

Zone Valve Local Controller ZVLC-2104

Operation Manual

1. Introduction

The Zone Valve Local Controller ZVLC-2104 (Fig 1) provides control of the Building's Steam Zone Valve to regulate the amount of heat (thermal energy) supplied to the Building.

ZVLC-2104 works as a standalone controller or can be connected to a Local Server, which furnishes the additional settings' adjustment to ZVLC-2104 based on apartments real time temperature reading in order to improve the heating supply efficiency and avoid apartment over/under-heating. When the ZVLC-2104 is connected to the Local Server it can be monitored and controlled from the local Intranet and/or Internet with appropriate authentications.



Fig 1. ZVLC-2104. Front view

The ZVLC-2104 features:

- Controls the zone valve with floating point type motor and position feedback potentiometer. Adaptable to valves with 4-20mA, 0–5V, 0–10V or 135ohm input control types.
- Automatic positioning of the zone valve in accordance with operation settings and measured temperatures.
- Manual positioning of the control valve.
- Displays the valve position.
- Measures and displays Out Door Temperature.
- Day and Night modes of operation.
- Programmable heating season dates.
- Five programmed sequential Events can be set by operator (or remotely).
- Programmable Heat- Up Scheduling.
- Morning Boost period up to 120 min.
- Vacuum Pumps control output.
- Boiler shutdown output signal during mild weather or summer time.
- Condensate Return Temperature measurements.
- Programmable Condensate Return Temperature Cutoff Set-Point.
- Programmable indoor temperature Cut-Off.
- Indoor Temperature Cutoff, Day/Night Set-Points.
- Adjustable no action zone (D_Band) for Indoor and or Condensate Return Temperature Cut-Off.

- Adjustable Cut-Off depth from 0-100%.
- Detects for open and short of the temperature sensors input and displays on the status screen.
- Adaptable to different types of standard temperature sensors and valve motors.
- Provides Compensator control for unusual weather conditions.
- Processing Boiler Pressure Loss signal from host computer.
- Programmable maximum valve position limit.
- Simple calibration procedure.
- Internal real-time clock/calendar with backup battery.
- Automatic Daylight Saving Time clock adjustment.
- Programmable Heat Gain from: .1 to 50.
- Programmable Compensation Scale from: 1.0 to 20.0
- Locally controlled by the four-button keypad and convenient menu.
- Password protection for the critical parameters' settings.
- Automatic storage of setup values. No loss of setup values or mode of operation if power is OFF for extended time.
- Fail Safe Mode of operation.
- Remotely controlled and/or monitored through the RS485 interface.

2. Controls

The four-button keypad and 16 characters by 2 lines LCD backlit display can be found on the front panel of the ZVLC-2104. These controls provide full local management of the system. Operator can read system status information (e.g. temperatures, valve position, alerts), set the operational modes, or change settings.

The control keypad consists of four pushbuttons: Escape (Esc), Down (▼), Up (▲), Enter (Enter). The keys are also marked with letters A, B, C, D to simplify the passwords memorizing.

The upper line of the display shows a current mode (OFF, AUTO, MANUAL OPEN, MANUAL CLOSE, SET) and operational state during normal operation. When calibration modes selected, the upper line displays the information regarding particular mode.

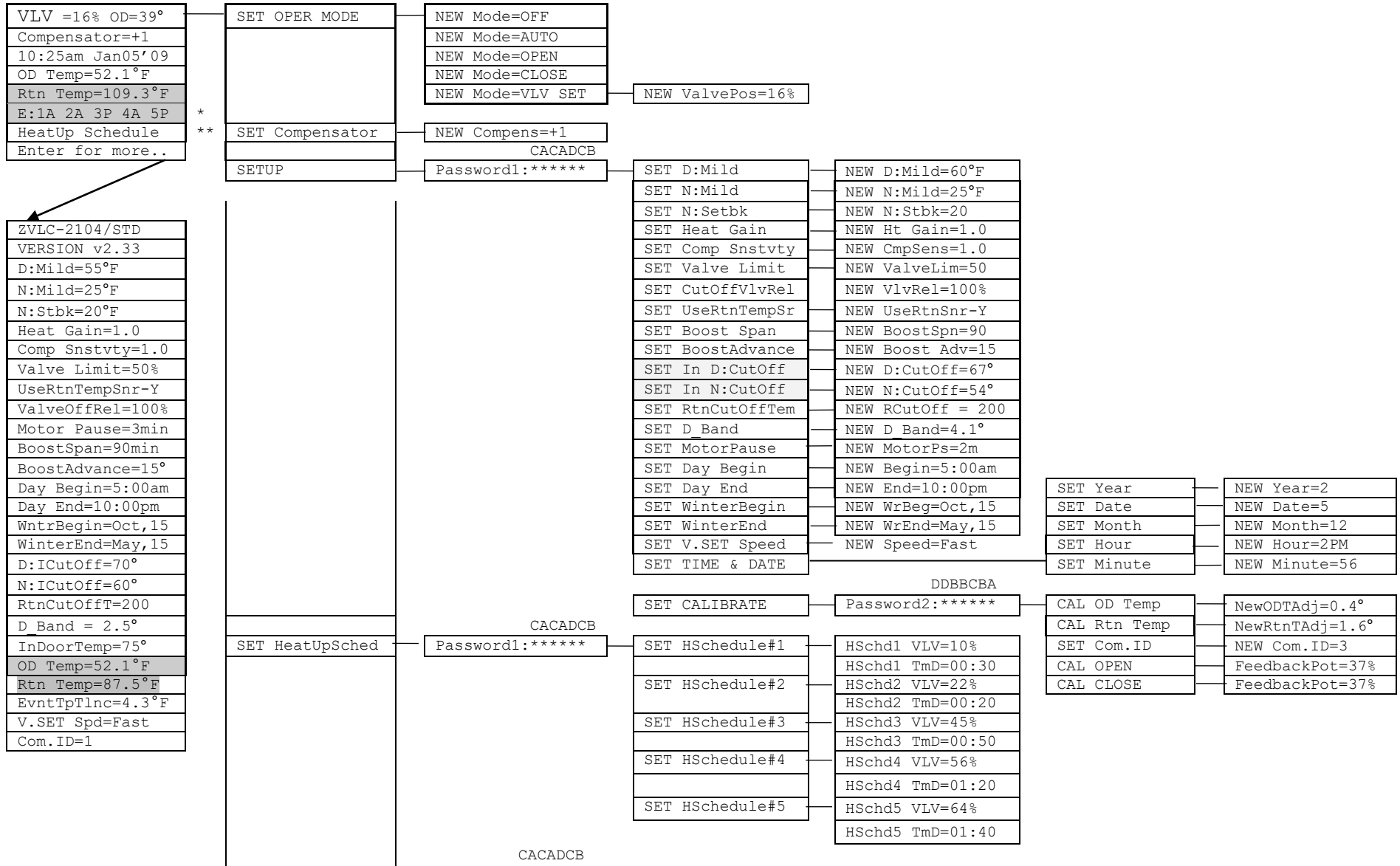
The lower line is dedicated to various status information and menu-driven setup dialog.

3. Menu

The process of interaction is menu driven. Menu chart is shown on Fig 2. The menu is organized in convenient and logical way, and follows a simple set of rules.

- The menu chart is organized as a set of menu boxes. To navigate between the boxes one should press Enter key to move to the right on the chart, and Esc key to move backward.
- Each box contains one or more menu items. To switch between the items inside a box one should press Up or Down keys.
- Each item represents one menu entry - select a parameter to change, enter a new parameter value, change mode of operation etc.
If the item contains "NEW" word then the new value has to be entered, and Up and Down keys will change the value, pushing Enter accepts the new value, Esc - rejects the new value, and leaves the parameter unchanged.
- If a password is required then one should enter a certain key sequence. For convenience the passwords are coded as the sequence of letters (e.g. CACADCB).
- Starting point of the menu is the topmost item of the leftmost box (current valve position VAV=xx%) on the chart. If lost in the menu just press Esc repeatedly, until the display shows VAV =xx%. You are now in the upper left corner of the menu chart.

Fig 2. ZVLC-2104/STD (V2.39) Menu
(Lower line of the display)



ZVLC-2104 Operation, Maintenance and Installation Manual

SET EVENTS	Password1:*****	SET TmpTolerance	NEW TOLERNC=4.6°
		SET EVENT#1	EVNT1 StTm=06:00
			EVNT1 EdTm=08:00
			EVNT1 TGT=120°F
			EVNT1 PASSIVE
		SET EVENT#2	EVNT2 StTm=08:00
			EVNT2 EdTm=09:40
			EVNT2 TGT=130°F
			EVNT2 ACTIVE
		SET EVENT#3	EVNT3 StTm=09:40
			EVNT3 EdTm=10:40
			EVNT3 TGT=160°F
			EVNT3 ACTIVE
		SET EVENT#4	EVNT4 StTm=10:40
			EVNT4 EdTm=11:40
			EVNT4 TGT=150°F
			EVNT4 PASSIVE
		SET EVENT#5	EVNT5 StTm=10:40
			EVNT5 EdTm=11:40
			EVNT5 TGT=170°F
			EVNT5 ACTIVE

Notes:

1. InDoorTemp=N/A if information from Server is not supplied.
2. Shading cells are not displayed if 'UseCndTempSnr - N'
3. *) Events Status. Please see explanation on Page 7 and 10.
4. **) Heat Up Schedule. Please see explanation on Page 7 and 11.

4. System Status Information

4.1. Upper Line of the Display

The ZVLC – 2104 has five Modes of Operation: Off, Auto, Manual Open, Manual Close, and Valve Set. The Mode can be selected by operator or remotely. Depending on the Operation Mode and many parameters the controller can be in one of the Operational States. The Mode and the Operational State are permanently displayed in the upper line of the LCD as follows:

LCD Indication			
Mode of Operation	Upper line begins with	Description	Possible Operational States (indicates on the right corner of the upper line)
Off	OFF:	The Valve stops immediately in the position it has before operation was entered	PrLoss
Auto	AUTO:xxx%	Calculated Target Valve Position 'xxx' in the range of (0%-100%)	SUMMER, PrLoss, D:ICOFF (N:ICOFF), RtnCtf, FailSf, D:Mild (N:Mild), HeatUp, Boost, N:Stbk, D:Norm (N:Norm) .
	AUTO:yyy°F	Target Temperature for the Condensate Return, if sensor is used and one of the five programmable Events is working at current time. 90°F < yyy < 255°F	EVNTi
	AUTO:xxx%	Target Valve Position for the particular (i) Heat Up Schedule	HSchdi
VLV SET	SET:xxx%	Target Valve Position 'xxx' in the range of (0%-100%)	Slow, Medium, Fast - three different Valve Positioning Speed
Manual Open	MANUAL OPEN	Unconditional opening Valve	No Operational States
Manual Close	MANUAL CLOSE	Unconditional closing Valve	No Operational States

Examples of the upper line display:

The upper line of the LCD	Description
OFF	ZVLC is in Operation Mode OFF. No alarms.
OFF PrLoss	ZVLC is in Operation Mode OFF. Pressure Loss signal from Host computer
AUTO: 35% Boost	Operation Mode: AUTO. Morning boost in effect.
AUTO: 0% D:Mild	Operation Mode: AUTO. Mild weather. Daytime. Valve to be closed completely.
AUTO: 0% D:ICOFF	Operation Mode: AUTO. Indoor temperature Cutoff. Day time. Valve to be closed.
AUTO: 7% RtnCtf	Operation Mode: AUTO. Condensate Return Temperature is higher than Set Point. Valve to be closed.
AUTO^45% N:Stbk	Operation Mode: AUTO. Setback at Nighttime. Valve position is limited by programmed setting of 45% though request for heat is higher.
AUTO:nn% D:Norm	Operation Mode: AUTO. Day Normal operation
AUTO:xx% FailSf	Operation Mode: AUTO. Outdoor Temperature Sensor fails. The controller would use external Outdoor Temp. info from another device or host or server, if they are attached. If they are not attached the controller would use 35°F as Outdoor Temperature nighttime or 45°F as Outdoor Temperature daytime.

