

CONFIGURATION INSTRUCTIONS FOR PCML / PCMLF CONTROLLER

PCMLd
APR 2011

Hansen PCML / PCMLF controllers are factory programmed to provide precise control of refrigerant liquid level in refrigeration applications when used in conjunction with Hansen Sealed Motor Valves. It is expected that the controller as shipped from the factory will give reasonable to very good control. If control difficulties occur during startup, it is recommended to thoroughly check system and components for proper installation, operation, and sensor location before attempting to tune the liquid level controller. Upon power-up, the controller will be in operator mode.

Utilizing the West 6100PLUS Controller

These Instructions apply to the West 6100+ Controller. If your controller does not have a “+” suffix; that is, West 6100 instead of West6100+, refer to the “West 6100” instructions at the end of this document.

OPERATOR MODE

1. In operator mode, the process liquid level is displayed in the uppermost display, of the WEST 6100+ controller, with the liquid level setpoint just below it.
2. The liquid level setpoint can be adjusted by depressing the up or down keys of the controller.
3. MANUAL OPERATION of the Sealed Motor Valve may be performed at the controller by depressing the manual (AUTO/MAN) key. When in manual, the lower display will show valve Position setpoint as “**P (position)**”. For example, “**P 0**” the valve is closed; “**P 50**” the valve is half open; “**P100**” the valve is wide open. Manual operation is useful in recalibrating the valve, or for manual override of the control system. The valve will remain at the manual position until the manual position is altered, or if control is returned to automatic operation. To return to automatic operation, depress the manual (AUTO/MAN) key again.

There are four modes of display within the West 6100PLUS controller, which is the control unit used in the Hansen PCML / PCMLF Sealed Motor Valve Liquid Level Control System: operator mode; setup mode; configuration mode; information mode. Field alteration of the controller configuration mode is not recommended.

Controller tuning, that is, adjusting the P-I-D parameters, is performed in the setup mode, explained below.

SET UP MODE (manual tuning of the liquid level controller)

1. Check the connections of the valve, liquid level sensor, and 24VAC power in accordance to the Hansen wiring installation drawing 7502-38.
2. Start with the controller in operator mode with the upper display showing the actual liquid level, and the lower display showing the liquid level set point.
3. Hold down the “scroll” (circular arrow) key and press the “up” arrow key. “**SLCt**” will be displayed in the lower display. Press the “up” arrow until “**SEtP**” is displayed in the upper display.
SEtP
SLCt will be displayed.
4. Press the “scroll” (circular arrow) key until “**ULoc**” is displayed. Press the “up” arrow until
10
ULoc is displayed.
5. Scroll (circular arrow key) through the setup parameters and set each parameter according to the TABLE 1, below.

TABLE 1

SET UP PARAMETERS	DESIRED VALUES	COMMENTS
FiLt	2.0	(two second filter to reduce noise problems on the milliamp input)
OFFS	0.0	(offsets the displayed liquid level from the actual liquid level)
PPLJ	**	(** a read-only, useless trivia in our application)
Pb_P	10.0	(THIS IS WHERE THE PROPORTIONAL BAND IS SET AND STORED. AUTOTUNE WILL ADJUST THIS VALUE WHILE AUTOTUNE IS ACTIVE.)[0.00 = ON/OFF CONTROL]
ArSt	0.45	(THIS IS WHERE THE INTEGRAL TIME CONSTANT IS SET AND STORED. AUTOTUNE WILL ADJUST THIS VALUE WHILE AUTOTUNE IS ACTIVE.)[0.00 = OFF]
rAtE	0.00	(THIS IS WHERE THE DERIVATIVE TIME CONSTANT IS SET AND STORED. AUTOTUNE WILL ADJUST THIS VALUE WHILE AUTOTUNE IS ACTIVE.)[0.00 = OFF]
biAS	25	(THIS PARAMETER ALLOWS THE CONTROLLER TO UNBALANCE THE CONTROL RESPONSE TO ACT MORE AGGRESSIVELY ABOVE OR BELOW THE SETPOINT UPON STARTUP. A BIAS OF 50 IS NEUTRAL. A BIAS OF 25 CAUSES A MORE AGGRESSIVE RESPONSE WHEN THE LEVEL IS ABOVE SETPOINT, AND LESS AGGRESSIVE WHEN THE LEVEL IS BELOW SETPOINT. A BIAS OF 75 CAUSES A MORE AGGRESSIVE RESPONSE WHEN THE LEVEL IS BELOW SETPOINT, ETC. POSSIBLE SETTING IS 0.0 TO 100).
SPuL	100.0	(the maximum limit for setpoint adjustment)
SPLL	0.0	(the minimum limit for setpoint adjustment)
OPuL	100	(the maximum valve position limit, set at 100 % allows the valve to open wide)
PhA1	60.0*	(THIS IS WHERE THE HIGH ALARM SETPOINT IS SET AND STORED. *SET THIS VALUE TO THE DESIRED HIGH-ALARM SETPOINT APPROPRIATE FOR YOUR APPLICATION).
AHY1	1.0	(ALARM HYSTERESIS SETTING, THE PERCENT BELOW THE PhA1 ALARM SETPOINT WHERE THE ALARM TURNS BACK OFF.)
APt	diSA	(diSA DISABLES; EnAb ENABLES THE AUTO P-I-D PRE-TUNE).
PoEn	EnAb	(diSA DISABLES; EnAb ENABLES MANUAL CONTROL . MANUAL CONTROL ALLOWS THE VALVE TO BE MANUALLY OPENED OR CLOSED AT THE CONTROLLER PANEL.)
SPr	diSA	(setpoint ramp enable; disabled for liquid level control)
rP	-	(ramp rate; disabled for liquid level control)
SP1 SP2	**	(setpoint 1 and setpoint 2 values. Setpoint 2 is not used for level control. And setpoint 1 is accessed using the arrow keys in operator mode.)
Sloc	10	(password value to enter into configuration mode)

