



Installation and Setup Guide

ComfortSense® 8500 Commercial
Programmable Thermostat Series -
(14X57 and 14X58) (Zoning)

507612-02
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Supersedes 507612-01

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Shipping and Packing List

Verify the following items have been included with in the packing:

Table 1. Packing List

Quantity	Item
1	CS8500 Zoning Unit
1	Wall Plate
2	Mounting Plate
2	Wall Anchors
1	Warranty
1	User Guide



WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life.

Installation and service must be performed by a licensed professional HVAC installer (or equivalent) or service agency.

CS8500 Features

The ComfortSense® 8500 (CS8500) Commercial Series — Zoning is a thermostat which will communicate with the L Connection network. In addition, it can be used as a thermostat/zone controller. This CS8500 is available with or without CO₂ sensing option.

This CS8500 can be used along with ZoneLink and a Network Controller (NTC) to relay data to the M3 Unit controller. In-turn that data can be relayed via either BACnet or LonTalk to a building automation system.

Table 2. Model Information

Type	Model Number	Catalog #
Without CO ₂ Sensor	C0SNZN04FF1L	14X57
With CO ₂ Sensor	COSNZN31FF1L	14X58

For use with Emergence® commercial rooftop units equipped with Prodigy.

CO₂ models can be used to control Lennox' premium rooftop unit Demand Control Ventilation features based on CO₂ set points and conditions stored in the unit controller.

This CS8500 is a electronic touch screen interface devices. It also offers enhanced capabilities which include:

- Built-in humidification monitoring - range 5% to 95% with accuracy at + 5%.
- Built-in carbon dioxide monitoring (14X58 only) - range 400-2000 ppm, range 5% to 95% and with accuracy at + 40 ppm + 3% or reading @ 77°F (25°C). Sensor has built-in self-calibration algorithm.
- Temperature monitoring - two internal thermistors, range 32°F (0°C) to 99°F (37°C). Measurement accuracy + 0.5°F (-17.5°C).
- External indoor temperature sensor connections 10kΩ (47W37) or 11kΩ (94L61) — up to nine (9) sensor in parallel may be used.
- External occupancy sensor connection (24VAC).
- Supports 50 and 60Hz operations.

Product Dimensions

Unit Dimensions (H x W x D)

Case dimensions: 3-5/16 x 4-5/16 x 7/8 in. (84 x 110 x 22mm)

Wall Plate Dimensions (H x W)

Plate dimensions: 4-1/2" x 5-3/4" (114 x 146mm)

Wiring Specifications

Communication Wire

Use one of the following Lennox communication cables (twisted pair with shield plenum):

**Table 3. Twisted Pair Communication Wiring
(SysBus - Yellow)**

Catalog Number	Item
27M19	500 foot roll
94L63	1000 foot roll
68M25	2500 foot roll

Remote Sensor Wire

All remote sensors use standard non-shielded thermostat wiring; sensors may be wired using two wires of a multiple wire cable.

NOTE: *Outdoor and indoor sensor wire runs should not exceed 300 feet (100m).*

Transformer Wire

Standard thermostat wire (one pair 20 AWG minimum) may be used to wire the CS8500 to the optional wall plug 24VAC transformer 18M13 or other field-provided 2VA minimum, 24VAC output transformer.



CAUTION

This is a 24VAC low-voltage sensor. Do not install on voltages higher than 30VAC.

Do not short (jumper) across terminals to test installation. This will damage the sensor and void the warranty.

Installation

1. Unpacked the CS8500 and open the case with a thin-blade screwdriver. Place between wall base and unit and twist to separate unit from base.

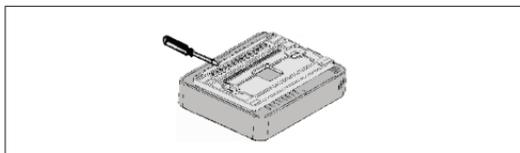


Figure 1. Removing Back Plate

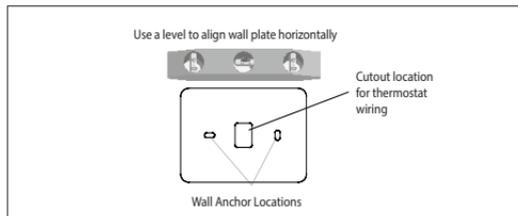
2. Select a location for the sensor about five (5) feet (1.5m) above the floor in an area with good air circulation at average temperature.
3. Do not install the CS8500 where it can be affected by:
 - Drafts or dead spots behind doors and in corners.
 - Entrance or automatic doors.
 - Heat generating equipment such as kitchen equipment.
 - Enclose environment unless a remote indoor sensor is used.
 - Hot or cold air from ducts.
 - Radiant heat from sun or appliances.
 - Concealed pipes and chimneys.

- Non-heated or non-cooled areas such as an outside wall behind the sensor.

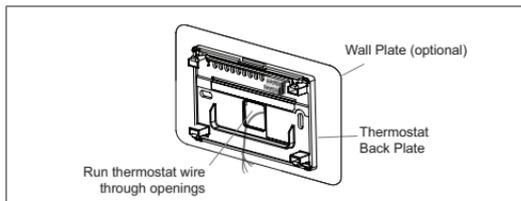
4. Use the following steps:

- Determine location using best practices.
- Use the provided wall plate as a template to determine location cutout for wiring and location for wall anchors.

