# Model 2000 Series RS-232 Option Card

Model 2000 Series instruments may be remotely programmed and have information recalled via a RS-232 serial connection by using the RS-232 Option Card. The serial connection is full-duplex and uses no parity bit, 8 data bits, and 1 stop bit. The baud rate is user selectable from the front panel of the instrument. Baud settings include 300, 600, 1200, 2400, 4800, 9600, 19200, and 57600 baud. XON/XOFF is used for serial data flow control.

Electrical connections are made to the Option Card via a 6 position terminal block as outlined below. The card is wired as a DCE (data communication equipment) device.

Position: **Connection:**

1   RxD, received data
2   TxD, transmitted data
3   GND, signal ground
4   CTS, clear to send
5   RTS, request to send
6   shield
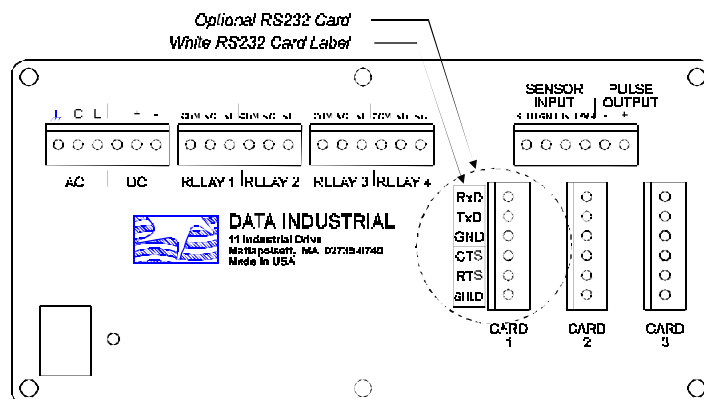
Note: One RS232 Card may be installed per unit.
All Option Cards may be installed in any slot configuration.

The instrument is programmed/queried via a series of ASCII text commands. The serial programming commands mimic the text labels found when programming the unit from the front panel. A list of the programming commands may be displayed by entering the command "HELP" which will scroll through the list of acceptable commands, one screen at a time. The command "HELP NO SCROLL" will list the commands in one continuous stream. All of the commands are case insensitive. Commands with an equal sign ("=") at the end of command denote a parameter that is programmable. For example the command "FLOW1 TOTAL" is a query only command to recall the flow total value for flow channel 1 while the command "DSPY URATE =" is a command that allows the current value of the display update rate to be recalled by entering nothing after the equal sign or to be configured by typing an appropriate value after the equal sign (i.e. "DSPY URATE = 40").

The serial interface functions in one of two modes of operation. In the first mode, characters entered from a remote terminal are echoed back to the terminal by the instrument. A backspace entered at the remote terminal will delete one character from the incoming data buffer until it is empty. One programming command may be entered and processed at a time when the prompt symbol (">") is displayed. A carriage return sent from the remote terminal is used to denote the end of each command. If the command is a request for data, the command is echoed back with the data value. For example, a request for the flow rate for flow channel 1 is executed by entering the command "FLOW1 RATE" to which the instrument will respond "FLOW1 RATE = 10.54 GPM" for a hypothetical flow rate of 10.54 gallons/minute.

In the second mode of operation, characters sent from a remote terminal are NOT echoed back to the terminal and the text commands are stripped from the response to a query for data. For example, in response to the command same "FLOW1 RATE" command, the instrument will respond "10.54 GPM", removing the ASCII text "FLOW1 RATE =" which would appear when operating in the first mode. A series of commands may be uploaded to the instrument in an ASCII text file. The instrument will store the commands in an incoming data buffer and process the commands in batch.

A list of serial programming commands is shown on the following pages. The list includes a number of commands that may not be present in every meter depending on the software variation and hardware configuration. For instance, a Model 2100 single channel flow monitor will only include commands for flow channel 1 and not flow channel 2. Meters with no relays will not include any serial programming commands for relays. A list of the commands that are valid for the particular meter can be obtained by using the "HELP" command.

