Instruction Manual

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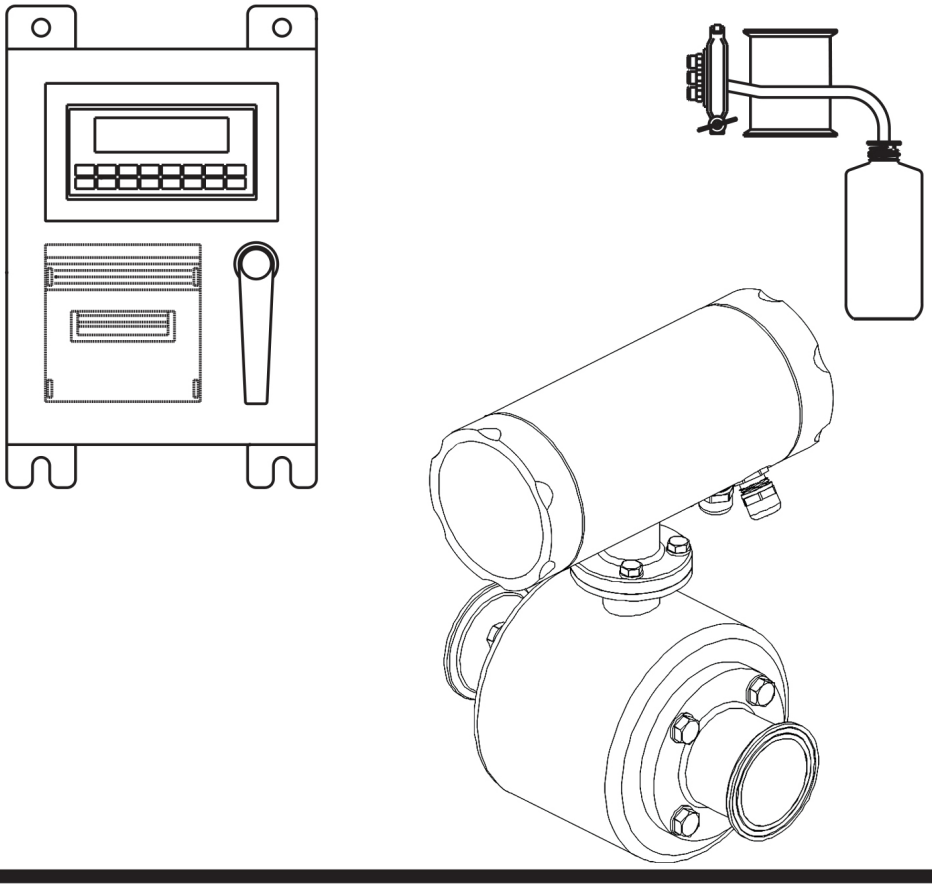
ANDERSON-NEGELE

Instrument Model Number _____

Instrument Serial Number _____



DS series Controller With Printer and Sampler

Form Number AIC2055

Revised: Nov 2017

Contents

1. Description

The Anderson DS series Farm system offers multiple functions to satisfy the needs of an advanced dairy farm. Using an IZMAG electromagnetic flowmeter for measurement of milk flow, the system then collects the information in a controller that offers the ability to totalize and print information based on an external input defining animal groups, or totalizing the entire amount pumped into a transport trailer or bulk cooler for comparison purposes. In addition to the totalization and print capability, the system can be configured for use to control the quantity of milk that is pumped into a transport trailer or tank to prevent the over-filling of that container. In this instance a relay output is used to trigger an alarm or directly stop the pumping of milk into the tank. If configured as a DS2 system, the ability to take a composite bacterialogical sample of milk which has passed through the system is also possible using the pneumatic sampler which is integrated into the control system. Proper use of this portion of the system is defined in SOP document at the end of this manual. During the wash process that takes place between milkings, a 110 VAC input is required to define this period. When this input is received the recording of the meters measurement is surpressed so that milk measurement values are not affected by wash water flow. Also if equipped with the optional sampling function, the sampling system will cycle on a time basis when this input is present for the purpose of cleaning the sampler head and piping.

FTT Controller/Printer

Description

The FTT Controller/Printer is functions to provide the display of measured milk. Along with displaying the measured quantity it is equipped with a tape printer which will give a paper copy of measured volumes

Installation

All systems will have a display enclosure which should be mounted on a wall for easy viewing. Mounting tabs are provided on the enclosure for this purpose. Locate the enclosure in a easily accessible place within close proximity of the trailer or tank that is being filled. This will make operation of the device convenient when changeover occurs which is the time that it is most often accessed. The unit is seldom located in the actual milking parlor due to the high

likelihood of water being sprayed into the tape printer if the door is left open. Often a location in a hallway or in a office can prove to be a better choice. Wiring The display will require that continuous 110 VAC power supply be made available to give uninterrupted operation. The power source should be a clean instrument electrical circuit. If the unit is to be used for group totals, a remote print/ reset switch (shown in Fig.2.2 as AIC part # FTT-710-REM-BOX) will be used to allow for remote printing of group totals from the milking parlor by dairy personnel.

Electrical Connections DS1

The control enclosure for the DS1 is provided pre-wired with a 110VAC power cord to be plugged directly into a standard power outlet In addition to the power cord, 25’ of 2 conductor signal cable has been pre-wired for connection to the flowmeter. Figure 1.1 identifies the 110VAC input from the farm wash panel which is necessary to enable measurement suppression during the wash cycle. In applications where the display is used for fill control the relay output from the controller will need to be wired to turn on an alarm to alert dairy personnel of the tank status. If the control is to be used for group production monitoring the termination for a remote momentary contact switch is also indicated.

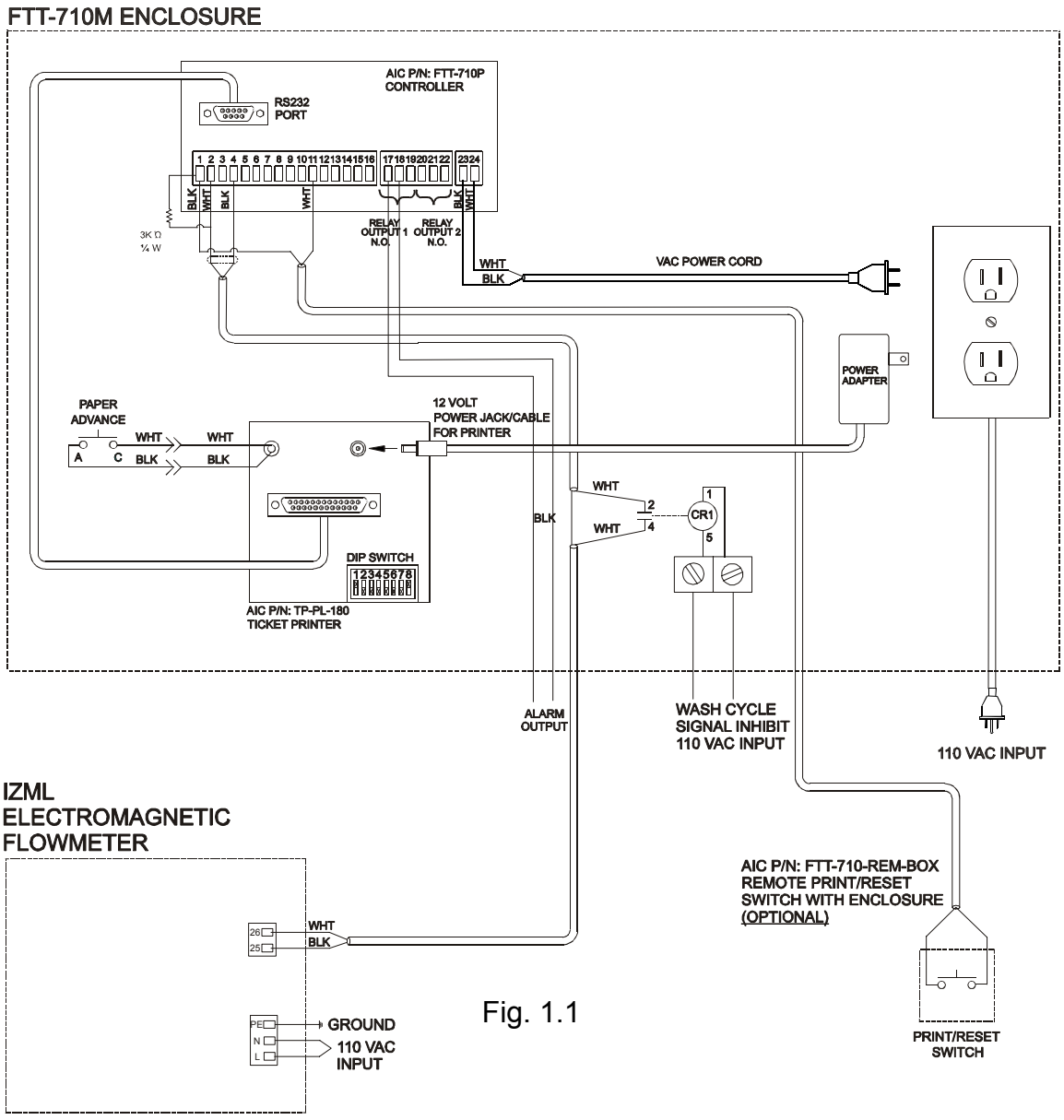
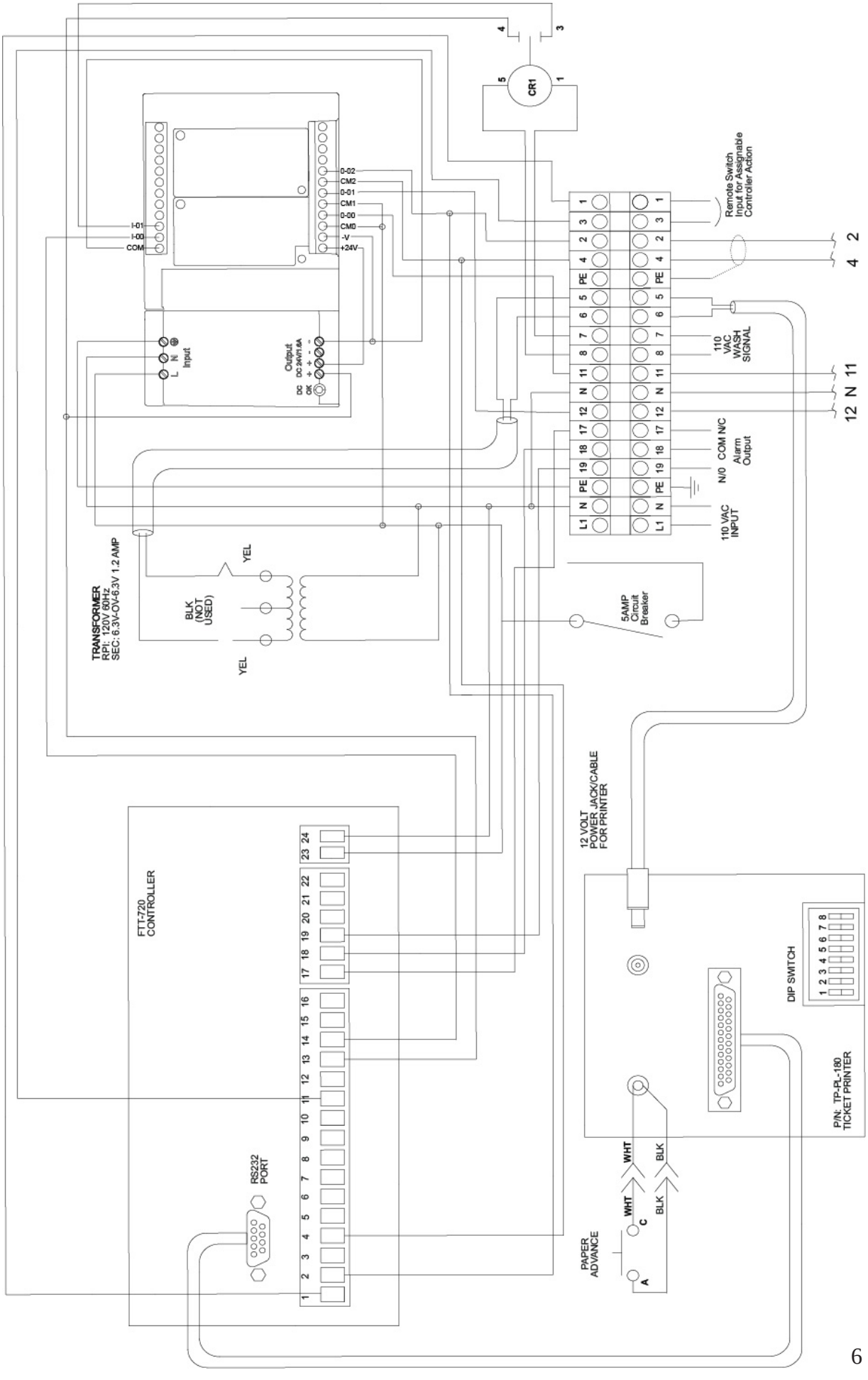


Fig. 1.1

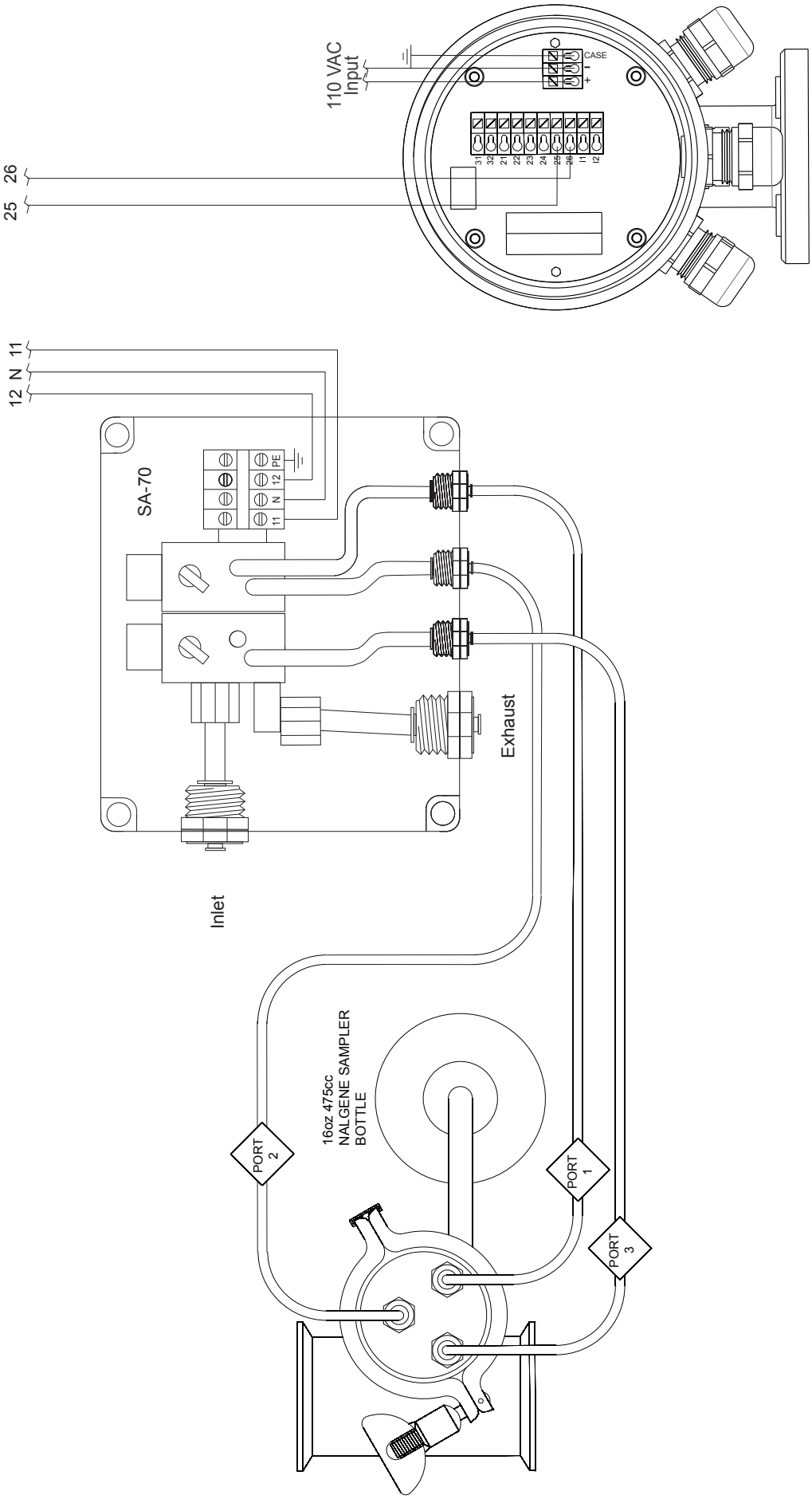
Electrical Connections DS2

The DS2 differs from the DS1 due to the addition of sampling capability. With the need for additional electrical connections the DS2 enclosure is provided with (3) 1 2” electrical connection holes on the bottom of the enclosure to allow for permanent rigid or flexible conduit connections to be made. It will be necessary dependant on the environment to keep these connections water-tight. Fig. 1.2 identifies the necessary connections needed for a DS2 system . In addition to the incoming power and the signal from the flowmeter, the DS2 also requires connections to the air solenoid valves which operate the sampler. Note that the solenoid wiring is 110VAC operating voltage and should be installed to the samecodes and standards as other high voltage wiring in the facility.

FTT-710-SA1 ENCLOSURE



SA-70 & IZMAG ENCLOSURE



Component Location

The attached diagram (Fig 1.3) Illustrates the preferred locations within the piping schematic of a typical dairy installation

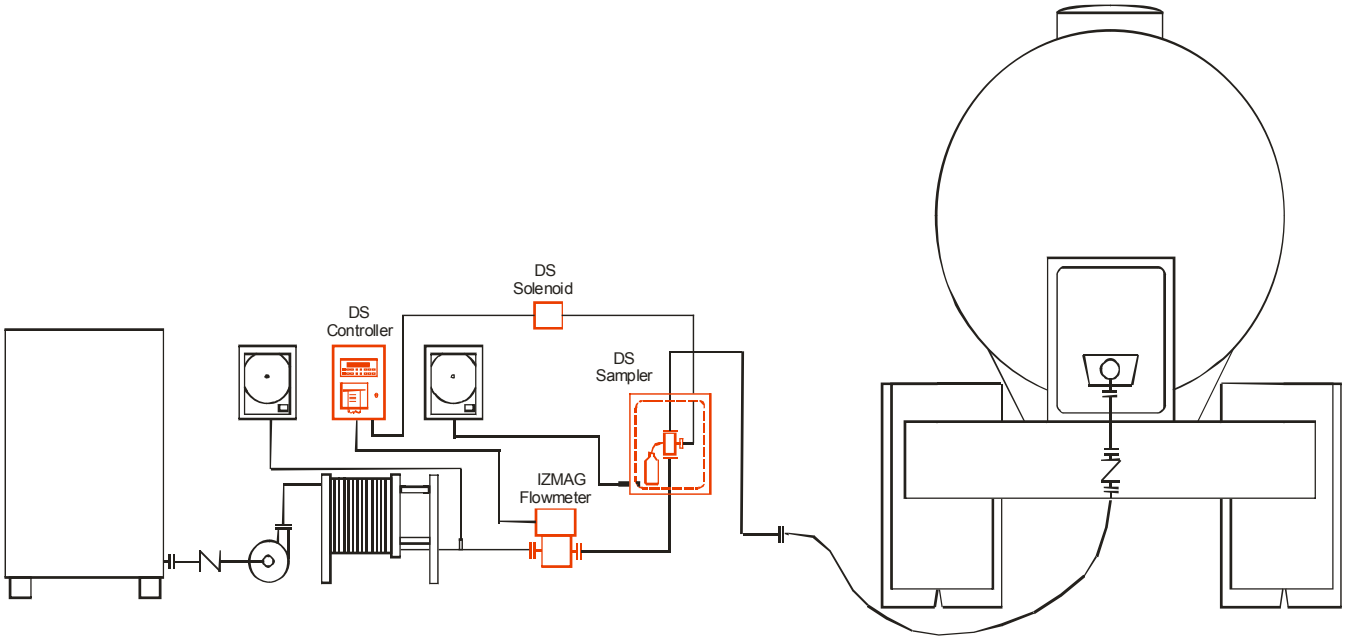


Fig 1.3

FTT-710-SA

CONTENTS

7. PRINCIPLE OF OPERATION

8. TEST, SERVICE and MAINTENANCE

9. GLOSSARY OF TERMS

10. DIAGNOSIS AND TROUBLESHOOTING

APPENDIX A

1. Description

1.1 Unit Description:

The FTT 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 FTT 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 FTT 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
Character Size: 0.3" nominal
User selectable label descriptors and units of measure

Keypad

Keypad Type: Membrane Keypad
Keypad Rating: Sealed to Nema 4
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, 50/60 Hz
Order Option 2: 220VAC: 170 to 276 Vrms, 50/60 Hz
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
Fast Transient 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)

Analog Output

The analog output is menu assignable to correspond to the Rate or Total.
Type: Isolated Current Sourcing
Isolated I/P/C: 500 V
Available Ranges: 4-20 mA, 0-20 mA
Resolution: 12 bit
Accuracy: 0.05% FS at 20 Degrees 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 DSP Averaging constant to cause an smooth control action.

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 FTT 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 FTT 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

FTT'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 FTT 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 FTT. 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 FTT is assumed to be operating in a remote metering role. In addition, the FTT 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 FTT 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 the 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:

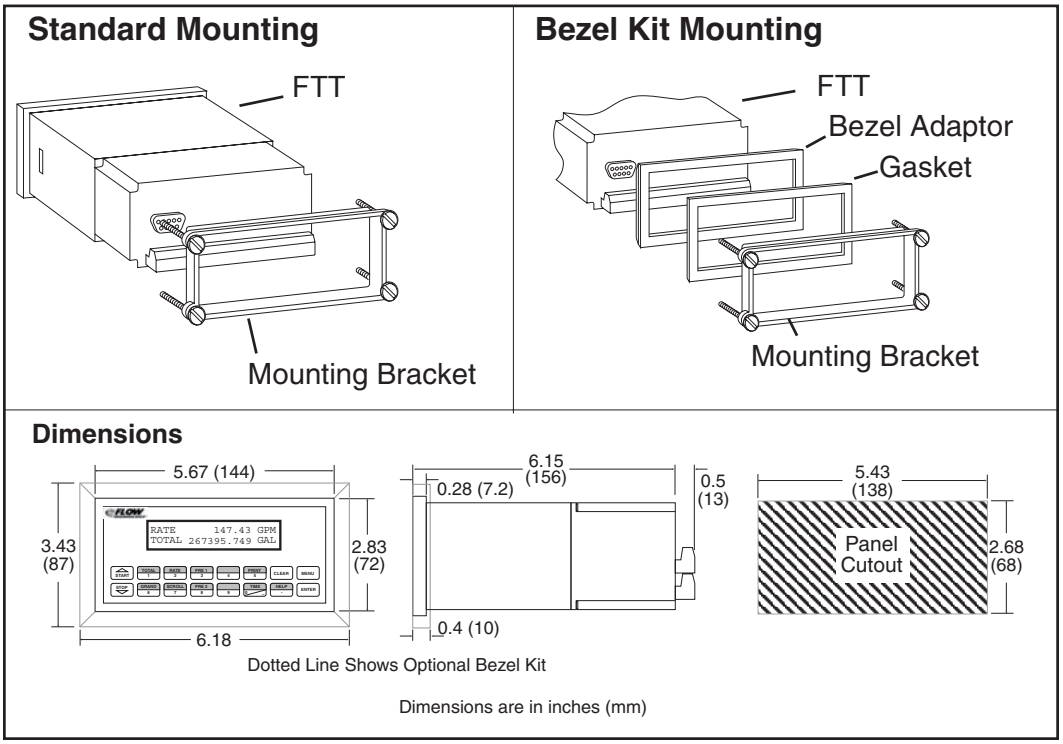
- A switch or circuit breaker shall be included in the building installation;
- It shall be in close proximity to the equipment and within easy reach of the OPERATOR;
- It shall be marked as the disconnecting device for the equipment.

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)



3. Applications

3.1 Liquid Volume

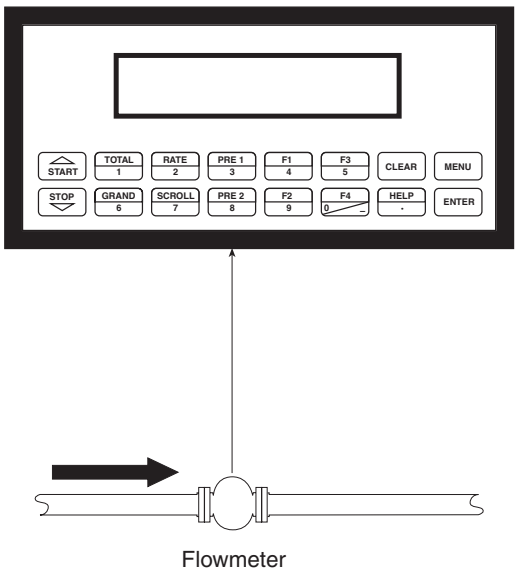
Measurements:
A flowmeter measures the actual volume in a liquid line.

