Fan Powered Terminals VAV Terminals

Receiving Inspection

After unpacking the terminal, check it for shipping damage. If any shipping damage is found, report it immediately to the delivering carrier. Store units in a clean dry location and do not stack more than four high.

Also, inspect damper rotation of the unit by rotating the damper by hand to check for free movement, and ensure there is no damage or binding of the damper. If controls are connected to the damper, release the manual clutch (most controls are equipped with this) and rotate the damper by hand. If there is any restriction to the rotation of the damper, contact your Titus rep and inform them of this issue.

Caution: Do not use the inlet collar, damper shaft, flow sensor or air tubing as a handle to lift or move assembly. Damage to the unit or controls may result.

Before installation, remove fan packing and all foreign material from the unit. Check the blower wheel for free rotation.

Supporting the Assembly

Suspend the unit from the building structure in a horizontal plane with the access panels facing downward.

Do not obstruct the access panels with support channels or straps.

One inch long sheet metal screws can be used to penetrate the casing (see Figure 1). Use the support method prescribed for the rectangular duct on the job specifications. Unit may be equipped with optional hanging brackets (see Figure 2). Hanger rod up to 7/16" diameter may be used.

Any flexible conduate shall be supported per UL 60335, national electric code, and any state and local codes having juristiction

Note: If equipped with pneumatic controls, or unit is parallel fan type (Model TQP or FLP), the terminal must be mounted right side up. It must be level within ±10 degrees of horizontal, both parallel to the air flow and at the right angle of air flow. The control side of the terminal is labeled with an arrow indicating UP.

Duct Connections

Slip each inlet duct over the inlet collar of the terminal. Fasten and seal the connection by the method prescribed by the job specification. The diameter of the inlet duct “D” in inches must be equal to the listed size of the terminal; e.g. a duct that actually measures 8 inches must be fitted to a size 8 terminal. The inlet collar of the terminal is made 1/8" smaller than listed size in order to fit inside the duct (see Figure 1).

Important: Do not insert duct work inside the inlet collar of the assembly.

Inlet duct should be installed in accordance with SMACNA guidelines. Rectangular discharge opening is designed for flanged duct connections. Fasten and seal by method prescribed in the job specification.

If single-point electronic velocity sensor is used, 3 to 5 inlet duct diameters of straight duct should be provided at the terminal inlet.

Minimum Access

Fan Powered terminals require sufficient clearance to service the fan blower assembly and internal actuator (if so equipped) from the bottom of the unit, low voltage controls from the side of the unit, and line voltage motor controls or electric heat section (if so equipped) from the rear or discharge of the unit.

For bottom access panel removal, 3" minimum vertical clearance below the unit is required, plus sufficient horizontal clearance to slide the access panel clear of the bottom of the unit. Horizontal clearance is dependent on access panel dimensions as indicated on product submittals.

For low voltage control enclosure access, a minimum of 18" is recommended. Specific control enclosure location is indicated on product submittals. Panel for low voltage enclosures are removable (not hinged). For line voltage motor controls or electric heat control access, a minimum of 36" should be provided to allow full opening of hinged access doors. Specific location is indicated on product submittals.

Important: These recommendations do not preclude NEC or local codes that may be applicable, which are the responsibility of the installing contractor.

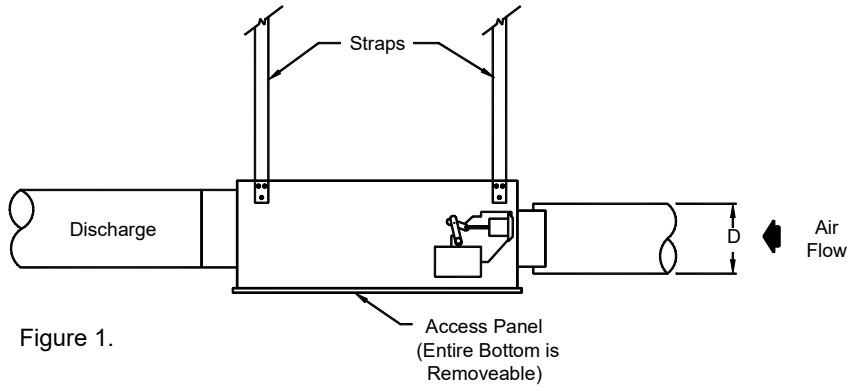

Figure 1.