- To exit the set up mode, press and hold the “scroll” (circular arrow) key and press the “up” arrow key. Press the “up” arrow key until

Optr
SLCt is displayed.

- Press the “scroll” (circular arrow) key. Controller will resume operator mode.

CONFIGURATION MODE
(Changes the basic function of the controller).

Changes to the configuration of the controller would be considered unusual. The most common instance is changing the operation from a reverse-acting (filling) application to a direct-acting (draining) application. Any changes to the configuration parameters will corrupt the setup parameters, requiring reprogramming of the setup parameters.

- Check the connections of the valve, liquid level sensor, and 24VAC power in accordance to the Hansen wiring installation drawing 7502-38.
- Start with the controller in operator mode with the upper display showing the actual liquid level, and the lower display showing the liquid level set point.
- Hold down the “scroll (circular arrow)” key and press the “up” arrow key. “**SLCt**” will be displayed in the lower display. Press the “up” arrow until “**ConF**” is displayed in the upper display.

ConF
SLCt will be displayed.

- Press the “scroll” (circular arrow) key until “**ULoc**” is displayed. Press the “up” arrow until

20
ULoc is displayed.

- Scroll (circular arrow key) through the setup parameters and set each parameter according to the CONFIGURATION TABLE, below. Changes to configuration parameters using the “up” and “down” keys will show flashing temporary values in the display. To accept the new value, press the AUTO/MAN key to enter the new value into the controller, evidenced by a non-flashing, continuous value in the display.

CONFIGURATION FACTORY SETTINGS (REFERENCE)

PARAMETER	DESIRED VALUE	COMMENTS
inPt	4_20	(configures the controller to accept 4-20mA input)
ruL	100.0	(range upper limit is the display value at 20mA input)
rLL	0.0	(range lower limit is the display value at 4 mA)
DPoS	1	(decimal point position)
CtYP	SnGL	(Single-acting control type)
Ctrl	rEv	(reverse-acting control; valve opens wider with falling level input)
ALA1	P_Hi	(alarm 1 trips on high liquid level)

PhA1	60.0*	(THIS IS WHERE THE ALARM SETPOINT IS STORED. *SET THIS VALUE DURING SETUP MODE; NOT HERE).
AHY1	1.0	(alarm 1 hysteresis value.)
ALA2	nonE	(no alarm 2 installed.)
LAEn	diSA	(loop alarm is disabled. Unless system is finely tuned, loop alarm may nuisance trip.)
inhi	nonE	(no alarms are inhibited)
USE1	Pri	(output 1(4-20mA) is primary control output)
TYP1	4_20	(output 1 is 4-20mA)
USE2	Or_r	(output 2 is alarm, NORMALLY OPEN contact closes upon high level alarm)
diSP	2	(display strategy 2 displays process level in upper display, setpoint in lower display, and allows setpoint to be adjusted)
diGi	diSI	(Aux input activates secondary setpoint)
CLoc	20	(password value to enter into configuration mode)

6. To exit the set up mode, press and hold the “scroll” (circular arrow) key and press the “up” arrow key. Press the “up” arrow key until

Optr
SLCt is displayed.

7. Continue to SET UP MODE on page two of these instructions. SET UP parameters must be reset to the desired values any time the configuration parameters have been changed.

AUTOTUNING

Autotuning is possible, but not recommended for level control. Very good to excellent control can be achieved by manually tuning, using primarily proportional (Pb_P in setup mode) control, with a small integral (ArSt) value. If the system seems sluggish, halve Pb_P. If the system swings excessively, double Pb_P. Avoid tuning during light load conditions.

