CD-2PCc

Duplex Pump Controller
Description of Operation
PN 61002-0004-02

IMPORTANT:

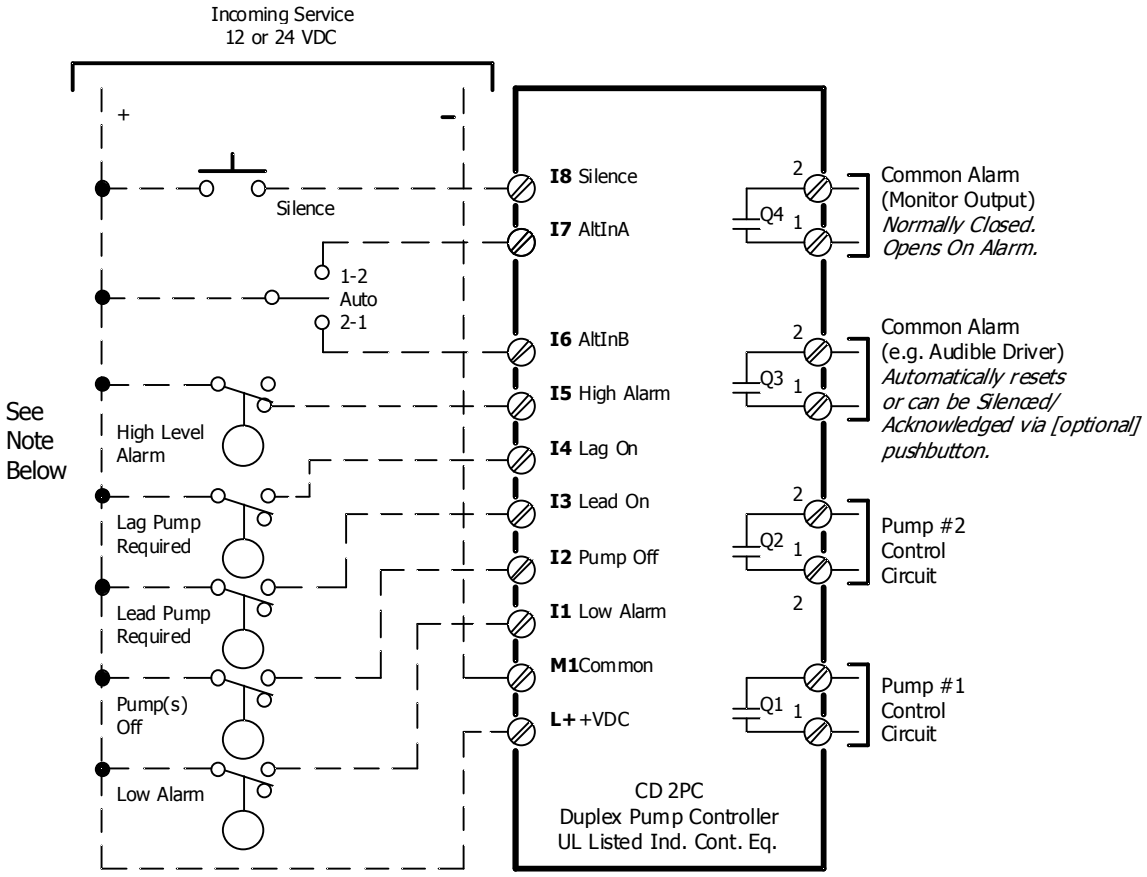
This controller contains both TEMPORARY and PERMANENT memory. When an operator changes a setpoint, the change is held in the TEMPORARY (i.e. 'operating') memory. After making all of the desired setpoint and timing adjustments and before leaving the controller, the changes should be copied to the controller's PERMANENT memory.

Instructions on moving the setpoints and adjustments to the PERMANENT memory are found in subsequent sections.

