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SMART EQUIPMENT

DIGITAL CONTROLS

Installation, Operation & Maintenance Manual
for Johnson Controls Digital Controllers
SE-ZEC510-1

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Smart Equipment Digital Controls

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INITIAL SETUP

MOUNTING SE-ZEC CONTROLLERS

1. Ensure that you have the appropriate personal protective equipment (PPE), such as a hard hat, safety glasses, steel toe boots, and gloves.
2. Disconnect power to the VAV unit.
3. Set the MS/TP address, and ensure the end of line (EOL) switch is set to off. Instructions on setting the VAV address and EOL are in the sections below.
4. Place the SE-ZEC Controller in the proper mounting position on the actuator shaft so that the wiring connections are easily accessible. Make sure the SE-ZEC Controller base is parallel to the VAV box (perpendicular to the damper shaft). If needed, use a spacer to offset tipping of the SE-ZEC Controller caused by the shaft bushings.
5. Use the alignment marks to center the captive spacer to ensure sufficient movement in either direction. (*Figure 1)*

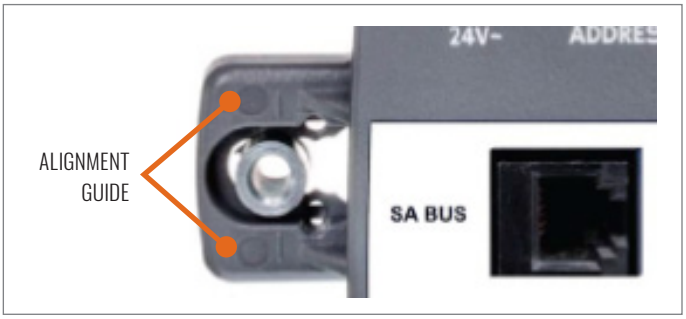

Figure 1: Captive Spacer Alignment Marks

6. Secure the self-drilling #10 screw through the captive spacer with a power screwdriver and 4" (100 mm) extension socket. Otherwise, use a punch to mark the position of the shoulder washer, and then drill a hole into the VAV box using a 5/16" drill bit. Insert the mounting screw and tighten against the spacer.
7. Locate the damper position using the typical marking on the end of the damper shaft.
8. Note the direction, clockwise (CW) or counterclockwise (CCW), required to close the damper. The actuator setup depends on the necessary amount of rotation required for the damper to go from full-open to full-closed. For 90° rotation, install the damper full-closed.
9. Push down and hold the manual override button and turn the SE-ZEC Controller until it contacts the mechanical end-stop at either the full-closed or full-open position. (*Figure 2)*

Figure 2: Manual Override and Coupler

10. Tighten the square coupler bolt to the shaft using a 5/16" (8 mm) wrench or a 3/8" (10 mm) 12-point socket. Tighten to 95 to 105 lb·in (10.5 to 11.5 N·m)
11. Put a loop in the pneumatic tubing, to trap condensation, when you attach the tubing to the SE-ZEC Controller pressure transducer ports. Loop the tubing before you make the final connections.
12. Push the manual override button, and turn the actuator coupling manually to ensure the actuator can rotate from full-closed to full-open positions without binding.
13. Complete the mounting by rotating the damper to the full-open position.

NETWORKING

FIELD CONTROLLER (FC) BUS

The field controller (FC) Bus terminal block is a blue, removable, 4-terminal plug that is keyed to only fit in to the board-mounted, gray FC Bus jack. Wire the removable FC Bus terminal block plugs on the SE-ZEC Controller and other FC Bus controllers in a daisy-chain configuration using 3-wire twisted, shielded cable. *(Figure 3)*

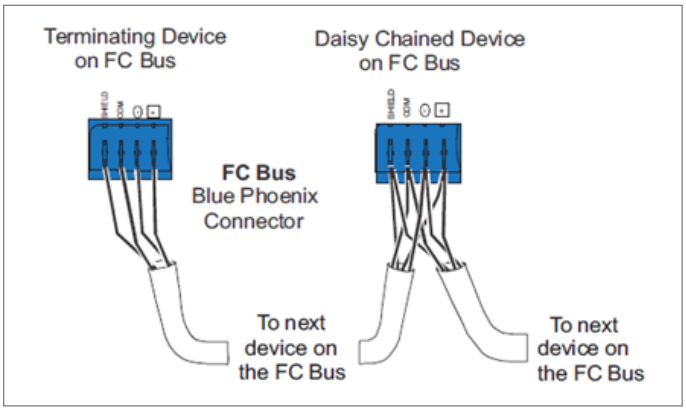

Figure 3: FC Bus Connections

SE-ZEC CONTROLLER ADDRESS

SE-ZEC Controllers are master devices on BACnet MS/TP (SA or FC) Buses. Before operating field controllers on a Bus, you must set a valid and unique device address for each controller on the Bus. You set a field controller's device address by setting the positions of the switches on the devise address DIP switch block at the top of the controller. Device addresses 4-127 are the valid addresses for the SE-ZEC controller. SE-ZEC Controllers ship with all address switches set to ON. Set a valid and unique device address on the field controller before applying power to the controller on the Bus. The DIP switch block has eight switches numbered 128, 64, 32, 16, 8, 4, 2, and 1.

