TEMSPEC INC.

Vertical Stack Fan Coil Units

Model: TLA or TLS

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Table of Contents

1.0 Design and Take-off Precautions

Attention should be paid to the height of drywall which encapsulates ductwork in a bulkhead. Note the height of the side supply air opening shown in the submittal and ensure that the drywall does not interfere with the side wall grille. Make allowance for the 1" flange around the grille. Call Temspec at the time of submittal review if side supply air openings need to be lowered or rotated to a vertical position to avoid interference with walls or doors.

The TL vertical stacked fan coil unit is designed to have drywall applied directly to the face of the unit. F loor sleeves and extension sleeves through shear walls are not included.

It is important to accurately locate the floor sleeve relative to the fan coil and the drywall.

2.0 Receiving Inspection

- The entire shipment should be inspected for damage, either readily visible or concealed. Any damage must be noted on the freight bill by the carrier's agent and Temspec notified within 24 hours.
- Check riser projections at each end of the cabinet for damage that would prevent making an acceptable piping connection.
- Check internal piping, coil and valve packages for possible transit damage. If contractor / installer deem it necessary to tighten mechanical fittings Temspec does not assume any responsibility for this procedure. It is stressed that the component manufacturer's recommended procedures be strictly followed.
- Thermostats, and other accessories which have been shipped separately should be inspected for transit damage.

Electrical Connection

- It is assumed that the fan coil unit will be in a dedicated electrical circuit. If the unit is to be in a circuit which includes electrical outlets or other electrical devices, Temspec must be informed prior to releasing the units for production.

Handling

- Avoid dropping or jarring the fan coil unit during offloading and moving the unit into position. Do not lift the unit using the riser pipes.
- Unless otherwise requested by the customer at the time of shop drawing approval, the cabinet insulation is left intact, covering the supply air openings and, if applicable, the secondary return air opening to prevent dust, snow or rain from entering the unit. The installer is responsible for cutting out the insulation and buttering the cut edge prior to installing the grilles.

Accessories

Do not install grilles or thermostats until after the walls have been painted. Caution the painter against spraying over the labels on the front cover of the unit.

3.0 Installation Identification

- The fan coil unit has a label pasted on the panel that shields the motor/blower.
- The label shows either the floor and riser number or the room number.
- The unit must be placed in the correct location in the building in accordance with the label.

Handling

- If the unit has risers attached, do not lift the unit using the riser pipes.
- Protect the fan coil from rain and snow.

Installation of Units with Risers Attached

- A rectangular opening is made in the floor slab, usually sleeved before pouring the floor. Refer to the catalog or submittals for sizes.
- Rotate the unit from the horizontal position to vertical so that the bottom end of the risers insert into the expanded end of the risers on the unit below. 2" is allowed in the riser length for the depth of the insertion. Shim the unit plumb.
- Before making the solder joint, ensure that the run outs from the supply and return risers are centered in the slots in the cabinet. If this is not done there is considerable risk of distorting the run out when the hot water riser expands causing the run out to contact the edge of the slot in the sheet metal potentially causing failures or leaks. Also ensure that the condensate riser stub out is at 90° to the cabinet so that the drain hose is not kinked.

- Use solder to connect the risers. Do not use Silfos (brazing) as this will cause the pipe to overheat and the insulation to be damaged. Connect the risers by soldering (not brazing) using 95/5 solder. An additional cap of 50/50 solder can be added for extra strength.

- **Ensure that the horizontal run-out from each riser is centered in the slot in the cabinet and that the run-out from the riser is at 90º as it enters the cabinet, prior to soldering the risers. Anchoring the risers to the floor slabs is the responsibility of the contractor.** Shim the unit plumb. It is not necessary to use a pad under the unit. Fire stopping the floor opening and making good the riser insulation at the floor opening is the responsibility of the contractor. Check that the drain hose is not kinked before soldering the condensate riser.

- The fan coil unit has unions at the shut off valves. These fittings must be checked prior to pressure testing the system by the contractor as part of the installation procedure. Mechanical fittings can loosen during transportation and handling. If contractor /installer deem it necessary to tighten mechanical fittings Temspec does not assume any responsibility for this procedure. **It is stressed that the component manufacturer's recommended procedures be strictly followed**.

- The coil is pressure tested hydrostatically at the factory using a propylene glycol solution. Trace amounts of this solution are allowed to remain in the coil to ensure that the coil does not freeze during transportation. After testing on site with water the fan coil unit must not be exposed to freezing temperatures.

