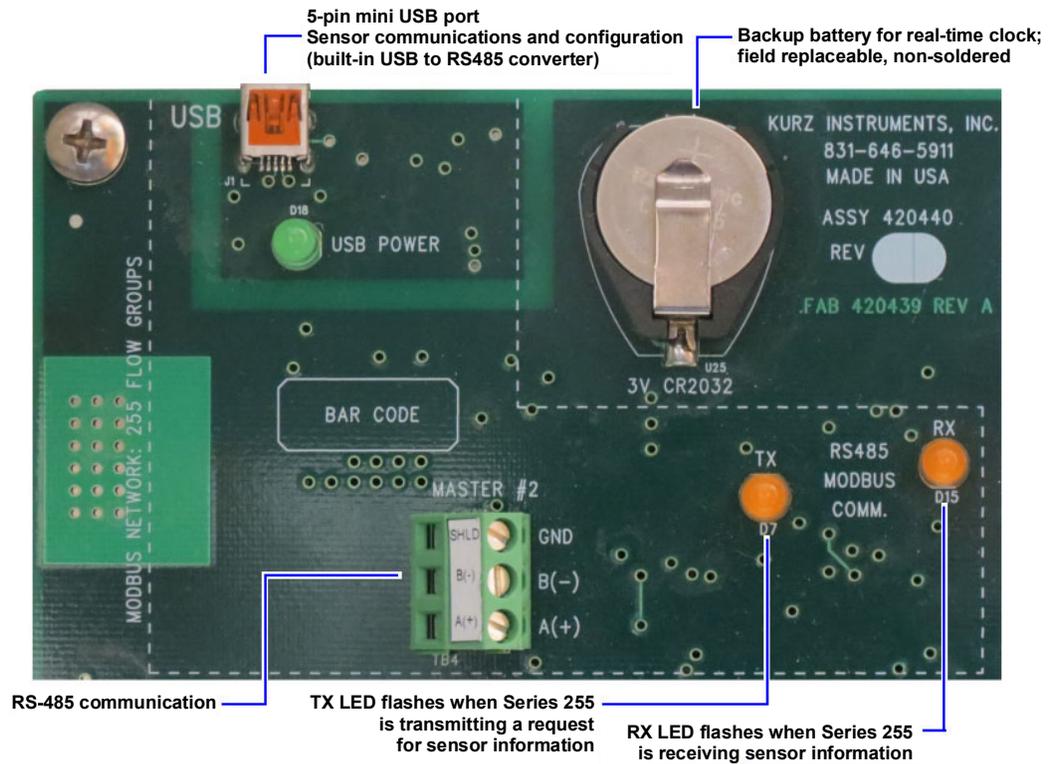


Figure 6-5. System Communications Area

Sensor Power and Communications Connections

Six isolated ports supply power to and exchange communications with sensors;
 each port supports one electronics enclosure;
 each enclosure supports up to four sensors with a maximum draw of 5 amps;
 port use independent of sensor Modbus address - any available port supports any channel function

