

1 YEAR
WARRANTY

Ω OMEGA™ **User's Guide**



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DPU91-BC SERIES **Batch Controller System**



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1. Safety

- Follow instructions carefully to avoid personal injury.
 - This unit is designed to be connected to equipment which can be hazardous to persons and property if used incorrectly. Read and understand all associated equipment manuals and safety warnings before using with this product.
 - Remove power to unit before wiring input and output connections.
 - Wiring connections to this product should only be performed by qualified personnel.
 - Do not use unit if display is cracked or broken.
-

2. Compatibility

The Omega DPU91-BC Batch Controller is compatible with the Omega models FP-5300, FP-8500, FP-5600, FP-5200, FPB, FP-2540, FP-3-1500 paddlewheel flow sensors, models FMG-3000 and FMG-550 insertion magmeters, and models FP-5070 and FP-5060 in-line flow sensors.

3. Description

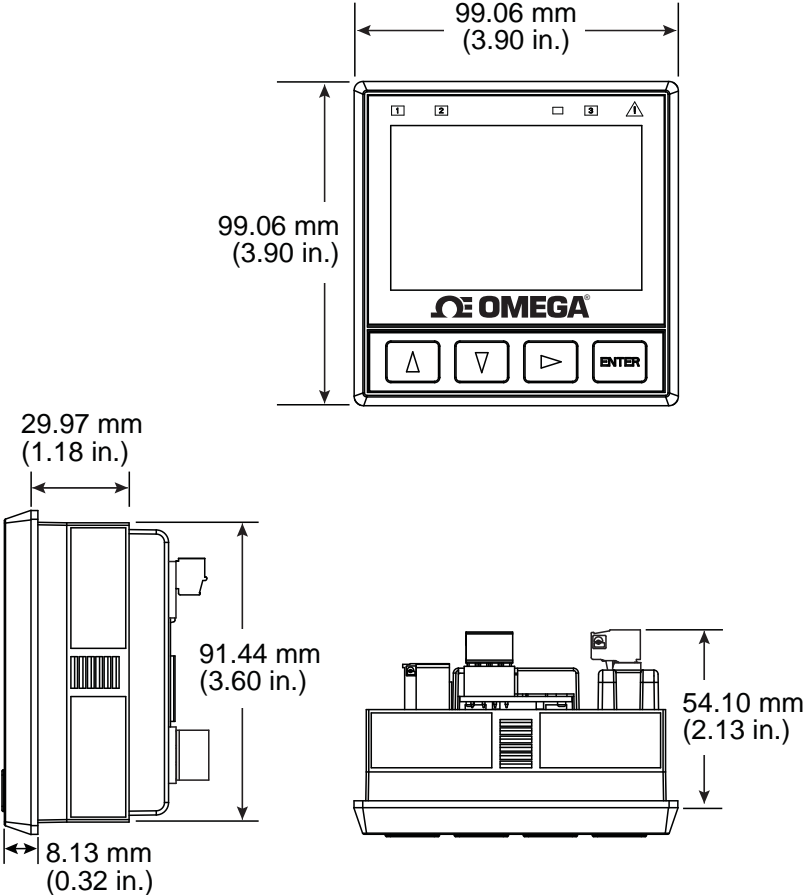
Your new DPU91-BC Batch Controller system includes the following items:

- Omega DPU91P Transmitter (Generation II or later)
- Omega Relay Module DPU90-R
- Omega Batch Module DPU90-BCM

Note: Verify DPU91 Transmitter Generation under the OPTIONS Menu.

4. Dimensions

DPU91-BC Batch Controller System



5. Installation

► System Start-up: Step 1

Prepare the Controller installation location.

If the back of the Controller is difficult to access when installed, wire the removable terminal plugs first, then attach to DPU91P Transmitter.

Next step: Wiring (Step 2) ►

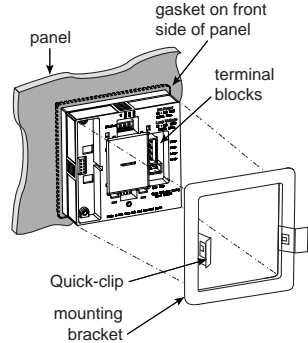


Do not mount in direct sunlight.

Panel Mount Installation

Tools and Equipment Required

- Fine-tooth file
 - ¼ DIN punch or jigsaw suitable for cutting panel opening to within 1 mm (0.04 in) tolerance.
 - ¼ DIN punches are available and recommended for creating clean, precise openings quickly and easily in most instrument panels.
 - If a punch is not available, a jigsaw or other cutting tool can be used. An adhesive template is provided to help guide the cutting process.
- De-burr and smooth the opening with a file.

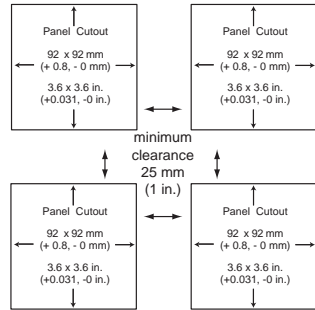


Recommended clearance on all sides between instruments is 25 mm (1 in).

1. Place gasket on instrument, and install through ¼ DIN size opening.
2. Slide mounting bracket over back of instrument until bracket snaps into latches on sides of instrument.

To remove:

1. Secure instrument temporarily with tape from front or grip from rear of instrument. **DO NOT RELEASE.**
2. Press bracket clips outward and remove.



Field Mount Installation

The DPU91-BC unit can be installed in the optional Wall Mount Accessory DPU90-WM, for field mount installation.

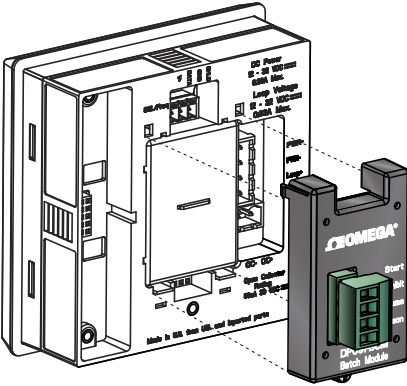


CAUTION:

Avoid Electrostatic Discharge (ESD)

- Minimize handling of plug-in modules to reduce the possibility of damage due to ESD.
- Handle modules by the edges. Never touch any exposed circuitry or contacts.
- Wear an anti-static wristband or stand on an anti-static mat, or keep one hand touching a properly grounded pipe or other properly grounded piece of metal when handling modules.

6. Modules

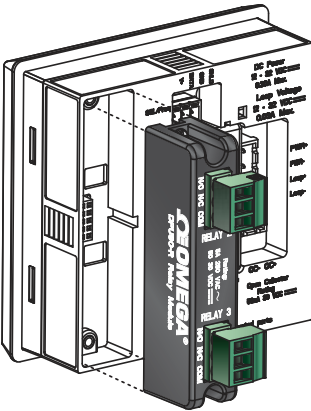


Batch Module

Convert a DPU91P Transmitter (Generation II or later) to a DPU91-BC Batch Controller System by plugging in DPU90-BCM Batch Module.

Optional Module Wiring:

- Wire an external button or keypad (customer supplied) to stop, start or resume a batch remotely.
- Wire an external input that can inhibit a batch from starting.



