



Flexsys Underfloor Design Level 2 MIT2 w/ Airvalve

INSTALLATION OPERATION & MAINTENANCE

Supersedes 130.16-N1 (106)

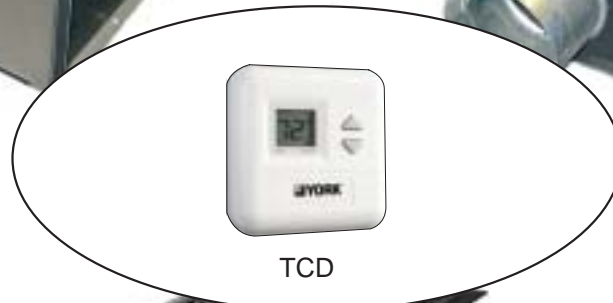
Form: 130.16-N1 (406)



MIT-A



MIT-G



TCD



MIT-C

LD11474A

ATTENTION: READ THIS MANUAL AND ALL LABELS ATTACHED TO THE UNIT CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THESE UNITS! CHECK UNIT DATA PLATE FOR ELECTRICAL SPECIFICATIONS AND MAKE CERTAIN THAT THEY AGREE WITH THOSE AT POINT OF INSTALLATION. RECORD THE UNIT MODEL AND SERIAL NO. IN THE SPACE PROVIDED. RETAIN FOR FUTURE REFERENCE.

Model No. _____

Serial No. _____

INSTALLER'S RESPONSIBILITY

Installer Please Note: This equipment has been tested and inspected. It has been shipped free from defects from our factory. However, during shipment and installation, problems such as loose wires, leaks or loose fasteners may occur. It is the installer's responsibility to inspect and correct any problems that may be found.

TABLE OF CONTENTS

INSTALLATION 3 - 20

RECEIVING 3

STORAGE 3

UNPACKING 3

PREPARE FLOOR FOR MOUNTING 3

INSTALLATION INSTRUCTIONS:

MIT2-A..... 6

MIT2-C..... 7

MIT2-G 8

PCD..... 8

Flexfloor 9

UFE/UFW - Underfloor heating terminals..... 12

HCE/HCW 15

TCD – Thermostat Control..... 17

PM – Power Module..... 18

IBOX – Network Communication with BAS..... 18

OPERATION 22

MAINTENANCE 23

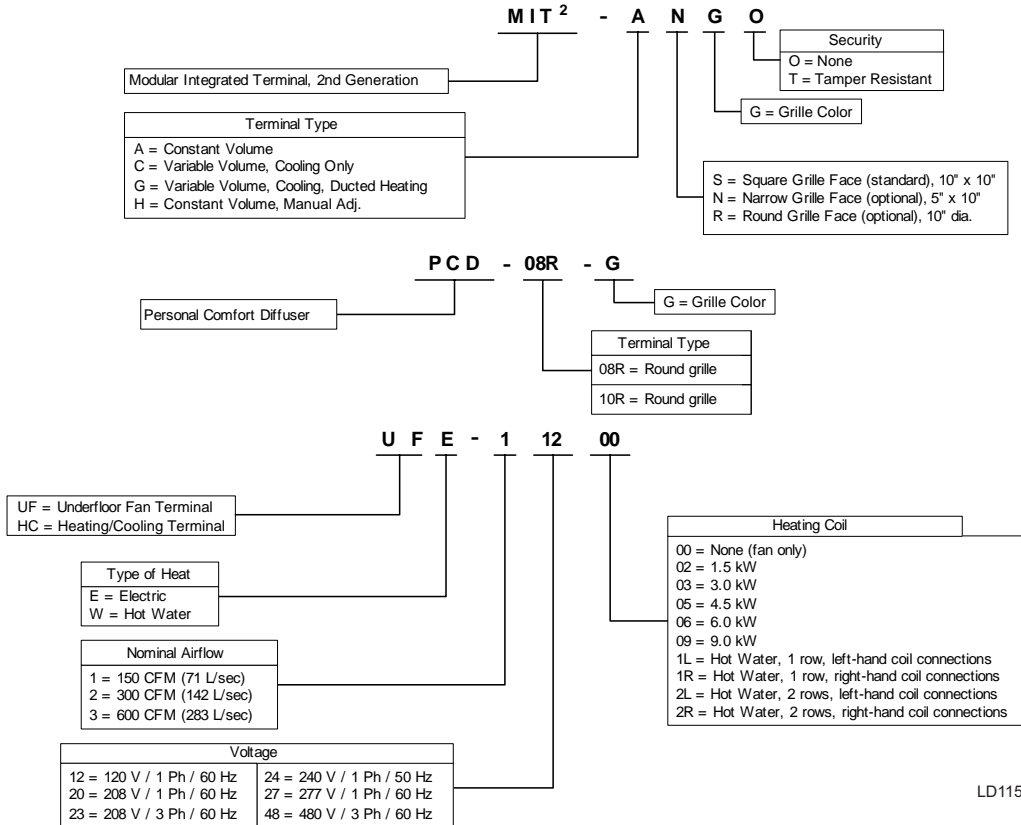
START-UP CHECKLIST 24

Reference Documents:

- Engineering Guide: *See Form 130.16-EG1(Latest)*
- Users Guide for Flexfloor: *See Form 450.20-NOM3 (Latest)*
- Renewal Parts List: *See Form 130.15-RP1 (Latest)*
- Application Guide: *See Form 130.16-AG1 (Latest)*

These documents can be ordered through Publications Dept.
 or downloaded @ <http://intranet.york.com/web0003/library/default.asp>

TABLE 1 - FLEXSYS DIFFUSER AND FAN TERMINAL NOMENCLATURE



LD11553B

INSTALLATION

RECEIVING

Material in this shipment has been inspected at the factory and released to the transportation agency in good condition. When received, a visual inspection of all cartons should be made immediately. Any evidence of rough handling or apparent damage should be noted on the delivery receipt and the material inspected in the presence of the carriers representative.



If damage is found, a claim should be filed against the carrier immediately.

STORAGE

If the equipment is not to be immediately installed, store it in a dry location with the motor protected against moisture, dust, corrosion and physical damage.

UNPACKING

MIT chassis are shipped assembled, on a standard skid, 48 per skid, banded and shrink-wrapped. All hardware will be shipped loose in a bag, included on a single skid. PCD chassis are shipped 96 per skid.

Ship loose items include:

- #8 x 1-3/4" flat head screws
- PAP-1 cable (one/terminal)

Finished grilles will also be shipped together on separate skid(s). Setscrews for tamper-proof grilles are installed in the grilles at the factory.

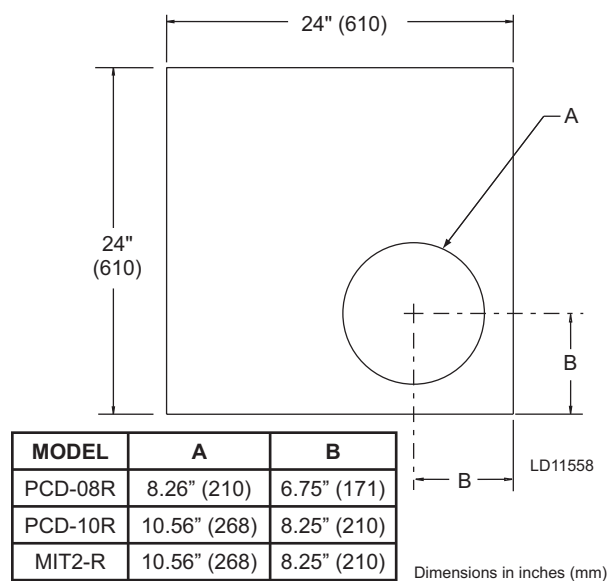


FIG. 1 - FLOOR PANEL OPENING FOR ROUND GRILLES

PREPARE FLOOR FOR MOUNTING

Depending upon building construction, provisions for mounting the unit must be made by the contractor according to architects drawings.

Inspect the floor panel and verify the floor opening hole size (see Fig. 1-3).

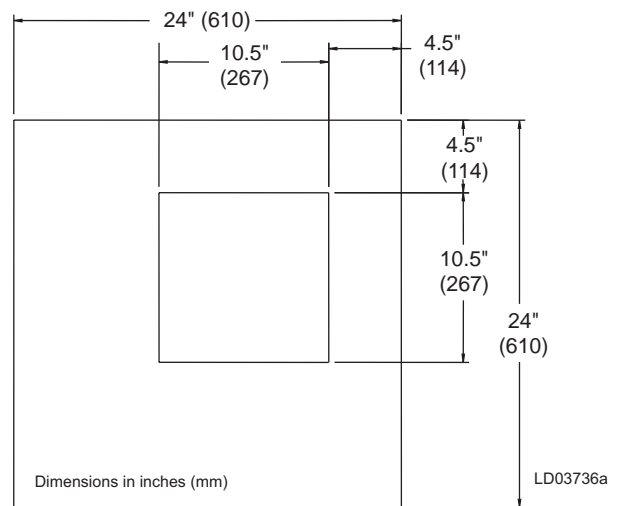


FIG. 2 - FLOOR PANEL OPENING FOR 10 X 10 GRILLES

When a carpet surface is used, the type of installation must be selected. With "butt" edge carpeting, the carpet opening is cut to allow the MIT to set directly on the floor panel surface and the trim ring edge "butts" the carpet. With "lap" edge carpeting, the carpet is installed before the MIT and the entire MIT sets on the carpet edge under the trim ring (see Fig. 4).

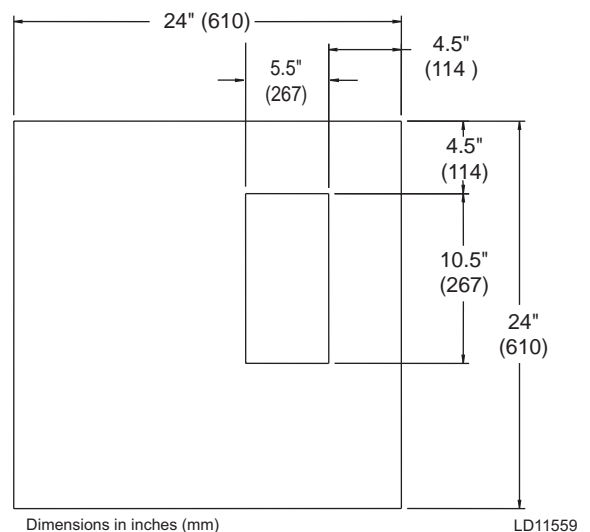
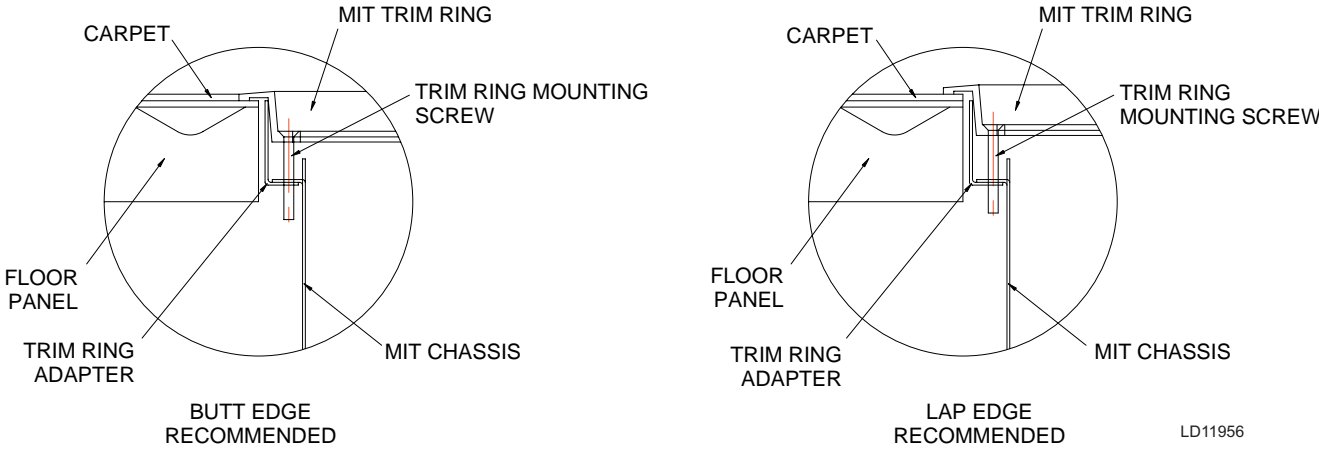


