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Design & Manufacture of:
Custom-built switchboards
Electronic control equipment
AC/DC pumping controls
Installation & service

INCA MODEL

PVJ3

TRIPLEX PRESSURE SYSTEM VARIABLE SPEED CONTROLLER

USER MANUAL
Inca Reference PVJ3

Software Version 1.7

Technical Support
Pumps & Mechanicals – Pump supplier
Controls – Inca Control Pty Ltd
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Drawing supplied separately

1.0 Control Panel Overview

1.1 Features

- PVJ3 controller with user friendly setup & display
- Display of system Pressure
- Low pressure pump shutdown
- Low level pump shutdown with automatic reset
- Manual/off/auto selectors on panel Face
- Hour run meter (resetable)
- Microprocessor controlled
- Useable with any 4-20mA loop powered Pressure Transducer

1.2 Description

The pressure control panel is designed to maintain a system discharge pressure via adjustable control points entered by the operator. The display shows the actual live pressure input received from the system discharge pressure transducer. It also displays the pump operating condition & alarm conditions.

User Interface

Display	An LCD screen displaying 2 lines of text, each 16 characters long.
Keypad	Operator keyboard, 16 sealed membrane keys.

Performance

Range	0 – 1000kpa generally, programmable to suit transducer range.
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Inputs

2 wire plus shield connected to terminals located on panel base plate for pressure transducer.
2 wire connected to terminals for Low Level float switch.

Outputs

Motors	3 wire plus earth sized to suit motor FLC connected directly to motor starters overload terminals.
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Power Supply

415V 3phase neutral & earth power supply sized to suit the total load of the three motor & must have a protection circuit breaker sized to suit the starting characteristics of the motor.

Mechanical Specification

Enclosure Mild steel powder coated IP54.

Pump Unit See Pumping detail by Pump supplier.

Environmental Specification

Operating Temp -10 to 50deg C

Relative Humidity Do not install in areas of high humidity.

Locate control panel internally where possible to help reduce heat & weather damage & increase mechanical life.

Vibration Do not install in a location that is subject to large amounts of vibration.

2.0 Installation

Note: If any damage to control panel is found, please notify Inca Control Pty Ltd as soon as possible prior to installation.

The control panel can be wall mounted separately from the pumping unit; distance is governed by the cable sizing to the motor.

It is recommended that the control panel is within view of the pumping unit for safety reasons. If not in view lockable isolating switches must be installed at the pump motors.

2.1 Mechanical Installation

Mount the control panel via the mounting holes in each corner at the back of the enclosure using minimum 6mm screws, nuts & locking washers, or masonry anchors.

Install in a dry well ventilated location that matches with environmental specification in 1.2 above.

2.2 Sensor Installation

Locate the pressure transducer in the discharge pipe work as close as practical to the control panel.

2.3 Electrical Installation

Note: All cable entries must enter via the bottom of the cabinet. If cables are entered via the roof Inca Control Pty Ltd reserve the right to withdraw warranty because of the possibility of shaving entering sensitive electronic equipment.

Transducer wiring

The pressure transducer must be wired in 1 pair overall screened data cable. This type of cable provides the most protection against electrical noise & allows a more accurate outcome.

Connect to the sensor as per data supplied by the sensor supplier

At the control panel connect the positive lead to terminal No10 & the return signal to terminal No12.

The screen must be solidly earthed, with a saddle clamp providing the best screening earth.

Float switch wiring

The float switch is wired in the cable supplied with switch. The cable to be connected must close the circuit when water in the suction tank falls

Connect the float switch as per data supplied by the float switch supplier

At the control panel connect the float switch lead to terminal No10 & terminal No11.

Motor Wiring

The motor must be wired in cabling sized to suit the motor power requirement. The motor is to be connected in star or delta as instructed by the nameplate on the motor.

The cabling entering into the motor terminal box shall be glanded unless a submersible motor is being used in this case the pump lead is supplied by the pump manufacturer.

The cable entering the control panel end can be glanded using standard nylon glands & run directly to the VSD terminals T1, T2, T3. The cables screen must be earthed via the supplied screening saddle.

2.4 Maintenance

Check that all connections are tight as copper is soft & can work loose.

Check that all controls are functioning as intended.

Check & ensure that the ventilation mats are regularly cleaned as reduced air flow will damage drives.

3.0 Start up

3.1 Notes on Value Entry

When entering a numeric value, the cursor can be backspaced to correct mistakes by pressing the LEFT ARROW button.

Decimal points can only be entered on entries with decimal points in the display line. The decimal point is entered by pressing the +/- . down arrow key on the bottom of the blue buttons.

You can only enter a value of as many digits as is displayed on the screen. Example an input that displays 3 digits can only have 3 digit entered.

3.2 Power Up Display

On power up the screen will display the main page including the system pressure, & Pump motor speeds in %.

