926-ST1LE
FLOW COMPUTER

Flowmetrics, Inc.
“Where Quality is Measurable”

9201 Independence Avenue • Chatsworth, CA 91311
(818) 407-3420 • FAX (818) 700-1961
SAFETY INSTRUCTIONS

The following instructions must be observed.

• This instrument was designed and is checked in accordance with regulations in force EN 60950 (“Safety of information technology equipment, including electrical business equipment”).

A hazardous situation may occur if this instrument is not used for its intended purpose or is used incorrectly. Please note operating instructions provided in this manual.

• The instrument must be installed, operated and maintained by personnel who have been properly trained. Personnel must read and understand this manual prior to installation and operation of the instrument.

• This instrument is internally fused. Replace the internal fuse with the following specified type and rating only:

  Input Power  |  Recommended Fuse
  115 VAC     |  160 mA slow blow fuse
  230 VAC     |  80 mA slow blow fuse
  12-24 VDC   |  800 mA slow blow fuse

Disconnect power supply before replacing fuse!

• The manufacturer assumes no liability for damage caused by incorrect use of the instrument or for modifications or changes made to the instrument.

Symbols Used On Unit

<table>
<thead>
<tr>
<th>Number</th>
<th>Symbol</th>
<th>Publication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image" alt="Symbol" /></td>
<td>IEC 417, No. 5031</td>
<td>Direct current</td>
</tr>
<tr>
<td>2</td>
<td><img src="image" alt="Symbol" /></td>
<td>IEC 417, No. 5172</td>
<td>Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION (equivalent to Class II of IEC 536—see annex H)</td>
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<tr>
<td>3</td>
<td><img src="image" alt="Symbol" /></td>
<td>ISO 3864, No. B.3.1</td>
<td>Caution (refer to accompanying documents)</td>
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Technical Improvements

• The manufacturer reserves the right to modify technical data without prior notice.
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1. Description

1.1 Unit Description:

The 926-ST1LE Flow Computer satisfies the rate, total and batching instrument requirements for a variety of pulse producing flowmeter types in liquid applications. Multiple flow equations and instrument functions are available in a single unit with many advanced features.

The alphanumeric display shows measured and calculated parameters in easy to understand format. Single key direct access to measurements and display scrolling is supported.

The versatility of the 926-ST1LE permits a wide measure of versatility within the instrument package. The various hardware inputs and outputs can be “soft” assigned to meet a variety of common application needs. The user “soft selects” the usage of each input/output while configuring the instrument. Consider the following illustrative examples.

The user can assign the standard RS-232 Serial Port for data logging, transaction printing, or for connection to a modem for remote meter reading.

1.2 Unit Features:

The 926-ST1LE Flow Computer offers the following features:

- Compatible with Pulse Producing Flowmeters
- Multiple Instrument Functions; Rate, Total, Batching
- Menu Selectable Hardware & Software Features
- Two Line LCD Display
- Automatic Batch Overrun Compensation
- Isolated Pulse Output Standard
- Isolated Analog Output Standard
- Versatile RS-232 Port Standard
- Linearization Capability Standard
- DIN Enclosure with Two Piece Connectors
- EZ Setup Feature
- Advanced Batching Features
1.3 Specifications:

Specifications:
Environmental
Indoor Use
Altitude up to 2000m
Operating Temperature: 0°C to +50°C
(-20°C to 55°C optional)
Storage Temperature: -40°C to +85°C
Maximum Relative Humidity: 80% for temperatures up to 31°C decreasing linearly to 50% RH at 40°C
Main supply voltage fluctuations not to exceed ±10% of the nominal voltage
Transient overvoltage according to INSTALLATION CATEGORY II (see UL 3101-1 Annex J)
POLLUTION DEGREE 2 in accordance with IEC 664 (see 3.7.3) Materials: UL, CSA, VDE approved

Approvals: CE Compliant Light Industrial, UL File #: E192404, C/UL

Display
Type: 2 lines of 20 characters
Types: Backlit LCD, OLED or VFD ordering options
Character Size: 0.2” nominal
User selectable label descriptors and units of measure

Keypad
Keypad Type: Membrane Keypad
Keypad Rating: Sealed to Nema 4X/IP65
Number of keys: 16

Enclosure
Size: See Dimensions
Depth behind panel: 6.5” including mating connector
Type: DIN
Materials: Plastic, UL94V-0, Flame retardant
Bezel: Textured per matt finish
Equipment Labels: Model, safety, and user wiring

Power Input
The factory equipped power option is internally fused. An internal line to line filter capacitor is provided for added transient suppression.
Order Option 1: 110VAC: 85 to 127 VRms, 50/60Hz
Order Option 2: 220VAC: 170 to 276 VRms, 50/60Hz
Order Option 3: 12VDC: 10.5 to 14 VDC
Order Option 4: 24VDC: 18 to 24 VDC

Flow Inputs:
Pulse Inputs:
Number of Flow Inputs: one
Configurations supported: single input with or without quadrature (menu selectable)
Input Impedance: 10 KΩ nominal
Pullup Resistance: 10 KΩ to 5 VDC (menu selectable)
Pull Down Resistance: 10 KΩ to common
Trigger Level: (menu selectable)
High Level Input
Logic On: 3 to 30 VDC
Logic Off: 0 to 1 VDC
Low Level Input (mag pickup)
Selectable sensitivity: 10 mV & 100 mV
Minimum Count Speed: User selectable down to 1 pulse in 99 sec.
Maximum Count Speed: Selectable: 0 to 20kHz
Overvoltage Protection: 50 VDC
Fast Transient: Protected to 500 VDC (Capacitive Clamp)

Control Inputs
Switch Inputs are menu selectable for Start, Stop, Reset, Lock, Inhibit, Alarm Acknowledge, Print or Not Used.
Control Input Specifications
Input Scan Rate: 10 scans per second
Logic 1: 4 - 30 VDC
Logic 0: 0 - 0.8 VDC
Transient Suppression: 500 V fast transient (Capacitive Clamp)
Input Impedance: 100 KΩ
Control Activation: Positive Edge or Pos. Level based on product definition

Excitation Voltage
110/220 VAC Powered Units
Menu Selectable: 5, 12 or 24 VDC @ 100mA
24 VDC Powered Units
Menu Selectable: 5 or 12 VDC @ 100mA
12 VDC Powered Units
5 VDC @ 100mA
Relay Outputs
The relay outputs are menu assignable to (Individually for each relay) Low Rate Alarm, Hi Rate Alarm, Prewarn Alarm, Preset Alarm, General purpose warning (security), overrun or not used.

Number of relays: 2 (4 optional)
Contact Style: Form C contacts
Contact Ratings:  250 VAC @ 5 amps
                30 VDC @ 5 amps
FastTransient Threshold: 1000 V

Serial Communication
The serial port can be used for printing, datalogging, modem connection and communication with a computer.

RS-232:
  Device ID: 01-99
  Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19200
  Parity: None, Odd, Even
  Handshaking: None, Software, Hardware
  Print Setup: Configurable print list and formatting

RS-485:
  Device ID: 01-247
  Baud Rates: 2400, 4800, 9600, 19200
  Parity: None, Odd, Even
  Protocol: Modbus RTU (Half Duplex)

Isolated Analog Output
The analog output is menu assignable to correspond to the Rate or Total.
Type: Isolated Current Sourcing
Available Ranges: 4-20 mA, 0-20 mA
Resolution: 12 bit
Accuracy: 0.05% FS at 20° C
Update Rate: 1 update/sec minimum
Temperature Drift: Less than 200 ppm/C
Maximum Load: 1000 ohms (at nominal line voltage)
Compliance Effect: Less than .05% Span
60 Hz rejection: 40 dB minimum
Calibration: Operator assisted Learn Mode
Averaging: User entry of damping constant to cause a smooth control action
Note: DC powered units are not isolated

Isolated Pulse output
The isolated pulse is assigned to Volume Total.
Isolation I/O/P: 500 V
Pulse Output Form: Isolated Photomos Relay
Maximum On Current: 125 mA
Maximum Off Voltage: 30 VDC
Saturation Voltage: 1.0 VDC
Maximum Off Current: 0.1 mA
Pulse Duration: User selectable: 10mSec, 100mSec
Pulse output buffer: 8 bit
Fault Protection
  Reverse polarity: Shunt Diode
  Transient Protection: 500 VDC (Capacitive Clamp)
**Operating Mode**

The Flow Computer can be thought of as making a measurement of flow and then performing calculations which are then updated periodically on the display as rate and total. The pulse output, analog output and the alarm relays are also updated. The cycle then repeats itself.

**Step 1:** Update the measurements of input signals -
Raw Input Measurements are made at each input.

**Step 2:** Compute the Volumetric Flow -
Uncompensated flow is the term given to the flow in volume units. The value is computed based on the flowmeter input type selected and augmented by any performance enhancing linearization that has been specified by the user.

**Step 3:** Check Flow Alarms -
The flow alarm functions have been assigned to flow rate during the setup of the instrument. A comparison is now made by comparing the current flow rates against the specified hi and low limits.

**Step 4:** Compute the Flow Totals by Summation -
A flow total increment is computed for each flow rate. This increment is computed by dividing the pulses by the K-Factor and then summing. The totalizer format also includes provisions for total rollover.

**Step 5:** Total Preset Comparisons -
The total associated with a preset function is then compared against the corresponding preset value and any required control actions taken.

**Step 6:** Pulse Output Service -
The pulse output is next updated by scaling the total increment which has just been determined by the pulse output scaler and summing it to any residual pulse output amount.

**Step 7:** Compute the Analog Output -
This designated flow rate value is now used to compute the analog output.

**Step 8:** Update Display and Printer Output -
The instrument finally runs a task to update the various table entries associated with the front panel display and serial outputs.

**Setup Mode**

The setup mode is password protected by means of a numeric lock out code established by the user. In addition, a secret, manufacturers numeric unlock entry sequence is available.

The system also provides a minimum implementation of an “audit trail” which tracks significant setup changes to the unit. This feature is increasingly being found of benefit to users or simply required by Weights and Measurement Officials in systems used in commerce, trade, or “custody transfer” applications.

A Worksheet is provided to assist the user in setting up the instrument. An Easy Setup (EZ Setup) feature is offered in the setup menu. The EZ Setup routine is a quick and easy way to configure the unit for the most commonly used instrument functions.

The setup mode has numerous subgrouping of parameters needed for flow calculations. There is a well conceived hierarchy to the setup parameter list. Selections made at the beginning of the setup affect offerings further down in the lists.

In the setup mode, the flow computer activates the correct setup variables based on the instrument configuration, the flow equation, and the hardware selections, the flow transmitter type, and meter enhancements (linearization) options selected. All required setup parameters are enabled. All setup parameters not required are suppressed.

A help line prompt is provided for each entry. In addition a help message is available which may be accessed by depressing the “HELP” key.

Also note that in the setup mode are parameter selections which have preassigned industry standard values. The unit will assume these values unless they are modified by the user.

**Maintenance (Test) Mode:**
The Maintenance Mode of the 926-ST1LE provides a number of specialized utilities required for instrument checkout on start-up, setup documentation and data logger access.

A password is required to gain access to this specialized mode of operation. Quality and maintenance personnel will find this mode of operation very useful. It is also useful for factory testing.

Many of these tests may be used during start-up of a new system. Inputs signals may be read, and output signals may be exercised to verify the electrical interconnects before the entire system is put on line.

The following action items may be performed in the Maintenance Mode:

- Print Setup Report
- Examine Audit Trail
- Examine Error History
- Perform Keypad Checkout
- Perform Display Checkout
- Perform Pulse Input Checkout
- Perform Pulse Output Checkout
- Perform Control Input Checkout
- Perform Relay Output Checkout
- Perform Analog Output Checkout
- Calibrate Analog Output using the Learn Feature
- Perform Excitation Output Test
- Examine or Dump Data Logger

**RS-232 Serial Port**

The 926-ST1LE has a general purpose RS-232 Port which may be used for any one of the following purposes:

- Transaction Printing
- Data Logging
- Remote Metering by Modem (optional)
- Computer Communication Link
- Configuration by Computer
- Print System Setup
- Print Malfunction History

**Operation of Serial Communication Port with Printers**

926-ST1LE’s RS-232 channel supports a number of operating modes. One of these modes is intended to support operation with a printer in metering applications requiring transaction printing, data logging and/or printing of maintenance reports.

