

Installation & Operation Manual

0250 Series Secondary Electronics

BROOKS[®]
INSTRUMENT

Beyond Measure

Essential Instructions Read before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. These products must be properly installed, operated and maintained to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, operating and maintaining Brooks Instrument products.

- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- Read all instructions prior to installing, operating and servicing the product. If this instruction manual is not the correct manual, please see back cover

for local sales office contact information. Save this instruction manual for future reference.

⚠ WARNING: Do not operate this instrument in excess of the specifications listed in the Instruction and Operation Manual. Failure to heed this warning can result in serious personal injury and / or damage to the equipment.

- If you do not understand any of the instructions, contact your Brooks Instrument representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.

⚠ WARNING: Prior to installation ensure this instrument has the required approval ratings to meet local and national codes. Failure to heed this warning can result in serious personal injury and / or damage to the equipment.

- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- Operation: (1) Slowly initiate flow into the system. Open process valves slowly to avoid flow surges. (2) Check for leaks around the flow meter inlet and outlet connections. If no leaks are present, bring the system up to the operating pressure.
- Please make sure that the process line pressure is removed prior to service. When replacement parts are required, ensure that qualified people use replacement parts specified by Brooks Instrument. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place to prevent electrical shock and personal injury, except when maintenance is being performed by qualified persons.

⚠ WARNING: For liquid flow devices, if the inlet and outlet valves adjacent to the devices are to be closed for any reason, the devices must be completely drained. Failure to do so may result in thermal expansion of the liquid that can rupture the device and may cause personal injury.

European Pressure Equipment Directive (PED)

All pressure equipment with an internal pressure greater than 0.5 bar (g) and a size larger than 25mm or 1" (inch) falls under the Pressure Equipment Directive (PED).

- The Specifications Section of this manual contains instructions related to the PED directive.
- Products described in this manual are in compliance with EN directive 2014/34/EU.
- All Brooks Instrument Flowmeters fall under fluid group 1.
- Products larger than 25mm or 1" (inch) are in compliance with PED category I, II or III.
- Products of 25mm or 1" (inch) or smaller are Sound Engineering Practice (SEP).

European Electromagnetic Compatibility (EMC)

The Brooks Instrument (electric/electronic) equipment bearing the CE mark has been successfully tested to the regulations of the Electro Magnetic Compatibility (EMC directive 2014/30/EU).

Special attention however is required when selecting the signal cable to be used with CE marked equipment.

Quality of the signal cable, cable glands and connectors:

Brooks Instrument supplies high quality cable(s) which meets the specifications for CE certification.

If you provide your own signal cable you should use a cable which is overall completely screened with a 100% shield. "D" or "Circular" type connectors used should be shielded with a metal shield. If applicable, metal cable glands must be used providing cable screen clamping.

The cable screen should be connected to the metal shell or gland and shielded at both ends over 360 Degrees.

The shield should be terminated to an earth ground.

Card Edge Connectors are standard non-metallic. The cables used must be screened with 100% shield to comply with CE certification.

The shield should be terminated to an earth ground.

For pin configuration : Please refer to the enclosed Instruction Manual.

ESD (Electrostatic Discharge)

⚠ CAUTION: This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling procedures must be observed during the removal, installation or other handling of internal circuit boards or devices.

Handling Procedure:

1. Power to unit must be removed.
2. Personnel must be grounded, via a wrist strap or other safe, suitable means before any printed circuit card or other internal device is installed, removed or adjusted.
3. Printed circuit cards must be transported in a conductive container. Boards must not be removed from protective enclosure until immediately before installation. Removed boards must immediately be placed in protective container for transport, storage or return to factory.

Comments

This instrument is not unique in its content of ESD (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, SMOS, etc.). Experience has proven that even small amounts of static electricity can damage or destroy these devices. Damaged components, even though they appear to function properly, exhibit early failure.

Section 1 Introduction

Description	6
Architecture	6
Communication	6
Process Controls	6
Operator Controls and Indicators	7
Diagnostic Capabilities	7
Specifications (Reference Table 1-1)	7
Mounting Kit Options	9
Power Supply Options	9
Input/Output Pin-Out Adapters	9

Section 2 Installation

General	11
Receipt of Equipment	11
Recommended Storage Practice	11
Return Shipment	12
Transit Precautions	12
Removal from Storage	12
Ventilation and Mounting Requirements	12
Cleaning Instructions	12
Cable Requirements	13
Installation Instructions	13
Panel Mount Installation Instructions	13
Tabletop Stand Assembly Instructions	15
Retrofit to Model 0152/0154 Tabletop Housing (Model 0254 only)	17
19-in. Rack Assembly and Installation Instructions (Model 0254 only)	18

Section 3 Operation

Home Screen.....	20
Operating Controls	21
Primary Functions	21
Key Functions	22
Navigation	23
Display or Instrument Configuration Screen Selection	23
User Interface Screen Map	24
Process Values (PV) and Setpoints (SP)	26
PV-SP Measures and Status	26
PV-SP Configuration	27
Value Programming	28
Global Settings	31
Global Information	31
Global System Power	32
Global Control Services	33
Global Communication	34
Instrument Configuration and Control	34
Rate (Setpoint) Control	34
PV Configuration	36
Batch Control	37
Blend Control (Model 0254 only)	38
Blend Control Setup	39
Start Blend	40
Terminate Blend In-Process	41
SP VOR (Valve Override) Function	41
Totalization	42
Emergency Off	43

Appendix A Engineering Units

Available Engineering Units	44
-----------------------------------	----

Appendix B Blending Examples

Examples 1 through 6	45
----------------------------	----

Appendix C Serial Communications Protocol

Overview.....	46
RS232 Port Settings	46
Hyperterminal Set-Up	47
Command Structures	50
Command Addressing	51
General Commands	52
Command Synchronize	52
Menu Command	52
View Programmed Channel Port Values	53
Identify Command	53
Message Serial Character Pacing Controls	54
Serial Message Error Control	55
Measured Channel Values Command	56
Send Channel Input Port Programmed Values	57
Program Channel Input Port Values	58
Clear Accumulated Values	58
Channel Control Output Port Values	58
Batch and Blend Control Commands	59
Global Setting Values	61
Set Global Settings Values	61
Communication Message Basics	61
Message Structure	62
Message Format	62
Serial Value Programming	63
Read a Programmed Value	63
Program a New Value	64
Channel Input Port Values	65
Channel Output Port Values	67
Global Setting Values	68

Warranty, Local Sales/Service Contact Information	Back Cover
--	-------------------

Figures

1-1 Model 0251 Signal Wiring	10
1-2 Model 0254 Signal Wiring	10
2-1 Panel Mount Cut-Out Dimensions	14
2-2 Table Top Stand Mount Installation	16
2-3 Power Supply Bracket and Bezel	19
2-4 Rack Installation	19
3-1 Home Screen.....	20
3-2 Model 0251 - User Interface Screen Map	24
3-3 Model 0254 - User Interface Screen Map	25

Tables

1-1 Specifications - 0250 Series	8
3-1 Display Home Screen Fields	20

Description

0250 Series is a versatile full-featured measurement and control process instrument, available with single or multiple channel capabilities. The architecture supports a wide range of operating capabilities organized to meet the requirements of nearly any high-accuracy measurement and control application.

This system suits applications requiring advanced single & multiple channel operation. It provides control services including rate, batch, and proportional blending.

The system is all digital, based on microcomputer technology. There is no power switch to be left off, no feature selection switches or jumpers, and no analog trimming potentiometers.

It employs surface mount technology and incorporates floating-point digital signal processing arithmetic. Built-in test capabilities enable simple installation, and extensive self-tests ensures long-term operating reliability. The rugged package is modular, providing an ideal solution for use in demanding applications and tough environments. Options are available for panel mount, desktop & rack mount (0254 only).

Architecture

The system is built on the basics of a multiple-port based architecture, modularly organized, which are combined as channels, able to meet present and future instrumentation requirements.

Channel(s) provide for value measurements and quantity accumulation, rate measurements, scalar measurements, supported by value scaling for process voltage and current process signals. Signal acquisition uses digital signal processing rejecting ambient noise and interference.

Communication

The communication facilities provide for data acquisition, command, and control functions, supporting configuration programming and information gathering.

Communication is initiated by command (solicited), alarms (unsolicited) & real time scheduled reporting using its internal date-time clock.

Process Controls

Totalizer, batch, and proportional blending (0254 only) are readily achieved using the front panel key controls or serial commands.

Operator Controls and Indicators

The instrument has no power switch to be accidentally turned off. Operation may be completely controlled from its integral eight-key pad used to view operation and programmed operating values. Key activations are single touch with hold-and-repeat capability. The front panel key pad provides splash proofing and environment protection.

The 0250 Series primary indicator is its large back lit liquid crystal graphic display - visible at a distance even in low light conditions - to view values, support programming operations, and indicate process state information. A user-selectable audio indicator annunciates key activations.

Diagnostic Capabilities

Powerful automatic diagnostics support easy installation and ensure a trouble-free operating life. Tests include memory facility scans, channel input-output status, and communication status.

Specifications (Reference Table 1-1)

<p style="text-align: center;"> WARNING</p> <p>Do not operate this instrument in excess of the specifications listed below. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.</p>

Table 1-1 Specification - 0250 Series
Performance

Display	0251: 8 line x 20 character back-lit LCD display. 0254: 8 line x 40 character back-lit LCD display.
Controls	Keypad: 8-Key metal dome tactile push buttons with selectable audio beep for setpoint (rate, batch, blend), VOR, emergency stop, full operation and programming.
Date Retention	Non-volatile ram/rom, 100 year retention.
Power Input	Voltage: 12-24 Vdc required, -15 Vdc permitted. Current: 400 mA max. current draw per channel. Instrument power draw: 0.8 Watts. Optional power module: 100-240 Vac, 47-63Hz.
Power Output	+15 V/2.0 A, -15 V/1.0 A or 12-24 Vdc/2.0 A.
Signal Input	0(1)-5 Volts, 0(2)-10 Volts, 0(4)-20 mA.
Signal Output	0(1)-5 Volts, 0(2)-10 Volts, 0(4)-20 mA.
Communications	Full communications capability for remote readout, setpoint, control, programming and data acquisition via RS232.
Enclosure	ABS cyclolac resin.
Mounting Options	Panel mount kit, table top kit, rack mount kit, rack mount kit with 19" sub-rack. (Rack mount available for 0254 only)
Dimensions	See product dimensions on pages 4 - 6.
Temperature/Humidity	Operating: 32-122°F (0-50°C), 0-95% non-condensing. Ship/Storage: (-)40-185°F (-)40-85°C, 0-95% non-condensing.
Certifications	CE Mark EMC Directive 2014/30/EU EN:61326-1:2013 Low Voltage Directive 2014/35/EU EN:61010-1-2010 Machinery Directive 2006/42/EC EN/ISO:13849-1:2009, EN:60204-1:2009 RoHS Directive 2011/65/EU FCC Part 15 Class A, part 68 UL-USA & Canada 0254: UL 61010 Electrical Safety for General Purpose Indoor Use.

Mounting Kit Options

The 0250 Series can be mounted using the following kits:

Panel Mount Kit: Brackets accept panel thickness up to 0.25 in. (6.35 mm).

Table Top Kit: Weighted base with fixed tilt for easy viewing.

Rack Mount Kit: Hardware for mounting the Model 0254 and optional power supply into 19-in. sub-rack.

Rack Mount Kit with 19-in. sub-rack: 19-in. sub-rack included with Rack Mount Kit (Model 0254 only).

Retrofit Applications, Model 0152/0154: Rack Mount Kit will adapt the Model 0254 and power supply to the table top enclosure used for the Model 0152/0154.

Power Supply Options

The 0250 Series supports the following power supply options:

- Factory supplied: +15 Vdc/2 A, -15 Vdc/1 A, 100–240 Vac, 47–63 Hz
- Factory supplied: +24 Vdc/2.5 A, 100–240 Vac, 47–63 Hz
- User supplied: 12–24 Vdc into 9-pin D connector, 5 A rated

Input/Output Pin-Out Adapters

The Model 0251 has one 15-pin female D-channel connector.

The Model 0254 has four 15-pin female D-channel connectors. The pin configuration is compatible with standard Brooks 0(4)-20 mA cables.

An optional pin-out adapter kit with four adapters is available for use with Brooks 0(1)-5 Vdc cables.