3.3 Screen Display Layout

The screen displays two lines of information

- The top line displays the live discharge pressure in kPa.
- The bottom line displays each Pump motor speed in %. (P1S for Pump 1 & P2S for Pump 2)

4.0 Calibration

The calibration of the controller is carried out on pages accessed by pressing & holding in the RIGHT ARROW Button for 5seconds. The first calibration page will appear. You can move through the calibration pages by pressing the RETURN ARROW button & then the RIGHT ARROW button to move on. Continuing this process will move you through the pages with out making any changes. If changes are made the inputted value is recorded once the enter button has been pressed. The enter button is the return arrow located at the bottom right corner of the facia. To get out of calibration pages press the RETURN ARROW button twice & return to the main page.

4.1 Pressure Sensor Calibration

Calibrate Sensor will now be displayed.

The Cursor will be flashing under the first digit of the SENSOR CALIBRATE setting. Simply type in the 20mA scale off the pressure transducer to be used, example 1000kPa (10bar) Press 1, Press 0, press 0, press 0 & then press Return Arrow button.

Press the RIGHT ARROW Button to move onto the next Page.

4.2 Setting Low Pressure Shutdown

Low pressure will now be displayed.

The Cursor will be flashing under the first digit of the LOW PRESSURE setting. Simply type in the appropriate pressure you want the low pressure shutdown to operate at, example 200kPa Press 2, press 0, press 0 & then press Return Arrow button.

Press the RIGHT ARROW Button to move onto the next Page.

4.3 Setting Low Pressure Time Delay

Low pressure time will now be displayed.

The Cursor will be flashing under the first digit of the LOW PRESSURE TIME setting. Simply type in the appropriate delay time you want after the low pressure set point has been reached, example 45sec Press 0, press 0, press 4, Press 5, & then press Return Arrow button.

Press the RIGHT ARROW Button to move onto the next Page.

4.4 Set point Pressure Setting

Set point pressure will now be displayed.

The Cursor will be flashing under the first digit of the SETPOINT PRESSURE setting. Simply type in the appropriate pressure you want the pumps to maintain the System at, example 400kPa Press 4, press 0, press 0 & then press Return Arrow button.

Press the RIGHT ARROW Button to move onto the next Page.

4.5 Start Pressure Setting

Start pressure will now be displayed.

The Cursor will be flashing under the first digit of the START PRESSURE setting. Simply type in the appropriate pressure you want the Pump to restart at once it has gone to sleep, example 375kPa Press 3, press 7, press 5 & then press Return Arrow button.

Press the RIGHT ARROW Button to move onto the next Page.

4.6 Pump Stop Minimum Speed Setting

Pump Stop Minimum Speed will now be displayed.

The Cursor will be flashing under the first digit of the PUMP STOP MINIMUM SPEED setting. The pump stop minimum speed is the speed at which the standby pump is turned off after the duty pump has reached the pump stop minimum speed plus a short time delay. ***This set point is critical to be set correctly so as to prevent short cycling.***

To set the Pump stop Min Speed you must first operate 1-off pump in manual with a closed discharge to find out the pump speed required to maintain set point pressure. Add 2% to ensure the system will get to the setpoint. This speed value is then entered. Example say 67%. Press 6, press 7, the Return arrow button to accept.

Press the RIGHT ARROW Button to move onto the next Page.

4.7 Sleep Shutdown Time Setting

Sleep Shutdown Time will now be displayed.

The Cursor will be flashing under the first digit of the SLEEP SHUTDOWN TIME setting. Simply type in the appropriate time value in minutes & seconds you want the duty pump to run on for before going to sleep, example 20seconds Press 0, press 0, press 2, press 0 & then press Return Arrow button.

Press the RIGHT ARROW Button to move onto the next Page.

4.8 Standby Start Time Setting

Standby Start Time will now be displayed.

The Cursor will be flashing under the first digit of the STANDBY START TIME setting. Simply type in the appropriate time value in minutes & seconds you want the standby pump to be delayed from starting once the Standby Start Speed has been reached, example 20seconds Press 0, press 0, press 2, press 0 & then press Return Arrow button.

Press the RIGHT ARROW Button to move onto the next Page.

4.9 Standby Stop Time Setting

Standby Stop Time will now be displayed.

The Cursor will be flashing under the first digit of the STANDBY STOP TIME setting. Simply type in the appropriate time value in minutes & seconds you want the standby pump to be delayed from stopping once the Standby Stop Speed has been reached, example 20seconds Press 0, press 0, press 2, press 0 & then press Return Arrow button.

Press the RIGHT ARROW Button to move onto the next Page.

4.10 2nd Standby Start Time Setting

2nd Standby Start Time will now be displayed.

The Cursor will be flashing under the first digit of the 2nd STANDBY START TIME setting. Simply type in the appropriate time value in minutes & seconds you want the 2nd standby pump to be delayed from starting once the Standby Start Speed has been reached, example 20seconds Press 0, press 0, press 2, press 0 & then press Return Arrow button.

Press the RIGHT ARROW Button to move onto the next Page.

