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DF130-MA-ENG-1236.pdf 11/06

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Webtec Products Limited

DF130 Series
Pulse Input

Flow Rate
Flow Totalizers
Flow Batch Controls

www.webtec.co.uk

Installation and Operation

System Calibration

Customer: _____ WI Control #: _____

Customer Order #: _____ Calibration Date:_____

Order Date:_____ Calibration By:_____

Voltage: AC DC (strike one) Fluid: DTE 24, 150 SUS, 30 cST @ 100 °F

Readout Model #: DF130-_____ Serial #:_____

Flow Meter Model #:_____ Serial #: _____

Flow Meter Range: _____ Recommended K Factor _____ PPL

OPTIONAL OUTPUT SETTINGS

Analog Output Settings:

Low: _____ = _____

High:_____ = _____

Relay / Alarm Settings:

Hysteresis:_____

Relay #1 Low: _____ = _____

High:_____ = _____

Relay #2 Low: _____ = _____

High:_____ = _____

RS485 Settings

Address: _____ (00-99)

Baud Rate: 1200, 2400, 4800, 9600, 19200

Parity: Even, Odd, None

INTRODUCTION / DESCRIPTION

This manual describes the installation of Webster Series DF130. Because of unique features, these rate meters / counters may be used in a variety of applications. However, they are intended for use with our LT series pulsed output flowmeters; this manual will focus on their use in flow applications. When ordered as a set (DF130-LTXXX) the DF130 is supplied factory calibrated to the LT series flowmeter. No programming on your part is required.

This manual starts with a general description of flow applications and the DF130. This should provide a useful reference point for the installer. Installers are the unsung heroes of industry who laugh in the face of the three most-feared words in the English language: Some Assembly Required. Installers are often given a vague objective and some equipment; in this case pipe, valves, a flowmeter, and a counter, with which to accomplish the mission. It is then up to the installer to use his knowledge and ingenuity to make the system work.

The installation section of this manual follows the description. This provides detailed information on mounting, wiring, and programming the DF130 readout. The installation section uses terms that were explained in the description. Installation is normally the most complex aspect of the DF130, therefore the installation section is the largest section of this manual. The bad news is that the DF130 is very versatile, and through wiring and programming variations, can solve a variety of applications. The manual must document all the possibilities. The good news is that most flow applications will not require all of the wiring and programming choices that are possible with the DF130. The key for the installer is to know what must be accomplished and to know what is in the DF130 with which to do it.

There are three final sections in this manual. Run mode describes the operator functions of the DF130. Diagnostics explains the self diagnostics and error messages that may appear on the display. The last section is specifications.

Description

Forty (40) model variations of the DF130 are covered by this manual. The DF130 is either AC powered or DC powered. It consists of a base unit rate meter with 8 possible combinations of optional outputs, or a base unit totalizer or batch control with 12 possible combinations of optional outputs. While reading this description, it is important to remember two things. First, all models display flow rate. Second, the batch control, known simply as the “batcher” does all of the functions of the totalizer. Check the part number breakdown chart on the next page to determine what your unit is made up of. Read the description section(s) to identify how those functions will be used in your particular application.

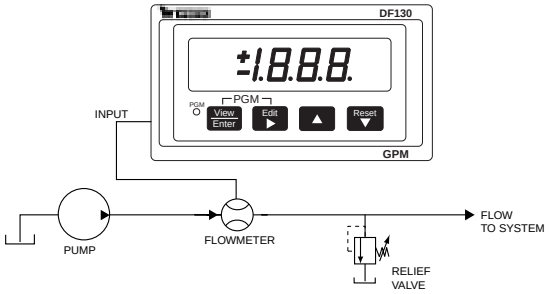
DESCRIPTION cont.

D F 1 3 0 - X X - X X

OUTPUT OPTIONS	POWER SUPPLY
S = Standard (No Options)	DC = 9-30 VDC
R = Dual Relay (5A Form C)	AC = 100-230 VAC
A = Analog (4-20 mA & 0-10V simultaneous)	
C = RS485	

Base Unit

A **ratemeter** is basically a counter that counts input pulses and scales the input to a predefined time interval. The DF130 can answer the question “how fast?”. When calibrated as a totalizer the DF130 can also answer the question “how much?”. A typical application for a rate meter would be monitoring the output of a pump as illustrated below. This flow causes the flowmeter to generate electrical pulses, sending it to the ratemeter.
As a totalizer the DF130 accumulates pulses and displays total flow in gallons. All



flowmeters are not created equal. Even though two flowmeters may be the same model number, they probably put out a slightly different number of pulses per unit volume (ie gallon or liter). Each flowmeter is calibrated at our factory after it is assembled. The actual number of pulses that the flowmeter puts out per gallon (or pound, or liter, etc.) is known as the K factor, and is stamped on the flowmeter’s label. Webster Instruments uses Pulses per Liter (PPL) as the standard unit for flowmeter K factors. A simple conversion to Pulses per Gallon (PPG) is accomplised by multiplying the PPL by a factor of 3.785. See table XX, page XX for a listing of nominal K factor values for different LT series models. The DF130 does the arithmetic to convert pulses into familiar units of measure such as GPM or not so familiar units such as IPM (inches per minute if stroke of a cylinder needs to be monitored.

WARRANTY

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In the construction of the control described herein, the full intent of the specifications will be met. Webtec Products, however reserves the right to make, from time to time and without proper written notice, such departures from the detail specifications as may be required to permit improvements in the design of the product.

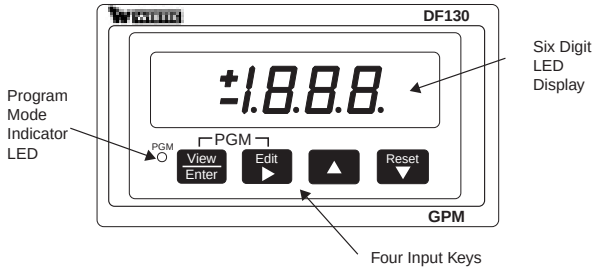
The information included herein is believed to be accurate and reliable; however no responsibility is assumed by Webtec Products, for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

This equipment is capable of generating radio frequency energy. If not installed and used in accordance with the instructions, this unit may interfere with radio communications.

NOTES

DESCRIPTION cont.

Once installed, normally only the front panel of the DF130 totalizer will be visible. It will look like this



The LED display dominates the front panel. The operator will view the rate and / or total on this display. In totalizing applications, six digits (up to 999,999) is often not adequate. The specifier has three options in this case, all available through programming.

1. The factory (or installer) can program the DF130 to divide the total by 10 (display up to 999,999 tens of gallons).
2. The DF130 can divide by 100 (display up to 999,999 hundreds of gallons).
3. The DF130 can display a 10 digit total in the form of the low five digits and the high five digits on successive screens.

The display also is used to display programming menus and values.

The four input keys will be used primarily by the factory for programming purposes, but the operator can use them also for changing the display screen from rate to total, for example. The reset key is programmable. For the base unit, the reset key does nothing for the operator, it can be programmed to reset the total count if the DF130 was ordered as a totalizer.

The program mode LED indicates when the DF130 is in the program mode.

The DF130 base unit has no control circuitry. A control input board can be ordered that allows external switches to reset the total and to lock out the program mode from the operator. These inputs may also perform other functions if the relay option board is installed.

Relay Output Option Board

A dual relay output board is available for the DF130, indicated by the sixth digit of the part number as R (DF130-RA-AC).

Either relay output can be programmed to perform one of the following functions:

1. Totalizer setpoint. This option is not available if the totalizer is programmed to 10 digit total. Turns ON when the totalizer counts to a number greater than or equal to the totalizer preset value. Turns OFF either after a programmable time in the range of 0.01 to 99.99 seconds elapses, or after an unlatch input occurs. If the output is programmed to latch (no timeout), the output will be checked at each input pulse until an unlatch input occurs, even after power has been cycled OFF and then ON to the unit.

2. Rate low setpoint. Turns ON when the rate is less than or equal to the rate low setpoint. However, from a start condition (power up for the totalizer; batch start for the batcher), the rate reading must first become greater than or equal to the rate low setpoint before this alarm feature is enabled. Turns OFF after a programmed timeout in the range of 0.01 to 99.99 seconds, or when an unlatch input occurs, or when the rate becomes greater than the setpoint (follows mode). This output is updated each time the rate display updates.

3. Rate high setpoint. Turns ON when the rate is greater than or equal to the rate high setpoint. Turns OFF after a programmed timeout, or when an unlatch input occurs, or when the rate becomes less than the setpoint (follows mode).

4. Rate low-high setpoint. Turns ON when the rate is less than or equal to the rate low setpoint, OR is greater than or equal to the rate high setpoint. If the rate low setpoint is greater than the rate high setpoint, the output will be ON when the rate is greater than the rate high setpoint AND less than the rate low setpoint. Follows mode only.

5. Totalizer pulse output. Puts out a timed pulse for each totalizer count. This signal is intended to go to a remote totalizer. The pulse width ON time is selectable to be either 500 +/- 84 msec, 2 msec, or 50 msec. The minimum OFF time is the same as the ON time. Regardless of the totalizer display mode selected for the Eclipse (i.e. divide by 1, 10, or 100), the totalizer pulse output operates in the divide by 1 mode. The totalizer pulse output has a 9,999 count register. Because of the nature of this output, it is recommended that a transistor output be used for this function.

