FLOWtrol

Installation & Operating Instructions

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WARNING

This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling* procedures must be observed during the removal, installation, or other handling of internal circuit boards or devices.

*Handling Procedure:

1. Power to unit must be removed.

2. Personnel must be grounded, via a wrist strap or other safe, suitable means, before any printed circuit board or other internal device is installed, removed or adjusted~

3. Printed circuit boards must be transported in a conductive bag or other conductive container. Boards must not be removed from protective enclosure until the immediate time of installation.
Removed boards must be placed immediately in protective container for transport, storage, or return to factory.

*Comments

This instrument is not unique in its content of EDS (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, CMOS, etc.). Experience has proven that even small amounts of static electricity can damage or destroy these devices. Damaged components, even though they appear to function properly, exhibit early failure.

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SECTION 1 INTRODUCTION

1-1 General Description

The KEP FLOWtrol Two-Stage Electronic Batch Controller is a microprocessor-based panel-mounted instrument designed to be used in conjunction with primary flow sensors which have a pulse or contact closure output. The main function of the unit is to provide indication and control of process batch size.

1-2 Principle of Operation

The FLOWtrol factors input pulses into engineering units and provides two control outputs at adjustable set points. The control output consists of 2 DPDT, 115/230 VAC, 5 amp relay contacts. One contact actuates at prewarn (first stage). The second contact actuates at preset complete or end of batch. In addition to the control outputs, the FLOWtrol also provides a scaled output and a buffered (un-factored) output to drive other remote indicating devices. Output voltages of 12 volts grounded and 12 volts isolated are provided to power external sensors and other peripheral devices.

Both local and remote start-stop-reset functions are provided.

Selection of counter configurations (reset to zero, set to preset, inventory totalization) as well as input scaling, preset levels, decimal point locations, software selectable debounce settings and special security numbers are entered on the sealed, front keypad by following the displayed instructions.

1-3 Specifications

Accuracy:	+ 1 Count
Mode of Operation:	Single or two-stage controller, totalizer
Housing:	High impact plastic case with moisture resistant front panel.
Dimensions:	Reference Figure 1- 1.

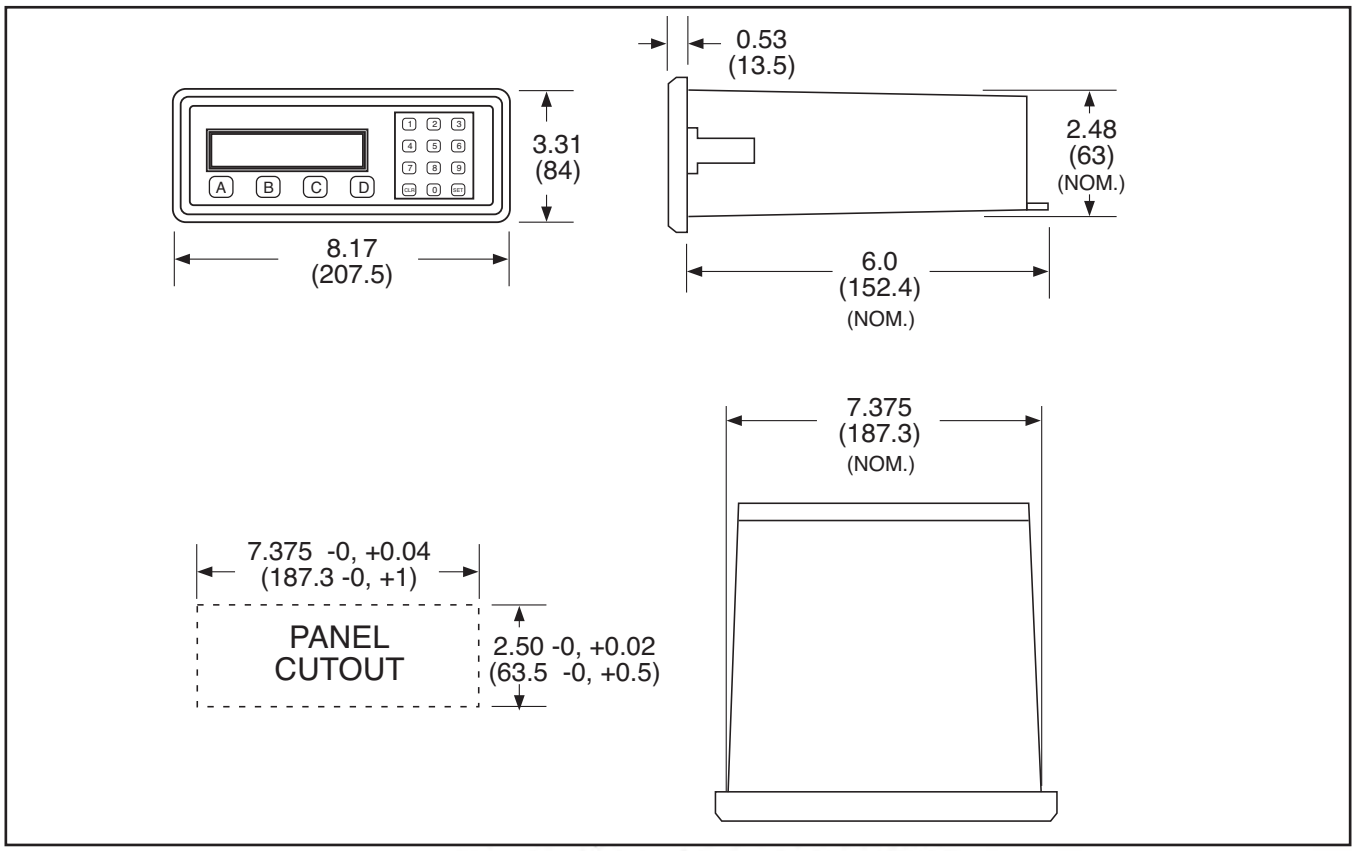


FIGURE 1-1 FLOWtrol DIMENSIONS

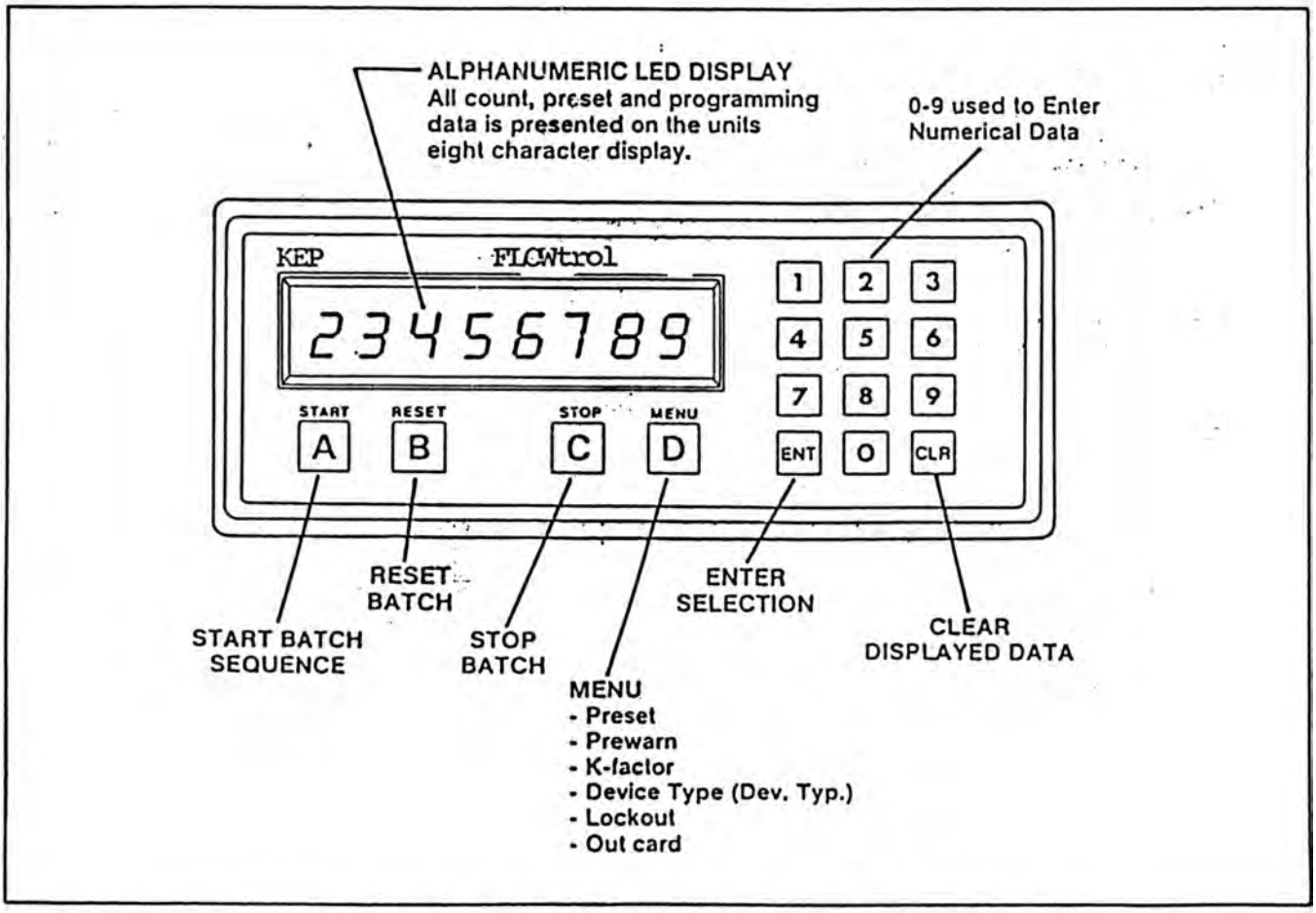


FIGURE 1-2 KEYPAD AND FRONT PANEL FUNCTIONS

Power Requirements:
110 VAC + 15% 50/60 Hz or 12 to 27 VDC
220 VAC + 15% 50/60 Hz or 12 to 27 VDC

Note: When DC power is used, no DC outputs are available.