For transaction printing, the user defines the items to be included in the printed document. The user can also select what initiates the transaction print generated as part of the setup of the instrument. The transaction document may be initiated via a front panel key depression, a remote contact closure, upon completion of a batch, time of day or at a timed interval.

In data logging, the user defines the items to be included in each data log as a print list. The user can also select when or how often he wishes a data log to be made. This is done during the setup of the instrument as either a time of day or as a time interval between logging.

The system setup and maintenance report lists all the instrument setup parameters and usage for the current instrument configuration. In addition, the Audit trail information is presented along with a status report listing any observed malfunctions which have not been corrected.

The user initiates the printing of this report at a designated point in the menu by pressing the requested key on the front panel.

**Operation of Serial Port with Modems (optional)**

The 926-ST1LE RS-232 channel supports a number of operating modes. One of these modes is intended to support operation with a modem in remote metering applications.

An external modem is intentionally being used with the 926-ST1LE. This permits use with the variety of modem standards worldwide while avoiding the specialized approvals required for equipment that is deemed to fall under the category of telecommunication equipment.

In the modem mode, the 926-ST1LE is assumed to be operating in a remote metering role. In addition, the 926-ST1LE will be capable of initiating a call to a designed telephone number in the event of a metering malfunction.
2. Installation

2.1 General Mounting Hints:

The 926-ST1LE Flow Computer should be located in an area with a clean, dry atmosphere which is relatively free of shock and vibration. The unit is installed in a 5.43" (138mm) wide by 2.68" (68mm) high panel cutout. (see Mounting Dimensions) To mount the Flow Computer, proceed as follows:

a. Prepare the panel opening.
b. Slide the unit through the panel cutout until it touches the panel.
c. Install the screws (provided) in the mounting bracket and slip the bracket over the rear of the case until it snaps in place.
d. Tighten the screws firmly to attach the bezel to the panel. 3 in. lb. of torque must be applied and the bezel must be parallel to the panel.

Termination Connectors:
Minimum Wire Gauge: 22 AWG
Maximum Wire Gauge: 14 AWG
Voltage/current limits are limited by unit specifications.

Permanently Connected Equipment:
UL 3101-1, Section 6.12.2.1 specifies that:
• A switch or circuit breaker shall be included in the building installation;
• It shall be in close proximity to the equipment and within easy reach of the OPERATOR;
• It shall be marked as the disconnecting device for the equipment.

NOTE: Ensure that the switch or circuit breaker chosen is suitable for the power requirements of the unit.

2.2 Mounting Diagrams:

IMPORTANT!
To provide protection type IP65/NEMA 4X, the unit must be mounted with the bezel adaptor and the gasket (supplied with the mounting kit). The bezel must be glued to the unit with silicon.
(see Instructions supplied with the mounting kit)

Termination Connectors:
Minimum Wire Gauge: 22 AWG
Maximum Wire Gauge: 14 AWG
Voltage/current limits are limited by unit specifications.

Permanently Connected Equipment:
UL 3101-1, Section 6.12.2.1 specifies that:
• A switch or circuit breaker shall be included in the building installation;
• It shall be in close proximity to the equipment and within easy reach of the OPERATOR;
• It shall be marked as the disconnecting device for the equipment.

NOTE: Ensure that the switch or circuit breaker chosen is suitable for the power requirements of the unit.

2.2 Mounting Diagrams:
3. Applications

3.1 Liquid Volume

**Measurements:**
A flowmeter measures the actual volume in a liquid line.

**Calculations:**
• For Flowmeters with Pulse Outputs, Volume flow is calculated using the flowmeter frequency output and the user entered K-Factor or Linearization Table.

**Output Results:**
• Display Results
  Flow Rate, Resettable Total, Non-Resettable Total
• Pulse Output
  Total
• Analog Output
  Rate or Total
• Relay Outputs
  Rate or Total Alarms

**Applications:**
The Flow Computer can monitor actual volume flow and total of any liquid. Flow alarms are provided via relays and datalogging is available via serial outputs.

**Liquid Volume Illustration**

**Calculations**

\[
\text{Volume Flow} = \frac{\text{input frequency} \times \text{time scale factor}}{\text{K-Factor}}
\]
3.2 Batching

**Measurements:**
A flowmeter measures the actual volume in a liquid line.

**Calculations:**
- For Flowmeters with Pulse Outputs, Volume flow is calculated using the flowmeter frequency output and the user entered K-Factor or Linearization Table.

**Output Results:**
- Display Results
  - Flow Rate, Batch Total, Non-Resettable Total
- Pulse Output
  - Total
- Analog Output
  - Rate or Total
- Relay Outputs
  - Batch Total, Rate, or Alarms

**Applications:**
Batching and monitoring flow and total of any liquid. Batching is accomplished via relays and datalogging is available via serial outputs.

**Batching Illustration**

**Calculations**

*Pulse Input; Average K-Factor or Linearization Table*

\[
\text{Volume Flow} = \frac{\text{input frequency} \times \text{time scale factor}}{\text{K-Factor}}
\]
4 WIRING

4.1 Typical Batcher Wiring:

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<tr>
<th></th>
<th>DC OUTPUT</th>
<th>FLOW IN</th>
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<tbody>
<tr>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>PULSE IN 1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PULSE IN 2</td>
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</tr>
<tr>
<td>4</td>
<td>COMMON</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>NOT USED</td>
<td></td>
</tr>
<tr>
<td>6</td>
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<td>7</td>
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</tr>
<tr>
<td>8</td>
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4.2 Typical Rate/Total Wiring:

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<tr>
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<tbody>
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<tr>
<td>2</td>
<td>PULSE IN 1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PULSE IN 2</td>
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<td>7</td>
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<td></td>
</tr>
<tr>
<td>8</td>
<td>NOT USED</td>
<td></td>
</tr>
</tbody>
</table>

(+) V Signal
Common

115 VAC

115 VAC SOLENOID VALVE

MOV recommended

AC LINE

DC + DC - POWER IN

115 VAC

FLOW SENSOR with magnetic pickup

Remote Electronic Counter

123456

Alarm Relay 1

Alarm Relay 2

115 VAC

AC LINE
5. UNIT OPERATION

5.1 Front Panel Operation Concept for Run Mode

The 926-ST1LE is fully programmable through the front panel. Please review the following usage summary before attempting to use the instrument.

HELP
On-line help is provided to assist the operator in using this product. The help is available during RUN and SETUP modes simply by pressing the HELP key. The HELP key is used to enter decimals when entering numeric values.

FUNCTION KEYS
In the RUN mode, several keys have a special, direct access feature, to display an item of interest (i.e. RATE, TOTAL, PRE 1, etc.). Press the key to view your choice. Press the SCROLL key to return to scrolling display.

CLEARING TOTALIZER
To clear the total, you must press the TOTAL Function Key 3 times quickly to select the total. Once the total is selected, press the CLEAR key to reset the total. The operator will be prompted to enter password if the unit is locked.
NOTE: In the Batcher Mode, simply press the CLEAR key to reset the total (the batcher must be stopped or finished batching). It is not necessary to press the TOTAL Function Key first.

CLEARING GRAND TOTAL
To clear the grand total, you must press the GRAND Function Key 3 times quickly to select the grand total. Once the grand total is selected, press the CLEAR key to reset the grand total. The operator will be prompted to enter password if the unit is locked.

PRESET KEYS
In the RUN mode, PRE 1, PRE 2, F1 and F2 keys are used to view and/or change the preset setpoints. To view the Presets, simply press the desired Preset key once. Rapidly press the Preset keys 3 times, then press the Clear key for direct editing of the preset setpoints.

SCROLL
Rapidly press the Scroll key 3 times to setup a display list.
Press the CLEAR key to remove old scroll list.
Press the function key for the item you wish to add
Use the A V keys to assign the line.
Press the ENTER key to save scroll list.

PRINT
The PRINT key is used to print on demand. When the PRINT key is pressed, a user defined list of data (TOTAL, RATE, PRE 1, etc.) is sent to the RS232 port. A timed message of "PRINTING" will be displayed to acknowledge the print request.

SPECIAL BATCHING KEYS
The START and STOP keys are used only when batching to start and stop batches. The CLEAR key will clear the total without first pressing the TOTAL key (unit must be stopped). All other keys work the same in both Rate/Total mode and Batch mode. The Start and Stop keys operation are set by the control input settings. The Start options are: START or RESET/START. The Stop options are: STOP or STOP/RESET.

MENU KEY
The MENU key is used to enter the Setup and Test modes. Press the MENU key to enter the Setup and Test modes. The user will be prompted to enter a password if the unit is locked. (See section 6 for Setup mode, section 8 for Test mode). The MENU key is also used as "escape" in Setup and Test Programming. Pressing the MENU key while programming in the Sub-Menu groups will backup the display to that Sub-Menu group heading. Pressing the MENU key while viewing the Sub-Menu groups will backup the display to the Top Level Menu.

ACKNOWLEDGING ALARMS
Most alarm messages are self-clearing. Press the ENTER key to acknowledge and clear alarms.

NOTE: Some keys and functions are password protected. Enter the password to gain access. The passwords are factory set as follows: Operator = 0; Supervisor = 2000

TIME/DATE
The TIME key is reserved for displaying Time and Date. To View the Time or Date, press the TIME key once.
5.2 General Operation

The unit can display: Rate, Total, Grand Total, Presets and Time of Day. The unit can be programmed to perform Ratemeter/Totalizer or Batching functions.

5.3 Ratemeter/Totalizer Operation

The Ratemeter/Totalizer mode is used primarily to monitor flowrate and accumulated total. The relays can be used to trigger on flow rate, total, or alarms.

5.3.1 Password Protection for Rate/Total mode

After an Operator and/or Supervisor Password is entered in the setup mode (see section 6.3, SETUP PASSWORD submenu), the unit will be locked. The unit will prompt the user for the password when trying to perform the following functions:

- Clear Total
- Clear Grand Total
- Enter Menu
- Edit Preset 1 (PRE 1 Key)
- Edit Preset 2 (PRE 2 Key)
- Edit Preset 3 (4 Key)
- Edit Preset 4 (9 Key)

The Supervisor password should be reserved for supervisors. The Supervisor password will allow access to restricted areas of the Setup and Test menus.

5.3.2 Relay Operation in Rate/Total mode

Up to four relays are available (two standard) for alarm outputs. The relays can be assigned to trip according to rate, total or general system alarms. The relays can be programmed for low or high alarms. Preset 1 (RLY1) and Preset 2 (RLY2) are easily accessible by pressing the PRE 1 or PRE 2 key on the front panel. Preset 3 and Preset 4 are accessible by pressing the 4 or 9 keys.

5.3.3 Pulse Output in Rate/Total mode

The isolated pulse output (open collector) is assigned to Volume Total. The pulse output duration can be set for 10mS (50 Hz max) or 100mS (5 Hz max). A pulse output scale factor (pulse value) can be set to scale the pulse output. The pulse output is ideal for connecting to remote totalizers or other devices such as a PLC. See section 1.3 for electrical specifications.

5.3.4 Analog Output in Rate/Total mode

The analog output is menu assignable to correspond to the Volume Rate or Volume Total. The analog output is ideal for "trend" tracking using strip chart recorders or other devices.
5.3.5 RS-232 Serial Port Operation in Rate/Total mode

The RS-232 serial port can be used for programming (using the Setup Disk) or for communicating to printers and computers in the Operating Mode (Run Mode).

PC Communications:
The Setup Disk also allows the user to query the unit for operating status such as Flow Rate, Flow Total, Presets, etc.

Operation of RS-232 Serial Port with Printers:
Transaction Printing
For transaction printing, the user defines the items to be included in the printed document (see section 6.3.20 SET DATA OUTPUT, Select_list). The transaction document can be initiated by pressing the PRINT key or by a remote contact closure.

Data Logging
In data logging, the user defines the items to be included in each data log (see section 6.3.20 SET PRINTER OUTPUT, Select_list). The user can also select when (time of day) or how often (print interval) the data log is to be made (see section 6.3.19 SET PRINTER OUTPUT, Configure).

System Setup and Maintenance Report
The system setup and maintenance report lists all of the instrument setup parameters and usage for the current instrument configuration. The audit trail information and a status report is also printed. This report is initiated in the Test menu (see section 8.2.3 PRINT SYSTEM SETUP).

