Mode 4S

PCS 3000

Ultra Flow Controller Quick Reference Guide

Production Control Services, Inc.

Mode 4S

PCS 3000 Ultra Flow Controller Quick Reference Guide

Contents

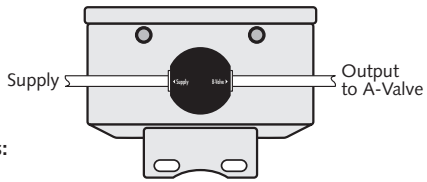
Installation Instructions

CAUTION! Turn off the controller before you connect or disconnect any wires.

Supply Gas & Motor-Valve Output Hookup

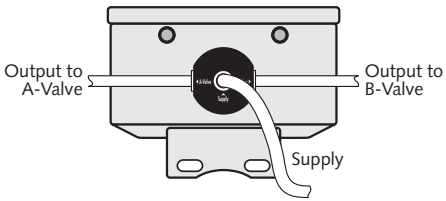
Pressure Connectors:
- 1/4" NPT for supply and output
- 35-50 PSI

Single-Valve Controller



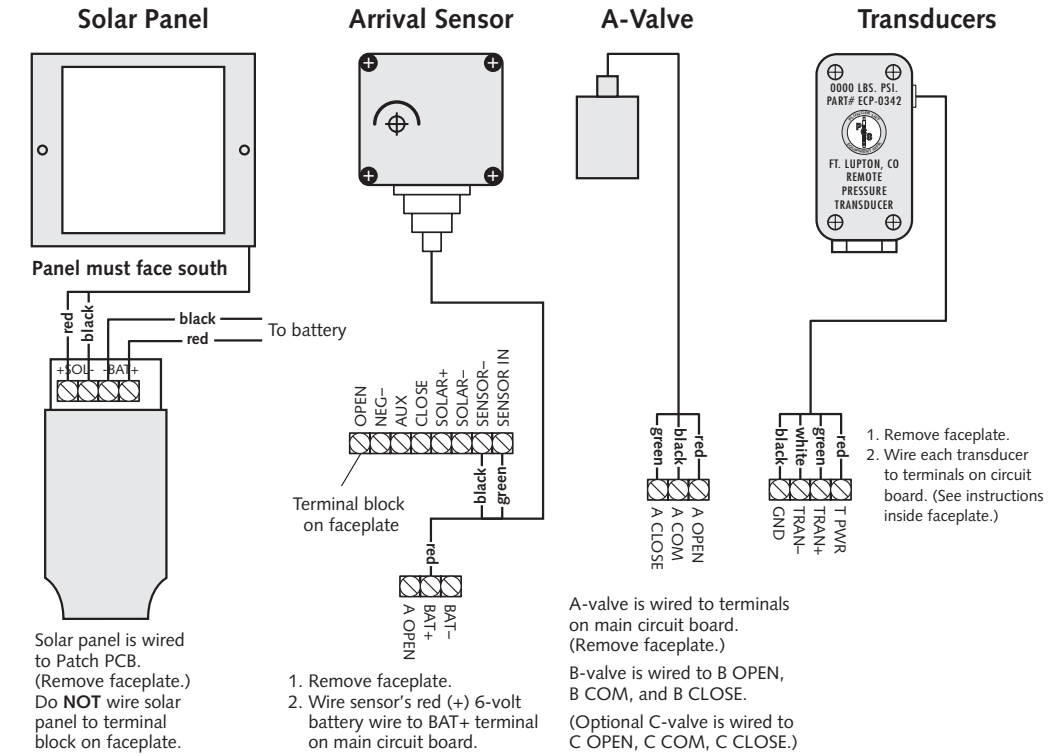
Controller Bottom View

Dual-Valve Controller



Controller Bottom View

Wiring



Solar panel is wired to Patch PCB. (Remove faceplate.) Do **NOT** wire solar panel to terminal block on faceplate.

1. Remove faceplate.
2. Wire sensor's red (+) 6-volt battery wire to BAT+ terminal on main circuit board.

A-valve is wired to terminals on main circuit board. (Remove faceplate.)

B-valve is wired to B OPEN, B COM, and B CLOSE.

(Optional C-valve is wired to C OPEN, C COM, C CLOSE.)

1. Remove faceplate.
2. Wire each transducer to terminals on circuit board. (See instructions inside faceplate.)

Figure 1 –Installation Instructions

Circuit Board Wiring

CAUTION! Turn off the controller before you connect or disconnect any wires.