Operating Temperature :
+32 to +131 degrees Fahrenheit (0 to +55 degrees Centigrade)

Storage Temperature:
-40 to +158 degrees Fahrenheit (-40 to +70 degrees Centigrade)

Front Panel Control: (Reference Figure 1-2)
Indication - 8 character, alphanumeric LED's
- Programmable decimal point location
Data Entry - 12 button numeric keypad

Controls - 4 multifunction push buttons
The run mode includes separate buttons for START, STOP, RESET and MENU.
Remote START, STOP and RESET are rear terminal connections.

Scaling -
K-factor is a 4-digit number entered in by scientific notation.
The incoming pulses are divided by this K-factor to obtain the scaled quantity for display or output.

Range of K-factor Selection:

0.100 E0 to (Equalling 10 or 1)
9.999 E5 inclusive (E5 equalling 10 to 5th power or 100,000)
Total K-factor range: 0.100 to 999,900

Entry of K-factor is accomplished and illustrated in the following examples:

Example 1: Meter K-factor is 386.3
Enter: 3.863; E2 (E2 = 10 to the 2nd power or 100)

Example 2: Meter K-factor is 23.91
Enter: 2.391 E1 (E1 = 10 to 1st power or 10)

Example 3: Meter K-factor is 1969.1
Enter: 1.969 E3 (E3 = 10 to 3rd power or 1,000)

Input Signals
Pulse:
0 to 20KHz (for K factor greater than 1.0); minimum pulse width 3µs Vlo: 0 to 1.0VDC; Vhi: 3.0 to 30VDC.
For K-factor less than 1.0; Max. Input Frequency = (20000)x(K-factor).

Contact Closure:
0 to 400Hz internal switch, debounce keypad selectable.
Remote START, STOP, RESET 3 to 30VDC (active high).

Output Signals:
Auxiliary Power:
12 VDC +/- 5% regulated, 100mA (not available when operated with DC power).
Isolated 12VDC, 100mA (not available when operated with DC power).

Relays:
2 DPDT -one for Preset and one for Prewarn.
(115/230VAC 5A contact ratings)
Open Collector Outputs: 100mA from 30V max.

Un-scaled (buffered) output: 1 negative pulse out for each pulse input; pulse length same as input.

Scaled Output: 1 negative pulse out for each count on display; The user can program the speed of the scaled output to drive units that require a longer pulse (see chart below). An internal buffer holds up to 10000 pulses for output at the selected speed before "Datalost" flashes, indicating pulses are lost. Press "D' menu button to "Out Freq"; enter. Press "0" button view selections and enter desired frequency.

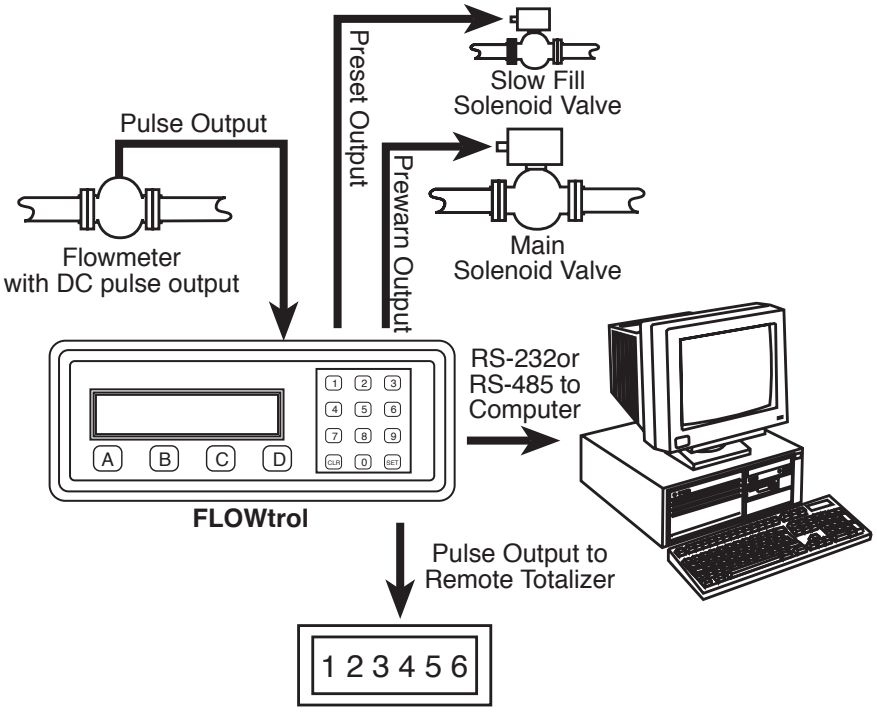
Speed(Hz)	Min. On/Off (msec)
10	47.5
200	2.0
2000	0.2
20000	0.013

The buffered and scaled outputs are open collector outputs. To use these outputs, place a resistor (2.2K ohms to 10K ohms) between terminal pin 12 (12V out) and output (terminal pin 6 or 7).

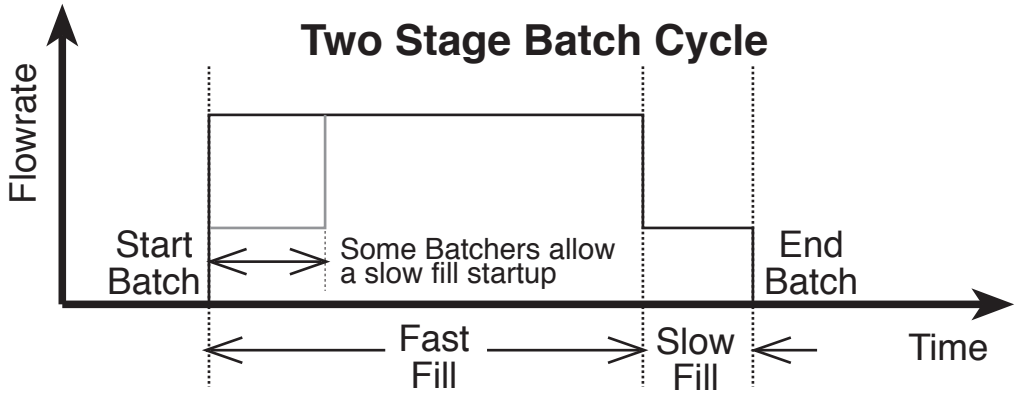
External Connections:
All power, input and output connections are rear panel terminals.

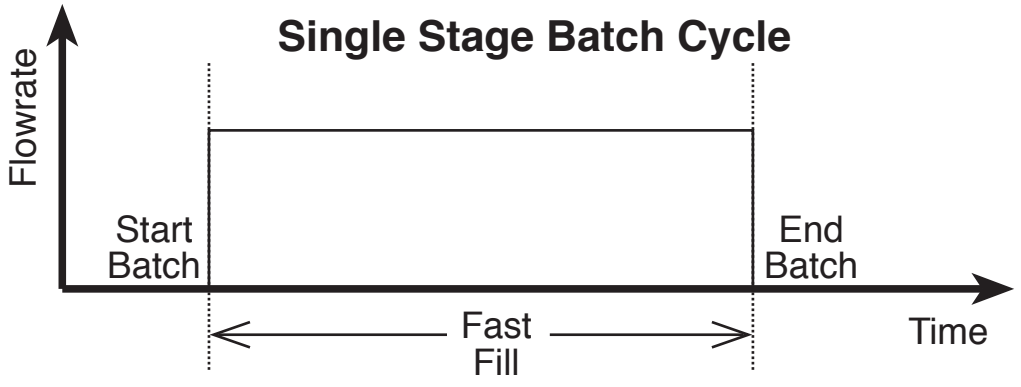
Data Retention:
Data is stored in EEPROM memory.

1-4 Typical Batcher Application



1-5 Two Stage vs. Single Stage Batching Illustration





SECTION 2 INSTALLATION

2-1 Receipt of Equipment

When the equipment is received, the outside packing case should be checked for any 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 or KEP, 10 Industrial Way East, Eatontown, NJ 07724.

Remove the Installation and Operation Instructions. Carefully remove the equipment from the packing case and inspect for damaged or missing parts.

2-2 Return Shipment

Do not return assembly or part without a Return Material Authorization. The RMA is obtained by calling KEP Customer Service, Eatontown, NJ, 732-935-1320.

2-3 Panel Mounting

The controller should be located in an area with a clean, dry atmosphere which is relatively free of shock and vibration. The FLOWtrol is installed in a 7.365" (187.0N) wide by 2.495" (63.4MM) high panel cutout. To panel mount the controller proceed as follows:

a. Prepare the panel opening.

