ZENER 8000

SW08024   Application Guide

PID Irrigator Control

ZENER

VARIDRIVE SOLUTIONS

Important Warnings:

- ALL PROTECTION PROVIDED BY THE ZENER 8000 IS FOR OPERATIONAL PURPOSES ONLY. SEPARATE INDEPENDENT METHODS MUST BE EMPLOYED TO PREVENT ECONOMIC LOSS.

- THIS EQUIPMENT CONTAINS HIGH VOLTAGE AND REMAINS CHARGED FOR A PERIOD AFTER POWER IS REMOVED. ALWAYS ALLOW 15 MINUTES FOR COMPLETE DISCHARGE AND CHECK FOR THE PRESENCE OF AC OR DC VOLTAGE BEFORE ACCESSING MOTOR PHASE TERMINALS, WIRING OR INTERNAL COMPONENTS.

Check List: What information you need to know

1. What is the motor nameplate Full Load Current ?   _____Amps

2. What is the motor nameplate RPM ?   _____rpm

3. What is the desired operating pressure (in psi) ?   _____psi

4. What is the maximum system pressure allowable (in psi) ?   _____psi

5. What is the transducer's pressure rating (ie. @ 20mA) ?   _____psi

6. What is the minimum operating speed of the pump (= X% of 50Hz) ? _____Hz

Product Support
www.zener.com.au/support-8r.php

Reference Manual
www.zener.com.au/images/im00140.pdf

PID Irrigator Application Guide (this document)
www.zener.com.au/images/im00160.pdf

Commissioning Overview

Each step must be completed in order shown before proceeding to the next. Before proceeding to power the ZENER 8000 and operating the pump, check all wiring is correct and that the pump and plumbing system is in a state fit for operation. If any parameters are changed it is important to 'save changes' when prompted exiting the menu.

Preparation:

1.	Read all safety instructions & warnings	*Refer to the installation manual*
2.	Install as per instruction manual and this 'Application' guide	*Refer to the installation manual and Page 4 of this guide*
3.	Read this application guide carefully and ensure it meets your requirements	Go to page 3
4.	Familiarise yourself with operating the ZENER 8000 and application menus	*Go to page 5 to 11*

Preliminary Checks:

5.	Load the application & adjust initial parameters	*Go to Page 7*
6.	Operate in local mode to check direction	*Go to Page 11*
7.	Check pressure transducer feedback	*Go to Page 11*

Operational Check &Fine Tuning:

8.	Operate in remote mode and check PID. Calibrate PID if required	*Go to Page 12*
10.	Check & calibrate 'PIPE FILL' if required	*Go to Page 14*
11.	Check overall operation and protection	
12.	Save 'Custom Defaults' and/or record settings	

Application Overview

Part Number: SW08024
App Group: Standard
Description: PID Irrigator Control
Menu Text: PID Irrigator
Compatibility: ZENER 8000 Firmware 5.2.13 or later
Application Guide: IM00160

What is a ZENER 'Application'?

An 'Application' is firmware that aims to simplify wiring, programming and the commissioning of ZENER 8000. An 'Application' programs the drive and creates new user friendly menus with the essential settings. This eliminates timely setups, the reading & interpretation of complex manuals and ensures all critical protection is installed & set up correctly. There is generally no reason to program additional parameters unless there is a variation to the intended operation of this 'Application'.

PID Irrigator Application Summary:

This application provides an advanced PID Pressure Control System using an external pressure transducer. The ZENER 8000 will maintain a constant pressure with changing water consumption requirements.

1 of 4 user configured set points provides the pressure for the system to maintain. As the pressure changes the ZENER 8000 automatically adjusts the speed to ensure constant pressure is maintained.

When demand decreases the drive will reduce speed to reduce pressure accordingly. As the flow & speed reduce the load (current) also reduces. If the installed flow switch detects "no-flow", the ZENER 8000 will stop pumping and await reset.

A 'Pipe Fill' feature is available to run at a set speed during filling then automatically changeover to PID mode when the set pressure is reached.

