Installation and Operation Manual
X-SE-0151-eng
Part Number: 541B092AHG
April, 2008

Models 0151E and 0151*i*
Flow Computers

BROOKS® INSTRUMENT

Essential Instructions

Read this page before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use and maintain them 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, using and maintaining Brooks Products.

- 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.
- 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.
- Inform and educate your personnel in the proper installation, operation and maintenance of the product.
- 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.
- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- 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, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

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 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.

Tables

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1-1 General

The Brooks® Model 0151 Flow Computers are designed to work with the gas and liquid thermal mass flowmeters and thermal mass flow controllers and pressure controllers. Two versions available:

Model 0151E	Provides +15Vdc and -15Vdc supply and 0-5Vdc command signal to the flowmeters and accepts a 0-5Vdc flow signal.
Model 0151*i*	Provides a +24Vdc supply and (0)4-20mA command signal to the flowmeters and accepts either a 4-20mA or 0-20mA flow signal. Programmable high and low flow alarms are also available.

Both versions are microprocessor based and are fully programmable. They include the following functions:

Rate	Display of the flowrate directly in engineering units.
Total	Integration of the flowrate to display a resettable total directly in engineering units. Flow total engineering units can be different from flow engineering units.
Setpoint Control	A setpoint can be programmed directly from the front panel or, alternatively, sourced from a remote device such as a process controller.
Valve Override	The valve position can be overridden from the front panel or from a remote switching unit to force the mass flow controller's valve fully open or fully closed.
Communications	Optional RS232/422 Communications enable interfacing with a computer or printer.
Alarms	The Model 0151*i* provides high and low flowrate alarm outputs in the form of relay contacts.

Program functions can be password protected, with all calculation constants set via the front panel switches and stored in a nonvolatile memory which will retain data for 10 years. The user can program spans, filtering levels, display resolution and cutoff points.

1-2 Model Number Designation

Refer to Table 1-1 below for Model Code Number Designation. The Model number of the instrument describes the version and options. The Model number of the instrument is displayed on first entering the Calibration Mode (see Section 5).

Table 1-1 Model Code Number Designation

MODEL	SECONDARY ELECTRONICS
0151AA	1 CHANNEL POWER SUPPLY/CONTROLLER, HARDWARE REVISION A, SOFTWARE REVISION A

CODE	PHYSICAL DESCRIPTION
D	TABLE TOP MODEL WITH HANDGRIP AND POWER CORD
E	PANEL MOUNT MODEL WITH POWER CORD

CODE	POWER SUPPLY
1	220 V
2	110 V

CODE	OUTPUT POWER TO MFM/MFC	INPUT/OUTPUT SIGNAL TO MFC
A1	±15 VDC (E-SERIES VERSION)	0-5 VDC (E-SERIES VERSION)
B3	24 VDC (*i*-SERIES VERSION)	4-20 OR 0-20 Ma (i-SERIES VERSION)

CODE	OPTIONS
1	NONE
2	RS232 AND RS422/4485 SERIAL COMMUNICATIONS

CODE	OEM CODE
A	BROOKS

0151AA	D	1	A1	1	A	TYPICAL MODEL CODE

2-1 General

Display:	6 digit LCD, 0.7" high digits.
Update Rate:	2 times per second.
Data Retention:	All setup parameters and totals are stored in a nonvolatile memory with 10 years retention. Instrument returns to same condition after power interruption.
Power:	ac Mains set internally via switch to 90 - 135 Vac, 50 - 60 Hz or 190 - 260 VAC, 50 - 60 Hz.
Operating Temperature:	0 to 55°C
Dimensions	
Panel Mount:	5.67" (144mm) wide x 2.83" (72mm) high x 7.99" (203mm) deep. See Figure 1-2.
Cutout:	5.5" (139mm) wide x 2.6" (67mm) high. See Fig 2-1.
Table Top:	10.66" (270.7 mm) wide x 4.16" (105.6 mm) high x 9.59" (243.7 mm) deep. See Figure 2-2.
Enclosure:	Polycarbonate facia and bezels. Panel Mount case is extruded aluminium. Table top enclosure is Polycarbonate.

2-2 Flow Input

Signals:	Model 0151E: 0-5Vdc.
Model 0151*i*:	0-20mA or 4-20mA as program selected. Input Impedance of 250 ohm.
Display Accuracy:	0.075% of full scale with the respect to flow signal input.
Relationship:	Linear to mass flow.
Secondary Input:	Model 0151*i*: 0-5Vdc Input from Mass Flow Controller.
Integration:	The rate is integrated with a timebase selectable in days, hours, minutes or seconds.
Cutoff:	A cutoff point can be set below which the rate is not integrated. This is factory set to 1%.

2-3 Model 0151E

Power Out:	+15Vdc ±5%, 350mA.	
	-15Vdc ±5%, 350mA.	
Flow Output:	0-5Vdc non-isolated retransmission.	
	Resolution:	10 bits.
	Accuracy:	< 0.05%.
Valve Override Output:	+15Vdc	Valve Open

	-15Vdc	Valve Closed
	Tristate(1)	Normal
Setpoint Signal:	0-5Vdc	

(1) In Tristate, the output is floating with a high impedance.

(2)Derated for table top version.

2-4 Model 0151*i*

Power Out:	+24Vdc ±5%, 800mA.	
Flow Output:	0-20mA or 4-20mA isolated retransmission of mass flow signal. External loop power of 12-24Vdc required to power loop and the output can drive loads up to 250 ohms.	
	Resolution:	12 bits.
	Accuracy:	< 0.02%.
Valve Override Output:	+24V	Valve Open
	0V	Valve Closed
	Tristate(1)	Normal
Setpoint Signal:	0-20mA/4-20mA selectable. Input impedance is 250 ohms.	
Relays:	Moving Coil relays (2) for high, low and mass flow controller alarms. SPDT (1 form C)	
	Max Current:	2A.(2)
	Max Voltage:	250Vac, 30Vdc.

(1) In Tristate, the output is floating with a high impedance.

(2)Derated for table top version.

2-5 Option

Communications: An RS232 and RS422/485 interface for driving printers and for communicating with computers. Baudrate, parity and protocol are fully programmable.

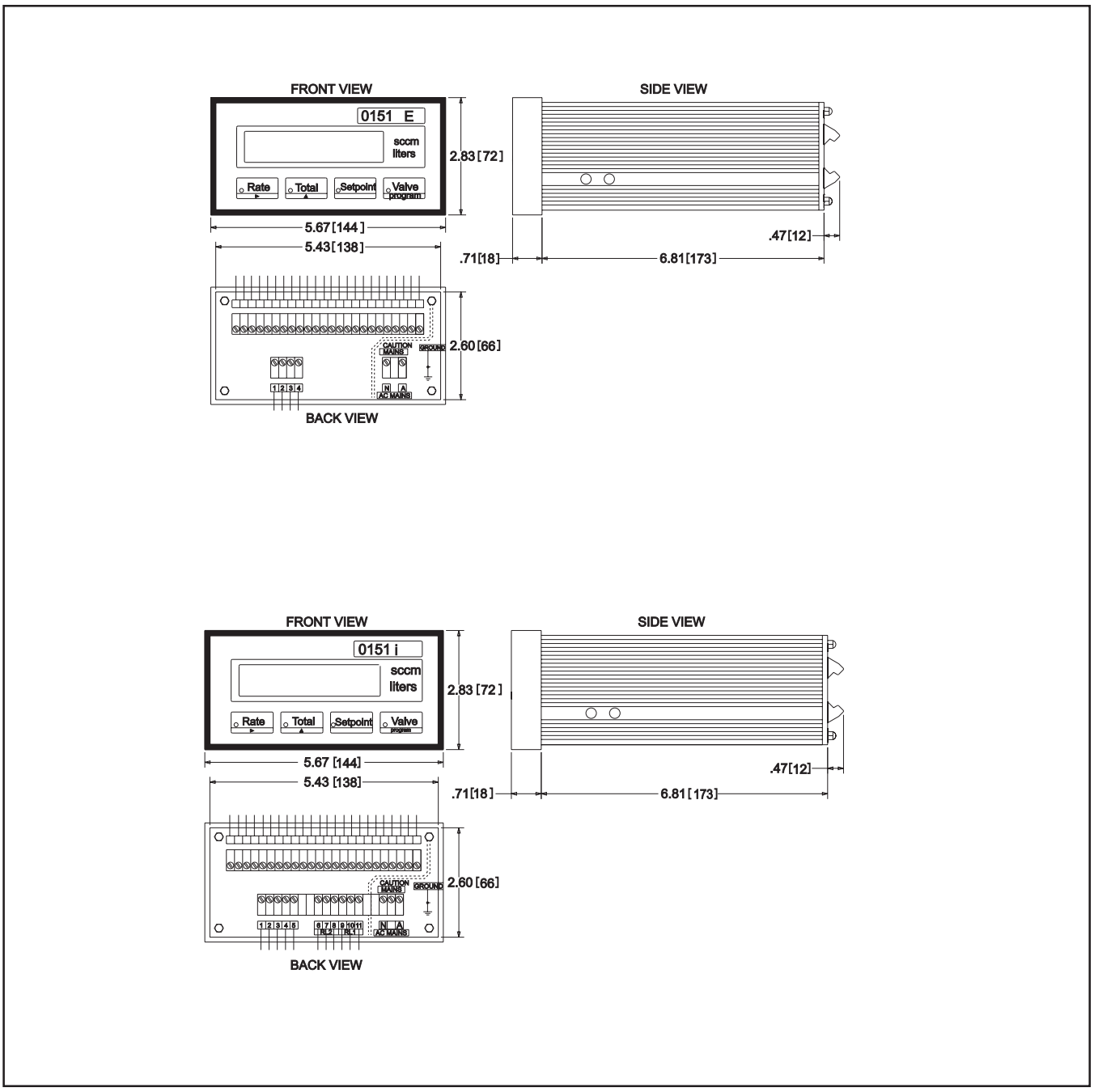

Figure 2-1 Panel Mount Dimensions

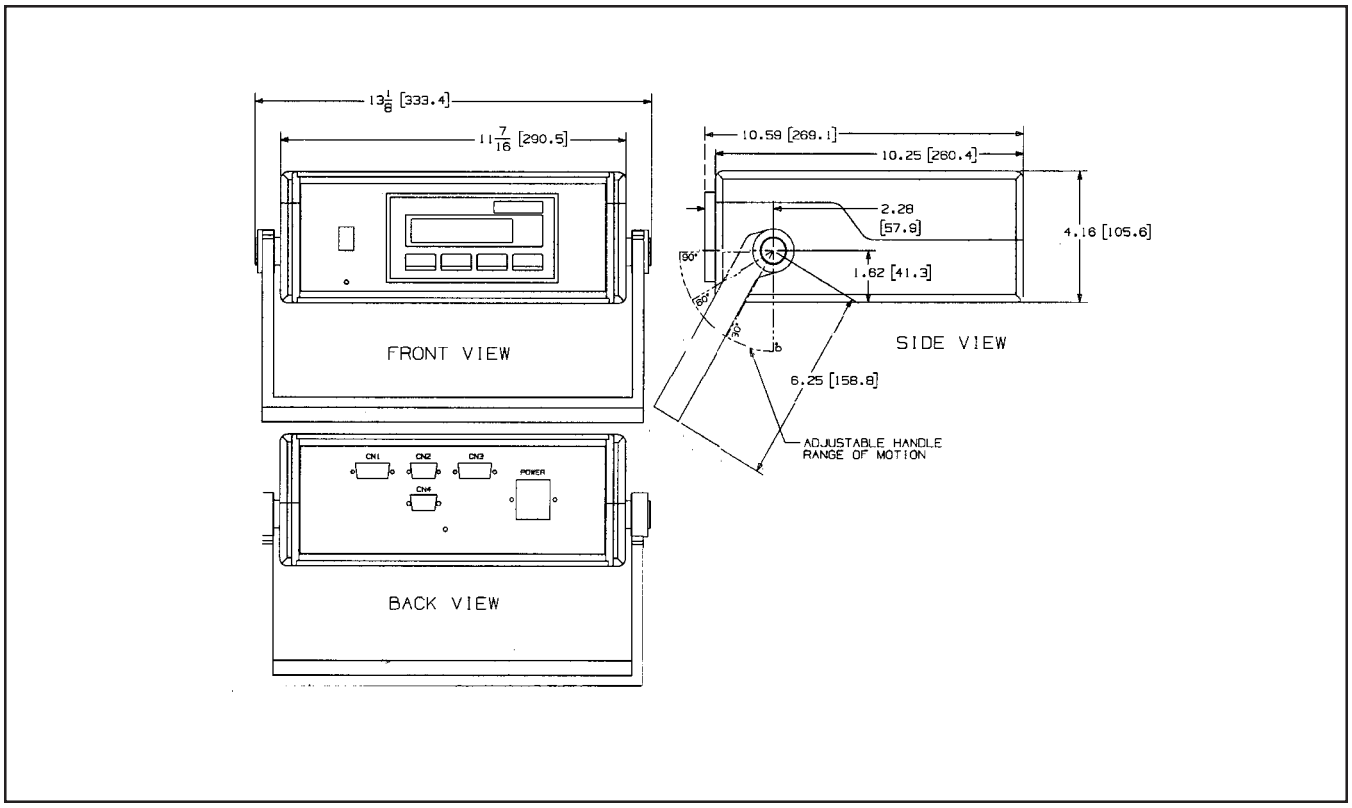

Figure 2-2 Table Top Dimensions

3-1 Block Diagram of Model 0151E

Refer to Figure 3-1.