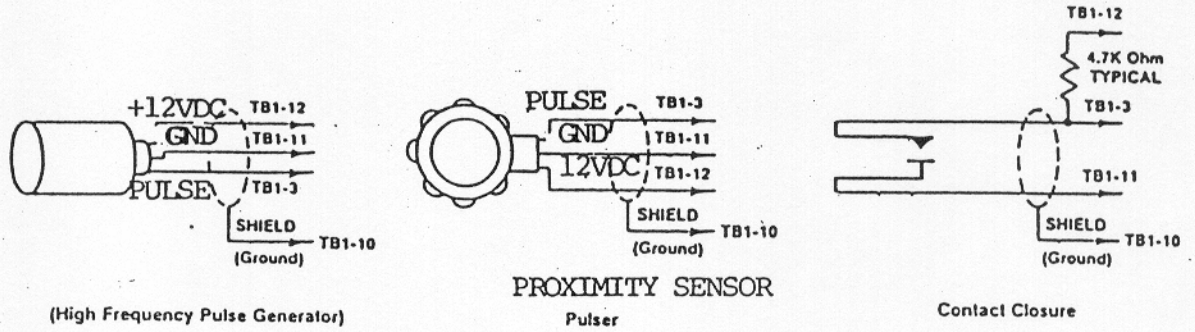
b. Slip the gasket (provided) over the rear of the counter case and slide it forward until it engages the inner surface of the front bezel.

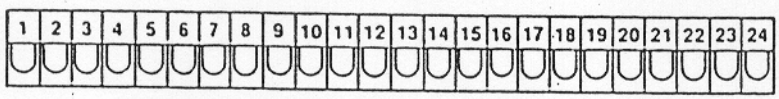
c. Install the screws (provided) in the mounting brackets and insert in the holes located on both sides of the counter.

d. Tighten the screws firmly to attach the counter bezel to the panel.

2-4 Electrical Connections (Reference Figures 2-1 and 2-3)

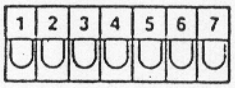
All connections to the controller are completed at terminal strips located at the rear of the case as indicated in the external wiring diagram. Make sure all power is disconnected before making any electrical connections. In cases where cables are situated in areas with heavy electrical fields, shielding is required for maximum noise immunity. One end of the shielding should be connected to earth ground.





TB-1

1. START INPUT
2. GROUND
3. COUNT INPUT
4. RESET INPUT
5. STOP INPUT
6. SCALED OUTPUT
7. BUFFER OUTPUT
8. NOT USED
9. GROUND
10. GROUND
11. GROUND
12. 12 VOLTS OUT
13. DC POWER IN
14. ISOLATED -12 VOLTS OUT
15. ISOLATED +12 VOLTS OUT
16. AC GROUND
17. AC INPUT
18. AC INPUT
19. NO CONNECTION
20. PREWARN NORMALLY CLOSED 1
21. PREWARN COMMON 1
22. PREWARN NORMALLY OPEN 1
23. PREWARN NORMALLY CLOSED 2
24. PREWARN COMMON 2



TB-2

1. PREWARN NORMALLY OPEN 2
2. PRESET NORMALLY CLOSED 1
3. PRESET COMMON 1
4. PRESET NORMALLY OPEN 1
5. PRESET NORMALLY CLOSED 2
6. PRESET COMMON 2
7. PRESET NORMALLY OPEN 2

REMOTE INPUTS:

The remote inputs START, STOP, and RESET will all take 3-30 volt input with a pulse width of 1 millisecond minimum.

FIGURE 2-1 TYPICAL WIRING CONNECTIONS AND UNIT TERMINAL CONNECTIONS

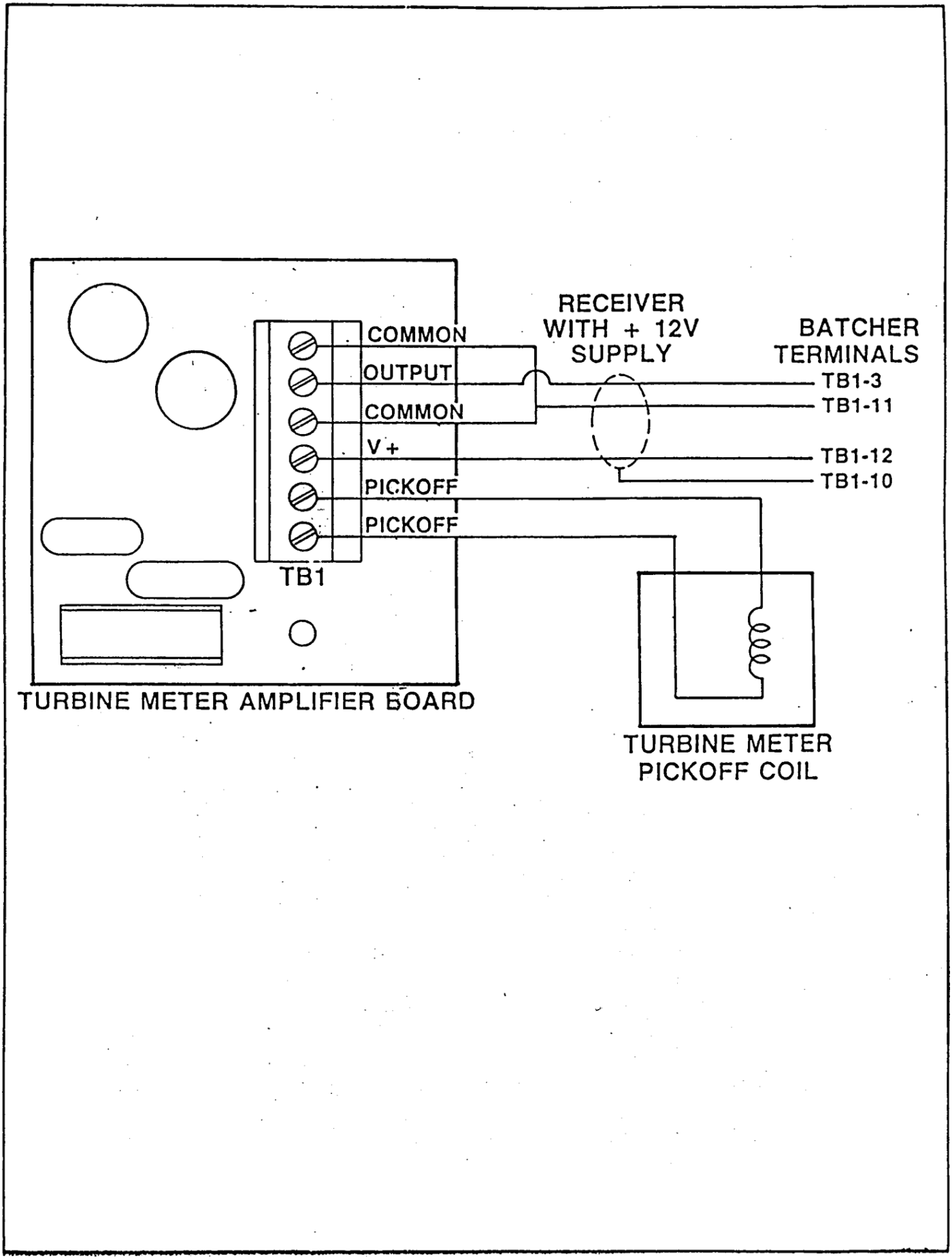
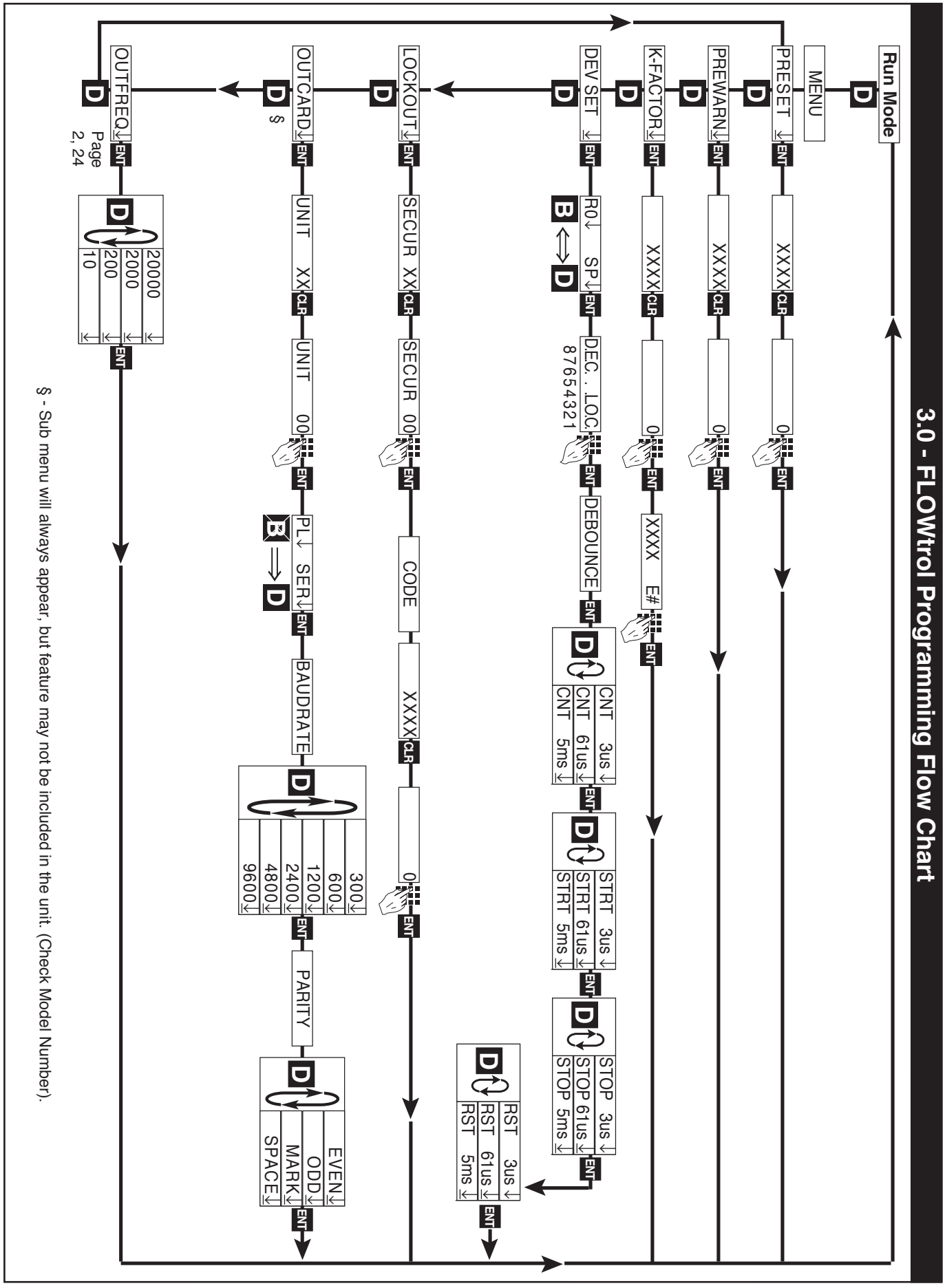