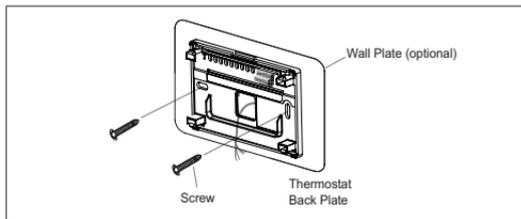
NOTE: The use of the provided wall plate is optional.



- Cut or drill a small hole approximately 3/4" x 3/3" for wiring.
- Pull about 3 inches of all wiring through opening and remove outer communication wire jacket.
- Trim 1/4" insulation from end of each wire.
- Drill 3/16" holes at marked locations on wall for wall anchors.
- Route CS8500 and outdoor temperature sensor (optional) wiring from wall through center openings on wall plate (use is optional) and back plate.



- Secure back plate and wall plate (optional) to wall with the two provided mounting screws.



NOTE: Remember to seal the hole in the wall with a suitable material to prevent drafts from entering the zone sensor case. Not doing so could affect the internal temperature and humidity sensors.

Terminal Connections

External sensors use standard thermostat wiring; and may be wired using two wires of a multiple wire cable. Wire run should not exceed 300 feet (100m).

Terminals **CM-** and **CM+** will require wiring as specified in "Table 3. Twisted Pair Communication Wiring (SysBus - Yellow)" on page 4.

Table 4. Twisted Pair Communication Wiring (SysBus - Yellow)

Terminals	Purpose
DO	10VDC to damper actuator
SG	Common to damper actuator
HR	Heat relay
FR	Fan relay
RH	Relay hot
R	24VAC
T T	External indoor temperature sensor (10K Ω or 11K Ω)
OC OC	Occupancy sensor
CM- CM+	Zone bus communications (L Connection)
C	24VAC common

IMPORTANT!

Damage to the ComfortSense 8500 may occur if 24VAC polarity is not maintained.

Wiring CS8500 (with or without CO₂)

Below are the terminal designations and a general description of their purpose.

1. Connect wiring between CS8500 and applicable controller.
2. Connect external sensors if applicable.
3. Seal the hole in the wall with a suitable material to prevent drafts from entering the CS8500 case.
4. Configure CS8500 and equipment for system type and test system.

CS8500 ZONING (14X57 OR 14X58) - (TEMPERATURE SENSOR AND RELAYS CONNECTIONS)

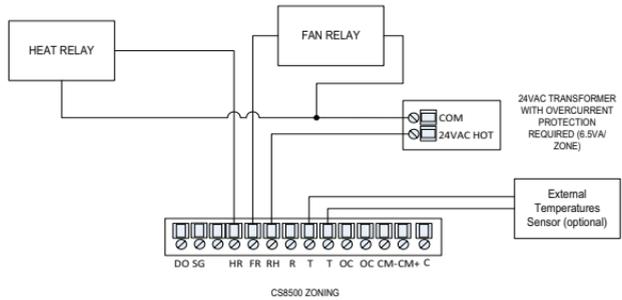


Figure 2. CS8500 Connections (14X57 or 14X58)

CS8500 ZONING (14X57 OR 14X58) - (ZONE LINK AND DAMPER ACTUATOR)

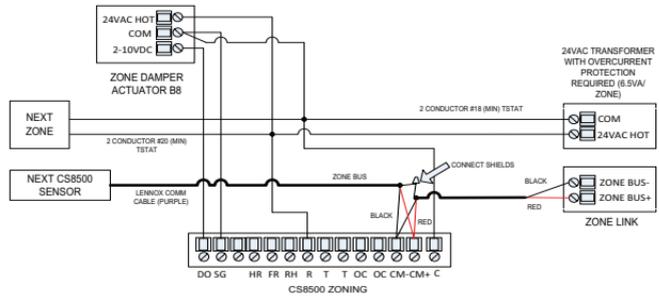


Figure 3. CS8500 Zoning Connections (14X57 or 14X58)

Installing Indoor Temperature Sensors

Wire external sensors as illustrated below. Up to nine sensors may be used in averaging sensor applications. Use Lennox catalog numbers 10k Ω (47W37) or 11k Ω (94L61). Sensors are not polarity sensitive.

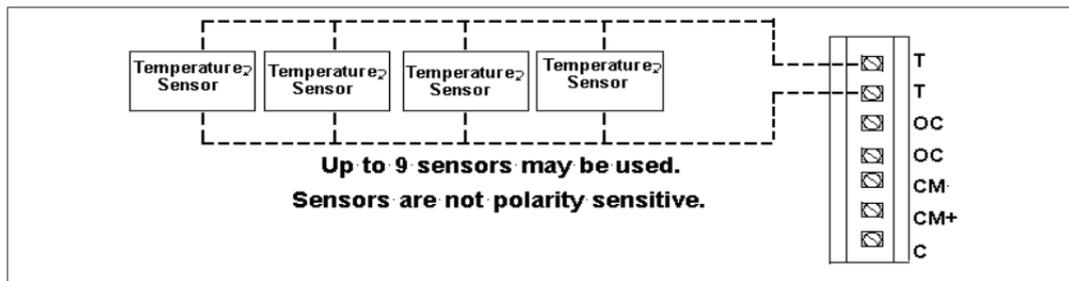


Figure 4. Temperature Sensor Wiring (parallel)

The CS8500 will calculate the average temperature readings from all connected external temperature sensors. If any of the sensors malfunction, they may still report a temperature value. Only when the average value of the connected temperature sensors including any malfunction sensor(s) is lower than -40°F, or higher than 158°F, will the CS8500 determine that an external temperature sensor(s) has failed and switch automatically to the CS8500's internal temperature sensor. A error message will be displayed on the home screen and under notification screen indicating an "external temperature sensor" error.