Relay Module

In addition to the Open Collector output in the DPU91P base unit, the DPU91-BC includes a Relay Module (DPU90-R) which adds two programmable dry-contact relays. The Open Collector output in the base unit uses the Relay 1 setting in the menus. The Relay Module is assigned to relays 2 and 3 in the menus.

Dry-contact relays are electromechanical switches with a moving contact armature. They are suitable for many general-purpose applications, AC or DC, including AC loads up to 250 V.

Install RC Filter Kits, FP90RC, on relays used to switch motor or inductive loads.

- The Indicator LEDs on the front panel of the DPU91-BC show the status of Open Collector (relay 1) and relays 2 and 3.
- Hysteresis and time delay are adjustable for each relay.

- Two SPDT dry-contact relay inputs
- User programmable
- 250 V, 5 A maximum resistive loading (AC)
- Can switch line voltage (typically 120 to 240 VAC)
- Can switch DC voltage (< 30 VDC @ 5A)
- Larger voltage and current ratings than Open Collector outputs (30 VDC, 50 mA maximum)



CAUTION:

Switching active loads (usually inductive) can cause contact arcing sufficient to damage the relays. The RC Filter Kit or “snubber” (part number FP90RC) is available as an accessory to reduce or eliminate these damaging effects. Recommended for inductive loads greater than 50 VAC (remote relays, solenoids, pumps, etc.).

To remove modules:

- 1) Remove power from the DPU91P
- 2) Remove the Relay module
- 3) Loosen bottom screw of Batch module
- 4) Carefully grip and squeeze the tabs at the top of the module to release
- 5) Pull module away from the unit
- 6) Do not bend the connecting pins

7. Terminal Identification

Terminals 1-2: DC Power

- Required by the instrument
- Provides power to sensors, relays and the LCD backlight

Terminals 3-4: 4 to 20 mA

- Passive 4 to 20 mA output

Terminals 5-6: Open Collector

- Software selectable for Normally Open or Normally Closed

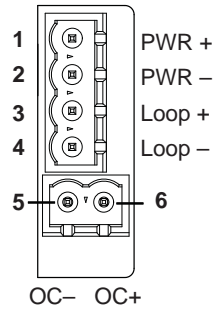
Terminals 7-10: Digital (S³L)/Frequency Input

- Sensor wiring
- DPU90-COMM wiring

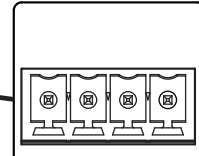
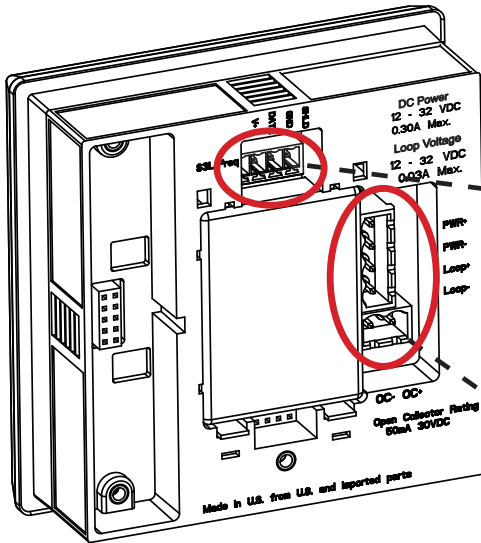


The DPU91-BC requires regulated 10.8 to 35.2 VDC (24 VDC nominal) from an external power supply. Maximum current draw is 300 mA.

Power

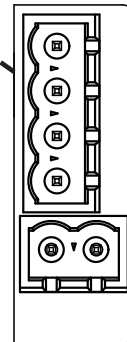


Digital (S³L) / Frequency



Connect sensor wire plug here as shown on page 7.

Connect power and open collector wire plug here as shown on pages 8 and 9.



8. Wiring



System Start-up: Step 2

Wire the transmitter connections with the power off. Keep any 4 to 20 mA and relay-actuated output devices that are connected to it offline at this time.

Wire the sensor (pg. 7), power (pg. 8) and Open Collector and relay(s) (pg. 9).

Next step: System Setup (Step 3)

Wiring Tips:

- Do not route the sensor or DC power cables in conduit containing AC power wiring. Electrical noise may interfere with sensor signal.
- Routing the sensor cable in grounded metal conduit can help prevent electrical noise and mechanical damage.
- Seal the cable entry points to prevent moisture damage.
- Only one wire should be inserted into a terminal.
- Splice double wires outside the terminal or use appropriate wire ferrule, not to exceed 2 mm (0.08 in) diameter.

Tools Required

- Phillips screwdriver
- Flat-head screwdriver
- Wire strippers



CAUTION:

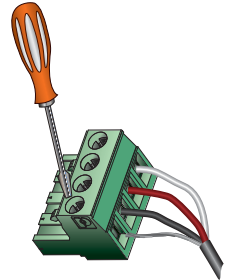
DO NOT bundle Relay Module wiring with other wiring.

Doing so may cause injury and/or damage to DPU91P Transmitter, Relay Module, and Batch Module.

All wiring connections to the DPU91-BC are made via removable terminal plugs.

In general:

- Terminals accept 12 to 24 AWG wire.
- Strip 7 mm (0.28 in.) of insulation from wire tips and tin bare ends to eliminate fraying.
- Insert wire tip or ferrule completely into the terminal and secure with the screw.
- Do not allow any AC leads that may be connected to the internal relays to come in contact with low voltage wiring.



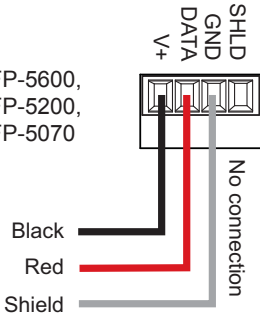
CAUTION:

Avoid Electrostatic Discharge (ESD)

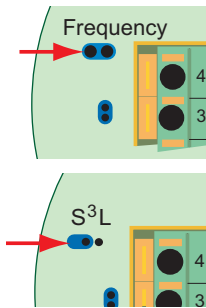
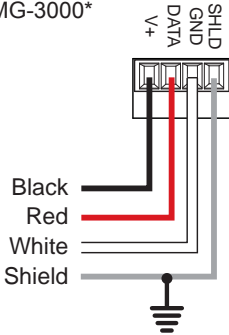
- Minimize handling of plug-in modules to reduce the possibility of damage due to ESD.
- Handle modules by the edges. Never touch any exposed circuitry or contacts.
- Wear an anti-static wristband or stand on an anti-static mat, or keep one hand touching a properly grounded pipe or other properly grounded piece of metal when handling modules.

9. Sensor Wiring

FP-5300, FP-5600,
FP-8500, FP-5200,
FP-5060, FP-5070



FMG-3000*



Connect the silver (shield) wire to earth ground in case of EMI noise interference.

