COX INSTRUMENTS
FLOW MEASUREMENT

Proven Performance for Over 50 Years

SERIES 4000 ADVANCED FLOW COMPUTER REFERENCE MANUAL

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Introduction

How to Use This Manual

To get started using the 4010 there are a few basic concepts to be grasped. The programming chart contained in the Appendix of this manual is your key to using the instrument.

The following steps are to be followed:

- Read the section entitled Setting up the 4010. This is a “hands on” section that enables you to set up the unit and begin using it as quickly as possible.

- Read chapters 2 & 3 of this manual.

- If you want to view any of the MAIN FUNCTION displays, press the key with the desired display on the front. These functions are listed on page 12 of this user’s manual.

- If you want to see one of the SECOND FUNCTION (5 SEC.) displays, press the “UP ARROW” key and the appropriate number key. These functions are listed on page 12 of this user’s manual.

- If you want to program the instrument from the front panel, Press the “LEFT ARROW” key and the “RIGHT ARROW” key simultaneously. (The unit will display **“PROGRAM”**).

- Choose the branch on the chart you wish to program and use the “UP ARROW” key to get to the chosen branch. (i.e. PROGRAM CALIBRATE, PROGRAM TOTAL, PROGRAM RATE, OR PROGRAM OTHER.); then, use the “RIGHT ARROW” and “LEFT ARROW” keys to move right or left through the branch.

- When you finish programming the unit, press the “LEFT ARROW” key and the “RIGHT ARROW” key simultaneously. (The unit will display **“PROGRAM”**.) Press “RESET” and the unit will be in the display mode.

- If you want to program the instrument through the RS485 interface, read the section on Programming the 4010 From a Personal Computer.

1

Setting Up the 4010 (A quick start)

Unpacking the Unit

Unpack the unit and check the contents of the box. There should be an installation kit included in the package. The installation kit contains:

- Two mounting brackets
- Four mounting screws
- One rubber gasket
- Two seven pin connectors
- One seven pin connector with a blocked off middle pin
- One six pin connector with a blocked off pin (second from the right end)
- One nine pin connector

To install the unit into a panel, follow the diagram located on the bottom of the 4010.

Connections to the 4010

Connection pins for the unit are designated on the back of the 4010 and on the label located on the top of the enclosure. For explanations of the connection points see the Appendix section of the User's Manual.

A Sample Hookup and Instrument Set Up

Hookup:

BE SURE ALL POWER IN THE LINES IS OFF!!!!

Use a COX signal conditioner to interface the turbinemeter with the 4010.

Connect power to the appropriate connector on the rear of the box (see Appendix).

Connect the output from the signal conditioner to Flowmeter Input A. (See instructions provided with the Cox Signal Conditioner).

Connect the shield from the turbinemeter cable to the – DC on the signal conditioner.

Instrument Set Up:

The 4010 will be set up to linearize the output from an LF-6-00 turbinemeter. The calibration data for this meter and the curve fitted K-FACTOR and FREQ/VISC points are included in this package. They will be used to set up the 4010 to read Flowrate and Total. Flowrate will be in Pounds Per Hour (PPH). Total will be in Pounds.

In setting up the instrument follow the steps on the programming chart along with these instructions. Example 1 shows a sample program points chart and calibration sheet.

Apply power to the unit.

The unit will do a self diagnosis test and come up with an initial display.

Press the "LEFT ARROW" and "RIGHT ARROW" keys simultaneously. The display will read: **"PROGRAM?"**.

Press the "UP ARROW" key. The display read **"PROG. CALIBRATE"**.

Press the "RIGHT ARROW" key. The display reads **"1 Knnnnnn Fnnnn"**.

Press the "RIGHT ARROW" key. The K will blink. Press "CLR". Enter the Point 1 K-Factor (6 digits max.) from the Program Points chart. Press "ENT" key.

Press the "RIGHT ARROW" key. The F will blink. Press "CLR". Enter the Point 1 F/V (4 digits max.) from the Program Points chart. Press "ENT" key.

Press the "UP ARROW" key. The display will read **"2 Knnnnnn Fnnnn"**.

Repeat the preceding steps to enter Point 2 data.

Continue entering all 18 points.

Press the "RIGHT ARROW" key. The display will read **"VISCOSITY nn"**. Press "CLR". Enter the customer viscosity from the calibration sheet. In this case enter 1.12 cstks. Press "ENT".

Press the "RIGHT ARROW" key. The display will read **"K MUTL. nnn"**. Press "CLR". Enter 8.32778 (obtained from the table in the Appendix of this document). Press "ENT".

Press the "RIGHT ARROW" key. The display will read **"SPEC. GRAV. nnnnn"**. Press "CLR". Enter the customer Specific Gravity from the calibration sheet. In this case enter 0.7593. Press "ENT".

Press the "RIGHT ARROW" key. The display will read **"RATE MULT. nnnnn"**. Press "CLR". Enter 3600 to read in units per hour. Press "ENT".

Press the “RIGHT ARROW” key. The display will read **“R RESOLUTION nn”**. Press the “UP ARROW” key to choose the correct factor. Based on the calibration data three decimal placed are needed; therefore, choose 1K as the Resolution Factor.

Press the “RIGHT ARROW” key twice. The display will read **“PROG. CALIBRATE”**.

Press the “UP ARROW” key. The display will read **“PROG. TOTALIZER”**.

Press the “RIGHT ARROW” key until the display reads **“DEC.PT. 0000000000”**. Press the “0” number key.

Press the “RIGHT ARROW” key. The display will read **“PROG. TOTALIZER”**.

Press the “UP ARROW” key. The display will read **“PROG. RATEMETER”**.

Press the “RIGHT ARROW” key until the display reads **“DEC. PT. 000000”**. Press the number three to give three decimal places.

Press the “RIGHT ARROW” key until the display reads **“RATE HEADER xxx”**. Use the “UP ARROW” key to select the proper letter for the first letter in the header. Press the “RIGHT ARROW” key and repeat for the second letter. Press the “RIGHT ARROW” key and repeat for the third letter.

Press the “LEFT ARROW” and “RIGHT ARROW” keys simultaneously. The display will read **“PROGRAM ?”**.

Press the “RESET” key. The display will read **“T n nnnnPPH”**. This is the dual Total and Rate display.

The unit is now ready to measure flowrate and to totalize the flow. Read the User’s Manual for more elaborate programming techniques.

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PROGRAM POINTS

METER MODEL: LFC 6-00

POINTS	F/V	K FACTOR
1	106.700	510929.75
2	115.856	531033.25
3	125.449	549283.75
4	136.507	567420.00
5	149.257	585228.0
6	163.998	602534.00
7	181.134	619200.00
8	199.870	634148.75
9	222.788	648912.50
10	248.661	662105.00
11	281.369	674965.00
12	320.447	686401.75
13	368.978	696597.00
14	433.016	705721.00
15	517.347	713312.00
16	645.315	719929.25
17	885.145	726504.00
18	1068.460	730372.00

EXAMPLE 1

COX INSTRUMENT

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TURBINE METER FLOW CALIBRATION

		Flowmeter Specifications	
Model Number	LF 6-00		
		Calibration Min. (GPM)	0.04
		Calibration Max. (GPM)	0.09
		Linear Min. (GPM)	NA
Calibration Date	08/07/02	Linear Max. (GPM)	NA
Calibration Stand	5	Percent Linearity +/- % O.R.	NA
Operator's Initials	297	Percent Accuracy +/- % O.R.	0.5

Customer's Fluid		Cox Calibration Specifications	
TYPE:	MIL-C-7024C Type 2	Fluid Type:	MIL-C-7024C Type 2
Temperature (F)	116.6	Temperature (F)	116.6
Specific Gravity	0.7593	Specific Gravity	0.7593
Viscosity (CSTK)	1.120	Viscosity (CSTK)	1.120

SET FREQUENCY (Hz)	COUNTS	TIME (Sec)	FLUID WEIGHT (Lbs)	TEMP (° F)	SPECIFIC GRAVITY
120	2422	20.170	0.030	116.0	0.7596
120	2423	20.194	0.030	116.0	0.7596
240	5097	21.341	0.050	116.5	0.7594
240	5096	21.246	0.050	116.0	0.7596
360	6479	18.016	0.060	116.4	0.7594
360	6483	18.031	0.060	116.4	0.7594
480	8946	18.644	0.080	116.3	0.7595
480	8939	18.596	0.080	116.2	0.7595
720	13659	19.003	0.120	116.0	0.7596
720	13655	18.962	0.120	116.1	0.7596
1200	23081	19.211	0.200	116.0	0.7596
1200	23087	19.238	0.200	116.0	0.7596

EXAMPLE 1 (continued)

FREQUENCY (Hz)	F/V	K-FACTOR (C/G)	FLOW (GPM)	FLOW (PPH) CALIB. SG	FLOW (PPH) CUST. SG
120.08	106.79	510714.	0.0141	5.354486	5.352372
119.99	106.70	510925.	0.0140	5.348123	5.346010
238.84	21.306	644697.	0.0222	8.434468	8.433358
239.86	213.31	644740.	0.0223	8.472182	8.468836
359.62	320.62	682953.	0.0315	11.989340	11.987130
359.55	320.55	683374.	0.0315	11.979360	11.977160
479.83	427.52	707287.	0.0407	15.447320	15.443660
480.69	428.05	706767.	0.0408	15.487200	15.482790
718.78	639.22	720015.	0.0598	22.733250	22.724270
720.12	640.81	719802.	0.0600	22.782400	22.774600
1201.45	1068.46	730046.	0.0987	37.478520	37.463720
1200.07	1067.23	730235.	0.0986	37.425920	37.411140

Frequency at Minimum Flow (Hz)	340.5
Frequency at Maximum Flow (Hz)	1095.4
Pressure Drop at Maximum Flow (PSID)	7
Back Pressure at Maximum Flow (PSIG)	11
Voltage Output @120Hz (mV)	7

Best Line Equation for GPM vs. Frequency:
GPM = Freq(Hz) * 0.0000787 + 0.0036139

Maximum Device Overflow Range =	1.71%
Minimum Device Overflow Range =	-7.35%

The minimum and maximum deviations result from comparing the actual calculated GPM over the flow range.

EQUATIONS

K-Factor = Cycles Per Gallon
Frequency = Counts/Time(Sec)
F/V = Frequency/Viscosity (Hz/CSTK)
NA = Not Available

Flow (PPH) = [Wt(Lbs) * 3600/Time(Sec)]
K-Factor = [Counts * 8.328 * SG/WT]
Flow(GPM) = [Freq. * 60 / K-Factor]

Calculations based on water = 8.328 Lbs./Gal at 60° F in air at standard atmosphere.

EXAMPLE 1 (continued)

2

Flow Rate Measurement with Turbinemeters

A brief discussion of flow measurement:

Turbinemeter flow rate is generally determined by this equation:

Flowrate = Frequency * (Rate Factor/K-Factor) * Specific Gravity

where:

Flow is in gallons per minute (GPM), pounds per hour (PPH), etc.

Frequency is the frequency in Hertz from the turbinemeter.

The Rate Factor is the number used to quantify the flow rate.

The K-Factor is obtained from turbinemeter calibration data. It is in counts per unit to be measured; for example, Counts per Gallon.

Specific Gravity is used when calculating gravimetric flowrates (PPH, etc); it is entered as a 1 when computing volumetric flow rates (GPM, etc.)

Figure 1 shows a signature curve for a typical turbinemeter.

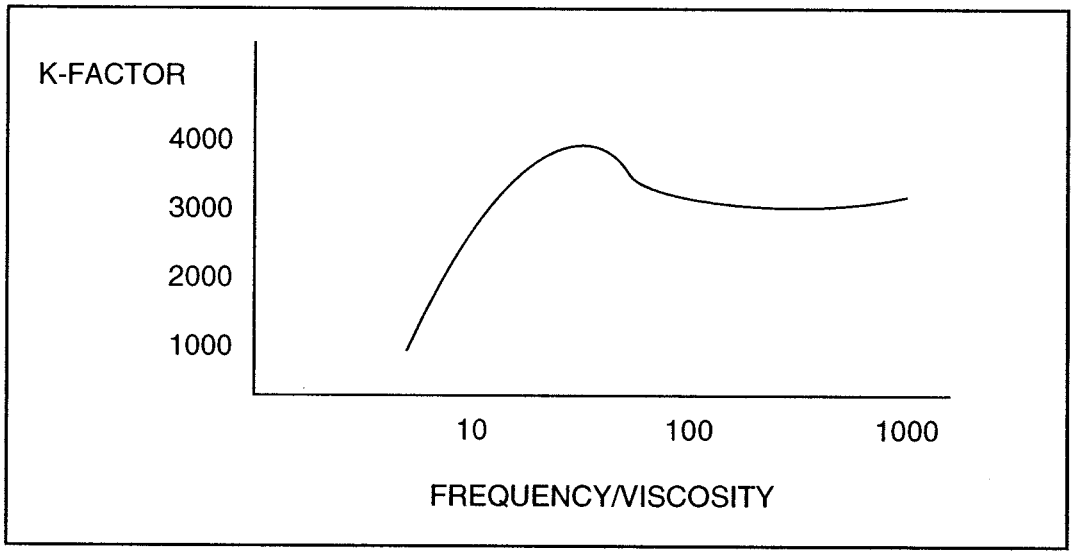

FIGURE 1.

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The System 4010 Solution

The system is capable of accepting the input from one turbinemeter and instantaneously determining the K-Factor to go into the Flowrate and Total equations over the turbinemeter's operating frequency range. The system then solves both the flowrate and total equations and can display them either as separate displays or as a dual display. In addition, this information can be sent to a PC via the RS485 interface that is standard on the 4010 system (If your PC does not have a RS485 interface, an adapter is available from COX that will allow you to use the RS232 port on your PC to communicate with the 4010).

The flow equation solved by the 4010 is as follows:

Flowrate = Frequency * (Rate Factor/K-Factor) * K T Factor * Resolution Factor * Specific Gravity

The additional factors in this equation are the following:

K T Factor: This number is used to convert the K-Factor into units desired in the flow measurement. For example, if the desired flowrate is in PPH and the K-Factor available is in Counts Per Gallon, the K T Factor entered into the 4010 would be 8.32 lbs. which is the weight of a gallon of water. The 4010 would then convert the Counts Per Gallon K-Factor into Counts Per Pound.

R Resolution: This number allows the resolution of the flow rate to be optimized. It can be set at any of the following numbers: 1, 10, 100, 1000, 10000. If 10 is entered there will be one decimal place, 100 gives 2 decimal places, etc.. The 4010 can thus be used most efficiently over the entire product line of COX's turbinemeters.

In addition, the 4010 Totalizes the flow using the following equation:

Total = Flowrate * Time

Introduction to the 4010:

TOTALIZER

Operation:

The totalizer is a ten-digit flow totalizer with a scaler to accept K-Factor values from 100 to 999,999. The KT multiplier is divided into the K-Factor to obtain the proper dimensions for totalizing units. The Reset key can be programmed to reset the Totalizer count. The Totalizer counts up only.

Outputs:

Two transistor outputs are available from the Totalizer. Transister 1 provides a scaled output pulse for remote totalizing applications. The pulse output duration can be programmed for Fast (125 microseconds), Medium (2 msec), or Slow 50 msec). The Totalizer has a buffer capable of storing 255 scaled counts if the Totalizer count rate temporarily exceeds the scaled output rate. If the buffer capacity is exceeded, any Totalizer count attempting to cause the buffer to go to 256 will be lost from the scaled pulse output, and the message PULSE OVERFLOW will appear on the display. The contents of this buffer are saved if the power is removed from the unit before all of the counts have been put out. This buffer is reset when the Totalizer is reset.

Transistor 2 is the Totalizer setpoint output which turns on when the Totalizer count reaches the Totalizer setpoint. The output can be programmed to time out (turn off) from .01 to 99.99 seconds after it turns on. Programming the timer to a value of 0.00 disables the time and causes the output to remain on until an input or keyboard command unlatches it.