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

Pulse Input; Average K-Factor or Linearization Table

$$\text{Volume Flow} = \frac{\text{input frequency} * \text{time scale factor}}{\text{K-Factor}}$$

3.2 Batching

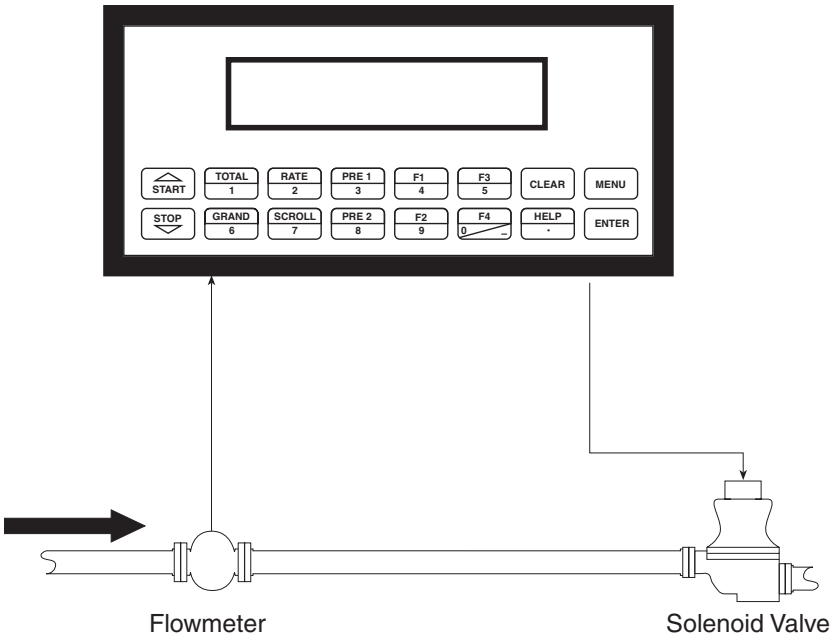
Measurements:
A flowmeter measures the actual volume in a liquid line.

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

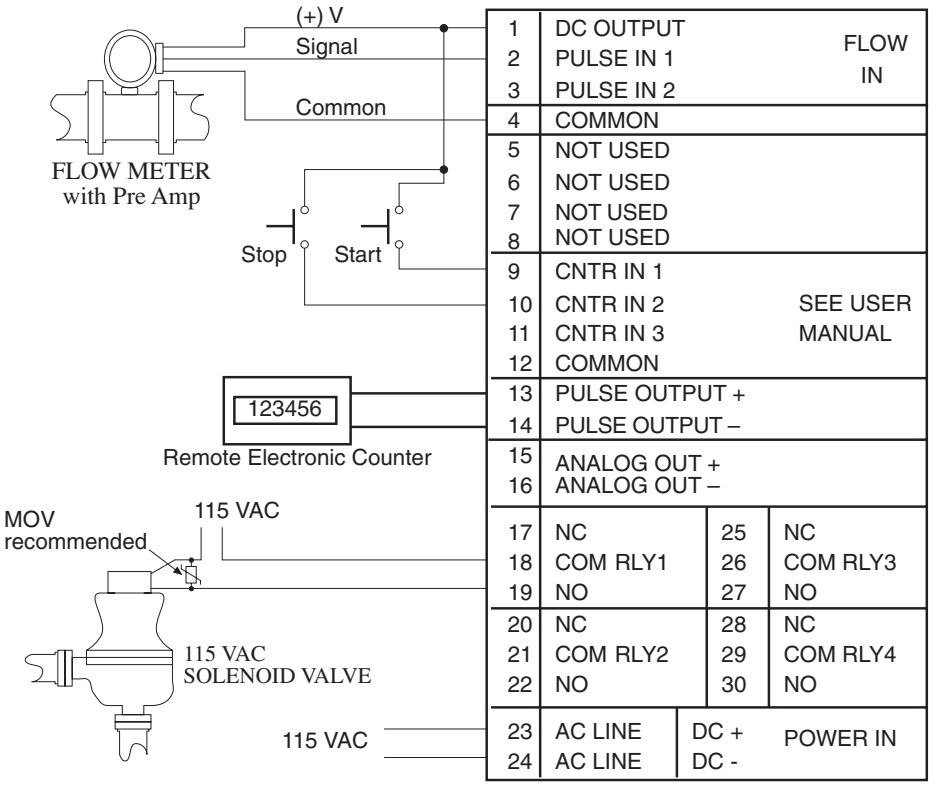


Calculations *Pulse Input; Average K-Factor or Linearization Table*

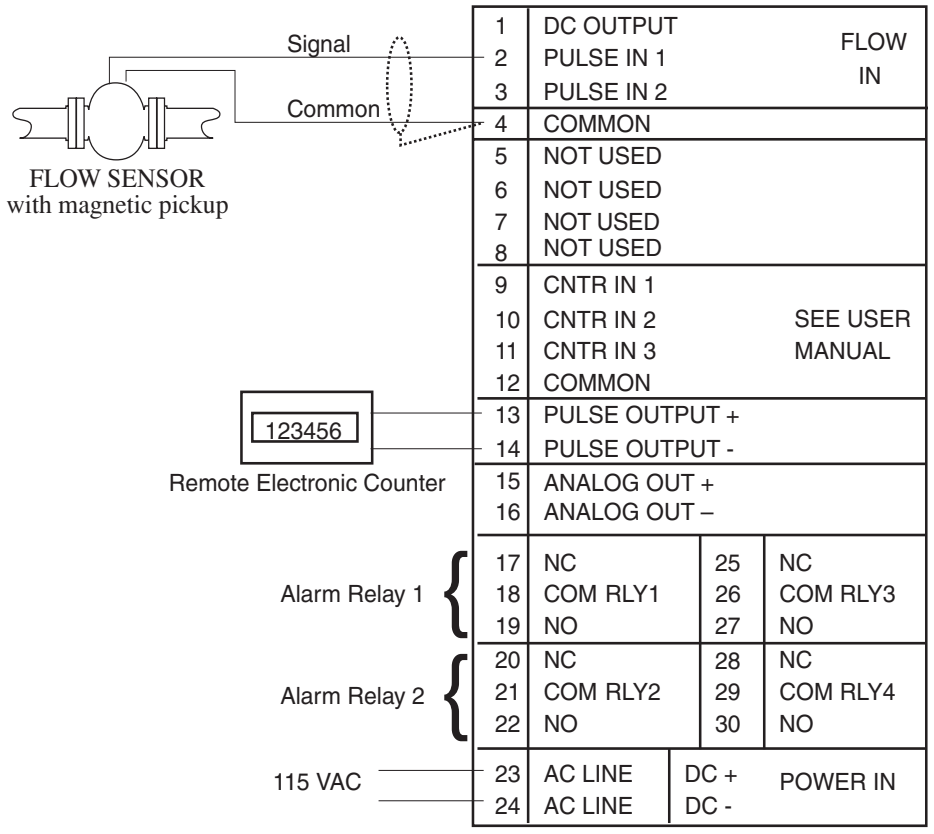
$$\text{Volume Flow} = \frac{\text{input frequency} * \text{time scale factor}}{\text{K-Factor}}$$

4 WIRING

4.1 Typical Batcher Wiring:



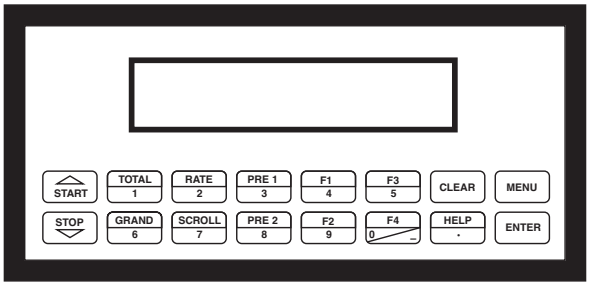
4.2 Typical Rate/Total Wiring:



5. UNIT OPERATION

5.1 Front Panel Operation Concept for Run Mode

The FTT 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 Δ ∇ 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 FTT 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 flowrate. 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 over flows 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 Input1 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 Input1 or the front panel Start key is pressed (provided that the pervious 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.

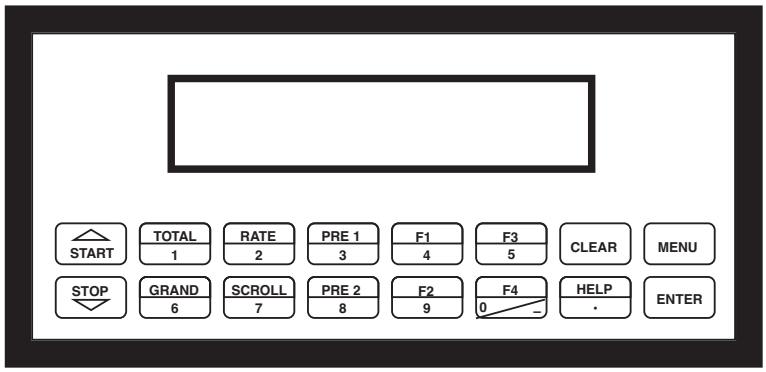
The user reads and writes information from/to the RS-485 using the Modbus RTU commands. The FTT then responds to these information and command requests.

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 FTT 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.

Menus	Display	Notes
6.2.1 TOP LEVEL SETUP MENU	SELECT OPERATE STATE Run Setup Test	Select Setup to enter the instrument setup routine.
	ENTER	
6.2.2 EZ Setup Sub-menu Groups	SELECT EZ SETUP	Press ENTER to begin EZ Setup routine.
	ENTER	
	CHANGES ALL SETUPS ! No Yes	Confirm that you want to run EZ Setup. **Caution:** Any previous program settings may be lost or reset.
	ENTER	
	INSTRUMENT TYPE Rate/Tot Batch	Instrument Type.
	ENTER	
	RATE TIME BASE Sec Min Hour Day	Select the appropriate rate time base.
	ENTER	
	RATE DEC PLACES(0-4) 0	Enter the desired rate decimal location. 0-4 decimal places allowed.
	ENTER	
	TOTAL VOLUME UNITS gal	Enter the desired totalizer units label.
	ENTER	
	TOT DEC PLACES (0-3) 0	Enter the desired totalizer decimal location. 0-3 decimal places allowed.
	ENTER	
	K_FACTOR TYPE Avg LinTbl	Enter the desired K-Factor Type.
	ENTER	
	AVERAGE KA-FACTOR ######## P/gal	If Average selected, Enter the desired Average K-Factor.
	LINEAR TABLE KA Fre01:######### Hz	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	
Through 16 Points	LINEAR TABLE KA KA--01:###########	
	ENTER	
	FS ANALOG OUT 20mA ########gal/m	Enter the desired full scale setting for the analog output.
	ENTER	
	RATE 00.0 gal/m TOTAL 0 gal	Return to Run Mode

6.3 Setup Menus

Sub-menus	Display	Notes
6.3.1 Top Level Setup Menu	SELECT OPERATE STATE Run Setup Test MENU ENTER	Select Setup to enter the instrument setup routine.
6.3.2 Sub-menu Groups	SELECT EZ SETUP	Refer to Page 17 for Details.
	INSTRUMENT TYPE	Refer to Page 19 for Details
	SETUP INDICATORS	Refer to Page 21 for Details.
	SETUP FLOW INPUT	Refer to Page 22 & 23 for Details.
	SETUP PULSE OUTPUT	Refer to Pages 24 for Details.
	SETUP ANALOG OUTPUT	Refer to Pages 24 for Details.
	SETUP RELAYS	Refer to Page 25 & 26 for Details.
	SETUP CONTROL INPUTS	Refer to Page 27 for Details.
	SETUP REALTIME CLOCK	Refer to Page 28 for Details.
	SERIAL USAGE	Refer to Page 29 for Details.
	SETUP DATALOG/PRINT	Refer to Pages 30 & 31 for Details.
	ADMINISTRATIVE SETUP	Refer to Page 31 for Details.
	SETUP NETWORK CARD	Refer to Page 32 for Details. (Setup Network Card menu will only appear on units equipped with a network card)

START

STOP

6.4 Setup Sub-Menus

Sub-menus	Display	Notes
6.4.1 **SELECT EZ SETUP**	SELECT EZ SETUP STOP / START Advance To INSTRUMENT TYPE	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.
6.4.2 **INSTRUMENT TYPE**	INSTRUMENT TYPE ENTER	Press ENTER to enter Instrument Type sub-menus.
	INSTRUMENT TYPE Rate/Tot Batch STOP / START ENTER	Press ENTER when Rate/Total is flashing to configure the instrument as a Ratemeter/Totalizer.
Rate/Tot	Advance To SELECT FLOW EQUATION	If Rate/Tot selected, advance to Setup Indicators.
	INSTRUMENT TYPE ENTER	Press ENTER to enter Instrument Type sub-menus.
Batch	INSTRUMENT TYPE Rate/Tot Batch STOP / START ENTER	Press ENTER when Batch is flashing to configure the instrument as a Batcher.
	SELECT PRESET TYPE Standard EZ-Preset STOP / START ENTER	Select Standard for standard preset operation. Select EZ-Preset for quick preset editing mode. (see section 5.4.1 Batcher Configuration.)
	BATCH COUNT MODE Up Down STOP / START ENTER	Select UP to Reset to 0 and count up to preset. Select DOWN to reset to Preset and count down to 0.

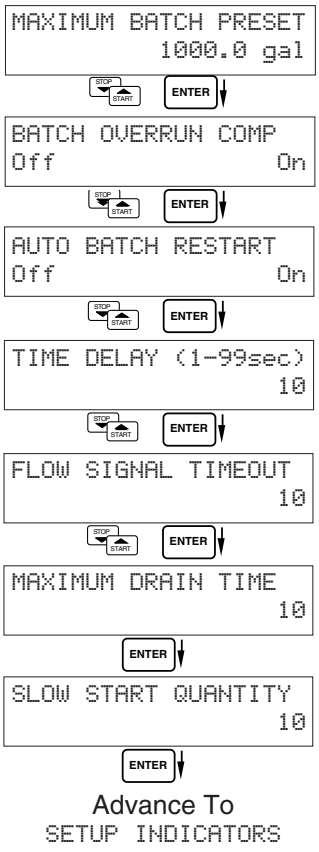
Continue On Next Page

Sub-menus

Notes

6.4.2
INSTRUMENT TYPE
(continued)

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



Advance To
SETUP INDICATORS

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.

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

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".

Sub-menus	Display	Notes
6.4.3 SETUP INDICATORS (Total)	SETUP INDICATORS	Press ENTER to begin setup of the Indicators
	ENTER	
	SETUP INDICATORS Total Rate	Press ENTER when Total is flashing to configure the Totalizer Indicators
	ENTER	
	TOTAL DESCRIPTOR TOTAL	Enter the desired Total Descriptor text
	ENTER	
	TOTAL VOLUME UNITS gal	Enter the desired Volume Units Label text for the Totalizer.
	ENTER	
	TOT DEC PLACES (0-3) 0	Select the desired Total Decimal Place. 0-3 decimal places allowed.
	ENTER	
	Advance To SETUP INDICATORS (Rate)	
6.4.4 SETUP INDICATORS (Rate)	SETUP INDICATORS Total Rate	Press ENTER when Rate is flashing to configure the Ratemeter Indicators
	ENTER	
	RATE TIME BASE Sec Min Hour Day	Select the desired Rate Time Base.
	ENTER	
	RATE DESCRIPTOR RATE	Enter the desired Descriptor text for the Ratemeter.
	ENTER	
	RATE DEC PLACES(0-4) 4	Select the desired Rate Decimal Place. 0-4 decimal places allowed.
	ENTER	
	RATE AVG FILTER 0	Enter desired Rate Averaging Filter. (see Definitions for more details)
	ENTER	
	QUICK UPDATE % 5	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.)
	ENTER	
	Advance To SETUP FLOW INPUT	

Sub-menus	Display	Notes
6.4.5 SETUP FLOW INPUT (Pulse - chA & chA=chB)	SETUP FLOW INPUT	Press ENTER to begin setup of Flow Input.
	ENTER	
	EXCITATION VOLTAGE 5v 12v 24v	Select the desired Excitation Voltage for your flow sensor. Caution: Improper selection may cause damage to sensor
	ENTER	
NOTE: chA = Single Pulse chA=chB = Pulse checking for missing pulses Qx1 = Quadrature Qx2 = Quadrature x 2	PULSE INPUT TYPE chA chA=chB Qx1 Qx2	Enter the desired Pulse type. See side note.
	ENTER	
	PULSE TRIGGER LEVEL 10mV 100mV 2.5V	Select the desired Input Pulse Trigger Level.
	ENTER	
	LOW PASS FILTER 40Hz 3KHz 20KHz	Select the desired Low Pass Filter. (Max. Count Speed). Use 3kHz with turbine flowmeters.
	ENTER	
	INPUT TERMINATION Pullup Pulldown None	Select the proper input termination.
	ENTER	
	MAX WINDOW (1-99) 1	Enter the desired Maximum Sample Window Time (1-99 sec) that can occur at the lowest flowrate. Use 1 second for turbine flowmeters.
	ENTER	
	K_FACTOR TYPE Avg LinTbl	Enter the desired K-Factor Type.
	ENTER	
	AVERAGE KA-FACTOR ######## P/gal	If Avg selected, Enter the desired Average K-Factor in the units requested.
	ENTER	
	LINEAR TABLE KA Fre01:######### Hz	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.
	Through 16 Points	
	LINEAR TABLE KA KA--01:######## P/gal	
	ENTER	
	LOW FLOW RATE ALARM ######## gal/m	Enter the desired volumetric Low Rate Alarm. This will trigger an alarm message if alarm conditions occur. The relays are not affected.
	ENTER	
	HIGH FLOW RATE ALARM ######## gal/m	Enter the desired volumetric High Rate Alarm. This will trigger an alarm message if alarm conditions occur. The relays are not affected.
	ENTER	
	Advance To SETUP PULSE OUTPUT	

Sub-menus	Display	Notes
6.4.6 SETUP FLOW INPUT (Pulse - Quadrature, Qx1 or Qx2)	SETUP FLOW INPUT	Press ENTER to begin setup of Flow Input.
	ENTER	
	EXCITATION VOLTAGE 5v 12v 24v	Select the desired Excitation Voltage.
	ENTER	
	FLOW INPUT TYPE Pulse	Press ENTER when Pulse is flashing to configure the flow input for Pulse signals.
	ENTER	
NOTE: chA = Single Pulse chA=chB = Pulse checking for missing pulses Qx1 = Quadrature Qx2 = Quadrature x 2	PULSE INPUT TYPE chA chA=chB Qx1 Qx2	Enter the desired Pulse type. See side note.
	ENTER	
	PULSE TRIGGER LEVEL 10mV 100mV 2.5V	Select the desired Input Pulse Trigger Level.
	ENTER	
	LOW PASS FILTER 40Hz 3KHz 20KHz	Select the desired Low Pass Filter. (Max. Count Speed). . Use 3kHz with turbine flowmeters.
	ENTER	
	INPUT TERMINATION Pullup Pulldown None	Select the proper input termination.
	ENTER	
	MAX WINDOW (1-99) 1	Enter the desired Maximum Sample Window Time (1-99 sec) that can occur at the lowest flowrate. Use 1Hz for turbine flowmeters.
	ENTER	
	K_FACTOR TYPE Avg LinTbl	Enter the desired K-Factor Type.
	ENTER	
	AVERAGE KA-FACTOR ######## P/gal	If Avg selected, Enter the desired Average K-Factor (KA for channel A).
	AVERAGE KB-FACTOR ######## P/gal	Enter the desired Average K-Factor (KB for channel B).
	LINEAR TABLE KA Fre01:######### Hz	If LinTbl selected, Enter the desired frequency/ K-Factor pair for each point in the Linearization Table. (channel A) **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.
	ENTER	
Through 16 Points	LINEAR TABLE KA KA--01:######## P/gal	
	ENTER	
	LINEAR TABLE KB Fre01:######### Hz	Enter the desired frequency/ K-Factor pair for each point in the Linearization Table. (channel B) **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.
	ENTER	
Through 16 Points	LINEAR TABLE KB KA--01:######## P/gal	
	ENTER	
	LOW FLOW RATE ALARM ######## gal/m	Enter the desired volumetric Low Rate Alarm. This will trigger an alarm message if alarm conditions occur. The relays are not affected.
	ENTER	
	HIGH FLOW RATE ALARM ######## gal/m	Enter the desired volumetric High Rate Alarm. This will trigger an alarm message if alarm conditions occur. The relays are not affected.
	ENTER	
	Advance To SETUP PULSE OUTPUT	

Sub-menus	Display	Notes
6.4.7 SETUP PULSE OUTPUT	SETUP PULSE OUTPUT	Press ENTER at this prompt to setup the Pulse Output.
	ENTER	
	PULSE OUTPUT USAGE Off Volume	Select the desired Pulse Output Usage.
	ENTER	
	PULSE WIDTH 10mS 100mS	Select the desired Pulse Width for the Pulse Output.
	ENTER	
	PULSE VALUE 1000 gal/P	Enter the desired Pulse Value for the Pulse Output (Volume Units per Pulse).
	ENTER	
	Advance To SETUP ANALOG OUTPUT	
6.4.8 SETUP ANALOG OUTPUT	SETUP ANALOG OUTPUT	Press ENTER when Analog is flashing to setup the Analog Output.
	ENTER	
	ANALOG OUTPUT USAGE Rate Total	Select the desired Analog Output Usage.
	ENTER	
	ANALOG OUTPUT RANGE 4-20mA 0-20mA	Select the desired current range for the Analog Output.
	ENTER	
	LS ANALOG OUTPUT 0.0 gal/m	Enter desired Analog Output Low Scale Value. **NOTE:** Units label will correspond with output usage type selected.
	ENTER	
	FS ANALOG OUT 20mA 1000.0 gal/m	Enter desired Analog Output Full Scale Value.
	ENTER	
	ANALOG OUT DAMPING 0.0	Enter the desired Analog Output Damping Constant. See Definitions for additional information.
	ENTER	
	Advance To SETUP RELAYS	

Sub-menus	Display	Notes
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).	SETUP RELAYS Rly1 Rly2 Rly3 Rly4 ENTER	Select the desired Relay for setup. (Relays 3 & 4 Optional, menus will always appear even if option not installed)
	RELAY 1 USAGE RATE TOTAL NA ENTER	If Relay 1 or Relay 2 Selected, Select Rate, Total or NA.
	RELAY 1 DELAY sec 0 ENTER	If Rate selected, enter desired relay activation delay value. Alarm condition must be continuously present for this amount of time before alarm will activate.
	RELAY 1 DURATION ##### ENTER	If Total Selected, Enter desired Relay Duration.
	RELAY 1 MODE LO_ALARM HI_ALARM ENTER	Select the desired Relay Activation. Low: Relay activates when reading is below setpoint. High: Relay activates when reading is above setpoint.
	RELAY 1 SETPOINT ####### gal ENTER	Enter the desired Setpoint. The Setpoint can be edited in run mode using the PRE 1 key (PRE 2 key for Relay 2).
	RELAY 1 HYSTERESIS ##### gal/m ENTER	If Rate, selected, Enter desired Relay Hysteresis.
	Advance To SETUP RELAYS 3, 4	

Sub-menus	Display	Notes
6.4.9 (Continued) **SETUP RELAYS** **(Relay 3 & Relay 4)**	SETUP RELAYS Rly1 Rly2 Rly3 Rly4	Select the desired Relay for setup. (Relays 3 & 4 Optional)
	ENTER	
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.	RELAY 3 USAGE Rate Tot Alrm Ovr NA	If Instrument Type is set for BATCHER, Choose Rate, Total, Alrm, Ovr or NA.
	RELAY 4 USAGE Rate Tot Alrm NA	If Instrument Type is set for RATE/TOTAL, Choose Rate, Total, Alrm or NA.
	ENTER	
	RELAY 3 DELAY sec 0	If Rate / Alrm selected, enter desired relay activation delay value.
	ENTER	
	RELAY 3 DURATION #####	If Total Selected, Enter desired Relay Duration.
	ENTER	
	RELAY 3 MODE LO_ALARM HI_ALARM	Select the Relay Activation for Rate/Alrm. Low: Relay activates when reading is below setpoint. High: Relay activates when reading is above setpoint.
	ENTER	
	RELAY 3 SETPOINT ####### gal	Enter the desired Setpoint. The setpoint 3 can be edited in the "Run Mode" using the 4 key (9 key for Relay 4).
	ENTER	
	RELAY 3 HYSTERESIS ##### gal/m	If Rate, selected, Enter desired Relay Hysteresis.
	ENTER	
	Advance To SETUP CONTROL INPUTS	

RELAY NOTES & CONSIDERATIONS

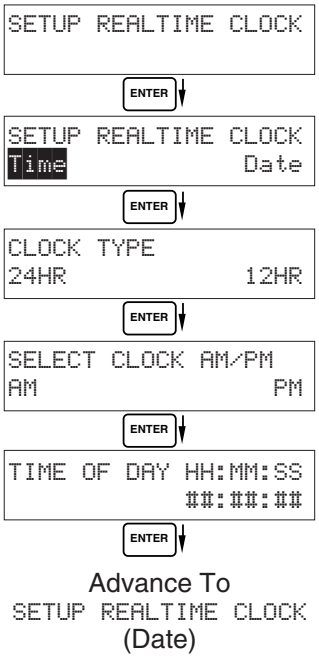
1. Relay activation is based on the computed readings not the displayed value. Therefore the display damping factor will not affect the relay response time. The RELAY DELAY feature allows the user to enter a time delay for relay activation. This feature is very useful in applications where short over/under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

