MODEL 205D-1
Flow Computer

USER'S MANUAL

HP-288
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HOFFER FLOW CONTROLS, INC.
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1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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1. Introduction

The Model 205D-1 Flow Computer accepts pulse or frequency flow signals from a wide variety of flowmeters and displays Rate, a resettable Total, and an accumulated Total.

This manual covers the Model 205D-1 which accepts most frequency and pulse signals, including mV outputs from turbine flowmeters and two wire proximity switch outputs. It also allows all four front panel switches to be remotely connected via the rear panel terminal strip.

The instrument is fully configurable, with all calculation constants set via the front panel switches and stored permanently in a non-volatile memory.

This instrument conforms to the EMC-Directive of the Council of European Communities 89/336/EEC and the following standards:

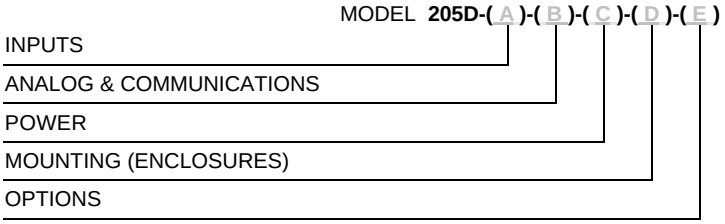
Generic Emission Standard EN 50081-1	Residential, Commercial & Light Industry Environment.
Generic Emission Standard EN 50081-2	Industrial Environment.
Generic Immunity Standard EN 50082-1	Residential, Commercial & Light Industry Environment.
Generic Immunity Standard EN 50082-2	Industrial Environment.

In order to comply with these standards, the wiring instructions in Section 7 must be followed.

1.1 Model Number Designation

The Model number of an instrument describes which input and output options are installed and the AC voltage rating.

MODEL 205D
DIGITAL FLOW COMPUTER
(TO BE USED ONLY WHEN APPROVALS ARE REQUIRED)



INPUTS (SELECT ONLY ONE OPTION)
MODEL **205D-(A)-( )-( )-( )-( )**
OPTION (A)
(1) BASIC UNIT/SINGLE CHANNEL*****
(LA) 4-20 MA TEMPERATURE*****
(LR) RTD, 4 WIRE LINEARIZED
(Q) QUADRATURE BI-DIRECTIONAL FLOW*****
(S) ADD/SUBTRACT, TWO FLOW INPUTS

***SEE NOTE 3**

ANALOG & COMMUNICATIONS
MODEL **205D-( )-(B)-( )-( )-( )**
OPTION (B)
(0) NO OPTIONS OTHER THAN SCALED OPEN COLLECTOR STANDARD ALL OPTIONS
(1) 4-20 MA ISOLATED
(2) RS232/422/485
(3) HIGH/LOW FLOW ALARMS*****
(4) 4-20 MA ISOLATED & HIGH/LOW FLOW ALARMS*****
(5) RS232/422/485 & HIGH/LOW FLOW ALARMS*****

POWER
MODEL **205D-( )-( )-(C)-( )-( )**
OPTION (C)
(A) 95-135 VAC 50/60 HZ AND 11.5-28.5 VDC SELECT
(C) 190-260 VAC 50/60 HZ

MOUNTING (ENCLOSURES)

MODEL **205D-( )-( )-( )-(D)-( )**

OPTION (D)

(1) PANEL MOUNT (STD)
(2) NEMA 4X, WHITE FIBERGLASS
(2B) NEMA 4X, ALUMINUM WITH HEAVY DUTY EXTERNAL SWITCHES
(CEX) CENELEC FLAME-PROOF, CSA & SAA APPROVED Eexd11BT6
(EX) UL/CSA EXPLOSION-PROOF ENCLOSURE

OPTIONS

MODEL **205D-( )-( )-( )-( )-(E)**

OPTION (E)

(H) 50 W HEATER (SPECIFY 12 VDC, 115 VAC OR 220 VAC)
(B) BACKLIGHTING DISPLAY
(C) CONFORMAL COATING
(CE) INTERFERENCE CE COMPLIANCE
(NTEP) WEIGHTS & MEASURES CUSTODY TRANSFER*****
(UL) ELECTRICAL ETL (US) APPROVED TO UL508 & CSA
(CEN) CENELEC, CSA NRTL/C AND SAA APPROVAL

***SEE NOTE 7.**

NOTES:

1. LCD DISPLAY 6 DIGIT 0.7" (17.8MM) HIGH, NON-VOLATILE TO TEN YEARS.

2. TRANSDUCER SUPPLY 8-24 VDC @ 50 MA MAX., FIELD ADJUSTABLE.

3. 10 POINT LINEARIZATION WITH INPUT OPTIONS (LA), (LR) AND (Q). THE (Q)OPTION CAN BE CONFIGURED WITH EITHER THE (LA) OR (LR) OPTION. SINGLE POINT 'K' FACTOR WITH INPUT OPTIONS (1) AND (S).

4. BOTH MAGNETIC COIL AND HALL EFFECT INPUTS ACCEPTED.

5. HI/LO ALARMS TWO SPDT, SWITCHING CURRENT MAX 5 AMS @ 250 VAC OR 30 VDC, MAX. SWITCHING POWER.

6. TEMPERATURE RANGE
   (LR) RTD INPUT. . . . . -148 TO +392 DEG. F.
   (LA) 4-20 MA INPUT:
   GENERAL LIQUIDS. . . . . -459 TO +392 DEG. F.
   PETROLEUMS. . . . . -148 TO +392 DEG. F.
   LPG. . . . . .-49 TO +140 DEG. F.