FIGURE 2-3 TYPICAL WIRING HOOK-UP DIAGRAM



§ - Sub menu will always appear, but feature may not be included in the unit. (Check Model Number).

3-1 A Menu (Button D)
The menu section is the area of the batch controller's programming where control points or parameters for operation are set. In order, the control parameters that are available within the menu section are PRESET, PREWARN, K-FACTOR, Device TypeUP (Dev Typ), LOCKOUT and OUTCARD.

PRESET
Menu Control Parameter I is the location in the batch controllers programming where the batch amount is set into the unit.

PRESET OPERATION - The batch size entered by keypad when indicator shows unit is in PRESET mode. Maximum batch size of six digits is required.

PREWARN
Menu Control Parameter II is the location in the batch controllers programming where the low flow shutdown quantity (first stage trip quantity) is set into the unit.

PREWARN OPERATION - This is the anticipated quantity prior to the batch preset amount at which time the first stage relay actuation takes place. It is entered by keypad when indicator shows unit is in PREWARN mode. A maximum quantity size. of four digits is required.

Example:
Enter PRESET as 1500
Enter PREWARN as 125
First stage relay drops out at a batch count of 1375
Final stage relay drops out at a batch count of 1500.

K-FACTOR
Menu Control Parameter III is the location in the batch controllers programming where the number of counts per unit volume, produced by the flow meter, are scaled for display or output.

Dev Typ (Device Type)
Menu Control Parameter IV is the location in the batch controllers programming where the preset mode is configured, the decimal point location is set, and switch debounce settings are entered.

LOCKOUT
Menu Control Parameter V is the security parameter of the unit. The lock out feature enables the operator to shut off selected features of the batch controller to the general user of the equipment.
This feature requires a four digit security code to gain access to change parameters which are protected by the LOCKOUT feature. The normal operator can interrogate these protected parameters but cannot make changes without the security code.
All data will be protected by this feature except the PRESET quantity.

Outcard
The Outcard control parameter is included in the batch controller's software for the optional addition of RS232 or RS422 communications cards for two-way communication.

How to Program
The initial programming of the unit is accomplished by first depressing the MENU button. After pressing the MENU button once, the display will read Preset To cycle to the next control parameter option, merely press the MENU button and Prewarn will appear on the display. If the user does not wish to choose this section of the menu, depress MENU button again and the next control/parameter will appear.

Selection of all MENU control parameters is accomplished through the routine described for Preset and Prewarn.

3-1-B Preset Menu Control Parameter I
When Preset is selected, depress the ENTER (ENT) button, and the unit will show the value that is currently entered in the unit and the display will flash to indicate this is not the batch amount. If the operator does not wish to change this value, depress the ENTER (ENT) button and this value will be saved. To change the Preset value, depress the CLEAR (CLR) button and enter in the new number. When the display holds the desired Preset value, depress the ENTER (ENT) button. At this point the new data is entered into the batch controller and stored in non-volatile memory. Simultaneously, the batcher will return to the Run Mode.

Note: Within Device Type (Dev Typ) - Menu Control Parameter IV -There are two ways to configure the Preset:

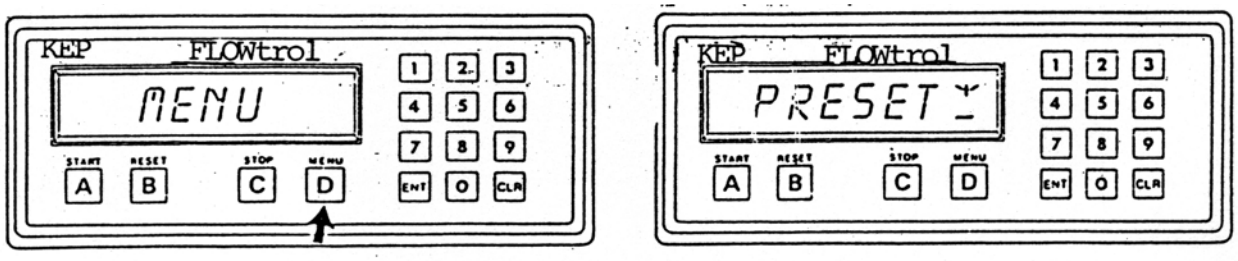
I. Set to the preset value. Designated in this manner SP.
II. Reset to "0" zero. Designated R0.

When SP (Set to Preset) is selected in Dev Typ, Menu Control Parameter IV, the unit will load the Preset value into the display when the the "Reset" is activated. Incoming pulses will count down. The Prewarn output will activate at the Prewarn set-point and the Preset output will activate at "0". Activate "Reset" again to reload the Preset number into the display.

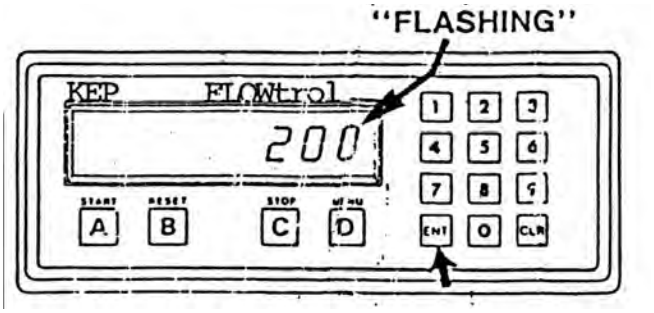
When RO (Reset to "0") is selected at Dev Typ, the display will go to "0" when the "Reset" is activated, incoming pulses will count up. The Prewarn output will activate when the count reaches the Prewarn value selected minus the Preset value. The Preset output will activate at the Preset value. (Eg. If Preset is 100 and Prewarn is 25, Prewarn output will activate at 75 and Preset output will activate at 100.

Following is the entry sequence for a Preset quantity.

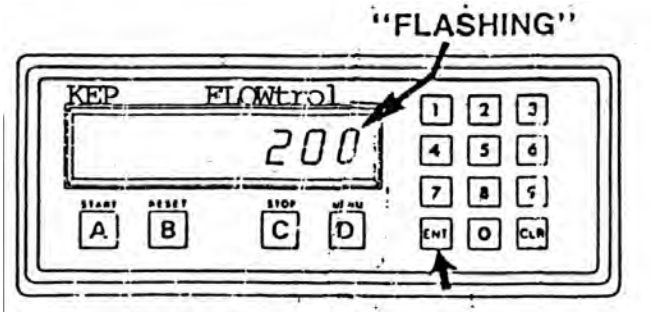
1. Depress the Menu ("D") button once. The display will read MENU. After a one-second pause the display will read PRESET.



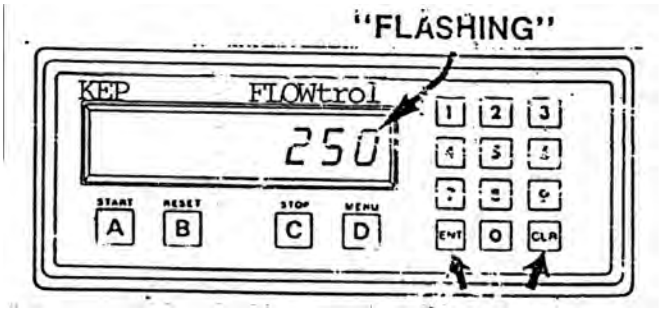
2. Depress the ENTER (ENT) button; display will flash to indicate this is not the batch quantity.