RELAY / TRANSISTOR OUTPUTS (standard on batch controls, optional on totalizers)

Number:	2 relays or 1 relay and 1 transistor
Relay Contact Type:	1 set form C per relay
Relay Contact Rating:	5A, 250 VAC or 30 VDC
Transistor Type:	NPN, Opto Isolated
OFF State Block:	30 VDC max., 0.1 mA max. leakage current
ON State Conduct:	50 mA max., 1.2 VDC max. C-E drop
Max. Switching Frequency:	4 kHz (50-50 duty cycle)
Isolation dielectric strength:	2300 VAC

OPTIONAL OUTPUTS

Analog Retransmission

Output signals:	4-20 mA (<750 W) and 0-10 V (>2500 W)
Accuracy:	0.13% full scale and 100 PPM /°C (and 0.07% full scale change over 4-20 mA load ranges
Isolation dielectric strength:	2300 VAC to signal inputs, relays, and AC power inputs, 500 VAC to analog outputs and DC power inputs

RS 485 Serial Communications

Baud Rate:	1200, 2400, 4800, 9600, or 19,200, programmable
Parity:	Even, odd, or no parity
Address Range:	00 to 99 decimal (00 indicates offline)
Protocol:	Opto 22® compatible
Isolation Dielectric Strength:	2300 VAC to signal inputs, relays, and AC power inputs, 500 VAC to analog outputs and DC power inputs

ENVIRONMENTAL

Operating Environment:		Indoor use to 2000 meters
Temperature:	Operating:	0 to 50°C
	Storage:	-20 to 70°C
Humidity:	0 to 85% RH, non-condensing	
Vibration:	2.5 g's, 30 to 200 Hz	
Shock:	30 g's, 11 msec half sinewave	
EMC:	Immunity to EN 50082-2 (Heavy Industrial) Emissions to EN 50081-2 (Heavy Industrial)	
Front Panel:	NEMA 4X when mounted with gasket provided	
Agency Approval:	UL, cUL listed, CE marked CE EMC immunity and emissions requirements were met using shielded wiring on the RS-485, analog output, and pulse input/ power lines. The shields were connected to earth ground at the Eclipse end of the shields.	
Polution Degree 2	Overvoltage category II	

SPECIFICATIONS

MECHANICAL

Cutout Dimensions: 3.62" W x 1.77" H (92mm x 45mm) DIN standard
Outline Dimensions: 4.04" W x 2.19" H x 3.87" D (103mm x 56mm x 98mm)
3.60" (92mm) maximum depth in panel
Enclosure: Plastic with polyester front label
Connectors: Up to six de-pluggable terminal blocks

INPUT POWER

AC Powered Models (DF130-XX-AC)
Input Power: 85-265 VAC, 47-63 Hz, 20 VA
External Fuse: 0.2A, 250 VAC, Time Delay (T200mA, 250V)
Isolation Dielectric Strength: 2300 VAC

DC Powered Models (57750-4XX)
Input Power: 9-30 VDC, 12 VA
External Fuse: 2.0A, 50 VDC, Time Delay (T2A, 50V)
Reverse Voltage Protection: Yes
Isolation Dielectric Strength: 2300 VAC to signal inputs and relays, 500 VAC to RS 485 and analog outputs

HUMAN INTERFACE

Display: 6 digits
Type: .56" high, seven segment, red LED

DATA RETENTION

Memory Type: EEPROM, no batteries required
Duration: 100 years

COUNT SIGNAL INPUT / COUNT INHIBIT SIGNAL INPUT

Sensor Type: Sink or source, DIP switch selectable
Input Impedance: 4.75 k ohms to +5 VDC or 34.9 k Ohms to ground
Thresholds: High 3.5 to 28 VDC, low 0 to 1.9 VDC, for single ended signals
Magnetic Pickup Range: 50 mV p-p to 65 VRMS into 34.9 k Ohms
Slow Response: 50 Hz max. (DIP switch 2 and/or 5 ON)
Fast Response: 10 kHz

CONTROL INPUTS

Sensor Type: Sink only
Input Impedance: 4.75 k ohms to +5 VDC
Threshholds: High 3.5 to 28 VDC, low 0 to 1.0 VDC
Response: 25 msec maximum (5V signal)

ACCESSORY POWER OUTPUT

Voltage: 12 VDC +/- 12%
Current: 75 mA max.
Protection: Short circuit protected

DESCRIPTION cont.

Analog Output Option Board

Sometimes known as analog retransmission, the installer can assign the output to follow displayed rate, or total, or batch count, or cycle count. Both 4-20 mA and 0-10V outputs are available simultaneously; however they are not independently programmable. The installer programs not only the assignment, but the offset and full scale values. Both outputs follow the assigned count or rate and go from minimum value (4 mA and 0V) to maximum value (20 mA and 10V) as the displayed count or rate goes from offset value to full scale value. Both outputs are electrically isolated from all other circuitry inside the DF130.

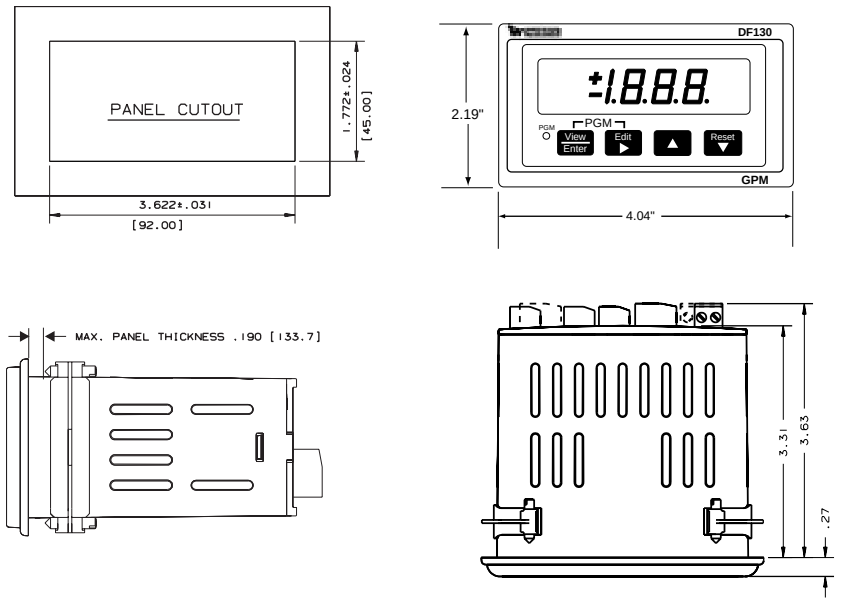
RS 485 Serial Communications Option Board

This option board allows a host device, such as a computer, to download and read programming selections, and to perform most of the run mode operator functions such as read count and rate, enter setpoints, reset counters, and start and stop batch delivery.

This manual does not contain information on the serial command protocol or the serial command list. That information is contained in the DF130 serial specification and obtainable by contacting Webster technical sales department at 800-932-8378 (US and Canada), or 414-769-6400 or by FAX at 414-769-6591.

DESCRIPTION cont.

Mounting Instructions



1. Remove mounting brakets, slide mounting gasket (not shown) over unit body until adhesive surface makes contact with the front bezel.

2. Slide unit into cutout in panel.

3. Attach mounting brakets.

4. Tighten screws until unit is firmly in place. DO NOT OVERTIGHTEN screws to the point of squeezing the gasket out from behind the bezel.

DIAGNOSTICS and ERROR MESSAGES cont.

There are four keyboard diagnostic tests, one for each key. The tests are performed by pressing each key. The unit's response is maintained as long as the key is held.

Test Key		Unit Response
View/Enter	View / Enter	Display shows software revision number
Edit/Right Arrow	Edit ▶	All display segments and the program LED will turn OFF, and the analog output will go to maximum values (20 mA and 10V).
Up Arrow	Start ▲	Each display digit will turn ON, one at a time, and relay 2 will turn ON.
Down Arrow	Stop / Reset ▼	Each display segment of all digits will turn ON, one segment at a time, and relay 1 will turn ON.

To exit the keyboard diagnostic mode, turn unit power off.

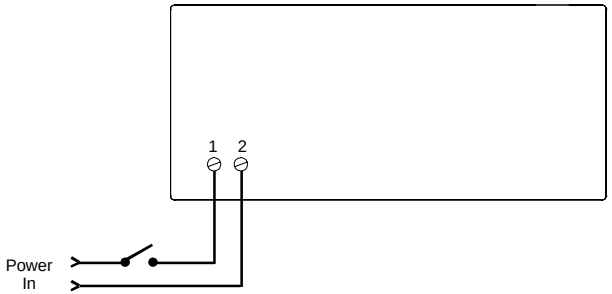
Keyboard Diagnostic Mode

The keyboard diagnostics allows the user to test each of the front panel keys, the display, and the analog and relay outputs if present in the unit.

Caution: performing the keyboard diagnostic tests will turn ON the analog and relay outputs if they are installed in the unit. Remove power from the counter and disconnect any output that should not activate its load during the diagnostic tests.

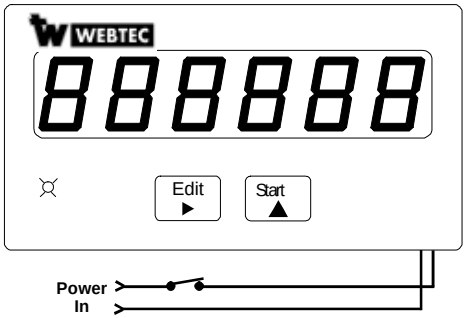
To enter the keyboard diagnostic mode,

1. Turn power to the unit OFF.



2. If any control input is programmed to a lock function, remove the jumper wire from that input to ground.

3. While holding down both the Edit ▶ and Start ▲ keys, turn unit power ON. After 1.5 seconds, the unit will be in the diagnostic mode. Release the Edit ▶ and Start ▲ keys at this time. All LED segments and the program LED will be ON. If present, both relays will be OFF, and the analog output will be at minimum values (4 mA and 0V).

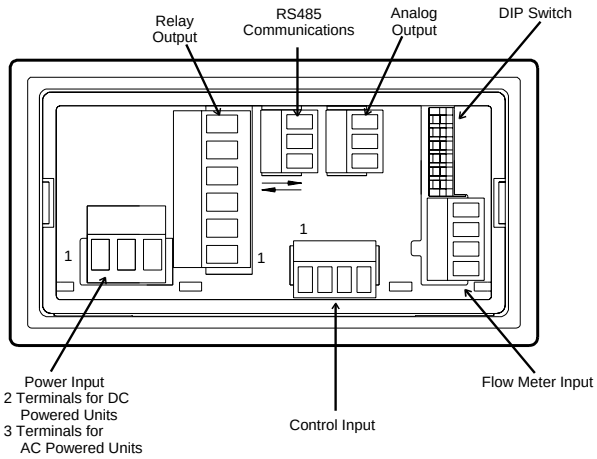


WIRING AND DIP SWITCHES

All wiring to the counter is done to rear terminal, de-pluggable connectors. Up to six headers accept the wired connectors on the counter. All units have at least three headers, power input, count input and control input. Any combination of three additional circuit boards with headers may be installed. These option boards are relay output, RS 485 serial communications and analog output. The option boards occupy specific locations in the counter and are not interchangeable. All boards are keyed to prevent installation in the wrong location.

Disconnect all power before wiring terminals. **A safety hazard exists if this precaution is not observed. Treat all control and count inputs as hazardous since they may carry line voltage.**

A switch shall be included in the building installation:
- It shall be in close proximity to the equipment and within easy reach of the operator.
- It shall be marked as the disconnecting device for the equipment.
- Switches and circuit breakers in Europe must comply with IEC 947.