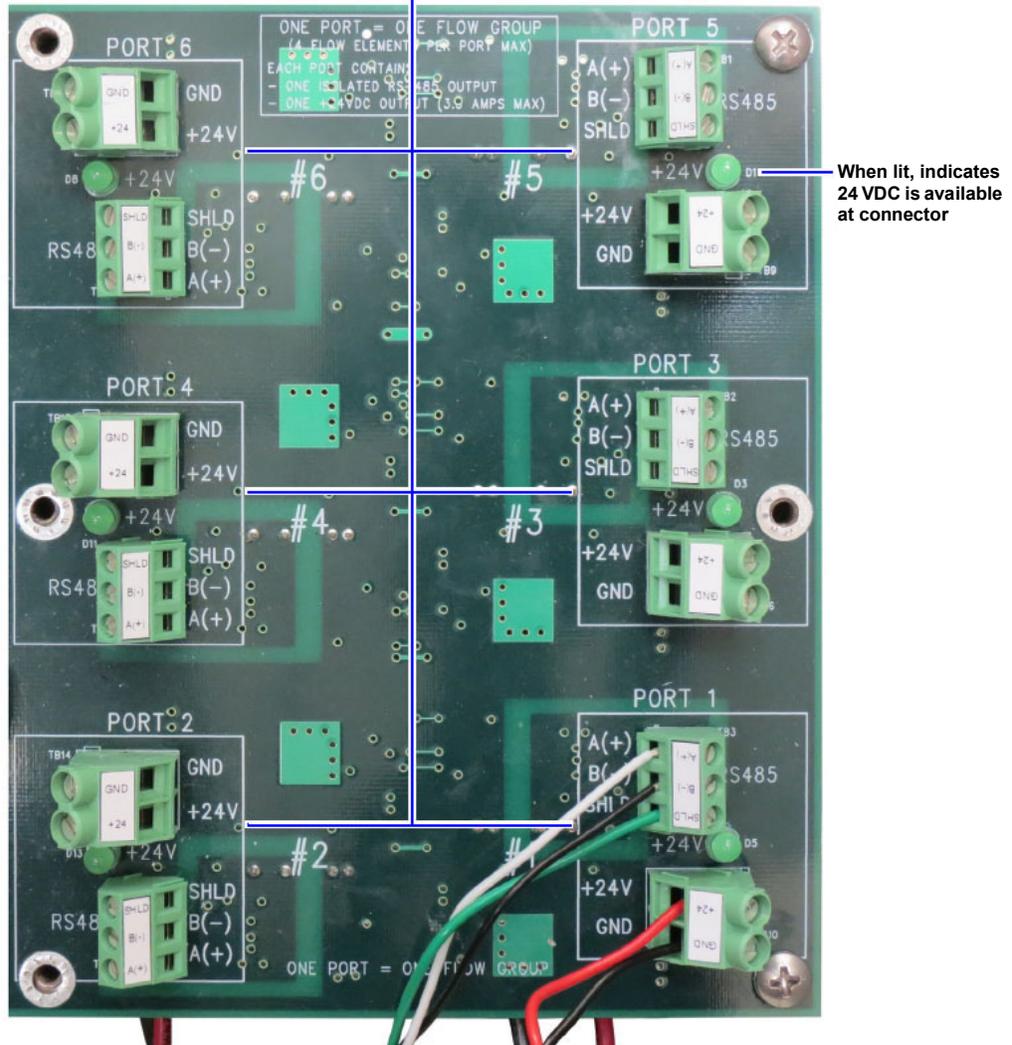


Figure 6-6. Sensor Power and Communications Connections

Troubleshooting

This section provides troubleshooting suggestions for the most common operating problems.

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Refer to the following safety messages before performing an operation preceded by this symbol.

Safety Requirements

Warning *Failure to follow safe installation and servicing guidelines could result in death or serious injury.*

Make sure only qualified personnel perform the installation.

Use the equipment only as specified in the guide. Failure to do so may impair the protection provided by the equipment.

Do not perform and service other than those contained in the s guide unless you are qualified.

High voltage that may be present on leads could cause electrical shock.

Avoid contact with leads and terminals.

Make sure the main power to Series 255 is off and the lines to any other external power source are disconnected or not powered while wiring the Series 255.

Caution *Make sure that there is no water or snow on top of the Series 255 when it is opened. This may damage the electronics inside the housing.*

Be careful when opening the cover in very low temperatures. High humidity and temperatures far below the freezing point may cause the gasket to get stuck in the cover. In that case you may use a heating fan to warm the housing in order to release the gasket. Be careful not to use excess heat, which may damage the housing and the electronics.

Channel Kickout

The Series 255 shows a CHANNEL KICKOUT event if any of the active flow sensor channels are kicked out of the average. When this event is active, the MAINTENANCE REQUIRED front panel status indicator illuminates. There are several reasons a flow sensor channel can be kicked out of the average.

- A flow sensor channel is kicked out of the average when its status error code is non-zero. A non-zero status error code indicates there is a problem with the channel's flow sensor. The Channel Detail is available in Display mode, Option 5. The status error code appears in the top right-hand corner of the Channel Detail.

```
CHF TEST-001 0000      <----- Status code is zero = Good
VEL 2.2 NMPS ONL
TEMP 20.0 DEGC INC
```

```
CHJ KURZ MFT 4025     <----- Status code is non-zero = Error
VEL 0.0 NMPS ONL
TEMP ***** DEGC INC
```

- A flow sensor channel is kicked out if the measurement units are not metric (SI units). During power up the Series 255 requests configuration information from each flow sensing channel, including the velocity and temperature engineering units. This information is also requested when a channel is placed ONLINE. If the velocity unit is not NMPS (or UNKNOWN), the Series 255 kicks out the channel from the average. The Channel Detail is available in Display mode, Option 5.

```
CHD 3F253-RT 0000
VEL 34.3 SFPM ONL      <----- English velocity units
TEMP 68.0 DEGF INC     <----- English temperature units
```

- A communication fault causes a flow channel data to be kicked out of the average. A communication fault on a flow channel occurs if the flow sensor does not respond to Series 255 Modbus commands or if the response packet is not readable. When a communication fault occurs, the Series 255 does not perform a retry on a flow sensor but will continue to send cyclic commands. The Channel Summary that shows each channel’s communication status is available in Display mode, Option 4.