- Riser anchoring is required for two purposes. The risers are anchored to the floor slab at one or more points in the height of the building so that they do not slip down under gravity. The second reason is to spread the expansion in opposite directions from the anchor point. Typically risers will be anchored at the midpoint of the height of the building. If there are riser expansion loops included in the risers inside the unit, the anchor point will be at the midpoint between two sets of loops. For example in a 16 storey building there will be a loop on the hot water riser on floor 8 and anchors at floors 4 and 12. After anchoring, the risers are in effect attached to the building structure so it does not matter if the plastic straps holding the risers to the unit break off after installation. **Temspec does not advise on the location or method of anchoring as this is the responsibility of the engineering company retained to design the riser system.**

- Make good the riser insulation between floors.

- Fire stop the floor opening in accordance with code.

Drain Pan Instruction

- Please check the drain pan for proper drainage as part of commissioning.
- The unit should be checked to ensure the drain pan is level, free of debris, and the drain line properly connected to the riser stub-out

Flushing and Testing

- The fan coil is normally equipped with ball type shut off valves. The unit is shipped with the ball valves open to the coil.
- After checking mechanical fittings inside the unit for tightness, it is recommended that the units on each riser stack are pressure tested using compressed air or nitrogen.
- Close the ball valves and flush the riser system.
- Open the supply side ball valve and bleed air from the coils. The coil has a manual
  air vent for this purpose. The top of each riser should also have an air vent (not provided by the factory).
- Test the units and risers hydrostatically. Open the return side ball valve after testing.
- Check that the strainer mesh is not choked, if there are strainers included with the unit.

Drywall Installation

- The fan coil model series "TL" has a cabinet which is designed to be furred-in. Drywall can be directly attached to the cabinet or the unit can be framed.

- Direct Application – The hinged air panel must be used. It is designed to fit the ½" drywall flange around the return air / access opening on the unit. Use drywall screws no longer than 1 ¼" and follow the instructions on the page in the submittals which shows where the screws can be located to avoid damaging internal components. When using the hinged panel, drywall must be attached to the front. The sides and back can be framed.

- Framing – Frame the unit using metal studs.. It is preferable that the stud does not touch the fan coil cabinet so that any

slight vibration which may exist is not transferred to the stud.

- Before installing the thermostat and grilles, the walls must be painted. Instruct the painter not to spray over the labels on the unit. After installation, dust must be vacuumed from the coil surfaces, the drain pan, the motor windings and the cabinet insulation.
- **Temspec does not recommend the use of a fan coil unit during construction/drywall installation as a space heater or air conditioner. Motor exposure to drywall dust can reduce motor life and leads to premature failure.**

Ducted Units

- Remove the supply air opening knock-out in the top panel of the fan coil. Cut out the cabinet insulation from the opening and butter the cut edge if it is glass fiber insulation. Attach the supply air duct.

Note: that supply air duct flanges are not provided by the factory.

Electrical Connection

- The unit has a single point connection at the junction box inside the unit. It might also have a disconnect switch and/or a fuse. All electrical wiring must be in accordance with the current version of the national and local codes. A qualified electrician must carry out the work. The junction box is located behind the fan/motor shield. Electrical power to the unit should be disconnected by opening the remote disconnect device prior to removing the fan/motor shield. All wiring must enter the unit through designated openings and not through the riser stub out openings.

Supply Air Grille Installation

- The grille is a snap-in fit into the collar on the unit. If the unit has a ducted supply, side supply air grilles are provided with a balancing damper. If the unit has two unit mounted grilles and is not ducted, one of the grilles is provided with a damper. This grille is to be fitted to the opening which requires the lesser of the two air flows (for example the bedroom).

Return Air/Access Panel Installation

- Remove the hinged door by raising to the horizontal position and gently pull out past the hinge pins.
- Place the return air panel in place and align the pre-drilled holes and secure using 4 sheet metal screws.
- Re-install the hinged filter access door using the same technique used to remove it.

Thermostat Installation

- **Unit mounted thermostat** – Connect the wires from the thermostat to the wire harness usually inside the electrical box using the plug provided. Fit the thermostat onto the electrical box using the machine screws provided. The electrical box is located on the front of the unit, above the return air panel.

- **Remote mounted thermostat** – Run low voltage wires from the 24V thermostat on the wall back to the terminal strip inside the unit.