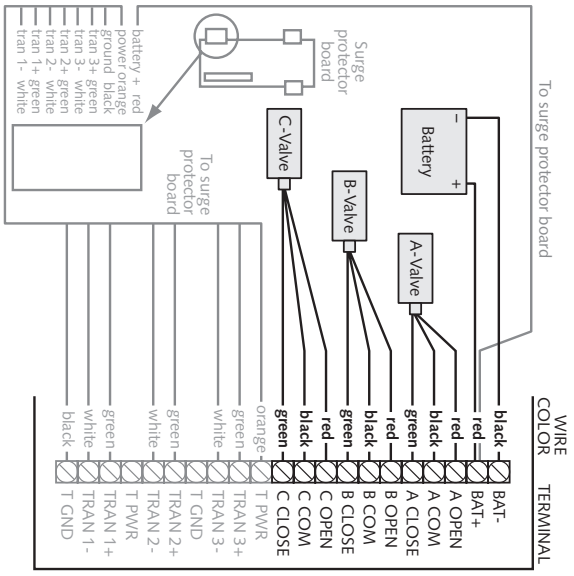


Figure 2 –Terminal Block on Main Circuit Board

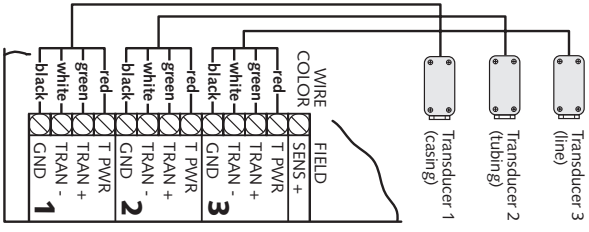


Figure 3 –Terminal Block on Surge Protector Board

Turning the Controller On and Off

To turn the PCS 3000 Ultra Flow Controller on or off, insert a screw driver into the slot marked POWER ON/OFF. See Figure 4 on page 4.

Move the toggle switch to the left to turn the controller on. Move the toggle switch to the right to turn the controller off.

The plunger program does not run while the controller is off. When you turn the controller on, it closes the A-valve and starts counting down the OPEN time DELAY (see step 1 on page 6).

Reading Reports and Functions

1 Press READ.

This screen appears: SELECT PARAMETER
READ: 00

2 Enter report or function parameter. Example: 10.

Programming Functions

1 Press SET.

This screen appears: SELECT PARAMETER
SET: 00

2 Enter function parameter. Example: 05.

3 Enter value for function. Time is in hours:minutes: seconds. Pressure is in pounds per square inch (psi).

To exit function without changing its value, press CE.

Using the Buttons

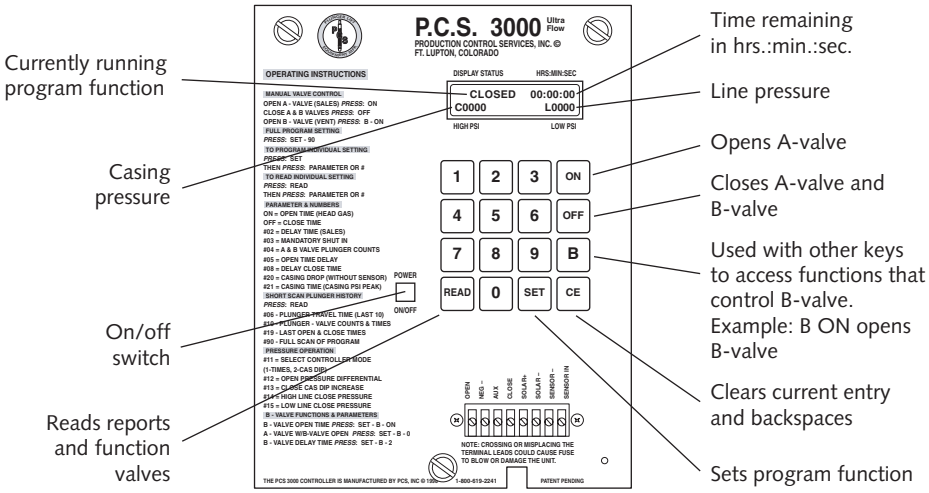


Figure 4 –Controller's Faceplate

Reading the Controller Reports

Plunger Travel Time Reports

READ 06

These 10 reports show the 10 most recent plunger travel times. PLT-0 shows the most recent plunger run, PLT-1 shows the second most recent, and PLT-9 shows the tenth most recent. On these reports:

- A = plunger surfaced during OPEN time.
- B = plunger surfaced during B OPEN time.

The time shows how long the plunger took to surface. For example: PLT-0 A 00:01:15 shows that the plunger surfaced after 1 minute and 15 seconds of OPEN time. If the plunger does not surface, this screen appears: PLT-3 NO PLUNGER.

To display the next report, press READ.

Valve/Plunger Counts and Total Time Reports

READ 10

This reporting option displays the two Valve and Plunger Counts Reports (READ 04 and READ B 4) and the two Total Time Reports (READ 07 and READ B 7). To display the next report, press READ.

A-Valve and Plunger Counts Report

READ 04

This report shows how many times the A-valve opens, and how many times the plunger arrives while the A-valve is open. Example: A PLUNGER = 0092
A VALVE = 0096

In this example, the plunger did not arrive 4 times while the A-valve was open. If the well has a B-valve, the plunger may have arrived 4 times while the B-valve was open. See the next report: "B-Valve and Plunger Counts Report".

B-Valve and Plunger Counts Report

READ B 4

This report shows how many times the B-valve opens, and how many times the plunger arrives while the B-valve is open. Example: B PLUNGER = 0004
B VALVE = 0004

A-Valve Total Time Report

READ 07

This report shows 2 times of up to 999 hrs., 59 min., 59 sec. accumulated since you last cleared the report:

- Total OPEN time and DELAY time (SALES).
- Total time that the controller was closed. MANDATORY SHUT-IN (if any), OPEN time DELAY (if any), and CLOSE time are accumulated under TOT CLS time.

