Installation, Operation & Maintenance of the T_3SQ Analog VAV Diffuser

Step 1

The units should be shipped assembled except for the backpan. The thermal T_3SQ is shipped with additional packaging to protect the actuator assembly. Remove all packaging from the components.

If the unit is not assembled, follow the steps below before proceeding (see Figure 1):
1. Insert the control disc guide into the control disc.
2. Screw the bottom of the actuator / control disc assembly into the mounting channel.

Note: The T_3SQ-1 diffuser is shipped as a dummy unit. Master and drone operation is determined by the wiring – discussed in Step 3. Master and drone locations are not needed at this point in installation.

Step 2

Place the back pan into ceiling grid. Connect duct work to back pan. Insert the supply air temperature sensor into the supply duct. If the unit has an optional inlet heater, the supply air sensor must be positioned above the heater in the supply duct.

Set minimum airflow by adjusting the brass nuts at the top of the actuator shaft. 0.5" down from the top of the shaft allows the diffuser to go to the full closed position.

Step 3

Installation is completed by lining up the hooks on the face plaque assembly with the corresponding slot. Insert the RJ-45 cable on actuator / control disc assembly through wiring conduit. The hooks are inserted and the face plaque assembly is rotated clockwise, and lowered so that each hook is firmly in place. (See Figure 2)

Plug the RJ-45 cable on actuator / control disc assembly into any RJ-45 jack on the wiring interface box on the backpan.