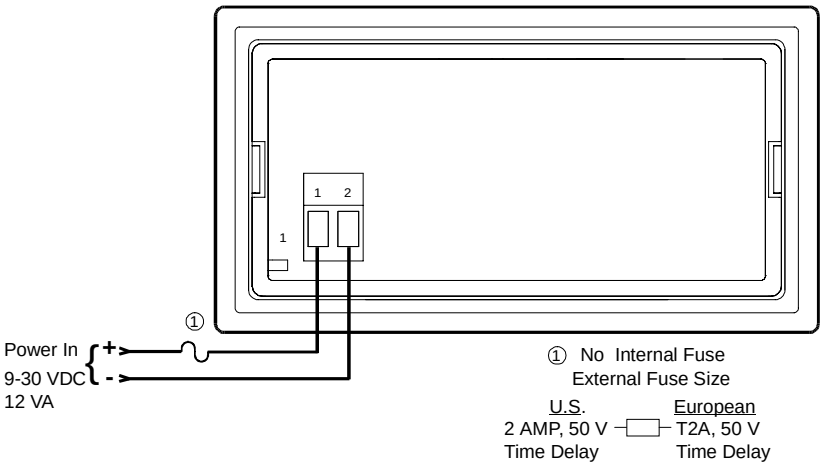


Rear Terminal Layout

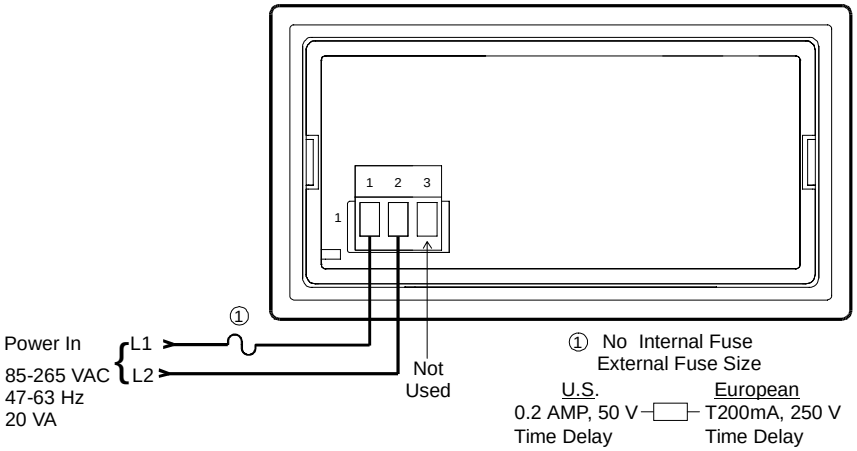
Terminal Connector Ratings

AC or DC Power Input / Relay Output: 10A, 250VAC;
Wire size: 12-24AWG (3.1mm^2 - 0.24mm^2), 600V.
RS485 / Analog Output / Flowmeter Input / Control Input: 8A, 125VAC;
Wire size: 16-28AWG (1.3mm^2 - 0.1mm^2), 300V.

DC Power Input (for DC powered models DF130-XX-DC)



AC Power Input (for AC powered models DF130-XX-AC)



dF rUn. Re-enter preset values and count factors before putting unit back in service.

There is one more error message that may occur at any time. The DF130 has an internal watchdog timer that must be reset every second. If the unit is busy handling high priority tasks, such as counting input pulses above the maximum count input speed, or if electrical noise disrupts the microprocessor, the watchdog timer may time out and the display will show:

Er doG — Watchdog timeout. Press any key to acknowledge and return the display to normal. Nothing will be defaulted, however, the user should check all run and program data to insure that nothing was corrupted.

Run Mode Five (5) Second Messages

A number of messages may appear on the run mode display every five seconds. These messages indicate that a programming error has been made, or that the count inhibit input is active, or an overflow condition occurred. In some cases, the message can be cleared by entering a setpoint. In other cases, the user must correct a change made in the program mode.

The messages and descriptions are:

Ao Er — Analog output span error. The analog output offset value is greater than the full scale value.

PUL OF — Pulse overflow. The totalizer scaled pulse output buffer has exceeded 9,999 counts.

PUL Er — Pulse error. The count factor causes more than 9,999 counts to enter the scaled pulse output buffer for each count pulse in.

b-3 Er — Error in programming block b-3. Autocycle is disabled in block b-3, but Autostop is selected in block b-4.

LA Err — Error in programming column L. An input has been programmed for Start, but no input is programmed for Stop.

Lb Err — Error in programming Column L. Opposing functions programmed. Output 2 is programmed for batch prewarn and an input is programmed to unlatch output 2.

tot 00 — Totalizer setpoint is set to zero and an output is programmed for totalizer setpoint.

Ct inH — Count inhibit input is active.

OUt Er — Output error. An output is programmed for totalizer setpoint and the totalizer is programmed to 10 digit total.

rAt Er — Rate error. The rate low setpoint is greater than the rate high setpoint.

DIAGNOSTICS and ERROR MESSAGES

This section of the manual deals with the unexpected. Normally the installer or operator will not come to these pages because the installation is working just fine. However, there may come a time when you get that feeling that the DF130 is trying to tell you something by putting up an error message on the display, or you may feel that an input key or an output is not doing what it is supposed to do. These unexpected events are what this section is all about.

Power Up Diagnostics

Each time power is applied to the DF130, it runs a series of memory tests. While these tests are being run, a lamp test is done on the display. The lamp test consists of all display segments being ON for 1 to 2 seconds.

After the lamp test, any diagnostic test failure will be indicated by an error message. If one of the following occurs,

Err 1
Err 2
Err 3

an internal RAM, ROM, or EEPROM memory device has failed and the unit should be returned to the factory for repair. These errors are not recoverable.

Additionally, four memory checksum tests are performed. A failure in any of these tests will result in an error message on the display. These errors are recoverable, however, program selections or calibration data or run data will be lost. A checksum test failure indicates that the stored data does not match the stored checksum of the date; therefore the data is invalid. The recovery process loads default data into the affected memory area. The user acknowledges the error message by pressing any key on the keypad. The DF130 responds with an appropriate default message indicating which section of memory has been defaulted. The user should then re-enter program values or presets before operating the unit. In the case of a calibration error, which applies only to the analog output option, the unit should be re-calibrated before being put back into service.

The four checksum test error messages are:

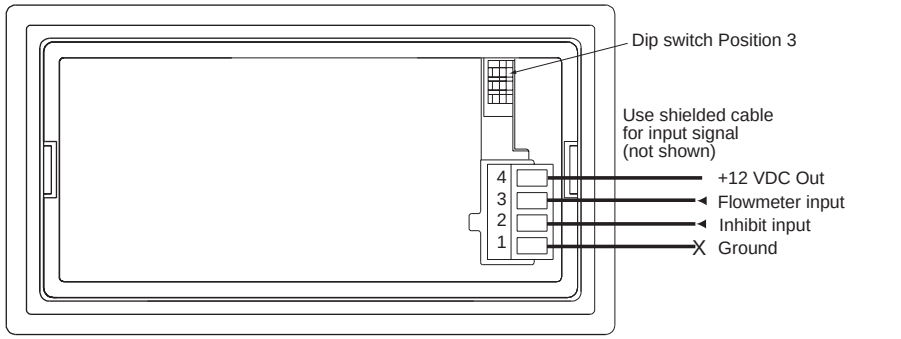
Er CAL Calibration error. This applies only to the calibration of the analog output option. Press any key to clear the message. The display will respond with **dF CAL**. Re-calibrate the analog output before putting the unit back in service.

Er PrG Program data error. Press any key to clear the message. The display will respond with **dF PrG**. Re-enter the program mode selections for your application before putting the unit back in service.

Er run Run data error in EEPROM or NOVRAM.

Er run Press any key to clear the message. The display will respond with

DESCRIPTION cont.



TYPICAL LT SERIES FLOWMETER WIRING, factory settings (⊘ DENOTES TERMINAL)

SENSOR POWER OUT (not used with standard LT series flowmeter)
12 VDC +/- 12%, 75 mA max, short circuit protected

DIP SWITCH SETTINGS (factory settings)

3 = On
2 = Off
1 = Off

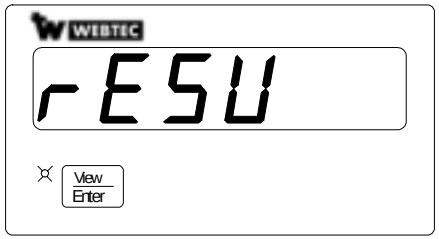
OFF ←	#	ON →
Single Ended	3	Mag Pickup (self energized)
Fast Response (>200 Hz)	2	Slow Response (<200 Hz)
Sourcing (PNP) Input	1	Sinking (NPN) Input

Programming Considerations for Flowmeter Input and DIP Switch Definitions

The inhibit input will normally not be used. The count inhibit function means that the counter will ignore flowmeter pulses when inhibit is active. This function can be useful at times such as when the system is being purged. The inhibit input on the DF130 is programmable (in block F1, page 26) to either inhibit input signal, or to select between two pre-loaded K factors. This allows the readout to display flow rate in two different engineering units. The first K factor can be loaded for the number of pulses per gallon and the other K factor is the number of pulses per liter, the user can go from counting in gallons to counting in liters and vice versa simply by pressing a switch. Gallons to say inches per minute or revolutions per minute conversion are other likely scenarios.

Setting the DIP switches can be an adventure since there are a wide variety of flowmeter types and there is no standard output pulse signal. Furthermore, signal conditioning devices, such as flow transmitters, may change the electrical characteristics of the signal. The standard flow signal from an LT series flowmeter is a differential, AC voltage generated by the turbine rotation beneath a magnetic pickup . This is a self energized two wire signal, with a minimum output frequency of 20 hHz. Depending on the size of flowmeter, the full flow signal can be between 600 Hz and 1500 Hz. Magnetic pickups do not require power as they are self energizing and the output is both sink and source. DIP switch 1 will have no effect on the input signal, DIP switch 2 should be OFF and 3 ON. Contact outputs, such as reed switches, are much less common in flow applications. They are normally used in RPM or linear speed applications and can be set up as sink, as shown in the diagram, or source. Since the diagram shows how to wire them as sinking sensors, use that method. Contact inputs will normally be low speed (< 200 Hz.), so switch 2 must be ON.

