2360 Millrace Court Tel: (905) 670 3595
Mississauga, Ontario Fax: (905) 670 3592
Canada, L5N 1W2 Web: www.temspec.com

TEMSPEC INC.

VERTICAL FAN COIL UNIT

MODELS TVG, TFG, TCG

"TV"

"TF"

"TC"

INSTALLATION AND MAINTENANCE MANUAL

INSTALLATION PRECAUTIONS

Architectural Details

For the Furred-In TV units, 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 submittals 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.

Temspec does not include wall sleeves which might be needed to bridge a gap between the grille collar on the unit and the drywall surface, howsoever caused. Also, floor sleeves, extension sleeves through shear walls and extension of thermostat speed switch wiring through shear walls are not included.

It is important to accurately locate the floor sleeve relative to the fan coil and the drywall. If subsequently a wall sleeve is used because the unit is incorrectly located back from the face of the drywall, a problem with access for servicing can arise if the sleeve depth is too long (over 4"). Also note that the return air panel of the type which attaches with quarter-turn fasteners cannot be used with a sleeve and ½" drywall must be attached directly to the front of the unit.

Inspection

- The entire shipment should be inspected for damage, either readily visible or concealed. Any damage should be noted on the freight bill by the carrier's agent and Temspec notified as soon as possible.
- Remove the inlet service panel and check the fan wheel for free rotation by spinning it manually. Slight misalignment can be corrected by repositioning the motor or by loosening the fan hub set screw and repositioning the fan on the motor shaft.
- 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. Tighten all mechanical fittings.
- Check to make sure the drain pan overflow switch did not become loose or shift during shipping.
- Thermostats, speed switches and other accessories which have been shipped separately should be inspected for quantity and transit damage.

Handling

The fan coil units must be handled with the due care required for an HVAC unit. Avoid dropping or jarring the unit during offloading and moving the unit into position. Do not lift the unit using the riser pipes.

If the cabinet has a painted finish, do not remove the protective packaging material until after the unit is set in position.

Installation

Use solder to connect the risers. Do not use Sil-Fos (brazing) as this will cause the pipe to overheat and the insulation to be damaged. Caution must be exercised not to strain the coil connection. Excessive pressure in any direction can cause the coil casing to cut into the coil connection stub or cause it to bend and lead to leaks. 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 90° as it enters the cabinet, prior to soldering the risers. If the risers are shipped loose, the insulation in the riser inset holes will need to be cut. To do this simply cut an "X" in the hole to allow the stub-out to enter the unit with minimal insulation damage. Anchoring the risers to the floor slabs is the responsibility of the contractor. Shim the unit plumb to avoid standing water. It is not necessary to use a pad under the unit. Firestopping 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 tightened prior to pressure testing the system by the contractor as part of the installation procedure. Mechanical fittings can loosen during transportation and handling.

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 a risk of freezing.

The interior of the unit must be vacuumed clean before the unit is started up. This includes fan motor windings.

Two-way Control Valves

When two-way valves are used, pump and chiller bypass or pump speed control must be included in the system. This is necessary to ensure that the close-off pressure rating of the valve is not exceeded. The maximum close-off pressure rating is given in the submittals.

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.

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.

INSTALLATION METHOD

Identification

The fan coil unit has a label pasted the motor cover panel for TV units, and on a panel inside TF and TC units

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

1. If the unit has risers attached, do not lift the unit using the riser pipes.
2. Protect the fan coil from rain and snow. Be aware that there have been instances of units being stood upright, unsecured on the edge of a building and being blown off the building during a windstorm.

Installation of Units with Risers Attached

1. A rectangular opening is made in the floor slab, usually sleeved before pouring the floor. Refer to the catalog or submittals for sizes.
2. Rotate the unit from the horizontal position to vertical so that the bottom end of the risers inserts 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 to avoid standing water.
3. Before making the 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 bottom out on the edge of the slot in the sheet metal. Also ensure that the condensate riser stub out is at 90° to the cabinet so that the drain hose is not kinked.
4. 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 mid-point of the height of the building. If there are riser expansion loops, the anchor point will be at the mid-point between two sets of loops. For example, in a 16 story 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.