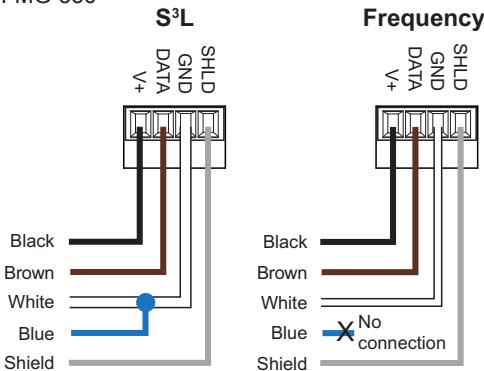
*FMG-3000 Blind Magmeter Output Selection Jumpers

FMG-3000

Technical Notes:

- When the blue jumper illustrated is placed over both pins, the FMG-3000 (Blind Magmeter) outputs an open collector frequency signal. When the jumper is removed (or placed over one pin for storage) the FMG-3000 outputs a Digital (S³L) signal.

FMG-550



FMG-3000 & FMG-550

Technical Notes:

- Either Frequency or Digital (S³L) may be used.
- The frequency output will be displayed as positive flow regardless of the flow direction.
- Omega recommends configuring the FMG-3000 with the Digital (S³L) output because it is more accurate.**
- Input sensor type is selected by choosing between "SENSOR FREQ" and "SENSOR S3L" in the INPUT menu.
- 5 VDC power is provided to the FMG-3000 Magmeter by the DPU91-BC. No additional power is required.

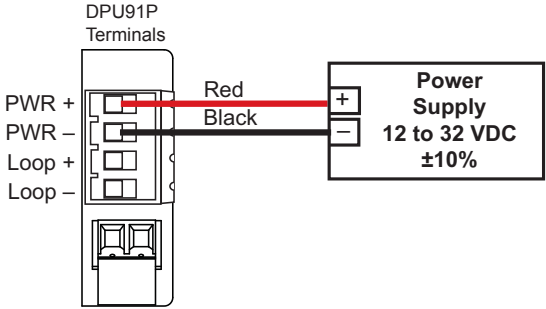
10. Power Wiring



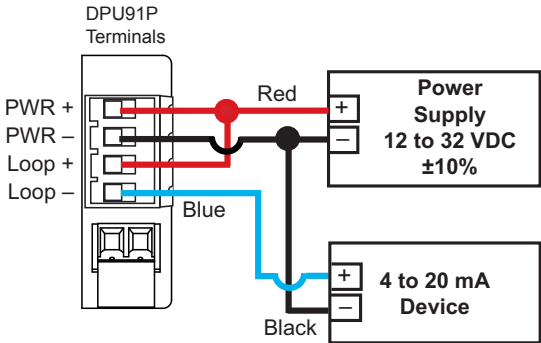
CAUTION!

DO NOT connect your DPU91 to AC power.
The DPU91 MUST be powered by 10.8-35.2 VDC ONLY.

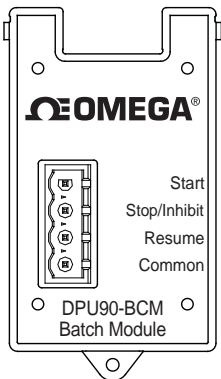
Stand-alone application



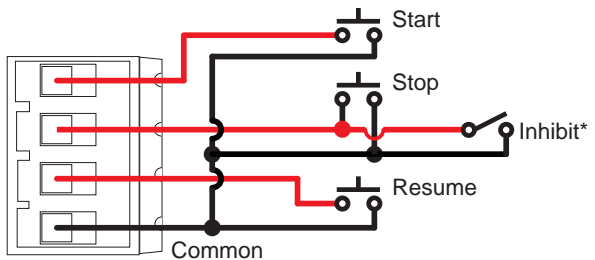
Connection to a 4 to 20 mA device



11. Batch Module Wiring



Connect an external button or keypad (not supplied) to remotely control the DPU91-BC by wiring the Batch Module as shown.



*Wire an external input as override for preventing batch from starting.

12. Open Collector Wiring

- Longer life than a mechanical relay
- No moving parts
- Faster ON/OFF switching capabilities than mechanical relays
- Can switch DC voltage only (< 30 VDC, < 50 mA)
- Not recommended for use with inductive loads

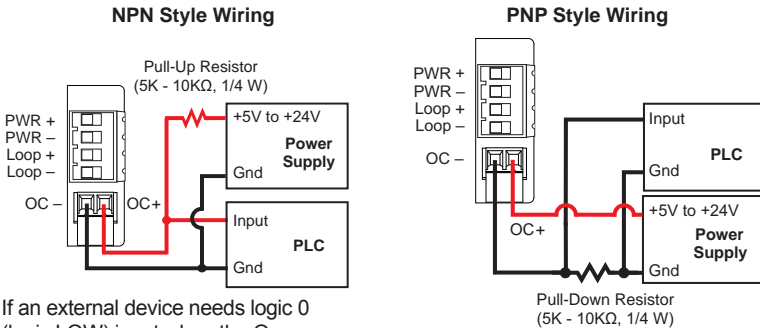
Fail-Safe Behavior

No matter the setting, the Open Collector output turns off if the DPU91 loses power. This must be taken into account when evaluating system failure consequences. If the system layout requires a “closed” or “on” condition for the output in case of power loss, a mechanical dry-contact relay (NC contacts) must be used instead of the Open Collector (R1) output.

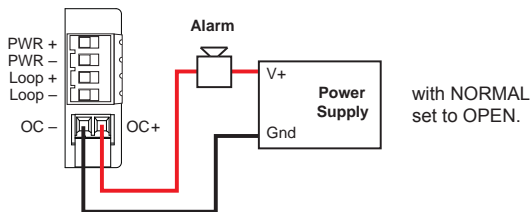
The DPU91 Open Collector (R1) output provides high-speed switching capability. Signal frequencies can reach 400 pulses per minute.

The DPU91 Open Collector (R1) output connection is dependent upon the type of circuit being controlled by the output.

Most indicating instruments or control system inputs require a signal voltage of 0 to 5 V (TTL or CMOS logic levels) or 0 to 24 V. Therefore, the DPU91 Open Collector output circuits must be equipped with a pull-up or pull-down resistor (not supplied), and a quality regulated 5 to 24 V (depending on the application) power supply (not supplied) is recommended to function properly.



If an external device needs logic 0 (logic LOW) input when the Open Collector is de-energized in an NPN configuration, set R1 NORMAL to CLOSED in the RELAY menu.

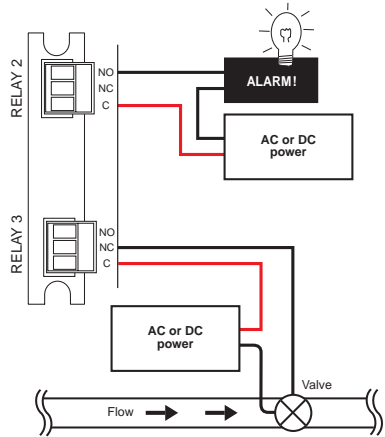


13. Relay Module Wiring

The alarm is OFF during normal operation, and will go ON when relay energizes according to DPU91 Relay settings.

The valve is OFF during normal operation, and will go ON when relay energizes according to DPU91 Relay settings.

- NO = normally open (closes when energized)
- NC = normally closed (opens when energized)



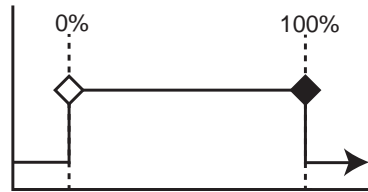
14. Relay Mode Settings

BATCH – Batch*:

Activates relay while batch is running

*Simple Mode

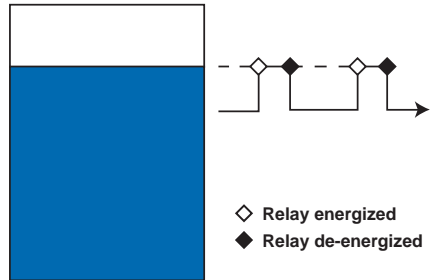
(See Input Menu - Page 17)



- ◇ Relay energized
- ◆ Relay de-energized
- % Batch Percentage

VOL PULS – Volumetric Pulse*:

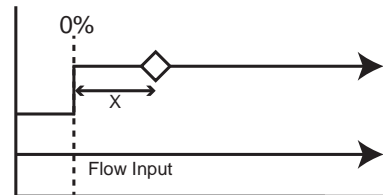
Generates a pulse each time a user defined volume is reached.



- ◇ Relay energized
- ◆ Relay de-energized

MISSING – Missing Signal*:

Activates relay when no flow is detected in X seconds after a batch cycle starts. (X is user defined) Default = 5 seconds.



- ◇ Relay energized
- ◆ Relay de-energized
- % Batch Percentage

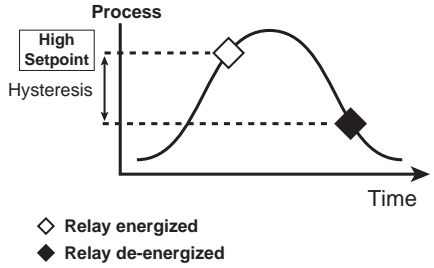
Relay Settings - continued

HI FLOW – High Flow:

In HI FLOW Mode, Relay is energized at Set Flow value and will be de-energized at Set Flow value minus Hysteresis value.

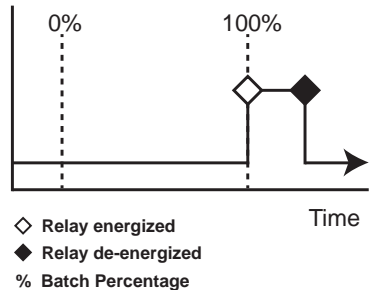
If STOP BATCH is set to YES, the hysteresis is ignored. A batch stopped for a high flow condition will not automatically resume when the flow decreases below the hysteresis level. User interaction is required to resume the batch.

Advanced Mode (See Input Menu - Page 17)



EOB PULS – End of Batch Pulse:

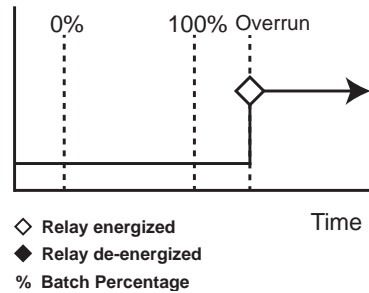
Generates a pulse at the end of a batch which can be used for external counter or to start a second batch controller.



OVERRUN – Overrun:

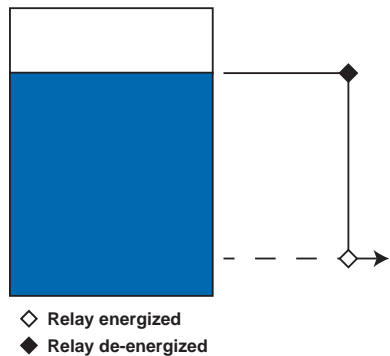
Activates relay when Overrun reaches the specified volume (see Set Overrun Volume, pg. 19).

Note: The Overrun Alarm Volume must be greater than the Manual Compensation Volume. If the Overrun Alarm Volume is less than or equal to the Manual Compensation Volume, the Overrun Alarm will activate on every batch.



SRC VOL – Source Volume:

Activates relay when Source Volume falls to specified volume (*only available when "Source Volume" is ON*).



Relay Settings - continued

TOT VOL – Totalizer Volume:

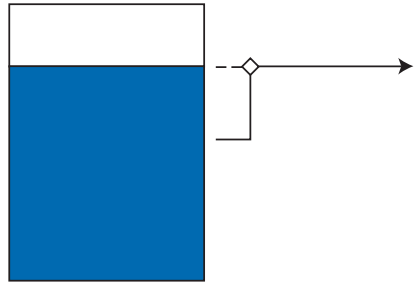
When resettable totalizer exceeds specified volume, relay activates and latches.

Requires Totalizer Volume Reset to deactivate relay (see Reset Total, pg. 16).

This mode is useful to trigger a reminder when a process is due, as for a backwash cycle or filter change.

Advanced Mode

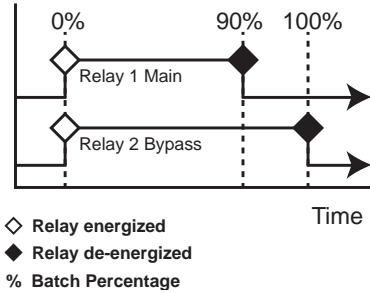
(See Input Menu - Page 17)



- ◇ Relay energized
- ◆ Relay de-energized

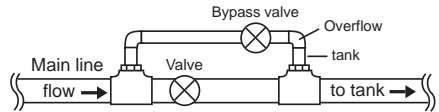
TWO STG – Two Stage:

This function is designed to prevent overflowing or to minimize water hammer. Both the mainline relay and the bypass relay are energized when the batch starts. The mainline relay then de-energizes at a programmed batch percentage, allowing flow to continue through a smaller bypass line to reduce the fill rate (see diagram). After the batch is dispensed, the bypass relay de-energizes, completing the sequence.



- ◇ Relay energized
- ◆ Relay de-energized
- % Batch Percentage

NOTE: If Relay 1 is selected for Two-Stage operation, relay 2 defaults to Bypass. If Relay 2 is selected, relay 3 defaults to bypass. If Relay 3 is selected, relay 2 defaults to bypass.



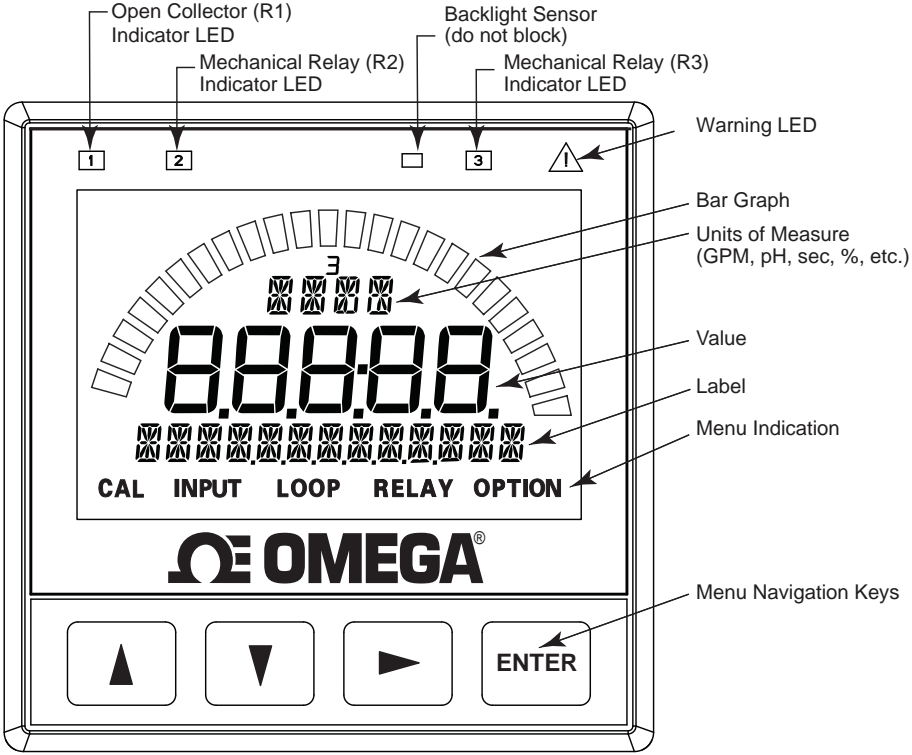
MULTIPLE – Multiple Mode:

Activates relay when any one of the four enabled conditions are met. User can select from Missing Signal, Overrun, High Flow or Error.