Installing Occupancy Sensor

When occupied the sensor will output 24VAC and 0VAC when unoccupied. Below is an example on how to make connections for a occupancy sensor.

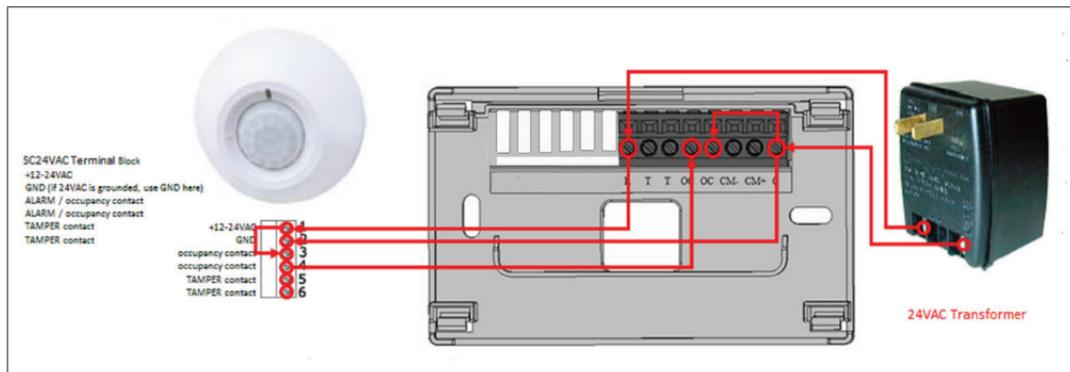


Figure 5. Occupancy Sensor Connections and 24VAC Transformer

Fan and Heat Relay Outputs

Table 5. Fan and Heat Relay Outputs

		Local Heat Mode				Heating Mode	
		First Stage Heat		Second Stage Heat		First and Second Stage Heat	
Fan Type	Heat Type	Fan Output	Heat Output	Fan Output	Heat Output	Fan Output	Heat Output
None	None	-	-	-	-	-	-
Series	None	On	-	On	-	On	-
Parallel	None	On	-	On	-	Off	-
None	Reheat	-	On with unit blower damper to Vent	-	On with unit blower damper to Vent	-	Off
Series	Reheat	On	On	On	On	On	Off
Parallel	Reheat	On	On	On	On	Off	Off
None	Auxiliary	-	Off	-	On with unit blower	-	Off
Series	Auxiliary	On	Off	On	On	Off	Off
Parallel	Auxiliary	On	Off	On	On	Off	Off
None	Peripheral	-	On	-	On	-	On
Series	Peripheral	On	On	On	On	On	On
Parallel	Peripheral	On	On	On	On	Off	On

NTC or Unit Controller System Setups

The optional settings (M2 ECTOs or M3 Parameters) can be adjusted using Unit Controller software, a PC with UC software, and L Connection PC converter. Settings do not have to be adjusted for zoned system operation; default parameters will be used. See the M2 and M3 application guides for additional M2 ECTOs or M3 Parameters information.

NTC Setup

ECTO A4.07 - Set to 1. Enables remote sensor mode in the NTC.

M1 or M2 Unit Controller Setup

The following options (M1/M2 ECTOs and M3 Parameters) must be set when the CS8500 is used.

ECTO 6.01 - Set to 4 through 7. Tells the M1/M2 unit controller what control mode and back-up set points to use.

- 4 = Remote Demand mode with no backup.
- 5 = Remote Demand mode with local sensor backup.
- 6 = Remote Demand mode with return air sensor backup.
- 7 = Remote Demand mode with zone sensor backup.

ECTO 5.27 - Set to 2, 3, 10, or 11, depending on the options available. Zone temperature reading is standard on all models. Setting tells the M1/M2 unit controller where to get zone temperature, CO₂, and indoor RH input.

- 2 = Zone temperature (A2)

- 3 = Zone temperature and IAQ (A63)
- 10 = Zone temperature and indoor RH (A91)
- 11 = Zone temperature, IAQ, and indoor RH

ECTO A4.07 - Set to 1. Enables remote sensor mode in the network thermostat controller (NTC).

M3 Unit Controller — L Connection Setup

To enable the M3 Unit Controller to use the CS8500, use the following procedure:

1. Set **CONFIGURATION ID1**, position **5** to **N**.
2. Go to **SETUP** and select **NETWORK INTEGRATION**.
3. Use the adjust and set values arrows to display **L-CONNECTION** and press the **SAVE** button to continue.
4. Adjust the **L-CONNECTION ADDRESS** if required and press **SAVE** button to continue.