5. Connect the risers by soldering (not brazing) using 95/5 solder. An additional cap of 50/50 solder can be added for extra strength.
6. Make good the riser insulation between floors.
7. Firestop the floor opening in accordance with code.

Flushing and Testing

1. The fan coil is normally equipped with ball type shut off valves. The unit is shipped with the ball valves open to the coil.
2. 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. Check for audible air leaks.
3. Close the ball valves and flush the riser system.
4. 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).
5. Test the units and risers hydrostatically. Open the return side ball valve after testing.
6. Check that the strainer mesh is not choked, if there are strainers included with the unit.
7. City water is very corrosive to brass components. Provide water treatment as soon as the system is charged to avoid premature leaks and/or avoid failure of internal components.

Drywall Installation

The fan coil model series "TV" has a cabinet which is designed to be furred-in. Fan coils which are exposed in the room (model "TF") or free standing in a closet (model series "TC") have a different style of cabinet. For the "TV" series the drywall can be directly attached to the cabinet, or the unit can be framed.

1. **Direct Application** – The return air panel which has quarter turn fasteners 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 panel which has quarter turn fasteners the drywall **must** be attached to the front. The sides and back can be framed.
2. **Framing –** Frame the unit using metal studs**.** The flange around the return air/access opening is 2" deep. The type of return air panel which has a hinged filter door in its upper half is used with this type of installation. 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.

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 access panel. Electrical power to the unit should be disconnected by opening the remote disconnect device prior to removing the fan/motor shield. Do not use the motor speed switch as a disconnect method.

Thermostat Installation

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

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

Supply Air Grille Installation

The grill is a snap-in fit into the collar on the unit. If the unit has a ducted supply, all the 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).

Top Extension

If a top extension has been provided to trim the unit up to the ceiling, the extension overlaps the top of the unit by 1 ½". Use sheet metal screws to attach the extension directly to the top of the unit.

Riser Pipe Cover

If a riser cover has been provided it is installed after the floor opening has been fire-stopped. An offset bracket is included which is screwed to the front of the side face of the unit. An angle wall bracket is also provided. The cover snaps into the offset bracket and is screwed to the wall bracket. Refer to the catalog for illustrations of the bracket arrangements.

Return Air/Access Panel Installation

Type which has quarter turn fasteners:

1. Insert the square shaft of the fastener into the recessed hole in the panel. Put the plastic washer onto the shaft, followed by the retainer. Push the retainer as far as possible so that it firmly holds the fastener in place.
2. Put the pawl onto the shaft and position it so that the pawl will pull the panel tightly against the wall. Tighten the lock screw in the pawl.
3. Install the filter in the panel, hook the panel over the bottom collar of the fan coil unit, rotate the panel upright so that it is against the wall and turn the head of the fastener clockwise to the locked position.

Type which has a hinged filter door in the upper half of the grille panel:

1. If the drywall has not been installed flush with the outer edge of the collar on the unit and if a gap exceeding ½" exists between the inner surface of the drywall and the outer edge of the collar, the opening will have to be sleeved.
2. Insert the grille panel into the 2" deep collar on the unit so that the grille frame is against the drywall.
3. Lift the hinged filter door to the horizontal position and secure the grille panel by driving two sheet metal screws through the inside of the grille frame and into the collar on the unit. Do not over-tighten the screws as this can distort the frame.
4. Install the filter into the channels behind the grille and close the filter access door.

Changing the Motor Speeds

Occasionally the speeds at which the motor runs at will need to be changed on site. This process depends on the type of motor. If there are any questions after reading, please contact Temspec.

PSC motors

For 4 or 5 speed PSC motors, the wiring needs to be changed at the quick connect connecting the high voltage wire harness to the motor wires. The high voltage wire harness wires need to be removed from the quick connect and reattached to the new desired settings. For example, if Low=MED-LO, Med=MED, High=MED-HI and the speeds want to be increased, the new setup should be Low=MED, Med=MED-HI, High=HI. To change the pins, a technician needs to use a pin extractor (see the following document as an example on how to use pin extractor: https://www.te.com/commerce/DocumentDelivery/DDEController?Action=srchrtrv&DocNm=408-10376&DocType=SS&DocLang=EN). Wire colours vary depending on the motor, to make sure the motor is wired correctly, consult both the electrical drawing and the wiring diagram on the motor.

Discrete Speed ECM Motors

Temspec's discrete speed ECM motors come with five programmed speed taps, of which only three are used at once corresponding to the thermostat fan speeds. All five taps are wired with a single plug that attaches to the motor, see Figure 1 as an example. The desired speed taps are then wired into the terminal block in connection to the thermostat fan speed outputs, and the unused motor wires are capped off, see Figure 2 as an example. To change the taps, a technician needs to cut the cap off the new wire to be used and the motor wires need to be wired into the terminal strip into the corresponding thermostat fan speed terminals in the new desired setup. The new unused wire must be capped off. Always consult the unit drawing before attempting work as the wire colours and the taps used can vary between projects and unit sizes.

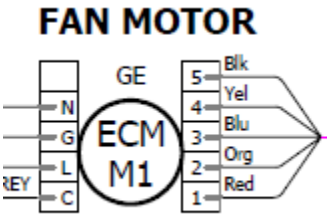

Figure 1: Speed tap wiring on right side of motor

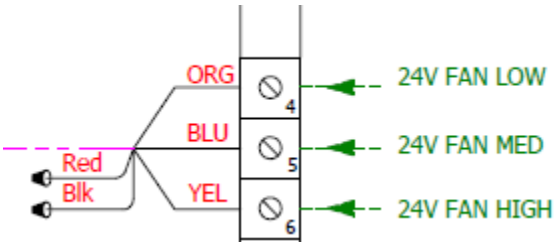

Figure 2: Terminal strip connection with capped wires

Variable Speed ECM Motors

There are two different controls that could come with the motor. An EVO board to convert 0-10VDC to PWM or a cable to do the same function. If there is an EBM board, rotate the single dial to either increase or decrease the maximum airflow for the unit. If there is just a cable, the motor will need to be reprogrammed. To do this contact Temspec.

MAINTENANCE INSTRUCTIONS

Safety

1. Always isolate the unit electrically before removing the front access panel. Do this by opening the circuit breaker (or other switching device) the distribution panel in the suite. Do not use the three-speed 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.
2. Ensure that the fan has stopped rotating before proceeding to work within the unit.
3. 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.
4. Take care when working inside the unit. Sheet metal components may have sharp edges.
5. If the black acrylic coating on the glass fiber cabinet liner is damaged, it must be patched to prevent glass fiber particles entering the air stream.

Every 3 Months

Replace the filter. The filter can be one of two types: a 1" thick cardboard framed type or a wire frame with filter media attached. The filter is accessed by removal of the front panel.

Annually (before the start of the cooling season)

Remove the return air/access panel from the unit.

1. 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.
2. 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.
3. 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.
4. Replace the thermostat battery if it is a seven-day programmable type.

The following components do not require routine maintenance:

Fan, fan motor, control valve, electric heater (fan coil models TFE, TCE), thermostat.

Note that fan motors have sealed bearings and do not require additional lubrication. Older units may have oiler tubes into which are added a few drops of SAE-20 non-detergent oil every 6 months.

Sequence of Operation

Note: always refer to wiring diagram on the motor cover panel to the determine the model and type of fan coil.

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 aquastat 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 labeled 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

Troubleshooting/ Diagnosis

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 wire harness to connect the motor to the terminal strip. 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 24VAC 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 AC voltage on fan speed terminals of the thermostat. If no voltage is present, replace the thermostat.
- If the voltage is 24VAC on the terminal, check the connections between the thermostat and the motor. If the motor is a PSC, a relay will be used to power the motor.
- If the motor is getting proper voltage on the control side and power side, the motor may need to be replaced.

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.
- 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

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 an auto 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 reveals 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.
- 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.

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