RATEMETER:

Operation:

The ratemeter has six-digits of display and calculates flow by measuring the time interval between input pulses or average time between groups of pulses and then reciprocating the time. The calculated rate is multiplied by 1 /K-Factor, a Rate Multiplier and a Resolution Multiplier and a Specific Gravity to provide rate readings in the desired units of measure. The K-Factor is determined from the calibration curve for the turbinemeter. Points on this curve are programmed into the 4010. The reset key can be programmed to act on the Ratemeter; it can be used to unlatch Rate alarms.

Smoothing:

The smoothing function allows the ratemeter to average rate readings from 1 second to 7.5 seconds in .5 second steps. There is no smoothing when programmed for .5 seconds.

High / Low Outputs:

The Rate HI and LO setpoints are used to set Rate values at which the rate output alarms turn on. The HI output is turned on if the Rate is greater than the HI setpoint, the LO output is turned on if the rate is lower than the LO set point. The outputs can be programmed to follow, time out, or to latch until a keyboard or input signal is received. In the follow mode of operation, the rate is compared to the HI and LO setpoints after each rate update. If an output is turned on, it remains on until the next rate update occurs and then the output is either left on or turned off depending on the comparision of the new rate reading with the setpoints. In the time out mode of operation, the outputs can be programmed to turn on for .01 to 99.99 seconds. Programming a value of 0.00 disables the time and causes the outputs to latch until unlatched by a keyboard or input signal. Transistor 3 and Relay K1 are Rate LO Alarm outputs. Transistor 4 and Relay K2 are Rate HI Alarm outputs.

Rate at Zero:

The Ratemeter displays zero rate when the time interval between pulses exceed the programmed Rate Zero time. The timer can be set from 1 to 15 seconds.

Rate Header:

The Rate units of measure (up to three characters) can be programmed into the unit and will be shown along with the rate value and rate setpoints on the display. If the Rate data exceed our digits, the rate header will be shifted off the display in the split display mode.

THE FRONT PANEL DISPLAY:

The information to be shown on the display can be selected as follows:

Main Function Keys:

These keys cause a permanent display to be evoked. To use these keys the unit must be in Run Mode (Not in Program Mode). Press the proper key for the desired display.

The key numbers and associated display are as follows:

Key	Display
1	Total
2	Totalizer Set Point
3	Flow Rate
4	LO Flowrate Alarm Point
5	HI Flowrate Alarm Point
6	Turbinemeter Frequency
7-8-9-0	Two Value Display (See programming instructions)

Second Function Keys:

These keys cause the unit to display the selected value for 5 seconds, then return to the programmed dual display.

To obtain these displays the unit must be in Run mode; then press the “UP ARROW” key and the appropriate number key.

Key	Display
1	Rate Multiplier
2	Specific Gravity
3	K Multiplier
4	Viscosity
5	Resolution Multiplier
6	K-Factor
7	1/K-Factor
8,9	Point on K-Factor/(F/V) Curve
0	Software Version

DUAL DISPLAY PROGRAMMING INSTRUCTIONS:

The display key shows two items displayed at the same time. The items are identified with the first letter of the full identifier except for rate, which is identified by the rate header, if programmed. Pressing the “DP” key momentarily will display the full identifiers for both values being displayed for about 1 second. The items displayed by the display key can be changed by pressing and holding down the “DP” key until the left side of the display starts to blink. Use the “UP ARROW” key to scroll through the items that can be displayed stopping at the desired item. Use the “RIGHT ARROW” key to select the desired data display (selected display blinks) and use the “UP ARROW” key to select the data to be displayed. Return to the normal display be pressing the “DISPLAY” key or any numeric key.

The functions able to be displayed on the dual display are as follows:

LO RATE
HI RATE
FLOWRATE
FREQUENCY
K POINT
KPV
TOTAL / RATE (This is a unique display not combinable with any of the above options).

Front Panel Programming

The 4010 system can be programmed from the front panel as follows:

Press the left and right arrow keys on the front panel simultaneously.

The display will read **"PROGRAM"**. The user can now go to any function on the Program Chart by pressing first the Row number then pressing the Column number. The Program Chart is in the Appendix of this manual. Programming steps are covered in detail in the next several sections.

Press the "UP ARROW" key and the display will read **"PROG. CALIBRATE"**.

Program Calibrate Operations

Press the "RIGHT ARROW" key and the display will read **"1 K 0 F 0"/**.

Press the "RIGHT ARROW" key and the **"K"** in the display will begin to blink.

Press "CLEAR" button then proceed to enter a K-FACTOR number (maximum of 6 digits).

Press the "ENTER" button.

Press the "RIGHT ARROW" key and the **"F"** in the display will begin to blink.

Press the "CLEAR" button then proceed to enter an F/V number (maximum of 4 digits). Press "ENTER". Press the "UP ARROW" key and enter the next points in the same manner as you entered the first data.

Up to 40 points can be programmed in this manner.

Press the "RIGHT ARROW" key. The display will read **"VISCOSITY"**.

Press "CLEAR" and proceed to enter the viscosity (any number between 0.1 and 800).

Press the "ENTER" button.

Press the "RIGHT ARROW" key. The display will read **"KMULT"**.

The number used as the KMULT will determine the units of the K-Factor. If the K-Factor on the turbinemeter calibration data is in counts per gallon and the user desires to read flow rate in the Pounds Per Hour the number entered here is 8.32 which is the weight of one gallon of water in the English system of measurement.

Press “CLR” then enter K Multiplier (.00001 → 10,000, 6 digits max.)

Other conversion numbers can be found in the Appendix of this manual.

Press the “RIGHT ARROW” key. The display will read **“SPEC GRAV”**.

The number entered here can be anywhere from .000001 to 2.0. Press “CLR”. Enter the specific gravity value (5 digits max.) and press “ENTER”.

Press the “RIGHT ARROW” key. The display will read **“RATE MULT”**.

Press “CLEAR”. Enter the desired number and press “ENTER”. Enter 60 to read flowrate in units per minute. Enter 3600 to read flowrate in units per hour (.00001 → 99,999, 6 digit max).

Press the “RIGHT ARROW” key. The display will read **“RESOLUTION”**.

This number is the Resolution Factor in the 4010 flow equation. This number is chosen by the user based on the number of decimal places desired in the flow rate readout; this determination should be made based on the turbinemeter calibration data received with your turbinemeter. Pressing the “UP ARROW” key changes the KMULT value to one of the following: 1 gives no decimal place, 10 gives one place, 100 gives two places, 1000 gives three places, and 10000 gives four places.

Example: The maximum flow rate to read is 24.987 PPH. The resolution factor chosen would be 1000. (The ratemeter decimal point for this number should be set at 3).

Press the “RIGHT ARROW” key. This display will read **“DIAGNOSTICS”**.

Your system runs these self tests every time you power up. You can run them manually at this time by simply pressing the “UP ARROW” key. There are three self tests. Test 1 displays all 8’s. Test 2 displays all *’s. Test 3 displays **“TEST IN PROCESS”** for three seconds then displays **“SYSTEM TEST OK”**. A self test failure will result in one of the following displays:
“ROM ERROR”
“INTERNAL ERROR”
“EXTERNAL ERROR”

These errors are unrecoverable errors. If they occur try to re-power up. If this is not successful call COX Sales Engineering for instructions.

There is one test performed at power up that is not done when the self diagnostics are initiated manually. This test results in a recoverable error when it occurs. When this test fails the error message is **"STORE ERROR"**. It indicates that the users program data has been corrupted. If this occurs press "RESET". The display will read **"VERIFY PGM DATA"** for one second. The user should then check all his entered data to find the error.

Press the "RIGHT ARROW" key. The display will read **"PROG CALIBRATE"**. Press the "UP ARROW" key. The display will read **"PROG TOTLIZER"**.

Program Totalizer Operations

Press the "RIGHT ARROW" key. The display will read **"CTRL 1 NONE"**. This display allows the choosing of a function for one of the five control inputs on the unit. Any input can be programmed as follows: Choose the desired input (1 through 5) by pressing one of the front panel buttons 1 through 5. The input you choose will appear in the display. You can choose the function you want the input to perform by pressing the "UP ARROW" key. The functions are as follows:

Function	***Description***
RST COUNT	When the selected input is grounded TOTAL displayed goes to zero.
NONE	Input has no effect on TOTAL display.
RST + UNL	When selected input is grounded TOTAL displayed goes to zero and the output transistor associated with TOTAL is turned off.
UNL OUTPUT	When selected input is grounded the output transistor associated with TOTAL is turned off.

(See the Appendix for a complete table of Totalizer and Ratemeter control options).

Press the "RIGHT ARROW" key. The display reads **"OUTPUT PULSE"**. This function chooses the width of the Totalizer output pulse. The user has the following options:

Fast:	125 microseconds on 125 microseconds off. 1500 Hertz maximum output frequency.
Medium:	1 ms on 2 ms off. 200 Hertz maximum output frequency.
Slow:	50 ms on 50 ms off. 10 Hertz maximum output frequency.
No pulse:	Off continuously

Press the "RIGHT ARROW" key. The display reads **"OUTPUT STPT"**.

The transistor that turns on when the Totalizer set point is reached can be set to turn itself off anywhere from .01 seconds to 99.99 seconds after the set point is reached. If the OUTPUT STPT is set to 0 the transistor will stay on until it is turned off by either a control input or the reset button. Enter the value by pressing “CLEAR”. Enter the value. Press “ENTER”.

Press the “RIGHT ARROW” key. The display will read **“RESET”**. This function programs the reset key on the front panel. It can be programmed by pressing the “UP ARROW” key until the desired operation is displayed. The following functions are provided:

Function	Description
RST COUNT	Reset key will reset Totalizer.
NONE	Reset key will have no effect on Totalizer.
RST + UNL	Reset key will reset Totalizer & turn off Totalizer output transistor.
UNL OUTPUT	Reset key will turn off Totalizer output transistor.

Press the “RIGHT ARROW” key. The display will read **“DEC PT”**. The user can enter the decimal point that will apply to the Totalizer. There can be anywhere from 0 to 5 decimal places. Press the number corresponding to the number of desired decimal places and watch the decimal point move on the display. Normally the totalizer will have no decimal places since it is usually totalizing whole units ie. gallons, pounds, etc.

Press the “RIGHT ARROW” key. The display reads **“PROG TOTALIZER”**.
Press the “UP ARROW” key. The display reads “**PROG. RATEMETER”**.

Program Ratemeter Operations

Press the “RIGHT ARROW” key. The display reads **“SMOOTHING”**.

The display is normally updated every .5 seconds. Smoothing allows the display update time to be set anywhere from .5 seconds to 7.5 seconds in .5 second increments. When times longer than .5 seconds are chosen, the last reading is averaged with previous readings to determine the display value. Use the “UP ARROW” key to select the amount of smoothing desired.

Press the “RIGHT ARROW” key. The display will read **“CTRL n”**.

The same five control inputs used to control Totalizer functions can be used to control Ratemeter functions. Pressing the numbers 1 through 5 selects the control input to be set. The options are:

Function	Description
UNL. OUTPUT	Causes the HI and LO Rate alarm transistors and relays to turn off when the chosen input is grounded.
NONE	Causes the input to have no effect on the alarm transistor and relays.

(See the Appendix for a complete table of Totalizer and Ratemeter control options).

Press the “RIGHT ARROW” key. The display will read **“OUTPUTS”**.

This display refers to the HI and LO Rate alarm outputs. These outputs can be set as follows:

Function	Description
FOLLOWS	The HI and LO Rate alarm transistors and relays will follow the input flow rates. The appropriate relays and transistors will turn on when set values are exceeded and off when the flow is within the set limits.
LO HI	If these values are set to 0, the relays and transistors will latch upon exceeding of the limits and will remain latched until cleared by the “RESET” button or a programmed Control Input. If a value is entered for either of these functions, the appropriate relay and transistor will turn off after the set time has elapsed.

Times are set for the LO and HI functions as follows:

Press “CLR”. Enter number (.01 to 99.99 seconds). Press “ENTER”. Press the “RIGHT ARROW” key. The **HI** will blink.

Enter number. Press “ENTER”.

Press the “RIGHT ARROW” key. The display will read **“RESET”**.

The options for this function are as follows:

Function	Description
NONE	Reset key on front panel has no effect on Ratemeter Alarm output transistors and relays.
UNL. HI/LO	The reset key on the front panel will turn off the Ratemeter Alarm output transistors and relays.

The desired function is chosen using the “UP ARROW” key.

Press the “RIGHT ARROW” key. The display will read **“DEC. PT”**.

Choose the appropriate decimal place for the Ratemeter.

Example: If you chose 1K as a Resolution multiplier you will be set up for three decimal places; therefore, press 3 for the decimal place and your readout will be as desired.

If you had chosen 100 as a Resolution multiplier you would want 2 decimal places; therefore, press 2 for the decimal place.

Press the “RIGHT ARROW” key. The display will read **“RATE AT ZERO”**.

When the time interval between Ratemeter input pulses exceeds this number the display will show 00 flow rate. The timer can be set from 1 second to 15 seconds in 1 second intervals. Use the CLR, NUMBER, and ENTER keys to enter a new value.

Press the “RIGHT ARROW” key. The display will read **“RATE HEADER”**.

Use the “LEFT ARROW” and “RIGHT ARROW” keys to select the letter you want to change then use the “UP ARROW” key to scroll through the alphabet. Blank is located between A and Z.

Press the “RIGHT ARROW” key. The display will read **“PROG. RATEMETER”**.

Program Other Operations

Press the “UP ARROW” key. The display will read **“PROG. OTHER”**.

Press the “RIGHT ARROW” key. The display will read **“KEYn”**.

The key refers to three keys on the front panel. Keys 2, 4, and 5. They can be programmed as follows:

Function	Description
OPEN	The instrument operator can change the setting of the designated parameter by pressing the appropriate fornt panel switch. EXAMPLE: The operator can press 2 on the front panel and if 2 is programmed as open, the operator can change the Totalizer set point.
LOCKED	The instrument operator cannot change the setting of the designated parameter by pressing the appropriate front panel switch. EXAMPLE: The operator can press 2 on the front panel. This gives the operator access to the Totalizer set point but if the operator presses “CLR” in an attempt to enter a new set point the display will read “SET POINT LOCKED”.

Open or Locked is chosen for each of the three keys using the “UP ARROW” key.

Press the “RIGHT ARROW” key. The display reads **“PASSWORD”**.

Up to a 6 digit password can be entered. If a password is chosen access to the programming mode is preceded by a request for the password. Responding with the wrong password will cause access to the Programming mode to be denied. The password is entered as follows:

Press the “CLR” key. Enter the 6 digit password from the front panel. Press the “ENTER” key.

Press the “RIGHT ARROW” key. The display will read **“BAUDnnnn XXXX”**.

This step sets up the computer communications link from the instrument end. Use the “CLR”, “NUMBER”, and “ENT” keys to enter a baud rate of 300, 600, 1200, 2400, 4800, 9600, or 19200. An attempt to enter an invalid baud rate will result in a display of **“INVALID ENTRY”**. The parity is chosen with the “UP ARROW” key. Parity can be EVEN, ODD, or SPACE.

Press the “RIGHT ARROW” key. The display will read **“ID nn TIME nnn”**.

The ID is required if the computer interface is to be used. It will identify the instrument to the computer. The ID can be any number from 0 to 99 and is entered using the “CLR”, “NUMBER”, and “ENTER” keys. The TIME refers to the time required to respond to communication requests. The use of the “UP ARROW” key allows times of 0, 10, 100, or 500 milliseconds. 500 works best with most systems.

5

The 4020 Flow Measurement Computer (Overview):

Temperature Compensation with the 4020:

The 4020 flow measurement computer can compensate for changes in viscosity (30 temperature and viscosity points) and specific gravity (10 temperature and specific gravity points) due to variations in the temperature of the fluid being monitored. The unit comes with the customer fluid data programmed at the factory; this will account for the changes in viscosity and specific gravity with temperature. The unit will compensate for the expansion and contraction of the turbinemeter housing due to thermal effects; if the turbinemeter is a COX turbinemeter, the correct coefficient of expansion will be programmed at the factory.

Analog Output from the 4020:

The 4020 flow measurement computer provides a 4 to 20 milliamp signal that is directly proportional to the flowrate being displaced on the instruments readout. This output is updated every 500 milliseconds.