7. AVAILABLE WITH (LA) AND (LR) OPTIONS ONLY.

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2. Specification

General

Display:	6 digit LCD. 0.7" (17.8mm) high digits
Display Update Rate:	0.25 seconds
Transducer Supply:	8-24VDC field adjustable, 50mA maximum
Power Requirements:	DC: 11.5 to 28.5 volts 60mA typical current (no options) AC: 95-135 VAC or 190-260 VAC (Set internally at factory)
Operating Temperature:	0°C to 55°C standard
Dimensions:	5.7" (144mm) wide x 2.8" (72mm) high x 7.0" (178mm) deep
Cutout**:**	5.5" (139mm) wide x 2.6" (67mm) high

Frequency Input

Frequency Range:	Minimum:	0.25Hz on Rate 0Hz on Total
	Maximum:	10KHz
Input Circuits:	See Section 6.1	
Scaling Range:	0.1000 to 50,000	

Relay Outputs

Maximum Switching Power:	1250VA
Maximum Switching Voltage:	250VAC, 30VDC
Maximum Switching Current:	5 Amps

4-20mA Output

Resolution:	10 bits
Accuracy:	Better than 0.05%
Maximum Load:	500 ohms internally powered, 950 ohms from 24VDC
Isolation:	Output is isolated

Pulse Output

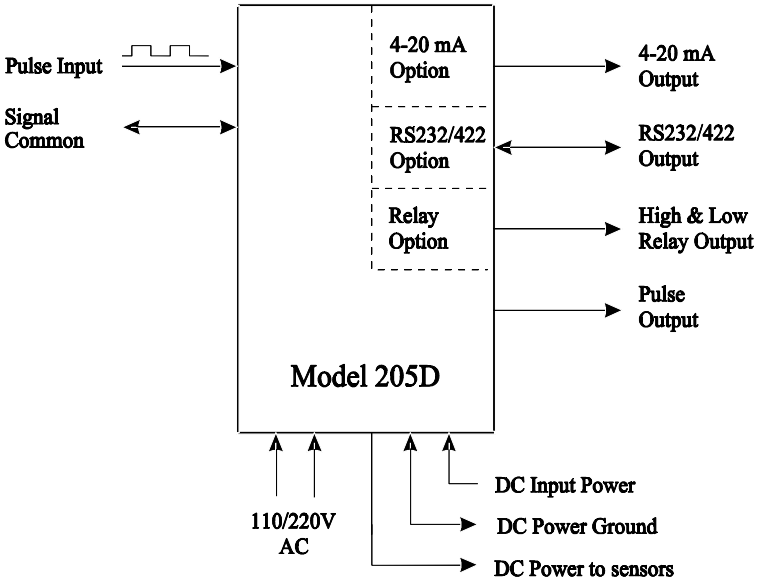
Pulse Width:	10msec (negative going pulse)
Maximum Duty Cycle:	49 pulses per second
Output:	Open collector transistor will sink 100mA.
Scaling:	The pulse output is scaled and outputs one pulse each time the accumulated total increments.

3. **Operation**

The Model 205D-1 uses a low power CMOS microprocessor to perform all control functions and calculations.

The instrument is fully configurable with all operating parameters and calculation constants user settable. (See Section 5 entitled "Configuration" for information on configuring.) All parameters and constants are stored in a non-volatile memory which retains data without battery backup for a minimum of 10 years.

A block diagram of the instrument is shown below.



3.1 Front Panel Operation

The display will normally show the Rate or resettable Total, as selected by the RATE or TOTAL keys on the front panel. A LED in the key panel will light to indicate which function is currently displayed.

The DISPLAY key can be used to display the Accumulated Total. On the first press of the DISPLAY key, the display shows ACCTOT for one second followed by the actual total. The Accumulated Total continuously totalizes the flow and is not resettable from the front panel.

On reaching the maximum displayed total, all totals will roll over to zero and continue totalizing. If, at any time, power is lost or the instrument is switched off, the totals will be stored in the non-volatile memory. When power is switched back on to the instrument, the stored totals will be recalled from memory and the totals will be incremented from the last values.

3.2 Calculation of Rate and Total

3.2.1 Frequency Input

The flowrate, R, is calculated as follows:

$$R = \frac{fxH}{S}$$

where f is the input frequency in Hz.
H is the timebase of rate and is 1 for seconds, 60 for minutes,3600 for hours, and 86,400 for days.
S is the Scaling Factor.

The Scaling Factor, *S*, is equal to the K-factor of the flowmeter expressed in pulses per unit volume.

The user sets the Scaling Factor and selects the timebase during the configuration process as detailed in Section 5 of this manual.

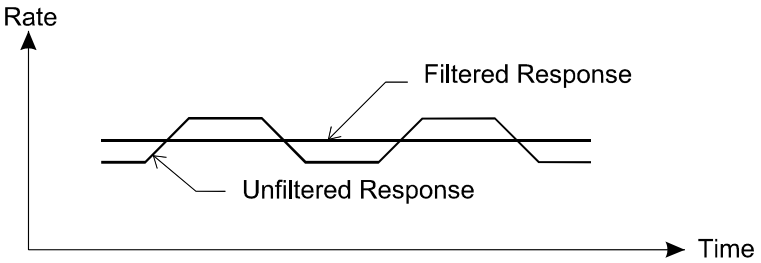
3.2.2 Filtering

Frequency fluctuations caused by pulsating flow through a flowmeter, often makes the Rate impossible to read with any precision.

The Flow Computer has a digital filter which will average out these fluctuations and enable the Rate to be read to four digit accuracy. The degree of filtering is fully configurable which means that highly accurate and stable readings can be obtained without excessive lag.

When the Rate is retransmitted via the 4-20mA output, the filtering will also average out any fluctuations on the output.

The diagram below shows a pulsating signal input together with the effect of filtering.



As a guideline to the degree of filtering to be used, the following table shows the response to a step change in input. The value, *A*, is the filter constant which is set during the configuration process. The times for the display value to reach 90% and 99% of full swing are given in seconds for different values of *A*.

A	*90%*	*99%*
1	0	0
2	1	2
4	2	4
6	3	6
10	5	11
15	8	17
20	11	22
25	14	28
35	20	40
45	25	51
60	34	69
75	43	86
90	52	103
99	57	113

Table 1 - Response to a step Input (in seconds).

Note: If *A* is set to 1, there is **NO** filtering of the input signal.

3.3 Total Conversion

The Total Conversion feature enables the rate to be displayed in one engineering unit (e.g., gallons/minute) and the totals to be displayed in another engineering unit (e.g., barrels).

The Scaling Factor is always set in the unit relating to Rate and the Total Conversion constant is a division factor which can be used to convert the totals to the different unit. The Total Conversion factor affects the net, accumulated, and gross totals and is limited between 0.01 and 2000.