5.3.6 RS-485 Serial Port (optional)

RS-485 Port Description:
The optional RS-485 card utilizes Modbus RTU protocol to access a variety of process parameters and totalizers. The Relays can be controlled via Modbus. In addition, action routines can be executed. For further information, contact factory and request RS-485 Protocol manual.

Operation of Serial Communication Port with PC
The flow computer's RS-485 channel supports a number of Modbus RTU commands. Modbus RTU drivers are available from third party sources for a variety of Man Machine Interface software for IBM compatible PC's.

The user reads and writes information from/to the RS-485 using the Modbus RTU commands. The 926-ST1LE then responds to these information and command requests.

Process variables and totalizers are read in register pairs in floating point format. Time and date are read as a series of integer register values. Alarms are individually read as coils. Action routines are initiated by writing to coils.
5.4 Batcher Operation

The Batcher mode is used primarily to control batches. The main difference between the Batch mode and Rate/Total mode is the relay operation. The Batch mode allows the operator to "START" the unit via the front panel or remote input. Once started, the relays (RLY1 & RLY2) will energize and send a contact to a flow control device (i.e. solenoid valve or pump). The flow sensor will send a signal to the unit and total accumulation will begin. Just before the end of batch, when the Prewarn value (PRE 2) is reached, Relay 2 will drop out (this is ideal for flow slow down). When the final Batch amount (PRE 1) is reached, Relay 1 will drop out and the Batch is complete.

Several messages will be displayed during normal batch operation (i.e. Batch Fill, Batch Stopped). The keypad is disabled for the duration of these timed messages (approx. 2 sec).

5.4.1 Batcher Configuration.

When the unit is programmed for batch mode, several batch operation choices are available. These choices include: EZ Preset, Up or Down Counting, Maximum Batch Preset, Batch Overrun Compensation, Auto Batch Restart, Time Delay, Flow Signal Timeout, Maximum Drain Time, Slow Start Quantity, Start or Reset/Start, and Stop or Stop/Reset.

**EZ Preset**
A selectable mode of batching where user can press "PRE 1", then "ENTER" then the quantity to be batched, then "START" for a quick enter-start sequence.

**Batch Count Mode**
The Batch Count Mode allows the user to choose whether the unit will batch up to a preset value or batch down from a preset value to zero.

**Maximum Batch Preset**
The Maximum Batch Preset allows the user to program the Maximum Batch value allowed to be entered by the operator. If an operator should try to program a batch higher then this value, the unit will not allow the value to be entered and will prompt the user with an error message saying that the permitted Maximum Batch Preset size has been exceeded.

**Batch Overrun**
The Batch Overrun is used for batch applications that have slow responding valves and a consistent batching flow rate. When the Batch Overrun is set, the unit will compensate for batch overruns by computing an averaged overrun value from the last four batches. This average is used to internally adjust the batch setpoint to minimize overrun. The maximum drain time must be set greater than the slowest valve response time for proper operation of this feature.

**Auto Batch Restart**
The Auto Batch Restart function allows the user to set an amount of time to automatically restart a batch after the completion of a batch. This time can be set from 1 to 99 seconds.

**Flow Signal Timeout**
The Flow Signal Timeout allows the user to enter a timeout of 0 to 99 seconds. If a batch is “Filling” and zero flow persists for more than the user entered time then the batch will be aborted. This prevents overflows due to faulty flow sensors and/or wiring.

**Maximum Drain Time**
The unit declares that a batch is “done” when the flow rate equals “0”. A flow rate may be present long after the Preset Relay de-energizes due to slow reacting valves or leaky valves. The Maximum Drain Time allows the user to enter an amount of time (0 to 99 seconds) to wait before declaring “Batch Done”. After the Preset Batch quantity is reached, the unit will declare “Batch Done” when the flow rate is “0” or the Maximum Drain Time has expired. The batch data will then be available for printing and datalogging.

**Slow Start Quantity**
The Slow Start Quantity is a function that allows an amount to be entered for a Slow Start of fill. This function requires two stage valve control. RLY 1 (slow flow) will energize for Slow Start and RLY 2 (fast flow) will energize after the Slow Start Quantity has been delivered. This helps reduce turbulence when filling an empty container.
START, RESET/START and STOP, STOP/RESET
When configuring the control inputs, Control Input 1 can be set for START or RESET/START. When set for START, the unit will start batching when a signal is applied to Control Input 1 or the front panel Start key is pressed. A separate Reset signal or CLEAR key depression must be used to clear the previous batch total. When set for RESET/START, the unit will automatically reset then start when a signal is applied to Control Input 1 or the front panel Start key is pressed (provided that the previous batch was completed). If a previous batch was stopped during a batch cycle, the unit will Start from where it was stopped.

Control Input 2 can be set for STOP or STOP/RESET. When set for STOP, the unit will stop batching when a signal is applied to Control Input 2 or the front panel Stop key is pressed. A separate Reset signal or CLEAR key depression must be used to clear the batch total. When set for STOP/RESET, a running batch will stop when a signal is applied to Control Input 2 or the front panel Stop key is pressed. If the unit is Stopped or after a completed batch, the unit will reset when a signal is applied to Control Input 2 or the front panel Stop key is pressed.

NOTE: Applying a voltage level to Control Input 2 will inhibit and override all Start inputs in either mode.

5.4.2 Password Protection for Batcher Mode
After an Operator and/or Supervisor Password is entered in the setup mode (see section 6.3, SETUP PASSWORD Sub-menu), the unit will be locked. The unit will prompt the user for the password when trying to perform the following functions:
- Clear Grand Total
- Enter Menu

The Supervisor password should be reserved for supervisors. The Supervisor password will allow access to restricted areas of the Setup and Test menus.

The passwords are factory set as follows:
- Operator = 0
- Supervisor = 2000

NOTE: A password of "0" should not be used since it will leave the unit unlocked and open to accidental changes.

5.4.3 Relay Operation in Batcher mode
Up to four relays are available (two standard) for alarm outputs. Preset 1 (RLY1) is reserved for batch amount, Preset 2 (RLY2) is reserved for prewarn. (see section 5.4 Batcher Operation for Relay 1 & Relay 2 functions) Preset 1 (RLY1) and Preset 2 (RLY2) are easily accessible by pressing the PRE 1 or PRE 2 key on the front panel. Preset 3 and Preset 4 are accessible by pressing the 4 or 9 keys. Relays 3 and 4 can be assigned to trip according to rate, total, overrun or alarm. When Rate is selected the relays can be programmed for low or high alarms. When N.A (not assigned) is selected, the relays may be tripped via serial commands. Alternately, Preset 2, 3 or 4 may be used to enter alternate information and can be printed in the print list for transaction history.

5.4.4 Pulse Output in Batcher mode
The isolated pulse output (open collector) is assigned to Volume Total. The pulse output duration can be set for 10mS (50 Hz max) or 100mS (5 Hz max). A pulse output scale factor (pulse value) can be set to scale the pulse output. The pulse output is ideal for connecting to remote totalizers or other devices such as a PLC. See section 1.3 for electrical specifications.

5.4.5 Analog Output in Batcher mode
The analog output is menu assignable to correspond to the Volume Rate or Volume Total. The analog output is ideal for "trend" tracking using strip chart recorders or other devices.
5.4.6 RS-232 Serial Port Operation in Batcher mode

The RS-232 serial port can be used for programming (using the Setup Disk) or for communicating to printers and computers in the Operating Mode (Run Mode).

PC Communications:
The Setup Disk also allows the user to query the unit for operating status such as Flow Rate, Flow Total, Presets, etc.

Operation of RS-232 Serial Port with Printers:

Transaction Printing
For transaction printing, the user defines the items to be included in the printed document (see section 6.3.20 SET DATA OUTPUT, Select_list). The transaction document can be initiated by pressing the PRINT key, by a remote contact closure or print at end of batch.

Data Logging
In data logging, the user defines the items to be included in each data log (see section 6.3.20 SET PRINTER OUTPUT, Select_list). The user can also select when (time of day) or how often (print interval) the data log is to be made (see section 6.3.19 SET PRINTER OUTPUT, Configure).

System Setup and Maintenance Report
The system setup and maintenance report lists all of the instrument setup parameters and usage for the current instrument configuration. The audit trail information and a status report is also printed. This report is initiated in the Test menu (see section 8.2.3 PRINT SYSTEM SETUP).

5.4.7 RS-485 Serial Port (optional)

RS-485 Port Description:
The optional RS-485 card utilizes Modbus RTU protocol to access a variety of process parameters and totalizers. Batches/Relays can be controlled remotely via Modbus. In addition, action routines can be executed. For further information, contact factory and request RS-485 Protocol manual.

Operation of Serial Communication Port with PC
The flow computer's RS-485 channel supports a number of Modbus RTU commands. Modbus RTU drivers are available from third party sources for a variety of Man Machine Interface software for IBM compatible PC's.

The user reads and writes information from/to the RS-485 using the Modbus RTU commands. The 926-ST1LE then responds to these information and command requests.

Process variables and totalizers are read in register pairs in floating point format. Time and date are read as a series of integer register values. Alarms are individually read as coils. Action routines are initiated by writing to coils.
6. PROGRAMMING
6.1 Front Panel Operation Concept for Program Mode

The 926-ST1LE is fully programmable through the front panel. Please review the following usage summary before attempting to use the instrument.

Setup Mode:

MODE CHANGES
Pressing the MENU key will offer selections of RUN, SETUP, TEST. RUN is the normal operating mode for the instrument. SETUP offers various sub-menus used for instrument setup. TEST offers various sub-menus for Test, Calibration and System Start-up testing.

Sub-menu GROUP NAVIGATION
Use the UP and DOWN arrow keys to navigate up and down through the Sub-Menu groups when in the SETUP or TEST mode. Press the ENTER key to enter a desired setup or test Sub-Menu group.

SELECTION OF ITEM
During setup, the unit will often offer multiple choices for a given topic. The topic prompt appears on the top line of the display. The choices are shown on the lower line of the display.
To select an item, press the key (in top row) beneath the desired choice. The selected choice will blink. Press the ENTER key to accept the selected choice.

NUMERIC ENTRY
The keys labeled "0 - 9", ",", ",", CLEAR and ENTER are used to enter numerical values. A leading 0 will assume that you intend to enter a minus "," sign. Press the CLEAR key to clear the existing value and to enable editing. Enter the digits of your desired values, press ENTER to accept the value.

TEXT CHARACTER ENTRY
Some setup items (i.e. Descriptors, Units Label) require the user to enter text characters. Press CLEAR to enable editing. The UP and DOWN arrow keys are used to scroll through the available character sets for each individual character. Press the ENTER key to accept the character and advance to the next character.
6.2 EZ Setup

The EZ Setup routine is a quick and easy way to configure the unit for the most commonly used instrument functions. This setup assumes that you are measuring Volumetric Flow using a high level, DC Pulsing flow sensor. Entering the EZ Setup mode automatically sets many features. This may cause any previously programmed information to be lost or reset. For a complete customized configuration, see sections 6.3 and 6.4.

<table>
<thead>
<tr>
<th>Menus</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2.1</td>
<td>TOP LEVEL</td>
<td>SETUP MENU</td>
</tr>
<tr>
<td>SELECT OPERATE STATE</td>
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<tr>
<td>Run</td>
<td>Setup</td>
<td>Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SELECT EZ SETUP</td>
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<td></td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>CHANGES ALL SETUPS!</td>
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<td>INSTRUMENT TYPE</td>
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<td>Rate/Tot</td>
<td>Batch</td>
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<td>RATE TIME BASE</td>
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<td>AVERAGE KA-FACTOR</td>
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</tr>
<tr>
<td>******* P/gal</td>
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<td>LINEAR TABLE KA</td>
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<tr>
<td>Fre01: ******* Hz</td>
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<td>LINEAR TABLE KA</td>
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<tr>
<td>KA----01:************</td>
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<tr>
<td>FS ANALOG OUT 20mA</td>
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<td></td>
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<tr>
<td>*******gal/m</td>
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</tr>
<tr>
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</tr>
<tr>
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<td>TOTAL</td>
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<tr>
<td>00.0 gal/m</td>
<td>0 gal</td>
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</tr>
</tbody>
</table>

Select Setup to enter the instrument setup routine.

