ECO-FLOW - C

NEMA 12 (Modbus)

Read and understand this manual before installing, operating, or servicing your Aquatic Controller

SAFETY INSTRUCTIONS

This Eco-Flow - C variable speed pool pump drive is intended for professional incorporation into complete equipment or systems. If installed incorrectly it may present a safety hazard.

The Eco-Flow - C uses high voltages and currents and carries a high level of stored electrical energy.

Close attention is required to system design and electrical installation to avoid hazards in either normal operation or in the event of equipment malfunction.

System design, installation, commissioning, and maintenance must be carried out only by personnel who have the necessary training and experience. They must carefully read this safety information and the instructions in this Guide and follow all information regarding transportation, storage, installation, and use of the Eco-Flow - C, including the specified environmental limitations.

⚠ WARNING

Installation of the Eco-flow - C must comply with all local Electrical codes and standards

To prevent injury and property damage, follow these instructions during the installation and operation of the Eco-Flow - C. Incorrect operation due to ignoring these instructions may cause harm or damage.

Do not remove the cover while power is applied or the unit is in operation, electric shock could occur.

Do not operate the Eco-Flow - C with the front cover removed, electric shock could occur due to the exposed terminals and bus bars.

Do not remove the cover except for periodic inspections or wiring, even if the input power is not applied, electric shock can occur due to accessing capacitor banks.

Wiring and periodic inspections should be performed at least 5 minutes after disconnecting the input power, electric shock could occur.

Operate the switches with dry hands. Otherwise, electric shock could occur.

Install the Eco-Flow - C on a non-flammable surface. Do not place flammable materials nearby, fire could occur.

Disconnect the input power if the Eco-Flow - C has been damaged, it could result in a secondary accident and/or fire.

Do not touch the Eco-Flow - C after shutting down or disconnecting it. It will remain hot for a couple of minutes, bodily injuries such as skin-burn or damage could occur.

Do not apply power to a damaged Eco-Flow - C or to an Eco-Flow - C with parts missing even if the installation is complete. Otherwise, electric shock could occur.

Do not allow lint, paper, wood chips, dust, metallic chips, or other foreign material into the Eco-Flow - C, fire or accidents could occur.

Install the Eco-Flow - C according to instructions specified in this manual.

The connection orientation of the motor output cables U, V, W will affect the direction of rotation of the motor. Verify correct wiring before starting Eco-Flow - C.

Always install the Eco-Flow - C before wiring, otherwise, electric shock or bodily injury can occur.

Always apply voltage within the permissible range of each terminal as indicated in this manual. Otherwise damage may result.

OPERATION PRECAUTIONS

All Start/Stop functions must be carried out from the Aquatic controller.

If a fault condition occurs with the Eco-Flow - C drive, reset the fault by pressing the RESET key on the drive keypad.

Do not modify the Eco-Flow - C

The operation of the Eco-Flow - C is intended to be controlled by the Aquatic controller. Do not use a magnetic contactor or any other device that routinely disconnects the Eco-Flow - C and reconnects the Eco-Flow - C to the input supply power for the purpose of starting and stopping the motor.

Prior to operating the unit, be sure to restore covers and circuit protection according to specifications

INSPECTION

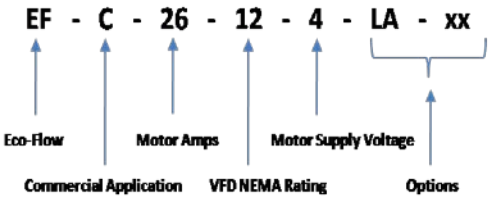
Remove Eco-Flow - C from its packing and inspect its exterior for shipping damage. If damage is apparent, notify the shipping agent and your Eco-Flow - C sales representative.

Remove the cover and inspect the Eco-Flow - C for any apparent damage or foreign objects. Ensure that all mounting hardware and terminal connection hardware is properly seated, securely fastened, and undamaged.

