MASSbatch

Installation & Operations Manual

KESSLER-ELLIS PRODUCTS
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99333 REV 9/3/96

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INTRODUCTION

Description:
Featuring 8 digits of bright, .55", alpha-numeric display, the unit can accept up to 10 kHz (5 kHz for 16 Point Linearization) and a direct 100Ω platinum RTD or analog input. The unit has two separate, 8 digit, floating decimal, “K” factors to convert the inputs to meaningful count and rate data. The user, with the push of a button, can view the total of the batch, the rate of flow, temperature or density and the grand total count. Two control outputs are provided for two-stage valve control.
A scaled pulse output is also provided by an open collector driver. Since the output frequency is user selectable at 10, 200, 2K or 20K Hz, the unit can transmit the count data to electro-mechanical or electronic counters as well as computers, programmable controllers or other monitor equipment.
An optional analog output allows the user to select low and high settings to control strip recorders or other peripherals.
A 16 Point Linearization variable K-factor option makes flow systems more accurate and often extends their usable range by allowing users to dial in different K-factors for different flow rates. It is recommended for flow meters whose K-factors change with different rates of flow. From 3 to 16 points of frequency (0 to 5,000Hz) and K-factors greater than .0001 to 999,999 are dialed in at set up. The unit uses 8 digit floating math to interpolate between settings. Rate per second, per minute or per hour programmability eliminates the need to calculate separate K-factors for total and rate.

Features

- Accepts 4-30V Inputs or Pulses Directly From Magnetic Pickup Meters (no pre-amp required)
- Takes a Direct 100Ω Platinum RTD or Analog Signal For Compensation Input
- Display Mass or Corrected Volume, Rate, Grand Total, Temperature or Density
- Two Setpoints For Two-Stage Valve Control
- 10KHz Count Input Frequency (5 kHz for 16 Point Linearization)
- K-Factor Programmable to 8 Places
- Security Lockout
- Two Way RS232/422 Communications
- NEMA 4X/IP 65 Front Panel
- Scalable 4-20mA Output of Rate/Total
- 16 Point Linearization Option
- Temperature or Density Compensation Input

INSTALLATION

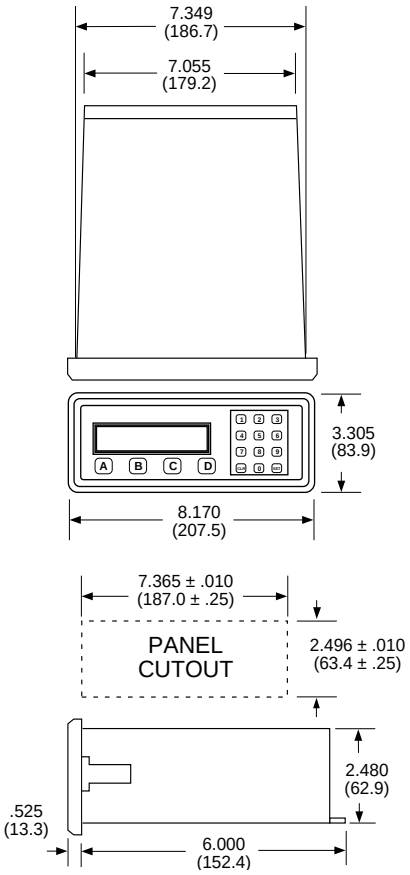
Receipt of Equipment
When the equipment is received, the outside packing case should be checked for damage incurred during shipment. If the packing case is damaged, the local carrier should be notified at once regarding his liability. A report should be submitted to the distributor.
Carefully remove the equipment from the packing case and inspect for damage or missing parts.

Return Shipment
Do not return assembly or part without a Return Material Authorization. The RMA is obtained by calling your local authorized distributor.

Mounting
The controller should be located in an area with a clean, dry atmosphere which is relatively free of shock and vibration. The Batcher is installed in a 7.365" (187mm) wide by 2.495" (63.4mm) high panel cutout. (see Mounting Dimensions) To mount the controller, proceed as follows:
a. Prepare the panel opening.
b. Slip the gasket (provided) over the rear of the case and slide it forward until it engages the inner surface of the front bezel.
c. Install the screws (provided) in the mounting brackets and insert into the mounting holes on top, bottom and sides of case.
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 to maintain NEMA4 rating.

NOTE: To seal to NEMA 4X specs., supplied gasket must be used and panel cannot flex more than .010". All 4 clamps must be tightened a min. of 3 in. lbs. torque. If panel flex occurs, seal unit to panel with RTV type sealer.

Mounting Dimensions



WIRING

AC / DC CONNECTIONS:
NOTE: Connect power only after other connections are finished. Do not touch the live AC power terminals. The unit has been designed with an isolated AC input, therefore polarity is not a concern for the AC power. The chasis is plastic, therefore earth ground is not used. For DC operation, connect +DC to terminal 14 and -DC to terminal 12.

Although the unit is designed to be immune from line or RF interference, the unit is controlled by a microprocessor and an electrically "noisy" environment could cause operating problems. The input power lines should not be common to power lines for motors, pumps, contactors, etc.

Four sources of noise can occur:

1) AC power line noise- If the unit cannot be connected to an electrically clean power source, an inductive load supressing device (MOV as GE#V130LA1 or Resistor Capacitor as Paktron# .2uf/220 ohm @ 400V) can be installed. Although locating the suppressor across the AC supply at the unit should help, best results are obtained by connecting the suppressor across the leads of the "load" at the device causing the spikes.

2) Input line noise- The noise is carried on the input and DC ground lines. Make sure the input wires are not run into the unit in a bundle with power input lines. We recommend using shielded cable. Connect the shield to DC ground of the unit and "earth" at one point in the circuit preferably at the DC ground terminal of the unit.

3) Output lines- The unit has Two open collector outputs and two relay outputs. When these outputs are used to run external relays or solenoids, spikes can be generated upon activation. This noise can spread through the instrument causing operating problems. If the source is a D.C. operated device, a general purpose diode (IN4004) placed across the solenoid prevents electrical noise spikes. Connect the cathode (banded side) to the more positive side of the coil. If the source is an A.C. operated device, use a Resistor Capacitor or MOV across the coil.

4) DC output supply- Noise can be generated on the DC output supply if it is used to drive inductive loads or if the current draw exceeds 100mA. Insure that all inductive loads have a diode (such as IN4004) across the coil and that the current does not exceed 100mA.

WIRING CONNECTIONS

Terminal Connections

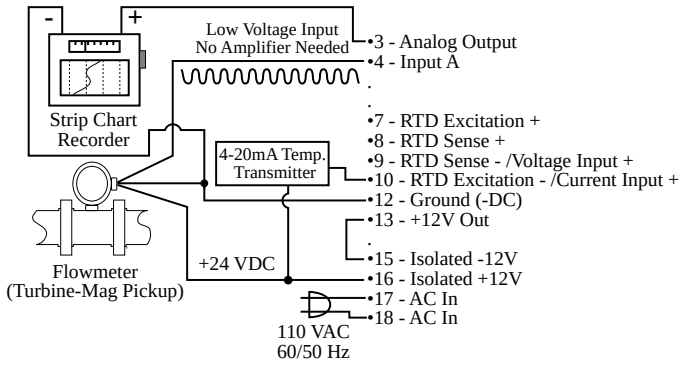
1 - REMOTE START
2 - SCALED OUTPUT (OPEN COLLECTOR)
3 - ANALOG OUTPUT
4 - INPUT A (PULSE)
5 - RESET INPUT
6 - REMOTE STOP
7 - RTD EXCITATION +
8 - RTD SENSE + (SECURITY OUT)*
9 - RTD SENSE - (VOLTAGE INPUT +)*†
10 - RTD EXCITATION - / CURRENT INPUT +
11 - GROUND (-DC)
12 - GROUND (-DC)
13 - 12 VOLTS OUT
14 - DC POWER IN
15 - ISOLATED -12 VOLTS OUT
16 - ISOLATED +12 VOLTS OUT
17 - AC INPUT
18 - AC INPUT
19 - PREWARN TRANSISTOR
20 - PRESET TRANSISTOR

1 - N.O.
2 - N.C. — **PRESET**
3 - COMMON
4 - N.O.
5 - N.C. — **PREWARN**
6 - COMMON

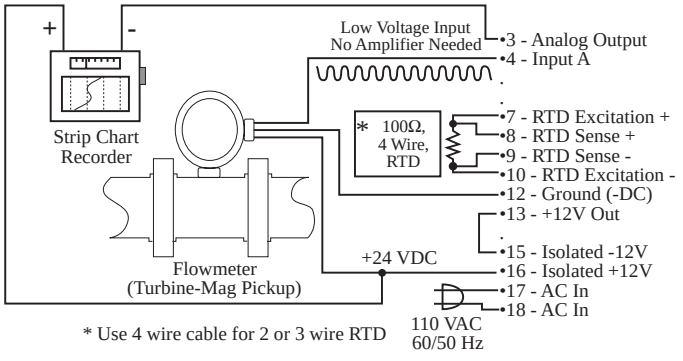
* INTERNAL JUMPER SELECTABLE (see Pg. 29)
† ALSO REQUIRES MENU SELECTION

Typical Wiring

Mag. Pulse Input /Analog Input/ Voltage Output



Mag. Pulse Input /RTD Input/ Current Output



DEFINITION OF MENU PROMPTS

MENU - This prompt is displayed when the programming menu is entered.

PRESET - This sets the setpoint at which the preset A will drop out (R0, reset to 0 mode). In the "SP" (set to preset mode) the unit will reset to this Preset value and count down to 0.

PREWARN - This value is the amount before the Preset value that the Prewarn relay will drop out. For example: if you want the Prewarn relay to drop out 10 counts before the Preset and your Preset is 1234, then set the Prewarn at 10 (not at 1224). **Note:** If the Prewarn is a larger number than the Preset, the warning "**PREWRONG**" will be displayed.

PRE TYP - (PRESET TYPE); This section of the menu allows the user to choose between "EZ PRE" (easy preset) or "STD PRE" (standard preset).

EZ PRE - (EASY PRESET); See "OPERATION USING EZ PRE" Pg.19

STD PRE - (STANDARD PRESET); See "OPERATION USING STD PRE" Pg.19

16 POINT - This section of the menu allows the user to enter 16 point variable K-Factor data.
Note: This prompt only appears on units with the 16 point option.

16PT - (16 POINT); Enter this section to enter the 16 point setup procedure.

LN - (LINEAR); Enter this section to setup a linear K-Factor.

TEST - When "TEST" is selected, point data can be entered exactly as in selected time entries. However, when the unit "runs" in Test Mode, "K-Factor" is always 1. "Rate" (R) displays frequency (inputs per second). "Counter" displays 1 count per each input.

HOURS - When "Hours" is selected, the ratemeter will display units per hour.

MINUTES - When "Minutes" is selected, the ratemeter will display units per minute.

SECONDS - When "Seconds" is selected, the ratemeter will display units per second.

POINT ## - This prompt appears before each of the 16 points are entered. To exit the 16 point setup, press "CLR" then "ENTER".

F####### - This prompt indicates the Frequency for each of the 16 points.

K####### - This prompt indicates the K-Factor for each of the 16 points.

COUNT - This section of the menu is used to set up the counter information.

K-FACTOR - This is a scaling factor that converts the input into engineering units. Since there are separate scaling factors for rate and count, this prompt will appear after entering the COUNT or RATE section of the menu.
Examples: If your meter puts out 100 pulses per gallon and you want to total in gallons, the count K-Factor to enter is 100. To read gallons per minute, the rate K-Factor to enter is 1.6666667 (100 ÷ 60; Hours = 100 ÷ 3600).