Press ENTER to begin EZ Setup routine.

Confirm that you want to run EZ Setup. Caution: Any previous program settings may be lost or reset.

Instrument Type.

Select the appropriate rate time base.

Enter the desired rate decimal location. 0-4 decimal places allowed.

Enter the desired totalizer units label.

Enter the desired totalizer decimal location. 0-3 decimal places allowed.

Enter the desired K-Factor Type.

If Average selected, Enter the desired Average K-Factor.

If LinTbl selected, Enter the desired frequency/ K-Factor pair for each point in the Linearization Table.

Enter a frequency of 0 for any point other than Fre01 to exit Linearization Table setup.

Enter the desired full scale setting for the analog output.

Return to Run Mode
6.3 Setup Menus

6.3.1 Top Level Setup Menu

Select Setup to enter the instrument setup routine.

6.3.2 Sub-menu Groups

SELECT EZ SETUP

INSTRUMENT TYPE

SETUP INDICATORS

SETUP FLOW INPUT

SETUP PULSE OUTPUT

SETUP ANALOG OUTPUT

SETUP RELAYS

SETUP CONTROL INPUTS

SETUP REALTIME CLOCK

SERIAL USAGE

SETUP DATALOG/PRINT

ADMINISTRATIVE SETUP

SETUP NETWORK CARD

(Setup Network Card menu will only appear on units equipped with a network card)

Display

Notes

Select Setup to enter the instrument setup routine.

Refer to Page 17 for Details.

Refer to Page 19 for Details

Refer to Page 21 for Details.

Refer to Page 22 & 23 for Details.

Refer to Pages 24 for Details.

Refer to Pages 24 for Details.

Refer to Page 25 & 26 for Details.

Refer to Page 27 for Details.

Refer to Page 28 for Details.

Refer to Page 29 for Details.

Refer to Pages 30 & 31 for Details.

Refer to Page 31 for Details.

Refer to Page 32 for Details.
### 6.4 Setup Sub-Menus

<table>
<thead>
<tr>
<th>Sub-menus</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6.4.1 SELECT EZ SETUP</strong></td>
<td><strong>SELECT EZ SETUP</strong> Advance To INSTRUMENT TYPE</td>
<td>Refer to page 17 for EZ Setup routine. Press the DOWN (stop) key to advance to Instrument Type. Press the UP (start) key to advance to Administrative Setup.</td>
</tr>
<tr>
<td><strong>6.4.2 INSTRUMENT TYPE</strong></td>
<td><strong>INSTRUMENT TYPE</strong> Rate/Tot Batch</td>
<td>Press ENTER when Rate/Total is flashing to configure the instrument as a Ratemeter/Totalizer. If Rate/Tot selected, advance to Setup Indicators.</td>
</tr>
<tr>
<td>Rate/Tot</td>
<td><strong>INSTRUMENT TYPE</strong> Rate/Tot Batch</td>
<td>Press ENTER to enter Instrument Type sub-menus.</td>
</tr>
<tr>
<td>Batch</td>
<td><strong>INSTRUMENT TYPE</strong> Rate/Tot Batch</td>
<td>Press ENTER when Batch is flashing to configure the instrument as a Batcher. Select Standard for standard preset operation. Select EZ-Preset for quick preset editing mode. (see section 5.4.1 Batcher Configuration.) Select UP to Reset to 0 and count up to preset. Select DOWN to reset to Preset and count down to 0.</td>
</tr>
</tbody>
</table>

Continue On Next Page
6.4.2
INSTRUMENT TYPE
(continued)

See Section 5.4, see also Max. Drain Time note.

NOTE: Max Drain time value must be greater than the slowest valve response time when using Batch Overrun Comp.

Enter the maximum allowable Batch Preset. The operator will not be able to enter a batch preset larger than this value.

Select ON to set the unit to operate using a Batch Overrun Compensation routine. Select OFF to inhibit Batch Overrun Compensation routine.

Select On to enable the Auto Batch Restart. This will automatically restart the unit at the end of each batch run (after programmed timeout). Select Off to disable.

Enter Time Delay for Auto Batch Restart. When a batch is completed, the next batch will start automatically after the amount of time entered here has elapsed.

Enter a timeout of 0 to 99 seconds. If a batch is “Filling” and zero flow persists for more than this time, the batch filling will be stopped.

Enter time (0-99 sec.) for Max. Drain Time. After batch quantity is reached, “Batch Done” is declared when the flow rate is “0” or the Maximum Drain Time has expired.

Enter a quantity for a Slow Start up. RLY 1 (slow flow) will energize for Slow Start and RLY 2 (fast flow) will energize after the Slow Start Quantity has been delivered. Both RLY 1 and RLY 2 are energized during “fast fill”.

Advance To
SETUP INDICATORS
## Sub-menus

### 6.4.3 SETUP INDICATORS (Total)

<table>
<thead>
<tr>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setup Indicators&lt;br&gt;Press ENTER to begin setup of the Indicators</td>
<td>Press ENTER when Total is flashing to configure the Totalizer Indicators&lt;br&gt;Enter the desired Total Descriptor text&lt;br&gt;Enter the desired Volume Units Label text for the Totalizer.&lt;br&gt;Select the desired Total Decimal Place. 0-3 decimal places allowed.</td>
</tr>
</tbody>
</table>

| Setup Indicators<br>Total<br>Rate<br>Total Descriptor<br>Total Volume Units<br>Tot Dec Places <br>0 | Advance To Setup Indicators <br> (Rate) |

### 6.4.4 SETUP INDICATORS (Rate)

<table>
<thead>
<tr>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setup Indicators&lt;br&gt;Press ENTER when Rate is flashing to configure the Ratemeter Indicators</td>
<td>Select the desired Rate Time Base. &lt;br&gt;Enter the desired Descriptor text for the Ratemeter.&lt;br&gt;Select the desired Rate Decimal Place. 0-4 decimal places allowed. &lt;br&gt;Enter desired Rate Averaging Filter. (see Definitions for more details) &lt;br&gt;Enter desired Percent of Change for Quick Update. If the current flowrate deviates by an amount greater than the percentage value entered, the Rate Averaging is inhibited. (See Definitions for more details.)</td>
</tr>
</tbody>
</table>

| Setup Indicators<br>Total<br>Rate<br>Rate Time Base<br>Sec Min Hour Day<br>Rate Descriptor<br>Rate<br>Rate Dec Places<br>4<br>Rate Avg Filter<br>0<br>Quick Update %<br>5 | Advance To Setup Flow Input |
6.4.5

SETUP
FLOW INPUT
(Pulse - chA & chA=chB)

<table>
<thead>
<tr>
<th>Sub-menus</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETUP FLOW INPUT</td>
<td>setup flow input</td>
<td>Press ENTER to begin setup of Flow Input.</td>
</tr>
<tr>
<td></td>
<td>excitation voltage</td>
<td>Select the desired Excitation Voltage for your flow sensor. Caution: Improper selection may cause damage to sensor</td>
</tr>
<tr>
<td></td>
<td>pulse input type</td>
<td>Enter the desired Pulse type. See side note.</td>
</tr>
<tr>
<td></td>
<td>pulse trigger level</td>
<td>Select the desired Input Pulse Trigger Level.</td>
</tr>
<tr>
<td></td>
<td>low pass filter</td>
<td>Select the desired Low Pass Filter. (Max. Count Speed). Use 3kHz with turbine flowmeters.</td>
</tr>
<tr>
<td></td>
<td>input termination</td>
<td>Select the proper input termination.</td>
</tr>
<tr>
<td></td>
<td>max window</td>
<td>Enter the desired Maximum Sample Window Time (1-99 sec) that can occur at the lowest flowrate. Use 1 second for turbine flowmeters.</td>
</tr>
<tr>
<td></td>
<td>k-factor type</td>
<td>Enter the desired K-Factor Type.</td>
</tr>
<tr>
<td></td>
<td>average k-factor</td>
<td>If Avg selected, Enter the desired Average K-Factor in the units requested.</td>
</tr>
<tr>
<td></td>
<td>linear table k-factor</td>
<td>If LinTbl selected, Enter the desired frequency/ K-Factor pair for each point in the Linearization Table. NOTE: Enter 0 for Fre value of any point (other than Fre01) to exit the routine and use the values entered up to that point.</td>
</tr>
<tr>
<td></td>
<td>low flow rate alarm</td>
<td>Enter the desired volumetric Low Rate Alarm. This will trigger an alarm message if alarm conditions occur. The relays are not affected.</td>
</tr>
<tr>
<td></td>
<td>high flow rate alarm</td>
<td>Enter the desired volumetric High Rate Alarm. This will trigger an alarm message if alarm conditions occur. The relays are not affected.</td>
</tr>
</tbody>
</table>

NOTE:
chA = Single Pulse
chA=chB = Pulse checking for missing pulses
Qx1 = Quadrature
Qx2 = Quadrature x 2

Advance To
SETUP PULSE OUTPUT
### 6.4.6 SETUP FLOW INPUT

(Pulse - Quadrature, Qx1 or Qx2)

Note:
- chA = Single Pulse
- chA=chB = Pulse checking for missing pulses
- Qx1 = Quadrature
- Qx2 = Quadrature x 2

<table>
<thead>
<tr>
<th><strong>Display</strong></th>
<th><strong>Notes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SETUP FLOW INPUT</td>
<td>Press ENTER to begin setup of Flow Input.</td>
</tr>
<tr>
<td><strong>EXCITATION VOLTAGE</strong>&lt;br&gt;5v 12v 24v</td>
<td>Select the desired Excitation Voltage.</td>
</tr>
<tr>
<td><strong>FLOW INPUT TYPE</strong>&lt;br&gt;Pulse</td>
<td>Press ENTER when Pulse is flashing to configure the flow input for Pulse signals.</td>
</tr>
<tr>
<td><strong>PULSE INPUT TYPE</strong>&lt;br&gt;chA chA=chB Qx1 Qx2</td>
<td>Enter the desired Pulse type. See side note.</td>
</tr>
<tr>
<td><strong>PULSE TRIGGER LEVEL</strong>&lt;br&gt;10mV 100mV 2.5V</td>
<td>Select the desired Input Pulse Trigger Level.</td>
</tr>
<tr>
<td><strong>LOW PASS FILTER</strong>&lt;br&gt;40Hz 3kHz 20kHz</td>
<td>Select the desired Low Pass Filter. (Max. Count Speed). Use 3kHz with turbine flowmeters.</td>
</tr>
<tr>
<td><strong>INPUT TERMINATION</strong>&lt;br&gt;Pullup Pulldown None</td>
<td>Select the proper input termination.</td>
</tr>
<tr>
<td><strong>MAX WINDOW (1-99)</strong> 1</td>
<td>Enter the desired Maximum Sample Window Time (1-99 sec) that can occur at the lowest flowrate. Use 1Hz for turbine flowmeters.</td>
</tr>
<tr>
<td><strong>K_FACTOR TYPE</strong>&lt;br&gt;Avg LinTbl</td>
<td>Enter the desired K-Factor Type.</td>
</tr>
<tr>
<td><strong>AVG KA-FACTOR</strong></td>
<td>If Avg selected, Enter the desired Average K-Factor (KA for channel A).</td>
</tr>
<tr>
<td><strong>AVG KB-FACTOR</strong></td>
<td>Enter the desired Average K-Factor (KB for channel B).</td>
</tr>
<tr>
<td><strong>LINEAR TABLE KA</strong>&lt;br&gt;Fre01: Freq Hz</td>
<td>If LinTbl selected, Enter the desired frequency/ K-Factor pair for each point in the Linearization Table. (channel A)</td>
</tr>
<tr>
<td><strong>LINEAR TABLE KB</strong>&lt;br&gt;Fre01: Freq Hz</td>
<td>NOTE: Enter 0 for Fre value of any point (other than Fre01) to exit the routine and use the values entered up to that point.</td>
</tr>
<tr>
<td><strong>LOW FLOW RATE ALARM</strong></td>
<td>Enter the desired volumetric Low Rate Alarm. This will trigger an alarm message if alarm conditions occur. The relays are not affected.</td>
</tr>
<tr>
<td><strong>HIGH FLOW RATE ALARM</strong></td>
<td>Enter the desired volumetric High Rate Alarm. This will trigger an alarm message if alarm conditions occur. The relays are not affected.</td>
</tr>
</tbody>
</table>

**Notes**

Display Sub-menus Through 16 Points

NOTE:
- chA = Single Pulse
- chA=chB = Pulse checking for missing pulses
- Qx1 = Quadrature
- Qx2 = Quadrature x 2

Enter the desired volumetric Low Rate Alarm. This will trigger an alarm message if alarm conditions occur. The relays are not affected.

