

IE Auto Load Inventory Control System

GENERAL INSTRUMENTATION

Description

The IE Auto Load Inventory Control System control unit is a compact electronic preset designed to provide precise delivery of petroleum, industrial and chemical products. The control unit easily adapts to any type of pulsed output flow meter and all types of two stage control valves. The control unit utilizes advanced high-speed microcomputer technology which provides unlimited flexibility. Programming the control unit is easily performed by simply selecting the desired options from built-in menus. Available enclosures include iiA iiB Explosion Proof, and rack mount. Delivered quantities are displayed on a large 8 character numeric display. Operator prompts and program menus are presented on a 32 character alphanumeric display. A four push-button keypad provides push buttons Function Select, Digit Select, Digit/DP Advance Stop and Enter/Start. These are used for entering values for the various user selectable parameters in addition to the batch delivery quantities.

Design Features

- IIA IIB EXPLOSION PROOF ENCLOSURES
- TWO LIQUID CRYSTAL DISPLAYS WITH BACK LIGHTING, 8-CHARACTER NUMERIC AND 2X16

Two Data Communication Channels

INSTANTANEOUS FLOW RATE INDICATION 0DIGITAL TIME AND TEMPERATURE DISPLAYS (WHEN MODE IS ACTIVATED)

Principle Of Operation

The IE Auto Load Inventory Control System control unit offers a unique approach of providing a wide selection of options in the microcomputer firmware while keeping the hardware simple, permitting maximum flexibility. Simple programming of the unit is required for the specific functions required by the application. It can be set up as a simple batch totalizer or as a self contained full featured inventory control system by selecting from hundreds of options resident in the microcomputer's firmware. Once the Auto Load is set up, operation is simple and easy. Operating instructions are presented on the display screen to assist the operator. The instructions displayed will vary depending on how the Auto Load is configured by the site engineer.

Specifications

WARNING: Do not operate this instrument in excess of the specifications listed below. Failure to heed w

Inputs

Pulse Input 12 Vdc Configuration: Threshold - 6 Vdc +1 Vdc; Hysterisis - 0.5 Vdc; Input Resistance - 12.1 kOhm; Maximum Input Voltage - 30 Vdc; Maximum Input Frequency - 10 kHz 5 Vdc Configuration: Threshold - 2.2 Vdc +0.5 Vdc; Hysteresis - 0.25 Vdc; Input Resistance - 23.0 kOhm; Maximum Input Voltage - 30 Vdc; Maximum Input Frequency - 10 kHz 20 mA Configuration: Threshold - 7.8 mA; Hysteresis - 1 mA; Input Resistance - 772 Ohm; Maximum Input Voltage - 20 Vdc; Maximum Input Frequency 10 kHz Digital Inputs Nominal Input Voltage: 12 Vdc; Maximum Input Voltage - 30 Vdc; Threshold - 6 Vdc +1 Vdc; Hysteresis - 1 Vdc; Input Resistance - 1.95 kOhm; Minimum Pulse Width - 10 ms Permissive Power Detect Input Input Voltage: 90 Vac to 270 Vac; 47 Hz to 63 Hz; Input Impedance - 56 kOhm minimum PRTD Input Connection Type: Three wire with provision for terminating a fourth wire; PRTD Type: DIN 43760 Standard with a temperature coefficient of 0.00385 Onh/Ohm/deg. C; Drive Current: 1 mA nominal Current Loop Inputs

Input Resistance - 250 Ohm; Nominal Input Current - 4-20 mA; Maximum Input Current - 45 mA

OUTPUTS

Digital Outputs

Maximum Off State Voltage - 60 Vdc; Maximum On State Voltage - 0.35 Vdc ($I=0.25$ amp); Maximum Current - 1.0 amp; Maximum Frequency - 100 Hz; Minimum Pulse Width - 5 ms

AC Solid State Relays

Load Voltage - 24 Vdc to 280 Vac; 25 Hz to 70 Hz; Maximum Current - 1.5 amp; Maximum Off State Leakage - 6 mA; Maximum On State Voltage Drop - 1.6 Vac

DC Solid State Relays

Load Voltage - 3.0 Vdc to 60 Vdc; Load Current - 0.01 amp dc to 1.5 amp dc; Maximum Off State Leakage - 1.0 mA dc; Maximum On State Voltage Drop - 1.85 Vdc

DC Power Sources for Use with Pulsers, Digital Inputs and Current Loop Transmitters

+12 Vdc Regulated at 110 mA, Fused at 250 mA
 +24 Vdc Unregulated at 100 mA, 1% ripple maximum, fused at 250 mA

AC Power Sources for use with relays

Line Power Fused at 3 amps; Permissive Power Fused at 3 amps

ENVIRONMENTAL SPECIFICATIONS

Temperature

iiA iiB Enclosures

Operating: -20 to 50°C

Storage: -40 to 70°C

Rack Mount

Operating: 0 to 40°C

Storage: 60°C

Thermal Shock

No harmful effect for operating ($< 1^{\circ}\text{C}/\text{Min.}$) or storage ($< 3^{\circ}\text{C}/\text{Min}$)

Humidity

Division 1 and 2: 0-100%

Rack Mount: 0-95%

PROGRAMMING

The control unit contains four basic programming modes which permit the user to configure each unit for the specific application. The programming variables are selected from a built in menu and are advanced by using the select and repeat keys.