R0 - (RESET TO 0); When "R0" is selected, the counter will reset to 0 (count up) when reset.

SP - (SET TO PRESET); When "SP" is selected, the unit will reset to preset (count down) when reset.

DEC LOC - (DECIMAL LOCATION); This sets the decimal location for the counter, preset and prewarn.

RATE - This section of the menu is used to set up the ratemeter information.

WINDOW - This is the amount of time (02 to 24 sec.) that the unit will "look" for valid input data before the rate display defaults to 0.

SIG FIG - (SIGNIFICANT FIGURE); This sets the number (1-6) of meaningful digits the ratemeter will display.
For example: If 2 is entered, a rate of 723.456 will be displayed as 720.

WEIGHT - This is a weighted averaging factor (00-99). Higher settings provide more averaging for a more stable display.
Derived from the equation:

$$\frac{\text{(OLD DATA x "WEIGHT" + NEW DATA)}}{\text{("WEIGHT + 1)}}$$

LOCKOUT- This section of the menu is used to set up the lock code and security time.

SECUR ## - This sets the security time (00 - 99 sec). Enter 00 to disable the security feature. The security feature monitors the input for loss of data. If the unit is started and doesn't receive a pulse in the amount of time entered, the relays will drop out and the display will read "SECURITY". The unit can not be re-started until the 4 digit lockout code is entered.

CODE - This sets the 4 digit lockout code. This code is used to lock and unlock the unit and to return the unit to the run mode when in "SECURITY".

OUTCARD - This section of the menu is used to set up the RS232 or RS422 communication information.

UNIT ##- This sets the unit ID number. This number is to be addressed when the unit is to be on line.

PL - (PARALLEL); This sets the unit for a parallel input.

SER - (SERIAL); This sets the unit for a serial input. The unit should always be set for serial, parallel is disabled.

BAUDRATE - This sets the baudrate of the serial communication.

PARITY - This sets the parity of the serial communication.

ALG OUT - (ANALOG OUT), This section of the menu is used to set up the analog output information.

ANLG RT- (ANALOG RATE); When this is selected the analog output will correspond to the rate display.

ANLG CT - (ANALOG COUNT); When this is selected the analog output will correspond to the counter display.

SET LOW - This sets the low value for the analog output. EXAMPLE: If you want 4mA out to equal a rate of 10, enter 10.

SET HIGH- This sets the high value for the analog output. EXAMPLE: If you want 20mA out to equal a rate of 10000, enter 10000.

OUTFREQ - (OUTPUT FREQUENCY); This sets the frequency of the scaled pulse output (10, 200, 2000 or 20000 Hz). If the scaled input frequency exceeds the selected output frequency, internal buffers will eventually fill up and the unit will display "DATA LOST".

COMP IN - (COMPENSATION INPUT); This section of the menu is used to set up the compensation input information.
IN TYPE - (INPUT TYPE); This sets the input type (RTD, analog or manual).
RTD - This sets the compensation input for an RTD when selected.
°**C** °**F**- Choose between °F or °C for the temperature information.
4-20MA - This sets the compensation input for a 4-20mA input when selected.
0-5V - This sets the compensation input for a 0-5V input when selected.
0-10V - This sets the compensation input for a 0-10V input when selected.
DN TEMP- (DENSITY or TEMPERATURE); Choose to compensate for density or temperature.
DEFLT DN - (DEFAULT DENSITY); The value entered here will be the density value used in the equations when or if there is a density error (the density input goes above or below range, signal lost or sensor failure).
DENS LOW - (DENSITY LOW); This sets the low value for the density input. EXAMPLE: If 4mA = .2, enter .2.
DENS HI- (DENSITY HIGH); This sets the high value for the density input. EXAMPLE: If 20mA = 20.8 enter 20.8.
DEFLT TP- (DEFAULT TEMPERATURE); The value entered here will be the temperature value used in the equations when or if there is a temperature error (the temperature input goes above or below range, signal lost or sensor failure).
TEMP LOW - (TEMPERATURE LOW); This sets the low value for the temperature input. EXAMPLE: If 4mA = 0, enter 0.
TEMP HI- (TEMPERATURE HIGH); This sets the high value for the temperature input. EXAMPLE: If 20mA = 100.0 enter 100.0.
MANUAL - This allows the user to enter in his operating temperature or density when the compensation input is not used.
ENT DEN - (ENTER DENSITY); When the compensation input is set for manual and density, this prompt allows the user to enter the density at which you are operating.
ENT TEMP - (ENTER TEMPERATURE); When the compensation input is set for manual and temperature, this prompt allows the user to enter the temperature at which you are operating.
FLUID - This section of the programming menu is used to set up the fluid properties.
REF DENS - (REFERENCE DENSITY); This allows the user to enter the reference density of the liquid.
REF TEMP- (REFERENCE TEMPERATURE); This allows the user to enter the reference temperature.
EXP COEF - (EXPANSION COEFFICIENT); This allows the user to enter the thermal coefficient of expansion for the liquid. The value must be entered in straight decimal notation. EXAMPLE: If the coefficient of expansion is 115×10^{-6}, then enter 0.000115.
FLOW EQ - (FLOW EQUATIONS); This section of the programming menu is used to set up the type of flow equation used.
MASS - When this is selected the flow equation will be calculated for mass (weight i.e. pounds, Kgrams etc.).
COR VOL - (CORRECTED VOLUME); When this is selected the flow equation will be calculated for corrected volume (area i.e. gallons, liters etc.).

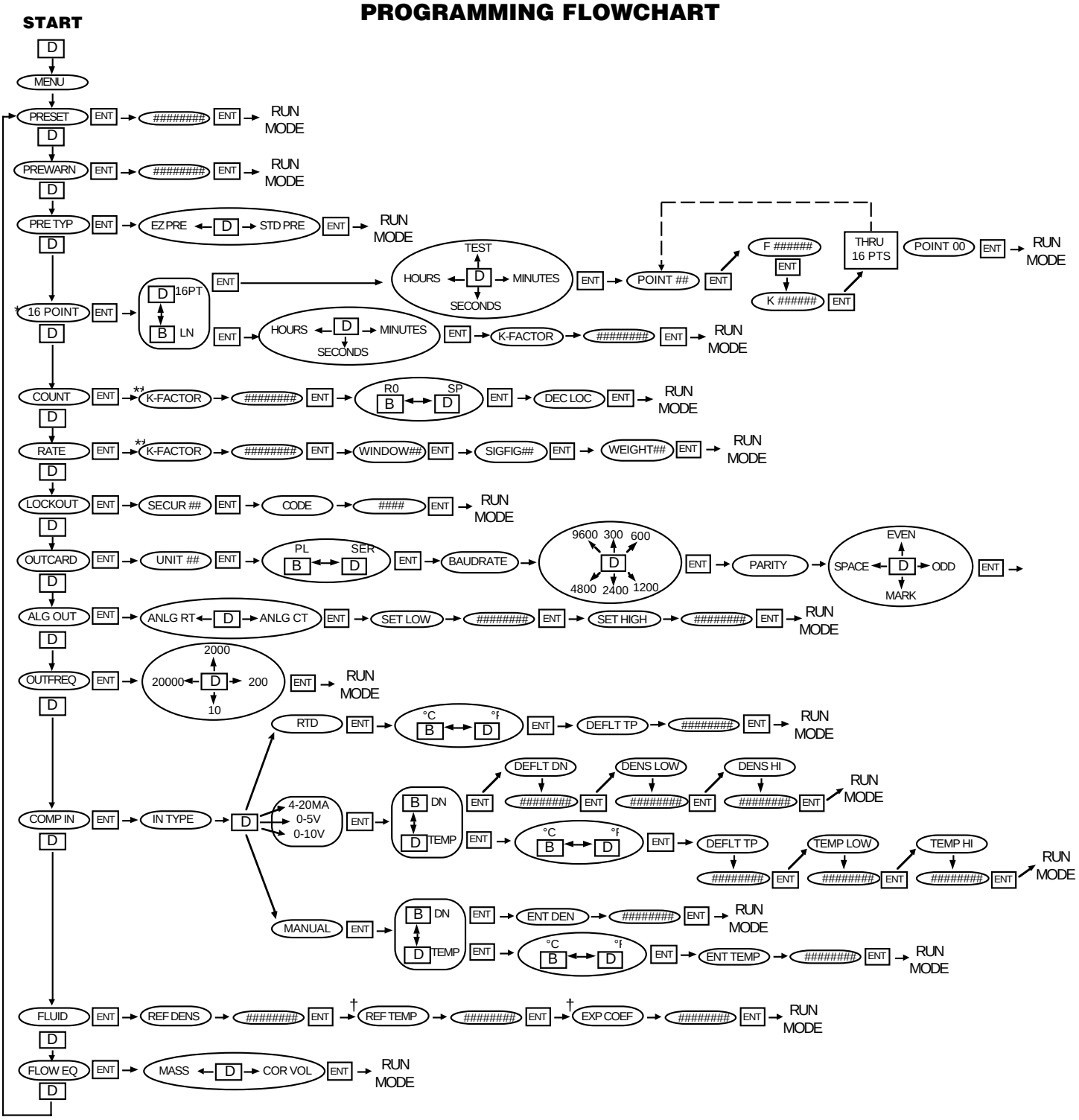
ERROR MESSAGES

While programming and running the unit, various error messages may be displayed. The messages signal when a programming or operating error has occurred. In some cases the error messages will be displayed until the error is fixed.

PROGRAMMING ERRORS:
PREWRONG: This error message will be displayed when the Prewarn value is greater than the Preset value. Re-enter the Prewarn and Preset values correctly to clear the message.
HIGH ≤ LOW: This error message will be displayed if the analog out "HIGH" value is less than or equal to the "LOW" value. Re-enter the High and Low values correctly to continue programming.
TMPWRONG: This error message will be displayed if the temperature "HIGH" value is less than the "LOW" value. Re-enter the High and Low values correctly to continue programming.
DENWRONG: This error message will be displayed if the density "HIGH" value is less than the "LOW" value. Re-enter the High and Low values correctly to continue programming.

OPERATING ERRORS:
SECURITY: This error message will be displayed when the unit enters the security mode. The security feature monitors the input as described in the "Definitions Of Menu Prompts" (see SECUR ##). To get the unit out of security, enter the 4 digit lockout code. Be sure to check the input wiring and sending device to find why no pulses were received.
NOTE: A Security Output is available on units using current or voltage for the compensation input. This output is not available on units using an RTD because they share a common terminal on the terminal block (pin 8). The Security Output is an NPN (sinking) transistor output internally pulled up to +5VDC. This output is intended to trigger an external alarm when the unit is in the security mode. The output will turn on when the unit enters security and remain on until the security warning is cleared.
ERROR TP: This error message will be displayed when the temperature input is defective or out of range. (i.e. below 4mA or above 20mA). The unit uses the default temperature value when there is a temperature error. Pressing the "CLR" button will clear the message, but the unit will continue to use the default temperature value until the error is corrected.
ERROR DN: This error message will be displayed when the density input is defective or out of range. (i.e. below 4mA or above 20mA). The unit uses the default density value when there is a density error. Pressing the "CLR" button will clear the message, but the unit will continue to use the default density value until the error is corrected.

PROGRAMMING FLOWCHART



* The 16 POINT menu items will only appear on units ordered with the 16 Point Linearization option.

** The K-FACTOR menu selections will not appear under RATE and COUNT on units with the 16 Point Linearization option.

† REF TEMP and EXP COEF menu selections will not appear if COMP IN is set for DN (density).