3. If batch size is satisfactory, depress the ENTER (ENT) button. value will be entered into memory. Simultaneously, the unit will return to the Run Mode.



4. To change the Preset value, depress the CLEAR (CLR) button and enter new number. Example "250", New Batch Size.



When the display holds the desired value, depress the ENTER (ENT) button. The new batch size will be stored in memory and simultaneously the batcher will return to the Run Mode.

3-l-C Prewarn -Menu Control Parameter II

When Prewarn is selected, depress the ENTER (ENT) button and the unit will display the amount at which the unit will initiate low flow operation. This value will flash at one second intervals to indicate it is not the batch amount. In the event the operator does not wish to change the value on the display, depress the ENTER (ENT) button and the value is restored to memory. Should the user wish to change this value, press the CLEAR (CLR) button and enter the desired value. When the display holds the proper value, depress the ENTER (ENT) button. At this point the new data is entered into the batch controller and stored in non-volatile memory. Simultaneously, the batcher will return to the Run Mode.

3-1-D K-Factor Menu Control Parameter III

Scaling is accomplished in the FLOWtrol by entering the four most significant digits of
the K-factor. For entry of the K-factor, the DECIMAL POINT LOCATION IS FIXED. Therefore, an order of magnitude is assigned to this number to multiply the number by
factor of 10. The incoming pulses are divided by this K-factor to obtain the scaled quantity
for display or output.

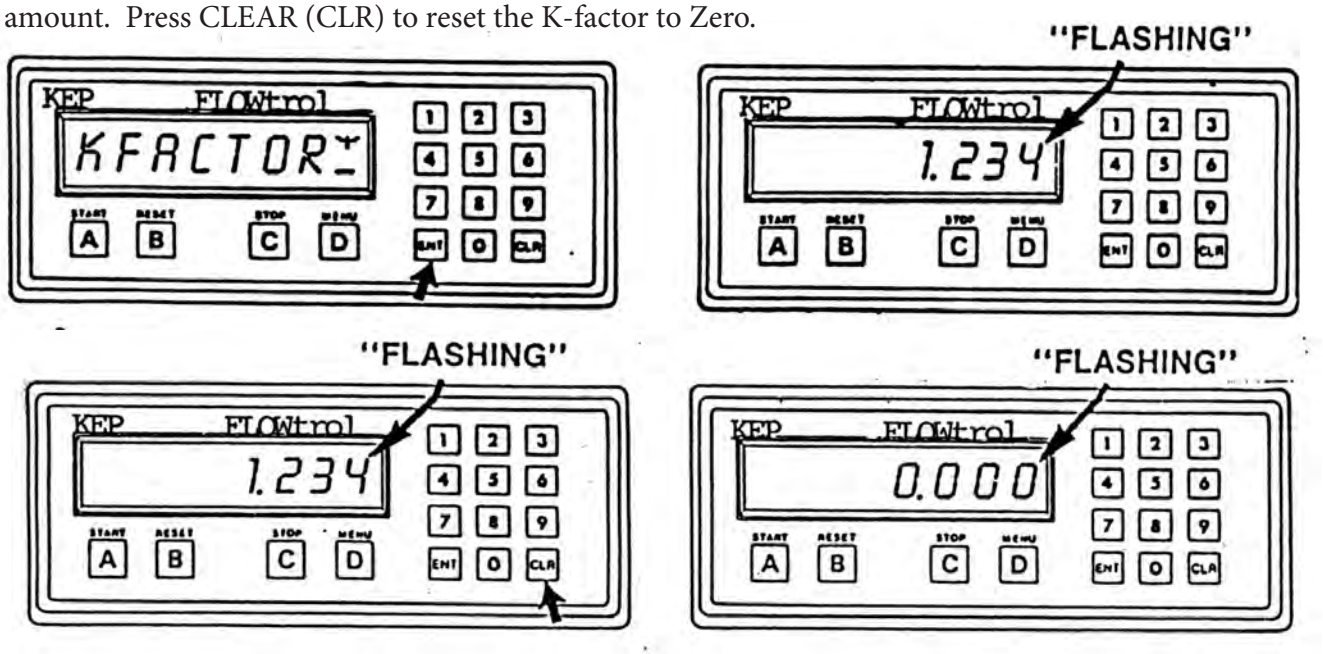
Arithmetically:

Example: K-Factor is 386.3
Enter 3.863 E2 (E2 = 10 to 2nd power = 100)
3.863 X 100 = 386.3
386.3
K-factor 386.3 = 1 Scaled Unit

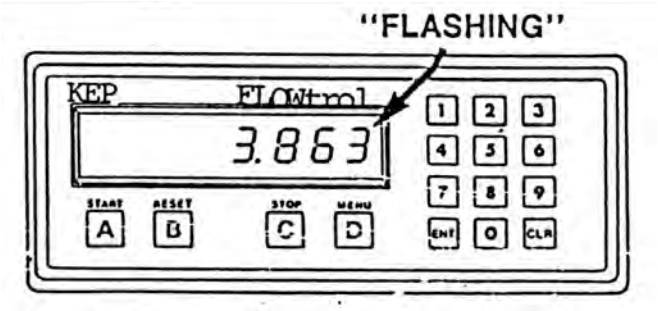
The following are step-by-step instructions for entry of K-factor.

Example: K-Factor is 386.3

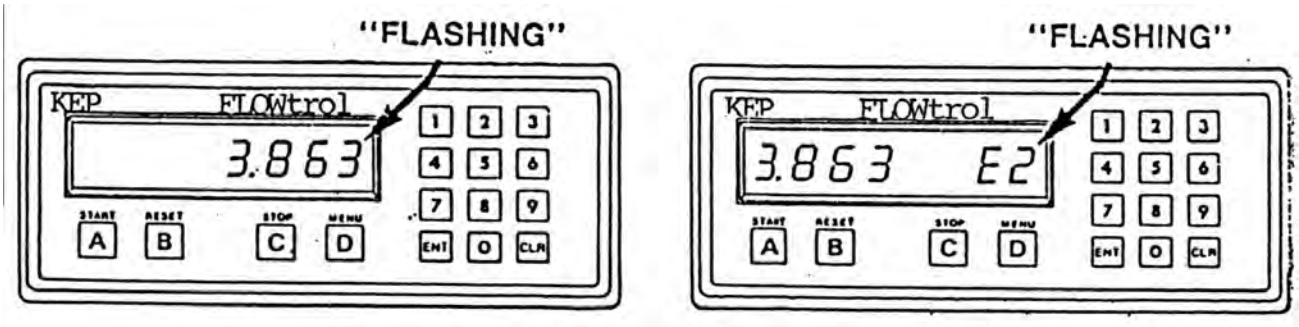
When K-factor is selected, depress the ENTER (ENT) button. The operator will see the K-factor that is currently set into the unit. The display will flash once per second to indicate this is the current K-factor setting and not the batch amount. Press CLEAR (CLR) to reset the K-factor to Zero.



Enter the new K-factor utilizing the keypad. In this example 386.3 the new K-factor will be displayed on the unit in the following manner:



Once the proper data is in the display, depress the ENTER (ENT) button. At this point, the display will show the order of magnitude assigned to the K-factor.



For this example the unit should read 3.863 E2 (Reference Table 3-1, Truth Table, Equivalent Powers of E).

Table 3-1 Truth Table, Equivalent Powers of "E"

E0	=	10^0	=	1
E1	=	10^1	=	10
E2	=	10^2	=	100
E3	=	10^3	=	1,000
E4	=	10^4	=	10,000
E5	=	10^5	=	100,000

To change the order of magnitude of the K-factor, depress any number from 0 to 5. When the proper data is in the display window, depress the ENTER (ENT) button to save the data in memory. Simultaneously, the batcher will return to the Run Mode.

Examples 1 through 5 provide a convenient method for determining the appropriate factor setting in Control Parameter III. Likewise, these examples show the proper decimal location for batcher display.