Transistor output signals are generally three wire (ie in-line amplifier model ASTC or powered transducer part # FT7566). These amplifier and powered transducer require DC power. The DF130 puts out 12 VDC for these types of sensors. Transistors are either NPN or PNP. NPN outputs are sinking outputs; they provide the path to ground. PNP outputs are sourcing; they provide the path to positive. These signals are considered “single ended” because they are referenced to common (ground). They can easily be high frequency signals. Switches 2 and 3 should be OFF, and switch 1 is OFF for PNP, and ON for NPN.

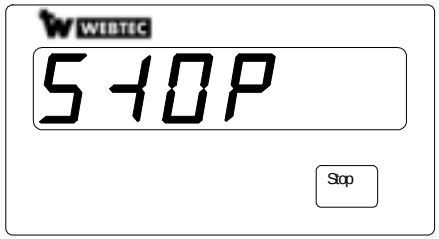


the display will show rESU (resume) for two seconds, and the indicating LED will flash.

To terminate a batch that has been stopped, simply reset the batch counter with the reset key.

Variations of starting and stopping are possible due to external inputs and programming. However, the method described above should be fairly common.

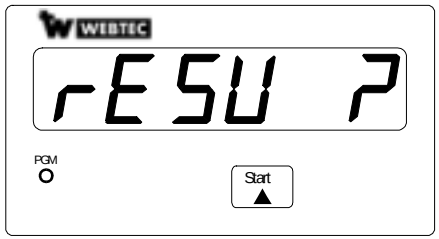
If the DF130 has been programmed to autorecycle; that is, to deliver a batch, then wait for a timeout period and start another batch, the message rECY will appear briefly on the display each time a new batch is started. If the cycle setpoint is used to stop delivery after a preset number of batches has been delivered, the message nrECY will appear on the display after the number of batches is completed.



the display will show StOP for two seconds, and the indicating LED will turn OFF.

To resume a batch that has been stopped,

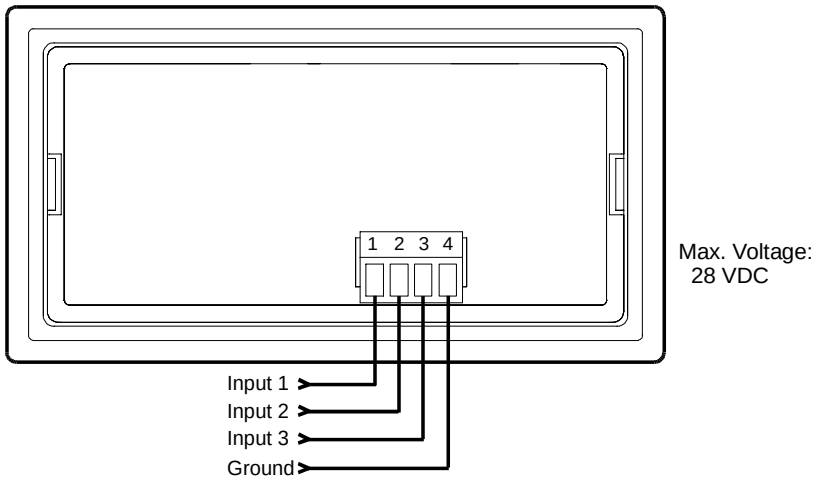
1. Press the Start ▲ key,



the display will show the resume prompt for three seconds.

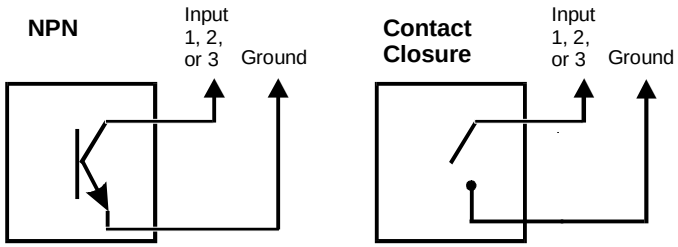
2. Press the View Enter key before the start prompt times out,

Control Inputs



The control inputs are pulled up to +5VDC through a 4.75k W resistor. Control inputs require current sinking (NPN) sensors, or contact closures to ground.

Typical Wiring



Programming Considerations for Control Inputs

All models of the DF130 have three control inputs. The factory setting is for one of them as a lock input and is activated by a jumper. The lock input prevents making unauthorized changes to the program. It is strongly advised that the lock input jumper should not be removed.

A control input may be used to reset one or more counters in the DF130. This means that an external pushbutton can be used instead of, or along with, the front panel reset. For instance, the user may want the operator to reset the batch count with the front panel reset and allow a supervisor to reset the totalizer with a key lock reset switch.

If the unit has an output programmed to latch at one of four setpoints; namely totalizer, cycle, rate high, or rate low, a control input may unlatch the output. There may be occasions where two outputs are latched. A control input may be programmed to unlatch either, or both of the outputs.

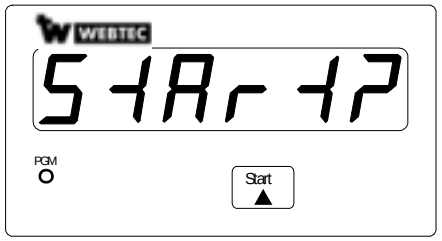
The front panel start and stop key functions of the batcher may be duplicated by control inputs. However, remember that if the batch is manually stopped before the batch is complete, the start input always resumes the batch unless the batch counter is reset. In order to remotely start, stop, and terminate the batch, three inputs must be used. This configuration does not allow for a control input to be used for the lock function. In most applications, the front panel start and stop keys will be used, but it may be handy for an operator to be able to stop delivery from a remote location by using a control input.

Control inputs may be programmed to perform multiple functions as long as the functions are not mutually exclusive, such as start and unlatch output 1. An input could be programmed to do up to three functions, such as start, reset the batch counter, and unlatch a rate alarm output. If an input is programmed to a lock function, then it cannot be programmed to also perform a start, stop, unlatch, or reset function.

The lock function is considered a maintained signal, meaning that the lock is active as long as the lock input is connected to ground. Normally this is done with a jumper wire, but occasionally the installer will employ an NC keylock switch. All other control input functions, as well as the front panel key functions are momentary signals. This means that the start, unlatch, reset, etc. function occurs immediately upon switch closure, and then the DF130 ignores the input until the switch opens, and then closes again. Therefore, momentary pushbuttons are appropriate for control inputs programmed for any function except lock.

Programming column L contains three blocks for the control inputs, one for each. Column L also contains a block for the reset key function(s), and for the batcher, a block each for the start and stop key function(s). Taking into account the type of unit (totalizer, totalizer with relays, or batcher) and the functions necessary for the particular application (reset, unlatch, start, etc.), determine the function(s) of each control input and select an input device appropriate to the function (not applicable for standard DF130 rate meters).

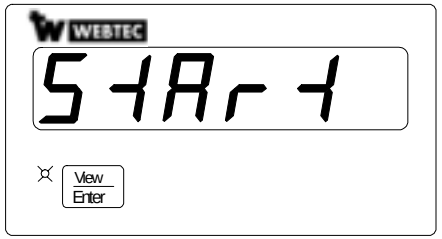
3. Press the Start ▲ key,



the display will show the start prompt for three seconds.

If the unit has not been reset since the last batch was delivered, one of the following error messages will appear - C1 00, or C1 nEG, or C1 FnL. Reset the batch count and try again. If the batch final preset has been set to zero, the following error message will appear - Fin 00. Enter a batch final preset other than zero and try again.

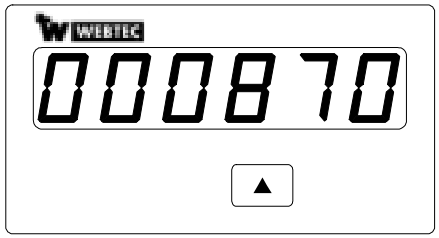
4. Press the View Enter key before the start prompt times out,



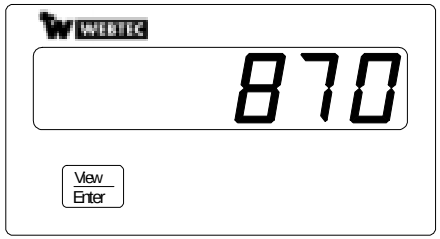
the display will show StArt for two seconds, and the indicating LED will flash.

To stop a batch:

Press the Stop Reset ▼ key,



5. Press the View Enter key to enter the new value.



All leading zeros disappear and the flashing stops.

Starting and Stopping Batch Delivery

This function can only be performed with a DF130 batch control. Totalizers do not have this capability.

Normally, every batch will be manually started and will stop automatically when the batch is complete. However, conditions may cause the operator to stop the delivery before the batch is complete. If the operator manually stops a batch, he may resume delivery from the point at which he stopped, or may simply terminate the batch.

To start a batch:

1. Enter the batch final preset as shown on page 40.

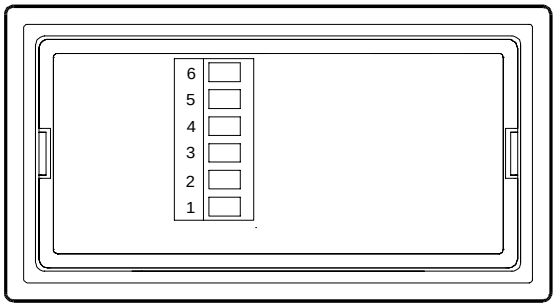
2. Reset the batch counter as explained in “Pushing the Reset Button.” If the batch count value screen is displayed, it will go either to zero or to the batch final preset value.

Programming Considerations for Power Up Operation

What can there possibly be to program that has anything to do with power wiring? Considering this from the operator’s perspective, what does he expect to see when he turns on the power? The default menu column “d” (page 28) has four (4) programming blocks. The set default blocks d3 and d4 are the domain of the installer or maintenance person, but the other two blocks affect what the operator can see and do at power up. Block d1 sets the power up display. Should the unit always display rate*, or count at power up, or should it just come up to the display that was showing when the power went down? Block d2 determines what the totalizer displays, either a six digit total in divide by 1, or 10, or 100 mode, or a 10 digit total*. (* = factory default)

Speaking of the front panel keys, what should they do for the operator? The program mode is entered using these keys, but it is a good idea to lock out the program from the operator. This is done by programming a control input (in column “L”, page 29) to do one of the lockout functions and then wiring that input to common as shown in the control input wiring diagram. For totalizers with the relay option and for all batchers, the reset key may perform an output unlatch function as well as, or instead of, the reset function. This is set by programming block L4. Batchers have start and stop keys available to the operator. Both keys can do one or more functions depending upon the choices made in blocks L5 and L6 respectively.