AUTO: 125°F EVNT3	Operation Mode: AUTO. Event#3 is workin, Target Temperature is 125°F.
AUTO: 63% HSchd4	Operation Mode: AUTO. Heat Up Schedule#4 in progress, Target Valve position is 63%. No regular Heat Up, No Boost, no Event actions during Heat Up Schedule.
SET: 22% Medium	Operation Mode VALVE SET. Valve moves to 22% opening with medium speed.

4.2. Lower Line of the Display

The following status information and settings' values can be selected for displaying in the lower line of display:

Information	Example	Description
Valve Position and Temperature	VAV=16% Rtn=124°F	VLV - Current valve position. OD – Out Door Temperature (if Condensate Return Temperature Sensor not used). Rtn – Condensate Return Temperature.
Compensator	Compensator=+1	Current Compensator setting
Time and Date	10:45am Nov21'07	Current time and date. The "am/pm" displayed with capital letters when Daylight Saving Time is in effect.
Outdoor Temperature	OD Temp=52.1°F	Outdoor temperature at the RTD sensor ("fail" when temperature sensor malfunction).
Condensate Return Water Temperature*	Rtn Temp=82.8°F	Condensate Temperature at the RTD sensor ("fail" when temperature sensor malfunction).
All Events Status*	E: 1P 2A 3A 4A 5P	Event#1 and #5 are Passive, events##2,3,4 are Active**.
HeatUp Schedule#1	T1=01:00 VLV=10% (after pressing "Enter" key)	T1 – Heat Up Schedule#1 duration time (1hour and 0minutes), VLV = 10% - Target Valve Position for the Schedule#1***
Apartments temperature average	InDoorTemp=80.0°F	Information supplied by host and displayed if host renews it in period of 20 minutes.
System settings	Enter for more...	Invitation to show system settings in this line. Press Enter to display settings, which usually can be seen only in the SET part of the menu (password protected).

* Line is displayed only when Condensate Return. Temp. Sensor is Use.

** Pressing "Enter" key operator can see Event#1 information as follows: 07:50/12:30 125° (Start Time/End Time and Target Temperature). By manipulating Up/Down keys operator can see all event's information.

*** By manipulating Up/Down keys operator can see all Heat Up Schedule information.

If Heat Up Schedule exists, then in right corner of the bottom line of the LCD is given time remained before end of the corresponding Heat Up Schedule as: Tm=01:36.

5. Modes of operation

The ZVLC-2104 operates in one of the following modes:

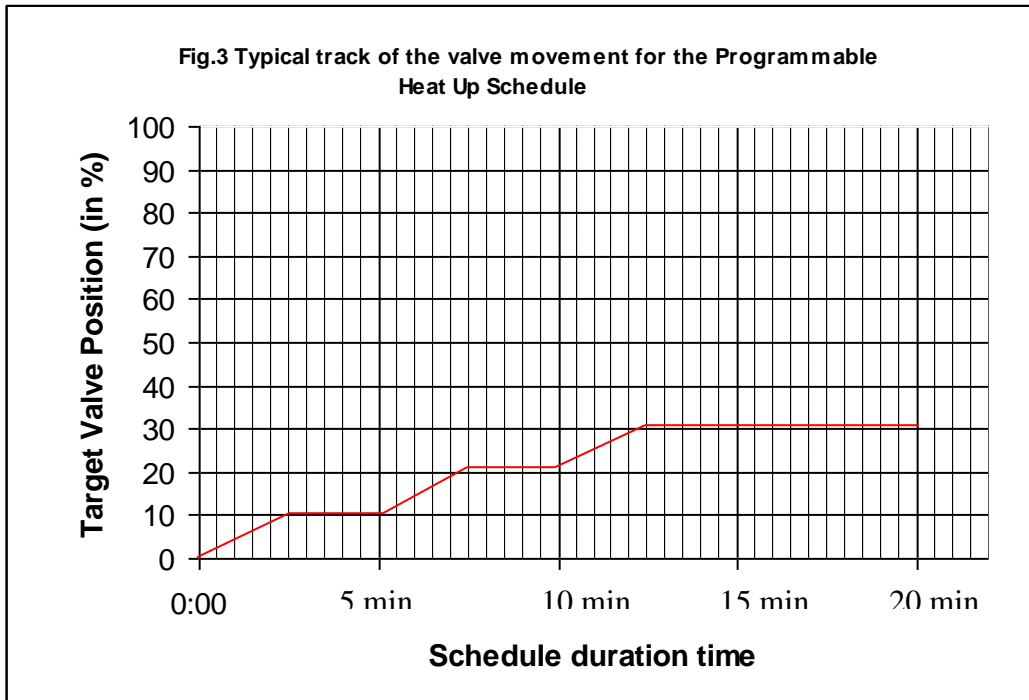
Operation Mode	Description
OFF	<p>Motor control is disabled. The controller is hot ready, continuing measurements and processing the sensors' data. This mode is useful when performing motor/valve maintenance.</p>
AUTO	<p>The controller provides automatic positioning of the control valve in accordance with the measured temperatures, time of day/year, and selected parameters. This mode is designed to be the main mode of operation. If the system parameters are set properly, then there is no need in manual intervention in the system performance virtually at any weather condition.</p> <p>In regular work (when no Programmable Heat Up Schedule), if Condensate Return Temp. Sensor is not Use or events not setup (all events are Passive) the controller distinguishes four periods of day:</p> <ol style="list-style-type: none"> 1. Morning heat-up period starts at 5:00AM. During this period the controller changes the valve position from nighttime to daytime values with a constant rate of 1% per minute. The time span of this period is variable and is calculated by the controller automatically (0 to 30 minutes). 2. Morning Boost period begins immediately after the morning heat-up period ends. The BOOST SPAN and BOOST ADVANCE settings define the boost duration and its amount. 3. Daytime period (from morning heat-up to 10PM). Normal daytime operation. 4. Nighttime period (10PM to 5AM). The amount of delivered heat can be reduced against the daytime period as defined by the NIGHT SETBACK settings. <p>When the events are setup and one of them is in working state* the controller provides automatic valve positioning in accordance with the measured Condensate Return Temperature and keeps this temperature to the event's Target Temperature set point. The Morning Heat-up and Boost Procedures can be ignored if they are contemporizing with Event execution.</p> <p>The valve will be unconditionally set to 0% when:</p> <ul style="list-style-type: none"> - Out Door Temperature achieves Day time Mild Weather Set Point (at Day Time) or Night Mild Weather Set Point (at Night time); - If current date is between the Winter End and Winter Begin settings. <p>Using the average Indoor Temperature feedback:</p> <p>The Indoor temperature information supplied wirelessly the WEM's (Wireless Energy Module) to the Local Server. The Local Server will average the apartments indoor temperature information for the defined Zone and will send it to the ZVLC2104 heating controller which controls this Zone. If the apartments average indoor temperature, higher then Indoor Temperature Cut-Off (Day/Night) set Point +/- the D_Band value then the valve will move to close direction to the position which is defined by Cut-Off-Relative parameter (%). For example if the Cut-Off-Relative= 80% and the current valve position (before the Cut-Off) = 30% then the valve position during the Cut-Off will be = $30\% * .2 = 6\%$.</p> <p>Programmable Heat Up Schedule.</p> <p>Specially designated procedure to provide 'soft' programmable increase of the supplied heating energy when the heat supply just started (the valve position was = 0%). For this procedure operator can program five consecutive time duration and corresponding valve positions following right after request for heat and valve starts opening. During the Heat Up Schedule regular Heat Up, Boost, or Event will not run. Upon expiration of all the programmed schedules time the controller will return to regular work or can begin execution of an Event if such are active at this time. The Heat Up Schedule will be repeated every time valve is closed completely and there is a sudden new heat request. The Heat Up schedule won't be executed if time duration for the schedule 1 is set to 0.</p> <p>In contrast to the regular not scheduled Heat Up, the valve will be moving with different velocity and will be determined by duration of the current HeatUp time and the valve target position. Typical track of the valve movement for the Programmable Heat Up Schedule is shown on Fig.3.</p>