To set the device addresses on a ZEC field controller:

1. Set all of the switches on the field controller's device address DIP switch block (128 through 1) to OFF.
2. Set one or more of the seven address switches from 64 to 1 to ON, so that the sum of the switch numbers set to ON equals the intended device address. Set the highest number switch that is less than or equal to the intended device address to ON. Then continue setting lower numbered switches until the total equals the intended address.

   Example: If the intended device address is 21, set the switches so that 16 + 4 + 1 = 21.

   a. Set switch 16 to ON
   b. Set switch 4 to ON
   c. Set switch 1 to ON
3. Set a unique and sequential device address for each of the field controllers connected on the FC Bus, starting with device address 4. To ensure the best Bus performance, set sequential device addresses with no gaps in the device address range (4, 5, 6, and so on). The field controllers do not need to be physically connected on the Bus in their numerical device address order.
4. Write each field controller's device address on the white label below the DIP switch block on the controller's cover.

END-OF-LINE (EOL) SWITCH

The EOL switch must be set to ON for the two devices located at either end of each bus segment on an FC bus. The EOL switches must be set to OFF for all other devices on the bus segment on an FC bus.

OPTIONAL COMPONENTS

SENSOR ACTUATOR (SA) BUS

Factory or field supplied zone sensors are wired to the SA bus on the SE-ZEC Controller. The SA Bus is a brown, removable 4-terminal plug that is keyed to only fit into the board mounted SA bus. Wire the removable SA bus terminal block plugs on the SE-ZEC Controller and other field devices in a daisy-chain configuration using 4-wire, shielded cable.

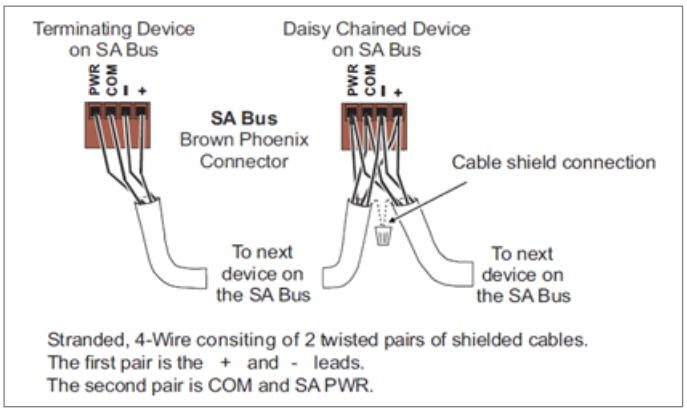

Figure 4: SA Bus Connections

SUPPLY AIR TEMPERATURE SENSOR

Factory or field-supplied supply air temperature sensors can be used to measure the supply air temperature at the inlet of the VAV box. The supply air temperature is wired between terminals ICOM3 and IN3 on the SE-ZEC Controller. The sensor should be mounted in the inlet duct centered in the side of the ductwork. Avoid installing the sensor near an elbow, take off or transition. Avoid blocking air to the primary airflow sensor.

Factory provided nickel (1k ohm) temperature sensors have 4" long probes and stainless steel mounting flanges with (2) provided hex-head self-drilling mounting screws. Sensors come equipped with 10 ft. plenum rated cables with ¼" internal thread insulated quick-connect terminations on leads. Install sensor by drilling a hole into the ductwork, inserting the sensor, and securing with provided screws. The sensor tip should not touch any part of the ductwork.

With the supply air temperature sensor installed, the SE-ZEC controller will change its control sequence based on the measured supply air temperature. When parameter *Heating Limit Enable* is TRUE the controller will not allow re-heat to engage when the supply air temperature is greater than the value set in *Heating Supply Air Limit*.

Additionally, the controller will switch to warmup mode when warmup conditions are present. Warmup conditions are present when the supply air temperature (SAT) sensor value exceeds the zone temperature (ZNT) sensor in unoccupied mode or exceeds it by the *Warmup Differential* in occupied mode. While in Warmup mode the minimum flow will be set to the *Warmup Min Flow*.

DISCHARGE AIR TEMPERATURE SENSOR

Factory or field supplied discharge air temperature sensors can be used to measure the temperature of the air being discharged from the VAV box. The discharge air temperature sensor is wired between terminals ICOM1 and IN1 on the SE-ZEC controller. The sensor should be mounted a minimum of 36" from the discharge of the unit and be centered in the side of the ductwork. Avoid installing the sensor near an elbow, take off, or transition.

Factory provided nickel (1k ohm) temperature sensors have 4" long probes and stainless steel mounting flanges with (2) provided hex-head self-drilling mounting screws. Sensors come equipped with 10 ft. plenum rated cables with ¼" internal thread insulated quick-connect terminations on leads. Install sensor by drilling a hole into the ductwork, inserting the sensor, and securing with provided screws. The sensor tip should not touch any part of the ductwork.

OCCUPANCY SENSOR

The SE-ZEC Controllers adjust the heating and cooling temperature setpoints, as well as the airflow setpoints based on the zone occupancy. There are three different states of zone occupancy:

Occupied Mode
- Uses Occupied Heating (68°F) and Occupied Cooling (72°F) temperature setpoints as well as Occupied Heating and Occupied Cooling Airflow setpoints
- For Series Fan Powered Terminals the Fan is always on
- For Parallel Fan Powered Terminals the Fan is only on during a call for heating

Standby Mode
- Uses Standby Heating (66°F) and Standby Cooling (77°F) temperature setpoints as well as Unoccupied Heating and Unoccupied Cooling Airflow setpoints
- For Series Fan Powered Terminals the Fan is always on
- For Parallel Fan Powered Terminals the Fan is only on during a call for heating

Unoccupied Mode
- Uses Unoccupied Heating (55°F) and Unoccupied Cooling (85°F) temperature setpoints as well as Unoccupied Heating and Unoccupied Cooling Airflow setpoints
- For Series Fan Powered Terminals the Fan is only on during a call for heating or cooling
- For Parallel Fan Powered Terminals the Fan is only on during a call for heating

Table 1 (below) shows how occupancy states are determined for the SE-ZEC Controllers.

TABLE 1: SE-ZEC OCCUPANCY DETERMINATION

TERMINAL UNIT TYPE	CONTROLLER TYPE	
	ZEC500 (STANDALONE)	ZEC510 (NETWORKED)
Single Duct Terminal Unit	The controller will switch from Occupied to Unoccupied states by comparing the measured airflow to the Occupancy Determination Flow Setpoint. When the measured airflow is below the Occupancy Determination Flow Setpoint the state is set to Unoccupied. When the measured airflow is above the Occupancy Determination Flow Setpoint the state is set to Occupied	The building automation system (BAS) will schedule when the controller will switch from Occupied and Unoccupied states. A room occupancy sensor (wired to IN2 and ICOM2 on the controller) can be used to temporarily set the VAV box to Standby mode when occupancy is not sensed.
Fan Powered Terminal Unit	The controller will read the occupancy sensor wired between IN2 and ICOM2 on the controller to switch between Occupied and Unoccupied states. The occupancy sensor can be a room occupancy sensor or another kind of occupancy detection (such as a duct pressure switch*). Without an occupancy sensor, the controller will always be in Occupied mode.	The building automation system (BAS) will schedule when the controller will switch from Occupied and Unoccupied states. A room occupancy sensor (wired to IN2 and ICOM2 on the controller) can be used to temporarily set the VAV box to Standby mode when occupancy is not sensed.

**An optional factory provided occupancy pressure switch is available for standalone fan powered terminal units to determine occupancy by measuring duct pressure to determine whether the air handler is on (zone is occupied) or off (zone is unoccupied).*

CONTROL SEQUENCES

SMART EQUIPMENT CONTROLS

VAV boxes with Smart Equipment Controls will be factory mounted and wired according to the selected control sequence. Links to each individual control submittal are shown below:

T&B ZEC CONTROLS - CONTROL SEQUENCES			
DESCRIPTION	SINGLE DUCT	SERIES FAN POWERED	PARALLEL FAN POWERED
	ZEC51	ZEC51	ZEC51
Cooling Only	ZE30	ZE50	ZE70
1-Stage Electric Heat	ZE31	ZE51	ZE71
2-Stage Electric Heat	ZE32	ZE52	ZE72
3-Stage Electric Heat	ZE33	ZE53	ZE73
Proportional Electric Heat	ZE34	ZE54	ZE74
On/Off Hot Water Heat	ZE35	ZE55	ZE75
Floating Hot Water Heat	ZE36	ZE56	ZE76
Proportional Hot Water Heat	ZE37	ZE57	ZE77
Supplemental Heat	ZE38	ZE58	ZE78

CONTROLLER PARAMETERS

PARAMETER DESCRIPTIONS

This section provides information on the SE-ZEC Controller Parameters.

STATIC PARAMETERS (ALL APPLICATIONS)

The list of available SE-ZEC Controller Parameters changes depending on the application type that is selected (Staged/ Incremental/SCR). Table 3 shows the SE-ZEC Controller parameters that are available for every application (Staged/ Incremental/SCR).

TABLE 3: DEFAULT SE-ZEC CONTROLLER PARAMETERS				
MENU 1	MENU 2	PARAMETER NAME	PARAMETER DESCRIPTION	PARAMETER VALUES
Home Page	Setup	Active Baud Rate	Displays the active baud rate used for network communication.	Read Only
Home Page	Setup	Actuator Stroke Time	Sets the damper actuator stroke time. Note: The SE-ZEC5X0-1 actuator is a 60 second motor.	Adjustable: 30-120 seconds
Home Page	Setup	Application Type	Set the type of application for the VAV Box.	Adjustable: Incremental/Staged/ Proportional SCR
Home Page	Setup	Auto Tune Enable	Allows PRAC+ auto tuning algorithm to continuously tune the loops in the controller. Setting this to Disable turns off this feature.	Adjustable: Enable/Disable
Home Page	Setup	Autocalibration Command	This feature drives the VAV box damper shut and once shut offsets the differential pressure sensor so it reads zero.	Adjustable: False/True
Home Page	Setup	BACnet Id	Sets the BACnet ID for the BACnet MS/TP system.	Read Only: 0-4194302
Home Page	Setup	Box Heating Installed	Specifies if box re-heat is installed (local re-heat).	Adjustable: False/True
Home Page	Setup	Box Heating Type	Displays the type of heat installed.	Read Only: No Heat/1 Stage Electric /2 Stage Electric/ Modulating Hot Water Valve/3 Stage Electric