Example: A TOTAL016:31:13
TOT CLS008:12:45

B-Valve Total Time Report

READ B 7

This report shows the total amount of B OPEN time accumulated since you cleared the report, up to 999 hrs., 59 min., 59 sec. Example: B TOTAL001:24:32.

Last Open and Close Reports

READ 19

LST OP (LAST OPEN) – The last time the A-valve was open, the letter shows why the A-valve closed:

- P = pressure input
- S = switch gauge input
- T = time ran out

The time shows how long the A-valve was last open. It consists of OPEN time and DELAY time (SALES) – which includes DELAY CLOSE time, if any. It does **not** include B OPEN time, if any.
Example: LST OP T00:20:00

LST CL (LAST CLOSED) – The last time the A-valve was closed, the letter shows why the A-valve opened:

- C = casing peak pressure input
- D = differential open pressure input
- T = time ran out

The time shows how long the A-valve was last closed.
Example: LST CL D00:15:00

Program Function Reports

READ 90

These reports display the current values of the time and pressure program functions. For a list, see "Programming All Functions" on page 12.

Battery Report

READ 00

This report displays BATTERY OK or BATTERY LOW.

Version Report

READ CE

This report displays the chip and software version numbers, for example: VERSION: 076-03.

Clearing Report Values

SET 10

Press the ON button to clear all of the valve and plunger counts and total times.

Note: Press the OFF button to exit the Clearing Report Values function without clearing any of the report values.

How Pressure Operation Works

1 The controller closes the A-valve and counts down the OPEN time DELAY (SET 05). This gives the plunger time to fall to the bottom of the well. The display status shows CLOSED 00:00:00.

Note: CLOSE time is normally set to 00:00:00 because the controller opens the A-valve in response to changes in pressure. For more information, see "CLOSE Time" on page 10.

2 While the A-valve is closed, the casing pressure rises. The controller monitors casing pressure minus sales line pressure. It opens the A-valve when:

- The difference between casing and sales line pressure is equal to or greater than the DIFFERENTIAL OPEN PRESSURE (SET 12) value, **and**
- The OPEN time DELAY countdown has reached zero.

Go to step 3.

If the DIFFERENTIAL OPEN PRESSURE value is reached during the OPEN time DELAY countdown, the display status shows the OPEN time DELAY remaining.

Note: To open the well when the casing pressure peaks (instead of using the DIFFERENTIAL OPEN PRESSURE), see "CASING PEAK Time and CASING RISE PRESSURE" on page 10.

3 The controller opens the A-valve and counts down the OPEN time (SET ON).

- If the plunger arrives during the OPEN time countdown, the controller goes to step 5.
- If the plunger does not arrive during the OPEN time countdown, the controller goes to step 4.

4 The controller opens the optional B-valve and counts down the B OPEN time (SET B ON).

- If the plunger arrives during the B OPEN time countdown, the controller goes to step 5.
- If the plunger does not arrive during either OPEN time or B OPEN time, the controller closes the A-valve and B-valve and counts down the MANDATORY SHUT-IN time (SET 03). When this countdown reaches zero, the controller opens the A-valve. Go to step 3.

Note: If the well has liquid trailing behind the plunger, you may want to set B DELAY time. See "B DELAY Time" on page 11 for more information.

5 The controller monitors the casing pressure for a minimum value and counts down the DELAY time (SALES) – SET 02.

Note: Normally DIFFERENTIAL CLOSE PRESSURE (SET 13) controls the sale of gas, and the DELAY time (SALES) does not reach zero. For more information, see "DELAY Time (SALES)" on page 9.

6 When the casing pressure starts to build, the controller monitors the increase in pressure. When the increase equals the DIFFERENTIAL CLOSE PRESSURE value, the controller goes to step 7.

7 The controller counts down the DELAY CLOSE time (SET 08). When the DELAY CLOSE time countdown reaches zero, the controller checks the casing pressure again to see if it has still increased by the DIFFERENTIAL CLOSE PRESSURE value.

- If the increase is a brief spike in pressure, the controller continues the DELAY time (SALES) countdown. Return to step 6.
- If the increase is an actual or solid pressure increase, the controller closes the A-valve and starts to count down the OPEN time DELAY. Go to step 1.

Sales Line Pressure Safeguards

At all times, the controller makes sure that the sales line pressure is within a range of safe values: the HIGH LINE CLOSE PRESSURE (SET 14) and LOW LINE CLOSE PRESSURE (SET 15). If the sales line pressure goes outside these values, the controller prevents the A-valve from opening. If the A-valve is open, the controller closes it.

Calibrating the Transducers

Mode 4 pressure operation uses two transducers:

- Casing transducer (SET 16)
- Sales line transducer (SET 18)

Casing Transducer Calibration

1 Set the casing transducer to zero (no pressure):

   - With transducer in place, remove pressure.
   - SET 16, ON, OFF, ON.