Overview

The CD-2PCc provides duplex pump control, automatic alternation and common abnormal (i.e. High/Low) alarm annunciation/indication. The controller accepts a maximum of five float inputs as shown below. The controller can provide duplex pump and high level alarm with the use of only one float switch located at a high level and connected to the high alarm input.

The controller's connection diagram is shown below.



Note: The CD-2PCc can accept either a Normally Open (NO) or Normally Closed (NC) high alarm input. The controller's internal software switch must be set for the selected input type.

Internal Timers

The CD-2PC contains three field adjustable timers as described in the Status Displays (immediately below). The timers enable the CD-2PC to provide several unique features. The timers have been set with nominal factory default values.

Changes to the timing values are temporarily stored in the controller's working memory. To ensure proper ongoing operation, the changes must be moved to the controller's permanent memory. The steps to move the setpoints to the permanent memory are detailed on subsequent pages.

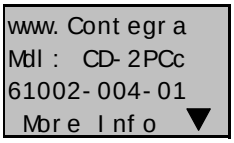
Display Screens

The CD-2PC contains a total of 11 display screens. Five of the displays are permanently enabled. These six displays – the Status Displays – show timer adjustments (i.e. Lag Add and Pump Off timing). The other four displays – Dynamic Displays – appear and are removed as the controller steps through its control sequence.

Status Displays

Initialization Display (Status 5) =>

The display shows Contegra's contact information (www.Contegra.com), the controller's model information (i.e. CD-2PC) and the controller's part number. The fourth line indicates that more information is available by pressing the down pushbutton.

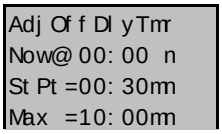


Press DN

There are no user changeable setpoints on this display.

Adjust Pump Off Delay (Status 4) =>

The Off delay timer (shown/adjusted on this screen) is only enabled when the Off float is disconnected (i.e. opened or broken). The present Off-Delay timing value is shown on the second line. The setpoint [StPt] (third line) represents the present Off Delay SetPoint[1] (00:30 mn = 30 Sec). The maximum value is 10:00 minutes. [The maximum delay is enforced by an internal non-adjustable timer that prohibits protracted run times.] This display allows the operator to view and change the timer's setpoint.



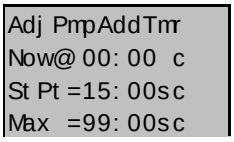
Press UP or DN

<u>Changing the setpoint:</u>

Press ESC for four seconds. A cursor appears under the 'S' in StPt. Use the Up/Dn and Left/Right arrows to change the number. Press OK to accept the change or ESC to revert to the previous number.

Adjust Pump Add Timer (Status 3) =>

The Pump Add timer (shown/adjusted on this screen) can be used to prohibit the simultaneous activation of both the Lead and Lag pumps. The present Pump-Add timing value is shown on the second line. The setpoint [StPt] (third line) represents the present Pump Add-Delay[2] (15:00 sc = 15 Sec). The maximum value is 99:90 seconds.] This display allows the operator to view and change the timer's setpoint. This timer is activated when the Lag input is activated but the Lead input is NOT active.



Press UP or DN

<u>Changing the setpoint:</u>

Press ESC for four seconds. A cursor appears under the 'S' in StPt. Use the Up/Dn and Left/Right arrows to change the number. Press OK to accept the change or ESC to revert to the previous number.

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[1] A label on the right side of the controller describes the adjustment procedure.

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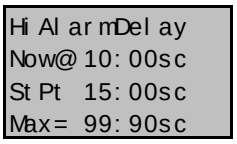
High Alarm Delay (Status 2) =>
The activation of the high alarm output can be delayed up to 99.99 seconds. The High Alarm delay is activated when the Lead Pump Starts. When the Delay timer completes its timing cycle the High Alarm circuitry is enabled. Thereafter, when the High Alarm sensor closes, the High Alarm output is activated. The Alarm output can be restored to the non-alarm state by completing the acknowledge circuit. Alternatively, the High Alarm output returns to the non-alarm state when the pumps are no longer required.