3-2 Block Diagram of Model 0151*i*

Refer to Figure 3-2.

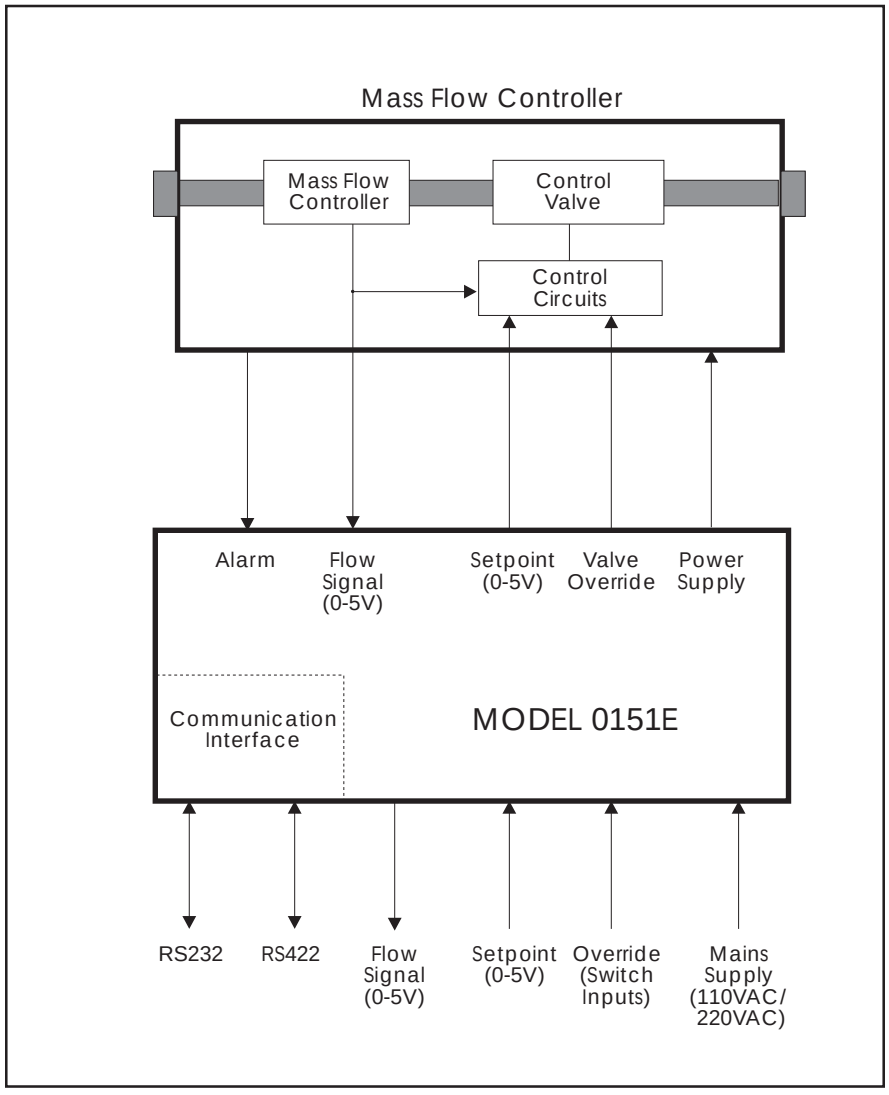

Figure 3-1 Block Diagram of the Model 0151E

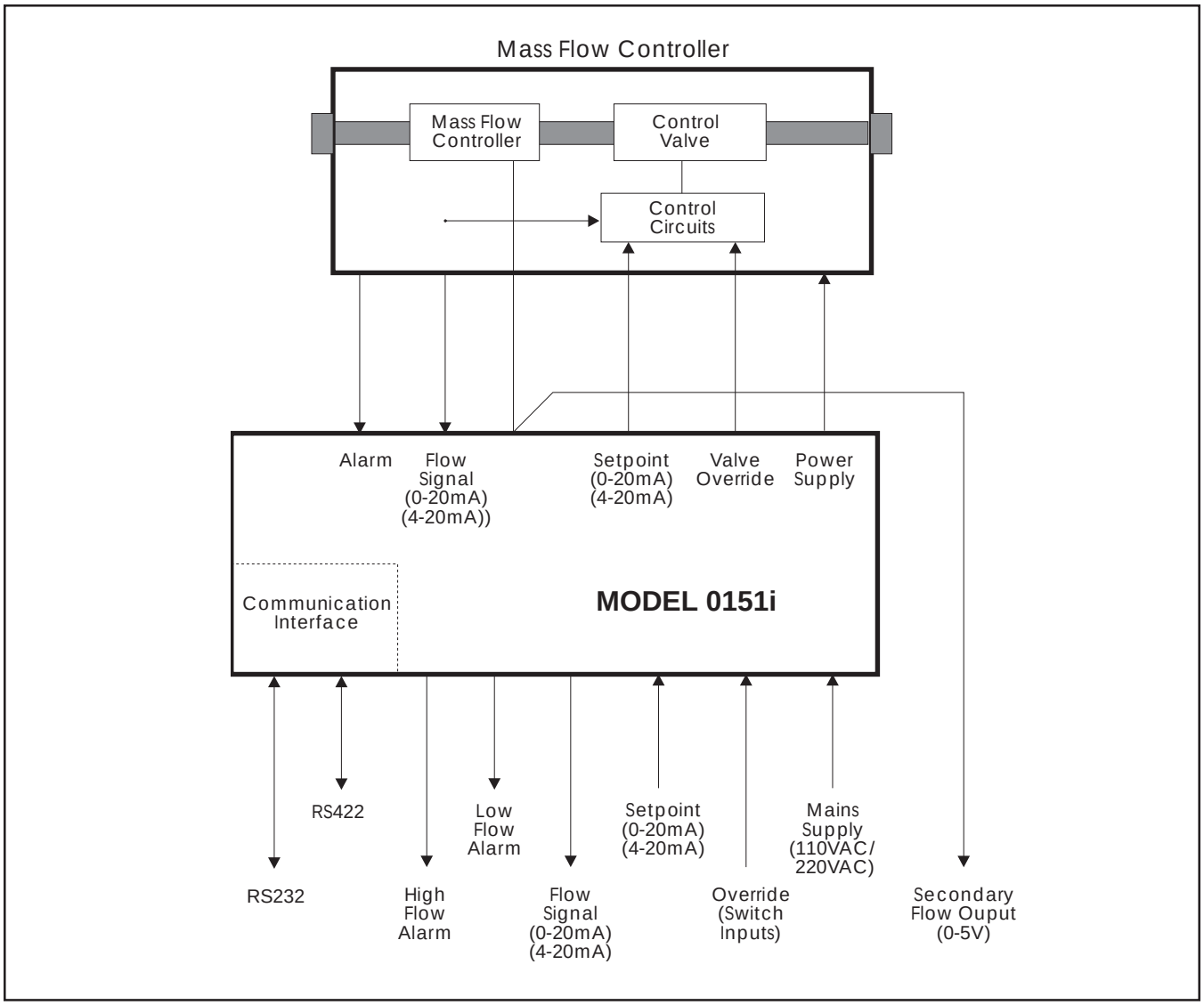

Figure 3-2 Block Diagram of the Model 0151*i*

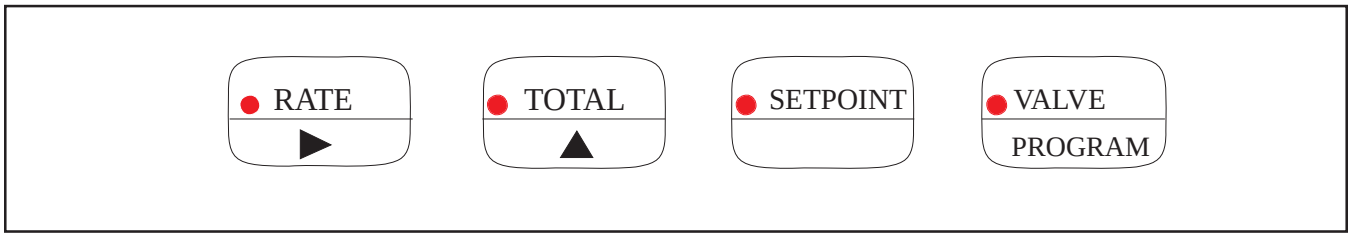

Figure 3-3 Keyboard Legends

3-3 Front Panel Operation

See Figure 3-3 for the keyboard legends. Keyboard Operation is as follows:

3-3-1 RATE Key

1. Press to display Rate. The LED within the key will light when the Rate is displayed.
2. The key can also be used to change the flashing digit when programming a setpoint or other setup data.

3-3-2 TOTAL Key

1. Press to display Total. The LED within the key will light when the Total is displayed.
2. Press and hold key for four seconds to reset total (Note the reset function can be disabled during Calibration, See Section 5).
3. The key can also be used to increment the flashing digit when programming a setpoint or setup data.

3-3-3 SETPOINT Key

1. If the instrument has been programmed to enable front panel control of setpoint, this key will allow the setpoint to be viewed and changed.

   On pressing SETPOINT key, the display will show "SET" for 1 second followed by the setpoint. The LED within the key will also light and remain lit as long as setpoint is displayed.

   The setpoint is displayed in the same engineering units as the rate display.

   The left most digit will be flashing and can be incremented or the digit changed by using the △ and ▷ keys.

   Note that the VALVE (PROGRAM) key can be used to reset the currently flashing digit to zero.

   Once programmed, the output is not changed until the SETPOINT key is pressed again, whereupon the display reverts to either the RATE or TOTAL (whichever was previously displayed) and the command signal changes to the new value.

2. If the setpoint has been set to remote operation, this key will enable the remote setpoint to the viewed but not changed.

   On pressing the SETPOINT key, the display will show the setpoint in engineering units for 3 seconds. The LED within the key will also light to indicate the setpoint is being displayed.

3-3-4 VALVE PROGRAM Key

1. If the instrument has been programmed to enable front panel control of the override feature, this key will allow the valve override to be viewed and changed.

   On pressing the VALVE PROGRAM key, the override condition will be displayed as:

   OPEN
   CLOSED
   AUTO

   ...depending upon the condition last entered. In the Auto position, the valve will automatically set the flowrate to the setpoint, while if Open or Closed is selected, the valve will fully open or close respectively.

   The display will flash indicating that it can be changed using the △ key. However, the output will not change until the VALVE PROGRAM key is pressed a second time to enter the value.

   At this time, the display will also revert to the RATE or TOTAL display. Whenever the valve is in the override position (either open or closed), the LED within the key will blink when the valve is open and show a steady light when the valve is closed.