2 Calibrate the casing transducer for the high pressure:

   - Apply pressure to transducer.
   - SET 16, ON, ON, enter pressure value. For example: if the current casing pressure is 200 psi, enter 0200.

Sales Line Transducer Calibration

1 Set the sales line transducer to zero (no pressure):

   - With transducer in place, remove pressure.
   - SET 18, ON, OFF, ON.

2 Calibrate the sales line transducer for the high pressure:

   - Apply pressure to transducer.
   - SET 18, ON, ON, enter pressure value. For example: if the current sales line pressure is 50 psi, enter 0050.

Turn off a Transducer

Mode 4 does not use the tubing transducer. If it is on, it appears on the Display Status as a T followed by a pressure value, for example, T0400.

To turn off the tubing transducer: SET 17, OFF.

Creating a Pressure-Operation Plunger Program

The fastest way to program the time and pressure functions is to press SET 90. For more information, see "Programming All Functions" on page 12.

Pressure-Operation Selection Functions

Operating Mode
SET 11

Set operating mode to 4.

Sensor Operation
SET 09

Set SENSOR to ON.

Transducer Calibration
SET 16 and SET 18

See "Calibrating the Transducers" on this page.

Status of A-Valve when B-Valve Is Open
SET B 0

The controller works on wells that require the A-valve to be either open or closed when the B-valve is open.

- To keep A-valve open when B-valve is open: ON
- To close A-valve when B-valve is open: OFF

Pressure-Operation Control Functions

OPEN Time DELAY
SET 05

OPEN time DELAY guarantees a minimum shut-in time for the plunger to fall to the bottom of the well. See step 1 on page 6.

DIFFERENTIAL OPEN PRESSURE

SET 12

This is the casing pressure minus the sales line pressure. See step 2 on page 6. Choose an appropriate value for your well by following these instructions.

1 For wells with sales line pressure between 30 and 200 psi, start with the sales line pressure. Add 15-20 psi for every 1/10th barrel to lift.

   Examples:
   - Sales line pressure is 60 psi. To move 1/10th barrel, set the DIFFERENTIAL OPEN PRESSURE to 80 psi (60 + 20).
   - Sales line pressure is 100 psi. To move one barrel, set the DIFFERENTIAL OPEN PRESSURE to 300 psi (100 + 200).

2 Adjust the DIFFERENTIAL OPEN PRESSURE based on the plunger travel time. The optimum plunger speed is between 750 and 1000 feet per minute.
   - If the plunger is running fast, lower the DIFFERENTIAL OPEN PRESSURE.
   - If the plunger is running slow, increase the DIFFERENTIAL OPEN PRESSURE.

OPEN Time

SET ON

OPEN time is when the well is first opened and gas is flowing through the motor valve (A-valve). During OPEN time, the plunger starts to surface and the well sells its initial head gas. See step 3 on page 6.

B OPEN Time

SET B ON

B OPEN time is after the well has sold its initial head gas, but the plunger has not arrived. It is additional time to surface the plunger and the liquid load it is carrying. Typically, this gas is vented to the low side of the separator or to a tank. See step 4 on page 6.

If you are not using a B-valve, set the B OPEN time to 00:00:00.

MANDATORY SHUT-IN Time

SET 03

This time is used when a plunger does not surface. Usually, after the A-valve and B-valve are opened, but a plunger does not surface, a well needs more time to rebuild pressure for the next plunger attempt. See step 4 on page 6.

Set the MANDATORY SHUT-IN time to twice the time required to build enough pressure to surface the plunger. For example, if a well usually takes 2 hours to build enough pressure to surface the plunger, set MANDATORY SHUT-IN time to 4 hours.

Be sure to use this feature. **Don't** set the MANDATORY SHUT-IN time to 00:00:00.

Note: The MANDATORY SHUT-IN time must be greater than OPEN time DELAY (and CLOSE time, if any). If the plunger does not surface, MANDATORY SHUT-IN time **replaces** OPEN time DELAY. MANDATORY SHUT-IN time **is not in addition to** OPEN time DELAY.

Advanced Tip

Use MANDATORY SHUT-IN time with a motor valve between the casing and the tubing to let casing gas flow into the tubing. This forces liquid down and out of the tubing. The controller opens the valve when the MANDATORY SHUT-IN countdown starts and closes the valve when the countdown reaches zero. To use this feature, you need a remote shift valve with gas supply. To wire the shift valve to the controller's C-valve terminals, see "Circuit Board Wiring" on page 3. The controller is already programmed to open the C-valve for the entire MANDATORY SHUT-IN time.

DIFFERENTIAL CLOSE PRESSURE

SET 13

After the plunger surfaces, the casing pressure falls and then levels off. The casing pressure then starts to build as liquids accumulate downhole.

You want to close the well when the casing pressure builds to an amount equal to the minimum casing pressure recorded by the controller plus the amount of the DIFFERENTIAL CLOSE PRESSURE. The higher you set the DIFFERENTIAL CLOSE PRESSURE, the longer the well attempts to sell gas. See step 6 on page 6.

A good DIFFERENTIAL CLOSE PRESSURE setting for many wells is 1, 2, or 3 psi.

Set a marginal well to 0 psi so that the controller shuts it in as soon as the casing pressure stops breaking.