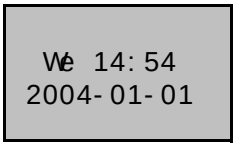


Press UP or DN

Changing the setpoint:

Press ESC for four seconds. A cursor appears under the 'S' in StPt. Use the Up/Dn and Left/Right arrows to change the number. Press OK to accept the change or ESC to revert to the previous number.

Tech Assist Displays (Status 1) =>
There are a total of five Tech Assist Displays. The controller remembers the last Tech Assist Display to be viewed and returns to that display. Tech Assist Displays consist of the clock display (shown) an "Input" display, an "Output", a "Memory Marker" and a Soft Key (ESC Keys) display. Press ◂ or ▸ to view other Tech Assist displays. Press ▴ to return to the Status Displays.

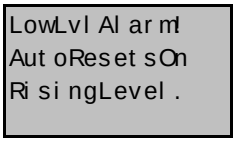


Press UP, Left or Right

There are no user changeable setpoints on the Tech Assist Displays.

Dynamic Displays

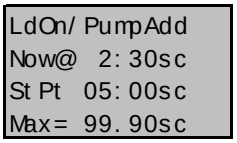
Low Level Alarm (Dynamic 1) =>
The display indicates that the low level alarm input has opened. If the low level alarm is not required, a jumper is required from +VDC into input #1 (Low Level Alarm).



Press DN

There are no user changeable setpoints on this display. This display is hidden until a low level alarm is sensed.

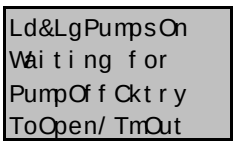
Lead On/Pump Add (Dynamic 2) =>
The display indicates that the Lead pump is called into service and that the Pump Add timer is active. When the Pump Add timer completes its timing cycle, the Lag Pump may subsequently be called into service. The Lag Pump is called into service by completing either the controller's Lag Pump Input or the High Alarm Input.



Press DN

There are no user changeable setpoints on this display. This display is hidden until the Lead Pump is called into service.

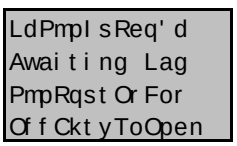
Lead & Lag Pumps On (Dynamic 3) =>
The display indicates that both the Lead and Lag pumps are being called into service. The controller continues to call for both pumps until either the Off sensor opens or the Pump Off Delay timer completes its timing cycle. (The Off Delay timer is ONLY active if the Off Float is disconnected. Therefore, as long as the Off Float is operational, the Off Delay timer is disabled)



Press DN

There are no user changeable setpoints on this display. This display is hidden until both the Lead and Lag Pumps are called into service.

Lead Required & Waiting (Dynamic 4) =>
The display indicates that the Lead pump is required. Additionally, the CD-2PC's is ready to act immediately and call for the Lag pump upon activation of the Lag input or the High alarm input. Alternatively, the Lead pump request is removed if the Lead and Off input are deactivated. (If the Off input is not connected, the Lead pump goes through the Off delay timing period before



Press DN

There are no user changeable setpoints on this display. This display is hidden until both the Lead and Lag Pumps are called into service.

the pump control output is deactivated.)

High Level Alarm (Dynamic 5) =>
The display indicates that the high-level alarm input has activated. (The controller contains an internal software switch that allows the end user to apply either a normally open or a normally closed float switch. The default 'soft switch' position requires a normally open float that closes on rising level.)

```
HighLvl Alarm
Auto Resets
When Pumping
Ceases.
```

There are no user changeable setpoints on this display. This display is hidden until a high level alarm is sensed.