For Example

If the Rate is required in gallons per minute:

1. The Scaling Factor would be set to pulses per gallon
2. The timebase would be set to minutes

If the Totals are required in barrels:

3. The Total Conversion factor is set to 42 (there are 42 gallons in a barrel). All totals, including the Batch Quantity and Batch Total, will now be in barrels.

Some common units are given below together with the Total Conversion constant (TOTCON) which should be set.

Rate*	Totals	TOTCON
Gallons (US)/	Barrels (oil)	42.00
Liters/	Kiloliters	1000
ml/	Liters	1000
Mgallons/	Acre-feet	0.32587

* Units per second, minute, hour or day. The timebase is set separately during configuration.

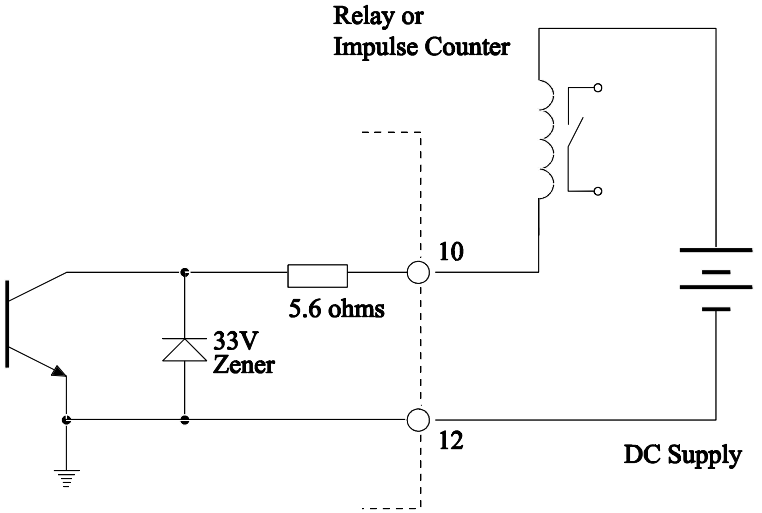
3.4 The Output Pulse

An **OUTPUT PULSE** is available on terminal 10 for driving remote counters and produces a pulse each time the Accumulated Total increments by one digit. For example, if the Accumulated Total has a resolution of 0.01 gallons, a pulse is produced each 0.01 gallons.

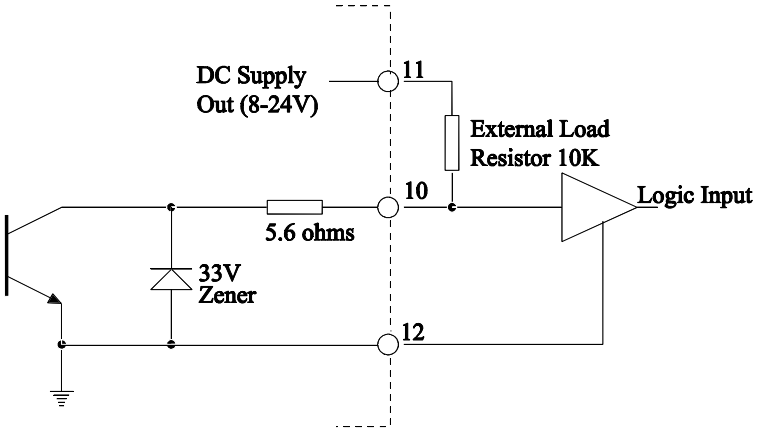
The pulse is a current sinking pulse of approximately 10msec produced by an open collector transistor and can sink up to 100mA. The maximum pulse rate is limited to 49 pulses per second and the resolution on the Accumulated Total must be set so that the Accumulated Total increments at less than 49 counts per second.

Note that due to the uneven pulse output spacing on this output, the pulse output cannot be used to drive rate indicators.

Connection of the Output Pulse is as follows:



Driving an External Relay or Impulse Counter



Driving a Logic Input such as a PLC or Electronic Counter

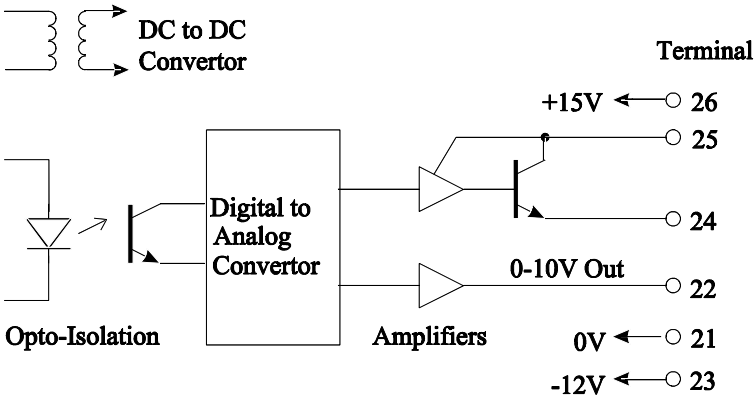
4. Options

4.1 The 4-20mA Output Option

The 4-20mA output option provides an analog output of RATE as either a 4-20mA current or a 0-10 Volt level. All output signals are electrically isolated from the instrument power supply and signal inputs to ensure minimum interference. The 4-20mA is directly proportional to the displayed rate.

Either 2 wire current transmission is available with the loop powered internally or 3 wire transmission from an external loop supply.

A block diagram of the output is shown below and various methods of interconnection are outlined on the following pages.



4.1.1 Load Specification

Maximum load which the output can drive:

Internally powered loop: 500 ohms
Externally powered: R = (V-5)/0.02
where V is the external loop voltage
R is the maximum load in ohms.