Serial Command List For The Model 2100 Flow Monitor Series

Command:	Function:	Input Values:
ANLG IN1 INPUT = **ANLG IN2 INPUT =**	flow channel associated with analog input Option Card 1 or 2	integer value 0 or 1 where 0 = flow channel 1 1 = flow channel 2 (Valid only for Model 2101 and 2111.)
ANLG OUT1 INPUT = **ANLG OUT2 INPUT =**	driving source associated with analog output Option Card 1 or 2	for Model 2100 and 2110: value fixed at 0 where 0 = flow channel 1 for Model 2101 and 2111: integer value 0 or 1 where 0 = flow channel 1 1 = flow channel 2
ANLG OUT1 HIGH = **ANLG OUT2 HIGH =**	calibration value for the upper end of the analog output range for Card 1 or 2 (i.e. 10 volts = 100.0 GPM for the 0 to 10 volt output range)	floating point value 0.0 to 999999.9
ANLG OUT1 LOW = **ANLG OUT2 LOW =**	calibration value for the lower end of the analog output range for Card 1 or 2 (i.e. 4 mA = 40.0 GPM for the 4 to 20 mA output range)	floating point value 0.0 to 999999.9
ANLG OUT1 RANGE = **ANLG OUT2 RANGE =**	output range for analog output Option Card 1 or 2	integer value 0 to 4 where 0 = 0 to 10 volt output range 1 = 0 to 5 volt output range 2 = 0 to 1 volt output range 3 = 4 to 20 mA output range 4 = 0 to 20 mA output range
ANLG OUT1 UNIT = **ANLG OUT2 UNIT =**	flow rate unit of analog output Option Card 1 or 2	integer value 0 to 19 (See chart below for flow rate units of measure.)
CNT1 INPUT = **CNT2 INPUT =**	mechanical counter 1 or 2 input driving source	integer value 0 or 1 where 0 = flow channel 1 1 = flow channel 2
CNT1 RATE = **CNT2 RATE =**	mechanical counter 1 or 2 totalizing rate (i.e. 1 count = x totalizing units)	floating point value 0.0 to 999999.9
CNT1 UNITS = **CNT2 UNITS =**	mechanical counter 1 or 2 flow totalizing units	integer value 0 to 7 (See chart below for flow total units of measure.)
DIAG ERROR	recall the warning/error table	none
DIAG SER#	recall instrument's serial number	none
DIAG SREV#	recall revision of the instrument's software	none

Command:	Function:	Input Values:
DIG/SINE1 INPUT = **DIG/SINE2 INPUT =**	flow channel associated with digital pulse/sinewave input Option Card 1 or 2	integer value 0 or 1 where 0 = flow channel 1 = flow channel 2 (Valid only for Model 2101 and 2111.)
DSPY LINE1 =	value to display on line #1 of the screen (with the appropriate unit of measure)	for Model 2100 and 2110: integer value 0 or 1 where 0 = flow channel 1 rate 1 = flow channel 1 total for Model 2101 and 2111: integer value 0 to 3 where 0 = flow channel 1 rate 1 = flow channel 1 total 2 = flow channel 2 rate 3 = flow channel 2 total
DSPY LINE2 =	value to display on line #2 of the screen	for Model 2100 and 2110: integer value 0 to 2 where 0 = flow channel 1 rate 1 = flow channel 1 total 2 = relay status line for Model 2101 and 2111: integer value 0 to 4 where 0 = flow channel 1 rate 1 = flow channel 1 total 2 = flow channel 2 rate 3 = flow channel 2 total 4 = relay status line
DSPY URATE =	display update rate	integer value 20 to 200 where the display update rate is the (value * .025 seconds)
FLOW1 ANLOG HIGH = **FLOW2 ANLOG HIGH =**	calibration value for the upper end of the analog input range for Card 1 or 2 (i.e. 10 volts = 100.0 GPM for the 0 to 10 volt input range)	floating point value 0.0 to 999999.9 (Valid only for analog input sensor type.)
FLOW1 ANLOG LOW = **FLOW2 ANLOG LOW =**	calibration value for the lower end of the analog input range for Card 1 or 2 (i.e. 4 mA = 40.0 GPM for the 4 to 20 mA input range)	floating point value 0.0 to 999999.9 (Valid only for analog input sensor type.)
FLOW1 ANLOG RANGE = **FLOW2 ANLOG RANGE =**	input range for analog input Option Card 1 or 2	integer value 0 to 4 where 0 = 0 to 10 volt input range 1 = 0 to 5 volt input range 2 = 0 to 1 volt input range 3 = 4 to 20 mA input range 4 = 0 to 20 mA input range (Valid only for analog input sensor type.)
FLOW1 ANLOG UNITS = **FLOW2 ANLOG UNITS =**	analog input flow rate units (for selecting units associated with the FLOW1 ANLG HIGH, FLOW2 ANLG HIGH, etc. settings)	integer value 0 to 19 (See chart below for flow rate units of measure.) (Valid only for analog input sensor type.)
FLOW1 DICAL KNUM = **FLOW2 DICAL KNUM =**	flow channel 1 or 2 Data Industrial k calibration number	floating point value 0.0 to 999999.9 (Valid only for sensor types using Data Industrial calibration.)