Sub-menus	Display	Notes
6.4.10 SETUP CONTROL INPUTS (RATE/TOTAL)	SETUP CONTROL INPUTS	Press Enter to begin setup of the Control Inputs.
	ENTER	
	SETUP CONTROL INPUTS Input1 Input2 Input3	Select the desired Control Input for setup.
	ENTER	
	CONTROL INPUT1 USAGE INHIBIT_TOTAL NA	If Control Input 1 Selected, Select Inhibit Total or NA (Not Assigned).
	CONTROL INPUT2 USAGE RESET_TOTAL NA	If Control Input 2 Selected, Select Reset Total or NA (Not Assigned).
	CONTROL INPUT3 USAGE Prn Ack KeyLk NA	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.
	ENTER	
	Advance To SETUP REALTIME CLOCK	
6.4.11 SETUP CONTROL INPUTS (BATCH)	SETUP CONTROL INPUTS Input1 Input2 Input3	Select the desired Control Input for setup.
	ENTER	
	CONTROL INPUT1 USAGE Start Rst/Start NA	If Control Input 1 Selected, Select Start ,Reset/Start, NA (Not Assigned).
	CONTROL INPUT2 USAGE Stop Stop/Rst NA	If Control Input 2 Selected, Select Stop, Stop/Reset, NA (Not Assigned).
	CONTROL INPUT3 USAGE Rst Prn KeyLk Ack NA	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.
	ENTER	
	Advance To SETUP REALTIME CLOCK	

Sub-menus	Display	Notes
6.4.12 SETUP REALTIME CLOCK (Time)		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)		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

Sub-menus	Display	Notes
6.4.14 SERIAL USAGE	SERIAL USAGE	Press Enter to begin setup of the Serial Port.
	ENTER	
	SERIAL HARDWARE RS232 RS485	Select Serial Hardware type for standard port. RS-232 is standard. (See SETUP NETWORK CARD for RS485 Modbus option)
	ENTER	
	DEVICE ID ##	Select the Device ID (0-99).
	ENTER	
	BAUD RATE 300 600 1200 <more>	Select the desired Baud Rate.
	BAUD RATE 2400 4800 9600 19200	(If <more> selected, additional baud rates are offered. 9600 is standard)
	ENTER	
	PARITY None Odd Even	Select the desired Parity. (NONE is standard)
	ENTER	
	HANDSHAKING None Softwre Hardwre	Set the Handshake. (NONE is standard)
	ENTER	
	DEVICE LINE FEED <CR> <CR+LF>	Choose end of line termination. Only choose <CR> if your external device automatically assigns a line feed for every <CR> carriage return.
	ENTER	
	MODEM CONTROL No Yes	Select "Yes" if the serial port will be used to control a Hayes compatible modem.
	ENTER	
	MODEM AUTO ANSWER No Yes	Select the desired Modem Auto Answer mode. Select YES to setup modem to answer incoming calls.
	ENTER	
	CALL OUT PHONE # 0	Enter the Call Out Phone Number to be dialed at "Call Out Time" or upon "Call On Error/Alarm".
	ENTER	
	CALL OUT TIME ##:##:##	Enter the time of day to perform Call Out transmission.
	ENTER	
	CALL ON ERROR/ALARM No Yes	Select "Yes" to have the unit perform a Call Out transmission upon error/alarm condition.
	ENTER	
	NUMBER OF REDIALS 0	Enter the number of redials to be performed on call out time if busy or no answer. (error/alarm tries until connected)
	ENTER	
	HANGUP IF 2MIN INACT No Yes	Select "Yes" to perform hang-up if there is inactivity for more than 2 minutes for calls initiated by the SUPERtrol-I LE
	ENTER	
	Advance To SETUP DATALOG/PRINT	

Sub-menus	Display	Notes
6.4.15 SETUP DATALOG/PRINT (Configure)	SETUP DATALOG/PRINT	Press Enter to setup the Datalog/Print information.
	ENTER	
	SETUP DATALOG/PRINT Config Select_list	Select Config to configure the Datalog/Print information.
	ENTER	
	OUTPUT FORMAT Printer Term Dbase	Select the type of Output Format.
	ENTER	
	PAGE LENGTH [99 max] 99	Enter the desired Page Length. If Printer selected above.
	ENTER	
	TOP MARGIN [99 max] 3	Enter the desired Top Margin. If Printer selected above.
	ENTER	
	DATALOG ONLY No Yes	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 HH:MM:SS 00:00:00	Enter Print Time, printer will print at this time every day. Enter 00:00:00 to inhibit print time.
	ENTER	
	PRINT INTERVAL 00:00:00	Enter Print Interval, (HH:MM:SS) Enter 00:00:00 to inhibit print interval.
	ENTER	
	ENABLE PRINT KEY NO YES	Select YES to enable Print Key. Select NO to disable Print Key
	ENTER	
	PRINT END OF BATCH NO YES	Batch mode only. Select Yes to print at end of batch.
	ENTER	
	Advance To SETUP DATALOG/PRINT (Select_list)	

Sub-menus	Display	Notes
6.4.16 SETUP DATALOG/PRINT (Select_list)	SET DATALOG/PRINT	Press enter to begin Setup Datalog/Print routine.
	ENTER	
	SET DATALOG/PRINT Config Select_list	Press enter when Select_list is selected to setup print list.
	PRINT LIST ITEMS TOTAL YES	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
	STOP / START	
	PRINT LIST ITEMS RATE YES	
List Items: TOTAL RATE PRE1 PRE3 GRAND PRE2 PRE4 TIME	PRINT LIST ITEMS PRE 1 YES	
	ENTER	
	PRINT LIST ITEMS DataLog size =001489	The Select Print List Information display shows the current possible Datalog size after your list has been entered.
	ENTER	
	Advance To ADMINISTRATIVE SETUP	
6.4.17 ADMINISTRATIVE SETUP NOTE: Accessed only with supervisor password.	ADMINISTRATIVE SETUP	Press Enter to begin Administrative Setup.
	ENTER	
	OPERATOR PASSWORD ****	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 ****	Enter Supervisor Password. (Factory Set to 2000)
	ENTER	
	SOFTWARE VERSION vxx.xx	This display is used to show the software version of the installed software.
	ENTER	
	PRODUCT ORDER CODE SL90xxxxxxx	This display is used to show the product order code (model number). Factory set.
	ENTER	
	UNIT SERIAL NUMBER 00000	This display is used to show the unit's serial number. Factory set.
	ENTER	
	SENSOR SERIAL NUMBER 00000	This display is used to edit and show the sensor's serial number.
	ENTER	
	Advance To SETUP NETWORK CARD	

Sub-menus	Display	Notes
6.4.18 SETUP NETWORK CARD (optional)	SETUP NETWORK CARD	Press Enter to setup Network Card
	ENTER	
	SELECT NETW PROTOCOL Mod	Select desired Network Protocol. (only Modbus RTU is supported)
	ENTER	
	NETWORK DEVICE ID 1	Enter the device address on network (00-247).
	ENTER	
	BAUD RATE 2400 4800 9600 19200	Select the desired Baud Rate.
	ENTER	
	PARITY None Odd Even	Select the desired Parity.
	ENTER	
	Advance To DO EZ SETUP?	

7. Principals Of Operation

7.1 General:

The FTT 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:

Pulse Input; Average K-Factor

$$\text{Volume Flow} = \frac{\text{input frequency} \bullet \text{time scale factor}}{\text{K-Factor}}$$

Pulse Input; Linear Table

$$\text{Volume Flow} = \frac{\text{input frequency} \bullet \text{time scale factor}}{\text{K-Factor (Hz)}}$$

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.

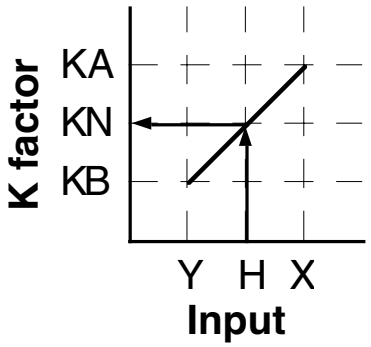
7.3.3 Linearization Table Interpolation

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

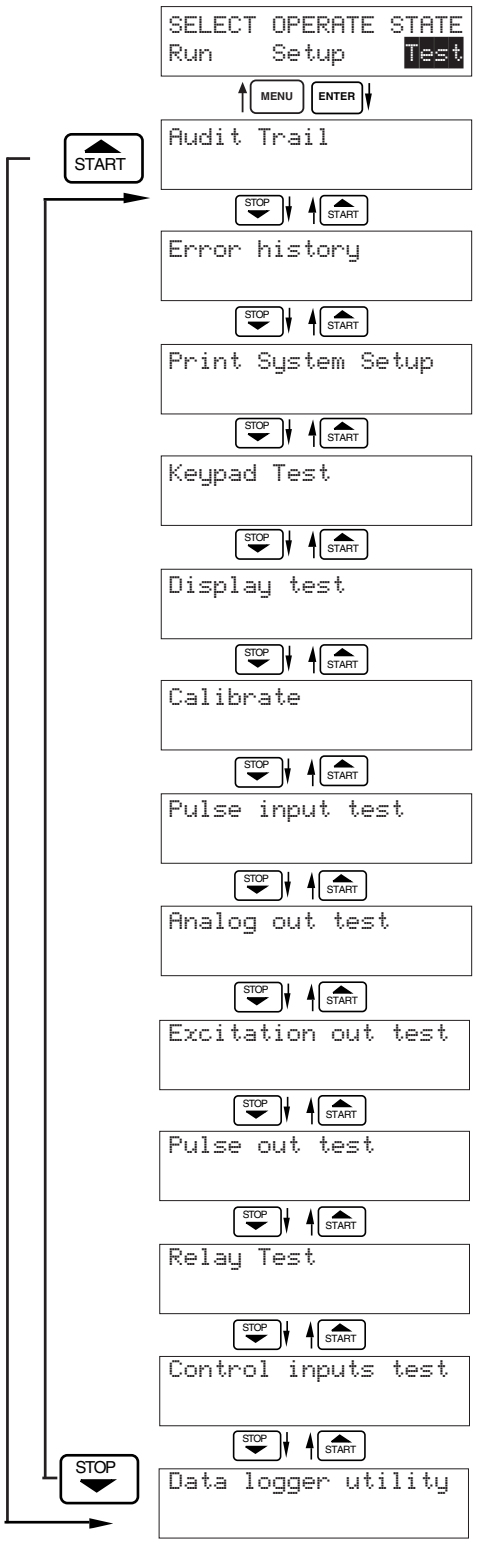


To find KN use this formula:

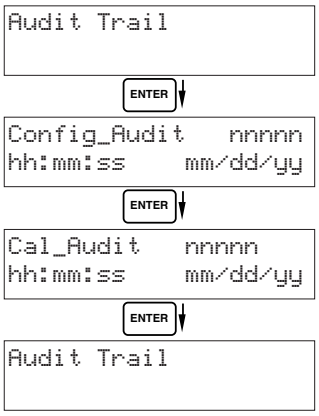
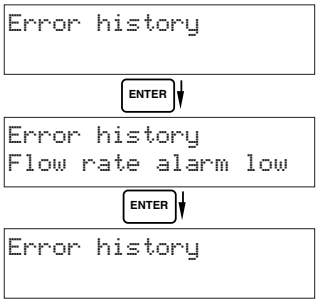
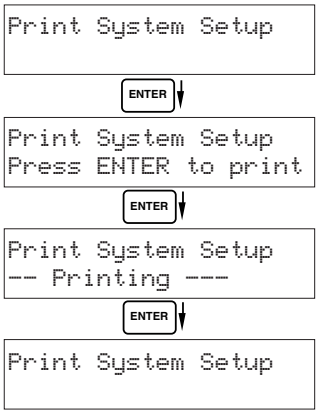
$$\frac{H - Y}{X - Y} \times (KA - KB) + KB = KN$$

8. Test, Service and Maintenance

8.1 Test Menus

Sub-menus	Display	Notes
8.1.1 TOP LEVEL TEST MENUS		Select Test to enter the instrument test & calibration routine. **NOTE:** Supervisor (Service) password required to gain access to this mode. Refer to Page 36 for Details. Refer to Page 36 for Details. Refer to Page 36 for Details. Refer to Page 37 Details. Refer to Page 37 for Details. Refer to Page 37 Details. Refer to Page 38 Details. Refer to Page 38 for Details. Refer to Page 38 for Details. Refer to Page 39 for Details. Refer to Page 39 for Details. Refer to Page 39 for Details. Refer to Page 39 for Details.

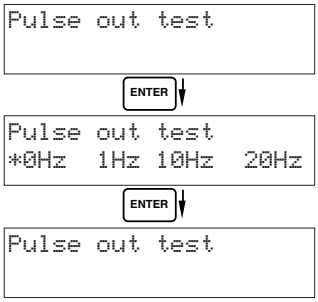
8.2 Test Sub-Menus

Sub-menus	Display	Notes
8.2.1 Audit Trail Sub-menu Group		Press Enter to view the audit trail information. The configuration audit trail format: nnnnn= number of critical menu changes, hh:mm:ss; mm/dd/yy = time and date of last change. The calibration audit trail format: nnnnn= number of calibration changes, hh:mm:ss; mm/dd/yy = time and date of last change. Press Menu to get back to audit trail top-level menu.
8.2.2 Error History Sub-menu Group		Press Enter to view error history. **NOTE:** Press Print Key to print Error History. Printout will include time/date of each errors first occurrence. Press Up/Down arrow keys to scroll through error message history. Press CLEAR to clear entire error log. Press Menu to get back to error history top-level menu.
8.2.3 Print System Setup Sub-menu Group		Press enter key to enter print system setup Sub-menu Press enter to begin printing the system setup. This message will display as the data transmission takes place. Press Menu to get back to print system setup top-level menu.

Sub-menus	Display	Notes
8.2.4 Keypad test Sub-menu Group	Keypad test	Press Enter to enter keypad test
	ENTER	
	Keypad test Key pressed-> ENTER	Press the various keys and the display will show the key that was pressed. Press Menu to exit the test
	ENTER	
	Keypad 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.
	ENTER	
	00000000000000000000 00000000000000000000	Upon pressing enter the each digit on the display will scroll 0-9 then A-Z. Press menu to exit the test.
	ENTER	
	Display test	Press Menu to get back to Display test top-level menu.
	Calibrate	Calibrate Sub-menu group
	ENTER	
8.2.6 Calibrate 0 mA Out Sub-menu Group	Calibrate 0mA out + TB1-15 - TB1-16	Connect ammeter to (+) TB1-15, (-) TB1-16. Press enter.
	ENTER	
	Calibrate 0mA out Enter mA: 0.00000	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.
	ENTER	
	Calibrate 0mA out + TB1-15 - TB1-16	The display will return to Calibrate 0mA out. Press the down arrow key to advance to Cal. 20mA out or repeat above if necessary.
	ENTER	
8.2.7 Calibrate 20mA Out Sub-menu Group	Calibrate 20mA out + TB1-15 - TB1-16	Connect ammeter to (+) TB1-15, (-) TB1-16. Press enter.
	ENTER	
	Calibrate 20mA out Enter mA: 20.00000	To trim 20mA output: Press CLEAR to enable editing and enter the current reading that is on the ammeter display. Press enter.
	ENTER	
	Calibrate 20mA out + TB1-15 - TB1-16	The display will automatically return to the Calibrate 20mA out Sub-menu. Calibration is complete.
	ENTER	
	Calibrate	Press the Menu key to go back to Calibrate top-level menu.

Sub-menus	Display	Notes
8.2.8 **Pulse input test** **Sub-menu Group**	Pulse input test	Press Enter key to test the pulse input.
	ENTER	
2.5V 10mV 100mV	START / STOP Pulse input test Trigger level 2.5V	Use the Up/Down arrow keys to select the appropriate trigger level.
	ENTER	
40Hz 3KHz 20kHz	START / STOP Pulse input test count speed 3kHz	Use the Up/Down arrow keys to select the appropriate frequency range.
	ENTER	
	Pulse input test F1: 0 F2: 0	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.
	ENTER	
	Pulse input test	Press Menu key to return to Pulse input test top-level menu.
8.2.9 **Analog out test** **Sub-menu Group**	Analog out test	Press Enter to test the analog output.
	ENTER	
	Analog out test *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.
	ENTER	
	Analog out test	Press Menu key to return to Analog out test top-level menu.
8.2.10 **Excitation out test** **Sub-menu Group**	Excitation out test	Press Enter to test the excitation output.
	ENTER	
	Excitation out test *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.
	ENTER	
	Excitation out test	Press Menu key to return to Excitation out test top-level menu.

8.2.11
Pulse out test
Sub-menu Group

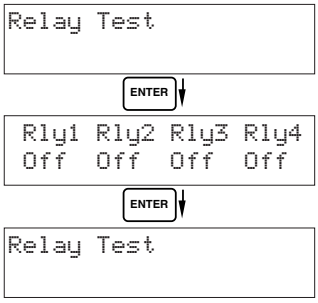


Press Enter key to test the pulse output.

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

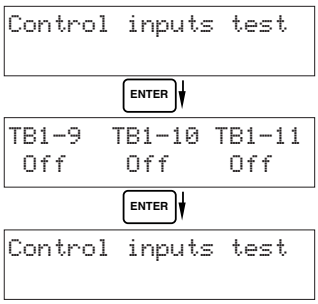


Press Enter to test the relays.

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

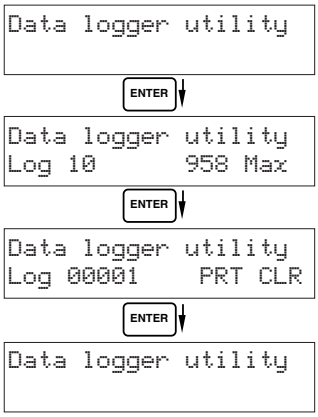


Press Enter to test the control inputs.

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 FUS-BC-T5-R160(Wickman 19372-030-k) or equivalent

fig. 1

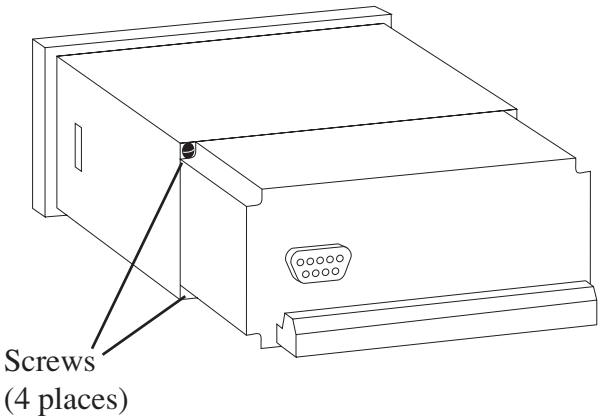
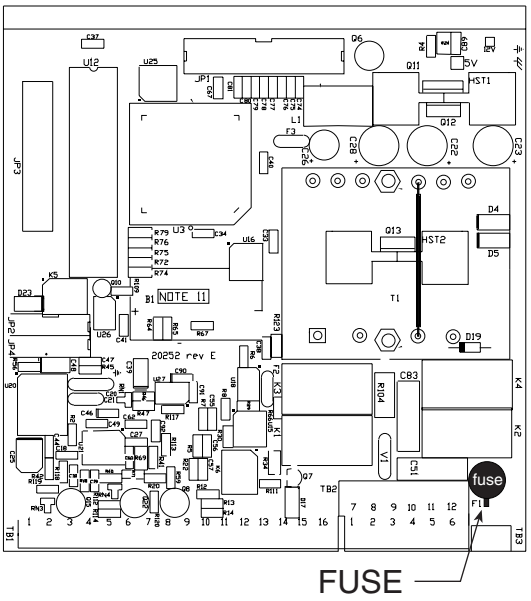


fig. 2



9. Glossary Of Terms

Acknowledge & Clear Alarms
Acknowledge 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 FTT. 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 FTT 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 FTT 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 FTT 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 FTT 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 FTT 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 FTT 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 FTT, 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 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 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 FTT.

Print Interval
The print interval allows the FTT 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 FTT 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 FTT 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.

10. Diagnosis and Troubleshooting

10.1 Response of FTT on Error or Alarm:

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

TYPE OF ERROR	DESCRIPTION
Sensor/Process Alarms	Errors detected due to sensor failure or process alarm conditions
Self Test Errors	Errors detected during self test.
System Alarms	Errors detected due to system failure

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.

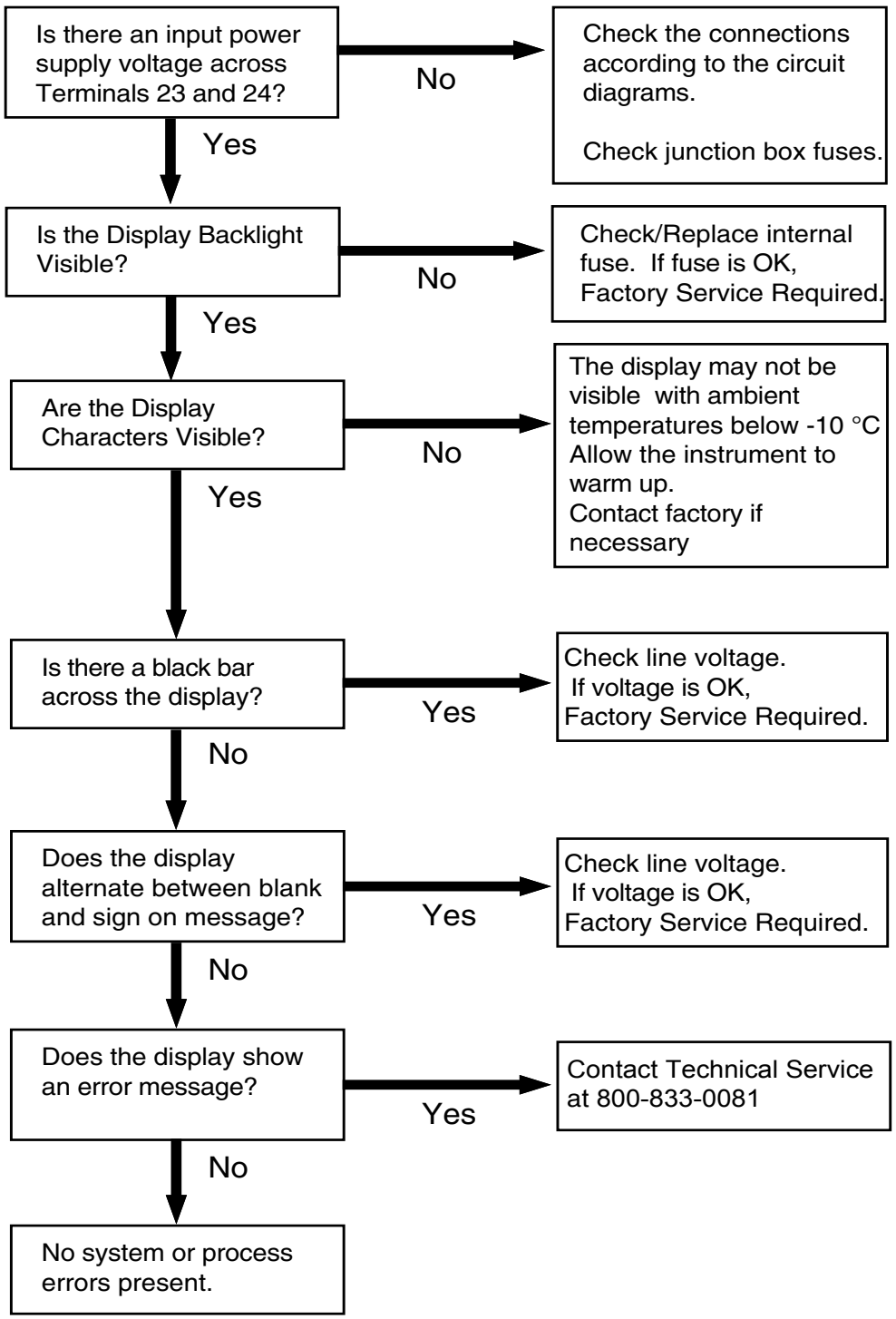
NOTE: A historical error alarm log is available in the "Test Mode".

The following descriptions suggest possible causes and corrective actions for each alarm message.

10.2 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.