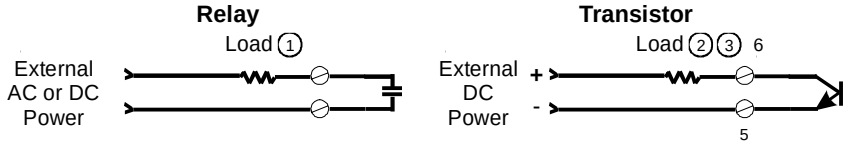
Relay Output



Terminal Designations

Dual Relay	Relay/Transistor
6, 5, 4 — Output 2	6 (+), 5 (-) — Output 2
3, 2, 1 — Output 1	3, 2, 1 — Output 1

Typical Wiring



Relay Contact Ratings
5 A @250 VAC or 30 VDC maximum

Transistor Ratings
OFF state: Block 30 VDC max, 0.1 mA max leakage current
ON state: Conduct 50 mA max, 1.2 V max C-E voltage drop

(1) An RC surge suppressor is recommended across all inductive loads.

(2) The transistor is optically isolated and may be connected as a sink (shown), or a source by wiring the load between terminal 5 and - (minus).

(3) A reverse-biased diode (1N 4001 or equiv.) is recommended across all inductive loads.

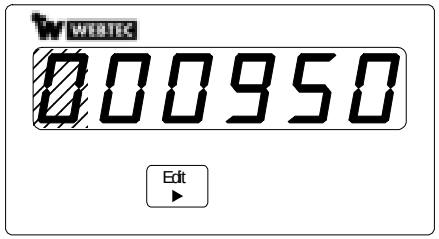
General Wiring Practices

- Use shielded cables for signal and control inputs.
- Keep all signal lines as short as possible (<30M or 100 ft.).
- Do NOT bundle or route signal lines with power or machine control wiring.
- Do not allow signal or control wires to leave the building.

these presets are tot P, rat L, rat H, bat F, bat P, and CYC P. When the View Enter key is released, the present preset value appears on the display.

To change the value of a preset or pulses per item (example - change preset 1 from 950 to 870):

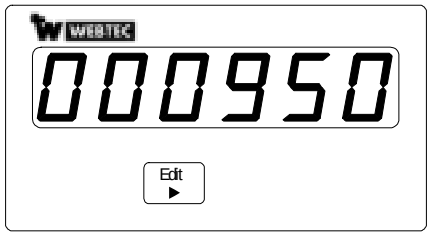
1. Press the Edit ▶ key,



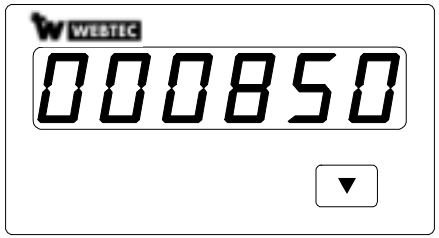
Indicates flashing digit.

the left-most digit (MSD) begins to flash. The preset is edited one digit at a time by selecting a digit (flash) and changing the value of that digit.

2. Press the Edit ▶ key until a digit that must be changed is flashing. The flash moves one digit to the right each time the Edit ▶ key is poked.

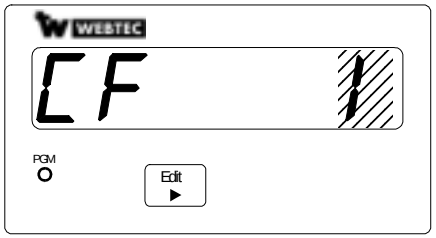


3. Press the ▲ or ▼ key to change the value of the flashing digit.



4. Repeat steps 2 and 3 until all digits are changed to the new preset value.

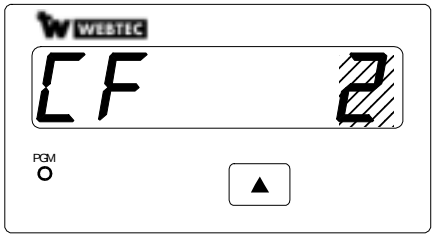
1. Press the Edit ▶ key,



Indicates flashing digit.

The “1” will flash.

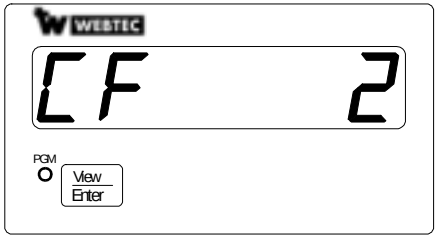
2. Press the ▲ or Start ▲,



Indicates flashing digit.

The flashing 1 becomes a flashing 2.

3. Press the View Enter key,



The flashing stops and count factor 2 is now the active count factor.

Changing a Preset Value

There are six possible presets, also known as setpoints, that can appear on the display. No DF130uses more than four of them, and some or all of them may be “locked”. If the operator attempts to change a preset value that is locked, the error message LOC will appear on the display when the Edit ▶ key is pressed. The title screens for

Programming Considerations for the Output Board

Programming for the outputs is done in column “r”. If your unit is a rate meter **and** does not contain the optional output board, your unit will not have column “r” in the program mode, and you can skip this page and go on to the RS 485 communication wiring.

Output 1 is always a relay, and is connected to terminals 1, 2, and 3. Output 2 is either a relay connected to terminals 4, 5, and 6, or it is an optically isolated transistor connected to terminals 5 and 6. The transistor output is generally used for the totalizer pulsed output if that function is required. Relays are normally used for all other output functions.

In the batcher, output 1 is not programmable. It is dedicated as the batch final relay. It turns ON when the unit receives a start input, and turns OFF when the batch final setpoint is reached, or when a stop input is received. Output 2 in the batcher and both outputs in the totalizer are programmable. When dealing with these outputs, there are two things to consider: when to turn ON, and when to turn OFF.

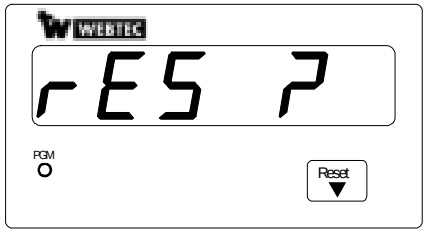
Turning ON will always be determined by an “event” appropriate to the function that they are programmed to do. For the totalizer, there are three events that can cause an output to turn ON:

1. When the totalizer count reaches the totalizer setpoint value (total setpoint).
2. When the flow rate crosses a setpoint value (rate low, rate high, rate low or high).
3. Each time a unit of flow is counted (totalizer pulsed output).

Output 2 in the batcher may also turn ON at any one of these events, or may turn ON at one of two others. They are a start input (prewarn setpoint) and when the cycle count reaches a setpoint value (cycle setpoint).

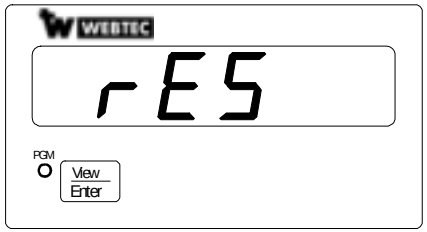
Turning OFF will either be determined by an event or by timing. There are four possibilities. Totalizer pulsed outputs are **pulsed** and turn OFF either after 500 +/- 84 msec (pulse fast), or 2 msec (pulse medium), or 10 msec (pulse slow). Totalizer setpoint, rate setpoint, and cycle setpoint outputs may be timed or latched. **Timed** outputs allow the installer to program an ON time in the range of 0.01 to 99.99 seconds. When this time elapses, the output(s) turn OFF. **Latched** outputs turn off when an unlatch event occurs. This event can be a start, stop, or reset input, or a control input programmed as unlatch. Rate setpoint outputs will turn OFF when the rate drops below a rate high setpoint, or goes above a rate low setpoint if the output is in the **follows** mode.

In the batcher, the batch final output and the batch prewarn outputs are latched. However, they are not programmable. They always turn ON at a start, and turn OFF at a stop, or when the count reaches their setpoint value. They do not respond to any other turn ON or turn OFF event, including an unlatch input. Keep in mind that a start may be generated internally by programming a batch autorecycle time in program block b-3. If this is done, once a manual start initiates the first batch, the unit will stop, wait for the timeout period, and then automatically re-start another batch. Automatic batch delivery will continue until either a manual stop input occurs, or until a preset number of batches is delivered if the cycle autostop feature is selected in block b-4.



a prompt message will appear on the display and remain there for up to three seconds.

2. Press the View/Enter key within three seconds,



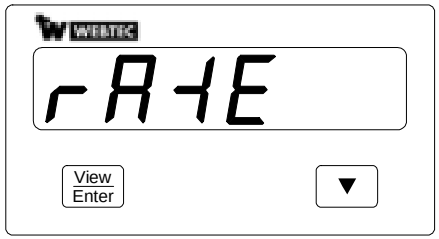
the display will indicate that the reset has been done. After one second, the display will return to whatever item it was showing before the reset key was pressed.

If the reset key is programmed to do an unlatch function only, the prompt message will be UnL ?, and the acknowledge message will be UnL. If both reset and unlatch functions are programmed, the prompt message will be r-U?, and the acknowledge message will be r-U. If the reset key is programmed to do nothing, or if a batch is running or recycling, pressing the reset key will result in a two-second display of six dashes (------), which is the counter's way of telling you, "I'll just ignore that, thank you."

Alternate Between Two Count Factors

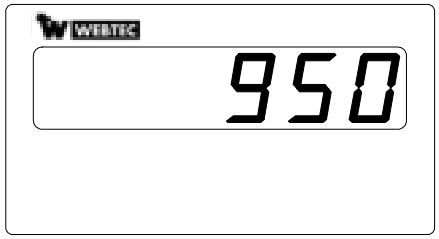
If CFACt appears while scrolling through the title screens, the counter is programmed with two pre-loaded count factors and the operator may select the active count factor via the front panel keys. The count factors are shown as CF1 and CF2, and the active count factor appears on the display when the View/Enter key is released.

To change from CF1 to CF2, or vice versa,



a new title screen will appear on the display each time ▲ or ▼ is pressed.

3. When the title screen for the desired item is reached, release all keys to display the value for that item.

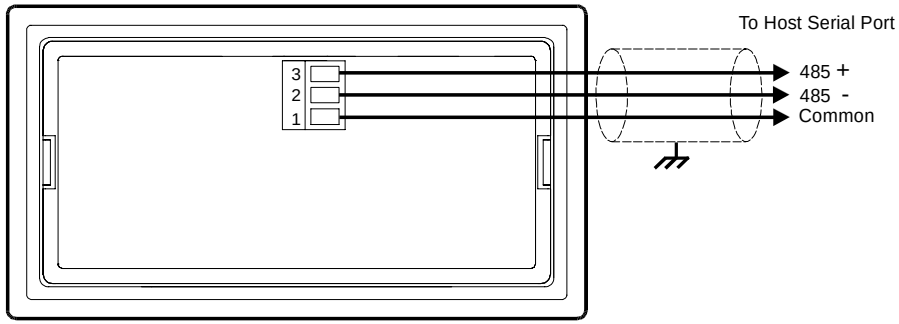


Pushing the Reset Button

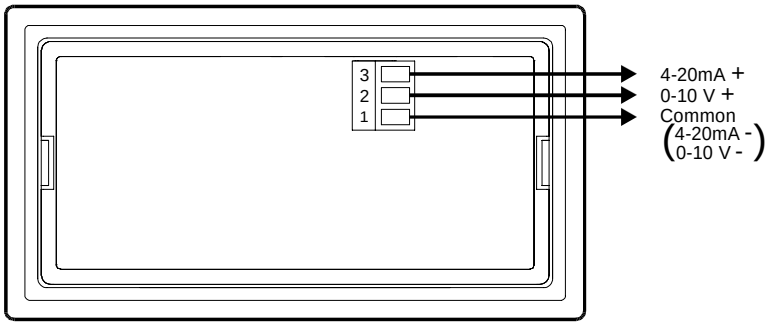
The reset key can be programmed to not reset anything, or reset any count register or combination of count registers in the unit. For batchers, resetting is only allowed if the unit is stopped. The reset key may also be programmed to unlatch one or both outputs, or reset count(s) and unlatch output(s). As long as the reset key is programmed to either reset, unlatch, or both, two steps are required:

1. Press the Reset ▼ or Stop/Reset ▼ key,

RS 485 Communication Option Board



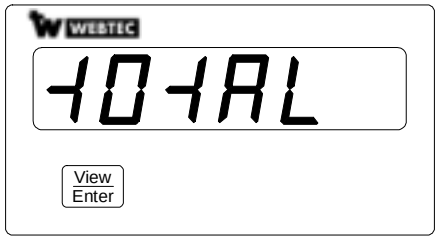
Analog Output Option Board



Output Ratings

4-20 mA into 750 W (Ohms) maximum
0-10 V into 2500 W (Ohms) minimum

Programming defines the DF130's personality. The DF130 is shipped from the factory precalibrated to a specific flowmeter with any optional parameters predefined. The DF130 hardware can be used in a wide variety of ways; how the hardware works depends upon how the unit is programmed. If the installer wants the unit to act like an orange, he must program it to act like an orange. If the installer wants the unit to act like an apple, he must program it to act like an apple.



the title screen will appear on the display.

2. While holding View/Enter, press either the ▲ or ▼ key,

3. Alternate between two count factors.
4. Change preset values.
5. Start and stop batch delivery.

Viewing Count and Rate Data

There are 14 items that may appear on the display as count or rate data. The number of items depends upon the model and how it is programmed. At least two items will appear on all models (total count and rate), and no DF130 will show all 14 items under any given programming configuration.

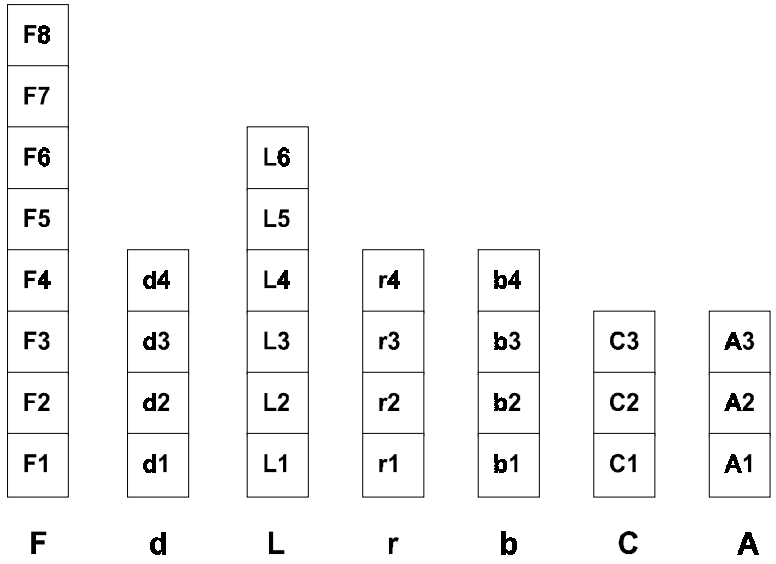
Each item that shows on the display will have two “screens” associated with it. One screen is a title screen that identifies the item. The other screen is the value screen that displays the numeric value for that item. Normally, a value screen showing a number is displayed. The title screen, which identifies an item, appears when the View Enter key is pressed. Title screens are made up of the dreaded 7 segment LED versions of alpha characters. Use the magic decoder ring below to translate the title screen.

Title Screen	Item
tot	6 digit Totalizer Count
tot L	Low 5 Digits of 10 Digit Totalizer Count
tot H	High 5 Digits of 10 Digit Totalizer Count
tot P	Totalizer Preset
rATE	Rate
rAt L	Rate Low Setpoint
rAt H	Rate High Setpoint
PC	Analog Output Percentage
CFACt	Count Factor Selection
bAtCH	Batch Count
bAt F	Batch Final Preset
bAt P	Batch Prewarn Preset
CYCLE	Cycle Count
CYC P	Cycle Preset

To change which item is displayed,

1. Press and hold the View Enter key,

The program resides in the DF130 memory. We could think of the program as a series of columns, with each column being made up of blocks, as represented in the diagram below:



Each block has a name and a value, selected from a range of values, and each block is associated with a particular programmable feature of the unit called a parameter. In the program mode, the microprocessor is able to access these blocks, and put the names and their values on the display for viewing. Programming is accomplished by entering the “correct” value for each parameter. For instance, program block F1 is the K factor 1 parameter. If the flowmeter has a K factor of 25.3 pulses per gallon, the unit would be supplied from the factory with a value of 25.300 in this block.

Each column contains parameters that are related to a general function of the DF130. Column F (Factors) is made up of parameter blocks that handle the count and rate scaling, which convert raw flowmeter pulses into meaningful count and rate displays. Column d (defaults) is somewhat of a miscellaneous collection of display and totalizer mode parameters. It also contains the blocks where the default program and default run data commands reside. Column L (controL inputs and keyboard) consists of blocks that assign the functions of the control inputs and the front panel keys. All DF130 units have these three columns.

Ratemeters, totalizers and batchers equipped with the relay output board, will have column r (relays). The blocks in column r assign the relay functions. Ratemeters or totalizers without relays do not have column r.

WIRING cont.

All batchers come with column b (batch control functions) as standard equipment. The parameter blocks in b determine what is shown to the operator in the batch count display, manual or automatic timed batch operation, and the cycle counter's role in batching. Ratemeters and totalizers do not have column b.

The two remaining columns, C (Communications) and A (Analog Output), will appear in any unit that has respectively, the serial communications board option, or the analog output board option installed. Column C sets the unit address, baud rate, and parity. Column A assigns the analog retransmission function, and sets the offset and full scale values.

The block diagram on page 19 shows all columns and all blocks. Only batchers with the communications and analog output options will have all programming columns. Lesser units will have columns missing, appropriate to the functions that are missing. Additionally, totalizers will have blocks missing in column L. Ratemeters and totalizers do not have start and stop keys, therefore blocks L5 and L6, which program these keys, are not available.

If the program needs to be changed, the installer will use the front panel keys to navigate from column to column and from block to block. While navigating around, the display will show the block name; for instance, F1 or r3. The block name is like a front door address that is used to locate each parameter that must be programmed. Behind the front door is where the parameter value resides. The value is a number that tells the parameter how to behave. Changing the value changes the behavior of the parameter. The majority of the remainder of this section will deal in detail with parameters and their values, but before we can get into that, we must first discuss how to surf from block to block.

PROGRAMMING cont.

RS 485 is an industrial communications format that allows multiple units to be connected to a single communication line. Up to 100 units may be on the line, but each must have a unique address entered in block C1.

Each character in the serial command string consists of ten bits. The first bit is a start bit that is followed by seven data bits (ASCII), one parity bit, and finally, one stop bit. The serial protocol used by the DF130uses string checksum error detection and does not use parity error detection, but the parity bit must always be sent. The DF130 will include the parity bit in its response, either as even, odd, or no parity (space).

Column A - Analog Output

Block	Parameter	Range
A1	Assignment	**0 Rate** 1 Six digit total 2 Batch 3 Cycle
A2	Offset Value	**000000-999999**
A3	Full Scale Value	**000000-999999**

The 4-20 mA and 0-10 V analog outputs can be assigned to follow the ratemeter, the totalizer (six digit mode), the cycle counter, or the batch counter. Obviously, the cycle counter and batch counter options are only available in the batch control. The offset value entered in block A2 is the displayed value that causes the analog output to go to its minimum output of 4 mA and 0 V. The full scale value entered in block A3 is the displayed value that causes the analog output to go to its maximum output of 20 mA and 10 V. If a decimal point is programmed for the assigned rate or count display, the decimal point will appear in its proper position in blocks A2 and A3.

Welcome to the operator's section of this manual. A naive person would believe that this section would be required reading for the person who deals with the counter on a day-to-day basis. In reality, however, about the only time these pages will see the light of day is when the installer is in the checkout phase of the installation. This is o.k. After all, who knows more about the specifics of the application than the installer? Since the information in this section covers all models of the DF130 flow family and all of the general programming possibilities, the installer is the best person to distill the general information in this section into specific operator instructions that are appropriate to the application. Furthermore, this section only describes the operator functions of the front panel of the counter. What the operator needs to know about the entire system, including external switches wired to the counter, will be specific to the application.

There are five functions that the operator may be expected to do through the front panel of this counter:

1. View count and rate values.
2. Push the reset button.

The batch control functions program column b is not in the totalizer unit. Totalizer installers, however, may read this description to see what they're missing. The batch counter will count from zero up to the batch final preset if b1 is set to 0. The batch count then shows gallons delivered. If b1 is set to 1, the batch counter resets to the batch final preset and counts down, showing gallons remaining to be delivered.

At the end of each batch, there may be some overrun due to the flow not stopping precisely when the batch final relay turns OFF, or due to the flowmeter being installed downstream of the valve. The batch counter wants to count the entire amount delivered, including the overrun. If this causes mental anguish with the operator, a value of 0 in block b2 will cause the batch counter to freeze when it reaches the batch final setpoint.