Command:	Function:	Input Values:
FLOW1 DICAL OFFSET = **FLOW2 DICAL OFFSET =**	flow channel 1 or 2 Data Industrial offset calibration number	floating point value -999999.9 to +999999.9 (Valid only for sensor types using Data Industrial calibration.)
FLOW1 KFACT KFACT = **FLOW2 KFACT KFACT =**	flow channel 1 or 2 K factor calibration where the K factor = number of pulses per 1.0 totalizing unit (i.e. 60 pulses/gallon)	floating point value 0.0 to 999999.9 (Valid only for sensor types using the K factor calibration.)
FLOW1 KFACT UNITS = **FLOW2 KFACT UNITS =**	flow totalizing units associated with K factor calibration for flow channel 1 or 2	integer value 0 to 7 (See chart below for flow total units of measure.)
FLOW1 RATE **FLOW2 RATE**	recall the present flow rate for flow channel 1 or 2 (the output will be formatted to match the display of flow rate on the LCD screen)	none
FLOW1 RATE CONV = **FLOW2 RATE CONV =**	conversion from gallons per minute to the user defined custom flow rate unit	floating point value 0.0 to 999999.9
FLOW1 RATE LABEL = **FLOW2 RATE LABEL =**	label for user definable custom flow rate unit	1 to 7 alphanumeric characters
FLOW1 RATE UNITS = **FLOW2 RATE UNITS =**	flow channel 1 or 2 rate rate display units	integer value 0 to 19 (See chart below for flow rate units of measure.)
FLOW1 RATE #.DIG = **FLOW2 RATE #.DIG =**	flow channel 1 or 2 number of digits after the decimal point for the display of flow rate	integer value 0 to 2
FLOW1 SENSR AVG = **FLOW2 SENSR AVG =**	flow channel 1 or 2 sensor rate averaging (for smoothing of erratic flow rates)	integer value 0 to 20 where 0 is no filtering and 20 is the maximum filtering
FLOW1 SENSR TYPE = **FLOW2 SENSR TYPE =**	flow channel 1 or 2 sensor type/calibration technique	integer value 0 to 7 where 0 = standard pulse input, Data Industrial calibration (flow channel 1 only) 1 = standard pulse input, 16 point table or K factor calibration (flow channel 1 only) 2 = Option Card pulse input, Data Industrial calibration 3 = Option Card pulse input, 16 point table or K factor calibration 4 = Option Card pulse input (with pull-up), 16 point table or K factor calibration 5 = Option Card sinewave input, 16 point table or K factor calibration 6 = Option Card analog in 7 = no sensor, channel disabled

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Command:	Function:	Input Values:
FLOW1 TOTAL **FLOW2 TOTAL**	recall the present flow total for flow channel 1 or 2 (the output will be formatted to match the display of flow total on the LCD screen)	none
FLOW1 TOTAL CONV = **FLOW2 TOTAL CONV =**	conversion from gallons to the user defined custom flow total unit	floating point value 0.0 to 999999.9
FLOW1 TOTAL LABEL = **FLOW2 TOTAL LABEL =**	label for user definable custom flow total unit	1 to 4 alphanumeric characters
FLOW1 TOTAL UNITS = **FLOW2 TOTAL UNITS =**	flow channel 1 or 2 totalizer display units	integer value 0 to 7 (See chart below for flow total units of measure.)
FLOW1 TOTAL #.DIG = **FLOW2 TOTAL #.DIG =**	flow channel 1 or 2 number of digits after the decimal point for the display of flow total	integer value 0 to 2
HELP	display the valid programming commands, listing the commands one screen at a time, prompting with a yes/no to continue the listing	none
HELP NO SCROLL	display the valid programming commands in one continuous stream	none
LIST	recall and display the present values/settings of all parameters in the instrument, one screen at a time	none
LIST NO SCROLL	recall and display the present values/settings of all parameters in the instrument in one continuous stream	none
PASSWORD ENABLE	serial interface password enable (entering this command will enable password protection for the serial interface only)	none
PULSE INPUT =	pulse output driving source	for Model 2100 and 2110: value fixed at 0 where: 0 = flow channel 1 for Model 2101 and 2111: integer value 0 or 1 where 0 = flow channel 1 1 = flow channel 2
PULSE RATE =	pulse output totalizing rate (i.e. 1 pulse = x totalizing units)	floating point value 0.0 to 999999.9
PULSE UNITS =	pulse output totalizing units	integer value 0 to 7 (See chart below for flow total units of measure.)