FIG. 3 - FLOOR PANEL OPENING FOR 5 X 10 GRILLES

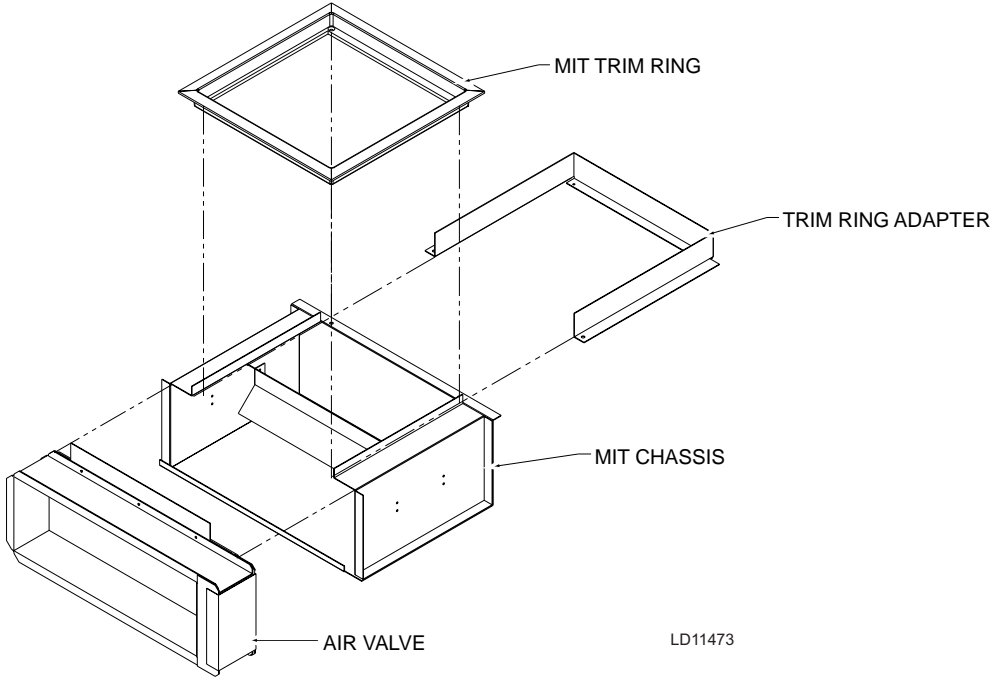
INSTALLATION

INSTALLATION



LD11956

FIG. 4 - MIT TRIM RING POSITIONING



LD11473

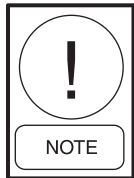
FIG. 5 - MIT ASSEMBLY (MIT-C SHOWN)

INSTALLATION

INSTALLATION GUIDELINES



Do not leave floor with exposed holes.



Orient the MIT box in the floor panel according to architects drawings. The air valve is the AIR INLET to the MIT box.

Complete the installation of each grille. Check each grille for a solid fit in the floor. If floor must be left unfinished, use a solid, temporary cover over any unfinished holes in the floor.

If the inlet side of an MIT terminal is installed WITHIN 15 ft. and is facing the supply point, the air velocity pressure would increase the terminal's air flow and distort the air distribution pattern. In this case, the MIT inlet should be turned away from the supply point.

Additional units can be added after the installation is completed. Models A & H can be added w/o additional wiring. Models C and G can be added by extending control from the last MIT in the chain with a PAP-1 cable.

Locate the TCD in an area with good air circulation at average temperature conditions. Install the TCD about 4 ft above the floor, for all ceiling heights. This height may be lower to comply with Americans with Disabilities Act.

DO NOT install the TCD:

- In drafts, dead air space, behind doors or in corners.
- In line of hot or cold air from underfloor grilles.
- In sunlight or close to appliances (includes copiers and printers).

- Close to concealed pipes or chimneys.
- On Outside walls.

The UFE/UFW terminals should be located under the floor in a convenient location between the supply and return MIT boxes. Provide access to the UFE/UFW boxes thru an accessible floor panel to change out the filter. For MIT-H installation, see *Form 130.15-N2.7*

APPLICATION GUIDELINES

The recommended minimum number of thermal zones per floor on a rectangular freestanding building is nine: four on the corners, four between corners, and one in the center. However, more zones offer greater flexibility, improved comfort, and more energy savings.

When underfloor air distribution is used, the supply air temperature generally should not be lower than 60°F leaving the air handling unit or coldest air terminal.

MIT's can be networked from a single thermostat and Power Module (PM) or multiple PM's can be daisy-chained to form huge zones. A single PM serves up to 14 devices, but multiple PM's can be added to provide unlimited capacity responding to a single thermostat.

To avoid air noise issues at the floor supply point, the air velocity should not be more than 1500 fpm entering the floor.

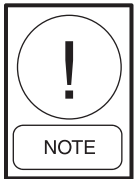
The recommended maximum distance from the floor supply point to the most distant MIT terminal should not be more than 50 ft. This specifically applies to underfloor applications of more than one floor being served. MIT terminals further than 50 feet will result in air temperature degradation and unsatisfied zones. Adding a second supply point closer to this terminal will correct this issue. For applications of a single floor, the maximum distance is recommended to be no more than 70 feet. See *applications guide, Form 130.16-AG1 for more details.*

INSTALLATION

MIT2-A Install as follows:

See Fig. 4 for trim ring to carpet orientation; see Fig. 7 for attachment of trim ring to MIT chassis.

From the topside of the floor panel, set the terminal down thru the panel opening.



The terminal height is less than 7-1/2"; if the floor panel is elevated higher than this, the terminal laying on the sub-floor will be lower than the floor.

The terminal can still be installed this way, as follows:

- 1) Set the floor panel in the floor.
- 2) Slide the terminal thru the opening and set on the subfloor, orienting the inlet side according to the architects plans.
- 3) Set the trim ring in the opening.
- 4) With the 4 screws in hand, pull the terminal back up thru the opening to the edge of the trim ring, using the deflector vane inside the terminal to pull it up and hold it in place.

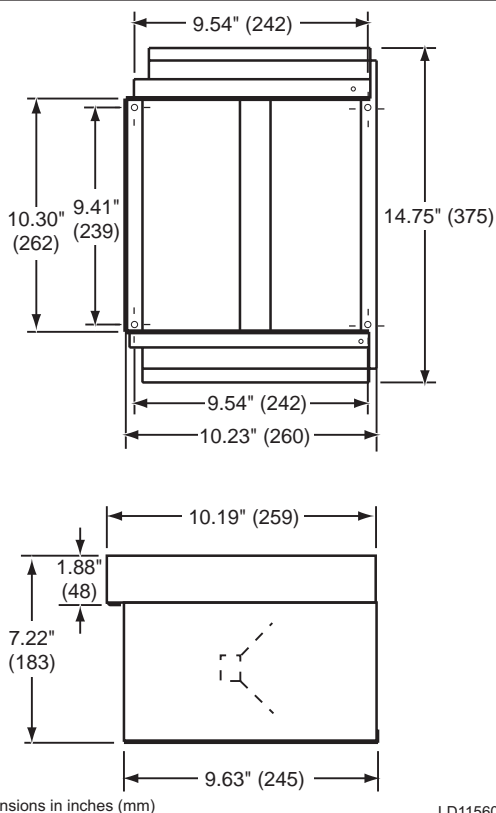
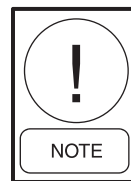


FIG. 6 - MIT2-A DIMENSIONS

- 5) Attach the screws thru the trim ring into the terminal.
- 6) Install the grilles in the trim ring.

An alternate method is to install the terminal in the floor panel and set the completed assembly in the floor, as follows:

- 1) Set the terminal on a flat surface.
- 2) Place the floor panel on top of the terminal, checking to be sure the chassis is square in the opening and oriented in the floor panel correctly. Support the panel with a block of wood; the height of the block to be the height of the terminal less the thickness of the floor panel.
- 3) Place the trim ring on top of the floor panel (and inside the flanges of the terminal).
- 4) Attach the trim ring, floor panel and the chassis together with the four 1-3/4" screws provided.
- 5) Set the completed assembly in the floor and attach the floor panel to the floor structure.
- 6) Install the grilles in the trim ring.



Regardless of installation method, make sure that terminal sets square in the opening and the orientation of the terminal is correct (air inlet side is facing in the correct direction).

Be sure to observe that the carpet, if already laid, is under the flanges of the trim ring. If the carpet has not been laid, leave the screws loose so the carpet edge can be inserted under the trim ring flange. Do not over tighten.

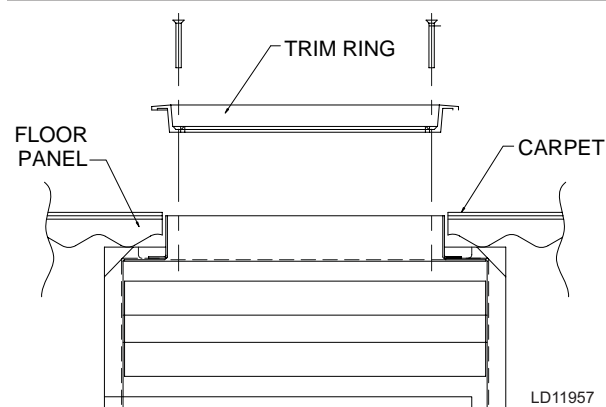


FIG. 7 - TRIM RING INSTALLATION (MIT-2A SHOWN)

INSTALLATION

MIT2-C install as follows:

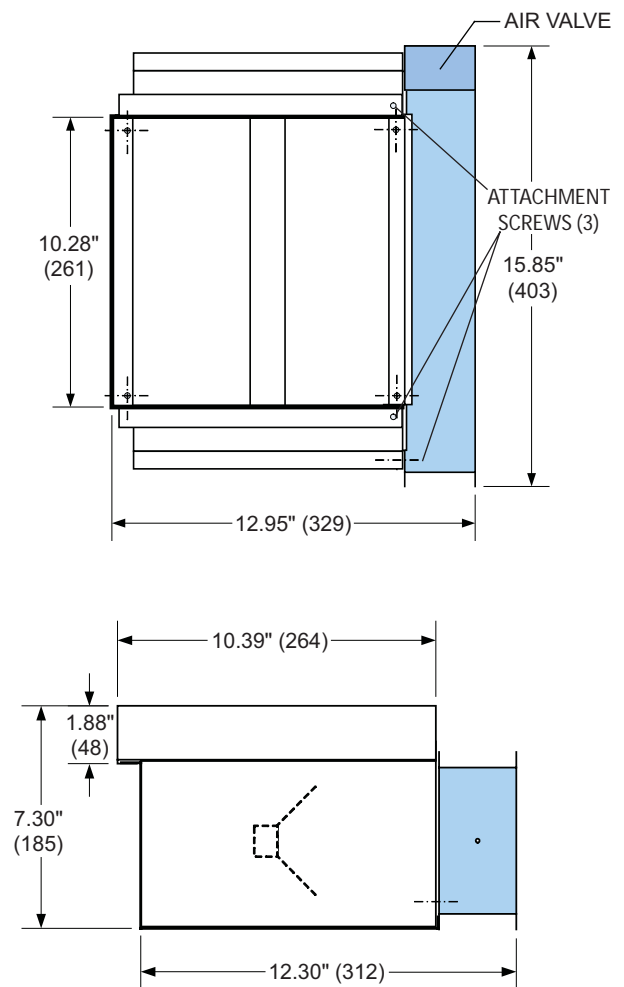
See Fig. 8 for MIT-2C dimensions; see Fig. 4 for trim ring to carpet orientation; see Fig. 5 for attachment of trim ring to MIT chassis.