ERROR – Error:

If using S³L flow sensor, activates relay when no sensor is detected.

15. Operation

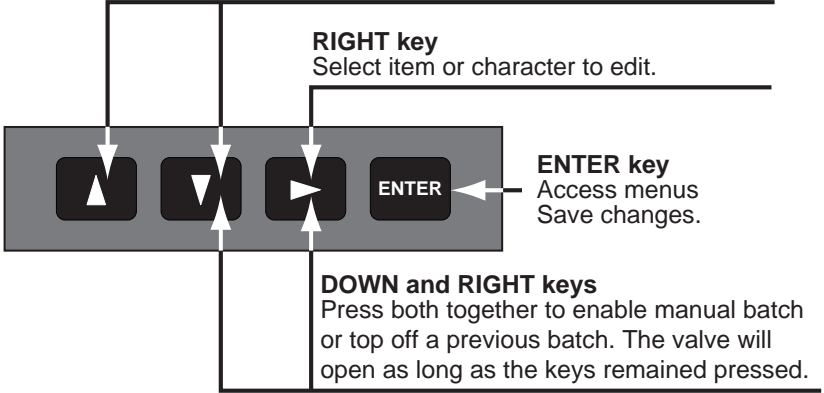


UP, DOWN keys

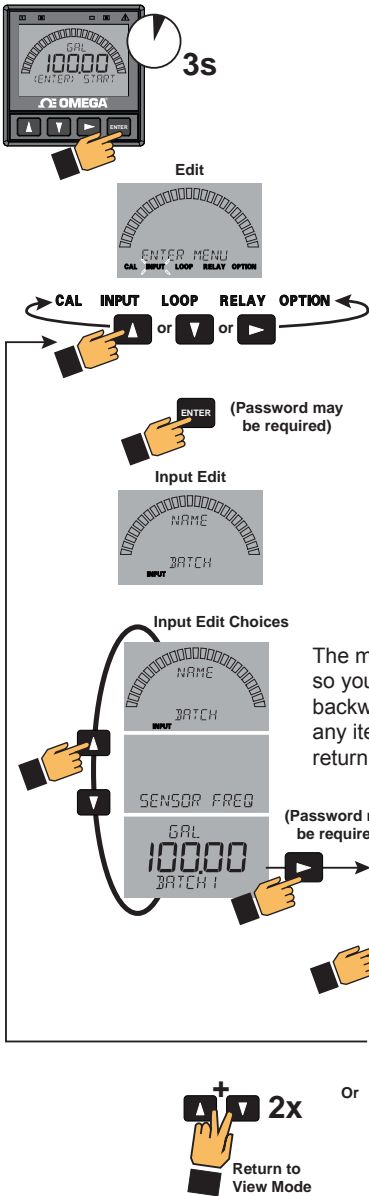
Scroll through Menu options or adjust values during editing.
 Press both together to exit a menu or escape without saving.

RIGHT key

Select item or character to edit.



16. System Setup



System Setup: Menu Navigation

This basic operating procedure repeats throughout the DPU91 program:

1. Press ENTER for 3 seconds to enter EDIT menu.
2. Press ► to move to a specific menu item.
3. Press ENTER key to select the item for editing.
4. Press ▲ or ▼ to edit the value/selection.
5. Press ENTER to store the new value/selection.
6. Press ▲+▼ to select another menu item. Repeat steps 3-5 as required.
7. Press ▲+▼ again to return to normal operation.



NOTE: The DPU91 displays the BATCH instrument type ONLY if the Remote Batch Module is installed.

The menu is constructed in a loop, so you can move forward and backward to select an item. After any item is edited, the display will return to the selected item.

NOTE: Example only. Your display may be different.

17. Menu System



This is the normal display (when batch is running).

BATCH Setup Checklist

1. Set the Units of Measure in Input Menu.
2. Set Flow Timebase in Input Menu.
3. Set Sensor Type (Freq or S²L) in Input Menu.
4. Set Batch Size in Input Menu.
5. Set K-Factor (pulses per Unit Volume) from Flow Sensor manual in CAL Menu.
6. Set up relay functions and other settings for your own application.

VIEW Mode Menu - Batch Running



Stop Running Batch Press ENTER to stop batch that is running.
Note: ENTER button stops batch in any screen on VIEW Mode.



Time Left displays estimated time remaining (in minutes) until batch is completed.



Percent Complete displays percent remaining or percent completed of running batch. Count direction based on COUNT UP/DOWN setting in INPUT menu.



Flow Rate displays current flow rate of running batch.



Output Current displays the output loop current in milliamperes (mA).



Source Volume displays the calculated remaining source volume. Shown if SOURCE VOLUME is ON.



Relay Status displays relay status for Relays 1, 2 and 3. One of three states (OFF, ON, PLS) for each relay will be displayed.

VIEW Mode Menu - Batch Stopped

GAL
125
(ENTER) START
BATCH 1

Start Batch Press Up or Down arrows to select the desired batch number. Press ENTER to start selected batch. Selected batch alternately displays on the bottom line of the display.
(Confirmation screen or password screen are user-selectable in INPUT menu.)
Available batches determined by the number of stored batches whose size is not zero.

GAL
50
RESUME CANCEL

Resume/Cancel Batch Displays when a batch is stopped without completing. Press the ► key to select either RESUME or CANCEL and then press ENTER to either resume the batch or cancel it. A confirmation or password screen for resuming a batch is user selectable. This screen will not display if the batch reaches completion.

GAL
325.00
(ENTER) START
OVERRIDE

Override Batch occurs when the user temporarily changes a batch size in View Mode. The change is temporary and is only active until a batch is run. After any batch is run, an overridden batch reverts back to its stored size. Only one batch can be overridden at a time. If the user overrides a second batch, the first overridden batch will revert to its stored size. The batch name will display OVERRIDE while it is overridden. A batch is overridden by pressing ► to edit the batch size.

GAL
00
MANUAL BATCH
(DOWN+RIGHT)

Manual Batch is used for "topping off" a batch. The Batch Controller will open the valve as long as the user simultaneously holds down the ▼ and ► keys.

Note: A manual batch will cancel a batch in the RESUME/CANCEL state.

GAL
15
SOURCE VOL?