Command:	Function:	Input Values:
PULSE WIDTH =	pulse output pulse width	integer value 0 to 200 or 201 where the pulse width is (value * .025 seconds) or if the value is 201 is latched on until user reset
PWORD WORD =	security password	1 to 4 alphanumeric characters
RESET FLOW1	flow channel 1 totalizer reset (entering this command will zero the flow channel 1 totalizer)	none
RESET FLOW2	flow channel 2 totalizer reset (entering this command will zero the flow channel 2 totalizer)	none
RESET OUTS	latched output reset (entering this command will turn off any latched output devices, i.e. relays, pulse output)	none
RLY1 CTIME = **RLY2 CTIME =** **RLY3 CTIME =** **RLY4 CTIME =**	relay 1, 2, 3, or 4 contact closure time	integer value 4 to 200 or 201 or 202 depending upon the relay function where the time is (value * .025 seconds) or if value = 201, latched on until user reset or if value = 202, on conditionally
RLY1 DELAY = **RLY2 DELAY =** **RLY3 DELAY =** **RLY4 DELAY =**	relay 1, 2, 3, or 4 alarm delay time	integer value 0 to 4800 where the delay time is value * .025 seconds (Valid only for alarm type relay functions.)
RLY1 FUNC = **RLY2 FUNC =** **RLY3 FUNC =** **RLY4 FUNC =**	relay 1, 2, 3, or 4 operating function	integer value 0 to 3 where 0 = totalizing function 1 = high rate alarm function 2 = low rate alarm function 3 = manual on/off function
RLY1 HYST = **RLY2 HYST =** **RLY3 HYST =** **RLY4 HYST =**	relay 1, 2, 3, or 4 hysteresis	integer value 0 to 50 (Valid only for alarm type relay functions.)
RLY1 INPUT = **RLY2 INPUT =** **RLY3 INPUT =** **RLY4 INPUT =**	relay 1, 2, 3, or 4 input driving source	for Model 2100 and 2110: value fixed at 0 where 0 = flow channel 1 for Model 2101 and 2111: integer value 0 or 1 where 0 = flow channel 1 1 = flow channel 2
RLY1 MANUAL = **RLY2 MANUAL =** **RLY3 MANUAL =** **RLY4 MANUAL =**	relay 1, 2, 3, or 4 manual control	integer value 0 or 1 where 0 = relay off 1 = relay on (Valid only for manual relay function setting.)

Command:	Function:	Input Values:
RLY1 RATE = **RLY2 RATE =** **RLY3 RATE =** **RLY4 RATE =**	relay 1, 2, 3, or 4 rate (the rate value either represents the alarm set point or the totalizing rate depending upon the relay function)	floating point value 0 to 9999999.0
RLY1 STAT **RLY2 STAT** **RLY3 STAT** **RLY4 STAT**	relay 1, 2, 3, or 4 on/off status (0 = relay is off, 1 = relay is on)	none
RLY1 UNITS = **RLY2 UNITS =** **RLY3 UNITS =** **RLY4 UNITS =**	relay 1, 2,3, or 4 units	integer value 0 to 19 or 0 to 7 depending upon the relay function (See either the chart for the flow rate or flow total units of measure.)