Press DN

Pumps are timing off. (Dynamic 6) =>
The display indicates that Pump Off float is inoperative or disconnected. The pumps were called into service by the activation of one of the higher level floats (Lead Req'd, Lag Req'd or High Alarm). When the lowest of those floats opens, the controller begins an off-delay timing process. At the end of the timing cycle all pumping activity ceases.

```
PmpsTimngOff
Now@  2:35m
St Pt 5:30m
Max  10:00m
```

There are no user changeable setpoints on this display. This display is hidden until the pumps are running and the off float is inoperative/ disconnected

Press UP,
Left or Right

Pump Off Delay

If the Off float becomes disconnected or if were to fail in an "open" condition, a typical controller may short cycle the pumps. That is, the typical controller would start a pump when the "Lead Pump Required" float closes and stop the pump when same float opens. This would cause short cycling and may cause the pumps to exceed their maximum starts/hour.

The CD-2PC tests the 'Pump Off' input. If the 'Off' input is not active then the controller enables an Off-Delay timer. The Off-Delay timer is used to ensure a minimum amount of pump run time.

When a higher level float closes (e.g. Lead, Lag or High Alarm) the controller immediately calls for the Lead Pump. When the float opens, the CD-2PC continues pumping operation until the completion of the Off-Delay timing cycle. (Again, this is only true of the Off float input is not active.)

The CD-2PC allows the user to program a minimum run time. The timer can be programmed in one-second increments from 00:00m to 99.59m. The factory default is 00:30m (i.e. 30 seconds.)

NOTE: If the Off float/input is closed/active then the timer is disabled.

Pump Add Timer

If the Lead Pump float fails in an open condition (or is not connected) then the Lag Pump On float controls BOTH the Lead and Lag pumps. (If the Lead Pump On float is closed, the Pump Add timer is inactive.)

If the "Lead Pump On" float is open and the "Lag Pump On" float is closed then the controller sequences the two pumps into service based on the "Pump Add" timing value. When the Lag Pump On float closes, the controller calls for the Lead Pump's output. If the Lag Pump required input remains closed, and the Pump Add Timer completes its timing cycle, then the Lag Pump is also called into service.

The pumps turn off when either 1) the Pump Off float opens or 2) the Off Delay timer (described above) completes its timing cycle.

The CD-2PC allows the user to program the Pump Add Timer. The timer can be programmed in 1/100th second increments from 00:00s to 99.99s. The factory default is 00:15s (15 seconds.)

[Note: Changing from 00:00 seconds to 00:01 seconds is a change of 1/100th of a second.)

In addition to the Lag Enable Delay the controller contains an internal 10-second Staggered Start delay. This delay ensures that the Lead and Lag pumps do not start simultaneously on power restoration (i.e. under high level conditions). The internal 10-second delay is only active on power-up and is not adjustable. After the power has stabilized, the Pump Add Timer determines The Lag Pump's on delay.

High Level Alarm Delay

If the "Lag Pump On" float should fail open (or if it is not connected) then the High Level Alarm float automatically provides the Lag pump `Required' input. Additionally, the High Alarm Delay timer allows the user to delay the activation of the alarm output (if desired).

When the High Alarm float closes, the controller ensures that the Lead pump is called. Thereafter, if the input remains active and the Pump Add timer completes its timing cycle (as described above), then Lag Pump is called into service. If the High Alarm Delay completes its timing cycle the High Level Alarm is activated.

The High Level Alarm is cleared when the pumps are no longer required. The pumps stop when the Pump Off float opens or when the Off Dealy timer completes its Off Delay timing cycle.

The CD-2PC allows the user to program a High Level Alarm Delay. The timer can be programmed in 1/100th second increments from 00:00s to 99.99s. The factory default is 00:00s (immediate).

Pump Down Operation - Rising Level

Assume that the level is below the Low Level float and that the control power is off. When power is restored the controller goes through a brief (5 second) power-up delay. This delay ensures that the incoming power is relatively stable.

After the power-up delay the Low Level Alarm screen appears and the controller's alarm contacts are activated. (Remember that there is a low level alarm condition.) Output Q3 closes (alarm) and Q4 opens (monitor). These outputs automatically return to their normal state when the level rises to the Off float or when a pump is required. Activating the Silence/Acknowledge input (I8) immediately restored Q3 to its normal state. Output Q4 does not respond to input I8. Output Q4 automatically resets.

