INSTRUCTIONS

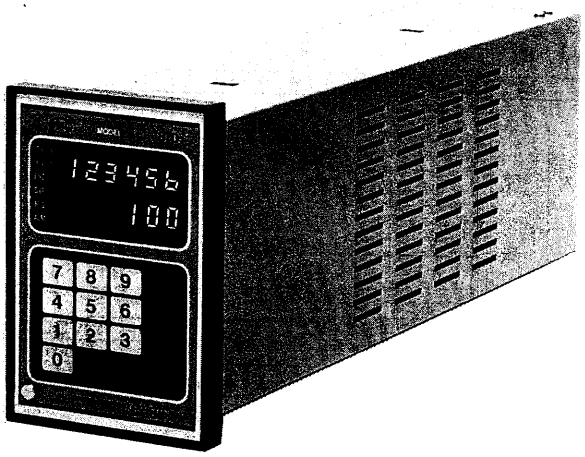
Ins.No. E-240-1-E

BATCH CONTROLLER

MODEL EL1870

■ GENERAL

This batch controller is designed for use in combination with a flowmeter and a shutoff valve. It digitally measures the quantity of process fluid in a batch process. Built around a microprocessor, this multi-function batch controller offers highly sophisticated batch functions along with various fail-safe and display functions. With communications capabilities added, the application engineer can simply and readily design and formulate an advanced process-control system which connects with a host computer or personal computers.
With its labor saving benefits, it is ideally suited for computerizing the routines of blending, preparation and emptying-filling processes in food, paint, chemical plants or elsewhere where flexible production lines are required in today's increasingly diversified industrial environments.



■ FEATURES

1. Easy to use.
2. Precise batch control.
3. Full display capabilities to ensure reliable control, including the display of individual parameters, operating status and alarm conditions, besides the batch setpoint and accumulated total flow.
4. With the addition of communications capability, it is simple to build a process-control system using a host computer or PCs.
5. Increased safety of processing.
6. Highly reliable and easy to maintain.

TABLE OF CONTENTS

■ PART NAMES AND FUNCTIONS

Counter A 6-digit LED (red)

Batch Setpoint Indicator Lamp (LED)

Display		Clor	Function
Operation Status	SV	Yel	Stays on while a restricted-flow signal is being produced (from a start signal to a stop signal).
	MV	Yel	Stays on while a full-flow "open" signal is being produced (from the moment the initial setpoint is reached until the restricted-flow starts).
	END	Yel	Stays on while an end output signal is being produced (from the moment the batch setpoint is reached until the batch process is reset).
Alarm	OVR	Red	Lights up when the amount of overshoot exceeds the target setpoint, or when the flow velocity exceeds predetermined setpoint of excessive flow velocity. It goes out upon resetting.
	MIS	Red	Lights up whenever a missing pulse is detected, or when a pulse deviation is detected. It goes out upon resetting.
	ALM	Red	Lights up when an open or short on the side of flowrate input, or a fault in CPU, is found, or when the input pulse frequency exceeds the acceptable frequency limit.

Numeric Keypad
- Sets the desired quantity of batch.
- Establishes individual parameters and settings.
- Reads individual parameters and settings.

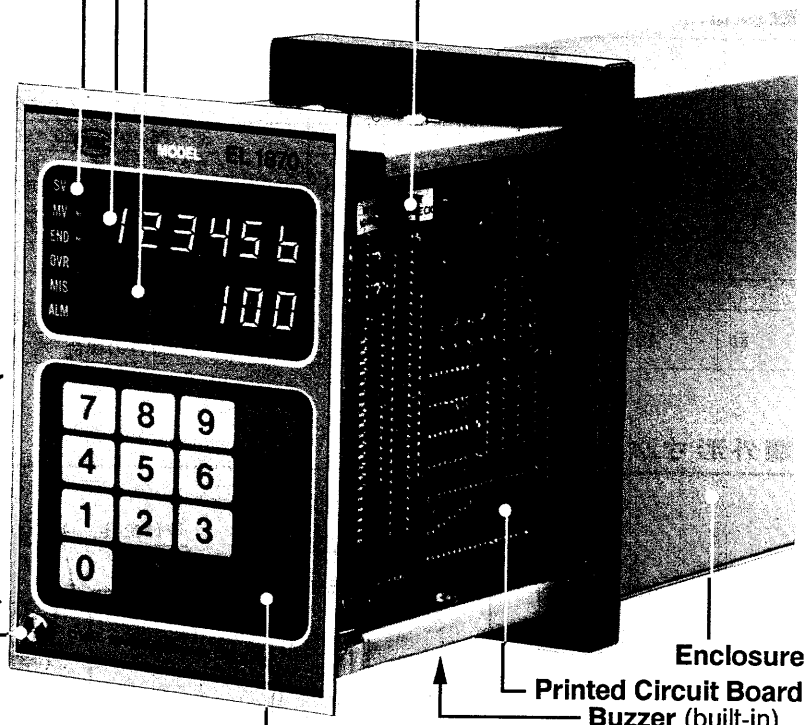
Internal Ass'y Withdrawal Knob
- Taking off the lockscrew at the rear permits you to draw the slide-out chassis forward.

Counter B 6-digit LED (red)
- Accumulated Total
- Instantaneous Flowrate
- Parameters and Settings
- Alarm Indication

(※ See Table below.)

Mode Select Switch

SW1: RUN/SET Mode
RUN: Meters and displays.
SET: Sets parameters and setpoints except for the quantity of batch.
SW2: NORM/CHECK Mode
NORM (Normal): Metering, numerical setting, etc.
CHECK: Self test



Enclosure

Printed Circuit Board

Buzzer (built-in)

Tone Annunciator and Buzzer

Type	Conditions	Description
Annunciator Buzzer	Full-flow open signal OFF (MV off)	3 times, intermittent
	Batch metering end	5 seconds
Alarm Buzzer	Keypad entry error	0.5 sec.
	Started with batch set at "0".	3 seconds approx.
	Started with batch setting < Acc. total.	
	Indicator lamp "OVR" with "MIS" and "ALM" staying on.	Stays on until ST arrives. (With "ALM", if frequency is exceeded, until power is turned off.

* Information Displayed on Counter B

Display Information		INDICATION	Examples on Display	Access Code
Accumulated Total		At all times		/
Instantaneous Flowrate		During metering only. The indicated value is expressed in the units of the least significant digit of the accumulated total × 1000/h. Following DISP • 8 operation, it shows "0" until the flow velocity is determined. Upon determination of fluid velocity, it shows for 3 seconds and then goes back to the the accumulated total reading automatically.		8
Batch Function	Initial Setting	INDICATION: STOPPED? / ITEM SHOWN / DISP / 3s LATER / ACCESS CODE IS KEYED IN; SETTING LIGHTS / 3s LATER / GOES OUT / AUTO RETURN / TOTAL LIGHTS	80	1
	Final Setting		80	2
	Antic. Overshoot		2	3
	Overshoot		2	4
Protection	Pulse Deviation		2	5
	Missing Pulses		15	6
	Excessive Velcty		100	8
Scal	Meter Factor		0.125	7
Alarm	Overshoot	Shown in the most significant digit (10^5)	4	/
	Excessive Velcty		8	/
	Missing Pulses		6	/
	Pulse Deviation		5	/
	CPU Error		[-]	/

Function Keys

Label	in Full	Function
SELT	SELECT	Selects the code of individual settings to be stored in the memory.
ENT	ENTRY	Completes storage in the memory upon depression of ENT key after individual settings have been keyed in.
DISP	DISPLAY	Reads out individual setpoints stored in the memory.
SA	START	Starts metering.
RE/CLR	RESET	Resets the ended or interrupted metering cycle to the initial state of metering. Turns off indicator lamps "END", "OVR", "MIS."
	CLEAR	Cancels an erratic entry of a setting in the memory.
ST/•	STOP	Stops metering; stops alarm buzzer and error code indication on counter B.
	Decimal	Enters a decimal point.