Check the nameplate on the unit. Verify that the Eco-Flow - C unit is the correct horsepower and input voltage for the application.

		Max Motor HP		
Frame Size	**Model**	**208 / 230V**	**480V**	**VFD Max Amps**
A	EF-C-04-12-4		2	4
A	EF-C-08-12-4		5	8
A	EF-C-13-12-4		7.5	13
A	EF-C-26-12-4		15	26
A	EF-C-31-12-4		25	31
A	EF-C-46-12-4		30	46
B	EF-C-60-12-4		40	60
B	EF-C-73-12-4		50	73
A	EF-C-04-12-2	1		4
A	EF-C-08-12-2	2		8
A	EF-C-13-12-2	3		13
A	EF-C-26-12-2	7.5		26
A	EF-C-31-12-2	10		31
A	EF-C-46-12-2	15		46
B	EF-C-60-12-2	20		60
B	EF-C-73-12-2	25		73

Part Number	**Description**
PS-30	Pressure Sensor, 0-30 psi,1/4" NPT male thread and with 4-20 mA output and 10' cable
PS-100	Pressure Sensor, 0-100 psi,1/4" NPT male thread and with 4-20 mA output and 10' cable
LA	Lightning Arrestor
BP-A	NEMA 12 Bypass Panel for Frame Size A
BP-B	NEMA 12 Bypass Panel for Frame Size B



Introduction

Overview

The Eco-Flow - C Variable Frequency Drive is an electronic controller that adjusts the speed of an electric motor by regulating the power being delivered and by changing the frequency of that power. A motor's speed is directly proportional to the frequency supplied to it. If a motor nameplate speed is 1720 RPM at 60Hz, lowering the frequency to 30Hz will cause the motor to run at 860 RPM.

Energy Saving

Electrical energy is billed to the consumer in Kilowatt Hours (kWh) – i.e. how many kilowatts are used in one hour. A 'watt' is a measurement of power that is derived from calculating the voltage, current, and power factor.

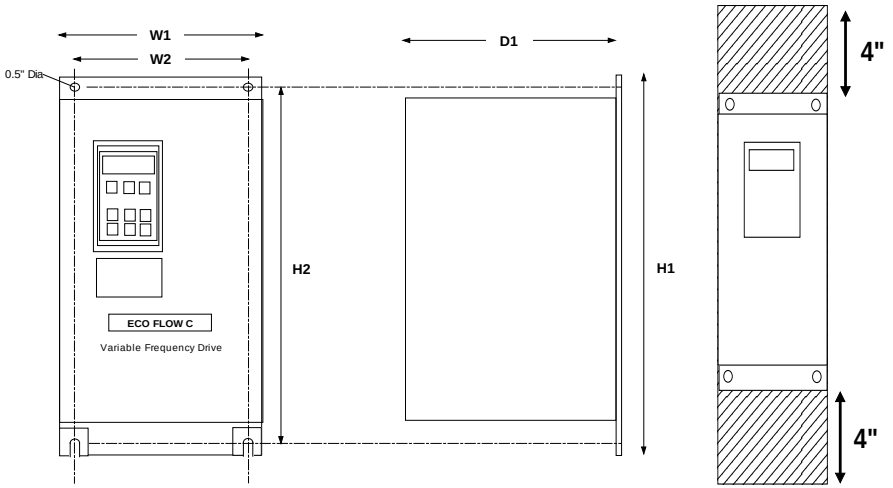
Centrifugal Pumps (used in pool applications), use far less power when they run slower. The decrease in power is due to the Affinity Laws.

Title 20 states:

The Aquatic Controller will, if programmed to run the pump at a maximum speed of 100% (60hz) for a period of 24hrs, reduce that speed to 83% (50hz) for a period of 1 hour each day from 11:00 PM to 12:00 AM (23:00hrs to 00:00hrs).