NOTE: *In most cases both the L-Connection address setting and CS8500 address setting will need to be exactly the same. One exception would be in multi-zone applications.*

5. **CONTROL MODE** will need to be set to **NETWORK THERMOSTAT**. Press the **SAVE** button to continue.
6. **NETWORK SENSOR > CO2** (if equipped) needs to be set to **YES** if needed. Press the **SAVE** button to continue.

7. **NETWORK SENSOR > RELATIVE HUMIDITY** needs be set to **YES** if needed. Press the **SAVE** button to continue.
8. **NETWORK SENSOR > TEMPERATURE** will need to be set to **YES** (mandatory).
9. Press the **SAVE** and quit the menu.

NOTE: *If the CS8500 is not communicating with the Unit Controller, cycle power to the Unit Controller.*

M3 Unit Controller — Return Air Temperature Limits Setup

The M3 unit controller may be set up to monitor return air temperature and interrupt the demand if return temperature is above the heating adjustable limits.

To enable this feature set parameters 113 and 115 locally at the Prodigy 2.0 unit controller which is located inside Lennox rooftop unit.

- Adjusting parameter 113 enables return room temperature limits. Default is 0 (OFF). To enable set to 1 (ON). Go to **SETTINGS > RTU OPTION > EDIT PARAMETER = 113 (EN RET AIR TMP LMT)**
- Adjusting parameter 115 is used to interrupt a heating demand. Default is 85.0°F. Adjustable range is 60.0°F to 100.0°F. Go to **SETTINGS > RTU OPTION > EDIT PARAMETER = 115 (HEAT RET AIR LIMIT)**

If return air temperature is above the adjustable limits, alarm code 40 will be displayed but not stored in memory for recall.

CS8500 Troubleshooting

1. Make sure 24VAC is supplied to the CS8500.
2. Check communication cable wiring.
3. Verify that the sensor data from the zone sensor display matches the Prodigy Unit Controller display.
4. For the M1 unit controller (IMC), use the IMC MODE TEMP switch to display the data.
5. For the M2 unit controller use the **DATA > SENSORS** menu to display the data.
6. For the M3 Unit Controller use the **DATA > IN/OUTPUT > SENSORS > NETWORK**.

CS8500 Zoning Configuration

Multiple CS8500s (14X57 or 14X58) cannot be connected directly to the Prodigy Unit Controller for zoning applications. From the Prodigy unit controller a connection is made to the Zone Link device and a separate connection is made from the Zone Link to the Network Control Panel (NCP).

Connect the L Connection PC Converter phone cable to the NCP to configure all of the CS8500s. When the converter is connected to the CS8500, only the Controllers on that Zone Bus can be adjusted.

The following optional settings (M2 ECTOs or M3 Parameters) can be adjusted using Unit Controller software, a PC with UC software, and L Connection PC converter. Settings do not have to be adjusted for zoned system operation; default parameters will be used. See the M2 and M3 application guides for additional M2 ECTOs or M3 Parameters information.

NOTE: *One exception is the installation of a zone terminal box. Heat Type and Fan Type must be set.*

Main Screen Display Options

- Setpoint High Resolution
- Zone Temperature High Resolution
- CO₂ Display
- Outdoor Temperature
- Temperature Set points
- RH

- Damper Position
- Momentary Back Light - Display back light intensity within 30 seconds of button being pressed.
- Continuous Back Light - Display back light intensity all of the time.

Fan Type

Terminal Box Fan Type - none, series, or parallel.

Heat Type

Zone Heat Type - none, terminal box, auxiliary, peripheral.

Heating

- Heating votes (1st stage: 2nd stage).
 - > 0:0 - No votes (no affect on system heating demands).
 - > 0:1 - Vote only when sensing high zone heating demand.
 - > 1:1 - Vote single weight vote during either low or high zone heating demand
 - 1:2 - Vote single weight during low zone heating demand, vote double weight during high demand.
- Heating Differential 1 - Defines the temperature below setpoint that creates a low heating demand.
- Heating Differential 2 - Defines the temperature below setpoint that creates a high heating demand. Must be greater than Differential 1.

- Heating Deadband - Defines the temperature above demand start temperature that ends the demand.
- Heating Integration Constant - The integration time, in seconds, that is used in the damper position control algorithm during a zone heating demand.
- Heating Proportional Constant - The proportion band, in degrees Fahrenheit, that is used in the damper control algorithm during a zone heating demand.
- Heating Supply Air Temperature Differential - The amount warmer that the supply air temperature must be than the zone temperature, to be used for a heating demand.

Damper

- Minimum zone damper position.
- Maximum zone damper position.
- Zone damper ventilation position.
- Zone control loop reset position (damper starting position).
- Zone CO₂ setpoint for ventilation (IAQ / indoor air quality ventilation setpoint 500-2000ppm of CO₂).