SETUP PROCEDURE

NOTE: Start here and finish to the end. If you make a mistake, press ENT until you reach the beginning.

	PRESS	DISPLAY
STEP 1 **SETTING THE PRESET**	**D**	**MENU** FLASHES TO **PRESET** ↓
	ENT	######## (EXISTING PRESET FLASHES)
	CLR	**0** FLASHES
	1 **4** **2** **7** **8** (AS AN EXAMPLE)	**1 4 2 7 8** FLASHES
	ENT (PRESET ENTERED)	***RUN MODE***
STEP 2 **SETTING THE PREWARN**	**D**	**MENU** FLASHES TO **PRESET** ↓
	D	**PREWARN** ↓
	ENT	######## (EXISTING PREWARN FLASHES)
	CLR	**0** FLASHES
	4 **8** (AS AN EXAMPLE)	**4 8** FLASHES
	ENT (PREWARN ENTERED)	***RUN MODE***
STEP 3 **SETTING PRESET TYPE**	**D**	**MENU** FLASHES TO **PRESET** ↓
	D	**PREWARN** ↓
	D	**PRE TYP** ↓
	ENT	**EZ PRE** ↓ (EXISTING PRESET TYPE)
	D	**STD PRE** ↓ (PRESS **D** TO GO TO **EZ PRE** ↓)
	ENT (PRESET TYPE ENTERED)	***RUN MODE***

STEP 4

SETTING THE COUNTER

See Pg. 18 For 16 Point Option Setup

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D	**PREWARN** ↓
D	**PRE TYP** ↓
D	**COUNT** ↓
ENT	**K-FACTOR** (FLASHES, FOLLOWED BY EXISTING K-FACTOR)
CLR	**0** FLASHES
1 **1** **D** **6** **8** (AS AN EXAMPLE) (PRESS **D** FOR DECIMAL)	**1 1 . 6 8** FLASHES
ENT (K-FACTOR ENTERED)	**RO** ↓ **SP** ↓ (**R0:** RESET TO 0 "ADD" OR **SP:** SET TO PRESET "SUBTRACT")
B OR **D**	SELECTS **R0** OR **SP**
ENT (SELECTION ENTERED)	**DEC LOC** (DECIMAL LOCATION)
PRESS ANY NUMBER	DECIMAL MOVES TO THAT LOCATION
ENT (DECIMAL LOCATION ENTERED)	***RUN MODE***

STEP 5

SETTING THE RATEMETER

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D	**PREWARN** ↓
D	**PRE TYP** ↓
D	**COUNT** ↓
D	**RATE** ↓
ENT	**K-FACTOR** (FLASHES, FOLLOWED BY EXISTING K-FACTOR)
CLR	**0** FLASHES
D **1** **9** **4** **6** (AS AN EXAMPLE) (PRESS **D** FOR DECIMAL)	**. 1 9 4 6** FLASHES
ENT (K-FACTOR ENTERED)	**WINDOW** ## (EXISTING WINDOW VALUE)
CLR	**WINDOW 00**
4	**WINDOW 04**
ENT (WINDOW ENTERED)	**SIGFIG** ## (EXISTING VALUE)
CLR	**SIGFIG 00**
6	**SIGFIG 06**
(SIG FIG INDICATES HOW MANY MEANINGFUL DIGITS ARE SHOWN; TRAILING ZEROES ARE INSERTED IF NECESSARY)	
ENT (SIG FIG ENTERED)	**WEIGHT** ## (EXISTING WEIGHT VALUE)
CLR	**WEIGHT 00**
4	**WEIGHT 04**
ENT (SIGFIG ENTERED)	***RUN MODE***

STEP 6

SETTING LOCKOUT CODE

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D	**PREWARN** ↓
D	**PRE TYP** ↓
D	**COUNT** ↓
D	**RATE** ↓
D	**LOCKOUT** ↓
ENT	**SECUR** ## (EXISTING VALUE)

SECUR (Security) is the amount of time (seconds) that the unit will "look" for valid input pulses. If no pulses are received in the programmed amount of time, the relays will drop out and the unit will display "SECURITY". The four digit lockout code must be entered to return to normal operation. **Note:** Entering 00 will disable the security feature.

CLR	**SECUR 00**
4 (AS AN EXAMPLE)	**SECUR 04**
ENT (SECUR ENTERED)	**CODE** FOLLOWED BY FLASHING CODE NUMBER
CLR	**0**
1 **1** **1** **1** (AS AN EXAMPLE)	**1 1 1 1** (FLASHING)

This is the code used to lock and unlock the unit the unit. **RECORD THIS NUMBER FOR LATER USE..**

ENT (CODE ENTERED)	***RUN MODE***

STEP 7

SETTING THE COMM. OUT CARD

SKIP IF NOT USED

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D	**PREWARN** ↓
D	**PRE TYP** ↓
D	**COUNT** ↓
D	**RATE** ↓
D	**LOCKOUT** ↓

STEP 7

SETTING THE COMM. OUT CARD CONTINUED

PRESS	DISPLAY
D	**OUTCARD ↓**
ENT	**UNIT ##** (EXISTING VALUE)
This is the unit ID number. It can be any number from 1 to 15.	
CLR	**UNIT 00**
1 (AS AN EXAMPLE)	**UNIT 01**
ENT (UNIT NUMBER ENTERED)	**PL↓ SER↓ ***
ENT	**BAUDRATE** (FLASHES FOLLOWED BY LAST BAUDRATE USED)
	300 ↓
D	**600 ↓**
D	**1200 ↓**
D	**2400 ↓**
D	**4800 ↓**
D	**9600 ↓** (PRESS **D** TO GO TO **300 ↓**)
ENT	**PARITY** (FLASHES, THEN LAST PARITY USED)
D	**EVEN ↓**
D	**ODD ↓**
D	**MARK ↓**
D	**SPACE ↓** (PRESS **D** TO GO TO **EVEN ↓**)
ENT	***RUN MODE***

*** UNIT SHOULD ALWAYS BE "SER", "PL" IS DISABLED**

STEP 8

SETTING THE ANALOG OUTPUT

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**ALG OUT** ↓
ENT	**ANLG RT** (ANALOG OUTPUT FOR RATE)
D (PRESS D TO TOGGLE BETWEEN SELECTIONS)	**ANLG CT** (ANALOG OUTPUT FOR COUNT)
ENT	**SET LOW** (FLASHES TO LAST VALUE STORED)
CLR	**0** (FLASHING)
1 **D** **2** **4** (AS AN EXAMPLE) (PRESS D FOR DECIMAL); IN THIS EXAMPLE 1.24 = 4mA	**1 . 2 4** (FLASHING)
ENT (LOW SET AT 1.24)	**SET HIGH** (FLASHES TO LAST VALUE STORED)
CLR	**0** (FLASHING)
1 **0** **0** **D** **0** (AS AN EXAMPLE) (PRESS D FOR DECIMAL); IN THIS EXAMPLE 100.0 = 20mA	**1 0 0 . 0** (FLASHING)
ENT (HIGH SET AT 100.0)	***RUN MODE***

STEP 9

SETTING OUTPUT PULSE FREQUENCY

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**OUTFREQ**↓
ENT	**20000**↓ (DISPLAYS LAST SELECTION)
D	**2000**↓
D	**200**↓
D	**10**↓ (PRESS **D** TO GO TO **20000**↓)
ENT	***RUN MODE***

STEP 10A

SETTING COMPENSATION INPUT FOR RTD

NOTE:
When RTD input is desired, the RTD "R" input option must be ordered or jumper changes made. See "Jumper Options" Pg. 29

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**COMP IN** ↓
ENT	**IN TYPE** (FLASHES TO LAST TYPE ENTERED)
D	**4-20MA**↓
D	**0-5V**↓
D	**0-10V**↓
D	**MANUAL** ↓
D	***RTD*** ↓ (PRESS **D** TO GO TO **4-20MA** ↓)
ENT (WHEN **RTD** IS DISPLAYED)	°**C**↓ °**F**↓ (PRESS **B** FOR °C, PRESS **D** FOR °F)
ENT	**DEFLT TP** (FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
1 **D** **2** **4** (AS AN EXAMPLE) (PRESS D FOR DECIMAL)	**1 . 2 4** (FLASHING)
ENT	***RUN MODE***

STEP 10B

SETTING COMPENSATION INPUT FOR ANALOG (TEMPERATURE)

NOTE:
If an analog input (mA or V) is desired, the unit must be ordered without the "R" (RTD) option or jumper changes made.
See "Jumper Options" Pg. 29

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**COMP IN** ↓
ENT	**IN TYPE** (FLASHES TO LAST TYPE ENTERED)
	RTD↓
D	***4-20MA***↓
D	***0-5V***↓
D	***0-10V***↓
D	**MANUAL** ↓ (PRESS **D** TO GO TO **RTD**↓)
ENT (WHEN **4-20MA, 0-5V** or **0-10V** IS DISPLAYED)	**DN**↓ ***TEMP***↓ (PRESS **B** FOR DN (DENSITY); **D** FOR TEMP (TEMPERATURE)
ENT (WHEN **TEMP** IS SELECTED)	°**C**↓ °**F**↓ (PRESS **B** FOR °C, PRESS **D** FOR °F)
ENT	**DEFLT TP** (FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
1 **D** **2** **4** (AS AN EXAMPLE)	**1 . 2 4** (FLASHING)
(PRESS D FOR DECIMAL, PRESS C TO CHANGE SIGN i.e. + or -)	
ENT	**TEMP LOW** (FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
1 **0** **D** **0** (AS AN EXAMPLE)	**1 0 . 0** (FLASHING)
(PRESS D FOR DECIMAL, PRESS C TO CHANGE SIGN i.e. + or -)	
ENT	**TEMP HIGH**(FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
1 **0** **0** **D** **0** (AS AN EXAMPLE)	**1 0 0 . 0** (FLASHING)
(PRESS D FOR DECIMAL, PRESS C TO CHANGE SIGN i.e. + or -)	
ENT	***RUN MODE***

STEP 10C

SETTING COMPENSATION INPUT FOR ANALOG (DENSITY)

NOTE:
If an analog input (mA or V) is desired, the unit must be ordered without the "R" (RTD) option or jumper changes made.
See "Jumper Options" Pg. 29

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**COMP IN** ↓
ENT	**IN TYPE** (FLASHES TO LAST TYPE ENTERED)
	RTD↓
D	***4-20MA***↓
D	***0-5V***↓
D	***0-10V***↓
D	**MANUAL** ↓ (PRESS **D** TO GO TO **RTD**↓)
ENT (WHEN **4-20MA, 0-5V** or **0-10V** IS DISPLAYED)	***DN*** ↓ **TEMP**↓ (PRESS **B** FOR DN (DENSITY); **D** FOR TEMP (TEMPERATURE)
ENT (WHEN **DN** IS SELECTED)	**DEFLT DN** (FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
1 **D** **2** **4** (AS AN EXAMPLE) (PRESS D FOR DECIMAL)	**1 . 2 4** (FLASHING)
ENT	**DENS LOW** (FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
1 **0** **D** **0** (AS AN EXAMPLE) (PRESS D FOR DECIMAL)	**1 0 . 0** (FLASHING)
ENT	**DENS HI** (FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
1 **0** **0** **D** **0** (AS AN EXAMPLE) (PRESS D FOR DECIMAL)	**1 0 0 . 0** (FLASHING)
ENT	***RUN MODE***

STEP 10D

SETTING COMPENSATION INPUT FOR MANUAL (TEMPERATURE)