Enter the desired volumetric High Rate Alarm. This will trigger an alarm message if alarm conditions occur. The relays are not affected.
6.4.7
SETUP
PULSE OUTPUT

Press ENTER at this prompt to setup the Pulse Output.

Select the desired Pulse Output Usage.

Select the desired Pulse Width for the Pulse Output.

Enter the desired Pulse Value for the Pulse Output (Volume Units per Pulse).

Advance To
SETUP ANALOG OUTPUT

6.4.8
SETUP
ANALOG OUTPUT

Press ENTER when Analog is flashing to setup the Analog Output.

Select the desired Analog Output Usage.

Select the desired current range for the Analog Output.

Enter desired Analog Output Low Scale Value.
**NOTE:** Units label will correspond with output usage type selected.

Enter desired Analog Output Full Scale Value.

Enter the desired Analog Output Damping Constant. See Definitions for additional information.

Advance To
SETUP RELAYS
6.4.9
SETUP RELAYS
(Relay 1 & Relay 2)

NOTE:
In Batch mode, Relay 1 is reserved for Preset, Relay 2 is reserved for Prewarn or NA (not assigned).

<table>
<thead>
<tr>
<th>Sub-menus</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4.9 SETUP RELAYS (Relay 1 &amp; Relay 2)</td>
<td></td>
<td>Select the desired Relay for setup. (Relays 3 &amp; 4 Optional, menus will always appear even if option not installed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If Relay 1 or Relay 2 Selected, Select Rate, Total or NA.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If Rate selected, enter desired relay activation delay value. Alarm condition must be continuously present for this amount of time before alarm will activate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If Total Selected, Enter desired Relay Duration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Select the desired Relay Activation. Low: Relay activates when reading is below setpoint. High: Relay activates when reading is above setpoint.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enter the desired Setpoint. The Setpoint can be edited in run mode using the PRE 1 key (PRE 2 key for Relay 2).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If Rate, selected, Enter desired Relay Hysteresis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Advance To SETUP RELAYS 3, 4</td>
</tr>
</tbody>
</table>
6.4.9 (Continued)

**SETUP RELAYS**
(Relay 3 & Relay 4)

**NOTE:**
Settings for Relays 3 & 4 may be entered even if relays are not supplied. The settings will still trigger display alarm messages if applicable.

**Sub-menus**

**Display**

<table>
<thead>
<tr>
<th>Sub-menus</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4.9 (Continued)</td>
<td></td>
</tr>
<tr>
<td>SETUP RELAYS</td>
<td>Select the desired Relay for setup. (Relays 3 &amp; 4 Optional)</td>
</tr>
<tr>
<td>(Relay 3 &amp; Relay 4)</td>
<td>If Instrument Type is set for BATCHER, Choose Rate, Total, Alrm, Ovr or NA.</td>
</tr>
</tbody>
</table>

**SETUP RELAYS**

<table>
<thead>
<tr>
<th>Rly1</th>
<th>Rly2</th>
<th>Rly3</th>
<th>Rly4</th>
</tr>
</thead>
</table>

**RELAY 3 USAGE**
Rate Tot Alrm Ovr NA

**RELAY 4 USAGE**
Rate Tot Alrm NA

**RELAY 3 DELAY**
sec

**RELAY 3 DURATION**

**RELAY 3 MODE**
LO_ALARM HI_ALARM

**RELAY 3 SETPOINT**

**RELAY 3 HYSTERESIS**

Advance To
SETUP CONTROL INPUTS

**RELAY NOTES & CONSIDERATIONS**

1. Relay activation is based on the computed readings not the displayed value. Therefore the display damping factor will not affect the relay response time. The RELAY DELAY feature allows the user to enter a time delay for relay activation. This feature is very useful in applications where short over/under range conditions are not considered alarm conditions.

2. When INSTRUMENT TYPE is set to batcher, Relay 1 is reserved for PRESET and Relay 2 is reserved for PREWARN or NA (not assigned).

3. Setting the relays to NA (Not Assigned), will allow the relay activation to be controlled via the RS-232 Serial and/or RS-485 Modbus ports. It also allows the Presets to be used for other numeric entry values via serial commands which can be part of the print list.

4. Relay 3 and Relay 4 settings may be used to trigger display alarm conditions even if the relays are not supplied.
0.4.10
SETUP CONTROL INPUTS
(RATE/TOTAL)

Press Enter to begin setup of the Control Inputs.

Select the desired Control Input for setup.

If Control Input 1 Selected,
Select Inhibit Total or NA (Not Assigned).

If Control Input 2 Selected,
Select Reset Total or NA (Not Assigned).

If Control Input 3 Selected,
Select Prn (Print), Ack (acknowledge), KeyLk (Keylock)
or NA (Not Assigned). ACK will acknowledge and clear
alarms and warning messages.

Note: Alarms may reassert themselves if alarm
conditions are still present.

6.4.11
SETUP CONTROL INPUTS
(BATCH)

Select the desired Control Input for setup.

If Control Input 1 Selected,
Select Start, Reset/Start, NA (Not Assigned).

If Control Input 2 Selected,
Select Stop, Stop/Reset, NA (Not Assigned).

If Control Input 3 Selected,
Select Prn (Print), Ack (acknowledge), KeyLk (Keylock)
or NA (Not Assigned). ACK will acknowledge and clear
alarms and warning messages.

Note: Alarms may reassert themselves if alarm
conditions are still present.
### 6.4.12
**SETUP REALTIME CLOCK**
(Time)

- **Display**
  - SETUP REALTIME CLOCK
  - Time
  - Date
  - CLOCK TYPE
    - 24HR
    - 12HR
  - SELECT CLOCK AM/PM
    - AM
    - PM
  - TIME OF DAY HH:MM:SS
    - ##:##:##

- **Notes**
  - Press Enter to begin setup of the Realtime Clock.
  - Select Time to set the time.
  - Select 24Hr or 12Hr clock
  - If 12Hr Clock, Enter AM or PM
  - Enter time of day.

- Advance To
  - SETUP REALTIME CLOCK (Date)

### 6.4.13
**SETUP REALTIME CLOCK**
(Date)

- **Display**
  - SETUP REALTIME CLOCK
  - Time
  - Date
  - DATE: MONTH, DAY, YEAR
    - ##/##/####

- **Notes**
  - Select Date to enter the date.
  - Enter the date. (Month, Day, Last two digits of Year, first two digits of year will adjust accordingly)

- Advance To
  - SERIAL USAGE
6.4.14
SERIAL USAGE

Press Enter to begin setup of the Serial Port.

Select Serial Hardware type for standard port. RS-232 is standard. (See SETUP NETWORK CARD for RS485 Modbus option)

Select the Device ID (0-99).

Select the desired Baud Rate.

(If <more> selected, additional baud rates are offered. 9600 is standard)

Select the desired Parity. (NONE is standard)

Set the Handshake. (NONE is standard)

Choose end of line termination. Only choose <CR> if your external device automatically assigns a line feed for every <CR> carriage return.

Select “Yes” if the serial port will be used to control a Hayes compatible modem.

Select the desired Modem Auto Answer mode. Select YES to setup modem to answer incoming calls.

Enter the Call Out Phone Number to be dialed at “Call Out Time” or upon “Call On Error/Alarm”.

Enter the time of day to perform Call Out transmission.

Select “Yes” to have the unit perform a Call Out transmission upon error/alarm condition.

Enter the number of redials to be performed on call out time if busy or no answer. (error/alarm tries until connected)

Select “Yes” to perform hang-up if there is inactivity for more than 2 minutes for calls initiated by the 926-ST1LE.

Advance To
SETUP DATALOG/PRINT
### 6.4.15

**SETUP DATALOG/PRINT**

(Configure)

#### Sub-menus

<table>
<thead>
<tr>
<th>Setup Datalog/Print</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SETUP DATALOG/PRINT</strong></td>
<td>Enter</td>
</tr>
<tr>
<td><strong>SETUP DATALOG/PRINT</strong></td>
<td>Config Select_list</td>
</tr>
<tr>
<td><strong>OUTPUT FORMAT</strong></td>
<td>Printer Term Dbase</td>
</tr>
<tr>
<td><strong>PAGE LENGTH</strong> [99 max]</td>
<td>99</td>
</tr>
<tr>
<td><strong>TOP MARGIN</strong> [99 max]</td>
<td>3</td>
</tr>
<tr>
<td><strong>DATALOG ONLY</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>PRINT TIME</strong> HH:MM:SS</td>
<td>00:00:00</td>
</tr>
<tr>
<td><strong>PRINT INTERVAL</strong></td>
<td>00:00:00</td>
</tr>
<tr>
<td><strong>ENABLE PRINT KEY</strong></td>
<td>YES</td>
</tr>
<tr>
<td><strong>PRINT END OF BATCH</strong></td>
<td>YES</td>
</tr>
</tbody>
</table>

#### Notes

- Press Enter to setup the Datalog/Print information.
- Select Config to configure the Datalog/Print information.
- Select the type of Output Format.
- Enter the desired Page Length. If Printer selected above.
- Enter the desired Top Margin. If Printer selected above.
- Select Yes to record events to the datalogger only. Events will not be sent to the serial port. Select NO to output immediately and also log data.
- Enter Print Time, printer will print at this time every day. Enter 00:00:00 to inhibit print time.
- Enter Print Interval, (HH:MM:SS) Enter 00:00:00 to inhibit print interval.
- Select YES to enable Print Key. Select NO to disable Print Key.
- Batch mode only. Select Yes to print at end of batch.
**Sub-menus**

---

### 6.4.16
**SETUP**
**DATALOG/PRINT**
(Select_list)

---

**Display**

- SET DATALOG/PRINT
- SET DATALOG/PRINT
- PRINT LIST ITEMS
- PRINT LIST ITEMS
- PRINT LIST ITEMS
- PRINT LIST ITEMS
- PRINT LIST ITEMS

**Notes**

- Press enter to begin Setup Datalog/Print routine.
- Press enter when Select_list is selected to setup print list.
- Use Up and Down arrow keys to view list status.
- Press the PRINT key to add or remove items from the list. Items marked with Yes will be added to the list, items marked with No will be removed from the list. Press ENTER to accept list when ready.

The Select Print List Information display shows the current possible Datalog size after your list has been entered.

---

### 6.4.17
**ADMINISTRATIVE SETUP**

---

**Display**

- ADMINISTRATIVE SETUP
- OPERATOR PASSWORD
- SUPERVISOR PASSWORD
- SOFTWARE VERSION
- PRODUCT ORDER CODE
- UNIT SERIAL NUMBER
- SENSOR SERIAL NUMBER

**Notes**

- Press Enter to begin Administrative Setup.
- Enter Operator Password. (Factory Set to 0) Define a nonzero value for each unit to lock unit and prevent accidental menu changes.
- Enter Supervisor Password. (Factory Set to 2000)
- This display is used to show the software version of the installed software.
- This display is used to show the product order code (model number). Factory set.
- This display is used to show the unit's serial number. Factory set.
- This display is used to edit and show the sensor's serial number.

---

**List Items:**

- TOTAL
- RATE
- PRE1
- PRE3
- GRAND
- PRE2
- PRE4
- TIME
### Sub-menus

<table>
<thead>
<tr>
<th>Setup Network Card (optional)</th>
</tr>
</thead>
</table>

### Display

<table>
<thead>
<tr>
<th>Option</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setup Network Card</td>
<td>Press Enter to setup Network Card.</td>
</tr>
<tr>
<td>Select Network Protocol</td>
<td>Select desired Network Protocol. (only Modbus RTU is supported)</td>
</tr>
<tr>
<td>Network Device ID</td>
<td>Enter the device address on network (00-247).</td>
</tr>
<tr>
<td>Baud Rate</td>
<td>Select the desired Baud Rate.</td>
</tr>
<tr>
<td>Parity</td>
<td>Select the desired Parity.</td>
</tr>
</tbody>
</table>

### Notes

Press Enter to setup Network Card.
Select desired Network Protocol. (only Modbus RTU is supported)
Enter the device address on network (00-247).
Select the desired Baud Rate.
Select the desired Parity.

