

INSTALLATION & OPERATION MANUAL

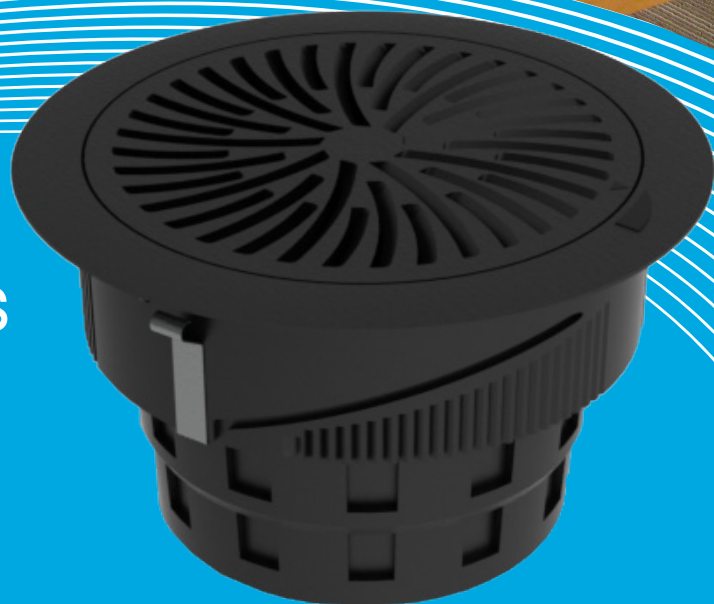


Underfloor Products

TAF-D / TAF-V / TAF-HC

TAF-R / TAF-G

LHK / PFC



LHK and PFC Underfloor Fan Powered 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.

Caution: Do not use the inlet collar, damper shaft, flow sensor or air tubing (available on LHK only) 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.

FLOOR SUPPORTS

The units can be mounted directly on the slab. If isolation from the slab is necessary, the unit can be placed on a rubber or cork pad.

Access to the motor, blower, and damper assembly is on the top of the unit. The access and control enclosure doors are sectioned so that each door is aligned with a floor panel.

Note: If equipped with pneumatic controls 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 FOR LHK

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.

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, low voltage controls and line voltage motor controls or electric heat section from the top of the unit.

For top access panel removal, 2" minimum vertical clearance above the unit is recommended, plus sufficient horizontal clearance to slide the access panel clear of the top of the unit. Horizontal clearance is dependent on access panel dimensions as indicated on product submittals.

Low voltage control enclosure doors are "L" shaped to allow access from the top and sides. For low voltage control enclosure access, a minimum of 18" clear 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.