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**COMP IN** ↓
ENT	**IN TYPE** (FLASHES TO LAST TYPE ENTERED)
	RTD↓
D	**4-20MA**↓
D	**0-5V**↓
D	**0-10V**↓
D	***MANUAL*** ↓ (PRESS **D** TO GO TO **RTD**↓)
ENT (WHEN **MANUAL** IS DISPLAYED)	**DN**↓ ***TEMP***↓ (PRESS **B** FOR DN (DENSITY); **D** FOR TEMP (TEMPERATURE)
ENT (WHEN **TEMP** IS SELECTED)	°**C**↓ °**F**↓ (PRESS **B** FOR °C, PRESS **D** FOR °F)
ENT	**ENT TEMP** (FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
1 **0** **0** **D** **0** (AS AN EXAMPLE) (PRESS D FOR DECIMAL, PRESS C TO CHANGE SIGN i.e. + or -)	**1 0 0 . 0** (FLASHING)
ENT	***RUN MODE***

STEP 10E
SETTING COMPENSATION INPUT FOR MANUAL (DENSITY)

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**COMP IN** ↓
ENT	**IN TYPE** (FLASHES TO LAST TYPE ENTERED)
	RTD↓
D	**4-20MA**↓
D	**0-5V**↓
D	**0-10V**↓
D	***MANUAL*** ↓ (PRESS **D** TO GO TO **RTD**↓)
ENT (WHEN **MANUAL** IS DISPLAYED)	***DN*** ↓ **TEMP**↓ (PRESS **B** FOR DN (DENSITY); **D** FOR TEMP (TEMPERATURE)
ENT (WHEN **DN** IS SELECTED)	**ENT DEN** (FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
1 **2** **D** **4** (AS AN EXAMPLE) (PRESS D FOR DECIMAL)	**1 2 . 4** (FLASHING)
ENT	***RUN MODE***

STEP 11
SETTING FLUID PROPERTIES

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**FLUID** ↓
ENT	**REF DENS** (FOLLOWED BY EXISTING VALUE)

NOTE: If the compensation input is set for temperature and the flow equation is set for corrected volume, the reference density needs to be entered only for the density display in the run mode. If the reference density is not known, enter one (1). Realize that when one (1) is entered the density displayed in the run mode will be incorrect.

CLR	**0** (FLASHING)
6 **1** **D** **2** (AS AN EXAMPLE) (PRESS D FOR DECIMAL)	**6 1 . 2** (FLASHING)

STEP 11 — SETTING FLUID PROPERTIES CONTINUED

PRESS	DISPLAY
ENT	***REF TEMP** (FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
1 **0** **0** **D** **0** (AS AN EXAMPLE) (PRESS D FOR DECIMAL, PRESS C TO CHANGE SIGN i.e. + or -)	**1 0 0 . 0** (FLASHING)
ENT	***EXP COEF** (FOLLOWED BY EXISTING VALUE)
CLR	**0** (FLASHING)
D **0** **0** **0** **0** **0** **1** (AS AN EXAMPLE); (PRESS D FOR DECIMAL)	**. 0 0 0 0 0 1** (FLASHING)
ENT	***RUN MODE***

***** These menu selections will not appear if COMP IN is set for density

STEP 12 — SETTING FLOW EQUATIONS

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**FLOW EQ** ↓
ENT	**MASS** (LAST EQUATION SELECTED)
D (PRESS D TO TOGGLE BETWEEN MASS & COR VOL)	**COR VOL**
ENT	***RUN MODE***

LOCKING AND UNLOCKING THE UNIT

PRESS	DISPLAY
	RUN MODE (with LOCK off)
1 **1** **1** **1** per example set in step 6	**LOCK ON** (flashes) Menu changes are not allowed
	RUN MODE (with LOCK on)
1 **1** **1** **1** per example set in step 6	**LOCK OFF** (flashes) Menu changes are allowed
	RUN MODE

SETTING 16 POINT OPTION FOR LINEAR INPUT

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**16POINT** ↓
ENT	**LN**↓ **16PT**↓ (**LN:** LINEAR **16PT:** 16 POINT) (PRESS B FOR LINEAR)
ENT	**SECONDS, MINUTES** or **HOURS** (RATE TIMEBASE) (PRESS D TO CHOOSE DESIRED TIMEBASE)
ENT	**K-FACTOR** (FLASHES, FOLLOWED BY EXISTING K-FACTOR)
CLR	**0** FLASHES
1 1 D 6 8 (AS AN EXAMPLE) (PRESS D FOR DECIMAL)	**1 1 . 6 8** FLASHES
ENT	***RUN MODE***

SETTING 16 POINT OPTION FOR NON-LINEAR INPUT

NOTE: If TEST is entered, point data can be entered exactly as in selected time entries. However, when the unit "runs" in Test Mode "K-factor is always 1. "Rate" (R) displays frequency (inputs per second). Counter displays 1 count per each input.

PRESS	DISPLAY
D	**MENU** FLASHES TO **PRESET** ↓
D UNTIL	**16POINT** ↓
ENT	**LN**↓ **16PT**↓ (**LN:** LINEAR **16PT:** 16 POINT) (PRESS D FOR 16 POINT)
ENT	**MINUTES** ↓
D	**HOURS** ↓
D	**TEST** ↓
D	**SECONDS** ↓ (PRESS D TO GO TO MINUTES)
ENT (PRESS AS DESIRED)	**POINT 00** (ENTER POINT 00 TO GO TO RUN MODE)
1 (SELECT POINT 1)	**POINT 01** (KEY IN POINT DESIRED)

SETTING 16 POINT OPTION FOR NON-LINEAR INPUT CONTINUED

NOTE: "BAD SEQ" will appear if frquencies are not in ascending order with point numbers. After 2 seconds, the first point number with error will appear so data can be viewed and corrected.

PRESS	DISPLAY
ENT	**F** ## (SHOWS FREQUENCY IN MEMORY)
CLR	**F 0**
1 **0** **0** (AS AN EXAMPLE)	**F 100** (FREQUENCY FOR POINT 1 IS 100)
ENT	**K** ## (SHOWS K-FACTOR IN MEMORY)
CLR	**K 0**
1 **0** **0** (AS AN EXAMPLE)	**K 100** (K-FACTOR FOR POINT 1 IS 100)
2	**POINT 02** (ENTER POINT DATA AS DESIRED) (REPEAT THROUGH 16 POINTS)
CLR	**POINT 00** (ENTER POINT 00 TO EXIT SETUP)
ENT	***RUN MODE***

OPERATION USING EZ PRE

The EZ PRE (easy preset) programming option has been designed for users who are changing the batch amount often. By choosing EZ PRE, the user has less buttons to push to change the Preset. The EZ PRE feature functions as follows:
Initially, the preset is entered under PRESET in the programming menu. Once the unit is started, the relays energize and the unit begins to count. When the batch is complete the relays drop out and the display flashes showing the present preset value. Press START to run another batch of the same quantity. If the user wishes to change this value, simply key in the new value (pressing CLR is not necessary). Pressing START will automatically reset the count and start a new batch using the new preset value. To view the other parameters without starting the unit, simply press the ENT button (stores flashing preset into memory). Pressing the VIEW button steps through the different parameters.

NOTE: If the STOP is activated before a batch is complete, pressing START will continue the batch from the point where it was stopped.

NOTE: The Start button and remote Start input are inhibited once the user begins to edit the preset in the EZ PRE mode. At this point the user must enter the new preset, clear the total and then activate Start to start a batch.

RS232/RS422 Batch Operation:
When controlling batches through RS232 or RS422, the following steps must be taken:
To start a new batch, send an ET command to enter preset then send an RC command to reset the total before a GO command can be sent to start the batch.

OPERATION USING STD PRE

The STD PRE (standard preset) programming option has been used in the past in our other batching units. When the STD PRE option is selected, the unit operates as follows:
The Preset and Prewarn values are entered by entering the programming menu and selecting Preset or Prewarn. After these values are entered, the user can reset the counter (front panel or remote) and start the batcher. When started both relays energize, and the counter begins to count. When the batch is complete the relays drop out and the unit displays the amount that was batched (0 if set to preset mode). To run a batch of the same amount, the user must reset the counter and press start. To run a batch of a different value, the user must enter the programming menu and enter the new Preset and Prewarn values. The counter must be reset before the new batch is started.

OUTCARD RS232/RS422 SERIAL INTERFACE

If the serial interface option is supplied, up to 15 units can be linked together. (See "Strobe Input Operation" to link more than 15 units). Units status and new set points can be communicated by remote hook-up. Mode changes, however, must always be made on the front keypad. Data is transmitted at selected baud rates using standard seven bit ASCII characters and parity with two additional bits of "Start" and "Stop" to make up the standard ten bit character. (See Unit setup to select and enter desired Code Number, Baud Rate and Parity).
NOTE: To prevent lost counts, parameters should not be changed through serial communication while batches are running.

UNIT CODE
Each Unit in the hook-up must be assigned a code number from 1 to 15 through the front keypad in the "Outcard" set up mode. Number "00" is reserved for a dedicated hook-up to only one terminal and its transmit output line remains in an "on" active state. (Units assigned other numbers have outputs that remain in the "off" high impedance state until addressed by their code number or brought on line by positive edge of Strobe input). Once a unit is addressed, do not address another unit until the data has been entered, a "Carriage Return" has been sent and any data requested has been transmitted back.

BAUD RATE
The baud rate is the speed at which data is transmitted, expressed in bits per second. Baud rates of 300, 600, 1200, 2400, 4800 or 9600 are available. Use the front keyboard to call up the "Outcard" set up mode and select the desired baud rate that is compatible with the remote terminal.

PARITY
Parity is a bit of information that is inserted before the stop bit is used. It is used to help check that the transmission is correct. In the "Outcard" set up mode, select between "Odd" (Parity bit is logical zero if total number of logical 1's in the first seven data bits is odd)' "Even" (Parity bit is logical zero if total number of logical 1's in the seven data bits is even), "Mark" (Parity data bit always logical 1 - high/ Mark), "Space" (Parity data bit always logical 0' low/Space). If a "Mark" parity is chosen, it will appear that two (2) stop bits are used. Use the "Mark" parity with terminals using parity "OFF or "NONE". These terminal ignore the parity. The unit does not check the received parity but does transmit the parity chosen. If the parity requirements of the interface terminal are not known, it is often practical to key in a different parity until the correct one works.

RS232 ELECTRICAL REQUIREMENTS
Standard EIA specifications. Standard inputs must present a load of 3000 to 7000 Ohms. A voltage level of +3V to +25V (referenced to signal ground) is read as a "Space" or "0" and indicates an active state (asserts a control line). A voltage level of -3 to -25V is read as a "Mark" or "1" and does not indicate an active state (does not assert a control line). Outputs must send a voltage of +5 to +25V (referenced to signal ground) for a "Space" and a voltage of -5 to -25V for a "Mark" when loaded with a 3000 Ohm load to signal ground. Outputs must be capable of being shorted to other signal lines without burning out. It is normally recommended that cable length be limited to 50 feet.

RS422 ELECTRICAL REQUIREMENTS
The input of the unit follows the standard EIA high impedance minimum of 12K Ohms. When the 422 + (A) input is more positive than the 422 - (B) input by .2V to 6V, a "1" or "Mark" condition is recognized. When the 422+ input .2V to 6V, a "0" or "Space" is recognized. Data is recognized by the polarity of the voltage difference between the two lines. Noise picked up on the line will make little difference since the noise is usually added to each line, and the voltage differential remains the same. The output driver drives the transmit lines to a differential of 2 to 6V. It is designed to handle loads up to 60mA of sink or source current and features positive and negative current limiting for protection from line fault conditions. Since the RS422 is more immune to noise, cable links up to 1000 feet or more can be used. Because of the high input impedance of RS422, line terminating loads are recommended. For hook up to a single unit a 150 to 200 Ohm resistor across Receive Data + or - at the unit and at the remote terminal is often sufficient. For multiple hook-up, other standard terminations should be used. Total loading should not be greater than 90 Ohms.