Frequency Output from the 4020:

The 4020 provides a frequency output that is identical to the Input A frequency. This signal is available at the Output 1 terminal. It is an open collector transistor output.

Temperature Compensation with the 4020:

The 4020 has its media compensation data programmed in at the factory; in addition, a listing of this data is provided with each 4020 flow computer. If it becomes necessary to re-enter this data it can be done from the front panel as follows:

CALIBRATING THE 4020 TEMPERATURE MEASURING SYSTEM:

The operating range of the temperature measuring system should be set into the 4020.

Connect an RTD substitution box to the RTD input on the 4020. Set the RTD substitution box to the resistance value that is appropriate for the low end of the desired temperature range.

Press the “LEFT ARROW” and “RIGHT ARROW” keys on the front panel simultaneously.

The display will read **“PROGRAM ?”**.

Press the “UP ARROW” key until the display reads “PROG. ANALOG”.
Press the “RIGHT ARROW” key three times.
The display will read **“TEMP. 1 nnnn F”**.
Press the “CLR” button on the front panel.
Enter the temperature in degrees Fahrenheit that corresponds to the RTD setting (up to 5 digits plus decimal point).
Press the “ENT” button on the front panel.
The display will read **“TEMP. 2 nnnn F”**.
Set the RTD substitution box to the resistance value that is appropriate for the high end of the desired temperature range.
Press the “CLR” button on the front panel.
Enter the temperature in degrees Fahrenheit that corresponds to the RTD setting (up to 5 digits plus decimal point).

Press the “ENT” button on the front panel.
The display will read **“TEMP. 1 nnnn F”**.

Entering Viscosity and Temperature data:

Press the “LEFT ARROW” and “RIGHT ARROW” keys on the front panel simultaneously.

The display will read **“PROGRAM ?”**.
Press the “UP ARROW” key until the display reads **“PROG. CALIBRATE”**.
Press the “RIGHT ARROW” key four times until the display reads **“1 V nn F.---”**.
Press the “RIGHT ARROW” key once. The display will exhibit a blinking **“V”**.
Press the “CLR” button on the front panel.
Enter the viscosity (5 digit number plus decimal point having a value between

0.1 cstk and 800 cstk).

Press the “ENT” button on the front panel.
Press the “RIGHT ARROW” key once. The display will exhibit a blinking **“F”**.
Enter the temperature (4 digit number plus decimal point having a value between -320.0 F and 850.0 F).
Press the “UP ARROW” key once. The display will read: **“2 V nn F.---”**.
Repeat the procedure used to enter point 1.
Continue the process until all 30 points are entered.

Entering Specific Gravity Data:

Press the “LEFT ARROW” and “RIGHT ARROW” keys on the front panel simultaneously.

The display will read **“PROGRAM ?”**.
Press the “UP ARROW” key until the display reads **“PROG. CALIBRATE”**.
Press the “RIGHT ARROW” key 8 times until the display reads **“1 S.G. n F.---”**.
Press the “RIGHT ARROW” key once. The display will exhibit a blinking **“S.G.”**.
Press the “CLR” button on the front panel.
Enter the Specific Gravity (5 digit number plus decimal point having a value between 0.00001 and 2.000).
Press the “ENT” button on the front panel.
Press the “RIGHT ARROW” key once. The display will exhibit a blinking **“F”**.
Enter the temperature (4 digit number plus decimal point having a value between –320.0 F and 850.0 F).
Press the “UP ARROW” key once. The display will read: **“2 S.G. n F.---”**.
Repeat the procedure used to enter point 1 to enter the next Specific Gravity and temperature point. Since specific gravity is a linear function with temperature over normal operating range, in measuring the flowrate of hydrocarbons it will only be necessary to enter two points.

Entering the co-efficient of expansion:

Press the “LEFT ARROW” and “RIGHT ARROW” keys on the front panel simultaneously.

The display will read **“PROGRAM ?”**.
Press the “UP ARROW” key until the display reads **“PROG. ANALOG”**.
Press the “RIGHT ARROW” key four times until the display reads **“CAL. TEMP. nnn F”**.
Press the “CLR” button on the front panel.
Enter the reference temperature for the turbinemeter. The usual value will be 80 F. The temperature can have a maximum of four characters and a decimal point.
Press “ENT” button on the front panel.
Press the “RIGHT ARROW” key once.
The display will read **“EX. COEF. nnn E-6”**.
Press the “CLR” button on the front panel.
Enter the linear coefficient of expansion (three digit number plus the decimal point. The range of the number is between 7.0 and 12.0) of the meter housing.
Press the “ENT” button on the front panel.

UPON COMPLETION OF ANY OF THE ABOVE OPERATIONS, THE COMPUTER CAN BE PUT INTO THE RUN MODE AS FOLLOWS:

Press the “LEFT ARROW” and “RIGHT ARROW” keys on the front panel simultaneously.

The display will read **“PROGRAM ?”**.

Press the “RESET” key.

The display will go to the dual display of the RUN mode.

ANALOG OUTPUT FROM THE 4020:

Connect a milliameter in series with the analog output of the 4020:

Press the “LEFT ARROW” and “RIGHT ARROW” keys on the front panel simultaneously.

The display will read **“PROGRAM ?”**.

Press the “UP ARROW” key until the display reads **“PROG. ANALOG”**.

Press the “RIGHT ARROW” one time.

The display will read **“4 MA RATE nnn”**.

Press the “CLR” button on the front panel.

Enter the 4 ma flow rate (6 digits).

Press the “ENT” button on the front panel.

Press the “UP ARROW” key.

The display will read **“20 MA RATE nnn”**.

Press the “CLR” button on the front panel.

Enter the 20 ma flow rate (6 digits).

Press the “ENT” button on the front panel.

Press the “RIGHT ARROW” one time.

The display will read **“4 MA OUT START?”**.

Press the “CLR” button on the front panel.

Adjust the 4 ma output by using the “RIGHT ARROW” (INCREASES current) and “LEFT ARROW” (DECREASES current). Adjust until the milliameter reads 4 ma.

Press the “ENT” button on the front panel.

Press the “UP ARROW” key.

The display will read **“20 MA OUT START?”**.

Press the “CLR” button on the front panel.

Adjust the 20 ma output by using the “RIGHT ARROW” (INCREASES current) and “LEFT ARROW” (DECREASES current). Adjust until the milliameter reads 20 ma.

Press the “ENT” button on the front panel.

FREQUENCY OUTPUT FROM THE 4020:

Output 1 on the 4020 provides an open collector transistor output that is the same signal as the signal conditioner information appearing at A on the instrument.

If the 4020 is being used in conjunction with another 4020 or a 4010 (this combination can be used to read flow rates in two engineering units at the same time), a connection from Output 1 on the unit receiving the signal conditioner signal (the receiving unit must be a 4020 since only the 4020 has the frequency output at Output 1) on the A terminal of the non-receiving unit and a connection between the signal grounds of both units is all that is necessary to allow both units to read flowrates from the same signal conditioner.

6

Programming the System 4000 from a Personal Computer

Introduction to Serial Communications

Purpose

The Flow Rate Totalizer is equipped with an RS-485 serial communication port for the purpose of allowing a computer to:

1. Issue control commands such as reset.

2. Query run mode data such as count, rate, setpoints, etc.

3. Load setpoints.

4. Query and program all program mode sub-menus except number 13, 15, 43 & 44.

Description

The serial format follows the Opto 22 Optomux™ protocol. This consists of a start character (>), a two character unit ID number, a three character command, data for the command, if applicable, a two character checksum and a termination character.

Each character is ten bits. This first bit is the start bit, followed by the parity bit and the tenth bit is the stop bit. If the unit is programmed to space parity, the unit ignores the received parity and transmits space parity. The unit ID number and the checksum are in ASCII hexadecimal and have range of 00 to FF. The checksum is the two lease significant hexadecimal digits of the sum of the ASCII values of the unit ID number, the command and the data. All hexadecimal characters A through F must be in uppercase. All leading zeros in data fields must be sent. Decimal points within the data field are indicated by an ASCII comma. Commas within data fields sent to the control are ignored. The termination character may be an ASCII carriage return or an ASCII decimal point.

Responses by the control consist of three possibilities:

1. A (acknowledge).

2. Ad..cc (acknowledge with data, d…, and a checksum of the data, cc)

3. Nee (not acknowledge with a two digit error code, ee)

Example:

Command sent to control ->01RST18B.

where;

> is the start character,
01 is the unit ID number,
RST is the three character command (reset),
1 is applicable data (reset option – reset only),
8B is the two lease significant digits of the hexadecimal checksum,

0	1	R	S	T	1

30+31+52+53+54+31 = 18B hexadecimal

and . is the termination character.

Error Codes

Error codes consist of the following:

01	Invalid Command
02	Communication Checksum Error
03	Buffer Overrun Error
05	Format Error
08	Parity or Framing Error
10	In Run Mode, Command not Allowed
12	In Program Mode, Command not Allowed
13	Mode Already Active. Command not Allowed
21	Data out of Range

Model 4010 Control & Query Commands

All commands in the following tables are preceded by the start character (>) and unit number and succeeded by the two character checksum and carriage return.

The following Control Commands are supported by this control.

Command	Response	Description
RSTa	A	RESET COMMAND where “a” determines functions to be performed.
Digit “a”	= 1 – Reset Totalizer = 2 – Unlatch Totalizer Output = 3 – Reset Totalizer and Unlatch Totalizer Output = 4 – Unlatch Rate Alarms = 5 – Reset Totalizer and Unlatch Rate Alarms = 6 – Unlatch Totalizer Output and Unlatch Rate Alarms = 7 – Reset Totalizer, Unlatch Totalizer Output and Rate Alarms	
EPM	A	ENTER PROGRAM MODE
PEX	A	EXIT PROGRAM MODE

The following Data Query Commands are supported:

Command	Response	Description
QST	ASTabcd	QUERY STATUS
where a	= Current Mode = R – Run Mode = P – Program Mode	b = Totalizer Output Status = A – Output On = N – Output Off
c	= Rate High Alarm Status = A – Alarm On = N – No alarm	d = Rate Low Alarm Status = A – Alarm On = N – No Alarm
QRT	ARTaaaaaa	QUERY RATE where aaaaaa = Rate
QTC	ATCaaaaaaaaaa	QUERY TOTALIZER COUNT where aaaaaaaaaa = Totalizer Count
QRH	ARHaaaaaa	QUERY RATE HI SETPOINT where aaaaaa = Rate HI Setpoint
QRL	ARLaaaaaa	QUERY RATE LO SETPOINT where aaaaaa = Rate LO Setpoint

Command	Response	Description
L36 aa	A	LOAD ZERO RATE TIME where aa = Zero Time (01 – 15)
Q36	A36 aa	QUERY ZERO RATE TIME where aa = Zero Time
L37 aaa	A	LOAD RATE DISPLAY HEADER where aaa = Rate Display Header (Space or Uppercase letters)
Q37	A37 aaa	QUERY RATE DISPLAY HEADER where aaa = Rate Display Header
L41 a b	A	LOAD KEY LOCK (KEYS 2,4,5) where a = Key Number (2,4,5) b = O – Unlocked = 1 – Locked
Q41	A41 a b	QUERY KEY LOCK (KEYS 2,4,5) where a = Key Number (2,4,5) b = O – Unlocked = 1 – Locked
L32 a b	A	LOAD RATEMETER CONTROL INPUT where a = Control Input (1-5) b = O – No Function = 1 – Unlatch Alarms
Q32	A32 a b	QUERY ALL RATEMETER CONTROL INPUTS where a = Control Input b = O – No Function = 1 – Unlatch Alarms
L33 a bbbb	A	LOAD RATEMETER OUTPUT FUNCTION where a = O – Timed Outputs bbbb = Low Rate Output Time or cccc = High Rate Output Time
L33 a		a = 1 – Output Follow
Q33	A33 a bbbb cccc	QUERY RATEMETER OUTPUT FUNCTION where a = O – Timed Outputs bbbb = Low Rate Output Time or cccc = High Rate Output Time

Command			Response	Description
Q33			A33 a	where a = 1 – Outputs Follow
L34 a			A	LOAD RATEMETER RESET KEY FUNCTION where a = Reset Key Function = O – No Function = 1 – Unlatch Outputs
Q34			A34 a	QUERY RATEMETER RESET KEY FUNCTION where a = Reset Key Function = O – No Function = 1 – Unlatch Outputs
L35 a			A	LOAD RATEMETER D.P. LOCATION
	where	a	= O – No Dec. Pt.	= 3 – xxxxxxx.xxx
			= 1 – xxxxxxxxx.x	= 4 – xxxxxx.xxxx
			= 2 – xxxxxxxx.xx	= 5 – xxxxx.xxxxx
Q35			A35 a	QUERY RATEMETER D.P. LOCATION
	where	a	= O – No Dec. Pt.	= 3 – xxxxxxx.xxx
			= 1 – xxxxxxxxx.x	= 4 – xxxxxx.xxxx
			= 2 – xxxxxxxx.xx	= 5 – xxxxx.xxxxx
L21 a b			A	LOAD TOTALIZER CONTROL INPUT
	where	a	= Control Input (1-5)	
		b	= O – No Function	= 2 – Unlatch Output
			= 1 – Reset Totalizer	= 3 – Reset and Unlatch
Q21			A21 a b	QUERY ALL TOTALIZER CONTROL INPUTS
	where	a	= Control Input (1-5)	
		b	= O – No Function	= 2 – Unlatch Output
			= 1 – Reset Totalizer	= 3 – Reset and Unlatch
L22 a			A	LOAD TOTALIZER PULSE OUTPUT SPEED
	where	a	= O – No Pulse	= 2 – Pulse Medium
			= 1 – Pulse Fast	= 3 – Pulse Slow
Q22			A22 a	QUERY TOTALIZER PULSE OUTPUT SPEED
	where	a	= O – No Pulse	= 2 – Pulse Medium
			= 1 – Pulse Fast	= 3 – Pulse Slow
L23 aaaa			A	LOAD TOTALIZER OUTPUT TIME where aaaa = Output Time
Q23			A23 aaaa	QUERY TOTALIZER OUTPUT TIME where aaaa = Output Time

Command			Response	Description
L24 a			A	LOAD TOTALIZER RESET KEY FUNCTION
	where	a	= Reset Key Function	
			= O – No Function	= 2 – Unlatch Output
			= 1 – Reset Totalizer	= 3 – Reset and Unlatch
Q24			A24 a	QUERY TOTALIZER RESET KEY FUNCTION
	where	a	= Reset Key Function	
			= O – No Function	= 2 – Unlatch Output
			= 1 – Reset Totalizer	= 3 – Reset and Unlatch
L25 a			A	LOAD TOTALIZER D.P. LOCATION where a = Decimal Point Location (0-5)
Q25			A25 a	QUERY TOTALIZER D.P. LOCATION
	where	a	= 0 – No Dec. Pt.	= 3 – xxxxxxx.xxx
			= 1 – xxxxxxxxx.x	= 4 – xxxxxx.xxxx
			= 2 – xxxxxxxx.xx	= 5 – xxxxx.xxxxx
L31 aa			A	LOAD RATEMETER SMOOTHING where aa = Smoothing Fact. (0.5-7.5) (Must be .5 sec. Resolution)
Q31			A31 aa	QUERY RATEMETER SMOOTHING where aa = Smoothing Factor

The following Program Mode Commands are supported by this control. Decimal points are required for those commands which allow for a floating decimal point as indicated by 'incl DEC PT (0-3) or (0-5)'. All other program blocks will insert decimal point in the correct location.