Mechanical Installation

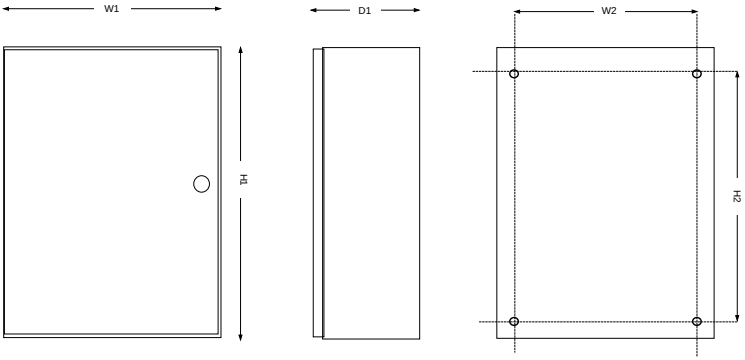
Eco-Flow - C Dimensions



Allow 4.00” above and below the Eco-Flow - C for air circulation

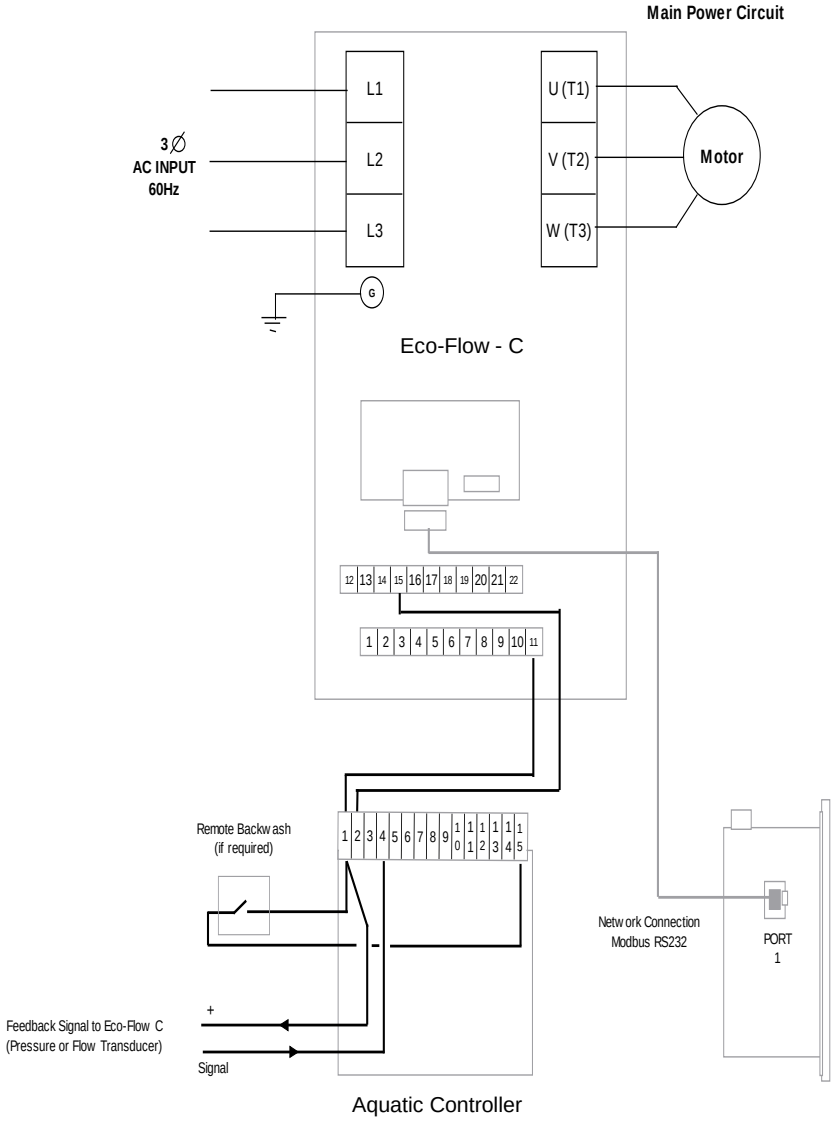
Model	W1	W2	H1	H2	D1
EF-C-04-12-x EF-C-08-12-x EF-C-13-12-x	8.0”	5.0”	16.4”	N/A	8.0”
EF-C-26-12-x EF-C-31-12-x EF-C-46-12-x	7.0”	5.0:	20.1”	19.4	11.5”
EF-C-60-12-x EF-C-73-12-x	8.67”	6.3”	23.2”	22.4”	10.6