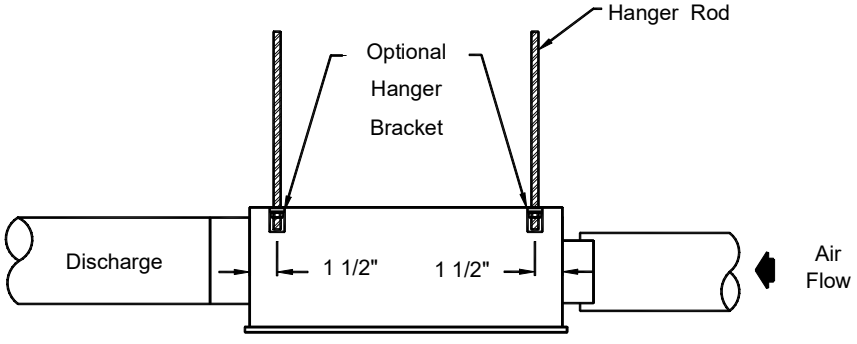

Figure 2.

Field Wiring

All field wiring must comply with the local codes and with the National Electrical Code (ANSI/NFPA 70-1996). Disconnect switches are optional equipment. Electrical, control, and piping diagrams are shown on the exterior labeling or on a diagram on the inside of the control and high voltage enclosure covers. Unless specified otherwise in the order write-up, all units are wired for a single point electrical connection to the fan and optional electrical heater. All electric heaters if provided by TITUS are balanced by kW per stage. The installing electrician should rotate incoming electric service by phase in order to help balance the building electric load.

Caution—Electrical Requirement:

1. Provide a safety disconnect per NEC 424-19, 20 & 21.
2. Disconnect all incoming power before wiring or servicing unit. All disconnect switches on the terminal (if so equipped) should be in OFF position while making power connections.
3. All field wiring must be in accordance with NEC and local code requirements. All units with electric heat should have copper wires for 125% of Nameplate Amperage.
4. Observe wiring diagram and instructions mounted on the unit. 480 V/3 phase units require a 4th (neutral) wire in addition to the full sized ground wire. All units must be grounded as required by NEC 424-14 and 250.

Unit Labeling

Each unit will have two main labels attached to the casing. The FAN UNIT label (Figure 3) lists the Model Number, Supply Voltage requirements, Motor Horsepower, and Overcurrent Protection requirements. The AIR FLOW label (Figure 4) lists the Model Number, Unit Size, Factory Order Number, and Location. The Location (or "Tag") indicates the engineer's planned location for the unit to be installed. There may be other labels attached to the unit, as options or codes may require.

Please read all labels on a typical unit, before beginning installation. If you have any questions, please contact the local TITUS Representative for clarification. Have the key points from the Air Flow label available for reference before calling.

Control Start-up, Operation

Detailed information regarding power, accessory and communications connections, start-up and operating procedures for the TITUS TD-1 controller (digital) or pneumatic and analog controls are available from your local TITUS representative. For specific information on controls by other manufacturers contact that manufacturer's local branch or dealer.

Note: Controllers may incorporate specific communication addresses based on Building Management Systems Architecture, and original engineering drawings. Installing the terminal in a different location than noted on unit label may result in excessive start-up labor.

Note: If unit is utilizing optional electric heat with solid state relay and is not energizing the coil, check the potentiometer on the SSR control board to ensure that it is in the 100% position.

Primary Air Damper

TFS, TQS and TQP Models:

To replace the damper blade and/or shaft assemblies:

a. Disconnect power before servicing. Remove control enclosure cover to access actuator.b.

Note position of damper shaft, using indicating arrow. Loosen linkage or actuator collar to allow damper to rotate freely.

c. Remove bottom access door to expose damper assembly. Rotate damper to fully closed position, exposing rivets holding damper blade to shafts.

d. Drill out rivets using 1/2" drill, rotate damper to fully open position, and slide damper and/or shaft assemblies out of the duct.

e. Fit new damper and/or shaft assemblies in place, using 1/4-20 screws with lock nuts to replace rivets.

f. Reverse procedure in steps c, b, and a, for assembly. When locking down actuator linkage or collar, position indicating arrow on damper in the same location as before the repair.

Note: FLS and FLP units use an opposed blade damper assembly that is not repairable. The entire assembly must be replaced.

Titus
Redefine your comfort zone.™

FAN UNIT

MODEL NO.:	DTFS	CODE:	88-XXXXX-A 2 REV: 02			
MOTOR	VOLT:	277	PHASE:	1	HZ	60
	HP:	1/4	FLA(EA)	1.4		
HEAT	VOLT 277	PHASE	1	HZ	60	
	KW	6.0	AMPS	21.66		

MOTOR (S) ARE THERMALLY PROTECTED
MIN. SUPPLY CIRCUIT AMPS: 24 AMP
MAX. FUSE OR OVERCURRENT PROTECTION: 30 AMP
MAX. OUTLET AIR TEMPERATURE: 200F
UNIT DESIGNED TO OPERATE AT NO LESS THAN 0.2 IWG STATIC PRESSURE
ZERO CLEARANCE FROM UNIT, CONNECTED DUCT AND/OR PLENUM
TO COMBUSTIBLE MATERIAL

Figure 3. FAN UNIT Label

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AIR FLOW

MODEL NO.	DTFS	SIZE:	C12
TOTAL CFM:	1100	MIN.CFM:	0
LOCATION:	AH-1		
FACTORY NO:	XXXXX	ITEM:	1
MOTOR:	DL01 L&G		
COIL:	E41-277V KW 6.00		
THST:			
DPR. POSITION:	DL01-FMA L&G		

UP

303155001015

Figure 4. AIR FLOW Label

Standard PSC Motor Fan Flow Adjustment

Note: Before starting fan motor, follow steps 1 and 2.

1. Discharge ductwork should be connected. The minimum recommended discharge static pressure is 0.2" wg. Be sure fan packing is removed from units with fan packing!
2. All foreign materials should be removed from duct system. Filters should be installed where required.
3. Standard PSC motors are shipped from factory at full speed setting. Allow motor to run-in at least 15 minutes before adjusting speed. During initial run-in, check ductwork connections for leaks and repair if necessary. (Do not adjust fan speed down if ductwork is not connected).
4. Unit is equipped with manual fan speed control, mounted on the bottom of the line voltage motor enclosure or electric heat enclosure. Turning the control counterclockwise will reduce the fan speed; clockwise will increase speed.
5. Set the unit to full heating (maximum induction). Adjust and set remote balancing dampers, if present. Adjust the speed control to deliver the required CFM by measuring air quantity at the room outlets. Note: Minimum CFM required for electric heat shall not be less then 70 CFM/kW heating.
6. Proceed to primary air adjustment procedure, detailed in control installation information. Fan should be re-adjusted with primary air and ventilation air at maximum setpoint, to insure that no supply air is discharged at the induction port.

ECM Motor Fan Flow Adjustment

Note: Before starting fan motor, follow steps 1 and 2.

1. Discharge ductwork should be connected. The minimum recommended discharge static pressure is 0.2" wg. Be sure fan packing is removed from units with fan packing!
2. All foreign materials should be removed from duct system. Filters should be installed where required.
3. PWM Fan Speed Controller
   a. ECM motors with manual PWM controllers are shipped from factory at design CFM when provided. Otherwise motors are shipped at motor full speed setting.
   b. ECM motors shipped with remote PWM controller require a signal from the DDC controller to control fan speed. **(See page 4 for operating instructions for remote pwm.)**
   c. Allow motor to run-in at least 15 minutes before adjusting speed. During initial run-in, check ductwork connections for leaks and repair if necessary. (Do not adjust fan speed down if ductwork is not connected).
4. ECM unit is equipped with either a manual control or a remote control PWM fan speed controller, mounted on the bottom of the line voltage motor enclosure or electric heat enclosure.
   a. The manual PWM controller has a screwdriver dial adjust pot and an LED readout. The LED display shows the flow index when the screwdriver adjust is turned. The flow index is a number from 0-100 which correlates to a CFM shown in the PWM calibration table. Use the screwdriver adjust to set the CFM of the unit.
   b. Remote PWM controllers require a signal from the DDC controller to control fan speed. An increase in DDC voltage signal from 0-10Vdc correlates linearly to the 0-100 flow index shown in the PWM calibration table. A green lamp continuously flashes to indicate the flow index value. Long flashes represent the tens digit and short flashes represent the units digit of the flow index.
5. Set the unit to full heating (maximum induction). Adjust and set remote balancing dampers, if present. Adjust the speed control to deliver the required CFM by measuring air quantity at the room outlets. Note: Minimum CFM required for electric heat shall not be less then 70 CFM/kW heating.
6. Proceed to primary air adjustment procedure, detailed in control installation information. Fan should be re-adjusted with primary air and ventilation air at maximum setpoint, to insure that no supply air is discharged at the induction port.

Maintenance Procedures:
Fan and Motor

Motor is equipped with permanently lubricated bearings. Inspect fan and motor assembly for accumulation of dust and dirt as required by operating environment. Clean as necessary.

If fan motor does not run:
a. Free rotation of blower wheel fan packing removed. Freight or installation damage.
b. Check for proper unit power Disconnects should be ON .Check optional fusing.
c. Check for proper control signal, P/E switch setting, proper air control 24 Vac at fan contactor, coil energized.

If fan motor runs, excessive noise:
a. Clearance problems on blower. All components securely attached.
b. Verify integrity of ductwork. Leaks or loose connections. Rattling diffusers or balancing dampers.
c. Maximum CFM too high, or discharge static pressure too low

If fan motor runs, insufficient air flow:
a. Check for ductwork restrictions. Dirty air filters. Clogged water coils.
b. Re-adjust fan speed control.
c. Discharge static pressure too high.

If repair or replacement is required:
Motor and fan should be removed as an assembly. Disconnect all power before servicing. Remove the hex nuts from the mounting lugs holding the fan assembly to the discharge panel, and lower the assembly. For model TFS, lift the motor / blower assembly to release the tabs from the discharge panel, then lower the assembly. Do not allow assembly to hang from wiring.

If removing motor from blower, first loosen the set screw holding the blower wheel to the motor shaft. Remove the three screws holding motor to the fan housing, and slide motor and fan housing apart.

Reverse the procedure for assembly.

Note: Over tightening motor mounting screws may crush isolation bushings, causing excessive fan noise.

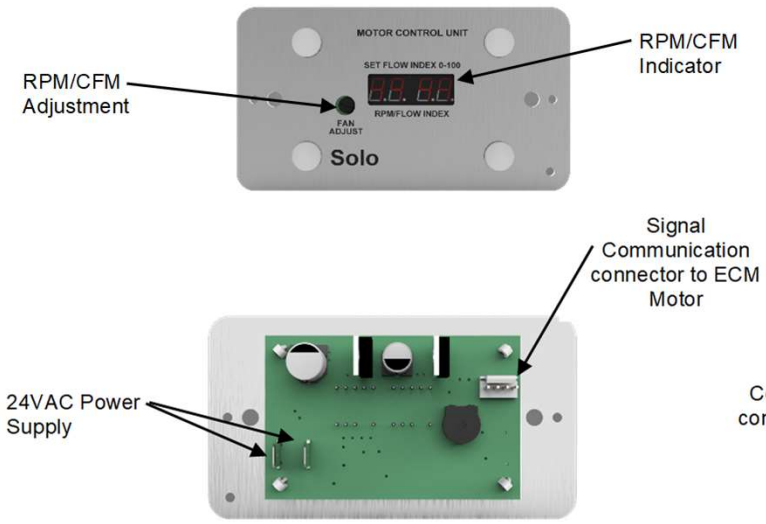
Optional Water Coil Cleaning

In most cases, the supply side of the water coil (optional) can be cleaned by removing the bottom access door and cleaning the coil face through the open space between the motor / blower assembly and the unit casing.

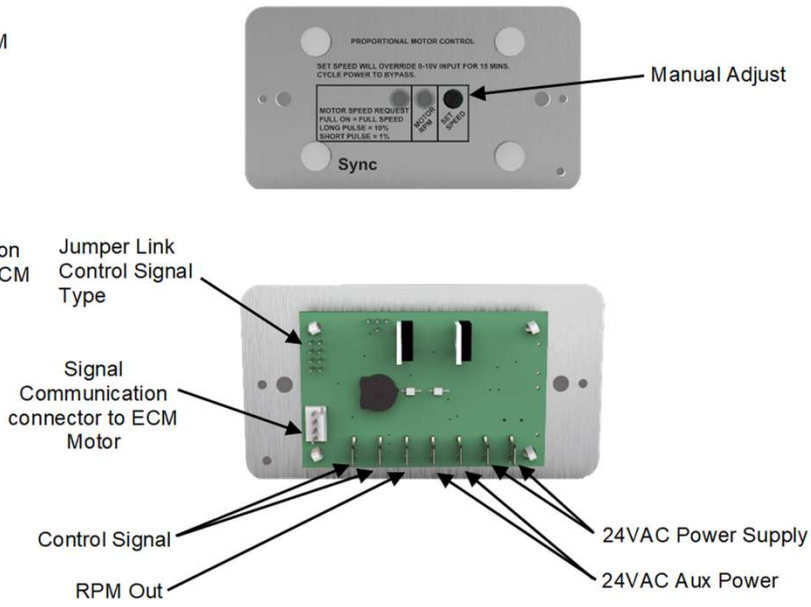
If more space is desired to clean the water coil, the motor / blower assembly may be removed and reinstalled as described above.

ECM Overview and Setup

Manual / Unit PWM Signal Interface Board



Remote PWM Signal Interface Board Details



The Manual PWM interface board allows accurate manual adjustment and monitor of fan with the GE Electric ECM Motor.
The Manual interface board features a 4 digit LED numerical display to allow easy reading in dark spaces. Watch the display and set the flow index with a screwdriver adjust. Twenty seconds later, the display shows the motor RPM. Then, the display periodically alternates between the flow index and motor RPM.

Operation

ECM motors configured for Vspd operation are factory configured for external torque or airflow adjustment. A numerical flow index accurately adjusts the fan to the desired torque or airflow. The flow index is a number from 0-100 having a linear relationship to the minimum to maximum torque or airflow range specified by Titus. Refer to the fan specifications, data and charts to convert the flow index to torque or mass airflow.
The Manual PWM interface board allows local on/off and fan airflow adjustment. Rotating a single screwdriver adjuster changes the variable output signal to the motor from off to full output. While rotating the adjuster, a numerical flow index is locked on the illuminated numerical display. After adjustment, the display shows fan RPM.

The remote interface allows industry standard 0-10Vdc automation signals to adjust and monitor General Electric's ECM Motor.
The interface board provides remote adjustment of the ECM output from 0% to 100% of the programmed control range. A signal lamp on the control continuously flashes out the flow index2. Instruments are not required to read the flow index. A 0-10Vdc signal connects RPM to the automation control. Jumpers allow the Interface to be configured for 0-10Vdc automation signal, 2-10Vdc automation signal, and manual/override control. The interface can also be used for stand-alone manual control.