ZENER 8000 protection for the pump & motor:
  i.   Motor Overload protection
  ii.   Output Short Circuit protection
  iii. Loss of transducer signal
  iv.   High Pressure Pulse Protection
  v.   Pressure Out of Regulation Protection
  vi.   Optional Low Bore level protection
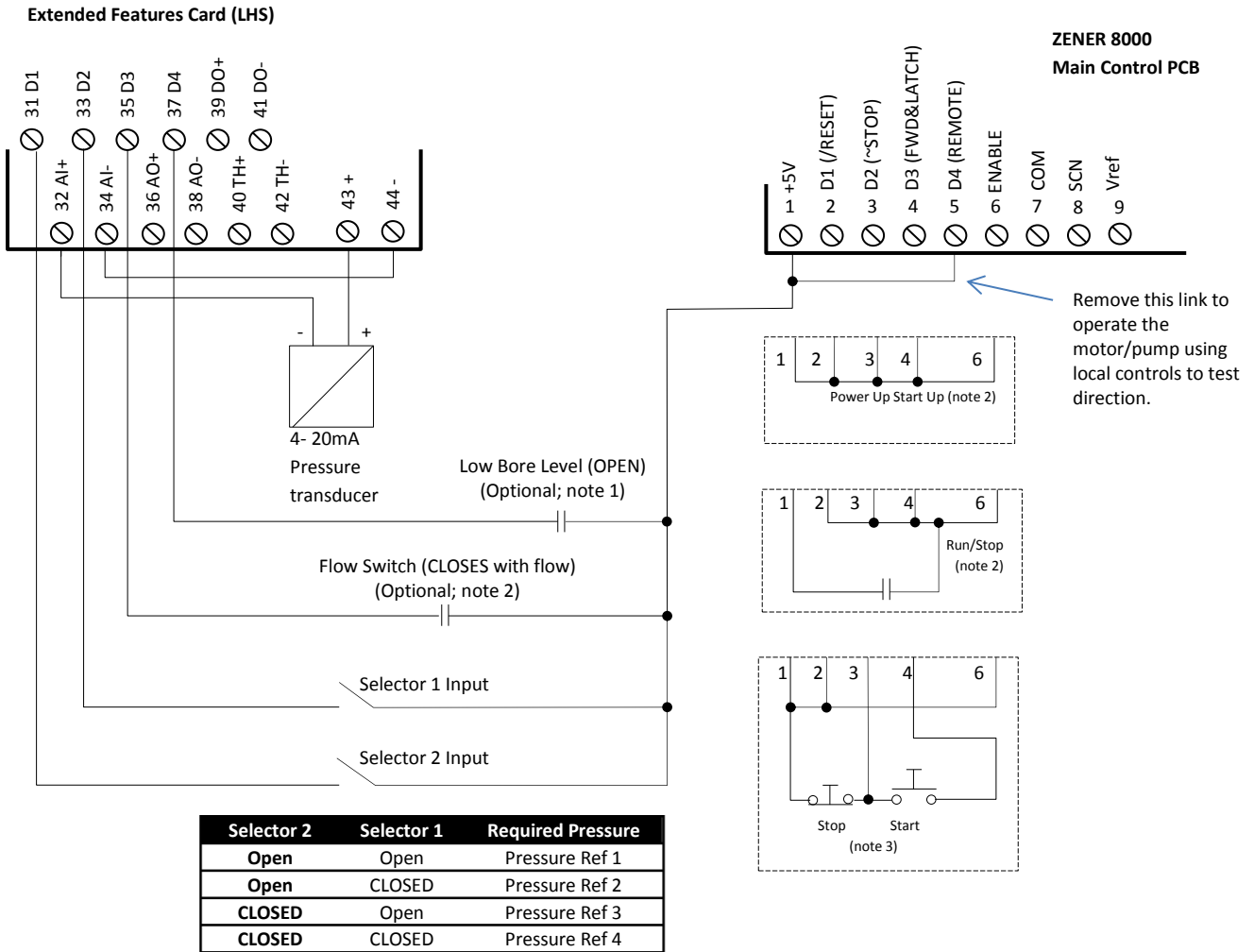 vii. Optional No Flow protection
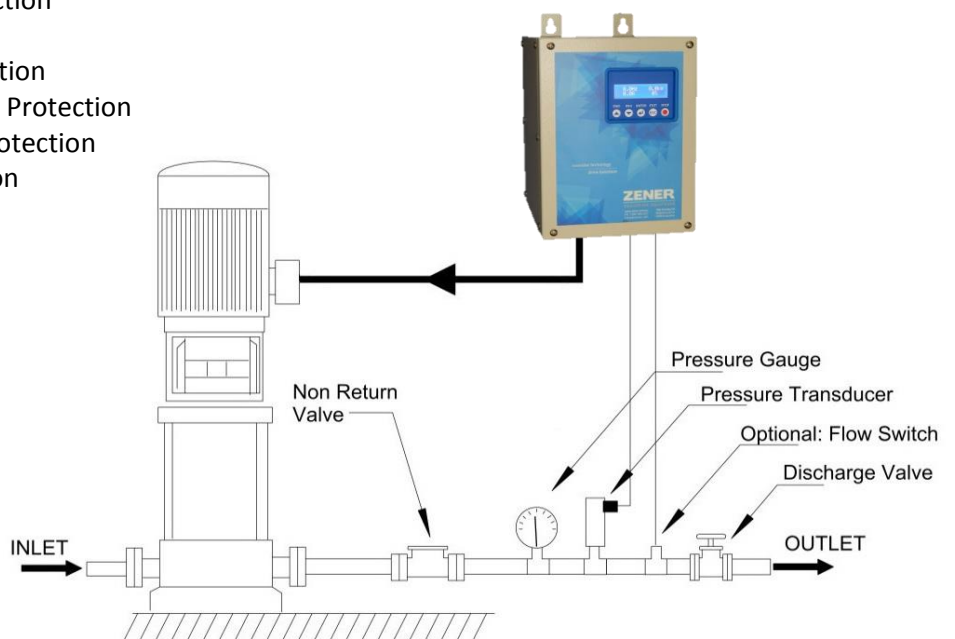
System Requirements:

1. ZENER 8000 with the Application: "PID Irrigator" fitted with an extended features board (AF08001).
2. A pressure transducer and a pressure gauge (for calibration purposes) located between the pump and any discharge valves.
3. A 4-20mA pressure transducer. However different devices can be used by varying the appropriate parameters.
4. Non return valves may be located as determined by the application. Their location does not affect pressure regulation.
5. The motor & pump are in good working order.
6. The "HI PRESSURE" trip and "PRESSURE ERR" trip are for operational purposes only. Separate and independent methods must be employed to prevent economic loss. A pressure relief valve is recommended.
7. Optional control input available for 'Bore level'. External level sensing device required.
8. Optional control input available for 'Flow Switch'. Closed contact indicates flow.

Control Wiring:

Note: All control wiring should be screened.

Extended Features Card (LHS)

ZENER 8000 Main Control PCB

Remove this link to operate the motor/pump using local controls to test direction.

4- 20mA Pressure transducer

Low Bore Level (OPEN) (Optional; note 1)

Flow Switch (CLOSES with flow) (Optional; note 2)

Selector 1 Input

Selector 2 Input

Power Up Start Up (note 2)

Run/Stop (note 2)

Stop   Start (note 3)

Selector 2	Selector 1	Required Pressure
Open	Open	Pressure Ref 1
Open	CLOSED	Pressure Ref 2
CLOSED	Open	Pressure Ref 3
CLOSED	CLOSED	Pressure Ref 4

****
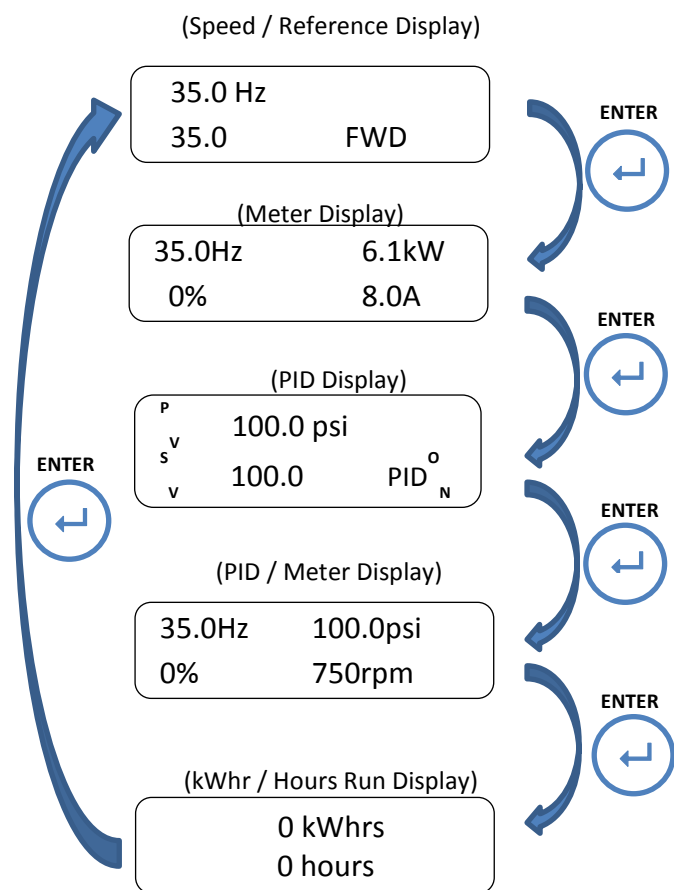
Ensure the ZENER 8000 is in local mode (remove link in terminal 5) to prevent operation while programming and performing preliminary checks.

NOTES:
1. If the optional 'Flow switch' is not installed, a bridging link must be fitted. i.e. +5V ➔ D3(35)
2. If the optional 'Low Bore Level' switch is not installed, a bridging link must be fitted. i.e. +5V ➔ D4(37)
3. The set up supports several run wiring methods. As shown in the diagram above these include: "START/STOP" with pushbuttons, "RUN/Stop" and "Power Up /Start Up".