Programming Modes			
Setup	Status	Archive	Test

In the control unit's setup mode, menus are presented for selection in the following:

Delivery	I/O Configurations
Factors	T&P Compensation
Alarms	Data Communications

Valve Control

Select from digital or conventional two stage valve control with independent selections for low flow start, low flow stop and final stop.

Valve Control Error Limit

When digital valve control is selected, the control tolerance for the programmed flow rate is entered as a percentage value. If the flow rate exceeds the tolerance, the valve is signaled to adjust (open or close) as required to maintain the programmed flow rate.

K-Factor Linearization

Flow meter accuracy is maintained with programmable multi-point linearization. Apply these meter factors to the digital valve flow rate set points for maximum flow meter accuracy.

Voltage Selection

Configure the Auto Load for 230 Vac or 115 Vac, 50 or 60 Hz operation by installing program jumpers on the customer connector board.

Permissive Sense

Use the permissive power input circuit as a safety device or to verify operational integrity such as: ground connectors, high level or dead main interrupts.

Data Acquisition

Two separate digital signals are provided for net and/or gross outputs. The outputs may be factored from 0.1 to 10.0 for each unit quantity delivered. Pulse widths (5.0 to 25.0 milliseconds) are adjustable and selections are made from the menu.

Preset Options

Three options are available including conventional numeric, repeat previous or select from four preprogrammed values. In addition, minimum and maximum allowable preset values may be programmed.

Operator View Group

Up to nine separate user selectable variables may be configured for instantaneous operator viewing. These parameters may be viewed but not changed by the operator and often include:

Flow Rate	Relay Status
Temperature	Delivered Gross
Pressure	Delivered Net
Current Time	Status Registers
Density	Preset Quantity
K-Factor	Preset Remaining
Meter Factor	

Display Test Enable

Engage the local display test function as necessary for display segment checks if required by the local weights and measures authority.

Operator I.D. Codes

Operational security controls may be implemented by requiring the operator to input a numeric access code of eight digits or less.

Alarms

Built in programmable alarm conditions are user selectable and may be programmed to monitor one or more of the following conditions:

Low Flow Rate	Preset Over Delivery Quantity
High Flow Rate	Preset Under Delivery Quantity
Valve Failure	Pulse Security Error
	Data Communications Error

Alarm Actions

An internal menu permits selection of desired responses when an alarm condition occurs. The responses are:

- Off (no response)**
- Display Only**
- Display and Close an Alarm Contact**
- Display, Alarm and Stop the Control Unit**
- Display, Alarm, Stop and Lock the Control Unit**

Digital Output Signals

User programmable output relays provide flexibility for a broad range of control unit applications. Output relays K-1 through K-10 with Digital Outputs DO-1 and DO-2 provide a total of twelve configurable outputs which may be assigned for:

Pump Contact	N.C. Valve Stem Switch
N.O. Valve Pilot	Auxiliary Contacts 1-6
N.C. Valve Pilot	Data Acquisition Net/Gross
N.O. Valve Stem Switch	Alarm Annunciator

Relay Options

The control unit can be ordered with 5 ac, 10 ac or 5 ac/5 dc solid state relays.

Meter Pulse Inputs

Program the control unit to accept the meter pulse signal which suits the application. The 10 kHz input may be configured for a 5 Vdc, 12 Vdc, 5 mA or 20 mA threshold level.

Pulse Security

Connect a dual channel pulse signal, 90 degrees out of phase for Level 'B' pulse integrity.

Analog Inputs

Two 4-20 mAdc analog inputs are provided for pressure, density or temperature. If pressure and density inputs are used, a separate RTD input is available for high precision temperature sensing.

Temperature Compensation

From the menu, select the temperature compensation method by linear equation or API Tables 6A, B or C, 24, 24A or B, 54, 54A, B or C.

Pressure Compensation

If correction for pressure effects on the fluid are desired, the pressure transmitter scaling, i.e., upper limit, lower limit and offset are programmed via the keypad. Compressibility (K-factor) sources are selectable from API 11.2.1, 11.2.2, 11.2.1.M OR 11.2.2.M.

Density Compensation

Density inputs either manual or via the analog current loop may be used when the API Table option is selected for temperature corrections as the fluid's density is a function of the CTL calculation.

Data Communications

Full two way data communications are provided for remote access using either computer mode or terminal mode. In communications port 1, select RS232 for serial communications or RS-485. Communications port 2 is dedicated for RS-485 for multi-drop configurations. Program these ports with unique data rates, word size, stop/parity bits, and communications port time out settings for customer configuration to suit the host equipment.

Status Registers

All control unit parameters may be viewed on the local display or by using a remote access computer for monitoring:

Operating Status	Auxiliary Contact Status
Alarm Status	Totalizer Status
Meter Factor Status	Flow rate Status
Delivery Status	Temperature Density/Pressure Status

Archive Registers

An archive memory storage of past transactions is maintained constantly even after a power outage. These registers may be set to free run or halt when full. These registers are user programmable for selection of:

Transaction Number	Net Quantity Delivered
Start Time	Effective Temperature
Completion Time	Alarm Status
Preset Quantity	Date
Gross Quantity Delivered	

Data Logging

Connect a serial interface printer to communications port 1 to record transactions details such as:

Drive I.D.	Net Total
Unit Address	Time In
Gross Delivered	Time Out
Net Delivered	Effective Temperature
Gross Total	

Data Security

Program data is secured with a wire sealable mechanical switch plus a user defined 8 digit access code.