Contegra®
intelligent design™

CD-2RC
User's Guide

Float Based
Redundant Control
(Pump Down)

IMPORTANT:

This controller contains both **TEMPORARY** and **PERMANENT** memory (both are defined immediately below). 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 must be copied to the controller's **PERMANENT** memory.

See Appendix A for instructions on moving the setpoints and adjustments to the **PERMANENT** memory.

Definitions:

TEMPORARY (i.e. Operating) Memory

Temporary Memory is also called RAM (Random Access Memory). The controller's microprocessor can quickly access the data that is held in the RAM. The connection between the microprocessor and the TEMPORARY memory (i.e. RAM) is similar to cars traveling on a multi-lane freeway. The RAM is buried within the control and cannot be removed.

PERMANENT Memory

Permanent Memory is also called EEPROM (Electrically Erasable, Programmable Read Only Memory [or equal]). The connection between the microprocessor and the PERMANENT memory is similar the congestion that occurs when several cars are crossing a single-lane bridge. A single-lane bridge does not allow the simultaneous passage of multiple vehicles. Only one vehicle can use the bridge at any given time. The bridge is reliable but the transit time is slow.

The PERMANENT memory is contained with the beige 'key' that is inserted into the controller's upper-right corner. The controller ceases operation if the PERMANENT memory is removed from its connector.

Overview

The CD-2RC redundant controller accepts from one to a maximum of three float control inputs and provides automatic pump-down control of two constant speed pumps. Additionally, the CD-2RC contains integral pump running time meters, pump running indicators and pump start counters.

Input Configurations

Single float operation (High Alarm):

Pump(s) Start:

Upon activation of the High Alarm input the controller immediately
1) starts the lead pump,
2) activates the alarm output
3) deactivates the monitor output.

Subsequently, if required and following a brief time delay, the lag pump is activated.

Pump(s) Stop:

The operating pump(s) turn off following the deactivation of the High Alarm input and the expiration of an adjustable Off-Delay timer.

Two float operation (High Alarm & Pump Off):

Pump(s) Start:

Same as above

Pump(s) Stop:

The operating pump(s) turn off when the Pump Off input deactivates.

Three float operation:

Pump(s) Start:

Upon activation of the Pump Add input the controller immediately starts the lead pump. Subsequently, if required and following a brief time delay, the lag pump is activated.

Should the level continue to rise and thus cause the activation of the High Alarm input the controller 1) activates the High Alarm output and 2) deactivates the Monitor output.

Pump(s) Stop:

The operating pump(s) turn off when the Pump Off input deactivates.

Controller Inputs

I8 – Acknowledge

Momentarily connecting +VDC to Input 8 (e.g. via a N.O. pushbutton) completes the acknowledgement circuit and deactivates Output #3. (Output #4 deactivates when the pumps are no longer required.)

I7 – Alternator 1-2

A three-position switch can be used to set the alternation sequence. Connecting +VDC to Input 7 sets the alternator so that Pump 1 is lead.

I6 – Alternator 2-1

Connecting + VDC to Input 6 sets the alternator so that Pump 2 is lead.

I5 – Pump 2 Running

Pump 2's counters and timers are activated when +VDC is connected to Input 5.

I4 – Pump 1 Running

Pump 1's counters and timers are activated when +VDC is connected to Input 4.

I3 – High Alarm Input (Programmable)

This is a programmable input. Therefore, the installing technician may use either a NO or a NC input. Adjustment procedures are shown in a subsequent section of the user's guide.

I2 – Pump(s) Required

Use a N.O. float that closes on rising level. Connecting +VDC to this terminal activates the input.

I1 – Pump(s) Off

Use a N.O. float that closes on rising level. The controller senses the float closure (on rising level). The controller then uses the OFF float to control the "Pump Stop". If an OFF float is NOT provided, the controller uses its internal Off-Delay timer to stop the pump(s).

Controller Outputs

Q4 – Alarm Monitor

Q4 is normally energized. The output de-energizes on power loss or if the High Alarm input is active. This output is not effected by the Pump Add input.

Q3 – Alarm Output (e.g. Audible Driver)

Q3 is normally inactive. The output activates when the High Alarm input is active. Acknowledging the alarm deactivates Q3. (Refer to page 1 – Input 8.) This output is not effected by the Pump Add input.

Q2 – Pump 2 Control

Q2 is normally de-energized. The output energizes as required by activation of either the Pump Add input or the High Alarm input.