CH	ABCDEF	<---- Channel D is indicating a
COM	YYY-YY	<---- COM failure and is
KO	---Y--	<---- Kicked out

Note A flow sensor that is not responding should be placed OFFLINE. A communication failure for a channel that is not kicked out causes the total communication cycle time to be longer.

- A flow channel data is kicked out of the average if the channel velocity value is negative. This can occur when the flow sensor’s Modbus configuration is not compatible with the Series 255 Modbus configuration (referred to the “endianness” of the flow channel data). This information is configured as REGISTER ORDER on the flow meter’s Modbus configuration, while the Series 255 is expecting the REGISTER ORDER to be BYTE #12 34.

The multipoint flow sensor array degrades in accuracy as sensors in the array drop out. The flow reading calculated by the Series 255 can go up or down, depending on which sensors in the array drop out and the dynamic profile at the current flow rate. The best corrective action is to fix or replace the kicked out sensor.

Modbus Communication Between the Series 255 and the Flow Sensors

The Series 255 communicates to the flow sensor channels using the Modbus protocol over RS-485. If the Series 255 is not able to communicate with a flow sensor channel, the channel’s process measurement is kicked out of the average. A flow sensor kicked out of the average may affect the accuracy of the flow measurement.

The Modbus protocol is a messaging structure that allows a Master device to communicate with Slave devices. Modbus communication allows only one Master device talking to one or more Slave devices. Each Slave has a unique address. Poll-response type of messaging requires the Master device initiates a message, and each Slave device remains quiet until receiving an address-specific message.

Some tips to troubleshoot the Series 255 flow sensor network:

- Never put two Modbus-RTU masters on the same network. The Modbus-RTU protocol allows only one Master. Adding a second Master will interfere with the operation of the network or completely prevent communications.
- To troubleshoot the communication network, the Series 255 must be put in Maintenance mode to use the RS-485 auxiliary ports on the main board that are used to communicate or troubleshoot the flow sensors.

- When possible, gradually create the network. Add flow devices one at a time and confirm the network is stable after each addition. In the event of any problem, debugging the network is easier in the event of a problem.
- The Series 255 and the flow sensors must be configured with the same baud rate. The default baud rate is 38400 bps for the Series 255 and the flow sensors. The highest baud rate may not be useful for your application. Slower baud rates can provide more efficient communication with lower error rates and fewer transmission errors. Distance between devices is also a factor, as long cables and high speeds do not always work well.
- Each flow sensor must be configured with a unique Modbus address. Duplicating an address can cause problems communicating with that address because two flow sensors will attempt to respond to commands at the same time.
- Avoid routing cables for communication with AC power cables. The 24V DC power cables can be routed with the RS-485 cables.
- The RS-485 connections between the Series 255 and the flow sensors are not polarity-sensitive. Reversed polarity is supported with B-Series Modbus communication. Reversing the RS-485(+) and RS-485(-) will not affect communication.
- The point-to-point wiring provided with your system indicates where the terminating resistor should be placed in the network. The terminating resistor in the Modbus wiring is usually placed on the last flow sensor on the Port string to signify the end of the line. When purchasing the Series 255 and flow sensors as a system, the terminating resistors are pre-installed on the required flow sensors. The terminating resistor should be a 120 Ohm resistor.
- When suspecting that a flow sensor is not communicating properly, change the sensor's physical position in relation to a flow sensor that is working properly. This can help determine if the problem is equipment-related (typically configuration) or position-related (typically cabling problem or noise).
- The LEDs on the main board provide valuable information on system operation. The Series 255 and the Kurz flow sensors have two LEDs that indicate sending (Tx) and receiving (Rx) Modbus transmissions. The LEDs flash accordingly when receiving and sending commands or responses. With the Series 255 LEDs, the flashes for the sending LED are closely followed by the receiving LED (indicating the response from the slave). The receiving LED typically flashes more frequently because of all the received commands, including commands sent to the other flow meters. The sending LED flashes only when sending a response, which occurs only when a command is addressed to a specific flow meter.
- The RS-485 network must use three wires. The third conductor serves as a ground or common reference signal against which the positive and negative wire voltage is measured. This helps avoid problems in communication due to a difference in potential from one location to another.

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