Output impedance of 0-10 Volt source: 100 ohms

4.1.2 Calculation

Parameters relating to this option are configured when calibrating the instrument (see Section 5) and provide for:

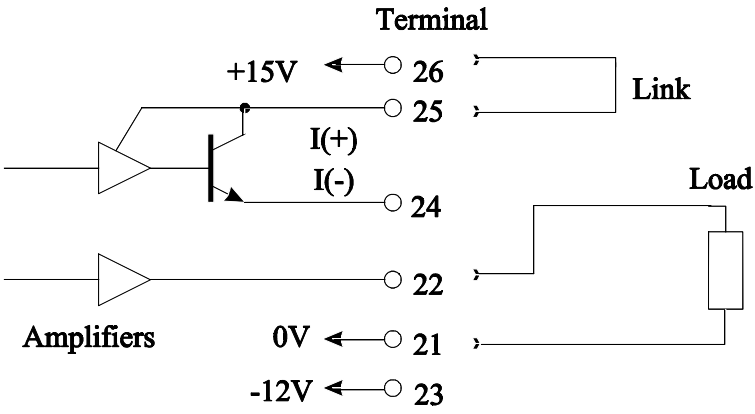
- Defining the rate which is equivalent to 4mA or 0 volts.
- Defining the rate which is equivalent to 20mA or 10 volts.
- Selecting the output range as 4-20mA (which also gives 2-10 volts on the voltage output circuit) or as 0-10 volts (which gives 0-20mA on the current output circuit).

By being independently able to set the output range, the instrument can effectively be programmed to amplify the input signal. In driving chart recorders, for example, this enables the output to zoom in on a particular operating area, instead of having to display the full operating range of the transducer.

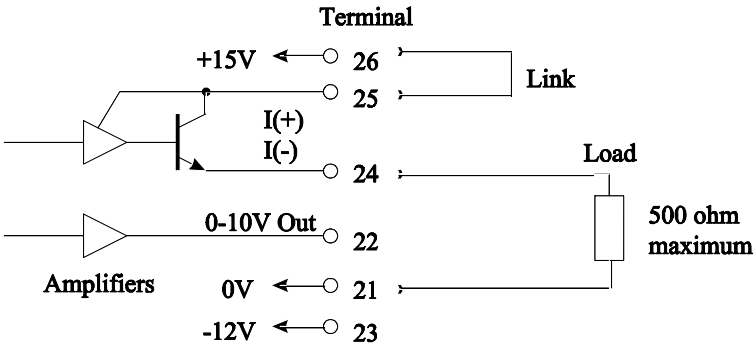
For example, 4mA may be set as 0 gallons/min and 20mA as 100 gallon/min. However, the user could set 4mA as representing 100 gallons/min and 20mA as representing 120 gallons/min.

For rates or displayed values above and below the maximum and minimum values the output will remain at its 20mA or 4mA level respectively.

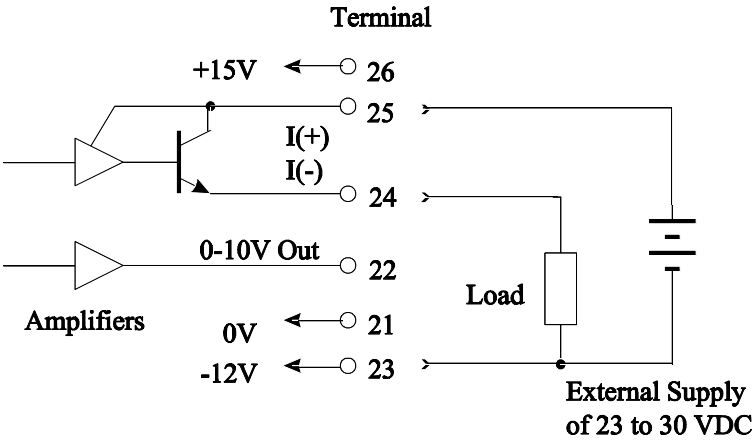
It should be noted that the output will be updated every 0.25 seconds in unison with the display and, between updates, the output value is constant .



Voltage Output Configurations



Two Wire Transmission (Internal Supply)



Three Wire Transmission (External Supply)

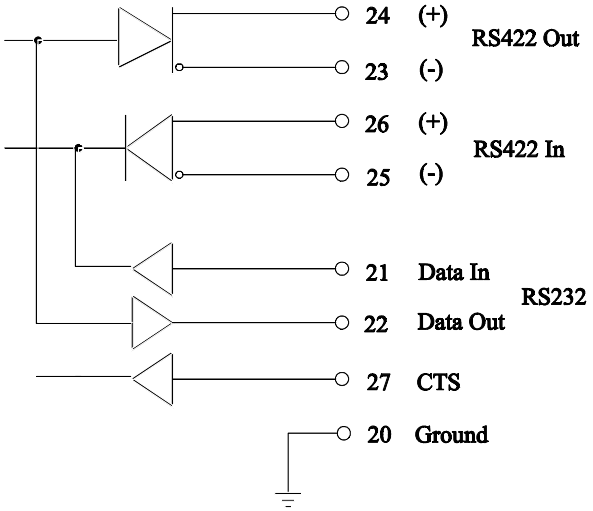
4.2 The RS232/422/485 Interface Option

With this option installed, the circuits for both the RS232 and RS422/485 interfaces are provided as standard. They can be used to interface to both printers and computers. A number of standard printer protocols are built into the instrument.

4.2.1 Hardware

The following diagram provides an overview of the RS232/RS422/RS485 communications hardware. All three interfaces are available on the rear terminal strips and the user can select either one by making the appropriate connections.

The RS232 interface is primarily used with printers or for simple communication with a computer over a short distance. The RS422 and RS485 interfaces are used for communication over a long distance or in applications requiring multipoint communication.



4.2.2 Multipoint Communication

Multipoint Communication is a system whereby a number of instruments can be addressed over a dual twisted pair interface. Up to 32 instruments can be connected to a common bus using the RS422 and RS485 interfaces as shown below.

To convert the RS422 interface to an RS485 interface, the RS422 (-) Data In Terminal must be connected to the RS422 (-) Data Out Terminal and the RS422 (+) Data In Terminal must be connected to the RS422 (+) Data Out Terminal. These connections will convert the RS422 4 wire interface to the RS485 2 wire interface, as shown in Figure 2.

Each instrument can be configured with a unique address which is used by the Master Controller (e.g., an IBM/PC) to identify each instrument. The Controller will send the address down the line and will alert the relevant instrument. Subsequent software protocol will control the flow of data between the Controller and the Instrument.