RS232/RS422 SERIAL INPUT CODES

WARNING: The unit will lose counts if critical setup information (preset, k factor, temp, etc.) is accessed via the serial port while the unit is running.

DXX(S) (Device and address number followed by space) activates the unit that has been assigned that number. That unit comes on line and transmits "Device XX:". Unit is now ready to receive a code or string of codes separated by a space. A "Carriage Return" (Enter) code enters the codes and processing of requests begins.

CODES

DC	Will transmit count (total).
DD	Will transmit density.
DH	Will transmit Density Hi
DH(S)XXXX	Will set Density Hi at XXXX
DL	Will transmit Density Lo
DL(S)XXXX	Will set Density Lo at XXXX
DR	Will transmit rate.
DT	Will transmit grand total.
EC	Will transmit the Expansion Coeficient
EC(S)XXXX	Will set Expansion Coeficient at XXXX
ET	Will Enter EZ PRESET at end of batch
GO	Will start the unit
KC	Will transmit counter K-Factor.
KC(S)XXXX	Will load counter K-Factor at XXXX.
KR	Will transmit rate K-Factor.
KR(S)XXXX	Will load rate K-Factor at XXXX.
PA	Will transmit Preset.
PA(S)XXXX	Will load preset at XXXX.
PW	Will transmit Prewarn.
PW(S)XXXX	Will load Prewarn at XXXX.

RC	Will reset counter to zero if in “RO” mode (adding) or set counter to Preset A if in “SP” mode (subtracting). Output is reset.
RC(S)XXXX	Will set counter to XXXX (no other change is made).
RD	Will transmit reference density
RD(S)XXXX	Will set reference density at XXXX.
RT	Will reset grand total to zero.
RT(S)XXXX	Will reset grand total to XXXX.
ST	Will stop the unit.
TH	Will transmit Temperature Hi.
TH(S)XXXX	Will set Temperature Hi at XXXX.
TL	Will transmit Temperature Lo.
TL(S)XXXX	Will set Temperature Lo at XXXX.
TP	Will transmit Temperature.
TR	Will transmit Temperature Reference.
TR(S)XXXX	Will set Temperature Reference at XXXX

SERIAL INTERFACE OPERATION

Data is received and transmitted over standard EIA RS232 or RS422 levels. Each 10 bit character is made up of a start bit, 7 bit ASCII code, parity bit and stop bit. Unit number, baud rate and parity are entered in the “Outcard” set up mode and remain in memory even if power is off.

Note that the input impedance of RS232 is 3K or 7K Ohm worst case. The terminal addressing the unit must be capable of driving all loads in the loop. RS422 input impedance is much higher and there is usually no problem driving 15 units. Unit serial transmit line remains in a high impedance “OFF” state until addressed. Insure that only one unit is addressed at a time.

To address a unit, transmit a “D” (device) followed by the 1 to 15 code number and a “Space”. Once the “Space” has been received, the unit becomes active and responds back, “Device XX:” (Device number). (Once active, the unit works in a full duplex, echo back mode, so that data sent from the terminal will be transmitted back for verification). Once the unit is “on line”, use the proper serial transmit codes to request data or set a new value. (See RS232/RS422 Serial Input Codes). Up to 80 characters of data may be linked together and transmitted to the unit in a string as long as there is a space between the different codes. If an error is made, a correction can be made by back spacing and retyping correct data before the “Carriage Return” (Enter) is sent, the unit starts processing the data and will transmit the requested data on a non-priority basis over the data transmit line. A keypad entry, Error Display or incoming data will halt the data communication cycle. Therefore, there should be a pause after data is requested to insure that all data has been transmitted before another unit is addressed and brought on line. (If the unit is not busy, It should not require more than 5 msec to process each request. To find the cycle time to process and transmit a request, calculate the bit transmit time by dividing 1 by the baud rate; multiply by the number of requests made. Example: Typical time to transmit 1 uninterrupted request at 300 baud rate is .272 sec. (1-300) x (80) + .005.

This time will be extended if the unit must service the front keypad or one of the inputs. In practice if transmission has not started within 2 seconds after data is requested, It can be assumed that there is a problem.

When transmitting, the unit will precede each data value with a “Carriage Return” and “Line Feed” code and answer only with requested data in the order the requests were made. After all requested data has been transmitted any new communication must be started again by DXX (Device number) and space.

Following are two examples of requests and responses:

Transmit fromTerminal	Receive from Unit
(S) = Space	
Example A:	
D13(S)	Device #13
[Unit #13 Activated]	
PA(S)76546(S)PA(S)	PA 76546 PA
KC(S)1575(S)KC(S)	KC 1575 KC
RC(ENTER)	RC
[Unit presets and counter K-Factor are set, counter is reset]	
	76546
	1575
Example B:	
D7(S)	Device #7
[Unit #7 Activated]	
PA(S)12347(S)PA(S)	PA12347 PA
RC(S)456789(S)DC(S)	RC 456789 DC
RT(S)376(S)DT(ENTER)	RT 376 DT
[Unit preset, counter and total count are set]	
	12347
	456789
	376

STROBE ADDRESS OPERATION

Another method of reading the status of a unit with either a RS232 or RS422 option is by means of a separate strobe address and a 3 bit data request code. Use of the strobe address method does not allow the input of new set points but theoretically hundreds of units could be linked together to transmit the data in the unit over the serial transmit line in the standard RS232 or RS422 format. The unit could be assigned any code number other than “00”.

The 3 bit data request code would be latched in at the positive edge of a 3 to 30 VDC strobe input that remain high a minimum of 25 milliseconds. Requests are processed on a nonpriority basis. Normally data will begin to be transmitted from the unit over the RS232 or RS422 serial transmit line within 5 msec unless interrupted by a keypad entry or other signal input.
No other unit should be brought on line until data requested has been transmitted.

STROBE INPUT

Both the RS232 and RS422 interface option cards have inputs that allow data to be requested over a separated strobe input and a 3-bit data request code input. Any number of the 3 data request code lines can be linked in parallel as long as the source can drive the combined load of all inputs linked together (1.5K Ohm divided by the total number linked together). Data is transmitted over the serial lines using standard RS232 or RS422 characteristics. Strobe and data ground as reference:

STROBE INPUT LEVELS

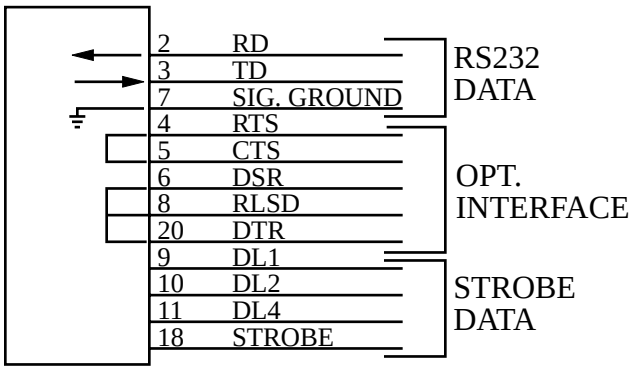
0 or low:	Open or 0 to 1VDC
1 or high:	3 to 30 VDC
Impedance:	1.5K Ohm

STROBE INPUT CODES (Octal Code)

#	DL4	DL2	DL1	Description
0	0	0	0	PA (Preset request)
1	0	0	1	PW (Prewarn request)
2	0	1	0	KC (K-Factor or counter request)
3	0	1	1	KR (K-Factor of rate request)
4	1	0	0	DC (Display of count request)
5	1	0	1	DT (Display of grand total request)
6	1	1	0	DR (Display of rate request)

RS232 HOOKUP

RS232/STROBE
(SUB-D 25 PIN CONN.)



RS232 WIRING

The unit requires only three wires for RS232 communication: Pin 7 (Signal Ground), Pin 2 (Receive Data), Pin 3 (Transmit Data). Pin 4 (Request to Send) are jumped internally to echo back the signals. Pins 6 (Data Set Ready), 8 (Received Line Signal Detector) and 20 (Data Terminal Ready) are also jumped internally to echo back any signal. The RS232 option has a subminiature D25 pin female connector and is wired as a DCE (Data Communications Equipment) device. If it is connected to a DTE (Data Terminal Equipment) device, the interconnect cable should have wires 2 and 3 connected straight to the same pins on each end. If it is connected to another DCE device, Pins 2 and 3 must be crossed so that the wire to Pin 2 on one end goes to Pin 3 on the other end and Pin 3 on one end goes to Pin 2 on the other end.

STROBE WIRING FOR RS232

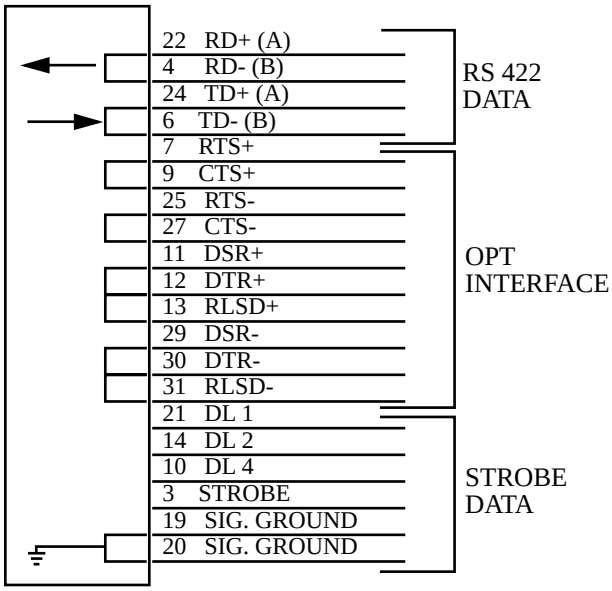
The 3 data lines to generate the request code (DL 1: Pin 9, DL 2: Pin 10, 2: DL 4 Pin 11) must be set and remain constant while the positive strobe of at least 25 milliseconds is given on the strobe input (Pin 18). Data is transmitted in RS232 serial format on Transmit Data Line (Pin 3).

RS422 WIRING

The unit RS422 option has a subminiature D 37 pin female connector and is wired as a DCE (Data Communication Equipment) device. It is designed to be connected to a DTE (Data Terminal Equipment) device. If it must be connected to a DCE device, it will be necessary to cross wires 4 and 6 as well as 22 and 24 at one end of the connector harness. The unit requires only 5 wires for RS422 communications; Pin 22 [Receive Data + (A)], Pin 4 [Receive Data - (B)], Pin 24 [Transmit Data + (A)], Pin 6 [Transmit Data - (B)], Pin 20 (Sig. Ground). The following groups of pins have been jumped internally to echo back the signals: (7, 9), (25, 27), (11, 12, 13), (29, 30, 31). Signal ground (Pins 19, 20) must be connected to provide a common reference

RS422 HOOKUP

RS422/Strobe (SUB-D 37 Pin Conn.)