OUTLINE DIMENSIONS

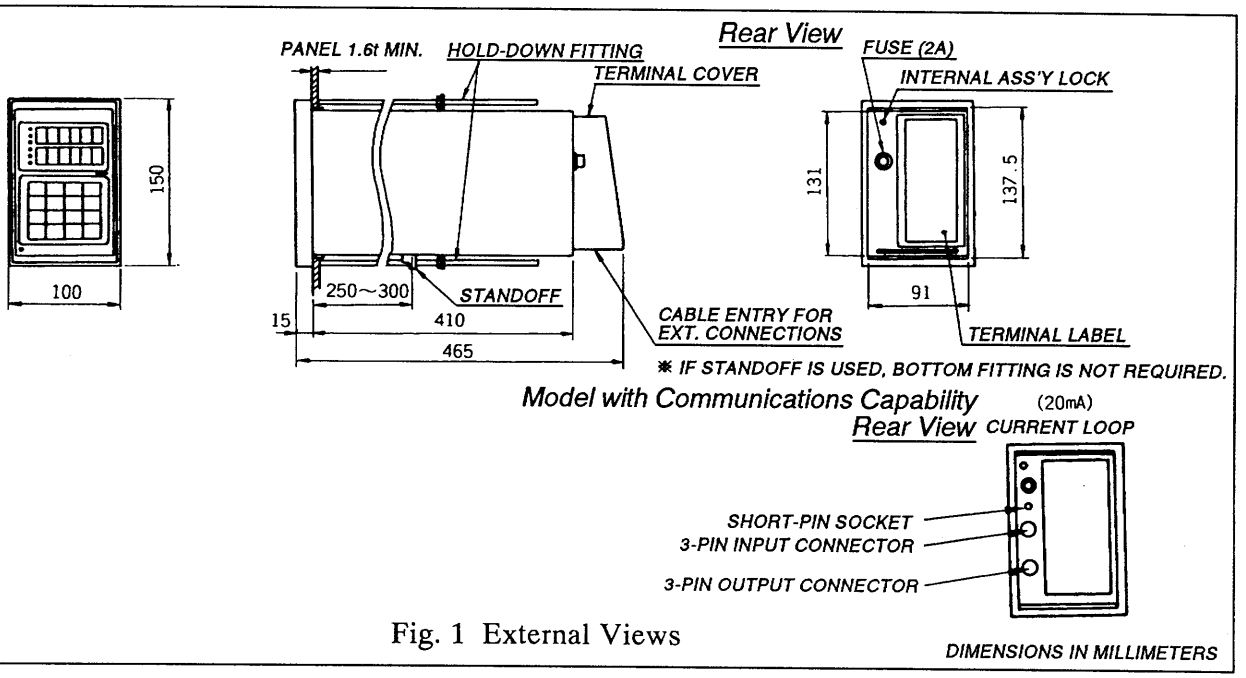


Fig. 1 External Views

INSTALLATION

Installation Location

Select an installation site:

1. where mechanical vibration, shock and corrosive gases least exist.
2. where the air is dry and temperature at room temperature and stable.

➡ **NOTE:** Although the manufacturer guarantees stated performance at ambient temperatures up to +50 °C, it is recommended that the instrument be placed in service at room temperature.

3. Provide a sufficient working space behind the instrument – at least 50 centimeters from the back panel to facilitate wiring connections and maintenance.

Panel

1. Use a rigid steel sheet 1.6 millimeters min. thick. Recommended panel is 3.2mm thick.
2. If two or more computers are to be installed side by side, dimensions in Fig. 2 are suggested.
3. Recommended mounting height is given in Fig. 3.

Installation

1. Insert the controller through the cutout in the panel from the front.
2. Fit the enclosure hold-down fittings in the top and bottom slots on the rear of the enclosure and, confirming that the controller is positioned on a level plane, secure it to the panel with the hold-down fittings (Fig. 1).

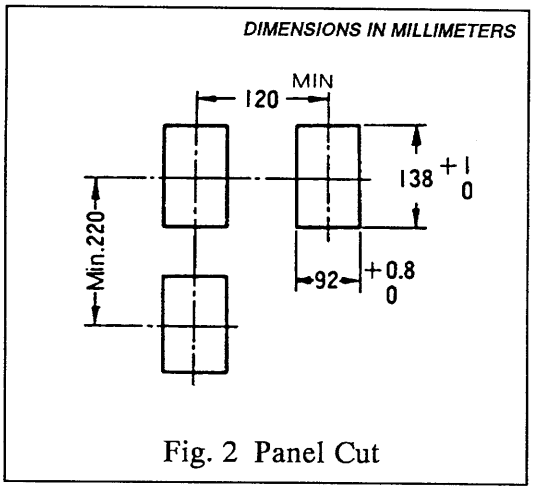


Fig. 2 Panel Cut

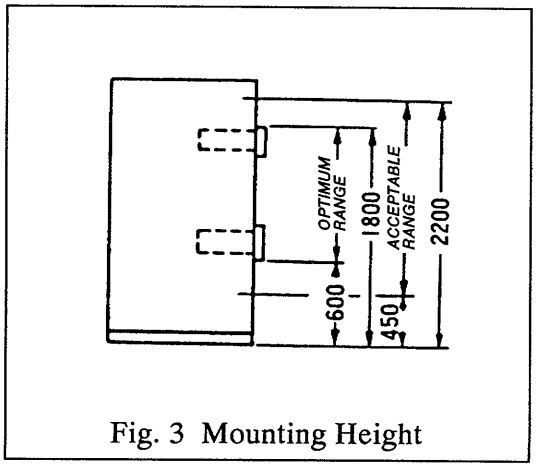


Fig. 3 Mounting Height

■ WIRING

● Connections on Terminal Block

Terminal Identification

Term. No.	LABEL		DESCRIPTION	
1	Flowrate Input	SUP	(+) 2-wire-system pulse generator (except for voltage pulses)	3-wire pulse generator
2		SIG. 1	(-)	
3		0V	(+) (-) Voltage pulses (from other electrical instrument, etc.)	
4		SIG. 2	Used for pulse deviation detection	
5	Accum. Total Out	(+)	Output to a remote total counter Open collector (standard) or contact-closure	
6		(-)		
7	Control Input	Start	Remote command input: Form "b" contact; Form "a" contact; Form "a" contact	
8		Reset		
9		Stop		
10		Com.		
11	End Output		Makes the required circuit at the end of a batch cycle. Breaks the required circuit on "resetting".	
12				
3	Final Output		Valve operating signals	Restricted-flow signal (Partial-open or partial-close signal)
14				
15	Anticipate Output			Full-flowrate-open signal (full-open signal)
16				
17	Alarm Output		Makes the required circuit in an alarmed condition. Breaks the required circuit with "ST" or power turned off.	
18				
L1	Power		Hot	
L2			Neutral	
G	Ground			

Wiring Precautions

1. Low-voltage input/output signal line wiring connections
   When you make electrical connections of individual input and output lines, such as the flowrate input, accumulated total output, and control input, the following instructions should be observed:
   1) Input/output signals are of voltage, current or open collector signal (other than contact-closure input/output):
   Use electrostatically shielded, polyethylene-insulated vinyl-sheathed control cables (CEVS 1.25-2mm², 2- or 3-conductor), or equivalent, for signal cables.
   All ground shields of shielded cables on the instrument side must be connected to terminal G, while the probe circuitry must be floated from the earth ground.
   2) Input/output signal lines should be routed as far away from power lines (100V ac or higher) as possible. Never pass signal cables through the same conduit as power cables. The same precautions apply to the wiring in the instrument panel.

2. Power source and power line (100V ac and higher) wiring
   1) If significant noise surges from power lines are present, a noise filter, or similar noise suppressor, should be provided in the preceding stage to the controller.
   2) Provide a surge suppressor, such as a CR network, as necessary, for motors, electromagnetic valves or other devices which could be potential noise sources connected to the power lines.

3. Grounding

Ensure that the ground of the controller is connected to terminal "G".
Type of grounding: Kind 3 grounding (100 ohms or less) or better.

4. Miscellaneous

1) Ensure good electrical connections using crimp-type lugs.
2) This controller has no provision for a power switch inside. Provide one externally if necessary.

> ⚠ **CAUTION:** Before you make electrical connections, make sure of the validity of the companion flowmeter (pulse generator) and receiving instrument combination by referring to their model number and instrument number.