2. If the Valve Override has been set to remote, the VALVE PROGRAM key will enable the valve position to be viewed but not changed.

   On pressing the key, the override condition will be displayed for 3 seconds. Whenever the valve is in the override position (either open or closed), the LED within the key will blink when the valve is open and show a steady light when the valve is closed.

   Note: If the remote valve override inputs are not active, the valve will assume the condition that was last selected, via the front panel, before the valve override was set to remote.

3-4 Calculation of Rate and Total

3-4-1 The Flowmeter Input

The flowrate, R, is calculated as follows:

$$R = S \times A$$

where A = the input value.
S = the span.

At the minimum input (ie. 4mA, 0mA, or 0 Volts), A = 0, and at the maximum input (ie. 20mA, or 5 Volts), A = 1.

The Span, S, can be set during calibration anywhere in the range of 0.1000 (min.) to 50000.0 (max.). The Span can be selected to display rate in any units desired, such as liters/minute or kilograms/hour.

3-4-2 The Cutoff Point

Because many transducers do not always exactly transmit 4mA (0mA, or 0V) when they are at zero rate, it is often necessary to define a rate below which no integration takes place. This is termed the cutoff point and is programmed as a percentage of the Span, S.

For example, if S = 220 kg/hour and the cutoff point is set at 20.0%, the actual cutoff rate Rc can be determined as follows:

At 20% cutoff,

Rc = 220 x 0.2
= 44 kg/hour

with an equivalent input signal of (with a 4-20mA signal):

I = 16mA x 0.2 + 4 mA
= 7.2 mA

Any flow rate below cutoff point will be displayed as 0 on front panel. Note that integration will not occur if A=0 (ie. 4mA, 0mA, or 0 Volts), even with an offset programmed.

3-4-3 Filtering

Frequency fluctuations caused by pulsating flow through a flowmeter, often makes the Rate impossible to read with any precision.
The Flow Computer has a digital filter which will average out these fluctuations and enable the Rate to be read to four digit accuracy. The degree of filtering is fully programmable which means that highly accurate and stable readings can be obtained without excessive lag.

When the Rate is retransmitted via the 0-5V or 4-20mA output, the filtering will also average out any fluctuations on the output.

Refer to Figure 3-4 which shows a pulsating signal input together with the effect of filtering.

As a guideline to the degree of filtering to be used, Table 3-1 shows the response to a step change in input. The value, A, is the filter constant which is programmed during the Calibration routine. The times for the display value to reach 90% and 99% of full swing are given in seconds, for different values of A.

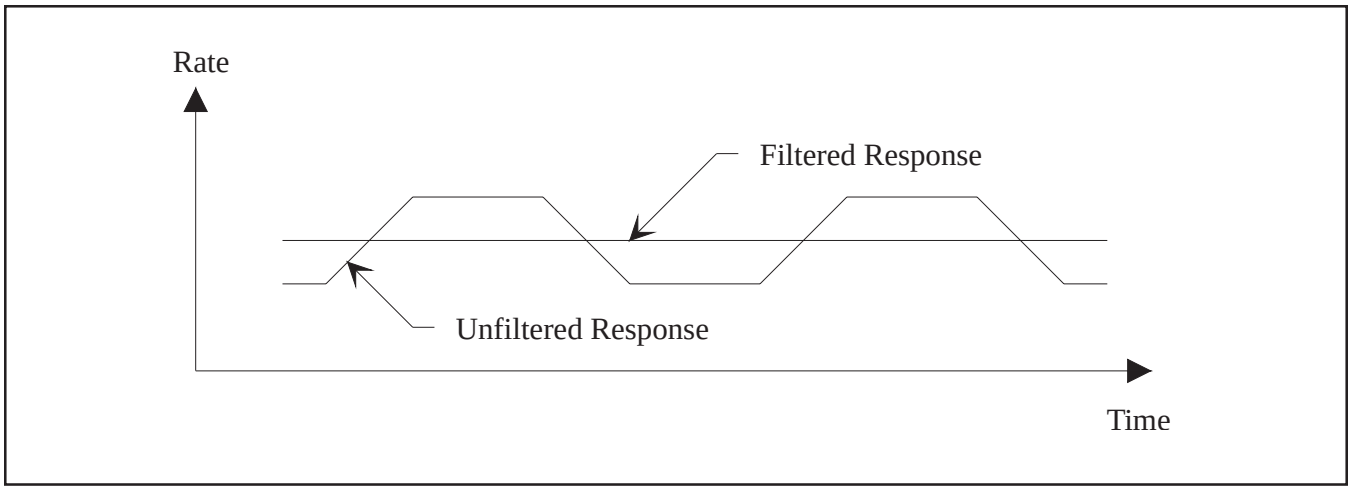

Figure 3-4 Pulsating Signal Input

Table 3-1 Response to a step Input (in seconds)

A*	90%	99%
1	0	0
2	1	2
4	2	4
6	3	6
10	5	11
15	8	17
20	11	22
25	14	28
35	20	40
45	25	51
60	34	69
75	43	86
90	52	103
99	57	113

*Note that if A is set to 1 there is no filtering of the input signal.

3-5 Mass Flow Controller Alarm

A Mass Flow Controller (MFC) Alarm input is provided to accept the alarm signal from the Brooks S-series mass flow products. When this input becomes active the display will alternate between the currently displayed function (Rate or Total) and the word “FAULT”. An audible “beep” will also sound while the word “FAULT” is displayed. On the Model 0151*i*, either the high or low setpoint relay can be programmed to activate while the alarm condition exists.

3-6 Total Conversion

The Total Conversion feature enables the rate to be displayed in one engineering unit (e.g. ml_n/hour) and the totals to be displayed in another engineering unit (e.g. L_n).

The Span is always programmed in the unit relating to Rate, and the Total Conversion constant is a division factor which can be used to convert the totals to the different unit. The Total Conversion factor affects the total, and is limited between 0.01 and 2000.

Example:

If the Rate is required in milliliters per hour (normalized):

1. The Span would be programmed as pulses per ml_n.
2. The timebase would be programmed as hours.

If the Totals are required in liters (normalized):

3. The Total Conversion factor is programmed as 1000 (there are 1000 ml in a l). All totals will now totalize in liters.

Some common units are given below together with the Total Conversion constant (TOTCON) which should be programmed.

Rate*	Totals	TOTCON
Liters/	Kiloliters	1000
ml/	Liters	1000

*Units per second, minute, hour or day. The timebase is programmed separately during Calibration.

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4-1 Hardware

With this option installed, the circuits for both the RS232 and RS422 are provided. They can be used to interface to both printers and computers, and a number of standard protocols are built into the instrument.

Figure 4-1 provides an overview of the RS232/RS422 communications hardware. Both interfaces are available on the rear terminal strips and the user can select either one by making the appropriate connections.

The RS232 interface is primarily used with printers or for simple communication with a computer over a short distance. The RS422 is used for communication over a long distance or in applications requiring multipoint communication.

Note: The RS232 or RS422 are not isolated and where long wiring runs are involved, it is recommended that signal isolators are used.

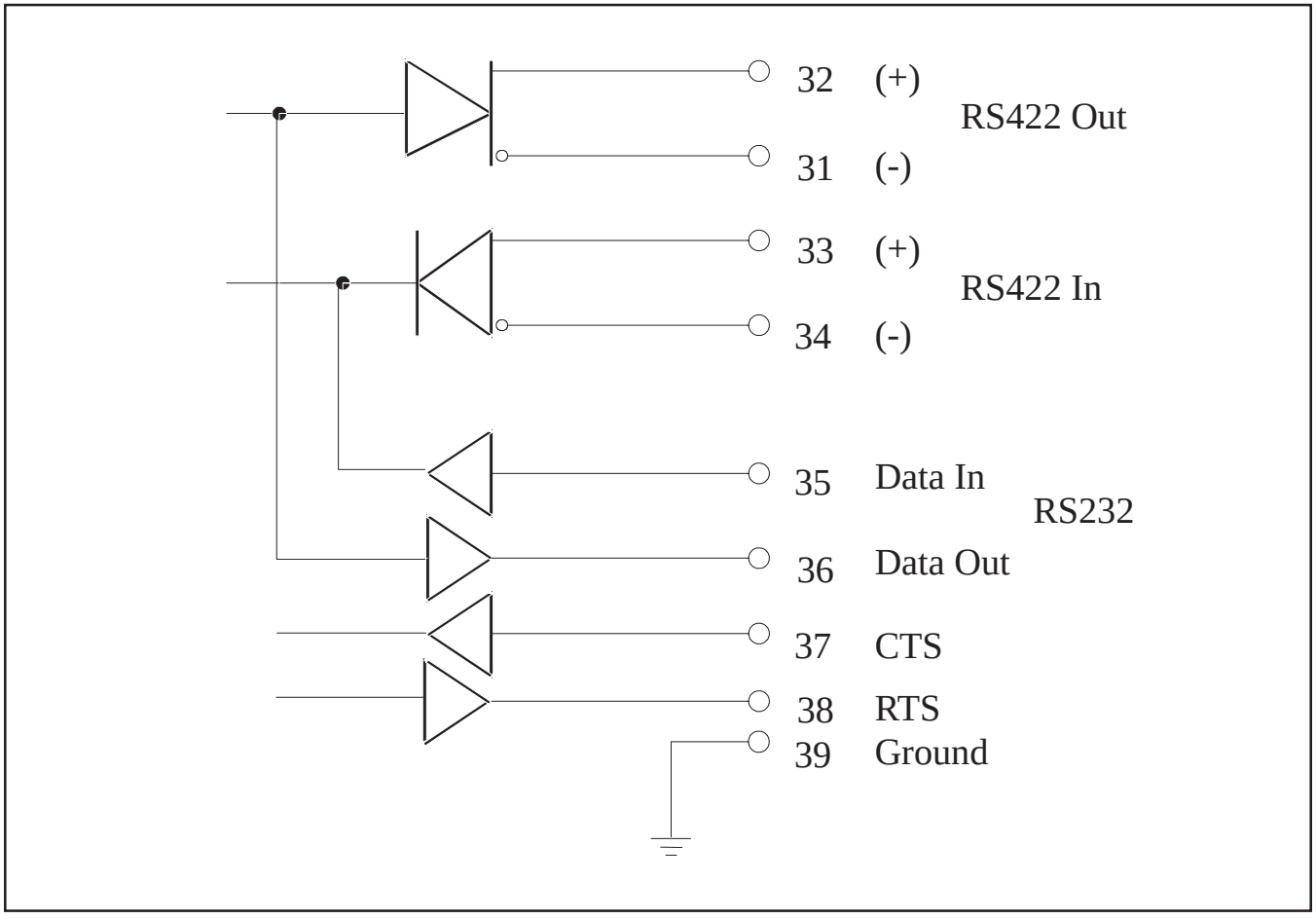

Figure 4-1 RS232/RS422 Communications Hardware

4-1-1 Computer Connection using RS232

Computers use either 9 pin or 25 pin D type connectors and connections to each type are shown in Figure 4-2. In DOS based computers the serial port is generally termed COM1 or COM2.

The printer must have a serial interface installed to be able to communicate with the instrument, refer to Figure 4-3. Communication via a parallel port on the printer is not possible.

Normally, it is only necessary to connect the Data Out signal and the Signal Ground. However, the CTS input on the instrument also allows a “Print Buffer Full” or “Request to Send” output from the printer to be connected to the instrument. This line is used only when the printer has a very small buffer and there is danger of overwriting the contents of the printer’s buffer (See operating manual for the printer).

In most cases the printer will have an adequate buffer and this line can be left unconnected.