10.3 Error & Warning Messages:

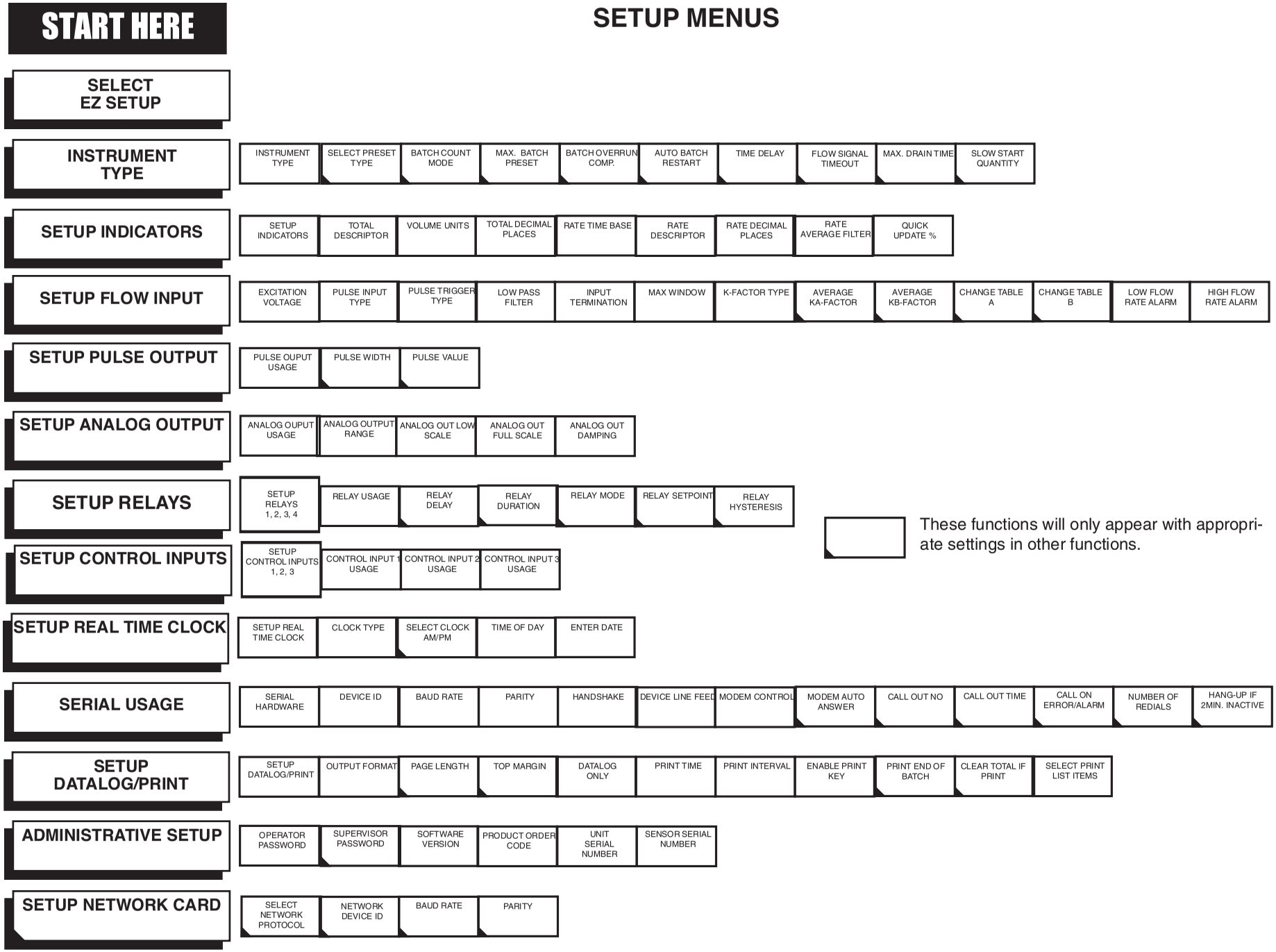
10.3.1 Sensor/Process Alarms

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

10.3.2 Self Test Alarms

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

SETUP MENUS


START HERE
SELECT EZ SETUP
INSTRUMENT TYPE
INSTRUMENT TYPE
SELECT PRESET TYPE
BATCH COUNT MODE
MAX. BATCH PRESET
BATCH OVERRUN COMP.
AUTO BATCH RESTART
TIME DELAY
FLOW SIGNAL TIMEOUT
MAX. DRAIN TIME
SLOW START QUANTITY
SETUP INDICATORS
SETUP INDICATORS
TOTAL DESCRIPTOR
VOLUME UNITS
TOTAL DECIMAL PLACES
RATE TIME BASE
RATE DESCRIPTOR
RATE DECIMAL PLACES
RATE AVERAGE FILTER
QUICK UPDATE %
SETUP FLOW INPUT
EXCITATION VOLTAGE
PULSE INPUT TYPE
PULSE TRIGGER TYPE
LOW PASS FILTER
INPUT TERMINATION
MAX WINDOW
K-FACTOR TYPE
AVERAGE KA-FACTOR
AVERAGE KB-FACTOR
CHANGE TABLE A
CHANGE TABLE B
LOW FLOW RATE ALARM
HIGH FLOW RATE ALARM
SETUP PULSE OUTPUT
PULSE OUPUT USAGE
PULSE WIDTH
PULSE VALUE
SETUP ANALOG OUTPUT
ANALOG OUPUT USAGE
ANALOG OUTPUT RANGE
ANALOG OUT LOW SCALE
ANALOG OUT FULL SCALE
ANALOG OUT DAMPING
SETUP RELAYS
SETUP RELAYS 1, 2, 3, 4
RELAY USAGE
RELAY DELAY
RELAY DURATION
RELAY MODE
RELAY SETPOINT
RELAY HYSTERESIS
SETUP CONTROL INPUTS
SETUP CONTROL INPUTS 1, 2, 3
CONTROL INPUT 1 USAGE
CONTROL INPUT 2 USAGE
CONTROL INPUT 3 USAGE
SETUP REAL TIME CLOCK
SETUP REAL TIME CLOCK
CLOCK TYPE
SELECT CLOCK AM/PM
TIME OF DAY
ENTER DATE
SERIAL USAGE
SERIAL HARDWARE
DEVICE ID
BAUD RATE
PARITY
HANDSHAKE
DEVICE LINE FEED
MODEM CONTROL
MODEM AUTO ANSWER
CALL OUT NO
CALL OUT TIME
CALL ON ERROR/ALARM
NUMBER OF REDIALS
HANG-UP IF 2MIN. INACTIVE
SETUP DATALOG/PRINT
SETUP DATALOG/PRINT
OUTPUT FORMAT
PAGE LENGTH
TOP MARGIN
DATALOG ONLY
PRINT TIME
PRINT INTERVAL
ENABLE PRINT KEY
PRINT END OF BATCH
CLEAR TOTAL IF PRINT
SELECT PRINT LIST ITEMS
ADMINISTRATIVE SETUP
OPERATOR PASSWORD
SUPERVISOR PASSWORD
SOFTWARE VERSION
PRODUCT ORDER CODE
UNIT SERIAL NUMBER
SENSOR SERIAL NUMBER
SETUP NETWORK CARD
SELECT NETWORK PROTOCOL
NETWORK DEVICE ID
BAUD RATE
PARITY
These functions will only appear with appropriate settings in other functions.

FTT-710 REINITIALIZE SEQUENCE

1. Remove power from the FTT-710 controller.
2. Press and hold the START and MENU keys while applying power.
3. Release keys when display indicated “FLOW COMPUTER INITIALIZING UNIT”.
4. Press the MENU key.
5. Display indicates “ENTER PASSWORD”.
6. Enter the 2000 and press the ENTER key.
7. Display indicates “SELECT OPERATE STATE”.
8. Select “TEST” by pressing the 5 key then ENTER.
9. Display indicates “AUDIT TRAIL”.
10. Press the STOP key and “ERROR HISTORY” is displayed.
11. Press the ENTER key.
12. Indicated errors can be cleared by pressing the CLEAR key.
13. Press the MENU key until the display indicates “SELECT OPTERATE STATE”.
14. Select “SETUP” by pressing the 3 key then ENTER. (see factory configuration table)

FTT-710 FACTORY PARAMETER SEQUENCE

1. Press MENU key
2. Enter password 0000 select the ENTER key.
3. Display indicates OK PASSWORD VALID.
4. At “SELECT OPERATE STATE” Press 3, select the ENTER key. (See manual page 18)
5. Display indicates SELECT EZ SETUP
6. Use STOP key to arrow down to SET UP INDICATORS, select the ENTER key.
7. Display indicates SETUP INDICATORS with TOTAL flashing, select the ENTER key
8. Display indicates TOTAL DESCRIPTOR with TOTAL on the screen, Select the ENTER key.
9. Display indicates TOTAL VOLUME UNITS with gal on the screen.
10. Change gal to lbs by pressing CLEAR then START key to arrow up to desired letter then select the ENTER key.
11. Display indicates TOT DEC PLACES (0-3) with 0 highlighted select the ENTER key.
12. Display indicates SETUP INDICATORS with RATE flashing, select the ENTER key.
13. RATE TIME BASE is displayed, select MIN by pressing “3”, select the ENTER key.
14. RATE DESCRIPTOR is displayed with RATE highlighted, select the enter key.
15. RATE DEC PLACES (0-4) is displayed with 3 highlighted, press CLEAR, select 1 then select the ENTER key.
16. RATE AVG FILTER is displayed, 0 is selected, select the ENTER key.
17. QUICK UPDATE % is displayed, 1 is selected, select the ENTER key.
18. Display indicates SETUP FLOW INPUT select the ENTER key.
19. EXCITATION VOLTAGE is displayed, select 12V select the ENTER key.
20. PULSE INPUT TYPE is displayed, select chA, select the ENTER key.
21. PULSE TRIGGER LEVEL is displayed, select 2.5V select the ENTER key.
22. LOW PASS FILTER is displayed, select 20KHz, select the ENTER key.
23. INPUT TERMINATION is displayed, with Pulldown highlighted , select the ENTER key.
24. MAX WINDOW (1.99) is displayed, 1 sec is selected, select the ENTER key.
25. K_FACTOR TYPE is displayed, select Avg, select the ENTER key
26. AVERAGE KA-FACTOR is displayed, press CLEAR. •Enter 11.6279 then select the ENTER key.
27. Select the ENTER key 2 times.
28. Display indicates SETUP PULSE OUTPUT, select the ENTER key.
29. PULSE OUTPUT USAGE is displayed, select Volume by pressing #5, select the ENTER key.
30. PULSE WIDTH is displayed, select 100 mS by pressing #5, select the ENTER key.
31. PULSE VALUE is displayed, press CLEAR.
32. Enter 110 then select the ENTER key.
33. Display indicates SETUP ANALOG OUTPUT, press the STOP (DOWN ARROW) key three times.
34. SETUP REALTIME CLOCK is displayed, select the ENTER key.
35. SETUP REALTIME CLOCK is displayed, select Time, select the ENTER key.
36. CLOCK TYPE is displayed, select 24HR, select the ENTER key.
37. TIME OF DAY is displayed, use arrow keys to change flashing digit, once the selected digit is correct, select the ENTER key, to get to the next digit until (CORRECT TIME OF DAY) is displayed, select the ENTER key.
38. SETUP REALTIME CLOCK is displayed, select Date, select the ENTER key.
39. Enter the date using XX,XX,XX (MONTH, DAY, LAST TWO DIGITS OF THE YEAR) format, select the ENTER key.
40. SERIAL USAGE is displayed, select the ENTER key.
41. SERIAL HARDWARE is displayed, select RS232, select the ENTER key.
42. DEVICE ID is displayed, select 1,select the ENTER key.
43. BAUD RATE is displayed, select 9600 which is not displayed yet so, select the ENTER key.
44. BAUD RATE is displayed, select 9600, select the ENTER key.

45. PARITY is displayed, select NONE, select the ENTER key.
46. HANDSHAKING is displayed, select NONE, select the ENTER key.
47. DEVICE LINE FEED is displayed, select (CR + LF), select the ENTER key.
48. MODEM CONTROL is displayed, select NO, select the ENTER key.
49. SETUP DATALOG/PRINT is displayed, select the ENTER key.
50. SETUP DATALOG/PRINT is displayed, select Config, select the ENTER key.
51. OUTPUT FORMAT is displayed, select Printer, select the ENTER key.
52. PAGE LENGTH (99 max) is displayed, enter 0, select the ENTER key.
53. TOP MARGIN (99 max) is displayed, select 3, select the ENTER key.
54. DATALOG ONLY is displayed, select No, select the ENTER key.
55. PRINT TIME is displayed, select the ENTER key with 00:00:00 displayed.
56. PRINT INTERVAL is displayed, select the ENTER key with 00:00:00 displayed.
57. ENABLE PRINT KEY is displayed, select YES, select the ENTER key.
58. CLEAR TOTAL IF PRINT is displayed, select NO, select the ENTER key.
59. SETUP DATALOG/PRINT is displayed, select Select_list, select the ENTER key. Use the UP (START) and DOWN (STOP) arrow keys to view list status. Press the print key (F3) to add or remove from the list. Items marked with YES will be added to the list, items marked with NO will be removed from the list. Select TOTAL, TIME, and GRAND to be printed on the ticket. Remove PRE1, PRE2, PRE3, PRE4 and RATE from the list of printed items. Press the ENTER key when the list is complete.

PARAMETER CONFIGURATION TABLE.

SETUP INDICATORS (See manual page 21)	
SETUP DESCRIPTOR	TOTAL
TOTAL VOLUME UNITS	LBS
TOT DEC PLACES	0
RATE TIME BASE	Min
RATE DESCRIPTOR	RATE
RATE DEC PLACES (0-4)	1
RATE AVG FILTER	0
QUICK UPDATE %	1
SETUP FLOW INPUT (See manual page 22)	
EXCITATION VOTAGE	12V
PULSE INPUT TYPE	ChA
PULSE TRIGGER LEVEL	2.5V
LOW PASS FILTER	20KHz
INPUTE TERMINATION	Pulldown
MAX WINDOW	1
K_FACTOR TYPE	Avg
AVERAGE KA-FACTOR	11.6279
LOW FLOW RATE ALARM	NA
HI FLOW RATE ALARM	NA
SETUP PULSE OUTPUT (See manual page 24)	
PULSE OUTPUT USAGE	Volume
PULSE WIDTH	100ms
PULSE VALUE	110
SETUP REALTIME CLOCK (See manual page 28)	
CLOCK TYPE	24HR
SELECT CLOCK AM/PM	CURRENT TIME
TIME OF DAY	CURRENT TIME
DATE: MONTH,DAY,YEAR	CURRENT DATE
SERIAL USAGE (See manual page 29)	
SERIAL HARDWARE	RS232
DEVICE ID	1
BUAD RATE	9600
PARITY	NONE
HANDSHAKING	NONE
DEVICE LINE FEED	(CR+LF)
MODEM CONTROL	NO
SETUP DATALOG PRINT (See manual page 30/31)	
OUTPUT FORMAT	Printer
PAGE LENGTH	0
TOP MARGIN	3
DATALOG ONLY	No
PRINT TIME	00:00:00
PRINT INTERVAL	00:00:00
ENABLE PRINT KEY	YES
CLEAR TOTAL IF PRINT	NO
PRINT LIST ITEMS	TOTAL,TIME,GRAND

IZMAG

Table of contents

Table of contents

Table of contents

1. General description

1.1. Preface

This documentation includes some information protected by copyright. Without prior authorization by **Anderson Instrument Company** this instruction manual is not allowed to be photocopied, copied, duplicated, translated, or recorded on data carriers (neither completely nor in extracts).

This instruction manual should be carefully read before the installation and operation of the device is started. It should be kept in the direct proximity of the device described and readily accessible to all persons concerned.
The safety instructions have to be strictly observed.
Anderson cannot assume any liability or legal responsibility for operating errors caused by the non-observance of these directions.

1.2. Structure and Identification of the device

This instruction manual refers to the integral all-in-one design of the electromagnetic flow meter.
The IZMAG™ is available in the following versions:
operated by DC power supply, integral version
operated by AC power supply, integral version

Integral version:
Transmitter and converter form a single unit.

This instruction manual does not deal with the Weights and Measures-approved versions of the flow meter.

1.3. Function

The electromagnetic flow meter, type IZMAG™, measures both the flow rate and the volume of liquid flows at a high precision.

The measuring device is suitable for measuring conductive liquids.

The IZMAG converter is a microprocessor based device that supplies the transmitter with a switched and regulated coil current.
The signal generated at the electrodes is amplified in the converter, conditioned and shown in the internal measuring registers both as flow rate and volume information.
Volume pulses (pulses per volume unit) are output for controlling and measuring uses.
The instantaneous flow rate is output as an analog signal of 0 or 4...20 mA according to the desired range of 0...100 %.

When leaving the factory, each device is adjusted such that only the power supply and any peripherals will have to be connected.

1.4. Technical data

1.4.1. Converter

Supply voltage: IZMAG™ DC: 9 - 32 V DC
IZMAG™ AC: 100 - 240 V AC, 50/60 Hz

Power consumption: 10 VA max. / 8 watts

Electrical fuse connection: AC power supply: T 500 mA
DC power supply: T 1.5 A

Digital pulse output: 3 x galvanically isolated optocoupler output
Maximum load: 32 V / 20 mA / pulse sequence: 1 kHz max.

Analog output: 0 or 4 - 20 mA (active or passive), maximum load 500 Ω
(optional) 4-20 mA passive output with Hart communication
Max.500 Ω load

Digital input: 1 x galvanically isolated optocoupler input;
9 - 32 V, Ri < 3.2 kΩ, activation: 9 - 32V DC,
1 kHz max.

Serial interface: RS485, CS3-Bus protocol

Ambient temperature: -20°C ... +55°C DC power supply
-20°C ... +45°C AC power supply

For further technical data please refer to item 5.3.

1.4.2. Transmitter in integral design

Transmitter		Integral version
Process connection:		Aseptic flange
Nominal widths:		DN 15, 25, 32, 50, 65, 80, 100
Optional product connections:		Tri-Clamp, Cherry I-line
Materials:	Meter tube:	Material no.: 1.4404 / AISI 316 L
	Liner:	PFA
	Electrodes:	Material no.: 1.4404 / AISI 316 L
	Housing:	Material no.: 1.4301 / AISI 304 (micro blasted)
Protection class:		IP67
Electrical connection:		Internal cable connection Calibration data included in the associated converter
Product temperature:		100°C max.
Cleaning temperature:		130°C for a maximum period of 30 minutes
Product conductivity:		5 µS/cm at a minimum
Admissible pressure:		0.1 bar absolute at a maximum at 20°C, 10 bar max.
Flow velocities:		0.1 - 10 m/s

1.4.3. Measuring ranges and error limits

Size	Total measuring range [gal/min]			Flow rate at a flow velocity of 1 m/s [gal/min]	Measuring tolerance ± 0.2 % *		Unit
15	.31	-	31	2.8	>	.31	Gal/min
25	.80	-	80	7.8	>	.80	Gal/min
32	1.3	-	130	12.8	>	1.3	Gal/min
50	3	-	300	30	>	3.0	Gal/min
65	5.2	-	525	53	>	5.2	Gal/min
80	8	-	800	80	>	8.0	Gal/min
100	12	-	1200	125	>	12.0	Gal/min

* see measuring accuracy 7.2

Safety instructions

Due to the great variety of possible uses, this instruction manual addresses the general application conditions.

Special cases such as extraordinary ambient conditions or special safety instructions require coordination with the manufacturer.

1.5. General remarks

1.5.1. Special attention of the user

This measuring instrument has been designed and built in consideration of a risk analysis and after a careful consideration of standards and technical specifications which correspond to a product which is state of the art and offers an optimum in safety.

In practical use, however, that degree of safety can only be obtained when all measures required in this respect will be really taken. It belongs to the user of the flow meter to plan such measures and to check and survey if they are really fulfilled.

In particular, the user has to ensure that:

- The measuring instrument is only used for the intended application as directed (also see the following chapter “Intended use”).
- The measuring instrument is operated in a correct and functioning condition and that especially the safety devices are regularly checked for their proper operation.
- The personal protective equipment required for the operating, maintenance, and repair staff is kept available and is used.
- The complete instruction manual in a legible condition is permanently available at the location of the measuring device.
- The device is operated, serviced, and repaired by sufficiently qualified and authorized personnel only.
- The personnel concerned are regularly trained for all applicable questions of the protection of labor and environment and familiarized with the instruction manual and especially the safety precautions included therein.

- All the safety and warning instructions attached to the measuring instrument are not removed and kept in a legible condition.

In case of problems that cannot be resolved by the user, contact the service department of **Anderson Instrument Co**.

1.5.2. General safety instructions

These safety instructions have to be strictly observed in order:

- To not endanger the safety of persons and environment
- To avoid any damages to the measuring instrument
- To prevent any faulty batches upon the production

The electric connection may only be carried out by persons who have got the necessary expert knowledge (e.g. trained electrical fitters or persons instructed in electrical engineering) and the necessary authorization from the user.

Unauthorized persons are not allowed to open a housing that shows this symbol!

Warning of dangerous voltage!

Important information

The wiring of the voltage supply and the inputs and outputs of the control circuits has to be carried out professionally in consideration of the up-to-date state of the art. Also refer to **chapter 5** “Installation”/”Electrical Connection”.

In particular, the following references have to be observed:

- Safety instructions
- Electrical connection data

1. All persons who are involved in the installation, commissioning, operation, service, and maintenance of the flow meter have to be qualified accordingly.
2. This instruction manual has to be strictly observed. The user of the flow meter has to guarantee that the personnel concerned has read and fully understood the instruction manual.
3. All kinds of work have to be done with utmost care and may be carried out by authorized and trained personnel only.
4. The instruction manual has to be available close to the flow meter, easily accessible to the operating staff.
5. Before starting any cleaning, conversion, service or maintenance work, the measuring device has to be switched off and disconnected from the mains power. This requires a device for separating all live wires, e.g. a 2-pole main switch in the control cabinet. The associated device has to be protected against unauthorized switching-on.
6. Before starting any service and maintenance work, the system has to be flushed with water and emptied. If the flow meter has to be removed from the pipe system, all pipelines will have to be previously emptied and protected by means of some appropriate emptying and shut-off measures.
7. The flow meter fulfils the general safety requirements according to EN 61010.

8. Never remove or put out of action any safety devices by modifications to the flow meter!
9. Do not touch any part of the flow tube while the measuring instrument is cleaned. Otherwise, you run the risk of getting burnt!
10. To minimize the danger of injury, the working area of the operator has to allow sufficiently free space.
11. The technical data according to the instruction manual, nameplate and, if available, the performance specification has to be considered.

If damage is done to the meter all warranties are void.

Dangers not resulting from the functionality of the device, but from the ambient and operating conditions prevailing at the place of application, have to be referred to in appropriate instructions to the operators and by the attachment of some danger signs!

The user of the device is exclusively responsible for the compliance with these instructions!

1.6. Intended use

The measuring instrument is only allowed to be used for the application that it has been designed, dimensioned and built for:

- the connection to an earthed monophase network or a direct current network (see the nameplate)
- in industrial areas according to EN 61000-6-2/4 for reasons of EMC

The intended purpose of the electromagnetic flow meter is the measurement of conductive liquids in the food processing industry and in the cosmetic, pharmaceutical and chemical industries.

This flow meter is *not* suitable for the measurement of hazardous, explosive, and combustible liquids of PED group 1.

Any modifications to the measuring device that might have an influence on the function and the safety devices of the flow meter are only allowed to be carried out by the engineering specialists or authorized persons of Anderson.

Possible misuse

Any utilisation being in contradiction to the above-mentioned application means an inadmissible misuse of the measuring instrument! In such a case Anderson does not assume any responsibility for the safety.

Anderson has to be contacted before the flow meter will be used for any different application, and after a careful investigation of all facts Anderson could possibly release the flow meter for the intended new application.

1.7. Special safety instructions and devices

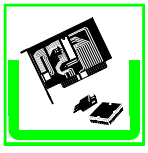
The following dangers could be directly or indirectly caused by the flow meter, type IZMAG, during operation or commissioning:

- Electric shock if the electronic housing is opened improperly
- Burns by touching hot pipe sections

- Scalds and/or chemical burns by hot liquids or gas coming out through leaking flange connections or because of an inexpert opening of the pipe system

1.8. Explanation of the safety symbols used

The IZMAG™ flow meters are reliable in operation and meet the highest technical specifications. They leave our factory at a safety-related flawless condition. The devices correspond to the relevant standards and directives according to EN 61010 “Electrical safety testing for measurement and laboratory devices”. However, a hazard can originate from the devices, if they are used inexpertly and not for their intended purpose. Therefore, strictly observe the safety instructions of this instruction manual which are marked by the following symbols:

 **Important information**	 **Hot caustic solution can cause serious chemical burns**	 **Caution**
 **Warning of dangerous voltage**	 **Warning against hand injuries**	 **Warning against hot surfaces**
 **Warning against hot liquids and steam**	 **Warning against irritating substances or media detrimental to health**	 **Warning against an increased risk of skidding in wet areas**
 **Endangered electrostatic component**	 **Electronic scrap**	

2. Transport

2.1. General information

The following points have to be respected in order to avoid damages to the measuring instrument or injuries during the transport of the device:

Caution

Transport work is only allowed to be carried out:

- By accordingly qualified and authorized persons
- By the aid of appropriate load suspension and fastening devices
- If any risk can be fully excluded while the device is lifted or conveyed

The packing of the measuring instruments is subject to the following labelling:

Fragile goods

Keep dry!

Check the added packing list before you will start opening the packing!
Compare by means of the packing list if all parts are really available or not!
Treat sensitive parts with special care!