An Example of Wiring Connections

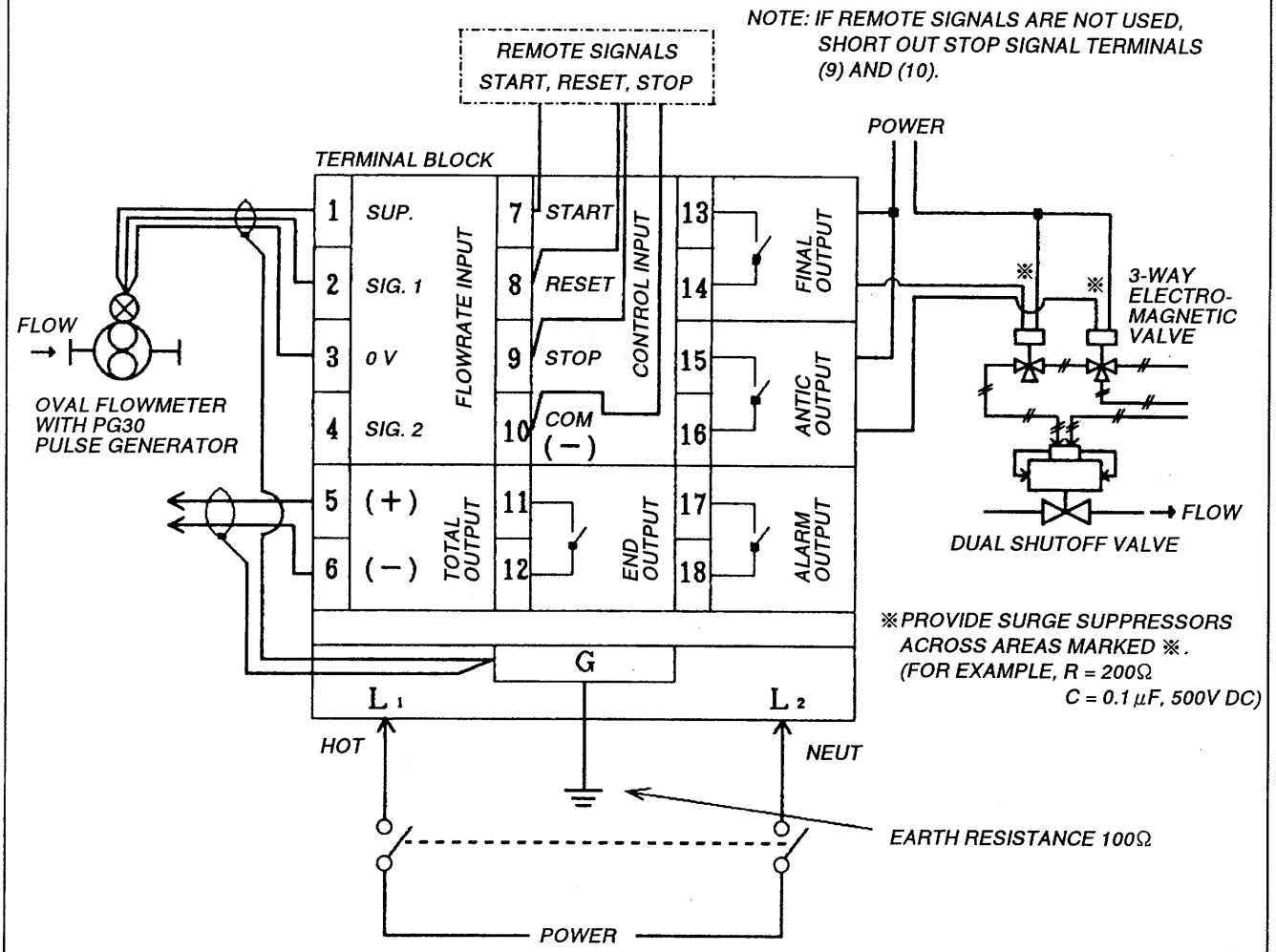


Fig. 4 An Example of Wiring Connections

● **Connections for Communication Functions**

1. 20mA current loop connections (See Fig. 5.)

(1) Use the 3-pin metal connectors furnished for interconnecting the communication interface box (CIB) EC1000 with the batch controller and for interconnecting individual batch controllers.

(2) Current loop input/output connectors have terminal pins arranged as follows:

Terminal pin No.
1: Current loop (+ polarity)
2: Shield
3: Current loop (- polarity)

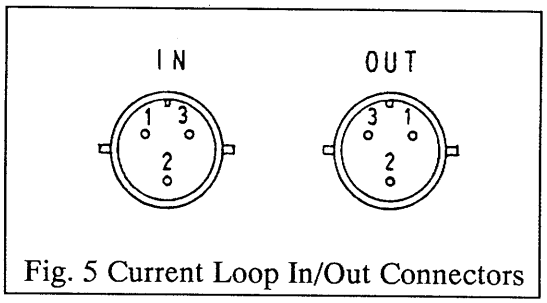


Fig. 5 Current Loop In/Out Connectors

(3) Electrostatically shielded, polyethylene-insulated, vinyl-sheathed control cables (CEVS 1.25-2mm^2, 2-conductors), or equivalent, must be used.