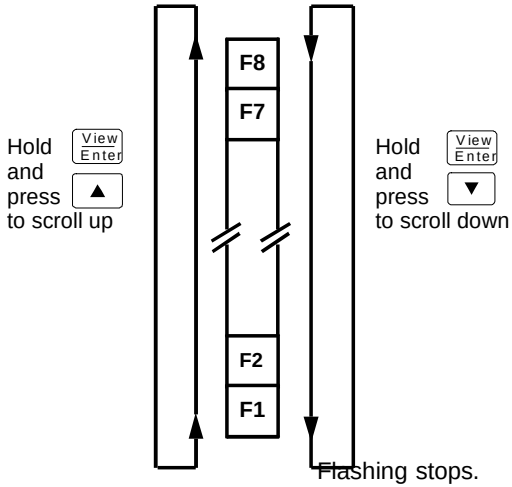
Batch autorecycle is a feature that will not often be used. If the value of b3 is zero, each batch must be started by the operator or by a start input. If b3 is programmed to a time in the range of 0.1 to 9.9 seconds, the batch autorecycle feature is enabled. This means that once the first batch has been delivered (started by normal means), the batch counter will stop for the timeout period and then automatically reset and start another batch, and another, and another; until the process is stopped by the operator, or by a stop input, or when the cycle counter reaches its setpoint value.

Normally the cycle counter will be used just to count the number of batches that have been delivered. The value of 0 in block b4 covers this function. If the batch counter autorecycle feature is enabled in block b3, the cycle counter will stop the batch counter from autorecycling when the number of batches delivered is equal to the cycle preset by programming a value of 1 into b4. The final variation on the autorecycling theme occurs when b4 is set to 2. This causes the cycle counter to reset itself when the cycle setpoint is reached. Furthermore, if output 2 is programmed as a timed cycle setpoint output (block r3 = 80), the batcher will wait the timeout period and then automatically restart delivery of another cycle setpoint worth of batches. This will continue until the process is stopped by the operator, or by a stop input.

Column C - Communications

Block	Parameter	Range
C1	Serial Address	**00 - 99**
C2	Baud Rate	0 1200 1 2400 2 4800 3 9600 **4 19200**
C3	Parity	**0 None** 1 Odd 2 Even

Whenever you go into the program mode, you will always enter at block F1. Skeptics are welcome to try this for themselves. Pressing the View Enter key displays the block name; in this case, F1. While holding the View Enter key, pressing the ▲ key scrolls the display up through F8. Since F8 is the last block in the F column, scrolling up from F8 wraps around back to F1. Scrolling down through a column is done by holding the View Enter key and pressing the ▼ key, as illustrated below:



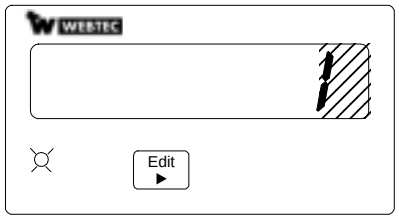
To scroll from column to column, while holding the View Enter key, press the Edit ▶ key. The display will land on the bottom (1) block of the next column to the right, as illustrated below. Note that since there is no ◀ key, scrolling to the left is undefined.

Hold View Enter and press Edit ▶ to scroll columns

Upon arrival at a new block, release the View Enter key to display the parameter value. Parameter values will always be a number. The range of numbers available will depend upon the parameter. For instance, the totalizer display mode parameter has four possible values in block d2: 0, 1, 2, and 3. A value of 1 means that the totalizer will be divided by 1 to display whole units (gallons, liters, etc.). A value of 2 means that the totalizer will be divided by 10 to display tens of units. In order to change totalizer display from total divided by 1 to total divided by 10, change the value in block d2 from 1 to 2.

To change a value,

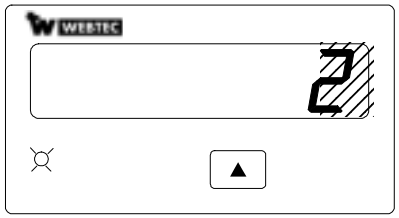
1. Press the Edit ▶ key:



Indicates flashing portion of display.

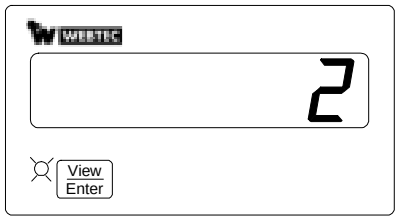
the most significant digit of the value will flash.

2. Use the ▲ or ▼ key to change the value of the flashing digit:



Indicates flashing portion of display.

3. Press the View Enter key to enter the new value and display 2.



Totalizer

Output 1 (block r1)

AM	
00	**Total Setpoint, Timed**
01	Total Setpoint, Latched
10	Rate Low, Timed
11	Rate Low, Latched
12	Rate Low, Follows
20	Rate High, Timed
21	Rate High, Latched
22	Rate High, Follows
32	Rate High/Low, Follows

Output 2 (block r3)

AM	
00	Total Setpoint, Timed
01	Total Setpoint, Latched
10	Rate Low, Timed
11	Rate Low, Latched
12	Rate Low, Follows
20	Rate High, Timed
21	**Rate High, Latched**
22	Rate High, Follows
32	Rate High/Low, Follows
43	Total Pulse Out Fast
53	Total Pulse Out Medium
63	Total Pulse Out Slow

Batch Control

Output 1 (block r1)

AM	
91	**Batch Final, Latched**

Output 2 (block r3)

AM	
00-63	Same choices as Totalizer Output 2, and
71	**Prewarn Setpoint, Latched**
80	Cycle Setpoint, Timed
81	Cycle Setpoint, Latched

Column b - Batch Control Functions

Block	Parameter	Range
b1	Batch Counter	**0 Reset to Zero (Count Up)** 1 Reset to Preset (Count Down)
b2	Hide/Show Overrun	0 Hide overrun **1 Show overrun**
b3	Batch Autorecycle	0.1-9. sec. between batches, autorecycle enabled **0.0 Autorecycle disabled.**
b4	Cycle Autostop	**0 No autostop** 1 Batch autostop at cycle setpoint. No cycle count autoreset. 2 Batch autostop at cycle setpoint. Cycle count autoreset

but only certain modes are appropriate for each assignment. The totalizer setpoint can be timed, in which case the output will turn OFF after a programmed timeout, or latched, in which case the output will turn OFF after an unlatch input occurs. Rate low and rate high assignments can be timed or latched, or can be follows. Follows mode means that the output will turn OFF automatically when the rate goes back above a rate low setpoint, or below a rate high setpoint. The rate low/high assignment is follows only. Rate low/high means that the ratemeter has a low setpoint and a high setpoint; the output is ON when the rate is lower than the low setpoint or greater than the high setpoint. The output will be OFF whenever the displayed rate is in the window. The totalizer scaled pulse output mode is called pulsed. Pulsed is really a timed mode, but instead of selecting an output time in the range of 0.01 to 99.99 seconds, there are three outputs times from which to choose. Pulsed fast outputs turn OFF after 500 msec, pulsed medium outputs turn OFF after 2 msec, and pulsed slow outputs turn OFF after 10 msec. If the totalizer is counting faster than it can spit pulses out, it can store up to 9999 counts in a buffer. This is great as a temporary fix; however, if this condition is persistent, pick a faster pulsed output mode.

The batcher only has one programmable output, relay 2. This output can be set to any of the totalizer assignments mentioned above, or to one of two other assignments unique to batchers. The prewarn setpoint output is a latched mode that is used for two valve batch delivery and variations thereof. Prewarn operation is described on page 5. Finally, the assignment can be cycle setpoint. If this is chosen, relay 2 will turn ON when the cycle count equals the cycle preset. Cycle setpoint modes are timed and latched.

Assignment and mode selections are made in programming blocks r1 and r3. If a timed mode is selected in r1, the timeout is entered into block r2. If a timed mode is elected in r3, the timeout is entered into r4.

All assignment and mode (AM) selections for blocks r1 and r3 are listed below. Note that there are two lists: one for a totalizer and one for a batcher. You already know by now which one you have, so pick the right list and make your choice(s).

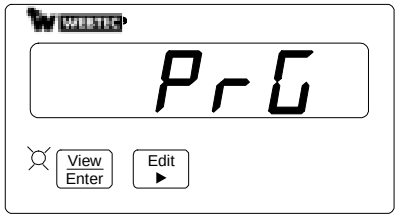
Entering the Program Mode

Note: The DF130 is shipped with one of the control inputs programmed to be the Lock Function. This lock function is activated via a jumper to ground to prevent inadvertent entry into the program mode. If the program mode must be accessed, remove the jumper wire and follow the procedure below.

Caution: Entry into the program mode will cause both relays, if installed, to turn OFF, and will cause the analog output, if installed, to go to its minimum values (4 mA and 0V).

To enter the program mode,

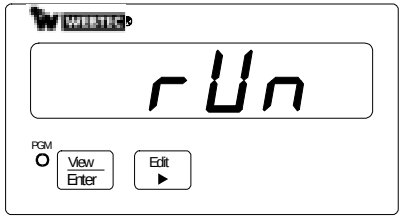
1. Press the View/Enter and ▶ keys simultaneously.



The program LED will turn ON, and the display will show Pr G (program) for one second, then show F1 for one second, and then show the value selected for programming block F1.

Exiting the Program Mode

To exit the program mode, press the View/Enter and ▶ keys simultaneously.



The display will show rUn. When the keys are released, the program LED will turn OFF, and the display will show the value of the default run mode display.

Programming Parameters

The programming columns are listed below, column by column. Each block name, the parameter that it represents, the default value, and the range of values is listed in the order in which the blocks appear when scrolling up through the column. There may be some blocks that will cause the installer to wonder "should I do anything with this, or not?" A comments section follows each column breakdown. These sections attempt to provide some practical information that the installer may find helpful in making programming choices.