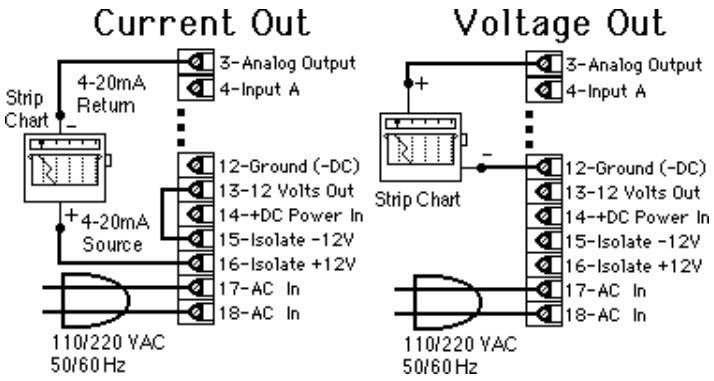


STROBE WIRING FOR RS422

The 3 data lines to generate the request code (DL1: Pin 21, DL2: Pin 14, DL4: Pin10) must be set and remain constant while the positive strobe of at least 12 milliseconds is given on strobe input (Pin 3). Data is transmitted in RS422 serial format on Transmit Data Lines (Pin 6-24).

ANALOG OUTPUT

The output on external pin 3 is a 4 - 20 mA, 0 - 5 VDC or 0 - 10 VDC output corresponding to the selected rate readings. When the output is 4 - 20 mA, a sinking driver generates a linear current across recorder, PLC, computer or external meter. When the output is a voltage, the unit generates a positive voltage with respect to ground (pin 12). In the program set up mode the user is prompted to "SET LOW" (4mA rate or 0V rate) and "SET HIGH" (20mA rate or 5V; 10V rate).
The unit can supply the 24VDC to power the current loop. Connect Pin 15 to Pin 13. Pin 16 is now + 24VDC with respect to Pin 12). With Pin 15 connected to Pin 13, connect Pin 16 to the + DC side of the external device and connect Pin 3 to - DC side of the external device.



16-POINT LINEARIZATION OPTION

DESCRIPTION
The 16 point K-Factor option allows the user to dial in from 3 to 16 different frequency points (inputs per second) and different K-Factor dividers from 0.0001 to 99999999 for each of these frequencies.

The 16 point unit determines the incoming frequency and calculates a K-Factor line slope from the two closest data points that had been entered. The "specific K-Factor" is then proportionally interpolated using 8-position floating math. This K-Factor is applied to all inputs until the next frequency calculation, usually 1 second later. If a "0" frequency is entered into "point 1", the "point 1" K-Factor will be applied to all inputs received before the first frequency calculation.

The rate can be displayed in 3 ways: "SECONDS _", "MINUTES _", "HOURS _", or "TEST _". If "SECONDS" is selected, the unit displays the "base rate" calculated from the incoming frequency and the "specific K-Factor". If "MINUTES _" is selected, the rate displayed is 60 times the "base" rate. If "HOURS _" is selected, the rate displayed is 3600 times the base rate.

POINT DATA FORMATTING
Each Frequency/K-Factor data entry is assigned a point number. Any point number may be selected to view and/or change the Frequency/K-Factor data as long as the frequencies of the ascending frequencies. "BAD FREQ" will flash when exiting the set up mode if there is a sequence error. The unit will then display the sequence error point # so that corrections can be made.

NOTE A: Unit defaults "0" K-Factor to K-Factor of "1" since it is impossible to divide by "0".

NOTE B: "Point 01" will be the "low shut-off" frequency. Below this frequency no rate will be displayed nor count recorded. Point 01 should be assigned a frequency of "0" with a K-Factor for lowest flow especially if very slow flow is to be counted.

NOTE C: The entry of a frequency of "0" for "Point 03" or above will tell the unit to continue the K-Factor slope line calculated from the two previous Frequency/K-Factor points and ignore any higher point data. If a fixed K-Factor is desired, select LN in 16 Point setup.

NOTE D: K-Factors are always positive numbers. To avoid undesired K-Factors projected around "0" K-Factors, insure that a positive K-Factor is assigned for the highest used frequency.

NOTE E: The decimal in the "Total" and "Grand Total" is a dummy. The K-Factor should be calculated to show all numbers as if there were no decimal and then decimal added under DEC LOC section of DEV TYP MENU.

Note that the autoranging decimal in the rate (R) display will be shifted to the left as the "Dummy Decimal" is shifted to the left so that the rate display will be the same as the count. Example: A meter gives 33.4 pulses per gal. and it is desired to display in 1/10 gal. Move K-Factor decimal place to the left and key-in a decimal under DEC LOC MENU. K-Factor for gal. and 1/10 is 3.34 Rate will show 3.34 with decimal added while it would show 33.4 if no decimal were added.

TEST MODE
A special "TEST" mode can be selected to help set-up the points and K-Factors. If "TEST" is selected, the RATE ("R" display) will show the frequency (pulses per second) of the incoming signal. The TOTAL section will accumulate one count for each incoming pulse.

TEST MODE K-FACTOR CALCULATION

To calculate the K-Factors for flow meters with pulse transmitters:

A) Set the 16 point units to "TEST" and ENT point 00 to go to the run mode.
B) At the lowest desired flow rate, reset the counter and let the unit count the incoming signal while the rate displayed is recorded.
C) Interrupt the input signal when the known tested volume has gone through the flow meter. Switch to count display and read the number of counts that came in from the known volume as displayed on the unit. Divide the counts by the volume that past through the meter to determine the number of counts for 1 unit of measure, gallon, cubic foot, etc.
D) Record this frequency and K-Factor for later entry into point 1 or point 2. (See NOTE B above to determine if data should be entered in point 1 or 2).
E) Assign ascending point numbers to correspondingly ascending frequencies when recording frequency/K-Factor data. A minimum of 3 points and a maximum of 16 points must be entered.

DATA ENTRY FOR 16-POINT

Press "D" until "16 POINT" appears on display. ENT.
Press D to step through options:

SECONDS (Scaled rate per second selected)
MINUTES (Scaled rate per minute selected)
HOURS (Scaled rate per hour selected)
TEST (Test mode-rate per second with 1 count for each input (fixed K-Factor of 1) selected)

Press ENT when selected option is displayed.
Point 00 will appear on the display. ENT "POINT 00" to exit the set up and go to run mode or key in a point number from 1 to 16 and ENT.
"K" will flash with present K-Factor for that point. ENT or CLR and key in desired K-Factor.
Continue to step through the POINT numbers to view or change data. If a frequency of 0 is entered, in POINT 3 or above, the unit will ignore data above that point number. A K-Factor generated from the line slope of the 2 previous POINT entries will be applied to higher frequencies.
Exit "point set" routine by setting to POINT 00 and ENT. Unit will go to run mode. "BAD FREQ" will flash when exiting the set up mode if there is a sequence error. The unit will then display the sequence error point # so that corrections can be made.
If "TEST" is selected, point data can be entered into memory but when running, unit will add one count per each input (fixed K-Factor of "1") and display frequency (rate per second) of incoming signal. (See TEST MODE for more information).

COMMUNICATION FOR 16 POINT

When 16-Point option is supplied with either RS232 or RS422 option, data can be read and changed as explained under Communication Section of the manual.

WARNING: The unit will lose counts if critical setup information (preset, k factor, temp, etc.) is accessed via the serial port while the unit is running.

Codes to address 16-point data: (F=frequency; K=K-Factor; A to P = Point number 1 to 16)

16 POINT CODES

DC	Will transmit count.
DD	Will transmit density.
DH	Will transmit Density Hi
DH(S)XXXX	Will set Density Hi at XXXX
DL	Will transmit Density Lo
DL(S)XXXX	Will set Density Lo at XXXX
DR	Will transmit rate.
DT	Will transmit grand total.
EC	Will transmit the Expansion Coeficient
EC(S)XXXX	Will set Expansion Coeficient at XXXX
ET	Will Enter EZ PRESET at end of batch
GO	Will start the unit
KR	Will transmit Linear K-Factor (not available if 16PT selected)
KR(S)XXXX	Will set Linear K-Factor at XXXX (not available if 16PT selected)
PA	Will transmit Preset.
PA(S)XXXX	Will load preset at XXXX.
PW	Will transmit Prewarn.
PW(S)XXXX	Will load Prewarn at XXXX.
RC	Will reset counter to zero if in "RO" mode (adding) or set counter to Preset A if in "SP" mode (subtracting). Output is reset.
RC(S)XXXX	Will set counter to XXXX (no other change is made).
RD	Will transmit reference density
RD(S)XXXX	Will set reference density at XXXX.
RT	Will reset grand total to zero.
RT(S)XXXX	Will reset grand total to XXXX.
ST	Will stop the unit.
TH	Will transmit Temperature Hi.
TH(S)XXXX	Will set Temperature Hi at XXXX.
TL	Will transmit Temperature Lo.
TL(S)XXXX	Will set Temperature Lo at XXXX.
TP	Will transmit Temperature.
TR	Will transmit Temperature Reference.
TR(S)XXXX	Will set Temperature Reference at XXXX
FA	Will transmit Frequency of A (point 1)
KA	Will transmit K-Factor of A (point 1)
FA(S)XXXX	Will set Frequency of A (point 1) at XXXX
KA(S)XXXX	Will set K-Factor of A (point 1) at XXXX
FB	Will transmit Frequency of B (point 2)
KB	Will transmit K-Factor of B (point 2)
- - -	
FP	Will transmit Frequency of P (point 16)
KP	Will transmit K-Factor of P (point 16)
FP(S)XXXX	Will ser Frequency of P (point 16) at XXXX
KP(S)XXXX	Will set K-Factor of P (point 16) at XXXX

To request a transmit of data, send a code for information desired. To change data, send the desired address code followed by a space and the new number desired.

Sample Code request and response:

Transmit from terminal	Receive from unit
(S) = Space	
Example A:	
D13(S) (unit #13 activated)	Device #13
FA(S)0(S)KA(S)123 (ENTER)	FA 0 KA 123
(Frequency for A (Point 1) is set to 0, K-Factor for A (Point 1) is set to 123)	(Unit echoes back command as sent)
Example B:	
D11(S) (unit #11 is activated)	Device #11
FC(S)500(S)KC(S)305(S)	FC 500 KC 305
FC(S)KC(S)(ENTER)	FC KC
(Frequency for C (Point 3) is set to 500, K-Factor for C (Point 3) is set to 305,	(Unit echoes back command as sent)
Frequency of C (Point 3) is sent, K-Factor of C (Point 3) is sent.	500
	305
	(Unit transmits frequency and K-Factor data for C (Point 3).

CAUTION:

1) Frequency speed must increase with ascending point numbers. A bad sequence can be entered over the serial port.The unit will use calculated K-Factor based on first frequency match found, which may be wrong. Check by requesting a transmit of all frequency points used: FA FB FC FD to F_ to insure ascending sequence is entered or enter “POINT 00” on front keypad and unit displays “BAD SEQ” if there are errors.

2) After device is activated, there must be a delay to allow “Device #--” to be transmitted by the device before new commands are sent to the unit.