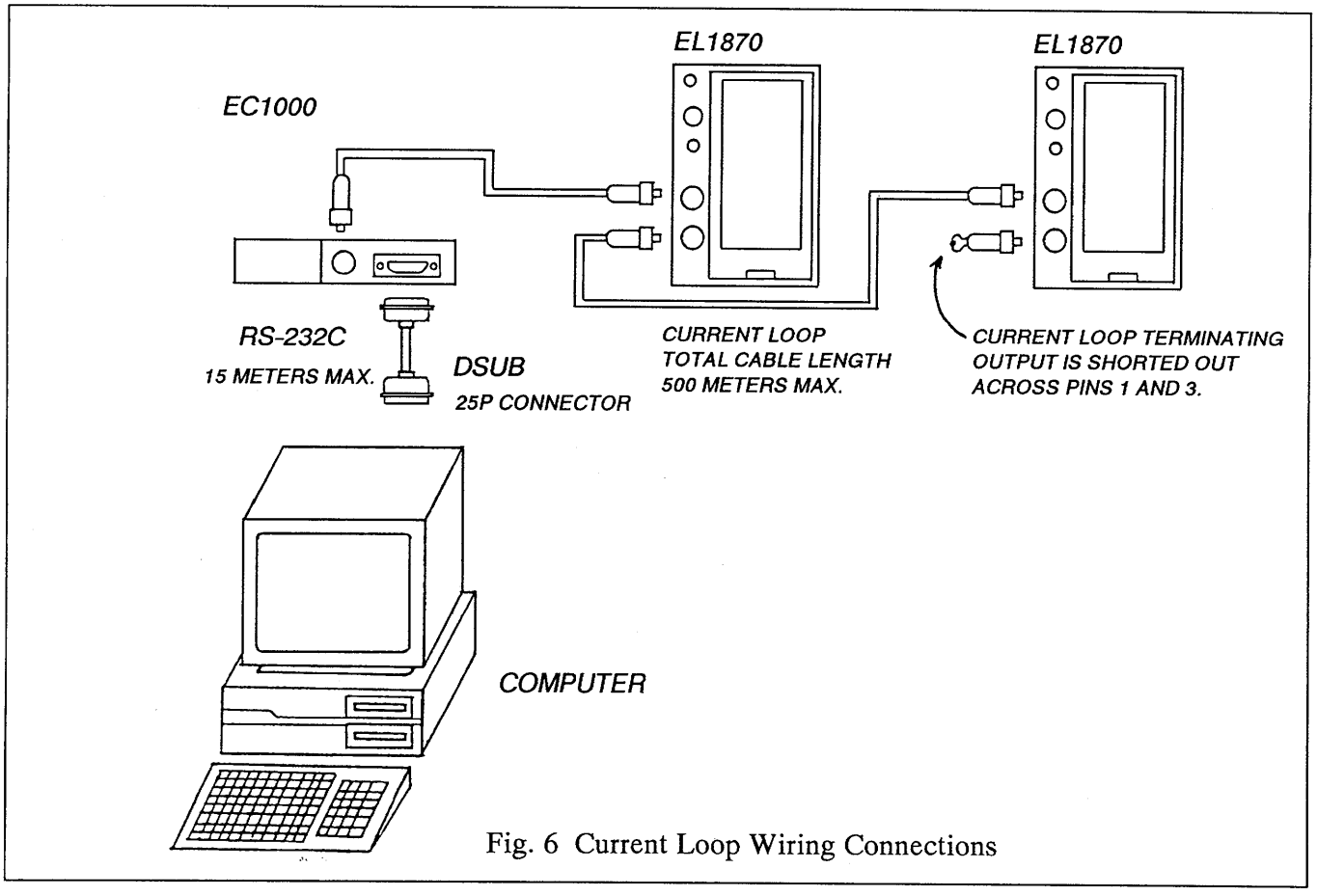


Fig. 6 Current Loop Wiring Connections

OVERALL BLOCK DIAGRAM

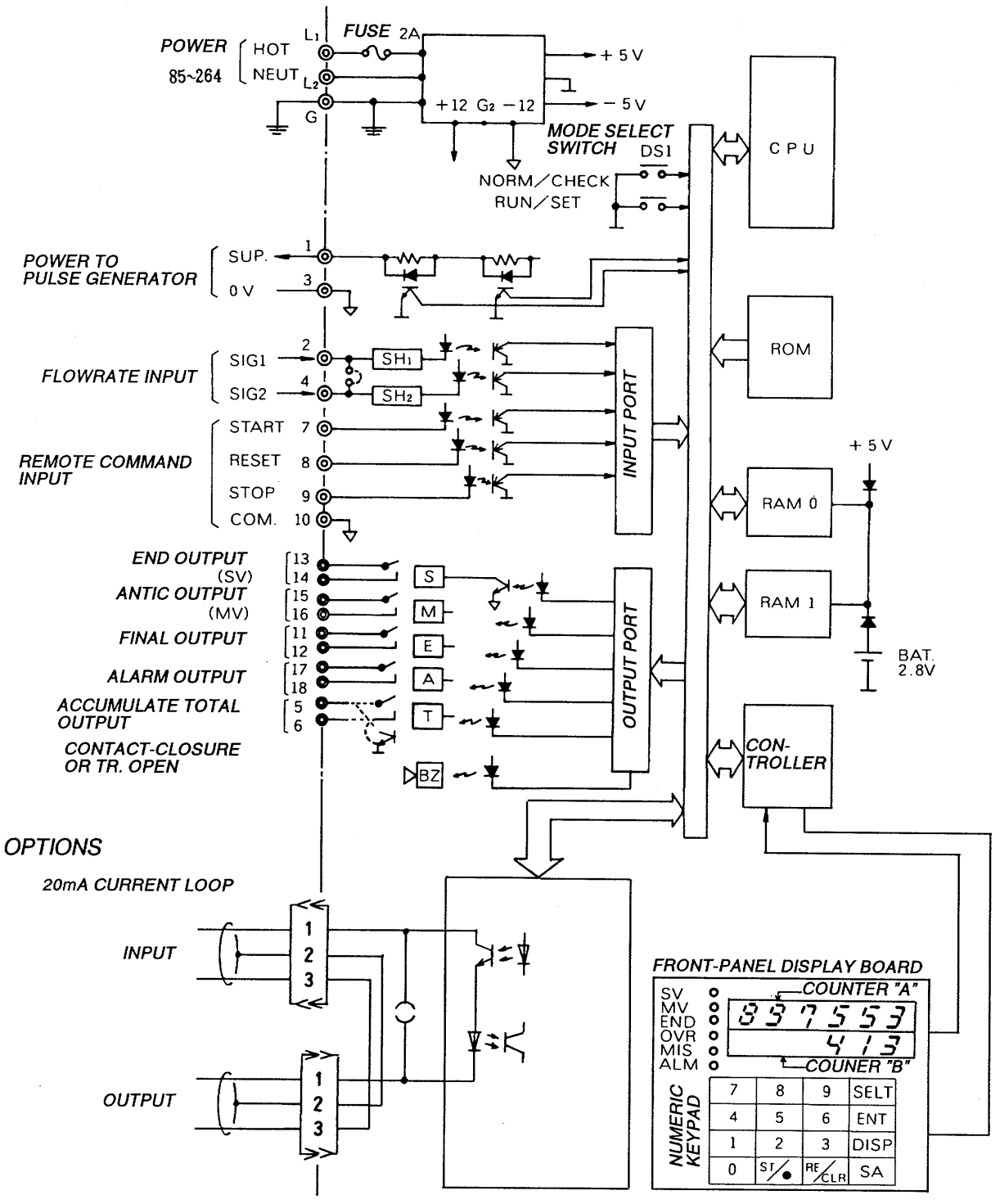
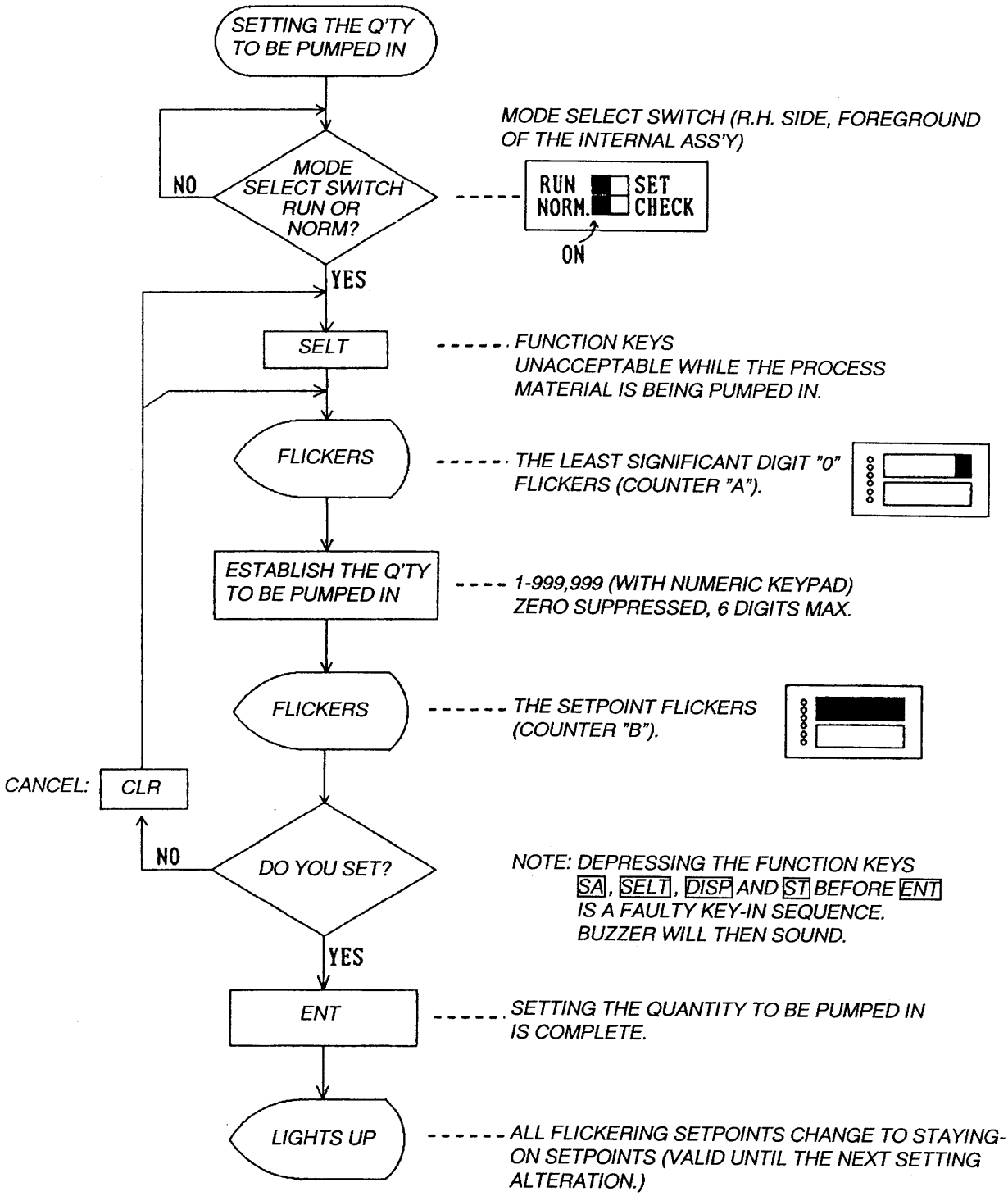


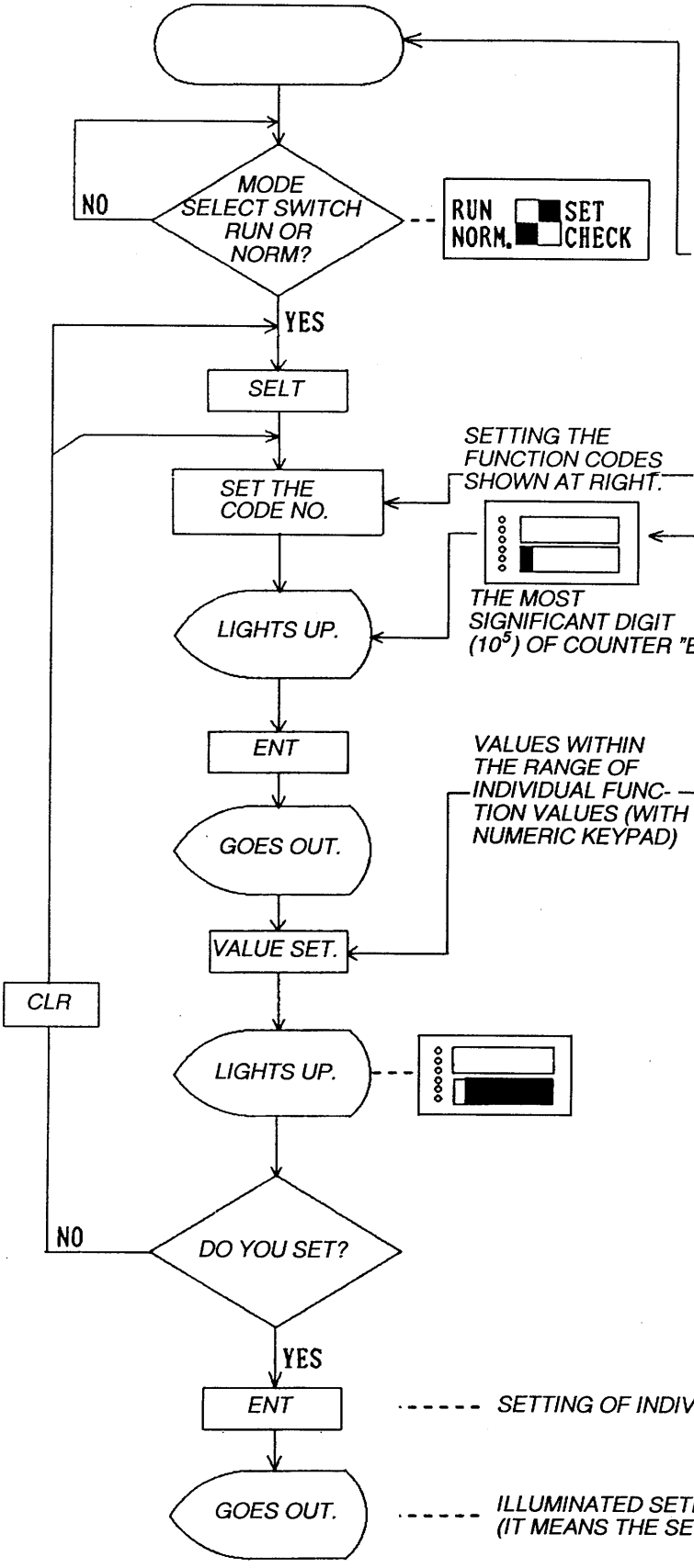
Fig. 7

■ BATCH FUNCTIONS

1. Programming .. Individual setpoints are established by the right entry method.
   A. Establishing the quantity of process material to be pumped in ....
   Counter A (upper LED) stays on at all times.