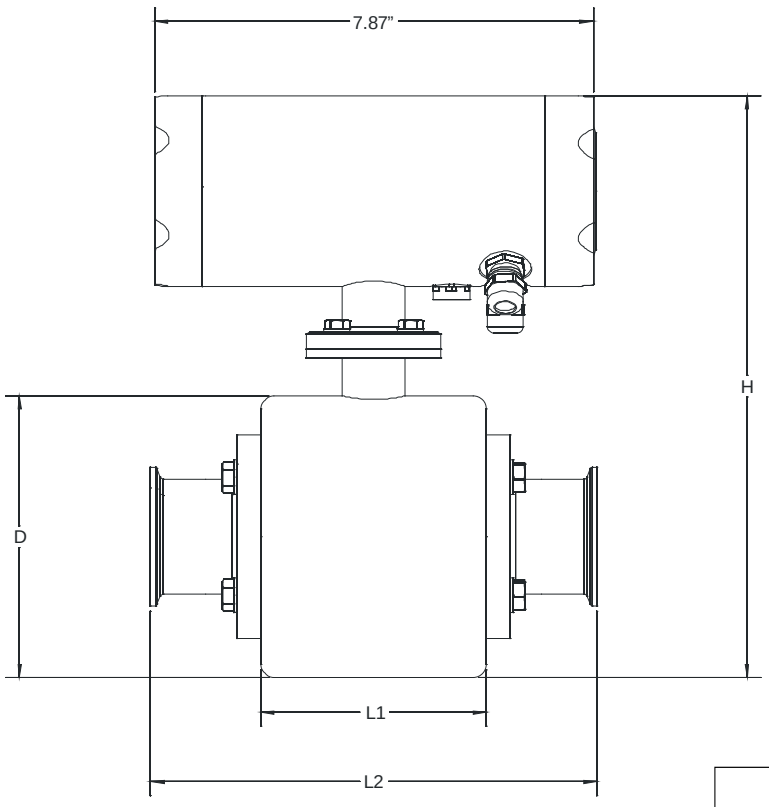
Please do not fail to dispose of the packing material according to the appropriate regulations.

2.2. Special notes

When removing the packaging film, see to it that no components of the device (such as display or keypad) are damaged.

2.3. Dimensions

2.3.1. Integral version



3. Application

3.1. Conditions required for the transmitter

The transmitter has to be installed in the product line and the converter has to be supplied with voltage.

When selecting the place for the installation of the measuring instrument you should in any rate ensure that the housing can be opened for service work whenever desired and that the flow meter can be simply removed, if necessary.

Cross-flows should be absolutely avoided, as they could cause some damages to the electronic part.

Caution

In order to protect the transmitter against damages, select the place of installation so that:

- the process pressure is always kept within the admissible operating pressure
- the product temperature is always kept within the admissible temperature
- the transmitter is mechanically levelled out (e.g. to avoid vibration)
- the meter tube can be emptied in case of the danger of frost
- the measuring instrument is not arranged straight above a gully or sink hole
- the connection housing is not permanently exposed to dripping water

3.1.1. Measuring of air and gas

The electromagnetic measuring instrument can supply perfect measuring results in case of **gas-free liquids** only. Air locks or deaeration in a liquid will lead to faulty measurements.
Thus, make sure that air locks or other possible parts of gas are eliminated before the measuring device e.g. by air eliminators or that deaeration can be excluded by a sufficient working pressure.

The measuring device is not damaged e.g. by air locks.

3.1.2. Solids

Normally, solids do not have any negative influence on the volume measurement.
The pipe diameter should always be chosen sufficiently large in order to prevent the meter tube from being clogged in case of products with solid particles.

Due to the fact that the flow velocity of solid matters is usually lower than that of the liquid part of the product, a higher flow fluctuation can be caused while the flow rate is measured.

The measurement of abrasive materials can cause a drifting of the measuring accuracies and, in the end, a deterioration of the transmitter.

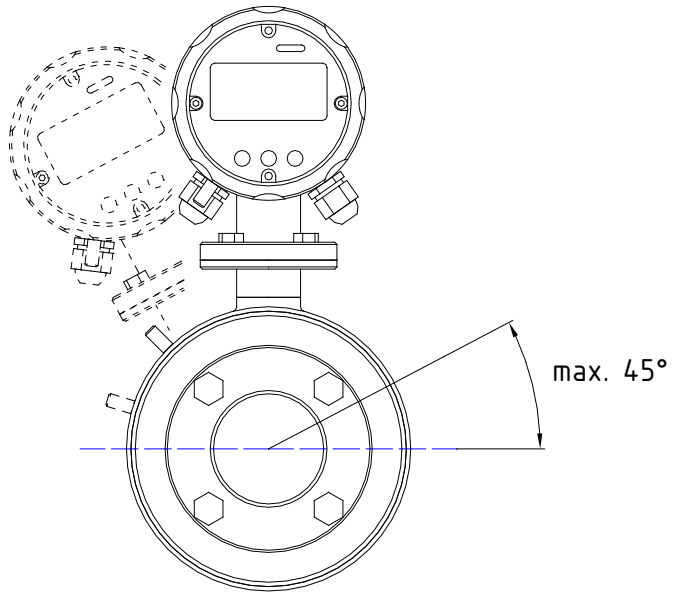
3.1.3. Mounting position – electrode axis

Due to the principle described, the fitting position – to a certain extent – can be selected any way desired. The basic condition for accurate measuring results is, however, a full and gas-free meter tube.
If possible, the electrode axis should be horizontally arranged, in order to avoid a deposition of gas bubbles or solid particles on the surface of the electrodes. Therefore, a slightly ascending pipeline is advisable, preferably with a deaerating possibility at its highest position.

The fitting position should be chosen in such a way that a good readability and handling of the operating unit is guaranteed.

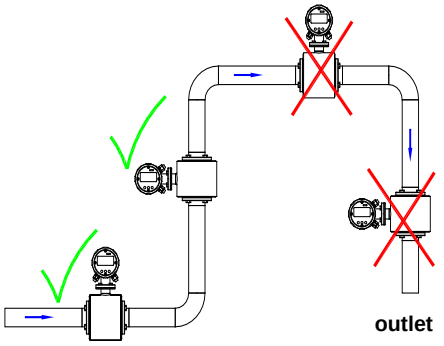
The pipelines within the inlet and outlet pipe sections must not show any unevenness, e.g. welding beads internally.

In the case of 3-A applications, the transmitter **should not** be mounted below the center line of the flow tube.



Electrode axis

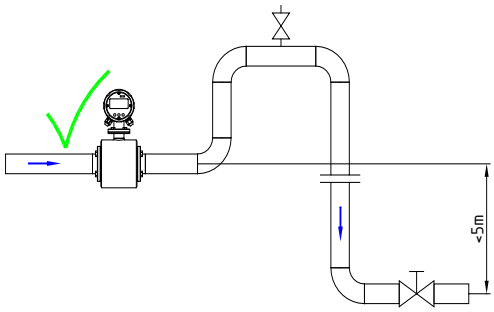
General Installation Requirements



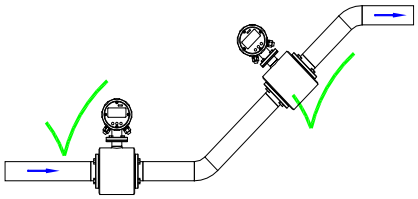
Wrong
At the highest point of the pipeline. Gas bubbles accumulate in the transmitter. → incorrect measurement!

Wrong
Descending pipe:
At the end of the conveyance of the metered product the pipe runs empty. → Measuring errors!

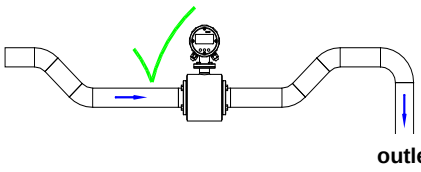
Correct
Preferred mounting position:
Rising pipeline and horizontal pipe section before an



Descending pipelines of a length of more than 5 m have to be equipped with a deaeration valve after the flow meter.

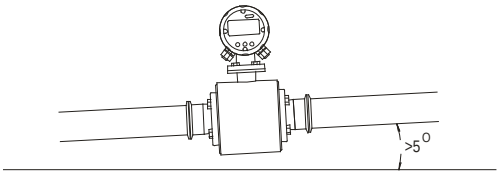


Correct
In case of a horizontal pipe the mounting position is placed in slowly rising section to ensure fill.



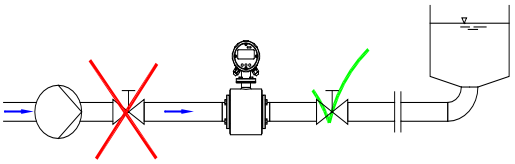
Correct
Provide a low spot in the pipe line to maintain pipe line fill.

Installation requirements for 3-A sanitary applications

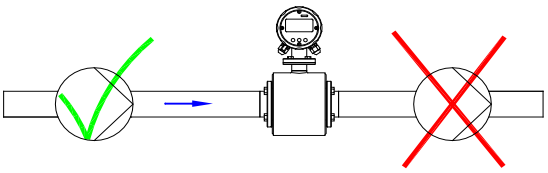


Correct
In horizontal applications a slope of greater than 5 degrees is required to ensure that proper drainage occurs in the pipeline

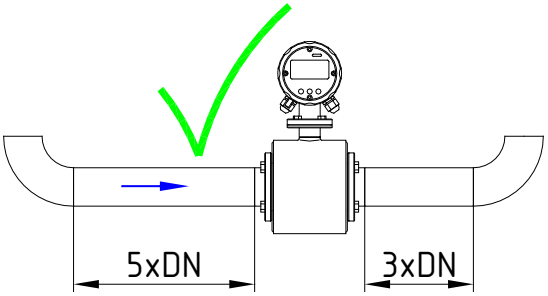
Other Installation Considerations



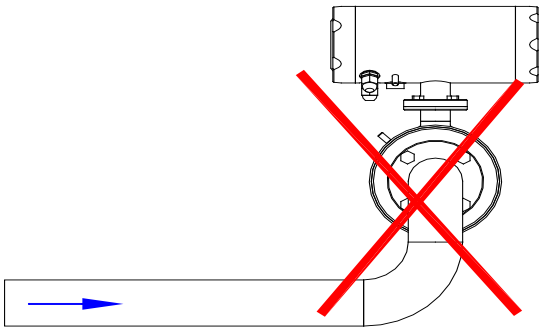
Long lines **after** the flow meter always have to be equipped with a shut-off device. If it is placed before the flow meter, a vacuum will be caused in the metering pipe by the big kinetic energy in the liquid column when shutting off. This can damage the lining of the tube and should be avoided!



Do not place the flow meter on the suction side of the pump! → **Danger of negative pressure!**



Keep the recommended inlet and outlet sections!



Avoid curvatures of space before the flow meter!

3.1.4. Inlet and outlet pipe sections

For the installation of electromagnetic transmitters DIN 1944 recommends an inlet pipe section of 5 x DN and, accordingly, an outlet pipe section of 3 x DN in case of an undisturbed flow. For an irregular flow (e.g. distorted rotational flow profile) the inlet and outlet pipe sections have to be extended accordingly or a rectifying device for the flow has to be installed in order to guarantee the specified measuring accuracy.

3.1.5. Conductivity conditions

The liquid to be measured has to show a minimum conductivity of ≥ 5 µS/cm.
Demineralised water requires a conductivity of ≥ 20 µS/cm.
A count suppressor for empty meter tubes belongs to the standard equipment of the converter. That function will have to be switched off at conductivities below 50 µS/cm.

3.1.6. Interference fields

Direstly at the transmitter masses of iron or strong permanent or electromagnetic fields must absolutely not exist, as they could influence the defined exciting magnetic field, thus falsifying the signal.

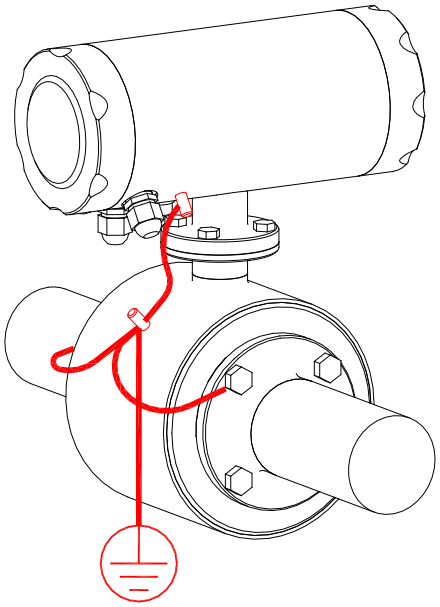
3.1.7. Earthing/grounding conditions

A ideal earthing/grounding of the transmitter is an essential requirement for a reliable and accurate measurement.

“Inductive measuring method” means that the metered liquid itself acts as an electric conductor, i.e. a correct and careful earthing/grounding ensures that no additional potentials will falsify the extremely low metering signal.

For that reason, the earthing/grounding resistance has to be smaller than 10 Ω. The earth/ground wire used must not transfer any interference voltages, i.e. no other electric devices must be connected to that line.

In case of a plastic pipe system no equipotential bonding is available between the inlet and outlet sides, it will be necessary to take some appropriate measures for a potential equalisation.



The transmitter has to be earthed/grounded as shown in this picture.

3.1.8. Meter tube lining

A damaged PFA lining can cause faulty measurements or even a failure of the flow meter.

Choose the place of installation in such a way that no negative pressure can be caused, even not when the pump is switched off. An installation at the highest point of the pipeline has to be avoided!

3.2. Flow direction

The arrow on the nameplate shows the calibrated flow direction from MINUS to PLUS.

The flow meter can measure in both directions, in principle.

Provided that the recommended inlet and outlet conditions are kept, the accuracy of the measurement in both directions is only slightly different.

3.3. Conditions required for the converter

Caution

In order to guard the converter against damages, always select the place of installation so that:

- the ambient temperature is within a range from –20...+55 °C
- the field housing is fastened free from any mechanical distortion
- no moisture can enter the field housing through the cable gland
- the housing is not permanently strained by dripping water

Apart from that, please ensure that the housing can be easily opened for service purposes. The converter has to be installed in such a way that reading and operation of the unit is guaranteed!

4. Installation

Only qualified personnel with the authorization of the user are allowed to carry out the installation work. The qualified personnel have to have read and fully understood this instruction manual and follow all instructions given therein.
The current accepted practices must always be considered during the installation.

The following points should be taken into account after completion of the installation work:

- It has to be checked whether all external supply connections really meet the requirements specified in the technical data of the flow meter (e.g. pressure, temperature, etc.).
- The pipelines have to be flushed before the production is started.
- All external supply joints have to be checked for their safe, leakproof, and nearly stress-free connection to the transmitter.
- The media supplied have to be cautiously adjusted to their required working pressure.
- Occurring leaks have to be removed immediately.
- All electrical lines have to be remote from the flow meter before welding work is started at the pipeline.

The electric wiring of the voltage supply and the inputs and outputs of the control circuits has to be carried out according to the wiring diagram.

4.1. Installation instructions for the transmitter

Caution

Pay attention to the fact that the threaded fittings, clamps, or flanges are correctly tightened! Otherwise, hot or caustic solutions or gasses could come out of the gaps and clearances.

- Leaking liquids can lead to slip hazard.
- Leaking liquids have to be mopped up immediately and disposed of safely.
- If combustible liquids come out, they could cause an explosion hazardous area around that place which has to be marked accordingly.

If the transmitter is connected to existing process lines, those lines have to be unpressurized and free from product.

Do not omit to insert the gaskets into connections!
In case of leaking pipe connections you should check the seals.

After installation of the measuring device you should not fail to ensure optimum earthing/grounding, if some welding work is required.
The best solution is to separate the complete measuring device from the network and to allow an electrically conductive bridging-over of the pipe connections of a possibly large cross section.

Lead the mass electrode of the welding device as close as possible to the welding seam in order to avoid any stray currents within the pipe system and the measuring device!

Always fix the mass electrode of the welding device at the side of the welding seam opposite to the measuring device (in that case the current will flow away from the measuring device)!

4.2. Installation instructions for the converter

When installing the flow meter, pay special attention to the fact that no moisture by drip or splash water can get onto the electronic board.

Metal particles, such as scobs or residues of the shielding braid, have to be removed from the boards before the electric power supply is switched on.

See to it that the pipelines are supported in such a way that no forces and moments are exerted on the measuring device.

Caution

The display must not be exposed to direct sunlight!

4.2.1. Installation of the electrical power supply

Caution

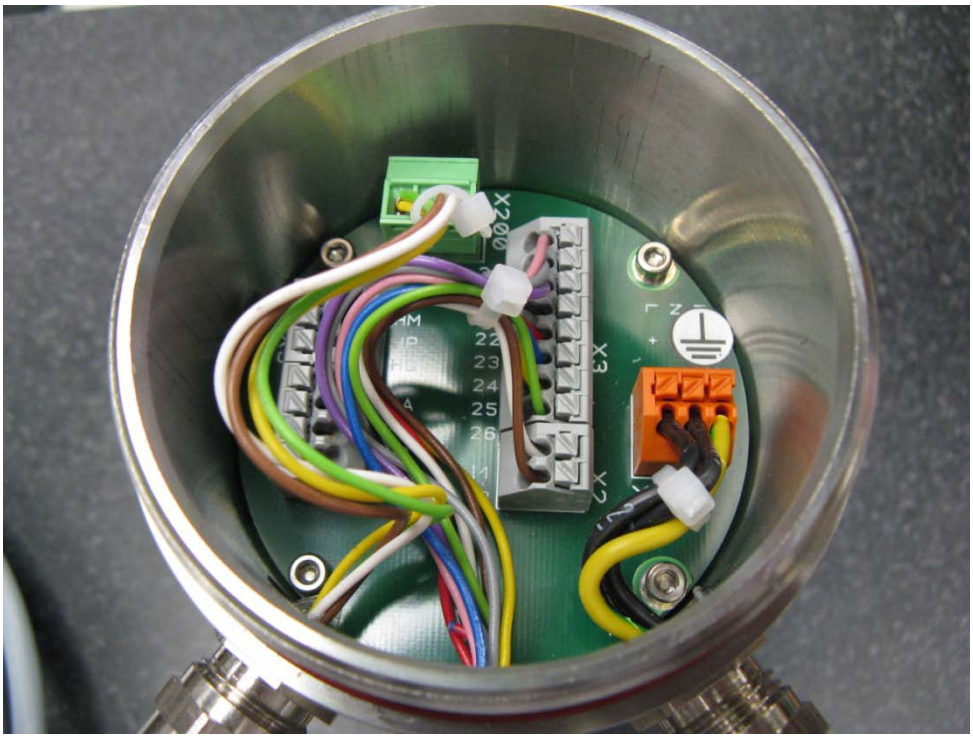
The following safety precautions have to be followed for the execution of the electrical installation work:

This equipment must be connected to a wiring system in accordance with ANSI/NFPA 70, NEC with CSA C22.1, CEC, Part 1

Intended use

The flow meter, type IZMAG, is exclusively destined for:
- The connection to an earthed/grounded monophase network
- The use in industrial areas for reason of EMC (according to definition EN 50 081-2)

Apart from that:
- The supplying system has to guarantee an overvoltage protection for the device according to category II.
- The connection cables have to be secured by a cable strap (AC version) as shown in the photograph on the next page.



Staff qualification

Necessary work to the flow meter, type IZMAG, is only allowed to be performed by trained and qualified personnel in consideration of the relevant regulations for occupational safety. The flow meter has to be correctly connected according to the electrical wiring diagrams.

The nameplate of the flow meter has to be considered for the electrical connection. It is most important that the nominal voltage and the kind of voltage (AC or DC) are equal to those of the flow meter.

Important information

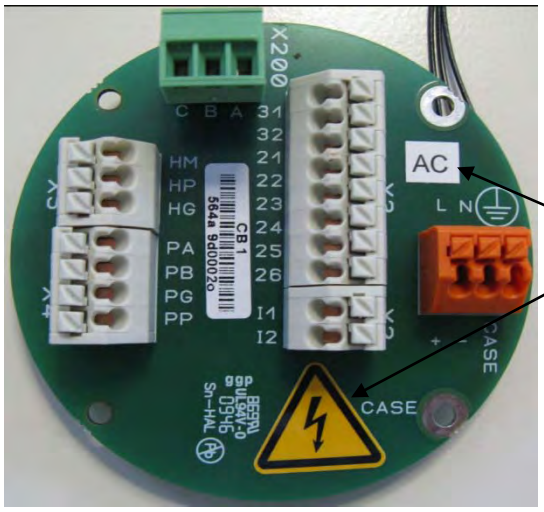
The electrical power supply is connected to terminal X1:

Connection of the AC power supply:

L line	to	X1 / L
N line	to	X1 / N
Protective conductor	to	X1 / PE

Connection cable: ÖPVC-JZ 3G0.75mm², 18 ga. minimum external diameter: 5.7mm

The terminal board is marked by additional AC stickers.



Indicating labels for the AC version

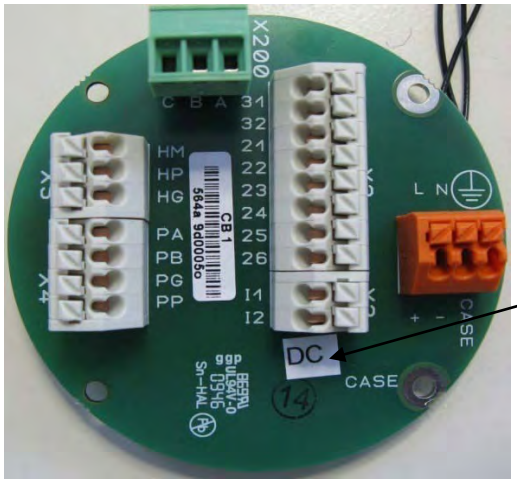
Connection of the DC power supply:

Positive cable (plus)	to	X1 / +
Negative cable (minus)	to	X1 / –
Protective conductor	to	X1 / Case

In case of the DC version the protective conductor has to be connected, too.

Connection cable: ÖPVC-JZ 3G0.75mm² (18ga.), Minimum external diameter: 5.7mm

The terminal board is marked by an additional DC sticker.



Indicating label for the DC version

The shielding braid has to be correctly connected to the cable gland in order to guarantee an optimum operation of the device according to the EMC directives.

Caution

In case of hard-wired devices without any mains switch it is **absolutely necessary to install a 2-pole switch** or a power switch in the structure of the building. That switch has to be fixed in the direct vicinity of the device, easily accessible to the user and clearly marked as a disconnecting or isolating switch for the device.

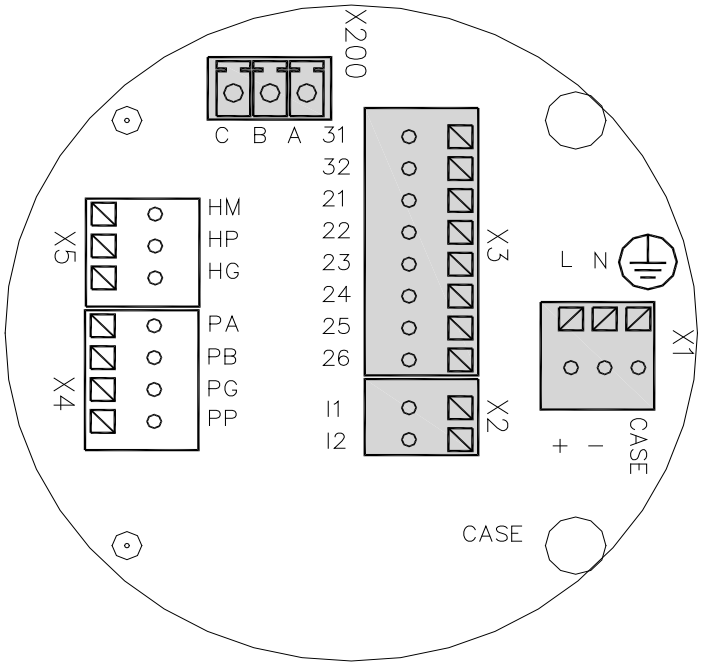
This meter can be supplied by different voltages. The supply voltage type and range is indicated on the nameplate.

4.3. Electrical connection of peripherals

The following signal outputs are available:

3 x digital outputs, configurable for volume pulses and status output
1 x digital input, configurable for measuring interruption or setting to zero
1 x analog current output for the flow rate, configurable for:
0...20 mA/active, 4...20 mA/active, and 4...20 mA/passive
1 x CS3BUS interface (RS485 interface with AndersonCS3-Bus protocol)

The measured values of the IZMAG™ are usually put out as volume pulses (pulses per gallon) through a digital pulse output:



X200 → CS3BUS, data communication
X2 → Analog output / current output
X3 → Digital outputs and digital input
X1 → Connection of the power supply

4.3.1. Digital output

Digital output	
Hardware	Optocoupler, passive
Auxiliary voltage	32 V max.
Output current	20 mA max.
Voltage drop at the optocoupler at 20 mA	0.5…1 V
Output frequency	1kHz max.

The following figure shows the basic wiring diagram of the pulse outputs.
The outputs switch off in case of overload. By removal of the overload the outputs will be reactivated after a few seconds.