This is the cooling only MIT box with the air valve attached.

There are two ways to install this into the floor panel, as follows:

- Install the completed assembly in the panel and insert this assembly into the floor (this is the preferred method of installation, particularly for raised floors that are 12" or less), and round or narrow grilles:
 - 1) Set the MIT chassis on a steady surface, such as a table.
 - 2) Place the floor panel on top of the terminal; checking to be sure the chassis is square in the opening and oriented in the floor panel correctly. Support the panel with a block of wood; the height of the block to be the height of the terminal less the thickness of the floor panel.
 - 3) Place the trim ring on top of the floor panel (and inside the flanges of the terminal).
 - 4) Attach the trim ring, floor panel and the chassis together with the four 1-3/4" screws provided. Do not over tighten.
 - 5) Connect the PAP-1 and PAP-5 cables to the MIT box air valve. These are plug-and-play cable connections. Be sure the plugs fit tight and "snap" when inserted.
 - 6) Set the completed assembly in the floor and attach the floor panel to the floor structure.

- Install from the top (for units to be installed with 12" square grilles) with the floor panel already installed in the raised floor:
 - 1) Remove the air valve from the box by removing the 3 screws holding the air valve to the terminal box.
 - 2) Insert the air valve thru the opening and lay on the floor, orienting it in the final position on the floor (note that this is the inlet to the box and orientation in the floor panel has already been decided, according to architect plans and drawings).



Dimensions in inches (mm)

LD11475A

FIG. 8 - MIT2 - C

- 3) Insert the terminal thru the floor opening and set on the floor.
- 4) Reattach the air valve to the box using the 3 screws previously removed (note that the bottom flange of the air valve fits inside the bottom flange of the terminal).
- 5) Connect the PAP-1 and PAP-5 cables to the MIT box air valve. These are plug-and-play cable connections. Be sure the plugs fit tight and "snap" when inserted.
- 6) With the 4 screws in hand, pull the terminal back up thru the opening to the edge of the trim ring, using the deflector vane inside the terminal to pull it up and hold it in place. Do not over tighten.

INSTALLATION

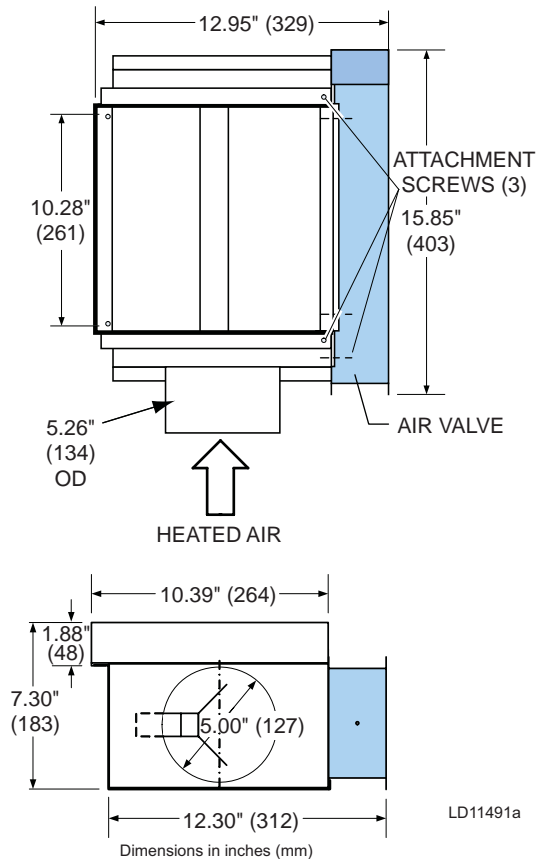


FIG. 9 - MIT2 - G

MIT2-G, install as follows:

This MIT box comes fully assembled with only the trim ring to install.

Install the completed assembly on the panel and insert this assembly into the floor as follows:

- Set the MIT chassis on a steady surface, such as a table.
- Place the floor panel on top of the terminal, checking to be sure the chassis is square in the opening and oriented in the floor panel correctly. Support the panel with a block of wood; the height of the block to be the height of the terminal less the thickness of the floor panel.
- Place the trim ring on top of the floor panel (and inside the flanges of the terminal).
- Attach the trim ring, floor panel and the chassis together with the four 1-3/4" screws provided. Do not over tighten.
- Connect the PAP-1 and PAP-5 cables to the MIT box air valve. These are plug-and-play cable connections. Be sure the plugs fit tight and “snap” when inserted.

- Install the flexible duct on to the collar. Verify connection is secure.
- Set the completed assembly in the floor and attach the floor panel to the floor structure.

Be sure to observe that the carpet, if already laid, is butted against the flanges of the terminal. If the carpet has not been laid, leave the screws loose so the carpet edge can be inserted under the trim ring flange.

PCD

The round-style PCD-8R is a manually adjustable, constant-volume air terminal rated at 50 cfm. The unit installs in a floor panel through an 8-1/4 inch (210-mm) round opening, as shown in Fig. 10. Airflow direction may be changed by loosening the single mounting screw and rotating the diffuser. A manually adjustable thumbwheel varies the airflow rate.

The PCD-10R is a manually adjustable, constant-volume air terminal rated at 100 cfm (47 L/sec). It is similar in construction to the PCD-8R and installs in a floor panel through a round opening 10-9/16 inches (268-mm) in diameter. A manually adjustable thumbwheel mounted in the grille varies the airflow rate, and airflow direction may be changed by loosening the single mounting screw and rotating the diffuser. *See Fig. 1 for panel opening dimensions.*

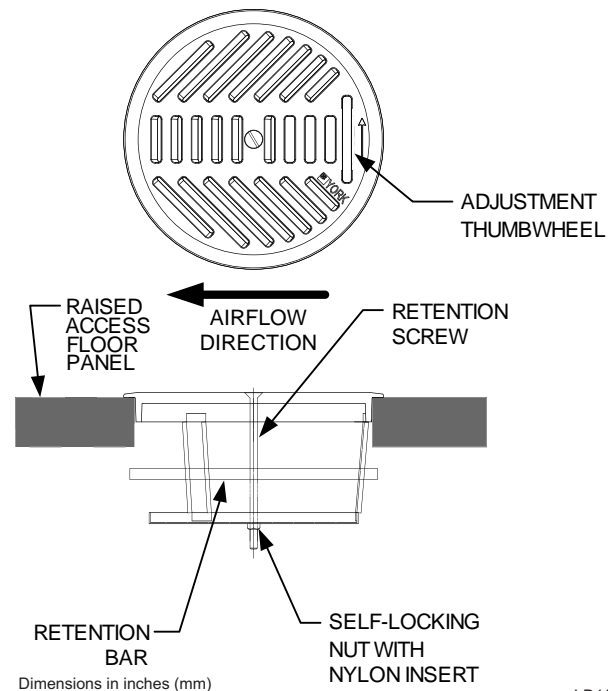
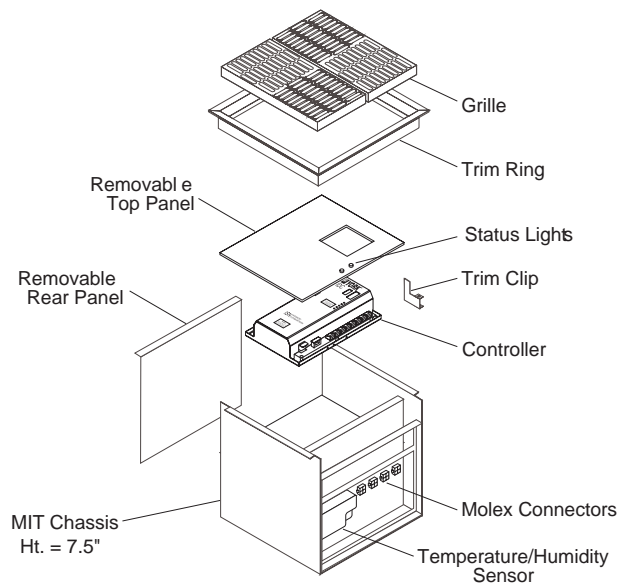


FIG. 10 - PCD-8R/PCD-10R

INSTALLATION



LD11552

FIG. 11 - FLEXFLOOR CONSTRUCTION

Flexfloor

The flexfloor is the standard control used in flexsys systems to control underfloor pressure and humidity. It is provided with an IDC control to monitor and process data; a humidity control and a pressure transducer to control humidity and underfloor pressure, respectively. See Fig. 11 for flexfloor construction/component location.

Install the trim ring onto the unit, making sure the recesses on the bottom of the outside flanges fit down over the flanges on the chassis. Align holes in the trim ring with the holes in the end panels (see Fig 12).

Install the long #8 x 3" sheet metal screw in position A-1 by inserting it thru the trim ring and end plate hole and engaging the threads on the hold down that is placed on the bottom side of the panel. Be sure the hold-down has the wing turned up to engage the panel bottom. Install the #8 x 1/2" flat head screw in position B-1 in the trim ring (see Fig. 12).

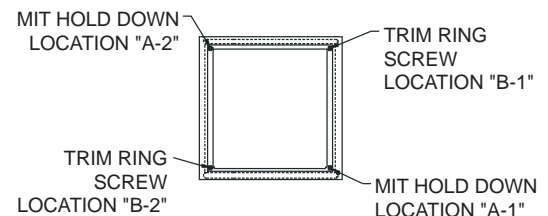
Tighten the two hold down screws A-1 and A-2 in the trim ring flange to retain the chassis snug in the opening. Do not tighten more than necessary to prevent movement of the chassis in the floor. The chassis hold-down should rotate out as the screw tightens and engages the bottom of the panel, causing the trim ring to pull down.

It is accessible (above the floor, thru the removable grille). It is provided in either a 115v or 230v version with power connections thru a side KO, using 16 AWG copper wire; (removal of the back panel by removing three screws provides access to power); is provided with four 4-pin connectors for direct connections using PAP cables marked SLAB, SPACE, DAMPER/VFD and BYPASS.

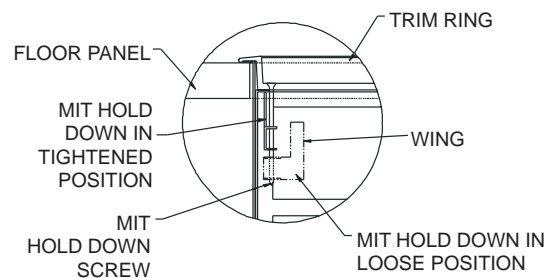
- SLAB is a PAP cable connection (cable provided) and sensor (provided) to monitor slab temp.
- SPACE is a PAP cable connection to a zone or duct sensor (use a 10K, type III thermistor). This may be a return air sensor used to reset the space setpoint, otherwise it is not used with an MIT system.
- DAMPER/VFD is a PAP cable connection to the floor damper or the supply fan VFD (0-10vdc output) to control underfloor pressure.
- BYPASS is a PAP cable connection to an air handler cooling coil bypass damper, to control supply air temp. to the space (0-10vdc output).

In addition, when applied with a York RTU with either Optilogic controls or IPU primary controller, these units are provided with the damper control and humidity/temperature sensor; therefore this control is not needed for this application.

See IDC component drawing, Fig. 13.



PLAN VIEW OF TRIM RING



LD03741C

FIG. 12 - TERMINAL/TRIM RING ATTACHMENT

INSTALLATION

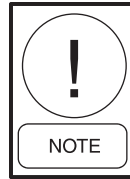
Flexfloor has 2 LEDs to indicate status, as follows:

- Green LED indicates there is power present
- Red LED indicates alarm status – either the underfloor pressure has risen 0.015” above setpoint OR underfloor air temperature is within 3° F of slab dewpoint.

The IDC information and configuration of setpoints can be accessed thru the RS232 port from a laptop computer operating a VT100 terminal emulation program (Hyperterminal) or using the Keypad and Display Module, available through York and can be connected directly to the IDC control. The IDC is configured at the factory with default setpoints except for system calendar and time schedule.

The default setpoints are as follows:

- Underfloor pressure = 0.05” H2O (occ), = 0.025” H2O (unocc)
- Plenum temp. = 63°F (occ), = 67° F (unocc)
- Space cooling setpoint = 75°F; zone sensor adj range = 5°F
- Unoccupied offset = 10° F (or 85°F for default setpoint); override minutes = 60 min.



Reference Users Guide, Form 450.20-NOM3, for further details on installation and operation of the flexfloor control.

INSTALLATION

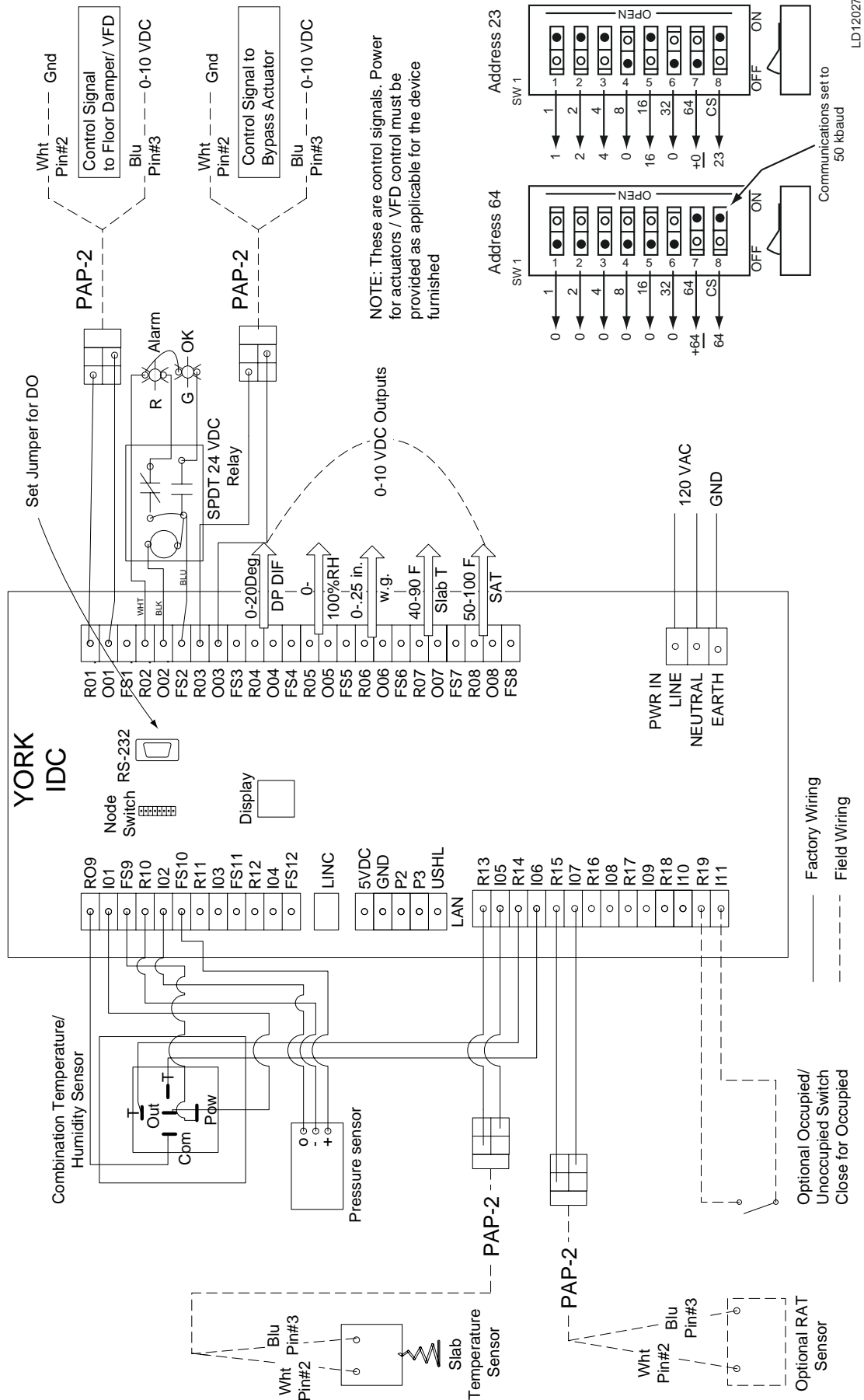


FIG. 13 - FLEXFLOOR WIRING DETAILS

INSTALLATION

UFW-2, -3	1-ROW COIL	2-ROW COIL
DIM X	40.75"	35.63"

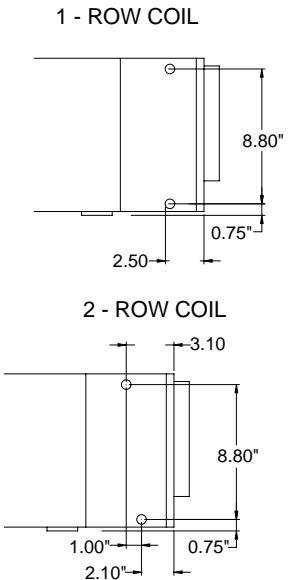
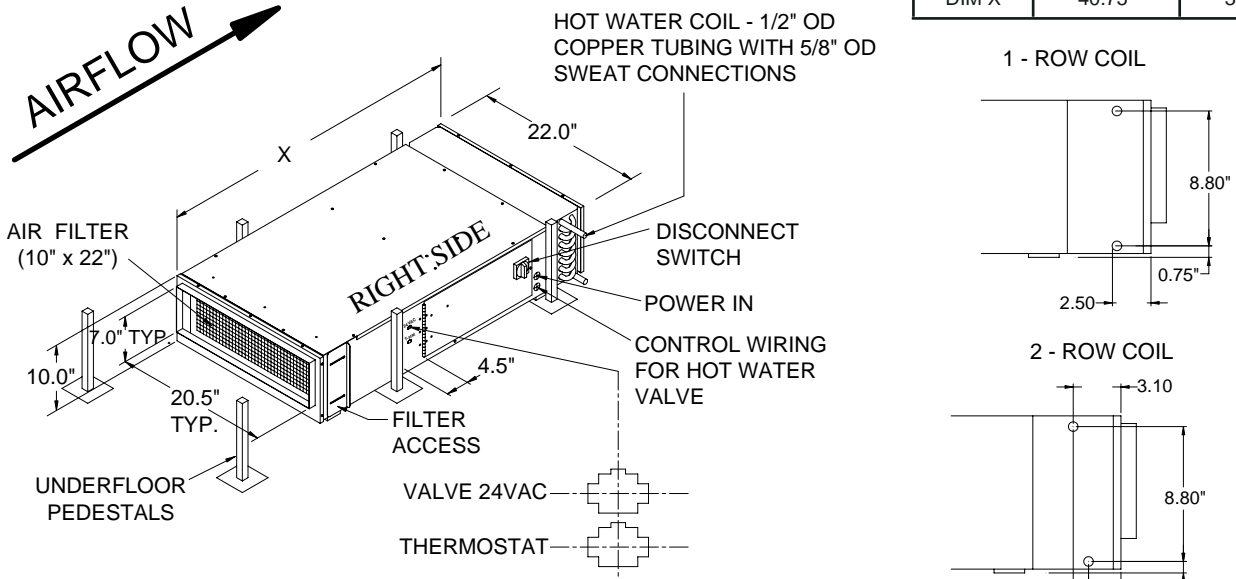


FIG. 14 - FAN-POWERED TERMINAL W/HW HEAT (UFW-3 SHOWN)

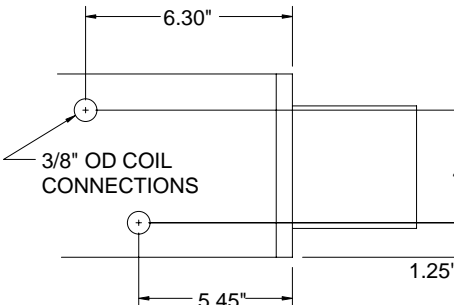
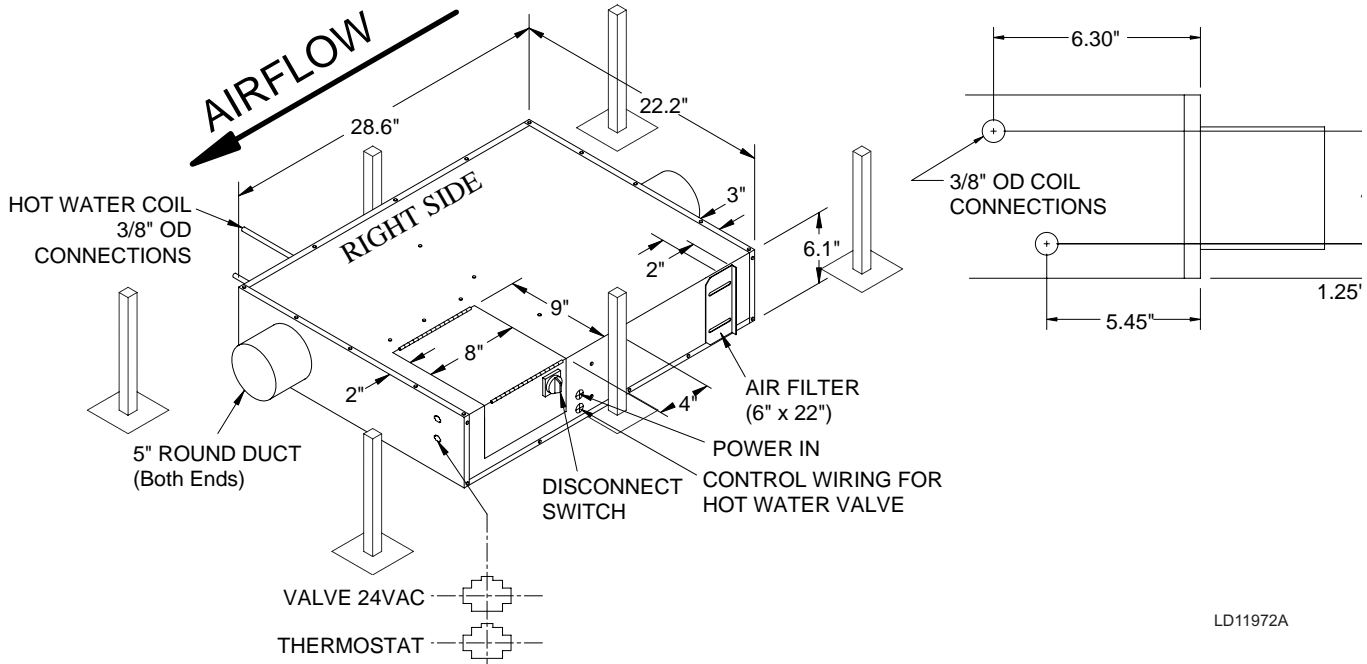