DELAY CLOSE Time

SET 08

This time ensures that the casing pressure increase is not a brief spike in pressure. During the level period before the casing pressure starts to build, the pressure may flutter up and down. The controller delays closing the A-valve to make sure that the casing pressure has not dropped again. See step 7 on page 6.

If you set DIFFERENTIAL CLOSE PRESSURE to 1, 2, or 3 psi, set DELAY CLOSE time to 10, 20, or 30 seconds.

If you set DIFFERENTIAL CLOSE PRESSURE to 0 psi, set DELAY CLOSE time to 00:00:00.

If you set DIFFERENTIAL CLOSE PRESSURE to a high psi, set DELAY CLOSE time to 00:00:00. The well has flowed long enough when the casing pressure builds to an amount equal to the minimum casing pressure plus the amount of DIFFERENTIAL CLOSE PRESSURE. DELAY CLOSE time is not needed.

DELAY Time (SALES)

SET 02

DELAY time (SALES) sells gas through the A-valve after the plunger has arrived.

During pressure operation, the DIFFERENTIAL CLOSE PRESSURE stops the sale of gas, and the DELAY time (SALES) does not reach zero. DELAY time (SALES) ensures that the controller closes the A-valve even if the DIFFERENTIAL CLOSE PRESSURE is not reached. See step 5 on page 6.

The setting for DELAY time (SALES) should be longer than the well's gas sales time before you installed this controller. For example, if the well's gas sales time with an intermitter was 5 hours, set the controller's DELAY time (SALES) to 6 hours to aggressively pursue gas sales.

That's all you need to do to program the PCS 3000 Ultra Flow Controller!

Sales-Line Safeguard Functions

LOW LINE CLOSE PRESSURE

SET 15

If the sales line pressure reaches this low value, the controller prevents the A-valve from opening and closes the A-valve if it is open. If you don't want the controller to monitor low sales line pressure, set LOW LINE CLOSE PRESSURE to 0 psi.

HIGH LINE CLOSE PRESSURE

SET 14

If the sales line pressure reaches this high value, the controller prevents the A-valve from opening and closes the A-valve if it is open. You can use HIGH LINE CLOSE PRESSURE to shut-in the well when the line pressure increases to the point where the plunger will not surface.

Reopening the A-valve after high sales-line pressure is reached: The controller prevents the A-valve from opening until the line pressure drops 15 psi below the HIGH LINE CLOSE PRESSURE. For example, if the HIGH LINE CLOSE PRESSURE is 300 psi, the controller prevents the A-valve from opening until the line pressure drops below 286 psi.

Venting: If the HIGH LINE CLOSE PRESSURE is reached during B OPEN time (see page 8), which is used to vent the well, the controller does not close the A-valve.

DELAY HIGH LINE CLOSE Time

SET 22

If you are using HIGH LINE CLOSE PRESSURE, you can use DELAY HIGH LINE CLOSE time to keep the controller from shutting in the well if there is a brief spike in sales line pressure right after the controller opens the well. These brief spikes in pressure often occur when the controller opens the well after an extended shut-in period.

When the controller opens the A-valve, it does not monitor the sales line pressure during the DELAY HIGH LINE CLOSE time period. For example, if there is a 3 to 5 minute spike in line pressure when the controller opens the well and starts to count down the OPEN time, set the DELAY HIGH LINE CLOSE time to 6 minutes. For the first 6 minutes of the OPEN time countdown, the controller does not shut-in the well even if the HIGH-LINE CLOSE PRESSURE is reached. After 6 minutes, the controller shuts in the well as soon as the HIGH LINE CLOSE PRESSURE is reached.

Functions for Special Circumstances

CLOSE Time

SET OFF

CLOSE time is normally set to 00:00:00 because the controller opens the A-valve in response to changes in pressure.

Advanced Tip

If you want to open the A-valve after an elapsed period of time, regardless of pressure changes, you can set the CLOSE time. When CLOSE time is not 00:00:00, the controller counts down the CLOSE time as soon as the A-valve closes. If the CLOSE time reaches 00:00:00, the controller opens the A-valve. If you program a CLOSE time, it should always be greater than the OPEN time DELAY.

If the controller opens the well when the CLOSE time countdown reaches zero, you are using the controller to operate the well based on time instead of pressure.

CASING PEAK Time and CASING RISE PRESSURE

SET 21

CASING PEAK time is normally set to 99:00:00 because the controller opens the A-valve in response to the difference between casing and line pressure.

Advanced Tip

If your well always surfaces the plunger at a certain casing pressure, you can use casing pressure to open the A-valve. This approach to selling gas is less aggressive than using the difference between casing and line pressure to open the A-valve. The controller opens the A-valve after the casing pressure peaks (instead of using the difference between casing and line pressure). To use this approach, you must set the CASING PEAK time and the CASING RISE PRESSURE.

Once you specify a CASING PEAK time and a CASING RISE PRESSURE, the controller monitors the casing pressure independently of the sales line pressure. The controller counts down the CASING PEAK time. It restarts the countdown whenever the casing pressure increases by the CASING RISE PRESSURE value.