Advance To
DO EZ SETUP?
7. Principals Of Operation

7.1 General:

The 926-ST1LE Flow Computer uses several internal calculations to compute the input frequency based on specific data input. Several computations are performed to yield flow or linearized flow.

7.2 Flow Equations:

Uncompensated Flow Computation:

\[ \text{Pulse Input; Average K-Factor} \]

\[
\text{Volume Flow} = \frac{\text{input frequency} \cdot \text{time scale factor}}{\text{K-Factor}}
\]

\[ \text{Pulse Input; Linear Table} \]

\[
\text{Volume Flow} = \frac{\text{input frequency} \cdot \text{time scale factor}}{\text{K-Factor (Hz)}}
\]

Where K-Factor (Hz) is the K-Factor returned at frequency (Hz) from interpolation of the 16 point table.
7.3 Linearization Table

7.3.1 Linearization Table General Information
The Linearization Table is used when the flow input device gives a nonlinear input signal. The unit uses up to 16 different points, as entered by the operator, to form a curve for linearizing the input signal.

Notes:
1) A minimum of three points must be set up.

2) If "0" is entered for the frequency of any point other than point 1, the Flow Computer assumes there are no more points above the points that preceded them. The display will advance to the next setup prompt.

3) If the input frequency is above the highest or below the lowest frequency programmed, the unit will use the last known point for the K factor in computing the resulting actual flow.

4) Frequency- Point pairs should be entered in ascending order of frequency.

7.3.2 Linearization Table for Pulse Inputs
The linearization table for pulse inputs programming is quite simple when values of frequency and K-Factors are known. The Flow Computer asks for 16 different frequencies (Freq) and 16 corresponding K factors (K). It then uses this data to determine what the actual flow is for any given input frequency. Usually the necessary data is provided with the flowmeter.

7.3.3 Linearization Table Interpolation
The Linearization Table routine uses the entered data to determine the K factor for any given input frequency signal. This is done by taking the closest data points above and below the input signal, then using those points to interpolate the K factor (correction factor), then calculating the flow from the data. Below are the formulas.

Parameters:
Determine closest point above input signal
signal = X,  K factor (correction factor) = KA

Determine closest point below input signal
signal = Y,  K factor (correction factor) = KB

Let input signal = H,
unknown K factor (correction factor) = KN

To find KN use this formula:

\[
\frac{H - Y}{X - Y} \cdot (KA - KB) + KB = KN
\]
8. Test, Service and Maintenance

8.1 Test Menus

8.1.1 TOP LEVEL TEST MENUS

<table>
<thead>
<tr>
<th>Sub-menus</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT OPERATE STATE</td>
<td></td>
<td>Select Test to enter the instrument test &amp; calibration routine. <strong>NOTE:</strong> Supervisor (Service) password required to gain access to this mode.</td>
</tr>
<tr>
<td>Run</td>
<td>Setup</td>
<td>Test</td>
</tr>
<tr>
<td>Audit Trail</td>
<td></td>
<td>Refer to Page 36 for Details.</td>
</tr>
<tr>
<td>Error history</td>
<td></td>
<td>Refer to Page 36 for Details.</td>
</tr>
<tr>
<td>Print System Setup</td>
<td></td>
<td>Refer to Page 36 for Details.</td>
</tr>
<tr>
<td>Keypad Test</td>
<td></td>
<td>Refer to Page 37 Details.</td>
</tr>
<tr>
<td>Display test</td>
<td></td>
<td>Refer to Page 37 Details.</td>
</tr>
<tr>
<td>Calibrate</td>
<td></td>
<td>Refer to Page 37 Details.</td>
</tr>
<tr>
<td>Pulse input test</td>
<td></td>
<td>Refer to Page 38 Details.</td>
</tr>
<tr>
<td>Analog out test</td>
<td></td>
<td>Refer to Page 38 Details.</td>
</tr>
<tr>
<td>Excitation out test</td>
<td></td>
<td>Refer to Page 38 Details.</td>
</tr>
<tr>
<td>Pulse out test</td>
<td></td>
<td>Refer to Page 38 Details.</td>
</tr>
<tr>
<td>Relay Test</td>
<td></td>
<td>Refer to Page 39 for Details.</td>
</tr>
<tr>
<td>Control inputs test</td>
<td></td>
<td>Refer to Page 39 for Details.</td>
</tr>
<tr>
<td>Data logger utility</td>
<td></td>
<td>Refer to Page 39 for Details.</td>
</tr>
</tbody>
</table>
### 8.2 Test Sub-Menus

<table>
<thead>
<tr>
<th>Sub-menus</th>
<th>Display</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8.2.1 Audit Trail</strong></td>
<td>Press Enter to view the audit trail information.</td>
<td></td>
</tr>
<tr>
<td>Sub-menu Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audit Trail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Config_Audit</td>
<td>The configuration audit trail format: nnnnn= number of critical menu changes, hh:mm:ss; mm/dd/yy = time and date of last change.</td>
<td></td>
</tr>
<tr>
<td>hh:mm:ss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mm/dd/yy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cal_Audit</td>
<td>The calibration audit trail format: nnnnn= number of calibration changes, hh:mm:ss; mm/dd/yy = time and date of last change.</td>
<td></td>
</tr>
<tr>
<td>hh:mm:ss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mm/dd/yy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audit Trail</td>
<td>Press Menu to get back to audit trail top-level menu.</td>
<td></td>
</tr>
<tr>
<td><strong>8.2.2 Error History</strong></td>
<td>Press Enter to view error history. <strong>NOTE</strong>: Press Print Key to print Error History. Printout will include time/date of each errors first occurrence.</td>
<td></td>
</tr>
<tr>
<td>Sub-menu Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error history</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Press Up/Down arrow keys to scroll through error message history. Press CLEAR to clear entire error log.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow rate alarm low</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error history</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error history</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8.2.3 Print System Setup</strong></td>
<td>Press enter key to enter print system setup Sub-menu.</td>
<td></td>
</tr>
<tr>
<td>Sub-menu Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print System Setup</td>
<td>Press enter to begin printing the system setup.</td>
<td></td>
</tr>
<tr>
<td>--- Printing ---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print System Setup</td>
<td>This message will display as the data transmission takes place.</td>
<td></td>
</tr>
<tr>
<td>--- Printing ---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print System Setup</td>
<td>Press Menu to get back to print system setup top-level menu.</td>
<td></td>
</tr>
</tbody>
</table>
### 8.2.4 Keypad test
#### Sub-menu Group
- **Keypad test**
  - Press Enter to enter keypad test.
  - Press the various keys and the display will show the key that was pressed. Press Menu to exit the test.
  - Press Menu to get back to Keypad test top-level menu.

### 8.2.5 Display test
#### Sub-menu Group
- **Display test**
  - Press Enter to enter display test.
  - Upon pressing enter the each digit on the display will scroll 0-9 then A-Z. Press menu to exit the test.
  - Press Menu to get back to Display test top-level menu.

### 8.2.6 Calibrate 0 mA Out
#### Sub-menu Group
- **Calibrate 0 mA out**
  - To trim 0mA output: Press CLEAR to enable editing and enter a small negative number (i.e. -0.100) to force a display reading, then clear and enter small quantity measured on your meter.
  - The display will return to Calibrate 0mA out. Press the down arrow key to advance to Cal. 20mA out or repeat above if necessary.

### 8.2.7 Calibrate 20mA Out
#### Sub-menu Group
- **Calibrate 20mA out**
  - To trim 20mA output: Press CLEAR to enable editing and enter the current reading that is on the ammeter display. Press enter.
  - The display will automatically return to the Calibrate 20mA out Sub-menu. Calibration is complete.
  - Press the Menu key to go back to Calibrate top-level menu.
8.2.8 Pulse input test
Sub-menu Group

- **Pulse input test**
  - **Trigger level 2.5V**
  - **Count speed 3kHz**

To check Pulse input accuracy: Use TB1-4 as reference ground, input a frequency F1 on TB1-2, frequency F2 on TB1-3. The display should show frequency being input. Use a frequency counter to verify input.

Press Menu key to return to Pulse input test top-level menu.

Press Enter key to test the pulse input.

Use the Up/Down arrow keys to select the appropriate trigger level.

Use the Up/Down arrow keys to select the appropriate frequency range.

8.2.9 Analog out test
Sub-menu Group

- **Analog out test**
  - **Current setting 0 4 10 15 20 mA**

To simulate analog output: Connect an ammeter to (+) TB1-15, (-) TB1-16. Press the key under the desired current setting to move the asterisk (*). The unit should output the selected current.

Press Menu key to return to Analog out test top-level menu.

Press Enter to test the analog output.

8.2.10 Excitation out test
Sub-menu Group

- **Excitation out test**
  - **Voltage setting 5V 12V 24V**

To test the excitation output: Connect a voltmeter to (+) TB1-1, (-) TB1-4. Press the key under the desired voltage setting to move the asterisk (*). The unit should output the selected voltage.

Press Menu key to return to Excitation out test top-level menu.

Press Enter to test the excitation output.
8.2.11
Pulse out test
Sub-menu Group

Press Enter key to test the pulse output.
To simulate a frequency on the pulse output: Connect a
frequency counter to (+)TB1-13,
(-)TB1-14. Press the key under the desired frequency
setting to move the asterisk (*). The unit should output
the selected frequency.

Press Menu key to return to Pulse out test top-level
menu.

8.2.12
Relay test
Sub-menu Group

Press Enter to test the relays.
To manually control the relay outputs: Press the key
under the desired relay to toggle the relays On/Off. Use
an ohmmeter to check the relay contacts.

Press Menu key to return to Relay Test top-level menu.

8.2.13
Control inputs test
Sub-menu Group

Press Enter to test the control inputs.
To check the control inputs: Use TB1-12 as reference,
input a DC voltage (4-24VDC) signal to TB1-9, TB1-10
and/or TB1-11, The Display will show ON when input is
active, OFF when inactive.

Press Menu key to return to control input test top-level
menu.

8.2.14
Data logger utility
Sub-menu Group

Press Enter to access data logger utility.
The displays shows the number of Data Logs.
Press the Down arrow key to advance to PRT (print) or
CLR (clear) to clear datalog contents.

Press PRINT key to output data logger logs to printer.
Press CLEAR key to clear the data logger contents.

Press Menu key to return to Data logger utility top-level
menu.
8.3 Internal Fuse Replacement

Instructions:
1. Make sure you follow proper E.S.D. Precautions. All persons performing this replacement must follow proper grounding procedures.
2. Turn the power to the unit off.
3. Disconnect the two piece connector rear terminal block, leaving all connections in place.
4. Remove the unit from the panel.
5. Remove the four machine screws (see fig. 1) which hold the two sections of the case together.
6. The rear section of the case should detach from the rest of the case. With the rear section of the case removed the fuse will be exposed (located near the rear terminal, AC connection).
7. Locate the Fuse F1 (see fig. 2) and unplug the fuse from its socket.
8. Insert the new fuse into the socket. Insure that the pins are fully inserted and straight.
9. Reassemble the case and install the four machine screws which join the two sections of the case.
10. Reinstall the unit into the panel.
11. Reconnect the rear terminal block.
12. Turn the unit back on.

Fuse Specifications:
110 VAC Power: 160mA/250V, TD Wickman 19372-030-k or equivalent
220 VAC Power: 80mA/250V, TD Wickman 19372-026-k or equivalent
12/24 VDC Power: 800mA/250V, TD Wickman 19374-046-k or equivalent
9. RS-232 Serial Port

9.1 RS-232 Port Description:
The 926-ST1LE has a general purpose RS-232 Port which may be used for any one of the following purposes:
- Transaction Printing
- Data Logging
- Remote Metering by Modem (optional)
- Computer Communication Link
- Configuration by Computer
- Print System Setup
- Print Calibration/Malfunction History

9.2 Instrument Setup by PC’s over Serial Port
A Diskette program is provided with the 926-ST1LE that enables the user to rapidly configure the 926-ST1LE using a Personal Computer. Included on the diskette are common instrument applications which may be used as a starting point for your application. This permits the user to have an excellent starting point and helps speed the user through the instrument setup.