4.11 2nd Standby Stop Time Setting

2nd Standby Stop Time will now be displayed.

The Cursor will be flashing under the first digit of the 2nd STANDBY STOP TIME setting. Simply type in the appropriate time value in minutes & seconds you want the 2nd standby pump to be delayed from stopping once the Standby Stop Speed has been reached, example 20seconds Press 0, press 0, press 2, press 0 & then press Return Arrow button.

Press the RIGHT ARROW Button to move onto the next Page.

You will now be returned to the main screen.

4.12 Maximum Continuous Running Time

This setting allows you to limit the total continuous running time of either pump to a maximum of 24 hours before alternating to the opposite pump. This function is only available if both pumps are selected in AUTO.

4.13 Hours Run Meters

To view 'hours run' press the FUNCTION (Up arrow) button. The first two pump hours run meters will be displayed. Press the function button again will transfer you to the Data logger.

4.14 Data Logger

The data logger logs the last 6 fault events which are number from 1-6 & display the fault the time of the fault & the date of the fault to view the logger you enter via the hour meters, press the FUNCTION (Up arrow) button. The first two pump hours run meters will be displayed. Press the function button again & the 3rd pump hours run meter is displayed, press the function button

again & the logger will be displayed. Press the down arrow to run through the last 6 logged events.

Press the function button to return to the main page.

4.15 Auto Tuning

After setting all the calibration setting above (which may need small adjustments once auto tuning has been carried out), carry out an auto tune which will set up the controller PID parameters to suit the live input from the field pressure transducer.

It is critical that the following is observed: -

1) Make shore pump is running at set point pressure & is not wanting to call other pump online.

2) Use only one pump in automatic, Turn the remainder off.

Auto tuning takes from 5 to 20 seconds & is a three stage process.

To carry out an auto tune ensure that 1-off selector is in auto, press& hold the LEFT ARROW button for 5seconds the display will flash AUTO-TUNE IN PROGRESS until auto tune is complete. During this time you cannot access other screens.

5 Operation

5.1 System Operation

The system is designed to maintain a constant pressure in the discharge line of a pumping system. The duty pump will start & ramp up & down in speed maintaining the set point pressure until this duty pump reaches & maintains 100% speed for a short time delay. At this point the standby pump will start. Both pumps will then ramp up & down maintaining the set point pressure until the pumps reach & maintains (Standby stop speed) for a short time delay. At this point the standby pump will be turned off & the duty pump will take over by itself.

The duty pump will then ramp up & down to maintain the set point pressure until this pump reaches & maintains the pump stop criteria plus a delay set in (pump shutdown delay) & will then turn off stopping all pump operation until the wake-up pressure is again reached.

The pressure will fall to the wake-up pressure set point where the duty pump will then start the cycle once again.

Each time the system goes to sleep the duty pump will be alternated to the next pump ready for the next operation.

If a motor fails the standby pump will be started & will remain as duty until the faulted pump is put back on line.

Pump Stop Criteria

Duty Pump – The duty pump requires 3 things to shut down-

1. The system pressure has reached & maintains set point pressure less 5kPa.
2. The motor speed is less & maintains less than the speed set in PUMP STOP MINIMUM SPEED.
3. And the time value entered into LOW STOP TIMER parameter has timed out.

Standby Pump – The standby pump requires 3 things to shut down-

1. The system pressure has reached & maintains set point pressure less 5kPa.
2. The motor speed is less & maintains less than the speed set in PUMP STOP MINIMUM SPEED.
3. And the time value entered into parameter STANDBY STOP TIMER.

5.2 Manual/Off/Auto Selector Switches

Each pump has a Manual/Off/Auto selector switch. Each function of the switch is selected by operating the appropriate selector on the Panel facia.

Manual Selecting MANUAL will turn the pump on continuously at a fixed full speed.

Off Selecting OFF will turn the pump off.

Auto Selecting AUTO will select the pump on automatic & is then controlled via the set points within the PVJ3 controller.

6.0 Warranty Statement

The Products manufactured by Inca Control Pty Ltd is guaranteed against faulty workmanship for a period of 12months from the date of delivery.

Our obligation assumed under this guarantee is limited to the replacement of parts which, by our examination are proved to be defective & have not been misused, carelessly handled, defaced or damaged. This guarantee is VOID where the purchaser has modified or repairs have been made or attempted by anyone except an authorised representative of Inca Control Pty Ltd.

Products for attention under guarantee (unless otherwise agreed) must be returned to the factory freight paid and, if accepted for free repair, will be returned to the customers address in Australia free of charge.

Equipment supplied by Inca Control Pty Ltd, but manufactured by others is covered by their manufacturers warranty only.

When returning the product for service or repair, a full description of the fault must be given and the mode of operation used when the product failed.

In addition to the above, equipment manufactured, installed & commissioned by Inca Control Pty Ltd, within the Sydney Metropolitan Area, includes onsite replacement.

In any event Inca Control Pty Ltd has no other obligation or liability beyond replacement or repair of this product.

NOTES: