DAIKIN

Installation, Operation, and Maintenance Manual

IOM 1148-3

Group: **Chiller**
Part Number: **IOM1148-3**
Date: **February 2022**

Electronic Expansion Valve Upgrade

For All Oiled Centrifugal Chiller Models (Except WSC 160)

Manufactured in an ISO 9001 & ISO 14001 certified facility

This manual provides installation, operation, and maintenance information for Daikin electronic expansion valve centrifugal chillers models WSC, WDC, & WCC.

NOTE: Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations, and experienced with this type of equipment.

READ THIS DOCUMENT IN ITS ENTIRETY PRIOR TO BEGINNING ANY WORK. ALL FEDERAL, STATE, LOCAL ENVIRONMENTAL AND SAFETY REGULATIONS INCLUDING DAIKIN APPLIED SAFETY RULES MUST BE FOLLOWED.

All appropriate Personal Protective Equipment (“PPE”) must be used, and a Job Hazard Analysis (“JHA”) must be completed before beginning any work. Technicians performing this work must be EPA 608 certified and knowledgeable with and properly trained on oiled Centrifugal equipment.

Refer to SB 87-1401-B and SB 10-1456-B for information regarding the process for working on refrigerant circuits of Daikin Centrifugal chillers and working behind a check valve.

Introduction

This manual provides installation, operating, and troubleshooting information for Electronic Expansion Valve (EXV) upgrades on Daikin centrifugal chillers. The EXV replaces existing Thermal Expansion Valves (TXV) on centrifugal chillers.

Installation involves removing the existing TXV, mounting the EXV, liquid line piping modifications (in some cases), mounting the EXV driver, field wiring, and setup of related EXV setpoints.

Features of the EXV

- Control of leaving chilled water within a ±0.5°F (±0.3°C) tolerance (MicroTech II controller).
- Helps facilitate starting with colder water temperatures.
- Better regulation during low charge conditions.
- Better part-load control.
- Light load liquid control operation.
- Bolts up to an existing pilot driven Thermal Expansion Valve location.
- Utilizes the existing MicroTech II controls platform.
- Sight glasses give instant diagnostic feedback.

Table 1: WDC EXV Assembly Part Numbers

Model	Tonnage	EXV Part Number	RPL
WDC 048/050	150	330386204	7000001
	250	330386201	
	500	330386210	
WDC 063	650	335971942	7000003
WDC 079	1000	335971942	7000005
WDC 087	1500	335649953	7000007
WDC100	1000	335649952	7000009
WDC 113	1000	335971942	7000013
WDC 126	1500	335649953	7000011

NOTE: WDC 100-126 will require two valves of the same part number.

Table 2: WSC EXV Assembly Part Numbers

Model	Unit Code String	Tonnage	EXV Part Number	RPL
WSC 048/050	Code 29 = BY	150	330386204	7000000
	Code 29 = CY	250	330386201	
WSC 063	Code 27 = BY	150	330386204	7000002
	Code 27 = BY	250/325	330386205	
	Code 27 = BY	650	335971942	
WSC 079	Code 27 = BY	650	335971942	7000004
	Code 27 = BY	1000	335971942	
WSC 087	Code 27 = BY	650	335971942	7000006
	Code 27 = BY	1000	335971942	
WSC 100	N/A	1000	335649952	7000008
WSC 113	N/A	1500	335649953	7000012
WSC 126	N/A	1500	335649953	7000010

NOTE: WSC160 models were only offered with an EXV.

Table 3: WCC EXV Assembly Part Numbers

Model	Tonnage	EXV Part Number	RPL
WCC 100	1500	335649953	7000061
WCC 113	1500	335649953	7000061
WCC 126	1500	335649953	7000061

NOTE: WCC 100-126 will require two valves of the same part number.

Mounting the Sporlan IB-G Driver Board

1. For all non WCC units, find a suitable location in the unit control panel to mount the driver board. The board is supplied with a snap-in-plastic track that can be attached to Din-rail. If this is not used, the board must be mounted on non-metallic standoffs.
2. WCC units will require the driver board to be mounted in the compressor control panel.
3. Connect wiring from unit controller (WSC/WDC) to the driver board as described below.
4. Connect wiring from compressor controller pCOe expansion module (WCC) to the driver board as described below.
5. For all units, connect wiring from EXV actuator(s) to the driver board as described in Table 4.