Operation Displays

The operational displays show the operating state of the ZENER 8000. The operational displays include: Speed / Reference Display, Meter Display, PID Display, PID / Meter Display and kWhr / Hours Run Display. Press ↵ (ENTER) to step through each display.

(Speed / Reference Display)

```
35.0 Hz
35.0          FWD
```

ENTER ↵

(Meter Display)

```
35.0Hz          6.1kW
0%              8.0A
```

ENTER ↵

(PID Display)

```
P
 V    100.0 psi
S
 V    100.0      PID  O
                      N
```

ENTER ↵

(PID / Meter Display)

```
35.0Hz      100.0psi
0%          750rpm
```

ENTER ↵

(kWhr / Hours Run Display)

```
0 kWhrs
0 hours
```

ENTER ↵

Speed / Reference Display
The top line displays the operating output frequency and the second line displays the speed reference and the drive status

Meter Display
The top line displays the operating output frequency and power and the second line displays motor load and output current.

PID Display
The top line displays the process variable (PV) with its units and the second line displays set-point variable (SV) expressed with the same units.

PID / Meter Display
The top line displays the operating output frequency and process variable (PV) and the second line displays output current and motor speed.

kWhr / Hours Run Display
The top line displays the kWhrs consumed by the motor and the second line displays accumulated running time of the motor

Display Messages

| Message	Meaning
REM	REMOTE MODE: Start/stop control from digital inputs.
LOC	LOCAL MODE: Start/stop control from local console.
PID-A ON (OFF)	PID ON (or OFF): PID controller is operating or not.
FWD or REV	Forward or Reverse direction selected from local console or Digital inputs or internal
PV-A OOR	'Out of Regulation': A warning that PID is operating and the PV is not equal to the SV.
-DRY-	Bore level switch is indicating a low bore and/or in the timeout period before
Filling	Pipe Fill Mode is active. When set pressure is reached will switch to PID mode.
Fill T/out	Warning: The fill time has lapsed and pressure has not reach required level
• Refer to the installation manual for a full list of warnings	

Loading an Application:

ESC → A00 DEFAULTS   **ENTER & DOWN**
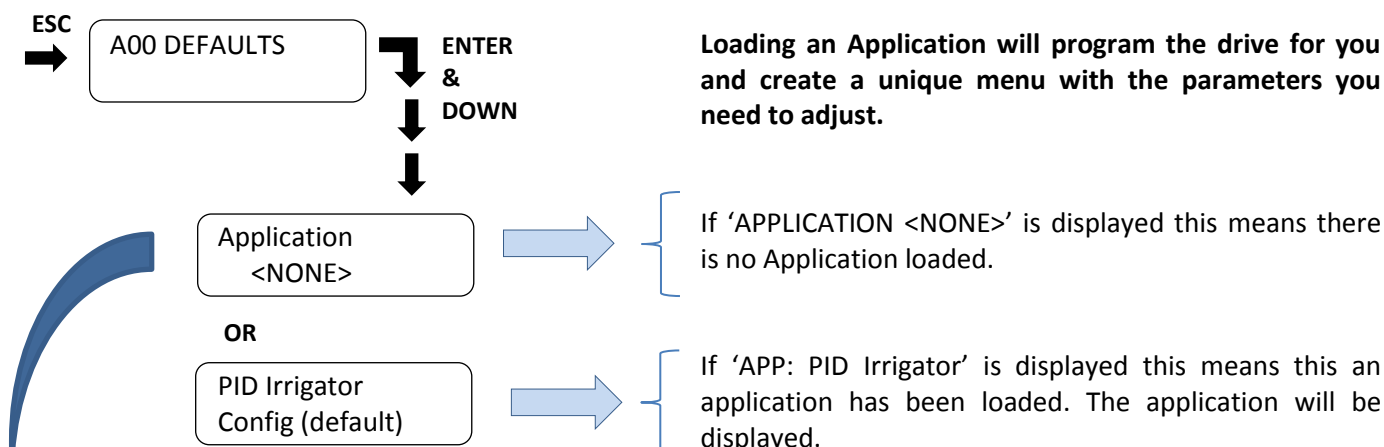
Loading an Application will program the drive for you and create a unique menu with the parameters you need to adjust.

Application <NONE>

→ If 'APPLICATION <NONE>' is displayed this means there is no Application loaded.

OR

PID Irrigator Config (default)

→ If 'APP: PID Irrigator' is displayed this means this an application has been loaded. The application will be displayed.

To remove an unwanted application, see the section "Removing an Application" below.

To load the application:
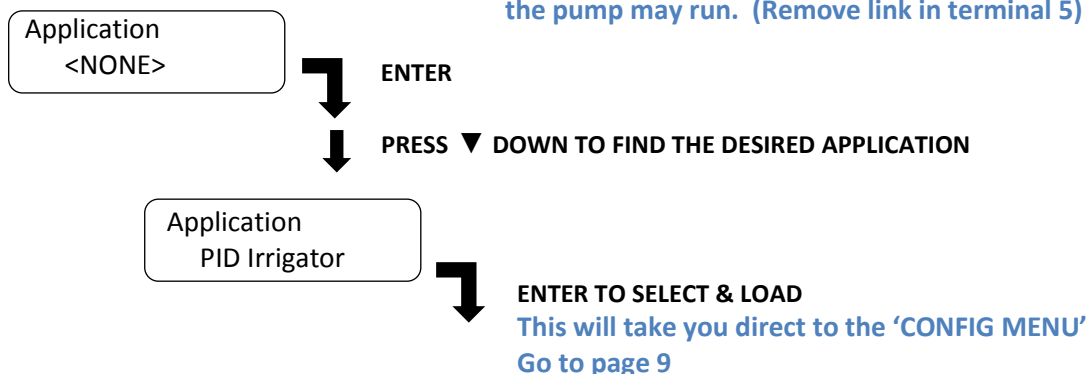
This should be performed in LOCAL MODE as the pump may run. (Remove link in terminal 5)

Application <NONE>   **ENTER**

PRESS ▼ DOWN TO FIND THE DESIRED APPLICATION

Application PID Irrigator

ENTER TO SELECT & LOAD
This will take you direct to the 'CONFIG MENU'.
Go to page 9

Removing an Application:

Factory defaults must be restored to prepare the ZENER 8000 for application loading. To restore defaults follow the procedure below.
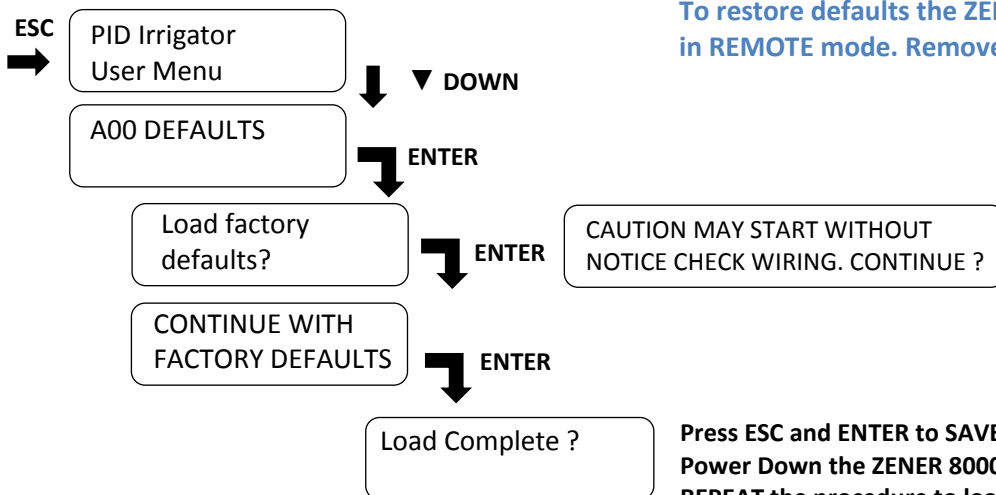
NOTE:
To restore defaults the ZENER 8000 must not be in REMOTE mode. Remove terminal 5.

ESC → PID Irrigator User Menu   **▼ DOWN**

A00 DEFAULTS   **ENTER**

Load factory defaults?   **ENTER**   CAUTION MAY START WITHOUT NOTICE CHECK WIRING. CONTINUE ?

CONTINUE WITH FACTORY DEFAULTS   **ENTER**

Load Complete ?

Press ESC and ENTER to SAVE CHANGES when prompted.
Power Down the ZENER 8000 completely and then
REPEAT the procedure to load the application.
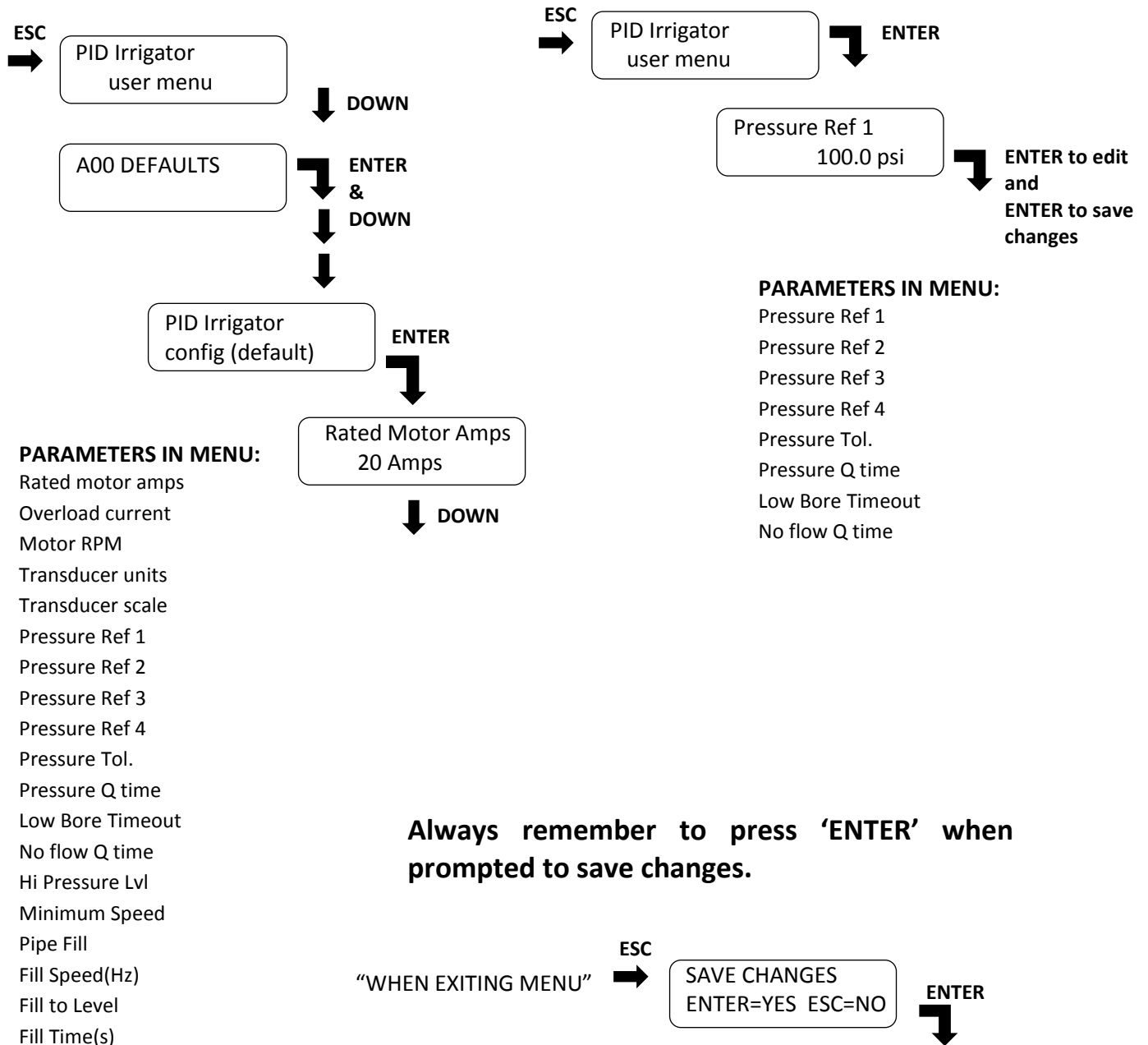
Application 'CONFIG' & 'USER' Menu:

There are now 2 additional menus with this application, a 'CONFIG MENU' and a 'USER MENU'.

CONFIG MENU

The 'CONFIG MENU' is created for initial setup. This can be found in the A00 DEFAULT' Menu and has all the parameters required. General access to this menu can be locked out.

ESC → PID Irrigator user menu

↓ **DOWN**

A00 DEFAULTS → **ENTER & DOWN**

↓

PID Irrigator config (default) → **ENTER**

↓

Rated Motor Amps 20 Amps

↓ **DOWN**

PARAMETERS IN MENU:

Rated motor amps
Overload current
Motor RPM
Transducer units
Transducer scale
Pressure Ref 1
Pressure Ref 2
Pressure Ref 3
Pressure Ref 4
Pressure Tol.
Pressure Q time
Low Bore Timeout
No flow Q time
Hi Pressure Lvl
Minimum Speed
Pipe Fill
Fill Speed(Hz)
Fill to Level
Fill Time(s)

USER MENU

The 'USER MENU' is created for the operator. In this application it provides access to the 'Set pressure' only. Access to other settings can be locked out.
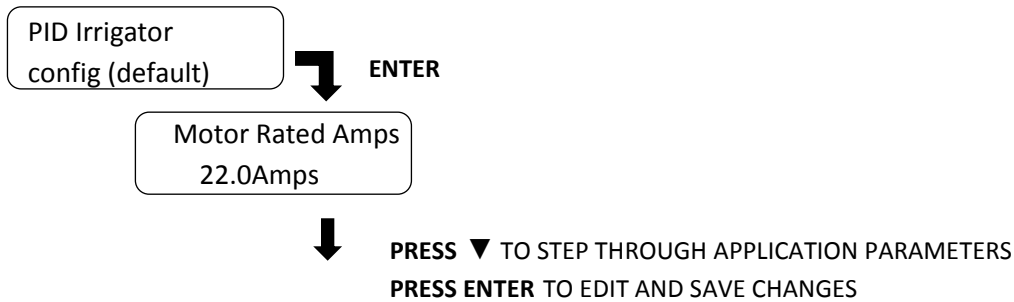
ESC → PID Irrigator user menu → **ENTER**

↓

Pressure Ref 1 100.0 psi → **ENTER to edit and ENTER to save changes**

PARAMETERS IN MENU:

Pressure Ref 1
Pressure Ref 2
Pressure Ref 3
Pressure Ref 4
Pressure Tol.
Pressure Q time
Low Bore Timeout
No flow Q time

Always remember to press 'ENTER' when prompted to save changes.