For example, the CASING PEAK time is 10 minutes and the CASING RISE PRESSURE is 5 psi. When the A-valve closes, the controller counts down the CASING PEAK time. If the casing pressure builds 5 psi within 10 minutes, the controller restarts the CASING PEAK time countdown. If the casing pressure does not build 5 psi within 10 minutes, the controller counts down the CASING PEAK time to zero. It then checks the OPEN time DELAY countdown. It opens the A-valve when both the CASING PEAK time and OPEN time DELAY countdowns have reached zero.

Note: While the controller counts down the CASING PEAK time, the display shows CLOSED 00:00:00.

Typical CASING PEAK time values for a well with casing pressure that builds fast are 10-12 minutes. For a well with casing pressure that builds slowly, a typical value is 30 minutes.

Possible CASING RISE PRESSURE values range from 0-5 psi. Typical values for a fast-building well are 3 or 4 psi. Typical values for a slow-building well are 1 or 2 psi.

When you are using casing pressure to control the well, set the DIFFERENTIAL OPEN PRESSURE to a high value that will never be reached.

B DELAY Time
SET B 2

B DELAY time is normally set to 00:00:00.

Advanced Tip

For those few wells that have liquid trailing behind the plunger, you may want to set the B DELAY time to a few seconds to let the liquid flow out of the dump valve on the separator.

When the B DELAY time is set and when the plunger arrives during the B OPEN time countdown, the controller delays the B-valve from closing by starting the B DELAY time countdown. When the countdown reaches zero, the controller closes the B-valve and starts the DELAY time (SALES) countdown.

CASING DROP PRESSURE
SET 20

CASING DROP PRESSURE is normally set to 0 psi.

Advanced Tip

You can use CASING DROP PRESSURE as a backup in case the arrival sensor stops working. If the casing pressure drops by the specified value, the controller starts the DELAY time (SALES) countdown even if it does not receive an input from the arrival sensor.

1 Note the casing pressure at the moment when the A-valve opens, for example, 400 psi.

2 Then note the casing pressure when the plunger surfaces, for example, 300 psi.

3 Set the CASING DROP PRESSURE to the difference between these two values (400 – 300 = 100) plus an additional 10-15 psi, for example, 115 psi.

   The additional 10-15 psi makes sure that the plunger surfaces before the CASING DROP PRESSURE is reached. If the CASING DROP PRESSURE is too tight, it may be reached before the plunger surfaces. The Plunger Travel Time Reports (see below) then will show a C even when the arrival sensor is working.

Note on Plunger Travel Time Reports: On these reports (see page 4):

- C = CASING DROP PRESSURE was reached.

For example: PLT-0 C 00:10:20 shows that the CASING DROP PRESSURE was reached after 10 minutes and 20 seconds of OPEN time (and B OPEN time, if any). The plunger did not surface during that time.

Intermitting a Well with Pressure Operation

Follow the instructions for "Creating a Pressure-Operation Plunger Program" on page 7 with these differences.

Note: Make sure the SENSOR (SET 09) is ON. Don't turn it off.

OPEN Time DELAY
SET 05

Set OPEN time DELAY to 00:00:00.

In step 1 on page 6, the controller closes the A-valve. The display status shows CLOSED 00:00:00. OPEN time DELAY is not needed because there is no plunger.

"Intermitting a Well with Pressure Operation" continues on the next page.

DIFFERENTIAL CLOSE PRESSURE
SET 13

Determine this pressure on a well-by-well basis. (See step 6 on page 6.)

CASING DROP PRESSURE
SET 20

Because the well does not have a plunger, the controller can't start the DELAY time (SALES) when the plunger surfaces during OPEN time (see step 3 on page 6) or B OPEN time (see step 4 on page 6). Instead, the controller monitors the casing pressure. When the casing pressure drops by the CASING DROP PRESSURE value, the controller starts the DELAY time (SALES) countdown (see step 5 on page 6).

To specify the CASING DROP PRESSURE, follow these instructions.

1 Note the casing pressure at the moment when the A-valve opens. Example: A well, intermitting without a plunger into a 100 psi sales line and trying to produce 1 barrel of water each cycle, should have a beginning casing pressure near 400 psi.

2 Then note the casing pressure when the fluid hits surface. Example: 300 psi.

3 Set the CASING DROP PRESSURE to the difference between these two values. Example: 100 psi.

Note on Plunger Travel Time Reports: On these reports (see page 4):

- C = CASING DROP PRESSURE was reached.

For example: PLT-0 C 00:10:20 shows that the CASING DROP PRESSURE was reached after 10 minutes and 20 seconds of OPEN time (and B OPEN time, if any).

Programming All Functions

Press SET 90 to program all the time and pressure functions quickly. They appear in this order.