Cooling

- Cooling Votes (1st Stage; 2nd Stage)
 - > 0:0 - No votes (no affect on system cooling demands).
 - > 0:1 - Vote only when sensing high zone cooling demand.
 - > 1:1 - Vote single weight vote during either low or high zone cooling demand.
 - > 1:2 - Vote single weight during low zone cooling demand, vote double weight during high demand.
- Cooling Differential 1 - Defines the temperature above setpoint that creates a low cooling demand.
- Cooling Differential 2 - Defines the temperature above setpoint that creates a high cooling demand. Must be greater than Differential 1.
- Cooling Deadband - Defines the temperature below demand start temperature that ends the demand.
- Cooling Integration Constant - The integration time, in seconds, that is used in the damper position control algorithm during a zone cooling demand.
- Cooling Proportional Constant - The proportion band, in degrees Fahrenheit, that is used in the damper control algorithm during a zone cooling demand.

Setpoint Range and Sensor Calibration

There is a set point adjustment range except when the zone is in manual mode.

- Internal temperature offset calibration.
- External temperature offset calibration.
- RH offset calibration.

Troubleshooting

Make sure the CS8500 is displayed on the NCP network list. If the CS8500 is not displayed:

1. Make sure 24VAC is supplied to the CS8500.
2. Make sure the CS8500 address setting is different from all other CS8500s on its ZoneBus.
3. Check communication cable wiring: the red and black leads should be connected to CS8500's CM- and CM+ terminals.
 - Make sure connections are correct at the Zone Link and unit.
 - Verify communication using LEDs on the Zone Link and IMC or NTC.
4. Make sure the IMC or NTC is setup for zoning application. Refer to the Zone Link installation instruction.
5. Re-poll the network at the NCP (see NCP user's manual).

Verify that the sensor data from the CS8500 display matches the NCP zone data screen.

Parameters (ECTOs)

Table 6. Parameters

	NAME	DESCRIPTION	MIN	MAX	DEF.	UNIT	Notes
D0	DISPLAY_ OPT	bit	Option				
		7	1, Disable override button				
		6	Damper				
		5	RH				
		4	Set points				
		3	Outdoor Temperature				
		2	CO ₂				
		1	Zone Temp. High Resolution				
	0	Setpoint High Resolution	0	255	8		
D1	BACKLIGHT	Upper nibble: bright setting, lower nibble: dim setting	0	255	98(\$62)		
D2	SP_ADJ_ RNG	Setpoint Adjustment Range	0	40	8		
			0	10	2	°F	
D3	IT_CAL	Calibration factor, internal temperature	-5	5	0	°F	
			236	20	0		
D4	ET_CAL	Calibration factor, external temperature	-5	5	0	°F	
			236	20	0		

Table 6. Parameters

	NAME	DESCRIPTION	MIN	MAX	DEF.	UNIT	Notes
D5	RH_CAL	Calibration factor, RH sensor	-5	5	0	%	
			251	5	0		
D6	CO2_CAL	Calibration factor, CO ₂ sensor	-200	200	0	PPM	Last of the Sensor Only ECTOs.
			236	20	0		
D7	FAN_TYPE	None, series, parallel	0	2	0		
			None	Parallel	None		
D8	HEAT_TYPE	None, reheat, auxiliary, peripheral	0	3	0		
			None	Peripheral	None		
D9	DAMP_MIN	Minimum damper position	0	100	20	%	
D10	DAMP_MAX	Maximum damper position	0	100	100	%	
D11	DAMP_VNT	Damper ventilation position	0	100	60	%	
			0	255			
D12	DAMP_RST	Damper control loop reset position	0	100	50	%	
			0	255			
D13	IAQ_SP	CO ₂ setpoint to go to vent position	50	201	201		201 is Off.
D13	IAQ_SP	CO ₂ setpoint to go to vent position	500	2000	2000	PPM	
	Name	DESCRIPTION	MIN	MAX	DEF.	UNIT	Notes
D14	VOTING_COOL	(1st stage: 2nd) 0:0, 0:1, 1:1, 1:2	0	3	3		
			0:00	1:02	1:02	Votes	

Table 6. Parameters

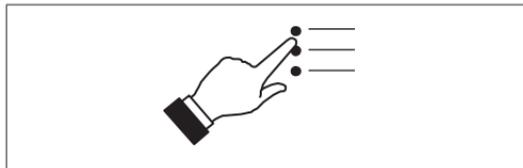
	NAME	DESCRIPTION	MIN	MAX	DEF.	UNIT	Notes
D15	CLG_DF	First cooling setpoint differential	0	3	0.5	°F	
			0	12	2	Counts	
D16	CLG_DF2	2nd cooling setpoint differential	0	3	1	°F	
			0	12	4	Counts	
D17	CLG_DB	Cooling deadband	1	4	2	°F	
			4	16	8	Counts	
D18	CLG_TI	Integration constant, cooling	100	2550	1200	SEC	0 is no integration term.
			10	255	120	Count	
D19	CLG_PB	Proportional constant, cooling	2	30	4	°F	0 or 31 is no PI control; damper operates at reset value.
D20	VOTING_ HEAT	(1st stage: 2nd) 0:0, 0:1, 1:1, 1:2	0	3	3		
			0:00	1:02	1:02	Votes	
D21	HTG_DF	First heating setpoint differential	0	3	0.5	°F	
			0	12	2	Counts	
D22	HTG_DF2	2nd heating setpoint differential	0	3	1	°F	
			0	12	4	Counts	
D23	HTG_DB	Heating deadband	1	4	2	°F	
			4	16	8	Counts	