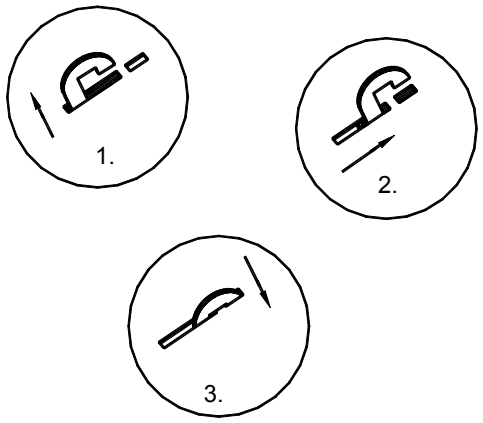


Figure 2. Face Panel Installation

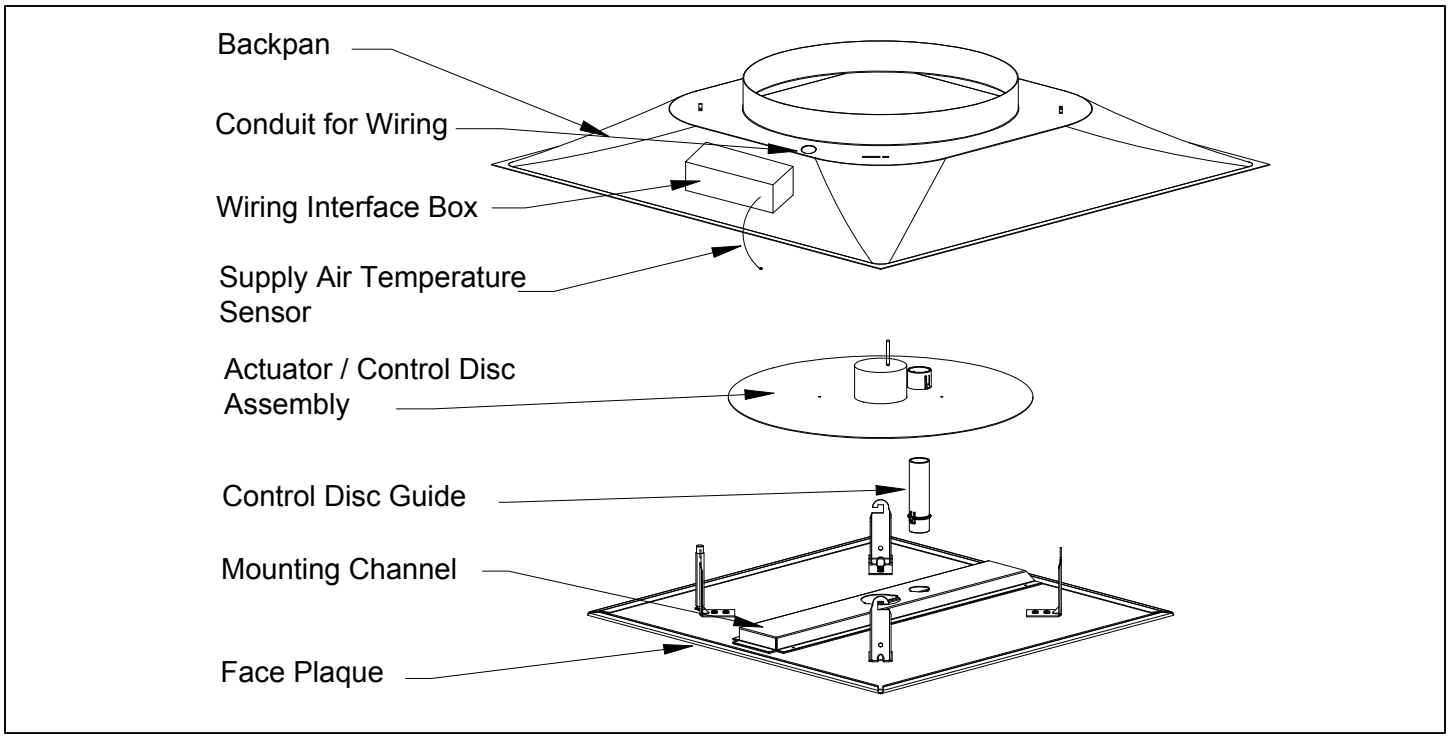


Figure 1. T_3SQ-1 Assembly

Step 4

Wiring Instructions:

T_3SQ-1 diffusers are all shipped as dummy units. Determination of master and drone units is made through plug and play cable connections.

One power module is required for every six (6) diffusers without electric reheat or every five (5) diffusers with electric reheat. (See Figure 3) Power module requires 120VAC line voltage input – hardwired by others. (See Figure 4)

Master diffusers must be connected to a controller / thermostat. (See Master Controller / Thermostat section on next page for details.) Drone diffusers must be connected to a master diffuser. Disconnect the supply air temperature sensor on all drone units.

White RJ-12 6-pin cables provide 24VAC power between diffusers. RJ-12 cables should be used between the power module and the first diffuser and to connect a master unit to another master unit. The RJ-12 jacks are interchangeable – either RJ-12 jack may be used during installation. (See Example below)

Blue RJ-45 8-pin cables provide 24VAC power and control signal between diffusers. RJ-45 cables should be used between diffuser and master controller / thermostat and between master and drone units. Disconnect the supply air temperature sensor on all drone units.

The RJ-45 jacks are interchangeable – any open RJ-45 jack may be used during installation. (See Example below)

Figure 3. T_3PM Power Module

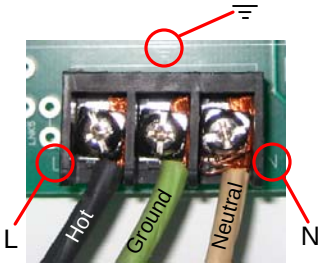
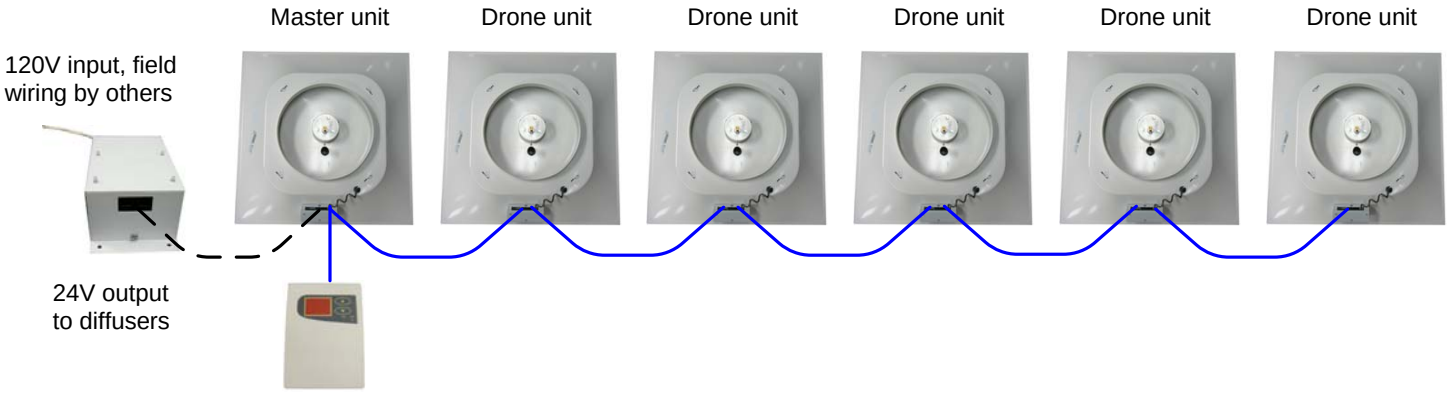