LHK and PFC Underfloor Fan Powered Terminals

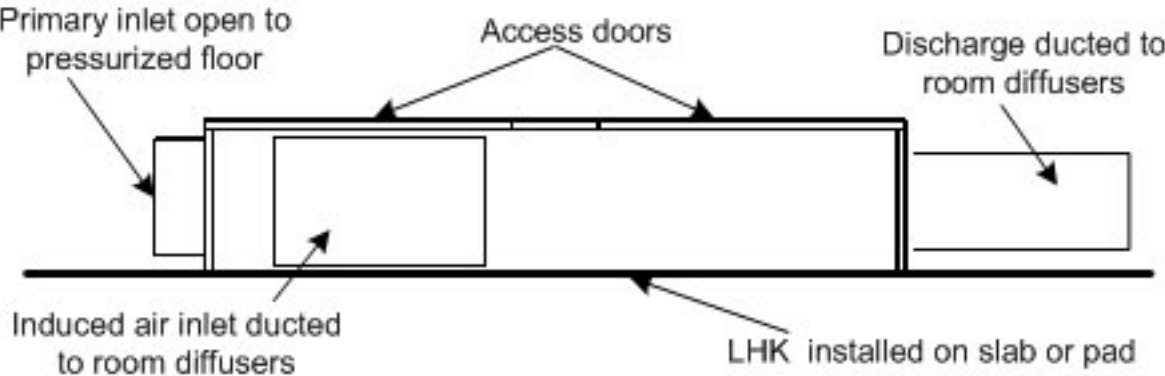


Figure 1. LHK

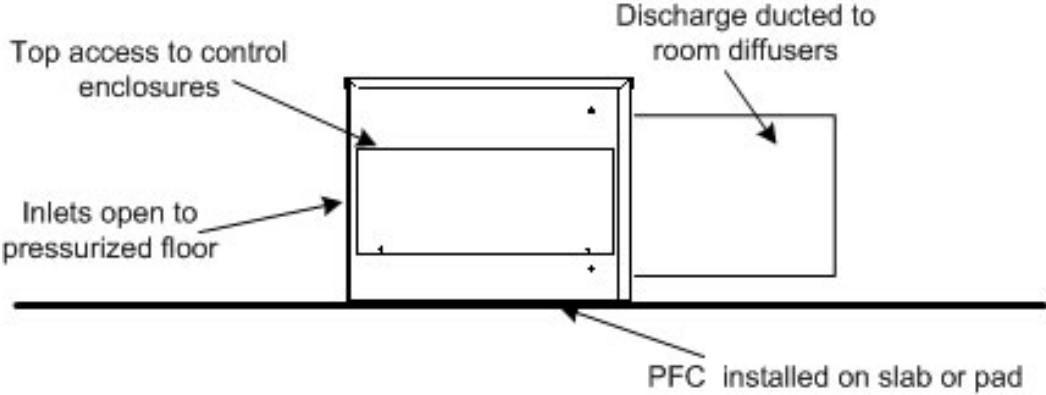


Figure 1. PFC

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 AirFlow label available for reference before calling.

			AIR FLOW
UP 			
MODEL NO.	DLHK	SIZE:	410
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		
303155001015			

Figure 4.

			FAN UNIT			
MODEL NO.:	DLHK	CODE:	88-XXXX-A 2 REV:02			
MOTOR	VOLT:	277	PHASE:	1	HZ	60
	HP:	1/3	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.

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.

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!
2. All foreign materials should be removed from duct system. Filters should be installed where required.
3. Motor is 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 side of the line voltage motor 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.
6. Proceed to primary air adjustment procedure (LHK only), 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 airflow:

- 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 four hex nuts from the mounting lugs holding the fan assembly to the discharge panel, and 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.

Primary Air Damper

LHK MODEL:

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.

Replacement Parts List

Description	Part Number	Unit Size	Filter Size	Part Number	Description	Part Number
<u>Multipoint Velocity Sensors</u>		<u>Induced Air Filters</u>			<u>Plugs for Tees</u>	
Size 9"	3151520005	3	18 x 10	1026491810	.25"	42160081
Size 10"	3151520006	4	18 x 14	1026491814	.38"	10015601
<u>Damper Shaft Bearing</u>		Model PFC			<u>Fan Motor Fuse (SC-CL-G 300V)</u>	
Shaft Bearing – All	70324901	10	18 x 10	1026491810	1 Amp	10048301
		14	16 x 14	1026491614	3 Amp	10048501
		16	14 x 16	1026491614	4 Amp	10048601
<u>Primary Damper Assembly (LHK)</u>		<u>Control Tube</u>			6 Amp	10048801
Size 9	31171304	Red Stripe .25" O.D.		61510035	8 Amp	10049001
Size 10	31171305	Green Stripe .25" O.D.		61510034	10 Amp	10049101
		Red Stripe .38" O.D.		61510279	12 Amp	10049201
		Green Stripe .38" O.D.		61510280	15 Amp	10049301
		<u>Tees for Sensor Taps</u>			20 Amp	10105201
		Plastic .25"		42150011	<u>Disconnects</u>	
		Plastic .38"		42150020	Fan Toggle (All)	10027801
					Door Interlock 3P/40A (All)	10053201
					Door Knob 40 Amp	100532011
					Door Interlock 3P/80A (All)	10054601
					Door Knob 80 Amp	100546011

Replacement Parts List (continued)

Description	Part Number	Description	Part Number	Description	Part Number
<u>Fan Relays</u>		<u>Fan Speed Controllers (SCR)</u>		<u>ECM Motor Components</u>	
1 Pole, 24V Coil	10156901	120V	10055301	ECM Motor Mounting Assembly	31484401
2 Pole, 24V Coil	10161801	208/240V	10057601	PWM (Manual Operation)	10334801
		277V	10053301	PWM (Remote Operation)	10334801
<u>Contactors, Magnetic</u>		<u>Fan Motor Capacitors (120V,208/240V, 277V)</u>		277V Power Cable, 8 ft.	10320501
2P/20A, 24V coil	10054401	1/4 Hp Motor 5 MFD	10053002	277V Power Cable, 5 ft.	10320520
2P/20A, 120V coil	10054402	1/3 Hp Motor 10 MFD	10053003	24V Comm. Cable, 8 ft.	10334901
2P/20A, 208/240V coil	10054404	3/4 Hp Motor 20 MFD	10055701	24V Comm. Cable, 5 ft.	10334902
2P/20A, 277V coil	10054403	Mounting Bracket (all)	10054501		
<u>Safety Devices</u>				<u>LHK Inductor</u>	
Auto Reset Thermal Cutout for Elec. Coils	10052101			277V:	
Air Flow Switch (AFS)	10269501			Inductor 3.0 Amp (Size 3)	10335101
AFS Sensor 4" length	10057201			Inductor 5.5 Amp (Size 4)	10335001
AFS Sensor 6" length	10057202			120V:	
P.E. Switch, 1 step	10000901			Inductor 11 Amp (All)	10348001
P.E. Switch, 2 step	10199801			<u>PFC Inductor</u>	
P.E. Switch, 3 step	10199802			277V:	
				Inductor 5.5 Amp (All)	10335001
<u>Control Transformers</u>				120V:	
120/24V, 50 VA	10029301			Inductor 11 Amp (All)	10348001
208/240/24V, 50 VA	10057501				
277/24V, 50 VA	10006601				