Optional Bypass Enclosure Dimensions



Model	W1	W2	H1	H2	D1
BPA	**16”**	**14.5”**	**20”**	**18.5”**	**9.0**
BPB	**20”**	**18.5”**	**24”**	**22.5”**	9.0”

Electrical Installation: Eco-Flow - C and Aquatic Controller



Eco-Flow - C Controller

Overview

The Aquatic controller program has been written in such a way as to intuitively walk the installer through options to enable the pump to be controlled in the way the operator requires. As questions are answered on the Aquatic Controller, information is written to the Eco-Flow - C drive.

Fixed Speeds

Objective: Running the pump at one or two programmable fixed speeds. The speeds being time of day (hh:mm) related.

Also programmable with these speeds is an off/on duration if required.

When programming the fixed speeds, it is essential that the speeds be such that the required pool turn-over times are met.

Constant Flow

Objective: Running the pump at a variable speed to maintain a constant flow in the system for a 24 hour period.

A feedback signal from either a flow or pressure transmitter is compared with a desired set point programmed within the Eco-Flow - C controller. The Eco-Flow - C will automatically vary the speed of the pump to maintain the desired flow rate within the system.

Also programmable with Constant Flow control, is an off/on duration if required.

Constant Flow with Fixed Speed

Objective: Running the pump at a variable speed to maintain a constant flow in the system for a programmable time of day period followed by a fixed speed for another part of the day.

A feedback signal of either flow or pressure is compared within the Eco-Flow - C drive to a desired set point programmed within the Eco-Flow - C controller. The Eco-Flow - C will vary the speed of the drive to maintain the desired set point. When the Constant Flow programmed time has elapsed, the Eco-Flow - C switches to a programmable fixed speed value until the next day when the Constant Flow time period begins again.

Also programmable with Constant Flow with Fixed Speed control is an off/on duration if required.

Filter backwashing

a) **Manual Filer Backwash**. The Eco-Flow – C controller can be programmed to provide a backwashing pump speed and associated backwashing time. The pump is stopped via the controller and the filter valves are manually moved by the operator. The pump is then restarted in the backwash mode, whereupon the pre-programmed backwash speed for the pre-programmed backwash time will activate. At the conclusion of the backwash period the pump will be automatically stopped. The operator can then move the filter valves to their normal running positions and restart the pump in Automatic mode via Eco-Flow - C controller.

b) **Automatic Filter Backwash**. In cases where a building management system controls the backwash procedure, an input from the building management systems tells the Eco-Flow - C controller to move to the programmed backwash speed. At the conclusion of the backwashing procedure, the Eco-Flow - C returns to the Automatic mode.

Programming Mode

The first time the Eco-Flow - C controller is powered up, it will power up in the programming Mode. Once a program has been entered, each subsequent power up will give the user a 15 second window to enter the programming mode. If at the end of that 15 second period, a programming mode has not been selected, the Eco-Flow - C controller will enter the Automatic mode.

Password Protection

The Eco-Flow - C controller program is password protected to prevent unauthorized entry into the program mode. The programmed password is **6535**. This password cannot be changed by the installer.

Programming the Aquatic Controller

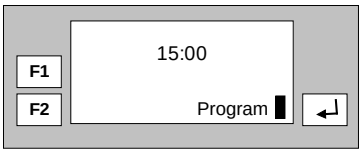
The following guides you through the Aquatic Controller programming steps.

NOTE:

The Eco-Flow - C Controller's Hours and Minutes have to be programmed using Military Time. Please refer to the table below.