Example#1

K-Factor (Pulses per Unit Volume)	÷	Required Pulses Per unit volume	=	Scale Factor	Power Of "ten"	Key In	Display Will Read	Decimal Location	Factored Pulse Output Per Unit Volume
2163	÷	1	=	2163.	2 1 6 3. 3 2 1	2.163 E3	Whole Units	0 0 0 0 0 0 0 0. DECIMAL	1
2163	÷	10	=	216.3	2 1 6.3 2 1	2.163 E2	1/10 Units	0 0 0 0 0 0 0 0. DECIMAL	10
2163	÷	100	=	21.63	2 1 .63 1	2.163 E1	1/100 Units	0 0 0 0 0 0 0 0. DECIMAL	100
2163	÷	0.1	=	21630.	2 1 6 3 0. 4 3 2 1	2.163 E4	Units X 10	0 0 0 0 0 0 0 0. DECIMAL	0.1
2163	÷	0.01	=	216300.	2 1 6 3 0 0. 5 4 3 2 1	2.163 E5	Units X 100	0 0 0 0 0 0 0 0. DECIMAL	0.01

EXAMPLE #2

K-Factor (Pulses per Unit Volume)	÷	Required Pulses Per unit volume	=	Scale Factor	Power Of "E"	Key In	Display Will Read	Decimal Location	Factored Pulse Output Per Unit Volume
175	÷	1	=	175.	1 7 5. (3 2 1)	0.175 E3	Whole Units	0 0 0 0 0 0 0 0. DECIMAL	1
175	÷	10	=	17.5	1 7.5 (2 1)	0.175 E2	1/10 Units	0 0 0 0 0 0 0.0 DECIMAL	10
175	÷	100	=	1.75	1.75 (1)	0.175 E1	1/100 Units	0 0 0 0 0 0.00 DECIMAL	100
175	÷	0.1	=	1750.	1 7 5 0. (3 2 1)	1.750 E3	Units X 10	0 0 0 0 0 0 0 0. DECIMAL	0.1
175	÷	0.01	=	17,500.	1 7 5 0 0. (4 3 2 1)	1.750 E4	Units X 100	0 0 0 0 0 0 0 0. DECIMAL	0.01

K-Factor (Pulses per Unit Volume)	÷	Required Pulses Per unit volume	=	Scale Factor	Power Of "E"	Key In	Display Will Read	Decimal Location	Factored Pulse Output Per Unit Volume
49	÷	1	=	49.	0 4 9. (3 2 1)	0.049 E3	Whole Units	0 0 0 0 0 0 0 0. DECIMAL	1
49	÷	10	=	4.9	0 4.9 (2 1)	0.049 E2	1/10 Units	0 0 0 0 0 0 0.0 DECIMAL	10
49	÷	100	=	0.49	0.49 (1)	0.049 E1	1/100 Units	0 0 0 0 0 0.0 0 DECIMAL	100
49	÷	0.1	=	490.	4 9 0. (3 2 1)	0.490 E3	Units X 10	0 0 0 0 0 0 0 0. DECIMAL	0.1
49	÷	0.01	=	4900.	4 9 0 0. (3 2 1)	4.900 E3	Units X 100	0 0 0 0 0 0 0 0. DECIMAL	0.01

EXAMPLE #4

K-Factor (Pulses per Unit Volume)	÷	Required Pulses Per unit volume	=	Scale Factor	Power Of "E"	Key In	Display Will Read	Decimal Location	Factored Pulse Output Per Unit Volume
1	÷	1	=	1.	1.	1.000 E0	Whole Units	0 0 0 0 0 0 0 0.	1

K-Factor (Pulses per Unit Volume)	÷	Required Pulses Per unit volume	=	Scale Factor	Power Of "E"	Key In	Display Will Read	Decimal Location	Factored Pulse Output Per Unit Volume
49	÷	1	=	49.	0 4 9. (3 2 1)	0.049 E3	Whole Units	0 0 0 0 0 0 0 0. DECIMAL	1
49	÷	10	=	4.9	0 4.9 (2 1)	0.049 E2	1/10 Units	0 0 0 0 0 0 0.0 DECIMAL	10
49	÷	100	=	0.49	0.49 (1)	0.049 E1	1/100 Units	0 0 0 0 0 0.0 0 DECIMAL	100
49	÷	0.1	=	490.	4 9 0. (3 2 1)	0.490 E3	Units X 10	0 0 0 0 0 0 0 0. DECIMAL	0.1
49	÷	0.01	=	4900.	4 9 0 0. (3 2 1)	4.900 E3	Units X 100	0 0 0 0 0 0 0 0. DECIMAL	0.01

EXAMPLE #4

K-Factor (Pulses per Unit Volume)	÷	Required Pulses Per unit volume	=	Scale Factor	Power Of "E"	Key In	Display Will Read	Decimal Location	Factored Pulse Output Per Unit Volume
1	÷	1	=	1.	1.	1.000 E0	Whole Units	0 0 0 0 0 0 0 0.	1

Note: If a K-factor that is less than 0.100 is entered, an error message "TOO SMALL" will appear on the display.

3-1-E Device Type (Dev Typ) -Menu Control Parameter IV

When the Dev Typ parameter is selected, depress the ENTER (ENT) button. The display will read: SP RO. If SP is selected, the device will load the Preset value into the display when the reset is activated. Incoming pulses will count down. The unit gives an output at Prewarn setting and at 0. If R0 is selected, the device will clear the display to 0 when the reset is activated. Incoming pulses will count up and the unit will give an output at Prewarn (number of counts before Preset) and at the Preset setting.

To select between SP (set to Preset) or R0 (reset to zero), the operator Presses the button "B" (RESET) or "D" (MENU). A bar under the arrow indicates which configuration has been selected.

Once the desired unit configuration has been selected the operator presses the ENTER (ENT) button. At this point the unit will prompt the user to set the Location
of the Decimal Point. The Decimal Point is moved by pressing any number from 0 to 8, with 0 (zero) indicating no decimal location and 8 indicating a decimal location to the far left of the display. Once the location of the decimal is determined, press the ENTER (ENT) button to load this information into the unit. Next the unit will display RST STR (RESET/START) or START. If RST STR is selected the unit will reset than start (if the total is at or beyond the PRESET) when START is activated. If START is selected, the unit must be manually reset before the START is activated. Press the ”D" (MENU) button to select between RST STR or START. .Press ENTER (ENT) to load the displayed selection. The next programming function is the setting of switch debounce information. Once the debounce message leaves the display, it will be replaced by the letters CNT and a debounce time. CNT stands for the count input. The debounce time is the minimum time needed to see a pulse.

TABLE 3-2: Count Input Debounce Settings

COUNT INPUT	SELECT
100Hz Max	5msec
8KHz Max	1usec
20KHz Max	3usec

Note: For START, STOP and RESET debounce settings, the 5msec setting is recommended when operating with mechanical switches. Either the 61usec or 3usec setting is recommended when operating with electronic switches.
The debounce time is changed by pressing the “D” (MENU) button until the desired debounce time is displayed. The debounce setting choices are: 5msec, 61usec or 3usec. When the desired setting is displayed, press the ENTER (ENT) button to load the data into the unit.

Start Input Debounce Time - The unit will display “STRT” and the existing debounce time. To change the setting, press the “0” MENU button until the desired setting is displayed. When the desired setting is displayed, press the ENTER (ENT) button to load the data.

Stop Input Debounce Time - The unit will display “STOP” and the existing debounce time. To change the setting, press the “0” MENU button until the desired setting is displayed. When the desired setting is displayed, press the ENTER (ENT) button to load the data.

External Reset Debounce Time - The last debounce setting is for the external reset. The unit will display “RST” and the existing debounce time. To change the setting, press the “0” MENU button until the desired setting is displayed. When the desired setting is displayed, press the ENTER (ENT) button to load the data.

At this point the unit will return to the run mode. The external START, STOP and RESET inputs require a 1msec pulse after the debounce selected to insure acceptance. A VOLTAGE LEVEL PRESENT AT THE REAR STOP INPUT WILL DISABLE THE FRONT & BACK START AND BACK RESET.

Note: Each time a menu control parameter is completed, the unit will return to the run mode.

3-1-F Lockout - Menu Control Parameter V
When the lockout parameter is selected, depress the ENTER (ENT) button. The unit will display SECUR (SECURITY) and the existing security data (00 to 99 sec.). Enter 00 to eliminate the security feature. The Security feature will monitor the count input for loss of data. If the unit is started and the unit does not receive a pulse for a period from 1 to 99 sec (user selectable), the unit will automatically stop. The word SECURITY will be displayed and the start relays will drop out. The unit will continue to count any received pulses, but the unit can not be restarted until the 4-digit lock- out code is entered. Entry of the lockout code will not change the status of the lockout command; however, it will enable the user to return the unit back to the batch count and enable all controls.

After the security data is entered, the word CODE will flash on the display followed by the existing lockout code. This code can be any 4-digit number desired by the operator. If the operator does not wish to change this value, press the ENTER (ENT) button and the unit will return to the run mode. If the operator wishes to change this value, press the CLEAR (CLR) button and key in a new 4-digit code. Press the ENTER (ENT) button to store the new code in memory.

The LOCK ON or LOCK OFF mode of operation is controlled by entry of the 4-digit code.

For Example: The 4-digit code is 7777. Lock Out is in the Lock On state. To change Lock Out status to Lock Off: Enter 7777; "LOCK OFF" will be displayed for 1 second.
Note: Lock Out status may be changed any time the unit is in the run mode.

The Lock Out feature enables the operator to shut off selected features of the batch controller to the general user of the equipment. When the 4-digit code is keyed in, the unit will respond with one of two statements: LOCK ON or LOCK OFF. If the lock is "ON", the user will have limited access from the front keypad. The "START" (A button), RESET (B button) and STOP (C button) are unaffected by the lock. However, the user will have limited access to the MENU (D button).

When the lock is "ON", the user will have the ability to change the PRESET values. The PREWARN value may be viewed but not altered. The totalizing counter will be displayed, but the lock must be "OFF" in order to reset it. When the lock is off, any user will have full access to all functions.

WHEN THE LOCKOUT IS ON, THIS CONTROL PARAMETER WILL NOT BE DISPLAYED IN THE MENU.

KEP FLOWtrol CONTROLLERS ARE SHIPPED FROM THE FACTORY WITH THE LOCKOUT NUMBER OF 1000 AND SET IN THE "OFF" STATE.

3-2 Recommended Programming Sequence:

The initial programming of the FLOWtrol is critical to the satisfactory operation of the unit.