UTILIZING THE WEST 6100 CONTROLLER

(no plus on faceplate)

Earlier versions of Hansen Controllers utilize the West 6100 controller. The earlier version is functionally equivalent and compatible with the later "plus" version; however there are different terms and menus in the setup and configuration. There are four modes of operation within the West 6100 controller, the control unit used in the Hansen PCML / PCMLF Sealed Motor Valve Liquid Level Control System: normal or operator mode; setup mode; configuration mode; hardware definition mode. Field alteration of the controller configuration mode and hardware definition mode is not recommended. Controller tuning, that is, adjusting the P-I-D parameters, is performed in the setup mode, explained below. It is expected that the controller as shipped from the factory will give reasonable to very good control. If control difficulties occur during startup, it is recommended to thoroughly check system and components for proper installation, operation, and sensor location before attempting to tune the liquid level controller.

AUTOTUNING (*SELF-TUNE*)

1. Check to make sure that the manual over-ride is enabled to allow manual control of the Sealed Motor Valve by the operator to avert undesirable system conditions during the tuning process (temporarily enter manual over-ride by depressing the "manual" (hand symbol) button and check for manual valve action. Return to automatic operation).
2. To engage Autotuning, with the controller in normal automatic operation, depress and *hold* the "up" and "down" arrows simultaneously. The upper display flashes and the "AT" light flashes once and the upper display stops flashing. Release the "up" and "down" arrows, and depress the "manual" button. The "AT" light will remain lit.
3. To disengage autotuning, with the controller in normal automatic operation, depress and *hold* the "up" and "down" arrows simultaneously. The upper display flashes and the "AT" light flashes once and the upper display stops flashing. Release the "up" and "down" arrows, and depress the "manual" button. The "AT" light will go off.
4. Careful system observation and intervention, if necessary, is required until the system exhibits stable control. If good system control is not achieved, often operators can achieve better control manually tuning the controller from the setup mode.

SET UP MODE (*manual tuning of the liquid level controller*)

1. Check the connections of the valve, liquid level sensor, and 24VAC power in accordance to the Hansen wiring installation drawing 7502-38.
2. Start with the controller in operator mode with the upper display showing the actual liquid level, and the lower display showing the liquid level set point.
3. Simultaneously press the "up" and "scroll" (circular arrow) buttons.

0
ULoc

will be displayed. Press the "up" button until

10
ULoc

is displayed. Press the "scroll" button to enter the set up mode.

4. Scroll through the setup parameters and set each parameter according to TABLE 1

TABLE 1

SET UP PARAMETERS	DESIRED VALUES	COMMENTS
FiLt	2.0	(two second filter to reduce noise problems on the milliamp input)
OFFS	0.0	(offsets the displayed liquid level from the actual liquid level)
Out 1	**	(** a read-only, useless trivia in our application)
Pb1	10	(THIS IS WHERE THE PROPORTIONAL BAND IS SET AND STORED. AUTOTUNE WILL ADJUST THIS VALUE WHILE AUTOTUNE IS ACTIVE.)[0.00 = ON/OFF CONTROL]
rSEt	0.45	(THIS IS WHERE THE INTEGRAL TIME CONSTANT IS SET AND STORED. AUTOTUNE WILL ADJUST THIS VALUE WHILE AUTOTUNE IS ACTIVE.)[0.00 = OFF]
rAtE	0.00	(THIS IS WHERE THE DERIVATIVE TIME CONSTANT IS SET AND STORED. AUTOTUNE WILL ADJUST THIS VALUE WHILE AUTOTUNE IS ACTIVE.)[0.00 = OFF]
biAS	25	(THIS PARAMETER ALLOWS THE CONTROLLER TO UNBALANCE THE CONTROL RESPONSE TO ACT MORE AGGRESSIVELY ABOVE OR BELOW THE SETPOINT. A BIAS OF 50 IS NEUTRAL. A BIAS OF 25 CAUSES A MORE AGGRESSIVE RESPONSE WHEN THE LEVEL IS ABOVE SETPOINT, AND LESS AGGRESSIVE WHEN THE LEVEL IS BELOW SETPOINT. A BIAS OF 75 CAUSES A MORE AGGRESSIVE RESPONSE WHEN THE LEVEL IS BELOW SETPOINT, ETC. POSSIBLE SETTING IS 0.0 TO 100).
SPhi	100	(the maximum limit for setpoint adjustment)
SPLo	0.0	(the minimum limit for setpoint adjustment)
OPhi	100	(the maximum valve position limit, set at 100 % allows the valve to open wide)
h_A1	60*	(THIS IS WHERE THE ALARM SETPOINT IS SET AND STORED. *SET THIS VALUE TO THE DESIRED HIGH-ALARM SETPOINT APPROPRIATE FOR YOUR APPLICATION).
LAEn	0	(0 DISABLES; 1 ENABLES THE CONTROL LOOP ALARM . REFER TO PRODUCT MANUAL VOL.1 P2-10 FOR LOOP ALARM EXPLANATION. UNLESS THE CONTROL IS FINELY TUNED WITH NO NORMAL SHUTDOWNS, THE LOOP ALARM MAY NUISANCE TRIP.)
rPnt	1	(number of digits behind decimal point).
rhi	100	(display value at 20 milliamps).
rLo	0	(display value at 4 milliamps).
APt	0	(0 DISABLES; 1 ENABLES THE P-I-D PRE-TUNE).
PoEn	1	(0 DISABLES; 1 ENABLES MANUAL CONTROL . MANUAL CONTROL ALLOWS THE VALVE TO BE MANUALLY OPENED OR CLOSED AT THE CONTROLLER PANEL.)
rPEn	0	(setpoint ramp enable; disabled for liquid level control)
SPSt	2	(configures the display to show actual level and setpoint level simultaneously)