As the level continues to rise the Lead Pump On float closes and the Lead Pump is called into service. Subsequently, when the level rises to the Lag Pump On float the Lag Pump is called into service.

As previously described under the timer section, when the Lag Pump On float closes, the controller first ensures that the Lead Pump is called into service. (The lead pump's float may have broken. Therefore the controller ensures that the Lead Pump starts before the Lag Pump is called into service.)

Should the level continue to rise the High Level Alarm input is activated and the alarm contacts transfer (as previously described).

As the level falls, it must descend below and open the Pump Off float. When the Pump Off input deactivates all pumping ceases and the alternator advances to the next pumping sequence.

Alternator Selector

The alternator can be set into the 1-2, 2-1 or Automatic position. Completing the circuit between +VDC and input 7 sets the alternator in a 1-2 sequence. Completing the circuit between +VDC and input 6 sets the alternator in a 2-1 sequence. Leaving inputs 6 and 7 open/inactive sets the alternator in the automatic mode.

Changing High Alarm Float NO/NC

The CD-2PC can be configured to accept either a Normally-Open (N.O.) or Normally-Closed (N.C.) High Alarm input. If the input configuration is changed, the operator must copy the setpoint change into the PERMANENT memory.

Some installing technicians prefer to use a Normally Open sensor as the High Alarm input. The possible downside is that if a Normally Open float were to break (i.e. open) or if it is disconnected, the CD-2PC's input does not (i.e. cannot) activate.

Other technicians prefer to use a Normally Closed sensor as the High Alarm input. If a Normally Closed float were to break (i.e. open) or if it is disconnected, the CD-2PC's interprets the open circuit as a request for pumps. Not only does the CD-2PC then start the pumps but it also activates the 'audible driver" (Q3) and opens the monitor output (Q4). Obviously these alarms highlight the fact that there is a problem at the pump station. (Note: If the circuit within the float were to short together the CD-2PC would interpret the short as a normal condition and would not call for pumps. As can be seen, each configuration has its advantages.)

The following table shows the steps that are required in order to change the High Alarm input from normally open to normally closed.

Accessing the N.O. Alarm Parameter

The parameter is accessed via the Tech Assist Displays.

Follow these steps to change the desired parameter:

	See this …	Do this …
1	www.Contegra Mdl: CD-2PCc 61002-004-01 More Info ▼	Press the DOWN pushbutton. Move down to any one of the five Tech Assist Displays.
2	Tu 08:20 2001-09-11	Press ESC to reveal a hidden menu that provides several options
3	>Stop Set Param Set Clock Prg Name	Press the DOWN pushbutton and move to **Set Param** (Set Parameter).
4	Stop >Set Param Set Clock Prg Name	Press OK and thus reveal the controller's single configurable parameter.
5	Hi Alarm=Off Switch=Off	If Switch=Off then use a N.C. float. If Switch=On then use a N.O. Float
5	Hi Alarm=Off Switch=Off	To change the parameter, press OK. A cursor appears under the 'S' in Switch.
6	Hi Alarm=Off **S**witch=Off	Press the DOWN pushbutton to reveal Switch=On. Then … press OK to confirm the selection or press ESC to revert to the present selection.
7	Hi Alarm=Off **S**witch=On	Press the ESC pushbutton to move up one level in the menu structure.
8	Stop >Set Param Set Clock Prg Name	Press the ESC pushbutton to return to the TechAssist Displays

Permanent Memory

This controller contains both TEMPORARY and PERMANENT memory. During power-up the controller goes through an initialization process that copies the control strategy and numerous operating setpoints from the PERMANENT (slow) memory and into the TEMPORARY (fast) memory. Thereafter, the controller operates from the TEMPORARY (a.k.a. working) memory.