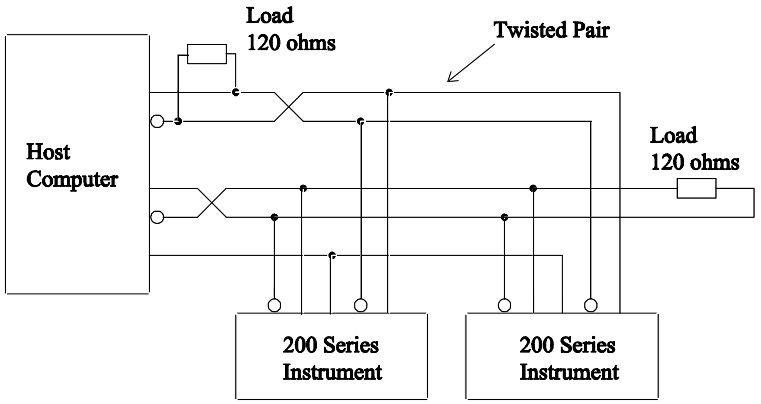


Figure 1 RS422 Interface

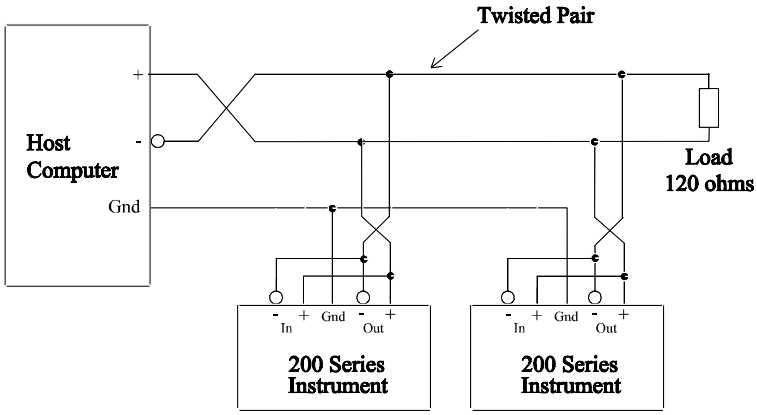


Figure 2 RS485 Interface

4.2.3 Communication Protocol

The RS232/422/485 option has a real time clock and enables the time and date to be set and printed on tickets. The date format can be European (day/month/year) or USA (month/day/year) while the time is on a 24 hour clock.

Note that the clock will only retain its time for 3 days (minimum) if there is no power connected to the instrument. After this period, the clock may need to be reset.

The baud rate, parity, and word length can be selected during configuration and the user must ensure that these correspond to the setting on the printer or computer with which the instrument is communicating.

The software protocols can be selected during configuration to provide standard interfaces to a number of printers and computers. Since other interfaces will continue to be added, the user should consult the factory for the latest protocols and/or printer drivers.

Printer

A ticket is printed each time the RESET key is pressed. The instrument prints the ticket before resetting the resettable total. Protocols are provided to drive the following printers:

1 Standard Computer Printer (Note that the printer must have an RS232 Serial Interface)
2 EPSON CTM290 Slip Printer
3 Contrec Model 624
4 EPSON TM290-2 Slip Printer
5 Contrec Model 632-2
6 Syntest SP-210

Consult with the factory if any other printer is to be interfaced with the instrument.

The tickets can also be printed with a number of different units of measure including liters and gallons. The units of measure are selectable from a pre-programmed list.

A CTS input is provided and prevents the instrument from transmitting any further characters to a printer if the printer buffer is full. The CTS

input is usually connected to the "Data Buffer Full" output from the printer.

If the printer buffer is large enough to handle the message output from the instrument, then this input need not be used and should be left unconnected.

Computer

The instrument receives and transmits messages in ASCII with all command strings to the instrument terminated by a carriage return. While replies from the instrument are terminated with a carriage return and a line feed.

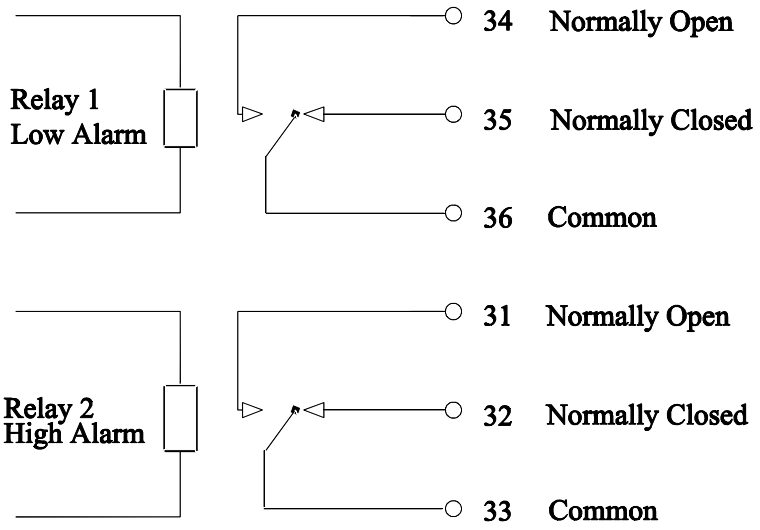
Xon/Xoff protocol is also supported and the instrument will automatically determine if the message sent by the host computer is preceded by an Xoff character. If it does recognize an Xoff as the first character of a command string, the instrument will automatically switch to the Xoff/Xon protocol beginning and ending all messages with Xoff and Xon characters respectively. Xoff/Xon protocol is only available when the RS232 interface is selected.

During configuration, the instrument can be configured to operate in a full duplex or half duplex transmission mode. In full duplex mode, all commands sent to the instrument are echoed back to the host computer. In half duplex, the commands are not echoed.

4.3 The Relay Output Option

The Relay output option consists of two Form C relays which can be preset during configuration to energize when the rate or displayed value exceeds or drops below the preset values.

The "low" relay is energized whenever the rate is below the preset value, and the "high" relay is energized whenever the rate exceeds the preset value. The preset values are programmed during configuration as described in section 5.



5. Configuration

The Configuration process enables the Setup Parameters to be configured, as well as enabling the input signals to be checked.

The configuration process can be entered in one of two ways:

1. By connecting a wire link (or switch) to the rear terminal strip across terminals 1 and 2
2. By pressing the TOTAL key and while holding, pressing the RESET key. Both keys must then be held for approximately 6 seconds. This second method of access can be disabled during the configuration so that it is only possible to enter the configuration process via the link across terminals 1 and 2.