B. Establishing the parameters and setpoints of scaler, batch and protective functions ..... Counter B (lower LED)



	QUANTITY OF BATCH				PRO-TECT		SCAL-ER	PRO-TECT
	INITIAL SETTING	FINAL SETTING	ANTIC OVERSHOOT	OVERSHOOT	PULSE DEVIATION	MISSING PULSE INTERVAL	METER FACTOR	EXCESSIVE FLOWRATE
	1	2	3	4	5	6	7	8
	1	2	3	4	5	6	7	8
	MAJOR VALVE OPEN	MAJOR VALVE CLOSE				5 SEC. LATER UNTIL END AFTER STARTUP.		
	0 ∫ 999	0 ∫ 999	0 ∫ 99	1 ∫ 99	2 ∫ 15	2 ∫ 99 sec.	0.0001 ∫ 1.9999	1 ∫ 9999
						※1	※2	※3

NOTE: WHEN VALUES ※1, ※2, ※3 REMAIN UNESTABLISHED, THE FOLLOWING DEFAULT VALUES WILL BE CHOSEN AUTOMATICALLY.

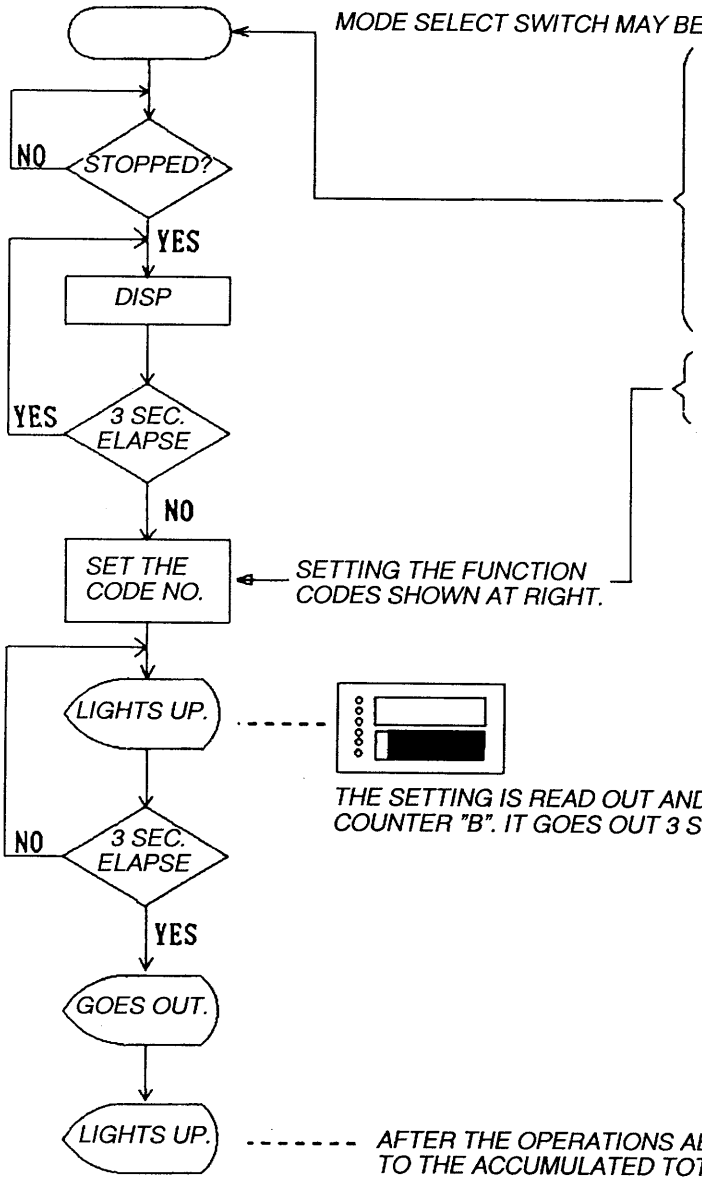
※1 ------ "2"
※2 ------ 1.0000
※3 ------ 9999

------ SETTING OF INDIVIDUAL FUNCTIONS IS COMPLETE.

------ ILLUMINATED SETPOINT SHOWN ON COUNTER "OUT. (IT MEANS THE SETPOINT HAS BEEN STORED IN .

2. Display Selection

A. Reviewing the parameters and setpoints stored in the memory for the scaler, target batch quantities, and protective functions ... Counter B (lower LED)



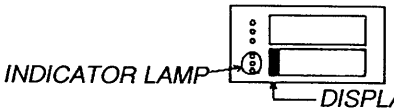
QUANTITY OF BATCH				PRO-TECT		SCAL-ER	PRO-TECT
INITIAL SETTING	FINAL SETTING	ANTIC OVERSHOOT	OVERSHOOT	PULSE DEVIATION	MISSING PULSE INTERVAL	METER FACTOR	EXCESSIVE FLOWRATE
1	2	3	4	5	6	7	8
0	0	0	1	2	2	0.0001	1
↓	↓	↓	↓	↓	↓	↓	↓
999	999	99	99	15	99 sec.	1.9999	9999

B. Accumulated Total Reading display ..... Counter "B"
With the mode select switch set as shown, the numbers of input pulses multiplied by the meter factor established is displayed, whether the controller has started operation or it has been interrupted.

C. Instantaneous flowrate display ..... Counter "B"
May be displayed with the mode select switch set as shown, only when the computer has started operation.

Following DISP and 8, it shows "0" until the instantaneous flowrate is determined; upon determination (the number of counts at intervals of 3.6 seconds after the scaler), it shows for 3 seconds and then it returns to the total count automatically.

3. Erratic Operation ... How error Messages are shown.



A. "OVR" indicator lights.

CAUSE / STATUS	OVERSHOOT	EXCESSIVE FLOWRATE
"OVR" LIGHTS	ALARM OUT	
ANTIC, END OUT		
BUZZER		ALARM OUT
CODE SHOWN	4 SHOWN	9 SHOWN
OCCURRED AND CANCELLED	OCCURS ST RE	OCCURS ST RE OR SA AGAIN

B. "MIS" indicator lights.

CAUSE / STATUS	MISSING PULSE INTERVAL	PULSE DEVIATION
"MIS" LIGHTS		
ANTIC, END OUT		
BUZZER	ALARM OUT	ALARM OUT
CODE SHOWN	5 SHOWN	5 SHOWN
OCCURRED AND CANCELLED	OCCURS ST RE OR SA AGAIN	OCCURS ST RE OR SA AGAIN

C. "ALM" indicator lights.

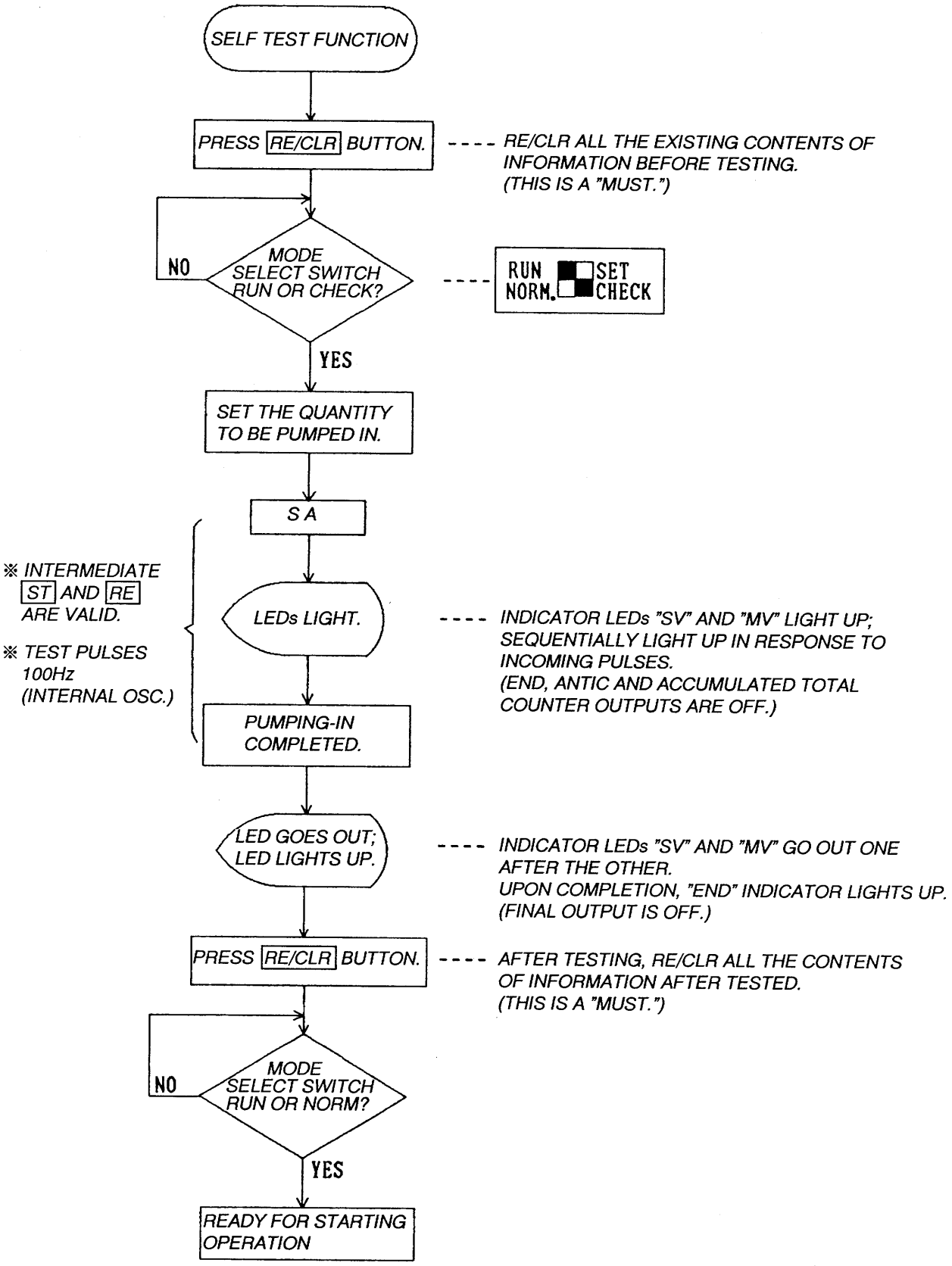
CAUSE / STATUS	PULSE GENERATOR OPEN OR SHORTED.	CPU AT FAULT
"ALM" LIGHTS	ALARM OUT	ALARM OUT
ANTIC, END OUT		
BUZZER		
CODE SHOWN	NONE	– SHOWN
OCCURRED AND CANCELLED	OCCURS ST CAUSE REMOVED	OCCURS ST POWER OFF OR CPU RESET (1 SEC. MIN.)