When a setpoint or timing adjustment is changed the controller simply changes the value in the TEMPORARY memory. After making all of the desired changes the operator must:

1) Temporarily stop the controller's standard operation

2) Go through a simple sequence to copy the contents of the TEMPORARY memory into the PERMANENT memory.

3) Restart the controller

Those steps are detailed in the paragraphs that appear in the following table.

After making timing changes, the operator must transfer the changes from the TEMPORARY memory to the PERMANENT memory. DO NOT turn off the controller's power before the adjustments have been successfully transferred to the PERMANENT memory. Do not attempt to transfer the values during a time of possible power loss (e.g. storms).

The controller contains an internal battery backup that maintains the controller's clock and temporary memory. Therefore, if the clock is flashing, the values in the TEMPORARY memory may have been lost. However, if the setpoint and timing values have been stored to the permanent memory then the loss of the temporary memory is not a concern.

Transferring the setpoints to the PERMANENT memory

	See this ...	***Do this ...***	***Purpose ...***
1	Tu 08:20 2001-09-11	*Press the DOWN pushbutton until one of the five TechAssist screens appears then press ESC Pushbutton*	*Pressing ESC reveals a hidden menu that provides several options*
2	>Stop Set Param Set Clock Prg Name	*Press the OK Pushbutton and thus begin the process to Stop the controller's operation.*	*The operating strategy must be stopped in order to copy the TEMPORARY memory to the PERMANENT memory.*
3	Stop Prg >No Yes	*Press the DOWN Pushbutton and thus move the cursor to the word 'Yes'.*	*This display is a safeguard that ensures that the controller is not unintentionally stopped.*
4	Stop Prg No >Yes	*While the cursor is pointed to 'Yes' press the OK Pushbutton.*	*This confirms the operator's desire to stop the controller's operation in preparation for the copying process.*
5	>Program. Card .. Clock .. Start	*Press the DOWN Pushbutton and thus move the cursor to the word 'Card...'.*	*The PERMANENT memory is held in the card (i.e. beige plug-in module) that is loaded into the socket that's on the front of the controller.*
6	Program. >Card .. Clock .. Start	*Press the OK Pushbutton and thus reveal the 'Card' programming options.*	*This confirms the desire to move data into or out of the plug-in module.*
7	>[▣]->Card Card->[▣] CopyProtect	*With the cursor positioned at the top selection, press the OK Pushbutton.*	*This indicates to the controller that the operator desires to copy from the TEMPORARY memory to the PERMANENT memory.*
8	>[▣]->Card >No Yes	*Press the DOWN pushbutton in order to move the cursor to the 'Yes' selection that appears on the third line.*	*This display is a safeguard that ensures that the memory card is intentionally overwritten.*
9	>[▣]->Card No >Yes	*With the cursor positioned at the 'Yes', press the OK pushbutton to confirm the memory write.*	*This display and key sequence begin the writing process.*
10	>[▣]->Card No >Yes	*Wait as the 'storing' dots to progress across the bottom line. The dots indicate that the information is being written to the permanent memory.*	*This display indicates that the contents of the TEMPORARY memory are being copied to the PERMANENT memory.*
11	Program. >Card .. Clock .. Start	*Following the writing process the screen (at left) appears. From here, press the DOWN Pushbutton TWICE and thus move the cursor to START.*	*This screen automatically appears when the write process is complete. It allows the operator to restart the control strategy.*

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12	Program . Card . . Clock . . >Start	*With the cursor positioned on 'Start' press the OK pushbutton. When OK is pressed the controller exits the programming mode and returns to operation.*	*This is the final step that is required to restart the control strategy.*
13	www.Contegra Mdl: CD-2PCc 61002-004-01 More Info ▼	*You're done. The strategy and variables have been copied to the PERMANENT memory*	*Success! Now, test the writing process by cycling the power. Upon power restoration the new setpoints and timing values should appear on the control's display.*