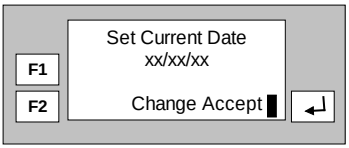
AM	Enter	PM	Enter
12:00	00:00	**12:00**	12:00
01:00	01:00	**1:00**	13:00
02:00	02:00	**2:00**	14:00
03:00	03:00	**3:00**	15:00
04:00	04:00	**4:00**	16:00
05:00	05:00	**5:00**	17:00
06:00	06:00	**6:00**	18:00
07:00	07:00	**7:00**	19:00
08:00	08:00	**8:00**	20:00
09:00	09:00	**9:00**	21:00
10:00	10:00	**10:00**	22:00
11:00	11:00	**11:00**	23:00

Start Up Screen

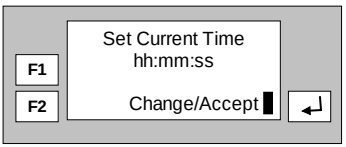


Press ENTER within 15 Seconds to enter Program Mode

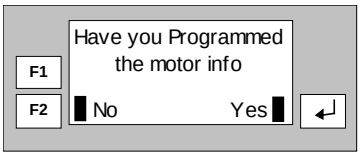
Using the ENTER key and the Number keys enter the system password



Using the ENTER key and the number keys enter today's date

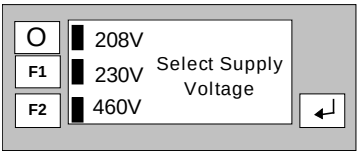


Using the ENTER key and the number keys enter the current time

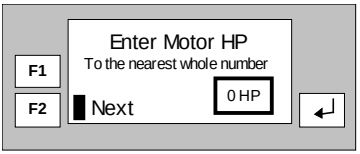


The Motor Data must be programmed.
If you have already programmed this data once, Select No to move on.

No

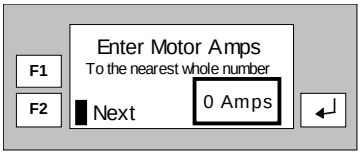


Select the supply Voltage of the system

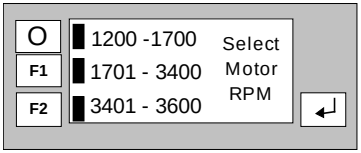


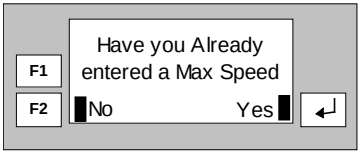
Use the ENTER key and the Number keys to enter the Motor HP to the nearest whole number (7.5HP enter 8HP). Then press F2

Yes



Use the ENTER key and the Number keys to enter the Motor Amps to the nearest whole number (Then press F2)

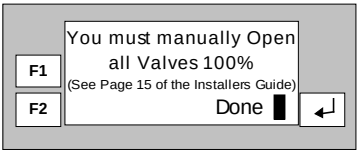




A maximum motor speed must be Programmed. If you have already Programmed this data once, Press F2 to move on

No

Yes



To be able to accurately set the maximum speed all valves must be 100% open

Notes for Programming Max Speed

The flow through the system is governed by the maximum flow that can be produced by the pump and the discharge head. Any valves that are 'throttled in' to reduce flow also reduce the effectiveness of the pump and result in higher energy costs than necessary.

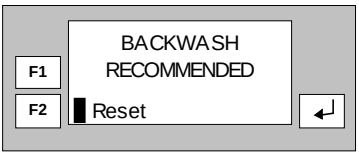
For Constant Flow Applications

The flow rate will decrease as the filter becomes dirty. To ensure that the flow rate remains constant with a dirty filter and that the system cannot be over-pressurized by running the pump too fast with all discharge valves open 100%, it is essential that a maximum speed for the Eco-flow - C is set.