The key switch actions are during Configuration are as follows:

RATE	changes a flashing digit to the next digit.
TOTAL	increments a flashing digit or changes a parameter selection.
RESET	resets a flashing digit to zero.
DISPLAY	steps through the configuration sequences.

Note that the arrows in the RATE and TOTAL key switches indicate that these switches can be used to change and increment digits respectively.

In stepping through the configuration sequence, the Parameter Description is always displayed first followed by the actual value or parameter. When a value or parameter can be changed, it is always shown as flashing and the LED's in the switch panels are lit if that key switch can be used to change a value.

On first entering the Configuration routine, the display will show:

CAL	Setup Program parameters
Option	Options (if installed)
Test	Check Input Signals
End	Exit to Normal Operation

The user can toggle between these modes using the TOTAL key and by using the DISPLAY key select the appropriate mode.

To exit Configuration, step through the Setup program or Test program until the end and press the DISPLAY key when **End** is displayed (ensure the configuration link is removed).

5.1 Configuring the Setup Parameters

Step	*Display*	*Description*	*Text Ref*
1	***CAL***	Setup Program Parameters	
	OPTION	Options (if installed)	5.2
	TEST	Check Input Signals	5.3
	END	Exit to normal operation	
	*The following steps are displayed when **CAL** is selected.*		
2	***RESTOT***	Reset all totals to zero. To clear all totals (resettable and accumulated) press the RESET key once.	
3	***SCALE***	Scaling Factor.	
	Fact	Enter the Scaling factor (K-factor) of the flowmeter.	3.2
4	***F dPt***	Number of decimal points which the Rate is to be displayed between 0 to 0.00000.	
5	***t.base***	The Timebase which the Rate is calculated must be entered as:	3.2.1
	60secs	units/min	
	hours	units/hour	
	days	units/day	
	secs	units/second	
6	***FILTER***	The filter constant for filtering the Rate display.	3.2.2
	1 to 99	No filtering. Very heavy filtering.	
7	***TOTCON***	A division factor to convert the totals to different units from those used for rate (e.g., gallons/min and barrels).	3.30
	1	Rate and Totals have the same engineering units.	
	x.xxxx	Other factors can be programmed between 0.01 and 2000.	
8	***t.dPt***	Number of decimal points which the resettable Total is displayed between 0 to 0.000.	

Step	*Display*	*Description*	*Text Ref*
9	***A.dPt***	Number of decimal points which the Accumulated (non resettable) total is displayed between 0 to 0.000.	
10	***ACCESS***	Enable access to configuration routine via the front keyboard only.	
	Front	Enable access via front keyboard.	
	No Acc	Disable access via front keyboard.	

5.2 Configuring the Options

Step	*Display*	*Description*	*Text Ref*
1	***OPTION***	Options (if installed)	
	TEST	Check Input Signals	5.3
	END	Exit to normal operation	
	CAL	Setup Program Parameters	5.1
	If the 4-20mA option is installed, the following will be displayed:		
2	***OUTPUT***	Select output option.	4.1
	4-20	4-20mA (also 2-10 volts).	
	0-10	0-10 volt (also 0-20mA).	
3	***OP 4***	Flowrate at 4mA or 0 volt	
	xxxx		
4	***OP20***	Flowrate at 20mA or 10 volt	
	xxxx		
	If the RS232/422/485 option is installed, the following will be displayed:		
5	***DF***	Date Format.	4.2.3
	Eur	European (i.e., days/months/years).	
	USA	USA (i.e., months/days/years).	
6	***Date***	Enter date as:	
	xx:xx:xx	Years:Months:Days.	
7	***HOUR***	Enter time as a 24 hour clock.	4.2.3
	xx:xx	Hours:Minutes.	
8	***BAUD***	Baudrate	
	xxxx	300, 600, 1200, 2400, 4800, or 9600	
9	***DATA***	Word length.	
	7	7 bits	
	8	8 bits	
10	***PARITY***	Parity.	
	NP	No Parity	
	OP	Odd Parity	
	EP	Even Parity.	
11	***SIGNAL***	Signal Type.	
	rs232	RS232	
	rs422	RS422/RS485	

Step	*Display*	*Description*	*Text Ref*
12	***ID NO***	Unit Identification Number	
	0	None	
	1 - 99	Id Number.	
13	***PTYPE xx***	Printer/Computer Type.	
	00	Standard Computer Printer	
	01	EPSON CTM 290 Slip Printer	
	02	Contrec Model 624 Printer	
	03	EPSON TM290-2 Slip Printer	
	04	Contrec Model 632-2 Printer	
	05	Syntest SP-210 Printer	
	20	Computer	
	If a Printer Protocol is selected, the following message is displayed:		
14	***UNIT xx***	Units of measurement printed.	
	00	None	
	01	Liters (Ltrs).	
	02	Gallons (Gals)	
	03	Barrels (bbls)	
	04	Pounds (lbs)	
	05	Grams (gms)	
	06	Kilograms (kgs)	
	07	Tons (tons)	
	If a Computer Protocol is selected, the following message is displayed:		
14	***ECHO***	ECHO Commands.	
	On	Echo (Full Duplex)	
	Off	No Echo (Half Duplex)	
	If the relay option is installed, the following is displayed:		
15	***AL: Hi***	High Alarm switch point. The high relay energizes when the flowrate exceeds this value.	4.3
	xxxxxx		
16	***AL: Lo***	Low Alarm switch point. The low relay energizes when the flowrate fall below this value.	4.3
	xxxxxx		

5.3 Checking the Input Signal

Step	*Display*	*Description*	*Text Ref*
1	***TEST***	Check Input Signals	
	END	Exit to normal operation	
	CAL	Setup Program Parameters	5.1
	OPTION	Options (if installed)	5.2
	*The following steps are displayed when **TEST** is selected.*		
2	***Sr x.xx***	Software revision number.	
3	***Freq***	Displayed for 1 second followed by the actual frequency.	
	xxxx.x	Frequency in Hz.	
	If the RS232/422/485 option is installed, the display will then show:		
4	***CLOC***	Clock.	
	xx:xx:xx	Time in Hours:Mins:Sec.	

6. Input Circuits

This section covers the connection of flowmeter signals for the Model 205D Series Flow Computers.

The 205D Series has a regulated power supply output which can be used to power sensors. A trimpot on the rear of the instrument allows the voltage to be adjusted in the range of 8-24 Volts and the output can supply a maximum of 50mA.

6.1 Input Circuit for the 205D Series

The 205D Series has an input conditioning card which will accept signals from most pulse or frequency producing flowmeters. An 8 position DIP switch on the rear panel enables the input circuit to be configured for different signal types.

The input will interface directly to:

- Turbine Flowmeters
- Open Collector Outputs
- Reed Switches
- Logic Signals

The following pages give examples of the interconnection to various signal outputs and a circuit diagram of the input is also provided.

Switch Settings

The following switch settings are recommended for different input signal types.

Input Signal Type	Input Terminals		Switch Settings							
	CH1									
	(+)	(-)	1	2	3	4	5	6	7	8
a. Logic Signal, CMOS, Pulse	9	8	off	off	off	off	on	off	off	off
b. Open Collector or Reed switch	9	8	off	off	off	off	on	off	on	off
c. Namur Proximity (set DC out to 8 volts)	11	9	off	off	on	on	on	off	off	off
d. Switch or Reed Switch with debounce circuit (200Hz max)	9	8	off	off	off	off	on	off	on	on
e. Coil (20mV P-P minimum)	9	8	off	on	off	off	off	off	off	off
f.. Coil (low Impedance; 22mV pp minimum)	9	8	on	on	off	off	off	off	off	off

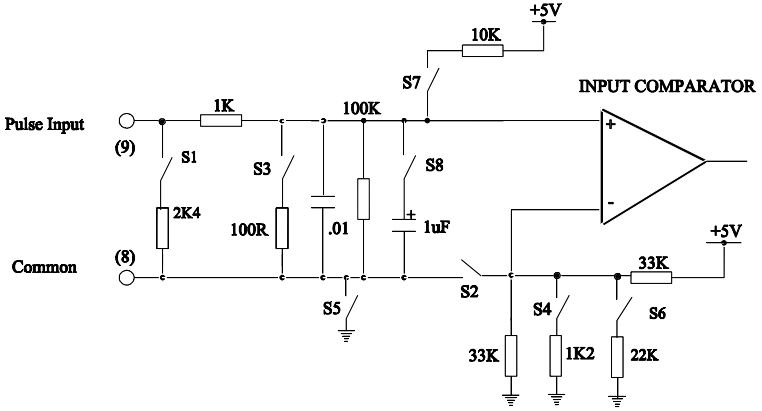
General Specification

Switching Threshold: 2.5 Volts (except for input type c, e, and f)

Maximum Input Voltage: 50V peak

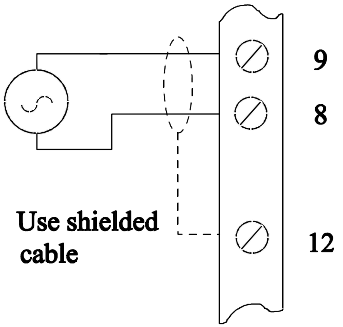
Input Impedance:

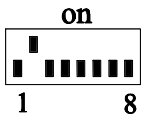
Input type a:	100K
Input types b & d:	10K
Input type c:	1K
Input type e:	100K
Input type f:	2.4K



The Frequency Input Circuit

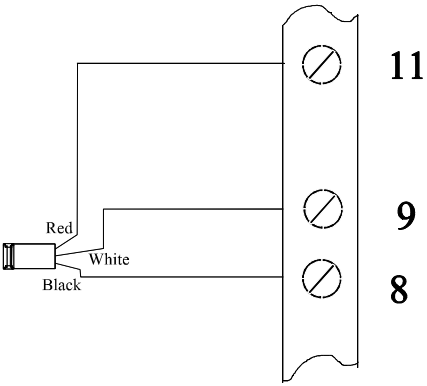
1. MAG Coil

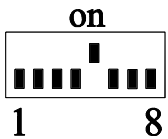




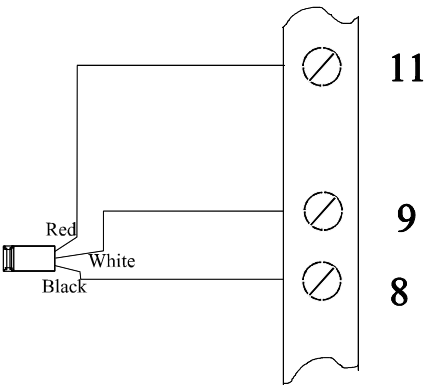
e.g., millivolt signal
from a turbine flowmeter
(single input only)