Fan Motors

Model	Unit Size	HP	120V/1	208/240V/1	277V/1	Blower Assembly
LHK	3	1/4	10095303	10150103	10096703	10045501
	4	1/3	10151201	10151203	10151202	10045501
PFC	10	1/4	10095303	10150103	100967-03	10045001
	14	1/3	10151201	10151203	10151202	10346201
	16	3/4	10051401	10057003	10051402	10261701
LHK w/ECM Motor	3	1/3	31535224	N/A	31535209	10045501
	4	1/3	31535225	N/A	31535210	10045501
PFC w/ECM Motor	10	1/3	31535234	315352138	31535233	10045001
	14	1/2	31535226	315352131	31535211	10346201
	16	1	31535227	315352132	31535212	10261701

TAF-R Diffusers and TAF-G Grommet

The TAF-R diffuser and TAF-G grommet were designed to install easily in the floor without the need to remove the floor tile. The TAF-R and TAF-G should be installed after the installation of carpet. The TAF-R and TAF-G install using the mounting ring spring clip assembly.

Installation requires a 8 5/8" mounting hole cut into the access floor tile. It is recommended that the tile is pre-cut from the tile manufacturer to ensure a consistent, round 8 5/8" hole.

Note: The trim ring should be able to move freely in the mounting hole. Irregular shaped holes may bind the trim ring and force it to not properly seat in the mounting hole.

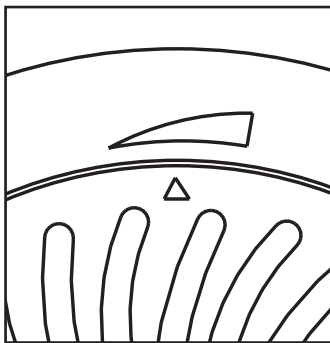


Figure 6. Position Indicator

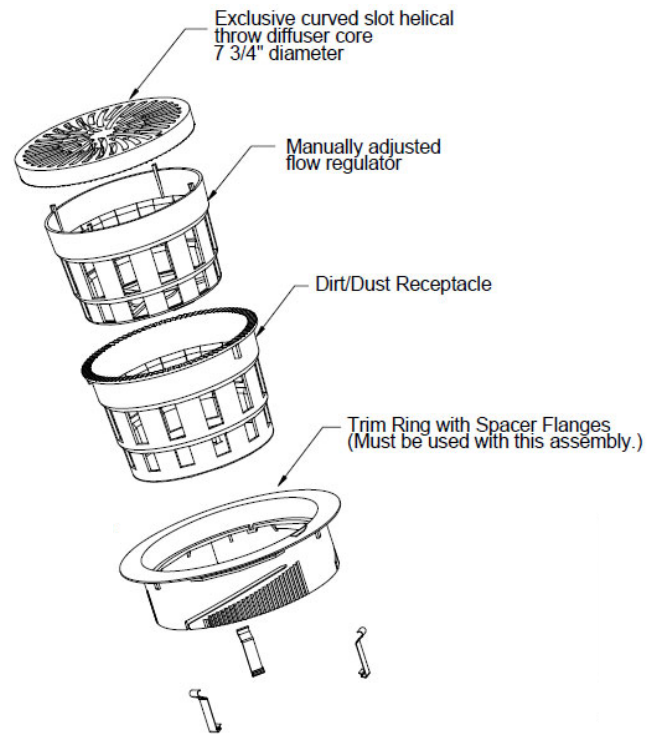


Figure 5. TAF-R Diffuser

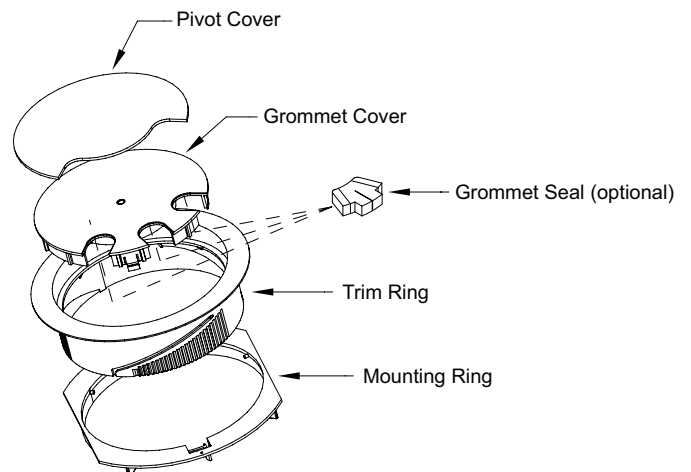


Figure 7. TAF-G Grommet

TAF-R Diffusers and TAF-G Grommet (continued)

Place trim ring above the mounting hole. Press the trim ring into the floor by using your weight to press down on the trim rings so the clips engage below the floor tile (Figure 8).