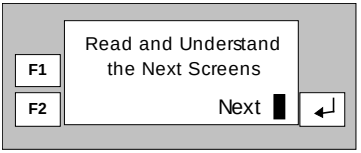
It is important that this step is carried out with a dirty filter. If carried out with a clean filter an estimation of how much the flow will be reduced by a dirty filter and what speed increase will be required to overcome this reduction will have to be made by the installer. Alternatively, it may be necessary to repeat the procedure for setting the maximum speed at a later date when the filter is dirty.

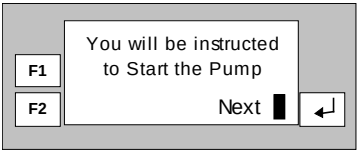
In most systems, valves are used to reduce the system flow to maintain the flow rate required by local code. As stated above, these valves cause electrical inefficiency. It is very important in order to maximize energy efficiency, that these valves are fully open. In the case of valves that are used to create a back-pressure to force water through heaters and/or chemical systems, these valves should only be throttled, such that the minimum required flow to operate the pressure switches associated with the heater and/or chemical system is obtained. With these valves throttled they will govern the flow of the whole system.

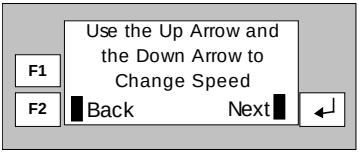
Associated with the maximum speed setting and the Constant Flow mode is an alarm level which triggers the following screen message.

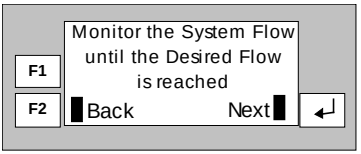


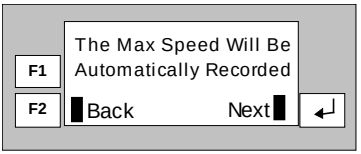
This message will only be displayed if the pump has been running at maximum speed for a period of one hour.

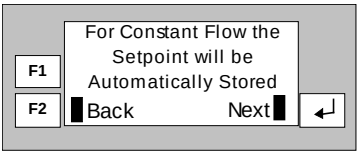

F1
F2
Read and Understand
the Next Screens
Next

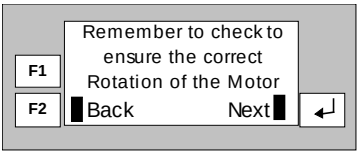

F1
F2
You will be instructed
to Start the Pump
Next

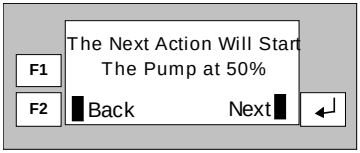

F1
F2
Use the Up Arrow and
the Down Arrow to
Change Speed
Back
Next


F1
F2
Monitor the System Flow
until the Desired Flow
is reached
Back
Next

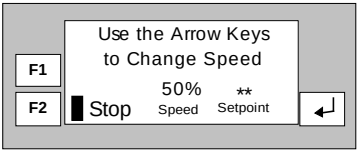

F1
F2
The Max Speed Will Be
Automatically Recorded
Back
Next


F1
F2
For Constant Flow the
Setpoint will be
Automatically Stored
Back
Next

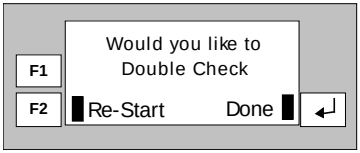

F1
F2
Remember to check to
ensure the correct
Rotation of the Motor
Back
Next



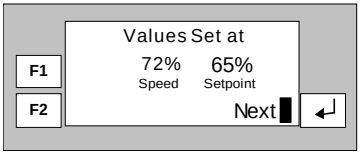
Use the ENTER key to run the motor at 50% of the RPM Programmed under Motor info

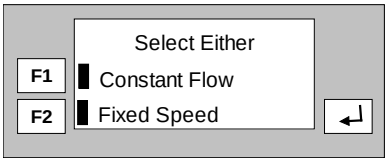


Monitor the system flow as you increase the motor speed using the Up Arrow key until the desired flow rate is achieved. Press F2 to Stop the motor



F2 will take you back two screens.