- The thermostat must have a 0-10VDC fan speed control signal to control the fan. A motor speed board model SPDM will allow the contractor to adjust the maximum fan speed if the factory set point is not suitable. If the thermostat has a 3 speed fan control, the digital to analog interface board, EVO board model EVO/10Y-4Spd must be used. This board has max RPM adjustment pots where the CFM can be adjusted for each spd if factory settings are not suitable.

Caution: Adjusting fan RPM to a higher speed may result in excessive air flow noise.

4.0 Maintenance

- Always isolate the unit electrically before removing the front access panel. Do this by opening the circuit breaker (or other switching device) in the distribution panel in the suite. Do not use the fan switch as the means of isolation. There is a high risk of electrocution if the unit is improperly isolated. If in doubt have a qualified electrician perform the service work.
- Ensure that the fan has stopped rotating before proceeding to work within the unit.
- If the unit is equipped with a fuse or circuit breaker, do not change out either of these devices with ones of a higher Amp rating.

The purpose of a fuse or circuit breaker is to protect the power wiring to the unit.

- Take care when working inside the unit. Sheet metal components may have sharp edges.Every 3 Months

- Check/replace the filter. The filter can be one of two types: a 1" thick cardboard framed type or a metal frame with filter media attached.

Filter Size Chart

Unit Size	03-04	06-08	10-12
1" Filter Size	12"x20"	14"x25"	16"x25"

Unit with a hinged filter door in the upper half of the grille panel – Grasp the bottom edge of the door and sharply pull the door forwards. Lift the door to the horizontal position. The filter is now accessible and is removed by sliding it upwards out of the channels attached to thecoil.

Annually (before the start of the cooling season)

- Remove the return air/access panel from the wall. Remove the two sheet metal screws which secure the panel that shields the fan assembly. Pull the shield panel sharply downward and remove.

- Vacuum the drain pan and check that the drain outlet is not blocked. Pour water into the pan and check that it drains quickly. If it appears to be partly blocked, remove and clean the drain hose beneath the pan.

- If the coil surface is dirty, vacuum the surface which faces the room. Take care not to damage the aluminum fins on the coil. If the fins are flattened, the performance of the unit will be reduced.

- Inspect the surface of the cabinet liner for evidence of dampness. The liner should be completely dry in all areas. Vacuum excessive dust from the liner, taking care not to damage the black acrylic coating on the liner. Do not run the unit if the liner is damp as this can promote mold growth. Determine the cause of the dampness. If there is evidence of mold growth it might be necessary to replace part or all of the liner. If in doubt consult a remediation specialist.

- Fan, fan motor, control valve(s), electric heater, drain pan over-flow switch, andthermostat do not require routine maintenance.

Note: fan motor has sealed bearings and does not require additional lubrication.

5.0 Operating Instructions

- Turn on the disconnect switch located behind the fan enclosure cover to the "On" position.

- Standard Thermostat Digital Programmable Thermostat

- Select the mode, heating or cooling by pressing the "Mode" button

- Adjust the setpoint to desired temperature setting using the up/down arrow buttons.

- Toggle the "Fan" button between auto and run. In auto mode, the fan speed will vary based on the difference between room temperature and room setpoint. This is the most economical operating mode. In "Run" mode, the fan will operate a predetermined speed set it the "Engineering parameters".

- The "On/Off" button turns the unit on or off.

- The thermostat is pre-programmed which can be altered and programmed for 5/2 day, 5,1,1 and 7 day. The battery back-up lasts for 5 years.

- See thermostat operating instructions for further information. Refer to thermostat operating instructions for other thermostats used.

- Note: the thermostat must have 0-10VDC fan signal to control fan speed. A motor speed board model SPDM will allow the contractor to adjust the maximum fan speed if the factory set point is not suitable. If a thermostat with a 3-speed fan switch is used, a digital to analogue interface board model EVO/10Y-4Spd must be used to convert the fan signal to a 0-10VDC.

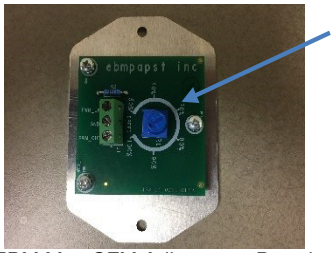
Adjusting the maximum CFM

- The maximum CFM is factory set to the closest nominal design CFM, (300, 400, 600, 800, 1000 or 1200), but can be field adjusted if needed.
- With the 0-10VDC thermostat fan signal,

the max CFM can be adjusted by adjusting the blue knob on the EBM fan board in the electrical box. See Fig. 1 and reference chart 1. To increase the maximum CFM, turn the adjustment clockwise toward `100% and to reduce the maximum CFM, adjust counter clock-wise toward 0%. The chart below indicates the % flow, CFM, relative to cabinet size and external static pressure.

- If a 3 speed fan control thermostat is used, the CFM for each speed is factory set to be 50% on low speed, 75% on medium speed, and 100% on high speed. Each motor speed CFM may be adjusted by turning the adjustment pots on the EVO board. Call 1=low speed, call 2=medium speed and call 3=high speed. See Fig. 2.

Fig. 1



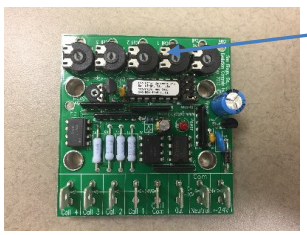
Rotate dial clockwise to increase max CFM or counter clockwise to decrease. (Used with 0-10VDC fan speed signal)

EBM Max CFM Adjustment Board

Chart 1 EBM Fan Speed Controller Setting Reference

Cabinet Size	CFM	Dial Position @ free blow	Dial Position@ 0.2" ESP	Dial Position@ 0.4" ESP
03 -04	200	50%	-	-
03 -04	300	60%	70%	-
03 -04	400	80%	90%	-
06 -08	500	50%	60%	70%
06 -08	600	60%	70%	80%
06 -08	700	70%	80%	90%
06 -08	800	80%	90%	100%
10-12	900	50%	55%	60%
10-12	1000	55%	60%	65%
10-12	1100	60%	65%	70%
10-12	1200	65%	70%	75%

Warning: if the maximum CFM is adjusted to a value above the design airflow, excessive air noise could occur



Rotate dial(s) clockwise to increase max CFM or counter clockwise to decrease. Call 1, 2 & 3 are used with 3 spd fan thermostat. (Call 4 not used) No call must be at zero flow.

EVO 3 Spd Max CFM Adjustment Board

6.0 Sequence of Operation

Note: always refer to wiring diagram on the motor cover panel to the determine the model and type of fan coil. This can be viewed by lifting the hinged filter access panel door.

2-Pipe Heating/Cooling Units

- The control valve is activated by the cool and heat outputs from the thermostat which are connected to an aquastat.
- On a call for cooling from the thermostat and the water temperature is less than 65F, the aquastat energizes the control valve. If the water temperature rises above 85F, the aquastat de-energizes the control valve.
- On a call for heating from the thermostat and the water temperature is greater than 85F, the aquastat energizes the control valve. If the water temperature drops below 65F, the aquastat de-energizes the control valve.
- The aquatat has black, yellow and orange wire leads. The switch closes for heating at 85F +/- 5F through BL and ORA and cooling at 65F +/- 5F through BL and YEL.

2-Pipe Heating/Cooling Auxiliary Electric Heat Unit

- The control valve and electric heat relay are activated by the cool and heat outputs of the thermostat which are connected to two aquastats labled A1 and A-2 on the wiring diagram.
- On a call for cooling from the thermostat and the water temperature is less than 65F, the A1 aquastat energizes the control valve. If the water temperature rises above 85F, the aquastat deenergizes the control valve.
- On a call for heating from the thermostat and the water temperature is more than 85F, the A1 aquastat energizes the control valve. If the water drops below 65F, the aquastat de-energizes the control valve and energizes the electric heat relay.
- The A2 aquastat has black, yellow and orange wire leads. The switch closes for heating at 85F +/- 5F through BL and ORA and cooling at 75F +/- 5F through BL and YEL. The A2 aquastat has 2 brown wire leads. The switch closes for heating at 85F +/- 5F and cooling at 65F +/- 5F.

2-Pipe Heating/Cooling Total Electric Heat Unit

- The control valve and electric heat relay are activated by the cool and heat outputs of the thermostat. No aquastats are used.

- On a call for cooling from the thermostat, the thermostat energizes the child water control valve.
- On a call for heating from the thermostat, the thermostat heat output energizes the electric heat relay. The control valve remains closed.

4-Pipe Heating/Cooling Unit

- The hot water control valve and chilled water control valve are activated by the cool and heat outputs of the thermostat. No aquastats are used.
- On a call for cooling from the thermostat, the thermostat cool output energizes the child water control valve.
- On a call for heating from the thermostat, the thermostat heat output energizes the heating water control valve

  Note: See submittal for more information specific to the unit and refer to the wiring diagram on the motor cover.