Table 6. Parameters

	NAME	DESCRIPTION	MIN	MAX	DEF.	UNIT	Notes
D24	HTG_TI	Integration constant, heating	100	2550	1200	SEC	0 is no integration term.
			10	255	120	Count	
D25	HTG_PB	Proportional constant, heating	2	30	4	°F	0 or 31 is no PI control; damper operates at reset value.
			2	30	4		
D26	SA_DF	Supply air differential, determines if suitable for heating	0	20	10	°F	

Menu Options

During initial power up of the CS8500, the technician settings menu will appear first. The S-bus address option must be selected and a address set before you can proceed. Use either the minus/plus buttons or numeric keypad to enter the address. After the s-bus address is set, press the back button to return to the technician settings menu.



Menu includes the following selections:

- Notifications
- Owner Settings
- Technician Settings

Notifications

When a system error occurs, a pop-up screen will appear indicating the condition.

- Error code notification pop-up can be dismiss by pressing the **OK** button. Contact the contractor to resolve the issue.

Any active history for notifications are listed under **settings > notification**.

1. Press the down arrow icon next to the notification to expand the notification for further details.
2. Press the contractor info option for assistance.

Owner Settings

See the included user guide for further details.

Technician Settings

If you need to access the technician settings option in the future, go to the home page, press **menu** > **technician settings** and enter technician PIN code 864. This code cannot be changed.

1. S-Bus Address

Options are 0 through 31. Select address and press the set button to save the setting and return to the technician setting screen.

2. Display on Home Screen

Turn ON or OFF for the followings options:

- CO₂ value (only on models with CO₂ sensor).
- Box heater state.
- Box fan state.
- RTU function state.
- Service required alert.

Factory default is OFF for all of the above options. Press < in the upper left-hand corner of the screen to return to the technician settings menu.

3. Contractor Information

Information to be completed for this option is name, address, phone, email and website. Press < in the upper left-hand corner of the screen to return to the technician settings menu.

4. Temperature Sensor Config.

Temp. Sensor source by default is set to internal temp. sensor. The other option is external temp. sensor(s). When external temp. sensor(s) is selected, the following settings need to be configured;

- Number of external temp. sensor: Default is 1, and up to nine can be selected.
- Type of external sensor: Options are 10k sensor type 2 (47W37) or 11k sensor type 2 (94L61). Default sensor type is 10k sensor type 2.

Press < in the upper left-hand corner of the screen to return to the technician settings menu.

5. Offsets

- Internal temp. Sensor offset: Offset for the built-in temperature sensor (internal) is -5°F to +5°F. Default is 0°F.
- External temp. sensor offset (only selectable when external temp. sensor is selected under temperature sensor config.): Offset for the external temp. sensor is -5°F to +5°F. Default is 0°F.
- Humidify offset: The setting option for this is -10% to +10%. Default is 0%.
- CO₂ sensor offset: Offset for the CO₂ sensor is -200 ppm to +200 ppm. Default is 0 ppm. (Only on models with internal CO₂ sensor.)

6. **Temperature Adjustment Range**

The adjustment range for screen unlock is 0 to 10 degrees in increments of 1 degree. The default setting is 2. There is a on / off adjustment for screen lock as well.

7. **Remember Override Setpoint**

This setting is only available when local scheduling is set to ON. When an override is set the status text will display "Period of Time" instead of "Schedule Hold".

When an override is set the unit will remember this override setting for the current occupied period and re-apply it at the same occupied period, every time it occurs.

This setting will be able to be enabled or disabled.

8. **Reset to Factory Defaults:**

There are three options under this setting, partial reset and all reset.

- Reset all settings - Resets everything to factory default.
- Reset all owner settings - Resets all owners settings listed under general display menus.
- Reset technician settings: Resets all technician settings listed on the technician menu.

Press < in the upper left-hand corner of the screen to return to the technician settings menu.

9. **Installation Test**

The installation test function allows the

technician to check the HVAC system after the CS8500 setup has been completed. Test options are fan relay, heater relay and damper position. The damper position range bar allow the position of the damper to be manually set from fully closed (0%) to fully open (100%).

NOTE: *In test mode normal operation is suspended and the technician can exercise all of the outputs (fan, heat and damper). No save parameters are modified in this process.*

10. **Change Owner Pin**

This option is used to create or change the owner pin number when screen lock is enabled under the owner settings > generals settings. The default owner pin is 864. Screen lock can be set under home screen > menu > owner settings > general. Screen lock ON or OFF. Default is OFF.

11. **Damper Invert**

Options for this setting are ON or OFF. Default is OFF.

- When damper invert option is set to OFF, the analog control for the damper actuator is a 2-10VDC with 10VDC being fully closed. The CS8500 uses percent (%) for bypass damper position. For example, 70% bypass damper position equals 4.4VDC.

- When damper invert option is set to ON, the analog control for the damper actuator is a 2-10VDC with 2VDC being fully closed. The CS8500 uses percent (%) for bypass damper position. For example, 30% bypass damper position equals 4.4VDC.

Table 7. Damper Invert is OFF

Damper Position (%)	Control Voltage (VDC)
0 (closed)	10.0
10	9.2
20	8.4
30	7.6
40	6.8
50	6.0
60	5.2
70	4.4
80	3.6
90	2.8
100	2.0

Table 8. Damper Invert is ON

Damper Position (%)	Control Voltage (VDC)
0 (closed)	2.0
10	2.8
20	3.6
30	4.4
40	5.2
50	6.0
60	6.8
70	7.6
80	8.4
90	9.2
100	10.0

System Status Descriptions

The technician system status icon screen can be accessed by pressing the *** (three dots) which is located on the left side of the home screen. Then press the view status option.

Press the red toolbox to access the technician system status screen. Technician pin 864 is required to access that screen.

Table 9. System Status Descriptions

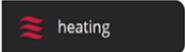
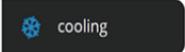
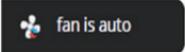
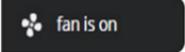
Icon	Icon Location	Description
 heating	Home Screen	When current RTU function is heating, this icon will be displayed.
 cooling	Home Screen	When current RTU function is cooling, this icon will be displayed.
 dehumidifying	Home Screen	When current RTU function is dehumidifying, this icon will be displayed.
 fan is auto	Home Screen	When fan operation was set to auto, if blower of RTU is ON, this icon will be displayed.
 fan is on	Home Screen	When fan operation was set to on, if RTU blower is ON, this icon would be displayed.
 CO ₂ 1265 ppm	Home Screen	This icon is displayed on the screen in CO ₂ mode. If display function is turned on

Table 9. System Status Descriptions

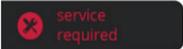
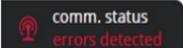
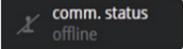
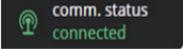
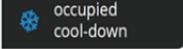
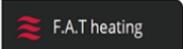
Icon	Icon Location	Description
	Home Screen	When either of following error occur, this icon would be displayed. <ul style="list-style-type: none">• Some RTU compr. Locked• All RTU compr. Locked• RTU fault state - fault detected• CS fault state - fault detected
	Technician Status Screen	There are communication errors.
	Technician Status Screen	Lost communications with host.
	Technician Status Screen	There are no communication errors.
	Technician Status Screen	When RTU state is warm-up mode coming out of an unoccupied state, this icon will be displayed.
	Technician Status Screen	When RTU state is cool-down mode coming out of an unoccupied state, this icon will be displayed.
	Technician Status Screen	Fresh air tempering heating

Table 9. System Status Descriptions

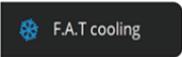
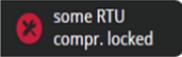
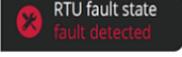
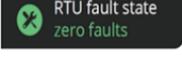
Icon	Icon Location	Description
	Technician Status Screen	Fresh air tempering cooling
	Technician Status Screen	Fresh air tempering dehumidifying.
	Technician Status Screen	This status is displayed when the RTU compressor has partially failed (or generates an error).
	Technician Status Screen	This status is displayed when all RTU compressors have failed (or error occurred).
	Technician Status Screen	RTU faults detected
	Technician Status Screen	No RTU faults detected

Table 9. System Status Descriptions

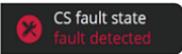
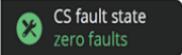
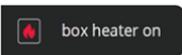
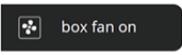
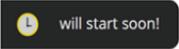
Icon	Icon Location	Description
	Technician Status Screen	<p>When the CS8500 (CS) state has a fault state, this icon would be displayed. The following possible errors may have occurred which would generate this icon:</p> <ul style="list-style-type: none"> • Local Temp Sensor error • External sensor error • Memory error • Hum sensor error • CO₂ sensor error
	Technician Status Screen	No faults detected
	Technician Status Screen	<p>Current damper position would be displayed. Minimum value is 0%. Maximum value is 100%.</p>
	Technician Status Screen	<p>When box heater is on, this status is displayed Display / hide the display of [technician system status] with [box heater state] of [home screen display options] in [system configuration]</p>
	Technician Status Screen	<p>When box fan is on, this status is displayed Display / hide the display of [technician system status] with [box fan state] of [home screen display options] in [system configuration]</p>

Table 9. System Status Descriptions

Icon	Icon Location	Description
	Technician Status Screen	<ol style="list-style-type: none"><li data-bbox="429 194 1129 243">1. The box heater is "none" and satisfies "room temperature + SA_DF Discharge Air Temperature" when there is a heat demand<li data-bbox="429 253 1129 279">2. There is a cool request, but the RTU is not in the cooling state <p data-bbox="429 290 1129 315">This Status is displayed when either of the above 1 or 2 is satisfied</p>

Error Codes and Reminders

Table 10. Error Codes

Condition	Issue	Display	System Action	Action to Clear / Recovery Condition
Critical	Built-In Temp Sensor error - temperature sensor reads -4°F or less or 158°F (+ 5°F) or greater.	Temperature Sensor Error	Indoor temp is displayed as "--" on the home screen. This error is displayed on the notification screen as well.	If the sensor starts detecting a normal operating range, the error message will automatically clear and the system will return to normal operation. Contact service contractor to replace the CS8500.
Critical	Remote temperature sensor error. External sensor reads -4°F or less or 158°F (+ 5°F) or greater.	External Sensor Error	Indoor temp is displayed as "--" on the home screen. This error is displayed on the notification screen as well. When configured for external temperature sensors and there is an error, the unit will automatically switch to the internal temperature sensor.	If the sensor starts detecting a normal operating range, the error message will automatically clear and the system will return to normal operation. Contact service contractor to replace the external temperature sensor. Other than replacing the CS8500, go to the technician setting > temperature sensor configuration and change the temperature sensor source back to internal temperature sensor. That will remove the error message from the home and notification screens.