Following, in order, are the recommended steps for initial programming.

1. Program the required K-factor Setting. (Menu Control Parameter Ill; “K-FACTOR”)
2. Program the correct Decimal Point Location. (Menu Control Parameter IV “DEVICE TYPE”)
3. Program the desired Prewarn Setting. (Menu Control Parameter II “PREWARN”)
4. Program the desired Reset Mode. “SET TO PRESET” (SP) or “RESET TO 0” (RO). (Menu Control Parameter IV “Device Type”)
5. Program the appropriate Debounce information. (Menu Control Parameter IV “DEVICE TYPE”)
6. Program the desired Security Time and 4-digit Lockout Code. (Menu Control Parameter V “LOCKOUT”)
7. Reset the totalizing counter to zero. (See Section 3-5 Totalizer Counter) 8. Enter the 4-digit Lockout code so that the lock is in the “ON” state.
9. Program the desired Preset batch amount. (Menu Control Parameter I “PRESET”)

At this point the unit is programmed to start a batch delivery.

3-3 Security: See section 3-1-F (Lockout)

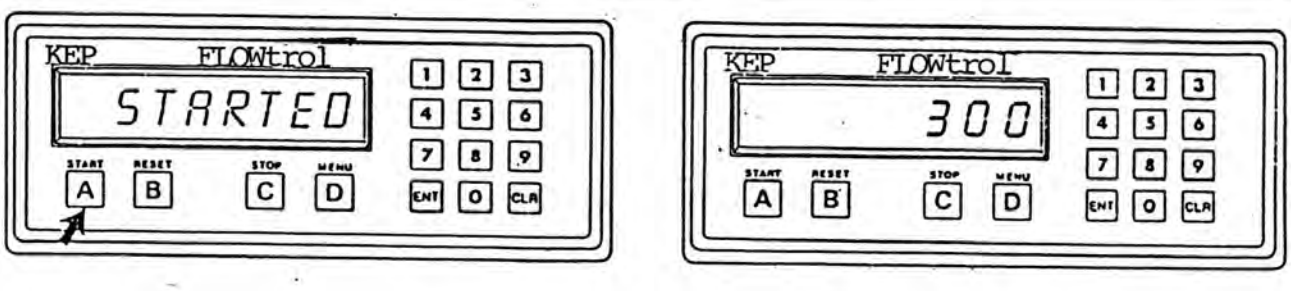
3-4 Run Mode:

In this mode, the unit will display zero (preset if “SP”). In order to start a batch, the user presses the START button or activates the rear START. This action will en- gage both relays. The unit will count up (down if “SP”) to the PREWARN amount less than Preset and Prewarn Relay will drop out. The unit will continue to count to the Preset value, at which time the Preset Relay will drop out. Both relays will remain unenergized until the unit is reset and started again (START mode) or the front or rear start is activated (RESET/START mode).
In the event the STOP (rear or front) is activated during a batch, both relays will immediately drop out. The batch can be resumed by merely activating the START (front or back) or the counter can be reset if desired.

TYPICAL BATCHING SEQUENCE; "RO" MODE & PRESET @ 300

1. Depress the reset ("B" button) the display will reset to 0.

2 Depress the Start ("A") button. The display will read Started. The batch will begin, count up to the preset batch quantity (300), and shut off.



3. At this point, start a new batch of 300 units, depress the Reset button then the Start button. Following is a typical batching sequence with the unit in the "Set to Preset" (SP) mode.

1. Select menu control Parameter I, "Preset", and enter the desired batch size.

2. Activate the Reset and the Preset number will be loaded into the display.

3. Depress the Start button. At this point, the batch will start at the Preset value. It will count down and shut off at zero.

4. Upon completion of a batch, the Preset value will be loaded into the display when Reset is activated.

3-5 Totalizer Counter

By depressing the ENTER (ENT) button while the unit is in the run mode, the unit will display the word TOTAL for approximately two seconds, then display the inventory total. This total will flash at approximately one second intervals. This is a separate counter that totalizes at the same rate as the batch counter. This totalizer can only be reset while its volume appears on the display and the lock is "Off". Reset is accomplished by depressing the CLEAR (CLR) button.

FLOWtrol used only as a Totalizing Counter

The following is the programming sequence for the FLOWtrol when it is to be used as a Totalizing Counter only.

1 Enter the four digit user security code in order to turn the lock-out to the "Off" state.
2. Program the unit to Reset to Zero (R0) mode.
3. Set the Prewarn and Preset to 110".
4. Program into the unit the K-factor setting.
5. Activate the Reset and the unit is ready to count up.
6. To view the grand total, depress the ENTER (ENT) button.
7. To clear the grand total, depress the CLEAR (CLR) while the grand total number is flashing. Press (ENT).
8. Again, enter the 4-digit Lockout code. This action will turn the lock-out to the "On" state. By arming the lock-out, the grand total counter cannot be mistakenly reset. Secondly, the K-factor setting cannot be altered.

At this point, the FLOWtrol is programmed to function only as a totalizer.

3-6 Start (" A" Button)

This command is used to initiate the batch sequence. There are two ways of giving the Start command. The first is to push button "A" (START) on the front panel. The second is to use the remote START input on the rear terminal block.

Once the unit is started, the display will prompt the operator with the word ST ARTED to indicate the unit has received the command and is carrying it out.

The unit will engage both relays unless the Prewarn relay set point has already been attained. The relays will remain engaged until the predetermined set points are reached. Once the set points are attained for Prewarn and Preset, the relays will disengage .

NOTE: Once both Prewarn and Preset points are reached, the unit cannot be started until it receives a reset command (If RESET/START is not selected).

Once the unit is started, all buttons are locked out from use except the STOP button and the ENTER (ENT) button which allows access to the totalizing counter.

3-7 Reset ("B" Button)

This command is used when the unit is stopped to reset the batch. When the reset button ("B") is pressed, the unit will reset to "0" Zero.

There are two ways to initiate this command. The first is through the front panel using the Reset button (“8”). The second is through the terminal block (remote reset) in the rear of the unit.

When the unit is reset, the relays are also re-enabled if they were turned off by reaching the preset values.

3-8 Stop (“C” Button)

This command is used to stop a batch that has already started. There are two ways to initiate this command. The first is through the front panel with the STOP (“C”) button. The second is through the terminal block (remote stop) in the rear of the unit.

When the unit receives a stop command, the word STOPPED will appear on the display and both relays will disengage. Once a batch has been stopped, it can be restarted by pressing the START (“A”) button if the count has not exceeded the preset values.

When the unit is stopped, the operator has the option of resetting all of the parameters of the unit. .

NOTE: A voltage level present at the rear stop will override the front and rear start and rear reset.

3-9 WARNING MESSAGES

3-9-1 Prewrong

Prewrong is a warning message, given to the operator indicating the values in Preset and Prewarn are not acceptable. For example: This condition will occur if the Preset value is less than the Prewarn value.

3-9-2 Overflow

Overflow is a warning message to the user that, the unit is receiving too many pulses into the count input. This indicates that the input frequency has exceeded the 20KHz maximum of the unit. The unit will not be able to handle the overflow of pulses. At this point, the unit will begin to lose count in the display.

3-9-3 Data Lost

Data lost is a warning message indicating the unit is trying to output more pulses out of the scaled pulse output line than the unit can handle. The maximum count speed out is 20KHz.

3-9-4 Outcard

RS232/RS422 Serial/Strobe 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.) Unit 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 Keypad setup to select and enter desired Code Number, Baud Rate and Parity.)

Unit Code

Each FLOWtrol 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 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 I1'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 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 terminals ignore the parity. The FLOWtrol does not check the 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

FLOWtrol uses standard E1A 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 FLOWtrol RS422 follows the standard E1A 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 is more negative than the 422- input by .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 + and - at the FLOWtrol 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

DXX(S) (Device-and address number followed by space) activates the FLOWtrol that had 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 for FLOWtrol

GO (START)	WILL START THE UNIT ON A BATCH
RC (RESET)	WHEN STOPPED THE UNIT WILL CARRY OUT A RESET COMMAND RC 1234 WILL LOAD THE BATCH COUNTER WITH 1234
RT	WILL RESET THE TOTAL COUNTER BACK TO O
RT 1234	WILL LOAD THE TOTAL COUNTER WITH THE NUMBER 1234 ST (STOP) WILL STOP THE UNIT FROM THE BATCH IN PROGRESS
BC	WILL RESPOND BACK WITH THE BATCH COUNT
BT	WILL RESPOND BACK WITH THE TOTAL COUNT
PA	WILL RESPOND BACK WITH THE PRESET VALUE
PA 1234	WILL LOAD THE PRESET NUMBER WITH 1234
PW	WILL RESPOND BACK WITH THE PREWARN VALUE
PW 1234	WILL LOAD THE PREWARN VALUE WITH 1234
KF	WILL RESPOND BACK WITH K FACTOR VALUE
KF1234	WILL LOAD 12.34 INTO THE K FACTOR

Serial Interface Operation

Data is received and transmitted over standard E1A 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 to 7K Ohm worst case. The terminal addressing the FLOWtrol 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. FLOWtrol serial transmit line remains in a high impedance "Off" state until addressed. Insure that only one unit is addressed at a time.