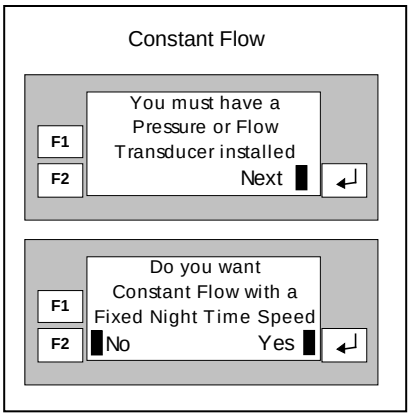




Select which type of pump control you require

Constant Flow Control

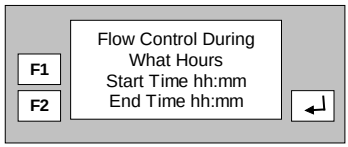
Two types of control are available under Auto Flow Control: **a)** 24hr control of the system flow (using a flow or pressure transmitter for feedback) and by varying the pump speed to maintain a constant flow, or **b)** daytime control of the system flow when the pool is in use and at night time running the pump at a fixed lower speed to further reduce energy consumption.



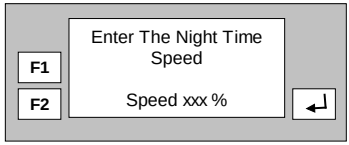
Fixed Speed (Page 19)

No

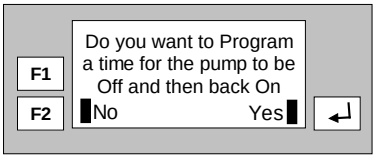
Yes



Use the Enter key and the number keys to enter the Start and End Hours



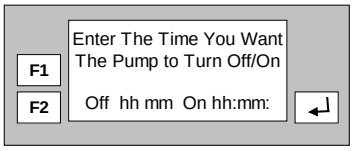
Use the ENTER key and the Number keys to enter a Night Time Speed



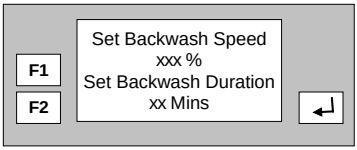
Is the pump required to turn off during the day / night for a time period

No

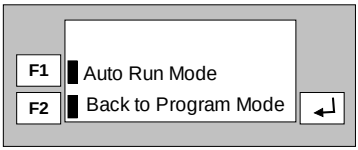
Yes



Use the ENTER key and the number keys to enter the Off and On times required



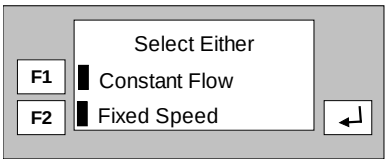
Use the ENTER key and the Number keys to enter the backwash speed and number of minutes for backwash



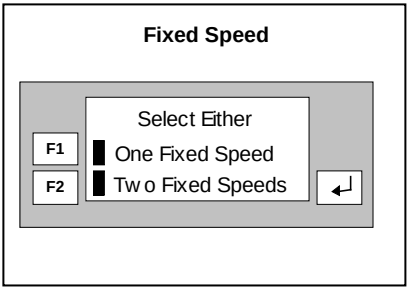
Select Auto Run Mode F1 or Back to Program Mode F2