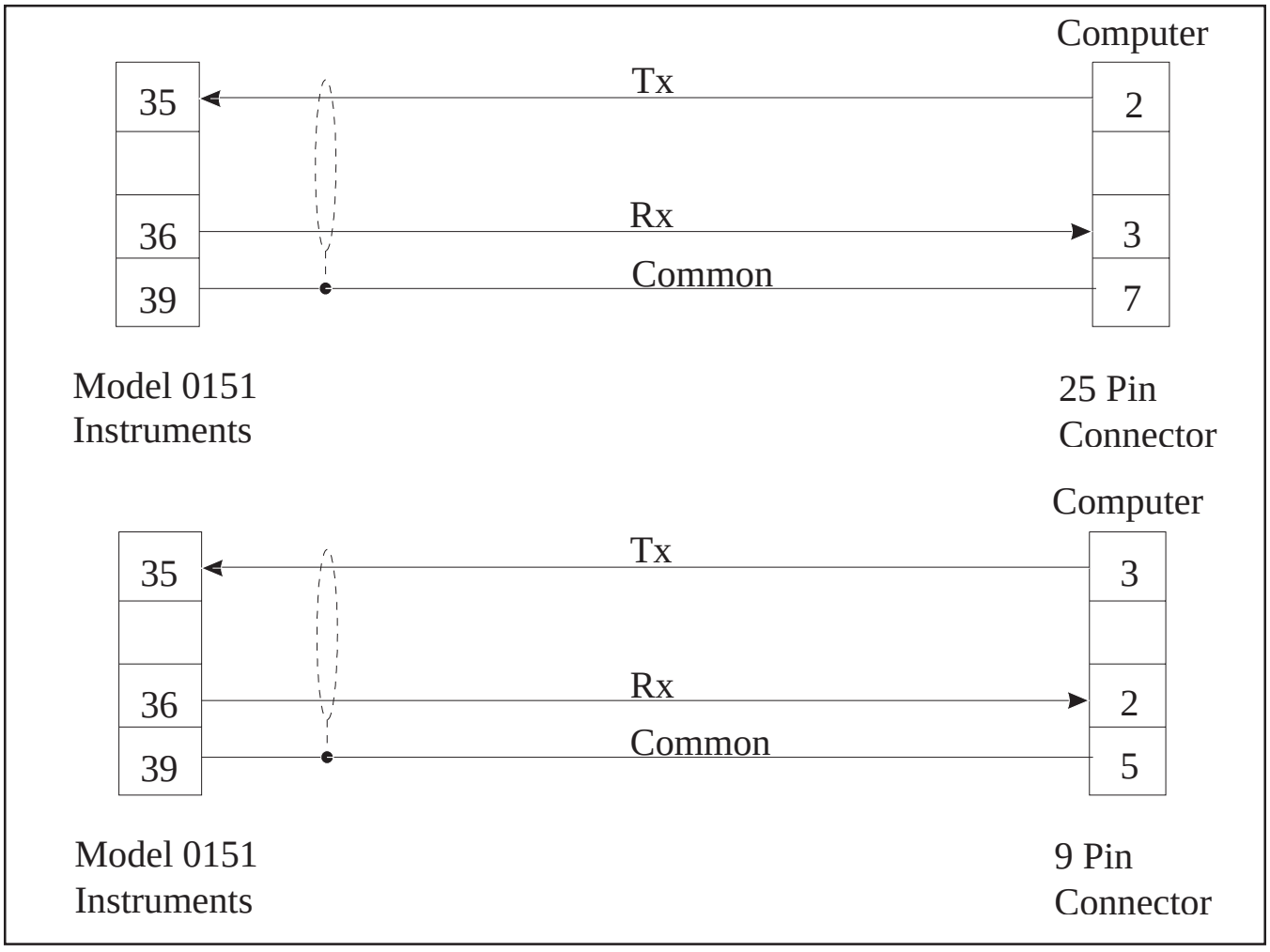

Figure 4-2 Connection to Computers with 25 Pin (Top) and 9 Pin (Bottom) Connectors

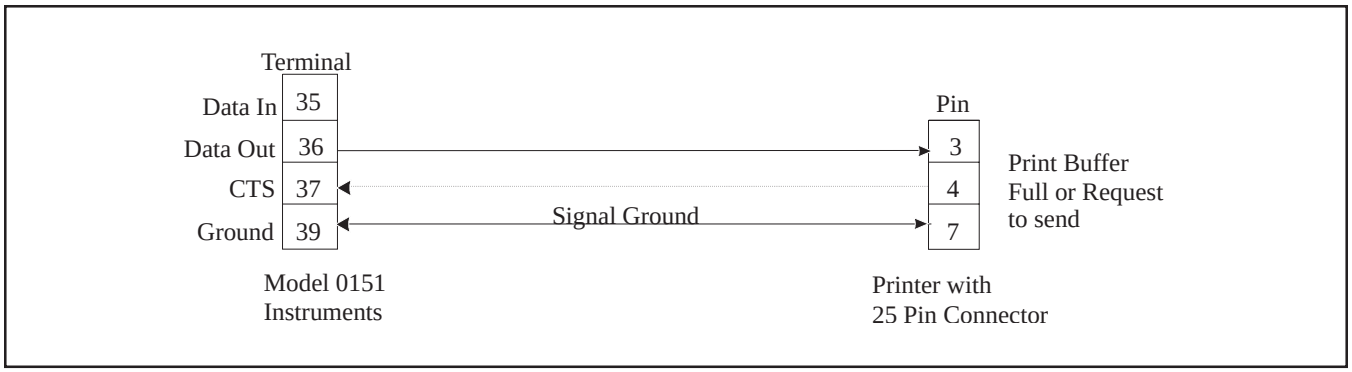

Figure 4-3 Connection to a Standard Computer Printer

4-2 Multipoint Communication

Multipoint Communication is a system whereby a number of instruments can be addressed over a dual twisted pair interface. Up to 32 instruments can be connected to a common bus using the RS422 (RS485) interface as shown in Figure 4-4.

Each instrument can be programmed with a unique address which is used by the Master Controller (ie: IBM/PC) to identify each instrument. The Controller will send the address down the line and will alert the relevant instrument. Subsequent software protocol will control the flow of data between the Controller and the Instrument.

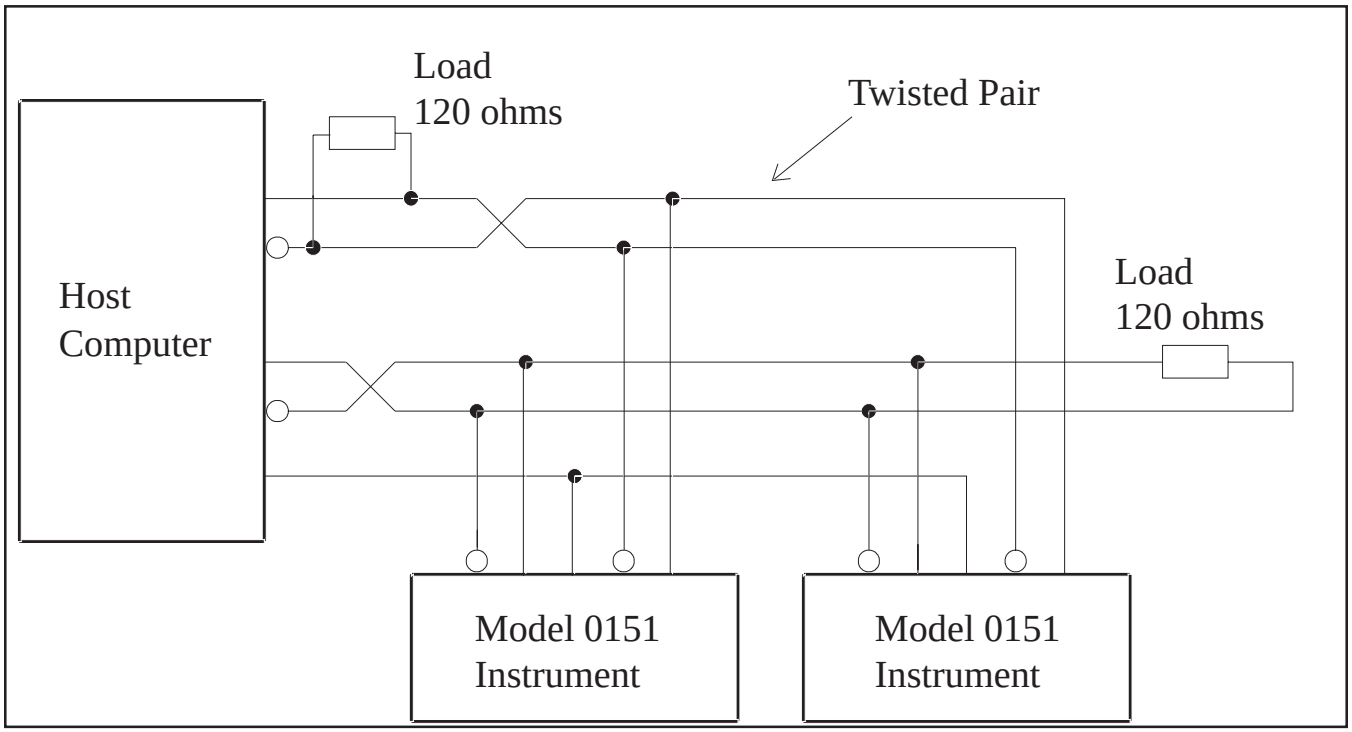

Figure 4-4 RS422 (RS485) Interface

4-3 Computer Communications

Two types of protocol are supported on the serial interface board:

- ASCII Protocol.
- XOFF/XON Protocol.

ASCII Protocol is most commonly used since it is easy to interface to, using “string” commands which are supported by C and Basic.

Note: The **Maximum Delay Time** is no more than a 2 second delay between characters transmitted from a host computer or terminal. If there is more than a 2 second delay, the first character after the delay will be accepted as the first character of a new command.

4-3-1 ASCII Protocol

This protocol requires that all command strings be terminated with a carriage return and the command will only be executed on receipt of the carriage return.

All messages received from the instrument will be terminated with a carriage return and a line feed.

4-3-2 XOFF/XON Protocol

All communications are initiated by the host computer which sends out an XOFF character (ASCII 19, DC3, Ctrl S) at the start of its message and an XON character (ASCII 17, DC1, Ctrl Q) at the end of the message.

The instrument automatically switches to the XOFF/XON protocol if the first character it receives is an XOFF command. Hence, the protocol selection is fully automatic.

The instrument responds by also sending XOFF/XON characters at the start and the end of its messages respectively back to the host computer.

At any time, the instrument will stop transmission within two byte periods of receiving an XOFF character from the host computer and will resume transmission immediately on receipt of an XON character.

4-3-3 Echoing Commands

The instrument can be programmed to Echo all commands it receives back to the host computer. This is termed Full Duplex and is most often used with a terminal which is also working in Full Duplex mode.

Alternatively, the Echo can be programmed to off and command strings are not echoed back to the host computer. This is called Half Duplex and is commonly used in communicating with computers.

4-3-4 Commands and Responses

Commands sent to the instruments consist of two ASCII characters. If the command includes a value (such as a setpoint quantity), the value follows immediately after the two characters. Commands can be sent in upper or lower case. Unrecognized commands are answered with an "Invalid Command" message from the instrument.

4-3-5 Single Instrument Communications

If a single instrument is connected to a computer, the ID number for that instrument should be programmed during the instrument Calibration procedure to:

ID = 0

All commands issued by the computer will always be accepted by the instrument and there is no need for the computer to address the instrument with an ID number.

The instrument will echo all commands sent by the computer if Echo is on.

4-3-6 Multipoint Communication

Where a number of instruments are connected over a common RS422 bus, each instrument must have its own unique ID number which is programmed during Calibration.

An instrument is selected by the computer sending the command:

IDx
where x is the ID number.

Once selected, any of the commands relevant to that instrument can be sent by the computer, without having to again select the instrument.

It is also possible to determine which instrument is currently selected by sending the command:

ID

without the value x. On receiving this command the selected instrument will reply with its ID number.

4-3-7 Commands

The following commands are recognized by all the Model 0151 Flow Computers:

Command	
IDx	The instrument ID number and the value (either 1 or 2 ASCII characters depending upon the value).
TR	Reset the total.
T?	Request totals to be sent.