SERIAL MODE =	operating mode for RS-232/
	RS-485 serial Option Card
		integer value 0 or 1 where
		0 = echo characters to remote
		   terminal with command text
		   strings
		1 = do NOT echo characters or command
		   text strings

Flow Rate Units Of Measure

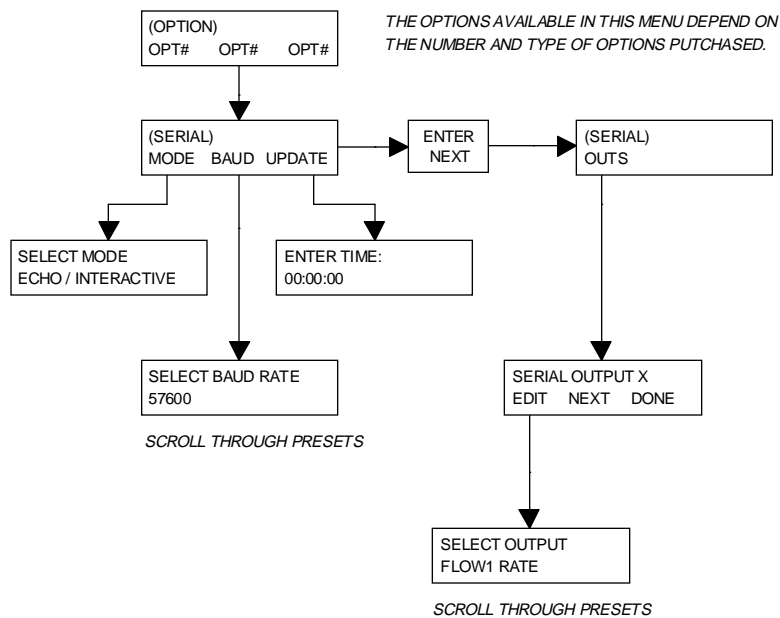| Value:	Unit:
0	GPM (gallons per minute)
1	GPS (gallons per second)
2	GPH (gallons per hour)
3	MGD (millions of gallons per day)
4	L/SEC (liters per second)
5	L/MIN (liters per minute)
6	L/HR (liters per hour)
7	FT3/SEC (cubic feet per second)
8	FT3/MIN (cubic feet per minute)
9	FT3/HR (cubic feet per hour)
10	CM/SEC (cubic meters per second)
11	CM/MIN (cubic meters per minute)
12	CM/HR (cubic meters per hour)
13	ACF/SEC (acre-feet per second)
14	ACF/MIN (acre-feet per minute)
15	ACF/HR (acre-feet per hour)
16	BBL/SEC (barrels per second)
17	BBL/MIN (barrels per minute)
18	BBL/HR (barrels per hour)
19	CUST (user defined custom flow rate units)

Flow Total Units Of Measure

Value:	**Units:**
0	GAL (gallons)
1	MG (millions of gallons)
2	LIT (liters)
3	FT3 (cubic feet)
4	CM (cubic meters)
5	ACF (acre-feet)
6	BBL (barrels)
7	CUST (user defined custom flow total units)

RS232 OPTION MENU PROGRAM

```
(OPTION)                    THE OPTIONS AVAILABLE IN THIS MENU DEPEND ON
OPT#    OPT#    OPT#        THE NUMBER AND TYPE OF OPTIONS PUTCHASED.
   |
   v
(SERIAL)              -->  ENTER   -->  (SERIAL)
MODE  BAUD  UPDATE         NEXT         OUTS
  |         |                             |
  v         v                             v
SELECT MODE      ENTER TIME:
ECHO / INTERACTIVE   00:00:00

          |                      SERIAL OUTPUT X
          v                      EDIT   NEXT   DONE
SELECT BAUD RATE                     |
57600                                v
                              SELECT OUTPUT
SCROLL THROUGH PRESETS        FLOW1 RATE

                              SCROLL THROUGH PRESETS
```

Connecting RS232 Output

2100 Pin#	2100 Connection:	RS232 Connection	DB9 Pin#	DB25 Pin#
1	RxD, received data	TxD, transmitted data	3	2
2	TxD, transmitted data	RxD, received data	2	3
3	GND, signal ground	GND, signal ground	5	7
4	CTS, clear to send	Not used (rev B0)	N/A	N/A
5	RTS, request to send	Not used (rev B0)	N/A	N/A
6	shield	shield	5	7