Source Volume shows the calculated remaining source volume. Displays if SOURCE VOLUME is ON. Reset source volume with ► key.
Note: If PWD REQUIRED is set to YES, you may be prompted to enter your password. PWD REQUIRED setting can be changed in the OPTIONS menu.

NO
3000
RESET VOLUME?

Reset Volume? Confirmation screen for resetting SOURCE VOLUME. Press ▲ or ▼ to select YES and press ENTER to reset source volume.

GAL
00
0 12345678 -)

Resettable Totalizer displays the resettable totalizer. Press ► to reset the totalizer. **Note:** If PWD REQUIRED is set to YES, you may be prompted to enter your password. PWD REQUIRED setting can be changed in the OPTIONS menu.

NO
RESET TOTAL?

Reset Total? Confirmation screen for clearing the resettable Totalizer. Press ▲ or ▼ to select YES and press ENTER.

GAL
00
P 0 1234567 -)

Permanent Totalizer displays the Permanent Totalizer value (note the "P" indicating Permanent). Pressing ► displays units of measure.

GAL
10
OVERRUN

Overrun displays the amount of overrun volume detected after the DPU91-BC deactivates the batch relay, triggering valve closure. Overrun resets each time a new batch starts.

4
BATCH COUNT

Batch Count shows the number of batches which have run to at least 90% of completion. Press ► to reset Batch Count.

Note: If PWD REQUIRED is set to YES, you may be prompted to enter your password. PWD REQUIRED setting can be changed in the OPTIONS menu.

NO
4
RESET COUNT?

Reset Count? Confirmation screen for clearing the Batch Count. Press ▲ or ▼ to select YES and press ENTER.

GAL
00
BATCH

Customizable Label is the View name assigned to the DPU91P. Default is BATCH for DPU91-BC.

CAL Menu

KF 600000	K-Factor Set K-Factor (pulses per unit volume) according to Flow Sensor manual. Min: 0.0001, max: 999999. Cannot be zero. Default = 60.0000. In Simple Mode, the K-Factor will be used for all batches. In Advanced Mode, there is one K-Factor for each stored batch. See NOTE in Calibration section for Volume Calibration procedure.
TF 10000	T-Factor sets the volume of each count of the Totalizer as a multiple of the volume unit of the K-Factor. Min: 0.0001, max 999999. Cannot be zero. Default = 1.0000.
VOLUME CAL	Volume Calibration Enter the dispensed volume so the DPU91 can calculate a K-Factor. Refer to Volume Calibration section on page 24 for procedure. Note: Relays and 4 to 20 mA output will be suspended while Volume Calibration is performed, except for relays used for Batch or Two Stage modes. Relays in pulse mode will suspend pulsing while Volume Calibration is being performed.
OVR 100 MANUAL COMP	Manual Overrun Compensation (ADVANCED Mode only) When Manual Compensation is enabled, a batch will be stopped when the dispensed batch volume reaches an amount equal to the batch size volume minus the Manual Overrun Compensation volume.
LAST CAL MM-DD-YYYY II	Calibration Date Enter date of calibration (mm-dd-yyyy) and initials of calibrator (ii).

INPUT Menu

NAME BATCH	Customize Label If desired, a custom name can be entered. Enter 13-character string. Default = BATCH.
SENSOR FREQ SENSOR S3L	Freq or S³L If your flow sensor is configured for frequency output, select FREQ. If configured for Digital (S ³ L) output (recommended), select S ³ L. Default = FREQ.
GAL 100.00 BATCH 1	Batch Size Set batch size and batch name of up to ten stored batches. Setting batch size to zero hides the batch in VIEW Mode. One batch must be non-zero. Note: Same batch names can be assigned to multiple batches.
GAL BATCH UNITS	Batch Units Enter up to four characters to define Batch Units. Default = GAL. (Actual calculations are determined by the K-Factor). Divide this unit by Flow Timebase to get Flow Units.
TOT Unit GALLONS	Totalizer Units Identifies the Totalizer Units. It has no effect on any calculation. Default = GALLONS.
GPM FLOW UNITS	Flow Units Identifies the Flow Units. It has no effect on any calculation. Flow Units equal Batch Units divided by Flow Timebase. Default = GPM.
/S FLOW TIMEBASE	Flow Timebase Select S (seconds), M (minutes), H (hours), or D (days). Default = s.
OFF BATCH CONFIRM	Batch Confirmation Select Batch Confirmation option. Choose ON, OFF, or PWD (password). Default = OFF.

INPUT Menu - continued

SIMPLE MODE

Mode Select Select ADVANCED or SIMPLE Mode. ADVANCED Mode enables additional features in RELAY and LOOP Modes. Default = SIMPLE.

ADVANCED MODE

VOL
COUNT UP

Count Up/Down Select count direction of Batch Volume and Percent Complete (Source Volume always counts down). Default = Count Up.

YES
MISSING SIG

Missing Signal? Determines if a Batch is stopped when No Flow is detected. If YES is selected, Batch will be stopped; if NO is selected, Batch will continue. Default = NO.

Note: This setting is independent of Missing Signal Relay Mode; see page 19.

SEC
60
ON DELAY

Set On Delay Shown if MISSING SIGNAL is set to YES. Set desired ON delay time in seconds. Default = 6 sec.

TYPE
BATCH

Select Batch Type To change desired instrument type (i.e., Flow, pH, etc.). The bottom line will display ALL SETTINGS WILL BE RESET. ARE YOU SURE? The top line of the display will blink NO. Press ▼ or ▲ to select YES. Press ENTER again to finalize your selection. For other DPU91 instruments, BATCH will be displayed only when the Batch Module is installed.

LOOP Menu

LOOP
COMPLETION

Loop Source In ADVANCED Mode, select COMPLETION or FLOW RATE. In SIMPLE Mode, only COMPLETION is available for the loop source.

mA
20
AT COMPLETION

mA at Completion Shown if COMPLETION is selected. Enter mA value to be output when batch is completed. Select 4.0 mA or 20 mA.

mA
3.6
ERROR VALUE

Error Value Shown if COMPLETION is selected. Set desired Loop output value when sensor error (e.g., bad sensor, broken wire) is detected. Select 3.6 mA, 22 mA, NONE. Default = 3.6.

GPM
00000
4 mA SETPNT

4 mA Setpoint Shown if FLOW RATE is selected. Set flow rate value corresponding to desired 4 mA output. Default = 0.

GPM
10000
20 mA SETPNT

20 mA Setpoint Shown if FLOW RATE is selected. Set flow rate value corresponding to desired 20 mA output. Default = 100.

mA
4.00
ADJUST 4 mA

Adjust 4 mA Allows fine-tuning to compensate for errors in other equipment connected to the DPU91. The display value represents the precise current output. Adjustment limits: 3.80 mA to 5.00 mA. Default = 4.00 mA.

mA
20.00
ADJUST 20 mA

Adjust 20 mA Allows fine-tuning to compensate for errors in other equipment connected to the DPU91. The display value represents the precise current output. Adjustment limits: 19.00 mA to 21.00 mA. Default = 20 mA.

mA
TEST LOOP

Test Loop Press ▲ or ▼ to manually output a current value from 3.6 mA to 21.00 mA to test the output loop.

RELAY Menu

R 1
NORMAL OPEN

R1 Normal Open/Closed Set Open Collector (R1) as Normally Open or Normally Closed. Default = NORMAL OPEN.