D. Buzzer ..... In addition to the causes A) through C) above, the following causes also activate the buzzer.

	ALARM BUZZER	ANNUNCIATOR BUZZER
1	Incorrect nemeric keypa operation ... 0.5s approx.	Anticipate signal off ..... 3 times, intermittent
2	Started with setpoint at "0" / Setpoint < accum. total ... 3 sec. approx.	End signal off ..... for 5 sec.

4. Miscellaneous

A. Self Test for Batch Operation
An internal oscillator contained in the controller enables the operator to test batch and related operations with all remote outputs turned off.



B. Startup Conditions

① The accumulated total count is at "0". ... You can restart following a "STOP" depression, however.
② The target batch setting is not at "0".
③ The target batch setting > the anticipated overshoot

C. Anticipated Output Conditions

① An end output is being generated.
② Target batch setting - (initial setting + final setting) > 0

NOTE: If the left-hand side < 0, only an end output signal is produced from the start to the end.

D. Total Counter Output

An output is produced irrespective of whether the controller has started or stopped operation.
(Number of input pulses) × (Meter factor) × (Frequency reduction)
= Total counts of the output
where the frequency reduction is 1/1 (standard).

E. In Case of Power Failure

In the event an a.c. power fails after the controller has started operation, it will turn off all its outputs and stores the most recent accumulated total reading in its memory.
When power suspension is restored, the controller will, in the STOP mode, displays the most recent accumulated total reading stored immediately before power interruption. (Due to such factors as the timing of incoming pulses, the reading could have an extra count in certain cases.) The Individual parameters established will remain unchanged before and after power interruption.

■ COMMUNICATIONS CAPABILITIES

1. Selecting the Communication Modes

Switches DSW1 and DSW2 located on the CUB board select the communications modes (see Fig. 7).

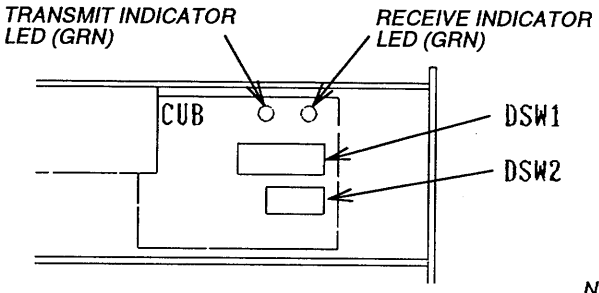


Fig. 7 Component Locations on CUB

NOTE: CUB STANDS FOR COMMUNICATIONS UNIT BOARD.

(1) Setting the DWS1 (See Fig. 8.)

A DIP switch to select the baud rate of your home address.

① Home address

Home address is the device identification number assigned to individual batch controllers in a system.

BY specifying this number, the host computer opens up communications with individual batch controllers. It is established in the binary system and a number expressed in the hexadecimal system represents your home address.

② Baud Rate

The baud rate establishes the speed of communications. It is expressed in BPS or bits per second. It is established in the binary system and a number expressed in the hexadecimal system corresponds to individual baud rate. If the current loop cable is a long run, good practice is to select a lower baud rate.

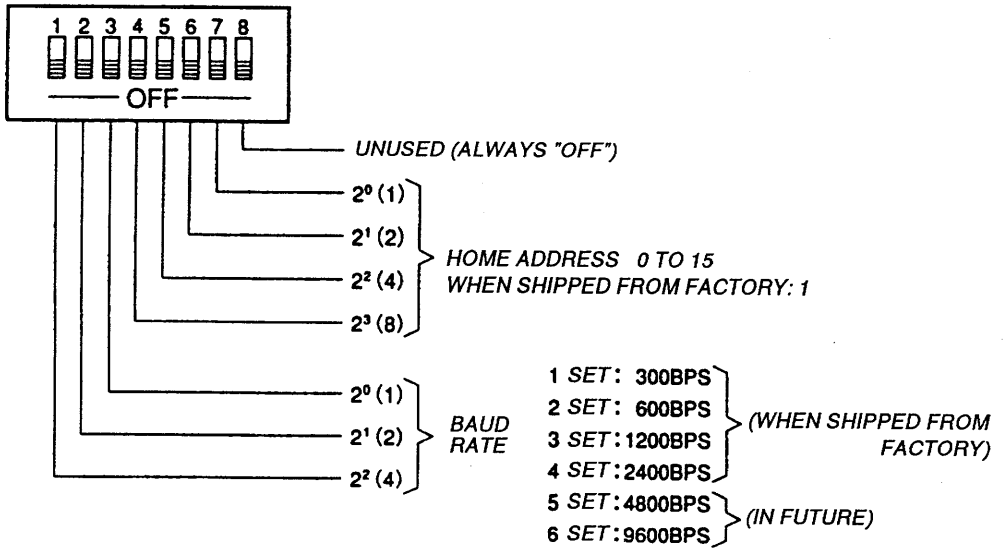
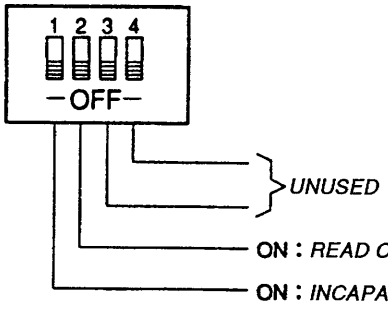


Fig. 8 Description of DSW1

(2) Setting the DSW2 (See Fig. 9.)



In ordinary communications (where read commands/write commands are acceptable), all rocker switches of DSW2 are set in the OFF.

Fig. 9 Description of DSW2

In ordinary communications (read command/write command acceptable), all switches in DSW2 are set in the OFF.

2. Communications Status Indication

During communications, make sure that the transmit/receive indicator LEDs (see Fig. 7) flicker. In the current loop communications, the transmit/receive indicator LEDs flicker, irrespective of communications from the host computer. This is because of the polling at certain intervals between the CIB (EC1000) and the batch controller.

3. Communications Commands

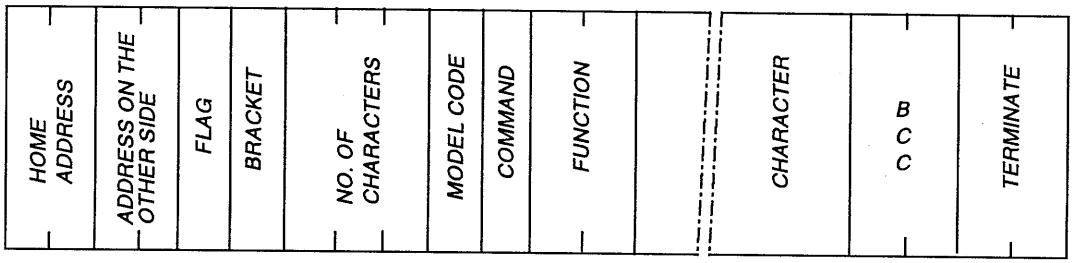
(1) Read command (R) ····· Reads the data of the batch controller.
(2) Write command (W) ····· Writes individual settings to the batch controller.
(3) Check command (C) ····· Checks communications on the current loop.
(4) Overview command (O) ····· Reads a specific group of data altogether.