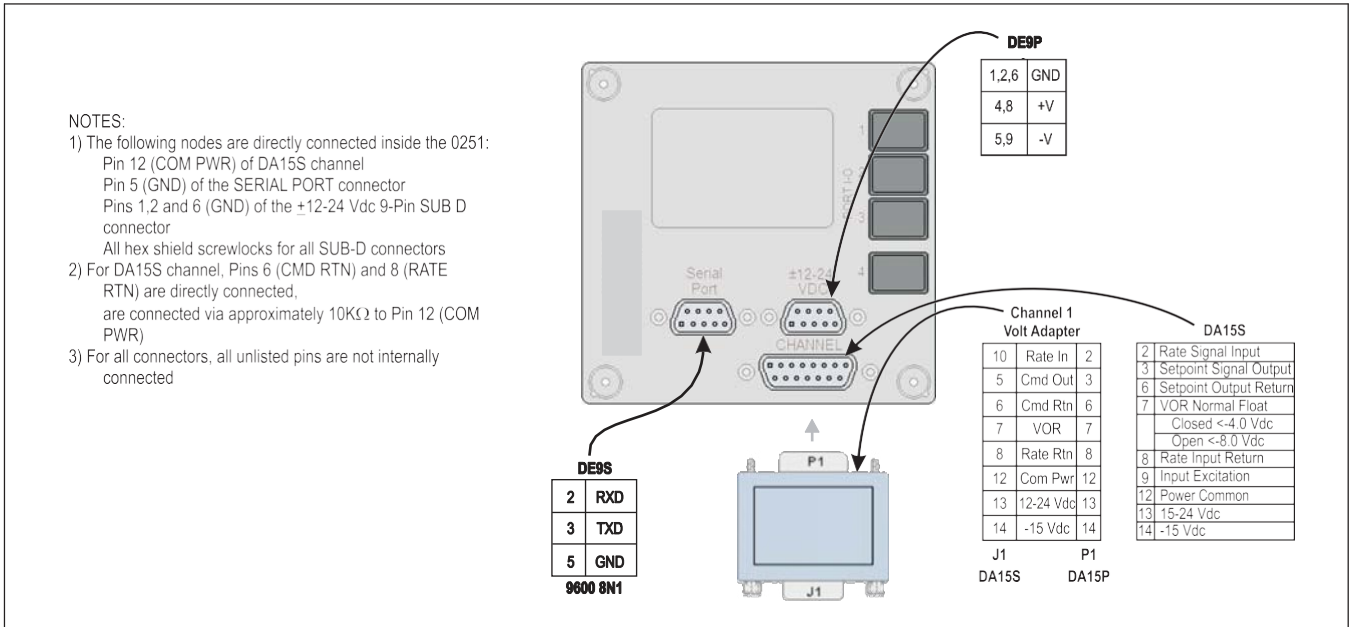


Figure 1-1 Model 0251 Signal Wiring

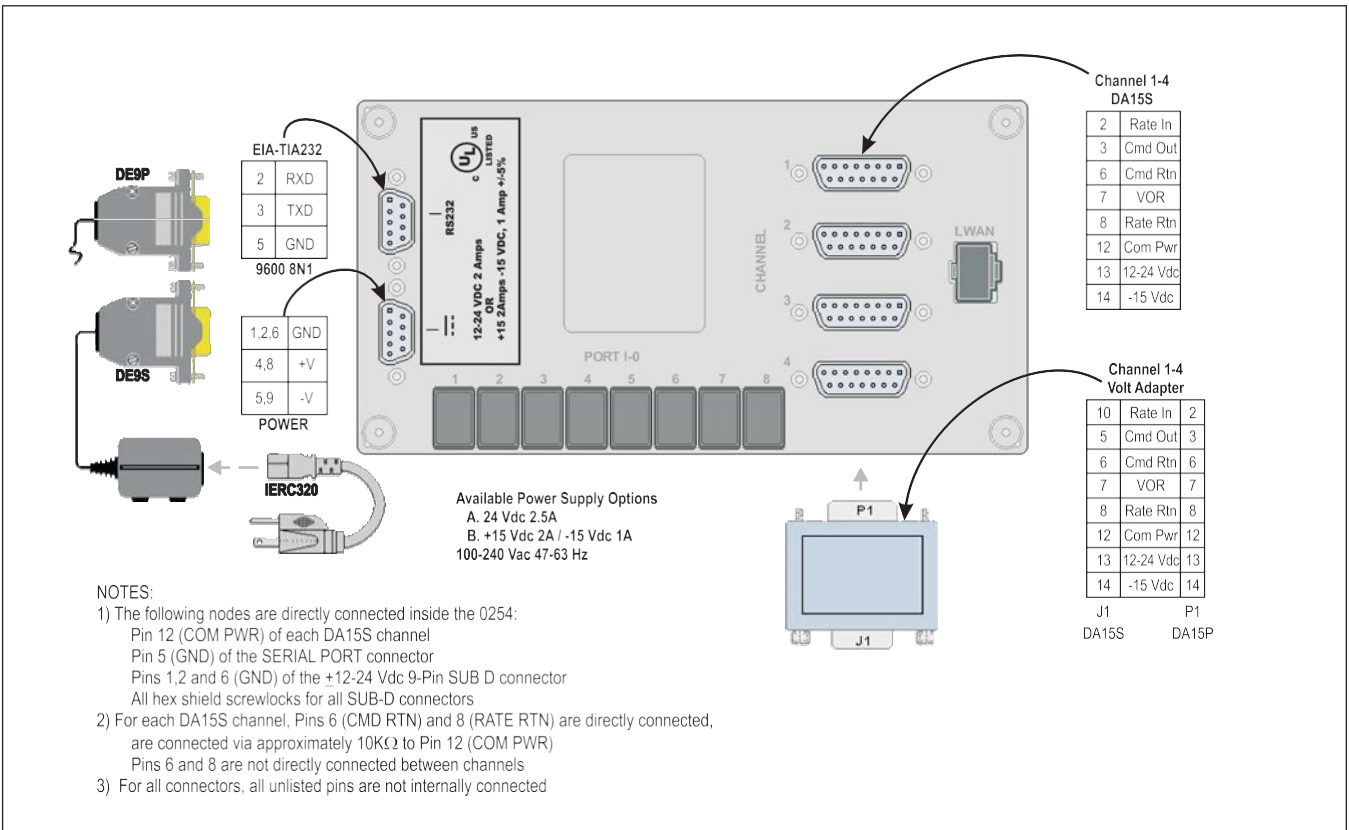


Figure 1-2 Model 0254 Signal Wiring

General

This section provides installation instructions for the 0250 Series Secondary Electronics device.

Receipt of Equipment

A Return Material Authorization (RMA) should be submitted to the nearest Brooks Instrument location via this page on our website:
BrooksInstrument.com/Service

Recommended Storage Practice

If intermediate or long-term storage of equipment is required, it is recommended that the equipment be stored in accordance with the following:

- Within the original shipping container.
- Stored in a sheltered area, preferably a warm, dry, heated warehouse.
- –40 to 185°F (–40 to 85°C); 0 to 95% non-condensing.
- Upon removal from storage, a visual inspection should be conducted to verify the condition of equipment is “as received”.

Return Shipment

Prior to returning any instrument to the factory for any reason, visit our website for instructions on how to obtain a Return Materials Authorization Number (RMA #) and complete a Decontamination Statement to accompany it: BrooksInstrument.com/Service. All instruments returned to Brooks also require a Material Safety Data Sheet (MSDS) for the fluid(s) used in the instrument. Failure to provide this information will delay processing of the instrument. Liquid Mass Flow Secondary Electronics device.

Transit Precautions

To safeguard against damage during transit, transport the instrument to the installation site in the same container used for transportation from the factory if circumstances permit.

Removal from Storage

Upon removal from storage, a visual inspection should be conducted to verify the condition of the equipment is “as received.”

Ventilation and Mounting Requirements

Because of their low power consumption, the 0250 Series devices do not have ventilation requirements. However, the ambient temperature surrounding the 0251 Series devices should not exceed 122°F (50°C). The optional power supply modules are also ventilation-free and limited to an ambient temperature of 122°F (50°C).

Cleaning Instructions

Do not use cleaning agents other than water because this might affect color and marking of the equipment.

Use a clean, soft and damp cloth for cleaning.

Cable Requirements

For compliance with the EMC directive 89/336/EEC, the equipment has to be installed with shielded signal cables which are overall completely screened with a shield of at least 80%. Sub-D connectors used must be shielded with a metal shield. The cable screen should be connected to the metal shell and shielded at both ends over 360°. The shield should be terminated to earth ground.

The optional power supplies available from Brooks are always supplied with a power cord that meets all agency certifications and has a protective conductor for grounding purposes. Any replacement cords must have similar construction and be certified by a recognized national test laboratory.

Installation Instructions

Do not use cleaning agents other than water because this might affect color and marking of the equipment.

Panel Mount Installation Instructions

1. Cut a hole according to the cut-out dimensions shown in Figure 2-1.
2. Pass the 0250 Series device enclosure through the cut-out.
3. Position one of the two brackets included in the Panel Mount kit on the side of the enclosure, while aligning the two holes at the top and bottom of the bracket flange with the holes at the corners of the back of the enclosure. Secure the bracket to the enclosure with two of the screws provided in the kit.

! CAUTION

Do not over-tighten these attachment screws.

4. Secure the second bracket to the other side of the enclosure.
5. Tighten the panel mounting screws in the middle of both brackets to secure the enclosure to the panel.

! CAUTION

Do not over-tighten these attachment screws.

6. Connect the power supply cable with the D-connector to the power connector on the back of the enclosure.
7. Connect the power supply AC cord to a power outlet.
8. Connect the cables to the RS232 and Channel connectors, as appropriate for the application.

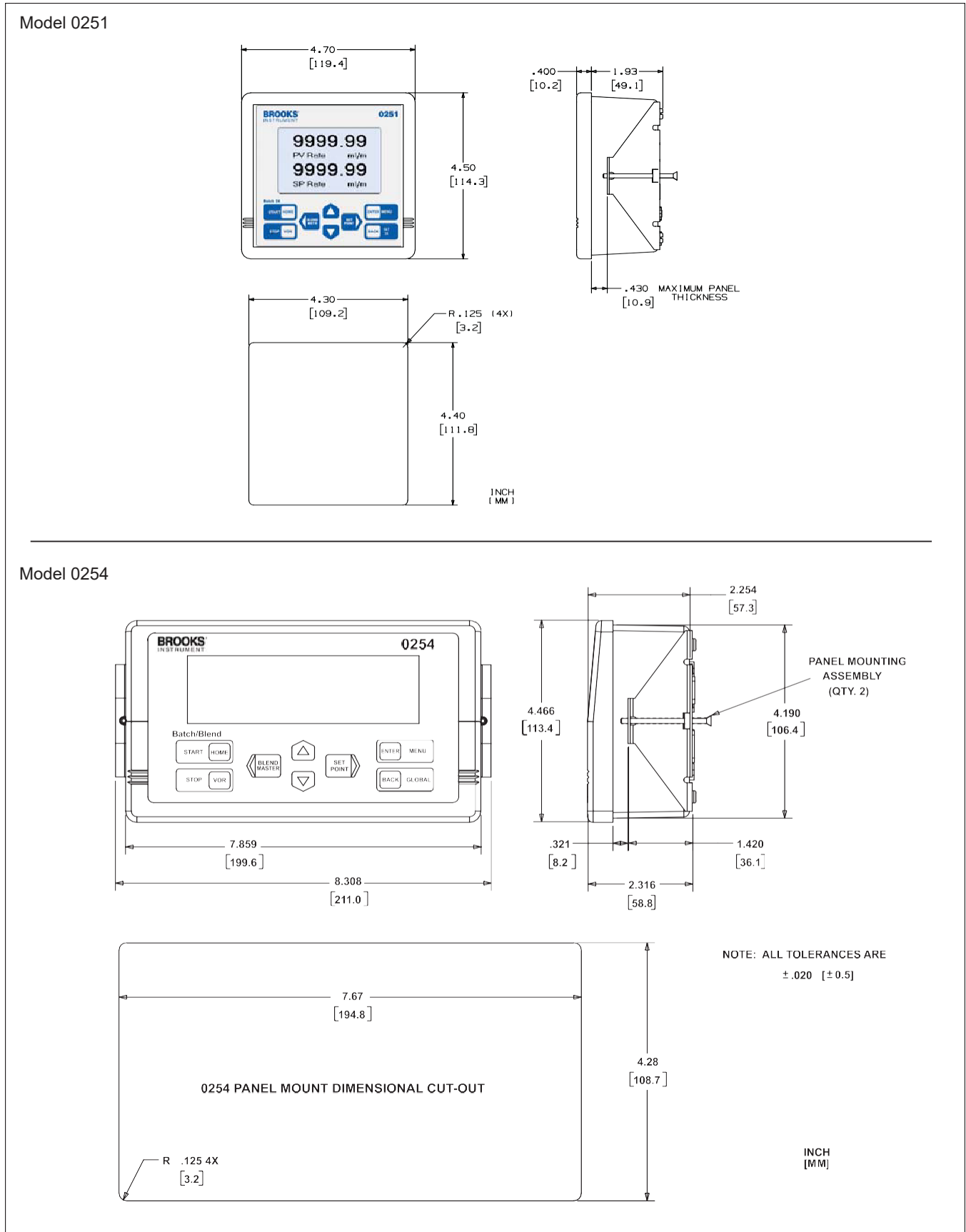


Figure 2-1 Panel Mount Cut-Out Dimensions

Tabletop Stand Assembly Instructions

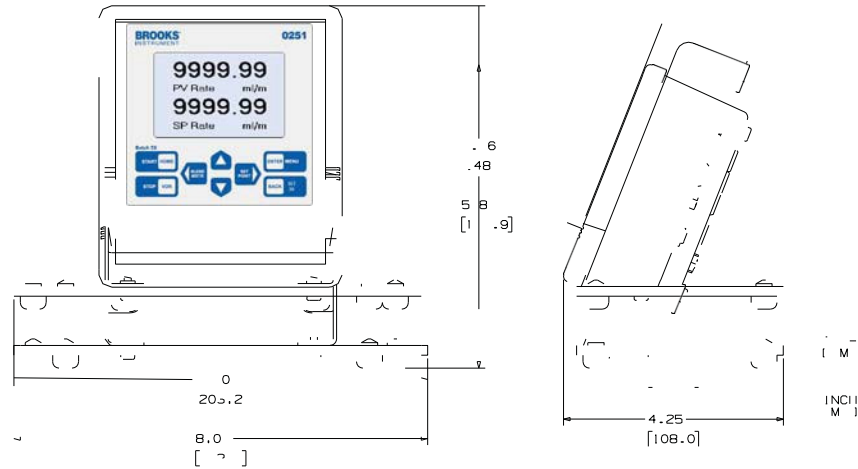
1. Attach the four rubber mounting feet to the base, as shown in Figure 2-2.
2. Use four of the provided screws to attach the two brackets to the base.
3. Slide the 0250 Series device enclosure into the brackets.
4. Use four screws to secure the enclosure to the brackets.