R 1
MODE OFF

Relay Mode Select the desired mode of operation for the open-collector (R1) output. Simple Mode: BATCH, VOL PULS, MISSING.

Advanced Mode: OFF, BATCH, HI FLOW, VOL PULS, EOB PULS, MISSING, OVERRUN, SRC VOL (if SOURCE VOL is set to ON; see OPTIONS menu), TOT VOL, TWO STG, MULTIPLE, ERROR.

Defaults: Relay 1 = VOL PULS; Relay 2= BATCH; Relay 3 = MISSING.

Note: Same Relay Modes are available for Relays 2 and 3. **See pg. 10-12.**

R1 TEST RELAY

Test Relay Select OFF or ON to test relay.

SHOW REMOTE

View Remote Button Status Press ► to view status of remote buttons.

1 0 0
STR STP RES

Remote Button Status Displays status of Remote Buttons: STA (Start), STP (Stop), RES (Resume). 1 = pressed, 0 = not pressed. Press ENTER to exit.

GPM
00000
R1 SET FLOW

Set Flow In HI FLOW Mode, set flow value to activate relay.

GPM
05000
R1 HYSTERESIS

Set Hysteresis Prevents the system from chattering around the set point. In HI FLOW Mode, Relay is energized at Set Flow value and will be de-energized at Set Flow value minus Hysteresis value.

SEC
50
R1 ON DELAY

Set On Delay In HI FLOW, ERROR, and MISSING Modes, set desired ON delay. Default = 5 sec.

YES
R1 STOP BATCH

Stop Batch? In HI FLOW, MISSING, MULTIPLE, and ERROR Modes, determines if a Batch is stopped when a Relay Activates. If YES is selected, Batch will be stopped; if NO is selected, Batch will continue. Default = YES.

GAL
10000
R1 OVERRUN VOL

Set Overrun Volume In OVERRUN and MULTIPLE Modes, set desired Overrun Volume.

Note: Overrun Volume must be greater than Manual Overrun Compensation, otherwise the Overrun Alarm will activate at the end of every batch.

R 1
tot
000 10000 VOL

Set Totalizer Volume In TOT VOL Mode, set desired totalizer volume.

Note: This volume is resettable and totalizer volume must be reset to clear relay. (see Resettable Totalizer, pg. 16)

GAL
10000
R1 VOL PULS

Set Pulse Volume In VOL PULS Mode, set desired volume.

SEC
01
R1 PLS WIDTH

Set Pulse Width In VOL PULS Mode, set desired pulse width.

RELAY Menu - continued

RELAY MULTIPLE Mode options (see discussion on page 12)

ON R1 MISSING	Missing Signal On/Off Energizes selected relay if signal is missing. Select ON or OFF.
R1 OVERRUN	Overrun On/Off Energizes selected relay if overrun occurs. Select ON or OFF.
R1 HI FLOW	Hi Flow On/Off Energizes selected relay if Hi Flow condition occurs. Select ON or OFF.
R1 ERROR	Error On/Off Energizes selected relay if an error condition occurs. Select ON or OFF.

RELAY TWO STAGE Mode option (see discussion on page 12)

R1 MODE TWO STG	Main Relay Select (ADVANCED Mode only) Selects the specified relay as the main relay for two-stage valve control. This relay will be de-energized when the batch volume reaches the setpoint percentage.
% 95 SETPOINT	Setpoint Percent Select Selects the percentage of batch volume at which the main relay will be de-energized. Default = 95%.
2STG R2 BYPASS	Bypass Relay Select Selects the specified relay as the Bypass relay for two-stage valve control. This relay will remain energized while the batch is running.
R2 IN BYPASS	Relay Bypassed The specified relay is in Bypass. Note: A relay is taken out of bypass using the Bypass select screen, found under the relay which is in TWO STG Mode.

OPTION Menu

3
CONTRAST

Contrast Adjust the LCD contrast for best viewing. A setting of 1 is lowest contrast, 5 is highest. In general, select lower contrast if the display is in warmer surroundings. Default = 3.

AUTO
BACKLIGHT

Backlight Adjust backlight level. Select OFF, LOW, HIGH or AUTO. Default = AUTO.

BATCH DECIMAL

Batch Decimal Set the decimal to the best resolution for your application. The display will automatically scale up to this resolution. Select -----, ----., ---.- or --.---. Default = ----.

TOTAL DECIMAL

Total Decimal Set the decimal to the best resolution for the Permanent Totalizer display. The display will automatically scale up to this resolution. Select -----, ----., ---.- or --.---. Default = ----.

YES
PWD REQUIRED

PWD REQUIRED requires password to reset TOTALIZER, BATCH OVERRIDE, SOURCE VOLUME reset, and BATCH COUNT reset. Select YES/NO. (Does not affect Permanent Totalizer.) Default = YES.

OFF
SOURCE VOLUME

Source Volume Selects SOURCE VOLUME display option. Choose ON or OFF. Default = OFF.

GAL
3000
SOURCE VOLUME

Volume Reset If SOURCE VOLUME is ON, set the reset value for the source volume. Default = 1000 GAL.

BATCH
BATCH VOLUME

Bar Graph Source If SOURCE VOLUME is ON, select source for Bar Graph (choose BATCH VOLUME or SOURCE VOLUME). If SOURCE VOLUME is OFF, Bar Graph source is the batch volume. Default = BATCH VOLUME.

STD
PASSWORD TYPE

Password Type Select STD or CODE. Default = STD.

PASSWORD

Set Code If CODE is selected in PASSWORD TYPE, enter desired password code. 4-character entry not displayed, ---- displayed instead.

MEMO

Memo Enter 13-character string, if desired.

NO
REMOTE SETUP

Remote Setup Enables Remote Setup to configure the DPU91 via a computer and the PC COMM tool. Press ► and select YES to enable. REMOTE SETUP flashes when mode is enabled. Refer to the PC COMM Configuration/Diagnostic Tool manual, DPU90-CT, included with your PC COMM tool.

GENERATION II

Version Level Generation II or later indicates that the DPU91 is Batch-capable.

18. Error Messages

<pre>----- NO BATCH MODULE</pre>	Remote Batch Module is missing.
<pre>----- NO SENSOR</pre>	No signal from Flow Sensor.
<pre>EXTERNAL STOP IS ACTIVE</pre>	External Stop signal is preventing batch start or Remote Stop button is held down.
<pre>CHANGE BYPASS ON 2576 RELAY</pre>	Bypass relay must be set on Bypass Relay Select option, under the Relay Menu. See page 20, under Relay Two Stage mode.
<pre>% MUST BE MORE THAN 0</pre>	Main relay shutoff percentage cannot be zero.
<pre>ERROR VOLUME TOO LOW</pre>	Volume entered during Volume Calibration is too low to calculate a K-Factor.
<pre>ERROR NEW KF OUT OF RANGE</pre>	K-Factor error during volume calibration.
<pre>VALUE MUST BE MORE THAN 0</pre>	Value cannot be zero.
<pre>1 BATCH MUST BE NONZERO</pre>	At least one batch must have a non-zero volume.
<pre>MANUAL COMP TOO HIGH</pre>	Batch size is less than or equal to Manual Compensation value.
<pre>OVR BATCH VOLUME TOO LOW</pre>	Manual overrun compensation is greater than or equal to the size of at least one of the stored batches.