ITEM	*Read Command (R)*	*Write Command (W)*	*Overview Command (O)*
① *Initial Flowrate Setting*	○	○	
② *Final Flowrate Setting*	○	○	
③ *Anticipated Overshoot*	○	○	
④ *Overshoot*	○	○	
⑤ *Pulse Deviation*	○	○	
⑥ *Missing Pulse Interval*	○	○	
⑦ *Meter Factor*	○	○	
⑧ *Excessive Flowrate*	○	○	
⑨ *Quantity to be Pumped in*	○	○	
⑩ *Accumulated Total Flow*	○		○
⑪ *Instantaneous Flowrate*	○		○
⑫ *Operating Status*	○		○
⑬ *Valve Status*	○		○
⑭ *Start, Stop, Reset*		○	
⑮ *Alarm Indication*	○		○

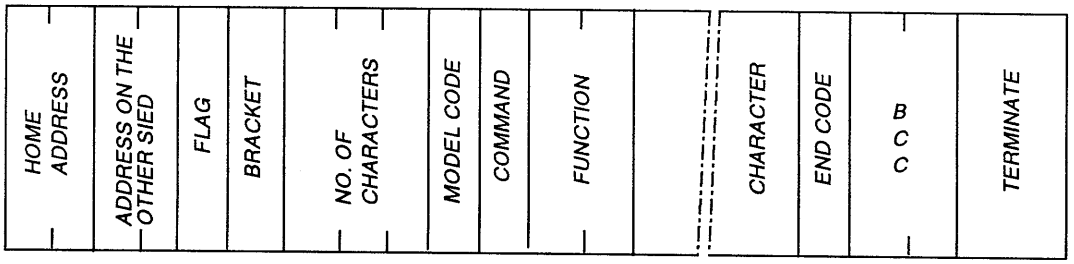
➡ **NOTE:** Communications are acceptable where marked with a circle ○.
The overview command reads all information marked ○ with this command alone.

4. Communications Format

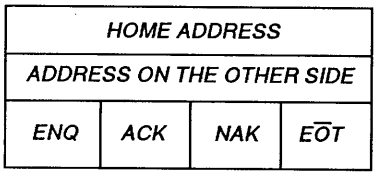
(1) Output on the part of host computer

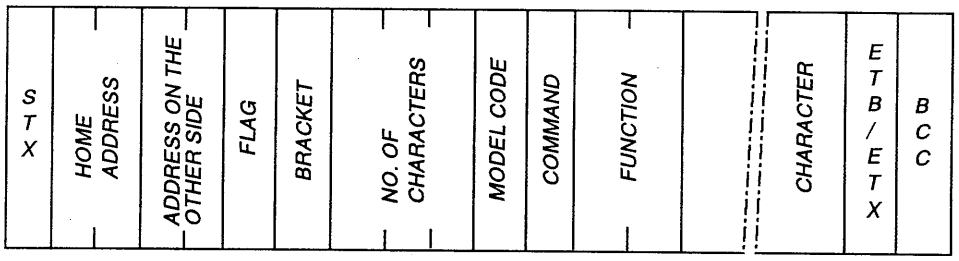


(2) Input (CIB EC1000) response on the part of host computer



(3) Across CIB EC1000 ⟷ Computer Model EL1870





■ PREPARATION BEFORE OPERATION

1. Ensure to see that your controller and associated equipment are correctly installed, connected with pipeline and electrically interconnected with no place left unfinished.

   CAUTION: **Be sure that the power terminals are connected to a power source of rated voltage. Placing an incorrect line voltage across the power terminals will ruin your controller.**
2. Thoroughly dehumidify the supply air.
   Using an air filter, or similar element, thoroughly remove water and oil content present in the supply air.
3. Set the supply air pressure to the shutoff valve to the specified air pressure with the reducing valve (air set).
4. Supply power to the controller.
5. Make sure of items 2 and 4 above for day-to-day operation.

Preoperational Checks

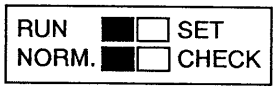
Without allowing the process fluid, check the shutoff valve for correct operation.

1. Turn the power switch on.
2. Set the counter A to any setpoint.
3. Depressing the start button [SA], make sure to see that the shutoff valve opens.
4. Depressing the stop button [ST/.] , make sure of proper opening and closure of the shutoff valve.
5. Repeat steps 3 and 4 above several times to make certain that the shutoff valve opens and closes properly.
6. If remote start and stop are provided, repeat steps 3, 4 and 5 above at the remotely located point.

■ OPERATION

Refer to the sections under the topic PART NAMES AND BATCH FUNCTIONS.

1. Draw the internal assembly out and make sure to see that the mode selector switches are set as follows:

2. Turn on the power.
3. Be sure that individual parameters and settings are correctly established. (Only at the time you received the controller or restart operation after being left idle for extended periods of time.)
   Refer to the section under the topic "[Reviewing the Parameters and Settings]" (page 10).
   Have the settings stored in the memory for scaler, target batch and protective functions shown on the display and ensure that they are correctly retained in the memory.
4. As for the stages following the setting of the quantity of process fluid to be pumped in, operation should be adhered to according to the flowchart (see Fig. 10).

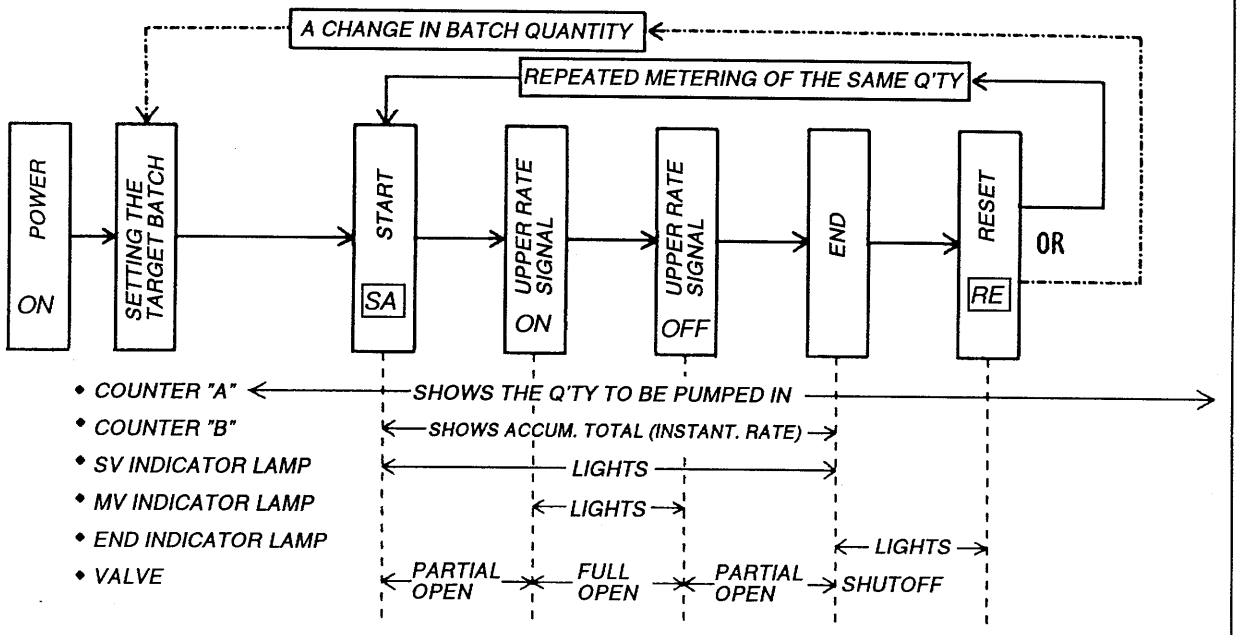


Fig. 10 Flowchart Showing How to Establish Process Fluid Quantity to be Pumped In

5. Operation Time Chart

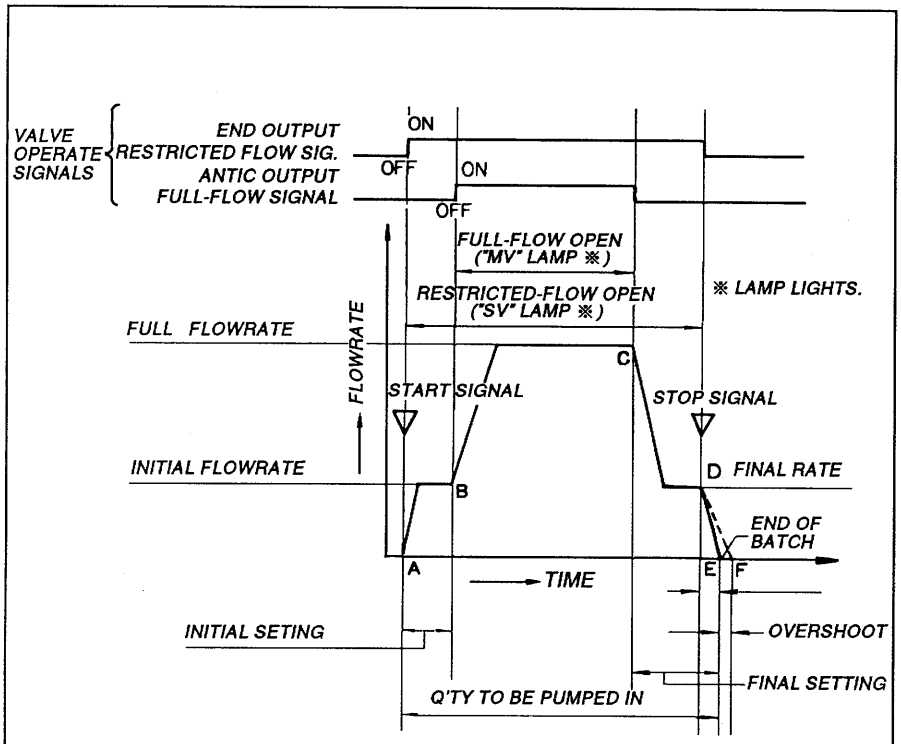


Fig. 11 Operation Time Chart

Simultaneous with SA "on" (point A), the valve opens to a predetermined position (initial flowrate). When a predetermined amount (from point A [= initial setpoint] to point B) is reached, it opens fully; when the measurement reaches point C, the valve automatically reduces its passage and maintains a predetermined valve position (final flowrate). At point D, a closure signal is generated, but due to some inherent time lag in valve actuation, the valve actually closes at point E.