⚠ CAUTION

Do not over-tighten these attachment screws.

5. Connect the power supply cable with the D-connector to the power connector on the back of the enclosure.
6. Connect the power supply AC cord to a power outlet.
7. Connect the cables to the RS232 and Channel connectors, as appropriate for the application.

Model 0251



Model 0254

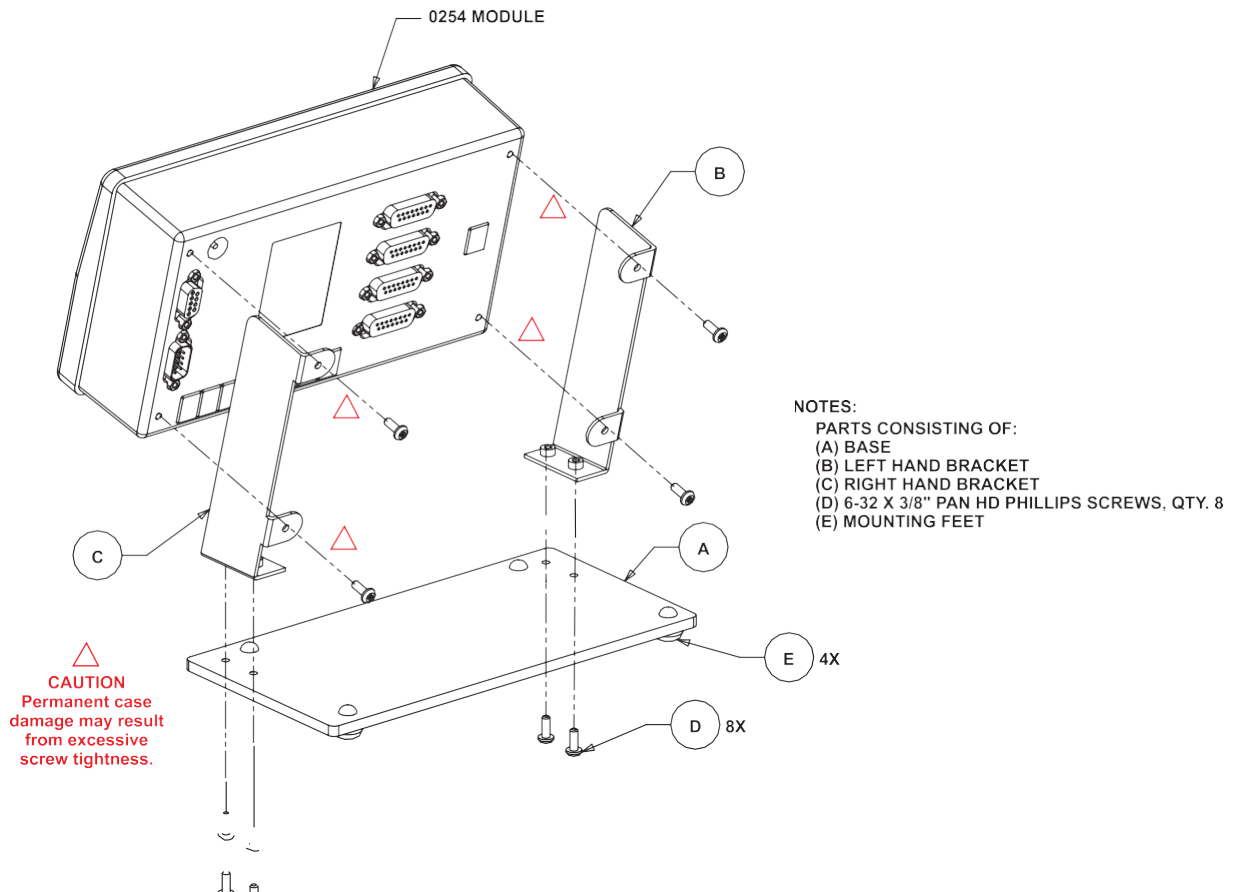


Figure 2-2 Table Top Stand Mount Installation

Retrofit to Model 0152/0154 Table Top Housing (Model 0254 only)

It is possible to retrofit the Model 0254 into a tabletop box that was used for the Model 0152/0154.

1. Slide the flange on the front of the power supply bracket, shown in Figure 2-3, under the rear channel rail of the box. For an illustration of the rail engagement, refer to Figure 2-4.
2. Use the two thumbscrews at the back of the power supply bracket to slide the back flange under the front channel rail of the box. Finger tighten the two thumbscrews.
3. Place the power supply onto the bracket, with the AC cord receptacle facing the back of the box.
4. Secure the power supply to the bracket using the Velcro strap.
5. Install the four plastic screw retainers into the bezel, then add the bezel screws.
6. Slide the bezel over the back of the Model 0254 enclosure. Secure the bezel to the enclosure by threading two screws through the holes in the bezel mounting brackets and tightening them.

 **CAUTION**

Do not over-tighten these attachment screws.

7. Connect the power supply cable with the D-connector to the power connector on the back of the enclosure.
8. Connect the cables to the RS232 and Channel connectors, as appropriate for the application.
9. Slide the enclosure into the box until the bezel is flush with the front of the box.
10. Secure the bezel to the front of the box using the bezel screws.
11. Connect the power supply AC cord to a power outlet.

19-in. Rack Assembly and Installation Instructions (Model 0254 only)

Use these instructions whether you are installing the Model 0254 into your own rack or into the optional 19-in. rack assembly from Brooks Instrument.

1. The optional 19-in. rack comes with a blind front plate covering half of the rack. This plate can be removed or repositioned, depending on the application, such as installing two Model 0254 modules side by side.
2. Slide the flange on the front of the power supply bracket, shown in Figure 2-3, under the rear channel rail of the rack.
3. Use the two thumbscrews at the back of the power supply bracket to slide the back flange under the back-channel rail of the rack. Finger tighten the two thumbscrews.
4. Place the power supply onto the bracket, with the AC cord receptacle facing the back of the box.
5. Secure the power supply to the bracket using the Velcro strap.
6. Install the four plastic screw retainers into the bezel, then add the bezel screws.
7. Slide the bezel over the back of the Model 0254 enclosure. Secure the bezel to the enclosure by threading two screws through the holes in the bezel mounting brackets and tightening them.

⚠ CAUTION

Do not over-tighten these attachment screws.

8. Connect the power supply cable with the D-connector to the power connector on the back of the enclosure.
9. Connect the cables to the RS232 and Channel connectors, as appropriate for the application.
10. Place the enclosure into the rack until the bezel is flush with the front of the rack.
11. Secure the bezel to the front of the rack using the bezel screws.
12. Connect the power supply AC cord to a power outlet.

Figure 2-4 shows a completed rack installation.

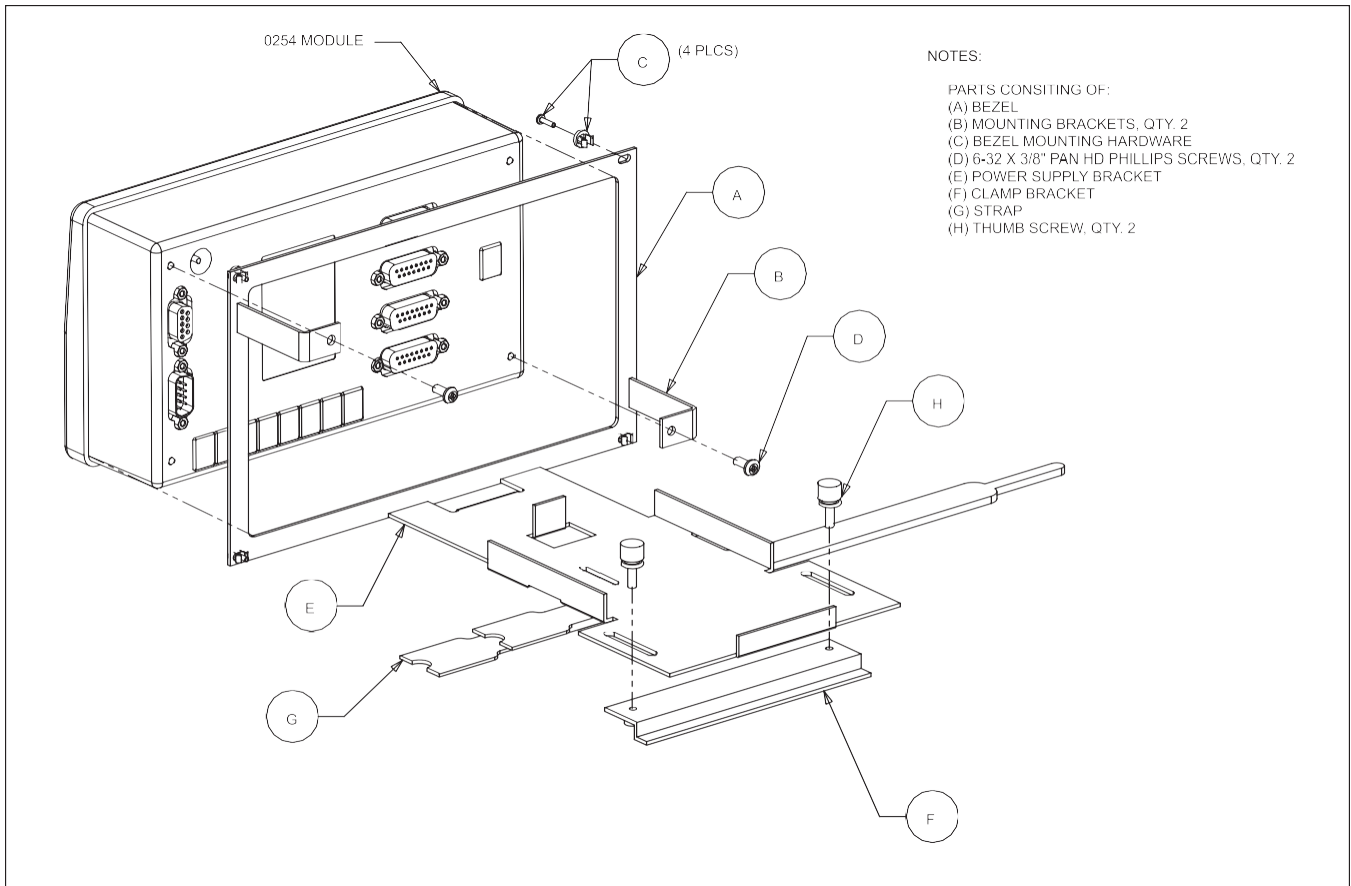


Figure 2-3 Power Supply Bracket and Bezel

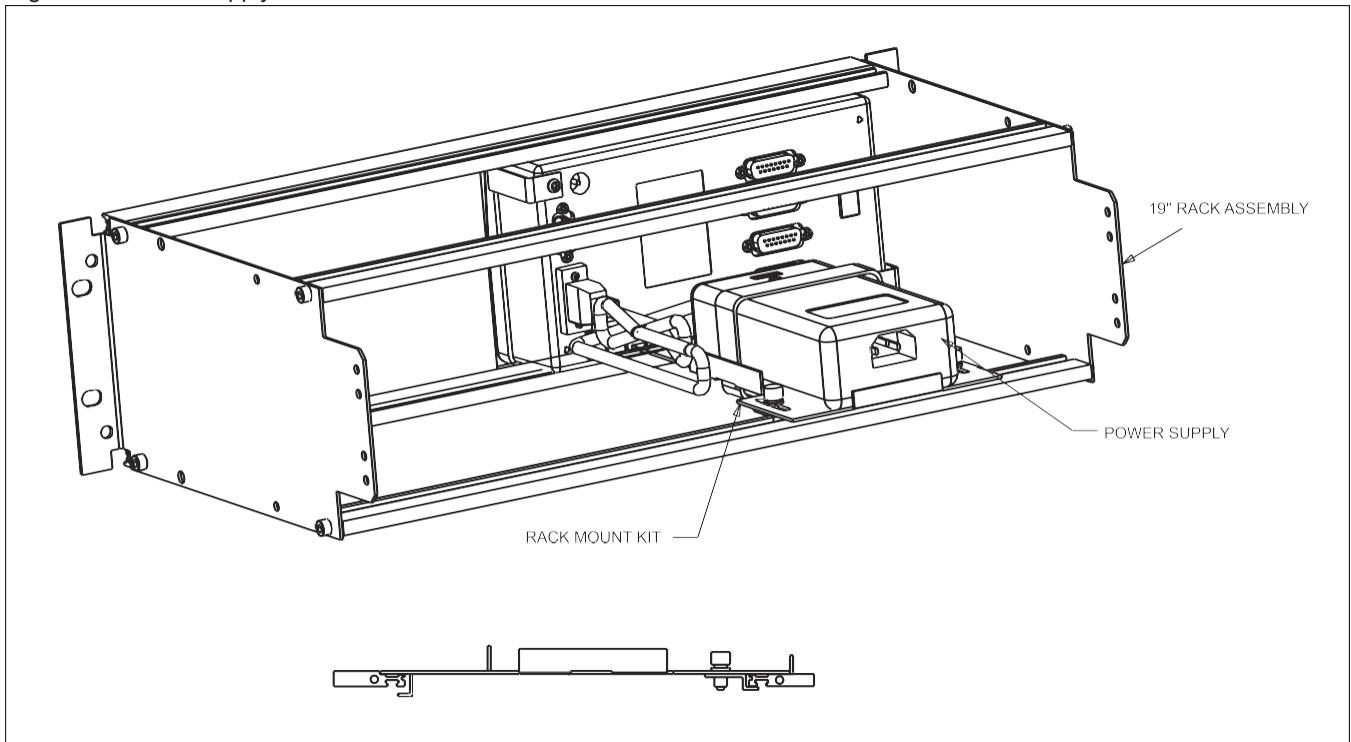


Figure 2-4 Rack Installation

Home Screen

The 0250 Series home screen is the instrument's central information and navigation indicator. The home screen displays following initial power application, and automatically follows the make-model screen banner. It provides an overall view of the instrument's operation. Table 3-1 below describes the main elements of the home screen.