To address FLOWtrol unit, transmit a "D" (device) followed by the 1 to 15 code number and a "Space". Once the "Space" has been received, the FLOWtrol 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 FLOWtrol 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. Once "Carriage Return" (Enter) is sent, the FLOWtrol starts processing the data and will transmit the requested data on a non-priority basis over the data transmit line. A FLOWtrol keypad entry 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 FLOWtrol is not busy, it should not require more than 5msec. 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 that by 80 (8 characters each; 10 bits per character);
add 5msec. to this product and 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 FLOWtrol 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 FLOWtrol 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 from terminal	Receive from FLOWtrol
(S) = Space	
D13(S) [FLOWtrol #13 Activated]	Device #13
PA(S)76546(S)PA(S)	PA 76546 PA
PW(S)1575(S)PW(S)	PW 1575 PW
KF(S)12.34(S)KF	KF SC
RC(Enter)	RC 12.34 KF
[FLOWtro1 presets and K Factor	
are set, counter is reset]	76546
	1575
	12.34

D7(S) [FLOWtrol #7 Activated]	Device #7
PA(S)12347(S)PA(S)	PA 12347 PA
RC(S)456789(S)BC(S)	RC 456789 BC
RT(S)376(S)BT(Enter)	RT 376 BT
[FLOWtrol 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 FLOWtrol over the serial transmit line in the standard RS232 or RS422 format. The FLOWtrol units 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 30VDC strobe input that remained high, a minimum of 25 milliseconds. Requests are processed on a non-priority basis. Normally data will begin to be transmitted from the FLOWtrol over the RS232 or RS422 serial transmit line within 5msec. unless interrupted by a keypad entry or other signal input.

No other unit should be brought on line until data requested has been received. After the strobe input has been high, a minimum of 25msec, and data has been latched, the strobe should not be generated until the requested data has been transmitted by the FLOWtrol.

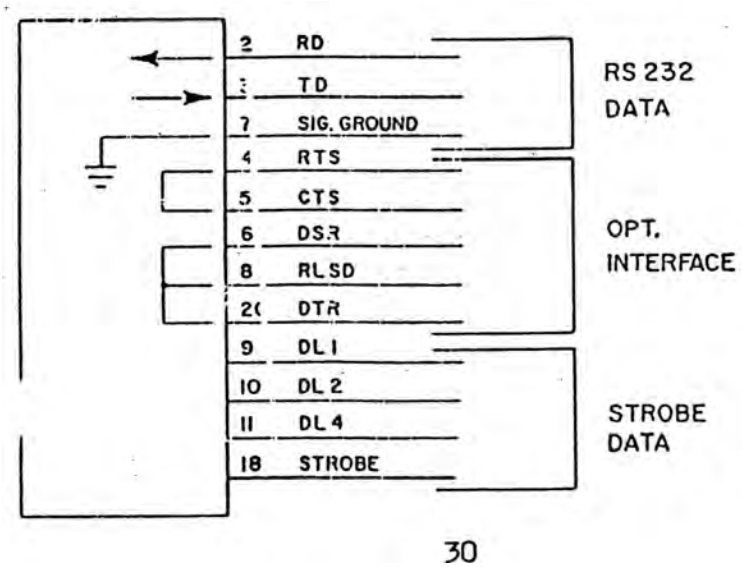
Strobe Input Electrical Requirements
Both the RS232 and RS422 interface option cards have inputs that allow data to be requested over a separate strobe input and a 3 bit data request code input. Any number of the 3 data request code lines can be linked in parallel as long as the source can drive the 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 request inputs are positive true with
signal 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)

0:	PA (Preset A request)
1:	PW (Prewarn request)
2:	KF (K Factor request)
3:	DC (Display of Batch request)
4:	DB (Display of Total request)



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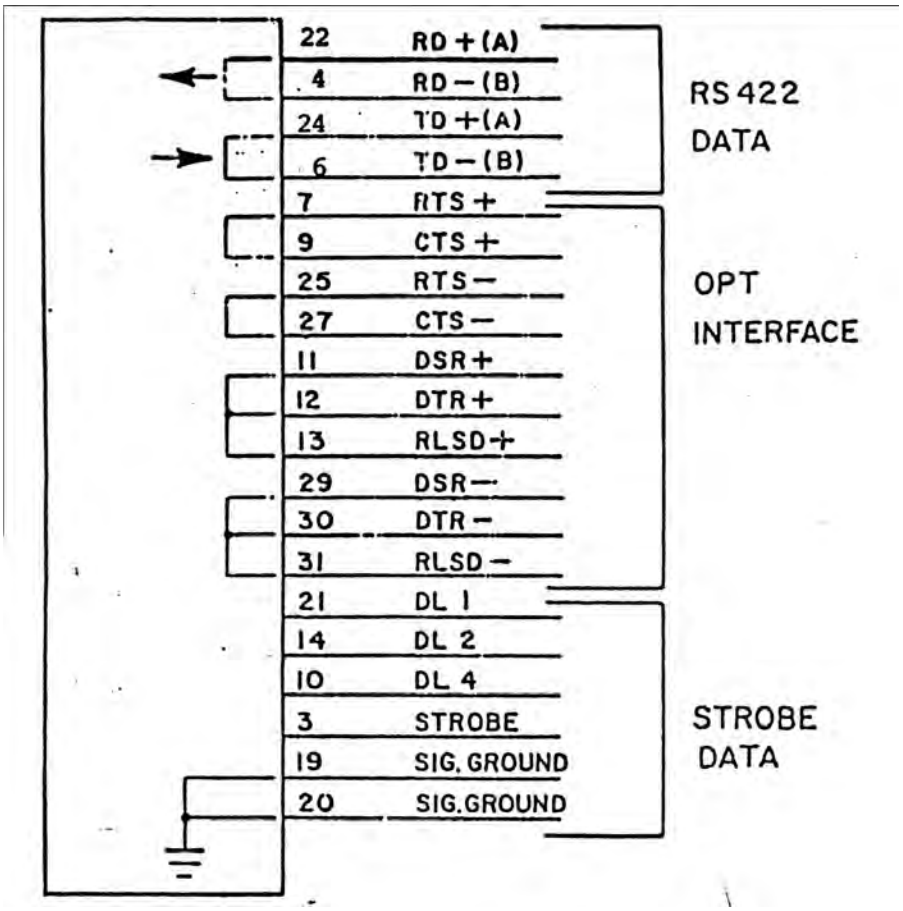
Strobe Input Wiring
The FLOWtrol RS232 option has a sub-miniature D 25 pin female connector and is wired as a DCE (Data Communications Equipment) device. If it is connected to a DTE (Data Terminal Equipment) device, the interconnect cable should have wires 2 and 3 connected straight to the same pins 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.

RS232 Wiring
FLOWtrol 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), Pin8 (Received Line Signal Detector) and 20 (Data Terminal Ready) are also jumped internally to echo back any signal.

Strobe Wiring (of RS232 25 Pin Connector)
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/Strobe Input Wiring
The FLOWtrol RS422 option has a sub-miniature 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.



RS422 Wiring

FLOWtrol requires only 4 wires for RS422 communications: Pin 22 [Receive Data +(A)], Pin 4 [Receive Data -(B)]), Pin 24 [(Transmit Data +(A)], Pin 6 [(Transmit Data -(8)]. 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) do not need to be connected but may be used as a reference if desired.

Strobe Wiring (of RS422 37 Pin Connector)
The 3 data lines to generate the request code (DL1: Pin 21, DL2: Pin 14, DL4: Pin 10) 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
(Pins 6-24).

SECTION 4 MAINTENANCE

4-1 General

FLOWtrol does not require any "Routine Maintenance" to be performed by the user. If a problem should occur; and if after all troubleshooting procedures have been exhausted, refer to Section 5-2 for procedures for repair and/or replacement.

SECTION 5 TROUBLESHOOTING

5-1 GENERAL

The following troubleshooting procedures have been developed as an aid in locating defects. Each problem could not be considered or listed, but general isolation procedures are presented. A standard recommendation is the removal of power for 2 seconds. Most micro-processor based units go through a reset cycle at power up. If it is determined that the unit is faulty, contact your local KEP Factory Representative or Sales Office concerning replacement. The FLOWtrol is not field serviceable and all repairs should be performed at the factory.

Symptom	Possible Cause	Test Procedure	Corrective Action
No display reading	No power to unit.	Check AC voltage input on terminals TB1-17 and 18. Check D.C. voltage input on terminals TB1-11 and 13. (See Specifications Sect. 1-3 for proper input voltages)	If power checks okay - replace unit.
Unable to start batch	1. Incorrect programming 2. Defective P.C. board	Review operational procedures in manual. Depress start button and check for relay action on terminals TB2-1 through 7. Use an OHM meter to perform check.	Reprogram unit as required. If no relay action, replace unit.
Unit not totalizing	1. Incorrect programming 2. No pulse input	Review operational procedures in manual. Use oscilloscope to check for pulse input between terminals: TB1-2=GRD TB1-3=Count Input (+) (See specifications Sect. 1-3 for proper pulse input voltage levels.)	Reprogram unit as required. If pulse input is present, replace unit.

TABLE 5-1 TROUBLESHOOTING

WARRANTY

Kessler-Ellis Products Co. warrants its products 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 KEP. This Warranty is void if the product has been altered mis-used, dismantled, or otherwise abused.

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