FIG. 15 - FAN-POWERED TERMINAL W/HW HEAT (UFW-1 SHOWN)

UFE/UFW - Underfloor heating terminals

The UFE and UFW models are underfloor heating terminals that operate to bring heat to perimeter zones from the interior MIT boxes (see Fig's. 14 - 17). They are located under the floor and connected to MIT terminals via ductwork (by others).

The UFE is the heat source, containing a pre-filter, supply fan and electric heat option. First stage heat is fan only, 2nd stage is fan and electric heat. The UFW contains the pre-filter, fan and hot water coil, either 1- or 2-row, as the heat option (piped by others). See Fig's. 14 - 17 for construction details.

INSTALLATION

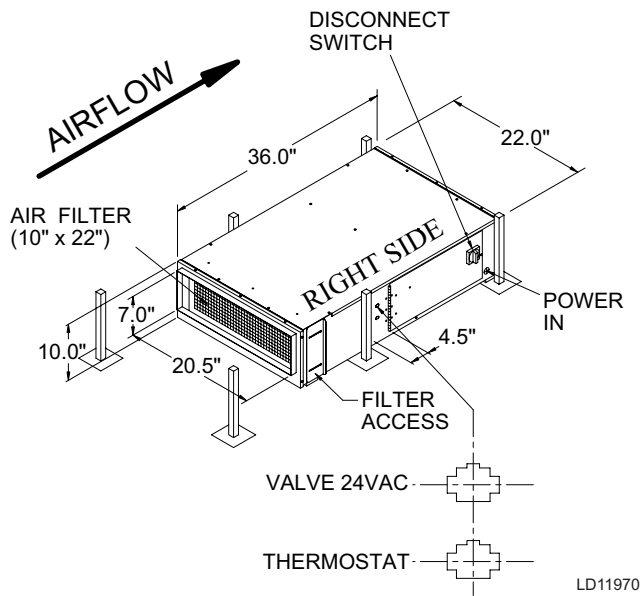


FIG. 16 - FAN-POWERED TERMINAL W/EH (UFE-3 SHOWN)

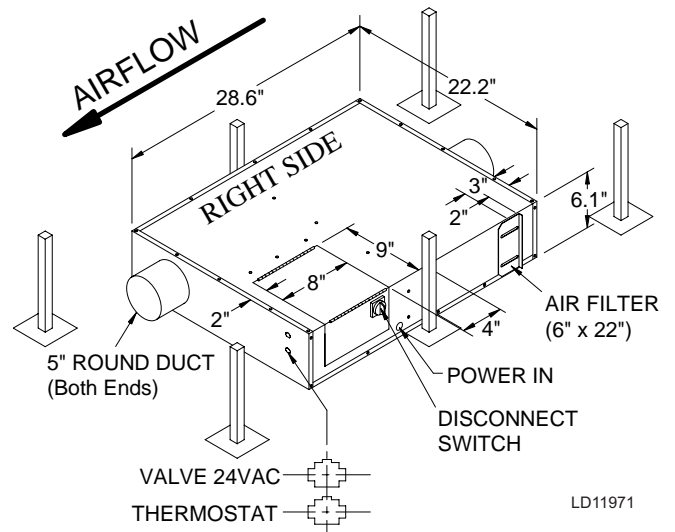


FIG. 17 - FAN-POWERED TERMINAL W/EH (UFE-1 SHOWN)

- Power is supplied to the unit thru a KO in the side and is wired to the disconnect switch.
- The thermostat connection is thru a 4-pin connector that mates with a PAP cable; the 24 VAC connection is for PAP cable to supply power to MIT terminals and TCD sensors.

- Control wiring for UFW terminals with hot water valves (by others) are connected thru a KO in the side close to the power entry; either open/spring return close or modulating valve control is wired to a terminal block in the control box (*see Fig.18 for wiring details*).

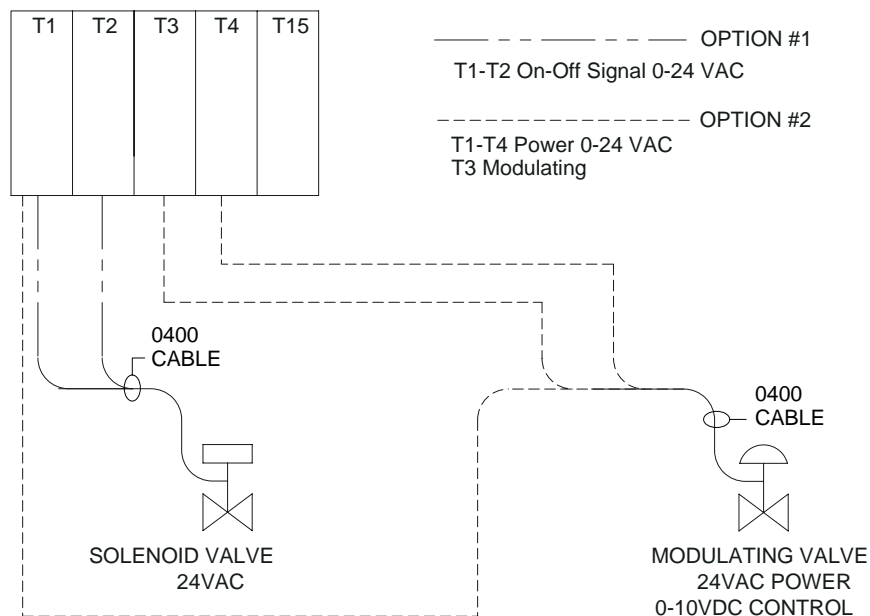


FIG. 18 - HW VALVE CONTROL WIRING

LD11979

INSTALLATION

The UFE/UFW terminals should be located under the floor in a convenient location between the supply and return MIT boxes. Provide access to the UFE/UFW boxes thru an accessible floor panel to change out the filter.

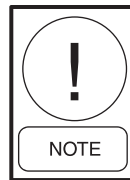
The terminal is connected both supply and return, to MIT2-G boxes, which have 5" round duct connections. Flexible 5" duct is recommended to make these connections. The UFE/UFW-1 has 5" round duct connections. The UFE/UFW-2, and -3 terminals have rectangular, flanged inlet and outlet. *See Fig 14 - 17 for duct connection details.*

UNIT MODEL SIZE	COIL SIZE HT X W	# ROWS	# CIRC	COIL FINS	AIRFLOW CFM
UFW-1	4" X 8"	2 ROWS	1 CIRC	6 FPI	150 CFM
UFW-2	10" X 22"	1 ROW	1 CIRC	6 FPI	300 CFM
UFW-2	10" X 22"	2 ROWS	2 CIRC	10 FPI	300 CFM
UFW-3	10" X 22"	1 ROW	1 CIRC	10 FPI	600 CFM
UFW-3	10" X 22"	2 ROW	2 CIRC	10 FPI	600 CFM

- All UFW-1 coils are 3/8" OD copper tubing with 3/8" connections.
- UFW-2 and UFW-3 coils are 1/2" OD copper tubing with 5/8" OD connections.
- UFW-1 coil connections are right hand; UFW-2, -3 are either right or left hand from the factory.



Minimum airflow through these terminals should be no less than airflow based on a maximum temperature rise of 50°F through the terminal. Airflow below this limit will result in reduced life of the heaters and nuisance tripping of the heater limit switches. It is recommended that the ductwork connected to the terminal be sized to provide the nominal airflow.



1st stage heat is always fan only; additional heat is single stage for hot water coil, one or two additional stages of electric heat (see Tables 3 & 3A).

UNIT MODEL	KW AVAIL	# STAGES HEAT	VOLTAGE
UFE-1	1.5 KW	1-STAGE HEAT	120/208-1-60, 208-3-60, 277-1-60
UFE-2	1.5 KW	1-STAGE HEAT	120/208-1-60, 208-3-60, 277-1-60
	3.0 KW	2-STAGE HEAT	120/208-1-60, 208-3-60, 277-1-60
UFE-3	4.5 KW	2-STAGE HEAT	120/208-1-60, 208-3-60, 277-1-60, 480-3-60
	4.5 KW	2-STAGE HEAT	208-1-60, 208-3-60, 277-1-60, 480-3-60
	6 KW	2-STAGE HEAT	277-1-60
	9 KW	2-STAGE HEAT	277-1-60, 208-3-60, 480-3-60

UNIT MODEL	KW AVAIL	# STAGES HEAT	VOLTAGE
UFE-1	1.13 KW	1-STAGE HEAT	240-1-50
UFE-2	1.13 KW	1-STAGE HEAT	240-1-50
	3.13 KW	2-STAGE HEAT	240-1-50
	4.5 KW	2-STAGE HEAT	240-1-50
UFE-3	4.5 KW	2-STAGE HEAT	240-1-50
	6 KW	2-STAGE HEAT	240-1-50
	8.5 KW	2-STAGE HEAT	240-1-50

INSTALLATION

HCE/HCW - Underfloor heating terminals



Minimum airflow through these terminals should be no less than airflow based on a maximum temperature rise of 50°F through the terminal. Airflow below this limit will result in reduced life of the heaters and nuisance tripping of the heater limit switches. It is recommended that the ductwork connected to the terminal be sized to provide the nominal airflow.

The HCE and HCW models are underfloor heating options that operate to bring heat to perimeter zones from the interior MIT boxes. These terminals are designed to be set in the floor and attached to floor panels, with two blank panels between the inlet and outlet panels.

The HCE consists of the interior MIT terminal, a pre-filter, supply fan and electric heat option and a perimeter MIT terminal. First stage heat is fan only; second stage is fan and electric heat.

The HCW consists of the interior MIT terminal, a pre-filter, fan and 2-row hot water coil as the heat option (piped by others) and a MIT perimeter terminal.

Power is supplied to the unit thru a KO in the side, below the disconnect. The thermostat connection is thru a 4-pin connector that mates with a PAP cable. The 24v connector is for PAP cable to supply power to MIT terminals and TCD sensors (all wiring is located on the left side).