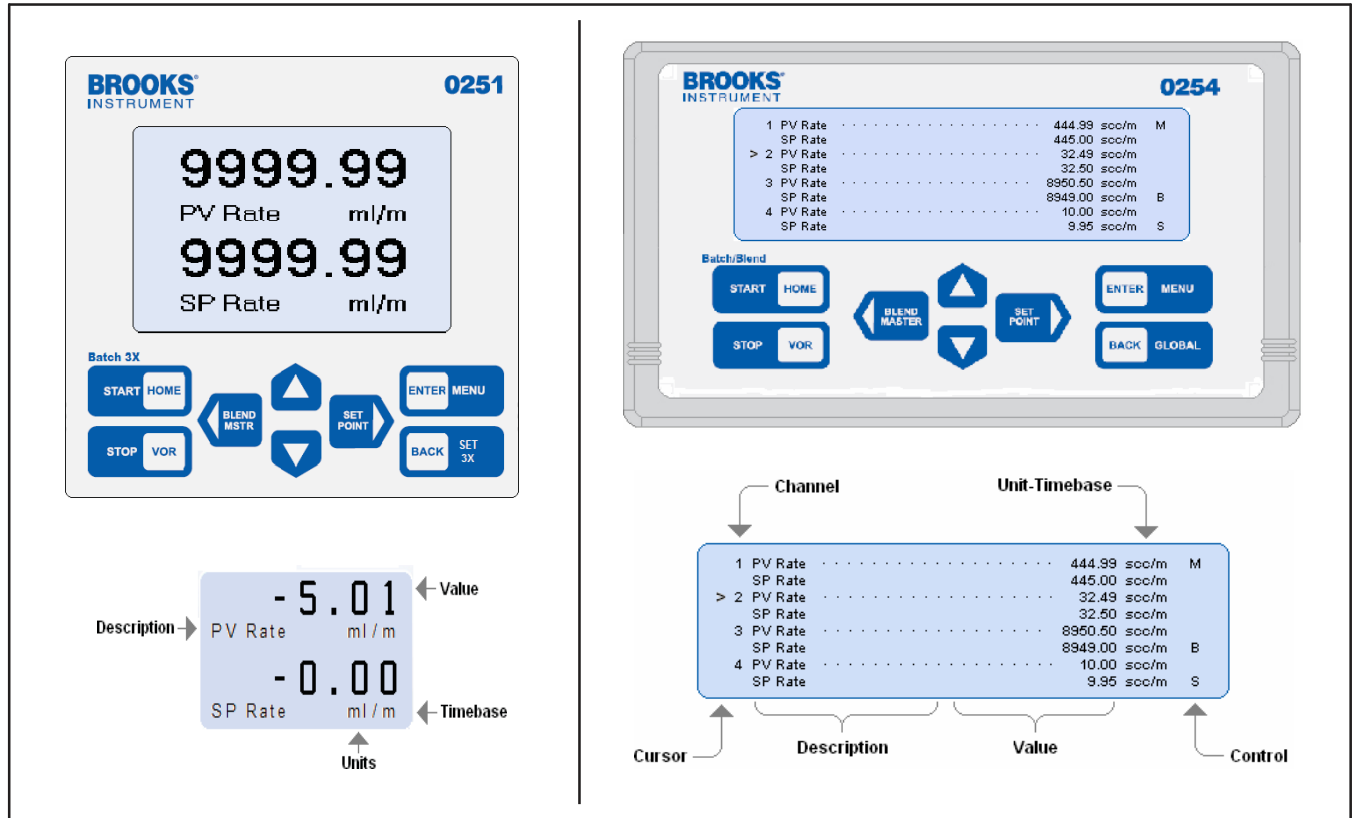


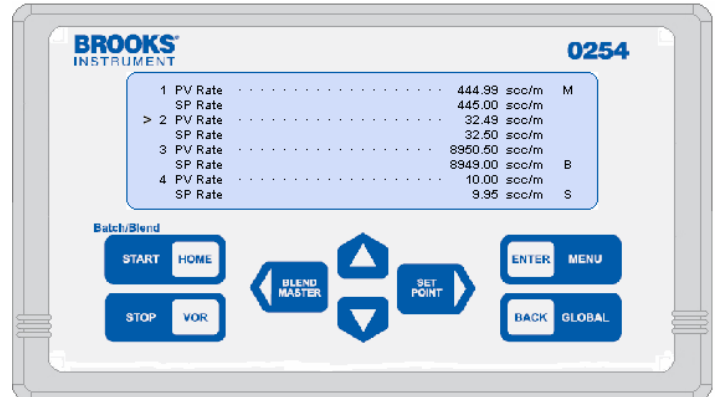
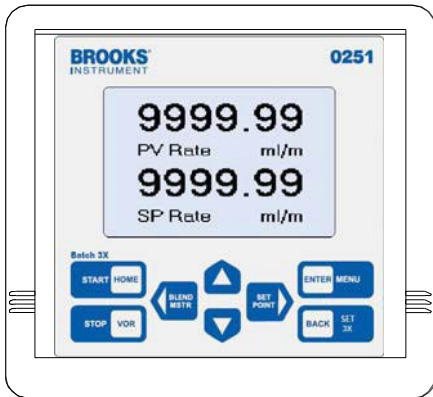
Figure 3-1 Home Screen

Table 3-1 Display Home Screen Fields

Cursor	Points to channel even when channel is Off.
Channel	Numbers 1-4. (Model 0254 only)
Description	Process value text.
Value	Numeric process value.
Unit / Time-base	Combined measure units and rate time-base.
Control	Process control state indicators.



Operating Controls

The primary instrument control is supported by eight front panel tactile snap-action keys, and alternatively by serial communications. Every function that can be accomplished by using the keys can also simultaneously be accomplished by serial communication commands. The serial communication functions are described more fully in Section D.



Primary Functions









Primary functions performed from the Home screen are as follows:

- Select a channel using the  and  keys
- Enter the configuration selection menu
- Enter the Global System Settings selection menus
- Quickly navigate to setpoint or valve override functions
- Start and stop control functions
- Select a blend control master
- Execute the emergency stop function

Instructions for the using the above are described in their respective subsections throughout this section.

Key Functions

The control function of the keys is dependent on the context of the function that has been requested to be accomplished as follows:

Key	Present Location	System Response
	Home Screen	Navigates to channel configuration screen.
	Function Select Screen	Selects viewing configuration or programming configuration.
	Display Configuration Screen	Selects the home screen value.
	Input Configuration Screen	Programs the value that the cursor points to and saves the value.
	Home Screen	Press three times to enter Global System Settings.
	All Other Screens	Navigates immediately to previous screen.
	Home Screen	Press three times to start batch and/or blend controls operation.
	Power Down Condition	Press to restore power.
	Home Screen	Terminates operating controls if any. Otherwise HOT navigates to change channel VOR state. This key can be used to power down the system when pressed for 3 seconds.
	All Screens	Move cursor up to desired item.
	All Screens: Selected Item	Increase blinking program selection to succeeding choice.
	All Screens	Move cursor down to desired item.
	All Screens: Selected Item	Decrease blinking program selection to preceding choice.
	All Screens: Selected Item	Move cursor left.
	Home Screen	Select channel pointed to by cursor as blend master unless the channel is already the master, in which case the existing master is deselected and no master is chosen.
	Display Configuration Screen PV Total. Program Screen	Zero PV Total when cursor points to Move blinking program selection to next left choice.
	All Screens: Selected Item	Move cursor right.
	Home Screen	HOT navigates to change channel setpoint value.

Navigation

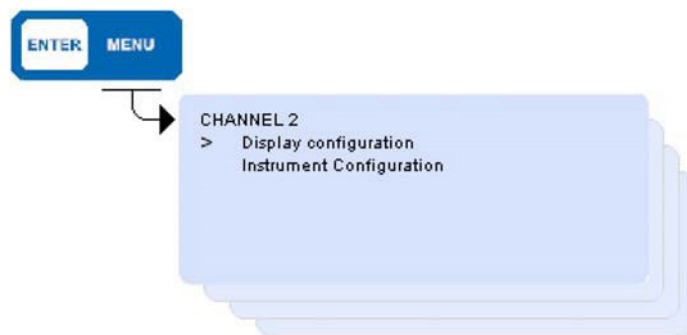
This subsection provides an overview of the various values that are available to set up the various program values, which determine how the instrument is desired to perform. It also describes the performance operating states.

Navigation is primarily performed using the keypad controls described in “3-2-1 Primary Functions” on p. 3-2. The same operating characteristics set using the keypad are also fully supported by serial communication. The serial communication functions are described more fully in Section D. A complete map of the user interface screens is provided to support the overview of the instrument. It shows the entire organization of all of the instrument process values (PV), all setpoint (SP) values, and all system global settings.

Display or Instrument Configuration Screen Selection

Pressing the menu button from the Home screen provides a secondary navigation layer for the operator to specify whether PV-SP Display Configuration or PV-SP Instrument Configuration is desired for a channel. The screen shown below is displayed as a result of having pressed the ENTER key while viewing the home screen.

This screen shown is for Channel 2. Use the cursor keys to point to either Display Configuration to show the present PV Measurements and SP Status, or Instrument Configuration to program PV and SP values, and then press ENTER to proceed to the desired selection.



User Interface Screen Map

The Figures 3-2 and 3-3 show the screen mapping from the home page to the channel values.

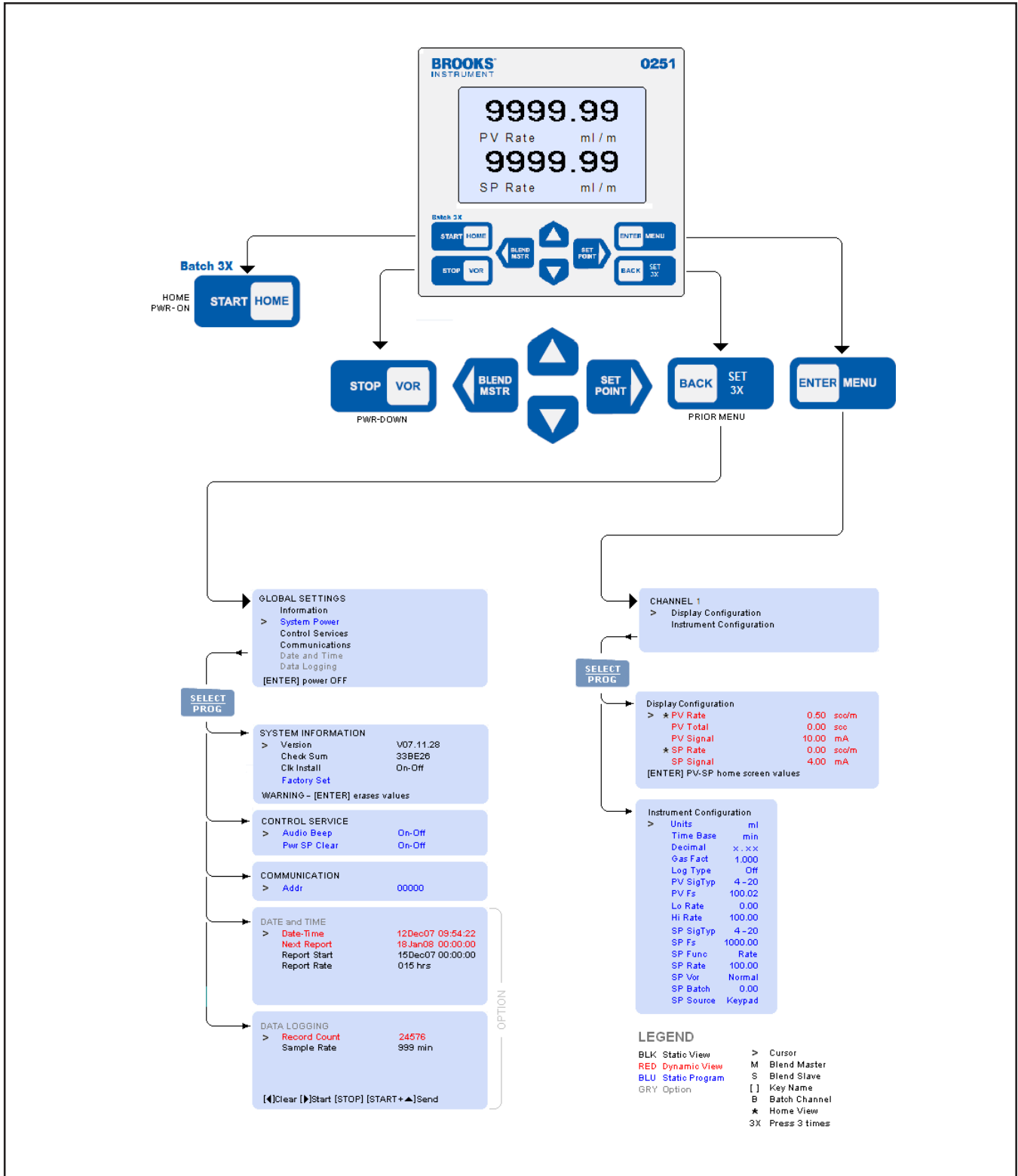


Figure 3-2 Model 0251 - User Interface Screen Map

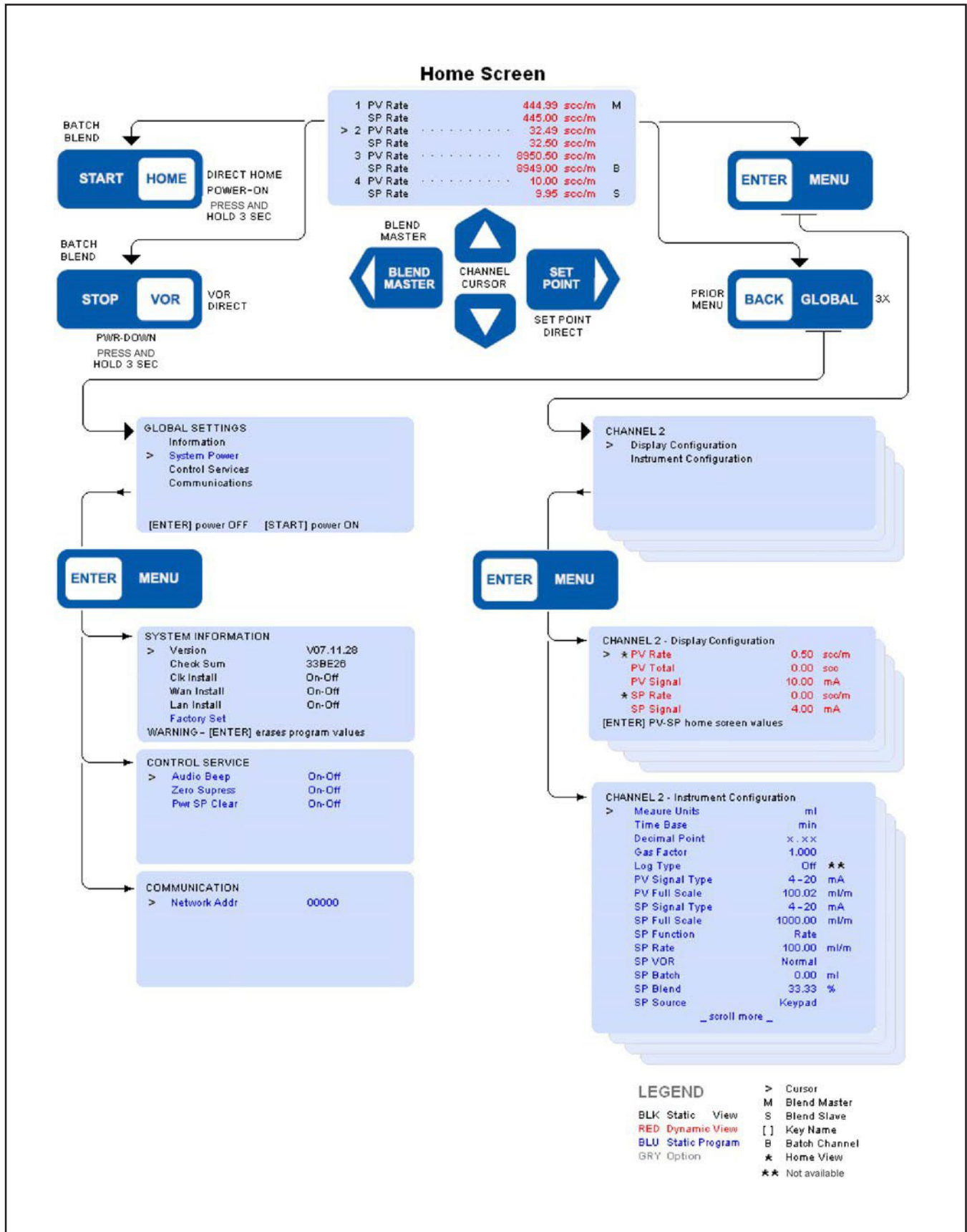
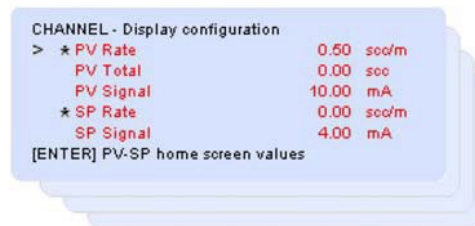


Figure 3-3 Model 0254 - User Interface Screen Map

Process Values (PV) and Setpoints (SP)

This subsection provides a detailed description of the various system map values that are used to set up the instrument's desired operating characteristics. These characteristics establish how the instrument is desired to perform. The subsection also covers the various process values, which are the outcome of the setup, that show the operating state.

PV-SP Measures and Status



The present PV and SP values shown on the home screen are indicated by an asterisk (*) prefix.

To change the PV displayed on the home screen, point the cursor to the desired PV value and press the ENTER key.

To change the SP displayed on the home screen, point the cursor to the desired SP value and press the ENTER key.

For both PV and SP, note that the star indicator is now prefixed to a new PV or SP value.

PV Rate

This value is either a Rate, defined as quantity per unit time, or None, which is a scalar value not having a time associated attribute. The Rate and Time base are configured in the Channel Instrument Configuration screen. A Time base value must be configured for the totalizer function to operate. The value displayed is updated in real time as the value changes.

PV Total

This is a quantity accumulator for a rate value. The quantity values are displayed when the channel time base is NOT programmed for None. PV Total quantity is not accumulated for None values, and no PV Total will be shown on the screen. The value displayed is updated in real time as the value changes.

To clear an accumulated quantity to zero, point the cursor to PV Total and press the ◀ key. Note the value becomes zero.

PV Signal

This value is the measured electrical value being input into the instrument channel. It may be used to provide assistance in system installations and is used to support instrument calibration. The value displayed is updated in real time as the value changes.

SP Setpoints

Separate setpoints are provided for rate control (SP Rate), Batch quantity (SP Batch), and Blend proportion (SP Blend). The specific setpoint shown on the screen is dependent on the SP Function control type that has been selected. The value displayed is updated in real time as the value changes.

SP Signal

This value is the output signal being sent from the instruments channel, and is expressed in the appropriate analog signal type units of Volts or mA.

PV-SP Configuration

The PV and SP channel configuration allows you to program the channel values to determine how signal inputs and outputs are displayed, calculated, operated, and scaled. These values are programmed in the Channel Instrument Configuration screen. For more information, refer to “3-6 Process Controls” on p. 3-15, which describes in greater detail the setup, configuration, operation, and termination of control processes.

The PV and SP program values are used to determine the following channel attributes:

- Gas type service
- Channel override signal
- PV signal type and full-scale range
- SP signal type and full-scale range
- Channel service function
- Channel override signal
- SP values
- SP programming source

The PV and SP values are static and are updated only after a value has been changed and saved.

Value Programming

Program a value by pointing the cursor to its line and pressing the ENTER key. Note a character or string (character string) will be blinking, ready to be edited.

Edit the character string as follows:

1. Change character string to next value ▲ key or previous value ▼ key.
2. Move blinking character-string edit field left ◀ key or right ▶ key.
3. Press the ENTER key to save the changed value (any other key causes the edited value to be ignored and not saved) and the original value to be edited will remain unchanged.

When editing a character field that is blinking, the program state will be terminated if a key is not detected within 30 seconds of the last detected key. In this case, the value edited will not be saved, and the original value to be edited will remain unchanged.



Measure Units

Measure units are a combination of symbols used to identify a physical engineering measurement. The measure units may be selected from a fixed set of customary strings. Measure Units have no arithmetic affect. Supported measure units are listed in Section A.

Time Base

This selection is used to set the quantity per unit time (rate) measurement as either Sec, Min, Hrs, or Days and None. The None, or scalar, time base selection is presumed not to have a time-quantity association and does not perform quantity accumulation.

Decimal Point

The decimal point for values may be freely selected for none, one, two, or three places. The decimal sets the number of measurement value digits that are to the right of the decimal point. Setting the decimal has an arithmetic function that, when changed, automatically multiplies or divides an existing value so values continue to retain their power-of-ten value. The values so affected include PV and SP Full Scale, SP Rate, SP Batch.

Gas Factor

This value is a unit-less factor by which measured PV Signals are compensated by multiplication, and SP Signals corrected by division. This instrument performs the arithmetic compensation using the Gas Factor. This capability makes it possible to compensate for other gases that are not the calibration gas. However, the existing Gas Factor must be known and then methodically changed. By knowing the present factor for the calibration gas, and desiring to control known gases for which an attached TMF has not been calibrated, then just divide the new gas factor by the previously known calibrated gas factor. The result becomes the new Gas Factor.

Log Type (Future Option)

All logging option selections should be set to Off.

PV-SP Signal Types

Signal Selections May be set for full scale ranges which include 0–20 mA, 4–20 mA, 0–5 V, 1–5 V, 0–10 V, 2–10 V, or OFF.

OFF selection Suspends service for either or both channel PV and SP signals. Inactive OFF is indicated on the home screen as a blank line.

PV-SP Full Scale

This value sets the maximum engineering unit range over which the Signal Type is valid. The minimum is always presumed to be zero.

SP Function

The allowable setpoint Functions are Rate, Batch, or Blend.

Rate The value set in SP Rate is converted to a corresponding analog signal, which is directly sent to the channel analog signal output. Refer to “Rate (Setpoint) Control” on p.34 for more details.

Batching Batching is a discontinuous control process that delivers the quantity set in the SP Batch. This process is started using either the keypad or a serial communication command. Batching is terminated when the desired batch quantity has been delivered, or any time before delivery is complete by pressing the STOP. Refer to “Batch Control” on p.37 for more details.

Blending (0254 only) Blending is a continuous control process after having been started that delivers a rate proportion set in the SP Blend register, which is referred to as the prevailing Blend Master input rate. This process is started using either the keypad or a serial communication command. Blending is terminated any time by pressing the STOP key from the home screen. Refer to “Blend Control” on p.38 for more details.

SP VOR (Valve Override)

This value is set to Normal for standard TMF operation. VOR Normal causes a VOR signal output voltage to be disconnected (i.e., floating). The VOR function is used in TMF applications to override the normal analog command signals and is used for installation and system diagnostic purposes.

Valve Open

The VOR output signal is connected and provides a voltage > 8.0 Vdc, causing the TMF valve to be fully open.

Valve Closed

The VOR output signal is connected and provides a voltage < -4.0 Vdc, causing the TMF valve to be fully closed.

SP Source

This control enables selection of the source from which setpoints may be entered as either Keypad or Serial. When set for Serial, changing a setpoint using the keypad is prohibited.

Global Settings

Global settings are the various system wide variables used to set up and review the overall operating characteristics that establish how the entire instrument will perform. The values include those provided only for viewing, those that can be selected, and those that invoke immediate action.

Global Information

To access the Global Settings screen, press the BACK/GLOBAL key three times from the Home screen.



This screen contains system information values and configuration states. These values are not programmable, with the only exception being the Factory Set immediate action selection described below, which erases present programmed values and replaces them with factory default values.



NOTE: The Cik Install, Wan Install, and Lan Install settings are not available for use.

Unit Serial Number

This is a factory-entered manufacturing serial number and does not relate directly to the device serial number.

Version

This is the date the firmware was last upgraded represented as year, month, and day, and is only for viewing.

Check Sum

This value is the hexadecimal double word sum of the instruction read-only memory used for factory quality assurance and is only for viewing.

Factory Set

When the cursor is pointing to Factory Set, a pop-up warning displays “WARNING - ENTER erases program values” at the bottom of the display. Pressing ENTER will cause all user program values to be erased and over-written with factory standard default values. Factory Set does NOT erase factory pre-set calibration values, which continue to be retained.

Global System Power

To enter the System Power function, point the cursor to System Power on the Global Settings screen and press the ENTER key. This is an immediate action selection.



The System Power functions causes power to equipment connected to the instrument to be placed in an Off state, allowing the user to conduct installation services and diagnostics. The power-off state is also useful for placing the instrument and connected equipments in an un-powered dormant state when the instrument is expected to remain unused for extended periods. The pop-up at the bottom of the display is shown on the screen only when the cursor is pointing to System Power.

Power OFF

Press the ENTER key with the cursor pointing to System Power. This will cause entry into the power down state, the screen to become blank with its back-light off, and all signals and power to be removed from connected equipment.

Power ON

Press the START key to restore normal system operation.

Global Control Services

To enter the Control Services screen, point the cursor to Control Services on the Global Settings screen and press the ENTER key.



These Control Service settings are programmable but are not updated in real time. They establish operation of the several system level operating controls.



Audio Beep	When this control is selected ON, allows normal audio annunciation for alarms and key activation. Otherwise, all audio indications remain disabled.
Zero Suppress	When this control is selected ON, numeric measured values are displayed with leading zeros suppressed.
Pwr SP Clear	When this control is selected ON, power restoration causes every channel SP value to be erased and made zero. Any VOR setting will be returned to normal.

Global Communication

To enter the Communications service screen, point the cursor to Communications on the Global Settings screen and press the ENTER key.



The Network Addr (address) is shown on the service screen. The Network Address is a unique identification for the instrument operating in a network environment. It is factory pre-set and not customer programmable.



Instrument Configuration and Control

This subsection provides a detailed description of the instrument's Rate, Batch, and Blend control functions, and the channel configuration for the SP and PV signals.

Rate (Setpoint) Control

Rate control is a continuous process performed on a channel-by-channel basis.

To configure Rate control:

1. Position the cursor pointing towards the appropriate channel on the Home screen.
2. Press the Enter/Menu key, and select Instrument Configuration by pressing the Enter/Menu key.
3. Once in the Instrument Configuration screen, scroll down to the SP Function option and select Rate.

4. Scroll down to the SP Rate option and select the flow rate setpoint that is desired. This control type causes an SP Rate signal programmed by the operator to be output to a controller. The setpoint can also be programmed by the Setpoint hot key.



Start Rate Control

To start rate control, a setpoint must be provided. To set setpoint, use the Setpoint hot key or the Instrument Configuration screen.



Home Screen

The delivery process can be monitored as shown on the real-time updated screens above and below. Observing that the SP Rate is the same as the monitored PV Rate.



Terminate Rate Control

When the channel SP Rate is set to zero, the process is off.
To set setpoint to zero, use the Setpoint hot key or the Instrument Configuration screen.

PV Configuration

Independently, the controller's output signal is monitored and indicated as the channel PV Rate, PV Signal, or PV Total, as selected in the Display Configuration screen. The PV Signal Type and PV Full Scale values are configured in the channel instrument configuration. Rate is a continuous process performed on a channel-by-channel basis.

To configure the PV Signal Type and PV Full Scale values:

1. Position the cursor pointing towards the appropriate channel on the Home screen.
2. Press the ENTER/MENU key.
3. Select Instrument Configuration by pressing the ENTER/MENU key.
4. Once in the Instrument Configuration screen, scroll down to the PV Signal Type and PV Full Scale options and select the applicable PV Signal Type and PV Full Scale values that are desired.



Batch Control

Batch processing is a non-continuous process that is started, conducted, and terminated when a desired quantity has completed delivery. You can stop batch delivery at any time prior to completion.



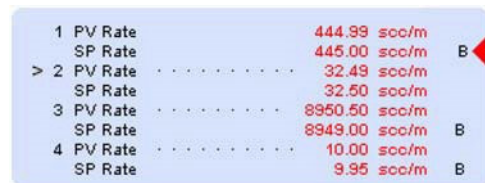
Setup

The following items must be programmed as follows:

- SP Function Select Batch
- SP Rate Set desired batch delivery rate
- SP Batch Set desired delivery quantity

Start Batch

Return to the home screen. Note that the home screen indicates a 'B' control indicator for all channels selected to perform batching.



Home Screen

Press the START key three times. 'B' indicators will be blinking to indicate channels with batch now in process.

The delivery process can be monitored as shown on the screen below by observing that the PV Total increases toward the SP Batch amount and verifying that the PV Rate properly indicates the desired delivery rate.

The values in this screen are updated in real time. If the SP Function is set for Batch, the SP Batch quantity appears on this screen.



Terminate Batches

Batching for each channel set for batch will automatically terminate when each batch channel PV Total has reached or exceeded its programmed SP Batch setpoint.

You can terminate any channels that continue with batching remaining in process by first returning to the home screen, then pressing the STOP key once. Note that the ‘B’ control indicators on the home screen stop blinking, indicating that all batch processes are stopped. Pressing the START key three times will always reset all batch totals to zero before starting the process.

Blend Control (Model 0254 only)

Blending is a continuous process that, when started, causes slave SP Rates to be a proportion of the actual rate being delivered by the master rate.

NOTE: Blend parameters are saved when power is lost, allowing blending to continue after power is restored unless Pwr SP Clear is selected to be ON. Refer to “3-5-3 Global Control Services” on p. 3-14.

Select a master channel and set its delivery SP Rate. One or more slave channels are then selected, and the process is started from the home screen. Once started, blending will continue and may ONLY be terminated by an operator.



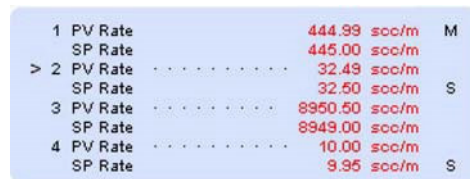
Blend Control Setup

Program the above values for master and slave channels desired to perform blending.

Select Blend Master

From the home screen, point to a channel desired to be the master and press the ◀ master blend key. This causes the home screen to show an 'M,' indicating master channel. If you press the master key again at that moment, the 'M' control indicator will no longer be present—no master is then selected—and blending will not be conducted.

To de-select a blend master, point to the present master channel and press the ◀ master blend key. Note that the 'M' control indicator is no longer present and the master has been de-selected.



1	PV Rate	444.99	scoc/m	M
	SP Rate	445.00	scoc/m	
> 2	PV Rate	32.49	scoc/m	S
	SP Rate	32.50	scoc/m	
3	PV Rate	8950.50	scoc/m	
	SP Rate	8949.00	scoc/m	
4	PV Rate	10.00	scoc/m	
	SP Rate	9.95	scoc/m	S

Home Screen

Master Channel Setup

It is recommended that you wait until after the blending setup is complete before selecting the desired flow rate setpoint to the Master Channel (refer to “Start Blend” on p. 40).

To configure the Master Channel for blending:

1. Position the cursor pointing towards the appropriate channel on the Home screen.
2. Press the ENTER/MENU key.
3. Select Instrument Configuration by pressing the ENTER/MENU key.
4. Once in the Instrument Configuration screen, scroll down to the SP Function option and select Rate.
5. Scroll down to the SP Rate option and input a zero flow rate setpoint (or via the Setpoint hot key).

NOTE: If you input a flow rate setpoint other than zero, the Master Channel will immediately respond to that setpoint and will start to flow.

Slave Channels Setup

Navigate to each desired slave channel and set each SP Function to Blend, then set the desired SP Blend rate percentage referenced to the master channels actual delivery rate. Note that the home screen shows 'S,' indicating selected blend slave channels.

NOTE: Once a slave channel is set to Blend, SP Rate programming is prohibited for both keypad and serial command.



Start Blend

1. Return to the Home screen.
2. Press the START key three times. Note the 'M' and 'S' suffix now blinking to indicate channels with blend now in process.
3. Navigate to the Master Channel Instrument Configuration screen (or via the Setpoint hot key) and set the Master SP Rate to the desired value. The blending process is visible on the Home screen, observing that the SP Rate of the slave channels is the programmed proportion of the master rate. If desired, the Home screen can be reconfigured to replace SP Rate of the slave channels with SP Blend ratio, as described in "PV-SP Measures and Status" on p. 26.

Terminate Blend In-Process

Once blending has started, it will continue unless manually terminated. To terminate blending:

1. Return to the Home screen, if not already there, and press the STOP key. This resets the master channel SP Rate to zero, which stops all flow.
2. Observe that the 'M' and 'S' process indicators no longer blink.
3. To resume blending, press the START key three times and re-enter the setpoint of the master channel, as described in "Start Blend" on p. 40.

SP VOR (Valve Override) Function

The SP VOR function is typically used in Mass Flow applications to override the normal analog command signals for installation and system diagnostic purposes.

The SP VOR function allows operators to either open or close the Mass Flow Control (MFC) valve independent of the current setpoint value.

The SP VOR function has three available settings.

- The Normal setting is for normal MFC operation in which the valve is controlled by the selected Setpoint values.
- The Open setting causes the valve to be fully open regardless of setpoint. This allows operators to purge the system or to force maximum flow through the MFC.
- The Closed setting causes the valve to be fully closed regardless of setpoint.

To activate one of the SP VOR function modes:

1. Position the cursor pointing towards the appropriate channel on the Home screen.
2. Press the ENTER/MENU key.
3. Select Instrument Configuration by pressing the ENTER/MENU key.
4. Once in the Instrument Configuration screen, scroll down to the SP VOR Function option and select the mode that is desired (Normal, Open, or Closed). The SP VOR selection can also be accessed directly by the VOR hot key.



Once activated, the SP VOR function mode is shown on the appropriate channel display to indicate which VOR function mode is active. The setting of the SP VOR Valve override function is memorized. After power down and power up, the memorized SP VOR function mode will remain in the previous mode until it is changed by the operator.

To return to Normal operation after activating one of the SP VOR function modes:

1. Position the cursor pointing towards the appropriate channel on the Home screen.
2. Press the ENTER/MENU key.
3. Select Instrument Configuration by pressing the ENTER/MENU key.
4. Once in the Instrument Configuration screen, scroll down to the SP VOR Function option and select the Normal mode. The SP VOR selection can also be accessed directly by the VOR hot key.

Totalization

The Totalizer function is used to provide a total of a selected channel's PV Output Rate over time. The total is based on the Rate and Time base that is configured in the particular channel's Instrument Configuration screen. A Time base value must be configured for the Totalizer function to operate. To display the Totalizer value:

1. Position the cursor pointing towards the appropriate channel on the Home screen.
2. Press the ENTER/MENU key.
3. Select Display Configuration by pressing the ENTER/MENU key.
4. Once in the Display Configuration screen, scroll down and select the PV Total option.



5. Once selected, return to the Home screen. The Totalizer value will now be displayed on the channel PV line. The accumulated quantity value displayed is updated in real time as the value changes.

To clear or reset an accumulated quantity to zero, point the cursor to PV Total and press the ◀ key. Note that the value is reset to zero.

Emergency Off

To shut down the instrument, press and hold the STOP/VOR button for three seconds.



Available Engineering Units

ml mls
mln l
ls ln
cm³
cm³s
cm³n
m³ m³s
m³n g
lb kg
ft³ ft³s
ft³n scc
sl mbar
bar psi
kPa Torr
atm Volt
mA oC
oK oR
oF g/cc
sg
%
lb/in³ lb/
ft³ lb/gal
kg/m³ g/
ml kg/l
g/l

Note: “. ^3” means cubic “. 3 “

Blending Examples

Example 1:

Master channel flow is 80 l/min
Slave channel flow has to be 0.8 l/min

Mass flow controller selections are :

Master channel unit: 100 l/min = Full Scale Value
Slave channel unit: 10 l/min = Full Scale Value

$$\text{Blending ratio is} = \frac{0.8 \text{ l/min}}{80 \text{ l/min}} = 0.01 = 1\%$$

Example 2:

Master channel flow is 240 l/min Slave
channel flow has to be 40 l/min

Mass flow controller selections are:

Master channel unit: 300 l/min = Full Scale Value
Slave channel unit: 50 l/min = Full Scale Value

$$\text{Blending ratio is} = \frac{40 \text{ l/min}}{240 \text{ l/min}} = 0.167 = 16.7\%$$

Example 3:

Master channel pressure is 1000 mbar
Slave channel flow has to be 50 l/min

Mass flow and pressure controller selections are:

Master channel unit: 2000 mbar = Full Scale Value
Slave channel unit: 100 l/min = Full Scale Value

$$\text{Blending ratio is} = \frac{50 \text{ l/min}}{1000 \text{ mbar}} = 0.05 = 5\%$$

Example 4:

Master channel flow is 100%
Slave channel flow has to be 50% (of slave channel full
scale)

Mass flow controller selections are:

Master channel unit: 6 l/min = 100% Full Scale
Slave channel unit: 4 l/min = 100% Full Scale

Blending ratio is = 50%

NOTE: When the blend ratio is % of slave channel, use 100% as the full-scale setting for master and slave.

Example 5:

Master channel flow is 80%
Slave channel flow has to be 20 kg/hr

Mass flow controller selections are:

Master channel unit: 100 kg/hr = 100% Full Scale
Slave channel unit: 50 kg/hr = Full Scale Value

Determination of entered setpoint:

$$\text{Blending ratio is} = \frac{20 \text{ kg/h}}{80\%} = 0.25 = 25\%$$

$$\text{Setpoint}_{\text{slave}} = 0.25 \frac{\text{kg/h}}{\%} \times 100\% = 25 \text{ kg/h}$$

Example 6:

Master channel pressure is 10 bar
Slave channel flow has to be 50% (of master channel full
scale)

Mass flow controller selections are:

Master channel unit: 15 bar = Full Scale Value
Slave channel unit: 20 l/min = Full Scale Value

Blending ratio is = 50%

Overview

This section describes in detail the various aspects of providing the 0250 Series commands and responses that result in operating value programming—fundamental to employing the system for acquiring and communicating measured information—and providing for process control output.

Firmware

Serial communication is supported by firmware versions V10.05.13 and later, see Section 3-5-1 for more information on the firmware version.

Structure

The 0250 Series is a general platform into which are installed certain standard and special operating modules. This section focuses on standard universal input-output module offerings. The platform supports input signal measures and control output signals. The platform supports various communication facilities.

Channels and Ports

The 0250 Series is comprised of pairs of ports, each of which has an input and output to form a channel, with four channels total.

Channel and port numbering

Channel Number	Port Number	Port Type	Description
1	1	Input	Input Port Settings
	2	Output	Output Port Settings
2	3	Input	Input Port Settings
	4	Output	Output Port Settings
3	5	Input	Input Port Settings
	6	Output	Output Port Settings
4	7	Input	Input Port Settings
	8	Output	Output Port Settings
N/A	9	Global	Global Settings

RS-232 Port Settings

The RS232 serial port setting of the PC which is used to communicate with the 0254 Read Out needs to be as follows:

Bit Rate 9600

Data Bits 8

Parity None

Stop Bits 1

Flow Control None

Hyperterminal Set-Up

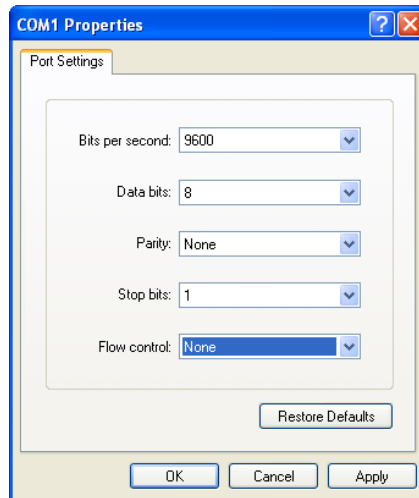
Within the windows operating system a software application is available, called Hyperterminal, which can be used to setup a serial connection to the 0254 Read Out. This software application is available in the following shortcut menu “Start->All Programs->Accessories->Communications->Hyperterminal”. This shortcut will put up the screen shown below.”



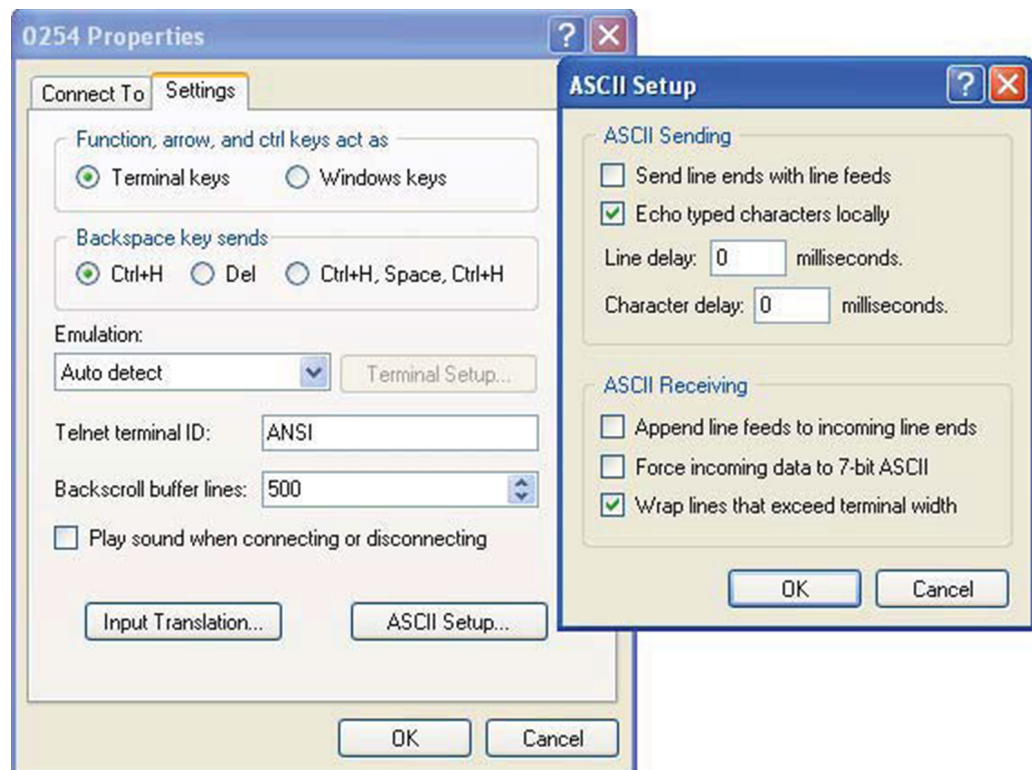
Enter a name for the connection and click the ‘OK’ button. In the next screen enter the right COM port number, see below.



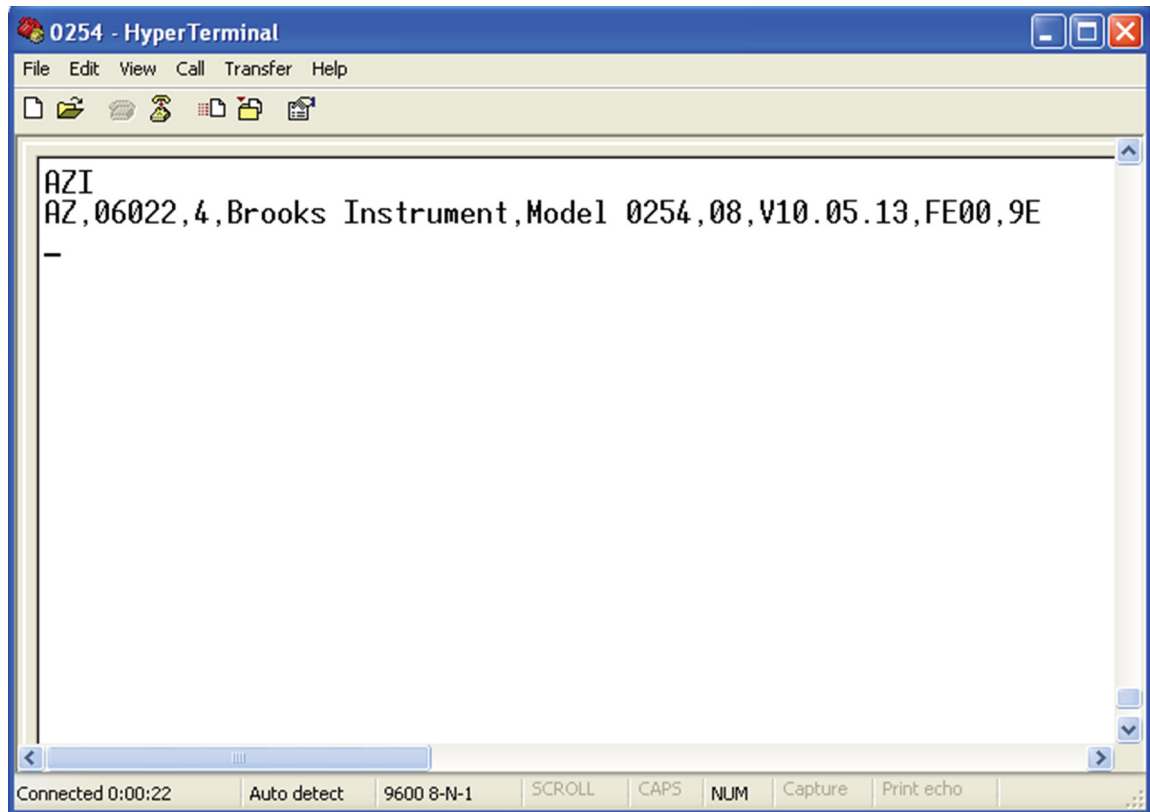
In the 'Port Settings' screen enter the values as shown in the picture below and click the 'OK' button.



Open the 'File->Properties' pull-down menu and click the ASCII Setup' button and configure the settings as shown below.



Dismiss both screens by clicking the OK button and enter the command 'AZI' to check if the connection was successful, as seen in the following screen.



Command Structures

This protocol was selected to service the need for serial error control while operating in local or wide area networks to transfer information between a unit and host computer.

Elements

The command format is a free-form variable entry implementation, enabling expeditious economic means of achieving required programming results. Commands are comprised of the following structural elements:

Block Pre-limiter	Sentinel indicating start of multiple packets message
Packet Pre-limiter	Sentinel indicating start of a packet message.
Information Frame	Contains comma pre-limited fields that start with the first character immediately following the message pre-limiter and includes all successive characters up to and including a comma, which immediately precedes the first ASCII hexadecimal checksum character.
Checksum	Two ASCII hexadecimal characters created for a Model 0254 negated sum of all characters available in the Information Frame, which is used by a host computer to check a message packet's validity.
Packet delimiter	Sentinel indicating end of a packet message.
Block Delimiter	Sentinel indicating end of multiple packets message

Transfer

All messages are serial half-duplex send-response types.

Baud Rate = 9600

Mastering

The protocol initiator or originator is the master. The master is responsible for managing the communication link connection.

Command Addressing

Each Model 0254 unit is assigned a unique 5-digit address, from 0 to 65535, which must be pre-programmed in the instrument prior to deployment in a networked system. The ports that comprise a channel are designated with an appended [.x} or [.xx] sub-address.

The 5-digit address may be omitted when operating a single un-networked unit but must be used in multiple unit networks to differentiate the units from each other.

Command arguments are single ASCII alpha non-case sensitive characters. No spaces are allowed between the 'AZ' and <cr>, i.e. start and the end of the command respectively.

```

HOST SEND
  AZ  YYYYY          .xx K <cr> | | | | |
  |                    | |           + - message delim-
  iter | |           | +- command argument | | +-
  port sub-address | +- unit address +- message prelimit-
  er

  AZ[.xx]<argument><cr>  Non-networked sub-addressed port

  AZ[yyyyy.xx]<argument><cr>  Networked sub-addressed port

RESPONSE - <argument> dependent

```


View Programmed Channel Port Values

This command enables the operator to review all present programmed channel port values.

```
HOST SEND
  AZ.xxV<cr>           Non-network xx=port number (1-8)
  AZ[yyyyy.xx]V<cr>   Network
```

RESPONSE

Response is dependent upon whether the port is off, input, output, or Global Settings (port 9), which will be further described in subsequent subsections.

Identify Command

This command causes the addressed unit to respond with a string providing identity information about the instrument. This command is useful to determine a networked instrument complement. More detailed structural information is available in Section 3.

The responding unit checksum may be validated by the host, who may request the information again if the received packet is in error. The checksum is calculated over the complete Information Frame, see Section C-3-1.

```
HOST SEND
  AZI<cr>               Non-network
  AZ[yyyyy]I<cr>       Network
```

RESPONSE

```
AZ,00000,4,BROOKS,0254,08,01.01.13,FE00,<sum><cr><lf>
```

FIELDS

```
AZ           Pre-limiter ,00000
Unit address ,4   Response type ,Brooks
Instrument     Make ,Model 0254 Model
,08           Port provision count
,V09.01.30     Code version date yy-mm-
dd ,FE00       Start vector ,<sum>
Negated mod256 sum <cr><lf>  Delimiter
```

Message Serial Character Pacing Controls

These commands provide for the terminal or host to suspend character sending or to re-enable the sending to continue. This facility is particularly useful when the instrument sends large data amounts, such as logged information.

Serial Character Pacing

This command acts as an XOF to temporarily suspend unit from sending further characters:

```
HOST SEND
    AZH<cr>                Non-network
    AZ [yyyyy]H<cr>       Network
```

RESPONSE - none

This command acts as an XON to allow or re-enable unit to continue sending characters:

```
HOST SEND
    AZS<cr>                Non-network
    AZ [yyyyy]S<cr>       Network
```

RESPONSE - none

Serial Message Error Control

Commands provide for error control of information packets sent by the instrument. This is particularly useful when transferring information over wide area networks and causes the instrument to continue to send the next packet or to resend a previously sent packet.

The send-resend is determined by the receiving host based on having computed a checksum from the received characters, then comparing it with the checksum sent by the unit. The instrument must be pre-configured to enable the error control protocol.

Positive Acknowledge Command

This command must be issued by the receiving host to enable the instrument to send its packet, which is next eligible. Should the instrument not receive positive acknowledgement within four seconds, it will resend the previous packet up to four times before abandoning the send session.

```
HOST SEND
    AZA<cr>                Non-network
    AZ [yyyyy]A<cr>        Network

RESPONSE - none
```

Negative Acknowledge Command

This command may be issued from the terminal or host to cause the instrument to resend its previous packet. Should the instrument not receive negative acknowledgement prior to a lapse of four seconds, it will automatically resend the previous unacknowledged packet up to four times before abandoning the send session.

```
HOST SEND
    AZN<cr>                Non-network
    AZ [yyyyy]N<cr>        Network

RESPONSE - none
```

Measured Channel Values Command

This command is used to gather measured information from one or all channel input ports. Protocol responses are compatible with existing published protocol formats. Frames noted below as lower case 'x' remain <reserved>, regardless of frame content.

```
HOST SEND
  Non-Networked
    AZ[.xx]K<cr>          Send one channel input
  port values Networked
    AZ[yyyyy.xx]K<cr>    Send one channel input port values
```

```
RESPONSE - ONE CHANNEL INPUT PORT MESSAGE
AZ,00909.01,2,xxxxxxxx.xx,00162871.43,-0000003.27,xxxxxxxx.xx,xxxxx,X,X,X,X,X,<sum><cr><lf>
```

Explanation of response values above

Parameter Number	Value in Example	Description
1	AZ	response pre delimiter
2	00909	network address of 0254 Read Out device
3	01	port number (input port channel 1)
4	2	response type
5	xxxxxxxx.xx	Non resettable totalizer value
6	00162871.43	Totalizer value
7	0000003.27	process value
...		reserved parameters
15	<sum>	check sum
16	<cr>	carriage return character
17	<lf>	line feed character

Send Channel Input Port Programmed Values

This command enables a terminal operator or host to acquire the present state of input port programmed values. Valid input port numbers (xx) are [1, 3, 5, 7].

```
HOST SEND
    AZ [.xx]V<cr>                Non-network
    AZ [yyyyy.xx]V<cr>           Network
```

RESPONSE

```
PROGRAM VALUES - Channel 1 - Port 01

<04> Measure Units           ml <10>
Time Base                    min
<03> Decimal Point          x.xx
<27> Gas Factor              1.000
<28> Log Type                Off <00>
PV Signal Type               0-20mA
<09> PV Full Scale          20.00
ml/m
```

Each of the input port programmed operating values can be individually queried or changed in accordance with the procedures in Section C-5-1 and C-5-2.

Program Channel Input Port Values

Each of the input port programmed operating values can be individually queried or changed in accordance with the procedures in Section 3 using the <xx> value index.