Column F - Factors

Block	Parameter	Range (default Value is Bold)	Factory Setting
F1	Count Factor Select	0 CF1/CF2 select by front panel **1 Count Factor 1 only** 2 Count Factor 2 only 3 CF1/CF2 select by inhibit input	_____
F2	Count Factor 1	0.001-99999 **1.0000**	_____
F3	Count Factor 2	0.001-99999 **2.0000**	_____
F4	Count Display Decimal point	**0 XXXXXX** 1 XXXXX**.**X 2 XXXX**.**XX 3 XXX**.**XXX 4 XX**.**XXXX	_____
F5	Rate Display Decimal point	**0 XXXXXX** 1 XXXXX**.**X 2 XXXX**.**XX 3 XXX**.**XXX 4 XX**.**XXXX	_____
F6	Rate Time Unit # of Seconds	1-99999 **60**	_____
F7	Rate Smoothing Factor	**1**-9	_____
F8	Rate Zero Time	**1**-9	_____

2 Stop

7 Lock Pgm, P2, & Cyc
8 Lock Pgm, P1, P2, & Cyc

4 Reset Cycle
5 Reset Tot & Cycle
6 Reset Batch & Cycle
7 Reset Tot, Batch & Cycle
8 Reset Displayed Count

Cyc = Cycle Setpoint

Column r - relays

Block	Parameter	Range
r1	Output 1 Assignment	AM, where A and M are Assignment and Mode choices from the table on page 32. **00 for totalizers** **91 for batchers**
r2	Output 1 Timeout	0.01 - 99.99 seconds **1.00 for totalizers** **Latch for batchers**
r3	Output 2 Assignment	AM, where A and M are Assignment and Mode choices from the table on page 32. **21 for totalizers** **71 for batchers**
r4	Output 2 Timeout	0.01 - 99.99 seconds **1.00 for totalizers** **Latch for batchers**

In the batcher, relay 1 is dedicated as the batch final output. It cannot be programmed to do any other function. Relay 2 in the batcher and both relays in the totalizer are indeed programmable. The output assignment (should the output turn ON at a rate or count setpoint, or each time a unit of flow is counted?), and the output mode (should the output turn OFF at a count or rate setpoint or an unlatch input, or after a programmable timeout?) are set in this column.

For a totalizer, there are three events that can occur that can cause an output to turn ON. You get to pick the event as the assignment. The events are when the totalizer count reaches the totalizer preset value (totalizer setpoint), when the displayed rate reaches a high or low (or either) setpoint (rate high, rate low, rate low/high), and when a unit of flow is counted (totalizer scaled pulse out). This may be a good time to mention that if the totalizer is programmed to 10 digit total (block d2 = 0), the totalizer will not have a setpoint, and no output can occur. Once the assignment is determined, the mode must be selected. There are four modes: timed, latched, follows, and pulsed,

grammed to lock may lock out any combination of the program mode, the relay 1 setpoint (P1), and the relay 2 setpoint (P2). Lock inputs cannot be programmed to do any unlatch or reset function, and the front panel reset key cannot be programmed as a lock input.
All totalizers have programming blocks L1 through L4. The default value for each block is 000, which decodes out to be no unlatch (U function), no lock (L function), and no reset (R function). In block L4, the reset key cannot be programmed to do a lock function, so the L value remains at 0, and the edit key skips this category. For totalizers without relays, there are no unlatch functions; therefore the U value remains at 0 and the edit key skips the U category.

Batchers have blocks L1 through L4 plus blocks L5 (start key) and L6 (stop key). In addition to all the input choices available to the totalizer with relays, batchers have more choices for L (Lock) functions and R (Reset) functions, and also have S (Start/Stop) functions. The default value for blocks L1 through L6 is 0000, which decodes out to be no Start/Stop (S function), no unlatch (U function), no lock (L function), and no reset (R function). Control inputs can be programmed to do a lock function or any non-opposing combination of start/stop, unlatch, and reset functions. An example of opposing functions would be Start (which turns ON relay 1), and Unlatch 1 (which turns OFF relay 1). Attempting to program opposing functions will cause the display to read "Lb Err" when the View Enter key is pressed. The front panel reset key cannot be programmed for a start/stop function or for a lock function, so the S and L values in block L4 remain at 0 and the edit key skips these categories. The front panel start key cannot be programmed for a lock function, or for the start/stop function of stop. The front panel stop key cannot be programmed for a lock function or a reset function or start.

The input function selection table is shown below. Pick the appropriate S, U, L, and R values from the table for programming blocks L1 through L6.

Control Input / Key Function Table

Totalizers

U	L	R
0 No Unlatch	0 No Lock	0 No Reset
1 Unlatch 1	1 Lock Pgm	1 Reset Total
2 Unlatch 2	2 Lock Pgm & P1	
3 Unlatch 1&2	3 Lock Pgm & P2	
	4 Lock Pgm, P1, & P2	

1 = Output 1	PGM = Program Mode	P2 = Preset 2
2 = Output 2	P1 = Preset 1	

Batch Controls - U functions 0 and 2 above, all L and R functions above, and:

S	U	L	R
0 No Start/Stop		5 Lock Pgm & Cyc	2 Reset Batch
1 Start		6 Lock Pgm, P1, & Cyc	3 Reset Tot & Batch

The count factor (CF) is the K factor of the flowmeter. Normally only one count factor will be used. If so, leave F1 at the default setting of 1, enter the K factor into F2, and skip F3. If two K factors are to be used, only one can be active at a time. The active count factor will be selected via the front panel keys if F1 is set to 0, or will be selected via the rear terminal inhibit input if F1 is set to 3.

The DF130 internally calculates a count scaler based upon the K factor and another factor, that it derices from the count decimal point location. This will not be on the test, but for those curious installers who want to know what the formula is, it is:

$$\text{Count Scaler} = \frac{10^{(\text{F4 value})}}{\text{K Factor}}$$

The result of the calculation must fall in the range of 0.0002-99999. Since this is an extremely wide range for a count scaler, most values for F2 and F4 will work. Every time a K factor is entered, the DF130 calculates the new count scaler just to make sure that it's in range. If it is, it accepts the number and displays the result of the calculation for one second. If the calculated scaler falls out of the range, the new K factor value is not accepted, and an error message "bad C1", or "bad C2" appears on the display. Every time a new F4 value is entered, the DF130 calculates the new count scalers for both K factors (even if only one is used), and checks to see that they are in range. If one or both K factors are out of range, it will not accept the new count decimal location that is being changed in F4, and it will display the appropriate error message(s).

The count display decimal point shows on the totalizer and batch count displays.

The DF130 also uses the K factor to calculate a rate scaler. The calculation includes another factor, deduced from the rate display decimal point location as determined by block F5, and also the number of seconds value entered into F6. The rate scaler formula is:

$$\text{Rate Scaler} = \frac{(\text{\# of seconds}) \quad (10^{(\text{F5 value})})}{\text{K Factor}}$$

The result of his calculation must fall in the range of 0.001-9999. The rate scaler is calculated every time a K factor (F2 or F3), or the number of seconds (F6), or the rate decimal point location (F5), is changed. Any calculated rate scaler that falls outside the range will cause the Eclipse to not accept the new value, and to display the error message "bad r1", or "bad r2", or both.

The rate smoothing factor parameter F7 provides a filtering effect on the rate display when flow rate changes. The ratemeter updates every 0.5 seconds. Since the rateme-ter is deadly accurate, if flow rate changes, the rate display will change. In some systems, the rate display will bounce around due to fluctuations in flow rate. A rate

smoothing factor of 1 causes no filtering to occur. This is useful when the user must be quickly made aware via the display or a rate alarm output, of minor variations in flow rate. As the smoothing factor increases, the rate display gets progressively more stable. The best advice for fluctuating readings is to increment the F7 value by 1 from the factory default until the rate achieves a happy medium between response and steadiness.

The rate zero timeout is the number of seconds between pulses that the ratemeter will wait before making a zero calculation. If the rate smoothing factor is 1, the rate display will go to zero if the time between pulses exceeds the rate zero time. One second is normally a good number for flow applications.

Column d - defaults

Block	Parameter	Range (Default Value is Bold)	
d1	Power Up Display	0	Last
		1	Total low
		2	**Rate**
		3	Batch count
		4	Cycle count
d2	Totalizer Display Mode	0	10 digit total
		1	**Totalizer ¸ 1**
		2	Totalizer ¸ 10
		3	Totalizer ¸ 100
d3	Reset Count Commands	**0**	**No reset**
		1	Reset totalizer
		2	Reset batch count
		3	Reset totalizer and batch count
		4	Reset cycle count
		5	Reset totalizer and cycle count
		6	Reset cycle and batch counts
		7	Reset totalizer, cycle, and batch counts
d4	Default Commands	**0**	**No default action**
		1	Default program values
		2	Default run values
		3	Default program and run values

Depending upon model, options, and programming, there will be anywhere from two to eleven different display screens that the operator can look at in the run mode. When the operator powers this up, what display should he see? Normally it will be the

rate display, in which case the d-1 default setting of 2 is correct. However, the DF130 can be programmed to always power up to the totalizer display. Batchers have, in addition, the ability to power up to rate, batch count, or cycle count.

Block d2 essentially moves the count decimal point location for the totalizer to the right. This is exactly the opposite of what block F4 does. This can be handy in batchers where the batch count resolution must be in tenths (XXXXX.X), yet the totalizer resolution must be in whole numbers (XXXXXX).

Blocks d3 and d4 are commands. When the enter key is pressed, they do whatever function is associated with the value that was entered, and then the value returns to 0. d3 commands will reset any combination of count registers. d4 can default all program parameters to the factory settings, or default all run mode values (counts and setpoints), or both.

Column L - ControL Inputs and Front Panel Keys

Block	Parameter	Range
L1	Control Input 1	S U L R, where S,U,L,&R are
L2	Control Input 2	Start/Stop, Unlatch, Lock, and
L3	Control Input 3	Reset functions from the table on page 30
		0000
L4	Front Panel Reset Key Functions	0 U 0 R, where U & R are Unlatch and Reset functions from the table on page 30
		0000
L5	Front Panel Start	S U 0 R, where S, U, & R are Start/Stop, Unlatch, and Reset functions from the table on page 30
		0000
L6	Front Panel Stop Key Functions	S U 0 0, where S & U are Start/Stop and Unlatch functions from the table on page 30
		0000

All totalizers have three control inputs and a front panel reset key. Batchers have both a front panel start key and stop key as well. These inputs perform certain functions necessary in all flow applications. A totalizer without relays has the least number of possible input functions, two. They are lock program and reset total. Use a control input for lock program and either the front panel reset key, or a remote pushbutton or keylock reset switch, or both for reset. The choices for L (Lock) and R (Reset) functions are very limited.

For a totalizer with relays, the number of choices for the Lock function increases, the Reset choice remains the same, and another function category, U (Unlatch) appears. An unlatch input will turn one or both relays OFF if they have been latched ON at a rate or total setpoint. Unlatch functions can be combined with the reset function simply by programming a control input or the reset key to do both. Control inputs pro-