9.3 Operation of Serial Communication Port with Printers
926-ST1LE's RS-232 channel supports a number of operating modes. One of these modes is intended to support operation with a printer in metering applications requiring transaction printing, data logging and/or printing of calibration and maintenance reports.

For transaction printing, the user defines the items to be included in the printed document. The user can also select what initiates the transaction print generated as part of the setup of the instrument. The transaction document may be initiated via a front panel key depression, a remote contact closure, or upon completion of a batch.

In data logging, the user defines the items to be included in each data log as a print list. The user can also select when or how often he wishes a data log to be made. This is done during the setup of the instrument as either a time of day or as a time interval between logging.

The system setup and maintenance report list all the instrument setup parameters and usage for the current instrument configuration. In addition, the Audit trail information is presented as well as a status report listing any observed malfunctions which have not been corrected.

The user initiates the printing of this report at a designated point in the menu by pressing the print key on the front panel.

9.4 926-ST1LE RS-232 Port Pinout

1 Handshake Line
2 Transmit
3 Receive
4 Do Not Use
5 Ground
6 Do Not Use
7 Do Not Use
8 Do Not Use
9 Do Not Use

[Diagram of RS-232 Port Pinout]
10. RS-485 Serial Port (optional)

10.1 RS-485 Port Description:

The 926-ST1LE has a an optional general purpose RS-485 Port which may be used for any one of the following purposes:

- Accessing Process Parameters
  - Rate, Temperatures, Density, Setpoints, Month, Day, Year, Hour, Minutes, Seconds, etc.
- Accessing System Alarms
  - System, Process, Self Test, Service Test Errors
- Accessing Totalizers
  - Totalizer and Grand Totalizer
- Executing Various Action Routines
  - Reset Alarms, Reset Totalizers, Print Transaction, Reset Error History, Start, Stop, Clear

10.2 General

The optional RS-485 card utilizes Modbus RTU protocol to access a variety of process parameters and totalizers. In addition, action routines can be executed. For further information, contact factory and request RS-485 Protocol manual for 926-ST1LE.

10.3 Operation of Serial Communication Port with PC

The flow computer's RS-485 channel supports a number of Modbus RTU commands. Refer to port pinout (below) for wiring details. Modbus RTU drivers are available from third party sources for a variety of Man Machine Interface software for IBM compatible PC's.

The user reads and writes information from/to the RS-485 using the Modbus RTU commands. The 926-ST1LE then responds to these information and command requests.

Process variables and totalizers are read in register pairs in floating point format. Time and date are read as a series of integer register values. Alarms are individually read as coils. Action routines are initiated by writing to coils.

10.4 926-ST1LE RS-485 Port Pinout

1. Ground
2. Ground
3. Ground
4. TX/RX (+)
5. TX/RX (-)
6. Do Not Use
7. Terminating Resistor (180 Ω)
8. TX/RX (+)
9. TX/RX (-)
11. Flow Computer Setup Software

The 926-ST1LE setup program provides for configuring, monitoring and controlling a 926-ST1LE unit.

Sample applications are stored in disk files. The setup program calls these Templates. You can store the setup from the program’s memory to either the 926-ST1LE (Downloading the file) or to a disk file (Saving the file) for later usage. Similarly you can load the setup in program memory from either a disk file (Opening a file) or from the 926-ST1LE unit (Uploading a file).

The program can monitor outputs from the unit while it is running.

The program can reset alarms and totalizers.

For assistance there are mini-helps at the bottom of each screen in the program. There is also context sensitive help available for each screen accessible by pressing the F1 key.

11.1 System Requirements:

IBM PC or compatible with 386 or higher class microprocessor
4 MB RAM
3 MB free disk space
VGA or higher color monitor at 640 x 480
Microsoft® Windows™ 3.1 or 3.11 or Windows 95/98™ or higher
Communication Port - RS-232
RS-232 Cable

11.2 Cable and Wiring Requirements:

The serial communication port on your PC is either a 25 pin or 9 pin connector. No cabling is supplied with the setup software. A cable must be purchased separately or made by the user. It is recommended to purchase a modem cable which matches the available communication port on you PC and a 9 pin male connection for the 926-ST1LE serial port.

11.3 Installation for Windows™

The Setup Software includes an installation program which copies the software to your hard drive.
Insert Setup Disk 1 in a floppy drive.
In the Program Manager, click File, and then select Run.

    NOTE: For Windows 95™ Click the Start button, select Run and proceed as follows:
Type the floppy drive letter followed by a colon (:) and a backslash (\), and the word setup. For Example:
a:\setup
Follow the instructions on your screen.

11.4 Using the Flow Computer Setup Software

The setup software window consists of several menu “Tabs”. Each tab is organized into groups containing various configuration and/or monitoring functions. To view the tab windows, simply click on the tab. The previous tab window will be hidden as the new tab window is brought to the foreground.
11.5 File Tab
The File Tab has three sections. Any of the options on this tab can also be accessed from the File Sub-menu.

The **Template Section** provides for opening and saving templates. The Save and Save As buttons provide the standard Windows functionality for dealing with files. The Open button is used to open existing templates.

There are two additional menu items available only from the File pulldown menu: Open Existing File and Open Template.

The **Open Existing File** option allows for creating custom templates using the existing template in memory as the starting point.

The **Open Template** option will bring up a list of predefined templates that can be loaded into the program. These predefined templates are useful as a starting point when defining custom templates.

A typical scenario using the setup program would be the following:

- Open up a predefined template from the supplied list
- Choose ‘Save As’ to save this to a new file name
- Proceed to customize the template by making any changes that are needed
- Save the template to disk (if you want to reuse this template)
- Download the template to an attached unit.

The **Communications with Flow Computer Section** allows the user to upload a template file from the unit or download the program’s current template to the unit.

The **Print (report) Section** allows the user to:

1. Configure the current Windows printer through the Select Printer option.
2. Print a Maintenance Report through the PC's printer using the Print Maintenance option.
3. Print the current template through the PC's printer using Print Setup option.

11.6 Setup Tab
The Setup tab is where majority of the 926-ST1LE instrument setup modifications are done. The Setup tab is divided into five sections.

**System Section:** Instrument, Indicators

**Input Section:** Flow, Control Inputs

**Output Section:** Pulse, Currents

**Relay Section:** Relays

**Other Settings Section:** Administration, Serial Usage, Datalog/Printing, Time Clock

**NOTE:** Many setup items are enabled or disabled depending on previous setup selections. It is important to work your way through the above list in the order shown. Be sure to verify your selections when you are through programming to insure that no settings were changed automatically.
11.7 View Tab

The View Tab screen allows for viewing selected group items on the PC in a similar format as shown on the unit display. Data from the following groups can be viewed in the List of Values section:

Process Parameters (i.e. rate, input frequency, K-Factor, mA output)
Totalizers (i.e. total, grand total)
Version
Error Log

The setup software assumes the current setup has been uploaded from the flow computer into the PC. It is important that the setup program and the 926-ST1LE unit are using the same setup information at all times or the data will be inconsistent. It is best to upload or download the setup before using this feature.

To start the viewer, first check the boxes of items to view and then click the start button. The data will appear in the appropriate sections and will be continuously updated. The refresh rate is dependent on the number of items that are being viewed and the baud rate of the connection. Data in the List of Values section can be collapsed by clicking on the ‘minus’ sign in front of the group title. The data can be expanded by clicking on the ‘plus’ sign in front of the group title. If a group is collapsed and data in the group changes on refresh, the group will automatically expand. Changing the view items requires stopping the current viewing, checking the new selections and then restarting the viewer.

If communication errors occur while reading data from the 926-ST1LE device, the word ‘Error’ will appear in place of the actual value. If the connection to the 926-ST1LE is lost, the viewer will time out with a message saying the device is not responding.

The viewer will attempt to communicate with the 926-ST1LE device matching the device ID set in the communications screen. If you are having trouble establishing communication, compare settings for the PC and the flow computer. Also verify the connections between the PC and flow computer.

11.8 Misc. Tab

This tab has three sections: Tools, Actions and Options.

The tools section contains various system administration activities such as creating/modifying the initial sign-on screen and/or print header:
Create Sign-on, Create Print Header

The Actions section is used to send commands to the 926-ST1LE unit:
Reset Totalizers, Reset Alarms, Reset Alarm History

The Options section has the following selections:
Network Card Enable, Network Card Setup
12. Glossary Of Terms

Acknowledge & Clear Alarms
Acknowledged is used to clear alarm relays and remove any visual alarm messages from the display. In the run mode, press the ENTER key or activate CONTROL INPUT 3 (if set for ACK) to momentarily clear alarms and alarm messages. Alarms will reassert themselves if alarm conditions are still present.

Analog Output
The analog signal (4-20mA) that is generated by the 926-ST1LE. It can correspond to the Rate or Total. This output is used primarily for transmission of process information to remote systems.

Audit Trail
The audit trail is used to track the number of changes made to the units setup program and calibration.

Auto Batch Restart
The Auto Batch Restart function allows the user to set an amount of time to automatically restart a batch after the completion of a batch. This time can be set from 1 to 99 seconds.

Batch Count Mode
Batch Count Mode specifies the user preference for count direction. The "Up" selection begins with a value of "0" and counts up until the batch size is reached. The "Down" selection begins with a value equal to the desired batch size and counts down to "0".

Batch Overrun
The 926-ST1LE offers a batch overrun compensation routine. If batch overrun occurs due to slow valve response time, the unit will compensate for the overrun amount on the next batch. This feature can be disabled if desired. **NOTE:** A nonzero MAX DRAIN TIME value is also required.

Batcher
An instrument which controls the dispensing of desired batch amounts. Liquid batching systems are usually comprised of a batch controller (batcher), flowmeter and control valve. The batcher opens and closes the valve through the use of relays and measures the amounts of liquid being dispensed via the flowmeter.

Baud Rate
The speed of serial communication transmissions, expressed in bits per second.

Custody Transfer
Weights and Measure metering codes often specify several requirements for instruments and mechanisms to prevent and track changes in the setup of an instrument which may be used in the commercial sale of goods. The 926-ST1LE tracks changes via the Audit Trail.

Data Logger
The capturing of information for later use and the mechanism for specifying the conditions where a capture should be made.

DC Output / Excitation Voltage
An on-board DC power supply used to power peripheral sensors. The 926-ST1LE offers excitation voltages of 5VDC, 12VDC or 24VDC when powered by AC voltage.

Default Value
The value to be used by the instrument if a sensor failure or out of range signal is detected.

EZ Setup
A utility that provides for rapid configuration of an instrument. The 926-ST1LE EZ Setup provides the following:
1) Prompts the user for only critical information.
2) Automatically sets specifications to common uses.
After following the EZ Setup procedure, the unit will be operational to perform the basic measurement. The setup can be further customized using the setup menus.

Flow Alarm
A visual indication that the volumetric flowrate is above or below the flow alarm setpoint specified by the user.
Flow Signal Timeout
The Flow Signal Timeout allows the user to enter a timeout of 0 to 99 seconds. If a batch is “Filling” and zero flow persists for more than the user entered time then the batch will be aborted. This prevents over flows due to faulty flow sensors and/or wiring.

Flow Equation
A flow control expression or algorithm describing a mathematical equation to be solved by a flow computer in the desired application.

Follow Alarm
Alarm relays which are non latching and whose output state is based solely on the comparison of the current process value, the alarm setpoint (trip point) and hysteresis.

Function Key
A key on a push-button panel or keyboard (whose function is described by the key label) used to perform an instrument function or special routine.

Handshake
A means of controlling the information flow between two pieces of equipment to prevent the sending device from transmitting information at a rate faster than what can be accepted by the receiver.

Hysteresis
The relay hysteresis is a "dead band" setting which allows the relay to remain energized for a given amount below the setpoint. This is used to prevent relay chatter when the process value is near the setpoint value.
Example: If the Preset is set at 100, and the hysteresis is set at 10, the relay will energize when the rate, temp or dens. reaches 100, the relay will remain energized until the reading falls below 90.

Input Termination
Input signal lines on digital inputs often require pullup or pulldown resistor configurations to operate properly with different sensor configurations. The 926-ST1LE contains such resistors and may be enabled via the setup menu.