Place the inner damper basket in the outer dirt basket and insert the baskets into the trim ring (Figure 9). The outer basket has three tabs which are keyed to the trim ring so that the baskets will only install flush in one position.

For the TAF-R, place the diffuser in the trim ring (Figure 8) and align the open / closed position indicator (Figure 6). For the TAF-G, snap the grommet cover into the trim ring (not shown).

For the TAF-R with the optional actuator, the actuator interconnect diagram can be seen on page 12 of this document.



Figure 8. Trim ring installation



Figure 9. Basket installation

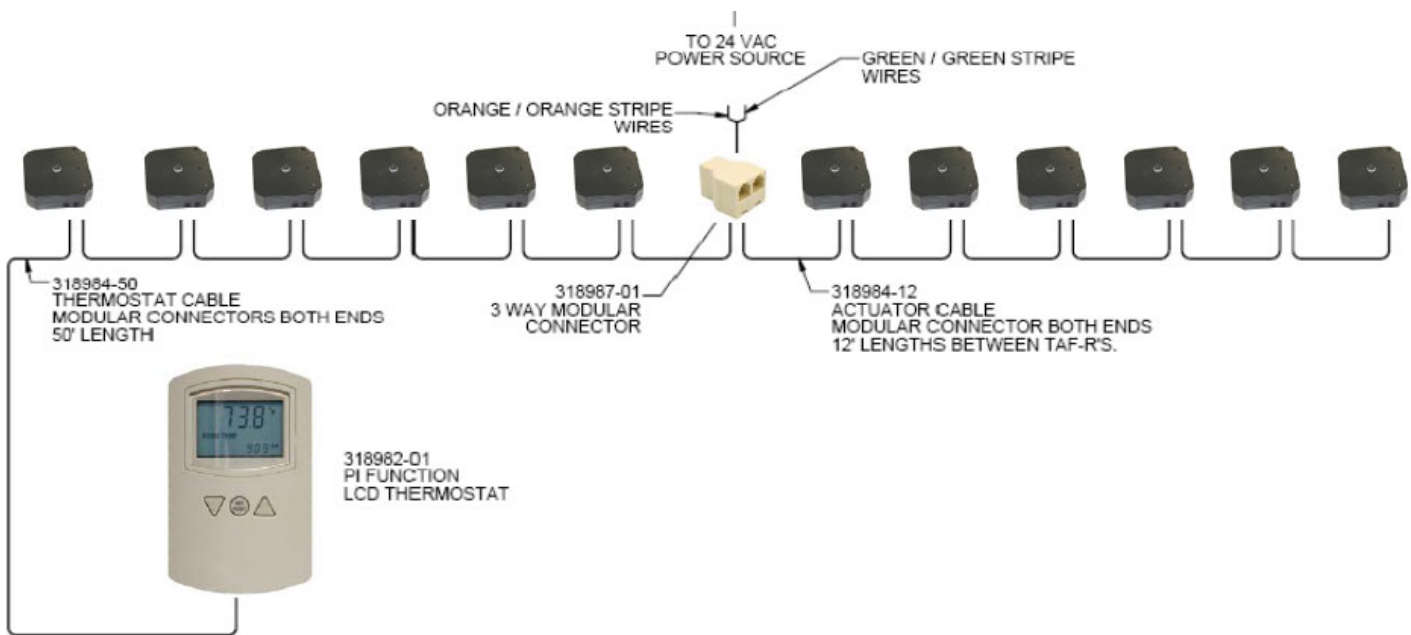


Figure 10. Face installation

Actuated TAF-R Interconnect Wiring Diagram

Note:

1. All referenced part numbers in the interconnect diagram below can be found on the TAF-R ordering procedure
2. A maximum of six actuators may be daisy chained between the thermostat and transformer. After that, a maximum of six more actuators may be daisy chained on the opposite side of the transformer. A maximum of 12 actuators may be supplied from one transformer and controlled from one thermostat.
3. The transformer must have an internal circuit breaker or equivalent breaker or equivalent 2.25A external fuse in the secondary circuit.