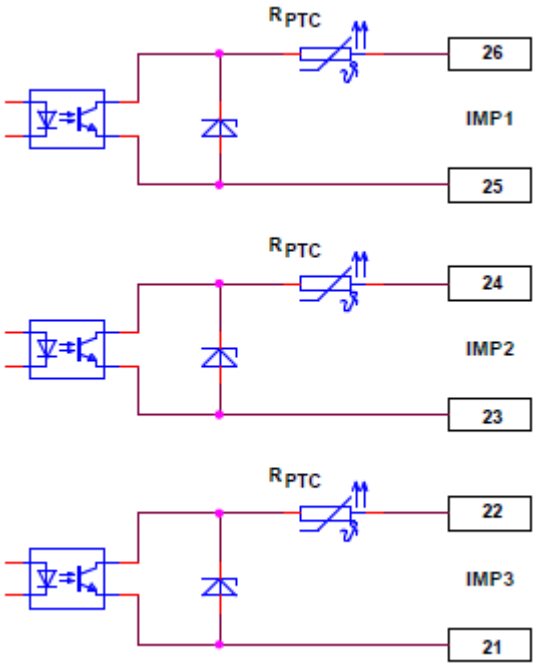
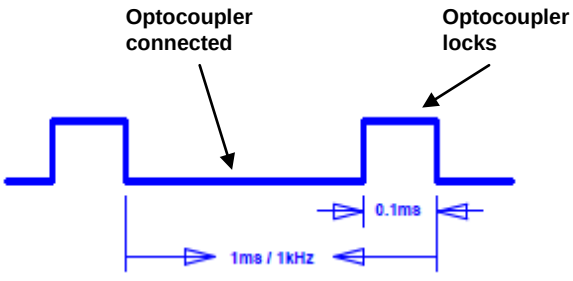


Figure 2: **Pin assignment of the pulse outputs**



Output signal at 1 kHz

The pulse duty cycle depends on the load, too. An electronic counter has to have an input frequency of at least 5 kHz.

4.3.2. Digital input

Digital input	
Hardware	Optocoupler, passive
Auxiliary voltage	9…32 V
Input resistance	< 3.2 kΩ
Input frequency	1kHz max.
Function	Voltage ON → Function active
Terminal X3 / No. 32	Plus
Terminal X3 / No. 31	Minus

The following figure shows the basic wiring diagram of the control input:

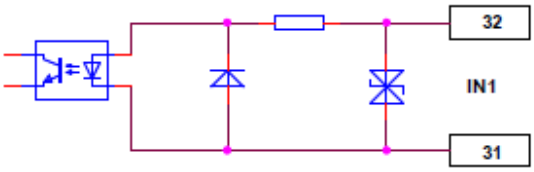


Figure 3: **Pin assignment of the digital input**

4.3.3. Analog output - current output

Analog output	
Hardware mode	Active or passive
Operating mode	4...20 mA / 0...20 mA
Load	500 Ω max.
Error	< 0.2 %

The analog output works in both flow directions!

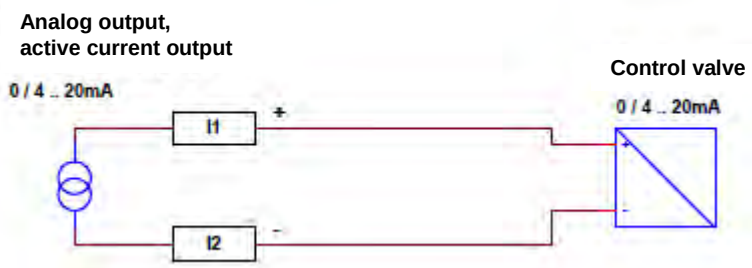


Figure 4: Pin assignment of the active current output

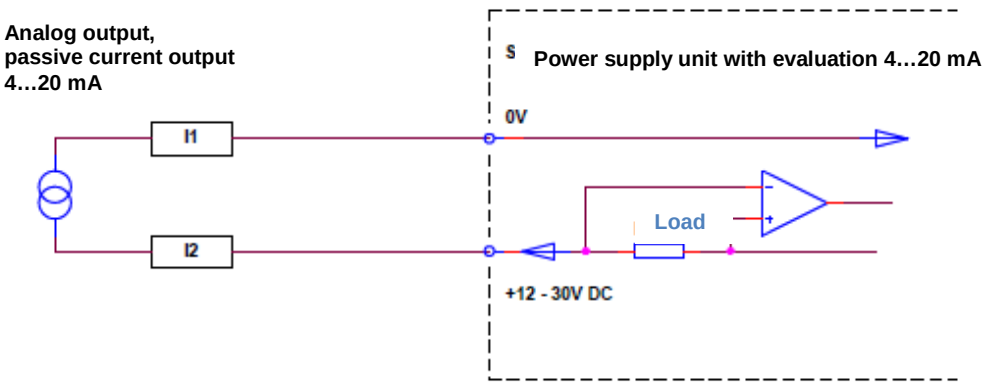


Figure 5: **Pin assignment of the passive current output**

4.3.4. CS3-Bus

CS3-Bus	
Hardware interface	RS485
Bus protocol	AndersonCS3-Bus protocol
Baud rate	57600 Bauds
X200 / A	Signal A
X200 / B	Signal B
X200 / C	GND
Cable length	100 m max.
Cable	LIYCY-0; 4 x 0.5 mm², shielded

The BUS is connected by a 3-pole plug-in terminal with the signals "**A-B-C**".
Further BUS connections are always made 1 to 1, i.e. A is connected to A, B to B, and C to C.

A BUS interface is available for a data communication. It can be used for the connection of the IZMAG™ to the **IVON** service program.

5. Commissioning

5.1. General information

This measuring device may only be operated by trained persons who have got the necessary authorization from the owner of the device. The operators have to be familiar with the process sequence, able to recognize possible dangers, and in a position to take the necessary steps for the removal of accident risks.

Safety measures for the commissioning work

Caution

Both an orderly performed installation and a correct electrical connection are absolute prerequisites for commissioning!

Pay attention to the following points upon the initial start-up of the flow meter:

- Close the housings of transmitter and converter!
  - Personal injury by electric shock can be caused, if the electric lines are touched.
  - Instrument damage can be caused by moisture or metal parts on the electronic unit.
- Ensure that all threaded joints at the measuring instrument and in the direct vicinity are properly tightened.
-

5.2. Advice for starting-up the IZMAG

1. First of all the measuring device has to be installed into the pipeline!

- Pay attention to the flow direction.
- The flow range adjusts itself automatically.
- After the electrical start-up a "**ZERO adjust**" should be carried out by means of the typical liquid to be measured (full meter tube and **no** flow!).

2. How to put into operation the analog output?

- The output can be parameterized specific for the application and it can be operated actively of passively. The current range can be adjusted to 4...20 mA or 0...20 mA. Factory setting: 4...20 mA.
- Dependent on the flow rate, the analog output will produce a current of 0/4...20 mA.
- The 20mA point is determined by setting the "QMAX value of the IZMAG.
- The flow simulation can be used for a functional check.

3. Which other conditions should be taken into consideration?

- Too low product conductivity?
  At less than 50 µS/cm, the internal empty-pipe detection has to be switched off by the respective parameter setting.
- Is the analog output too unsteady?
  A time constant can be set using the "Average" or TP3 parameters.

5.3. Basic settings upon delivery

At the factory the electromagnetic flow meter is adjusted and delivered with application specific settings as standard.

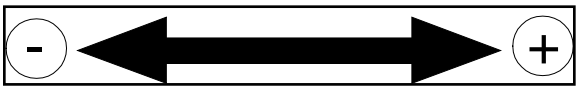
5.3.1. System structure and operating elements

The electronics are permanently installed in the IZMAG™ converter. The display is arranged on the front above the three optical keys. The electrical connections are on the rear side of the converter.
The status of the device can be read on the display.

5.4. Flow direction

The IZMAG™ measures the flows in both flow directions in principle.

The main flow direction is marked by ⊕ on the transmitter.



In the standard setting (output mode 1), the digital outputs release the volume pulses independently of the flow direction.

Negative flows or quantities are displayed with a MINUS sign.

5.5. Zero point adjustment ("ZERO adjust")

Upon the first start-up of the flow meter it is recommendable to carry out a **zero point adjustment** ("**ZERO adjust**") for an adaptation of the flow meter to the conditions prevailing in situ.
Normally, such an adaptation is not required for the integral flow meter version.

ATTENTION! The following conditions have to be observed for a "**ZERO adjust**":

(1) The device has to have reached its working temperature, i.e. it should have been switched on at least 5 minutes before.

(2) The transmitter has to be completely filled with the typical liquid free of air.

(3) **No flow** is allowed to occur during the whole "**ZERO adjust**" measurement.

5.6. Metering interruption (assignment of the digital input)

To externally interrupt the measurement, e.g. during cleaning, a digital signal can be connected to input **IN1** on the terminal board.
The input is activated by a DC voltage between 9 V and 32 V DC at terminal **X3** with PLUS to **no. 32** and MINUS to **no. 31**.
This function has to be switched on by the parameter settings.

5.7. Metering with an empty meter tube

Metrologically accurate flow measurements are only possible, if the meter tube is completely filled with liquid.
In order to avoid an undefined counting in case of an empty meter tube, the IZMAG™ offers both an **internal** and an **external** possibility for measurement suppression:

5.7.1. Internal "EMPTY pipe detection"

The IZMAG™ is equipped with a special "EMPTY pipe detection" ("**pipe detect**"). The setting is made via the parameters. Usually, the EMPTY pipe detection is switched on, i.e. an undefined count will be suppressed in case of an empty meter tube.

At the following situations, the internal EMPTY pipe detection has to be switched off by the parameter setting:

- At a product conductivity of less than 50µS/cm.
- At a heavily pulsating flow (piston, membrane or hose pumps).

5.8. Metering at low conductivities

The IZMAG™ is capable of measuring liquids from a minimum conductivity of 5 µS/cm. In order to obtain perfect results even at conductivities of less than 50µS/cm, the internal "EMPTY pipe detection" has to be switched off in the parameters.

5.9. Use of the internal BUS interface

Via the BUS interface it is possible to connect the intelligent AndersonCS3 systems to the IZMAG™.

6. Operation

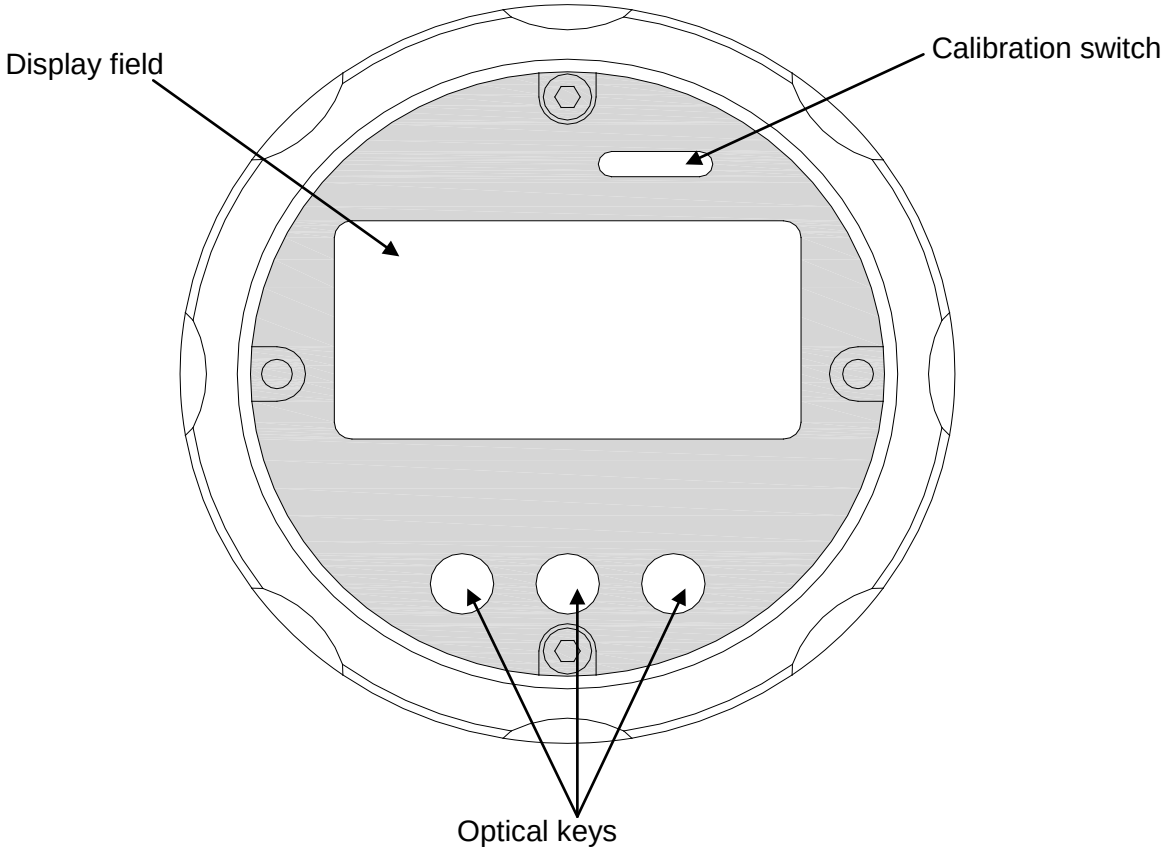
Only qualified persons with authorization of the user are allowed to operate the IZMAG™.

During normal measurements the operation is restricted to the zero reset of the volume registers. The keypad is dynamically controlled by the image navigator.

The display unit can be rotated in steps of 90°, thus enabling a proper orientation for viewing and operating the meter.

The display is illuminated by a permanently switched on background lighting which permits a stress free reading.

Elements of the operating unit:



6.1. Basic keypad functions

The keypad consists of 3 optical keys. The functions of the keys are indicated by symbols and texts. The function of the keypad is dynamically controlled by the image navigator:

^^^^^^ To change the main image level

HOME To return to the main image level or to the measuring image

>>>> To change to the next sub-image

ZERO To reset the volume to zero

++ To change the setting parameters, e.g. to change the pulse mode
This is only displayed, if the parameter setting is enabled.

change To change the numerical parameters, e.g. low flow quantity
This is only displayed, if the parameter setting is enabled.

Key functions for the value input (numerical parameter):

<< Next input position

++ Changes the input position

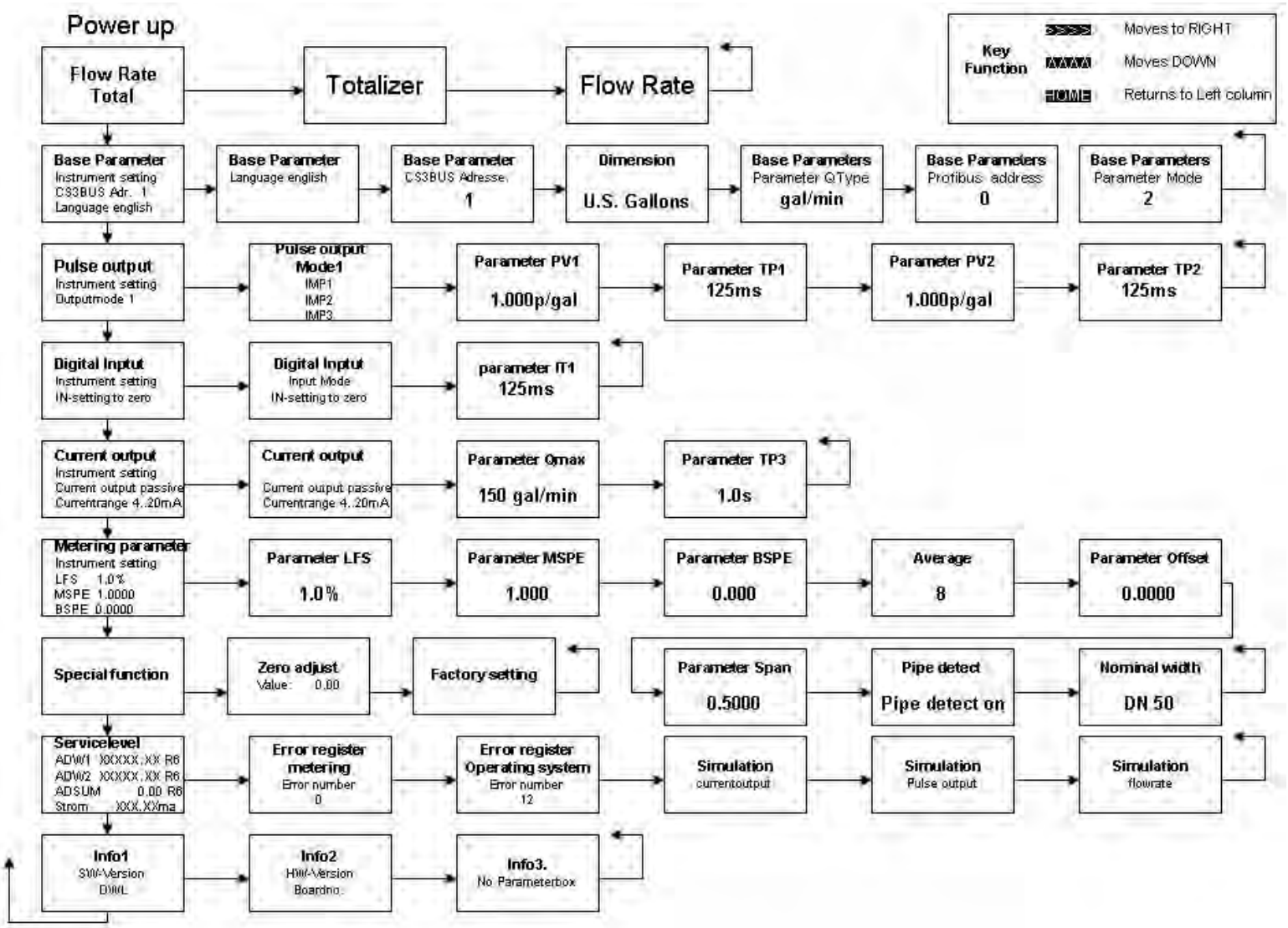
← ENTER, terminates the numeric input

6.2. Image navigator

The display is divided into **main images** and **sub-images**. Sub-images are allocated to each main image level.
To permit a quick overview of the parameterization the main image shows the most important parameters and settings for the adjustment of the device.
The basic setting of the image navigator is the measured value level where the volume and the flow rate are displayed. A timeout function makes sure that the IZMAG™ always returns to that image level.
The image navigator is controlled by the keys ^^^^^^, >>>> and HOME.

Basic functions of the image navigator:

- Reading the measured values
- Selecting the different functions
- Parameterization
- Service display


Power up
Flow Rate Total
Totalizer
Flow Rate
Key Function
Moves to RIGHT
Moves DOWN
HOME
Returns to Left column
Base Parameter
Instrument setting
CS3BUS Adr. 1
Language english
Base Parameter
Language english
Base Parameter
CS3BUS Adresse
1
Dimension
U.S. Gallons
Base Parameters
Parameter QType
gal/min
Base Parameters
Profibus address
0
Base Parameters
Parameter Mode
2
Pulse output
Instrument setting
Outputmode 1
Pulse output
Mode1
IMP1
IMP2
IMP3
Parameter PV1
1.000p/gal
Parameter TP1
125ms
Parameter PV2
1.000p/gal
Parameter TP2
125ms
Digital Input
Instrument setting
IN-setting to zero
Digital Input
Input Mode
IN-setting to zero
parameter IT1
125ms
Current output
Instrument setting
Current output passive
Currentrange 4..20mA
Current output
Current output passive
Currentrange 4..20mA
Parameter Qmax
150 gal/min
Parameter TP3
1.0s
Metering parameter
Instrument setting
LFS 1.0%
MSPE 1.0000
BSPE 0.0000
Parameter LFS
1.0%
Parameter MSPE
1.000
Parameter BSPE
0.000
Average
8
Parameter Offset
0.0000
Special function
Zero adjust
Value: 0.00
Factory setting
Parameter Span
0.5000
Pipe detect
Pipe detect on
Nominal width
DN 50
Servicelevel
ADW1 XXXXX.XX R6
ADW2 XXXXX.XX R6
ADSUM 0.00 R6
Strom XXX.XXma
Error register
metering
Error number
0
Error register
Operating system
Error number
12
Simulation
currentoutput
Simulation
Pulse output
Simulation
flowrate
Info1
SW-Version
DWL
Info2
HW-Version
Boardno.
Info3.
No Parameterbox

6.3.

6.3.1. Zero reset of the volume counter

The main image shows the total. “Zero reset” is a function which can be carried out without any additional activation.
For a zero reset, please keep the ZERO key depressed for about 5 seconds.

6.3.2. How to delete malfunction messages

Possible malfunction messages are deleted by resetting the volume counter.

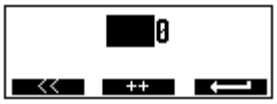
6.3.3. Parameter change

There are two kinds of parameters, in principle:
- **Selected parameters**, e.g. pulse mode
- **Numerical parameters**, e.g. TP1

A setting parameter is changed by the ++ key. The change key opens an input field for the entry of the numerical parameter selected.
A parameter change is only possible, if it has been unlocked before. Unless it is unlocked, the input of the unlock code is requested automatically.

How to change a numerical parameter:

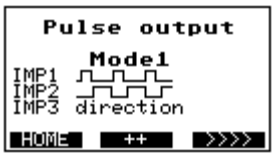
Press the change key and an input field will appear. The instantaneous value is shown inversely, whereas the changeable position is shown as normal.



The ++ key changes the digit in the input position. The next left-hand input position is selected by the << key. If the numerical parameter is set to the desired value, then accept using the ↵ key.

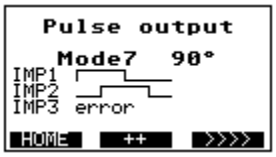
How to change a selected parameter:

The procedure is described by means of the example of the “pulse mode”.



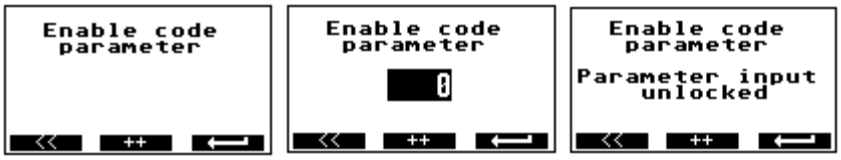
The current pulse output mode is set to “Mode 1”. The next mode is selected and/or adjusted by means of the ++ key.

The next pulse output mode appears on the display.



6.3.4. How to release a parameter change:

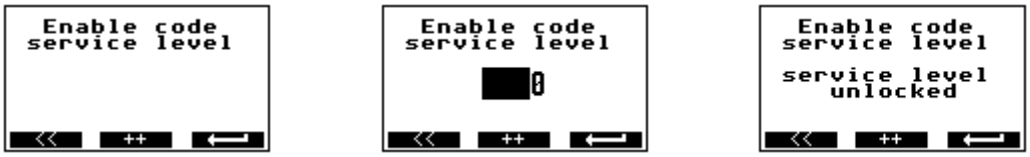
If a parameter has to be changed and the parameter change is open for change, the display will request the input of the code number.



Input the code number as described in item 7.2.3. If the correct code number has been input, the display will show the message “Parameter input unlocked”. In case of a wrong code number the display will show “parameter input blocked”.
Code number for parameter changes: **222.**

6.3.5. How to release the service functions:

Some service functions have to be released by a code number. Unless they are released, the display will show a request to input the code number.



Input the code number as described in item 7.2.3. If the correct code number has been input, the display will show the message "Service level unlocked". In case of a wrong code number the display will show "Service level blocked".
Code number for the service level: **333.**

6.3.6.

6.4. Image level: Measured values

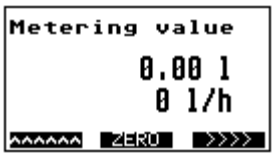
6.4.1. Measured value: Volume

A 4-seconds long activation of the ZERO key will reset the volume to “0”.
The size of the digits is controlled by the size of the measured value.
The volume indication is the central image that is always shown after a reset.

6.4.2. Measured value: Flow rate

The size of the digits depends on the size of the measured value.

6.4.3. Measured value: Flow rate and volume



Joint indication of volume and flow rate

6.5. Image level: Base parameters

The image level consists of the following pictures: BE2, BE2S1, BE2S2, and BE2S3.

This image level offers the possibility to make some basic settings. The main image shows the current device setting.

6.5.1. Language

Use the key ++ for changing the language.
You might be prompted to first input an unlock code.

6.5.2. CS3Bus address

The CS3-Bus address can be changed by means of the key ++.
You might be prompted to first input an unlock code.

6.5.3. Dimension

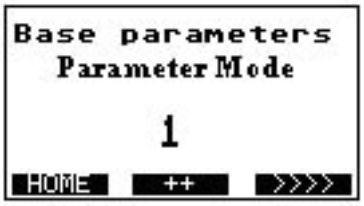
The ++ key can be used for changing the dimension (unit) of the measured value.
You might be prompted to first input an unlock code.