Program Function	Faceplate Label	Common Industry Names	Parameter	Value
OPEN	OPEN TIME (HEAD GAS)	ON TIME	SET ON	time
CLOSED	CLOSE TIME	OFF	SET OFF	time
A DELAY	DELAY TIME (SALES)	GAS SALES or AFTERFLOW	SET 02	time
MAND-SI	MANDATORY SHUT-IN	BACK UP	SET 03	time
B OPEN	B-VALVE OPEN TIME	VENT	SET B ON	time
B DELAY	B-VALVE DELAY TIME		SET B 2	time
DEL-ON	OPEN TIME DELAY	FALL TIME	SET 05	time
DEL-OFF	DELAY CLOSE TIME	PAUSE	SET 08	time
SENSOR?			SET 09	ON
1-TIME 2-PSID 3-PSIG 4-CS-DIP	SELECT CONTROLLER MODE		SET 11	4
DIFF OPEN PRES.	OPEN PRESSURE DIFFERENTIAL		SET 12	psi
DIFF CLOSE PRES.	CLOSE CAS DIP INCREASE		SET 13	psi
HIGH LINE PRES.	HIGH LINE CLOSE PRESSURE		SET 14	psi
LOW LINE PRES.	LOW LINE CLOSE PRESSURE		SET 15	psi
CASING DROP PRS.	CASING DROP (WITHOUT SENSOR)		SET 20	psi
CS TIME	CASING TIME (CASING PSI PEAK)		SET 21	time
CASING RISE PRS.				psi
L-DELAY			SET 22	time

Troubleshooting

If you have a problem with the controller, try these troubleshooting tips. If they don't solve the problem, call your PCS sales and service representative.

Controller Display Problems

Controller won't turn on.
Controller Version 076-03 never sleeps. Display should never be blank while controller is on.

1 Turn power switch off and on. See page 3. If display remains blank, go to step 2.
2 Check fuse. See page 15.
3 Check battery and wire connection. See page 15.
4 Check solar panel. See page 15.

Controller's display is blank.
See above: "Controller won't turn on."

Controller's display is scrambled.
Static electricity may have made controller lose its place in program cycle.

- Reset controller: Turn power switch off and on.

Controller's display shows Xs and Os.
See above: "Controller's display is scrambled."

Program Cycle Problems

Controller won't run program cycle.

1 Check HIGH LINE CLOSE PRESSURE: SET 14. Make sure pressure setting is above well's:
   - Expected casing peak pressure
   - Normal high line pressure
2 Check calibration on transducers. Controller's display must show values for both casing and line pressure. If necessary, recalibrate transducers. See "Calibrating the Transducers" on page 7.
3 Check battery and wire connection. See page 15. If battery voltage is low, controller closes motor valve and shuts-in.
4 Check solenoid (shift valve). See page 15.
5 Check gas supply pressure to motor valve. Recommended supply pressure is 35 psi. If supply pressure is too low, it will not open motor valve. Check filter and regulator(s) for debris and ice.

Controller won't open motor valve.
See previous problem: "Controller won't run program cycle."

CLOSE time goes directly to DELAY time (SALES).
Check controller's Plunger Travel Time Reports.

- READ 06. If display shows PLT-0 A 00:00:00, controller went through opening and closing part of program even though plunger did not arrive.

Test 1: *Check controller by disconnecting sensor.*

- See page 15.

Test 2: *Check plunger.*

1 Check whether plunger is stuck in lubricator.
2 If plunger is not stuck in lubricator, go to Test 3.

Test 3: *Look for wellhead electrical current.*

1 Remove sensor from wellhead.
2 Press OPEN. Controller should count down OPEN time.
3 Hold sensor in your hand, and move steel wrench through sensor band.
   - If controller goes to DELAY time (SALES), problem may be wellhead electrical current. Go to step 4.
   - If controller does not go to DELAY time (SALES), problem should be sensor or sensor wire. Call PCS sales and service representative.
4 Wrap electrical tape on wellhead at location of sensor to isolate it from possible wellhead electrical current.
5 If electrical tape does not fix problem:
   - Sensor or sensor wire may be defective, or
   - Well may need a two-wire, 9 volt sensor or a cathodic (PCS black lead) sensor.

   Call PCS sales and service representative.

Short-term fix for sensor problem: Use CASING DROP PRESSURE feature (see page 11).

Plunger has surfaced, but OPEN time does not go to DELAY time (SALES).

Test 1: *Check controller by disconnecting sensor.*

- See page 15.

Test 2: *Check sensor alignment.*

- Sensor should be aligned on east or west side of wellhead.
  - If sensor is aligned on north or south side, realign it on east or west side.
  - If sensor is aligned on east or west side, sensor or sensor wire may be defective. Call PCS sales and service representative.

Short-term fix for sensor problem: Use CASING DROP PRESSURE feature (see page 11).

Plunger has surfaced, but Plunger Travel Time Reports (READ 06) show C instead of A or B.

Check controller's Plunger Travel Time Reports.

- READ 06. Example: PLT-0 C 00:07:30.

Test 1: *Check CASING DROP PRESSURE.*

1 READ 20.
2 Make sure CASING DROP PRESSURE is high enough that plunger surfaces before pressure is reached. For instructions, see page 11.
If CASING DROP PRESSURE is set correctly, go to Test 2.

Test 2: *Check controller by disconnecting sensor.*

- See page 15.

Test 3: *Check sensor.*

1 Press OPEN.
2 Run steel wrench along back of sensor.
  - If controller goes to DELAY time (SALES), sensor is OK.
  - If controller does not go to DELAY time (SALES), problem should be sensor or sensor wire.
3 Call PCS sales and service representative.