Clear Accumulated Values

This command allows any one channel input port accumulated value to be independently reset to zero, or all unit programmed values to be set to factory default.

```
HOST SEND
  AZ [.xx]Zn<cr>           Non-network
  AZ [yyyyy.xx]Zn<cr>     Network
  n=0,2,3,5,6 <reserved>
  n=1                      Measured quantity for one channel input port n=4
  Set all channels to be set to Factory default program values
```

RESPONSE - none

Channel Control Output Port Values

This command enables terminal operator or host to acquire the present state of a channel output port programmed values. Valid output port numbers (xx) are [2, 4, 6, 8].

```
HOST SEND
  AZ [.xx]V<cr>           Non-network
  AZ [yyyyy.xx]V<cr>     Network
```

RESPONSE

```
PROGRAM VALUES - Channel 1 - Port 02
<00> SP Signal Type 0-20mA <09> SP
Full Scale 20.00 ml/m <02> SP Func-
tion
Rate <01> SP Rate
0.00 ml/m <29> SP VOR
Normal <44> SP Batch
0.00 ml <45> SP Blend
0.000 % <46> SP Source
Keypad
```

Each of the port programmed operating values can be individually queried or changed in accordance with the procedures in Section C-5-1 and C-5-2.

Batch and Blend Control Commands

These commands are provided to conduct output port control operations that require starting and stopping.

Batch Command

This command is used to start a new batch quantity process or stop a batch process that may currently be in processing.

Bulk Batching

Bulk batching starts all qualified batch processes for all qualified channel ports at the same time.

Qualified channel output ports [Control Function] must be programmed to [Batch] and [Batch Quantity] set greater than zero, with [Link] to the channel input port programmed to accumulate quantity.

HOST SEND

```
AZ F*<cr>          start all channel batches
AZ F<cr>          stop all channel batches
```

RESPONSE (S)

```
AZ, [yyyyy.xx], 5, FOK, DA, <cr><lf>    batch started and in process
AZ, [yyyyy.xx], 5, FDONE, 4E, <cr><lf>  batch(s) completed
AZ, [yyyyy.xx], 5, FERROR, 5D, <cr><lf> command error
```

Blend Command

This command is used to select a blend master channel and thereafter start the desired blending operation. At least one, or more, slaves output rates are controlled to be a proportion of the selected masters delivery rate.

The qualified channel output port must have its [Control Function] set to [Blend].

The required master channel input port is specified in the start command by inserting its port sub-address [.xx] in the command, and must be one of the following:

Channel	Sub-Address
1	1
2	3
3	5
4	7

```
HOST SEND
  AZ[.xx] B<cr> Start blending AZ
  F<cr> Stop blend-
  ing
```

RESPONSE - none

Brooks Instrument

Global Setting Values

This command enables a terminal operator or host to acquire the present state of the Global programmed values. The Global Settings port number is one greater than the maximum number of available ports, which is 9 for Model 0254.

```
HOST SEND
  AZ[.09]V<cr>           Non-Network
    <or>
  AZ[.9] V<cr>
```

```
  AZ[yyyyy.09]V<cr>
  Network AZ[yyyyy.9]V<cr>
```

RESPONSE

PROGRAM VALUES - Channel Global

```
<39> Audio Beep           On
<32> Zero Supress        On <33>
Pwr SP Clear             Off
<43> Record Count        000000 (view only)   log
option <25> Sample Rate   535 sec             log
option <22> Date-Time      00Jan00 00:00:00     log
option <17> Network Addr   00000
```

Set Global Settings Values

Each of the system port programmed operating values can be individually queried or changed in accordance with the procedures in Section 3 using the <xx> value index.

Communication Message Basics

Messages between host and instrument are either polled (solicited) or unpolled (un-solicited), where the host is normally the polling (soliciting) party.

Message Structure

A packet is a group of information from channel input ports. A group of packets sent together is a block message, as shown in the examples below. Protocol responses are compatible with existing published protocol formats. Frames noted below as lower case 'x' remain <reserved>, regardless of frame content.

```
MESSAGE
AZ,00909.00,2,xxxxxxxx.xx,00162871.43,-0000003.27,xxxxxxxx.xx,xxxxx,X,X,X,X,X,<sum><cr><lf>
```

Message Format

```
BLOCK PRELIMITER
    <dle><stx>                                Start of multi-port block

PACKET PRELIMITER
    AZ                                          Start of a port packet

ADDRESS - unit and port(s) providing the information ,xxxxx
    unit address
    .xx                                        port sub-address

TYPE - message purpose
    Un-pollled Types
    ,0                                        <reserved>
    ,1                                        <reserved>
    ,2                                        <reserved>
    ,3                                        <reserved>
    ,6                                        <reserved>
    Polled Types
    ,4                                        Information request response
    ,5                                        Control batch status
    ,6                                        <reserved>
    ,7                                        <reserved>
    ,8                                        <reserved>
    ,9                                        <reserved>

MEASURE - channel input port values - sign convention as (+), space(+), or minus(-)
    ,xxx                                        <reserved>
    ,QTY                                        Quantity
    ,RATE                                       Rate-Value
    ,xxx                                        <reserved>
    ,xxx                                        <reserved>

CHECKSUM
    ,<sum>                                    Negated mod256 sum

PACKET DELIMITER
    <cr><lf>                                    Packet end

BLOCK DELIMITER
    <dle><etx>                                    Block end
```

Serial Value Programming

This sub-section is organized into reading and programming values. The <index> value is a numeric designator unique to each programmable value, except Port Type.

Read a Programmed Value

The command below is used to read a single parameter. The parameter is identified by the index number (zz), see Sections C-4-3, C-4-4 and C-4-5 for a list of index values.

```
HOST SEND
  AZ [.xx]P[zz]?<cr>           Non-Net-
  work AZ [yyyyy.xx]P[zz]?<cr> Network

RESPONSE
  AZ,yyyyy.xx,4,Pzz,<present value>,<sum><cr><If>
```

A received response indicates that no error was detected.
Response parameters

Parameter Number	Value in Example	Description
1	AZ	response pre delimiter
2	yyyyy	network address of 0254 Read Out device
3	xx	port number
4	4	response type
5	Pzz	zz is the index indicating which parameter is retrieved
6	<present value>	value of retrieved parameter
7	<sum>	check sum
8	<cr>	carriage return character
9	<lf>	line feed character

The example below retrieves the setpoint, i.e. 20.00, for output port 8 channel 4

```
Request
AZ.08P01?<cr>
```

```
Response AZ,00909.08,4,P01,20.00,D-
F<cr><lf>
```

Program a New Value

The command below is used to write a single parameter. The parameter is identified by the index number (zz), see Sections C-5-3, C-5-4 and C-5-5 for a list of index values.

```
HOST SEND
  AZ[.xx]P[zz]=<new value><cr>           Non-net-
work  AZ[yyyyy.xx]P[zz]=<new value><cr> Network
```

```
RESPONSE
  AZ,yyyyy.xx,4,Pzz,<new value>,<sum><cr><If>
```

A correct received response indicates that no error was detected. It is recommended that host software validates the responding message checksum, followed by the unit message address, port number, value index, and new programmed value, to be certain that the desired value change was programmed successfully.

Response Parameters

Parameter Number	Value in Example	Description
1	AZ	response pre delimiter
2	yyyyy	network address of 0254 Read Out device
3	xx	port number
4	4	response type
5	Pzz	zz is the index indicating which parameter is retrieved
6	<new value>	value of retrieved parameter
7	<sum>	check sum
8	<cr>	carriage return character
9	<lf>	line feed character

The example below configures the setpoint for output port 8 channel 4 to be 10.00.

```
Request
AZ.08P010.00<cr>
```

```
Response AZ,00909.08,4,P01,10.00,D-
F<cr><if>
```


Channel Input Port Values

Port Type is the input signal type and is the first serial character received when programming a new Type. An optional second character may be received after Port Type with a range from 0-2 and has no operational effect. The second character is always returned when Port Type is serially interrogated.

Note that the input and output port signal types have their own set of configuration values. If you use an input port signal type value to configure an output port the 0254 Read Out might not function well. If this is the case you need to configure factory settings again, see Section 3-5-1 in this manual.

<u>Index</u>	<u>Value Title</u>	<u>Value</u>	<u>Range</u>	<u>Notes</u>
0	Port Type	0 Off 1-6 0-20mA 8 0-10V : 2-10V ; 0-5V < 1-5V		1 or 2 ascii chars with char range 0-2 not affecting proper operation <reserved> 7 1 ascii char min 4-20mA 9
	Excitation Type	0-2		1 ascii char optional <reserved>
Measurement magnitude range 3	Decimal Point	0 xxx. 1 xx.x 2 x.xx 3 .xxx		1 ascii char

Character string identifying the physical measurement type

4 Measure Units fixed indexed strings

- 0 ml
- 1 mls
- 2 mln
- 3 l
- 4 ls
- 5 ln
- 6 cm^3
- 7 cm^3s
- 8 cm^3n
- 9 m^3
- 10 m^3s
- 11 m^3n
- 12 g
- 13 lb
- 14 kg
- 15 ft^3
- 16 ft^3s
- 17 ft^3n
- 18 scc
- 19 sl
- 20 bar
- 21 mbar
- 22 psi
- 23 kPa
- 24 Torr
- 25 atm
- 26 Volt

Index	Value Title	Value	Range	Notes
		27 mA		
		28 oC		
		29 oK		
		30 oR		
		31 oF		
		32 g/cc		
		33 sg		
		34 %		
		35 lb/in^3		
		36 lb/ft^3		
		37 lb/gal		
		38 kg/m^3		
		39 g/ml		
		40 kg/l		
		41 g/l		

Analog interpolator representing the engineering units of the greater measured signal
 9 PV Full Scale xxxxxx 0 to ±999.999 1-7 ascii chars var dp

Measurement per unit time relationship
 10 Rate Time Base 0 none (Scalar) 1 ascii char
 1 sec
 2 min
 3 hrs
 4 day

Scale Factor by which interpolated channel units are multiplied
 27 Gas Factor xxx.xxx 0 to ±999.999 1-7 ascii chars fix dp

Channel Output Port Values

Port Type is the output signal type and is the first serial character received when programming a new Type. An optional second or third character may be received after Port Type with a range of 0-99 and has no operational effect. These characters represent the port number of the linked input and are always returned when Port Type is serially interrogated.

<u>Index</u>	<u>Value Title</u>	<u>Value</u>	<u>Range</u>	<u>Notes</u>
0	Port Type	0 Off 1 0-20mA 2 4-20mA 3 0-10V 4 2-10V 5 0-5V 6 1-5V		1 or 2 ascii chars with second or third chars range 0-99 not affecting proper operation 1 ascii char min
	Link Input Port			0-99 1 or 2 ascii char optional
1	Rate (Manual) output set-point SP Rate	xxxxxx	0 to ±999.999	1-7 ascii char var dp
2	Select output control service SP Function	1 Rate 2 Batch 3 Blend		1 ascii char
	Analog De-Interpolate Scale	xxxxxx	0 to ±999.999	1-7 ascii char var dp
29	Valve Override valve state selection SP VOR	0 Normal 1 Closed 2 Open	0-2	1 ascii char tri-state vo < -4V vo > +8V
44	Batch Delivery Set-Point SP Batch	xxxxxx	0 to ±999.999	1-7 ascii char var dp
45	Blend Mixing Set-Point SP Blend	xxxxxx	0 to ±999.999	1-7 ascii char var dp (automatic % units)
46	Set-Point Programming Source SP Source	0 Keypad 1 Serial	0-1	1 ascii char keypad prohibit

Global Setting Values

These settings affect all aspects of the system; they are not port or channel associated.

Index	Value Title	Value	Range	Notes
Zero Suppression 0-1	- ON suppresses leading value zero values 1 ascii char	0 Off 1 On	32	Zero Supress
Power Set-Points Clear 0-1	- ON causes all channel set-points to become zero 1 ascii char	0 Off 1 On	33	Pwr SP Clear
Audio Annunciate Control 0-1	- ON enables annunciate key activation and alarms 1 ascii char	0 Off 1 On	39	Audio Beep

LIMITED WARRANTY

Visit www.BrooksInstrument.com for the terms and conditions of our limited warranty.

BROOKS SERVICE AND SUPPORT

Brooks is committed to assuring all of our customers receive the ideal flow solution for their application, along with outstanding service and support to back it up. We operate first class repair facilities located around the world to provide rapid response and support. Each location utilizes primary standard calibration equipment to ensure accuracy and reliability for repairs and recalibration and is certified by our local Weights and Measures Authorities and traceable to the relevant International Standards.

Visit www.BrooksInstrument.com to locate the service location nearest to you.

START-UP SERVICE AND IN-SITU CALIBRATION

Brooks Instrument can provide start-up service prior to operation when required.

For some process applications, where ISO-9001 Quality Certification is important, it is mandatory to verify and/or (re)calibrate the products periodically. In many cases this service can be provided under in-situ conditions, and the results will be traceable to the relevant international quality standards.

SEMINARS AND TRAINING

Brooks Instrument can provide seminars and dedicated training to engineers, end users and maintenance persons.

Please contact your nearest sales representative for more details.

Due to Brooks Instrument's commitment to continuous improvement of our products, all specifications are subject to change without notice.

TRADEMARKS

Brooks is a trademark of Brooks Instrument, LLC
All other trademarks are the property of their respective owners.



Installation-Manual-0250-Series-EN/2023-03
Part Number: 541B129AAG

Global Headquarters

Brooks Instrument
407 West Vine Street
Hatfield, PA
19440-0903 USA

Toll-Free (USA): 888-554-FLOW
T: 215-362-3500

BrooksAM@BrooksInstrument.com

A list of all Brooks Instrument locations and contact details can be found at www.BrooksInstrument.com

© Copyright 2023 Brooks Instrument, LLC All rights reserved. Printed in U.S.A.

BROOKS[®]
INSTRUMENT
Beyond Measure