Abbreviation	Unit	m dim
l	Litres	1
m³	Cubic metres	0.001
hl	Hectolitres	0.01
ml	Millilitres	1000
gal	U.S. gallons	0.2642
gal	Gallons (CDN)	0.21997
gal	Imp. Gallons	0.21997
lb	lb raw milk	2.27189
bbl	beer barrels	0.00611
dm³	Cubic decimetres	1

6.5.4. Profibus address

The profibus address can be adjusted by means of the key. Change

6.5.5. Parameter Mode

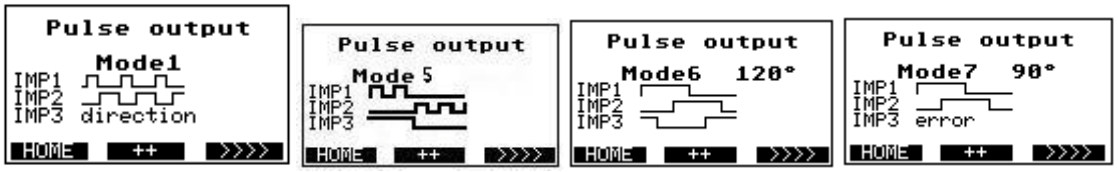


The Parameter Mode can be changed by means of the key ++.
Mode 0 Meter unlocked
Mode 1 Parameter locked until code entry
Mode 2 Parameter always requires code entry
If the parameter switch is locked (to the left) parameter changes are blocked in Mode 2
You might be prompted to first input an unlock code.

6.6. Image level: Pulse output

This image level serves for the setting of the pulse output. The main image shows the current device setting.

6.6.1. Pulse mode



The pulse mode can be changed by means of key ++.
You might be prompted to first input an unlock code.

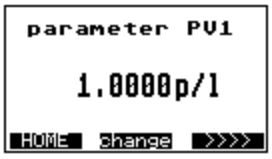
Mode1 2 independent channels (IMP1 and IMP2) with different values (pv1 and pv2)
Pulse output independent of the flow direction.
Maximum pulse length of tp1 and tp2 in ms
0 ms = pulse-to-pause ratio 1:1.
Maximum frequency: 1000 Hz.
IMP3 determines the direction. Positive flow direction: IMP3 is connected.

Mode 5 2 independent channels (IMP1 and IMP2) with different values (pv1 and pv2)
Pulse output dependent of the flow direction output 1 forward flow, output 2 reverse flow
Maximum pulse length of tp1 and tp2 in ms
0 ms = pulse-to-pause ratio 1:1.
Maximum frequency: 1000 Hz.
IMP3 determines the direction. Positive flow direction: IMP3 is connected.

Mode6 3-channel, shifted by 120°: IMP1, IMP2 and IMP3.
Pulse value: pv1.
Pulse-to-pause ratio: 1:1
Maximum frequency: 333 Hz
In the event of an error IMP2 is switched off.

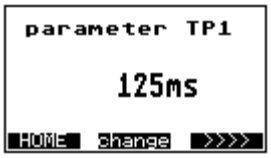
Mode7 2-channel, shifted by 90°: IMP1 and IMP2. Pulse value pv1.
Pulse-to-pause ratio: 1:1.
Maximum frequency: 500 Hz.
In the event of an error IMP3 is connected.

6.6.2. PV1



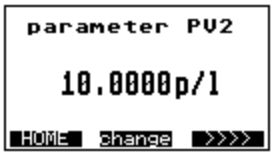
The pulse value PV1 can be changed by the change key.
PV1 is valid for Mode1, Mode 5, Mode7 and Mode6.
You might be prompted to first input an unlock code.

6.6.3. TP1



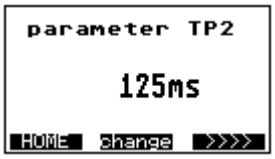
Use the key change to change the pulse length of TP1 to ms.
TP1 is valid for Mode1 & 5 only. The value of 0 ms sets the pulse-to-pause ratio to 1:1.
You might be prompted to first input an unlock code.

6.6.4. PV2



The key change can be used to change the pulse value PV2 for the output IMP2.
PV2 is valid for Mode1 and mode 5.
You might be prompted to first input an unlock code.

6.6.5. TP2

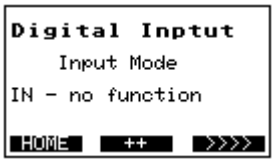


By means of the key change the pulse length of TP2 in ms can be changed for output IMP2. TP1 is valid for Mode1 & 5 only. The value of 0 ms is used to set the pulse-to-pause ratio to 1:1.
You might be prompted to first input an unlock code.

6.7. Image level: Digital input

The settings for the digital input are made on this image level. The main image shows the current device setting.

6.7.1. Function: Digital input

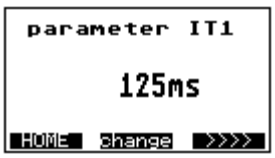


The function of the digital input can be selected by means of key ++.
The input can be set to:

- No function
- Count interruption
- Zero setting

The key ++ only appears if the unlock code has been activated before.
You might be prompted to first input an unlock code.

6.7.2. IT1



The change key can be used to change IT1 to ms. IT1 determines how long the signal will have to be available for the input to permit the selected function to become active.
You might be prompted to first input an unlock code.

6.8. Image level: Current output

On this image level the settings for the current output are made.
The main image shows the current setting of the device.

6.8.1. Current output mode

By this key ++ you can change the mode for the current output.
You can choose among 3 different modes:

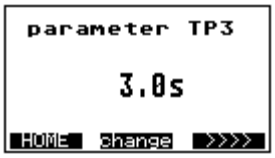
- 4 – 20 mA active
- 4 – 20 mA passive
- 0 – 20 mA active

Active / passive - see analog output.
You might be prompted to first input an unlock code.

6.8.2. Qmax

The key change can be activated for changing the Qmax value for the current output.
Qmax is the value for 20 mA.
You might be prompted to first input an unlock code.

6.8.3. TP3

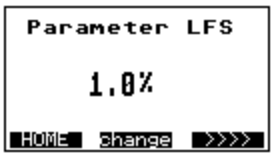


By means of the key change you can change the time delay TP3.
The current output is attenuated by this time.
You might be prompted to first input an unlock code.

6.9. Image level: Metering parameters

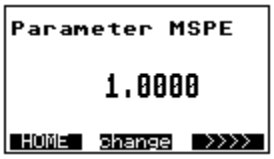
The settings for the measurement are made on this image level.
The main image partially shows the current device settings.

6.9.1. LFS



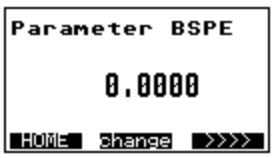
The key change can be used to change the low-flow suppression LFS in %. The low-flow volume is calculated from the Qmax value.
You might be prompted to first input an unlock code.

6.9.2. MSPE



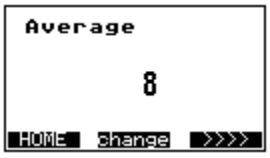
By means of the key change you can change the dimensionless factor MSPE.
You might be prompted to first input an unlock code.

6.9.3. BSPE



Use the key change for changing the dimensionless offset BSPE.
You might be prompted to first input an unlock code.

6.9.4. Average

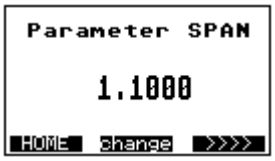


The average value can be changed by means of the key change.
You might be prompted to first input an unlock code.

6.9.5. Offset

Press the key change for changing the Offset value.
The Offset is a calibration value of the sensor which is normally not changed!
You might be prompted to first input an unlock code.

6.9.6. SPAN



The SPAN value can be changed by the aid of the change key.
The SPAN value is a calibration value of the sensor which is normally not changed!
You might be prompted to first input an unlock code.

6.9.7. Pipe Detect (recognition of an empty meter tube)

The empty pipe detection can be switched on and off by means of the ++ key.
You might be prompted to first input an unlock code.

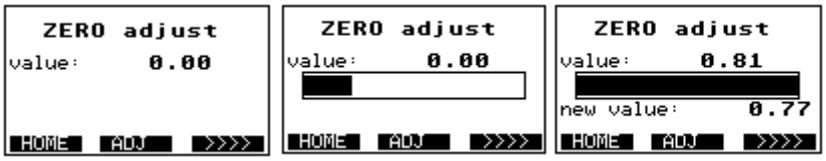
6.9.8. Nominal width

The display shows the nominal width of the transmitter.

6.10. Image level: Special functions

Special functions can be carried out on this image level.

6.10.1. Zero adjust



The “ZERO adjust” measurement is activated if the ADJ key is depressed for a period of 1.5 seconds. The top line of the display shows the current ZERO value. The course of the bargraph shows the progress of the measurement. The measurement is finished when the bargraph is completely filled. The new ZERO value is displayed below the bargraph and taken over.

Important information

Prerequisite:
The meter tube has to be filled up with the liquid to be measured.
No flow rate is allowed to be available, the liquid rests.
Unless the prerequisites are observed, a faulty ZERO value will be determined and the IZMAG™ will not be able work correctly.

6.10.2. Factory setting

All parameters are reset to the factory setting. After the execution of the function, the image navigator will change back to the image of item 7.9.
You might be prompted to first input an unlock code.

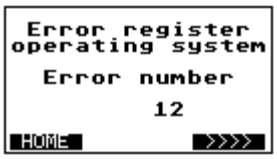
6.11. Image level: Service level

Only service values are displayed and service functions are performed on this service level.

6.11.1. Error register: Metering

This image shows the error numbers of the measurement.
The error number is reset while the flow meter is set back to zero.

6.11.2. Error register: Operating system

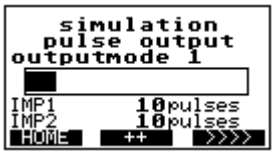


This image shows the error numbers of the operating system.

6.11.3. Simulation of the current output

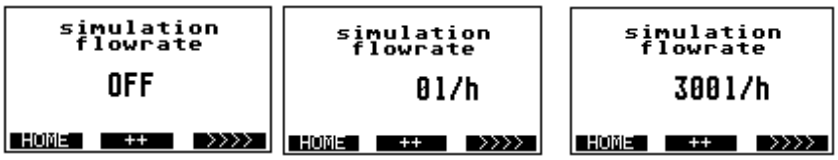
The simulation can be used to check the cable connection or to adjust an analog instrument.
The first value 20 mA is set to 100 % by means of the key ++. Another activation of the key ++ will set 12 mA, 50 %. After that the key ++ is used for the setting of the value of 4 mA to 0 %. The simulated current value is determined by the current mode, see item 7.7.1. If the setting is 0...20 mA, the simulated values are 20 mA, 10 mA, and 0 mA.
You might be prompted to first input an unlock code.

6.11.4. Simulation of the pulse outputs



This simulation can be used for checking a cable connection or a counting instrument or even a connected controller. According to the output mode, the number of pulses to be simulated is shown in display lines 6 and 7. The simulation is started by the key ++ and a bargraph is displayed. The simulation is finished when the bargraph is completely filled. Then the bargraph is erased.
You might be prompted to first input an unlock code.

6.11.5. Simulation of the flow rate



This function can simulate the complete metrological functionality of the IZMAG™ converter, i.e. the pulse outputs and the current output behave like in the normal operation. This function is suitable for the “dry” commissioning of a system or of system sections.
The ++ key starts the function. The flow reads 0 l/h. Each additional activation of the ++ key increases the flow in steps of 10% of Qmax. The function stops running after the maximum value is reached.
You might be prompted to first input an unlock code.

6.12. Image level: Info

6.12.1. Info1

The Info1 image shows the software versions and the date of the recent software download.

6.12.2. Info2

The Info2 image shows the hardware version and the board number of the main board.

7. Parameterization

At the factory the IZMAG™ is provided with standard parameters (factory settings).

Important information

Only trained persons authorized by the user of the flow meter are allowed to set and/or change parameters. The persons concerned have to be familiar with the process sequence. They have to be able to recognize possible risks and to take the necessary steps to eliminate dangers of accident.
Take into account that interventions into the parameters of the flow meter carried out while the production is running could lead to undefined reactions!

It is possible to modify the set parameters via the keypad and the display unit in principle.

The following table shows the functions of the different switch positions:

Parameters	Factory settings	Minimum value	Maximum value
CS3Bus address	32	32	64
Profibus address	5	0	255
Pulse mode	Output mode1	Refer to:	Pulse mode
PV1	1.0	0.0	Depending on output mode, dimension and Qmax
TP1	125 ms	0 ms	16000 ms
PV2	Depending on the nominal width	0.0	Depending on dimension und Qmax
TP2	125 ms	0 ms	16000 ms
Digital input mode	No function		
IT1	125 ms	0 ms	32000 ms
Current output mode	4 – 20 mA active	Refer to:	Current output mode
Qmax 100% for 20mA	Depending on the nominal width	1.0	999999.0
TP3	0.2 s	0.0 s	30.0 s
LFS = Low Flow Suppression	1.0 %	0.0 %	10.0 %
MSPE	1.0	-1000.0	+1000.0
BSPE	0.0	-1.0	+1.0
Average	8	1	128
Offset	See nameplate	-1.0	+1.0
SPAN	See nameplate	0.000001	1000.0
Pipe detect	Pipe detect	No pipe detect	Pipe detect

Table of the abbreviations used and their meaning:

Abbreviation	Function
IMP1	Pulse output 1
IMP2	Pulse output 2
IMP3	Pulse output 3
IN1	Digital input 1
PV1	Pulse value for IMP1
TP1	Pulse length for IMP1
PV2	Pulse value for IMP2
TP2	Pulse length for IMP2
IT1	Pulse length for IN1
Q max.	100% of the flow value for the current output
TP3	Time constant for the current output
Dimension	Unit of the volume
LFS	Low-flow suppression
MSPE	Calibration factor
BSPE	Calibration offset
Average	Filter of the flow signal (averaging)
Offset	Calibration value of the sensor (Do not change!)
SPAN	Calibration value of the sensor (Do not change!)
Pipe-Detect	Internal EMPTY pipe detection

Description of the parameter “dimension”

When selecting the volume units **“US gallons”** and **“Litres”** you should take into account, that fixed flow ranges are valid for the “4...20mA” output depending on the nominal width!

List of the STANDARD parameters set for the unit “LIT”

Designation	Function	Standard	Changeable
dimension	Unit of volume	Litres	different units
lfs	Low-flow suppression	1.00 %	0...10%
average	Flow signal filter (averaging)	8	64
currmode	Analog output range 0/4 mA	4 – 20 mA	0 – 20 mA
pipe detect	Internal EMPTY pipe detection	pipe detect	no pipe detect
Qmax	100% flow value for 20 mA	Dependent on the nominal width	
pv1	Value of the volume pulses per litre	1	0,001...99999
tp1	Pulse length of the digital output	125 ms	0 … 9999 ms
tp3	Time constant for the 4...20 mA output	1.0 sec	99
m spe	Calibration factor (-10%...+ 10%)	1.0000	0.900...1.100
b spe	Calibration offset	0.0000	± 0.2000

7.1. Adjustments

The IZMAG™ normally needs no adjustment.

Usually, the zero point adjustment ("**ZERO adjust**") is carried out during the first commissioning only.

If, however, some deviations have to be compensated which were determined e.g. upon a comparison with a calibration vessel or a balance it is possible to make an adjustment via the factor "**m spe**".

However, before you will start carrying out an adjustment you should have clarified the following questions in any rate:

- Are you sure that the reference standard (reference meter, balance, or calibrated vessel) does really deliver an exactly comparative value?
- Is the limitation of quantities always equal from measurement to measurement?

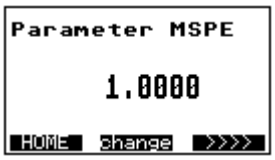
  Take into account that differently emptying pipelines, a missing break-off edge for the liquid or temporary air occlusions will lead to faulty results during the measurement!

- Have the production paths been unlocked? Or are there any manual valves or sampling valves or any cross links possibly open?
- Is the liquid really conveyed during the measurement without any air or gas?
- Are the flow limits kept?
- Is the conductivity of the product within the required tolerance?

An adjustment is only reasonable if similar (reproducible) deviations have been ascertained during the comparative measurements.

7.1.1. Adjustment by calibration factor "m spe"

The adjustment by the calibration factor "**m spe**" can be set via the operating unit.



The standard value is set to 1.

The calibration factor is calculated by means of the following formula:

V_{ref} → Target volume (e.g. calibration vessel, balance, or the like)

V_{dis} → IZMAG™ display

Example:

Deviation **ΔF** of +0.54% determined during a comparative measurement

Calibration vessel: V_{ref} **= 5000 L**

Display: V_{dis} **= 5027 L**

$$m\ spe = \frac{5000}{5027} \bullet 1.0 = 0.9946$$

7.2. Measuring accuracy:

± 0.2 % ± 1 mm/s under reference conditions

Reference conditions for the determination of the measuring accuracy according to DIN EN 29104 and VDI/VDE 2641:

- Temperature of the measured product: +28°C ± 2 K
- Ambient temperature: +22°C ± 2 K
- Warm-up period: 30 minutes

Installation:

- Inlet pipe section > 10 x DN
- Outlet pipe section > 5 x DN
- Transmitter and converter are earthed/grounded.
- The transmitter is positioned in the centre of the pipeline.

8. Troubleshooting

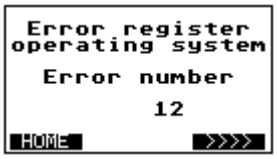
8.1. Error diagnosis

The IZMAG™ is equipped with an integrated self-monitoring function.
Malfunctions are recognized and automatically removed, if necessary.

8.1.1. Error diagnosis via the display

Displayed messages can support the troubleshooting in case of malfunction or faulty measurement. A distinction is made between error messages for the measurement or for the operating system. The messages are displayed on the service level:

Error message for the measurement



Error message for the operating system

Usually, all displayed messages are erased when the volume is reset to zero. In case of a permanent malfunction, however, the message will be reactivated over and over again.

8.1.2. Error list

Error No.:	Diagnosis	Remedial actions
901	Measurement is continued after an interruption due to: - Voltage drop (POWER-FAIL) - Parameter change - Activation of the digital input "**IN1**"	None
903	Signal overflow within the electronic unit due to: - Too high flow rate (> 12 m/s) - Electrical influences that can occur in case of an empty meter tube - Defective electronics	a. Check the flow rate! b. If the meter tube is empty, a check will be possible with short-circuited electrodes only.
905	Error found on the occasion of the internal examination of the quantity registers	a. The measuring result can be falsified due to the interference received. - Reset the message by resetting the individual quantity to zero! b. Check the whole installation for possible EMC interference sources; frequency converters have to be laid into separate cable channels! - Ensure good shieldings and earthings/groundings for all devices! - Use the integral device version for critical installations!
922	Reference voltage is missing	Replace the converter!
924	Reference voltage is outside the tolerance	Replace the converter!
928	Coil current is outside the tolerance	Replace the converter!
932	No coil current is available	Check the connection of the transmitter!
963	Pulse output of the output channel **IMP1** is exceeded.	- Adapt the flow rate! - Reduce the pulse value "**pv1**"!
964	Pulse output of the output channel **IMP2** is exceeded.	- Adapt the flow rate! - Reduce the pulse value "**pv2**"!
3031	Parameters of the transmitter cannot be saved.	Replace the converter!
3034	The calibration parameters of the electronics are faulty.	Replace the converter!
3035	Free parameters are faulty.	Replace the converter!
3036	Parameters of the transmitter are defective: Checksum error.	Replace the converter!
3037	Base parameters for the measurement are faulty: Checksum error.	Replace the converter!
3052	Meter parameters are faulty: Checksum error.	Replace the converter!
3063	Pulse value "**pv1**" set for the counting output **IMP1** is too high (>1000 Hz).	Reduce the pulse value "**pv1**"!
3064	Pulse value "**pv2**""set for the counting output **IMP2** is too high (>1000 Hz).	Reduce the pulse value "**pv2**"!
3070	One of the calibration factors is set to zero.	Input the respective factor (e.g. SPAN)!
3083	The "ZERO adjust" measurement has not been accepted.	During the adjustment the flow rate was not "zero".

8.2. Typical effects or error sources

Disturbances or malfunctions can normally be recognized by the aid of the display unit only.

8.2.1. Flow without flow rate indication:

(a) Is the conductivity higher than 5 µS/cm?

(b) Has the internal **EMPTY pipe detection** to be switched off?

Check whether the display shows “0 gal/min” while the flow is running!

If “adsum 0” is displayed, the internal EMPTY pipe detection is active! This is the case, when:

- The conductivity of the liquid is below 50 µS/cm.
- The type of transmitter connected is smaller than DN 15.
- A heavily pulsating flow is present.

To make sure that the electronic part is working correctly, use the existing simulating function (hardware or software) for your further diagnosis of the digital or analog output!

8.2.2. No pulse transmission despite displayed flow

(a) Check the electric circuit (the IZMAG™ outputs have to be supplied by an auxiliary voltage of 24 V DC)!

(b) Is the polarity of the pulse counter correctly connected?

(c) Check the parameters:
- Is the pulse value too low? (Parameter setting)

Use the simulating function for your further diagnosis (hardware or software)!

8.2.3. No analog signal available

If no analog signal or a faulty analog signal is measured, the following checks are recommended to be carried out:

a. First the connected measuring system (digital display, PLC or the like) has to be disconnected from the IZMAG™. The analog output signal has to be checked by the simulating function by the aid of an ammeter:

- If the analog output is ZERO at a 50% simulation, the electronic part is defective, i.e. it will be necessary to replace the complete converter.
- If the analog output remains constant at 20 mA, the internal “current mode” parameter could be wrong. Verification is possible by means of the operating unit.

b. If the differences only occur after the disconnection of the external evaluating device, it should be checked:

- If the burden of the whole current loop is higher than 500 Ω? (Observe the technical data sheets of the connected devices!)

- If the input of the external evaluating device is erroneously designed as an "**active**" analog output?
  Faults can especially occur upon a connection to a PLC due to the fact that it might both have an "**active**" and a "**passive**" configuration.

c. If nonlinearities occur over the whole range from 0 - 100%, it should be checked:

- Whether the burden of the whole current loop is higher than 500 Ω?

8.2.4. Deviations of measured values

a) Is there a time-related connection between the occurrence of the problem and some modifications to a system in the vicinity of the measuring device?

b) Does the deviation show more or less similar values or a constant shift or does it heavily scatter into the positive or negative direction?

c) Has something been repaired or replaced?

d) Does the deviation always occur at a certain point of time (e.g. on Mondays at the start of production, on the early shift, or the like) or at certain process steps?

e) If a display unit is connected, the measuring signals can be checked by means of the service data while the flow is static.

- Change the display to the presentation of the measured values "adksum" which may be fluctuating between -300 ... +300 units at a maximum.
- If you carry out several zero point measurements ("ZERO adjust"):
  The displayed value is not allowed to change by more than 10 units among the repeated measurements.

Unless stability exists, the earthing/grounding of the transmitter will have to be checked.

The same verification has to be carried out with a full meter tube <u>while the transmitter is removed as a whole</u>. In that status any influences by electrical disturbances or a leaking pipe system can be excluded.

f) In case of moisture or other faults in the transmitter or converter it will be necessary to replace the measuring instrument with a new one.

g) Check the pipe path for by-pass lines or air inclusions (faulty seals).

h) Check the reference measuring methods or the test procedure (reference meter such as a balance):

- Take into account the temperature compensation of the volume.
- If different products are compared with the value of the balance, the conversion will have to be carried out by means of the density.

Or the same volume differences always occur e.g. at different quantities!
If so, possible reasons could be:

- A start and stop of the measurement while the meter tube is empty.
- An undefined limitation of quantity due to the absence of a break-off edge.
- An undefined dropping-off behaviour due to the absence of an appropriate draining sieve.

i) Low conductivities or pulsating flow upon the use of the internal **EMPTY pipe detection**.

8.3. Error reset

Error messages can be reset:

(a) By a zero reset of the quantity counter
(b) Automatically after a maximum period of 30 seconds, unless any further fault did occur.

8.3.1. Visual check

The transmitter can be optically checked while being disassembled:

Reason	Action
Humidity in the connection housing	Dry the housing and perform an insulation test subsequently!
Damaged PFA liner	Replace the transmitter; check the seal!

Table: **Visual check**

9. Maintenance

9.1. Safety instructions for maintenance work

Maintenance and repair work must only be carried out by skilled and accordingly trained personnel entrusted with the required authorization from the user.

The persons concerned have to be familiar with the process sequence and be able to recognize possible dangers and to take all necessary steps to remove imminent risks of accidents.

First ensure your personal safety before you will start carrying out any service and maintenance work!

Caution

- Appropriate measures have to be taken to guarantee a safe stability (approved ladders, lifting platforms, safety harnesses, etc.).
- Applicable tools and personal protective measures are necessary.
- Before you start working at electrical or rotating equipment, make absolutely sure that the equipment concerned is disconnected from the power supply network! An unintended restart has to be avoided by suitable safety precautions (e.g. information signs or padlocks).
- Fittings and instruments and their contents can be hot! First permit them to cool down before you will start working at such parts!
- If fittings and instruments have to be removed from the pipe system, the whole pipe system has to be completely emptied, depressurized, and protected by some appropriate shut-off fittings.
- Rinse the pipe system with clear water before the disassembly of fittings or instruments in order to remove possible residuals of chemicals!