7.0 Trouble/Diagnosis

- 2-Pipe valve control heating/cooling units
- 2-Pipe valve control heating/cooling auxiliary heat units
- 2-Pipe valve control heating/cooling with total electric heat units
- 4-Pipe valve control heating/cooling units

- Most problems can be promptly diagnosed at the thermostat. The fan assembly is accessible and removable through the return air opening, after removal of the return air grill and fan access cover. The fan assembly has a five wire plug harness for power and 0-10VDC speed control signal. The 2-pipe units are equipped with a change-over aqua-stat mounted on the riser accessed through the return air panel. The 2-pipe with auxiliary heat units have 2 aqua-stats and the 2-pipe with primary electric heat have no aqua-stat. Thermostats and control valves are 24VAC.

If Fan Motor Fails To Start

- Check main power supply, (circuit breaker) and unit switch are “on” and unit has power.
- Set thermostat on/off switch to “on” and press fan button to “on”.
- If fan will not operate, check that there is 24VAC coming from the transformer.
- If 24VAC is not present, replace the transformer.
- If 24 VAC is present from the transformer, check the thermostat wiring connections and motor wiring harness plug and thermostat connections.
- If all is good and system is 4-pipe (no aquastat), check the DC voltage on terminals 11 & 12 on the thermostat. If no voltage is present, replace the thermostat.
- If the voltage is between 1 & 10VDC on terminals 11 & 12, and there is supply voltage to the fan motor, replace the fan assembly.
- If the system is change-over or has auxiliary electric there, check the voltage at the aquastats*.
- Aquastat with black, yellow and orange wire leads closes for heating at 85F +/- 5F through BL: and ORA and cooling at 65F +/ 5F through BL and YEL.
- If no voltage is present at BL or YEL, replace the aquastat

Control Valve Fails to Operate

- Check the voltage from the thermostat, if no voltage, replace the thermostat. If 24 volts or a DC voltage for modulating valves is present, replace the actuator. If the system has an aquastat(s), check that 24 volts is present from the aquastat. If 24 volts is present, replace the actuator. If no voltage is present, replace the aquastat.

Electric Heat Coil Fails to Operate

- The electric heat coil module is located behind the motor cover above the fan and consists of a relay operated by the thermostat, a high temperature automatic limit control and thermal cut-off directly attached to the heating element. Both the thermal cut off and high temperature limit control are in the heating coil control circuit. The temperature limit control sensing element protrudes through the control box directly above the heating element to sense over heating of the coil including fan failure. This is a manual reset type and will reset when the temperature drops below the preset limit. The thermal cut off is part of the coil element. The manual reset device can be replaced easily in the field if continuity test reveal an open circuit. If these circuits are both closed, replace the heating element by removing the 4 screws securing the mounting plate and removing the entire heating assembly.

8.0 Start-up Check List

- Receiving & Inspection
- Unit received undamaged
- Unit received as ordered
- Handling & Installation
- Unit installed level & square
- Proper access is provided
- Proper over-current protection is provided
- Unit protected from dirt & foreign matter
- Cooling/heating Connections
- Protect valve package components from excessive heat
- Pressure test all piping for leaks
- Install drain lines and traps as required
- Insulate all piping as required
- Connect risers from master to secondary units if required
- Connect risers to piping package if shipped separately or supplied by others
- Electrical Connections
- Refer to unit wiring diagram
- Connect incoming power service
- Install and connect “shipped lose” components like thermostat
- Unit Start-up
- Check for free and proper fan rotation
- Record electrical supply voltage and amperage
- Check all wiring for secure connections
- Close all unit isolation valves
- Flush water systems
- Open all isolation valves after system flush
- Check that Erie control valve is not in the “locked” open position.
- Vent water systems as required
- All duct work and grills are in place
- Filters are in place
- Start blowers, pumps, chillers etc
- Check all units for electrical over-load
- Check all duct work and units for air leaks
- Balance water systems as required
- The Erie control valve can be “locked” open by manually positioning the lever on the back of the valve actuator. Ensure this released so after flushing to allow the valve to be controlled by the thermostat
- Balance air system as required
- Record all final settings for future reference
- Check piping and walls for severe vibration
- Check all dampers for proper operation (if any)
- Verify heating and cooling operation
- Ensure all access panels and grilles are securely 1 in place
- Verify condensate is flowing