Short-term fix for sensor problem: Use CASING DROP PRESSURE feature (see page 11).

Solenoid (Shift Valve) Problems

Solenoid (shift valve) does not operate at any time.

1 Check fuse, battery, and battery wire connection. See page 15.
2 Check solenoid. See page 15.

Solenoid (shift valve) does not operate at night.

Solar panel may be powering controller during day.

1 Check fuse, battery, and battery wire connection. See page 15.
2 Check solenoid. See page 15.

Transducer Problems

Display shows transducer reading of 0 psi.

Surge protector or transducer may be defective, or transducer wire may have been completely cut.

- Check transducer, transducer wire, and surge protector. See page 15.

Display shows fluctuating transducer reading.

Transducer wire may be defective.

- Check transducer wire. See page 15.

Display shows false transducer reading.

Transducer may be defective.

- Check transducer. See page 15.

Transducer does not stay calibrated.

Surge protector may be defective.

- Check surge protector. See page 15.

Equipment Checks

Check fuse.

1 Turn power switch off (see page 3).
2 Remove controller's faceplate.
3 Remove fuse from yellow casing.
4 If fuse is defective, replace it with 5 amp, 250 volt fuse. Controller's box contains 1 extra fuse.
5 Turn power switch on.

Check battery and wire connection.

Battery life is approximately 1 to 3 years.
Controller has a safety feature. If battery voltage is low, controller closes motor valve and shuts-in.

1 Turn power switch off (see page 3).
2 Remove controller's faceplate.
3 Check battery wire connection (see "Circuit Board Wiring" on page 3).
4 Check battery voltage with ohm meter. Low voltage is 5.7 volts.
5 Replace battery if it is below 6 volts.
6 Check manufacture date on battery and replace if it is over 3 years old.
7 Turn power switch on.

Check solar panel.

1 Check solar panel installation.
   - Solar panel should face south.
   - Element should be free from dirt, oil, and so on.
   - Check for cracks in solar panel.
   - Check whether solar panel is shaded during any part of the day. If it is, position it so it receives the most sunlight each day.
2 Check solar panel wire connection (see "Installation Instructions" on page 2).
3 Make sure power switch is on. Controller's display should be on.
4 Remove one terminal from battery.
5 Check whether display is on.
   - If display is on, solar panel is good. Controller is using power directly from solar panel.
   - If display goes off, solar panel may be defective.
6 Disconnect solar panel from terminals. Use a high-end volt meter to obtain voltage and amperage. A good solar panel reading is 10.7 volts and 430 mA.
7 Change solar panel. Repeat step 1 through step 6.

Check transducer, transducer wire, and surge protector.

1 Recalibrate transducer. See "Calibrating the Transducers" on page 7.
2 If transducer won't hold calibration, change controller to Time Mode: press SET 11 and enter 1.
3 Call PCS sales and service representative.

Check solenoid (shift valve).

1 Press OPEN.
2 If solenoid won't open, clean supply hoses and puck inside solenoid valve.
3 If they are good, consider replacing puck or entire solenoid.
4 Retest.

Check sensor and sensor wire.

See troubleshooting tips for one of the following:

- "CLOSE time goes directly to DELAY time (SALES)." Go to page 13.
- "Plunger has surfaced, but OPEN time does not go to DELAY time (SALES)." Go to page 14.

Check controller by disconnecting sensor.

1 Disconnect sensor from *Sensor* – and *Sensor In* terminals on controller's faceplate.
2 Press OPEN.
3 Use a wire to short *Sensor* – and *Sensor In* terminals. Controller is OK if it goes to DELAY time (SALES).
4 Reconnect sensor to terminals. Go to next test.

Mode 4 S

Specifications

CSA Certification:	Exia, INTRINSICALLY SAFE for use in Class I Div I Groups C and D
Battery:	6V 12 AH sealed rechargeable
Solar Panel:	10.7V 430mA
Power Consumption:	3.5-4.0 mA active display
Protection:	
electronics	Short circuit and reverse polarity
LCD	Ultra-violet
Environmental:	Operates in sub-zero to tropical extremes
Temperature:	-20° F to 150° F
Humidity:	0-95% non-condensing
Water Resistant:	Steel case with rubber gasket seal. NEMA 4
Keypad:	Stainless steel dome switches
Dimensions with extensions:	8" x 12" x 4"
Weight:	13 lbs. with battery
Gas supply:	
pressure	25-50 psi
connections	1/4" NPT brass or stainless steel
Transducer:	
accuracy	+/-2%
output	0-100 mV 5Vdc supply
over pressure	2 times rated pressure
burst pressure	20,000 psi

Warranty: Production Control Services, Inc. warrants all PCS manufactured equipment to be free of defects in material and workmanship for ONE YEAR from date of purchase by original buyer only. Warranty is completely void if abuse, neglect, misuse or misapplication is the cause of the malfunction. Determination of abuse or damage to be made solely by PCS.

U.S. Patent: 6,196,324 B

6/12/03

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You can get more information about the PCS plunger lift line of products on the Internet at: www.PCSplungerlift.com

Mode 4S

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