

# ES-747

## Flow Computer for Liquid and Gas Applications

### Features

- Supports Pulse Producing Flowmeters
- Rate/Total and Batching Functions
- Universal Viscosity Curve (UVC) and Strouhal/Roshko Advanced Linearization Methods
- Gas & Liquid Flow Equations (Volume, Mass, Corrected Volume)
- API 2540, AGA-7 Equations
- 10 Selectable Fluid Tables
- Advanced Batching Features: Overrun Compensation, Print End of Batch
- Menu Selectable Hardware & Software Features
- Data Logging
- Two Line LCD or VFD Display

### Description:

The ES-747 Flow Computer satisfies the instrument requirements for pulse producing flowmeters in liquid and gas 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 ES-747 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.

The isolated analog output can be chosen to follow volume flow, corrected volume flow, mass flow, temperature, pressure or density by means of a menu selection. Most hardware features are assignable by this method.

The user can assign the standard RS-232 Serial Port for data recording, transaction printing, or for connection to a computer.

Front panel selection of fluid type is supported.

Linearization options include UVC, Strouhal/Roshko and 40 point linearization tables.

A Service or Test mode is provided to assist the user during start-up system check out by monitoring inputs and exercising outputs and printing system setup.



- Isolated Pulse and Analog Outputs Standard
- RS-232 Port Standard, RS-485 Optional
- Windows™ Setup Software
- DDE Server & HMI Software Available

### Specifications:

#### Flow Meters and Computations

Meter Types: Supports pulse producing meters including: vortex, single rotor turbine, magnetic, PD flowmeter  
Linearization: 40 point table, UVC table or Strouhal/Roshko  
Computations: Volume, Corrected Volume & Mass  
Fluid Computations: Density, Viscosity

#### Environmental

Operating Temperature: 0°C to +50°C  
Storage Temperature: -40°C to +85 C  
Humidity : 0-95% Non-condensing  
Materials: U.L. approved

#### Approvals: CE Compliant, UL/CUL Listed

#### Display

Type: 2 lines of 20 characters, Blue VFD or Backlit LCD  
Character Size: 0.3" nominal  
User programmable label descriptors and units of measure

#### Keypad

Keypad Type: Membrane Keypad with 16 keys  
Keypad Rating: Sealed to Nema 4

#### 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

#### Fluid Types

General Purpose, Water, Skydraul 500B, 50/50 Ethylene, Air, Propane, MIL-C-7024D, MIL-O-5606, MIL-23699, JETA-1, Diesel, Methanol

**Real Time Clock**

The ES-747 is equipped with a battery backed real time clock with display of time and date.

Format:

- 12 or 24 hour time display
- Day, Month, Year date display

**Excitation Voltage**

Menu Selectable: 5, 12 or 24 VDC @ 100 mA (fault protected with self resetting fuse)

**Relay Outputs**

The relay outputs are menu assignable to (Individually for each relay) Low Rate Alarm, Hi Rate Alarm, Prewarn Alarm, Preset Alarm, Temperature, Pressure, Density or General purpose warning (security).

- Number of relays: 2 (4 optional)
- Contact Style: Form C contacts
- Contact Ratings: 5 amp, 240 VAC or 30 VDC
- Capabilities: Alarm Delay, Setpoint, Hysteresis, Duration

**Power Input**

The factory equipped power option is internally fused. An internal line to line filter capacitor and MOV are provided for added transient suppression.

- 110 VAC Power: 85 to 127 Vrms, 50/60 Hz
- 220 VAC Power: 170 to 276 Vrms, 50/60 Hz
- DC Power:
  - 12 VDC (10 to 14 VDC)
  - 24 VDC (14 to 28 VDC)
- Power Consumption:
  - AC: 11.0 VA (11W)
  - DC: 300 mA max.

**Flow Inputs:****Pulse Inputs:**

- Number of Flow Inputs: one input available for single pickup or with dual pickups or quadrature
- Input Impedance: 10 K $\Omega$  nominal
- Pullup Resistance: 10 K $\Omega$  to 5 VDC (menu selectable)
- Pull Down Resistance: 10 K $\Omega$  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)
    - Sensitivity:
      - 10 mV or 100 mV
- Minimum Count Speed:
  - Menu selectable: 1-99 seconds
- Maximum Count Speed:
  - Menu Selectable: 40Hz, 3000Hz or 20 kHz
- Overvoltage Protection: 50 VDC

**Control Inputs**

Switch Inputs are menu selectable for Start, Stop, Reset, Lock, Inhibit, Alarm Acknowledge, Print or Not Used.