R?	Request flowrate to be sent.
SPxx.xxxx	The setpoint value x can be programmed if the instrument is not setup for remote setpoint. x must have the same format as the Rate display.
VOx	Valve override can be programmed if the instrument is not setup for remote override, where x is A for automatic, C for closed and O for open.
S?	Request setpoint value to be sent.
V?	Request valve override status to be sent.

4-3-8 Responses

On receipt of a “T?” request, the instrument sends the following:

xx	xx.x	CRLF
ID	Total	Carriage Return Line Feed

On receipt of a “R?” request, the instrument sends the following:

xx	xx.x	CRLF
ID	Rate	

On receipt of a “S?” request, the instrument sends the following:

xx	xx.xxxx	CRLF
ID	Setpoint	

On receipt of a “V?” request, the instrument sends the following:

xx	x	CRLF
ID	Status	

All numeric values are variable length and are as displayed on the instrument. The values are transmitted in ASCII with one or more spaces (ASCII code 20) between each field.

4-4 Printer Communications

With the Flow Computers, a ticket is printed whenever a reset of the total is performed. The Flow Computer will first print the ticket and then reset the total to zero.

4-4-1 Information Printed

The format with which the data is printed depends on the type of printer selected. Each printout is shown in Table 4-1.

Table 4-1 Printout Information

1	Header	This is a factory programmed header on the ticket which can show the company or product name. (Maximum 30 characters.) The required header must be specified on ordering the instrument.
2	Unit ID	This is the ID number programmed during Calibration.
3	Ticket Number	The ticket number is a sequential number which increments and is printed with every ticket. It enables each ticket to be uniquely identified.
4	Time/Date	An internal clock enables the ticket to be printed with the time & date. The date can be programmed to print in European (dd/mm/yy) or US (mm/dd/yy) format. Note that the clock can only maintain the time/date for a maximum of 3 days without power applied to the instrument.
5	Total	The resettable total.
6	Rate	The flowrate.

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5-1 General

The Calibration routine enables the Setup Parameters to be programmed and is password protected.

The calibration routine is entered by pressing the RATE key and, while still holding, pressing the VALVE (Program) key. Both keys must then be held for approximately 6 seconds.

Passwords
If a Password is programmed, the display will then show “PASS”. By pressing the Program key, four underline characters will be displayed and the password can be programmed using the ▷ and △ keys. If the correct password is entered, the Model Number is displayed briefly followed by the word “CAL”. If an incorrect password is entered an Error message is displayed.

When no password is programmed, the PASS message is not displayed and the program will go directly into the CAL mode.

During Calibration, the key switch actions are as follows:

RATE (▷)	will move the operator to the next digit.
TOTAL (△)	will increment a flashing digit or change a parameter selection.
SETPOINT	will reset a flashing digit to zero.
VALVE (Program)	will step through the program sequences.

Note that the arrows in the Rate and Total key switches indicate that these switches can be used to change and increment digits respectively.

In stepping through the program sequence, the Parameter Description is always displayed first, followed by the actual value or parameter. When a value or parameter can be changed, it is always shown as flashing, and the LED’s in the switch panels are lit if that key switch can be used to change a value.

On first entering the Calibration routine, the display will show the Model number followed by:

CAL	Setup Program parameters.
Other modes available at start of calibration are:	
ChPASS	Change Password.
Options	Options (if applicable).
End	Exit to Normal Operation.

The user can toggle between these modes using the △ switch and by using the PROGRAM switch, select the appropriate mode.

To exit Calibration, step through the program until the end, and press the PROGRAM switch when **End** is displayed.

Table 5-1 Programming the Setup Parameters

Step	Display	Description	Text Ref
1	**CAL**	Select the Calibrate mode to setup program parameters	
	ChPASS	Change Password.	
	OPTIONS	Communication Option (if applicable).	
	END	Returns to normal operation.	
	The following steps are displayed if CAL is selected.		
2	**SETPNT**	Selects how the setpoint is changed.	3-3
	Front	Setpoint changed by keyboard.	
	Rear	Setpoint changed by remote signal input.	
3	**OV.RIDE**	Select how the valve override is changed.	3-3
	Front	Override is changed by keyboard.	
	Rear	Override is changed using remote switch inputs.	
4	**RESTOT**	Reset totals to zero.	
	Enable	Enables the total to be reset by pressing the TOTAL key for four seconds.	
	Disable	Prevents the total from being reset.	
5	**RATE.DP**	Number of decimal points with which the Rate is to be displayed between 0 to 0.00000.	
6	**SPAN**	Program the Span.	3-4.1
	xxxxx.	Whole numbers	
	.xxxxx	Decimal.	
7	**OUTPUT**	The zero and span output range can be programmed, (Model 0151*i* only).	2-4
	0-20	The Output, Input and Setpoints are programmed as 0-20 mA signals.	
	4-20	The Output, Input and Setpoints are programmed as 4-20 mA signals.	
8	**OP 4/OP 0**	Flow rate corresponding to 0/4 mA (Model 0151*i*) or 0 volts	
	xx.xxxx	(Model 0151E) can be programmed.	
9	**OP20/OP 5**	The flowrate corresponding to Full Scale 20 mA	
	xx.xxxx	(Model 0151*i*) or 5 Volts (Model 0151E) can be programmed.	
10	**cutoff**	The signal Cutoff.	3-4.2
	xx.x	Enter as a % of Span.	
11	**tbase**	The Timebase with which the Span is entered must be programmed as:	
	60secs	units/min	
	hours	units/hour	
	days	units/day	
	secs	units/second	
12	**TOTL.DP**	Number of decimal points with which the resettable total is displayed between 0 to 0.000.	
13	**FILTER**	The filter constant for filtering the rate display and the 4-20 mA or 0-5V output.	3-4.3
	1	No filtering.	
	to		
	99	Very heavy filtering.	
14	**TOTCON**	A division factor to convert the totals to different units from those used for rate (i.e. ml/min and liters).	3-6
	1	Rate and totals have the same engineering units.	
	x.xxxx	Other factors can be programmed between 0.01 and 2000.	
15	END	Ends calibration mode.	

5-2 Programming the Setup Parameters

Refer to Table 5-1.

5-3 Changing the Password

Refer to Table 5-2.

5-4 Programming Options with Communications Port

Refer to Table 5-3.

Table 5-2 Changing the Password

Step	Display	Description	Text Ref
1	**CAL** **ChPASS** **OPTIONS** **END**	Program Setup Parameters. Change Password. Options (if applicable). Exit to normal operation.	
The following steps are displayed if **ChPASS** mode is selected:			
2	**PASS** ____ xxxx	The PASS message is displayed for one second followed by four underlines. Program the password using the and keys. Note that if 0000 is programmed, the password will be disabled.	

Table 5-3 Programming Options with Communication Port

Step	Display	Description	Text Ref.
	CAL	Program Setup Parameters.	
	ChPASS	Change Password.	
1	**OPTIONS**	Options.	
	End	Exit to normal operation.	
	The following steps are displayed if **OPTIONS** mode is selected:		
2	**RELAY1**	Functions for Relay 1. For Model 0151*i* only.	
	AL:LO	Program as low flowrate alarm.	
	xx.xxxx	Enter the flowrate below which relay 1 will energize.	
	FAULT	Program Relay 1 to act as a fault alarm for the Mass Flow Controller.	3-5
3	**RELAY2**	Functions for Relay 2. Model 0151*i* only.	
	AL:HI	Program as a high flowrate alarm.	
	xx.xxxx	Enter the flowrate above which Relay 2 will energize.	
	FAULT	Program Relay 2 to act as a fault alarm for the Mass Flow Controller.	3-5
	If the RS232/422 option is installed, the following will be displayed:		
4	**DF**	Date Format.	
	Eur	European (i.e. days/months/years).	
	USA	USA (i.e. months/days/years).	3-4.1
5	**Date**	Enter date as:	
	xx:xx:xx	Years:Months:Days.	
6	**TC**	Enter time as a 24 hour clock.	
	xx:xx	Hours:Minutes.	
7	**BAUD**	Baudrate.	
	xxx	300,600,1200,2400,4800 and 9600.	
8	**DATA**	Word length.	
	7	7bits.	
	8	8 bits.	
9	**PARITY**	Parity.	3-4.2
	NP	No Parity.	
	OP	Odd Parity.	
	EP	Even Parity.	
10	**SIGNAL**	Signal Type.	
	rs232	RS232.	
	rs422	RS422.	
11	**ID NO**	Unit Identification Number.	4-3.4
	0	None.	
	1-255	Id Number.	
12	**PTYPE xx**	Printer/Computer Type	
	00	Standard Computer Printer	
	01	EPSON CTM 290 Slip Printer.	
	02	Model 624 Roll Printer.	
	20	Computer.	
	If a Computer Protocol is selected, the following message is displayed:		
13	**ECHO**	ECHO Command.	4-3.3
	On	Echo (Full Duplex).	
	Off	No Echo (Half Duplex).	

6-1 General

⚠ WARNING

Hazardous voltages are present and can cause serious injury. Refer all servicing to qualified personnel. Proper grounding is essential for electrical safety.

Models 0151E and 0151*i* are available in two housings: Panel Mount and Table Top and are designed for indoor use in dry locations. The panel mount version is designed to be mounted in a test or instrument panel. The wiring connections are made by screw terminals in the rear of the instrument. The table top version is designed to be portable and the wiring connections are made by standard Brooks D-Connector cables.

6-2 Panel Mount Installation

The panel mount cutout is 5.5" (139mm) wide x 2.6" (67mm) high (See Figure 2-1). This corresponds to DIN 43700. The Greenlee company punch, part number 60047 can be used to punch a suitable hole for panel mounting. Two side clips are supplied to secure the instrument into the panel. When used, the supplied gasket makes the Model 0151 suitable for wash down.

To install the Model 0151 in a panel the supplied gasket is slipped over the housing from the rear and positioned against the back of the panel flange. The instrument is then inserted into the panel cut out from the front of the panel. The supplied panel mount clips are then placed in the large holes in each side of the housing and the screws tightened while the weight of the housing is supported.

A case grounding point is provided via a grounding lug on the side of the case. Note the grounding point is for the case only and there is complete electrical isolation between this point and all electronic circuits. The AC power supply voltage is internally set to either 110Vac or 220 Vac at the factory.

Refer to Table 7-1A for Model 0151E Wiring designations. Refer to Table 7-1B for Model 0151*i* wiring designations. Reference Section 7 for hardware interface wiring diagrams.

6-3 Table Top Installation

The table top version is the panel mount version of the Model 0151 that has been put into an enclosure to make it portable, eliminate point to point wiring and provide a power switch. While no installation is required per se, the table top version should be placed in a dry location. The table top version is hooked up by connecting the power cord to the receptacle in the back of the housing. The mass flow product is connected to the 15 pin D-connector marked CN-1 using the appropriate Brooks cable. Connections for remote operations are on the 9 pin D-connector marked CN-2. Connections for communications are on 15-pin D-connector marked CN-3 and connections for relay alarm contacts (Model 0151*i* only) are located on 9-pin D-connector marked CN-4.

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7-1 Connection Between Model 0151E and Mass Flow Controller

Refer to Figure 7-1.

7-2 Connection Between Model 0151E and External Equipment

Refer to Figure 7-2.

7-3 Connection Between Model 0151*i* and Mass Flow Controller

Refer to Figure 7-3.

7-4 Connection Between Model 0151*i* and External Equipment

Refer to Figure 7-4

7-5 Flow Alarm Relays

Applies to the Model 0151*i* only. Refer to Figure 7-5.

The Relay output option consists of two Form C relays which can be preset during calibration to energize when the flowrate exceeds or drops below the preset values.

The “low” relay is energized whenever the rate is below the preset value, and the “high” relay is energized whenever the rate exceeds the preset value. The preset values are programmed during calibration as described in Section 5.

Alternatively, either relay can be programmed to energize when an alarm signal is received from the Mass Flow Controller. Note that Relay Ratings are in Section 2-4.

7-6 Wiring Designations for Model 0151E

Refer to Table 7-1a.

7-7 Wiring Designations for Model 0151*i*

Refer to Table 7-1b.

7-8 Connection between 0151E and Card Edge Connector

Refer to Table 7-2a.