Figure 4. T_3PM Power Module Wiring

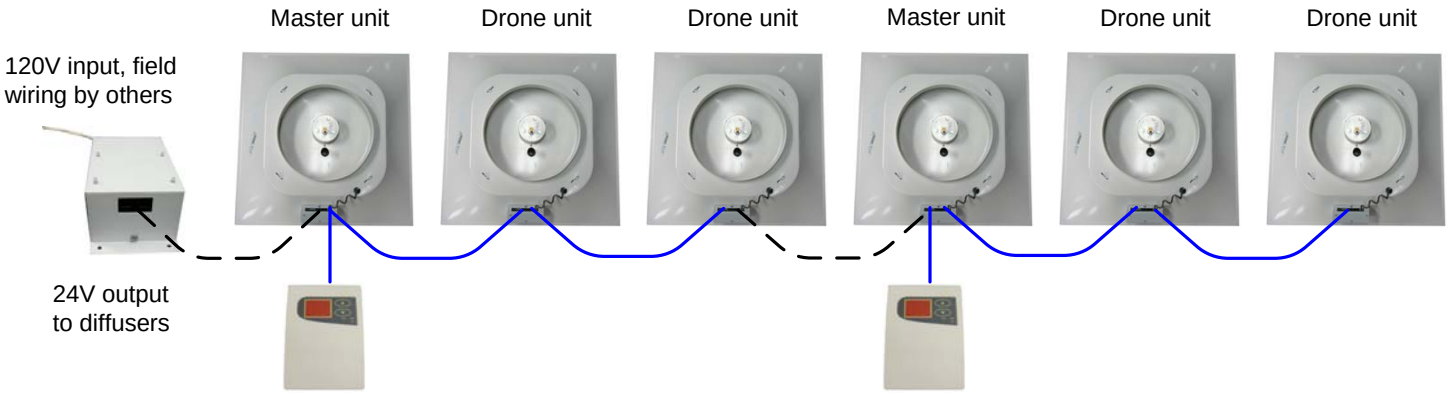
Examples:

RJ-12 24V power only
RJ-45 power and control signal

One master unit controlling 5 drone units:



Two master units controlling 2 drone units each:



Master Controller / Thermostat Operation

When power is supplied to the diffusers and the controller / thermostat, the controller / thermostat will drive the diffusers to full closed to calibrate the movement of the master and drone units. During this startup operation the controller / thermostat will display “ST”.

The controller / thermostat normally displays room temperature.

The Cool and Heat indicator lights show the mode of operation that the unit is in. If the zone is above setpoint, the Cool indicator will be lit to show that the zone requires more cooling. If the zone is below setpoint, the Heat indicator will be lit to show that the zone requires more heating.

To adjust the setpoint adjustment press either button. An audible sound will let you know the button was pressed. The current setpoint value will flash on the display. Default setpoint is 71º F (22º C). Press the up or down arrow buttons to increase or decrease the setpoint. The setpoint adjustment function will exit after 5 seconds of no user input.

To drive the damper full open or full closed, you must put the controller / thermostat into override mode. Override mode should be used for commissioning. Press the down arrow for 5 seconds until display will read “LI” to indicate the override mode.

Pressing the up arrow will drive the damper to the closed position. Pressing the down arrow will drive the damper to the open position. Pressing both buttons simultaneously will take the unit out of override mode.

Press the up arrow on the controller / thermostat for 5 seconds to display supply air temperature. A display of “00” denotes that a changeover sensor is not being used. The display will revert back to zone temperature after 5 seconds.