Inhibit Totalizer
"Inhibit Total" is a Control Input 1 setting that is used to stop the totalization. If enabled, a voltage level on control input 1 will inhibit the total as long as the voltage is present. This feature is useful during meter proving and in applications that provide a sensor to signal the flow computer when liquid is present.

K-Factor
A scaling factor derived from the pulses produced by a flowmeter output, expressed in pulses per unit (i.e. pulses/gallon)

LCD
Abbreviation for: Liquid Crystal Display

Limit Setpoint
An alarm trip point setting which specifies the value or magnitude of a process parameter necessary to activate an alarm indicator or control relay.

Linear Flowmeter
A flow measurement device whose output is proportional to flow.

Linearization
The mathematical correction of a nonlinear device. The 926-ST1LE uses a linearization Table which is made up of input frequency and K-Factor values and makes interpolations of the table to arrive at a "linearized" measurement.

LinTbl
Abbreviation for Linearization Table.
Low Flow Cutoff
A value set at which any flow measurements read below this value will be ignored.

Low Pass Filter
A low pass filter passes low input frequencies while blocking high frequencies. In the 926-ST1LE, this is the maximum input count speed to be encountered in an application. It is expressed in counts per second (Hz).

Maximum Batch Preset
The Maximum Batch Preset allows the user to program the Maximum Batch value allowed to be entered by the operator. If an operator should try to program a batch higher than this value, the unit will not allow the value to be entered and will prompt the user with an error message saying that the Maximum Batch Preset has been exceeded.

Maximum Drain Time
The unit declares that a batch is “done” when the flow rate equals “0”. A flow rate may be present long after the Preset Relay de-energizes due to slow reacting valves or leaky valves. The Maximum Drain Time allows the user to enter an amount of time (0 to 99 seconds) to wait before declaring “Batch Done”. After the Preset Batch quantity is reached, the unit will declare “Batch Done” when the flow rate is “0” or the Maximum Drain Time has expired. The batch data will then be available for printing and datalogging.

NOTE: A nonzero MAX DRAIN TIME value must be entered when using batch overrun compensation.

Max Window
The max. window time sets the maximum sample time (1 to 99 sec) for the ratemeter.

Operator Code
An operator password code which authorizes changes to the setup of the instrument but blocks access to the Service/Calibration/Test mode. The operator code also blocks the clearing of the Grand Total.

Parity
A method for detecting errors in transmissions of serial communications data.

Preset
A set point used to trigger the relay outputs of the 926-ST1LE.

Print Interval
The print interval allows the 926-ST1LE to transmit information to the serial port at selectable time intervals.

Process Parameters
Any sensor information which has been scaled to engineering units including Flow, Temperature and Density.

Pulldown (Input Termination)
The termination of an input at which the input is pulled down to ground through a resistor. Inputs that are terminated by this method need to be driven high with a positive voltage pulse.

Pullup (Input Termination)
The termination of an input at which the input is pulled up to a positive voltage through a resistor. Inputs that are terminated by this method need to be pulled low with a sinking current or contact to ground.

Pulse Output
The pulse output of the 926-ST1LE is available for remote accumulation of the total or sent to peripheral devices, such as a PLC. The output can be scaled using the Pulse Output Scaling Constant.

Quad
Abbreviation for Quadrature. Quadrature signals are used for direction control. Two flowmeter signals are output with a 90° phase shift. The counter counts UP when channel A precedes channel B, and counts DOWN when Channel A lags Channel B.
Quick Update %
This feature is used to disable the rate averaging filter when a significant change in the flow rate occurs. The user can enter the percent of change needed to be detected to disable the averaging feature. This is especially useful during start-up and shutdown of flow.

Rate Averaging Filter
The rate averaging filter is used to stabilize fluctuating rate displays. Higher settings provide more averaging for a more stable display. Derived from the equation:
\[
\frac{(\text{OLD DATA} \times \text{"Avg. Filter"}) + \text{NEW DATA}}{(\text{"Avg. Filter"} + 1)}
\]

Ratemeter
Any device used to display the speed of a process. The ratemeter in the 926-ST1LE displays flow rate.

Reset/Start Control Input
In a batching system, a single operator activation of the START key or Control Input 1 will reset the total then start the batch process.

Select Preset Type
This menu selection allows the user to choose between Standard Preset or EZ Preset. Select Standard for standard preset operation. Select EZ-Preset for quick preset editing mode. (see section 5.4.1 Batcher Configuration.)

Single_Pulse
The Single_Pulse setting is used for flowmeters with single pulse outputs.

Slow Start Quantity
The Slow Start Quantity is a function that allows an amount to be entered for a Slow Start up. This function requires two stage valve control. RLY 1 (slow flow) will energize for Slow Start and RLY 2 (fast flow) will energize after the Slow Start Quantity has been delivered. This helps reduce turbulence when filling an empty container.

Stop/Reset Control Input
In a batching system, a single operator activation of the STOP key or Control Input 2 will stop the batch process then reset the total.

Totalizer
Any device which accumulates and displays a total count.

Volume Flow
The measurement of volumetric flow.
13. Diagnosis and Troubleshooting

13.1 Response of 926-ST1LE on Error or Alarm:

Error and warning indications which occur during operation are indicated in the RUN mode alternately with the measured values. The 926-ST1LE Flow Computer has three types of error:

<table>
<thead>
<tr>
<th>TYPE OF ERROR</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor/Process Alarms</td>
<td>Errors detected due to sensor failure or process alarm conditions</td>
</tr>
<tr>
<td>Self Test Errors</td>
<td>Errors detected during self test.</td>
</tr>
<tr>
<td>System Alarms</td>
<td>Errors detected due to system failure</td>
</tr>
</tbody>
</table>

Some alarms are self clearing. Other alarms require the user to acknowledge and clear the alarm. Press the ENTER button to acknowledged and clear alarms. Alarms may reassert themselves if the alarm condition is still present.

NOTE: A historical error alarm log is available in the "Test Mode".

The following descriptions suggest possible causes and corrective actions for each alarm message.
13.2 Diagnosis Flow Chart and Troubleshooting

All instruments undergo various stages of quality control during production. The last of these stages is a complete calibration carried out on state-of-the-art calibration rigs.

A summary of possible causes is given below to help you identify faults.

![Flow Chart Diagram]

- Is there an input power supply voltage across Terminals 23 and 24?  
  - No: Check the connections according to the circuit diagrams.
  - Yes: Check junction box fuses.

- Is the Display Backlight Visible?  
  - No: Check/Replace internal fuse. If fuse is OK, Factory Service Required.
  - Yes: The display may not be visible with ambient temperatures below -10 °C. Allow the instrument to warm up. Contact factory if necessary.

- Are the Display Characters Visible?  
  - No: Check line voltage. If voltage is OK, Factory Service Required.
  - Yes: Check line voltage. If voltage is OK, Factory Service Required.

- Does the display alternate between blank and sign on message?  
  - Yes: Factory Service Required.
  - No: See section 12.3 for cause and remedy.

- Does the display show an error message?  
  - Yes: See section 12.3 for cause and remedy.
  - No: No system or process errors present.
## 13.3 Error & Warning Messages:

### 13.3.1 Sensor/Process Alarms

<table>
<thead>
<tr>
<th>Error/Warning Message</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTALIZER ROLLOVER</td>
<td>Displayed when totalizer rolls over</td>
<td>• Acknowledge Rollover</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Remedy not required</td>
</tr>
<tr>
<td>RATE OVERFLOW ERROR</td>
<td>Pulse counter overflowed. The totalizer may have lost counts.</td>
<td>• Report error to factory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check application conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check wiring</td>
</tr>
<tr>
<td>PULSE OUT OVERFLOW</td>
<td>Calculated pulse frequency too large:</td>
<td>• Adjust pulse value</td>
</tr>
<tr>
<td></td>
<td>• Pulse width setting too long</td>
<td>• Adjust pulse width</td>
</tr>
<tr>
<td></td>
<td>• Larger pulse scaler needed</td>
<td>• Check process conditions</td>
</tr>
<tr>
<td>FLOW RATE ALARM LOW</td>
<td>Limit value exceeded.</td>
<td>• Check application if necessary</td>
</tr>
<tr>
<td>FLOW RATE ALARM HIGH</td>
<td></td>
<td>• Check limit value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Adjust the limit value if required</td>
</tr>
<tr>
<td>BATCH OVERRUN ALARM</td>
<td>Batch size exceeded by more than set limit.</td>
<td>• Check valves in system for proper operation and/or leaks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check limit value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Adjust the limit value if required</td>
</tr>
<tr>
<td>MODEM NOT PRESENT</td>
<td>The setup expects modem usage and a modem is not responding.</td>
<td>• Check setup for proper baud rate, parity, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check modem connection and cycle power to 926-ST1LE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Replace modem</td>
</tr>
<tr>
<td>SOFTWARE ERROR RESET</td>
<td>Software error</td>
<td>• Report error to factory</td>
</tr>
<tr>
<td>EXTENDED PFI LOCKUP</td>
<td>Unit was operated with an input power level lower than safe operating range for an extended period of time.</td>
<td>• Check data in unit. Totalizer may have inaccuracies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Investigate brownout cause.</td>
</tr>
</tbody>
</table>

### 13.3.2 Self Test Alarms

<table>
<thead>
<tr>
<th>Error/Warning Message</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>BATTERY LOW WARNING</td>
<td>Battery voltage too low</td>
<td>• Replace Battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Consult Factory for service information</td>
</tr>
<tr>
<td>TIME CLOCK ERROR</td>
<td>The correct time/date is no longer shown</td>
<td>• Re-enter time and date</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If error occurs again contact factory</td>
</tr>
<tr>
<td>CAL CHECKSUM ERROR</td>
<td>Calibration constants have been corrupted</td>
<td>• Report error to factory</td>
</tr>
<tr>
<td>SETUP CHECKSUM ERROR</td>
<td>The units setup has been corrupted</td>
<td>• Report error to factory</td>
</tr>
</tbody>
</table>
### Ordering Information

<table>
<thead>
<tr>
<th>Example 926-ST1LE</th>
<th>L</th>
<th>A</th>
<th>0</th>
<th>P</th>
<th>ET</th>
</tr>
</thead>
</table>

**Series:**

| Display Type: | L= LCD | V= VFD |

**Input Type:**

| 1 = 110 VAC |
| 2 = 220 VAC |
| 3 = 12 VDC (10 to 14 VDC) |
| 4 = 24 VDC (14 to 28 VDC) |

**Relays:**

| A = 2 SPDT Relays |
| B = 4 SPDT Relays |

**Network Card:**

| 0 = None (STD) |
| 2 = RS485/Modbus (optional 2nd COM port) |

**Mounting:**

| P = Panel Mount (see Fig. 1) |
| N = NEMA 4 Wall Mount (see NEMAtrolST4X) |
| W = NEMA 12/13 Wall Mount w/ Clear Cover (see Fig. 2) |
| E = Explosion Proof (No Button Access) (see XHVD 7/4) |
| X = Explosion Proof (with Button Access) (see XTROL 7/4) |

**Options:**

| TB = RS485 Terminal Block for Panel Mount Enclosure |
| ET = Extended Temperature (-4°F to 131°F (-20°C to 55°C)) |
| IM = Internal Modem |
| M = Modem Power Option |

**Accessories:**

- KEPS-KEP1-32: KEP RS232 for 926-ST1LE • 32 Bit OPC/DDE Server
- KEPS-MBS32: Supports RS485 for 926-ST1LE (Modbus RTU)
- Modern Available, see MPP-2400 and MPP-2400N (requires M option)
- Serial printer available, see P1000, P295
- Ethernet Port Server available, see IEPS
- RS-422/485 to RS-232 Communication Adaptor available, see CA285
- Remote metering and data collection software available, see TROLLink

### WARRANTY

Flowmetrics, Inc. warrants its products against defects in material and workmanship for a period of two (2) years from the date of shipment to the Buyer.

The Warranty is limited to repair or replacement of the defective unit at the option of Flowmetrics, Inc. This Warranty is void if the product has been altered, misused, dismantled, or otherwise abused.

**ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ARE EXCLUDED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

We hope you will be pleased with our products. If you have any questions concerning our Warranty, repair, modification or return goods process, please contact the Flowmetrics, Inc Customer Service Department.
These functions will only appear with appropriate settings in other functions.