Command	Response	Description
L11 aa bbbbbbb cccc A		LOAD CURVE POINT where aa = Point (1-40) bbbbbbb = Kpv (1-999999) – Incl DEC PT (0-3) cccc = F/V (0-9999) – Incl DEC PT (0-3) DEC PT (0-3) for F/V indicates that 'cccc' must be xxxx. - xxx.x - xx.xx or x.xxx
Q11	A11 bb ccccccc ddddd	QUERY ALL CURVE POINTS where bb = Curve Point ccccc =Kpv including DEC PT (0-3) dddd =F/V including DEC PT (0-3)
L12 aaaaaaa	A	LOAD STANDARD VISCOSITY where aaaaaaa – Std Viscosity – incl DEC PT (0-3)
Q12	A12 aaaaaaa	QUERY STANDARD VISCOSITY where aaaaaaa – Std Viscosity – incl DEC PT (0-3)

Command	Response	Description
L13 aaaaaaa	A	LOAD-K MULTIPLIER where aaaaaaa – Multiplier – incl DEC PT (0-5)
Q13	A13 aaaaaaa	QUERY K MULTIPLIER where aaaaaaa = Multiplier – incl DEC PT (0-5)
L14 aaaaaaa	A	LOAD SPECIFIC GRAVITY where aaaaaaa = Spec Gravity – incl DEC PT (0-5)
Q14	A14 aaaaaaa	QUERY SPECIFIC GRAVITY where aaaaaaa = Spec Gravity – incl DEC PT (0-5)
L15 aaaaaaa	A	LOAD RATE MULTIPLIER where aaaaaaa = Multiplier – incl DEC PT (0-5)
Q15	A15 aaaaaaa	QUERY RATE MULTIPLIER where aaaaaaa – Multiplier – incl DEC PT (0-5)
L16 a	A	LOAD RATE RESOLUTION where a = O – 4 (x1, x10, x100, x1000, x10000)
Q16	A a	QUERY RATE RESOLUTION where a = O – 4 (x1, x10, x100, x1000, x10000)
QTS	ATSaaaaaaaaaa	QUERY TOTALIZER SETPOINT where aaaaaaaaaa = Totalizer Setpoint
QKP	AKPaaaaa,a	QUERY CURRENT KPV where aaaaa,a = Current Kpv
QKM	AKMa,aaaaaa	QUERY CURRENT KMF where a,aaaaaa = Current Kmf
QMD	Aa…	QUERY MENU DATA where a… = Data Specified in LCM Menu
QAP	Aab c… ab c… …	QUERY ALL PROGRAM DATA where a = Program Menu Row b = Program Menu Column c = Applicable data

The following Data Load Commands are supported:

Command	Response	Description
LRHaaaaaa	A	LOAD RATE HI SETPOINT where aaaaaa = Rate HI Setpoint
LRLaaaaaa	A	LOAD RATE LO SETPOINT where aaaaaa = Rate LO Setpoint
LTSaaaaaaaaaa	A	LOAD TOTALIZER SETPOINT where aaaaaaaaaa = Totalizer Setpoint
LCMabc	A	LOAD COMMUNICATION MENU

where abc determine the information that will be sent by the control when it is issued in a QMD command. The following table illustrates the bit assignments for the available data. Setting the appropriate bits will cause the data to be sent.

Digit "a" (0-F)	Digit "b" (0-F)	Digit "c" (0-F)
0 – Status	0 – Total SP	0 – Rate Mult
1 – Total	1 – Rate LO SP	1 – Standard Viscosity
2 – Rate	2 – Rate HI SP	2 – Specific Gravity
3 – KPV	3 – KMF	

Example: To obtain Rate & Total, "LCM600" should be sent.

Model 4020 Control & Query Commands

All commands in the following tables are preceded by the start character (>) and unit number and succeeded by the two character checksum and carriage return.

The following Control Commands are supported by this control:

Command	Response	Description
RSTa	A	RESET COMMAND where "a" determines functions to be performed.
Digit "a"	= 1 – Reset Totalizer = 2 – Unlatch Totalizer Output = 3 – Reset Totalizer and Unlatch Totalizer Output = 4 – Unlatch Rate Alarms = 5 – Reset Totalizer and Unlatch Rate Alarms = 6 – Unlatch Totalizer Output and Unlatch Rate Alarms = 7 – Reset Totalizer, Unlatch Totalizer Output and Rate Alarms	
EPM	A	ENTER PROGRAM MODE
PEX	A	EXIT PROGRAM MODE

The following Data Query Commands are supported:

Command	Response	Description
QST	ASTabcd	QUERY STATUS
where a	= Current Mode = R – Run Mode = P – Program Mode	b = Totalizer Output Status = A – Output On = N – Output Off
c	= Rate High Alarm Status = A – Alarm On = N – No alarm	d = Rate Low Alarm Status = A – Alarm On = N – No Alarm
QRT	ARTaaaaaa	QUERY RATE where aaaaaa = Rate
QTC	ATCaaaaaaaaaa	QUERY TOTALIZER COUNT where aaaaaaaaaa = Totalizer Count
QRH	ARHaaaaaa	QUERY RATE HI SETPOINT where aaaaaa = Rate HI Setpoint
QRL	ARLaaaaaa	QUERY RATE LO SETPOINT where aaaaaa = Rate LO Setpoint
QTS	ATSaaaaaaaaaa	QUERY TOTALIZER SETPOINT where aaaaaaaaaa = Totalizer Setpoint

Command	Response	Description
QKP	AKPaaaaa,a	QUERY CURRENT KPV where aaaaa,a = Current Kpv
QKM	AKMa,aaaaaa	QUERY CURRENT KMF where a,aaaaaa = Current Kmf
QKF	AKFaaaaa,a	QUERY CURRENT K FREQUENCY where aaaaa,a = Current K Frequency
QTP	ATPaaa,aa ATP-aaa,aa ATP-HIGH- ATP NO TEMP	QUERY CURRENT TEMPERATURE F where (-)aaa,aa = Current Temperature -HIGH- = Temperature > RTD Limit NO TEMP = No Temperature Input
QMD	Aa…	QUERY MENU DATA where a… = Data Specified in LCM Menu
QAN	AANaaa,a	QUERY ANALOG OUT PERCENT where aaa,a = Analog Out Percent
QVK	AVKaaa,aa	QUERY VISCOSITY where aaa,aa = Viscosity
QSG	ASGaaa,aa	QUERY SPECIFIC GRAVITY where aaa,aa = Specific Gravity
QKT	AKTaa	QUERY K/F POINT where aa = K/F Point (00-40)
QVT	AKTaa	QUERY V/F POINT where aa = V/F Point (00-30)
QGT	AKTaa	QUERY SG/F POINT where aa = SG/F Point (00-10)
QAP	Aab c… ab c… …	QUERY ALL PROGRAM DATA where a = Program Menu Row b = Program Menu Column c = Applicable Data

The following Data Load Commands are supported:

Command	**Response**	**Description**
LRHaaaaaa	A	LOAD RATE HI SETPOINT where aaaaaa = Rate HI Setpoint
LRLaaaaaa	A	LOAD RATE LO SETPOINT where aaaaaa = Rate LO Setpoint
LTSaaaaaaaaaa	A	LOAD TOTALIZER SETPOINT where aaaaaaaaaa = Totalizer Setpoint
LCMabcde	A	LOAD COMMUNICATION MENU

where abcde determine the information that will be sent by the control when it is issued in a QMD command. The following table illustrates the bit assignments for the available data. Setting the appropriate bits will cause the data to be sent.

Digit “a” (0-F)	Digit “b” (0-F)	Digit “c” (0-F)	Digit “d” (0-F)	Digit “e” (0-3)
0 – Status	0 – Total SP	0 – Rate Mult	0 – K/F Point	0 – Analog Out Percent
1 – Total	1 – Rate LO SP	1 – Standard Viscosity	1 – V/F Point	1 - Time
2 – Rate	2 – Rate HI SP	2 – Specific Gravity	2 – SG/F Point	
3 – KPV	3 – KMF	3 – Temperature F	3 - Frequency	

Example: To obtain Rate, Total & LCOE, “LCM60100” should be sent.
To obtain Total & Time, “LCM20002” should be sent.

The following Program Mode Commands are supported by this control. Decimal points are required for those commands which allow for a floating decimal point as indicated by 'Incl DEC PT (0-x)'. All other program blocks will insert the decimal point in the correct location.

Command	**Response**	**Description**
L11 aa bbbbbbb ccccc	A	LOAD K/F CURVE POINT
	where aa	= Point (1-40)
	bbbbbbb	= Kpv (0100.00 - 999999.) – Incl DEC PT (0-2)
	ccccc	= F/V (00.01 – 9999.) – Incl DEC PT (0-2)
Example: L11 11 123456. 2222.		
DEC PT (0-2) for F/V indicates that 'ccccc' must be xxxx. - xxx.x - xx.xx		
Q11	A11 aa bbbbbbb ccccc	QUERY ALL K/F CURVE POINTS
	where aa	= Curve Point
	bbbbbbb	=Kpv including DEC PT (0-2)
	ccccc	=F/V including DEC PT (0-2)
L12 aa bbbbbb Cddddd	A	LOAD V/F CURVE POINT
	where aa	= Point (1-30)
	bbbbbb	= VISC (00.100 – 800.00) – Incl DEC PT (0-3)
	C	= Sign (Pos = Space, Neg = '-')
	ddddd	= Temp F (-320.0 – 850.0) – Incl DEC PT (0-2)
Examples: L12 01 00.100 – 100.0		Loads Point 1 with VISC = 00.100, TEMP = 100.0 F
L12 30 800.00 0850.		Loads Point 30 with VISC = 800.00, TEMP = 850.0 F
Q12	A12 aa bbbbbb Cddddd	QUERY ALL V/F CURVE POINTS
	where aa	= V/F Curve Point
	bbbbbb	= VISC including DEC PT (0-3)
	C	= Sign (Pos = Space, Neg = '-')
	ddddd	= Temp F including DEC PT (0-2)
L13 aaaaaaa	A	LOAD-K MULTIPLIER
		where aaaaaaa = Multiplier – Incl DEC PT (0-5)
Examples: L 13 000001.	K MULT = 1.0	
L13 1.23456	K MULT = 1.23456	
L13 010000.	K MULT = 10000.0	
Q13	A13 aaaaaaa	QUERY K MULTIPLIER
		where aaaaaa = Multiplier – Incl DEC PT (0-5)
L14 aa bbbbbb Cddddd	A	LOAD SG/F CURVE POINT
	where aa	= Point (1-10)
	bbbbbb	= SPEC GRAV (0.0001 – 2.0000) - Incl DEC PT (0-4)
	C	= Sign (Pos = Space, Neg = '-')
	ddddd	= Temp F (-320.0 – 850.0) – Incl DEC PT (0-2)
Examples: L14 01 0.0001 –100.0		Loads Point 1 with SG – 0.0001, TEMP = -100.0 F
L14 10 2.0000 0850.		Loads Point 10 with SG = 2.0000, TEMP = 850.0 F

Command	**Response**	**Description**
Q14	A14 aa bbbbbb Cddddd	QUERY ALL SG/F CURVE POINTS where aa = SG/F Curve Point bbbbbb = SG including DEC PT (0-4) C = Sign (Pos = Space, Neg = '-') ddddd = Temp F including DEC PT (0-2)
L15 aaaaaaa	A	LOAD RATE MULTIPLIER where aaaaaaa = Multiplier – Incl DEC PT (0-5)
Examples:	L15 0.00001	R MULT = 0.00001
	L15 1.23456	R MULT = 1.23456
	L15 099999.	R MULT = 99999.0
Q15	A15 aaaaaaa	QUERY RATE MULTIPLIER where aaaaaa – Multiplier – Incl DEC PT (0-5)
L16 a	A	LOAD RATE RESOLUTION where a = O – 4 (x1, x10, x100, x1000, x10000)
Q16	A a	QUERY RATE RESOLUTION where a = O – 4 (x1, x10, x100, x1000, x10000)
L21 a b	A	LOAD TOTALIZER CONTROL INPUT
where a = Control Input (1-3) b = O – No Function = 1 – Reset Totalizer = 2 – Unlatch Output = 3 – Reset and Unlatch		
Q21	A21 a b	QUERY ALL TOTALIZER CONTROL INPUTS
where a = Control Input (1-3) b = O – No Function = 1 – Reset Totalizer = 2 – Unlatch Output = 3 – Reset and Unlatch		
L22 a bbbb	A	LOAD TOTALIZER OUTPUT SELECTION where a = 0 – Setpoint b = Output Time (00.00 – 99.99)
or		
L22 a	A	where a = 1 – Pulse Fast = 2 – Pulse Medium = 3 – Pulse Slow
Q22	A22 a bbbb	QUERY TOTALIZER OUTPUT SELECTION where a = 0 – Setpoint b = Output Time

Command	Response	Description
or		
Q22	A22 a	QUERY TOTALIZER PULSE OUTPUT SPEED where a = 1 – Pulse Fast = 2 – Pulse Medium = 3 – Pulse Slow
L23 a where a	A = Reset Key Function = O – No Function = 1 – Reset Totalizer	LOAD TOTALIZER RESET KEY FUNCTION = 2 – Unlatch Output = 3 – Reset and Unlatch
Q23 where a	A23 a = Reset Key Function = O – No Function = 1 – Reset Totalizer	QUERY TOTALIZER RESET KEY FUNCTION = 2 – Unlatch Output = 3 – Reset and Unlatch
L25 a	A	LOAD TOTALIZER D.P. LOCATION where a = Decimal Point Location (0-5)
Q25 where a	A25 a = 0 – No Dec. Pt. = 1 – xxxxxxxxx.x = 2 – xxxxxxxx.xx	QUERY TOTALIZER D.P. LOCATION = 3 – xxxxxx.xxx = 4 – xxxxx.xxxx = 5 – xxxxx.xxxxx
L31 aa	A	LOAD RATEMETER SMOOTHING where aa = Smoothing Fact. (0.5-7.5) (Must be .5 sec. resolution)
Q31	A31 aa	QUERY RATEMETER SMOOTHING where aa = Smoothing Factor
L32 a b	A	LOAD RATEMETER CONTROL INPUT where a = Control Input (1-3) b = O – No Function = 1 – Unlatch Alarms
Q32	A32 a b …	QUERY ALL RATEMETER CONTROL INPUTS where a = Control Input (1-3) b = O – No Function = 1 – Unlatch Alarms
L33 a bbbb cccc	A	LOAD RATEMETER OUTPUT FUNCTION where a = O – Timed Outputs bbbb = Low Rate Output Time cccc = High Rate Output Time

Command	Response	Description
or		
L33 a		a = 1 – Outputs Follow
Q33	A33 a bbbb cccc	QUERY RATEMETER OUTPUT FUNCTION where a = O – Timed Outputs bbbb = Low Rate Output Time cccc = High Rate Output Time
or		
Q33	A33 a	where a = 1 – Outputs Follow
L34 a	A	LOAD RATEMETER RESET KEY FUNCTION where a = Reset Key Function = O – No Function = 1 – Unlatch Outputs
Q34	A34 a	QUERY RATEMETER RESET KEY FUNCTION where a = Reset Key Function = O – No Function = 1 – Unlatch Outputs
L35 a	A	LOAD RATEMETER D.P. LOCATION
where a	= O – No Dec. Pt. = 1 – xxxxx.x = 2 – xxxx.xx	= 3 – xxx.xxx = 4 – xx.xxxx = 5 – x.xxxxx
Q35	A35 a	QUERY RATEMETER D.P. LOCATION
where a	= O – No Dec. Pt. = 1 – xxxxx.x = 2 – xxxx.xx	= 3 – xxx.xxx = 4 – xx.xxxx = 5 – x.xxxxx
L36 aa	A	LOAD ZERO RATE TIME where aa = Zone Time (01-15)
Q36	A36 aa	QUERY ZERO RATE TIME where aa = Zero Time
L37 aaa	A	LOAD RATE DISPLAY HEADER where aaa = Rate Display Header (Space or Uppercase Letters)
Q37	A37 aaa	QUERY RATE DISPLAY HEADER where aaa = Rate Display Header

Command	Response	Description
L41 aaaaaa bbbbbb	A	LOAD ANALOG RATE where aaaaaa = 4ma rate bbbbbb = 20 ma rate
Q41	A 41 aaaaaa bbbbbb	QUERY ANALOG RATE where aaaaaa = 4ma rate bbbbbb = 20 ma rate
L51 a b	A	LOAD KEY LOCK (KEYS 2,4,5) where a = Key Number (2,4,5) b = O – Unlocked = 1 – Locked
Q51	A41 a b	QUERY KEY LOCK (KEYS 2,4,5) where a = Key Number (2,4,5) b = O – Unlocked = 1 – Locked

7

Programming Tips for the Series 4000

- The decimal point is entered by pressing the “LEFT ARROW” key.