Q2 – Pump 1 Control

Q1 is normally de-energized. The output energizes as required by activation of either the Pump Add input or the High Alarm input.

Integral Timers

Lag Add Timing

The controller immediately calls for the lead pump when either the Pump Add input or the High Alarm inputs are activated. Additionally, the controller immediately starts the "Lag Pump Add" timer. The lag pump is called into service only if the Pump Add float remains closed and the Lag Add timer completes its timing cycle. If the Pump Add float opens, before the Lag Add timer completes its timing cycle, then the timer is reset.

The Lag Add timer is adjustable from 0.00 to 99.99 seconds. Adjustment procedures are presented in a subsequent section of the manual.

Pump Off – Timer

As described above, when an Off Float is NOT connected, the redundant controller automatically uses an internal Off-Delay timer to determine the length of time the pump control outputs are to remain active following the deactivation of the Pump-Add or High Alarm inputs.

The Pump Off timer is adjustable from 0.00 to 99.99 minutes. As stated previously, the CD-2RC contains an internal timer that ensures that the maximum Pump Off delay is 10 minutes. Adjustment procedures are presented in a subsequent section of the manual.

Initialization Timers

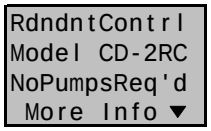
The CD-2RC contains an embedded initialization timer. Upon application of power the controller goes through a five-second-initialization delay. The initialization delay helps ensure that the power is stable. During the initialization process both pump outputs are inhibited. The output inhibit is removed following the completion of the timing cycle. Following initialization the lead-pump output may be activated, depending upon wet well depth and activation of either the Pump Add or High Alarm inputs.

Display Screens

The CD-2RC contains a total of 10 display screens. Six of the displays are permanently enabled. These six displays – the Status Displays – show timer adjustments (i.e. Lag Add and Pump Off timing) and pump running time (i.e. Pumps 1 & 2 RTMs, etc.) The other four displays – Dynamic Displays – appear and are removed as the controller steps through its control sequence.

Status Displays

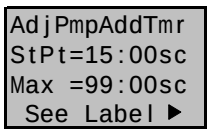
Initialization display[1] (Status 1) =>
The display shows the controller's function (Redundant Controller) its model (CD-2RC) and that reveals that no pumps are presently required. The fourth line indicates that more information is available by pressing the down pushbutton.



Press DN

There are no user changeable setpoints on this display. This display is temporarily hidden while pumps are called into service.

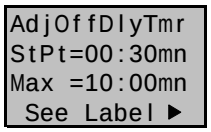
Adjust Pump Add Timer (Status 2) =>
StPt represents the present Lag Pump Add SetPoint (15:00sc = 15 seconds). The maximum value is 99 seconds.



Press UP or DN

Changing the setpoint is easy. See page 4 for instructions.

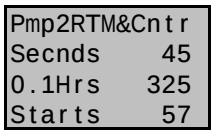
Adjust Pump Off Delay (Status 3) =>
StPt represents the present Off Delay SetPoint[2] (00:30 mn = 30 Sec). The maximum value is 10:00 minutes. [The maximum delay is enforced by an non-adjustable timer that prohibits protracted run times.] This display allows the operator to view and change the timer's setpoint.



Press UP or DN

Changing the setpoint is easy. See page 4 for instructions.

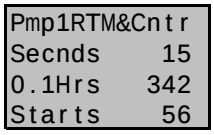
Pump 2 Timers (Status 4) =>
Pump 2's timers and counters are enabled by Input #5. Line 2 shows an RTM that accumulates 1/10ths of hours (i.e. 453 = 45.3 hours). Line 3 shows the number of pump starts. Line 4 shows the shows the run time (seconds) of the current pumping cycle.



Press UP or DN

There are no user changeable setpoints on this display. The RTM rolls-over at 999999.

Pump 1 Timers (Status 5) =>
Pump 1's timers and counters are enabled by Input #4. See the above screen for line by line description.



Press UP or DN

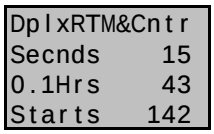
There are no user changeable setpoints on this display. The RTM rolls-over at 999999.

Continued on the following page ...

[1] This assumes that both the Pump Add and the High Alarm inputs are inactive.