7-9 Connection between 0151E and 15-pin D-Connector

Refer to Table 7-2b.

7-10 Connection between 0151E and Model 5864E Round Connector

Refer to Table 7-3.

7-11 Connection between 0151i and 15-pin D-Connector

Refer to Table 7-3.

7-12 Connection between 0151i and Flomega

Refer to Table 7-4b.

7-13 Wiring Designations for Table Top Series

Refer to Table 7-5.

Table 7-1a Wiring Designations for the Model 0151E Panel Mount

Terminal	Description	Comment
1	Power Supply Common	0 V
2	Positive dc out V (supply)	+15 V @ 350 mA
3	Power Supply Common	0 V
4	Negative dc out V (supply)	-15V @ 350mA
Blue	Mains (ac power input)	110Vac or 220 Vac
Blue	Mains (ac power input)	110 Vac or 220 Vac
20	Flowmeter input +	0-5V Signal
21	Flowmeter input -	Signal Common
22	Remote Setpoint Input +	0-5V Signal
23	Remote Setpoint Input -	Signal Common
24	Valve Override Output	+15V Open, -15V Closed
25	Remote Valve Override Closed +	Switch Input
26	Remote Valve Override Closed -	Switch Input
27	Remote Valve Override Open +	Switch Input
28	Remote Valve Override Open -	Switch Input
29	Mass Flow Controller Alarm Input +	Open Collector
30	Mass Flow Controller Alarm Input -	Collector Common
31	RS422 Data Out -	Option
32	RS422 Data Out +	Option
33	RS422 Data In +	Option
34	RS422 Data In -	Option
35	RS232 Data In	Option
36	RS232 Data Out	Option
37	RS232 CTS	Option
38	RS232 RTS	Option
39	RS232 Ground	Option
40	Setpoint Output +	0-5V Signal
41	Setpoint Output -	Signal Common
42	Flow Output +	0-5V Signal
43	Flow Output -	Signal Common

Table 7-1b Wiring Designations for the Model 0151*i* Panel Mount

Terminal	Description	Comment
1	Power Supply Common	0V
2	Positive dc out V (supply)	+24V @ 800 mA
3	Power Supply Common	0V
4	Flow 0-5V	Secondary Flow Output
5	Flow 0-5V	Secondary Flow Output
6	Relay 2 COMMON	Flow Alarm
7	Relay 2 NC	Flow Alarm
8	Relay 2 NO	Flow Alarm
9	Relay 1 COMMON	Flow Alarm
10	Relay 1 NC	Flow Alarm
11	Relay 1 NO	Flow Alarm
Blue	Mains (ac Power Input)	110Vac or 220 Vac
Blue	Mains (ac Power Input)	110 Vac or 220 Vac
20	Flowmeter Input +	0/4-20mA In
21	Flowmeter Input -	Signal Return
22	Remote Setpoint Input +	0/4-20mA In
23	Remote Setpoint Input -	Signal Return
24	Valve Override Output	+24V Open, 0V Closed
25	Remote Valve Override Closed +	Switch Input
26	Remote Valve Override Closed -	Switch Input
27	Remote Valve Override Open +	Switch Input
28	Remote Valve Override Open -	Switch Input
29	Mass Flow Controller Alarm Input +	Open Collector
30	Mass Flow Controller Alarm Input -	Collector Common
31	RS422 Data Out -	Option
32	RS422 Data Out +	Option
33	RS422 Data In +	Option
34	RS422 Data In -	Option
35	RS232 Data In	Option
36	RS232 Data Out	Option
37	RS232 CTS	Option
38	RS232 RTS	Option
39	RS232 Ground	Option
40	Setpoint Output +	0/4-20mA Out
41	Setpoint Output -	Signal Return
42	Flow Output +	Isolated 0/4-20mA Output
43	Flow Output -	Signal Return

Table 7-2a Model 0151E Wiring for Open Frame Cables to Card Edge Connectors

Term.	Description	Color	Conn. Pin (1)
1	Supply Common	Blue	6
2	+15V Power Supply Output	Violet	7
3	Supply Common		
4	-15V Power Supply Output	Red	12
Blue	Mains (ac Power Input)		
Blue	Mains (ac Power Input)		
20	0-5V Flow Signal Input (+)	Green	5
21	Signal Common (-)	Orange	3
22	0-5V Remote Setpoint Input (+)		
23	Signal Common (-)		
24	Valve Override Output	Violet	17
25	Remote Valve Override Closed (+)		
26	Remote Valve Override Closed (-)		
27	Remote Valve Override Open (+)		
28	Remote Valve Override Open (-)		
29	Mass Flow Alarm Input (+)		
30	Mass Flow Alarm Input (-)		
31	RS422 Data Out (-)		
32	RS422 Data Out (+)		
33	RS422 Data In (-)		
34	RS422 Data In (+)		
35	RS232 Data In		
36	RS232 Data Out		
37	RS232 CTS		
38	RS232 RTS		
39	RS232 Ground		
40	0-5V Setpoint Output (+)	Red	2
41	Setpoint Output (-)	Yellow	4
42	0-5V Flow Signal Output (+)		
43	Signal Common (-)		
Lug	Chassis Ground	Brown	1

Note:
(1) Reference Card Edge Connector @ Mass Flow Electronics.

Table 7-2b Model 0151E Wiring to E-Series, S-Series and Model 5866 D-Connectors with Shielded Cable.

Terminal	Description	Color	Conn. Pin (1)
1	Supply Common	Grn/Blk	9
2	+15V Power Supply Output	Orange	5
3	Supply Common		
4	-15V Power Supply Output	Blue	6
Blue	Mains (ac Power Input)		
Blue	Mains (ac Power Input)		
20	0-5V Flow Signal Input (+)	White*	2*
21	Signal Common (-)	Org/Blk	10
22	0-5V Remote Setpoint Input (+)		
23	Signal Common (-)		
24	Valve Override Output	Blk/Wht	12
25	Remote Valve Override Closed (+)		
26	Remote Valve Override Closed (-)		
27	Remote Valve Override Open (+)		
28	Remote Valve Override Open (-)		
29	Mass Flow Alarm Input (+)	Red**	3**
30	Mass Flow Alarm Input (-)		
31	RS422 Data Out (-)		
32	RS422 Data Out (+)		
33	RS422 Data In (-)		
34	RS422 Data In (+)		
35	RS232 Data In		
36	RS232 Data Out		
37	RS232 CTS		
38	RS232 RTS		
39	RS232 Ground		
40	0-5V Setpoint Output (+)	Red/Blk	8
41	Setpoint Output (-)	Black	1
42	0-5V Flow Signal Output (+)		
43	Signal Common (-)		
Lug	Chassis Ground	Grn/Wht	14***

*For Model 5866RT this input can be connected to the Blu/Wht wire (Pin 14) to display pressure instead of flow
**Make this connection only with S-Series
***Do not connect on S-Series only.

Note:
(1) Reference 15-pin D-Connector @ Mass Flow Electronics.

Table 7-3 Model 0151E Wiring to Model 5864E, Round Connector with Shielded Cable.

Term.	Description	Color	Conn. Pin(1)
1	Supply Common	Black	9
2	+15V Power Supply Output	Red	5
3	Supply Common		
4	-15V Power Supply Output	Blue	3
Blue	Mains (ac Power Input)		
Blue	Mains (ac Power Input)		
20	0-5V Flow Signal Input (+)	White	2
21	Signal Common (-)	Pink	10
22	0-5V Remote Setpoint Input (+)		
23	Signal Common (-)		
24	Valve Override Output		
25	Remote Valve Override Closed (+)		
26	Remote Valve Override Closed (-)		
27	Remote Valve Override Open (+)		
28	Remote Valve Override Open (-)		
29	Mass Flow Alarm Input (+)		
30	Mass Flow Alarm Input (-)		
31	RS422 Data Out (-)		
32	RS422 Data Out (+)		
33	RS422 Data In (-)		
34	RS422 Data In (+)		
35	RS232 Data In		
36	RS232 Data Out		
37	RS232 CTS		
38	RS232 RTS		
39	RS232 Ground		
40	0-5V Setpoint Output (+)		
41	Setpoint Output (-)		
42	0-5V Flow Signal Output (+)		
43	Signal Common (-)		
Lug	Chassis Ground	Shield	Housing

Note:
(1) Reference 12 pole Circular Connector @ Mass Flow Electronics.

Table 7-4a Model 0151*i* Wiring for Open Frame Cables to *i*-Series and S-Series D-Connectors with Shielded Cable.

Term.	Description	Color	Conn. Pin(1)
1	Supply Common	Grn/Blk	9
2	+24V Power Supply Output	Orange	5
3	Supply Common		
4	0-5V Flow Signal Input (+)	White	2
5	0-5V Flow Signal Output (+)		
6	Relay 2 Common		
7	Relay 2 NC		
8	Relay 2 NO		
9	Relay 1 Common		
10	Relay 1 NC		
11	Relay 1 NO		
Blue	Mains (ac Power Input)		
Blue	Mains (ac Power Input)		
20	0/4-20mA Flow Signal Input (+)	Green	4
21	Signal Return (-)	Org/Blk	10
22	0/4-20mA Remote Setpoint Input (+)		
23	Signal Return (-)		
24	Valve Override Output	Blk/Wht	12
25	Remote Valve Override Closed (+)		
26	Remote Valve Override Closed (-)		
27	Remote Valve Override Open (+)		
28	Remote Valve Override Open (-)		
29	Mass Flow Alarm Input (+)	Red	3*
30	Mass Flow Alarm Input (-)		
31	RS422 Data Out (-)		
32	RS422 Data Out (+)		
33	RS422 Data In (-)		
34	RS422 Data In (+)		
35	RS232 Data In		
36	RS232 Data Out		
37	RS232 CTS		
38	RS232 RTS		
39	RS232 Ground		
40	0/4-20mA Setpoint Output (+)	Wht/Blk	7
41	Signal Return (-)	Black	1
42	Isolated 0/4-20mA Flow Signal Output (+)		
43	Isolated Flow Signal Return (-)		
Lug	Chassis Ground	Grn/Wht	14**

*Make this connection on S-Series only.
**Do not connect on S-Series only.

Note:
(1) Reference 15 Pin D-Connector @ Mass Flow Electronics.

Table 7-4b Model 0151*i* wiring to Flomega with Shielded Cable

Term.	Description	Color	Conn. Pin(1)
1	Supply Common	Black	9
2	+24V Power Supply Output	Red	5
3	Supply Common	Grey/Pink	3
4	0-5V Flow Signal Output (+)		
5	0-5V Flow Signal Output (+)		
6	Relay 2 Common		
7	Relay 2 NC		
8	Relay 2 NO		
9	Relay 1 Common		
10	Relay 1 NC		
11	Relay 1 NO		
Blue	Mains (ac Power Input)		
Blue	Mains (ac Power Input)		
20	0/4-20mA Flow Signal Input (+)	Red/Blue	4
21	Signal Return (-)	Pink	10
22	0/4-20mA Remote Setpoint Input (+)		
23	Signal Return (-)		
24	Valve Override Output	Green	12
25	Remote Valve Override Closed (+)		
26	Remote Valve Override Closed (-)		
27	Remote Valve Override Open (+)		
28	Remote Valve Override Open (-)		
29	Mass Flow Alarm Input (+)		
30	Mass Flow Alarm Input (-)		
31	RS422 Data Out (-)		
32	RS422 Data Out (+)		
33	RS422 Data In (-)		
34	RS422 Data In (+)		
35	RS232 Data In		
36	RS232 Data Out		
37	RS232 CTS		
38	RS232 RTS		
39	RS232 Ground		
40	0/4-20mA Setpoint Output (+)	Grey	8
41	Signal Return (-)	Brown	1
42	Isolated 0/4-20mA Flow Signal Output (+)		
43	Isolated Flow Signal Return (-)		
Lug	Chassis Ground	Shield	Shell

Note:
(1) Reference 12 Pole Circular Connector @ Flomega.