- If a negative temperature is to be entered, the – is obtained by pressing the “RIGHT ARROW” key.

- The fastest way to program:

  The fast way to program either the 4020 or the 4010 is to use the Programming Chart for the appropriate unit and proceed as follows:

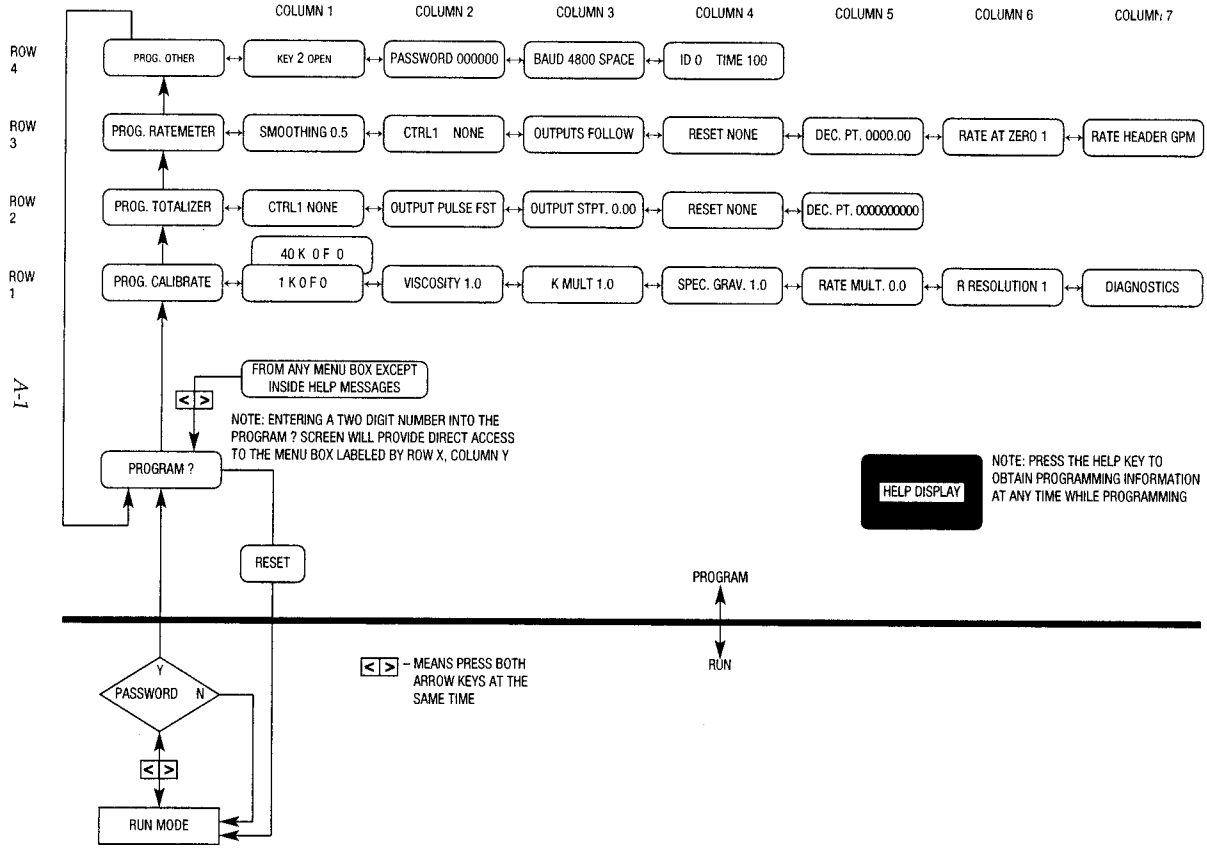
  Press the “LEFT ARROW” and “RIGHT ARROW” keys on the front panel simultaneously.
  The display will read **“PROGRAM ?”**.
  Look at the programming chart for your flow computer. Choose the box you want to get to.
  Press the ROW NUMBER then the COLUMN NUMBER. The display will show the box you have chosen. Proceed to carry out the desired action at this display.
  Press the “LEFT ARROW” and “RIGHT ARROW” keys on the front panel simultaneously.
  The display will read **“PROGRAM ?”**.
  If it is required to do further programming, pick another ROW and COLUMN from the Programming Chart and repeat the above sequence.
  If it is desired to go to the RUN mode, when the display reads **“PROGRAM ?”** press the “RESET” button and the dual display will appear on the display.

  Example:

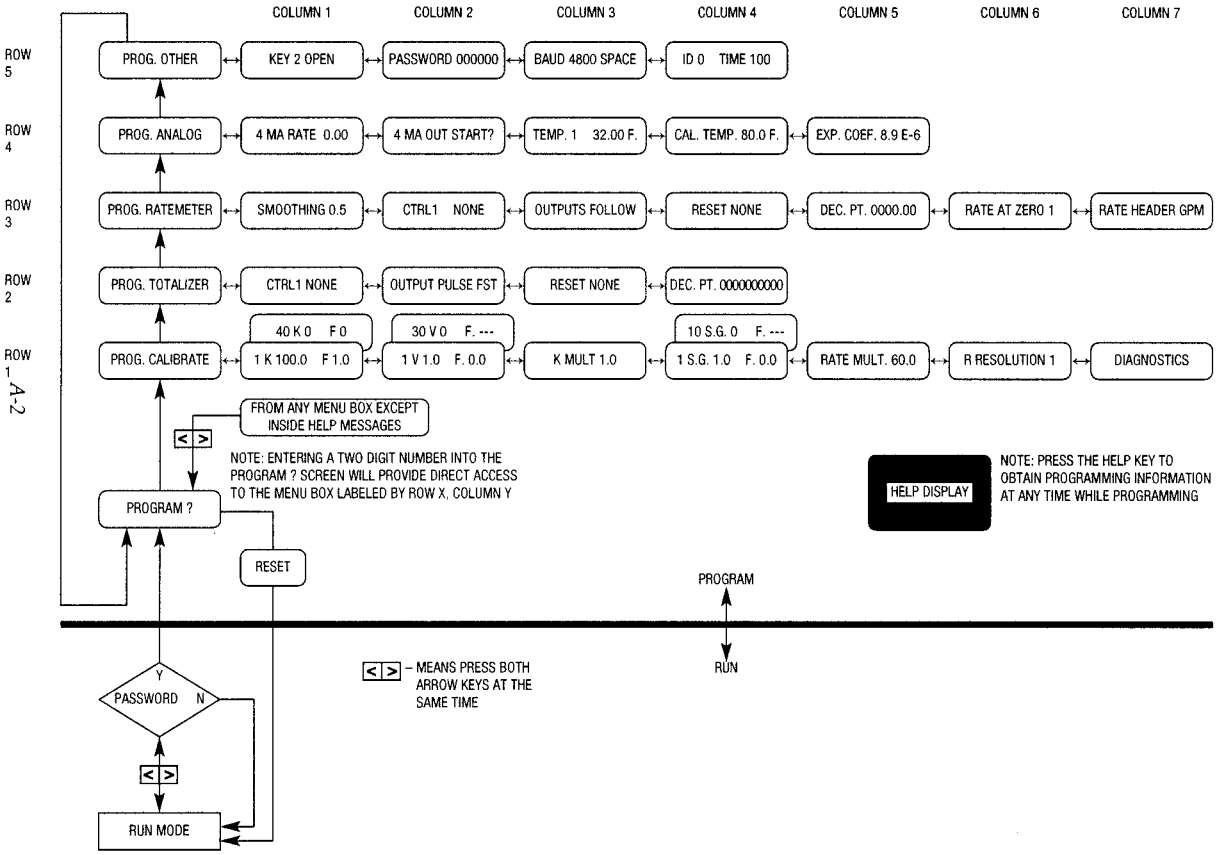
  The display is reading **“PROGRAM ?”**.
  It is desired to enter a K MULT value. Press 1 on the front panel. Press 3 on the front panel.
  The display will read **“K MULT nnn”**.
  Enter the desired K MULT number.
  Press the “LEFT ARROW” and “RIGHT ARROW” keys on the front panel simultaneously.
  The display will read **“PROGRAM ?”**.
  At this point the user can choose another location from the programming chart by pressing the appropriate ROW and COLUMN numbers or can press the “RESET” button to return to the dual display in the RUN mode.

APPENDIX

Programming Chart – Model 4010



Programming Chart – Model 4020



Control Inputs

There are 5 control inputs which can be programmed to any of the functions shown in the chart below. An input can be assigned up to two tasks but only one task can be assigned under each of the two control functions shown below. The following table lists the tasks that can be selected.

	CONTROL FUNCTION	
CONTROL INPUT	RATE	TOTAL
1	None Unlatch Output	None Reset Count Unlatch Output Reset & Unlatch
2	None Unlatch Output	None Reset Count Unlatch Output Reset & Unlatch
3	None Unlatch Output	None Reset Count Unlatch Output Reset & Unlatch
4	None Unlatch Output	None Reset Count Unlatch Output Reset & Unlatch
5	None Unlatch Output	None Reset Count Unlatch Output Reset & Unlatch

4010 & 4020 Specifications

ENVIRONMENTAL

Temp:	Operating: 0 to 55°C Storage: -40 to 70°C
Humidity:	0 to 85% RH non-condensing
Front Panel:	Sealed to NEMA 4X

INPUTS

Power:	120 VAC +10%, -15%, 50/60 Hz @ 0.2 amps (0.1 amps w/240 VAC) or 18 to 27 VDC @ 0.4 amps max w/6 watts max

Control:

Number:	5
Type:	Requires current sinking device such as contact closure to ground or NPN transistor to ground
Impedance:	5.8kΩ to +5 VDC
Voltage:	High 3.5 to 24 VDC Low 0.0 to 1.0 VDC
Response:	Min. Low 30 ms., High 30 ms.

Flow:

Number:	2
Type:	Pulse. Requires current sinking device such as contact closure to ground or NPM transistor to ground.
Impedance:	5.8kΩ to +5 VDC
Voltage:	High 2.8 to 24 VDC Low 0.0 to 1.0 VDC
Response:	High 0 – 7.5 kHz, min. pulse width 50 μsec.

Temperature:

Type:	4 wire RTD, Platinum to European Alpha 3850 curve
Impedance:	100Ω
Response:	2 Hz
Resolution:	14 bits
Accuracy:	±0.1@25°C, ±0.25% of FS (defined over temperature range)
Range:	-320° to 850° in 0.1°F (Span definable)

OUTPUTS

Accessory Power:	24VDC ±5%, 100 mA max

Alarms (Relay):

Type:	2 sets relay assigned to Hi/Low limits for Flow
Contacts:	Each relay has 1 for C contacts rated 240 VAC, 10 amps resistive or 30 VDC, 10 amps resistive
Operation:	Follows, Latched or Timed from 00.01 to 99.99 seconds

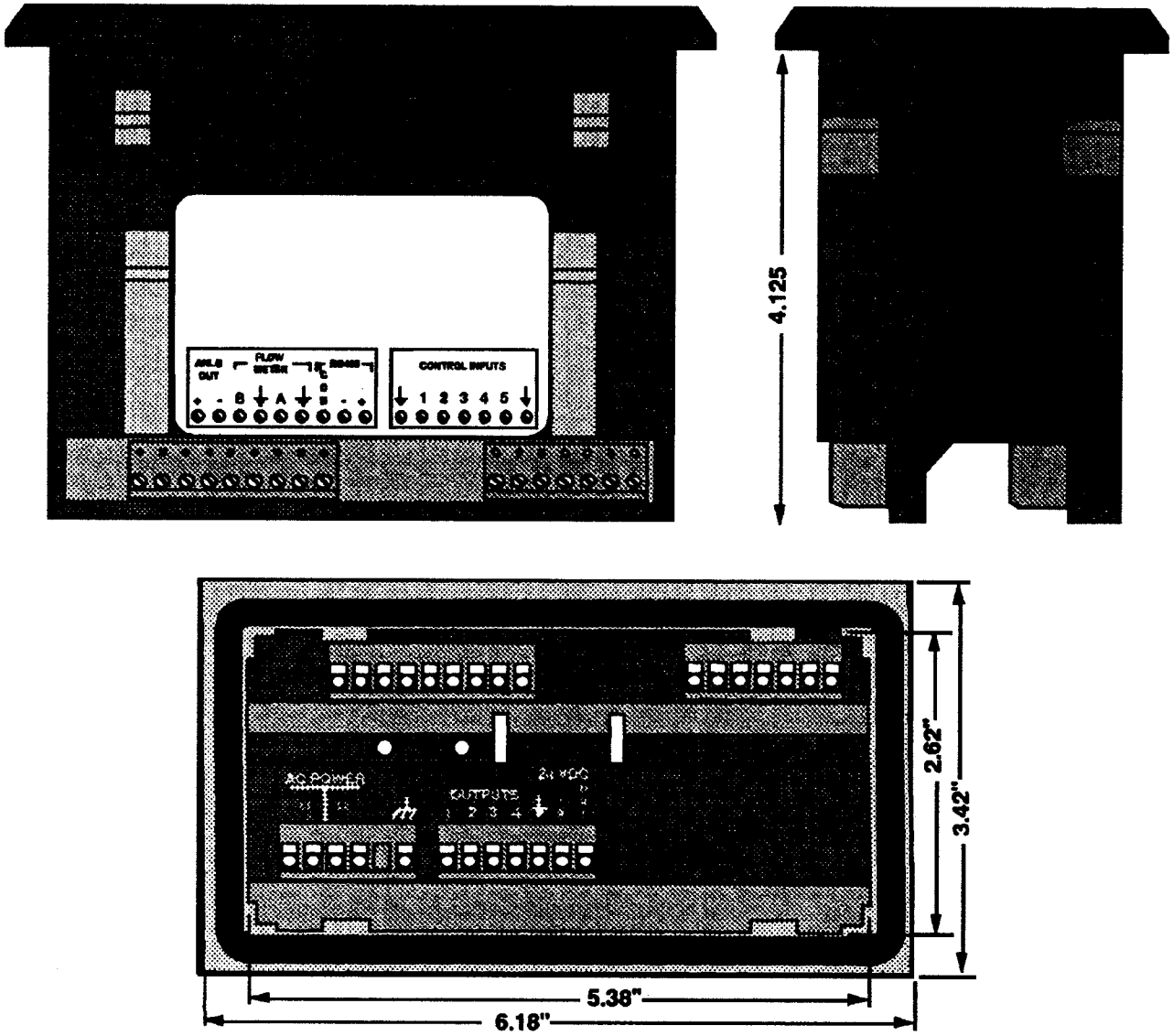
RATEMETER

Type:	1/Tue
Display:	5 digits with 6 character units of measure identifier
Accuracy:	±.05%

COMMUNICATIONS

Type:	RS-485 multidrop
Baud Rate:	300, 600, 1200, 2400, 4800, 9600, 19.2K
Parity:	Space, Even, Odd
Protocol:	Opto-22 Compatible

Dimensions


CONTROL INPUTS
1 2 3 4 5
4.125
AC POWER
OUTPUTS
1 2 3 4
2.62"
3.42"
5.38"
6.18"

K Multiplier & Rate Multiplier Tables

K MULTIPLIER VALUE TABLES

If the K-Factor is in counts / gallon, use the following K Multipliers to achieve the selected flow units:

FLOWRATE UNITS	TOTALIZER UNITS	K MULTIPLIER
GALLONS PER MINUTE (GPM)	GALLONS	1
GALLONS PER HOURS (GPH)	GALLONS	1
LITERS PER MINUTE (LPM)	LITERS	3.78541
LITERS PER HOUR (LPH)	LITERS	3.78541
POUNDS PER HOUR (PPH)	POUNDS	8.32778
KILOGRAMS PER HOUR (KPH)	KILOGRAMS	3.77742

If the K-Factor is in counts / liter, use the following K Multipliers to achieve the selected flow units:

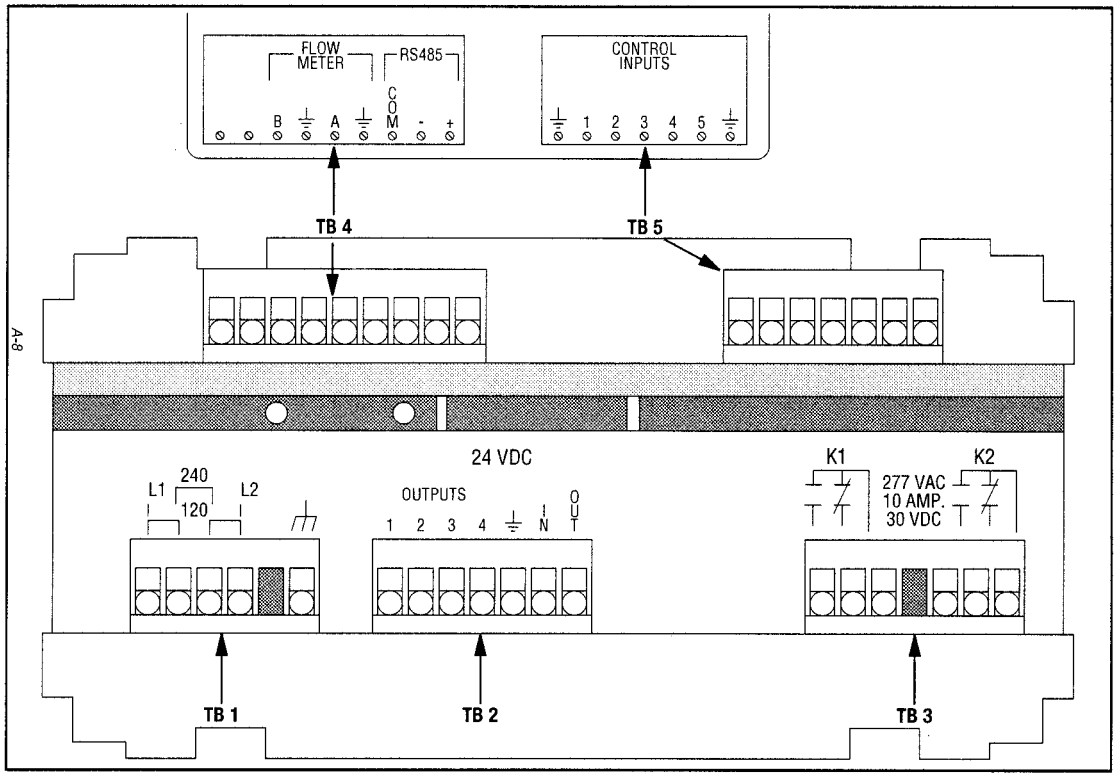
FLOWRATE UNITS	TOTALIZER UNITS	K MULTIPLIER
GALLONS PER MINUTE (GPM)	GALLONS	0.26417
GALLONS PER HOURS (GPH)	GALLONS	0.26417
LITERS PER MINUTE (LPM)	LITERS	1
LITERS PER HOUR (LPH)	LITERS	1
POUNDS PER HOUR (PPH)	POUNDS	2.19997
KILOGRAMS PER HOUR (KPH)	KILOGRAMS	0.99789

To obtain units per time segment use the following Rate Multipliers:

FLOWRATE UNITS	RATE MULTIPLIER
UNITS PER SECOND	1
UNITS PER MINUTE	60
UNITS PER HOUR	3600

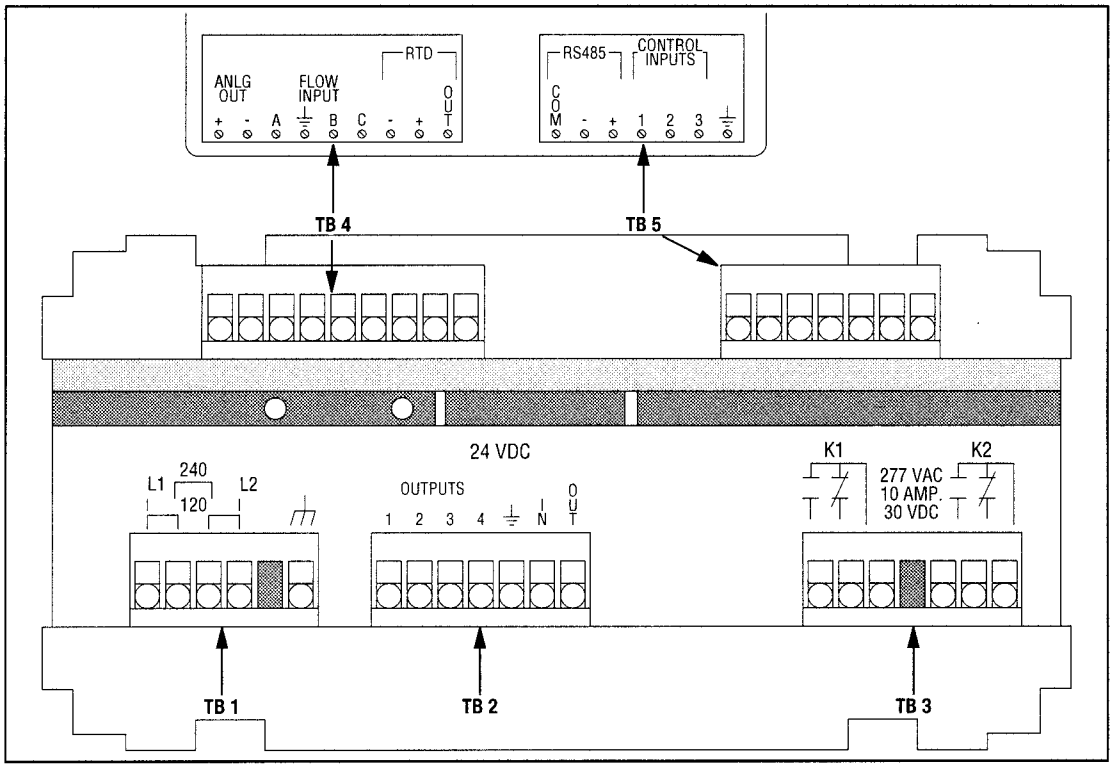
Model 4010

(See Appendix pages A-10 through A-17 for specific wiring digrams.
See Appendix page A-29 for I/O Terminal descriptions)

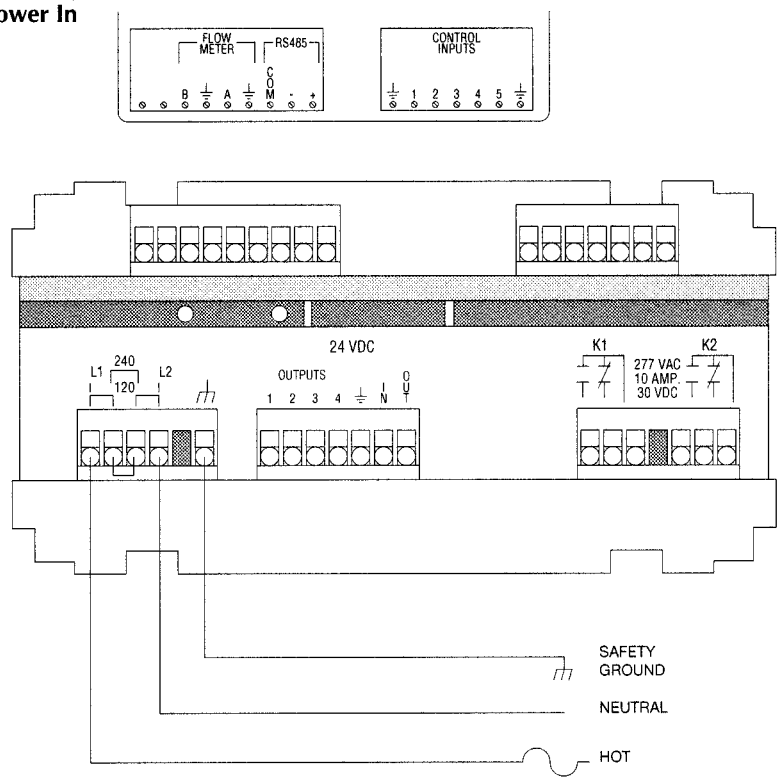


Model 4020

(See Appendix pages A-18 through A-28 for specific wiring digrams.
See Appendix page A-29 for I/O Terminal descriptions)

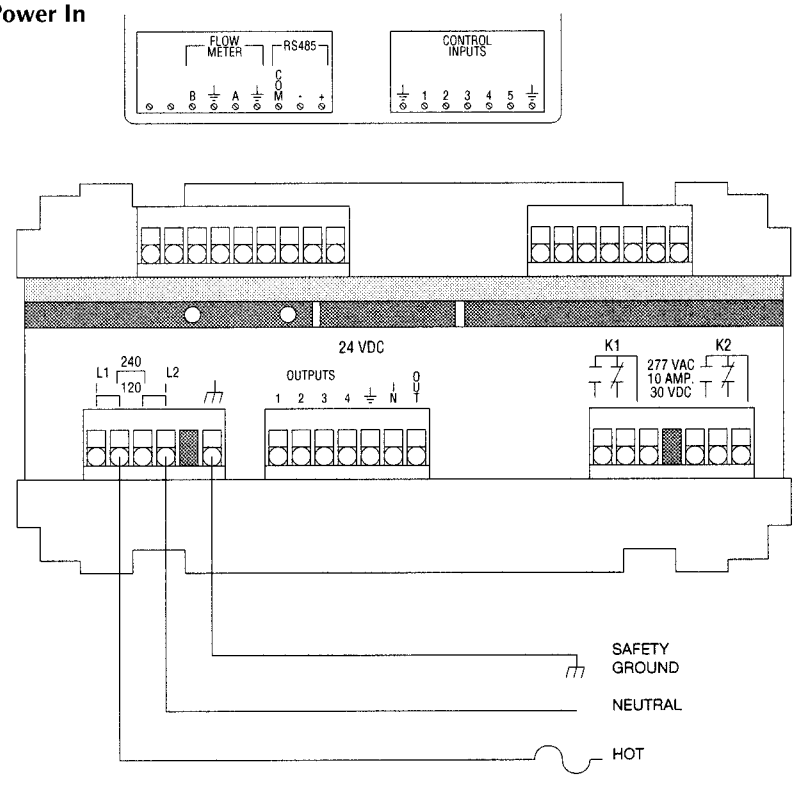


AC Power 4010
220 VAC Power In



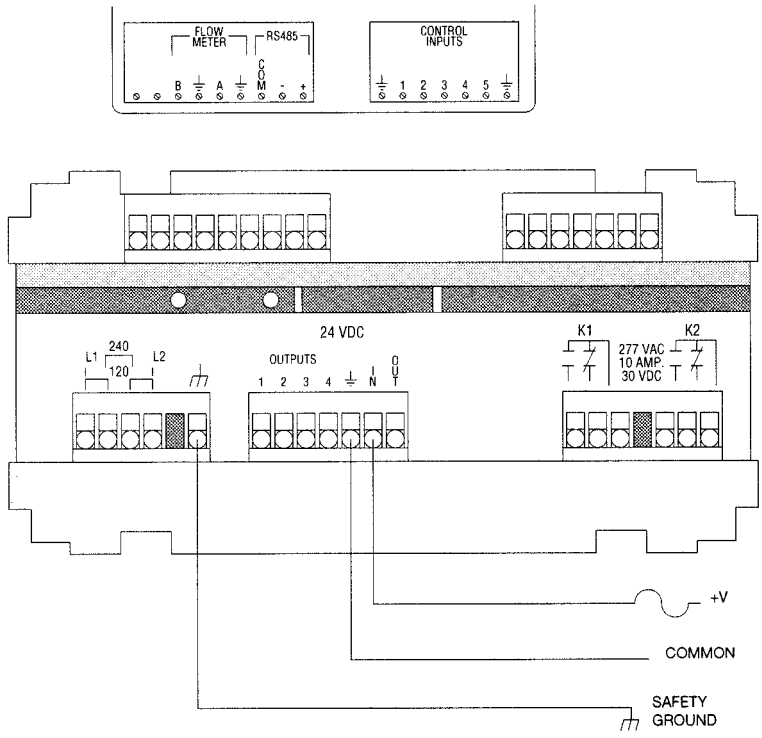
1. Fuse: .2A Slow Blow

AC Power 4010
110 VAC Power In



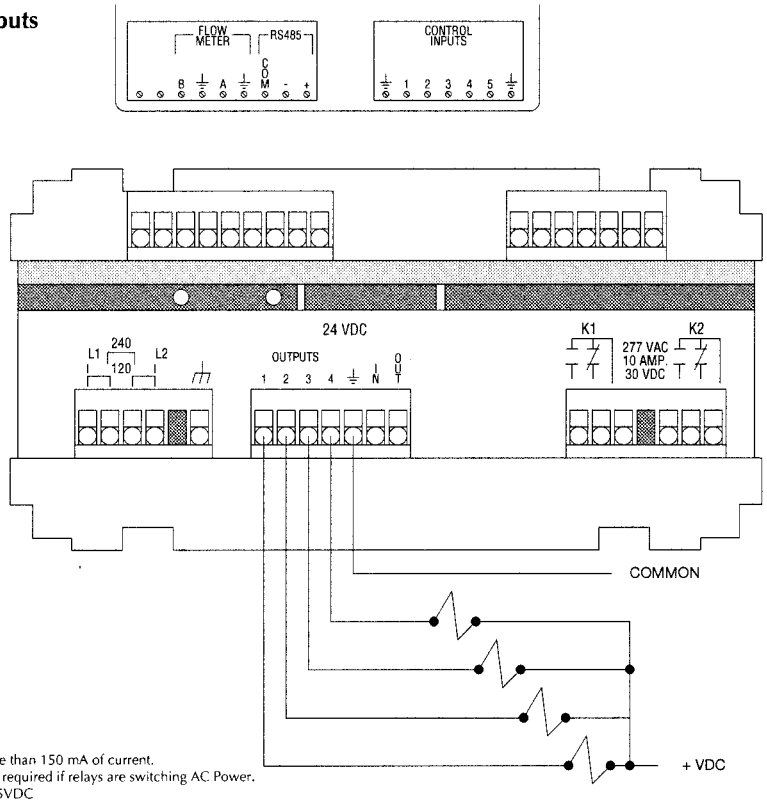
1. Fuse: .2A Slow Blow

DC Power Input
4010



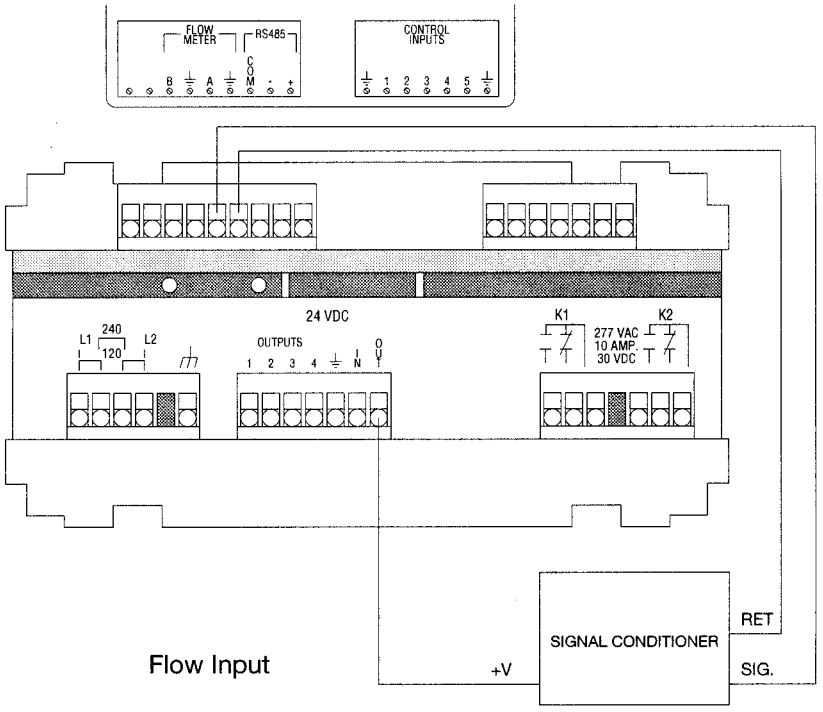
1. Fuse: .2A Slow Blow
2. Safety ground optional, only required if relays are switching AC Power.