Loc	10	(this parameter defines the four digit code required to enter set up mode; leave set at 10, or do not lose the new value. If the value has been changed and subsequently lost, refer to the procedure for scrolling through the configuration mode parameters to view the current Loc code.)
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- To exit the set up mode, scroll through the set up mode parameters using the “scroll” button until the operator mode display (actual level in upper display, level setpoint in lower display) is displayed. Simultaneously press the “up” and “scroll” buttons, whereupon the controller will return to the operator mode.

OPERATOR MODE

- In operator mode, the process liquid level is displayed in the uppermost display of the WEST 6100 controller, with the liquid level setpoint just below it.
- The liquid level setpoint can be adjusted by depressing the “up” or “down” buttons of the controller.
- MANUAL OPERATION of the Sealed Motor Valve may be performed at the controller by depressing the “manual” (hand symbol) button. When in manual, the lower display will show valve position setpoint. The valve will remain at the position setpoint until the setpoint is altered, or returned to automatic operation. To return to automatic operation, depress the “manual” button again.

CONFIGURATION MODE

If the PCML / PCMLF controller configuration mode and/or the hardware definition mode has been inadvertently altered, the following steps enable the controller to be restored to the original desired configuration. All of these modes must be set up in the order explained below for best operation of the Hansen PCML / PCMLF Controller.

- Connect the valve, liquid level sensor, and 24VAC power in accordance to the Hansen wiring installation drawing 7502-38.
- The Hansen PCML / PCMLF Controller configuration mode may only be entered during the first 30 seconds after power-up. To enter into configuration mode, power-up the controller. As the first selection and within the first 30 seconds, simultaneously press and hold the “up” and “scroll” buttons. After a few seconds,

inPt

will be displayed. If unsuccessful at entering the configuration mode, disconnect and then reconnect the power, and the first selection should be simultaneously pressing and holding the “up” and “scroll” buttons. Check the hardware definition code while in configuration mode by simultaneously pressing the “down” and “scroll” buttons.

After a few seconds,

3710
dEFn

will be displayed. If it is not, select it using the “up” or “down” buttons to display the proper value. Enter the proper value into memory by pressing the “manual” button. Press the “scroll” button again.

nonE
oPtn

should be displayed. If it is not, press the “up” or “down” buttons to display the proper value. Enter the proper value into memory by pressing the “manual” button.

- Return to configuration mode by simultaneously pressing the “down” and “scroll” buttons. After a few seconds,

3414
inPt

will be displayed. If it is not, use the “up” or “down” buttons to display the proper value. Enter the proper value into memory by pressing the “manual” button.

4. Scroll through the menu using the “scroll” button, setting the individual parameters according to TABLE 2

TABLE 2

PARAMETER	DESIRED VALUE	COMMENTS
inPt	3414	(configures the controller to accept 4-20mA input)
Ctrl	rEv	(reverse-acting control; valve opens wider with falling level input)
ALA1	P_hi	(alarm trips on high liquid level)
ALA2	nonE	(second alarm output is not installed)
inhi	nonE	(no alarms are inhibited)
USE2	Or_r	(alarm NORMALLY OPEN contact closes upon high level alarm)
Loc	10	(read-only display of unlocking code to allow entry into set up mode for P-I-D and alarm setpoint adjustments (see table 1, “lost Loc code”))

Exit from configuration mode by simultaneously pressing the “up” and “scroll” buttons.

5. Proceed to the set up mode instructions. Alteration of configuration parameters will result in multiple decimals in the display, requiring the set up parameters to be reset.

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