Table 7-5 Table Top Connector Designations

Table Top 0151E Connector Designations		Table Top 0151*i* Connector Designations	
Connector CN-1		Connector CN-1	
Pin	Function	Pin	Function
1	N/C	1	N/C
2	N/C	2	0/4-20mA Flow Signal Input (+)
3	N/C	3	0/4-20mA Setpoint Signal Output (+)
4	N/C	4	N/C
5	0-5V Setpoint Output (+)	5	N/C
6	Setpoint Common (-)	6	Setpoint Return (-)
7	Valve Override Output	7	Valve Override Output
8	Signal Common (-)	8	Signal Return (-)
9	Mass Flow Alarm Input (+)	9	Mass Flow Alarm Input (+)
10	0-5V Flow Signal Input (+)	10	Mass Flow Alarm Input (+)
11	Chassis Ground	11	Chassis Ground
12	Supply Common	12	Supply Common
13	+15V Power Supply Output	13	+24V Power Supply Output
14	-15V Power Supply Output	14	N/C
15	N/C	15	N/C
Connector CN-2		Connector CN-2	
Pin	Function	Pin	Function
1	0-5V Remote Setpoint Input (+)	1	0/4-20mA Remote Setpoint Input (+)
2	Setpoint Common (-)	2	Signal Return (-)
3	N/C	3	Isolated 0/4-20mA Flow Signal Output (+)
4	0-5V Flow Signal Output (+)	4	0-5V Flow Signal Output (+)
5	Signal Common (-)	5	Signal Common (-)
6	Remote Valve Override (-)	6	Remote Valve Override (-)
7	Remote Valve Override Open (+)	7	Remote Valve Override Open (+)
8	Remote Valve Override Closed (+)	8	Remote Valve Override Closed (+)
9	N/C	9	Isolated Flow Signal Return (-)