16 Point Strobe Input Codes

#	DL4	DL2	DL1	Description
0	0	0	0	PA (Preset request)
1	0	0	1	PW (Prewarn request)
2	0	1	0	DD (Density request)
3	0	1	1	TP (Temperature request)
4	1	0	0	DC (Display of count request)
5	1	0	1	DT (Display of grand total request)
6	1	1	0	DR (Display of rate request)

UNITS OF MEASURE TABLE

Compatible units of measure must be used when entering data and when calculating the coeficient of expansion.
Acceptable combinations for units of entry include:
Table 1

K-factor	pulses / gallon	pulses / ft^3	pulses / liter	pulses / M^3
Ref Density	lbs. / gallon	lbs. / ft^3	Kg. / liter	Kg. / M^3
Mass Display	lbs.	lbs.	Kg.	Kg.
Volume Display	gallon	ft^3	liter	M^3

EQUATIONS

Volume Correction Factor (VCF):
VCF = 1 - [Coefficient of Expansion x (T_{flow} - T_{ref})]
Density:
Density = Reference Density x VCF
(where: Density is in units of mass per unit volume)
Totalizer:

$$\textbf{Corrected Volume Total} = \frac{\textbf{(Input Pulses x VCF)}}{\textbf{K-Factor}}$$

$$\textbf{Mass Total} = \frac{\textbf{(Input Pulses x Density)}}{\textbf{K-Factor}}$$

Ratemeter:

$$\textbf{Corrected Volume Rate} = \frac{\textbf{(Frequency x VCF)}}{\textbf{K-Factor}}$$

$$\textbf{Mass Total} = \frac{\textbf{(Frequency x Density)}}{\textbf{K-Factor}}$$

(where the various time bases for rate are implied in the rate K-Factor)

CALCULATING EXPANSION COEFFICIENT

Given:
The liquid density is a function of the flowing temperature for many fluids. This unit solves an equation which represents this physical property of the fluid.
The information which the unit uses to describe the fluid is entered by the user in the following variables: Reference Temperature, Reference Density, Expansion Coefficient
This information is available for many fluids in one or more of the following forms:
Fluid Specific Gravity vs. Temp. Table
Specific Gravity vs. Temp. Graph
Fluid Density vs. Temp. Table
Fluid Density vs. Temp. Graph
Begin by obtaining one of the fluid properties for the fluid you are using from available manufacturers information or Engineering Handbooks. In some cases this information is listed on the Material Safety Datasheet for the fluid.
Two temperature-density pairs will be required to compute the temperature coefficient.
The reference temperature is simply chosen by the user. Common reference temperatures are 60° F or 15° C.
However, for cryogenic fluids, the normal boiling point may also be used. In some cases the fluid data may list properties at 100° F, this temperature may also be used as the reference temperature.
The reference temperature should be chosen so that it is in the application temperature range. i.e. application temperature range - 10 to 120° F, reference temperature of 60° F chosen.
Enter the reference temperature at this point.
The reference density corresponds to the fluid DENSITY (not Specific Gravity) at the reference temperature chosen.
The reference density must be represented in terms of mass unit's desired with respect to the volume units corresponding to the flowmeters K-Factor. i.e. If readout in pounds is desired, and the K-Factor is entered for pulses/gallon, the density must be entered in units of pounds/gallon.
Eq.1
Density of fluid = (Specific Gravity of fluid) x (Density of Water)
Table 1 Lists a number of K-Factor/Mass readout units. If your temperatur, fluid density or specific gravity is in units other than those required. You must convert them before entering.
Given the Ref. Temp, Ref. Dens., Second Temp and Second Dens., calculate the expansion coefficient as follows:
Eq.2

$$\text{Expansion Coef.} = \frac{\textbf{(Ref. Density - Second density) / Ref. Density}}{\textbf{Secondary Temperature - Ref. Temperature}}$$

You are now ready to enter these parameters describing the fluid into the unit.

WORKSHEET

Fill in and file for future reference

Model # _____

Serial # _____

Unit # _____

PRESET _____

PREWARN _____

PREset TYPe

EZ PREset ☐ STD PREset ☐

COUNT

K-FACTOR __ __ __ __ __ __ __ __

Reset to 0 ☐ Set to Preset ☐

DECimal LOCation (0-8)

8 7 6 5 4 3 2 1 (
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

RATE

K-FACTOR __ __ __ __ __ __ __ __

WINDOW (02 - 24) __ __

SIGnificant FIGure (1 - 6) __ __

WEIGHT (0 - 99) __ __

LOCKOUT

SECURity (0 - 99) __ __

CODE __ __ __ __

OUTCARD

UNIT (00 - 15) __ __

ParalleL ☐ SERial ☐

BAUDRATE

300 ☐
600 ☐
1200 ☐
2400 ☐
4800 ☐
9600 ☐

PARITY

SPACE ☐
EVEN ☐
ODD ☐
MARK ☐

AnaLoG OUT

ANaLoG RaTe ☐ ANaLoG CounT ☐

SET LOW __ __ __ __ __ __ __ __

SET HIGH __ __ __ __ __ __ __ __

OUTput FREQuency

20000 ☐ 2000 ☐
200 ☐ 10 ☐

COMPensation INput

RTD ☐

°C ☐ °F ☐

4-20MA ☐ 0-5V ☐ 0-10V ☐

DeNsity ☐

DEFauLT DeNsity __ __ __ __ __ __ __ __

DENSity LOW __ __ __ __ __ __ __ __

DENSity HIgh __ __ __ __ __ __ __ __

TEMPerature ☐

°C ☐ °F ☐

DEFauLT TP __ __ __ __ __ __ __ __

TEMP LOW __ __ __ __ __ __ __ __

TEMP HIgh __ __ __ __ __ __ __ __

MANUAL ☐

DeNsity ☐

ENTer DENsity __ __ __ __ __ __ __ __

TEMPerature ☐

°C ☐ °F ☐

ENTer TEMPerature __ __ __ __ __ __ __ __

FLUID

REFerence DENsity __ __ __ __ __ __ __ __

REFerence TEMP __ __ __ __ __ __ __ __

EXPansion COEF __ __ __ __ __ __ __ __

FLOW EQuation

MASS ☐ CORrected VOLume ☐

Specifications

DISPLAY: 8 Digit, .55" High, 15 Segment, Red Orange, LED.

INPUT POWER

A: 110 VAC ±15% or 15 to 27 VDC

B: 220 VAC ±15% or 15 to 27 VDC

CURRENT: Maximum 350 mA DC or 8.8 VA at rated AC voltage.

OUTPUT POWER (On AC powered units only):

+12 VDC at 100mA. Separate Isolated 12 VDC at 100mA to allow +12 VDC or +24 VDC regulated +5% worst case.

MEMORY: EEPROM stores all program and count data for minimum of 10 years if power is lost.

PULSE INPUT

3A: (Standard) 4-30VDC 30 k Ohm impedance to GND, 10kHz max. input speed (min. on/off 50µsec.). (5kHz max for 16 point linearization version)

3C: (Magnetic Pickup) 30mV to 30V P/P min., 2Hz to 5KHz Input Speed.

COMPENSATION INPUT: The compensation input can be hooked up directly to a RTD or an analog signal. The input types available are: RTD, 4-20mA, 0-5V or 0-10V. If The compensation input is not used, select the "MANUAL" input type and enter the parameters at which you are operating.

RESET

Front push button: “CLEAR” resets displayed number and control output.

Remote: 4 to 30 VDC positive edge resets batch counter and control output. Impedance: 10K to ground (-DC)

Minimum pulse: 5 msec.

START

Front push button: “START”: When pressed, the unit displays "STARTED" and both relays energize. The relays will remain energized until the preset values are reached or the "STOP" is activated.

Remote: 4 to 30 VDC positive edge starts unit as described above. Impedance: 10K to ground (-DC)

Minimum pulse: 5 msec.

STOP

Front push button: “STOP”: When pressed, the unit displays "STOPPED" and both relays drop out. The relays will remain inactive until the unit is started again.

Remote: 4 to 30 VDC positive level stops unit as described above. If the stop is held high, the unit will flash "STOPPED" and inhibit any start inputs. Impedance: 10K to ground (-DC).

Minimum pulse: 5 msec.

TEMPERATURE

Operating: +41°F (5°C) to +130°F (+54°C).

Extended Temperature Option:

- 40° F (-40° C) to + 158° F +(70° C)

Storage: -40°F (-40°C) to +200°F (+93°C).

FACTORED OUTPUT: The unit gives one pulse out for each factored count. The open collector sinks 30 VDC maximum to 1 volt maximum at 100mA maximum. Output speed is user selectable (see table below). An internal buffer holds up to 10,000 pulses for output at the selected frequency before “DATALOST” flashes, indicating pulses are lost. If factored rate exceeds 7 digits “RFF…” flashes. These alarms indicated that speed has been exceeded.

Speed(HZ)	10	200	2000	20000
Min. on/off (msec)	47.5	2.0	0.2	0.013

CONTROL OUTPUTS: (Each of two outputs)

1. NPN Transistor Version: Open collector sinks max. 250mA from 30 VDC when active. (When relay is used, 10 VDC is provided at transistor outputs through relay coil. If greater than 2mA is used, relay will remain energized. Applying greater than 10 VDC may destroy unit. Transistor will sink 100mA in “ON” state).

2. SPDT Relay Version: 10A 120/240 VAC or 28 VDC (Standard).

ANALOG OUTPUT: The unit can be ordered with an analog output of the rate or count reading. The user keys in the low and high settings at set-up.

Current Outputs:

A sinking driver generates a corresponding linear current through the external devices, updating with each update of the rate. Accuracy is .1% @ 20°C (max. drift .01%/C°). Compliance voltage must be 3 to 24 VDC, non inductive. (The unit can provide the DC source as long as the drop across any device being driven does not exceed 21V).

Voltage Outputs:

When the voltage out option is ordered, a controlled voltage output is located at terminal 3 and referenced to pin 12 (ground). Accuracy is .1% @ 20°C (max. drift .01%/C°).

SECURITY: The unit has a missing pulse detector. The user selects the amount of time (1 to 99 sec.) that the unit will "wait" for input pulses. If the unit doesn't receive pulses within the selected time, the unit displays "SECURITY" and both relays drop out. (00 Disables the security feature; Entering the lockout code returns the unit to the run mode)

SECURITY OUTPUT: When the unit is in "SECURITY", a normally high (5V) at PIN 8 goes low (<0.4V). This output is not available when using a RTD input.

PRESETS: The user may enter two numbers to set up the batch counter, Preset and Prewarn. The Prewarn value is thw number of counts before the Preset value that the Prewarn relay will de-activate. For instance, you may want one hundred gallons in a particular batch. You may also want a valve to close and slow down flow 25 gallons before the end. Your preset is 100, your prewarn is 25. When the start is activated, the relays energize simultaneously to start flow. When the counter reaches 75 (25 before 100), the prewarn relay drops out. When the counter reaches 100 the preset relay drops out. The preset values can be viewed or changed via the menu (when stopped).

K-FACTOR: A user selectable K-Factor is used to convert the input pulses into engineering units. The value to enter is the number of pulses per unit of volume.

16-POINT LINEARIZATION

The 16 point K-Factor option allows the user to dial in from 3 to 16 different frequency points (inputs per second) and different K-Factor dividers from 0.0001 to 99999999 for each of these frequencies.

The 16 point unit determines the incoming frequency and calculates a K-Factor line slope from the two closest data points that had been entered. The “specific K-Factor” is then proportionally interpolated using 8-position floating math. This K-Factor is applied to all inputs until the next frequency calculation, usually 1 second later. If a “0” frequency is entered into “point 1”, the “point 1” K-Factor will be applied to all inputs received before the first frequency calculation.

The rate can be displayed in 3 ways: “SECONDS _”, “MINUTES _”, “HOURS _”, or “TEST _”. If “SECONDS” is selected, the unit displays the “base rate” calculated from the incoming frequency and the “specific K-Factor”. If “MINUTES _” is selected, the rate displayed is 60 times the “base” rate. If “HOURS _” is selected, the rate displayed is 3600 times the base rate.

COUNTER: Each of the total and grand total counters have 8 digits. In the set-up mode choose “RO” (reset to zero) for adding operation or “SP” (set to preset) for subtracting operation. While viewing the count the display can be made to flash the grand total by pressing “ENT”. Activating “CLR” while the grand total is flashing, resets the grand total counter.