* Event is in working state when his status is Active and current time is between event's Start time and End time.

<p>MANUAL OPEN, MANUAL CLOSE</p>	<p>Unconditional opening (closing) of the valve. These modes can be used in emergency if one wants to open (close) the valve fast and completely regardless of the valve position sensor reading. Valve Limit setting is ignored in these modes.</p>
<p>VALVE SET</p>	<p>Fast positioning of the control valve to the desired value (0 to 100%). This mode is useful when the valve should be positioned manually for some reason (e.g. if the temperature sensor failed and automatic control is impossible)</p>

To change the mode one should select SET OPER MODE item in the menu, press Enter, then, with Up or Down key select a new mode, and press Enter. When the VALVE SET mode is selected, the new valve position must be entered.

When the ZVLC in the AUTO mode and Out Door Temperature are above the Mild Weather Set Point, 'Shut Down' signal is generated to the Boiler controller.



6. Compensator

The COMPENSATOR setting provides manual adjustment to the amount of heat being delivered to compensate the influence of extreme weather condition.

The controller, when calculating target valve position, subtracts the Compensator value from the outdoor temperature multiplied by the Compensator Sensitivity thus correcting valve position.

The COMPENSATOR range: -5 to +5 units. Positive values of the parameter increase heat delivery, while negative values reduce it. Fig.4 illustrates the Compensator's influence on the control curve.

This is the only setting, which is not protected by the password and not affected during event execution.

7. Operation Settings

To provide correct and reliable operation of the ZVLC-2104 operational parameters must be set properly. The parameter section of the menu is divided in two parts – General SETUP, Events Setup (if Condensate Return Temperature Sensor is Use) and Heat Up Schedule (if allowed). Each part protected with a password. Use following tables as guidelines when selecting parameters' values:

SETUP (Password: CACADCB)

Setting	Description
MILD WEATHER DAY	The controller closes the valve completely when the outdoor temperature is higher than this set point during the Day - time between Day Begin and Day End (D:Mild state). Range: 40 to 80 °F
MILD WEATHER NIGHT	If the outdoor temperature is lower than this setpoint and the time is between Day End and Day Begin, then the valve position is corrected in accordance with the NIGHT SETBACK setting. If the outdoor temperature is higher than this setpoint and the time is between Day End and Day Begin, then the valve is closed completely (N:Mild). Range: 20 to 60 °F
NIGHT SETBACK	The controller adds to the outdoor temperature the NIGHT SETBACK value thus correcting the valve position to reduce heat delivery during the nighttime (N:Stbk). Range: 0 to 30 °F
HEAT GAIN	Determines the slope of the control curve: Valve Position vs. Outdoor Temperature. Fig 3 represents the family of control curves with Heat Gain as parameter when COMPENSATOR=0 and NIGHT SETBACK=0. Positive Compensator values shift a curve up, negative - down. Positive Night Setback values shift a curve down. Range: 1.0 to 50.0 (from Version V2.31 range: 0.1 to 50.0)
COMPENSATOR SENSITIVITY	Determines the weight of the compensator's unit. Range: 0.1 to 9.9 (from Version V2.31 range : 0.1 to 20.0)
VALVE LIMIT	This setting works only with AUTO mode in effect. The valve cannot be automatically positioned beyond this limit (Valve Max Limit).Range: 10 to 100 %
CutOffVlvRel	Percentage from the valve Auto Target Position during InDoorCutOff (Indoor Cut Off state) or Return CutOff (Condensate Return Cut Off state). Range: 0-100%. Default 100%
UseRtnTempSr (Y/N)	Letter 'Y' defines that a Condensate Return Temperature Sensor is connected to the controller and controller measures the Condensate Return Temperature. 'N' – sensor is not connected. From version V2.30 Pressure Sensor can be connected to the controller's input instead Condensate Return Temperature Sensor. In this case if the UseRtnTempSr –'N' then controller will detect and indicate Pressure Loss. In AUTO mode of operation if 'Pressure Loss' is detected valve will be close.
BOOST SPAN	Morning boost time span. The controller boosts heat only with AUTO mode in effect. Range: 0, 30, 60, 90 or 120 minutes (0 means no boost)
BOOST ADVANCE	The controller subtracts the BOOST ADVANCE value from the outdoor temperature thus correcting the valve position to increase heat delivery during the morning boost period. Range: 0 to 30 °F (0 means no boost)
Indoor Day Temperature Cutoff	The controller closes the valve completely when the Indoor temperature average (supplied from host computer) is higher than this set-point during the Day time between Day Begin and Day End (D:ICOFF state). Range: 40 to 90 °F

Indoor Night Temperature Cutoff	If the Indoor temperature average (supplied from host computer) is higher than this set point and the time is between Day End and Day Begin, then the valve will be closed completely (N: ICOFF state). Range: 40 to 80 °F
Condensate Return Temperature Cutoff	If Condensate Return Temperature Sensor is used and Condensate Return Temperature is higher than set point plus D_Band, then the valve will move to close direction to the position defined by the cutoff depth (RtnCtf state). The CutOFF set point range: 60 to 240 °F, Default 200 °F.
D_Band	Used along with 'In Door Temperature' parameter and 'In Door Day(Night) Temperature Cutoff Set Point'. This parameter defines the allowable delta between the actual In Door Temperature and Cutoff Set Point. Range: 0.1°F to 19.9°F with 0.1°F steps.
MotorPause	Motor Pause. Range 1 - 40 minutes. Default 3 minute. With step of 1m. Used only while Event processing on the AUTO mode of operation.
DAY BEGIN	Hours and minutes (with 10 minutes step) when Day Begins
DAY END	Hours and minutes (with 10 minutes step) when Day Ends
WINTER BEGIN	Month and Day when Winter Begin (dependent of the region)
WINTER END	Month and Day when Winter End (dependent of the region)
V.SET Spd = Fast	There are three different values of valve positioning speed (Slow, Medium, Fast) in the VLV SET operation mode.

SET EVENTS (Password: **CACADCB**)

Setting	Description
Events Temperature Tolerance (TmpTolerance)	Used in AUTO mode of operation with conjunction all events . This parameter defines the allowable delta between the actual Condensate Return Temperature and the event's Target Temperature. Range: 0.5°F to 25.5°F with 0.1°F steps.
Following Parameters are valid from event#1 to event #5 :	
Event#i Start Time (EVNTi StTm)	Event #i Start Time. Hours and minutes (with 10 minutes step)
Event#i End Time (EVNTi EdTm)	Event#i End Time. Hours and minutes (with 10 minutes step)
Event#i Target Temperature (EVNTi TGT)	Event#i Target Temperature (with 1 °F step)
Event#i Status (ACTIVE/PASSIVE)	Determines the Event#i status. A- event is in Active status and can be in the working state when Current Time achieves the event's Start time. P- event is in Passive status and can not be switch to the working state.

Note:

Event Start Time(End Time) - Represented on military format from 00:00 to 23:50.

Start Time of the Event#1 can be select (set) from 00:00 to 23:50.

Start Time of the follow up event will be set as End Time of the previous event and can not be change.

End Time of the all events can be set from 00:00 to 23:50.

SET HeatUp Schedule (Password1: CACADCB)

Setting	Description
SET HSchedule#1 SET HSchedule#2 SET HSchedule#3 SET HSchedule#4 SET HSchedule#5 SET HSchedule#1....	After entering the Password first 'HSchedule#1' will appear .By manipulating Up/Down keys operator can change number of the schedule (from 1 to 5) he wants to modify (see previous column). To modify selected Heat Up schedule operator should press 'Enter' key. It allows sequentially change two schedule parameters – target Valve Position(VLV) and Time Duration(TmD) for the schedule.
Following Parameters are valid from schedule#1 to schedule #5 :	
Schedule #i Target Valve Position: HSchdi VLV=12%	Schedule #i Target Valve Position in percent. Range 0 to 100% with step of 1% .
Schedule #i Time Duration: HSchdi TmD=01:30	Schedule #i Time Duration , Hours and minutes (with 10 minutes step) .Range from 00:00 to 23:50.

Note:

Time Duration (TmD) - Represented on military format from 00:00 to 23:50.

The Heat Up Schedule won't be executed if time duration for the schedule#1 is set to 0.

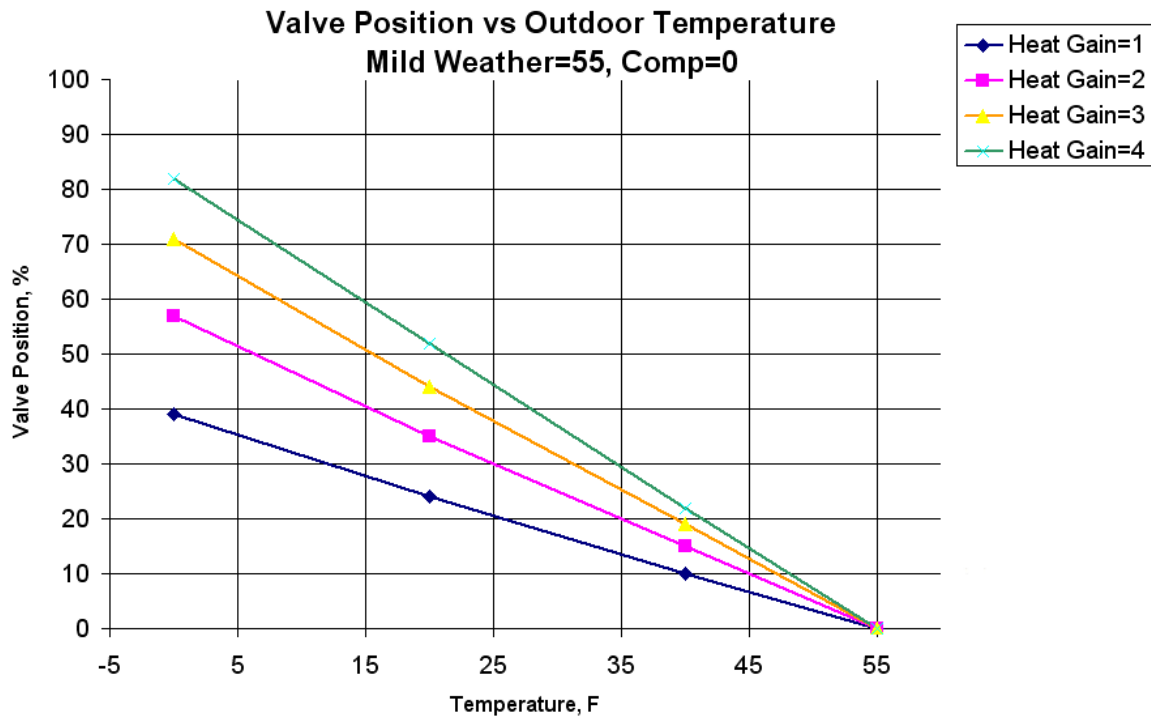


Fig 3. Valve position vs. outdoor temperature curves.
Parameter - Heat Gain
(Mild Weather=55, Compensator=0)

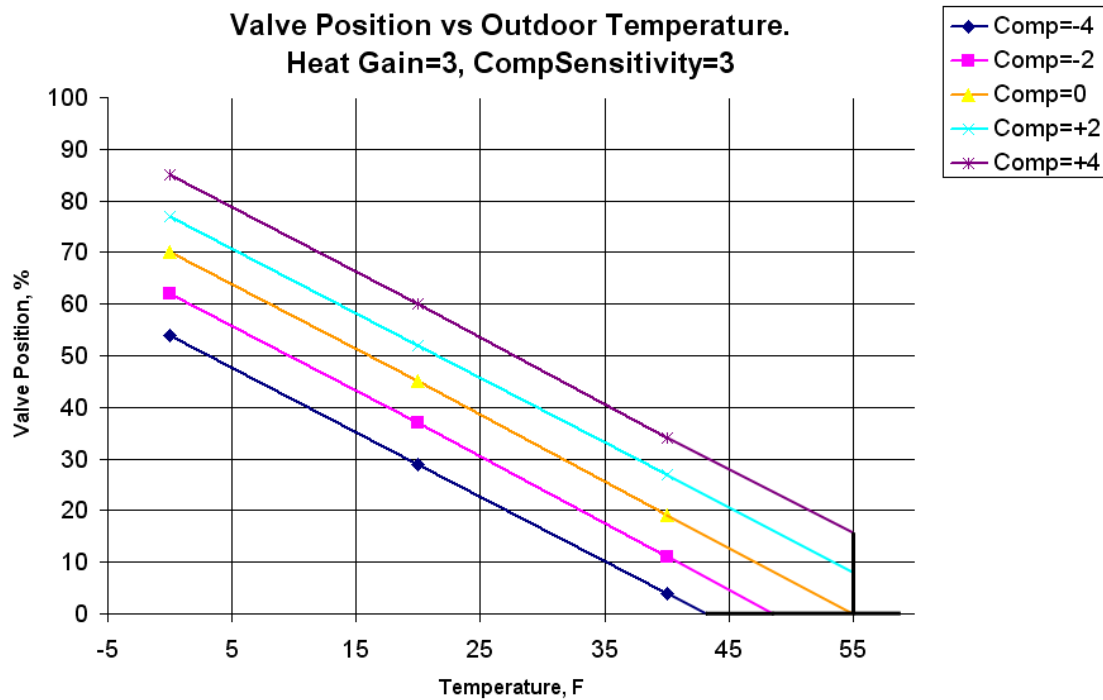


Fig 4. Valve position vs. outdoor temperature curves.
Parameter - Compensator
(Mild Weather=55, Heat Gain=3.0, Compensator Sensitivity=3.0)

8. Calibration Procedure

The temperature sensors and motor current loop interface must be calibrated after the initial system installation or after the parts replacement. The ZVLC-2104 facilitates the calibration procedure. To enter the calibration section of the menu, select **SET CALIBRATE** and then enter the password2 (DDBBCBA). Following table provides explanations for the calibration procedure.

<p>Outdoor Temperature Sensor Calibration</p>	<ol style="list-style-type: none"> 1. Select CAL OD Temp. and press Enter 2. The upper line of the display indicates mode of operation ("CALBR") and shows the current reading of the outdoor temperature: " ODT=xx.y° " 3. The lower line of the display shows possible adjustment for example "NewODTAdj=0.1°" 4. Press Up or Down key to make the ODT equal to the real outdoor temperature, measured by a reference thermometer. 5. Press Enter.
<p>Condensate Return Temperature Sensor Calibration</p>	<ol style="list-style-type: none"> 1. Select CAL Rtn Temp. and press Enter 2. The upper line of the display indicates mode of operation ("CALBR") and shows current reading of the condensate return temperature: " RtnT=xx.y° " 3. The lower line of the display shows possible adjustment for example "NewRtnTAdj=0.1°" 4. Press Up or Down key to make the Rtn temperature equal to the real condensate return temperature, measured by a reference thermometer. 5. Press Enter.
<p>Valve Position Calibration</p>	
<p>Motorized Valve with 24VAC Floating Point interface</p>	<p>Open Position:</p> <ol style="list-style-type: none"> 1. Select CAL OPEN. 2. The upper line of the display should show: "CAL Opening..." 3. The valve begins to open. 4. The lower line of the display shows reading of the sensor potentiometer position: "FeedbackPot=xx%" 5. After the valve is fully opened, the controller waits for 15 seconds more to be sure the valve is opened completely and doesn't move. 6. If the upper line of the display shows: "CAL Opened 100%" it means the calibration of the Open position of the sensor is finished. 7. Press Enter <p>Close Position:</p> <ol style="list-style-type: none"> 1. Select CAL CLOSE. 2. The upper line of the display should show: "CAL Closing..." 3. The valve begins to close. 4. The lower line of the display shows reading of the sensor potentiometer position: "FeedbackPot=xx%" 5. After the valve is fully closed, the controller waits for 15 seconds more to be sure the valve is closed completely and doesn't move. 6. If the upper line of the display shows: "CAL Closed 0%" it means the calibration of the Close position of the sensor is finished. 7. Press Enter
<p>Motor current loop interface Calibration</p>	<p>From 'MANUAL CLOSE' Operation when Valve is closed (VALVE POS=0%):</p> <ol style="list-style-type: none"> 1. Connect ampere meter between the ZVLC's terminal pin#2 (CLOSE) and motor connector (use 100ohm resistor when motor is not connected). 2. Select CAL Out Current. and press Enter 3. The upper line of the display indicates mode of operation ("CALBR") and OutCr=4ma. 4. The lower line of the display shows possible adjustment for example