Control Input Specifications

- Number of Control Inputs: 3
- Input Scan Rate: 10 scans per second
- Logic 1: 4 - 30 VDC
- Logic 0: 0 - 0.8 VDC
- Input Impedance: 100 K $\Omega$
- Control Activation:
  - Positive Edge or Pos. Level based on product definition for switch usage.

**Auxiliary / Compensation Inputs**

The auxiliary/compensation inputs are menu selectable for temperature, pressure, density or not used. These inputs are used for the compensated input when performing compensated flow calculations. It can also be used as a general purpose input for display and alarming.

Number of inputs: 2

- Operation: Ratiometric
- Accuracy: 0.02% FS at 20° C
- Basic Measurement Resolution:
  - 16 bit

Update Rate: 1 update/sec minimum

Automatic Fault detection:

- Signal Over-range/under-range
- Current Loop Broken
- RTD short
- RTD open
- Fault mode to user defined default settings

Fault Protection:

- Reverse Polarity: No ill effects
- Over-Voltage Limit (Voltage Input): 50 VDC

Available Input Ranges

- Voltage: 0-10 VDC, 0-5 VDC, 1-5 VDC
- Current: 4-20 mA, 0-20 mA
- Resistance: 100 Ohms DIN RTD
- Proprietary Thermistor

100 Ohm DIN RTD (liquid equations only)  
(DIN 43-760, BS 1904):

- Three Wire Lead Compensation
- Internal RTD linearization learns ice point resistance
- 1 mA excitation current with reverse polarity protection
- Temperature Resolution: 0.1°C

### Isolated Analog Output

The analog output is menu assignable to correspond to the Uncompensated Volume Rate, Corrected Volume Rate, Mass Rate, Temperature, Pressure, Density, Volume Total, Corrected Volume Total or Mass Total.

Type: Isolated Current Sourcing

Available Ranges: 4-20 mA, 0-20 mA

Resolution: 12 bit

Accuracy: 0.05% FS at 20° C

Update Rate: 1 update/sec minimum

Temperature Drift: Less than 200 ppm/C

Maximum Load: 1000 ohms (at nominal line voltage)

Compliance Effect: Less than .05% Span

60 Hz rejection: 40 dB minimum

Calibration: Operator assisted Learn Mode

Averaging: User entry of damping constant to cause a smooth control action

### Isolated Pulse output

The isolated pulse output is menu assignable to Uncompensated Volume Total, Compensated Volume Total or Mass Total

Pulse Output Form: Photo MOS Relay

Maximum On Current: 100 mA

Maximum Off Voltage: 30 VDC

Saturation Voltage: 1.0 VDC

Maximum Off Current: 0.1 mA

Pulse Duration: 10 mSec or 100 mSec (user selectable)

Pulse output buffer: 256

Fault Protection

Reverse polarity: Shunt Diode

### Serial Communication

The serial port can be used for printing, data recording, and/or 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: (optional 2nd COM port)

Device ID: 01-247

Baud Rates: 2400, 4800, 9600, 19200

Parity: None, Odd, Even

Protocol: Modbus RTU (Half Duplex)

### Setup Diskette Capabilities

Capabilities include: View Live Results Configure unit, Upload and Download to unit, Load and Save to file, Print Setup,

### Data Logging Capabilities

Capabilities:

Permits unit to automatically gather data during use.

Data Log List:

User selectable: includes process variables, totalizers, set points, time and date

Data Log Event Trigger:

selectable: includes interval, time of day, front key, external contact, end of batch

Data Log Format:

selectable: Printer format, Database CSV format

Data Transmission:

Selectable: Output may be transmitted immediately or held in data log for later polling

Remote Request Capabilities include:

Send data log, clear data log

### External Modem Support Capabilities:

Compatibility: Hayes Compatible

Polling Capabilities:

Answers incoming calls, responds to requests for information of action

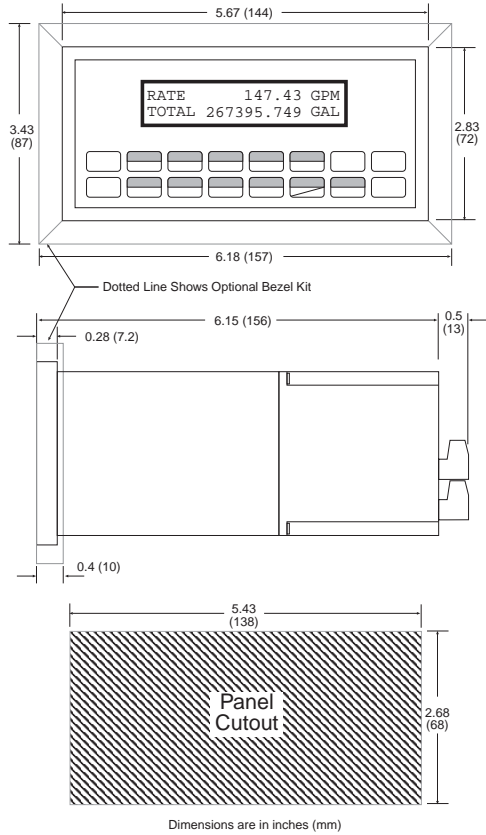
Call Out Capabilities:

Can initiate call on user selectable event condition, or upon error

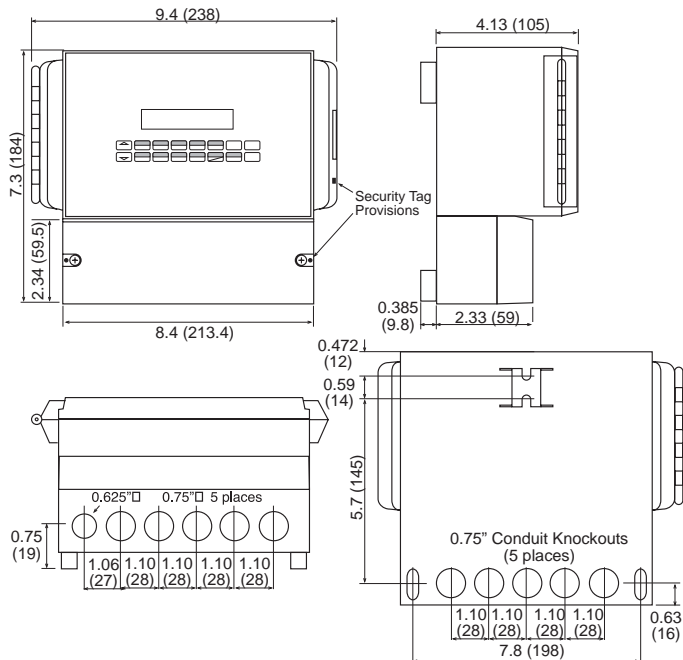
Error Handling:

Supports multiple retry, automatic disconnect upon loss of line or remote inactivity

**Fig. 1: Standard Dimensions**



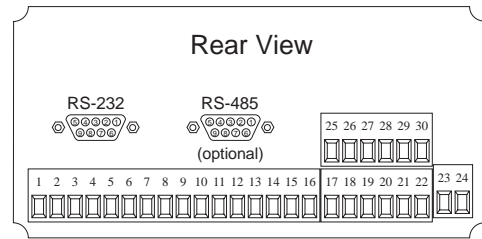
**Fig. 2: Wall Mount ("W" mounting option) Dimensions**