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

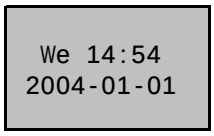
Duplex Timers (Status 6) =>
The Duplex timers and counters are enabled when BOTH pumps are running. See the above screen for line by line description.



Press UP or DN

There are no user changeable setpoints on this display. The RTM rolls-over at 999999.

Tech Assist Displays (Status 7 - Tech Assist) =>
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.

Caution

Do not change the timing range of the two internal timers.

The Lag Off timer is factory set to respond in minutes with a maximum off delay of 10 minutes.

The Pump Add timer is factory set to respond in seconds with a maximum on delay of 99 seconds.

A label has been applied to the right side of the controller. It reminds the operator of the adjustment procedure. Changing the timing range causes a noticeable change on the setpoint display.

The Lag Add and Pump Off adjustment displays show the respective timing ranges. The Lag Add timing range should show 'sc' which denotes 'Seconds'. The Pump Off timing range should show 'mn' which denotes minutes.

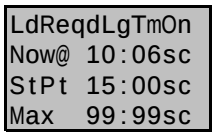
If either if the displays are not as described above, they're respective timing ranges must be restored to the proper value.

Changing a Parameter
A setpoint value is changed as follows:

1. Move to the desired setpoint (i.e. move to Status Display #2 or Status Display #3).
2. Press and hold the ESC pushbutton for approximately 3 seconds. A cursor appears in the second line from the top and at the left-most position [i.e. under the letter 'S' in the cryptic label StPt (i.e. Setpoint)]
3. Press OK. The cursor moves to setpoint's left-most digit.
4. Use the Right (or Left) arrow to move the cursor to the particular digit that is to be changed.
5. Use the Up and Down arrows to change the timing value. DO NOT change the timing range (i.e. do not change from sec => min => Hrs).
6. Press OK to accept the newly programmed value or press ESC to return the previous value.

Dynamic Displays

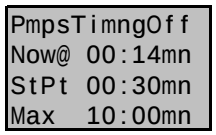
Lead Required – Lag Time On ***(Dynamic 1)*** => Appears when either the Pump Add or High Alarm inputs are activated. The 2nd line shows the timer's present value. The 3rd line shows the timer's setpoint value. The fourth line shows the maximum as 99:99 seconds. The Lag pump is called into service when value in the 2nd line reaches the value in the 3rd or 4th lines. The controller closes the display when neither pump is required.



Press Up or Dn

There are no user changeable points on this display.

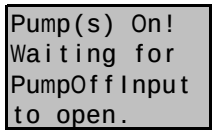
Pumps Timing Off ***(Dynamic 2)*** => Appears when the Off Float is not connected. In such cases the controller uses a programmable Off-Delay timer. The display appears when both the High Alarm AND Pump Add inputs deactivate. The 2nd line shows the timer's current value. The 3rd line shows the timer's setpoint. The 4th line shows the maximum value. When the current value (shown in the 2nd line) reaches either the setpoint (3rd line) or the maximum (4th line) then the pump outputs are deactivated.



Press Up or Dn

There are no user changeable points on this display.

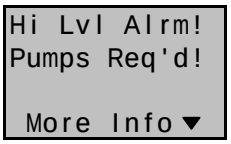
Pump(s) On & … Waiting **(Dynamic 3) =>** Appears when a Pump Off input (i.e. float) is used. Controller started pumps based upon the activation of the Pump Add or the High Alarm inputs. However, those inputs are no longer active. At this point the controller is waiting for the Pump Off input to deactivate.



Press Up or Dn

There are no user changeable points on this display.

High Level Alarm ***(Dynamic 4)*** => Appears only when the High Alarm Input is active. Deactivating the High Alarm input closes the display. (Note: The display's closure is provided with a 10-second delay. This feature limits the screens opening and closing simply due to wave action.)



Press Up or Dn

There are no user changeable points on this display.

Changing the Single User-Configurable Parameter

The CD-2RC can be configured to accept either a Normally-Open (N.O.) or Normally-Closed (N.C.) High Alarm input (i.e. Input #3). The operator must confirm the input's configuration. If the input configuration is changed, the operator must copy the setpoint change into the PERMANENT memory (See Appendix A.)

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-2RC'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-2RC's interprets the open circuit as a request for pumps. Not only does the CD-2RC 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-2RC would interpret the short as a normal condition and would not call for pumps. As can be seen, each configuration has its advantages.)