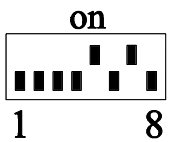
2. Redi-Pulse, CMOS or Pulse



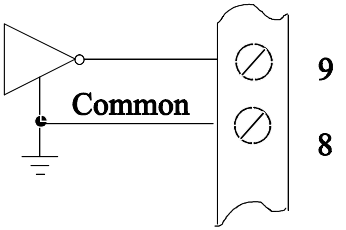


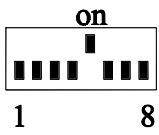
3. Redi-Pulse, Open Collector





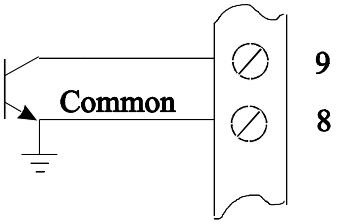
4. Squarewave, CMOS or Pulse

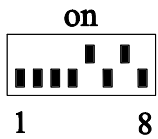




e.g., vortex, pre-amplifiers or magnetic flowmeters

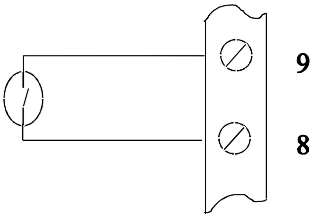
5. Open-Collector

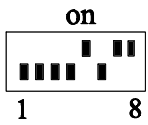




e.g., hall effect sensor

6. Reed Switch



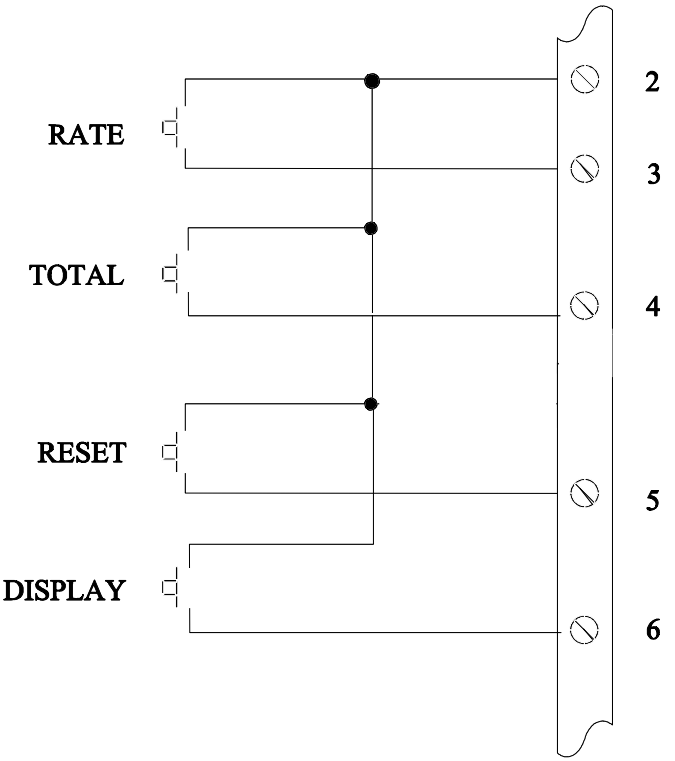


e.g., positive displacement flowmeters with reed switch output

6.2 Remote Key Switches

Remote push-buttons can be connected to the Model 205D-1 to duplicate the keys on the front panel.

The switches are wired as follows:



7. Installation

7.1 General

Terminal designations for the Model 205D Flow Computer are given on the following pages. The cutout hole in the panel should be 5.5" (139mm) wide x 2.6" (67mm) high. Two side clips are supplied to secure the instrument into the panel.

A case grounding point is provided via a ground lug on the side of the case. Note that this grounding point is for the case only and there is complete electrical isolation between this point and all electronic circuits. For EMC purposes or when the instrument is connected to AC power source, this point must be connected to a good earth ground using a multi-stranded, braided wire or strap. All relay options are totally isolated from the case and from the internal circuitry.

A Supply Output Voltage is provided to power sensors. This output will provide a regulated voltage of 8 to 24 volts and the voltage is adjustable by means of the potentiometer on the rear panel. Maximum current is 50mA and the instrument comes with the voltage factory set at 24 Volts, unless specified otherwise. When the instrument is powered from a DC power source, the maximum output voltage on the Supply Output is the DC Input Voltage less 3.5 volts.

The instrument will operate from either 12-28 volts DC or from the AC line. The AC voltage is factory set to either 95 - 135 VAC (110 VAC nominal) or 190 - 260 VAC (220 VAC nominal). An internal AC transformer provides full isolation between the AC line and the electronic circuits.

The DC Ground terminal 12 provides a common ground for the 12-28 Volt power input, the 8 - 24 Volt output, and the pulse output.

It is good practice to use shielded cables for all signal connections to the instrument. Care must be taken to separate signal cables from power cables so as to minimize interference. Overall shields should be connected to the case earth at the instrument end only. This connection should be as short as possible and connected to the grounding lug on the side of the case.

In order to comply with the requirements for Electromagnetic Compatibility as per EMC-Directive 89/336/EEC of the Council of European Community, this wiring practice is mandatory.

Although it is also possible to connect shields to the signal ground (terminal 2) this practice is not in accordance with EMC directives.

RC Networks for Interference Suppression

When driving highly inductive loads with the control relays, it is recommended that RC suppression networks (often called "Snubbers") are used for two reasons:

- To limit the amount of electrical noise caused by arcing across the relay contacts which may, in extreme cases, cause the microprocessor to act erratically.
- To protect the relay contacts against premature wear through pitting.

RC suppression networks consist of a capacitor and series resistor and are commonly available in the electrical industry. The values of R and C are dependant entirely on the load. However, if the user is unsure of the type of snubber to use, values of 0.25µF and 100 ohms will usually suffice. Note that only AC voltage approved RC suppression networks should be used.

The basic principle of operation is that the capacitor prevents a series of sparks from arcing across the contact as the contact breaks. The series resistor limits the current through the contact when the contact first makes

7.2 Terminal Wiring Designations

Terminal	*Description*
1	Configuration Link
2	Signal Ground
3	Remote RATE Switch
4	Remote TOTAL Switch
5	Remote RESET Switch
6	Remote PROGRAM Switch
7	Not Used
8	Flow Common (-)
9	Flow Pulse Input
10	Pulse Out
11	DC Power Out (8-24 VDC)
12	DC Ground (-)
13	DC Power Input (+)
14	Not Used

Terminal	*Analog Output Option*	*RS232/422/485 Option*
20	Not Used	RS232 Signal Ground
21	0 Volts	RS232 Data in
22	0-10 Volts	RS232 Data Out
23	-12 Volts	RS422/485 (-) Data Out
24	I(-)	RS422/485 (+) Data Out
25	I(+)	RS422/485 (-) Data In
26	+15 Volts	RS422/485 (+) Data In
27	Not Used	RS232 CTS

Terminal	*Relay Option*
31	Relay 2 - Normally Open
32	Relay 2 - Normally Closed
33	Relay 2 - Common
34	Relay 1 - Normally Open
35	Relay 1 - Normally Closed
36	Relay 1 - Common

8. Trouble Shooting

8.1 Error Codes

The instrument has extensive self test facilities and will display an error code if it detects an invalid condition. If the instrument displays an error code other than those listed below, please contact the factory.

Error codes are displayed as "Err ##" and a list of the commonly encountered codes are given below:

Input Errors

11 Invalid input configuration programmed.
14 Communications Input error (RS232/422/485 interface).

Output Errors

21 Invalid output configuration.
22 Communications error - Baud rate not set.
23 Communications error - Printer fault.

Configuration Errors

30 Zero Value not allowed.
33 Invalid Printer Type.
34 Invalid Volume Units selected.

.

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