Figure 5. Master Controller / Thermostat

Optional Inlet Heater Operation

The optional SCR controlled inlet electric heater is mounted in the neck of the T_3SQ-1 diffuser. (Line voltage must be supplied to the electric heaters.)

If the inlet heater is used with the T_3SQ-1, all wiring should be connected through the wiring interface board on the heater assembly instead of the wiring interface board on the diffuser backpan. The wiring interface board on the diffuser may be discarded or ignored. The power wiring to the heater has to be connected by removing the face from the wiring interface board enclosure per Figure 7. The wires must be routed through the grommets, connected to L & N, and then re-attach the face of the enclosure.

The controller / thermostat will energize the inlet heater when the zone temperature is 1^{o}F below setpoint. The SCR heater controller will modulate a time pulsed signal from minimum output to full output over a 2^{o}F temperature range. At 3^{o}F over setpoint the heater will be at full output.

An airflow switch and two thermal cutouts protect the heater from operation without airflow or at temperatures above 200^{o}F.

Figure 6. Optional Inlet Heater

Figure 7. Optional Inlet Heater Wiring

Replacement Parts

Description	Part Number
Master Controller / Thermostat	18200601
T_3PM - 120V/24VAC Power Module	31673701
Blue RJ-45 Power and Control Cable	31623701
White RJ-12 Power Cable	31623601
Actuator / Control Disc Assembly	31623301
Supply Air Temperature Changeover Sensor	31625601
Wiring Interface Box	31623401
Venturi Tube	72540201
Venturi Tube Guide	72540301
Control Disc Sleeve	72540401
Analog Induction Channel	31623101
Plaque / Actuator / Control Disc Assembly for T3SQ-1	31625201

Inlet Size	120V Inlet Heater		277V Inlet Heater		208V Inlet Heater	
	kW	Part Number	kW	Part Number	kW	Part Number
6	0.75	31633501	0.75	31633503	0.75	31633502
8	1.0	31633504	1.0	31633506	1.0	31633505
10	1.25	31633507	1.5	31633509	1.5	31633508
12	1.25	31633510	2.0	31633512	2.0	31633511

Master / Drone Control Parts Worksheet

This worksheet is to be used to calculate the quantity of Master Controllers / Thermostats, Cables, and Power Modules needed to make operational T_3SQ masters and drones. See the Wiring section of this IOM for wiring information.

# of Master units _____ = # of Master Controller / Thermostats needed

# of Master Controller / Thermostats _____ = # of White RJ-12 Power Cables needed

# of total T_3SQ-1 diffusers _____ = # of Blue RJ-45 Power and Control Cables needed

# of total T_3SQ-1 diffusers divided by 6 _____ = # of T_3PM Power Modules needed – FOR NON-ELECTRIC REHEAT UNITS

OR

# of total T_3SQ-1 diffusers divided by 5 _____ = # of T_3PM Power Modules needed – FOR ELECTRIC REHEAT UNITS

Troubleshooting

Symptom	Action
No display on master controller / thermostat or Dim display on master controller / thermostat	Verify power module wiring. Verify cables are correct. RJ-12, 6-pin, straight through pinout from power module to first T_3SQ diffuser or between master T_3SQ units and RJ-45, 8-pin, straight through pinout from T_3SQ diffuser to master controller / thermostat. Verify cable continuity with a cable tester. Note: The Power Module has integral circuit protection that protects it from shorts in the RJ-12 and RJ-45 cabling by shutting down the Power Module. During this process, the Power Module may heat up enough that the component coatings emit a smell much like burnt electronics, but the transformer is NOT damaged. Replace the bad cable and cycle power to the Power Module.
Control disk will not move	Verify that control disk cable has been properly inserted through conduit and plugged into wiring interface box on backpan. Verify that master units is properly connected with RJ-45 to master controller / thermostat or verify that drone units are properly connected with RJ-45 to a master unit.
Control disk will not go to full closed	Adjust brass nuts at the top of the actuator shaft to desired minimum position.
Occupant uncomfortable, control disc closed	Adjust setpoints on master controller / thermostat. Check supply air temperature by pushing and holding top arrow for 5 seconds. If supply air is warmer than setpoint and setpoint is below zone temperature, damper will close to reduce supply air volume into space. If supply air is cooler than setpoint and setpoint is above zone temperature, damper will close to reduce supply air volume into space.
Supply air temperature reading is incorrect	Verify that the supply air temperature sensor is securely connected on all master units – thermostat display will show “00” if the supply air temperature sensor is not connected. Verify that the supply air temperature sensor has been disconnected from all drone units – thermostat display will read incorrectly if drone units has a supply air temperature sensor.
Unit is operating in reverse (closing when it should be opening, etc.)	Follow steps in “Occupant uncomfortable” above to ensure proper setpoints and verify supply air temperature. Follow steps in “Supply air temperature reading is incorrect” above to ensure supply air temperature is correct.