Because the amount from points D to E is an overshoot that can be determined beforehand (an anticipated overmeasurement), you can determine the exact setpoint with this overshoot taken into account for correction.

Even if the time required for the valve to close remains the same, however, due to several factors, including the variation in line pressure, the exact point of closure may deviate more or less from point E. So, interpreting such spreads from point E as an overshoot, you preselect a permissible magnitude of overshoot. As a result, your controller will indicate an alarm condition whenever measurement exceeds this setpoint.

In this way, safe and precise measurement can be achieved. In this regard, valve positions from points A to B and from points C to D should be adjusted in advance on the part of the valve used.

■ TROUBLESHOOTING

● In case trouble is found to be internal, seek our service.

Symptom	Inspect	Possible Causes
Indicator lamps and LEDs fail to light up.	*1. Check supply voltage.* *2. Inspect fuse.* *3. Check constant voltage source.* *4. CPU watchdog lamp on the control board flickering?*	*1. Fuse blown.* *2. Incorrect supply voltage.* *3. A fault in internal assembly of the controller.* *4. Control board is at fault. (When the lamp remains unilluminated.)*
It does start operation but fails to generate a valve output.	*1. Wiring connections correct? Particularly, stop input terminals (9) and (10) shorted?* *2. "ALM" indicator lamp lights and buzzer sounds.* *3. The process fluid quantity to be pumped in correctly set? (Set to "0", for example)* *4. Individual setpoints correctly set?* *5. Mode selector switches set as follows?* RUN ■□ SET NORM. ■□ CHECK *6. CPU watchdog lamp on the control board flickering?*	*1. Correct wiring connections.* *2. Pulse generator is not correctly wired. (It is so arranged to inhibit starting if shorted or open.)* *3. If counter A setting flickers, see section under the topic "Establishing the Process Fluid Quantity to be Pumped in" and establish the correct quantity.* *4. Write to the memory such that the final setting > overshoot once again.* *5. In the CHECK mode, valve outputs (final and anticipate) will not be produced.* *6. Control board is at fault.*
Flowmeter is running but counter B fails to count.	*1. Input signal lines correctly wired?* *2. Is signal coming in?* *3. Pulse generator type matched?* *4. CPU watchdog lamp on the control board flickering?*	*1. Input wiring connections faulty.* *2. Pulse generator itself is at fault.* *3. Pulse generator to waveshaping circuit mismatched.* *4. Control board is at fault.*

■ GENERAL SPECIFICATIONS

ITEM				DESCRIPTION		
Counter Actuation				Add impulse counter		
Batch Quantity Programming				Front panel numeric keypad		
Batch Quantity Display and Capacity				6-digit front panel counter A: top (zero suppressed)		
Total Counter Display				6-digit front panel counter B: bottom (zero suppressed) (Shows the number of input pulses × meter factor established.)		
Instantaneous Flowrate Display				Digital display on front panel counter B		
Input Signals	Flowrate Input	Contact-closure pulse or open collector	Pulse generator	Contact-closure pulse PG20M or equiv.	2-wire system open collector	
			Power to pulse generator	—	—	
				60mA approx., shortcircuit protected		
			Signal levels	15V dc, 10mA max.	24V dc, 5mA max.	
			Pulse response	50Hz max.	200Hz max.	
			Cutoff pulse width	1ms max.	1ms max.	
		Voltage pulse or current pulse	Pulse generator	Voltage pulse PG30, PG40 PG60A(F) or equiv.	Current pulse 12V, 2-wire OG30S or equiv.	Current pulse 24V, 2-wire PA04, 05, 45, 15 PG60A(E) or equiv.
			Power to pulse generator	12V dc or 24V dc	12V dc	24V dc
				60mA approx., shortcircuit protected		
			Signal levels	"1": 5V min. "0": 1.5V max.	"1": 7.5V min. "0": 4.5V max.	"1": 5V min. "0": 1.5V max.
			Input impedance	20kΩ	510Ω	240Ω
			Pulse response	200Hz max.		
	Remote Command Input	Contact-closure pulse	Cutoff pulse width	1ms max.		
			Capacity	24V dc, 20mA max.		
			Pulse width	Instantaneous signal 10ms min.		
			Start	instantaneous make signal (Form "a" contact)		
			Stop	Instantaneous break signal (Form "b" contact)		
			Reset	Instantaneous make signal (Form "a" contact)		
Individual Setting	Scaler	Meter factor setting range		0.0001-1.9999 (reduction 1/1, fixed)		
	Batch Functions	Initial setpoint		0-999 counts (80 counts, standard)		
		Final setpoint		0-999 counts (80 counts, standard)		
		Antic. overshoot setpoint		0-99 counts (2 counts, standard)		
		Overshoot setpoint		1-99 counts (2 counts, standard)		
	Alarm Functions	Pulse deviation detection		2-15 counts (2 counts, standard)		
		Missing pulse		2-99 seconds (15 seconds standard: invalid for 5 s. after startup)		
		Excessive flowrate		1-9999 counts (9999 × least significant digit unit × 100/h, standard)		
Output Signals	Valve operating signals	Contact-closure output		Current carrying capacity 250V ac, 0.5A One Form "a" contact each		
		Full-flowrate signal open (Full-open signal)		Held "on" from the time the initial setting is reached to the time the final restricted flow is started. (Indicator lamp MV lights up.)		
		Restricted-flow signal (Partial closure signal)		Held "on" from a START signal until a STOP signal. (Indicator lamp MV lights up.)		
	End output	Contact-closure output		Current carrying capacity 250V ac, 0.5A One Form "a" contact each Held "on" from the time the target batch is reached; Released upon RESET depression.		
	Output to a remote total counter			Open collector (capacity 30V dc, 50mA, pulse width 1ms), standard or contact-closure pulse (capacity 125V ac/50V dc, 200mA pulse width 50ms)		
	Alarm Output	Contact-closure output		Current carrying capacity 250V ac, 0.5A, one Form "a" contact		

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ITEM		DESCRIPTION
Communi-cations Functions	Communication System	20mA current loop
	Synchronization	Semi-duplex start-stop
	Transmission Code	ASCII
	Transfer Rate	300 or 600 or 1200 (standard) bps (2400, 4800, 9600 bps in the future)
	Signal Cable Length	500 meters max.
	Signal Levels	Mark: 1mA max. Space: 20mA ± 4mA
	Interface Connectors	3-pin metal connectors
Diagnostic Capability		With the mode selector switch 2 inside the enclosure placed in the CHECK, an internal oscillator generates a 100Hz pulse train. Remote output is automatically shut off at this time.
Power Failure Backup		Stores individual setpoints and total count for 5 years min.
Power Source		85-264V ac, 50/60Hz Power consumption 15VA max.
Ambient Temperature		-10 to +50°C Model with power failure backup, 0 to +40°C
Insulation Resistance		Greater than 10MΩ across power terminals bundled and ground terminal and across contact-closure output terminals bundled and ground terminal (when tested by 500V dc Megger)
Withstanding Voltage		1500V ac for one minute across power terminals bundled and ground terminal
Installation		Panel mount
Finish		Instrument frame (aluminum die casting): Munsell N1.5 (standard) Enclosure (steel sheet): Munsell N6
Weight		4 kilograms approx.

■ PRODUCT CODE EXPLANATION

ITEM	CODE ① ② ③ ④ ⑤ ⑥		Supplementary Code ⑦	⑧	⑨	⑩ ⑪	⑫	DESCRIPTION
Model	E L 1 8 7 0							Batch Controller with communications capability
Power Source			7					85 - 264V ac, 50/60Hz
			9					Other than above
Additional Feature				1				Scaler provided
Communications Capability					0			None
					1			(20mA) current loop
						0 0		Always "0 0"
Instrument Enclosure Finish							1	Munsell N1.5 (standard)
							9	Other than above