Sporlan IB-G Driver Board: Part # 910176100

- Requires 24Vac input voltage
- Can power up to three actuators on a single valve
- Replaces IB-1, IB-2, IB-3, & IB-6 Sporlan driver boards
- Accepts 4-20 mA or 0-10V input control signal (Configured for 0-10V)

Figure 1: Sporlan IB-G Driver Terminal Board

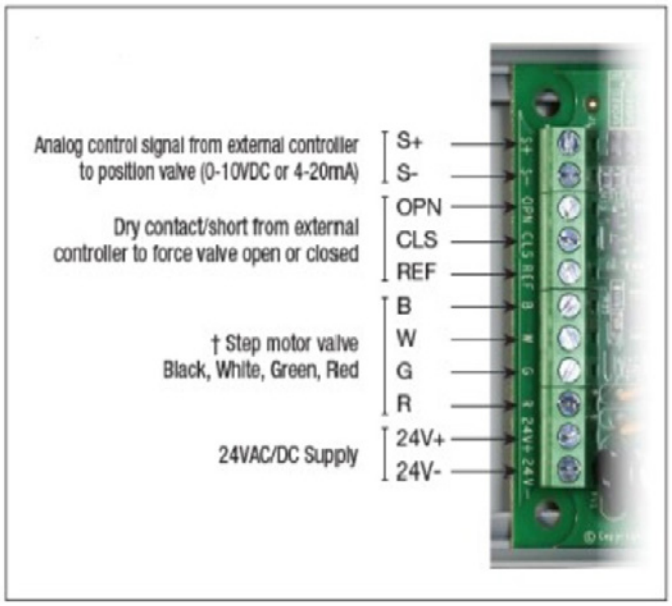


Figure 2: Sporlan IB-G Driver Board Configuration

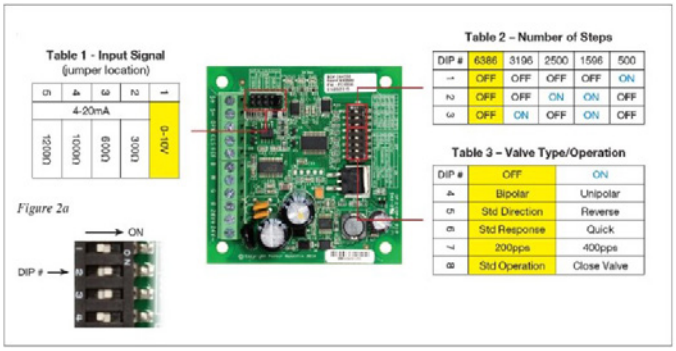


Table 4: Wiring from EXV actuator to EXV driver board

EXV Actuator Wire Color	Sporlan IG-B Driver Board Terminal
Blue	B
White	W
Green	G
Red	R

Figure 3: WAGO Compact Lever Nuts

Preparation for EXV Removal

1. Install latest chiller software revision and refer to accompanying notes/mask set for appropriate EXV operation and setup.
2. Operate the chiller using the Tech Data Sheet to verify correct water flows for both the evaporator and condenser.
3. Verify the tube conditions of both vessels using designed approach temperatures.
4. Evaluate the unit refrigerant charge using evaporator and condenser approach temperatures along with design subcooling values.
5. Leak check unit prior to refrigerant isolation or removal.
6. Pump the refrigerant charge into the condenser or remove entire refrigerant charge.
7. If required, remove and store refrigerant pursuant to EPA regulations as well as Daikin Applied safety regulations.

Mounting the EXV

1. Remove the existing Thermal Expansion Valve and pilot valve.
2. Seal the refrigerant feed line to the pilot valve.
3. Mount the EXV (matching up the connections to the TXV) and install replacement o-rings. The same o-ring part number used for the TXV will be needed to install the new EXV.
4. Modification of existing liquid line piping may be required. WCC units will need a liquid line temp sensor well added to each liquid line.
5. Leak test the joints and prepare unit for operation.

Field Wiring

1. On all non WCC model chillers the unit controller operates the EXV and connections below referring to “controller” are made to it.
2. On WCC model chillers the compressor controller operates the EXV and connections below referring to “controller” are made to it or the pCOe expansion module.
3. The field wiring diagrams are shown below.
4. The cable running from the EXV actuator will connect to the Sporlan IB-G driver board.
5. If connecting multiple actuators to a single Sporlan IB-G driver board use WAGO 222-412, 222-413, or 222-415 Compact Lever-Nuts (or equivalent) to connect a single conductor to the driver board terminals. See Figure 3.

For HSC/TSC/ WSC/WDC-A Vintage Chillers:

AC power to Sporlan IB-G Driver Board

(From T5 Transformer)

- (Wire 348) to (24+) Terminal on driver board
- (Wire 349) to (24-) Terminal on driver board

Digital Input from unit controller J14 to driver board for calibration

(From Unit Controller J14)

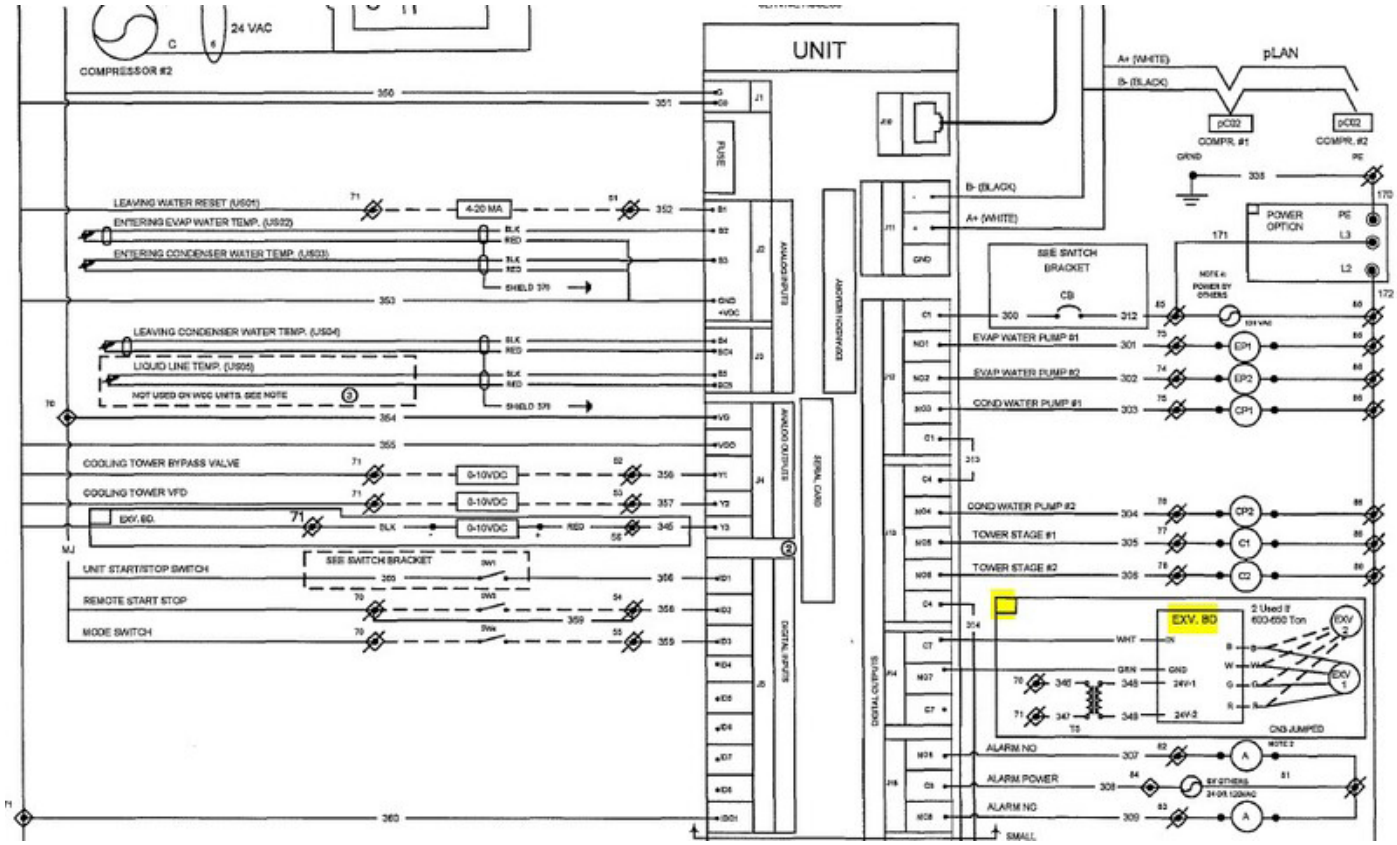
- (C7 or +24V) to (CLS) Terminal on driver board
- (NO7 or Ground) to (REF) Terminal on driver board

0-10V Analog Input Signal

(From Unit controller J4-Y3 Signal)

- 0-10V Signal - (Wire 345) or (Terminal 56) to (S+) Terminal on driver board
- Ground - (Terminal 71 on UTB1) to (S-) Terminal on driver board

Figure 4: HSC/TSC/WSC/WDC/WCC-A Vintage Unit Schematic – 3304210550 – REV.0C



For WSC-B Vintage Chillers:

AC power to Sporlan IB-G Driver Board

(From 24VDC Supply)

- (Wire 24-20) or (Terminal 23) to (24+) Terminal on driver board
- (Wire 24N-10) or (Terminal 42) to (24-) Terminal on driver board

Digital Input from unit controller J14 to driver board for calibration

(From UC1 J14)

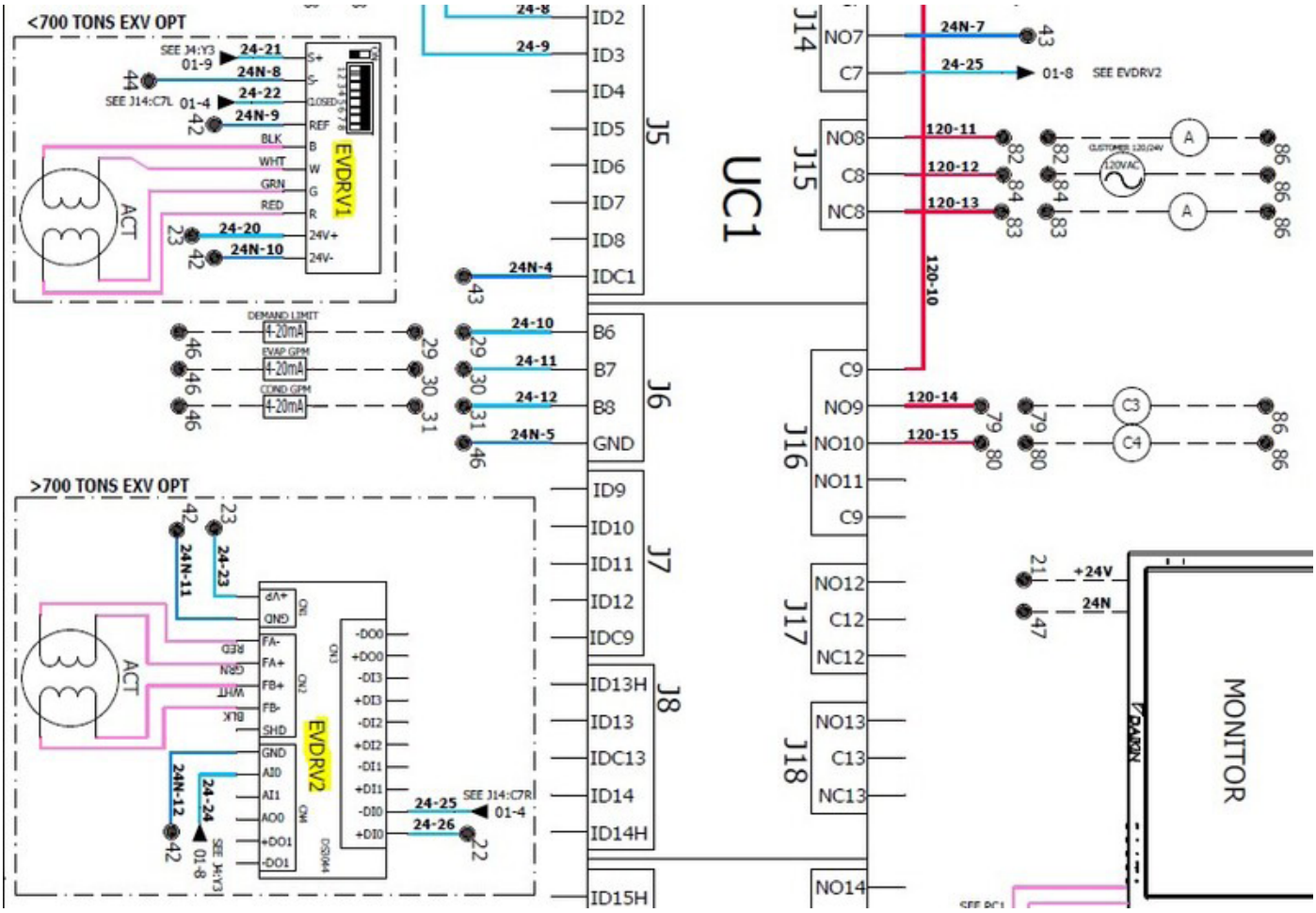
- (Wire 24-22) or (C7 +24V) to (CLS) Terminal on driver board
- (Wire 24N-9) or (Terminal 42) to (REF) Terminal on driver board

0-10V Analog Input Signal

(From UC1 J4-Y3)

- 0-10V Signal - (Wire 24-21) to (S+) Terminal on driver board
- Ground - (Wire 24N-8) or (Terminal 44) to (S-) Terminal on driver board

Figure 5: WSC-B Vintage Unit Schematic – 335661101 – REV.0B



Mounting the pCOe004850 Expansion Module - WCC

WCC chillers require additional components in order to facilitate EXV installation and operation. One of these components is the Carel pCOe004850 Expansion Module.

See Figure 6. This module is to be mounted inside the compressor control panel using din-rail. Each compressor controller will need a pCOe expansion module to support EXV operation. The other required component is a liquid Line Temperature Sensor (ES01). Each compressor controller will need a liquid line temperature sensor to support EXV operation.

1. 1. Find a suitable location in the compressor control panel to mount the expansion module. If there is no unused Din-rail in the panel, install approx. 4 inches of Din-rail in the compressor control panel and install the module.
2. Connect communication wiring from the pCO3 compressor controller to the pCOe module. (From pCO3 Compressor Controller J23)

- (Wire J23-E+) to (J3-T+) on pCoe module COMM
- (Wire J23-E-) to (J3-T-) on pCoe module COMM
- (Wire J23-GRN) to (J3-GND) on pCoe module COMM

3. Connect ES01 Liquid Line Temp Sensor to pCOe module.

- Wire sensor between (J9-B1 & J9-GND) on pCOe module.

4. Connect power wiring from T3 Transformer to pCOe module.

- (Wire T3-S) to (J1-G) on pCOe module POW
- (Wire T3-C) to (J1-G0) on pCoe module POW

Figure 6: Carel pCOe004850 Expansion Module – Part # 330277101

EXV Retrofit Kits

The EXV retrofit kits listed below will contain a completed electronic expansion valve assembly, o-rings, and a Sporlan driver board.

Kits are not available for CE 048 or CE 050 compressor units. If a retrofit is required for these unit types, simply order the appropriate valve assembly fromTable 1or Table 2. A Sporlan driver board and o-rings (listed in the RPL for that model chiller) will need to be ordered as well.

The electronic expansion valves are selected based on the maximum tonnage of each chiller model. There may be cases where a chiller is applied at a much lower tonnage than the maximum. In these instances, it may be possible to use a smaller valve than the one selected to allow for maximum tonnage. Contact the Technical Response Center if you would like to explore the possibility of using a smaller exv. Otherwise, select the appropriate retrofit kit from those listed below.

WSC/WDC 063, WSC/WDC 079, WSC 087, WDC 113* – 1000 Tons – 4” Connection

Kit Part # - **Q910376835**

WSC 100/WDC 100* - 1000 Tons – 6” Connection

Kit Part # - **Q910283366**

WSC 113/WSC126/WDC 087/WDC 126* - 1500 Tons – 6” Connection

Kit Part # - **Q910283349**

WCC 100/WCC 113/WCC 126 - 1500 Tons – 6” Connection

Kit Part # - **Q910290298**

NOTE: WDC 100 units will require two kits (Q910283366) to be ordered as the unit uses two electronic expansion valves. WDC 113 units will require two kits (Q910376835) to be ordered as the unit uses two electronic expansion valves. WDC 126 units will require two kits (Q910283349) to be ordered as the unit uses two electronic expansion valves.

For WCC-A vintage machines:

AC power to Sporlan IB-G Driver Board

(From T7 Transformer)

- (T7-S) to (24+) Terminal on driver board
- (T7-C) to (24-) Terminal on driver board

Digital Input from pCOe J5 to driver board for calibration

(From pCOe J5)

- (Wire from J5-NO1) to (CLS) Terminal on driver board
- (Wire from J5-C1) to (REF) Terminal on driver board

0-10V Analog Input Signal

(From pCOe J2-Y1 Signal)

- 0-10V Signal - (Wire from pCOe J2-Y1) to (S+) Terminal on driver board
- Ground - (Wire from T3-C Terminal) to (S-) Terminal on driver board

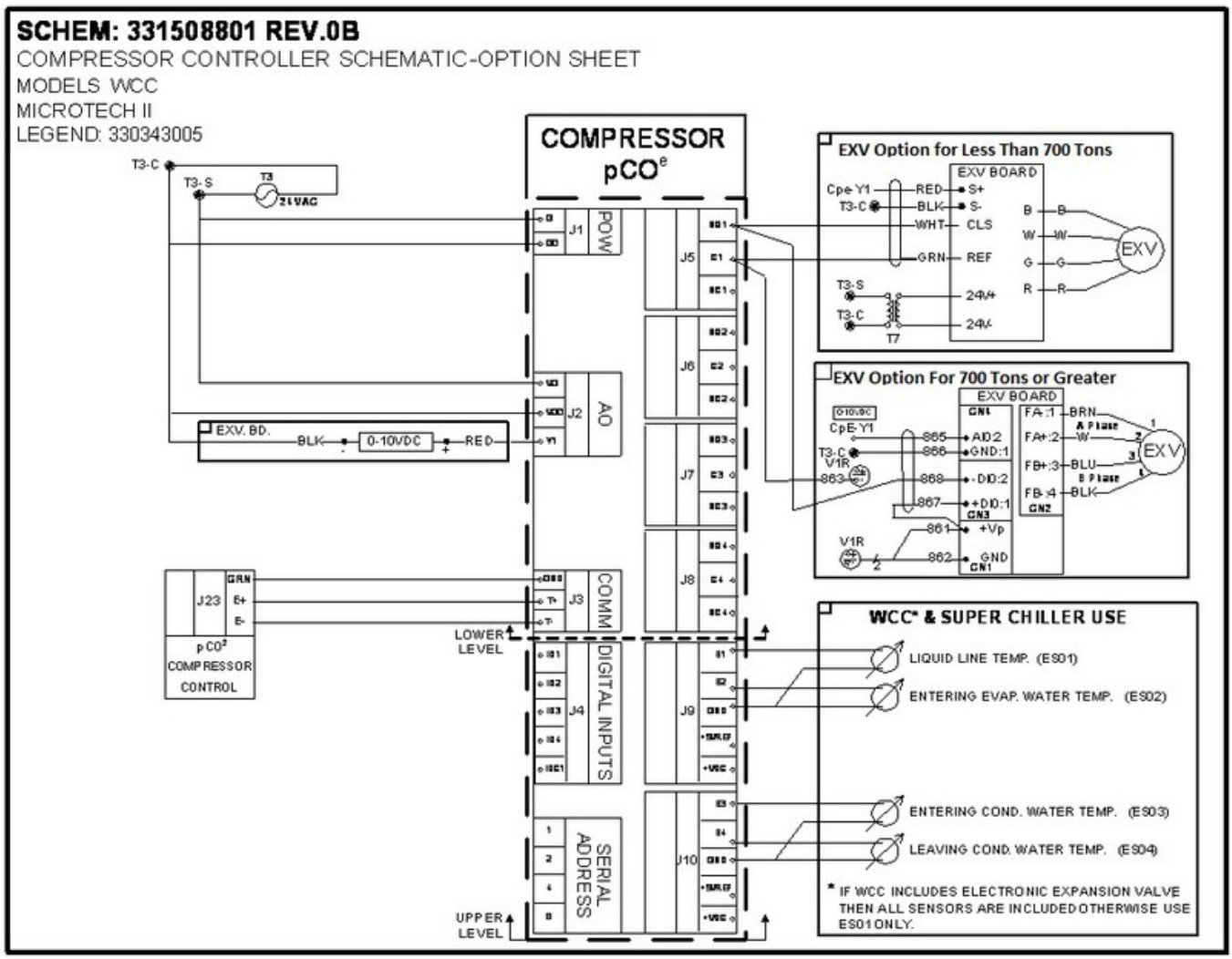
Operating the EXV

Changing Setpoints:

Set points are changed on the unit controller for WSC and WDC units or compressor controller for WCC units.

Basic Theory of Operation:

When the chiller starts the expansion valve will operate based on Evaporator Pressure (EP) control. When the Evap Leaving Water Temperature (ELWT) pulls down to within a selected degree above the ELWT target set point (10 Degrees default), the control switches to a “Programmed” solution based on capacity.



Typical Operation

General:

1. Just prior to the chiller starting the compressor (first compressor on dual units), the expansion valve will close and then open fully based on control logic. This is a means of recalibrating the valve's position.
2. Working under Evap Pressure control, the valve will start fully open, and as the chiller pulls down the valve will begin closing and then slowly re-open as the pull-down progresses.
3. When the evaporator leaving water temp has been pulled below the Drop Out (DO XX.X°F) set point, the valve will switch to Program control.
4. If the chiller is off, and the evaporator entering water temp equals the condenser entering water temp the expansion valve will open 30% to allow refrigerant to drain back into the condenser vessel.

Expansion Valve Adjustment

Refer to the "Set Unit Ex-Val(15)" Screen found in recent centrifugal code WCFU3UU0xx. Changes may be made with the Manager Level password access.

SET UNIT EX-Val	**(15)**
Ex-Valve Gain =	**78**
Offset(Slope) =	**700**
Prs Ctrl DOut =	**10.0°F**

Expansion-Valve Gain:

The default value for gain is 78. This default value will allow for chiller operation. Increasing the gain value will increase the level of refrigerant in the evaporator and decreasing the gain value will decrease the amount of refrigerant in the evaporator.

To properly adjust this value, the chiller should be operating at a stable load above 70% at design evaporator and condenser water flows. If the unit has dual compressors, both compressors should be operating at a stable load above 70% prior to adjusting the gain value.

Adjust the gain by using the design approach temperatures on both the evaporator and condenser and design subcooling temperature for the current load condition. See Figure 7 for details.

Expansion Valve Offset (Slope):

Default is 700, is a constant adder in the Equation for valve position. Changing this value influences the slope of the equation for valve position, and its biggest influence is when the valve is running fairly closed at a light load setting.

This is changed only after you have defined the full load Gain setting above. The range of this setpoint is 100 to 999. See Figure 8 for details.

This value should not need to be adjusted in most cases.

Prs Ctrl DOut (Pressure Control Dropout):

Default is DO = 10.0 °F. This setting will change the control of the expansion valve from suction pressure control to program solution control 10 degrees above the chilled water setpoint. Increasing the setting will change to program solution earlier in the pulldown cycle. Lowering the setting will change to program solution later in the pulldown cycle. It is not recommended to lower this setting.

This value should not need to be adjusted in most cases.

Variable Condenser Flow:

Refer to the "Adv Set#15 Screen found in recent centrifugal code WCFU3UU0xx. Changes may be made with the Technician Level password access.

The temperature across the condenser, (Cond-Delta-T) is a parameter used in the Program Based Control. However, if the water flow rate is variable, then an alternate control parameter must be selected. The following choices as found in the Advanced Set series of Unit Controller masks are; Condenser Delta-T (C dT), Evaporator Delta-T (E dT), or Power (%RLA).

Adv Set#15 EEV Confg
Control Source = %RLA
%RLA-Mode Ctl Range
Max = 200 Min = 025

NOTE: Electronic Expansion Valve Configuration

C_dT, E_dT, or Pwr (WMC default)

KW(Quasi) matched to motor/s performance

Combined %RLAs from all running compressors

on common refrigeration circuit.

Compressor drives that do not provide KW feedback can use the %RLA parameter as a rough equivalent. For WDC chillers the full load Max value should be 200 (2*100), for WSC chillers the Max value should be 100. The Min (minimum capacity) value should be the lowest %RLA of one compressor running with vanes nearly closed.