Wiring DC Loads
To Transistor Outputs
4010



1. The load must not draw more than 150 mA of current.
2. Safety ground optional, only required if relays are switching AC Power.
3. +VDC equal to +30VDC to 5VDC

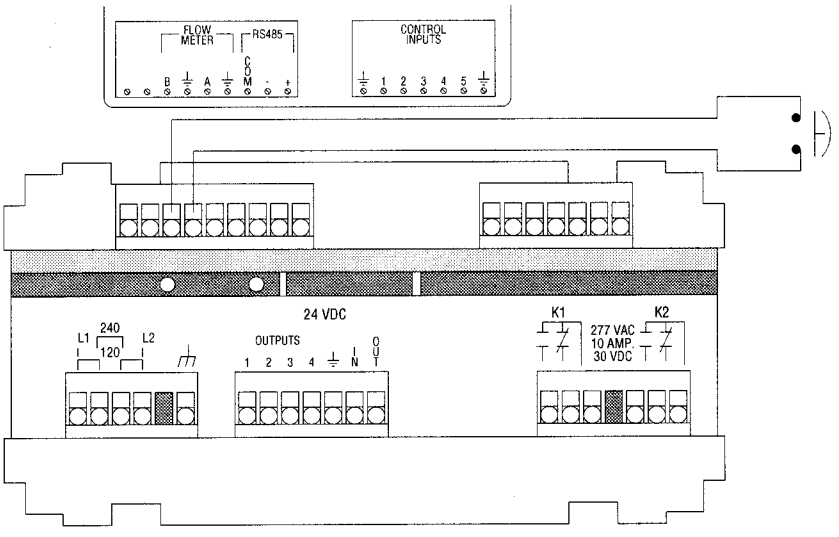
Typical Signal Conditioner
4010



• Read the instructions that came with your COX SIGNAL CONDITIONER for specific hook up instructions.

A-14

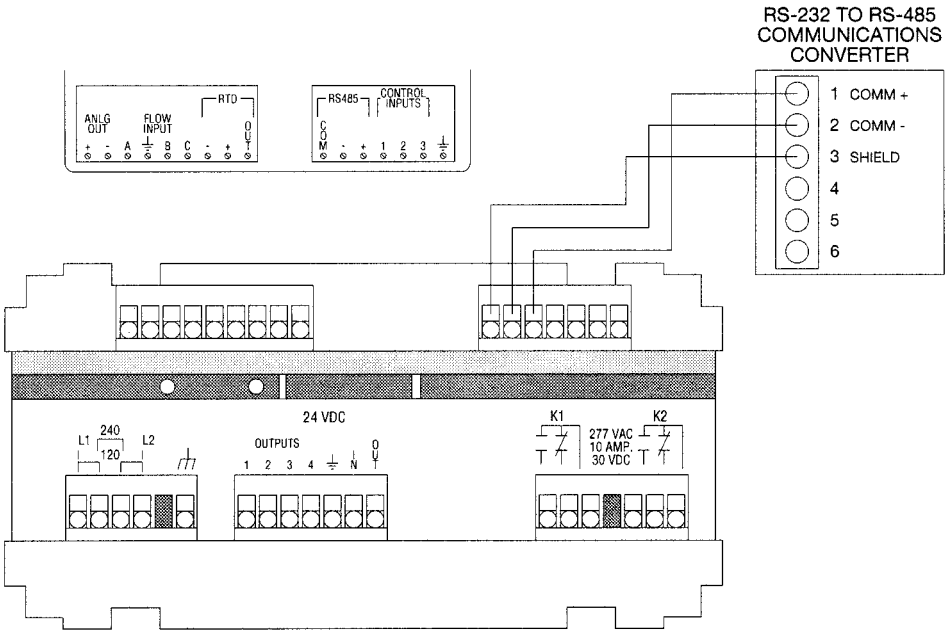
Inhibit Input
4010



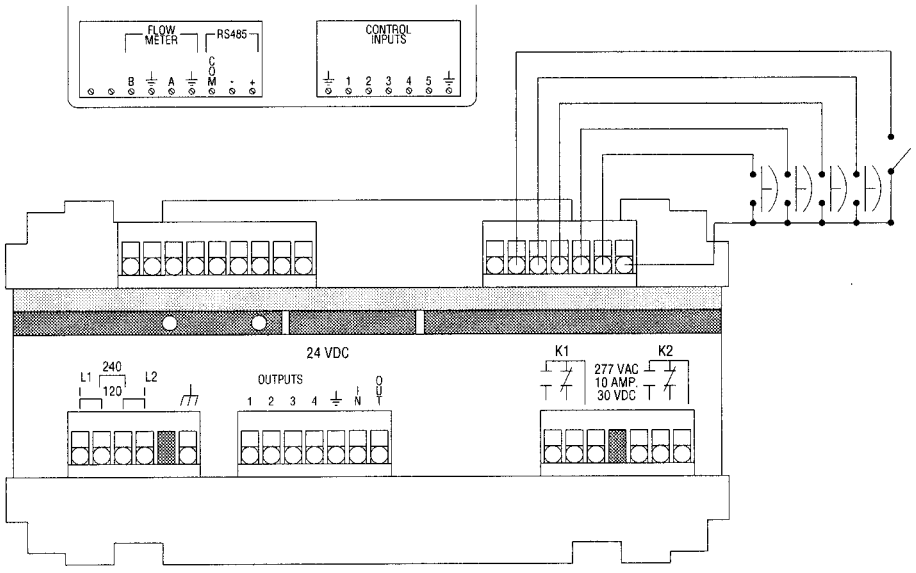
1. Inhibit input device may be a switch or an NPN transistor.

A-15

PC Interface
4010

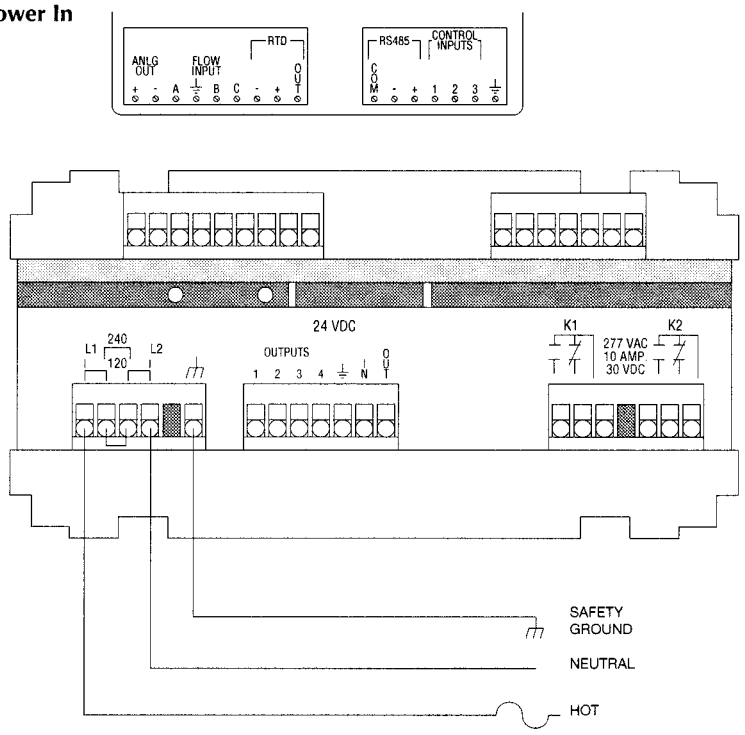


Wiring Control Inputs
4010



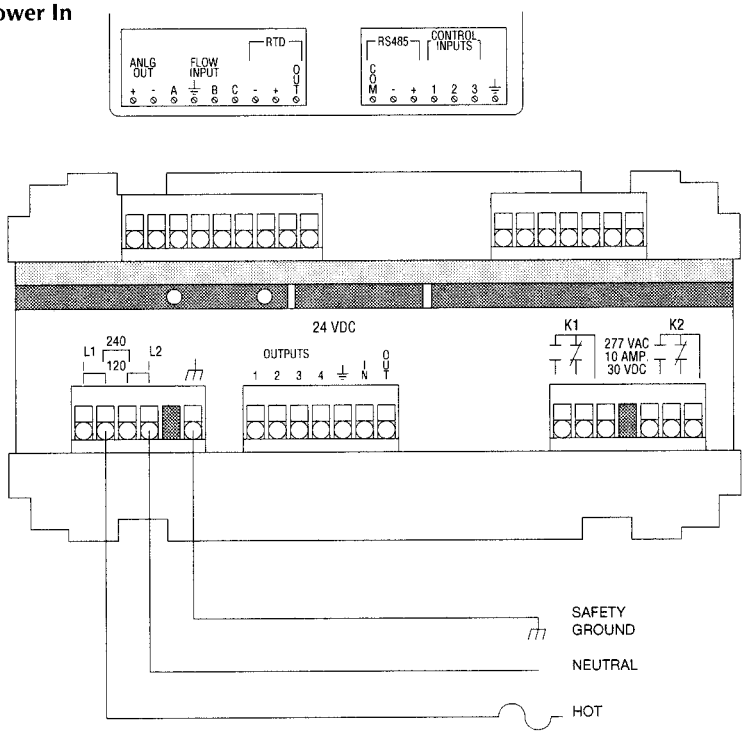
1. Control input devices may be a switch or an NPN transistor.

AC Power 4020
220 VAC Power In



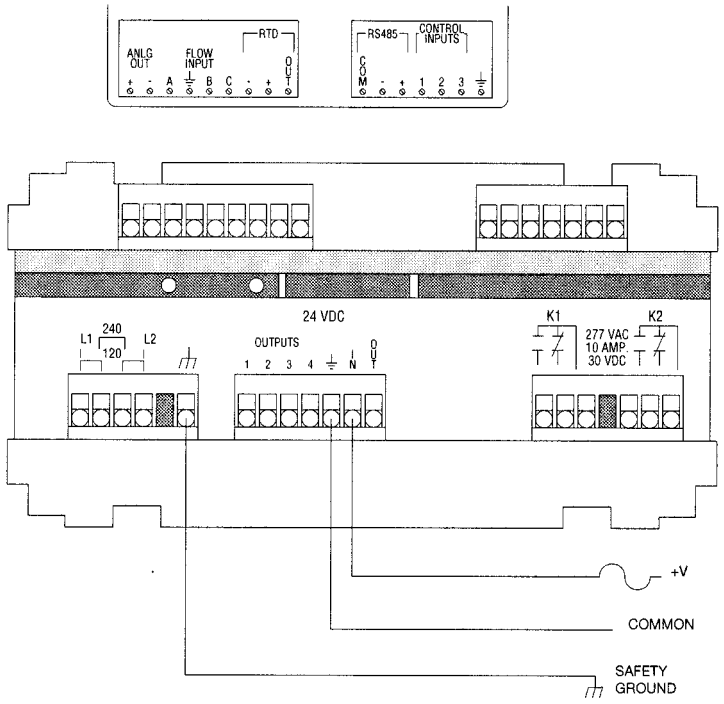
1. Fuse: .2A Slow Blow

AC Power 4020
110 VAC Power In



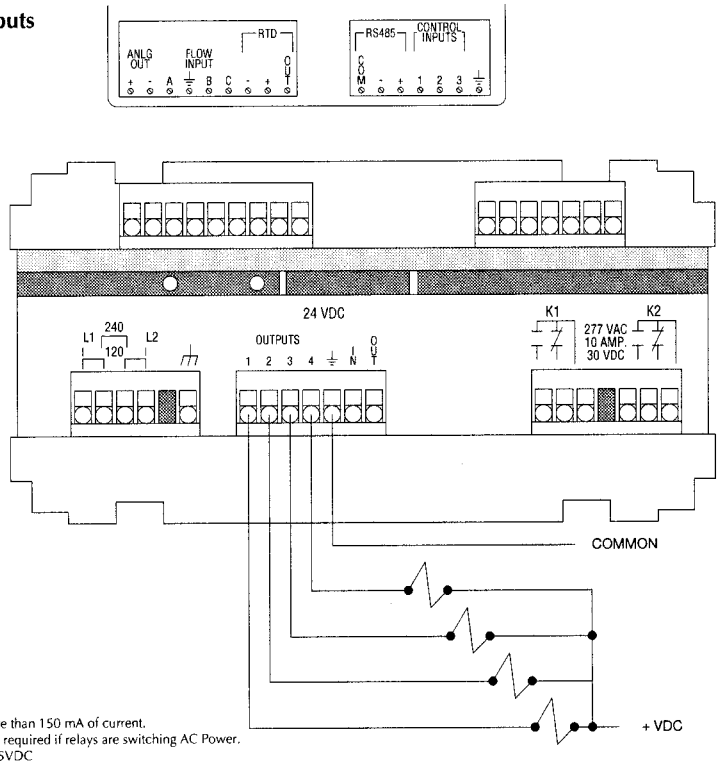
1. Fuse: .2A Slow Blow

DC Power Input
4020



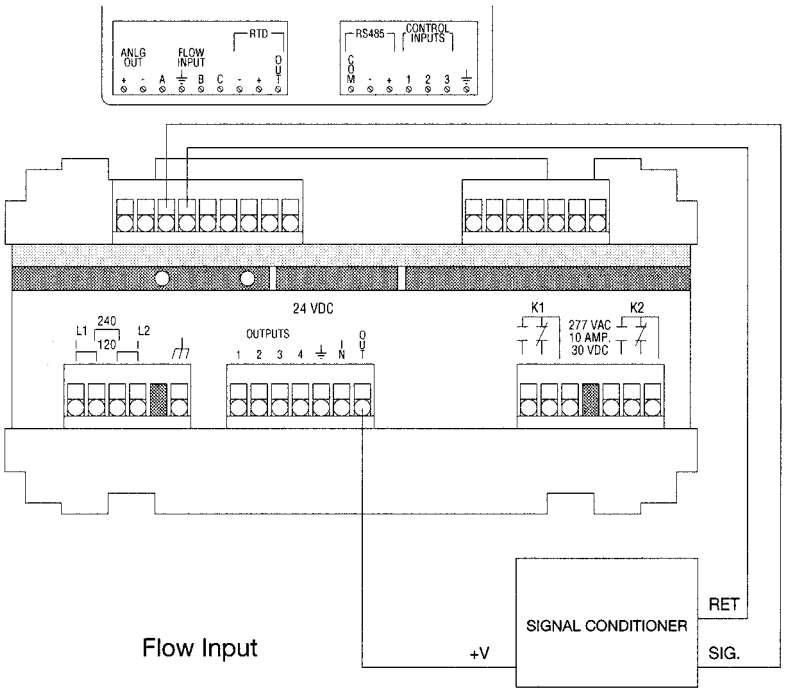
1. Fuse: .2A Slow Blow
2. Safety ground optional, only required if relays are switching AC Power.