TABLE 3: DEFAULT SE-ZEC CONTROLLER PARAMETERS				
MENU 1	MENU 2	PARAMETER NAME	PARAMETER DESCRIPTION	PARAMETER VALUES
Home Page	Setup	Damper Mode	Defines the direction of the damper rotation. (Normal = CCW to close, Reverse = CW to close)	Adjustable: Normal/Reverse
Home Page	Setup	Discharge Air Temperature Offset	Used to calibrate the supply air temperature sensor.	Adjustable: -5°F to 5°F
Home Page	Setup	Fan Control Type	Set the type of fan for the VAV Box.	Adjustable: None/Parallel/Series
Home Page	Setup	Heating Limit Enable	Enables/Disables the activation of re-heat when the incoming air temperature exceeds the temperature set in Heating Supply Air Limit. This is to avoid engaging re-heat when the inlet temperature is too high.	Adjustable: False/True
Home Page	Setup	Heating Priority	Determines whether box or supplemental heat is turned on first.	Adjustable: Supplemental/Box
Home Page	Setup	Heating Supply Air Limit	Sets the highest inlet air temperature at which re-heat can be engaged when Heating Limit Enable is set to True. When the inlet air temperature is higher than Heating Supply Air Limit, re-heat cannot engage.	Adjustable
Home Page	Setup	Occupancy Determination Flow Setpoint	Sets airflow threshold for determining occupancy when Occupancy Sensor Enable is false. Whenever the measured flow exceeds the Occupancy Determination Flow Setpoint, the system will be in the occupied mode. Whenever the measured flow is less than the Occupancy Determination Flow Setpoint, the system will be in the unoccupied mode.	Adjustable: 0 cfm to 10000 cfm
Home Page	Setup	Occupancy Polarity	Sets input polarity of occupancy sensor when Occupancy Sensor Enable is True. Open = Unoccupied when open, Closed = Unoccupied when closed.	Adjustable: Close/Open
Home Page	Setup	Occupancy Sensor Enable	Enables determining occupancy by reading IN2 and ICOM2 on the controller via an occupancy sensor. When Occupancy Sensor Enable is disabled, occupancy is determined by comparing measured airflow to the Occupancy Determination Flow Setpoint.	Adjustable: Enable/Disable
Home Page	Setup	PID Tuning Reset	Resets the PRAC+ tuning parameters of the PID controllers to the factory defaults.	Adjustable: Enable/Disable
Home Page	Setup	Power Fail Restart Time	Sets the amount of time the controller waits to operate the unit after power is restored when Power Fail Restart Enable is True. This is to avoid a power surge with lights, computers, and other electrical loads that come back on immediately when power is restored.	Adjustable
Home Page	Setup	Standalone Min Occupied Time	After switching to occupied mode, the box will stay in occupied mode for at least the amount of time specified in Standalone Min Occupied Time, before being able to switch back to unoccupied mode.	Adjustable: 0-360 minutes
Home Page	Setup	Standalone Mode	Enables Standalone Mode. This mode is intended to allow the controller to utilize unoccupied setpoints when there is no connection to a building automation system. When Standalone Mode is enabled, occupancy is determined by comparing the measured flow against the Occupancy Determination Flow Setpoint when Occupancy Sensor Enable if False, or by using the Occupancy Sensor when Occupancy Sensor Enable is True.	Adjustable: Off/On
Home Page	Setup	Supplemental Heating Installed	Specifies if re-heat is installed in the zone/space (non box re-heat).	Adjustable: False/True
Home Page	Setup	Supply Air Temperature Offset	Used to calibrate the supply air temperature sensor.	Adjustable: -5°F to 5°F
Home Page	Setup	Supply Airflow Pickup Gain	Amplification provided by the pitot tube for supply flow.	Adjustable
Home Page	Setup	Supply Area	Shows the supply inlet area used to calculate the supply flow.	Adjustable: 0 sq. ft. to 8.0 sq. ft.
Home Page	Setup	Supply Flow	The supply airflow measured by the VAV box.	Read Only
Home Page	Setup	Supply Flow Setpoint	The flow setpoint the damper is controlling the supply air flow to. This will be based on the unit conditions (occupancy, temperature setpoint, morning warmup conditions, etc.)	Read Only
Home Page	Setup	Warmer/Cooler Adjust Enable	Enables the warmer/cooler adjustment to offset the current setpoint.	Adjustable: False/True
Home Page	Setup	Zone Temperature Offset	Used to calibrate the zone temperature sensor.	Adjustable: -5°F to 5°F
Home Page	Setpoints	Effective Cooling Setpoint	Effective Cooling Setpoint	Read Only
Home Page	Setpoints	Effective Heating Setpoint	Effective Heating Setpoint	Read Only
Home Page	Setpoints	Occupied Cooling Setpoint	When occupied the thermostat controls cooling to this level. Set above Occupied Heating Setpoint. Defaults to 72°F.	Adjustable: 46°F to 99°F
Home Page	Setpoints	Occupied Heating Setpoint	When occupied the thermostat controls heating to this level. Set below Occupied Cooling Setpoint. Defaults to 68°F.	Adjustable: 45°F to 98°F

TABLE 3: DEFAULT SE-ZEC CONTROLLER PARAMETERS (CONTINUED)				
MENU 1	MENU 2	PARAMETER NAME	PARAMETER DESCRIPTION	PARAMETER VALUES
Home Page	Setpoints	Standby Cooling Setpoint	In order for the Standby Cooling Setpoint to appear, set the Occupancy Schedule to external. When set to external the zone switches to this setpoint when motion is no longer sensed and the unit is occupied. Defaults to 74°F.	Adjustable: 46°F to 99°F
Home Page	Setpoints	Standby Heating Setpoint	In order for the Standby Heating Setpoint to appear, set the Occupancy Schedule to external. When set to external, the zone switches to this setpoint when motion is no longer sensed and the unit is occupied. Defaults to 66°F.	Adjustable: 45°F to 98°F
Home Page	Setpoints	Unoccupied Cooling Setpoint	When unoccupied the thermostat controls cooling to this level. Defaults to 80°F.	Adjustable: 46°F to 99°F
Home Page	Setpoints	Unoccupied Heating Setpoint	When unoccupied the thermostat controls heating to this level. Set below Unoccupied Cooling Setpoint. Defaults to 60°F.	Adjustable: 45°F to 98°F
Home Page	Setpoints	Warmer/Cooler Adjust Range	This is the range that the warmer cooler adjustment on the sensor can affect the setpoint. Setting it to zero (0) means the user has no adjustment at the sensor. Defaults to 5°F.	Adjustable: 0°F to 5°F
Home Page	Setpoints	Warmup Differential	Sets the required differential between the supply air temperature (SAT) sensor and the zone temperature (ZNT) sensor in occupied mode to notify the controller that warmup conditions are present. When warmup conditions are present the minimum supply airflow will be set to Warmup Min Flow.	
Home Page	Commissioning	Cooling Max Flow	Sets the maximum supply air flow of the VAV box when cooling.	Adjustable: 0 cfm to 10000 cfm
Home Page	Commissioning	Occupied Cooling Min Flow	Sets the minimum supply air flow of the VAV box when cooling.	Adjustable: 0 cfm to 10000 cfm
Home Page	Commissioning	Occupied Heating Min Flow	Sets the minimum supply air flow of the VAV box when heating. Note: When the zone is in heating mode, the supply air flow is constant. Thus, no maximum heating air flow. This value must exceed Staged Device Min Flow to allow electric heat to energize.	Adjustable: 0 cfm to 10000 cfm
Home Page	Commissioning	Staged Device Min Flow	Sets the minimum heating flow for electric reheat control. This parameter serves an additional control safety to the high-limit switches in the box. It is best practice to set this parameter to 70 cfm per kW of electric heat.	Adjustable: 0 cfm to 10000 cfm
Home Page	Commissioning	Unoccupied Cooling Min Flow	Sets the minimum supply air flow of the VAV box when unoccupied cooling and in the cooling mode.	Adjustable: 0 cfm to 10000 cfm
Home Page	Commissioning	Unoccupied Heating Min Flow	Sets the minimum supply air flow of the VAV box when unoccupied heating and in the heating mode.	Adjustable: 0 cfm to 10000 cfm
Home Page	Commissioning	Warmup Min Flow	Sets the minimum supply airflow when warmup conditions are present. Warmup conditions are present when the supply air temperature (SAT) sensor value exceeds the zone temperature (ZNT) sensor in unoccupied mode or exceeds it by the Warmup Differential in occupied mode.	Adjustable: 0 cfm to 10000 cfm
Inputs		Discharge Air Temperature	Discharge air temperature reading from the discharge air temperature sensor (if included).	Read Only
Inputs		Discharge Air Velocity Pressure	Displays differential pressure measured across the airflow probe.	Read Only
Inputs		Occupancy Status	Displays state of occupancy input.	Read Only
Inputs		Supply Air Temperature	Supply air temperature reading from the supply air temperature sensor (if included).	Read Only
Inputs		Zone Temperature	Displays temperature measured at zone sensor.	Ready Only
Outputs		Supply Air Damper Output	Displays damper position (0% = Fully Closed, 100% = Fully Open).	Read Only
Outputs		Supply Fan Command	Displays fan status.	Read Only
Parameters		Factory Use Only		

APPLICATION SPECIFIC PARAMETERS

Table 4 below shows application specific parameters for the staged, incremental, and SCR applications:

TABLE 4: APPLICATION SPECIFIC SE-ZEC CONTROLLER PARAMETERS

MENU 1	MENU 2	PARAMETER NAME	STG	INC	SCR	PARAMETER DESCRIPTION	PARAMETER VALUES
Home Page	Setup	Box Heating Polarity		•		Reverses the direction of the incremental heating valve. You can either switch this or reverse the wiring to the actuator.	Adjustable: Normal/Reverse
Home Page	Setup	Box Heating Stroke Time		•		Sets the actuator stroke time for incremental heating valve.	Adjustable: 30-120 seconds
Home Page	Setup	Dual Max Enable		•		Enables the Dual Max Control Sequence	Adjustable: Enable/Disable
Home Page	Setup	Number Of Heating Stages	•			Sets the number of box heating stages.	Adjustable: 0 - 3
Home Page	Setup	Supplemental Heating Polarity		•	•	Reverses the direction of the incremental supplemental heating valve. You can either switch this or reverse the wiring to the actuator.	Adjustable: Normal/Reverse
Home Page	Setup	Supplemental Heating Stroke Time		•	•	Sets the actuator stroke time for incremental supplemental heating valve.	Adjustable: 30-120 seconds
Home Page	Setpoints	Discharge Air Setpoint Heating Max		•		When the space temperature drops below the heating setpoint the zone controller will start from the supply air temperature setpoint and reset to the supply air setpoint heating max. Once the heating max setpoint is reached the supply air flow will be reset from heating minimum flow to cooling maximum flow.	Adjustable: 45°F to 140°F
Home Page	Setpoints	Discharge Air Temperature Setpoint		•		When the space temperature drops below the heating setpoint the zone controller will start from the supply air temperature setpoint and reset to the supply air setpoint heating max. Once the heating max setpoint is reached the supply air flow will be reset from heating minimum flow to cooling maximum flow.	Adjustable: 45°F to 130°F
Outputs		Heating Command			•	Displays the heat command (on/off) of the heat output to the proportional actuator or electric heat	Read Only
Outputs		Heating Output		•	•	Displays the heat command (0-100%) of the heat output to the proportional actuator or electric heat	Read Only
Outputs		Heating Stage 1 Command	•			Displays status of stage 1 heat.	Read Only
Outputs		Heating Stage 2 Command	•			Displays status of stage 2 heat.	Read Only
Outputs		Heating Stage 3 Command	•			Displays status of stage 3 heat.	Read Only
Outputs		Supplemental Heating Output		•	•	Displays the supplemental heat command (0-100%) of the heat output to the proportional actuator or electric heat	Read Only
Outputs		Supplemental Heating Stage 1 Command	•			Displays status of stage 1 supplemental heat.	Read Only

FACTORY PROGRAMMED PARAMETERS

This section outlines how the SE-ZEC Controller parameters are programmed at the factory.

DEFAULT PARAMETERS

The following table shows factory programming for SE-ZEC Controller parameters that are independent of inlet size and control sequence.

TABLE 5: FACTORY PROGRAMMED DEFAULT PARAMETERS

PARAMETER NAME	VALUE	PARAMETER NAME	VALUE
Supplemental Heating Stroke Time	N/A	Heating Supply Air Limit	75
Supplemental Heating Polarity	N/A	Rotation	90
BACnet ID	10000	Warmup Min Flow	200
BACnet Encoding Type	ISO10646	Occupied Cooling Setpoint	72
Power Fail Restart Time	180	Occupied Heating Setpoint	68
Warmer/Cooler Adjust Range	3	Unoccupied Cooling Setpoint	85
Warmup Differential	10	Unoccupied Heating Setpoint	55
Autocalibration Command	FALSE	Standby Cooling Setpoint	77
Zone Temperature Offset	0	Standby Heating Setpoint	66
Supply Air Temperature Offset	0	Standalone Min Occupied Time	15
Discharge Air Temperature Offset	0	Actuator Stroke Time	60
Heating Limit Enable	TRUE		

SIZE DEPENDENT PARAMETERS

The following table shows factory programming for SE-ZEC Controller parameters that are inlet size dependent.

TABLE 6: FACTORY PROGRAMMED SIZE DEPENDENT PARAMETERS

SIZE	4	5	6	7	8	9	10	12	14	16	20	22
Supply Area	0.087	0.136	0.196	0.267	0.349	0.442	0.545	0.785	1.069	1.396	0.738	2.667
Supply Airflow Pickup Gain	2.329	2.327	2.332	2.325	2.329	2.327	2.327	2.327	2.328	2.328	1.982	2.328
Cooling Maximum Flow	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order
Occupied Cooling Min Flow	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order
Unoccupied Cooling Min Flow	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order
Occupied Heating Min Flow	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order
Unoccupied Heating Min Flow	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order	Per Order
Staged Device Min Flow	55	85	110	140	190	240	300	425	580	750	425	1800
Occupancy Determination Flow Setpoint	29	46	66	89	117	148	182	262	357	466	267	891

SEQUENCE DEPENDENT PARAMETERS

The following section shows factory programming for SE-ZEC Controller parameters that are control sequence specific.

TABLE 7: FACTORY PROGRAMMED SEQUENCE SPECIFIC PARAMETERS							
CONTROL CODE	**6101, 7101**	**6102, 7102, 6106, 7106**	**6103, 7103**	**6104, 7104**	**6105, 7105, 6108, 7108**	**6107, 7107**	**6109, 7109**
Heating Type	Cooling Only	Staged	Staged	Staged	SCR	Incremental	Staged
Fan-Type	None	None	None	None	None	None	None
Number of Heating Stages	No Heat	1	2	3	No Stages	No Stages	No Heat
Damper Polarity	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Supplemental Heating Installed	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
Box Heating Installed	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE
Box Heating Stroke Time	N/A	N/A	N/A	N/A	N/A	60	N/A
Box Heating Polarity	N/A	N/A	N/A	N/A	N/A	Normal	N/A
Staged Device Min Flow	Per Size Table	Per Size Table	Per Size Table	Per Size Table	Per Size Table	N/A	Per Size Table
Occupancy Determination Flow Setpoint	Per Size Table	Per Size Table	Per Size Table	Per Size Table	Per Size Table	Per Size Table	Per Size Table
Occupancy Polarity	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Occupancy Sensor Enable	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Standalone Mode	TRUE, FALSE	TRUE, FALSE TRUE, FALSE	TRUE, FALSE	TRUE, FALSE	TRUE, FALSE TRUE, FALSE	TRUE, FALSE	TRUE, FALSE
CONTROL CODE	**6201, 7201**	**6202, 7202, 6206, 7206**	**6203, 7203**	**6204, 7204**	**6205, 7205, 6208, 7208**	**6207, 7207**	**6209, 7209**
Heating Type	Cooling Only	Staged	Staged	Staged	SCR	Incremental	Staged
Fan-Type	Series	Series	Series	Series	Series	Series	Series
Number of Heating Stages	No Heat	1	2	3	No Stages	No Stages	No Heat
Damper Polarity	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse
Supplemental Heating Installed	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
Box Heating Installed	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Box Heating Stroke Time	N/A	N/A	N/A	N/A	N/A	60	N/A
Box Heating Polarity	N/A	N/A	N/A	N/A	N/A	Normal	N/A
Staged Device Min Flow	0	0	0	0	0	N/A	0
Occupancy Determination Flow Setpoint	0	0	0	0	0	0	0
Occupancy Polarity	Close	Close	Close	Close	Close	Close	Close
Occupancy Sensor Enable	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Standalone Mode	TRUE,FALSE	TRUE, FALSE TRUE, FALSE	TRUE, FALSE	TRUE, FALSE	TRUE, FALSE TRUE, FALSE	TRUE, FALSE	TRUE, FALSE

TABLE 7: FACTORY PROGRAMMED SEQUENCE SPECIFIC PARAMETERS (CONTINUED)							
CONTROL CODE	6301, 7301	6302, 7302, 6306, 7306	6303, 7303	6304, 7304	6305, 7305, 6308, 7308	6307, 7307	6309, 7309
Heating Type	Cooling Only	Staged	Staged	Staged	SCR	Incremental	Staged
Fan-Type	Parallel	Parallel	Parallel	Parallel	Parallel	Parallel	Parallel
Number of Heating Stages	No Heat	1	2	3	No Stages	No Stages	No Heat
Damper Polarity	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse	Reverse
Supplemental Heating Installed	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
Box Heating Installed	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Box Heating Stroke Time	N/A	N/A	N/A	N/A	N/A	60	N/A
Box Heating Polarity	N/A	N/A	N/A	N/A	N/A	Normal	N/A
Staged Device Min Flow	0	0	0	0	0	N/A	0
Occupancy Determination Flow Setpoint	0	0	0	0	0	0	0
Occupancy Polarity	Close	Close	Close	Close	Close	Close	Close
Occupancy Sensor Enable	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Standalone Mode	TRUE, FALSE	TRUE, FALSE TRUE, FALSE	TRUE, FALSE	TRUE, FALSE	TRUE, FALSE TRUE, FALSE	TRUE, FALSE	TRUE, FALSE

COMMISSIONING

For networked units, SE-ZEC Controller parameters can be changed by the BAS. For stand-alone units, controller parameters can only be changed using the optional MAP Tool. An optional VAV Handheld balancing tool is available to aid in the balancing process.

MOBILE ACCESS PORTAL (MAP) GATEWAY

The Mobile Access Portal (MAP) Gateway is an alternate local display solution or a temporary portable commissioning device that enables users to leverage the power of mobility using smart phones, tablets, or laptop computers to interact with building automation equipment controls. The MAP Gateway serves up web pages through a built-in Wi-Fi access point or tethered Ethernet connection, which allows users to view and edit equipment controller configuration parameters, setpoints, schedules, and alarms through a browser. A mobile application is not required to use the MAP Gateway with your mobile device.

The MAP Gateway can be used to see field bus devices on Metasys® systems, Facility Explorer systems, and Smart Equipment rooftop units (RTUs) with unit control boards (UCBs). The MAP Gateway supports Johnson Controls® branded Field Controllers, including FEC, FAC, VMA, PCA, PCG, and PCV Series devices. MAP Gateway also supports the TEC3000 Series Thermostats.

The MAP Gateway comes in two configurations: a portable configuration and a stationary configuration. The portable configuration is an optional factory provided accessory (Part # PC-01-0206). PC-01-0206 includes the MAP Gateway, RJ-12 cable, bumper guard, and lanyard. To use the MAP Gateway:

1. Connect the MAP Gateway to Equipment
    a. Use the supplied RJ-12 cable to connect the RS-485 port of the MAP Gateway to the sensor bus or field bus port of the equipment controller, or to the zone sensor connected to the equipment controller.
    b. The MAP Gateway LEDs flash, indicating that the device is initializing. When the fault LED turns off and the Wi-Fi LEDs flash in succession, the MAP Gateway is ready to use.
2. Connect to the MAP Gateway Wi-Fi Network
    a. In the Wi-Fi settings of your mobile device or laptop, connect to the MAP Gateway Wi-Fi network using the credentials found in the MAP Gateway Quick Start Guide that is provided with the MAP Gateway (Part No. 24-10737-16)
3. Open a Web Browser
    a. On your mobile device or laptop navigate to www.mapgwy.com on your internet browser.
4. Log in to the MAP Gateway
    a. Log in to the MAP Gateway using the default Admin login credentials found in the MAP Gateway Quick Start Guide that is provided with the MAP Gateway (Part No. 24-10737-16)

5. Change Passwords
    a. The first time you log in to the MAP Gateway, the Change Password and Passphrase web page appears. You must change the Admin password and Wi-Fi passphrase. After you change the Wi-Fi passphrase or SSID, the web server restarts and you must rejoin the MAP Gateway Wi-Fi network using the new passphrase. On some mobile devices, you must select and forget the original MAP Gateway Wi-Fi network before rejoining the network with the new passphrase.
6. Use the MAP Gateway
    a. Select a device from the equipment list and use the web pages from the MAP Gateway to view, commission and configure devices as needed.

For more information on the MAP Gateway reference the following Johnson Controls documents:

- Installation Instructions: LIT-24-10737-8
- Catalog Page: LIT-1900869
- User's Guide: LIT-12011999
- Product Bulletin: LIT-12011884
- Technical Bulletin: LIT-12012015

VAV HANDHELD BALANCING TOOL

A Handheld Balancing Tool (Part # 15037701) can be used to aid in balancing units with SE-ZEC Controllers.

1. Connect the VAV Balancing Tool to the Network Zone Sensor associated with the controller you want to balance.
2. Press and hold the Enter and Cancel buttons on the VAV Balancing Tool for 5 seconds to enter balancing mode.
3. Balance the unit. Reference the Metasys Balancing Sensor User Guide that comes with the VAV Handheld Balancing Tool.

    Parameters that can be balanced include:

    - Cooling Max Flow [CMAX]
    - Cooling Min Flow [CMIN]
    - Heating Flow [HTG]
    - Differential Flow [DIFF]
    - Box Area [AREA]
    - Pickup Gain – K Factor [K]
    - dP Offset [DPO]
4. To Exit, Press the enter button when Exit appears on the screen at the highest sub menu.

For more information on the VAV Handheld Balancing Tool reference the following Johnson Controls documents:

- Catalog Page: LIT-1900348
- Installation Instructions: LIT-24-10211-2
- User Guide: LIT-24-10159-5

TROUBLESHOOTING

Use the following information to troubleshoot the SE-ZEC Controllers. *NOTE: Please use the appropriate personal protective equipment when troubleshooting.

POWER STATUS LED

Ensure SE-ZEC Controller is receiving power. A green LED shows the power supply status to the SE-ZEC Controller. LED OFF = No Power. LED ON = Power is supplied by primary voltage (normal operation)

COMMUNICATION BUS PROBLEMS

Several factors may influence the behavior of the FC Communication Bus.

I/O WIRING

The SE-ZEC Controller must be wired properly. If the SE-ZEC Controller is wired incorrectly, communication problems may occur. These problems include devices going online and offline, or devices not coming online at all.

DUPLICATE ADDRESSES

Two or more devices on a communication Bus cannot have the same address. Two controllers on the FC Communication Bus cannot both have an address of 18, for example. If two devices on the same Bus have the same address, performance can degrade or serious communication problems may occur. These problems include the devices not coming online and all communication stopping completely.

Check for duplicate addresses in the following ways:

- If a specific device is not communicating, remove the device with communication problems and check if device address remains online at the MAP Gateway to determine if the device address remains online.
- If the Bus communication problems are severe and no communication is present, or you cannot determine where communication is unreliable, partition (disconnect and isolate a portion of the Bus for testing purposes) and test the Bus portion connected to the Zone Coordinator.

CORRECT PHYSICAL COMMUNICATION BUS PROBLEMS

The communication Bus is subject to a number of physical factors that can affect performance. Consider the following list of common physical problems that affect the communications Bus:

1. Check status LED to verify power at the controller
2. Check wires
    - Verify that the wire is a 0.6 mm (22 AWG) three-conductor, twisted, shielded cable.
    - Ensure the wires are not broken or frayed. Check wire connections.

PARTS AND ACCESSORIES

TABLE 8: SE-ZEC CONTROLLER PARTS AND ACCESSORIES	
PART NUMBER	PART DESCRIPTION
PC-01-0189	SE-ZEC500-1 Standalone Controller (Un-programmed)
PC-01-0190	SE-ZEC510-1 BACnet Controller (Un-programmed)
PC-01-0159	TE-631GV-2 Supply Air or Discharge Air Temperature Sensor
PC-01-0206	TL-MAP1810-OP Mobile Access Portal Gateway
15037701	NS-ATV7003-0 VAV Handheld Balancing Tool
15037501	NSB8BTN241-0 Network Sensor (LCD Display)
15037503	NSB8BTN141-0 Network Sensor (Warmer/Cooler Interface)
15037502	NSB8BTN041-0 Network Sensor (No Display)

ADDITIONAL INFORMATION

- Refer to Johnson Controls LIT-24-10143-01493 for more information on the SE-ZEC Controllers.
- Refer to Johnson Controls LIT-1900217 for more information on the TE-631GV-2 supply air or discharge air temperature sensors.
- Refer to Johnson Controls LIT-1901099 for more information on NS8000 Series Network Sensors
- Refer to Johnson Controls LIT-12012362 for more information on networking the SE-ZEC Controllers.

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