9.2. Routine maintenance

On normal operating conditions the flow meter type IZMAG™ does not require any special maintenance work.
Nevertheless, we wish to give you some recommendations for maintenance steps:

Cleaning

Deposits in the meter tube or at the electrodes will cause measuring errors or malfunctions.

Thus, ensure a regular and careful cleaning of both the pipelines and the flow meter!

See to it during the external cleaning that e.g. no high-pressure steam-jets are directed to the housing parts!

In case of flow meters with integrated display the external cleaning temperature must not exceed 50 °C.

The pane of the operating unit should only be cleaned by means of clear water and a soft cloth.

The IZMAG™ transmitter is suitable for CIP.

Regarding the cleaning, disinfecting, and flushing agents and procedures we refer to the manufacturers and the guidelines of the food processing industry.

Seals

That connection seals need periodic replacement.

Accuracy Test

Accuracy tests of the flow meter should be carried out by your in-house quality assurance.

A regular calibration by the Service Engineers of Andersonincreases the reliability of the measuring instrument.

9.2.1. Preventive maintenance steps

A regular and careful maintenance of the measuring spot (flow meter in its fitting situation) is indispensable in order:

- To avert any danger for persons and the environment
- Not to endanger the product quality
- Not to reduce the service life of the system and its components

The preventive maintenance steps for the flow meter type IZMAG™ refer to the **seals of the pipe connections**.

The recommended maintenance intervals result from the experience in other systems. However, the actual required maintenance intervals can considerably different from that experience for the following reasons:

- Daily running time and number of the annual production days
- Aggressiveness of the media
- Frequency of cleaning phases, especially with hot water and caustic solution as well as disinfectants
- Duration and temperature of the cleaning phases
- Possible beginning to dry of product residuals

Anderson recommends checking the measuring spot continuously, i.e.:

The **operators** of the system should **currently** pay attention to:

- occurring leaks
- unusual measuring results

Regular maintenance:

The following are suggestions for determining a maintenance schedule:

1. A replacement of **all** seals and wearing parts in regular intervals, e.g. every year. Exceptions have to be allowed as a matter of course.
2. Replacement of heavier stressed seals and wearing parts in short intervals (e.g. once a year) and of less stressed parts in larger intervals (e.g. every 2 years). It is important that the serviced components are marked accordingly.
3. Exchange of the seals and wearing parts when required (e.g. when leaks occur). On that occasion it is reasonable to replace the wearing parts in the whole adjoining area, especially of the strongly stressed parts. It is indispensable to mark the serviced components accordingly.
4. Accuracy tests of the measuring instruments of the system in regular intervals under the guidance of in-house quality assurance. Otherwise, the meter should be regularly calibrated at the Anderson Instrument.

9.3. Repairs

9.3.1. Sending-in the flow meter to the manufacturer

If repairs have to be carried out at the factory, the following conditions will have to be fulfilled in order to enable a quick and effective repair.

- The components/devices have to be packed in such a way that damage does not occur in shipment.
- An RMA needs to be established with Anderson to identify the meter upon receipt and determine the actions needed by Anderson instrument Company personnel.
- Without the above, delays will occur in the repair process.

9.3.2. Repair Work

Repairs should be restricted to skilled, trained personnel only. Service of the circuit boards should not be attempted. Only complete circuit boards can be exchanged.

For each repair it is indispensable to strictly observe the general maintenance safety instructions.

A replacement of components within the meter should not be done in the installed location for the following reasons:

- Lock washers could drop out and be left on the electronic part when the fastening screws are loosened.
- Metal particles could destroy the electronic part when the power supply is switched on.
- When the electronic housing is open there is the risk that moisture could drip down onto the electronic boards. Moisture immediately destroys the electronic parts when the power supply is switched on.

For all repairs of the flow meter it must be removed from the main power supply!

9.3.2.1. Replacement of the sealing cover of the operating unit

The sealing cover will have to be replaced if the front pane is destroyed or scratched and if the operating unit does not function.

9.3.2.2. Replacement of the transmitter

Before replacing the transmitter, ensure that the pipe system is empty and unpressurized! Flush the pipe system before the removal of the transmitter with clear cold water in order to avoid any residues of chemicals or elevated temperatures.

The distribution voltage for the electronic part has to be switched off.

Carry out a zero point measurement ("**ZERO adjust**") with the new transmitter in order to optimize the accuracy of the flow meter!

9.4. Special program functions

The program of the IZMAG offers some functions that could support a troubleshooting process.

Moreover, it is possible to use those functions for the adjustment and verification of connected devices.

9.4.1. Flow simulation

As an adjusting aid or for diagnosing purposes of connected devices the IZMAG offers the possibility to simulate flow without any flowing product.

9.4.2. Simulation via the display unit

Select the “SIMULATION” function by means of the keypad.

During the simulation the analog output is set to 12.0 mA (4...20 mA setting) or 10.0 mA (0...20mA setting). The volume pulses are produced for the flow of 50 % according to the set pulse value.

9.5. Spare parts to be kept available on stock

The spare parts list results from the experience in the different applications of the flow meter. However, the actually required spare parts may be different from it for the following reasons:

- Daily running time and number of the annual production days
- Aggressiveness of the media
- Frequency of the required cleaning phases, especially with hot water, caustic solution, and disinfectants
- Duration and temperature of the cleaning phases

The following details are absolutely necessary and should never be missing in a spare parts order:

- Quantity and unit
- Description
- Anderson part number

The appendix of this instruction manual includes some lists of wearing parts or spare parts.

10. Decommissioning

10.1. Temporary decommissioning

Should the device be put out of operation for a temporary period only, no special measures have to be observed for its later recommissioning.
If the transmitter is removed out of the process line, the pipe system first has to be emptied and depressurized.

Before removing the transmitter flush the pipe system with clear cold water in order to avoid any residues of chemicals or elevated temperatures.
Attach the covering caps for the protection of the connections.

10.2. Final decommissioning / disposal

If the whole device is defective beyond repair, you should take into account that system components to be scraped will have to be disposed of according to the valid laws and regulations for waste disposal.

PS Sampler

The DS2 Sampling System

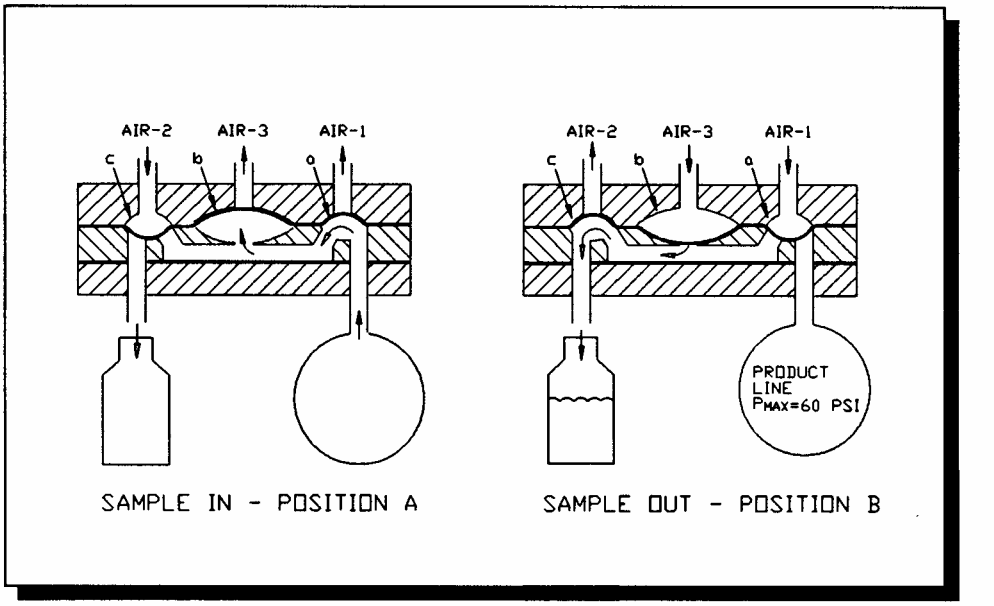
Description

The pneumatic sampling system consists of a programmable logic controller added to the DS1 electronic package, a set of air solenoids remote mounted in a nonmetallic enclosure, and a PS-series pneumatic sampling head to be installed in the process pipe. The pneumatic sampler operates similar to a diaphragm pump to provide fixed volume samples from a flowing stream to an attached sample bottle.

Theory Of Operation

The pneumatic sampler operates similar to a diaphragm pump. By alternating air pressure across the diaphragm air ports, the diaphragm acts as the inlet and outlet valves to control very precise and repeatable delivery of the sample quantity.

In position A, air pressure is applied to air port-2. The product pressure allows liquid to fill cavity B. Air pressure is applied to air port-1 causing the sample inlet to close and seal. After a slight time delay, air pressure is applied to air port-3 and released from air port-2. The precise sample quantity is then forced or “pumped” out into the sample bottle.



Specifications

Product line connections: 1-1/2",2" sanitary clamp

Product contact materials: Sampler body: 304 SS, Diaphragm: 3-A approved silicone

Insertion length: Face to Face 4"

Operational line pipe line pressure: 6-60 psi* (pressures below 6 psi require a vacuum source to be connected to solenoid valve assembly exhaust)

Supply Air: Clean,dry, non lubricated 75 psi minimum

Air consumption:0.1 CFM @ 45 psi at sample rate of 60 samples/min.

Sample quantity : 1CC per cycle

Max. product temperature: 200 °F

Installation

Location in System

The PS-series sampler is placed at a point in the system after the milk chiller in a vertical pipe where milk flow is in the upward direction.

Mounting in the pipe line

The PS-series sampler is designed to be used on the pressure side of a milk line. Standard configuration for the sampler head with bottle is for a vertical pipeline installation with the collection bottle hanging down. In dairy farm applications it is necessary to refrigerate the sample bottle to maintain the integrity of the sample. This is typically accomplished by routing the milk line through a small 1.0 cu.ft. refrigerator to provide a chilled environment for the sample. It is recommended that the refrigerator be equipped with a temperature recorder to ensure that the temperature is maintained.

Solenoid enclosure

The solenoid enclosure needs to be located within 6 ft of the sampler head to eliminate the possible dampening effect that can occur with longer air lines which will adversely effect sampling.

Connection of vacuum source

A vacuum line from the milking system is connected to the solenoid valve exhaust port to assist in consistent sampling during periods when line pressure drops below 6 psi pressure. This vacuum line should be protected from the

possible failure of the sampler diaphragm which would introduce milk into the vacuum system.

Electrical Wiring and Pneumatics

Wiring

Interconnecting wiring is needed between the controller/printer and the solenoid enclosure. The voltage used to operate the solenoids is 110VAC and so necessary precautions for connections and wiring should be used. Use wiring diagram # ? for termination information.

Pneumatics

Included with the system is 20 ft. of ¼" air line, cut the air line down to (3) equal lengths and attach them to their respective solenoid ports on the SA70 enclosure. Next, shorten the tubing as needed and connect the air lines to their respective ports on the sampler head paying close attention to their location (refer to diagram?) Supply the SA70 solenoid enclosure with 125 psi @ .1 CFM clean non-oiled air, use the supplied air pressure regulator to control the solenoid supply pressure to 15 psi higher than the product line pressure. If the product line pressure is not known, with the system flowing at maximum flow, lower the air pressure using the regulator until a steady stream of milk flows out of the sampler outlet pipe, then, note the pressure reading and increase the air pressure 15 psi above this point.

Operation and Cleaning

Once connected to an operational controller/printer and given an air supply, the PS sampler is ready for use. The system has been preconfigured to fill the 500ml sample bottle for every 6500 gallons of milk that passes through the flow meter and will automatically switch to cleaning mode once the controller/printer has been given the input to do so from the wash panel. The basic protocol used for proper operation is as follows:

1.) start of a new trailer should begin with the attachment of a new clean bottle on the sampling system.

2.) At the completion of filling a transport trailer, the sampler bottle should be removed and replaced with a new clean bottle to collect the sample for the next truck. The product sample in the full bottle is representation of the trailer load that has just been filled. In the event that a complete milking has not filled the trailer, prior to the start of the cleaning cycle the sampler bottle should be removed from the sampler and placed in a refrigerator with a cover. A means of collecting wash water should be affixed to the sampler discharge pipe during the cleaning cycle. A hose that directs the

solution back for recovery is recommended but other methods can be used to recover the cleaning solution. Following the cleaning cycle, the exterior surfaces of the bottle mount should be manually cleaned and dried. Following the cleaning cycle the sample bottle containing the milk from the prior milking should be reinstalled on the sampler to collect the rest of the samples until the transport trailer is filled producing a single bottle to represent each trailer load.

Assembly Of Sampler

When reassembling the sampler, follow the procedure below (refer to Drawing 97-9500-02).

1. Check to see that locating pin (PSP-004) is in place.

2. Insert diaphragm (PSD-51).

3. Center top plate (PSP-002); locate hole in top plate over locating pin.

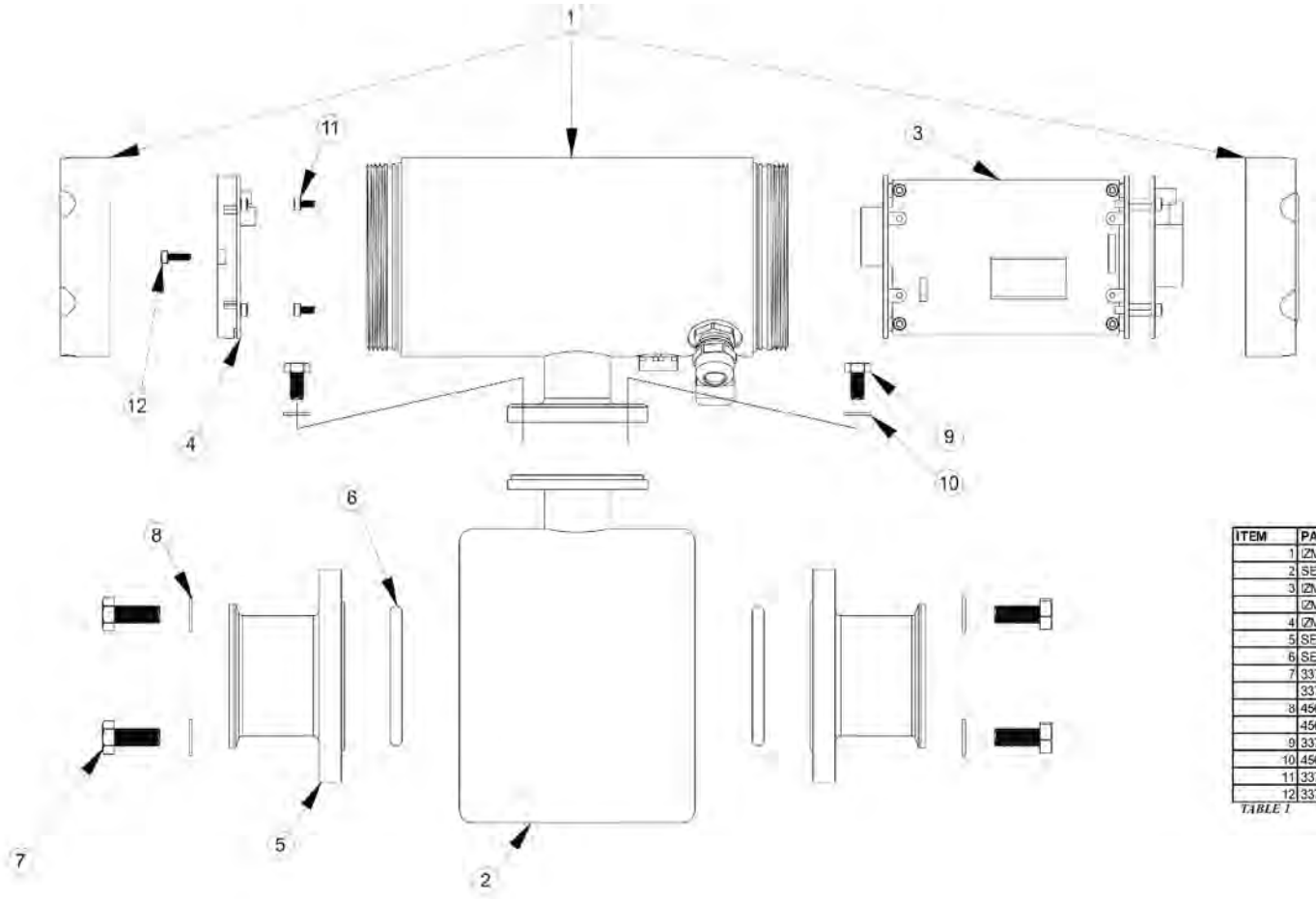
4. Carefully assemble clamp fitting (GH13LAH-2) over top and bottom plate and tighten clamp.

NOTES:

A. Hand tighten clamp fitting only to the point sufficient to prevent leakage – do not over tighten.

B. When disassembling sampler, care should be taken to not damage any of the sealing surfaces. Lay parts on a soft surface.

C. Before assembling samplers, always check diaphragm PSD-51 for holes or wear. (Stretch wear points over finger). Diaphragm should be changed at first sign of wear or at least once a month. If sampler operates at maximum pressure, a more frequent change may become necessary.



ITEM	PART NUMBER	DESCRIPTION
1	IZMAG-ING	INTEGRAL HOUSING
2	SEE TABLE 2	FLOWTUBE
3	IZMAG-EL	A/C POWERED ELECTRONICS
	IZMAG-EL-DC	D/C POWERED ELECTRONICS
4	IZMAG-DB	DISPLAY BOARD
5	SEE TABLE 3	ADAPTORS
6	SEE TABLE 4	ADAPTOR O-RINGS
7	33720T200906	ADAPTOR BOLTS 3/4" THRU 2-1/2"
	33720T2009010	ADAPTOR BOLTS 3" & 4"
8	45678M0809	ADAPTOR WASHERS 3/4" THRU 2-1/2"
	45678M1009	ADAPTOR WASHERS 3" & 4"
9	33720T120906	HOUSING BOLTS
10	45678M0609	HOUSING WASHERS
11	33720W060903	SCREW
12	33720W100903	SCREW

TABLE 1

PART NUMBER	DESCRIPTION
IZMAG-010	1/2" FLOWTUBE
IZMAG-015	3/4" FLOWTUBE
IZMAG-025	1" FLOWTUBE
IZMAG-032	1-1/2" FLOWTUBE
IZMAG-050	2" FLOWTUBE
IZMAG-065	2-1/2" FLOWTUBE
IZMAG-080	3" FLOWTUBE
IZMAG-100	4" FLOWTUBE

TABLE 2

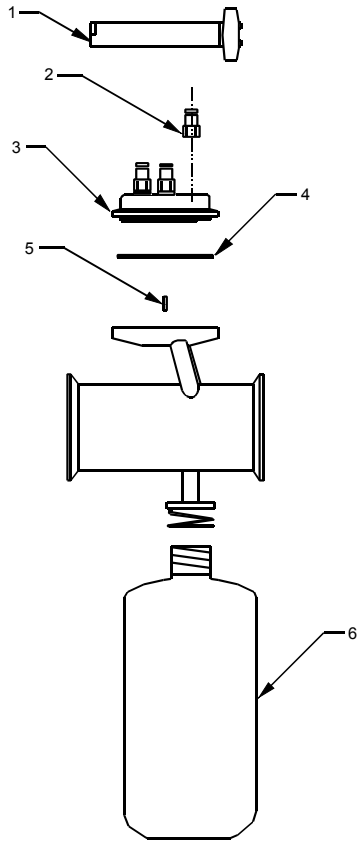
FLOWTUBE	SHORTEST	9.88"	13.25"
1/2"	56721A0010	-	-
3/4"	56721A0015	56721B0015	56721C0015
1"	56721A0025	56721B0025	56721C0025
1-1/2"	56721A0032	56721B0032	56721C0032
2"	56721A0050	56721B0050	56721C0050
2-1/2"	56721A0065	56721B0065	56721C0065
3"	56721A0080	56721B0080	56721C0080
4"	56721A0100	56721B0100	56721C0100

FLOWTUBE	O-RINGS
1/2"	45669A0010
3/4"	45669A0015
1"	45669A0025
1-1/2"	45669A0032
2"	45669A0050
2-1/2"	45669A0065
3"	45669A0080

TABLE 4

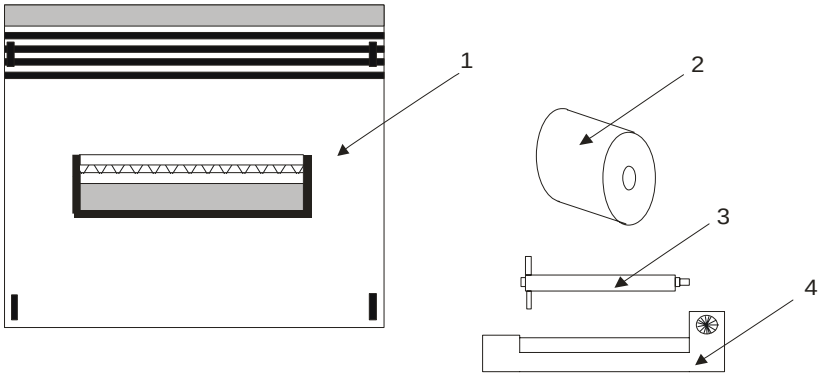
Sampler Parts

Item	Description	Qty.	Part Number
1	Clamp	1	GH13LAH-2
2	Connector	3	PSP-005
3	Top Plate	1	PSP-002
4	Diaphragm, Silicone	1	PSD-51
5	Locating Pin	1	PSP-004
6	Nalgene Bottle (16 oz.)	6	PSB-64-PVC



TP-PL-180 PRINTER AND PARTS

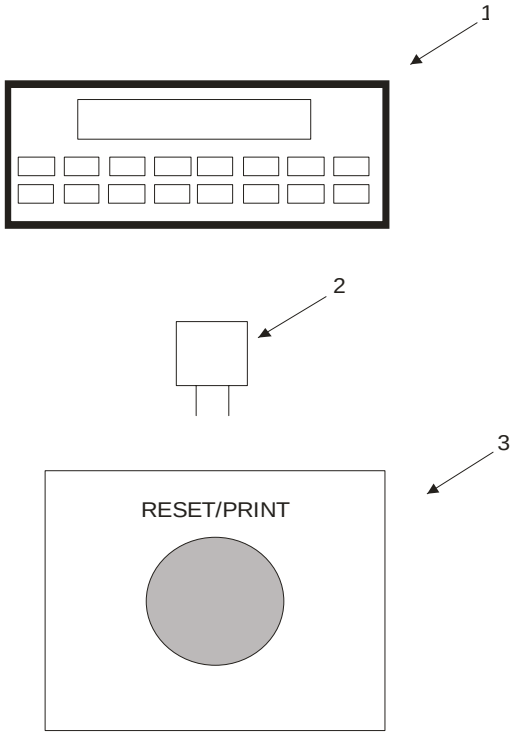
TP-PL-180



PT-PL-180 Replacement Parts

Item	Description	Part Number
1	Printer Cover	TP-PL-180-COVER
2	Paper roll	TP-PL-180-TAPE
3	Spindle	TP-PL-180-SPNDL
4	Ink Ribbon	TP-PL-180 RIBN

FTT-710 PARTS



FTT-710P Replacement Parts

Item	Description	Part Number
1	Keypad and Front Assembly	FTT-710P-FRTEND
2	Fuse	FUS-BC-T5-R161
3	Remote Print/Reset Pushbutton Assembly	FTT-710-REM-BOX

Appendix F - Warranty and Return Statement

These products are sold by the Anderson Instrument Company (Anderson) under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to a purchase of these products, as new merchandise, directly from Anderson or from an Anderson distributor, representative or re-seller, and are extended only to the first buyer thereof who purchases them other than for the purpose of resale.

Warranty

These products are warranted to be free from functional defects in materials and workmanship at the time the products leave the Anderson factory and to conform at that time to the specifications set forth in the relevant Anderson instruction manual or manuals, sheet or sheets, for such products for a period of one year.

THERE ARE NO EXPRESSED OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREIN AND ABOVE SET FORTH. ANDERSON MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCTS.

Limitations

Anderson shall not be liable for any incidental damages, consequential damages, special damages, or any other damages, costs or expenses with the exception of the cost or expense of repair or replacement as described above.

Products must be installed and maintained in accordance with Anderson instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from corrosion, misapplication, improper specifications or other operating conditions beyond our control. Claims against carriers for damage in transit must be filed by the buyer.

This warranty is void if the purchaser uses non-factory approved replacement parts and supplies, or if the purchaser attempts to repair the product themselves, or through a third party, without Anderson authorization.

Returns

Anderson's sole and exclusive obligation and buyer's sole and exclusive remedy under the above warranty is limited to repairing or replacing (at Anderson's option), free of charge, the products which are reported in writing to Anderson at its main office indicated below.

Anderson is to be advised of return requests during normal business hours, and such returns are to include a statement of the observed deficiency. The buyer shall prepay shipping charges for products returned, and Anderson, or its representative, shall pay for the return of the products to the buyer.

Approved returns should be sent to:

ANDERSON INSTRUMENT COMPANY INC.
156 AURIESVILLE ROAD
FULTONVILLE, NY 12072 USA

ATTN: REPAIR DEPARTMENT