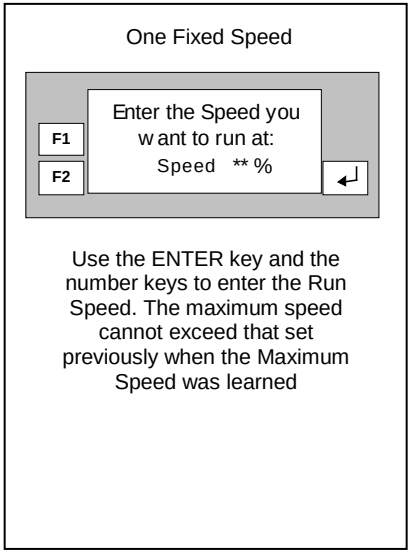
Fixed Speeds

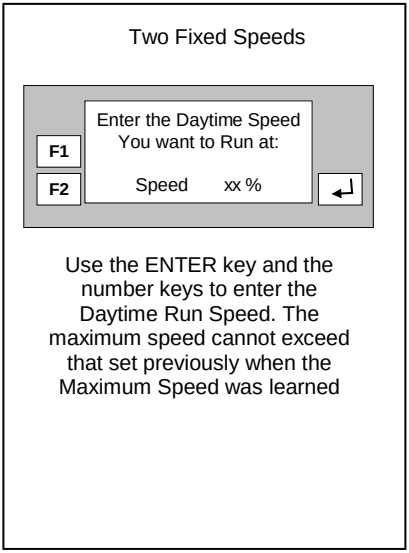
This type of control allows the pump to run at one speed for 24 hours a day or: the day can be divided into two periods. Different speeds can be programmed for each period.



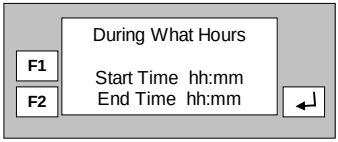
Select which type of Pump Control you require



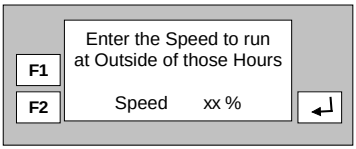




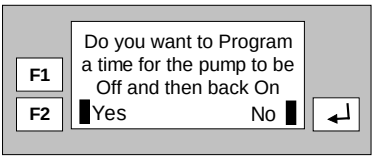
Two Fixed Speeds



Use the Enter key and the number keys to enter the Start and End Hours



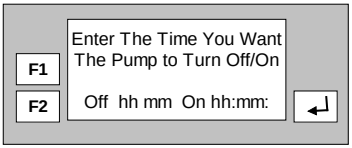
Use the ENTER key and the number keys to enter the Run Speed. The maximum speed cannot exceed that set previously when the Maximum Speed was learned



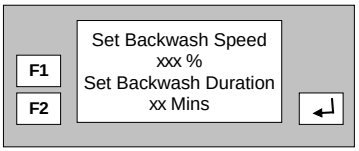
Is the pump required to turn off during the day / night for a time period

No

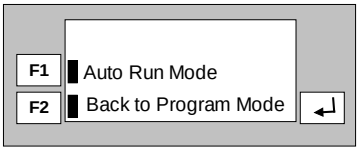
Yes



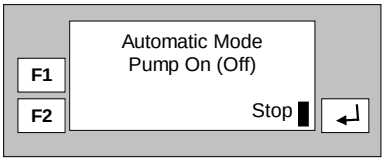
Use the ENTER key and the number keys to enter the Off and On times required



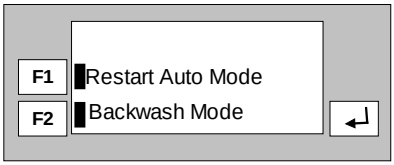
Use the ENTER key and the Number keys to enter the backwash speed and number of minutes for backwash



Select Auto Run Mode F1 or
Back to Program Mode F2



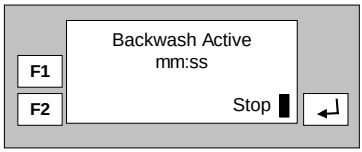
Press ENTER to Stop the pump



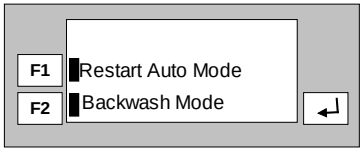
Press F1 to Restart the pump in Auto Mode
Press F2 to run the Backwash program

Restart

Backwash



Press ENTER to end Backwash early



Press F1 to Restart the pump in Auto Mode

Press F2 to run the Backwash program