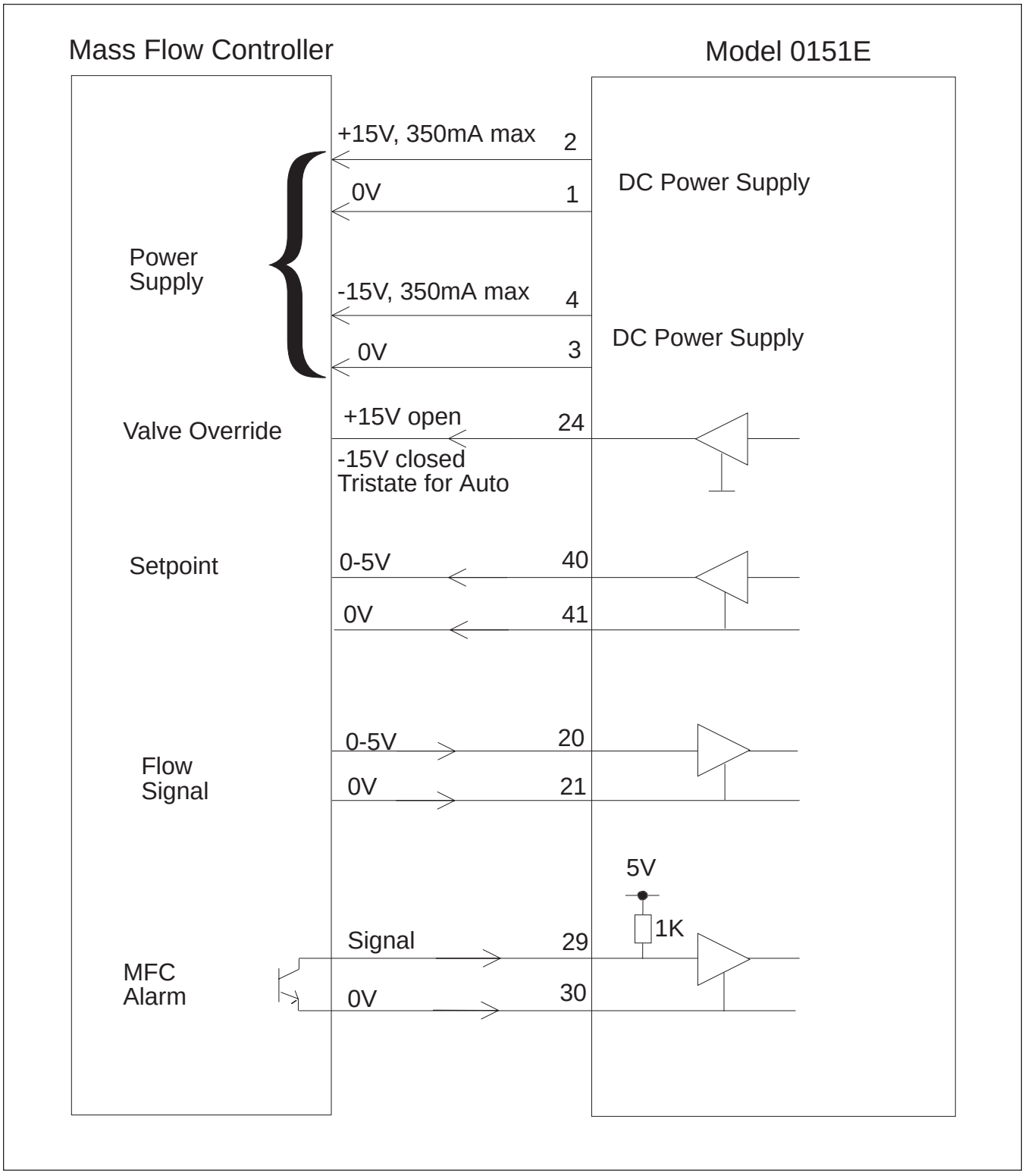

Figure 7-1 Connection Between Model 0151E and Mass Flow Controller

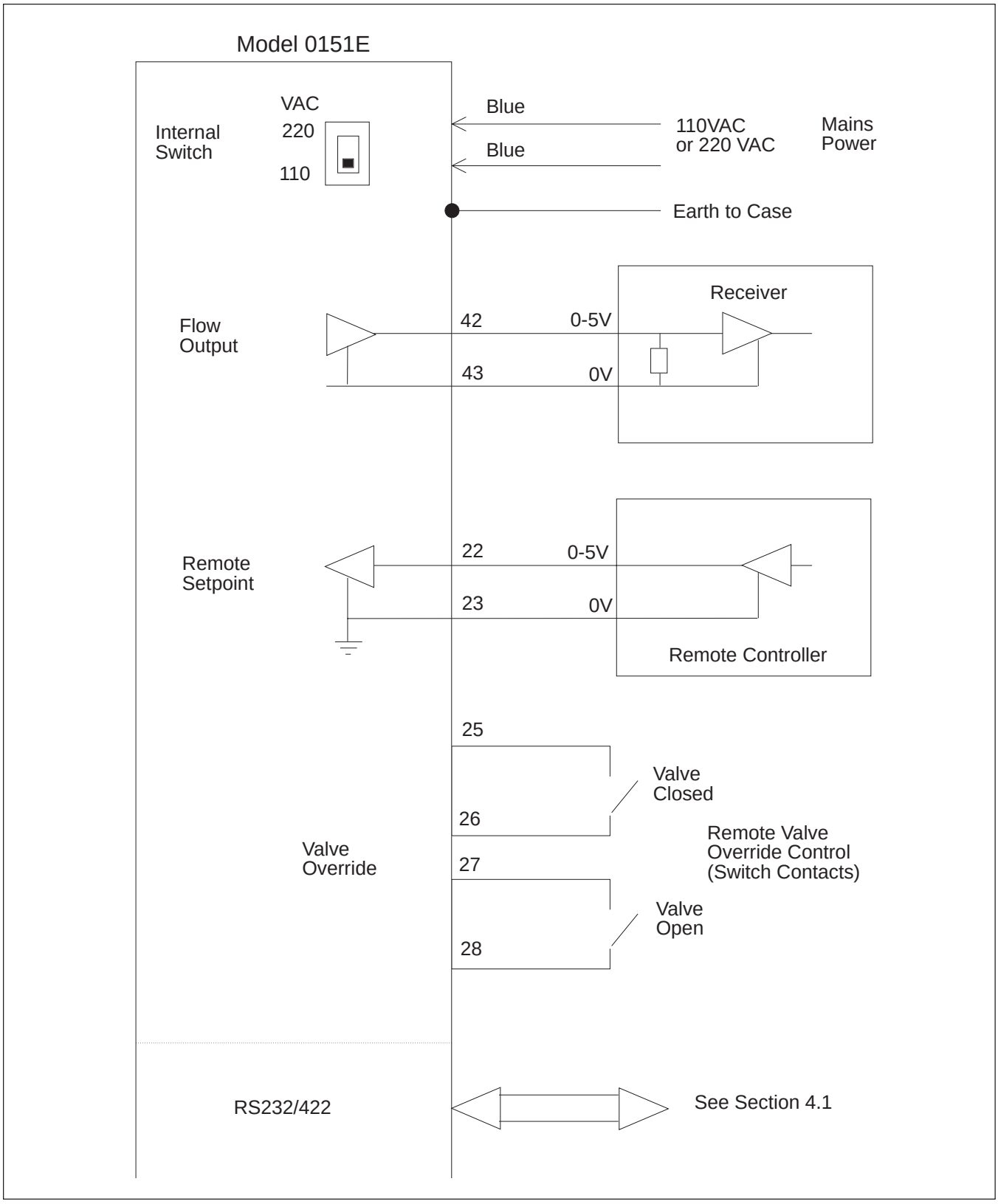

Figure 7-2 Connection Between Model 0151E and External Equipment

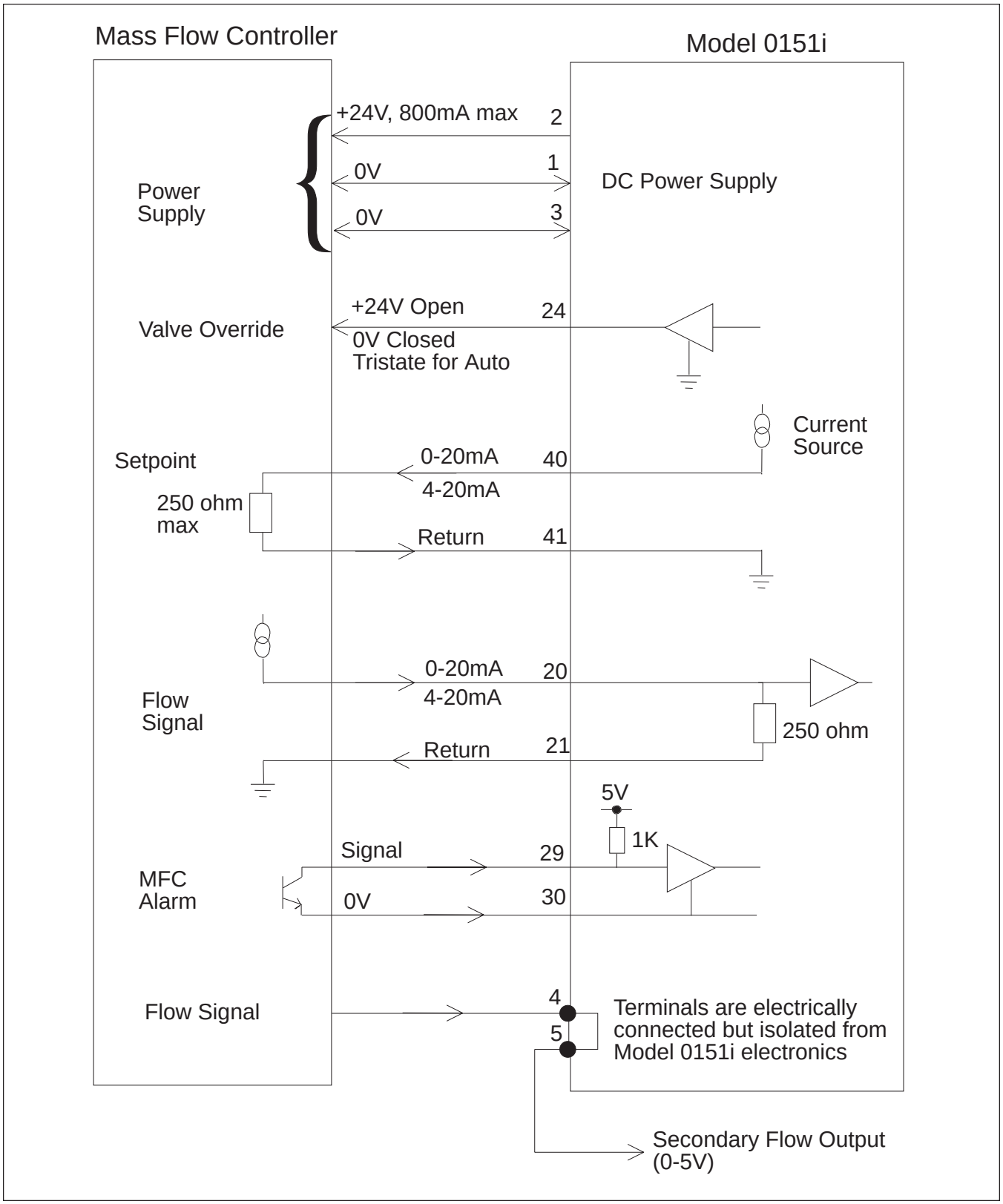

Figure 7-3 Connection Between Model 0151*i* and Mass Flow Controller

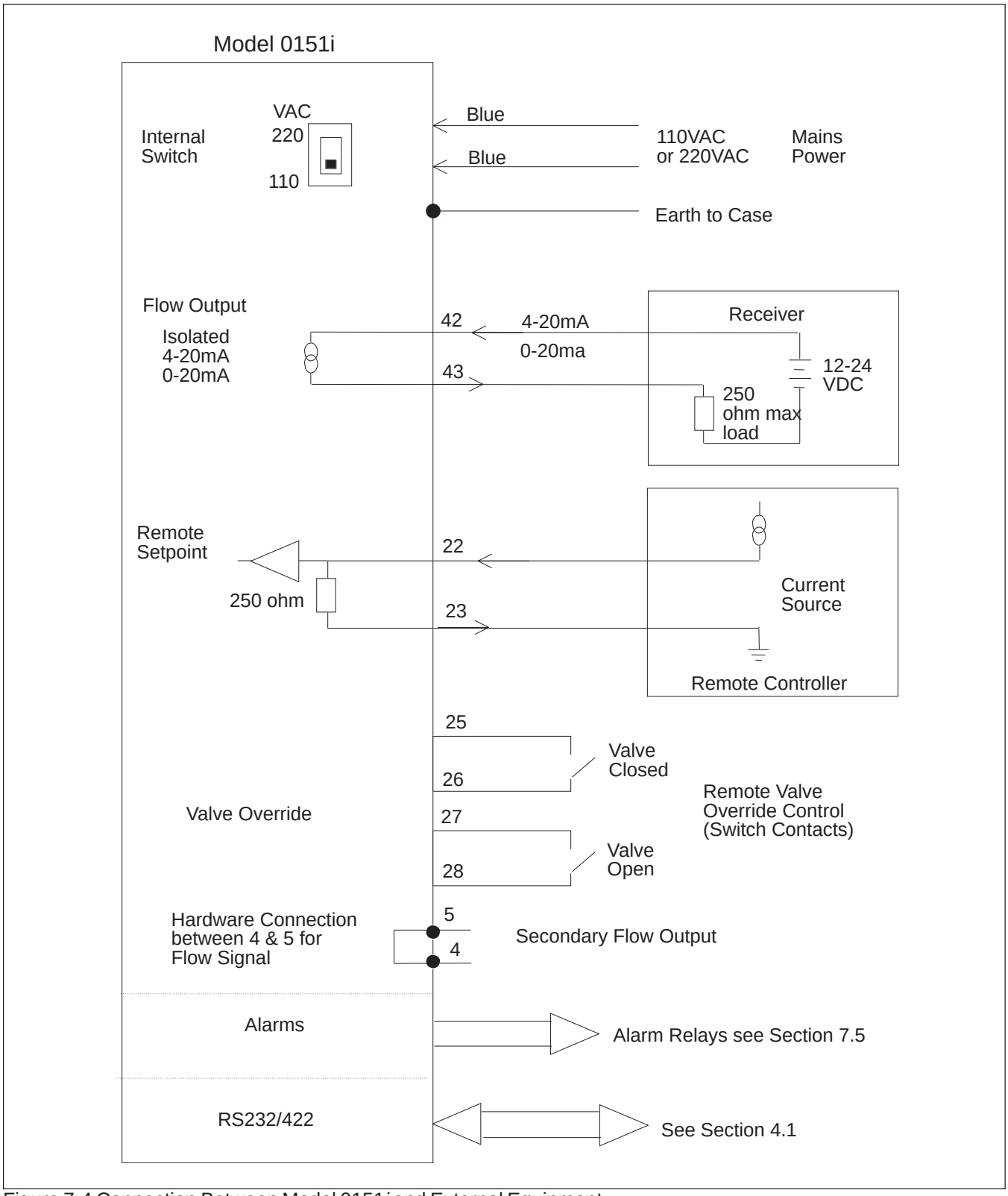

Figure 7-4 Connection Between Model 0151*i* and External Equipment

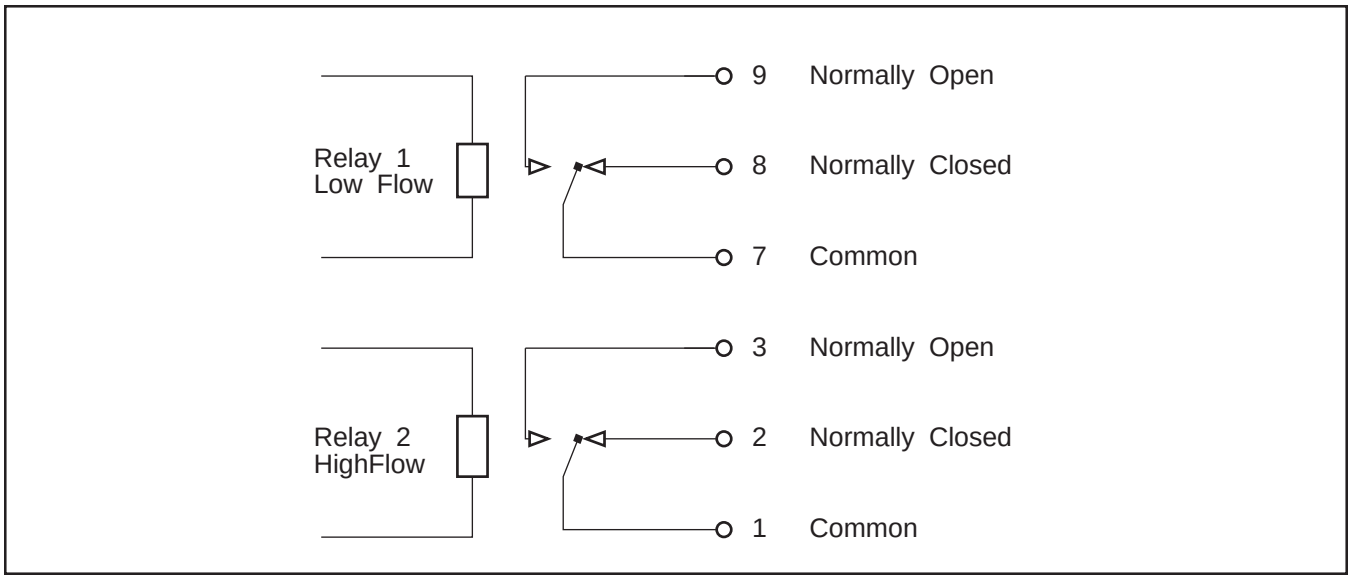

Figure 7-5 Flow Alarm for Model 0151*i* only

8-1 Error Codes

The instrument has extensive self test facilities and will display an error code if it detects an invalid condition. If the instrument displays an error code other than those listed below, please contact the factory.

Error codes are displayed as “Err 14” and a list of commonly encountered codes are given below:

Error Codes

Input Errors
03 Calibration data not saved.
04 Totals not saved.
06 Invalid calibration parameters specified.
14 Communications Input error (RS232/422 Interface).

Output Errors
21 Invalid output configuration.
23 Communications error - Printer fault.

Calibration Errors
30 Zero Value not allowed.

A FAULT message displayed on the readout indicates an alarm condition in the Mass Flow Controller. This is not a fault in the Model 0151 Flow Computer and the user should check the Mass Flow Controller.

8-2 Fuses/Voltages

⚠ WARNING

Hazardous voltages can cause serious injury. Disconnect from power before attempting any service or repair on fuses. Only qualified service personnel or the factory should attempt disassembly or repair.

This instrument contains protective fuses. In the event of severe overload, improper line voltage, or component failure, these fuses may open, rendering the instrument inoperable. After verifying that proper line voltage is available, the fuse may be checked. If the instrument is panel mounted, remove from the panel. Disconnect ALL power and proceed as follows.

1. Panel mount style (cassette with terminal block). The fuse is located on the main circuit board. Replace with a 250V, 0.5 Amp., 5 x 20mm fuse. To access this fuse remove the four screws from the back plate and slide the circuit board from the housing. NOTE: Removing these screws will cause the front and rear panel to come loose. Replace the defective fuse and carefully reassemble instrument. Remove all loads and power the instrument. If the fuse blows again, the instrument is probably damaged, and must be returned to the factory for repairs.

2. Table top styple (plastic enclosure with "D" connectors). In addition to the fuse mentioned above, another fuse (250V, 1.0 Amp., 5 x 20mm) is used to protect the internal wiring associated with the table top enclosure. This fuse should be checked first and is located in fuse holder on the rear of the back panel. If this fuse continues to fail, a problem with the internal wiring is suspected and the instrument should be returned to the factory for repairs. If this fuse is OK, remove the cassette from the table top box and check the internal fuse as described above.

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Models 0151E and 0151*i*

LIMITED WARRANTY

Seller warrants that the Goods manufactured by Seller will be free from defects in materials or workmanship under normal use and service and that the Software will execute the programming instructions provided by Seller until the expiration of the earlier of twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller. Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer.

All replacements or repairs necessitated by inadequate preventive maintenance, or by normal wear and usage, or by fault of Buyer, or by unsuitable power sources or by attack or deterioration under unsuitable environmental conditions, or by abuse, accident, alteration, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense.

Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller.

BROOKS LOCAL AND WORLDWIDE SUPPORT

Brooks Instrument provides sales and service facilities around the world, ensuring quick delivery from local stock, timely repairs and local based sales and service facilities.

Our dedicated flow experts provide consultation and support, assuring successful applications of the Brooks flow measurement and control products.

Calibration facilities are available in local sales and service offices. The primary standard calibration equipment to calibrate our flow products is certified by our local Weights and Measures Authorities and traceable to the relevant international standards.

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.

CUSTOMER SEMINARS AND TRAINING

Brooks Instrument can provide customer seminars and dedicated training to engineers, end users and maintenance persons. Please contact your nearest sales representative for more details.

HELP DESK

In case you need technical assistance:

Americas	☎ 1-888-554-FLOW	
Europe	☎ +(31) 318 549 290	Within Netherlands ☎ 0318 549 290
Asia	☎ +011-81-3-5633-7100	

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

TRADEMARKS

Brooks ..... Brooks Instrument, LLC

ISO 9001 QUALITY SYSTEM

Brooks Instrument
407 West Vine Street
P.O. Box 903
Hatfield, PA 19440-0903 USA
T (215) 362-3700
F (215) 362-3745
E-Mail BrooksAm@EmersonProcess.com
www.BrooksInstrument.com

Brooks Instrument
Neonstraat 3
6718 WX Ede, Netherlands
T 31-318-549-300
F 31-318-549-309
E-Mail BrooksEu@EmersonProcess.com

Brooks Instrument
1-4-4 Kitasuna Koto-Ku
Tokyo, 136-0073 Japan
T 011-81-3-5633-7100
F 011-81-3-5633-7101
E-Mail BrooksAs@EmersonProcess.com

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