Accessing the N.O. Alarm Parameter

The parameter is accessed via the Tech Assist Displays (previously described).

Follow these steps to change the desired parameter:

	See this …	Do this …
1	RdndntContrl Model CD-2RC NoPumpsReq'd 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	HiAlarmIf Switch=Off	If Switch=Off then use a N.C. float. If Switch=On then use a N.O. Float
5	HiAlarmIf Switch=Off	To change the parameter, press OK. A cursor appears under the 'S' in Switch.
6	HiAlarmIf Switch=Off	Press the DOWN pushbutton to reveal Switch=On.
7	HiAlarmIf Switch=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 Tech assist Displays

Caution

Do not change the timing range of the two internal timers.

The Lag Off timer is factory set to respond in minutes with a maximum off delay of 10 minutes.

The Pump Add timer is factory set to respond in seconds with a maximum on delay of 99 seconds.

A label has been applied to the right side of the controller. It reminds the operator of the adjustment procedure. Changing the timing range causes a noticeable change on the setpoint display.

The Lag Add and Pump Off adjustment displays show the respective timing ranges. The Lag Add timing range should show 'sc' which denotes 'Seconds'. The Pump Off timing range should show 'mn' which denotes minutes.

If either if the displays are not as described above, they're respective timing ranges must be restored to the proper value.

Appendix A – Transferring Information to the Permanent Memory

Types of 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** 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 following paragraphs.

Adjusting the Controller

As described in the preceding pages, most of the On and Off setpoints and timing values can be viewed and changed from one of the Status Displays. (Several infrequently used adjustments are viewed and changed in the controller's 'Set Parameter' area.) Use the procedures that are detailed on the preceding pages to make all of the desired setpoint and timing adjustments. Thereafter, test the changes before copying the adjustments from the TEMPORARY memory to the PERMANENT memory.

Maintain Power during the Save Process

After making changes in setpoints and timing values, the operator must successfully 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).

Saving Counters and Timers:

A portion of the TEMPORARY memory is reserved for counters (e.g. Start Counters) and timers (e.g. Running Time Meters) that must be preserved through a power failure. Only that portion of the TEMPORARY memory is not overwritten on power-up.

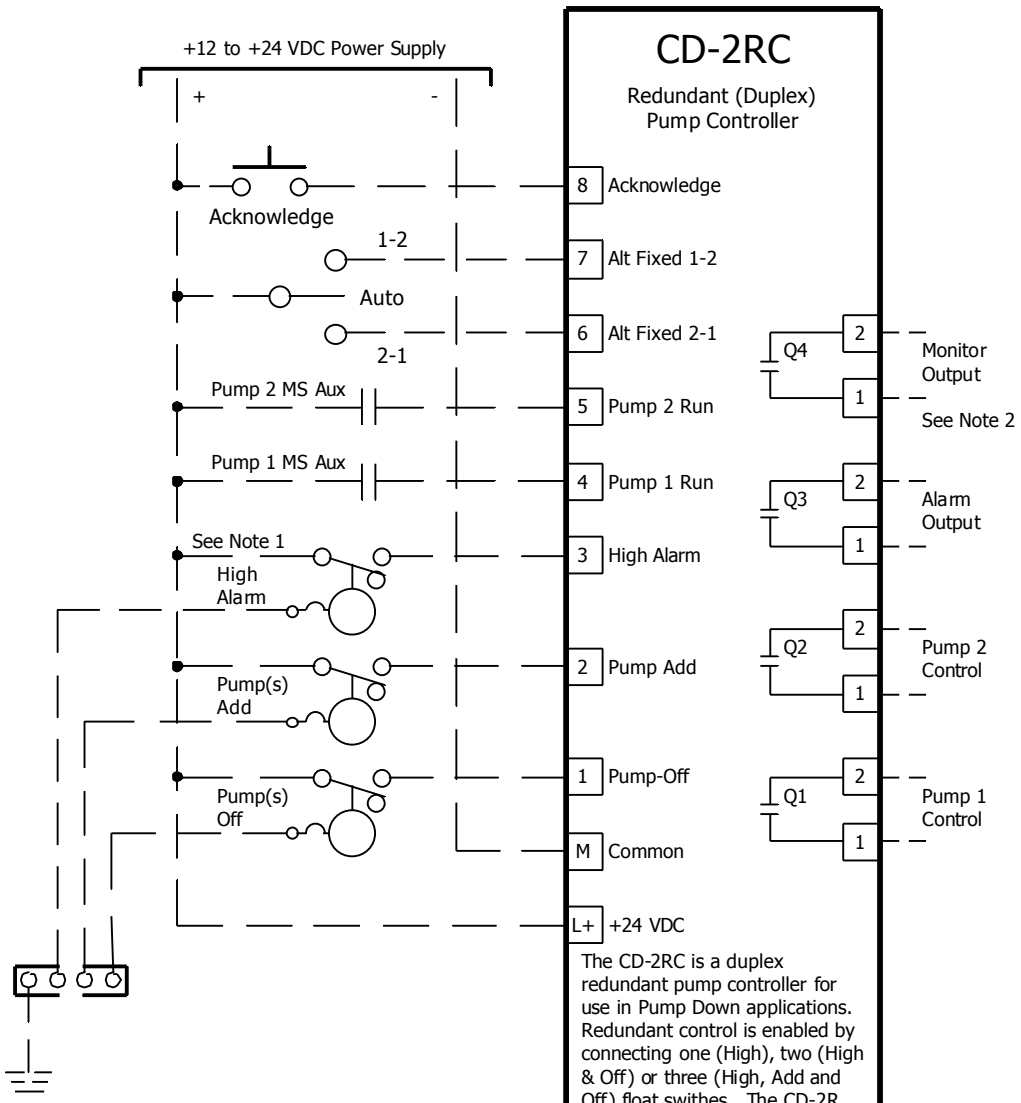
Those counter and timer values are maintained by a memory backup system (i.e. capacitor) that is capable of holding the values for approximately 30 days. If the controller remains unpowered for more than 30 days those values may be lost.