"WHEN EXITING MENU" **ESC** → SAVE CHANGES ENTER=YES ESC=NO **ENTER** ↓

Do not remove power while saving!!

CONFIG MENU Parameters:

After loading the application the CONFIG MENU will appear. Modify the following parameters. If the CONFIG menu does not appear read page 8.
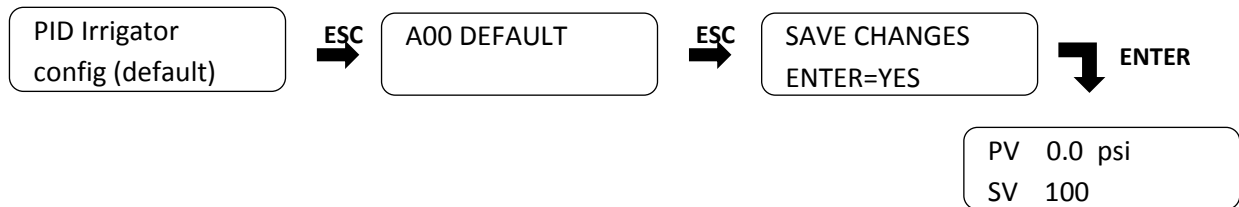
```
┌─────────────────────┐
│ PID Irrigator       │      ┐
│ config (default)    │      ┘  ENTER
└─────────────────────┘
              ┌─────────────────────┐
              │ Motor Rated Amps    │
              │   22.0Amps          │
              └─────────────────────┘

              ▼  PRESS ▼ TO STEP THROUGH APPLICATION PARAMETERS
                 PRESS ENTER TO EDIT AND SAVE CHANGES
```

Ensure the ZENER 8000 is in local mode (remove terminal 5) to prevent unexpected operation.

Initial parameters to adjust:

	Parameter	**Default**	**Explanation**
1.	Rated Motor Amps	?? Amps.	**Enter Motor nameplate full load current.**
2.	Overload Current	?? Amps.	**Enter Motor nameplate full load current.**
3.	Rated Motor rpm	1470 rpm	**Enter Motor nameplate speed in rpm.**
4.	Transducer units	"psi"	**Select the desired pressure units.**
5.	Transducer Scale	200.0	**Enter the rating of the pressure transducer at 20mA, in psi**
6.	Pressure Ref 1	100 psi	**Enter the desired operating pressure when this reference is selected.**
7.	Pressure Ref 2	100 psi	**Enter the desired operating pressure when this reference is selected.**
8.	Pressure Ref 3	100 psi	**Enter the desired operating pressure when this reference is selected.**
9.	Pressure Ref 4	100 psi	**Enter the desired operating pressure when this reference is selected.**
10.	Pressure Tol.	25%	**Enter the tolerance of pressure from the reference as a percentage of the transducer pressure scale**
11.	Pressure Q time	30 sec	**Enter the out of tolerance time to register "PRESSURE ERR"**
12.	Low Bore timeout	0 sec	**Leave at 0 sec for the moment.** • This feature requires an external bore level switch. Link terminal 1 to Terminal D4(37) if no bore level switch installed. • Enter the time to restart after the 'Low Bore' switch-contact returns to the closed position. "-DRY-" is displayed during the timeout period.

	Parameter	Default	Explanation
13.	No Flow Q time	20 sec	**Enter the out of tolerance time to register "No Flow"** This feature requires an external no flow switch. Link terminal 1 to Terminal D3(35) if a flow switch is not installed.
14.	High Trip Level	180 psi	**Adjust if required .**Adjust level for 'high pressure' trip (in psi). The trip time (default 0 seconds) can be adjusted in another menu if required (Refer to User Alarm 4).
15.	MIN Speed (Hz)	0 Hz	**Leave at 0Hz (or minimum pump speed) to check pump rotation**. This should be at least the minimum operating speed for the pump. Eg. 30Hz. When started, the pump will run to this speed.
16.	Pipe Fill	OFF	**Leave OFF for the moment.** Pipe fill mode runs the pump at a fixed speed until the pipes fill and the pressure begins to build. When the 'Fill to Level' pressure is reached it automatically switches to PID mode. Select 'PV Threshold' for pipe fill based on pressure.
17.	Pipe Fill Speed (Hz)	40 Hz	**Leave for the moment.** This is the operating speed for pipe fill mode
18.	Fill to Pressure	80.0 psi	**Leave for the moment.** This is the pressure level to change from Pipe Fill to PID mode
19.	Fill Time	40 sec	**Leave for the moment.** This is the time period for the pipe fill to reach pressure.

When back to the beginning (first parameter 'Rated Motor Amps'), press ESC until:

PID Irrigator config (default) **ESC** → A00 DEFAULT **ESC** → SAVE CHANGES ENTER=YES **ENTER** ↓
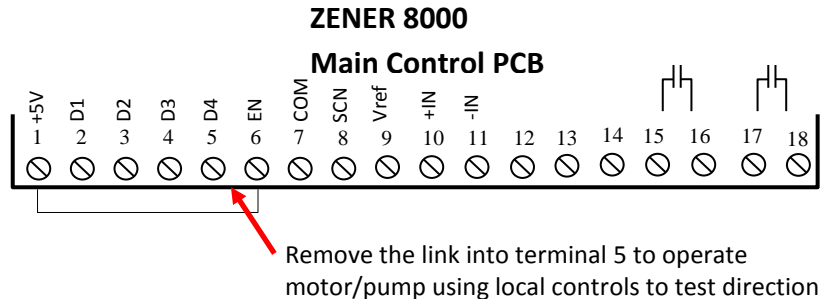
PV   0.0 psi
SV   100

Preliminary Checks

The following should be performed with the ZENER 8000 in local mode to provide better control to carry out the checks. Ensure the **motor, pump and plumbing is ready and safe** to operate.

To operate in local mode:

Remove the link in terminal 5, this selects local mode.