Table 10. Error Codes

Condition	Issue	Display	System Action	Action to Clear / Recovery Condition
Critical	EEPROM error (power-on)	Memory Error	System will restore all settings to factory default and resume operations. This error is displayed in notification screen.	Contact service contractor to replace the CS8500.
Critical	EEPROM error (operating)	Memory Error	System will operate in normal mode until power off. This error is displayed in notification screen.	Contact service contractor to replace the CS8500.
Critical	Humidity sensor error (without Humidifier or Dehumidifier): Sensor reads out of range 0% to 100%	Humidity Sensor Error	<ul style="list-style-type: none">The reading for humidity is not valid. This message indicates humidity sensor is not working correctly. When there is an error the home screen humidity display will indicate "--".This error is displayed on the notification screen as well.	Contact service contractor to replace the CS8500. If the sensor starts detecting a normal operating range, the error message will automatically clear and the system will return to normal operation.

Table 10. Error Codes

Condition	Issue	Display	System Action	Action to Clear / Recovery Condition
Critical	CO ₂ Sensor error - sensor reads out of range (above 3500 ppm)	CO ₂ Sensor Error	<p>The reading for CO2 is not valid. This message indicates CO2 sensor is not working correctly.</p> <p>The display of Indoor CO₂ from HOME will be "---".</p> <p>This error is displayed on the notification screen as well</p>	<p>Contact service contractor to replace the CS8500.</p> <p>If the sensor starts detecting a normal operating range, the error message will automatically clear and the system will return to normal operation</p>
Critical	Comm error state at start-up.	Comm Status – Errors Detected	<p>When the failed (off-line) state is detected, continue listening for a valid message.</p> <p>If this occurs then normal operation should resume.</p> <p>This error is displayed in notification screen.</p>	<p>Contact service contractor to check communication wire connection.</p> <p>If a valid message is received, then the error message will be automatically cleared and system will resume normal operations.</p>
Critical	Some RTU compressors Locked	Some RTU Compressors Locked	<p>This error is displayed in notification screen and technician system status screen.</p>	<p>User will have to contact the Service Contractor to have the system serviced.</p> <p>Will need to check RTU state</p> <p>If the RTU recovered from the error automatically the error will also automatically clear.</p>

Table 10. Error Codes

Condition	Issue	Display	System Action	Action to Clear / Recovery Condition
Critical	All RTU compressors Locked	All RTU compressors Locked	This error is displayed in notification screen and technician system status screen.	User will have to contact the Service Contractor to have the system serviced. Will need to check RTU state If the RTU recovered from the error automatically the error will also automatically clear.
Critical	RTU Fault State Detected	RTU Fault State Detected	This error is displayed in notification screen and technician system status screen.	User will have to contact the Service Contractor to have the system serviced. Will need to check RTU state. If the RTU recovered from the error automatically the error will also automatically clear.
Minor	Outdoor Temperature (RT17) Sensor Problem	Outdoor Temp Sensor	Displayed in notification screen.	If measurement of the outdoor temperature sensor is out of specified range (including open / short detection, the alarm will be activated. Alarm will automatically clear once in range condition is detected. Check sensor and wiring.
Minor	Discharge (Supply) Air Temperature Sensor (RT6) problem.	Discharge Air Temp Sensor	Displayed in notification screen.	If measurement of the discharge air temperature sensor is out of specified range (including open / short detection, the alarm will be activated. Alarm will automatically clear once in range condition is detected.

Table 10. Error Codes

Condition	Issue	Display	System Action	Action to Clear / Recovery Condition
Minor	Return Air Temperature Sensor (RT16) problem	Return Air Temp Sensor	Displayed in notification screen.	If measurement of the return air temperature sensor is out of specified range (including open / short detection), the alarm will be activated. Alarm will automatically clear once in range condition is detected. Check sensor and wiring.
Minor	Advanced Airflow Low Outdoor Airflow	Economizer Fault	Displayed in notification screen.	Outdoor airflow is too low so the building is not getting the designed outdoor airflow based on IAQ.
Minor	Advanced Airflow Outdoor Airflow Too High	Economizer Fault	Displayed in notification screen.	Ventilation CFM is too high so the RTU is wasting energy.
Minor	OA Damper Error (During Free Cooling)	Economizer Fault	Displayed in notification screen.	During free cooling damper is not modulating.
Minor	Not Economizing When Outdoor Air is Suitable	Economizer Fault	Displayed in notification screen.	May be due to the damper motor being unplugged or disconnected.
Minor	Economizing When Outdoor Air is Not Suitable	Economizer Fault	Displayed in notification screen.	This may be due to damper motor being blocked or stuck open and therefore not closing.