Figure 7: Gain Effect on Valve Position

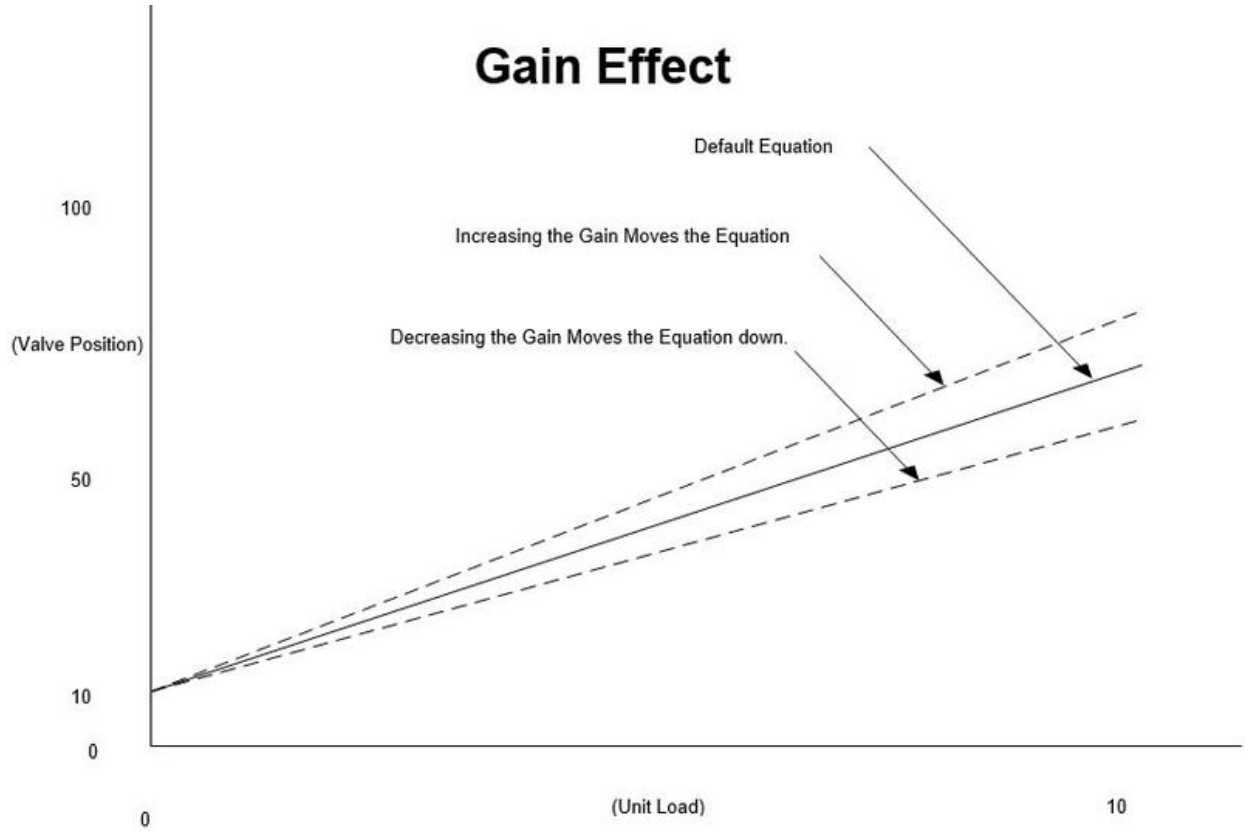
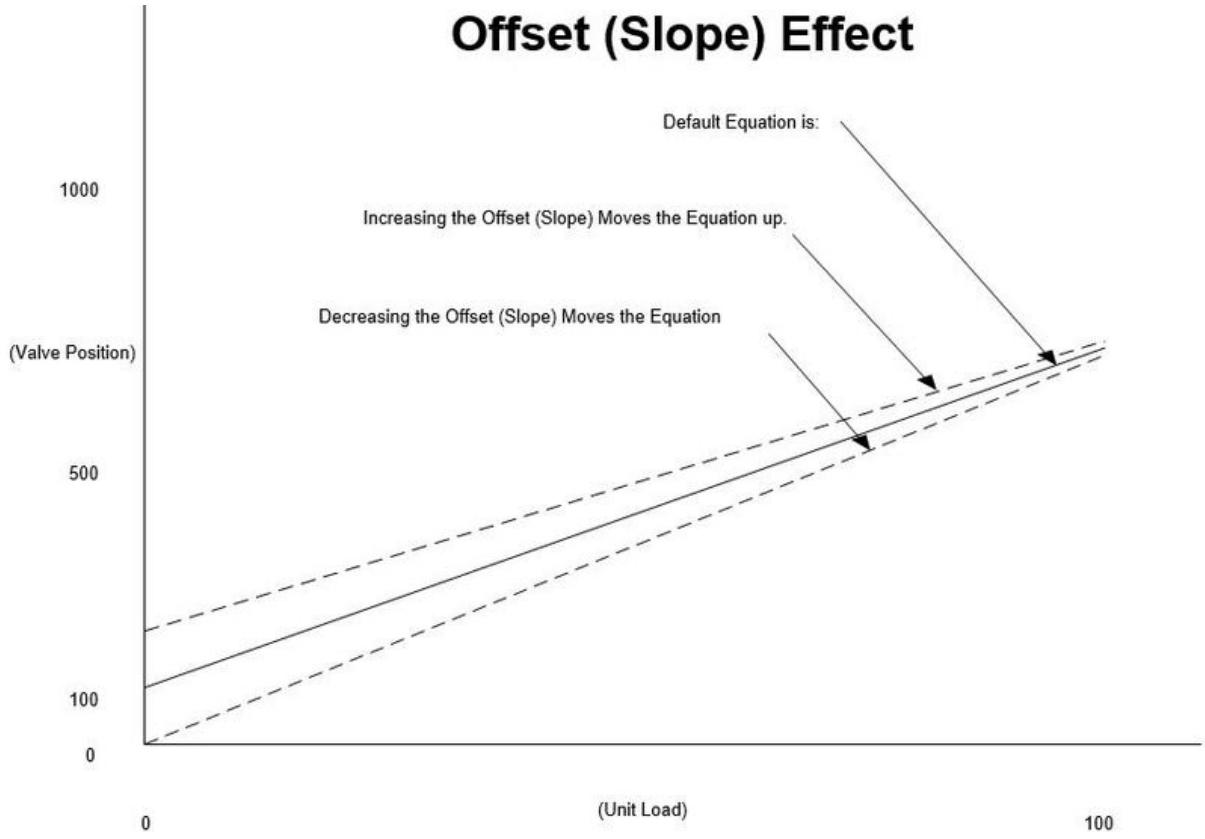


Figure 8: Offset Effect on Valve Position



Daikin Applied Training and Development

Now that you have made an investment in modern, efficient Daikin equipment, its care should be a high priority. For training information on all Daikin HVAC products, please visit us at www.DaikinApplied.com and click on Training, or call 540-248-9646 and ask for the Training Department.

Warranty

All Daikin equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied Representative for warranty details. To find your local Daikin Applied Representative, go to www.DaikinApplied.com.

Aftermarket Services

To find your local parts office, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787). To find your local service office, visit www.DaikinApplied.com or call 800-432-1342.

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