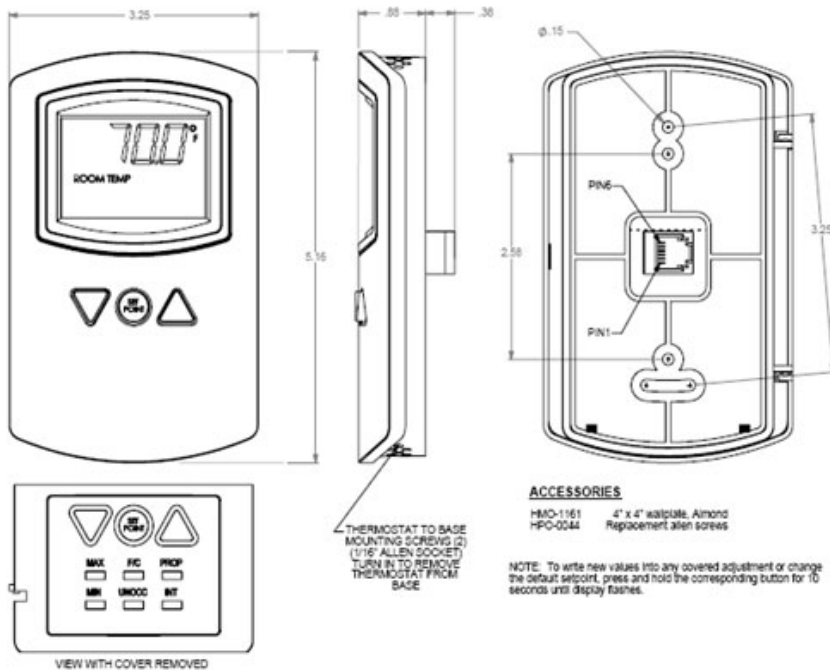


Actuated TAF-R Interconnect Wiring Diagram

Replacement Parts List (See pages 13-15 for interconnect part details)

Part Number	Description	Part Number	Description
31898201	Thermostat for Actuated Flow Regulator	31898301	Transformer Cable RJ12 Length (12in)
72541702	TAF-R Black Grille	31898450	Thermostat Cable Length (50 ft)
10304502	TAF-R Black Trim Ring	31898701	3-Way Modular Connector
10304602	TAF-R Black Flow Regulator (Inner Basket)	31898412	Actuator RJ12 Jumper Cable Length (12 ft)
10304802	TAF-R Black Dust Basket (Outer Basket)		
72541701	TAF-R Grey Grille		
10304501	TAF-R Grey Trim Ring		

Actuated TAF-R Interconnect Components

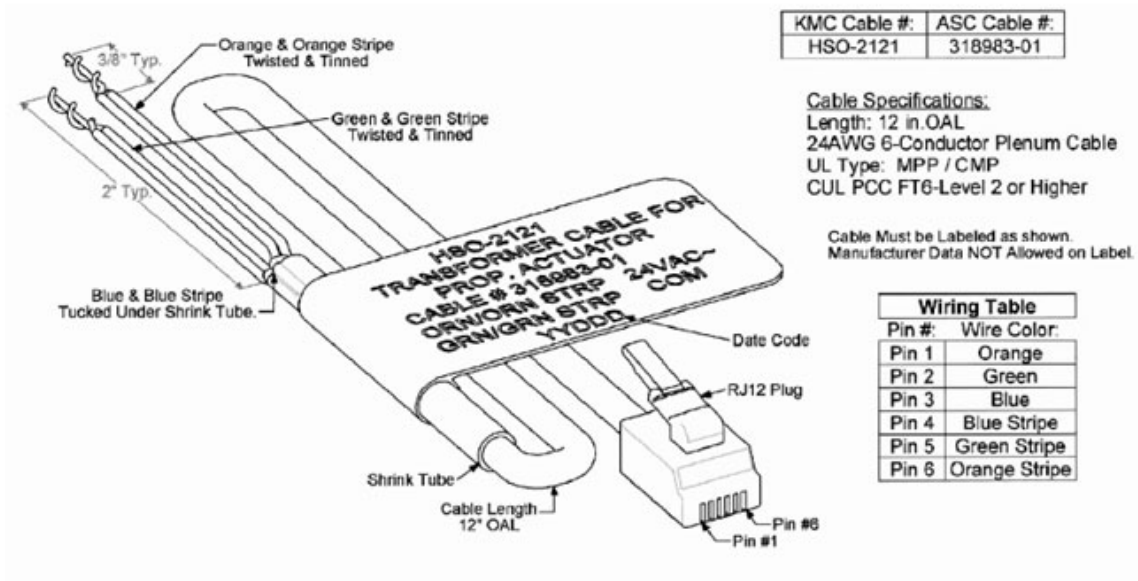


- ◇ Specifications
- ◇ Supply Voltage: 14-19 VDC
- ◇ Set Point Range: 60-85F (15.6-29.4C)
(Power on Default: 70F/21.1C)
- ◇ Temperature Sensor Type: Thermistor
- ◇ Accuracy: +/- .36F (2C)
- ◇ Display Degrees F or C: Selectable (Factory Setting: Degrees F)
- ◇ Direct Acting Output: 0-10 VDC
- ◇ Min/Max Limits: Adjustable 0-100% (Factory Settings: Min = 20, Max = 100)
- ◇ Proportional Band: 2-6F (1.1-3.3C) (Factory Setting: 4F)
- ◇ Integration Time: 15-60 Minutes (0 = Off) (Factory Setting: 30)
- ◇ Unoccupied Setpoint Modes: Off or Deadband (Factory Setting: Off)
- ◇ Off Mode: Output Voltage = 0.0 Volts (Safety Override: Output Cycles 0.0 Volts to 2.0 Volts to maintain 50F to 55F)
- ◇ Deadband Mode: Integral Action Disabled & Setpoint set to default +/- 10F Deadband. Deadband output midway between max. & min.
- ◇ Temperature Offset: Adjustable +/- 2F (+/- 1.1C)
(Press min & int together)
- ◇ Operating Ambient: 34-125F (1.1-51.6C)
- ◇ Shipping Ambient: -40-140F (-40-60C)
- ◇ Humidity: 0-95% non condensing
- ◇ Case Material: Light almond abs, UL Flame Class 94HB
- ◇ RJ-12 Female Connector:

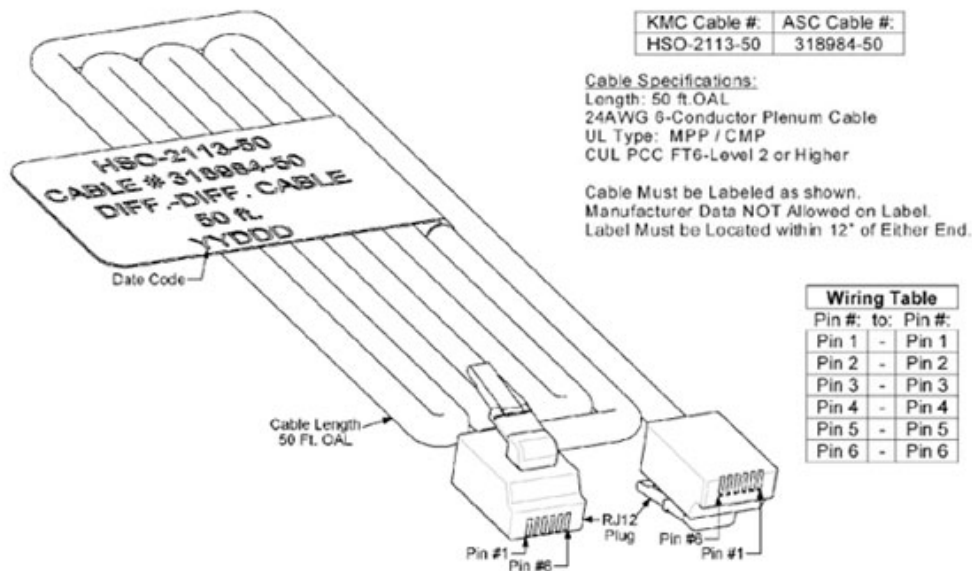
PIN1 NC	PIN2 COM	PIN3 SUPPLY
PIN4 OUT	PIN5 COM	PIN5 NC

31898201 Thermostat

Actuated TAF-R Interconnect Components (continued)

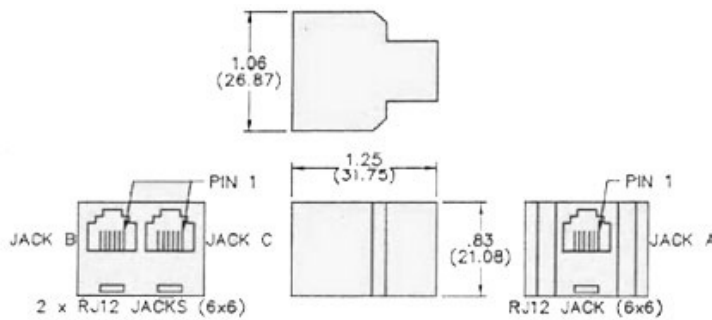


31898301 Transformer Cable



31898450 Thermostat Cable

Actuated TAF-R Interconnect Components (continued)

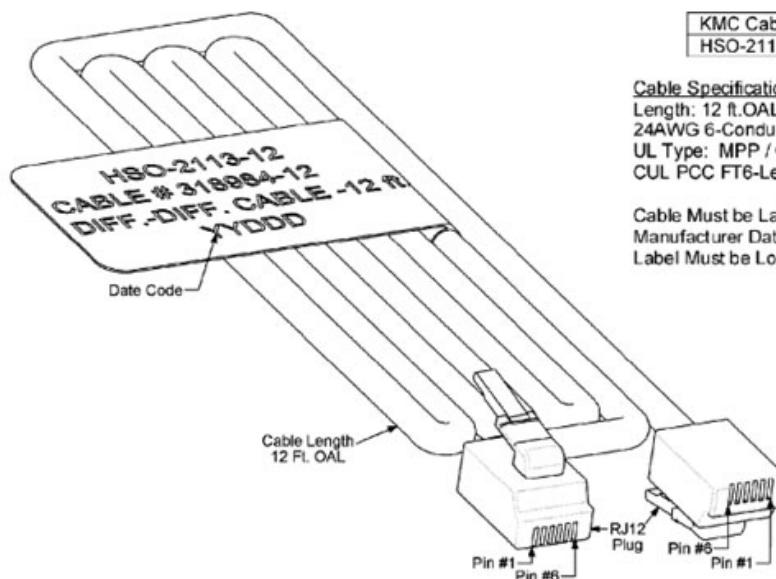


WIRING CHART		
JACK A	JACK B	JACK C
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6