RATEMETER: Accurate to 51/2 digits (±1 display digit). The rate meter can be programmed to accept almost any number of pulses per unit of measurement, sample from 2 to 24 seconds maximum, perform a weighted averaging function to stabilize fluctuating displays and autorange up to 6 digits of significant information. The rate meter with a “K” factor of 1 displays the rate of pulses per second. Simply dial in the proper “K” factor to display in minutes, hours or other units of measurement. Press the “C” button to display the rate, total, temperature, preset and density.

LOCKOUT: Unauthorized front panel changes can be prevented by entering a user selected four digit code.

OUTCARD: RS232 or RS422 serial two way communication options are available. Up to 15 units can be linked together and addressed separately to transmit unit status or accept new set points in the standard ASCII format. Baud rates of 300, 600,1200,2400 4800 or 9600 as well as choice of odd, even, space or mark parity can be selected by keypad control.

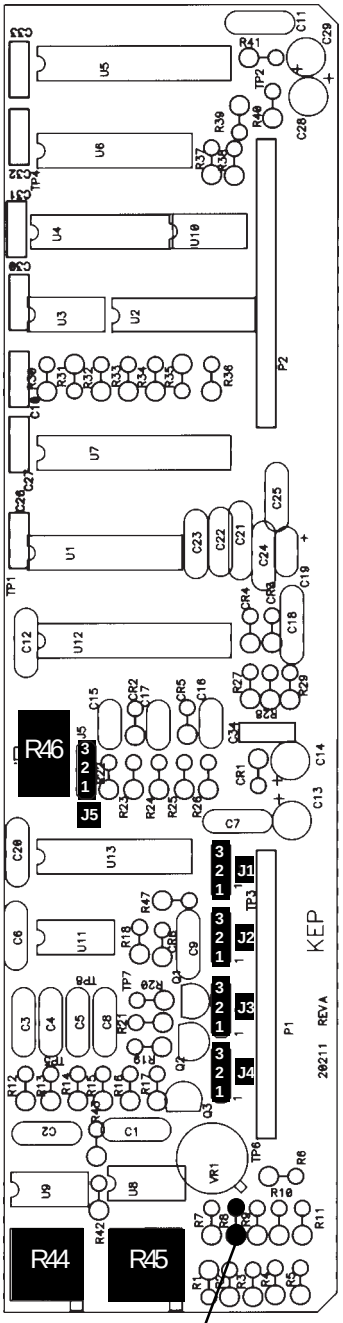
OPERATION: Through the 16 key, NEMA 4X/IP 65 front panel, the operator enters all of the necessary operating parameters. First the user enters all of the count and rate information (i.e. K-Factors, Decimal Location, etc.), as well as the lockout configuration and available options. Next the compensation parameters are entered. These parameters consist of:

COMP IN (input type): RTD, 4-20mA, 0-5V, 0-10V or MANUAL (when an input other than RTD is selected, The user selects whether to compensate for Density or Temperature and enters the low and high values).

FLUID (Fluid Parameters): reference density, reference temperature and coefficient of expansion.

FLOW EQ (Flow Equations): Corrected volume or Mass.

After these operating parameters are entered, the operator enters his Prewarn (slow down) and Preset (batch size) values. With the push of the "START" button (or remote start) the unit will energize the relays which open the valves and begins flow. The flow will continue until the final preset is reached. The operation can be halted at any time by activating the "STOP" (front panel or remote).



R8

Output Adjust

R44 - Analog output 0 adjust

R45 - Analog output span adjust

R8 - 0-10V out = 47.5KΩ 1%
0-5V out = 22.1KΩ 1%

Input Adjust

R46 - Input threshold adjust

NOTE:
To calibrate input threshold, see Troubleshooting Guide (Pg.30).

JUMPER OPTIONS

Jumper	Connection	Function
J1	1 to 2	High Pulse Speed Input 10KHz Max. (5KHz for 16 Pt.)
J1	2 to 3	Low Pulse Speed Input 40Hz Max.
J2	1 to 2	Compensation Input For RTD
J2	2 to 3	Enables Security Output (not available w/ RTD)
J3	1 to 2	Compensation Input For RTD
J3	2 to 3	Compensation Input For Voltage
J4	1 to 2	Sets Analog Out For 4-20mA
J4	2 to 3	Sets Analog Out For Voltage
J5	1 to 2	High Level Pulse Input (4-30VDC)
J5	2 to 3	Low Level Pulse Input (30mV)

NOTE: 4-20mA input is available regardless of the jumper positions of J2 and J3

CALIBRATION

CAUTION: Calibration should only be attempted by someone who has the equipment to generate a very accurate frequency signal and who has the training to open the unit and work with grounded equipment necessary to protect the static sensitive CMOS circuitry.

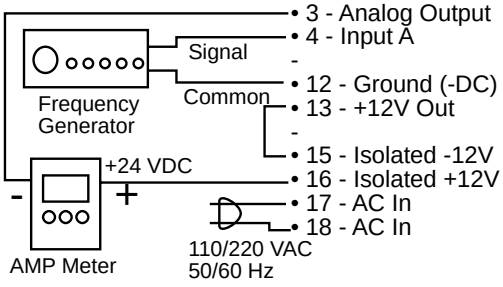
REMOVING THE CASE

To install or change the input or data interface cards, the case must be removed. Before opening case, remove all power. CMOS logic is used. Use standard precautions against damage by static discharge. If the unit has a data interface option (RS232/422/422M), two screws in the back, designed to secure the top left connector, may have to be removed. Next remove the six (6) flat head 4-40 x 1/4" screws behind the panel and lift off the panel/ lens assembly. Slide the main board display out the front of the case. Once modifications are made, reverse the procedure to re-assemble the unit, insuring that the main board is in the track. The six (6) screws that hold the panel must be tight to seal the rubber keypad panel assembly, approximately 0.6 in" lb. torque.

ANALOG OUT CALIBRATION

To calibrate the analog output, you need: 1 - Signal Generator (5 kHz or 10 kHz ±1 Hz), 1 - Amp Meter (Volt Meter for voltage). After the case is removed (see above), power the unit and make the following menu selections:

MENU ITEM	SETTINGS
RATE	K-Factor = 1, Window = 2, Sig Fig = 6, Weight = 0
ALG OUT	Alg Rate, Set Low = 0, Set Hi = Frequency selected above i.e. 5000 or 10000
COMP IN	In Type = Manual, Temp, °F, Ent Temp = 60
FLUID	Ref Dens = 1, Ref Temp = 60, Exp Coef = 0
FLOW EQ	Cor Vol



Apply signal and connect Amp Meter as shown. Adjust R45 until output reads 20.0 mA. Remove signal and adjust R44 until output reads 4.0 mA. Re-apply signal and adjust R45 until output reads 20.0 mA. Repeat 3 to 4 times with and without signaluntil both high (20.0 mA) and low (4 mA) are stable. (To calibrate for voltage, place volt meter between pins 3 (+) and 12 (-). Apply signal and adjust R45 to read high voltage, remove signal and adjust R44 to read low voltage.)

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSES	SOLUTIONS
Power is applied but the display does not light.	1. AC or DC power wiring is incorrect. 2. Excessive current draw or short on 12 volt output. 3. Damaged unit.	1. Recheck power wiring. 2. Recheck output wiring and insure that all peripheral devices powered by the 12 volt output do not exceed a 100mA current draw. 3. Call factory for RMA
Unit works but occasionally the display freezes or displays erratic counts.	Line noise is effecting the processor due to a current spike or surge.	Use a different power supply or install a surge suppressor.
Rate is erratic or greatly fluctuating.	Input pulse frequency is fluctuating.	Increase the "WEIGHT" value to average or dampen the rate display.
Unit displaying "DATALOST".	Pulse input is faster than scaled pulse output setting.	Increase the "OUTFREQ" value.
Unit displaying "PREWRONG".	Preset value is larger than the Prewarn value.	Recheck Preset and Prewarn values. (see Error Messages)
Unit displaying "SECURITY".	1. Unit was started and no input pulses were received. 2. Defective flow sensor	Recheck input wiring, sending device and "SECUR" time value. (see Error Messages)
Unit displaying "ERROR TP".	1. Temperature input is out of range. (i.e. below 4mA or above 20mA) 2. Defective temperature sensor	Recheck temperature input wiring and sending device. (see Error Messages)
Unit displaying "ERROR DN".	The density input is out of range. (i.e. below 4mA or above 20mA)	Recheck density input wiring and sending device. (see Error Messages)
Unit not counting,counting fast or counting during periods of no flow	1. False signal pickup (input noise) 2. Input threshold adjust (R46) needs calibration	Locate R46 (see Pg. 29). Apply the signal to be used and adjust R46 until desired sensitivity. Turn clockwise for greater sensitivity and counter-clockwise for less sensitivity.

16 POINT WORKSHEET

FILL IN THE 16 POINT DATA BELOW AND FILE FOR FUTURE USE.

Point 00 ..... Exit 16 Point Setting routine.

Point 01 ..... Frequency _____ K Factor _____ _

Point 02 ..... Frequency _____ K Factor _____ _

Point 03 ..... Frequency _____ K Factor _____ _

Point 04 ..... Frequency _____ K Factor _____ _

Point 05 ..... Frequency _____ K Factor _____ _

Point 06 ..... Frequency _____ K Factor _____ _

Point 07 ..... Frequency _____ K Factor _____ _

Point 08 ..... Frequency _____ K Factor _____ _

Point 09 ..... Frequency _____ K Factor _____ _

Point 10 ..... Frequency _____ K Factor _____ _

Point 11 ..... Frequency _____ K Factor _____ _

Point 12 ..... Frequency _____ K Factor _____ _

Point 13 ..... Frequency _____ K Factor _____ _

Point 14 ..... Frequency _____ K Factor _____ _

Point 15 ..... Frequency _____ K Factor _____ _

Point 16 ..... Frequency _____ K Factor _____ _

COPY BEFORE USING ! ! !

Decoding Part Number

Example MB8 A 3A 2 H R3

MASSbatch:

Operating Voltage:
A: 110 VAC ±15% or 12 to 27 VDC
B: 220 VAC ±15% or 12 to 27 VDC

Count Inputs:
3A: (STD) Pulse 4-30 VDC 10KHz Max.
3C: (Mag. Pickup) 30mV 2Hz to 10KHz

Control Outputs:
1: Open Collector
2: SPDT Relay 10A

Input Speed:
L: (Low Speed) 0-40Hz
H: (High Speed) 0-10KHz (0-5KHz for 16 Point Linearization)

Options:
R: RTD and 4-20 mA Temperature Input (No Security Output)
NOTE: Standard unit incorporates current and voltage temperature/density input with security output
All input and output configurations are jumper selectable.
1: RS232 Serial Interface
2: RS422 Serial Interface
3: 4-20 mA Output (standard)
3Y: 0-5VDC Output (jumper selectable)
3Z: 0-10VDC Output (jumper selectable)
4: 16 Point Linearization
ET: Extended Temperature: -40° to +158° F (-40° to 70° C)

Accessories:
NEMATROL 4X1 - NEMA 4X/IP 65 Enclosure for wall mounting accommodating 1 unit.
NEMATROL 4X2 - NEMA 4X/IP 65 Enclosure for wall mounting accommodating 2 units.
FLEXCOVER #36120

NOTE TO OUR CUSTOMER

KEP is dedicated to providing complete customer service and customer satisfaction. If you have any comments or criticisms about how to improve this manual, please make a note of the problem/improvement and notify us. We are always open to new ideas and improvements. So please let us know your ideas and comments.

Call us toll free: 800-631-2165

WARRANTY

This product is warrantied against defects in materials and workmanship for a period of two (2) years from the date of shipment to Buyer.

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

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