The HCE/HCW boxes should be located under the floor in a:

- Convenient location between the inlet and outlet floor panels.
- and
- Convenient access thru the panel closest to the MIT interior terminal end to change out the filter.

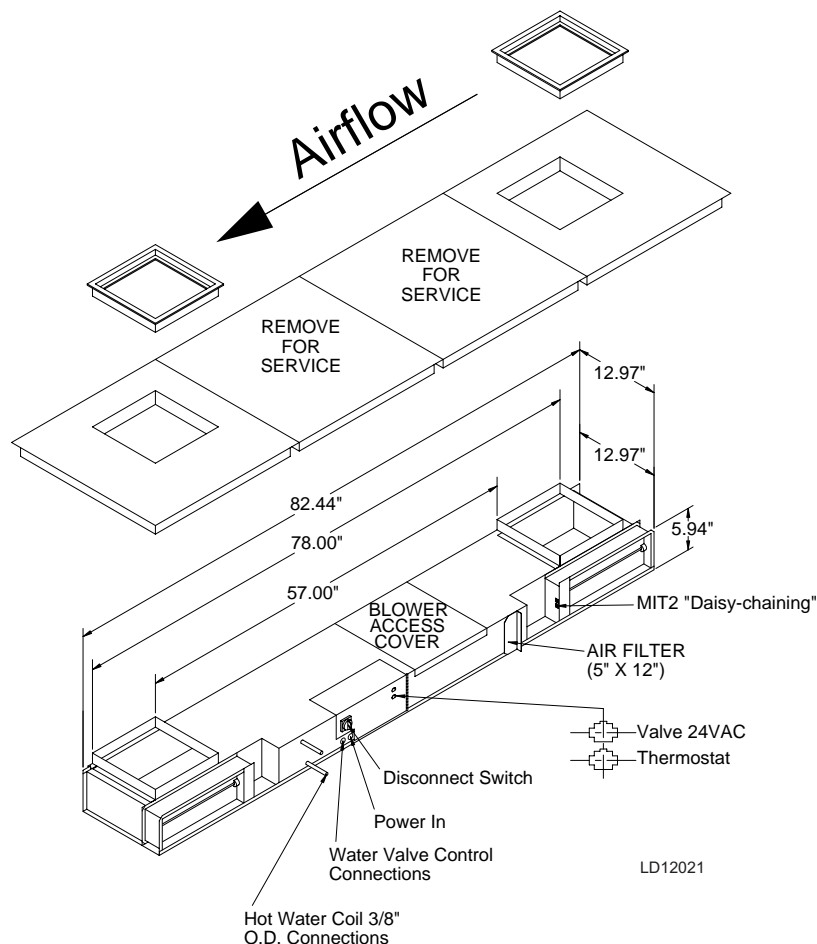


FIG. 19 - HCW-1

INSTALLATION

Positioning the assembly so that the floor openings line up with the flanges of both the terminal openings is critical for proper fit-up between the assembly and the floor panel openings. The inside to inside dimension of the assembly flanges is 57"; the two blank panels measure 48", leaving 9". Therefore, the panels with openings have them spaced 4-1/2" from the inside edges (see Fig 2).

See Figs 19 and 20 for overall panel layout required to fit-up to the HCE/HCW terminal.

UNIT MODEL SIZE	COIL SIZE HT X W	# ROWS	# CIRC	COIL FINS	AIRFLOW
HCW-1	4" X 8"	2	1	6 FPI	150 CFM

The HCW is provided with left hand access for control box, power and control voltage, as well as the PAP cable connection to the air valves and 2-row hot water coil.

Hot water coils are 3/8" OD copper tubing w/ 3/8" connectons.

UNIT MODEL	KW AVAIL	# STAGES HEAT	VOLTAGE
HCE-1	1.5	1	120/208-1-60, 208-3-60, 277-1-60
HCE-1	1.13	1	240-3-50

The HCE-1 is provided with left hand access for control box, power and control voltage, as well as the PAP cable connection to the air valves.

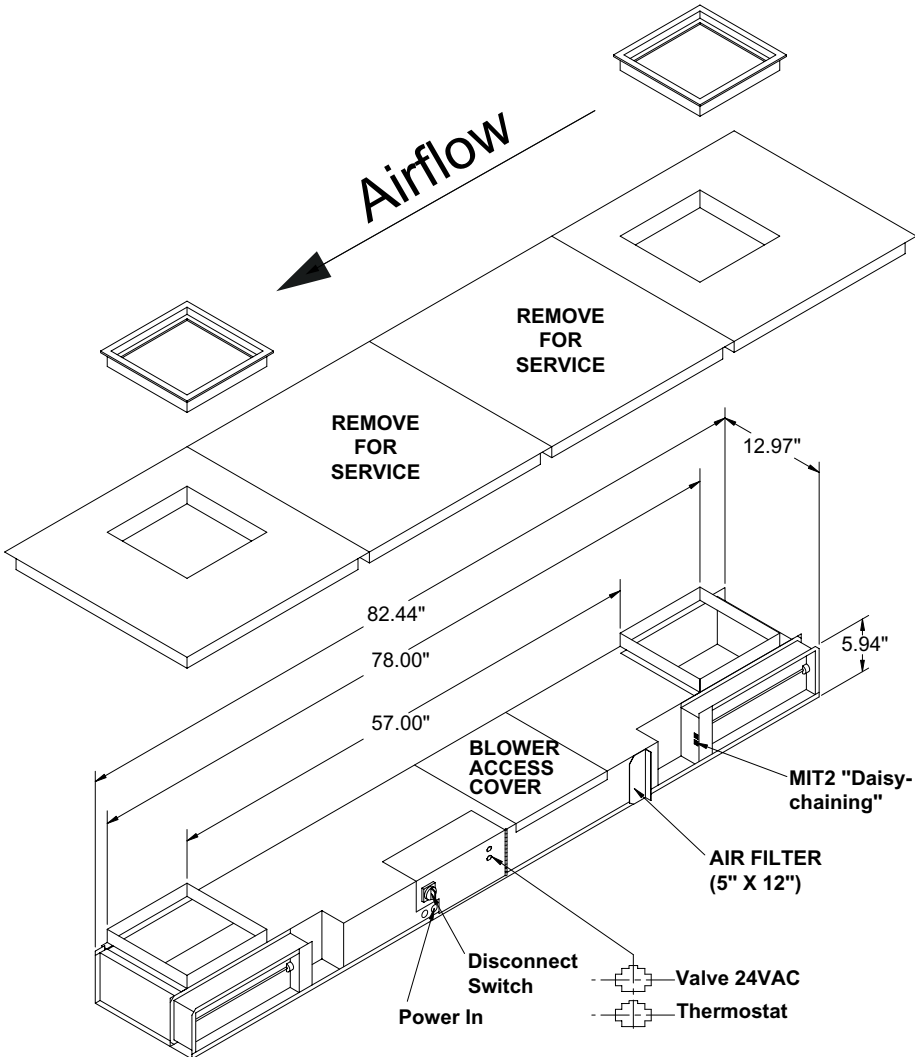


FIG. 20 - HCE-1

LD12022

INSTALLATION

TCD – Thermostat Control

The TCD-S is a stand-alone, cooling only thermostat, no communication.

The TCD-C is a heat/cool thermostat with communication ability and is provided with both a PAP-7 and PAP-4 cable.

See Fig 23 - 27 for connection details.

For cooling only applications, the TCD-S is the preferred control.

Connections @ TCD-S:

- Connect a PAP-1 cable to the back of the TCD 4-pin connector labelled J2.
- Connect the other end of the PAP-1 cable to the MIT box connection.

For cooling/heating applications, the TCD-C is preferred.

Connections @ TCD-C:

- Connect a PAP-7 cable to the back of the TCD mounting plate, using the 2/4-pin connector end.
- Connect the 4-pin connector in the white jacket to point marked J1, with the 4-pin connector in the blue jacket to other marked J2.

Connections @ other end of PAP-7:

- Female connector, blue jacket, goes to a PAP-1 cable from the MIT terminal.
- Female connector, orange jacket, goes to a PAP-6 cable from a fan terminal, such as a UFE.
- Female connector, white jacket, goes to a PAP-4 cable from an IBOX (if available).



TCD-C & TCD-S FRONT VIEW

ON --- OFF

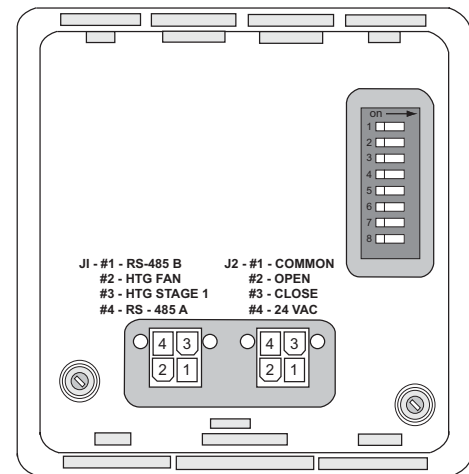
#1	0 = NETWORKED 1 = NO NETWORK
#2	6TH BIT OF ADDRESS (MSB) or 0 = C DEGREES 1 = F DEGREES
#3	5TH BIT OF ADDRESS or 0 = FLOATING POINT 1 = PULSE MODULATION
#4	INTEGRAL SPEED (4 & 5) 00 = NORMAL 01 = SLOWER 10 = SLOWEST 11 = FASTER
#6	0 = SMALL DEADBAND 1 = LARGE DEADBAND
#7	0 = NORMAL DISPLAY 1 = BLANK DISPLAY
#8	0 = KEYPAD NORMAL 1 = LOCKOUT KEYPAD

"0" --- "1" DIP SWITCH

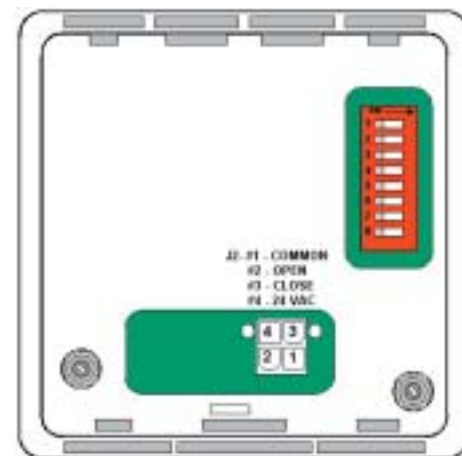


When network is not used (#switch set to = 1), the switch meaning changes to the alternative settings as shown.

FIG. 21 - TCD-C & TCD-S



TCD-C BACK VIEW



TCD-S BACK VIEW

INSTALLATION

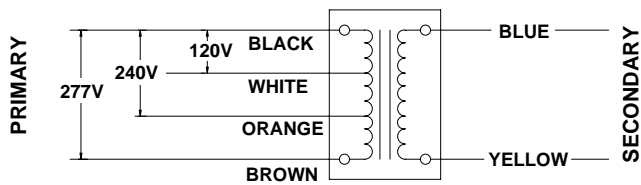
PM – Power Module

This is the 24v power source for the MIT terminals – up to 13 MIT terminals and 1 TCD thermostat.