**Terminal Designations**

1	DC OUTPUT	25	NC	26	COM RLY1	27	NO	28	NC	29	COM RLY2	30	NO	23	AC LINE	24	DC -
2	PULSE IN 1	6	RTD EXCIT +	7	RTD SENS +	8	RTD SENS -	9	CNTR IN 1	10	CNTR IN 2	11	CNTR IN 3	12	COMMON	13	PULSE OUTPUT +
3	PULSE IN 2	14	PULSE OUTPUT -	15	ANALOG OUTPUT +	16	ANALOG OUTPUT -	17	NC	18	COM RLY1	19	NO	20	NC	21	COM RLY2
4	COMMON	5	.....	10	SEE USER MANUAL	11	4-20 mA	12	NC	13	COM RLY3	14	NO	15	NC	16	COM RLY4
5	.....	10	SEE USER MANUAL	11	4-20 mA	12	NC	13	COM RLY3	14	NO	15	NC	16	COM RLY4	17	POWER IN
6	RTD EXCIT +	7	RTD SENS +	8	RTD SENS -	9	CNTR IN 1	10	CNTR IN 2	11	CNTR IN 3	12	COMMON	13	PULSE OUTPUT +	14	PULSE OUTPUT -
7	RTD SENS +	8	RTD SENS -	9	CNTR IN 1	10	CNTR IN 2	11	CNTR IN 3	12	COMMON	13	PULSE OUTPUT +	14	PULSE OUTPUT -	15	ANALOG OUTPUT +
8	RTD SENS -	9	CNTR IN 1	10	CNTR IN 2	11	CNTR IN 3	12	COMMON	13	PULSE OUTPUT +	14	PULSE OUTPUT -	15	ANALOG OUTPUT +	16	ANALOG OUTPUT -
9	CNTR IN 1	10	CNTR IN 2	11	CNTR IN 3	12	COMMON	13	PULSE OUTPUT +	14	PULSE OUTPUT -	15	ANALOG OUTPUT +	16	ANALOG OUTPUT -	17	NC
10	CNTR IN 2	11	CNTR IN 3	12	COMMON	13	PULSE OUTPUT +	14	PULSE OUTPUT -	15	ANALOG OUTPUT +	16	ANALOG OUTPUT -	17	NC	18	COM RLY1
11	CNTR IN 3	12	COMMON	13	PULSE OUTPUT +	14	PULSE OUTPUT -	15	ANALOG OUTPUT +	16	ANALOG OUTPUT -	17	NC	18	COM RLY1	19	NO
12	COMMON	13	PULSE OUTPUT +	14	PULSE OUTPUT -	15	ANALOG OUTPUT +	16	ANALOG OUTPUT -	17	NC	18	COM RLY1	19	NO	20	NC
13	PULSE OUTPUT +	14	PULSE OUTPUT -	15	ANALOG OUTPUT +	16	ANALOG OUTPUT -	17	NC	18	COM RLY1	19	NO	20	NC	21	COM RLY2
14	PULSE OUTPUT -	15	ANALOG OUTPUT +	16	ANALOG OUTPUT -	17	NC	18	COM RLY1	19	NO	20	NC	21	COM RLY2	22	NO
15	ANALOG OUTPUT +	16	ANALOG OUTPUT -	17	NC	18	COM RLY1	19	NO	20	NC	21	COM RLY2	22	NO	23	AC LINE
16	ANALOG OUTPUT -	17	NC	18	COM RLY1	19	NO	20	NC	21	COM RLY2	22	NO	23	AC LINE	24	DC -
17	NC	18	COM RLY1	19	NO	20	NC	21	COM RLY2	22	NO	23	AC LINE	24	DC -		
18	COM RLY1	19	NO	20	NC	21	COM RLY2	22	NO	23	AC LINE	24	DC -				
19	NO	20	NC	21	COM RLY2	22	NO	23	AC LINE	24	DC -						
20	NC	21	COM RLY2	22	NO	23	AC LINE	24	DC -								
21	COM RLY2	22	NO	23	AC LINE	24	DC -										
22	NO	23	AC LINE	24	DC -												
23	AC LINE	24	DC -														
24	DC -																

**Terminal Layout**



**Ordering Information**

**Example ES747 L 1 A 0 P**

**Series:** ES747= ES-747

**Display Type:** L= LCD, V= VFD

**Input Type:** 1= 110 VAC, 2= 220 VAC, 3= 12 VDC (10 to 14 VDC), 4= 24 VDC (14 to 28 VDC)

**Relays:** A= 2 SPDT Relays, B= 4 SPDT Relays

**Network Card:** 0= None (STD), 2= RS485/Modbus (optional 2nd COM port)

**Mounting:** P= Panel Mount (see Fig. 1), N= NEMA 4 Wall Mount (see NEMAtr01ST4X), W= NEMA 12/13 Wall Mount w/ Clear Cover (see Fig.2), E= Explosion Proof (No Button Access) (see XHVD 7/4), X= Explosion Proof (with Button Access) (see XTROL 7/4)

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

**Accessories:** KEPS-KEP1-32 (KEP RS232 for SUPERtrol 1, SUPERtrol 1LE, SUPERtrol 2 and LEVELtrol 2 • 32 Bit OPC/DDE Server), KEPS-MBS32 (Supports RS485 for ST1, ST1LE, ST2, LT2, MRT, DRT & MB2 (Modbus RTU))

Modem Available, see MPP-2400 and MPP-2400N (requires M option)  
 Serial printer available, see P1000, P295  
 Ethernet Port Server available, see IEPS  
 RS-422/485 to RS-232 Communication Adaptor available, see CA285  
 Remote metering and data collection software available, see TROLlink