ZENER 8000

Main Control PCB

+5V	D1	D2	D3	D4	EN	COM	SCN	Vref	+IN	-IN							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Remove the link into terminal 5 to operate motor/pump using local controls to test direction

```
25.0 Hz
35.0 FWD LOC
```

FWD   REV   ENTER   EXIT   STOP

▲   ▼   ↵   ESC   ●

REM= REMOTE OR PID MODE [Control using terminal inputs]
LOC = LOCAL MODE [Control using push buttons]
Top display: Actual Speed in Hz (50Hz = full speed)
Bottom Display: Set speed

Press **FWD/▲** to start
Press **FWD/▲** to increase the speed
Press **STOP** to stop the pump

Note: If there is a minimum speed set it will go straight to that speed. To increase above this speed you will need to hold down the UP button until it goes above the minimum speed setting.

Check motor/pump direction:

Press **FWD/ ▲** to start and increase the motor speed sufficient to test the direction. The ZENER 8000 will run to the minimum speed. Use the ▲ to increase the speed above the minimum speed level.

If the motor shaft or pump rotates in the wrong direction, remove the input power, wait for the ZENER 8000 to discharge and swap any two motor phase wires. Re-apply input power and recheck direction

Check pressure transducer feedback:

Press **FWD/ ▲** to start & increase the motor speed until the desired operating pressure is indicated on the pressure gauge. Press ↵ (ENTER) to scroll through the operator displays (see page 5) to the PID display shown below.

- Check that the top display (PV) is displaying the correct pressure as per the pressure gauge. The service menu can be used to display the mA being received from the transducer. If this is not within acceptable tolerance, investigate and rectify.
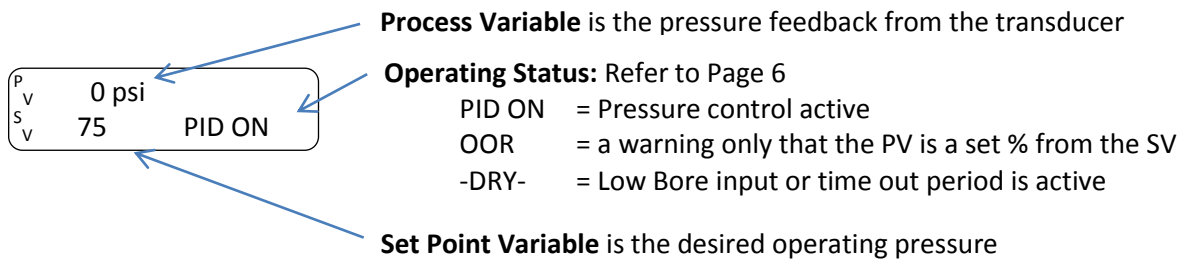
=

```
P
V    100.0 psi
S
V    100.0 psi FWD LOC
```
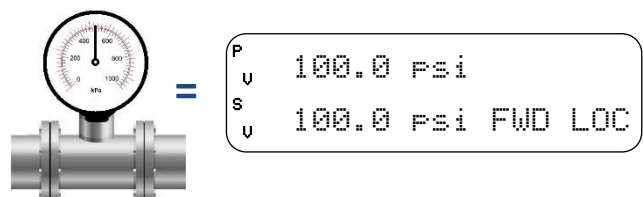
- Check the motor & pump are adequate and operating correctly.
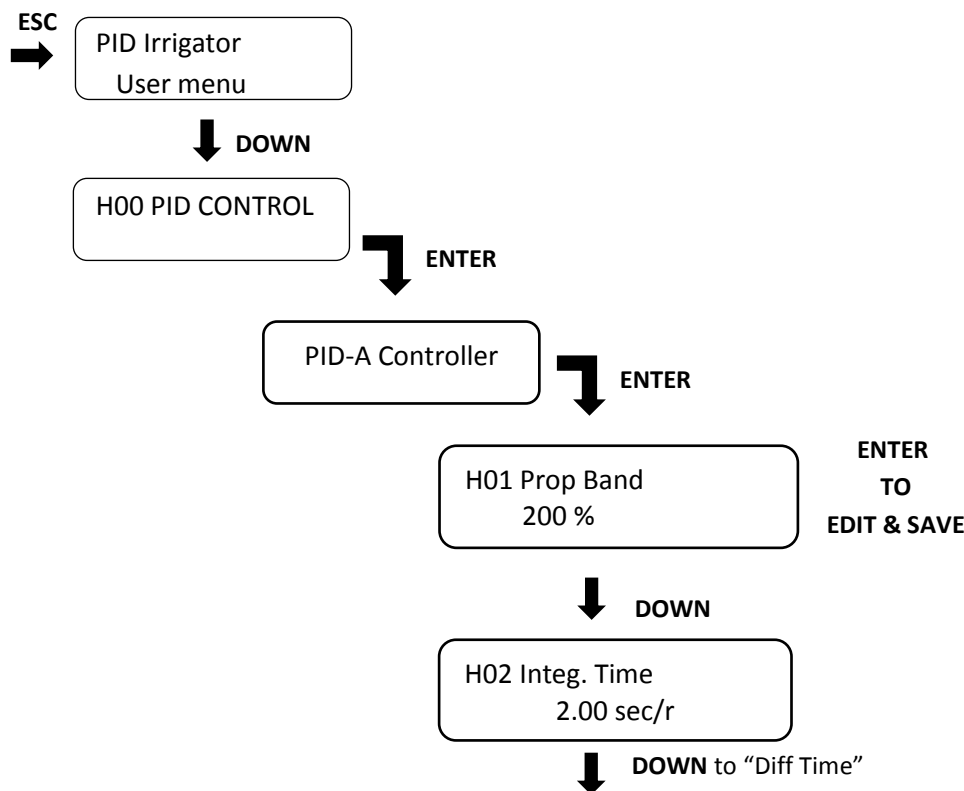
Checking the PID operation

Ensure the system is ready to pump and discharge valve is open for flow required. **Re-install the wire in terminal 5 to operate in Remote/PID Mode** and apply power to the ZENER 8000.

Find the PID display to monitor the performance:

Process Variable is the pressure feedback from the transducer

```
Pv     0 psi
Sv    75      PID ON
```

Operating Status: Refer to Page 6

PID ON	= Pressure control active
OOR	= a warning only that the PV is a set % from the SV
-DRY-	= Low Bore input or time out period is active

Set Point Variable is the desired operating pressure

Check the following:

1. Start the system as intended.
2. The ZENER 8000 operates and stabilises at a speed where the PV = SV.
3. The pressure (i.e. PV) indicated on the ZENER 8000 is correct with reference to the gauge. If not correct turn the pump off and investigate.
4. Check that the control is stable and responds as desired to changes in set point. Refer to PID tuning guide if unstable. These parameters are found in the following menu:

ESC →

```
PID Irrigator
    User menu
```

↓ **DOWN**

```
H00 PID CONTROL
```

ENTER

```
PID-A Controller
```

ENTER

```
H01 Prop Band
    200 %
```

ENTER
TO
EDIT & SAVE

↓ **DOWN**

```
H02 Integ. Time
    2.00 sec/r
```

↓ **DOWN** to "Diff Time"

5. Check pressure regulation with all combinations of equipment connected to the discharge port.
6. Check to see that pressure is maintained and the system responds acceptably. Refer to tuning guide if response is slow or over shooting occurs.