	<p>“New CAdj = 1”</p> <ol style="list-style-type: none">5. Press Up or Down key to make the reading 4ma at the ampere meter.6. Press Enter.
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8.1 Communication Address Setting

Setting the communication address (ID) is not particularly a calibration process. But it was located in this section of the menu because the communication address is set usually just once during the system set-up. Each ZVLC-2104 connected to the same RS485 bus should have a unique address.

9. Maintenance, Troubleshooting and Failure Mode Recovery Procedures

Introduction

In case of failure of the ZVLC-2104 and/or other parts of the system (cables, terminals, valve motor, temperature sensor) it is necessary as soon as possible to address the problem. To repair the system, please follow the steps described in Section 2, where the most common sources of problems are listed.

If for some reason it is impossible to perform system troubleshooting immediately, then it is still feasible to operate the system, though in a somewhat limited way. It should minimize the impact of the failure. Please refer to Section 3.

9.1 Troubleshooting

Problem description	Troubleshooting
1. LCD Display is blank. No backlight.	1. Check if the power transformer connected to 110VAC. 2. Check the Low Voltage Cable Assembly between the transformer and the controller.
2. Outdoor Temperature reading fails.	1. Check the Ribbon Cable. 2. Disconnect the temperature sensor wires from terminals 11-14 of the Terminal Board. Short circuit terminals 13-14. Connect 100 Ohm resistor to terminals 11-12. Select the Temperature Calibration mode. If the Temperature Reading "NEW OUTTmp=" is not 70°F±15°F, then the controller should be replaced. 3. Check the resistance value of the reference pair, then check the resistance of the sensor pair. Subtract the resistance of the reference pair from the sensor pair resistance. The result should be the resistance of the sensor itself. Measure the real temperature at the sensor and compare results to the Resistance/Temperature chart of the sensor. Considerable difference means faulty sensor. The reference pair should read very low resistance totaling 1 to 2 Ohms per 100 feet of wire length. A dead short or opening will result in a temperature reading failure.
3. Outdoor Temperature reading does not correspond with the real outdoor temperature position.	Re-calibrate the Outdoor Temperature: In the Menu: SETUP, SET CALIBRATE, CAL OUT Temp, NEW OUTTmp=. Press Up or Down keys to set the reading equal to the real outdoor temperature, then press Enter

<p>4. Valve Position reading fails.</p>	<p>1. Check the 6-wire cable connecting the valve motor and the Terminal Board. Check the Ribbon Cable.</p> <p>2. Disconnect the Ribbon Cable from Terminal Board. If the resistance between terminals 5-6 is not 300 Ohm \pm15 Ohm, or the resistance between terminals 4-6 is not within 0 to 300 Ohm limits, then the feedback potentiometer of the motor should be replaced.</p>
<p>5. Valve Position reading does not correspond with the real valve position.</p>	<p>Re-calibrate the motor. Menu: SETUP, SET CALIBRATE, CAL OPEN. When Upper Line of the LCD Display shows "Opened 100%" press Enter, then choose CAL CLOSE. When Upper Line of the LCD Display shows "Closed 0%" press ENTER.</p>
<p>6. Valve position cannot be controlled in any mode.</p>	<p>1. Check the 6-wire cable connecting the valve motor and the Terminal Board. Check the Ribbon Cable.</p> <p>2. Test the motor: Motor should close the valve if the terminals 1-2 are shorted, or should open the valve if the terminals 1-3 are shorted.</p> <p>3. Controller should be replaced.</p>
<p>7. The Valve Position does not change when the outdoor temperature changes.</p>	<p>1. Make sure the ZVLC Operational Mode is set to AUTO.</p> <p>2. Check the parameters' settings. See the ZVLC-2104 Operation Manual.</p>
<p>8. No RS-485 communications</p>	<p>1. Check the communication cable. Check the polarity when connecting wires to the RS-485 plug.</p> <p>2. Make sure the Communication ID is set properly. Menu: SETUP, SET CALIBRATE, SET Com. ID=. Choose the ID pressing Up or Down, then press Enter.</p>
<p>9. After disconnecting the ZVLC-2104 from power and connecting back again the time and date readings are reset.</p>	<p>The backup battery is completely discharged. The battery should be replaced with the same type of 3V Li battery</p>