- It can be located under the floor at any convenient location, but should be accessible thru a convenient floor panel, since the transformer has a 3-amp, manual reset circuit breaker on the load side.
- It has a 90va transformer with connections for either 120/24, 240/24 or 277/24 configuration – connect power as follows:
 - 120v power – white and black leads
 - 208/240 power – orange and black leads
 - 277v power – brown and black leads.
- It is mounted on a 4 x 4 conduit box with KO's for power connection in the box. The 24 volt PAP cable connection is pre-wired with a female cable connection for a PAP-5 cable (provided). *See Wiring Detail below.*

IBOX – Network Communication with BAS

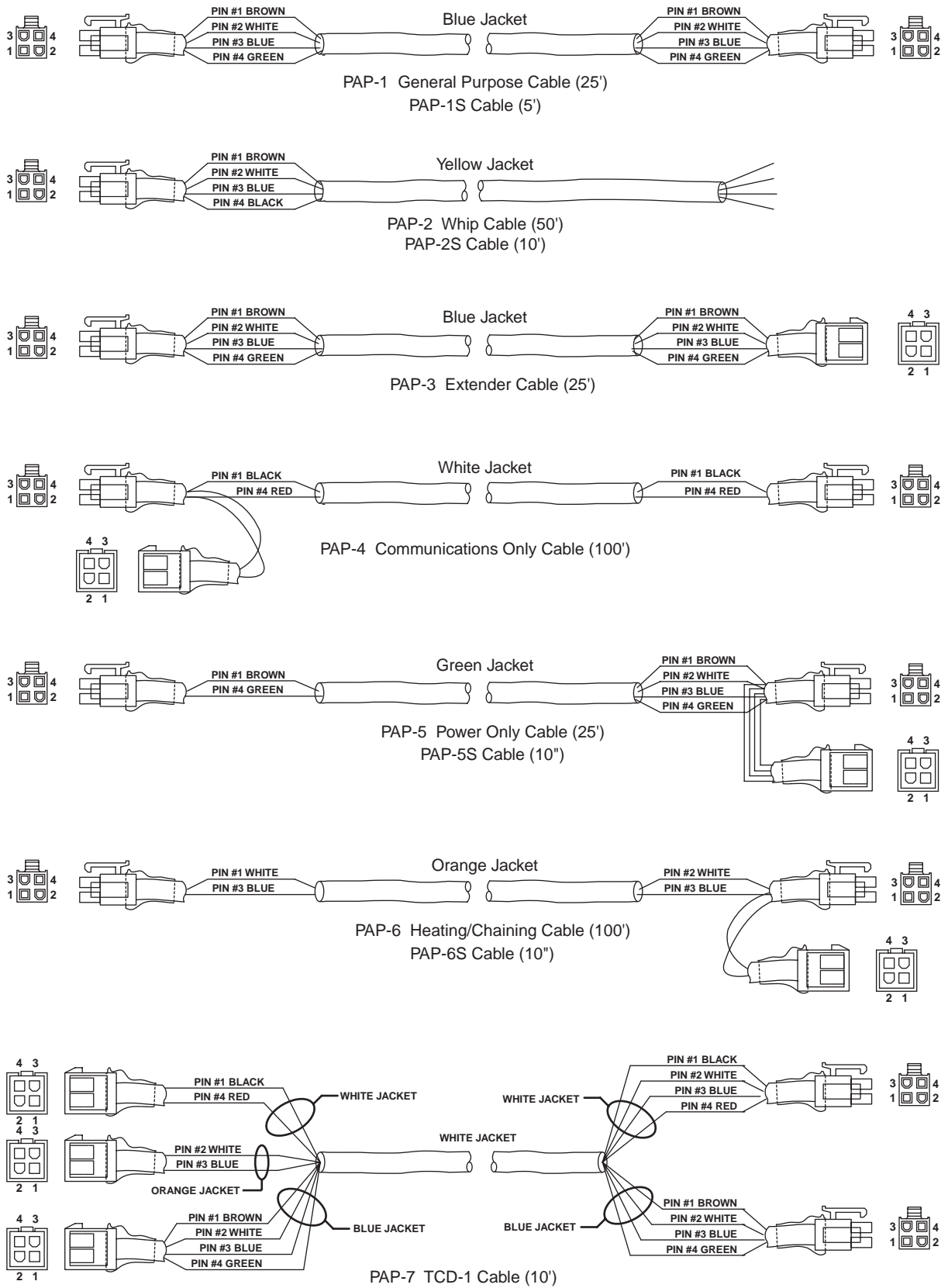
This is the device to communicate between all TCD's and the building automation system. It communicates thru BACnet/IP (ethernet) or BACnet MS/TP (RS485) or LONworks.



LD12205

POWER MODULE WIRING

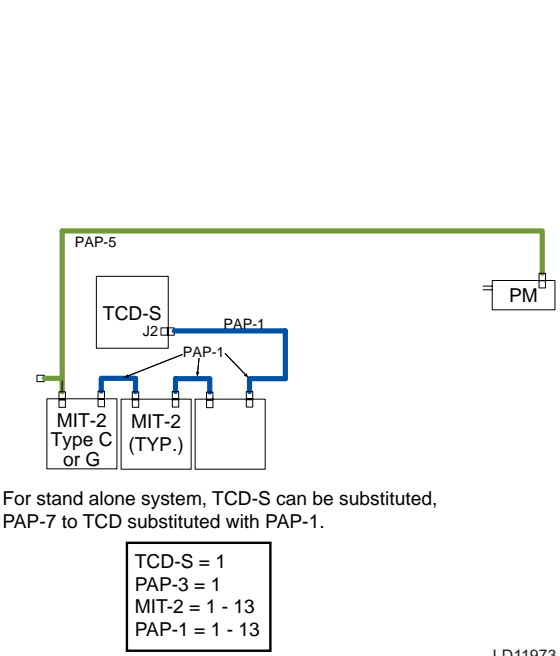
INSTALLATION



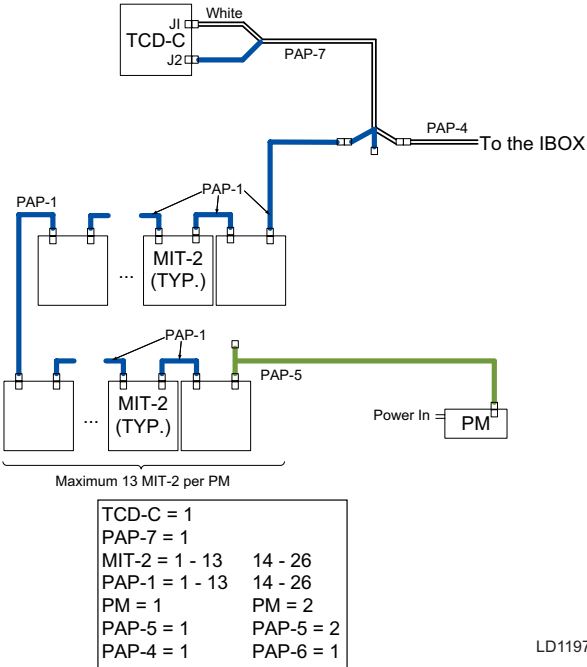
LD11492B

FIG. 22 - MODULAR CABLES

INSTALLATION



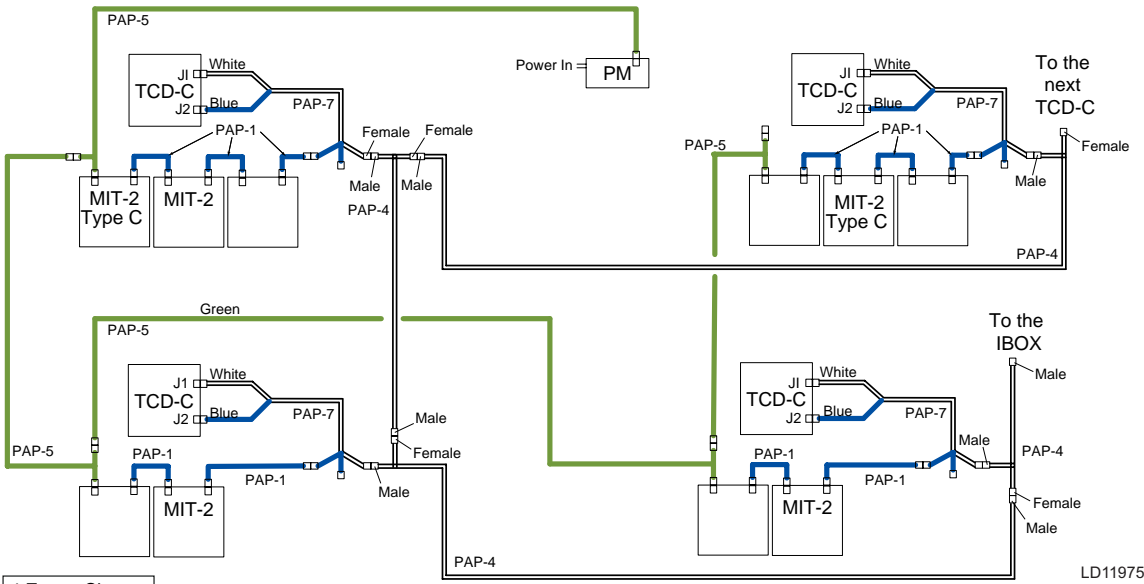
LD11973



LD11974

FIG. 23 - STAND ALONE SINGLE ZONE, COOLING ONLY

FIG. 24 - SINGLE ZONE COOLING ONLY, W/BAS.



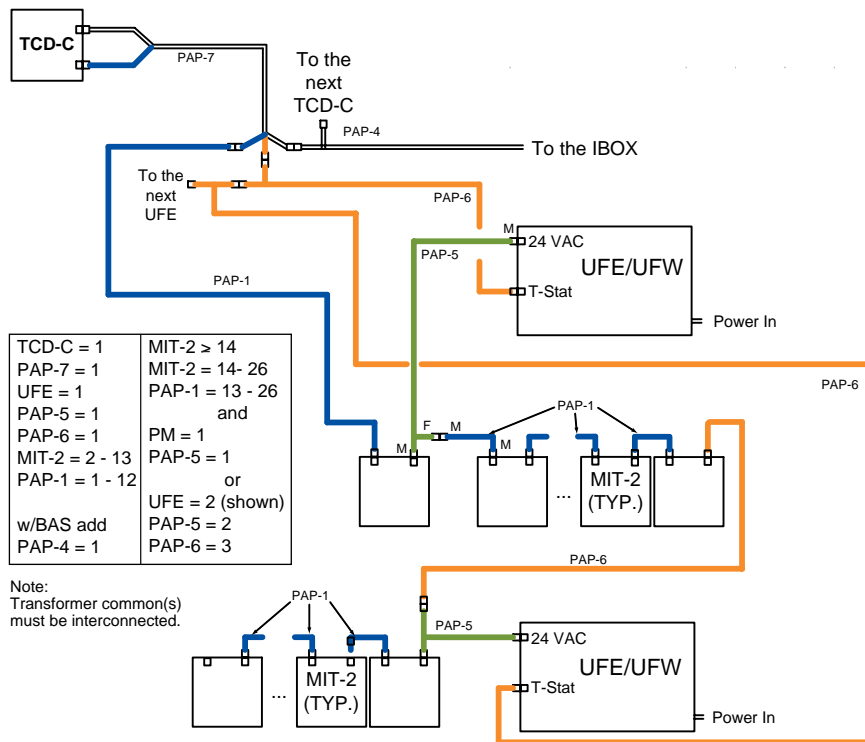
LD11975

4 Zones Shown
TCD-C = 4
PAP-7 = 4
PAP-5 = 4
MIT-2 = 4 - 10
PAP-1 = 4 - 10
w/BAS
PAP-4 = 4

- To add a new Zone, you will need a TCD-C, a PAP-7 & PAP-4 cable. Connect as follows:
- PAP-4 (male) to existing, open PAP-4 (female) (Note that a PAP-3 cable will extend a PAP-4 cable, if necessary); Other end of PAP-4 (male) to PAP-7 (female, white jacket).
 - PAP-7 (males) to TCD-C (white jacket to J1, blue jacket to J2); other end of PAP-7 (female, blue jacket) to PAP-1 (from new MIT terminal(s)).
- To add a PM to a zone (when total # of MIT's + TCD > 14), you will need a PM-1, PAP-6 and a PAP-5 cable. Connect as follows:
- PAP-5 (male) to the PM-1; other end PAP-5 (male) to MIT terminal (note that a PAP-3 cable will extend a PAP-5 cable, if necessary). Be sure that the commons of the PM's are interconnected.
- NOTE: when adding a new PM-1, be sure it is not interconnected to more than 14 MIT's + TCD's, otherwise you will overload the PM.