PID Tuning Guide

The Proportional gain: amplifies the difference between the set point reference and feedback signals. The **H01 Prop. Band** value is the proportion of input required to generate 100% at the output of the PID control. For example **H01 Prop. Band** is 200.0%, the proportional gain is 100/200 = 0.5. That is 2 units of input will generate 1 unit of output. The higher the % value, the lower the 'proportional gain'.

The integral time: The integral action adds a corrective component to reduce a constant error difference between set point and feedback signals. The greater the error, the quicker the gain increases. The **H02 Integ. time** value sets the time to 'repeat' the error difference between set point and feedback signals - This assumes the Proportional gain is equal to 1.

A <u>low</u> **H02 Integ. time** value attempts to regulate the process variable quickly. However if excessively low, over shooting and under shooting will be more prominent.

A <u>high</u> **H02 Integ. time** value diminishes over shooting and under shooting. However regulation takes longer to achieve.

Guide to PID Tuning:

The guide below assumes short ramp times. Long ramp times will dominate system performance and the steps below will have little or no effect.

Step	Problem	Action
1.	The plumbing is set for typical flow but the system responds too slowly	1.1 Stop the ZENER 8000 & pump 1.2 Halve the value of **H01 Proportional band.** Avoid adjustments below 10%. 1.3 If **H01 Proportional band** is below 10% proceed to step2. 1.4 Stop & restart the ZENER 8000 & pump. 1.5 Observe the time it takes to reach pressure (or reacts to changes) 1.6 Repeat from step 1.2 if the response is slow. Otherwise proceed to step 2.
2.	The system starts to overshoot or oscillate	2.1 Stop the ZENER 8000 2.2 Double the value **H01 Proportional band** 2.3 Start the ZENER 8000 and observe the time it takes to reach pressure or reacts to changes 2.4 Repeat from step 2.1 if the system still overshoots or oscillates. Otherwise proceed to step 3.
3.	The system still responds slowly (after adjusting **H01 Proportional band**)	3.1 Halve the **H02 Integral Time** 3.2 Observe the time it takes to reach the pressure (or reacts to changes) 3.3 Repeat from step 3.1 if the response is still slow. Otherwise proceed to step 4
4.	The system starts to overshoot or oscillate (after initial adjustments to **H02 Integral Time**)	4.1 Double the **H02 Integral Time** 4.2 Observe the time it takes to reach the pressure (or reacts to changes) 4.3 Repeat from step 4.1 if the system still overshoots or oscillates 4.4 If the response is acceptable then you may stop tunning

Remaining Parameters:

The remaining parameters to implement & adjust if required are:

Pipe Fill:

The pipe fill option allows the ZENER 8000 to operate at a reduced speed to fill the pipes on start. Pipe fill is only activated when a start/run command is first given.

Pipe Fill	DISABLED	**To Enable, set to 'PV Threshold'.** This will provide an automatic changeover to PID when a pressure level is reached.
Pipe Fill Speed (Hz)	40	**Adjust the speed to operate during pipe fill mode**
Pipe Fill Level	80 psi	**Adjust the level to switch from 'Pipe Fill Mode' to 'PID mode'**
Pipe Fill time (s)	40	**Adjust to the time required to reach the 'Pipe Fill Level' pressure.**

Bore Level Timeout:

Low Bore timeout	0	**Enter a time period to restart after a 'Low Bore' is detected or install link if a 'Bore level switch' is not installed.** This feature requires a bore level switch to be installed. When an 'open contact' is present on input D4(terminal 37) the ZENER 8000 stops and displays the warning '–DRY-'. When the contact closes there is a delay before the pump restarts.

Note:
1. **If no 'Bore Level switch' is installed fit a bridging link between terminal 1 and 37.**
2. **If operated with a start/stop switch the low bore switch will stop the pump and not allow a restart until the time-out period has lapsed.**

Variations & Other Adjustments:

Other parameters may need to be adjusted because:

- The setup may vary from the intended application Eg. Use different set point source/reference such as a potentiometer.
- Additional requirements which the application does not include. Eg. An additional alarm for over current.

Parameters that you may want adjustment include:

Change Ramp Times:

Ramp types: C030 Accel Time & C031 Decel time = ramp time above minimum speed
C032 S-time = ramp time to minimum speed

*ESC to Menu> <DOWN>>> **C00 PERFORMANCE** <ENTER><DOWN>>>**C03 RAMP**<ENTER to edit><UP/DOWN to select ramp type>>and<ENTER to save><ESC>* ('ramp time' is time taken from 0 to 50Hz)

Note: The time entered is the time from 0 – B03 MOTOR Hz.

Thermistor Input:

Allows a thermistor input for motor protection into terminals 40 and 42 on the option board. This function needs to be enabled if required.

ESC to Menu> <DOWN>>> **G00 INPUT/OUTPUT** *<ENTER><DOWN>>>***G09 Thermistor***<ENTER to edit><<UP/DOWN to select enable>>and<ENTER to save><ESC>*

Set point Variable:

The set point in this application is a preset value. It is possible to alter this to another source such as;
- Potentiometer
- Multiple speed
- Analogue reference signal (0-5V, 0-10V, 4-20mA)
- Or other

ESC to Menu> <DOWN>>> **H00 PID PARAMETER** *<ENTER>***PID-A Controller***<ENTER><DOWN>>>***H06 SV Choice***<ENTER to edit><<UP/DOWN>> and <ENTER to save><ESC>*

Potentiometer:

To select Analogue input for SV Choice:
ESC to Menu> <DOWN>>> **H00 PID PARAMETER** *<ENTER>***PID-A Controller***<ENTER><DOWN>> >***H06 SV Choice***<ENTER to edit><<Select AI(10,11)>> and <ENTER to save><ESC>*

To configure Potentiometer input for 0-5Vdc:
ESC to Menu> <DOWN>>> **G00 INPUT/OUTPUT** *<ENTER> <DOWN>>>***Analogue Inputs***<ENTER to edit><<***Select AI(10,11)***><ENTER>***<Select 0-5V>***<ENTER. <ESC>*

Others:

For other Set point variable sources refer to the reference manual for details on connection, wiring and the input parameters required.

Max Hz:

To reduce or increase the maximum speed output.
ESC to Menu> <DOWN>>> **C00 PERFORMANCE** *<ENTER><DOWN>>>***C02 MAX Hz***<ENTER to edit><<UP/DOWN>>and<ENTER to save><ESC>*

Motor Volts & Hz:

Adjust the output voltage and frequency as per motor nameplate information.