9.2 Failure Mode Recovery Procedures

Failure	Recovery or Workaround Procedure
1. No Power.	The valve motor cannot be operated. Use bypass to control heat.
2. Outdoor Temperature reading fails.	In this case the valve cannot be controlled in AUTO mode. Use SET VALVE mode to set the valve in desired position.
3. Outdoor Temperature reading does not correspond with the real outdoor temperature and cannot be calibrated.	If the difference between the real temperature and the one measured by the controller is not dramatic then normal operation in AUTO mode is still possible. If the reading is lower than the real temperature, the Compensation parameter can be increased (decreased otherwise). Also the Heat Gain parameter can be used for the purpose.
4. Valve Position reading fails.	The valve motor cannot be operated in AUTO and SET VALVE modes. The valve can be opened or closed using MANUAL OPEN or MANUAL CLOSE modes with visual valve position control. Select OFF mode when the valve is in a desired position.
5. Motor position cannot be controlled in any mode.	The valve motor cannot be operated. Use bypass to control heat. The controller can be used just to measure the outdoor temperature.
6. Valve Position reading does not correspond with the real valve position and cannot be calibrated.	It is still possible to operate in AUTO mode, however the amount of heat delivered will not agree with the outdoor temperature. The situation can be improved to some extent by changing the Compensation or Heat Gain.
7. No RS-485 communications	This condition does not affect normal valve control operation. But the controller cannot communicate with the server computer and therefore is not incorporated in the building management system. Remote control is impossible.
8. After disconnecting the ZVLC-2104 from power and connecting back again the time and date readings are reset.	<p>This condition does not affect normal valve control operation unless the power is cycled (turned off/on). After power returns one must set the time/date manually to maintain normal night/day operation (5am to 10pm - daytime mode).</p> <p>To eliminate the impact of time reset, though retaining basic functionality:</p> <ol style="list-style-type: none"> 1. Set the Night Setback parameter to zero, and Cold Night to the maximum value, which yields no difference between day and night time operation. The night energy saving becomes impossible. 2. Set Boost Span parameter to zero, thus turning off the morning boost mode.

9.3 Technical Support

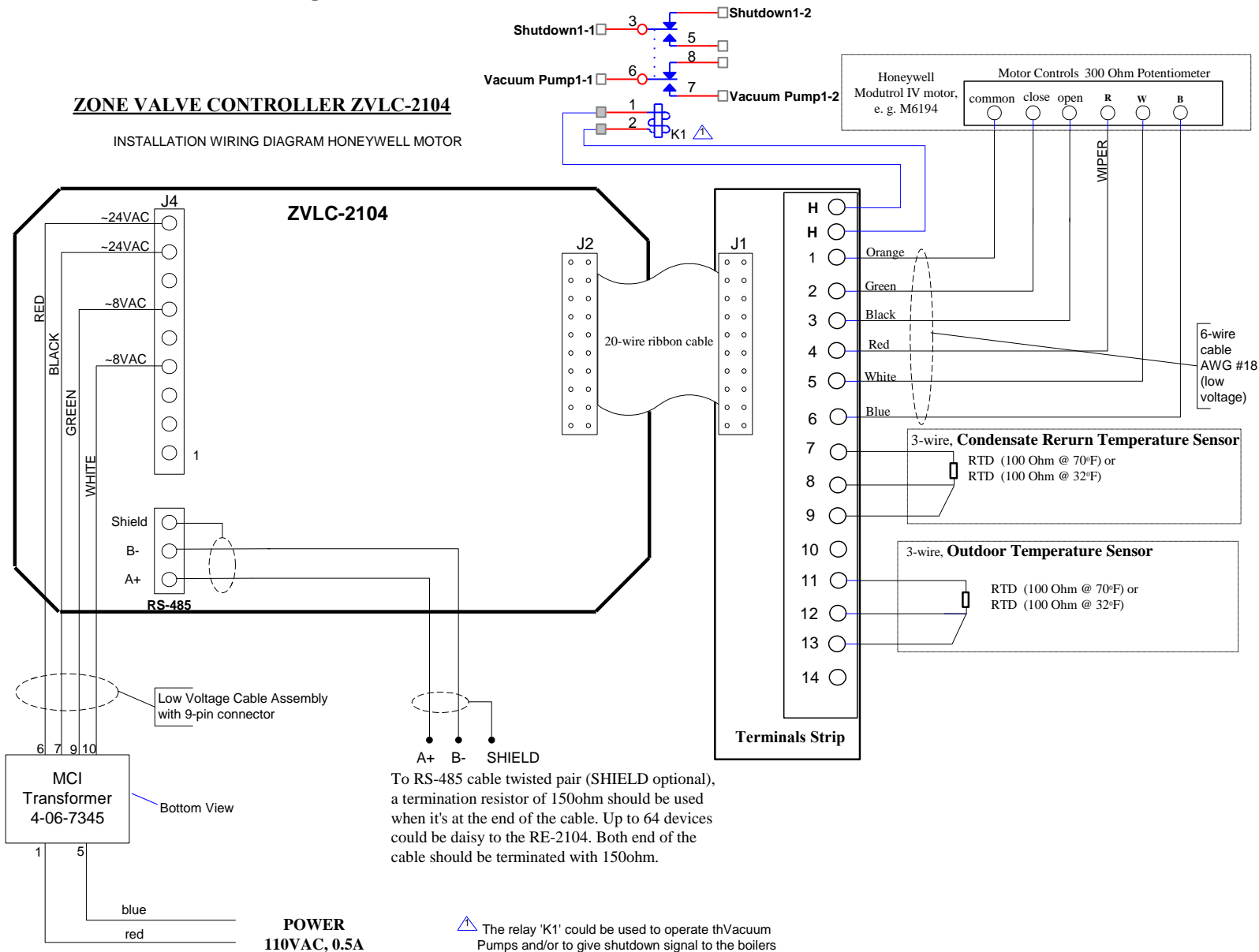
For technical support please contact Intech 21, Inc. When requesting technical support for the ZVLC-2104, please have the following information handy:

- Device serial number and/or firmware version (displayed when powering-up).
- Type of the temperature sensor
- Type of the valve motor

10. Installation Diagrams.

ZONE VALVE CONTROLLER ZVLC-2104

INSTALLATION WIRING DIAGRAM HONEYWELL MOTOR



ZVLC-2104 Installation Diagram.

ZVLC-2104 Network Connection Diagram.



ZVLC-2104 NETWORK CONNECTION