The memory backup also maintains the controller's clock. Therefore, if the clock is flashing, the values in the TEMPORARY memory have been lost.

If a controller is to be unpowered for some length of time, and if historical information is desired, the counter (e.g. Starts) and timer (e.g. RTM) values should be recorded prior to removing power from the controller.

Transferring the setpoints to the PERMANENT memory

	See this …	Do this …	Purpose …
1	RdndntContrl Model CD-2RC NoPumpsReq'd More Info ▼	Press the DOWN pushbutton until one of the five Tech Assist screens appears.	The PERMANENT memory can only be accessed through one of the Tech Assist screens
2	Tu 08:20 2001-09-11	Press ESC Pushbutton	Pressing ESC reveals a hidden menu that provides several options
3	>Stop Set Param Set Clock Prg Name	Press the OK Pushbutton	The operating strategy must be stopped in order to copy the TEMPORARY memory to the PERMANENT memory.
4	Stop Prg >No Yes	Press the DOWN Pushbutton	This display is a safeguard that ensures that the controller is intentionally stopped.
5	Stop Prg No >Yes	Press the OK Pushbutton	This confirms the operator's desire to stop the controller's operation in preparation for the copying process.
6	>Program.. Card .. Clock .. Start	Press the DOWN Pushbutton	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.
7	Program.. >Card .. Clock .. Start	Press the OK Pushbutton	This confirms the desire to move data into or out of the plug-in module.
8	>□✧->Card Card->□✧ CopyProtect	Press the OK Pushbutton	This indicates to the controller that the operator desires to copy from the TEMPORARY memory to the PERMANENT memory.
9	>□✧->Card >No Yes	Press the DOWN Pushbutton	This display is a safeguard that ensures that the memory card is intentionally overwritten.
10	>□✧->Card No >Yes	Press the OK Pushbutton	This display and key sequence begin the writing process.
11	>□✧->Card No >Yes	Wait as the dots progress across the bottom line.	This display indicates that the contents of the TEMPORARY memory are being copied to the PERMANENT memory.
12	Program.. >Card .. Clock .. Start	Press the DOWN Pushbutton TWICE. (Move the cursor to START.)	This screen automatically appears when the write process is complete. It allows the operator to restart the control strategy.
13	Program.. Card .. Clock .. >Start	Press OK	This is the final step that is required to restart the control strategy.
14	RdndntContrl Model CD-2RC NoPumpsReq'd 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.



Notes:

1) The High Alarm input is field programmable and can be either a NO contact that closes (i.e. turns ON) on rising level or a NC contact that opens (i.e. turns OFF) on rising level. See the User's Guide for programming guidance.

2) The monitor output is normally energized. The output deactivates only when the High Alarm input is activated.