ESC to Menu> <DOWN>>> **B00 MOTOR** *<ENTER><DOWN>>>***B01 MOTOR VOLTS** *<ENTER to edit><<UP/DOWN>>and<ENTER to save><ESC>*
ESC to Menu> <DOWN>>> **B00 MOTOR** *<ENTER><DOWN>>>***B03 MOTOR HZ** *<ENTER to edit><<UP/DOWN>>and<ENTER to save><ESC>*

Adjust Transducer feedback Zero/Span:

If there is a slight error in the PV reading it may be necessary to make minor adjustment to the input signal for the transducer feedback. Adjust the 'Ref @ MIN in' and/or 'Ref @ MAX in'.
- *ESC to Menu> <DOWN>>>* **G00 INPUT/OUTPUT** *<ENTER> <DOWN>>>***Analogue Inputs***<ENTER to edit><<***Select AI(32,34)***><ENTER><DOWN>***G103 ref @ MIN in***<ENTER><UP/DOWN to adjust><ENTER to save><ESC>*
- *<DOWN>***G104 ref @ MAX in***<ENTER><UP/DOWN to adjust><ENTER to save><ESC>*

Parameters programmed by the Application:

The following parameters are automatically programmed by the 'Application' when it is loaded. They are listed below for reference purposes only.

Application Menu:

1. "Rated motor amps"
   B02= ?
2. "Overload current"
   D020= ?
3. "Motor RPM"
   B04= ?
4. "Transducer units" = "psi"
   H08= 1
5. "Transducer scale" = 200psi
   H09= 200.0
6. "Pressure Ref 1" = 100psi
   F100= 50.0
7. "Pressure Ref 2" = 100psi
   F100= 50.0
8. "Pressure Ref 3" = 100psi
   F100= 50.0
9. "Pressure Ref 4" = 100psi
   F100= 50.0
10. "Pressure Tol." = 25%
    H131= 250
11. "Pressure Q time" = 30sec
    H132= 30
12. "Low Bore Timeout" = 0sec
    G070= 0
13. "No flow Q time" = 20sec
    G252= 20
14. "Hi Pressure Lvl" = 180psi
    H111=180.0
15. "Minimum Speed   " = 0Hz
    C01= 0
16. "Pipe Fill" = DISABLED
    H120= 0
17. "Fill Speed(Hz)" = 40Hz
    H123=40
18. "Fill to Level" = 80psi
    H122=80.0
19. "Fill Time(s)" = 40sec
    H121=40

Other Preset Parameters

C030= 3.0 //1 sec Accel
C031= 3.0 //1 sec Decel
C032= 1 //1sec Accel & Decel to Min Hz
C033= 1 // Dual ramp
F010= 2 //Remote ref: PID-A Opt
F061= 7 //USER REF1: PRESET1
F062= 8 //USER REF2: PRESET2
F0631=22 //Selector 1: D2(33)
F0630=26 //Selector 2: D1(31)
F1001=1 //PRESET1..4 units: PID-A
F1011=1
F1021=1
F1031=1
G108= 2 //AI(32,34) config: 4 to 20mA

// Pressure Error Trip config
G230= 2 //UA1 active in PID closed loop
G231= 101 //UA1 signal: "PV-A OutOfReg"
G232= 0 //no delay
G233= "UA1:PRESSURE ERR"

// Siganl lost Trip
G106= 2.0 //AI(32,34) cmp lo thresh = 2.0mA
G240= 1 //UA2 trip active with RUN cmd
G241= 64 //UA2 signal: Lo AI(32,34)
G243= "UA2: SIGNAL LOST"

// No Flow Trip config
G250= 1 //Run command
G251= 31 //UA3 signal: ~D3(35)
G253= "UA3: NO FLOW   "

// High Pressure Trip config
G260= 0 //UA1 trip always active
G261= 72 //UA1 signal: PV-A OVER
G262= 0 // No time delay on this trip
G263= "UA4: HI PRESSURE"

// Low Bore config
G271=55 //~TMR1
G272=" -DRY- "
G01=7 //Custom
I02=95 //Logic Block 1
I201=10 //D2(3)
I202=54 //TMR1
I203=17 // LB1 logic
G071=2 //TMR1 mode: Delay ON Init
G0720=0 //TMR1 IN2=ON
G0721=34 //TMR1 IN1=D4(37)

// PID config
H01= 200.0,"Prop. band value"
H02= 2.00,"Integrator time"
H06= 15 //PID-A SV: REF SEL
H07= 1 //PID-A PV: AI(32,34)
H102= 1 //Resume: by PV threshold
J02= 2 //display: PID disp

Trouble Shooting Guide:

The following assumes all standard configurations programmed by the Application without any changes.

Symptom	Checks/Remedy
No Application 'PID Irrigator' Menu is present	• If you have not loaded the 'Application' following the instructions on page 7 • If you have loaded the Application and no menu, restore defaults and reload following the instructions on page 7
Pump running wrong direction	• Swap two motor cables on the ZENER 8000 output or at the motor
PV display is 0 when gauge indicates pressure	• Check the application has been loaded. Refer to page 7 • Check transducer scale has been entered and is correct. • In the service menu, check analogue input AI(32,34) is reading correct mA • If not reading correct mA, check transducer wiring & polarity • Measure DC mA in transducer wiring
PV reading is not correct	• Check transducer scale has been entered and is correct. • In the service menu, check analogue input AI(32,34) is reading the correct mA • Measure & check DC mA in transducer wiring is correct and transducer is operating correctly • If only a small error may need to adjust AI(32,34) to read correctly
Pump does not start	• In the service menu, check digital inputs have '1' on terminals 2,3,4,5 & 6. If a start push button is used, check it provides a '1' on terminal 4 when pushed. If not, check input wiring. • Is the 'SV' on the display indicating the 'Set pressure' entered in the 'Application Menu'? E.g. 100psi. • Is the PV reading the correct pressure (as per pressure gauge) • If a trip is displayed investigate & rectify. Will need to reset trip. • If pipe fill is enabled, check 'Pipe Fill Speed' entered is not 0Hz.
-DRY- is displayed and will not start	• Bore level is low • Check bore level switch operating correctly and connections. • If no bore level switch, check bridging link is fitted between terminal 1 and 37.
Pressure does not build up to the 'Set Pressure'.	• Ensure PV display is correct • Motor/Pump rotating wrong direction. Check & rectify. • If Pipe fill is enabled check 'Fill speed (Hz)'is not too low. Disable Pipe fill and check again • If the drive is not running at 50Hz, check motor current in all 3 phases and drive is not indicating 'current limit' • If running at 50Hz check pump and plumbing.
PID/ pressure control is unstable	• Ensure Pressure Transducer is operating correctly and the feedback (PV) is stable when the pump is not running and also running in local mode at a fixed speed. • Tune the PID using the parameters and guide on page 12
Current limit is displayed	• Check the motor current and the drive is correctly matched to the motor & pump. • Check the current in each motor phase to ensure balanced
Continually in Pipe Fill Mode	• Pipe Fill Speed too low, insufficient flow and pressure not reaching pipe fill level. • Problem with pump/motor not increasing pressure to pipe fill level. Check Pump/motor

More Information or Assistance:

For details on all the features and parameters available refer to the ZENER 8000 Reference Manual available on the ZENER website: www.zener.com.au

ZENER

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