Note: This IOM is meant to demonstrate general dimensions of this product. The drawings on this IOM are not meant to detail every aspect of the product with exactness. Drawings are not to scale. TITUS reserves the right to make changes without written notice.

Troubleshooting (cont.)

Symptom	Action
Thermostat not operating properly	No Power Check main power supply to power pack. Check two power supplies not on same circuit. This will definitely be a problem if the two power supplies are driven from different phases. Check thermostat cable If cable fine check drone cable between drone board and master controller Replace with another wall thermostat Replace with another power supply.
Thermostat display codes	Display 00 Unit is in special supply sensing mode, but no supply sensor is fitted. This function will be activated when the top button is pressed for 5 seconds. It will automatically reset to control position. If the unit do not automatically reset to control position, the button is damaged, and the wall thermostat needs to be replaced Display Li Unit is in Special commissioning mode. This function will be activated when the bottom button is pressed for 5 seconds. The unit will reset to control position when both buttons are pressed simultaneously. If the unit do not reset to control position when both buttons are pressed simultaneously, the unit is faulty. Display Flashing digits Unit is in Room Setpoint adjustment mode. This function is activated when the top or bottom buttons is pressed at short intervals for up and down adjustment of Room Setpoint The display will automatically reset to control position. Display 88 or 56 or possibly other numbers Two Wall thermostats are possibly connected on the same loop. Make sure that an RJ45 cable does not loop between two Masters. Use an RJ12 cable instead. If unit is in supply sensing mode, more than one supply air sensor (Change over sensor is plugged into the same loop. Every master and it's drones can have only one CO sensor plugged in. Unplug all CO sensors from the drones.
Inlet Heater not operating properly	Heater not working Check to see if the motor is working. If the motor is working, wait at least 120 seconds for the damper to get to minimum. The heater will only be activated 120 seconds after heating mode is activated. If motor is not working, check RJ11 and RJ45 cabling through to master. Check to see if the main power is available to connection point of Triac on the drone board. Check to see if the heating mode light is on the front of wall display. If the heating mode light is on, check to see if the difference between the Set-point and room temp is big enough to keep the heater on full time. The proportional band of the heater is between -1°F and -3°F. The heater will therefore only be on full time if the room temperature is 3°F lower than setpoint. If the room temperature is 1°F lower than setpoint, the heater will not fire at all. Check RJ11 and RJ45 cabling through to master. Check to see if another wall stat is connected to triac and will activate the heater. If yes replace wall stat If no, replace triac Heater remains on Triac failed in open position. Master heater operates, drone heater does not Check Cabling

Troubleshooting (cont.)

Symptom	Action
Motor not operating properly	Erratic driving Check if controller is in proportional band. The motor will start pulsing when room is 1°F from setpoint and the motor will only drive full time when the room 3°F away from setpoint. Check to see if only one master controller is connected to diffusers in the same control loop. Not driving open or close Check if controller is in proportional band. The motor will start pulsing when room is 1°F from setpoint and the motor will only drive full time when the room 3°F away from setpoint. Check cabling. Check to see if the master is connected to the control loop. Disconnect diffuser from control loop and test with external master. Last resort change motor. Only drives open If change over sensor is fitted then motor will drive open when it normally would have driven closed when supply air is higher than setpoint. If change over not fitted, check to see if the room temperature is at least 3°F higher than setpoint. Only drives close If change over sensor is fitted then motor will drive closed when it normally would have driven open when supply air is higher than setpoint. If change over not fitted check to see if the room temperature is at least 3°F lower than setpoint. Continuous driving up and down Check if two master controllers are connected to the same control loop. Master unit driving while drone unit non-responsive Check drone RJ45 cabling Check motor RJ45 cabling Check to see if the motor is faulty Noisy motor Voltage too low Faulty motor