NOTE:
ELECTRICAL:
 INSULATION RESISTANCE ---- 10 MEGOHMS MIN.
 DIELECTRIC WITHSTANDING VOLTAGE ---- 1000VRMS 60HZ 1MINUTE
 CURRENT RATING ---- 1.5AMPS @20°C
PHYSICAL:
 HOUSING ---- UL94V-0 RATED ABS.COLOR-IVORY
 CONTACTS ---- PHOSPHOR BRONZE
 PLATING ---- 30μINCHS GOLD OVER NICKLE

L-COM NO. TDS1039-6C-001 DESCRIPTION-TELECOM MODULAR

31898701 3-Way Modular Connector



KMC Cable #:	ASC Cable #:
HSO-2113-12	318984-12

Cable Specifications:
 Length: 12 ft.OAL
 24AWG 6-Conductor Plenum Cable
 UL Type: MPP / CMP
 CUL PCC FT6-Level 2 or Higher

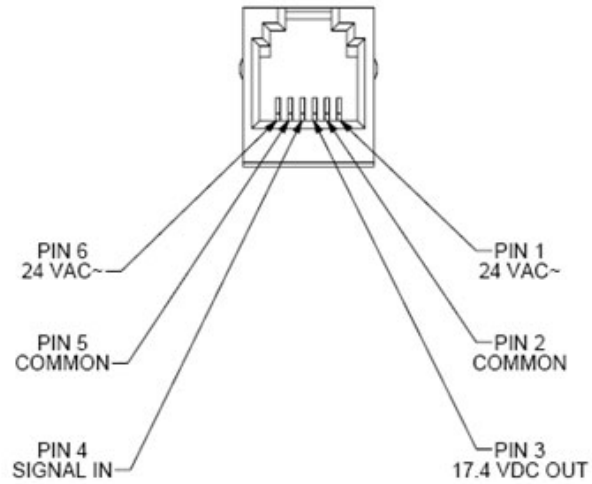
Cable Must be Labeled as shown.
 Manufacturer Data NOT Allowed on Label.
 Label Must be Located within 12" of Either End

Wiring Table	
Pin #:	to: Pin #
Pin 1	- Pin 1
Pin 2	- Pin 2
Pin 3	- Pin 3
Pin 4	- Pin 4
Pin 5	- Pin 5
Pin 6	- Pin 6

31898412 Actuator Jumper Cable

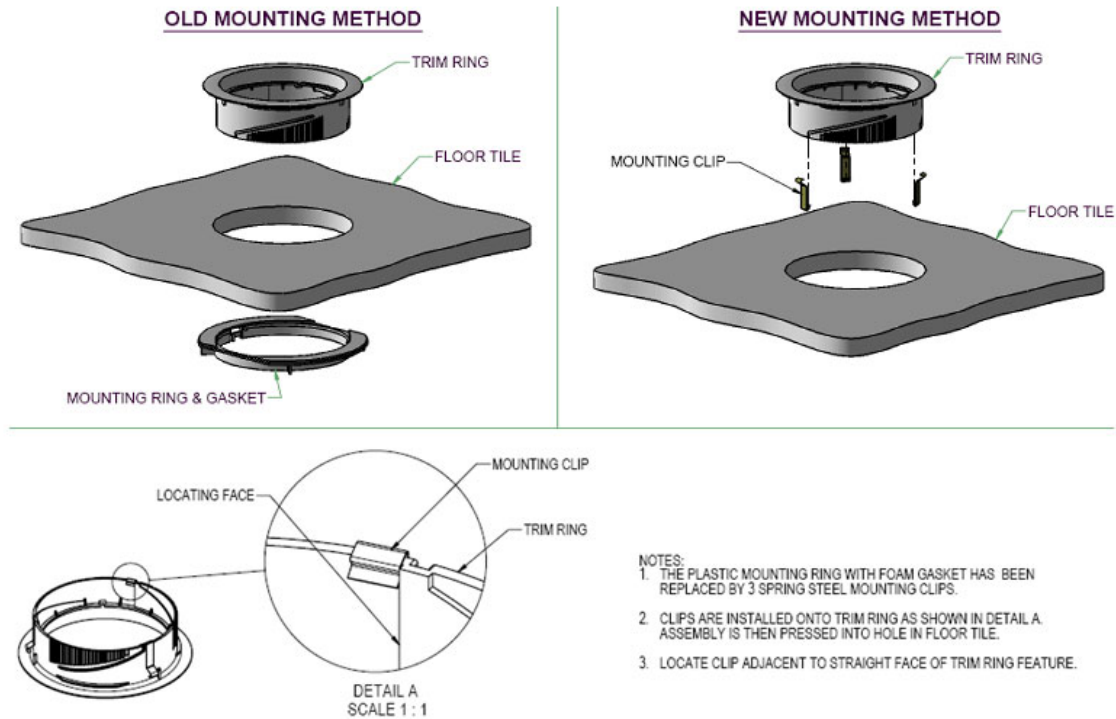
Actuated TAF-R Interconnect Components (continued)