Wiring DC Loads
To Transistor Outputs
4020



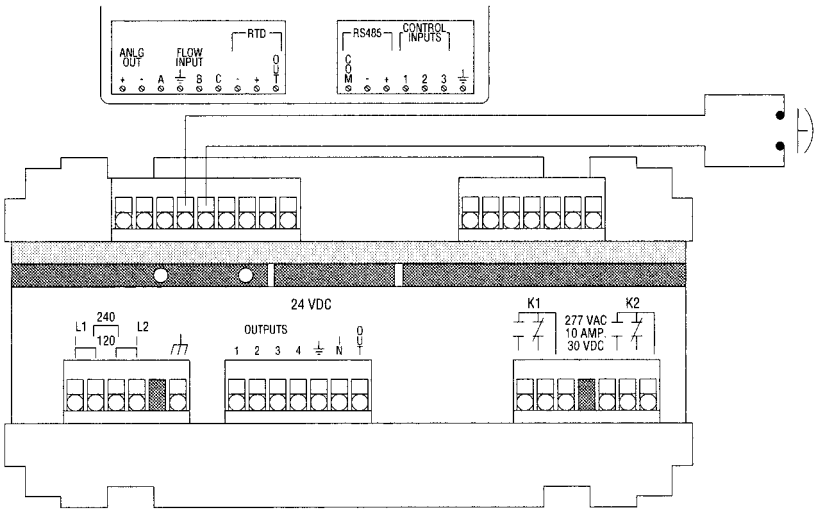
1. The load must not draw more than 150 mA of current.
2. Safety ground optional, only required if relays are switching AC Power.
3. +VDC equal to +30VDC to 5VDC

Typical Signal Conditioner
4020



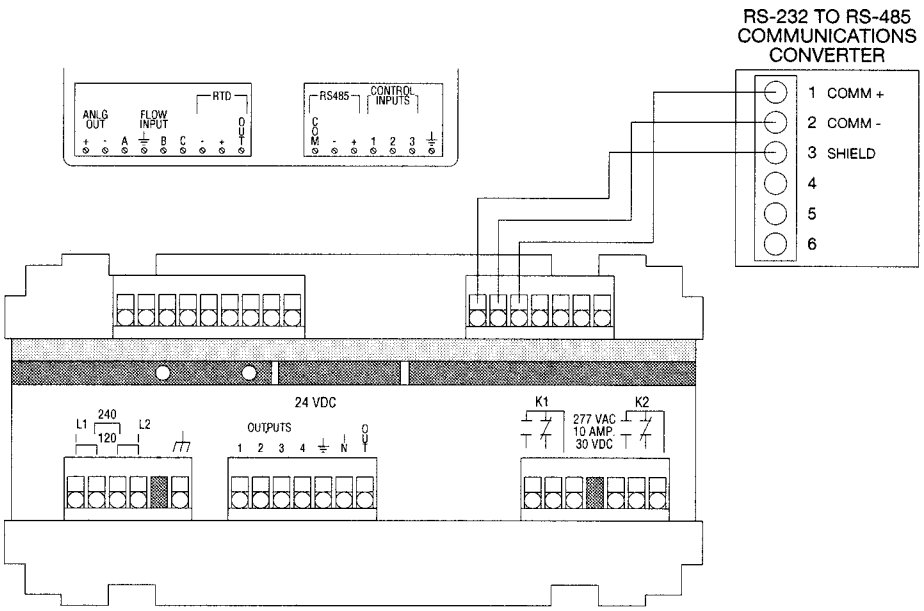
- Read the instructions that came with your COX SIGNAL CONDITIONER for specific hook up instructions.

Inhibit Input
4020

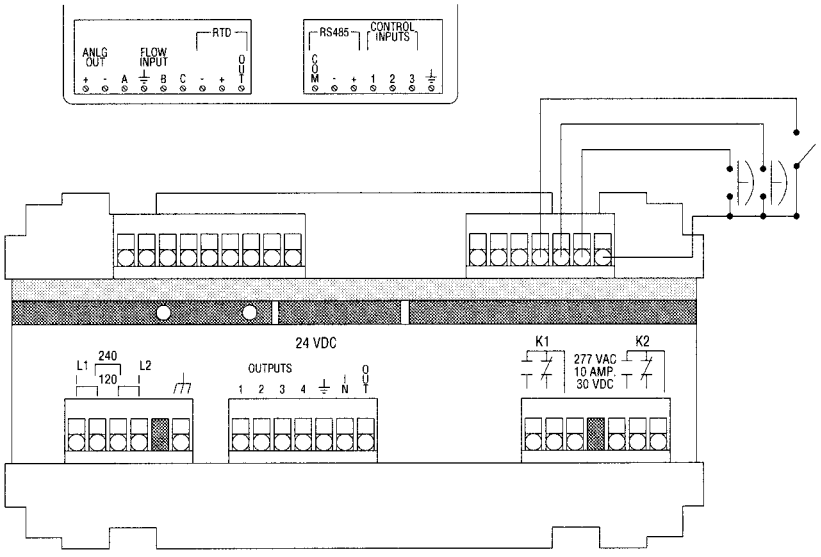


1. Inhibit input device may be a switch or an NPN transistor.

PC Interface
4020

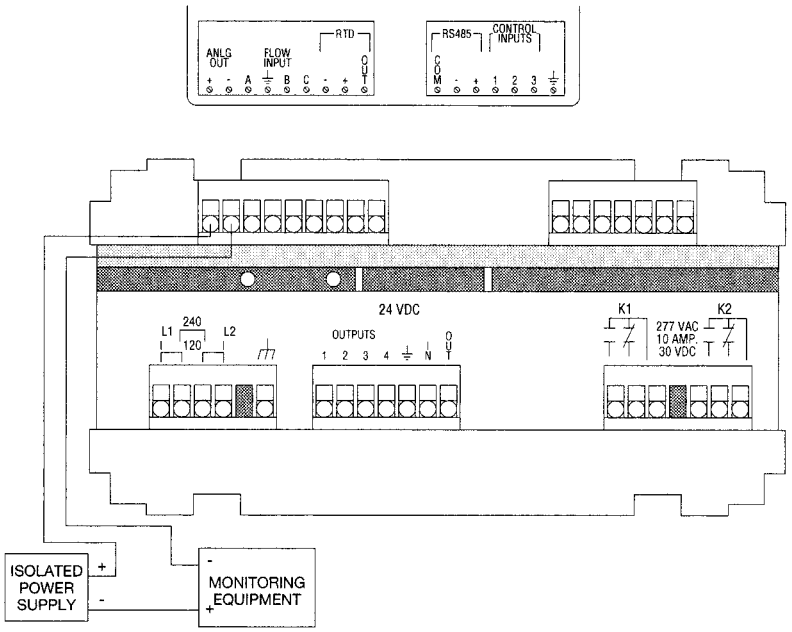


Wiring Control Inputs
4020

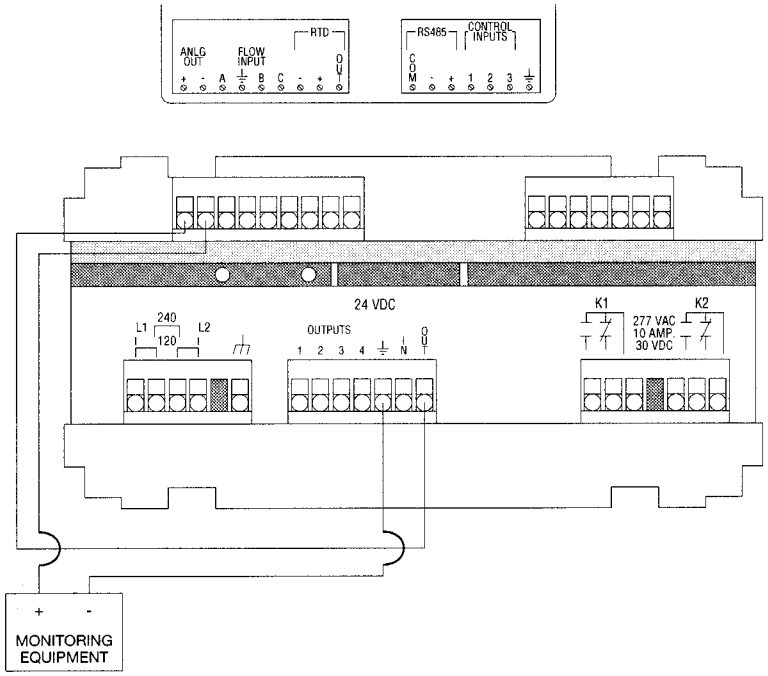


1. Control input devices may be a switch or an NPN transistor.
2. Control inputs 1and 2 wired in a similar manner.

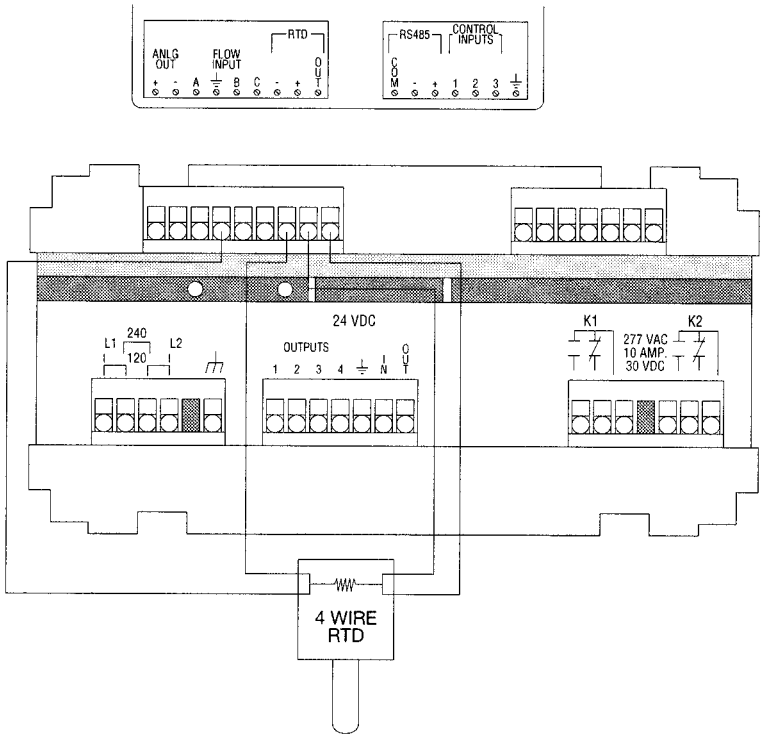
Analog Rate Output (Isolated)
4020



Analog Rate Output (Non-Isolated)
4020



RTD Connections
4020



I/O Terminal Description

TB1 – AC POWER INPUT

AC POWER L1 ..... Terminal connection for 120/240 VAC.

AC POWER L2 ..... Terminal connection for 120/240 VAC.

⏚ ..... Chassis ground. This terminal should be connected to earth ground.

TB2 – TRANSISTOR OUTPUTS, 24VDC POWER

OUTPUT 1 ..... Totalizer scaled pulse output.

OUTPUT 2 ..... Totalizer setpoint output.

OUTPUT 3 ..... Rate low alarm output.

OUTPUT 4 ..... Rate high alarm ouput.

24 VDC ⏚ ..... DC common. When unit is powered by DC, connect minus side of 18 - 27 VDC power supply to this terminal. When unit supplies 24 VDC power for accessories, connect accessory DC common to this terminal.

24 VDC IN ..... When unit is powered by DC, connect plus side of 18 - 27 VDC power suppiy to this terminal.

24 VDC OUT ..... Plus 24 VDC accessory power. Connect this terminai to the accessory plus 24 VDC input. Accessory power is available only if the unit is powered by AC.

TB3 – RELAY CONTACTS

K1 ..... Rate Low alarm relay contacts.

K2 ..... Rate High alarm relay contacts.

TB4 – FLOWMETER INPUT, COMMUNICATIONS OUTPUT (Model 4010)

FLOWMETER B ..... This is the inhibit input.

FLOWMETER ⏚ ..... DC Common. DC common is the reference level for the flowmeter and control inputs (input active when connected to DC common) and transistor outputs conduct to DC common when in the "on" state. DC Common is not connected to chassis ground.

FLOWMETER A ..... This terminal is the count input.

RS 485 COM ..... Communications common terminal. Connected to DC common by a 100 n internal resistor.

RS 485-/ RS 485+ ..... Communications differential signal input / output.

TB4 – ANALOG OUTPUT, FLOWMETER INPUT, RTD INPUT (Model 4020)

ANLG OUT + ... The analog output positive terminal is connected to the analog circuit power supply positive or the 24 VDC out terminal on TB2. Maximum voltage applied to ANLG OUT + IS 27 VDC. MINIMUM VOLTAGE IS 12 VDC + LOAD DROP @ 20 MA.

ANLG OUT - ..... The analog output negative terminal is connected to the analog load positive terminal. The 4 - 20 mA signal with respect to common is put out at the ANLG OUT - terminal.

FLOWMETER A ..... This terminal is the count input.

FLOWMETER ⏚ ..... DC Common. DC common is the reference level for the flowmeter and control inputs (input active when connected to DC common) and transistor outputs conduct to DC common when in the "on" state. DC Common is not connected to chassis ground.

FLOWMETER B ..... This is the inhibit input.

FLOWMETER C ..... No connection

RTD INPUT ..... For a 4 wire RTD, the one lead from one end of the RTD goes to the RTD terminal marked OUT; the other lead from the same end of the RTD goes to the RTD terminal marked +. The one lead from the other end of the RTD goes to the RTD terminal marked -; the other lead from the same end of the RTD goes to any terminal indicated as signal ground ( )

TB5 – CONTROL INPUTS (Model 4010)

CONTROL INPUTS ⏚ .... DC Common. Control inputs are active when connected to DC common.

CONTROLINPUTS 1 – 5 .... Programmable inputs which may be assigned to various functions as explained in the program mode.

TB5 – CONTROL INPUTS, COMMUNICATIONS OUTPUT (Model 4020)

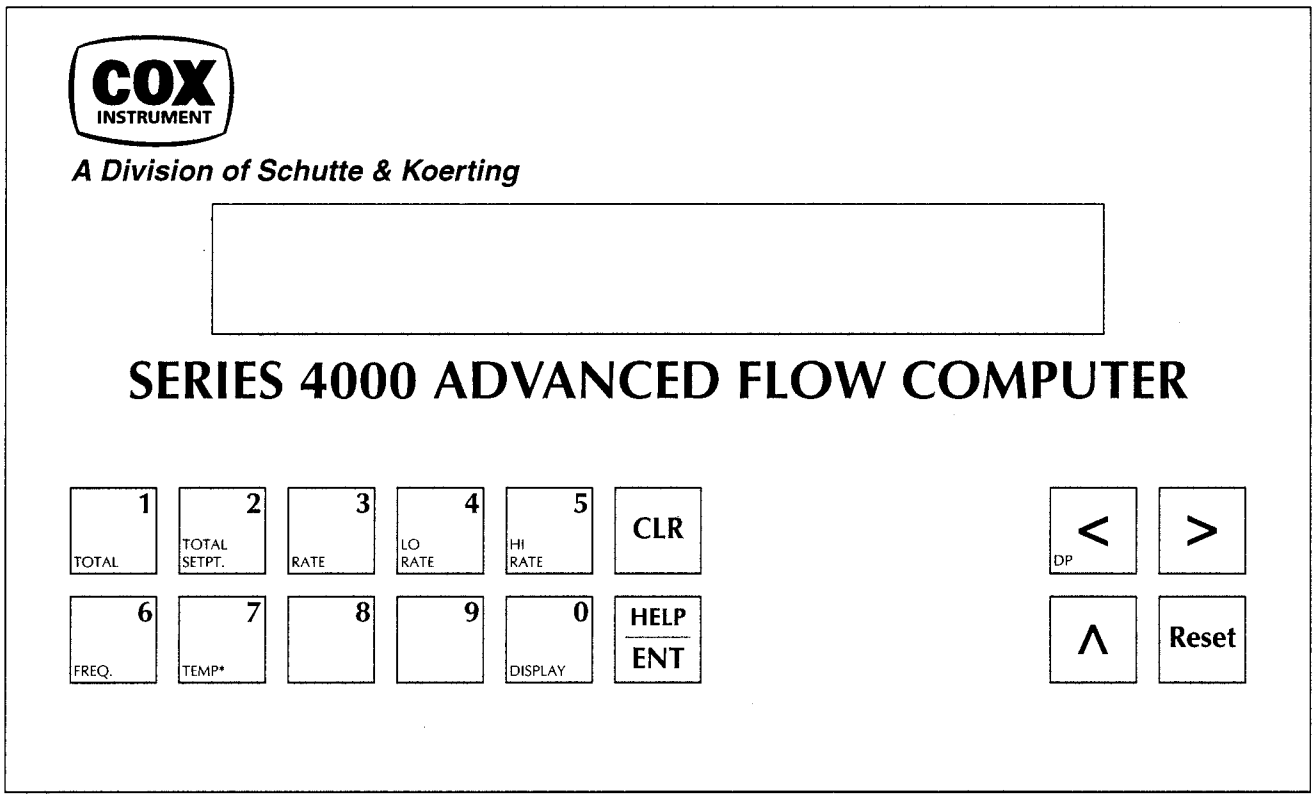
CONTROL INPUTS ⏚ .... DC Common. Control inputs are active when connected to DC common.

CONTROLINPUTS 1 – 3 .... Programmable inputs which may be assigned to various functions as explained in the program mode.

RS 485 COM ..... Communications common terminal. Connected to DC common by a 100 n internal resistor.

RS 485-/ RS 485+ ..... Communications differential signal input / output.

Front Panel Display



*4020 Only