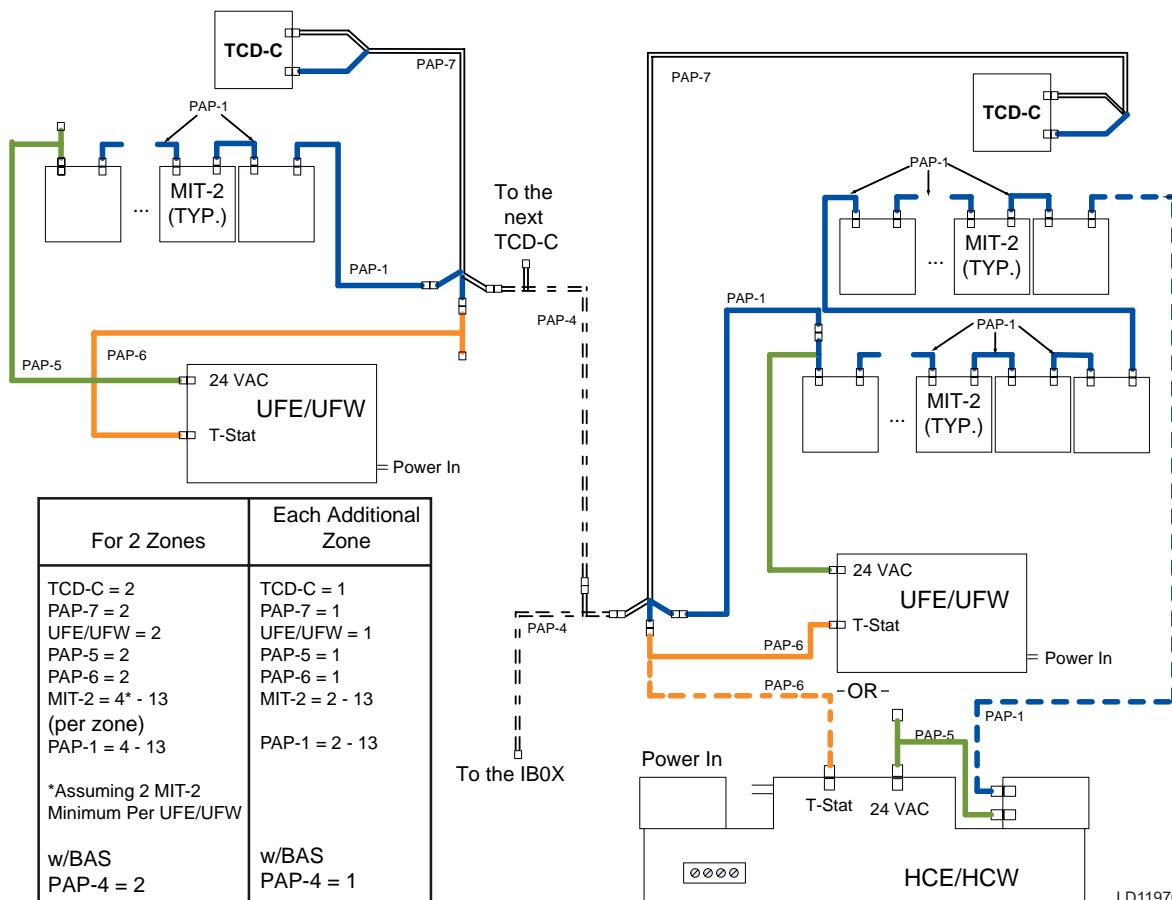
FIG. 25 - MULTI - ZONES, COOLING ONLY, W/BAS

INSTALLATION



LD11977

FIG. 26 - SINGLE ZONE, COOLING/HEATING, STAND ALONE OR W/BAS



LD11976

FIG. 27 - MULTIPLE ZONES, COOLING/HEATING, STAND ALONE OR W/BAS

OPERATION

The system operates off cooling/heating demands from the TCD thermostat.

COOLING OPERATION

The air handler/chiller, (or rooftop unit) will start and the damper in the floor will open (or the air handler fan VFD will start) to pressurize the floor to 0.05". The MIT boxes will be commanded to open in the duty cycle based on the space temp. deviation from the setpoint; the further the temp. is from setpoint, the higher the duty cycle.

The MIT2-C air valve will cycle based on the cooling operation demand; the MIT2-G air valve will cycle the duration of the cooling operation, as the airstream is from the underfloor and the heating terminal connected to it is inactive.

The duty cycle is the cycling rate the air valve opens and closes; for example, the air valve will open for 54 seconds, close for 6 seconds, or a duty cycle of 90% ($54 \text{ sec}/(54 \text{ sec}+6 \text{ sec}) = .90$). Therefore, the air valve will be opening and closing virtually all of the time, but the lower the cycle rate, the less time the valve is open, responding to the lower cooling demand.

However, the MIT will never be in a "100%" duty cycle, but will be open at 98% duty cycle at the highest demand. At the highest duty cycle, the close time is restricted to a minimum of 6 seconds. At the lowest duty cycle, (2%) the minimum open time is similarly restricted to 6 seconds. In no case is the duty cycle time longer than 300 seconds. Open time for duty cycle below 50% will be 6 seconds; air valve close time, when duty cycle is above 50%, will also be 6 seconds.

1. To verify that the TCD and associated devices and cables are connected correctly, it has a "Test Mode" that can be activated by using the up-down arrows on the front of the TCD (*see Fig. 21*).
2. To enter the installer test mode:
 - Adjust setpoint display to read minimum value (default is 45° F).
 - While the display is showing the minimum setpoint, press and hold down the down arrow button.

- While holding down the down arrow button, press the up arrow button.
- Release both buttons.

3. The device is now in Test Mode:

- The display will count from 0 to 99 continually (each digit equals ½ second).
- Every 16 seconds an open or close air valve pulse will be sent.
- Every 32 seconds the heating outputs will change from stage 1, to stage 2, to stage 3, back to off and then repeat.

4. To exit the Test Mode press both the up and down buttons at the same time, and then release both buttons.

HEATING OPERATION

The TCD-C is a heating/cooling thermostat that can control the UFE/UFW underfloor heating terminals.

The fan will be initiated when there is a demand; the TCD will respond to further demand by initiating the 1st stage of heat, be it 1st stage of electric or open/closing a control valve (provided by others) for terminals with hot water coil heat.

The MIT2-G air valve will remain at minimum duty cycle for the duration of the heating operation, as the airflow is now thru the duct connection from the UFE/UFW. The MIT2-G terminals, one acting as a warm air return to the UFE/UFW and the other, located close to the perimeter of the zone, will act as the warm air supply from the UFE/UFW.

The TCD's will always respond to a network command for cooling or heating, including morning warm up and unoccupied time periods.

MAINTENANCE

CLEANING MIT2 TERMINALS

- Clean the top of the grilles with a vacuum cleaner when you vacuum the floor. If there is dirt inside the unit, remove the grilles and vacuum out the chassis.
- If you want to hold grilles more securely in place, a short bead of silicone caulk can be placed on the underside edge of the grille in each corner. Be careful to use as little as possible so the grille can be removed later if required.

REMOVAL OF MIT2 TERMINALS

- Remove the grille.
- Loosen four screws in trim ring.
- Lift the MIT out from the top.



Be sure to cover opening as a safety precaution.

FILTER REMOVAL/REPLACEMENT



Clean or replace air filters regularly. Under normal conditions, the room air filter requires cleaning every six to eight weeks.

If heating terminals have been run during construction/renovation, filters are dirty and need to be replaced before commissioning.

To remove/replace filters:

- Remove the floor panel above the heating terminal.
- Filter is located on the entering air end of the unit.
- Remove the screws holding the filter blockoff plate and slide off the terminal.
- Filter is side access and is secured in a track – slide it out of the side of the terminal.
- Install a new filter by sliding in track and replacing the cover.

REMOVAL/REPLACEMENT OF FAN MOTOR

To replace the fan, motor and transformer:

- Access to the fan, motor and 24v transformer is by removing the top cover on the terminal.
- The fan motor is part of the fan housing assembly; the fan housing will have to be removed to replace the motor. In this case, it may be easiest to pull the terminal from the underfloor, remove the covers and unbolt the housing from the cabinet.
- Once the top panel is removed, the transformer is readily available.

ELECTRIC HEAT ELEMENTS

To replace the electric heat elements:

- Access is thru the same top panel as noted above for the fan motor.



As these are sheathed elements, they will not glow when on and can be very hot to the touch, even after the power is removed. Be sure the power is off for at least 30 minutes before touching the elements.

START-UP CHECKLIST

INSTALL CHECKLIST

<input type="checkbox"/> Equipment received as ordered.
<input type="checkbox"/> Unit checked for damage interior and exterior.
<input type="checkbox"/> Make sure all ductwork and heating terminals are complete and available for full air flow.
<input type="checkbox"/> Unit installed with proper clearances.
<input type="checkbox"/> Check that coil(s), valves and piping have been leak checked and insulated as required.
<input type="checkbox"/> Check that all floor panels are secure.
<input type="checkbox"/> Ensure that all air has been vented from the system (for hot water heating systems).
<input type="checkbox"/> Repair any solder joint leaks and gently tighten any leaking valve packing nuts and piping accessories as required.
<input type="checkbox"/> Check whether the floor is sealed against the perimeter walls.
<input type="checkbox"/> Verify correct MIT boxes are located in the required positions.
<input type="checkbox"/> Check that carpet butts up against the trim ring or under the trim ring, and extends to the edge of the box.
<input type="checkbox"/> Verify MIT boxes are secured to floor.
<input type="checkbox"/> Check that UFE/UFW ductwork is secured to the flanges of the UFE/UFW and the MIT2-G terminals.

CLEANING CHECKLIST

<input type="checkbox"/> Installer has cleaned out interior.
<input type="checkbox"/> Ensure air filters are clean, installed properly and secured. Use the directional arrows or other information on the filter to determine the proper flow direction.

CONTROLS CHECKLIST

<input type="checkbox"/> Ensure that the unit is properly grounded.
<input type="checkbox"/> Verify controls installation complete.
<input type="checkbox"/> Review electrical print for correct wiring.
<input type="checkbox"/> Verify wiring penetrations have been sealed from the underfloor.

WIRING CHECKLIST

<input type="checkbox"/> Check that supply voltage matches nameplate data.
<input type="checkbox"/> Check all electrical connections for tightness.