RJ-12 Connector Pinout Diagram



Detail applies to "ALL" RJ-12 cables used on actuated TAF-R

TAF-R Mounting Clip Replacement



TAF-R Mounting Clip Replacement

Note:

1. "Old Mounting Method" detail above illustrates the previous installation method of the TAF-R which utilized a mounting ring & gasket as shown in the above view. The mounting ring & gasket can be discarded in place of the new mounting clips shown in the "New Mounting Method" view above.
2. Detail "A" shows the location for the replacement clip. There are 3 slotted features on the trim ring that will require the replacement clip be located adjacent to this slotted feature as shown in Detail "A".
3. The mounting clip replacement part number is 72821301. This part number should be ordered for a quantity of 3 clips per unit being replaced. For example, if 5 TAF-R units need to have the mounting ring & gasket replaced, then a quantity of 15 clips should be ordered.

TAF-HC, TAF-D and TAF-V Diffusers with Plenum

The TAF-HC, TAF-V and TAF-D diffuser plenums were designed to install easily in the floor without the need to remove the floor tile.

Installation requires a 8 5/8" by 16 5/8" mounting hole cut into the access floor tile.

Attach the CT-TAF grille frame to the TAF-HC / TAF-V / TAF-D plenum using sheet metal screws prior to installation in the floor. For the TAF-HC

and TAF-V, the actuator and thermostat must be wired before the unit is installed in the floor tile. Once the CT-TAF frame is attached to the plenum, slide the assembly into the hole in the floor tile. (Figure 11).

The wiring for the TAF-HC and TAF-V is shown in (Figure 12).

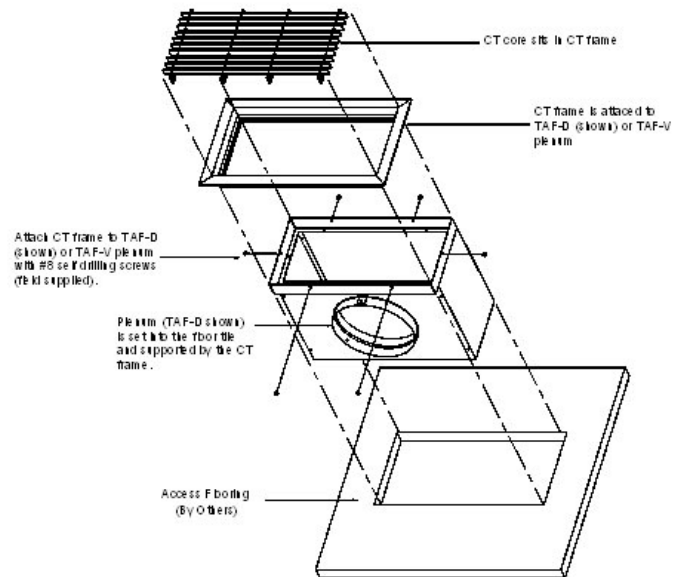


Figure 11. TAF-HC, TAF-D and TAF-V Installation

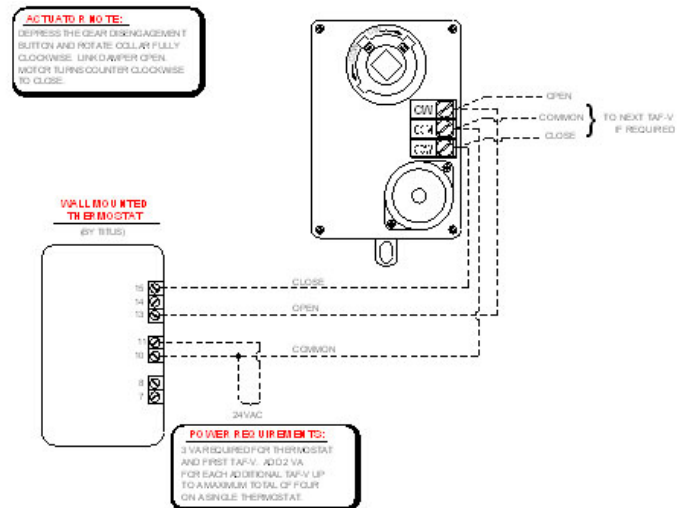


Figure 12. TAF-HC and TAF-V Wiring

Notes



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