19. Alarm Acknowledgement Messages

<pre>OVERRUN ALARM PRESS ENTER</pre>	Overrun was detected.
<pre>HI FLOW ALARM PRESS ENTER</pre>	High flow was detected.
<pre>ERROR ALARM PRESS ENTER</pre>	No S ³ L communication or a sensor was detected.
<pre>MISSING SIG PRESS ENTER</pre>	No flow was detected.

20. Calibration

NOTE:

In Advanced Mode the Batch Controller has a separate K-Factor for each stored batch. In Simple Mode the stored batches use a common K-Factor. If you switch from Simple Mode to Advanced Mode, the single K-Factor will be copied to the K-Factor for each batch. If you switch from Advanced Mode to Simple Mode, the K-Factor for Batch 1 will be copied to the single K-Factor used for all batches.

Volume Calibration Procedure

1. Press ENTER to start the volumetric calibration period.
The DPU91 activates the BATCH Relay and starts counting pulses from the flow sensor.
2. Press ENTER to stop the volumetric calibration period.
The DPU91 deactivates the BATCH Relay and stops counting pulses from the flow sensor.
3. Enter the volume of fluid known to have flowed past the DPU91 during the volumetric calibration period.
This will modify the existing K-Factor.
4. The DPU91 displays the newly calculated K-Factor for your reference.
Note: If the calculated K-Factor is less than 0.0001 or greater than 999999 (out of range at either extreme), the DPU91 displays "ERROR VOLUME TOO HIGH" (or LOW) and returns to VOLUME CAL.
5. Press ENTER to accept the new K-Factor (DPU91 displays "SAVING") or press ▲+▼ keys simultaneously to escape without saving and return to Enter Volume.



NOTE:

- You may enter your own calculated K-Factor in the CAL menu.
- In Simple Mode, the calculated K-Factor will replace the current K-Factor.
- In Advanced Mode, the calculated K-Factor value will replace the first K-Factor.
- A K-Factor can be calculated for each batch. Repeat steps 1-5 for each batch and enter calculated K-Factor for the corresponding batch.

21. Specifications

General

Input channels: ..One

Enclosure and Display

Case MaterialPBT

WindowShatter-Resistant Glass

Keypad4 buttons, injection-molded
silicone rubber seal

Display.....Backlit, 7- and 14-segment

Indicators.....“Dial-type” digital bar graph

Update rate.....1 s

LCD Contrast.....5 settings

Enclosure

Size.....¼ DIN

ColorBlack

Mounting

Panel¼ DIN, ribbed on four sides
for panel mounting clip
inside panel

Wall.....Large enclosure (sold as
an accessory) that encases
the transmitter

Environmental Requirements

Ambient operating temperature:

Backlit LCD -10 °C to 70 °C
(14 °F to 158 °F)

Storage Temp -15 °C to 70 °C
(5 °F to 158 °F)

Operating Temp -10 °C to 70 °C
(14 °F to 158 °F)

Relative Humidity.... 0 to 100% condensing
for front only; 0 to 95%
non-condensing for
back side.

Maximum Altitude ... 4,000 m (13,123 ft)

Enclosure Rating Designed to meet
NEMA 4X/IP65
(front face only).

Performance Specifications

Accuracy.....±0.2%

System Response:

- Primarily dependent upon the sensor. Transmitter adds a maximum 150 ms processing delay of the sensor electronics.
- Minimum update period is 100 ms.
- System response is tempered by the display rate.

Electrical Requirements

Power to Sensors:

Voltage: +4.9 to 5.5 VDC
@ 25 °C, regulated

Current: 20 mA max

Short Circuit Protected

Terminal Blocks

- Pluggable screw type
- 14 AWG max wire gauge

Input Power Requirements

DC (preferred)..... 24 VDC Input;
range: 10.8 to 35.2
VDC regulated
300 mA maximum

Overvoltage protection... 48 Volt Transient
Protection Device

Current limiting for circuit protection

Reverse-Voltage protection

Loop Characteristics

With DC power input (preferred)

Max. loop impedance

@ 12 V loop power 250 Ω max.

@ 18 V loop power 500 Ω max.

@ 24 V loop power 750 Ω max.

Relay Specifications

Hysteresis Adjustable (absolute
in Engineering Units)

Latch Reset in test screen or
View Mode

On Delay 9999.9 seconds (max)

Test Mode Set On or Off

Maximum pulse rate 400 pulses/minute

Volumetric Pulse Width.. 0.1 s to 3200 s

Open Collector

Type NPN

Max. Voltage Rating 30 VDC

Max. Current Rating 50 mA

Dry-Contact Relays

Type SPDT

Form C

Max. Voltage Rating 30 VDC or 250 VAC

Max. Current Rating 5 A

Shipping Weights

Base Unit 0.63 kg (1.38 lb)

Batch Module..... 0.16 kg (0.35 lb)

Relay Module..... 0.19 kg (0.41 lb)

Input Specifications

Digital (S²L)..... Serial ASCII,
TTL level, 9600 bps

Frequency:

Sensitivity 80 mV @ 5 Hz,
gradually increasing
with frequency

Range 0.5 Hz to 1500 Hz @
TTL level input for
open collector

Accuracy ± 0.5% of reading
max error @ 25 °C

Resolution 1 µs

Repeatability ± 0.2% of reading

Power Supply

Rejection No Effect ± 1 µA/V

Short Circuit Protected

Reverse Polarity..... Protected

Update Rate (1/frequency) + 150 ms

Output Specifications

One 4 to 20 mA output

Current Loop Out.... ANSI-ISA 50.00.01
Class H

Span 3.8 to 21 mA

Zero 4.0 mA factory set;
user programmable
from 3.8 to 4.2 mA

Full Scale..... 20.00 mA factory set;
user programmable
19.0 to 21.0 mA

Accuracy ± 32 µA max. error
@ 25 °C @ 24 VDC

Resolution..... 6 µA or better

Temp. Drift ± 1 µA per °C

Pwr Sply Rejection .. ± 1 µA per V

Isolation Low voltage
(< 48 VAC/DC)

Voltage..... 10.8 to 35.2 VDC

Max. Impedance 250 Ω @ 12 VDC
..... 500 Ω @ 18 VDC
..... 750 Ω @ 24 VDC

Update Rate 150 mS nominal

Short circuit and reverse polarity protected

Adjustable span, reversible

Error Condition Selectable error
condition 3.6 or 22 mA
or NONE

Actual update rate .. Determined by
sensor type

Test Mode Increment to
desired current
(range 3.6 to 21.00 mA)

OC Outputs..... 1

Analog Outputs..... 1 passive

Linear scaling

22. Ordering Information

DPU91-BC Batch Controller System

Mfr. Part No	Description
DPU91-BC	Batch Controller System
DPU91P	DPU91 Panel Mount Transmitter
DPU90-R	Relay Module - 2 DCR (dry-contact relays)
DPU90-BCM	Batch Module

Accessories

DPU90-CT	PC COMM Configuration tool
DPU90-WM	Wall Mount Accessory
FPM-5000-LTCK	Liquid Tight Connector Kit, NPT (1 pc.)

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. **BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS).** The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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