The green lamp continuously indicates the flow index. After a pause, the lamp flashes out the tens digit, then the units digit of a number between 1 and 99. Long flashes represent the tens digit, and short flashes represent the units digit. For example, a flow index of 23 flashes two longs, then three shorts.
Two extra long flashes indicate a flow index of 0. An extra long flash and ten short flashes indicates a flow index of 100. The lamp flashes the signal that was present when the flash sequence started.
Turning Adjust controls the ECM motor to the manually adjusted setting. The manual setting has authority for 15 minutes.Set the unit to full heating (maximum induction). Adjust and set remote balancing dampers, if present. Adjust the speed control to deliver the required CFM by measuring air quantity at the room outlets.

ECM Overview and Setup

Remote PWM Signal Interface Board Details

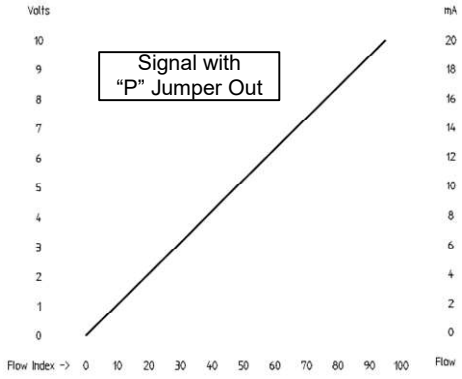
Jumpers

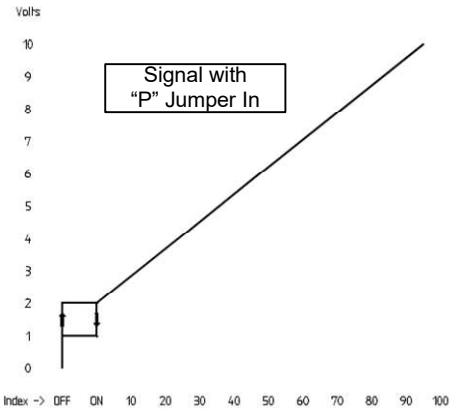
M – Enables SET SPEED potentiometer manual override (bypassed when automation SIGNAL exceeds 0.2VDC).

S – Enables SET SPEED potentiometer reversal (used when the set speed potentiometer is going to be adjusted from the component side of the board).

P – Enables hysteresis option

With P Jumper: Configures the SIGNAL input to a 2-10v range; corresponding to 0-100% motor speed request.





Input / Output Control Signals

Input

Power Supply: 18-30 VAC, 60Hz
SIGNAL & COMMON: 0-10VDC = 0-100% PWM request
ECM supplied feedback: 5VDC (motor at rest or not connected)

Output

PWM supplied to ECM: 18VDC (10mA max)
ON/OFF supplied to ECM: 18VDC (10mA max)
RPM & COMMON: 0-10VDC (5mA max) = 0-2000 RPM (10 RPM increments)

DDC Control - Air Balance

If the DDC Controller signal is already installed, air balance can be achieved using the DDC Controller software tools. Please notice that a control signal less than 0.2Vdc may put the interface board into manual override. Avoid setting the DDC signal to less than 0.2Vdc.

WARNING

Turning Adjust potentiometer locks out the BAS signal for 15 minutes

Cycle power ON/OFF for faster lockout removal.

Manual Air Balance

The interface board can be manually adjusted before the DDC Controller signal is available. The balancer's manual adjustment has authority until automation is connected.

Air Balancer

1. Use Adjust to set the air flow. This adjustment will have authority for at least 15 minutes.

2. Read the flashing green light and record the flow index on the air balance report.

DDC Integrator

1. Set the Signal to 0Vdc to invoke manual override.

2. Record the RPM on the air balance report.

3. Enter the flow index the air balancer entered on the air balance report.

4. Observe the RPM is at or near the RPM observed in step 2.

5. Cycle the motor on/off 5 times. This clears the manual override function unless the "M" jumper is in place.